Invitation for Bid
Volume 2

Old Forge Dam and Sixth Lake Dam Rehabilitation

Contract No. D012025

State of New York
Hudson River – Black River Regulating District
Albany, New York

June 2025

Invitation for Bid

Table of Contents

VOLUME 1

SECTION 1

Notice to Bidders AD-1

SECTION 2

Information for Bidders **Section**

Project Location	I-1
Site Access	I-2
Description of Work	I-3
Mandatory Pre-Bid Site Meeting	I-4
Weather Delay	I-5
Schedule and Timing	I-6
Bidder Qualifications and Experience	I-7
Preliminary Schedule and Adequate Work Force and Project Equipment	I-8
Subcontractors	I-9
Trade Subcontractors	I-10
Clarifications, Interpretations and Addenda	I-11
Estimated Quantities	I-12
Errors and Omissions	I-13
Bidder's Cost	I-14
Bid Security – Bid Bond	I-15
Rejection of Bid	I-16
Cancellation	I-17
Bid Disposition	I-18
Condition of Work	I-19
Water	I-20
Surface and Subsurface Conditions and Investigations	I-21
Obligation of Bidder	I-22
Authorized Contract Documents	I-23
Bid Instructions	I-24
Receipt and Opening of Bids	I-25
Discrepancy in Bids	I-26
Low Bidder	I-27
Successful Bidder / Conditional Award of Contract	I-28
Contract	I-29
Commencement of Work	I-30
Security for Faithful Performance – Performance Bond/Payment Bond	I-31
Statement of Surety Company	I-32
Liquidated Damages for Failure to Enter into Contract	I-33
Power of Attorney	I-34
Indemnification	I-35
Insurance	I-36
Notice of Special Conditions	I-37
Laws and Regulations	I-38
Environmental Conditions	I-39
Site/Facility Security	I-40
Sales and Compensating Use Tax Exemption for Materials Sold to Board	I-41
Sales and Compensating Use Tax for Materials Purchased for Resale	I-42
Required Certificates	I-43
Non-Collusive Bidding Certification	I-44
Resolution Accompanying Bid	I-45
NYS Department of Taxation and Finance Contractor Certification	I-46
NYS Finance Law and Vendor Responsibility	I-47
Standard Requirements for New York State Contracts	I-48
MWBE / EEO Requirements	I-49

Invitation for Bid

Table of Contents

Sexual Harassment Prevention Certification Requirements	I-50
Owner Exempt from Taxes	I-51
Certification of Compliance with 6 NYCRR Part 248	I-52
Permits	I-53
Not Part of Contract	I-54

SECTION 3

Bid Documents and Forms **Page**

Bid Proposal	B-1
Bid Sheets (B2.1 – B2.5)	B-2
Bid Delivery Page	B-3
Bidder Qualifications and Experience	B-4
Non-Collusive Bidding Certification	B-5
Resolution Accompanying Bid	B-7
Contractor Preliminary Schedule Affirmation	B-9
Preliminary Schedule of Work	B-10
Subcontractor Preliminary Schedule Affirmation	B-11
Estimated Project Labor/Work Force	B-12
Estimated Project Equipment	B-13
Bid Security	B-14
Statement of Surety's Intent	B-15
EEO/MWBE/SDVOB Requirements and Procedures for Bidders and Contractors	B-16
Sexual Harassment Prevention Certification Pursuant to State Finance Law 139-L	B-17
Vendor Responsibility Questionnaire	B-18
Offerer's Affirmation of Understanding of, and Agreement Pursuant to State Finance Law Section 139-J	B-19
Offerer's Certification of Compliance with State Finance Law Section 139-K	B-20
Offerer Disclosure of Prior Non-Responsibility Determination	B-21
Certification of Compliance with 6 NYCRR Part 248	B-22

SECTION 4

Agreement - Sample **Page**

Agreement Articles	A-1
Certificate of Acknowledgement - Contractor (Corporation)	A-6
Certificate of Acknowledgement - Contractor (Partnership)	A-7
Certificate of Acknowledgement - Contractor (Individual)	A-8
Waiver of Immunity Clause	A-9
Non-Discrimination Clause	A-10
Appendix A - Standard Clauses for All New York State Contracts	A-11
Schedule A – Bid Documents and Forms	A-12
New York State Labor Law Requirements Article 8 & Article 9 (NYS Wage Rates)	A-13
Contractor Certification ST-220	A-14
Insurance Certificates	A-15
Performance Bond	A-16
Payment Bond	A-17
Request for Tax Payer Identification Number	A-18

SECTION 5

General Conditions GC-1 – CG-51

Invitation for Bid

Table of Contents

VOLUME 2

SECTION 6

Material and Performance Specifications

See Section 6 for Material and Performance Specifications Table of Content

SECTION 7

Construction Drawings

See Section 7, Drawing G-01 for Construction Drawing Index to Drawings

Invitation for Bid

Table of Contents

VOLUME 3

SECTION 8

Permits and Plans

Department of Environmental Conservation Permit
US Army Corps of Engineers Nationwide Permit No. 3
Stormwater Pollution and Prevention Plan (SWPPP)
APA “no permit required”
PRHP “no impact”

SECTION 9

Payment Items

Payment Item No.	Title	Old Forge Dam	Sixth Lake Dam	Page No.
PI-1	Mobilization and Demobilization	X	X	PI-3
PI-2	Underground Utility Locator Service	X	X	PI-6
PI-3	Temporary Facilities and Controls	X	X	PI-8
PI-4	Erosion and Sediment Control	X	N / A	PI-11
PI-5	Survey	X	N / A	PI-14
PI-6	Demolition – Existing Gatehouse	X	N / A	PI-17
PI-7	Demolition – Existing Concrete	X	N / A	P-19
PI-8	Concrete Cutting	X	N / A	PI-21
PI-9	Soil and Sediment Excavation	X	N / A	PI-23
PI-10	Bedrock Removal	X	N / A	PI-25
PI-11	Offsite Disposal	X	N / A	PI-27
PI-12	Post Tension Anchors	X	N / A	PI-30
PI-13	Grout Rock Surface	X	N / A	PI-33
PI-14	Cofferdams	X	N / A	PI-35
PI-15	Concrete – Spillway Foundation	X	N / A	PI-38
PI-16	Concrete – Slabs and Aprons	X	N / A	PI-41
PI-17	Concrete - Walls	X	N / A	PI-44
PI-18	Dewatering	X	N / A	PI-47
PI-19	Structural Backfill	X	N / A	PI-49
PI-20	Wood Fence	X	N / A	PI-51
PI-21	Temporary Rip Rap Apron	X	N / A	PI-53
PI-22	Gate (House) Enclosure	X	N / A	PI-55
PI-23	Sluice Gates	X	N / A	PI-57
PI-24	Trash Racks	X	N / A	PI-59
PI-25	Log Boom	X	N / A	PI-61
PI-26	Floating Aluminum Docks	X	N / A	PI-63
PI-27	Boulder Retaining Wall	X	N / A	PI-65
PI-28	Gravel Fill Restoration	X	N / A	PI-67
PI-29	Geneal Site Restoration	X	N / A	PI-69
PI-30	Asphalt Path	X	N / A	PI-71
PI-31	Restoration of Pavement	X	X	PI-73
PI-32	Chain Link Fence	X	N / A	PI-75
PI-33	20 kW Standby Generator and Automatic Transfer Switch	X	N / A	PI-78
PI-34	Electrical	X	N / A	PI-80

Invitation for Bid

Table of Contents

PI-35	Erosion and Sediment Control	N / A	X	PI-82
PI-36	Survey	N / A	X	PI-85
PI-37	Demolition – Existing Gatehouse	N / A	X	PI-88
PI-38	Demolition – Existing Concrete	N / A	X	PI-90
PI-39	Concrete Cutting	N / A	X	PI-92
PI-40	Soil and Sediment Excavation	N / A	X	PI-94
PI-41	Bedrock Removal	N / A	X	PI-96
PI-42	Offsite Disposal	N / A	X	PI-98
PI-43	Cofferdams	N / A	X	PI-101
PI-44	Concrete – Spillway Foundation	N / A	X	PI-104
PI-45	Concrete – Slabs and Aprons	N / A	X	PI-107
PI-46	Concrete - Walls	N / A	X	PI-110
PI-47	Dewatering	N / A	X	PI-113
PI-48	Structural Backfill	N / A	X	PI-115
PI-49	No 57 Stone Seepage Filter	N / A	X	PI-117
PI-50	No 9 Sand Seepage Filter	N / A	X	PI-119
PI-51	Concrete Sand Seepage Filter	N / A	X	PI-121
PI-52	Rip Rap	N / A	X	PI-123
PI-53	Gate (House) Enclosure	N / A	X	PI-125
PI-54	Sluice Gates	N / A	X	PI-127
PI-55	Spillway Sluice Gate	N / A	X	PI-129
PI-56	Trash Racks	N / A	X	PI-131
PI-57	Log Boom	N / A	X	PI-133
PI-58	Timber Steps	N / A	X	PI-135
PI-59	General Fill	N / A	X	PI-137
PI-60	General Site Restoration	N / A	X	PI-139
PI-61	Chain Link Fence	N / A	X	PI-141
PI-62	20 kW Standby Generator and Automatic Transfer Switch	N / A	X	PI-144
PI-63	Electrical	N / A	X	PI-146

Supplemental Information – Not Part of Contract

Emergency Action Plan for the Old Forge Dam and Sixth Lake Dam

Material and Performance Specifications

Old Forge Dam and Sixth Lake Dam Rehabilitation

Contract No. D012025

State of New York
Hudson River – Black River Regulating District
Albany, New York

June 2025

Hudson River – Black River Regulating District

54 State St., Suite 501, Albany, NY 12207

OLD FORGE DAM AND SIXTH LAKE DAM - REHABILITATION
HAMLET OF OLD FORGE, HERKIMER CO., NEW YORK (NYS DAM NO. 140-2000)
TOWN OF INLET, HAMILTON CO., NEW YORK (NYS DAM NO. 140-0860)

ENGINEER: Arcadis of New York, Inc. 646 Plank Road, Suite 100, Clifton Park, NY 12065, (518) 250-7300

Michael F. Kosier, PE 077878 	The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual: • **Division 01** • **Division 02** • **Division 31** • **Division 32** • **Division 35**
Christopher J. B. Jedrich, PE 079007 	The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual: • **Division 03** • **Division 05**

John J. Domanski, PE 081623  	The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual: • **Division 26** • **Division 40**
Errol Antonio Dawkins, PE 023835  	The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual: • **Division 06** • **Division 07** • **Division 08** • **Division 09** • **Division 10**

Engineer's seal and signature does not apply to the documents that comprise Division 00, Bidding and Contracting Requirements.

It is a violation of applicable laws and regulations governing professional licensing and registration for any person, unless acting under the direction of the licensed and registered design professional(s) indicated above, to alter in any way the Specifications in this Project Manual.

TABLE OF CONTENTS

VOLUME 1 OF 1

Document or Section Number	Name or Description	Initial Page
SPECIFICATIONS		
DIVISION 01 – GENERAL REQUIREMENTS		
01 11 13	Summary of Work	01 11 13-1
01 13 13	Milestones	01 13 13-1
01 14 16	Coordination with Owner's Operations	01 14 16-1
01 14 19	Use of Site	01 14 19-1
01 25 00	Substitution Procedures	01 25 00-1
01 26 00	Contract Modification Procedures	01 26 00-1
01 29 73	Schedule of Values	01 29 73-1
01 29 76	Progress Payment Procedures	01 29 76-1
01 31 13	Project Coordination (Single Prime)	01 31 13-1
01 31 19.13	Pre-Construction Conference	01 31 19.13-1
01 31 19.23	Progress Meetings	01 31 19.23-1
01 31 26	Electronic Document Protocol	01 31 26-1
01 32 16	Progress Schedule	01 32 16-1
01 32 33	Photographic Documentation	01 32 33-1
01 33 00	Submittal Procedures	01 33 00-1
01 35 23	Safety Requirements	01 35 23-1
01 35 43.13	Environmental Procedures for Hazardous Materials	01 35 43.13-1
01 35 44	Spill Prevention Control and Countermeasures Plan	01 35 44-1
01 41 24	Permit Requirements	01 41 24-1
01 41 26	Storm Water Pollution Prevention Plan and Permit	01 41 26-1
01 41 27	Earthmoving Permit and Dust Control	01 41 27-1
01 45 29.13	Testing Laboratory Services Furnished by Contractor	01 45 29.13-1
01 51 05	Temporary Utilities	01 51 05-1
01 52 11	Engineer's Field Office	01 52 11-1
01 52 13	Contractor's Field Office and Sheds	01 52 13-1
01 52 16	First Aid Facilities	01 52 16-1
01 52 19	Sanitary Facilities	01 52 19-1
01 55 13	Access Roads and Parking Areas	01 55 13-1
01 55 26	Maintenance and Protection of Traffic	01 55 26-1
01 57 05	Temporary Controls	01 57 05-1
01 57 33	Security	01 57 33-1
01 58 00	Project Identification and Signs	01 58 00-1
01 61 00	Common Product Requirements	01 61 00-1

01 62 00 Product Options 01 62 00-1
01 65 00 Product Delivery Requirements 01 65 00-1
01 66 00 Product Storage and Handling Requirements 01 66 00-1
01 71 23 Field Engineering 01 71 23-1
01 71 33 Protection of the Work and Property 01 71 33-1
01 73 19 Installation 01 73 19-1
01 73 24 Connections to Existing Facilities 01 73 24-1
01 73 29 Cutting and Patching 01 73 29-1
01 74 05 Cleaning 01 74 05-1
01 74 19 Construction Waste Management and Disposal 01 74 19-1
01 75 11 Checkout and Startup Procedures 01 75 11-1
01 77 19 Closeout Requirements 01 77 19-1
01 78 23 Operations and Maintenance Data 01 78 23-1
01 78 36 Warranties 01 78 36-1
01 78 39 Project Record Documents 01 78 39-1

DIVISION 02 – EXISTING CONDITIONS

02 41 00 Demolition 02 41 00-1

DIVISION 03 – CONCRETE

03 01 30 Repair and Rehabilitation of Cast-in-place Concrete 03 01 30-1
03 11 00 Concrete Forming 03 11 00-1
03 15 00 Concrete Accessories 03 15 00-1
03 20 00 Concrete Reinforcing 03 20 00-1
03 30 00 Cast-in-place Concrete 03 30 00-1
60 00 Grouting 03 60 00-1

DIVISION 04 – MASONRY

(NOT USED)

DIVISION 05 – METALS

05 05 33 Anchor Systems 05 05 33-1
05 50 13 Miscellaneous Metal Fabrications 05 50 13-1
05 52 15 Aluminum Handrails and Railings 05 52 15-1
05 53 16 Aluminum Grating 05 53 16-1

Document or Section Number	Name or Description	Initial Page
DIVISION 06 – WOOD, PLASTICS AND COMPOSITES		
06 10 53	Miscellaneous Rough Carpentry	06 10 53-1
DIVISION 07 – THERMAL AND MOISTURE PROTECTION		
07 31 05	Asphalt Shingles	07 31 05-1
07 46 46	Fiber-Cement Siding	07 46 46-1
07 51 23	Glass-fiber Reinforced Asphalt Emulsion Roofing	07 51 23-1
07 62 00	Sheet metal Flashing and Trim	07 81 00-1
07 92 00	Joint Sealants	07 92 00-1
DIVISION 08 – OPENINGS		
08 11 13	Hollow Metal Doors and Frames	08 11 13-1
08 71 00	Door Hardware	08 71 00-1
DIVISION 09 – FINISHES		
09 61 53	Concrete Hardener	09 61 53-1
09 91 00	Painting	09 91 00-1
DIVISION 10 – SPECIALTIES		
10 14 00	Signage	10 14 00-1
10 44 00	Fire Protection Specialties	10 44 00-1

DIVISION 11 – EQUIPMENT (NOT USED)

DIVISION 12 – FURNISHINGS (NOT USED)

DIVISION 13 – SPECIAL CONSTRUCTION (NOT USED)

DIVISION 14 – CONVEYING EQUIPMENT (NOT USED)

DIVISION 21 – FIRE SUPPRESSION (NOT USED) (NOT USED)

DIVISION 22 – PLUMBING (NOT USED)

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (NOT USED)

DIVISION 25 – INTEGRATED AUTOMATION (NOT USED)

DIVISION 26 – ELECTRICAL

26 05 05	General Provisions for Electrical Systems	26 05 05-1
26 05 19	Low-voltage Electrical Power Conductors and Cables	26 05 19-1
26 05 26	Grounding and Bonding for Electrical Systems	26 05 26-1
26 05 29	Hangers and Supports for Electrical Systems	26 05 29-1
26 05 33.13	Rigid Conduits	26 05 33.13-1
26 05 33.16	Flexible Conduits	26 05 33.16-1
26 05 33.23	Sealing Fittings	26 05 33.23-1
26 05 33.26	Expansion/Deflection Fittings	26 05 33.26-1
26 05 33.33	Pull, Junction and Terminal Boxes	26 05 33.33-1
26 05 33.36	Outlet Boxes	26 05 33.36-1
26 05 36	Cable Trays for Electrical Systems	26 05 36-1
26 05 43.13	Underground Ductbanks for Electrical Systems	26 05 43.13-1
26 05 45	Utility Services for Electrical Systems	26 05 45-1
26 05 53	Identification for Electrical Systems	26 05 53-1
26 24 16	Panelboards	26 24 16-1
26 27 26.13	Low Voltage Receptacles	26 27 26.13-1
26 27 26.23	Snap Switches	26 27 26.23-1
26 28 16.33	Disconnect Switches	26 28 16.33-1
26 29 36	Low-voltage Manual Motor Starters	26 29 36-1
26 32 13	Engine Generators	26 32 13-1
26 36 23	Automatic Transfer Switches	26 36 23-1
26 43 00	Surge Protective Devices	26 43 00-1
26 51 19	LED Interior Lighting	26 51 19-1
26 56 19	LED Exterior Lighting	26 56 19-1

DIVISION 27 – COMMUNICATIONS (NOT USED)

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

DIVISION 31 – EARTHWORKS

31 05 19	Geosynthetics for Earthwork	31 05 19-1
31 09 13	Geotechnical Instrumentation and Monitoring	31 09 13-1
31 11 00	Clearing and Grubbing	31 11 00-1
31 23 05	Excavation and Fill	31 23 05-1
31 23 16.26	Rock Removal	31 23 16.26-1
31 37 00	Riprap	31 37 00-1
31 51 16	Rock Anchors	31 51 16-1

Document or Section Number	Name or Description	Initial Page
31 52 13	Temporary Cofferdams	31 52 13-1

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 12 00	Flexible Paving	32 12 00-1
32 31 00	Fences	32 31 00-1
32 92 00	Lawns and Meadows	32 92 00-1

DIVISION 33 – UTILITIES (NOT USED)

DIVISION 34 – TRANSPORTATION (NOT USED)

DIVISION 35 – WATERWAY AND MARINE

35 52 33	Pre-Engineered Floating Dock System	35 52 33-1
35 52 34	Dock Mooring System	35 52 34-1

DIVISION 40 – PROCESS INTEGRATION

40 05 57.23	Electric Motor Actuators	40 05 57.23-1
40 05 59.23	Stainless Steel Gate Specification	40 05 59.23-1

DIVISION 41 – MATERIAL PROCESSING AND HANDLING EQUIPMENT (NOT USED)

DIVISION 42 – PROCESS HEATING, COOLING, AND DRYING EQUIPMENT (NOT USED)

DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE EQUIPMENT (NOT USED)

DIVISION 44 – POLLUTION CONTROL EQUIPMENT (NOT USED)

DIVISION 45 – INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT (NOT USED)

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT(NOT USED)

DIVISION 48 – ELECTRICAL POWER GENERATION (NOT USED)

+ + END OF TABLE OF CONTENTS + +

REMAINDER OF PAGE LEFT INTENTIONALLY BLANK

SECTION 01 11 13

SUMMARY OF WORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. This Section includes the following Articles:

Article	Title
1.1	Section Includes
1.2	Location and Description of Work
1.3	Sequence and Progress of Work
1.4	CONTRACTOR's Use of Site
1.5	Easements and Rights-of-Way
1.6	Notices to Owners and Authorities of Properties Adjacent to the Work
1.7	Salvage of Materials and Equipment
1.8	Partial Utilization by OWNER

1.2 LOCATION AND DESCRIPTION OF WORK

A. The Work is located at the Old Forge Dam at the western end of the First Lake in the Town of Webb in Herkimer County, New York and the Sixth Lake Dam at the southern end of the Sixth Lake in the Town of Inlet, in Hamilton County, New York.

B. The Work to be performed under this Contract includes, but is not limited to, constructing the Work described below and all related appurtenances. The Work includes, but is not limited to, the following:
   1. Replacement and expansion of the Old Forge Dam spillway, construction of a new gate enclosure, installation of new gates in the gate enclosure, and construction of a new downstream apron at the Old Forge Dam. The replacement gate enclosure at the Old Forge Dam will be in the same architectural fashion as the existing gate house.
   2. Replacement and expansion of the Sixth Lake Dam spillway, construction of a new gate enclosure, installation of new gates in the gate enclosure, and construction of a new downstream apron at the Sixth Lake Dam. The replacement gate enclosure at the Sixth Lake Dam will be in the same architectural fashion as the existing gate house.

C. Contracting Method: The Project shall be constructed under one prime Contract.

D. Hazardous Environmental Conditions:

1. To the best of Owner's knowledge, information, and belief, the Old Forge Dam Site was reportedly built as a timber crib dam circa 1881 and replaced with a concrete dam circa 1905. The Old Forge Dam ogee spillway was repaired most recently in 1953. The Sixth Lake Dam Site was originally built as a timber crib and concrete structure in 1904 with several upgrades and repairs since its original construction.

1.3 SEQUENCE AND PROGRESS OF WORK

A. Requirements for sequencing and coordinating with OWNER's operations, including maintenance of facility operations during construction, and requirements for tie-ins and shutdowns, are in Section 01 14 16, Coordination with Owner's Operations.

1.4 CONTRACTOR'S USE OF SITE

A. CONTRACTOR's use of the Site shall be confined to the areas shown.

B. Move stored materials and equipment that interfere with operations of OWNER, other contractors, and others performing work for OWNER.

C. Limits on CONTRACTOR's use of the Site are:
   1. As indicated in Section 01 14 19, Use of Site.
   2. Do not use the Site for operations other than those required for the Project.

1.5 EASEMENTS AND RIGHTS-OF-WAY

A. General:
   1. Easements and rights-of-way required for the permanent improvements included in the Work will be provided by OWNER in accordance with the General Conditions and Supplementary Conditions.
   2. Confine construction operations within OWNER's property, public rights-of-way, easements obtained by OWNER, and limits shown, and property for which CONTRACTOR has made arrangements directly with property owner(s).
   3. Use care in placing construction tools, equipment, excavated materials, and materials and equipment to be incorporated into the Work to avoid damaging property and interfering with traffic.
   4. Do not enter private property outside the construction limits without permission from the owner of the property.

1.6 NOTICES TO OWNERS AND AUTHORITIES OF PROPERTIES ADJACENT TO THE WORK

A. Notify owners of adjacent property and utility owners when prosecution of the Work may affect their property, facilities, or use of property.

B. When it is necessary to temporarily obstruct access to property, or when utility service connection will be interrupted, provide notices sufficiently in advance to enable affected persons to provide for their needs. Such notifications shall comply with Laws and Regulations and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.

C. Notify utility owners and other concerned entities not less than 72 hours prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or exposed utilities.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 13 13

MILESTONES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section describes Work to be substantially completed to comply with Milestones indicated in the Agreement. This Section is not intended to describe all the Work or its constraints, interrelationships, or sequential requirements required.
   2. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals required to perform the Work in accordance with the Contract Times provisions of the Contract Documents.
   3. To achieve each Milestone indicated in this Section, substantially complete those elements of the Work indicated starting with Article 1.2 of this Section, together with related equipment, systems, and appurtenant Work and activities.
   4. Comply with the General Conditions, as may be modified by the Supplementary Conditions, regarding partial utilization and property insurance.

1.2 MILESTONE REQUIREMENTS

A. Milestone - Old Forge Dam:
   1. Mobilization.
   2. Completion of Phase I
   3. Completion of Phase II
   4. Demobilization

B. Milestone – Sixth Lake Dam :
   1. Mobilization.
   2. Completion of Phase I
   3. Completion of Phase II
   4. Demobilization

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 14 16

COORDINATION WITH OWNER'S OPERATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for coordinating with OWNER's operations during the Project, and includes requirements for tie-ins and shutdowns necessary to complete the Work without impact on OWNER's operations except as allowed in this Section.
   2. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals shown, specified, and required to coordinate with OWNER's operations during the Work in accordance with this Section.

B. Coordination:
   1. Review construction procedures under other Specifications sections and coordinate Work that will be performed with or before the Work specified in this Section.
   2. Notify other contractors in advance of Work requiring coordination with OWNER's operations, to provide other contractors sufficient time for work included in their contracts that will be performed with or before Work specified in this Section.

C. Related Sections:
   1. Section 01 11 13, Summary of Work.
   2. Section 01 51 05, Temporary Utilities.

D. Except for shutdowns specified in this Section, perform the Work such that OWNER's facilities remain in continuous satisfactory operation during the Project. Schedule and conduct the Work such that the Work does not: impede OWNER's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, cause odors or other nuisances, or affect the public health, safety, and convenience.

E. Work not specifically covered in this Section or in referenced Sections may, in general, be completed, within the Contract Times, at any time during regular working hours in accordance with the Contract Documents, subject to the requirements in this Section.

F. As a substitute to the procedures specified in this Section, CONTRACTOR may propose providing additional temporary facilities that can eliminate or mitigate a constraint without additional cost to OWNER, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect OWNER's ability to comply with Laws and Regulations, permits, and operating

requirements; that such temporary facilities do not generate or foster the generation of odors and other nuisances; and that requirements of the Contract Documents are fulfilled.

G. Coordinate shutdowns with OWNER and ENGINEER. When possible, combine multiple tie-ins into a single shutdown to reduce impacts on OWNER's operations and processes.

H. Operation of Existing Systems and Equipment during the Work:
   1. Do not shut off or disconnect existing operating systems or equipment, unless accepted by ENGINEER in writing.
   2. Operation of existing systems and equipment will be by OWNER unless otherwise specified or indicated.
   3. Where necessary for the Work, CONTRACTOR shall seal or bulkhead OWNER-operated gates and valves to prevent leakage that may affect the Work, OWNER's operations, or both.
   4. Provide temporary watertight plugs and bulkheads as required. After completing the Work, remove seals, plugs, and bulkheads to satisfaction of ENGINEER.

I. Requirements for temporary utilities are in Section 01 51 05, Temporary Utilities.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Substitute Sequence Submittal: When deviation from specified sequence or procedures is proposed, furnish submittal explaining in detail the proposed sequence or procedures and associated effects, including evidence that OWNER's operations will not be adversely affected, to an extent greater than originally contemplated in the Contract Documents, by proposed substitution. List benefits of proposed substitution, including benefits to Progress Schedule. Submit in accordance with Section 01 25 00, Substitution Procedures, and other requirements of the Contract Documents regarding substitution requests.

B. Informational Submittals: Submit the following:
   1. Shutdown Planning Submittal:
      a. For each shutdown, submit an inventory of labor, materials, and equipment required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for OWNER to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown.
      b. Furnish submittal to ENGINEER not less than 30 days prior to proposed shutdown start date. Do not start shutdown until obtaining ENGINEER's acceptance of shutdown planning submittal.
   2. Shutdown Notification: After ENGINEER's acceptance of shutdown planning submittal and prior to starting the shutdown, submit written notification to OWNER and ENGINEER of date and time each shutdown is

to start. Submit notification not less than 72 hours in advance of each shutdown.

1.3 GENERAL CONSTRAINTS

A. Indicated in the Contract Documents are the sequence and shutdown durations, where applicable, for OWNER'S equipment, systems, and conduits (including piping and ducting) that are to be taken out of service temporarily for the Work. New materials, equipment, and systems may be used by OWNER after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete in accordance with the Contract Documents.

B. The following constraints apply to coordination with OWNER's operations:
   1. Operational Access: OWNER'S personnel shall have access to equipment and areas of the facility that remain in operation.
   2. Temporary Partitions and Enclosures: Provide temporary partitions and enclosures necessary to maintain dust-free, heated, and ventilated spaces in areas of the facility that are adjacent to the Work and that must be kept operational. Comply with Section 01 51 05, Temporary Utilities.
   3. Schedule and perform equipment and system start-ups for Monday through Thursday. Equipment and systems shall not be placed into operation on Friday, Saturday, and Sunday without prior approval of OWNER, unless specifically indicated otherwise in the Contract Documents.
   4. Dead End Valves or Conduits: Provide blind flanges, watertight bulkheads, or valve at temporary and permanent terminuses of conduits, including piping and ducting. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by ENGINEER. Temporary valves shall be suitable for their associated service. Where valve is provided at permanent terminus of conduit, including piping or ducting, also provide on downstream side of valve a blind flange with drain/flushing connection.

1.4 SEQUENCE OF WORK

A. Perform the Work in the indicated sequence. Certain phases or stages of the Work may require working 24-hour days or work during hours outside of regular working hours. Work may be accelerated from a later stage to an earlier stage if OWNER's operations are not adversely affected by proposed sequence change, with ENGINEER's acceptance. Stages specified in this Article 1.4 are sequence-dependent.

B. Stage I (Old Forge Dam): Install temporary cofferdam and turbidity curtain around Phase I work area, as shown on the Drawings; construct Phase I portion of the labyrinth spillway, as shown in the Drawings, outlet structure, and downstream channel concrete. Refill the dewatered area.

C. Stage II (Old Forge Dam): Relocate temporary cofferdam and turbidity curtain around Phase II work area, as shown on the Drawings; remove existing outlet

structure and portions of the spillway, construct Phase II portion of the labyrinth spillway and downstream channel. Refill the dewatered area.

D. Stage III (Old Forge Dam): Remove temporary cofferdam, restore site, remove temporary controls.

E. Stage I (Sixth Lake Dam): Install temporary cofferdam and turbidity curtain around Phase I work area, as shown on the Drawings; excavate the south embankment; construct Phase I portion of the labyrinth spillway and associated ancillary items, as shown in the Drawings, and downstream channel concrete. Install temporary low-level gate. Refill the dewatered area.

F. Stage II (Sixth Lake Dam): Relocate temporary cofferdam and turbidity curtain around Phase II work area, as shown on the Drawings; remove existing outlet structure and portions of the spillway; construct Phase II portion of the labyrinth spillway and downstream channel, and construct new outlet structure. Refill the dewatered area.

G. Stage III (Sixth Lake Dam): Remove temporary cofferdam, restore site, remove temporary controls.

1.5 TIE-INS

A. Table 01 14 16-A in this Section lists connections by CONTRACTOR to existing facilities. Table 01 14 16-A may not include all tie-ins required for the Work; CONTRACTOR shall perform tie-ins required to complete the Work as shown or indicated regardless of whether tie-in is indicated in Table 01 14 16-A. For tie-ins not indicated in Table 01 14 16-A, obtain requirements for tie-ins from ENGINEER by requesting an interpretation or clarification.

1.6 SHUTDOWNS

A. General:
   1. Terminology: A “shutdown” is when a portion of the normal operation of OWNER’s facility, whether equipment, systems, conduit (including piping and ducting), has to be temporarily suspended or taken out of service to perform the Work.
   2. Work that may interrupt normal operations shall be accomplished at times convenient to OWNER unless otherwise indicated in the Contract Documents.
   3. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, materials, equipment, spare parts, both temporary and permanent, necessary to successfully perform the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to commencing the associated shutdown. Demonstrate to ENGINEER’s satisfaction that CONTRACTOR has complied with such requirements before commencing the shutdown.
   4. If CONTRACTOR’s operations cause an unscheduled interruption of OWNER’s operations, immediately re-establish satisfactory operation for OWNER.

5. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of OWNER's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by CONTRACTOR if, in ENGINEER's opinion, CONTRACTOR did not comply with requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in performing the Work and complying with applicable permits, Laws, and Regulations.
6. Shutdowns shall be in accordance with Table 01 14 16-B of this Section. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns.
7. Temporary, short-term shutdowns of smaller conduits (including piping and ducting), equipment, and systems may not be included in Table 01 14 16-B. Coordinate requirements for such shutdowns with ENGINEER and OWNER. Where necessary, obtain ENGINEER's interpretation or clarification before proceeding.

B. Shutdowns of Electrical Systems:
1. Comply with Laws and Regulations, including the National Electric Code.
2. CONTRACTOR shall lock out and tag circuit breakers and switches operated by OWNER and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started.
3. Upon completion of shutdown Work, remove the locks and tags and notify ENGINEER that facilities are available for use.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL

A. In addition to requirements of this Section, comply with Section 01 73 29, Cutting and Patching, and Section 01 73 24, Connections to Existing Facilities, and other Contract Documents applicable to Work associated with shutdowns, tie-ins, temporary pumping (where applicable), and similar work.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 14 19

USE OF SITE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for use of the Site during the Project, and includes requirements for use of existing facilities, as applicable.
   2. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals shown, specified, and required to comply with restrictions on CONTRACTOR's use of the Site and other areas.
   3. Comply with requirements of the General Conditions, as may be modified by the Supplementary Conditions, regarding the CONTRACTOR's use of the Site and other areas.

1.2 USE OF PREMISES

A. Limit use of premises at the Site to work areas shown or indicated on the Drawings and as specified in this Section. Do not disturb portions of the Site beyond areas of the Work.
   1. Limits:
      a. Confine construction operations to the following areas:
         1) Old Forge Dam and surrounding parcel; Sixth Lake Dam and surrounding parcel
      b. Confine storage of materials and equipment, and locations of temporary facilities to the following areas:
         1) Contractors laydown area.
      c. Do not enter the following areas:
         1) Old Forge Covered Bridge
         2) Areas outside of the work areas indicated in Paragraph 1.2.A.1.a of this Section and outside of work areas indicated on the Drawings, including outside the Project areas indicated on the "key plan" in the Drawings.
   2. Access to Site, Access Roads, and Parking Areas: Refer to Section 01 55 13, Access Roads and Parking Areas.

B. Use of Existing Buildings and Structures: Maintain existing buildings and structures in weather-tight condition throughout construction unless otherwise indicated in the Contract Documents. Protect buildings, structures, and occupants during construction.
   1. Use of Existing Utilities, Sanitary Facilities, and First-aid Facilities: Refer Section 01 51 05, Temporary Utilities; Section 01 52 19, Sanitary Facilities; and Section 01 52 16, First Aid Facilities.

C. Promptly repair damage to premises caused by construction operations. Upon completion of the Work, restore premises to specified condition; if condition is not specified, restore to pre-construction condition.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 21 00

CONTINGENCY ALLOWANCES

PART 1 – GENERAL

1.1 SCOPE

A. Scope:
   1. This Section includes administrative and procedural requirements governing contingency allowances:

B. Authorization of Allowances:
   1. Work that will be paid under an allowance will be authorized in Owner's written instruction to Contractor using the form included with this Section or other written allowance authorization issued by Owner.
   2. Do not perform Work under an allowance without written authorization of Owner.

1.2 CONTINGENCY ALLOWANCE

A. Contingency allowances are stipulated amounts available as reserve for sole use by Owner to cover unanticipated costs.

B. When authorization of Work under contingency allowance is contemplated by Owner for a defined scope, submit Change Proposal to Engineer. Prepare Change Proposal in accordance with the General Conditions and Supplementary Conditions and Section 01 26 00, Contract Modification Procedures, except those payments within limit of contingency allowance shall exclude cost of bond and insurance premiums.

1.3 SCHEDULE OF ALLOWANCES

A. Contingency Allowances:
   1. Schedule of Contingency Allowances: Include the following allowances for use in accordance with Owner's instructions:

Contract and Bid/Payment Item No.	**Allowance Number/Name**
General Contract, Payment Item 1.3 Contingency Allowance	General Contingency

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 ATTACHMENTS

A. The document listed below and attached following this Section's "End of Section" designation, are part of this Specification Section.
   1. Allowance Authorization Form (one page).

+ + END OF SECTION + +

ALLOWANCE AUTHORIZATION

Project: _____ Authorization Number: _____

_____ From: _____

To: _____ Date: _____

_____ Engineer Project No.: _____

Re: _____ Contract For: _____

You are authorized to perform the following item(s) of Work and to adjust the Contract allowance amount accordingly:

1. [*Allowance Title*] / [*Title of Change*]:

THIS IS NOT A CHANGE ORDER AND DOES NOT INCREASE OR DECREASE THE CONTRACT PRICE

Original Allowance ..... $ _____
Allowance Expenditures prior to this Authorization..... $ _____
Allowance Balance prior to this Authorization..... $ _____
Allowance will be decreased by this Authorization..... $ _____
New Allowance Balance..... $

RECOMMENDED BY

ARCADIS U.S., Inc.
Engineer

By Date

OWNER APPROVAL

Owner

By Date

CONTRACTOR ACCEPTANCE

Contractor

By Date

☐ Attachments

Copies: ☐ Owner ☐ Contractor ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ File

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope: Section includes:
   1. Administrative and procedural requirements for selecting materials and equipment for the Project.
   2. Procedural requirements for substitutions of materials and equipment.
   3. Procedural requirements for substitute construction methods or procedures, when construction methods or procedures are specified.

B. A proposed substitute will not be accepted for review if:
   1. Approval would require changes in design concept or a substantial revision of the Contract Documents.
   2. Approval would delay completion of the Work or the work of other contractors.
   3. Substitution request is indicated or implied on a Shop Drawing or other submittal, or on a request for interpretation or clarification, and is not accompanied by CONTRACTOR's formal and complete request for substitution.

C. If proposed substitute is not approved, CONTRACTOR shall provide the specified materials, equipment, method, or procedure, as applicable.

D. Approval of a substitute does not relieve CONTRACTOR from requirement for submitting Shop Drawings and other submittals in accordance with the Contract Documents.

E. ENGINEER and OWNER have the right to rely upon the completeness and accuracy of the information included in CONTRACTOR's request for approval of a substitute, and CONTRACTOR accepts full responsibility for the completeness and accuracy thereof.

F. When approved substitute is defective or fail to perform in accordance with the Contract Documents, responsibility for remedying the defect or failure resides solely with CONTRACTOR and Supplier.

1.2 SUBSTITUTE MATERIALS AND EQUIPMENT

A. Requests for approval of substitute items of materials or equipment will be considered within a period of 60 days after the Effective Date of the Contract. After the end of specified period, substitution requests will be considered only in case of

unavailability of a specified item of material or equipment or other conditions beyond CONTRACTOR's control.

B. Procedure:
   1. Submit requests for substitution in accordance with requirements for furnishing submittals, as indicated in Section 01 33 00, Submittal Procedures.
   2. Submit separate request for each proposed substitute.
   3. Submit request for substitution using forms attached to this Section. Complete all information requested on each form, and enclose with the forms supplementary information as required. In addition to requirements of the General Conditions and information required on substitution request forms, include with each substitute request the following:
      a. Identification of the materials and equipment (as applicable), including manufacturer's name and address.
      b. Manufacturer's literature with description of the materials and equipment, performance and test data, and reference standards with which materials and equipment comply.
      c. Samples, when appropriate.
      d. Name and address of similar projects on which the materials and equipment were used, date of installation, and names and contact information (including telephone number) for the facility operations and maintenance manager.

1.3 SUBSTITUTE CONSTRUCTION METHODS OR PROCEDURES

A. The provisions of the General Conditions, as may be modified by the Supplementary Conditions, regarding substitute items of materials and equipment are hereby extended to apply to substitute construction methods or procedures.

C. Procedure:
   1. Submit requests for substitution in accordance with requirements for furnishing submittals, as indicated in Section 01 33 00, Submittal Procedures.
   2. Submit separate request for each proposed substitute.
   3. Submit request for substitution using forms attached to this Section. Complete all information requested on each form, and enclose with the forms supplementary information as required. In addition to requirements of the General Conditions and information required on substitution request forms, include with each substitute request the following:
      a. Detailed description of proposed method or procedure.
      b. Itemized comparison of the proposed substitution with the specified method or procedure.
      c. Drawings illustrating method or procedure.
      d. Other data required by ENGINEER to establish that proposed substitution is equivalent to specified method or procedure.

1.4 CONTRACTOR'S REPRESENTATIONS

A. In submitting request for substitution, CONTRACTOR represents that:
   1. CONTRACTOR has read and fully understands the provisions regarding substitutes as indicated in the General Conditions, as may be modified by the Supplementary Conditions.
   2. Substitution request is complete and includes all information required by the Contract Documents.
   3. CONTRACTOR certifications required by the General Conditions, as may be modified by the Supplementary Conditions, are valid and made with CONTRACTOR's full knowledge, information, and belief.
   4. CONTRACTOR will provide the same or better guarantees or warranties for proposed substitute as for the specified materials, equipment, methods, or procedures, as applicable.
   5. CONTRACTOR waives all Claims for additional costs or extension of time related to proposed substitute that subsequently may become apparent.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 ATTACHMENTS

A. The documents listed below, and attached following this Section's "End of Section" designation, are part of this Specification Section.
   1. Substitution Request Form (two pages).
   2. Product Substitution Checklist (one page).

+ + END OF SECTION + +

SUBSTITUTION REQUEST

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ Engineer Project. No._____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitute: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 1 to 4 years old ☐ 5 to 10 years old ☐ More than 10 years old

Differences between proposed substitute and specified item: _____

_____

_____

☐ Point-by-point comparative data attached — REQUIRED BY THE CONTRACT DOCUMENTS

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Engineer: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitute: ($)
(attach detailed, itemized estimate)

_____ _____

Proposed substitute changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.
(clarify whether change is to Substantial Completion, Milestone, or time for readiness for final payment)

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SUBSTITUTION REQUEST
(Continued)

☐ Substitute product, method, or procedure is subject to payment of licensing fee or royalty (check if "yes" and attach information)

☐ Substitute product, method, or procedure is patented or copyrighted (check if "yes" and attach information)

The undersigned certifies:

- Representations in the General Conditions and in Section 01 25 00, Substitution Procedures, regarding substitutions are valid.
- Same or better warranty and guarantee will be furnished for proposed substitution as for specified item.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitute will have no adverse effect on other trades and will not affect or delay Progress Schedule.
- Cost data as stated above is complete. Claims for additional costs or time related to accepted substitution which may subsequently become apparent are waived.
- Proposed substitute does not affect dimensions and functional clearances.
- Payment will be made for Engineer's review and changes, if any, to the design and Contract Documents, and construction costs caused by the substitute.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: ☐

ENGINEER'S REVIEW AND ACCEPTANCE (OR NON-ACCEPTANCE) WILL BE DOCUMENTED IN A FIELD ORDER OR CHANGE ORDER, AS APPROPRIATE. _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ Engineer
☐ Other:

Adapted from CSI Form No. 13.0B, 2004 edition

PRODUCT SUBSTITUTION CHECKLIST

Date: _____ Re: _____

Engineer Proj No.: _____ Manufacturer's Project No.: _____

Filing No.: _____ Contract For: _____

Item Equivalence:

☐ Is the submitted item equivalent to the specified item? _____

☐ Does it serve the same function? _____

☐ Does it have the same dimensions? _____

☐ Does it have the same appearance? _____

☐ Will it last as long? _____

☐ Does it comply with the same codes, and standards and performance requirements? _____

☐ Has the item been used locally, and where are the projects? _____

_____

☐ Has a problem occurred with the item, and what was the remedy? _____

_____

Effect on the Project:

☐ Will the substitute affect other aspects of the construction? _____

☐ Are any details affected and are changes required? _____

☐ What is the cost of the changes? _____

☐ Who pays for the required changes? _____

☐ Are Contract Times affected? _____

_____

Effect on the Warranty:

☐ How does the proposed warranty differ from the specified warranty? _____

_____

☐ Does the manufacturer have a track record of standing behind the warranty? _____

_____

Adapted from CSI Form No. 20.3, 1998 edition

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. Scope.
   1. This Section includes administrative and procedural requirements governing the following:
      a. Requests for interpretation.
      b. Written clarifications.
      c. Minor changes in the Work and Field Orders.
      d. Work Change Directives.
      e. Proposal requests.
      f. Change Proposals.
      g. Change Orders.

B. Submit Contract modification documents to Engineer, addressed to the contact person and contact information indicated in Section 01 33 00, Submittal Procedures, and in accordance with Section 01 31 26, Electronic Document Protocol.

1.2 REQUESTS FOR INTERPRETATION

A. General.
   1. Do not transmit request for interpretation when another form of communication is appropriate, such as Contractor's submittals, requests for approvals of substitutes, notices, ordinary correspondence, or other form of communication. Improperly prepared or inappropriate requests for interpretation will be returned without response or action by Engineer.
   2. Do not submit request for interpretation or clarification when:
      a. answer may be obtained by observations at the Site; or
      b. required information is clearly indicated in the Contract Documents; or
      c. required information is included in industry standards referenced in the Contract Documents or Supplier's instructions that are consistent with the Contract Documents; or
      d. answers are reasonably inferable from any of foregoing.
   3. Contractor shall have sole financial responsibility for requests for interpretations or clarifications that are submitted late.

B. Procedure.
   1. Transmit requests for interpretation to Engineer in accordance with Section 01 31 26, Electronic Document Protocol, and requirements of this Section. Include with each request for interpretation a separate letter of transmittal.

2. Engineer's response to requests for interpretation will be transmitted in accordance with Section 01 31 26, Electronic Document Protocol, and requirements of this Section. Each response to a request for interpretation will include a separate letter of transmittal.
3. Engineer's written response to each request for interpretation will be distributed to:
    a. Contractor.
    b. Owner.
    c. Resident Project Representative (RPR).
4. If Engineer requests additional information to make an interpretation, entity requesting the interpretation shall transmit the information requested within ten days, unless Engineer allows additional time, via correspondence referring to request for interpretation number.
5. If Contractor or Owner believes that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of Engineer's interpretation, advise Engineer in writing before proceeding with the Work associated with the request for interpretation.
6. If, after this initial communication, either Owner or Contractor believes that change in Contract Price or Contract Times, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.

C. Preparation of Requests for Interpretation:
1. Prepare each request for interpretation on the "Request for Interpretation" form included with this Section, or other form acceptable to Engineer.
2. Numbering system for Requests for Information shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First request for interpretation on the general contract for project titled, "Contract A15" would be, "RFI No. A15-GC-001".
3. In space provided on form, describe the interpretation requested. Provide additional sheets as necessary. Include text and sketches as required in sufficient detail to describe the need for an interpretation.
4. When applicable, request for interpretation shall include Contractor's recommended resolution.

1.3 WRITTEN CLARIFICATIONS

A. General:
1. Written clarifications, when required, will be initiated and issued by Engineer.
2. Written clarifications do not change the Contract Price or Contract Times, and do not alter the Contract Documents.

B. Procedure.
1. Engineer's written clarifications will be transmitted as correspondence in accordance with Section 01 31 26, Electronic Document Protocol, and requirements of this Section.

2. Each written clarification will be distributed to:
   a. Contractor.
   b. Owner.
   c. Resident Project Representative (RPR).
3. If Contractor or Owner believes that a change in the Contract Price or Contract Times, or other change to the Contract is required as a result of Engineer's written clarification, advise Engineer in writing before proceeding with the Work associated with the written clarification.
4. If, after this initial communication, either Owner or Contractor believes that change in Contract Price or Contract Times, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.
5. If Engineer's written clarification is unclear, prepare and transmit a request for interpretation.

1.4 MINOR CHANGES IN THE WORK AND FIELD ORDERS

A. General:
   1. Field Orders, when required, will be initiated and issued by Engineer in the form of Engineers Joint Contract Documents Committee document EJCDC® C-942, "Field Order".

B. Procedure.
   1. Field Orders will be transmitted in accordance with Section 01 31 26, Electronic Document Protocol, and requirements of this Section. Each Field Order will include a separate letter of transmittal.
   2. Each Field Order will be distributed to:
      a. Contractor.
      b. Owner.
      c. Resident Project Representative (RPR).
   3. If Contractor or Owner believes that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of a Field Order, so advise Engineer in writing before proceeding with the Work associated with the Field Order.
   4. If, after this initial communication, Contractor believes that change in Contract Price or Contract Times, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.
   5. If the Field Order is unclear, submit request for interpretation.

1.5 WORK CHANGE DIRECTIVES

A. General:
   1. Work Change Directives will be in the form of EJCDC® C-940, "Work Change Directive".

B. Procedure.

1. Work Change Directives signed by Owner and Engineer will be transmitted in accordance with Section 01 31 26, Electronic Document Protocol, and requirements of this Section. Each Work Change Directive will include a separate letter of transmittal. Contractor shall print three originals of Work Change Directive for Contractor's signature.
2. Contractor shall promptly sign each original Work Change Directive and, within five days of receipt, return all originals to Engineer.
3. Original, signed Work Change Directives will be distributed as follows:
    a. Contractor: One original.
    b. Owner: One original.
4. One copy of each Work Change Directive will be distributed to:
    a. Resident Project Representative (RPR).
5. Transmit documentation of costs to Engineer as a Change Proposal.

1.6 PROPOSAL REQUESTS

A. General:
1. Proposal Requests are for requesting the effect on the Contract Price or Contract Times and other information relative to contemplated changes in the Work. Proposal Requests do not authorize changes or variations in the Work, and do not change the Contract Price or Contract Times or terms of the Contract.
3. Proposal Requests will be issued by Engineer using the "Proposal Request" form included with this Section.

B. Procedure.
1. Proposal Requests will be transmitted in accordance with Section 01 31 26, Electronic Document Protocol, and requirements of this Section. Each Proposal Requests will include a separate letter of transmittal.
2. Each signed Proposal Request will be transmitted to:
    a. Contractor.
    b. Owner.
    c. Resident Project Representative (RPR).
3. Transmit request for interpretation to clarify conflicts, errors, ambiguities, and discrepancies in Proposal Request.
4. Upon receipt of Proposal Request prepare and transmit to Engineer a Change Proposal for the proposed Work described in the Proposal Request.

1.7 CHANGE PROPOSALS

A. General.
1. Change Proposals shall be submitted on the "Change Proposal" form included with this Section.

B. Procedure.
1. Transmit Change Proposals in accordance with Section 01 31 26, Electronic Document Protocol, and requirements of this Section. Include with each

Change Proposal all required supporting documentation and a separate letter of transmittal.

2. Engineer's Review and Requests for Additional Information:
   a. When, Engineer requests additional information to render a decision, submit required information within five days of receipt of Engineer's request, unless Engineer allows more time. Submit the required information via correspondence that refers to the specific Change Proposal number.
   b. Owner will transmit to Engineer such comments, if any, that Owner has on the Change Proposal, within 10 days of Owner's receipt of the Change Proposal.
   c. Engineer's response to Change Proposals will be transmitted in accordance with Section 01 31 26, Electronic Document Protocol, and requirements of this Section, the General Conditions, and the Supplementary Conditions.
3. Engineer's response to each Change Proposal will be distributed to:
   a. Contractor.
   b. Owner.
   c. Resident Project Representative (RPR).
4. If Change Proposal is recommended for approval by Engineer and is approved by Owner, a Change Order will be issued or, when applicable, an appropriate use of contingency allowance will be authorized by Owner.

C. Preparation of Change Proposals:
1. Numbering system for Change Proposals shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First Change Proposal for the general contract for project named "Contract A15" would be, "Change Proposal No. A15-GC-001".
2. In space provided on Change Proposal form:
   a. Describe scope of each proposed change. Include text and sketches on additional sheets as required to provide detail sufficient for Engineer's review and response. If a change item is submitted in response to Proposal Request, write in as scope, "In accordance with Proposal Request No." followed by the Proposal Request number.
   b. Submit justification for each proposed change. If change is in response to proposal request, write in as justification, "In accordance with Proposal Request No." followed by the proposal request number.
   c. List the total change in the Contract Price and Contract Times for each separate change item included in the Change Proposal.
3. Unless otherwise directed by Engineer, attach detailed breakdowns of pricing to the Change Proposal.

1.8 CHANGE ORDERS

A. General:
1. Change Orders will be in the form of EJCDC® C-941, "Change Order".

B. Procedure.
   1. Change Orders for signature by Contractor will be transmitted in accordance with Section 01 31 26, Electronic Document Protocol, and requirements of this Section. Each Change Order will include a separate letter of transmittal. Contractor shall print three originals of Change Order for Contractor's signature.
   2. Contractor shall promptly sign each original Change Order and, within five days of receipt, return all originals to Engineer.
   3. Engineer will sign each original Change Order and forward them to Owner.
   4. After approval and signature by Owner, original Change Orders will be distributed as indicated below.
   5. Original, signed Change Orders will be distributed as follows:
      a. Contractor: One original.
      b. Owner: One original.
   6. One copy of each Change Order will be distributed to:
      a. Resident Project Representative (RPR).

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 ATTACHMENTS

A. The forms listed below, following this Section's "End of Section" designation, are part of this Specifications Section:
   1. Request for Interpretation form (one page).
   2. Proposal Request form (one page).
   3. Change Proposal form (one page).

+ + END OF SECTION + +

REQUEST FOR INTERPRETATION

Owner: _____

Project Name: _____

Contractor: _____ RFI No. _____

Date Transmitted: _____ Date Received: _____

Date Response Requested: _____ Date Response Transmitted: _____

Subject: _____

Specification Section and Paragraph: _____

Drawing References: _____

INTERPRETATION REQUESTED:

Signature: _____ Date: _____

ENGINEER'S RESPONSE:

Signature: _____ Date: _____

PROPOSAL REQUEST

Owner: _____
Project Name: _____

Proposal Request No.: _____ Date: _____

Contract Name and No.: _____

Contractor: _____

Other Contracts Involved in Proposed Change: _____

_____

TO CONTRACTOR: Please submit a complete Change Proposal for the proposed modifications described below. If the associated Change Proposal is approved, a Change Order or allowance authorization will be issued to authorize adjustment so the scope of the Work. This Proposal Request is not a Change Order, Work Change Directive, Field Order, or an authorization to proceed with the proposed Work described below.

SCOPE OF PROPOSED WORK:

1. *Item*:
2. *Item*:
3. *Item*:

Proposal requested by: _____

Signature of Requestor: _____

CHANGE PROPOSAL

Owner: _____
Project Name: _____

Change Proposal No.: _____ Date: _____

Submitted in Response to Proposal Request No.: _____

Contract Name and No.:_____

Contractor: _____

Subject: _____

_____

The following changes to the Contract are proposed:

SCOPE OF WORK: *(attach and list supporting information as required)*

1. *Item*:
2. *Item*:

JUSTIFICATION:

1. *Item*:
2. *Item*:

CHANGES IN CONTRACT PRICE AND CONTRACT TIMES:

We propose that the Contract Price and Contract Times be changed as follows:

For Contract Price, attach detailed cost breakdowns for Contractor and Subcontractors, Supplier quotations, and other information required.

For the Contract Times, state increase, decrease, or no change to Contract Times for Substantial Completion, readiness for final payment, and Milestones, if any. If increase or decrease, state specific number of days for changes to the Contract Times.

Description	Amount	Contract Times (days)	
		Substantial	Final
1. Item	$0.00	0	0
2. Item	$0.00	0	0
Total This Change Proposal	**$0.00**	**0**	**0**

Changes to Milestones, if any: _____

Contractor represents that supporting data attached to this Change Proposal are accurate and complete. The requested time or price adjustment indicated in this Change Proposal is the entire adjustment to which Contractor believes it is entitled as a result of the proposed change(s) indicated herein.

Change Proposal by: _____

Signature of Proposer: _____

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 29 73

SCHEDULE OF VALUES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall prepare and submit to ENGINEER for acceptance a Schedule of Values that allocates cost to each item of the Work. Schedule of Value list of line items shall correspond to each aspect of the Work, establishing in detail the portion of the Contract Price allocated to each major component of the Work.
   2. Upon request of ENGINEER, support values with data that substantiate their correctness.
   3. Submit preliminary Schedule of Values to ENGINEER for initial review. CONTRACTOR shall incorporate ENGINEER's comments into the Schedule of Values and resubmit to ENGINEER. ENGINEER may require corrections and re-submittals until Schedule of Values is acceptable.
   4. Schedule of Values may be used as a basis for negotiating price of changes, if any, in the Work.
   5. Schedule of Values and the Progress Schedule updates specified in Section 01 32 16, Progress Schedule, will be basis for preparing each Application for Payment.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Submit to ENGINEER Schedule of Values in the form and quantity required in Section 01 33 00, Submittal Procedures, and in accordance with Section 01 31 26, Electronic Communication Protocols.
   2. Content of Schedule of Values submittals shall be in accordance with Article 1.3 of this Section.
   3. Timing of Submittals:
      a. Submit preliminary Schedule of Values within time limit indicated in the General Conditions.
      b. Submittal of the Schedule of Values for acceptance by ENGINEER shall be in accordance with the General Conditions. ENGINEER will not accept Applications for Payment without an acceptable Schedule of Values.
      c. When required by ENGINEER, promptly submit updated Schedule of Values to include cost breakdowns for changes in the Contract Price.

1.3 SCHEDULE OF VALUES FORMAT AND CONTENT

A. Organization and Major Elements of Schedule of Values
   1. Prepare Schedule of Values on the "progress estimate" or "continuation sheets", as applicable, of the Application for Payment form indicated in Section 01 29 76, Progress Payment Procedures.
   2. Include in Schedule of Values itemized list of Work for each major work area included in the Work, for each payment item specified in Section 01 22 13, Measurement and Payment. Group the Work in the Schedule of Values into the following areas:
      a. Old Forge Dam.
      b. Sixth Lake Dam.
   3. Organization in Accordance with Specification Sections:
      a. Within each work area, organize the Schedule of Values by the various Specifications Section numbers and titles included in the Contract Documents.
      b. Label each row in the Schedule of Values with the appropriate Specifications Section number. Include an amount for each row in the Schedule of Values.
      c. List sub-items of major products or systems, as appropriate or when requested by ENGINEER.
   4. Include in Schedule of Values unit price payment items with their associated quantity. Provide in the Schedule of Values detailed breakdown of unit prices when required by ENGINEER.

B. Requirements for preliminary Schedule of Values and Schedule of Values are:
   1. Subcontracted Work:
      a. Schedule of Values shall show division of Work between CONTRACTOR and Subcontractors.
      b. Line items for Work to be done by Subcontractor shall include the word, "(SUBCONTRACTED)".
   2. Apportionment between Materials and Equipment, and Installation:
      a. Schedule of Values shall include breakdown of costs for materials and equipment, installation, and other costs used in preparing the Bid by CONTRACTOR and each Subcontractor.
      b. List purchase and delivery costs for materials and equipment for which CONTRACTOR may apply for payment as stored materials.
   3. Sum of individual values shown on the Schedule of Values shall equal the total of associated payment item. Sum of payment item totals in the Schedule of Values shall equal the Contract Price.
   4. Overhead and Profit: Include in each line item a directly proportional amount of CONTRACTOR's overhead and profit. Do not include overhead and profit as separate item(s).
   5. Include separate line item for each allowance, and for each unit price item.
   6. Bonds and Insurance Costs: Include line item for bonds and insurance in payment item for Item 1 in amount not exceeding 2.0 percent of the Contract Price. This amount may be applied for in the first Application for Payment.
   7. Include relevant items for the General Conditions, permits (when applicable), construction Progress Schedule, and other items required by ENGINEER.

Include such items in Applications for Payment on payment schedule acceptable to ENGINEER

8. Line items for Site maintenance such as dust control, snow removal, compliance with storm water pollution prevention plans and permits, spill prevention control and countermeasures plans, and for construction photographic documentation; temporary utilities and temporary facilities, field offices, temporary controls, field engineering, and similar Work shall be included in the Schedule of Values and proportioned in Applications for Payment throughout duration of the Work.
9. Mobilization and Demobilization:
    a. Include separate line items under each appropriate payment item for mobilization and demobilization. Document for ENGINEER the activities included in mobilization and demobilization line items.
    b. Mobilization will be limited to 2.0 percent of the Contract Price, and will be paid in 4 payments, each of 25 percent of total amount for mobilization.
    c. Demobilization shall be not less than 1.0 percent of the Contract Price and shall be included with the Application for Payment following Substantial Completion, or other schedule acceptable to ENGINEER.
10. Costs for Shop Drawings, Samples, and other submittals; operations and maintenance manuals; field testing; and training of operations and maintenance personnel shall be as follows, unless otherwise accepted by ENGINEER:
    a. Up to eight percent of cost (including all associated overhead and profit) of each equipment item, exclusive of transportation and installation costs associated with that item, may be allocated to preparation of Shop Drawings, Samples ,and other submittals and may be included in the Application for Payment following ENGINEER's approval of Shop Drawings (and acceptance of other submittals, as applicable) required for fabricating or purchasing for that item for the Work.
    b. Up to three percent of total cost of each item (including all associated overhead and profit), including materials and equipment, and installation, may be apportioned to testing and included in the Application for Payment following ENGINEER's acceptance of the associated written field testing report(s).
    c. Up to a total of four percent of equipment cost (including all associated overhead and profit), exclusive of transportation and installation costs, may be apportioned to operations and maintenance manuals and training of operations and maintenance personnel, which may be included in the Application for Payment following completion of training for that item.
11. Project Record Documents:
    a. Include in the Schedule of Values a line item with appropriate value for Project record documents.
    b. If adequate record documents are maintained, up to 50 percent of the value of the record documents line item will be eligible for payment, spread evenly over those progress payments in which construction at the Site is performed.

c. Remainder of Project record documents line item will be eligible for payment when complete record documents are submitted in accordance with the Contract Documents. If record documents submitted are unsatisfactory to ENGINEER, amount may be reduced via set-offs in accordance with the Contract Documents.

12. Schedule of Values shall include an itemized list of Work by work area, as applicable, for Work included in Section 01 14 16, Coordination with Owner's Operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 29 76

PROGRESS PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 PROGRESS PAYMENTS

A. Scope:
   1. CONTRACTOR's requests for payment shall be in accordance with the Agreement, General Conditions and Supplementary Conditions, and the Specifications.
   2. Form: Applications for Payment shall be in the form of Engineers Joint Contract Documents Committee (EJCDC) document EJCDC® C-620, "Contractor's Application for Payment", 2013 edition or later.

B. Procedure:
   1. Review with Resident Project Representative (RPR) quantities and the Work proposed for inclusion in each progress payment. Application for Payment shall cover only the Work and quantities recommended by the RPR.
   3. Submit to ENGINEER 2 printed originals, each with CONTRACTOR's original, "wet" signature, of each complete Application for Payment and other documents to accompany the Application for Payment.
   4. ENGINEER will act on request for payment in accordance with the General Conditions and Supplementary Conditions.

C. Each request for progress payment shall include:
   1. Completed Application for Payment form, including summary/signature page, progress estimate sheets, and stored materials summary. Progress estimate sheets shall have the same level of detail as the Schedule of Values.
   2. Documentation for Stored Materials and Equipment:
      a. For materials and equipment not incorporated in the Work but suitably stored, submit documentation in accordance with the General Conditions and Supplementary Conditions.
      b. UCC-1 Financial Statement:
         1) For each lot or delivery of stored materials and equipment for which payment is requested prior to installation of the item(s) at the Site, complete UCC-1, "Financial Statement" form. On UCC-1 form, indicate OWNER as "security party"; indicate Supplier as "debtor" when stored item(s) are in Supplier's custody, and indicate CONTRACTOR as "debtor" when stored item(s) are in CONTRACTOR's custody; and clearly indicate in detail all stored item(s) included in the filing as "collateral" on the form. Include attachments to the form when necessary to clearly and fully indicate in detail the associated "collateral".

2) File completed UCC-1 form with the secretary of state in the state where the subject item(s) are stored.
3) Include with Application for Payment the completed UCC-1 form together with evidence of filing with the required state(s). Submit UCC-1 form and related documentation once for each lot or delivery of stored items.

c. Photographs of the stored items at the storage location, in accordance with requirements for progress photographs in Section 01 32 33, Photographic Documentation. Submit photographs sufficient to clearly indicate each stored item, clearly showing marking of OWNER's property in accordance with Paragraph 1.2.C.1 of this section. Such photographs do not count as photographs required under Section 01 32 33, Photographic Documentation. For each month that such item(s) are stored, take and submit monthly new photographs of each stored item.

d. Legibly indicate on invoice or bill of sale the specific stored materials or equipment included in the payment request and corresponding bid/payment item number for each and the Supplier price for each item.

3. Listing of Subcontractors and Suppliers:
   a. In accordance with the General Conditions, submit not less than monthly updated listing of all Subcontractors and Suppliers known to CONTRACTOR, whether or not such entities have a contract directly with CONTRACTOR.
   b. Submit complete information using the form attached to this Section.
4. Allowance Work:
   a. For payment requests that include payment for Work under an allowance, include with the progress payment request copy of OWNER's authorization of the associated allowance Work, in accordance with Section 01 21 00, Allowances.
5. Partial Release or Reduction of Retainage:
   a. For each Application for Payment where CONTRACTOR requests partial release or reduction of retainage in any amount (other than request for final payment), submit with associated progress payment request consent of surety to partial release or reduction of retainage, duly completed by CONTRACTOR and surety.
   b. Acceptable form includes AIA® G707A™, "Consent of Surety to Reduction in or Partial Release of Retainage", 1994 or later edition, or other form acceptable to OWNER.
   c. For payment requests that include reduction in or payment of retainage in an amount greater than that required by the Contract Documents, obtain OWNER's concurrence for partial release or reduction in retainage prior to submitting such Application for Payment.

D. Final Payment:
   1. Requirements for request for final payment are in the General Conditions, as may be modified by the Supplementary Conditions, and Section 01 77 19, Closeout Requirements.

1.2 PAYMENT FOR STORED MATERIALS AND EQUIPMENT

A. Observation of Stored Materials and Equipment Prior to Application for Payment:
   1. General:
      a. Prior to materials or equipment suitably stored but not yet incorporated into the Work can be eligible for payment, ENGINEER or Resident Project Representative (RPR) shall visit the storage location and verify the extent, condition, and storage environment of the stored items.
      b. When the same material or equipment item is stored for more than two months, such visits to storage location shall be not less than once every two months.
   2. Cost Responsibility for Observations:
      a. When storage location is less than 20 miles from the Site or less than 20 miles from ENGINEER's office, CONTRACTOR is not responsible for reimbursing OWNER for cost of ENGINEER's time and expenses for observing stored materials and equipment.
      b. When storage location is more than 20 miles from the Site and more than 20 miles from ENGINEER's office, CONTRACTOR shall reimburse OWNER, via a set-off under the Contract Documents, for cost of ENGINEER's time and expenses, including travel time, to visit the storage location and observe the stored materials and equipment.

B. Other Requirements for Stored Items: Regardless of storage location, perform the following for stored materials and equipment for which payment is sought:
   1. Clearly mark each stored container, crate, or item as follows: "Property of Hudson River - Black River Regulating District" using permanent marking. Such marking shall not blemish or deface the finish of items that will be exposed to view after installation at the Site.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 ATTACHMENTS

A. The forms listed below, following this Section's "End of Section" designation, are part of this Specification Section:
   1. List of Subcontractors and Suppliers form (two pages).

+ + END OF SECTION + +

LIST OF SUBCONTRACTORS AND SUPPLIERS

Owner: _____
Project Name: _____

Contractor: _____ Date: _____
Contract Designation: _____

Indicate below complete information for each Subcontractor and Supplier known to Contractor, regardless of whether the firm has a direct contract with Contractor. Include all lower-tier Subcontractors and associated Suppliers. Copy and paste the paragraphs below as required to indicate all Subcontractors and Suppliers.

SUBCONTRACTORS

1. **Subcontractor Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Work Under Specifications Section Nos.*:
   - *Brief Description of Work*:
   - *Current Subcontract Price*:
   - *Approximate Subcontract Start Date*:
   - *Approximate Subcontract End Date*:

2. **Subcontractor Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Work Under Specifications Section Nos.*:
   - *Brief Description of Work*:
   - *Current Subcontract Price*:
   - *Approximate Subcontract Start Date*:
   - *Approximate Subcontract End Date*:

3. **Subcontractor Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Work Under Specifications Section Nos.*:
   - *Brief Description of Work*:
   - *Current Subcontract Price*:
   - *Approximate Subcontract Start Date*:
   - *Approximate Subcontract End Date*:

Total of Subcontract Prices for all subcontracts equals approximately ___ percent of the Contract Price *(Contractor to fill in blank monthly)*

SUPPLIERS

1. **Supplier Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Furnishing Items Under Specifications Section Nos.*:
   - *Brief Description of Items*:
   - *Current Purchase Order Amount*:
   - *Approximate Purchase Order Date*:
   - *Approximate Purchase Order End Date*:

2. **Supplier Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Furnishing Items Under Specifications Section Nos.*:
   - *Brief Description of Items*:
   - *Current Purchase Order Amount*:
   - *Approximate Purchase Order Date*:
   - *Approximate Purchase Order End Date*:

3. **Supplier Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Furnishing Items Under Specifications Section Nos.*:
   - *Brief Description of Items*:
   - *Current Purchase Order Amount*:
   - *Approximate Purchase Order Date*:
   - *Approximate Purchase Order End Date*:

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 31 13

PROJECT COORDINATION (SINGLE PRIME)

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall coordinate the Work, including testing agencies whether hired by CONTRACTOR, OWNER, or others; Subcontractors, Suppliers, and others with whom coordination is necessary, in accordance with the General Conditions, Supplementary Conditions, and this Section, to perform the Work within the Contract Times and in accordance with the Contract Documents.

B. Coordination:
   1. In accordance with the General Conditions as may be modified by the Supplementary Conditions, CONTRACTOR shall cooperate with and coordinate the Work with other contractors, utility owners, utility service companies, OWNER's and facility manager's employees working at the Site, and other entities working at the Site, in accordance with Section 01 11 13, Summary of Work.
   2. CONTRACTOR will not be responsible or liable for damage unless damage is through negligence of CONTRACTOR, or Subcontractors, Supplier, or other entity employed by CONTRACTOR.
   3. Attend and participate in all project coordination and progress meetings, and report on the progress of the Work and compliance with the Progress Schedule.

C. Layout and Coordination Drawings:
   1. Maintain sufficient competent personnel, drafting and computer-aided drafting/design (CADD) equipment, software, systems, and supplies at the Site for preparing layout drawings, coordination drawings, and record documents.
   2. With the Contract Documents and Shop Drawings, use such coordination drawings as tools for coordinating the Work of various trades.
   3. Where such coordination drawings are to be prepared by mechanical, electrical, plumbing, or heating-ventilating-air conditioning Subcontractors and other Subcontractors, ensure that each Subcontractor maintains required personnel and facilities at the Site.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 31 19.13

PRE-CONSTRUCTION CONFERENCE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. A pre-construction conference will be held for the Project.
   2. CONTRACTOR shall attend the conference prepared to discuss all items on the pre-construction conference agenda.
   3. ENGINEER will distribute an agenda, preside at conference, and prepare and distribute minutes to all conference participants and others as requested.

B. Purpose of Pre-construction Conference:
   1. Purpose of conference is to designate responsible personnel, establish working relationships, discuss preliminary schedules submitted by CONTRACTOR, and review administrative and procedural requirements for the Project.
   2. Matters requiring coordination will be discussed and procedures for handling such matters will be established.
   3. Unless otherwise indicated in the Contract Documents or otherwise agreed to by the entities involved, Site mobilization meeting will be part of the pre-construction conference.

1.2 PREPARATION FOR PRE-CONSTRUCTION CONFERENCE

A. Date, Time, and Location:
   1. Conference will be held after execution of the Contract and before Work starts at the Site.
   2. ENGINEER will establish the date, time, and location of conference and notify the interested and involved entities.

B. Submittals Required Prior to Pre-construction Conference:
   1. Not less than three days prior to pre-construction conference, submit the following preliminary schedules in accordance with the General Conditions and other requirements of the Contract Documents:
      a. Preliminary Progress Schedule information by each prime contractor.
      b. Preliminary Schedule of Submittals.
      c. Preliminary Schedule of Values.
      d. Listing of identity and general scope of Work or supply (as applicable) of planned Subcontractors and Suppliers. Indicate extent of each Subcontract proposed and overall percentage of Contract Price to be subcontracted.

C. CONTRACTOR shall furnish information required and contribute appropriate items for discussion at the pre-construction conference.

D. Handouts for Pre-Construction Conference:
   1. CONTRACTOR shall bring to the conference the following, with sufficient number of copies for each attendee:
      a. Preliminary progress scheduling information, as submitted to ENGINEER.
      b. Preliminary Schedule of Submittals, as submitted to ENGINEER.
      c. Preliminary Schedule of Values, as submitted to ENGINEER.
      d. Listing of identity and general scope of Work or supply of planned Subcontractors and Suppliers.
      e. List of emergency contact information, in accordance with Article 1.5 of Section 01 35 23, Safety Requirements.

1.3 REQUIRED ATTENDEES

A. Representative of each entity attending the conference shall be authorized to act on that entity's behalf.

B. Contractor Attendance: Conference shall be attended by CONTRACTOR's:
   1. Project manager.
   2. Site superintendent
   3. Project managers for major Subcontractors, and major equipment Suppliers as CONTRACTOR deems appropriate.

C. Other attendees will be representatives of:
   1. OWNER.
   2. ENGINEER.
   3. Resident Project Representative (RPR), if available.
   4. Construction coordinator.
   5. Authorities having jurisdiction over the Work, if available.
   6. Utility owners, as applicable.
   7. Others as requested by OWNER, CONTRACTOR, or ENGINEER.

1.4 AGENDA

A. Preliminary Agenda: Be prepared to discuss in detail the topics indicated below. Revisions, if any, to the agenda below will be furnished to required attendees prior to the pre-construction conference.
   1. Procedural and Administrative:
      a. Personnel and Teams:
         1) Designation of roles and personnel.
         2) Limitations of authority of personnel, including personnel who will sign Contract modifications and make binding decisions.
         3) Subcontractors and Suppliers in attendance.
         4) Authorities having jurisdiction.

b. Procedures for communications and correspondence, including electronic communication protocols.
c. Copies of the Contract Documents and availability.
d. Subcontractors and Suppliers.
    1) Lists of proposed Subcontractors and Suppliers.
e. The Work and Scheduling:
    1) General scope of the Work.
    2) Contract Times, including Milestones (if any).
    3) Phasing and sequencing.
    4) Preliminary Progress Schedule.
    5) Critical path activities.
f. Safety:
    1) Responsibility for safety.
    2) Contractor's safety representative.
    3) Emergency procedures and accident reporting.
    4) Emergency contact information.
    5) Confined space entry permits.
    6) Hazardous materials communication program.
    7) Impact of Project on public safety.
g. Permits.
h. Review of insurance requirements and insurance claims.
i. Coordination:
    1) Project coordination.
    2) Coordination with Owner's operations.
    3) Progress meetings.
    4) Preliminary Schedule of Submittals.
    5) Procedures for furnishing and processing submittals.
    6) Work not eligible for payment until submittals are approved or accepted (as required).
    7) Construction photographic documentation.
j. Submittals:
    1) Preliminary Schedule of Submittals.
    2) Submittal procedures.
    3) Contractor coordination and approval stamp.
    4) Meaning of Engineer's actions/submittal disposition.
    5) Preliminary discussion of initial, critical submittals.
    6) Construction photographic documentation.
k. Substitutes and "Or-Equals":
    1) Product options.
    2) Procedures for proposing "or-equals".
    3) Procedures for proposing substitutes.
l. Contract Modification Procedures
    1) Requests for interpretation
    2) Written clarifications
    3) Field Orders
    4) Proposal Requests
    5) Change Proposals

6) Work Change Directives.
7) Change Orders.
8) Procedure for Claims and dispute resolution

m. Payment:
1) Owner's Project financing and funding, as applicable.
2) Owner's tax-exempt status.
3) Preliminary Schedule of Values
4) Procedures for measuring for payment.
5) Retainage.
6) Progress payment procedures.
7) Prevailing wage rates and payrolls.

n. Testing and inspections, including notification requirements.
o. Disposal of demolition materials.
p. Record documents.
q. Preliminary Discussion of Contract Closeout:
1) Procedures for Substantial Completion.
2) Contract closeout requirements.
3) Correction period.
4) Duration of bonds and insurance.

2. Site Mobilization (if not covered in a separate meeting):
a. Working hours and overtime.
b. Field offices, storage trailers, and staging areas.
c. Temporary facilities.
d. Temporary utilities and limitations on utility consumption (where applicable).
e. Utility company coordination (if not done as a separate meeting).
f. Access to Site, access roads, and parking for construction vehicles.
g. Maintenance and protection of traffic.
h. Use of Site and premises.
i. Protection of property.
j. Security.
k. Temporary controls, such as sediment and erosion controls, noise controls, dust control, storm water controls, and other such measures.
l. Site barriers and temporary fencing.
m. Storage of materials and equipment.
n. Reference points and benchmarks; surveys and layouts.
o. Site maintenance during the Project.
p. Cleaning and removal of trash and debris.
q. Restoration.

3. General discussion and questions.
4. Next meeting.
5. Site visit, if required.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 31 19.23

PROGRESS MEETINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Progress meetings will be held throughout the Project. CONTRACTOR shall attend each progress meeting prepared to discuss in detail all items on the agenda.
   2. ENGINEER will preside at progress meetings and will prepare and distribute minutes of progress meetings to all meeting participants and others as requested.

1.2 PREPARATION FOR PROGRESS MEETINGS

A. Date and Time:
   1. Regular Meetings: Every other week on a day and time agreeable to OWNER, ENGINEER, and CONTRACTOR. Meetings to be conducted using Microsoft Teams or other agreed-to teleconference method.
   2. Other Meetings: As required.

B. Location:
   1. CONTRACTOR's field office at the Site or other location mutually agreed upon by OWNER, CONTRACTOR, and ENGINEER.

D. Handouts:
   1. CONTRACTOR shall bring to each progress meeting each of the following:
      a. List of Work accomplished since the previous progress meeting.
      b. Up-to-date Progress Schedule.
      c. Up-to-date Schedule of Submittals.
      d. Detailed "look-ahead" schedule of Work planned through the next progress meeting, with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting the OWNER, Project, and Site.
      e. When applicable, list of upcoming, planned time off (with dates) for personnel with significant roles on the Project, and the designated contact person in their absence.

1.3 REQUIRED ATTENDANCE

A. Representatives present for each entity shall be authorized to act on that entity's behalf.

B. Required Attendees:
   1. CONTRACTOR:
      a. Project manager.
      b. Site superintendent.
      c. Safety representative.
      d. When needed for the discussion of a particular agenda item, representatives of Subcontractors and Suppliers shall attend meetings.
   2. Construction coordinator (if any).
   3. ENGINEER:
      a. Project manager or designated representative
      b. Resident Project Representative (if any).
      c. Others as required by ENGINEER.
   4. OWNER's representative(s), as required.
   5. Testing and inspection entities, as required.
   6. Others, as appropriate.

1.4 AGENDA

A. Preliminary Agenda: Be prepared to discuss in detail the topics listed below. Revised agenda, if any, will be furnished to CONTRACTOR prior to first progress meeting. Progress meeting agenda may be modified by ENGINEER during the Project as required.
   1. Review, comment, and amendment (if required) of minutes of previous progress meeting.
   2. Review of progress since the previous progress meeting.
   3. Planned progress through next progress meeting.
   4. Review of Progress Schedule
      a. Contract Times, including Milestones (if any)
      b. Critical path.
      c. Schedules for fabrication and delivery of materials and equipment.
      d. Corrective measures, if required.
   5. Submittals:
      a. Review status of critical submittals.
      b. Review revisions to Schedule of Submittals.
   6. Contract Modifications
      a. Requests for interpretation
      b. Written clarifications
      c. Field Orders
      d. Proposal Requests
      e. Change Proposals
      f. Work Change Directives.
      g. Change Orders.
      h. Claims.
   7. Applications for progress payments.
   8. Problems, conflicts, and observations.
   9. Quality standards, testing, and inspections.

10. Coordination between parties.
11. Site management issues, including access, security, maintenance and protection of traffic, maintenance, cleaning, and other Site issues.
12. Safety.
13. Permits.
14. Construction photographic documentation.
15. Record documents status.
16. Punch list status, as applicable.
17. Other business.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 31 26

ELECTRONIC DOCUMENT PROTOCOL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section establishes the procedures with which the parties will comply regarding transmission or exchange of electronic data for the Project.
   2. Contractor shall provide labor, materials, tools, equipment, services, utilities, and incidentals shown, specified, and required for complying with this Section throughout the Project.
   3. This Section does not supersede the General Conditions, as may be modified by the Supplementary Conditions, regarding transmitting of the Contract Documents to Contractor after the Effective Date of the Contract.
   4. In addition to the requirements of this Section, comply with requirements for exchange of electronic data in the following:
      a. Section 01 32 16, Progress Schedule.
      b. Section 01 32 33, Photographic Documentation.

B. Coordination:
   1. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

1.2 TERMINOLOGY

A. The term “Electronic Document” is defined in Paragraph1.01.A.20 and the term “Electronic Means” is defined in Paragraph1.01.A.21 of the General Conditions.

B. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. “Confidential information” means electronic data that the transmitting party has designated as confidential and clearly marked with an indication such as “Confidential”, “Business Proprietary”, or similar designation.
   2. “Written” or “in writing” means any and all communications, including without limitation a notice, consent, or interpretation, prepared and sent to an address provided in the Contract Documents or otherwise agreed upon by the parties and Engineer using a transmission method sent forth in this Section that allows the recipient to print or store the communication.

Communications transmitted electronically are presumed received when sent in conformance with this Paragraph 1.2.A.3.

1.3 ELECTRONIC DOCUMENTS

A. Transmission of Electronic Documents constitutes a warrant by the transmitting party to the receiving party that the transmitting party is one or more of the following:
   1. The copyright owner of the Electronic Document.
   2. Has permission from the copyright owner to transmit the Electronic Document for its use on the Project.
   3. Is authorized to transmit confidential information.

B. Receiving party agrees to keep confidential information confidential and not to disclose it to another person except to (1) its employees, (2) those who need to know the content of the confidential information to perform services or construction solely and exclusively for the Project, or (3) its consultants, contractors, Subcontractors, and Suppliers whose contracts include similar restrictions on the use of any Electronic Document and confidential information.

C. Transmitting party does not convey any right in any Electronic Document or in the software used to generate or transmit such data. Receiving party may not use electronic data unless permission to do so is provided in the Contract Documents, or in a separate license.

D. Unless otherwise granted in a separate license, receiving party's use, modification, or further transmission of Electronics Documents, as provided the Contract Documents, is specifically limited to the design and construction of the Project in accordance with this Section, and nothing contained in this Section conveys any other right to use the Electronic Document for any other purpose.

E. To the fullest extent permitted by Laws and Regulations, receiving party shall indemnify and defend the transmitting party from and against all claims arising from or related to receiving party's modification to, or unlicensed use of, Electronic Documents.

1.4 ELECTRONIC DOCUMENT PROTOCOL

A. Basic Requirements
   1. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.
   2. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.
   3. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged

using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.

4. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

B. System Infrastructure For Electronic Document Exchange

1. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.
    a. The maximum size of an email attachment for exchange of Electronic Documents under this EDP is 20 MB. Attachments larger than that may be exchanged using large file transfer functions or physical media.
    b. Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.
2. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.
3. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.
4. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall

cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

5. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.
6. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.
7. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.

C. Software Requirements For Electronic Document Exchange; Limitations

1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.
    a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.
2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.
3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this Section, including software versions, if listed.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EXHIBITS

A. Exhibit A, Software Requirements for Electronic Document Exchange following this Section's "End of Section" designation, is part of this Specifications Section.

+ + END OF SECTION + +

Exhibit A - Software Requirements for Electronic Document Exchange

Item	Electronic Documents	Transmittal Means	Data Format	Note (1)
a.1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
a.2	Meeting agendas, meeting minutes, RFI's and responses to RFI's, and Contract forms.	Email w/ Attachment	PDF	(2)
a.3	Contactors Submittals (Shop Drawings, "or equal" requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Engineer, and Owner's and Engineer's responses to Contractor's Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment	PDF	
a.4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Engineer and for responses from Engineer and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE	PDF	
a.5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE	DWG	
a.6	Correspondence, reports and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE	DOC	
a.7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	EXC	
a.8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	DB	

Notes	
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.

Key	
Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies
LFE	Agreed upon Large File Exchange method (FTP, CD, DVD, hard drive)
PDF	Portable Document Format readable by Adobe® Acrobat Reader Version **[2020]** or later
DWG	Autodesk® AutoCAD .dwg format Version **[2018]**
DOC	Microsoft® Word .docx format Version **[2211]**
EXC	Microsoft® Excel .xls or .xml format Version **[2211]**
DB	Microsoft® Access .mdb format Version **[2211]**

SECTION 01 32 16

PROGRESS SCHEDULE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall prepare and submit Progress Schedules and related documents in accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section, unless otherwise accepted by ENGINEER.
   2. Maintain and update Progress Schedules and related documents.
   3. Progress Schedule shall be resource loaded CPM Progress Schedule.
   4. ENGINEER's acceptance of the Progress Schedule or related documents, and comments or opinions concerning activities in the Progress Schedule and related documents shall not control CONTRACTOR's independent judgment concerning means, methods, techniques, sequences and procedures of construction, unless the associated means, method, technique, sequence, or procedure is directed by the Contract Documents. CONTRACTOR is solely responsible for complying with the Contract Times.

B. Use of Float:
   1. Float belongs to the Project and may be used by OWNER or CONTRACTOR to accommodate changes in the Work, or to mitigate the effect of events that delay performance or compliance with the Contract Times.
   2. Changes or delays that influence Activities that have float and that do not extend the Critical Path are not justification for an extension of the Contract Times.

C. Factors Affecting the Progress Schedule:
   1. In preparing the Progress Schedule, take into consideration submittal requirements and submittal review times, time for fabricating and delivering materials and equipment, source quality control (including shop testing) and field quality control (including testing at the Site), Subcontractors' work, availability and abilities of workers, availability of construction equipment, weather conditions, restrictions in operations at the Site and coordination with OWNER's operations, and other factors that have the potential to affect completion of the Work within the Contract Times.
   2. Comply with sequencing requirements indicated in the following:
      a. Section 01 11 13, Summary of Work.
      b. Section 01 13 13, Milestones.
      c. Section 01 14 16, Coordination with Owner's Operations.
      d. Section 01 31 19.23, Progress Meetings.
      e. Section 01 31 26, Electronic Document Protocol.

1.2 DEFINITIONS

A. The following terms are defined for this Section and supplement the terms defined in the General Conditions and Supplementary Conditions:
   1. Activity: An element of the construction work that has the following specific characteristics: consumes time, consumes resources, has a definable start and finish, is assignable, and is measurable.
   2. Constraint: An imposed date on the Progress Schedule or an imposed time between Activities. The Contract Times are Constraints.
   3. CPM Progress Schedule: Computerized Progress Schedule in Critical Path Method (CPM) format which accounts for the entire Work, defines the interrelationships between elements of the Work, reflects the uncompleted Work, and indicates the sequence with which the Work has been completed, indicates the sequence in which uncompleted Work will be completed, and indicates the duration of each Activity.
   4. Critical Path: The continuous chain of Activities with the longest duration for completion within the Contract Times.
   5. Early Start: The earliest possible date an Activity can start according to the assigned relationships among Activities.
   6. Early Finish: The earliest date an Activity can finish according to the assigned relationships among the Activities.
   7. Late Finish: The latest date an Activity can finish without extending the Contract Times.
   8. Late Start: The latest date an Activity can start without extending the Contract Times.
   9. Float: The time difference between the calculated duration of the Activity chain and the Critical Path.
   10. Total Float: The total number of days that an Activity (or chain of Activities) can be delayed without affecting the Contract Times.
   11. Network Diagram: A time-scaled logic diagram depicting the durations and relationships of the Activities.
   12. Work Areas, Area, or System: A logical breakdown of the Project elements or a group of Activities which, when collectively assembled, are readily identifiable on the Project (for example: yard piping, a structure or building, a treatment process, or other logical grouping).

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Progress Schedule Preparer:
      a. CONTRACTOR shall retain services of a scheduling consultant or shall self-prepare and maintain the Progress Schedule using qualified employee with experience in scheduling, and experienced with the scheduling software required for the Project, and experience serving as Progress Schedule preparer on construction projects of similar type, size, and scope to this Project.

b. Progress Schedule preparer shall have not less than five years experience using the schedule software required on construction projects of similar type, size, and scope as the Project.
c. Prior to engaging a scheduling consultant or using a qualified employee, submit to ENGINEER the following:
   1) Name and address of proposed Progress Schedule preparer and the names of personnel who will be assigned to scheduling the Project.
   2) Information sufficient to demonstrate that proposed Progress Schedule preparer and scheduling personnel to be assigned to the Project possess qualifications complying with this Section. For each person assigned, submit list of similar type, size, contract value of projects, names and contact information of engineer or architect and owner.
d. Engineer's Review of Qualifications:
   1) ENGINEER will respond to CONTRACTOR whether proposed scheduling personnel are acceptable within five days after ENGINEER's receipt of complete qualifications.
   2) If qualifications are not acceptable, submit qualifications of acceptable personnel within five days of receipt of ENGINEER's non-acceptance.
   3) ENGINEER's acceptance or non-acceptance of qualifications does not release CONTRACTOR from its obligations under the Contract Documents.

1.4 SUBMITTALS

A. Quantity of each submittal required and timing of submittals are in this Section.

B. Informational Submittals: Submit the following:
   1. Initial Progress Schedules:
      a. Preliminary Progress Schedule with associated Network Diagrams and narrative report.
      b. Acceptable Progress Schedule with associated Network Diagrams and narrative report.
      c. Preliminary resource-loaded Progress Schedule and associated reports.
      d. Acceptable resource-loaded Progress Schedule and associated reports.
      e. Submit each Progress Schedule submittal with letter of transmittal complying with requirements of Section 01 33 00, Submittal Procedures.
   3. Progress Schedule Updates.
      a. Progress Schedule updates shall comply with requirements of this Section, and shall include updated Progress Schedule, narrative report, updated Network Diagram when relationships among Activities are changed.
      b. Submit updated Progress Schedule prior to each progress meeting. When a Progress Schedule remains unchanged from one progress meeting to the next, submit a written statement to that effect. In addition to monthly Progress Schedule submittals, also bring to progress meeting the number of printed copies of the updated Progress Schedule indicated in Section 01 31 19.23, Progress Meetings.

4. Look-Ahead Schedules
    a. Furnish 30-day look-ahead schedule at each progress meeting.
5. Time Impact Analyses: Submit in accordance with this Section.
6. Recovery Schedule: Submit in accordance with this Section.
7. Qualifications:
    a. Submit qualifications of Progress Schedule preparer, and other personnel that will assist Progress Schedule preparer in preparing and maintaining the Progress Schedule.

1.5 INITIAL PROGRESS SCHEDULES

A. Type and Organization of Progress Schedules:
1. Prepare Progress Schedule using Microsoft Project software, unless other scheduling software is acceptable to ENGINEER.
2. Sheet Size: 11 inches by 17 inches, unless otherwise accepted by ENGINEER.
3. Time Scale: Indicate first date of each work week.
4. Activity Designations: Indicate title and related Specifications Section number.
5. Progress Schedules shall be CPM Progress Schedules.
6. Organization:
    a. Indicate on the separate Schedule of Submittals dates for submitting and reviewing Shop Drawings, Samples, and other submittals.
    b. Group deliveries of materials and equipment into a separate sub-schedule that is part of the Progress Schedule.
    c. Group construction into Work Area sub-schedules (that are part of the Progress Schedule) by Activity.
    d. Clearly indicate the Critical Path on the Progress Schedule.
    e. Organize each Work Area sub-schedule by Specifications Section number.

B. Preliminary Progress Schedule:
1. Within 10 days after the Contract Times commence running, CONTRACTOR shall submit to ENGINEER the preliminary Progress Schedule covering the entire Project, with associated Network Diagrams.
2. Submit preliminary Progress Schedule in accordance with Section 01 31 26, Electronic Document Protocol and Section 01 33 00, Submittal Procedures. Also submit preliminary Progress Schedule in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Document Protocol.
3. ENGINEER will conduct a timely review of the preliminary Progress Schedule.
4. Preliminary Progress Schedule shall comply with the Contract Documents relative to Progress Schedules, but need not be resource-loaded.

C. Initial Acceptance of Progress Schedule:
1. Not less than 10 days before submission of the first Application for Payment, a scheduling conference attended by CONTRACTOR, Progress Schedule preparer, ENGINEER, and others as appropriate will be held at the Site to

review for acceptability to ENGINEER the preliminary Progress Schedule and associated Network Diagram and other reports and schedule-related documents required. Following the scheduling conference, CONTRACTOR shall have 10 days to make corrections and adjustments and to complete and resubmit the Progress Schedule and associated Network Diagram. No progress payment will be made to CONTRACTOR until acceptable Progress Schedule, Network Diagram, and other reports and schedule-related documents required are submitted to ENGINEER.

2. Submit acceptable Progress Schedule, together with Network Diagram, reports, and other schedule-related documents required to accompany the initial acceptable Progress Schedule, in accordance with the Submittals Article of this Section, Section 01 31 26, Electronic Document Protocol, and Section 01 33 00, Submittal Procedures. Also submit acceptable form of Progress Schedule in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Document Protocol.
3. The Progress Schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within the Contract Times, in accordance with the Contract Documents. Such acceptance will not impose on ENGINEER responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.
4. Initially-accepted Progress Schedule shall be identified as the baseline Progress Schedule.

D. Resource-Loaded Progress Schedule:
   1. Not more than 15 days after ENGINEER's acceptance of the Progress Schedule, submit to ENGINEER resource-loaded Progress Schedule complying with resource-loading requirements in this Section.
   2. Submit of the preliminary and the acceptable resource-loaded Progress Schedules and associated reports to accompany the initial submittals of resource-loaded Progress Schedules in accordance with the Submittals Article of this Section, Section 01 31 26, Electronic Document Protocol, and Section 01 33 00, Submittal Procedures. Also submit preliminary and acceptable form of resource-loaded Progress Schedules in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Document Protocol.
   3. Resource-loaded Progress Schedules will be reviewed by ENGINEER within 10 days of ENGINEER's receipt, and ENGINEER's comments will be transmitted to CONTRACTOR.
   4. Make revisions required in accordance with ENGINEER's comments and resubmit to ENGINEER within 10 days of CONTRACTOR's receipt of ENGINEER's comments.
   5. Resource-loaded Progress Schedule accepted by ENGINEER shall be the basis for determining the amount of each CONTRACTOR progress payment.

E. If the Progress Schedule reflects completion date(s) different than the Contract Times, the Contract Times are not thereby voided, nullified, or affected. The Contract Times govern. Where the Progress Schedule reflects completion date(s) that are earlier than the Contract Times, ENGINEER may accept such Progress Schedule with CONTRACTOR to specifically understand that no Change Request or Claim for additional Contract Times or additions to the Contract Price shall be brought against OWNER resulting from CONTRACTOR's failure to complete the Work by the earlier date(s) indicated on the accepted Progress Schedule.

1.6 PROGRESS SCHEDULE UPDATES

A. Updates:
   1. Update the Progress Schedule not less-often than once per month. If during progress of the Work events develop that necessitate changes in the initially accepted Progress Schedule (e.g., baseline Progress Schedule), identify updated Progress Schedules sequentially as "Progress Schedule Revision 1", "2", "3", and continuing in sequence as required. Number the Progress Schedule submittals in accordance with Section 01 33 00, Submittal Procedures.
   2. CONTRACTOR's Progress Schedule update shall include a narrative report in accordance with this Section. Narrative report shall include description of current progress and status of each Area of the Project, a description of progress for the period, a description of the Critical Path, a discussion of current or potential delays, Change Orders (pending and approved in since the previous Progress Schedule update), and other problems associated with maintaining the Work on schedule.
   3. The update to the Progress Schedule shall be based on retained logic. Progress override logic is not allowed.
   4. Required scheduling software, and schedule organization, format, and content for updated Progress Schedules are identical to that required in this Section for initial Progress Schedules.
   5. Submit to ENGINEER updated Progress Schedule, together with Network Diagram (when required), reports, and other schedule-related documents required to accompany the updated Progress Schedule, in accordance with Section 01 31 26, Electronic Document Protocol, and Section 01 33 00, Submittal Procedures. Also submit updated Progress Schedule in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Document Protocol.
   6. Submit updated Network Diagrams when revisions are proposed to the logic. Indicate in the narrative report delays that have occurred since the previous updated Progress Schedule. ENGINEER will not recommend payment by OWNER of progress payments until updated Progress Schedule is received, reviewed, and accepted by ENGINEER. Payment for out-of-sequence Work is not allowed.

B. Monthly Schedule Meeting:

1. During the month, utilizing the previous month's 30-day look-ahead schedule. CONTRACTOR shall record the percent complete, start and finish dates of each scheduled Activity with the remaining duration for each Activity started but not completed, including Activities associated with procurement of materials and equipment.
2. On the same day each month, not less than one week prior to a progress meeting, CONTRACTOR, Progress Schedule preparer, ENGINEER, and others as appropriate shall meet at the Site and tour the Work to review and update the schedule and progress information gathered by CONTRACTOR during the month. After acceptance of CONTRACTOR's updated data, Progress Schedule preparer shall use this information to update the Progress Schedule.

1.7 NETWORK DIAGRAMS (PERT CHARTS)

A. Not Used.

1.8 RESOURCE LOADING REPORTS

A. Resource Loading:
   1. After ENGINEER's initial acceptance of the Progress Schedule, CONTRACTOR shall assign resources for personnel labor-hours, materials, and equipment to each construction Activity within each responsibility code. Submit resource schedule reports with each updated Progress Schedule.

1.9 NARRATIVE REPORT

A. Prepare and include with the preliminary Progress Schedule and each subsequent Progress Schedule submittal, written narrative report describing the schedule-related requirements of the Contract Documents and CONTRACTOR's plan and schedule for complying with such requirements. Narrative report shall describe the methods of sequencing and operation, resources to be employed, time frames for the construction of each of the major Systems on the Project, and time frames for complying with the Contract Times and CONTRACTOR's interim schedule milestones.

1.11 TIME IMPACT ANALYSIS

A. Time Impact Analyses – General:
   1. Prepare and submit a time impact analysis when one or more of the following occurs: a Change Proposal is prepared, a Work Change Directive is issued that will affect the Progress Schedule, or when delays are experienced. Time impact analysis shall illustrate the influence of each Change Order, Work Change Directive, allowance authorization, or delay, as applicable, on the Contract Times and schedule milestones.
   2. Each time impact analysis shall include a sketch (fragnet) demonstrating how CONTRACTOR proposes to incorporate the changes in the Work or, as

applicable, delays into the Progress Schedule. Fragnet shall include all logic, resource changes, and additions required as result of said Change Order, Work Change Directive, allowance authorization, or delay.

3. Fragnet shall show all CPM logic revisions for the Work associated with the Change Order, Work Change Directive, allowance authorization, or delay and its relationship to other Activities in the Network Diagram.
4. Time impact analysis shall demonstrate the time impact, based on date the Change Order, Work Change Directive, or allowance authorization was given to CONTRACTOR, or as applicable the date the delay was implemented; the status of the Work at that point in time; and the Activity duration of affected Activities. Activity duration used in the time impact analysis shall be those included in the latest update of the Progress Schedule accepted by ENGINEER, closest to the time of the start of the delay or start of the Change Order, Work Change Directive, or allowance authorization as adjusted by mutual, written agreement of the parties and ENGINEER.
5. Timing of Time Impact Analysis:
    a. Submit each time impact analysis within 10 days after the following, as applicable:
        1) Start of the delay.
        2) After the submittal of Change Proposal.
        3) After CONTRACTOR receipt of Work Change Directive.
    b. When CONTRACTOR does not submit time impact analysis for a specific change or delay, within the specified period of time for such submittal, such non-submittal shall be construed that no extension of the Contract Times is required.

B. Evaluation by Engineer and Acceptance:
    1. ENGINEER's evaluation of each time impact analysis comprised of complete information will be completed in timely manner after ENGINEER's receipt. Changes in the Contract Times will be made only by Change Order.
    2. When mutual agreement is reached between the parties on effect of the change or delay in the Project, incorporate into the next Progress Schedule update the associated fragnets illustrating the influence of changes and delays.

1.12 RECOVERY SCHEDULES

A. Recovery Schedules – General:
    1. When updated Progress Schedule indicates that the ability to comply with the Contract Times falls 10 or more days behind schedule, and there is no excusable delay, Change Order, or Work Change Directive to support an extension of the Contract Times, CONTRACTOR shall prepare and submit a Progress Schedule demonstrating CONTRACTOR's plan to accelerate the Work to achieve compliance with the Contract Times ("recovery schedule") for ENGINEER's acceptance.
    2. Submit recovery schedule within 10 days after submittal of updated Progress Schedule where need for recovery schedule is indicated.

B. Implementation of Recovery Schedule:
   1. At no additional cost to OWNER, do one or more of the following: furnish additional labor, provide additional construction equipment, provide suitable materials, employ additional work shifts, expedite procurement of materials and equipment to be incorporated into the Work, and other measures necessary to complete the Work within the Contract Times.
   2. Upon acceptance of recovery schedule by ENGINEER, incorporate recovery schedule into the next Progress Schedule update.

C. Lack of Action:
   1. CONTRACTOR's refusal, failure, or neglect to take appropriate recovery action, or to submit a recovery schedule, shall constitute reasonable evidence that CONTRACTOR is not prosecuting the Work or separable part thereof with the diligence that will ensure completion within the Contract Times. Such lack of action shall constitute sufficient basis for OWNER to exercise remedies available to OWNER under the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall retain professional photographer to perform services specified, including:
      a. Digital photography.
   2. Furnish photographic documentation for the following:
      a. Pre-construction.
      b. Construction progress.
      c. Final.

B. Image Quality:
   1. Photographic documentation shall be in color.
   2. Photographic images shall be suitably staged and set up ("framed"), focused, and shall have adequate lighting to illuminate the Work and conditions that are the subject of the photograph.
   3. For still photographs, use camera with minimum 16.0-megapixel resolution.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Photographer:
      a. None.

B. At the Site, ENGINEER or Resident Project Representative will indicate the views to be taken and will select time at which images will be taken. Photographic subjects, views, and angles will vary with progress of the Work.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Pre-construction Photographic Documentation: Submit acceptable pre-construction photographic documentation (prints and digital files) prior to mobilizing to and disturbing the Site. Submit pre-construction photographic documentation not later than the first Application for Payment, unless other schedule for pre-construction photographic documentation is accepted by ENGINEER.
   2. Construction Progress Photographic Documentation: Submit acceptable construction progress photographic documentation (prints and digital files) not

less-often than monthly. Submit with each Application for Payment, unless otherwise agreed to by ENGINEER.

3. Qualifications Statements:
    a. When requested by ENGINEER, prior to starting photographic documentation, submit photographer qualifications and record of experience. List of construction photography experience shall include the following for each project:
        1) Project name and location
        2) Nature of construction.
        3) Photographer's client with contract information.
        4) Approximate duration of photographer's services.

B. Closeout Submittals: Submit the following:
    1. Final Photographic Documentation: Submit acceptable final photographic documentation (prints and digital files) prior to requesting the final inspection by ENGINEER.

1.4 PHOTOGRAPHIC DOCUMENTATION – GENERAL

A. Photographic Prints:
    1. Quantity: For each photograph taken, submit to ENGINEER three prints.
    2. Print Size and Finish:
        a. Photographs: Submit five-inch by seven-inch prints on professional-grade, nine-mil-thick, photographic paper with semi-gloss or satin finish, unless otherwise specified.
    3. Include the following information on back of each print:
        a. Date photograph was taken.
        b. Name of OWNER.
        c. Name of the Site.
        d. Project name.
        e. Description of view shown in photograph.
        f. Photographer name and address.

B. Digital Files of Photographs:
    1. For each photograph taken, furnish high-quality digital image in "JPG" file format compatible with Microsoft Windows 7 and higher operating systems.
    2. Image resolution shall be sufficient for clear, high-resolution prints. Minimum resolution shall be 150 dots per inch (dpi). Minimum size of digital images shall be equal to specified print size .
    3. Do not imprint date and time in the image.
    4. Electronic image filename shall describe the image; do not submit filenames automatically created by digital camera. For example, an acceptable electronic filename would be, "Dewatering Building – Looking West at Centrifuge No. 2.jpg".
    5. Form of Digital Submittal – Images on Discs:
        a. Submit digital files on compact discs (CD) or digital video discs (DVD).

b. Submit three copies of each disc with digital files of photographic images.
c. Include the following information on front of each disc containing photographic documentation:
    1) Date(s) photographs were taken.
    2) Name of OWNER.
    3) Name of the Site.
    4) Project name.
    5) Photographer name and address.

1.5 PRE-CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION

A. Pre-construction Photographic Documentation:
    1. Obtain and submit sufficient pre-construction photographic documentation to record Site conditions prior to construction. Photographs shall document work areas of all prime contracts under the Project.

B. If disagreement arises on the condition of the Site and insufficient pre-construction photographic documentation was submitted prior to the disagreement, restore the grounds or area in question to extent directed by ENGINEER and to satisfaction of ENGINEER.

1.6 CONSTRUCTION PROGRESS PHOTOGRAPHIC DOCUMENTATION

A. Progress Photographs:
    1. Take photographs not less often than twice per month.
    2. Take not less than 20 photographs each time photographer is at the Site.
    3. Obtain and submit photographic documentation of each structure in the work area as directed by ENGINEER at the time photographic documentation is taken.

1.7 FINAL PHOTOGRAPHIC DOCUMENTATION

A. Final Photographs:
    1. Take photographs at time and day acceptable to ENGINEER. Do not take final photographs prior to Substantial Completion of the entire Project. Work documented in final photographs shall be generally complete, including painting and finishing, furnishings, landscaping, and other visible Work
    2. Take not less than 20 final photographs, based on scope of the Project at the time that the Contract Times commence running. Proportionately modify the number of final photographs if scope of Project is modified. Final photographs are not part of construction progress photographs required under Paragraph 1.6.A of this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing the following types of Submittals:
   1. Action Submittals that include:
      a. Shop Drawings.
      b. Product data.
      c. Delegated design Submittals, which include documents prepared, sealed, and signed by a design professional retained by Contractor, Subcontractor, or Supplier for materials and equipment to be incorporated into the completed Work. Delegated design Submittals do not include Submittals related to temporary construction unless specified otherwise in the related Specifications Section. Delegated design Submittals include: design drawings, design data including calculations, specifications, certifications, and other Submittals prepared by such design professional.
      d. Samples.
      e. Testing plans, procedures, and testing limitations.
   2. Informational Submittals that include:
      a. Certificates.
      b. Design data not sealed and signed by a design professional retained by Contractor, Subcontractor, or Supplier.
      c. Pre-construction test and evaluation reports, such as reports on pilot testing, subsurface investigations, testing for a potential Hazardous Environmental Condition, and similar reports.
      d. Supplier instructions, including installation data, and instructions for handling, starting-up, and troubleshooting.
      e. Source quality control Submittals (other than testing plans, procedures, and testing limitations), including results of shop testing.
      f. Field or Site quality control Submittals (other than testing plans, procedures, and testing limitations), including results of operating and acceptability tests at the Site.
      g. Supplier reports.
      h. Sustainable design Submittals (other than sustainable design closeout documentation).
      i. Special procedure Submittals, including plans for shutdowns and tie-ins and other procedural Submittals.
      j. Qualifications statements.
      k. Administrative Submittals including:
         1) Progress Schedules.

2) Schedules of Submittals.
3) Schedules of Values.
4) Photographic documentation.
5) Coordination drawings, when submittal of such is required.
6) Copies of permits obtained by Contractor.
7) Field engineering reports, survey data, and similar information.

3. Closeout Submittals that include:
   a. Maintenance contracts.
   b. Operations and maintenance data.
   c. Bonds, such as special maintenance bonds and bonds for a specific material, equipment item, or system.
   d. Warranty documentation.
   e. Record documentation.
   f. Sustainable design closeout documentation.
   g. Software.
   i. Keying.

B. Not Included in this Section: Administrative and procedural requirements for following are covered elsewhere in the Contract Documents:
   1. Requests for interpretations of the Contract Documents.
   2. Change Orders, Work Change Directives, and Field Orders.
   3. Applications for Payment
   4. Reports, documentation, and permit applications required to be furnished by Contractor to authorities having jurisdiction.

C. When type of Submittal is not specified and is not included in the list above, request an interpretation from Engineer.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Scheduling
   1. Provide Submittals well in advance of need for the material or equipment, or procedure (as applicable), in the Work and with ample time required for delivery of materials and equipment and to implement procedures following Engineer's approval or acceptance of the associated Submittal. Work covered by a Submittal will not be included in progress payments until approval or acceptance of related Submittals has been obtained in accordance with the Contract Documents.
   2. Samples and Submittals that are related to the same element of the Work or Specifications section should be furnished at the same time. Engineer will not review Submittals without associated Samples and will not review Samples without associated Shop Drawing or product data.
      a. Samples shall clearly illustrate functional characteristics of materials, all related parts and attachments, and full range of color, texture, pattern, and materials

B. Coordination for Multiple Prime Contracts

1. Expedite Submittals for Work that requires coordination with work of other contractors.
2. Simultaneously with furnishing Submittal to Engineer, transmit to each other prime contractor one copy of each Submittal, with transmittal letter to other contractors advising that Submittal is being furnished to Engineer.
3. Upon receipt of Submittal from another contractor, Contractor shall determine its effect on the Work. Within five days of receipt of Submittal, Contractor shall advise Engineer in writing of interferences, objections, or questions and request clarification.
4. If no interferences, objections, or questions are reported by other contractors within time specified, Engineer will assume that none exist and will review the Submittal. If Contractor fails to report interferences or objections of other contractors within time specified, Contractor shall, at no additional cost to Owner, do all cutting, restoring, or relocating that may result from interference or inconsistency with work performed relative to the Submittal as approved or accepted by Engineer.
5. After Submittal is approved or accepted by Engineer, the Engineer will distribute one copy to each other prime contractor, except for those Submittals that do no require written response from Engineer.

C. Dimensions: Contractor is responsible for dimensions to be confirmed and corrected at the Site; quantities; information pertaining solely to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the work of all trades.

D. Representation: Contractor's signature on Submittal's stamp and letter of transmittal shall be Contractor's representation that Contractor has complied with his obligations under the Contract Documents relative to that Submittal. Engineer and Owner shall be entitled to rely on such representations by Contractor.

1.3 SCHEDULE OF SUBMITTALS

A. Timing:
1. Furnish Schedule of Submittals within time frames indicated in the Contract Documents.
2. Submit updated Schedule of Submittals with each Submittal of the updated Progress Schedule.

B. Content: Identify on Schedule of Submittals all Submittals required in the Contract Documents. Requirements for content of preliminary Schedule of Submittals and subsequent updates of the Schedule of Submittals are identical. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Indicate Submittals that are on the Project's critical path. Indicate the following for each Submittal:
1. Date by which Submittal will be received by Engineer.

2. Whether Submittal will be for a substitution or "or-equal". Procedures for requesting approval of substitutes and "or-equals" are specified in the General Conditions, Section 01 25 00, Substitution Procedures, and Section 01 62 00, Product Options (for "or-equals").
3. Date by which Engineer's response is required. Not less than 14 days shall be allowed for Engineer's review, starting upon Engineer's actual receipt of each Submittal. Allow increased time for large or complex Submittals.
4. For Submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of other contractors, if any.

C. Prepare Schedule of Submittals using same software, and in same format, specified for Progress Schedules in Section 01 32 16, Progress Schedule.

D. Coordinate Schedule of Submittals with the Progress Schedule.

E. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate Submittals on the Project's critical path, or that that places extraordinary demands on Engineer for time and resources, is unacceptable. Do not include Submittals not required by the Contract Documents.

F. In preparing Schedule of Submittals:
   1) Consider the nature and complexity of each Submittal, and allow sufficient time for review and revision.
2. Reasonable time shall be allowed for: Engineer's review and processing of Submittals, for Submittals to be revised and resubmitted, and for returning Submittals to Contractor.
3, Identify and accordingly schedule Submittals that are expected to have long anticipated review times.

1.4 PROCEDURE FOR SUBMITTALS

A. Submittal Identification System: Use the following Submittal identification system, consisting of Submittal number and review cycle number.
1. Submittal Number: Shall be separate and unique number correlating to each individual Submittal required. Assign Submittal numbers as follows:
   a. First part of Submittal number shall be the applicable Specifications Section number, followed by a hyphen.
   b. Second part of Submittal number shall be a three-digit number (sequentially numbered from 001 through 999) assigned to each separate and unique Submittal furnished under the associated Specifications Section.
   c. Submittal number for the third Submittal furnished for Section 40 05 19, Ductile Iron Process Pipe, would be "40 05 19-003".
2. Review Cycle Number: Shall be a letter designation indicating the initial Submittal or re-submittal associated with each Submittal number:
   a. "A" = Initial (first) Submittal.

b. "B" = Second Submittal (e.g., first re-submittal).
c. "C" = Third Submittal (e.g., second re-submittal).

3. Examples:

Example Description	Submittal Identification	
	Submittal No.	Review Cycle
Initial (first) review cycle of the third Submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	A
Second review cycle (first re-submittal) of third Submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	B

B. Letter of Transmittal for Submittals:
1. Each letter of transmittal shall be for one Specifications Section.
2. At beginning of each letter of transmittal, include a reference heading indicating: Contractor's name, Owner's name, Project name, Contract designation, transmittal number, and Submittal number.
3. For Submittals with proposed deviations from requirements of the Contract Documents, letter of transmittal shall specifically describe each proposed variation.

C. Contractor's Review and Stamp:
1. Contractor's Review: Before transmitting Submittals to Engineer, review Submittals to:
   a. ensure proper coordination of the Work;
   b. determine that each Submittal is in accordance with Contractor's needs;
   c. verify that Submittal contains sufficient information for Engineer to determine compliance with the Contract Documents.
2. Incomplete or inadequate Submittals will be returned without review.
3. Contractor's Stamp and Signature:
   a. Each Submittal furnished shall bear Contractor's stamp of approval and signature, as evidence that Submittal has been reviewed by Contractor and verified as complete and in accordance with the Contract Documents.
   b. Submittals without Contractor's stamp and signature will be returned without review. Signatures that appear to be computer-generated will be regarded as unsigned and the associated Submittal will be returned without review.
   c. Contractor's stamp shall contain the following:

"Project Name: _____

Contractor's Name: _____

Contract Designation: _____

Date: _____

---------- *Reference* ----------

Submittal Title: _____

Specifications:

Section: _____

Page No.: _____

Paragraph No.: _____

Drawing No.: _____ of _____

Location of Work: _____

Submittal No. and Review Cycle: _____

Coordinated by Contractor with Submittal Nos.: _____

_____

I hereby certify that the Contractor has satisfied Contractor's obligations under the Contract Documents relative to Contractor's review and approval of this Submittal. Approved for Contractor by: _____"

D. Submittal Marking and Organization:
   1. Mark on each page of Submittal and each individual component submitted with Submittal number and applicable Specifications paragraph.
   2. Arrange Submittal information in same order as requirements are written in the associated Specifications Section.
   3. Each Shop Drawing sheet shall have title block with complete identifying information satisfactory to Engineer.
   4. Package together Submittals for the same Specifications Section. Do not furnish required information piecemeal.

E. Format of Submittal and Recipients:
   1. Action Submittals and Informational Submittals: Furnish in accordance with Table 01 33 00-A:

TABLE 01 33 00-A: SUBMITTAL CONTACTS AND REQUIRED FORMAT

	Address for Deliveries	Contact Person	E-mail Address	Format*	No. of Printed Copies
a.	Engineer: ARADIS U.S., Inc., 201 Fuller Road, Suite 201 Albany, NY 12203	TBD	TBD	E	Zero
b.	Resident Project Representative: At the Site.	TBD	TBD	E & P	One
c.	Other Prime Contractors (addresses TBD)	TBD	TBD	E	Zero
* **Format**: E = Electronic files; P = Printed copies. TBD = To Be Determined					

2. Samples:
   a. Securely label or tag Samples with Submittal identification number. Label or tag shall include clear space at least four inches by four inches in size for affixing Engineer's review stamp. Label or tag shall not cover, conceal, or alter appearance or features of Sample. Label or tag shall not be separated from the Sample.
   b. Submit quantity of Samples required in Specifications. If quantity of Samples is not indicated in the associated Specifications Section, furnish not less than three identical Samples of each item required for Engineer's approval. Samples will not be returned to Contractor. If Contractor requires Sample(s) for Contractor's use, so advise Engineer in writing and furnish additional Sample(s). Contractor is responsible for furnishing, shipping, and transporting additional Samples.
   c Deliver one Sample to Engineer's field office at the Site. Deliver balance of Samples to Engineer at address indicated in Table 01 33 00-A, unless otherwise directed by Engineer.
3. Closeout Submittals:
   a. Furnish the following Closeout Submittals in accordance with Table 01 33 00-A: maintenance contracts; bonds for specific materials, equipment, or systems; warranty documentation; and sustainable design closeout documentation. On documents such as maintenance contracts and bonds, include on each document furnished original ("wet") signature of entity issuing said document. When original "wet" signatures are required, furnish such Submittals in printed form and electronic form to Engineer, and to other entities furnish as indicated in Table 01 33 00-A.
   b. Operations and Maintenance Data: Submit in accordance with Section 01 78 23, Operation and Maintenance Data.
   c. Record Documentation: Submit in accordance with Section 01 78 39, Project Record Documentation.
   d. Software: Submit number of copies required in Specifications Section where the software is specified. If number of copies is not specified,

provide two copies on compact disc in addition to software loaded on Owner's computer(s) or microprocessor(s).

4. Maintenance Material Submittals: For spare parts, extra stock materials, and tools, furnish quantity of items specified in associated Specifications Section. Furnish in accordance with Section 01 78 43, Spare Parts and Extra Materials.

F. Electronic Submittals:
   1. Format: Electronic files shall be in accordance with Section 01 31 26, Electronic Document Protocol. Files shall be electronically searchable.
   2. Organization and Content:
      a. Each electronic Submittal shall be one file; do not divide individual Submittals into multiple files.
      b. When Submittal is large or contains multiple parts, furnish PDF file with bookmark for each section of Submittal.
      c. Content shall be identical to printed Submittal. First page of electronic Submittal shall be Contractor's letter of transmittal.
   3. Quality and Legibility: Electronic Submittal files shall be made from the original and shall be clear and legible. Do not submit scans of faxed copies. Electronic file shall be full size of original, printed documents. Properly orient all pages for reading on a computer screen.
   5. Submitting Electronic Files:
      a. Transmit electronic files in accordance with Section 01 31 26, Electronic Document Protocol.

G. Distribution:
   1. Distribution of Engineer's Response via Electronic Files: Upon completion of Engineer's review, electronic Submittal response will be distributed by Engineer to
      a. Contractor.
      b. Other prime contractors.
      c. Owner.
      d. Resident Project Representative (RPR).
      e. Engineer's file.

H. Resubmittals: Refer to the General Conditions for requirements regarding resubmitting required Submittals.

1.5 ENGINEER'S REVIEW

A. Submittals not required by the Contract Documents will not be reviewed by Engineer nor be recorded in Engineer's Submittal log and the Contractor will be advised accordingly andall printed copies of such Submittals will be returned to Contractor. Electronic copies of such Submittals, if any, will not be retained by Engineer.

B. Action Submittals, Results of Engineer's Review: Each Submittal will be given one of the following dispositions by Engineer:

1. Approved: Upon return of Submittal marked "Approved", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents.
2. Approved as Corrected: Upon return of Submittal marked "Approved as Corrected", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents, and in accordance with the corrections indicated in the Engineer's Submittal response.
3. Approved as Corrected – Resubmit: Upon return of Submittal marked "Approved as Corrected – Resubmit", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents, and in accordance with corrections indicated in Engineer's Submittal response. Furnish to Engineer a re-submittal with all corrections made. Receipt of corrected re-submittal is required before materials or equipment covered in the Submittal will be eligible for payment.
4. Revise and Resubmit: Upon return of Submittal marked "Revise and Resubmit", make the corrections indicated and re-submit to Engineer for approval.
5. Not Approved: This disposition indicates material or equipment that cannot be approved. Upon return of Submittal marked "Not Approved", repeat initial Submittal procedure utilizing approvable material or equipment, with a complete Submittal clearly indicating all information required.

C. Informational Submittals, Results of Engineer's Review:
   1. Each Submittal will be given one of the following dispositions:
      a. Accepted: Information included in Submittal complies with the applicable requirements of the Contract Documents, and is acceptable. No further action by Contractor is required relative to this Submittal, and the Work covered by the Submittal may proceed, and materials and equipment with Submittals with this disposition may be shipped or operated, as applicable.
      b. Not Accepted: Submittal does not indicate compliance with applicable requirements of the Contract Documents and is not acceptable. Revise Submittal and re-submit to indicate acceptability and compliance with the Contract Documents.

D. Closeout Submittals, Results of Engineer's Review: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Closeout Submittals will not receive a written response from Engineer. Disposition as "accepted" will be recorded in Engineer's Submittal log. When Closeout Submittal is not acceptable, Engineer will provide written response to Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 35 23

SAFETY REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section augments the requirements elsewhere in the Contract Documents regarding CONTRACTOR's responsibilities for safety and protection and includes requirements for CONTRACTOR's safety representative and other safety requirements applicable to the Project.
   2. CONTRACTOR shall provide labor, materials, tools, equipment, training, certifications, protective measures, and incidentals shown, specified, and required to comply with CONTRACTOR's obligations under the Contract for safety and protection of personnel and property.

B. Coordination:
   1. When multiple contractors are working at the Site, CONTRACTOR shall communicate to each other contractor, OWNER, ENGINEER, and other entities working at the Site those elements of CONTRACTOR's safety program with which such other entities are to comply.

C. Related Sections: Provisions of this Section are coordinated with, but are not limited to, the following:
   1. Section 01 35 43.13, Environmental Procedures for Hazardous Materials.
   2. Section 01 35 44, Spill Prevention Control and Countermeasures Plan.
   3. Section 01 52 16, First-Aid Facilities.
   4. Section 01 71 33, Protection of the Work and Property.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. CONTRACTOR's Safety Representative:
      a. ENGINEER's acceptance of CONTRACTOR's safety representative's qualifications does not in any way mitigate or relieve CONTRACTOR of CONTRACTOR's safety obligations under the Contract Documents.
      b. CONTRACTOR's safety representative shall possess not less than five years of experience serving as the safety representative on projects similar to or larger in size than this Contract, and for type(s) of construction similar in nature to the Work.
      c. CONTRACTOR's safety representative shall be experienced in the types of Work to be performed under the Contract and shall be experienced with safety precautions, procedures, and equipment appropriate for the safe performance of the Work.

d. Prior to the Effective Date of the Contract, shall have successfully completed a 30-hour OSHA Construction Safety and Health training course, and a 40-hour OSHA Hazardous Materials training course, and training for confined space entry.
e. CONTRACTOR's safety representative shall be completely experienced with and knowledgeable of all applicable health and safety Laws and Regulations and with good safety practices, and shall ensure compliance with such Laws and Regulations and practices at the Site.
f. Minimum responsibilities of CONTRACTOR's safety representative are indicated in this Section.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
1. Emergency contact information, in accordance with Article 1.5 of this Section.
2. Citations:
a. Copies of safety citations from authorities having jurisdiction and insurance companies, submitted within 24 hours of CONTRACTOR's receipt of such citations.
3. Qualifications Statements:
a. CONTRACTOR's Safety Representative: Submit name and qualifications of CONTRACTOR's safety representative, including summary of experience, and training received and valid certifications and accreditations applicable to the Project.

1.4 SAFETY REPRESENTATIVE RESPONSIBILITIES

A. General:
1. CONTRACTOR's safety representative shall be at the Site full-time when Work is in progress. When CONTRACTOR employs multiple shifts, furnish more than one safety representative as necessary.
2. CONTRACTOR's safety representative shall have appropriate space at the Site to maintain and keep available safety records, up-to-date copies of pertinent safety Laws and Regulations, Material Data Sheets, CONTRACTOR's site-specific health and safety plan, copies of OWNER's health and safety requirements with which CONTRACTOR shall comply, and the Site safety plan including information concerning foreseeable emergency conditions, and emergency contact information as required in Article 1.5 of this Section.

B. CONTRACTOR's safety representative's responsibilities include:
1. Duties and responsibilities in accordance with the General Conditions.
2. CONTRACTOR's safety representative shall coordinate with CONTRACTOR's "competent person" required under Laws and Regulations.
3. CONTRACTOR's safety representative shall attend progress meetings in accordance with Section 01 31 19.23, Progress Meetings.
4. Schedule and conduct safety meetings and safety training programs as required by Laws and Regulations, CONTRACTOR's Site-specific health and safety

plan (SSHASP), and good safety practices. Include in the SSHASP a specific schedule (dates) of such meetings and an outline of materials to be covered. Advise ENGINEER prior to the time and place of such meetings. Invite OWNER's personnel to meetings. Instruct CONTRACTOR's employees (and Subcontractors, Suppliers with personnel at the Site, and others for whom CONTRACTOR is responsible) on recognition of hazards, observance of precautions, of the contents of the SSHASP and other safety programs with which CONTRACTOR shall comply, and use of personal protective equipment (PPE) and safety equipment.

5. Determine that operators of specific construction equipment (and permanent equipment used for construction operations) are qualified by training and experience before such personnel are allowed to operate such equipment.
6. Develop and implement emergency response procedures, including names, locations, and contact telephone numbers for emergency services and medical assistance as indicated in requirements for the emergency contact list in Article 1.5 of this Section.
7. Post appropriate notices regarding health and safety Laws and Regulations at locations at the Site and CONTRACTOR's office that afford maximum exposure to personnel.
8. Post appropriate instructions and warning signs in regard to all hazardous areas and hazardous conditions that cannot be eliminated. Identification of such areas shall be based on experience, site surveillance, and severity of the associated hazard. Signage shall not be used in place of appropriate workplace controls.
9. Ascertain via personal inspection that safety Laws and Regulations and safety program requirements are enforced. Make inspections at appropriate frequencies to ensure that machines, tools, and equipment are in a safe operating condition; and that all work areas are free of hazards to the extent practicable. Implement necessary and timely corrective actions to eliminate unsafe acts and unsafe conditions, and submit to ARCADIS daily copy of findings resulting from inspection, using inspection checklist forms established in CONTRACTROR's SSHASP.
10. Submit to ENGINEER copies of safety citations from authorities having jurisdiction and insurance companies within 24 hours of CONTRACTOR's receipt of such citations.
11. Provide appropriate orientation to employees, visitors, Subcontractors, and Supplier personnel at the Site.
12. Perform all related tasks necessary to achieve the highest degree of safety that the nature of the Work allows.

1.5 EMERGENCY CONTACT INFORMATION

A. CONTRACTOR shall submit list of emergency contact information for 24-hour use throughout the Project. Emergency contact information shall be updated and kept current throughout the Project. If personnel or contact information change, furnish updated emergency contact information list at the next progress meeting.

B. CONTRACTOR's list of emergency contact information shall include:
   1. CONTRACTOR's project manager's office, field office, and cellular telephone numbers.
   2. CONTRACTOR's Site superintendent's office, field office, and cellular telephone numbers.
   3. CONTRACTOR's foreman's field office, and cellular (if available) telephone numbers.
   4. CONTRACTOR's safety representative's office, and cellular telephone numbers.
   5. Major Subcontractors' and Suppliers' office, and cellular telephone numbers of project manager and foreman (when applicable).

C. Additional Emergency Contact Information:
   1. OWNER's Chief Engineer: office and cellular, telephone numbers.
   2. OWNER's Executive Director: office and cellular telephone numbers.
   3. OWNER's central 24-hour emergency telephone number.
   4. ENGINEER's project manager's office, and cellular telephone numbers.
   5. ENGINEER's project engineer's office, and cellular telephone numbers.
   6. Resident Project Representative's office, field office, and cellular telephone numbers.
   7. Utility companies' 24-hour contact telephone number(s), including gas, water, sewer, oil, telephone, cable television/telecommunications, and other companies or concerns having utilities in the vicinity of the Work.
   8. Highway and street owners' 24-hour telephone number(s).
   9. Emergency telephone numbers, including: "Emergency: Dial 911", and seven-digit telephone numbers for the hospital, ambulance, police, and fire department nearest to the Site. Furnish names of each of these institutions.
   10. Other involved entities as applicable.
   11. Include with list of emergency contact information an 8.5-inch by 11-inch map showing route from the Site to the nearest hospital.

D. Emergency Contact Information for Multiple-Prime Contract Project:
   1. General CONTRACTOR shall have responsibility to assemble all emergency contact information into a single emergency contact list for the Project, and shall maintain, update, and redistribute the listing throughout the Project.
   2. Prime contractors other than General CONTRACTOR are not required to submit the "additional emergency contact information" indicated in Paragraph 1.5.C of this Section.
   3. Prime contractors other than General CONTRACTOR shall promptly furnish to General CONTRACTOR updated emergency contact information when prime contractor's emergency contact information or personnel change.

1.6 SAFETY EQUIPMENT

A. General:
   1. CONTRACTOR shall provide proper safety and rescue equipment, adequately maintained and readily available, for any foreseeable contingency.

2. Such equipment shall include items such as safety ropes and harnesses, fall-prevention devices, stretchers, water safety devices, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, combustible gas detectors, fire extinguishers and first-aid equipment in accordance with the Division 01 Specifications, and similar equipment.
3. Keep safety equipment in protected areas. Check safety equipment at scheduled intervals.
4. Temporary First-Aid Facilities: Provide and maintain in accordance with Section 01 52 16, First-Aid Facilities.

B. Safety Equipment Log:
1. Maintain a log indicating the person who checked the equipment, when equipment was checked, and that equipment was acceptable.
2. Update equipment log not less-often than monthly.
3. Include in safety representative's onsite records copies of equipment calibration records.

C. Provide replacement safety equipment when primary safety equipment is unavailable due to use or when undergoing maintenance.

D. Personal Protective Equipment (PPE):
1. All persons entering the work areas shall wear appropriate PPE required for the particular area.
2. Remove from the Site any person failing to comply with this or any other safety requirement.
3. Continuously provide all necessary PPE for ENGINEER's employees, Resident Project Representative, and consultants. ENGINEER will furnish for ENGINEER's employees and consultants protective helmets (hard hats), safety eyewear, reflective vests, and hearing protection. CONTRACTOR shall furnish other equipment required.

1.7 EVACUATION DRILL

A. Included in CONTRACTOR's SSHASP shall be evacuation drills, conducted not less-often than once every six months, scheduled and conducted by CONTRACTOR under supervision of CONTRACTOR's safety representative.

B. Perform evacuation drill during regular working hours, scheduled to minimize disruption of the Work.

C. Upon evacuation, CONTRACTOR and all personnel for whom CONTRACTOR is responsible, immediately advise ENGINEER's onsite personnel and OWNER's facility manager that all personnel have been evacuated.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 35 43.13

ENVIRONMENTAL PROCEDURES FOR HAZARDOUS MATERIALS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals necessary to comply with environmental procedures for Constituents of Concern.
   2. CONTRACTOR shall develop, implement, and maintain throughout the Project a hazardous materials management program (HMMP) in accordance with Laws and Regulations.
   3. Constituents of Concern Brought to Site by CONTRACTOR: Transport, handle, store, label, use, and dispose of in accordance with this Section, other applicable provisions of the Contract Documents, and Laws and Regulations.
   4. Constituents of Concern Generated by CONTRACTOR:
      a. Materials containing Constituents of Concern shall be properly handled, stored, labeled, transported and disposed of by CONTRACTOR in accordance with Laws and Regulations, and this Section.
      b. If CONTRACTOR will generate or has generated materials containing Constituents of Concern at the Site, obtain a USEPA identification number listing CONTRACTOR's name and address of the Site as generator of the Constituents of Concern. Obtain identification number from state environmental agency or similar authority having jurisdiction at the Site. Submit identification number within time frame specified in Article 1.3 of this Section.
      c. CONTRACTOR shall be responsible for identifying, analyzing, profiling, transporting, and disposing of Constituents of Concern generated by CONTRACTOR.
   5. Fines or civil penalties levied against OWNER for violations committed at the Site by CONTRACTOR, and costs to OWNER (if any) associated with cleanup of a Hazardous Environmental Condition created by CONTRACTOR shall be paid by CONTRACTOR. If CONTRACTOR has exacerbated a Hazardous Environmental Condition existing at the Site prior to the start of the Work, CONTRACTOR shall pay a share of costs associated with fines, civil penalties, and cleanup costs to in proportion equal to the extent of CONTRACTOR's responsibility for creating the Hazardous Environmental Condition and fines and civil penalties associated therewith.

B. Enforcement of Laws and Regulations:
   1. Interests of OWNER are that accidental spills and emissions, Site contamination, and injury of personnel at and near the Site are to be avoided.

2. When OWNER is aware of suspected violations, OWNER will notify CONTRACTOR, and authorities having jurisdiction if OWNER reasonably concludes that doing so is required by Laws or Regulations.
3. Responsibilities regarding Laws and Regulations shall be in accordance with the General Conditions, as may be modified by the Supplementary Conditions.

C. Related Sections:
1. Section 01 35 44, Spill Prevention Control and Countermeasures Plan.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following to the entity(ies) specified for each:
1. Constituents of Concern (including Chemicals) Proposed for Use at the Site:
a. Content:
1) Current (dated within the past two years) material safety data sheets (MSDS) in accordance with 29 CFR 1910.1200 (OSHA Hazard Communication Standard).
2) Manufacturer of material or equipment containing such substance.
3) Supplier (if different than manufacturer).
4) Container size(s) and number of containers proposed to be at the Site.
5) Minimum and maximum volume of material intended to be stored at the Site.
6) Description of process or procedures in which Constituent of Concern will be used at the Site.
b. Furnish the information required above in sufficient time to obtain OWNER's acceptance not later least three days before bringing Constituent of Concern to the Site.
c. Submit to OWNER's environmental representative with copy to ENGINEER.
2. Material Containing Constituents of Concern Generated at the Site:
a. Submit for each Constituent of Concern generated at the Site identification number, analysis results, and number and size of storage containers at the Site.
b. Furnish such information within not less than 48 hours after CONTRACTOR's receipt of analytical results.
c. Submit to OWNER's environmental representative with copy to ENGINEER.
3. Permits:
a. Submit copies of permits for storing, handling, using, transporting, and disposing of materials containing Constituents of Concern, obtained from authorities having jurisdiction.
b. Submit to OWNER's environmental representative with copy to ENGINEER.
4. Other Documents required for the HMMP: Submit to OWNER's environmental representative the requested documents within 72 hours of

CONTRACTOR's receipt of such request. HMMP documents may include emergency/spill response plan, communication plan, and other documents.

1.3 HAZARDOUS MATERIALS MANAGEMENT

A. Obtain OWNER's environmental representative's acceptance before bringing to the Site each material containing a Constituent of Concern.

B. Communication Plan:
   1. CONTRACTOR shall develop a communication plan relative to materials containing one or more Constituents of Concern.
   2. MSDS Notebooks:
      a. At minimum, maintain at the Site two notebooks containing: 1) Inventory of materials containing a Constituent of Concern (including all chemicals); and, 2) Current (dated within the past two years) material safety data sheets (MSDS) for all materials being used to accomplish the Work, whether or not defined as a Constituent of Concern.
      b. Keep one notebook in CONTRACTOR's field office at the Site; keep second notebook at location acceptable by OWNER's environmental representative.
      c. Keep notebooks up-to-date as materials are brought to and removed from the Site.

C. Emergency/Spill Response Plan: Develop, implement, and maintain an emergency/spill response plan, for each Constituent of Concern or each class/group of material containing a Constituent of Concern, as applicable. At minimum, response plan shall include the following:
   1. Description of equipment available at the Site to contain or respond to emergency related to or spill of the material.
   2. Procedures for notifying, and contact information for: authorities having jurisdiction, emergency responders, OWNER, ENGINEER, the public as applicable, and other entities as required.
   3. Response coordination procedures between CONTRACTOR, OWNER, and others as appropriate.
   4. Site plan showing proposed location of Constituents of Concern storage area and location of spill containment/response equipment, and location of storm water drainage inlets and drainage routes, including storm sewers, ditches and swales, and surface waters.
   5. Description of Constituent of Concern handling and spill response training provided to CONTRACTOR's and Subcontractors' employees, in accordance with 29 CFR 1926.21(b) and other Laws and Regulations.
   6. Comply with Section 01 35 44, Spill Prevention Control and Countermeasures Plan.

D. Storage of Materials~~s~~ Containing Constituents of Concern and Storage of Non-Hazardous Materials:

1. Vessels containing materials with a Constituent of Concern shall bear applicable hazard diamond(s).
2. Container Labeling:
    a. Properly label each container of consumable materials, whether or not classified as containing a Constituent of Concern.
    b. Stencil CONTRACTOR's name and, as applicable, Subcontractor's name, on each vessel containing a Constituent of Concern and, for non-hazardous materials, on each container over five-gallon capacity. Containers shall bear securely-attached label clearly identifying contents. Label containers that are filled from larger containers.
    c. If OWNER becomes aware of unlabeled containers at the Site, OWNER's environmental representative will so advise CONTRACTOR. Properly label container(s) within one hour of receipt of such notice from OWNER or remove container from the Site.
3. To greatest extent possible, store off-Site materials containing a Constituent of Concern until required for use in the Work.

E. Area for Storing Materials Containing a Constituent of Concern:
    1. Maintain designated storage area for materials containing a Constituent of Concern. Storage area shall include secondary containment to prevent release of spilled or leaking substances. Storage area shall include barriers to prevent vehicles from colliding with storage containers, and shall include protection from environmental factors such as weather.
    2. Provide signage in accordance with Laws and Regulations, clearly identifying the storage area.

F. Not less than monthly, CONTRACTOR's safety representative shall meet with OWNER's environmental representative to review CONTRACTOR's HMMP documents, procedures, and inspect storage areas and the Site in general, to verify compliance with this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 35 44

SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section pertains to spill prevention control and countermeasures applicable to the Project under the provisions of 40 CFR 112 and other Laws and Regulations.
   2. CONTRACTOR shall provide all labor, materials, equipment, tools, professional services (when required), and incidentals as shown, specified, and required to comply with Laws and Regulations regarding spill prevention control and countermeasures (SPCC) planning and compliance, including 40 CFR 112.
   3. Multiple Prime Contracts:
      a. General CONTRACTOR shall determine whether a SPCC Plan is required. Other prime contractors shall furnish to General CONTRACTOR information and data relative to the work under their respective contracts as necessary for determining whether the Project requires a SPCC Plan.
      b. When SPCC Plan is required, General CONTRACTOR shall prepare, implement, and maintain SPCC Plan as required by Laws and Regulations.
      c. In cooperation with the General CONTRACTOR, each prime contractor at the Site shall implement the SPCC Plan for tanks at the Site used by such prime contractor.
      d. General CONTRACTOR shall have overall responsibility for the Project's SPCC Plan.

1.2 DETERMINATION OF NEED FOR SPCC PLAN FOR PROJECT

A. Determination of Need for SPCC Plan:
   1. General CONTRACTOR shall determine need for SPCC Plan for the Project.
   2. CONTRACTOR's Professional Engineer:
      a. If the Site will include storage of more than 10,000 gallons of oil in above-ground storage, or if the Site does not comply with oil discharge history criteria specified in 40 CFR 112, CONTRACTOR shall retain a qualified professional engineer to determine need for SPCC Plan for the Project and, if SPCC Plan is required, professional engineer shall prepare or supervise preparation of SPCC Plan for the Project.
      b. If a professional engineer is not required to prepare the full SPCC Plan for the Project, but the SPCC Plan includes environmentally-

equivalent SPCC measures, or impracticality determinations, CONTRACTOR shall retain a qualified professional engineer to prepare and certify those portions of the SPCC Plan dealing with environmentally equivalent measures and impracticality determinations; the balance of the SPCC Plan may be prepared by and be self-certified by CONTRACTOR.

3. Submit to ENGINEER letter presenting results of evaluation of whether a SPCC Plan is required for the Project in accordance with Laws and Regulations.

B. SPCC Plan is required when the Project activities at the Site meet the following criteria:
   1. The Site and activities thereon are not exempt from Laws and Regulations relative to SPCC planning and implementation.
   2. Oil is stored, used, transferred, or otherwise handled at the Site, unless otherwise exempted by Laws and Regulations.
   3. Maximum oil storage capacity at the Site equals or exceeds either of the following thresholds: 42,000 gallons of completely-buried capacity, or 1,320 of above-ground capacity. Capacity includes total storage tank volume and operational storage volume at the Site for contractors and Subcontractors, including bulk storage tanks, containers with 55-gallon storage capacity and larger, mobile tanks located at the Site, and other containers covered by Laws and Regulations. Exempt are motive storage containers, such as those on construction equipment and vehicles. Oil includes petroleum products, fuel oil, hydraulic fluid, oil sludge, oil refuse, oil mixed with wastes other than dredged material, synthetic oil, vegetable oil, animal fats and oils, and other oils defined in Laws and Regulations.
   4. There is reasonable expectation, based on location of the Site, that oil spill would reach navigable waters of the United States or adjoining shorelines.

C. When SPCC Plan is not required, General CONTRACTOR shall ensure that conditions that preclude the need for SPCC Plan for the Project, including the activities of all contractors and Subcontractors working on the Project at the Site, are maintained throughout duration of the Project. Should changes that affect the storage, use, or handling of oil at the Site occur, reassess the need for SPCC Plan for the Project at no additional cost to OWNER and submit to ENGINEER evaluation letter regarding need for SPCC Plan.

1.3 SPCC PLAN AND IMPLEMENTATION

A. When SPCC Plan is required, develop SPCC Plan and submit for acceptance by OWNER, with copy to ENGINEER. SPCC Plan shall be specific to the Site and the Project and shall include the following:
   1. Seal or stamp, original signature, and license number of CONTRACTOR'S professional engineer, when self-certification by CONTRACTOR is not allowed by Laws and Regulations.

2. Site plan identifying the name (or tag number) and location of each tank and container that will contain a substance regulated in 40 CFR 112 and other Laws and Regulations, including above-ground and buried tanks. Site plan shall indicate general directions of storm water runoff, including storm sewers and drainage inlets (including arrows indicating directions of flow), and storm sewer outfall locations shown and labeled.
3. For each tank and container shown or indicated on the Site plan, include a table that lists the tank or container's name and tag number, type of oil stored therein, and maximum storage capacity. List total storage capacity of all regulated tanks and containers at the Site covered by SPCC Laws and Regulations.
4. Predictions of direction, rate of flow, and total quantity of oil that could be discharged from the Site as result of storage tank or container failure.
5. Operating procedures that prevent oil spills, including procedures for oil handling, details of secondary containment structures at fuel and oil transfer areas, and details and descriptions of equipment to be used for oil handling, including piping.
6. Control Structures and Secondary Containment:
    a. Furnish details of and descriptions of control measures installed at the Site by CONTRACTOR to prevent spill from reaching navigable waters of the United States and associated shorelines, including secondary containment and diversionary structures.
    b. For on-shore Sites, one of the following must be used, at minimum: dikes, berms, or retaining walls; curbing; culverts, gutters, or other drainage systems; weirs, booms, or other barriers; spill diversion ponds; retention ponds; or sorbent materials.
    c. Where appropriate, the SPCC Plan shall clearly demonstrate that containment or diversionary structures or equipment are not practical.
    d. Include brittle fracture evaluation, where required, for field-constructed above-ground storage containers undergoing repair, alteration, construction, or change in service.
7. Plans for countermeasures to contain, clean up, and mitigate effects of oil spill that reaches navigable waters of the United States or their shorelines, including written commitment of manpower, equipment, and materials to quickly control and remove spilled oil. Include estimation of time required to contain spill after spill occurs.
8. Contact list and telephone numbers for facility response coordinator, National Response Center, cleanup contractors, and all appropriate federal, state, and local authorities having jurisdiction to be contacted in event of spill or discharge.
9. Program for monthly inspections of the Site by CONTRACTOR for SPCC Plan compliance. Advise OWNER in writing of each inspection not less than 72 hours in advance.
10. Measures for Site security relative to oil storage.
11. Procedures for safely handling mobile containers such as totes, drums, and fueling vehicles and construction equipment that remain at the Site.

12 Procedures and schedules for periodic testing of integrity of tanks and containers, and associated piping and valves.
13. Plans for bulk storage container compliance.
14. Plans for personnel training and oil spill prevention briefings.
15. For SPCC Plans that do not follow the format listed in Laws and Regulations, provide cross-reference to requirements of Laws and Regulations, including 40 CFR 112.7.

B. Obtain acceptance of SPCC Plan by OWNER, for coordination with OWNER's Site-specific SPCC Plan, if any.

C. SPCC Plan shall be reviewed by CONTRACTOR's professional engineer (when professional engineer is required) and OWNER every five years, as applicable. CONTRACTOR shall perform updates and revisions of the Project's SPCC Plan as necessary and submit same in accordance with the provisions of this Section for submittal and acceptance of initial SPCC Plan.

D. Post a copy of accepted, certified SPCC Plan in conspicuous location at the Site and furnish copies to OWNER, ENGINEER, other contractors, and Subcontractors as appropriate. All contractors shall comply with SPCC Plan.

E. In event of violation of SPCC Plan or release of oils attributable to construction operations, CONTRACTOR shall:
1. Immediately issue notifications in accordance with Laws and Regulations, including 40 CFR 110 and 40 CFR 112. When required by Laws and Regulations, report to National Response Center, US Environmental Protection Agency, and other authorities having jurisdiction, if any.
2. Have spill clean-up performed in accordance with Laws and Regulations, the SPCC Plan, and requirements of authorities having jurisdiction.
3. Pay fines and civil penalties (or responsible portion thereof) imposed on OWNER by authorities having jurisdiction, and pay costs associated with clean-up of spills.
4. Should cleanup of spills attributable to CONTRACTOR be necessary, no resulting change in the Contract Price or Contract Times will be allowed. Should CONTRACTOR share responsibility for spill and cleanup with another entity, changes in Contract Price and Contract Times, if any, will be proportionate.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. CONTRACTOR's Professional Engineer:
a. When required by Laws and Regulations, engage a licensed, registered professional engineer legally qualified to practice in the jurisdiction where the Site is located and experienced in performing engineering services of the type required.
b. Submit qualifications data.

c. Responsibilities include but are not necessarily limited to:
   1) Carefully reviewing Laws and Regulations relative to SPCC.
   2) Preparing written requests for clarifications or interpretations of criteria specified in the Contract Documents for submittal to ENGINEER by CONTRACTOR, and obtaining from authorities having jurisdiction clarifications regarding Laws and Regulations as required.
   3) Preparing or supervising the preparation of letter-report evaluation of need for SPCC Plan in accordance with the Contract Documents. Evaluation shall include professional engineer's seal or stamp, registration number, and original signature.
   4) When SPCC Plan is required, preparing, supervising the preparation of, or reviewing the SPCC Plan (or designated portions thereof when oil storage at the Site will be 10,000 gallons or less) in accordance with the Contract Documents. SPCC Plan (or designated portions thereof) shall include professional engineer's seal or stamp, registration number, and original signature.
   5) Periodically re-evaluating the need for SPCC Plan and issuing findings as letter-reports with seal or stamp, license number, and signature. When SPCC Plan is required, periodically evaluating the SPCC Plan and providing recommendations for compliance with Laws and Regulations, in accordance with the Contract Documents.
   6) Certifying that:
      a) it is familiar with the Laws and Regulations, including 40 CFR 112, and
      b) it has visited, examined, and is familiar with the Site, planned modifications to the Site under the Project as such modifications pertain to SPCC Laws and Regulations, and
      c) it has performed the evaluations and prepared SPCC Plan in accordance with the Contract Documents, and
      d) procedures for required testing and inspections have been established, and
      e) the said evaluations and SPCC Plan are adequate for the Project, and
      f) the said evaluations and SPECC Plan complies with Laws and Regulations, applicable industry standards, and to prevailing standards of practice.

1.5 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Certifications: With each evaluation letter and SPCC Plan submittal, include certification signed by preparer of submittal that the submittal complies with the Contract Documents and Laws and Regulations. Signature on all certifications shall be original.
   2. Evaluations:

a. Submit letter presenting results of evaluation of whether a SPCC Plan is required for the Project. Submit evaluation not later than fourteen days after the Contract Times commence running, unless longer time is allowed by ENGINEER.
b. Submit updated evaluations as required when conditions at the Site change. Submit updated evaluation not later than seven days after the conditions at the Site change, or within seven days of ENGINEER's request, unless longer time is allowed by ENGINEER.

3. SPCC Plan: When SPCC Plan is required:
   a. Submit jointly to OWNER and ENGINEER. Submit within 14 days of receipt of ENGINEER's acceptance of evaluation submittal.
   b. Update and resubmit the SPCC Plan, or acceptable SPCC Plan amendments, as required when conditions at the Site change. Submit updated SPCC Plan or amendments not later than seven days after the change in conditions at the Site change giving rise to the SPCC Plan change or amendment, or within seven days of ENGINEER's request, unless longer time is allowed by ENGINEER.
4. SPPC Plan Distribution: When SPCC Plan is required, submit copies of letters transmitting SPCC Plan and amendments (if any) to contractors and Subcontractors working at the Site.
5. Qualifications Statements: CONTRACTOR's professional engineer, when requested by ENGINEER or OWNER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 41 24

PERMIT REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements relative to permitting requirements of which OWNER and ENGINEER are aware that apply to the Project.
   2. CONTRACTOR shall provide labor, materials, equipment, tools, and incidentals shown, specified, and required to obtain required permits and comply with required permits and licenses.
   3. Obtain, pay for, and comply with required permits and licenses whether or not indicated in this Section or elsewhere in the Contract Documents.

B. Coordination:
   1. Coordinate compliance with permit and license requirements with Work under other Sections and with other contractors, if any, working at the Site.
   2. Coordinate with the Progress Schedule the time required to apply for and obtain required permits and licenses. Changes in Contract Times or Contract Price will not be authorized because of timing and costs associated with obtaining permits and licenses required for the Work.

C. Related Sections: In addition to permits and licenses required under this Section, obtain and comply with permits required under the following Sections:
   1. Section 01 35 43.13, Environmental Procedures for Hazardous Materials.
   2. Section 01 41 26, Storm Water Pollution Prevention Plan and Permit.
   3. Section 01 41 27, Earthmoving Permit and Dust Control.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Copy of each of the following permits as applicable to the Contract:
      a. Town of Webb Building Permit (if required).
      b. Town of Inlet Building Permit (if required).
      c. Traffic Control Permit (if required).

1.3 MUNICIPAL PERMITS AND LICENSES

A. Permits:
   1. Town of Webb Building Permit (if required).
   2. Town of Inlet Building Permit (if required).
   3. Traffic Control Permit (if required).

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 41 26

STORM WATER POLLUTION PREVENTION PLAN AND PERMIT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for compliance with storm water pollution prevention plans (SWPPP) and permit(s) applicable to the Project.
   2. CONTRACTOR shall comply with the Project's State Pollutant Discharge Elimination System (SPDES) Permit issued by New York State. Regarding this permit, CONTRACTOR shall be a co-permittee with OWNER and shall be responsible for providing necessary materials and taking appropriate measures to comply with requirements of the permit and minimize discharge of pollutants in storm water runoff from the Site.
   3. Controls – General:
      a. Prevent discharge of sediment to and erosion from the Site to surface waters, drainage routes, public streets and rights-of-way, and private property, including dewatering operations.
      b. Prevent trash and demolition and construction debris from leaving the Site via storm water runoff.
      c. Provide berms, dikes, and other acceptable methods of directing storm water around work areas to drainage routes.
      d. Prior to starting the Work associated with such discharge, construction-related discharges to publicly owned conveyance or treatment systems shall be approved by owner of system to which the discharge will be directed.
   4. Water Quality:
      a. Do not cause or contribute to a violation of water quality standards, Laws, or Regulations.
      b. Notify ENGINEER of revisions to the SWPPP necessary to protect receiving water quality and comply with applicable permits. Provide and implement measures to control pollutants in storm water runoff from the Site to prevent:
         1) Turbidity increases that will cause a substantial visible contrast to natural conditions.
         2) Increase in suspended, colloidal, and settleable solids that would cause sediment deposition or impair receiving water quality and use.
         3) Presence of residue from oil and floating substances, visible oil, and globules of grease.
   5. CONTRACTOR shall pay civil penalties and other costs incurred by OWNER, including additional engineering, RPR, and inspection services, associated with non-compliance with applicable permits related to storm water discharges associated with construction activity and sediment and erosion controls

associated with the Work. OWNER may deduct as set-offs such amounts from payments due CONTRACTOR.

6. Contract Price includes all material, labor, and other permits and incidental costs related to:
    a. Preparing SWPPP Revisions and other documents that are CONTRACTOR's responsibility, in accordance with this Section.
    b. Installing and maintaining structural and non-structural items used in complying with the SWPPP and its revisions.
    c. Clean-up, disposal, and repairs following wet weather events or spills caused by CONTRACTOR.
    d. Implementing and maintaining "best management practices", as defined in applicable permits and Laws or Regulations, to comply with requirements that govern storm water discharges at the Site.
5. Inspections of storm water, sediment, and erosion controls as specified.

B. Multiple-prime Contract Projects:
1. General CONTRACTOR is responsible for the Project's SWPPP and for complying with applicable permits for storm water and control of sediment and erosion. General CONTRACTOR shall coordinate with other prime contractors on the Project to update and revise the SWPPP as required by the Contract Documents and Laws or Regulations. Revisions to the SWPPP shall be by General CONTRACTOR.
2. Prime contractors, other than General Contractor, engaging in earthwork, including trenching, stockpiling, and backfilling, shall be co-permittees with OWNER on the storm water permit, and shall comply with the SWPPP and other applicable permits and with requirements for controlling discharges of storm water and sediment, and erosion control requirements associated with their Work. Prime contractors engaging in earthwork shall coordinate their earthwork with General Contractor on a daily basis, and submit to ENGINEER complete Notice of Termination documents.

C. Documents: The following are part of the Work included under this Section:
1. Storm Water Pollution Prevention Plan (SWPPP):
    a. Prepared by OWNER and filed with authorities having jurisdiction over storm water discharges during construction. The SWPPP is part of the Contract Documents.
2. Sediment and Erosion Control Permit:
    a. Prepared by OWNER and filed with the authority having jurisdiction over sediment and erosion control during construction. Sediment and erosion control permit is part of the Contract Documents.
3. SWPPP Revisions:
    a. Prepared by CONTRACTOR and submitted to ENGINEER.
    b. CONTRACTOR shall file a SWPPP Revision prior to starting Work at the Site, and as required by authorities having jurisdiction.
    c. SWPPP Revision shall include CONTRACTOR's proposed temporary means for storm water control during all phases of the Work and include plans for storm water conveyance and retention, as applicable.

Coordinate with excavation plan submittals required in Division 31 of the Specifications.

d. Should CONTRACTOR-propose deviations to the SWPPP included in the Contract Documents, or if Project-specific modifications of the SWPPP are required because of field conditions, CONTRACTOR shall prepare and submit additional SWPPP Revisions as necessary, in accordance with requirements of authorities having jurisdiction and applicable permits.

e. Comply with Article 1.4 of this Section.

f. SWPPP Revisions shall use the SWPPP Revision form included in this Section, with supporting documents attached as required, or forms provided by authorities having jurisdiction.

g. SWPPP Revisions that do not comply with the Contract Documents and are not required by authorities having jurisdiction will be regarded as substitutions, in accordance with the General Conditions and substitution procedures in the Specifications.

4. Storm Water Certification Statement:
   a. To be prepared by CONTRACTOR and submitted to ENGINEER on the form included with this Section, or on a form provided by authority having jurisdiction.
   b. Do not perform Work at the Site until the Storm Water Certification has been submitted to and accepted by ENGINEER.
5. Notice of Intent (NOI):
   a. Prepared by OWNER or ENGINEER and submitted to authorities having jurisdiction following ENGINEER's receipt and acceptance of CONTRACTOR's SWPPP Revision and preliminary Progress Schedule.
   b. NOI will be filed with authorities having jurisdiction by ENGINEER within ten days of ENGINEER's acceptance of CONTRACTOR's SWPPP Revision and preliminary Progress Schedule.
   c. Do not perform Work at Site until NOI is submitted to authorities having jurisdiction.
6. Co-permittee Agreement:
   a. Prepared by CONTRACTOR using forms included with the SWPPP, and submitted to ENGINEER within five days of the date the Contract Times commence running, for signature by OWNER.
   b. ENGINEER will file co-permittee agreement with authorities having jurisdiction.
   c. Do not perform Work at the Site until co-permittee agreement is submitted to authorities having jurisdiction.
7. Storm Water Inspection Report:
   a. Prepared by ENGINEER's Resident Project Representative (RPR) using the form included with this Section, or a form provided by authority having jurisdiction.
   b. Storm water inspection reports will be filed in a log book kept at the Site by RPR. Copy of each report will be furnished to CONTRACTOR upon request.

c. Storm water inspection report will be completed for each of the following:
   1) Pre-construction: After placement of storm water management measures, including sediment and erosion controls, and temporary field offices and other temporary facilities, prior to starting other Work at the Site.
   2) During the Work: Every seven days until Notice of Termination is completed. When the Site is stabilized relative to storm water, erosion, and discharge of sediment, inspection frequency during temporary shutdowns and seasonal shutdowns is once per month until Notice of Termination is completed.
   3) Final: Final inspection report will be prepared prior to completion of Notice of Termination.

8. Notice of Termination (NOT):
   a. Prepared by CONTRACTOR on the form included with storm water permit and submitted to ENGINEER for review and signature by OWNER.
   b. ENGINEER will submit the NOT to authority having jurisdiction.
   c. CONTRACTOR shall submit the NOT following completion of all Work that may result in pollution in storm water discharges, including landscaping Work.
   d. Final Payment will not be made until the NOT is filed with authority having jurisdiction.

D. Coordination:
   1. Coordinate requirements of this Section with requirements for earthwork, erosion control, and landscaping in the Contract Documents, applicable permit requirements, and Laws and Regulations.
   2. Implement SWPPP controls and practices prior to starting other Work at the Site. Each prime contractor and Subcontractor identified in the SWPPP and SWPPP Revisions shall sign a copy of the storm water certification statement.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with Laws and Regulations relative to environmental protection and restoration, including:
   1. Storm water permit applicable to the Work and Site.
   2. State and local erosion and sediment control guidelines and requirements,
   3. State and local storm water regulations and guidance.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Submit the following, in accordance with Paragraph 1.1.C and Article 1.4 of this Section. When the Project involves Work at multiple sites, submit each of the following for each Site, as applicable:
      a. SWPPP Revisions.

b. Co-permittee Agreement.
c. Storm Water Certification Statement.
d. Notice of Termination

2. Approval to Discharge to Publicly-owned Treatment Works:
   a. For storm water discharges associated with construction activity that are discharged to a publicly owned conveyance or treatment system, prior to commencing discharges, submit system owner's written approval for such discharges.
3. Storm Water Site Plan Updates:
   a. Within three days after each storm water inspection, submit updated storm water site plan.

1.4 SWPPP REVISIONS

A. CONTRACTOR shall prepare a SWPPP Revision in accordance with the Project's storm water permit when:
   1. There is a significant change in design, construction, operation, or maintenance of the Project that significantly affects the potential of discharging pollutants to Waters of the United States, and has not otherwise been addressed in the SWPPP.
   2. SWPPP proves to be ineffective relative to:
      a. eliminating or significantly minimizing pollutants from sources identified in the SWPPP required by the Project's storm water permit, or
      b. achieving general objectives of controlling pollutants in storm water discharges from permitted construction activity.
   3. Prepare and submit SWPPP Revision identifying prime contractors and Subcontractor responsible for implementing part of the SWPPP.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 INSPECTIONS AND REPAIRS

A. Perform Site inspections and assessments as required in applicable storm water permit and this Section. Inspections and assessments shall be done by CONTRACTOR's site superintendent or project manager, together with ENGINEER's RPR.

B. Inspections:
   1. During the Work, relative to the storm water permit, inspections of the Site shall be performed:
      a. Pre-Construction: After SWPPP controls are provided and prior to starting other Work at the Site.

b. During the Work: Every seven days until Notice of Termination is completed and submitted to authority having jurisdiction. When the Site is stabilized relative to storm water, erosion, and discharge of sediment, inspection required frequency during temporary shutdowns and seasonal shutdowns is not less than once per month until Notice of Termination is completed.

c. Prior to CONTRACTOR submitting the Notice of Termination.

2. During each inspection, verify sediment control practices and record the approximate degree of sediment accumulation as percentage of acceptable sediment storage volume; inspect erosion and sediment control practices and record maintenance performed; observe and record deficiencies relative to implementation of the SWPPP. RPR or ENGINEER will complete Storm Water Inspection Reports and CONTRACTOR shall record and submit the following.

   a. Storm Water Site Plan: On a copy of the Site plan included in the Contract Documents or other map of the Site acceptable to ENGINEER, indicate extent of all disturbed areas and drainage pathways. Indicate areas expected to undergo initial disturbance or significant site work within the next fourteen days.

   b. Indicate on storm water site plan areas of Site that have undergone temporary or permanent stabilization.

   c. Indicate on storm water site plan all disturbed areas that have not undergone active site Work during the previous 14 days.

C. Maintain at the Site a copy of storm water site plans from each storm water inspection and submit each storm water site plan to ENGINEER and RPR. RPR will maintain at the Site a log book with a copy of each Storm Water Inspection Report.

D. Cooperate with representatives of authorities having jurisdiction during their periodic visits to the Site, and promptly furnish information requested by authorities having jurisdiction.

E. Perform repairs to SWPPP controls, in accordance with applicable requirements and to satisfaction of ENGINEER, within two days of each inspection.

3.2 ATTACHMENTS

A. The documents listed below, following this Section's "End of Section" designation, are part of this Specifications Section. Notice of Intent (NOI) form, Co-permittee Agreement form, and Notice of Termination (NOT) form are included with storm water permit.

1. Storm Water Inspection Report form (two pages).
2. Storm Water Permit Certification form (one page).
3. SWPPP Revision Form (one page).

+ + END OF SECTION + +

STORM WATER INSPECTION REPORT

Owner:
Site:
Project:
Contractor:

Date of Inspection:_____
Day of Week:

S	M	T	W	T	F	S

Sheet No. _____ of _____ Sheets

If pertinent to the Operation	
Weather	
Temperature	

This inspection and maintenance form is to be used when the Work is subject to a Storm Water General Permit for Construction Activity. Inspections shall be performed not less than once every seven calendar days; for sites that are stabilized and temporarily shut down inspections may be reduced to once per month. Each erosion and sediment control measure installed on the Site is to be inspected and the Contractor must complete all required maintenance within two calendar days from the date of inspection.

Reason for this inspection:
- ☐ Pre-construction Site assessment
- ☐ Seven calendar day inspection
- ☐ Monthly inspection (when Site is stabilized and shut down)
- ☐ Post-construction inspection prior to Notice of Termination

Key for erosion and sediment control measures to be inspected: [Use the following designations in the table below] (1) mulch, (2) seed and mulch, (3) check dams, (4) hay bale/straw bales, (5) silt fence, (6) sediment trap, (7) turbidity curtains, (8) pipe slope drains, (9) drainage structure inlet protection, (10) rolled erosion control products, (11) soil stabilizers, (12) construction entrances, (13) pipe inlet/outlet protection, (14) water diversion structures, (15) sedimentation basins, (16) cofferdams, (17) Other _____.

ID	**Location**	**Disturbance**		**Measure**		**Remarks** (Evaluate integrity of measure, describe evidence of erosion)	**Approximate Sediment Accumulation** (% of Depth)	**Maintenance Required?** (Y or N) (If Yes, Describe Below)
		Existing? (Y or N)	**Next 14 Days?** (Y or N)	**Code #**	**Temp or Perm?** (T, P or NA)			
1								
2								
3								
4								
5								
6								
7								
8								

ID	Location	Disturbance		Measure		Remarks (Evaluate integrity of measure, describe evidence of erosion	Approximate Sediment Accumulation (% of Depth)	Maintenance Required? (Y or N) (If Yes, Describe Below)
		Existing? (Y or N)	Next 14 Days? (Y or N)	Code #	Temp/Perm or N/A? (T, P or NA)			
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

DESCRIPTION OF REQUIRED MAINTENANCE AND ANY EXISTING DEFICIENCIES IN THE SWPPP: Specify for each location using row ID number.

I certify under penalty of Law that this document and all attachments were prepared under my direction or supervision in accordance with a system to ensure that qualified personnel property gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein may be punishable by Law.

Signature: _____ Prepared: _____ Copy to Contractor: _____
Resident Project Representative (Date) (Date)

Qualified Professional Name _____
(w/Firm Name, if Consultant)

STORM WATER PERMIT CERTIFICATION

Contract Number:_____ Project:_____

Owner:_____

Each Contractor and Subcontractor identified in the Storm Water Pollution Prevention Plan (SWPPP) must certify that they understand the permit conditions and their responsibilities. Every Contractor and Subcontractor performing an activity that involves soil disturbance shall sign this certification and submit it to the Engineer prior to performing the Work. This certification shall be signed by an owner, principal, president, secretary, or treasurer of the firm.

> I certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP for the construction Site identified in such SWPPP as a condition of authorization to discharge storm water. I also understand that my firm and its employees and Subcontractors shall comply with the terms and conditions of Owner's general permit for storm water discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards, Laws, or Regulations.

Firm: _____

Address: _____

City:_____ State_____ Zip_____

_____ _____ _____

Name (Print) Signature Date

_____

Title

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REVISION

Date of Inspection: _____

Sheet No. _____ of _____ Sheets

Owner:
Site:
Project:
Contractor:

This form shall be used when revisions to the current Storm Water Pollution Prevention Plan (SWPPP) are required by the Storm Water General Permit for Construction Activity or the Contract Documents.

Reason for the Revision(s): Revisions were requested by State: ☐ Yes ☐ No

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Describe the Revision(s) to the SWPPP: _____

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

I certify under penalty of Law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein may be punishable by Law.

Signature: _____ Prepared: _____ (Date) Submitted: _____ (Date)

Copy to: ☐ Engineer ☐ Contractor _____

SECTION 01 41 27

EARTHMOVING PERMIT AND DUST CONTROL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for controlling fugitive dust emissions resulting from construction activities, including earthmoving, in coordination with Laws and Regulations.
   2. CONTRACTOR shall obtain, pay for, and comply with permits required for earthmoving and dust control required because of dust-generating operations related to the Work, and shall develop and comply with provisions of dust control plan.
   3. Provide necessary labor, materials, equipment, tools, services, and incidentals to: apply sufficient dust suppressants; properly clean all track-out areas to driveways, roadways, and highways; and provide adequate physical stabilizations of soils to comply with earthmoving permits and accepted dust control plan.
   4. Control fugitive dust generation from CONTRACTOR's operations including the following:
      a. Construction areas.
      b. Vehicle and equipment parking areas.
      c. Material and equipment storage areas.
      d. Field office area(s) and staging areas.
      e. Haul and access roadways.
      f. Track-out areas.
      g. Other areas where CONTRACTOR will work, store materials or equipment, or park vehicles and equipment.
   5. Do not cause or allow dust-generating operations, earthmoving operations, use of property, or other operations that result in fugitive dust emissions that exceed limits prescribed by authorities having jurisdiction.
   6. Pay fines and civil penalties incurred by OWNER because of CONTRACTOR's actions or violations of earthmoving permits and dust control plan. OWNER may deduct as set-offs such amounts from payments due CONTRACTOR.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1 Dust Control Plan:
      a. Prepare and submit to ENGINEER and OWNER in accordance with Article 1.4 of this Section. Submit within the earlier of 30 days after

the Contract Times commence running or prior to commencing earth-disturbing operations at the Site.

2. Earthmoving Permit:
   a. Submit copy of permits obtained from authorities having jurisdiction, within seven days of CONTRACTOR's receipt of such permits. Do not commence earthmoving operations at the Site until required permits are obtained and submitted to ENGINEER.
3. Daily Logs and Reasonably-Available Control Measures (RACM) Records:
   a. Submit upon request of OWNER or ENGINEER.
4. Field Quality Control Submittals:
   a. When opacity monitoring is required, submit results not later than two days following completion of observations.

1.3 POSTING AND RECORDKEEPING

A. Post copy of earthmoving permit and accepted dust control plan at conspicuous location at the Site.

B. Recordkeeping:
   1. Maintain daily written log to record the actual application or implementation of reasonably-available control measures (RACM) described in the accepted dust control plan.
   2. Maintain the written log and supporting documentation at the Site, and submit copies to ENGINEER or OWNER upon request.
   3. Retain copies of dust control plan, RACM implementation records, and supporting documentations for not less than three years after Substantial Completion of the entire Project.

1.4 DUST CONTROL PLAN

A. Prepare and submit to ENGINEER and OWNER a dust control plan that includes the following:
   1. Names, address, office and cellular telephone numbers, and e-mail address of person(s) responsible for preparing and overseeing implementation of dust control plan. Designate one person responsible for overseeing implementation of dust control plan for the Project.
   2. Name(s), address(es), office and cellular telephone numbers, and e-mail addresses of person(s) responsible for dust generating operations.
   3. Site plan delineating total area of land surface to be disturbed. Delineate each area of phased disturbances, when applicable.
   4. Total disturbed area in acres; earthmoving and dust-generating operations and activities to be performed at the Site; actual and potential sources of fugitive dust emissions; and delivery, transportation, and storage areas for the Site, including types of materials stored and appropriate size of material stockpiles.

5. Description of reasonably-available control measures (RACM) to be implemented during dust-generating operations at actual and potential sources of fugitive dust.
6. Description of dust suppressants to be used including product data and material safety data sheets (MSDS); method, frequency, and intensity of application; type, number, and capacity of application equipment; and certifications related to the suppressant's appropriate and safe use. Calcium chloride is not allowed.
7. Description of specific surface treatment(s) or RACM proposed for controlling material deposition along paved surfaces (e.g., "track-out" areas) where unpaved Site surfaces or Site access points meet paved surfaces.
8. As contingency measure, designate and include description of not less than one alternative RACM for each actual and potential fugitive dust source.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 FIELD QUALITY CONTROL

A. Testing and Monitoring.
   1. Upon direction of OWNER or ENGINEER, obtain opacity observations for visible emissions of fugitive dust.
   2. Opacity Monitoring Method:
      a. TAGM 4031, Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites.
   3. Location and Frequency of Opacity Observations:
      a. Obtain opacity observations from not less than six locations at downwind perimeter of the Site during construction operations.
      b. Perform opacity monitoring at frequency required by applicable earthmoving/dust control permit, unless more-frequent monitoring is required by OWNER or ENGINEER.
   4. Qualifications: Opacity monitoring observations shall be by person trained and experienced with the opacity monitoring method specified.
   5. Prepare and submit to ENGINEER written report of results of opacity monitoring and observations.
   6. No additional compensation or addition to the Contract Times will be authorized for opacity observations.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 45 29.13

TESTING LABORATORY SERVICES FURNISHED BY CONTRACTOR

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall employ and pay for services of independent testing laboratory to perform specified services.
   2. Inspection, sampling, and testing shall be as specified in the Specifications including but not limited to:
      a. Section 03 30 00, Cast-in-Place Concrete.
      b. Section 03 60 00, Grouting.
      c. Section 05 05 33, Anchor Systems.
      d. Section 05 12 00, Structural Steel Framing.
      e. Section 09 91 00, Painting.
      f. Section 31 23 05, Excavation and Fill.
      g. Section 32 12 00, Flexible Paving.
      h. Other tests indicated in the Contract Documents that are not specifically assigned to others.
   3. CONTRACTOR shall pay for:
      a. Tests not specifically indicated in the Contract Documents as being OWNER's responsibility.
      b. Tests made for CONTRACTOR's convenience.
      c. Repeat tests required because of CONTRACTOR's negligence or defective Work, and retesting after failure of test for the same item to comply with the Contract Documents.
   4. Testing laboratory is not authorized to approve or accept any portion of the Work or defective Work; rescind, alter, or augment requirements of Contract Documents; and perform duties of CONTRACTOR.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
   2. ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration Laboratories.
   3. NIST SRM, Standard Reference Materials.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory:

a. Comply with applicable requirements of ASTM E329.
b. Testing laboratory shall be licensed to operate in the same jurisdiction as the Site. Where applicable, laboratory shall be certified by the authority having jurisdiction for the types of testing required.
c. Testing equipment used by laboratory shall be calibrated at intervals of not more than twelve months by devices of accuracy traceable to one of the following: NIST SRM, ISO/IEC 17025, certified by state or local bureau of weights and measures, or values of natural physical constants generally accepted in the engineering and scientific community.

1.4 SUBMITTALS

A. Informational Submittals: Submit the following:
1. Quality Control Submittals and Test Reports: Testing laboratory shall promptly submit to CONTRACTOR results of testing and inspections, including:
a. Date issued.
b. Project title, number, and name of the Site.
c. Testing laboratory name and address.
d. Name and signature of inspector or person obtaining samples.
e. Date of inspection or sampling.
f. Record of temperature and weather conditions.
g. Date of test.
h. Identification of material or item tested, and associated Specifications Section.
i. Location in the Project.
j. Type of inspection or test.
k. Results of tests and observations regarding compliance with the Contract Documents.
2. Qualifications Statements:
a. Testing Laboratory:
1) Qualifications statement indicating experience and facilities for tests required under the Contract Documents.
2) Copy of report of inspection of facilities during most recent NIST inspection tour. Include memorandum of remedies of deficiencies reported during inspection.
3) Copy of certificate of calibration for each instrument or measuring device proposed for use, by accredited calibration agency.

1.5 TESTING LABORATORY DUTIES

A. Testing laboratory shall:
1. Cooperate with CONTRACTOR and provide qualified personnel promptly on notice.
2. Perform required inspections, sampling, and testing of materials and methods of construction; comply with applicable reference standards and the Contract Documents; and ascertain compliance with requirements of the Contract Documents.

3. Promptly notify ENGINEER and CONTRACTOR of irregularities or deficiencies in the Work that are observed during performance of services.
4. Promptly submit to CONTRACTOR reports of inspections and tests.
5. Perform additional tests and services, as required by CONTRACTOR.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. CONTRACTOR shall:
   1. Cooperate with testing laboratory personnel.
   2. Provide to testing laboratory preliminary representative samples of materials and items to be tested, in required quantities.
   3. Promptly submit to ENGINEER results of tests and inspections received from testing laboratory.
   4. Furnish to laboratory the preliminary design mix proposed for concrete and other material mixes to be tested by testing laboratory.
   5. Provide labor and facilities:
      a. For access to the Work to be tested, and where required, to Suppliers' operations.
      b. For obtaining and handling samples at the Site.
      c. For facilitating inspections and tests.
      d. For testing laboratory's exclusive use for storing and curing of test samples.
      e. Forms for preparing concrete test beams and cylinders.
   6. Notify laboratory and ENGINEER sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.
   7. Arrange with laboratory and pay for additional services, sampling, and testing required for CONTRACTOR's convenience.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 51 05

TEMPORARY UTILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall provide all temporary utilities and temporary facilities required for the Project, including the following:
      a. Electricity.
      b. Lighting.
      c. Telephone and communications.
      d. Heating, cooling, ventilating, and temporary enclosures.
      e. Water.
      f. Sanitary facilities.
      g. First-aid facilities.
      h. Fire protection.
   2. Make all arrangements with utility owners for temporary utilities and with others as appropriate for temporary facilities. Obtain required permits and approvals for temporary utilities and temporary facilities.
   3. Pay all service costs for utilities and facilities indicated in this Section as General CONTRACTOR's responsibility, including cost of electricity, water, fuel, and other utility services and temporary facilities required for the Work.
   4. Continuously maintain adequate temporary utilities and temporary facilities for all purposes for the Project, until removal of temporary utilities and temporary facilities. At minimum, provide and maintain temporary utilities and temporary facilities through Substantial Completion and removal of temporary field offices and sheds unless otherwise approved in writing by ENGINEER.
   5. Should OWNER occupy part of the Work prior to Substantial Completion of the entire Work, cost of utilities consumed via temporary utilities serving the portion occupied by OWNER will be shared proportionately by OWNER and General CONTRACTOR as mutually agreed to by the parties.
   6. Maintain, including cleaning, temporary utilities and temporary facilities, and continuously provide consumables as required.
   7. Temporary utilities and temporary facilities shall be adequate for personnel using the Site and the needs of the Project.
   8. Provide temporary utilities and temporary facilities in compliance with Laws and Regulations and, when applicable, requirements of utility owners.

1.2 REQUIREMENTS FOR TEMPORARY UTILITIES AND TEMPORARY FACILITIES

A. Electrical:

1. Provide temporary electrical service required for the Work, including continuous power for temporary field offices and sheds. Provide temporary outlets with circuit breaker protection and ground fault protection.

B. Lighting.
   1. Provide lighting at the Site of not less than five foot-candles for open areas and not less than ten foot-candles for stairs and shops. Provide not less than one, 300-watt lamp every 15 feet in indoor work areas. Provide night security lighting of not less than five foot-candles within 50 feet of all parts of the Site during hours of darkness, controlled by photocell.
   2. Do not work in areas with insufficient lighting. Where lighting is insufficient for the work activities to be performed, provide additional temporary lighting.
   3. Provide temporary lighting sufficient for observation of the Work by ENGINEER and inspection by General CONTRACTOR and authorities having jurisdiction. Where required by ENGINEER, provide additional temporary lighting.
   4. Provide temporary lighting for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

C. Telephone and Communications.
   1. Provide temporary telephone and communications required for CONTRACTOR's operations at the Site and for summoning emergency medical assistance.
   2. Provide temporary telephone and communications for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

D. Heating, Ventilating, and Enclosures.
   1. Provide sufficient temporary heating, cooling, ventilating, and enclosures to ensure safe working conditions and prevent damage to existing facilities and the Work.
   2. Except where otherwise specified, temporary heating shall maintain temperature of the space served between 50 degrees F and maximum design temperature of building or facility and its contents.
   3. Maintain temperature of areas occupied by OWNER's personnel or electronic equipment, including offices, lunch rooms, locker rooms, toilet rooms, and rooms containing computers, microprocessors, and control equipment, between 65 degrees F and 80 degrees F with relative humidity less than 75 percent.
   4. Required temperature range for storage areas and certain elements of the Work, including preparation of materials and surfaces, installation or application, and curing as applicable, shall be in accordance with the Contract Documents for the associated Work and the Supplier's recommended temperature range for storage, application, or installation, as appropriate.
   5. Provide temporary ventilation sufficient to prevent accumulation in construction areas and areas occupied by OWNER of hazardous and nuisance levels or concentrations of dust and particulates, mist, fumes or vapors, odors, and gases, associated with construction.

6. Provide temporary enclosures and partitions required to maintain required temperature and humidity.
7. Provide temporary heating, ventilating, and cooling for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

E. Water:
   1. General:
      a. Provide temporary water facilities including piping, valves, meters if not provided by owner of existing waterline, backflow preventers, pressure regulators, and other appurtenances. Provide freeze-protection as required.
      b. Continuously maintain adequate water flow and pressure for all purposes during the Project, until removal of temporary water systems.
   2. Water for Construction Purposes:
      a. Provide water for Site maintenance and cleaning and, water necessary for construction activities, and water for testing of systems.
   3. Water for Human Consumption and Sanitation:
      a. Provide potable water in accordance with Laws and Regulations for consumption by personnel at the Site, for field offices, and for sanitary facilities.
      b. When necessary, provide bottled, potable water for use and consumption by personnel at the Site, including CONTRACTOR, ENGINEER, and visitors to the Site.
      c. Provide temporary water for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

F. Sanitary Facilities.
   1. Provide suitably-enclosed chemical or self-contained toilets for CONTRACTOR's employees, Subcontractors, Suppliers, ENGINEER, and visitors to the Site. Location of temporary toilets shall be acceptable to OWNER and ENGINEER.
   2. Refer to Paragraph 1.2.E of this Section for requirements for water intended for human consumption during construction.
   3. Provide suitable temporary washing facilities for employees and visitors.
   4. Provide temporary sanitary facilities for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

G. First-aid Facilities.
   1. Provide temporary first-aid stations at or immediately adjacent to the Site's work areas, and inside CONTRACTOR's temporary field office. Locations of first-aid stations shall be determined by General CONTRACTOR's safety representative. Replenish supplies in first-aid stations as items are used, prior to expiration of items, and as necessary. Monitor and log inventory of supplies in first-aid stations in accordance with requirements for monitoring and logging safety equipment as indicated in Section 01 35 23, Safety Requirements.

2. Provide list of emergency telephone numbers at each hardwired telephone at the Site. List shall be in accordance with the list of emergency contact information required in Section 01 35 23, Safety Requirements.
3. Provide temporary first-aid facilities for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

H. Fire Protection.
1. Provide temporary fire protection, including portable fire extinguishers rated not less than 2A or 5B in accordance with NFPA 10, Portable Fire Extinguishers, for each temporary building and for every 3,000 square feet of floor area under construction.
2. Provide Class A (ordinary combustibles), Class B (combustible liquids and gases), and Class C (electrical equipment) fire extinguishers as necessary.
3. Comply with NFPA 241, Standard for Safeguarding Construction, Alternation, and Demolition Operations, and requirements of fire marshals and authorities having jurisdiction at the Site.
4. Provide temporary fire protection for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

1.3 USE OF OWNER'S SYSTEM

A. Existing Utility Systems: Do not use systems in existing buildings or structures for temporary utilities without OWNER's written permission and mutually acceptable basis agreed upon by the parties for proportionate sharing of costs between OWNER and General CONTRACTOR.

B. Use of Permanent Utility Systems Provided Under the Project:
1. Permanent electrical, lighting, water, heating, ventilating, and fire protection systems and first-aid facilities may be used to provide temporary utilities and temporary facilities if the following are met:
a. Obtain OWNER's written permission to use permanent systems.
b. Permanent systems to be used for temporary utilities or temporary facilities shall be substantial complete, including complete functionality of all controls.
c. General CONTRACTOR shall pay all costs while using permanent system, including operation, maintenance, replacement of consumables, and provide replacement parts.
2. Do not use the following permanent facilities:
a. Telephone and communication facilities.
b. Sanitary facilities.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for temporary utilities and temporary facilities may be new or used, but shall be adequate for purposes intended and shall not create unsafe conditions, and shall comply with Laws and Regulations.

B. Provide required materials, equipment, and facilities, including piping, cabling, controls, and appurtenances.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install temporary utilities and temporary facilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.

B. Location of Temporary Utilities and Temporary Facilities:
   1. Locate temporary systems for proper function and service.
   2. Temporary systems shall not interfere with or provide hazards or nuisances to: the Work under this and other contracts, movement of personnel, traffic areas, materials handling, hoisting systems, storage areas, finishes, and work of utility owners and others.
   3. Do not install temporary utilities on the ground, with the exception of temporary extension cords, hoses, and similar systems in place for short durations.

C. Modify and extend temporary systems as required by progress of the Work.

3.2 USE

A. Maintain temporary systems to provide safe, continuous service as required.

B. Properly supervise operation of temporary systems:
   1. Enforce compliance with Laws and Regulations.
   2. Enforce safe practices.
   3. Prevent abuse of services.
   4. Prevent nuisances and hazards caused by temporary systems and their use.
   5. Prevent damage to finishes.
   6. Ensure that temporary systems and equipment do not interrupt continuous progress of construction.

C. At end of each work day, check temporary systems and verify that sufficient consumables are available to maintain operation until work is resumed at the Site. Provide additional consumables if the supply on hand is insufficient.

3.3 REMOVAL

A. Completely remove temporary utilities, temporary facilities, equipment, and

materials when no longer required. Repair damage caused by temporary systems and their removal and restore the Site to condition required by the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

B. Where temporary utilities are disconnected from existing utility, provide suitable, watertight or gastight (as applicable) cap or blind flange, as applicable, on service line, in accordance with requirements of utility owner.

C. Where permanent utilities and systems were used for temporary utilities, upon Substantial Completion replace all consumables such as filters and light bulbs and parts used during the Work.

+ + END OF SECTION + +

SECTION 01 52 11

ENGINEER'S FIELD OFFICE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for CONTRACTOR-provided field office, with furnishings, equipment, and consumables, for use by ENGINEER.
   2. General CONTRACTOR shall provide and maintain field office for ENGINEER's sole use. Provide field office at location approved by ENGINEER, near CONTRACTOR's field office.
   3. Field office shall be complete and fully functional within 14 days after date on which the Contract Times commence running.
   4. Obtain required permits for field offices.

1.2 SUBMITTALS

A. Action Submittals: Obtain ENGINEER's approval of the following prior to staging field office to the Site:
   1. Field Office Submittal: Submit all of the following as one submittal which shall include:
      a. Site plan indicating proposed location of field office, parking for field office, facilities related to the field office, and material of both field office parking and sidewalk or walkway to field office.
      b. Information on proposed field office size, construction, exterior appearance, interior finishes, and field office security measures.
      c. Proposed layout of field office interior, showing location of offices, common areas, restroom, closet, other areas specified (if any), with dimensions indicated for each.
      d. Proposed layout of field office exterior identifying sign, showing all text, font, colors, and graphics (if any).
      e. Proposed type of Internet service; name of proposed Internet service provider; and product data and technical information on equipment (if any) required for Internet service.
      f. Office Equipment: Product data and technical information for copier, telephones, and other office equipment.
      g. Computer System: Product data and technical information on the complete computer system.
      h. Digital Camera: Product data and technical information on camera and accessories.

PART 2 – PRODUCTS

2.1 FIELD OFFICE CONSTRUCTION AND SITE REQUIREMENTS

A. Site at Field Office:
   1. Allocate total of three reserved parking spaces for use by ENGINEER and OWNER in close proximity to ENGINEER's field office. Parking area shall be paved with bituminous paving, concrete, crushed stone, or other material approved by ENGINEER. Parking area shall be suitably drained and free of standing water during wet weather.
   2. Provide sidewalk or walkway, not less than four feet wide, of bituminous pavement, concrete, crushed stone, or other material approved by ENGINEER, for the full distance between parking area and field office.

B. Field Office, Minimum Construction: Field office shall comply with the following:
   1. Structurally sound foundation and superstructure.
   2. Size: Floor area of not less than 430 square feet, and not less than 10 feet wide.
   3. Completely weather-tight and insulated, with minimum R-19 insulation.
   4. Exterior finish approved by ENGINEER.
   5. New interior finishes approved by ENGINEER, including resilient floor covering in first-class condition.
   6. Field Office Ingress and Egress:
      a. Two doors for ingress and egress for each field office unit, each with landing, stairs, and railing complying with building codes and other Laws and Regulations in effect at the Site.
      b. Landing and stairs shall have slip-resistant walking surfaces, and be metal, pressure-treated wood, fiberglass, or concrete.
      c. Railing shall be metal, wood, or fiberglass.
      d. Door Security:
         1) Doors shall be secure and lockable.
   7. Windows:
      a. Window area equal to not less than ten percent of floor area.
      b. Windows shall each have insect screen and operable sash.
      c. Provide each window with lock approved by ENGINEER.
   8. One lockable closet for storage.
   9. Keys:
      a. Furnish to ENGINEER two identical sets of keys suitable for operating all keyed locks, including ingress/egress door locks, window locks, closets, and office furnishings.
      b. Permanently label each key to indicate its associated lock.
   10. Restroom:
      a. Provide in field office one private restroom including one lavatory, one toilet, medicine cabinet with mirror, soap dispenser, and paper towel holder.
      b. Provide each restroom with appropriate electric ventilation fan with positive discharge to location outside the field office.
   11. Exterior Sign:

a. Field office identifying exterior sign, approved by ENGINEER. Sign shall be durable, weatherproof, suitable for long-term exposure to sunlight.
b. Exterior sign shall be not less than 1.5 feet high by four feet wide, installed at location determined in field and acceptable to ENGINEER.
c. Sign shall be in color, as presented in the layout below.
d. Sign layout and general proportions shall be as presented below. Text of first line and last line shall be Arial. Text size and size of graphic shall be proportionate to the graphic below. ENGINEER will furnish graphic as JPG file for use by CONTRACTOR in preparing the sign.



C. Field Office Optional Construction:
1. Provide mobile office trailer in first-class condition approved by ENGINEER, specifically designed for use as construction field office and complying with requirements of this Section.
2. Provide skirting around perimeter of each mobile field office trailer.
3. Supplier: Provide field office by one of the following:
a. Pac-Van, Inc.
b. Modular Space Corporation (ModSpace).
c. Williams Scotsman, Inc.
d. Or equal.

2.2 FIELD OFFICE UTILITIES

A. Comply with Section 01 51 05, Temporary Utilities.

B. Provide the following for the ENGINEER's field office:
1. Electrical System and Lighting:
a. Electric service as required, including paying all costs. Provide electrical submeter if electrical service is obtained from OWNER's system.
b. Interior lighting of not less than 50 foot-candles at desktop height.
c. Minimum of eight 120-volt, wall-mounted, duplex convenience electrical receptacles.
d. Exterior, wall-mounted lighting at each entrance to field office, not less than 250 watts each.
2. Heating, Ventilating, and Air Conditioning System:

a. Provide automatic heating to maintain indoor temperature in field office of not less than 65 degrees F in cold weather. Furnish all fuel and pay all utility costs.
b. Automatic cooling to maintain indoor temperature in field office of not warmer than 75 degrees F in warm weather.

3. Water and Sewerage:
   a. Provide potable water service for each plumbing fixture associated with field office.
   b. Provide sanitary sewerage for each lavatory/sink and toilet.
   c. Utility Connections – General:
      1) Comply with Laws and Regulations, including plumbing and sewer codes, and requirements of authorities having jurisdiction.
      2) Protect plumbing from freezing.
   c. Potable Water Service: Provide the following:
      1) Type K copper waterline from potable water main to each plumbing fixture.
      2) Reduced pressure zone (RPZ)-type backflow preventer in accordance with Laws and Regulations and requirements of authorities having jurisdiction.
      3) Provide 15-gallon electric hot water tank or tankless hot water heater, and hot water piping to serve each lavatory/sink in field office.
      4) Not less than one exterior hose bibb, with not less than 50 feet of hose, located adjacent to field office sidewalk or walkway, near field office ingress/egress doors. Provide wall-mounted hose reel or hose caddy.
      5) Before placing potable water system into service, disinfect piping and appurtenances in accordance with Laws and Regulations.
   d. Sanitary Sewerage:
      1) Provide PVC or other appropriate piping, arranged in accordance with Laws and Regulations, to convey wastewater from field office to sanitary sewer that discharges to a permitted wastewater treatment facility, or to holding tank provided by CONTRACTOR.
      2) When holding tank is provided, also provide pumping and disposal of holding tank contents at appropriate, regular intervals.
4. Telephone Service:
   a. Cellular Telephones and Service: ENGINEER will provide cellular telephones and service for ENGINEER's employees assigned to the field office.
5. Internet Access:
   a. Obtain and pay for Internet service until removal of the field office, with unlimited (untimed) Internet access, for ENGINEER's sole use.
   b. Set up system and appurtenances required and verify functionality in the field office.
   c. Internet service shall be one of the following, listed in order of preference; provide a lower type of access only when the next-higher level is unavailable:
      1) Fiber-optic or Cable Provider Service:

a) Provide service via communication service provider via either cable or fiber-optic service at download speed of not less than 15 megabytes per second (Mbps) and upload speed of not less than 1 Mbps.
b) Provide appropriate modem, cabling, and appurtenances.

2) DSL:
a) Provide service via symmetrical digital subscriber line with download speed of not less than 1.5 Mbps and upload speed of not less than 384 kilobits per second (Kbps).
b) Provide dedicated telephone line for Internet access.
c) Provide DSL filters on each non-DSL outlet in the field office telephone system.

3) Mobile Broadband Wireless:
a) Provide mobile broadband wireless 4G network by AT&T, Verizon, Sprint, T-Mobile, or equal, with download speed of not less than 37 Mbps and upload speed of not less than 17 Mbps.
a) Provide mobile broadband wireless router. Product and Manufacturer: Linksys Wireless-G Router for Mobile Broadband, or equal.
b) Mobile broadband air-card for field office. Product and Manufacturer: Sierra Wireless 597E, Novatel Merlin EX720, or equal.
c) Router and air-card will remain CONTRACTOR's property upon removal of field office from the Site.

4) Satellite:
a) Provide 4G network service with download speed of not less than 12 Mbps.
b) Provide required equipment, including outdoor unit (dish) and indoor satellite modem equipment, together with required cabling.
c) Provide telephone modem in computer, together with telephone line and service, for file uploading.

C. Should actions of utility companies delay the complete set up of field office, CONTRACTOR shall provide temporary electricity, heat, water supply, sanitary facilities, and telephone service as required at no additional cost to OWNER.

2.3 FURNISHINGS AND EQUIPMENT

A. Provide the following furnishings and equipment:
1. Desks: Two 5-drawer desks, each with desktop surface five feet long by 2.5 feet wide with not less than one file drawer per desk, suitable for storing 8.5-inch by 11-inch documents.
2. Desk Chairs: Two new or used (in good condition) five-point, high backed, cushioned swivel chairs with seat-height adjustment.
3. Other Chairs: Four side chairs with arm rests and padded seats and backs, and eight metal folding chairs without arm rests.

4. Two new or used (in good condition) folding tables each eight feet long by 2.5 feet wide.
5. Two new or used (in good condition) folding tables each four feet long by 2.5 feet wide.
6. Plan rack(s) to hold not less than eight sets of the Drawings.
7. Two 4-drawer file cabinets.
8. One 2-door storage cabinet.
9. Shelving or bookcase with a total of 12 feet of shelf length and not less than 12 inches deep.
10. Four polyethylene waste baskets, each with capacity of not less than seven gallons.
11. Suitable doormat at each exterior ingress/egress door.
12. Two cork tack-boards, each 2.5 feet by three feet, with thumbtacks.
13. One white board for use with dry markers, approximately six feet by four feet, with marker holding tray, installed by CONTRACTOR at location directed by ENGINEER in the field office. Furnish supply of colored markers and eraser for the white board.
14. Safety Equipment: Provide the following:
    a. Fire extinguishers with associated signage.
    b. Smoke detector with supply of batteries.
    c. Carbon monoxide detector with power supply.
    d. Provide in accordance with Laws and Regulations. For each field office structure, provide not less than two wall-mounted fire extinguishers, one battery-operated ceiling-mounted smoke detector, and one carbon monoxide detector suitably installed.
15. First-Aid Station:
    a. In addition to first-aid stations otherwise required by the Contract Documents, provide for ENGINEER's sole use a first-aid station in ENGINEER's field office.
    b. Product and Manufacturer: Zee Medical USA, Item 0152, "Medium Four-Shelf Plastic Cabinet", www.zeemedical.com; or equal.
16. Temperature and Humidity Monitor:
    a. Sensor installed outdoors in shade, display installed inside field office.
    b. Unit shall display daily minimum and maximum temperature and current temperature, and be capable of displaying daily minimum and maximum relative humidity and current relative humidity, and have audible alarm and adjustable alarm setpoints.
    c. Manufacturer and Product: Provide Fisher Scientific "Traceable Remote Alarm RH/Temperature Monitor" Catalog No. 14-649-84; or equal.
    d. Provide batteries for unit as required.
16. Personal Protective Equipment for Visitors: Furnish the following:
    a. Protective Helmets (Hard Hats): Four, each with full brim, of fiberglass or thermoplastic; each with ratchet suspension; white in color.
    b. Safety Glasses: Four, each with clear lenses, polycarbonate, anti-fog and anti-scratch coating, suitable to fit over personal eyewear.

c. Reflective Safety Vest: Four, each of polyester mesh or other material acceptable to ENGINEER, color to be high-visibility orange, with one-inch-wide reflective tape, one-size-fits-all design.
d. Earplugs: Supply of foam, disposable earplugs. Promptly resupply when stock is depleted.

17. Two electric clocks.
18. One electric coffee maker, with ten-cup capacity or larger.
19. Bottled water with electric cooler dispenser for five-gallon bottles, with cup dispenser.
21. Computer System:
    a. Computer: ENGINEER will furnish computers and software required for ENGINEER's personnel assigned to the field office.
    b. Printer/Copier/Scanner:
        1) System Description: Provide one inkjet printer/copier/scanner with color printing capability.
        2) Manufacturer and Model: Provide one of the following:
            a) Brother Printer MFC J5720DW Wireless Color Inkjet All-in-One Printer.
            b) Canon PIXMA iX6820 Inkjet Business Printer.
            c) Or equal.
        3) Sheet Size: Capable of printing 8.5-inch by 11-inch, 8.5-inch by 14-inch, and 11-inch by 17-inch sheets.
        4) Printing Speed: 20 pages per minute (black and white), 18 pages per minute (color).
        5) Scanning: Capable of scanning to PDF and JPG files, selectable by the user.
        6) Ink Cartridges: Provide all cartridges required for full-color printing, and promptly replace cartridges as needed throughout the Project.
    c. Computer system shall have not less than one USB port beyond those required for specified equipment, including printer, mouse, and digital camera. Provide additional external USB bus when necessary.
    d. Wireless Router:
        1) Provide wireless router to be configured by ENGINEER.
        2) Router capacity shall be not less than 54 Bbps.
        3) Manufacturer: Router shall be Linksys, or equal.
22. Copier: Furnished under the "Computer System" paragraph, above.
23. Digital Camera: ENGINEER will furnish digital camera for ENGINEER's field office.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install field office and related facilities in accordance with Laws and Regulations.

B. Install materials and equipment, including prefabricated structures, in accordance

with manufacturer's instructions, and to provide optimal performance and accuracy.

3.2 CLEANING, MAINTENANCE, AND SUPPLIES

A. Furnish the following maintenance services:
   1. Immediately repair malfunctioning, damaged, leaking, or defective field office structure, site improvements, systems, and equipment.
   2. Provide computer supplies and pay for maintenance on CONTRACTOR-furnished computer system and copier.
   3. Promptly provide snow and ice removal for ENGINEER's field office, including parking area, walkways, and stairs and landings.
   4. Provide continuous maintenance and janitorial service of field office and sanitary facilities. Clean field office not less than once per week Sweep or vacuum field office not less than daily, or more-frequently when site conditions are such that dirt or mud is frequently tracked into field office. Clean and wax (as appropriate) flooring every six months.
   5. Waste Disposal:
      a. Properly dispose of trash and waste as needed, not less than twice per week.
      b. Properly handle and dispose of recyclables. Do not dispose of recyclables as trash.
      c. Dispose of other waste, if any, as required, to avoid creation of nuisances and adverse environmental effects. Properly dispose of electronic waste, when necessary, at proper waste receiving facility.

B. Consumables: Provide the following consumables as needed:
   1. Toner and ink cartridges for printers and copier, as required.
   2. Paper supplies for printer and copier. Always maintain in field office not less than one ream of each size of paper for which printer and copier are capable.
   3. Dry markers in six colors and white board eraser set. Replace markers when exhausted or lost.
   4. Bottled water suitable for water dispenser and disposable cups.
   5. Coffee supplies, including coffee, filters, cups, sugar, creamer, and stir-sticks.
   6. Hand-soap, paper towels, toilet paper, cleansers, and janitorial implements, including broom.
   7. Batteries for smoke detector and other battery-powered items furnished by CONTRACTOR.
   8. Replace fire extinguishers upon expiration.
   9. Not less-often than monthly, inspect first-aid kit and inventory items consumed or used and remove items that are at or near their expiration date. Promptly replace and restock consumed and expired items.

3.3 REMOVAL

A. Remove field office and furnishings when directed by ENGINEER, prior to inspection for final completion. Deliver specified equipment to OWNER.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 52 13

CONTRACTOR'S FIELD OFFICE AND SHEDS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide a temporary field office for CONTRACTOR's use with not less than the minimum facilities specified.
   2. Provide required temporary storage and work sheds.
   3. Obtain and pay for required permits and utilities. Field offices and sheds shall comply with Laws and Regulations.

B. Coordination:
   1. Coordinate with OWNER, facility manager, other contractors, and others using the Site the location of field offices and sheds, including contracts indicated in Section 01 12 13, Summary of Work.

C. Location:
   1. Locate field offices and sheds in accordance with the Contract Documents and in accordance with the Site mobilization discussions at the preconstruction conference.

D. Furnish in CONTRACTOR's field office one complete set of the Contract Documents for ready reference by interested persons. In addition to the reference set, comply with Section 01 78 39, Project Record Documents and related provisions of the General Conditions, as may be modified by the Supplementary Conditions.

PART 2 – PRODUCTS

2.1 FIELD OFFICE AND SHEDS – FURNISHINGS, AND EQUIPMENT

A. Contractor's Field Office and Furnishings:
   1. Construction: As required by CONTRACTOR and sufficient for Project meetings.
   2. Utilities and Services: Provide the following:
      a. Telephone service.
      b. Computer network and related facilities as required for CONTRACTOR's needs.
      c. Utilities and related facilities for lighting and maintaining temperature, in accordance with Section 01 52 11, Engineer's Field Office.
   3. Furnishings:

a. Conference Facilities: General CONTRACTOR shall Provide conference area with conference table and chairs sufficient for 10 people. Conference facilities and furnishings shall be provided with suitable utilities, lighting, ventilation, and temperature controls prior to the first progress meeting, unless otherwise approved by ENGINEER.
b. Other furnishings required by CONTRACTOR.

4. Provide on field office's exterior an identification sign displaying CONTRACTOR's company name. Maximum size of sign shall be four feet by eight feet. Sign shall be suitable for outdoor use for the duration of the Project.
5. Furnish and maintain at CONTRACTOR's field office 12 protective helmets ('hard hats") for use by visitors to the Site.

B. Contractor's Storage and Work Sheds:
1. Provide storage and work sheds sized, furnished, and equipped to accommodate personnel, materials, and equipment involved in the Work, including temporary utility services and facilities required for environmental controls sufficient for personnel, materials, and equipment.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation:
1. Install CONTRACTOR's temporary field offices, sheds, and related facilities in accordance with Laws and Regulations.
2. Install materials and equipment, including prefabricated structures, in accordance with manufacturer's instructions.

3.2 MAINTENANCE AND REMOVAL

A. Maintenance:
1. Clean and maintain field offices and sheds as required.
2. Provide consumables as required.

B. Removal:
1. Do not remove temporary field offices and sheds until after Substantial Completion of the entire Work, unless otherwise approved by ENGINEER.
2. Remove field offices and sheds and restore areas prior to final inspection.

+ + END OF SECTION + +

SECTION 01 52 16

FIRST AID FACILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for temporary first-aid facilities for personnel use at Site during construction, including first-aid stations, lists of emergency contact information, and first-aid-trained personnel.
   2. General CONTRACTOR shall provide first-aid facilities during the Project, including:
      a. Paying all costs for first-aid facilities, including installation, maintenance, and removal.
      b. Maintaining, including cleaning, first-aid facilities. Keep first-aid facilities continuously supplied with consumables.
      c. Facilities shall be adequate for personnel using the Site.
      d. Providing facilities in compliance with Laws and Regulations.

1.2 TEMPORARY FIRST-AID FACILITIES REQUIRED

A. Provide the following temporary first-aid facilities:
   1. First-aid Stations at the Site:
      a. Provide temporary first-aid stations at or immediately adjacent to the Site's major work areas, and inside CONTRACTOR's temporary field office.
      b. Locations of first-aid stations shall be determined by CONTRACTOR's safety representative.
      c. Other contractors shall provide first-aid stations in their own field office.
      d. First-aid stations shall be adequate for the number of personnel at the Site and the types of work and hazards anticipated.
      e. Not less-often than monthly, inspect each temporary first-aid station and inventory items consumed or used and remove items that are at or near their expiration date. Promptly replace and restock consumables and expired items.
   2. Emergency Contact List:
      a. Provide list of emergency telephone numbers at each hardwired telephone at the Site.
      b. List shall be in accordance with the list of emergency contact information required in Section 01 35 23, Safety Requirements.
   3. Personnel Trained in First-Aid:
      a. When work is in progress, furnish at the Site not less than one person trained in first-aid.

b. First-aid-trained personnel shall possess valid certificate indicating that they have successfully completed first-aid training course by the American Red Cross or similar entity.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 USE

A. Use of Temporary Facilities:
   1. Properly supervise temporary facilities.
   2. Properly dispose of wastes.

3.2 REMOVAL

A. Completely remove temporary facilities and materials when no longer required. Repair damage caused by temporary facilities and their removal and restore Site to condition required by the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

+ + END OF SECTION + +

SECTION 01 52 19

SANITARY FACILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for temporary sanitary facilities, including toilet facilities, drinking water for personnel, and personnel washing facilities.
   2. General CONTRACTOR shall provide all temporary sanitary facilities required for the Project.
      a. Make all arrangements with temporary sanitary facility providers for temporary sanitary services and obtain required permits and approvals for temporary sanitary facilities and associated services.
      b. Pay all costs for temporary sanitary facilities and associated services, including cost of electricity, water, fuel, and other utility services required for temporary sanitary facilities.
      c. Continuously maintain adequate temporary sanitary facilities for all purposes during the Project, until removal of temporary sanitary facilities. At minimum, provide and maintain temporary sanitary facilities through Substantial Completion and removal of temporary field offices and sheds, and at all times thereafter when CONTRACTOR is at the Site performing Work.
      d. Maintain and clean the temporary sanitary facilities and continuously provide consumables as required.
      e. Temporary sanitary facilities shall be adequate for personnel using the Site and requirements of Project.
      f. Provide temporary sanitary facilities in compliance with Laws and Regulations and, when applicable, requirements of utility owners.

1.2 REQUIREMENTS FOR TEMPORARY SANITARY FACILITIES

A. Sanitary Facilities.
   1. Portable Toilets:
      a. Provide suitably-enclosed, temporary chemical or self-contained toilets for CONTRACTOR's employees and visitors to the Site.
      b. Location of temporary toilets shall be acceptable to OWNER.
   2. Drinking Water:
      a. Provide supply of potable drinking water and related facilities and consumables for all personnel using the Site, including employees of contractors, OWNER, facility manager, ENGINEER, visitors, and others.
      b. Location of potable drinking water supply shall be as required by CONTRACTOR and convenient for access by personnel
      c. Provide potable drinking water supply and cups.

d. Replenish drinking water supply as needed. Avoid creating hazards to health and safety caused by shortages of drinking water quantity and inadequate quality.
e. Drinking water quality shall comply with Laws and Regulations.

3. Washing Facilities:
   a. Provide suitable temporary washing facilities for employees, ENGINEER, and visitors to the Site.
   b. Washing facilities shall be adequate for the nature of work underway at the Site.
   c. Properly handle, store, and dispose of sued wash water, in accordance with Laws and Regulations.

1.3 USE OF OWNER'S SYSTEM

A. Existing Sanitary Facilities:
   1. Do not use facilities in existing buildings or structures for temporary sanitary facilities without written permission of OWNER and facility manager and mutually acceptable basis agreed upon by the parties for proportionate sharing of costs between OWNER and CONTRACTOR.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for temporary sanitary facilities may be new or used, but shall be adequate for purposes intended and shall not create unsafe conditions, and shall comply with Laws and Regulations.

B. Provide required materials, equipment, and facilities, including piping, wiring, and controls.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install temporary sanitary facilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.

B. Location of Temporary Sanitary Facilities:
   1. Locate temporary sanitary facilities for proper function and service.
   2. Temporary sanitary facilities shall not interfere with or provide hazards or nuisances to: the Work under this and other contracts, movement of personnel, traffic areas, materials handling, hoisting systems, storage areas, finishes, and work of utility companies.

C. Modify and extend temporary sanitary facilities as required by progress of the Work.

3.2 USE

A. Maintain temporary sanitary facilities to provide safe, continuous service as required.

B. Supervision and Enforcement of Use:
   1. Properly supervise operation of temporary sanitary facilities.
   2. Enforce compliance with Laws and Regulations.
   3. Enforce safe practices.
   4. Prevent abuse of services.
   5. Prevent nuisances and hazards caused by temporary sanitary facilities and their use.
   6. Prevent damage to finishes.
   7. Ensure that temporary sanitary facilities do not interrupt continuous progress of the Work.

C. Checks and Consumables:
   1. At end of each work day, check temporary sanitary facilities and verify that sufficient consumables are available to maintain operation until work is resumed at the Site.
   2. Provide additional consumables if the supply on hand is insufficient.

3.3 REMOVAL

A. Completely remove temporary sanitary facilities and materials when no longer required. Repair damage caused by temporary sanitary facilities and their removal and restore the Site to condition required by the Contract Documents; if restoration of damaged areas is not specified, restore to pre-construction condition.

B. When permanent sanitary facilities were used for temporary sanitary facilities, immediately prior to requesting inspection for Substantial Completion, replace all consumables used during the Work and verify suitability of sanitary facilities for OWNER's permanent use. Correct deficiencies and damage.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 55 13

ACCESS ROADS AND PARKING AREAS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall provide temporary construction roads, walks, parking areas, and appurtenances required during the Project for use by CONTRACTOR, other contractors employed on the Project, OWNER's, facility manager's, and emergency vehicles.
   2. Temporary roads and parking areas shall be designed and maintained by CONTRACTOR and shall be fully passable to vehicles in all weather conditions.

B. Use of Existing Access Roads:
   1. CONTRACTOR is allowed to use OWNER's existing roads starting on the Effective Date of the Contract and satisfying other Contract requirements relative to starting the Work.
   2. Prevent interference with traffic on existing roads and parking areas. Always keep access roads and entrances serving the Site clear and available to OWNER, facility manager, and their respective employees; emergency vehicles; and other contractors. Do not use access roads or Site entrances for parking or storage of materials or equipment.
   3. CONTRACTOR shall indemnify and hold harmless OWNER and ENGINEER from expenses and losses caused by CONTRACTOR's operations over existing roads, drives, and parking areas.
   4. Schedule deliveries to minimize use of driveways and Site entrances.

1.2 CONTRACTOR PARKING

A. CONTRACTOR employee vehicles shall park in area(s) indicated in Section 01 57 33, Security.

B. Park construction vehicles and equipment in work areas off of permanent roads and parking areas, in areas of the Site designated for CONTRACTOR staging.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials for temporary roads and parking areas shall comply with the Contract Documents' requirements for permanent roads, drives, and parking areas.

B. Traffic controls shall comply with requirements of authorities having jurisdiction. When such authority is the OWNER or facility manager, and no requirements are indicated, comply with the standard specifications of the state department of transportation in the area of the Project.

PART 3 – EXECUTION

3.1 TEMPORARY ROADS AND PARKING AREAS

A. Temporary Roads and Parking in Same Areas as Permanent Pavement:
   1. Provide temporary roads and parking areas adequate to support and withstand traffic and construction loads during the Project. Locate temporary roads and parking areas in same location as permanent roads and parking areas. Extend temporary roads and parking areas, within construction limits indicated, as required for construction operations.
   2. Coordinate elevations of temporary roads and parking areas with permanent roads and parking areas.
   3. Prepare subgrade, subbase, and base for temporary roads and parking areas in accordance with the Contract Documents requirements for permanent roads, drives, and parking areas.
   4. Where required by subgrade conditions and construction loads and traffic, provide geosynthetic separation fabric as required on compacted subgrade for subbase support and separation of subbase and subgrade materials.
   5. Re-condition granular subbase of temporary roads and parking areas, including removing and properly disposing of granular material that has become intermixed with soil, re-grading, proof-rolling, compacting, and testing.

3.2 TRAFFIC CONTROLS

A. Traffic Controls:
   1. Provide temporary traffic controls at intersections of temporary roads with each other and with parking areas, including intersections with other temporary roads, intersections with public roads, and intersections with permanent access roads at the Site.
   2. Provide temporary warning signs on permanent roads and drives, and provide temporary "STOP" signs for traffic on temporary roads where required and at entrances to permanent pavement.
   3. Comply with requirements of authorities having jurisdiction. When such authority is the OWNER or facility manager, and no requirements are indicated, comply with the standard specifications of the state department of transportation in the area of the Project

3.3 MAINTENANCE OF ROADS

A. General:
   1. Maintain temporary roads and parking to continuously provide at the Site access for construction vehicles and trucks, OWNER and facility manager vehicles, deliveries for OWNER and facility manager, emergency vehicles, and parking areas for OWNER's and facility manager's personnel.
   2. Public roads shall be passable at all times unless a road closure is allowed in writing by authority having jurisdiction.
   3. When granular material of temporary roads and parking without hard surfacing become intermixed with soil or when temporary roads otherwise create a nuisance, remove intermixed granular-and-soil material and replace with clean granular material as required.
   4. Provide snow and ice removal for temporary roads and parking areas.

B. Cleaning and Dust Control:
   1. Cleaning: Clean paved surfaces over which construction vehicles travel. Perform cleaning not less often than the frequency indicated in Section 01 74 05, Cleaning, or more frequently as directed by ENGINEER, by mechanical sweeping or other means acceptable to ENGINEER.
   2. Clean the following surfaces:
      a. Roads within limits of the Project.
      b. Permanent roads at the Site between the Site entrance and the work areas, and between the Site entrance and construction parking and staging areas.
      c. Public roads that require sweeping and cleaning due to construction operations.
   3. Dust Control:
      a. Control dust resulting from construction activities to prevent nuisances at the Site and in nearby areas.
      b. Comply with Section 01 41 27, Earthmoving and Dust Control, and Section 01 57 00, Temporary Controls.

C. Protection of Underground Facilities: Comply with the General Conditions, as may be modified by the Supplementary Conditions, Section 01 71 33, Protection of the Work and Property, and other requirements of the Contract Documents.

3.4 REMOVALS AND RESTORATION

A. Removals:
   1. Remove temporary roads, drives, walks, and parking areas that are not intended for, or acceptable for, integration into permanent pavement. Return areas of temporary roads, drives, walks, and parking to pre-construction condition unless otherwise required by the Contract Documents.
   2. Remove temporary gates, fencing, and traffic controls associated with temporary roads and parking areas.
   3. Where areas of temporary roads and parking will be permanently landscaped, remove pavement, granular subbase, geosynthetic (where required by

ENGINEER), soil, and other materials that do not comply with the Contract Documents regarding fill, subsoil, and landscaping.

4. Remove and properly dispose of materials contaminated with oil, bitumen, and other petrochemical compounds resulting from CONTRACTOR's operations, and other substances that might impair growth of plants and lawns.

B. Restoration:

1. Repair or replace paving, curbs, gutters, and sidewalks affected by temporary roads and parking, and restore to required conditions in accordance with authorities having jurisdiction.
2. Restore to pre-construction conditions existing roads, walks, and parking areas damaged by CONTRACTOR, subject to approval of the owner of affected roads, drives, walks, and parking areas.

+ + END OF SECTION + +

SECTION 01 55 26

MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall keep all roads, streets, and traffic ways open for passage of traffic and pedestrians during the Work, unless otherwise approved by owner of the street, traffic way, or right-of-way, as applicable.

   2. Unless otherwise shown or indicated in the Contract Documents, maintenance and protection of traffic shall be in accordance with New York State Department of Transportation Standard Specifications.

B. Coordination:
   1. Coordinate with owner of the highway or street right-of-way, as applicable, for maintenance and protection of traffic requirements.
   2. Give required advance notice to fire departments, police departments, and other emergency services as applicable of proposed construction operations.
   3. Give reasonable notice to owners or tenants of private property who may be affected by construction operations. Give such notice not less than 10 days prior to when such property will or may be affected by construction operations.
   4. Coordinate with requirements of the following:
      a. Section 01 55 13, Access Roads and Parking Areas.
      b. Section 01 71 33, Protection of the Work and Property, regarding temporary barriers.
      c. Section 31 23 05, Excavation and Fill, for temporary barriers at excavations.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Procedure Submittals: Detailed plan, procedures, and sequencing for maintaining and protecting traffic in accordance with the Contract Documents and requirements of authorities having jurisdiction. Include in the submittal the following:
      a. Traffic staging plan, and construction sequencing as applicable to maintain and protect traffic.
      b. Product data, including manufacturer's catalog information and specifications, for temporary signage, temporary signals, temporary illumination devices, and other products to be utilized in maintaining and protecting traffic.

c. Indication of number and types of personnel dedicated to maintaining and protecting traffic during construction.
d. Indication of plan acceptance from authorities having jurisdiction.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment used for maintenance and protection of traffic shall comply with the reference specification indicated in Paragraph 1.1.A.3 of this Section.

PART 3 – EXECUTION

3.1 GENERAL PROVISIONS

A. When required to cross, obstruct, or temporarily close a street or traffic way, provide and maintain suitable bridges, detours, or other acceptable temporary expedient for the accommodation of traffic. Closings shall be for shortest duration practical, and passage shall be restored immediately after completion of filling and temporary paving or bridging.

B. Temporary Control Devices:
   1. Provide temporary signs, signals, barricades, flares, lights and other equipment, services, and personnel required to regulate and protect traffic and warn of hazards.
   2. Such Work shall comply with requirements of OWNER and authorities having jurisdiction at the Site.
   3. Remove temporary equipment and facilities when no longer required, and restore grounds to condition indicated in the Contract Documents; if not indicated, resort to pre-construction conditions.

C. Keep accessible for use permanent facilities such as hydrants, valves, fire alarm boxes, postal boxes, delivery service boxes, and other facilities that may require access during construction.

3.2 TRAFFIC SIGNALS AND SIGNS

A. Provide and operate temporary traffic controls and directional signals required to direct and maintain an orderly flow of traffic in areas under CONTRACTOR's control, and areas affected by construction operations.

B. Provide temporary traffic controls and directional signs, mounted on temporary barriers or standard posts, at the following locations:
   1. Each change of direction of a roadway and at each crossroad.
   2. Detours and areas of hazard.
   3. Parking areas.

4. Traffic entrance to and exit from each construction area.

3.3 TRAFFIC CONTROL PERSONNEL

A. General:
   1. When construction operations encroach on traffic lanes, furnish qualified and suitably-equipped traffic control personnel as required for regulating traffic and in accordance with requirements of authorities having jurisdiction.
   2. Traffic control personnel shall use appropriate flags or mobile signs.
   3. Equip traffic control personnel with appropriate personal protection equipment and suitable attire.
   4. Attire and conduct of traffic control personnel shall be appropriate and shall not create nuisances or distractions for traffic.

3.4 FLARES AND LIGHTS

A. During periods of low visibility provide temporary flares and lights for the following:
   1. To clearly delineate traffic lanes, to guide traffic, and to warn of hazardous areas.
   2. For use by traffic control personnel directing traffic.

B. Provide adequate illumination of critical traffic and parking areas.

3.5 PARKING CONTROL

A. Control CONTRACTOR-related vehicular parking at the Site to preclude interfering with: traffic and parking, access by emergency vehicles, OWNER's and facility manager's operations, and construction operations. Provide temporary parking facilities for the public, as required because of construction operations.

B. Control parking of construction and private vehicles at the Site as follows:
   1. Maintain free vehicular access to and through parking areas.
   2. Prohibit parking on or adjacent to access roads, and in non-designated areas.
   3. Construction vehicles shall possess current vehicle registration.
   4. Private vehicles shall park only in designated areas.

3.6 HAUL ROUTES

A. Consult with authorities having jurisdiction to establish thoroughfares that will be used as haul routes and Site access.

B. Confine construction traffic to designated haul routes.

C. Provide temporary traffic controls at critical areas of haul routes to expedite traffic flow, and to minimize interference with normal traffic.

3.7 REMOVAL

A. Maintain and protect traffic until Substantial Completion and at all times thereafter when CONTRACTOR is working at the Site. Provide maintenance and protection of traffic measures at the Site until no longer required due to the progress of the Work. When no longer required, completely remove maintenance and protection of traffic measures and restore the Site to condition required by the Contract Documents or, when not indicated in the Contract Documents, to pre-construction conditions.

+ + END OF SECTION + +

SECTION 01 57 05

TEMPORARY CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall provide and maintain methods, materials, equipment, and temporary construction as required for controlling environmental conditions at the Site and adjacent areas during construction.
   2. Maintain controls until no longer required. Provide temporary controls at all times when CONTRACTOR is working at the Site.
   3. Temporary controls include, but are not limited to, the following:
      a. Erosion and sediment controls.
      b. Noise controls.
      c. Dust controls.
      d. Pest and rodent controls.
      e. Control of water, including storm water runoff.
      f. Pollution controls.

B. Related Sections:
   1. Section 01 35 43.13, Environmental Procedures for Hazardous Materials.
   2. Section 01 35 44, Spill Prevention Control and Countermeasures Plan.
   3. Section 01 41 26, Storm Water Pollution Prevention Plan and Permit.
   4. Section 01 41 27, Earthmoving Permit and Dust Control.
   5. Section 31 23 05, Excavation and Fill.
   6. Section 31 37 00, Riprap.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions and recommendations of the following:
   1. New York State Department of Environmental Conservation.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Plan for construction staging and maintenance of the Site relative to erosion and sediment controls. Indicate on a site plan approximate areas of planned disturbance of soils and soil cove over time during the Project. For areas not indicated in the Contract Documents as being disturbed and that CONTRACTOR proposes to disturb, Shop Drawing shall include proposed erosion and sediment control measures for the additional area.

2. Product Data:
    a. Silt fencing materials.

B. Informational Submittals: Submit the following:
    1. Procedural Submittals:
        a. Proposed dust control measures, when submittal is requested by ENGINEER.

PART 2 – PRODUCTS

2.1 MATERIALS FOR TEMPORARY EROSION AND SEDIMENT CONTROLS

A. Materials for temporary erosion and sediment controls shall be as shown or indicated on the Drawings.

PART 3 – EXECUTION

3.1 NOISE CONTROL

A. Noise Control – General:
    1. CONTRACTOR's vehicles and equipment shall minimize noise emissions to greatest degree practicable. When necessary, provide mufflers and silencers on construction equipment, and provide temporary sound barriers onsite when necessary.
    2. Noise levels shall comply with Laws and Regulations, including OSHA requirements and local ordinances.
    3. Noise emissions shall not interfere with the work of OWNER, facility manager, or others.

3.2 DUST CONTROL

A. Dust Control – General:
    1. Control objectionable dust caused by CONTRACTOR's operation of vehicles and equipment, clearing, demolition, cleaning, and other actions. To minimize airborne dust, apply water or use other methods subject to acceptance of ENGINEER and approval of authorities having jurisdiction.
    2. CONTRACTOR shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce onsite and off-Site damage, nuisances, and health hazards associated with dust emissions.
    3. Comply with Section 01 41 27, Earthmoving Permit and Dust Control.

B. Dust Control Methods:
    1. Dust control may be achieved by irrigation in which the dust-prone area of the Site shall be sprinkled with water until the surface is moist.

2. Apply dust controls as frequently as required without creating nuisances such as excessive mud and ponding of water at the Site. Do not use water for dust control when water will cause hazardous or objectionable conditions such as ice, mud, ponds, and pollution.
3. Provide dust control that is non-polluting and does not contribute to tracking-out of dirt and dust onto pavement.

C. Removal of Dust and Dirt from Travelled Surfaces:
1. Remove dust and dirt from roadways, drives, parking areas, and other travelled surfaces not less than the frequency indicated in Section 01 74 05, Cleaning.
2. Perform dust and dirt removals from travelled surfaces by mechanical sweeping or other method acceptable to ENGINEER.

3.3 PEST AND RODENT CONTROL

A. Pest and Rodent Control – General:
1. Provide pest and rodent controls as required to prevent infestation of the Site and storage areas.
2. Employ methods and use materials that do not adversely affect conditions at the Site or on adjoining properties.
3. In accordance with Laws and Regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled.

3.4 WATER CONTROL

A. Water Control – General:
1. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the Site, and adjoining properties.
2. Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff courses to prevent erosion, damage, or nuisance. Avoid directing to adjoining properties runoff from the Site and construction operations.

B. Equipment and Facilities for Water Control:
1. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

C. Discharge and Disposal:
1. Dispose of storm water and ground water in manner to prevent flooding, erosion, and other damage to any and all parts of the Site and adjoining areas, and that complies with Laws and Regulations.

3.5 POLLUTION CONTROL

A. Pollution Control – General:

1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from or caused by construction operations.
2. Equipment used during construction shall comply with Laws and Regulations.
3. Comply with Section 01 35 43.13, Environmental Procedures for Hazardous Materials.

B. Spills and Contamination:
1. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids.
2. Excavate contaminated material and properly dispose of off-Site, and replace with suitable compacted fill and topsoil.
3. Comply with Section 01 35 44, Spill Prevention Control and Countermeasures Plan, and OWNER's and facility manager's hazard control procedures as indicated in Section 01 35 23, Safety Requirements.

C. Protection of Surface Waters and Ground Water:
1. Provide and maintain special measures to prevent harmful substances from entering surface waters and ground water. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers, and in ground water.

D. Atmospheric Pollutants:
1. Provide and maintain systems for controlling atmospheric pollutants related to the Work.
2. Prevent toxic concentrations of chemicals and vapors.
3. Prevent harmful dispersal of pollutants into atmosphere.

E. Solid Waste:
1. Provide and maintain systems for controlling and managing solid waste related to the Work.
2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
3. Properly handle and dispose of solid waste.
4. Comply with requirements for cleaning and disposal of debris in the General Conditions, as may be modified by the Supplementary Conditions, and Section 01 74 05, Cleaning.

3.6 EROSION AND SEDIMENT CONTROLS

A. Installation and Maintenance of Erosion and Sediment Controls – General:
1. General:
a. Provide temporary erosion and sediment controls as shown and indicated on the Drawings and as indicated elsewhere in the Contract Documents. Provide erosion and sediment controls as the Work progresses into previously-undisturbed areas.

b. Installation of erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.2 of this Section, unless more-stringent methods are otherwise shown or indicated in the Contract Documents.
c. Use necessary methods to successfully control erosion and sedimentation, including ecology-oriented construction practices, vegetative measures, and mechanical controls. Use best management practices (BMP) in accordance with Laws and Regulations, and regulatory requirements indicated in Article 1.2 of this Section, to control erosion and sedimentation during the Project.
d. Plan and execute construction, disturbances of soils and soil cover, and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation. Provide temporary measures for controlling erosion and sedimentation, as indicated in the Contract Documents and as required for the Project.
e. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provide measures for regulating drainage and controlling erosion and sedimentation, subject to the ENGINEER'S approval.
f. Provide erosion and sediment controls, including stabilization of soils, at the end of each workday.

2. Coordination:
   a. Coordinate erosion and sediment controls with this Section's requirements on water control, and with Section 01 41 26, Storm Water Pollution Prevention Plan and Permit.
   b. Coordinate temporary erosion and sediment controls with construction of permanent drainage facilities and other Work to the extent necessary for economical, effective, and continuous erosion and sediment controls.
3. Before commencing activities that will disturb soil or soil cover at the Site, provide all erosion and sediment control measures required by the Contract Documents for the areas where soil or soil cover will be disturbed.
4. In general, implement construction procedures associated with, or that may affect, erosion and sediment control to ensure minimum damage to the environment during construction. CONTRACTOR shall implement any and all additional measures required to comply with Laws and Regulations, and Section 01 41 26, Storm Water Pollution Prevention Plan and Permit.
5. Vegetation Removal: Remove only those shrubs, grasses, and other vegetation that must be removed for construction. Protect remaining vegetation.
6. Access Roads and Parking Areas: When possible, access roads and temporary roads and parking shall be located and constructed to avoid adverse effects on the environment. Provide measures to regulate drainage, avoid erosion and sedimentation, and minimize damage to vegetation.
7. Earthwork and Temporary Controls:
   a. Perform excavation, fill, and related operations in accordance with Section 31 23 05, Excavation and Fill.

b. Control erosion to minimize transport of silt from the Site into existing waterways and surface waters. Such measures shall include, but are not limited to, using berms, silt fencing, baled straw silt barriers, gravel or crushed stone, mulching and soil stabilization, slope drains, and other methods. Apply such temporary measures to erodible materials exposed by activities associated with the construction of the Project.
c. Hold to a minimum the areas of bare soil exposed at one time.
d. Construct fills and waste areas by selectively placing fill and waste materials to eliminate surface silts and clays that will erode.
e. In performing earthwork, eliminate depressions that could serve as mosquito breeding pools.
f. CONTRACTOR shall provide special care in areas with steep slopes, where disturbance of vegetation shall be minimized to maintain soil stability.

8. Inspection and Maintenance:
   a. Periodically inspect areas of earthwork and areas where soil or soil cover are disturbed to detect evidence of the start of erosion and sedimentation; promptly implement corrective measures as required to control erosion and sedimentation. Continue inspections and corrective measures until soils are permanently stabilized and permanent vegetation has been established
   b. Inspect not less often than the frequency indicated in Section 01 41 26, Storm Water Pollution Prevention Plan and Permit.
   c. Repair or replace damaged erosion and sediment controls within 24 hours of CONTRACTOR becoming aware of such damage.
   d. Periodically remove silt and sediment that has accumulated in or behind sediment and erosion controls. Properly dispose of silt and sediment.
9. Duration of Erosion and Sediment Controls:
   a. Maintain erosion and sediment controls in effective working condition until the associated drainage area has been permanently stabilized.
   b. Maintain erosion and sediment controls until the Site is restored and site improvements including landscaping, if any, are complete with underlying soils permanently stabilized.
10. Work Stoppage:
    a. If the Work is temporarily stopped or suspended for any reason, CONTRACTOR shall provide additional temporary controls necessary to prevent environmental damage to the Site and adjacent areas while the Work is stopped or suspended.
11. Failure to Provide Adequate Controls:
    a. In the event CONTRACTOR repeatedly fails to satisfactorily control erosion and sedimentation, OWNER reserves the right to employ outside assistance or to use OWNER's own forces for erosion and sediment control.
    b. Cost of such work by OWNER, plus engineering and inspection costs, will be deducted from amounts due CONTRACTOR, as set-offs in accordance with the Contract Documents.

3.7 REMOVAL OF TEMPORARY CONTROLS

A. Removals – General:
   1. Upon completion of the Work, remove temporary controls and restore Site to specified condition; if condition is not specified, restore Site to pre-construction condition.
   2. After soils are permanently stabilized, remove from the Site temporary erosion and sediment controls.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 57 33

SECURITY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for security at the Site, including accessing the Site, securing the Work, temporary fencing, and other requirements.
   2. General CONTRACTOR shall safely guard all the Work, the Project, materials, equipment, and property from loss, theft, damage, and vandalism until Substantial Completion, unless otherwise agreed upon by the parties.
   3. CONTRACTOR's duty includes safely guarding OWNER's property in vicinity of the Work and Project, and other private property in the vicinity of the Project from injury and loss in connection with performance of the Project.
   4. Costs for security required under this Section shall be paid by CONTRACTOR.
   5. Make no claim against OWNER for damage resulting from trespass.
   6. Remedy damage to property of OWNER and others arising from failure to furnish adequate security.
   7. Provide temporary fencing in accordance with the Contract Documents.
   8. CONTRACTOR's security measures shall be at least equal to those usually provided by OWNER or facility manager to protect existing facilities during normal operation.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Temporary Fencing: Submit site plan drawings showing proposed locations and extent of temporary site security fencing and each breach therein.
   2. Product Data:
      a. Temporary Fencing: Manufacturer's literature, specifications, and installation instructions for temporary site security fencing proposed.

B. Informational Submittals: Submit the following:
   1. Employee Information: Submit to OWNER the following; do not submit to ENGINEER:
      a. Format of employee background data.
      b. Background data for employees to whom identification badges will be furnished.

c. Updated listing of personnel to whom identification badges have been issued. Submit updated listing within 24 hours of a change in the list or change in an employee's Site access status.

1.3 CONTRACTOR'S SITE ACCESS AND SECURITY PROCEDURES

A. Comply with Section 01 55 13, Access Roads and Parking Areas.

B. Comply with OWNER's security procedures and access restrictions at the Site throughout the Project. Comply with the following:
   1. Personnel Identification:
      a. All CONTRACTOR personnel, including Subcontractors, Suppliers, and others associated with the Project shall wear, at a visible location, at all times at the Site a durable, waterproof badge bearing CONTRACTOR's name, employer (if other than CONTRACTOR), employee's name and, as applicable, employee number.
   2. General Provisions Regarding Personnel Identification:
      a. Prerequisites to Issuance of Personnel Identification Badges:
         1) Do not issue personnel identification badge until the person receiving the badge is documented by CONTRACTOR as:
            a) Being eligible to perform work in the jurisdiction where the Project is located.
            b) Has received all required safety instructions, training, and equipment.
            c) Is known to CONTRACTOR as being qualified to perform the Work to which the person will be assigned.
      b. Listing of Personnel to Whom Badges are Issued:
         1) Maintain and continuously update a listing or log of all personnel to whom personnel identification badges have been issued.
         2) Listing or log shall indicate each person's full name, home address, personal telephone number, employer name, and employer address and telephone number.
         3) Submit copy of listing or to OWNER in accordance with Article 1.2 of this Section.
   3. Vehicle Identification:
      a. While on-Site, all CONTRACTOR vehicles, including employee vehicles, shall display vehicle identification tag in clearly visible location on dashboard.
      b. Vehicle tag shall be issued by CONTRACTOR.
      c. Vehicle tag shall include the following information: Site name, CONTRACTOR name, contract designation, vehicle license plate number and state of registration, name and employer of vehicle owner, and vehicle owner contact telephone number.
   4. Parking:
      a. Do not park outside of designated CONTRACTOR parking area, which is shown on the Drawings. Prepare and maintain parking area as required.

b. Personal vehicles are not allowed outside the contractor parking area.

PART 2 – PRODUCTS

2.1 TEMPORARY FENCING

A. When security fencing or barriers are breached or temporarily removed for the Project, provide and maintain temporary security fencing equal to existing, unless otherwise specified, in manner satisfactory to ENGINEER and OWNER.

PART 3 – EXECUTION

3.1 TEMPORARY FENCING

A. Installation:
   1. Provide temporary fencing for site security so that integrity of site security is maintained throughout the Project.
   2. Install temporary fencing used for site security in accordance with the Contract Documents and fence manufacturer's instructions.

B. Maintenance:
   1. Maintain temporary fencing throughout the Project.
   2. Repair damage to temporary fencing and replace fencing when required to preserve Site security.

C. Removal:
   1. Remove temporary fencing when permanent site security fencing is in place and fully functional, or when otherwise directed or ENGINEER.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 58 00

PROJECT IDENTIFICATION AND SIGNS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall furnish, install, and maintain temporary signage for Project identification and construction site information.
   2. Temporary signs required are indicated in Part 2 of this Section.
   3. Do not display any other temporary signs, other than those specified, without prior approved of OWNER.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Sign Painter:
      a. Shall be a professional in the type of Work required, regularly engaged in work similar to that required.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Layout of each temporary sign, indicating layout, text, font, character size, graphics (if any), type and grade of materials, including sign board, trim, supports, and bracing.
   2. Product Data:
      a. Specifications and product data for finishes proposed for use, when requested by ENGINEER.
   3. Samples: Submit color Samples when requested by ENGINEER.

PART 2 – PRODUCTS

2.1 MATERIALS AND CONSTRUCTION

A. Performance Criteria:
   1. Temporary signs, including supports and bracing, shall withstand sustained winds of 75 miles per hour.

B. Temporary Signage Required: Provide the following temporary signs:
   1. Project Sign:
      a. Location: Contractors Field Office.

b. Text to Read as Follows:

Old Forge Dam and Sixth Lake Dam - Rehabilitation
Hamlet of Old Forge, Herkimer Co., New York (NYS Dam No. 140-2000)
Town of Inlet, Hamilton Co., New York (NYS Dam No. 140-0860
For More Information: https://hrbrrd.ny.gov/

c. Characters:
   1) Size: 3 inches high
   2) Font: Ariel
   3) Color: PANTONE 288C or CMYK 100/87/27/19.
d. Background Color: White.
e. Dimensions:
   1) Minimum Sign Board Dimensions: 8 feet wide by 4 feet high.
   2) Distance from Ground to Bottom of Sign 3 feet.

1. Site Informational Signage:
   a. Provide temporary signage as required for construction site operations and controlling traffic at the construction site. Temporary signage for controlling traffic shall comply with Section 01 55 26, Maintenance and Protection of Traffic.

C. Materials:
   1. Sign Board:
      a. Signs shall be 3/4-inch thick, exterior-grade plywood, unless otherwise shown or indicated.
      b. Provide signs with trim, mitered on edges.
   2. Supports and Bracing:
      a. Provide supports and bracing as required to adequately support and brace temporary signs to comply with the performance criteria indicated in this Section.

D. Finishing:
   1. Paint sign with exterior gloss-finish enamel, suitable for long-term exposure to sunlight without fading for the duration of the Project.

PART 3 – EXECUTION

3.1 INSTALLATION, MAINTENANCE, AND REMOVAL

A. Installation:
   1. Location of signs shall be as shown or indicated on the Contract Documents, or as directed by ENGINEER. Temporary signs shall be plainly visible to vehicular traffic.
   2. Install signs in a neat, professional, workmanlike manner to withstand the performance criteria indicated in this Section.

B. Maintenance:
   1. Maintain temporary signage so that signs are clean, legible, and upright.
   2. Cut grass, weeds, and other plants so that temporary signs are not covered or obscured.
   3. Repair and repaint damaged temporary signs.
   4. Relocate signs as required by progress of the Project.

C. Remove temporary signage prior to final inspection of the Work, or when directed by ENGINEER.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 61 00

COMMON PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes:
      a. Common requirements for materials and equipment.
      b. Compatibility of materials and equipment.

1.2 REQUIREMENTS FOR MATERIALS AND EQUIPMENT

A. Unless otherwise indicated in the Contract Documents, furnish materials and equipment that:
   1. have not been previously been incorporated into another project or facility; and
   2. have not changed ownership after initial shipment from the manufacturer's factory or facility; and
   3. if stored since their manufacture or fabrication, have, while in storage, been properly maintained and serviced in accordance with the manufacturer's recommendations for long-term storage; submit documentation as required by ENGINEER that such maintenance and service has been performed; and
   4. that the item(s) have not been subject to degradation or deterioration since manufacture; and
   5. are the current model(s) or type(s) furnished by the Supplier.

B. To the extent possible, furnish from a single source those materials and equipment that are of the same generic kind.

C. Furnish materials and equipment complete with accessories, trim, finish, fasteners, and other items shown, indicated, or required for a complete installation for the indicated use and performance.

D. Standard Items: When available, and unless custom or nonstandard options are specified or indicated, furnish standard materials and equipment of types that have been produced and used successfully in similar situations on other projects.

E. Visual Matching: Where required in the Contract Documents, furnish materials and equipment that match (as determined by ENGINEER) referenced existing construction, and mock-ups and Sample(s) approved by ENGINEER.

F. Where the Contract Documents include the phrase "as selected" for color of materials or equipment, finish pattern, option, or similar phrase, provide materials and equipment selected by ENGINEER as follows:

1. Standard Range: Where the Contract Documents include the phrase "standard range of colors, patterns, textures" or similar wording, provide color, pattern, density, or texture selected by ENGINEER from manufacturer's product line that does not include premium items.
2. Full Range: Where the Contract Documents include the phrase "full range of colors, patterns, textures" or similar wording, ENGINEER will select color, pattern, density, or texture from manufacturer's entire product line, including standard and premium items.

1.3 COMPATIBILITY

A. Similar materials and equipment by the same Supplier shall be compatible with each other, unless otherwise indicated in the Contract Documents or approved by ENGINEER.

B. Provide materials and equipment compatible with items previously selected or installed on the Project.
   1. Provide materials and equipment and employ construction methods compatible with materials and equipment and construction methods of other contractors' construction of similar or associated work.
   2. If disagreement arises between contractors over concurrently-selectable but incompatible materials or equipment, ENGINEER will determine items to be used in accordance with the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 62 00

PRODUCT OPTIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes:
      a. CONTRACTOR's options for selecting materials and equipment.
      b. Requirements for consideration of "or-equal" materials and equipment.

1.2 PRODUCT OPTIONS

A. For materials and equipment specified only by reference standard or description, without reference to Supplier, furnish materials and equipment complying with such standard, by a Supplier or from a source that complies with the Contract Documents.

B. For materials and equipment specified by naming one or more items or Suppliers, furnish the named materials and equipment that comply with the Contract Documents, unless an "or-equal" or substitute item is approved by ENGINEER.

C. For materials and equipment specified by naming one or more items or Suppliers and the term, "or-equal", when CONTRACTOR proposes a material or equipment item or Supplier as an "or-equal", submit to ENGINEER a request for approval of an "or-equal" item or Supplier.

D. For materials and equipment specified by naming only one item or manufacturer and followed by words indicating that no substitution is allowed, there is no option and no "or-equals" or substitution will be allowed or approved.

1.3 "OR-EQUAL" ITEMS

A. Procedure:
   1. For proposed materials and equipment not named in the Contract Documents and considered as an "or-equal" in accordance with the General Conditions, CONTRACTOR shall request in writing ENGINEER's approval of the "or-equal".
   2. Request for approval of an "or-equal" item shall accompany the Shop Drawing or product data submittal for the proposed item

B. Requests for approval of "or-equals" shall include:
   1. CONTRACTOR's written request that the proposed item be considered as an "or-equal" in accordance with the General Conditions, accompanied by CONTRACTOR's certifications required in the General Conditions.

2. Documentation adequate to demonstrate to ENGINEER that proposed item does not require extensive revisions to the Contract Documents, that proposed item is consistent with the Contract Documents, and that proposed item will produce results and performance required in the Contract Documents, and that proposed item is compatible with other portions of the Work.
3. Detailed comparison of significant qualities of proposed item with the materials and equipment and manufacturers named in the Contract Documents. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements shown or indicated.
4. Evidence that proposed item's manufacturer will furnish warranty equal to or better than that specified, if any.
5. List of similar installations for completed projects with project names and addresses, and names and address of design professionals and owners, when requested.
6. Samples, when requested by ENGINEER.
7. Other information requested by ENGINEER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for preparing for shipping, delivering, and handling materials and equipment to be incorporated into the Work.
   2. CONTRACTOR shall make all arrangements for transporting, delivering, and handling of materials and equipment required for prosecution and completion of the Work.
   3. When required, move stored materials and equipment without changes to the Contract Price or Contract Times.

1.2 SUBMITTALS

A. Refer to individual Specifications Sections for submittal requirements relative to delivering and handling materials and equipment.

1.3 PREPARING FOR SHIPMENT

A. When practical, factory-assemble materials and equipment. Mark or tag separate parts and assemblies to facilitate field-assembly. Cover machined and unpainted parts that may be damaged by the elements or climate with strippable, protective coating.

B. Package materials and equipment to facilitate handling, and protect materials and equipment from damage during shipping, handling, and storage. Mark or tag outside of each package and crate to indicate the associated purchase order number, bill of lading number, contents by name, OWNER's contract designation, CONTRACTOR name, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Protect materials and equipment from exposure to the elements and damage by climate, and keep thoroughly dry and dust-free at all times. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Lubricate bearings and other items requiring lubrication in accordance with manufacturer's instructions.

D. Advance Notification of Shipments:
   1. Keep ENGINEER informed of delivery of all materials and equipment to be incorporated in the Work.

2. Upon receipt of Supplier's advance notice of shipment, not less than seven days prior to delivery of materials and equipment, provide ENGINEER written notification of anticipated date and place of arrival of the following:
    a. Generators
    b. Sluice gates
    c. Trashracks

E. Do not ship materials and equipment until:
1. Related Shop Drawings, Samples, and other submittals required by the Contract Documents have been approved or accepted (as applicable) by ENGINEER, including, but not necessarily limited to, all Action Submittals associated with the materials and equipment being delivered.
2. Manufacturer's instructions for handling, storing, and installing the associated materials and equipment have been submitted to and accepted by ENGINEER in accordance with the Specifications.
3. Results of source quality control testing (factory testing), when required by the Contract Documents for the associated materials or equipment, have been submitted to and accepted by ENGINEER.
4. Facilities required for handling materials and equipment in accordance with the Contract Documents and manufacturer's instructions are in place and available.
5. Required storage facilities have been provided.

1.4 DELIVERY

A. Scheduling and Timing of Deliveries:
1. Arrange deliveries of materials and equipment in accordance with the Progress Schedule accepted by ENGINEER and in ample time to facilitate inspection and observation prior to installation.
2. Schedule deliveries to minimize space required for and duration of storage of materials and equipment at the Site or other delivery location, as applicable.
3. Coordinate deliveries to avoid conflicting with the Work and conditions at Site, and to accommodate the following:
    a. Work of other contractors and OWNER.
    b. Storage space limitations.
    c. Availability of equipment and personnel for handling materials and equipment.
    d. OWNER's use of premises.
4. Deliver materials and equipment to the Site during regular working hours.
5. Deliver materials and equipment to avoid delaying the Work and the Project, including work of other contractors, as applicable. Deliver anchor system materials, including anchor bolts to be embedded in concrete or masonry, in ample time to avoid delaying the Work.

B. Deliveries:

1. Shipments shall be delivered with CONTRACTOR's name, Subcontractor's name (if applicable), Site name, Project name, and contract designation (example: "ABC Construction Co., City of Happy Beach, Idaho, Wastewater Treatment Plant Primary Clarifier Improvements, Contract 25, General Construction") clearly marked.
2. Site may be listed as the "ship to" or "delivery" address; but OWNER shall not be listed as recipient of shipment unless otherwise directed in writing by ENGINEER.
3. Provide CONTRACTOR's telephone number to shipper; do not provide OWNER's telephone number.
4. Arrange for deliveries while CONTRACTOR's personnel are at the Site. CONTRACTOR shall receive and coordinate shipments upon delivery. Shipments delivered to the Site when CONTRACTOR is not present will be refused by OWNER, and CONTRACTOR shall be responsible for the associated delays and additional costs, if incurred.
5. Comply with Section 01 35 43.13, Environmental Procedures for Hazardous Materials.

C. Containers and Marking:
1. Have materials and equipment delivered in manufacturer's original, unopened, labeled containers.
2. Clearly mark partial deliveries of component parts of materials and equipment to identify materials and equipment, to allow easy accumulation of parts, and to facilitate assembly.

D. Inspection of Deliveries:
1. Immediately upon delivery, inspect shipment to verify that:
   a. Materials and equipment comply with the Contract Documents and approved or accepted (as applicable) submittals.
   b. Quantities are correct.
   c. Materials and equipment are undamaged and of the required quality.
   d. Containers and packages are intact and labels are legible.
   e. Materials and equipment are properly protected.
2. Promptly remove damaged materials and equipment from the Site and expedite delivery of new, undamaged materials and equipment, and remedy incomplete or lost materials and equipment. Furnish materials and equipment in accordance with the Contract Documents, to avoid delaying progress of the Work.
3. Advise ENGINEER in writing when damaged, incomplete, or defective materials and equipment are delivered, and advise ENGINEER of the associated impact on the Progress Schedule.

1.5 HANDLING OF MATERIALS AND EQUIPMENT

A. Provide equipment and personnel necessary to handle materials and equipment, including those furnished by OWNER, by methods that prevent soiling or damaging materials and equipment and packaging.

B. Provide additional protection during handling as necessary to prevent scraping, marring, and otherwise damaging materials and equipment and surrounding surfaces.

C. Handle materials and equipment by methods that prevent bending and overstressing.

D. Lift heavy components only at designated lifting points.

E. Handle materials and equipment in safe manner and as recommended by the manufacturer to prevent damage. Do not drop, roll, or skid materials and equipment off delivery vehicles or at other times during handling. Hand-carry or use suitable handling equipment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for storing and protecting materials and equipment.
   2. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals to store and handle materials and equipment to be incorporated into the Work, and other materials and equipment at the Site.

1.2 STORAGE

A. Store and protect materials and equipment in accordance with manufacturer's recommendations and the Contract Documents.

B. General:
   1. CONTRACTOR shall make all arrangements and provisions necessary for, and pay all costs for, storing materials and equipment.
   2. Excavated materials, construction equipment, and materials and equipment to be incorporated into the Work shall be placed to avoid injuring the Work and existing facilities and property, and so that free access is maintained at all times to all parts of the Work and to public utility installations in vicinity of the Work.
   3. Store materials and equipment neatly and compactly in locations that cause minimum inconvenience to OWNER, facility manager, other contractors, public travel, and owners, tenants, and occupants of adjoining property.
   4. Arrange storage in manner to allow easy access for inspection by ENGINEER and Resident Project Representative (RPR).

C. Storage Location:
   1. Areas available at the Site for storing materials and equipment are shown or indicated in the Contract Documents, or as acceptable to ENGINEER.
   2. Restrictions:
      a Do not store materials or equipment in structures being constructed unless approved by ENGINEER in writing.
      b. Do not use lawns or other private property for storage without written permission of the owner or other person in possession or control of such premises.

D. Protection of Stored Materials:
   1. Store materials and equipment to become OWNER's property to ensure

preservation of quality and fitness of the Work, including proper protection against damage by freezing, moisture, and with outdoor ambient air high temperatures as high as 90 degrees F; temperature and humidity inside crates, containers, storage sheds, and packaging may be significantly higher than the outdoor ambient air temperature.

2. Store in indoor, climate-controlled storage areas all materials and equipment subject to damage by moisture, humidity, heat, cold, and other elements, unless otherwise acceptable to OWNER.
3. When placing orders to Suppliers for equipment and controls containing computer chips, electronics, and solid-state devices, CONTRACTOR shall obtain, coordinate, and comply with specific temperature and humidity limitations on materials and equipment, because temperature inside cabinets and components stored in warm temperatures can approach 200 degrees F.
4. CONTRACTOR shall be fully responsible for loss or damage (including theft) to stored materials and equipment.
5. Do not open manufacturer's containers until time of installation, unless recommended by the manufacturer or otherwise specified in the Contract Documents.
6. Comply with requirements of Article 1.3 of this Section.

1.3 PROTECTION – GENERAL

A. Equipment to be incorporated into the Work shall be boxed, crated, or otherwise completely enclosed and protected during shipping, handling, and storage, in accordance with Section 01 65 00, Product Delivery Requirements.

B. Store all materials and equipment off the ground (or floor) on raised supports such as skids or pallets.

C. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Painted equipment surfaces that are damaged or marred shall be repainted in their entirety in accordance with equipment manufacturer and paint manufacturer requirements, to the satisfaction of ENGINEER.

D. Protect electrical equipment, controls, and instrumentation against moisture, water damage, humidity, heat, cold, and dust. Space heaters provided in equipment shall be connected and operating at all times until equipment is placed in operation and permanently connected.

1.4 UNCOVERED STORAGE

A. The following types of materials may be stored outdoors without cover on supports so there is no contact with the ground:
   1. Reinforcing steel.
   2. Precast concrete materials.
   3. Structural steel.
   4. Metal stairs.

5. Handrails and railings.
6 Grating.
7. Checker plate.
8. Metal access hatches.
9. Castings.
10. Fiberglass items.
11. Rigid electrical conduit, except PVC-coated conduit.
12. Piping, except PVC or chlorinated PVC (CPVC) pipe.
13. Stone surfacing.

1.5 COVERED STORAGE

A. The following materials and equipment may be stored outdoors on supports and completely covered with covering impervious to water:
   1. Grout and mortar materials.
   2. Masonry units.
   3. Rough lumber.
   4. Soil materials and granular materials such as aggregate.
   5. PVC and CPVC pipe.
   6. PVC-coated electrical conduit.
   7. Filter media.
   8. Insulation.

B. Tie down covers with rope, and install covering properly sloped to prevent accumulation of water.

C. Store loose granular materials, with covering impervious to water, in well-drained area or on solid surfaces to prevent mixing with foreign matter.

1.6 FULLY PROTECTED STORAGE

A. Store all material and equipment not indicated in Articles 1.4 and 1.5 of this Section on supports in buildings or trailers that have concrete or wooden flooring, roof, and fully-closed walls on all sides. Covering with visquine plastic sheeting or similar material in space without floor, roof, and walls is unacceptable. Comply with the following:
   1. Provide heated storage for materials and equipment that could be damaged by low temperatures or freezing.
   2. Provide air-conditioned storage for materials and equipment that could be damaged by high temperatures or humidity.
   3. Protect mechanical and electrical equipment from being contaminated by dust, dirt, and moisture.
   4. Maintain humidity at levels recommended by manufacturers for electrical and electronic equipment.

1.7 HAZARDOUS MATERIALS AND EQUIPMENT

A. Prevent contamination of personnel, storage areas, and the Site. Comply with Laws and Regulations, manufacturer's instructions, Section 01 35 43.13, Environmental Procedures for Hazardous Materials, and other provisions of the Contract Documents.

1.8 MAINTENANCE OF STORAGE

A. On a scheduled basis, periodically inspect stored materials and equipment to ensure that:
   1. Condition and status of storage facilities is adequate to provide required storage conditions.
   2. Required environmental conditions are maintained on continuing basis.
   3. Materials and equipment exposed to elements are not adversely affected.

1.9 MICROPROCESSORS, PANELS, AND INSTRUMENTATION STORAGE

A. Store control panels, microprocessor-based equipment, electronics, and other devices subject to damage or decreased useful life because of temperatures below 40 degrees F or above 100 degrees F, relative humidity above 90 percent, or exposure to rain or exposure to blowing dust in climate-controlled storage space.

B. General:
   1. Storage shall be in third-party owned, bonded, insured, climate-controlled warehouse in Herkimer County, NY.
   2. OWNER and ENGINEER have the right to observe or inspect materials and equipment during normal working hours.
   3. Place inside each control panel or device a desiccant, volatile corrosion inhibitor blocks (VCI), moisture indicator, and maximum-minimum indicating thermometer.
   4. Check panels and equipment not less than once per month. Replace desiccant, VCI, and moisture indicator as often as required, or every six months, whichever occurs first.
   5. Certified record of daily maximum and minimum temperature and humidity in storage facility shall be available for inspection by OWNER and ENGINEER. Certified record of monthly inspection, noting maximum and minimum temperature for month, condition of desiccant, VCI, and moisture indicator, shall be made available to OWNER and ENGINEER upon request.

C. Costs for storing climate-sensitive materials and equipment shall be paid by CONTRACTOR. Replace panels and devices damaged during storage, or for which storage temperatures or humidity range has been exceeded, at no additional cost to OWNER. Delays resulting from such replacement are causes within CONTRACTOR's control.

D. Do not ship control panels and equipment to the Site until conditions at the Site are suitable for installation, including slabs and floors, walls, roofs, and environmental controls. Failure to have the Site ready for installation shall not relieve

CONTRACTOR from complying with the Contract Documents.

1.10 RECORDS

A. Keep up-to-date account of materials and equipment in storage to facilitate preparation of Applications for Payment, if the Contract Documents provide for payment for materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 71 23

FIELD ENGINEERING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes field engineering, surveying, and layouts by CONTRACTOR, and associated requirements. This Section supplements the General Conditions' provisions on reference points and other matters.
   2. CONTRACTOR shall provide field engineering services, surveying and layout services, and professional services of the types indicated for the Project, including:
      a. Furnishing civil, structural, and other professional engineering services specified or required to execute CONTRACTOR's construction methods.
      b. Developing and making all detail surveys and measurements required for construction; including slope stakes, batter boards, and all other working lines, elevations, and cut sheets.
      c. Providing materials required for benchmarks, control points, batter boards, grade stakes, structure and pipeline elevation stakes, and other items.
      d. Keeping a transit, theodolite, or total station (i.e., theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the Site at all times, and having a skilled instrument person available when necessary for laying out the Work.
      e. Being solely responsible for all locations, dimensions and levels. No data other than Change Order, Work Change Directive, or Field Order shall justify departure from dimensions and levels required by the Contract Documents.
      f. Rectifying all Work improperly installed because of not maintaining, not protecting, or removing without authorization established reference points, stakes, marks, and monuments.
      g. Providing such facilities and assistance necessary for ENGINEER and Resident Project Representative (if any) or Owner's Site Representative (if any) to check lines and grade points placed by CONTRACTOR. Do not perform excavation or embankment work until all cross-sectioning necessary for determining payment quantities for Unit Price Work have been completed and accepted by ENGINEER.

B. Coordination:
   1. Review requirements of this and other Sections and coordinate installation of items to be installed with or before field engineering, surveying, and layout Work.

2. Notify other contractors in advance of field engineering, surveying, and layout work to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before field engineering, surveying, and layout Work.
3. Coordinate with other prime contractors in advance locations of the Work allow other prime contractors sufficient space and time for laying out work under their contracts.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Certificates:
      a. When requested by ENGINEER, submit certificate signed by professional engineer or professional surveyor, as applicable, certifying that elevations and locations of the Work comply with the Contract Documents. Explain each deviation, if any.
   2. Field Engineering:
      a. Submit daily reports as indicated in this Section.
      b. When requested by ENGINEER, submit documentation verifying accuracy of field engineering.
   3. Surveying:
      a. Complete plan for performing survey work, submitted not less than 10 days prior to beginning survey Work.
      b. Example of proposed survey field books to be maintained by CONTRACTOR's surveyor. Example shall have sufficient information and detail, including example calculations and notes, to demonstrate that field books will be organized and maintained in a professional manner in accordance with the Contract Documents.
      c. Submit original field books within two days after completing survey Work.
      d. Submit certified survey in accordance with this Section.
   4. Qualifications Statements:
      a. Field Engineer: Name, employer, and professional address. When requested by ENGINEER, submit qualifications, including resume.
      b. Surveyor: Name, employer, and professional address of firm, and resumes of each professional land surveyor and crew chief that will be engaged in survey Work. Submit not less than 10 days prior to beginning survey Work. During the Project, submit resume for each new registered, licensed land surveyor and crew chief employed by or retained by CONTRACTOR not less than 10 days prior to starting on the survey Work.

1.3 CONTRACTOR'S ENGINEERS

A. Qualifications of Field Engineer:

1. Employ and retain at the Site a field engineer with experience and capability of performing all field engineering tasks required of CONTRACTOR, as indicated in this Article and elsewhere in the Contract Documents.
2. CONTRACTOR's field engineer shall possess not less than five years of experience performing duties similar in scope and extent to those required of CONTRACTOR's field engineer on this Project.

B. Responsibilities of Contractor's Field Engineer:
   1. Daily Reports:
      a. Prepare and maintaining daily reports of activity on the Contract. Submit reports to ENGINEER including the following information:
         1) Number of employees at the Site.
         2) Number employees at the Site for each Subcontractor.
         3) Breakdown of employees by trades.
         4) Major equipment and materials installed as part of the Work.
         5) Major construction equipment utilized.
         6) Location of areas in which construction was performed.
         7) Materials and equipment delivered to the Site or suitable, offsite storage location.
         8) Work performed, including field quality control and testing.
         9) Weather conditions.
         10) Safety concerns, events, and precautions taken.
         11) Delays encountered, extent of delay incurred, reasons for the delay, and measures that will be taken to rectify delays encountered.
         12) Acknowledgement of specific instructions received from ENGINEER or OWNER.
      b. Daily reports shall be signed and dated by responsible member of CONTRACTOR's staff, such as CONTRACTOR's project manager, field engineer, or superintendent, or foreman designated by CONTRACTOR as having authority to sign daily reports.
      c. Submit = CONTRACTOR's daily reports in accordance with Section 01 31 26, Electronic Document Protocol, by 9:00 a.m. the next working day after the day covered in the associated report.
   2. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment for compliance with the Contract Documents.
   3. Continually inspect the Work to ensure that the quality and quantities required by the Contract Documents are provided.
   4. Cooperate as required with ENGINEER and Resident Project Representative (if any) in observing the Work and performing field inspections.
   5. Check and coordinate the Work for conflicts and interferences, and immediately advise ENGINEER and Resident Project Representative, if any, of all discrepancies of which CONTRACTOR is aware.
   6. Maintain field office files and drawings, record documents, and coordinate field engineering services with Subcontractors and Suppliers as appropriate, and other prime contractors (if any).
   7. Prepare layout and coordination drawings for construction operations.

8. Review and coordinate the Work with Shop Drawings and CONTRACTOR's other submittals approved or accepted, as applicable, by ENGINEER.

C. Professionals Retained by Contractor (whether or not stationed at the Site):
   1. Professional Services that are Not Delegated Professional Design of the Completed Work:
      a. Where the Contract Documents require that CONTRACTOR retain a design professional for to carry out CONTRACTOR's responsibilities for construction means, methods, techniques, sequences and procedures (including temporary construction that will not remain as part of the completed Work), such services shall be performed by a registered professional of the discipline required for specific service on the Project, with valid license in the same jurisdiction as the Site.
      b. OWNER and ENGINEER shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed by such design professionals.

1.4 CONTRACTOR'S SURVEYOR

A. Qualifications:
   1. Employ or retain the services, as needed, at the Site a surveyor with experience and capability of performing surveying and layout tasks required in the Contract Documents and as required for the Work.
   2. CONTRACTOR's surveyor shall possess not less than five years of experience performing duties similar in scope and extent to those required of CONTRACTOR's surveyor on this Project.

B. Responsibilities of Contractor's Surveyor:
   1. Providing required surveying equipment, including transit, theodolite, or total station; level; stakes; and surveying accessories.
   2. Establishing required lines and grades for constructing all facilities, structures, pipelines, and site improvements, including outdoor electrical equipment and feeders.
   3. Preparing and maintaining professional-quality, accurate, well-organized, legible notes of all measurements and calculations made while surveying and laying out the Work.
   4. Prior to backfilling operations, survey, locate, and record on a copy of the Contract Documents accurate representation of buried Work and Underground Facilities provided and encountered.
   5. Locating on a site plan of the Site the actual location of above-ground Work to be indicated on record documents.
   6. Complying with requirements of the Contract Documents relative to surveying and related Work, including requirements of this Section's Articles 1.5 and 3.1.

1.5 RECORDS

A. Records – General:

1. Maintain at the Site a complete and accurate log of control and survey Work as such Work progresses.

B. Field Books and Records:
   1. Survey data and records shall be in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the locality where the Site is located.
   2. Original field notes, computations, and other surveying data shall be recorded by CONTRACTOR's surveyor in CONTRACTOR-furnished hard-bound field books.
   3. Completeness and accuracy of survey Work, and completeness and accuracy of survey records, including field books, shall be responsibility of CONTRACTOR.
   4. Failure to organize and maintain survey records in an appropriate manner that allows reasonable and independent verification of calculations, and to allow identification of elevations, dimensions, and grades of the Work, shall be cause for rejecting the survey records, including field books.
   5. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by ENGINEER.

C. Certified Survey of Surface Structures:
   1. Upon completion of foundation walls and major site improvements, prepare a survey, showing or indicating dimensions, locations, angles and elevations of construction and locations and elevations of Underground Facilities installed and encountered during the Work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SURVEYING

A. Reference Points:
   1. Refer the General Conditions, as may be modified by the Supplementary Conditions, for requirements regarding reference points.
   2. OWNER's established reference points that are damaged or destroyed by CONTRACTOR will be re-established by OWNER at CONTRACTOR's expense. OWNER may deduct from payments owed CONTRACTOR such amounts as set-offs in accordance with the Contract Documents.
   3. From OWNER-established reference points, establish lines, grades, and elevations necessary to control the Work. Obtain measurements required for executing the Work to tolerances specified in the Contract Documents.

4. Establish, place, and replace as required, such additional stakes, markers, and other reference points necessary for control, intermediate checks, and guidance of construction operations.

B. Surveys to Determine Quantities for Payment:
   1. For each application for progress payment, perform such surveys and computations necessary to determine quantities of Work performed or placed. Perform surveys necessary for ENGINEER to determine final quantities of Work in place.
   2. Notify ENGINEER not less than 24 hours before performing survey services for determining quantities to be included in Application for Payment. Unless waived in writing by ENGINEER, perform quantity surveys in presence of ENGINEER or Resident Project Representative (if any).

C. Construction Surveying: Comply with the following:
   1. Alignment Staking: Provide alignment stakes at 50-foot intervals on tangent, and at 25-foot intervals on curves.
   2. Slope Staking: Provide slope staking at 50-foot intervals on tangent, and at 25-foot intervals on curves. Re-stake at every ten-foot difference in elevation.
   3. Structure: Stake-out structures, including elevations, and check prior to and during construction.
   4. Pipelines: Stake-out pipelines including elevations, and check prior to and during construction.
   5. Roads, Drives, and Paved Areas: Stake-out roadway, driveway, and paved area elevations at 50-foot intervals on tangent, and at 25-foot intervals on curves.
   6. Cross-sections: Provide original, intermediate, and final staking as required, for site work other locations as necessary for quantity surveys.
   7. Easement Staking: Provide easement staking at 50-foot intervals on tangent, and at 25-foot intervals on curves. Also provide wooden laths with flagging at maximum intervals of 100 feet.
   8. Record Staking: Provide permanent stake at each blind flange and each utility cap provided for future connections. Stakes for record staking shall be material acceptable to ENGINEER.

D. Accuracy:
   1. Establish CONTRACTOR's temporary survey references points for CONTRACTOR’s use to not greater than second-order accuracy (e.g., 1:10000). Construction staking used as a guide for the Work shall be set at not greater than third-order accuracy (e.g., 1:5000). Basis on which such orders are established shall provide the absolute margin for error specified below.
   2. Horizontal accuracy of easement staking shall be plus or minus 0.1 feet. Accuracy of other staking shall be plus or minus 0.04 feet horizontally and plus or minus 0.02 feet vertically.
   3. Survey calculations shall include an error analysis sufficient to demonstrate required accuracy.

+ + END OF SECTION + +

SECTION 01 71 33

PROTECTION OF THE WORK AND PROPERTY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for safety and protection that augment the requirements of the General Conditions, as may be modified by the Supplementary Conditions. This Section also includes requirements for barricades and warning signals, and protection of trees and plants, existing structures, floors, roofs, installed items, and landscaping.
   2. CONTRACTOR shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect personnel health and safety, and to protect the Work and all public and private property and facilities from damage, as specified in the General Conditions, Supplementary Conditions, and the Specifications.
   3. To prevent damage, injury, or loss, CONTRACTOR's actions shall include the following:
      a. Provide measures for safety of personnel at the Site, including workers engaged in the Work, delivery personnel, testing and inspection personnel, personnel of authorities having jurisdiction, other visitors to the Site, the public, OWNER's personnel, facility manager's personnel (if different from OWNER), ENGINEER, and Resident Project Representative (if any).
      b. Storing apparatus, materials, supplies, and equipment in an orderly, safe manner that does not unduly interfere with progress of the Work or work of other contractors, utility owners, and owners of transportation rights-of-way.
      c. Providing suitable storage facilities for materials and equipment subject to damage or degradation by exposure to climate, temperature, theft, breakage, or other cause.
      d. Placing upon the Work or any part thereof only loads consistent with the safety and integrity of that portion of the Work and existing construction.
      e. Frequently removing and disposing of refuse, rubbish, scrap materials, and debris caused by CONTRACTOR's operations so that, at all times, the Site is safe, orderly, and workmanlike in appearance.
      f. Providing temporary barricades, fencing, and guard rails around the following: openings, scaffolding, temporary stairs and ramps, around excavations, for elevated walkways, and other areas that may present a fall-hazard or hazard to vehicles.
   4. Do not, except after written consent from proper parties, enter or occupy privately-owned property or premises with personnel, tools, materials or equipment, except on lands and easements provided by OWNER.

5. CONTRACTOR has full responsibility for preserving public and private property and facilities on and adjacent to the Site. Direct or indirect damage done by, or on account of, any act, omission, neglect, or misconduct by CONTRACTOR in executing the Work, shall be remedied by CONTRACTOR, at his expense, to condition equal to that existing before damage was done.
6. Owner May Remedy:
    a. Should CONTRACTOR fail to protect and safeguard property and the Work after requests from ENGINEER or OWNER, OWNER may implement measures to protect property and the Work.
    b. Cost of such OWNER-implemented measures shall be paid by CONTRACTOR. OWNER may deduct from payments due CONTRACTOR such amounts as set-offs in accordance with the Contract Documents.
    c. Such right, however, shall not result in any obligation by OWNER or ENGINEER to continuously monitor or have responsibility for protection of property and the Work, which responsibility is exclusively CONTRACTOR's.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 BARRICADES AND WARNING SIGNALS

A. Barricades and Warning Signals – General:
    1. Where the Work is performed on or adjacent to roadway, access road or driveway, right-of-way, or public place:
        a. Provide temporary barricades, fences, lights, warning signs, danger signals, watchmen, and take other precautionary measures for protecting persons, property, and the Work.
        b. Use appropriately colored and reflective barricades, or paint barricades accordingly, to be visible at night.
        c. From sunset to sunrise, provide and maintain not less than one temporary light at each barricade.
        d. Erect sufficient barricades to keep vehicles from being driven on or into Work under construction.
        e. Furnish watchmen in sufficient numbers to protect the Work.
    2. Provide temporary barricades to protect personnel and property for Work not in or adjacent to transportation routes and vehicular travel areas, including indoor work, in accordance with Laws and Regulations.
    3. CONTRACTOR's responsibility for maintaining temporary barricades, signs, lights, and for providing watchmen shall continue until the Work is substantially complete in accordance with the Contract Documents, unless other provision for security and protection is agreed to by the parties. After

Substantial Completion, protect Work and property during periods when final Work or corrective Work is underway.

B. Temporary Fencing: Refer to Section 01 57 33, Security.

3.2 TREE AND PLANT PROTECTION

A. Tree and Plant Protection – General:
   1. Protect existing trees, shrubs, and plants on or adjacent to the Site, shown or designated to remain in place, against unnecessary cutting, breaking, damage, or skinning of trunk, branches, bark, and roots.
   2. Do not store materials or equipment or park construction equipment and vehicles within foliage drip lines.
   3. In areas subject to traffic, provide temporary fencing or temporary barricades to protect trees and plants.
   4. Open fires are not allowed onsite.
   5. Within the limits of the Work, water trees and plants that are to remain to maintain their health during construction operations.
   6. Cover exposed roots with burlap, and keep such burlap continuously wet. Cover exposed roots with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, runoff, and noxious materials in solution.
   7. If branches or trunks are damaged, prune branches immediately and protect cut or damaged areas with emulsified asphalt compounded specifically for horticultural use, in manner acceptable to ENGINEER.
   8. When directed by ENGINEER, remove and dispose of at location away from the Site damaged trees and plants that die or suffer permanent injury, and replace each damaged tree or plant with specimen of equal or better species and quality.
   9. Coordinate Work in this Article with the following Specifications:
      a. Section 31 11 00, Clearing and Grubbing.
      b. Section 32 01 91, Tree Protection and Trimming.

3.3 PROTECTION OF EXISTING STRUCTURES

A. Underground Facilities:
   1. Underground Facilities known to OWNER and ENGINEER, except water, gas, sewer, electric, and communications services to individual buildings and properties, are shown. Information shown for Underground Facilities is the best available to OWNER and ENGINEER but, in accordance with the General Conditions, as may be modified by the Supplementary Conditions, is not guaranteed to be correct or complete.

2. CONTRACTOR shall explore ahead of trenching and excavating Work and shall sufficiently uncover Underground Facilities that will or may interfere with the Work to determine their location, to prevent damage to Underground Facilities, and to prevent service interruption to structures and properties served by Underground Facilities. If CONTRACTOR damages an Underground Facility, CONTRACTOR shall restore it to its pre-construction condition, in accordance with requirements of the owner of the damaged facility and the Contract Documents.
3. Necessary changes in the location of the Work may be directed by ENGINEER to avoid Underground Facilities not shown or indicated on the Contract Documents.
4. If permanent relocation of an existing Underground Facilities is required and is not otherwise shown or indicated in the Contract Documents, CONTRACTOR may be directed in writing to perform the required work. When such relocation Work results in a change in the Contract Price, Contract Times, the associated Contract modification procedures and payment for such Work shall be in accordance with the Contract Documents.

B. Surface Structures:
1. Surface structures are existing buildings, structures, and other facilities at or above ground surface, including their foundations and any extension below ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage routes, exposed piping and utilities, poles, exposed wires, posts, signs, markers, curbs, walks, fencing, and other facilities visible at or above ground surface.
2. Existing surface facilities, including but not limited to guard rails, posts, guard cables, signs, poles, markers, curbs, and fencing, that are temporarily removed to facilitate the Work shall be replaced and restored to their pre-construction condition at CONTRACTOR's expense.

C. Protection of Underground Facilities and Surface Structures:
1. CONTRACTOR shall sustain in their places and protect from direct or indirect injury all Underground Facilities and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure or facility.
2. Before proceeding with the Work of sustaining and supporting such structure or facility, CONTRACTOR shall satisfy ENGINEER that methods and procedures to be used have been approved by party owning same.
3. CONTRACTOR shall bear all risks attending the presence or proximity of all Underground Facilities and surface structures within or adjacent to limits of the Work, in accordance with the Contract Documents.
4. CONTRACTOR shall be responsible for damage and expense for direct or indirect injury, caused by CONTRACTOR's activities, to structures and facilities. CONTRACTOR shall promptly repair damage caused by CONTRACTOR's activities, to the satisfaction of owner of damaged structure or facility.

5. Protection of Underground Facilities Under Roads and Parking Areas: Provide temporary, heavy-duty steel roadway plates to protect existing manholes, handholes, valve boxes, vaults, and other Underground Facilities near to or visible at the ground surface.

3.4 PROTECTION OF FLOORS AND ROOFS

A. Protection of Floors and Roofs – General:
   1. Use proper protective covering when moving equipment, handling materials or other loads, when painting, handling mortar or grout, and when cleaning walls, ceilings, or structure contents.
   2. Use metal pans to collect oil and cuttings from piping, conduits, and rod threading machines, and under metal cutting machines.
   3. Do not load concrete floors less than 28 days old without written permission of ENGINEER. Do not load floors, roofs, or slabs in excess of design loading.
   4. Do not load roofs without written permission of ENGINEER.
   5. Restrict access to roofs, and keep CONTRACTOR personnel off existing roofs, except as required for the Work.
   6. If access to roofs is required, roofing, parapets, openings, and all other construction on or adjacent to roof shall be protected with suitable plywood or other acceptable means.

3.5 PROTECTION OF INSTALLED MATERIALS, EQUIPMENT, AND LANDSCAPING

A. Protect installed Work to prevent damage from subsequent operations. Remove protective items when no longer needed, prior to Substantial Completion of the Work.

B. Control traffic to prevent damage to equipment, materials, and surfaces.

C. Coverings:
   1. Provide temporary coverings to protect materials and equipment from damage.
   2. Cover projections, wall corners and jambs, sills, and soffits of openings, in areas used for traffic and for passage of materials and equipment in subsequent work.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 73 19

INSTALLATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section describes general requirements for installing materials and equipment. Additional installation requirements are included in the various Specifications Sections in Divisions 02 through 49 and elsewhere in the Contract Documents.
   2. CONTRACTOR shall provide all labor, materials, equipment, services, tools, and incidentals required to install materials and equipment.

1.2 QUALITY ASSURANCE

A. General:
   1. Provide appropriate quality assurance for installing materials and equipment, and provide quality control over Suppliers, materials and equipment, services, Site conditions, and workmanship, to provide Work of the required quality.

B. Qualifications:
   1. Installer:
      a. Installers shall be experienced in the types of Work required, including, but not limited to, the requirements of Section 01 42 00, References, and the Division 02 through 49 Specifications where the particular element of the Work is specified.

C. Regulatory Requirements: Comply with the following:
   1. 29 CFR 1910, OSHA.

PART 2 – PRODUCTS

2.1 EQUIPMENT DRIVE GUARDS

A. Equipment Drive Guards – General:
   1. Unless otherwise shown or indicated, provide all-metal guards complying with 29 CFR 1910, Subpart O, with equipment driven by open shafts, belts, chains, pulleys, sheaves, or gears. Guards shall enclose drive and driven mechanism.
   2. If material of guards are not otherwise specified, guards shall be galvanized sheet steel, galvanized woven wire, or expanded metal set in a frame of galvanized steel members, as appropriate.

3. Secure guards in position by steel braces or straps, securely fastened to frame of equipment, floor, or wall as required.
4. Fastenings shall allow removal of guards for servicing equipment.

2.2 MISCELLANEOUS MATERIALS

A. Shims shall be Type 304L stainless steel, clean and free of slag.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
   1. Installation Instructions and Requirements:
      a. Install materials and equipment in accordance with approved Shop Drawings and CONTRACTOR's other submittals approved by ENGINEER, the Contract Documents, and manufacturer's installation instructions. When manufacturer's installation instructions conflict with the Contract Documents, obtain interpretation or clarification from ENGINEER before proceeding.
      b. Manufacturer's installation instructions include manufacturer's written instructions; drawings; illustrative, wiring and schematic diagrams; diagrams identifying external connections, terminal block numbers and internal wiring; and other such information pertaining to installation of materials and equipment. Included are all of manufacturer's printed installation instructions, including those that may be attached to equipment upon delivery.
   2. Prior to installing materials and equipment, complete preparation of surfaces on which materials and equipment are to be installed. Prior to installing materials and equipment on new concrete, concrete shall achieve sufficient compressive strength to support the materials and equipment.
   3. Maintain the work area in a broom-clean condition while installing materials and equipment.
   4. Use proper tools to assemble materials and equipment. Do not deform or mar surface of shafts, nuts, and other parts.
   5. Do not support rigging from building or structure without written permission of ENGINEER. CONTRACTOR is responsible for and shall repair damage to building or structure resulting from CONTRACTOR's operations, in accordance with Section 01 71 33, Protection of the Work and Property.
   6. During installation, maintain materials and equipment in neutral position and do not exert undue stress on materials and equipment.
   7. Tighten connections requiring gaskets evenly all around to ensure uniform stress over entire gasket.
   8. Use only an oil bath heater to expand couplings, gears, and other mechanical components to be expanded for installation. Do not force or drive couplings,

gears, and other mechanical components onto equipment shafts, or subject such items to open flame or torch.

9. Do not alter or repair materials and equipment and do not burn or weld materials and equipment unless required in the Contract Documents or allowed by ENGINEER.
10. Provide plugs in lubrication holes to prevent entry of foreign matter.

B. Setting and Erection:
   1. Install materials and equipment plumb, level, true, and free of rack unless otherwise shown or indicated, and demonstrate plumbness and level to ENGINEER. Bring parts to proper bearing after installation and erection.
   2. Anchorages:
      a. Provide anchorage setting drawings in time to coordinate with fabrication of materials and equipment and the Work.
      b. Anchorages shall comply with Section 05 05 33, Anchor Systems. Requests for approval of substitute materials or methods of anchorage shall be in accordance with the General Conditions, Supplementary Conditions, and Section 01 25 00, Substitution Procedures.
   3. Shimming:
      a. Wedging is not allowed.
      b. During installation, use the minimum number of shims required for leveling the equipment.
      c. Provide shims, filling pieces, keys, packing, grouting of the type required by the Contract Documents, and other materials and equipment necessary to properly align, level, and secure apparatus in place.
   4. Installing Equipment onto Foundations:
      a. Using experienced millwrights, carefully set and align equipment on foundations, after equipment soleplates or baseplates (as applicable) have been shimmed to true alignment at anchorages.
      b. Set anchorages in place and tighten nuts against shims.
      c. Check bedplates or wing feet of equipment after securing to foundations and, after confirming alignments, grout soleplates or baseplates (as applicable) in place in accordance with the Contract Documents.
   5. Ream misaligned holes. Do not "force" bolts or keys.
   6. Where applicable, properly align equipment with associated piping and utility connections, without exerting undue stress on connecting piping and utilities.

C. Alignment and Leveling:
   1. Verify that all shafts, couplings, and sheaves are properly aligned and adjust to required tolerances.
   2. Align couplings while equipment is free of external loads.
   3. Check angular and parallel alignment and record actual alignment and submit to ENGINEER. Alignment shall be within tolerances specified in Contract Documents and as recommended by Supplier of the material or equipment item.
   4. Use laser indicators or dial indicators for checking angular and parallel alignment. Using dial indicators requires that, during rotation of half-couplings

in performing testing, dial indicator shall be maintained in same relative position, and dial indicator readings taken at same place on circumference of coupling.

D. Threaded Connections:
   1. Apply a molybdenum disulfide, anti-seize compound to threads in mechanical connections such as bolts, studs, cap screws, tubing, and other threads, unless otherwise shown or indicated.

3.2 FIELD QUALITY CONTROL

A. Supplier's Services:
   1. When specified, provide competent, qualified representatives of material or equipment Supplier to perform services required, including: supervising installation, checking the completed installation, adjusting, testing of materials and equipment, and where required instructing operations and maintenance personnel in the use and care of materials and equipment.

+ + END OF SECTION + +

SECTION 01 73 24

CONNECTIONS TO EXISTING FACILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for connections to existing facilities. Requirements for tie-ins and shutdowns necessary to complete the Work are in Section 01 14 16, Coordination with Owner's Operations.
   2. CONTRACTOR shall provide labor, materials, tools, equipment, and incidentals shown, specified, and required for performing connections to existing facilities.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate Work that will be performed with or before the Work specified in this Section.
   2. Notify other contractors in advance of Work for connections to existing facilities to provide other contractors sufficient time for work included in their contracts that will be installed with or before Work specified in this Section.

C. Related Sections:
   1. Section 01 14 16, Coordination with Owner's Operations.
   2. Section 01 51 41, Temporary Pumping.
   3. Section 01 73 29, Cutting and Patching.

D. General:
   1. Requirements for shutdowns, tie-ins, and other provisions on connections to existing facilities, are indicated in Section 01 14 16, Coordination with Owner's Operations.
   2. Requirements for temporary pumping for connections to existing facilities are in Section 01 14 16, Coordination with Owner's Operations, and Section 01 51 41, Temporary Pumping.
   3. Requirements for cutting and patching are in Section 01 73 29, Cutting and Patching.
   4. To extent possible, materials, equipment, systems, piping, and appurtenances that will be placed into service upon completion of connection to existing facilities shall be checked, successfully tested, and in condition for operation prior to making connections to existing facilities, if valves, gates, or similar watertight and gastight isolation devices are not provided at the connection point.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for cutting and patching Work.
   2. CONTRACTOR shall perform cutting and coring, and rough and finish patching of holes and openings in existing construction.
   3. Provide cutting, coring, fitting and patching, including attendant excavation and fill, required to complete the Work, and to:
      a. remove and replace defective Work;
      b. remove samples of installed Work as specified or required for testing;
      c. remove construction required to perform required alterations or additions to existing construction;
      d. uncover the Work for ENGINEER's observation of covered Work, testing or inspection by testing entities, or observation by authorities having jurisdiction;
      e. connect to completed Work not performed in proper sequence;
      f. remove or relocate existing utilities and piping that obstruct the Work in locations where connections are to be made;
      g. make connections or alterations to existing or new facilities.

B. Coordination:
   1. Cutting, coring, and rough patching shall be performed by the prime contractor requiring the opening. Finish patching shall be responsibility of General CONTRACTOR and shall be performed by trade associated with application of the particular finish.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Cutting and Patching Request:
      a. Submit written request to ENGINEER, well in advance of executing cutting or alteration that affects one or more of the following:
         1) Design function or intent of Project.
         2) Work of OWNER or other contractors.
         3) Structural value or integrity of an element of the Project.
         4) Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
         5) Efficiency, operational life, maintenance, or safety of operational elements.
         6) Visual qualities of sight-exposed elements.

b. Request shall include:
    1) Identification of Project and Contract designation.
    2) Description of affected Work of CONTRACTOR and work of others (if any).
    3) Necessity for cutting.
    4) Effect on work or operations of OWNER, other contractors (if any), and on structural or weatherproof integrity of Project.
    5) Description of proposed Work, describing: scope of cutting and patching; trades who will be executing the Work; materials and equipment to be used; extent of refinishing; schedule of operations; alternatives to cutting and patching, if any, and net effect on aesthetics following completion of finishing Work.
    7) Designation of entity responsible for cost of cutting and patching, when applicable.
    8) Written permission of other prime contractors (if any) whose work will or may be affected.

2. Recommendation Regarding Cutting and Patching:
    a. Should conditions of work or schedule indicate a change of materials or methods, submit written recommendation to ENGINEER including:
        1) Conditions indicating change.
        2) Recommendations for alternative materials or methods.
        3) Items required with request for approval of substitute, in accordance with the substitution request requirements of the Contract Documents.

3. Product Data:
    a. Submit manufacturer's data for the protective compound to be applied to core-drilled surfaces and cut concrete surfaces.
    b. When not required under other Sections, submit manufacturer's data on materials to be used for finishing around the cut or patched area.
    c. Furnish submittals for patching materials under the associated Specifications Section.

B. Informational Submittals: Submit the following:
    1. Written Notification of Cutting and Patching:
        a. Submit written indication designating the day and time that the construction associated with cutting and patching will be uncovered to allow for observation. Do not begin cutting or patching operations until submittal is accepted by ENGINEER.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials - General:
    1. Use materials that comply with the Contract Documents.

2. If not shown or indicated in the Contract Documents, use materials that are identical to existing materials affected by cutting and patching Work.
3. For exposed surfaces, use materials that visually match existing adjacent surfaces to fullest extent possible. If identical materials are unavailable or cannot be used, use materials whose installed performance will equal or surpass that of existing materials.
4. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using materials that do not void required or existing warranties.

B. Compound Applied to Core-Drilled Surfaces and Cut Concrete Surfaces:
1. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with solvent-free, two-component, protective, epoxy resin coating.
2. Color shall approximate the finish color of the existing surface to be coated.
3. Product and Manufacturer: Provide one of the following:
   a. Sikagard 62, by Sika Corporation.
   b. Or equal.

PART 3 – EXECUTION

3.1 GENERAL

A. Perform cutting and coring in such manner that limits extent of patching required.

B. Structural Elements:
1. Do not cut or patch structural elements in manner that would change the element's structural load-carrying capacity as load deflection ratio.

C. Operating Elements:
1. Do not cut or patch operating elements in manner that would reduce their capacity to perform as intended.
2. Do not cut or patch operating elements or related components in manner that would increase maintenance requirements or decrease operational life or safety.

D. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using methods that do not void required or existing warranties.

3.2 INSPECTION

A. Examine surfaces to be cut or patched, and conditions under which cutting or patching will be performed before starting cutting or patching Work.

B. Report unsatisfactory or questionable conditions to ENGINEER in writing. Do not proceed with cutting or patching Work until unsatisfactory conditions are corrected.

3.3 PREPARATION

A. Provide temporary support required to maintain structural integrity of facilities, to protect adjacent work from damage during cutting, and to support the element(s) to be cut.

B. Protection of Existing Construction during Cutting and Patching:
   1. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project and facility that will be exposed during cutting and patching operations.
   2. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
   3. Do not cut existing pipe, conduit, ductwork, or other utilities serving facilities scheduled to be removed or relocated until provisions have been made to bypass them.

3.4 CORING

A. Use core-drilling to make penetrations through concrete and masonry walls, slabs, or arches, unless otherwise accepted by ENGINEER in writing.

B. Coring:
   1. Perform coring with non-impact rotary tool using diamond core-drills. Size holes for pipe, conduit, sleeves, equipment or mechanical seals, as required, to be installed through the penetration.
   2. Do not core-drill through electrical conduit or other utilities embedded in walls or slabs without approval of ENGINEER. To extent possible, avoid cutting reinforcing steel in slabs and walls.

C. Protection:
   1. Protect existing equipment, utilities, and adjacent areas from water and other damage caused by or resulting from core-drilling operations.
   2. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.

D. Cleaning:
   1. After core-drilling, vacuum or otherwise remove slurry and tailings from the work area.

3.5 CUTTING

A. Cutting – General:
   1. Cut existing construction using methods least-likely to damage elements retained and adjoining construction and that provide proper surfaces to receive subsequent installation or repair.

2. In general, use hand tools or small power tools suitable for sawing or grinding. When possible, avoid using hammering and avoid chopping.
3. Cut holes and slots as small as possible, neatly to the size required, and with minimum disturbance of adjacent surfaces.
4. Prior to starting cutting, provide adequate bracing of area to be cut.
5. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed side.
6. Provide equipment of adequate size to remove the cut panel or "coupon".
7. Provide temporary covering over cut openings where not in use.

B. Cutting – Concrete and Masonry:
1. Cut through concrete and masonry using concrete wall saw with diamond saw blades.
2. On both of the element being cut, provide for control of slurry generated during sawing.
3. After cutting concrete and before installing subsequent construction on or through the opening, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.

3.6 PATCHING

A. Patching – General:
1. Patch construction by filling, repairing, refinishing, closing-up, and similar operations following performance of other Work.
2. Patch with durable seams that are as inconspicuous as possible. Provide materials and comply with installation requirements indicated in the Contract Documents.
3. Patch to provide airtight and watertight connections to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
4. Where feasible, test patched areas to demonstrate integrity of installation.

B. Restoration:
1. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in manner that eliminates evidence of patching and refinishing.
2. For continuous surfaces, refinish to nearest intersection.
3. For an assembly, refinish the entire unit that was patched.
4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 CLEANING

A. Cleaning and Restoration:
1. Clean areas and spaces where cutting, coring, or patching were performed.
2. Clean piping, conduit, and similar constructions before applying paint or other finishing materials.

3. Restore damaged coverings of pipe and other utilities to original condition.

+ + END OF SECTION + +

SECTION 01 74 05

CLEANING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for keeping the Site free of accumulations of waste materials during construction ("progress cleaning") and cleaning for Substantial Completion and prior to final inspection (collectively, "closeout cleaning").
   2. CONTRACTOR shall perform cleaning during the Project, including progress cleaning, upon completion of the Work, and as required by the General Conditions, as may be modified by the Supplementary Conditions, and this Section.
   3. Maintain in a clean manner the Site, the Work, and areas adjacent to or affected by the Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PROGRESS CLEANING

A. General:
   1. Clean the Site, work areas, and other areas occupied by CONTRACTOR not less than weekly. Dispose of materials in accordance with the General Conditions, as may be modified by the Supplementary Conditions, and the following:
      a. Comply with NFPA 241 for removing combustible waste materials and debris.
      b. Do not hold non-combustible materials at the Site more than three days if the temperature is expected to rise above 80 degrees F. When temperature is less than 80 degrees F, dispose of non-combustible materials within seven days of their generation.
      c. Provide suitable containers for storage of waste materials and debris.

d. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately.

B. Site:
   1. Keep outdoor, dust-generating areas wetted down or otherwise control dust emissions.
   2. Not less than weekly, brush-sweep roadways and paved areas at the Site that are used by construction vehicles or otherwise affected by construction activities.
   3. Comply with dust control requirements of Section 01 57 05, Temporary Controls, and Section 01 41 27, Earthmoving Permit and Dust Control.

C. Work Areas:
   1. Clean areas where the Work is in progress to maintain the extent of cleanliness necessary for proper execution of the Work.
   2. Remove liquid spills promptly. Immediately report spills to OWNER, ENGINEER, and authorities having jurisdiction, in accordance with the Contract Documents and Laws and Regulations.
   3. Where dust would impair proper execution of the Work, broom-clean or vacuum entire work area, as appropriate.
   4. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

D. Installed Work:
   1. Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of material or equipment installed, using only cleaning agents and methods specifically recommended by material or equipment manufacturer. If manufacturer does not recommend specific cleaning agents or methods, use cleaning agents and methods that are not hazardous to health and property and that will not damage exposed surfaces.

E. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

F. Cutting and Patching:
   1. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, trailings and cuttings, and similar materials.
   2. Thoroughly clean piping, conduits, and similar features before applying patching material, paint, or other finishing materials. Restore damaged coverings on piping, ducting, and similar items to its pre-construction condition.

G. Cleaning of Hydraulic Structures: Clean hydraulic structures that will contain fluid, such as tanks and channels, in accordance with this Section and Section 01 45 53, Cleaning, Testing, and Disinfecting Hydraulic Structures.

H. Waste Disposal:

1. Properly dispose of waste materials, surplus materials, debris, and rubbish off the Site.
2. Do not burn or bury rubbish and waste materials at the Site.
3. Do not discharge volatile or hazardous substances, such as mineral spirits, oil, or paint thinner, into storm sewers or sanitary sewers.
4. Do not discharge wastes into surface waters or drainage routes.
5. CONTRACTOR is solely responsible for complying with Laws and Regulations regarding storing, transporting, and disposing of waste generated by CONTRACTOR's operations or brought to the Site by CONTRACTOR.

I. During handling and installation of materials and equipment, clean and protect construction in progress and adjoining materials and equipment already in place. Apply protective covering where required for protection from damage or deterioration, until Substantial Completion.

J. Clean completed construction as frequently as necessary throughout the construction period.

3.2 CLOSEOUT CLEANING

A. Complete the following prior to requesting inspection for Substantial Completion:
1. Clean and remove from the Site rubbish, waste material, debris, and other foreign substances.
2. Sweep paved areas broom-clean. Remove petrochemical spills, stains, and other foreign deposits.
3. Hose-clean sidewalks and loading areas.
4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
5. Leave surface waterways, drainage routes, storm sewers, and gutters open and clean.
6. Repair pavement, roads, sod, and other areas affected by construction operations and restore to specified condition; if condition is not specified, restore to pre-construction condition.
7. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of spatter, grease, stains, fingerprints, films, and similar foreign substances.
8. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.
9. Clean transparent materials, including mirrors and glazing in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
10. Remove non-permanent tags and labels.
11. Surface Finishes:
    a. Touch-up and otherwise repair and restore chipped, scratched, dented or otherwise marred surfaces to specified finish and match adjacent surfaces.

b. Do not paint over "UL" or similar labels, including mechanical and electrical nameplates.

12. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint, and mortar droppings, and other foreign substances.
13. Clean plumbing fixtures to sanitary condition, free of stains, including stains resulting from water exposure.
14. Clean lighting fixtures, lamps, globes, and reflectors to function with full efficiency. Replace temporary lamps provided in permanent fixtures. Replace existing lighting fixture components that are burned out or noticeably dimmed from use during construction. Replace defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
15. Leave the Site clean, and in neat, orderly condition, satisfactory to OWNER and ENGINEER.

B. Complete the following prior to requesting final inspection:
   1. Following completion of the Work on the "punch list" of Work uncompleted at Substantial Completion, clean in accordance with Paragraph 3.2.A of this Section.

+ + END OF SECTION + +

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall comply with the requirements and procedures for construction waste management and disposal, including:
      a. Minimizing construction waste and debris and reusing, salvaging, and recycling to specified extent.
      b. Developing and implementing a plan for construction waste management and disposal.
   2. Extent of required construction waste management and disposal includes:
      a. Construction waste management disposal within the Project limits, as shown or indicated.
   3. This Section includes administrative and procedural requirements for:
      a. Disposing of non-hazardous demolition and construction waste.

B. Coordination:
   1. Coordinate salvaging, recycling, and disposing of waste as specified under this and other Sections.

C. Related Sections:
   1. Section 01 31 13, Project Coordination,
   2. Section 32 92 00, Lawns and Meadows

1.3 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Waste Management Coordinator" is the person responsible for implementing, monitoring, and reporting the status of the Waste Management Plan. Although available for other assignments, the Waste Management Coordinator shall be present at the Site full time for the duration of the Work.
   2. "Construction waste" is building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
   3. "Demolition waste" is building and site improvement materials resulting from demolition or selective demolition operations.
   4. "Disposal" is removal to an off-Site location of demolition and construction waste and subsequent sale, recycling, reuse, or disposal in a landfill or incinerator conforming to Laws and Regulations and acceptable to authorities having jurisdiction.

5. "Recycle" is recovery of demolition waste or construction waste for subsequent processing in preparation for reuse.
6. "Salvage' is recovery of demolition or construction waste and subsequent sale or reuse in another facility.
7. "Salvage and reuse" is recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Refrigerant Recovery Technician: Shall be certified via a U.S. EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal Laws and Regulations of authorities having jurisdiction.

C. Pre-construction Waste Management Coordination Conference: Within 14 days of the date the Contract Times commence running and before beginning Work at the Site, attend waste management coordination conference at the Site, in accordance with Section 01 31 13, Projection Coordination. Purpose of conference is to review methods and procedures related to waste management including, but not limited to:
   1. Review and discuss the preliminary waste management plan, including responsibilities of Waste Management Coordinator.
   2. Review requirements for documenting quantities of each type of waste and its disposition.
   3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Preliminary Waste Management Plan: Prepare in accordance with Article 1.7 of this Section and submit within 14 days of the date the Contract Times commence running, and before removing waste from the Site.
   2. Final Waste Management Plan: Submit within 14 days of receiving ENGINEER's comments on the preliminary waste management plan.

B. Informational Submittals
   1. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit monthly Construction and Demolition Waste Reduction Report, using the format included in Attachments G and H to this Section. Provide separate reports for demolition and construction waste. Include the following information:
      a. Material category.
      b. Location where the waste was generated, including building name.

c. Total quantity of waste in tons.
d. Quantity of waste salvaged, both estimated and actual, in tons.
e. Quantity of waste recycled, both estimated and actual, in tons.
f. Total quantity of waste recovered (salvaged plus recycled), in tons.
g. Total quantity of waste recovered (salvaged plus recycled) as percentage of the total waste.

2. Qualifications Statements:
   a. Waste Management Coordinator.
   b. Refrigerant recovery technician.

C. Closeout Submittals
1. Records of Donations: Submit copy of receipt and acceptance of salvageable waste donated to individuals and organizations. On the submittal indicate whether organization is tax-exempt under federal Law and include the organization's Federal Employer Identification Number (EIN).
2. Records of Sales: Submit copy of receipt and acceptance of salvageable waste sold to individuals and organizations. On the submittal indicate whether organization is tax-exempt under federal Law and include the organization's Federal EIN.
3. Recycling and Processing Facility Records: Submit copy of receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Submit manifests, weight tickets, receipts, and invoices.
4. Landfill and Incinerator Disposal Records: Provide copy of receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Submit manifests, weight tickets, receipts, and invoices.
5. Statement of Refrigerant Recovery: Provide statement of refrigerant recovery signed by refrigerant recovery technician for the Project, stating that all refrigerant that was present was recovered, and that recovery was performed according to U.S. EPA Laws and Regulations. Include name and address of technician and date that refrigerant was recovered.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop preliminary plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume. Use the same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Use the formats included in Attachments A and B to this Section.

C. Waste Reduction Work Plan: List each type of waste and whether waste will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in the Work, describe methods for preparing salvaged materials before

incorporating them into the Work.

2. Salvaged Materials for Sale: For materials that will be sold to individual and organizations, include list of names, addresses, and telephone numbers of such individuals and organizations.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Provide list of local receivers and processors of each type of recycled materials. Include names, addresses, and telephone numbers of each.
5. Disposed Materials: Provide information on how and where materials will be disposed. Include name, address, and telephone number of each landfill and incinerator facility that will be used.
6. Handling and Transportation Procedures: Provide information on the method(s) that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location at the Site where materials separation will be located.

D. Cost/Revenue Analysis: Include in the plan total cost of waste disposal as if there was no waste management plan, and the net additional cost or net savings resulting from implementing the waste management plan. Prepare cost/revenue analysis using the formats included in Attachments E and F to this Section. Include the following:
   1. Total quantity of waste.
   2. Estimated unit cost of disposal. Include hauling and tipping fees and cost of collection containers for each type of waste.
   3. Total cost of disposal without the waste management plan.
   4. Revenue from salvaged materials.
   5. Revenue from recycled materials.
   6. Savings in hauling and tipping fees by donating materials.
   7. Savings in hauling and tipping fees that are avoided.
   8. Handling and transportation costs. Include cost of collection containers for each type of waste.
   9. Net additional cost or net savings from implementing waste management plan.

E. Forms: Prepare preliminary and final waste management plan documents using the formats included in Attachments A through H to this Section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Salvage Materials: Provide protective handling and storage as required for all items identified in the Contract Documents for salvage and reuse.

B. Recyclable Waste: On daily basis remove all recyclable materials identified in the waste management plan from the work area in acceptable containers.

C. Provide separate collection containers as required by recycling haulers and to prevent contamination of materials, including protection from the elements as applicable.

D. Replace loaded containers with empty containers as demand requires, at least monthly.

E. Handling: Deposit recyclable materials in containers in clean (no mud, adhesives, solvents, petroleum contamination), debris-free condition.

F. If contamination chemically combines with materials so that materials cannot be cleaned, do not deposit into recycle containers.

G. Environmental Requirements: Transport recyclable waste materials from the work area to recycle containers, and carefully deposit in containers in manner to minimize noise and dust. Close the covers of container immediately after materials are deposited. Do not place recyclable waste materials on the ground adjacent to container.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement the waste management plan approved by ENGINEER. Provide handling, containers, storage, signage, transportation, and other items required to implement the waste management pan during the Project.

B. Training: Train all installers, Subcontractors, and Suppliers as required on proper waste management procedures required for the Work.
   1. Distribute the waste management plan as required within three days of ENGINEER's approval.
   2. Distribute the waste management plan to CONTRACTOR's personnel, Subcontractors, and Suppliers prior to these entities starting the Work. Review with installers, Subcontractors, and Suppliers the waste management plan's procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent facilities.
   1. Designate and label specific areas of the Site necessary for separating materials to be salvaged, recycled, reused, donated, or sold.
   2. Provide temporary controls in accordance with the Contract Documents.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items before reusing.
2. Pack or crate salvaged items after cleaning. Identify contents of containers.
3. Store items in secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make salvaged items functional for use indicated.

B. Salvaged Items for Sale and Donation at the Site: Not allowed at the Site. Sale and donations, if done, must be at location other than the Site.

C. Salvaged Items for OWNER's Use:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in secure area until delivery to OWNER.
4. Transport items to OWNER's storage area designated by OWNER.
5. Protect items from damage during transport and storage.

D. Instrumentation: Protect from breakage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. Recycle paper and beverage containers used by CONTRACTOR's personnel, Subcontractors, and Suppliers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials will accrue to the CONTRACTOR.

****
NTS: PROCEDURES IN PARAGRAPH "D" DESCRIBE THE "SOURCE SEPARATED" METHOD FOR HANDLING RECYCLABLE WASTE. IF SPACE AT THE SITE IS LIMITED, CONSIDER REVISING PARAGRAPH "D" TO ALLOW THE "CO-MINGLED" METHOD, WHICH REQUIRES LESS SPACE BECAUSE ALL RECYCLABLE WASTE CAN BE PLACED IN A SINGLE CONTAINER, FOR LATER SEPARATION AT THE RECYCLING FACILITY.
****

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris.
1. Provide appropriately marked containers or bins for controlling recyclable waste until recyclable materials are removed from Site. Provide list of acceptable and unacceptable materials at each container and bin.
a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials at the Site without intermixing with other materials. Place, grade, and shape stockpiles to drain water. Cover to prevent dust and blowing debris.
3. Stockpile materials away from the construction area. Do not store within drip line of trees.

4. Remove recyclable waste from the Site and from OWNER's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Metals:
   1. Separate metals by type.
   2. Structural Steel: Stack steel according to size, type of member, and length.
   3. Remove and dispose of bolts, nuts, washers, and other rough hardware.

B. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type and protect from the elements.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:
   1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store at dry location.
   2. Polystyrene Packaging: Separate polystyrene materials and store in bags.
   3. Pallets: Require that goods delivered on pallets have the pallets removed from Site, to the extent possible. For pallets that remain at the Site, break down pallets into component wood pieces and comply with requirements for recycling wood.
   4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from the Site and properly dispose of waste in facility such as permitted landfill or incinerator or other method acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, remove from the Site all waste and debris from the Work as it accumulates. Upon completion of the Work, remove materials, equipment, waste, and debris and leave the Site clean, neat, and orderly. Comply with the Contract Documents regarding cleaning and removal of trash, debris, and waste.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials at the Site.

3.7 SUPPLEMENTS

A. The forms listed below, following the "End of Section" designation, are part of this Specification Section:
   1. Attachment A – Construction Waste Identification -1 (one page).

2. Attachment B – Demolition Waste Identification -2 (one page).
3. Attachment C – Construction Waste Reduction Work Plan -3 (one page).
4. Attachment D – Demolition Waste Reduction Work Plan – 4 (one page).
5. Attachment E – Cost/Revenue Analysis of Construction Waste Reduction Work Plan – 5 (two pages)
6. Attachment F – Cost/Revenue Analysis of Demolition Waste Reduction Work Plan – 6 (two pages)
7. Attachment G – Construction Waste Reduction Progress Report – 7 (two pages)
8. Attachment H – Demolition Waste Reduction Progress Report – 8 (two pages)

+ + END OF SECTION + +

ATTACHMENT A

CONSTRUCTION WASTE IDENTIFICATION – 1							
MATERIAL CATEGORY	**GENERATION POINT**	**EST. QUANTITY OF MATERIALS RECEIVED* (A)**	**EST. WASTE - % (B)**	**TOTAL EST. QUANTITY OF WASTE* (C = A x B)**	**EST. VOLUME CY**	**EST. WEIGHT TONS**	**REMARKS AND ASSUMPTIONS**
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

ATTACHMENT B

DEMOLITION WASTE IDENTIFICATION - 2				
MATERIAL DESCRIPTION	**EST. QUANTITY**	**EST. VOLUME CY**	**EST. WEIGHT TONS**	**REMARKS AND ASSUMPTIONS**
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				

Other:

ATTACHMENT C

CONSTRUCTION WASTE REDUCTION WORK PLAN - 3						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS	DISPOSAL METHOD AND QUANTITY			
			EST. AMOUNT SALVAGED TONS	EST. AMOUNT RECYCLED TONS	EST. AMOUNT DISPOSED TO LANDFILL TONS	HANDLING AND TRANSPORTATION PROCEDURES
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

DEMOLITION WASTE REDUCTION WORK PLAN - 4						
			DISPOSAL METHOD AND QUANTITY			
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS	EST. AMOUNT SALVAGED TONS	EST. AMOUNT RECYCLED TONS	EST. AMOUNT DISPOSED TO LANDFILL TONS	HANDLING AND TRANSPORTATION PROCEDURES
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

ATTACHMENT E

COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN - 5								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								

COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN - 5								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Electrical Conduit								
Other:								

ATTACHMENT F

COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN - 6								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Asphaltic Concrete								
Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mech. Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								

COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN - 6								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

ATTACHMENT G

CONSTRUCTION WASTE REDUCTION PROGRESS REPORT - 7								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (D = B + C)	TOTAL QUANTITY OF WASTE OF WASTE R ECOVERED % (D / A x 100)
			ESTIMATED TONS	ACTUAL TONS (B)	ESTIMATED TONS	ACTUAL TONS (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								

CONSTRUCTION WASTE REDUCTION PROGRESS REPORT - 7								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (D = B + C)	TOTAL QUANTITY OF WASTE OF WASTE R ECOVERED % (D / A x 100)
			ESTIMATED TONS	ACTUAL TONS (B)	ESTIMATED TONS	ACTUAL TONS (C)		
Electrical Conduit								
Other:								

ATTACHMENT H

DEMOLITION WASTE REDUCTION PROGRESS REPORT - 8								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS	ACTUAL TONS (B)	ESTIMATED TONS	ACTUAL TONS (C)		
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								

DEMOLITION WASTE REDUCTION PROGRESS REPORT - 8								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS	ACTUAL TONS (B)	ESTIMATED TONS	ACTUAL TONS (C)		
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

+ + END OF SECTION + +

SECTION 01 77 19

CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.1 GENERAL

A. Scope:
   1. Section Includes.
      a. Substantial Completion.
      b. Final inspection.
      c. Request for final payment and acceptance of the Work.

1.2 SUBSTANTIAL COMPLETION

A. Substantial Completion – General:
   1. Prior to requesting Substantial Completion, perform the following for the substantially completed Work:
      a. Materials and equipment for which Substantial Completion is requested shall be fully ready for their intended use, including full operating and monitoring capability in automatic and manual modes.
      b. Complete field quality control Work, including testing at the Site, indicated in Specifications Sections for individual materials and equipment items. Submit results of, and obtain Engineer's acceptance of, field quality control tests required by the Contract Documents.
      c. Startup and checkout shall be completed in accordance with requirements of the Specifications for the various materials and equipment in the substantially completed Work.
      d. Cleaning for Substantial Completion shall be completed in accordance with Section 01 74 05, Cleaning.
      e. Spare parts, extra stock materials, and tools shall be delivered and accepted in accordance with Section 01 78 43, Spare Parts and Extra Materials, and the Specifications for the various materials and equipment.
      f. Training shall be completed in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
      g. Submit and obtain Engineer's acceptance of final operations and maintenance manuals.
      h. Obtain and submit to Engineer all required permits, inspections, and approvals of authorities having jurisdiction for the substantially completed Work to be occupied and used by Owner.
      i. Complete other tasks that the Contract require be completed prior to Substantial Completion.
   2. Procedures for requesting and documenting Substantial Completion are in the General Conditions, as may be modified by the Supplementary Conditions.

3. Sample letter for Contractor to request inspection for Substantial Completion is attached to this Specifications Section as Exhibit A. Use the model language of the sample letter, modified to suit the Project.
4. Unless decided otherwise by Owner and Engineer, form of certificate of Substantial Completion will be EJCDC® C-625, "Certificate of Substantial Completion" (2018 edition), prepared by Engineer.
5. Refer to the Agreement and Section 01 29 76, Progress Payment Procedures, for requirements regarding consent of surety to partial release of or reduction in retainage.

1.3 FINAL INSPECTION

A. Final Inspection – General:
   1. Prior to requesting final inspection, verify that all the Work is fully complete and ready for final payment. A Partial checklist for this purpose is attached to this Specifications Section as Exhibit B.
   2. Sample letter for Contractor to request final inspection is attached to this Specifications Section as Exhibit C. Use the model language of the sample letter, modified to suit the Project.
   3. Procedures for requesting and documenting the final inspection are in the General Conditions, as may be modified by the Supplementary Conditions, and as augmented in this Section.

1.4 REQUEST FOR FINAL PAYMENT AND ACCEPTANCE OF THE WORK

A. Procedure:
   1. Submit request for final payment in accordance with the Agreement and General Conditions, as may be modified by the Supplementary Conditions, and using procedure specified in Section 01 29 76, Progress Payment Procedures, and this Section.
   2. Acceptance of the Work:
      a. Upon Engineer's receipt of the final Application for Payment, accompanied by other required Contract closeout documentation in accordance with the Contract Documents, Engineer will issue to Owner and Contractor a notice of acceptability of the Work, in accordance with the General Conditions, as may be modified by the Supplementary Conditions.
      b. Nothing other than receipt of such notice of acceptability from Engineer constitutes acceptance of the Work.
      c. Unless decided otherwise by Owner and Engineer, form of acceptance will be EJCDC® C-626, "Notice of Acceptability of Work", (2018 edition).

B. Request for final payment shall include:
   1. Documents required for progress payments in Section 01 29 76, Progress Payment Procedures.

2. Documents required in the General Conditions, as may be modified by the Supplementary Conditions.
3. List of all disputes that Contractor believes are unsettled, presented on Contractor's letterhead. If there are no such disputes or Claims, so indicate in writing.
4. Consent of Surety to Final Payment:
    a. Acceptable form includes AIA® G707™, "Consent of Surety to Final Payment" (1994 or later edition), or other form acceptable to Owner.
5. Releases of Liens:
    a. Submit "complete and legally effective releases (satisfactory to Owner) of all Liens filed in connection with the Work, regardless of whether such Lien was filed by Contractor or any Subcontractor or Supplier.
    b. Each release of Lien shall be signed by an authorized representative of the entity submitting the release of Lien, and shall include Contractor's, Subcontractor's, or Supplier's (as applicable) corporate seal, when applicable.
6. Waivers of Lien Rights:
    a. Submit legally-binding waivers of rights to file Liens (acceptable to Owner), from Contractor and each Subcontractor and Supplier that provided Contractor, Subcontractor, or Supplier with labor, material, or equipment totaling $1,000 or more for the Work.
    b. Furnish final list of Subcontractors and Suppliers, using the form included in Section 01 29 76, Progress Payment Procedures, indicating final amount of the associated subcontract or purchase order for each. Include on the list all lower-tier Subcontractors and Suppliers retained by higher-tier Subcontractors and Suppliers.
    c. Each waiver of Lien rights shall be signed by an authorized representative of the entity submitting waiver of Lien rights, and shall include Contractor's, Subcontractor's, or Supplier's (as applicable) corporate seal, when applicable.
    d. Waiver of Lien rights may be conditional upon receipt of final payment.
    e. Required Affidavits: Submit the following:
        1) Affidavit of payment of debts and claims, submitted by Contractor. Acceptable form includes AIA® G706™, "Contractor's Affidavit of Payment of Debts and Claims" (1994 or later edition), or other form acceptable to Owner, and;
        2) Affidavit of release of Liens, submitted by Contractor. Acceptable form includes AIA® G706A™, "Affidavit of Release of Liens" (1994 or later edition).
    f. Waivers of Lien rights and affidavits and supporting documents furnished under this Paragraph 1.4.B.6 shall comply with the requirements of the General Conditions, as may be modified by the Supplementary Conditions.
    g. Each affidavit furnished shall be signed by an authorized representative of the entity furnishing the affidavit, and shall include issuing entity's corporate seal, when applicable.

h. Where all required waivers of Lien rights and affidavits are not submitted:
   1) Submit letter on Contractor's letterhead indicating the Subcontractor(s) and Suppliers for whom such waivers or releases were not obtained, amount owed to such entity, reason(s) why such amount was not previously paid and indicate how Contractor intends to fulfill its obligations and assure Owner that associated debts and claims are paid.
   2) In lieu of the releases or waivers of Liens specified in Paragraphs 1.4.B.5 and 1.4.B.6 of this section, and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied.
   3) If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

7. Evidence satisfactory to Owner that all title issues (not otherwise addressed by releases of Liens, waivers of Lien rights, and related documentation required in Paragraphs 1.4.B.5 and 1.4.B.6 of this section) have been resolved and that title will pass to Owner free and clear of other title defects, or will so pass upon final payment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EXHIBITS

A. The documents listed below, following this Section's "End of Section" designation, are part of this Specifications Section:
   1. Exhibit A - Sample letter for Contractor's use in requesting inspection for Substantial Completion (two pages).
   2. Exhibit B - Sample partial checklist to identify readiness for final inspection (four pages).
   3. Exhibit C - Sample letter for Contractor's use in requesting final inspection (one page).

B. In the model language of the attached sample letters for the Contractor to request inspection for Substantial Completion and the final inspection, italicized language in brackets, e.g., "[*insert date*]" indicates instructions to the drafter of the letter and often indicates specific information to be inserted by Contractor; do not include bracketed, italicized text in the final version of the letter(s) prepared for the Project. Non-italicized language in brackets is optional language; use the appropriate language to complete the actual letter for the Project and edit where required to suit the specific circumstances.

+ + END OF SECTION + +

EXHIBIT A - SAMPLE LETTER FOR CONTRACTOR'S USE IN REQUESTING INSPECTION FOR SUBSTANTIAL COMPLETION

[*Date*]

[*Name of Engineer's contact person*]
ARCADIS U.S., Inc.
[*Street address*]
[*City, state, postal code*]

Subject:
[*Project name, Contract designation*]
Request for Inspection for Substantial Completion

Dear [*addressee*]:

In our opinion, [all of] [*or*] [a portion of] the Work under the above-referenced Contract is substantially complete as of [*insert month, day, year on which Substantial Completion was achieved*]. [The specific portion of the Work that we believe is substantially complete is [*insert identification of that portion of the Work that is substantially complete*].]

Enclosed is our listing of uncompleted Work items ("punch list"). In accordance with Paragraph 15.03.A of the General Conditions, we hereby request: 1) That the Engineer schedule and perform the inspection for Substantial Completion as soon as possible, and 2) Issuance of the certificate of Substantial Completion.

In accordance with Paragraph 15.03.D of the General Conditions, upon Substantial Completion, we propose the following relative to apportionment of responsibilities between the Owner and the Contractor:

1. Security, Protection, Insurance:
    a. Site Security: [*insert proposal; address whether Owner or Contractor will be responsible for security of the Site*].
    b. Protection of the Substantially Completed Work: [*insert proposal; address whether Owner or Contractor will be responsible for protection*].
    c. Property Insurance: [*insert proposal; typically, Owner assumes responsibility for property insurance upon Substantial Completion*]
2. Operation and Maintenance:
    a. Operation: [*insert proposal; address whether Owner or Contractor will be responsible for operating the substantially completed Work*].

b. Maintenance: [*insert proposal; address whether Owner or Contractor will be responsible for maintaining the substantially completed Work*].

3. Utilities: [*for each of the following, indicate whether Owner or Contractor will be responsible for utilities and services, or whether responsibility will be shared; if shared, indicate proposed cost-sharing*]
   a. Electricity: [*insert proposal*].
   b. Natural Gas/Fuel/Heating: [*insert proposal*].
   c. Water Supply: [*insert proposal*].
   d. Wastewater: [*insert proposal*].
   e. Communications (Telephone, Internet, Video): [*insert proposal*].

In accordance with Paragraph 15.08.A of the General Conditions, we understand that the Contract's correction period for the Work covered by the certificate of Substantial Completion commences on the Substantial Completion date documented in said certificate. [*Drafter: Also see Paragraph 15.08.C of the General Conditions and, where necessary, edit this paragraph of the letter accordingly.*]

Should you have questions or comments regarding this notice, please contact [the undersigned] [*or*] [*insert other contact person's name*], at [*insert telephone number and e-mail address*].

Sincerely,

[*Contractor's company name*]

[*Signatory name*]
[*Signatory's title*]

Attachments:
Preliminary list of uncompleted Work items ("punch list"; [##] pages)

Copies:
[*Owner's project manager*]

EXHIBIT B - SAMPLE PARTIAL CHECKLIST TO IDENTIFY READINESS FOR FINAL INSPECTION

Project: _____
Contract: _____
Contractor: _____

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
1. All Shop Drawings, Samples, and Submittals approved by Engineer	☐		☐	☐	☐		
Remarks:							
2. Final services completed by Suppliers, including submittal of "Supplier Installation Certification" in Section 01 75 11, Checkout and Startup Procedures	☐		☐	☐	☐		
Remarks:							
3. Final Work completed by Subcontractors	☐		☐	☐	☐		
Remarks:							
4. Permits closed out and regulatory compliance transitioned from construction to operations	☐		☐	☐	☐		
Remarks:							

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
5. All outstanding change issues are addressed and all Change Proposals submitted	☐		☐	☐	☐		
Remarks:							
6. All Claims are resolved	☐		☐	☐	☐		
Remarks:							
7. All defective Work of which Contractor is aware has been corrected in accordance with the Contract Documents	☐		☐	☐	☐		
Remarks:							
8. Issues related to Constituents of Concern and potential Hazardous Environmental Condition have been fully addressed	☐		☐	☐	☐		
Remarks:							
9. All spare parts, tools, and extra stock materials have been furnished in accordance with the Contract Documents, and documentation thereof submitted to Engineer	☐		☐	☐	☐		
Remarks:							
10. All final Operations & Maintenance manuals have been	☐		☐	☐	☐		

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
submitted and accepted by Engineer							
Remarks:							
11. Manufacturer warranties and software license(s) furnished	☐		☐	☐	☐		
Remarks:							
12. Instruction and training of operations and maintenance personnel is complete and records of training submitted	☐		☐	☐	☐		
Remarks:							
13. MBE/WBE/DBE compliance report(s) submitted (when applicable)	☐		☐	☐	☐		
Remarks:							
14. All field engineering submittals, including survey data, furnished	☐		☐	☐	☐		
Remarks:							
15. All Work on "punch list" is complete in accordance with the Contract Documents	☐		☐	☐	☐		
Remarks:							
16. All record documents submitted to and accepted by Engineer	☐		☐	☐	☐		
Remarks:							

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
17. Contractor is fully demobilized from Site	☐		☐	☐	☐		
Remarks:							
18. All Site restoration is complete	☐		☐	☐	☐		
Remarks:							
19. Final cleaning of all work areas is complete	☐		☐	☐	☐		
Remarks:							
20. Lien waivers or affidavits of payment obtained from Subcontractors and Suppliers	☐		☐	☐	☐		
Remarks:							
21. Evidence of Contractor liability insurance furnished for correction period	☐		☐	☐	☐		
Remarks:							
22. All other required Contract closeout documents obtained	☐		☐	☐	☐		
Remarks:							

EXHIBIT C - SAMPLE LETTER FOR CONTRACTOR'S USE IN REQUESTING FINAL INSPECTION

SENT VIA E-MAIL AND U.S. CERTIFIED MAIL/RETURN RECEIPT REQUESTED

[*Date*]

[*Name of Engineer's contact person*]
ARCADIS U.S., Inc.
[*Street address*]
[*City, state, postal code*]

Subject:
[*Project name, Contract designation*]
Request for Final Inspection

Dear [*addressee*]:

In our opinion, all of the Work under the above-referenced Contract is complete and ready for final payment as of [*insert month, day, year on which final completion was achieved*]. In accordance with Paragraph 15.05.A of the General Conditions, we hereby request that the Engineer schedule and perform the final inspection as soon as possible. Upon successful completion of the final inspection, we will submit our final Application for Payment accompanied by the required Contract closeout documentation in accordance with the Contract Documents.

Should you have questions or comments regarding this notice, please contact [the undersigned] [*or*] [*insert other contact person's name*], at [*insert telephone number and e-mail address*].

Sincerely,

[*Contractor's company name*]

[*Signatory name*]
[*Signatory's title*]

Attachments:
None

Copies:
[*Owner's project manager*]

SECTION 01 78 23

OPERATIONS AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for manufacturers' operations and maintenance manuals and related data to be furnished by CONTRACTOR.
   2. CONTRACTOR shall submit operation and maintenance data, in accordance with this Section and in accordance with requirements elsewhere in the Contract Documents, as instructional and reference manuals by operations and maintenance personnel at the Site.
   3. Required operation and maintenance data groupings are listed in table(s) in Article 1.2 of this Section. At minimum, submit operation and maintenance data for:
      a. All equipment and systems.
      b. Valves, gates, actuators, and related accessories.
      c. Instrumentation and control devices.
      d. Electrical equipment.
   4. For each operation and maintenance manual, submit the following:
      a. Preliminary Submittal: Printed and bound copy of entire operation and maintenance manual, except for test data, service reports by Supplier, and submit electronic copies.
      b. Final Submittal: Printed and bound copy of complete operations and maintenance manual, including test data and service reports by Supplier, and submit electronic copies.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data:
      a. Submit the operations and maintenance data indicated in the Contract Documents, grouped into submittals as indicated in Table 01 78 23-A:

TABLE 01 78 23-A, REQUIRED OPERATIONS AND MAINTENANCE DATA

Name of O&M Manual/Data	For Materials or Equipment Specified in Section(s)
Generator O&M Manual	
Sluice Gate O&M Manual	

B. Quantity Required and Timing of Submittals:

1. Preliminary Submittal:
    a. Printed Copies: 2 copies, exclusive of copies required by CONTRACTOR.
    b. Electronic Copies: In accordance with Section 01 31 26, Electronic Document Protocol.
    c. Submit to ENGINEER by the earlier of: 90 days following approval of Shop Drawings and product data submittals, or 10 days prior to starting training of operations and maintenance personnel, or 10 days prior to field quality control testing at the Site.
    d. Furnish preliminary operation and maintenance data submittal in acceptable form and content, as determined by ENGINEER, before associated materials and equipment will be eligible for payment.
2. Final Submittal: Furnish final submittal prior to Substantial Completion, unless submittal is specified as required prior to an interim Milestone.
    a. Printed Copies: 2 copies.
    b. Electronic Copies: In accordance with Section 01 31 26, Electronic Document Protocol.

1.3 FORMAT OF PRINTED COPIES

A. Binding and Cover:
1. Bind each operation and maintenance manual in durable, permanent, stiff-cover binder(s), comprising one or more volumes per copy as required. Binders shall be not less than one inch wide and maximum of three inches wide. Binders for each copy of each volume shall be identical.
2. Binders shall be locking three-ring/"D"-ring type, or three-post type. Three-ring binders shall be riveted to back cover and include plastic sheet lifter (page guard) at front of each volume.
3. Do not overfill binders.
4. Covers shall be oil-, moisture-, and wear-resistant, including identifying information on cover and spine of each volume.
5 Provide the following information on cover of each volume:
    a. Title: "OPERATING AND MAINTENANCE INSTRUCTIONS".
    b. Name or type of material or equipment covered in the manual.
    c. Volume number, if more than one volume is required, listed as "Volume __ of __", with appropriate volume-designating numbers filled in.
    d. Name of Project and, if applicable, Contract name and number.
    e. Name of building or structure, as applicable.
6 Provide the following information on spine of each volume:
    a. Title: "OPERATING AND MAINTENANCE INSTRUCTIONS".
    b. Name or type of material or equipment covered in the manual.
    c. Volume number, if more than one volume is required, listed as "Volume __ of __", with appropriate volume-designating numbers filled in.
    d. Project name and building or structure name.

B. Pages:
1. Print pages in operations and maintenance manual on 30-pound (minimum)

paper, 8.5 inches by 11 inches in size.

2. Reinforce binding holes in each individual sheet with plastic, cloth, or metal. When published, separately-bound booklets or pamphlets are part of the manual, reinforcing of pages within booklet or pamphlet is not required.
3. Furnish each page with binding margin not less than one inch wide. Punch each page with holes suitable for the associated binding.

C. Drawings:
1. Bind into the operation and maintenance manual drawings, diagrams, and illustrations up to and including 11 inches by 17 inches in size, with reinforcing specified for pages.
2. Documents larger than 11 inches by 17 inches shall be folded and inserted into clear plastic pockets bound into the manual. Mark pockets with printed text indicating content and drawing numbers. Include not more than three drawing sheets per pocket.

D. Copy Quality and Document Clarity:
1. Contents shall be original-quality copies. Documents in the operations and maintenance manual shall be either original manufacturer-printed documents or first-generation photocopies indistinguishable from originals. If original is in color, copies shall be in color. Manuals that contain copies that are unclear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, are unacceptable. Pages that contain approval or date stamps, comments, or other markings that cover text or drawing are unacceptable. Faxed copies are unacceptable.
2. Clearly mark in ink to indicate all components of materials and equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options furnished or cross out inapplicable content. Using highlighters to so indicate options furnished is unacceptable.

E. Organization:
1. Table of Contents:
a. Provide table of contents in each volume of each operations and maintenance manual.
b. In table of contents and not less than once in each chapter or section, identify materials and equipment by their functional names. Thereafter, abbreviations and acronyms may be used if their meaning is clearly indicated in a table bound at or near beginning of each volume. Using material or equipment model or catalog designations for identification is unacceptable.
2. Use dividers and indexed tabs between major categories of information, such as operating instructions, preventive maintenance instructions, and other major subdivisions of data in each manual.

1.4 FORMAT OF ELECTRONIC COPIES

A. Electronic Copies of Operation and Maintenance Manuals:

1. Each electronic copy shall include all information included in the corresponding printed copy.
2. Submit electronic copies in accordance with Section 01 31 26, Electronic Document Protocol.
3. File Format:
    a. Files shall be in "portable document format" (PDF). Files shall be electronically searchable.
    b. Submit separate file for each separate document in the printed copy.
    c. Within each file, provide bookmarks for the following:
        1) Each chapter and subsection listed in the corresponding printed copy document's table of contents.
        2) Each figure.
        3) Each table.
        4) Each appendix.

B. Copies of Programming and Configuration Files:
1. Furnish on CD or portable USB "thumb drive" copy of all software programming, such as programmable logic controller programs, prepared specifically for the Project. Third-party, licensed, commercially available software is excluded from requirements of this Article; submit copies of commercially-available, licensed, third-party software, where required, in accordance with the Contract Documents.
2. Submit on CD or portable USB "thumb drive" copies of system configuration prepared specifically for the Project, such as plant monitoring system and SCADA display configurations.
3. Submit programming and configuration files concurrently with electronic copies of operation and maintenance data.

1.5 CONTENT

A. General:
1. Prepare each operations and maintenance manual specifically for the Project. Include in each manual all pertinent instructions, as-built drawings as applicable, bills of materials, technical bulletins, installation and handling requirements, maintenance and repair instructions, and other information required for complete, accurate, and comprehensive data for safe and proper operation, maintenance, and repair of materials and equipment furnished for the Project. Include in manuals specific information required in the Specification Section for the material or equipment, data required by Laws and Regulations, and data required by authorities having jurisdiction.
2. Completeness and Accuracy:
    a. Operation and maintenance manuals that include language stating or implying that the manual's content may be insufficient or stating that the manual's content is not guaranteed to be complete and accurate are unacceptable.
    b. Operations and maintenance manuals shall be complete and accurate.
    c. Operation and maintenance manuals shall indicate the specific

alternatives and features furnished, and the specific operation and maintenance provisions for the material or equipment furnished.

3. Submit complete, detailed written operating instructions for each material or equipment item including: function; operating characteristics; limiting conditions; operating instructions for start-up, normal and emergency conditions; regulation and control; operational troubleshooting; and shutdown. Also include, as applicable, written descriptions of alarms generated by equipment and proper responses to such alarm conditions.

B. Submit written explanations of safety considerations relating to operation and maintenance procedures.

C. Submit complete, detailed, written preventive maintenance instructions including all information and instructions to keep materials, equipment, and systems properly lubricated, adjusted, and maintained so that materials, equipment, and systems function economically throughout their expected service life. Instructions shall include:
   1. Written explanations with illustrations for each preventive maintenance task such as inspection, adjustment, lubrication, calibration, and cleaning. Include pre-startup checklists for each equipment item and maintenance requirements for long-term shutdowns.
   2. Recommended schedule for each preventive maintenance task.
   3. Lubrication charts indicating recommended types of lubricants, frequency of application or change, and where each lubricant is to be used or applied.
   4. Table of alternative lubricants.
   5. Troubleshooting instructions.
   6. List of required maintenance tools and equipment.

D. Submit complete bills of material or parts lists for materials and equipment furnished. Lists or bills of material may be furnished on a per-drawing or per-equipment assembly basis. Bills of material shall indicate:
   1. Manufacturer's name, address, telephone number, fax number, and Internet website address.
   2. Manufacturer's local service representative's or local parts supplier's name, address, telephone number, fax number, Internet website address, and e-mail addresses, when applicable.
   3. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished.
   4. For each part or piece include the following information:
      a. Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawings, Shop Drawings, or other type of graphic illustration where the part is clearly shown or indicated.
      b. Part name or description.
      c. Manufacturer's part number.
      d. Quantity of each part used in each assembly.
      e. Current unit price of the part at the time the operations and maintenance manual is submitted. Price list shall be dated.

E. Submit complete instructions for ordering replaceable parts, including reference numbers (such as shop order number or serial number) that will expedite the ordering process.

F. Submit manufacturer's recommended inventory levels for spare parts, extra stock materials, and consumable supplies for the initial two years of operation. Consumable supplies are items consumed or worn by operation of materials or equipment, and items used in maintaining the operation of material or equipment, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Include estimated delivery times, shelf life limitations, and special storage requirements.

G. Submit manufacturer's installation and operation bulletins, diagrams, schematics, and equipment cutaways. Avoid submitting catalog excerpts unless they are the only document available showing identification or description of particular component of the equipment. Where materials pertain to multiple models or types, mark the literature to indicate specific material or equipment supplied. Marking may be in the form of checking, arrows, or underlining to indicate pertinent information, or by crossing out or other means of obliterating information that does not apply to the materials and equipment furnished.

H. Submit original-quality copies of each approved and accepted Shop Drawing, product data, and other submittal, updated to indicate as-installed condition. Reduced drawings are acceptable only if reduction is to not less than one-half original size and all lines, dimensions, lettering, and text are completely legible on the reduction.

I. Submit complete electrical schematics and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.

J. Submit copy of warranty bond and service contract as applicable.

K. When copyrighted material is used in operations and maintenance manuals, obtain copyright holder's written permission to use such material in the operation and maintenance manual.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 78 36

WARRANTIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This section describes general requirements for warranties required in the various Specifications.
   2. Provisions on the Contract's correction period, CONTRACTOR'S general warranty and guarantee, and CONTRACTOR's warranty of title are in the General Conditions, as may be modified by the Supplementary Conditions.
   2. This section includes general requirements for:
      a. Suppliers' standard warranties.
      b. Suppliers' special warranties.
      c. Implied warranties.
      d. Commencement and duration of warranties.

1.2 SUBMITTALS

A. General:
   1. For each item of equipment furnished under the Contract, submit Supplier's standard warranty, regardless of whether such warranty or submittal thereof is required by the associated Specifications for that item. Submit such warranties for materials where such submittal is required in the Specifications for the material.
   2. For each item of material or equipment where Supplier's special (or extended) warranty is required by the Contract Documents, submit appropriate special warranty that complies with the Contract Documents.
   3. Supplier's warranties shall be specifically endorsed solely to OWNER by the entity issuing such warranty.
   4. Submit Suppliers' standard warranties and special warranties as submittals in accordance with Schedule of Submittals accepted by ENGINEER.

1.3 SUPPLIERS' WARRANTIES FOR MATERIALS AND EQUIPMENT

A. Warranty Types:
   1. Required by the General Conditions:
      a. Warranties specified for materials and equipment shall be in addition to, and run concurrent with, CONTRACTOR's general warranty and guarantee and requirements for the Contract's correction period.
      b. Disclaimers and limitations in specific materials and equipment warranties do not limit CONTRACTOR's general warranty and

guarantee, nor does such affect or limit CONTRACTOR's performance obligations under the correction period.

2. Material or equipment manufacturer's standard warranty is pre-printed, written warranty published by item's manufacturer and specifically endorsed by manufacturer to OWNER.
3. Special warranty is written warranty that either extends the duration of material or equipment manufacturer's standard warranty or provides other, increased rights to OWNER. Where the Contract Documents indicate specific requirements for warranties that differ from the manufacturer's standard warranty for that item, special warranty is implied.

B. Requirements for Special Warranties:
1. Submit written special warranty document that contains appropriate provisions and identification, ready for execution by material or equipment manufacturer and OWNER. Submit draft warranty with submittals required prior to fabrication and shipment of the item from the Supplier's facility.
2. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed by product manufacturer and other entities as appropriate.
3. Specified Form: When specified forms for special warranties are included in the Contract Documents, prepare written document, properly executed by item manufacturer and OWNER, using the required form.
4. Refer to the Specifications for content and requirements for submitting special warranties.

1.4 IMPLIED WARRANTIES

A. Warranty of Title and Intellectual Property Rights:
1. Except as may be otherwise indicated in the Contract Documents, implied warranty of title required by Laws and Regulations is applicable to the Work and to materials and equipment incorporated therein.
2. Provisions on intellectual property rights, including patent fees and royalties, are in the General Conditions, as may be modified by the Supplementary Conditions.

B. Warranty of Merchantability:
1. Notwithstanding any other provision of the Contract to the contrary, implied warranties of merchantability required by Laws and Regulations apply to the materials and equipment incorporated into the Work.

C. Warranty of Fitness-for-Purpose:
1. Implied warranty of fitness-for-purpose for materials and equipment to be incorporated into the Work is hereby disclaimed by OWNER and CONTRACTOR.
2. When Supplier is aware of, or has reason to be aware of, specified materials or features of the Work that are contrary to the intended use, purpose, service, application, or environment in which the material or equipment item will be

used, submit request for interpretation in accordance with Section 01 26 00, Contract Modification Procedures. Where appropriate, such request for interpretation shall indicate the apparent discrepancy and propose appropriate, alternative materials or equipment.

1.5 COMMENCEMENT AND DURATION OF WARRANTIES

A. Commencement of Warranties:
   1. Contract correction period and CONTRACTOR's general warranty commence as indicated in the General Conditions, as may be modified by the Supplementary Conditions.
   2. Suppliers' general warranties and special warranties commence running on the date that the associated item is certified by ENGINEER as substantially complete. In no event shall special warranties commence running prior to ENGINEER's review and acceptance of special warranty submittal for the item.
   3. Implied warranties commence in accordance with Laws and Regulations.

C. Duration of Warranties:
   1. Duration of correction period is in accordance with the General Conditions, as may be modified by the Supplementary Conditions.
   2. Duration of CONTRACTOR's general warranty and guarantee is in accordance with Laws and Regulations.
   3. Duration of Suppliers' general warranties is in accordance with the applicable general warranty document accepted by ENGINEER.
   4. Duration of required Suppliers' special warranties shall be in accordance with the requirements of the Contract Documents for the subject item.
   5. Duration of implied warranties shall be in accordance with Laws and Regulations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for Project record documents, to supplement the requirements of the General Conditions, as may be modified by the Supplementary Conditions.
   2. Contractor shall provide all labor, materials, equipment, and services to maintain and submit to Engineer Project record documents in accordance with the Contract Documents.

B. Maintenance of Record Documents:
   1. Maintain in Contractor's field office, in clean, dry, legible condition, complete sets of the following record documents: Drawings, Specifications, and Addenda; Shop Drawings, Samples, and other Contractor submittals, including records of test results, approved or accepted as applicable, by Engineer; Change Proposals, Proposal Requests, Change Orders, Work Change Directives, Field Orders, copies of all interpretations and clarifications issued, photographic documentation, survey data, and all other documents pertinent to the Work.
   2. Provide files and racks for proper storage and easy access to record documents. File record documents in accordance with the latest edition of the Construction Specification Institute's *MasterFormat*™ used for organizing the Project Manual, unless otherwise accepted by Engineer.
   3. Promptly make record documents available for observation and review upon request of Engineer or Owner. Requirements for review of record documents status as a condition precedent to progress payments is in Section 01 29 73, Schedule of Values, and Section 01 29 76, Progress Payment Procedures.
   4. Do not use record documents for any purpose other than serving as Project record. Do not remove record documents from Contractor's field office without Engineer's approval.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:
   1. Record Documents:
      a. Submit the following Project record documents:
         1) Drawings.
         2) Project manual including Specifications and Addenda (bound).
      b. Prior to readiness for final payment, submit to Engineer one copy of Project's final record documents and obtain Engineer's acceptance of

same. Submit complete record documents; do not make partial submittals.

c. Submit both printed record documents and electronic record documents, in accordance with Section 01 31 26, Electronic Document Protocol.

d. Submit record documents with transmittal letter on Contractor letterhead in accordance with requirements in Section 01 33 00, Submittal Procedures.

2. Certifications:

a. Record documents submittal shall include certification, with original signature of official authorized to execute legal agreements on behalf of Contractor, reading as follows:

"[*Insert Contractor's corporate name*] has maintained and submitted Project record documentation in accordance with the General Conditions and Supplementary Conditions, Section 01 78 39, Project Record Documents, and other elements of Contract Documents, for the Hudson River – Black River Regulating District, Herkimer County, Old Forge, NY, Old Forge and Sixth Lake Remedial Measures. We certify that each record document submitted is complete, accurate, and legible relative to the Work performed under our Contract, and that the record documents comply with the requirements of the Contract Documents.

[*Provide signature, print name, print signing party's corporate title, and date*]"

1.3 RECORDING CHANGES

A. Recording Changes – General:

1. At the start of the Project, label each record document to be submitted as, "PROJECT RECORD" using legible, printed letters. Letters on record copy of the Drawings shall be two inches high.
2. Keep record documents current consistent with the progress of the Work. Make entries on record documents within two working days of receipt of information required to record the change.
3. Do not permanently conceal the Work until required information has been recorded for Project record documents.
4. Accuracy of record documents shall be such that future searches for items shown on the record documents may rely reasonably on information obtained from Engineer-accepted record documents.
5. Marking of Entries:
   a. Use erasable, colored pencils (not ink or indelible pencil) for marking changes, revisions, additions, and deletions to record documents.
   b. Clearly describe the change by graphic line and make notations as required. Use straight-edge to mark straight lines. Writing shall be legible and sufficiently dark to allow scanning of record documents into legible electronic files in portable document format (".PDF").
   c. Date each entry on record documents.

d. Indicate changes by drawing a “cloud” around the change(s) indicated.
e. Mark initial revisions in red. In the event of overlapping changes, use different colors for subsequent changes.

B. Drawings:
1. Record changes on copy of the Drawings. Submittal of Contractor-originated or -produced drawings as a substitute for recording changes on a copy of the Drawings is unacceptable.
2. Record changes on plans, sections, elevations, schematics, schedules, and details as required for clarity, making reference dimensions and elevations (to Project datum) for complete record documentation.
3. Record actual construction including:
a. Depths of various elements of foundation relative to Project datum.
b. Horizontal and vertical location of Underground Facilities referenced to permanent surface improvements and project elevation datum. For each Underground Facility, including pipe fittings, show and indicate dimensions to not less than two permanent, visible surface improvements.
c. Location of exposed utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure and, where applicable, to Project elevation datum.
d. Changes in structural and architectural elements of the Work, including changes in reinforcing.
e. Field changes of dimensions, arrangements, and details.
f. Changes made in accordance with Addenda, Change Orders, Work Change Directives, and Field Orders.
g. Changes in details on the Drawings. Submit additional details prepared by Contractor when required to document such changes.
4. Recording Changes for Schematic Layouts:
a. Where arrangements of conduits, circuits, piping, ducts, and similar items are shown schematically and are not intended to portray physical layout the final physical arrangement shall be determined by Contractor subject to acceptance by Engineer.
b. Record on the Project record documents all revisions to schematics on the Drawings, including: piping schematics, ducting schematics, process and instrumentation diagrams, control and circuitry diagrams, electrical one-line diagrams, motor control center layouts, and other schematics when included in the Drawings. Show and indicate actual locations of equipment, lighting fixtures, in-place grounding system, and other pertinent data.
c. When dimensioned plans and dimensioned sections or elevations on the Drawings show the Work schematically, indicate on the record documents, by dimensions accurate to within one inch in the field, centerline location of items of Work such as conduit, piping, ducts, and similar items

1) Clearly identify each item of the Work by accurate notations such as "cast iron drain", "rigid electrical conduit", "copper waterline", and similar descriptions.
2) Show by symbol or by note the vertical location of each item of the Work; for example, "embedded in slab", "under slab", "in ceiling plenum", "exposed", and similar designations. For piping not embedded, also indicate elevation dimension relative to Project elevation datum.
3) Descriptions shall be sufficiently detailed to be related to the Specifications.

d. Engineer may furnish written waiver of requirements relative to schematic layouts shown on plans, sections, and elevations when, in Engineer's judgment, dimensioned layouts of Work shown schematically will serve no useful purpose. Do not rely on such waiver(s) being issued.

5. Supplemental Drawings:
   a. In some cases, drawings produced during construction by Engineer or Contractor supplement the Drawings; these shall be included with Project record documents submitted by Contractor. Supplemental record drawings shall include drawings or sketches that are part of Change Orders, Work Change Directives, and Field Orders and that cannot be incorporated into the Drawings because of space limitations.
   b. Supplemental drawings submitted with record drawings shall be integrated with the Drawings and include necessary cross-references between drawings. Supplemental record drawings shall be on sheets the same size as the Drawings.
   c. When supplemental drawings developed by Contractor using computer-aided drafting/design (CADD) software are to be included in record drawings, submit electronic files for such drawings in accordance with Section 01 31 26, Electronic Document Protocol, as part of record drawing submittal. Label such files, "Supplemental Record Drawings", including with Contractor's name, Project name, and Contract designation.

C. Specifications and Addenda:
   1. Mark each Specifications Section to record:
      a. Manufacturer, trade name, catalog number, and Supplier of each material and equipment item actually provided.
      b. Changes made by Addendum, Change Orders, Work Change Directives, and Field Orders.

1.4 ELECTRONIC FILES FURNISHED BY ENGINEER

A. CADD files of the Drawings will be furnished by Engineer upon the following conditions:
   1. Contractor shall submit to Engineer a letter on Contractor letterhead requesting CADD files of the Drawings and indicating specific definition(s)

or description(s) of how such files will be used, and specific description of benefits to Owner (including credit proposal, if applicable) if the request is granted.

2. Contractor shall execute Engineer's standard agreement for release of electronic files and shall abide by the provisions of such agreement for release of electronic files. A copy is attached as Exhibit A.
3. Layering system incorporated in CADD files shall be maintained as transmitted by Engineer. CADD files transmitted by Engineer containing cross-referenced files shall not be bound by Contractor. Drawing cross-references and paths shall be maintained. If Contractor alters layers or cross-reference files, Contractor shall restore all layers and cross-references prior to submitting record documents to Engineer.
4. Contractor shall submit record drawings to Engineer in same CADD format that files were furnished to Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXHIBITS

A. Engineer's Electronic File Release Agreement is attached as Exhibit A following this Section's "End of Section" designation, and is part of this Specifications Section:

+ + END OF SECTION + +

EXHIBIT A - ENGINEER'S ELECTRONIC FILE RELEASE AGREEMENT

AUS Electronic File Release Agreement

SECTION 02 41 00

DEMOLITION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified and required for demolition, removal, and disposal Work.
   2. The Work under this Section includes, but is not necessarily limited to:
      a. Demolition and removal of existing materials and equipment as shown or indicated in the Contract Documents. The Work includes demolition of structural concrete, foundations, walls, doors, windows, structural steel, metals, roofs, masonry, attachments, appurtenances, piping, electrical and mechanical systems and equipment, paving, curbs, sidewalks, gutters, fencing and similar existing facilities.
      b. Demolition and removal of all Underground Facilities underneath, and above-grade piping and utilities in, the building(s) and structures shown or indicated for demolition, unless the Underground Facilities or above-grade facilities are shown or indicated as to remain.
      c. Remove from slabs, foundations, walls, and footings that are to be demolished all utilities and appurtenances embedded in such construction.
   3. Demolitions and removals specified under other Sections shall comply with requirements of this Section.
   4. Perform demolition Work within areas shown or indicated.
   5. Pay all costs associated with transporting and, as applicable, disposing of materials and equipment resulting from demolition.

B. Coordination:
   1. Comply with Section 01 14 16, Coordination with Owner's Operations.
   2. Review procedures under this and other Sections and coordinate the Work that will be performed with or before demolition and removals.

C. Related Sections:
   1. Section 01 74 19, Construction Waste Management and Disposal.
   2. Section 31 09 13, Geotechnical Instrumentation and Monitoring.
   2. Section 33 11 00, Clearing and Grubbing.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Demolition, removal, and disposal Work shall be in accordance with 29 CFR 1926.850 through 29 CFR 1926.860 (Subpart T - Demolition), and all other Laws and Regulations.
2. Comply with requirements of authorities having jurisdiction.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Procedure Submittals:
      a. Demolition and Removal Plan: Not less than ten days prior to starting demolition Work, submit acceptable plan for demolition and removal Work, including:
         1) Plan for coordinating shut-offs, capping, temporary services, and continuing utility services.
         2) Other proposed procedures as applicable.
         3) Equipment proposed for use in demolition operations.
         4) Recycling/disposal facility(ies) proposed, including facility owner, facility name, location, and processes. Include copy of appropriate permits and licenses, and compliance status.
         5) Planned demolition operating sequences.
         6) Detailed schedule of demolition Work in accordance with the accepted Process Schedule.
   2. Notification of Intended Demolition Start: Submit in accordance with Paragraph 3.1.A of this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

A. Notification:
   1. At least 48 hours prior to commencing demolition or removal, notify Engineer in writing of planned start of demolition Work. Do not start removals without permission of Engineer.

B. Protection of Surrounding Areas and Facilities:
   1. Perform demolition and removal Work in manner that prevents damage and injury to property, structures, occupants, the public, and facilities. Do not interfere with use of, and free and safe access to and from, structures and properties.
   2. Closing or obstructing of roads, drives, sidewalks, and passageways adjacent to the Work is not allowed unless indicated otherwise in the Contract Documents. Conduct the Work with minimum interference to vehicular and pedestrian traffic.

3. Provide temporary barriers, lighting, sidewalk sheds, and other necessary protection.
4. Repair damage to facilities that are to remain.

C. Existing Utilities: In addition to requirements of the General Conditions, Supplementary Conditions, and Division 01 Specifications, do the following:
1. Should uncharted or incorrectly charted Underground Facilities be encountered, Contractor responsibilities shall be in accordance with the General Conditions as may be modified by the Supplementary Conditions. Cooperate with utility owners in keeping adjacent services and facilities in operation.
2. Sanitary Sewer: Before proceeding with demolition, locate and cap all sewer lines and service laterals discharging from the building or structure being demolished.
3. Storm Water: Existing storm water system shall remain in place until demolitions of existing building or structure is completed. Upon completing demolition, cut and cap storm sewer laterals at locations shown on the Drawings. Remove existing storm water piping and related structures between points of cutting, and backfill, restore to grade, and stabilize the area over the removed facilities.
4. Water Piping: Before proceeding with demolition, locate and cap all potable and non-potable waterlines and service laterals serving the building or structure being demolished.
5. Other Utilities: Before proceeding with demolition, locate and cap as required all other utilities, such as fuel and gas; heating, ventilating, and air conditioning; electric; and communications; and service laterals serving the building or structure being demolished.
6. Shutdown of utility services shall be coordinated by Contractor, assisted by Owner as required relative to contacting utility owners.

3.2 DEMOLITION – GENERAL

A. Locate construction equipment used for demolition Work and remove demolished materials and equipment to avoid imposing excessive loading on supporting and adjacent walls, floors, framing, facilities, and Underground Facilities.

B. Pollution Controls:
1. Use water sprinkling, temporary enclosures, and other suitable methods to limit emissions of dust and dirt to lowest practical level. Comply with Section 01 57 05, Temporary Controls, and Laws and Regulations.
2. Do not use water when water may create hazardous or objectionable conditions such as icing, flooding, or pollution.
3. Clean adjacent structures, facilities, properties, and improvements of dust, dirt, and debris caused by demolition Work, in accordance with the General Conditions and Section 01 74 05, Cleaning.

C. Comply with Section 01 73 29, Cutting and Patching.

D. Building or Structure Demolition:
   1. Unless otherwise approved by Engineer, proceed with demolition from top of building or structure to the ground. Complete demolition Work above each floor or tier before disturbing supporting members of lower levels.
   2. Demolish concrete and masonry in small sections.
   3. Remove structural framing members and lower to ground using hoists, cranes, or other suitable methods. Do not throw or drop to the ground.
   4. Break up and remove foundations and slabs-on-grade unless otherwise shown or indicated as remaining in place.

E. Demolition of Site Improvements:
   1. Pavement, Sidewalks, Curbs, and Gutters: Demolition of asphalt or concrete pavement, sidewalks, curbs, and gutters, as applicable, shall terminate at cut edges. Edges shall be linear and have a vertical cut face.
   2. Fencing, Guardrails, and Bollards: Remove to the limits shown or indicated on the Drawings. Completely remove below-grade posts and concrete.
   3. Landscaping: Comply with Section 33 11 00, Clearing and Grubbing.

F. Salvage and Ownership:
   1. Refer to Section 01 11 13, Summary of Work, for requirements on salvage, ownership, and handling of equipment and materials removed during demolition and removal Work.
   2. Materials and equipment to remain Owner's property shall be carefully removed and appropriately handled by Contractor to avoid damage and invalidation of warranties in effect, and shall be cleaned and stored at the Site (or other site specified in the Contract Documents) at place designated by Engineer or Owner.

G. Finishing of Surfaces Exposed by Removals: Unless otherwise shown or indicated in the Contract Documents, surfaces of walls, floors, ceilings, and other areas exposed by removals, and that will remain as finished surfaces, shall be repaired and re-finished with materials that match existing adjacent surface, or as otherwise approved by Engineer.

3.3 STRUCTURAL REMOVALS

A. Remove structures to lines and grades shown or indicated, unless otherwise directed by Engineer. Where limits are not shown or indicated, limits shall be four inches outside item to be installed. Removals beyond limits shown or indicated shall be at Contractor's expense and such excess removals shall be reconstructed to satisfaction of Engineer without additional cost to Owner.

B. Recycling and Reuse of Demolition Materials:
   1. All concrete, brick, tile, masonry, roofing materials, reinforcing steel, structural metals, miscellaneous metals, plaster, wire mesh, and other items contained in or upon building or structure to be demolished shall be removed,

transported, and disposed of away from the Site, unless otherwise approved by Engineer.

2. Do not use demolished materials as fill or backfill adjacent to structures, in pipeline trenches, or as subbase under structures or pavement.

C. After removing concrete and masonry walls or portions thereof, slabs, and similar construction that ties in to the Work or to existing construction, neatly repair the junction point to leave exposed only finished edges and finished surfaces.

D. Where parts of existing structures are to remain in service following demolition, remove the portions shown or indicated for removal, repair damage, and leave the building or structure in proper condition for the intended use.

1. Remove concrete and masonry to the lines shown or indicated by sawing, drilling, chipping, and other suitable methods. Leave the resulting surfaces true and even, with sharp, straight corners that will result in neat joints with new construction and be satisfactory for the purpose intended.
2. Do not damage reinforcing bars beyond the area of concrete and masonry removal. Do not saw-cut beyond the area to be removed.
3. Reinforcing bars that are exposed at surfaces of removed concrete and masonry that will not be covered with new concrete or masonry shall be removed to 1.5 inches below the final surface. Repair the resulting hole, with repair mortar for concrete and grout for masonry, to be flush with the surface.
4. Where existing reinforcing bars are shown or indicated to extend into new construction, remove existing concrete so that reinforcing bars are clean and undamaged.

E. Where equipment or material anchored to concrete or masonry are removed and anchors are not to be re-used, remove the anchors to not less than 1.5 inches beneath surface of concrete or masonry member. Repair the resulting hole, using repair mortar for concrete and grout for masonry, to be flush with the surface. Alternately, when the anchor is stainless steel, the anchor may be cut flush with the surface of the concrete or masonry, when so approved by Engineer.

E. Jambs, sills and heads of windows, passageways, doors, or other openings (as applicable) cut-in to the Work or to existing construction shall be dressed with masonry, concrete, or metal to provide smooth, finished appearance.

F. Where anchoring materials, including bolts, nuts, hangers, welds, and reinforcing steel, are required to attach the Work to existing construction, provide such materials under this Section, unless specified elsewhere in the Contract Documents.

3.4 MECHANICAL REMOVALS

A. Mechanical demolition and removal Work includes dismantling and removing existing piping, ductwork, pumps, equipment, tanks, and appurtenances as shown, indicated, and required for completion of the Work. Mechanical removals include cutting and capping as required, except that cutting of existing piping and ductwork

to make connections is included under Section 01 14 16, Coordination with Owner's Operations; Section 01 73 29, Cutting and Patching; and applicable Sections of Division 40, Process Integration.

B. Demolition and Removals of Piping, Ductwork, and Similar Items:
   1. Purge piping and tanks (as applicable) of chemicals or fuel (as applicable) and make safe for removal and capping. Remove to the extent shown or indicated existing process, water, waste and vent, chemical, gas, fuel, and other piping. Remove piping to the nearest solid piping support, and provide caps on ends of remaining piping. Where piping to be demolished passes through existing walls to remain, cut off and cap pipe on each side of the wall.
   2. Caps, Closures, Blind Flanges, and Plugs:
      a. Provide closure pieces, such as blind flanges and caps, where shown or required to complete the Work.
      b. Where used in this Section, the term "cap" means the appropriate type closure for the piping or ductwork being closed, including caps, blind flanges, and other closures.
      c. Caps shall be compatible with the piping or ductwork to which the cap is attached, fluid-tight and gastight, and appropriate for the fluid or gas conveyed in the pipe or duct.
      d. Unless otherwise shown or indicated, caps shall be mechanically fastened, fused, or welded to pipe or duct. Plug piping with means other than specified in this Section only when so shown or indicated in the Contractor Documents or when allowed by Engineer.
   3. When Underground Facilities are altered or removed, properly cut and cap piping left in place, unless otherwise shown or indicated.
   4. Remove waste and vent piping, and ductwork to extent shown and cap as required. Where demolished vent piping, stacks, and ductwork passes through existing roofing, patch the roof with the same or similar materials. Completed patch shall be watertight and comply with roofing manufacturer's recommendations.
   5. Modifications to potable water piping and other plumbing and heating system work shall comply with Laws and Regulations. All portions of potable water system that have been modified or opened shall be hydrostatically tested and disinfected in accordance with the Contract Documents, and Laws and Regulations. Hydrostatically test other, normally-pressurized, plumbing piping and heating piping.

C. Equipment Demolition and Removals:
   1. To the extent shown or indicated, remove existing process equipment; pumps; storage tanks; hoisting and conveying equipment; heating, ventilating, and air conditioning equipment; generators; and other equipment.
   2. Where required, disassemble equipment to avoid imposing excessive loading on supporting walls, floors, framing, facilities, and Underground Facilities. Disassemble equipment as required for access through and egress from building or structure. Disassembly shall comply with Laws and Regulations. Provide required means to remove equipment from building or structure.

3. Remove control panels, operator stations, and instruments associated with equipment being removed, unless shown or indicated otherwise.
4. Remove fuel appurtenances as applicable, including fuel storage tanks. Dispose of tank contents in accordance with Laws and Regulations.
5. Remove equipment supports as applicable, anchorages, base, grout, and piping. Remove anchorage systems in accordance with the "Structural Removals" Article in this Section. Remove small-diameter piping back to header unless otherwise indicated.
6. Remove access platforms, ladders, and stairs related to equipment being removed, unless otherwise shown or indicated.

3.5 ELECTRICAL REMOVALS

A. Electrical demolition Work includes removing existing transformers, distribution switchboards, control panels, motors, starters, conduit and raceways, cabling, poles and overhead cabling, panelboards, lighting fixtures, switches, and miscellaneous electrical equipment, as shown, specified, or required.

B. Remove existing electrical equipment and fixtures to avoid damaging systems to remain, to keep existing systems in operation, and to maintain integrity of grounding systems.

C. Remove or modify motor control centers and switchgear as shown or indicated. Modified openings shall be cut square and dressed smooth to dimensions required for installation of equipment.

D. Disconnect and remove motors, control panels, and other electrical gear where shown or indicated. Motors, microprocessors and electronics, other electrical gear to be reused shall be stored in accordance with Section 01 66 00, Product Storage and Handling Requirements.

E. Cables in conduits to be removed shall be removed back to the power source or control panel, unless otherwise shown or indicated. Verify the function of each cable before disconnecting and removing.

F. Conduits, raceways, and cabling shall be removed where shown or indicated. Abandoned conduits concealed in floor, ceiling slabs, or in walls shall be cut flush with the slab or wall (as applicable) at point of entrance, suitably capped, and the area repaired in a flush, smooth manner acceptable to Engineer. Exposed conduits, junction boxes, other electrical appurtenances, and their supports shall be disassembled and removed. Repair all areas of the Work to prevent rusting on exposed surfaces.

G. Conduits in Underground Facilities not scheduled for reuse shall be suitably capped watertight where each enters building or structure to remain.

H. Where shown or indicated, remove direct burial cable. Openings in buildings for entrance of direct burial cable shall be patched with repair mortar or other material approved by Engineer for this purpose, and made watertight.

I. Existing poles and overhead cables shall be removed or abandoned as shown and specified. Existing substation(s) and poles owned by electric utility will be removed by the electric utility. Completely remove from the Site poles not owned by electric utility and shown or indicated for removal. Make necessary arrangements with electric utility for removal of utility company's transformers and metering equipment after new electrical system has been installed and energized.

J. Lighting fixtures, wall switches, receptacles, starters, and other miscellaneous electrical equipment, not designated as remaining as Owner's property, shall be removed and properly disposed off-Site as required.

3.6 DISPOSAL OF DEMOLITION DEBRIS

A. Remove from the Site all debris, waste, rubbish, and material resulting from demolition operations and equipment used in demolition Work. Comply with the General Conditions, Supplementary Conditions, and Section 01 74 05, Cleaning. Comply with Section 01 74 19, Construction Waste Management and Disposal.

B. Transportation and Disposal:
   1. Non-hazardous Material: Properly transport and dispose of non-hazardous demolition debris at appropriate landfill or other suitable location, in accordance with Laws and Regulations. Non-hazardous material does not contain Asbestos, PCBs, Petroleum, Hazardous Waste, Radioactive Material, or other material designated as hazardous in Laws and Regulations.
   2. Hazardous Material: When handling and disposal of hazardous materials is included in the Work, properly transport and dispose of hazardous materials in accordance with the Contract Documents and Laws and Regulations.

C. Submit to Engineer information required in this Section on proposed facility(ies) where demolition material will be recycled. Upon request, Engineer or Owner, shall be allowed to visit recycling facility(ies) to verify adequacy and compliance status. During such visits, recycling facility operator shall cooperate and assist Engineer and Owner.

+ + END OF SECTION + +

SECTION 03 01 30

REPAIR AND REHABILITATION OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to repair or rehabilitate, as required, all existing concrete shown or indicated in the Contract Documents as being repaired or rehabilitated.
   2. CONTRACTOR shall repair all damage to new concrete construction as specified in this Section except for repair Work specified in Section 03 30 00, Cast-In-Place Concrete.

B. Unit Prices:
   1. General: Unit prices include the cost of preparing existing construction to receive the work indicated.
   2. Concrete Removal and Replacement or Patching: Work will be paid for by the square foot computed on the basis of rectangular solid shapes approximating the actual shape of concrete removed and replaced with average depths, widths, and lengths, measured to the nearest inch.
   3. Joint Repair: Work will be paid for by the lump sum for all joints repaired.
   4. Epoxy Crack Injection: Work will be paid for by the linear foot of crack injected.

C. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the Work that must be installed with or before repair and rehabilitation of concrete.
   2. Related Sections:
   3. Section 03 15 00, Concrete Accessories.
   4. Section 03 30 00, Cast-In-Place Concrete.
   5. Section 03 60 00, Grouting.

1.2 REFERENCES

Standards Tests referenced in this Section are:
1. ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens).
2. ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
3. ASTM D1042, Test Method for Linear Dimensional Changes of Plastics Under Accelerated Service Conditions.
4. ASTM D3574, Test Methods for Flexible Cellular Materials – Slab, Bonded, and Molded Urethane Foams.

5. ASTM G109, Test Method for Determining the Effects of Chemical Admixtures on the Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data: Information on all products proposed for use, including manufacturer's brochures, technical data, specifications, and other applicable data.
   2. Product Test Reports: For each manufactured bonding agent, cementitious patching mortar, joint-filler, and crack injection adhesive, for tests performed by manufacturer and witnessed by a qualified testing agency.
   3. Qualification Data: For installers and manufacturers.
   4. Maintenance Program: Submit before work begins.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions: Manufacturer's recommended procedures for installing materials proposed for use.
   2. Special Procedure Submittals: When requested by ENGINEER, submit information on methods for supporting during demolition and repair Work existing structures, pipes, and other existing facilities affected by the Work.

1.4 QUALITY ASSURANCE.

A. Manufacturer Qualifications: Each manufactured bonding agent, cementitious patching-mortar, joint-filler, and crack-injection-adhesive manufacturer shall employ factory-trained technical representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer to apply packaged patching-mortar materials, and epoxy crack injection materials.

C. Maintenance Program: Prepare a written plan for maintenance of cast-in-place concrete, including each phase or process, protection of surrounding materials during operations, and control of debris and runoff during the Work. Describe in detail materials, methods, equipment, and sequence of operations to be used for each phase of the work.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling of Materials:
   1. Conform to Section 01 65 00, Product Delivery Requirements, and this Section.
   2. Clearly mark on containers manufacturer's name and label, name or title of material, manufacturer's stock number, and date of manufacture.
   3. Handle materials carefully to prevent inclusion of foreign matter.
   4. Do not open containers or mix components until necessary preparatory Work has been completed and application Work is to start immediately.

B. Storage of Materials:
    1. Conform to Section 01 66 00, Product Storage and Handling Requirements, and this Section.
    2. Store only approved materials at the Site.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. All repair and rehabilitation materials that can or will come into contact with potable water or that will be treated to become potable shall be listed in ANSI/NSF 61.

B. Source Limitations: Obtain each color, grade, finish type, and variety of product from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 BONDING AGENTS

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Manufactured product that consists of water-insensitive epoxy adhesive, Portland cement, and water-based solution of corrosive-inhibiting chemicals that forms a protective film on steel reinforcement.

    1. Products: Subject to compliance with requirements, provide one of the following:
        i. BASF Construction Chemical – Building Systems; Emaco P24.
        ii. Euclid Chemical Company (The), an RPM company; Duralprep A. C.
        iii. Kaufman Products, Inc.; Surepoxy HM EPL.
        iv. Sika Corporation, Construction Product Division; Armatec 110 EpoCem.
        v. Sto Corp., Concrete Restoration Division; Sto Bonding and Anti-Corrosion Agent.

2.3 REPAIR MORTAR

A. Product Description: Repair mortar shall be prepackaged, cement-based product specifically formulated for repairing concrete surface defects.

B. Products and Manufacturers: Provide one of the following:
    1. SikaTop 122 Plus, SikaTop 123 Plus, or SikaTop 126 Plus, by Sika Corporation.
    2. DuralTop Gel, DuralTop Flowable Mortar by Euclid Chemical Company.
    3. Or equal.

C. Materials:
    1. Provide a two-component, polymer-modified, Portland cement, fast-setting, trowel-grade mortar. Repair mortar shall be enhanced with penetrating corrosion inhibitor, and shall have the following properties:

Physical Property	Value	ASTM Standard
Minimum Compressive Strength at One Day	2,000 psi	C109
Minimum Compressive Strength at 28 Days	6,000 psi	C109
Minimum Bond Strength at 28 Days	1,800 psi	C882*
* Modified for use with repair mortars.		

2. Where the least dimension of the placement in width or thickness exceeds four inches, extend repair mortar by adding aggregate as recommended by repair mortar manufacturer.

2.4 EXPANSION JOINT REPAIR SYSTEM

A. System Description: Joint repair system shall consist of two components: an epoxy resin adhesive and hypalon sheeting.

B. Products and Manufacturers: Provide one of the following:
   1. Sikadur Combiflex, by Sika Corporation.
   2. Or equal.

C. Materials:
   1. Epoxy Resin Adhesive: Provide two-component epoxy resin as follows:
      a. Component "A" shall be modified epoxy resin of epichlorohydrin bisphenol-A type containing suitable viscosity control agents and pigments. Resin shall not contain butyl glycidyl ether.
      b. Component "B" shall be primarily a reaction product of selected amine blend with epoxy resin of epichlorohydrin bisphenol-A type containing suitable viscosity control agents, pigments, and accelerators.
   2. Hypalon Sheeting:
      a. Provide sheeting of hypalon rubber, perforated along bonding edge to provide mechanical key. Sheeting shall have ability to be vulcanized with hydrocarbon solvent for adhesion to an epoxy resin adhesive.
      b. Provide sheeting in 12-inch width with thickness of 40 mils.
      c. Sheeting shall be able to be lapped or seamed by heat or by anaromatic hydrosolvent strip.
      d. Provide sheeting with removable center expansion strip.

2.5 REPAIR OF EXPOSED REINFORCING STEEL

A. System Description: System for repair of exposed reinforcing steel shall consist of two components: an initial application of corrosion inhibitor and subsequent application of protective slurry mortar.

B. Corrosion Inhibitor:
   1. Corrosion inhibitor shall penetrate the hardened concrete surface and form a protective layer on reinforcing steel.
   2. Products and Manufacturers: Provide one of the following:
      a. Sika FerroGard 903, by Sika Corporation.

b. Or equal.

3. Corrosion inhibitor shall:
   a. Not change the substrate's color, appearance, or texture.
   b. Penetrate independently of orientation (horizontal, vertical, overhead) at rate up to 1/10 to 4/5 inches per day, depending on density of concrete, measured using secondary neutron mass spectroscopy.
   c. Form on reinforcing steel a protective layer of high integrity of at least 100 angstroms thickness, measured using x-ray photon spectroscopy and secondary ion mass spectroscopy.
   d. Demonstrate reduction in corrosion currents after treatment as determined using cracked beam corrosion tests of concrete, as adapted from STM G109.
   e. Be capable of reducing active corrosion rates by at least 65 percent. Reduction shall be demonstrated by project references and an independent corrosion engineer using linear polarization resistance.
   f. Penetrate up to three inches in 28 days, measured using secondary neutron mass spectroscopy.

C. Protective Slurry Mortar:
   1. Material shall be two-component, polymer-modified, cementious waterproofing and protective slurry mortar. Provide two coats at coverage of 50 square feet per gallon per coat.
   2. Products and Manufacturers: Provide one of the following:
      a. Sikatop Seal 107, by Sika Corporation.
      b. Or equal.

2.6 CRACK INJECTION MATERIALS

A. Structural Crack Repair System:
   1. Epoxy for injection shall be low-viscosity, high-modulus moisture insensitive type.
   2. Products and Manufacturers: Provide one of the following:
      a. Sikadur 35, Hi Mod L.V. and Sikadur 31, Hi-Mod Gel, by Sika Corporation.
      b. Eucopoxy Injection Resin, by Euclid Chemical Company.
      c. Or equal.

B. Non-structural Crack Repair System:
   1. Hydrophobic Polyurethane Chemical Grout:
      a. Provide hydrophobic polyurethane that forms a flexible gasket.
      b. Products and Manufacturers: Provide one of the following:
         1) SikaFix HH LV, by Sika Chemical Company.
         2) Hydro Active Flex SLV, by De Neef Construction Chemicals, Inc.
         3) Or equal.
      c. Shrinkage limit shall not exceed 4.0 percent in accordance with ASTM D1042.
      d. Minimum elongation of 250 percent in accordance with ASTM D3574.
      e. Minimum tensile strength of 150 psi in accordance with ASTM D3574.
   2. Hydrophilic Acrylate-Ester Resin:

a. Hydrophilic crack repair system shall be acrylate-ester resin that forms a flexible gasket and increase in volume by at least 50 percent when in contact with water.
b. Products and Manufacturers: Provide one of the following:
   1) Duroseal Multigel 850, manufactured by BBZ USA, I
   2) Superflex AR, by DeNeef Construction Chemicals, Inc.
   3) Or equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which the repair Work is to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

B. PREPARATION Surface Preparation:
   1. Initial Surface Preparation: Remove by chipping, abrasive blasting, or hydro blasting all laitance, foreign material, and unsound concrete from entire area to be repaired. Further roughen surface as specified in this Section. Where non-shrink grout or repair mortar is used, perform additional surface preparation, if any, as recommended by product manufacturer.
   2. Wetting Procedure: Where repair concrete, shotcrete, or cement grout is used, and bonding agent is not required, or where repair mortar or non-shrink grout manufacturer recommends wet or saturated surface, perform the following:
      a. Continuously apply water for at least four hours to surface being repaired. Where large surface areas are to be repaired, use fog-spray nozzles, mounted on stands, in sufficient number so that entire surface to be repaired is contacted by fog spray cloud.
      b. Prevent concrete from drying until after repair is completed. Re-wet surfaces not yet repaired using water sprays at least a daily; should more than four days elapse without re-wetting surfaces not yet repaired, repeat the original saturating procedure.
      c. Remove standing water in areas to be repaired before placing repair material. Provide means to remove excess water from structure.
   3. Preparation for Epoxy Bonding Agent: Where repair material manufacturer recommends use of epoxy-bonding agent, conform to recommendations of both repair material manufacturer and bonding agent manufacturer.

3.2 INSTALLATION, GENERAL

A. Construction Tolerances: Shall be as specified in Section 03 30 00, Cast-In-Place Concrete, except as specified in this Section and elsewhere in the Contract Documents.

B. Care shall be taken to fully consolidate repair material, completely filling all portions of space to be filled.

C. Bring surface being repaired into alignment with adjacent surfaces, providing uniform, even surface. Surface repaired shall match adjacent existing surfaces in texture and shall receive coatings or surface treatments, if any, provided for the existing surface adjacent to repaired surface.

D. Curing:
   1. Curing of repair mortar and non-shrink grout shall be in accordance with manufacturer's recommendations, except that minimum cure period shall be three days.
   2. Curing of other materials shall be in accordance with requirements of Section 03 30 00, Cast-In-Place Concrete.

3.3 REPAIR OF SURFACE DEFECTS

A. Surface defects are depressions in a concrete surface that do not extend all the way through the concrete. Surface defects can result from removal of an embedded item, removal of an intersecting concrete member, physical damage, or unrepaired rock pockets created during original placement. For spalls that result from corroded reinforcing steel or other embedment refer to Article 3.7 of this Section.

B. Preparation: Perform the following in addition to requirements of Article 3.2 of this Section:
   1. Remove by chipping all loose, damaged concrete to sound material.
   2. Where existing reinforcing is exposed, remove concrete to minimum of one-inch around exposed bars. If existing bars are cut through, cracked, or cross sectional area is reduced by more than 25 percent from original, immediately notify ENGINEER.
   3. Score-cut perimeter of area to be repaired to minimum depth of 1/2-inch and maximum depth that will not cut existing reinforcing steel. Chip out existing concrete to the score line so that minimum thickness of repair mortar will be 1/2-inch.

C. Repair Material:
   1. Completely fill the surface defect with specified repair material, in accordance with material manufacturer's instructions and the Contract Documents.
   2. Perform, with repair mortar, repairs of surface defects in concrete normally in contact with water or soil, and interior surfaces of structures that contain water.
   3. Repair of other surface defects may be by applying repair mortar, repair concrete, shotcrete, or cement grout, as appropriate.

3.4 PATCHING OF HOLES IN CONCRETE

A. For holes larger than 12-inch diameter or equivalent area of hole, refer to the Drawings for reinforcing details.

B. Fill openings less than four inches in their least dimension with Class III non-shrink epoxy grout in accordance with Section 03 60 00, Grouting.

C. Openings greater than four inches and less than 16 inches in their least dimension shall be coated with an epoxy bonding agent prior to filling with Class I non-shrink grout in accordance with Section 03 60 00, Grouting.

D. Openings greater than 16 inches in their least dimension shall be coated with an epoxy bonding agent prior to filling with Class A concrete in accordance with Section 03 30 00, Cast-In-Place Concrete.

E. Where repaired holes are in contact with water or soil, provide hydrophilic rubber waterstop within the opening in accordance with Section 03 15 00, Concrete Accessories, prior to filling with repair material.

3.5 REPAIR OF LINED HOLES

A. This Article applies to openings with embedded material over all or a portion of inside surface of hole. Where indicated on the Drawings, remove embedded materials and repair the hole in accordance with Article 3.5 of this Section, as modified in this Article 3.6.

B. Where embedded material is allowed to remain, remove embedded material to at least two inches into the hole, as measured from the plane surface of concrete wall or slab, as applicable. Embedded material left in place shall be roughened or abraded for proper bonding to repair material. Completely remove substances that interfere with proper bonding.

C. Completely remove embedded items not securely and permanently anchored into concrete.

D. Completely remove embedded items larger than 12 inches in their smallest dimension. In lieu of removing the embedded item, where reinforcing is required as shown or indicated in the Contract Documents, weld reinforcing to embedded item to remain, provided embedded item to remain is composed of metal to which reinforcing steel can be welded.

3.6 REPAIR OF DETERIORATED CONCRETE

A. This Article pertains to deteriorated concrete which has been damaged due to corrosion of reinforcing steel, physical damage due to abrasion, or damage due to chemical attack. Use repair mortar, as specified in this Article, for repairing deteriorated concrete. Where repaired surface will be subsequently covered with plastic liner material, coordinate finishing with requirements for installing plastic liner material.

B. Surface Preparation: In addition to requirements of Article 3.2 of this Section, perform the following surface preparation:
   1. Remove loose, broken, softened, and acid-contaminated concrete by abrasive blasting and chipping to sound, uncontaminated concrete.
   2. Upon completion of removal of deteriorated concrete, notify ENGINEER in writing. Allow two weeks for ENGINEER to evaluate the surface, perform testing for acid contamination if required, determine if additional concrete shall be removed, and to develop special repair details (if any) required. Should

ENGINEER determine that additional concrete be removed to reach sound, uncontaminated concrete, allow another two-week period for further evaluation and testing following the additional removal.

3. Surface preparation shall conform to recommendations of repair mortar manufacturer.
4. Repair and rehabilitate isolated areas of exposed reinforcing bars in accordance with Article 3.4 of this Section. If extensive areas of reinforcing steel are uncovered after removal of deteriorated concrete, ENGINEER will determine the repair methods required.

C. Repair Mortar Placing:
   1. Conform to manufacturer's recommended procedures for mixing and placing repair mortar.
   2. After initial mixing of repair mortar, addition of water is not allowed.
   3. Minimum Thickness:
      a. Install repair mortar to not less than minimum thickness recommended by manufacturer, and not less than 1/2-inch.
      b. Where removal of deteriorated concrete results in repair thickness of less than minimum required thickness to return to original concrete surface in isolated areas totaling less than ten percent of total repair surface area, remove additional concrete to obtain at least the required minimum thickness.
      c. Where surface area with repair thickness less than minimum required thickness exceeds ten percent of total repair area, notify ENGINEER.
      d. Provide repair mortar so that minimum cover over existing reinforcing steel is two inches. Do not place repair mortar creating locally raised areas.
      e. Where transitioning to or from wall surfaces not requiring repair, do not feather-out repair mortar at transition. Instead, form the transition by saw cutting a score line to not less than minimum required repair mortar depth and chip out concrete to the saw cut line. Do not cut or otherwise damage reinforcing steel.
   4. Place repair mortar to an even, uniform plane to restore concrete member to its original surface. Out-of-plane tolerance shall be such that the gap between 12-inch long straight edge and repair mortar surface does not exceed 1/8-inch, and gap between a four-foot long straight edge and repair mortar surface shall not exceed 1/4-inch. Tolerances specified in this paragraph apply to straight edges placed in any orientation at any location.

D. Finishing:
   1. Provide smooth, steel trowel finish to repair mortar.
   2. When completed, there shall be no sharp edges. Provide exterior corners, such as at penetrations, one-inch radius. Interior corners shall be square, except corners to receive plastic lining which shall be made with two-inch fillet in repair mortar.

3.7 REPAIR OF EXPANSION JOINTS

A. Surface Preparation: Remove the following from surfaces to be repaired: laitance, foreign material, and unsound concrete. Remove by chipping, abrasive blasting, or

hydro blasting. Additional surface preparation, if required, shall be as recommended by expansion joint repair system manufacturer.

B. Installation: Installation shall be as recommended by expansion joint repair system manufacturer.

3.8 REPAIR OF EXPOSED REINFORCING

A. Remove, by abrasive blasting or hydro blasting, all corrosion, foreign materials, and unsound concrete from area to be repaired.

B. Surface shall be visually dry before applying corrosion inhibitor. Liberally apply corrosion inhibitor to achieve coverage of 100 square feet per gallon in two or more coats, by allowing corrosion inhibitor to soak into substrate. Time between coats shall be the longer of one hour, or as recommended by corrosion inhibitor manufacturer. Apply using rollers, brushes, or hand-pressure spray equipment.

C. After applying final coat of corrosion inhibitor, minimum cure time of 24 hours is required.

D. Provide high-pressure wash to surfaces to be repaired to remove filmy residue from corrosion inhibitor.

E. For mortar coating, conform to Paragraphs 3.7.C, 3.7.D, 3.7.E of this Section.

3.9 CRACK INJECTION

A. Examine areas under which injection Work will be installed and locate cracks that require injection. Identify and inject cracks greater than 0.010-inch wide in structures that retain or contain water, wastewater, or similar liquid.

B. Install injection material in accordance with crack injection manufacturer's requirements.

C. After injecting and curing, verify that injected material penetrated the crack adequately and that there is no visible leakage through the crack. After injecting, if crack continues to leak, re-inject crack at no additional cost to OWNER until structure is watertight.

D. If proper penetration of crack cannot be achieved, submit to ENGINEER a proposed alternate approach for modifying the specified injection procedure to properly seal the crack. In new concrete and in concrete cracked as a result of CONTRACTOR's operations, perform modifications to crack injection procedure and fully repair the crack without additional cost to OWNER or extension of the Contract Times.

3.10 SITE QUALITY CONTROL

A. OWNER will employ and pay for services of testing laboratory for Site quality control testing. ENGINEER will direct the number of tests and specimens required, including providing necessary materials for making and facility for storing test specimens.

CONTRACTOR shall make standard compression test specimens as specified in this Section under the observation of ENGINEER. CONTRACTOR shall provide:

1. Necessary assistance required by ENGINEER.
2. All labor, material, and equipment required, including rods, molds, thermometer, curing in heated storage box, and all other incidentals required, subject to approval by ENGINEER.
3. All necessary storage, curing, and transportation required for testing.
4. CONTRACTOR will be charged for cost of additional testing and investigation, if any, for Work performed that is not in accordance with the Contract Documents or is otherwise defective.

B. Site Tests of Cement-based Grouts and Repair Mortar:

1. Obtain compression test specimens during construction from first placement of each type of mortar or grout, and at intervals thereafter as selected by ENGINEER, to verify compliance with the Contract Documents. Specimens will be made by ENGINEER or ENGINEER's representative.
2. Compression tests and fabrication of specimens for repair mortar and non-shrink grout will be performed in accordance with ASTM C109. Set of three specimens will be made for each test. Tests will be made at seven days, 28 days, and additional time periods as deemed appropriate by ENGINEER.
3. Material, already placed, failing to conform to the Contract Documents, is defective.

C. Repair Concrete: Repair concrete shall be tested as required in Section 03 30 00, Cast-In-Place Concrete.

+ + END OF SECTION + +

+ + NO TEXT ON THIS PAGE+ +

SECTION 03 11 00

CONCRETE FORMING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete forming. The Work also includes:
      a. Designing forming systems in accordance with requirements of ACI 347 and the Contract Documents.
      b. Providing forming to accommodate the Work under this and other Sections and building into forming items such as sleeves, anchorage devices, inserts, pipe embedment, reinforcing, and all other items to be embedded in concrete for which placement is not specifically provided under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before concrete forming Work.2. Coordinate forming Specifications with requirements for finished surfaces specified in Section 03 30 00, Cast-In-Place Concrete.

C. Related Sections:
   1. Section 03 15 00, Concrete Accessories.
   2. Section 03 20 00, Concrete Reinforcing.
   3. Section 03 30 00, Cast-In-Place Concrete.
   4. Section 03 60 00, Grouting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 117, Specifications for Tolerances for Concrete Construction and Materials and Commentary.
   2. ACI 301, Specifications for Structural Concrete.
   3. ACI 347, Guide to Formwork for Concrete.
   4. ACI SP-4, Formwork for Concrete.
   5. ASTM C805/C805M, Test Method for Rebound Number of Hardened Concrete.
   6. ASTM C1074, Practice for Estimating Concrete Strength by the Maturity Method.
   7. American Plywood Association (APA):
      a. PS-1, Structural Plywood.
      b. V345, Concrete Forming.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Professional Engineer:
      a. CONTRACTOR or formwork Supplier shall retain a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall have at least five years of experience designing formwork and falsework of the type required.
      b. Responsibilities include:
         1) Reviewing formwork and falsework performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising preparation of design calculations verifying compliance of formwork and falsework with requirements of the Contract Documents.
         4) Signing and sealing all calculations.
         5) Certifying that:
            a) Design of formwork and falsework was performed in accordance with performance and design criteria stated in the Contract Documents, and
            b) Design conforms to all Laws and Regulations, and to prevailing standards of practice.

B. Formwork, and if required shoring and reshoring, shall be designed by a Professional Engineer licensed in the State of Virginia, and submitted to the Engineer for Review.

C. Mock-Ups for Concrete Finishes: Provide forming for mock-ups as required for finish work shown and specified for the Work. Construct forms to provide specified finishes to the requirements specified in Section 03 30 00, Cast-In-Place Concrete. Obtain ENGINEER'S acceptance of each mock-up prior to starting forming for the Work. Do not remove mock-up(s) until directed by ENGINEER.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Samples:
      a. Plywood form material used for smooth form finish, four inches square minimum.

B. Informational Submittals: Submit the following:
   1. Shop Drawings: When requested by ENGINEER, submit Shop Drawings showing and indicating general construction of individual forms, including:
      a. Jointing.
      b. Special formed joints or reveals.

c. Location, pattern, and details of form tie placement, removal, and repair procedures.
d. Location and details for temporary openings.
e. Other items that would visually affect the finished concrete.

2. Design of Temporary Measures: Design placement and maintenance of formwork, falsework, and form system is the CONTRACTOR's responsibility. Submit the following:
   a. Falsework layout drawings with the seal and signature of CONTRACTOR's or Supplier's professional engineer. Layout drawings shall show bracing details, waler arrangements, location of shores, joint forming details, and details at connections to previously placed concrete. ENGINEER's review will be for general conformance to the requirements of the Contract Documents and ACI 347, as indicated for delegated design in the General Conditions.
   b. Design calculations for formwork and falsework, when requested by ENGINEER.
   c. Certification letter from CONTRACTOR's or Supplier's professional engineer stating that in-place falsework was inspected and complies with the intent of the falsework design.
3. Product Technical Data: Manufacturer's data for proprietary materials, including form coatings, manufactured form systems, manufacturer and type of void form including compressive strength, ties, and accessories.
4. Manufacturer's Instructions: Installation instructions for proprietary materials, including form coatings, manufactured form systems, ties, and accessories.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage:
   1. Upon delivery to the Site, place materials in area protected from weather.
   2. Store materials in accordance with manufacturer's recommendations.
   3. Store materials above ground on framework or blocking. Cover wood for forms and other accessory materials with protective, waterproof covering. Provide for adequate air circulation or ventilation under cover.

B. Handle materials in accordance with the manufacturer's recommendations. Do not damage materials during handling.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:
   1. Design, erect, support, brace and maintain forming in accordance with ACI 347 so that forming safely supports vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by forming system or in-place construction

that has attained adequate strength for the purpose. Construct forming so that concrete members and structures are of correct size, shape, alignment, elevation, and position.

2. Design forms and falsework to include values of live load, dead load, weight of moving equipment operated on forming, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
3. Provide shores and struts with positive means of adjustment capable of taking up forming settlement during concrete placing operations, using wedges or jacks, or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
4. Support form facing materials by structural members spaced sufficiently close to prevent beyond tolerance deflection, in accordance with ACI 117. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances. For long-span members without intermediate supports, provide camber in forming as required for anticipated deflections resulting from weight and pressure of fresh concrete and construction loads.
5. Design and construct forming to be readily removable without impact, shock or damage to concrete surfaces and adjacent materials.
6. Provide forming sufficiently tight to prevent leakage of cement paste during concrete placing. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

2.2 FORM MATERIALS

A. General: For the purposes of this SPECIFICATION, exposure shall be defined as a surface, interior, or exterior, of a structure that will be exposed to view during its use.

B. Forms for Surfaces Exposed to View.
   1. Walls and Beams:
      a. APA PS 1-XX, B-B Plyform Class I, exterior. The plywood shall be mill oiled and edged sealed.
      b. Symons hand set steel-ply forms, or equal.
   2. Sides of Column Footings:
      a. APA PS 1-XX, B-B Plyform Class I, exterior. The plywood shall be mill oiled and edged sealed.
      b. Steel of sufficient thickness that the form remains true to shape after numerous repetitive uses.
      c. Symons hand set steel-ply forms, or equal.
   3. Sides of Curved or Straight Continuous Wall Footings:
      a. APA high-density overlay Plyform Class I exterior.
      b. APA PS 1-XX, B-B Plyform Class I, exterior.
      c. For curved surfaces, plywood of sufficient thickness, free from knots and other imperfections, which can be cut and bent and held in place

accurately to the required curvature without splintering or splitting, shall be used.

4. Floor and Roof Slabs: APA PS 1-XX, B-B Plyform Class I, exterior. The plywood shall be mill oiled and edged sealed.
5. Columns: Regardless of materials of construction, the forms shall be such to permit bracing in two directions as half height and full height at a minimum. two braces at ninety degrees are required at half and full height.
   a. Steel of sufficient thickness that the form remains true to shape after numerous repetitive uses.
   b. Fiberglass of sufficient thickness that the form remains true to shape.

C. Forms for Surfaces not Exposed to View
   1. Wood or steel sufficiently tight to prevent mortar leakage.

D. Anchorage in Slabs for Braces for Wall and Column Forms
   1. Braces shall be anchored to deadmen of sufficient size and weight to maintain the proper wall/column alignment under all load conditions including wind.
   2. Wedge anchors of any type, inserts or concrete nails are specifically not permitted for anchorage of wall or column braces in water retaining structures. Wedge anchors or nails may be used in other structures when in the opinion of ENGINEER, the resulting concrete finish patch will be acceptable.

E. Anchorage in Slabs for Upturned Column Footing Forms
   1. Braces shall be anchored to deadmen of sufficient size and weight to maintain the proper wall/column configuration and diameter. Wedge anchors of any type, inserts or concrete nails are specifically not permitted for anchorage of column footing forms.

F. Forms for Smooth Finish Concrete:
   1. In addition to information above, construct forming for smooth concrete surfaces with plywood, metal, metal-framed plywood-faced, or other panel type materials acceptable to ENGINEER, to provide continuous, straight, smooth as-cast surfaces with no wood grain or other surface texture imparted by forming. Provide in largest practical sizes to minimize number of joints and to conform to joint system shown or specified in the Contract Documents. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

G. Cylindrical Columns and Supports:
   1. Form round-section members with paper or fiber tubes, constructed of laminated plies using water-resistant type adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.
      a. Provide manufacturer's standard plastic-lined-interior units.
   2. Fiberglass or steel forms may be used for cylindrical columns if accepted by ENGINEER in writing.

H. Form Ties:
   1. Provide factory-fabricated metal form ties, designed to prevent form deflection, and to prevent spalling of concrete surfaces upon removal.
   2. Unless otherwise shown or indicated in the Contract Documents, provide ties so that portion of tie remaining within concrete after removal of exterior parts of tie is at least 1.5 inches from the outer concrete surface. Unless otherwise shown or indicated in the Contract Documents, provide form ties that will leave a hole no larger than one-inch diameter in concrete surface.
   3. Water Retaining Structures and Below Grade Structures shall be provided with Symons, S-Panel Ties, or equal, with water seal and one (1) inch break back cones on both tie ends, shall be used on all wall forms.
   4. Other Structures shall be provided with Symons, S-Panel Ties, or equal, with one (1) inch break back cones on both tie ends, unless otherwise called out or shown in the DRAWINGS or approved by ENGINEER, shall be used on all wall forms.
   4. Ties shall leave a uniform, circular hole when forms are removed.
   5. Do not use removable ties unless accepted by ENGINEER. Removable ties are not allowed on exterior below-grade walls or walls subject to hydrostatic pressure. If removable ties are accepted, CONTRACTOR shall submit hole repair details for ENGINEER approval.
   6. Twisted Wire ties with loops to hold forms in position are not allowed.
   7. Do not use reinforcing bars shown by the Drawings as part of the form tie system unless approved by ENGINEER.

I. Chamfer Strip:
   1. Chamfer strips, three-quarters (3/4) inch or as shown on the DRAWINGS, shall be placed in the corners of forms and at the tops of wall or up turned footings, to produce beveled edges on permanently exposed concrete surfaces. Interior angles of intersecting concrete surfaces and edges of construction joints shall not be beveled unless otherwise indicated in the DRAWINGS. The chamfer strip may be made of wood or polyvinyl chloride (PVC).

J. Form Coatings:
   1. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds. For concrete surfaces that will be in contact with potable water or water that will be treated to become potable, form coating shall be a mineral oil base coating.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrate and conditions under which the Work will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 FORM CONSTRUCTION

A. Construct forms in accordance with ACI 347; to the exact sizes, shapes, lines, and dimensions shown; as required to obtain accurate alignment, location, and grades; to tolerances specified; and to obtain level and plumb work in finish structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Use selected materials to obtain required finishes. Finish shall be in accordance with approved mock-up or sample panel, when specified.

B. Allowable Tolerances:
   1. Construct forming to provide completed concrete surfaces complying with tolerances specified in ACI 117, ACI 301, and ACI 347.
      a. Surfaces exposed to view shall be Class B surface, 1/4-inch offset.
      b. Other surfaces shall be Class C surface, 1/2-inch offset.
   2. Tolerances apply to form offsets and to irregularities within the formed surface when measured with a straightedge over a five-foot distance.

C. Install forming and accessories for facilities in accordance with manufacturer's instructions, Laws and Regulations, and the Contract Documents.

D. Fabricate forms for easy removal without damaging concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.

E. Provide temporary openings where interior area of forming is inaccessible for cleanout, for inspection before concrete placement, and for placing concrete. Brace temporary closures and set tightly to forms to prevent loss of cement paste. Locate temporary openings on forms in locations as inconspicuous as possible, consistent with requirements of the Work. Form intersecting planes of openings to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete.

F. Falsework:
   1. Erect falsework and support, brace, and maintain falsework to safely support vertical, lateral, and asymmetrical loads applied until such loads can be supported by in-place concrete structures. Construct falsework so that adjustments can be made for take-up and settlement.
   2. Provide wedges, jacks or camber strips to facilitate vertical adjustments. Carefully inspect falsework and formwork during and after concrete placement operations to determine abnormal deflection or signs of failure;

make necessary adjustments to produce finished Work of required dimensions.

G. Forms for Smooth Finish Concrete:
   1. Do not use metal cover plates for patching holes or defects in forms.
   2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.
   3. Use extra studs, walers, and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material that will produce bow.
   4. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.
   5. Form molding shapes, recesses, rustication joints and projections with smooth-finish materials, and install in forms with sealed joints to prevent displacement.

H. Corner Treatment:
   1. Form exposed corners of beams, walls, foundations, bases and columns to produce smooth, solid, unbroken lines, except as otherwise shown or indicated in the Contract Documents. Chamfer exposed corners.
   2. Form chamfers with 3/4-inch by 3/4-inch strips, unless otherwise shown or indicated in the Contract Documents, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer strips at changes in direction.
   3. Reentrant or internal and unexposed corners may be formed either square or chamfered.

I. Joints:
   1. For joint treatment, comply with Section 03 15 00, Concrete Accessories. Locate joints as shown and specified.

J. Openings and Built-In Work:
   1. Provide openings in concrete forming shown or required under other Sections or other contracts. Refer to Paragraph 1.1.B of this Section for coordination requirements.
   2. Accurately place and securely support items to be built into forms.

K. Sealing Forming:
   1. Forming joints shall be tight-fitting or otherwise sealed to prevent loss of cement paste.
   2. Provide forming resting against concrete surfaces with compressible gasket material between the concrete and edge of form, to fill irregularities and create tight seal.

L. Cleaning and Tightening:
   1. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before concrete is placed.

Retighten forms immediately after placing concrete, as required to eliminate cement paste leaks.

M. Tie Holes:
1. Patch tie holes in accordance with Section 03 30 00, Cast-In-Place Concrete.

3.3 FORM COATINGS

A. Coat form contact surfaces with non-staining form-coating compound before installing reinforcing materials. Do not allow excess form coating material to accumulate in forms or come into contact with surfaces that will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.

B. Coat steel forms with non-staining, rust-preventative form oil, or otherwise protect against rusting. Do not use rust-stained steel forming.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. Set and build into forming anchorage devices and other embedded items, shown, specified, or required under other Sections. Refer to Paragraph 1.1.B of this Section for coordination requirements. Use necessary setting drawings, diagrams, instructions, and directions.

B. Edge Forms and Screeds Strips for Slabs:
1. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units to support screeds.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:
1. Before placing concrete, check ties, tie cones, tie water stops, embedded items, form coatings, forming stability, alignment, and tolerances. Make corrections and adjustments to ensure forming complies with intent of the forming design, proper stability of forming systems, and accurate size and location of concrete members.
2. During concrete placing, check forming and related supports to ensure that forms are not displaced, and that completed Work will be within specified tolerances.
3. If forms are unsatisfactory in any way, either before or during concrete placing, stop or postpone placing of concrete until defects are corrected as required by CONTRACTOR's or Supplier's professional engineer and accepted by ENGINEER.

3.6 REMOVAL OF FORMS

A. Determination of time between placing concrete and removing forms is CONTRACTOR's responsibility. Requirements specified in this Section are

minimum times and requirements intended to ensure that concrete will support its own weight, and do not consider additional effects of the construction. Additional effects of the construction shall be accounted for by CONTRACTOR when determining time for removing forming. Coordinate removal times with curing methods specified in 03 30 00 – Cast-In-Place Concrete. Time for removing of forms is subject to ENGINEER's acceptance.

B. Comply with requirements of ACI 301 and ACI 347, except as indicated in the Contract Documents.

C. Removal of Forms for Walls, Columns, Sides of Beams and Girders, and Slab and Foundation Edges:
   1. Comply with requirements of Table 03 11 00-A of this Section:

TABLE 03 11 00-A, REMOVAL OF FORMS

Component	Average Daily Ambient Air Temperature (deg F)				Min. Concrete Compressive Strength for Form Removal
	Over 70 F	60 F to 70 F	50 F to 60 F	Below 50 F	
Walls	One day	Two days	Three days	See Paragraph 3.8.C.2 of this Section	750 psi
Columns	Two days	Three days	Four days		1000 psi
Side of beams and girders	One day	One day	Two days		500 psi
Slab and foundation edges	One day	One day	Two days		500 psi

   2. When average daily ambient air temperature is below 50 degrees F, do not remove forms until concrete attains minimum compressive strength indicated in Table 03 11 00-A for form removal, and comply with Paragraph 3.8.C.3.b of this Section.
   3. Concrete Strength Requirements for Form Removal:
      a. For other than beams and elevated slabs, do not remove forms until concrete attains minimum concrete compressive strength indicated in Table 03 11 00-A for form removal.
      b. For beams and elevated slabs, do not remove supporting forms or shoring until concrete attains minimum of 90 percent of its specified compressive strength.

D. Alternative Criteria for Removing Forms for Walls, Columns, Sides of Beams and Girders, and Slab and Foundation Edges: CONTRACTOR has the option of submitting an alternative removal of forms table, together with supporting data, for ENGINEER's acceptance. Supporting data shall include representative field data for each different placement ambient temperature condition and minimum of three tests per temperature condition to ensure that accurate correlation between concrete strength and placement temperature is obtained.

E. Determination of In-place Concrete Strength:
   1. Determine compressive strength of in-place concrete by compression test specimens cured at the Site under the same conditions of temperature and moisture as the concrete member under consideration.

2. Alternately, determine compressive strength of in-place concrete by maturity factor procedure in accordance with ASTM C1074 and approved by ENGINEER. Location of embedded thermistors or thermocouples shall be as approved by ENGINEER.

F. When high-early strength concrete is used, time for removing the forms will be developed at the Site from the age/strength relationships established for the materials and proportions used by tests in accordance with ACI 301.

G. Continue curing, including bottom surfaces of slabs and beams, after form removal in accordance with Section 03 30 00, Cast-In-Place Concrete.

3.7 PERMANENT SHORES

A. Provide permanent shores in accordance with ACI 347.

B. Reshores are not allowed.

3.8 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in the construction. Do not use split, frayed, delaminated, or otherwise damaged form facing material. Apply form coating compound material to concrete contact surfaces as specified for forming.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces. Form surfaces are subject to ENGINEER's approval.

+ + END OF SECTION + +

+ +NO TEXT ON THIS PAGE + +

SECTION 03 15 00

CONCRETE ACCESSORIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete accessories.

B. Related Sections:
   1. Section 03 11 00, Concrete Forming.
   2. Section 03 60 00, Grouting.
   3. Section 07 92 00, Joint Sealants.

C. Measurement and Payment:
   1. Measurement; Concrete accessories will not be measured separately for payment.
   2. Payment; Concrete accessories will be paid for as part of the indicated Contract unit price or lump-sum price for the associated concrete work as indicated in the Bid Schedule of the Bid Form.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 301, Standard Specifications for Structural Concrete.
   2. ASTM C920, Specification for Elastomeric Joint Sealant
   3. ASTM D1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
   4. ASTM D994/D 994M, Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
   5. CRD-C513, U.S. Army Corps of Engineers (CRD), Specification for Rubber Waterstops.
   6. CRD-C572, U.S. Army Corps of Engineers Specifications for Polyvinyl- Chloride Waterstop.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Layout of construction and expansion joint locations. Submit and obtain approval prior to submitting concrete reinforcement Shop Drawings.
      b. For construction and expansion joints that require waterstops, submit layout of locations showing waterstop details. Indicate waterstop type,

waterstop joint conditions, and details on how joint conditions will be handled.
c. Layout of all control joint locations.
d. Showing locations of all joints to be filled and sealed.

2. Samples:
a. Submit Sample, at least six inches long each, of each type of waterstop proposed for use.
b. Submit Sample of foam rubber and cork expansion joint fillers.
c. Submit Sample of each type of prefabricated PVC waterstop joint. Samples shall be submitted after approval of waterstop submittal. Approved samples shall remain accessible on Site during construction operations.

B. Informational Submittals: Submit the following:
1. Manufacturer's Instructions: Manufacturer's specifications and installation instructions for all materials required.

1.4 QUALITY ASSURANCE

A. Joint and Waterstop Coordination Conference:
1. Conduct coordination conference to review detailed requirements of CONTRACTOR's proposed joint locations, joint treatments, and required submittals. CONTRACTOR shall organize and schedule the conference, and prepare and distribute to all parties attending conference minutes of the conference.
2. Conduct joint and waterstop coordination conference prior to joint, waterstop and reinforcing submittal. Conference shall be held at mutually agreed upon date and time; conference shall be held at the Site unless otherwise mutually agreed upon. Notify all parties to attend concrete coordination conference not less than five days prior to scheduled date of conference.
3. Additional structure specific conferences shall be held as required by the ENGINEER.
4. All parties involved in the concrete joint and waterstop Work shall attend concrete coordination conference including, but not limited to, the following:
a. CONTRACTOR.
b. ENGINEER.
c. Concrete special inspector
d. Resident Project Representative (if any).

1.5 DELIVERY, STORAGE AND HANDLING

A. Transportation and Handling of Products:
1. Deliver materials to Site to ensure uninterrupted progress of the Work.
2. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
1. Store concrete joint materials on platforms or in enclosures or covered to prevent contact with ground and exposure to weather and direct sunlight.

Protect waterstop when only partially encased in concrete for over 48 hours. Comply with manufacturer's storage and protection requirements.

2. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 WATERSTOPS

A. Polyvinyl Chloride (PVC):
   1. Material Requirements:
      a. Waterstops shall be extruded from elastomeric PVC compound containing plasticizers, resins, stabilizers, and other materials necessary to meet requirements of the Contract Documents and requirements of CRD-C572. Do not use reclaimed or scrap material.
      b. Tensile strength of finished waterstop: 1,400 psi, minimum.
      c. Ultimate elongation of finished waterstop: 280 percent, minimum.
      d. Minimum thickness shall be 3/8-inch over entire width of waterstop.
      e. Provide waterstops with minimum of seven ribs equally spaced at each end on each side. First rib shall be at the edge. Ribs shall be a minimum of 1/8-inch in height.
      f. Provide waterstops with hog rings or factory-installed grommets anchored to exterior ribs to facilitate tying waterstop in position.
   2. Split waterstops are not allowed.
   3. Construction Joints: Waterstops shall be centerbulb ribbed type, six-inch minimum width, unless otherwise shown or indicated in the Contract Documents. Centerbulb shall have minimum outside diameter of 7/8-inch.
   4. Expansion Joints: Waterstops shall be centerbulb ribbed type, nine-inch minimum width, unless otherwise shown or indicated in the Contract Documents. Centerbulb shall have minimum outside diameter of 7/8-inch.
   5. Product and Manufacturer: Provide one of the following:
      a. W.R. Meadows, Inc.
      b. Durajoint Concrete Accessories.
      c. Sika Greenstreak.
      d. Paul Murphy Plastics Company.
      e. Vinylex Corporation.
      f. Or equal.

B. Hydrophilic Waterstop Materials:
   1. General Material Properties:
      a. Bentonite-free, and expandable by minimum of 80 percent of dry volume in presence of water to form watertight joint seal without damaging concrete in which material is cast. Provide only where shown or indicated in the Contract Documents.
      b. Material shall be composed of resins and polymers that absorb water and cause an increase in volume in completely reversible and repeatable process. Waterstop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.

c. Select materials that are recommended by manufacturer for type of liquid to be contained.

2. Hydrophilic Rubber Waterstop:
   a. Minimum cross sectional dimensions shall be 3/16-inch by 3/4-inch.
   b. Product and Manufacturer: Provide one of the following:
      1) Duroseal Gasket, by BBZ USA, Inc.
      2) Adeka Ultraseal MC-2010M, by Asahi Denka Kogyo K.K.
      3) Hydrotite, by Sika Corporation.
      4) Or equal.
3. Hydrophilic Sealant:
   a. Hydrophilic sealant shall adhere firmly to concrete, metal, and PVC in dry or damp condition. When cured sealant shall be elastic indefinitely.
   b. Product and Manufacturer: Provide one of the following:
      1) Duroseal Paste, by BBZ USA, Inc.
      2) Adeka Ultraseal P-201, by Asahi Denka Kogyo K.K.
      3) Hydrotite, by Sika Corporation.
      4) SikaSwell S, by Sika Corporation.
      5) Or equal.

2.2 PREFORMED EXPANSION/ISOLATION JOINT FILLER

A. Provide preformed expansion joint filler complying with ASTM D1752, Type I (sponge rubber) or Type II (cork).

2.3 CONCRETE CONSTRUCTION JOINT ROUGHENER

A. Provide water-soluble non-flammable, surface-retardant roughener.

B. Product and Manufacturer: Provide one of the following for the types of joints specified:
   1. Rugasol-S, by Sika Corporation for horizontal joints only.
   2. Concrete Surface Retarder-Formula S, by Euclid Chemical Company, for horizontal joints only.
   3. Concrete Surface Retarder-Formula F, by Euclid Chemical Company, for vertical joints only.
   4. TK-6100 Concrete Form Surface Retarder, by TK Products.
   5. Or equal.

2.4 EPOXY BONDING AGENT

A. Provide a two-component epoxy-resin bonding agent.

B. Product and Manufacturer: Provide one of the following:
   1. Sikadur 32 Hi-Mod LPL, by Sika Corporation.
   2. Eucopoxy LPL, by the Euclid Chemical Company.
   3. Resi-Bond J-58, by Dayton Superior.
   4. Or equal.

2.5 EPOXY-CEMENT BONDING AGENT

A. Provide three component epoxy resin-cement blended formulated as bonding agent.

B. Product and Manufacturer: Provide one of the following:
   1. Sika Armatec 110 EpoCem, as manufactured by Sika Corporation.
   2. Duralprep A.C., as manufactured by the Euclid Chemical Company.
   3. Emaco P24, as manufactured by MBT/ChemRex.
   4. Or equal.

2.6 JOINT SEALANT AND ACCESSORIES

A. For joint sealants and accessories used on isolation joints, control joints, and expansion joints, refer to Section 07 92 00, Joint Sealants.

2.7 CONCRETE BOND BREAKERS

A. Provide asphalt-saturated rag felt building paper, not less in weight than commercially known as 15 pound felt building paper, which weighs 15 pounds per 100 square feet.

B. Chemical Bond Breaker:
   1. Provide medium solids resin solution chemical concrete bond breaker complying with ASTM C309, Type I, Class B.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installing Subcontractor, if any, shall examine substrate and conditions under which the Work is to be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 CONSTRUCTION JOINTS

A. Comply with requirements of ACI 301 and the Contract Documents.

B. Locate and install construction joints as shown or indicated on the Drawings. Where not shown or indicated, locate joints to not impair strength of the structure; position joints at points of minimum shear. Location of joints shall be approved by ENGINEER. In addition to joints shown or indicated on the Drawings, locate construction joints as follows:
   1. In foundation mats, locate joints at spacing of approximately 30 feet. Joints shall be located within middle third of element span, unless otherwise shown or indicated on the Drawings. Element span shall be considered distance between piles or, as determined by ENGINEER, distance between bearing

elements, such as columns, exterior walls and interior walls. Place concrete in strip pattern, unless otherwise shown or indicated on the Drawings.

2. In walls, locate joints at a maximum spacing of 30 feet. Locate joints away from wall intersections a minimum of one-quarter of the clear span distance between wall intersections measured horizontally.
3. In structural slabs and beams, joints shall be located within middle third of element span and shall be located in compliance with ACI 301, unless otherwise shown or indicated on the Drawings.
4. In slabs on grade, locate joints at spacing of approximately 40 feet. Place concrete in strip pattern, unless otherwise shown or indicated on the Drawings.

C. Horizontal Joints:
1. Roughen concrete at interface of construction joints to a ¼" minimum amplitude. CONTRACTOR shall submit approach for roughening horizontal joints to ENGINEER for review and approval. Remove accumulated concrete on projecting rebar immediately subsequent to form stripping. Immediately before placing fresh concrete, thoroughly clean existing contact surface using stiff brush or other tools and stream of pressurized water. Surface shall be clean and wet, and free from pools of water at time of placing fresh concrete.
2. Remove laitance, waste mortar, and other substances that may prevent complete adhesion. Where joint roughening was performed more than seven days prior to concrete placing or where dirt or other bond reducing contaminants are on surface, perform additional light abrasive blasting or hydroblasting to remove laitance and all bond-reducing materials just prior to concrete placement.

D. Vertical Joints:
1. Apply roughener to the form in thin, even film by brush, spray, or roller in accordance with manufacturer's instructions. After roughener is dry, concrete may be placed.
2. When concrete has been placed, remove joint surface forms as early as necessary to allow for removal of surface retarded concrete. Forms covering member surfaces shall remain in place as required under Section 03 11 00, Concrete Forming. Wash loosened material off with high-pressure water spray to obtain roughened surface subject to approval by ENGINEER. Alternately, surface shall be roughened by abrasive blasting or hydroblasting to expose aggregate. Outer one-inch of each side of joint face shall be masked and protected from blasting to avoid damaging member surface.

E. Satisfactory Surface:
1. Roughen concrete surface so that amplitude between high and low point on any 2-inch square is at least 1/4 inch.
2. Remove all laitance, waste mortar or other substance, which may prevent complete adhesion.
3. Expose clean coarse aggregate.
4. Do not undercut edges of coarse aggregate particles.
5. After roughening, wash and rinse with potable water.
6. Continue rinsing as long as there is any trace of cloudiness of the rinse water.

7. Where the rinsing occurs more than 2 days prior to placing the next lift or where the work in the area subsequent to the cleaning causes dirt or debris to be deposited on the surface, the surface shall be rinsed again as the last operation prior to placing the next lift.

3.3 EXPANSION JOINTS

A. Comply with requirements of ACI 301 and this Section.

B. Locate and install expansion joints as shown and indicated in the Contract Documents. Install joint filler in accordance with manufacturer's instructions. Install sealants as specified in this Section.

3.4 CONTROL JOINTS

A. Provide control joints in slabs-on-ground as shown or indicated on the Drawings. (Note: Mat foundations are not considered slabs-on-grade.) Where control joints are not shown or indicated on the Drawings, space control joints at 24 to 36 times thickness of slab in both directions. Locate control joints only at places approved by ENGINEER.

B. A groove, with depth of at least 25 percent of the member thickness, shall be tooled, formed, or saw-cut in concrete. Groove shall be filled with joint sealant material in accordance with Section 07 92 00, Joint Sealants.

C. Where control joint is formed by sawcutting, make sawcut in presence of ENGINEER immediately after concrete has set sufficiently to support the saw and be cut without damage to concrete. Keep concrete continually moist during cutting. Joints shall be approximately 1/8-inch wide.

D. Control joints may be formed with tool or by inserting joint forming strip. After concrete has achieved design strength, remove upper portion of joint forming strip and fill void with sealant.

3.5 ISOLATION JOINTS

A. Provide isolation joint where sidewalk or other slab on grade abuts a concrete structure and slab on grade is not shown doweled into that structure. Form isolation joint by 1/2-inch joint filler with upper 1/2-inch of joint filled with sealant.

3.6 WATERSTOPS

A. General:
   1. Comply with ACI 301 and this Section. Make joints in accordance with manufacturer's instructions.
   2. Provide PVC waterstops, except where otherwise shown or indicated on the Drawings.

3. Provide waterstops in all joints where concrete construction is below grade or intended to retain liquid. Install waterstop to the higher of: at least 12 inches above grade, or 12 inches above maximum operationg liquid level in tanks.
4. Waterstops shall be fully continuous for extent of joint and with waterstops in intersecting joints. Maintain waterstop continuity at transitions between waterstops in joints at different levels and orientations.
5. In vertical joints in walls that are free at the top, waterstops shall extend no closer than six inches from top of wall.
6. In placing concrete around horizontal waterstops, with waterstop flat face in horizontal plane, work the concrete under waterstops by hand to avoid forming air and rock pockets.

B. Polyvinyl Chloride Waterstop:
1. Waterstops shall be positively held from displacement during concrete placing. Tie waterstops to reinforcement or other rigid supports at maximum spacing of 18 inches so that waterstop is securely and rigidly supported in proper position during concrete placing. Continuously inspect waterstops during concrete placing to ensure proper positioning.
2. Perform splicing in waterstops by heat sealing adjacent waterstop sections in accordance with manufacturer's printed recommendations. The following is required:
   a. Material shall not be damaged by heat sealing.
   b. Splices shall have tensile strength of not less than 60 percent of unspliced material's tensile strength.
   c. Maintain the continuity of waterstop ribs and of its tubular center axis.
3. Only butt-type joints of ends of two identical waterstop sections shall be made while material is in forms.
4. Prefabricated PVC Waterstop Joint:
   a. Joints with waterstops involving more than two ends to be jointed together, and joints that involve an angle cut, alignment change, or joining of two dissimilar waterstop sections, shall be prefabricated by CONTRACTOR or manufacturer prior to placing in the forms.
   b. Prefabricated joints shall have minimum of 2.0 feet of waterstop material beyond joint in each direction.
   c. Install prefabricated joint assembly in the forms and butt-weld each two-foot end to a straight-run portion of waterstop in place in the forms.
5. Where centerbulb waterstop intersects and is jointed with non-centerbulb waterstop, seal end of centerbulb using additional PVC material as required.
6. Symmetrical halves of waterstops shall be equally divided between concrete placements at joints and centered within joint width, unless shown or indicated otherwise in the Contract Documents. Place centerbulb waterstops in expansion joints so that centerbulb is centered on joint filler material.
7. When waterstop is installed in the forms or embedded in first concrete placement and waterstop remains exposed to atmosphere for more than four days, implement suitable precautions to shade and protect exposed waterstop from direct rays of sun during entire exposure, until exposed portion of waterstop is embedded in concrete.
8. Protect waterstop placed in joints intended for future concrete placement from direct rays of the sun by temporary means until permanent cover is installed,

so that waterstop is not exposed to direct rays of the sun for more than four days total.

C. Hydrophilic Rubber Waterstop and Sealant:
   1. Where a hydrophilic rubber waterstop or sealant is required in accordance with the Contract Documents, or where approved by ENGINEER, install waterstop or sealant in accordance with manufacturer's instructions and recommendations; except, as modified in the Contract Documents.
   2. When requested by ENGINEER, provide manufacturer's technical assistance at the Site.
   3. Locate waterstop or sealant as near as possible to center of joint. Waterstop or sealant shall be continuous around entire joint. Minimum distance from edge of waterstop to face of the member shall be three inches.
   4. Where hydrophilic rubber waterstop is used in combination with PVC waterstop, hydrophilic rubber waterstop shall overlap PVC waterstop for minimum of six inches. Fill contact surface between hydrophilic rubber waterstop and PVC waterstop with hydrophilic sealant.
   5. Where wet curing methods are used, apply hydrophilic rubber waterstop and sealant after curing water is removed and just prior to closing up of the forms for concrete placement. Protect hydrophilic rubber waterstop and sealant from direct rays of sun and from becoming wet prior to concrete placement. If material becomes wet and expands, allow material to dry until material has returned to original cross sectional dimensions before placing concrete.
   6. Install hydrophilic rubber waterstop in bed of hydrophilic sealant, before skinning and curing begins, so that irregularities in concrete surface are completely filled and waterstop is bonded to sealant. After sealant has cured, install concrete nails, with washers of a diameter equal to waterstop width, to secure waterstop to concrete at maximum spacing of 1.5 feet.
   7. Prior to installing hydrophilic sealant, wire brush or sandblast the concrete surface to remove laitance and other materials that may interfere with bonding. Metal and PVC surfaces to receive sealant shall be cleaned of paint and any material that may interfere with bond. When sealant alone is shown or indicated in the Contract Documents, place sealant placed in built-up bead which has a triangular cross section with each side of triangle at least 3/4-inch long, unless otherwise indicated in the Contract Documents. Do not place concrete until sealant has cured as recommended by sealant manufacturer.

3.7 BONDING AGENT

A. Use epoxy bonding agent for bonding of fresh concrete to concrete that has been in place for at least 60 days, and for bonding to existing concrete.

B. Use epoxy-cement bonding agent for the following:
   1. Bonding toppings and concrete fill to concrete that has been in place for at least 60 days, and for bonding to existing concrete.
   2. For locations where bonding agent is required and concrete cannot be placed within open time period of epoxy bonding agent.

C. Use cement-water slurry as bonding agent for toppings and concrete fill to new concrete. Cement water slurry shall be worked into surface with stiff bristle broom and place the concrete before cement-water slurry dries.

D. Handle and store bonding agent in accordance with manufacturer's printed instructions and safety precautions.

E. Mix bonding agent in accordance with manufacturer's instructions.

F. Before placing fresh concrete, thoroughly roughen and clean hardened concrete surfaces and coat with bonding agent not less than 1/16-inch thick. Place fresh concrete while bonding agent is still tacky (within its open time), without removing in-place bonding agent coat, and as directed by manufacturer.

+ + END OF SECTION + +

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete reinforcing.
   2. Extent of concrete reinforcing is shown and indicated in the Contract Documents.
   3. Work includes fabrication and placement of reinforcing including steel bars, ties, supports, and welded wire fabric.

B. Related Sections:
   1. Section 03 15 00, Concrete Accessories.
   2. Section 03 30 00, Cast-in-place Concrete.
   3. Section 04 05 05, Unit Masonry Construction.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 315, Details and Detailing of Concrete Reinforcement.
   2. ACI 318, Building Code Requirements for Structural Concrete.
   3. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
   4. ANSI/AWS D1.4, Structural Welding Code - Reinforcing Steel.
   5. ASTM A82, Specification for Steel Wire, Plain, for Concrete Reinforcement.
   6. ASTM A184, Specification for Fabricated Steel Bar or Rod Mats for Concrete Reinforcement.
   7. ASTM A185, Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
   8. ASTM A615, Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   9. ASTM A704/A704M, Specification for welded Wire Fabric, Deformed, for Concrete Reinforcement.
   10. ASTM A706/A706M, Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   11. ASTM A767/A767M, Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   12. ASTM A775/A775M, Specification for Epoxy-Coated Reinforcing Steel Bars.
   13. ASTM E8, Tension Testing of Metallic Materials.
   14. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.

15. Concrete Reinforcing Steel Institute (CRSI), CRSI 1MSP, Manual of Standard Practice.
16. ICC Evaluation Service (ES) AC 308, Acceptance Criteria for Post-Installed Anchors in Concrete Elements.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory: Shall meet requirements of ASTM E329 and shall have experience in tension testing of reinforcing bars set in adhesive in hardened concrete.
   2. Installer of Adhesive Dowels: Installation shall be performed by personnel certified under an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchors Installer Certification Program, or equivalent. Description of equivalent programs shall be submitted for ENGINEER's approval.

B. Compliance Certifications: The Contractor shall provide certified mill tests of the reinforcing steel in accordance with the standards referenced in these Specifications and sufficient to demonstrate compliance with the requirements set forth herein. Submit certified copies of mill test report of reinforcement materials analysis

1.4 SUBMITTALS

A. Certified Mill Report: Three (3) certified copies of mill tests on each heat of reinforcing steel delivered, showing physical and chemical analysis, shall be furnished to the Engineer by the Contractor. The ladle analysis shall be obtained from the manufacturer and the Contractor shall certify that the steel furnished conforms to the ladle analysis. The ladle analysis shall state the percentages of carbon, phosphorous, manganese, and sulfur present in the steel. The Engineer, at his option, may perform check analysis on the reinforcing steel and all steel not conforming to aforementioned ladle analysis and physical properties may be rejected and shall be replaced at no cost to the Owner.

B. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings for fabricating, bending, and placing concrete reinforcing. Comply with ACI 315, Parts A and B. Indicate bar size, spacing, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices.
      b. For walls, show elevations at minimum scale of 1/4-inch to one foot.
         1) Elevations shall show all openings and reference details that identify additional reinforcing required around each opening.
         2) Elevations shall denote each wall intersection and reference a detail that identifies additional reinforcing required at wall intersection. As an alternate to providing separate details for each wall intersection, provide overall plan detailing only the additional wall intersection reinforcing for each wall intersection.

c. For slabs and mats, show top and bottom reinforcing on separate plan views.
   1) Plans shall show all openings and shall reference details that identify additional reinforcing around each opening.
d. Show bar schedules, stirrup spacing, diagrams of bent bars, location of bar splices, length of lap splices, arrangements, and assemblies, as required for fabricating and placing concrete reinforcing unless otherwise noted.
e. Provide plans and elevations detailing location, spacing, and lengths of masonry wall dowels, where masonry is required. Coordinate location of dowels with masonry openings, masonry details, and with standard modular spacing. Submit masonry wall dowels with reinforcing submittal for element into which masonry dowel will be embedded. Coordinate with Section 04 00 05, Masonry.
f. Splices shall be kept to a minimum. Avoid, when possible, splices in regions of maximum tensile stresses.
g. Drawings detailing location of all construction and expansion joints, as required under Section 03 15 00, Concrete Accessories, shall be submitted and approved before Shop Drawings for reinforcing are submitted.
h. Drawings detailing location, spacing, edge distance, and embedment depth of adhesive dowels. Adhesive system shall be submitted and approved before Shop Drawings with adhesive dowels are submitted.

2. Product Data:
   a. Manufacturer's product data for adhesive, if not submitted under other Sections.
   b. Adhesive manufacturer's test data and ICC ES report to verify specified capacity of adhesive dowels.

C. Informational Submittals: Submit the following:
1. Certificates:

   a. Certification of welders employed on the work, verifying AWS qualification within previous 12 months, and weld procedures for splices.
   b. For each adhesive dowel installer, submit ACI/CRSI Adhesive Anchor Installer Certification.
2. Manufacturer's Instructions:
   a. Installation instructions for adhesive systems.
3. Field Quality Control Submittals:
   a. Reports of all field quality control testing, where applicable.
   b. Results of required tensile testing of adhesive dowels. Include size and location of bars tested.

1.5 DELIVERY, HANDLING, AND STORAGE

A. Deliver concrete reinforcing products to Site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings on approved Shop Drawings.

B. Store concrete reinforcing products to prevent damage and accumulation of dirt and excessive rust. Store on heavy wood blocking so that reinforcing does not come into contact with the ground.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Reinforcement: Shall be deformed in accordance with ASTM A615, and as follows:
   1. All reinforcing bars shall be ASTM A615, Grade 60, unless indicated otherwise.

B. Mechanical Couplers: Where dowel bar substitutes / mechanical couplers are shown or approved by ENGINEER, form saver-type mechanical couplers may be used. Form-saver couplers shall have integral plates designed to positively connect coupler to formwork.

C. Steel Wire: Shall be in accordance with ASTM A82.

D. Welded Smooth Wire Fabric: Shall be in accordance with ASTM A185.
   1. Furnish in flat sheets, not rolls.

E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing in place.
   1. Use wire bar type supports complying with CRSI 1 MSP recommendations, except as specified in this Section. Do not use wood, brick, or other unacceptable materials.
   2. For slabs-on-ground, use precast concrete blocks, four inches square in plan, with embedded tie wire as specified by CRSI 1 MSP. (Note: Mat foundations are not considered slabs-on-ground.) Precast concrete blocks shall have same or higher compressive strength as specified for concrete in which they are located.
   3. For concrete surfaces where legs of supports are in contact with forms, provide supports complying with CRSI 1 MSP as follows:
      a. At formed surfaces in contact with soil, weather, or liquid, or located above liquid, supports shall be CRSI Class 1 for maximum protection. Plastic coating on legs shall extend at least 0.5-inch upward from form surface.
      b. At interior dry surfaces (not located above liquid), supports shall be either Class 1 or Class 2 for moderate protection.

F. Adhesive Dowels:
   1. Products and Manufacturers:
      a. HIT-RE 500-V3 Injection Epoxy Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
      b. SET-3G Adhesive anchoring system, by Simpson Strong-Tie Company, Inc.
      c. Or Equal.
   2. Dowels:
      a. Dowel reinforcing bars shall be deformed in accordance with ASTM A615, Grade 60.
   3. Adhesive:
      a. Adhesive system shall use two-component adhesive mix.
      b. Adhesives shall have a current evaluation report by ICC Evaluation Service for use with steel reinforcing bars in both cracked and uncracked concrete with seismic recognition for SDC A through F as tested and assessed in accordance with ICC-ES AC308, which incorporates the requirements of ACI 355.4.
      c. Adhesives shall have minimum bond strength and minimum design bond strength in accordance with Table 03 20 00-A:

TABLE 03 20 00-A: ADHESIVE BOND STRENGTH [1,2]

Bond Strength (psi)					
Rod Diameter	**Uncracked Concrete**	**Cracked Concrete**	**Dowel Size**	**Uncracked Concrete**	**Cracked Concrete**
1/2-inch	1670	880	#4	1500	1080
5/8-inch	1670	750	#5	1460	1090
3/4-inch	1670	665	#6	1415	1015
7/8inch	1525	610	#7	1370	835
1-inch	1360	595	#8	1330	760
-	-	-	#9	1560	850
1.25-inch	1070	595	#10	1240	475

Table Notes:
1. Bond strengths listed for hammer-drilled, dry hole.
2. Bond strengths listed for maximum short term concrete temperature of 130 degrees F and maximum long term concrete temperature of 110 degrees F.

2.2 FABRICATION

A. General: Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI 1 MSP. In case of fabricating errors, do not re-bend or straighten reinforcing in manner that injures or weakens material.

B. Unacceptable Materials: Reinforcing with one or more of the following defects is not allowed:
   1. Bar lengths, bends, and other dimensions exceeding specified fabrication tolerances.
   2. Bends or kinks not shown on approved Shop Drawings.
   3. Bars that do not meet or exceed their ASTM specification requirements when hand-wire-brushed, with respect to cross section, nominal weight, or average height of deformations.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which concrete reinforcing is to be placed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable recommendations of Laws and Regulations, applicable standards, and CRSI 1 MSP for details and methods of reinforcing placement and supports, and as required below.

B. Clean reinforcing to remove loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Position, support, and secure reinforcing against displacement during formwork construction and concrete placing. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. The use of dropped bars will not be allowed. Reinforcing bars intended as main reinforcing and temperature reinforcing shall remain in their intended plane.
   1. Place reinforcing to obtain minimum concrete coverages specified in ACI 318, ACI 350, and the Contract Documents. Arrange, space, and securely tie bars and bar supports together with 16-gage wire to hold reinforcing accurately in position during concrete placing. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
   2. Prior to placing concrete, using surveyor's level or string line, demonstrate to ENGINEER that specified cover of reinforcing has been attained.
   3. Do not secure reinforcing steel to forms with wire, nails, or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.
   4. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than 1-bar diameter, or enough to exceed the inspection tolerances, the resulting arrangement of bars shall be subject to review and acceptance by ENGINEER.
   5. Conduit placement within slabs/walls shall follow the location and minimum clearance requirements shown on the Contract Drawings.

D. Allowable Placing Tolerances: Comply with ACI 318, Chapter 7 - Details of Reinforcement, and ACI 350, Chapter 7 - Details of Reinforcement, except as specified in this Section:
   1. Concrete surfaces in contact with liquid shall have minimum of two inches of concrete over reinforcing steel.

E. Provide sufficient number of supports of strength required to carry reinforcing. Do not place reinforcing bars more than two inches beyond last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

F. Lap Splices:
   1. Provide standard reinforcing splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown for minimum lap of spliced bars as shown on the Drawings.

G. Install welded wire fabric in lengths as long as practical. Lap adjoining pieces at least one full mesh and lace splices with 16-gage wire. Do not make end laps midway between supporting beams, or directly over beams of continuous structures. Offset end laps in adjacent widths to prevent continuous laps.

H. Adhesive Dowels:
   1. Prior to drilling, locate existing reinforcing steel in vicinity of proposed holes. If reinforcing conflicts with proposed hole location, obtain ENGINEER's approval of alternate hole locations to avoid drilling through or damaging existing reinforcing bars.
   2. Installation conditions shall comply with all requirements of the approved product Evaluation Service Report (ESR), including "Conditions of Use." Comply with manufacturer's written installation instructions and requirements of this Section.
   3. Drill holes to adhesive system manufacturer's recommended drill bit diameter and to specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits complying with tolerances indicated in ANSI B212.15. Core-drilled holes shall not be permitted.
   4. Before setting adhesive dowel, hole shall be made free of dust and debris by method recommended by adhesive system manufacturer. Brush the hole with adhesive system manufacturer-approved brush and blow hole clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
   5. Before injecting adhesive, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.
   6. Prior to injecting adhesive into the drilled hole, dispense to an appropriate location for waste an initial amount of adhesive from the mixing nozzle until adhesive is a uniform color, indicating that product is properly mixed.
   7. Inject adhesive into hole through injection system-mixing nozzle and extension tubes (as required) placed to bottom of hole. Withdraw nozzle's discharge end as adhesive is placed while keeping nozzle immersed to prevent formation of air pockets. Fill hole to depth that ensures that excess material is expelled from hole during dowel placing.
   8. Twist dowel during insertion into partially filled hole to ensure full wetting of rod surface with adhesive. Insert rod slowly to avoid developing air pockets.
   9. Provide adequate curing in accordance with adhesive system manufacturer's requirements prior to continuing with adjoining or adjacent Work that could

impose or impart load on the dowels. Do not begin adjoining or adjacent Work until dowels are successfully tested or when approved by ENGINEER.

10. Limitations:
    a. Installation Temperature: Comply with manufacturer's instructions for installation temperature requirements. Provide temporary protection and other measures, such as heated enclosures, necessary to ensure that base material temperature complies with requirements of adhesive systems manufacturer during installation and adhesive system curing.
    b. Oversized Holes: Advise ENGINEER immediately if size of drilled hole is larger than recommended by adhesive system manufacturer. Cost of corrective measures, including but not limited to redesign of dowels due to decreased capacities, shall be paid by CONTRACTOR.
    c. At time of dowel installation, concrete shall have compressive strength (f'c) of not less than 3,000 psi.
    d. At time of dowel installation, concrete shall have age of not less than 21 days.
    e. Obstructions in drill path: When existing reinforcing steel is encountered during drilling, stop and do not damage existing reinforcing. Obtain ENGINEER's approval for required modifications.

3.3 FIELD QUALITY CONTROL

A. Site Inspections and Tests:
    1. General:
        a. Do not place concrete until reinforcing is inspected, and permission for placing concrete is granted by ENGINEER. Concrete placed in violation of this provision will be rejected.
        b. Do not close up formwork for walls and other vertical members until reinforcing is inspected, and permission for placing concrete is granted by ENGINEER. Concrete placed in violation of this provision will be rejected.
        c. Correct defective Work by removing and replacing or correcting, as required by ENGINEER.
        d. CONTRACTOR shall pay cost of corrections and subsequent testing required to confirm integrity of post-installed anchors.
        e. Testing laboratory shall submit test results to CONTRACTOR and ENGINEER within 24 hours of completion of test.
    2. Site Tests:
        a. OWNER will employ testing laboratory to perform field quality testing of adhesive dowels at the Site.
            1) Testing shall comply with ASTM E488.
            2) Test at least ten percent of each type of adhesive dowel. If one or more dowels fail the test, CONTRACTOR shall pay cost to test all dowels of same diameter and type installed on the same day as the failed dowel.
            3) Test dowels to 60 percent of specified yield strength. ENGINEER will direct which dowels are to be tested.

4) Apply test loads with hydraulic ram.
5) Displacement of dowels shall not exceed D/10, where D is nominal diameter of dowel.

B. Manufacturer's Services:
1. Provide qualified adhesive manufacturer's representative at the Site during initial installation of adhesive dowel systems to train installing personnel in proper selection and installation procedures. Manufacturer's representative shall observe to verify that installer demonstrates proper installation procedures for adhesive dowels and adhesive material. Each installer shall be certified in writing by manufacturer as qualified to install adhesive anchors.

+ + END OF SECTION + +

+ + NO TEXT ON THIS PAGE + +

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install cast-in-place concrete as required in these specifications and the drawings.
   2. Concrete shall be in accordance with requirements of ACI 301 and ACI 350.5 unless otherwise specified.
   3. The Work includes providing concrete consisting of Portland cement, fine and coarse aggregate, water, and approved admixtures; combined, mixed, transported, placed, finished, and cured. The Work also includes:
      a. Providing openings in concrete to accommodate the Work under this and other Sections, and building into the concrete all items such as sleeves, frames, anchorage devices, inserts, and all other items to be embedded in concrete Work.

B. Measurement and Payment:
   1. General: Measurement and payment for cast-in-place concrete will either be by the lump-sum method or by the unit-price method as determined by the listing of the bid item for cast-in-place concrete indicated in the Bid Schedule of the Bid Form.
   2. Unit Price: If the Bid Schedule indicates a unit price for cast-in-place. The unit-price method of measurement and payment will be as follows:
      a. Measurement:
         1) Except as specified otherwise in other Section of these Specifications or the Contract Specifications, each class of concrete and type of placement of cast-in-place concrete will be measured for payment by the cubic yard, and quantity will be computed, based on the neat lines or pay lines section profiles, and dimensions indicated on the Contract Drawings, without deduction for chamfers, reinforcing steel and embedded items, and openings and recesses having an area of less than two square feet.
         2) Additional concrete used to replace overcut or for overbreak, or repair or replace defective work, will be measured separately for payment,
   3. Lump Sum: If the Bid Schedule indicates a lump-sum for cast-in-place concrete, the lump-sum method of measurement and payment will be in used accordance with Price and Payment Procedure.

C. Coordination:

1. Review installation procedures under other Sections and coordinate installation of items to be installed in the concrete Work.

D. Classifications of Concrete:
   1. Class “A1” concrete shall be used for the following:
      a. Strip Footings
      b. Interior slabs on ground in process (wet) areas
   2. Class “A2” concrete shall be used for the following:
      a. Basement and Tank walls less than 16” in thickness
      b. Exposed structural slabs less than 16” in thickness
      c. Exterior equipment pads/foundations less than 16” in thickness
      d. Concrete fill less than 16” in thickness. (Concrete “topping” is not considered concrete “fill”)
   3. Class “AF1” concrete shall be used for the following:
      a. Foundation walls (backfilled both sides) less than 16” in thickness.
      b. Exterior slabs on ground (door pads, door aprons, sidewalks)
   4. Class “AF2” shall be used for the following:
      a. Mat foundations less than 16” in thickness
   5. Class “AF3” shall be used for the following:
      a. Mat foundations greater than 16” in thickness
   6. Class “AF4” shall be used for the following:
      a. Basement and Tank walls greater than 16” in thickness
      b. Exposed structural slabs greater than 16” in thickness
      c. Concrete fill greater than 16” in thickness (Concrete “topping” is not considered concrete “fill”)
      d. Exterior equipment pads/foundations greater than 16” in thickness
   7. Class “AT” shall be used for the following:
      a. Concrete topping
   8. Class “B” concrete shall be placed without forms or with simple forms, with little or no reinforcing, and includes the following, unless otherwise shown or indicated:
      a. Interior slabs on ground in non-process (dry) areas.
      b. Housekeeping pads. (Heavy equipment and pump pads are not considered housekeeping pads).
      c. Duct banks.
      d. Unreinforced encasements.
      e. Thrust blocks.
   9. Class “D” concrete shall be unreinforced and used where required as concrete fill under foundations, filling abandoned piping, and where “lean concrete” or “mudmat” is shown or indicated in the Contract Documents.

E. Related Sections:
   1. Section 03 15 00, Concrete Accessories.
   2. Section 03 20 00, Concrete Reinforcing.
   3. Section 03 60 00, Grouting.
   4. Section 03 32 00, Joint in Concrete.
   5. Section 04 20 11, Concrete Unit Masonry.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AASHTO M 182, Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Materials.
   2. AASHTO T318, Standard Method of test for Water Content of Freshly Mixed Concrete Using the Microwave Oven.
   3. ACI 117, Specifications for Tolerances for Concrete Construction and Materials and Commentary.
   4. ACI 301, Specifications for Structural Concrete.
   5. ACI 305.1, Specification for Hot Weather Concreting.
   6. ACI 306.1, Specification for Cold Weather Concreting.
   7. ACI 318, Building Code Requirements for Structural Concrete and Commentary.
   8. ACI 350/350R, Code Requirements for Environmental Engineering Concrete Structures and Commentary.
   9. ACI 350.5, Specifications for Environmental Concrete Structures.
   10. ASTM C31/C31M, Practice for Making and Curing Concrete Test Specimens in the Field.
   11. ASTM C33, Specification for Concrete Aggregates.
   12. ASTM C39/C39M, Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   13. ASTM C42/C42M, Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   14. ASTM C94/C94M, Specification for Ready-Mixed Concrete.
   15. ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   16. ASTM C138/C138M, Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
   17. ASTM C143/C143M, Test Method for Slump of Hydraulic- Cement Concrete.
   18. ASTM C150, Specification for Portland Cement.
   19. ASTM C157/C157M, Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
   20. ASTM C171, Specification for Sheet Materials for Curing Concrete.
   21. ASTM C172, Practice for Sampling Freshly Mixed Concrete.
   22. ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
   23. ASTM C260, Specification for Air-Entraining Admixtures for Concrete.
   24. ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   25. ASTM C494/C494M, Specification for Chemical Admixtures for Concrete.
   26. ASTM C618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
   27. ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
   28. ASTM C989, Specification for Slag Cement for Use in Concrete and Mortars.

29. ASTM C1017, Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
30. ASTM C1064/C1064M, Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
31. ASTM C1077, Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
32. ASTM C1240, Specification for Silica Fume Used in Cementitious Mixtures.
33. ASTM C1260, Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).
34. ASTM C1293, Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.
35. ASTM C1567, Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.
36. ASTM D1042, Test Method for Linear Dimensional Changes of Plastics Caused by Exposure to Heat and Moisture.
37. ASTM D3574, Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams.
38. ASTM D1709, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
39. ASTM E96/E96M, Test Methods for Water Vapor Transmission of Materials
40. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
41. NRMCA, National Ready Mixed Concrete Association.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Concrete Testing Laboratory:
      a. Employ independent testing laboratory experienced in design and testing of concrete materials and mixes to perform material evaluation tests and to design concrete mixes. Employ different laboratories for design of concrete mixes and field testing.
         1) Testing agency shall be in accordance with ASTM E329 and ASTM C1077.
         2) Testing laboratory shall have been inspected and passed within previous two years by Cement and Concrete Reference Laboratory (CCRL) of NIST for: testing concrete aggregates, and for preparing and testing concrete trial batches with or without admixtures. Testing laboratory shall provide documentation indicating how deficiencies, if any, in most recent CCRL inspection report were corrected.
         3) Selection of testing laboratory is subject to OWNER's acceptance.
         4) Submit written description of proposed concrete testing laboratory giving qualifications of personnel, laboratory facilities, and equipment, and other information requested by ENGINEER.
   2. Batch Plant: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment. Manufacturer certified according to

NRMCA's "Certification of Ready-Mixed Concrete Production Facilities" or approved equivalent program.

3. Mix Designer: Person responsible for developing concrete mixture proportions certified as NRMCA Concrete Technologist Level 2 or DOT certified mix designer in jurisdiction of the Work. Requirement may be waived if individual is Contractor's Licensed Design Engineer.
4. Installer Qualifications: A qualify installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
5. Water Reducing Admixture Manufacturer:
    a. Water-reducing admixtures shall be manufactured under strict quality control in facilities operated under a quality assurance program. Submit copy of manufacturer's quality assurance handbook to document program existence.
    b. Manufacturer shall maintain a concrete testing laboratory approved by CCRL at NIST.
    c. Manufacturer shall be capable of providing services of qualified field service representatives at the Site.

B. Laboratory Trial Batch:
1. Each concrete mix design specified shall be verified by laboratory trial batch, unless indicated otherwise.
2. For classes of concrete that require air-entrainment, test the trial batch at highest percentage of air (plus 1.5 percent) allowed for that class of concrete.
3. Perform the following testing on each trial batch:
    a. Aggregate gradation for fine and coarse aggregates.
    b. Fly ash testing to verify meeting specified properties, unless fly ash Supplier submits certification by an independent testing laboratory.
    c. Slump.
    d. Air content.
    e. Compressive strength based on three cylinders each, tested at seven days and at 28 days.
    f. Shrinkage test in accordance with this Section, for Class "A" and Class "AF" concretes.
4. Submit for each trial batch the following information:
    a. Project identification name and number (if applicable).
    b. Date of test report.
    c. Complete identification of aggregate source of supply.
    d. Tests of aggregates for compliance with the Contract Documents.
    e. Scale weight of each aggregate.
    f. Absorbed water in each aggregate.
    g. Brand, type, and composition of cementitious materials.
    h. Brand, type, and amount of each admixture.
    i. Amounts of water used in trial mixes.
    j. Proportions of each material per cubic yard.
    k. Gross weight and yield per cubic yard of trial mixtures.
    l. Measured slump.
    m. Measured air content.

n. Compressive strength developed at seven days and 28 days, from not less than three test cylinders cast for each seven day and 28-day test, and for each design mix.

o. Shrinkage test results where required and as specified in this Section. Report results and averages for original length and at zero, seven, 14, 21, and 28 days of drying.

C. Shrinkage Test:

1. Perform drying shrinkage tests for trial batch as specified in this Section.
2. Drying shrinkage specimens shall be four-inch by four-inch by 11-inch prisms with effective gage length of ten inches; fabricated, cured, dried, and measured in accordance with ASTM C157 modified as follows: remove specimens from molds at an age of 23 hours, plus-or-minus one hour, after trial batching; shall be placed immediately in water at 70 degrees F plus-or-minus three degrees F for at least 30 minutes; and shall be measured within 30 minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F plus-or-minus three degrees F. Measurement to determine expansion expressed as percentage of original length shall be made at age of seven days. Length at age of seven days shall be base length for drying shrinkage calculations (zero days drying age). Immediately afterward store specimens in humidity-controlled room maintained at 73 degrees F plus-or-minus three degrees F, and 50 percent (plus-or-minus four percent) relative humidity for remainder of test. Obtain measurements to determine shrinkage expressed as percentage of base length and report measurements separately for seven, 14, 21, and 28 days of drying after seven days of moist curing.
3. Determine drying shrinkage deformation of each specimen as the difference between base length (at zero days drying age) and length after drying at each test age. Determine average drying shrinkage deformation of specimens to nearest 0.0001-inch at each test age. If drying shrinkage of a specimen departs from average of that test age by more than 0.0004-inch, results obtained from that specimen shall be disregarded. Report results of shrinkage test to nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from same concrete used for preparing drying shrinkage specimens. Tests shall be considered part of normal compression tests for the Work. Allowable shrinkage limitations shall be as specified in Part 2 of this Section.

D. Component Supply and Compatibility:

1. Provide a certificate of compatibility for all admixture materials.

E. Mock-up Panels:

1. Provide mock-up panels representative of specified finished surfaces at locations on the Site directed by ENGINEER. Form, reinforce, mix, cast, cure, and finish mock-up panels using selected materials and construction methods proposed for the Work. Provide mock-up panels as follows:
   a. Wall section approximately four feet high by minimum of three feet each side of joint, by ten inches thick and set on an 24-inch wide by

twelve-inch thick base, unless otherwise shown or indicated. Form faces to represent each specified formed surface finish. Include not less than two form ties, two form panel intersections, one vertical construction joint with pvc waterstop, and one horizontal construction joint. Construction joints are in Section 03 15 00, Concrete Accessories.

2. Reinforce mock-up panels as required to prevent cracking and to be structurally stable or as shown or indicated; reinforcing steel shall not be less than 0.25 percent of the gross concrete cross section in each direction.
3. Protect mock-up panels from damage and do not remove approved mock-up panels without written ENGINEER's permission. When directed by ENGINEER, demolish mock-up panels, and remove from the Site.

F. Concrete Coordination Conference:
1. Conduct concrete coordination conference to review detailed requirements of CONTRACTOR's proposed concrete design mixes, to discuss procedures for producing proper concrete construction, and to clarify roles of the parties involved. CONTRACTOR shall organize and schedule the conference and prepare and distribute to all parties attending conference minutes of the conference.
2. Conduct concrete coordination conference no later than 14 days after the date the Contract Times commence running. Conference shall be held at mutually agreed upon date and time; conference shall be held at the Site unless otherwise mutually agreed upon. Notify all parties to attend concrete coordination conference not less than five days prior to scheduled date of conference.
3. Additional structure specific concrete construction conferences shall be held as required by the ENGINEER.
4. All parties involved in the concrete Work shall attend concrete coordination conference including, but not limited to, the following:
   a. CONTRACTOR.
   b. Field testing services representative.
   c. Concrete Subcontractor (if any).
   d. Reinforcing steel Subcontractor (if any) and reinforcing steel Supplier and detailer.
   e. Concrete Supplier.
   f. Admixture manufacturer's representative.
   g. ENGINEER.
   h. Concrete special inspector
   i. Resident Project Representative (if any).

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Mix Design:
   a. List of concrete materials and proportions for the proposed concrete mix designs. Include data sheets, test results, certifications, and mill reports (including heat of hydration of cement) to qualify the materials

proposed for use in the mix designs. Do not start laboratory trial batch testing until this submittal is approved by ENGINEER.

b. Laboratory Trial Batch Reports: Submit laboratory test reports for concrete cylinders, materials, and mix design tests.

c. Test results per ASTM C33 confirming meets limit on deleterious material in fine aggregate.

d. Test results per ASTM C1260, ASTM C1293, and ASTM C1567 to determine potential for alkali-silica reactivity.

e. Certificate of compatibility of combined admixtures.

f. Certification of mix designer.

2. Concrete Supply:

a. Ready-mixed Concrete: Submit the following information.

1) NRMCA plant certification.

2) Physical capacity of mixing plant.

3) Trucking facilities available.

4) Estimated average amount of the specified concrete that can be produced and delivered to the Site during a normal, eight-hour day, excluding output to other customers.

3. Product Data:

a. Manufacturers' specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.

4. Samples:

a. Submit Samples of materials as specified and as requested by ENGINEER. Include with each Sample names of product and Supplier, and description.

5. Curing and Protection Plans:

a. Submit detailed plan for curing concrete in water retaining and non-water retaining structures.

b. Submit detailed plan for curing and protection of concrete placed and cured in cold weather.

c. Submit detailed plan for curing and protection of concrete placed and cured in ambient temperatures over 80 degrees F.

B. Informational Submittals: Submit the following:

1. Certifications:

a. Notarized certification of conformance to reference standards used in this Section, when required by ENGINEER.

b. Flatwork finisher certification.

2. Delivery Tickets: Copies of all delivery tickets for each load of concrete delivered to or mixed at the Site submitted prior to unloading. Each delivery ticket shall contain the information in accordance with ASTM C94 requirements of sections 14.2.1 through 14.2.10 along with project identification name and number (if any), date, mix type, mix time, quantity and amount of water initially withheld and introduced on site.

3. Field Quality Control Submittals:

a. Report of testing results for testing of field concrete cylinders for each required time. Submit within 24 hours after completion of associated

test. Test report shall include results of all testing required at time of sampling.

4. Minutes of the Concrete Coordination Conference and other subsequent structure specific concrete construction conferences.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Transportation, Delivery, and Handling:
   1. Materials used for concrete shall be clean and free from foreign matter during transportation and handling and kept separate until measured and placed into concrete mixer.
   2. Implement suitable measures during hauling, piling, and handling to ensure that segregation of coarse and fine aggregate particles does not occur and grading is not affected.

B. Storage:
   1. For storage, provide bins or platforms with hard, clean surfaces.

PART 2 – PRODUCTS

2.1 CEMENTITIOUS MATERIALS

A. Cement:
   1. Portland cement shall be Type II(MH) ASTM C150. Type II or Type I/II may be used in lieu of Type II(MH) when approved by ENGINEER.
   2. Portland cement shall be produced by one manufacturer's facility. Cement from other facilities of the manufacturer shall be tested for similarity of properties. Tested cement with different properties or alternate cement sources of other manufacturers may be used provided that mix design has been approved and acceptable trial batch verifying performance has been made.
   3. Do not use cement that has deteriorated because of improper storage or handling.

B. Fly Ash:
   1. Fly ash, when used, shall conform to the requirements of ASTM C618 Class F, except as follows:
      a. The loss on ignition shall be a maximum of four percent.
      b. The maximum percent of sulfur trioxide (SO3) shall be 4.0.
   2. Fly ash shall be considered to be a cementitious material.
   3. Laboratory trial batches shall be tested to determine compliance with strength requirements, times of setting, slump, slump loss, and shrinkage characteristics.

C. Fly ash shall be provided in all concrete mixes where designated in Table 03 30 00 - CONCRETE DESIGN MIX CRITERIA. When Type I/II Cement is used, in lieu of Type II(MH) Cement, fly ash shall be used such that total tricalcium

aluminate content (C3A) of the resulting cementitious material is not greater than eight percent.

1. When fly ash is indicated to be used, it shall replace 20 percent of cementitious material by weight.

2.2 AGGREGATES

A. General:
   1. Aggregates shall conform to ASTM C33, Class Designation 4S, and as specified in this Section.
   2. Aggregates shall be tested to determine potential for alkali-silica reactivity.

B. Fine Aggregate:
   1. Provide clean, sharp, natural sand free of loam, clay, lumps, and other deleterious substances.
   2. Dune sand, bank run sand, and manufactured sand are unacceptable.

C. Coarse Aggregate:
   1. Provide clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
      a. Crushed stone, processed from natural rock or stone.
      b. Washed gravel, either natural or crushed. Slag, pit gravel, and bank run gravel are unacceptable.
      c. Lightweight Aggregate: Not acceptable for use.

2.3 WATER

A. Water used in producing and curing concrete shall be potable.

2.4 CONCRETE ADMIXTURES

A. Provide admixtures in accordance with product manufacturer's published instructions. Admixtures shall be compatible with each other. Admixtures shall not contain thiocyanates, shall not contain more than 0.05 percent chloride ion, and shall be non-toxic in the concrete mix after 30 days. Do not use admixtures that have not been incorporated and tested in the accepted mixes, unless otherwise approved by ENGINEER.

B. Air Entraining Admixtures: ASTM C260 / C 260M.

C. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

D. Water-Reducing Admixture: ASTM C494/C 494M, Type A or D.

1. Proportion concrete with non-air entraining, water-reducing, aqueous solution of modified organic polymer. Admixture shall not contain lignin, nitrates, or chlorides added during manufacturing.

E. High Range Water-Reducing Admixture (HRWR): ASTM C494/C 494M, Type F or G.
   1. Use high range water-reducing admixture in the concrete classifications so specified or indicated. Use of HRWR admixture is allowed at CONTRACTOR's option in all other classifications of concrete. Specific admixture formulation shall be as recommended by admixture manufacturer for Project conditions.
   2. Products:
      a. Plastol Series by The Euclid Chemical Company.
      b. Glenium Series by MASTER BUILDERS SOLUTIONS.
      c. Or equal.

F. Plasticizing Admixtures: ASTM C1017/C 1017M, Type I or Type II
   1. Use plasticizing admixture as an alternate to high range water-reducing admixture. Specific admixture formulation shall be as recommended by admixture manufacturer for Project conditions.

G. Set Control Admixtures: In accordance with ASTM C494/C 494M. Use the following as required:
   1. Type B, Retarding.
   2. Type C, Accelerating.
   3. Type D, Water reducing and Retarding.
   4. Type E, Water reducing and accelerating.
   5. Type F, Water-reducing, high range admixtures.
   6. Type G, Water-reducing, high range, and retarding admixtures.

H. Shrinkage Reducing Admixture:
   1. Shrinkage reducing admixture may be used in mix design when necessary to conform to specified shrinkage limitations, provided that specified strength requirements are complied with and there is no reduction in sulfate resistance in the concrete and no increase in concrete permeability.
   2. Products:
      a. Conex or Eucon SRA by The Euclid Chemical Company
      b. MasterLife SRA 20 by Master Builders Solutions.
      c. Sika Control 40 by Sika Corporation.
      d. Or equal.

I. Hydration Controlling Admixture
   1. Where extended concrete delivery times are authorized by the ENGINEER, one of the following hydration controlling admixtures shall be used.
      a. SikaTard 440, manufactured by Sika Corporation.
      b. Eucon DS, manufactured by the Euclid Chemical Company.
      c. MasterSet DELVO, manufactured by Master Builders Solutions.
      d. Or equal.

2.5 PROPORTIONING AND DESIGN OF MIXES

A. Prepare concrete design mixes in accordance with Table 03 30 00-A:

TABLE 03 30 00-A
CONCRETE DESIGN MIX CRITERIA

Concrete Class	Coarse Aggregate (1)		Minimum Cementitious Content (5) (lbs/cu yd)	Fly Ash (7) (% by wt)	Max. W/CM (4)	Slump (2)	Air (6) (%)	Min. Comp Strength (3) (psi)
	Size A	Size B						
Class "A1"	No. 57	No. 8	535	20%*	0.42	4" max.	-	4,500
Class "A2"	No. 57	No. 8	535	20%	0.42	4" max.	6 +/- 1.5	4,500
Class "AF1"	No. 57	No. 8	535	20%*	0.42	4" max.	6 +/- 1.5	4,500
Class "AF2"	No. 57	No. 8	535	20%	0.42	4" max.	-	4,500
Class "AF3"	No. 467	No. 8	515	20%	0.42	4" max.	-	4,500
Class "AF4"	No. 467	No. 8	515	20%	0.42	4" max.	5.5 +/- 1.5	4,500
Class "AT"	No. 67	No. 8	535	20%	0.42	4" max.	6 +/- 1.5	4,500
Class "B"	No. 57 or No. 67		517	20%*	0.50	4" max.	-	3,000
Class "D"	Any ASTM C33		← No requirements →					2,000

Notes (applicable to Table 03 00 00-A):

1. Coarse aggregate size numbers refer to ASTM C33. Where Size A and B are designated in Table 03 30 00-A, it is intended that the smaller Size B aggregate is to be added, replacing a portion of the coarse or fine aggregate, in the minimum amount necessary to make a workable and pumpable mix with sand content not exceeding 41 percent of total aggregate.
2. Slumps indicated are prior to addition of high range water reducing admixture or plasticizing admixture. Maximum allowable slump at point of delivery after admixture is added is 8".
3. Mix designs shall be made for all but Class "D", which does not require trial batch, so that the compressive strength achieved for laboratory trial batches will not be less than 125 percent of specified design strength.
4. Quantity of water to be used in the determination of water-cementitious materials (W/CM) ratio shall include free water on aggregates in excess of SSD and water portion of admixtures.
5. Minimum cementitious content shall be adjusted in accordance with the requirements of ACI 350.5 and ACI 301 if smaller maximum coarse aggregate size is used.
6. Required air content listed shall be adjusted in accordance with the requirements of ACI 350.5 and ACI 301 for cycles of freezing and thawing if a different maximum coarse aggregate size is used.
7. Fly ash (Class F) shall be provided in all class mixes as designated in the table above. Use of fly ash is at contractor and floor finisher's option in those mixes where the % is followed by an asterisk (*).

B. Adjustment to Concrete Mixes: Mix design adjustments may be requested by CONTRACTOR when characteristics of materials, Site conditions, weather, test results, or other circumstances warrant; at no additional cost to OWNER and as

approved by ENGINEER. Before using adjusted concrete mixes, laboratory test data and strength results shall be submitted to and approved by ENGINEER.

C. Admixtures:
   1. Use air-entraining admixture in concrete, unless otherwise shown or indicated. Add air-entraining admixture at admixture manufacturer's prescribed rate to produce concrete at point of placement having air content within prescribed limits.
   2. Use water-reducing or high-range water-reducing admixtures in all Classes of concrete, except B and D.
   3. Use amounts of admixtures recommended by admixture manufacturer for climatic conditions prevailing at the Site at time of placing. Adjust quantities and types of admixtures as required to maintain quality.

D. Shrinkage Limitation:
   1. Concrete shrinkage for specimens cast in laboratory from trial batch with total water of 30.2 gallons per cubic yard or less, as measured at 21-day drying age and at 28-day drying age shall not exceed 0.035 percent and 0.040 percent, respectively. For trial batch with total water of 32.7 gallons per cubic yard or greater, respective limits shall not exceed 0.030 percent and 0.036 percent. Limits in between shall be linear interpolated. Use mix design for construction that complies with trial batch shrinkage requirements. Shrinkage limitations apply to Class "A" concretes and Class "AF" concretes.
   2. Trial Batch Does Not Comply with Shrinkage Limitation:
      a. If trial batch results do not comply with shrinkage limitation specified in the Contract Documents, redesign the mix to reduce shrinkage.
      b. After mix has been repeatedly redesigned and ENGINEER is satisfied that all reasonable means to provide concrete mix that complies with shrinkage requirement have been exercised; and mix design still fails to comply with shrinkage limitation in the Contract Documents, ENGINEER reserves the right to accept the higher-shrinkage mix, provided that the quantity of shrinkage reinforcing in structures is increased.
      c. "Reasonable means" will be construed as reducing the total water content to a maximum of 27 gallons per cubic yard, having the large aggregate blended so that eight percent to 18 percent of combined aggregate is retained on each sieve, using an alternate aggregate source, using a shrinkage reducing admixture, and a combination of these means.
      d. Basis for shrinkage reinforcing increase will be proportional to amount that shrinkage value is over the specified shrinkage limitation and will be determined by ENGINEER. The cost of providing additional shrinkage reinforcement will be paid by the Owner.

2.6 BONDING AGENT

A. Provide epoxy and epoxy-cement bonding agents in accordance with Section 03 15 00, Concrete Accessories.

2.7 CONCRETE CURING MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 10 ounces per square yard and complying with AASHTO M 182, Class 3.

B. Curing Mats: Shall be heavy carpets or cotton mats, quilted at four inches on centers, and weighing minimum of 12 ounces per square yard when dry.

C. Moisture-Retaining Cover: Provide one of the following, complying with ASTM C171:
   1. Waterproof paper.
   2. Polyethylene film.
   3. White burlap polyethylene sheet.

D. Liquid Curing Compound: ASTM C309 Type 1-D (water retention requirements):
   1. Provide fugitive dye.
   2. Curing compound shall be applied by roller or power sprayer.

2.8 FINISHING AIDS

A. Evaporation Retardant:
   1. Product and Manufacturer: Provide one of the following:
      a. Confilm, by Master Builders.
      b. Eucobar, by Euclid Chemical Company.
      c. SikaFilm, by Sika Corporation.
      d. Or equal.

2.9 CRACK INJECTION MATERIALS

A. Structural Crack Repair System:
   1. Epoxy for Injection: Low-viscosity, high-modulus moisture insensitive type.
   2. Products and Manufacturers: Provide one of the following:
      a. Sikadur 55 SLV or Sikadur 52 and Sikadur 31, Hi-Mod Gel, by Sika Corporation.
      b. Dural 335 by Euclid Chemical Company.
      c. Or equal.

B. Non-structural Crack Repair System:
   1. Hydrophobic Polyurethane Chemical Grout:
      a. Provide hydrophobic polyurethane that forms a flexible gasket.
      b. Products and Manufacturers: Provide one of the following:
         1) SikaFix HH LV, by Sika Chemical Company.
         2) Hydro Active Flex SLV, by De Neef Construction Chemicals, Inc.
         3) Or equal.
      c. Shrinkage limit shall not exceed 4.0 percent in accordance with ASTM D1042.
      d. Minimum elongation of 250 percent in accordance with ASTM D3574.

e. Minimum tensile strength of 150 psi in accordance with ASTM D3574.

2. Hydrophilic Acrylate-Ester Resin:
   a. Hydrophilic crack repair system shall be acrylate-ester resin that forms a flexible gasket and increase in volume a minimum of 50 percent when in contact with water.
   b. Products and Manufacturers: Provide one of the following:
      1) Gelacryl Superflex AR manufactured by DeNeef Corporation.
      2) AR870 manufactured by Prime Resins, Inc.
      3) Or equal.

2.10 CONCRETE REPAIR MATERIALS

A. Concrete repair mortar shall be pre-packaged, polymer-modified cementitious repair mortar with the following minimum properties:
   1. Compressive Strength at One Day: 2,000 psi (ASTM C109).
   2. Compressive Strength at 28 Days: 6,000 psi (ASTM C109).
   3. Bond Strength at 28 Days: 1,800 psi (ASTM C882 modified).

B. Products and Manufacturers: Provide one of the following:
   1. Five Star Structural Concrete, by Five Star Products, Inc. Use formulation recommended by manufacturer for the specific application conditions.
   2. SikaTop 122 Plus, SikaTop 123 Plus, SikaTop 111 Plus, or Sikacem 133, by Sika Corporation. Use formulation from among those listed in this paragraph recommended by manufacturer for specific application conditions.
   3. Emaco S88-CA or S66-CR, by Master Builders Inc. Use formulation from among those listed in this paragraph recommended by manufacturer for specific application conditions.
   4. Verticoat, Verticoat Supreme, or Euco SR-VO, by Euclid Chemical Company. Use formulation from among those listed in this paragraph recommended by manufacturer for specific application conditions.
   5. Or equal.

C. Cement Mortar: Shall consist of mix of one part cement to 1.5 parts sand with sufficient water to form trowelable consistency. Minimum compressive strength at 28 days shall be 4,000 psi. Where required to match the color of adjacent concrete surfaces, blend white portland cement with standard portland cement so that, when dry, patching mortar matches the color of surrounding concrete.

2.11 LIQUID SEALER/DENSIFIER

A. High performance, deeply penetrating concrete densifier, odorless, colorless, VOC compliant, non-yellowing siliconate based solution designed to harden, dustproof and protect concrete floors. The compound must contain a minimum solids content of 20% of which 50% is siliconate.

B. Product and Manufacturer: Provide one of the following:
   1. Euco Diamond Hard by Euclid Chemical Company.
   2. Sealhard by L & M Chemical Company.

3. Or equal.

2.12 SOURCE QUALITY CONTROL

A. Concrete materials may require testing, as directed by ENGINEER, at any time during the Work if concrete quality is in question. Provide access to material stockpiles and facilities at all times. Tests shall be done at no expense to OWNER.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which the Work will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 CONCRETE MIXING

A. General:
   1. Concrete may be produced at batch plants or by the ready-mixed process. Batch plants shall comply with requirements of ACI 301 and ACI 350.5 and have sufficient capacity to produce concrete of qualities required and in quantities required to comply with the accepted Progress Schedule. All plant facilities are subject to acceptance of ENGINEER.

   2. Mixing:
      a. Mix concrete with a rotating type batch machine, except where hand mixing of very small quantities is approved by ENGINEER.
      b. Remove hardened accumulations of cement and concrete from drum and blades to ensure proper mixing action.
      c. Replace mixer blades upon loss of ten percent of mixer blades' original height.

B. Ready-Mix Concrete:
   1. Comply with ASTM C94 and the Contract Documents.
      a. Plant Equipment and Facilities: Conform to requirements of NRMCA certification.
      b. Truck-Mixed Concrete: Mix concrete in revolving-type truck mixers that are in good condition and produce thoroughly mixed concrete conforming to the Contract Documents. Truck shall operate at agitating speed after mixing is complete or 100 revolutions, whichever occurs first.
      c. Central-Mixed Concrete: Truck shall operate at agitating speed while in transit.
      d. Do not exceed rated capacity of mixer.
      e. Mix concrete for minimum of two minutes after arrival at the Site, or as recommended by mixer manufacturer.

f. Mix at proper speed until concrete is discharged from mixer.
g. Maintain adequate facilities at the Site for continuous delivery of concrete at required rates.
h. Provide access to mixing plant for ENGINEER upon request.

C. Maintain equipment in proper operating condition, with drums cleaned before charging each batch. Schedule rates of delivery to prevent delay of placing concrete after mixing or holding dry-mixed materials too long in mixer before the adding water and admixtures.

3.3 TRANSPORTING CONCRETE

A. Transport and place concrete not more than 90 minutes after water has been added to the dry ingredients, unless a hydration controlling admixture is authorized by the ENGINEER.

B. Avoid spilling and separation of concrete mixture during transportation.

C. Do not place concrete in which the ingredients have separated.

D. Do not retemper partially set concrete.

E. Use suitable equipment for transporting concrete from mixer to forms.

3.4 PREPARATION FOR CONCRETING

A. Submit to ENGINEER laboratory trial batch test results for proposed mixes at least 15 working days prior to start of Work. Do not begin concrete production until associated laboratory trial batch test result submittal has been approved by ENGINEER.

B. Notify independent testing and inspection agency and ENGINEER a minimum of 24 hours in advance of placing concrete to allow for inspection of form work, joints, waterstops, reinforcement, and embedded items. The section to be placed shall be fully prepared for concrete placement at the time of notice. Confirm inspection status with independent testing and inspection agency and ENGINEER a minimum of 4 hours prior to concrete placement. Do not begin placing concrete until Work is in conformance with the Contract Documents.

C. Subgrade surfaces shall be thoroughly wetted by sprinkling, prior to the placing of concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

D. Reinforcing steel and embedded items shall be completely cleaned of mortar, loose rust, form release compounds, dirt, or other substances which would interfere with proper bonding with concrete. Protective coatings on embedded aluminum items

shall continuously cover the surface to be in contact with concrete. Any defects in the coating shall be repaired.

E. Do not place concrete until flow of water entering space to be filled with concrete has been properly stopped or has been diverted by pipes, or other means, and carried out of the forms, clear of the Work. Do not deposit concrete underwater, and do not allow water to rise on concrete surfaces until concrete has attained its initial set. Do not allow water to flow over concrete surface in manner and or velocity that will injure concrete surface finish. Provide temporary pumping or other dewatering operations for removing water as required.

F. Prepare joint surfaces in accordance with Section 03 15 00, Concrete Accessories.

3.5 CONCRETE PLACEMENT

A. General:
   1. Place concrete continuously, so that no concrete will be placed on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. If section cannot be placed continuously, provide construction joints in accordance with Section 03 15 00, Concrete Accessories.
   2. Deposit concrete as nearly as practical in its final location to avoid segregation due to rehandling or flowing. Do not subject concrete to action that may cause segregation.
   3. Screed concrete that is to receive other construction to proper level to avoid excessive skimming or grouting.
   4. Do not use concrete that becomes non-plastic and unworkable, or does not conform to required quality limits, or that has been contaminated by foreign materials. Do not use retempered concrete. Remove rejected concrete from the Site and dispose of it in conformance with Laws and Regulations.
   5. Do not place concrete until forms, bracing, reinforcing, and embedded items are each in final position and secure.
   6. Do not place footings in freezing weather unless adequate precautions are taken against frost action.
   7. Do not place footings on frozen soil.
   8. Unless otherwise instructed, place concrete only when Owner's Representative is present.
   9. Allow minimum of three days (72 Hours) between adjoining concrete placements. At expansion joints, allow minimum of one day between adjoining concrete placements.

B. Concrete Conveying:
   1. Handle concrete from point of delivery at the Site, transfer to concrete conveying equipment, and transfer to locations of final deposit as rapidly as practical by methods that prevent segregation and loss of concrete mix materials.
   2. Provide mechanical equipment for conveying concrete to ensure continuous flow of concrete at delivery end of conveyor. Provide runways for wheeled

concrete conveying equipment from concrete delivery point to locations of final deposit. Keep interior surfaces of conveying equipment, including chutes, free of hardened concrete, debris, water, snow, ice, and other deleterious materials.

3. Do not use chutes for distributing concrete, unless accepted by ENGINEER.
4. Pumping concrete is allowed, however do not use aluminum pipe for conveying concrete.

C. Placing Concrete into Forms:
   1. Deposit concrete in forms in horizontal layers not deeper than 18 inches each and in manner that avoids inclined construction joints. Where placement consists of several layers, place concrete at such rate that concrete being integrated with fresh concrete while still plastic.
   2. Do not allow concrete to free-fall within the form from height exceeding four feet. Where high-range water reducer is used to extend slump to at least six inches, maximum allowable free-fall of concrete is six feet. Use “elephant trunks” to prevent free-fall and excessive splashing of concrete on forms and reinforcing. Discontinue free-falls in excess of four feet if there is evidence of segregation.
   3. Remove temporary spreaders in forms when concrete placing has reached elevation of such spreaders.
   4. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidating concrete in accordance with requirements of ACI 301. Vibration of forms and reinforcement is not allowed.
   5. Where height of concrete placement in walls exceeds 14 feet, provide temporary windows in formwork to facilitate vibration. Properly close temporary windows when height of concrete approaches windows. Determine location, size, and spacing of temporary windows to suit equipment used.
   6. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate the layer of concrete and at least six inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcing and other embedded items without causing segregation of concrete mix.
   7. Do not place concrete in beam and slab forms until concrete previously placed in columns and walls is no longer plastic.
   8. Prevent voids in the concrete. Force concrete under pipes, sleeves, openings, and inserts from one side until visible from the other side.

D. Placing Concrete Slabs, Slabs on Ground, and Mat Foundations:
   1. Deposit and consolidate concrete in continuous operation, within limits of construction joints, until placing of a panel or section is completed.

2. Consolidate concrete during placing operations using mechanical vibrating equipment, so that concrete is thoroughly worked around reinforcing and other embedded items and into corners.
3. Consolidate concrete placed in beams and girders of supported slabs, and against bulkheads of slabs on ground and mat foundations, as specified in this Article for formed concrete structures.
4. Bring concrete surfaces to correct elevation and level. Smooth the surface, leaving surface free of humps or hollows. Do not sprinkle water on surface while concrete is plastic. Do not disturb concrete surfaces prior to commencing concrete finishing.
5. Where concrete is placed in conditions of high temperature or wind that could lead to formation of plastic shrinkage cracks, provide evaporation retardant applied in accordance with retardant manufacturer's recommendations.

E. Quality of Concrete Work:
1. Concrete shall be solid, compact, and smooth, and free of laitance, cracks, and cold joints.
2. Concrete for liquid-retaining structures, and concrete in contact with earth, water, or exposed directly to the elements shall be watertight.
3. Cut out and properly replace, to extent directed by ENGINEER, or repair to satisfaction of ENGINEER, items and irregularities as defined in 3.12. Thin patches or plastering are unacceptable.
4. Leaks through concrete that exhibit flowing water, and cracks, holes, or other irregular concrete in areas of potential leakage, shall be repaired and made watertight.
5. Repair, removal, and replacement of irregular concrete as directed by ENGINEER shall be at no additional cost to OWNER.

F. Cold Weather Placing:
1. Protect concrete Work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures, in compliance with ACI 306.1 and the Contract Documents.
2. When air temperature has fallen to or may be expected to fall below 40 degrees F, provide adequate means to maintain temperature in area where concrete is being placed between 50 degrees F and 70 degrees F for at least seven days after placing. Provide temporary housings or coverings including tarpaulins or plastic film. Maintain temporary heating and protection as necessary so that ambient temperature does not fall more than 30 degrees F in the 24 hours following the seven-day period. Avoid rapid dry-out of concrete due to overheating and avoid thermal shock due to sudden cooling or heating.
3. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing for concrete as required to obtain concrete mixture temperature not less than 55 degrees F and not more than 85 degrees F at point of placement.
4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Before placing concrete, verify that forms, reinforcing, and adjacent concrete surfaces are entirely free of frost, snow, and ice.

5. Use only specified accelerating admixtures approved for use. Do not use salt or other materials containing antifreeze agents.

G. Hot Weather Placing:
   1. When hot weather conditions exist that would impair the quality and strength of concrete, place concrete in compliance with ACI 305.1 and the Contract Documents.
   2. When ambient air temperature is at or above 90 degrees F and rising, cool ingredients before mixing concrete to maintain concrete temperature at time of placement below 80 degrees F. When ambient air temperature is at or above 90 degrees F and falling, cool the ingredients before mixing concrete to maintain concrete temperature at time of placement below 85 degrees F. In no case shall the concrete temperature at time of placement exceed 90 degrees F.
   3. Mixing water may be chilled, or chopped ice may be used to control concrete temperature provided the water equivalent of ice is calculated in total amount of mixing water. If required, reduce the time from addition of mix water to placement, or use set-retarding admixture.
   4. Cover reinforcing materials with water-soaked burlap if ambient air temperature becomes too hot, so that reinforcing material temperature does not exceed ambient air temperature immediately before embedment of reinforcing in concrete.
   5. Wet forms thoroughly before placing concrete.
   6. Do not place concrete at temperature that causes difficulty from loss of slump, flash set, or cold joints.
   7. Use of set-control admixtures shall be as approved by ENGINEER.
   7. Obtain ENGINEER's approval of substitute methods and materials proposed for use.

3.6 FINISHING OF FORMED SURFACES

A. Standard Form Finish:
   1. Standard form finish shall be basically smooth and even but is allowed to have texture imparted by the form material used. Repair defects in accordance with the Contract Documents.

   2. Use standard form finish for the following:
      a. Exterior vertical surfaces from foundation up to one foot below grade.
      b. Vertical surfaces not exposed to view.
      c. Other areas shown or indicated.

B. Smooth Form Finish:
   1. Produce smooth form finish by selecting form materials that will impart smooth, hard, uniform texture. Arrange panels in orderly and symmetrical manner with minimum of seams. Repair and patch irregular areas in accordance with the Contract Documents.

2. Use smooth form finish for the following:
    a. Exterior surfaces exposed to view.
    b. Surfaces to be covered with coating material. Coating material may be applied directly to concrete or may be a covering bonded to concrete such as waterproofing, dampproofing, painting, or other similar system.
    c. Interior vertical surfaces of liquid-containers.
    d. Interior and exterior exposed beams and undersides of slabs.
    e. Surfaces to receive abrasive blasted finish.
    f. Surfaces to receive smooth rubbed or grout cleaned finish.
    g. Other areas shown or indicated.

C. Grout Cleaned Finish:
1. Provide grout cleaned finish to concrete surfaces that have received smooth form finish and where defects have been repaired, as follows:
    a. Combine one part Portland cement to 1.5 parts fine sand by volume and mix with water to consistency of thick paint. Blend standard Portland cement and white Portland cement, in proportions determined by trial patches, so that final color of dry grout will closely match adjacent concrete surfaces.
    b. Thoroughly wet concrete surface and apply grout uniformly by brushing or spraying immediately to wetted surfaces. Scrub surface with cork float or stone to coat surface and fill surface holes. Remove excess grout by scraping, followed by rubbing with clean burlap to remove visible grout film. Keep grout damp during setting period by using fog spray on surface for at least 36 hours after final rubbing. Complete each area the same day the area is started, with limits of each area being natural breaks in the finished surface.
2. Use grout cleaned finish for the following:
    a. Interior exposed walls and other vertical surfaces.
    b. Exterior exposed walls and other vertical surfaces down to one foot below grade.
    c. Interior and exterior horizontal surfaces, except exterior exposed slabs and steps.
    d. Interior exposed vertical surfaces of liquid-containing structures down to one foot below normal operating liquid level.
    e. Other areas shown.

D. Related Unformed Surfaces:
1. At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise shown or indicated.

3.7 SLAB FINISHES

A. Float Finish:

1. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently. Check and level the surface plane to tolerance not exceeding 1/4-inch in ten feet when tested with a ten-foot straightedge placed on surface at not less than two different angles. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to uniform, smooth, granular texture.
2. Use float finish for the following:
    a. Interior exposed horizontal surfaces of liquid-containing structures, except those to receive grout topping.
    b. Exterior below-grade horizontal surfaces.
    c. Surfaces to receive additional finishes, except as shown or indicated.

B. Trowel Finish:
1. After floating, begin first trowel finish operation using power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over the surface.
2. Consolidate concrete surface by the final hand troweling operation. Finish shall be free of trowel marks, uniform in texture and appearance, and with surface plane tolerance not exceeding 1/8-inch in ten feet when tested with a ten-foot straight edge. Grind smooth surface defects that would otherwise project through applied floor covering system.
3. Use trowel finish for the following:
    a. Interior exposed slabs, unless otherwise shown or indicated.

C. Non-Slip Broom Finish:
1. Immediately after float finishing, slightly roughen concrete surface by brooming in direction perpendicular to main traffic route. Use fine fiber-bristle broom, unless otherwise directed by ENGINEER. Coordinate required final finish with ENGINEER before applying finish.
2. Use non-slip broom finish for the following:
    a. Exterior exposed horizontal surfaces subject to lightweight foot traffic.
    b. Interior and exterior concrete steps and ramps.

D. Scratched Finish:
1. After providing float finish, roughen concrete surface with rake before concrete's final set. Amplitude of surface shall be minimum of 1/4-inch.
2. Provide scratched finish for the following:
    a. Horizontal surfaces that will receive grout topping or concrete equipment pad.
    b. Surfaces so indicated on the Drawings or elsewhere in the Contract Documents.

3.8 CONCRETE CURING AND PROTECTION

A. General:
1. Protect freshly placed concrete from premature drying, excessive cold or hot temperatures, and maintain without drying at relatively constant temperature

for period necessary for hydration of cement and proper hardening of concrete.

2. Start curing after placing and finishing concrete, as soon as free moisture has disappeared from concrete surface. Keep surface continuously moist during entire curing period. Cure for a minimum of 10 days and in accordance with requirements of ACI 301 and ACI 308.1. For concrete sections over 30-inches thick, the curing period shall be for a minimum of 14 days. Avoid rapid drying at end of final curing period.
3. For curing, use water that is free of impurities that could etch or discolor exposed concrete surfaces.
4. Confine water for curing to area being cured.

B. Curing Methods: Curing methods are specified below. Curing methods to be used on each type of concrete surface are specified elsewhere in this Article.
   1. Water Curing. Cure by one of the following methods:
      a. Keep concrete surface continuously wet.
      b. Ponding or immersion.
      c. Continuous water-fog spray.
      d. Covering concrete surface with curing mats, thoroughly saturating mats with water, and keeping mats continuously wet with sprinklers or porous hoses. Place curing mats to cover concrete surfaces and edges with four-inch horizontal lap over adjacent mats; provide eight-inch lap over adjacent mats at vertical surfaces. If necessary, weigh down curing cover to maintain contact with concrete surface.
   2. Form Curing. Cure by one of the following methods:
      a. Forms shall be maintained and loosened during curing period.
      b. Immediately after forms are loosened or removed, continue with the required curing method as applicable, for remainder of curing period.
      c. Where wood forms are kept in place, apply water to keep forms wet.
   3. Moisture Retaining Cover Curing. Cure as follows:
      a. Cover concrete surfaces with the required moisture retaining cover for curing concrete, placed in widest practical width with sides and ends lapped at least three inches and sealed using waterproof tape or adhesive. Immediately repair holes or tears during curing period using cover material and waterproof tape.
   4. Liquid Compound Curing. Cure as follows:
      a. Unless otherwise approved by ENGINEER, provide water curing or form curing. Request to use liquid curing compound will be considered by ENGINEER on case-by-case basis. Construction joints formed surfaces prior to receiving specified form finish, and concrete to receive surface treatment where surface treatment will be bonded to concrete surface (such as, but not limited to grout fill, hardener, coatings, water repellent, painting, chemical resistant coatings, or other applications) shall be water-cured or form-cured.
      b. In liquid-retaining structures, provide water curing or form curing, unless other curing method is approved by ENGINEER. Requests to use liquid curing compound will be considered by ENGINEER on case-by-case basis. Request shall provide valid construction reason or safety

reason for using liquid compound curing including reason why other curing methods are not viable.

c. Apply curing compounds immediately after final finishing or after terminating water curing. Apply curing compound in continuous operation by power spray equipment in accordance with curing compound manufacturer's directions. If areas are subjected to rainfall within three hours after completing curing compound application, area shall be recoated. Maintain coating continuity and repair areas damaged during curing period.

d. When liquid curing compound is used, apply first coat of liquid curing compound at compound manufacturer's recommended coverage rate, and subsequently apply second coat at identical rate, thus providing twice the curing compound manufacturer's recommended coverage.

e. At end of curing period, remove liquid curing compound where required.

C. Formed Surfaces: Use the following curing methods:

1. Walls That Will Retain Liquid or That are Under Ground Surface:
   a. If forms are wood, form curing is allowed for entire curing period. If forms are steel, form curing is allowed for maximum of three days after which forms shall be removed so that concrete is free of the forms for remainder of the curing process.
   b. Immediately after the forms are loosened or removed, continue with water curing for remainder of curing period.
   c. When wall surface will not receive surface treatment and when approved by ENGINEER, use of liquid curing compound is allowed. Before using liquid compound curing, use water curing or form curing for at least the first three days of curing.
2. Formed Slab Underside and Beam Surfaces Where Forms Will Retain Liquid:
   a. Form curing is allowed for the full curing period.
   b. Immediately after forms are loosened or removed, continue with water curing for remainder of curing period.
   c. When slab surface will not receive surface treatment and when allowed by ENGINEER, use of liquid curing compound is allowed.
3. Vertical Joint Surfaces and Surfaces to Receive Surface Treatment:
   a. Form curing is allowed for entire curing period.
   b. Immediately after forms are loosened or removed, continue with water curing for remainder of curing period.
4. Cure other formed surfaces using an appropriate curing method specified in the Contract Documents.

D. Unformed Surfaces: Treat with one of the following curing methods:

1. Slabs and Mats That Will Retain Liquid or are Below Ground Surface:
   a. Water curing.
   b. Moisture-retaining cover curing when allowed by ENGINEER.
   c. When slab or mat surface will not receive surface treatment and when allowed by ENGINEER, use of liquid curing compound is allowed.

Before using liquid compound curing, use water curing or form curing for at least the first three days of curing.

2. Construction Joint Surfaces and Slab and Mat Surfaces to Receive Surface Treatment.
   a. Water curing.
   b. Moisture-retaining cover curing.
3. Cure other formed surfaces using an appropriate curing method specified in the Contract Documents.

E. Temperature of Concrete During Curing:
1. When ambient temperature is 40 degrees F or less, continuously maintain concrete temperature between 50 degrees F and 70 degrees F throughout curing period. When necessary, before concrete placing provide for temporary heating, covering, insulation, or housing as required to continuously maintain specified temperatures and moisture conditions throughout concrete curing period. Provide cold weather protection in accordance with requirements of ACI 306.1.
2. When the ambient temperature is 80 degrees F and above, or during other climatic conditions that would cause too-rapid drying of concrete, before starting concrete placing, provide wind breaks and shading as required, and fog spraying, wet sprinkling, or moisture retaining coverings as required. Continuously protect concrete throughout concrete curing period. Provide hot weather protection in accordance with requirements of ACI 305.1, unless otherwise specified.
3. Maintain concrete temperature as uniformly as possible and protect from rapid ambient temperature changes. Avoid concrete temperature changes that exceed five degrees F in one hour and 50 degrees F in 24-hour period.

F. Protection:
1. During curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and damage by rain and flowing water. Protect finished concrete surfaces from damage by subsequent construction operations.

3.9 CONCRETE INSTALLATION TOLERANCES

A. Installation Tolerances:
1. Concrete placement tolerances, unless otherwise specified in the Contract Documents, shall be in accordance with ACI 117. Tolerances for concrete cover shall be as required by Section 03 20 00, Concrete Reinforcing.
2. Notify ENGINEER in writing when concrete placement does not conform with required tolerances, as soon as the condition is known to CONTRACTOR.
3. When concrete installation does not conform to required tolerances, do not repair, or correct by grinding unless specified in the Contract Documents or approved by ENGINEER in writing.
4. Verification Measurements:

a. If surfaces where tolerances are in question, obtain measurements to verify conformance with tolerances in manner acceptable to ENGINEER.
b. If surfaces tolerances are in question, cost of obtaining measurements shall be at no additional cost to the OWNER.
c. Before obtaining measurements, obtain ENGINEER's acceptance of method proposed for obtaining measurements.
d. After obtaining measurements, submit measurements to ENGINEER.

5. Submit with verification measurements submittal proposed method to rectify out-of-tolerance concrete. Do not start repair Work without obtaining ENGINEER's approval.

3.10 FIELD QUALITY CONTROL

A. Field Testing Services:
1. OWNER will employ a special inspector and qualified testing and inspection agency to perform field quality control testing for concrete. ENGINEER will direct the testing requirements.

2. Testing laboratory will make standard compression test cylinders and entrained air tests as specified in this Article, under observation of ENGINEER or Resident Project Representative.
3. Testing laboratory will provide all labor, material, and equipment required for sampling and testing concrete, including scale, glass tray, cones, rods, molds, air tester, thermometer, and other incidentals required.
4. CONTRACTOR shall provide all curing and necessary cylinder storage as specified in Section 01 45 28, On-Site Facilities for Testing Laboratory.

B. Quality Control Testing During Construction:
1. Perform sampling and testing for field quality control during placement of concrete, as follows:
a. Sampling Fresh Concrete: ASTM C172.
b. Slump: ASTM C143/C 143M; one test for each concrete load at point of discharge.
c. Concrete Temperature: ASTM C1064/C 1064M; one for every two concrete loads at point of discharge, and when a change in the concrete is observed. Test each load when time from batching to placement exceeds 75 minutes.
d. Air Content: ASTM C231/C 231M, pressure method for normal weight concrete; ASTM C173/C 173M, volumetric method for light weight concrete; one for every two concrete loads at point of discharge, and when a change in the concrete is observed.
e. Unit Weight: ASTM C138; one for every two concrete loads at point of discharge, and when a change in the concrete is observed.
f. Compression Test Specimens:
1) In accordance with ASTM C31/C 31M; make one set of compression cylinders for each 50 cubic yards of concrete, or fraction thereof, of each mix design placed each day. Each set shall

be four standard cylinders, unless otherwise directed by ENGINEER.

2) Cast, store, and cure specimens in accordance with ASTM C31/C 31M.
3) Test and record the following when cylinders are cast: slump, concrete temperature, air content, w/c ratio, and unit weight.

g. Compressive Strength Tests:
1) In accordance with ASTM C39/C 39M; one specimen tested at seven days, and three specimens tested at 28 days. Test fifth cylinder if needed to verify test results.
2) Adjust mix design if test results are unsatisfactory and resubmit for approval.
3) Concrete that does not comply with strength requirements will be considered as defective Work.

h. Water/Cementitious Materials Ratio: Perform one test from each sample from which compression test specimens are taken, in accordance with AASHTO T318P23.

i. Within 24 hours of completion of test, testing laboratory will submit certified copy of test results to CONTRACTOR, concrete producer and ENGINEER.

C. Evaluation of Field Quality Control Tests:
1. Do not use concrete delivered to final point of placement having slump, concrete temperature, total air content or unit weight outside specified values.
2. Water/Cementitious Materials Ratio:
a. When water content testing indicates water/cementitious materials ratio to exceed specified requirements by greater than 0.02, remaining batches required to complete concrete placement shall have water content decreased in the mix and water reducing admixture dosage increased as required to bring subsequently-batched concrete within specified water/cementitious materials ratio.
b. Perform additional testing to verify compliance with specified water/cementitious materials ratio.
c. Do not resume concrete production for further concrete placement until CONTRACTOR has identified cause of excess water in the mix and revised batching procedures, or adjusted the mix design (and obtained ENGINEER's associated approval) to bring water/cementitious materials ratio into conformance with the Contract Documents.
3. Compressive Strength:
a. Compressive strength tests for laboratory-cured cylinders will be acceptable if the averages of all sets of three consecutive compressive strength tests results equal or exceed specified 28-day design compressive strength of the associated type or class of concrete, and no individual strength test falls below required compressive strength by more than 500 psi.
b. Questionable Field Conditions During Concrete Placement:

1) Where questionable field conditions exist during concrete placement or immediately thereafter, strength tests of specimens cured under field conditions will be required by ENGINEER to check adequacy of curing and protecting of concrete placed. Specimens shall be molded at the same time and from the same samples as laboratory-cured specimens.
2) Provide improved means and procedures for protecting concrete when 28-day compressive strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders.
3) When laboratory-cured cylinder strengths are appreciably higher than minimum required compressive strength, field-cured cylinder strengths need not exceed minimum required compressive strength by greater than 500 psi even though the 85 percent criterion may not be met.
4) If individual tests of laboratory-cured specimens produce strengths more than 500 psi below the required minimum compressive strength, or if tests of field-cured cylinders indicate deficiencies in protection and curing, provide additional measures to ensure that load-bearing capacity of the structure is not jeopardized or impaired. If likelihood of low-strength concrete is confirmed and evaluations indicate load-bearing capacity may have been reduced, perform tests of cores from the concrete in question at CONTRACTOR's expense.

c. If compressive strength tests fail to indicate compliance with minimum requirements of the Contract Documents, concrete represented by such tests will be considered defective.

D. Concrete Tolerance Verification Measurements: Refer to Article 3.9 of this Section.

E. Supplier's Services:
1. Water-Reducing Admixture Manufacturer: Furnish services of qualified concrete technician employed by admixture manufacturer to assist in proportioning concrete for optimum use of admixture. Concrete technician shall advise on proper addition of admixture to concrete and on adjustment of concrete mix proportions to meet changing conditions at the Site.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Temporary Openings:
1. Openings in concrete walls and slabs required for passage of Work are allowed only upon approval of ENGINEER.
2. Temporary openings made in concrete shall be provided with waterstop in below-ground or liquid-retaining members and structures. Reinforcement going through and around the opening shall be made continuous to provide continuity and shall be approved by the ENGINEER.
3. Temporary openings that remain in concrete structures shall be filled with the same class of concrete as the adjoining construction, after the Work causing need for temporary opening is complete, unless otherwise shown or directed

by ENGINEER. Mix, place, and cure concrete as specified in this Section to blend with in-place construction. Provide miscellaneous concrete filling shown or required to complete the Work.

B. Bases or Pads for Piping, Panels, and Equipment:
   1. Unless specifically shown or indicated otherwise, provide concrete bases or pads for equipment, floor-mounted panels, and floor-mounted supports for piping and similar construction. Provide all concrete pad and base Work not specifically included under other Sections.
   2. Dimensions and Elevations:
      a. Coordinate and construct bases and pads to dimensions shown or indicated, or as required to comply with equipment, panel, or piping manufacturer's requirements and elevations indicated on the Drawing.
      b. Unless otherwise shown or indicated, place concrete bases for equipment up to one-inch below the equipment manufacturer's base or mounting plate.
      c. Where specific dimensions or elevations are not shown or indicated, bases and pads shall be six inches thick and extend three inches outside dimensions of the equipment, panel, or supports.
   3. Finish: Bases and pads outside of areas to receive non-shrink grout shall have smooth trowel finish. Surfaces of bases and pads to receive non-shrink grout shall have broom finish.

C. Curbs:
   1. Provide monolithic finish to interior curbs by stripping forms while concrete is still green followed by steel-troweling surfaces to hard, dense finish with corners, intersections, and terminations slightly rounded.
   2. Exterior curbs shall have rubbed finish for vertical surfaces and broomed finish for top surfaces.

3.12 REPAIR OF CONCRETE PLACED UNDER THIS CONTRACT

A. Repair of Formed Surfaces:
   1. Repair the following items and irregularities in all formed finishes:
      a. Spalls, air bubbles, rock pockets, form depressions, and other irregularities that are more than 1/4-inch in depth.
      b. Holes from tie rods and other form tie systems.
      c. Fins, offsets, and other projections that extend more than 1/4-inch beyond designated concrete member surface.
      d. Structural cracks, as defined by ENGINEER.
      e. Non-structural cracks greater than 0.010-inch wide as defined by ENGINEER. In liquid-retaining structures, elevated slabs subject to the elements or washdowns, below-grade members, and cracks that evidence leakage. Where it is not possible to verify whether a crack is leaking, repair the crack.
   2. Repair the following items and irregularities in smooth-finish surfaces, in addition to those listed above in this Section:

a. Spalls, air bubbles, rock pockets, form depressions, and other irregularities that extend to more than 1/2-inch in width in any direction, no matter how deep.
b. Spalls, air bubbles, rock pockets, form depressions, and other irregularities of any size that exceed three in number in a 12-inch by 12-inch area, or 12 in number in a three-foot by three-foot area.
c. Fins, offsets, and other projections shall be completely removed and smoothed.
d. Scratches and gouges in concrete surface.
e. Texture and color irregularities. In liquid-retaining surfaces, texture and color irregularities need not be repaired when greater than 12 inches below minimum normal operating liquid surface elevation, except where such areas are indicative of reduced durability.

3. Where smooth rubbed or grout cleaned finish is specified, minor surface irregularities repairable by the finishing process need not be repaired prior to finish application, when approved by ENGINEER.

B. Method of Repair of Formed Surfaces:
1. Immediately after removing forms, repair and patch areas exhibiting surface irregularities with cement mortar or concrete repair mortar as directed by ENGINEER. Make repairs to liquid-retaining structures and below-grade surfaces with repair mortar only. Patch form tie holes in liquid-retaining or below-grade surfaces with non-shrink grout in accordance with Section 03 60 00, Grouting.
2. Honeycombs, Rock Pockets, and Holes Left by Tie Rods and Bolts:
a. Cut out honeycomb, rock pockets, voids, and holes left by tie rods and bolts, down to solid concrete but, in no case, to depth less than one-inch for cement mortar and ½-inch for repair mortar. Make edges of cuts perpendicular to concrete surface.
b. Before placing cement mortar, thoroughly clean and brush-coat area to be patched with specified bonding agent.
c. When using concrete repair mortar, use of bonding agent is optional; prepare the surface and place mortar in accordance with mortar manufacturer's recommendations.
d. Repairs at exposed-to-view surfaces shall match the color of surrounding concrete, except color matching is not required for interior surfaces of liquid-retaining surfaces up to one foot below typical minimum liquid level. Impart texture to repaired surfaces to match texture of existing adjacent surfaces. Provide test areas at inconspicuous locations to verify mixture, texture, and color match before proceeding with patching.
e. Compact mortar in place and strike off slightly higher than the surrounding surface.
3. Structural Cracks: Pressure-grout structural cracks using injectable epoxy installed using pressurized system. Apply in accordance with epoxy manufacturer's directions and recommendations.

4. Non-structural Cracks: Shall be pressure-grouted using injection material specified in paragraph 2.10.B. Install in accordance with manufacturer's directions and recommendations.
5. Determination of the crack type shall be made solely by the ENGINEER.
6. Holes Through Concrete:
    a. Using plunger-type gun or other suitable device, fill holes extending through concrete from least-exposed face, using flush stop held at exposed face; completely fill the hole with specified repair material.
    b. At below-grade and liquid-containing members, fill holes with concrete repair mortar and use color-matched cement mortar for outer two inches at exposed-to-view surfaces.
7. Where power washing or scrubbing is not adequate, abrasive blast exposed- to-view surfaces that require removal of stains, grout accumulations, sealing compounds, and other substances marring the surfaces. Use sand finer than No. 30 and air pressure from 15 to 25 psi.

C. Repair of Unformed Surfaces:
1. Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to specified tolerances for each surface and finish. Correct low and high areas in accordance with this Section.
2. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using template having the required slope. Correct high and low areas in accordance with this Section.
3. Repair finish of unformed surfaces containing irregularities that adversely affect concrete durability. Surface irregularities include crazing, cracks in excess of 0.01-inch wide, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
4. Repair structural cracks in all structures and non-structural cracks in liquid-retaining structures. In liquid-retaining structures, where dry face of concrete member can be observed, repair all cracks evidencing any rate of water flow through crack. Where dry face of member cannot be observed, repair all cracks.

D. Methods of Repair of Unformed Surfaces:
1. Correct high areas in unformed surfaces by grinding, after concrete has cured sufficiently so that repairs can be made without damage to adjacent areas.
2. Correct low areas in unformed surfaces, during or immediately after completion of surface finishing, by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Where repairs are required and concrete has already set, sawcut around perimeter of area to be repaired to depth of 1/2-inch and remove concrete so that minimum thickness of repair is 1/2-inch. Apply specified concrete repair mortar in accordance with repair mortar manufacturer's directions and recommendations.
3. Repair irregular areas, except random cracks and single holes not exceeding one-inch diameter, by cutting out and replacing with fresh concrete. Remove irregular areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least 3/4-inch clearance all around. Minimum

thickness of repair shall be 1.5 inches. Dampen concrete surfaces in contact with patching concrete and brush with specified bonding agent. Place patching concrete while bonding agent is tacky. Mix patching concrete of same materials and proportions to provide concrete of same classification as original, adjacent concrete. Place, compact, and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

4. Repair isolated, random, non-structural cracks (in members that are not below grade or liquid-retaining), and single holes not greater than one-inch diameter, by dry-pack method. Groove top of cracks, and cut out holes to sound concrete, and clean repair area of dust, dirt, and loose particles. Dampen all cleaned concrete surfaces and brush with the specified bonding agent. Place dry-pack before cement grout takes its initial set. Mix dry-pack, consisting of one-part Portland cement to 2.5 parts fine aggregate passing No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for at least 72 hours.
5. Structural cracks shall be pressure-grouted using injectable epoxy. Apply in accordance with epoxy manufacturer's directions and recommendations.
6. Non-structural cracks in below-grade and liquid-retaining structures shall be pressure-grouted using injection material specified in paragraph 2.10.B. Apply in accordance with resin manufacturer's directions and recommendations.
7. Determination of crack type will be solely by ENGINEER.

E. Other Methods of Repair:
   1. Repair methods not specified in this Section may be used when approved by ENGINEER.

+ + END OF SECTION + +

+ + NO TEXT ON THIS PAGE + +

SECTION 03 60 00

GROUTING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install grout and perform grouting Work.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before grouting Work.

C. Related Sections:
   1. Section 03 15 00, Concrete Accessories.
   2. Section 03 30 00, Cast-In-Place Concrete.

D. Application and Grout Material:
   1. The following is a listing of grouting applications and the corresponding type of grout material to be provided for the associated application. Unless shown or indicated otherwise in the Contract Documents, provide grout in accordance with the following:

TABLE 03 60 00-A, GROUT APPLICATIONS AND MATERIAL TYPES

Application	Required Grout Material Type
Beam and column base plates bearing less than 16 inches in the least dimension	Class II Non-Shrink
Base plates for storage tanks and other non-motorized equipment, and motorized equipment or machinery less than 50 horsepower	Class I Non-Shrink (unless otherwise recommended by equipment manufacturer)
Motorized equipment or machinery equal to and greater than 50 horsepower, and motorized equipment or machinery equipment less than 50 horsepower subject to severe shock loads or high vibration	Class III Non-Shrink Epoxy (unless otherwise recommended by equipment manufacturer)
Filling blockout spaces for embedded items such as guide frames for hydraulic gates, and similar applications	Class II Non-Shrink (Class I where placement time exceeds 15 minutes)
Grout fill or grout toppings less than four inches thick	Grout Fill

Application	Required Grout Material Type
Grout fill greater than four inches thick	Class "B" Concrete in accordance with Section 03 30 00, Cast-In-Place Concrete
Applications not listed above, where grout is indicated on the Drawings	Class I Non-Shrink, unless shown or indicated otherwise

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 211.1, Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
   2. ACI 301, Structural Concrete for Buildings.
   3. ASTM C33/C33M, Specification for Concrete Aggregates.
   4. ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   5. ASTM C230/C230M, Specification for Flow Table for Use in Tests of Hydraulic Cement.
   6. ASTM C531, Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   7. ASTM C579, Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   8. ASTM C827, Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
   9. ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
   10. ASTM C939, Text Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
   11. ASTM C1107/C1107M, Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
   12. ASTM C1181, Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Grout Testing Agency:
      a. Independent testing agency employed for design and testing of grout materials and mixes shall comply with testing agency requirements in Section 03 30 00, Cast-in-Place Concrete, and other applicable requirements in the Contract Documents.
   2. Manufacturer: Shall have a minimum of five years of experience providing products substantially similar to that required and shall be able to submit documentation of at least five satisfactory installations that have been in successful operation for at least five years each.
   3. Manufacturer's Field Service Technician: When required, provide services of manufacturer's full-time employee, factory-trained in handling, use, and

installing the products required, with at least five years of experience in field applications of the products required.

B. Trial Batch:
   1. Each grout fill and construction joint grout mix proportion and design shall be verified by testing agency trial batch or field experience methods. Comply with ACI 211.1 and submit to ENGINEER a report with the following data:
      a. Complete identification of aggregate source of supply.
      b. Tests of aggregates for compliance with specified requirements.
      c. Scale weight of each aggregate.
      d. Absorbed water in each aggregate.
      e. Brand, type, and composition of cement.
      f. Brand, type, and amount of each admixture.
      g. Amounts of water used in trial mixes.
      h. Proportions of each material per cubic yard.
      i. Unit weight and yield per cubic yard of trial mixtures.
      j. Measured slump.
      k. Measured air content.
      l. Compressive strength developed at seven days and 28 days, from not less than three test specimens cast for each seven-day and 28-day test, and for each design mix.
   2. Testing agency Trial Batches: When testing agency trial batches are used to select grout proportions, prepare test specimens, and conduct strength tests as specified in ACI 301.
   3. Field Experience Method: When field experience methods are used to select grout proportions, establish proportions as specified in ACI 301.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Schedule of Project-specific grout applications, installation locations, and the grout type proposed for each.
      b. List of grout materials and proportions for the proposed mix designs. Include data sheets, test results, certifications, and mill report to qualify the materials proposed for use in the mix designs. Do not start testing agency trial batch testing until submittal is approved by ENGINEER.
      c. Trial Batch Reports: Submit testing agency test reports for grout materials and mix design tests.
   2. Product Data:
      a. Data sheets, certifications, and manufacturer's specifications for all materials proposed for use.

B. Informational Submittals: Submit the following:
   1. Manufacturer’s Instructions:
      a. Special instructions for shipping, storing, protecting, and handling.
      b. Installation instructions for the materials.
   2. Supplier Reports:

a. Submit written report of results of each visit to Site by Supplier's field service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.

3. Qualifications Statements:
   a. Testing agency, when not submitted under other Sections.
   b. Manufacturer, when submittal of qualifications is required by ENGINEER.
   c. Manufacturer's field service technician, when submittal of qualifications is required by ENGINEER.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Storage of Materials: Store grout materials in a dry location, protected from weather and protected from moisture.

PART 2 – PRODUCTS

2.1 NON-SHRINK GROUT MATERIALS

A. General: Non-shrink grout shall be a prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or container in which the materials are packaged. Specific formulation for each type or class of non-shrink grout specified in this Section shall be that recommended by the grout manufacturer for the particular application.

B. Class I Non-Shrink Grout:
   1. Class I non-shrink grouts shall have a minimum 28-day compressive strength of 7,000 psi. Use grout for precision grouting and where water-tightness and non-shrink reliability in both plastic and hardened states is critical, in accordance with Table 03 60 00-A in this Section.
   2. Products and Manufacturer: Provide one of the following:
      a. MasterFlow 928, by Master Builders Solutions.
      b. Five Star Grout, by Five Star Products, Inc.
      c. Hi-Flow Grout, by Euclid Chemical Company.
      d. Or equal.
   3. Comply with ASTM C1107/C1107M, Grade C and B (as modified below) when tested using amount of water required to achieve the following properties:
      a. Fluid consistency (20 to 30 seconds) shall be in accordance with ASTM C939.
      b. At temperatures of 45, 73.4, and 95 °F.
   4. Length change from placing to time of final set shall not have shrinkage greater than the expansion measured at three or fourteen days. Expansion at three or fourteen days shall not exceed the 28-day expansion.

5. Non-shrink property shall not be based on chemically-generated gas or gypsum expansion.
6. Fluid grout shall pass through the flow cone, with continuous flow, one hour after mixing.

C. Class II Non-Shrink Grout:
1. Class II non-shrink grouts shall have minimum 28-day compressive strength of 7,000 psi. Use grout for general-purpose grouting applications in accordance with Table 03 60 00-A in this Section.
2. Products and Manufacturer: Provide one of the following:
   a. MasterFlow 100, by Master Builders Solutions.
   b. EZ-Cure Contractor's Grout, by Five Star Products, Inc.
   c. NS Grout, by Euclid Chemical Company.
   d. Or equal.
3. Comply with ASTM C1107/C1107M and the following when tested using the quantity of water required to achieve the following properties:
   a. Flowable consistency (140 percent flow in accordance with ASTM C230/C230M, five drops in 30 seconds).
   b. Fluid working time of at least 15 minutes.
   c. Flowable for at least 30 minutes.
4. When tested, grout shall not bleed at maximum allowed water.
5. Non-shrink property shall not be based on chemically-generated gas or gypsum expansion.

D. Class III Non-Shrink Epoxy Grout:
1. Epoxy grout shall be a pourable, non-shrink, 100-percent solids system.
2. Products and Manufacturer: Provide one of the following:
   a. E3 Flowable, by Euclid Chemical Company.
   b. Sikadur 42 Grout Pak, by Sika Corporation.
   c. HP Epoxy Grout, by Five Star Products, Inc.
   d. Or equal.
3. Epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all pre-measured and prepackaged. Resin component shall not contain non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are unacceptable. Variation of component ratios is not allowed without specific recommendation by manufacturer. Manufacturer's instructions shall be printed on each container in which products are packaged.
4. The following properties shall be attained with the minimum quantity of aggregate allowed by epoxy grout manufacturer.
   a. Vertical volume change at all times before hardening shall be between zero percent shrinkage and 4.0 percent expansion when measured in accordance with ASTM C827 (modified for epoxy grouts by using an indicator ball with specific gravity between 0.9 and 1.1).
   b. Length change after hardening shall be less than 0.0006-inch per inch and coefficient of thermal expansion shall be less than 0.00003-inch per inch per °F when tested in accordance with ASTM C531.

c. Compressive creep at one year shall be less than 0.001-inch per inch when tested under a 400-psi constant load at 140 °F in accordance with ASTM C1181.
d. Minimum seven-day compressive strength shall be 14,000 psi when tested in accordance with ASTM C579
e. Grout shall be capable of maintaining at least a flowable consistency for minimum of 30 minutes at 70 °F.
f. Shear bond strength to Portland cement concrete shall be greater than shear strength of concrete when tested in accordance with ASTM C882/C882M.
g. Minimum effective bearing area shall be 95%.

2.2 GROUT MATERIALS OTHER THAN NON-SHRINK GROUT

A. General: Materials for grouts (other than non-shrink grouts) shall be in accordance with Section 03 30 00, Cast-In-Place Concrete, except as otherwise specified in this Section.

B. Grout Fill:
1. Grout fill shall be comprised of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed in accordance with this Section.
a. Minimum Compressive Strength: 4,000 psi at 28 days.
b. Maximum Water-Cement Ratio: 0.45 by weight.
c. Coarse Aggregate: ASTM C33/C33M, No. 8 size.
d. Fine Aggregate: ASTM C33/C33M, approximately 60 percent by weight of total aggregate.
e. Air Content: Seven percent (plus or minus one percent).
f. Minimum Cement Content: 564 pounds per cubic yard.
g. Slump for grout fill shall be adjusted to match placing and finishing conditions and shall not exceed four inches.

2.3 CURING MATERIALS

A. Curing materials shall comply with Section 03 30 00, Cast-in-Place Concrete, and shall be as recommended by the manufacturer of prepackaged grouts.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrate and conditions under which grouting will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:

1. Place grout as shown and indicated, and in accordance with Laws and Regulations and grout manufacturer's instructions. If manufacturer's instructions conflict with the Contract Documents, obtain clarification or interpretation from ENGINEER before proceeding.
2. Consistency of non-shrink grouts shall be as required to completely fill the space to be grouted for the particular application. Do not install grout for dry-packing without approval of ENGINEER. When dry-packing is approved by ENGINEER, dry-pack consistency shall be such that grout has sufficient water to ensure hydration and grout strength development, and remains plastic, moldable, and that does not flow.
3. Grouting shall comply with temperature and weather limitations in Section 03 30 00, Cast-In-Place Concrete.
4. Cure grout in accordance with grout manufacturer's instructions for prepackaged grout and Section 03 30 00, Cast-In-Place Concrete, for grout fill.

B. Columns and Beams:
1. After shimming columns and beams to proper elevation, securely tighten anchors. Properly form around base plates allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of base plate and top of concrete base to assure that void is completely filled with non-shrink grout.

C. Equipment Bases:
1. Install equipment in accordance to manufacturer's recommendations, Laws, and Regulations, and the Contract Documents. After shimming equipment to proper elevation, securely tighten anchors. Properly form around base plates, allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of equipment base and top of concrete base to ensure that voids are completely filled with non-shrink grout.

D. Grout Fill:
1. All mechanical, electrical, and finish work shall be completed prior to placing grout fill. Base slab shall be provided with a scratched finish in accordance with Section 03 30 00, Cast-In-Place Concrete. Roughen existing slabs by abrasive blasting or hydroblasting exposing aggregates to ensure bonding to base slab.
2. Minimum thickness of grout fill shall be one-inch. Where finished surface of grout fill is to form an intersecting angle of less than 45 °F with concrete surface against which grout will be placed, form a key in the concrete surface at the intersection point. Key shall be minimum of 3.5 inches wide by 1.5 inches deep.
3. Thoroughly clean and wet base slab prior to placing grout fill. Do not place grout fill until slab is completely free of standing water. A thin coat of neat Type II cement slurry shall be broomed into surface of slab. Place grout fill while slurry is wet. Grout fill shall be compacted by rolling or tamping, brought to elevation, and floated. In tanks and basins where scraping-type equipment will be installed, grout fill shall be screeded by blades attached to

revolving mechanism of equipment in accordance with procedures recommended by equipment manufacturer after grout is brought to elevation.

4. Grout fill placed on sloping slabs shall be installed uniformly from bottom of slab to top, for full width of placement.
5. Test grout fill surface with a straight edge to detect high and low spots; immediately correct high and low spots in grout fill. When grout fill has hardened sufficiently, grout fill shall be steel troweled to provide a smooth surface free of bug holes and other imperfections. While an acceptable type of mechanical trowel may be used in this operation, the last pass over the grout fill surface shall be by hand-troweling. During finishing, do not apply the following to the grout fill surface: water, dry cement, or mixture of dry cement and sand.
6. Cure and protect grout fill in accordance with Section 03 30 00, Cast-In-Place Concrete.
7. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for pre-packaged mortars shall be done according to the instructions and recommendation of the manufacturer and this SPECIFICATION. In the event that a conflict occurs between this SPECIFICATION and manufacturer's instructions, the manufacturer's instructions shall prevail in all cases.

3.3 FIELD QUALITY CONTROL

A. Field Testing Services:
   1. OWNER will employ testing agency to perform field quality control testing for grout. ENGINEER will direct the testing requirements.
   2. CONTRACTOR shall provide all curing and necessary cube storage as specified in Section 01 45 29, Testing Agency Services Furnished by Owner.

B. Quality Control Testing During Construction:
   1. Grout Fill: Perform sampling and testing for field quality control during grout fill placing as follows:
      a. Sampling Fresh Grout Fill: ASTM C172.
      b. Slump: ASTM C143; one test for each load of grout at point of discharge.
      c. Air Content: ASTM C231; one sample for every two grout loads at point of discharge, and when a change in the grout is observed.
      d. Compression Test Specimens:
         1) In accordance with ASTM C109/C109M; make one set of compression cubes for each 50 cubic yards of grout, or fraction thereof, of each mix design placed each day. Each set shall be four standard cubes, unless otherwise directed by ENGINEER.
   2. Non-shrink Grout: Perform sampling and testing for field quality control during non-shrink grout placing as follows:
      a. Perform compression testing of non-shrink grout in accordance to ASTM C109/C109M at intervals during construction as selected by ENGINEER. Make a set of four specimens for testing compressive strength at a period of time selected by the ENGINEER.

b. Perform compression tests on epoxy grout and fabricate specimens for epoxy grout testing in accordance with ASTM C579, Method B, at intervals during construction as selected by the ENGINEER. Make a set of four specimens for testing compressive strength at a period of time selected by ENGINEER.

C. Evaluation of Field Quality Control Tests:
   1. Do not use grout, delivered to final point of placement, having slump or total air content that does not comply with the Contract Documents.
   2. Compressive strength tests for testing agency-cured cubes will be acceptable if averages of all sets of three consecutive compressive strength test results equal or exceed the required 28-day design compressive strength of the associated type of grout.
   3. If the compressive strength tests do not comply with the requirements in the Contract Documents, the grout represented by such tests will be considered defective and shall be removed and replaced, or subject to other action required by ENGINEER, at CONTRACTOR's expense.

D. Manufacturer's Services:
   1. Manufacturers of proprietary materials shall make available upon 72 hours notification the services of qualified, full-time employee, experienced in serving as a field service technician for the products required, to aid in assuring proper use of products under the actual conditions at the Site.

+ + END OF SECTION + +

+ + NO TEXT ON THIS PAGE + +

SECTION 05 05 33

ANCHOR SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all professional services, labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install anchor systems.
   2. This Section includes all anchor systems required for the Work, but not specified under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before anchor systems Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 318, Building Code Requirements for Structural Concrete.
   2. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
   3. ACI 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
   4. ANSI B212.15, Cutting Tools - Carbide-tipped Masonry Drills and Blanks for Carbide-tipped Masonry Drills.
   5. ANSI/MSS SP-58, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation.
   6. ASTM A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
   7. ASTM A276, Specification for Stainless Steel Bars and Shapes.
   8. ASTM A493, Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging.
   9. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
   10. ASTM A1011/A1011M, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
   11. ASTM B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
   12. ASTM C307, Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
   13. ASTM C881/C881M, Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
   14. ASTM D695, Test Method for Compressive Properties of Rigid Plastics.
   15. ASTM D790, Test Methods for Flexural Properties of Unreinforced and

Reinforced Plastics and Electrical Insulating Materials.

16. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
17. ASTM E488, Test Methods for Strength of Anchors in Concrete and Masonry Elements.
18. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
19. ASTM F594, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
20. ASTM F1554, Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
21. FS A-A-1922A, Shield, Expansion (Caulking Anchors, Single Lead).
22. FS A-A-1923A, Concrete Expansion Anchors.
23. FS A-A-1925A, Shield, Expansion (Nail Anchors).
24. FS A-A-55614, Shield, Expansion (non-drilling expansion anchors).
25. ICC-ES AC01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
26. ICC-ES AC58, Acceptance Criteria for Adhesive Anchors in Masonry Elements.
27. ICC-ES AC60, Acceptance Criteria for Anchors in Unreinforced Masonry Elements.
28. ICC-ES AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
29. ICC-ES AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
30. ISO 3506-1, Mechanical Properties of Corrosion-Resistant Stainless-Steel Fasteners -- Part 1: Bolts, Screws and Studs.
31. NSF/ANSI 61, Drinking Water System Components – Health Effects.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory: Shall comply with ASTM E329 and shall be experienced in tension testing of post-installed anchoring systems.
   2. Professional Engineer:
      a. CONTRACTOR or delegated system manufacturer shall retain a registered professional engineer legally qualified to practice in the state of Connecticut.
      b. Responsibilities include:
         1) Reviewing anchor system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising preparation of design calculations and related Shop Drawings.
         4) Signing and sealing all design calculations and Shop Drawings.
         5) Certifying that:

a) Design of anchor systems has been performed in accordance with performance and design criteria stated in the Contract Documents, and
b) Design conforms to all applicable local, state, and federal Laws and Regulations, and to prevailing standards of practice.

3. Post-installed Anchor Installer:
   a. Mechanical and Adhesive anchors, except as noted in 1.3.A.3.b: Installer shall be experienced and trained by post-installed anchor system manufacturer in proper installation of manufacturer's products. Product installation training by distributors or manufacturer's representatives is unacceptable unless the person furnishing the training is qualified as a trainer by the anchor manufacturer.
   b. Adhesive Anchors: Installation of horizontal or upwardly inclined adhesive anchors shall be performed by personnel certified under an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchors Installer Certification Program, or equivalent. Description of equivalent programs shall be submitted for ENGINEER's approval and acceptance by the building official having jurisdiction.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of all anchor systems products intended for use in the Work including product type, intended location in the Project, and embedded lengths.
   2. Product Data:
      a. Manufacturer's specifications, load tables, dimension diagrams, acceptable base material conditions, acceptable drilling methods, and acceptable bored hole conditions.
      b. Copies of valid ICC ES reports that presents load-carrying capacities and installation requirements for anchor systems.

B. Delegated Design Submittals:
   1. Design Data: Submit the following:
      a. Design Calculations for delegated anchor systems. Structural calculations shall include all specified performance criteria. The magnitude of delegated system/anchorage reactions to supporting structure shall be clearly noted. Design calculations shall be signed, sealed and dated by CONTRACTOR's professional engineer.

C. Informational Submittals: Submit the following:
   1. Certificates:
      a. For each type of anchor rod or threaded rod, submit copies of laboratory test reports and other data required to demonstrate compliance with the Contract Documents.
      b. Post-installed anchor system manufacturer's certification that installer received training in the proper installation of manufacturer's products required for the Work.
      c. For each required adhesive anchor installer, submit ACI/CRSI Adhesive Anchor Installer Certification.
   2. Manufacturer's Instructions:
      a. Installation instructions for each anchor system product proposed for use, including bore hole cleaning procedures and adhesive injection, cure and gel time tables, and temperature ranges (storage, installation and in-service).

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:
   1. Keep materials dry during delivery and storage.
   2. Store adhesive materials within manufacturer's recommended storage temperature range.
   3. Protect anchor systems from damage at the Site. Protect products from corrosion and deterioration.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. General:
   1. At locations where conditions dictate that Work specified in other Sections is to be of corrosion resistant materials, provide associated anchor systems of stainless-steel materials, unless other corrosion-resistant anchor system material is specified. Provide anchor systems of stainless-steel materials where stainless steel materials are required in the Contract Documents.
   2. Stainless Steel Nuts:
      a. For anchor rods and adhesive anchors, provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts for stainless steel anchors used for anchoring equipment, gates, and weirs, and other locations, if any, where the attachment will require future removal for operation or maintenance. Provide lock washer or double nuts on each anchorage device provided for equipment, as required by equipment manufacturer.
      b. For other locations, provide for each anchorage device a nut as specified or as required by anchor manufacturer. When ASTM A194/A194M, Grade 8S (Nitronic 60) nuts are not required for anchor rods and adhesive anchors as specified in this Section, provide anti-

seizing compound where stainless steel rods are used with stainless steel nuts of the same type.

B. Design Criteria
   1. Size, Length, and Load-carrying Capacity: Comply with the Contract Documents. When size, length or load-carrying capacity of anchor system is not otherwise shown or indicated, provide the following:
      a. Anchor Rods: Provide size, length, and capacity required to carry design load based on values and requirements of Paragraph 3.2.A of this Section. For conditions outside limits of critical edge distance and spacing in Paragraph 3.2.A of this Section, minimum anchor rod embedment as shown or indicated in Paragraph 3.2.A of this Section apply and capacity shall be based on requirements of Laws and Regulations, including applicable building codes.
      b. Adhesive Anchors or Expansion Anchors: Provide size, length, type, and capacity required to carry design load. Anchor capacity shall be based on the procedures required by the building code in effect at the Site. Where Evaluation Service Reports issued by the ICC Evaluation Service are required in this Section, anchor capacities shall be based on design procedure required in the applicable ICC Evaluation Service Report.
         1) General: Determine capacity considering reductions due to installation and inspection procedures, embedment length, strength of base fastening materials, spacing, and edge distance, as indicated in the manufacturer's design guidelines. For capacity determination, concrete shall be assumed to be in the cracked condition, unless calculations demonstrate that the anchor system will be installed in an area that is not expected to crack under any and all conditions of design loading.
         2) Concrete Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum embedment depth of the greater of the following: required to develop tensile strength of anchor, or a minimum embedment of 10 anchor diameters; and minimum anchor spacing and edge distance of 12 anchor diameters.
         3) Concrete Masonry Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance as indicated in anchor manufacturer's instructions.
         4) Concrete Expansion Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum embedment depth of six anchor diameters, and minimum anchor spacing and edge distance of seven anchor diameters.
         5) Concrete Masonry Expansion Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance as indicated in anchor manufacturer's instructions.
   2. Delegated Design: When anchor systems are used for supporting materials,

equipment, or systems delegated to CONTRACTOR, Subcontractor, or Supplier, provide anchor system suitable for loads indicated in delegated design documents and consistent with the design intent expressed in the Contract Documents. Anchor system shall be designed by a professional engineer, retained by CONTRACTOR, Subcontractor, or Supplier, registered in the same state as the Site, with proper consideration of concrete strength, spacing and edge distance

a. Design Loads. Comply with the Contract Documents. When design load of supported material, equipment, or system is not otherwise shown or indicated, provide the following:
    1) Equipment Anchors: Use design load recommended by equipment manufacturer. When equipment can be filled with fluid, use loads that incorporate equipment load and load imposed by fluid.
    2) Pipe Hangers and Supports: Use full weight of pipe, and fluid contained in pipe that are tributary to the support plus the full weight of valves and accessories located between the hanger or support being anchored and the next hanger or support.
    3) Hangers and Supports for Electrical Systems, and HVAC, Plumbing, and Fire Suppression Systems and Piping: Use the full weight of supported system that is tributary to the support plus the full weight of accessories located between the hanger or support being anchored and the next hanger or support. When piping or equipment is to be filled with fluid, anchor systems shall be sized to support such loads in addition to the weight of the equipment, piping, or system, as applicable.

C. Application:
1. Anchor Rods:
    a. Where anchor rods is shown or indicated, use cast-in-place headed anchor rods unless another anchor type is approved by ENGINEER.
    b. Provide headed anchor rods as shown or indicated, or as required to secure structural element to appropriate anchor surface.
2. Concrete Adhesive Anchors:
    a. Use where adhesive anchors are shown or indicated for installation in concrete.
    b. Suitable for use where subject to vibration.
    c. Suitable for use in exterior locations or locations subject to freezing.
    d. Suitable for use in submerged, intermittently submerged, or buried locations.
    e. Do not use in overhead applications, unless otherwise shown or approved by ENGINEER.
    f. Do not use for pipe hangers, unless otherwise shown or approved by ENGINEER.
3. Concrete Masonry Adhesive Anchors:
    a. Use where adhesive anchors are shown or indicated for installation in grout-filled or hollow masonry units.
    b. Suitable for use where subject to vibration.
    c. Suitable for use in exterior locations or locations subject to freezing.

d. Do not use for pipe hangers, unless otherwise shown or approved by ENGINEER.

4. Concrete Wedge Expansion Anchors:
   a. Use where expansion anchors are shown or indicated for installation in concrete.
   b. Do not use where subject to vibration.
   c. Do not use in exterior locations or locations subject to freezing.
   d. Do not use in submerged, intermittently submerged, or buried locations.
   e. Suitable for use in overhead applications.
5. Grout-filled Concrete Masonry Wedge Expansion Anchors:
   a. Use where expansion anchors are shown or indicated for installation on the interior face of grout-filled unit masonry.
   b. Do not use where subject to vibration.
   c. Do not use in exterior locations or locations subject to freezing.
6. Hollow Concrete Masonry Sleeve Expansion Anchors:
   a. Use where expansion anchors are shown or indicated for installation in hollow concrete unit masonry or solid brick.
   b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
   c. Do not use where subject to vibration.
   d. Do not use in exterior locations or locations subject to freezing.
7. Drop-in Expansion Anchors:
   a. Use drop-in expansion anchors installed in concrete where light-duty anchors are required to support piping or conduit two-inch diameter or smaller.
   b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
   c. Do not use where subject to vibration.
   d. Do not use at submerged, intermittently submerged, or buried locations.
   e. Do not use in exterior locations or locations subject to freezing.
   f. Suitable for use in overhead applications.
8. Drive-In Expansion Anchors:
   a. Use drive-in expansion anchors installed in concrete, precast concrete, grouted masonry units, or brick, where light-duty anchors are required to support piping or conduit one-inch diameter and smaller.
   b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
   c. Do not use in overhead applications.
9. For Use in Precast Concrete Planks:
   a. To support piping or conduit two-inch diameter and smaller, use low-profile drop-in anchors, hollow concrete masonry adhesive anchors, or through-bolts.

b. For piping greater than two-inch diameter, or to support safety-related systems, use through-bolts. Each through-bolt shall consist of threaded rod, nuts, washers, and bearing plate.

2.2 MATERIALS

A. Anchor Rods:
   1. Interior Dry Non-corrosive Locations: Provide straight threaded carbon steel rods complying with ASTM F1554, Grade 36, with heavy hex nuts complying with ASTM A563 Grade B, unless otherwise shown or indicated on the Drawings. Hooked anchor rods are unacceptable.
   2. Exterior, Buried, Submerged Locations, or When Exposed to Wastewater: Provide stainless steel straight threaded rods complying with ASTM F593, AISI Type 316, Condition A, with ASTM F594, AISI Type 316, stainless steel nuts. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required. Other AISI types may be used when approved by ENGINEER. Hooked rods are unacceptable.
   3. Equipment: Provide anchor rods complying with material requirements of this Section and equipment manufacturer's requirements relative to size, embedment length, and anchor rod projection. Anchor rods shall be straight threaded rods with washers and nuts as specified in this Section. Hooked rods are unacceptable.
   4. Anchoring of Structural Elements: Provide anchor rods of size, material, and strength shown or indicated in the Contract Documents.

B. Concrete Adhesive Anchors:
   1. General:
      a. Adhesive anchors shall consist of threaded rods anchored into hardened concrete using an adhesive system.
   2. Products and Manufacturers: Provide one of the following:
      a. HIT-RE 500-V3 Injection Epoxy Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
      b. HIT-HY 200-A and HIT-HY 200-R Adhesive Anchoring System, by Hilti Fastening Systems, Inc
      c. SET-XP Adhesive anchoring system, by Simpson Strong-Tie Company, Inc.
      d. Or equal.
   3. Adhesive:
      a. Adhesive system shall use two-component adhesive mix.
      b. Adhesives shall have a current evaluation report by ICC Evaluation Service for use in both cracked and uncracked concrete with seismic recognition for SDC A through F as tested and assessed in accordance with ICC-ES AC308, which incorporates the requirements of ACI 355.4-11
      c. Adhesives shall have minimum bond strength and minimum design bond strength in accordance with Table 05 05 33-A:

TABLE 05 05 33-A:
ADHESIVE BOND STRENGTH [1,2]

Bond Strength (psi)					
Rod Diameter	**Uncracked Concrete**	**Cracked Concrete**	**Dowel Size**	**Uncracked Concrete**	**Cracked Concrete**
1/2-inch	1670	880	#4	1500	1080
5/8-inch	1670	750	#5	1460	1090
3/4-inch	1670	665	#6	1415	1015
7/8inch	1525	610	#7	1370	835
1-inch	1360	595	#8	1330	760
-	-	-	#9	1560	850
1.25-inch	1070	595	#10	1240	475

Table Notes:
1. Bond strengths listed for hammer-drilled, dry hole.
2. Bond strengths listed for maximum short term concrete temperature of 130 degrees F and maximum long term concrete temperature of 110 degrees F.

4. Anchor:
   a. Provide continuously-threaded, AISI Type 316 stainless steel adhesive anchor rod. Threaded rods shall comply with the concrete adhesive anchor manufacturer's specifications as included in the ICC Service Evaluation Report for the anchor submitted. Nuts shall have specified proof load stresses equal to or greater than the minimum tensile strength of the stainless steel threaded rod used. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required.

C. Concrete Masonry Adhesive Anchors:
   1. General:
      a. Grout-filled concrete masonry adhesive anchors shall consist of threaded rods anchored into grout-filled concrete block masonry using an adhesive system.
      b. Hollow concrete masonry adhesive anchors shall consist of threaded rods with a cylindrical mesh steel or plastic screen tube anchored into hollow concrete block masonry using an adhesive system.
   2. Products and Manufacturers: Provide one of the following:
      a. HIT-HY 270 Hybrid Adhesive Anchor System, by Hilti Fastening Systems, Inc.
      b. Acrylic-Tie Adhesive, by Simpson Strong-Tie Company, Inc.
      c. Or equal.
   3. Adhesive:
      a. Adhesive system shall use two-component adhesive mix.
      b. Adhesives shall have current ICC Evaluation Service Report for use in grout-filled concrete masonry, tested and assessed in accordance with ICC-ES AC 58 and ICC-ES AC 60.

4. Anchor:
    a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM F594, AISI Type 316 stainless steel nuts. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required.
5. Mesh Screen Tube (for hollow masonry applications):
    a. Provide with mesh size, length, and diameter as specified by adhesive anchor manufacturer.

D. Concrete Wedge Expansion Anchors:
1. General:
    a. Concrete wedge expansion anchors shall consist of stud, wedge, nut, and washer.
2. Products and Manufacturers: Provide one of the following:
    a. Kwik Bolt TZ Wedge Anchor, by Hilti Fastening Systems, Inc.
    b. Strong Bolt 2 Wedge Anchor, by Simpson Strong-Tie Company, Inc.
    c. Or equal.
3. Anchors shall comply with physical requirements of FS A-A-1923A, Type 4. Provide concrete wedge expansion anchors suitable for use in cracked and uncracked concrete in accordance with ACI 318 Chapter 17 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete wedge anchors in accordance with ACI 355.2 prequalification tests.
4. Interior Dry Non-corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
5. Other Locations: Provide expansion anchors complete with nuts and washers, AISI Type 304 stainless steel anchor body, in accordance with ASTM A276 or ASTM A493.
6. Concrete wedge expansion anchors shall have a current ICC Evaluation Service Report for use in both cracked and uncracked concrete with seismic recognition in seismic design Categories A through F when tested and assessed in accordance with ICC-ES AC193.

E. Grout-filled Masonry Wedge Expansion Anchors:
1. General:
    a. Grout-filled masonry wedge expansion anchors shall each consist of stud, wedge, nut, and washer.
2. Product and Manufacturers: Provide one of the following:
    a. Kwik-Bolt 3 Expansion Anchors, by Hilti Fastening Systems, Inc.
    b. Wedge-All Wedge Anchors, by Simpson Strong-Tie Company, Inc.
    c. Or equal.
3. Anchors shall comply with physical requirements of FS A-A-1923A.
4. Anchors shall be non-bottom bearing type with single-piece steel expansion clip providing 360-degree contact with base material and shall not require oversized holes for installation.
5. Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
6. Grout-filled masonry wedge expansion anchors shall have a current ICC

Evaluation Service report for use in fully-grouted concrete masonry construction when tested and assessed in accordance with ICC-ES AC01.

F. Hollow Concrete Masonry Sleeve Expansion Anchors:
   1. General:
      a. Sleeve expansion anchors shall each consist of an externally threaded stud with full length expanding sleeve.
   2. Products and Manufacturers: Provide one of the following:
      a. HLC Sleeve Anchors, by Hilti Fastening Systems, Inc.
      b. Dynabolt Sleeve Anchors, by ITW Red Head.
      c. Or equal.
   3. Anchors shall comply with physical requirements of FS A-A-1922A. Anchors shall be non-bottom bearing type with single-piece steel expansion sleeve providing 360-degree contact with base material, and shall not require oversized holes for installation.
   4. Interior Dry Non-corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
   5. Other Locations: Provide expansion anchors complete with nuts and washers, Type 304 stainless steel, in accordance with ASTM A276 or ASTM A493.

G. Drop-in Expansion Anchors:
   1. General:
      a. Drop-in expansion anchors shall each consist of an internally threaded, deformation-controlled expansion anchor with pre-assembled expander plug.
   2. Products and Manufacturers: Provide one of the following:
      a. HDI Drop-In Anchors, by Hilti Fastening Systems, Inc.
      b. Drop-In Anchor, by Simpson Strong-Tie Company, Inc.
      c. Or equal.
   3. Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633, complying with physical requirements of FS A-A-55614, Type I. Anchors shall be flush or shell type. Provide low-profile anchors for use in precast concrete planks.

H. Drive-In Expansion Anchors:
   1. General:
      a. Drive-In expansion anchors shall each consist of stainless steel drive pin and expanding alloy body.
   2. Products and Manufacturers: Provide one of the following:
      a. Metal HIT Anchor, by Hilti Fastening Systems, Inc.
      b. Zinc Nailon Anchor, by Simpson Strong-Tie Company, Inc.
      c. Or equal.
   3. Provide Type 304 stainless steel drive pin with zinc alloy body. Anchor shall comply with physical requirements of FS A-A-1925A, Type 1.

I. Unless approved by ENGINEER, do not use power-actuated fasteners or other types of bolts and fasteners not specified in this Section.

J. Anti-Seizing Compound:
   1. Products and Manufacturers: Provide one of the following:
      a. Pure Nickel Never-Seez, by Bostik.
      b. Nickel-Graf, by Anti-Seize Technology.
      c. Or equal.
   2. Provide pure nickel anti-seizing compound.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials will be installed and advise ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Anchor Rods:
   1. Provide anchor rods as shown or indicated in the Contract Documents, or as required to secure structural element to the appropriate anchor surface.
   2. Locate and accurately set anchor rods using templates or other devices as required, prior to placing concrete. Wet setting of anchor rods is unacceptable.
   3. Protect threads and shank from damage during installation and subsequent construction operations.

B. Adhesive Anchors and Expansion Anchors – General:
   1. Prior to drilling, locate existing reinforcing steel in vicinity of proposed holes. If reinforcing conflicts with proposed hole location, obtain ENGINEER's approval of alternate hole locations to avoid drilling through or damaging existing reinforcing bars.

C. Adhesive Anchors:
   1. Installation conditions shall comply with all requirements of the approved product Evaluation Service Report (ESR), including "Conditions of Use." Comply with manufacturer's written installation instructions and the following.
   2. Drill holes to adhesive system manufacturer's recommended drill bit diameter to the specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits that comply with the tolerances of ANSI B212.15. Core-drilled holes are unacceptable.
   3. Before setting adhesive anchor, hole shall be made free of dust and debris by method recommended by adhesive anchor system manufacturer. Hole shall be brushed with adhesive system manufacturer-approved brush and

blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.

4. Before injecting adhesive, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.
5. Prior to injecting adhesive into the drilled hole, dispense to a location appropriate for such waste, an initial amount of adhesive from the mixing nozzle, until adhesive is uniform color.
6. Inject adhesive into hole through injection system-mixing nozzle and necessary extension tubes, placed to bottom of hole. Discharge end shall be withdrawn as adhesive is placed but kept immersed to prevent formation of air pockets. Fill hole to depth that ensures that excess material is expelled from hole during anchor placement.
7. Twist anchors during insertion into partially filled hole to guarantee full wetting of rod surface with adhesive. Insert rod slowly to avoid developing air pockets.
8. Provide adequate curing in accordance with adhesive system manufacturer's requirements prior to continuing with adjoining Work that could place load on installed adhesive anchors. Do not begin adjoining Work until adhesive anchors are successfully tested or when allowed by ENGINEER.
9. Limitations:
    a. Core drilled holes shall not be allowed.
    b. At time of anchor installation, concrete shall have compressive strength (f'c) of not less than 3,000 psi.
    b. At time of anchor installation, concrete shall have age of not less than 21 days.
    c. Installation Temperature: Comply with manufacturer's instructions for installation temperature requirements. Provide temporary protection and other measures, such as heated enclosures, necessary to ensure that base material temperature complies with anchor systems manufacturer's requirements during installation and curing of adhesive anchor system.
    d. Oversized Holes: Advise ENGINEER immediately if size of drilled hole is larger than recommended by anchor system manufacturer. Cost of corrective measures, including but not limited to redesign of anchors due to decreased anchor capacities, shall be paid by CONTRACTOR.
    e. Embedment depths shall be based on installation in normal-weight concrete with compressive strength of 3,000 psi when embedded in existing concrete, and 4,000 psi when embedded in new concrete.
    f. Obstructions in drill path: When existing reinforcing steel is encountered during drilling, stop and do not damage existing reinforcing. Obtain ENGINEER approval for any required modifications.

D. Expansion Anchors:
   1. Comply with expansion anchor manufacturer's written installation instructions and the following:
   2. Drill holes using anchor system manufacturer's recommended drill bit diameter and to the specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits complying with tolerances of ANSI B212.15. Core drilled holes are unacceptable.
   3. Before installing anchor, hole shall be made free of dust and debris by method recommended by anchor system manufacturer. Hole shall be brushed with anchor system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles.
   4. Before installing anchor, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.
   5. Protect threads from damage during anchor installation. Drive anchors not less than four threads below surface of the attachment. Set anchors to anchor manufacturer's recommended torque using a torque wrench.
   6. Limitations:
      a. At time of anchor installation, concrete shall have age of not less than 7 days.
      b. At time of anchor loading, concrete shall have attained full specified compressive strength (f'c).
      c. Expansion anchors shall only be used in interior locations where anchors are not subjected to freeze thaw cycles in a wet environment.

E. Anti-Seizing Compound:
   1. Provide anti-seizing compound in accordance with anti-seizing compound manufacturer's installation instructions, at locations indicated in Paragraph 2.1.B of this Section.
   2. Do not use anti-seizing compound at locations where anchor rod or adhesive anchor will contact potable water or water that will be treated to become potable.

3.3 CLEANING

A. After embedding concrete is placed, remove protection and clean rods.

3.4 FIELD QUALITY CONTROL

A. Site Tests:
   1. OWNER will employ testing agency to perform field quality tensile testing of production adhesive anchors at the Site, unless otherwise specified.
      a. Testing shall comply with ASTM E488.
      b. Test at least ten percent of all types of adhesive anchors. If one or more adhesive anchors fail the test, CONTRACTOR shall pay cost of testing all anchors of the same type installed in the Work. CONTRACTOR shall be responsible for retesting costs.

c. ENGINEER will direct which adhesive anchors are to be tested and indicate test load to be used
d. Apply test loads with hydraulic ram.
e. Displacement of post-installed anchors shall not exceed D/10, where D is nominal diameter of anchor being tested.

2. Mechanical Anchors:
   a. Responsibility:
      1) OWNER will employ testing agency to perform field quality control tensile testing of mechanical anchors at the Site.
      2) CONTRACTOR shall demonstrate competence in installing mechanical anchors by performing field quality control tests.
   b. Perform field quality control tests on test anchors at location directed by ENGINEER. Test anchors shall not be part of the finished Work.
   c. Test not less than one installation of each type of mechanical anchor used in the Work.
      1) Load each test anchor to failure.
      2) Testing shall comply with ASTM E488.
      3) Apply test loads with hydraulic ram.
   d. Anchors that fail to reach the specified test load shall be considered as not passing the test and shall be re-tested at no additional cost to OWNER.
   e. Testing agency shall submit test results to CONTRACTOR and ENGINEER within 24 hours of completion of test.
3. Correct defective Work by removing and replacing or correcting, as directed by ENGINEER.
4. CONTRACTOR shall pay for all corrections and subsequent testing required to confirm competence in the installation of post-installed mechanical anchors.
5. Testing agency shall submit test results to CONTRACTOR and ENGINEER within 24 hours of completion of test.

B. Manufacturer's Services:
   1. Provide at the Site services of qualified adhesive manufacturer's representative during initial installation of adhesive anchor systems to train CONTRACTOR's personnel in proper installation procedures. Manufacturer's representative shall observe to confirm that installer demonstrates proper installation procedures for adhesive anchors and adhesive material.

+ + END OF SECTION + +

+ + NO TEXT ON THIS PAGE + +

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all professional services, labor, materials, equipment, and incidentals as shown, specified, and required to furnish miscellaneous metal fabrications including surface preparation and shop priming.
   2. The Work also includes:
      a. Providing openings in miscellaneous metal fabrications to accommodate the Work under this and other Sections and attaching to miscellaneous metal fabrications all items such as sleeves, bands, studs, fasteners, and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the Work to be installed with, or attached to miscellaneous metal fabrications Work.
   2. Hot-dip Galvanizing: Coordinate with steel fabricator detailing for and fabrication of assemblies to be hot-dip galvanized, to minimize distortion during galvanizing process.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 05 52 15, Aluminum Handrails and Railings.
   4. Section 05 53 16, Aluminum Grating.
   5. Section 09 91 00, Painting,

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI A14.3, Ladders – Fixed –Safety Requirements.
   2. ANSI Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components.
   3. ASTM A36/A36M, Specification for Carbon Structural Steel.
   4. ASTM A53/A53M, Specification for Pipe Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   5. ASTM A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6. ASTM A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
7. ASTM A240/A240M, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.
8. ASTM A320/A320M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for Low-Temperature Service.
9. ASTM A384/A384M-02 Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
10. ASTM A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
11. ASTM A572/A572M, Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
12. ASTM A793, Specification for Rolled Floor Plate, Stainless Steel.
13. ASTM A992/A992M, Specification for Structural Steel Shapes.
14. ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
15. ASTM B211, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
16. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
17. ASTM B308/B308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
18. ASTM B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
19. ASTM B632/B632M, Specification for Aluminum-Alloy Rolled Tread Plate.
20. AWS D1.1/D1.1M, Structural Welding Code – Steel.
21. AWS D1.2/D1.2M, Structural Welding Code – Aluminum.
22. AWS D1.6, Structural Welding Code – Stainless Steel.
23. NAAMM, Metal Finishes Manual.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Welding:
      a. Qualify welding processes and welding operators in accordance with AWS D1.1/D1.1M, D1.2/D1.2M, or D1.6, as applicable.
      b. When requested by ENGINEER, provide certification that each welder employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.
   2. Professional engineer:
      a. CONTRACTOR shall retain a registered professional engineer legally qualified to practice in the same state as the Site to design miscellaneous metal fabrications as indicated in the Contract Documents.
      b. Responsibilities include but are not necessarily limited to:
         1) Reviewing performance and design criteria stated in the Contract Documents.

2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
3) Preparing or supervising preparation of design calculations and related Shop Drawings.
4) Signing and sealing all design calculations and Shop Drawings.
5) Certifying that:
   a) Design has been performed in accordance with performance and design criteria stated in the Contract Documents, and
   b) Design conforms to all applicable local, state, and federal Laws and Regulations, and to prevailing standards of practice

B. Regulatory Requirements: Conform to the following:
   1. 29 CFR 1910, Occupational Health and Safety Standards.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and erection details for assemblies of miscellaneous metal Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Include setting drawings and templates for locating and installing miscellaneous metal items and anchorage devices.
   2. Product Data:
      a. Copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions for products to be used in miscellaneous metal Work.
   3. Samples:
      a. Sets of representative Samples of materials including nosings, rungs, and other finished products as requested by ENGINEER. ENGINEER's review will be for color, texture, style, and finish only. Compliance with other requirements is exclusive responsibility of CONTRACTOR.

B. Delegated Design Submittals:
   1. Design Data: Submit the following:
      a. Design Calculations:
         1) Complete calculations required for the design required miscellaneous metals as one package with the Shop Drawings. Structural calculations shall include all specified performance criteria and design loads used in the design. All calculations and assumptions shall be presented so that ENGINEER can easily follow the progress and logic of CONTRACTOR's professional engineer. The design analysis shall include the name and office phone number of the designer to answer questions during the shop drawing review.
      b. Design calculations shall be signed, sealed, and dated by CONTRACTOR's professional engineer. State of professional engineer's

registration, registration number, and name on seal shall be clearly legible.

C. Informational Submittals: Submit the following:
   1. Test and Evaluation Reports:
      a. Mill test report that indicate chemical and physical properties of each type of material, when requested by ENGINEER.
   2. Qualifications Statements:
      a. Copies of welder's certifications, when requested by ENGINEER.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver products to Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in other construction in ample time to prevent delaying the Work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Steel:
   1. W-Shapes and WT-Shapes: ASTM A992/A992M.
   2. S-Shapes, Channels, Angles, Plates, Bars: ASTM A36/A36M.
   3. Hollow Structural Sections: ASTM A500/A500M, Grade C.
   4. Steel Pipe: ASTM A53/A53M, Grade B.

B. Aluminum:
   1. Aluminum Shapes: ASTM B308/B308M, Alloy 6061-T6, ASTM B 221, Alloy 6061-T6.
   2. Aluminum Tubes and Pipes: ASTM B429, Alloy 6061-T6.
   3. Aluminum Bars and Rod: ASTM B211, Alloy 6061-T6.
   4. Aluminum Plates: ASTM B209, Alloy 6061-T6.

C. Stainless Steel:
   1. Plates and Sheets: ASTM A240/A240M, Type 304L or Type 316 stainless steel.
   2. Submerged or Intermittently Submerged: Type 316 stainless steel.
   3. Non-submerged: Type 304L stainless steel.

D. Stainless Steel Fasteners and Fittings: ASTM A 320/A 320M, Type 304L or Type 316 Stainless Steel.

E. Zinc-coated Hardware: ASTM A153/A153M.

2.2 MISCELLANEOUS METAL ITEMS

A. Shop Assembly:
   1. Pre-assemble items in the shop to the greatest extent possible to minimize field-splicing and field-assembly of units at the Site. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Aluminum Ladders:
   1. Fabricate ladders for locations shown or indicated with dimensions, spacing, details, and anchorages as shown and specified. Comply with OSHA 29 CFR 1910 and ANSI A14.3, except as otherwise shown or specified.
      a. Unless otherwise shown, provide 1.5-inch diameter continuous side rails, spaced at least 1.5 feet apart.
      b. Provide extruded square rungs, spaced maximum of 12 inches on centers, with non-slip surface on top of each rung. Adhesive strips for non-slip surfaces are not acceptable.
   2. Fixed ladders with rungs and their attachment to supporting structures shall be designed per the requirements of ASCE 7, and the following:
      a. Concentrated load = 300 pounds applied at any point to produce the maximum load effect on the element being considered.
      b. Additional concentrated loads = minimum 1 unit of 300 pounds for every 10 feet of ladder.
      c. Where rails of fixed ladders extend above a floor or platform at the top of the ladder, each side rail extension shall be designed to resist a single concentrated live load of 100 pounds applied in any direction at any height up to the top of the side rail extension.
      d. Any additional loads exerted on the ladder by the fall protection system, but no less than required by OSHA 1910.
   3. Fit rungs in centerline of side rails, plug weld, and grind smooth on outer rail faces.
   4. Support each ladder at top and bottom and at intermediate points spaced not more than five feet on centers.
   5. Use welded or bolted brackets, designed for adequate support and anchorage, and to hold ladder clear of wall surface with minimum of seven inches between wall and centerline of rungs.
   6. Unless otherwise shown or approved by ENGINEER, extend rails 3.5 feet above top rung, and return rails to wall or structure, unless other secure handholds are provided. If adjacent structure does not extend above top rung, goose-neck extended rails back to structure to provide secure ladder access.
   7. Use extruded aluminum conforming to alloy and temper 6061-T6.

C. Fall Prevention System:
   1. All ladders that extend more than 24 ft above a lower level shall be provided with a fall prevention system.
   2. When required, provide each ladder with a fall prevention system complying with 29 CFR 1910, ANSI A14.3, and ANSI Z359.1.

3. System shall consist of a carrier rail securely and permanently attached to ladder, over which travels a sleeve to which harness belt can be attached.
4. Products and Manufacturers: Provide products of one of the following:
    a. Saf-T-Climb by North Safety Products.
    b. Or equal.
5. Rail:
    a. Notched at six-inch intervals and constructed of galvanized steel.
    b. Provide ladder attachments/rail mounting brackets of same material as rail, and as required by Supplier.
    c. For all ladders, include provisions to secure safety sleeve to carrier rail at top of vertical ladder so that sleeve will not slide down rail when safety belt is unsnapped.
    d. Ladders Below Hatches: Rail for ladder shall extend from bottom of ladder to top of ladder. Provide telescoping safety post as specified in this Article.
    e. Ladders Not Below Hatches: Rail for ladder shall extend from bottom of ladder to above horizontal landing or roof at top of ladder, Provide removable extension section at top of ladder. Arrange rail to allow climber to land on landing or roof without unsnapping climber's safety harness.
6. Accessories: Provide with each ladder the following, all furnished by fall prevention system Supplier:
    a. One safety sleeve compatible for use with the rail, per ladder provided. Sleeve shall be cast bronze with five zinc-plated steel roller bearings. Sleeve shall travel smoothly on straight or curved rail.
    b. One safety harness that attaches to sleeve, per ladder provided. Harness shall be of woven, high-strength nylon, with padded straps and forged steel buckles and rings. Harness shall distribute impact forces of a fall over climber's thighs, buttocks, chest, and shoulders.
    c. One shock-adsorbing Y-lanyard, per ladder provided. Lanyard shall be no longer than six feet, complying with ANSI Z359.1. Lanyard shall be 5/8-inch diameter nylon rope with double-locking snap hooks at each end.

D. Steel Lintels:
1. Provide loose structural steel lintels for openings and recesses in masonry walls and brick walls as specified or as shown.
2. Weld adjoining members together to form a single unit, where shown or indicated.
3. Provide not less than eight inches bearing at each side of openings, unless otherwise shown.
4. Steel lintels to be installed in exterior walls shall be hot-dipped galvanized and finish painted. Other steel lintels shall be painted.
5. Surface preparation and painting shall conform to Section 09 91 00, Painting.

E. Aluminum Stair Nosings:
1. Manufacturers: Provide products of one of the following:
    a. Supergrit Type 241BF by Wooster Products, Inc.

b. Or equal.

2. Fabricate extruded aluminum nosing of sizes and configurations as shown on the Drawings.
   a. Unless otherwise shown, provide ribbed abrasive filled type, using black abrasive filler.
3. Provide anchors for embedding in concrete, either integral or applied to treads, as standard with manufacturer.

F. Fall Prevention System:
1. Provide each ladder with a fall prevention system complying with 29 CFR 1910, ANSI A14.3, and ANSI Z359.1.
2. System shall consist of a carrier rail securely and permanently attached to ladder, over which travels a sleeve to which harness belt can be attached.
3. Products and Manufacturers: Provide products of one of the following:
   a. Saf-T-Climb by North Safety Products.
   b. Or equal.
4. Rail:
   a. Notched at six-inch intervals and constructed of stainless steel.
   b. Provide ladder attachments/rail mounting brackets of same material as rail, and as required by Supplier.
   c. For all ladders, include provisions to secure safety sleeve to carrier rail at top of vertical ladder so that sleeve will not slide down rail when safety belt is unsnapped.
   d. Ladders Below Hatches: Rail for ladder shall extend from bottom of ladder to top of ladder. Provide telescoping safety post as specified in this Article.
   e. Ladders Not Below Hatches: Rail for ladder shall extend from bottom of ladder to above horizontal landing or roof at top of ladder, Provide removable extension section at top of ladder. Arrange rail to allow climber to land on landing or roof without unsnapping climber's safety harness.
5. Accessories: Provide with each ladder the following, all furnished by fall prevention system Supplier:
   a. One safety sleeve compatible for use with the rail. Sleeve shall be cast bronze with five zinc-plated steel roller bearings. Sleeve shall travel smoothly on straight or curved rail.
   b. One safety harness that attaches to sleeve. Harness shall be of woven, high-strength nylon, with padded straps and forged steel buckles and rings. Harness shall distribute impact forces of a fall over climber's thighs, buttocks, chest, and shoulders.
   c. One shock-adsorbing Y-lanyard no longer than six feet, complying with ANSI Z359.1. Lanyard shall be 5/8-inch diameter nylon rope with double-locking snap hooks at each end.

G. Safety Post:
1. Provide safety post for each fixed access ladder located below an access hatch. Safety post shall be manufactured of high-strength structural material with telescoping tubular section that locks automatically when fully extended.

2. Products and Manufacturers: Provide products of one of the following:
   a. LadderUP Safety Post by Bilco Company
   b. Or equal.
3. Use upward and downward movement of post shall be controlled by stainless steel spring balancing mechanism.
4. Safety post shall be stainless steel.

H. Manhole Steps:
1. Provide manhole steps as shown on the Drawings. Conform to requirements of 29 CFR 1910 and ANSI A14.3.
2. Products and Manufacturers: Provide one of the following:
   a. ML-13-NCR, manufactured by American Step Company, Inc.
   b. Or equal.
3. Vertical separation of steps shall be uniform at maximum of 12 inches on centers. Steps shall project evenly from manhole or chamber walls.
4. Material: Copolymer polypropylene plastic coated, steel rebar reinforced.

I. Stainless Steel Bar Racks:
1. Provide manually cleaned bar racks as shown on the Drawings and as listed in the below Table.
2. Fabricate of all-stainless steel welded construction in accordance with details on the Drawings.
3. Bar size and spacing shall provide clear openings as shown.
4. Provide plates, angles, bars, and fasteners as shown.
5. Provide approved rake of suitable length and spacing to match rack dimensions.
6. Provide stainless steel bar rack supports such that trash rack can be readily removeable from the support system, channel, or wet well.

Bar Rack Location	Bar Rack Size	Bar Width	Bar Spacing	Notes
FOG Receiving Pit	2’ x 2’	2” dia	1”	
Septage Receiving Manhole	4’ x 4’	3/4"	3/4"	
SD1 Wet Well (Temporary)	5.5’ x 5.5’	1"	3/4"	Provide 2 for swapping/cleaning during use. Remove after temporary use.

J. Bollards:
1. Provide Schedule 80 galvanized steel pipe filled with concrete as shown on the Drawings. Paint as required in accordance with Section 09 91 00, Painting. Unless otherwise shown or specified, finish-paint bollard “Safety Yellow.”

K. Miscellaneous Framing and Supports:
   1. Provide miscellaneous metal framing and supports that are not part of structural steel framework and are required to complete the Work. Miscellaneous framing and supports shall be designed for the loads intended, maximum equipment vertical loads and/or vibrations. Access walkways shall be designed for a minimum 100 psf live load in addition to dead loads.
   2. Fabricate miscellaneous units to sizes, shapes, and profiles shown on the Drawings or, if not shown, of required dimensions to receive adjacent grating, plates, tanks, doors, and other work to be retained by the framing.
   3. Except as otherwise shown, fabricate from structural shapes, plates, and bars, of all-welded construction using mitered corners, welded brackets, and splice plates and minimum number of joints for field connection.
   4. Cut, drill, and tap units to receive hardware and similar items to be anchored to the Work.
   5. Furnish units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units are to be installed after concrete is placed.
      a. Except as otherwise shown, space anchors, 2.0 feet on centers, and provide units the equivalent of 1.25-inch by 1/4-inch by eight-inch strips.
      b. Galvanize exterior miscellaneous frames and supports.
      c. Where shown or indicated, galvanize miscellaneous frames and supports that are not to be installed outdoors.
   6. Miscellaneous steel framing and supports shall be hot-dip galvanized and finish-painted, unless otherwise shown or indicated.
   7. For railings, refer to Section 05 52 15, Aluminum Handrails and Railing.
   8. For grating requirements refer to Section 05 53 16, Aluminum Grating.
   9. Surface preparation and painting of galvanized surface shall conform to Section 09 91 00, Painting

L. Fasteners and Hardware: Provide Type 316 stainless steel fasteners for aluminum fabrications and zinc-coated hardware for galvanized fabrications, unless otherwise shown or specified.

M. Anchors and Expansion Anchors: Refer to Section 05 05 33, Anchor Systems.

2.3 FINISHING

A. Surface Preparation and Shop Priming: Perform surface preparation and apply primer coat to miscellaneous metal fabrications in the shop. Conform to surface preparation and shop priming requirements in Section 09 91 00, Painting.

B. Galvanizing:
   1. Galvanizing of fabricated steel items shall comply with ASTM A123/A123M.
   2. Details of fabrication of steel items and assemblies to be hot-dip galvanized shall conform to recommendations of ASTM A384/A384M to minimize the potential for distortion.

C. Aluminum Finish: Provide an Architectural Class 1 anodized finish, AA-M32C22-A41, clear matte, exterior UV resistant, as specified in NAAMM Metal Finishes Manual.

2.4 SOURCE QUALITY CONTROL

A. Tests and Inspections:
   1. Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve CONTRACTOR of responsibility for providing materials and fabrication procedures complying with the Contract Documents.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions under which the Work is to be performed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install miscellaneous metal fabrications accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Brace temporarily or anchor temporarily in formwork where fabrications are to be built into concrete, masonry, or other construction.

B. Anchor securely as shown and as required for the intended use, using concealed anchors where possible.

C. Fit exposed connections accurately together to form tight, hairline joints. Field-weld steel connections that are not to be exposed joints and cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1/D1.1M, D1.2/D1.2M and D1.6, as applicable to the material being welded. Grind steel joints smooth and touch-up shop paint coat. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Protection of Aluminum from Dissimilar Materials:
   1. Coat surfaces of aluminum that will contact dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09 91 00, Painting.

+ + END OF SECTION + +

SECTION 05 52 15

ALUMINUM HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install aluminum handrail and railing systems. The Work also includes:
      a. Providing openings in, and attachments to, aluminum handrail and railing systems to accommodate the Work under this and other Specification Sections. Provide all items for aluminum handrails and railings, including anchorages, fasteners, studs, and other items required for which provision for is not specifically included under other Sections.
   2. Aluminum handrails and railings Work shall include components and features shown and specified, and all components and features available from specified manufacturers required for providing complete aluminum handrail and railing system in accordance with the Contract Documents.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before aluminum handrails and railings Work.
   2. Aluminum handrail and railing locations shall comply with Laws and Regulations.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA, Aluminum Design Manual.
   2. ASTM B26/B26M, Specification for Aluminum-Alloy Sand Castings.
   3. ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
   4. ASTM B136, Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum.
   5. ASTM B137, Standard Test Method for Measurement of Coating Mass per Unit Area on Anodically Coated Aluminum.
   6. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

7. ASTM B241/B241M, Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
8. ASTM B244, Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.
9. ASTM B247, Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and rolled Ring Forgings.
10. ASTM B429/B429M, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
11. ASTM F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
12. ASTM E935, Standard Test Methods for Permanent Metal Railing Systems and Rails for Buildings.
13. NAAMM/Architectural Metal Products Division (AMP), Pipe Railing Manual.
14. NAAMM/AMP AMP 501 Finishes for Aluminum.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Upon request manufacturer shall submit document at least five years successful experience in fabricating aluminum handrail and railing systems of scope and type similar to that required.
      b. Manufacturer shall be capable of providing custom detail drawings for the products required.
   2. Professional Engineer:
      a. Contractor or handrail and railing manufacturer shall retain a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall have at least five years experience designing aluminum handrails and railings.
      b. Responsibilities include:
         1) Reviewing aluminum handrail and railing system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to Engineer by Contractor.
         3) Preparing or supervising preparation of design calculations verifying compliance of aluminum handrail and railing system with requirements of the Contract Documents.
         4) Signing and sealing all calculations.
         5) Certifying that:
            a) Design of aluminum handrail and railing system was performed in accordance with performance and design criteria stated in the Contract Documents, and
            b) Design conforms to all applicable local, state, and federal Laws and Regulations, and to prevailing standards of practice.

3. Installer:
    a. Retain a single installer trained and with record of successful experience in installing aluminum handrail and railing systems.
    b. Installer shall have record of successfully installing aluminum handrail and railing systems in accordance with recommendations and requirements of manufacturer, or shall provide evidence of being acceptable to the manufacturer.
    c. Installer shall employ only tradesmen with specific skill and successful experience in the type of Work required.
    d. When requested by Engineer, submit name and qualifications of installer with the following information for at least three successful, completed projects:
        1) Names and telephone numbers of owner and architect or engineer responsible for each project.
        2) Approximate contract cost of the aluminum handrail and railing systems for which installer was responsible.
        3) Amount (linear feet) of aluminum handrail and railing installed.

B. Component Supply and Compatibility:
    1. Obtain all materials furnished under this Section regardless of component manufacturer, from a single aluminum handrail and railing system manufacturer.
    2. Aluminum handrail and railing system manufacturer shall review and approve or prepare all Shop Drawings and other submittals (except for delegated design submittals, when professional engineer is retained by other than handrail and railing manufacturer) for all components furnished under this Section.
    3. Components shall be specifically constructed for specified service conditions and shall be integrated into overall assembly by aluminum handrails and railings manufacturer.

C. Regulatory Requirements: Comply with Laws and Regulations, including:
    1. International Building Code.
    2. OSHA Part 1910.28, Duty to have fall protection and falling object protection.
    3. OSHA Part 1910.29, Fall protection systems and falling object protection-criteria and practices.

D. Certifications:
    1. Submit certification, signed by authorized officer of manufacturer and notarized, stating that handrail and railing systems comply with the design prepared by the professional engineer.
    2. Submit certification, signed by authorized officer of Contractor and notarized, stating that all components and fittings are furnished by the same manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
    1. Shop Drawings:

a. Drawings for fabrication and installation of aluminum handrail and railing systems with sizes of members, pipe wall thickness, information on components, and anchorage devices. Show all anchorages. Provide details drawn at scale of 1.5-inch equal to one foot.
b. Indicate required location of posts.
c. Indicate locations and details of all expansion joints, if any.
d. Profile drawings of aluminum handrail and railing system components.
e. Custom detail drawings. Details of forming, jointing, sections, connections, internal supports, trim and accessories. Provide details drawn at scale of 1.5-inch equal to one foot.

2. Product Data:
   a. Manufacturer's specifications, standard detail drawings, and installation instructions for aluminum handrail and railing systems.
   b. Manufacturer's catalogs showing complete selection of standard and custom components and miscellaneous accessories for selection by Engineer.
3. Delegated Design Submittals:
   a. Design Data:
      1) Design computations or complete structural analysis of handrail and railing systems, signed and sealed by professional engineer. Professional engineer's seal shall be clearly legible, including state of registration, registration number, and name on seal.
      2) Certification by professional engineer that professional engineer has performed design of aluminum handrail and railing systems in accordance with performance and design criteria stated in the Contract Documents, and that design conforms to all local, state, and federal Laws and Regulations, and to prevailing standards of practice.
4. Samples:
   a. Full-size Sample, two feet long, of assembled railing system at post and rail intersections. Sample shall have all associated components including typical connections, mounted toeboard and sleeve, and handrail at wall return, complete with mounting brackets, all with specified controlled uniform metal finish.
   b. Color Samples: Maximum range of dark bronze anodized aluminum that shall appear in finished Work. Prepare range Samples, to show highest level of color control feasible for actual handrail and railing systems, as determined by licensor of finishing process specified, on actual extrusions and castings of the Work.
   c. Engineer will review Samples for finish, color, joint tolerances, workmanship, and general component assembly only. Compliance with other requirements is the responsibility of the Contractor.

B. Informational Submittals: Submit the following:
1. Certificates:
   a. Certification on source of supply, as specified in Article 1.3 of this Section.
   b. Manufacturer certification specified in Article 1.3 of this Section.
2. Qualifications Statements: Submit qualifications for the following:

a. Manufacturer, when requested by Engineer.
b. Professional engineer.
c. Installer, when requested by Engineer. Qualifications statement shall include record of experience with references specified.

C. Closeout Submittals: Submit the following:
1. Maintenance Manuals: Furnish detailed maintenance manuals that include the following:
a. Product name and number.
b. Detailed procedures for routine maintenance and cleaning, including cleaning materials, application methods and precautions in use of products that may be detrimental to finish when improperly applied.
c. Handrail and railings systems manufacturer's current catalog including individual parts.
d. Maintenance manuals shall be in accordance with Section 01 78 23, Operations and Maintenance Data.
2. Guarantee: Provide in maintenance manual the guarantee specified.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, and Unloading:
1. Prior to shipping, completely inspect products to assure that components are complete and comply with requirements of Contract Documents and recommendations of manufacturer. Box or crate products as required to prevent damage during shipment.
2. Deliver products to Site to ensure uninterrupted progress of the Work. Deliver anchorage products that are to be embedded in concrete in ample time to prevent delaying the Work.
3. Inspect all boxes, crates, and packages upon delivery to Site and notify ENGINEER in writing of loss or damage to products. Promptly remedy loss and damage to new condition per manufacturer's instructions.
4. Conform to Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
1. Keep products off ground using pallets, platforms, or other supports. Protect products from corrosion and deterioration.

C. Handling of Products:
1. Do not subject handrail and railing products to bending or stress.
2. Do not damage edges or handle products in a manner that will cause scratches, warping, or dents.
3. Protect handrails and railings by paper or coating as acceptable to handrail and railing manufacturer, against scratching, splashes of mortar, paint, and other marring during transportation, handling, and erection. Protect until completion of adjacent work.

1.6 GUARANTEE

A. Guarantee: Manufacturer shall provide written guarantee of availability of replacement parts and components for period of at least five years after completion of the Project.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description: Aluminum handrail and railing system shall consist of equally spaced horizontal rails with totally concealed mechanical fasteners, internally threaded tubular rivets and components fastened to posts spaced no more than five feet on centers and system of handrails supported from adjacent construction by mounting brackets spaced at no more than five feet on centers.

B. Design Criteria and Performance Criteria:
   1. Design, fabricate, and install aluminum handrail and railing systems to withstand the most critical effects resulting from the following loads (loads listed below do not act concurrently):
      a. Uniform Load: 50 pounds per foot, applied at top in any direction.
      b. Concentrated Load: 200 pounds single load, applied at any point along the top in any direction.
      c. Components: Intermediate rails (all rails except the handrail), balusters, and panel fillers, if any, shall withstand horizontally-applied normal load of 50 pounds on an area equal to one square foot, including openings and space between rails. Reactions due to this loading are not required to be superimposed to loading specified for main supporting members of handrails and railings.
      d. Comply with AA Aluminum Design Manual for determining allowable stresses and safety factors for aluminum structural components.
      e. Limit deflection in each single span of railing and handrail to 1.5-inch maximum. Horizontal deflection of posts shall comply with ASTM E985. Applied loads shall not produce permanent deflection in the completed Work when loads are removed.
   2. Thermal Control: Provide adequate expansion within fabricated systems that allows for thermal expansion and contraction caused by material temperature change of 140 degrees F to -20 degrees F without warp or bow of system components. Distance between expansion joints shall be based on providing 1/4-inch wide joint at 70 degrees F, which accommodates movement of 150 percent of calculated amount of movement for specified temperature range.
   3. Where handrail and railing systems cross expansion joints in the building or structure, provide expansion joints in handrail and railings systems.
   4. For posts located at or near end of runs as shown, uniformly space intermediate posts as required to conform to loading and deflection criteria specified, at intervals no greater than maximum post spacing specified. Where posts are

shown for handrails along both sides of walkways and other similar locations, locate posts opposite each other; do not stagger post locations.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Custom Fabricated Connectorail System, by Julius Blum & Company, Inc.
   2. Custom Fabricated Series 5 Non-Welded Aluminum Pipe Aluminum handrails and railing systems, by Superior Aluminum Products, Inc.
   3. Or equal.

2.3 MATERIALS

A. Extruded Aluminum Architectural and Ornamental Shapes: ASTM B221, Alloy 6063-T52.

B. Aluminum Forgings: ASTM B247.

C. Extruded or Drawn Aluminum Pipe and Tube:
   1. ASTM B429 or ASTM B241/B241M, Alloy 6061-T6, 6063-T6, 6063-T5, 6063-T52, or 6063-T832 as required by loadings, deflections, and post spacing specified.
   2. Provide Schedule 40 pipe, minimum, unless conditions of detail and fabrication require extra-heavy pipe to comply with Specifications. Rails and posts shall have minimum outside diameter of 1.90 inches.

D. Reinforcing Bars: Solid, circular profile, two feet long, 6061-T6 aluminum reinforcing bars with same outside diameter as inside diameter of post.

E. Anchors and Fastenings:
   1. For anchors and fasteners, use Type 316 stainless steel conforming to ASTM F593; minimum 3/8-inch diameter.
   2. Provide minimum of four bolt fasteners per post where top or side mounted posts are shown. Components shall be in accordance with manufacturer's recommendations and as approved or accepted (as applicable) by Engineer on submittals.
   3. Anchors: In accordance with Section 05 05 33, Anchor Systems.

F. Castings:
   1. Provide high-strength aluminum alloy brackets, flanges, and fittings suitable for anodizing as specified.
   2. Aluminum alloy sand castings: ASTM B26/B26M.

G. Connector Sleeves: Schedule 40, five-inch long by 1.610-inch diameter.

H. Sockets: Provide six-inch deep by 2.5-inch outside diameter aluminum sockets with 3.5-inch-wide socket cover on bottom of each socket and on top and bottom of removable post sockets.

I. Gates: Provide gates across openings in handrail or railing system. Comply with the following:
   1. Self-closing gate that slides or swings away from the opening and is equipped with a top rail and mid-rail that complies with OSHA 1910.29(b).
   2. Hinges: Two-self closing type 304 stainless hinges.
   3. Latches and Stops: One latch and stop with rubber bumper and one-inch diameter plastic knobs.

J. Custom Cover Flanges: 1/4-inch high by four-inch diameter, aluminum.

K. Adhesive: Two-part waterproof epoxy-type as recommended by handrail and railing systems manufacturer.

L. Non-shrink Grout: Comply with Section 03 60 00, Grouting.

M. Toeboards:
   1. Provide extruded Alloy 6063-T5 or T52 aluminum alloy toeboards, unless railing is mounted on curbs or other construction of sufficient height and type to comply with OSHA 1910.29. Bars or plates are not acceptable.
   2. Unless otherwise specified, toeboards shall comply with OSHA 1910.29(k).

N. System Components and Miscellaneous Accessories: Provide complete selection of manufacturer's standard and custom aluminum handrail and railing systems components and miscellaneous accessories required. Show type and location of all such items on Shop Drawings and other submittals as applicable.

2.4 FABRICATION

A. General: Unless otherwise shown or specified, provide typical non-welded construction details and fabrication techniques recommended in NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501.

B. Fabricate handrail and railing systems true to line and level, with accurate angles, surfaces and straight edges. Fabricate corners without using fittings. Provide bent-metal corners to radius shown without causing grain separation or otherwise impairing the Work. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces, or use prefabricated bends. Provide not less than four-inch outside radius.

C. Remove burrs from exposed edges.

D. Close aluminum pipe ends by using prefabricated fittings.

E. Weep Holes:
   1. Fabricate joints that will be exposed to weather to exclude water.
   2. Provide 15/64-inch diameter weep holes at lowest possible point on each post in handrail and railing systems.
   3. Provide pressure relief holes at closed ends of handrail and railing systems.

F. Toeboards:
   1. Provide manufacturer's standard toeboard, that accommodates movement caused by thermal change specified without warping or bowing toeboards.
   2. Provide manufacturer's standard toeboard, which accommodates storage for removable socket covers.
   3. Coordinate and cope toeboard as required to accommodate cover flanges at posts.
   4. Toeboards shall follow curvature of railing. Where railing is shown to have curved contours at corners, or other locations, toeboard shall likewise be curved to follow line of railing system.

G. Reinforcing Bars: Provide reinforcing bar friction-fitted at each post in railing system. Extend reinforcing bars of tubes six inches into cast-in-place sleeves or other types of supporting brackets.

H. Mechanically Fitted Component Pipe Handrail and Railing System:
   1. Use non-welded pipe handrail and railing system with posts, top and intermediate rail(s), and flush joints.
   2. Provide top and one intermediate horizontal rail(s), equally spaced.
   3. Do not use blind rivets, pop rivets, or other exposed fastening devices in the Work under this Section. Fasteners used for side-mounting fascia flanges where shown or specified may be exposed in the Work. Provide internal threaded aluminum rivets, stainless steel through-bolts with lock nuts, stainless steel sheet metal screws with lock washers, and epoxy adhesive for fastening components of the Work.

2.5 FINISHES

A. General:
   1. Prepare surfaces for finishing in accordance with recommendation of aluminum producer and the aluminum finisher or processor.
   2. Adjust and control direction of mechanical finishes specified to achieve best overall visual effect in the Work.
   3. Color and Texture Tolerance: Provide uniform color and continuous mechanical texture for aluminum components. Engineer reserves the right to reject aluminum materials because of color or texture variations that are visually objectionable, but only where variation exceed range of variations established by manufacturer prior to fabrication, by means of range of Samples approved by Engineer.
   4. Anodize aluminum components.

B. Finish:
   1. Mechanically finish aluminum by wheel or belt polishing with aluminum oxide grit of 180 to 220 size, using peripheral wheel speed of 6,000 feet per minute; AA Designation - M32 Medium Satin Directional Texture.
   2. Hand-Rubbed Finish: Where required to complete the Work and provide uniform, continuous texture, provide hand-rubbed finish to match medium satin

directional texture specified to even out and blend satin finishes produced by other means.

C. Cleaning:
   1. Provide non-etching chemical cleaning by immersing aluminum in inhibited chemical solution, as recommended by coating applicator, to remove lard oil, fats, mineral grease, and other contamination detrimental to providing specified finishes.
   2. Clean and rinse with water between steps as recommended by aluminum manufacturer.

D. Exposed Aluminum Anodic Coating: Provide anodic coatings as specified that do not depend on dyes, organic or inorganic pigments, or impregnation processes to obtain color. Apply coatings using only the alloy, temperature, current density, and acid electrolytes to obtain specified colors in compliance with designation system and requirements of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501. Comply with the following:
   1. Provide Architectural Class I high density anodic treatment by immersing the components in tank containing solution of 15 percent sulfuric acid at 70 degrees F with 12 amperes per square foot of direct current for minimum of sixty minutes; AA Designation A42 Bronze.
   2. Physical Properties:
      a. Anodic Coating Thickness, ASTM B244: Minimum of 0.7-mils thick.
      b. Anodic Coating Weight, ASTM B137: Minimum of 32 mg/sq. in.
      c. Resistance to Staining, ASTM B136: No stain after five minutes dye solution exposure.
      d. Salt Spray, ASTM B117: 30,000 hours exposure with no corrosion or shade change.
   3. Seal finished anodized coatings using deionized boiling water to seal pores and prevent further absorption.
   4. Products and Manufacturers: Provide one of the following:
      a. Duranodic 313 by Aluminum Company of America, Inc.
      b. Or equal.

2.6 SOURCE QUALITY CONTROL

A. Allowable Tolerances:
   1. Limit variation of cast-in-place inserts, sleeves and field-drilled anchor and fastener holes to the following:
      a. Spacing: Plus-or-minus 3/8-inch.
      b. Alignment: Plus-or-minus 1/4-inch.
      c. Plumbness: Plus-or-minus 1/8-inch.
   2. Minimum Handrails and Railings Systems Plumb Criteria:
      a. Limit variation of completed handrail and railing system alignment to 1/4-inch in 12 feet with posts set plumb to within 1/16-inch in 3.0 feet.

b. Align rails so variations from level for horizontal members and from parallel with rake of stairs and ramps for sloping members do not exceed 1/4-inch in 12.0 feet.

3. Provide “pencil-line” thin butt joints.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which Work will be performed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Verify to Engineer the gage of aluminum pipe railing posts and rails brought to the Site by actual measurement of on-Site material in presence of Engineer.

3.2 INSTALLATION

A. General:
   1. Do not erect components that are scarred, dented, chipped, discolored, otherwise damaged, or defaced. Remove from Site railing and handrail system components that have holes, cuts, gouges, deep scratches, or dents of any kind. Repairs to correct such Work will not be accepted. Remove and replace with new material.
   2. Comply with installation and anchorage recommendations of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501 in addition to requirements specified and approved or accepted (as applicable) submittals.

B. Fastening to In-Place Construction:
   1. Remove protective plastic immediately before installing.
   2. Adjust handrails and railings prior to securing in place, to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Secure posts and rail ends to building or structure as follows:
      a. Anchor posts to concrete by means of 4-bolt floor flanges or side mount sleeve brackets anchored into the concrete using stainless adhesive anchors. Refer to Section 05 05 33, Anchor Systems.
      b. Anchor posts to stair stringers with stringer or support flanges, angle type or floor type as required by conditions, shop-connected to posts and bolted to steel supporting members. Flanges shall be as recommended by manufacturer. Verify that reinforcing bars are inserted into posts before installation. Do not install posts without reinforcing bar.
      c. Side-mount posts by fastening them securely in brackets attached to steel or concrete fascia as shown and in accordance with approved or accepted (as applicable) submittals.
   3. Use devices and fasteners recommended by handrail and railing systems manufacturer and as shown on approved or accepted (as applicable) submittals.

C. Cutting, Fitting, and Placement:
   1. Perform cutting, drilling and fitting required for installation. Set the Work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels.
   2. Fit exposed connections accurately together to form tight hairline joints. Do not cut or abrade surfaces of units that have been finished after fabrication, and are intended for field connections.
   3. Make permanent field splice connections using manufacturer's recommended epoxy adhesive and five-inch minimum length connector sleeves. Tight press-fit field splice connectors and install in accordance with manufacturer's written instructions. Follow epoxy manufacturer's recommendations for requirements of installation and conditions of use.
   4. Make splices as near as possible to posts, but not exceeding 12 inches from nearest post.
   5. Field welding is not allowed. Make splices using pipe splice lock employing a single allen screw to lock joint.
   6. Provide hinged gates as shown.
   7. Securely fasten toeboards in place with not more than 1/4-inch clearance above floor level.
   8. Drill one 15/64-inch diameter weep hole not more than 1/4-inch above top of location of solid reinforcing bar or tube in each post.

D. Expansion Joints:
   1. Provide slip joint with internal sleeve extending not less than two inches beyond joint on each side.
   2. Construct expansion joints as for field splices, except fasten internal sleeve securely to one side of rail only.
   3. Locate joints within six inches of posts.

E. Protection from Dissimilar Materials:
   1. Coat aluminum surfaces in contact with dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09 91 00, Painting.
   2. Do not extend coating beyond contact surfaces. Remove coating where exposed-to-view in the finished Work.

3.3 CLEANING AND REPAIRING

A. Cleaning:
   1. Clean exposed surfaces of handrail and railing systems after completion of installation. Comply with recommendations of both handrail and railing system manufacturer and finish manufacturer. Do not use abrasives or unacceptable solvent cleaners. Test cleaning techniques on an unused section of railing before employing cleaning technique.
   2. Remove stains, dirt, grease, and other substances by washing handrails and railings systems thoroughly using clean water and soap; rinse with clean water.
   3. Do not use acid solution, steel wool, or other harsh abrasives.

4. If stain remains after washing, remove defective sections and replace with new material complying with this Section.

B. Handrails and railings shall be free of dents, burrs, scratches, holes, and other blemishes. Replace damaged or otherwise defective Work with new material that complies with this Section at no additional cost to Owner.

C. Prior to Substantial Completion, replace adjacent work marred by the Work of this Section.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 05 53 16

ALUMINUM GRATING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install aluminum grating and frames.
   2. The Work includes:
      a. Providing grating, frames, and appurtenances.
      b. Providing openings in aluminum grating to accommodate the Work under this and other Sections, and attaching to aluminum grating all items such as sleeves, bands, studs, fasteners, and items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before aluminum grating Work.

C. Related Sections:
   1. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA Aluminum Design Manual.
   2. ASTM B210, Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
   4. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   5. NAAMM MBG 531, Metal Bar Grating Manual.
   6. NAAMM MBG 533, Welding Specifications for Fabrication of Steel, Aluminum and Stainless-Steel Bar Grating.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Shall have at least five years-experience manufacturing products substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:
   1. Obtain all products and materials included in this Section regardless of component manufacturer from a single aluminum-grating manufacturer.
   2. Aluminum grating manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all products and materials furnished under this Section.
   3. Components shall be suitable for the specified service conditions and be integrated into overall assembly by aluminum grating manufacturer.
   4. Provide only one type of aluminum grating exclusively throughout the Project.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and erection of all Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items.
      b. Setting drawings and templates for location and installation of anchorage devices.
   2. Product Data:
      a. Manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions.
   3. Samples:
      a. Representative Samples of grating, appurtenances and other finished products requested by ENGINEER.
      b. ENGINEER'S review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices to be embedded in cast-in-place concrete in ample time to prevent delaying the Work.
   2. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Protect materials from corrosion and deterioration.
   2. Do not store materials in contact with concrete or other materials that might cause corrosion, staining, scratching, or damage materials or finish.
   3. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Aluminum Grating: Provide aluminum grating complying with the following:
   1. Grating Design Loads: Uniform live load shall be as shown or indicated in the Contract Documents. Where live load is not shown or indicated, uniform live and concentrated loads shall be as indicated in the table below, whichever results in the greater design stresses.

	Live Load	Concentrated Load
a.	300 psf	1,500 lbs. per foot of grating width at center of span

   2. Maximum Clear Span Deflection for Uniform Live Loads: 1/120 of span, but not more than 1/4-inch.
   3. Maximum Fiber Stress: 12,000 psi.
   4. Do not install aluminum grating in areas subject to vehicular traffic.
   5. Minimum Size of Members:
      a. Minimum size of bearing bars shall be within standard mill tolerance as indicated in load tables in NAAMM MBG 531 for applicable loading and deflection requirements.
      b. Minimum dimensions of cross bars shall be as indicated in tables of Minimum Standard Cross Bars and Connecting Bars in NAAMM MBG 531.
   6. Banding bar shall be 1/4-inch thick minimum. Top of banding bar shall be flush with top of grating, unless otherwise shown or indicated. Banding bar shall be 1/4-inch shorter than the bearing bar height.
   7. Comply with requirements of AA Aluminum Design Manual.

2.2 MANUFACTURERS

A. Grating, Products and Manufacturers: Provide one of the following:
   1. Swage-Locked I-Bar Grating, by IKG Industries.
   2. Swage-Locked I-Bar Grating, by AMICO.
   3. Or equal.

2.3 MATERIALS

A. Bearing Bars: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with ASTM B221.

B. Cross Bars or Bent Connecting Bars: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with either ASTM B221 or ASTM B210.

C. Frames: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with ASTM B221.

D. Stud anchors welded to steel supports and other fasteners shall be Type 316 stainless steel.

2.4 FABRICATION

A. Use materials of minimum depth and thickness specified and required to comply with performance criteria in the Contract Documents.

B. Provide grating as follows:
   1. Grating Type: Aluminum I-bar with swage-locked cross bars at right angles to bearing bars.
   2. Depth: One-inch minimum.
   3. Bearing Bars: Aluminum I-bar minimum of one-inch spaced at 1-3/16-inch on centers.
   4. Cross-Bars: Swage-locked to bearing bars at maximum spacing of four inches on centers.
   5. Surface: Grooved.
   6. Finish: Mill.

C. Provide cutouts in grating for passage of piping, electrical conduit, valve stems, columns, ducts, and similar work. Where more than two bearings bars are included in a cut out, provide banding bars of same dimensions as bearing bars around opening welded to grating component parts.

D. Gratings shall be accurately fabricated, free from warps, twists, and other defects that would affect grating appearance and grating serviceability.

E. Welding shall conform to requirements of NAAMM MBG 533. Welds shall be ground smooth at top surfaces and bearing surfaces.

F. Openings in and edges of gratings sections shall be banded with banding bars. Weld bands to intersecting members.

G. Size each section of grating to weigh not more than 100 pounds, unless otherwise indicated in the Contract Documents.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions under which Work is to be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Check all dimensions at the Site after piping and equipment are in place and determine exact locations of openings and cutouts.

3.2 INSTALLATION

A. Fastening to In-Place Construction:
   1. Use anchorage devices and fasteners to secure aluminum grating to supporting members or prepared openings, as recommended by manufacturer.
   2. Weld Type 316 stainless steel stud bolts to receive saddle clip or flange block anchors to supporting steel members. Drill for machine bolts when supports are aluminum.

B. Cutting, Fitting, and Placing:
   1. Perform cutting, drilling, and fitting required for installation. Set the Work accurately in location, alignment and elevation, plumb, level, true, and free of rack. Do not use wedges or shimming devices.
   2. Where gratings are penetrated by piping, electrical conduit, ducts, structural members, or similar protrusions, cut openings neatly and accurately to size and attach banding bar as specified.
   3. Divide panels into sections only to extent required for installation where aluminum grating is to be installed around previously installed piping, electrical conduit, ducts, structural members, or similar protrusions.

C. Aluminum gratings in concrete floors shall be removable and arranged in sizes to be readily lifted. Provide aluminum gratings in concrete with aluminum angle frames with mitered corners and welded joints. Grind exposed joints smooth. Frames shall have welded anchors set into concrete. Angle size shall match grating depth selected for flush fit.

D. Clearance at ends or between sections of grating shall be a maximum of 1/4-inch.

E. Tops of aluminum gratings shall be set flush with surrounding construction.

F. Aluminum gratings shall be set with full and uniform end bearing on frames to preclude rocking movement; do not use wedges or similar shimming devices.

G. Protection of Aluminum from Dissimilar Materials: Coat aluminum surfaces in contact with dissimilar materials such as concrete, masonry, steel, or other metals, in accordance with Section 09 91 00, Painting.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, material, tools, equipment, and incidentals as shown, specified, and required to furnish and install all miscellaneous rough carpentry Work.
   2. The Work also includes:
      a. Providing openings in miscellaneous rough carpentry to accommodate the Work under this and other Sections and building into miscellaneous rough carpentry items such as sleeves, anchorages, inserts and other items to be embedded in or penetrating miscellaneous rough carpentry for which placement is not specifically provided under other Sections.
   3. Extent of miscellaneous rough carpentry is shown or indicated.
   4. Types of materials required include:
      a. Framing lumber.
      b. Miscellaneous blocking, furring strips, and other miscellaneous wood framing.
      c. Lumber for temporary protection.
      d. Lumber for temporary support.
      e. Pressure treatment of lumber specified in this Section.
      f. Miscellaneous accessories.
      g. Air and water infiltration barrier system.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before miscellaneous rough carpentry Work.

C. Related Sections:
   1. Section 05 05 33, Anchor Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ALSC PS 20, American Softwood Lumber Standard.
   2. ASME B18.2.1 Square and Hex Bolts and Screws, Inch Series.
   3. ASME B18.6.1 Wood Screws, Inch Series.
   4. ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   5. ASTM F1667, Specification for Driven Fasteners: Nails, Spikes, and Staples.
   6. AWPA M4, Care of Preservative Treated Wood Products.

7. AWPA P5, Waterborne Preservatives.
8. AWPA P17, Fire Retardant Formulations.
9. AWPA T1, Use Category System: Processing and Treatment Standard.
10. AWPA U1, Use Category System: User Specification for Treated Wood.
11. APA E445S, Performance Standards and Policies for Structural-Use Panels (APA PRP-108).
12. NIST PS-1, Construction and Industrial Plywood.
13. Northeastern Lumber Manufacturers Association (NELMA), Standard Grading Rules for Northeastern Lumber.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and the building code referred to in Section 01 42 00, References for size, spacing and attachment of wood members, unless more stringent requirements are shown or specified in the Contract Documents.

B. Certifications:
   1. Pressure Treatment: For each type of pressure treatment specified, submit certification by wood treating plant stating chemicals and process used, and certifying conformance with applicable standards referenced in the Contract Documents.
      a. For water borne preservatives, include statement that moisture content of treated materials was reduced to maximum of 19 percent prior to shipment to the Site.
   2. Certificates of Grade: Where appearance of wood is important and grade marks will deface the Work, in lieu of grade markings on wood, submit certificates attesting that materials comply with grade requirements specified.

1.4 SUBMITTALS

A. Action Submittals; Submit the following:
   1. Shop Drawings:
      a. List of species and grade of lumber proposed for each use.
      b. Fastener schedule with location, size, material and type of each fastener to be used in the Work.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Lumber treater's certification of compliance, in accordance with Paragraph 1.3.B.1 of this Section.
      b. Certificates of grade in accordance with Paragraph 1.3.B.2 of this Section.
   2. Manufacturer's Instructions:
      a. Chemical treatment manufacturer's instructions for proper use of each type of treated material.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Deliver products to Site to ensure uninterrupted progress of the Work. Deliver anchorage products that are to be embedded in concrete or masonry in ample time to prevent delaying the Work.
   2. Handle treated materials in accordance with AWPA M4.
   3. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Keep materials dry during delivery and storage.
   2. Keep materials off ground using pallets, platforms, or other appropriate supports. Protect materials from corrosion and deterioration. Stack lumber and provide air circulation within stacks.
   3. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Lumber, General:
   1. Factory-mark each piece of lumber with type, grade, mill and grading agency. Surfaces that will be exposed to view shall not have grade marks or other types of identifying marks.
   2. Nominal sizes are shown or indicated, unless otherwise shown or indicated in the Contract Documents. Provide actual sizes as required by ALSC PS 20 for moisture content specified for each use.
      a. Provide dressed lumber, surfaced four sides (S4S), unless otherwise shown or specified.
      b. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing.
   3. Provide the following grade and species:
      a. Construction Grade, for material up to and including four-inch wide.
      b. No. 2 or better for material greater than four-inch wide up to and including 12-inch wide.
      c. No. 3 or better for material greater than 12-inch wide.
      d. Eastern White Pine, NELMA.
   4. Lumber for Protection and Temporary Support: Size and grades to conform to Laws and Regulations, including OSHA.

B. Plywood for Diaphragms: Provide the following:
   1. NIST PS-1 rated sheathing, exterior exposure, Grade C-C, with minimum thickness shown on the Drawings, and span rating not less than 24/0.
      a. Mark each sheet to identify plywood by species group or span rating, exposure durability classification, grade, and compliance with NIST PS-1) Surfaces that will be exposed to view shall not bear grade marks or other identifying marks.

C. Water and Air Infiltration Barrier:
   1. Provide vapor permeable membrane recommended by manufacturer for installation on outside face of plywood wall siding.
   2. Provide minimum moisture vapor transmission of 35 grains per square meter per 24-hour period.
   3. Products and Manufacturers: Provide one of the following:
      a. Tyvek Housewrap by DuPont Company Textile Fibers Department.
      b. Typar Housewrap by Reemay, Incorporated.
      c. Or equal.

D. Fasteners and Anchorages:
   1. Fasteners exposed to the weather as well as fasteners embedded in, or in contact with, preservative treated wood shall be hot-dip galvanized.
   2. Common wire nails shall conform to ASTM F1667.
   3. Wood screws shall conform to ASME B18.6.1.
   4. Lag screws and lag bolts shall conform to ASME B18.2.1.
   5. Anchorage devices shall conform to Section 05 05 33, Anchor Systems.
   6. Use joist hangers, framing anchors and clips where shown or specified.
      a. Joist hangers shall be steel, zinc coated, sized to fit the supporting member, of sufficient strength to develop full strength of the supported member in accordance with applicable building code, and furnished complete with special nails required by joist hanger manufacturer.
      b. Framing anchors shall be hot-dip galvanized steel conforming to ASTM A653/A653M, Z275 G90. Steel shall not be lighter than 18-gage. Use special nails furnished by manufacturer for nailing.
      c. Clips shall consist of hot-dip galvanized conforming to ASTM A653/A653M, Z275 G90 steel angles, minimum 3/16-inch thick.

E. Wood Trim:
   1. Western red cedar, custom grade.
   2. Provide solid wood boards and battens complying with ALSC PS 20 and with applicable grading rules of authorized lumber inspection bureau or association under which each species is produced, S4S, with square edges.
   3. Provide dressed, seasoned boards and battens with 15 percent maximum moisture content complying with dry size requirements of ALSC PS 20. Mark boards “MC-15” (moisture content 15 percent) or “KD” (kiln dried).

F. Panel edge clips: Extruded galvanized steel, H-shaped clips to prevent differential deflection of roof sheathing.

2.2 WOOD TREATMENT

A. Preservative Treatment: Comply with AWPA P5, "Alkaline Copper Quat Mixture". Mark each treated item to comply with AWPA quality mark requirements.
   1. Pressure-treat above ground items with water-borne preservatives in accordance with AWPA U1 and AWPA T1. After treatment, kiln-dry to

maximum moisture content of 19 percent. Treat materials indicated on the Drawings and the following:

a. Wood nailers, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
b. Wood, plates, blocking, furring, stripping, and similar concealed members and wood in contact with masonry, concrete, or steel.
c. Soffit and rain drainage framing.

2. Complete the fabrication of treated items prior to treatment, wherever possible. If wood is cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of wood after drying and discard damaged or defective pieces.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrates and supporting structure and conditions under which miscellaneous rough carpentry Work will be installed and notify Engineer in writing of conditions detrimental to proper completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordination: Fit miscellaneous rough carpentry Work to other Work and work under other contracts, as applicable, and scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other construction.

B. General:
1. Discard units of material with defects that might impair quality of the Work, and units too small to fabricate the Work with minimum joints or optimum joint arrangement.
2. Set miscellaneous rough carpentry Work accurately to required levels and lines, with members plumb and true, accurately cut and fitted.
3. Securely attach miscellaneous rough carpentry Work to substrates by anchoring and fastening as shown and indicated in the Contract Documents. Countersink nail heads on exposed miscellaneous rough carpentry Work and fill holes. Make tight connections between members.
4. Install fasteners without splitting of wood, pre-drill as required and for masonry anchors fastened to wood stud wall framing.

C. Wood Grounds, Nailers, and Blocking:
1. Provide where shown or indicated, and where required for attachment of other construction. Form to shapes as shown or indicated and cut as required for true line and level of Work to be attached. Coordinate location with other work involved.

2. Attach substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown or indicated.
3. Provide permanent grounds of dressed, preservative-treated, key-bevelled lumber not less than 1.5-inch wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

D. Plywood, General:
1. Install in accordance with the Contract Documents and requirements of authorities having jurisdiction.
2. Allow for installed clearances between individual plywood panels as specified by plywood manufacturer. Provide 1/4-inch space at panel edge joints and 1/8-inch space at panel end joints, unless otherwise recommended by manufacturer.
3. Install plywood with long dimension across supports.
4. Install roof sheathing using 8d helical or annular nails spaced fix inches at panel edges and 12 inches at intermediate framing.
5. Provide panel edge clips at unsupported edges of roof sheathing.

E. Plywood, Diaphragm:
1. Diaphragms shall be blocked or unblocked, as shown or indicated on the Drawings. Comply with nailing schedule on the Drawings.
2. Provide continuous lumber blocking at unsupported edges of blocked diaphragms. Do not use panel edge clips in blocked diaphragms.

F. Air and Water Infiltration Barrier:
1. Install air and water infiltration barrier over entire wall area of wood framed building, as shown or indicated in the Contract Documents.
2. Comply with manufacturer's written installation instruction and provide large head sheathing nails sufficiently long to penetrate and grip framing studs, sills, and plates.
3. Fabric shall be snugly taunt before nailing with all fabric lapped 12-inches minimum, at splices.
4. Tape all seams along sills.

+ + END OF SECTION + +

SECTION 07 31 10

ASPHALT SHINGLES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all supervision, labor, materials, and equipment in the Work for asphalt shingles, nails, ridge vents when required, rain diverters when required and prefabricated vent products for steep roofs, as shown and specified.
      a. Providing openings in asphalt shingles to accommodate the Work under this and other Sections and building into the asphalt shingles all items such as sleeves, inserts and all other items to be embedded in asphalt shingles for which placement is not specifically provided under other Sections.
   2. The extent of asphalt shingles Work is shown and is defined to include exterior asphalt shingles, ridge vents, cap and drip flashings, and all other associated trim and accessories.
   3. The types of preformed, metal roof panel Work required include the following:
      a. Asphalt shingles.
      b. Underlayment.
      c. Metal flashing and trim.
      d. Miscellaneous fasteners, and accessories.

B. Coordination
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or embedded in, the asphalt shingles.

C. Related Sections:
   1. Section 07 62 00, Sheet Metal Flashing and Trim.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ASTM D3462 – Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Minerals Granules
   2. ASTM D4586 – Asphalt Roof Cement, ASTM D1970 – Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   3. ASTM D3161 – Standard Test Method for Wind-Resistance of Asphalt Shingles.
   4. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings.

5. NRCA 0418 – Steep-slope Roof System Manual.
6. UL 790 – Standard Test Methods for Fire Tests of Roof Coverings.
7. UL 997 – Wind Resistance of Prepared Roof Covering Materials.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide company specializing in asphalt shingle roofing products with a minimum of ten years of experience.

B. Installer Qualifications:
   1. Engage a single installer regularly engaged in asphalt shingle installation and with experience in the erection of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.

C. Component Supply and Compatibility: Obtain all asphalt shingles and accessories from the same manufacturer.

D. Pre-installation meeting: Conduct conference at project site or other location as agreed upon by all participants.

E. Fire-Test-Response Classification: Where products with a fire-test-response classification are specified, provide asphalt shingles identical to those tested according to ASTM E 108 or UL 790 and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify each bundle of asphalt shingles with appropriate markings indicating fire-test-response classification of applicable testing and inspecting agency.

F. Wind-Resistance-Test Characteristics: Provide products identical to those tested according to ASTM D 3161 or UL 997 and passed. Identify each bundle of asphalt shingles with appropriate markings of applicable testing and inspecting agency.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Product data for each type of product specified, including details of construction relative to materials, dimensions of individual component, profiles, textures, and colors.
      b. Copies of manufacturer's specifications, standard and custom detail drawings, and installation instructions for asphalt shingles, and trim.
      c. Details of asphalt shingles, and the details of installing and overlapping shingles, fastening, trim, flashing, and accessories. Show details of weatherproofing at edges, terminations, and penetrations of the asphalt shingle Work. Show 1/4-inch to the foot scale layout and elevations of

entire Work. Show all details at 3-inch to the foot scale, indicating all flashing components, details, and any special fabrication techniques.

2. Samples:
    a. Samples of each type of asphalt shingle and trim complete with factory-applied finish, two foot long by full-width. Samples will be reviewed by Engineer for pattern, texture, and color only. Compliance with other requirements is the exclusive responsibility of Contractor.
    b. One of each type of fastener employed, with statement of intended use. Samples will be reviewed by Engineer for material and color only. Compliance with other requirements is the exclusive responsibility of Contractor.
    c. Complete selection of manufacturer's standard and custom colors. Provide full color board to be reviewed by Engineer.

B. Informational Submittals: Submit the following:
    1. Qualification Statements.
        a. Installer's qualifications.

C. Closeout Submittals:
    1. Warranty Documentation:
        a. Submit manufacturers and Contractor's written warranties as specified, herein.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in manufacturer's unopened bundles or containers with labels intact.

B. Handle and store materials at Project site to prevent water damage, staining, or other physical damage. Store roll goods on end. Comply with manufacturer's recommendations for job-site storage, handling, and protection. Requirements for sequencing and coordinating with current construction contracts and with Owner’s operations, including maintenance of facility operations during construction, are in Section 01 14 16, Coordination with Owner’s Operations.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installing asphalt shingles only when existing and forecasted weather conditions will permit work to be performed according to manufacturers' recommendations and warranty requirements, and when substrate is completely dry.

B. Scheduling:
    1. Coordinate asphalt shingle Work with flashing, trim, and the construction of soffits, fascias, parapets, and other adjoining work, to provide a permanently watertight, leak-proof, secure and non-corrosive installation.

2. Deliver materials to the Site in sufficient quantities to ensure uninterrupted progress of the Work.
3. Schedule the installation of asphalt shingles to coincide with the installation of waterproofing, drains, piping, vents, blocking, nailers, reglets, framing at openings, curbs, parapets, gutters and other adjoining and substrate Work.
4. Proceed with and complete the Work only when materials, equipment, and knowledgeable tradesmen, required for the installation of roof specialties, are at the Site and are ready to follow, and integrate asphalt shingle Work with flashing Work, in order to maintain watertight conditions.

1.7 WARRANTIES

A. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt-shingle roofing that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Provide a written manufacturer's warranty agreeing to replace asphalt shingle Work which fails in materials within specified warranty period.
   1. Failure shall include, but are not limited to, the following:
      a. Manufacturing defects.
   2. Materials warranty period: Limited Lifetime warranty from the date of Substantial Completion.
   3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 105 MPH for 25 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 DESIGN CRITERIA

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Laminated-Strip Asphalt Shingles: ASTM D 3462/D 3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
   1. Products and Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Landmark TL Shingles by CertainTeed Corporation.
      b. Timberline HDZ Shingles by GAF Materials Corporation.
      c. Duration Flex Shingles by Owens Corning.
      d. Or Equal.
   2. Algae Resistance: Granules resist algae discoloration.
   3. Impact Resistance: UL 2218, Class 4.
   4. Color and Blends: As selected by Engineer from manufacturer's full range.

2.2 METAL TRIM AND FLASHING

A. Sheet Metal Materials: Furnish sheet metal materials as specified in Section 07 62 00, Sheet Metal Flashing and Trim.

2.3 ACCESSORIES

A. Fiberglass-reinforced asphaltic underlayment.
   1. Roll size: 4 squares (432 sq. ft.).
   2. Roll width: 36-inches.
   3. Roll length: 144-feet.
   4. Approx. roll weight: 30 lb.
   5. Meets or exceeds ASTM D226, Type II and ASTM D4869.
   6. Product and Manufacturer: Provide one of the following:
      a. Shingle-Mate Roof Deck Protection by GAF.
      b. Or Equal.

B. Underlayment for shingles shall be waterproofing underlayment, total mm1mum thickness of 60 mil, fiberglass reinforced with SBS modified asphalt (15lb.), complying with ASTM D1970-90 and UL approved (two layers).

C. Asphalt Plastic Cement: Non-asbestos fibrated asphalt cement, complying with ASTM D4586.

D. Nails: Unless otherwise recommended by the shingle manufacturer nails shall be hot-dip galvanized steel, 0.120-inch diameter barbed shank, sharp-pointed, conventional roofing nails with a minimum 3/8-inch diameter head and of sufficient length to penetrate 3/4 inch into solid decking or at least 1/8 inch through plywood sheathing.

E. Where nails are in contact with flashing, prevent galvanic action by providing nails made from the same metal as the flashing.

F. Rain diverters: 20-gauge prefinished copper, where required on the drawings.

G. Ridge Vent: Nailable, designed for shingle overlay. Color as approved by Engineer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of asphalt shingles. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with noncorrosive roofing nails.

B. Coordinate installation with flashings and other adjoining work to ensure proper sequencing. Do not install roofing material s until all vent stacks and other penetrations through roof sheathing have been installed and are securely fastened against movement.

3.3 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendation s but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" or "The NRCA Steep Roofing Manual.

B. Fasten asphalt shingles to roof sheathing with nails.

C. Felt Underlayment: Apply layer of felt underlayment horizontally over the entire surface to receive asphalt shingles, lapping succeeding courses a minimum of 2 inches, lap ends a minimum of 4 inches, and hips and valleys a minimum of 6 inches. Fasten felt with a sufficient number of roofing nails or noncorrosive staples to hold underlayment in place until asphalt shingle installation. Apply the second layer of felt underlayment on roof deck over lapping joints on first layer by a minimum of 12 inches.

D. Flashing: Install metal flashing and trim as indicated and according to details and recommendations of the "Asphalt Roofing" section of "The NRCA Steep Roofing Manual" and ARMA 's " Residential Asphalt Roofing Manual."

E. Install asphalt shingles, beginning at the roof's lower edge, with a starter strip of roll roofing or inverted asphalt shingles with tabs removed. Fasten asphalt shingles in the desired weather exposure pattern; use the number of fasteners per shingle recommended by the manufacturer. Use vertical and horizontal chalk lines to ensure straight coursing.
   1. Cut and fit asphalt shingles at ridges, and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof. Lap asphalt shingles at ridges to shed water.

F. Use fasteners at ridges of sufficient length to penetrate sheathing as specified.

G. Install pre-molded vent products in full accordance with manufacturers' instructions.

H. Valleys: Provide either closed cut or woven valleys.
   1. Closed Cut Valleys: Provide 36-inch-wide valley lining of single layer of smooth-surfaced or mineral-surfaced roll roofing, with mineral-surface facing down, for full length of valleys as follows.
      a. Center lining in valley over underlayment. Provide minimum 12-inch end laps in the lining and seal laps with asphalt roof cement. Fasten lining to hold it in place until shingles are applied.
      b. Apply first regular course of shingles along eaves of one of the intersecting roof planes and across valley. Extend course at least 12 inches onto adjoining roof.
      c. Apply succeeding course in same manner as first course, extending across valley and onto adjoining roof.
      d. Press shingles tightly into valley and nail in normal manner, except apply nails not closer than 6 inches to valley centerline and apply additional nail in top corner of each shingle crossing valley.
      e. Apply shingles on the adjoining roof plane, starting alone eaves and across valley onto previously applied shingles. Trim overlapping courses back to a line parallel to and a minimum of 2 inches back from valley centerline.
      f. Trim one inch on a 45-degree angle from upper comer of each end shingle. Embed end shingles in a 3-inch-wide band of asphalt roof cement.
   2. Woven Valleys: Provide valley lining as specified for closed cut valley. Lay valley shingles over lining by either of the following methods:
      a. Method I: Apply regular shingles on both roofs simultaneously. Weave each course in tum over the valley. Lay the first regular course of shingles along eaves of roof up to and over valley. Extend course along adjoining roof deck at least 12 inches. Carry first regular course of shingles of adjoining roof over valley on top of previously applied shingles. Lay succeeding courses alternately, weaving valley shingles over each other for full length of valley.

b. Method II: Apply regular shingles on each roof surface separately to a line about 3 feet from center of valley, and weave valley shingles in place later, as specified for Method I. In following either method, press shingle s tightly into valley, and fasten in normal manner; except apply nails not closer than 6 inches to valley centerline, and apply additional nail in top comer of terminal shingle on both sides of valley.

I. Install in accordance with the manufacturer's printed instructions.

3.4 ADJUSTING

A. Replace any damaged materials installed under this Section with new materials that meet specified requirements.

+ + END OF SECTION + +

SECTION 07 46 46

FIBER-CEMENT SIDING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes fiber-cement siding and soffit.

B. Related Requirements:
   1. Section 06 10 53, Miscellaneous Rough Carpentry for wood furring, grounds, nailers, and blocking.

1.3 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site or virtually.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Initial Selection: For fiber-cement siding and soffit including related accessories.

C. Samples for Verification: For each type, color, texture, and pattern required.
   1. 12-inch-long-by-actual-width Sample of siding.
   2. 24-inch-wide by 24-inch-high Sample panel of siding assembled on plywood backing.
   3. 12-inch-long-by-actual-width Sample of soffit.
   4. 12-inch-long-by-actual-width Samples of trim and accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement siding and soffit.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.

C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
   1. Build mockups for fiber-cement siding and soffit including accessories.
      a. Size: 48 inches long by 60 inches high, minimum.
      b. Include outside corner on one end of mockup.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including cracking and deforming.
      b. Deterioration of materials beyond normal weathering.

   2. Warranty Period: 30 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   2. Basis-of-Design Product: Subject to compliance with requirements, provide James Hardie Siding Products; Sierra 8 HardiePanel, or comparable product by one of the following:
      a. CertainTeed Corporation.
      b. GAF Materials Corporation.
      c. James Hardie Building Products, Inc.
      d. James Hardie Siding Products.
      e. Or Approved Equal.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than 5/16 inch.

D. Vertical Pattern: 48-inch-wide sheets with wood-grain texture and smooth grooves.

E. Factory Priming: Manufacturer's standard acrylic primer.

2.3 FIBER-CEMENT SOFFIT

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

   1. Basis-of-Design Product: Subject to compliance with requirements, provide James Hardie Building Products; Hardie Soffit, Vented Smooth product or comparable product by one of the following:
      a. CertainTeed Corporation.
      b. James Hardie Building Products, Inc.
      c. Or Approved Equal.

B. Nominal Thickness: Not less than 5/16 inch.

C. Pattern: 12-inch-wide sheets with smooth texture.

D. Ventilation: Provide perforated soffit at bottom of roof, provide non-perforated soffit at rake ends.

E. Factory Priming: Manufacturer's standard acrylic primer.

2.4 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
   1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:
   1. Outside Corner Boards:
      a. Hardie Trim Batten Boards, Rustic Grain, 2-1/2” wide by ¾” thick.
      b. Or Equal.
   2. Door and Window Casings:
      a. Hardie Trim Boards, Rustic Grain, 3-1/2” wide by 1” thick.
      b. Or Equal.
   3. Fascia and Rake Boards.
      a. Hardie Trim Boards, Rustic Grain, 1” thick, width to match existing.
   4. Moldings and trim.
   5. <**Insert accessories**>.

C. Flashing: Provide stainless-steel flashing complying with Section 07 62 00, Sheet Metal Flashing and Trim at bottom of wall, window and door heads, and where indicated.

D. Fasteners:
   1. For fastening to wood, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch into substrate.
   2. For fastening fiber cement, use hot-dip galvanized fasteners.

E. Insect Screening for Soffit Vents: Aluminum, 18-by-16 mesh.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and soffit and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
   1. Do not install damaged components.
   2. Install fasteners no more than 24 inches O.C.

B. Install joint sealants as specified in Section 07 92 00, Joint Sealants and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install sheet metal flashing and trim.
   2. The Work also includes:
      a. Providing openings in sheet metal flashing and trim to accommodate the Work under this and other Sections and building into the sheet metal flashing and trim all items such as sleeves, anchor bolts, inserts and all other items to be embedded in sheet metal flashing and trim for which placement is not specifically provided under other Sections.
   3. Extent of the sheet metal flashing and trim is shown.
   4. Types of products required include the following:
      a. Stainless steel sheet flashing.
      b. Miscellaneous flashing not supplied under other Sections.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the sheet metal flashing and trim Work.
   2. Work advanced without sheet metal flashing and trim items that are specified to be cast-in-place or built-in-place as the Work advances, shall be stopped, demolished and rebuilt incorporating specified sheet metal flashing and trim Work, at no additional cost to OWNER.

C. Related Sections:
   1. Section 06 10 53, Miscellaneous Rough Carpentry.
   2. Section 05 50 13, Miscellaneous Metal Fabrications.
   3. Section 07 31 10, Asphalt Shingles.
   4. Section 07 92 00, Joint Sealants.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. The Aluminum Association, (AA).
      a. AA, ASD-1 - Aluminum Standards and Data.
      b. AA, DAF-45 - Designation System for Aluminum Finishes.
      c. AA, SAA-46 - Anodized Architectural Aluminum.
   2. American Society for Testing and Materials, (ASTM).

a. ASTM A 480, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
b. ASTM A 666, Specification for Annealed or Cold-Worked Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar.
c. ASTM B 29, Specification for Refined Lead.
d. ASTM B 32, Specification for Solder Metal.
e. ASTM B 749, Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
f. ASTM D 4586, Specification for Asphalt Roof Cement, Asbestos-Free.

3. FM Global, Loss Prevention Data for Roofing Contractors, 1-49 - Perimeter Flashing.
4. NRCA, Low-Slope Membrane Roofing Construction Details Manual.
5. SMACNA 1013, Architectural Sheet Metal Manual.
6. SSPC - Paint 12, Cold Applied Asphalt Mastic (Extra Thick Film).

1.3 QUALITY ASSURANCE

A. Installer Qualifications:
1. Engage a single installer who is a recognized flashing and trim installer, skilled and experienced in the type of flashing and trim Work required, and equipped to perform workmanship in accordance with recognized standards so that there will be undivided responsibility for the performance of the Work. Submit name and qualifications to ENGINEER along with at least three successfully completed Projects including names and telephone numbers of owners, architects and engineers, responsible for the project and the approximate contract price for flashing and trim work.
2. The installer of the sheet metal flashing and trim Work shall be franchised or otherwise accepted in writing by the roofing materials manufacturer for installation of fully guaranteed roofing Work in accordance with these Specifications. Refer to Section 07 31 10, Asphalt Shingles for roof warranty details.

B. Source Quality Control:
1. Except as otherwise shown, comply with recommendations of the roofing manufacturer concerning the installation of flashing and trim that affects the roofing bond or warranty.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
a. Drawings showing the manner of forming, jointing and securing flashings and trim. Show fully dimensioned joint details and waterproof connections to adjoining Work and details at obstructions and penetrations.
b. Drawings showing the coordination of the Work of this Section with Section 06 10 53, Miscellaneous Rough Carpentry, and Section 07 31 10, Asphalt Shingles. Provide detailed Shop Drawings showing large scale details of sections and profiles of all sheet metal flashing and trim to be

used in the Work, with all items, including fastener locations, cleats and other miscellaneous accessories necessary to complete the Work, fully dimensioned, properly located, quantified and presented such that sequence of installation is acceptable to each roofing system and adjacent construction material installer.

2. Samples:
   a. 12-inch square samples of specified sheet metal flashing and trim metals.
3. Product Data:
   a. Copies of manufacturer's specifications, installation instructions and general recommendations for sheet metal flashing and trim required. Include manufacturer's data substantiating that the materials comply with the requirements.

B. Informational Submittals: Submit the following:
   1. Qualifications Statements:
      a. Installer’s qualifications

C. Closeout Submittals: Submit the following:
   1. Warranty
      a. Submit warranty as specified in Article 1.7

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
   1. Deliver sheet metal flashing and trim materials in manufacturer's original, unopened, and undamaged containers and rolls, with labels intact and legible, indicating compliance with approved Shop Drawings.
   2. Items delivered in broken, damaged, rusted, or unlabeled condition shall immediately be removed from Site and not offered again for approval by ENGINEER.

B. Storage of Materials:
   1. Store materials in an area undercover and protected from construction traffic.
   2. Store materials in same package in which they were shipped, off the ground and on platforms protected from dirt and other contamination.
   3. Store in a manner which does not permit water to remain on sheet metal flashing and trim materials and system components.

C. Handling of Materials:
   1. Protect sheet metal flashing and trim from dents, scratches, warps and bends.
   2. Remove strippable protective film, immediately preceding installation of each system component.

1.6 JOB CONDITIONS

A. Scheduling:
   1. Do not proceed with sheet metal flashing and trim Work until curb and substrate construction, cant strips, blocking, reglets and other construction to receive the Work is completed.
   2. Deliver materials to the Site in sufficient quantities to ensure uninterrupted progress of the Work.
   3. Schedule the installation of sheet metal flashing and trim to coincide with the installation of roofing, waterproofing, drains, piping, blocking, nailers, siding and trim, reglets, framing at openings, curbs, parapets and other adjoining and substrate Work.
   4. Proceed with and complete the Work only when materials, equipment and knowledgeable tradesmen, required for the installation of sheet metal flashing and trim, are at the Site and are ready to follow, and integrate sheet metal flashing and trim Work with roofing Work, in order to maintain watertight conditions.

1.7 WARRANTY

A. Provide reglet and counterflashing manufacturer’s five year warranty against defects and workmanship.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Performance Criteria:
   1. Sheet metal flashing and trim shall be permanently watertight, and not deteriorate in excess of manufacturer's published limitations.
   2. Comply with fabrication details recommended by FM, SMACNA, NRCA and the requirements of the sheet metal flashing and trim manufacturer, and as shown on approved Shop Drawings.

2.2 MATERIALS

A. Sheet Metal Flashing and Trim:
   1. Stainless Steel Sheet metal flashing and trim: Provide 26 gage sheet stainless steel, Type 316, complying with ASTM A 666, with No. 2D dead soft, fully annealed finish, unless required to be harder temper for proper forming and performance for application indicated.

B. Miscellaneous Materials:
   1. Solder for Stainless Steel: ASTM B 32, 60 percent tin and 40 percent lead alloy grade 60A, used with an acid flux of the type recommended by the stainless steel manufacturer. Use a non-corrosive rosin flux over tinned surfaces.

2. Stainless Welding Rods: Type recommended by stainless steel sheet manufacturer for the type of metal sheets furnished.
3. Nails, Screws and Rivets: Same material as flashing sheet, or as recommended by manufacturer of flashing sheet.
4. Cleats: Same metal and gage as sheet being anchored, 2-inches wide, punched for two anchors.
5. Bituminous Coating: SSPC-Paint 12, cold-applied solvent-type bituminous mastic coating for application in dry film thickness of 15-mils per coat.
6. Sealants: Refer to Section 07 92 00, Joint Sealants.
7. Roofing Cement: Provide a medium to heavy trowel-grade, cut-back asphalt mastic roof cement reinforced with non-asbestos fibers, and containing petroleum solvents and special mineral stabilizers, complying with ASTM D 4586, Type II.
8. Base Flashing Felts: Asphalt-coated, polyester/glass scrim reinforced flashing sheet or as recommended by the manufacturer of the built-up bituminous roofing.
9. Miscellaneous steel plate for scuppers, escutcheon, and bearing plates: Section 05 50 13, Miscellaneous Metal Fabrications.

2.3 FABRICATION

A. Fabricated Metal Flashing: Shop-fabricate metal sheet metal flashing and trim to comply with profiles and sizes shown, and to comply with manufacturer's recommended details. Except as otherwise shown or specified, provide soldered flat-lock seams, and fold back metal to form a hem on the concealed side of exposed edges. Comply with metal producers' recommendations for tinning, soldering and cleaning flux from metal.

B. Where fabricator does not recommend grinding welds smooth, comply with SMACNA formed metal details requiring double-lock seamed construction.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installer shall examine the substrate and the conditions under which the sheet metal flashing and trim Work is to be performed, and notify ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with sheet metal flashing and trim Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 PREPARATION

A. Before installing sheet metal flashing and trim, verify shapes, and dimensions to be covered.

B. Prepare substrates as recommended by the sheet metal manufacturer.

3.3 INSTALLATION

A. General:
   1. Separate dissimilar metals from each other by painting each metal surface in the area of contact with a heavy application of bituminous coating, or by other permanent separation as recommended by the manufacturers of the dissimilar metals. Comply with the following:
      a. Separate stainless steel from dissimilar metals, including regular steel and iron, and from cementitious materials by a course of roofing felt wherever possible. Where felt application is not possible, coat the stainless steel or the other material with a 15-mil bituminous coating. Where felt is applied under sheets which will be soldered or welded, cover felt with a course of building paper before installing stainless steel. Comply with manufacturer's recommendations for other forms of protection of the stainless steel against corrosion.
   2. Provide thermal expansion for running trim, flashing, valleys, and other items exposed for more than 15 feet-0 inches continuous length. Maintain a watertight installation at expansion seams. Locate expansion seams as shown or, if not shown, at the following maximum spacing for each general flashing use:
      a. Valleys: Midway between drains (at high points in slopes), but in no case more than 30 feet-0 inches apart, except as otherwise shown.
      b. Sheet metal flashing and trim: At 10 feet-0 inch intervals and 2 feet-0 inch each side of corners and intersections.
   3. Fabricate and install Work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform, neat flat-locked seams with minimum exposure of solder, welds and sealant. Except as otherwise shown, fold back the sheet metal to form a hem on the concealed side of exposed edges. All exposed edges of all sheet metal flashing shall be hemmed not less than 1/2-inch wide.
   4. Conceal fasteners and expansion provisions wherever possible in exposed Work, and locate so as to minimize the possibility of leakage. Cover and seal Work as required for a watertight installation.
      a. Provide cleat-type anchorages for metal flashings and trim wherever practical, arranged to relieve stresses from building movement, and thermal expansion and contraction.
   5. On vertical surfaces lap two-piece flashings a minimum of 4-inches.
   6. On sloping surfaces, for slopes of not less than 6-inches in 12-inches, lap unsealed flashings a minimum of 6-inches. For slopes less than 6-inches in 12-inches use soldered flat locked seams.
   7. For embedment of metal flashing flanges in roofing or composition flashing or stripping, extend flanges for a minimum of 4-inches embedment.

B. Installation of Stainless Steel Sheet Metal Flashing and Trim:
   1. Tin the edges of plain stainless steel to be soldered, for a width of 1-1/2-inches, using solder for stainless steel and acid flux. Remove every trace of acid flux residue from the metal promptly after tinning or soldering.
   2. Where welded joints are shown, provide upturned, 1/2-inch wide hooked flanges, and weld between adjoining sheets; lay seam flat.

3.4 ADJUSTMENT AND CLEANING

A. Protect sheet metal flashing and trim until Final Acceptance of the Work.

B. Do not permit workmen, or others, to step directly on flashing sheets in place, or to place or move equipment over sheet metal flashing and trim surfaces. Protect surfaces during installation of permanent covering work and adjoining Work.

C. Neutralize excess flux as the Work progresses with five percent to percent washing soda solution and rinse thoroughly.

D. Clean exposed surfaces of every substance which is visible or might cause corrosion or prevent uniform oxidation of the metal surfaces. Exercise extreme care to remove fluxes and ferrous metal particles, including welding splatter and grinding dust.

++ END OF SECTION ++

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 07 92 00

JOINT SEALANTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install joint sealants.
   2. Extent of each type of calking and sealant is shown or indicated and includes the following:
      a. Interior and exterior joints in equipment and construction systems not filled by another material, and that are not required to be open for operation.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items to be installed with or before joint sealants.
   2. Coordinate final selection of joint sealants so that materials are compatible with all calking and sealant substrates specified.

C. Related Sections:
   1. Section 08 81 00, Glass Glazing.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM C510, Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
   2. ASTM C661, Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
   3. ASTM C793, Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants.
   4. ASTM C794, Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
   5. ASTM C920, Specification for Elastomeric Joint Sealants.
   6. ASTM C1021, Practice for Laboratories Engaged in Testing Building Sealants.
   7. ASTM C1087, Test method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
   8. ASTM C1193, Guide for Use of Joint Sealants.
   9. ASTM C1247, Practice for Durability of Sealants Exposed to Continuous Immersion in Liquids.
   10. BAAQMD Regulation 8, Rule 51.

11. FS TT-S-00227, Sealing Compound: Elastomeric Type, Multi-component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
12. FS TT-S-00230 Sealing Compound: Elastomeric Type, Single Component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
13. NSF/ANSI Standard 61, Drinking Water System Components - Health Effects.
14. SCAQMD Rule 1168.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer:
      a. Engage a single installer, approved by product manufacturer, regularly engaged in calking and sealant installation and with successful experience in applying types of products required, and who employs only tradesmen with specific skill and successful experience in the type of Work required.
   2. Testing Laboratory:
      a. Furnish services of independent testing laboratory qualified according to ASTM C1021, for conducting testing required.

B. Component Supply and Compatibility:
   1. Obtain materials only from manufacturers who will, if required:
      a. Furnish at the Site services of a qualified technical representative to advise installer of proper procedures and precautions for using materials.
      b. Test joint sealants for compatibility with substrates for conformance with FS-TT-S-00227, and recommend remedial procedures as required.
   2. Before purchasing each sealant, investigate its compatibility with joint surfaces, joint fillers, and other materials in joint system. Provide products that are fully compatible with actual installation condition, verified by manufacturer's published data or certification, and as shown on approved Shop Drawings and other approved submittals.

C. Product Testing: Provide test results of laboratory pre-construction compatibility and adhesion testing, as specified in Article 3.1 of this Section, by qualified testing laboratory, based on testing of current sealant formulations within a 36-month period preceding the Notice to Proceed for the Work.
   1. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920 and, where applicable, to other standard test methods.
   2. Test other joint sealants for compliance using specified post-construction field adhesion test.

D. Pre-installation Conference:
   1. Prior to installing joint sealants and associated Work, schedule and meet at the Site with calking and sealant installer, calking and sealant manufacturer's technical representative, other trades involved in coordinating with calking

and sealant Work, ENGINEER, and OWNER. Record discussions of pre-installation conference and decisions, agreements, and disagreements, and furnish copy of record to each party attending conference. Review foreseeable methods and procedures related to calking and sealant Work, including reviewing:

a. Required submittals, both completed and yet to be completed.
b. Status of test reports.
c. Mock-up construction results.
d. Status of substrate and similar considerations.
e. Each major calking and sealant application required.
f. Availability of products, tradesmen, equipment, and facilities required for avoiding delays.

2. Reconvene conference at earliest opportunity if additional information must be developed to conclude subjects under consideration.
3. Record revisions or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Schedule of joint sealants installation, indication each specific surface where calking or sealants are to be provided and the material proposed for each application.
   2. Product Data:
      a. Copies of manufacturer's data sheets including color charts, specifications, recommendations, and installation instructions for each type of sealant, calking compound, and associated miscellaneous material required. Include manufacturer's published data, indicating that each product complies with the Contract Documents and is intended for the applications shown or indicated.
      b. Product test reports.
   3. Samples:
      a. Each type of actual cured material of each calking and sealant specified, in each of manufacturer's standard colors.
      b. Samples will be reviewed by ENGINEER for color and texture only. Compliance with other requirements is responsibility of CONTRACTOR.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certify that materials are suitable for intended use and materials meet or exceed requirements of the Contract Documents.
      b. Certification from manufacturer that products furnished are appropriate for surfaces and conditions to which they will be applied.
      c. Certify that applicator is approved by manufacturer.
   2. Field Quality Control Submittals:
      a. Results of tests on job mock-ups.

b. Pre-construction and post-construction field test reports.
c. Compatibility and adhesion test reports.
d. Contractor's Field Test Report Logs:
1) Indicate time present at the Site.
2) Include observations and results of field tests, and document compliance with manufacturer's installation instructions and supplemental instructions provided to installers.

3. Pre-installation conference record.
4. Qualifications: Submit qualifications for:
a. Installer.
b. Testing laboratory (if not already submitted under Section 01 45 23, Testing Laboratory Services Furnished by Owner, or Section 01 45 13, Testing Laboratory Services Furnished by Contractor).

C. Closeout Submittals: Submit the following:
1. Operation and Maintenance Data:
a. Recommended inspection intervals.
b. Instructions for repairing and replacing failed sealant joints.
2. Warranty: Submit written warranties as specified in this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01 65 00, Product Delivery Requirements, and Section 01 66 00, Product Storage and Handling Requirements, and the following:
1. Delivery of Products:
a. Deliver products in calking and sealant manufacturer's original unopened, undamaged containers, indicating compliance with approved Shop Drawings and approved Sample color selections.
b. Include the following information on label:
1) Name of material and Supplier.
2) Formula or Specification Section number, lot number, color and date of manufacture.
3) Mixing instructions, shelf life, and curing time, when applicable.
2. Storage of Products:
a. Do not store or expose materials to temperature above 90 degrees F or store in direct sunlight.
b. Do not use materials that are outdated as indicated by shelf life.
c. Store sealant tape in manner that will not deform tape.
d. In cool or cold weather, store containers for sixteen hours before using in temperature of approximately 75 degrees F.
e. When high temperatures prevail, store mixed sealants in a cool place.
3. Handling:
a. Do not open containers or mix components until necessary preparatory Work and priming are complete.

1.6 JOB CONDITIONS

A. Environmental Conditions:
   1. Do not install joint sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
   2. Proceed with the Work when forecasted weather conditions are favorable for proper cure and development of high-early bond strength.
   3. Where joint width is affected by ambient temperature variations, install elastomeric sealants when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
   4. When high temperatures prevail, avoid mixing sealants in direct sunlight.
   5. Supplemental heat sources required to maintain both ambient and surface temperatures within the range recommended by manufacturer for material applications are not available at the Site.
   6. Provide supplemental heat and energy sources, power, equipment, and operating, maintenance, and temperature monitoring personnel.
   7. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas of calking, sealants, and painting Work, and areas where OWNER's personnel or construction personnel may work. Properly locate and vent such heat sources to outdoors so that joint sealants and other Work are unaffected by exhaust.

1.7 WARRANTY

A. Provide written warranty, signed by manufacturer and CONTRACTOR, agreeing to repair or replace sealants that fail to perform as air-tight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to deteriorate in any other manner not clearly specified in approved Shop Drawings and other submittals, as an inherent quality of material for exposure indicated.
   1. Provide manufacturer warranty for period of one year from date of Substantial Completion of joint sealants Work.
   2. Provide installer warranty for period of two years from date of Substantial Completion of joint sealants Work.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Provide elastomeric joint sealants for interior and exterior joint applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. VOC Performance Criteria:
   1. VOC content of sealants used shall comply with current VOC content limits of SCAQMD Rule 1168. Sealants used as fillers shall comply with or exceed requirements of BAAQMD Regulation 8, Rule 51.
      a. Sealants: 250 g/L.
      b. Sealant Primers for Nonporous Substrates: 250 g/L.
      c. Sealant Primers for Porous Substrates: 775 g/L.

C. Provide colors selected by ENGINEER from calking and sealant manufacturer's standard and custom color charts. "Or equal" manufacturers shall provide same generic products and colors as available from manufacturers specified.

2.2 MATERIALS

A. Exterior and Interior Vertical Joints; Non-submerged:
   1. Two-component Polyurethane Sealant:
      a. Products and Manufacturers: Provide one of the following:
         1) Sikaflex-2c NS by Sika Corporation.
         2) Dymeric 240 FC by Tremco Sealant/Waterproofing Division of RPM International, Inc.
         3) Or equal.
      b. Polyurethane based, two-component elastomeric sealant complying with:
         1) FS TT-S-00227E: Type II (non-sag) Class A and ASTM C920, Type M, Grade NS, Class 25.
         2) Adhesion-in-Peel, FS TT-S-00227E and ASTM C794: (Minimum five pounds per linear inch with no adhesion failure): 10 pounds.
         3) Hardness (Standard Conditions), ASTM C661: 25 to 35 (Shore A).
         4) Stain and color change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
         5) Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
         6) Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.
         7) VOC Content: 100 g/L, maximum.

B. Exterior and Interior Horizontal Joints; Non-submerged:
   1. Two-component Polyurethane Sealant:
      a. Products and Manufacturers: Provide one of the following:
         1) Sikaflex-2c SL by Sika Corporation.
         2) THC/900 by Tremco Sealant/Waterproofing Division of RPM International, Inc.
         3) Or equal.
      b. Polyurethane based, two-component elastomeric, self-leveling sealant complying with the following:
         1) FS TT-S-00227E, Type I (self-leveling) Class A. and ASTM C920, Type M, Grade P, Class 25

2) Water Immersion Bond, FS TT-S-00227E: Elongation of 50 percent with no adhesive failure.
3) Hardness (Standard Conditions), ASTM C661: 35 to 45.
4) Stain and Color Change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
5) Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
6) VOC Content: 165 g/L, maximum.

C. Miscellaneous Materials:
1. Joint Cleaner: As recommended by calking and sealant manufacturer.
2. Joint Primer and Sealer: As recommended for compatibility with calking and sealant by calking and sealant manufacturer.
3. Bond Breaker Type: Polyethylene tape or other plastic tape as recommended for compatibility with calking and sealant by calking and sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of calking and sealant. Provide self-adhesive tape where applicable.
4. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended for compatibility with calking and sealant by calking and sealant manufacturer. Provide size and shape of rod that will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide highly-compressible backer to minimize possibility of sealant extrusion when joint is compressed.
5. Low-temperature Catalyst: As recommended by calking and sealant manufacturer.

D. Products for Other Applications:
1. Glazing Sealants: Refer to Section 08 81 00, Glass Glazing.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine joint surfaces, substrates, backing, and anchorage of units forming sealant rabbet, and conditions under which calking and sealant Work will be performed, and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work and performance of sealants. Do not proceed with calking and sealant Work until unsatisfactory conditions are corrected.

B. Laboratory Pre-construction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers for testing indicated below samples of materials that will contact or affect joint sealants.

1. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit at least eight pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For products that fail tests, obtain joint-sealant manufacturer's written instructions for corrective measures including using specially formulated primers.
5. Immersion Testing: ASTM C1247 for potable water and wastewater.
6. Testing will not be required if joint sealant manufacturers submit joint preparation data based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted and mock-up field testing is acceptable.

3.2 PREPARATION

A. Protection: Do not allow joint sealants to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces including rough textured materials. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or calking and sealant materials.

B. Joint Surface Preparation:
   1. Clean joint surfaces immediately before installing sealant compound. Remove dirt, weakly adhering coatings, moisture and other substances that would interfere with bonds of sealant compound as recommended in sealant manufacturer's written instructions as shown on approved Shop Drawings.
   2. If necessary, clean porous materials by grinding, sandblasting, or mechanical abrading. Blow out joints with oil-free compressed air or by vacuuming joints prior to applying primer or sealant.
   3. Roughen joint surfaces on vitreous coated and similar non-porous materials, when sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or steel wool to produce a dull sheen.

C. Mixing:
   1. Comply with sealant manufacturer's written instructions for mixing multi-component sealants.
   2. Thoroughly mix components before use.
   3. Add entire contents of activator can to base container. Do not mix partial units.
   4. Mix contents for minimum of five minutes or as recommended by sealant manufacturer, until color and consistency are uniform.

3.3 INSTALLATION

A. Install joint sealants after adjacent areas have been cleaned and before joint has been cleaned and primed, to ensure calking and sealant joints will not be soiled. Replace calking and sealant joints soiled after installation.

B. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or indicated in the Contract Documents, and except where manufacturer's technical representative directs otherwise, only as acceptable to ENGINEER.

C. Prime or seal joint surfaces as shown on approved Shop Drawings and approved other submittals. Do not allow primer or sealer to spill or migrate onto adjoining surfaces. Allow primer to dry prior to applying sealants.

D. Apply masking tape before installing primer, in continuous strips in alignment with joint edge to produce sharp, clean interface with adjoining materials. Remove tape immediately after joints have been sealed and tooled as directed.

E. Do not install sealants without backer rods and bond breaker tape.

F. Roll back-up rod stock into joint to avoid lengthwise stretching. Do not twist, braid, puncture, or prime backer rods.

G. Employ only proven installation techniques that will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

H. Install sealants to depths recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of bead.
   1. For horizontal joints in sidewalks, pavements, and similar locations sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but not more than 5/8-inch deep or less than 3/8-inch deep.
   2. For vertical joints subjected to normal movement and sealed with elastomeric sealants and not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.

I. Remove excess and spillage of compounds promptly as the Work progresses.

J. Cure calking and sealant compounds in compliance with manufacturer's instructions and recommendations, to obtain high-early bond strength, internal cohesive strength, and surface durability.

3.4 FIELD QUALITY CONTROL

A. Post-construction Field Adhesion Testing: Before installing elastomeric sealants, field-test joint sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed elastomeric sealant joints as follows:
      a. Perform ten tests for the first 1,000 feet of joint length for each type of elastomeric sealant and joint substrate.
      b. Perform one test for each 1,000 feet of joint length thereafter, and minimum of one test per each floor per elevation.
      c. Test Method: Test joint sealants according to Method A, Field-applied Sealant Joint Hand Pull Tab, and Method D, Water Immersion in Appendix X1 of ASTM C1193. For joints with dissimilar substrates, verify adhesion to each substrate separately by extending cut along one side and verifying adhesion to opposite side. Repeat procedure for opposite side.
      d. Inspect joints for complete fill, absence of voids, and joint configuration complying with specified requirements. Record results in a log of field adhesion tests.
      e. Inspect tested joints and report on whether:
         1) Sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
         2) Sealants filled the joint cavities and are free of voids.
         3) Sealant dimensions and configurations comply with specified requirements.
      f. Record test results in a log of field adhesion tests. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
      g. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
      h. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other requirements will be satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.
      i. Do not proceed with installation of elastomeric sealants over joint surfaces that have been painted, lacquered, waterproofed, or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with FS TT-S-00227, has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed or shows

bond interference, remove coating or treatment from joint surfaces before installing sealant.

B. Water Leak Testing: Field test for water leaks as follows:
   1. Flood the joint exposure with water directed from a 3/4-inch diameter garden hose, without nozzle, held perpendicular to wall face, two feet from joint and connected to water system with 30 psi minimum normal water pressure. Move stream of water along joint at an approximate rate of 20 feet per minute.
   2. Test approximately five percent of total joint system, in locations that are typical of every joint condition, and that can be inspected easily for leakage on opposite face. Conduct test in presence of ENGINEER, who will determine actual percentage of joints to be tested and actual period of exposure to water from hose, based on extent of observed leakage or lack of observed leakage.
   3. Where nature of observed leaks indicates potential of inadequate joint bond strength, ENGINEER may direct that additional testing be performed at a time when joints are fully cured, and before Substantial Completion.

3.5 ADJUSTING AND CLEANING

A. Where leaks and lack of adhesion are evident, replace sealant.

B. Clean adjacent surfaces of sealant and soiling resulting from the Work. Use solvent or cleaning agent recommended by sealant manufacturer. Leave all finish Work in neat, clean condition.

C. Protect sealants during construction so that they will be without deterioration, soiling, or damage at time of readiness for final payment of the Contract.

3.6 PROTECTION

A. During and after curing period, protect joint sealants from contact with contaminating substances and from damage resulting from construction operations or other causes, so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original Work.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install hollow metal doors and frames.
   2. Extent of hollow metal doors and frames is shown.
   3. Types of products required include the following:
      a. Standard, seamless, galvannealed steel, paper honeycomb core, internally reinforced, flush doors.
      b. Standard, seamless, galvannealed steel, drywall frames.
      c. Miscellaneous supports; special, supplemental, and standard finish hardware reinforcements and preparation items; fasteners and accessories; all for high frequency, high-endurance use.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the hollow metal doors and frames Work.

C. Related Sections:
   1. Section 08 71 00, Door Hardware.
   2. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ANSI/DHI A115.1G, Installation Guide for Doors and Hardware.
   2. ANSI A250.4, Test Procedures and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
   3. ANSI/SDI A250.6 Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   4. ANSI/SDI A250.8 - 2003 Recommended Specifications for Standard Steel Doors and Frames.
   5. ANSI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   6. ANSI/SDI A250.11, Recommended Erection Instructions for Steel Frames.
   7. ANSI/SDI A250.13 Testing and Rating of Severe Windstorm Resistant Components for Swinging Door Assemblies
   8. ASTM A 153/A 153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

9. ASTM A 366, Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
10. ASTM A 653/A 653M, Specification for Steel Sheet, Zinc Coated (Galvannealed) or Zinc-Iron Alloy-Coated (Galvannealed) by The Hot-Dip Process.
11. ASTM A924, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
12. ASTM B 117, Practice for Operating Salt Spray (Fog) Apparatus.
13. ASTM C 518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
14. ASTM E 90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
15. ASTM E 329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
16. ASTM E 413, Classification for Rating Sound Insulation.
17. ASTM E 1408, Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems.
18. FEMA 320, Taking Shelter From the Storm: Building a Safe Room For Your Home or Small Business.
19. FEMA 361, Design and Construction Guidance For Community Shelters.
20. NFPA 80, Fire Doors and Fire Windows.
21. NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
22. NFPA 257, Standard on Fire Test for Window and Glass Block Assemblies.
22. SDI 111-B, Recommended Standard Details For Dutch Doors.
23. SDI/Door 117, Manufacturing Tolerances Standard Steel Doors and Frames.
24. SDI/Door 122, Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
25. SDI/Door 128, Guidelines for Acoustical Performance of Standard Steel Doors and Frames.
26. SSPC Paint 2, Cold Phosphate Surface Treatment.
27. SSPC Paint 27, Basic Zinc Chromate-Vinyl Butyral Wash Primer.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.
   2. Provide hollow metal doors, frames, and accessories manufactured by a single firm specializing in the production of this type of Work and complying with specified standards of ANSI, NFPA, SDI and UL.
   3. Provide hollow metal doors and frames from a manufacturer who is a member of SDI.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single hollow metal doors and frames manufacturer.

2. The hollow metal doors and frames equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the hollow metal doors and frames manufacturer.

C. Testing Agency Qualifications: The independent testing agency shall demonstrate to ENGINEER'S satisfaction, based on evaluation of criteria submitted by testing agency, that it has the experience and capability to satisfactorily conduct the testing indicated in accordance with ASTM E 329, without delaying the Work.

D. Source Quality Control:
1. Provide hollow metal door and frame products from a manufacturer who will provide test certificates for published fire, sound, hurricane and structural data covering systems designed and constructed according to its published specifications.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
a. Elevations of each door design.
b. Details of doors, including vertical and horizontal edge details and metal thicknesses.
c. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
d. Locations of reinforcement and preparations for hardware.
e. Details of each different wall opening condition.
f. Details of anchorages, joints, field splices, and connections.
g. Details of accessories.
h. Details of moldings, removable stops, and glazing.
i. Details of conduit and preparations for power, signal, and control systems.
j. Provide a schedule of doors and frames using same reference numbers for details and openings as those shown.
2. Samples:
a. Pressed metal corner section of frame, 12-inches by 12-inches minimum, showing all special, supplemental, and standard reinforcements, attachments, supports, and anchors specified. Provide corner sample for each type of frame specified. Provide sample for each type of frame specified. Show profile, corner joint, floor and wall anchors, and silencers.
b. Stick system components showing corner detail and glazing stops of all types specified, 12-inches by 12-inches, minimum.
c. Cut-away section of all door types specified, showing internal construction, edge details and reinforcements for butts, closers and similar items of finished hardware, 2 foot-0 inches by 2 foot-0 inches

minimum. Include louver sections, vision panel and glazing stops. Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement.

d. ENGINEER reserves the right to require samples showing fabrication techniques and workmanships of all component parts, and the detailing and fabrication of accessories and auxiliary items for all door and frame Work, before fabrication of the Work proceeds.

B. Informational Submittals: Submit the following:
   1. Test and Evaluation Reports:
      a. Laboratory test report for required performance and specified feature verification for doors and frames selected at random by ENGINEER for testing.
      b. Test reports indicating compliance with ANSI A250.4 and ANSI A250.5.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
   2. Deliver hollow metal doors and frames cartoned or crated to provide protection during transit and job storage.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store doors and frames at the Site under cover.
   3. Place units up off floors in a manner that will prevent rust and damage.
   4. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If cardboard wrapper on the door becomes wet, remove the carton immediately.
   5. Provide a 1/4-inch space between stacked doors to promote air circulation.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Coordinate the wiring of electrified hardware. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:
   1. Standard Door Classification: Provide hollow metal doors of Grades and Models in accordance with ANSI A250.8 as follows:
      a. Level 3, Extra Heavy-Duty, Physical Performance Level A, Model 2, Seamless.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Series CH Doors with Series F14 Frames by Pioneer Industries, Incorporated.
   2. LW14 Series Doors and F14 Series frames and DW Frames by Steelcraft, an Ingersoll-Rand Business.
   3. Regent Series Doors and SQ Frames by Ceco Door, an ASSA ABLOY Group Company.
   4. Or equal.

2.3 MATERIALS

A. Door Faces and Frames: Cold-rolled carbon steel sheets of commercial quality, complying with ASTM A 366, hot-dipped, zinc-iron alloy-coated, ASTM A924 and ASTM A 653/A 653M, A 60.

B. Honeycomb Core: Impregnated with 11 percent phenolic resin, nominal 1-inch hexagonal cell size, one piece, Kraft fiber core board, with 42 psi minimum crushing strength.

C. Supports and Anchors: Formed sheet metal, hot-dip galvannealed after fabrication complying with ASTM A 153/A 153M, Class B, and in compliance with requirements of ANSI A250.8.

D. Inserts, Bolts and Fasteners: Sheet metal hot-dip galvanized complying with ASTM A 153/A 153M, Class C or D as applicable.

E. Miscellaneous Accessories:
   1. Head Strut Supports: 3/8-inch by 2-inch hot-dipped galvanized steel.
   2. Structural Reinforcing Members: Provide structural reinforcing members as part of frame assembly, where shown at mullions, transoms, or other locations that are to be built into frame.
   3. Head Reinforcing: For frames over 4 feet-0 inch wide, in masonry openings, provide continuous steel channel or angle stiffener, not less than 12-gauge for full width of opening, welded to back of frame at head.
   4. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

2.4 FABRICATION

A. General:
   1. Fabricate hollow metal units to be rigid, neat in appearance and free for defects, warp, or buckle. Accurately form metal to required sizes and profiles.
   2. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify Work that cannot be permanently factory-assembled before shipment, to assure proper assembly at the Site. Weld exposed joints continuously, grind, dress, and make smooth, flush, and invisible. Filler to conceal manufacturing defects shall not be acceptable.
   3. Exposed Fasteners: Unless otherwise shown or specified, do not use exposed fasteners in the Work. Where exposed fasteners are shown or specified, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

B. Doors:
   1. Fabricate all hollow metal doors and panels in compliance with ANSI A250.5.
   2. Provide doors of two outer stretcher-leveled sheets, 14-gauge minimum. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or edges, except around glazed or louvered panel inserts. No fillers shall be used. Provide weep hole openings in the bottom of exterior doors to permit the escape of entrapped moisture.
   3. Vertical edges of doors shall be continuously welded, for the whole length of the door, and ground smooth. No plastic or epoxy fillers shall be used.
   4. Reinforce inside of doors with honeycomb core, unless indicated otherwise, completely filling the inside of the door and laminated to the inside of both face panels with an adhesive. The honeycomb material shall have a crushing strength not less than 6,000 pounds per square foot and the lamination shall withstand not less than 1,100 pounds per square foot in shear.
   5. Fabricate all doors with flush top and bottom closing channel, without exposed fasteners. Reinforce tops and bottoms of doors with inverted, flush-mounted, minimum 16-gauge, horizontal steel channels fastened to internal reinforcement channel and with 20-gauge closing plate spot-welded to closure channel. Close top and bottom edges to provide weather seal, as integral part of door construction or by addition of inverted steel channels and plates.

6. Edge profiles shall be provided on both stiles of doors beveled 1/8-inch in 2-inches, except where other profiles are required for certification.

C. Frame Construction:
   1. Fabricate all hollow metal frames in compliance with ANSI A250.8 and as specified.
   2. Form frames of cold-rolled sheet material, 14-gauge minimum. Provide seamless frames for all Work, unless specifically specified and shown as permitting exposed fasteners.
   3. Provide hollow metal frames for doors of size and profile as shown or specified.
   4. Fabricate frames with reinforced, mitered corners that are continuously arc-welded for the full depth and width of the frame, with bottom spreader bar; except provide drywall frames as specified.
   5. Grind all exposed welds flush and smooth.
   6. Head Reinforcing: Where installed in masonry, leave vertical mullions in frames open at the top so they can be filled with grout.
   7. Head Strut Supports: Provide vertical steel struts extending from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable bolted anchorage to frame jamb members.
   8. Jamb Anchors: 16-gauge minimum, and of the following types:
      a. Gypsum Wallboard and Steel Stud Construction: Two-piece compression anchors with exposed compression fasteners.
   9. Rubber Door Silencers: Drill stop to receive three silencers on single-door frames and four silencers on double-door frames. Install plastic plugs to keep holes clear during construction.

D. Door Hardware Preparation:
   1. General:
      a. Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping in accordance with approved Finish Hardware Schedule and templates provided by finish hardware supplier and as specified. Comply with applicable requirements of ANSI/DHI A115.1 to A115.17 and ANSI A250.4. Refer to Section 08 71 00, Door Hardware.
      b. Obtain approved hardware schedule, hardware templates, and samples of finish hardware where necessary to ensure correct detailing and fabrication of the hollow metal doors and frames, from finish hardware supplier.
   2. Doors:
      a. Preparation includes sinkages and cut-outs for mortised and concealed finish hardware and reinforcements for both concealed and surface-applied finish hardware.
      b. Drill and tap mortise reinforcements at factory, using templates.

c. Detail and fabricate reinforcements with concealed connections designed to develop full strength of reinforcements for high-frequency applications.
d. Reinforce doors for required finish hardware, with minimum gauges of reinforcements provided as follows:
1) Hinges: Steel plate 3/16-inches thick by 1-1/2-inches wide by 6-inches longer than hinge and secured by not less than six spot or projection welds with top hinge further reinforced with a high-frequency back-up reinforcement.
2) Mortise Locksets and Dead Bolts: 12-gauge steel sheet, secured with not less than four spot or projection welds.
3) Surface-Applied Closers and Overhead Stops: 3/16-inch steel plate, not less than 10-inches long, secured with not less than six spot or projection welds.
4) Surface Panic Devices: 16-gauge sheet steel secured with not less than two spot or projection welds.

3. Frames:
a. Reinforce frames for required finish hardware with minimum gauges as follows:
1) Hinges: Special full width of frame, 3/16-inch thick steel plate by 8-inches longer than hinge, secured to both rabbets by not less than twelve spot or projection welds.
2) Strike Plate Clips: 10-gauge steel plate by 1-1/2-inches wide by 3-inches long with mortar guard boxout secured with not less than six spot or projection welds.
3) Surface-Applied Closers: 3/16-inch steel plate, secured with not less than six spot or projection welds. Coordinate closer function and presence of overhead stops and weather-stripping, with location of reinforcement plate.

2.5 SHOP PAINTING

A. Clean, treat and paint exposed surfaces of fabricated hollow metal units, including galvanized surfaces.

B. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before the application of the shop coat of paint.

C. Refer to Section 09 91 00, Painting, for field-applied primer and finish paint for exterior or interior exposed ferrous, non-ferrous, or galvanized surfaces.

D. Apply shop-coat of prime paint within time limits recommended by pretreatment manufacturer. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 1.5-mils.

E. Finish shall be rust inhibitive primer capable of passing a 500-hour salt spray and a 1,000-hour humidity test in accordance with ASTM B 117 as certified by an independent laboratory.

2.6 SOURCE QUALITY CONTROL

A. After Shop Drawings approval, manufacturer shall not make any further detailing, fabrication, or changes to approved methods of support and anchorage, nor shall doors and frames be brought to the Site, which do not conform, in all ways, to performance criteria specified.

B. Allowable Tolerances: Provide door and frame manufacturing tolerances in compliance with SDI 117 and as follows:
   1. Nominal Clearance between Door and Frame Head and Jamb: 1/8-inch.
   2. Nominal Clearance at Bottom of Door: 3/4-inch.
   3. Nominal Clearance between Face of Door and Door Stop: 1/16-inch.
   4. Provide all Work plumb and true to adjoining surfaces with all miters and copes accurately formed.
   5. Provide completely water and vapor tight joints.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the substrate and conditions under which hollow metal doors and frames are to be installed and notify ENGINEER, in writing, of any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

B. Frames that are bowed, twisted or otherwise unacceptable shall be removed from the Site and replaced with properly constructed frames.

3.2 PREPARATION

A. Drilling and tapping for surface-applied, finish hardware may be done at Site.

B. Protective Coating: Protect inside, concealed, faces of door frames in plaster or masonry construction using fibered asphalt emulsion coating. Apply over shop primer approximately 1/8-inches thick and allow to dry before installation.

C. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

3.3 INSTALLATION

A. Install hollow metal units and accessories in accordance with approved Shop Drawings, SDI 105, and ANSI/SDI A250.11 as shown and specified.
   1. Do not install doors and frames until all the Work, which could damage doors and frames, has been completed.
   2. Provide temporary doors until construction sequencing allows installation of permanent doors and frames.
   3. Do not proceed with the installation of permanent hollow metal doors until CONTRACTOR can provide finished Work complying with all requirements of these Specifications.
   4. Protect built-in frame Work with temporary wood protection.

B. Placing Frames:
   1. Install frames plumb, level, rigid, and in true alignment in accordance with ANSI A250.11 and DHI A115.1G.
   2. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged. Remove spreader bars only after frames have been properly set and secured.
   3. Make field splices in frames as detailed on approved Shop Drawings, welded, and finished to match factory work.

C. Door Installation:
   1. Fit hollow metal doors accurately in their respective frames, with the following clearances:
      a. Jambs and Head: 1/8-inch.
      b. Meeting Edges, Pairs of Doors: 1/8-inch.
      c. Bottom: 3/4-inch, where no threshold or carpet.
      d. Bottom: At threshold or carpet, 3/8-inch.
   2. Finish hardware installation is specified under Section 08 71 00, Door Hardware. Locate finish hardware as shown on approved Shop Drawings, in accordance with hardware templates provided by finish hardware manufacturers and in accordance with Door and Hardware Institute, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

3.4 ADJUSTMENT AND CLEANING

A. Check and readjust operating finish hardware items in hollow metal door and frame Work just prior to final inspection. Leave Work in complete and proper operating conditions.

B. Where problems of installation or damage are cause for rejection of hollow metal door and frame Work, consult SDI 122 and the recommendations of the hollow metal door and frame manufacturer, for suggestions concerning required

adjustments in the Work. Submit recommendations to ENGINEER for approval. Replace and repair unacceptable Work, as directed by ENGINEER, so that there will be no doubt as to the acceptability of the Work at the time of Substantial Completion.

C. Prime Coat Touch-Up: Immediately after installation, sand smooth all rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

D. Protection: Protect installed hollow metal doors and frames against damage from other construction activities.

++ END OF SECTION ++

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install door hardware. Furnish door hardware for all doors in compliance with these Specifications herein.
   2. Extent of door hardware is specified. Door hardware is defined to include all items known commercially as door hardware, except special types of unique and non-matching hardware specified in the same Section as the door and door frame.
   3. Types of products required include the following:
      a. Mortise hinges.
      b. High-security mortise locksets.
      c. Heavy-duty, overhead, surface-mounted, door closers.
      d. Cylinders for doors specified in other Sections.
      e. Stripping and seals.
      f. Thresholds.
      g. Miscellaneous items and accessories for a complete installation functioning in compliance with the requirements of governing authorities having jurisdiction at the Site.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the door hardware.
   2. Coordinate the Work of other Sections to provide clearances and accurate positioning of recessed or cast-in-place items.

C. Related Sections:
   1. Section 08 11 13, Hollow Metal Doors and Frames.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ANSI A117.1, Accessible and Usable Buildings and Facilities.
   2. ANSI/BHMA A156.1, Butts and Hinges.
   3. ANSI/BHMA A156.3, Exit Devices.
   4. ANSI/BHMA A156.4, Door Controls - Closers.
   5. ANSI/BHMA A156.5, Auxiliary Locks and Associated Products.
   6. ANSI/BHMA A156.6, Architectural Door Trim.
   7. ANSI/BHMA A156.7, Template Hinge Dimensions.

8. ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders.
9. ANSI/BHMA A156.13, Mortise Locks and Latches, Series 1000.
10. ANSI/BHMA A156.16, American National Standard for Auxiliary Hard-ware.
11. ANSI/BHMA A156.18, Hardware - Materials and Finishes.
12. ANSI/BHMA A156.21, Thresholds.
13. ANSI/BHMA A156.22, Door Gasketing and Edge Seal Systems.
14. ANSI/BHMA A156.24, Delayed Egress Locks.
15. ANSI/BHMA A156.25, Electrified Locking Devices.
16. ANSI/BHMA A156.26, Continuous Hinges.
17. ANSI/DHI A115.1, Preparation of Mortise Locks in 1-3/8-inch and 1-3/4-inch Standard Steel Doors and Frames.
18. ANSI/NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
19. ASTM E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
20. BMHA, Certified Product Directory.
21. DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
22. DHI, Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
23. DHI, Sequencing and Format for the Hardware Schedule.
24. FF-TT-S-00227,
25. HMMA 830, Hardware Preparation and Locations for Hollow Metal Doors and Frames.
26. NIST, U. S. Standard.
27. NFPA 101, Life Safety Code.
28. SDI 109, Hardware for Standard Steel Doors and Frames.
29. UL, Building Materials Directory.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Provide door hardware and accessories manufactured by firms specializing in the production of this type of Work and complying with specified standards of ANSI, BHMA, DHI, NFPA, HMMA, SDI and UL.
   2. Provide door hardware from manufacturers who are members of BHMA and participate in BHMA certification programs.

B. Installer's Qualifications:
   1. The door hardware installer shall have in his employ an architectural hardware consultant. The architectural hardware consultant shall be a member of the Door and Hardware Institute, (DHI), who has passed the DHI certification examine and successfully completed an apprenticeship program. The architectural hardware consultant shall be responsible for preparing door hardware schedules and Shop Drawings and be present at the Site for the purpose of checking and supervising the Work of the installer during the time of installation and adjustment of the door hardware Work, and shall prepare a written field report on status of completed door hardware installation as specified.

2. Submit name and qualifications of the installer to ENGINEER.

C. Architectural Hardware Consultant Qualifications:
   1. A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations and electrified door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

D. Component Supply and Compatibility:
   1. Finish hardware equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   2. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the finish hardware manufacturer.
   3. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

E. Testing Agency Qualifications: The independent testing agency shall demonstrate to ENGINEER'S satisfaction, based on evaluation of criteria submitted by testing agency, that it has the experience and capability to satisfactorily conduct the testing indicated in accordance with ASTM E 329, without delaying the Work.

F. Regulatory Requirements:
   1. Provide door hardware for fire-resistance-rated openings in compliance with NFPA 80.
   2. Provide only door hardware that has been tested, listed and labeled by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.
   3. Modify features of door hardware items specified, and provide additional accessories and features as required to meet UL and NFPA requirements, at no additional cost to the OWNER.
   4. Codes: Comply with applicable requirements of codes.

G. Source Quality Control:
   1. Obtain each type of door hardware item from only one manufacturer.
   2. Provide door hardware schedule, for submission to, and for approval by, ENGINEER, prepared in compliance with DHI standards.
   3. Comply with specified BHMA standards.

H. Requirements of Regulatory Agencies:
   1. Provide finish hardware for fire-resistance-rated openings in compliance with NFPA 80.
   2. Provide only finish hardware that has been tested, listed and labeled by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.

3. Modify features of finish hardware items specified, and provide additional accessories and features as required to meet UL and NFPA 80 requirements, at no additional cost to the OWNER.
4. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.

I. Preconstruction and Keying Conference: Conduct conference at Project site to comply with requirements in Section 01 31 19.13, Preconstruction Conference. In addition to OWNER, CONTRACTOR, and ENGINEER, conference participants shall also include Architectural Hardware Consultant and OWNER's security consultant. Review methods and procedures related to electrified door hardware including, but not limited to, the following:
   1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
   2. Review sequence of operation for each type of electrified door hardware.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review required testing, inspecting, and certifying procedures.
   5. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
      a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      b. Preliminary key system schematic diagram.
      c. Requirements for key control system.
      d. OWNER entities responsible for signing off on keying and authorization to allow copies of keys.
      e. Address for delivery of keys.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Copies of the Door Hardware Schedule in the manner and format specified, complying with the actual construction Progress Schedule requirements (for each draft). Include explanation of abbreviations, symbols, and codes used to present scheduled information.
         1) Prepare and submit Door Hardware Schedule in compliance with HDI standards.
      b. Based on the door hardware requirements specified, organize the final Door Hardware Schedule into "hardware sets," indicating complete designation of every item required for each door or opening. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other Work (such as hollow metal frames) which may be critical in the Project Schedule. Furnish final draft of schedule after Samples, manufacturer's data sheets, coordination with Shop Drawings

for other Work, delivery schedules and similar information have been completed and accepted.

c. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

d. Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

e. Include a separate key schedule, showing clearly how OWNER'S final instructions on keying of locks have been fulfilled.

f. Door Hardware Schedules are intended for coordination of the Work. Review and acceptance by ENGINEER does not relieve CONTRACTOR of responsibility to fulfill the requirements as shown and specified.

2. Product Data:

a. Copies of manufacturer's data for each item of door hardware. Include whatever information may be required to show compliance with specified requirements, and include instructions for installation and for maintenance of operating parts and exposed finishes. Include mounting heights and locations for each item of door hardware. Provide ENGINEER with latest complete technical catalogue of all available door hardware manufactured by proposed manufacturers, even if manufacturer specified by ENGINEER is submitted by CONTRACTOR to perform the Work. Furnish templates to fabricators of other Work, which is to receive door hardware.

3. Samples: Submit the following:

a. Actual unit of each door hardware item specified incorporating all standard and special features and finishes specified, demonstrated and identified by manufacturer's representative to ENGINEER. Samples shall be presented at time of Shop Drawing submittal, as ENGINEER will not review or approve Shop Drawings without concurrent sample submissions.

b. Approved samples may be incorporated into the door hardware Work.

c. ENGINEER'S review will be for appearance and for general compliance with required features. Compliance with all other requirements is the responsibility of CONTRACTOR.

B. Informational Submittals: Submit the following:

1. Test and Evaluation Reports:

a. Certified independent laboratory test reports for BHMA certification program and certification tests for each type of product specified.

2. Site Quality Control Submittals:

a. Field Report: Architectural Hardware Consultant's Report.

3. Qualifications Statements:

a. Installer.

C. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Documentation: Upon completion of the Work, furnish five copies of detailed maintenance manuals, including the following information:
      a. Product name and manufacturer.
      b. Name, address, e-mail address and telephone number of manufacturer and local distributor.
      c. Detailed procedure for routine maintenance and cleaning.
      d. Detailed procedures for repairs such as dents, scratches and staining.
      e. Parts identification manual and maintenance manuals for each piece of door hardware.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
   2. Deliver all items of door hardware in manufacturer's original, undamaged packages, bearing accurate representation of the item within each package.
   3. Pack each piece of door hardware separately, complete with screws, keying, instructions, and templates, tagged to correspond with items submitted on approved Shop Drawings and as specified.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Provide secure storage area for door hardware items, secured by locks and accessible only to door hardware installer, ENGINEER and CONTRACTOR.
   3. Store door hardware in manufacturers' original packages.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Items that arrive in a damaged condition shall be removed from the Site and not offered again for acceptance. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection, cracking, or breakage.
      b. Faulty operation of operators and door hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
   2. Warranty Period: 3 years from date of Substantial Completion, except as follows:
      a. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:
   1. Where the door, shape, size, fire-resistance-rating, frequency of use, or function of a member receiving door hardware is such as to prevent, or make unsuitable, the types of door hardware specified, furnish similar types having as nearly as practicable the same operation but of type or kind more appropriate to the design intention and requirements of governing authorities having jurisdiction at the Site. Clearly identify and highlight to ENGINEER all such required modifications on Shop Drawings submitted for approval.
   2. If door hardware for any location is not specified, provide door hardware equal in design and quality to adjacent door hardware specified for comparable openings at no additional cost to OWNER.
   3. Furnish door hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements, as necessary for proper installation and function.
   4. Unless otherwise specified, comply with DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames and Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.

2.2 DETAILS OF CONSTRUCTION

A. General:
   1. Hand of Door: The Drawings show the swing or hand of each door leaf (left, right, reverse bevel, etc.). Furnish each item of door hardware for proper installation and operation of the door swing as shown.
   2. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit

removable nameplates), except in conjunction with labels required by governing authorities having jurisdiction at the Site.

3. Base Metals: Produce door hardware units of the basic metal and forming method specified, using the manufacturer's standard metal alloy, composition, temper and hardness. Do not substitute materials or forming methods for those specified.
4. Fasteners: Manufacture door hardware to conform to published templates, generally prepared for machine screw installation. Do not provide door hardware, which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
5. Furnish screws for installation, with each door hardware item. Provide Phillips flat-head screws except as otherwise specified. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces on other Work, to match the finish of such other Work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
6. Provide fasteners which are compatible with both the unit fastened and the substrate, and which will not cause corrosion or deterioration of door hardware, base material or fastener.
7. Provide concealed fasteners for door hardware units, which are not exposed when the door is closed, except to the extent no standard manufacturer units of the type specified are available with concealed fasteners. Do not use through bolts for installation where the bolt head or the nut on the opposite face is exposed in other Work under any condition, except where it is not possible to adequately reinforce the Work and use machine screws or concealed fasteners of another standard type to satisfactorily avoid the use of through bolts.

2.3 HARDWARE TYPES

A. Mortise Hinges:
   1. Templates and Screws: Provide only template-produced units.
   2. Base Metal: Except as otherwise specified, fabricate hinges from stainless steel and finish to match the latch and lock set.
   3. Number of Hinges: Provide three hinges on each door leaf of less than 60-inches in height; provide one additional hinge for next 30-inches of door height or fraction thereof; provide two additional hinges for each 30-inches, or fraction thereof, for doors above 90-inches tall.
   4. Hinge Size: Except as otherwise specified or as required to comply with UL and NFPA, provide hinges of the following sizes:
      a. Exterior Doors, Maximum 36-Inches Wide: 4-1/2-inch heavy-weight (0.180-inch).
   5. Types of Hinges: Provide full-mortise type, ball-bearing hinges, swaged for mortise applications, inner leaf beveled, square cornered, unless manufacturer's recommendations indicate that half-mortise, half-surface, full-surface or other type should be used for the frame and door type or condition.
   6. Hinge Pins: Except as otherwise specified, provide hinge pins as follows:
      a. Pins: Stainless steel.

b. Exterior Doors: Non-removable pins. Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed.
c. Tips: Slope ends of hinge barrel.

7. Conform to ANSI/BHMA A156.7.
8. Comply with UL, List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
9. Products and Manufacturers: Provide one of the following:
   a. FBB 199 by Stanley Commercial Hardware, Division of The Stanley Works.
   b. T4B3386, by McKinney Products Company, an ASSA ABLOY Group company.
   c. Or equal.

B. High-Security Mortise Locks Sets:
1. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with ADAAG.
2. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
3. Strikes: Provide manufacturer's standard wrought box strike, for each location and use shown. Provide stainless steel curved lip strikes, unless otherwise recommended by manufacturer, finished to match lock or latch set trim.
4. Lock Throw: Provide minimum of 3/4-inch anti-friction latch bolt and 1-inch dead bolt throw. Comply with UL requirements for throw of latch bolts and deadbolts on fire-resistance-rated openings.
5. Materials: Provide the following features and materials:
   a. Latch Bolt: Two-piece; mechanical; anti-friction, stainless steel.
   b. Dead Bolt: One-piece, stainless steel with two enclosed hardened-steel roller armor pins.
   c. Case: Wrought steel, zinc dichromatized.
   d. Cylinders: High-security; brass; pick- and drill-resistant; ANSI/BHMA A156.5 - E09211A.
   e. Armor Front: 8-inches by 1-1/4-inches wide, minimum; steel.
   f. Escutcheon: 8-inches by 2-1/2-inches wide by 3/16-inches thick, minimum; stainless steel, US 32D.
   g. Hubs: Sintered steel, copper infiltrated.
   h. Lever with Stop Pin: Brass, plated to match stainless steel, with additional built-in stop to prevent over-torquing of lever.
   i. All components shall be of marine quality, wherever possible.
6. Backset: 2-3/4-inches.
7. Modify specified locks and latches to comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
8. Latches and Locks for Means of Egress Doors: Comply with NFPA 101.
9. Finish: US 32D satin.
10. Conform to ANSI/BHMA A156.13, Series 1000, Security Grade 1.
11. Products and Manufacturers: Provide one of the following:

a. High Security SL8800 Mortise Lockset with Augusta - AUSL Lever Handles and Trim by Yale Commercial Locks and Hardware, an ASSA ABLOY Group company.
b. ML2000 Series Mortise Lockset with Newport NSM Lever Handles and Trim by Corbin Russwin Architectural Hardware, an ASSA ABLOY Group Company.
c. Or equal.

C. Cylinders and Keying System:
1. Review the keying system with OWNER'S and provide the type required (master, grandmaster or great grandmaster), either new or integrated with OWNER'S existing system.
2. Furnish all locks with manufacturer's cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these before Substantial Completion. Construction control keys and cores shall not be part of OWNER'S permanent keying system. Permanent cores and keys shall be furnished to OWNER prior to Substantial Completion.
3. Comply with the OWNER'S instructions for master keying and, except as otherwise specified, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.
4. Permanent keys and cores shall be stamped with the applicable key mark for identification. These visual key control marks or codes shall not include the actual key cuts. Permanent keys shall also be stamped "DO NOT DUPLICATE".
5. Cylinder Material: Brass, bronze or Series 300 stainless steels.
6. Cylinder Features: Seven-pin, high-security, removable core.
7. Key Material: Nickel silver.
8. Key Quantity: Furnish three keys for each lock and five keys for each master and grandmaster system. Provide one extra key blank for each lock.

D. Overhead, Surface-Mounted, Door Closers:
1. Provide all doors, unless specially shown or specified as being provided with floor-mounted or concealed overhead closers, with surface-mounted overhead door closers. Provide both active and inactive door leafs with closers.
2. Size of Units: Except as otherwise specified, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use.
3. Where parallel arms are specified, and for closers on exterior doors, provide closer unit one size larger than recommended for use with standard arms.
4. Use parallel arm arrangement for doors that would otherwise have the door closer appearing in finished corridors or entries.
5. Comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials, and NFPA 80. Modify closers specified as required.
6. Provide hold open feature for all non-fire-resistant-rated doors, unless otherwise specified.
7. Provide corner bracket mounting on exterior doors. Select all arms to clear weather-stripping, and overhead door holders.

8. Provide long arm to allow door to swing 180 degrees where long arm will eliminate floor-mounted stops.
9. Provide closers with spring power adjustment feature capable of increasing spring power 15 percent minimum in all closer sizes.
10. Provide individual regulating valves for closing and latching speeds, and separate adjustable back check valve.
11. Provide delayed closing action feature on all door closers. Position valve at top of closure.
12. Provide the following materials and features:
    a. Full Metal Cover: Aluminum.
    b. Case: Cast-iron.
    c. Arms: Plated to match full metal covers.
    d. Other Parts: Steel.
    e. Extreme temperature fluid.
    f. Security torx machine screws.
    g. Ten-year warranty.
    h. Provide manufacturer's optional corrosion protection.
13. Finishes: US 26D satin chrome. Color coordinate all arms and other accessories.
14. Highly Corrosive Atmospheres: Provide all closers with specified manufacturer's optional corrosion protection.
15. ANSI/BHMA: A156.4, C02011, in compliance with PT 1 and PT 4.
16. Products and Manufacturers: Provide one of the following:
    a. DC8000 Series by Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
    b. 4040 Series by LCN Closers, an Ingersoll Rand Company.
    c. Or equal.

E. Weatherstrip Gasketing:
1. Provide perimeter weather stripping at all exterior doors. Provide stripping and seals for interior doors where scheduled in List of Door Hardware Items at end of Part 3.
2. Continuity of Stripping: Except as otherwise specified, stripping at each opening shall be continuous and without unnecessary interruptions at door corners and hardware.
3. Replaceable Seal Strips: Resilient or flexible seal strip of every unit shall be easily replaceable and readily available from stocks maintained by the manufacturer.
4. Provide bumper-type weather-stripping at jambs and head, including a resilient insert and metal retainer strip, surface-applied, of the following metal, finish and resilient bumper material:
    a. Housing: Extruded aluminum with clear anodized finish; 0.062-inch minimum thickness of main walls and flanges.
    b. Dimensions: 1-3/8-inches by 7/8-inches, stop-mounted.
    c. Seals: Closed-cell extruded silicone.
    d. ANSI/BHMA: A156.22, R3E264.
    e. Products and Manufacturers: Provide one of the following:
        1) No. 2891 APK (for parallel arms) by Pemko Manufacturing Company.

2) No. 429A (for parallel arms) by Zero International.
3) Or equal.

5. Provide heavy-duty, surface-mounted, door-bottom sweep unit of manufacturer's standard design retained in an extruded metal bar and capable of closing a 3/4-inch gap (from door bottom to floor or threshold):
   a. Housing: Extruded aluminum, 0.062-inch thick, with mill aluminum finish.
   b. Seal: Eco-V.
   c. Mounting: Surface-mounted.
   d. ANSI/BHMA: A156.22, R3D534.
   e. Products and Manufacturers: Provide one of the following:
      a) No. 345AV for exterior doors with a No. 321CN on the interior face of exterior doors, by Pemko Manufacturing Company.
      b) Or equal.

F. Standard Thresholds:
   1. All exterior and interior doors shall be provided with thresholds.
   2. Metal: Mill finish extruded bronze.
   3. Surface Pattern: Fluted tread, manufacturer's standard.
   4. Provide countersunk stainless steel screws and expansion shields.
   5. Width: Five-inches wide and of length sufficient to span full width of rough openings, coped and scribed neatly at and around door frames.
   6. Construction:
      a. Single-piece, complying with manufacturer's recommendations.
   7. Profile: Provide manufacturer's unit, which conforms to the minimum size and profile requirements specified.
      a. Floor Drop: Except where no change in floor elevation is shown from one side of threshold to the other, provide profile that accommodates 1/2-inch drop in floor elevation, unless another dimension is shown.
      b. For doors equipped with panic hardware, including floor bolts, provide profile with stop bar of proper size and shape to function as the strike plate for the floor bolts.
   8. Thickness: 1/2-inch, minimum.
   9. ANSI/BHMA: A156.21, J12100.
   10. Products and Manufacturers: Provide one of the following:
      a. 2716 by Pemko Manufacturing Company.
      b. Or equal.

G. Sealants: Provide elastomeric sealant complying with FS TT-S-00227, Type 2 (non-sag) Class A for use with thresholds.

2.3 HARDWARE FINISHES

A. Provide matching finishes for door hardware units at each door or opening, to the greatest extent possible in compliance with ANSI/BHMA A156.18.

B. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of door hardware

exposed at the same door or opening. In general, match all items to the manufacturer's standard finish for the latch and lock set for color and texture.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the substrate to receive door hardware, and the conditions under which the Work will be performed, and notify ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with the door hardware Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 PREPARATION

A. Templates: Furnish door hardware templates to each fabricator of doors, frames and other Work to be factory-prepared for the installation of door hardware. Check the Shop Drawings of such other Work, to confirm that adequate provisions are made for the proper installation of the door hardware.

B. Prepare Work to receive door hardware Work in compliance with ANSI/DHI A115.1.

C. Surface-Applied Door Hardware: NFPA 80: Drill and tap doors and frames according to ANSI A250.6.

3.3 INSTALLATION

A. Installer shall check and approve the installation before operation. Installer shall assure that the system operates to the OWNER'S satisfaction.

B. Mount door hardware units at heights recommended in, Door and Hardware Institute, “Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames” and “Recommended Locations for Builders’ Hardware for Custom Steel Doors and Frames", except as otherwise specified or required to comply with governing authorities having jurisdiction at the Site, HMMA 830 and ADAAG requirements.

C. Install each door hardware item in compliance with the manufacturer's instructions and recommendations and approved Shop Drawings. Wherever cutting and fitting is required to install door hardware onto or into surfaces that are later to be painted or finished in another way, install each item completely, then remove, and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

G. Screw thresholds to substrate with No. 10 or larger screws, of the proper type for permanent anchorage and of bronze or stainless steel that will not corrode in contact with the threshold metal.

H. Set thresholds in a bead of elastomeric sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or block weeps. Remove excess sealant before sealant cures to a firm set.

I. Initial Adjustment: Adjust and check each operating item of door hardware and each door, to ensure proper operation or function of every unit. Lubricate moving parts with the type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
    1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

J. Final Adjustment: Where door hardware installation is made more than one month prior to Substantial Completion, return to the Work during the week prior to acceptance or occupancy, and make a final check and adjustment of all door hardware items in each space and area. Clean and re-lubricate operating items as necessary to restore proper function and finish of door hardware and doors. Adjust door control devices to compensate for final operating of heating and ventilating equipment.

K. Provide manufacturer’s authorized representative to instruct and train OWNER'S personnel in proper adjustment and maintenance of door hardware during the final adjustment of door hardware.

L. Door hardware, which is blemished or defective, will be rejected even though it was set in place before defects were discovered. Remove and replace with new door hardware. Repair all resultant damage to other Work.

M. Continued Maintenance Service: Approximately six months after the acceptance of door hardware in each area, the installer, accompanied by the representative of the

latch and lock manufacturer, shall return to the Project and re-adjust every item of hardware to restore proper function of doors and door hardware. Consult with and instruct OWNER'S personnel in recommended additions to the maintenance procedures. Clean and lubricate operational items wherever required. Replace door hardware items that have deteriorated or failed due to faulty design, materials or installation of door hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance or the door hardware.

3.4 FIELD QUALITY CONTROL

A. Provide a written field report, prepared by installer's architectural hardware consultant, identifying actual condition, location, manufacturer, and product designation for each item of door hardware actually present on each door at the Site, including whether door hardware is adjusted and operating properly, compared with each item referenced to approved Shop Drawings and Contract requirements.

B. Installer's hardware consultant shall provide opinions to, and assist ENGINEER in determining, acceptability of installation as Work proceeds. All comments and discussions, conversations and meetings with ENGINEER shall be included in written field report for submission to ENGINEER for review and approval at completion of door hardware installation.

C. As part of written field report to be submitted to ENGINEER for approval, recommend remedial actions for Work not in compliance with these Specifications. No payment for Work shall be made until remedial recommendations and actions have been approved by ENGINEER and incorporated into the Work.

3.5 LIST OF DOOR HARDWARE ITEMS

A. Scheduled items for each door are generic and rely on information specified above. The listing of hardware functions and types provided are only a general guideline for the final Door Hardware Schedule. CONTRACTOR shall submit a Door Hardware Schedule acceptable to all governing authorities having jurisdiction at the Site.

B. Provide the following door hardware items:
   1. Gate Enclosure.
      a. Door No. 101-1, Exterior, 3'-0"x7'-0", Hollow Metal.
         1) Mortise Hinges.
         2) Mortise Lock (F04).
         3) Overhead, Surface-Mounted Door Closers.
         4) Stripping and Seals.
         5) Threshold.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 09 61 53

CONCRETE HARDENER

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all concrete hardener Work.
   2. The extent of the concrete hardener includes all interior concrete floors not shown or scheduled to be finished with another material.
   3. The types of concrete hardener Work required include, but are not necessarily limited to, silicate penetrant.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the concrete hardener Work.

1.2 QUALITY ASSURANCE

A. Installer's Qualifications: Engage a single installer regularly engaged in the installation of concrete hardeners with five years experience in the application of the types of materials required, and who agrees to employ only tradesmen with specific skills and experience in this type of Work. Installer shall meet the requirements of the concrete hardener manufacturer for providing guarantee coverage. Submit name and qualifications to ENGINEER.

B. Source Quality Control: Obtain all material from only one manufacturer who will send a qualified technical representative to the Site for the purpose of advising the installer of proper procedures and precautions for the use of the material, at no additional cost to the OWNER.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Copies of manufacturer’s specifications, recommendations, and installation instructions. Include manufacturer’s published data, indicating the material complies with the requirements and is intended for the application shown.
      b. Submit installer's qualifications in accordance with Article 1.2, above.

B. Informational Submittals: Submit the following:

1. Certificates: Submit a certificate of coverage signed by a duly authorized representative of the manufacturer.

C. Closeout Submittals: Submit the following:
   1. Maintenance Data: Upon completion of the Work, furnish five copies of detailed maintenance manual including the following information:
      a. Product name and number.
      b. Name, address and telephone number of manufacturer and local distributor.
      c. Detailed procedures for routine maintenance and cleaning.
      d. Detailed procedure for light repair such as scratches and staining.

   2. Guarantee Documentation:
      a. Submit for approval written guarantee agreeing to replace the concrete hardener should it fail to perform as specified in Article 1.6, below.

1.4 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded, in ample time to prevent delay of that Work.
   2. Deliver materials in concrete hardener manufacturer's original unopened containers.
   3. Include the following information on the label:
      a. Name of material and supplier.
      b. Formula or specification number, lot number and date of manufacturer.
      c. Mixing instructions, shelf life and curing time when applicable.
   4. Failure to comply with these requirements shall be sufficient cause for the rejection of the material in question, by ENGINEER, and requiring its removal from the Site. In such a case, supply new material conforming to the specified requirements, at no additional cost to OWNER.
   5. Handle materials carefully to prevent inclusion of foreign materials.
   6. Do not open containers or mix components until all necessary preparatory Work has been completed.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store materials so as to preclude the inclusion of foreign material.
   3. Protect material from freezing.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if

any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.5 JOB CONDITIONS

A. Environmental Conditions:
   1. Do not apply concrete hardener to uncured concrete. Comply with manufacturer's written instructions for minimum ten days of curing time.
   2. Apply hardener only when temperature of concrete is 50°F or above.

B. Protection:
   1. Do not allow concrete hardener to overflow or spill onto adjoining surfaces.
   2. Remove concrete hardener that is splashed on surfaces not designated to receive concrete hardener immediately by flushing with water.

C. Sequencing:
   1. Coordinate the Work so that the concrete hardener is installed when best results will be obtained, as recommended by the manufacturer's technical representative.

1.6 GUARANTEE

A. Provide a five year written guarantee, signed by CONTRACTOR and installer, stating that should concrete floors show signs of dusting because of wear and abrasion they will be re-installed, in the manner specified herein, at no additional cost to OWNER, from the date of Final Acceptance of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Hardener: Provide a clear, colorless, aqueous solution of chemically active, magnesium, silicates and fluosilicates plus a wetting and penetrating agent, that reacts with the free lime and calcium carbonates to bind soft, loose particles together and form a hard dense vitreous surface which is resistant to chemical attack and the growth of mildew, fungi, and other organisms. Use potable water only.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. MasterKure HD 300WB by Master Builders Solutions Construction Systems US, LLC.
   2. Armortop by Anti-Hydro Waterproofing Company.
   3. Or equal.

2.3 MIXES

A. Follow manufacturer's written instructions for the proper mixing, dilution and coverage of each coat.

2.4 FINISH

A. The finished installation of the concrete hardener shall have a smooth, uniform even finish without discontinuities or discolorations.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the substrates and the conditions under which the concrete hardener Work is to be performed and notify ENGINEER, in writing, of any conditions detrimental to the proper and timely completion of the Work and performance of the concrete hardener. Do not proceed with the concrete hardener Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 SUBSTRATE PREPARATION

A. Steel trowel concrete in strict accordance with printed directions supplied by the concrete hardener manufacturer.

B. Provide concrete free of all honeycombing and fins.

C. Do not use sealers, curing or parting compounds on the concrete.

D. Provide wet curing only.

E. Surfaces to receive concrete hardener shall be clean, dry and free of all loose dirt, oil, wax and other foreign matter.

3.3 INSTALLATION

A. Provide the services of a manufacturer's technical representative for the purpose of advising the installer of proper procedures and precautions for the use of the material prior and during the installation of the concrete hardener.

B. Apply concrete hardener using the coverage recommended by the manufacturer per coat.

C. Apply a minimum of three separate coats.

D. Apply a fourth coat using undiluted material should the manufacturer's technical representative recommend this procedure, based on field conditions, and as directed by ENGINEER.

E. Apply each coat by spray.

F. Mop up excess solution or puddles.

G. After each of the first and second applications, allow the floor to dry until no longer visibly wet.

H. To avoid the development of crystals, when applying the third coat, flush the surface liberally with clean, hot water. At the same time, brush the floor rapidly with a stiff-bristle broom. Mop up excess water.

I. Follow manufacturer's written instructions should white crystals develop after the first or second coat. Consult manufacturer's technical representative.

3.4 ADJUSTMENT AND CLEANING

A. Clean adjacent surfaces of concrete hardener resulting from the Work. Use solvent or cleaning agent recommended by the concrete hardener manufacturer. Leave all finished Work in a clean neat appearance.

B. Protect the concrete hardener until fully cured.

++ END OF SECTION ++

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and apply paint systems.
      a. CONTRACTOR is responsible for surface preparation and painting of all new and existing interior and exterior items and surfaces throughout the Project areas included under this and other Sections.
   2. Extent of painting includes the Work specified below. Painting shown in schedules may not provide CONTRACTOR with complete indication of all painting Work. Refer to Article 2.2 of this Section where all surfaces of generic types specified are specified for preparation and painting according to their status, intended function, and location, using the painting system for that surface, function, and location as specified, unless specifically identified on the Drawings as a surface not to receive specified painting system.
      a. All new and specifically identified existing surfaces and items except where the natural finish of the material is specified as a corrosion-resistant material not requiring paint; or is specifically indicated in the Contract Documents as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint them the same as adjacent similar materials or areas.
      b. Mechanical and process items to be painted include:
         1) Piping, pipe insulation, pipe hangers, and supports, including electrical conduit.
         2) Motors, mechanical equipment, and supports.
         3) Accessory items.
      c. Surface preparation and painting of all new and specifically identified existing items, both interior and exterior, and other surfaces, including items furnished by OWNER, are included in the Work, except as otherwise shown or specified.
      d. Removal of all substances, top coats, primers and all intermediate coats of paint and other protective or decorative coatings on those items and surfaces to remain that are identified to receive a painting system under this Section, to provide surfaces acceptable for application of painting specified.
      e. Approved stepped-down mock-ups for all painting systems showing all components of the surface preparation and paint system application before start of Work. Check all dry film thicknesses; demonstrate methods of surface preparation, and methods of application, and obtain ENGINEER’s approval of colors and textures to be used in the Work.

B. Coordination:
   1. Review installation, removal, and demolition procedures under other Sections and coordinate them with the Work specified in this Section.
   2. Coordinate painting of areas that will become inaccessible once equipment, laboratory furniture, lockers and similar fixed items have been installed.
   3. Coordinate primers with finish paint materials to provide primers that are compatible with finish paint materials. Review other Sections and other contracts where primed surfaces are provided, to ensure compatibility of total painting system for each surface. CONTRACTOR is responsible for coordinating compatibility of all shop primed and field painted items in other Sections and in general contract.
   4. Furnish information to ENGINEER on characteristics of finish materials proposed for use and ensure compatibility with prime coats used. Provide barrier coats over incompatible primers or remove and repaint as required. Notify ENGINEER in writing of anticipated problems using specified painting systems with surfaces primed by others. Reprime equipment primed in factory and other factory-primed items that are damaged or scratched.

C. Related Sections:
   1. Section 07 92 00, Joint Sealants.

D. Work Not Included: The following Work is not included as painting Work, or are included under other Sections:
   1. Shop Priming: Shop priming of structural metal, miscellaneous metal fabrications, other metal items and fabricated components such as shop-fabricated or factory-painted process equipment, plumbing equipment, heating and ventilating equipment, electrical equipment, and accessories shall conform to applicable requirements of this Section but are included under other Sections.
   2. Pre-finished Items:
      a. Items furnished with such finishes as baked-on enamel, porcelain, and polyvinylidene fluoride shall only be touched up at Site by CONTRACTOR using manufacturer's recommended compatible field-applied touchup paint.
      b. Items furnished with finishes such as chrome plating or anodizing.
   3. Concealed Surfaces: Non-metallic wall or ceiling surfaces in areas not exposed to view, and generally inaccessible areas, such as furred spaces, pipe chases, duct shafts, and elevator shafts.
   4. Concrete surfaces below the interior slab elevation, unless otherwise shown or specified.
   5. Concrete floors, unless specifically shown as a surface to be painted.
   6. Face brick, glazed structural tile, and prefaced, ground-faced or split-faced concrete unit masonry.
   7. Exterior face of architectural precast concrete.
   8. Collector bearings, shafts and chains, wood flights, wood stop logs, and wood or fiberglass baffles.
   9. Corrosion-Resistant Metal Surfaces: Where the natural oxide of item forms a barrier to corrosion, whether factory- or Site-formed, including such materials as copper, bronze, muntz metal, terne metal, and stainless steel.

10. Operating Parts and Labels:
    a. Do not paint moving parts of operating units, mechanical and electrical parts such as valve and damper operators, linkages, sensing devices, interior of motors, and fan shafts.
    b. Do not paint over labels required by governing authorities having jurisdiction at Site, or equipment identification, performance rating, nameplates, and nomenclature plates.
    c. Cover moving parts and labels during the painting with protective masking. Remove all protective masking upon completion of Work. Remove all paint, coatings, and splatter that comes in contact with such labels.
11. Structural and miscellaneous metals covered with concrete need not receive primers, intermediate, or finish coats of paint.
12. Existing structures, equipment, and other existing surfaces and items unless otherwise shown or specified.

E. Description of Colors and Finishes:
    1. Color Selection:
        a. A maximum of five different colors will be selected by ENGINEER in addition to color coding of pipelines, valves, equipment, ducts, and electrical conduit.
        b. ENGINEER reserves the right to select non-standard colors for paint systems specified within ability of paint manufacturer to produce such non-standard colors. Provide such colors at no additional expense to OWNER.
    2. Color Coding of Pipelines, Valves, Equipment, and Ducts:
        a. In general, color-coding of pipelines, valves, equipment and ducts shall comply with applicable standards of ANSI A13.1, ANSI Z535.1 and 40 CFR 1910.144. Provide color-coding for pipelines per Table 09 91 00-B, Pipeline Color Table.
        b. For equipment on roofs or exposed to view, such as on exterior building facades and in offices and lobbies, color shall be selected by ENGINEER.
    3. Color Coding of Pipelines and Equipment:
        a. Finish coats of paint for pipelines and equipment shall be coded in basic colors. Colors shall be brilliant, distinctive shades matching the following safety and pipeline colors per ANSI Z535.1, Recommended Standards for Water Works; Recommended Standards for Wastewater Facilities, color specifications for safety colors and other primary colors:

F. Abbreviations and Symbols:
    1. Abbreviations and symbols used in painting systems are explained in Article 2.2 of this Section and provide information on generic composition of required materials, manufacturers, number of coats and dry mil film thickness per coat (DMFTPC), and coverage for determining required number of gallons for the Work.

1.2 REFERENCES

A. Referenced Standards: Standards referenced in this Section are:
   1. ANSI A13.1, Scheme for Identification of Piping Systems.
   2. ANSI Z535.1, Safety Color Code.
   3. ANSI/NSF Standard 60, Drinking Water Treatment Chemicals - Health Effects.
   4. ANSI/NSF Standard 61, Drinking Water System Components – Health Effects.
   5. ASTM D16, Terminology for Paint, Related Coatings, Materials and Applications.
   6. ASTM D2200, Pictoral Surface Preparation Standards for Painting Steel Surfaces.
   7. ASTM D4258, Practice for Surface Cleaning Concrete for Coating.
   8. ASTM D4259, Practice for Abrading Concrete.
   9. ASTM D4262, Testing Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
   10. ASTM D4263, Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   11. ASTM D4285, Test Method for Indicating Oil or Water in Compressed Air.
   12. ASTM D4417, Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
   13. ASTM D4541, Test Methods for Pull-Off Strength of Coatings Using Portable Adhesion-Testers.
   14. ASTM E329, Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
   15. AWWA C652, Disinfection of Water-Storage Facilities.
   16. AWWA D102, Coating Steel Water-Storage Tanks.
   17. California Air Resources Board (CARB) Revised Suggested Control Measure (SCM)
   18. 29 CFR 1910.144, Safety Color Code for Marking Physical Hazards.
   19. 40 CFR, Subpart D-2001, National Volatile Organic Compound Emission Standards for Architectural Coatings.
   20 South Coast Air Quality Management District (SCAQMD) Rule 1113,
   21. Green Seal, Inc. Paint, (GS-11).
   22. Maricopa County, Arizona Architectural Coatings Rule 335.
   23. National Association of Piping Fabricators, NAPF 500-03, Surface Preparation Standard For Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings And/or Special Internal Linings.
   24. Ozone Transport Commission, (OTC), OTC Model Rule for Architectural and Industrial Maintenance Coatings.
   25. Resource Conservation and Recovery Act of 1976 (RCRA).
   26. SSPC PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
   27. SSPC SP 1, Solvent Cleaning.
   28. SSPC SP 3, Power Tool Cleaning.
   29. SSPC SP 6, Commercial Blast Cleaning.
   30. SSPC SP 10, Near-White Blast Cleaning.
   31. SSPC SP 11, Power Tool Cleaning To Bare Metal.
   32. SSPC VIS 1, Visual Standard for Abrasive Blast Cleaned Steel.
   33. SSPC VIS 2, Method of Evaluating Degree of Rusting/Painted Steel Surfaces.

34. SSPC Volume 2, Systems and Specifications.

1.3 DEFINITIONS

A. Standard coating terms defined in ASTM D16 apply to this Section, including:
   1. Paint: Pretreatment and all painting system materials, such as primer, emulsion, enamel, organic/inorganic polymer coating, stain sealer and filler, and other applied materials whether used as prime, filler, intermediate, or finish coats.
   2. Exposed: All items not covered with cement plaster, concrete, or fireproofing. Items covered with these materials shall be provided with specified primer only, except where specified as a surface not to be painted. Exposed-to-view surfaces include areas visible after permanent or built-in fixtures, convector covers, ceiling tile, covers for finned tube radiation, grilles, and similar covering products are in areas scheduled to be painted.
   3. LEED Compliant: As defined by the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED), means interior field-applied coatings that shall have a maximum volatile organic compound (VOC) and chemical content as listed in Green Seal, Inc. Paints (GS-11).
   4. Low VOC: All interior and exterior field-applied coatings that have maximum VOC content as listed in OTC Model Rule for Architectural and Industrial Maintenance Coatings.
   5. OTC: Ozone Transport Commission, which recommends standard VOC content levels in several Northeastern and Mid-Atlantic states.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications:
   1. Engage a single applicator that regularly performs installation of paint materials, with documented skill and successful experience in installing types of products required and that agrees to employ only trained, skilled tradesmen who have successful experience in installing types of products specified.
   2. Submit name and qualifications to ENGINEER along with following information for at least three successful, completed projects:
      a. Names and telephone numbers of owner and design professional responsible for project.
      b. Approximate contract cost of paint products.
      c. Amount of area painted.
   3. Submit to ENGINEER proof of acceptability of applicator by manufacturer.

B. Testing Agency Qualifications: Provide an independent testing agency for testing specified in this Section. Testing agency shall be selected by OWNER and paid for by CONTRACTOR. When requested, submit documentation demonstrating to satisfaction of ENGINEER, that testing agency has experience and capability to satisfactorily conduct testing required without delaying the Work, in accordance with ASTM E329.

C. Source Quality Control:
   1. Obtain materials from manufacturers that will provide services of a qualified manufacturer's representative at Site at commencement of painting Work, to advise on products, mock-ups, installation, and finishing techniques and, at completion of Work, to advise ENGINEER on acceptability of completed Work and during the course of the Work as may be requested by ENGINEER.
   2. Certify long-term compatibility of all coatings with surfaces.
   3. Do not submit products that decrease number of coats, surface preparation, or generic type and formulation of coatings specified. Products exceeding VOC limits and chemical content specified will not be approved.
   4. ENGINEER may review manufacturers' recommendations concerning methods of installation and number of coats of paint for each painting system. CONTRACTOR shall prepare construction costs based on painting systems, number of coats, coverage's and installation methods specified.
   5. Submit "or equal" products, when proposed, with direct comparison to products specified, including information on durability, adhesion, color and gloss retention, percent solids, VOC's grams per liter, and recoatability after curing.
   6. "Or equal" manufacturers shall furnish same color selection as manufacturers specified, including intense chroma and custom pigmented colors in all painting systems.
   7. Color Pigments: Provide pure, non-fading, applicable types to suit surfaces and services to be painted. Comply with:
      a. Lead and Chromate: Lead and chromate content shall not exceed amount permitted by authorities having jurisdiction.
   8. Obtain each product from one manufacturer. Multiple manufacturing sources for the same system component are unacceptable.
   9. Certify product shelf life history for each product source for materials manufactured by the same manufacturer, but purchased and stored at different locations or obtained from different sources.
   10. Constantly store materials to be used for painting Work between 60 degrees F and 90 degrees F, and per paint manufacturer's written recommendations, for not more than six months. Certify to ENGINEER that painting materials have been manufactured within six months of installation and have not, nor will be, subjected to freezing temperatures.

D. Regulatory Requirements:
   1. Comply with VOC content limits of OTC Model Rule for Architectural and Industrial Maintenance Coatings:
      a. Industrial Maintenance Coatings: 340 grams per liter.
      b. Interior and Exterior Non-Flat Coatings: 150 grams per liter.
   2. Comply with the following:
      a. 29 CFR 1910.144, Safety Color Code for Marking Physical Hazards.
      b. 40 CFR, Subpart D-2001, National Volatile Organic Compound Emission Standards for Architectural Coatings.
      c. Resource Conservation and Recovery Act of 1976 (RCRA).
      d. SW-846, Toxic Characteristic Leaching Procedure (TCLP).

3. Comply with authorities having jurisdiction at Site for blast cleaning, confined space entry, and disposition of spent abrasive and debris.

E. Mock-ups:
   1. Demonstrate installation of specified painting systems on actual wall surfaces and building components at locations selected by ENGINEER.
   2. Provide 4-foot by 8-foot stepped-down sample area for each painting system. Prior to application of painting system, but after ENGINEER's approval of the components of each painting system, apply a 4-foot wide sample of each operation and application step required by this Section and specified manufacturer's written application recommendations. Show each application step as a 2-foot long section that shall remain exposed to demonstrate work performed in that step. Continue application procedures until topcoat is provided. Topcoat shall be a minimum of two feet long. When completed, finished mock-up for each paint system shall reveal each step and each coat of paint required for paint system with 2-foot wide strips revealing Work performed to prepare surface and apply each coat. Lengthen overall mock-up as required to completely demonstrate each painting system. Use tinted shades differing from coat to coat for each component of each painting system.
   3. ENGINEER may approve or disapprove each component of each painting system on an individual component basis.
   4. Painting Work that does not meet standard approved on sample areas shall be removed and replaced.
   5. Painting Work advanced without approved mock-ups shall stop, and mock-ups prepared for approval by ENGINEER.

F. Pre-painting Conference:
   1. Prior to installing painting systems, arrange a meeting at Site with painting applicator and its foreman, paint manufacturer's technical representative, installers of other work in and around painting that must follow painting Work, ENGINEER, and other representatives directly concerned with performance of painting Work. Record discussions of conference and decisions and agreements and disagreements and furnish a copy of record to each party attending. Review foreseeable methods and procedures relating to painting Work including:
      a. Review Project requirements including Contract Documents, approved Shop Drawings, pending and approved Change Orders, requests for information that submitted by CONTRACTOR to ENGINEER, and other pertinent documents.
      b. Review required samples and submittals, both completed and to be completed.
      c. Review status of surfaces including drying, surface preparations, and similar considerations.
      d. Review availability of materials, tradesmen, equipment, and facilities required for progress, to avoid delays, and to protect Work from damage.
      e. Review required inspection, testing, certifying, and quality control procedures.
      f. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions. Supplemental heating sources required to for

working in low-temperature conditions, shall be operating and acceptable to paint applicator and ENGINEER.

g. Review methods for complying with regulations of authorities having jurisdiction at Site, such as compliance with environmental protection, health, safety, fire, and similar regulations.

h. Review laws and procedures covering removal and disposal of blast debris.

2. Reconvene meeting at earliest opportunity if additional information must be developed to conclude the required topics of the meeting.

3. Record revisions or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:

1. Product Data:

a. Copies of manufacturer's technical information and test performance data, including paint analysis, VOC and chemical component content in comparison to maximum allowed by the Contract Documents, and application instructions for each product proposed for use.

b. Submit proof of acceptability of proposed application techniques by paint manufacturer selected.

c. Copies of CONTRACTOR's proposed protection procedures in each area of the Work explaining methods of protecting adjacent surfaces from splatter, for confining application procedures in a manner that allows other work adjacent to surface preparation and painting Work to proceed safely and without interruption, and for maintaining acceptable application, curing, and environmental conditions during and after painting systems application.

d. List each material and cross-reference to the specific painting system and application, including a list of site-specific surfaces to which painting system will be applied. Identify by manufacturer's catalog number and general classification. State number of gallons of each product being purchased for delivery to Site and square foot area calculated to be covered by each painting system specified based on theoretical loss of 20 percent. Where actual area to be covered by paint system exceeds area submitted to ENGINEER for that system, proof of additional material purchase shall be provided to ENGINEER. Calculated coverage shall be as specified for each component of each painting system specified. This requirement does not take precedence over CONTRACTOR's responsibility to provide dry film thickness required for each component of each painting system.

e. Identify maximum exposure times allowable for each paint system component before next coat of paint can be applied. Submit proposed methods for preparing surfaces for subsequent coats if maximum exposure times are exceeded.

f. Information on curing times and environmental conditions that affect curing time of each paint system component and proposed methods for

accommodating variations in curing time. Identify this information for each painting system in the Work.

g. Specification for spray equipment with cross-reference to paint manufacturer's recommended equipment requirements.

2. Samples:
   a. Copies of manufacturer's complete color charts for each coating system.
   b. Mock-ups specified for the Site.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certificate from paint manufacturer stating that materials meet or exceed Contract Documents requirements.
      b. Evidence of shelf life history for all products verifying compliance with the requirements of the Contract Documents.
      c. CONTRACTOR shall provide notarized statement verifying that all painting systems are compatible with surfaces specified. All painting systems components shall be reviewed by an authorized technical representative of paint manufacturer for use as a compatible system. Verify that all painting systems are acceptable for exposures specified and that paint manufacturer is in agreement that selected systems are proper, compatible, and are not in conflict with paint manufacturer's recommended specifications. Show by copy of transmittal form that a copy of letter has been transmitted to paint applicator.
   2. Test Reports:
      a. Certified laboratory test reports for required performance and analysis testing in compliance with ASTM E329.
      b. Locations of and test methods for soil sampling before beginning Work and after Substantial Completion.
      c. Proposed methods for testing, handling, and disposal of waste generated during Work.
      d. Results of alkalinity and moisture content tests performed in accordance with ASTM D4262 and ASTM D4263.
      e. Results of tests of film thickness, holidays, and imperfections.
   3. Manufacturer's Instructions: Provide paint manufacturer's storage, handling, and application instructions prior to commencing painting Work at Site.
   4. Manufacturer's Site Reports: Provide report of paint manufacturer's representative for each visit to Site by paint manufacturer's representative.
   5. Special Procedure Submittals:
      a. Proposed protection procedures for each area of Work, explaining methods of protecting adjacent surfaces from splatter, for confining application procedures in a manner that allows other work adjacent to surface preparation and painting Work to proceed safely and without interruption.
      b. Site-specific health and safety plan.
      c. Procedures for maintaining acceptable application, curing and environmental conditions during and after painting systems application.

d. Procedures for providing adequate lighting, ventilation, and personal protection equipment relative to painting Work.

6. Qualifications:
   a. Applicator.
   b. Testing laboratory

C. Closeout Submittals: Submit the following:
   1. Operations and Maintenance Data: Upon completion of the painting Work, furnish ENGINEER five copies of detailed maintenance manual including the following information:
      a. Complete and updated product catalog of paint manufacturer's currently available products including complete technical information on each product. Identify product names and numbers of each product used in the painting Work.
      b. Name, address, e-mail address and telephone number of manufacturer, local distributor, applicator and technical representative.
      c. Detailed procedures for routine maintenance and cleaning.
      d. Detailed procedures for light repairs such as dents, scratches and staining.
   2. Record Documentation: Statement of Application: Upon completion of the painting Work, submit a notarized statement to ENGINEER signed by CONTRACTOR and painting applicator stating that Work complies with requirements of the Contract Documents and that application methods, equipment, and environmental conditions were proper and adequate for conditions of installation and use.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Product Delivery Requirements: Deliver products to Site in original, new, and unopened packages and containers, accurately and legibly and accurately labeled with the following:
   1. Container contents, including name and generic description of product.
   2. Manufacturer's stock number and date of manufacture.
   3. Manufacturer's name.
   4. Contents by volume, for major pigment and vehicle constituents.
   5. Grams per liter of volatile organic compounds.
   6. Thinning instructions, where recommended.
   7. Application instructions.
   8. Color name and number.

B. Product Storage Requirements:
   1. Store acceptable materials at Site.
   2. Store in an environmentally controlled location as recommended in paint manufacturer's written product information. Keep area clean and accessible. Prevent freezing of products.
   3. Store products that are not in actual use in tightly covered containers.
   4. Comply with health and fire regulations of authorities having jurisdiction at Site.

C. Product Handling Requirements:
   1. Handle products in a manner that minimizes the potential for contamination, or incorrect product catalyzation.
   2. Do not open containers or mix components until necessary preparatory work has been completed and approved by ENGINEER and painting Work will start immediately.
   3. Maintain containers used in storing, mixing, and applying paint in a clean condition, free of foreign materials and residue.

1.7 SITE CONDITIONS

A. Site Facilities:
   1. Supplemental heat sources, as required to maintain both ambient and surface temperatures within range recommended by paint manufacturer for paint system application, are not available at Site.
   2. Provision of supplemental heat energy sources, power, equipment, and operating, maintenance and temperature monitoring personnel is responsibility of CONTRACTOR.
   3. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas being painted. Properly locate and vent such heat sources to exterior such that paint systems are unaffected by exhaust.

B. Environmental Requirements:
   1. Apply water-base paints when the temperature of surfaces to be painted and ambient air temperatures are between 55 degrees F and 90 degrees F, unless otherwise permitted by paint manufacturer's published instructions.
   2. Surfaces to be painted shall be at least 5 degrees F above dew point temperature and be dry to the touch. Apply paint only when temperature of surfaces to be painted, paint products, and ambient air temperatures are between 65 degrees F and 95 degrees F, unless otherwise permitted by paint manufacturer's published instructions.
   3. Apply paint system within shortest possible time consistent with manufacturer's recommended curing instructions for each coat. If chemical, salt, or other contamination contacts paint film between coats, remove contamination per SSPC SP 1 and restore surface before applying paint.
   4. Do not paint tanks or pipelines containing fluid without specific permission of ENGINEER and only under conditions where "sweating" of outside surface of vessel being painted is not likely to occur within 24 hours of paint application.
   5. Do not apply epoxy paints if ambient temperature is expected to go below 50 degrees F within twelve hours of application. Follow manufacturer's instructions when manufacturer's published recommendations require a higher minimum ambient temperature.
   6. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent. Do not apply paint to damp or wet surfaces or when surfaces will reach dew point due to falling or rising temperatures and humidity conditions during

course of paint application, unless otherwise permitted by paint manufacturer's published instructions.

7. Do not paint unacceptably hot or cold surfaces until such surfaces can be maintained within temperature and dew point ranges acceptable to paint manufacturer. Arrange for surfaces to be brought within acceptable temperature and dew point ranges as part of painting Work.
8. Moisture content of surfaces shall be verified to ENGINEER as acceptable prior to commencement of painting using methods recommended by paint manufacturer.
9. Painting may be continued during inclement weather only if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer for application and drying.
10. Provide adequate illumination and ventilation where painting operations are in progress.

C. Protection:
   1. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently, or not to be painted.
   2. During surface preparation and painting, facility shall remain in operation. Use procedures that prevent contamination of process or cause or require facility shutdown.
   3. Coordinate and schedule surface preparation and painting to avoid exposing personnel to hazards associated with painting Work. Provide required personnel safety equipment per requirements of authorities having jurisdiction at Site.
   4. Submit protection procedures to be employed. Do not begin surface preparation and painting Work until ENGINEER accepts protection techniques proposed by CONTRACTOR.
   5. When working with flammable materials, provide fire extinguishers and post temporary signs warning against smoking and open flame.

1.8 MAINTENANCE

A. Extra Materials: Furnish, tag, and store an additional one percent by volume of all coatings and colors installed. Provide a minimum of one gallon of each coating and color. Store in unopened containers as specified until turned over to OWNER.

PART 2 - PRODUCTS

2.1 PAINTING SYSTEM MANUFACTURERS

A. Products and Manufacturers: Where referenced under painting systems provide products manufactured by the following:
   1. Tnemec Company, Inc. (TCI).
   2. The Carboline Company, part of StonCor Group, an RMP Company (TCC).
   3. Sherwin-Williams Company (SWC).
   4. Benjamin Moore & Company (BMC).

5. Righter Group Inc. (RGI).
6. Duron Inc. (DI).

2.2 PAINTING SYSTEMS

Surface/ Exposure	Surf. Prep.	Primer/Surfacer System Type % Solids	(Coats) DFT (Mils) Max VOC g/l (EPA)	Intermediate System Type % Solids	(Coats) DFT (Mils) Max VOC g/l (EPA)	Finish System Type % Solids	(Coats) DFT (Mils) Max VOC g/l (EPA)
Cast-In-Place Concrete Walls (except walls within height of chemical containment wall areas), Columns, Underside of Roof Slabs and Beams, Architectural Precast Concrete, except as noted.							
Cast-In-Place Concrete, Including Water Storage Tanks, Concrete Unit Masonry; Wood							
TABLE 09 91 00-A							
Smooth Finish; Above Grade; Exterior	1.5.A.2. 3.2.A. 3.2.B.1. 3.2.B2. 3.2.B.3. 3.2.B.5. 3.2.B.6. 3.2.B.7. 3.2.B.8. 3.2.I.	Cast-In-Place Concrete, Concrete Unit Masonry Primer -Series 156 Enviro-Crete (TCI) -Flexxide Elastomer(TCC) Waterborne Acrylic 45%	(2) 6-8 85	Wood Primer -Series 151 Elasto-Grip (TCI) -Sanitile 120 (TCC) Waterborne Polyamine Epoxy 17%	(1) .7-1.5 170	- Series 1029 Enduratone(TCI) Flexxide Elastomer (TCC) Waterborne Acrylic Smooth 40%	(2) 6-8 94
Ferrous Metals, Structural Steel, Exterior Surfaces of Valves and Piping							
TABLE 09 91 00-B							
[1.]	1.5.A.2. 3.2.A. 3.2.C.1. 3.2.C2. 3.2.D. 3.2.E.	-Series 22 Pota-Pox 100 (TCI) - Phenoline 341 (TCC) Epoxy 100%	(1) 25 12			-Series 22FC Epoxoline (TCI) -Phenoline 341 (TCC) Epoxy 100%	(1) 15-30 12

1. At Ambient Temperatures of Greater Than (--2--) Gallon Capacity, Galvanized Metals and Non-ferrous metals, Exterior Surfaces of Piping; Non-Submerged and Intermittently Submerged, up to 4 feet above liquid level, ANSI/NSF Standard 61; Low VOC Content; Interior

TABLE 09 91 00-C							
Non-Submerged; VOC Compliant; Semi-Gloss; Exterior	1.5.A.2. 3.2.A. 3.2.C.1. 3.2.C2. 3.2.D. 3.2.E. 3.2.F.	<u>Ferrous Metal, Galvanized, and Non-Ferrous Metal Primer</u> -Series V69 Epoxoline II (TCI) -Carboguard 890 (TCC) Epoxy 67%	(1) 4-6 234	<u>Ferrous Metal Touch Up Low Temperature</u> - Series V69 Epoxoline II (TCI) -Carboguard 890 LT (TCC) Epoxy 69% <u>Ferrous Metal Touch Up Warm Temperature</u> - Series V69 Epoxoline II (TCI) -Carboguard 890 (TCC) Epoxy 69%	(1) 10 228 (1) 228	-Series V73 Endura-Shield (TCI) -Carbothane 133 LH (TCC) Polyureathane 71%	(2) 2-4 220

Gypsum Wallboard, Plaster, and Wood							
TABLE 09 91 00-D							
Low VOC Content; Interior.	1.5.A.2. 3.2.A. 3.2.H.	-Series 151 Elasto-Grip (TCI) -Sanitile 120 HD (TCC) Waterborne Epoxy or Waterborne Acrylic 17%	(1) 1-2 170			-Series 114 HB Tneme-Tufcoat (TCI) -Sanitile 255 WB (TCC) Waterborne Acrylic Epoxy or Water-Based Epoxy Acrylic 42%	(2) 4-6 244

TABLE 09 91 00-E							
Aluminum in Contact With Dissimilar Materials; Low VOC Content; Interior and Exterior.	1.5.A.2. 3.2.A. 3.2.D.	-Series 22 (TCI) -Carboguard 954 HB (TCC) Epoxy 100% 10	(1) 12-16			-Series 22 (TCI) -Carboguard 954 HB (TCC) Epoxy 100% 10	(1) 12-16

2.3 CALKING AND SEALANTS

A. Refer to Section 07 92 00, Joint Sealants.

2.4 INSTRUMENTS

A. Instruments:
   1. Provide one new dry-film thickness gauge for checking film thickness, one holiday detector to detect holidays or holes in the coating, and one set of visual standards to check surface preparation. Calibrate dry film thickness gauge at Site using Bureau of Standards standard shim blocks.
   2. Products and Manufacturers: Provide the following:
      a. Film Thickness Testers: Model FM-III manufactured by Mikrotest, or equal.
      b. Holiday detector shall be Model M-1 as manufactured by Tinker & Rasor, or equal.
      c. Visual Standards: ASTM D2200, Swedish Standards, SSPC VIS 1.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which painting Work is to be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film capable of performing in accordance with claims made in paint manufacturer's product literature for surfaces and conditions encountered.

C. Do not paint over existing paint where there is no assurance that existing paint will provide an acceptable surface for long-term adherence and durability of painting systems specified or where paint manufacturer requires removal of all existing paint to recommend use of specified painting system.

3.2 SURFACE PREPARATION

A. General:
   1. Test for moisture content of surfaces before commencement of painting Work. Test for moisture in concrete in compliance with ASTM D4263. Report results to ENGINEER before commencing Work.
   3. Perform preparation and cleaning procedures as specified herein and in strict accordance with paint manufacturer's approved instructions for each surface and atmospheric condition.

4. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items already in place that do not require field painting, or provide effective surface-applied protection prior to surface preparation and painting.
5. Remove as necessary items that must be field-painted where adjacent surfaces cannot be completely protected from splatter or overspray. Following completion of painting of each space or area, the removed items shall be reinstalled by workers skilled in the trades involved.
6. Clean surfaces to be painted before applying painting system components. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning.
7. Prepare surfaces that were improperly shop-painted and abraded or rusted shop-painted surfaces as specified.

B. Cast-In-Place Concrete:
1. Prepare surfaces of concrete unit masonry to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, and other contamination using soap and water. Surfaces shall be clean and dry at time of paint system application.
3. Prepare and clean cast-in-place concrete surfaces per ASTM D4259 to provide a uniform and continuous anchor profile of approximately one mil. Provide mechanical abrading and abrasive blasting per ASTM D4259. Use 40 to 80-mesh abrasive and clean, dry, compressed air. Compressed air cleanliness shall be per ASTM D4285. Pressure at blasting nozzle shall not exceed 80 pounds per square inch. Do not concentrate blast on surface; instead, move at a fairly rapid rate to provide a surface free of laitants and contaminants. Provide post-surface preparation cleaning per ASTM D4258 to remove loose material. Surface preparation shall open all surface air holes by removing laitance shoulders surrounding air holes. Vacuum surfaces to remove dust and sand, and wash with potable water.
5. Remove from cast-in-place concrete fins, projections, and other surface irregularities that would protrude above level of finished intermediate fillers and surfacers. Remove by chipping and scarification by mechanical abrasion.
6. Using specified filler and surfacer, patch cast-in-place concrete surfaces as required to completely fill surface air holes and honeycombing. Level all protrusions, grind filler and surfacing compounds smooth, and level with adjacent surfaces.
7. Perform tests per ASTM D4262 and ASTM D4263 to verify alkalinity and moisture content of surfaces to be painted, and report findings to ENGINEER. If, in ENGINEER's opinion, surfaces are sufficiently alkaline to cause blistering and burning of paint, correct the condition before applying paint. Provide suitable testing materials for alkalinity and moisture tests. Do not paint surfaces where the moisture content exceeds eight percent.

C. Ferrous Metals:
   1. Ferrous Metals Except Ductile and Cast Iron:
      a. Comply with paint manufacturer's recommendations for type and size of abrasive to provide a surface profile that meets manufacturer's painting system requirements for type, function, and location of surface. Verify that paint manufacturer-recommended profiles have been achieved on prepared surfaces. Report profiles to ENGINEER using Test Method C of ASTM D4417.
      b. Clean non-submerged ferrous surfaces including structural steel and miscellaneous metal to be shop-primed, of all oil, grease, dirt, mill scale, and other contamination by commercial blast cleaning complying with SSPC SP 6 at time of paint system application, using SSPC VIS 1 as a standard of comparison.
      c. Clean submerged ferrous surfaces including structural steel and miscellaneous metal to be shop-primed of all oil, grease, dirt, mill scale, and other contamination by near-white blasting complying with SSPC SP 10 at time of painting system application, using SSPC VIS 1 as a standard of comparison.
      d. Clean non-submerged, ferrous surfaces that have not been shop-coated of all oil, grease, dirt, loose mill scale, and other contamination by commercial blasting complying with SSPC SP 6 at the time of painting system application, using SSPC VIS 1 as a standard of comparison.
      e. Clean submerged ferrous surfaces that have not been shop-coated or that have been improperly shop-coated of all oil, grease, dirt, mill scale, and other contamination by near-white blasting complying with SSPC SP 10 at time of painting system application, using SSPC VIS 1 as a standard of comparison.
      f. Touch-up shop-applied prime coats that have damaged or have bare areas with primer recommended by paint manufacturer after commercial blasting complying with SSPC SP 6 at the time of painting system application, using SSPC VIS 1 as a standard of comparison, to provide a surface profile of not less than one mil.
      g. Power tool-clean per SSPC SP 3 to remove welding splatter and slag.
      h. Remove all rust and contamination on existing ferrous metals to sound surfaces by power tool-cleaning complying with SSPC SP 11 to provide a surface profile of not less than one mil.
   2. Ductile and Cast Iron:
      a. Comply with paint manufacturer's recommendations and NAPF 500-03 for type and size of abrasive to provide a surface profile meeting paint manufacturer's requirements for type, function and location of surface. Verify that paint manufacturer-recommended profiles are achieved on prepared surfaces.
      b. Clean submerged and non-submerged ductile and cast iron surfaces to be shop-primed of all oil, grease, dirt, mill scale, and other contamination by solvent cleaning and abrasive blasting complying with NAPF 500-03-01, NAPF 500-03-04, and NAPF 500-03-05 at time of paint system application.

c. Clean submerged ductile and cast iron that have not been shop-coated or that have been improperly shop-coated of all oil, grease, dirt, mill scale, and other contamination by solvent cleaning and abrasive blasting complying with NAPF 500-03-01, NAPF 500-03-04, and NAPF 500-03-05 at time of paint system application.
d. Touch-up shop-applied prime coats that are damaged or have bare areas with primer recommended by paint manufacturer, after power tooling complying with NAPF 500-03 at the time of painting system application.
e. Remove all contamination on existing ductile and cast iron to sound surfaces by power tool cleaning complying with NAPF 500-03-03.

D. Non-Ferrous Metal Surfaces: Prepare non-ferrous metal surfaces for painting by light whip blasting or by lightly sanding with 60- to 80-mesh sandpaper.

E. Galvanized (Zinc-Coated) Surfaces: Prepare galvanized surfaces for painting by lightly sanding with 60- to 80-mesh sandpaper or by light whip blasting.

F. Wood:
1. Clean wood surfaces to be painted of all dirt, oil, or other foreign substances using scrapers, mineral spirits, and sandpaper, as required. Use sandpaper to smooth finished surfaces exposed to view and dust off.
2. Prime, stain, or seal wood required to be painted at Site immediately upon delivery to Site. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling and similar items.
3. Backprime paneling or interior partitions only where masonry, plaster, or other wet-wall construction occurs on backside.
4. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying priming coat.
5. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler as recommended by manufacturers of paint and filler, sandpaper smooth when dried and dust off.

3.3 PROTECTION OF PROPERTY AND STRUCTURES

A. Protect property and structures adjacent to the Work from waste residues resulting from cleaning, surface preparation and paint application.

B. Use shrouding, vacuum blasting, or other approved methods for cleaning and surface preparation of exterior surfaces.

C. During blast cleaning and surface preparation of interior and exterior surfaces, control discharge of dust and grit, using shrouding, negative-pressure containment/dust collection systems, or other means to protect adjacent property and structures and prevent dust/grit from escaping. Similarly control removal and temporary storage of residues to protect adjacent property and structures.

D. For painting of exterior surfaces, use rollers, shrouding or other approved methods as required to protect adjacent property and structures from wind-blown paint residues.

E. Submit proposed procedures for cleaning, surface preparation and paint application describing methods for protecting adjacent property and structures from residues. Do not proceed with cleaning, surface preparation or painting until proposed procedures are approved by ENGINEER.

3.4 MATERIALS PREPARATION

A. General:
   1. Mix and prepare paint products in strict accordance with paint manufacturer's product literature.
   2. Do not mix painting materials produced by different manufacturers, unless otherwise permitted by paint manufacturer's instructions.
   3. Where thinners are required, they shall be produced by paint system manufacturer unless otherwise permitted by paint manufacturer's product literature and submitted to and accepted by ENGINEER with Shop Drawings.

B. Tinting:
   1. Where multiple coats of the same material are to be provided, tint each undercoat a lighter shade to facilitate identification of each coat of paint.
   2. Tint undercoats to match color of finish coat of paint, but provide sufficient difference in shade of undercoats to distinguish each separate coat. Provide a code number to identify material tinted by manufacturer.

C. Mixing:
   1. For products requiring constant agitation, use methods in compliance with manufacturer's product literature to prevent settling during paint application.
   2. Mix in containers placed in suitably sized non-ferrous or oxide resistant metal pans to protect floors from slashes or spills that could stain the floor or react with subsequent finish floor material.
   3. Mix and apply paint in containers bearing accurate product name of material being mixed or applied.
   4. Stir products before application to produce a mixture of uniform density and as required during the application. Do not stir into the product film that forms on surface; instead, remove film and, if necessary, strain product before using.
   5. Strain products requiring such mixing procedures. After adjusting mixer speed to break up lumps and after components are thoroughly blended, strain through 35 to 50-mesh screen before application.

3.5 APPLICATION

A. General:
   1. Apply paint systems by brush, roller, or airless spray per manufacturer's recommendations and in compliance with Paint Application Specifications No. 1 in SSPC Volume 2, where applicable. Use brushes best suited for type of paint applied. Use rollers of carpet, velvet back, or high pile sheeps wool as recommended by paint manufacturer for product and texture required. Use air spray and airless spray equipment recommended by paint manufacturer for specific painting systems specified. Submit a list of application methods proposed, listing paint systems and location.
   2. Paint dry film thicknesses required are the same regardless of the application method. Do not apply succeeding coats until previous coat has completely dried.
   3. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is uniform finish, color, and appearance, particularly for intense chroma primary colors. Ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a film thickness equivalent to that of flat surfaces.
   4. Surfaces of items not normally exposed-to-view do not require the same color as other components of system of which they are part, but require the same painting system specified for exposed surfaces of system.
   5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint before final installation of registers or grilles.
   6. Paint backs of access panels and removable or hinged covers to match exposed surfaces.
   7. Paint aluminum parts in contact with dissimilar materials with specified paint system.
   8. Paint tops, bottoms, and side edges of doors the same as exterior surfaces.
   9. Omit field-applied primer on metal surfaces that have been primed in the shop. Touch-up paint shop-primed coats and pre-finished items only when approved by ENGINEER using compatible primers and manufacturer's recommended compatible field-applied finishes.
   10. Welds shall be stripe-coated with intermediate or finish coat of paint after application of prime coat.

B. Minimum/Maximum Paint Film Thickness:
   1. Apply each product at not less than, nor more than, manufacturer's recommended spreading rate, and provide total dry film thickness as specified.
   2. Apply additional coats of paint if required to obtain specified total dry film thickness.
   3. Maximum dry film thickness shall not exceed 100 percent of minimum dry film thickness, except where more stringent limitations are recommended by paint manufacturer for a specific product.

C. Scheduling Surface Preparation and Painting:
   1. As soon as practical after preparation, apply first-coat material to surfaces that have been cleaned, pretreated, or otherwise prepared for painting. Apply first-coat material before subsequent surface deterioration due to atmospheric conditions existing at time of surface preparation and painting. Surfaces that have started to rust before first-coat application is complete shall be brought back to required standard by abrasive blasting.
   2. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure and application of another coat of paint does not cause lifting or loss of adhesion to undercoat.
   3. Scarify primers and other painting system components by brush-blasting if paint has been exposed for lengths of time or under conditions beyond manufacturer's written recommendations for painting systems required, intended use, or method of application proposed for subsequent coats of paint.
   4. Schedule cleaning and painting so that dust and other contaminants from cleaning process do not fall on wet, newly painted surfaces.

D. Prime Coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects caused by insufficient sealing.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

F. Brush Application:
   1. Brush out and work all brush coats onto surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections are unacceptable. Neatly draw all glass and color break lines.
   2. Brush-apply primer or first coats, unless otherwise permitted to use mechanical applicators.

G. Mechanical Applicators:
   1. Use mechanical methods for paint application when permitted by governing ordinances, manufacturer, and approved by ENGINEER.
   2. Limit roller applications, if approved by ENGINEER, to interior wall finishes for second and third coats. Apply each roller coat to provide the equivalent hiding as brush-applied coats.
   3. Where spray application is used, apply each coat to provide equivalent hiding of brush-applied coats. Do not double back with spray equipment for purpose of building up film thickness of multiple coats in one pass.

H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint Work not in compliance with specified requirements as required by ENGINEER.

3.6 FIELD QUALITY CONTROL

A. ENGINEER may invoke the following material testing procedure at any time for a maximum of five times during field painting Work:
   1. CONTRACTOR shall engage service of an independent testing laboratory to sample paints used, as designated by ENGINEER. Samples of products delivered to Site shall be obtained, identified, sealed, and certified as to being products actually applied to surfaces in each area, in presence of CONTRACTOR.
   2. A testing laboratory selected by OWNER and paid for by CONTRACTOR shall perform appropriate tests for any or all of the following:
      a. Abrasion resistance.
      b. Apparent reflectivity.
      c. Flexibility.
      d. Washability.
      e. Absorption.
      f. Accelerated weathering.
      g. Dry opacity.
      h. Accelerated yellowness.
      i. Recoating.
      j. Skinning.
      k. Color retention.
      l. Alkali resistance.
      m. Quantitative materials analysis.
   3. If test results show that products being used do not comply with specified requirements, CONTRACTOR may be directed to stop painting Work and remove non-complying paint, and shall prepare and repaint surfaces coated with rejected paint with material complying with the Contract Documents.

B. Notify ENGINEER after completing each coat of paint. After inspection and checking of film thickness, holidays, and imperfections, and after acceptance by ENGINEER, proceed with succeeding coat. Perform testing using testing instruments specified in Article 2.4 of this Section.
   1. ENGINEER will witness all testing and shall be notified of scheduled testing at least twenty-four hours in advance.
   2. Apply additional coats, if required, to produce specified film thickness and to correct holidays and to completely fill all surface air holes.

C. For magnetic substrates, measure thickness of dry film nonmagnetic coatings following recommendations of SSPC PA-2. These procedures supplement manufacturers' approved instructions for manual operation of measurement gauges and do not replace such instructions.

D. Record time, location, number of coats, dry film thickness, holidays, and other imperfections and submit testing results to ENGINEER.

3.7 PROTECTION OF NEW FINISHES

A. Provide signs that read, “Wet Paint” as required to protect newly painted finishes. Remove temporary wrappings provided for protection of the Work after completion of painting.

3.8 ADJUSTING AND CLEANING

A. Correct damages to work of other trades through cleaning, repairing or replacing, and repainting, as acceptable to ENGINEER.

B. During progress of Work, remove from Site all discarded paint materials, rubbish, cans, and rags at end of each workday.

C. Upon completion of painting, clean paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, while avoiding scratching or otherwise damaging finished surfaces.

D. At completion of work of other trades, touch-up and restore damaged or defaced painted surfaces as determined by ENGINEER.

3.9 SCHEDULES

A. The schedules listed below, following the “End of Section” designation, are a part of this Specification section.
   1. Table 09 91 00-C, Painting Schedule.

TABLE 09 91 00-C
PAINTING SCHEDULE

Facility or Surface *	Room No.	Painting System **	Remarks
All New Fiber-Cement Siding and Trim, Exterior		A	Colors: Plank siding to be red to match existing. Trim (fascia, soffit, door and window trim, etc.) to be white.
All Surfaces of Gates, Gate Handle, Etc.		B	Do not paint any stainless steel components
All Hollow Metal Doors and Frames		C	Color: Exterior of doors and frames to be red to match existing. Interior of doors and frames to match the interior wood color as selected by Owner.
All Interior Wood Surfaces of both Gate Enclosures, including but not limited to wood trusses, exposed interior face of plywood, wood framing, wood blocking, etc.		D	Colors: To be selected by Owner.
All New Aluminum in Contact with Dissimilar Surfaces		E	

* Refer to Drawings for facility locations and for facilities not listed above.

** Refer to Article 2.2 of this Section.

+ + END OF SECTION + +

SECTION 10 14 00

SIGNAGE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install signage.
      a. CONTRACTOR shall be responsible for all signage furnished under this Section for the entire Project in accordance with the Contract Documents.
   2. Extent of signage is shown and specified.
   3. Types of products required include the following:
      a. Health, safety, warning, floor loading and fire extinguisher location signs.
      b. Equipment nameplates.
      c. Individual dimensional letters.
      d. Stainless steel fasteners, supports, very-high-bond high-performance mounting tape, primers and other accessories.

B. Coordination:
   1. Coordinate adhesives and fasteners with mounting surfaces. Review other Sections to ensure compatibility of signage mounting accessories with various surfaces on which signage will be installed.
   2. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before signage Work.

C. Related Sections:
   1. Section 03 30 00, Cast-In-Place Concrete.
   2. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA DSA-45, Designation System for Aluminum Finishes.
   2. ASME A13.1 Scheme for the Identification of Piping Systems.
   3. ANSI/ICC A117.1, Accessible and Usable Buildings and Facilities.
   4. ANSI Z535.1, Marking Physical Hazards Safety Color Code.
   5. ANSI Z535.2, Environmental and Facility Safety Signs.
   6. ANSI Z535.3, Criteria for Safety Symbols.
   7. ASTM B26/B26M, Specification for Aluminum-Alloy Sand Castings.
   8. ASTM B584, Specification for Copper Alloy Sand Castings for General Applications.

9. ASTM E527, Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS).
10. CDA, Properties of Cast Copper Alloys.
11. NFPA 704, System for the Identification of the Hazards of Materials for Emergency Response.
12. UL 924, Safety of Emergency Lighting and Power Equipment.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Signage Manufacturers:
      a. Engage firms specializing in producing types of products specified, in compliance with the Contract Documents, with documented record of successful in-service performance, and that possess sufficient production capacity to avoid delaying the Work.
      b. Submit to ENGINEER name and experience record of manufacturers.

B. Component Supply and Compatibility:
   1. Obtain each separate type of signage from a single Supplier and from a single manufacturer.

C. Regulatory Requirements: Comply with applicable requirements of the following:
   1. OSHA, 29 CFR Part 1910.1200, Hazard Communication Standard.
   2. OSHA, 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances.
   3. OSHA, 29 CFR Part 1910.144, Safety Color Code for Marking Physical Hazards.
   4. OSHA, 29 CFR Part 1910. 145, Specification for Accident Prevention Signs and Tags.
   5. United States Access Board, Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines.
   6. Americans with Disabilities Act (ADA), Public Law 101-36, 28 CFR Part 36, Appendix A, Accessibility Guidelines for Buildings and Facilities (ADAAG), relative to characters and symbols contrast only.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Schedule of all signage required for the Work, indicating signage type location, and other information to demonstrate compliance with the Contract Documents.
      b. Fabrication and erection information for each type of signage
      c. Valve schedule for small-diameter valves, in accordance with this Section.
      d. Complete, camera-ready, color graphic layouts of custom- designed signs based on specified requirements and manufacturer recommendations.

e Complete selection of each specified manufacturer's standard and custom graphic layouts and pictograms, colors, and alphabetic/text styles.

f. Full-size graphic layout drawings for plaques, individual dimensional letters and numbers, and other items where final graphic appearance is necessary prior to signage fabrication, incorporating all required graphic features specified or shown.

g. Mounting and Installation Data:
   1) Drawings of and information on anchorages and accessory items.
   2) Submit location template drawings for items supported or anchored to permanent construction.
   3) Coordinate mounting position, method, and proposed mounting accessories and fasteners with actual Project conditions. Indicate required mounting accessories on plan drawings showing locations of required exit signs based on measurements taken at the Site. Show final location and identify type of mounting surface for each exit sign. Coordinate location of exit signs for non-interference with other Work and as required by authorities having jurisdiction.

2. Product Data:
   a. Copies of manufacturer's technical data, including catalog information and specifications, for each product specified.

3. Samples:
   a. Each color and finish of exposed materials and accessories required for signage.
   b. Sample Signage:
      1) Full-size Sample of each type of permanent room and space identification sign, and informational and directional sign incorporating all features specified.
      2) Full-sized Sample of each type (such has snap-on, strap-on, and adhesive) of pipe marker proposed for use with mounting accessories.
      3) Full-sized Sample equipment nameplate, valve tag, pipe tag, and accessories. Stamp valve tag with information shown on valve schedules. When not indicated in the Contract Documents, information on the type of coding system will be furnished to CONTRACTOR by ENGINEER.
      4) Full-sized Sample right-to-know signs, labels and tags.
      5) Full-size representative sample of each individual-type letter and number specified, demonstrating alphabetic style/text type, material, color and finish specified.
   c. ENGINEER's review of Samples will be for color and texture only. Compliance with other requirements is CONTRACTOR's responsibility.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Templates for anchorages to be installed in concrete or masonry.

b. Manufacturer's instructions and recommendations for support and foundations of signs installed outdoors.

C. Closeout Submittals: Submit the following:
1. Warranty Documentation:
a. General and special warranties required under this Section.

1.5 WARRANTY

A. General Warranty: The special warranty specified for each type of sign in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty on Products:
1. Provide each signage manufacturer's written warranty, running to the benefit of OWNER, agreeing to correct, or at option of OWNER, remove or replace materials specified in this Section found to be defective during a period of five years after the date of Substantial Completion.
2. Special warranty shall cover defective Work that includes, but is not limited to, the following:
a. Deterioration of metal and polymer finishes beyond normal weathering.
b. Deterioration of embedded graphic image colors and sign lamination.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. General:
1. Details shown or indicated for signage, such as alpha-numeric and text type representation, letter spacing, designs of borders, and other graphic features, are generic and intended only to establish text, general positions, and symbols.
2. Colors shall be brilliant, distinctive shades, matching the safety colors specified in ANSI Z535.1 and OSHA 1910.144.
3. Accident prevention signs and tags shall comply with OSHA 1910.145.
4. Health, safety, and warning signs shall comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, OSHA 1910.144, and 1910.145, unless otherwise shown or indicated. Colors shall be as indicated in Table 1 of ANSI Z535.1. In addition to text, safety symbol pictograms shall be incorporated into each sign.

2.2 PANEL SIGNS – HEALTH, SAFETY, WARNING, FLOOR LOADING, AND FIRE EXTINGUISHER LOCATION

A. Product Description: Provide rigid fiberglass reinforced plastic signs with fade-resistant embedded graphics.

B. Products and Manufacturers: Provide one of the following:
   1. Graphic Blast Word and Picture Series, by Best Sign Systems, Inc.
   2. Blast Etched Fiberglass Signs, by Visigraph Corporation.
   3. Or equal.

C. General:
   1. Size and Thickness: 0.125-inch thick; 10 inches by 14 inches, unless otherwise shown or indicated.
   2. Graphics and Text: Standard Helvetica Medium characters and matching arrow type-face; upper and lower case, one-inch high capitals and other text.
   3. Exposure: As recommended by sign manufacturer for both indoor and outdoor use and with an upper service temperature limit of 190degrees F. Average durability for outdoor use shall be 15 years.

D. Safety Instruction Signs: Standard color of sign background shall be white; panel shall be green with white letters and numbers. Letters and numbers used against white background shall be black.

E. Caution Signs: Standard color of sign background shall be yellow; panel shall be black with yellow letters and numbers.

F. Danger Signs: Standard color of sign background shall be white; panel shall be black with red insert with white letters and numbers. Letters and numbers used against white background shall be black.

G. Warning Signs: Standard color of sign background shall be orange; panel shall be black with orange insert with black letters and numbers. Letters and numbers used against orange background shall be black.

H. Fire Extinguisher Location Signs (surface-mounted units only): Standard color of sign background shall be red with white letters and numbers. Each sign shall include international fire extinguisher pictogram and directional arrow indicating location of fire extinguisher.

I. Auxiliary Products:
   1. Mounting Brackets: Provide sign manufacturer's standard mounting brackets for installing projected or double-sided signs.

2.3 EQUIPMENT NAMEPLATES

A. Description:
   1. Provide equipment nameplate for each equipment item furnished under the Contract, and for other equipment items indicated to receive nameplates. Equipment nameplates specified in this Article are in addition to equipment manufacturer's standard nameplate with manufacturer name, model number, serial number, and similar information.
   2. Install equipment nameplates as indicated in Part 3 of this Section. Mechanically fasten equipment nameplates to the associated equipment item.

B. Products and Manufacturers: Provide one of the following:
   1. Stainless Steel (HEET) Tags (B-748) custom engraved, by Brady Worldwide, Inc.
   2. Custom Engraved Stainless Steel Nameplates, by Seton Identification Products, a Tricor Direct Company
   3. Or equal.

C. Operating Stands for Gates:
   1. Nameplate material, size, and text requirements are the same as indicated above for other equipment nameplates.
   2. Operating stands for gates shall carry the legend "S.G. No. ___," with the appropriate equipment number to be indicated by ENGINEER.
   3. Background and text color of nameplates for gate operators shall be the same colors specified above for other equipment nameplates. Where no color is indicated, provide stainless steel nameplates.

2.4 INDIVIDUAL DIMENSIONAL PLASTIC SIGN CHARACTERS

A. Provide individual plastic sign letters with faces to match existing, sharp corners, true lines, and accurate profiles.

B. Products and Manufacturers: Provide one of the following:
   1. Plastic Sign Letters, by Alphabet Signs Inc.
   2. Plastic Sign Letters, by inpro Architectural Products.
   3. Or equal.

C. Material:
   1. Three dimensional formed letters made from durable cellulose acetate butyrate (CAB) plastic.
   2. Lifetime Guaranteed from breakage, and UV fade resistant.
   3. Provide letters with both faces and edges in a finish to match existing.
   4. Color: Match existing.

D. Style and Height: Provide height, depth font type face to match existing.

E. Mounting: Provide each letter with not less than two mounting studs as recommended by the manufacturer.

F. Provide the following individual dimensional cast letters located where shown or indicated:
   1. FULTON CHAIN OF LAKES

2.5 AUXILIARY MATERIALS

A. Very-High-Bond High-Performance Bonding Tape:
   1. Provide all surface-mounted signage with very-high-bond foam tape backing except where specified as requiring mechanical fasteners.
   2. Products and Manufacturers: Provide one of the following:
      a. Scotch Brand (Very-High-Bond) 4942 VHB Double Coated Acrylic Foam Tape and No. 94 Acrylic Primer, by 3M Industrial Tape and Specialties Division.
      b. Or equal.
   3. Provide a very-high-bonding pressure sensitive joining system consisting of double-coated conformable acrylic foam tape and release liners.
   4. Thickness: 0.045-inch.
   5. Tape Width: 1.5 inches.
   6. Color: Dark gray.
   7. Bonding Adhesive: Acrylic; very-high-bond, solvent and shear resistance.
   8. Primer: High-performance tape manufacturers recommended acrylic primer.

B. Fasteners: Provide fasteners of non-magnetic stainless steel of size and type required and recommended by the associated individual signage manufacturer.

C. Anchors and Inserts: Provide nonferrous metal or hot-dipped galvanized anchors and inserts. Provide toothed stainless steel or lead expansion bolts for drilled-in-place anchors.

D. Mounting Brackets:
   1. Provide manufacturer's standard mounting brackets for each of the following sign types: hanging, projected, double-sided.
   2. Provide inserts, and mechanical and adhesive anchoring devices as specified in this Article for installation of signage.

2.6 FABRICATION

A. Shop Assembly:
   1. Fabricate and preassemble items in the shop to the greatest extent possible.
   2. Disassemble units only to extent necessary for shipping and handling limitations.
   3. Clearly mark units for reassembly and coordinated installation.

2.7 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:
   1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within tolerance of plus or minus 1/16-inch measured diagonally across each sign.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which signage will be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Location:
      a. Install signage and appurtenances at the locations shown or indicated. When locations are not shown or indicated, install signage at locations directed by ENGINEER.
      b. Provide exit signs at locations shown or indicated. Surface-mount signs above each point of egress, unless otherwise shown or indicated.
      c. Lightly mark and locate position of each sign. Obtain ENGINEER's acceptance of marked locations before mounting.
   2. Installation – General:
      a. Install signs level, plumb, and at proper height.
      b. Signage shall be securely mounted with concealed, very-high-bond acrylic foam tape, specified adhesives, or mechanical fasteners where specified. Attach signs to surfaces in accordance with sign manufacturer's instructions, unless otherwise shown or indicated.
      c. Provide very-high-bond acrylic foam tape on back of signage using a full perimeter of specified tape. Leave no gaps in tape perimeter at back of signage; peel off second release liner and press onto surfaces.
   3. Repair or replace damaged units.

B. Panel Signs – Room Identification, Directional, and Information Signs:
   1. Where permanent identification is provided for rooms and spaces, install signs on the wall adjacent to the latch side of the door.
   2. Where there is no wall space on the latch side of the door, including at double leaf doors, install signs on the nearest adjacent wall.

C. Equipment Nameplates:
   1. Equipment Nameplates:
      a. Locate nameplates on equipment bases and on structures at readily-visible elevation in such positions relative to the equipment and structures as to prevent damage to nameplate.
      b. Position nameplate for ease of reading by operations and maintenance personnel.

D. Individual Dimensional Characters:
   1. Install characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
   2. Projected Mounting: Install characters at projection distance from wall surface to match existing.

3.3 PROTECTION AND CLEANING

A. After installation, clean soiled signage surfaces in accordance with manufacturer’s written instructions.

B. Protect signage from damage until completion of the Work.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install all fire protection specialties Work.
   2. Extent of fire protection specialties Work is shown and specified.
   3. Types of fire protection specialties Work required includes:
      a. Dry chemical extinguishers.
      b. Mounting accessories and miscellaneous fasteners.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items that must be installed with or before fire protection specialties.

C. Related Sections:
   1. Section 10 14 00, Signage.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM E814, Test Method for Fire Tests of Penetration Firestop Systems.
   2. FM Global, FM Approval Guide.
   3. NFPA 10, Portable Fire Extinguishers.
   4. UL Fire Classification Rating.

1.3 QUALITY ASSURANCE

A. Component Supply and Compatibility:
   1. Provide fire protection specialties products from one manufacturer.

B. Certifications: Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FM Global.
   2. Provide fire extinguishers approved, listed, and labeled to comply with ASTM E814.

C. Regulatory Requirements:
   1. Provide fire protection specialties approved and labeled by UL.
   2. Provide fire protection specialties conforming to NFPA 10 requirements.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit the following:
      a. Manufacturer's technical data, certification of UL rating, and installation instructions for fire protection specialties.
      b. Product Schedule: For fire extinguishers and fire protection cabinets. Coordinate final fire extinguisher and fire protection cabinet schedule to ensure proper fit and function.

B. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
   2. Warranty: Sample of special warranty.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. General: Provide manufacturer's standard mounting brackets for portable fire extinguishers size as specified.

B. Multi-Purpose Dry Chemical Fire Extinguishers:
   1. Ten-pound capacity, enameled steel container with pressure-indicating gauge, for Class A, Class B, Class C fires, UL rating 4A-60 B:C.

2. Products and Manufacturers: Provide one of the following:
   a. Cosmic Model 10E by J.L. Industries, a division of Activar Construction Products Group.
   b. MP 10 Series by Larsen's Manufacturing Company.
   c. Or equal.

C. Identification: Refer to Section 10 14 00, Signage.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which fire protection specialties will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to ENGINEER.

3.2 INSTALLATION OF FIRE EXTINGUISHERS

A. When exact locations of fire protection specialties are not shown on Drawings, locate as directed by ENGINEER.

B. Securely fasten products to structure, square and plumb, per Supplier's instructions. Mounting heights shall be:
   1. Install fire extinguishers with gross weight greater than 40 pounds with top of fire extinguisher no more than 3.5 feet above finished floor.
   2. Install fire extinguishers with gross weight less than 40 pounds with top of fire extinguisher no more than 4.0 feet above finished floor.
   3. Clearance between bottom of fire extinguisher and finished floor shall be at least four inches.

C. Identification Devices: Refer to Section 10 14 00, Signage.

D. Recharge fire extinguishers provided under this Contract so that most recent inspection date coincides as nearly as possible with date of Substantial Completion. Inform OWNER in writing of next required inspection and recharging date.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire extinguishers are installed unless otherwise indicated in manufacturer's written installation instructions.

3.4 FIRE EXTINGUISHER SCHEDULE

A. Type A – Dry chemical, wall mounted.

+ + END OF SECTION + +

SECTION 26 05 05

GENERAL PROVISIONS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals shown, specified, and required to complete the electrical Work, which includes:
    a. Providing conduits, inserts and other electrical items to be embedded in concrete, built into walls, partitions, ceilings, and panels provided by others.
2. Temporary Utilities: CONTRACTOR shall provide temporary power and lighting.
3. Utility Companies:
    a. Electric Utility Company: Perform the Work in connection with the electric service and utility metering in accordance with requirements of National Fuel.

B. Coordination:

1. Review installation procedures and schedules under other contracts and coordinate with other contractors the installation of electrical items to be installed with or within formwork, walls, partitions, ceilings, and panels constructed by other contractors.
    a. Furnish as required to other contractors detailed drawings or sketches of the locations of conduits and other built-in items.
    b. Coordinate with other contractors regarding progress of construction where conduits and built-in items are will be installed. Install conduits and built-in items in manner that does not delay work of other contractors.
2. Coordination and Intent of Electrical Drawings:
    a. Dimensions on Drawings related to equipment are based on equipment of certain manufacturers. Verify the dimensions of equipment furnished to space available at the Site and allocated to the equipment.
    b. Drawings show the principal elements of the electrical Work and are not intended as detailed working drawings for the electrical Work. Drawings supplement and complement the Specifications and other Contract Documents relative to principal features of electrical systems.
    c. Equipment and devices provided under this Contract and other contracts shall be properly connected and interconnected with other equipment and devices for successful operation of complete systems, whether or not all connections and interconnections are specifically mentioned or shown in the Contract Documents.

d. Drawings are provided for CONTRACTOR's guidance in fulfilling the intent of the Contract Documents CONTRACTOR shall comply with Laws and Regulations, including safety and electrical codes, and provide materials, equipment, appurtenances, and specialty items necessary for complete and operable systems.

3. Obtain from OWNER record drawings required to execute the Work.

C. Work Included in This Contract but Specified Elsewhere:
1. Concrete for pads, manholes, ductbanks, and conduit encasement.
2. Anchorage systems.
3. Shop painting and surface preparation.
4. Excavation and filling associated with buried electrical Work.

D. Area Classifications:
1. Materials, equipment, and incidentals shall be suitable for the area classification(s) shown, specified, and required.
2. Wet Locations: Comply with NEC and NEMA requirements for wet locations. Enclosures in wet locations shall comply with NEMA 4X unless specified otherwise.
3. Corrosive Locations: Comply with NEC and NEMA requirements for corrosive locations. Enclosures in corrosive locations shall conform to NEMA 4X requirements unless specified otherwise.
4. Hazardous Locations: Comply with NEC requirements for the Class and Division designated.
5. Dusty Locations: Indoor areas not designated as hazardous, corrosive, or wet are dusty locations. Comply with NEC and NEMA 12 requirements unless specified otherwise.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Wiring Coordinator:
   a. Retain services of a wiring coordinator who shall prepare complete point-to-point interconnection wiring diagrams. Diagrams shall identify all external interconnecting wiring associated with new or modified existing equipment.
   b. Qualifications: Wiring coordinator shall be experienced in developing diagrams of the type required and shall have served in a similar wiring coordinator role on a completed project of similar size and complexity to the Project.
      1) Submit qualifications and approach for the Project not later than the pre-submittal conference required in Section 40 61 13, Process Control Systems General Provisions.
      2) Submit to ENGINEER the items indicated below not less than three weeks prior to the pre-submittal conference required in Section 40 61 13, Process Control Systems General Provisions:
         a) List of projects where the wiring coordinator developed point-to-point wiring diagrams.

b) Samples of diagrams developed for the listed projects.
c) Example wiring diagram proposed for the Project with a preliminary list of drawings to be produced.
d) Plan of how information will be obtained and documented.

c. Responsibilities:
1) Develop diagrams for performing the Work and to document terminations. Prepare diagrams in accordance with this Section and the example wiring diagram accepted by ENGINEER.
2) Use information obtained from approved Shop Drawings and approved CONTRACTOR's other submittals, approved (and accepted, as applicable) shop drawings and submittals of other contractors, record drawings, and field inspections as required to complete the diagrams.

B. Component Supply and Compatibility:
1. Materials and equipment similar to each other shall be from the same manufacturer for uniformity.

C. Regulatory Requirements:
1. Permits: Refer to the General Conditions, Supplementary Conditions, and other parts of the Contract Documents for responsibilities relative to obtaining and paying for permits, licenses, and inspection fees.

1.3 SUBMITTALS

A. General:
1. To the extent practical, submit Shop Drawings and other CONTRACTOR submittals for each Specification Section into the smallest number of submittals possible. Do not furnish partial submittals.
2. Review of equipment submittals does not relieve CONTRACTOR of responsibility for providing complete and successfully operating systems.

B. Action Submittals: Submit the following:
1. Shop Drawings:
a. Internal wiring diagram and drawings indicating all connections to components and numbered terminals for external connections.
b. Dimensioned plan, section, elevations, and panel layouts showing means for mounting, conduit connection, and grounding.
c. List of components including manufacturer's name and catalog number (or part number) for each.
d. Point-to point interconnection wiring diagrams.
2. Product Data:
a. Manufacturer's name and product designation or catalog number.
b. Electrical ratings.
c. Manufacturer's technical data and specifications.
d. Manufacturer's indication of compliance with applicable reference standards.
e. Painting and coating systems proposed.

3. Test Procedures: Proposed testing procedures and testing limitations for source quality control testing and field quality control testing.

C. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Installation data and instructions.
      b. Instructions for handling, starting up, and troubleshooting.
   2. Source Quality Control Submittals: Results for required shop testing.
   3. Field Quality Control Submittals: Results for required field testing.
   4. Qualifications:
      a. Wiring coordinator, including information required of wiring coordinator in Paragraph 1.2.A of this Section.

D. Closeout Submittals: Submit the following:
   1. Record Documentation:
      a. System Record Drawings: Include the following:
         1) One-line wiring diagram of the electrical distribution system.
         2) Actual, in-place conduit and cable layouts with schedule of conduit sizes and number, and size of conductors.
         3) Layouts of the power and lighting arrangements and the grounding system.
         4) Control schematic diagrams, with terminal numbers and control devices identified, for all equipment.
      b. Point-to-Point Interconnection Wiring Diagram Drawings: Include the following:
         1) External wiring for each piece of equipment, panel, instrument, and other devices and wiring to control stations, lighting panels, and motor controllers.
         2) Numbered terminal block identification for each wire termination.
         3) Identification of the assigned wire numbers for all interconnections.
         4) Identification of wiring by the conduit tag in which the wire is installed.
         5) Terminal, junction, and pull boxes through which wiring is routed.
         6) Identification of equipment and the submittal transmittal number for equipment from which wiring requirements and termination information was obtained.
      c. Record documents shall indicate final equipment and field installation information.

PART 2 - PRODUCTS

A. Performance Criteria:

1. Electrical equipment shall be capable of operating successfully at full-rated load, without failure, with ambient outside air temperature of 15 degrees F to 80 degrees F and an elevation of 592 feet above mean sea level.
2. Unless specified otherwise, electrical equipment shall have ratings based on 75 degrees C terminations.

B. Testing Laboratory Labels: Electrical material and equipment shall bear the label of Underwriters' Laboratories, Inc. or other nationally recognized, independent testing laboratory, where standards have been established and label service applies.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which Work will be performed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
1. Install materials and equipment in accordance with the Contract Documents, Laws and Regulations, approved (and accepted, as applicable) Shop Drawings and other CONTRACTOR submittals, and manufacturer’s recommendations.
2. Provide tools and equipment required to trace circuits necessary for proper execution of the Work.
3. Define and identify all wiring, circuit terminations, and equipment to be modified to ensure proper interface of components. The Contract Price includes all costs associated with field services specified for a complete and functional system.

B. Staging, Sequencing, and Coordination with Existing Facilities:
1. Schedule, sequence, and install materials and equipment.
2. Perform the Work in a manner that will not interfere with the existing equipment and facilities or cause interruption of the functions of the Site, unless specified otherwise or otherwise allowed by OWNER.
3. Where the Work ties in with existing installations, take precautions and provide safeguards in connecting the Work to existing operating circuits to prevent interruption to existing circuits. Connection of Work to existing circuits shall be performed in the presence of OWNER and ENGINEER.

3.3 FIELD QUALITY CONTROL

A. Field Quality Control – General:
1. Perform field quality control for electrical Work in accordance with the Contract Documents.

B. Site Tests:
   1. Prior to requesting certificate of Substantial Completion, demonstrate to ENGINEER that electrical systems and electrically operated equipment installed or modified under the Contract operates in accordance with the Contract Documents and operates as required
   2. Perform the following operational tests on electrical systems:
      a. Operate power circuits to verify proper operation and connection to electrical systems materials and equipment, including mechanical key-interlocks for circuit breakers.
      b. Remove and re-apply power supply to automatic transfer equipment to verify operation. Activate standby power systems to verify their automatic start-up, proper de-energization, and cool down upon resumption of normal power supply.
      c. Operate control circuits, including pushbuttons, indicating lights, and similar devices, to verify proper connection and function. Operate all devices, such as pressure switches, flow switches, and similar devices, to verify that shutdowns and control sequences operate as required.
      d. Operate lighting systems and receptacle devices to verify proper operation and connections.
   3. Prepare and submit report on the equipment demonstration and operating field quality control tests. Report shall include complete information on the tests performed and results.

C. Manufacturer's Services:
   1. Furnish at the Site qualified, factory-trained representative(s) of equipment manufacturers for the services indicated in the Contract Documents.

+ + END OF SECTION + +

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install low-voltage conductors and cabling.
   2. Types of cabling required include:
      a. Insulated cable for installation in raceways.

B. Related Sections:
   1. Section 26 05 53, Identification for Electrical Systems.

C. Work Included but Specified Elsewhere:
   1. Perform excavation and filling for direct-burial cable.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.
   2. ASTM B3, Specification for Soft or Annealed Copper Wire.
   3. ASTM B8, Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.
   4. ASTM D3485, Specification for Smooth-Wall Coilable Polyethylene (PE) Conduit (Duct) for Preassembled Wire and Cable.
   5. ASTM F2160, Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD).
   6. NEMA TC 7, Smooth Wall Coilable Electrical Polyethylene Conduit.
   7. UL 44, Thermoset-Insulated Wires and Cables.
   8. UL 1277, Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

B. Regulatory Requirements: Comply with the following:
   1. NEC Article 300, Wiring Methods.
   2. NEC Article 310, Conductors for General Wiring.

C. Action Submittals: Submit the following:
   1. Product Data:
      a. Manufacturer’s literature, specifications, and engineering data for low volt insulated cable proposed for use.

D. Informational Submittals: Submit the following:
   1. Field Quality Control Submittals:
   2. Written results of field insulation resistance tests.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Insulated Cable in Raceways:
   1. Application: Use for circuits located indoors and outdoors.
   2. Manufacturers: Provide products of one of the following:
      a. Southwire.
      b. The Okonite Company.
      c. American Insulated Wire
      d. General Cable
      e. Or equal.
   3. Material: Single conductor copper cable complying with ASTM B3 and ASTM B8 with flame-retardant, moisture- and heat-resistant insulation rated for 90 degrees C in dry or wet locations, listed by UL as Type XHHW-2 or RHW-2 complying with UL 44.
   4. Wire Sizes: Not smaller than No. 12 AWG for power and lighting and No. 14 AWG for 120-volt control circuits.
   5. Stranding: 600-volt cable shall be stranded, except that solid cable, No. 10 and smaller may be used for lighting circuits.

B. Cable Connectors, Solderless Type:
   1. Products and Manufacturers: Provide products of one of the following:
      a. T&B Sta-Kon.
      b. Burndy Hylug.
      c. Or equal.
   2. For wire sizes No. 4 AWG and above, use either compression type or bolted type with silver-plated contact faces.
   3. For wire sizes up to and including No. 6 AWG, use compression type. Alarm and control wire shall be terminated using forked type connectors at terminal boards.
   4. For wire sizes No. 250 kcmil and larger, use connectors with at least two cable clamping elements or compression indents and provision for at least two bolts for joining to apparatus terminal.
   5. Properly size connectors to fit fastening device and wire size. Connectors shall be rated for 90 degree C, 600 volts.

C. Cable Splices:
   1. Products and Manufacturers:
      a. Compression-Type Splices: Provide one of the following:
         1) Burndy Hylink.
         2) T&B Color-Keyed Compression Connectors.
         3) Or equal.
      b. Spring Connectors: Provide one of the following:

1) Buchanan B-Cap.
2) T&B Wire Connector.
3) Or equal.

2. For wire sizes No. 8 AWG and larger, splices shall be made up with compression type copper splice fittings. Splices shall be taped and covered with materials recommended by cable manufacturer to provide insulation equal to that on conductors.
3. For wire sizes No. 10 AWG and smaller, splices may be made up with pre-insulated spring connectors.
4. For wet locations, splices shall be waterproof. Compression type splices shall be waterproofed by sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring thermosetting resin into mold that surrounds the joined conductor. Spring connector splices shall be waterproofed with sealant filler.
5. Splices shall be suitably sized for cable, rated 90 degrees C, and 600 volts.

D. Wire and Cable Markers:
1. Provide wire and cable markers in accordance with Section 26 05 53, Identification for Electrical Systems.

E. Factory Tests:
1. Factory-test wire and cable in accordance with UL standards

PART 3 - EXECUTION

A. Install cables complete with proper terminations at both ends. Check and correct for proper phase sequence and proper motor rotation.

B. Pulling:
1. Use insulating types of pulling compounds containing no mineral oil.
2. Pulling tension shall be within limits recommended by wire and cable manufacturer.
3. Use dynamometer where mechanical means are used.
4. Cut off section subject to mechanical means.

C. Bending Radius: Limit to minimum of six times cable overall diameter.

D. Slack: Provide maximum slack at all terminal points.

E. Splices:
1. Where possible, install cable continuous, without splice, from termination to termination.
2. Where required, splice as shown and also where required for cable installation. Splices below grade, in manholes, handholes, and wet locations shall be waterproof.
3. Splices are not allowed in conduits.

F. Identification:
1. Identify conductors in accordance with Section 26 05 53, Identification for Electrical Systems.

2. Identify power conductors by circuit number and phase at each terminal or splice location.
3. Identify control and status wiring using numeral tagging system.

G. Color-code power cables as follows:
1. No. 8 AWG and Smaller: Provide colored conductors.
2. No. 6 AWG and Larger: Apply general-purpose, flame-retardant tape at each end, wrapped in overlapping turns to cover an area of at least two inches.
3. Colors: Match color scheme in use at the Site. If the Site does not have an existing color scheme, use the following colors:
    a. Ground
        1) 208V delta or wye systems — Green
        2) 120/208V — Green
        3) 120/240V single phase — Green
        4) 480V delta or wye systems — Green with white stripe
        5) 277/480V single phase — Green with white stripe
    b. 120/240V, Single Phase
        1) Grounded Neutral — White
        2) Hot Leg — Black
        3) Other Hot Leg — Red
    c. 120/208V, Single Phase
        1) Grounded Neutral — White
        2) Hot Leg — Based on Phase derived from
        3) Other Hot Leg — Based on Phase derived from
    d. 208Y/120V and 208V
        1) Grounded Neutral (Wye Only) — White
        2) Phase A — Black
        3) Phase B — Red
        4) Phase C — Blue
    e. 277/480V, Single Phase
        1) Grounded Neutral — Gray
        2) Hot Leg — Based on Phase derived from
        3) Other Hot Leg — Based on Phase derived from
    f. 480Y/277V and 480V
        1) Grounded Neutral (Wye Only) — Gray
        2) Phase A — Brown
        3) Phase B — Orange
        4) Phase C — Yellow
    g. 240/120V Center Tapped Delta, Wild Leg Delta from either three or two single phase transformer banks.
        1) Grounded Neutral — White
        2) Phase A — Black
        3) Phase B (Wild Leg) — Orange
        4) Phase C — Blue

3.2 FIELD QUALITY CONTROL

A. Site Tests:

1. Test each electrical circuit after permanent cables are in place, to demonstrate that circuit and equipment are connected properly and will perform satisfactorily, free from improper grounds and short circuits.
2. Individually test 600-volt cable mechanical connections after installation and before they are put in service, with calibrated torque wrench. Values shall be in accordance with manufacturer's recommendations.
3. Individually test 600-volt cables for insulation resistance between phases and from each phase to ground. Test after cables is installed and before they are put in service, with Megger for one minute at voltage rating recommended by cable manufacturer or in accordance with ANSI/NETA ATS recommendations.
4. Insulation resistance for each conductor shall not be less than value recommended by cable manufacturer. Cables not meeting recommended value or that fail when tested under full load conditions shall be replaced with a new cable for full length.
5. Where existing cables are spliced to cables provided under the Project, test existing cables prior to splicing. Test cables at 1,000 vdc for one minute. Entire spliced cable installation shall be re-tested after splice is completed. Existing cable that fails or has value less than two megohms shall be brought to attention of ENGINEER and splicing shall not proceed until condition is acceptable.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install complete grounding for electrical systems, structures, and equipment.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.
   2. ASTM B8, Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.
   3. UL 467, Grounding and Bonding Equipment.

1.3 QUALITY ASSURANCE

A. Qualifications:

   1. Field Acceptance Testing Firm: Retain services of independent testing firm to perform acceptance field testing of grounding system. Testing firm shall have experience in testing grounding systems and shall be a member company of NETA.

B. Regulatory Requirements

   1. National Electrical Code, (NEC).
      a. NEC Article 250, Grounding and Bonding.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of grounding connector types identifying where each will be used.
      b. Layouts of each structure’s ground grid.
      c. Test point construction details.
   2. Product Data:

a. Manufacturer's technical information for grounding materials proposed for use.

3. Testing Plans:
    a. Ground resistance test procedure.

B. Informational Submittals: Submit the following:
1. Field Quality Control Submittals
    a. Results of ground resistance tests at each test point.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bare Ground Cable:
1. Manufacturers: Provide products of one of the following:
    a. Cablec Corporation.
    b. General Cable Corporation.
    c. Southwire Cable Company.
    d. Or equal.
2. Material: Soft-drawn, bare copper stranded cable complying with ASTM B8. No. 4/0 AWG minimum size unless otherwise shown or indicated on the Drawings.

B. Ground Rods:
1. Manufacturers: Provide products of one of the following:
    a. Copperweld, Bimetallics Division.
    b. ITT Blackburn Company.
    c. Or equal.
2. Material: Copper-clad rigid steel rods, 3/4-inch diameter, ten feet long.

C. Grounding Connectors:
1. Products and Manufacturers: Provide one of the following:
    a. Pressure Connectors:
        1) O.Z./Gedney, Division of General Signal Corporation.
        2) Burndy Corporation.
        3) Or equal.
    b. b. Welded Connections:
        1) Cadweld by Erico Products, Incorporated.
        2) Therm-O-Weld by Burndy Corporation.
        3) Or equal.
2. Material: Pressure connectors shall be copper alloy castings, designed and fabricated specifically for items to be connected and assembled with Durium or silicone bronze bolts, nuts, and washers. Welded connections shall be by exothermic process utilizing molds, cartridges, and hardware designed specifically for connection to be made.

D. Grounding Additive:

1. Grounding additive, in its set form, shall have resistivity of not more than 20 ohm-cm.
2. Product and Manufacturer:
    a. Ground Enhancement Material (GEM) by Erico
    b. Or equal.
3. Grounding additive shall be permanent and maintenance-free, without requiring recharging with salts or chemicals that may be corrosive and shall maintain its earth resistance with time.
4. Grounding additive shall set up firmly and not dissolve or decompose or otherwise pollute soil or groundwater.
5. Grounding additive shall be suitable for installation in dry form or in slurry form.
6. Grounding additive shall not depend on continuous presence of water to maintain its conductivity.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions for the Work and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 STRUCTURE GROUND SYSTEM

A. Provide ground grids as shown and indicated on the Drawings.

B. Connect grids to continuous underground water pipe system, when practical.

C. For new structures with concrete foundation or footings, connect structure's reinforcing steel or another concrete-encased electrode to grounding grid.

D. Provide accessible test points for measuring the ground resistance of each grid.

E. Weld all buried connections except for test points.

3.3 EQUIPMENT GROUNDING

A. Ground electrical equipment in compliance with Laws and Regulations and the Contract Documents.

B. Equipment grounding conductors shall be bare stranded copper cable of adequate size installed in metal conduit where required for mechanical protection. Ground conductors, pulled into conduits with non-grounded conductors, shall be insulated. Insulation shall be green.

C. Control panels grounding conductors shall be bare stranded copper cable of adequate size to ground grid from AC ground bus, and an insulated stranded copper cable of adequate size to ground grid from DC ground bus.

D. Connect ground conductors to conduit with copper clamps, straps, or with grounding bushings.

E. Connect to piping by welding or brazing. Use copper bonding jumpers on gasketed joints.

F. Connect to equipment by means of lug compressed on cable end. Bolt lug to equipment frame using holes or terminals provided on equipment specifically for grounding. Do not use hold-down bolts. Where grounding provisions are not included, drill suitable holes in locations recommended by equipment manufacturer or designated by ENGINEER.

G. Connect to motors by bolting directly to motor frames, not to soleplates or supporting structures.

H. Connect to service water piping by means of copper clamps. Use copper bonding jumpers on gasketed joints.

I. Scrape bolted surfaces clean and coat with conductive oxide-resistant compound.

3.4 FIELD QUALITY CONTROL

A. Site Tests:
   1. Test completed grounding systems for resistance to ground using an electrical three-terminal ground resistance tester. Test all grounded cables and metal parts for continuity of connection. ENGINEER and OWNER will witness the testing.
   2. Grounding system maximum resistance shall not exceed five ohms under normally dry conditions when measured by resistance tester. Resistance values above five ohms shall be brought to ENGINEER's attention. Provide additional ground rods as required to attain a resistance to ground of less than five ohms for each ground grid. Add grounding additive installing additional ground rods to increase their effectiveness.

   3. Acceptance Testing:
      a. Perform acceptance testing of grounding system. Testing shall be performed by testing firm in accordance with ANSI/NETA ATS.
      b. Test Equipment, Calibration and Reporting: Test equipment, instrument calibration, and test reports shall comply with ANSI/NETA ATS.

+ + END OF SECTION + +

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install hangers and supports for electrical systems.
   2. Area Classifications: Materials shall by suitable for the area classification(s) shown or indicated on the Drawings, and specified in Section 26 05 05, General Provisions for Electrical Systems.

B. Related Sections:
   1. Section 26 05 05, General Provisions for Electrical Systems.
   2. Section 26 05 33.13, Rigid Conduits.

1.2 REFERENCES

A. Standards referenced in this section are:
   1. ASTM A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   2. ASTM A1011/A1011M, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
   3. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Detailed installation drawings showing dimensions and compatibility with proposed layout.
   2. 2. Product Data:
      a. Manufacturer’s name, product designation, and catalog number of each material item proposed for use.
      b. Manufacturer’s specifications including material, dimensional and weight data, and load capacity for each supporting system component proposed for use.
      c. Pictorial views and corresponding identifying text of each component proposed for installation.

d. Documentation that confirms product compatibility with Laws and Regulations.

B. Informational Submittals: Submit the following:
1. Certifications:
a. Submit certifications required under this Section.
2. Manufacturer's Instructions:
a. Manufacturer's installation instructions, including recommended tightening torque values for all nuts and bolts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products of one of the following:
1. B-Line.
2. Kindorf.
3. Unistrut
4. Or equal.

2.2 MATERIALS

A. Strut, Fittings, and Accessories:
1. General
a. Unless otherwise shown or indicated, strut shall be 1-5/8 inches by 1-5/8 inches. Double struts shall be two pieces of the same strut, welded back-to-back at the factory.
b. Attachment holes, when required, shall be factory-punched on hole centers approximately equal to the cross-sectional width and shall be 9/16-inch diameter.
c. Fittings, braces, brackets, hardware, and accessories shall be Type 316 stainless steel.
d. Strut nuts shall be spring captured Type 316 stainless steel.
e. Square and round washers shall be Type 316 stainless steel.
2. Strut materials shall be suitable for area classifications indicated in Section 26 05 05, General Provisions for Electrical Systems, and shown or indicated on the Drawings.
a. Dusty Locations:
1) Strut shall be 12-gage carbon steel, hot-dip galvanized after fabrication, complying with ASTM A123/A123M.
b. Wet Locations:
1) Strut shall be 12-gage Type 316 stainless steel.
c. c. Corrosive Locations:
1) Strut shall be fiberglass-reinforced plastic (FRP) complying with ASTM E84.
3. Material:
a. Dry Locations: All-thread, zinc-coated
b. Wet, Corrosive, or Hazardous Areas: Stainless steel.

4. Size: Not less than 3/8-inch diameter, unless otherwise shown on the Drawings or specified.

B. Beam Clamps for Attaching Threaded Rods or Bolts to Beam Flanges for Hanging Struts or Conduit Hangers:
   1. Beam clamps shall be stainless steel equipped with stainless steel square head set screw and shall include threaded hole sized for attaching the all-thread rod or threaded bolt.

C. Miscellaneous Hardware:
   1. Bolts, screws, and washers shall be stainless steel.
   2. Hex Nuts: Shall be stainless steel and include nylon inserts.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Provide hangers and supports for electrical systems with necessary channels, fittings, brackets, and related hardware for mounting and supporting materials and equipment. Provide anchor systems, concrete inserts, and associated hardware for proper support of electrical systems.

B. Install equipment and devices on hangers and supports as shown on the Drawings, as specified, and as required.

C. Install hangers and supports level, true, free of rack, and parallel and perpendicular to building walls and floors, so that the hangers and supports are installed in a neat, professional, workmanlike manner.

D. Holes in suspended ceilings for rods for hangers and supports and other equipment shall be provided adjacent to bars, where possible, to facilitate removal of ceiling panels.

E. Coordinate installation of hangers and supports with equipment, cabinets, consoles, panels, enclosures, boxes, conduit, cable tray, wireway, busway, cablebus, piping, ductwork, lighting fixtures, and other systems and equipment. Locate hangers and supports clear of interferences and access ways.

F. Anchor Bolts, Expansion Anchors, and Concrete Inserts: Shall be in accordance with Section 05 05 33, Anchor Systems, and requirements of this Section.

G. Mounting of Conduit:

1. Provide space of not less than 1/4-inch between conduit surfaces and abutting or near surfaces except struts, cable trays, steel beams, and columns.
2. Fasten conduit to struts, cable trays, steel beams, and columns using specified clamps and straps as shown, specified, and required.
3. Devices shall be compatible with size of conduit and type of support. Following installation, size identification shall be visible and legible.
4. Install conduit supports and fasteners in accordance with Section, 26 05 33.13, Rigid Conduits.

H. Supports for Cabinets, Consoles, Panels, Enclosures, and Boxes:

1. Freestanding: Unless otherwise specified or shown on the Drawings, provide supports for floor-mounted equipment, cabinets, consoles, panels, enclosures, and boxes. Such supports shall be 3.5-inch-high concrete equipment base with a 45-degree chamfered edge. Base shall extend two inches beyond outside dimensions of equipment on all sides.
2. Wall-Mounted:
    a. Provide space not less than 1/4-inch between cabinets, consoles, panels, enclosures, and boxes and the surface on which each is mounted. Provide non-metallic or stainless-steel spacers as required.
    b. Do not mount equipment, enclosures, panels, and boxes directly to beams or columns. Mount struts to beams or columns using beam clamps, and mount equipment, enclosures, panels, and boxes to the struts.
3. Floor Stand Rack:
    a. Where equipment, cabinets, consoles, panels, enclosures, and boxes cannot be wall-mounted, provide an independent floor stand rack.
    b. Floor stand rack shall consist of struts, plates, brackets, connection fittings, braces, accessories, and hardware assembled in a rigid framework suitable for mounting of intended materials and equipment.
    c. Equip floor stand racks with brackets and bases for rigidly mounting the framework to the ceiling or floor, as applicable; or equip floor stand racks with beam clamps, angle plates, washers, and bolts for fastening to beam flanges, as applicable.
    d. When equipment, cabinets, consoles, panels, enclosures, and boxes weigh more than 100 pounds:
        1) Main vertical supports of floor stand rack assemblies shall be back-to-back struts.
        2) Bracing, clamping and anchoring of each floor stand rack shall be sufficient to ensure rigidity of the floor stand rack with the intended equipment, enclosures, conduit, cable tray, busway, cablebus, and wireway installed. Floor stand racks shall not be deflected more than 1/8-inch by a 100-pound force applied at any point on the floor stand rack in any direction.

I. Drilling into beams or columns is not allowed unless authorized by ENGINEER.

J. Tighten nuts and bolts to the manufacturer’s recommended torque values.

K. Field Cutting:

1. Cut edges of strut and hanger rod shall have rounded corners, edges beveled, and burrs removed. If field cutting the strut is required, use clean, sharp, dedicated tools. Remove oil, shavings, and other residue of cuttings prior to installation.

2. Coatings: To prevent corrosion:
    a. Coat cut edges with zinc-rich paint.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 05 33.13

RIGID CONDUITS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install conduit and fittings to form complete, coordinated and grounded raceway systems.

   2. When specific, detailed conduit routings for various systems within buildings and other areas are not shown on the Drawings, CONTRACTOR shall establish routings based on single-line, riser, and interconnection diagrams and other information on the Drawings. CONTRACTOR shall provide for the proper installation of conduits in each system.

   3. Conduit types and the installation methods shall comply with the following, unless otherwise shown or indicated in the Contract Documents:
      a. Use steel conduit (rigid steel or intermediate metallic) for exposed indoor conduit runs in non-corrosive areas.
      b. Use PVC-coated rigid steel conduit for exposed interior or exterior conduit runs in hazardous, wet, and corrosive locations.
      c. Use PVC-coated rigid steel conduit for individual conduits direct-buried in the ground.
      d. Use Schedule 40 PVC conduit for concrete-encased duct bank runs. All bends, elbows, and sweeps of 45-degrees or larger shall be steel.
      e. Use steel conduit for plant monitoring and control (PMCS) systems, system control and data acquisition (SCADA) systems, and communication systems, regardless of the installation. Conduit shall be PVC-coated rigid steel in hazardous, wet, and corrosive locations.

B. Coordination:
   1. Conduit runs shown are diagrammatic. Coordinate conduit installation with piping, ductwork, light fixtures, and other systems and equipment and locate to avoid interferences.
   2. For conduits to be embedded in concrete slabs, confirm adequate slab thickness and coordinate location of conduits with placement of reinforcing steel, waterstops, expansion joints, and other features of the concrete slab.

C. Related Sections:
   1. 4. Section 26 05 29, Hangers and Supports for Electrical Systems.
   2. 5. Section 26 05 53, Identification for Electrical Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI C80.1, Standard for Rigid Electrical Steel Conduit (ERSC).
   2. ANSI/NEMA FB1, Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.
   3. NEMA TC2, Electrical Polyvinyl Chloride (PVC) Conduit.
   4. NEMA TC3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
   5. NEMA TC14, Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
   6. UL 6, Electrical Rigid Metal Conduit – Steel.
   7. UL 514B, Conduit, Tubing, and Cable Fittings.
   8. UL 651, Safety Schedule 40 and 80 Rigid PVC Conduit and Fittings.
   9. UL 886, Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.
   10. UL 1242, Electrical Intermediate Metal Conduit – Steel.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
   1. NEC Article 342, Intermediate Metal Conduit
   2. NEC Article 344, Rigid Metal Conduit.
   3. NEC Article 352, Rigid Nonmetallic Conduit.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Assembly details of conduit racks and other conduit support systems.
      b. Layout drawings showing proposed routing of exposed conduits, conduits embedded in structural concrete, and conduits directly buried in the ground. Shop Drawings shall show locations of pull and junction boxes and penetrations in walls and floors. Shop Drawings of embedded conduits shall include cross-sections showing thickness of concrete slabs and locations of conduits relative to reinforcing steel, waterstops, and other features of the slab.
   2. Product Data:
      a. Manufacturer's catalog cuts and product data for conduit, fittings, and appurtenances.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. When requested by ENGINEER, provide copies of manufacturer's recommendations for handling and installing products.
   2. Site Quality Control Submittals:
      a. When requested by ENGINEER, provide copies of results of specified Site quality control testing.

C. Closeout Submittals: Submit the following:
   1. Record Drawings:

a. Show actual routing of exposed and concealed conduit runs in record documents in accordance with Section 01 78 39, Project Record Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rigid Steel Conduit, Elbows, and Couplings:
   1. Manufacturers: Provide products of one of the following:
      a. Allied Tube and Conduit.
      b. Wheatland Tube Company.
      c. Western Tube and Conduit Corporation.
      d. Or equal.
   2. Material: Rigid, heavy-wall, mild steel, hot-dip galvanized, smooth interior, tapered threads and carefully reamed ends; 3/4-inch NPS minimum size.

B. PVC-coated Rigid Steel Conduit, Elbows, and Couplings:
   1. Manufacturers: Provide products of one of the following:
      a. Robroy Industries.
      b. Perma-Cote Industries.
      c. OCAL, Inc.
      d. Or equal.
   2. Material: Rigid, heavy-wall, mild steel, hot-dip galvanized, smooth urethane interior coating, tapered threads, carefully reamed ends, 3/4-inch NPS minimum size with factory exterior coating of 40-mil thick PVC.
   3. Color: Color of coating shall be the same on all conduit and fittings.

C. Intermediate Metallic Conduit, Elbows, and Couplings:
   1. Manufacturers: Provide products of one of the following:
      a. Allied Tube and Conduit.
      b. Wheatland Tube Company.
      c. Western Tube and Conduit Corp.
      d. Or equal.
   2. Material: Rigid-type steel, work-hardened, hot-dip galvanized, smooth interior, tapered threads and carefully reamed ends; 3/4-inch NPS minimum size.
   3. Couplings: Same as for rigid steel conduit.
   4. Elbows: Factory formed of same material specification as for intermediate metallic conduit.

D. Metallic Conduit Fittings, and Outlet Bodies:
   1. Manufacturers: Provide products of one of the following:
      a. Crouse-Hinds Company.
      b. Appleton Electric Company.
      c. Or equal.
   2. Material and Construction: Cast gray iron alloy, cast malleable iron or aluminum bodies and covers consistent with conduit material. Units shall be threaded type with five full threads. Materials shall comply with ANSI/NEMA FB1 and be

listed by UL. Do not use “LB” fittings. Use type “LBD” fittings where use of fittings is unavoidable.

3. Use: Conduits shall be gasketed and watertight in hazardous, wet, and corrosive locations.

E. PVC-coated Conduit Fittings, and Outlet Bodies:
   1. Manufacturers: Provide products of one of the following:
      a. Robroy Industries.
      b. Perma-Cote Industries.
      c. OCAL, Inc.
      d. Or equal.
   2. Material and Construction: Cast gray iron alloy, cast malleable iron bodies and covers with factory coating of 40-mil thick PVC and smooth urethane interior coating. Units shall be threaded type with five full threads. Material shall comply with ANSI/NEMA FB1 and be listed by UL. Do not use “LB” fittings. Use type “LBD” fittings where use of fittings is unavoidable.
   3. Use: Provide PVC-coated or aluminum conduit fittings and outlet bodies in hazardous, wet, and corrosive locations. Fitting material shall be consistent with conduit material.

F. Non-metallic Conduit and Fittings:
   1. PVC Plastic Conduit:
      a. Manufacturers: Provide products of one of the following:
         1) 1) Amoco Chemicals Corp.
         2) 2) Carlon Electrical Products.
         3) 3) Or equal.
      b. Material: Schedule 40 PVC, rated for 90 degrees C, complying with NEMA TC3 and UL 514B and 651.
      c. Fittings: Form elbows, bodies, terminations, expansions, and fasteners of same material and manufacturer as base conduit. Provide cement by same manufacturer as base conduit.
   2. Fiberglass Conduit:
      a. Description: Filament-wound, fiberglass reinforced epoxy conduit complying with NEMA TC14A.
      b. Manufacturers: Provide products one of the following:
         1) Champion Fiberglass, Inc.
         2) Smith Fiberglass Products Company.
         3) United Fiberglass of American, Inc.
         4) Or equal.
      c. Joining Method: Integral bell and spigot, adhesive bonded, or silicone sealed for watertight connection.
      d. Fittings: Elbows, adaptors, and fittings constructed from same materials and manufacturing process as conduit.
      e. Ultraviolet Protection: Conduit and fittings shall include an ultraviolet inhibitor.
      f. Ultimate Tensile Strength: 11,000 psi minimum at 75 degrees F.

G. Conduit Hubs:
   1. Manufacturers: Provide products one of the following.

a. Myers Electrical Products Company.
b. Or equal.

2. Material: Threaded conduit hub, vibration-proof, weatherproof, with captive O-ring seal, zinc metal with insulated throat and bonding screw.
3. Use: Provide for all conduit terminations to boxes, cabinets, and other enclosures in areas designated as wet locations.

H. PVC-coated Conduit Hubs:
1. Manufacturers: Provide products one of the following:
a. Robroy Industries.
b. Perma-Cote Industries.
c. OCAL, Inc.
d. Or equal.
2. Material: Threaded conduit hub, vibration-proof, weatherproof, with captive O-ring seal, zinc metal with insulated throat and bonding screw, and factory coating of 40-mil thick PVC and smooth urethane interior coating.
3. Use: Provide for PVC-coated steel or aluminum conduit terminations to boxes, cabinets, and other enclosures in areas designated as corrosive location.

I. Conduit Bushings and Locknuts:
1. Manufacturers: Provide products one of the following:
a. O-Z/Gedney.
b. Appleton Electric Company.
c. Or equal.
2. Insulated Bushings: Malleable iron body with plastic liner. Threaded type with steel clamping screw. Provide with bronze grounding lug, as required.
3. Locknuts: Steel for sizes 3/4-inch through two-inch diameter and malleable iron for sizes 2.5-inch through four-inch diameter.
4. Use: Provide for all conduit terminations to boxes, cabinets and other enclosures except threaded type in areas designated as dusty locations.

J. Thruwall Seals
1. For new construction through concrete walls as required by 3.2.K.3 or shown on the drawings.
a. Manufacturer: Provide one of the following:
1) Type WSK and WSCS by O-Z/Gedney.
2) Or equal.
2. For new construction passing through concrete floors, floor slabs, and roof slabs as required by 3.2.K.3 or shown on the drawings.
a. Manufacturer: Provide one of the following:
1) Type FSK and FSCS floor seals by O-Z/Gedney.
2) Or equal.
3. For conduits passing through new exterior masonry block walls or through core-drilled holes in existing concrete walls, floors, floor slabs, and roof slabs as required by 3.2.K.3 or shown on the drawings.
a. Manufacturer: Provide one of the following:
1) Type CSMI sealing bushing at the inside of the structure and Type CSMC sealing bushing at the outside of the structure by O-Z/Gedney.

2) Or equal.

2.2 ACCESSORIES

A. Fasteners: To the extent possible, fastener material shall be consistent with conduit material. For PVC-coated rigid steel conduit runs, fasteners shall have factory applied PVC coating or be stainless steel. Fasten raceway systems to supporting structures using the following:
   1. To Wood: Wood screws.
   2. To Hollow Masonry Units: Toggle bolts, in accordance with Section 05 05 33, Anchor Systems.
   3. To Brick Masonry: Expansion bolts by Price, or equal.
   4. To Concrete: Anchors in accordance with Section 05 05 33, Anchor Systems.
   5. To Steel: Beam clamps in accordance with Section 26 05 29, Hangers and Supports for Electrical Systems.

B. Duct Sealing Compound
   1. Soft, fibrous, slightly tacky, non-hardening sealing compound.
   2. Remains workable at all temperatures.
   3. Manufacturer:
      a. Type DUX by O-Z/Gedney.
      b. Or equal.

2.3 IDENTIFICATION

A. Conduit Labels:
   1. Provide conduit labels in accordance with Section 26 05 53, Identification for Electrical Systems.

B. Warning Tape:
   1. Provide warning tape in accordance with Section 26 05 53, Identification for Electrical Systems.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. A. Install in accordance with Laws and Regulations.

B. Supports:

1. Rigidly support conduits by clamps, hangers, or Unistrut-type channels. Conduit supports and accessories shall be in accordance with Section 26 05 29, Hangers and Supports for Electrical Systems.
2. Support single conduits by means of one-hole pipe clamps in combination with one-screw back plates, to raise conduits from the support surface. Support multiple runs of conduits on trapeze type hangers.

C. Fastenings: Fasten raceway systems rigidly and neatly to supporting structures using specified materials.

D. Exposed Conduit:
1. Install parallel or perpendicular to structural members or walls.
2. Where possible, run-in groups. Provide conduit racks of suitable width, length, and height, arranged to suit field conditions. Provide support every ten feet, minimum.
3. Install on structural members in protected locations.
4. Locate clear of interferences.
5. Provide six inches of clearance from hot fluid lines and 1/4-inch from walls.
6. Install vertical runs plumb. Unsecured drop length shall not exceed 12 feet.

E. Conduit Embedded in Structural Concrete:
1. Run embedded conduit in structural concrete in center of slabs and walls and above waterstops. Conduit connections shall be made watertight.
2. Before placing concrete, arrange for observation of conduit installation by RPR or ENGINEER and make necessary conduit location measurements and provide required information on record documents.
3. Confirm that concrete thickness is sufficient for embedding the quantity of conduits intended. Unless specifically shown or indicated otherwise, embedded conduits shall be in accordance with the following criteria:
    a. Minimum concrete thickness shall be as follows:
        1) For concrete 16 inches thick and less, minimum concrete thickness shall be 11.5 inches plus the depth of largest conduit assembly. Conduit assembly depth shall be from the top of uppermost conduit to bottom of lowest conduit.
        2) For concrete greater than 16 inches thick, minimum concrete thickness shall be 13.5 inches plus depth of largest conduit assembly.
        3) For concrete at foundation slabs, provide a one inch additional to minimum concrete thicknesses specified.
    b. Conduit spacing shall be as follows:
        1) Two adjacent conduits shall be separated by center-to-center distance of three times the outer diameter of larger conduit
        2) When conduits cross at a point, conduits may be in direct contact and angle of cross shall be 45 degrees or greater. Conduits may also cross within the vertical spacing of multi-conduit layer assembly.
        3) When conduits cross structural expansion joint, two adjacent conduits shall be separated by center-to-center distance of three times the outer diameter of conduit fitting of the larger conduit

F. Underground Conduits:
   1. Install individual, underground conduits minimum of 24 inches below grade, unless otherwise shown or indicated.
   2. Perform excavation, bedding, backfilling, and surface restoration, including pavement replacement where required.
   3. Install warning tape 12 inches below finished grade over buried conduits.

G. Empty Conduits:
   1. Install nylon pull wire in each empty conduit and cap conduits not terminating in boxes with permanent fittings designed for the purpose.

H. Field Bends: No indentations. Diameter of conduit shall not vary more than 15 percent at bends.

I. Joints:
   1. Apply conductive compound to joints before assembly.
   2. Make up joints tight and ground thoroughly.
   3. Use standard tapered pipe threads for conduit and fittings.
   4. Cut conduit ends square and ream to prevent damaging wire and cable.
   5. Use full threaded couplings. Split couplings are not allowed.
   6. Use strap wrenches and vises to install conduit. Replace conduit with wrench marks.
   7. Apply zinc-rich paint to exposed threads and other areas of galvanized conduit system where base metal is exposed.

J. Terminations:
   1. Install insulated bushings on conduits entering boxes or cabinets, except when threaded hubs are used.
   2. Provide locknuts on both inside and outside of enclosure, except when threaded hubs are used.
   3. Use of bushings in lieu of locknuts is not allowed.
   4. Install conduit hubs on conduits entering boxes or cabinets in wet and corrosive areas.

K. Moisture Protection:
   1. Plug or cap conduit ends at time of installation to prevent entrance of moisture and foreign materials.
   2. Underground and embedded conduit connections shall be watertight.
   3. Thruwall Seals and Conduit Sealing Bushings:
      a. Install for conduits passing through exterior concrete slabs, floors, walls, or concrete block walls of buildings and structures where penetration will be below grade and space is provided to access penetration whether space is a confined space or not.
      b. Install for conduit passing through all interior concrete slabs, floors, walls, or concrete block walls of buildings and structures where they separate wet and dry areas.
   4. Drainage: Conduit runs shall be fully drainable. Where possible install conduit runs to drain to one end and away from building. Avoid pockets or depressions in conduit runs.

5. Seal conduit openings within control and instrumentation panels and distribution equipment with duct sealing compound to provide watertight seal.

L. Corrosion Protection:
   1. Conduit Curb:
      a. For conduits routed in concrete slabs or floors and stub-ups through floor, provide four-inch high concrete curb, extending two inches from outer surface of conduit penetrating floor, to prevent corrosion. For floor-mounted equipment, concrete equipment base shall be in lieu of concrete curb.
      b. Conduit stub-ups shall be 90-degree, PVC-coated, rigid, galvanized steel conduit elbow. PVC-coated elbow shall extend a minimum of 1/2-inch above top of concrete curb or equipment base. Should elbow not reach specified height, provide PVC-coated conduit extension to accommodate specified requirements. Provide coupling or fitting for transition from rigid galvanized steel conduit or PVC conduit in slab to PVC-coated elbow.
      c. For conduits stubbing up and terminating at equipment enclosure mounted on concrete base, provide insulated grounding bushing on PVC-coated rigid steel elbow.
      d. For conduits stubbing up and extending to boxes, cabinets, and other enclosures above the concrete curb in wet and dusty areas, provide conduit coupling/fittings between the PVC-coated rigid steel elbow and rigid steel conduit for transition between the two conduit types.
      e. For conduits stubbing up and extending to boxes, cabinets, and other enclosures above the concrete curb or equipment base in corrosive areas, continue conduit system with PVC-coated rigid steel conduit
   2. Dissimilar Metals:
      a. Prevent occurrence of electrolytic action between dissimilar metals.
      b. Do not use copper products in connection with aluminum, and do not use aluminum in locations subject to drainage of copper compounds on bare aluminum.
      c. Back paint aluminum in contact with masonry or concrete with two coats of aluminum-pigmented bituminous paint.

M. Reused Existing Conduits:
   1. Pull rag swab through conduits to remove water and to clean conduit prior to installing new cable.
   2. Repeat swabbing until all foreign material is removed.
   3. Pull mandrel through conduit, if necessary, to remove obstructions.

N. Core drill for individual conduits passing through existing concrete slabs and walls. Notify ENGINEER in writing in advance of core drilling. Prior to core drilling, drill sufficient number of small exploratory holes to establish that the area to be core drilled is free of existing embedded conduits. Seal spaces around conduit as indicated in Paragraph 3.2.K.3 of this Section.

O. Non-metallic Conduit:
   1. Install in accordance with manufacturer's recommendations.

2. Provide manufacturer's recommended adhesives or sealants for watertight connections.
3. Provide expansion fittings for expansion and contraction to compensate for temperature variations. Fittings shall be watertight and suitable for direct burial.
4. Transition to PVC-coated rigid steel conduit before making turn up to enclosures.

P. PVC-coated Rigid Steel Conduit:
1. Install in accordance with manufacturer's recommendations.
2. Install with manufacturer's installation tools to avoid damage to PVC coating.
3. Repair damaged PVC coating with manufacturer's recommended touch-up compound.

Q. Identify conduits, including spares, in accordance with Section 26 05 53, Identification for Electrical Systems.

3.3 FIELD QUALITY CONTROL

A. Site Tests:
1. Test conduits by pulling through each conduit a cylindrical mandrel with length not less than two pipe inside diameters, having an outside diameter equal to 90 percent of conduit's inside diameter.
2. Maintain a record, by number, of all conduits successfully tested.
3. Repair or replace conduits that do not successfully pass testing, and re-test.

+ + END OF SECTION + +

SECTION 26 05 33.16

FLEXIBLE CONDUITS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install flexible metallic conduit and fittings.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. UL 360, Liquid-Tight Flexible Steel Conduit.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
   1. NEC Article 350, Liquid-Tight Flexible Metal Conduit.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Manufacturer's literature and technical information for flexible conduit and fittings proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Flexible Conduit (Non-hazardous Areas and Class 1, Division 2, Hazardous Areas):
   1. Material: Flexible galvanized steel core with smooth, abrasion-resistant, liquid-tight, polyvinyl chloride cover. Continuous copper ground built in for sizes 3/4-inch through 1.25-inch. Material shall be UL-listed.
   2. Products and Manufacturers: Provide one of the following:
      a. Anaconda Sealtite Type UA by Anamet Electrical, Inc.
      b. Liquatite Type L.A. by Electric-Flex Company.
      c. Or equal.

B. Flexible Conduit (Class 1, Group D, Division 1, Hazardous Areas):

1. Material: Flexible brass inner core with bronze outer braid and protective neoprene plastic coating. Steel, brass, or bronze end fittings. Minimum of 12 inches long.
2. Products and Manufacturers: Provide one of the following:
    a. Type ECGJH or ECLK by Crouse Hinds Company.
    b. Type EXGJH or EXLK by Appleton Electric Company.
    c. Or equal.

C. Flexible Conduit Fittings:
1. Material and Construction: Malleable iron with cadmium finish. Fittings shall adapt the conduit to standard threaded connections, shall have an inside diameter not less than that of the corresponding standard conduit size and shall be UL listed.
2. Manufacturers: Provide products of one of the following:
    a. Crouse-Hinds Company.
    b. Appleton Electric Company.
    c. Or equal.
3. Use: Provide on flexible conduit in non-hazardous and Class 1, Division 2 hazardous areas.

D. PVC-Coated Conduit Fittings:
1. Material and Construction: Malleable iron with standard finish and 40-mil PVC exterior coating. Fittings shall adapt the conduit to standard threaded connections and shall have an inside diameter not less than that of the corresponding standard conduit size.
2. Manufacturers: Provide products of one of the following:
    a. Robroy Industries.
    b. Permacote Industries.
    c. OCAL, Inc.
    d. d. Or equal.
3. Use: Provide on flexible conduit in areas designated as corrosive locations.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install at motors, transformers, field instruments, and equipment subject to vibration or require movement for maintenance purposes. Provide necessary reducer where equipment furnished cannot accept 3/4-inch diameter flexible conduit. Limit flexible conduit length to three feet maximum.

B. Install in conformance with the Laws and Regulations.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 05 33.23

SEALED FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install conduit sealing fittings with sealing fiber and sealing compound.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. UL 886, Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, Class 1, Groups A, B, C and D and Class II, Groups E, F and G.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
   1. NEC Article 500, Hazardous (Classified) Locations.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of locations where fittings are to be used.
   2. Product Data:
      a. Manufacturer’s literature and technical information for sealing fittings, sealing fiber, and sealing compound proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers: Provide products of one of the following:
   1. Crouse Hinds Company.
   2. Appleton Electric Company.
   3. Or equal.

B. Materials and Construction:
   1. Cast gray iron alloy, or cast malleable iron, or copper free aluminum bodies with zinc electroplate and lacquer or enamel finish.

2. Ample opening with threaded closure for access to conduit hub for making dam.
3. In corrosive locations, fittings shall include factory-applied 40-mil PVC coating.
4. Construct fitting to allow 40 percent cross-sectional fill.

C. Sealing fiber for forming the dam within the hub and sealing compound shall be suitable for use with fittings furnished and shall be products of fitting manufacturer.

D. Sealing fitting, fiber, and sealing compound shall conform to UL 886.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install for hazardous locations as required by Laws and Regulations and as shown.

B. Provide fittings for proper use relative to mounting position.

C. Use oversized fittings with reducing bushings when necessary to maintain cable fill requirements of the conduit system.

+ + END OF SECTION + +

SECTION 26 05 33.26

EXPANSION/ DEFLECTION FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install conduit expansion and deflection fittings.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. UL 514B, Conduit, Tubing, and Cable Fittings.
   2. UL 467, Grounding and Bonding Equipment.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
   1. NEC Article 300, Wiring Methods.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of locations where fittings are required.
   2. Product Data:
      a. Manufacturer’s literature and technical information for expansion and deflection fittings proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products and Manufacturers: Provide one of the following:
   1. Type DX for expansion/deflection or AX for expansion only, by O-Z Gedney Company.
   2. Type XD for expansion/deflection or XJ for expansion only, by Crouse Hinds Company.
   3. Type DF for expansion/deflection or XJ for expansion only, by Appleton Electric Company.
   4. Or equal.

B. Cast gray iron alloy or bronze end couplings, malleable iron, or hot-dipped galvanized body, stainless steel clamps and tinned copper braid bonding jumper. Fitting shall be watertight, corrosion-resistant, UL-listed, and compatible with the conduit system.

C. Features:
   1. Expansion/Deflection Fittings:
      a. Axial expansion or contraction up to 3/4-inch.
      b. Angular misalignment up to 30 degrees.
      c. Parallel misalignment up to 3/4-inch.
   2. Expansion Fittings:
      a. Expansion/Contraction: Eight-inch total movement.

D. Expansion/Deflection fittings shall comply with UL 514B and UL 467.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install fittings in accordance with Laws and Regulations.

B. Provide expansion fittings on exposed conduit runs crossing structural expansion joints and where necessary to compensate for thermal expansion and contraction. Provide expansion fittings on exposed conduit runs exceeding 200 feet.

C. Provide expansion/deflection fittings on embedded conduit runs crossing structural expansion joints. Provide fittings above waterstops.

D. Unless specifically shown or indicated otherwise, when crossing structural expansion joints larger than one inch, provide expansion fitting together with expansion/ deflection fitting. Install fittings on each conduit run in accordance with manufacturer’s recommendations to accommodate additional movement necessary.

E. Provide expansion/deflection fittings for underground conduit runs at penetrations of buildings, manholes, handholes, and outdoor concrete equipment pads.

F. Where required in non-metallic conduit and duct systems, provide rigid metal conduit nipples and metal rigid-to-PVC adapters for connection to fittings. Ensure that joints exposed to water or other liquid are made watertight.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 05 33.33

PULL, JUNCTION, AND TERMINAL BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install pull, junction, and terminal boxes.

B. Related Sections:
   1. Section 26 05 05, General Provisions for Electrical Systems.
   2. Section 26 05 29, Hangers and Supports for Electrical Systems.
   3. Section 26 05 53, Identification for Electrical Systems.

1.2 REFERENCES

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. NEC Article 314, Outlet, Device, Pull and Junction Boxes; Conduit Bodies; Fittings; and Handhole Enclosures.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Manufacturer’s technical information for pull, junction, and terminal boxes proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pull, Junction, and Terminal Boxes:
   1. General – Applicable to All Boxes:
      a. Description and Performance Criteria:
         1) Provide pull, junction, and terminal boxes rated at not less than NEMA 12. Boxes shall be appropriate for each location in accordance with NEMA requirements and as required for area

classifications specified in Section 26 05 05, General Provisions for Electrical Systems.

2) For flush-mounted pullboxes in slabs or pavement potentially subject to vehicular traffic, boxes and covers shall be constructed for H-20 loading in accordance with AASHTO Standard Specifications for Highway Bridges.

b. Manufacturers: Provide products of one of the following:
   1) Appleton Electric Company.
   2) Crouse-Hinds Company.
   3) Hoffman Engineering Company.
   4) Or equal.

c. Materials: Pull boxes embedded in concrete slabs shall be cast iron.

d. Terminal strips and terminal blocks in terminal boxes shall be mounted on terminal box sub-panels.

e. Identification: Boxes shall be identified in accordance with Section 26 05 53, Identification for Electrical Systems.

2. Materials and Construction – Dusty Locations:
   a. Material: Welded and galvanized sheet steel of USS gauge.
   b. Gasket: Oil-resistant gasket.
   c. Access: Lift-off hinges and quick-release latches.
   d. Material Thickness:
      1) Boxes with dimension two feet and smaller shall be 14-gauge.
      2) Boxes with dimension between two and three feet shall be 12 gauge.
      3) Boxes with dimension of three feet or more in any direction shall be 10-gauge.

3. Materials and Construction - Wet, Corrosive, or Hazardous Locations:
   a. Rating:
      1) Pull boxes in wet, corrosive, or outdoor areas shall be NEMA 4X.
      2) Boxes for areas classified as hazardous locations, where required by NEC, shall be explosion-proof and comply with UL 886.
   b. Material:
      1) Cast gray iron alloy with hot-dip galvanized finish or cast malleable iron bodies and covers.
      2) Large boxes not generally available in cast iron construction shall be copper-free aluminum alloy or Type 316 stainless steel, as required by location.
      3) In corrosive locations, where the conduit system is PVC-coated, boxes shall be cast metal with factory-applied 40-mil PVC coating, Type 316 stainless steel, or non-metallic thermoplastic or fiberglass reinforced plastic material.
   c. Gasket:
      1) Provide neoprene gaskets for wet and corrosive locations.
      2) Gaskets shall be an approved type designed for the purpose. Improvised gaskets are not acceptable.
   d. Access: Stainless steel cover bolts.
   e. Features:
      1) External mounting lugs.
      2) Drilled and tapped conduit holes.

3) Boxes where conduits enter building or structure below grade shall have 1/4-inch drain hole at bottom of the box.
4) Provide threaded connections for explosion proof boxes.

B. Terminal Blocks:
1. Products and Manufacturers: Provide one of the following:
a. Allen-Bradley Company, Bulletin, Model 1492.
b. General Electric Company, Model CR151K.
c. Or equal.
2. Material and Construction:
a. NEMA-rated nylon modular terminal blocks.
b. 600-volt rated.
c. Control and alarm circuit terminals shall be screwed type with permanently affixed numeric identifiers beside each connection.
d. Power terminals shall be copper and rated for the circuit ampacity.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Mount boxes so that sufficient access and working space is provided and maintain clearance of not less than 1/4-inch from walls.

B. Securely fasten boxes to walls or other structural surfaces on which boxes are mounted. Provide independent supports that comply with Section 26 05 29, Hangers and Supports for Electrical Systems, where boxes will not be mounted on walls or other structural surface.

C. Install pull boxes where shown or indicated, and provide pull boxes where one or more of the following conditions exist:
1. Conduit runs containing more than three 90-degree bends.
2. Conduit runs exceeding 200 feet in length.

D. Provide removable, flame-retardant, insulating cable supports in boxes with any dimension exceeding three feet.

E. Field-apply PVC touch-up to scratched PVC boxes damaged during installation. Touch-up work shall be in accordance with manufacturer’s recommendations and instructions.

F. Size junction, pull, and terminal boxes in accordance with NEC Article 314 and other Laws and Regulations.

G. Provide terminal blocks in boxes where shown and where cable terminations or splices are required.

+ + END OF SECTION + +

SECTION 26 05 33.36

OUTLET BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install outlet boxes for mounting wiring devices and lighting fixtures.

B. Related Sections:
   1. Section 26 05 05, General Provisions for Electrical Systems.
   2. Section 26 05 29, Hangers and Supports for Electrical Systems.
   3. Section 26 05 53, Identification for Electrical Systems.
   4. Section 26 27 26.13, Low-Voltage Receptacles.
   5. Section 26 27 26.23, Snap Switches.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
   1. NEC Article 314, Outlet, Device, Pull and Junction Boxes; Fittings; and Handhole Enclosures.
   2. NEC Article 501, Class I locations.
   3. UL 514A, Metallic Outlet Boxes.
   4. UL 514B, Fittings for Conduit and Outlet Boxes.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Manufacturer’s technical information for outlet boxes proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Device Boxes:
   1. Manufacturers: Provide products of one of the following:
      a. Crouse-Hinds Company.
      b. Appleton Electric Company.
      c. Or equal.
   2. Material:

a. In Wet Locations: Cast gray iron alloy or cast malleable iron with zinc electroplate finish, or aluminum bodies consistent with conduit material.
b. In Dusty Locations: Zinc-coated sheet steel or aluminum bodies consistent with conduit material.
c. Where conduit is installed concealed, boxes shall include suitable extension rings and covers, as required.
d. Where used with PVC-coated conduit system, boxes shall include factory applied 40-mil-thick PVC coating.
e. Cast boxes shall be hub-type and include external mounting lugs.
f. Metallic outlet boxes shall comply with UL 514A.
g. Fittings for outlet boxes shall comply with UL 514B.

3. NEMA rating of box shall be as required for area classifications specified in Section 26 05 05, General Provisions for Electrical Systems.
4. Cover Plates:
   a. Type 302 stainless steel alloy for indoor finished areas.
   b. Plates in corrosive locations shall include factory-applied 40-mil PVC coating.
   c. Stainless steel screws and hardware.
   d. For receptacle and switch cover plates, comply with Section 26 27 26.13, Low-Voltage Receptacles, and Section 26 27 26.23, Snap Switches.

B. Flexible Fixture Hangers:
1. For Class I, Division 2 Hazardous Areas:
   a. Product and Manufacturers: Provide one of the following:
      1) Type AHG by Crouse-Hinds.
      2) Or equal
   b. Materials:
      1) Malleable iron top section and removable malleable iron bottom fixture support assembly with electro-galvanizing and aluminum acrylic paint.
      2) Include vapor-tight cushion to support fixture stem.
      3) Provide neoprene diaphragm to exclude moisture and dirt from conduit system.
      4) Provide with manufacturer's neoprene gasket between fixture hanger and box.
      5) Product shall be capable of eight-degree swing from perpendicular in all directions, before and after coating.
      6) Product shall allow fixtures to be pendant hung in accordance with NEC Article 501.130 (B).

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Fasten boxes rigidly and neatly to supporting structures.

B. Securely fasten equipment to walls or other surfaces on which materials or equipment is mounted. Provide independent supports complying with Section 26 05 29, Hangers and Supports for Electrical Systems, where boxes are not mounted on walls or other surface capable of supporting the materials or equipment.

C. For units mounted on masonry or concrete walls, provide suitable 1/2-inch spacers to prevent mounting back of box directly against wall.

D. Leave no open conduit holes in boxes. Close unused openings with capped bushings.

E. Label each circuit in boxes and identify each circuit in accordance with Section 26 05 53, Identification for Electrical Systems.

F. Install outlet boxes in accordance with NEC Article 314.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 05 43.13

UNDERGROUND DUCTBANKS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install underground ductbanks.

B. Coordination:
   1. Ductbank routing on the Drawings is diagrammatic. Coordinate installation with piping and other Underground Facilities and locate ductbanks clear of interferences.
   2. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before underground ductbank Work.
   3. Notify other contractors in advance of installing underground ductbanks to provide other contractors with sufficient time for installing items included in their contracts that will be installed with or before underground ductbank Work.

C. Related Sections:
   1. Section 26 05 26, Grounding and Bonding for Electrical Systems.
   2. Section 26 05 53, Identification for Electrical Systems.
   3. Section 26 05 33.13, Rigid Conduits.
   4. Section 26 05 33.26, Expansion/Deflection Fittings.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Layouts showing proposed routing of ductbanks and locations of manholes, handholes, and areas of reinforcement.
      b. Profiles of ductbanks showing crossings with piping and other Underground Facilities.
      c. Typical cross sections for each ductbank.

B. Informational Submittals: Submit the following:
   1. Special Procedure Submittals:
      a. Installation procedures.
   2. Field Quality Control Submittals:
      a. Field test report.

C. Closeout Submittals: Submit the following:
   1. Record Drawings:

a. Include actual routing of underground ductbank runs on record documents in accordance with Section 01060, Project Record Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Duct: Provide conduit and fittings in accordance with Section 26 05 33.13, Rigid Conduits. Conduit types shall be as follows:
   1. Schedule 40 PVC conduits for power circuits. All bends, elbows, and sweeps of 45-degrees or larger shall be rigid steel.
   2. Galvanized rigid steel conduits for the following types of circuits: low voltage status, analog, and communication.

B. Backfill: Provide backfill, including select backfill.

C. Reinforcing: Provide Ductbank reinforcing.

D. Concrete: Provide ductbank concrete.

E. Grounding: Provide ground cable in accordance with Section 26 05 26, Grounding and Bonding for Electrical Systems.

F. Conduit Spacers: Conduit spacers shall be nonmetallic, interlocking type to maintain spacing between conduits. Provide spacers suitable for all conduit types used in multiple sizes.

G. Duct Sealing Compound:
   1. Products and Manufacturers: Provide one of the following:
      a. O-Z/Gedney, Type DUX.
      b. Or equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Excavation and Backfilling:
   1. Provide excavation and backfilling for ductbank installation.

2. Do not backfill with material containing large rock, paving materials, cinders, large or sharply angular substances, corrosive material, or other materials that can damage or contribute to corrosion of ducts or cables or prevent adequate compaction of backfill.

B. Ductbank Layout:
1. Top of ductbank concrete shall be a minimum of 2.5 feet below grade, unless shown or indicated otherwise on the Drawings.
2. Slope ductbank runs for drainage toward manholes and away from buildings with slope of approximately three inches vertical per 100 feet of run.

C. Ductbank Assembly:
1. Assemble ductbanks using non-magnetic saddles, spacers, and separators. Position separators to provide minimum three-inch concrete separation between outer surfaces of each conduit. Provide side forms for each ductbank.
2. Make bends with sweeps of not less than four-foot radius or five-degree angle couplings.

D. Concrete Placing:
1. Provide minimum four-inch concrete covering on each side, top, and bottom of concrete envelopes around conduits. Concrete covering shall be as shown or indicated on the Drawings.
2. Provide red dye in concrete for easy identification during subsequent excavation; all concrete in entire ductbank, including top and bottom, shall be dyed.
3. Fix conduits in place during concrete placing. Carefully place and vibrate concrete to fill spaces between conduits.

E. Conduit Transitions:
1. Conduit installations shall be watertight throughout entire length of ductbank.
2. Transition from non-metallic to galvanized rigid steel conduit where ductbanks enter structure walls and slabs.
3. Terminate conduits in insulated grounding bushings.
4. Continue conduits inside buildings in accordance with Section 26 05 33.13, Rigid Conduits, and as shown or indicated in the Contract Documents.
5. If ducts are not concrete-encased, provide expansion and deflection fittings in accordance with Section 26 05 33.26, Expansion/Deflection Fittings.
6. Plug and seal empty spare conduits entering structures. Conduits in use entering structures shall be sealed watertight with duct sealing compound.

F. Ductbank Reinforcing:
1. Provide reinforcing for all ductbanks:
2. Install ductbank reinforcement as shown or indicated on the Drawings.
3. Provide maximum clearance of 1.5 inches from bars to edge of concrete encasement.

G. Connections to Structures:

1. Firmly anchor ductbanks to structure walls or slabs. Epoxy-grout ductbank rebar into structure concrete to eliminate sheer forces between ductbank and structure wall concrete.
2. Ductbank penetrations through structure walls shall be watertight. Refer to 26 05 33.13, Rigid Conduits for "Moisture Protection".

H. Grounding:
1. Provide bare stranded copper ductbank ground cable in each ductbank envelope. Make ground electrically continuous throughout entire ductbank system.
2. Connect ground cable to building and station ground grid or to equipment ground buses. Also, connect ground cable to steel conduit extensions of underground ductbank system.
3. Provide ground clamp and bonding of each steel conduit extension to maintain continuity of ground system.
4. Terminate ground cable at last manhole or handhole for outlying structures.

I. Detectable Underground Warning Tape:
1. Provide detectable underground warning tapes complying with Section 26 05 53, Identification for Electrical Systems, over the full length of each underground ductbank.
2. Install warning tapes approximately 12 inches below grade.
3. Provide multiple tapes across the width of each ductbank. Locate center of a warning tape above each edge of ductbank, and at intervals across top width of ductbank so that clear space between tapes does not exceed six inches.

+ + END OF SECTION + +

SECTION 26 05 45

UTILITY SERVICES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install electric services and associated equipment at the Site.
   2. Contractor shall furnish and install the following Work regarding electric service:
      a. secondary cable and terminations, conduits, and associated underground ductbanks.
   3. Electric utility company, National Grid, will furnish and install the following:
      a. 5KV primary cable, terminations, and splices.
      b. Transformers.
   4. The Contract Price includes an allowance amount specified Unit Bid Proposal, to be used for paying National Fuel, the natural gas utility company, for construction costs incurred by natural gas utility company and invoiced to Contractor relative to natural gas service for the Site.
      a. For purposes of determining Cost of the Work and Contractor's fee associated with construction by the utility company, the utility company will be considered as a Subcontractor to Electrical Contractor.
      b. Do not include in proposed payment under the allowance Contractor's cost other than cost invoiced to Contractor by utility company and Contractor fee (overhead and profit). Include such costs, if any, under other, non-allowance payment items.
      c. Include in an Application for Payment costs invoiced to Contractor by utility company, accompanied by utility company's invoice to Contractor for construction associated with the natural gas and electric service.
      d. If costs payable under the allowance exceeds the allowance, Owner will issue a Change Order to pay Contractor such extra amount, or will pay Contractor such extra amount by other means available under the Contract.
      e. If actual invoiced costs are less than the allowance amount, the Contract Price will be reduced by the difference between cost eligible and recommended by Engineer for payment, and the allowance amount via a Change Order.

5. Work in connection with natural gas and electric services shall be in accordance with requirements of the natural gas and electric utility company.

B. Coordination:
   1. Contractor shall coordinate with natural gas and electric utility company relative to natural gas and electric service connections and requirements. Contractor shall make all necessary arrangements with natural gas and electric utility company.
   2. The Contract Price as awarded includes all costs associated with providing electric service and natural gas service to the Site.

C. Related Section:
   1. Section 26 05 13, Medium Voltage Cables

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI C37.35, Guide for the Application, Installation, Operation and Maintenance of High Voltage Air Disconnecting and Load Interrupter Switches.
   2. ANSI C37.46, Specifications for Power Fuses and Fuse Disconnecting Switches
   3. ANSI/IEEE C62.11, IEEE Metal Oxide Surge Arresters of AC Power Circuits.
   4. ANSI C135.1, Galvanized Steel Bolts and Nuts for Overhead Line Construction.
   5. ANSI C135.2, Threaded Zinc-Coated Ferrous Strand-Eye Anchor Rods and Nuts for Overhead Line Construction.
   6. AWPA C4, Poles - Preservative Treatment by Pressure Processes.

1.3 QUALITY ASSURANCE

A. Pre-installation Conference:
   1. Prior to transmitting submittals for materials and equipment related to electrical service or telephone service, and prior to installing materials and equipment associated with electrical service or telephone service, arrange a conference at the Site with the following:
      a. Electric utility company and telephone company.
      b. Supplier representatives (as required) for materials and equipment associated with electrical service or telephone service.
      c. Installers of other work related to and adjacent to electric and telephone services Work.
      d. Engineer and Resident Project Representative (as applicable).
      e. Other representatives directly concerned with performance of electric service and telephone service Work.

2. Review at the conference the following relating to electrical service and telephone service Work:
    a. Review Project requirements including Contract Documents, approved Shop Drawings and other submittals, requests for interpretation transmitted by Contractor to Engineer, and other pertinent documents.
    b. Review scope of Work and scope of utility company work.
    c. Review required samples and submittals, both completed and to be completed.
    d. Review proposed costs for work that will be invoiced by utility companies.
    e. Review status of Work related to utility services and Progress Schedule related to utility services.
    f. Review availability of materials, tradesmen, equipment, and facilities required for progress, to avoid delays, and to protect the Work from damage.
    g. Review required inspection, testing, certifying, and quality control procedures.
    h. Review methods for complying with requirements of utility companies.
3. Reconvene conference at earliest opportunity if additional information must be developed to conclude the required topics of the conference.
4. Record in writing discussions of conference and decisions and agreements and disagreements; and revisions or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them. Furnish copy of record to each party attending and the Owner.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
    1. Shop Drawings:
        a. Drawings showing proposed layout of electrical utility service.
        b. Drawings showing proposed layout of telephone service.
    2. Product Data:
        a. Manufacturer's literature and technical information, including technical specifications, indicating compliance with the Contract Documents for materials and equipment and construction procedures specified in this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Riser Pole and Miscellaneous Equipment:
    1. General: Work related to the pole and associated equipment shall comply with NESC Grade C. Insulation levels shall be in accordance with 15KV class minimum.
    2. Materials and equipment shall be new and of current manufacture.

3. Pole: National Grid to utilize existing.
4. Framing: National Grid to utilize existing.
5. Line Conductors and Connectors: National Grid to utilize existing.
6. Insulators: National Grid to utilize existing.
7. Pole Line Hardware: National Grid to utilize existing.
8. Anchor Systems:
    a. Guy wire: National Grid to utilize existing.
    b. Guy hardware: National Grid to utilize existing.

B. Group-operated Load Break Switch:
    1. Load Break Switch: National Grid to utilize existing.

C. Fused Loadbreak Cutouts:
    1. Fused loadbreak cutouts: National Grid to utilize existing

D. Lightning Arresters:
    1. Arresters: National Grid to utilize existing.

E. Cable Terminators:
    1. Terminators: National Grid to utilize existing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electric and natural gas service materials and equipment in accordance with requirements of electric and natural gas utility company and install electrical and natural gas service materials and equipment in accordance with requirements of utility company. Install materials and equipment in accordance with NESC.

B. Install equipment in accordance with manufacturer's written recommendations.

+ + END OF SECTION + +

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install identification for electrical apparatus and electrical Work.

B. Related Sections:

   1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
   1. NEC Article 110, Requirements for Electrical Installation.
   2. NEC Article 210, Branch Circuits.
   3. NEC Article 215, Feeders.
   4. NEC Article 504, Intrinsically Safe Systems.
   5. NEC Article 700, Emergency Systems.
   6. NEC Article 701, Legally Required Standby Systems.
   7. NEC Article 702, Optional Standby Systems.
   8. 40 CFR 1910.145 (OSHA) – Specification for Accident Prevention Signs and Tags.
   9. NFPA 70E, Electrical Safety in the Workplace.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings: Submit the following:
      a. Complete description and listing of proposed electrical identification and electrical identification devices for associated equipment or systems.
      b. Conduit and wire identification numbering system and equipment signage.
   2. Product Data:
      a. Manufacturer’s literature, cut sheets, specifications, dimensions and technical data for all products proposed under this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Engraved Identification Devices (Nameplates and Legend Plates):
   1. Nameplates:
      a. Laminated thermoset plastic, 1/16-inch thick, engraved condensed block black lettering on white background, square corners, and beveled front edges, or match existing.
      b. Size: As required.
      c. Letter Size: Minimum 3/16-inch.
      d. Nameplates one inch or less in height shall have one mounting hole at each end. Nameplates greater than one inch in height shall have mounting holes in the four corners.
   2. Legend Plates:
      a. Legend plates for pushbuttons, pilot lights, selector switches, and other panel-mounted devices shall be large size with dimensions of approximately 2-7/16 inches wide by 2-13/32 inches tall (Allen Bradley large automotive size), plastic, custom engraved with black letters on white background.
         1) Provide standard-size legend plates where devices are mounted on motor control centers and spacing of devices precludes using automotive-size legend plates.
      b. Lettering size and line weight shall be the same for all legend plates on the same panel or enclosure. Maximum size shall be 1/4-inch and minimum size shall be 1/8-inch.

B. Safety Signs and Voltage Markers:
   1. Provide high voltage signs for equipment operating over 600 volts.
   2. High-Voltage Safety Signs for Outdoor Applications:
      a. Products and Manufacturers: Provide one of the following:
         1) B-120-45471 by Brady.
         2) Or equal.
      b. Unless otherwise shown or indicated, high voltage safety signs shall be not less than 10 inches high by 14 inches wide of fiberglass reinforced plastic and shall comply with 40 CFR 1910.145. Signs shall resist fading from exposure to temperature extremes, ultraviolet light, abrasive, and corrosive environments, and shall read, “DANGER – HIGH VOLTAGE – KEEP OUT”
      c. Mounting hardware shall be Type 316 stainless steel.
   3. High-Voltage Safety Signs for Indoor Applications:
      a. Products and Manufacturers: Provide one of the following:
         1) B-302-84084 by Brady.
         2) Or equal.
      b. High voltage safety signs for installation on indoor equipment shall be either pressure-sensitive acrylic or vinyl and shall be not less than 10 inches high by 14 inches wide, shall comply with 40 CFR 1910.145, and shall read, “DANGER – HIGH VOLTAGE – KEEP OUT”.
   4. Low-Voltage Safety Signs:
      a. Products and Manufacturers: Provide one of the following:

1) B-302-86060 by Brady.
2) Or equal.

b. Low voltage safety signs shall be pressure-sensitive vinyl complying with 40 CFR 1910.145, five inches by 3.5 inches in size, and shall read, "DANGER – 480 VOLTS".

5. Low-Voltage Markers:
   a. Products and Manufacturers: Provide one of the following:
      1) CV442xx by Brady.
      2) Or equal.
   b. Low voltage markers shall be either pressure-sensitive vinyl or vinyl cloth with black lettering on orange background and shall read, "120 VOLTS", "208 VOLTS", "208Y/120 VOLTS", or "240 VOLTS" as required.

C. Arc-flash Safety Signs:
1. Products and Manufacturers: Provide one of the following:
   a. Brady.
   b. Or equal.
2. Warning signs shall be adhesive-backed polyester.
3. Warning signs shall read, "Warning – Arc Flash and Shock Hazard. Appropriate PPE Required. Arc flash warning signs shall indicate the flash protection boundary, incident energy in calories per square centimeter, hazard level, description of required protective clothing, shock hazard, limited approach boundary, restricted approach boundary, prohibited approach boundary, and equipment name.

D. Voltage System Identification Directories:
1. 1. General:
   a. Directories shall be laminated thermoset plastic, 1/16-inch thick, engraved block black letters on white background, square corners, and beveled front edges.
   b. Directories shall identify all voltage systems within building or structure.
   c. Directories shall list the colors that identify ungrounded and grounded conductors of each system.
   d. Colors shall be in accordance with Section 26 05 19, Low Voltage Electrical Power Conductors and Cables, Section 26 05 13 Medium-Voltage Cable.
   e. Example Directory Text:

Voltage System Identification		
System	**A, B, C**	**Neutral**
480Y/277	Brown, Orange, Yellow	Gray
208Y/120	Black, Blue, Red	White

2. Large directories for rooms shall have text height not less than 1/2-inch.
3. Small directories for equipment shall have text height of not less than 1/4-inch.

E. Conduit Labels:
   1. Products and Manufacturers: Provide one of the following:
      a. B-915-xxxxx by Brady.
      b. Or equal.
   2. Shall be pre-tensioned acrylic/vinyl construction coiled to completely encircle conduit for conduit up through five-inch diameter, or pre-molded to conform to circumference of conduit six-inch diameter and larger.
   3. Attach strap-on style for six-inch diameter conduit with stainless steel springs.
   4. Shall be blank for use with custom printed labels.
   5. Custom Labels:
      a. Shall have black lettering on yellow background.
      b. Shall not contain abbreviations in legend.
      c. Shall be custom printed on continuous tape with permanent adhesive using thermal printer specified below.

F. Wire Identification:
   1. Heat Shrinkable Wire and Cable Labeling System:
      a. Products and Manufacturers: Provide one of the following:
         1) B-341 PS-xxx-2W by Brady.
         2) Or equal.
      b. White heat-shrinkable irradiated polyolefin shrink-on sleeves. Labels shall be thermal printed. Labels shall be not less than two inches wide.
   2. Wrap-Around Wire and Cable Labeling System:
      a. Products and Manufacturers: Provide one of the following:
         1) THT-XX-427 by Brady.
         2) Or equal.
      b. Self-laminating white/transparent self-extinguishing vinyl strips. Length shall be sufficient to provide at least 2.5 wraps. Labels shall be thermally printed and not less than two inches wide.

G. Detectable Underground Warning Tape:
   1. Products and Manufacturers: Provide one of the following:
      a. Indentoline by Brady.
      b. Or equal.
   2. Material: Polyethylene or polyester with detectable metal core and polyester underlaminate.
   3. Width: Two inches.
   4. Color and Labeling: Yellow or red with permanently imprinted black letters: “CAUTION – Buried Electric Line”, repeated continuously over full length of tape.

H. Thermal Printing System:
   1. Utilize thermal transfer process to provide non-smearing labels and markers.
   2. Wire and Cable Markers:
      a. Portable, Products and Manufacturers: Provide one of the following:
         1) TLS2200 by Brady.
         2) Or equal.
      b. Desktop, Products and Manufacturers: Provide one of the following:
         1) 200M by Brady.

2) Or equal.

3. Cable Markers:
    a. Portable, Products and Manufacturers: Provide one of the following:
        1) Handimark by Brady.
        2) Or equal.
    b. Desktop, Products and Manufacturers: Provide one of the following:
        1) Labelizer PLUS by Brady.
        2) Or equal.

I. Generator System Warning Signs:
1. Generator warning signs shall be labeled in accordance with NEC Article 700, NEC Article 701, or NEC Article 702.
2. Material, Colors, Letters: Plastic with white letters on red background. Letters shall be not less than 3/8-inch high.
3. Attachment: Use stainless steel self-tapping screws.
4. Location warning sign shall read, "WARNING – THIS SITE EQUIPPED WITH A DIESEL DRIVEN STAND-BY GENERATOR".
5. Generator ground warning sign shall read, "WARNING – GENERATOR GROUNDED CIRCUIT CONDUCTOR IS CONNECTED TO THE GROUNDING ELECTRODE CONDUCTOR IN THIS ENCLOSURE. DO NOT OPERATE GENERATOR WHILE EITHER CONDUCTOR IS DISCONNECTED TO AVOID SEVERE SHOCK HAZARD AND POSSIBLE EQUIPMENT DAMAGE."

2.2 FABRICATION

A. Engraved Identification Devices (Nameplates and Legend Plates):
1. Nameplate and legend plate text is preliminary and subject to change pending final review and approval of nomenclature by ENGINEER after start-up and testing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide electrical identification in accordance with manufacturer recommendations and as required for proper identification of equipment and materials.

B. Engraved Identification Devices (Nameplates and Legend Plates):
1. Unless otherwise indicated in the Contract Documents, attach permanent nameplates with permanent adhesive and with 3/16-inch diameter, round head, stainless steel machine screws into drilled and tapped holes.
2. Provide nameplate with 1.5-inch-high letters to identify each console, cabinet, panel, or enclosure as shown or indicated.
3. Provide nameplates for field-mounted motor starters, disconnect switches, manual starter switches, pushbutton stations, and similar equipment operating

components, which shall describe motor or equipment function and circuit number.

4. Provide nameplates with 1/2-inch-high letters to identify each junction and terminal box shown or indicated.
5. On switchgear, provide nameplates for each main and feeder circuit including control fuses, and for each indicating light and instrument.
    a. Provide nameplate with 1.5-inch-high letters giving switchgear designation, voltage rating, ampere rating, short circuit rating, manufacturer's name, general order number, and item number.
    b. Identify individual door for each compartment with nameplate giving item designation and circuit number.
6. Motor Control Centers:
    a. Provide nameplate with 1.5-inch letters with motor control center designation.
    b. Identify individual door for each unit compartment with nameplate identifying controlled equipment.
7. Except conduit, all electrical appurtenances including lighting panels, convenience outlets, fixtures, and lighting switches, shall be provided with nameplates indicating appropriate circuit breaker number(s).
8. Push Buttons:
    a. Provide legend plates for identification of functions.
    b. Provide nameplates for identification of controlled equipment.
    c. Provide red buttons for stop function.
    d. Provide black buttons for other functions.
9. Pilot Lights:
    a. Provide legend plates for identification of functions.
    b. Provide nameplates for identification of controlled equipment.
    c. Shall have lens colors as shown or indicated. Where no color is indicated, provide the following lens colors:
        1) Running, Open
            a) Green
        2) Stopped, Closed
            a) Red
        3) Alarm
            a) Amber
        4) Power
            a) Blue
        5) White
            a) Status
10. Selector Switches:
    a. Provide legend plates for identification of functions.
    b. Provide nameplates for identification of controlled equipment.
11. Panel Mounted Instruments:
    a. Provide nameplates for identification of function.
12. Interiors of Cabinets, Consoles, Panels, Terminal Boxes, and Other Enclosures:
    a. Provide nameplates for identification.
    b. Provide each item inside cabinet, console, panel, terminal box, or enclosure with laminated plastic nameplate as shown on approved Shop

Drawings and CONTRACTOR's other submittals. Install nameplates with adhesive.

c. Interior items requiring nameplates include:
   1) Terminal blocks and strips.
   2) Bus bars.
   3) Relays.
   4) Rear of face-mounted items.
   5) Rear of door-mounted items.
   6) Interior mounted items that require identification when mounted externally.

d. Circuit Breaker Directory:
   1) Provide engraved laminated plastic directory listing function and load controlled for each circuit breaker within panel used for power distribution.

13. Re-label existing equipment whose designation have changed.

C. Safety Signs and Voltage Markers:
1. Provide safety signs and voltage markers on and around electrical equipment as shown or indicated.
   a. Install rigid safety signs using stainless steel fasteners.
   b. Clean surfaces before applying pressure-sensitive signs and markers.
2. Install high voltage safety signs on all equipment doors providing access to uninsulated conductors, including terminal devices, greater than 600 volts.
3. Provide cable tray safety signs on both sides of cable trays at maximum intervals of 20 feet. Install signs on side rails of tray as acceptable to ENGINEER.
   a. Label cable trays that contain conductors greater than 600 volts with cable tray safety signs.
   b. Cable trays that contain conductors greater than 208 volts and less than 600 volts shall be labeled with low voltage safety signs.
   c. Cable trays that contain conductors of 208Y/120 volts shall be labeled with low voltage markers.
   d. Do not label cable trays that contain only instrument signal cables.
   e. Label cable trays that contain intrinsically safe wiring or cables in accordance with NEC Article 504.
4. Install low voltage safety signs on equipment doors that provide access to uninsulated 480-volt conductors, including terminal devices.
5. Install low voltage markers on each terminal box, safety disconnect switch, and panelboard installed, modified, or relocated as part of the Work and containing 208Y/120-volt conductors.

D. Voltage System Identification Directories
1. Provide voltage system identification directories as required by NEC Article 210 and NEC Article 215.
2. Provide in each electrical room voltage system identification directory mounted on wall or door at each entrance to room.
3. For panelboards, switchboards, motor control centers, and other branch circuit or feeder distribution equipment that are not located in electrical rooms, provide voltage system identification directory mounted on equipment.

a. Directories shall be affixed using epoxy glue. Screws or bolts shall not penetrate equipment enclosures.
b. Directories shall be readily visible and not obscure labels and other markings on equipment.

E. Arc-flash Safety Signs:
1. Provide arc-flash safety signs as required by NEC Article 110.
2. Provide signs for switchboards, panelboards, motor control centers, and industrial control panels. Provide signs for control panels that contain 480-volt equipment. Provide arc flash warning signs on other equipment where the incident energy is greater than 1.2 calories per square centimeter.

F. Conduit Labels:
1. Provide conduits with conduit labels unless otherwise shown or indicated.
2. Do not label flexible conduit.
3. Do not label exposed single conduit runs of less than 25 feet between local disconnect switches and their associated equipment.
4. Conduit labels shall indicate the following information:
a. Contract Number: Alphanumeric, three or four digits, as applicable.
b. Conduit Number: Alphanumeric as shown on the Drawings, as assigned by CONTRACTOR for unlabeled conduits, and in accordance with approved submittals.
5. Conduits that contain intrinsically safe wiring shall have an additional pipe marker provided that has blue letters on white background and reads, “INTRINSICALLY SAFE WIRING”.
a. Install intrinsically safe pipe markers in accordance with NEC Article 504 along entire installation. Spacing between labels shall not exceed 25 feet.
6. Provide conduit labels at the following locations:
a. Where each conduit enters and exits walls, ceilings, floors, or slabs.
b. Where conduit enters or exits boxes, cabinets, consoles, panels, or enclosures, except pull boxes and conduit bodies used for pull boxes.
c. At maximum intervals of 50 feet along length of conduit.
7. Orient conduit labels to be readable.

G. Wire and Cable Identification:
1. Color-coding of insulated conductors shall comply with Section 26 05 19, Low Voltage Electrical Power Conductors and Cables, Section 26 05 13 Medium-Voltage Cable.
2. Use heat-shrinkable wire labels where wire or cable is terminated. Use wrap-around labels where wire or cable is to be labeled but is not terminated.
3. Do not provide labels for the following:
a. Bare (uninsulated) conductors, unless otherwise shown or indicated as labeled.
4. Provide wire and cable labels for the following:
a. New, rerouted, or revised wire or cable.
b. Insulated conductors.
c. Wire and cable terminations:

1) Wire labels shall be applied between 1/2-inch and one inch of completed termination
2) Apply cable labels between 1/2-inch and one inch of cable breakout into individual conductors.
a) Label individual conductors in a cable after breakout as specified for wires.

d. Wire or cable exiting cabinets, consoles, panels, terminal boxes, and enclosures.
1) Label wires or cables within two inches of entrance to conduit.

e. Wire or cable in junction boxes and pull boxes
1) Label wires or cables within two inches of entrance to conduit.

f. Wire and cable installed in cable tray.
1) Wire and cable shall have labels at maximum intervals of 20 feet.

g. Wire and cable installed without termination in electrical manholes.
1) Wire and cable shall have wrap-around labels applied within one foot of exiting manhole.

5. Wire and Cable Identification System:
a. Wire and cable labels shall be imprinted with an identifying designator.
1) Wire and cable extending between two devices or items and that does not undergo a change of function shall be identified by a single unique designator as specified below.

b. Field Wiring:
1) Wire or cable designator shall consist of:
a) Three left-most characters shall consist of the Contract number under which wiring, or cable was installed.
b) Fourth character from the left shall be an asterisk (*), a plus sign (+) or a hyphen (-). Do not use other punctuation symbols in a wire designator.
c) Remaining characters shall be alphanumeric and make wire designator unique.
d) Numbering shall reflect actual designations used in the Work and shall be documented in record documents.

c. Cabinet, Console, Panel, and Enclosure Wiring, Internal:
1) New Cabinets, Consoles, Panels, and Enclosures:
a) Wire and cable inside cabinets, consoles, panels, and enclosures shall have designators as specified in Section 40 61 13, Process Control Systems General Provisions.

6. Modified Cabinets, Consoles, Panels, and Enclosures:
a. New or rerouted wire or cable in existing cabinets, consoles, panels, and enclosures shall be labeled as shown on the Drawings or be assigned a ten-character designator equivalent to field wire designator.

H. Terminal Strip Labeling:
1. Label panel side of terminal to match panel wire number.
2. Label field side of terminal to match field wire number. Terminal number shall not include the Contract number.

I. Generator System Warning Signs:
1. Provide warning signs for generator systems as required by NEC.

2. Install generator location warning sign on or immediately adjacent to service equipment, or to “normal” source disconnecting means when generator is located out of sight of service equipment or disconnecting means.
3. Install generator grounding warning sign on enclosure or immediately adjacent to point where generator neutral is connected to grounding electrode system if connection is made remote from generator.

+ + END OF SECTION + +

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install panelboards.

B. Related Sections:
   1. Section 26 05 05, General Provisions for Electrical Systems.
   2. Section 26 05 53, Identification for Electrical Systems.
   3. Section 26 22 14, Dry-Type Low-Voltage Distribution Transformers
   4. Section 26 43 00, Surge Protective Devices.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. NEMA PB 1, Panelboards.
   2. UL 67, Panelboards.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of panelboards to be furnished with identification of their proposed location, and all electrical characteristics, including number and rating of branch circuit breakers and enclosure type.
   2. Product Data:
      a. Manufacturer’s technical information for panelboards proposed for use, including product literature and specifications. Indicate options and features to be provided.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements; Comply with the following:
   1. NEC Article 408, Switchboards and Panelboards.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Packing:

a. Inspect prior to packing to assure that assemblies and components are complete and undamaged.
b. Protect mating connections.
c. Cover all openings into enclosures with-vapor inhibiting, water-repellent material.

2. Deliver materials and equipment to Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in concrete in ample time to prevent delaying the Work. Upon deliver, check materials and equipment for evidence of water that may have entered equipment during transit.

B. Storage and Protection:
1. Store panelboards in a clean, dry location with controls for uniform temperature and humidity. Protect equipment with coverings and maintain environmental controls.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Panelboards:
1. Manufacturers: Provide products of one of the following:
a. ABB (GE).
b. Eaton/Cutler-Hammer.
c. Schneider Electric/Square D Company.
d. Or equal.
2. Rating: Voltage rating, current rating, number of phases, number of wires and number of poles as shown or indicated on the Drawings.
3. Circuit Breakers: Molded case, bolt-in thermal magnetic type with number of poles and trip ratings as shown or indicated. Where indicated on the Drawings, circuit breakers shall be ground fault circuit interrupting type equipped with solid state sensing and five-milliamp sensitivity.
4. Circuit breakers for 480-volt panelboards shall have minimum interrupting rating of 14,000 ampere RMS symmetrical, unless otherwise indicated on the Drawings. Circuit breakers for other panelboards shall have minimum interrupting rating of 10,000 ampere RMS symmetrical, unless otherwise indicated on the Drawings.
5. Bus Bars: Bus bars shall be 98 percent conductivity copper. Four-wire panel-boards shall have solid neutral bar. Each panel shall have ground bus bar.
6. Main: Panelboards shall have main circuit breaker unless the Drawings specifically indicate main lugs only.
7. Connect branch circuit breakers for sequence phasing.
8. Enclosures: Panel enclosures shall be as required for the area classifications indicated in Section 26 05 05, General Provisions for Electrical Systems, unless otherwise indicated on the Drawings.
9. Construction: Code-grade steel, ample gutter space, flush door, flush snap latch and lock. Panelboards shall comply with NEMA PB 1 and UL 67.
10. Trim: Surface or flush as required.

11. Directory: Typed or computer-printed card, with transparent protective cover in frame on back of door giving circuit numbers and area or equipment served.
12. Identification: Identify panelboards in accordance with Section 26 05 53, Identification for Electrical Systems. Identification shall indicate panel number and voltage.
13. Directory of Existing Panelboards: When adding or removing breakers or loads from existing panelboards, provide a new typed or computer-generated directory card, indicating the circuit numbers and equipment served.
14. Provide surge protective device in accordance with Section 26 43 00, Surge Protective Devices, for each panelboard shown or indicated on the Drawings. Surge protective device shall be included and factory-mounted within panelboard by panelboard manufacturer. Surge protective device monitoring and display shall be visible from front of panelboard.

B. Integrated Panelboard and Transformer:
1. Products and Manufacturers: Provide products of one of the following:
    a. Mini-Power Zone by Schneider Electric/Square D Company.
    b. Mini-Power Center by Eaton/Cutler-Hammer.
    c. Panel Tran by Acme Electric Corporation.
    d. Or equal.
2. General: Unit shall consist of encapsulated dry-type transformer, primary and secondary main circuit breakers, and secondary panelboard all in one enclosure.
3. Transformer Rating: Transformer portion shall comply with Section 26 22 14, Dry-type Low-Voltage Distribution Transformers. KVA, primary voltage, secondary voltage, frequency and number of phases shall be as shown or indicated on the Drawings.
4. Branch Circuits: Molded case circuit breakers, plug-in thermal magnetic type with number of poles and trip ratings as shown or indicated on the Drawings.
5. Enclosure: Enclosures shall be as required for the area classifications indicated in Section 26 05 05, General Provisions for Electrical Systems, unless otherwise indicated on the Drawings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Mounting: Install panelboards at locations shown or indicated. Set cabinets so that top branch circuit breaker is not over six feet above the floor.

B. Directory: Complete typewritten or computer-printed directory indicating items controlled by each circuit breaker and the size of feeder serving the panel.

C. Arrange circuits to balance the loads on the panelboards.

D. Identify panelboards in accordance with Section 26 05 53, Identification for Electrical Systems.

E. Install in accordance with Laws and Regulations, manufacturer's recommendations, and the Contract Documents. Verify proper installation prior to energizing panelboards.

+ + END OF SECTION + +

SECTION 26 27 26.13

LOW-VOLTAGE RECEPTACLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install low-voltage receptacles.

B. Related Sections:
   1. Section 26 05 05, General Provisions for Electrical Systems.
   2. Section 26 05 53, Identification for Electrical Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. UL 498, Standard for Attachment Plugs and Receptacles.
   2. UL 514D, Cover Plates for Flush-Mounted Wiring Devices.
   3. UL 943, Standard for Ground-Fault Circuit-Interrupters.
   4. UL 1010, Standard for Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations.
   5. UL 1449, Standard for Surge Protective Devices.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
   1. Americans with Disabilities Act.
   2. NEC Article 406, Receptacles, Cord Connectors, and Attachment Plugs (Caps).

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data: Manufacturer’s technical information for receptacles and cover plates proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Receptacles:

1. Grounding receptacle, two-pole, three-wire, NEMA 5-20R configuration, ivory color.
    a. Single:
        1) Products and Manufacturers: Provide one of the following:
            a) HBL5361I by Hubbell, Inc.
            b) 5361-I by Pass & Seymour.
            c) Or equal.
    b. Duplex:
        1) Products and Manufacturers: Provide one of the following:
            a) HBL5362I by Hubbell, Inc.
            b) PS5362-I by Pass & Seymour.
            c) Or equal.
    c. Weather-resistant Duplex:
        1) UL-listed as weather-resistant.
        2) Products and Manufacturers: Provide one of the following:
            a) HBL5362IWR by Hubbell, Inc.
            b) WR5362-I by Pass & Seymour.
            c) Or equal.
2. Corrosion-resistant grounding receptacle, two-pole, three-wire, yellow color.
    a. Single, 125-volt, 20 ampere, NEMA 5-20R configuration:
        1) Products and Manufacturers: Provide one of the following:
            a) HBL53CM61 by Hubbell, Inc.
            b) CR6301 by Pass & Seymour.
            c) Or equal.
    b. Duplex, 125-volt, 20 ampere, NEMA 5-20R configuration:
        1) Products and Manufacturers: Provide one of the following:
            a) HBL53CM62 by Hubbell, Inc.
            b) CR6300 by Pass & Seymour.
            c) Or equal.
    c. Single, 125-volt, 30 ampere, NEMA 5-30 configuration:
        1) Products and Manufacturers: Provide one of the following:
            a) HBL9308 by Hubbell, Inc.
            b) 3802 by Pass & Seymour.
            c) Or equal.
3. Grounding receptacle, two-pole, three-wire, 250-volt, 20 ampere, NEMA 6-20 configuration, brown color.
    a. Single:
        1) Products and Manufacturers: Provide one of the following:
            a) HBL5461 by Hubbell, Inc.
            b) 5871 by Pass & Seymour.
            c) Or equal.
    b. Duplex:
        1) Products and Manufacturers: Provide one of the following:
            a) HBL5462 by Hubbell, Inc.
            b) 5862 by Pass & Seymour.
            c) Or equal.
4. Provide Type 304 stainless steel cover-plate conforming to UL 514D. Provide weatherproof-while-in-use cover where shown on the Drawings as “WP” or “WPU” and provide where receptacles are located in wet or corrosive location.

5. Receptacles shall comply with UL 498.

B. Receptacles for Hazardous Locations:
   1. Material: Factory-sealed receptacle suitable for installation in Class I, Group D hazardous locations. Copper-free aluminum receptacle and cover with cast gray iron alloy or cast malleable iron mounting box with zinc electroplate finish. Receptacle rated at 20 amperes, 125 to 250 volts AC, two-wire, and three-pole. Provide matching plug for each receptacle.
   2. Receptacles for hazardous locations shall conform to UL 1010.
   3. Products and Manufacturers: Provide one of the following:
      a. Series CPS by Crouse-Hinds Company.
      b. Type CPS by Appleton Electric Company.
      c. Or equal.

C. Ground Fault Interrupting Receptacles:
   1. Duplex grounding receptacle, two-pole, three-wire, NEMA 5-20R configuration, 125-volt AC, 20 amperes, gray color with ground fault circuit interrupting (GFCI) protection.
   2. Ground fault interrupting receptacles shall comply with UL 943.
   3. Provide Type 304 stainless steel cover-plate conforming to UL 514D. Provide weatherproof-while-in-use cover where shown on the Drawings as "WP" or "WPU" and provide where located in wet or corrosive location.
   4. Products and Manufacturers: Provide one of the following:
      a. GFR5362SGY by Hubbell, Inc.
      b. 2091-GRY by Pass & Seymour.
      c. Or equal.
   5. Weather-resistant Ground Fault Interrupting Receptacles
      a. Products and Manufacturers: Provide one of the following:
         1) 2095TRWRGRY by Pass & Seymour.
         2) Or equal.

D. Surge Suppression Receptacles:
   1. Duplex grounding, surge suppression receptacle, two-pole, three-wire, NEMA 5-20R configuration 125-volt AC, 20 amperes, blue color, capable of absorbing transient surge of 6,000 volts minimum. Receptacle shall include power-on indicator light.
   2. Surge suppression receptacles shall comply with UL 1449.
   3. Provide Type 304 stainless steel cover-plate conforming to UL 514D. Provide weatherproof-while-in-use cover when shown on the Drawings as "WP" or "WPU" and provide where located in a wet or corrosive location.
   4. Products and Manufacturers: Provide one of the following:
      a. HBL5362SA by Hubbell, Inc.
      b. 5362BLSP by Pass & Seymour.
      c. 5380-GY by Leviton Manufacturing Company.
      d. Or equal.

E. Weatherproof-While-in-Use Covers:

1. Where receptacles are shown on the Drawings as "WP" or "WPU," and where receptacles are installed in wet locations as defined in area classification portion of Section 26 05 05, General Provisions for Electrical Systems, provide receptacles as specified in Paragraphs 2.1.A through 2.1.D of this Section, as applicable, with weatherproof-while-in-use covers as specified below.

2. Provide covers that are UL-listed, weatherproof while receptacle is in use, and are of ultraviolet-resistant construction suitable for outdoor use in accordance with NEC 406.
3. Material:
    a. Non-metallic box with hinged, non-metallic cover.
    b. Sealing gaskets between box and cover.
    c. Stainless steel screws and hardware.
    d. Color: Gray finish
4. Products and Manufacturers: Provide one of the following:
    a. TayMac Corporation.
    b. Pass and Seymour Type WIU
    c. Or equal.

F. Power and Special Receptacles: Provide receptacles with number of poles and voltage and current rating as shown or indicated. Coordinate with equipment plugs. Provide matching plug for each receptacle.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Non-hazardous Locations: Install receptacles at locations shown, in outlet or device boxes in accordance with Section 26 05 33.36, Outlet Boxes.

B. Hazardous Locations: Install receptacles in rigid metallic conduit systems.

C. Install receptacles with ground pole in the down position.

D. Mount receptacles 48 inches above finished floor in non-hazardous locations and 4.5 feet above finished floor in hazardous locations, in accordance with the Americans with Disability Act, unless otherwise shown or indicated in the Contract Documents.

E. Install in conformance with Laws and Regulations.

F. Identification:
   1. Identify each conductor with circuit number and lighting panel number in accordance with Section 26 05 53, Identification for Electrical Systems.
   2. Identify each receptacle with permanent phenolic tag. Tags shall include circuit number and lighting panel number.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 27 26.23

SNAP SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install snap switches for lighting and other systems.

B. Related Sections:
   1. Section 26 05 53, Identification for Electrical Systems
   2. Section 26 05 33.36, Outlet Boxes.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. UL 20, General Use Snap Switches.
   2. UL 894, Switches for Use in Hazardous (Classified) Locations.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements
   1. Americans with Disabilities Act

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data: Manufacturer’s technical information for switches proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Switches for Non-Hazardous Locations:
   1. Single pole AC toggle switch, quiet type, 120/277-volt AC, 20 amperes, Ivory, specification grade.
      a. Products and Manufacturers: Provide one of the following:
         1) Catalog No. 1221-I, by Harvey Hubbel, Inc.
         2) Catalog No. 1991-I, by Arrow-Hart, Inc.
         3) Catalog No. 20AC1-I, by Pass & Seymour

4) Or equal.

2. Single pole, three-way AC toggle switch, quiet type, 120/277-volt AC, 20 amperes, Ivory, specification grade.
    a. Products and Manufacturers: Provide one of the following:
        1) Catalog No. 1223-I, by Harvey Hubbell, Inc.
        2) Catalog No. 1993-I, by Arrow-Hart, Inc.
        3) Catalog No. 20AC3-I, by Pass & Seymour
        4) Or equal.
3. Two-pole AC toggle switch, quiet type, 120/277-volt AC, 20 amperes, Ivory, specification grade.
    a. Products and Manufacturers: Provide one of the following:
        1) Catalog No. 1222-I, by Harvey Hubbel, Inc.
        2) Catalog No. 1992-I, by Arrow-Hart, Inc.
        3) Catalog No. 20AC2-I, by Pass & Seymour
        4) Or equal.
4. Switches in non-hazardous areas shall be UL-listed in accordance with UL 20.

B. Switches for Hazardous Locations:
1. Material: Factory sealed tumbler switch suitable for installation in Class I, Group D hazardous locations. Cast gray iron alloy or cast malleable iron body and cover with zinc electroplate finish. Switch rated at 20 amperes, 120/277-volt AC.
2. Switches in hazardous areas shall be UL-listed in accordance with UL 894.
3. Products and Manufacturers: Provide one of the following:
    a. Series EDS by Crouse-Hinds Company.
    b. Type EDS by Appleton Electric Company.
    c. Or equal.

C. Switch Covers:
1. Indoor, wet, or corrosive location covers shall be weatherproof and corrosion resistant.
2. Outdoor, wet, or corrosive location covers shall be weatherproof and corrosion resistant.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switches at locations as shown or indicated in the Contract Documents in outlet or device boxes, in accordance with Section 26 05 33.36, Outlet Boxes.

B. Mount wall switches 4.0 feet above finished floor, in accordance with the Americans with Disability Act, unless otherwise noted.

C. Identify each conductor with circuit number and lighting panel number. Identification shall be in accordance with Section 26 05 53, Identification for Electrical Systems.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches and enclosed controllers.
   2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches and fuseholders.
   3. Spare-fuse cabinets.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

   1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
      a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
      b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
   2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
   3. Current-limitation curves for fuses with current-limiting characteristics.
   4. Coordination charts and tables and related data.

B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Ambient temperature adjustment information.
   2. Current-limitation curves for fuses with current-limiting characteristics.

   3. Coordination charts and tables and related data.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
   1. Eaton Bussmann
   2. Mersen
   3. Ferraz Shawmut, Inc.
   4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 PLUG FUSES

A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

2.4 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
   1. Size: Adequate for storage of spare fuses specified with [15] <Insert number> percent spare capacity minimum.
   2. Finish: Gray, baked enamel.

B. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
   1. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:
   1. Service Entrance: Class J, time delay.
   2. Feeders: Class J, time delay.
   3. Motor Branch Circuits: Class RK1, time delay.
   4. Other Branch Circuits: Class J, time delay.
   5. Control Circuits: Class CC, fast acting.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

+ + END OF SECTION + +

SECTION 26 28 16.33

DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install disconnect switches.

B. Related Sections:
   1. Section 26 05 05, General Provisions for Electrical Systems.
   2. Section 26 05 53, Identification for Electrical Systems.
   3. Section 26 27 26.23, Snap Switches.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. UL 98, Enclosed and Dead-Front Switches.
   2. NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
   3. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. NEC Article 404, Switches.
   2. Disconnect switches shall bear the UL label.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of each switch to be furnished, including location, rating, and NEMA enclosure type for each.
   2. Product Data:
      a. Manufacturer’s technical information for disconnect switches proposed for use.

B. Maintenance Material Submittals: Submit the following:
   1. Extra Stock Materials:
      a. Furnish one set of spare fuses for each fused disconnect switch to be installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products of one of the following:
   1. Square-D Company.
   2. Cutler-Hammer.
   3. General Electric Company.
   4. Siemens.
   5. Or equal.

2.2 MATERIALS

A. Service Disconnect Switches:
   1. Type: Fused, heavy-duty, single throw, quick-make, quick-break mechanism, visible blades in “OFF” position and safety handle.
   2. Rating: Voltage, current and short circuit ratings and number of poles as shown or indicated on the Drawings. Switch shall bear UL label indicating suitability for use as service equipment and shall comply with UL 98, NEMA KS 1, and NEMA 250.

B. Single Throw, Circuit Disconnect Switches:
   1. Type: Fused or unfused, horsepower rated, heavy-duty, single throw, quick- make, quick-break mechanism, visible blades in the "OFF" position and safety handle.
   2. Rating: Voltage and current ratings and number of poles as required for motor or equipment circuits being disconnected. Switches shall bear a UL label and shall comply with the requirements of UL 98, NEMA KS 1 and NEMA 250.

C. Disconnect Switches for 120-volt, Single-phase Circuits:
   1. Refer to Section 26 27 26.23, Snap Switches.

D. Enclosures: NEMA rating shall be as required for area classifications specified in section 26 05 05, General Provisions for Electrical Systems.

E. Identification:
   1. Identify enclosures in accordance with Section 26 05 53, Identification for Electrical Systems.
   2. Provide nameplate to identify the equipment served by disconnect switch and associated source of power.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install equipment so that sufficient access and working space is provided for ready and safe operation and maintenance.

B. Securely fasten equipment to walls or other structural supports on which they are mounted. Provide independent stainless-steel supports where no wall or other structural surface exists. Mount disconnect enclosures at a height not exceeding six feet.

C. Provide suitable 1/4-inch spacers to prevent mounting enclosure directly against walls.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 29 36

LOW-VOLTAGE MANUAL MOTOR STARTERS

PART 1 - PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install low-voltage manual motor starters.

B. Related Sections:
   1. 1. Section 26 05 05, General Provisions for Electrical Systems.
   2. 2. Section 26 05 53, Identification for Electrical Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. NEMA ICS 2-110, General Standards for Manual and Magnetic Controllers.
   2. UL 508, Industrial Control Equipment

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
   1. NEC Article 430, Motors, Motor Circuits, and Controllers.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of low-voltage manual motor starters to be furnished, with identification of location of each, NEMA enclosure type, and equipment to be controlled.
   2. Product Data:
      a. Manufacturer’s technical information for low-voltage manual motor starters proposed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products of one of the following:
   1. Cutler-Hammer.
   2. General Electric Company.
   3. Allen Bradley Company.
   4. Square-D.
   5. Or equal.

2.2 MATERIALS

A. Low-Voltage Manual Motor Starters:
   1. Type: Toggle-operated, horsepower-rated, with thermal overload protection.
      a. Where shown or indicated on the Drawings, provide manual motor starters rated 600-volt, three-pole, 20-amp without overload protection for use as disconnects.
   2. Provide starters rated for 600-volt, three-pole; 240-volt, two-pole; or 120-volt, single-pole with amperage and horsepower rating as required for load to be controlled.
   3. Enclosure: As required for area classifications specified in Section 26 05 05, General Provisions for Electrical Systems.
   4. Identification: Identify starters in accordance with Section 26 05 53, Identification for Electrical Systems. Identify per the equipment controlled.
   5. Starter shall comply with NEMA ICS 2-110 and UL 508.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which Work will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install equipment so that sufficient access and working space is provided for ready and safe operation and maintenance.

B. Securely fasten equipment to walls or other surfaces on which equipment is to be mounted. Provide suitable 1/4-inch spacers to so that enclosure is not installed directly against walls. Provide independent supports where no wall or surface capable of supporting equipment exists.

C. Install in conformance with Laws and Regulations, the Contract Documents, and manufacturer recommendations.

+ + END OF SECTION + +

SECTION 26 32 13

ENGINE GENERATORS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment, and incidentals as shown specified and required to furnish and install 480-volt standby power generator system with appurtenances for complete and operational system.
   2. The following generator system(s) are included in this Section:
      a. 20 KW, 25 KVA, 0.8 power factor, 240 volts, 1-phase, 3 wire, weatherproof sound attenuated enclosure, diesel engine generator.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items that must be installed with or before engine generator Work.

1.2 REFERENCES

A. Standards referenced in this section are:
   1. International Standards Organization (ISO), ISO 8528, Reciprocating Internal Combustion Engine Driven Alternating Current Generator Sets.
   2. ISO 9001, Quality Management Systems – Requirements.
   3. NEMA MG-1, Motors and Generators.
   4. NFPA 30, Flammable and Combustible Liquids Code.
   5. NFPA 37, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines.
   6. NFPA 70E, Electrical Safety in the Workplace.
   7. NFPA 110, Standard for Emergency and Standby Power Systems.
   8. UL 142, Steel Aboveground Tanks for Flammable and Combustible Liquids.
   9. UL 508, Safety Standard for Industrial Control Equipment.
   10 UL 2200, Standard for Safety Stationary Engine Generator Assemblies (rated 600 volts or less)

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Shall have minimum of five years of experience of producing substantially similar equipment to that specified and shall document at least five installations in satisfactory operation for at least five years.
      b. Shall possess valid ISO 9001 certification.

c. Supplier shall have complete parts and service facilities, factory-trained service staff available for 24-hour emergency service, and be authorized to administer the warranty for all components of engine generator systems.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of component manufacturer from a single generator set manufacturer. Materials, equipment, and parts shall be new, of current production of a firm that manufactures the generator set as a matched system. Manufacturer shall have full responsibility for engine generator performance. Generator set manufacturer shall prepare or approve all Shop Drawings and other submittals for all components furnished under this Section.
   2. Engine generator shall be factory-assembled. Verify in the factory that system is free from electrical and mechanical defects and conforms to the Contract Documents.

C. Regulatory Requirements: Comply with applicable provisions of authorities having jurisdiction, including the following:
   1. Code of Federal Regulations (CFR), Title 40, Part 89, Control of Emissions from New and In-Use Nonroad Compression Ignition Engines, Subpart D Emission Test Equipment Provisions
   2. Local Ordinances: Systems shall conform to Laws and Regulations relative to noise control and emissions.
   3. Local and State Building Codes: Installations shall conform to applicable codes including requirements of local fire marshals.
   4. Permits: Obtain and pay for required permits, fees, and inspections by authorities having jurisdiction

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Installation drawings specific to the Project.
      b. Bill of material for all equipment and spare parts.
      c. Electrical wiring and interconnection diagrams with all external connections identified.
      d. Control panel data shall include:
         1) Description of control features.
         2) Operator panel control switches and functions.
         3) Alarm and status displays.
         4) Provisions for remote start signal and remote status and alarm.
         5) Compliance with UL 508.
      e. Enclosure data shall include the following:
         1) Plan and elevation drawings showing overall dimensions, interior equipment arrangement, and working spaces.
         2) Construction details and hardware specifications.
         3) Exhaust piping and silencer mounting arrangement.

4) Sound attenuation provisions and decibel levels.

f. Fuel system data shall include:
   1) Natural gas Utility connection and details. Shop drawing shall include nominal pipe size, all special fitting, pressure regulators, and pressure requirements for the generator system.
   2) Bill of Materials for natural gas system and required components.
   3) Alarm devices.

g. Provide the following relative to installation:
   1) Vibration isolators and anchor bolt requirements.
   2) Seismic restraint requirements.
   3) Provisions for fuel piping, electrical conduits, and other external connection requirements.

2. Product Data:
   a. Manufacturer's literature, specifications, engineering data sheets, and standard drawings, necessary to fully describe the engine generator sets and appurtenances, and substantiate compliance with the Contract Documents. Information shall be annotated to clearly indicate ratings, features, and options specific to the Project.
   b. Generator data shall include:
      1) Listed to UL 2200.
      2) Heat rejection to room
      3) Combustion air requirements.
      4) Factory painting specifications.
   c. Engine data shall include:
      1) Fuel flow at rated load.
      2) Fuel consumption at 1/4, 1/2, 3/4, and full load.
      3) Engine Type: Naturally aspirated or turbocharged and after-cooled.
      4) Maximum exhaust backpressure.
      5) Silencer attenuation rating.
      6) Jacket water heater system.
      7) Gaseous emissions data measurements for hydrocarbons, carbon monoxide, particulate matter, and NOx conforming to 40 CFR 89, Subpart D.
   d. Alternator data shall include:
      1) Winding insulation class and temperature rise in accordance with NEMA MG-1-1.65
      2) Standby and continuous KW/KVA ratings.
      3) Motor starting KVA at 90 percent sustained voltage.
      4) Surge KW capacity.
      5) Machine reactances and time constants.
   e. Starting system data shall include:
      1) Battery system.
      2) Battery charger.
      3) Cycle cranking configuration.
   f. Submit emissions data measurements for hydrocarbons (HC), carbon monoxide (CO), particulate matter (PM) and oxides of nitrogen (NO_x) confirming to USEPA test procedures. Include USEPA not-to-exceed requirements for each pollutant.

3. Testing Procedures:
    a. Source Quality Control Testing Procedures: For Units 501 kW and larger, provide factory testing procedures and dates at least thirty days prior to testing.
    b. Site Quality Control Testing Procedures: Testing procedures, provided at least thirty days prior to scheduled start of testing.

B. Informational Submittals: Submit the following:
1. Manufacturer's Instructions:
    a. Manufacturer's unloading, rigging, installing, testing, and startup instructions. Information shall be specific to and indicate options for the Project

2. Source Quality Control Submittals:
    a. For Units 500 kW and Smaller: Prototype testing certification.
    b. For Units 501 kW and Larger: Provide factory testing results within seven days of completing factory test.
3. Site Quality Control Submittals:
    a. Services to be performed by Supplier's representative, provided at least thirty days prior to start of Site testing.
    b. Report on results of testing at the Site, provided within seven days of completion of testing.
4. Manufacturer Reports: Reports of visits to Site by Supplier's representative, including purpose of visit, problems encountered, and resolutions.
5. Qualifications Statements:
    a. Manufacturer: When requested by ENGINEER, submit data documenting compliance with qualifications requirements of the Contract Documents.

C. Closeout Submittals:
1. Operation and Maintenance Manuals: Provide Operations and Maintenance Data. Include the following information:
    a. Operating Instructions: Instructions for starting, stopping, protection of circuits, automatic controls, battery charging and safety considerations. Methods for adjusting speed, output voltage, and control timers.
    b. Performance Parameters: Provide nominal values and acceptable limits for output voltage, frequency, load, engine temperature, and oil pressure Include circuit drawings with component identifications for reference .
    c. Maintenance Instructions: Procedures for daily, weekly, monthly, and annual basis, or on an hours-run basis. Include guidance for selecting fuel oil, lubricating oil, use of water treatment additives, and anti-freeze.
2. Warranty Documentation.

D. Maintenance Materials:
1. Provide the following spare parts for each generator set:
    a. Two sets of primary and secondary fuel filters.
    b. One set of air filters.
    c. Two control circuit fuses of each size used.
    d. Two sets of lube oil filters.

e. One set of fan belts.

1.5 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. Obligations of CONTRACTOR under the Contract Documents shall not be limited by provisions of the specified special warranty.

B. Special Warranty:
   1. Provide manufacturer's written warranty, running to the benefit of OWNER, agreeing to correct or, at option of OWNER remove or replace materials or equipment specified in this Section found to be defective during a period of five years after date of Substantial Completion or 3,000 hours of operation.
   2. Products supplied under this Section shall be covered by a single warranty for the coverage period. Warranty shall provide for free replacement or repair of parts for five years or 3,000 hours of operation, and free labor for the first two years.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Cover all generator air and exhaust openings with vapor inhibiting and water repellent material.
   2. Deliver anchorage devices that are to be embedded in cast-in-place concrete in ample time to prevent delaying the Work.
   3. Inspect equipment for shipping damage or loose parts upon delivery. Check for evidence of water that may have entered equipment during transit.
   4. Notify ENGINEER of loss or damage to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

B. Handle equipment in accordance with manufacturer's instructions. Furnish at least one copy of instructions with equipment at time of shipment.

C. Storage:
   1. Store equipment in a clean, dry location with controls for uniform temperature and humidity. Protect equipment with coverings and maintain environmental controls.
   2. Store materials for easy access for inspection and identification. Keep all materials off the ground, using pallets, platforms or other supports. Protect equipment from corrosion and deterioration.

PART 2 – PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Quantity and ratings of the systems shall be as indicated in Paragraph 1.1.A.2 of this Section.

B. Generators shall be rated for standby operation for duration of normal utility outage as defined by ISO 8528 for limited time operation. Generators shall be capable of operating for up to 500 hours per year, of which maximum of 300 hours is continuous running, and no overload is allowed.

D. Generator assemblies shall be UL 2200-listed, control panels shall be UL 508-listed and above-ground fuel tanks shall be UL 142-listed.

E. Generators shall be rated for the specified KW, without overload, at the following Site conditions:
   1. Maximum Ambient Temperature: 40 degrees C.
   2. Altitude: 592 feet above mean sea level.

2.2 MANUFACTURERS

A. Provide generator systems of one of the following:
   1. Caterpillar.
   2. Cummins.
   3. Or equal.

2.3 ENGINE

A. Engine Type: Six-cycle electronic distributor ignition, water cooled diesel 1800 RPM. Two-cycle engines are not acceptable. Horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories.

B. Engine Construction:
   1. Steel-backed bearings.
   2. Crank Case: Reinforced cast iron.
   3. Crank Shaft: Forged alloy steel with hardened journals, finished and dynamically balanced.
   4. Cylinder Head: Cast iron.
   5. Pistons: Aluminum alloy with chrome faced rings.
   6. Replaceable cylinder liners and valve seat inserts for engines rated over 200 horsepower.
   7. Single-block construction. Bolted, multiple blocks are not acceptable.

C. Cooling System:

1. Radiator: Engine-mounted with engine-driven blower fan capable of cooling the engine under full load conditions in an ambient temperature of 104 degrees F without de-rating.
2. Thermostatic valve in jacket water outlet between radiator and engine to maintain proper jacket water temperature. Engine-driven pump to circulate water through cooling system.
3. Coolant: Fill system with 50 percent solution of ethylene glycol with additives as recommended by engine manufacturer.
4. Coolant water temperature gauge.
5. High engine temperature shutdown.
6. Loss of coolant shutdown.
7. Fan guard.
8. Radiator face duct connection.
9. Extend radiator drain hose to shutoff valve located on the exterior of the generator enclosure.
10. Provide shutoff valves so that the engine coolant heater(s) can be removed without draining the engine coolant.
11. Engine coolant heaters, thermostatically controlled, capable of keeping jacket water at temperature not less than 90 degrees F in compliance with NFPA 110. Coolant heaters shall operate at 240 volts, single phase. House contactor for controlling heater in NEMA 4X stainless steel enclosure mounted on unit.

D. Lubrication System: Positive displacement, mechanical, full pressure lube pump, full flow and bypass lubrication filters with replaceable spin-on canister elements, oil drain line with valves and dipstick oil level indicator.

E. Fuel System: Suitable for operation on No. 2 diesel fuel oil. System to include primary and secondary fuel filters, fuel/water separator, fuel priming pump, flexible fuel lines and fuel pressure gauge.

F. Governor: Electronic system to provide automatic isochronous frequency regulation. System dynamic capabilities to be controlled as function of engine temperature for fast stable operation at varying engine operating conditions. System to actively control fuel rate and excitation. Fuel rate to be regulated as function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.

G. Fuel Oil Sub-base Tank
   1 Construction: Heavy-gage steel primary tank, 74-gallon capacity, and welded steel secondary containment sized to contain 110 percent of primary tank capacity. Rust inhibitor coating inside and prime- and finish-coated outside, color to match generator set exterior paint.
   2. Comply with the following:
      a. UL142-listed and labeled.
      b. NFPA 30, NFPA 37, and NFPA 110.
   3. Fittings: NPT for fuel supply and return; two-inch diameter NPT for normal vent, manual fill and level alarm; NPT for emergency vents, level gauge, basin drain, and leak detection alarm.

4. Fuel level gauge and leak detector switch with alarm lights and contacts for remote annunciation of low fuel level and leak detection.
5. Mushroom-type cap and screen for normal vent openings and pressure relief-type caps for emergency vent openings.
6. Manufacturers: Provide sub-base tank of one of the following:
    a. Pryco, Inc.
    b. Tramont Corp.
    c. Or equal.

G. Air Supply/Exhaust Systems:
1. Heavy duty air cleaner with service indicator.
2. Flexible stainless steel exhaust connector.
3. Critical grade silencer with condensate drain ports.
4. Schedule 40 stainless steel piping. Insulate indoor piping to limit surface temperature to 50 degrees C.

H. Air Emissions:
1. Comply with United States Environmental Protection Agency (USEPA) standards for non-road engines and with state and local requirements.

I. Starting System: DC system complete with engine mounted batteries, locally mounted charger and connecting cables between batteries and engine and between charger and batteries.
1. Batteries: Lead-acid or calcium/lead antimony, engine cranking type, rated in accordance with engine manufacturer's requirements for minimum of three 15-second cranking cycles at firing speeds without recharging, and to accommodate DC power requirements of control panel and other accessories requiring DC power.
2. Battery racks, cables, connectors, and disconnect switch.
3. Engine-mounted battery charging alternator and solid state voltage regulator.
4. Battery Charger:
    a. UL-listed, voltage regulated and equipped with float, taper and equalize charge settings.
    b. Automatic charge rate compensation based on ambient temperature at the batteries.
    c. Analog DC ammeter and voltmeter; 12-hour equalize timer; AC and DC fuses.
    d. Loss of AC power, low battery voltage and high battery voltage alarm lights and contacts for remote annunciation; power on light.

2.4 ALTERNATOR

A. Construction: Synchronous generator, four-pole, 2/3 pitch, revolving field, self ventilated, drip-proof construction, single bearing, dynamically balanced rotor with amortisseur windings to minimize voltage deviations and heating effects under unbalanced load conditions. Rotor directly connected to engine flywheel housing to ensure permanent alignment.

B. Winding Insulation Systems: Class H in accordance with NEMA MG-1. Temperature rise not to exceed 130 degrees C over 40 degrees C ambient at rated load. Epoxy coating for fungus resistance and abrasion protection.

C. Excitation System: Brushless construction. Excitation support system, permanent magnet type, to sustain 300 percent rated current for up to 10 seconds under short circuit conditions. Provide surge suppressors to protect against voltage spikes.

D. Voltage Regulator: Automatic solid state system to maintain generator output voltage within plus or minus 0.5 percent from no load to full load. Control voltage buildup, provide volts per Hertz regulation, protect from over-excitation, limit voltage overshoot on startup, and be environmentally sealed.

E. Provide anti-condensation heater to maintain temperature approximately five degrees Fahrenheit above ambient when generator is idle.

2.5 CONTROL PANEL

A. Controls shall be in accordance with NFPA 110, Level 2, and control panel shall conform to the following:
   1. Install control panel on vibration isolators with controls, instruments, lights, and devices necessary to manually and automatically start, stop, monitor, and protect the generator.
   2. Controls shall be UL 508-listed and microprocessor-based with programmable adjustments. Control power from starting battery system. Panel shall include the following:
      a. Emergency stop pushbutton.
      b. Adjustable cycle cranking.
      c. KW, KVA, KVAR, and power factor meters.
      d. Engine coolant temperature readout.
      e. Engine oil pressure readout.
      f. Running time readout.
      g. RPM meter.
      h. Cool down timer.
   3. Readouts and dry contact outputs shall be provided as required by NFPA 110, Level 2.
   4. Provide output dry contacts for remote monitoring and control for the following:
      a. Generator running
      b. Generator common warning alarm.
      c. Generator common shutdown alarm.
      d. Low day tank fuel if day tank is used (warning alarm).
   5. Reset Control: Manual or remote restarts are not allowed and alarm lamps shall remain in alarm state until manual reset is accomplished even if alarm condition has been corrected.
   6. Provide control panel anti-condensation space heater.

2.6 CIRCUIT BREAKERS

A. General: Provide main and exciter circuit breakers, sized for protecting the engine-generator.

B. Type: UL-listed, molded case with interchangeable electromechanical trip unit for sizes 225-amp and larger. Provide NEMA 1 enclosed units and mount on engine generator.

2.7 ENCLOSURE

A. Provide engine-generator system with outdoor weatherproof enclosure where indicated in Paragraph 1.1.A.2 of this Section.

B. Non-walk-in enclosure shall be constructed of minimum18-gauge, reinforced sheet steel and shall attach directly to engine-generator base or sub-base fuel tank. Enclosure shall be factory assembled structure with key-lockable access doors for performing normal maintenance operations. Hardware and fasteners shall be stainless steel. Lube oil and coolant drains shall be extended to exterior of enclosure and terminated with drain valves, capped with pipe nipples on flanged connections.

C. Sound Attenuation: Engine-generator enclosure shall be sound-attenuated to reduce noise level to 72 dBA at a point seven meters from engine-generator in free air environment, while operating at full load.

2.8 ACCESSORIES

A. Engine Generator Mounting:
   1. Vibration Isolators: elastomeric isolators factory installed between the engine and subbase fuel tank.
   2. Vibration Isolation: Provide flexible connections between engine-generator set and fuel lines, exhaust system, electrical conduits, and other externally connected support systems.
   3. Anchor Bolts: Type 316 stainless steel, conforming to Section 05 05 33, Anchor Systems.
   4. Template shall be furnished by manufacturer for setting anchorages devices, pipe sleeves, and nuts for mounting spring-type isolators to concrete foundation. Provide bolts and nuts for bolting isolators to channel frame base of engine-generator set.

2.9 FINISHING

A. Engine generator ferrous metal surfaces shall be prime-coated for corrosion protection and finish-painted in accordance with manufacturer's standard painting system.

B. Color of finish paint to be selected by ENGINEER from manufacturer's standard colors.

2.11 SOURCE QUALITY CONTROL

A. Factory Tests
   1. Provide results of tests and evaluations previously performed on prototype generator sets representative of the models to be provided, in accordance with NFPA 110.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install engine generator system in accordance with the Contract Documents, approved Shop Drawings, and manufacturer's recommendations.

B. CONTRACTOR shall be responsible to provide all final connections to generator.

3.3 SITE QUALITY CONTROL

A. Site Testing: Test engine-generator set in accordance with NFPA 110. Provide all materials and equipment, including load banks, fuel, lubricants and material required for Site testing. Installing Contractor to completely fill fuel tank at conclusion of testing.

B. Manufacturer's Services: Provide qualified, factory-trained serviceman to perform the following:
   1. Supervise unloading and installation of equipment.
   2. Instruct CONTRACTOR in the installation of equipment.
   3. Inspect and adjust equipment after installation and ensure that equipment operates properly.
   4. Instruct OWNER's personnel in operating and maintaining the equipment.

5. Service representative shall make a minimum of 1 visit, with a minimum of 8 hours at each Site. Visit shall be for checking completed installation, start-up of system and to instruct operations and maintenance personnel. Representative shall revisit the Site as often as necessary until installation is acceptable.

+ + END OF SECTION + +

SECTION 26 36 23

AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install automatic transfer switches.

   2. Switches specified under this Section include both open and enclosed types.

B. Related Sections:

   1. Section 26 05 53, Identification for Electrical Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. IEEE 472, Guide for Surge Withstand Capability Tests.
   2. IEEE 446, Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications.
   3. IEEE C62.41, Recommended Practice for Surge Voltages in Low Voltage AC Power Circuits.
   4. NEMA ICS1 109, Tests and Procedures.
   5. NEMA ICS10, AC Automatic Transfer Switches.
   6. UL 1008, Transfer Switch Equipment.
   7. UL 508, Industrial Control Equipment
   8. UL 61010B-1 (previously UL 3111-1), Electrical Measuring and Test Equipment; Part 1: General Requirements.
   9. ANSI C37.90a, Surge Withstand Capability Test (formerly IEEE Standard 472-1974) – Ring Wave Test.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

   1. NEC Article 701, Legally Required Standby Systems.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
    1. Shop Drawings:
        a. Listing of transfer switches to be provided, including ratings and location of each.
        b. Equipment dimensions, and construction details of enclosures with conduit entry locations.
    2. Product Data:
        a. Manufacturer's technical information for products proposed, including catalog cut sheets.
    3. Test Procedures:
        a. At least thirty days prior to actual factory and field testing, submit proposed testing procedures, methods and apparatus.

B. Informational Submittals:
    1. Source Quality Control Submittals:
        a. Submit reports of completed factory tests, including test results and procedures used for testing.
    2. Field Quality Control Submittals:
        a. Submit reports of completed field tests, including test results and procedures used for testing.
    3. Supplier Instructions:
        a. Manufacturer's written instructions for transporting, handling, storing, and installing the products.
    4. Supplier Reports:
        a. Written report of each visit to Site by supplier's service representative.

C. Closeout Submittals
    1. Operation and Maintenance Data:
        a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation, and spare parts information.
        b. Manuals shall include record drawings of control schematics, including point-to-point wiring diagrams.

D. Maintenance Material Submittals: Furnish the following:
    1. Spare Parts and Extra Stock Materials: Provide as specified in this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices to be embedded in cast-in-place concrete in time to prevent delay of the Work.

B. Shipping sections shall be designed to be shipped by truck, rail, and ship. Indoor sections shall be bolted to skids.

C. Equipment shall be equipped to be handled by crane. Where cranes are not available equipment shall be suitable for skidding in place on rollers using jacks to raise and lower the sections.

1.6 MAINTENANCE

A. Spare Parts and Extra Stock Materials:
   1. Furnish, tag, and box for shipment and long-term storage the following spare parts for each switch:
      a. Fuses — Two sets of each type and size used
   2. Furnish a list of additional recommended spare parts for an operating period of one year. Describe each part, quantity recommended, and current unit price of each.
   3. Package spare parts in suitable containers bearing labels clearly indicating contents and equipment with which they are to be used. Deliver spare parts at same time as switchgear.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Provide automatic transfer switches as specified for transferring loads from one power source to another.

2.2 MANUFACTURERS

A. Manufacturers: Provide products of one of the following:
   1. Same manufacturer as generator.
   2. Russelectric, Inc.
   3. ASCO Power Technologies.
   4. Or equal.

2.3 SWITCH

A. Ratings:
   1. Switches shall be capable of switching all classes of loads and rated for continuous duty when installed in a non-ventilated enclosure.
   2. Switches shall be rated with continuous ampere rating, number of poles and voltage as shown on Drawings.
   3. Switches shall be rated to withstand the magnitude of fault current available without welding of contacts in compliance with ANSI C37.90a and IEEE C62.41.

B. Standards and Performance:

1. Switches shall comply with UL Standard 1008, NEMA Standard ICS10, and applicable requirements of NEC Article 700, IEEE 446, IEEE C62.41, UL 508, and UL 61010B-1. Switches shall be UL labeled with performance meeting or exceed the following:
    a. Temperature Rise: Measurements shall be made after overload and endurance tests.
    b. Withstand: UL listed to withstand magnitude of fault current available at switch terminals when coordinated with respective protective devices shown on Drawings at an X/R ratio of 6.6 or less. Main contacts shall not trip open or weld when subjected to fault currents.
        1) As a condition for approval, manufacturer of automatic transfer switches shall verify that switches are listed by Underwriters Laboratories, Inc., Standard UL-1008 with three-cycle short circuit closing and withstand as follows:

100-amps to 400-amps	42,000
600-amps to 800 amps	65,000
1000-amps to 1200-amps	85,000
1600-amps to 4000-amps	100,000

        2) During three-cycle closing and withstand tests, there shall be no contact welding or damage. Three-cycle tests shall be performed without using current limiting fuses, and oscillograph traces across main contacts shall be furnished to verify that contact separation has not occurred, and there is contact continuity across all phases after completion of testing. Test procedures shall be in accordance with UL-1008, and testing shall be certified by UL.
        3) When conducting temperature rise tests to UL-1008, Supplier shall include post-endurance temperature rise tests to verify ability of transfer switch to carry full rated current after completing overload and endurance tests.
    c. Dielectric: Measurements shall be made at 1960 VAC RMS minimum following the withstand current rating test.
    d. Transient Withstand: Control panel shall pass the voltage surge withstand test per IEEE Standard 472 and voltage impulse withstand test per NEMA ICS1 109.

C. Construction:
1. Switch shall be double throw actuated by non-fused, momentarily energized operating mechanism(s).
2. Accomplish mechanical locking of main contacts in each direction without aid of latching solenoids, toggle mechanisms, or gear arrangements.
3. An overload or short-circuit shall not cause switch to go to a neutral position.
4. All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.
5. Switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.

6. Main contacts shall be silver-tungsten composition. Switches shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.
7. Inspection of contacts shall be possible from front of switch without disassembly of operating linkages and without disconnecting power conductors. Switches rated 600 amps and higher shall have front-removable and -replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors or bus bars.
8. Transfer switch shall be equipped with a safe manual operator designed to prevent injury to operating personnel. Manual operator shall provide same contact-to-contact transfer speed as electrical operator to prevent a flash-over from switching main contacts slowly. Manual operation shall be safe even if electrical operator becomes energized and shall not require prior disconnection of operators or control wiring. Safe manual transfer shall be possible under all load conditions, energized or non-energized. Manual operator shall be functional at all times, regardless of switch position or status. Manually initiated electrical operation does not meet intent of this requirement. Manual operator is not required on closed transition type switches.

9. Neutral Connections:
    a. Switch shall include a solid neutral suitable for neutral conductors to be solidly connected. Provide neutral conductor plate with fully rated ALCU pressure connectors.
    b. Provide switch with fully rated neutral transfer contacts.

D. Enclosure: Enclosed switches shall be NEMA 12 at minimum.
    1. Standard and optional door-mounted switches and pilot lights shall be 30.5-mm industrial grade type or equivalent.
    2. Provide door controls on a separate, removable plate that can be supplied loose for open type units.

E. Identification: Identify switches per Section 26 05 53, Identification for Electrical Systems.

2.4 TRANSFER SWITCHING FEATURES

A. Delay Transition (Open): Provide automatic delayed open transition transfer for each switch. Switch shall transfer load in delayed transition (break-before-make) mode. Transfer shall be accomplished with a user-defined interruption period in both directions adjustable from one second to five minutes in at least 15 increments.

2.5 SEQUENCE OF OPERATION

A. When voltage on any phase of normal source is outside of specified parameters and after a programmable time delay period to allow for momentary dips, engine starting contacts shall close to start generating supply.

B. Transfer switch shall transfer to emergency source when generating supply has reached specified voltage and frequency on all phases.

C. After restoration of normal supply on all phases to within specified parameters, an adjustable time delay shall delay retransfer to normal to assure stabilization of normal supply. After expiration of the time delay period, transfer switch shall retransfer to normal. Should emergency supply source fail during the time delay period, switch shall bypass time delay and automatically return to normal source. Provide an adjustable time delay between opening of closed contacts and closing of open contacts during transfers to allow loads to be demagnetized.

D. After retransfer to normal, engine generator shall be allowed to operate at no load for a programmable period to cool down.

E. Should transfer to emergency source be initiated by test switch rather than an actual source failure, transfer from normal to emergency shall be as described above.

2.6 MICROPROCESSOR CONTROLLER

A. Each switch shall include a microprocessor controller for operation of the switch. Equip controller with the following:
   1. Provide controller's sensing and logic by a built-in microprocessor with ability to communicate serially through an optional serial communication module.
   2. Controller shall provide a minimum of five selectable nominal voltages. Voltage sensing shall be true RMS type and be accurate to plus/minus one percent of nominal voltage. Frequency sensing shall be accurate to plus/minus 0.2 percent. Controller shall be capable of operating over a temperature range of -20 to +60 degrees C and storage from -55 to +85 degrees C.
   3. Connect controller to transfer switch by an interconnecting wiring harness that shall include a keyed disconnect plug to enable controller to be disconnected from transfer switch for routine maintenance. Interfacing relays shall be industrial grade plug-in type with dust covers. Enclose controller with a protective cover. Mount controller internally but separately from transfer switch.
   4. Customer connections shall be wired to a common terminal block.

B. Controller Display and Keypad:
   1. Display and keypad shall be an integral part of controller for viewing available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through serial communications input port. The following parameters shall be adjustable:
      a. Nominal line voltage and frequency
      b. Single- or three-phase sensing

c. Operating parameter protection
d. Transfer operating mode configuration: Open transition, closed transition or delayed transition

2. Instructions and controller settings shall be easily accessible, readable, and accomplished without using codes, calculations, or instruction manuals.

C. Controller Voltage, Frequency and Phase Rotation Sensing:
1. Voltage and frequency on both the normal and emergency sources shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities values shown as a percent nominal unless otherwise specified:
a. Under-voltage on Normal and Emergency, three phase
1) Dropout/Trip 70 to 98%
2) Pickup/ Reset 85 to 100%
b. Over-voltage on Normal and Emergency, three phase
1) Dropout/Trip 102 to 115%
2) Pickup/ Reset 2% below trip
c. Under-frequency on Normal and Emergency
1) Dropout/Trip 85 to 98%
2) Pickup/ Reset 90 to 100%
d. Over-frequency on Normal and Emergency
1) Dropout/Trip 102 to 110%
2) Pickup/ Reset 2% below trip
e. Voltage Unbalance on Normal and Emergency
1) Dropout/Trip 5 to 20%
2) Pickup/ Reset 1% below dropout
2. Repetitive accuracy of all settings shall be within plus/minus 0.5 percent over an operating temperature range of -20 degrees C to +60 degrees C.
3. Voltage and frequency settings shall be field adjustable in one percent increments, either locally with the display and keypad or remotely via serial communications port access.
4. When activated by keypad or through serial port, controller shall be capable of sensing phase rotation of both normal and emergency sources. Source will be unacceptable if phase rotation is not preferred rotation selected (ABC or CBA).
5. Source status screens shall be provided for both normal and emergency to provide digital readout of voltage on all three phases, frequency, and phase rotation.

D. Controller Time Delays:
1. Provide controller with time delays below. Time delay settings shall be adjustable over a range of zero to 9999 seconds (factory set at three seconds) unless specified otherwise.
a. Normal source failure, for engine starting.
b. Transfer to emergency on availability of emergency source.
c. Emergency source failure, retransfer on availability of normal source.
d. Engine cool down following retransfer to normal.
e. Time delay to control contact transition time during open transition transfer to either source.

f. All timers can be bypassed via operation on processor's keypad.

2. Provide adjustable time-delay on retransfer to normal. Time delay shall be automatically bypassed if emergency source fails, and normal source is acceptable.
3. Provide a time delay activated output signal to drive external relays for selective load disconnect control. Controller shall have the ability to activate an adjustable zero to five-minute time delay for one of the following modes:
    a. Prior to transfer only.
    b. Prior to and after transfer.
4. Time delay and sensing functions shall be field adjustable and operate with drift that does not exceed plus/minus one percent of set frequency, plus/minus two percent of set voltage, and plus/minus ten percent of set time delay, over the temperature range of -20 degrees C to +70 degrees C.
5. Time delays shall be adjustable in one-second increments, except extended parallel time, that shall be adjustable in 0.01-second increments.
6. Time delays shall be adjustable by using display and keypad or with a remote device connected to serial communications port. Time delay value displayed shall be time remaining until next event occurs.

7. For (open) delay transition transfer switches controller shall include the following built-in time delays for delayed transition operation:
    a. Zero to five-minute time delay for load disconnect position for delayed transition operation.

2.7 ACCESSORY FEATURES:

A. Provide each switch with the following:
1. A two-position maintained-type test switch for test/automatic/ modes. Test position shall simulate a normal source failure.
2. A SPDT silver-tungsten contact, rated five amps at 30 VDC, for a low-voltage engine start signal. Start signal shall prevent dry cranking of engine by requiring generator set to reach proper output and run for duration of cool down setting regardless of whether normal source restores before load is transferred.
3. Auxiliary contacts, rated ten amps at 250 VAC, consisting of one contact, closed when switch is connected to normal source and one contact closed when switch is connected to emergency source.
4. LED indicating lights (30.5 mm, industrial heavy duty, oil tight, NEMA rated to match automatic transfer switch enclosure). One shall indicate when switch is connected to normal source (green) and one to indicate when the switch is connected to emergency source (red).
5. Provide the following built-in to controller, capable of being activated through keypad programming or serial port only when required by user:

a. Provide ability to select “commit/no commit to transfer” to determine whether load should be transferred to standby generator if normal source restores before generator is ready to accept load.
b. Provide terminals for a remote contact that opens to signal switch to transfer to emergency, and for remote contacts that open to inhibit transfer to emergency or retransfer to normal. Provide ability to activate both inhibit signals through keypad or serial port.
c. Controller shall be capable of accepting a normally open contact that will allow transfer switch to function in a non-automatic mode using an external control device.
d. Engine Exerciser: Controller shall provide an internal engine exerciser that allows user to program up to seven different exercise routines. For each routine, user shall be able to:
    1) Enable or disable routine.
    2) Enable or disable transfer of load during routine.
    3) Set start time.
    4) Time of day
    5) Day of week
    6) Week of month (first, second, third, fourth, last, alternate, and every)
    7) Set duration of run.
    8) At end of specified duration, switch shall transfer load back to normal and run generator for specified cool down period. A ten-year life battery that supplies power to real time clock in event of a power loss shall maintain time and date information.

6. System Status: Controller display shall include a “System Status” screen that shall be readily accessible from all points in the menu by a maximum of two keystrokes. System status screen shall display a clear description of active operating sequence and switch position.
7. Self-Diagnostics: Controller shall contain a diagnostic screen for detecting system errors. Screen shall provide information on status input signals to controller that may be preventing completion of load transfer commands.
8. Communications Interface: Controller shall be capable of interfacing, through an optional full-duplex RS 485 serial communication module, with a network of transfer switches, within 4,000 feet (locally) and remotely through modem serial communications. Standard software specific for transfer switch applications shall be available from transfer switch manufacturer. Software shall include monitoring, control, and setup of parameters.
9. Data Logging: Controller shall have ability to log data and to maintain last 99 events, even during total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory:
    a. Event Logging
        1) Date and time and reason for transfer normal to emergency.
        2) Date and time and reason for transfer emergency to normal.
        3) Date and time emergency source available.
    b. Statistical Data
        1) Total number of transfers.

2) Last ten numbers of transfers due to source failure.
3) Total number of hours both normal and emergency sources are available.

10. Terminate control wires with crimp lugs and identify with sleeve type markers. Provide suitable copper connector lugs for each service and load connections.

2.8 DATA MONITOR

A. Provide a data monitor for each switch to monitor all functions specified. Flush-mount monitor on switch enclosure and equip monitor with continuous duty, long-life, lit display.

B. Data monitors shall be rated for an operating temperature range of -20 degrees C to +60 degrees C.

C. Data monitor shall be accurate to one percent measured, two percent computed values and display resolution to 0.1 percent. Voltage and current for all phases shall be sampled simultaneously to assure high accuracy in conditions of low power factor or large waveform distortions (harmonics).

D. Data monitor shall be capable of operating without modification at nominal frequencies of 45 to 66 Hertz and over a control power input range of 20 to 32 VDC.

E. Data monitor shall accept inputs from industry standard instrument transformers, including five-amp secondary current transformers. Direct-phase voltage connections, 600 VAC and under, shall be possible without using potential transformers.

F. Data monitor shall be applied in single, three-phase, or three- and four-wire circuits.

G. Setup parameters required by data monitors shall be stored in non-volatile memory and retained during control power interruption.

H. Metered readings listed below shall be available from display and transmitted remotely by serial communications module. Transmit data in format compatible with plant monitoring and control system.
   1. Current, per phase RMS.
   2. Current unbalance percentage
   3. Voltage, phase-to-phase, and phase-to-neutral
   4. Voltage unbalance percentage
   5. Real power (KW), per phase and three-phase total
   6. Apparent power (KVA), per phase and three-phase total
   7. Reactive power (KVAR), per phase and three-phase total
   8. Power factor, three-phase total and per phase
   9. Frequency.
   10. Accumulated energy, (MWH, MVAH, and MVARH)

I. The following energy readings shall be communicated by data monitor:

1. Accumulated real energy (KWH)
2. Accumulated reactive energy (KVAH)
3. Accumulated apparent energy (KVARH)
4. Real and reactive energy reported values for the load circuit.

J. Provide menu scroll buttons to display data monitor quantities.

K. Display shall remain continuously on, without detrimental effect on life of data monitor.

L. Setup for system requirements shall be via the front of data monitor. Setup provisions shall include:
   1. CT Rating: Five ampere secondary and primary rating equal to automatic transfer switch rating.
   2. System Type: Single, three-phase; three- and four-wire.
   3. Communication parameters

M. Provide capability to reset the following electrical parameters front of data monitor:
   1. Real energy (MWH), apparent energy (MVAH), and reactive energy (MVARH).
   2. All reset and setup functions shall have a means for protection against unauthorized and accidental changes.

2.9 SOURCE QUALITY CONTROL

A. Perform manufacturer's standard factory tests that shall include:
   1. Physical inspection and checking of components.
   2. Mechanical operation and device functional tests.
   3. Control operation and functionality tests.
   4. Primary, control, and secondary wiring hi-pot tests.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which Work is to be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install equipment so that sufficient access and working space is provided for ready and safe operation and maintenance.

B. Install equipment in accordance with Contract Documents and manufacturer recommendations.

C. Securely fasten equipment to floors, walls, or other surfaces on which equipment will be mounted. Install freestanding switches on raised concrete pad at locations shown on Drawings. Install in accordance with manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

A. Perform field testing and inspection of each automatic transfer switch. Testing and inspection shall be in accordance with manufacturer's recommendations and be performed by manufacturer's factory-trained representative, who shall inform OWNER and ENGINEER when equipment has been correctly installed. Do not energize equipment without permission of OWNER.

3.4 MANUFACTURER SERVICES

A. Manufacturer Services:
   1. Manufacturer's factory-trained representative shall test the system as specified in Article 3.3 of this Section. Representative shall operate and test system in the presence of ENGINEER and verify that equipment conforms to requirements. These services shall be at least one (1) eight-hour days at the Site.
   2. Manufacturer's factory-trained representative shall adjust the system to initial settings specified in Article 2.6 of this Section.
   3. Representative shall revisit the Site as often as necessary until all deficiencies are corrected, prior to readiness for final payment.
   4. Provide services of manufacturer's factory-trained representatives to correct defective Work within 72 hours of notification by OWNER during the Correction Period specified in the General Conditions as amended by the Supplementary Conditions.
   5. Replacement parts or equipment installed during the Correction Period shall be equal to or better than the original.

B. Training: Furnish services of qualified factory trained specialists from manufacturer to instruct OWNER's operations and maintenance personnel in recommended operation and maintenance of the products. Training requirements, duration of instruction, and other qualifications shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.

+ + END OF SECTION + +

SECTION 26 43 00

SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install surge protective devices (SPD).
   2. SPDs furnished under this Section shall be ANSI/UL 1449 Type 2 integrating both surge suppression and high-frequency noise filtering suitable for use on low-voltage distribution systems.

B. Related Sections:
   1. Section 26 05 05, General Provisions for Electrical Systems.
   2. Section 26 24 16, Panelboards.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI/UL 1449, Surge Protective Devices.
   2. IEEE C62.11, Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV)
   3. IEEE C62.41, Recommended Practice on Surge Voltages in Low-voltage AC Power Circuits.
   4. IEEE C62.45, Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1,000 V and Less) AC Power Circuits.
   5. UL 1283, Electromagnetic Interference Filters.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Shall have at least five years' experience manufacturing and servicing products substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:
   1. Obtain all products included in this Section regardless of component manufacturer from a single SPD manufacturer.
   2. SPD manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. Components shall be suitable for the specified service conditions and shall be integrated into overall assembly by SPD manufacturer.

C. Regulatory Requirements: Comply with the following:
   1. NEC 110.9, Requirements for Electrical Installations, Interrupting Rating.
   2. NEC 240.21, Overcurrent Protection, Location in Circuit.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Electrical and mechanical drawings for each type of unit, showing electrical ratings, dimensions, mounting provisions, connection details, and layout diagrams.
      b. Components list and nameplate schedule.
      c. Summary sheets with schedules of equipment.
   2. Product Data:
      a. Manufacturer’s technical information, including catalog information.
      b. Manufacturer's technical specifications with assembly and component ratings.

B. Informational Submittals: Submit the following:
   1. Certifications:
      a. Certification that SPD devices comply with standards referenced in this Section.
   2. Source Quality Control Submittals:
      a. Report of results of testing and inspections performed at manufacturer’s shop.
   3. Supplier Reports:
      a. Submit written report of results of each visit to Site by Supplier’s service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
   4. Qualifications Statements:
      a. Manufacture, when requested by ENGINEER.

C. Closeout Submittals: Submit the Following
   1. Operations and Maintenance Data:
      a. Submit in accordance with Section 01 78 23, Operations and Maintenance Data.
      b. Include acceptable test reports, maintenance data and schedules, description of operation, wiring diagrams, and list of spare parts recommended for one year of operation with current price list.
   2. Warranty Documentation: Submit example warranty at time of shipment of the equipment. Include final warranty accepted by ENGINEER in the operations and maintenance manual for the equipment.

1.5 DELIVERY, STORAGE, AND HANDLING.

A. Delivery:

1. Upon delivery, check for evidence of water that may have entered equipment during transit.

B. Storage:
   1. Store SPD equipment in a clean, dry location with controls for uniform temperature and humidity. Protect equipment with coverings and maintain environmental controls.
   2. Protect equipment from corrosion and deterioration.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty on Materials and Equipment:
   1. Provide manufacturer's written warranty, running to the benefit of OWNER, agreeing to correct, or at option of OWNER, remove or replace materials or equipment specified in this Section found to be defective during a period of five years after the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide equipment of one of the following:
   1. General Electric.
   2. Schneider Electric/Square-D Company.
   3. Eaton/Cutler-Hammer.
   4. Or equal.

2.2 EQUIPMENT

A. General:
   1. SPD shall be modular, high-energy, parallel design with fast-acting transient voltage suppression using metal oxide varistors. Equipment shall provide noise attenuation with electromagnetic interference filter.
   2. SPD shall comply with requirements of the following:
      a. ANSI/UL 1449.
      b. UL 1283.
      c. IEEE C62.11, IEEE C62.41 and IEEE C62.45.
   3. SPD shall be suitable for operation under the following environmental conditions:
      a. Relative Humidity: Zero to 95 percent, non-condensing.
      b. Frequency: 47 to 63 Hertz.

c. Temperature: Zero to 149 degrees F.

4. SPD operating voltage and IEEE C62.41 and IEEE C62.45 Category A, B, and C application environments shall be suitable for the associated SPD location(s) shown or indicated on the Drawings.

5. SPD shall be suitable for internal and external mounting. Where shown on the Drawings, SPD shall be factory-mounted and integrated into distribution equipment specified under the following Sections:
   a. Section 26 24 16, Panelboards.

B. SPD shall include a surge suppression path for each mode as required for the system configuration shown on the Drawings. Each mode shall be individually fused and equipped with thermal cutouts. SPD short-circuit rating shall be 200 kA. Protection modes shall include, to the extent applicable, the following:
1. Line-to-line.
2. Line-to-neutral.
3. Line-to-ground.
4. Neutral-to-ground.

C. SPD shall include electromagnetic interference/radio frequency interference (EMI/RFI) noise rejection filter with attenuation up to 30 dB from 10 kHz to 100 MHz.

D. SPDs and components in the operating path shall have maximum continuous operating voltage greater than 115 percent of nominal system operating voltage.

E. ANSI/UL 1449 minimum withstand rating shall be 20 kA per pole, and ANSI/UL 1449 voltage protection rating for SPD shall not exceed the following:
1. Modes L-N, L-G, N-G
   a. 208Y/120V 800
   b. 480Y/277V 1200
2. Mode L-L
   a. 208Y/120V 1200
   b. 480Y/277V 2000

F. SPD surge capacity based upon IEEE C62.41 location category shall, as a minimum, be the following:

1. Category C, service entrance
   a. 240kA per phase
   b. 120kA per mode
2. Category B, high exposure locations (distribution equipment)
   a. 160kA per phase
   b. 80kA per mode
3. Category A, branch location
   a. 120kA per phase
   b. 60kA per mode

2.3 ACCESSORIES

A. Provide SPD equipped with the following accessories:
   1. Surge counter with display for indicating the number of surges detected.
   2. LED indicators for monitoring device status.
   3. Audible alarm and silence switch for indicating an inoperative condition.
   4. Dry contacts, "Form C," for remote annunciation of unit status.
   5. Indicators, counter, alarm, and silence switch shall be visible and accessible from front of the SPD. When SPD is integral to switchgear, motor control center, panelboard, or other equipment, indicators, counter, alarm, and silence switch shall be visible and accessible from front of the equipment in which the SPD is installed.
   6. Enclosure for each externally mounted SPD: NEMA rating shall be as required for area classifications specified in Section 26 05 05, General Provisions for Electrical Systems.

2.4 SOURCE QUALITY CONTROL

A. Perform manufacturer's standard factory tests on equipment. Tests shall be in accordance with IEEE C62.45 and ANSI/UL 1449.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install SPD at locations shown on the Drawings in accordance with equipment manufacturer's recommendations, Laws, and Regulations, and the Contract Documents.

B. Conductor length between suppressor and connection point shall be as short and as straight as possible.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 51 19

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following types of LED luminaires:
   1. Interior lighting fixtures.
   2. Lighting fixture supports.
   3. Emergency LED Drivers.
   4. Emergency lighting units.
   5. Exit signs.

B. Related Requirements:
   1. “Lighting Control Devices” section for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
   2. “Central Dimming Controls” section or “Modular Dimming Controls” section for Architect/Engineer dimming systems and for fluorescent dimming controls with dimming ballasts specified in interior lighting Sections.
   3. “Addressable-Luminaire Lighting Controls” section for manual or programmable control systems with low-voltage control wiring or data communication circuits.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: Same as Luminaire.

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including light source, reflector, driver, and housing.

H. LPW: Lumens Per Watt (Efficacy).

1.4 SUBMITTALS

A. Organize submittals in bound brochures containing descriptive sheets for each different lighting fixture type.

B. Action Submittals: Submit the following:
   1. Product Data: For each type of product.
      a. Provide a typed index listing lighting fixture type designation, lighting fixture manufacturer, complete catalog number, quantity of LED drivers to be provided, type lens, modifications, and accessories. Arrange in order of lighting fixture designation.
      b. Include data on features, accessories, and finishes.
      c. Include data on lighting fixture efficacy (Lumens per Watt).
      d. Include physical lighting fixture description and dimensions of lighting fixture.
      e. Include LED emergency drivers, including batteries and chargers.
      f. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
      g. Manufacturer’s verification of LED color consistency, indicating the LED source binning tolerance.
      h. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-79 and IES LM-80.
         1) Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
   2. Shop Drawings: For nonstandard or custom lighting fixtures.
      a. Include plans, elevations, sections, and mounting and attachment details.
      b. Include details of lighting fixture assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
      c. Include diagrams for power, signal, and control wiring.

C. Informational Submittals: Submit the following:

D. Maintenance Material Submittals: Submit the following:
   1. Operation and Maintenance Data: For lighting fixtures and lighting systems to include in operation and maintenance manuals.
   2. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      a. Light sources (LED Boards): one of each type and rating installed.
      b. Diffusers and Lenses: one of each type and rating installed.
      c. Globes and Guards: one of each type and rating installed.

E. Product Schedule: For lighting fixtures and light sources. Use same designations and types indicated on Drawings.

1.5 QUALITY ASSURANCE

A. Lighting Fixture Photometric Data Testing Laboratory Qualifications: Lighting fixture manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Lighting Fixture Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. LED Lighting Fixture IES LM-79 Test Report: Submit test report on manufacturer's standard production model luminaire. Include all applicable and required data as outlined under "14.0 Test Report" in IES LM-79.

D. Provide lighting fixtures from a single manufacturer for each lighting fixture type.

E. Each lighting fixture type shall have light sources binned within a 3-step MacAdam Ellipse to ensure color consistency among luminaires.

F. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products must have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period must include applications of equipment and materials under similar circumstances and of similar size. The product must have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the two-year period. Where two or more items of the same class of equipment are required, these items must be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

G. Mockups: For interior lighting fixtures in room or module mockups, complete with power and control connections.
   1. Obtain Architect/Engineer's approval of lighting fixtures in mockups before starting installations.
   2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect/Engineer specifically approves such deviations in writing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

B. Delivery:
   1. Upon delivery, inspect equipment for evidence of water that may have entered equipment during transit.

C. Storage:
   1. Store lighting fixtures, controls, related materials and equipment in clean, dry location with controls for uniform temperature and humidity. Protect materials and equipment with coverings and maintain environmental controls.
   2. Store materials and equipment for easy access for inspection and identification. Keep materials and equipment off ground, using pallets, platforms, or other supports. Protect materials and equipment from corrosion and deterioration.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of lighting fixtures that fail in materials or workmanship within specified warranty period.

B. Warranty Period: 5 year(s) from date of Substantial Completion, to include materials and fixture finish. Material warranty must include all drivers, and fixture replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) are defective or non-starting.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Lighting fixtures shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

B. Ambient Temperature: 41 to 104 deg F (5 to 40 deg C)
   1. Relative Humidity: Zero to 95 percent.

C. Altitude: Sea level to 1000 feet (300 m)

2.2 LIGHTING FIXTURE AND COMPONENTS, GENERAL REQUIREMENTS

A. Provide lighting fixtures complete with power supplies (drivers) and light sources. Provide design information including lumen output and design life in lighting fixture schedule on project plans for LED luminaires. LED lighting fixtures must meet the following minimum luminaire efficacy (LE):

1. LED Troffers (recessed and surface): 90 LPW
2. LED Downlights: 50 LPW
3. LED Track or Accent: 40 LPW
4. LED Low Bay/High Bay: 80 LPW
5. LED Linear Ambient: 80 LPW

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Factory-Applied Labels: Comply with UL 1598. Include recommended light sources. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when light sources are in place.
   1. Label shall include the following lamp characteristics:
      a. "USE ONLY" and include specific light source type.
      b. CCT and CRI.

D. Recessed lighting fixtures shall comply with NEMA LE 4.

E. NRTL Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

F. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

G. California Title 24 compliant.

H. Lighting fixtures must be listed with the DesignLights Consortium 'Qualified Products List' when falling into category of "General Application" luminaires, i.e. Interior Directional, Display Case, Troffer, Linear Ambient, or Low/High Bay. Requirements are shown in the Designlights Consortium "Technical Requirements Table" at https://data.energystar.gov/dataset/EPA-Recognized-Laboratories-ForLighting-Products/jgwf-7qrr.

I. Standards:
   1. ENERGY STAR certified.
   2. RoHS compliant.
   3. Recessed luminaires shall comply with NEMA LE 4.
   4. Provide Department of Energy 'Lighting Facts' label for each luminaire.

2.3 LED DRIVER REQUIREMENTS

A. LED drivers must be electronic, UL Class 1, constant-current type and comply with the following requirements:
   1. Output power (watts) and luminous flux (lumens) as shown in Lighting Fixture Schedule for each luminaire type to meet minimum luminaire efficacy (LE) value provided.

2. Power Factor (PF) greater than or equal to 0.9 over the full dimming range when provided.
3. Current draw Total Harmonic Distortion (THD) of less than 20 percent.
4. Class A sound rating.
5. Operable at input voltage of 120-277 volts at 60 hertz.
6. RoHS compliant.
7. Integral thermal protection that reduces or eliminates the output power if case temperature exceeds a value detrimental to the driver.
8. UL listed for dry or damp locations typical of interior installations.
9. Non-dimmable, or as indicated in Lighting Fixture Schedule.

2.4 LED LIGHT SOURCE REQUIREMENTS

A. Correlated Color Temperature (CCT) of 4000 degrees K, unless otherwise indicated in the Luminaire Schedule.

B. Minimum Color Rendering Index (CRI) R9 value of 80, unless otherwise indicated in the Lighting Fixture Schedule.

C. High power, white light output utilizing phosphor conversion (PC) process**.**

D. RoHS compliant.

E. Provide light source color consistency by utilizing a binning tolerance within a 3 -step MacAdam ellipse.

2.5 BASIS OF DESIGN

A. Provide lighting fixtures indicated as Basis of Design for each luminaire type.

B. If substitution product and/or Manufacturer is proposed, submittal needs to clearly indicate that lighting fixture is a substitution and must clearly show compliance with being equivalent with Basis of Design product. If exceptions are taken based on nonequivalence than all exceptions must be identified in product submittal.

C. Refer to Lighting Fixture Schedule on the Drawings for specific fixture types.

2.6 LIGHTING FIXTURE SCHEDULE

A. General Requirements:
1. Lighting Fixtures shall be similar in construction and performance to the Basis of Design make; include necessary modifications.

B. Schedule General Notes:
1. Provide quantities of lighting fixtures as required.
2. Verify lighting fixture types with the Lighting Fixture Schedule located on the Drawings.

2.7 MATERIALS

A. Metal Parts:
   1. Free of burrs and sharp corners and edges.
   2. Sheet metal components shall be steel unless otherwise indicated.
   3. Form and support to prevent warping and sagging.

B. Steel:
   1. ASTM A 36/A 36M for carbon structural steel.
   2. ASTM A 568/A 568M for sheet steel.

C. Stainless Steel:
   1. Manufacturer's standard grade.
   2. Manufacturer's standard type, ASTM A 240/240 M.

D. Galvanized Steel: ASTM A 653/A 653M.

E. Aluminum: ASTM B 209.

2.8 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.9 LIGHTING FIXTURE SUPPORT

A. Comply with requirements in "Hangers and Supports for Electrical Systems" section for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm) size.

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to lighting fixture, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

2.10 EMERGENCY LED DRIVERS

A. Description:
   1. Single package that includes high temperature nickel cadmium battery, automatic charger and electronic control circuitry. Unit shall operate the scheduled light source at the specified power output for 90 minutes and then cutout to preserve battery; upon

restoration of normal AC power the battery shall automatically fully recharge within 24 hours.
2. Galvanized metal case, compact design for low-profile luminaires.
3. Input shall be dual rated, 120/277 volts, approximately 4 watt normal load.
4. Output voltage shall be 15 – 52 VDC.
5. Package shall be UL listed, per UL924 - Emergency Lighting Equipment.
6. Units for shall operate LED light source, initial minimum output of 10 watts. These units shall include a test switch, an LED charging indicator, and they shall include self-testing circuitry and controls to automatically test the unit for 30 seconds every 28 days and will initiate a 90 minute discharge test once a year; should a problem be detected the indicator light shall flash at 1 to 2 second intervals and an audible alarm shall sound 4 times every 30 seconds.

B. Basis of Design: Bodine BSL310LPST.

C. Installation: Field, or factory installed by luminaire manufacturer; the LED shall be visible without opening luminaire. Contractor shall apply an adhesive 1/4 in. diameter black dot on the luminaire trim to identify the emergency units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for lighting fixture to verify actual locations of lighting fixture and electrical connections before lighting fixture installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect/Engineer, use selected permanent lighting fixtures for temporary lighting. When construction is sufficiently complete, clean lighting fixtures used for temporary lighting and install new light sources if any LEDs are found to have failed.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install lighting fixtures level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install light sources in each lighting fixture.

D. Supports:
   1. Sized and rated for lighting fixture weight.
   2. Able to maintain lighting fixture position after cleaning and reinstalling LED boards.
   3. Provide support for lighting fixture without causing deflection of ceiling or wall.
   4. Lighting fixture-mounting devices shall be capable of supporting a horizontal force of 100 percent of lighting fixture weight and a vertical force of 400 percent of lighting fixture weight.

E. Flush-Mounted Lighting Fixtures:
   1. Verify ceiling construction and report in writing any discrepancies between the ceiling type and the fixture type before releasing lighting fixtures for manufacture.
   2. Secured to outlet box.
   3. Attached to ceiling structural members at four points equally spaced around circumference of lighting fixture.
   4. Trim ring flush with finished surface.

F. Suspended Lighting Fixtures:
   1. Ceiling Mount:
   2. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
   3. Stem-Mounted, Single-Unit Lighting Fixtures: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.

G. Minimum quantity of independent supports unless otherwise called for:
   1. Recessed types: Provide basic support for each from ceiling support grids plus provide supplementary supports for each lighting fixture as follows:
      a. 30 in. diameter and larger: Four supports.
      b. 30 in. square and larger: Four supports.
      c. Others: Two supports.
   2. Surface types:
      a. Up to 15 in. square or 15 in. diameter: Support from fixture stud in independently supported outlet box.
      b. 10-24 in. wide x 8 ft. long: Three supports.
      c. Others: Two supports.
   3. Suspended types:
      a. Round center supported: One support.
      b. 30 in. square and larger: Four supports.
      c. 2 to 8-1/2 ft. length: Two supports.
      d. Over 8-1/2 ft: Supports maximum 8 ft. - 6 in. on center.

H. Lighting fixtures located in Mechanical and Electrical Equipment Rooms:
   1. Coordinate lighting fixture, support, and outlet box locations with ductwork, piping, and equipment installation; unless otherwise indicated suspend fixtures below or between ducts; bottom of lighting fixtures to be 9 ft. - 0 in. above floor, where possible; minimum distance from bottom of lighting fixtures to floor shall be 6 ft. - 9 in.; layout shown is approximate only.

2. Do not install lighting fixtures above ducts and large pipes; all shall be accessible after work of all trades is completed.
3. Where lighting fixtures are located below heating, ventilating and air conditioning units, and/or ductwork or piping, provide trapeze hangers around obstruction and suspend lighting fixtures from the trapeze.

I. Provide additional unswitched conductor to lighting fixtures that contain Emergency LED Drivers.

J. Comply with requirements in Low-Voltage Electrical Power Conductors and Cables section for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Operational Test: After installing lighting fixtures, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Lighting fixture will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

D. Final Cleaning:
1. Immediately prior to the date of substantial completion, damp clean lighting fixtures, diffusers, glassware, fixture trim, reflectors, light sources, louvers, lens and similar objects.
2. Remove dirt, corrosion, foreign material, finger marks, blemishes. Clean top of each suspended lighting fixture and clean the reflecting surface in each indirect fixture.
3. Replace all failed components.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in any and all lighting control sections.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of lighting fixtures to

suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all lighting fixtures. Replace lamps or lighting fixtures that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of lighting fixtures in the presence of the Architect/Engineer.

END OF SECTION

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 26 56 19

LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior LED lighting fixtures.
   2. Lighting fixture supports.
   3. Lighting fixture poles.
   4. Fixture-mounted photocells and motion sensors.

B. Related Requirements:
   1. "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Common Work Results for Electrical Systems

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 SUBMITTALS

A. Organize submittals in bound brochures containing descriptive sheets for each different lighting fixture type.

B. Action Submittals: Submit the following:

1. Product Data: For each type of product:
    a. Provide a typed index listing lighting fixture type designation, lighting fixture manufacturer, complete catalog number, quantity of LED drivers to be provided, type lens, modifications, and accessories. Arrange in order of lighting fixture designation.
    b. Include data on features, accessories, and finishes.
    c. Include data on lighting fixture efficacy (Lumens per Watt).
    d. Include physical lighting fixture description and dimensions of lighting fixture.
    e. Include LED emergency drivers, including batteries and chargers.
    f. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
    g. Manufacturer's verification of LED color consistency, indicating the LED source binning tolerance.
    h. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project, IES LM-79 and IES LM-80.
2. Shop Drawings: For nonstandard or custom lighting fixtures.
    a. Include plans, elevations, sections, and mounting and attachment details.
    b. Include details of lighting fixture assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    c. Include diagrams for power, signal, and control wiring.

C. Maintenance Material Submittals: Submit the following:
1. Operation and Maintenance Data: For lighting fixtures and lighting systems to include in operation and maintenance manuals.
2. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    a. Light sources (LED Boards): Furnish at least one of each type.
    b. Diffusers and Lenses: Furnish at least one of each type.
    c. Globes and Guards: Furnish at least one of each type.

D. Product Schedule: For lighting fixtures and light sources. Use same designations and types indicated on Drawings.

1.5 QUALITY ASSURANCE

A. Lighting Fixture Photometric Data Testing Laboratory Qualifications: Lighting fixture manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. LED Lighting Fixture IES LM-79 Test Report: Submit test report on manufacturer's standard production model luminaire. Include all applicable and required data as outlined under "14.0 Test Report" in IES LM-79.

C. LED Lighting Fixture LM-80 Test Report: Submit report on manufacturer's standard production LED light source (package, array, or module). Include all applicable and required data as outlined under "8.0 Test Report" in IES LM-80.

D. Provide lighting fixtures from a single manufacturer for each fixture type.

E. Each lighting fixture type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

F. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products must have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period must include applications of equipment and materials under similar circumstances and of similar size. The product must have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the two-year period. Where two or more items of the same class of equipment are required, these items must be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

G. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

B. Delivery:
   1. Upon delivery, inspect equipment for evidence of water that may have entered equipment during transit.

C. Storage:
   1. Store lighting fixtures, controls, related materials and equipment in clean, dry location with controls for uniform temperature and humidity. Protect materials and equipment with coverings and maintain environmental controls.
   2. Store materials and equipment for easy access for inspection and identification. Keep materials and equipment off ground, using pallets, platforms, or other supports. Protect materials and equipment from corrosion and deterioration.

1.7 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with lighting fixture installation.

B. Mark locations of exterior lighting fixtures for approval by Architect prior to the start of fixture installation.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures, including lighting fixture support components.
      b. Faulty operation of lighting fixtures and accessories.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Warranty Period: 5 year(s) from date of Substantial Completion, to include materials and fixture finish. Material warranty must include all drivers, and fixture replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) are defective or non-starting.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Lighting fixtures shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the Lighting fixture will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

B. Ambient Temperature: 41 to 104 deg F (5 to 40 deg C).
   1. Relative Humidity: Zero to 95 percent.

C. Altitude: Sea level to 1000 feet (300 m)

2.2 LIGHTING FIXTURE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Lighting fixtures shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598[**and listed for wet locations**].

E. L70 LED light source life of [**50,000] [100,000]<Insert number**> hours.

F. Light sources dimmable from 100 percent to 0 percent of maximum light output.

G. Internal driver.

H. Lighting fixtures must be listed with the DesignLights Consortium 'Qualified Products List'. Requirements are shown in the DesignLights Consortium "Technical Requirements Table" at https://data.energystar.gov/dataset/EPA-Recognized-Laboratories-ForLighting-Products/jgwf-7qrr.

I.Lighting fixtures shall be Dark Sky compliant.

J. Standards:
   1. ENERGY STAR certified.
   2. RoHS compliant.
   3. Provide Department of Energy 'Lighting Facts' label for each luminaire.

K. Nominal Operating Voltage: 120 V ac.

L. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of lighting fixture from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LED DRIVER REQUIREMENTS

A. LED drivers must be electronic, UL Class 1, constant-current type and comply with the following requirements:
   1. Output power (watts) and luminous flux (lumens) as shown in Lighting Fixture Schedule for each luminaire type to meet minimum luminaire efficacy (LE) value provided.
   2. Power Factor (PF) greater than or equal to 0.9 over the full dimming range when provided.
   3. Current draw Total Harmonic Distortion (THD) of less than 20 percent.
   4. Class A sound rating.
   5. Operable at input voltage of 120-277, 208, 480 volts at 60 hertz.
   6. RoHS compliant.
   7. Integral thermal protection that reduces or eliminates the output power if case temperature exceeds a value detrimental to the driver.
   8. UL listed for wet locations typical of exterior installations.
   9. Step-dimmable to 50 percent output as indicated in Lighting Fixture Schedule.

2.4 LED LIGHT SOURCE REQUIREMENTS

A. Correlated Color Temperature (CCT) of 4000 degrees K, unless otherwise indicated in the Luminaire Schedule.

B. Minimum Color Rendering Index (CRI) R9 value of 80, unless otherwise indicated in the Lighting Fixture Schedule.

C. High power, white light output utilizing phosphor conversion (PC) process**.**

D. RoHS compliant.

E. Provide light source color consistency by utilizing a binning tolerance within a 3-step MacAdam ellipse.

2.5 LUMINAIRE-MOUNTED PHOTOCELL

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

C. NTS: Coordinate control functions with appropriate Energy Code. The International Energy Conservation Construction Code (and State modified versions) and ASHRAE 90.1 do not currently allow dusk to dawn operations without lighting output reductions (photocell with motion sensor), unless the area is required to be continually lit (emergency or security areas).
   1. Relay with locking-type receptacle shall comply with ANSI C136.10.
   2. Adjustable window slide for adjusting on-off set points.
   3. May be combined with integral motion sensor, as indicated in the Lighting Fixture Schedule.

2.6 BASIS OF DESIGN

A. Provide lighting fixtures indicated as Basis of Design for each luminaire type.

B. If substitution product and/or Manufacturer is proposed, submittal needs to clearly indicate that lighting fixture is a substitution and must clearly show compliance with being equivalent with Basis of Design product. If exceptions are taken based on nonequivalence than all exceptions must be identified in product submittal.

C. Refer to Lighting Fixture Schedule on the Drawings for specific fixture types.

2.7 GENERAL LIGHTING FIXTURE TYPES

A. Refer to Lighting Fixture Schedule for specific lighting fixture types.

B. NTS: Retain "Area and Site" Paragraph below for an outdoor luminaire used for general lighting of a large area, typically mounted on a pole with an arm or on top of a post. Typical uses include parking lots, walkways, and plazas.

C. Area and Site:
   1. Luminaire Shape: Square.
   2. Mounting: Building.
   3. Luminaire-Mounting Height: Existing luminaire location and as noted on plans.

4. Distribution: Type II.
5. Diffusers and Globes: Clear polycarbonate.
6. Housings:
    a. Cast-aluminum housing.
    b. Black powder-coat finish.

2.8 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit LED replacement without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during LED replacement and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:
1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:
1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed light fixtures.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
1. Label shall include the following light source characteristics:
    a. "USE ONLY" and include specific lamp type.
    b. CCT and CRI for all luminaires.

2.9 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Factory-Applied Finish for Aluminum Lighting Fixtures: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
      a. Color: Black.

2.10 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, and ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Fasten lighting fixtures to structural support.

D. Supports:
   1. Sized and rated for lighting fixture weight.
   2. Able to maintain lighting fixture position after cleaning and LED replacement.
   3. Support lighting fixtures without causing deflection of finished surface.
   4. Lighting fixture-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Wall-Mounted Lighting Fixture Support:
   1. Attached to a minimum 1/8 inch (3 mm) backing plate attached to wall structural members.

F. Wiring Method: Install cables in raceways. Conceal raceways and cables.

G. Install lighting fixtures level, plumb, and square with finished grade unless otherwise indicated.

H. Coordinate layout and installation of lighting fixtures with other construction.

I. Adjust lighting fixtures that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

J. Comply with requirements in "Low-Voltage Electrical Power Conductors and Cables" and "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Inspect each installed lighting fixtures for damage. Replace damaged fixtures and components.

B. Perform the following tests and inspections[with the assistance of a factory-authorized service representative]:

1. Operational Test: After installing lighting fixtures, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric and motion sensing controls.

C. Illumination Tests:
1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
    a. IES LM-5.
    b. IES LM-50.
    c. IES LM-52.
    d. IES LM-64.
    e. IES LM-72.
2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Lighting fixture will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting fixtures and photocell/motion sensor.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
1. During adjustment visits, inspect all lighting fixtures. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of lighting fixtures in the presence of the Architect.

END OF SECTION

SECTION 31 05 19

GEOSYNTHETICS FOR EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and services required to provide and place geosynthetics as shown and specified.

B. Related Sections:
   1. Section 31 23 05, Excavation and Fill.
   2. Section 31 37 00, Riprap.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Society for Testing and Materials, (ASTM).
      a. ASTM D4491/D4491M-22, Standard Test Methods for Water Permeability of Geotextiles by Permittivity
      b. ASTM D4533/D4533M-15(2023), Standard Test Method for Trapezoid Tearing Strength of Geotextiles
      c. ASTM D4632/D4632M-15a(2023), Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
      d. ASTM D5261-10(2018), Standard Test Method for Measuring Mass per Unit Area of Geotextiles
      e. ASTM D 1117, Test Methods for Non-Woven Fabrics.

ASTM
fg

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Geotextile manufacturer shall be a specialist in the manufacture of geotextile cushion fabric, and have produced and successfully installed a minimum of five million square feet.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Submit geotextile manufacturer's data, specifications, installation instructions and dimensions.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Submit an affidavit certifying that the filter fabric furnished complies with all requirements specified herein.
      b. No fabric shall be shipped until the affidavit is submitted to the ENGINEER.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Each roll of geotextile delivered to the Site shall be labeled by the manufacturer identifying the manufacturer's name, product identification, lot number, roll number and roll dimensions.

B. All rolls and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER if any loss or damage exists to geotextile filter fabric. Replace loss and repair damage to new condition, in accordance with manufacturer's instructions.

C. Geotextile shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions. Geotextile rolls shall be shipped and stored in relatively opaque and watertight wrappings.

PART 2 - PRODUCTS

2.1 GEOTEXTILE FILTER FABRIC

A. Geotextile shall be a needle punched, nonwoven fabric composed of 100 percent polyester filaments, which are formed into a stable network such that the filaments retain their relative position. The fabric shall be inert to biological degradation and naturally encountered chemicals, alkalizes, and acids. Geotextile shall conform to the following:

Fabric Property	Unit	Test Method	Minimum Value
Weight	oz/yd^2	ASTM D 5261	10.0
Grab Tensile Strength	lb	ASTM D 4632	250
Grab Strength Elongation	%	ASTM D 4632	50
Trapezoid Tear Strength	lb	ASTM D 4533	100
Water Permeability, "k"	cm/sec	ASTM D 4491	1.2 Sec^{-1}
Water Flow Rate	gal/min/ft2	ASTM D 4491	80

*

B. Product and Manufacturer: Provide one of the following:
1.US 250NW as manufactured by US Fabrics Inc.

2. Or equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the conditions under which the Work is to be installed and notify the ENGINEER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION - GENERAL

A. All geotextiles shall be weighted with sandbags or the equivalent when required. Such sandbags shall be installed during placement and shall remain until replaced with cover material or geomembrane.

B. CONTRACTOR shall take any necessary precautions to prevent damage to underlying layers during placement of the geotextile.

C. During placement of geotextiles, care shall be taken not to entrap in the geotextile stone, excessive dust, or moisture that could damage the geomembrane, generate clogging, or hamper subsequent seaming.

D. Geotextiles shall not be exposed to precipitation prior to being installed, and shall not be exposed to direct sunlight for more than 15 days.

E. Geotextiles shall be overlapped 12-inches.

3.3 GEOTEXTILE REPAIR

A. Any holes or tears in the fabric shall be repaired as follows:
   1. On slopes: A fabric patch shall be sewn into place using a double sewn lock stitch (1/4-inch to 3/4-inch apart and no closer than 1-inch from any edge). Should any tear exceed ten percent of the width of the roll, that roll shall be removed from the slope and replaced.
   2. Non-slopes: A fabric patch shall be spot-seamed in place with a minimum of 24-inches of overlap in all directions.

3.4 PLACEMENT OF COVER MATERIALS

A. CONTRACTOR shall place all cover materials in such a manner to ensure the geotextile is not damaged; minimal slippage of the geotextile on underlying layers; and no excess tensile stresses in the geotextile.

+ + END OF SECTION + +

SECTION 31 09 13

GEOTECHNICAL INSTRUMENTATION AND MONITORING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. The CONTRACTOR shall conduct activities in such a manner that damage is prevented to adjacent pipes, utilities, structures, property, and Work, and such that the ground vibrations caused by the Work are consistently maintained below the maximum levels specified by the CONTRACTOR'S independent specialist.
   2. The CONTRACTOR shall provide and install the geotechnical instrumentation required under this Section including, but not limited to, optical monitoring points and seismographs.
   3. The CONTRACTOR shall notify the ENGINEER before conducting any vibration producing activity and conduct appropriate monitoring at nearby structures and utilities in accordance with the plan prepared by the CONTRACTOR'S independent specialist and approved by the ENGINEER.
   4. The CONTRACTOR shall protect and monitor existing installed structures and utilities, including, but not limited to, existing structures and subsurface utilities.
   5. The CONTRACTOR shall coordinate work with public and private utility companies that have any aboveground, belowground, or other utility lines within or adjacent to the Site.
   6. The CONTRACTOR shall complete removal areas, installing components, and built structures associated with the Drawings, such that once installed, operations are conducted in a manner that avoids deteriorating or otherwise damaging these features.
   7. The CONTRACTOR shall contact residences and businesses within 500 feet of the property to conduct a pre- and post-construction survey. In addition, the CONTRACTOR shall extend monitoring to additional adjacent structures based on the potential vibration that occur based on the proposed activities.
   8. The CONTRACTOR shall establish vibration monitoring locations and establish a baseline vibration profile prior to mobilizing equipment and beginning work.

B. Related Sections:
   1. Section 02 41 00, Demolition.
   2. Section 31 23 05, Excavation and Fill.
   3. Section 31 23 16.26, Rock Removal.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Geotechnical Monitoring Consultant:
   a. CONTRACTOR shall employ and retain at the Site a Geotechnical Monitoring Consultant with experience and capability of performing all geotechnical monitoring tasks required of CONTRACTOR. Geotechnical Monitoring Consultant shall be a NYS licensed Professional Engineer having a minimum of 5 years of direct construction or environmental monitoring experience, and appropriate health and safety training in accordance with Laws and Regulations.
   b. Responsibilities include, but are not necessarily limited to, the following:
      1) Development of the Geotechnical Instrumentation and Monitoring Plan (Monitoring Plan).
      2) Photo documentation of pre- and post-construction activities of existing structures and utilities.
      3) Installation and pre- and post-construction monitoring of crack gauges at existing structures and utilities.
      4) Installing and removing all geotechnical instrumentation.
      5) Calibrating geotechnical instrumentation at frequencies recommended by the Manufacturer.
      6) Coordinating instrument maintenance and repairs.
      7) Collecting and recording instrument readings.
      8) Managing a database of geotechnical monitoring data at the Site.
      9) Preparing and submitting geotechnical monitoring reports in accordance with Article 1.5 of this Section.
      10) Responding to exceedances of alert or action levels during the Work.
      11) Notifying CONTRACTOR, ENGINEER, OWNER and other appropriate CONTRACTOR personnel when alert or action levels are exceeded during the Work.
2. The CONTRACTOR shall retain the services of a third-party surveyor (Surveyor) licensed in New York to complete the optical monitoring of the existing structures and utilities as required by the Monitoring Plan.

B. The Surveyor will establish and maintain site control points for surveys. Control points will be a closed-loop survey tied to the nearest monument. Site control points referenced to an arbitrary or relative vertical datum are not permitted. Site control points shall be spaced to provide repeatable references surrounding the Site, according to locations approved by ENGINEER.

C. Instrument Calibration:

1. A factory calibration shall be conducted on all geotechnical instrumentation at the place of manufacture before shipment to the Site. Review calibration record for each instrument and match to serial number of instrument. Submit factory calibration records to ENGINEER upon request.
2. During the Work, calibrate geotechnical instrumentation at frequencies recommended by the Manufacturer, in accordance with Manufacturer's calibration and quality assurance requirements. Document all instrument readings, field reference checks, and calibrations in a dedicated log.
3. Preventative maintenance and repair of geotechnical instrumentation, if required, shall only be performed by qualified personnel or authorized representatives of the Manufacturer.
4. Prepare and retain at the Site electronic or written records of all instrument calibrations, preventative maintenance, and repairs. Submit to ENGINEER upon request.

D. Pre-Installation Testing:

1. Examine geotechnical instrumentation and accessories upon delivery to the Site for damage due to shipment.
2. Verify that instruments and accessories are in working order before installing.
3. Immediately remove from the Site, and replace at CONTRACTOR's expense, damaged or malfunctioning instruments and accessories.

1.3 PROJECT CONDITIONS

A. Install and monitor engineering seismographs on or adjacent to the former existing structures and utilities within 50 feet of the active Work area for the purpose of monitoring and ensuring compliance with vibration limits specified herein.

B. Install and monitor optical monitoring points on the existing structures and utilities to ensure compliance with structure deformation/displacement limits specified herein.

C. Conduct vibration monitoring using personnel experienced in the correct placement and monitoring of engineering seismographs. Engineering seismographs shall be capable of recording vibration levels from 0.02 to 10 inches per second, at frequencies from 2 to 200 Hz.

D. Notify ENGINEER immediately if any vibration monitor readings exceed the threshold or limiting values specified herein.

1.4 SUBMITTALS

A. Informational Submittals:
1. Submit daily geotechnical monitoring reports to ENGINEER by 9:00 a.m. the next working day after the monitoring event in accordance with this Section.

2. Submit two copies of each pre- and post-construction survey report to ENGINEER no later than 5 business days from completion of each survey event.

B. Geotechnical Instrumentation and Monitoring Plan:
   1. Submit a Geotechnical Instrumentation and Monitoring Plan (Monitoring Plan) for review and approval by ENGINEER. Plan will define the details of the geotechnical monitoring program including locations of monitoring, frequency of monitoring, types of monitoring devices to be utilized and action plan for the monitoring and reporting of movement and vibration measurements.

1.5 MOVEMENT AND VIBRATION LIMITS

A. Maximum vibrations at existing structures and utilities shall not exceed the threshold or limiting value, maximum peak particle velocity (PPV) established by the CONTRACTOR'S independent specialist.

B. Maximum displacement of the existing structures and utilities shall not exceed the threshold or limiting value, established by the CONTRACTOR'S independent specialist.

C. Actions required if threshold or limiting values are exceeded:
   1. If threshold limits of vibration, displacement, or deflection are exceeded, the CONTRACTOR shall notify ENGINEER and OWNER immediately and shall submit to the ENGINEER, within 24 hours of the exceedance, a submittal indicating the activity causing the exceedance and the steps the CONTRACTOR has taken and will take to prevent further exceedances of the threshold limit. Implement one or more of the following, as determined by ENGINEER:
      a. Increase monitoring frequency to twice daily.
      b. Install one or more additional optical survey points in locations to be selected by ENGINEER.
      c. Evaluate and, if necessary and appropriate, modify construction techniques.

   2. If limiting values of vibration or movement are exceeded, all work by the CONTRACTOR in the vicinity of the exceedance shall stop until a meeting takes place between the CONTRACTOR and the ENGINEER to assess the causes of the exceedance. A submittal shall be prepared and submitted to the ENGINEER indicating what activity caused the exceedance and what steps the CONTRACTOR will take to prevent further exceedances of the limits. No work in the vicinity of the exceedance shall be restarted until the submittal is reviewed and approved by the ENGINEER.
   3. If any damage(s) are identified by the CONTRACTOR or ENGINEER, the CONTRACTOR shall prepare a submittal, for submittal to ENGINEER

indicating a proposed means of repairing the damage(s) and preventing further damage. No work in the vicinity of the damage(s) shall be restarted until the submittal is reviewed and approved by ENGINEER and the approved repair is completed. No claims for schedule impacts, costs of repair(s), new equipment, or other expenses associated with the damage(s) are acceptable.

1.6 RECORD KEEPING

A. The CONTRACTOR shall prepare a record of vibration monitoring activities. The record will include the following information:
   1. Serial number of Engineering Seismograph
   2. Location
   3. Start time, stop time, and duration of monitoring
   4. Maximum PPV for monitoring period
   5. Histograms of longitudinal, transverse, and vertical readings in units of inches per second
   6. Weather conditions
   7. Name of the responsible person in charge
   8. Signature and title of person making record entries.

B. The CONTRACTOR shall prepare displacement monitoring reports for all excavation, demolition, and backfill activities adjacent to the existing structures and utilities. The displacement monitoring report will include the following information for each optical monitoring point:
   1. Location/designation of optical survey point
   2. Date, time and reading for each monitoring event. Include cumulative readings and change from baseline readings
   3. Current work activities
   4. Weather conditions
   5. Name of the responsible person in charge
   6. Signature and title of person making record entries.

C. Exceedances (if any) of the alert levels and action levels. Provide the following:
   1. Time, location, and instrument reading of exceedance
   2. Summary of Work being performed at time of exceedance
   3. Corrective actions taken or to be taken in response to exceedance.

D. Provide a site plan showing approximate locations of all geotechnical instrumentation at the Site. Label each instrument with its serial number.

E. Provide copies of these records to ENGINEER on a daily.

F. Submit a final report documenting all monitoring activities within 20 days of completion of the excavation, demolition, and backfilling. This report shall consist of the following:

1. As-constructed drawings showing each monitored location point
2. Results of vibration and deflection monitoring.
3. Pre- and Post-Construction photographic and crack gauge monitoring.

1.7 INSTRUMENTATION

A. Install all instruments in the presence of ENGINEER. Maintain access to the work area for the purpose of observing instrumentation and obtaining data. Determine the elevation and location of all instrumentation a minimum of 1 week before excavation, demolition, or other activities.

B. The CONTRACTOR shall be responsible for all damage incurred to utilities and structures during geotechnical instrumentation installation.

C. Protect and maintain instrumentation until the end of the Project. Any instrumentation damaged or otherwise rendered non-functional shall be repaired or replaced with a new installation at no additional cost to ENGINEER and OWNER. Repair or replacement work shall conform to the requirements specified herein for the respective type of geotechnical instrumentation. Structural demolition shall not resume until the new installation has been completed and accepted by the ENGINEER.

D. Provide and maintain well-delineated protection devices at the surface of all instrumentation.

E. Provide installation plans for monitoring devices.

1.8 DELIVERY, STORAGE AND HANDLING

A. All instruments will be calibrated and in working order at the time of installation and will be verified on site by ENGINEER immediately before installation.

B. All appropriate precautions for working with electricity, as indicated in the CONTRACTOR's Site-Specific Health and Safety Plan (SSHASP), will be followed at time of installation.

PART 2 - PRODUCTS

2.1 ENGINEERING SEISMOGRAPH

A. Provide portable seismographs with triaxial geophones for the continuous monitoring of vibrations during demolition, excavation and other activities.

B. Manufacturer: Provide products of one of the following:
1. GeoSonics/Vibra-Tech, Inc.
2. Instantel

3. Or equal

C. Equipment Measuring Specifications:

1. Range: 0.02 to 10 inches per second.
2. Resolution: 0.005 inch per second.
3. Accuracy: Plus-or-minus 5 percent.
4. Frequency Response Range: 2 to 200 Hertz.
5. Equipment shall come complete with readout displays, data loggers, protective housings, software, and other accessories recommended by Manufacturer for the intended application.

2.2 OPTICAL SURVEY POINTS

A. Optical survey equipment shall meet a 0.05-inch tolerance in order to ensure that any variances in movements are not due to the equipment tolerance, but rather they are due to actual movements due to excavation and backfilling activities.

B. Optical Survey Points shall be fixed prisms, reflective targets, bolts, or an approved equivalent that will allow the points to be optically surveyed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Supply and install geotechnical instrumentation, per the Manufacturer's recommendations, in accordance with the CONTRACTOR's Monitoring Plan and Installation Plan or as directed by ENGINEER. Vibration monitoring locations shall be approved by ENGINEER.
2. Notify ENGINEER at least 24 hours before installing each instrument.
3. Lay out and stake individual instrument locations for approval of. Adjust locations when requested and obtain ENGINEER' acceptance of layout before installing. Make minor adjustments as required.

B. Engineering Seismograph:

1. Before commencing any construction activity that could cause vibration, firmly mount engineering seismographs on structures within 500 feet of the active work area to establish baseline vibration monitoring. Structures include, but are not limited to, existing on-site structures, existing water lines, roadways, and the adjacent offsite structures.
2. Use installation methods consistent with the Manufacturer's recommendations with consideration of the specific substrate of this Site.

C. Optical Monitoring Points:

1. CONTRACTOR shall have a qualified Surveyor establish a benchmark and optical survey points, at locations specified by ENGINEER.
2. ENGINEER shall be notified at least 24 hours before installing each fixed prism or approved equivalent.
3. Install optical survey points in approved locations (horizontal and vertical) and in accordance with Manufacturer's specifications.
4. The CONTRACTOR shall install optical survey points and establish baseline deflection monitoring before any significant excavation (3 feet or greater).

3.2 MONITORING

A. Engineering Seismograph Monitoring Schedule:

1. Baseline Monitoring:
   a. Perform baseline vibration monitoring, before initiating any mobilization, demolition, excavation or other activities at the Site.
   b. Baseline monitoring shall be performed continuously between the hours of 7:00 a.m. and 5:00 p.m. over a period of not less than 5 working days.
2. Routine Monitoring: Continuously monitor vibrations, at locations shown or indicated in the Monitoring Plan, during all demolition, excavation and other activities.

3.3 DAMAGE TO INSTRUMENTATION

A. The CONTRACTOR shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation from damage due to construction operations, weather, and vandalism.

B. If an instrument is damaged or inoperative, the CONTRACTOR shall repair or replace the damaged or inoperative instrument within 48 hours with no additional cost to ENGINEER and OWNER. ENGINEER will be the sole judge of whether repair or replacement is required.

3.4 REMOVAL

A. Completely remove geotechnical instrumentation and protective barriers when no longer required. Repair damage caused by geotechnical instrumentation and their removal and restore the Site to condition required by the Contract Documents. If restoration of damaged areas is not specified, restore to pre-construction condition.

B. Seismographs:

1. Remove seismographs at the end of each workday, and only after all site operations have been completed for the day.
2. Download monitoring data from seismographs at the end of each day.

A. Repair any damaged or disturbed surfaces to original condition unless otherwise directed by ENGINEER.

++ END OF SECTION ++

THIS PAGE WAS LEFT INTENTIONALLY BLANK

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to perform clearing and grubbing as shown and specified in the Contract Documents.
   2. The Work includes removing from the Site and disposing of trees, stumps, brush, roots, shrubs, vegetation, logs, rubbish, and other objectionable material.
   3. Pay all costs associated with transporting and disposing of debris resulting from clearing.
   4. Limits of Clearing and Grubbing Work: Clear and grub all areas within the Work areas unless otherwise shown or indicated in the Contract Documents.

B. Related Sections:
   1. Section 01 57 05, Temporary Controls.
   2. Section 02 41 00, Demolition.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Laws and Regulations applying to the Work under this Section include, but are not necessarily limited to, the following:
      a. New York State Department of Environmental Conservation.
      b. New York State Historic Preservation Office
      c. US Army Corps of ENGINEERs
      d. Adirondack Park Agency Jurisdictional Inquiry
      e. Town of Webb
      f. Town of Inlet

1.4 SUBMITTALS

A. Action Submittals: Submit the following
   1. Shop Drawings:
      a. Plan for removing trees and other large vegetation not explicitly shown or indicated for removal in the Contract Documents.
      b. Plan showing proposed limits of clearing and grubbing, if different from clearing and grubbing limits shown or indicated in the Contract Documents.

B. Informational Submittals: Submit the following
   1. Qualification Statements:
      a. Arborist. Separate submittal is not required under this Section when arborist qualifications are submitted under Section 32 01 91, Tree Protection and Trimming.

1.5 WARRANTY

A. CONTRACTOR shall warrant that Work performed under this Section will not permanently damage trees, shrubs, turf, and plants designated to remain, or other adjacent work, facilities, or property. If damage resulting from CONTRACTOR's operations becomes evident during the correction period, CONTRACTOR shall replace damaged items and property at no additional cost to OWNER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

A. Protection:
   1. Throughout the Project, protect existing site improvements, including streets, drives, and Underground Facilities to remain (if any), and adjacent property and structures. Repair damage caused by CONTRACTOR to original condition or replace in kind, to satisfaction of ENGINEER, at no additional cost to OWNER.
   2. Protect trees, shrubs, vegetation, and grassed areas to remain by providing temporary fencing, barricades, wrapping, or other methods shown, specified, or accepted by ENGINEER. Correct at CONTRACTOR's expense damage caused by CONTRACTOR outside the limits of clearing Work.
   3. Do not remove trees without approval of ENGINEER, unless shown or indicated for removal.
   4. Do not locate construction equipment, stored materials, or stockpiles within drip line of trees and vegetation to remain.

B. Site Preparation:
   1. Obtain, pay costs associated with, and comply with applicable permits required for clearing and grubbing Work.
   2. Delineation of Clearing and Grubbing Limits:
      a. Locate and clearly flag trees and vegetation to remain, and other materials to remain in the clearing and grubbing limits. Locate and clearly flag salvable vegetation to be relocated.

b. Provide flagging to delineate limits of areas to be cleared or grubbed. Review at Site with ENGINEER before commencing removal of trees, vegetation, and other materials to be removed.
c. Replace flagging that is lost, removed, or destroyed, until clearing and grubbing Work is complete and ENGINEER allows removal of flagging.

3. Erosion and Sediment Controls:
a. Provide applicable erosion and sediment controls before commencing clearing and grubbing Work.
b. Comply with Section 01 41 26, Stormwater Pollution Prevention Plan and Permit
c. Comply with erosion and sediment control requirements of Section 01 57 05, Temporary Controls.
d. Continue providing erosion and sediment controls as clearing and grubbing Work progresses to previously uncleared, ungrubbed areas of the Site.

3.2 CLEARING AND GRUBBING

A. Remove and dispose of all trees, shrubs, stumps, roots, brush, logs, rubbish, and debris within limits of clearing and grubbing shown or indicated in the Contract Documents, unless otherwise shown or indicated.

B. Trees and shrubs to remain shall be protected.

C. Disposal of Cleared and Grubbed Materials:
1. Dispose at appropriate off-Site location trees, stumps, rubbish, debris, and other cleared and grubbed material. Cleared or grubbed materials may remain at the Site only when allowed in the Contract Documents. Do not use cleared or grubbed material as fill, backfill, or in embankments.
2. Dispose of cleared and grubbed material in accordance with Laws and Regulations.
3. The burning of clearing debris at the Site is prohibited.

D. Removal of Site Improvements: Comply with Section 02 41 00, Demolition.

3.3 ENVIRONMENTAL PROTECTION AND RESTORATION

A. New York State Department of Environmental Conservation
B. Town of Webb
C. Town of Inlet

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 31 23 05

EXCAVATION AND FILL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to perform all excavating, filling, and grading, and disposing of earth materials as shown, specified, and required for construction of structures, Underground Facilities, roads, and other facilities required to complete the Work.
   2. Preparation of subgrade for slabs and pavements is included under this Section.
   3. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof, except rock requiring drilling, blasting or special equipment for removal which is under Section 31 23 16.26, Rock Removal.

B. Related Sections:
   1. Section 03 30 00, Cast-in-Place Concrete.
   2. Section 31 23 16.26, Rock Removal.
   3. Section 31 05 19, Geosynthetics for Earthwork.
   4. Section 31 09 13, Geotechnical Instrumentation and Monitoring.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AASHTO M 43-05, Standard Specification for Sizes of Aggregate for Road and Bridge Construction
   2. ACI 522R, Pervious Concrete.
   3. ANSI/AISC 360, Specification for Structural Steel for Buildings.
   4. ASTM C29/C29M, Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate.
   5. ASTM C33/C33M, Specification for Concrete Aggregates.
   6. ASTM C94/C94M, Specification for Ready-Mixed Concrete.
   7. ASTM C138/C138M, Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
   8. ASTM C172, Practice for Sampling Freshly Mixed Concrete.
   9. ASTM C150/C150M, Specification for Portland Cement.
   11. ASTM C595/C595M, Specification for Blended Hydraulic Cements.
   11. ASTM C618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

12. ASTM C989, Specification for Slag Cement for Use in Concrete and Mortars.
13. ASTM D448, Classification for Sizes of Aggregate for Road and Bridge Construction.
14. ASTM D698, Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3)).
15. ASTM D4318, Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
16. ASTM D6913-04, Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
17. ASTM D6938, Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
18. ASTM D7928, Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis
19. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.

1.3 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Subgrade" is the uppermost surface of native soil material unmoved from cuts; the bottom of excavation.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Professional ENGINEER:
      a. Engage a registered professional ENGINEER legally qualified to practice in the same jurisdiction as the Site and experienced in providing ENGINEERing services of the kind indicated.
      b. Responsibilities include but are not necessarily limited to:
         1) Reviewing system performance and requirements shown or indicated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance and requirements for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising the preparation of design calculations and related submittals verifying compliance of the system with the requirements of the Contract Documents.
         4) Signing and sealing all calculations, drawings, and submittals prepared by professional ENGINEER.
         5) Certifying that:
            a) it has performed the design of the system in accordance with the performance requirements stated in the Contract Documents, and

b) the said design conforms to Laws and Regulations, and to the prevailing standards of practice.

2. CONTRACTOR's Testing Laboratory:
   a. Retain the services of independent testing laboratory to perform testing and determine compliance with the Contract Documents of the materials specified in this Section.
   b. Testing laboratory shall comply with ASTM E329 and requirements of Section 01 45 29.13, Testing Laboratory Services Furnished by CONTRACTOR.
   c. Testing laboratory shall be experienced in the types of testing required.
   d. Selection of testing laboratory is subject to ENGINEER's acceptance.

B. Quality Assurance Testing:
   1. Quality assurance testing is in addition to field quality control testing required under Part 3 of this Section.
   2. Materials used in the Work may require testing and retesting, as directed by ENGINEER, during the Project. Allow free access to material stockpiles and facilities at all times. Tests not specifically indicated to be performed at OWNER's expense, including retesting of rejected materials and installed Work, shall be performed at CONTRACTOR's expense.
   3. CONTRACTOR's Testing Laboratory Scope:
      a. Collect samples and perform testing of proposed fill materials in the laboratory and in the field to demonstrate compliance of the Work with the Contract Documents.
      b. Testing laboratory shall perform testing required to obtain data for selecting moisture content for placing and compacting fill materials.
      c. Submit to ENGINEER and CONTRACTOR written report results of each test.
   4. Required Quality Assurance Material Testing by CONTRACTOR's Testing Laboratory:
      a. Gradation in accordance with ASTM D6913-04 and ASTM D7928. Perform one of each test for every 1,000 cubic yards of each of the following types of material incorporated into the Work: Concrete Sand, #9 Stone, #57 Stone, and, General Fill.
      b. Atterberg limits in accordance with ASTM D4318. Perform one test for every 1,000 cubic yards of the following types of materials incorporated into the Work: General Fill.
      c. Moisture/density relations in accordance with ASTM D698, ASTM D4253, or ASTM D4254, as applicable. Perform one test for every 5,000 cubic yards of the following types of materials incorporated into the Work: General Fill.
      d. Moisture content of stockpiled or borrow material in accordance with ASTM D2216. Perform one test for every 1,000 cubic yards of the following types of material incorporated into the Work: General Fill.

C. Regulatory Requirements:

1. Perform excavation work in compliance with requirements of authorities having jurisdiction and Laws and Regulations, including:
   a. OSHA, 29 CFR Part 1926, Section .650 (Subpart P – Excavations).
2. Obtain required permits and approvals for excavation and fill Work, including work permits from right-of-way OWNERs and permits from environmental authorities having jurisdiction over discharge of water from excavations.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Modifications to the Work proposed due to design of sheeting, shoring, bracing, cofferdams, and similar excavation supports.

B. Informational Submittals: Submit the following:
   1. Procedure Submittals:
      a. Excavation Plan: Prior to starting excavation operations, submit written plan to demonstrate compliance with OSHA 29 CFR Part 1926.650. As a minimum, excavation plan shall include:
         1) Name of CONTRACTOR's "competent person" in responsible charge of excavation and fill Work.
         2) Excavation method(s) and additional items to be included in the Work.
         3) Copies of "manufacturer's data" or other tabulated data if protective system(s) are designed on the basis of such data.
         4) Copies of required permits and approvals, from authorities having jurisdiction and affected utility OWNERs, for excavation methods proposed.
      b. Proposed compaction procedure and compaction equipment proposed for use. Where different procedures or equipment will be used for compacting different types of material or at different locations at the Site, indicate where each procedure and equipment item will be used.
   2. Excavation Support Plan and Related Information Prepared by CONTRACTOR's Professional ENGINEER:
      a. CONTRACTOR and CONTRACTOR's professional ENGINEER shall prepare the following for submittal:
         1) Sheeting and bracing, or other protective system(s) required.
         2) Dewatering system.
         3) Cofferdams.
      b. Drawings and calculations shall be prepared by professional ENGINEER qualified in the specialty involved. ENGINEER's review and acceptance of submittal does not imply approval by ENGINEER of the associated Work. CONTRACTOR shall be solely responsible for designing, installing, operating and maintaining the system(s) required to satisfactorily perform all necessary sheeting, bracing, protection, underpinning, and dewatering.

3. Delivery Tickets:
    a. Copy of delivery ticket for each load of aggregate and borrow material delivered to the Site. Each delivery ticket shall indicate project and contract by name and number, date, material type, department of transportation item number when applicable, and quantity delivered.
4. Quality Assurance Test Results Submittals:
    a. Submit results of quality assurance testing performed by in accordance with Paragraph 1.4.B of this Section, unless included as part of another submittal under this Section. Submit results for the following quality assurance testing:
        1) Tests on borrow fill material.
        2) Optimum moisture – maximum dry density curve for each type of fill material.
5. Field Quality Control Submittals:
    a. Submit results of testing and inspection performed in accordance with the field quality control Article in Part 3 of this Section, including:
        1) Field density testing.
6. Qualifications Statements:
    a. Professional ENGINEER.
    b. Quality Assurance Testing laboratory. Submit name and qualifications of testing laboratory to be employed, and qualifications of testing laboratory's personnel that will perform quality assurance testing required in this Section.
    c. Field Quality Control Testing Laboratory: Names and qualifications of testing laboratory employed, and qualifications of testing laboratory's personnel that will perform field quality control testing as required under this Section.

1.6 SITE CONDITIONS

A. Subsurface Information: The Supplementary Conditions indicate information available relative to subsurface conditions at the Site. Such information and data is not intended as a representation or warranty of continuity of conditions between soil borings or test pits, nor of groundwater levels at dates and times other than date and time when measured, nor that purpose of obtaining the information and data were appropriate for use by CONTRACTOR. OWNER will not be responsible for interpretations or conclusions drawn therefrom by CONTRACTOR.

B. Soil borings and other exploratory operations may be made by CONTRACTOR, at no additional cost to OWNER. Coordinate CONTRACTOR-performed test borings and other exploratory operations with OWNER and utility OWNERs as appropriate. Perform such explorations without disrupting or otherwise adversely affecting operations of OWNER or utility OWNERs. Comply with Laws and Regulations relative to required notifications.

C. Existing Structures:

1. The Contract Documents show or indicate certain structures and Underground Facilities adjacent to the Work. Such information was obtained from existing records and is not guaranteed to be correct or complete. CONTRACTOR shall explore ahead of the excavation to determine the exact location of all existing structures and Underground Facilities. Existing structures and Underground Facilities shall be supported and protected from damage by CONTRACTOR. Immediately repair and restore existing structures and Underground Facilities damaged by CONTRACTOR without additional cost to OWNER.
2. Movement or operation of construction equipment over Underground Facilities shall be at CONTRACTOR's sole risk and only after CONTRACTOR has prepared and submitted to ENGINEER and utility OWNERs (as applicable), and received acceptance therefrom, a plan describing CONTRACTOR's analysis of the loads to be imparted and CONTRACTOR's proposed measures to protect structures and Underground Facilities during the Project.
3. Coordinate with utility OWNERs for shut-off of services in active piping and conduits. When required by utility OWNER, OWNER will assist CONTRACTOR with utility OWNER notifications. Completely remove buried piping and conduits indicated for removal and not otherwise indicated as being abandoned or to remain in place.
4. Do not interrupt existing utilities serving facilities occupied and used by OWNER or others, except when such interruption is indicated in the Contract Documents or when allowed in writing by ENGINEER after acceptable temporary utility services are provided by CONTRACTOR for the affected structure or property.

PART 2 – PRODUCTS

2.1 MATERIALS

Concrete Sand, General Fill, Granular Fill, #57 Stone, #9 Stone, Rip Rap

A. Concrete Sand:
   1. Material shall be naturally- or artificially-graded mixture of natural or crushed sand, free of organic material, complying with the following gradation. Crushed slag is unacceptable.

Sieve Sizes (Square Openings)	**Percentage by Weight Passing Sieve**
3/8-inch	100
No. 4	90 to 100
No. 8	75 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	1 to 10

No. 200 (Wet)	0 to 3

B. General Fill:

1. Material shall be free of: rock and gravel larger than three inches in any dimension, debris, waste, frozen materials, organic material, and other deleterious matter.
2. Fill shall have a liquid limit not greater than 45, and plasticity index not greater than 25.
3. Previously-excavated materials complying with the Contract Documents requirements for general fill may be used for general fill.
4. When on-Site materials are found unsuitable for use as general fill, provide approved off-Site general fill materials. Prior to using off-Site material as general fill, furnish submittal for and obtain ENGINEER's approval of the material proposed for use.

C. Granular Fill:

1. Material shall be naturally- or artificially-graded mixture of, crushed aggregate, free of organic material, complying with the gradation requirements below. Crushed slag is unacceptable.

Sieve Sizes (Square Openings)	**Percentage by Weight Passing Sieve**
2-inch	100
1/4-inch	25 to 65
No. 40	5 to 40
No. 200	0 to 10

D. #9 Stone:

1. Material shall be naturally- or artificially-graded mixture of, crushed aggregate, free of organic material, complying with the gradation requirements below. Crushed slag is unacceptable.

Sieve Sizes (Square Openings)	**Percentage by Weight Passing Sieve**
3/8-inch	100
No. 4	85 to 100
No. 8	10 to 40
No. 16	0 to 10
No. 50	0 to 5

E. #57 Stone:

1. Material shall be naturally- or artificially-graded mixture of, crushed aggregate, free of organic material, complying with the gradation requirements below. Crushed slag is unacceptable.

Sieve Sizes (Square Openings)	Percentage by Weight Passing Sieve
1.5-inch	100
1-inch	95 to 100
1/2-inch	25 to 80
No. 4	0 to 10
No. 8	0 to 5

2.2 SOURCE QUALITY CONTROL

A. Perform quality assurance testing, and submit results to ENGINEER, in accordance with the 'Quality Assurance" Article in Part 1 of this Section.

PART 3 – EXECUTION

3.1 INSPECTION

A. Provide ENGINEER with sufficient notice and with means to examine areas and conditions under which excavating, filling, and grading will be performed. ENGINEER will advise CONTRACTOR in writing when ENGINEER is aware of conditions that may be detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 TEST PITS

A. General:
   1. In advance of the construction, excavate, make observations and measurements, and fill test pits to determine conditions or location of the existing Underground Facilities and structures. Perform all work required in connection with excavating, stockpiling, maintaining, sheeting, shoring, filling, and replacing pavement for test pits. CONTRACTOR shall be responsible for the definite location of each existing Underground Facility involved within the area of excavation for the Work. Exercise care during such location work to avoid damaging and disrupting the affected Underground Facility or structure. CONTRACTOR shall be responsible for repairing, at his expense, damage to Underground Facility or structure caused during the Work.

3.3 PREPARATION

A. Use of Explosives:
   1. Use of explosives is not allowed.

3.4 DEWATERING

A. Dewatering – General:
   1. Provide and maintain adequate drainage and dewatering equipment to remove and dispose of all surface water and ground water entering excavations, or other parts of the Work and work areas. Keep each excavation dry during excavation, subgrade preparation, and continually thereafter until the structure to be built therein is acceptable to ENGINEER and backfilling operations are completed and acceptable to ENGINEER.
   2. Keep all working areas at the Site free of surface water at all times. Provide temporary drainage ditches and temporary dikes, and provide required temporary pumping and other work necessary for diverting or removing rainfall and all other accumulations of surface water from excavations and fill areas. Perform diversion and removal of surface water in manner that prevents accumulation of water behind permanent or temporary structures and at any other locations in the construction area where such accumulations may be detrimental.
   3. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the surface water or groundwater downstream of the point of discharge, shall not be directly discharged. Divert such waters through temporary settling basin or filter before discharging to surface water, groundwater, or drainage routes.
   4. CONTRACTOR shall be responsible for condition of piping, conduits, and channels used for drainage and such piping, conduits, and channels shall be clean and free of sediment.
   5. Remove water from excavations as fast as water collects.

B. Temporary Dewatering System:
   1. CONTRACTOR shall design, provide, and operate dewatering system to include sufficient trenches, sumps, pumps, hose, piping, well points, deep wells, and similar facilities, necessary to depress and maintain groundwater level one-foot below the base of each excavation during all stages of construction operations.
   2. Design and operate dewatering system to avoid settlement and damage to existing structures and Underground Facilities.
   3. Groundwater table shall be lowered in advance of excavation for a sufficient period of time to allow dewatering of fine grain soils.
   4. Maintain groundwater level at excavations two feet below lowest subgrade excavation until the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural groundwater.
   5. Operate dewatering system continuously, 24 hours per day, seven days per week. Provide standby pumping facilities and personnel to maintain the continued effectiveness of the system. Do not discontinue dewatering operations without first obtaining ENGINEER's acceptance for such discontinuation.
   6. If, in ENGINEER's opinion, the water levels are not being lowered or maintained as required, provide additional or alternate temporary dewatering devices as necessary, at no additional cost to OWNER.

7. Locate elements of temporary dewatering system to allow continuous dewatering operation without interfering with the Work to the extent practicable.
8. Where portions of dewatering system are located in the area of permanent construction, submit to and obtain ENGINEER's acceptance of details of proposed methods of constructing the Work at such location. Control of ground water shall continue until the permanent construction provides sufficient dead load to withstand hydrostatic uplift of the normal groundwater, until concrete has attained sufficient strength to withstand earth and hydrostatic loads, and until waterproofing Work is completed.
9. Perform pumping of water from excavations in a manner that prevents carrying away of unsolidified concrete materials, and that avoids damaging the subgrade.
10. Before discontinuing dewatering operations or permanently allowing rise of groundwater level, prepare computations to demonstrate that structures affected by the water level rise are protected by fill or other means to sustain uplift. Use a safety factor of 1.25 when preparing such calculations.

C. Disposal of Water Removed by Dewatering System:
1. CONTRACTOR's dewatering system shall discharge to a suitable location acceptable to OWNER , in accordance with Laws and Regulations.
2. Convey water from excavations in closed conduits. Do not use trench excavations as temporary drainage ditches.
3. Dispose of water removed from excavations in a manner that does not endanger health and safety, property, the Work, and other portions of the Project.
4. Dispose of water in manner that causes no inconvenience to OWNER, others involved in the Project, and adjacent and downstream properties.

3.5 EXCAVATION

A. Perform all excavation required to complete the Work as shown, specified, and required. Excavations shall include removing and handling of earth, sand, clay, gravel, hardpan, soft, weathered or decomposed rock, pavements, rubbish, and other materials within the excavation limits. Where the excavation includes rock that requires drilling, blasting, or specialized equipment for removal, remove rock in accordance with Section 31 23 16.26, Rock Removal.

B. Excavation Protection:
1. Provide excavation protection system(s) in accordance with Laws and Regulations to prevent injury to persons and property, including Underground Facilities.
2. Excavation Less Than Five Feet Deep: Excavations in stable rock or in soil conditions where there is no potential for a cave-in may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced.

3. Excavations Greater Than Five Feet Deep: Excavations in stable rock may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced.
4. Provide and maintain excavation protection system(s) in accordance with submittals accepted by ENGINEER and required under Paragraph 1.5.B of this Section.

C. Maintain excavations in dry condition in accordance with "Dewatering" Article in Part 3 of this Section.

D. Elevation of bottom of footings shown is approximate. ENGINEER may direct such minor changes in dimensions and elevations as may be required to secure a satisfactory footing.

E. When excavations are made below required grades without written order of ENGINEER, prepare a repair plan detailing the materials and procedure to approximate the material type removed and required to fill to the required grade, at CONTRACTOR's expense. Fill unauthorized excavations at CONTRACTOR's expense.

F. Extend excavations sufficiently on each side of structures, footings, and similar construction to allow setting of forms, installation of shoring and bracing, and the safe sloping of banks, as necessary.

G. Subgrades – General:
1. Subgrades shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud, muck, and other soft or unsuitable materials; and shall remain firm and intact under all construction operations. Subgrades that are otherwise solid but become soft or mucky on top due to construction operations shall be reinforced with General Fill. Finished elevation of stabilized subgrades shall not be above subgrade elevations shown.
2. If, in ENGINEER's opinion, subgrade becomes softened or mucky because of construction delays, failure to dewater properly, or other cause within CONTRACTOR's control, subgrade shall be excavated to firm material, trimmed, and backfilled with select fill material at CONTRACTOR's expense.

H. Proofrolling Subgrades:
1. Prior to placing fill or constructing pavements or slabs, proofroll the subgrade surface with sufficient proofrolling apparatus. Before starting proofrolling, submit to and obtain acceptance from ENGINEER of proofrolling apparatus and procedure to be used.
2. Proofrolling operations shall be made in the presence of ENGINEER. Notify ENGINEER at least 24 hours in advance of start of proofrolling operations.

3. Subgrades displaying pronounced elasticity or deformation, deflection, cracking, or rutting shall be stabilized as directed by ENGINEER. Unsuitable materials shall be undercut to the depth directed by ENGINEER and replaced with select fill material. Other suitable stabilization methods may be directed by ENGINEER.

3.6 UNAUTHORIZED EXCAVATION

A. All excavations outside lines and grades shown or indicated and that are not approved by ENGINEER, together with removing and disposing of the associated material, shall be at CONTRACTOR's expense. Prepare a repair plan detailing the materials and procedure to approximate the material type removed and required to fill to the required grade, at CONTRACTOR's expense. Fill unauthorized excavations at CONTRACTOR's expense.

3.7 SHEETING, SHORING, AND BRACING

A. General:
   1. Design and provide sheeting, shoring, bracing, cofferdams, and similar excavation supports as shown, specified, and required for the Work.
   2. Clearances and types of temporary sheeting, shoring, bracing, and similar excavation supports, insofar as they may affect the finished character of the Work and the design of sheeting to be left in place, will be subject to the ENGINEER's approval; but CONTRACTOR is responsible for adequacy of all sheeting, shoring, bracing, cofferdams, and similar excavation supports.
   3. Materials:
      a. Previously-used materials shall be in good condition, and shall not be damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary sheeting, shoring, and bracing.
      b. All steel work for sheeting, shoring, bracing, cofferdams and other excavation supports, shall be in accordance with ANSI/AISC 360, except that field welding will be allowed.
   4. As excavation progresses, carry down shoring, bracing, cofferdams, and similar excavation supports to required elevation at bottom of excavation.
   5. Comply with Laws and Regulations regarding sheeting, shoring, bracing, cofferdams, and similar excavation supports.
   6. Maintain sheeting, shoring, bracing, bracing, and other excavation supports in excavations regardless of time period excavations will be open.
   7. Unless otherwise shown, specified, or directed, remove materials used for temporary construction when the Work is completed. Perform such removal in manner not injurious to the structures and Underground Facility, their appearance, and adjacent construction.

B. Removal of Sheeting and Bracing:
   1. Remove sheeting and bracing from excavations, unless otherwise directed by ENGINEER in writing. Perform removal to avoid damaging the Work

and adjacent construction. Removal shall be equal on both sides of excavation to ensure no unequal loads on structures and Underground Facilities.

2. Defer removal of sheeting and bracing, where removal may cause soil to come into contact with concrete, until the following conditions are satisfied:
   a. Concrete has cured for not less than seven days.
   b. Wall and floor framing, up to and including grade level floors, is in place.

3.8 TRENCH SHIELDS

A. Excavation of earth material below bottom of trench shield shall not exceed the limits established in Laws and Regulations.

B. When using a shield for installing piping:
   1. Portions of trench shield extending below the mid-diameter of an installed, rigid pipe, such as prestressed concrete pipe and other types of rigid pipe, shall be raised above the pipe's mid-diameter elevation prior to moving the shield along the trench for further construction.
   2. Bottom of shield shall not at any time extend below mid-diameter of installed pipe that is flexible or has flexing capability, such as steel, ductile iron, PVC, CPVC, polyethylene, and other pipe that has flexing capability.

C. When using a shield for installing structures, bottom of the shield shall not extend below the top of the bedding for the structures.

D. When removing the shield or moving the shield ahead, exercise extreme care to prevent moving piping, structures, and other Underground Facilities, and prevent disturbance of bedding material for piping, structures, and other Underground Facilities. When piping, structures, or Underground Facilities are disturbed, remove and reinstall the disturbed items in accordance with the Contract Documents.

3.9 FILL AND COMPACTION – GENERAL PROVISIONS

A. Provide and compact all fill required for the finished grades as shown and as specified in this Section.

B. Place fill in excavations as promptly as progress of the Work allows, but not until completing the following:
   1. ENGINEER's authorization after observation of construction below finish grade, including dampproofing, waterproofing, perimeter insulation, and similar Work.
   2. Removal of concrete formwork.
   3. Removal of shoring and bracing, and filling of voids with satisfactory materials.
   4. Removal of trash and debris.

C. Fill that includes organic materials or other unacceptable material shall be removed and replaced with approved fill material in accordance with the Contract Documents.

D. Placement – General:
   1. Place fill to the grades shown or indicated. Bring up evenly on all sides fill around structures and Underground Facilities.
   2. Fill areas shall be undercut and proof-rolled as directed by ENGINEER.
   3. Place fill materials at moisture content and density as specified in Table 31 23 05-A of this Section and this Article's requirements on compaction density. Furnish and use equipment capable of adding measured amounts of water to the fill materials to bring fill materials to a condition within required moisture content range. Furnish and use equipment capable of discing, aerating, and mixing the fill materials to ensure reasonable uniformity of moisture content throughout the fill materials, and to reduce moisture content of borrow materials by air drying, when necessary. When subgrade or lift of fill materials requires moisture-conditioning before compaction, fill material shall be sufficiently mixed or worked on the subgrade to ensure uniform moisture content throughout the lift of material to be compacted. Materials at moisture content in excess of specified limit shall be dried by aeration or stockpiled for drying.
   4. Perform compaction with equipment suitable for the type of fill material placed. Select and use equipment capable of providing the minimum density required in the Contract Documents. Use compaction equipment, with equipment gross weight not exceeding 10,000 pounds within horizontal distance of ten feet from the wall of completed, below-grade structures. Furnish and use equipment capable of compacting in restricted areas next to structures and around piping and Underground Facilities. Effectiveness of the equipment selected by CONTRACTOR shall be tested at start of compacted fill Work by constructing a small section of fill within the area where fill will be placed. If tests on the test section of fill indicate that required compaction is not obtained, do one or more of the following: increase the amount of coverages, decrease the lift thicknesses, or use different compactor equipment.
   5. Place fill materials in horizontal, loose lifts, not exceeding specified uncompacted thickness. Place fill in a manner ensuring uniform lift thickness after placing. Mechanically compact each lift, by not less than two complete coverages of the compactor. One coverage is defined as the conditions reached when all portions of the fill lift have been subjected to the direct contact of compactor's compacting surface. Compaction of fill materials by inundation with water is unacceptable.
   6. Do not place fill materials when standing water is present on surface of the area where fill will be placed. Do not compact fill when standing water is present on the fill to be compacted. Do not place or compact fill in a frozen condition or on top of frozen material. Fill containing organic materials or

other unacceptable material previously described shall be removed and replaced prior to compaction.

7. If required densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly-functioning compaction equipment, CONTRACTOR shall perform all work required to provide the required densities. Such work shall include, at no additional cost to OWNER, complete removal of unacceptable fill areas and replacement and re-compaction until acceptable fill is provided.
8. Repair, at CONTRACTOR's expense, observed or measured settlement. Make repairs and replacements as required within 30 days after being so advised by ENGINEER.

E. Fill Against Concrete:
1. Placing fill against concrete below finished grade is not allowed until the concrete has attained its specified strength, as determined by duration of concrete curing and testing of field-cured concrete cylinders. Requirements for strength and curing time are in Section 03 30 00, Cast-in-Place Concrete.
2. Elevation of fill placed against concrete walls shall not differ by more than two feet on each side of walls, unless walls are adequately braced or all floor framing is in place up to and including grade level slabs.
3. Backfill structural foundation units as soon as practicable, in accordance with this Section, after concrete has gained sufficient strength to avoid damage, to avoid ponding of surface water and accumulation of debris.
4. Where fill is placed against waterproofed surface, exercise care that waterproofing material is not damaged.

F. Compaction Density Requirements:
1. Compaction required for all types of fills shall be in accordance with Table 31 23 05-A of this Section. Moisten material or aerate the material as necessary to provide the moisture content that will facilitate obtaining the required compaction.

TABLE 31 23 05-A
REQUIRED MINIMUM DENSITY

Material	Percent Compaction (ASTM D698)	Uncompacted Lift (inches)
General Fill	90	8

2. Fill shall be wetted and thoroughly mixed to achieve optimum moisture content plus-or-minus three percent, with the following exceptions:
   a. On-site clayey soils: Optimum to plus three percent.
3. Replace natural, undisturbed soils or compacted soil subsequently disturbed or removed by construction operations with materials compacted as indicated in Table 31 23 05-A of this Section.

4. Field quality control testing for density; to verify that specified density was obtained, will be performed during each day of compaction Work. Responsibility for field quality control testing is specified in the "Field Quality Control" Article in Part 3 of this Section.
5. When field quality control testing indicates unsatisfactory compaction, provide additional compaction necessary to obtain the specified compaction. Perform additional compaction Work at no additional cost to OWNER until specified compaction is obtained. Such work includes complete removal of unacceptable (as determined by ENGINEER) fill areas and replacement and re-compaction until acceptable fill is provided in accordance with the Contract Documents.

I. Replacement of Unacceptable Excavated Materials: In cases where over-excavation to replace unacceptable soil materials is required, backfill the excavation to required subgrade with select fill material and thoroughly compact in accordance with Table 31 23 05-A and the associated "Compaction Density Requirements" in this Article. Slope the sides of excavation in accordance with the maximum inclinations specified for each structure location.

3.10 GRADING

A. General:
1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas.
2. Smooth subgrade surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free of irregular surface changes, and shall comply with the following:
1. Grassed Areas or Areas Covered with Gravel, Stone, Wood Chips, or Other Special Cover: Finish areas to receive topsoil or special cover to within not more than one inch above or below the required subgrade elevations.
2. Sidewalks: Shape surface of areas under sidewalks to line, grade, and cross section, with finish surface not more than one inch above or below the required subgrade elevation.
3. Pavements: Shape surface of areas under pavement to line, grade, and cross section, with finish surface not more than 1/2-inch above or below the required subgrade elevation.

C. Grading Surface of Fill Under Concrete Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a ten foot straight edge.

D. Compaction:

1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.11 DISPOSAL OF EXCAVATED MATERIALS

A. General:
   1. CONTRACTOR shall haul away material removed from excavations that does not comply with requirements for fill, or is in excess of the quantity required for fill.
   2. Disposal of materials shall be in compliance with Laws and Regulations, at no additional cost to OWNER.

3.12 TEMPORARY BARRIERS

A. Provide temporary barrier surrounding excavations and excavation work areas to provide temporary protection to persons and property. Barrier shall have openings only at vehicular, equipment, and worker access points.

B. Minimum Material Requirements for Temporary Barriers:
   1. Temporary barrier shall not be less snow fence-type fencing, four feet high.
   2. Fence shall be constructed of vertical hardwood slats measuring not less than 1.5 inches by 1/4-inch interwoven with strands of horizontal wire, or shall be of equivalent plastic construction.
   3. Posts:
      a. Posts shall be steel, either “U”-, “Y”-, “T”-shaped, or channel section.
      b. Posts shall have a nominal weight of not less than 1/3-pound per linear foot, exclusive of the anchor.
      c. Posts shall have tapered anchors weighing not less than 0.67 pounds, each firmly attached by means of welding, riveting or clamping.
      d. Posts shall have corrugations, knobs, notches, or studs placed and constructed to engage a substantial number of fence line wire in the proper position.
      e. Provide each post with sufficient quantity of galvanized wire fasteners or clamps, of not less than 0.120-inch diameter, for attaching fence wire to post.

3.13 FIELD QUALITY CONTROL

A. Site Tests: employ a testing laboratory to perform field quality control testing.
   1. Testing Laboratory Scope:
      a. Perform field moisture content and density tests to ensure that the specified compaction of fill materials has been obtained.
      b. Tests of actual unconfined compressive strength or bearing tests on each stratum.
      c. Report results of each test to ENGINEER and CONTRACTOR.
   2. Required Material Tests:
      a. Compaction: Comply with ASTM D6938, as applicable.

3. Authority and Duties of Testing Laboratory:
    a. Technicians representing the testing laboratory shall inspect the materials in the field, perform testing, and report findings to ENGINEER and CONTRACTOR. When materials furnished or the Work performed does not comply with the Contract Documents, technician will direct attention of ENGINEER and CONTRACTOR to such failure.
    b. Technician will not act as foreman or perform other duties for CONTRACTOR. Work will be checked as it progresses, but failure to detect defective Work or non-complying materials shall not in any way prevent later rejection when defect is discovered, nor shall it obligate ENGINEER for Substantial Completion or final acceptance. Technicians are not authorized to revoke, alter, relax, enlarge, or release requirements of the Contract Documents, or to approve or accept any portion of the Work.
4. Responsibilities and Duties of CONTRACTOR:
    a. Use of testing laboratory shall in no way relieve CONTRACTOR of the responsibility to provide materials and Work in full compliance with the Contract Documents.
    b. To facilitate testing laboratory, CONTRACTOR shall advise testing laboratory at least two days in advance of filling operations to allow for completion of field quality control testing and for assignment of personnel.
    c. It shall be CONTRACTOR's responsibility to accomplish the specified compaction for fill and other earthwork. CONTRACTOR shall control construction operations by confirmation tests to verify and confirm that CONTRACTOR has complied, and is complying at all times, with the Contract Documents relative to compaction, control.
    d. CONTRACTOR shall demonstrate adequacy of compaction equipment and procedures before exceeding one or more of the following quantities of earthwork. Each test location shall include tests for each layer, type, or class of fill to finish grade.
        1) 100 cubic yards of general fill.
5. Testing laboratory will inspect and indicate acceptable fill layers before construction work is performed thereon. Testing fill layers shall be taken as follows:
    a. For General Fill: One per 1,000 square feet on every compacted lift.
6. Periodic compliance tests will be made by ENGINEER to verify that compaction is complying with the requirements specified, at no cost to CONTRACTOR. CONTRACTOR shall remove the overburden above the level at which ENGINEER wishes to test and shall fill and re-compact the excavation after testing is complete.
7. If testing laboratory reports or inspections indicate subgrade, fills, or bedding compaction below specified density, CONTRACTOR shall remove unacceptable materials as necessary and replace with specified materials and provide additional compaction at CONTRACTOR's expense until subgrades, bedding, and fill are acceptable. Costs for retesting of subgrade,

fills, or bedding materials that did not originally comply with specified density shall be paid by CONTRACTOR.

+ + END OF SECTION + +

+ + THIS PAGE LEFT BLANK INTENTIONALLY + +

SECTION 31 23 16.26

ROCK REMOVAL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to perform rock removal required for the Work, including disposing of excavated rock material.
   2. Obtain permits required by authorities having jurisdiction for rock removal Work, including transporting, storing, and using blasting materials.
   3. Perform rock removal Work in compliance with Laws and Regulations applicable permits, and requirements of authorities having jurisdiction.

B. Coordination:
   1. Review procedures under this and other Sections and coordinate the Work that must be performed with or before rock removal.

C. Related Sections:
   1. Section 31 23 05, Excavation and Fill.
   2. Section 31 09 13, Geotechnical Instrumentation and Monitoring.

D. Measurement: Limits of rock removal shall be as follows:
   1. Structures: Limit for all structures shall be bounded by the following:
      a. Bottom of footing, drainage course material, or compacted backfill.
      b. Pre-construction rock surface.
      c. Vertical planes located 12 inches outside footing.
   2. Trenches: Limit for trenches shall be bounded by the following:
      a. Width of trenches shall be the outside diameter or outside edge (as applicable) of the Underground Facility plus two feet, exclusive of pipe bells, branches, hubs, spurs, or cradles. Sides of trench shall be considered vertical.
      b. Depth of trench shall be six inches below the outside of the Underground Facility in the trench unless indicated otherwise on the Drawings.
      c. Length shall be equal to installed length of the Underground Facility, measured horizontally.
   3. No payment will be made for additional quantity outside the limits described in this Section.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. United States Bureau of Mines (USBM), Report of Investigations (RI) 8507.

1.3 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Rock removal" is removal of igneous, metamorphic, or sedimentary rock or stone; boulders over two cubic yards in volume in open areas and boulders over one cubic yard in volume in trenches; and mass concrete; that cannot be removed using rippers or other mechanical methods and therefore requires drilling and blasting or use of large excavator-mounted pneumatic breakers. The following material will not be measured nor allowed for payment as rock removal:
      a. Soft, weathered or disintegrated rock that can be removed by normal excavating equipment, including bulldozers with rippers and large trackhoes with rock teeth or rock buckets.
      b. Loose or previously blasted rock.
      c. Broken stone in rock fills.
      d. Rock or stone that falls into the excavation from outside limits of excavation shown or indicated in the Contract Documents.
      e. Boulders that can be removed without drilling, blasting, or pneumatic breakers.
      f. Pavements, sidewalks, and gutters of concrete, asphalt, or masonry.
   2. "Trenches" means excavations having vertical sides whose depth exceeds its width, made for Underground Facilities and drainage beds.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Professional Engineer:
      a. Contractor or blasting Subcontractor shall retain a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall have at least five years experience conducting preblast surveys, structural evaluations, and structural condition assessments.
      b. Responsibilities include:
         1) Preparing or supervising preparation of preblast survey.
         2) Preparing written requests for clarifications or interpretations of the Contract Documents for submittal to Engineer by Contractor.
         3) Signing and sealing preblast survey report.
         4) Performing condition assessments of structures damaged by blasting.

1.5 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Test and Evaluation Reports:
      a. Rock surface survey information, in accordance with Article 3.1 of this Section.

b. Vibration monitoring results, in accordance with Paragraph 3.4.A.3 of this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Top-of-Rock Survey:
   1. Prior to rock removal, Contractor shall survey and measure the elevation of the top of rock to determine the in-place quantity of rock to be excavated.
   2. Uncover rock to be excavated in sections or areas acceptable to Engineer for surveying.
   3. Conform to Section 01 71 23, Field Engineering.
   4. Submit to Engineer field notes, site plan showing rock elevations measured, cross-sections of rock surface when necessary or required by Engineer, and detailed estimation of quantity of rock to be excavated.

3.2 PREBLAST SURVEY

A. None.

3.3 ROCK REMOVAL

A. Perform rock removal adjacent to Underground Facilities and above-ground utilities and life-safety facilities with utmost care, after properly notifying and coordinating with utility owners, life-safety facility owners, and authorities having jurisdiction.

C. Perform rock removal to avoid endangering persons or property, and damaging or weakening adjacent foundations, structures, sheeting, bracing, and other facilities. Cover or otherwise suitably confine blasting.

D. Contractor shall be fully responsible for injury and damage caused by rock removal , and shall repair or replace all injury and damage immediately, as accepted by Engineer at no additional cost to Owner.

E. Removal and Disposal of Rock:
   1. Remove blasted or broken rock from excavations with suitable equipment in accordance with Section 31 23 05, Excavation and Fill.
   2. Do not use excavated rock as backfill. Dispose of excavated rock off the Site at Contractor’s expense in compliance with Laws and Regulations.

3.4 SITE QUALITY CONTROL

A. Monitoring:
   1. Submit vibration monitoring results to Engineer within 24 hours. Contractor's monitoring does not relieve Contractor of responsibility for controlling vibration.

3.5 UNAUTHORIZED ROCK REMOVAL

A. Rock removal outside the limits shown or indicated in the Contract Documents or that is not approved by Engineer, including removal, disposal, and backfill, will be at Contractor's expense.
B. Fill unauthorized excavation below pipe or foundation with compacted select backfill as directed by Engineer in writing, at no additional cost to Owner. Backfill other unauthorized excavation as specified in Section 31 23 05, Excavation and Fill.

+ + END OF SECTION + +

SECTION 31 37 00

RIPRAP

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to furnish and install riprap at locations shown or indicated in the Contract Documents.

B. Coordination:
   1. Review procedures under this and other Sections and coordinate the Work that must be performed with or before riprap.

C. Related Sections:
   1. Section 31 05 19, Geosynthetics for Earthwork.
   2. Section 31 11 00, Clearing and Grubbing.
   3. Section 31 23 05, Excavation and Fill.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM C127, Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
   2. NSSGA-293, Aggregate Handbook.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Riprap Supplier:
      a. Supplier of riprap and other materials furnished under this Section shall be certified by the New York State Department of Transportation for furnishing such materials.

B. Regulatory Requirements:
   1. Reference Specifications and Details:
      a. Comply with applicable requirements of New York State Department of Transportation Standard Specification Books and Standard Sheet Books.

1.4 SUBMITTALS

A. Acton Submittals: Submit the following:
   1. Product Data:

a. Source or quarry name, gradation, and other information required by ENGINEER. Submit for each source of material proposed.

PART 2 – PRODUCTS

2.1 MATERIAL

A. Riprap: Material shall be Item 620.04, Stone Filling (Medium), in accordance with the reference specifications indicated in Article 1.3 of this Section.

PART 3 – EXECUTION

3.1 PREPARATION

A. Clear ground surface of brush, trees, stumps, and other objectionable material, and dress to a smooth surface. Clearing and grubbing, where required, shall comply with Section 33 11 00, Clearing and Grubbing.

B. Remove all soft or spongy material to depth shown or indicated on the Drawings or as directed by ENGINEER, and replace with acceptable material. Excavation, removal of unsuitable material if any, and backfilling shall comply with Section 31 23 05, Excavation and Fill.

C. Placing of geosynthetics, where required, shall comply with Section 31 05 19, Geosynthetics for Earthwork.

3.2 INSTALLATION

A. Riprap Placing:
   1. Minimum total thickness of riprap shall be as shown on the Drawings.
   2. Place riprap stones so that weight of stone is carried by underlying material and not by adjacent stones. Carefully place the stones on geosynthetics, where required, to produce an even distribution of pieces, with minimum of voids and without damaging the geosynthetic. Place the full-course thickness in one operation while preventing segregation and avoiding displacing of underlying material. Do not place stones in layers, by dumping into chutes, or by other methods that cause segregation or damage to geosynthetic, if any. When necessary, rearrange individual stones for uniform distribution.
   3. Riprap may be placed using equipment, and placing shall produce an installation of firm and solid riprap. Level the top surface of riprap to required alignment and slope by hand-placing stones to fill large voids and to make surface even.
   4. On slopes, place the largest stones at the bottom. Riprap shall be properly sized to form compact, solid blanket to protect the slope or channel, as

applicable. On slopes steeper than one foot vertical to 1.5 feet horizontal, do not use rounded boulders or cobbles without grouting stones in place.

5. When existing riprap is in proximity to riprap provided under this Section, place riprap to conform as closely as practicable in size and character to existing riprap.

+ + END OF SECTION + +

+ + THIS PAGE LEFT BLANK INTENTIONALLY + +

SECTION 31 51 16

ROCK ANCHORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to perform rock anchor installation and maintenance required to complete the Work. Extent of rock anchor work includes, but is not limited to, the following:
      a. Temporary rock anchors designed, furnished, installed, tested and stressed in accordance with this Specification and as shown on the Contract Drawings.
      b. Develop the load-carrying capacity required to stabilize the dam during construction and in accordance with the testing subsection of this Specification. The Contractor shall select the installation method.
      c. The anchor tendon for the rock anchors shall be protected from corrosion in accordance with the requirements of this Specification.
   2. Types of shoring and bracing system includes, but is not limited to, the following:
      a. Rock or soil anchors.

B. Related Sections
   1. Section 03 00 05, Concrete.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AASHTO Standards.
   2. ACI Standards.
   3. ASTM Standards.
   4. FHWA Standards.
   5. Post-Tensioning Institute “Guide Specification for Post-Tensioning Materials” Post-Tensioning Manual, 4th Edition.
   6. Post-Tensioning Institute “Specification For Unbonded Single Strand Tendons,” Post-Tensioning Institute, 1993.
   7. Post-Tensioning Institute “Recommendations for Prestressed Rock and Soil Anchors,” Post-Tensioning Institute, 4th Edition, 2004.

1.3 DEFINITIONS

A. Anchorage Devices: The anchored wedges or nuts which grip the prestressing steel.

B. Bearing/Anchor Plate: The steel plate which distributes the anchor force to the structure.

C. Bond Length: The length of the anchor which is bonded to the ground and transmits the tensile force to the rock.

D. Centralizer: A device used to center the bond length of the anchor in the hole to assure minimum grout cover over the anchor.

E. Contractor: The person/firm responsible for the rock anchor work.

F. Creep Rate: The magnitude of total movement measured during a load hold per log cycle of time.

G. Design Load: The design load is the anticipated working load (typically 50 to 70 percent GUTS) that will be applied to the anchor during its service life after stressing and testing has been completed. The design load includes appropriate load factors to insure that the overall structure has adequate strength for its intended use.

H. Encapsulation: That portion of the anchor which encases or encapsulates the entire length of the anchor, including the sheath, to provide an additional barrier to corrosion.

I. Rock Anchor: A system used to transfer tensile loads to rock. A rock anchor includes all prestressing steel, anchorage devices, bearing plates, grout, coatings, corrosion protection, sheathings and couplers if used.

J. GUTS: Guaranteed Ultimate Tensile Strength of prestressing steel.

K. Load Cell: A steel cylinder calibrated to measure the load developed and sustained over several years by the rock anchor, using vibrating wire technology.

L. Lock-off Load: The load that the prestressing steel is locked off at during installation. This load typically exceeds the design load by 10 percent.

M. Minimum Specified Ultimate Tensile Strength: The minimum breaking strength of the prestressing steel as defined by the specified standard.

N. Sheath: That portion of the anchor which encases the tendon in the stressing length only.

O. Tendon: The steel rods or strands used to transfer load from the anchorage to rock.

P. Tendon Bond Length: The length of the tendon which is bonded to the anchor grout.

Q. Total Anchor Length: The unbonded length plus the tendon bond length.

R. Total Movement: The total elongation of the anchor under load, measured at the anchor head.

S. Trumpet: A steel pipe or tube, integrally attached to the bearing plate that surrounds the tendon in the vicinity of the structure.

T. Unbonded Length: The length of the tendon which is not bonded to the grout. The grout surrounding the unbonded length is a void filler and provides corrosion protection.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Contractor's Professional Engineer
      a. Engage and assign design and installation oversight of rock anchor work to a registered professional engineer legally qualified to practice in New York State and is experienced in providing engineering services of the kind indicated.
      b. Responsibilities include but are not necessarily limited to:
         1) Reviewing system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising the preparation of design calculations and related submittals verifying compliance of the rock anchors with the requirements of the Contract Documents.
         4) Signing and sealing all calculations, drawings, and submittals prepared by professional engineer.
         5) Certifying that:
            a) it has performed the design of the system in accordance with the performance requirements stated in the Contract Documents, and
            b) the said design conforms to Laws and Regulations, and to the prevailing standards of practice.
   2.. Contractor:
      a. The Contractor or Subcontactor performing the work described in this Specification shall have installed permanent anchors for a minimum of three (3) years. The Contractor shall submit a list containing at least five (5) projects, completed within the last three (3) years, where the Contractor or Subcontractor has installed permanent anchors. A brief description of each project and a reference shall be included for each project listed. As a minimum, the reference shall include an individual's name, business address and current phone number.

B. Regulations: Comply with local codes and ordinances of governing authorities having jurisdiction.

C. Pre-Installation Conference: Conduct conference with the Owner, Engineer, Contractor, Contractor's Professional Engineer, and Subcontractor (if applicable) to discuss the installation of rock anchor systems.
   1. Review geotechnical report.
   2. Review existing utilities and subsurface conditions.
   3. Review rock anchor installation procedures and testing requirements.
   4. Review proposed equipment.
   5. Review monitoring requirements.

1.4 SUBMITTALS

A. Information Submittals: Submit the following:
   1. At least ten (10) calendar days, prior to the start of work, the contractor shall submit a detailed anchor installation procedure, detailing proposed methods of installing and testing anchors. Include the following at a minimum:
      a. Drilling method(s) and equipment, including proposed drill hole diameter and length of unbonded and bond zone.
      b. Grout mix, including type of Portland Cement, proportions of mix and water-cement ratio, and compressive strength test results provided by a qualified independent testing laboratory verifying the specified minimum 3 and 28 day compressive strengths.
      c. Grouting procedures and equipment, including proposed grout pressures.
      d. Load test procedures, including details of jacking or load frame.
      e. Quality control procedures.
      f. Identification numbers and certified calibration record for each test jack, pressure gage, and load cell to be used. Jack and pressure gage shall be calibrated as a unit. Calibration records shall include the date tested, device identification number, and the calibration test results, and shall be certified for an accuracy of at least 2 percent of the applied calibration loads by a qualified independent testing laboratory within 90 days prior to submittal.
      g. Certificates of compliance for core reinforcing centralizers, epoxy coating and other materials. The certificates shall state that the material or assemblies to be provided will fully comply with the requirements of the contract.
   2 Layout Drawings: Submit layout drawings for the anchors prepared and sealed by a registered professional engineer licensed in New York State. System design and calculations must be acceptable to local authorities having jurisdiction. Submittal is for information only. Design and construction of rock anchors remains sole responsibility of the CONTRACTOR.
      a. Include plans, elevations, sections, and details.
      b. Show arrangement, locations, and details of anchor system according to engineering design.
      c. Include written plan for anchor installation, including sequence of construction.

2. Design Calculations sealed by a registered professional engineer licensed in New York State. Submittal should also include the following items:
    a. Statement of geotechnical parameters used in design.
    b. FHWA, AASHTO, ASTM, ACI, or PTI Design codes utilized.
    c. Geotechnical calculations demonstrating adequate stability against failure due to bearing, sliding, overturning, or overall (Global) stability exceeding 1.3 for the following loading conditions:
        1) Top of Flashboard Pool elevation of 1707.0 at Old Forge Dam.
        2) Spillway Flood elevation of 1711.0 at Old Forge Dam.
        3) Ice load of 5,000 lbf/ft at the Winter Pool elevation of 1705.0 at Old Forge Dam.
    d. Structural calculations demonstrating that individual structural components have adequate capacity to the applied forces.
    e. Calculations demonstrating minimum required bond length of anchors including minimum free-stressing length of anchors.
    f. Alignment load, design load and lock-off load for all anchors.
    g. Plan view layout of all anchors including anticipated extents and potential interference with existing subsurface structures or utilities.
    h. Performance testing requirements for anchors and any other element requiring strength verification.
    i. Description of pre-stresssing steel and associated hardware including steel mill test reports for all anchors or other structural steel element used in the design of the anchors.
3. The Engineer shall accept or reject the Contractor's Working Drawings and design submission within seven (7) working days after receipt of the submission.
4. The Contractor shall submit to the Engineer within twenty (20) calendar days after completion of the rock anchor work a report containing:
    a. Drilling records, including length and diameter of rock anchor hole, a description of all subsurface materials encountered during drilling and the location in the hole, drilling rates, and the location of special features, including soft or fractured rock zones, loss of water, tool drops, and other items of interest in connection with drilling.
    b. Grouting records indicating the cement type, quantity injected and the grout pressures; and
    c. Rock anchor test results and graphs.

1.5 SITE CONDITIONS

A. Before starting work, check and verify governing dimensions and elevations. Take photographs to record any prior damage or cracking of structures, pavements, and other improvements. Notify ENGINEER prior to survey to allow them to attend. Prepare a list of such damages, verified by dated photographs, and signed by the CONTRACTOR and others performing investigation.

B. During installation, monitor vibrations transmitted to adjacent structures, employing a licensed land surveyor or registered professional engineer. Maintain

record of monitored vibrations. Vibrations causing peak velocities in excess of 2 inch per second may cause damage to adjacent structures. CONTRACTOR shall be responsible for damages caused installation of rock anchors that do not conform to specifications.

C. Project-Site Information: A geotechnical data report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. OWNER is not responsible for interpretations or conclusions drawn from the data.
   1. Contractor shall make additional test borings and conduct other exploratory operations necessary for the design and installation of rock anchors.

D. Existing Utilities
   1. Protect existing active sewer, water, gas, electricity, and other utility services and structures.
   2. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services as affected by the Work.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Performance Criteria:
   1. Provide a minimum of two anchors to provide and maintain a minimum factor of safety for overturning and sliding of 1.3.

2.2 MATERIALS

A. Contractor shall provide a detailed list of proposed materials including but not limited to :
   1. Admixtures.
   2. Tendons.
   3. Anchorage Devices
   4. Bar anchors
   5. Bearing/Anchor Plates
   6. Bondbreaker
   7. Cement
   8. Centralizers
   9. Corrosion Inhibiting Grease
   10. Prestressing Steel Couplers
   11. Sheaths
   12. Trumpets

B. Contractor shall use potable water for mixing grout.

2.3 TENDON FABRICATION

A. Load-carrying Capacity: Unless otherwise directed, the Contractor shall select the type of tendon to be used, provided it meets all of the contract requirements.

2.4 TENDON STORAGE AND HANDLING

A. Tendons shall be handled and stored in such a manner as to avoid damage or corrosion. Damage to the prestressing steel as a result of abrasions, cuts, nicks, welds and weld splatter will be cause for rejection by the Engineer. The prestressing steel shall be protected if welding is to be performed in the vicinity. Grounding of welding leads to the prestressing steel is forbidden. Prestressing steel shall be protected from dirt, rust or deleterious substances. If heavy corrosion or pitting is noted, the Engineer shall reject the affected tendons.

B. The Contractor shall use care in handling and storing the tendons at the site. Prior to inserting a tendon in the drill hole, the Contractor and the Inspector shall examine the tendon for damage to the encapsulation and the sheathing. If, in the opinion of the Inspector, the encapsulation is damaged, the Contractor shall repair the encapsulation in accordance with the tendon supplier's recommendations. If, in the opinion of the Inspector, the smooth sheathing has been damaged, the Contractor shall replace the tendon with a non-damaged tendon at no additional cost to the Owner.

2. 5 EQUIPMENT

A. Washing Equipment: Washing incidental to the drilling operation is not sufficient, and each hole shall be washed with water using special hole washing equipment after drilling is complete. Furnish a special washout bit capable of directing jets of water onto walls of bore hole at sufficient velocity to ensure that all drilling debris are efficiently removed from the bond zone.

B. Water Testing Equipment: Contractor's Professional Engineer shall furnish proposed testing procedure including but not limited to the following:
   1. Pump equipment.
   1. Packers.
   2. Flowmeters.
   3. Pressure gages.
   4. Pipes and Fittings.

PART 3 - EXECUTION

3.1 GENERAL

A. Unless otherwise directed, the Contractor shall select the drilling method, the grouting procedure and the grouting pressure used for the installation of the rock

anchors.

B. Drilling: Unless otherwise directed, core drilling or rotary drilling can be used. The drill hole shall be located so the longitudinal axis of the drill hole and the longitudinal axis of the tendon are parallel. In particular, the anchor hole shall not be drilled in a location that requires the tendon to be bent in order to enable the bearing plate to be connected to the supported structure. At the point of entry the angle made by the anchor and a line drawn perpendicular to the plane of the structure shall be within plus/minus three (3) degrees.

C. Washing Drill Holes
   1. Washing that is incidental to the drilling operation is not sufficient. Washing shall be performed at the completion of drilling using a wash out bit or attachment as specified in Section 2.5. The washing procedure will continue for each drill hole to the satisfaction of the Engineer. Washed holes shall be temporarily sealed with expandable plugs after washing is complete. The Contractor will be required to rewash any holes not properly protected prior to tendon installation.

D. Water tightness Testing, Pregrouting, Re-drilling, and Retesting
   1. Perform water tightness testing in all anchor holes after initial drilling and washing.
   2. Contractor's Professional Engineer shall prepare a procedure to address anchor holes that fail water tightness testing.

E. If artesian conditions are encountered, the hole should be grouted immediately with the approved mix. Grouting will need to be completed under pressure in excess of the artesian pressure in the hole. The Contractor shall determine the artesian pressure and grout at a pressure 5 psi greater than the artesian pressure of as directed by the Engineer. Continue grouting until there is no measureable grout take over a 10 minute period and maintain pressure on the hole until initial set has occurred or as directed by the Engineer. The Contractor shall propose the grout mix design.

F. Tendon Insertion: The tendon shall be inserted into the drill hole to the desired depth without difficulty. When the tendon cannot be completely inserted, the Contractor shall remove the tendon from the drill hole and clean or redrill the hole to permit insertion. Partially inserted tendons shall not be driven or forced into the hole.

G. Grouting: Grouting shall be performed in accordance with the Contractor's Professional Engineer recommendations.

H. Installation of Trumpet and Anchorage: Trumpet and Anchorage shall be installed in accordance with the Contractor's Professional Engineer recommendations.

I. The bearing plate and anchor head shall be installed in accordance with the Contractor's Professional Engineer recommendations.

3.2 TESTING AND STRESSING

A. Each anchor shall be guaranteed proof tested in accordance with the Contractor's Professional Engineer recommendations. Recommendations shall include acceptance criteria.

B. Performance Test: A minimum of two (2) anchors shall be tested.

+ + END OF SECTION + +

+ + PAPGE LEFT BLANK INTENTIONALLY + +

SECTION 31 52 13

TEMPORARY COFFERDAMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to design, construct, and maintain temporary cofferdams as required to perform the Work.
      a. Temporary cofferdams shall be configured as single row, double row, or cellular sheet pile cofferdams to create a complete system, which may include but is not limited to sheeting, h-piles, bracing, supports, ballast fill, grout, sealants, and other components necessary to complete the work.
      b. Provide temporary pumping to maintain the Work area in a dry condition.
      c. Reconfigure temporary cofferdams as needed to accommodate phasing and sequencing
      d. Temporary cofferdams shall be completely removed upon complete of the work.

B. Related Sections
   1. Section 03 00 05, Concrete.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM A 36/A 36M, Standard Specification for Carbon Structural Steel.
   2. ASTM A 328/A 328M, Standard Specification for Steel Sheet Piling.
   3. ASTM A 416/A 416M, Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete.
   4. ASTM A 572/A 572M, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel,
   5. ASTM A 615/A 615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   6. ASTM A 690/A 690M, Standard Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments.
   7. ASTM A 722/A 722M, Standard Specification for High-Strength Steel Bars for Prestressed Concrete.
   8. ASTM A 992/A 992M, Standard Specification for Structural Steel Shapes.
   9. AASHTO Guide Design Specifications for Bridge Temporary Works, latest version with all interims

10. AASHTO Construction Handbook for Bridge Temporary Works, latest version with all interims
11. AASHTO LRFD Bridge Construction Specifications, latest version with all interims12. AASHTO LRFD Bridge Design Specifications, latest allowed version with interims

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Contractor's Professional Engineer
      a. Engage a registered professional engineer legally qualified to practice in New York State and is experienced in providing engineering services of the kind indicated.
         1) Professional Engineer shall have designed a minimum of 3 cofferdams of similar sizes to those indicated on the Plans. Provide a list of those projects. List for each referenced project, the project start and completion dates, total volume of cofferdam installed, and a detailed description of the project, site conditions, and subsurface conditions. The project description shall include details of the cofferdam, the client name and address, the name and telephone number of the representative of the consultant and owner for whom the work was performed and who can attest to the successful completion of the work, and any other information relevant to demonstrating the engineer's qualifications. Allow 15 calendar days for review of these projects prior to commencing cofferdam design.
      b. Responsibilities include but are not necessarily limited to:
         1) Reviewing system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising the preparation of design calculations and related submittals verifying compliance of the system with the requirements of the Contract Documents.
         4) Signing and sealing all calculations, drawings, and submittals prepared by professional engineer.
            a) Design all cofferdams to resist all dead and live loadings including earth pressures, hydrostatic pressures, point loads, line loads, and surcharge loads that the cofferdam system may experience during the duration of its installation.
         5) Certifying that:
            a) it has performed the design of the system in accordance with the performance requirements stated in the Contract Documents,
            b) the design provides a minimum factor of safety of 1.3 for expected loading throughout the duration of the work, and
            c) the said design conforms to Laws and Regulations, and to the prevailing standards of practice.

2. Cofferdam Contractor
    a. Cofferdam Contractor shall have installed a minimum of 3 cofferdams of similar sizes to those indicated on the Plans. Provide a list of those projects. List for each referenced project, the project start and completion dates, total volume of cofferdam installed, and a detailed description of the project, site conditions, and subsurface conditions. The project description shall include details of the cofferdam, the client name and address, the name and telephone number of the representative of the consultant and owner for whom the work was performed and who can attest to the successful completion of the work, and any other information relevant to demonstrating the engineer's qualifications. Allow 15 calendar days for review of these projects prior to commencing temporary cofferdam.
    b. The Cofferdam Contractor is solely responsible for:
        1) The external and internal stability of the cofferdam system.
        2) Use the soils information provided in the plans for these designs.
        3) If additional cofferdams are required by the Contractor's means and methods, the Contractor is solely responsible for obtaining any required geotechnical information.

B. Regulations: Comply with local codes and ordinances of governing authorities having jurisdiction.

C. Pre-Installation Conference: Conduct conference with Owner, Engineer, Contractor's Professional Engineer, and Cofferdam Contractor responsible for installation of temporary cofferdam.
    1. Review geotechnical report.
    2. Review existing conditions.
    3. Review proposed equipment.
    4. Review monitoring of cofferdam installation.
    5. Review coordination with waterproofing.
    6. Review staging, phasing and sequencing.
    7. Review removal of cofferdam.

1.4 SUBMITTALS

A. Information Submittals: Submit the following:
    1. Layout Drawings: Submit layout drawings for cofferdam and bracing system prepared and sealed by a registered professional engineer licensed in New York State. System design and calculations must be acceptable to local authorities having jurisdiction. Submittal is for information only. Design and construction of cofferdam and bracing remains sole responsibility of the CONTRACTOR.
        a. Include plans, elevations, sections, and details.

b. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of cofferdam support and protection system according to engineering design.
c. Indicate type and location of waterproofing (if any).
d. Include written plan for temporary cofferdam construction.
e. Include locations, quantities, offsets of material stockpiles and equipment during each phase.

2. Design Calculations sealed by a registered professional engineer licensed in New York State. Submittal should also include the following items:
   a. Statement of geotechnical parameters used in design.
   b. Design codes utilized.
   c. Geotechnical calculations demonstrating adequate stability against failure due to bearing, sliding, overturning, or overall (Global) stability of temporary cofferdam.
   d. Structural calculations demonstrating that individual structural components have adequate capacity to resist shear and moment forces.
   e. Structural steel mill test reports for all piles, sheeting, threadbar, strands, casing, waler, strut, bracing or other structural steel element used in the design of the temporary cofferdam.

1.5 SITE CONDITIONS

A. During temporary cofferdam installation, monitor vibrations transmitted to adjacent structures, employing a licensed land surveyor or registered professional engineer. Maintain record of monitored vibrations. Vibrations causing peak velocities in excess of 2 inch per second may cause damage to adjacent structures. CONTRACTOR shall be responsible for damages caused by temporary cofferdam installation.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. OWNER is not responsible for interpretations or conclusions drawn from the data.
   1. Make additional test borings and conduct other exploratory operations necessary for temporary cofferdam design and construction according to the performance requirements.

C. Existing Utilities
   1. Protect existing active sewer, water, gas, electricity, and other utility services and structures.
   2. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services as affected by the Work.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Provide, design, monitor, and maintain temporary cofferdam capable of resisting earth and hydrostatic pressures and construction loads.
   1. CONTRACTOR Design: Design cofferdam system, including comprehensive engineering analysis by a qualified professional engineer.
   2. Create watertight seals to allow construction to be performed in dry conditions.

B. Performance Criteria:
   1. Provide a minimum factor of safety for stability of 1.3 for expected loading conditions.
      a. Minimum loading design shall include dead loads, construction loads, ice loading, normal reservoir elevations, and high water elevations of 1711 at Old Forge Dam and 1791 at Sixth Lake Dam.

2.2 MATERIALS

A. General: Provide materials in accordance with the Contractor's Professional Engineer recommendations.

PART 3 - EXECUTION

3.1 GENERAL

A. Phasing and sequencing of temporary cofferdams shall be as shown on the drawings and as needed to accommodate the Work.
B. Installation of the temporary cofferdams shall be in accordance with the Contractor's Professional Engineer's recommendations.
C. Install temporary turbidity curtain prior to temporary cofferdam construction.
D. Sheeting, bracing, whales, and structural components used to construct the cofferdam shall be steam cleaned before use to prevent introduction of invasive species to the water bodies.
E. Capture and proper disposal of water generated by cleaning shall be included in the cost of the cofferdam installation.
F. Ensure the steel sheet piling sections are plumb prior to driving and are driven at the locations shown on the Contractor's Professional Engineers plans.
G. Do not re-strike, or drive steel sheet piling to a greater depth once concrete is cast adjacent to sheeting sections.
H. The maximum deflection allowed at the top of the steel sheet piling is 2 inches.
I. Do not pull up the sheeting, cut off, and then re-drive.
G. Contractor shall keep a copy of the temporary cofferdam design on site during construction.
H. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that temporary cofferdam remains stable.

3.2 REMOVAL AND REPAIRS

A. Remove temporary cofferdam for each phase of the Work only after dam construction has been inspected and accepted by NYSDEC.
   1. Refill area between temporary cofferdams and completed dam phases at a maximum rate of 1-foot per day.
   2. Remove temporary cofferdam inclusive of all installed components.
   3. Repair finished work and existing surfaces disturbed or damaged by removal of the temporary cofferdam.

+ + END OF SECTION + +

SECTION 32 12 00

FLEXIBLE PAVING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install flexible, hot-mix, hot-laid, asphalt concrete pavement.
   2. The Work includes:
      a. Preparation such as sawcutting, milling where shown or indicated, cleaning, and other preparation for installing flexible pavements.
      b. Providing asphalt concrete paving materials.
      c. Providing tack coat material.
      d. Providing pavement markings where shown or indicated.
      e. Providing quality controls and testing.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before flexible paving Work.
   2. Notify other contractors in advance of installing flexible paving to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before flexible paving Work.

C. Related Sections:
   1. Section 31 23 05, Excavation and Fill.
   2. Section 31 05 19, Geosynthetics for Earthwork.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AASHTO M320, Specification for Performance-Graded Asphalt Binder.
   2. AASHTO MP1a, Specification for Performance-Graded Asphalt Binder.
   3. AI MS-2, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
   4. ASTM C1371, Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
   5. ASTM C1549, Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
   6. ASTM D242/D242M, Specification for Mineral Filler For Bituminous Paving Mixtures.
   7. ASTM D692/D692M, Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.

8. ASTM D946/D946M, Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
9. ASTM D977, Specification for Emulsified Asphalt.
10. ASTM D1073, Specification for Fine Aggregate for Bituminous Paving Mixtures.
11. ASTM D1188, Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
12. ASTM D2726, Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
13. ASTM D2950, Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
14. ASTM D3549, Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
15. ASTM D6690, Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
16. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.
17. ASTM E408, Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
18. ASTM E1918, Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
19. ASTM E1980, Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
20. FS TT-P-115, Paint, Traffic, Highway, White and Yellow.
21. USGBC LEED-NC, Reference Guide, For New Construction and Major Renovation.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Asphalt Concrete Production Facility:
      a. Production facility for asphalt concrete, tack coat materials, and other bitumastic materials shall be certified by the New York State Department of Transportation for furnishing such materials for New York State highways.
   2. Contractor’s Testing Laboratory:
      a. Retain the services of independent testing laboratory to perform testing and determine compliance with the Contract Documents of the materials provided under this Section.
      b. Testing laboratory shall comply with ASTM E329 and requirements of Section 01 45 29.13, Testing Laboratory Services Furnished by Contractor.
      c. Testing laboratory shall be experienced in the types of testing required.
      d. Selection of testing laboratory is subject to Engineer's acceptance.

B. Regulatory Requirements:
   1. Reference Specifications and Details:
      a. Comply with applicable requirements of New York State Department of Transportation Standard Specification Books and Standard Sheet Books.
   2. Obtain required highway and street rights-of-way work permits.
   3. Jurisdiction:
      a. Paved areas to be constructed are jurisdiction of the Town of Webb; the Town of Inlet; or OWNER.

C. Quality Assurance Testing:
   1. Quality assurance testing is in addition to source quality control testing, when required, and field quality control testing required under Article 3.4 of this Section.
   2. Materials used in the Work may require testing and retesting, as directed by Engineer, during the Project. Allow free access to material stockpiles and facilities at all times. Tests not specifically indicated to be performed at Owner's expense, including retesting of rejected materials and installed Work, shall be performed at Contractor's expense.
   3. Contractor's Quality Assurance Testing Laboratory Scope:
      a. Use of testing laboratory shall not relieve Contractor of responsibility for providing materials and the Work in compliance with the Contract Documents.
      b. Quality assurance testing laboratory shall perform the following, unless evidence of material compliance with reference specifications indicated in Paragraph 1.3.B of this Section, is submitted to Engineer by Contractor and asphalt concrete production facility:
         1) Test in accordance with reference specifications indicated in Article 1.3 of this Section. In lieu of quality assurance testing, submit evidence and certification of material compliance with reference specifications. When evidence of conformance submitted is not acceptable to Engineer, perform quality assurance testing.
      c. To facilitate testing services, Contractor shall:
         1) Secure and deliver to testing laboratory and Engineer (when requested by Engineer) representative Samples of materials that Contractor proposes to furnish and that are required to be tested.
         2) Furnish such labor as is necessary to obtain and handle Samples at the Site or at asphalt concrete production facility and other material sources.
         3) Advise testing laboratory and Engineer sufficiently in advance of operations to allow for completion of quality assurance tests and for the assignment of personnel.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:

a. Submit the proposed asphalt concrete mix design for each asphalt concrete material, and other bituminous materials, required under this Section, providing complete data on materials, including location in the Work, source, material content and percentages, temperatures and all other pertinent data. Indicate proportion of bituminous material from reclaimed asphalt pavement.
b. Proposed gradation for each aggregate to be used in flexible paving. Submit gradation test results for the same material furnished on a previous project. Indicate the proportion of reclaimed asphalt pavement.
c. In lieu of the information required under Paragraphs 1.4.A.1.a and 1.4.A.1.b, above, submit certificates of compliance with the reference specifications indicated in Article 1.3 of this Section, for each for the following:
1) Each mix design required.
2) Bituminous materials required.
3) Aggregates to be used in flexible paving, from each material source and each required gradation.
4) Density of uncompacted asphalt concrete material.
5) Density of previously-compacted, previously-tested asphalt concrete material.
6) Density and voids analysis for each asphalt concrete material test specimen.
7) Evidence of asphalt concrete plant inspection and compliance with the reference specifications indicated in Article 1.3 of this Section.
8) Proportion of reclaimed asphalt pavement in bituminous materials and aggregate.

2. Product Data:
a. Manufacturer's complete product data on all pavement marking materials proposed for use, including product literature, specifications, and recommended application techniques and other installation data.

B. Informational Submittals: Submit the following:
1. Quality Assurance Test Data Submittals and Source Quality Control Submittals:
a. Submit for quality assurance tests and source quality control tests required.
2. Delivery Tickets:
a. Submit copy of delivery ticket for each load of asphalt concrete, tack coat materials, and other materials obtained from asphalt concrete production facility, signed by Contractor
3. Field Quality Control Submittals:
a. Submit results of required field quality control testing.
4. Qualifications:
a. Asphalt concrete production facility, when required by Engineer.
b. Contractor's testing laboratory, when required by Engineer.

1.5 SITE CONDITIONS

A. Weather Limitations:
   1. Temperature:
      a. For base course and binder course paving lifts equal to or greater than two inches thickness, atmospheric temperature shall be 40 degrees F and rising.
      b. For surface course paving or other pavement courses in lifts less than two inches thick, temperature of surface on which pavement is to be placed shall be 50 degrees F or greater.
   2. Prohibitions:
      a. Do not place flexible paving materials when weather is foggy or during precipitation.
      b. Do not place flexible paving materials when the base on which the material will be placed contains moisture in excess of optimum.
      c. Place flexible paving materials only when Engineer concurs that weather conditions are suitable.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description:
   1. Provide subbase course of the thickness shown or indicated, in accordance with Section 31 23 05, Excavation and Fill.

2.2 ASPHALT CONCRETE MIXES

A. Asphalt Concrete Mixtures: Provide the following materials designed and manufactured in accordance with reference specifications indicated in Article 1.3 of this Section:
   1. Base Course: NYSDOT Item No. 403.118902, Asphalt Concrete – Type 1 Base Course.
   2. Binder Course: NYSDOT Item No. 403.138902, Asphalt Concrete – Type 3 Binder Course.
   3. Surface Course (Wearing Course, Top Course): NYSDOT Item No. 403.198202, Asphalt Concrete – Type 7 F2 Top Course.

2.3 BITUMINOUS MATERIALS

A. Bituminous Materials for Asphalt Concrete:
   1. Bituminous materials for asphalt concrete shall comply with the reference specifications indicated in Article 1.3 of this Section, for the asphalt concrete mixes specified.
   2. Bituminous Materials from Reclaimed Asphalt Pavement (RAP): When use of RAP in bituminous materials is acceptable, comply with requirements for RAP in Article 2.4 of this Section.

B. Tack Coat:
   1. Tack coat shall be emulsified asphalt.
   2. Provide Item NYSDOT Item. No. 407, "Diluted Tack Coat, in accordance with reference specifications indicated in Article 1.3 of this Section.

C. Crack Sealant:
   1. Provide Item 705-02 Item II Joint Sealant, in accordance with reference specifications indicated in Article 1.3 of this Section.

2.4 AGGREGATES IN FLEXIBLE PAVEMENTS

A. Aggregates for Asphalt Concrete – General:
   1. Aggregate materials used in flexible pavement shall be in accordance with the reference specifications indicated in Article 1.3 of this Section, for the asphalt concrete mix designs indicated.

2.5 PAVEMENT MARKING MATERIALS

A. Material:
   1. Pavement marking paint shall have chlorinated rubber base.
   2. Factory-mixed, quick-drying and non-bleeding, complying with FS TT-P-115, Type III.

B. Colors:
   1. Roadway Miscellaneous Lane Markings (turn lane arrows and text): White.
   2. No-Parking Areas: Yellow.
   3. Handicap Parking Spaces: Unless otherwise indicated with signs, provide handicap symbol on pavement with white paint on blue background.

2.6 SOURCE QUALITY CONTROL

A. Tests: Obtain and test samples in accordance with AI MS-2. Testing is responsibility of Contractor or asphalt concrete production facility. Submit results to Engineer.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the subbase and base on which flexible paving will be installed. Notify Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Do not place materials on subgrades, or subbase that is muddy or has water thereon.

3.2 PREPARATION

A. Preparation: Before starting installation of flexible paving, perform the following:
   1 Grade Control: Establish and maintain throughout flexible paving installation the required lines and grades, including crown and cross-slope for each asphalt concrete course during construction operations.
   2. Prepare subgrade and provide subbase for flexible pavement in accordance with Section 31 23 05, Excavation and Fill. Before installing flexible pavement, obtain Engineer's concurrence that subgrade and subbase are suitable for installing flexible pavement.
   3. Coordinate placement of flexible pavement with the Work and Work including drainage structures, manholes, valve boxes, and similar items.
   4. Provide appropriate maintenance and protection of traffic measures during placement of pavement.

B. Surface Preparation:
   1. Repair surface defects in existing pavement to provide uniform surface to receive new pavement.
   2. Provide crack sealant to completely fill cracks more than 1/16-inch wide in areas shown or indicated on the Drawings.
   3. Clean existing surfaces over which asphalt concrete pavement will be installed, by removing from the surface foreign material, excess asphalt concrete, excess joint sealant, and crack filler, and other undesirable matter.
   4. Provide tack coat as indicated in Article 3.3 of this Section.

3.3 INSTALLATION OF FLEXIBLE PAVING

A. General:
   1. Provide final pavement surfaces of uniform texture, at required grades and cross-sections.
   2. Construct roadways to the lines, grades, and typical sections shown or indicated.

B. Installation of Asphalt Concrete:
   1. Asphalt concrete mixture shall be transported to the site of paving and placed as soon as possible after mixing.
   2. Placement of each asphalt concrete course shall be completed over the full width of the section under construction during each day's paving operations.
   3. Spread and finish asphalt concrete courses by means of self-propelled mechanical spreading and finishing equipment. Compacted thickness of layers placed shall not exceed 150 percent of specified thickness unless approved in writing by Engineer.
   4. Compaction:
      a. Rollers:
         1) Use sufficient rolling equipment to satisfactorily compact and finish the quantity of asphalt concrete placed. There shall be not less than

two rollers on the Project at all times. When acceptable to Engineer, one of the rollers may be a pneumatic-tire roller.

2) During rolling operations, roller speed shall not exceed three miles per hour. When sufficient number of rollers is not available, reduce the quantity of asphalt concrete placed to accommodate the available rollers' speed.
3) Required rollers shall be at the Site, in acceptable operating condition, prior to placing of asphalt concrete.
4) Use of vibratory rollers in lieu of steel-wheeled rollers is acceptable, however when thickness of asphalt concrete is one-inch or less, rolling shall be in the static mode.

b. Rolling of initially-placed asphalt concrete material, or breakdown rolling, shall begin as soon as the asphalt concrete mixture will bear the roller without undue displacement.
c. Rolling shall be longitudinal, overlapping on successive trips by not less than one-half roller rear wheel width, and not more than three-quarters of roller rear wheel width. Alternate trips of the roller shall be of slightly different lengths.
d. At all times, roller motion shall be slow enough to avoid displacing the asphalt concrete.
e. Operate rollers continuously from breakdown of laid asphalt concrete through finish rolling.
f. Perform finish rolling using a steel-wheeled roller or a vibratory steel-wheel roller operating in the static mode.
g. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
h. At each location not accessible to roller, thoroughly compact asphalt concrete with tampers and finish, where necessary, with a hot smoothing iron to provide uniform, smooth layer over the entire area so compacted.

5. Each compacted asphalt concrete course shall be within plus or minus 1/4-inch of the indicated thickness.
6. Placement of Adjacent Strips of New Asphalt Concrete:
   a. When more than one width of asphalt concrete material will be placed, a six-inch wide strip of asphalt concrete adjacent to the area on which the future material is to be placed shall not be rolled until such future material is placed.
   b. Do not leave the unrolled strip unrolled for more than two hours after placement, unless the six-inch unrolled strip is first heated with a joint heater.
   c. After the first strip or width of asphalt concrete is compacted, place, finish, and compact the second width or strip as required for the first width, except that rolling shall be extended to include the six-inch strip of the first width not previously compacted.

C. Construction Joints:
   1. Construction joints shall be made in such a manner as to ensure a neat junction, thorough compaction, and bond throughout.

2. Provide a transverse joint extending over the full width of the strip being laid and at right angles to its centerline at end of each workday and at other times when the placement of hot-mix asphalt concrete will be suspended for a period of time that will allow asphalt concrete mixture to chill.
3. Thoroughly compact by rolling the forward end of a freshly laid strip of asphalt concrete before the asphalt concrete mixture becomes chilled. When the Work is resumed, the end shall be cut vertically for the full depth of the layer.

D. Joining of Pavements:
1. When pavement is to join existing or previously-laid pavement, the existing or previously-laid pavement shall be neatly and carefully edged to allow for overlapping and feathering of the subsequent course of asphalt concrete material.
2. Where new pavement is to meet existing pavement, the existing pavement shall be sawcut and notched.
3. Where new pavement will meet existing asphalt pavement, remove existing pavement 12 inches onto undisturbed existing pavement course at edges where new pavement will meet existing pavement.
4. Tack Coat:
a. Provide tack coat material at the following locations:
1) At edges where new pavement will connect to existing or previously-installed pavement.
2) On surface of existing or previously-installed pavement course over which new pavement will be installed, prior to placement of the subsequent pavement course. Tack coat may be deleted when a succeeding layer of asphalt pavement is being applied over a freshly-placed asphalt pavement course that has been subjected to very little or no traffic, with approval of Engineer
3) Where new pavement will abut curbing, concrete gutters, drainage structures and frames, manhole cover frames, valve boxes, and similar items.
b. Tack Coat Installation: Install tack coat immediately prior to installing pavement. Place pavement while tack coat is wet. Apply tack coat in accordance with reference specification indicated in Article 1.3 of this Section.

E. Curing:
1. Do not allow traffic onto pavement until directed by Engineer. Traffic will not be allowed on new asphalt concrete pavement until surface temperature is less than 140 degrees F.
2. Hold construction traffic on new pavement to a minimum as acceptable to Engineer.

F. Asphalt Concrete Curbs: Provide extruded asphalt curbs of the height and profile indicated on the Drawings.

G. Defective Pavement Work:

1. When directed by Engineer, remove and replace defective flexible paving Work. Cut out such areas of defective pavement and fill with fresh asphalt concrete materials, compacted to required density.

3.4 FIELD QUALITY CONTROL

A. Site Tests:
   1. Responsibility:
      a. Contractor's field quality control testing laboratory will:
         1) Perform field density tests to verify that required compaction of asphalt materials has been obtained.
         2) Test the proposed materials for compliance with the Contract Documents, as directed by Engineer.
         3) Submit reports of all test results to Engineer and Contractor.
      b. Authority Field Quality Control Testing Laboratory:
         1) Technicians representing the testing laboratory will inspect materials at the Site and perform required testing. When the materials furnished or Work performed do not comply with the Contract Documents, field quality control testing laboratory technician shall direct the attention of Engineer and Contractor to such non-compliance.
         2) Testing laboratory personnel shall not act as foreman or perform other duties for Contractor. The Work will be checked as it progresses, but failure to detect defective Work shall not in any way prevent the later rejection of such defective Work when defect is discovered. Failure to detect defective Work as it occurs does not obligate Engineer to final acceptance. Testing laboratory personnel are not authorized to revoke, alter, relax, enlarge, or release requirements of the Contract Documents, nor to approve or accept any portion of the Work.
   2. Asphalt Concrete Mix Temperature: Measure temperature at time of placement, record, and submit to Engineer.
   3. Surface Smoothness:
      a. Test finished surface of each flexible paving course for smoothness, using a ten-foot straightedge applied parallel to and at right angles to centerline of paved areas.
      b. Check surfaced areas at intervals as directed by Engineer.
      c. Surfaces will be acceptable relative to smoothness when measurements are equal to or less than the following:
         1) Base Course: 3/8-inch vertical in ten feet horizontal.
         2) Binder Course: 3/8-inch vertical in ten feet horizontal.
         3) Surface Course (Wearing Course): 1/4-inch vertical in ten feet horizontal.
      d. Elevation: Finished surface of pavement shall be within plus or minus 1/2-inch of elevations shown or indicated.
   4. Density:
      a. Test Method: ASTM D2950 nuclear method; test one sample every 1,000 square yards of pavement. Test for each asphalt concrete course installed.

b. In addition, when directed by Engineer, compare density of in-place flexible paving materials against laboratory specimen or certificates on same asphalt pavement mixture, using nuclear density device.
c. Criteria for Acceptance: Density of in-place asphalt pavement material shall be not less than 90 percent of the recorded laboratory specimen or certificate density. Density shall be not greater than 98 percent.

3.5 ADJUSTING

A. Frames and Covers:
1. Set frames of drainage structures, manholes, valve boxes, and similar items to final grade. Adjust frames of existing structures and frames furnished under other Sections. Frames shall be substantially similar elevation to finished surface course of pavement.
2. Replace covers and gratings of existing structures immediately following adjusting associated frames. Install covers and gratings of structures provided under the Project as quickly as possible.
3. Where there is a delay between adjusting of frames and installation of surface course, provide temporary bituminous material around perimeter of each frame to smooth vehicle access over the frame. Maintain and repair temporary bituminous material as required until placement of surface course. Remove temporary bituminous material before installing surface course.

B. Pavement Adjustment:
1. Repair or replace in manner acceptable to Engineer areas of pavement that are observed to pond or collect water.

3.6 CLEANING

A. Cleaning: After completing the paving operations, clean surfaces of excess or spilled bituminous materials, excess asphalt concrete, and foreign matter.

3.7 PROTECTION

A. Protect finished pavement until pavement has become properly hardened and cool.

B. Cover openings of drainage structures, manholes, valve boxes, and similar items in the paved area until permanent coverings are provided.

3.8 PAVEMENT MARKINGS

A. Pavement Markings: Provide pavement markings where shown or indicated.
1. Preparation:
a. Sweep surface with power broom supplemented by hand brooms to remove loose material and dirt.
b. Do not begin marking bituminous concrete pavement until approved by Engineer.

c. When reflective glass beads are required, mix with paint prior to paint application.

2. Application:
   a. Using mechanical equipment, provide uniform, straight edges in two separate coats. Apply in accordance with paint manufacturer's recommendations.

+ + END OF SECTION + +

SECTION 32 31 00

FENCING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to furnish and install fencing.
   2. Extent of fencing is shown or indicated.
   3. Types of materials required under this Section include:
      a. Aluminum-coated, steel chain link fabric.
      b. Galvanized steel framework.
      c. Grounding and bonding.
      d. Auxiliary system components, gates, accessories, fasteners, and fittings.
   4. Substitutions: Structural shapes of satisfactory sections and equal strengths may be substituted upon Engineer's approval of Contractor's substitution request.

B. Related Sections:
   1. Section 03 30 00, Cast-In-Place Concrete.
   2. Section 03 60 00, Grouting.

.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   2. ASTM A90/A90M, Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
   3. ASTM A123, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   4. ASTM A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   5. ASTM A428/A428M, Test Method for Weight [Mass] of Coating on Aluminum-Coated Iron or Steel Articles.
   6. ASTM A491, Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
   7. ASTM A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   8. ASTM A817, Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric.

9. ASTM A1011/A1011M, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
10. ASTM B6, Specification for Zinc.
11. ASTM D412, Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension.
12. ASTM D746, Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
13. ASTM D792, Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
14. ASTM D1499, Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics.
15. ASTM D2240, Test Method for Rubber Property—Durometer Hardness.
16. ASTM F552, Terminology Relating to Chain Link Fencing.
17. ASTM F567, Practice for Installation of Chain-Link Fence.
18. ASTM F626, Specification for Fence Fittings.
19. ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
20. ASTM F668, Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
21. ASTM F900, Specification for Industrial and Commercial Swing Gates.
22. ASTM F1043, Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
23. ASTM F1083, Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
24. ASTM F1184, Specification for Industrial and Commercial Horizontal Slide Gates.
25. ASTM F1664, Specification for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Tension Wire Used with Chain-Link Fence.
26. ASTM F1665, Specification for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used With Chain-Link Fence.
27. CLFMI CLF 2445, Product Manual.
28. CLFMI, Step-by-Step Installation Guide.
29. IEEE C2, National Electrical Safety Code.
30. IEEE 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements.
31. NEMA ICS 1, Industrial Control and Systems General Requirements.
32. NEMA ICS 2, Industrial Control and Systems: Controllers, Contactors and Overload Relays Rated 600 Volts.
33. NEMA ICS 6, Industrial Control and Systems Enclosures.
34. NEMA MG 1, Motors and Generators.
35. UL 467, Grounding and Bonding Equipment.

1.3 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning.
   1. "Knuckling" describes the type of selvage obtained by interlocking adjacent pairs of wire ends and then bending the wire ends back into a closed loop.
   2. "Gate operating cycle" is one gate opening plus one gate closing.
   3. "Fencing" describes an assembly of metal components, including wire chain-link fabric fastened to top, bottom and intermediate horizontal rails and to vertical line posts, corner posts and terminal posts. This assembly includes all auxiliary components, gates, fittings, fasteners, and other accessories, all with specified protective coatings.

B. Terminology used in this Section and not defined in this Article will be construed in accordance with the terminology used in CLF 2445 and ASTM F552.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Erector/Installer:
      a. Engage a single erector that is skilled and trained, and possesses successful and documented experience installing fencing, and employs only workers with specific skill and successful experience in the type of Work required.
      b. Erector shall be acceptable to fencing manufacturer,
      c. Submit name and qualifications of erector with the following information for a minimum of three successful projects:
         1) Names and telephone numbers of owner and architect or engineer responsible for project.
         2) Approximate fencing contract amount.
         3) Quantity of fencing installed.

B. Component Supply and Compatibility:
   1. Provide fencing as complete system with all gates, hardware, appurtenances and other components produced by a single manufacturer, including custom erection accessories, fittings, clamps, and fastenings as required for complete system.

C. Regulatory Requirements:
   1. Comply with Laws and Regulations, including:
      a. Americans with Disabilities Act of 1990 (Public Law 101-336), Appendix A of 28 CFR 36, Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG).

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings at scale of 1/4-inch equal to one foot of typical fence assembly, identifying all materials, dimensions, sizes, weights, and

finishes of rails, posts, braces, supports and other fencing components. Show fence heights, and locations of gates. Show gate swing, or other operation, hardware, and accessories. Include plans, elevations, and sections, with required installation and operating clearances, and details of post anchorage, attachments, and bracing.

b. List of all hardware, fasteners, and accessories.

2. Product Data:
   a. Copies of manufacturer's technical product information, and specifications for all fencing components.
   b. Data substantiating that materials proposed comply with the following:
      1) Weight of aluminum coating on wire fabrications, in compliance with ASTM A428.
      2). Weight of zinc coating on pipe fabrications, in compliance with ASTM A90.
3. Samples: Engineer's review will be for color and texture only. Compliance with other requirements is Contractor's responsibility. Submit the following:
   a. Each fencing component, fastener, post, rail, support, chain-link fabric type, and other auxiliary and miscellaneous items labeled with identification of proposed use and location.
   b. Sample of each chain-link fabric material, six inches square; and framework members, and typical accessories, each approximately six inches long.
   c. Full range of manufacturer's standard and custom color Samples.

B. Informational Submittals: Submit the following:
1. Certifications:
   a. Submit shipping list for materials used, endorsed with manufacturer's voucher, signed by authorized employee of manufacturer, certifying that material used in fencing complies with the Contract Documents and with the approved submittals.
2. Design Data: Submit with the Shop Drawings:
   a. All structural calculations verifying that all system components comply with requirements of authorities having jurisdiction at the Site.
   b. When proposing fencing framework or other structural components that varies from the Contract Documents, submit fabricator's structural calculations for design of proposed fencing. Structural analysis shall verify that all system components including supports, gates, fasteners, fittings, and connections comply with the Contract Documents and requirements of authorities having jurisdiction at the Site.
3. Manufacturer's Instructions:
   a. Manufacturer's installation instructions.
4. Qualifications Statements:
   a. Erector.

C. Closeout Submittals: Submit the following:
1. None.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:
   1. Packaging and Marking: Comply with CLFMI CLF 2445.
   2. Deliver materials in manufacturer's original, unopened packaging with all factory-applied tags, labels and other identifying information intact, legible and accurately representing material on approved submittals.

B. Storage of Materials:
   1. Store all materials under weatherproof cover, off the ground and away from other construction activities.
   2. Do not store material in a manner that would create a humidity chamber. Provide for free movement of air under protective cover and between components of the fencing.

C. Handling of Materials:
   1. Handle material in manner that is in compliance with manufacturer's recommendations and that avoids damaging coatings.

1.7 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities unless allowed:
   1. in Section 01 14 16, Coordination with Owner's Operations; or
   2. under the following conditions, only after providing temporary utility services according to requirements indicated.
      a. Notify Engineer and Owner not less than 10 days in advance of proposed utility interruptions.
      b. Do not proceed with utility interruptions without Engineer's written permission.

B. Obtain measurements at the Site to verify layout information and dimensions for fencing and gates in relation to reference points provided by Owner or indicated in the Contract Documents.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Considerations:
   1. Verify size of framing members shown or indicated in the Contract Documents. Where structural analysis indicates the need, provide additional members, or increased member size, thickness or weight.
   2. Modifications may be made only as necessary to meet Site conditions to ensure proper fitting and support of the Work and only upon submittal of Shop Drawings and receipt of approval by Engineer.

2.2 MATERIALS

A. General:
   1. Tube sizes specified are nominal outside dimension.
   2. Roll-formed section sizes are nominal outside dimensions.
   3. Wire gages shall conform to American Steel and Wire Company gage.
   4. Heat-form arcs and chords before applying protective coatings to metal.
   5. Sizes specified are given for uncoated metal. Protective coatings are in addition to specified metal dimensions, gages, and sizes.
   6. Provide weights of zinc and aluminum coatings on wire and pipe fabrications in accordance with CLFMI CLF 2445.
   7. Provide thickness of PVC coating on wire and pipe fabrications in accordance with CLFMI CLF 2445.

B. Chain-Link Fence Fabric:
   1. One-piece fabric widths, for fencing 12 feet and less in height, complying with CLFMI CLF 2445.
   2. Wire mesh shall be woven throughout in form of approximately-uniform square mesh with parallel sides and horizontal and vertical diagonals of approximately-uniform dimensions, of size and gage specified and in compliance with ASTM A817, Type 1, cold-drawn carbon steel wire with minimum breaking strength of 2,170 pounds and coated with aluminized finish, as specified. Fabric shall be as recommended by CLFMI for heavy industrial usage.
   3. Provide fence fabric imprinted with manufacturer's trade name, country of origin, core wire gage, and finished outside diameter gage.
   4. Provide fabric knuckled to eliminate exposure of sharp edges.
   5. Fabric Gage: Provide the following:
      a. No. 9-gage wires.
   6. Mesh Size: Provide the following:
      a. Two-inch mesh.

2.3 FRAMEWORK

A. General: The following table presents actual OD and equivalent nominal NPS size and trade size of round members:

Actual OD (inches)	NPS Size (inches)	Trade Size (inches)
1.315	1.0	1-3/8
1.660	1.25	1-5/8
1.900	1.5	2
2.375	2.0	2.5
2.875	2.5	3
3.500	3.0	3.5
4.000	3.5	4
6.625	6.0	6-5/8
8.625	8.0	8-5/8

B. Pipe shall be commercial grade, plain-end steel pipe with standard-weight walls. Steel strip used for manufacture of pipe shall comply with ASTM F1083, Schedule 40 pipe with minimum yield strength of 25,000 psi and protected with zinc, as specified.

C. Fittings: Comply with ASTM F626.

D. End, Corner, and Pull Posts: Provide end, corner, and pull posts of following minimum sizes:
   1. Over six feet fabric height and less than eight feet fabric height:
      a. 2.875 inches OD pipe weighing 5.79 pounds per linear foot.

E. Line Posts: Provide line posts of following minimum sizes and weights:
   1. Over six feet fabric height and less than eight feet fabric height:
      a. 2.375 inches OD pipe weighing 3.65 pounds per linear foot.

F. Gate Posts: Provide gate posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
   1. Up to six feet wide:
      a. 2.875 inches OD pipe weighing 5.79 pounds per linear foot.

G. Top Rail: Provide top rails, unless otherwise shown or indicated, conforming to the following:
   1. 1.900 inch OD pipe weighing 2.72 pounds per linear foot.
   2. Provide in manufacturer's longest lengths, with expansion-type coupling 0.051-inch thick rail sleeves, approximately seven inches long, for each joint.
   3. Provide means for attaching top rail securely to each gate, corner, pull, and end post.

H. Center Rails Between Line Posts: Provide center rails between line posts, where shown, consisting of 1.660-inch OD pipe weighing 2.27 pounds per linear foot.

I. Roll-Formed Steel: Provide rolled steel shapes produced from structural-quality steel conforming to ASTM A1011, Grade 45, with minimum yield strength of 45,000 pounds psi. Protective coating system shall conform to ASTM F1043, as specified.

2.4 GATES

A. Swing gates shall comply with ASTM F900.

B. Padlocks: Provide each gate with heavy-duty bronze padlock and shackle chain as follows:
   1. Product and Manufacturer: Provide one of the following:
      a. No. 160DHM with 11/32-inch marine brass shackle by Master Lock Company.

b. Or equal.

2. Provide three keys for each padlock. Where more than one gate is required for same enclosure, padlocks shall be keyed identically.

C. Provide gate frames with intermediate horizontal rails. Gate frames shall be welded construction and shall be galvanized after fabrication. Provide single gates six feet or greater in width, and double gates 12 feet or greater in width, with diagonal bracing in one direction, extending from top to bottom rail.

D. Fabricate gate perimeter frames of tubular members. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, and accessories. Space so that frame members are not more than eight feet apart. Fabricate as follows:

1. Over six feet high, or leaf width exceeding eight feet:
   a. 1.900-inch OD pipe weighing 2.72 pounds per linear foot.

H. Assemble gate frames by welding or with special malleable or pressed steel fittings and rivets for rigid connections. Use same fabric as provided for fence. Install fabric with stretcher bars at vertical edges. Bars may also be used at top and bottom edges. Attach stretchers to gate frame at not more than 15 inches on centers. Attach hardware with rivets or by other means that will provide security against removal and breakage.

I. Install diagonal cross-bracing on gates consisting of 1/2-inch diameter adjustable length truss rods provided with turnbuckles to ensure frame rigidity without sag or twist.

2.5 AUXILIARY FENCING MATERIALS AND ACCESSORIES

A. Wire Ties:

1. For tying fabric to line posts, use nine-gage, aluminum alloy 1100-H4, PVC-coated wire ties to match fence fabric, spaced 12 inches on centers.
2. For tying fabric to rails and braces, use nine-gage, aluminum alloy 1100-H4, PVC-coated wire ties to match fence fabric, spaced two feet on centers.
3. For tying fabric to tension wire, use 11-gage, aluminum alloy 1100-H4, PVC-coated wire hog ring ties to match fence fabric, spaced two feet on centers.

B. Tension Wire: Provide tension wire consisting of aluminized, seven-gage, coiled spring steel wire coated with 0.40-ounces of aluminum per square foot of wire surface, minimum, in compliance with ASTM F1664.

1. Locate at bottom and top of fabric.

C. Post Caps: Pressed steel, wrought iron, or cast aluminum alloy, designed as weather-tight closure cap, for tubular posts. Provide one cap for each post unless equal protection is afforded by combination post-top cap and barbed wire supporting arm, where barbed wire is required.

1. Provide caps with openings to allow through-passage of top rail.

2. Provide cone-type caps for terminal posts and loop-type caps for line posts.

D. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16-inch by 3/4-inch. Provide one stretcher bar for each gate and end-post, and two for each corner- and pull-post, except where fabric is integrally woven into the post.

E. Stretcher Bar Bands: Pressed steel, galvanized, 0.078-inch to 0.108-inch thick depending on post diameter, spaced not greater than 15 inches on centers to secure stretcher bars to end-, corner-, pull-, and gate-posts.
   1. Bands may also be used with special fittings for securing rails to end-, corner-, pull-, and gate-posts.

F. Truss Rods: Steel rods, 3/8-inch diameter, merchant quality with turnbuckle.

G. Concrete: In accordance with Section 03 30 00, Cast-In-Place Concrete.

2.6 FENCE GROUNDING

A. Conductors: Bare, solid wire for No. 6-gage and smaller, stranded wire for No. 4-gage and larger.
   1. Material Above Finished Grade: Copper.
   2. Material On or Below Finished Grade: Copper.
   3. Bonding Jumpers: Braided copper tape, one inch wide, woven of No. 30-gage bare copper wire, terminated with copper ferrules.

B. Connectors and Ground Rods: As listed in UL 467.
   1. Connectors for Below-Grade Use: Exothermic welded type.
   2. Ground Rods: Copper-clad steel.
      a. Size: 5/8-inch by eight feet.

2.7 FINISHING

A. Chain-Link Fence Fabric:
   1. Aluminized finish with not less than 0.40 ounces aluminum per square foot, complying with ASTM A491, Class II.

B. Framework and Appurtenances: Provide the following finishes for steel framework, auxiliary system components, and miscellaneous accessories:
   1. Galvanizing: Zinc for galvanizing shall be of High Grade or Special High Grade conforming to ASTM B6 with maximum aluminum content of 0.01 percent. Galvanize metal using hot-dip process in accordance with the following:
      a. Structural Iron and Steel Shapes: ASTM A123
      b. Rolled-Form Sheet Steel: ASTM A653
      c. Hardware and Accessories: ASTM A153
      d. Fittings: ASTM F626
      e. Pipe: ASTM A53

2. Provide minimum weights of zinc as follows:
    a. Pipe: 1.8-ounces of zinc per square foot. Apply Type A coating both inside and outside according to ASTM F1043, as determined by ASTM A90.
    b. Rolled-Form Sheet Steel: 4.0-ounces of zinc per square foot of surface area.
    c. Hardware and Accessories: Zinc weights in compliance with Table 1 of ASTM A153.

C. Welded Joints:
    1. Repair zinc coatings at welded joints by applying zinc-rich paint, as specified in Section 09 91 00, Painting, and ASTM A780.
    2. Repair polymer-coated steel by applying an epoxy primer, intermediate coat and urethane topcoat, as specified in Section 09 91 00, Painting, matching color and reflectivity of adjacent PVC finish.

2.8 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:
    1. Fabric, posts, rails, and other supports shall be straight or uniformly curved to provide the profiles shown, to dimensional tolerance of 1/16-inch in 10 feet without warp or rack in the finished Work.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be erected and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 ERECTION

A. Comply with CLFMI Step-by-Step Installation Guide and ASTM F567. Do not begin installation and erection of fencing until final grading is completed.

B. Excavation: Drill holes of diameters specified, for post footings in firm, undisturbed or compacted soil.
    1. For posts set in cast-in-place concrete, provide hole diameters dug or drilled a minimum of four times the largest cross section of post.
        a. Unless otherwise shown or indicated, excavate hole depths approximately three inches lower than bottom of post, with bottom of posts set not less than two feet below the surface of finished grade when in firm, undisturbed soil, plus an additional three inches for each foot increase in the fence height over four feet.
    2. Spread soil from excavations uniformly adjacent to fence line, or on adjacent areas of the Site, as directed by Engineer.

3. When solid rock is encountered at ground surface, drill into rock at least 12 inches for line-posts and at least 1.5 feet for end-, pull-, corner-, and gate-posts. Drill hole at least one inch greater diameter than largest dimension of post to be placed.
    a. If solid rock is below soil overburden, drill to full depth required, except penetration into rock need not exceed the minimum depths specified above for rock encountered at ground surface.

C. Setting Posts: Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete.
1. Center and align posts in holes 3-inches above bottom of excavation.
2. Posts shall be set in concrete footings, except as otherwise shown or specified. Place concrete around posts in continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
3. Extend concrete to two inches above ground surface, or to two inches below ground surface if cover of sod, bituminous asphalt paving, or other material is shown or indicated to conceal concrete. Crown to shed water away from posts.
4. Extend footings for gate posts to underside of bottom hinge. Set keeps, stops, sleeves, and other accessories into concrete as required.
5. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with membrane curing materials, or other acceptable curing method.
6. Grout posts set in sleeved holes, concrete constructions, or rock with grout, as specified in Section 03 60 00, Grouting, and as recommended in CLFMI CLF 2445.

D. Concrete Strength: Allow concrete to attain at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than seven days after placement, before installing rails, tension wires, barbed wire, or chain-link fabric.
1. Do not stretch and tension fabric and wires, and do not hang gates, until concrete has attained its full design strength.

E. Posts and Rails:
1. Line Posts: Set posts in cast-in-place concrete footings as specified, spaced not more than ten feet on centers. Provide caps on top of each post to exclude moisture and to receive top rail, unless equal protection is afforded by combination post-top cap and barbed wire supporting arm, where barbed wire is required.
2. Top Rails: Run rail continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer to form continuous rail between terminal posts.
3. Center Rails: Provide center rails, where shown or specified, erected in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.

4. Brace Assemblies: Install braces so posts are plumb when diagonal rod are under proper tension. Install brace assemblies at end-posts and at both sides of corner- and pull-post panels. Panels adjacent to gates shall have intermediate horizontal rails and diagonal bracing. Diagonal bracing shall run from center of first line-post to bottom of terminal-post.

F. Chain-Link Fabric:
1. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released. Fasten to terminal posts and gate posts with tension bars threaded through mesh and secured with tension bands at maximum intervals of 14 inches.
2. Tie to line-posts, gate frames and top and bottom rails with tie wires spaced at maximum 12 inches on posts and two feet on rails.
3. Connect tension bars to posts and frames by means of adjustable bolts and bands spaced not more than 14 inches apart.
4. Leave approximately two inches between finish ground surface and bottom selvage, except where bottom of fabric extends into concrete.
5. Join roll of chain-link fabric by weaving a single picket into the ends of roll to form continuous mesh.

G. Stretcher Bars: Thread through or clamp to fabric four inches on centers, and secure to posts with metal bands spaced 15 inches on centers.

H. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as shown on approved Shop Drawings. Adjust hardware for smooth operation and lubricate where necessary.

I. Tie Wires: Use U-shaped wires conforming to diameter of pipe. Clasp pipe and fabric firmly with ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons and clothing.

J. Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.3 GROUNDING AND BONDING

A. Protection at Crossings of Overhead Electrical Power Lines: Ground fencing at location of crossing and at maximum distance of 150 feet on each side of crossing.

B. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2, unless otherwise shown or indicated.

C. Grounding Method: At each grounding location, drive ground rod vertically until the top is six inches below finished ground surface. Connect rod to fence with No. 6-gage conductor. Connect conductor to each fence component at grounding location, including the following:

D. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

E. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Provide connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
   1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
   2. Make connections with clean, bare metal at points of contact.
   3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
   4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
   5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.4 FIELD QUALITY CONTROL

A. None.

3.5 ADJUSTMENT AND CLEANING

A. Repair coatings damaged in the shop or at the Site by recoating with manufacturer's recommended repair compound, applied in accordance with manufacturer's directions. Repair hot-dip galvanized coatings in accordance with ASTM A780.

B. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, and malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

C. Lubricate operating equipment and clean exposed surfaces.

D. Repair and replace broken or bent components.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

SECTION 32 92 00

LAWNS AND MEADOWS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install all lawns and meadows.
   2. Extent of lawns and meadows is shown.
   3. Types of products required include the following.
      a. Topsoil.
      b. Lawn grass seed.
      c. Meadow grass seed mixture.
      d. Organic soil amendments.
      e. Fertilizers.
      f. Mulches.
      g. Erosion-control materials.
      h. Accessories.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, lawns and meadows.
   2. Notify other contractors in advance of the planting of lawns and meadows to provide them with sufficient time for the installation of items that must be installed with, or before, lawns and meadows.

C. Related Sections:
   1. Section 33 11 00, Clearing and Grubbing.
   2. Section 32 31 00, Fences.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. Association of Official Analytic Chemists, (AOAC).
      a. Official Methods of Analysis of AOAC International.
   2. Association of Official Seed Analysts, (AOSA).
      a. Journal of Seed Technology; Rules for Testing Seeds.
   3. American Society of Agronomy, (ASA).
      a. Reference No. 1 - Methods of Soils Analysis, Soil Science Society of America, Incorporated.
   4. American Society for Testing and Materials, (ASTM).

a. ASTM B 221, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
b. ASTM C 602, Specification for Agricultural Liming Materials.
c. ASTM D 75, Practice for Sampling Aggregates.
d. ASTM D 6913, Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
e. ASTM D 977, Specification for Emulsified Asphalt.
f. ASTM D 2487, Practice for Classification of Soils for Engineering Purposes (United Soil Classification System).
g. ASTM D 5268, Specification for Topsoil Used for Landscape Purposes.
h. ASTM E 329, Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
i. ASTM E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.

5. Turfgrass Producers International, (TPI).
   a. Guideline Specifications to Turfgrass Sodding.

1.3 DEFINITIONS

A. The term “finish grade” shall be used to describe the finished surface elevation of planting soil.

B. The term “manufactured topsoil” shall be used to describe soil produced off-Site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil acceptable as a component of loam.

C. The term “loam” shall be used to describe topsoil that has been mixed with additional organic and inorganic additives, as specified.

D. The term “percentage pure live seed” shall be defined as the percent (%) purity multiplied by percent (%) germination divided by 100 to equal the percent pure live seed (PLS) and shall be calculated for all seed lots using each seed lots own unique purity and germination test results. A PLS pound shall be defined as the bulk weight of seed required to equal one pound of 100 percent pure, germinated seed.

E. The term “subgrade” shall be used to describe the surface of subsoil remaining after completing excavation; or the top surface of a fill or backfill immediately beneath topsoil and which has not been tested for acceptable use as topsoil.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Engage a single landscape installer skilled, trained and with successful and documented experience in the planting of lawns and meadows and with specific skill and successful experience in the installation of the types of

materials required; and who agrees to employ only tradesmen with specific skill and successful experience in this type of Work. Submit names and qualifications to Engineer along with the following information on a minimum of three successful projects:

a. Names and telephone numbers of owner, architects or engineers responsible for projects.
b. Approximate contract cost of the lawns and meadows.
c. Amount of area installed.

2. Installer's Site Supervisor: Require installer to maintain an experienced full-time landscape supervisor on-Site during the time of preparation for, and planting of, lawns and meadows. Supervisor shall have achieved landscape or horticultural certification acceptable to governing authorities having jurisdiction at the Site.
3. Ratio of laborers to certified landscape supervisors shall not exceed 12 to one. Certified landscape supervisor shall be on-Site throughout the day-to-day performance of the Work of this Section.
4. Application of herbicides, chemicals and insecticides shall be done by personnel licensed to perform such applications by governing authorities having jurisdiction at the Site and in accordance with each manufacturer's instructions provided on each product label.

B. Soil-Testing Laboratory Qualifications:
1. An independent laboratory, recognized by governing authorities having jurisdiction at the Site, with the experience and capability to conduct testing indicated and that specializes in types of soil tests to be performed.
2. To qualify for approval, an independent testing agency shall demonstrate to Engineer's satisfaction, based on evaluation of criteria submitted by testing agency, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work, in accordance with ASTM E 329 and as documented according to ASTM E 548.

C. References: Comply with the applicable requirements referenced in Section 01 42 00, References.

D. Soil Analysis: Furnish report of soil analysis to Engineer, prepared by a qualified soil-testing laboratory, stating percentages of organic matter; mechanical gradation of sand, silt, and clay content in compliance with ASTM D 6913; cation exchange capacity; sodium absorption ratio; deleterious materials content; pH; and mineral and plant-nutrient content of soil. Chemical analysis shall include tests for percentages of nitrate nitrogen, ammonium nitrogen, phosphorus, potassium, calcium, iron, manganese, copper, zinc, and total soluble salts.
1. Manufactured Imported Topsoil:
a. Test each 1000 cubic yards of manufactured topsoil at the proposed source. In addition, after Engineer's approval of manufactured topsoil based on results and recommendations of soil testing reports, test each 1000 cubic yards of manufactured topsoil that is delivered to the Site for conformance to results and recommended modifications of

approved soil test reports. Manufactured topsoil that differs from proposed source material, after modification according to recommendations of soil test reports, shall be rejected for use in the Work.

b. Obtain a one cubic foot representative sample for each 1000 cubic yards of manufactured topsoil proposed for lawn and meadow Work, in compliance with ASTM D 75 and Appendixes, for securing samples from stockpiles.

c. Place samples taken from each stockpile into separate clean, new and previously unused, containers and mix thoroughly. Maintain separation and legible labeling of each sample, taken from each stockpile, throughout the process of mixing, drying and delivering to soil analysis laboratory. Label samples on outside of container.

d. Take one cup of topsoil from each container and allow to dry at room temperature. Once dry, place each one-cup sample in a separate, accurately labeled, new and previously unused one-cup sized plastic container, seal tightly and deliver to soil testing laboratory.

e. Report suitability of manufactured topsoil as a component for lawn and meadow plant growth. State recommended quantities of nitrogen, phosphorus, secondary and micronutrients, potash and soil amendments to be added to produce satisfactory manufactured topsoil. Include calculations, types of fertilizer and recommendations for application rates in either gallons or pounds per cubic foot of manufactured topsoil.

f. Organic component of manufactured topsoil shall be obtained from compost and peat moss amendments specified, for such material to be used as loam.

E. Source Quality Control:

1. Analysis and Standards: Package all products with manufacturer's certified analysis performed in accordance with methods established by AOAC, wherever applicable, or as specified.
2. Provide manufactured imported topsoil from a commercial processing facility specializing in the manufacture of topsoil.
3. Seed that has been stored at temperatures, or under conditions not recommended by the seed supplier, or has become wet, moldy, or otherwise damaged, shall not be acceptable. The PLS for each seed lot shall be 75 percent, minimum.
4. Certify that all seed has been stored under conditions recommended by the seed supplier and has not been subjected to conditions damaging to PLS percentages.
5. Seed may be mixed by an approved method on-Site or at the seed supplier’s facilities. If the seed is mixed on-Site, each variety shall be delivered in the original containers and shall bear the supplier’s certified analysis. Where seed is mixed by the seed supplier, provide Engineer with the seed supplier’s certified statement as to the composition of the mixture.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Schedule for lawn and meadow-planting showing anticipated planting dates for each type of Work.
   2. Product Data:
      a. Manufacturer's product data, specifications and installation instructions for all required materials.
      b. Composition and analysis of commercial fertilizers and all purchase receipts showing the total quantity actually purchased for this Project.
      c. Proportions of each component contained in hydro seed mixture. Identify number of pounds of each component required for each 100 gallons of water. Include the number of square feet of lawn, grass meadow or wildflower meadow mixture that can be installed with each full tank of hydro seed mixture.
      d. PLS for each type of seed and each seed lot. Include bulk weight of seed required to equal one pound of 100 percent pure, germinated seed.
   3. Samples:
      a. Submit 12-inch by 12-inch sheet of erosion control fabric with manufacturer’s selections of standard biodegradable filler papers, and yarns.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certification of Grass and Wildflower Seed: For each grass-seed monostand and seed mixture, furnish seed supplier’s certification stating the botanical and common name, and percentage by weight of each species and variety, and percentage of purity, germination and weed seed. Include the year of production and date of packaging. Certify that seed has been stored in compliance with all recommendations of the seed supplier.
      b. Certificates of inspection as may be required by governmental authorities to accompany shipments, and manufacturer's certified analysis for soil amendments and fertilizer materials. For standard products submit other data substantiating that materials comply with specified requirements.
   2. Test Reports: Submit the following:
      a. Soil analysis reports for existing soil and imported manufactured topsoil, as specified. Include recommendations for remediating existing soil into acceptable topsoil.
   3. Qualifications Data: Submit qualifications data for the following:
      a. Landscape installer.
      b. Landscape supervisor.
      c. Testing agency.
   4. Source Quality Control Submittals

a. Written statement providing the location from which manufactured topsoil is to be obtained and the names and addresses of the suppliers.

C. Closeout Submittals: Submit the following:
1. Operations and Maintenance Data:
a. Submit recommended procedures to be established by Owner for the maintenance of lawns and meadows for one full year. Submit prior to expiration of required maintenance period.
2. Warranty Documentation:
a. Submit written warranty, signed by Contractor and landscape installer, as specified.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
1. Do not deliver seed until Site conditions are ready for installation.
2. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery.
3. Deliver seed in undamaged, original containers, sealed by the supplier and indicating compliance with approved Shop Drawings.
4. Inspect lawn and meadow materials upon arrival at Site. Immediately and permanently remove unacceptable materials from Site.

B. Storage of Materials:
1. Store and cover materials to prevent deterioration. Remove packaged materials that become wet or show deterioration or water marks from the Site.
2. Seed that becomes wet, moldy or damaged during the time of storage on-Site or that has been damaged during transit is not acceptable.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
1. Proceed with and complete lawn and meadow planting as rapidly as portions of the Site become available, working within the seasonal limitations for each type of lawn, grass and wildflower planting required.
2. Proceed with planting only when current and forecasted weather conditions are favorable to successful planting and establishment of lawns and meadows.
a. Do not spread seed when wind velocity exceeds five miles per hour.
b. Do not plant when drought, or excessive moisture, or other unsatisfactory conditions prevail.
3. Herbicides, chemicals and insecticides shall not be used on areas bordering wetlands.

B. Scheduling:

1. Coordinate planting with specified extended service periods to provide required service from date of Substantial Completion. Plant during one of the following periods:
   a. Spring Planting: March 15 to June 1.
   b. Fall Planting: September 1 to October 30.
2. Do not begin lawn and meadow planting until water, acceptable for use and adequate in supply, is available on-Site and can be successfully transported to the areas of Work. Coordinate provision of adequate and acceptable water supply with Project Schedule.
3. Do not proceed with installation of loam until all subgrade utility services have been installed, are operating successfully and have been approved by Engineer.

C. Pre-installation Conference:
   1. Prior to commencement of lawn and meadow planting and associated Work, Contractor shall schedule and meet at the Site with the landscape installer, the installers of other Work in and around lawn and meadow areas that follows the lawn and meadow Work, including fencing Work specified in Section 32 31 00, Fences; and Engineer and other representatives directly concerned with performance of the Work. Review foreseeable methods and procedures related to the lawn and meadow Work, including the following:
      a. Review Project requirements and the Contract Documents.
      b. Review required submittals, both completed and yet to be completed.
      c. Review availability of water and methods of delivery.
      d. Review status of below-grade work and required access during lawn and meadow planting and establishment.
      e. Review Project Schedule and availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
      f. Review environmental conditions, other Project conditions, and procedures for coping with unfavorable conditions.
      g. Review procedures required for protection of lawns and meadows during the remainder of the construction period.
      h. Review required inspection, testing, and certifying procedures.
   2. Record the discussions of the Pre-installation Conference and the decisions and agreements or disagreements reached, and furnish a copy of the record to each party attending.
   3. Record all revisions or changes agreed upon, reasons therefor, and parties agreeing or disagreeing with them.
   4. Reconvene the meeting at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.

1.8 WARRANTY

A. General Warranty: The special warranties specified in this Article shall not deprive Owner of other rights or remedies Owner may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under the Contract Documents.

B. Special Warranties: Warranty lawns and meadows through the specified extended service period.

1.9 EXTENDED SERVICE

A. Extended Lawn Service:
   1. Begin extended service immediately after each lawn area is acceptably established. Provide extended service for not less than the following periods:
   2. Seeded Lawns: Sixty days from date after lawn areas are acceptably established.
      a. When full service period has not elapsed before end of planting season, or if lawn is not acceptably established, continue service during next planting season.
   3. Service lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
      a. In areas where mulch has been disturbed by wind or extended service operations, add new mulch. Anchor as required to prevent displacement.
   7. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources. Keep newly germinated plants uniformly moist to a depth of 4-inches, applied at a minimum rate of 1-inch per week, or greater as required to maintain minimum moisture depth specified. Provide and maintain watering gages and soil moisture probes until end of maintenance period.
      a. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
      b. After plants have their first true leaves and grasses show mature blades, watering shall be performed to provide moisture to a depth of 6-inches, and not performed again until top 1-inch of loam has dried.
   8. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass-leaf height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowing to maintain the following grass height:
      a. Mow grass 1 to 2-inches high.
   9. Lawn Fertilization: Apply fertilizer after initial mowing and when grass is dry.
      a. Use fertilizer that will provide actual nitrogen of at least one pound for each 1000 square feet of lawn area.
   10. After seed has passed its expected germination period, reseed all areas and parts of areas that fail to show a uniform stand of grass. Reseed repeatedly until all areas are covered with grass.

B. Extended Meadow Service:
   1. Begin extended service immediately after each meadow area is satisfactorily established and continue for not less than 40 days.
   2. Service meadow by watering, weeding, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch.
   3. Watering: Provide and maintain temporary piping, hoses, and meadow-watering equipment to convey water from sources. Keep meadow uniformly moist to a depth of 6-inches. Provide and maintain watering gages and soil moisture probes until end of maintenance period.
      a. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
      b. Water meadow at a minimum rate of 1/2-inch per week for eight weeks after planting.
      c. After plants have their first true leaves and grasses show mature blades, perform watering to provide moisture to a depth of 8-inches, and do not perform again until top 1-inch of loam has dried.
   4. Provide a report cataloging those species present in the meadow mix that can be expected not to germinate in the first growing season. Recommend action for introducing species, originally present in the meadow mix, that do not appear after two seasons, including best introduction method for each species identified as a slow germinator. Recommend maintenance to enhance the diversity of plant species present in the meadow.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
   1. All soil accepted as topsoil, whether obtained from on-Site or off-Site sources, shall comply with specified topsoil analysis.
   2. Provide fertile, friable, natural loam, surface soil, capable of sustaining vigorous plant growth; free of any admixture of subsoil, clods of hard earth, plants or roots, sticks, stones larger than 1-inch in diameter, or other extraneous material harmful to plant growth, in compliance with ASTM D 5268. Provide topsoil with the following analysis:
      a. 3/4-inch mesh: 100 percent passing.
      b. No. 4-sieve: 90 to 100 percent passing.
      c. No. 200-sieve: 0 to 10 percent passing.
      d. Clay content of material passing No. 200-sieve not greater than 60 percent, as determined by hydrometer tests.
      e. pH-adjusted with ferrous sulphate or ground limestone to provide pH 5.5 to pH 7.0 at time of installation of lawns, grass and meadow areas, unless particular species of grass or wildflower stand requires a different pH to meet its growing needs.

f. Electrical conductivity of a 1:2 soil-water suspension shall not exceed 1.0 milliohm per centimeter and with less than 200 parts per million of extractable aluminum.
g. Cation Exchange Capacity: 5, minimum.
h. Organic content not less than five percent, as determined by ignition loss of oven-dried samples passing No. 10-sieve (Muffle Furnace Temperature: 110 plus or minus five degrees C for eight hours).
i. Free of pests and pest larvae.

3. Topsoil Source: Amend existing in-place surface soil to produce topsoil, where possible. Verify suitability of surface soil to produce topsoil, as specified. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
   a. Supplement acceptable surface soil with manufactured topsoil from off-Site sources, when quantities available on Site are insufficient to complete the Work.

B. Lawn Grass Seed:
   1. Lawn Grass Seed Mixture: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by AOSA. Provide seed of the grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, specified.
   2. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 80 percent pure seed, and not more than 0.25 percent weed seed by weight:
      a. Full Sun: Kentucky Bluegrass (Poa pratensis), a minimum of three cultivars.

C. Meadow Grass Seed:
   1. Tall Grassy Meadow with Minor Forbs: Provide a mixture of fresh, clean, new-crop seed complying with the tolerance for purity and germination established by AOSA. Provide seed of each species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed specified.
   2. Seed Species: Seed of grass and forb species as follows, with not less than 95 percent germination, not less than 80 percent pure seed, and not more than 0.25 percent weed seed by weight:
      a. Full Sun: Proportioned by weight as follows:
         1) Ten percent Big Bluestem (Andropogon gerardii).
         2) Three percent Patridge Pea (Chamaecrista fasciculata).
         3) Ten percent Silky Wild Rye (Elymus villosus).
         4) Fifty percent Creeping Red Fescue (Festuca ruba).
         5) Five percent Deertongue (Panicum clandestinum).
         6) Five percent Switchgrass (Panicum virgatum).
         7) Five percent Foul Bluegrass (Poa palustris).
         8) Two percent Black-Eyed Susan (Rudbeckia hirta).
         9) Five percent Little Bluestem (Schizachyrium scoparium).
         10) Five percent Indiangrass (Sorghastrum nutans).

D. Organic Soil Amendments:
   1. Compost: Well-composted, stable, weed-free organic matter, produced by the aerobic decomposition of organic residues; pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch screen; soluble salt content of 5 to 10 decisiemens/meter; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
      a. Organic Matter Content: 50 to 60 percent of dry weight.
      b. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
   2. Peat: Partially decomposed stems and leaves of several species of sphagnum moss; finely divided or granular texture. Supply shredded material, free from lumps, wood, roots, stones, decomposed collodial residue and other extraneous foreign matter, capable of passing through a 1/2-inch screen, which can easily be incorporated with the soil. Supply material, which has been conditioned in storage piles after excavation for at least six months, including one freezing and thawing period. Supply peat humus with the following analysis:
      a. Not less than 90 percent organic matter by weight on an ovendry basis.
      b. pH range of 3.4 to 4.8.
      c. Moisture content 35 percent at time of incorporation into soil.
      d. Water absorbing ability 150 percent to 350 percent by weight.
   3. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
   4. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

E. Fertilizers:
   1. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of four percent nitrogen and 20 percent phosphoric acid.
   2. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
   3. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   4. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
      a. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

F. Mulches:

1. Straw Mulch: Provide air-dry, clean, mildew- and certified seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
2. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch screen; soluble salt content of 5 to 10 decisiemens/meter; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
    a. Organic Matter Content: 30 to 70 percent of dry weight.
    b. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
4. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
5. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

G. Erosion-Control Materials:
1. Erosion-Control Blankets: 100 percent biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended 6-inches long steel wire staples.

H. Accessories:
1. Provide herbicides, chemicals and insecticides as needed for disease, fungus or pest control. All herbicides, chemicals and insecticides shall be bear approval labels indicating they are approved by the United States Department of Agriculture for the intended uses and application rates.
2. Post Emergent Crab Grass and Plantain Chemical: Provide recommended post emergent crab grass and plantain control throughout the maintenance period to ensure germinated and established lawns free of crab grass and other undesirable grasses and forbs.

I. Water: Acceptable for lawn and meadow application and containing no material harmful to plant growth and establishment.

2.2 LOAM MIXES

A. Follow recommendations of soil-testing laboratory for modifying on-Site soil and manufactured soil, for use as topsoil.

B. On-Site soil and manufactured soil that has been provided with all inorganic soil amendments and fertilizers recommended by soil-testing laboratory, and acceptable for use as topsoil, shall be mixed with an additional organic soil amendment mix in a ratio of two parts topsoil to one part organic soil amendment mix, by volume.

C. Loam: Thoroughly blend topsoil with organic soil amendment mix and use as planting media for all lawn and meadow Work.

PART 3 - EXECUTION

3.1 INSPECTION

A. Contractor shall examine the areas and conditions under which lawn and meadow Work is to be performed, and notify Engineer, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

3.2 PREPARATION

A. Thoroughly blend and mix loam before spreading. Incorporate fertilizers, and ground limestone or acidulant, after spreading, as specified, and at rates recommended by soil-testing laboratory.

B. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   1. Protect adjacent and adjoining areas from hydroseeding overspray.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Excavate or fill subgrade, as required, to bring subgrade to elevations shown. Maintain all angles of repose. Confirm that subgrade is at proper elevations and that no further earthwork is required to bring the subgrade to proper elevations. Provide subgrade elevations that slope parallel to finished grade and towards subsurface drains shown.

E. Remove all construction debris, trash, rubble and all extraneous materials from subgrade. In the event that fuels, oils, concrete washout or other material harmful to plant growth or germination have been spilled into the subgrade, excavate the subgrade sufficiently to remove all such harmful materials and fill with approved fill, compacted to the required subgrade compaction level.

3.3 FINE GRADING

A. Immediately prior to dumping and spreading loam, clean subgrade of all stones greater than 2-inches and all other extraneous matter. Remove all such material from Site. Notify Engineer that subgrade has been cleaned, and obtain approval prior to spreading loam.

B. Do not attempt to spread excessively wet, muddy or frozen loam. Do not spread loam more than five days before seeding or planting.

C. Spread loam to a depth of 4-inches but not less than required to meet finish grades after light rolling and natural settlement.
   1. Spread approximately one-half the thickness of required loam depth. After spreading loam, rototill, disk or harrow loam and subgrade to bring top 2-inches of subgrade upward into loam layer, so that there is a transitional layer between loam and subgrade.
   2. Spread remainder of loam to required finish grades.
   3. Compact each lift sufficiently to reduce settling, but not enough to prevent the movement of water and feeder roots through loam. After compaction spread loam should offer firm, even resistance when a soil sampling tube is inserted.
   4. Phase the placement of the final lift so that wheeled vehicles do not have to travel over areas where final lifts are already in-place.
   5. Spread and compact to a smooth, uniform surface plane, to within plus or minus 1/2-inch of finish elevations. Roll and rake and remove all ridges, and fill depressions, as required. Remove all stones larger than 1-inch in any dimension and all sticks, roots, trash and other extraneous matter.
   6. Perform percolation tests as for subgrades, except limit depth of holes to 2/3 the depth of loam layer.

D. Spread ground limestone or acidulant and fertilizer, as specified. Mix ground limestone with dry loam before spreading fertilizer and work lightly into the top 4-inches of loam by harrowing or tilling at least three days before applying commercial fertilizers.

E. Grade planting areas to smooth, even surface with loose, uniformly fine texture. Remove all stones and extraneous material in excess of 1-inch diameter. Roll, rake and remove ridges and fill depressions, as required to meet finish grades.

F. Moisten prepared areas before seeding, sodding, sprigging or plugging. Water thoroughly and allow surface moisture to dry before planting. Do not create a muddy loam condition.

G. Prior to seeding or planting, restore loam to specified condition, if eroded or otherwise disturbed.

3.4 CONVENTIONAL SEEDING

A. General: Maintain grade stakes until removal is mutually agreed upon by all parties concerned.

B. Rake or harrow all seedbeds immediately prior to seeding to produce a rough, grooved surface, no deeper than 1-inch. Seed only when seedbed is in a friable condition and not muddy or hard.

C. Sow seed using a spreader or seeding machine.

D. Distribute seed evenly over entire area by sowing equal quantity in two directions at right angles to each other.

E. Sow lawn grass seed mixture at the rate of not less than eight-pounds for every 1000 square feet.

F. Sow meadow grass with minor forbs seed mixture at the rate of not less than 38-pounds per acre.

G. Cultipacker, or approved similar equipment, may be used to cover the seed and to firm the seedbed in one operation. In areas inaccessible to cultipacker:
   1. Rake the seed lightly into top 1/8-inch of loam, roll in two directions with a water ballast roller, weighing not less than 100 pounds per linear foot.
   2. Take care during raking that seed is not raked from one spot to another.
   3. Protect seeded areas against erosion by spreading specified mulch after completion of seeding operations.
      a. Protect seeded areas against hot, dry weather or drying winds by applying peat moss mulch not more than 24 hours after completion of seeding operations. Presoak and scatter evenly to a depth of from 1/8-inch to 3/16-inches thick and roll to a smooth surface. Do not mound.
      b. Protect seeded areas, with slopes exceeding one on six, by providing erosion-control fiber mesh and where slopes exceed one on four, by providing erosion-control blankets. Install erosion-control materials according to manufacturer's written instructions and as follows:
         1) Vertically down slope without stretching fabric.
         2) Install hold down staples three per square yard minimum in center of fabric or as required to hold and shape the fabric to the contours of the slope. Install hold down staples along edges and overlaps of fabric at 9 inches on centers minimum, or as required to hold and shape the fabric to the contours of the slope.
         3) Lap fabric 4-inches minimum and turn edges of fabric into 8-inch deep by 16-inch wide earth trench and fill trench with earth.

I. Using a uniform fine spray, thoroughly and evenly water seeded areas. Provide adequate water to moisten seedbed to a depth of 2-inches.
   1. Repeat this process when peat mulch color lightens. Maintain all seedbeds in a uniformly moist condition, conducive to seed germination and plant establishment, as specified.

J. Reseed areas that remain without mulch for longer than three days.

K. Take precautions to prevent damage or staining of construction or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

L. Prevent foot or vehicular traffic, or the movement of equipment, over the mulched areas. Reseed areas damaged as a result of such activity.

3.5 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

B. Mix slurry with an appropriate tackifier.

C. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry application at a minimum rate of 500-pounds per acre dry weight, but not less than the rate required to obtain specified seed-sowing rate so that the seed comes into direct contact with loam.

D. Apply slurry cover coat of fiber mulch at a rate of 1000-pounds per acre.

3.6 RECONDITIONING EXISTING LAWNS AND MEADOWS

A. Recondition existing lawn and meadow damaged by Contractor's operations, including areas used for storage of materials or equipment and areas damaged by movement of vehicles. Recondition existing lawns and meadow areas where minor regrading is required.

B. Recondition other existing lawn and meadow areas shown.

C. Provide fertilizer, seed or sod and soil amendments, as specified for new lawn and meadow, and as required to provide satisfactorily reconditioned lawns and meadows. Provide new loam as required to fill low spots and meet new finish grades.

D. Till stripped, bare, and compacted areas thoroughly to a depth of 12-inches.

E. Remove diseased or unsatisfactory lawn and meadow areas; do not bury into soil. Remove topsoil containing extraneous materials resulting from Contractor's operations including oil drippings, stone, gravel and other construction materials.

F. In areas approved by Engineer, where substantial lawns and meadows remain (but are thin), mow, dethatch, core aerate and rake. Fill low spots, remove humps, cultivate soil, fertilize, and seed. Remove weeds before seeding or if extensive, apply selective chemical weed killers, as required. Apply a seedbed mulch, if required, to maintain moist condition.

G. Water newly planted areas and keep moist until new lawns and meadows are established, as specified.

3.7 ACCEPTANCE CRITERIA FOR LAWNS AND MEADOWS

A. Lawn and meadow Work will be considered acceptable when:
   1. Seeded Lawn: When a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 square feet and bare spots not exceeding 5-inches by 5-inches.
   2. Seeded Meadow: When a healthy, uniform, close stand of meadow grass and forbs has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 20 square feet and bare spots not exceeding 12-inches by 12-inches.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris, created by lawn and meadow Work, from paved areas. Clean wheels of vehicles before leaving Site to avoid tracking soil and loam onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout extended service period and remove when service period ends. Treat, repair or replace damaged lawns and meadows.

C. Remove erosion-control measures after lawn and meadow extended service period ends.

D. Take all precautions to ensure that hydroseed slurry is only placed on the areas designated. Completely clean any overspray, on areas not designated to receive slurry.

3.12 INSPECTION AND ACCEPTANCE

A. Where lawns and meadows do not comply with specified acceptance criteria, reestablish lawns and meadows and continue extended service period until lawns and meadows comply with criteria for acceptance.

3.13 DEMONSTRATION

A. Engage installer’s Site supervisor to train and instruct Owner’s personnel in the proper maintenance of lawns and meadows and procedures to be performed throughout the year for proper care and maintenance of lawn and meadows.
   1. Include instructions and training on reconditioning established lawns and meadow and sources of lawn and meadow materials.
   2. Schedule training with Owner, through Engineer, with at least seven days' advance notice.

B. Review Operation and Maintenance information and be sure all instructions are clearly understood by Owner's personnel and are supplemented with additional information, clarifications and instructions, as required.

C. Provide minimum of two, nonconsecutive, full days on-Site training time during day shift normal working hours.

++ END OF SECTION ++

SECTION 35 52 33

PRE-ENGINEERED FLOATING DOCK SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall furnish all labor, materials, equipment, and incidentals required to provide floating docks, gangway, anchorage, fendering and other marine hardware and accessories as shown on the Contract Drawings and as specified herein.

B. Coordination:
   1. Review procedures under this and other Sections and coordinate the Work that must be performed.

C. Related Sections:
   1. Section 35 52 34, Dock Mooring System.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer of the pre-engineered dock systems shall have a minimum of 5 years of experience manufacturing this product and a minimum of 5 similar applications.
   2. Design and Fabrication Standards:
      a. The deck and frame structural components of the floating docks and gangways shall be designed with minimum safety factors on working stress which conform to those set forth in the latest issue of the Aluminum Association "SPECIFICATIONS FOR ALUMINUM STRUCTURES" for buildings and similar type structures.
      b. The installing contractor shall be a qualified Marine Contractor or General Contractor licensed by the appropriate governing agency and shall be capable of securing building or construction permits.
      c. The manufacturer/supplier shall have a minimum of 5 years continuous experience in commercial pier, dock or gangway fabrication and may be required to submit a list of previous experience on similar projects

1.4 SUBMITTALS

A. Submittals: Submit the following:
   1. Product Data:

a. The Contractor shall submit to the Engineer the dimensional layout of docks, gangways and anchorage systems to be furnished under this contract.
b. Typical sections or details of the following:
1. Floating docks, including flotation.
2. Gangways, including connections to shore and floating dock and handrails.
3. Anchorage system.
4. Decking material and connection details.
5. Cleats-location and connection details.

2. Engineering Calculations:
a. Engineering calculations showing compliance with the design criteria specified herein.
b. All calculations will be stamped with the seal of a qualified licensed, professional engineer.
c. Computations shall include as a minimum the following:
1. Compliance with combined live and dead load requirements considering both bending and deflection.
2. Compliance with freeboard requirements under normal load conditions.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The pre-engineered dock system shall be fabricated in accordance with the requirements specified herein.

2.2 MATERIALS OF MANUFACTURE

A. Frame: Aluminum extrusions for dock, pier, and gangway structures shall be aluminum alloy 6061-T6 “E” channels extruded in accordance with the requirements of applicable sections of Federal Specifications QQ-A-200. Miscellaneous aluminum may be 6063-T5 or 5052-H32.

B. Flotation shall consist of rigid urethane foam utilizing a two-component polymeric MDI system designed for Marine Flotation applications injected into aluminum shells to 2.0 pounds per cubic foot.

C. Decking: Aluminum decking shall be symmetrically extruded slats with integrated ribs and mechanical knurling to provide a non-skid surface. Decking to be aluminum alloy 6061-T6.

D. Cleats: Cleats shall be cast aluminum alloy meeting the requirements of the Federal Specifications QQ-A-571F and QQ-A-601E.

E. Hardware: All hardware shall be stainless steel type 304.

F. Fenders: None.

G. Bumpers: None.

H. Rollers: Rollers for either pile guides or gangways shall be UHMW polyethylene with black ultra-violet light inhibitor added.

I. Handrails: None.

2.3 PRODUCT DESIGN

A. Frame: For gangways, and the structural frame design of floating docks, the aluminum frame and decking shall be designed to withstand the full calculated dead load of all framing & accessories combined with a live load of 50 pounds per square foot. Allowable deflection shall be L/180 where "L" in inches is the freespan between supports for fixed piers & gangways, or the freespan between cross members for floating docks.

B. Flotation: All floating docks shall be designed for a minimum freeboard of 8 inches under full dead plus live load, and 10 inches under a dead load plus concentrated load of 400 pounds applied at any location on the dock walking surface. Additional flotation shall be added to support the gangway dead loads without creating undue distortion in the dock. Docks shall be designed for a minimum of 40psf live load providing a minimum of 16" unloaded freeboard.

C. Cleats: Cleats shall be designed to withstand a mooring line load of 1500 pounds in any direction.

D. Handrails: None.

E. Dock Connectors: Hinged or bolted floating dock module connectors shall be able to withstand a load of 3000 pounds applied to the full connector.

F. Dock Anchoring: Anchoring devices for floating docks shall allow free movement of the dock, while minimizing damage due to normal dock movement caused by tides, boat wakes, water fluctuation and seasonal winds. Anchoring devices shall be of sufficient number to restrain a uniform lateral force of 150 pounds per linear foot applied along the entire length of the dock.

2.4 PRODUCT FABRICATION

A. Frame: All aluminum structural members shall be welded in accordance with the American Welding Society Structural Welding Code D1.2. Individual dock and pier sections shall be sequentially numbered, matched, and pre-drilled in the shop prior to shipment.

B. Flotation: All flotation shall be fully installed in the shop. Selected floats may be removed to facilitate shipping.

C. Docks shall have the float fully welded with gussets between the float frame & dock frame at each cross member location or maximum 5’ centers.

D. Accessories: Aluminum decking shall be spaced with not more than 3/8 inch air space between the slats. Asymmetric/interlocking decking slats shall be prohibited to prevent water pooling on dock surface. The legs of each decking slat shall be welded to the side members and to any longitudinal with a minimum of 1-1/4 inches of weld per leg. The decking slats shall be placed transversely on the gangway, pier or dock.

E. Cleats: Cleats on aluminum decked docks shall be welded with a continuous fillet weld. All cleats shall be installed in locations shown on plans.

F. Handrails: None.

G. Hinge: Hinge mount extrusions shall be welded to the frame of the dock with a continuous fillet weld unless otherwise shown on the plans.

H. Anchoring: Anchoring devices, including pile guides, shall be bolted or welded to the piers and docks in locations and according to the details shown in the plans. Framing shall be braced at pile guides.

2.5 MANUFACTURER

A. The pre-engineered floating dock system shall be manufactured by:
   1. Gator Dock & Marine, LLC., Full Float™ Docks.
   2. Meeco Sullivan.
   3. Or Equal.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Floating docks must move freely during the entire cycle of water level extremes with the normal expected wind condition. Utility lines must not be installed on top of the deck or in a location subject to damage during normal use and must be installed to function properly during normal expected water level and weather extremes.

B. Gangways shall be securely fastened to the wall or fixed structure as shown on plans. Utilities running on the gangway shall be installed so as not to interfere with the access area of the gangway or to be damaged during normal operation.

C. Any potentially corrosive installation of dissimilar metals shall be properly insulated to minimize or eliminate corrosion in a marine environment.

+ + END OF SECTION + +

+ + THIS PAGE LEFT BLANK INTENTIONALLY + +

SECTION 35 52 34

DOCK MOORING SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall furnish all labor, materials, equipment, and incidentals required to provide a fully designed and integrated dock mooring system and accessories as shown on the Contract Drawings and as specified herein.

B. Coordination:
   1. Review procedures under this and other Sections and coordinate the Work that must be performed.

C. Related Sections:
   1. Section 35 52 33, Pre-Engineered Floating Dock System .

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer of the dock mooring system shall have a minimum of 5 years of experience manufacturing this product and a minimum of 5 similar applications .

1.3 SUBMITTALS

A. Submittals: Submit the following:
   1. Product Data:
      a. The Contractor shall submit to the Engineer the dimensional layout of docks mooring system and anchorage systems to be furnished under this contract.
   2. Engineering Calculations:
      a. Engineering calculations showing compliance with the design criteria specified herein.
      b. All calculations will be stamped with the seal of a qualified licensed, professional engineer.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The dock mooring system shall be fabricated in accordance with the requirements specified herein.

2.2 MATERIALS OF MANUFACTURE

A. Tensioner System: A rubber tensioner system that will provide a constant tension on the dock system holding it place laterally while allowing the dock to adjust to reservoir level changes .

B. Hardware: Mooring system hardware shall be marine grade and resistant to corrosion .

C. Anchor: Anchors shall consist of a system as proposed by the contractor. Helix earth anchors, deadmen, or anchorage to existing stuctures (i.e. intake structure) .

2.5 MANUFACTURER

A. The dock mooring system shall be manufactured by: :
   1. Seaflex.
   2. Or Equal.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Floating docks must move freely during the entire cycle of water level extremes with the normal expected wind condition .

B. Any potentially corrosive installation of dissimilar metals shall be properly insulated to minimize or eliminate corrosion in a marine environment

+ + END OF SECTION + +

SECTION 40 05 57.23

ELECTRIC MOTOR ACTUATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes:
   1. Electric Motor Actuators (230 AC).
   2. Materials and installation of electric motor actuators for valves and gates that were not expressly described in other sections.

B. Related Requirements:
   1. This Specification covers electric actuators for valves and gates which shall include related operator appurtenances as shown on the Drawings.
   2. Powered actuators shall be sized, furnished, installed, tested and commissioned by the Supplier, as specified in this section.
   3. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the electric actuators Work.
   4. Notify the OWNER and other CONTRACTORs in advance of the installation of the electric actuators to provide them with sufficient time for operational coordination and the installation of items included in their contracts that must be installed with, or before, the electric actuators Work.

C. Related Work:
   1. Section 01 33 00, Submittal Procedures.
   2. Section 40 05 59.23, Stainless Steel Gates

1.2 REFERENCES

D. Standards or Codes: The edition of the publications of the organizations listed below in effect at the time of the advertisement for bids form a part of this specification to the extent referenced. See the various paragraphs for the specified standard. In the case of a conflict between the requirements of this SECTION and those of the listed document, the requirements of this SECTION shall prevail.
   1. American Society of Mechanical ENGINEERs (ASME)/American National Standards Institute (ANSI):
   2. B1.5 ACME Screw Threads
   3. B36.10 Welded and Seamless Wrought Steel Pipe

E. American Water Works Association (AWWA):
   1. C513 Open-Channel, Fabricated-Metal Slide Gates
   2. C541 Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates
   3. C542 Electric Motor Actuators for Valves and Slide Gates
   4. C560 Cast Iron Slide Gates
   5. C561 Fabricated Stainless Steel Slide Gates

F. ASTM International (ASTM):

1. A126 Gray Iron Castings for Valves, Flanges, and Pipe Fittings
2. A240 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications
3. A582 Standard Specification for Free-Machining Stainless Steel Bars
4. B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
5. B211 Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire
6. B584 Standard Specification for Copper Alloy Sand Castings for General Applications
7. F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs

G. National Electric Manufacturers Association (NEMA):
1. MG 1-10.40 Nameplate Marking for Medium Single-Phase and Polyphase Induction Motors

1.3 SUBMITTALS

A. General: Contract Submittals shall be in accordance with the requirements of Section 01 33 00 – Submittals. Additional and specific information to be included in the submittal are described herein.

B. Product literature to consist of the most recent printed product instructions, product information and product specifications for all equipment supplied. Identify product used when more than one product is described on a page.

C. Submit manufacturer's catalog data showing motor actuator parts and materials of construction, referenced by AISI, ASTM, SAE, or CDA specification and grade. Identify coatings.

D. Show the maximum torque required to open and close each actuator. Show maximum torque shall include sating or unseating torque, bearing torque, dynamic torque, and hydrostatic torque. Assume that the differential pressure across the valve is equal to the valve pressure rating.

E. Shop Drawings: Submit the following:
1. Fabrication, assembly and installation diagrams including dimensions and weights.
2. Setting drawings, templates, and directions for the installation of anchor bolts and other anchorages.
3. Wiring diagrams specific for electric actuators being furnished. General wiring diagrams are not acceptable.
4. Complete nameplate data for electric actuators.
5. Deviations from the Contract Documents.

F. Shop Test Results: Supplier shall submit Test procedures and test documentation forms for review and acceptance by the OWNER at least two (2) weeks before the proposed Test date.

G. Field Test Results: Submit a written report giving the results of the field tests required.

H. Operation and Maintenance Manuals: Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Equipment Operating, and Maintenance Manual Information. Submit complete Installation, Operation and Maintenance Manuals including, test reports, maintenance data and schedules, description of operation and spare parts information.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 19 –Closeout Procedures.

B. Shop Test Results: Supplier shall submit Test procedures and test documentation forms for review and acceptance by the OWNER at least two (2) weeks before the proposed Test date.

C. Field Test Results: Submit a written report giving the results of the field tests required.

D. Operation and Maintenance Manuals: Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Equipment Operating, and Maintenance Manual Information. Submit complete Installation, Operation and Maintenance Manuals including, test reports, maintenance data and schedules, description of operation and spare parts information.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Electric Actuators shall be the product of one manufacturer.

B. Component Supply and Compatibility
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single electric actuator manufacturer.
   2. The electric actuator manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically designed for the specified service and shall be integrated into the overall assembly by the electric actuator manufacturer.

C. Shop Tests
   1. Test each electric actuator fully assembled in the vertical position for proper seating.
   2. Fully open and close gate disc in its guide system to ensure that it operates freely.
   3. Operate and test floor stands, bench stands, and motor operators to ensure proper assembly and operation.

D. Start up and Field Tests: Refer to section 3.02A.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 60 00 for delivery and handling requirements.

B. Storage and Protection
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store all mechanical equipment in covered storage off the ground and prevent condensation.
   3. Protect motors and electrical systems from moisture during transport and delivery.

C. Acceptance at Site: All boxes, crates, and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify OWNER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.7 WARRANTY

A. CONTRACTOR shall warrant specified equipment free from defects in material and workmanship for a minimum of one (1) year from the date of substantial completion. Refer to Specification 01 78 36 for warranty requirements.

B. The warranty shall cover all parts and labor for onsite preventive maintenance and onsite demand maintenance, providing replacement components and/or parts, and replenishment of onsite spare parts. The following spare parts are required:
   1. Fuses (quantity 3 of each type)
   2. Bulbs (quantity 3 of each type)
   3. Others as recommended by Vendor

C. Furnished spare parts shall be stored onsite for usage during the warranty period. At the completion of the warranty period deliver the spares to the OWNER.

PART 2 - PRODUCTS

2.1 ELECTRIC MOTOR ACTUATORS (230 VAC)

A. General:
   1. The electric gate actuator shall include the motor, actuator unit gearing, limit switch gearing, position limit switches, torque switches, declutch lever, and handwheel as a self-contained unit and shall connect to the gate via a threaded stem and stem nut.
   2. Section includes Open/Stop/Close actuators and modulating actuators.
   3. Actuators shall conform to AWWA C540, Power-Actuating Devices for Valves and Slide Gates, and as specified herein.
   4. The CONTRACTOR shall be responsible for coordinating torque requirements with motorized actuator manufacturer.

B. Manufacturers:
   1. Limitorque - MX Series or QX Series.
   2. Approved Equal.

C. Application Criteria:
   1. Power Supply: 230 volts, 1-Phase, 60 Hz.
   2. Control Voltages: Furnish internal control transformer with 120 VAC, single phase, 60 Hz.
      a. Control transformers shall include short circuit and overload protection.
   3. Torques: Electric motor operator shall be capable of providing not less than 1-1/2 times the required operator torque for opening and closing of its associated device.
   4. Ambient Temperature Rating: -22 to + 140(F.
   5. Ambient Humidity: 100 percent.

D. Duty Cycle (unless otherwise specified):
   1. Minimum 60 starts per hour rating for open/close actuators
   2. Minimum 1,200 starts per hour or continuous rated for modulating actuators.

E. Electric Motor:

1. For Open/Stop/Close actuators, provide reversible type motors suitable for OPEN-STOP-CLOSE service of high-torque characteristics.
2. For modulating actuators, provide reversible type motors suitable for modulating service of high-torque characteristics.
3. Motor shall have sufficient power to operate the gate through one complete cycle, Open-Close-Open or Close-Open-Close under the maximum unbalanced head when voltage to terminals is within 10% of specified voltage.
4. The motor starting torque shall be equal to 2-1/2 times the running torque.
5. Service Factor: 1.15
6. Power Supply: 230 Volt, 1-Phase, 60 Hz, unless otherwise specified.
7. Efficiency: High-efficiency conforming to NEMA MG 1.
8. Windings: Motor windings shall be copper.
9. Motor shall be TENV with Class F insulation.
10. Bearings: Anti-friction with a minimum B-10 life of 100,000 hours, lifetime pre-lubricated and sealed.
11. Horsepower: As required for torque requirements.
12. Overcurrent protection: provide winding thermostats.
13. Built-in thermostat and condensation heater, if indicated on the Drawings.

F. Actuator Gearing:
1. Close coupled to electric motor, 90-degree gear operator, double reduction.
2. Input Shaft Gearing: Spur, bevel, helical gear and pinion or single stage worm gear drive assembly.
3. Output Shaft Gearing: Self-locking worm gears with minimum gear backlash.
4. All gearing shall be hardened alloy steel or a combination of hardened alloy steel and alloy bronze, accurately cut by hobbing machine.
5. Lubrication: Grease or oil bath. Motor shall have the capability of removal without the need of draining oil from the actuator gearbox.
6. Bearings: Ball or roller with a minimum B-10 life of 100,000 hours, lifetime pre-lubricated and sealed.
7. Input Shaft: Hardened alloy steel.
8. Provide mechanical stops adjustable to ± 5 degrees at each end of travel.
9. Provide mechanical position indicator.
10. For rising stem actuators, it shall be possible to remove the stem from the top without removing the actuator from the valve, disconnecting any electrical wiring, or disassembling any of the gearing. All gearing shall be designed to withstand a 100 percent overload.

G. Enclosure:
1. Housing: Die-cast aluminum.
2. Enclosure shall be in conformance with Division 26.
3. Unless otherwise specified, motor and all electrical enclosures shall be rated NEMA 4X.
4. Operators located in hazardous areas shall be provided with NEMA 7 enclosures.
5. All externally-exposed nuts, bolts and other fasteners shall be Type 316 stainless steel.
6. Fasteners shall be installed with appropriate anti-seize compound to allow subsequent disassembly.
7. Enclosure shall be explosion-proof type for Class I, Division 1 areas, as indicated in the schedule.

H. Position Control and Indication:

1. Opened and Closed limit switches shall be geared to the drive mechanism and in step at all times, whether the unit is operated electrically or manually and whether or not the actuator is powered. Friction devices or set-screw arrangements shall not be used to maintain the setting.
2. Opened and Closed limit switches for all gates, unless otherwise shown or specified, shall be set to 100% and 0% of travel respectively.
3. Provide driving mechanism totally enclosed to prevent entrance of foreign matter or loss of lubricant.

I. Torque Switches:
1. Provide adjustable torque switches with each associated gate or valve.
2. The torque switches shall operate during the complete gate or valve cycle without the use of auxiliary relays, linkages, latches or other devices.
3. Factory set torque switches to satisfy the calculated value corresponding to the maximum operating conditions. Furnish detailed instructions by manufacturer for final setting after installation.
4. It shall be possible to select the torque switches to control the open and close limit positions in either direction of gate or valve travel.
5. Torque and turns limitation to be adjustable as follows:
   a. Position Setting Range: Multiturn 1 to 500 or 10 to 5,000 turns, with resolution to 7.5° of actuator output. 1/4 turn – 90 degrees + or – 5 degrees at each end.
   b. Torque Setting: 40% to 100% rated torque.
   c. Torque sensing must input directly into electronic controls. Extrapolating torque from mechanically measured motor speed is not acceptable due to response time. Torque measurement shall be independent of variations in frequency, voltage, or temperature.
   d. "Latching" to be provided for the torque sensing system to inhibit torque off during unseating or during starting in mid-travel against high inertia loads.
   e. The electric circuit diagram of the actuator should not vary, remaining identical regardless of whether the gate is to open or close on torque or position limit.
   f. Provide integral keypad, manufacturer's wireless handheld keypad, Windows based software, or setting tool required for non-intrusive calibration and interrogation of the actuator.

J. Controls:
1. Provide the following in a separate compartment integral with the actuator.
   a. Starter: Reversing magnetic starter for open/close actuators and reversing solid-state starter for modulating actuators.
   b. Control Power Transformer: Provide a transformer to transform the rated 1-phase, 60 Hz power to 120 Volts AC, single phase for control power. The transformer shall be rated for no more than 80% of the load and complete with a grounded and fused secondary and dual primary fuses.
2. Provide the following control devices integral to the actuator:
   a. Open-Close-Stop pushbuttons (or switches) with hold-to-run or momentary contact selection.
3. Provide thermal overload protection of the motor.
4. Actuator circuit boards shall be rated for high temperature service, minimum 55(C).
5. External signal interface interposing terminals shall be of sufficient size to accommodate #12 AWG solid conductors. Interposing terminals shall be clearly designated to indicate signal type and termination details.

6. Actuator shall have an internal watertight and dustproof O-ring seal between the internal electrical elements of the actuator and the terminal compartment to protect from ingress of dust when the terminal cover is removed for wiring.
7. Motorized actuators shall be of the non-intrusive design housed in a double sealed watertight enclosure rated to IEC Publication 529, IP68 (6 meters, 48 hours).

K. Diagnostics/Configurations Features:
1. Actuators shall include provisions to view and modify actuators configuration parameters as well as receive diagnostic information for faults.

L. Hand Wheel and Chain Wheel Operation:
1. Furnish the actuator with a hand wheel for manual operation, so connected that operation by the motor will not cause the hand wheel to rotate.
2. Provide integral declutching mechanisms to disengage motor and motor gearing mechanically.
3. Should power be returned to the motor while the hand wheel is in use, design of the unit shall prevent transmission of the motor torque to the hand wheel.
4. The hand wheel shall require an effort of no more than 80 pounds on the rim for seating or unseating load, or 60 pounds on running load.
5. The hand wheel shall have an arrow and the word OPEN or CLOSE indicating required rotation. The hand wheel shall operate in the clockwise direction to close.
6. Operators more than 6 feet-0 inches above the operating floor level shall be equipped with chain operators.

M. Testing:
1. Test each actuator in the shop in conformance with AWWA C540.

2.2 SURFACE PREPARATION AND PAINTING

A. Clean, prime coat, and finish coat ferrous metal surfaces of equipment in the shop in to conform with aggressive process environments in wastewater treatment plants.

B. Actuator shall be painted with a high-solids epoxy primer and finish painted with a polymer powder coat.

C. Coat machined, polished and non-ferrous surfaces bearing surfaces and similar unpainted surfaces with corrosion prevention compound, which shall be maintained during storage, and until equipment begins operation.

2.3 SOURCE QUALITY CONTROL

A. Shop Tests
1. Test each electric actuator fully assembled in the vertical position for proper seating.
2. Fully open and close gate disc in its guide system to ensure that it operates freely.
3. Operate and test floor stands, bench stands, and motor operators to ensure proper assembly and operation.

B. Start up and Field Tests: Refer to section 3.2A

2.4 LOCAL CONTROL STATIONS (FOR LARGE MOTORIZED ACTUATORS)

A. When integrated actuator controls are not accessible from grade (greater than 60" Above Finished Floor) due to installation requirements, a remote-mounted Local Control Station shall be provided with the actuator.

B. Local Control Stations shall have the following functions:
   1. Open-Stop-Close selector switch
   2. OPENED green indicating light
   3. FAULT amber indicating light
   4. CLOSED red indicating light

C. Local Control Stations can be a manufacturer standard remote unit with umbilical cable or a stainless steel NEMA 4X enclosure.
   1. If manufacturer design remote unit, furnish cabling required to connect actuator to remote control unit.
   2. If enclosure, devices shall be per Section 26 27 16.
   3. All Local Control Stations shall be no larger than 10" wide by 6" deep.

D. Regardless of local control configurations, actuator must still provide dry fault contacts for SCADA interface, in addition to requirements for control stations noted above.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All wires and cables shall be tagged with legible permanent tags that shall be per the designations provided in the Specifications and Drawings.

B. All components mounted inside and outside of the actuator shall be tagged per the designations (including terminal blocks, termination units, and power supplies) provided in the documents and instructions provided herein. Tagging shall be firmly affixed permanent non-corrosive labels.

C. Powered actuators shall be located so that they are readily accessible for operation and maintenance. Powered actuators shall not be mounted where shock or vibration will impair their operation. Support systems shall not be attached to handrails, process piping, or mechanical equipment.

D. Powered actuators shall have their manual operating accessory, where possible, located between 36 to 48 inches above the floor or a work platform or pedestal.

E. Each powered operator shall be provided with a 16-gage stainless steel identification tag.
   1. Identification tags shall bear the complete equipment number of the actuator, as specified.
   2. Characters shall be ¼ inch, die-stamped.
   3. Identification tags shall be securely attached to the actuator in a readily visible location using stainless steel screws or wire.

3.2 FIELD QUALITY CONTROL

A. Start-Up and Field Testing

1. Field test and calibrate equipment to demonstrate to the OWNER's representative that all equipment will satisfactorily perform the functions and criteria specified in Part 2.
2. Provide all test apparatus required at no extra cost to OWNER.
3. Follow testing procedures recommended by the manufacturer and approved by the OWNER.
4. Perform field tests, to be witnessed by the OWNER, to verify operation under field conditions. The objective of these tests shall be to demonstrate that the overall system, including actuators and controls, meets the requirements of the Contract Documents.
5. Each actuator shall be field-tested and individual test certificates shall be furnished. Each test certificate shall record gear ratios for both manual and automatic drive, closing direction and wiring diagram code number.
6. Field testing shall record the following parameters
    a. Current at maximum torque setting
    b. Torque at maximum torque setting
    c. Actuator Output speed or Operating time
7. Supplier shall provide installation oversight for the connectivity between the powered actuator and the control system. Supplier shall perform the required power and signal interface checkout to confirm signal interface connectivity to the control system.
8. Once all installation activities have been completed, Supplier shall certify in writing that the installation is satisfactory and the equipment and system will perform as required.
9. Supplier shall perform on-site testing in compliance with Section 01 75 07 – Operational Testing.

B. Instruction of Operations and Maintenance Personnel:
1. Comply with Section 01 79 00, Training.
2. Instruction Course: After equipment is fully operational, and before OWNER will assume responsibility for the operation of electric actuators. Electric Actuator manufacturer’s operating specialists shall instruct the OWNER's operating personnel in the care, maintenance, and proper operation of the equipment. Two training sessions shall be required. One shall consist of two (2) hours devoted to operations training and one shall consist of two (2) hours devoted to maintenance training.
3. All training sessions may be videotaped by OWNER.

C. Manufacturer's Installation Report: Prepare manufacturer's installation reports and submit within 30 days after completion of field-testing and operation instruction. The reports shall be prepared in accordance with the requirements of Section 01 78 23, Equipment Operating, and Maintenance Manual Information, and shall include the following:
1. Field tests, including and not limited to operational test reports.
2. Description of installation deficiencies not resolved to the OWNER's satisfaction.
3. Description of problems or potential problems.
4. Names of OWNER personnel who attended the operations and maintenance training sessions.
5. Record copy of materials used for the training sessions including an outline summary of the course.

3.3 MANUFACTURER SERVICES

A. Required Manufacturer’s Services: Retain qualified factory-trained representatives of the electric actuators manufacturer for a minimum period of two (2) 48 hour days (total) to perform the following services. The manufacturer’s representatives shall check and approve their respective

portions of the installation, supervise initial operation and testing in the presence of the OWNER and instruct the OWNER's personnel in operation and maintenance of the equipment.

1. Equipment Installation:
   a. Oversee installation of the equipment and accessories specified herein. Several field trips may be required.
   b. Inspect the completed installation and note deficiencies.
2. Start-up and Field Testing:
   a. Be present and assist CONTRACTOR during start-up, adjusting, and field-testing of completed installation, as outlined in 3.2.A.
   b. Furnish test forms and procedures for field-testing.
   c. The manufacturer's representative shall revisit the jobsite as often as necessary until all trouble is corrected and the installation is entirely satisfactory to the OWNER.
3. Instruction of Operation and Maintenance Personnel: Provide Operation and Maintenance training as outlined below.

B. All costs, including travel, lodging, meals, and incidentals, for additional visits and field retests shall be at no additional cost to the OWNER.

C. Diagnostic Equipment: Supplier personnel providing the onsite installation and warranty service under this contract shall:
1. Be individual(s) normally assigned to the geographic area. Out of area personnel assigned to commission and service the systems shall be approved by the OWNER prior to any fieldwork.
2. Have been factory-trained at the actuator manufacturer's facility.
3. Be a full-time employee of the actuator manufacturer.
4. Have at least 2 years of experience in maintaining the actuator and systems being provided.
5. Be recertified by the manufacturer via a testing program once every two years.
6. Furnish Diagnostic software (qty 2), cable (qty 2) and one (1) hand held programming/setting tool to allow configuration and diagnostic information review, analysis and reconfiguration.

TABLE 1

ELECTRIC MOTORIZED ACTUATOR SCHEDULE

Designation	Location / Description	Type of Gate or Valve	Size, WxH or Inches	Type of Actuator	Sep. Rem. LCS?	NEMA Area Rating	Voltage
OF-1	Old Forge Dam Gate Enclosure / Sluce Gate 1	Sluice Gate	30"	Rotary	No	4X	230V
OF-2	Old Forge Dam Gate Enclosure / Sluce Gate 2	Sluice Gate	30"	Rotary	No	4X	230V
SL-1	Sixth lake Dam Gate Enclosure / Sluce Gate 1	Sluice Gate	30"	Rotary	No	4X	230V
SL-2	Old Forge Dam Gate Enclosure / Sluce Gate 2	Sluice Gate	30"	Rotary	No	4X	230V

+ + END OF SECTION+ +

SECTION 40 05 59.23

STAINLESS STEEL GATES

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope
1. CONTRACTOR shall furnish all labor, materials, equipment, and incidentals required to install, ready for operation and field test stainless steel gates and appurtenances as shown on the Contract Drawings and as specified herein.
2. The gates and appurtenances shall be supplied in accordance with the latest edition of AWWA C561 Standard for Fabricated Stainless Steel Slide Gates as modified herein. The allowable leakage rate for the stainless steel gates in this specification shall be as shown on the drawings or 1/2 the allowable leakage listed in the latest revision of AWWA C561, which ever is lower.

1.2 QUALITY ASSURANCE

A. Qualifications
1. The equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20 years experience designing and manufacturing water control gates. The manufacturer shall have manufactured water control gates for a minimum of 100 projects.

1.3 SUBMITTALS

A. Provide the following information to confirm compliance with the specification.
1. Complete description of all materials including the material thickness of all structural components of the frame and slide.
2. Installation drawings showing all details of construction, details required for installation, dimensions and anchor bolt locations.
3. Maximum bending stress and deflection of the slide under the maximum design head.
4. The location of the company headquarters and the location of the principle manufacturing facility. Provide the name of the company that manufactures the equipment if the supplier utilizes an outside source.

PART 2 EQUIPMENT

2.1 GENERAL

A. Gates shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings.

B. Leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter in seating head and unseating head conditions.

C. The gate shall utilize self-adjusting seals. Due to the difficulty of accessing gates when they are in service, gates that utilize adjustable wedges, wedging devices or pressure pads are not acceptable.

D. All structural components of the frame and slide shall be fabricated of stainless steel having a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.

E. Slide gate frames shall be shipped fully assembled with the invert member welded to the side frames and the slide installed in the frame unless the overall width of the slide gate exceeds 96 inches or the overall height of the slide gate exceed 25 feet.

F. All welds shall be performed by welders with AWS D1.6 certification.

G. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale. All iron and steel components shall be properly prepared and shop coated with a primer.

H. Materials:

Components	Materials
Frame Assembly and Retainers	Stainless Steel, Type 304L, ASTM A240
Slide and Stiffeners	Stainless Steel, Type 304L, ASTM A240
Stem	Stainless Steel, Type 304, ASTM A276
Anchor Studs, Fasteners and Nuts	Stainless Steel, Type 316, ASTM A276
Invert Seal (Upward Opening Gates Only)	Neoprene ASTM D-2000 or EPDM
Seat/Seals and Facing	Ultra-High Molecular Weight Polyethylene ASTM D4020
Lift Nuts	Bronze ASTM B584
Pedestals and Wall Brackets	Stainless Steel, Type 304L, ASTM A240
Operator Housing	Cast aluminum or ductile iron

2.2 FRAME

A. The frame assembly, including the guide members, invert member and yoke members, shall be constructed of formed stainless steel plate with a minimum thickness of 1/4-inch.
   1. Frame design shall allow for embedded mounting, mounting directly to a wall with stainless steel anchor bolts and grout or mounting to a wall thimble with stainless steel mounting studs and a mastic gasket material. Mounting style shall be as shown on the Contract Drawings.
   2. All wall mounted or wall thimble mounted gates shall have a flange frame. Flat frame gates are not acceptable.
   3. The structural portion of the frame that incorporates the seat/seals shall be formed into a one-piece shape for rigidity. Guide members that consist of two or more bolted structural members are not acceptable. Guide member designs where water loads are transferred through the assembly bolts are specifically not acceptable.
   4. Gussets shall be provided as necessary to support the guide members in an unseating head condition. The gussets shall extend to support the outer portion of

the guide assembly and shall be positioned to ensure that the load is transferred to the anchor bolts or the wall thimble studs.

5. The frame shall extend to accommodate the entire height of the slide when the slide is in the fully opened position on upward opening gates or downward opening weir gates.
6. On self-contained gates, a yoke shall be provided across the top of the frame. The yoke shall be formed by two structural members affixed to the top of the side frame members to provide a one-piece rigid assembly. The yoke shall be designed to allow removal of the slide.
7. A rigid stainless steel invert member shall be provided across the bottom of the opening. The invert member shall be of the flushbottom type on upward opening gates.
8. A rigid stainless steel top seal member shall be provided across the top of the opening on gates designed to cover submerged openings.
9. A rigid stainless steel member shall be provided across the invert of the opening on downward opening weir gates.

2.3 SLIDE

A. The slide and reinforcing stiffeners shall be constructed of stainless steel plate. All structural components shall have a minimum thickness of 1/4-inch.

1. The slide shall not deflect more than 1/360 of the span or 1/16 inch, whichever is smaller, under the maximum design head.
2. When the width of the gate opening multiplied by the maximum design head is greater than 120 square feet, the portion of the slide that engages the guide members shall be of a "thick edge" design. The thick edge portion of the slide shall have a minimum thickness of 3 inches." to "When the width of the gate opening in feet multiplied by the maximum design head in feet is less than 100 square feet the portion of the slide member that engages the guide shall be 1/4" thick. When the width of the gate opening in feet multiplied by the maximum design head in feet is between 100-140 square feet the portion of the slide member that engages the guide shall be 1/2" thick. When the width of the gate opening in feet multiplied by the maximum design head in feet is greater than 120 square feet, the portion of the slide that engages the guide members shall be of a "thick edge" design.
3. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. Vertical stiffeners shall be welded on the outside of the horizontal stiffeners for additional reinforcement.
4. The stem connector shall be constructed of two angles or plates. The stem connector shall be welded to the slide. A minimum of two bolts shall connect the stem to the stem connector.

2.4 SEALS

A. All gates shall be provided with a self-adjusting UHMW-PE seal system to restrict leakage in accordance with the requirements listed in this specification.

A .

1. The seat/seals shall extend to accommodate the 1-1/2 x the height of the slide when the slide is in the fully closed or fully opened position.
2. All upward opening gates shall be provided with a resilient seal to seal the bottom portion of the gate. The seal shall be attached to the invert member or the bottom of the slide and it shall be held in place with stainless steel attachment hardware.

3. All downward opening weir gates shall be provided with UHMW polyethylene seat/seals across the invert member.
4. The seal system shall be durable and shall be designed to accommodate high velocities and frequent cycling without loosening or suffering damage.
5. All seals must be bolted or otherwise mechanically fastened to the frame or slide. Arrangement with seals that are force fit or held in place with adhesives are unacceptable.
6. The seals shall be mounted so as not to obstruct the water way opening.
7. Gates that utilize rubber "J" seals or "P" seals are not acceptable.
8. The seal system shall have been factory tested to confirm negligible wear (less than 0.01") and proper sealing. The factory testing shall consist of an accelerated wear test comprised of a minimum of 25,000 open-close cycles using a well-agitated sand/water mixture to simulate fluidized grit.

2.5 STEM

A. A threaded operating stem shall be utilized to connect the operating mechanism to the slide. On rising stem gates, the threaded portion shall engage the operating nut in the manual operator or motor actuator. On non-rising stem gates, the threaded portion shall engage the nut on the slide.

1. The threaded portion of the stem shall have a minimum outside diameter of 1-1/2 inches. Stem extension pipes are not acceptable.
2. The stem shall be constructed of solid stainless steel bar for the entire length, the metal having a tensile strength of not less than 75,000 psi.
3. The stem shall be threaded to allow full travel of the slide unless the travel distance is otherwise shown on the Contract Drawings.
4. Maximum L/R ratio for the unsupported part of the stem shall not exceed 200.
5. In compression, the stem shall be designed for a critical buckling load caused by a 40 lb effort on the crank or handwheel with a safety factor of 2, using the Euler column formula.
6. The stem shall be designed to withstand the tension load caused by the application of a 40 lb effort on the crank or handwheel without exceeding 1/5 of the ultimate tensile strength of the stem material.
7. The threaded portion of the stem shall have machine rolled threads of the full Acme type with a 16 microinch finish or better. Stub threads are not acceptable.
8. Stems of more than one section shall be joined by stainless steel or bronze couplings. The coupling shall be bolted to the stems.
9. Stems, on manually operated gates, shall be provided with adjustable stop collars to prevent over closing of the slide.

2.6 STEM GUIDES

A. Stem guide shall be provided when necessary to ensure that the maximum L/R ratio for the unsupported part of the stem is 200 or less.

1. Stem guide brackets shall be fabricated of stainless steel and shall be outfitted with UHMW or bronze bushings.
2. Adjustable in two directions.

2.7 WALL THIMBLES

A. Wall thimbles shall be provided when shown on the Contract Drawings.
   1. The wall thimble depth shall be equal to the thickness of the concrete wall in which the thimble is to be mounted.
   2. Wall thimbles shall be fabricated stainless steel construction of adequate section to withstand all operational and reasonable installation stresses.
   3. Wall thimbles shall be constructed of 1/4-inch minimum thickness stainless steel and the front face shall have a minimum thickness of 1/4–inch.
   4. The fabrication process shall ensure that the wall thimble is square and plumb and the front face is sufficiently flat to provide a proper mounting surface for the gate frame.
   5. The face of the wall thimble shall only be machined if recommended by the gate manufacturer. If the wall thimble is to be machined, the front face shall have a minimum thickness of 1/4-inch after machining.
   6. A water stop shall be welded around the periphery of the thimble. Wall thimbles shall be designed to allow thorough and uniform concrete placement during installation.
   7. Studs and nuts shall be stainless steel. Water stop may be stitch welded.
   8. A suitable gasket or mastic shall be provided to seal between the gate frame and the wall thimble.

2.8 MANUAL OPERATORS

A. Unless otherwise shown on the Drawings, gates shall be operated by a manual handwheel or a manual crank-operated gearbox. The operator shall be mounted on the yoke of self contained gates or on the pedestal of non-self contained gates.
   1. The gate manufacturer shall select the proper gear ratio to ensure that the gate can be operated with no more than a 40 lb effort when the gate is in the closed position and experiencing the maximum operating head.
   2. An arrow with the word "OPEN" shall be permanently attached or cast onto the operator to indicate the direction or rotation to open the gate.
   3. Handwheel operators shall be fully enclosed and shall have a cast aluminum housing.
      a. Handwheel operators shall be provided with a threaded cast bronze lift nut to engage the operating stem.
      b. Handwheel operators shall be equipped with roller bearings above and below the operating nut.
      c. Positive mechanical seals shall be provided above and below the operating nut to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
      d. The handwheel shall be removable and shall have a minimum diameter of 15 inches.
   4. Crank-operated gearboxes shall be fully enclosed and shall have a cast aluminum or ductile iron housing.
      a. Gearboxes shall have either single or double gear reduction depending upon the lifting capacity required.
      b. Gearboxes shall be provided with a threaded cast bronze lift nut to engage the operating stem.
      c. Bearings shall be provided above and below the flange on the operating nut to support both opening and closing thrusts.
      d. Gears shall be steel with machined cut teeth designed for smooth operation.
      e. The pinion shaft shall be stainless steel and shall be supported on ball or tapered roller bearings.

f. Positive mechanical seals shall be provided on the operating nut and the pinion shafts to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
g. The crank shall be cast aluminum or cast iron with a revolving nylon grip.
h. The crank shall be removable.

5. All gates having widths in excess of 72 inches and widths greater than twice their height shall be provided with two gearboxes connected by an interconnecting shaft for simultaneous operation.
   a. Interconnecting shafting shall be constructed of aluminum or stainless steel.
   b. Flexible couplings shall be provided at each end of the interconnecting shaft. Couplings shall be stainless steel or non-metallic.
   c. One crank shall be provided to mount on the pinion shaft of one of the gearboxes.
6. An extended operator system utilizing chain and sprockets shall be furnished by the manufacturer when the centerline of the crank or handwheel, on a non-geared operator, is located over 48-in above the operating floor. Chain wheels are not acceptable.
   a. A removable stainless steel or aluminum cover shall be provided to enclose chain and sprockets.
   b. The extended operator system shall lower the centerline of the pinion shaft to 36-in above the operating floor.
   c. A handwheel may be utilized in conjunction with a gearbox in lieu of the extended operator system if the centerline of the pinion shaft is 60-in or less above the operating floor.
7. Pedestals shall be constructed of stainless steel. Aluminum pedestals are not acceptable.
   a. The pedestal height shall be such that the handwheel or pinion shaft on the crank-operated gearbox is located approximately 36-in above the operating floor.
   b. Wall brackets shall be used to support floor stands where shown on the Drawings and shall be constructed of stainless steel.
   c. Wall brackets shall be reinforced to withstand in compression at least two times the rated output of the operator with a 40 lb effort on the crank or handwheel.
   d. The design and detail of the brackets and anchor bolts shall be provided by the gate manufacturer and shall be approved by the ENGINEER. The gate manufacturer shall supply the bracket, anchor bolts and accessories as part of the gate assembly.
8. Operators shall be equipped with fracture-resistant clear butyrate or lexan plastic stem covers.
   a. The top of the stem cover shall be closed.
   b. The bottom end of the stem cover shall be mounted in a housing or adapter for easy field mounting.
   c. Stem covers shall be complete with indicator markings to indicate gate position.
9. When shown on the Contract Drawings, provide 2 inch square nut, mounted in a floor box, with a non-rising stem.
   a. The square nut shall be constructed of bronze.
   b. The floor box shall be constructed of stainless steel or cast iron and shall be set in the concrete floor above the gate as shown.
   c. Provide one aluminum or stainless steel T-handle wrench for operation.

2.9 ELECTRIC MOTOR ACTUATORS

A. See Section 40 05 57.23, Electric Motor Actuators.

2.10 ANCHOR BOLTS

A. Anchor bolts shall be provided by the gate manufacturer for mounting the gates and appurtenances.
   1. Quantity and location shall be determined by the gate manufacturer.
   2. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.
   3. Anchor bolts shall have a minimum diameter of 1/2-inch.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the CONTRACTOR to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.

B. The CONTRACTOR shall review the installation drawings and installation instruction prior to installing the gates.

C. The gate assemblies shall be installed in a true vertical plane, square and plumb.

D. The CONTRACTOR shall fill the void in between the gate frame and the wall with non-shrink grout as shown on the installation drawing and in accordance with the manufacturer’s recommendations.

E. The CONTRACTOR shall add a mastic gasket between the gate frame and wall thimble (when applicable) in accordance with the manufacturer’s recommendations.

3.2 FIELD TESTING

A. After installation, all gates shall be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate shall be cycled to confirm that they operate without binding, scraping, or distorting. The effort to open and close manual operators shall be measured, and shall not exceed the maximum operating effort specified above. Electric motor actuators shall function smoothly and without interruption. Each gate shall be water tested by the CONTRACTOR, at the discretion of the ENGINEER and OWNER, to confirm that leakage does not exceed the specified allowable leakage.

+ + END OF SECTION + +

THIS PAGE WAS LEFT INTENTIONALLY BLANK

Construction Drawings

Old Forge Dam and Sixth Lake Dam Rehabilitation

Contract No. D012025

State of New York
Hudson River – Black River Regulating District
Albany, New York

June 2025

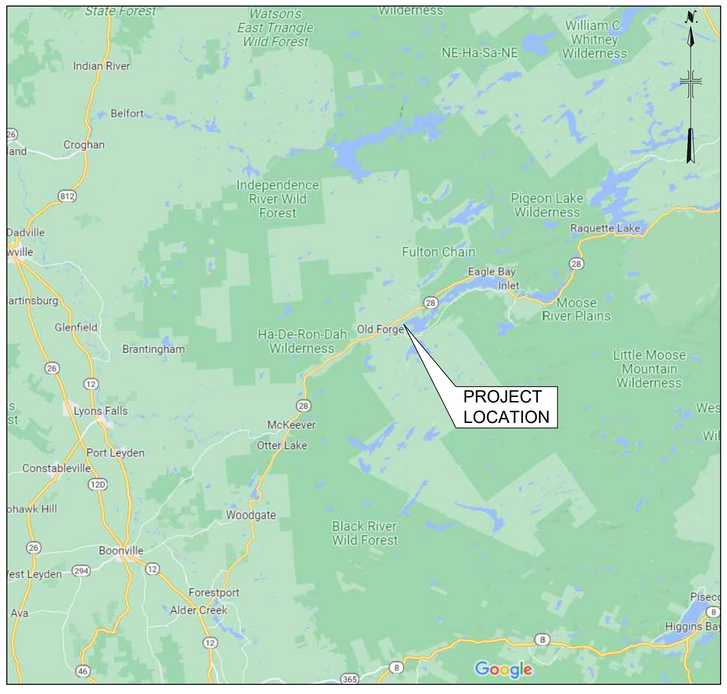
NEW YORK STATE OF OPPORTUNITY.

Hudson River – Black River Regulating District

HUDSON RIVER BLACK RIVER
REGULATING DISTRICT
54 STATE ST., SUITE 501, ALBANY, NY 12207

OLD FORGE DAM AND SIXTH LAKE DAM - REHABILITATION
HAMLET OF OLD FORGE, HERKIMER CO., NEW YORK (NYS DAM NO. 140-2000)
TOWN OF INLET, HAMILTON CO., NEW YORK (NYS DAM NO. 140-0860)

JUNE 2025



OLD FORGE DAM LOCATION PLAN

APPROXIMATE SCALE: 1"=1000'

EXECUTIVE DIRECTOR
JOHN C. CALLAGHAN

GENERAL COUNSEL
ROBERT P. LESLIE

CHIEF ENGINEER
ROBERT S. FOLTAN PE

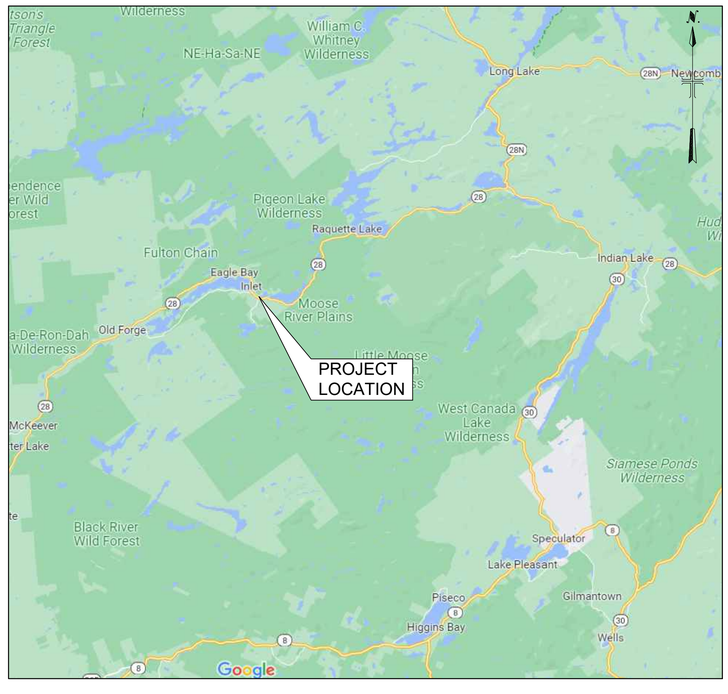
CHIEF FISCAL OFFICER
TIMOTHY MANICCIA

DIRECTOR OF ADMINISTRATIVE SERVCIES
STEPHANIE RUZYCKY

BOARD MEMBERS
MARK M. FINKLE
KENNETH F. DEWITT
ALFRED J. CANDIDO, JR.
ALBERT J. HAYES
RICHARD BIRD
TIMOTHY J. REAGAN
NICOLE T. ALLEN

CONSULTING ENGINEERS

ARCADIS OF NEW YORK, INC.
646 PLANK ROAD
SUITE 100
CLIFTON PARK, NEW YORK 12065



SIXTH LAKE DAM LOCATION PLAN

APPROXIMATE SCALE: 1"=1000'

ARCADIS | Design & Consultancy for natural and built assets

STATE OF NEW YORK
MICHAEL F. KOSIER
No. 077878
LICENSED PROFESSIONAL ENGINEER

APPROVED FOR
ARCADIS OF NEW YORK, INC. _____

NOTE:
SCALES SHOWN HEREIN ARE FOR FULL SIZE PLOTS. CONTRACTOR SHALL BE RESPONSIBLE FOR CONVERTING SCALES ON REDUCED OR ENLARGED PLOTS.

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

USER: LANZAROTTA FILENAME: C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\OLD CAD\V8.1 - OLD FORGE DAM CAD\03-SHEETS\GENERAL\OF-G-001.DWG SAVE DATE: 6/9/2025, 11:27 AM PLOT DATE: 6/17/2025, 10:35 AM

GENERAL NOTES:

1. THE "DISTRICT" SHALL BE DEFINED AS THE HUDSON RIVER–BLACK RIVER REGULATING DISTRICT.
2. TOPOGRAPHY AND BATHYMETRY COMPLETED MAY 2018 BY HOLLISTER GEOMANTICS LAND SURVEYING PLLC.
3. ELEVATIONS SHOWN ON THE DRAWINGS ARE IN FEET AND REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF NGVD 29 VERTICAL DATUM. HORIZONTAL CONTROL WAS ESTABLISHED USING THE NEW YORK STATE PLANE WEST SYSTEM.
4. PROJECT NORTH ORIENTATION IS BASED ON OBSERVATIONS TAKEN AT THE TIME OF THE FIELD SURVEY.
5. PROPERTY BOUNDARIES FOR OLD FORGE DAM ARE BASED ON "BOUNDARY SURVEY FOR OLD FORGE DAM, TOWN OF WEBB" COMPLETED BY JOHN W. FERGUSON, DATED 9–09–2004.
6. PROPERTY BOUNDARIES FOR SIXTH LAKE DAM ARE BASED ON "PROPERTY RESURVEY" OF 1967 SURVEY, NOT DATED.
7. CONTRACTOR SHALL ESTABLISH LOCAL SURVEY CONTROL AND BENCHMARKS USING THE NORTH AMERICAN VERTICAL DATUM OF NGVD 29 AND THE NEW YORK STATE PLANE WEST SYSTEM. CONTRACTOR SHALL PROVIDE SIGNED AND SEALED SURVEY MEASUREMENTS FROM A LICENSED NYS SURVEYOR. CONTRACTOR SHALL PROTECT BENCHMARKS FROM DAMAGE DURING CONSTRUCTION AND REPLACE AS NECESSARY. OWNER AND ENGINEER SHALL HAVE USE OF SURVEY BENCHMARKS DURING CONSTRUCTION. CONTRACTOR SHALL CONFIRM COORDINATES ON DRAWINGS AND NOTIFY ENGINEER OF DISCREPANCIES PRIOR TO THE START OF WORK.
8. AERIAL IMAGERY SHOWN FOR ILLUSTRATIVE PURPOSES ONLY AND SHALL NOT BE USED FOR LAYOUT, MEASUREMENTS, OR OTHER PURPOSES THAT MAY IMPACT CONSTRUCTION.
9. THE CONTRACTOR SHALL FURNISH ALL LABOR, EQUIPMENT, MATERIALS, SUPPLIES, FACILITIES, POWER, AND INCIDENTALS NECESSARY TO FULLY COMPLETE THE WORK AS SHOWN, AS SPECIFIED, AND AS DIRECTED BY THE ENGINEER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PERFORMING ALL WORK DESCRIBED IN THE CONTRACT DOCUMENTS, INCLUDING ITEMS NOT SPECIFICALLY IDENTIFIED, AS REQUIRED TO COMPLETE THE WORK.
10. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS, AND THE CONTRACTORS APPROVED SUBMITTALS. IF ANY LAW, REGULATION AND/OR CONTRACT DOCUMENTS HAVE CONTRAINDICATING REQUIREMENTS, THEN THE MOST STRINGENT REQUIREMENT SHALL APPLY, AS DETERMINED BY THE ENGINEER. LOCAL LAWS SHALL INCLUDE ANY TOWN, VILLAGE, CITY OR OTHER LOCAL REGULATORY AUTHORITY HAVING JURISDICTION.
11. THE CONTRACTOR SHALL COMPLY WITH ALL PERMITS OBTAINED BY THE DISTRICT, AS INDICATED IN THE CONTRACT DOCUMENTS. IN ADDITION TO THE PERMITS OBTAINED BY THE DISTRICT, THE CONTRACTOR SHALL IDENTIFY, APPLY FOR AND OBTAIN, PAY ALL FEES FOR, AND COMPLY WITH ALL REQUIREMENTS OF ALL ISSUED LICENSES, PERMITS, APPROVALS AND INSURANCE REQUIRED FROM FEDERAL, STATE AND LOCAL GOVERNMENT; PUBLIC AGENCIES; AND AUTHORITIES NECESSARY TO PERFORM THE WORK. THE CONTRACTOR SHALL PROVIDE INDEMNIFICATIONS TO PUBLIC AND PRIVATE AGENCIES AND AUTHORITIES AS NECESSARY TO PERFORM THE WORK.
12. THE CONTRACTOR IS RESTRICTED FROM PERFORMING ANY OPERATIONS OUTSIDE THE DEFINED CONTRACT LIMITS UNLESS OTHERWISE APPROVED BY THE DISTRICT.
13. UTILITIES SHOWN ON THE PLANS ARE FOR INFORMATION ONLY AND HAVE BEEN OBTAINED FROM AVAILABLE SOURCES. THE EXISTENCE AND LOCATION OF UTILITIES INDICATED ON THE PLANS ARE NOT GUARANTEED AND SHALL BE INVESTIGATED AND VERIFIED IN THE FIELD BY THE CONTRACTOR BEFORE STARTING WORK. PUBLIC AND PRIVATE UTILITIES SHALL BE LOCATED BY THE CONTRACTOR, AT NO ADDITIONAL COST TO THE DISTRICT. EXCAVATION IN THE VICINITY OF UNDERGROUND UTILITIES SHALL BE DUG BY HAND. THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR ANY DAMAGE TO EXISTING UTILITIES.
14. PRIOR TO EXCAVATION, CONTRACTOR SHALL PROVIDE PROPER NOTICE TO ALL UTILITY COMPANIES AFFECTED BY THE WORK IN THIS PROJECT. CONTRACTOR SHALL BE RESPONSIBLE FOR RELOCATION OF ALL UTILITIES AS REQUIRED AND COORDINATION WITH ALL UTILITY OWNERS. UTILITIES HAVE BEEN PLOTTED FROM AVAILABLE SURVEY INFORMATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THEIR FIELD LOCATION AND AVOID DAMAGE.
15. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO TEST PIT (AT NO ADDITIONAL COST) TO ASCERTAIN THE EXACT LOCATION/ELEVATION OF ALL UTILITIES AND TO DETERMINE THE LOCATION/ELEVATION OF ANY OTHER UTILITIES NOT SHOWN HEREON PRIOR TO COMMENCING ANY EXCAVATION OPERATIONS. EXISTING UTILITIES LOCATIONS AND ELEVATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE AND ARE INTENDED ONLY TO NOTE EXISTENCE OF SUCH UTILITIES IN THE AREAS SHOWN. BEFORE PROCEEDING WITH THE WORK, VERIFY UTILITY, AND ELEVATIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
16. CARE SHALL BE TAKEN NOT TO DAMAGE EXISTING UTILITIES OR STRUCTURES DURING CONSTRUCTION. ALL DAMAGE CAUSED BY THE CONTRACTOR'S OPERATION SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE DISTRICT BY THE CONTRACTOR AT NO EXPENSE TO THE DISTRICT.
17. PROTECT ALL EXISTING UNDERGROUND UTILITIES AND FACILITIES AGAINST DAMAGE FROM HAULING AND CONSTRUCTION OPERATIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY SUCH UTILITIES AND FACILITIES. IN NO CASE SHALL THE CONTRACTOR PLACE VEHICLE LOADS EXCEEDING THE LEGAL LOAD LIMIT WITHIN 10 FEET OF THESE UTILITIES AND FACILITIES. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE REQUIREMENTS OF SECTION 105–12 OF THE NYS DOT STANDARD SPECIFICATIONS. IF THE CONTRACTOR ELECTS TO PLACE LOADS EXCEEDING THE LEGAL LIMIT ON THESE OR OTHER UNDERGROUND FACILITIES OR UTILITIES, IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE AND ADVISE THE OWNER OF THE TYPE, SIZE AND WEIGHT OF ALL VEHICLES HE INTENDS TO USE OVER THESE FACILITIES DURING CONSTRUCTION TAKING INTO ACCOUNT THE CONDITION OF THE EXISTING FACILITIES. THIS DETERMINATION SHALL BE MADE BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW YORK EMPLOYED AND PAID BY THE CONTRACTOR, AND IS TO BE MADE PRIOR TO THE USE OF ANY FACILITIES WITH ALL RESTRICTIONS ENUMERATED BY HIM BEING STRICTLY ADHERED TO. IN THE EVENT THE CONTRACTOR OR ANY SUBCONTRACTORS FAIL TO COMPLY WITH FINDINGS OF THE PROFESSIONAL ENGINEER, THE WORK SHALL BE IMMEDIATELY CEASED UNTIL CORRECTIVE PROCEDURES, SATISFACTORY TO THE PROFESSIONAL ENGINEER, ARE EMPLOYED. ALL DAMAGE, DIRECT OR INDIRECT, OF WHATEVER NATURE RESULTING FROM THE PERFORMANCE OF THE WORK OR RESULTING TO THE WORK DURING ITS PROGRESS, FROM WHATEVER CAUSE, SHALL BE BORNE AND SUSTAINED BY THE CONTRACTOR.
18. DURING CONSTRUCTION, THE CONTRACTOR SHALL MAINTAIN TRAFFIC ON ALL ROADWAYS WHERE THE WORK IS IN PROGRESS OR WOULD OTHERWISE BE IMPACTED BY CONSTRUCTION ACTIVITIES. ALL ROADWAYS SHALL REMAIN OPEN AND ACCESSIBLE TO ALL, EXCEPT AS OTHERWISE SPECIFIED OR APPROVED. NO ROAD CLOSURES SHALL BE ALLOWED AS PART OF THE CONTRACT.
19. ALL TRAFFIC SIGNS SHALL CONFORM TO THE LATEST EDITION OF THE NYS DOT MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES. IN THE EVENT OF A CONFLICT BETWEEN THE NYS DOT MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND THE FEDERAL MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, THE FEDERAL MANUAL SHALL APPLY.
20. ALL MATERIALS ARE TO BE PROPERLY STORED AND SECURED AWAY FROM TRAFFIC AND PEDESTRIANS.
21. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LINES, GRADES AND ELEVATIONS.
22. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND CONDITIONS BEFORE COMMENCING WORK. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REPORT ANY DISCREPANCIES TO THE ENGINEER AND THE DISTRICT IN A TIMELY MANNER. FAILURE TO PROSPECT IN ADVANCE OF WORK DIMENSIONS SHALL NOT BE CAUSE FOR ADDITIONAL COSTS TO THE OWNER OR TIME TO THE CONTRACT.
23. CONTRACTOR SHALL PROTECT WETLANDS FROM DISTURBANCE UNLESS OTHERWISE SHOWN.
24. CLEAR TREES AND BRUSH FROM WITHIN THE DESIGNATED WORK AREA TO THE EXTENTS SHOWN AND AS NECESSARY TO PERFORM THE WORK.
25. THE CONTRACTOR MUST REMOVE ALL CONSTRUCTION WASTE MATERIAL AND BARRICADES FROM ALL AREAS WHEN CONSTRUCTION IS COMPLETED.
26. UNLESS OTHERWISE SHOWN CONTRACTOR SHALL RESTORE GROUND SURFACE, DRAINAGE DITCHES AND EMBANKMENTS IMPACTED BY HIS WORK TO ORIGINAL EXISTING GRADE. RESTORE ALL AREAS DISTURBED BY THE CONTRACTOR TO THE ORIGINAL CONDITIONS OR AS INDICATED ON THE CONTRACT DRAWINGS.
27. ANY EXCAVATION THAT IS TO REMAIN OPEN AFTER NORMAL WORKING HOURS SHALL BE COMPLETELY FENCED AND WITH APPROPRIATE SIGNAGE, CONFORMING WITH OSHA REGULATIONS, DETERMINED BY A COMPETENT PERSON, AND TO THE SATISFACTION OF THE ENGINEER TO PROTECT THE PUBLIC AND PREVENT UNAUTHORIZED ENTRY.
28. ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH APPLICABLE STATE AND LOCAL STATUTES AND U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS (O.S.H.A.). COPIES OF O.S.H.A.'S STANDARDS MAY BE PURCHASED FROM THE U.S. GOVERNMENT PRINTING OFFICE. THE CONTRACTOR ALONE WILL BE RESPONSIBLE FOR THE EXECUTION OF WORK IN ACCORDANCE WITH ALL APPLICABLE HEALTH AND SAFETY REQUIREMENTS. THE OWNER NOR THE ENGINEER SHALL INSPECT THE WORK OR METHODS OF CONSTRUCTION FOR COMPLIANCE WITH THESE REQUIREMENTS.
29. CONTRACTOR SHALL COORDINATE THE WORK WITH THE DISTRICT'S OPERATION OF OLD FORGE AND SIXTH LAKE DAMS. REFER TO PROJECT COORDINATION WITH OWNER'S OPERATIONS SECTION 011416.
30. CONTRACTOR SHALL PERFORM DAILY CLEANUP OPERATIONS WHICH INCLUDE SWEEPING OF THE ROADWAYS, REMOVAL OF DEBRIS (TRASH, DEBRIS, ETC.) REMOVAL OF EXCESS CONSTRUCTION MATERIALS, ALL TO THE SATISFACTION OF THE ENGINEER THROUGHOUT THE CONTRACT DURATION.
31. CONTRACTOR SHALL RESTORE SITE TO A CONDITION AT LEAST AS GOOD AS EXISTED PRIOR TO DISTURBANCE (IN KIND) UNLESS OTHERWISE SPECIFICALLY DIRECTED IN THE CONTRACT DOCUMENTS. DAMAGED ITEMS SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
32. SCALES SHOWN HEREIN ARE FOR FULL SIZE PLOTS ON 22x34 INCH SHEETS. THE CONTRACTOR IS RESPONSIBLE FOR CONVERTING SCALES ON REDUCED OR ENLARGED PLOTS.
33. SYMBOLS AND ABBREVIATIONS SHOWN ARE STANDARD AND MAY NOT BE UTILIZED WITHIN THESE CONTRACT DRAWINGS FOR THE WORK DEPICTED.

DESCRIPTION OF WORK: OLD FORGE DAM

1. THIS CONSTRUCTION CONTRACT WORK INCLUDES, BUT IS NOT LIMITED TO: GENERAL SITE SECURITY; GENERAL SITE MAINTENANCE; INSTALLATION, MAINTENANCE, AND REMOVAL OF EROSION AND SEDIMENT CONTROLS; COORDINATING AND SUPPORTING THE DISTRICT'S MANAGEMENT OF LAKE LEVELS ACCORDING TO THE TARGET ELEVATION CURVE (SEE SHEET C–02) AND INCLUDING ADDITIONAL DRAW DOWN AHEAD OF STORM EVENTS OR ADDITIONAL DISCHARGES TO MEET PERMIT REQUIREMENTS; DESIGN AND CONSTRUCTION OF POST–TENSIONED ANCHORS TO STABILIZE THE EXISTING SPILLWAY AND OUTLET WORKS; INSTALLATION, MAINTENANCE, PHASING, AND REMOVAL OF TEMPORARY COFFERDAM AND TURBIDITY CURTAIN FOR PERFORMANCE OF THE WORK; PHASED EXCAVATION OF THE EMBANKMENT, ABUTMENTS, UPSTREAM SEDIMENTS, OR OTHER AREAS WHERE SOIL OR ROCK REMOVAL IS REQUIRED TO REACH THE DESIGN ELEVATION; DEMOLITION OF CONCRETE STRUCTURES USING CUTTING OR CHIPPING TO NOT DISTURB CONCRETE STRUCTURES REMAINING UNTIL OTHER PHASES OF THE WORK OR COMPLETED CONCRETE STRICTURES; FORMING AND PLACEMENT OF NEW STRUCTURAL CONCRETE; PLACEMENT OF FILL MATERIALS (E.G., GENERAL FILL, STONE, RIP RAP, ETC); PHASED CONSTRUCTION OF DAM REHABILITATION FEATURES; ACCEPTANCE TESTING OF NEW VERTICAL LIFT GATES; SITE RESTORATION INCLUDING PAVING, TOPSOIL AND SEEDING, AND OTHER PLANTINGS; COORDINATION OF THE WORK WITH OTHER WORK; AND CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

   THE ELECTRICAL WORK INCLUDES, BUT IS NOT LIMITED TO: REMOVAL AND SAFE STORAGE OF EXISTING INSTRUMENTATION INCLUDING BUT NOT LIMITED TO WEATHER STATIONS, WATER LEVEL GAUGES, PIEZOMETERS, CAMERAS, OR OTHER EQUIPMENT IDENTIFIED AS BEING REUSED IN THE PROJECT; TEMPORARILY DISCONNECT EXISTING ELECTRICAL SERVICE IN COORDINATION WITH OTHER WORK; COORDINATION AND COMPLETION OF THE INSTALLATION OF THE NEW ELECTRICAL SERVICE; INSTALLING NEW ELECTRICAL METERS, DISTRIBUTION, INTERIOR AND EXTERIOR ELECTRICAL OUTLETS AND LIGHTING; REINSTALLATION OF REUSED EQUIPMENT; PERFORMANCE TESTING OF NEW INSTRUMENTATION, CAMERAS, ETC; COORDINATION OF THE WORK; AND CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

DESCRIPTION OF WORK: SIXTH LAKE DAM

1. THIS CONSTRUCTION CONTRACT WORK INCLUDES, BUT IS NOT LIMITED TO: GENERAL SITE SECURITY; GENERAL SITE MAINTENANCE; INSTALLATION, MAINTENANCE, AND REMOVAL OF EROSION AND SEDIMENT CONTROLS; COORDINATING AND SUPPORTING THE DISTRICT'S MANAGEMENT OF LAKE LEVELS ACCORDING TO THE TARGET ELEVATION CURVE (SEE SHEET C–02) AND INCLUDING ADDITIONAL DRAW DOWN AHEAD OF STORM EVENTS OR ADDITIONAL DISCHARGES TO MEET PERMIT REQUIREMENTS; INSTALLATION, MAINTENANCE, PHASING, AND REMOVAL OF TEMPORARY COFFERDAM AND TURBIDITY CURTAIN FOR PERFORMANCE OF THE WORK; PHASED EXCAVATION OF THE EMBANKMENT, ABUTMENTS, UPSTREAM SEDIMENTS, OR OTHER AREAS WHERE SOIL OR ROCK REMOVAL IS REQUIRED TO REACH THE DESIGN ELEVATION; DEMOLITION OF CONCRETE STRUCTURES USING CUTTING OR CHIPPING TO NOT DISTURB CONCRETE STRUCTURES REMAINING UNTIL OTHER PHASES OF THE WORK OR COMPLETED CONCRETE STRICTURES; FORMING AND PLACEMENT OF NEW STRUCTURAL CONCRETE; PLACEMENT OF FILL MATERIALS (E.G., GENERAL FILL, STONE, RIP RAP, ETC); PHASED CONSTRUCTION OF DAM REHABILITATION FEATURES; ACCEPTANCE TESTING OF NEW VERTICAL LIFT GATES; SITE RESTORATION INCLUDING PAVING, TOPSOIL AND SEEDING, AND OTHER PLANTINGS; COORDINATION OF THE WORK WITH OTHER WORK; AND CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

   THE ELECTRICAL WORK INCLUDES, BUT IS NOT LIMITED TO: REMOVAL AND SAFE STORAGE OF EXISTING INSTRUMENTATION INCLUDING BUT NOT LIMITED TO WEATHER STATIONS, WATER LEVEL GAUGES, PIEZOMETERS, CAMERAS, OR OTHER EQUIPMENT IDENTIFIED AS BEING REUSED IN THE PROJECT; TEMPORARILY DISCONNECT EXISTING ELECTRICAL SERVICE IN COORDINATION WITH OTHER WORK; COORDINATION AND COMPLETION OF THE INSTALLATION OF THE NEW ELECTRICAL SERVICE; INSTALLING NEW ELECTRICAL METERS, DISTRIBUTION, INTERIOR AND EXTERIOR ELECTRICAL OUTLETS AND LIGHTING; REINSTALLATION OF REUSED EQUIPMENT; PERFORMANCE TESTING OF NEW INSTRUMENTATION, CAMERAS, ETC; COORDINATION OF THE WORK; AND CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

OPERATION OF DAM, CONSTRAINTS AND CONTRACTOR'S RESPONSIBILITIES DURING CONSTRUCTION

1. WORK UNDER THIS CONTRACT SHALL BE CONDUCTED BY THE CONTRACTOR SO AS NOT TO IMPEDE OPERATION OF THE DAM AS EXPLICITLY PERMITTED IN PERFORMING THE WORK SHOWN AND SPECIFIED.
2. CONTRACTOR SHALL NOT DRAW DOWN THE WATER LEVEL DURING CONSTRUCTION OF EITHER OLD FORGE OR SIXTH LAKE DAM REHABILITATION.
3. CONTRACTOR'S WORK MAY BE IMPACTED BY THE DISTRICT'S RELEASES FROM THE LAKES IN ACCORDANCE WITH THE DISTRICT'S RULE CURVE. CONTRACTOR SHALL BE AWARE THAT MANAGEMENT OF THE WATER LEVEL MAY INCLUDE BUT IS NOT LIMITED TO REGULATORY DOWNSTREAM RELEASES, DRAW DOWN OF THE WATER LEVELS PRIOR TO STORM EVENTS, MAINTAINING HIGHER WATER LEVELS OUTSIDE OF THE DISTRICTS'S RULE CURVE, OR OTHER OPERATION VARIATIONS.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING AND PROVIDING TEMPORARY POWER AS NECESSARY FOR PERFORMANCE OF THEIR WORK.
5. THE CONTRACTOR SHALL SCHEDULE ALL WORK SO THAT THE DAMS AND ALL APPURTENANCES, ARE MAINTAINED IN CONTINUOUS OPERATION.
6. DISTRICT PERSONNEL SHALL HAVE ACCESS TO ALL AREAS THROUGHOUT THE CONSTRUCTION PERIOD. THE CONTRACTOR SHALL LOCATE STORED MATERIAL, DISPOSE OF CONSTRUCTION DEBRIS AND TRASH, PROVIDE TEMPORARY WALKWAYS, PROVIDE TEMPORARY POWER, AND OTHER SUCH WORK AS DIRECTED BY THE ENGINEER TO MAINTAIN PERSONNEL ACCESS TO AREAS IN OPERATION.
7. CONTRACTOR SHALL PROVIDE UNINTERRUPTED ACCESS FOR THE DISTRICT TO MANAGE THE WATER LEVEL FOR THE DURATION OF THE CONSTRUCTION PERIOD.
8. ANY TEMPORARY WORK, FACILITIES, ROAD OR ACCESS THEREOF, WALKS, PROTECTION OF EXISTING STRUCTURES, ETC. THAT MAY BE REQUIRED WITHIN THE CONTRACTOR'S WORK LIMITS TO MAINTAIN CONTINUOUS AND DEPENDABLE DAM OPERATION SHALL BE FURNISHED BY THE CONTRACTOR IN A MANNER ACCEPTABLE TO THE ENGINEER AT NO ADDITIONAL COST TO THE DISTRICT.
9. THE DISTRICT AND ENGINEER SHALL HAVE THE AUTHORITY TO ORDER WORK STOPPED OR PROHIBITED THAT WOULD, IN ITS OPINION, UNREASONABLY RESULT IN INTERRUPTING THE NECESSARY FUNCTIONS OF THE DAM'S OPERATIONS, INCLUDING THE SPILLWAY.
10. ACCESS TO ROADWAYS AND PARKING AREAS.
    A. AN UNOBSTRUCTED TRAFFIC ROUTE ON THE DISTRICT PROPERTY SHALL BE MAINTAINED AT ALL TIMES FOR DISTRICT PERSONNEL AND MAINTENANCE EQUIPMENT, PARKING FOR PERSONAL VEHICLES OF CONSTRUCTION PERSONNEL WILL BE ALLOWED AS APPROVED BY DISTRICT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING AND MAINTAINING PARKING AREAS.
    B. VEHICULAR ACCESS TO THE DAM SHALL BE MAINTAINED AT ALL TIMES BY THE CONTRACTOR.

INDEX TO DRAWINGS

SHEET NO.	TITLE
GENERAL	
G–00	COVER SHEET
G–01	GENERAL NOTES, SYMBOLS, AND LEGEND
G–02	RESERVOIR TARGET ELEVATION CURVES
G–03	EROSION AND SEDIMENT CONTROL DETAILS I
G–04	EROSION AND SEDIMENT CONTROL DETAILS II
G–05	SITE RESTORATION DETAILS
G–06	OLD FORGE DAM EROSION CONTROL AND STAGING PLAN
G–07	SIXTH LAKE DAM EROSION CONTROL AND STAGING PLAN
CIVIL	
C–01	OLD FORGE DAM EXISTING SITE PLAN
C–02	OLD FORGE DAM DEMOLITION PLAN
C–03	OLD FORGE DAM FINAL PLAN I
C–04	OLD FORGE DAM FINAL PLAN II
C–05	OLD FORGE DAM CONSTRUCTION PHASE I
C–06	OLD FORGE DAM CONSTRUCTION PHASE II
C–07	OLD FORGE DAM SECTIONS I
C–08	OLD FORGE DAM SECTIONS II
C–09	SIXTH LAKE DAM EXISTING SITE PLAN
C–10	SIXTH LAKE DAM DEMOLITION PLAN
C–11	SIXTH LAKE DAM FINAL PLAN
C–12	SIXTH LAKE DAM CONSTRUCTION PHASE 1
C–13	SIXTH LAKE DAM CONSTRUCTION PHASE II
C–14	SIXTH LAKE DAM SECTIONS AND DETAILS I
C–15	SIXTH LAKE DAM SECTIONS AND DETAILS II
C–16	OLD FORGE DAM SLUICE GATE DETAILS
C–17	SIXTH LAKE DAM SLUICE GATE DETAILS
C–18	DETAILS WATER ACCESS
STRUCTURAL	
S–01	GENERAL NOTES
S–02	DESIGN CRITERIA AND ABBREVIATIONS
S–03	OLD FORGE DAM SPILLWAY PLAN PHASE 1 LOWER PLAN
S–04	OLD FORGE DAM SPILLWAY PLAN PHASE 1 UPPER PLAN
S–05	OLD FORGE DAM SPILLWAY PLAN PHASE 2
S–06	OLD FORGE DAM SPILLWAY SECTIONS AND DETAILS SHEET 1
S–07	OLD FORGE DAM SPILLWAY SECTIONS AND DETAILS SHEET 2
S–08	SIXTH LAKE DAM SPILLWAY PLAN
S–09	SIXTH LAKE DAM SPILLWAY SECTIONS AND DETAILS SHEET 1
S–10	SIXTH LAKE DAM SPILLWAY SECTIONS AND DETAILS SHEET 2
S–11	TYPICAL DETAILS SHEET 1
S–12	TYPICAL DETAILS SHEET 2
ELECTRICAL	
E–01	LEGEND, NOTES, AND ABBREVIATIONS
E–02	OLD FORGE DAM ELECTRICAL DEMOLITION PLAN
E–03	OLD FORGE DAM ELECTRICAL PLAN
E–04	OLD FORGE DAM ONE – LINE DIAGRAM AND SCHEDULES
E–05	SIXTH LAKE DAM ELECTRICAL DEMOLITION PLAN
E–06	SIXTH LAKE DAM ELECTRICAL PLAN
E–07	SIXTH LAKE DAM ONE – LINE DIAGRAM AND SCHEDULES
E–08	DETAILS
E–09	BLOCK DIAGRAMS
ARCHITECTURAL	
A–01	ABBREVIATIONS, LEGEND AND NOTES
A–02	CODE CHARTS
A–03	OLD FORGE DAM – FLOOR AND ROOF PLAN
A–04	OLD FORGE DAM – EXTERIOR ELEVATIONS
A–05	OLD FORGE DAM – BUILDING AND WALL SECTIONS
A–06	SIXTH LAKE DAM – FLOOR AND ROOF PLAN
A–07	SIXTH LAKE DAM – EXTERIOR ELEVATIONS
A–08	SIXTH LAKE DAM – BUILDING AND WALL SECTIONS
A–09	SCHEDULES
A–10	MISCELLANEOUS DETAILS

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · No. 077878 · LICENSED PROFESSIONAL ENGINEER

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE:	JUNE 2025
PROJECT NO.:	30001381
FILE NAME:	OF–G–01
DESIGNED BY:	EJL
DRAWN BY:	EJL
CHECKED BY:	TM

SHEET TITLE

GENERAL

GENERAL NOTES, SYMBOLS, AND LEGEND

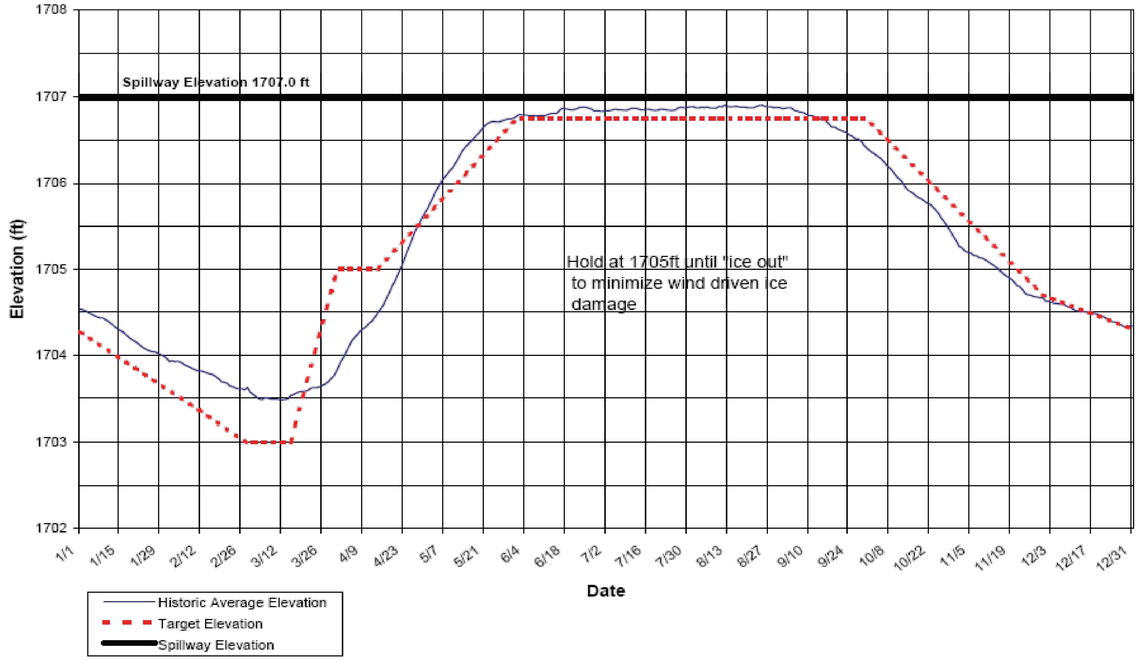
SCALE: NO SCALE

G–01

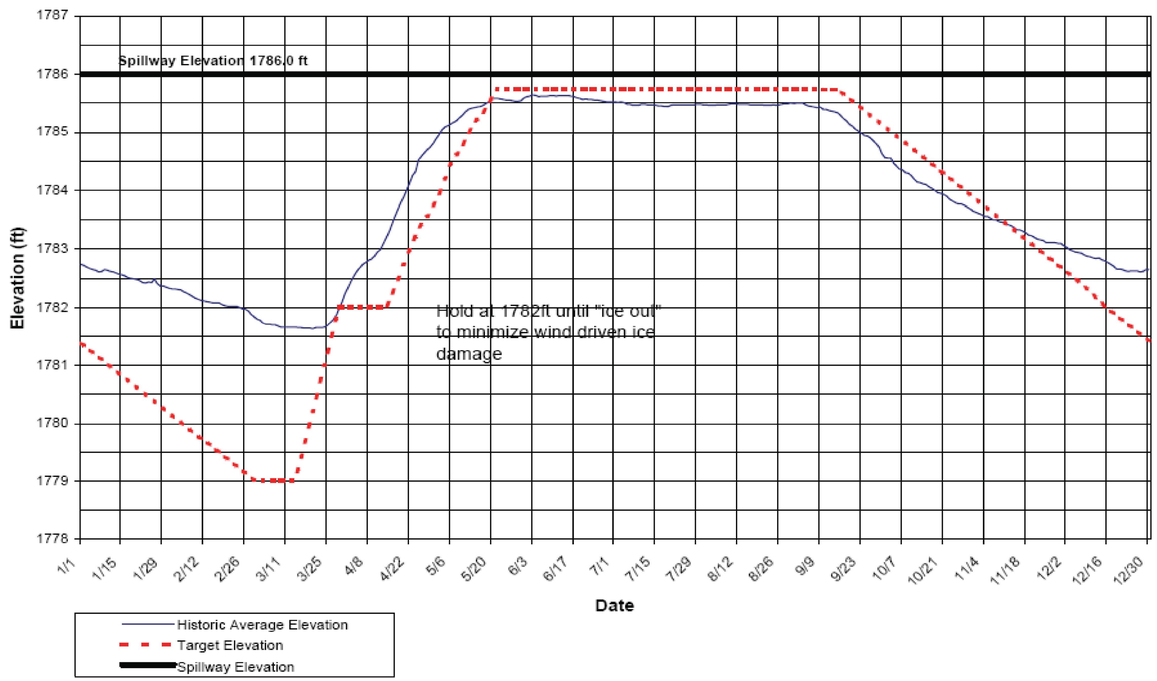
SHEET 1 OF 7

User:LANZAROTTA, Spec:AIS–NCSMOD File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.1 – OLD FORGE DAM CADD\03–SHEETS\GENERAL\OF–G–01.DWG
Scale:1:1 Saved:Date 6/7/2025 Time:10:19 Plot Date: Contractor, Eric 6/7/2025 10:35 Layout:G–01

Old Forge Reservoir
Target Elevation



Sixth Lake Reservoir
Target Elevation



ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-G-02
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

GENERAL

RESERVOIR TARGET ELEVATION CURVES

SCALE: NO SCALE

G-02

SHEET 2 OF 7

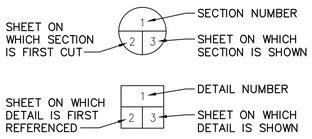
User:LANZAROTTA Spec: AUS-NOSMOD File: C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\GENERAL\OF-G-02.DWG
Scale: 1:1 Save Date: 6/17/2025 Time: 13:50 Plot Date: Lanzarotta, Eric, 6/17/2025 10:36 Layout: G-02

GENERAL EROSION AND SEDIMENT CONTROL NOTES:

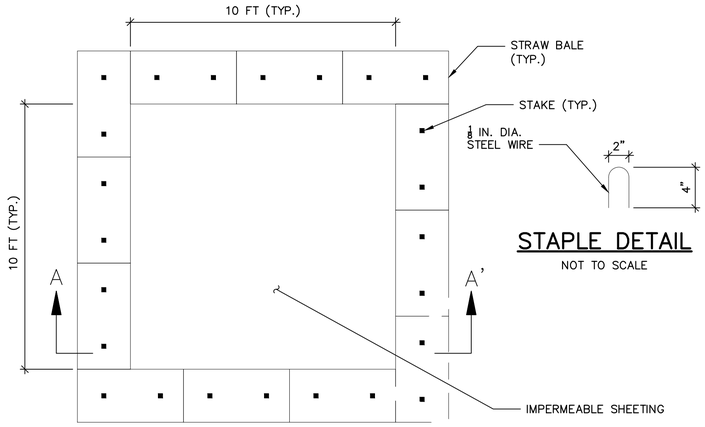
1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL (BLUE BOOK), CURRENT EDITION. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE STORMWATER PERMITS, INCLUDING THE NYSDEC SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES, AND WITH THE REQUIREMENTS OF THE APPROVED STORMWATER POLLUTION PREVENTION PLAN.
2. ALL SOIL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCE, AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED. CONTRACTOR SHALL INSPECT AND REPAIR SEDIMENT AND EROSION CONTROL MEASURES DAILY.
3. UPON COMPLETION OF FINAL GRADING, IF THE SEASON PREVENTS THE ESTABLISHMENT OF A PERMANENT COVER, THE DISTURBED AREA WILL BE TEMPORARILY SEEDED IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.
4. PERMANENT VEGETATION TO BE SEEDED ON ALL EXPOSED AREAS WITHIN SEVEN (7) DAYS AFTER FINAL GRADING. MULCH TO BE USED AS NECESSARY FOR PROTECTION UNTIL SEEDING IS ESTABLISHED.
5. AT THE TIME WHEN THE SITE PREPARATION FOR PERMANENT VEGETATIVE STABILIZATION IS GOING TO BE ACCOMPLISHED, ANY SOIL THAT WILL NOT PROVIDE A SUITABLE ENVIRONMENT TO SUPPORT ADEQUATE VEGETATIVE GROUND COVER SHALL BE REMOVED OR TREATED IN SUCH A WAY THAT WILL PERMANENTLY ADJUST THE SOIL CONDITIONS AND RENDER THEM SUITABLE FOR VEGETATIVE GROUND COVER. IF THE REMOVAL OR TREATMENT OF THE SOIL WILL NOT PROVIDE SUITABLE CONDITIONS, NON-VEGETATIVE MEANS OF PERMANENT GROUND STABILIZATION SHALL BE EMPLOYED.
6. DISTURBED AREAS AND STOCKPILED MATERIALS, WHICH WILL NOT BE RE-DISTURBED WITHIN TEN (10) DAYS, SHALL BE STABILIZED BY USE OF MULCHING, SEEDING, GEOTEXTILE FABRIC, OR OTHER APPROVED METHODS.
7. CLEANING OF ROADWAYS: CONTRACTOR SHALL KEEP THE TRAVELED WAY FREE OF FOREIGN OBJECTS SUCH AS SPILLED EARTH, ROCK, TIMBER, AND OTHER ITEMS THAT MAY FALL FROM TRANSPORTING VEHICLES. MATERIALS SPILLED BY OR DROPPED FROM THE UNDERCARRIAGE OF ANY CARRYING VEHICLE USED IN CONTRACTOR'S HAULING OPERATIONS ALONG OR ACROSS ANY PUBLIC TRAVELED WAY SHALL BE REMOVED IMMEDIATELY.
8. CONDUIT OUTLET PROTECTION MUST BE INSTALLED AT ALL REQUIRED OUTFALLS PRIOR TO THE DRAINAGE SYSTEM BECOMING OPERATIONAL.
9. LIME, FERTILIZE AND SEED IN THE AREAS OF EROSION CONTROL FABRIC IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.
10. PROVIDE INLET DETAIL WHERE NO OBSTRUCTION TO TRAFFIC EXISTS. WHERE CATCH BASIN IS IN TRAFFIC AREA PROVIDE SILT BAG THAT MOUNTS INSIDE CATCH BASIN.

ABBREVIATIONS

AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWWA	AMERICAN WATER WORKS ASSOCIATION
NYS	NEW YORK STATE
NYS DEC	NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NYS DOT	NEW YORK STATE DEPARTMENT OF TRANSPORATION
USACE	UNITED STATES ARMY CORPS OF ENGINEERS
USGS	UNITED STATE GEOLOGICAL SURVEY
CO	CLEAN OUT
CONC	CONCRETE
CORP	CORPORATION
CPT	CONE PENETROMETER TEST
DEG	DEGREES
DI	DUCTILE IRON
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DN	DOWN
E	EAST
EL/ELEV	ELEVATION
EOP	EDGE OF PAVEMENT
EXIST	EXISTING
FH	FIRE HYDRANT
FF	FINISHED FLOOR
FLG	FLANGED
FT OR '	FEET OR FOOT
GP	GEOPROBE
GV	GATE VALVE
HDPE	HIGHT-DENSITY POLYETHYLENE
HP	HIGH POINT OR HORSEPOWER

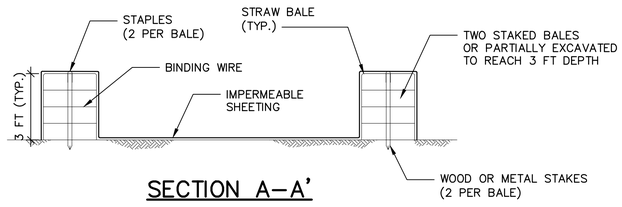


SECTION AND DETAIL KEY



CONCRETE TRUCK WASHOUT

NOT TO SCALE



SECTION A-A'

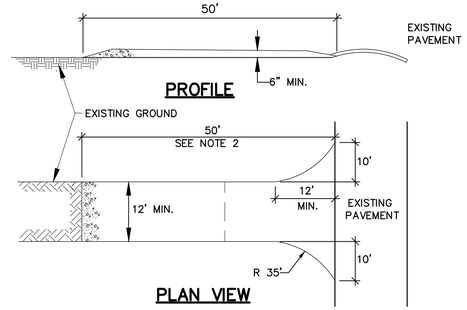
NOT TO SCALE

NOTES:

1. CONCRETE TRUCK WASHOUTS SHALL CONFORM TO THE MORE STRICT REQUIREMENTS OF THE CONTRACT DOCUMENTS OR THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL.
2. THE CONCRETE TRUCK WASHOUT SHALL BE INSTALLED PRIOR TO USING MATERIALS THAT REQUIRE WASHOUT ON THIS PROJECT.
3. A SIGN SHALL BE PLACED TO CLEARLY INDICATE THE LOCATION OF THE CONCRETE WASHOUT.
4. THE WASHOUT AREA WILL BE REPLACED AS NECESSARY TO MAINTAIN CAPACITY FOR LIQUID WASTE.
5. WASHOUT RESIDUE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF AT AN APPROVED WASTE FACILITY.
6. DO NOT WASHOUT INTO STORM DRAINS, OPEN DITCHES, STREETS, OR STREAMS.
7. AVOID DUMPING EXCESS CONCRETE IN NON-DESIGNATED DUMPING AREAS.
8. THE WASHOUT SHALL BE USED ONLY FOR NON-HAZARDOUS WASTES.
9. WASHOUT SHOULD BE PLACED NEAR A LOCATION WHERE CONCRETE IS BEING PLACED, IN AN ACCESSIBLE AND CONVENIENT LOCATION FOR CONCRETE TRUCKS AND EQUIPMENT. INGRESS AND EGRESS TO THESE LOCATIONS SHALL BE MAINTAINED.

LEGEND

- AREA OF GENERAL SOIL & SEDIMENT EXCAVATION
- AREA OF STRUCTURAL DEMOLITION
- GENERAL RESTORATION
- BOULDER RETAINING WALL
- LIMITS OF DISTURBANCE
- APPROXIMATE PROPERTY LINE
- SF — SILT FENCE
- TREE PROTECTION
- X — TEMPORARY CONSTRUCTION FENCE
- OH — EXISTING OVERHEAD ELECTRIC
- COFFERDAM ALIGNMENT
- 1700 — EXISTING CONTOUR
- 1700 — NEW MAJOR CONTOUR
- 1701 — NEW MINOR CONTOUR
- NEW WOODEN FENCE

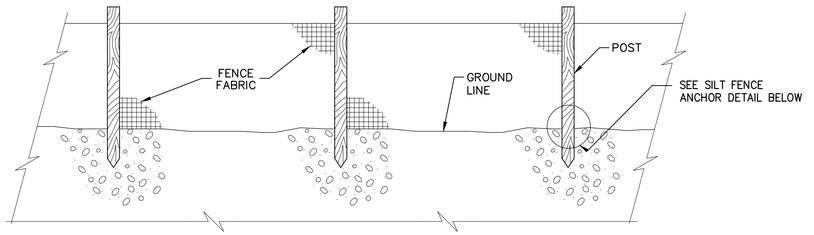


NOTES:

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE
2. LENGTH-AS REQUIRED, BUT NOT LESS THAN 50 FEET.
3. THICKNESS-NOT LESS THAN 6".
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE FABRIC WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE-THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

STABILIZED CONSTRUCTION ACCESS DETAIL

NOT TO SCALE

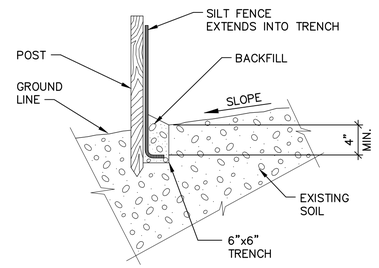


NOTES:

1. CONTRACTOR SHALL FURNISH AND INSTALL SILT FENCE AT LOCATIONS SHOWN.
2. FENCE FABRIC SHALL BE FASTENED SECURELY TO FENCE POSTS WITH TIES OR STAPLES
3. WHEN TWO SECTIONS OF FENCE FABRIC ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE FENCE.

SILT FENCE DETAIL

NOT TO SCALE



SILT FENCE ANCHOR DETAIL

NOT TO SCALE

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM - REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-G-03
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

GENERAL

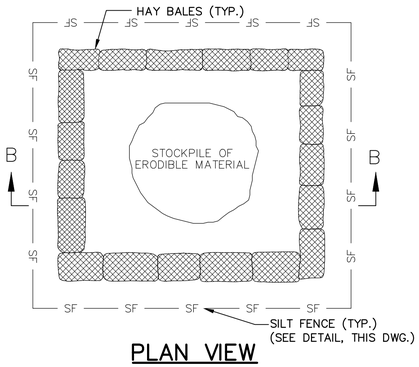
EROSION AND SEDIMENT CONTROL DETAILS I

SCALE: NO SCALE

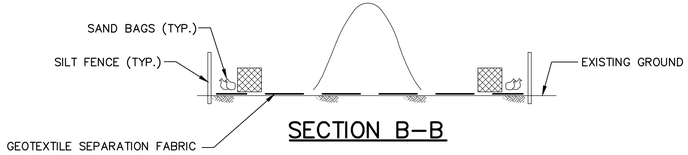
G-03

SHEET 3 OF 7

User:LANZAROTTA, Spec:AUS-NCSM0D File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\GENERAL\OF-G-03.DWG
Scale:1:1 Saved:Date:5/7/2025 Time:13:30 Plot Date: Layout:Date: 6/17/2025, 10:36 Layout:G-03



PLAN VIEW



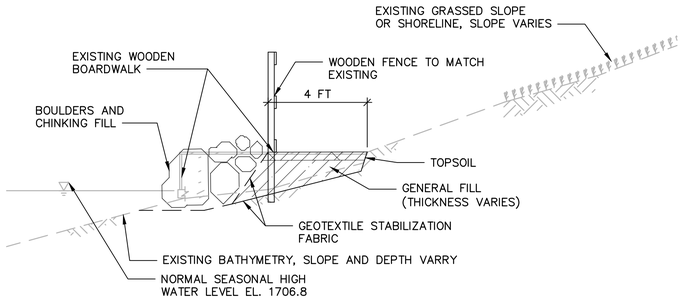
SECTION B–B

NOTES:

1. CONTRACTOR SHALL COORDINATE REMOVAL AND REPLACEMENT OF SILT FENCE AND HAY BALES, AS NECESSARY, TO FACILITATE ACCESS TO STOCKPILED MATERIAL.
2. TOP AND BOTTOM LINER SHALL BE PROVIDED FOR STOCKPILING CONTAMINATED MATERIALS. REFER TO THE SPECIFICATIONS.

SEDIMENT CONTROL DETAIL FOR STOCKPILING OF ERODIBLE MATERIAL

NOT TO SCALE

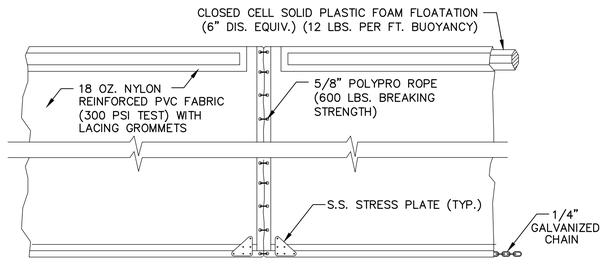


NOTES:

1. CONTRACTOR SHALL REMOVE EXISTING WOODEN BOARDWALK INCLUDING SURFACE WALKING SURFACE, INTERNAL STRUCTURE, VERTICAL FACING, AND OTHER COMPONENTS MAKING UP THE EXISTING WOODEN BOARDWALK.
2. CONTRACTOR SHALL REMOVE UNSUITABLE MATERIAL BEFORE PLACING GEOTEXTILE.
3. CONTRACTOR SHALL EXCAVATE SURFACE TO CREATE SPACE FOR BOULDERS. TOP SURFACE OF BOULDERS SHALL VARY MORE THAN 6 INCHES ABOVE OR BELOW ORIGINAL SURFACE, INCLUDING WOODEN BOARDWALK.
4. BOULDERS SHALL NOT EXCEED 30 INCHES IN ANY DIMENSION. BOULDERS SHALL BE GENERALLY ROUNDED IN SHAPE. SHARP CORNERS AND FLAT SURFACES SHOULD BE AVOIDED WHEREVER POSSIBLE.
5. CONTRACTOR SHALL PLACE SMALLER CHINKING FILL UNDER AND BETWEEN BOULDERS TO CREATE A RELATIVELY UNIFORM FINISHED SURFACE.

BOULDER RETAINING WALL DETAIL

NOT TO SCALE

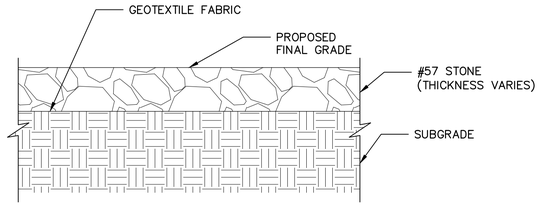


NOTES:

1. TURBIDITY CURTAIN SHALL EXTEND FROM THE WATER SURFACE TO 6" OFF THE RESERVOIR BED AND FROM END TO END WITHOUT GAP.
2. SHORE AND BOTTOM ANCHORS SHALL BE SUPPLIED AS REQUIRED UPON INSTALLATION.
3. MAINTENANCE SHALL BE PERFORMED AS SPECIFIED AND THE CURTAIN ADJUSTED BEFORE ACCUMULATED SEDIMENT REACHES THE LOWER EDGE OF THE SKIRT.

TURBIDITY CURTAIN DETAIL

NOT TO SCALE

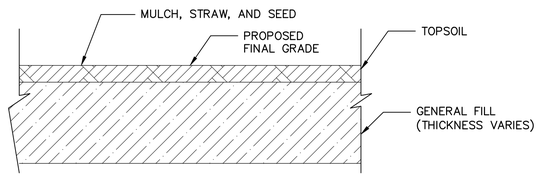


NOTES:

1. THICKNESS OF #57 STONE VARIES.
2. CONTRACTOR SHALL REMOVE DELETERIOUS MATERIAL FROM THE SURACE OF THE SUBGRADE BEFORE PLACING #57 STONE.
3. CONTRACTOR SHALL PREPARE SUBGRADE PER SPECIFICATIONS PRIOR TO PLACING #57 STONE.

GRAVEL FILL RESTORATION

NOT TO SCALE

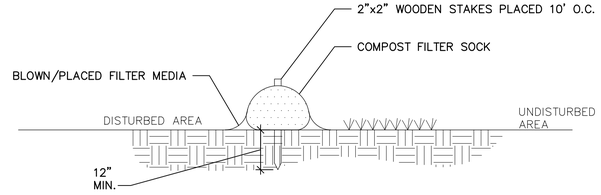


NOTES:

1. BACKFILL OR REGRADING MAY NOT OCCUR IN ALL AREAS AND DEPTH OF DISTURBANCE VARIES.
2. THICKNESS OF GENERAL FILL VARIES.
3. PROVIDE A MINIMUM OF 4–INCHES OF TOPSOIL.
4. CONTRACTOR SHALL AVOID DRIVING EQUIPMENT ON PLACED TOPSOIL TO PREVENT COMPACTION AFTER PLACEMENT.
5. CONTRACTOR SHALL PLACE STRAW, MULCH, AND SEED IN ACCORDANCE WITH CONTRACT DOCUMENTS IN AREAS WHERE TOPSOIL PLACEMENT HAS BEEN COMPLETED.
6. CONTRACTOR SHALL PLACE STRAW, MUCH, AND SEED IN ACCORDANCE WITH SPECIFICATION 32 92 00 – LAWNS AND MEADOWS.

GENERAL SITE RESTORATION

NOT TO SCALE

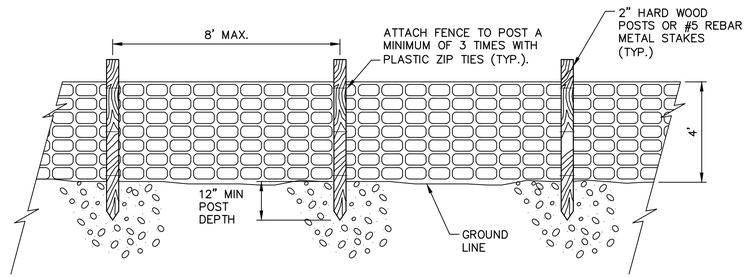


COMPOST FILTER SOCK

NOT TO SCALE

NOTES:

1. COMPOST FILTER SOCK SHALL MEET THE REQUIREMENTS OF THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL, LATEST EDITION.
2. COMPOST SHALL INCLUDE 25% TO 100% DRY WEIGHT ORGANIC MATTER CONTENT WITH A pH BETWEEN 6.0 AND 8.0; HAVE A MOISTURE CONTENT BETWEEN 30% AND 60%; 100% PASSING A 1" SCREEN AND 10% TO 50% PASSING A 3/8" SCREEN; AND HAVE A MAXIMUM SOLUBLE SALT CONCENTRATION OF 5.0 dS/m.
3. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY SOCK SHALL NOT EXCEED THAT SHOWN ON FIGURE 5.1 OF THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL, LATEST EDITION. STAKES MAY BE INSTALLED IMMEDIATELY DOWNSLOPE OF THE SOCK IF SO SPECIFIED BY THE MANUFACTURER.
4. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
5. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE ABOVEGROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
6. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
7. BIODEGRADABLE FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
8. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCKS, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.



NOTES:

1. THE CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN THROUGHOUT THE DURATION OF THE WORK ORANGE CONSTRUCTION FENCING AT LOCATIONS SHOWN ON THE CONTRACT DRAWINGS.
2. UTILIZE NON–PENETRATING POSTS SUCH AS CONCRETE FILLED PAILS FOR LOCATIONS WHERE POSTS CAN NOT BE INSTALLED AT HARD SURFACES.
3. WHERE POSTS ARE REQUIRED IN PAVED AREAS, DIG HOLES IN PAVEMENT TO ADEQUATELY INSTALL POSTS, 15–INCH MINIMUM DEPTH.

CONSTRUCTION FENCE DETAIL

NOT TO SCALE

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF–G–04
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

GENERAL

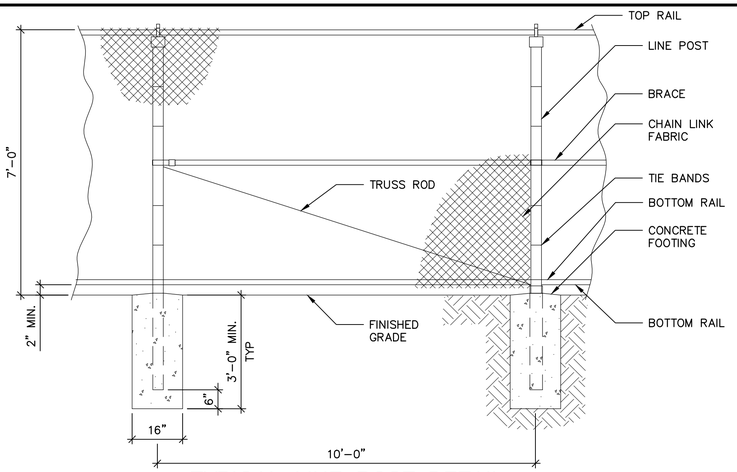
EROSION AND SEDIMENT CONTROL DETAILS II

SCALE: NO SCALE

G–04

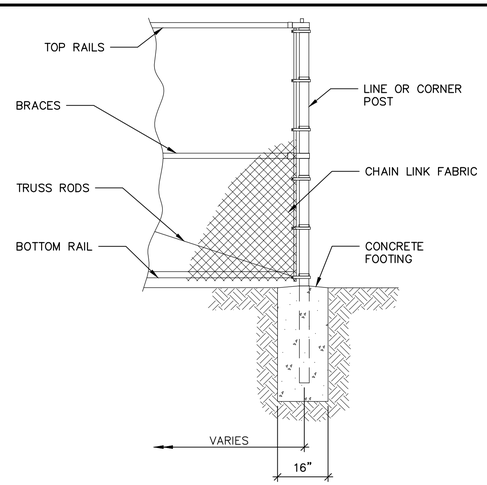
SHEET 4 OF 7

User:LANZAROTTA Spec:AUS-MCSMOD Fnc:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\GENERAL\OF-G-04.DWG
Scale:1:1 Saved:6/6/2025 Time:15:37 Plot Date: Lanzarotta, Eric 6/17/2025 10:36:1 Layout:G-04



TYPICAL LINE POST DETAIL

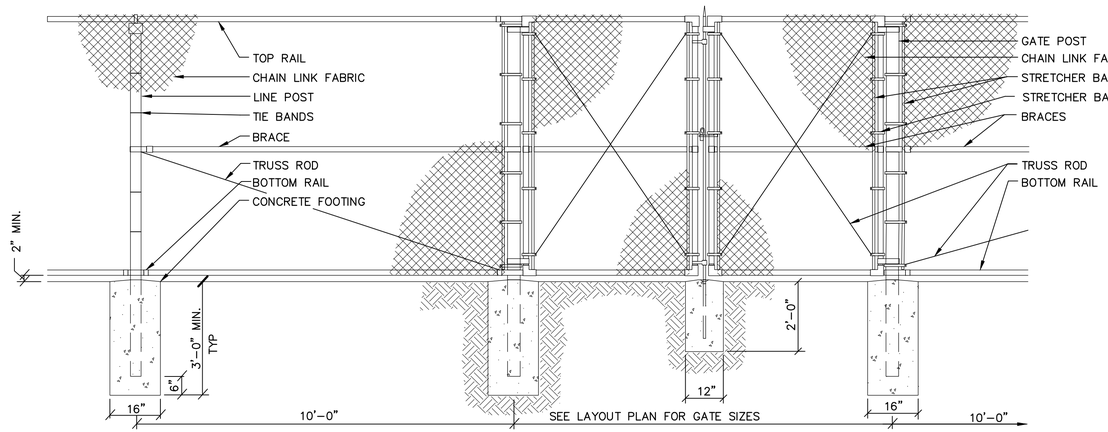
NOT TO SCALE



TYPICAL END POST DETAIL

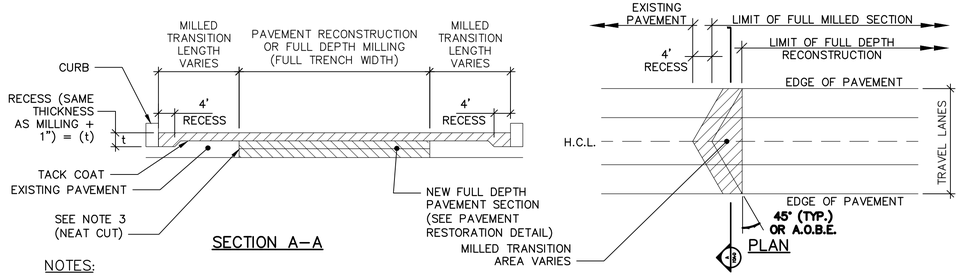
NOT TO SCALE

NOTES:
1. CONTRACTOR SHALL PROVIDE AND INSTALL PRIVACY FENCE SLATS (ULINE MODEL NO. S-25653 OR APPROVED EQUAL) AT THE ENTIRE FENCELINE AND GATES.
2. CONTRACTOR SHALL PROVIDE SWING GATE OPENING, MATCHING THE TOP AND BOTTOM OF THE FENCE.



TYPICAL DOUBLE GATE DETAIL

NOT TO SCALE

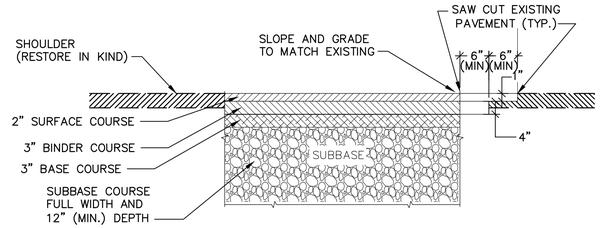


SECTION A-A

NOTES:
1. THE COST OF ALL WORK ASSOCIATED WITH PAVEMENT TERMINATION (NEAT CUT, TACK COAT, MILLING AND PAVEMENT REMOVAL) SHALL BE INCLUDED IN THE PRICE BID. TACK COAT SHALL MEET THE REQUIREMENTS OF SECTION 702 OF THE NYSDOT STANDARD SPECIFICATIONS, LATEST REVISION.
2. IF BINDER COURSE IS LEFT EXPOSED OVER WINTER, IT SHALL BE KEYED INTO THE EXISTING PAVEMENT WITH A 3" DEEP RECESS.
3. IN THE TRANSITION AREA, PAVEMENT COURSES OTHER THAN THE TOP COURSE SHALL BE FEATHERED OUT USING THE APPROPRIATE MATERIAL.

PAVEMENT TERMINATION FOR MILLING OR RECONSTRUCTION

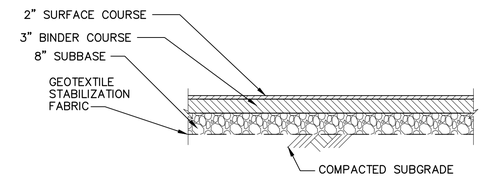
NOT TO SCALE



RESTORATION-ASPHALT PAVEMENTS (ROADS AND DRIVEWAYS)

NOT TO SCALE

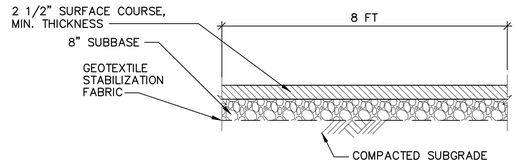
NOTES:
1. EXISTING PAVEMENTS SHALL BE SAW CUT AND VERTICAL SURFACES TACK COATED PRIOR TO PLACING ASPHALT.



PARKING AREA ASPHALT PAVEMENT DETAIL

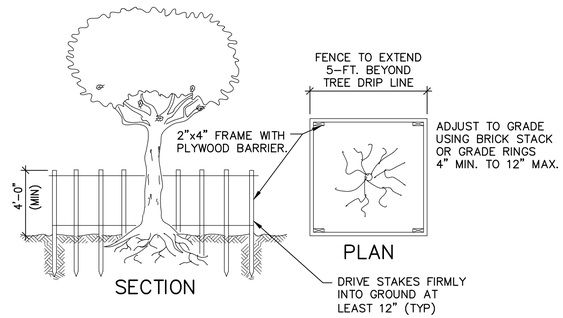
NOT TO SCALE

NOTES:
1. EXISTING ASPHALT IN CONTACT WITH ASPHALT PAVEMENT, SHALL BE TACK COATED PRIOR TO PLACING ASPHALT.



ASPHALT SIDEWALK PAVEMENT DETAIL

NOT TO SCALE



NOTES:
1. PROTECT TREES WITHIN THE WORK LIMITS AND ALONG THE SEWER ALIGNMENT.

TEMPORARY TREE PROTECTION

NOT TO SCALE

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE:	JUNE 2025
PROJECT NO.:	30001381
FILE NAME:	OF-G-05
DESIGNED BY:	EJL
DRAWN BY:	EJL
CHECKED BY:	TM

SHEET TITLE

GENERAL

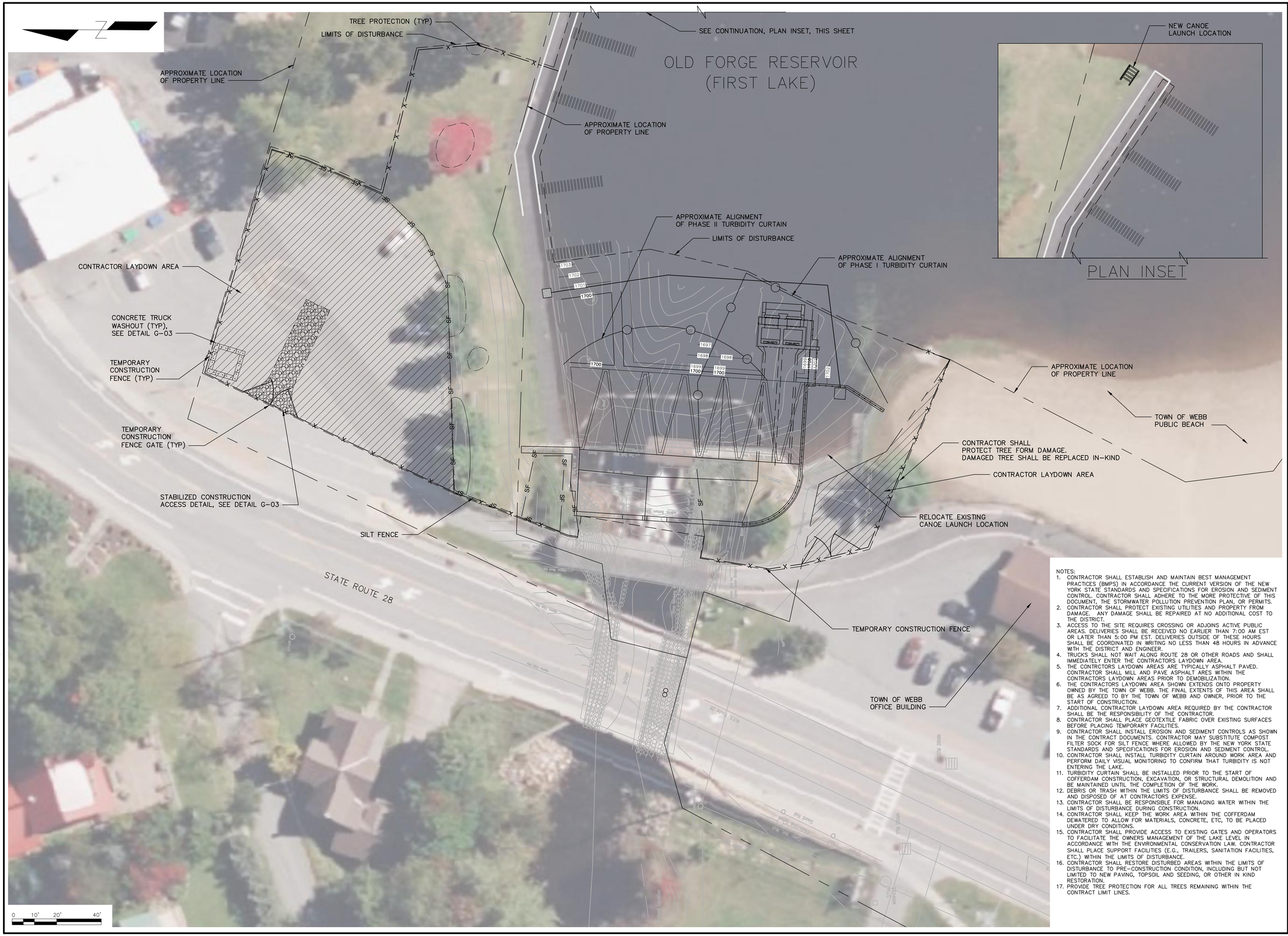
SITE RESTORATION DETAILS

SCALE: NO SCALE

G-05

SHEET 5 OF 7

User:LANZAROTTA Spec:AUS-NCSMOD File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.1 – OLD FORGE DAM CADD\03-SHEETS\GENERAL\OF-G-05.DWG
Scale:1:1 Speed:Low Date/Time:6/17/2025 10:36 Layout:G-05
Plot Date: Canzarotta, Eric, 6/17/2025 Time: 13:27



NOTES:

1. CONTRACTOR SHALL ESTABLISH AND MAINTAIN BEST MANAGEMENT PRACTICES (BMPS) IN ACCORDANCE THE CURRENT VERSION OF THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL. CONTRACTOR SHALL ADHERE TO THE MORE PROTECTIVE OF THIS DOCUMENT, THE STORMWATER POLLUTION PREVENTION PLAN, OR PERMITS.
2. CONTRACTOR SHALL PROTECT EXISTING UTILITIES AND PROPERTY FROM DAMAGE. ANY DAMAGE SHALL BE REPAIRED AT NO ADDITIONAL COST TO THE DISTRICT.
3. ACCESS TO THE SITE REQUIRES CROSSING OR ADJOINS ACTIVE PUBLIC AREAS. DELIVERIES SHALL BE RECEIVED NO EARLIER THAN 7:00 AM EST OR LATER THAN 5:00 PM EST. DELIVERIES OUTSIDE OF THESE HOURS SHALL BE COORDINATED IN WRITING NO LESS THAN 48 HOURS IN ADVANCE WITH THE DISTRICT AND ENGINEER.
4. TRUCKS SHALL NOT WAIT ALONG ROUTE 28 OR OTHER ROADS AND SHALL IMMEDIATELY ENTER THE CONTRACTORS LAYDOWN AREA.
5. THE CONTRCTORS LAYDOWN AREAS ARE TYPICALLY ASPHALT PAVED. CONTRACTOR SHALL MILL AND PAVE ASPHALT ARES WITHIN THE CONTRACTORS LAYDOWN AREAS PRIOR TO DEMOBILIZATION.
6. THE CONTRACTORS LAYDOWN AREA SHOWN EXTENDS ONTO PROPERTY OWNED BY THE TOWN OF WEBB. THE FINAL EXTENTS OF THIS AREA SHALL BE AS AGREED TO BY THE TOWN OF WEBB AND OWNER, PRIOR TO THE START OF CONSTRUCTION.
7. ADDITIONAL CONTRACTOR LAYDOWN AREA REQUIRED BY THE CONTRACTOR SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
8. CONTRACTOR SHALL PLACE GEOTEXTILE FABRIC OVER EXISTING SURFACES BEFORE PLACING TEMPORARY FACILITIES.
9. CONTRACTOR SHALL INSTALL EROSION AND SEDIMENT CONTROLS AS SHOWN IN THE CONTRACT DOCUMENTS. CONTRACTOR MAY SUBSTITUTE COMPOST FILTER SOCK FOR SILT FENCE WHERE ALLOWED BY THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL.
10. CONTRACTOR SHALL INSTALL TURBIDITY CURTAIN AROUND WORK AREA AND PERFORM DAILY VISUAL MONITORING TO CONFIRM THAT TURBIDITY IS NOT ENTERING THE LAKE.
11. TURBIDITY CURTAIN SHALL BE INSTALLED PRIOR TO THE START OF COFFERDAM CONSTRUCTION, EXCAVATION, OR STRUCTURAL DEMOLITION AND BE MAINTAINED UNTIL THE COMPLETION OF THE WORK.
12. DEBRIS OR TRASH WITHIN THE LIMITS OF DISTURBANCE SHALL BE REMOVED AND DISPOSED OF AT CONTRACTORS EXPENSE.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR MANAGING WATER WITHIN THE LIMITS OF DISTURBANCE DURING CONSTRUCTION.
14. CONTRACTOR SHALL KEEP THE WORK AREA WITHIN THE COFFERDAM DEWATERED TO ALLOW FOR MATERIALS, CONCRETE, ETC, TO BE PLACED UNDER DRY CONDITIONS.
15. CONTRACTOR SHALL PROVIDE ACCESS TO EXISTING GATES AND OPERATORS TO FACILITATE THE OWNERS MANAGEMENT OF THE LAKE LEVEL IN ACCORDANCE WITH THE ENVIRONMENTAL CONSERVATION LAW. CONTRACTOR SHALL PLACE SUPPORT FACILITIES (E.G., TRAILERS, SANITATION FACILITIES, ETC.) WITHIN THE LIMITS OF DISTURBANCE.
16. CONTRACTOR SHALL RESTORE DISTURBED AREAS WITHIN THE LIMITS OF DISTURBANCE TO PRE-CONSTRUCTION CONDITION, INCLUDING BUT NOT LIMITED TO NEW PAVING, TOPSOIL AND SEEDING, OR OTHER IN KIND RESTORATION.
17. PROVIDE TREE PROTECTION FOR ALL TREES REMAINING WITHIN THE CONTRACT LIMIT LINES.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK
MICHAEL F. KOSIER
LICENSED PROFESSIONAL ENGINEER
No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-G-06
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

GENERAL

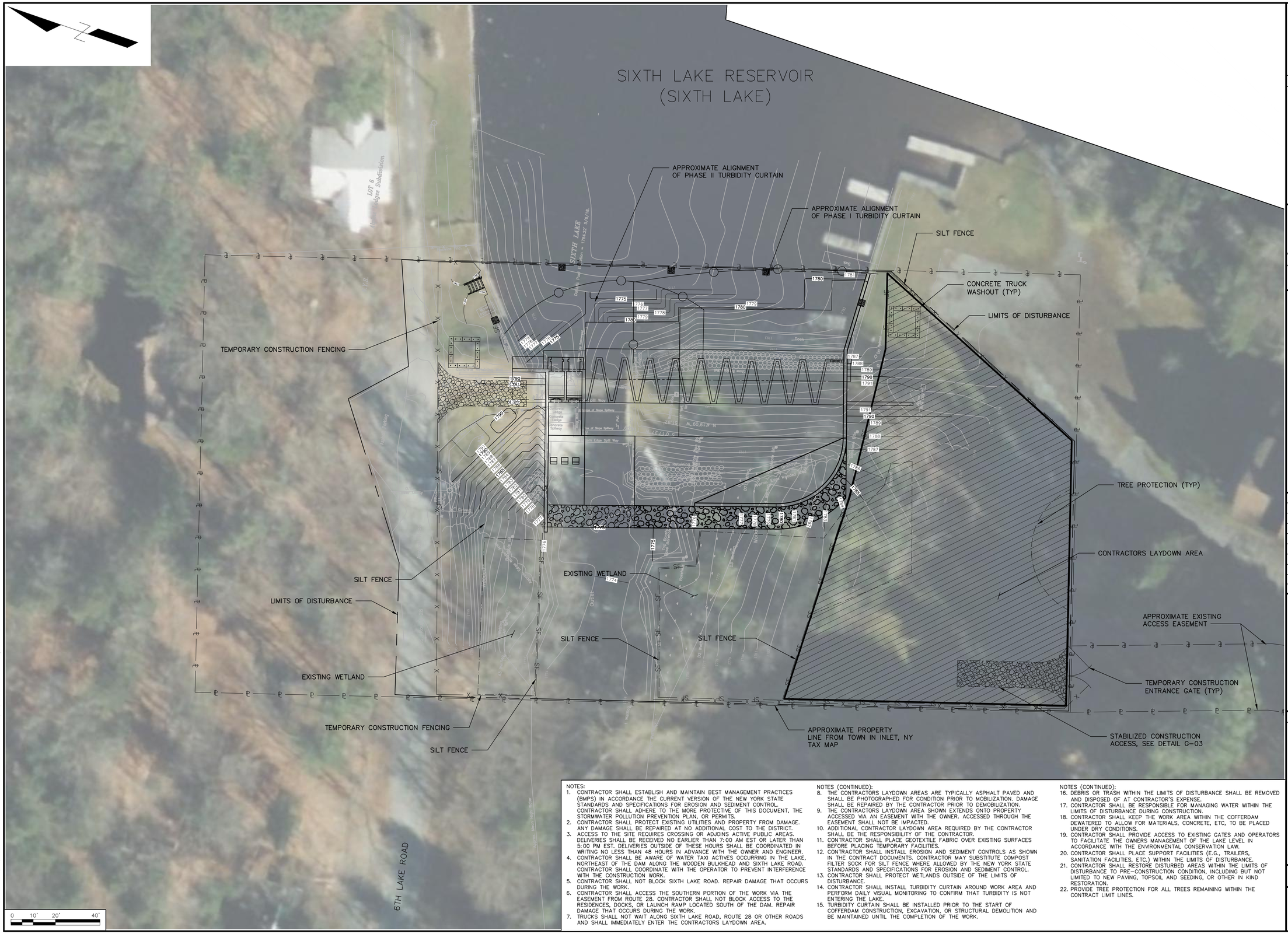
OLD FORGE DAM EROSION CONTROL AND STAGING PLAN

SCALE: AS NOTED

G-06

SHEET 6 OF 7

User:LANZAROTTA, Sper:AVS-NCSMOD File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\GENERAL\OF-G-06.DWG
Saved:6/6/2025 Time:08:47 Plot Date:6/17/2025 10:38 Layout:G-6



NOTES:
1. CONTRACTOR SHALL ESTABLISH AND MAINTAIN BEST MANAGEMENT PRACTICES (BMPS) IN ACCORDANCE THE CURRENT VERSION OF THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL. CONTRACTOR SHALL ADHERE TO THE MORE PROTECTIVE OF THIS DOCUMENT, THE STORMWATER POLLUTION PREVENTION PLAN, OR PERMITS.
2. CONTRACTOR SHALL PROTECT EXISTING UTILITIES AND PROPERTY FROM DAMAGE. ANY DAMAGE SHALL BE REPAIRED AT NO ADDITIONAL COST TO THE DISTRICT.
3. ACCESS TO THE SITE REQUIRES CROSSING OR ADJOINS ACTIVE PUBLIC AREAS. DELIVERIES SHALL BE RECEIVED NO EARLIER THAN 7:00 AM EST OR LATER THAN 5:00 PM EST. DELIVERIES OUTSIDE OF THESE HOURS SHALL BE COORDINATED IN WRITING NO LESS THAN 48 HOURS IN ADVANCE WITH THE OWNER AND ENGINEER.
4. CONTRACTOR SHALL BE AWARE OF WATER TAXI ACTIVES OCCURRING IN THE LAKE, NORTHEAST OF THE DAM ALONG THE WOODEN BULKHEAD AND SIXTH LAKE ROAD. CONTRACTOR SHALL COORDINATE WITH THE OPERATOR TO PREVENT INTERFERENCE WITH THE CONSTRUCTION WORK.
5. CONTRACTOR SHALL NOT BLOCK SIXTH LAKE ROAD. REPAIR DAMAGE THAT OCCURS DURING THE WORK.
6. CONTRACTOR SHALL ACCESS THE SOUTHERN PORTION OF THE WORK VIA THE EASEMENT FROM ROUTE 28. CONTRACTOR SHALL NOT BLOCK ACCESS TO THE RESIDENCES, DOCKS, OR LAUNCH RAMP LOCATED SOUTH OF THE DAM. REPAIR DAMAGE THAT OCCURS DURING THE WORK.
7. TRUCKS SHALL NOT WAIT ALONG SIXTH LAKE ROAD, ROUTE 28 OR OTHER ROADS AND SHALL IMMEDIATELY ENTER THE CONTRACTORS LAYDOWN AREA.

NOTES (CONTINUED):
8. THE CONTRACTORS LAYDOWN AREAS ARE TYPICALLY ASPHALT PAVED AND SHALL BE PHOTOGRAPHED FOR CONDITION PRIOR TO MOBILIZATION. DAMAGE SHALL BE REPAIRED BY THE CONTRACTOR PRIOR TO DEMOBILIZATION.
9. THE CONTRACTORS LAYDOWN AREA SHOWN EXTENDS ONTO PROPERTY ACCESSED VIA AN EASEMENT WITH THE OWNER. ACCESSED THROUGH THE EASEMENT SHALL NOT BE IMPACTED.
10. ADDITIONAL CONTRACTOR LAYDOWN AREA REQUIRED BY THE CONTRACTOR SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
11. CONTRACTOR SHALL PLACE GEOTEXTILE FABRIC OVER EXISTING SURFACES BEFORE PLACING TEMPORARY FACILITIES.
12. CONTRACTOR SHALL INSTALL EROSION AND SEDIMENT CONTROLS AS SHOWN IN THE CONTRACT DOCUMENTS. CONTRACTOR MAY SUBSTITUTE COMPOST FILTER SOCK FOR SILT FENCE WHERE ALLOWED BY THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL.
13. CONTRACTOR SHALL PROTECT WETLANDS OUTSIDE OF THE LIMITS OF DISTURBANCE.
14. CONTRACTOR SHALL INSTALL TURBIDITY CURTAIN AROUND WORK AREA AND PERFORM DAILY VISUAL MONITORING TO CONFIRM THAT TURBIDITY IS NOT ENTERING THE LAKE.
15. TURBIDITY CURTAIN SHALL BE INSTALLED PRIOR TO THE START OF COFFERDAM CONSTRUCTION, EXCAVATION, OR STRUCTURAL DEMOLITION AND BE MAINTAINED UNTIL THE COMPLETION OF THE WORK.

NOTES (CONTINUED):
16. DEBRIS OR TRASH WITHIN THE LIMITS OF DISTURBANCE SHALL BE REMOVED AND DISPOSED OF AT CONTRACTOR'S EXPENSE.
17. CONTRACTOR SHALL BE RESPONSIBLE FOR MANAGING WATER WITHIN THE LIMITS OF DISTURBANCE DURING CONSTRUCTION.
18. CONTRACTOR SHALL KEEP THE WORK AREA WITHIN THE COFFERDAM DEWATERED TO ALLOW FOR MATERIALS, CONCRETE, ETC, TO BE PLACED UNDER DRY CONDITIONS.
19. CONTRACTOR SHALL PROVIDE ACCESS TO EXISTING GATES AND OPERATORS TO FACILITATE THE OWNERS MANAGEMENT OF THE LAKE LEVEL IN ACCORDANCE WITH THE ENVIRONMENTAL CONSERVATION LAW.
20. CONTRACTOR SHALL PLACE SUPPORT FACILITIES (E.G., TRAILERS, SANITATION FACILITIES, ETC.) WITHIN THE LIMITS OF DISTURBANCE.
21. CONTRACTOR SHALL RESTORE DISTURBED AREAS WITHIN THE LIMITS OF DISTURBANCE TO PRE-CONSTRUCTION CONDITION, INCLUDING BUT NOT LIMITED TO NEW PAVING, TOPSOIL AND SEEDING, OR OTHER IN KIND RESTORATION.
22. PROVIDE TREE PROTECTION FOR ALL TREES REMAINING WITHIN THE CONTRACT LIMIT LINES.

ARCADIS
LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-G-07
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

GENERAL

SIXTH LAKE DAM EROSION CONTROL AND STAGING PLAN

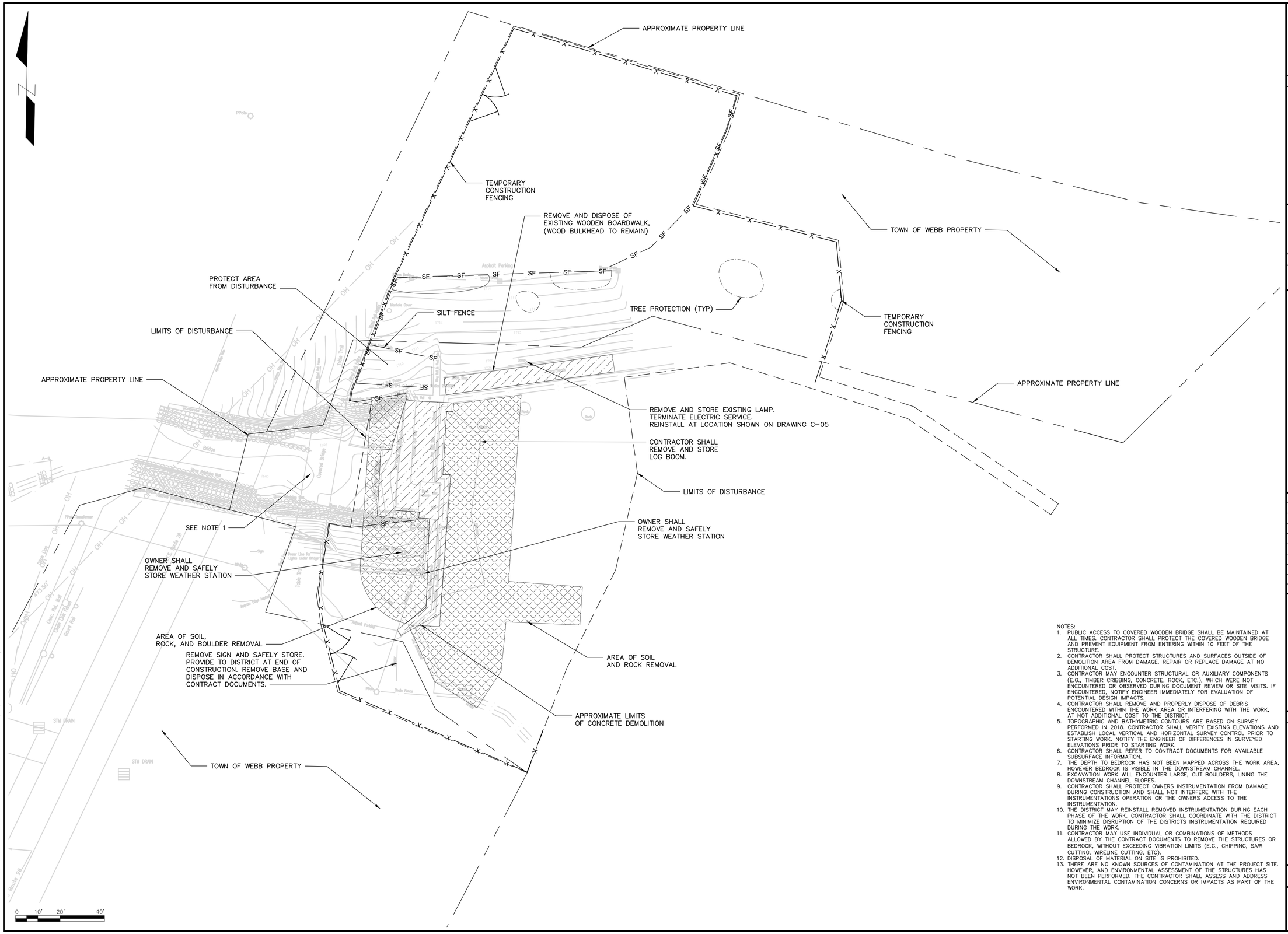
SCALE: AS NOTED

G-07

SHEET 7 OF 7

User:LANZAROTTA, Spec:AUS-NCSMOD File:Q:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.1 – OLD FORGE DAM CADD\03-SHEETS\GENERAL\OF-G-07.DWG
Style:T1 Saved:Date:6/6/2025 Time:08:47 Plot Date: Layout:G-07


APPROXIMATE LOCATION OF PROPERTY LINE
APPROXIMATE LOCATION OF PROPERTY LINE
TOWN OF WEBB PROPERTY
APPROXIMATE LOCATION OF PROPERTY LINE
SEE NOTE 1
DISTRICT PROPERTY
EXISTING OGEE SPILLWAY
EXISTING OUTLET STRUCTURE
EXISTING NON-OVERFLOW SECTION
OLD FORGE RESERVOIR
(FIRST LAKE)
TOWN OF WEBB PROPERTY
APPROXIMATE LOCATION OF PROPERTY LINE
TOWN OF WEBB OFFICE BUILDING
TOWN OF WEBB PUBLIC BEACH
STATE ROUTE 28
Asphalt Parking
Boardwalk
Bridge
Dock
Dam House
Weather Station
Weather Shelter
Covered Bridge
Table Trail
Ditch Line
Power Line for Lights Under Bridge
Chain Fence
Sign
Monument
Rock
Rock Wall
Wood Fence
Wood Rail Fence
Concrete Retaining Wall
Stone Retaining Wall
Storm Drain
Monhole Cover
Lamp
GPS Station 2693005
Wet Tap Gauge
Concrete Retaining Wall Inlet
Dam House Inlet
Inlet
Ditch Line
Guard Rail
Power Pole
Power Pole-Transformer
Utility Pole
Utility Pole-Telephone
Utility Pole-Light
STM DRAIN
STM DRAIN
Asphalt Paving
Concrete Retaining Wall
Stone Retaining Wall
Wood Step
Wood Rail Fence
Wood Rail Rail
Wood Rail Post
Wood Rail Top
Wood Rail Bottom
Wood Rail Fence Top
Wood Rail Fence Bottom
Wood Rail Fence Post
Wood Rail Fence Rail
Wood Rail Fence Post
Wood Rail Fence Rail
Wood Rail Fence Post
Wood Rail Fence Rail



NOTES:
1. PUBLIC ACCESS TO COVERED WOODEN BRIDGE SHALL BE MAINTAINED AT ALL TIMES. CONTRACTOR SHALL PROTECT THE COVERED WOODEN BRIDGE AND PREVENT EQUIPMENT FROM ENTERING WITHIN 10 FEET OF THE STRUCTURE.
2. CONTRACTOR SHALL PROTECT STRUCTURES AND SURFACES OUTSIDE OF DEMOLITION AREA FROM DAMAGE. REPAIR OR REPLACE DAMAGE AT NO ADDITIONAL COST.
3. CONTRACTOR MAY ENCOUNTER STRUCTURAL OR AUXILIARY COMPONENTS (E.G., TIMBER CRIBBING, CONCRETE, ROCK, ETC.), WHICH WERE NOT ENCOUNTERED OR OBSERVED DURING DOCUMENT REVIEW OR SITE VISITS. IF ENCOUNTERED, NOTIFY ENGINEER IMMEDIATELY FOR EVALUATION OF POTENTIAL DESIGN IMPACTS.
4. CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF DEBRIS ENCOUNTERED WITHIN THE WORK AREA OR INTERFERING WITH THE WORK, AT NOT ADDITIONAL COST TO THE DISTRICT.
5. TOPOGRAPHIC AND BATHYMETRIC CONTOURS ARE BASED ON SURVEY PERFORMED IN 2018. CONTRACTOR SHALL VERIFY EXISTING ELEVATIONS AND ESTABLISH LOCAL VERTICAL AND HORIZONTAL SURVEY CONTROL PRIOR TO STARTING WORK. NOTIFY THE ENGINEER OF DIFFERENCES IN SURVEYED ELEVATIONS PRIOR TO STARTING WORK.
6. CONTRACTOR SHALL REFER TO CONTRACT DOCUMENTS FOR AVAILABLE SUBSURFACE INFORMATION.
7. THE DEPTH TO BEDROCK HAS NOT BEEN MAPPED ACROSS THE WORK AREA, HOWEVER BEDROCK IS VISIBLE IN THE DOWNSTREAM CHANNEL.
8. EXCAVATION WORK WILL ENCOUNTER LARGE, CUT BOULDERS, LINING THE DOWNSTREAM CHANNEL SLOPES.
9. CONTRACTOR SHALL PROTECT OWNERS INSTRUMENTATION FROM DAMAGE DURING CONSTRUCTION AND SHALL NOT INTERFERE WITH THE INSTRUMENTATIONS OPERATION OR THE OWNERS ACCESS TO THE INSTRUMENTATION.
10. THE DISTRICT MAY REINSTALL REMOVED INSTRUMENTATION DURING EACH PHASE OF THE WORK. CONTRACTOR SHALL COORDINATE WITH THE DISTRICT TO MINIMIZE DISRUPTION OF THE DISTRICTS INSTRUMENTATION REQUIRED DURING THE WORK.
11. CONTRACTOR MAY USE INDIVIDUAL OR COMBINATIONS OF METHODS ALLOWED BY THE CONTRACT DOCUMENTS TO REMOVE THE STRUCTURES OR BEDROCK, WITHOUT EXCEEDING VIBRATION LIMITS (E.G., CHIPPING, SAW CUTTING, WIRELINE CUTTING, ETC).
12. DISPOSAL OF MATERIAL ON SITE IS PROHIBITED.
13. THERE ARE NO KNOWN SOURCES OF CONTAMINATION AT THE PROJECT SITE. HOWEVER, AND ENVIRONMENTAL ASSESSMENT OF THE STRUCTURES HAS NOT BEEN PERFORMED. THE CONTRACTOR SHALL ASSESS AND ADDRESS ENVIRONMENTAL CONTAMINATION CONCERNS OR IMPACTS AS PART OF THE WORK.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-C-02
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

CIVIL

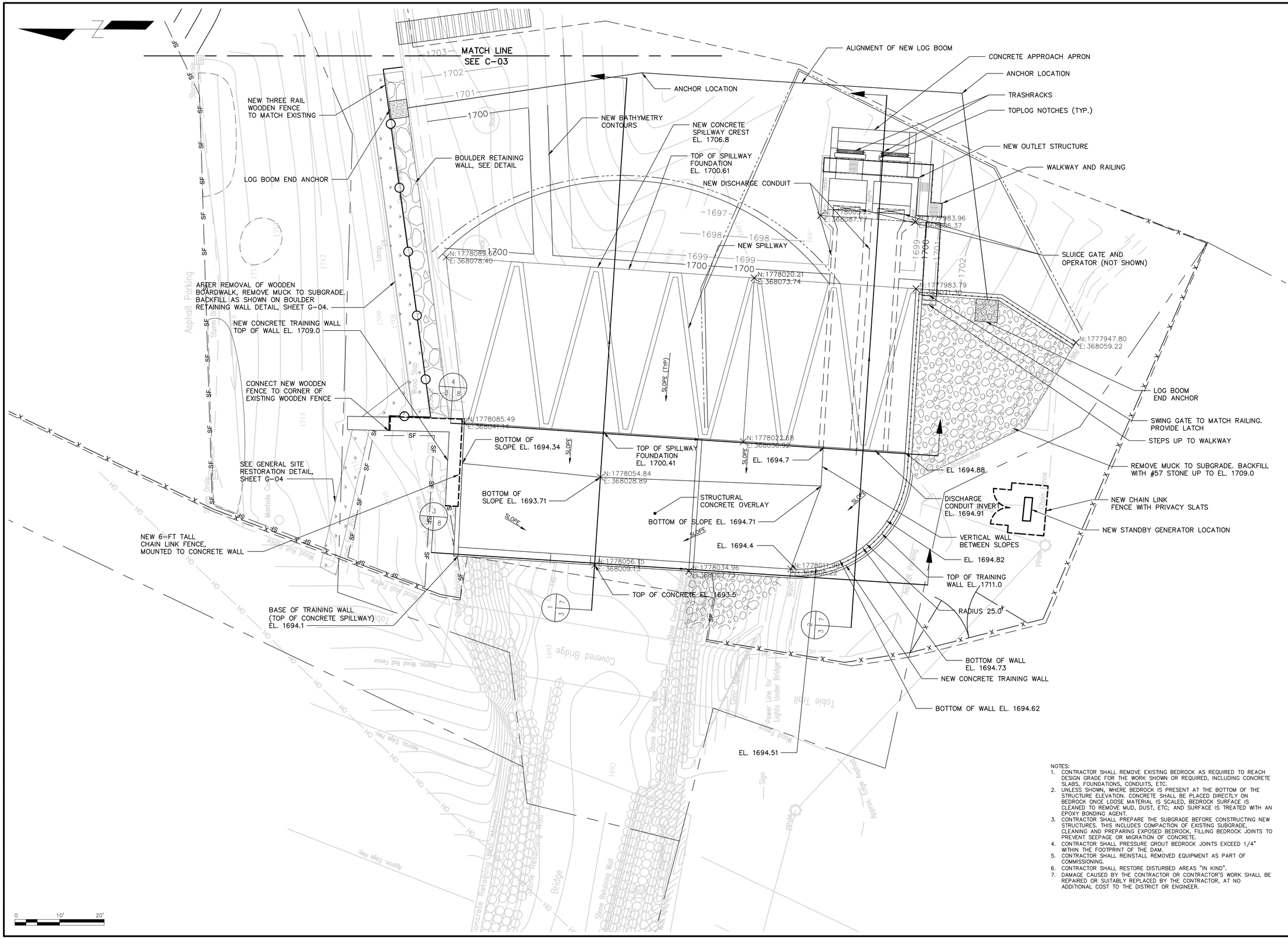
OLD FORGE DAM DEMOLITION PLAN

SCALE: AS NOTED

C-02

SHEET 2 OF 18

User:LANZAROTTA Spec:AUS-NCSM0D File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\CIVIL\OF-C-02.DWG
Scale:1:1 Saved:Date:6/7/2025 Time:7:22:48 Plot Date: Layout:C-02 6/7/2025 10:37 - Layout:C-02



NOTES:
1. CONTRACTOR SHALL REMOVE EXISTING BEDROCK AS REQUIRED TO REACH DESIGN GRADE FOR THE WORK SHOWN OR REQUIRED, INCLUDING CONCRETE SLABS, FOUNDATIONS, CONDUITS, ETC.
2. UNLESS SHOWN, WHERE BEDROCK IS PRESENT AT THE BOTTOM OF THE STRUCTURE ELEVATION. CONCRETE SHALL BE PLACED DIRECTLY ON BEDROCK ONCE LOOSE MATERIAL IS SCALED. BEDROCK SURFACE IS CLEANED TO REMOVE MUD, DUST, ETC; AND SURFACE IS TREATED WITH AN EPOXY BONDING AGENT.
3. CONTRACTOR SHALL PREPARE THE SUBGRADE BEFORE CONSTRUCTING NEW STRUCTURES. THIS INCLUDES COMPACTION OF EXISTING SUBGRADE, CLEANING AND PREPARING EXPOSED BEDROCK, FILLING BEDROCK JOINTS TO PREVENT SEEPAGE OR MIGRATION OF CONCRETE.
4. CONTRACTOR SHALL PRESSURE GROUT BEDROCK JOINTS EXCEED 1/4" WITHIN THE FOOTPRINT OF THE DAM.
5. CONTRACTOR SHALL REINSTALL REMOVED EQUIPMENT AS PART OF COMMISSIONING.
6. CONTRACTOR SHALL RESTORE DISTURBED AREAS "IN KIND".
7. DAMAGE CAUSED BY THE CONTRACTOR OR CONTRACTOR'S WORK SHALL BE REPAIRED OR SUITABLY REPLACED BY THE CONTRACTOR, AT NO ADDITIONAL COST TO THE DISTRICT OR ENGINEER.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE:	JUNE 2025
PROJECT NO.:	30001381
FILE NAME:	OF–C–03
DESIGNED BY:	EJL
DRAWN BY:	EJL
CHECKED BY:	TM

SHEET TITLE

CIVIL

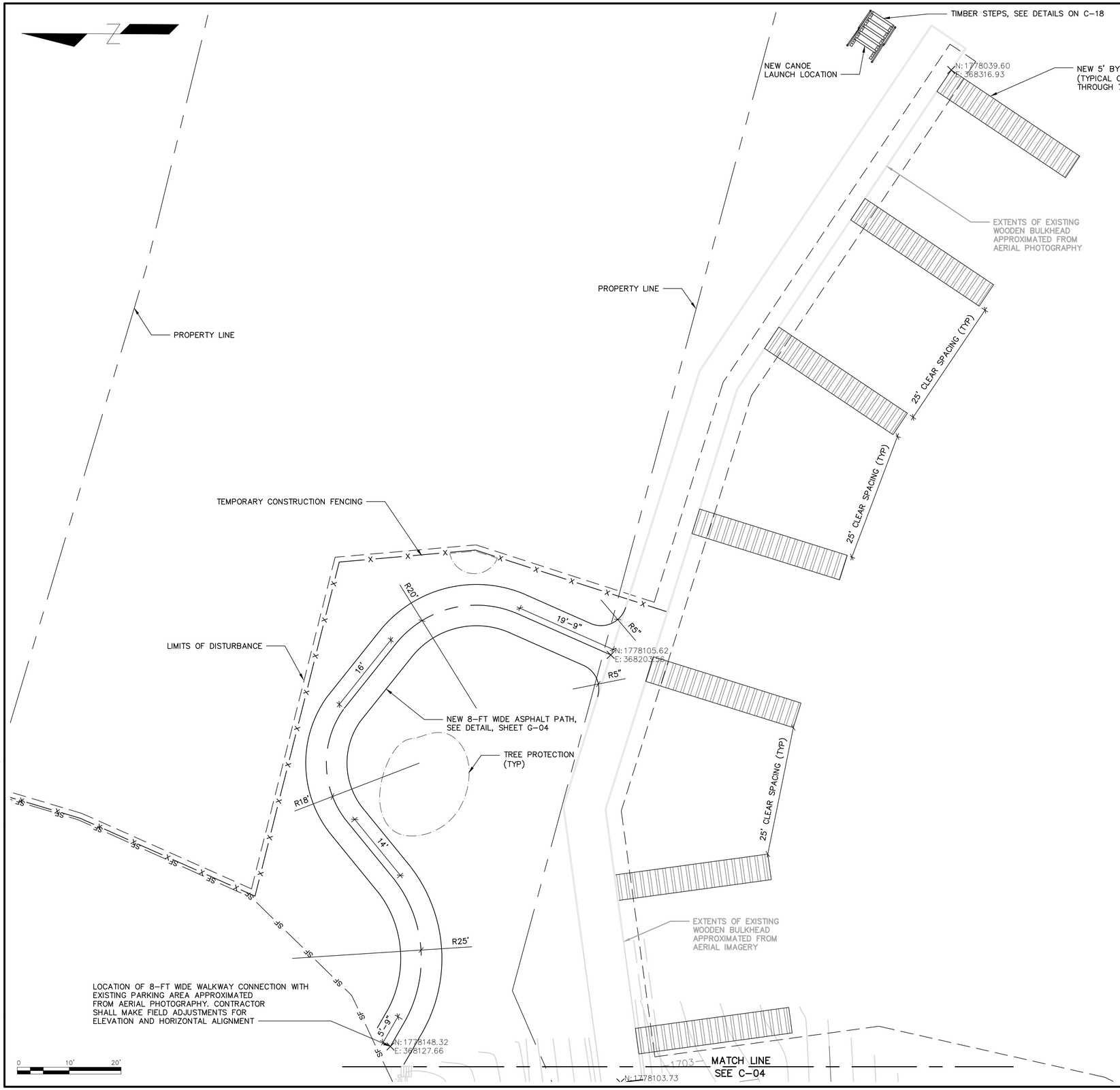
OLD FORGE DAM FINAL PLAN I

SCALE: AS NOTED

C–03

SHEET 3 OF 18

User:LANZAROTTA Spec:AUG-MCSMOD File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.1 – OLD FORGE DAM CADD\03–SHEETS\CIVIL\OF–C–03.DWG
Scale:1:1 Saved:6/6/2025 Time:10:43 Plot Date/Time:6/17/2025 10:37:1 Layout:C–03



NOTES:
1. CONTRACTOR SHALL COORDINATE DISRUPTIONS TO THE BULKHEAD WITH THE TOWN OF WEBB DURING INSTALLATION OF THE NEW FLOATING DOCKS.
2. CONTRACTOR SHALL PROVIDE AND INSTALL NEW 5' BY 30' FLOATING CAT 5 ALUMINUM DOCKS WITH TIMBERTECH COMPOSITE DECKING (TYPICAL OF 7 LOCATIONS), AS MANUFACTURED BY MEECO SULLIVAN OR APPROVED EQUAL.
3. CONTRACTOR SHALL PROVIDE DOCK AND CONNECTION FINISH AND CUT SHEETS FOR REVIEW AND APPROVAL.
4. NEW DOCKS SHALL BE MOUNTED TO THE EXISTING BULKHEAD WITH SUITABLE HARDWARE WITH A PINNED, FLEXIBLE CONNECTION TO ALLOW FOR MOVEMENT, IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS AND ACCOMMODATE WATER LEVEL VARIATION BETWEEN EL. 1707.0 AND EL. 1705.5.
5. DOCKS SHALL HAVE FLOATS CONSISTING OF AN EXPANDED POLYSTYRENE CORE ENCAPSULATED IN A HIGH MOLECULAR WEIGHT POLYETHYLENE SHELL.
6. PROVIDE HINGED TRANSITION PLATE BETWEEN BLUKHEAD AND DOCKS.
7. CONTRACTOR SHALL MATCH TOP SURFACE OF COMPLETED DOCKS WITH EXISTING BULKHEAD AT NORMAL WATER EL. 1706.8.
8. CONTRACTOR SHALL PROVIDE AND INSTALL NEW FLOATING DOCKS IN ACCORDANCE WITH MANUFACTURERS INSTALLATION INSTRUCTIONS.
9. CONTRACTOR SHALL REMOVE VEGETATION AND TOPSOIL AND EXCAVATE SOIL ALONG THE ALIGNMENT OF THE ASPHALT PATH TO THE DEPTHS REQUIRED TO INSTALL NEW ASPHALT PATH. CONTRACTOR SHALL PERFORM LOCAL CUT AND FILL FOR NEW PATH TO ACHIEVE A 1 VERTICAL TO 20 HORIZONTAL UNIFORM GRADE ALONG THE CENTERLINE OF THE PATHWAY.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-C-04
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

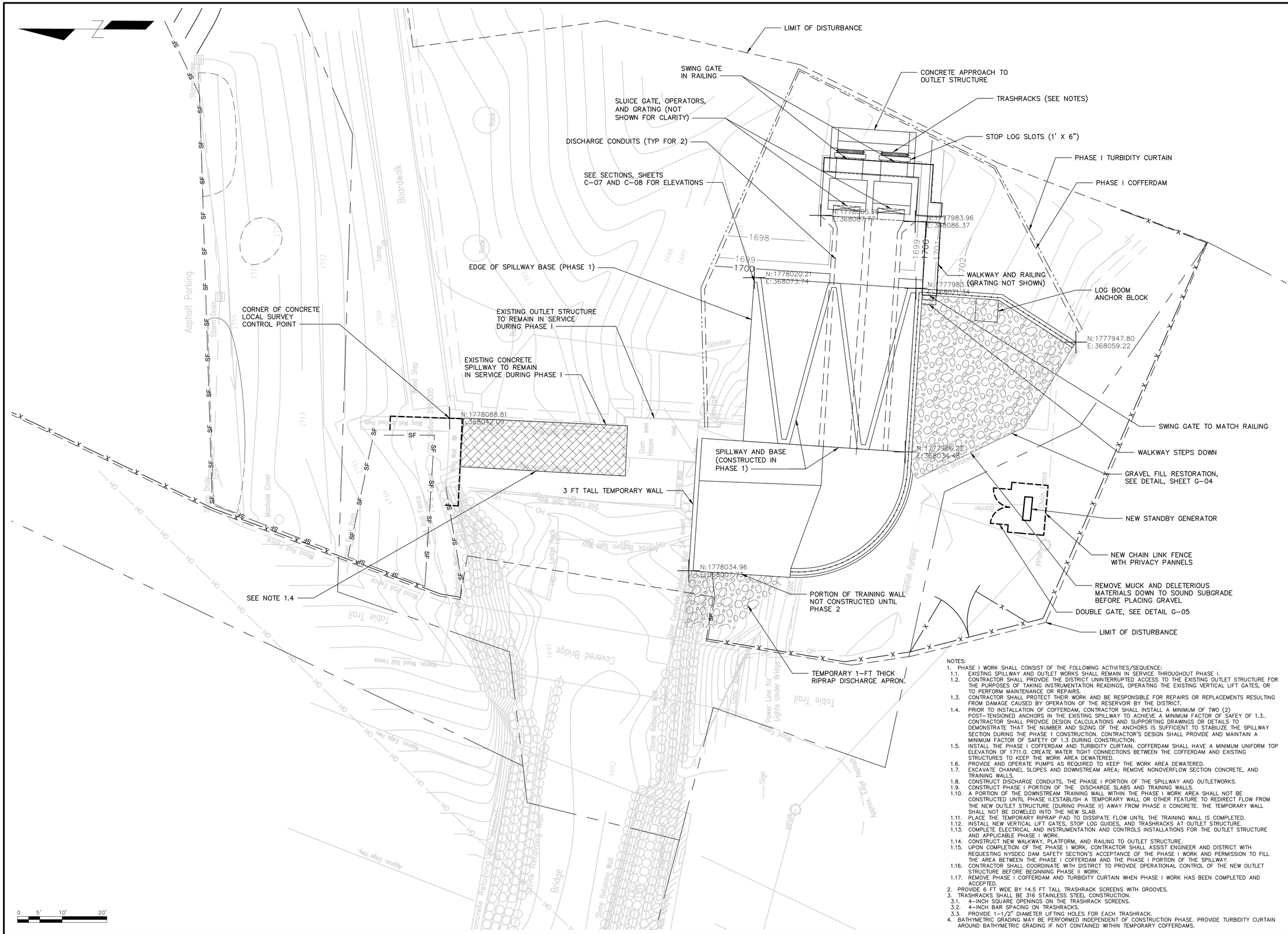
CIVIL

OLD FORGE DAM
FINAL PLAN II

SCALE: AS NOTED

C-04
SHEET 4 OF 18

User:LANZAROTTA Spec:AUS-NCSM0 File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\CIVIL\OF-C-04.DWG
Scale:1:1 Speedplot:6/6/2025 Time:08:47 Plot Date: Lanzarotta, Eric, 6/7/2025 10:37:, Layout:C-04



0 5' 10' 20'

NOTES:
1. PHASE I WORK SHALL CONSIST OF THE FOLLOWING ACTIVITIES/SEQUENCE:
 1.1. EXISTING SPILLWAY AND OUTLET WORKS SHALL REMAIN IN SERVICE THROUGHOUT PHASE I.
 1.2. CONTRACTOR SHALL PROVIDE THE DISTRICT UNINTERRUPTED ACCESS TO THE EXISTING OUTLET STRUCTURE FOR THE PURPOSES OF TAKING INSTRUMENTATION READINGS, OPERATING THE EXISTING VERTICAL LIFT GATES, OR TO PERFORM MAINTENANCE OR REPAIRS.
 1.3. CONTRACTOR SHALL PROTECT THEIR WORK AND BE RESPONSIBLE FOR REPAIRS OR REPLACEMENTS RESULTING FROM DAMAGE CAUSED BY OPERATION OF THE RESERVOIR BY THE DISTRICT.
 1.4. PRIOR TO INSTALLATION OF COFFERDAM, CONTRACTOR SHALL INSTALL A MINIMUM OF TWO (2) POST-TENSIONED ANCHORS IN THE EXISTING SPILLWAY TO ACHIEVE A MINIMUM FACTOR OF SAFEY OF 1.3.. CONTRACTOR SHALL PROVIDE DESIGN CALCULATIONS AND SUPPORTING DRAWINGS OR DETAILS TO DEMONSTRATE THAT THE NUMBER AND SIZING OF THE ANCHORS IS SUFFICIENT TO STABILIZE THE SPILLWAY SECTION DURING THE PHASE 1 CONSTRUCTION. CONTRACTOR'S DESIGN SHALL PROVIDE AND MAINTAIN A MINIMUM FACTOR OF SAFETY OF 1.3 DURING CONSTRUCTION.
 1.5. INSTALL THE PHASE I COFFERDAM AND TURBIDITY CURTAIN. COFFERDAM SHALL HAVE A MINIMUM UNIFORM TOP ELEVATION OF 1711.0. CREATE WATER TIGHT CONNECTIONS BETWEEN THE COFFERDAM AND EXISTING STRUCTURES TO KEEP THE WORK AREA DEWATERED.
 1.6. PROVIDE AND OPERATE PUMPS AS REQUIRED TO KEEP THE WORK AREA DEWATERED.
 1.7. EXCAVATE CHANNEL SLOPES AND DOWNSTREAM AREA; REMOVE NONOVERFLOW SECTION CONCRETE, AND TRAINING WALLS.
 1.8. CONSTRUCT DISCHARGE CONDUITS, THE PHASE I PORTION OF THE SPILLWAY AND OUTLETWORKS.
 1.9. CONSTRUCT PHASE I PORTION OF THE DISCHARGE SLABS AND TRAINING WALLS.
 1.10. A PORTION OF THE DOWNSTREAM TRAINING WALL WITHIN THE PHASE I WORK AREA SHALL NOT BE CONSTRUCTED UNTIL PHASE II.ESTABLISH A TEMPORARY WALL OR OTHER FEATURE TO REDIRECT FLOW FROM THE NEW OUTLET STRUCTURE (DURING PHASE II) AWAY FROM PHASE II CONCRETE. THE TEMPORARY WALL SHALL NOT BE DOWELED INTO THE NEW SLAB.
 1.11. PLACE THE TEMPORARY RIPRAP PAD TO DISSIPATE FLOW UNTIL THE TRAINING WALL IS COMPLETED.
 1.12. INSTALL NEW VERTICAL LIFT GATES, STOP LOG GUIDES, AND TRASHRACKS AT OUTLET STRUCTURE.
 1.13. COMPLETE ELECTRICAL AND INSTRUMENTATION AND CONTROLS INSTALLATIONS FOR THE OUTLET STRUCTURE AND APPLICABLE PHASE I WORK.
 1.14. CONSTRUCT NEW WALKWAY, PLATFORM, AND RAILING TO OUTLET STRUCTURE.
 1.15. UPON COMPLETION OF THE PHASE I WORK, CONTRACTOR SHALL ASSIST ENGINEER AND DISTRICT WITH REQUESTING NYSDEC DAM SAFETY SECTION'S ACCEPTANCE OF THE PHASE I WORK AND PERMISSION TO FILL THE AREA BETWEEN THE PHASE I COFFERDAM AND THE PHASE I PORTION OF THE SPILLWAY.
 1.16. CONTRACTOR SHALL COORDINATE WITH DISTRICT TO PROVIDE OPERATIONAL CONTROL OF THE NEW OUTLET STRUCTURE BEFORE BEGINNING PHASE II WORK.
 1.17. REMOVE PHASE I COFFERDAM AND TURBIDITY CURTAIN WHEN PHASE I WORK HAS BEEN COMPLETED AND ACCEPTED.
2. PROVIDE 6 FT WIDE BY 14.5 FT TALL TRASHRACK SCREENS WITH GROOVES.
3. TRASHRACKS SHALL BE 316 STAINLESS STEEL CONSTRUCTION.
 3.1. 4-INCH SQUARE OPENINGS ON THE TRASHRACK SCREENS.
 3.2. 4-INCH BAR SPACING ON TRASHRACKS.
 3.3. PROVIDE 1-1/2" DIAMETER LIFTING HOLES FOR EACH TRASHRACK.
4. BATHYMETRIC GRADING MAY BE PERFORMED INDEPENDENT OF CONSTRUCTION PHASE. PROVIDE TURBIDITY CURTAIN AROUND BATHYMETRIC GRADING IF NOT CONTAINED WITHIN TEMPORARY COFFERDAMS.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE:	JUNE 2025
PROJECT NO.:	30001381
FILE NAME:	OF-C-05
DESIGNED BY:	EJL
DRAWN BY:	EJL
CHECKED BY:	TM

SHEET TITLE

CIVIL

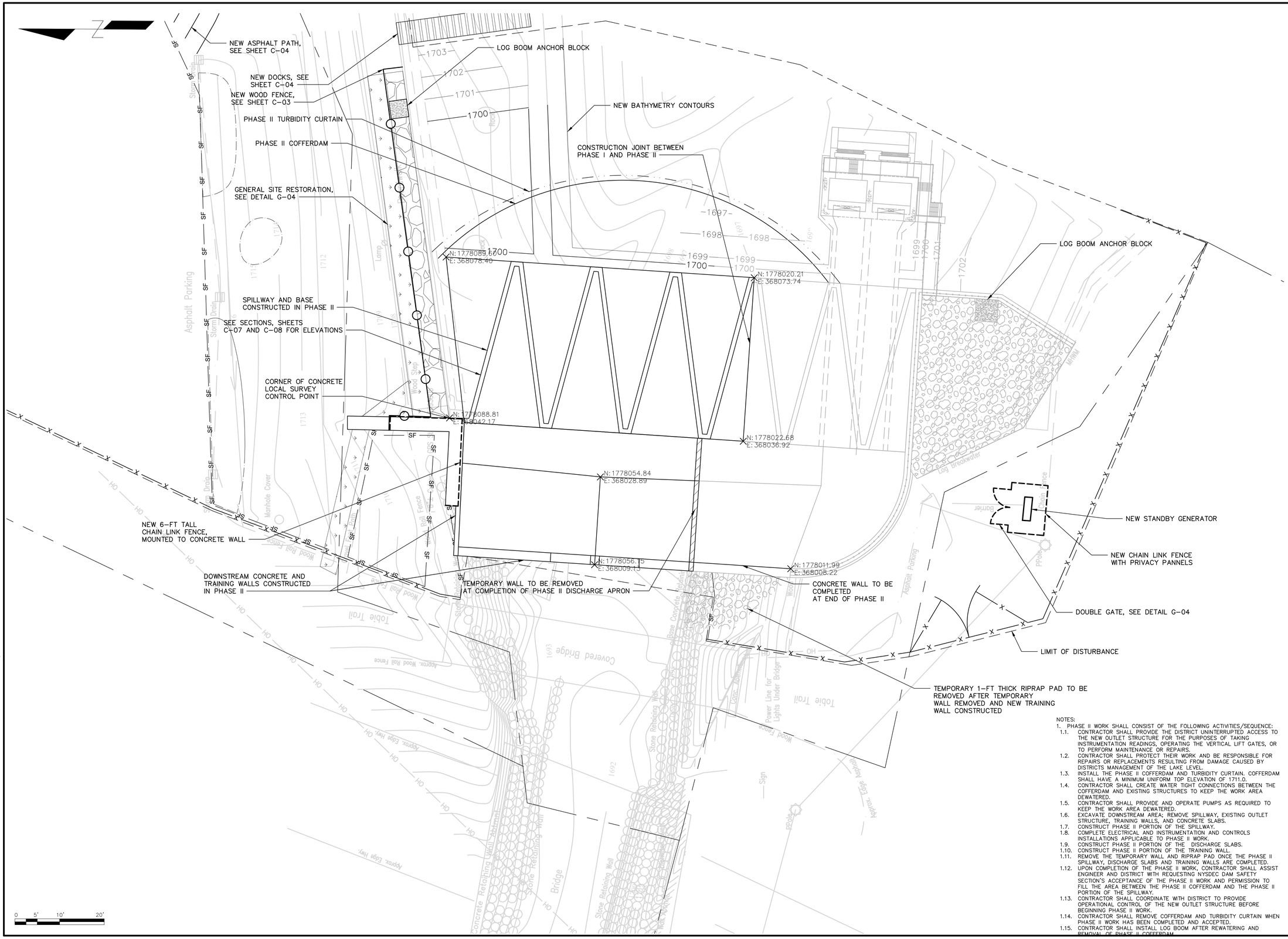
OLD FORGE DAM CONSTRUCTION PHASE I

SCALE: AS NOTED

C-05

SHEET 5 OF 18

User:LANZAROTTA Spec:AUS-NCSMOD File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.1 – OLD FORGE DAM CADD\03-SHEETS\CIVIL\OF-C-05.DWG
Scale:1:1 Saved:6/16/2025 Time:08:37 Plot Date: Landscape, Effec: 6/17/2025 10:37 , Layout:C-05



NOTES:

1. PHASE II WORK SHALL CONSIST OF THE FOLLOWING ACTIVITIES/SEQUENCE:
   - 1.1. CONTRACTOR SHALL PROVIDE THE DISTRICT UNINTERRUPTED ACCESS TO THE NEW OUTLET STRUCTURE FOR THE PURPOSES OF TAKING INSTRUMENTATION READINGS, OPERATING THE VERTICAL LIFT GATES, OR TO PERFORM MAINTENANCE OR REPAIRS.
   - 1.2. CONTRACTOR SHALL PROTECT THEIR WORK AND BE RESPONSIBLE FOR REPAIRS OR REPLACEMENTS RESULTING FROM DAMAGE CAUSED BY DISTRICTS MANAGEMENT OF THE LAKE LEVEL.
   - 1.3. INSTALL THE PHASE II COFFERDAM AND TURBIDITY CURTAIN. COFFERDAM SHALL HAVE A MINIMUM UNIFORM TOP ELEVATION OF 1711.0.
   - 1.4. CONTRACTOR SHALL CREATE WATER TIGHT CONNECTIONS BETWEEN THE COFFERDAM AND EXISTING STRUCTURES TO KEEP THE WORK AREA DEWATERED.
   - 1.5. CONTRACTOR SHALL PROVIDE AND OPERATE PUMPS AS REQUIRED TO KEEP THE WORK AREA DEWATERED.
   - 1.6. EXCAVATE DOWNSTREAM AREA; REMOVE SPILLWAY, EXISTING OUTLET STRUCTURE, TRAINING WALLS, AND CONCRETE SLABS.
   - 1.7. CONSTRUCT PHASE II PORTION OF THE SPILLWAY.
   - 1.8. COMPLETE ELECTRICAL AND INSTRUMENTATION AND CONTROLS INSTALLATIONS APPLICABLE TO PHASE II WORK.
   - 1.9. CONSTRUCT PHASE II PORTION OF THE DISCHARGE SLABS.
   - 1.10. CONSTRUCT PHASE II PORTION OF THE TRAINING WALL.
   - 1.11. REMOVE THE TEMPORARY WALL AND RIPRAP PAD ONCE THE PHASE II SPILLWAY, DISCHARGE SLABS AND TRAINING WALLS ARE COMPLETED.
   - 1.12. UPON COMPLETION OF THE PHASE II WORK, CONTRACTOR SHALL ASSIST ENGINEER AND DISTRICT WITH REQUESTING NYSDEC DAM SAFETY SECTION'S ACCEPTANCE OF THE PHASE II WORK AND PERMISSION TO FILL THE AREA BETWEEN THE PHASE II COFFERDAM AND THE PHASE II PORTION OF THE SPILLWAY.
   - 1.13. CONTRACTOR SHALL COORDINATE WITH DISTRICT TO PROVIDE OPERATIONAL CONTROL OF THE NEW OUTLET STRUCTURE BEFORE BEGINNING PHASE II WORK.
   - 1.14. CONTRACTOR SHALL REMOVE COFFERDAM AND TURBIDITY CURTAIN WHEN PHASE II WORK HAS BEEN COMPLETED AND ACCEPTED.
   - 1.15. CONTRACTOR SHALL INSTALL LOG BOOM AFTER REWATERING AND REMOVAL OF PHASE II COFFERDAM.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-C-06
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

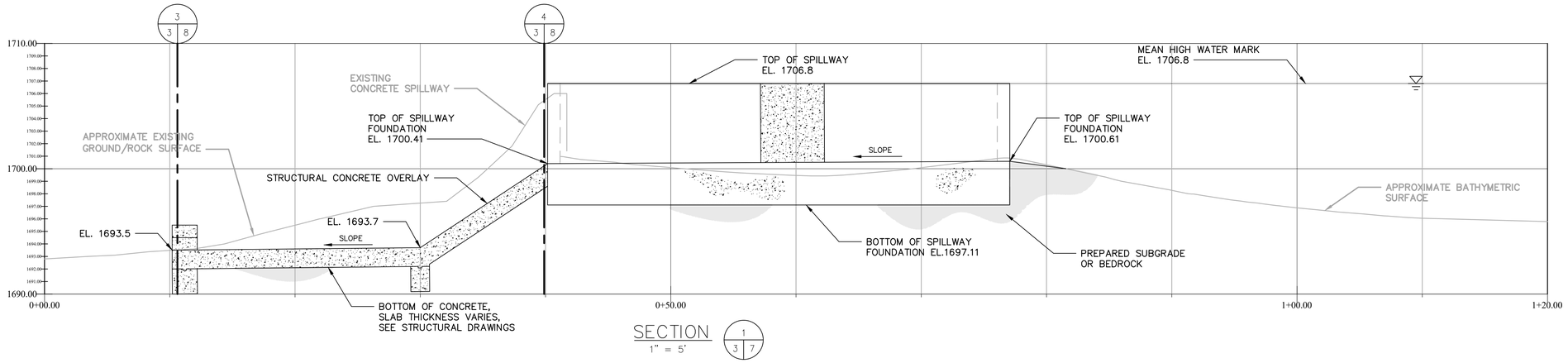
CIVIL

OLD FORGE DAM CONSTRUCTION PHASE II

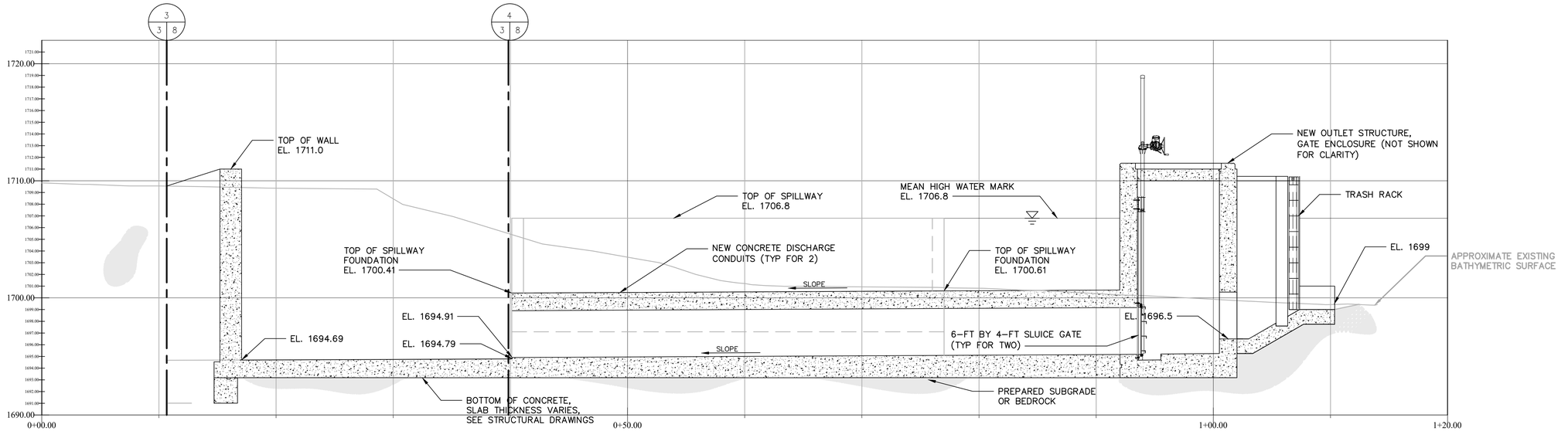
SCALE: AS NOTED

C-06
SHEET 6 OF 18

User:LANZAROTTA, Sheet:A1S-NCSMOD Files:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.1 – OLD FORGE DAM CADD\03-SHEETS\CIVIL\OF-C-06.DWG
Saved:6/7/2025 Time:10:43 Plot Date/Time:Lanzarotta, Eric 6/17/2025 10:37 Layout:C-06



SECTION 1 / 3 7
1" = 5'



SECTION 2 / 3 7
1" = 5'

NOTES:
1. PHASING OF THE WORK SHALL BE AS SHOWN OR SPECIFIED.
2. TOPOGRAPHY AND BATHYMETRY SHOWN IN SECTIONS MAY VARY FROM FIELD CONDITIONS.
3. EXISTING MATERIAL MAY DIFFER FROM THE MATERIAL DISPLAYED ON SECTIONS.
4. COFFERDAMS AND TURBIDITY CURTAIN ARE NOT SHOWN.
5. CONTRACTOR SHALL COMPACT SUBGRADE PRIOR TO PLACING CONCRETE, CONCRETE SAND, #9 STONE, #57 STONE, OR GENERAL FILL, EXCEPT FOR BEDROCK SURFACE.
6. CONTRACTOR SHALL FILL VOIDS ENCOUNTERED DURING EXCAVATION AND ROCK REMOVAL AS REQUIRED BY THE CONTRACT DOCUMENTS.
7. WATERSTOPS REQUIRED WHEN POURING NEW CONCRETE AGAINST ALREADY PLACED CONCRETE. REFER TO STRUCTURAL DRAWINGS FOR WATERSTOP DETAIL.
8. CONCRETE REINFORCEMENT SIZING AND DETAILING IS PROVIDED ON THE STRUCTURAL DRAWINGS.
9. CONSTRUCTION OF WOOD FRAMED STRUCTURE PORTION OF OUTLET STRUCTURE IS SHOWN ON THE ARCHITECTURAL DRAWINGS.
10. REFER TO ELECTRICAL DRAWINGS FOR LAYOUT FOR NEW ELECTRICAL AND INSTRUMENTATION COMPONENTS AND CONTROLS.
11. RAILING INFORMATION PROVIDED ON STRUCTURAL DRAWINGS.
12. DISCHARGE SLABS SHALL BE SLOPED TO PROVIDE DRAINAGE INTO THE DOWNSTREAM CHANNEL.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-C-07
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

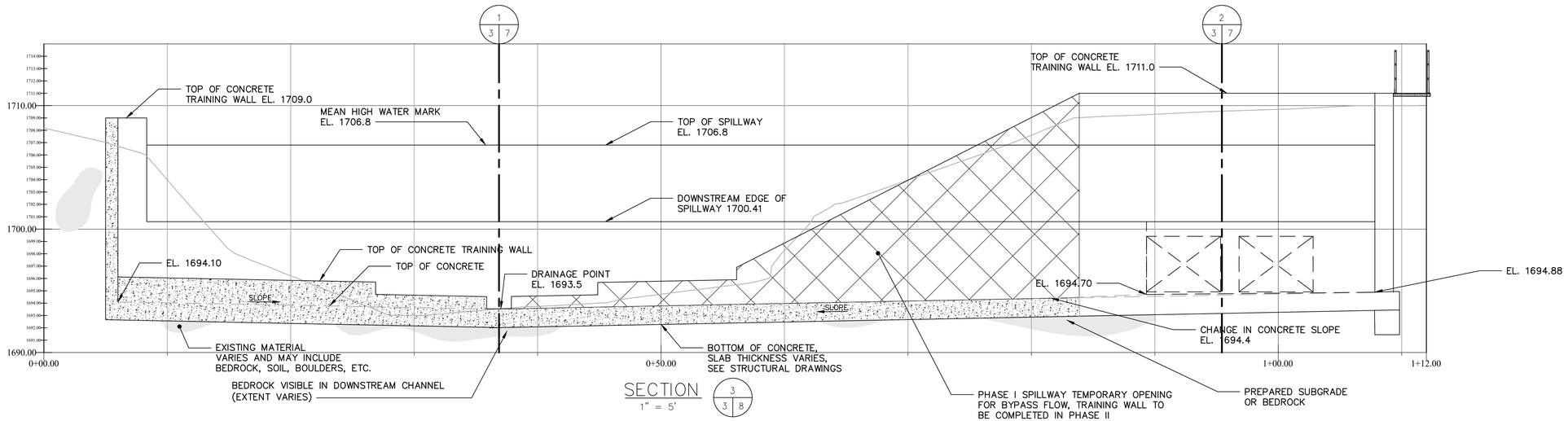
CIVIL

OLD FORGE DAM
SECTIONS I

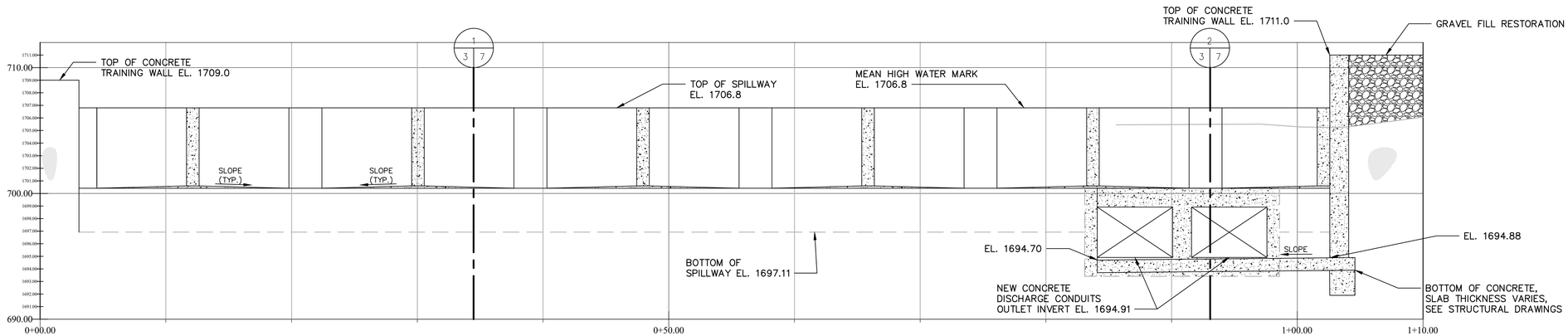
SCALE:
AS NOTED

C-07
SHEET 7 OF 18

User:LANZAROTTA Spec:AUS-NCSMOD File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\CIVIL\OF-C-07.DWG
Sheet:1 SavedDate:6/13/2025 Time:11:22 Plot Date: Lanzarotta, Eric 6/17/2025, 10:38 , Layout:C-07



SECTION (1 / 3 / 8)
1" = 5'



SECTION (4 / 3 / 8)
1" = 5'

NOTES:
1. PHASING OF THE WORK SHALL BE AS SHOWN OR SPECIFIED. THE SECTION OF PHASE I TRAINING WALL NOT CONSTRUCTED UNTIL PHASE II IS SHOW.
2. TOPOGRAPHY AND BATHYMETRY SHOWN IN SECTIONS MAY VARY FROM FIELD CONDITIONS.
3. EXISTING MATERIAL MAY DIFFER FROM THE MATERIAL DISPLAYED ON SECTIONS.RIP RAP APRON NOT SHOWN IN SECTIONS.
4. COFFERDAMS AND TURBIDITY CURTAIN ARE NOT SHOWN.
5. CONTRACTOR SHALL COMPACT SUBGRADE PRIOR TO PLACING CONCRETE, CONCRETE SAND, #9 STONE, #57 STONE, OR GENERAL FILL, EXCEPT FOR BEDROCK SURFACE.
6. WATERSTOPS REQUIRED WHEN POURING NEW CONCRETE AGAINST ALREADY PLACED CONCRETE. REFER TO STRUCTURAL DRAWINGS FOR WATERSTOP DETAIL.
7. CONTRACTOR SHALL FILL VOIDS ENCOUNTERED DURING EXCAVATION AND ROCK REMOVAL AS REQUIRED BY THE CONTRACT DOCUMENTS.
8. CONCRETE REINFORCEMENT SIZING AND DETAILING IS PROVIDED ON THE STRUCTURAL DRAWINGS.
9. DISCHARGE SLABS SHALL BE SLOPED TO PROVIDE DRAINAGE INTO THE DOWNSTREAM CHANNEL.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-C-08
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

CIVIL

OLD FORGE DAM SECTIONS II

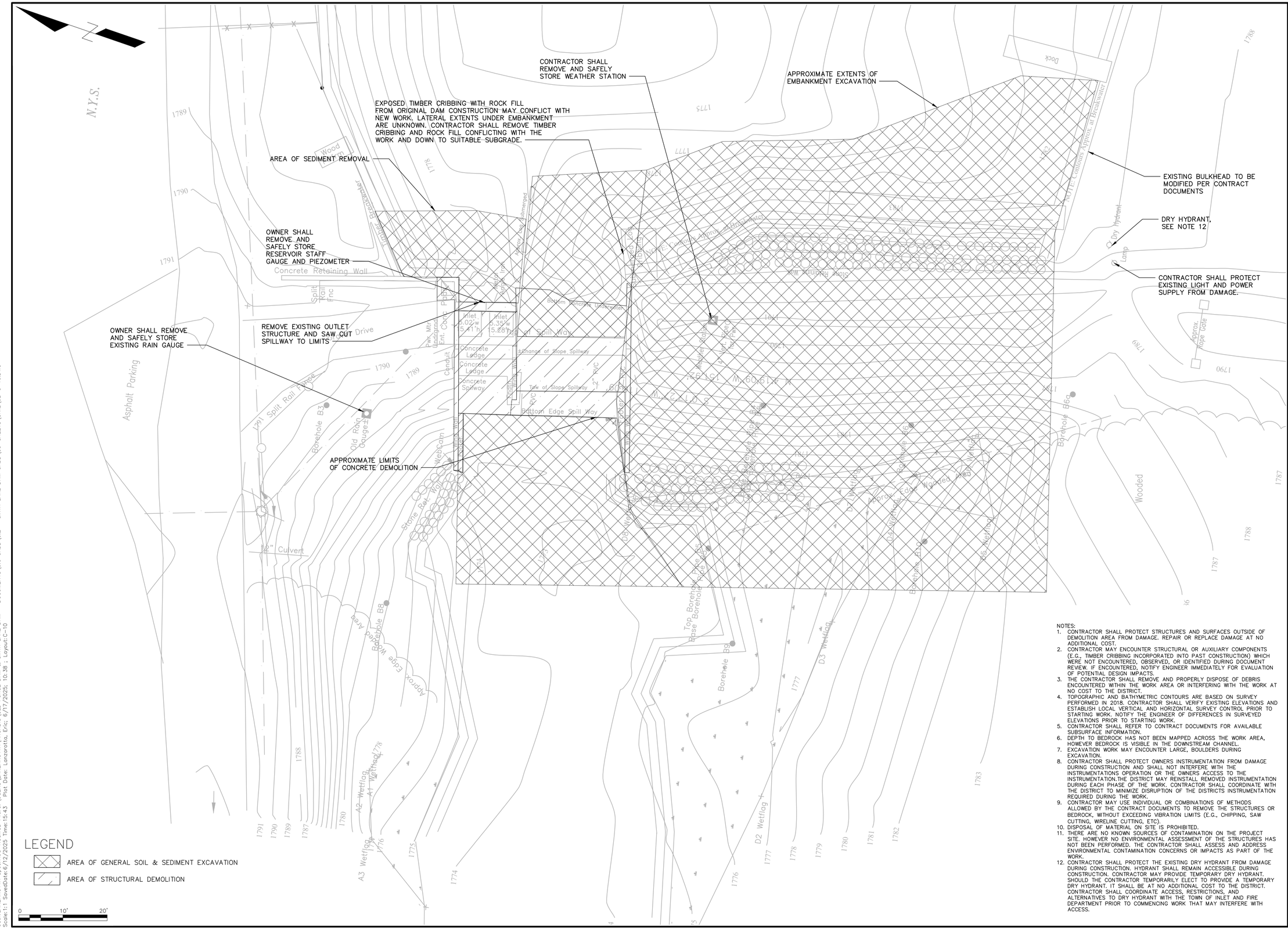
SCALE: AS NOTED

C-08

SHEET 8 OF 18

User:LANZAROTTA, Spec:A/S-NCSMOD Files:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.1 – OLD FORGE DAM CADD\03-SHEETS\CIVIL\OF-C-08.DWG
Scale:1:1 SavedDate:6/13/2025 Time:11:23 Plot Date: Corporate, Eric 6/17/2025 10:38 ; Layout:C-08


SIXTH LAKE RESERVOIR
(SIXTH LAKE)
DISTRICT PROPERTY
EXISTING CONCRETE OGEE SPILLWAY
EXISTING EMBANKMENT
EXISTING OUTLET STRUCTURE
EXISTING EMBANKMENT
EXISTING DOWNSTREAM CONCRETE APRON
EXISTING DOWNSTREAM CHANNEL
EXISTING WETLAND
EXISTING WETLAND
NOW OR FORMERLY THE PROPERTY OF JEAN L. BIRD
DISTRICT PROPERTY
APPROXIMATE EXISTING ACCESS EASEMENT
NOW OR FORMERLY THE PROPERTY OF JEAN L. BIRD
APPROXIMATE PROPERTY LINE FROM TOWN IN INLET, NY TAX MAP
NOW OR FORMERLY THE PROPERTY OF JOSEPH G. WILLIS
NOW OR FORMERLY THE PROPERTY OF JEAN L. BIRD
6TH LAKE ROAD
Asphalt Road
To N.Y.S. Route 28
LOT 6
Alpine Lodges Subdivision
SIXTH LAKE
Dam Crest Elevation = 1784.22' 5/9/18
N.Y.S.
No Outlet
Concrete Retaining Wall
Gravel Drive
Bottom Edge Spill Way
Top of Spill Wall
Change of Slope Spillway
Top of Slope Spillway
Concrete Ledge
Concrete Spillway
Stone Retaining Wall
Boulder Rip Rap
Woodland
Rockweed
Outlet
Approx. Mean High Water
Approx. Mean High Water
Bedrock Ridge
Drainage Ditch
Boundary Line
Overhead Utility
Bedrock Rip Rap
Stone Retaining Wall
Dock
Boathouse
Pump House
Shed
Garage
Cabin
Bridge
Culvert
Boulder Rip Rap
Boulder Rip Rap
Boulder Rip Rap



NOTES:

1. CONTRACTOR SHALL PROTECT STRUCTURES AND SURFACES OUTSIDE OF DEMOLITION AREA FROM DAMAGE. REPAIR OR REPLACE DAMAGE AT NO ADDITIONAL COST.
2. CONTRACTOR MAY ENCOUNTER STRUCTURAL OR AUXILIARY COMPONENTS (E.G., TIMBER CRIBBING INCORPORATED INTO PAST CONSTRUCTION) WHICH WERE NOT ENCOUNTERED, OBSERVED, OR IDENTIFIED DURING DOCUMENT REVIEW. IF ENCOUNTERED, NOTIFY ENGINEER IMMEDIATELY FOR EVALUATION OF POTENTIAL DESIGN IMPACTS.
3. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF DEBRIS ENCOUNTERED WITHIN THE WORK AREA OR INTERFERING WITH THE WORK AT NO COST TO THE DISTRICT.
4. TOPOGRAPHIC AND BATHYMETRIC CONTOURS ARE BASED ON SURVEY PERFORMED IN 2018. CONTRACTOR SHALL VERIFY EXISTING ELEVATIONS AND ESTABLISH LOCAL VERTICAL AND HORIZONTAL SURVEY CONTROL PRIOR TO STARTING WORK. NOTIFY THE ENGINEER OF DIFFERENCES IN SURVEYED ELEVATIONS PRIOR TO STARTING WORK.
5. CONTRACTOR SHALL REFER TO CONTRACT DOCUMENTS FOR AVAILABLE SUBSURFACE INFORMATION.
6. DEPTH TO BEDROCK HAS NOT BEEN MAPPED ACROSS THE WORK AREA, HOWEVER BEDROCK IS VISIBLE IN THE DOWNSTREAM CHANNEL.
7. EXCAVATION WORK MAY ENCOUNTER LARGE, BOULDERS DURING EXCAVATION.
8. CONTRACTOR SHALL PROTECT OWNERS INSTRUMENTATION FROM DAMAGE DURING CONSTRUCTION AND SHALL NOT INTERFERE WITH THE INSTRUMENTATIONS OPERATION OR THE OWNERS ACCESS TO THE INSTRUMENTATION.THE DISTRICT MAY REINSTALL REMOVED INSTRUMENTATION DURING EACH PHASE OF THE WORK. CONTRACTOR SHALL COORDINATE WITH THE DISTRICT TO MINIMIZE DISRUPTION OF THE DISTRICTS INSTRUMENTATION REQUIRED DURING THE WORK.
9. CONTRACTOR MAY USE INDIVIDUAL OR COMBINATIONS OF METHODS ALLOWED BY THE CONTRACT DOCUMENTS TO REMOVE THE STRUCTURES OR BEDROCK, WITHOUT EXCEEDING VIBRATION LIMITS (E.G., CHIPPING, SAW CUTTING, WIRELINE CUTTING, ETC).
10. DISPOSAL OF MATERIAL ON SITE IS PROHIBITED.
11. THERE ARE NO KNOWN SOURCES OF CONTAMINATION ON THE PROJECT SITE. HOWEVER NO ENVIRONMENTAL ASSESSMENT OF THE STRUCTURES HAS NOT BEEN PERFORMED. THE CONTRACTOR SHALL ASSESS AND ADDRESS ENVIRONMENTAL CONTAMINATION CONCERNS OR IMPACTS AS PART OF THE WORK.
12. CONTRACTOR SHALL PROTECT THE EXISTING DRY HYDRANT FROM DAMAGE DURING CONSTRUCTION. HYDRANT SHALL REMAIN ACCESSIBLE DURING CONSTRUCTION. CONTRACTOR MAY PROVIDE TEMPORARY DRY HYDRANT. SHOULD THE CONTRACTOR TEMPORARILY ELECT TO PROVIDE A TEMPORARY DRY HYDRANT. IT SHALL BE AT NO ADDITIONAL COST TO THE DISTRICT. CONTRACTOR SHALL COORDINATE ACCESS, RESTRICTIONS, AND ALTERNATIVES TO DRY HYDRANT WITH THE TOWN OF INLET AND FIRE DEPARTMENT PRIOR TO COMMENCING WORK THAT MAY INTERFERE WITH ACCESS.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L–C–10
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

CIVIL

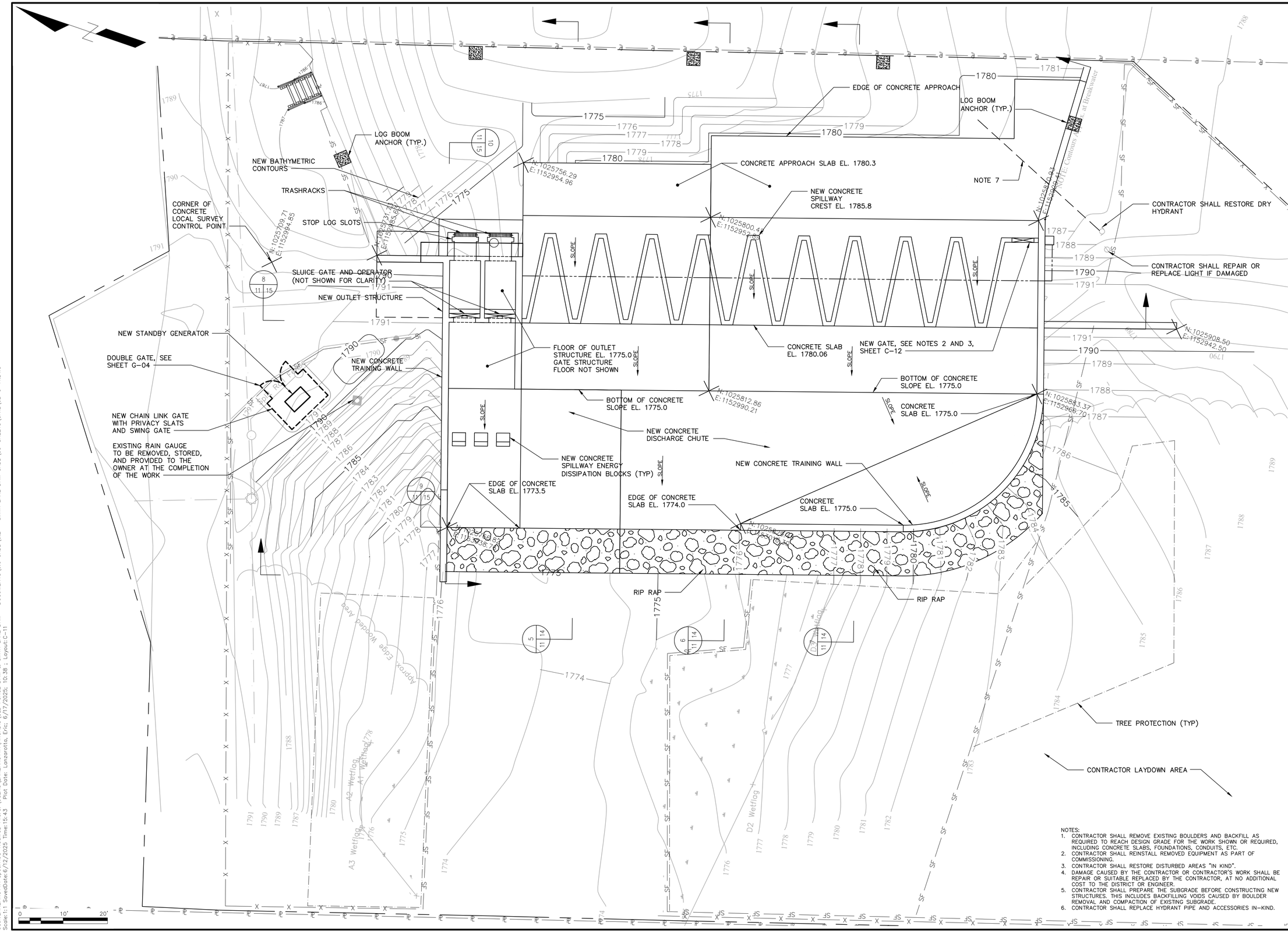
SIXTH LAKE DAM DEMOLITION PLAN

SCALE: AS NOTED

C–10

SHEET 10 OF 18

User:LANZAROTTA, Spec:A/S-NCSMOD File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.2 – SIXTH LAKE DAM CADD\03-SHEETS\CIVIL\6L-C-10.DWG
Scale:1:1 Saved Date:6/12/2025 Time:15:45 Plot Date/Time:Corporate, Eric 6/17/2025 10:36 Layout:C-10



NOTES:
1. CONTRACTOR SHALL REMOVE EXISTING BOULDERS AND BACKFILL AS REQUIRED TO REACH DESIGN GRADE FOR THE WORK SHOWN OR REQUIRED, INCLUDING CONCRETE SLABS, FOUNDATIONS, CONDUITS, ETC.
2. CONTRACTOR SHALL REINSTALL REMOVED EQUIPMENT AS PART OF COMMISSIONING.
3. CONTRACTOR SHALL RESTORE DISTURBED AREAS "IN KIND".
4. DAMAGE CAUSED BY THE CONTRACTOR OR CONTRACTOR'S WORK SHALL BE REPAIR OR SUITABLE REPLACED BY THE CONTRACTOR, AT NO ADDITIONAL COST TO THE DISTRICT OR ENGINEER.
5. CONTRACTOR SHALL PREPARE THE SUBGRADE BEFORE CONSTRUCTING NEW STRUCTURES. THIS INCLUDES BACKFILLING VOIDS CAUSED BY BOULDER REMOVAL AND COMPACTION OF EXISTING SUBGRADE.
6. CONTRACTOR SHALL REPLACE HYDRANT PIPE AND ACCESSORIES IN-KIND.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-C-11
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

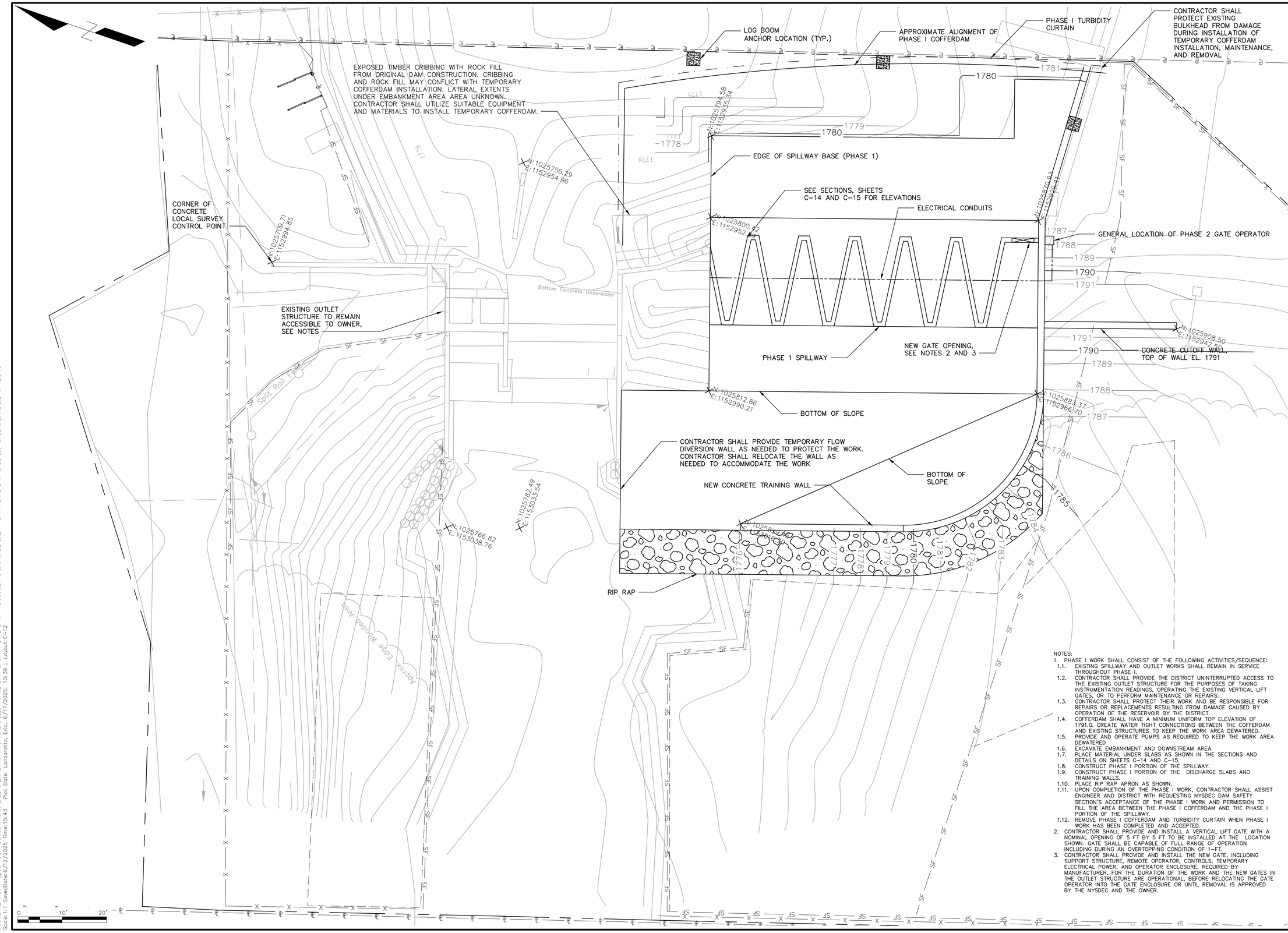
CIVIL

SIXTH LAKE DAM FINAL PLAN

SCALE: AS NOTED

C-11
SHEET 11 OF 18

User:LANZAROTTA, Spec:AUS-NCSMOD Flie:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\CIVIL\6L-C-11.DWG
Scale:1:1 Saved:6/12/2025 Time:15:43 Plot Date: Lanzarotta, Eric, 6/17/2025 10:38 ; Layout:C-11



NOTES:

1. PHASE I WORK SHALL CONSIST OF THE FOLLOWING ACTIVITIES/SEQUENCE:
   - 1.1. EXISTING SPILLWAY AND OUTLET WORKS SHALL REMAIN IN SERVICE THROUGHOUT PHASE I.
   - 1.2. CONTRACTOR SHALL PROVIDE THE DISTRICT UNINTERRUPTED ACCESS TO THE EXISTING OUTLET STRUCTURE FOR THE PURPOSES OF TAKING INSTRUMENTATION READINGS, OPERATING THE EXISTING VERTICAL LIFT GATES, OR TO PERFORM MAINTENANCE OR REPAIRS.
   - 1.3. CONTRACTOR SHALL PROTECT THEIR WORK AND BE RESPONSIBLE FOR REPAIRS OR REPLACEMENTS RESULTING FROM DAMAGE CAUSED BY OPERATION OF THE RESERVOIR BY THE DISTRICT.
   - 1.4. COFFERDAM SHALL HAVE A MINIMUM UNIFORM TOP ELEVATION OF 1791.0. CREATE WATER TIGHT CONNECTIONS BETWEEN THE COFFERDAM AND EXISTING STRUCTURES TO KEEP THE WORK AREA DEWATERED.
   - 1.5. PROVIDE AND OPERATE PUMPS AS REQUIRED TO KEEP THE WORK AREA DEWATERED
   - 1.6. EXCAVATE EMBANKMENT AND DOWNSTREAM AREA.
   - 1.7. PLACE MATERIAL UNDER SLABS AS SHOWN IN THE SECTIONS AND DETAILS ON SHEETS C-14 AND C-15.
   - 1.8. CONSTRUCT PHASE I PORTION OF THE SPILLWAY.
   - 1.9. CONSTRUCT PHASE I PORTION OF THE DISCHARGE SLABS AND TRAINING WALLS.
   - 1.10. PLACE RIP RAP APRON AS SHOWN.
   - 1.11. UPON COMPLETION OF THE PHASE I WORK, CONTRACTOR SHALL ASSIST ENGINEER AND DISTRICT WITH REQUESTING NYSDEC DAM SAFETY SECTION'S ACCEPTANCE OF THE PHASE I WORK AND PERMISSION TO FILL THE AREA BETWEEN THE PHASE I COFFERDAM AND THE PHASE I PORTION OF THE SPILLWAY.
   - 1.12. REMOVE PHASE I COFFERDAM AND TURBIDITY CURTAIN WHEN PHASE I WORK HAS BEEN COMPLETED AND ACCEPTED.
2. CONTRACTOR SHALL PROVIDE AND INSTALL A VERTICAL LIFT GATE WITH A NOMINAL OPENING OF 5 FT BY 5 FT TO BE INSTALLED AT THE LOCATION SHOWN. GATE SHALL BE CAPABLE OF FULL RANGE OF OPERATION INCLUDING DURING AN OVERTOPPING CONDITION OF 1-FT.
3. CONTRACTOR SHALL PROVIDE AND INSTALL THE NEW GATE, INCLUDING SUPPORT STRUCTURE, REMOTE OPERATOR, CONTROLS, TEMPORARY ELECTRICAL POWER, AND OPERATOR ENCLOSURE, REQUIRED BY MANUFACTURER, FOR THE DURATION OF THE WORK AND THE NEW GATES IN THE OUTLET STRUCTURE ARE OPERATIONAL, BEFORE RELOCATING THE GATE OPERATOR INTO THE GATE ENCLOSURE OR UNTIL REMOVAL IS APPROVED BY THE NYSDEC AND THE OWNER.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-C-12
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

CIVIL

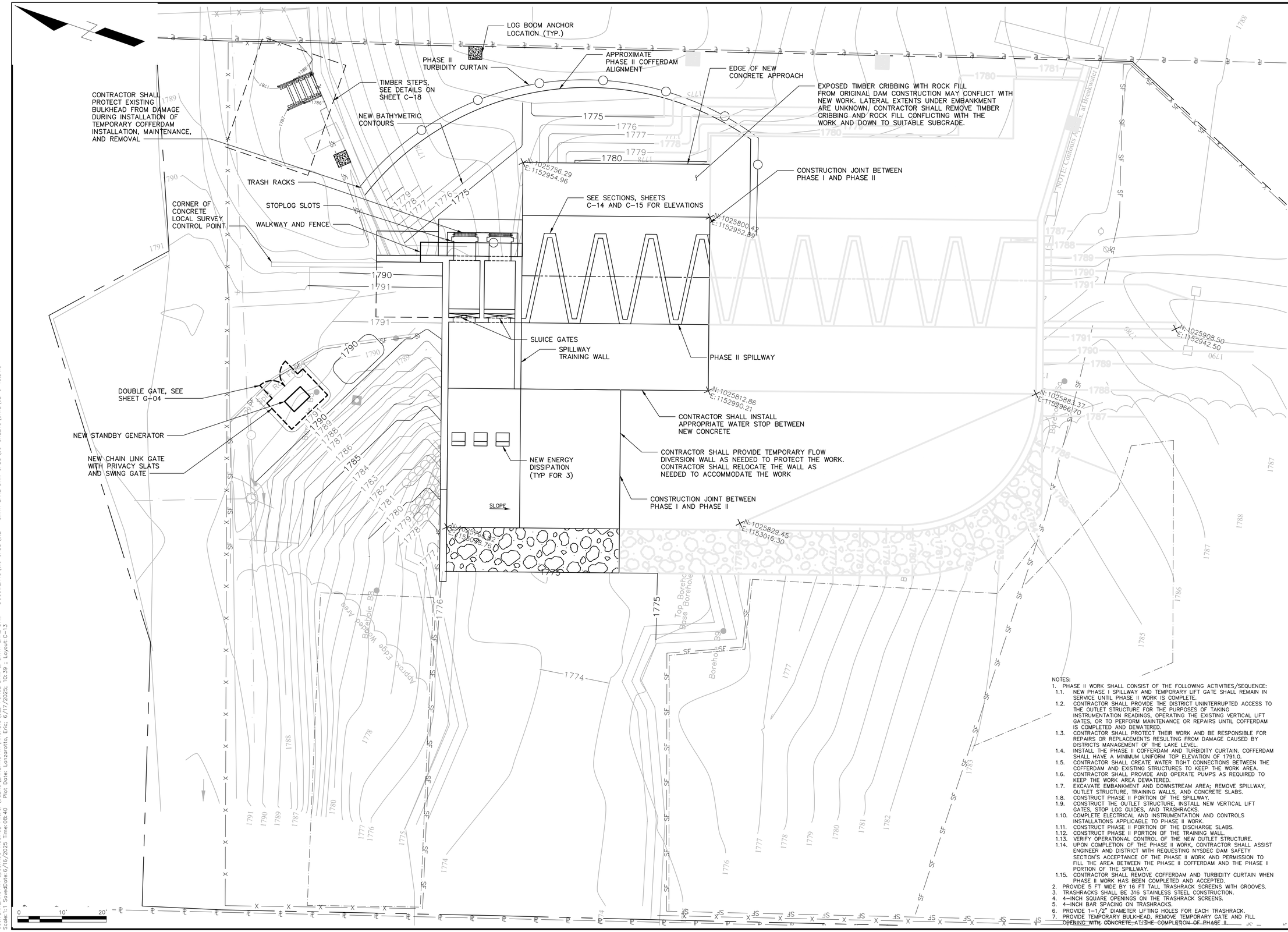
SIXTH LAKE DAM CONSTRUCTION PHASE I

SCALE: AS NOTED

C-12

SHEET 12 OF 18

User:LANZAROTTA, Spec:AUS-NOSMOD, File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\CIVIL\6L-C-12.DWG
Scale:1:1, SaveDate:6/12/2025 Time:15:43, Plot Date/Time:Corporate, Date: 6/12/2025 10:39, Layout:C-12



NOTES:
1. PHASE II WORK SHALL CONSIST OF THE FOLLOWING ACTIVITIES/SEQUENCE:
   - 1.1. NEW PHASE I SPILLWAY AND TEMPORARY LIFT GATE SHALL REMAIN IN SERVICE UNTIL PHASE II WORK IS COMPLETE.
   - 1.2. CONTRACTOR SHALL PROVIDE THE DISTRICT UNINTERRUPTED ACCESS TO THE OUTLET STRUCTURE FOR THE PURPOSES OF TAKING INSTRUMENTATION READINGS, OPERATING THE EXISTING VERTICAL LIFT GATES, OR TO PERFORM MAINTENANCE OR REPAIRS UNTIL COFFERDAM IS COMPLETED AND DEWATERED.
   - 1.3. CONTRACTOR SHALL PROTECT THEIR WORK AND BE RESPONSIBLE FOR REPAIRS OR REPLACEMENTS RESULTING FROM DAMAGE CAUSED BY DISTRICTS MANAGEMENT OF THE LAKE LEVEL.
   - 1.4. INSTALL THE PHASE II COFFERDAM AND TURBIDITY CURTAIN. COFFERDAM SHALL HAVE A MINIMUM UNIFORM TOP ELEVATION OF 1791.0.
   - 1.5. CONTRACTOR SHALL CREATE WATER TIGHT CONNECTIONS BETWEEN THE COFFERDAM AND EXISTING STRUCTURES TO KEEP THE WORK AREA.
   - 1.6. CONTRACTOR SHALL PROVIDE AND OPERATE PUMPS AS REQUIRED TO KEEP THE WORK AREA DEWATERED.
   - 1.7. EXCAVATE EMBANKMENT AND DOWNSTREAM AREA; REMOVE SPILLWAY, OUTLET STRUCTURE, TRAINING WALLS, AND CONCRETE SLABS.
   - 1.8. CONSTRUCT PHASE II PORTION OF THE SPILLWAY.
   - 1.9. CONSTRUCT THE OUTLET STRUCTURE, INSTALL NEW VERTICAL LIFT GATES, STOP LOG GUIDES, AND TRASHRACKS.
   - 1.10. COMPLETE ELECTRICAL AND INSTRUMENTATION AND CONTROLS INSTALLATIONS APPLICABLE TO PHASE II WORK.
   - 1.11. CONSTRUCT PHASE II PORTION OF THE DISCHARGE SLABS.
   - 1.12. CONSTRUCT PHASE II PORTION OF THE TRAINING WALL.
   - 1.13. VERIFY OPERATIONAL CONTROL OF THE NEW OUTLET STRUCTURE.
   - 1.14. UPON COMPLETION OF THE PHASE II WORK, CONTRACTOR SHALL ASSIST ENGINEER AND DISTRICT WITH REQUESTING NYSDEC DAM SAFETY SECTION'S ACCEPTANCE OF THE PHASE II WORK AND PERMISSION TO FILL THE AREA BETWEEN THE PHASE II COFFERDAM AND THE PHASE II PORTION OF THE SPILLWAY.
   - 1.15. CONTRACTOR SHALL REMOVE COFFERDAM AND TURBIDITY CURTAIN WHEN PHASE II WORK HAS BEEN COMPLETED AND ACCEPTED.
2. PROVIDE 5 FT WIDE BY 16 FT TALL TRASHRACK SCREENS WITH GROOVES.
3. TRASHRACKS SHALL BE 316 STAINLESS STEEL CONSTRUCTION.
4. 4-INCH SQUARE OPENINGS ON THE TRASHRACK SCREENS.
5. 4-INCH BAR SPACING ON TRASHRACKS.
6. PROVIDE 1-1/2" DIAMETER LIFTING HOLES FOR EACH TRASHRACK.
7. PROVIDE TEMPORARY BULKHEAD, REMOVE TEMPORARY GATE AND FILL OPENING WITH CONCRETE, AT THE COMPLETION OF PHASE II.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-C-13
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

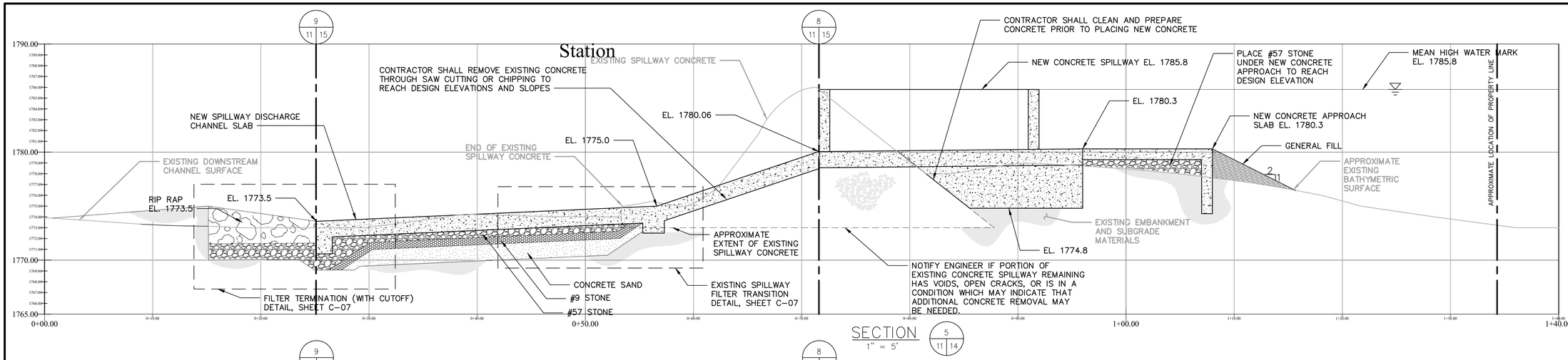
CIVIL

SIXTH LAKE DAM CONSTRUCTION PHASE II

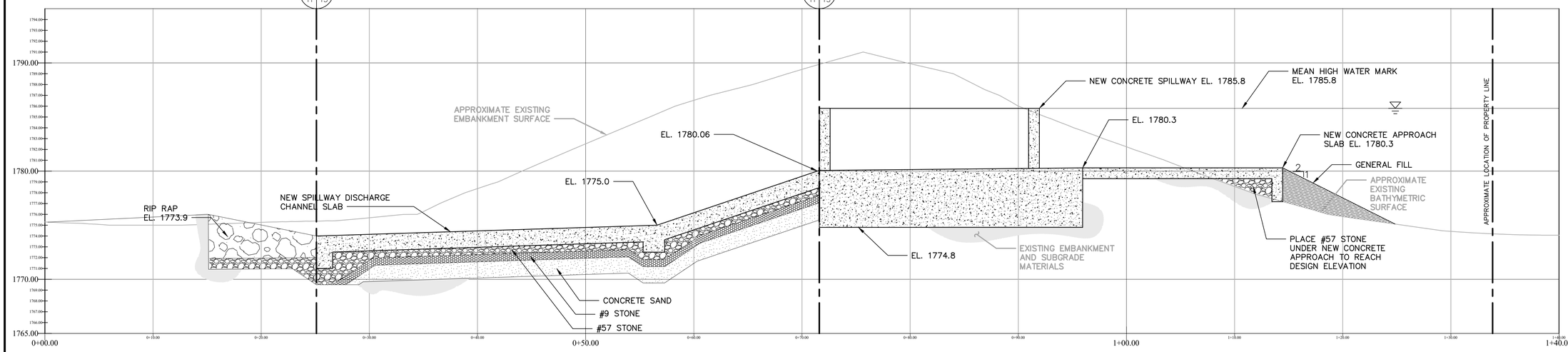
SCALE: AS NOTED

C-13
SHEET 13 OF 18

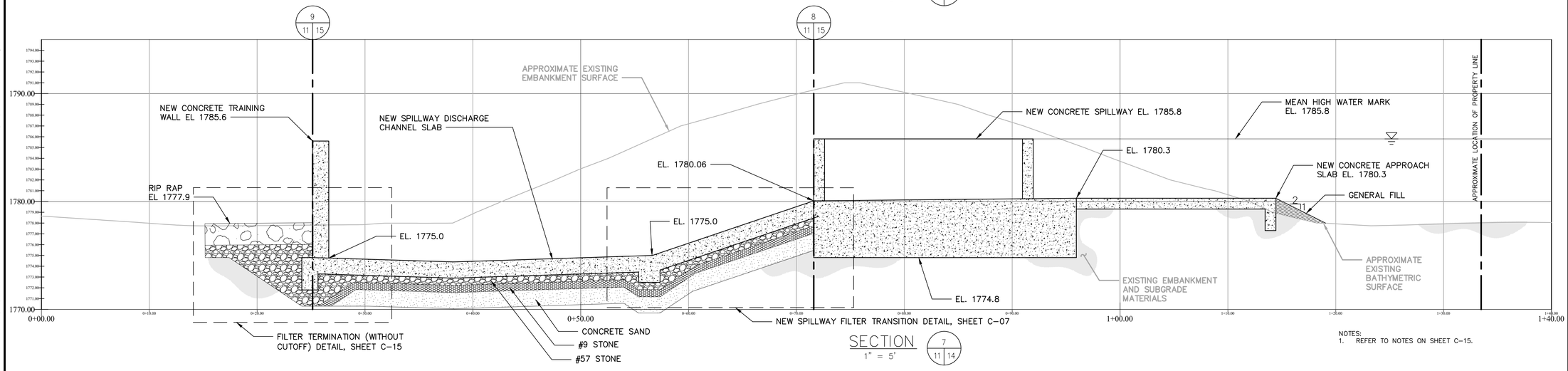
User:LANZAROTTA, Spec:AUS-ACSM3D, File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\CIVIL\6L-C-13.DWG
Saved Date: 6/16/2025 Time: 08:40 Plot Date: Tuesday, June 17, 2025 10:39 | Layout: C-13



SECTION 5 (9 | 11 | 15) (8 | 11 | 15) (11 | 14)
1" = 5'



SECTION 6 (9 | 11 | 15) (8 | 11 | 15) (11 | 14)
1" = 5'



SECTION 7 (9 | 11 | 15) (8 | 11 | 15) (11 | 14)
1" = 5'

NOTES:
1. REFER TO NOTES ON SHEET C-15.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE:	JUNE 2025
PROJECT NO.:	30001381
FILE NAME:	6L-C-14
DESIGNED BY:	EJL
DRAWN BY:	EJL
CHECKED BY:	TM

SHEET TITLE

CIVIL

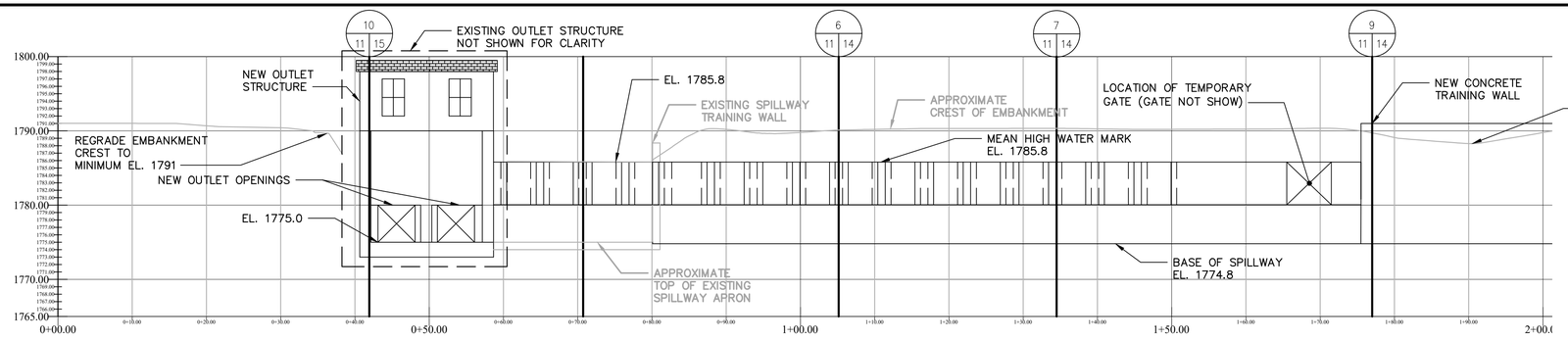
SIXTH LAKE DAM SECTIONS AND DETAILS I

SCALE: AS NOTED

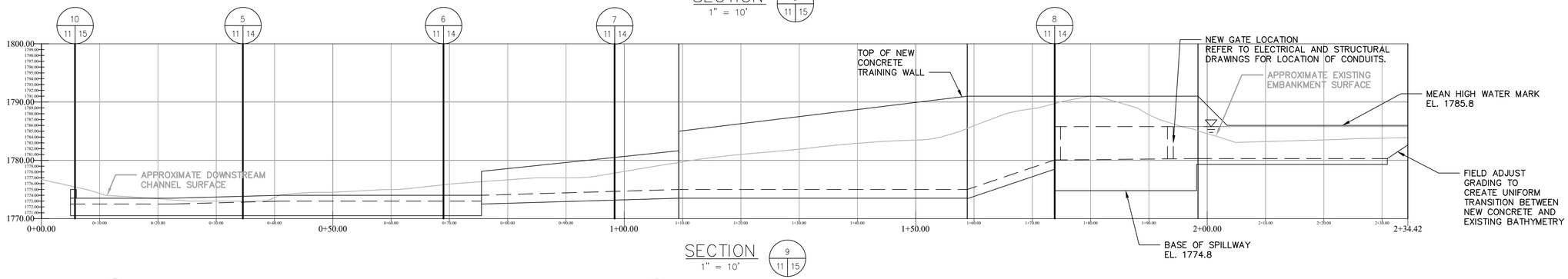
C-14

SHEET 14 OF 18

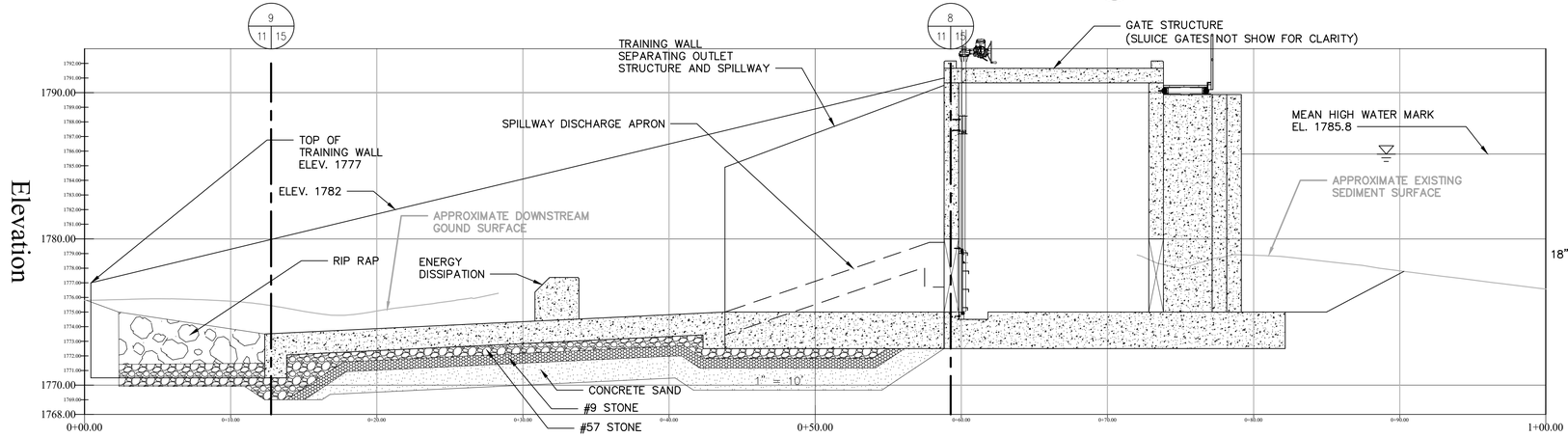
User:LANZAROTTA, Spec:AVS-NCSMOD File:C:\VSEPS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.2 – SIXTH LAKE DAM CADD\03-SHEETS\CIVIL\6L-C-14.DWG
Scale:1:1 Saved:Date 6/13/2025 Time:11:27 Plot Date:Lanzarotta, Eric 6/17/2025 10:39 Layout:C-14

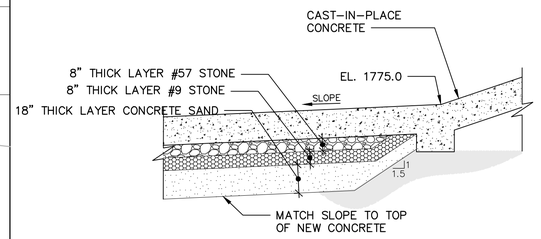


SECTION (10 / 11 / 15)
1" = 10'



SECTION (9 / 11 / 15)
1" = 10'

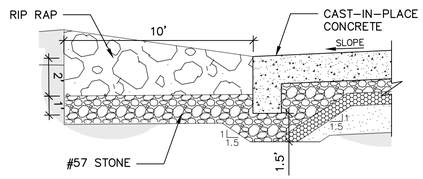




EXISTING SPILLWAY FILTER TRANSITION DETAIL
1" = 3'

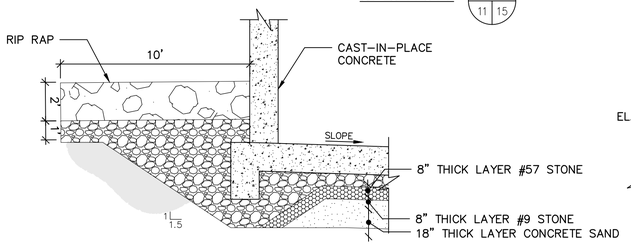
NOTES:
1. CONTRACTOR SHALL COMPACT EXISTING SUBGRADE TO CREATE A UNIFORM SURFACE BEFORE PLACING MATERIALS.
2. CONTRACTOR SHALL NOTIFY ENGINEER IF BASE OF EXISTING CONCRETE SPILLWAY ELEVATION DIFFERS THAN THAT SHOWN.

SECTION (10 / 11 / 15)



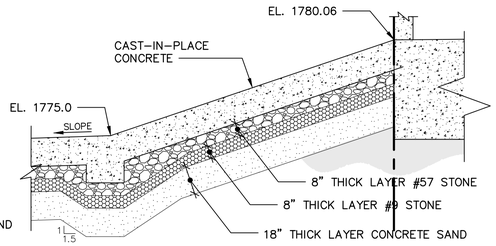
FILTER TERMINATION (WITH CUTOFF) DETAIL
1" = 3'

NOTES:
1. CONTRACTOR SHALL COMPACT EXISTING SUBGRADE TO CREATE A UNIFORM SURFACE BEFORE PLACING MATERIALS.



FILTER TERMINATION (WITHOUT CUTOFF) DETAIL
1" = 3'

NOTES:
1. CONTRACTOR SHALL COMPACT EXISTING SUBGRADE TO CREATE A UNIFORM SURFACE BEFORE PLACING MATERIALS.



NEW SPILLWAY FILTER TRANSITION DETAIL
1" = 3'

NOTES:
1. CONTRACTOR SHALL COMPACT EXISTING SUBGRADE TO CREATE A UNIFORM SURFACE BEFORE PLACING MATERIALS.

NOTES:
1. PHASING OF THE WORK IS NOT SHOWN.
2. COFFERDAMS AND TURBIDITY CURTAIN ARE NOT SHOWN.
3. CONTRACTOR SHALL COMPACT SUBGRADE PRIOR TO PLACING CONCRETE, CONCRETE SAND, #9 STONE, #57 STONE, OR GENERAL FILL, EXCEPT FOR BEDROCK SURFACE.
4. CONTRACTOR SHALL FILL VOIDS ENCOUNTERED DURING EXCAVATION AND ROCK REMOVAL AS REQUIRED BY THE CONTRACT DOCUMENTS.
5. TOPOGRAPHY AND BATHYMETRY SHOWN IN SECTIONS MAY VARY FROM FIELD CONDITIONS.
6. EXISTING MATERIAL MAY DIFFER FROM THE MATERIAL DISPLAYED ON SECTIONS.
7. WATERSTOPS REQUIRED WHEN POURING NEW CONCRETE AGAINST ALREADY PLACED CONCRETE. REFER TO STRUCTURAL DRAWINGS FOR WATERSTOP DETAIL.
8. CONCRETE REINFORCEMENT SIZING AND DETAILING IS PROVIDED ON THE STRUCTURAL DRAWINGS.
9. CONSTRUCTION OF WOOD FRAMED STRUCTURE PORTION OF OUTLET STRUCTURE IS PROVIDED ON THE ARCHITECTURAL DRAWINGS.
10. REFER TO ELECTRICAL DRAWINGS FOR LAYOUT FOR NEW ELECTRICAL AND INSTRUMENTATION COMPONENTS AND CONTROLS.
11. RAILING INFORMATION PROVIDED ON ARCHITECTURAL DRAWINGS.
12. DISCHARGE SLABS SHALL BE SLOPED TO PROVIDE DRAINAGE INTO THE DOWNSTREAM CHANNEL.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-C-15
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

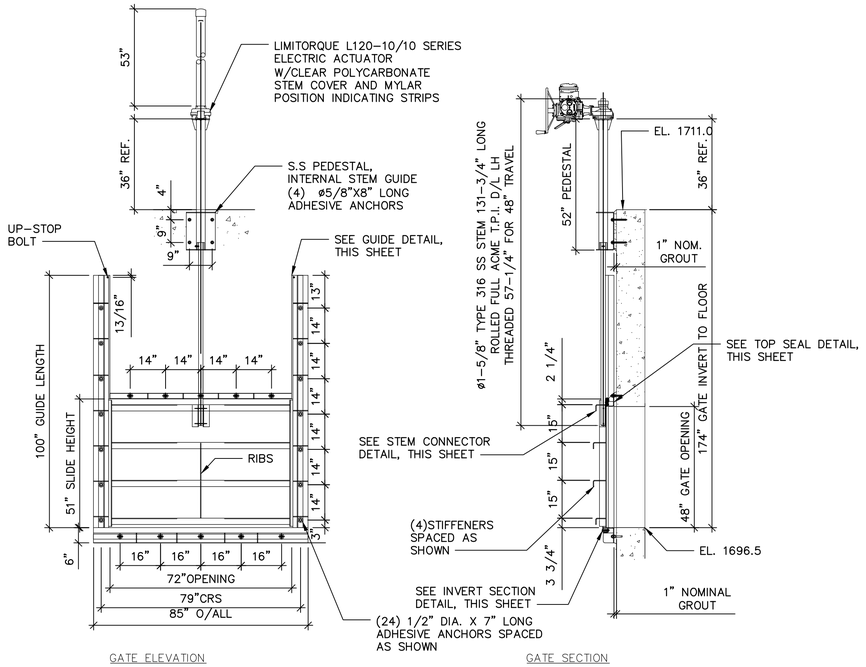
CIVIL

SIXTH LAKE DAM SECTIONS AND DETAILS II

SCALE: AS NOTED

C-15
SHEET 15 OF 18

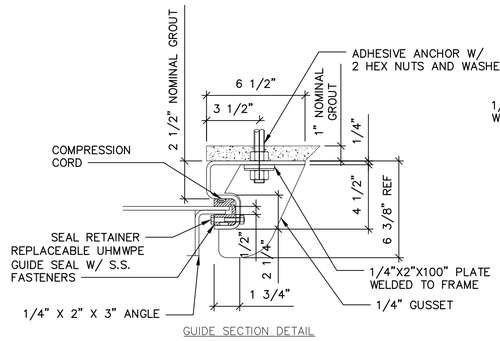
User:LANZAROTTA, Spec:AUS-NCSMOD File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\CIVIL\6L-C-15.DWG
Scale:1:1 Saved:Date 6/13/2025 Time:11:21 Plot Date:Lanzarotta, Eric 6/17/2025 10:39:1 Layout:C-15



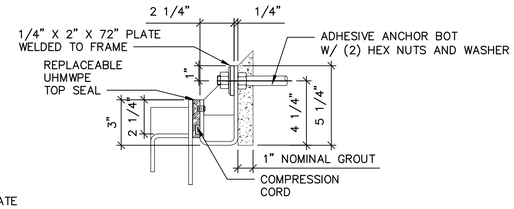
GATE ELEVATION

GATE SECTION

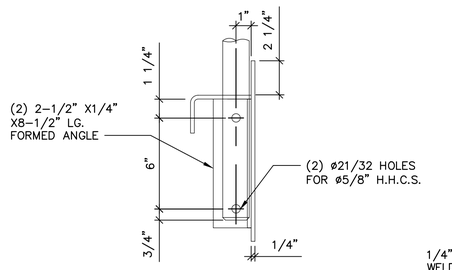
6 FT BY 4 FT SLUICE GATE



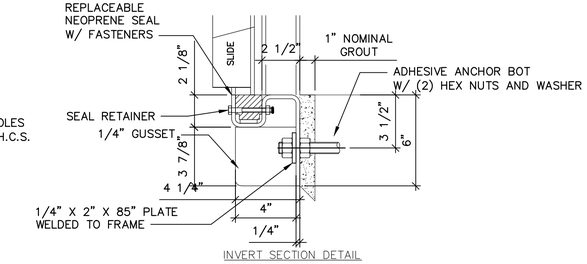
GUIDE SECTION DETAIL



TOP SEAL SECTION DETAIL



STEM CONNECTOR SECTION DETAIL



INVERT SECTION DETAIL

NOTES:
1. GATE SHALL BE A SERIES 935 SLUICE GATE BY WHIPPS INC OR APPROVED EQUAL.
2. ALLOWABLE LEAKAGE RATE: 0.05 GPM/FT OF SEAL.
3. GATE SHALL BE CAPABLE OF SEATING AND UNSEATING UNDER 9 FT OF HEAD.
4. HORIZONTAL STIFFENERS: 5"X2-1/2"X1/4"ANGLE.
5. VERTICAL STIFFENERS: 2"X3"X1/4"ANGLE.
6. STEM GUIDE SUPPORT: 2"X2-1/2"X1/4"ANGLE.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER
BLACK RIVER
REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-C-16
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

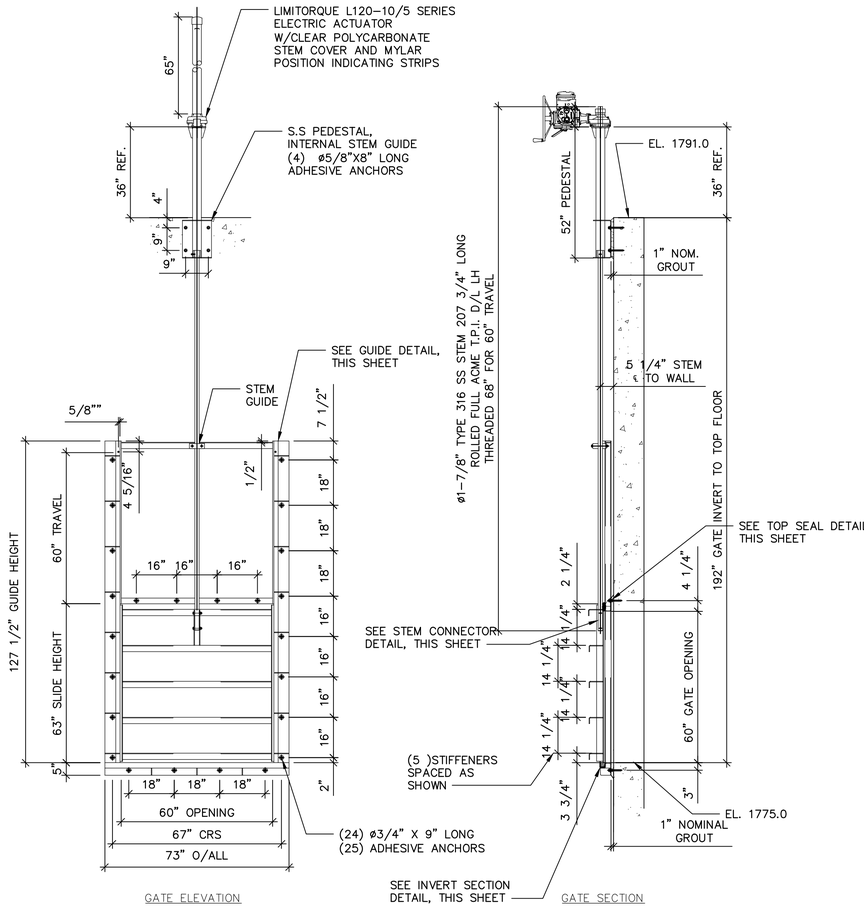
CIVIL

OLD FORGE DAM
SLUICE GATE DETAILS

SCALE: AS NOTED

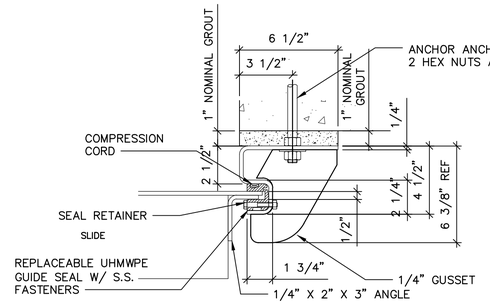
C-16
SHEET 16 OF 18

User:LANZAROTTA Spec:AUS-NCSMOD File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.2 – SIXTH LAKE DAM CADD\03-SHEETS\CIVIL\6L-C-16.DWG
Scale:1:1 SaveDate:6/17/2025 Time:09:25 Plot Date: Layout:Ltr Effec 6/17/2025 10:39 Layout:C-16

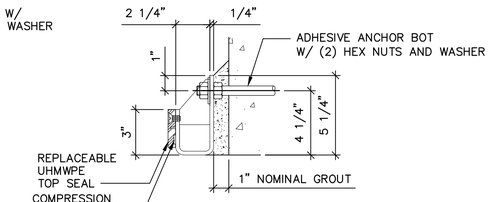


GATE ELEVATION GATE SECTION

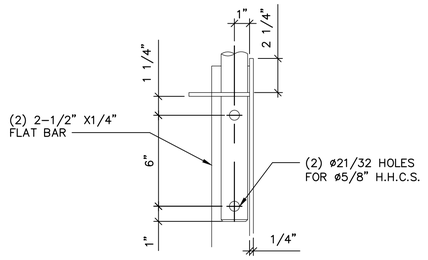
5 FT BY 5 FT SLUICE GATE



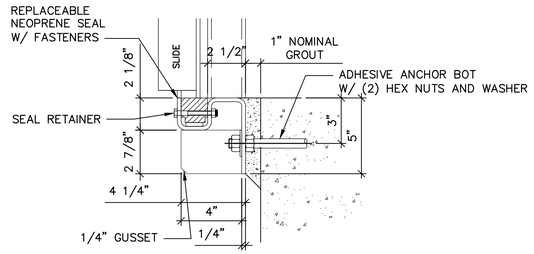
GUIDE SECTION DETAIL



TOP SEAL SECTION DETAIL



STEM CONNECTOR SECTION DETAIL



INVERT SECTION DETAIL

NOTES:
1. GATE SHALL BE A SERIES 935 SLUICE GATE BY WHIPPS INC OR APPROVED EQUAL.
2. ALLOWABLE LEAKAGE RATE: 0.1 GPM/FT OF SEAL.
3. GATE SHALL BE CAPABLE OF SEATING AND UNSEATING UNDER 16 FT OF HEAD.
4. HORIZONTAL STIFFENERS: 5"X2-1/2"X1/4"ANGLE.
5. VERTICAL STIFFENERS: 2"X3"X1/4"ANGLE.
6. STEM GUIDE SUPPORT: 2"X2-1/2"X1/4"ANGLE.

ARCADIS
LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-C-17
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

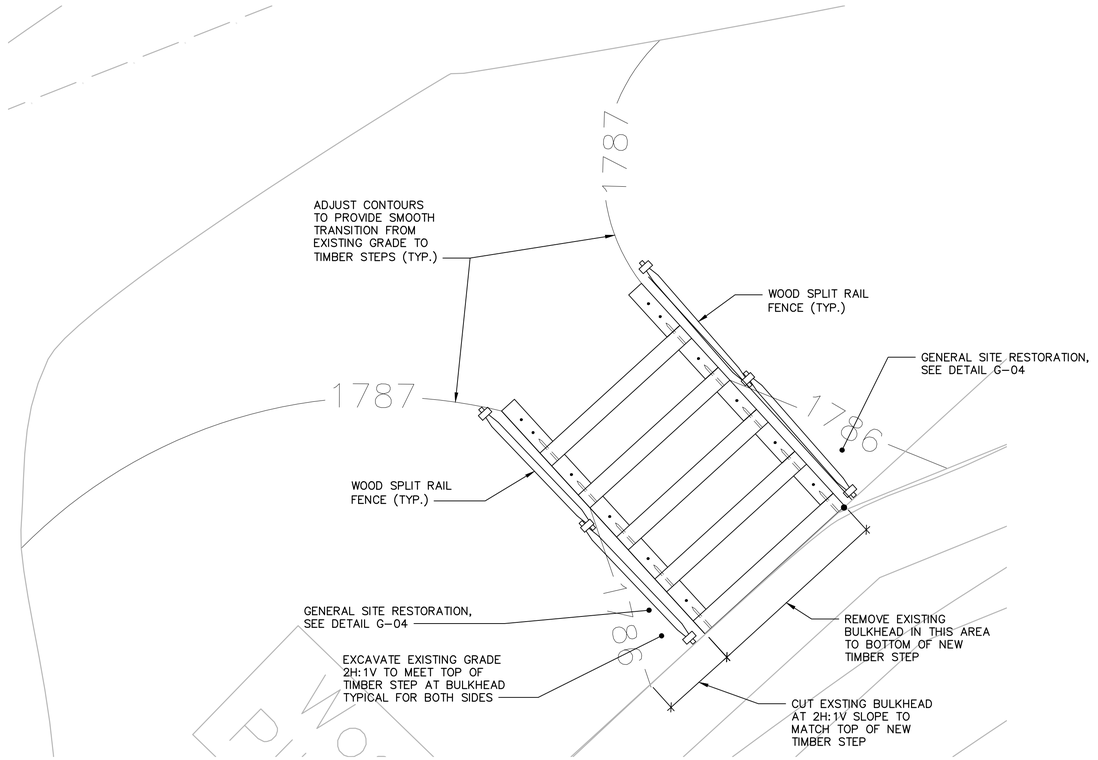
CIVIL

SIXTH LAKE DAM SLUICE GATE DETAILS

SCALE: AS NOTED

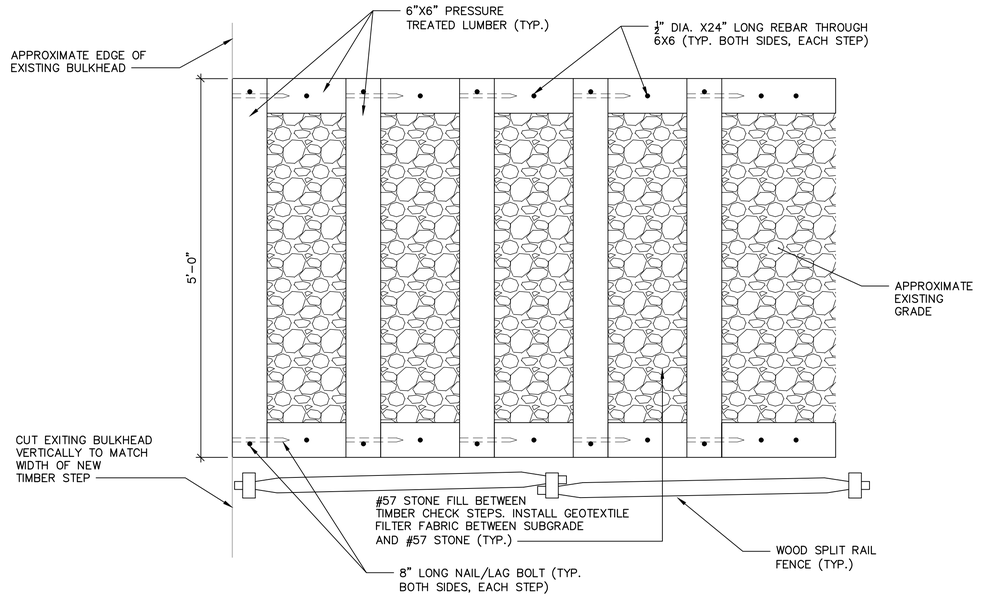
C-17
SHEET 17 OF 18

User:LANZAROTTA, Sheet:ALL Files:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\CIVIL\6L-C-17.DWG
Saved:11 Saved Date:6/17/2025 Time:16:18 Plot Date:Lanzarotta, Eric 6/17/2025 10:39 | Layout:C-17



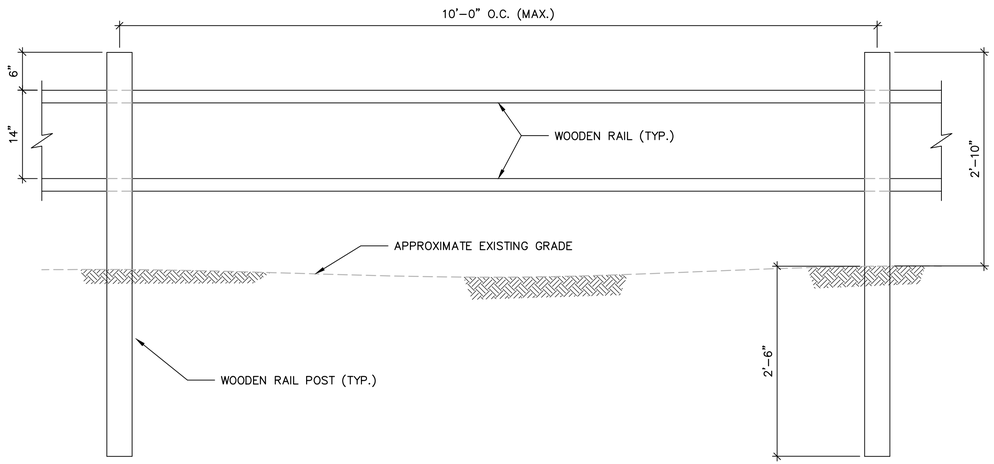
ENLARGED PLAN
WATER ACCESS

SCALE: 1" =2'



TIMBER CHECK STEP CONSTRUCTION PLAN

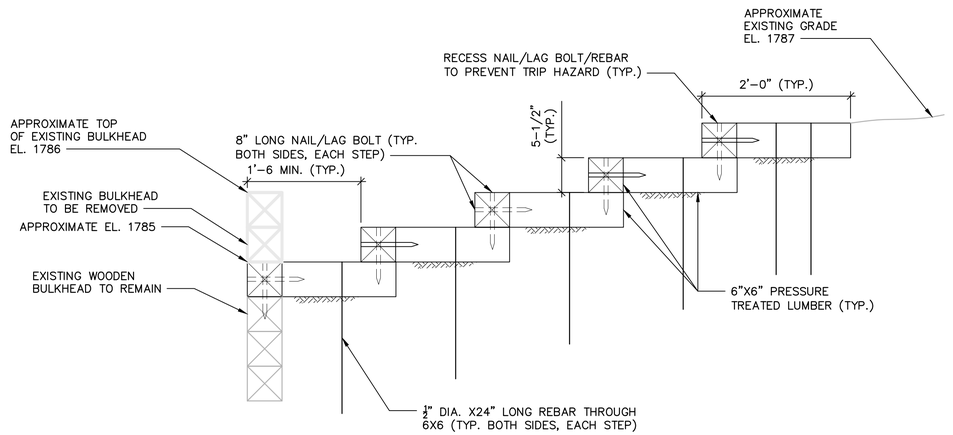
1" = 1'



TYPICAL WOOD SPLIT RAIL FENCE ELEVATION

SCALE: 1" =1'

NOTES:
1. POSTS SHALL BE SET TO TRUE LINE AT GRADE.
2. CORNER OR END POSTS SHALL BE SET IN 12" DIA. CONCRETE, EXTENDED 24" MIN. INTO UNDISTURBED GROUND OR COMPACTED GENERAL FILL



TIMBER CHECK STEP CONSTRUCTION ELEVATION

1" = 1'

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK · MICHAEL F. KOSIER · LICENSED PROFESSIONAL ENGINEER · No. 077878

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-C-18
DESIGNED BY: EJL
DRAWN BY: EJL
CHECKED BY: TM

SHEET TITLE

CIVIL

SIXTH LAKE DAM WATER ACCESS

SCALE: AS NOTED

C-18

SHEET 18 OF 18

User:LANZAROTTA, Spec: AUS-NCSMOD, File:C:\USERS\LANZAROTTA\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\CIVIL\6L-C-18.DWG
Style:1) Saved:Date: 5/19/2025 Time: 13:27 Plot Date: Lanzarotta, Eric: 6/17/2025 10:49 , Layout:C-18

GENERAL NOTES:

1. THESE NOTES ARE GENERAL AND SUPPLEMENTAL TO THE SPECIFICATIONS AND APPLY TO THE ENTIRE PROJECT UNLESS MODIFIED OR NOTED OTHERWISE IN THE CONTRACT DOCUMENTS.
2. SECTIONS/DETAILS APPLY TO SIMILAR LOCATIONS AND CONDITIONS UNLESS OTHERWISE INDICATED.
3. TYPICAL SECTIONS/DETAILS AS SHOWN ON STRUCTURAL TYPICAL DRAWINGS SHALL BE USED WHEN REFERRED TO, OR WHEN OTHER SECTIONS/DETAILS ARE NOT SHOWN ON THE DRAWINGS OR WHEN OTHER SECTIONS/DETAILS ARE NOT AVAILABLE.
4. DESIGN IS IN ACCORDANCE WITH AND CONSTRUCTION SHALL COMPLY WITH THE PROVISIONS OF THE 2020 NEW YORK STATE BUILDING CODE.
5. EQUIPMENT ANCHOR BOLT SIZES, TYPES, AND PATTERNS SHALL BE AS REQUIRED BY THE APPROVED EQUIPMENT MANUFACTURER. ALL BOLT PATTERNS SHALL BE TEMPLATED TO ENSURE ACCURACY OF PLACEMENT.
6. STRUCTURAL DRAWINGS SHALL BE USED IN COORDINATION WITH DRAWINGS OF ALL OTHER DISCIPLINES AND MANUFACTURER'S SHOP DRAWINGS.
7. IF A CONFLICT IS FOUND BETWEEN DIFFERENT PORTIONS OF THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL NOTIFY THE DISTRICT IMMEDIATELY. CONTINUED CONSTRUCTION OF THE AREA IN CONFLICT SHALL BE AT THE CONTRACTOR'S OWN RISK UNTIL THE CONFLICT IS RESOLVED BY THE DISTRICT.
8. STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL LOADS ON THE COMPLETED STRUCTURE. DURING CONSTRUCTION, THE STRUCTURES SHALL BE PROTECTED BY BRACING AND TEMPORARY SUPPORTS WHEREVER EXCESSIVE CONSTRUCTION LOADS MAY OCCUR. OVERSTRESSING OF ANY STRUCTURAL ELEMENT IS PROHIBITED.
9. WHERE SPACE PERMITS, CONTRACTOR SHALL PROVIDE 1.5:1 LAYBACK DISTANCE FOR EXCAVATION AT STRUCTURES. IN OTHER CASES, EXCAVATION PROTECTION SHALL BE PROVIDED AS SPECIFIED.
10. BACKFILL SHALL NOT BE PLACED AGAINST ANY WALL UNLESS ALL SUPPORTING ELEMENTS OF THE STRUCTURE HAVE BEEN CONSTRUCTED AND HAVE REACHED THE SPECIFIED MINIMUM CONCRETE STRENGTH.
11. CONTRACTOR'S CONSTRUCTION AND/OR ERECTION SEQUENCES SHALL RECOGNIZE AND CONSIDER THE EFFECTS OF THERMAL MOVEMENTS OF STRUCTURAL ELEMENTS DURING THE CONSTRUCTION PERIOD.
12. FOR SIZES AND LOCATIONS OF EQUIPMENT SUPPORTS AND PIPE OPENINGS, SEE OTHER DISCIPLINE DRAWINGS. OPENINGS SIZES LESS THAN 12" ARE NOT SHOWN ON STRUCTURAL DRAWINGS, REFERENCE OTHER DISCIPLINE DRAWINGS FOR LOCATIONS.
13. OPENINGS AND PENETRATIONS: THE CONTRACTOR SHALL SUBMIT COMPOSITE DRAWINGS INDICATING ALL FLOOR OPENINGS AND PENETRATIONS THROUGH STRUCTURAL MEMBERS REQUIRED TO ACCOMMODATE THE HVAC, PLUMBING AND ELECTRICAL WORK. THE CONTRACTOR SHALL FOLLOW THE TYPICAL FRAMING DETAILS AT OPENINGS AND REINFORCEMENT DETAILS AT PENETRATIONS THROUGH STRUCTURAL MEMBERS. ACCORDINGLY, THE CONTRACTOR SHALL SUBMIT SHOP DETAILS TO THE ENGINEER FOR REVIEW.

FOUNDATION NOTES:

1. THE FOUNDATION DESIGNS ARE BASED ON FOUNDATION BEARING ON ROCK WITH BEARING CAPACITY OF 12000 PSI, FOR RESULTS OF SUBSURFACE INVESTIGATION SEE GEOTECHNICAL REPORT BY ARCADIS DATED SEPTEMBER 2021. BEARING STRATUM FOR FOOTINGS SHALL BE VERIFIED IN FIELD BY THE GEOTECHNICAL ENGINEER BEFORE PLACING CONCRETE FOUNDATIONS.
2. THE CONTRACTOR SHALL REVIEW THE GEOTECHNICAL REPORT AND BORING LOGS DURING THE BIDDING PHASE OF THE PROJECT.
3. THE CONTRACTOR SHALL PROVIDE SATISFACTORY SUPPORT OF EXCAVATION (SOE) AND A TEMPORARY EXCAVATION PROTECTION SYSTEMS (EPS), TO PROTECT AND PREVENT ANY VERTICAL AND HORIZONTAL MOVEMENT OF EXISTING PAVEMENTS, STRUCTURES AND UNDERGROUND UTILITIES AS WELL AS TO PROVIDE WORKER SAFETY PER OSHA AND NYCRR REGULATIONS AND THE LAW. ALL SOE AND TEMPORARY EPS SHALL BE DESIGNED BY A NYS LICENSED ENGINEER (HIRED AND PAID FOR BY THE CONTRACTOR), WHO HAS AT LEAST 5 YEARS OF EXPERIENCE IN DESIGN AND INSTALLATION OF SUCH SYSTEMS.
4. THE CONTRACTOR SHALL INCLUDE THE PROVISIONS FOR MONITORING THE MOVEMENT OF ANY NEARBY EXISTING STRUCTURES DURING INSTALLATION, IN-SERVICE, AND AFTER EXTRACTION/REMOVAL OF THE SOE, WHERE APPLICABLE. SUCH MONITORING PROVISIONS SHALL INCLUDE MAXIMUM LIMITS FOR MOVEMENT, LOCATION, TYPE AND DETAILS OF THE GEOTECHNICAL INSTRUMENTS/MONITOR POINTS, AND SHALL ADDRESS MAXIMUM FUGITIVE VIBRATION LIMITS SO THAT EXISTING OR NEW CONSTRUCTION IS NOT DAMAGED. A DETAILED MONITORING PLAN SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.
5. ALL EXCAVATIONS SHALL BE MADE AND MAINTAINED IN-THE-DRY UNTIL SATISFACTORILY BACKFILLED. THE CONTRACTOR SHALL INSTALL TEMPORARY DEWATERING SYSTEMS PRIOR TO COMMENCING FOUNDATION AND UTILITY EXCAVATIONS. THE GROUNDWATER LEVEL SHOULD BE LOWERED TO AT LEAST 2 FEET BELOW BOTTOM OF PROPOSED EXCAVATION, PRIOR TO MAKING THE EXCAVATION. ALL TEMPORARY DEWATERING SYSTEMS SHALL BE DESIGNED BY A NYS LICENSED ENGINEER (HIRED AND PAID FOR BY THE CONTRACTOR), WHO HAS AT LEAST 5 YEARS OF EXPERIENCE IN DESIGN AND INSTALLATION OF SUCH SYSTEMS AND SUBMITTED FOR REVIEW PRIOR TO INSTALLATION.
6. SIGNIFICANT CONSTRUCTION DEWATERING WILL BE REQUIRED FOR THIS PROJECT. DEWATERING ADJACENT TO EXISTING STRUCTURES SHALL BE CAREFULLY DESIGNED AND IMPLEMENTED TO PROTECT EXISTING STRUCTURES FROM SUBSIDENCE.
7. DO NOT PLACE FOUNDATIONS IN WATER OR ON FROZEN GROUND. DO NOT ALLOW GROUND BENEATH FOUNDATIONS TO FREEZE.
8. EXTENT OF EXCAVATION AND AMOUNT OF SUBGRADE MODIFICATION AND PREPARATION WILL VARY AT EACH STRUCTURE. REFERENCE DRAWINGS AND GEOTECHNICAL REPORTS FOR SPECIFIC REQUIREMENTS. BEAR ALL FOUNDATIONS ON APPROVED SUBGRADE, MODIFIED SUBBASE COURSE, BUILDING PAD OR WORKING PAD AS DEFINED IN THE GEOTECHNICAL REPORT.
9. WHERE INDICATED, WORKING PADS SHALL CONSIST OF AN 18" MINIMUM LAYER OF NYSDOT SIZE DESIGNATION NO. 2 OR 3 CRUSHED STONE PLACED OVER A WOVEN GEOTEXTILE STABILIZATION FABRIC, SUCH AS MIRAFI ®500X, OR APPROVED EQUAL. WORKING PAD SHALL EXTEND A MINIMUM OF 3 FEET BEYOND THE PERIMETER OF THE FOUNDATION IN ALL DIRECTIONS. THE EXPOSED GRADES SHALL BE VISUALLY EXAMINED AND APPROVED BY THE INSPECTING PROFESSIONAL GEOTECHNICAL ENGINEER (IPGE), PRIOR TO WORKING PAD INSTALLATION. CRUSHED STONE SHALL BE COMPACTED WITH A MINIMUM OF 3 OVERLAPPING PASSES OF A VIBRATORY PLATE TYPE COMPACTOR OR UNTIL WELL CHINKED-UP AND STABLE, AS APPROVED BY THE IPGE. SOIL BEARING SURFACES, PREVIOUSLY ACCEPTED BY THE IPGE WHICH ARE ALLOWED TO BECOME SATURATED, FROZEN OR DISTURBED SHALL BE REWORKED TO SATISFACTION OF OF THE IPGE.
10. STRUCTURAL FILL MATERIAL CONSISTING OF SELECT GRANULAR FILL SHALL BE USED FOR ALL FILL AND BACKFILL AREAS.
11. SELECT GRANULAR FILL MATERIAL SHALL BE WELL-GRADED GRAVEL AND SAND, APPROVED RECYCLED PRODUCT OR CRUSHED ROCK PRODUCT WHICH IS CAPABLE OF BEING COMPACTED TO THE REQUIRED DENSITY AT THE PROPER MOISTURE CONTENT AND WHICH IS FREE OF DELETERIOUS MATERIALS, TRASH, ROOTS, DEBRIS, FROZEN MATERIAL AND ORGANIC OR OTHER FOREIGN MATTER:

SELECT GRANULAR FILL RECOMMENDED GRADATION

SIEVE SIZE	% PASSING
2"	100
1/4"	25 TO 65
NO. 40	5 TO 40
NO. 200	0 TO 10

SELECT GRANULAR FILL SHALL BE ACCEPTED BASED ON GRADATION, SOUNDNESS, PLASTICITY INDEX AND A WELL-DEFINED MOISTURE-DENSITY RELATIONSHIP CURVE. SELECT GRANULAR FILL TO BE PLACED WITHIN 2'-0" OF FINAL EXTERIOR GRADE SHALL BE SUBJECTED TO SOUNDNESS REQUIREMENTS. SOUNDNESS SHALL BE LESS THAN 30% LOSS BASED ON A FOUR-CYCLE MAGNESIUM SULFATE SOUNDNESS TEST. PLASTICITY INDEX OF THAT PORTION OF FILL MATERIAL PASSING THE NO. 40 MESH SIEVE SHALL NOT EXCEED 5.0

12. SOIL BENEATH THE STRUCTURE SHALL FOLLOW DETAILS SHOWN ON DRAWINGS AND PER SPECIFICATION SECTION 31 23 05.
13. REFER TO THE GEOTECHNICAL REPORT AND PROJECT SPECIFICATIONS FOR ADDITIONAL SOIL PREPARATION NOTES.

CONCRETE NOTES:

1. CONCRETE 28-DAY COMPRESSIVE STRENGTH:
   CLASS A – 5000 PSI : ALL CONCRETE UON
   CLASS B – 3000 PSI : CONCRETE FILL WITHIN STRUCTURES, DUCT BANKS, UNREINFORCED ENCASEMENTS AND THRUST BLOCKS. CLASS D – 2000 PSI – LEAN: UNREINFORCED THRUST BLOCKS, UNREINFORCED ENCASEMENT AND MISCELLANEOUS NONSTRUCTURAL.
2. REINFORCEMENT: ASTM A767 HDG, GRADE 60.
3. CONCRETE COVER FOR REINFORCING:
   A. SURFACES CAST AGAINST SUBGRADE: 3"
   B. TOP SURFACES OF SLABS WHERE PVC WATERSTOP IS REQUIRED IN WALLS: 3"
   C. FORMED SURFACES IN CONTACT WITH WEATHER, SOIL, OR LIQUID: 2"
   D. BOTTOM SURFACES OF SLABS OVER LIQUID: 2"
   E. SURFACES NOT IN CONTACT WITH WEATHER, SOIL, OR LIQUID: 1 1/2"
4. ROUGHEN SURFACES OF HORIZONTAL JOINTS AT INTERFACE OF CONSTRUCTION JOINT TO 1/4" MINIMUM AMPLITUDE, WHERE SHOWN ON DRAWINGS AND AT LOCATIONS WHERE NO KEYWAYS ARE DETAILED.
5. CONSTRUCTION JOINTS SHALL BE LOCATED AS SHOWN ON THE DRAWINGS. WHERE NOT SHOWN, CONSTRUCTION JOINTS SHALL BE LOCATED AS REQUIRED BY THE SPECIFICATIONS. CONSTRUCTION JOINT TYPES AND LOCATIONS SHALL BE AS APPROVED BY THE ENGINEER.
6. WHERE HORIZONTAL CONSTRUCTION JOINTS, LOCATED ABOVE THE FOUNDATION SLAB, EXTEND BEYOND WHERE NEEDED, TERMINATE AT A VERTICAL CONSTRUCTION JOINT AS APPROVED BY THE ENGINEER.
7. UON, PROVIDE WATERSTOPS IN ALL FOUNDATIONS, TANKS AND OTHER SUBSTRUCTURES UP TO AN ELEVATION AT LEAST 12 INCHES ABOVE GRADE OR TO AN ELEVATION AT LEAST 12 INCHES ABOVE MAXIMUM OPERATING LIQUID LEVEL WHICHEVER IS HIGHER, REGARDLESS IF LEVEL IS SHOWN.
8. EQUIPMENT SUPPORTS, ANCHORAGES, OPENINGS, RECESSES AND REVEALS NOT SHOWN ON THE STRUCTURAL DRAWINGS BUT REQUIRED BY OTHER CONTRACT DOCUMENTS, SHALL BE PROVIDED FOR PRIOR TO PLACING CONCRETE.
9. WHERE DRILLED ADHESIVE DOWELS ARE PLACED INTO HARDENED CONCRETE, ADJUST THE DOWEL LOCATIONS AS NEEDED TO AVOID DRILLING THROUGH ANY REINFORCING BARS. IF THE DOWEL LOCATION NEEDS TO BE MODIFIED, CONTACT THE ENGINEER BEFORE PROCEEDING.
10. DOWELS, ANCHOR BOLTS, PIPES, AND OTHER EMBEDDED ITEMS SHALL BE HELD SECURELY IN POSITION WHILE CONCRETE IS BEING PLACED.
11. CONDUITS AND PIPES EMBEDDED IN OR PENETRATING THROUGH CONCRETE SHALL BE SPACED ON CENTER NOT LESS THAN 3 TIMES THEIR OUTSIDE DIMENSION, BUT NOT LESS THAN 2 1/2 INCHES CLEAR. OUTSIDE DIMENSION OF EMBEDDED ITEMS SHALL NOT EXCEED 1/3 OF THE CONCRETE MEMBER THICKNESS. CLEAR SPACING REQUIREMENTS SHALL APPLY FOR EMBEDDED CONDUITS OR PIPES CROSSING AT AN ANGLE LESS THAN 60 DEGREES.
12. THE EFFECTIVE DIMENSION USED TO MEET MEMBER THICKNESS LIMITATIONS SHALL BE THE SUM OF THE OUTER DIMENSIONS OF CROSSING ELEMENTS.
13. EMBEDDED CONDUITS AND PIPES SHALL BE LOCATED BETWEEN THE LAYERS OF REINFORCEMENT AND A MINIMUM OF 2 1/2 INCHES CLEAR FROM APPROXIMATELY PARALLEL REINFORCING BARS. REQUIREMENTS FOR EMBEDDED ELEMENTS CROSSING REINFORCING BARS SHALL BE AS REQUIRED FOR CROSSING EMBEDDED ELEMENTS.
14. CONDUITS AND PIPES SHALL NOT BE EMBEDDED IN OR PASS THROUGH COLUMNS AND BEAMS UNLESS INDICATED OTHERWISE OR AUTHORIZED BY DISTRICT.
15. REINFORCING BARS AND ACCESSORIES SHALL NOT BE IN CONTACT WITH ANY METAL PIPE, PIPE FLANGE, METAL CONDUIT OR OTHER METAL PARTS EMBEDDED IN CONCRETE. A MINIMUM CLEARANCE OF 2 INCHES SHALL BE PROVIDED.
16. CONTRACTOR SHALL PROVIDE 3/4 INCH CHAMFER USING WOOD CHAMFER STRIPS ON ALL EXPOSED CORNERS OF COLUMNS, BEAMS, EQUIPMENT PADS AND WALLS OR AS REQUIRED TO MATCH EXISTING.
17. LAP SPLICES SHALL BE IN ACCORDANCE WITH THE TABLE SHOWN IN THE STRUCTURAL TYPICAL DETAILS.
18. PROVIDE ADDITIONAL REINFORCEMENT AT OPENINGS AND WALL INTERSECTIONS AS SHOWN ON TYPICAL DETAILS (UON).

User:SANGALANG, Spec:AIS-NCSMOD, Filter:C:\USERS\WKELLY\ARCADIS\OLD FORCE DAM & SIXTH LAKE DAM - 6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\STRUCTURAL\OF-S-01.DWG
Scale:1:1 Saved:Date 6/17/2025 Time 13:17 Plot Date: Peter J Meighan, 6/17/2025, 12:50 Layout:S-01

ARCADIS
LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER
BLACK RIVER
REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-S-01
DESIGNED BY: A. OCCIL
DRAWN BY: Z. SANGALANG
CHECKED BY: M. VERMA

SHEET TITLE

STRUCTURAL

GENERAL NOTES

SCALE: NO SCALE

S-01

SHEET 1 OF 12

WOOD FRAMING NOTES:

1. WALL SHEATHING SHALL BE APA RATED 24/16 W/ MIN. THICKNESS. 7/16". PLYWOOD SHALL BE EXTERIOR GRADE. NAILING SHALL BE 8d NAILS 6" O.C. AT EDGES AND 12" O.C. AT INTERIOR SUPPORTS.

2. ROOF SHEATHING SHALL BE APA RATED 32/16. W/ MIN. THICKNESS OF 3/4". PLYWOOD SHALL BE EXTERIOR GRADE. PANEL CLIPS SHALL BE PROVIDED AT ALL NON-SUPPORTED EDGES. NAILING SHALL BE 8d NAILS 6" O.C AT EDGES AND 12" O.C. AT INTERIOR SUPPORTS. PROVIDE RECOMMENDED GAP AT ALL PANEL JOINTS.

3. ROOF TRUSSES SHALL BE DESIGNED FOR LOADS AS INDICATED. LIVE LOAD DEFLECTION SHALL NOT EXCEED L/240 OF THE SPAN. ROOF TRUSSES SHALL BE MANUFACTURED BY SUPPLIERS MEETING THE STANDARDS OF TRUSS PLATE INSTITUTE (TPI). TRUSS DESIGN SHALL ACCOUNT FOR COMPONENT AND CLADDING WIND LOADING AS CALCULATED BY THE TRUSS DESIGN ENGINEER. SUBMITTED SHOP DRAWINGS SHALL BE STAMPED AND SIGNED BY A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER. PROVIDE TRUSS CONNECTORS AS RECOMMENDED BY THE TRUSS DESIGN ENGINEER.

4. TRUSS BOTTOM CHORD DOES NOT RECEIVE CONTINUOUS SHEATHING. PERMANENT BOTTOM CHORD TRUSS BRACING SHALL BE PROVIDED IN THE PLANE OF THE TRUSS BOTTOM CHORD. BRACING SHALL BE CONSTRUCTION GRADE 2X4 UNLESS NOTED OTHERWISE. PERMANENT WEB TRUSS BRACING SHALL BE PROVIDED IN THE PLANE OF THE TRUSS WEB MEMBERS AND SHALL CONSIST OF DIAGONAL BRACING. BRACING SHALL BE CONSTRUCTION GRADE 2X4'S PLACED AT NEAR 45 DEGREE ANGLES.

5. ROOF TRUSSES, INCLUDING DESIGN, CONNECTIONS, BRACING, ERECTION, AND QUALITY SHALL CONFORM TO THE SPECIFICATIONS AND RECOMMENDATIONS OF NFPA AND THE TRUSS PLATE INSTITUTE (TPI). TEMPORARY AND PERMANENT BRACING SHALL BE IN STRICT ACCORDANCE WITH TPI BWT-76, BRACING WOOD TRUSSES. TRUSS MANUFACTURER'S REPRESENTATIVE SHALL BE ON SITE AS NECESSARY TO ENSURE THAT TRUSSES AND BRACING ARE INSTALLED PER MANUFACTURER'S SHOP DRAWINGS.

6. TRUSSES SHALL BE DESIGNED FOR ALL LOADS AS REQUIRED BY THE NEW YORK STATE BUILDING CODE, INCLUDING WIND, SNOW AND SEISMIC. DEAD LOADS SHALL BE COMPUTED FOR BUILDING MATERIALS AS INDICATED. ALL LOADS SHALL NOT BE LESS THAN THE FOLLOWING MINIMUM LOADS:
   A. TOP CHORD, ROOF LIVE LOAD: 20 PSF MINIMUM
   B. TOP CHORD, ROOF DEAD LOAD: 15 PSF
   C. BOTTOM CHORD, ROOF DEAD LOAD: 15 PSF
   D. BALANCED SNOW LOAD: 79.83 PSF
   E. UNBALANCED SNOW LOAD: 105.6 PSF

7. STRUCTURAL DIMENSIONAL LUMBER SHALL HAVE THE FOLLOWING MINIMUM DESIGN PROPERTIES:
   A. HEM FIR NO. 2 OR BETTER.
      1. 850 PSI – F_b (SINGLE USE)
      2. 405 PSI – F_c (PERP. TO GRAIN)
      3. 75 PSI – F_v
      4. 1,300,000 PSI – E

8. SEE ARCHITECTURAL DRAWINGS FOR GATEHOUSE ENCLOSURE FRAMING PLANS AND DETAILS,

9. TYPICAL TRUSS PITCH, OVERHANG AND FINISHED PROFILE SHALL BE AS INDICATED ON ARCHITECTURAL DRAWINGS.

POST INSTALLED ANCHOR NOTES:

1. POST INSTALLED ANCHORS HAVE BEEN DESIGNED WITH HILTI ANCHORS (NOTED BELOW) AS THE BASIS OF DESIGN. INSTALL ANCHORS PER THE MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS.
   A. EXPANSION ANCHORS: KWIK BOLT (3 OR TZ)
   B. SLEEVE ANCHORS: HLC SLEEVE
   C. ANCHOR ADHESIVE ANCHORS: HIT HY-200
   D. SCREEN TUBE ANCHORS: HIT HY-270

2. CONTRACTOR MAY PROVIDE EQUIVALENT ANCHORS WITH SIZE AND FINISH AS NOTED AND EQUIVALENT SHEAR AND TENSION CAPACITIES AFTER MODIFICATION DUE TO EMBEDMENT, SPACING AND EDGE DISTANCES AT THE DISCRETION OF THE DISTRICT'S REPRESENTATIVE.

3. ALL ADHESIVE ANCHORS FOR REINFORCING SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ACI 355.4 AND ICC-ES AC308 FOR CRACKED CONCRETE AND SEISMIC APPLICATIONS.

4. DESIGN ADHESIVE BOND STRENGTH FOR ADHESIVE ANCHORS IN CONCRETE HAS BEEN BASED ON ACI 355.4, TEMPERATURE CATEGORY B WITH INSTALLATIONS INTO DRY HOLES DRILLED USING A CARBIDE DRILL BIT INTO CRACKED CONCRETE THAT HAS CURED FOR AT LEAST 21 DAYS.

5. ADHESIVE ANCHORS REQUIRING CERTIFIED INSTALLATIONS SHALL BE INSTALLED BY A CERTIFIED ADHESIVE ANCHOR INSTALLER PER ACI 318 D.9.2.2. INSTALLATIONS REQUIRING CERTIFIED INSTALLERS SHALL BE INSPECTED PER ACI 318 D.9.2.4.

SPECIAL INSPECTION NOTES:

1. DISTRICT, OR ARCHITECT/STRUCTURAL ENGINEER OF RECORD ACTING AS THE DISTRICT'S AGENT, SHALL DIRECTLY EMPLOY AND PAY FOR SERVICES OF THE SPECIAL INSPECTORS TO PERFORM REQUIRED SPECIAL INSPECTIONS.

DESIGN LOADS:

THE FOLLOWING DESIGN LOADS WERE USED FOR DESIGN OF SPILLWAY AT OLD FORGE:

STRUCTURE RISK CATEGORY:	III
ROOF SNOW LOAD:	
GROUND SNOW LOAD:	P_g = 96 PSF
FLAT-ROOF SNOW LOAD:	P_f = 79.83 PSF
SNOW EXPOSURE FACTOR:	C_e = 0.8
SNOW LOAD IMPORTANCE FACTOR:	I_s = 1.1
THERMAL FACTOR:	C_t = 1.2
WIND DESIGN LOAD:	
BASIC DESIGN WIND SPEED:	V = 120 MPH
ALLOWABLE STRESS DESIGN WIND SPEED:	V_{ASD} = 93 MPH
RISK CATEGORY:	III
EARTHQUAKE DESIGN DATA:	
RISK CATEGORY:	III
SEISMIC IMPORTANCE FACTOR:	I_e = 1.25
MAPPED SPECTRAL RESPONSE ACCELERATIONS:	S_s = 0.3049
	S_1 = 0.0752
SITE CLASS:	C
DESIGN SPECTRAL RESPONSE ACCELERATIONS:	S_{DS} = 0.264
	S_{D1} = 0.075
SEISMIC DESIGN CATEGORY:	B
BASIC SEISMIC-FORCE-RESISTING SYSTEM(S):	ORDINARY REINFORCED CONCRETE SHEAR WALLS
SEISMIC RESPONSE COEFFICIENT(S):	C_s = 0.0826
RESPONSE MODIFICATION FACTOR:	R = 4.0
ANALYSIS PROCEDURE USED:	EQUIVALENT LATERAL FORCE METHOD

DESIGN LOADS:

THE FOLLOWING DESIGN LOADS WERE USED FOR DESIGN OF GATEHOUSE AT OLD FORGE:

1. DESIGN AND CONSTRUCTION SHALL CONFORM TO THE "2020 BUILDING CODE OF NEW YORK STATE".

STRUCTURE RISK CATEGORY:	I
ROOF LIVE LOAD:	20 PSF
ROOF SNOW LOAD:	
GROUND SNOW LOAD:	P_g = 96 PSF
FLAT-ROOF SNOW LOAD:	P_f = 79.83 PSF
SNOW EXPOSURE FACTOR:	C_e = 0.8
SNOW LOAD IMPORTANCE FACTOR:	I_s = 0.8
THERMAL FACTOR:	C_t = 1.2
WIND DESIGN LOAD:	
BASIC DESIGN WIND SPEED:	V = 120 MPH
ALLOWABLE STRESS DESIGN WIND SPEED:	V_{ASD} = 93 MPH
IMPORTANCE FACTOR:	I_W = 1.0
EXPOSURE:	D
INTERNAL PRESSURE COEFFICIENTS:	GC_{pi} = ±0.18
EARTHQUAKE DESIGN DATA:	
RISK CATEGORY:	I
SEISMIC IMPORTANCE FACTOR:	I_e = 1.0
MAPPED SPECTRAL RESPONSE ACCELERATIONS:	S_s = 0.3049
	S_1 = 0.0752
SITE CLASS:	C
DESIGN SPECTRAL RESPONSE ACCELERATIONS:	S_{DS} = 0.264
	S_{D1} = 0.075
SEISMIC DESIGN CATEGORY:	B
BASIC SEISMIC-FORCE-RESISTING SYSTEM(S):	LIGHT-FRAME WALLS WITH SHEAR PANELS OF OTHER MATERIALS
RESPONSE MODIFICATION FACTOR:	R = 2.0
ANALYSIS PROCEDURE USED:	EQUIVALENT LATERAL FORCE METHOD

DESIGN LOADS:

THE FOLLOWING DESIGN LOADS WERE USED FOR DESIGN OF SPILLWAY AT SIXTH LAKE:

STRUCTURE RISK CATEGORY:	III
ROOF SNOW LOAD:	
GROUND SNOW LOAD:	P_g = 96 PSF
FLAT-ROOF SNOW LOAD:	P_f = 79.83 PSF
SNOW EXPOSURE FACTOR:	C_e = 0.8
SNOW LOAD IMPORTANCE FACTOR:	I_s = 1.1
THERMAL FACTOR:	C_t = 1.2
WIND DESIGN LOAD:	
BASIC DESIGN WIND SPEED:	V = 120 MPH
ALLOWABLE STRESS DESIGN WIND SPEED:	V_{ASD} = 93 MPH
RISK CATEGORY:	III
EARTHQUAKE DESIGN DATA:	
RISK CATEGORY:	III
SEISMIC IMPORTANCE FACTOR:	I_e = 1.25
MAPPED SPECTRAL RESPONSE ACCELERATIONS:	S_s = 0.3672
	S_1 = 0.0821
SITE CLASS:	C
DESIGN SPECTRAL RESPONSE ACCELERATIONS:	S_{DS} = 0.318
	S_{D1} = 0.082
SEISMIC DESIGN CATEGORY:	B
BASIC SEISMIC-FORCE-RESISTING SYSTEM(S):	ORDINARY REINFORCED CONCRETE SHEAR WALLS
SEISMIC RESPONSE COEFFICIENT(S):	C_s = 0.0995
RESPONSE MODIFICATION FACTOR:	R = 4.0
ANALYSIS PROCEDURE USED:	EQUIVALENT LATERAL FORCE METHOD

DESIGN LOADS:

THE FOLLOWING DESIGN LOADS WERE USED FOR DESIGN OF GATEHOUSE AT SIXTH LAKE:

STRUCTURE RISK CATEGORY:	I
ROOF LIVE LOAD:	20 PSF
ROOF SNOW LOAD:	
GROUND SNOW LOAD:	P_g = 96 PSF
FLAT-ROOF SNOW LOAD:	P_f = 79.83 PSF
SNOW EXPOSURE FACTOR:	C_e = 0.8
SNOW LOAD IMPORTANCE FACTOR:	I_s = 0.8
THERMAL FACTOR:	C_t = 1.2
WIND DESIGN LOAD:	
BASIC DESIGN WIND SPEED:	V = 120 MPH
ALLOWABLE STRESS DESIGN WIND SPEED:	V_{ASD} = 93 MPH
IMPORTANCE FACTOR:	I_W = 1.0
EXPOSURE:	D
INTERNAL PRESSURE COEFFICIENTS:	GC_{pi} = ±0.18
EARTHQUAKE DESIGN DATA:	
RISK CATEGORY:	I
SEISMIC IMPORTANCE FACTOR:	I_e = 1.0
MAPPED SPECTRAL RESPONSE ACCELERATIONS:	S_s = 0.3672
	S_1 = 0.0821
SITE CLASS:	C
DESIGN SPECTRAL RESPONSE ACCELERATIONS:	S_{DS} = 0.318
	S_{D1} = 0.082
SEISMIC DESIGN CATEGORY:	B
BASIC SEISMIC-FORCE-RESISTING SYSTEM(S):	LIGHT-FRAME WALLS WITH SHEAR PANELS OF OTHER MATERIALS
RESPONSE MODIFICATION FACTOR:	R = 2.0
ANALYSIS PROCEDURE USED:	EQUIVALENT LATERAL FORCE METHOD

ABBREVIATIONS

@	AT
AB	ANCHOR BOLT
ADDL	ADDITIONAL
ADJ	ADJACENT
AFF	ABOVE FINISHED FLOOR
AHR	ANCHOR
ALT	ALTERNATE
ALUM	ALUMINUM
APPROX	APPROXIMATE
AR	ANCHOR ROD
ARCH	ARCHITECT
B/B	BACK TO BACK
BEV	BEVEL
BLDG	BUILDING
BLKG	BLOCKING
BO	BOTTOM OF
BOS	BOTTOM OF STEEL
BOT	BOTTOM
BP	BASE PLATE
BRDG	BRIDGING
BRG	BEARING
BSMT	BASEMENT
CANTL	CANTILEVER
CFMF	COLD FORMED METAL FRAMING
CHFR	CHAMFER
CJ	CONTRACTION/CONSTRUCTION JOINT
CJP	COMPLETE JOINT PENETRATION
CL	CENTER LINE
CLKJ	CAULKED JOINT
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
COL	COLUMN
CONC	CONCRETE
CONT	CONTINUOUS
COORD	COORDINATE
CSK	COUNTER SUNK
CU FT	CUBIC FEET
CU YD	CUBIC YARD
DBL	DOUBLE
DEMO	DEMOLITION
DET	DETAIL
DIA	DIAMETER
DIM	DIMENSION
DL	DEAD LOAD
DN	DOWN
DWG	DRAWING
DWLS	DOWELS
EA	EACH
EE	EACH END
EF	EACH FACE
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRICAL
EOD	EDGE OF DECK
EOS	EDGE OF SLAB
EQ	EQUAL
EQUIP	EQUIPMENT
EW	EACH WAY
EXP	EXPANSION
EXIST	EXISTING
EXT	EXTERIOR
FAB	FABRICATE
FBO	FURNISHED BY OTHERS
FD	FLOOR DRAIN
FDTN	FOUNDATION
FLR	FLOOR
FOM	FACE OF MASONRY
FRMG	FRAMING
FS	FOOTING STEP
FT	FOOT
FTG	FOOTING
FW	FIRE WALL
GA	GAGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GDR	GUARD RAIL
GR BM	GRADE BEAM
HNDRL	HANDRAIL
HORIZ	HORIZONTAL
HP	HIGH POINT
ID	INSIDE DIAMETER
IF	INSIDE FACE
IN	INCHES
INFO	INFORMATION
INSUL	INSULATION
INV	INVERT
ISO JT	ISOLATION JOINT
JBE	JOIST BEARING ELEVATION
K	KIPS
KB	KNEE BRACE
KO	KNOCKOUT
KPL	KICK PLATE
KSF	KIPS PER SQUARE FOOT
KWY	KEY WAY

ABBREVIATIONS

LD BRG	LOAD BEARING
LG	LONG
LL	LIVE LOAD
LLBB	LONG LEG BACK TO BACK
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LNTL	LINTEL
LONG	LONGITUDINAL
LP	LOW POINT
MAX	MAXIMUM
MECH	MECHANICAL
MEP	MECHANICAL, ELECTRICAL, PLUMBING
MFR	MANUFACTURER
MIN	MINIMUM
MO	MASONRY OPENING
MTL	METAL
NIC	NOT IN CONTRACT
NOM	NOMINAL
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OPNG	OPENING
OPP	OPPOSITE
PAF	POWDER ACTUATED FASTENER
PCC	PRECAST CONCRETE
PEMB	PRE ENGINEERED METAL BUILDING
PL	PLATE
PLAT	PLATFORM
PLF	POUNDS PER LINEAR FOOT
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PSF	POUNDS PER SQUARE FOOT
PT	PRESSURE TREATED
PUR	PURLINS
PVMT	PAVEMENT
QC	QUALITY CONTROL
R	RADIUS
RD	ROOF DRAIN
RDG INSUL	RIGID INSULATION
REF	REFERENCE
REINF	REINFORCING
REM	REMAINDER
REQD	REQUIRED
RET	RETAINING
RH	ROOF HATCH
RO	ROUGH OPENING
SCHED	SCHEDULE
SF	SQUARE FEET
SIM	SIMILAR
SOG	SLAB ON GROUND
SPA	SPACE(S)
SPEC	SPECIFICATION
SQ	SQUARE
SST	STAINLESS STEEL
STA	STATION
STD	STANDARD
STL	STEEL
T&B	TOP AND BOTTOM
TD	TRENCH DRAIN
TEMP	TEMPORARY
THK	THICKNESS
THRU	THROUGH
TO	TOP OF
TOC	TOP OF CONCRETE
TOS	TOP OF STEEL
TOSL	TOP OF SLAB
TYP	TYPICAL
UNEX	UNEXCAVATED
UON	UNLESS OTHERWISE NOTED
VERT	VERTICAL
VIF	VERIFY IN FIELD
VR	VAPOR RETARDER
W/	WITH
W/O	WITHOUT
WBL	WOOD BLOCKING
WF	WALL FOOTING
WP	WORKING POINT
WS	WATERSTOP
WWF	WELDED WIRE FABRIC
X BRACE	CROSS BRACE
XS	EXTRA STRONG
XXS	DOUBLE EXTRA STRONG

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-S-02
DESIGNED BY: A. OCCIL
DRAWN BY: Z. SANGALANG
CHECKED BY: M. VERMA

SHEET TITLE

STRUCTURAL

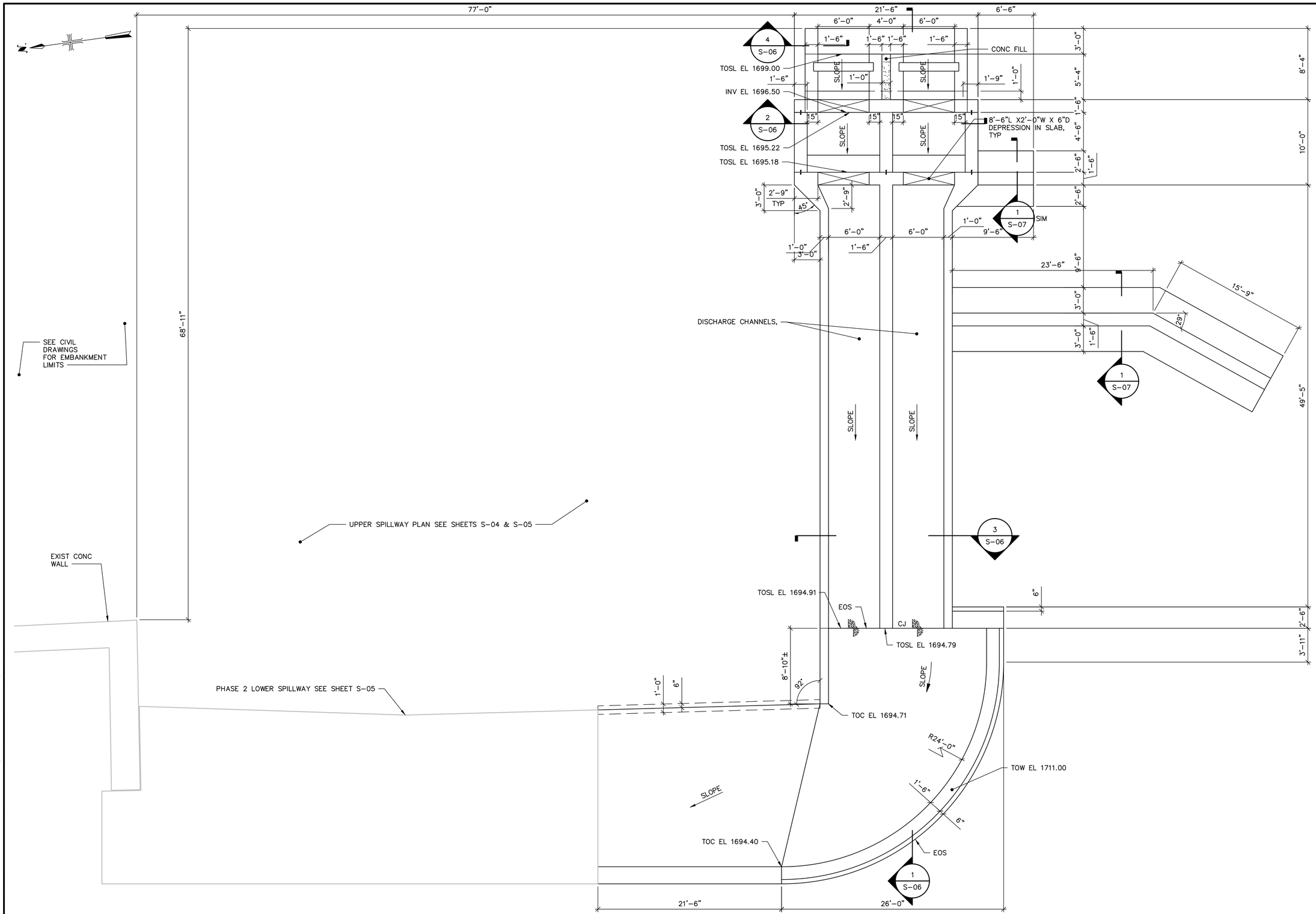
DESIGN CRITERIA AND ABBREVIATIONS

SCALE: NO SCALE

S-02

SHEET 2 OF 12

User:SANGALANG, Spec:AUS-NCSMOD, File:C:\USERS\WELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – 6.0 CADD\6.1 – OLD FORGE DAM CADD\03-SHEETS\STRUCTURAL\OF-S-02.DWG
Scale:1:1, SaveDate:6/17/2025 Time:13:21 Plot Date: Reiker, Meagan, 6/17/2025, 12:52 , Layout:S-02



LOWER SPILLWAY PARTIAL PLAN (PHASE 1)

SCALE: 3/16" = 1'-0"

0 4' 8' 12'

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK
CHRISTOPHER J.B. VERRY
075907
PROFESSIONAL ENGINEER
06-17-2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-S-03
DESIGNED BY: A. OCCIL
DRAWN BY: Z. SANGALANG
CHECKED BY: M. VERMA

SHEET TITLE

STRUCTURAL

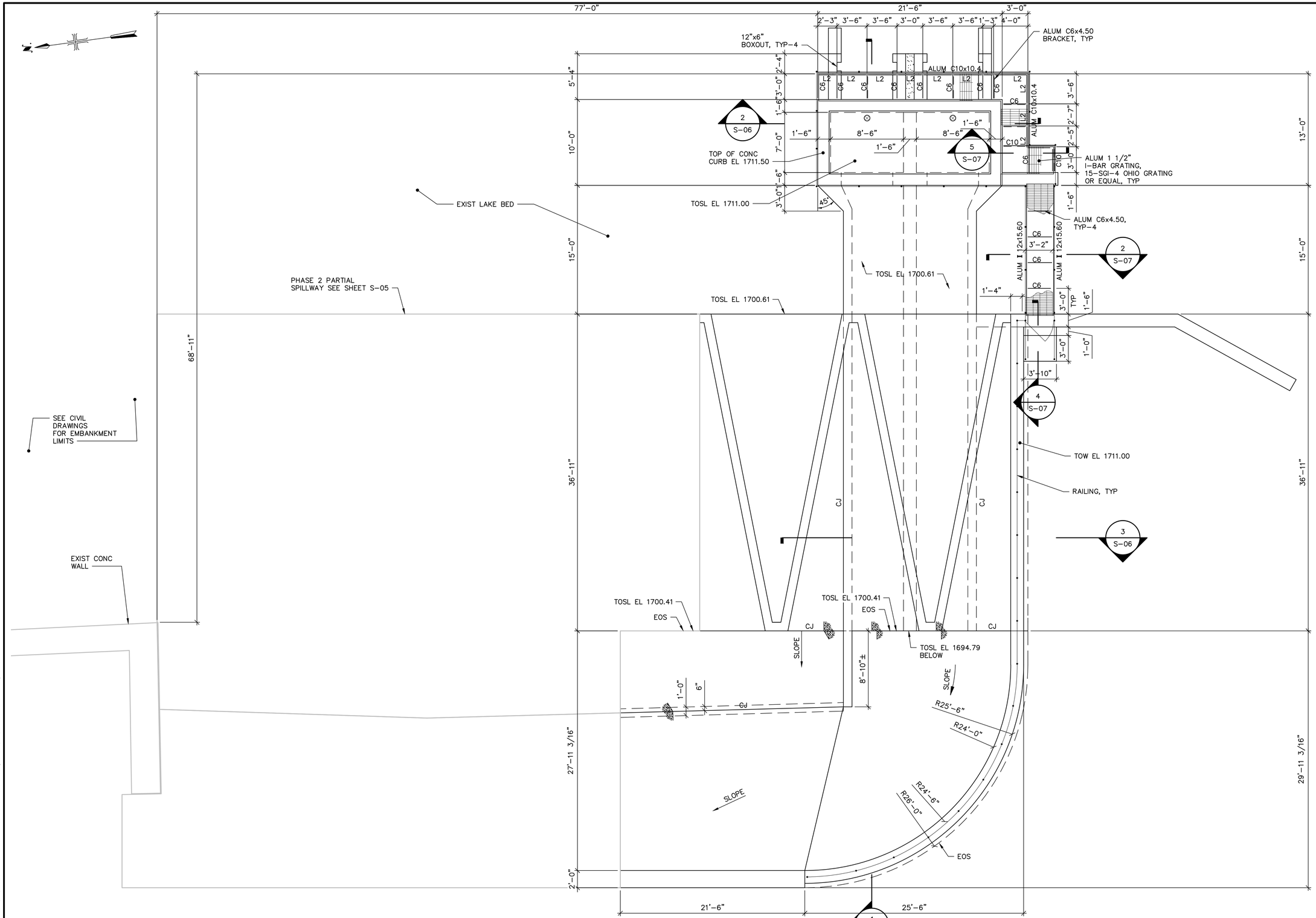
OLD FORGE DAM LOWER SPILLWAY PARTIAL PLAN (PHASE 1)

SCALE: AS SHOWN

S-03

SHEET 3 OF 12

User:MROLLER Spec: AUS-NCSMOD Filter: C:\USERS\MKELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – 6.0 CADD\6.1 – OLD FORGE DAM CADD\03-SHEETS\STRUCTURAL\OF-S-03.DWG
Scale:1:1 Saved:Date: 6/6/2025 Time:11:48 Plot Date: Roller, Meghan, 6/17/2025, 15:14:1 Layout:S-03



UPPER SPILLWAY PARTIAL PLAN (PHASE 1)

SCALE: 3/16" = 1'-0"

0 4' 8' 12'

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN any WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK
CHRISTOPHER J.B. VERRICO
075907
PROFESSIONAL ENGINEER
06-27-2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE:	JUNE 2025
PROJECT NO.:	30001381
FILE NAME:	OF-S-04
DESIGNED BY:	A. OCCIL
DRAWN BY:	Z. SANGALANG
CHECKED BY:	M. VERMA

SHEET TITLE

STRUCTURAL

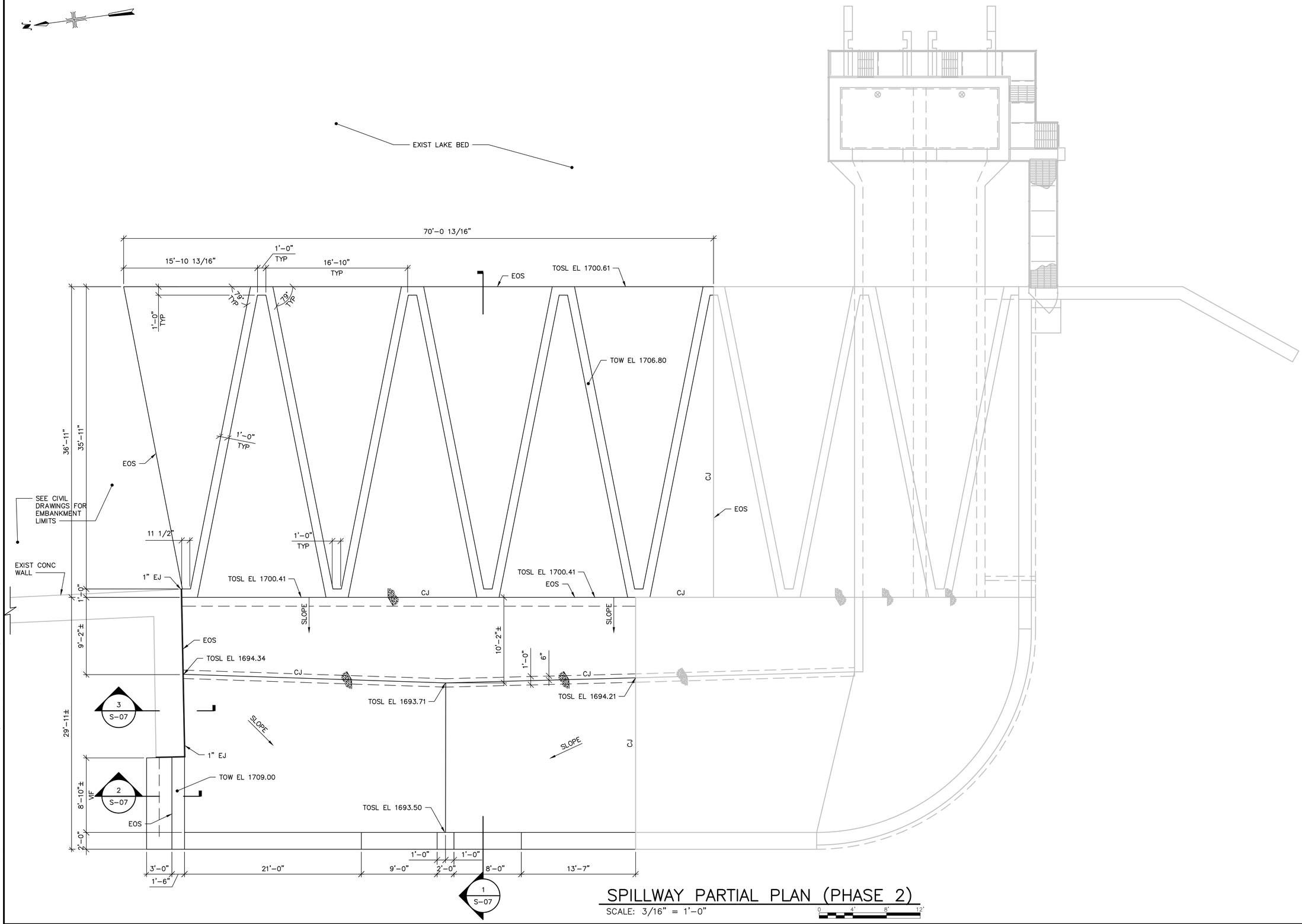
OLD FORGE DAM UPPER SPILLWAY PARTIAL PLAN (PHASE 1)

SCALE: AS SHOWN

S-04

SHEET 4 OF 12

User:SANGALANG Spec:AUS-NCSMOD File:C:\USERS\MKELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – 6.0 CADD\6.1 – OLD FORGE DAM CADD\03-SHEETS\STRUCTURAL\OF-S-04.DWG
Style:17 Saved:Date:6/17/2025 Time:13:20 Plot Date: Roller, Meagnon: 6/17/2025 12:54 | Layout:S-04



SPILLWAY PARTIAL PLAN (PHASE 2)

SCALE: 3/16" = 1'-0"

0 4' 8' 12'

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN any WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK
CHRISTOPHER J.B. VERRO
079001
PROFESSIONAL ENGINEER
06-17-2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-S-05
DESIGNED BY: A. OCCIL
DRAWN BY: Z. SANGALANG
CHECKED BY: M. VERMA

SHEET TITLE

STRUCTURAL

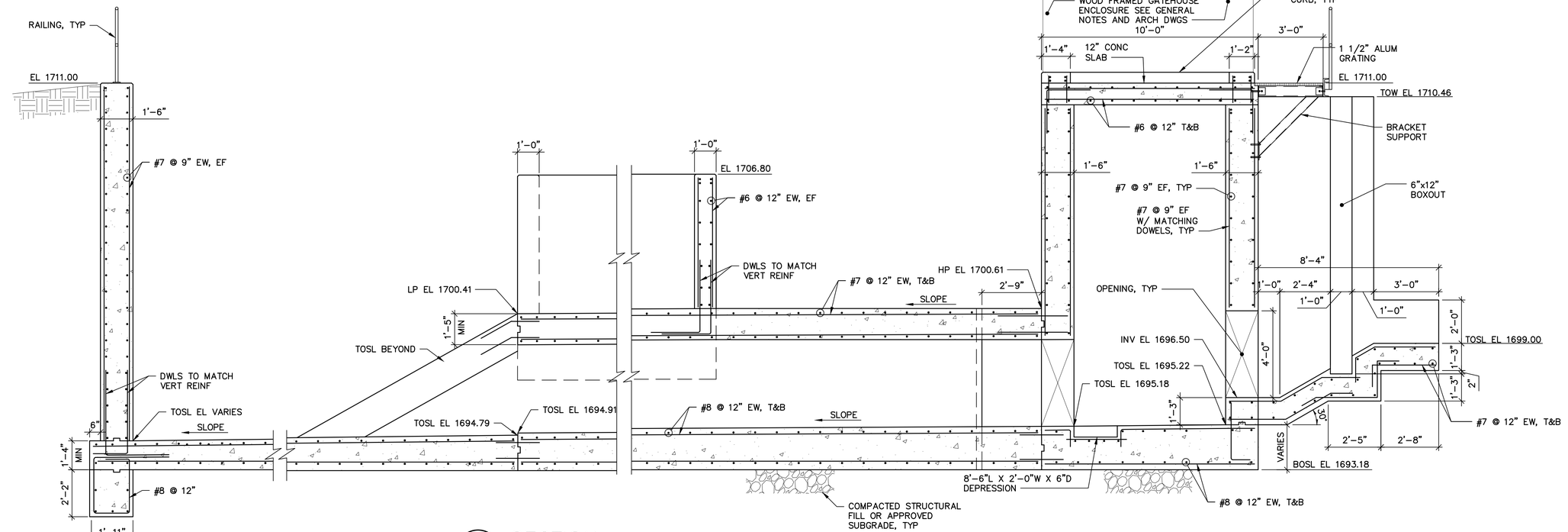
OLD FORGE DAM SPILLWAY PARTIAL PLAN (PHASE 2)

SCALE: AS SHOWN

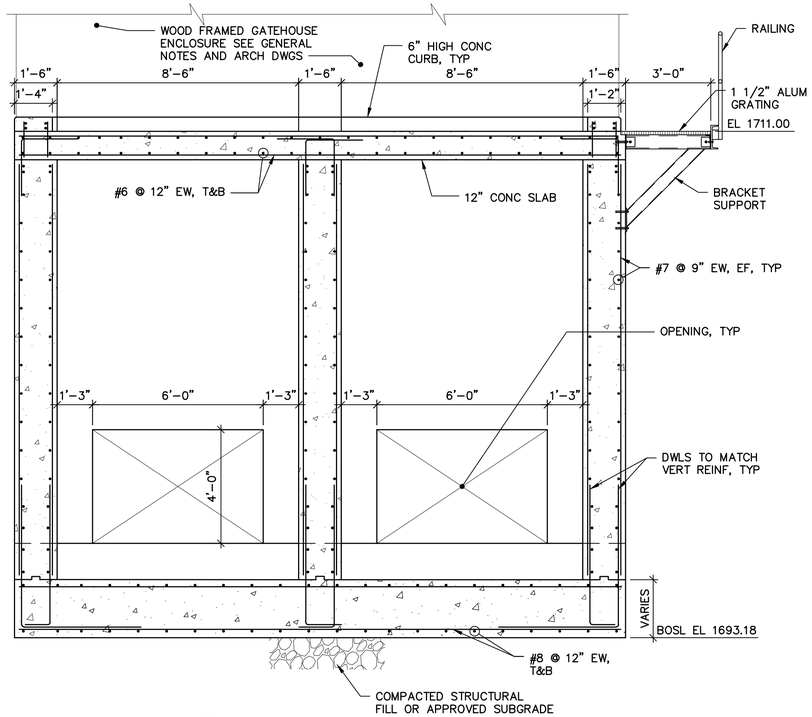
S-05

SHEET 5 OF 12

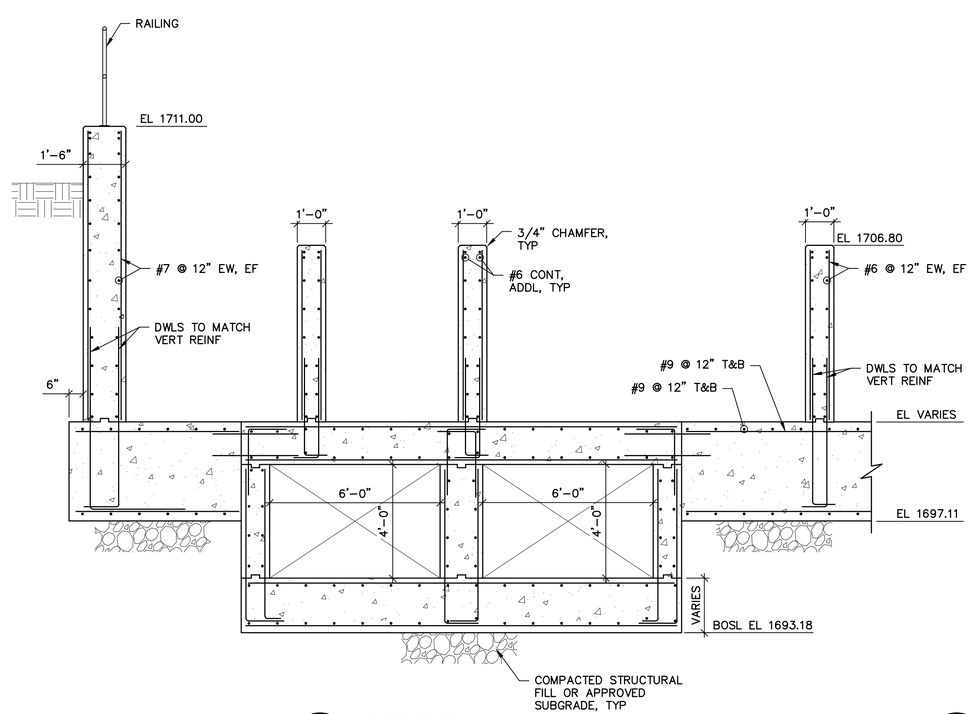
User:SANGALANG, Spec:AUS-NCSMOD, File:C:\USERS\WKELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – 6.0 CADD\6.1 – OLD FORGE DAM CADD\03-SHEETS\STRUCTURAL\OF-S-05.DWG
Scale:1:1, SavedDate:6/17/2025, Time:14:54, Plot Date: Tuesday, June 17, 2025, 12:56, Layout:S-05



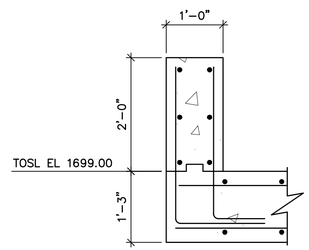
1 S-03 **SECTION**
3/8" = 1'-0"



2 S-03 **SECTION**
3/8" = 1'-0"



3 S-03 **SECTION**
3/8" = 1'-0"



4 S-03 **SECTION**
3/8" = 1'-0"

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-S-06
DESIGNED BY: A. OCCIL
DRAWN BY: Z. SANGALANG
CHECKED BY: M. VERMA

SHEET TITLE

STRUCTURAL

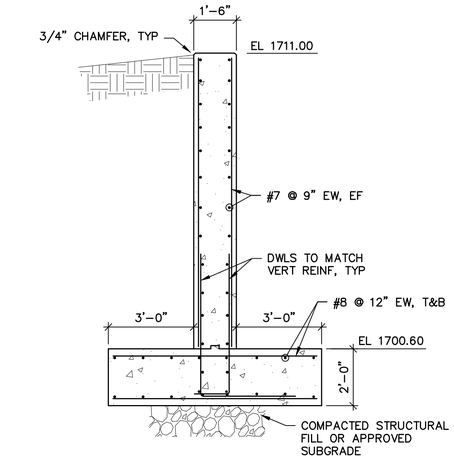
OLD FORGE DAM SPILLWAY SECTIONS AND DETAILS SHEET 1

SCALE: AS SHOWN

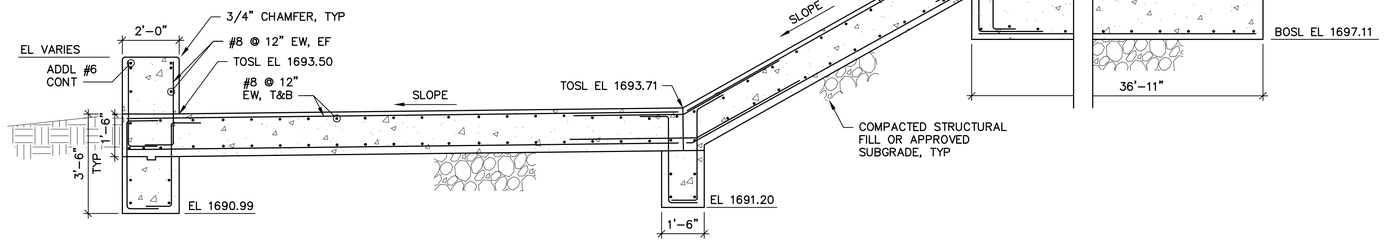
S-06

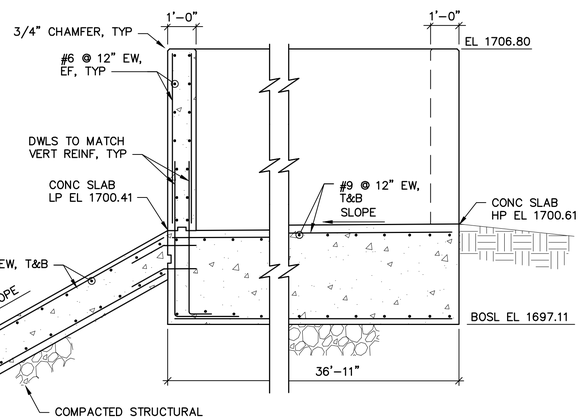
SHEET 6 OF 12

User:MROLLER Spec:AUS-NCSMOD Files:C:\USERS\MKELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - 6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\STRUCTURAL\OF-S-06.DWG
Scale:1:1 SaveDate:6/27/2025 Time:13:19 Plot Date: Roller, Meaghan, 6/26/2025, 15:13 Layout:S-06

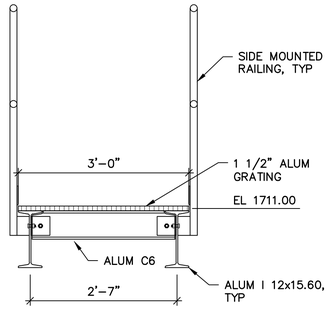


1 S-03 SECTION
3/8" = 1'-0"





1 S-05 SECTION
3/8" = 1'-0"

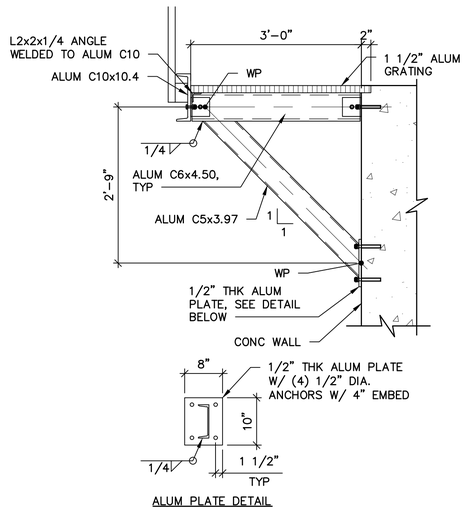


2 S-04 SECTION
3/4" = 1'-0"

2 S-05 SECTION
3/8" = 1'-0"

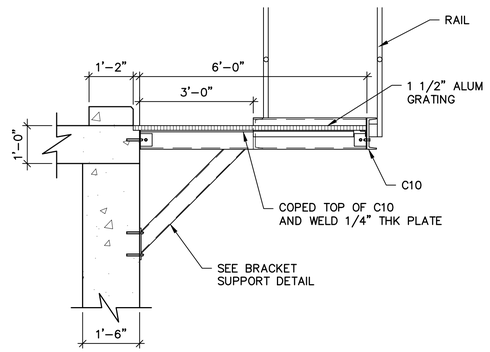
3 S-05 SECTION
3/8" = 1'-0"

4 S-04 SECTION
1/2" = 1'-0"



ALUM PLATE DETAIL

BRACKET SUPPORT DETAIL
SCALE: 3/4" = 1'-0"



5 S-05 SECTION
1/2" = 1'-0"

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK
CHRISTOPHER J.B. VERCH
075901
PROFESSIONAL ENGINEER
06-17-2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE:	JUNE 2025
PROJECT NO.:	30001381
FILE NAME:	OF-S-07
DESIGNED BY:	A. OCCIL
DRAWN BY:	Z. SANGALANG
CHECKED BY:	M. VERMA

SHEET TITLE

STRUCTURAL

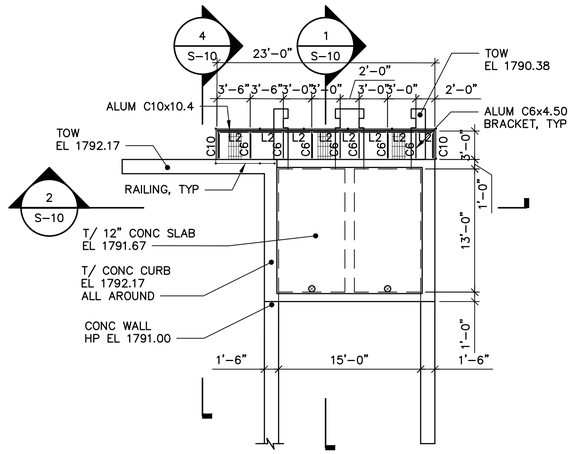
OLD FORGE DAM SPILLWAY SECTIONS AND DETAILS SHEET 2

SCALE: AS SHOWN

S-07

SHEET 7 OF 12

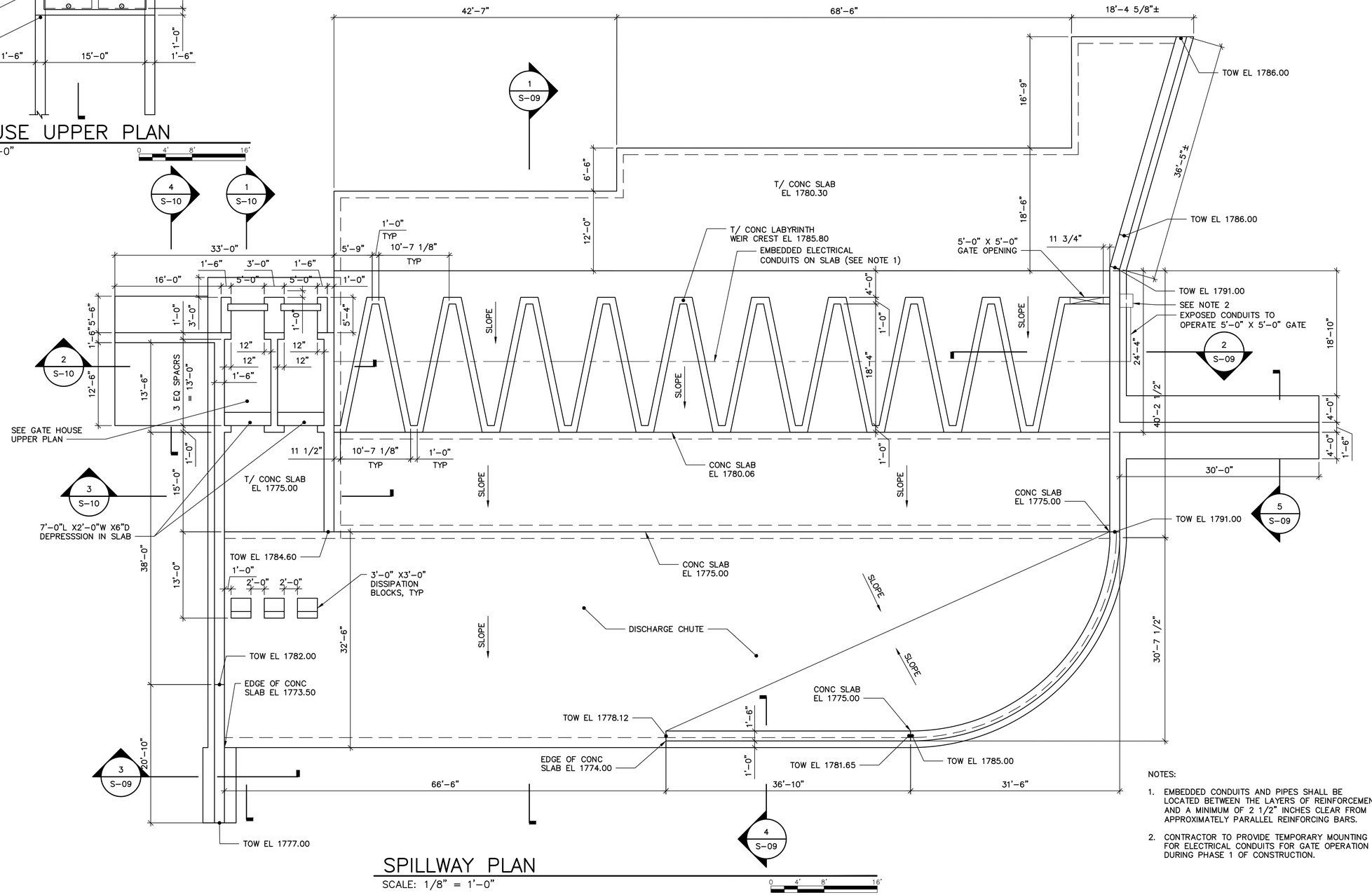
User:SANGALANG, Spec:AUS-NCSMOD, File:C:\USERS\MKELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - 6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\STRUCTURAL\OF-S-07.DWG
Scale:1:1, Saved:Date:6/17/2025 Time:13:22 Plot Date: Plotter: Megnorm, 6/17/2025, 12:37:1, Layout:S-07



GATE HOUSE UPPER PLAN

SCALE: 1/8" = 1'-0"

0 4' 8' 16'



SPILLWAY PLAN

SCALE: 1/8" = 1'-0"

0 4' 8' 16'

NOTES:

1. EMBEDDED CONDUITS AND PIPES SHALL BE LOCATED BETWEEN THE LAYERS OF REINFORCEMENT AND A MINIMUM OF 2 1/2" INCHES CLEAR FROM APPROXIMATELY PARALLEL REINFORCING BARS.
2. CONTRACTOR TO PROVIDE TEMPORARY MOUNTING FOR ELECTRICAL CONDUITS FOR GATE OPERATION DURING PHASE 1 OF CONSTRUCTION.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN any WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE/TOWN ON INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-S-08
DESIGNED BY: A. OCCIL
DRAWN BY: Z. SANGALANG
CHECKED BY: M. VERMA

SHEET TITLE

STRUCTURAL

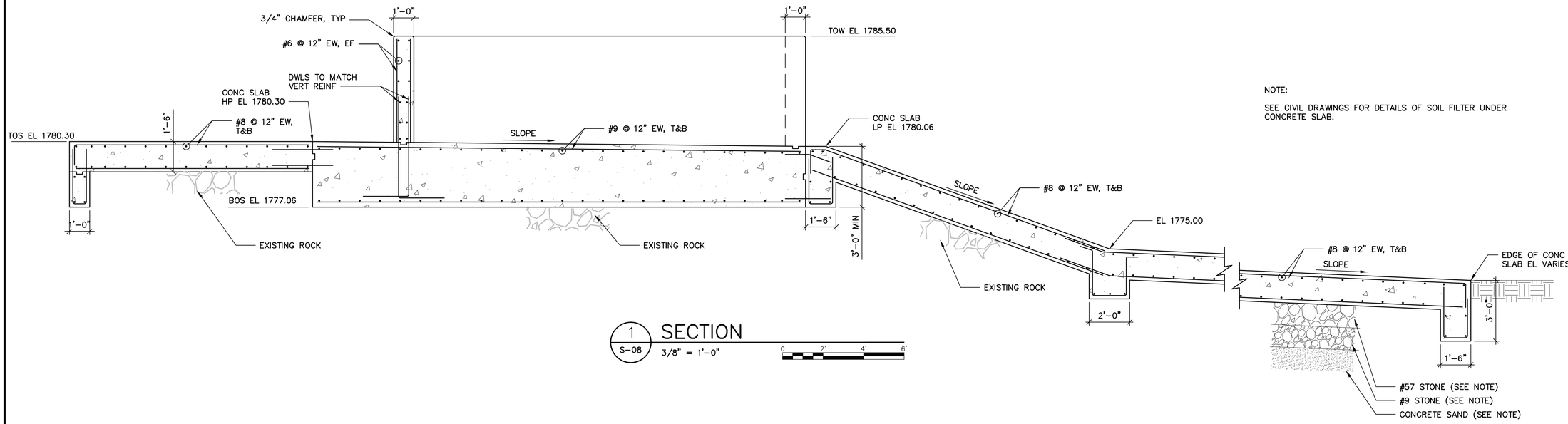
SIXTH LAKE DAM SPILLWAY PLAN

SCALE: AS SHOWN

S-08

SHEET 8 OF 12

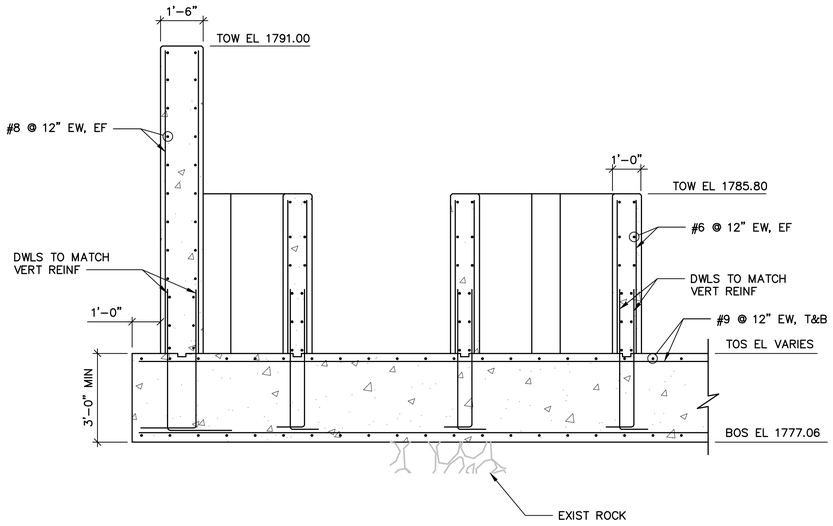
User:SANGALANG Spec:AUS-ACSM00 File:C:\USERS\MKELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - 6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\STRUCTURAL\6L-S-08.DWG
Scale:1:1 Saved:Date:6/17/2025 Time:15:04 Plot Date: Rollers, Meighan 6/18/2025, 7:19 , Layout:S-08



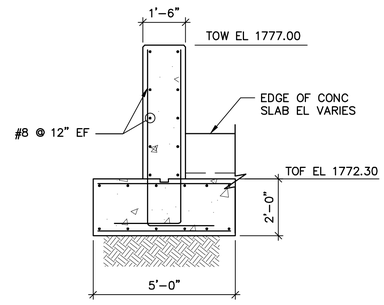
1 S-08 **SECTION**
3/8" = 1'-0"

NOTE:

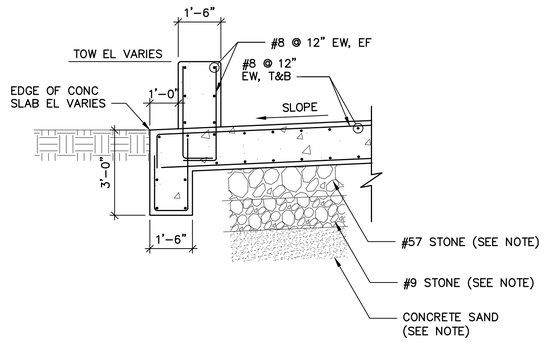
SEE CIVIL DRAWINGS FOR DETAILS OF SOIL FILTER UNDER CONCRETE SLAB.



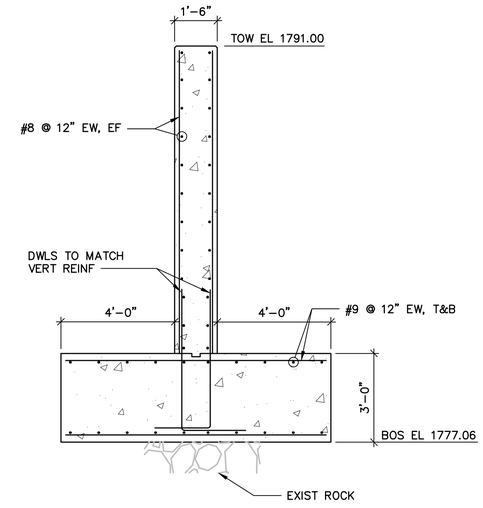
2 S-08 **SECTION**
3/8" = 1'-0"



3 S-08 **SECTION**
3/8" = 1'-0"



4 S-08 **SECTION**
3/8" = 1'-0"



5 S-08 **SECTION**
3/8" = 1'-0"

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK
CHRISTOPHER J.B. VERROT
075907
PROFESSIONAL ENGINEER
06-27-2025

HAMLET OF OLD FORGE/TOWN ON INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE:	JUNE 2025
PROJECT NO.:	30001381
FILE NAME:	6L-S-09
DESIGNED BY:	A. OCCIL
DRAWN BY:	Z. SANGALANG
CHECKED BY:	M. VERMA

SHEET TITLE

STRUCTURAL

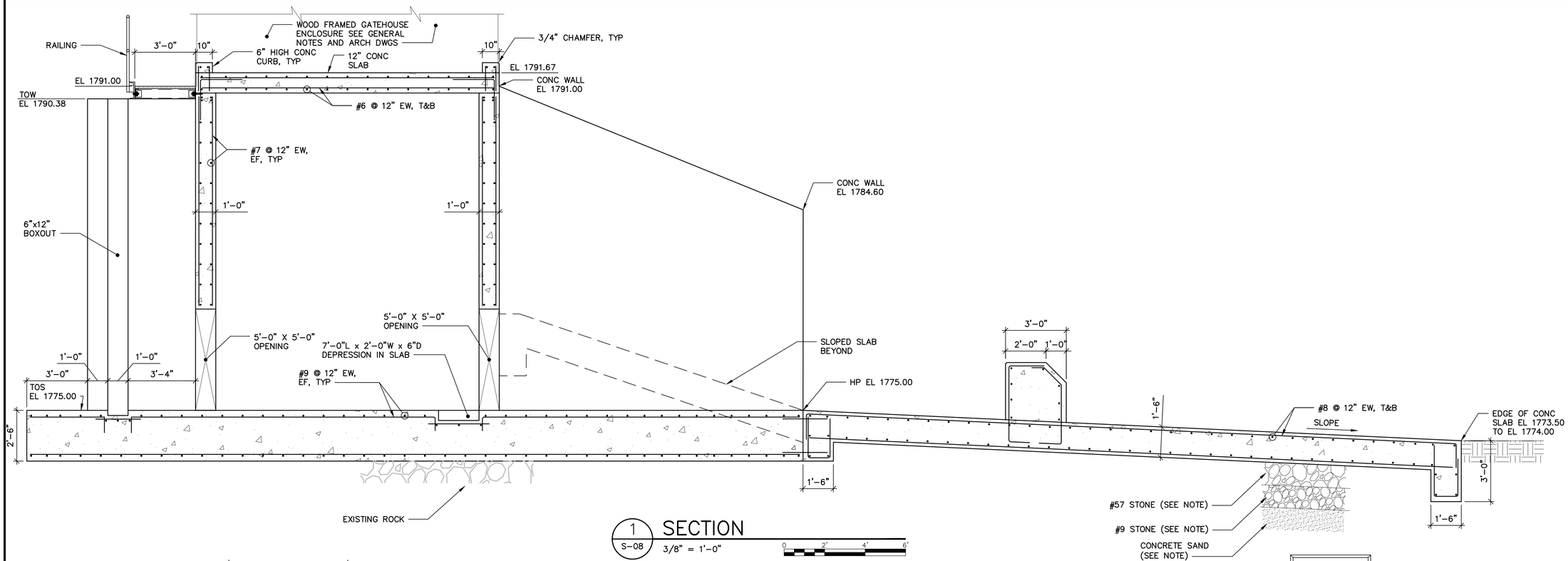
SIXTH LAKE DAM SPILLWAY SECTIONS AND DETAILS SHEET 1

SCALE: AS SHOWN

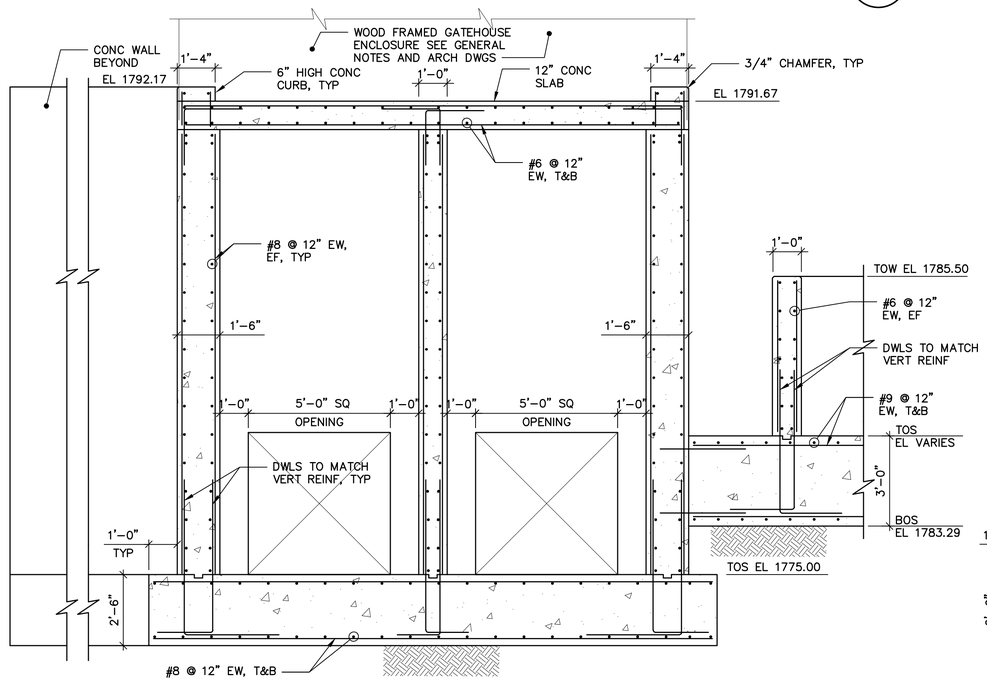
S-09

SHEET 9 OF 12

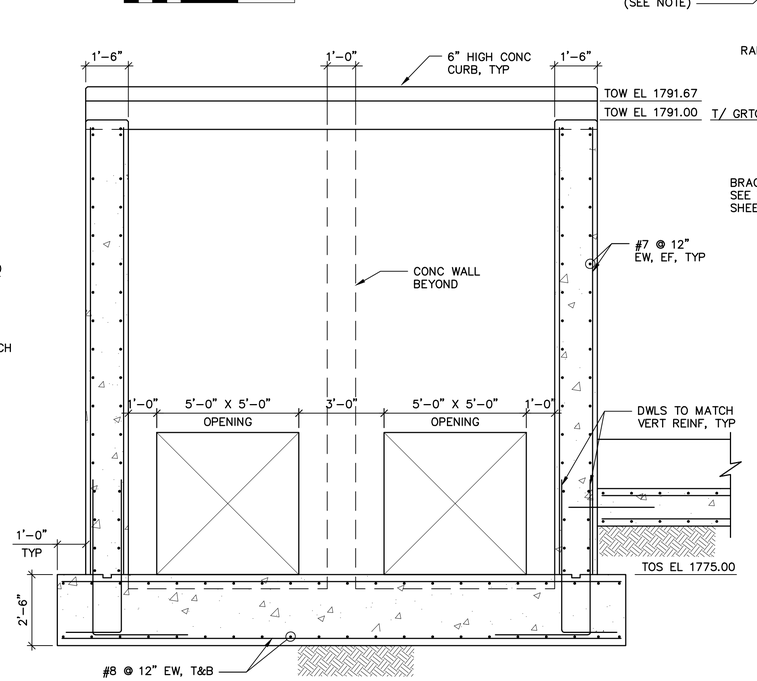
User:MROLLER Spec:AUS-MOSMOD File:C:\USERS\MKELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – 6.0 CADD\6.2 – SIXTH LAKE DAM CADD\03-SHEETS\STRUCTURAL\6L-S-09.DWG
Scale:1:1 SaveDate:6/16/2025 Time:15:03 Plot Date: Roller, Meghan, 6/16/2025; 15:12 ; Layout:S-09



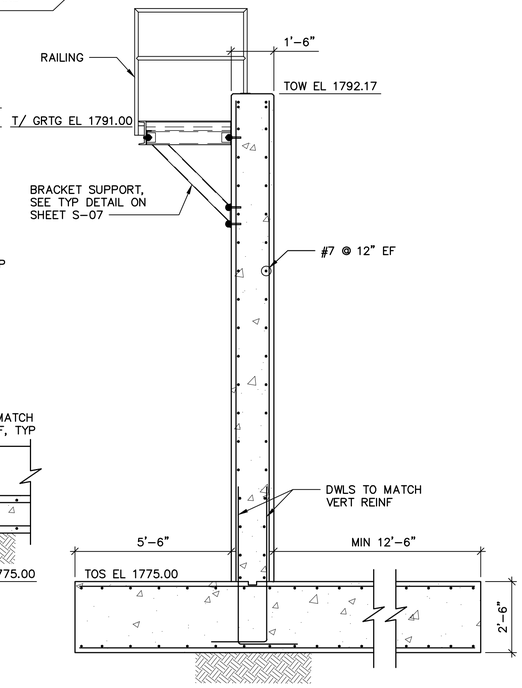
1 S-08 **SECTION**
3/8" = 1'-0"



2 S-08 **SECTION**
3/8" = 1'-0"



3 S-08 **SECTION**
3/8" = 1'-0"



4 S-08 **SECTION**
3/8" = 1'-0"

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK
CHRISTOPHER J.B. VERROT
079007
PROFESSIONAL ENGINEER
06-27-2025

HAMLET OF OLD FORGE/TOWN ON INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE:	JUNE 2025
PROJECT NO.:	30001381
FILE NAME:	6L-S-10
DESIGNED BY:	A. OCCIL
DRAWN BY:	Z. SANGALANG
CHECKED BY:	M. VERMA

SHEET TITLE

STRUCTURAL

SIXTH LAKE DAM SPILLWAY SECTIONS AND DETAILS SHEET 2

SCALE: AS SHOWN

S-10

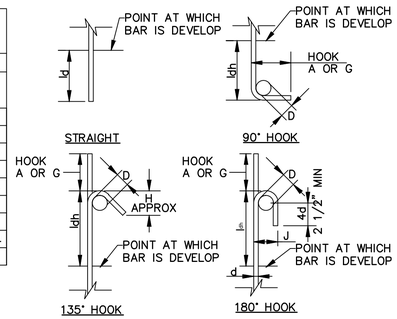
SHEET 10 OF 12

User:MROLLER Spec:AUS-NCSMOD File:C:\USERS\MROLLER\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – 6.0 CADD\6.2 – SIXTH LAKE DAM CADD\03-SHEETS\STRUCTURAL\6L-S-10.DWG
Scale:1:1 Saved:Date 6/16/2025 Time:15:09 Plot Date: Plotter: Weapon: 6/16/2025, 15:12 , Layout:S-10

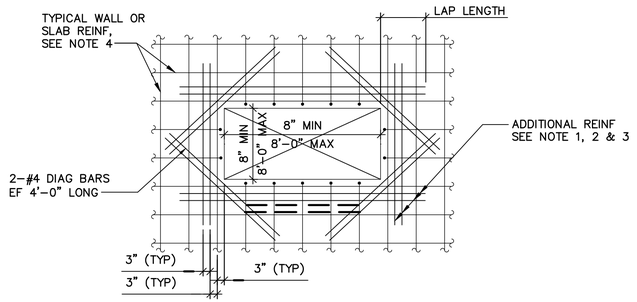
REINFORCEMENT LAP SPLICE, DEVELOPMENT LENGTH AND STANDARD HOOKS

BAR SIZE	MIN LAP LENGTHS FOR CLASS B		MIN DEVELOPMENT LENGTHS (l_d)		STD HOOKS l_{dh}	MIN STD. HOOKS FOR PRIMARY REINFORCEMENT					
			(STRAIGHT BAR)			90°	135°		180°		INSIDE BEND DIA, D
	TOP*	OTHERS	TOP*	OTHERS		A OR G	A OR G	H	A OR G	J	
#3	24	19	18	14	7	6	4	2 1/2	5	3	2 1/4
#4	32	24	24	18	9	8	4 1/2	3	6	4	3
#5	39	30	30	23	12	10	5 1/2	3 3/4	7	5	3 3/4
#6	46	36	35	27	14	12	8	4 1/2	8	6	4 1/2
#7	67	52	51	40	16	14	9	5 1/2	10	7	5 1/4
#8	77	59	59	45	18	16	10 1/2	6	11	8	6
#9	86	67	66	51	21	19	–	–	15	11 3/4	9 1/2
#10	97	75	74	57	23	22	–	–	17	13 1/4	10 3/4
#11	107	84	82	64	26	24	–	–	19	14 3/4	12

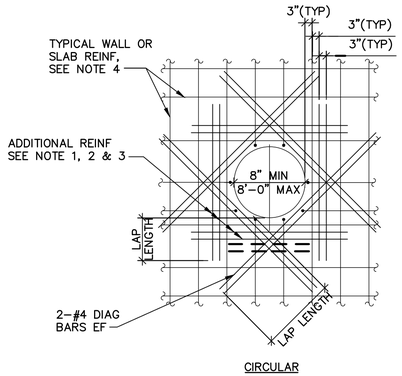
1. REINFORCEMENT LAP SPLICE, DEVELOPMENT LENGTH AND STANDARD HOOK TABLE ON A MINIMUM CONCRETE COMPRESSIVE STRENGTH OF 4500 PSI AND 60,000 PSI REINFORCEMENT (WITH NO EPOXY COATING).
2. ALL LAPS SPLICES SHALL BE CLASS B SPLICES.
3. * TOP BARS ARE DEFINED AS ALL HORIZONTAL BARS WITH 12 INCHES OR MORE FRESH CONCRETE BENEATH.
4. WHERE SPLICES ARE REQUIRED BETWEEN BARS OF DIFFERENT SIZES, THE LAP LENGTH SHALL BE NO LESS THAN THE DEVELOPMENT LENGTH OF THE LARGER BAR OR THE LAP LENGTH OF THE SMALLER BAR, WHICHEVER GREATER.



REINF SPLICE AND EMBEDMENT LENGTH TABLE (4500 PSI)



RECTANGULAR

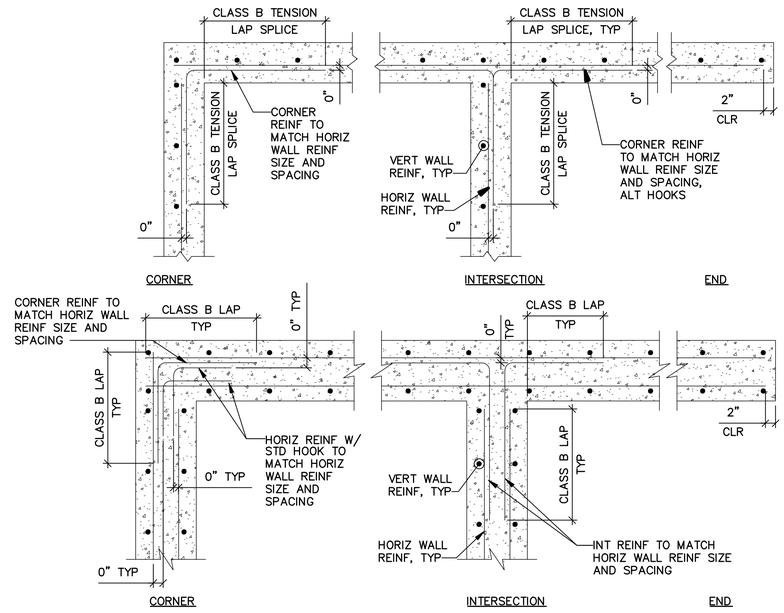


CIRCULAR

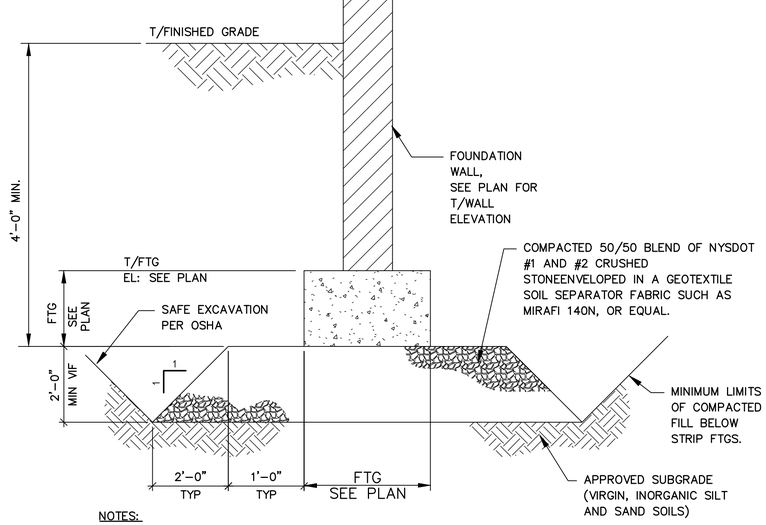
NOTES:

1. PROVIDE ADDITIONAL REINFORCEMENT AT EACH SIDE OF ALL OPENINGS, ACCESS HATCHES, PIPE PENETRATIONS, ETC. EQUAL IN AREA TO 1/2 OR MORE THE AREA OF REINFORCEMENT CUT BY OPENING IN EACH DIRECTION. ADDITIONAL REINFORCEMENT TO MATCH SIZE OF TYPICAL REINFORCEMENT (MIN. 2 BARS EACH SIDE AND EF) AND PLACED BETWEEN TYPICAL REINFORCEMENT @ 3" SPACING ON EACH SIDE OF OPENING. IF A WALL OR BEAM IS ADJACENT TO THE OPENING, THE ADDITIONAL REINFORCEMENT ON THAT SIDE OF THE OPENING CAN BE OMITTED.
2. ANY OPENING 6" OR LESS TO AN ADJACENT WALL DOES NOT REQUIRE ADDITIONAL REINFORCEMENT AT THAT SIDE OF OPENING.
3. PROVIDE MATCHING DOWELS WHERE REQUIRED TO PROVIDE CLASS "B" LAP WITH ADDITIONAL REINFORCEMENT. (WHERE LAPPING OF ADDITIONAL REINFORCEMENT FROM ADJACENT OPENINGS OCCUR, ADDITIONAL REINFORCEMENT SHALL BE COMBINED).
4. PROVIDE STANDARD HOOK AT END OF ALL BARS TERMINATING AT OPENING.

REINFORCING AROUND OPENING IN SLAB AND WALL



WALL REINFORCING DETAILS (PLAN)



NOTES:

1. SUBGRADE SHALL BE INSPECTED AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACING COMPACTED FILL
2. LIMITS SHOWN ARE MINIMUM.

FOUNDATION/EXCAVATION/BACKFILL REQUIREMENTS

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS

STATE OF NEW YORK
CHRISTOPHER J.B. VERROT
075007
PROFESSIONAL ENGINEER
06-27-2025

HAMLET OF OLD FORGE/TOWN ON INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-S-11
DESIGNED BY: A. OCCIL
DRAWN BY: Z. SANGALANG
CHECKED BY: M. VERMA

SHEET TITLE

STRUCTURAL

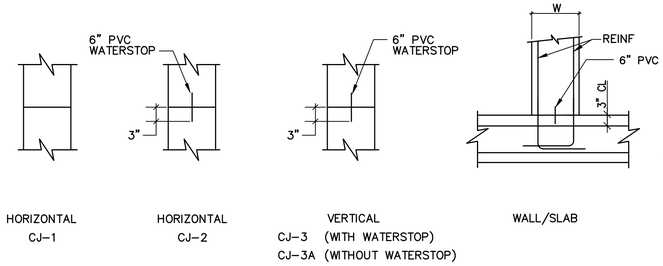
TYPICAL DETAILS SHEET 1

SCALE: NOT TO SCALE

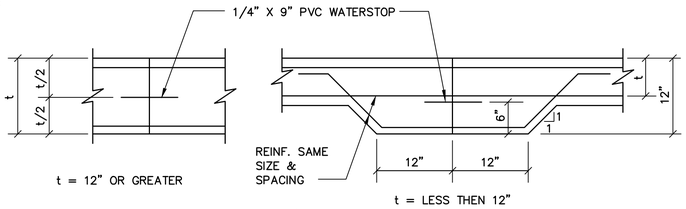
S-11

SHEET 11 OF 12

User:SANGALANG, Spec:AUS-NCSMOD File:C:\USERS\WKELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - 6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\STRUCTURAL\6L-S-11.DWG
Scale:1:1 Saved Date:6/17/2025 Time:15:03 Plot Date: Rules, Meighton, 6/17/2025, 12:48 L, Crystal15-11



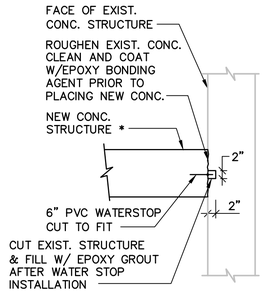
HORIZONTAL CJ–1 | HORIZONTAL CJ–2 | VERTICAL CJ–3 (WITH WATERSTOP) CJ–3A (WITHOUT WATERSTOP) | WALL/SLAB



t = 12" OR GREATER

t = LESS THEN 12"

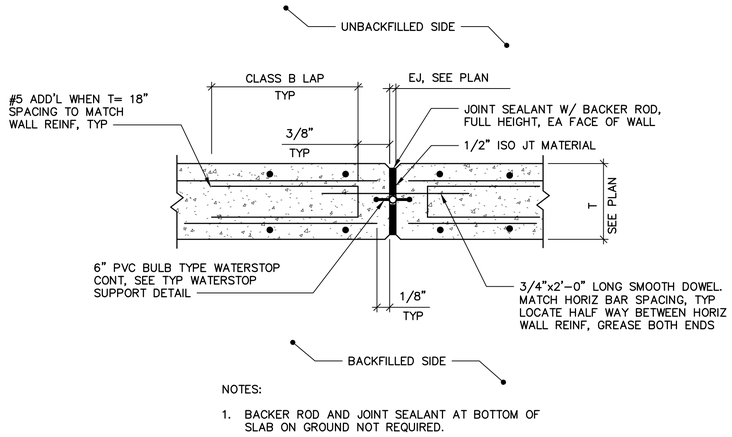
SLAB ON GRADE
CJ–4 (WITH WATERSTOP)
CJ–4A (WITHOUT WATERSTOP)



HORIZONTAL & VERTICAL CJ–5

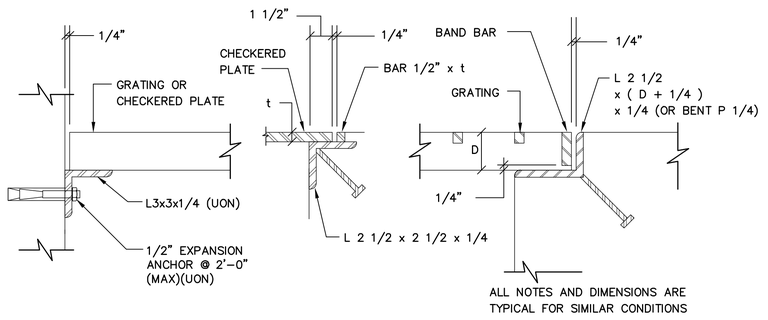
NOTES:
1. CONTINUE ALL REINFORCEMENT BARS THRU JOINTS.
2. ALL WALL VERTICAL CONSTRUCTION JOINTS TO BE CJ–3 U.O.N.
3. * PLACE NEW CONCRETE STRUCTURE AFTER PVC WATERSTOP HAS BEEN GROUTED IN PLACE.

TYPICAL CONSTRUCTION JOINT DETAILS



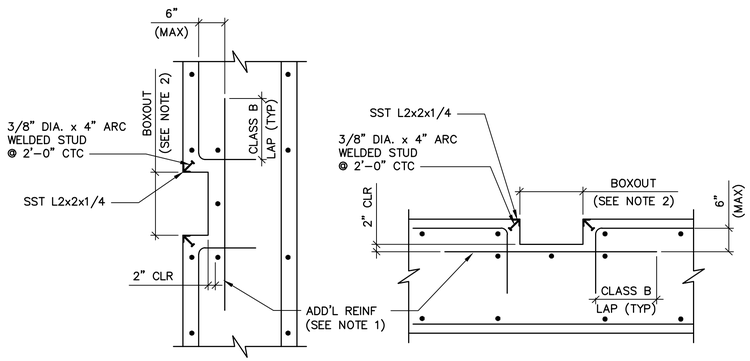
NOTES:
1. BACKER ROD AND JOINT SEALANT AT BOTTOM OF SLAB ON GROUND NOT REQUIRED.

CONCRETE WALL EXPANSION JOINT DETAIL – PLAN



NOTES:
1. PROVIDE TYPICAL SUPPORT AS SHOWN FOR ALL GRATING AND PLATE SUPPORT.
2. PROVIDE SUPPORT ANGLE AND ANCHOR STUD OF THE SAME MATERIAL AS THE GRATING AND PLATE.

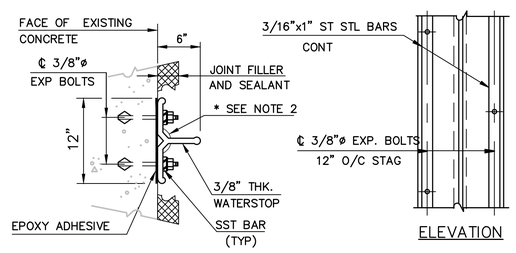
GRATING AND CHECKERED PLATE SUPPORT DETAILS



WALL SECTION | SLAB SECTION

NOTES:
1. PROVIDE ADDITIONAL REINFORCEMENT AT BOXOUT TO MATCH SIZE AND SPACING OF TYPICAL REINFORCEMENT.
2. BOXOUT SIZE AND DEPTH SHALL BE AS REQUIRED BY WHIPPS, INC. OF ATHOL, MASSACHUSETTS OR EQUAL.
3. FILL AROUND FRAME AND GUIDE WITH NON–SHRINK GROUT (UON).

TYPICAL BOXOUT FOR STOPLOG AND SLIDE GATE DETAIL



NOTES:
1. EXP BOLTS TO BE TORQUED TO INDUCE AN AXIAL FORCE OF 900# PER BOLT.
2. * PROVIDE CENTER BULB FOR EXPANSION JOINTS. (MIN 1" BULB)

WATERSTOP BETWEEN NEW AND EXISTING CONCRETE

User:SANGALANG, Spec:AUS-NCSMOD, File:C:\USERS\WELLY\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – 6.0 CADD\6.2 – SIXTH LAKE DAM CADD\03-SHEETS\6L-S-12.DWG
Scale:1:1, SaveDate:6/17/2025 Time:15:04 Plot Date: Rotation: 6/16/2025 15:12, Layout:S-12

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE/TOWN ON INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L–S–12
DESIGNED BY: A. OCCIL
DRAWN BY: Z. SANGALANG
CHECKED BY: M. VERMA

SHEET TITLE

STRUCTURAL

TYPICAL DETAILS SHEET 2

SCALE: NOT TO SCALE

S–12

SHEET 12 OF 12

DIAGRAMS:

- POWER ON–OFF SNAP SWITCH, 1PH, 120V AC, 20A S2–DENOTES, 2 POLE, 240 VOLTS, 20A
- 20A TWO OR THREE POLE MANUAL STARTER,
- INDICATING LIGHT
- CONTROL STATION
- DISCONNECT SWITCH, F DENOTES FUSING, ONLY WHERE INDICATED. FIRST NUMBER DENOTES SWITCH AMP RATING. (60/40)
- VARIABLE FREQUENCY DRIVE – VFD –B WHEN INDICATED DENOTES WITH STARTING AND FULL SPEED BYPASS
- CONTROL STATION
- JUNCTION BOX; SIZE AS REQUIRED BY N.E.C.
- FRACTIONAL HORSEPOWER, SINGLE PHASE, MOTORIZED GATE ACTUATOR FURNISHED WITH SLIDE GATE
- PFD DENOTES PULL FUSE DISCONNECT TYPE
- CURRENT TRANSFORMER, RATIO AND QUANTITY DENOTED (600/5, 3)
- POTENTIAL TRANSFORMER
- TRANSFORMER– SIZE AS NOTED ON THE DRAWINGS
- DISCONNECT SWITCH WITH FUSING WHERE NOTED
- SUBMERSIBLE CABLES BY VENDOR
- DELTA/WYE TRANSFORMER CONNECTION W/GROUND
- AUTOMATIC TRANSFER SWITCH –ATS
- FULL VOLTAGE NON–REVERSING STARTER (CONTINUOUS AMP RATING) (MOTOR CIRCUIT PROTECTOR) (7A MCP)
- MAGNETIC MOTOR STARTER
- OVERLOAD RELAY
- (FRAME SIZE) (TRIP SIZE) (100/30 2P)

GROUNDING:

- GROUND ROD
- GROUND TEST POINT
- GROUND GRID CABLE CONNECTION
- #4/0 GROUND CABLE BURIED 2'–6" BELOW GRADE, UNLESS NOTED OTHERWISE

INSTRUMENTS:

- INSTRUMENT DEVICE: LETTERS IDENTIFY DEVICE FUNCTION, NUMBERS WHERE INDICATED DENOTE LOOP NUMBER (PS 123)
- PRESSURE CONTROLLER (PC)
- PRESSURE SWITCH (PSH DENOTES PRESSURE SWITCH HIGH AND PSL DENOTES PRESSURE LOW) (PS)

PLANS:

- LIGHTING FIXTURES, L# INDICATES TYPE (OR L#)
- COMBINATION MANUAL MOTOR STARTERS MOUNTED AT 48"AFF
- GFCI OUTLET WITH WEATHERPROOF IN–USE COVER MOUNTED AT 48" AFF
- SINGLE POLE SWITCH MOUNTED AT 48" A.F.F.
- NVR — NETWORK VIDEO RECORDER CABINET
- TEL — TELEMETRY EQUIPMENT CABINET
- FIXED POSITION, CLOSED CIRCUIT CAMERA
- CIRCUIT BREAKER PANELBOARD, MOUNTED AT 72" A.F.F. TO TOP
- HATCHING INDICATES EQUIPMENT TO BE REMOVED
- INDICATES NEW EQUIPMENT/EXPOSED CONDUIT
- INDICATES EXISTING EQUIPMENT/CONDUIT
- INDICATES CONCEALED OR UNDERGROUND EQUIPMENT/CONDUIT
- CONDUIT–TURN DOWN
- CONDUIT–TURN UP
- CONDUIT–CAPPED
- INDICATES HOME RUN TO PANEL
- INDICATES BRANCH CIRCUIT ARRANGEMENT
- INDICATES SWITCHING ARRANGEMENT

UNLESS OTHERWISE INDICATED:
ALL HOME RUNS TO A 1P–20A C/B
ALL CONDUCTORS ARE NO. 12 AWG
ALL CONDUITS SHALL BE SIZED PER CODE
SEPARATE GROUND CONDUCTOR SHALL BE RUN W/ EACH

THESE DRAWINGS INDICATE BRANCH CIRCUIT CONNECTIONS, BRANCH CIRCUIT SIZE, AND SWITCHING ARRANGEMENTS DIAGRAMMATICALLY.

THE CONTRACTOR MAY, AT HIS OPTION, GROUP CIRCUITS TOGETHER AND ROUTE CONDUITS AS NECESSARY TO SUIT FIELD CONDITIONS.

CONDUITS LARGER THAN 1"SHALL NOT BE USED FOR BRANCH CIRCUIT WORK.

WHERE CIRCUITING IS INDICATED IN PLAN WITH STRAIGHT LINES, THE ACTUAL ROUTING SHALL BE AS CLOSE AS PRACTICAL TO THAT SHOWN.

- P14 — CODUIT AND CABLE TAG, REFER TO CONDUIT AND CABLE SCHEDULE

ABBREVIATIONS

AC	ALTERNATING CURRENT
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISHED GRADE
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BKR	BREAKER
C	CONDUIT
CKT	CIRCUIT
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CTRL	CONTROL
DP	DISTRIBUTION PANEL
EC	EMPTY CONDUIT
EF	EXHAUST FAN
EL	ELEVATION
EXP	EXPLOSION PROOF
EXIST	EXISTING
FDR	FEEDER
FVNR	FULL VOLTAGE NON–REVERSING
G OR GND	GROUND
GF	GROUND FAULT
HOA	HAND–OFF–AUTOMATIC
I&C	INSTRUMENTATION & CONTROL
JB	JUNCTION BOX
LCP	LOCAL CONTROL PANEL
L.O.	LOCKOUT
LP	LIGHTING PANELBOARD
LTG	LIGHTING
M	MOTOR
MCC	MOTOR CONTROL CENTER
MTS	MANUAL TRANSFER SWITCH
NA	NON–AUTOMATIC
NTS	NOT TO SCALE
OL'S	MOTOR OVERLOAD HEATERS
OT	OVER TEMPERATURE
PB	PULL BOX
PNL	PANEL
PP	POWER PANEL
PT	POTENTIAL TRANSFORMER
PWR	POWER
RECEP	RECEPTACLE
RVNR	REDUCED VOLTAGE NON–REVERSING
(S)	(SH) SHIELDED CABLE
SP	SPARE
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
TEMP	TEMPERATURE
UON	UNLESS OTHERWISE NOTED, USE UNDERGROUND SERVICE ENTRANCE CABLE
V	VOLT
VFD	VARIABLE FREQUENCY DRIVE
WP	WEATHERPROOF
XFMR	TRANSFORMER
NEC	NATIONAL ELECTRIC CODE
(TYP)	TYPICAL
ø	PHASE
#	NUMBER

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MOUNTING	DELIVERED LUMENS	INPUT WATTAGE	COLOR TEMPERATURE	CRI	VOLTAGE	BASIS OF DESIGN	NOTES
L1	NOMINAL 4 FT. LONG LOW-PROFILE, LED VAPOR TIGHT. FIBERGLASS HOUSING WITH INTEGRAL PERIMETER CHANNEL UTILIZING CONTINUOUS POURED-IN-PLACE NEMA 4X GASKET, WHITE FINISH. CAPTIVE POLYMER LATCHES. LOW PROFILE HIGH IMPACT INJECTION MOLDED ACRYLIS LENS (0.08" THICK). PROVIDE UNIT WITH EMERGENCY BATTERY PACK, 10W CONSTANT POWER AND INTEGRAL PIR ON/OFF OCCUPANCY SENSOR. DLC LISTED.	SURFACE	4009	24	4000K	>80	MULTI-VOLT	LITHONIA FEM-L48-4000LM-LPAFL-MD-MVOLT-GZ10-40K-80CRI-E10WCP-SBOR10	
L2	LED EXTERIOR BUILDING MOUNTED, SMALL, FULL CUTOFF. DIE-CAST ALUMINUM HOUSING, WEDGE SHAPED, BLACK POWDER COAT FINISH. DIE-CAST ALUMINUM DOOR FRAME WITH ONE-PIECE SILICON GASKET, IP66 RATED. FULL CUTOFF OPTICS. PROVIDE WITH BI-LEVEL SENSOR (100%/35%). PROVIDE UNIT WITH COLD WEATHER EMERGENCY BATTERY PACK, 18W CONSTANT POWER. DLC LISTED.	SURFACE	3213	23	4000K	>80	MULTI-VOLT	LITHONIA WDGE2 LED-P3SW-40K-80CRI-VW-MVOLT-SRM-E20WC-PE-PIR1FC3V-DBLXD	1

NOTES:
1. PROVIDE WITH BI-LEVEL MOTION SENSOR FOR CONTROLLED CIRCUIT, DUSK TO DAWN OPERATION.

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L–E–01
DESIGNED BY: L. BOULERICE
DRAWN BY: K. STEHLE
CHECKED BY: J. DOMANSKI

SHEET TITLE

ELECTRICAL

LEGEND, NOTES, AND ABBREVIATIONS

SCALE: NONE

E–01

SHEET 1 OF 9

User: AOLSON, Spec: AUS–NCSMOD File: C:\USERS\AOLSON\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.2 – SIXTH LAKE DAM CADD\03–SHEETS\ELECTRICAL\6L–E–01.DWG
Scale:1:1 SavedDate:4/25/2025 Time:09:17 Plot Date: Olson, Arlo; 4/27/2025; 13:25 ; Layout: –

NOTES:

1. EXISTING GATEHOUSE TO REMAIN FULLY FUNCTIONAL FOR THE DURATION OF PHASE I CONSTRUCTION. REMOVE EXISTING UNDERGROUND ELECTRIC SERVICE AND PROVIDE TEMPORARY ELECTRIC SERVICE TO ALLOW FOR PHASE I CONSTRUCTION. REMOVE AND RELOCATE ALL EXISTING TELEMETRY EQUIPMENT AS DIRECTED BY OWNER'S REPRESENTATIVE. AT COMPLETION OF PHASE I, REMOVE ALL EXISTING LIGHTS, OUTLETS, PANELBOARDS, LOAD CENTERS, TRANSFORMERS AND TEMPORARY ELECTRIC SERVICE TO ALLOW FOR PHASE II CONSTRUCTION.
2. EXISTING ELECTRIC PANELBOARD AND UTILITY METER TO REMAIN DURING PHASE I. COORDINATE REMOVAL WITH NATIONAL GRID DURING PHASE II.
3. EXISTING OVERHEAD TEL/COM SERVICE AND NETWORK INTERFACE TO REMAIN DURING PHASE I. COORDINATE REMOVAL WITH FRONTIER COMMUNICATIONS DURING PHASE II.
4. EXISTING UNDERGROUND ELECTRIC SERVICE TO REMAIN DURING PHASE I. COORDINATE REMOVAL WITH NATIONAL GRID DURING PHASE II.
5. REMOVE UNDERGROUND CONDUIT WIRING. REMOVE AND STORE CAMERA.
6. REMOVE AND STORE WEATHER STATION.
7. REMOVE UNDERGROUND CONDUIT AND WIRING. REMOVE AND STORE WATER LEVEL TRANSDUCER.

SEE NOTE 7
SEE NOTE 2
EXISTING GATEHOUSE (SEE NOTE 1)
SEE NOTE 6
SEE NOTE 5
SEE NOTE 4
SEE NOTE 3
EXISTING UTILITY POLE NG 22-1 (NG 22-2)

1 ELECTRICAL SITE PLAN – DEMOLITION
E-02 SCALE: 1" = 5'-0"

0 5' 10'

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

DRAWINGS NOT FOR CONSTRUCTION

SEALS

STATE OF NEW YORK · JOHN J. DOMANSKI · 081623 · LICENSED PROFESSIONAL ENGINEER
4/29/2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-E-01
DESIGNED BY: L. BOULERICE
DRAWN BY: K. STEHLE
CHECKED BY: J. DOMANSKI

SHEET TITLE

ELECTRICAL

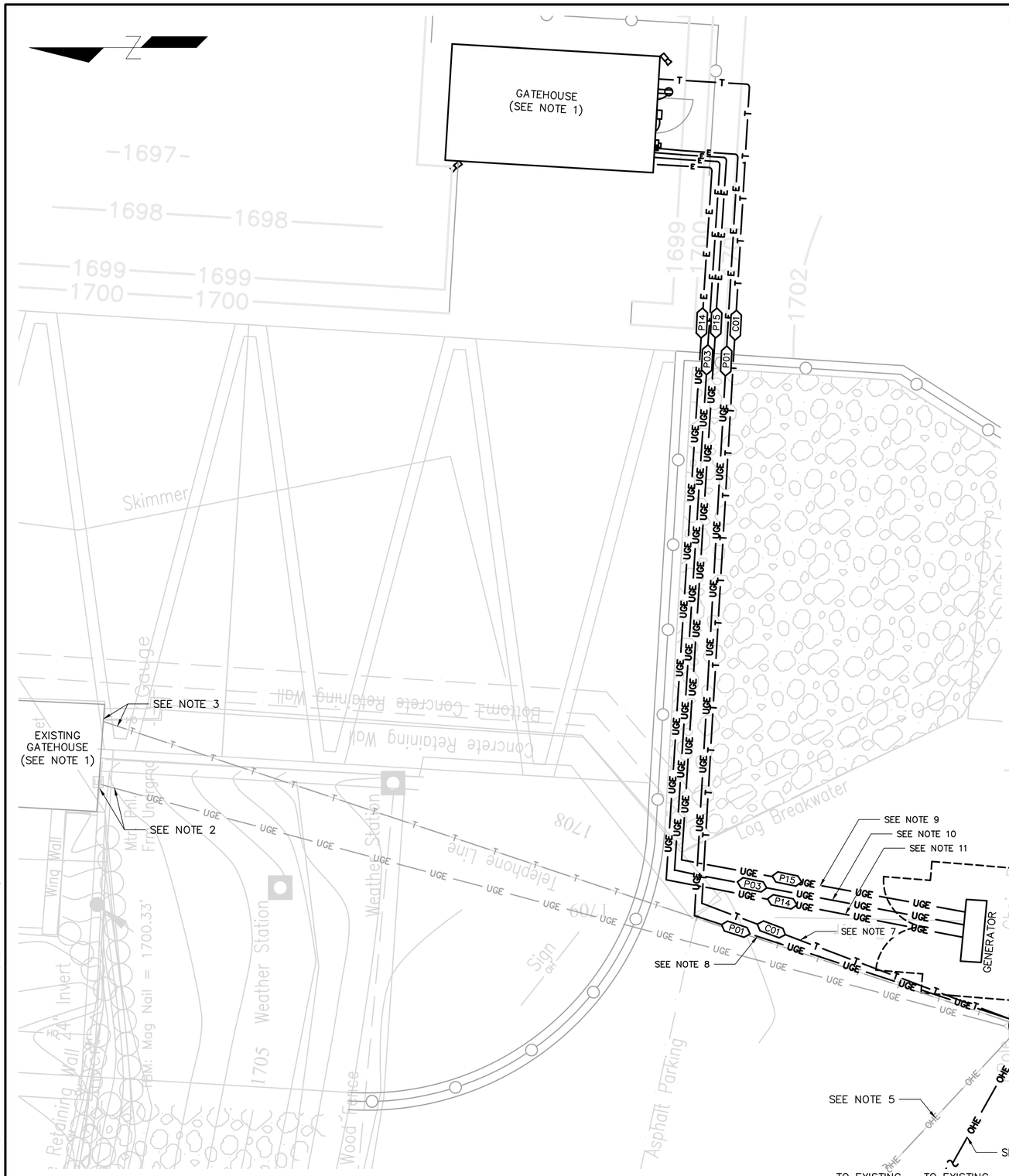
OLD FORGE DAM ELECTRICAL DEMOLITION PLAN

SCALE: AS INDICATED

E-02

SHEET 2 OF 9

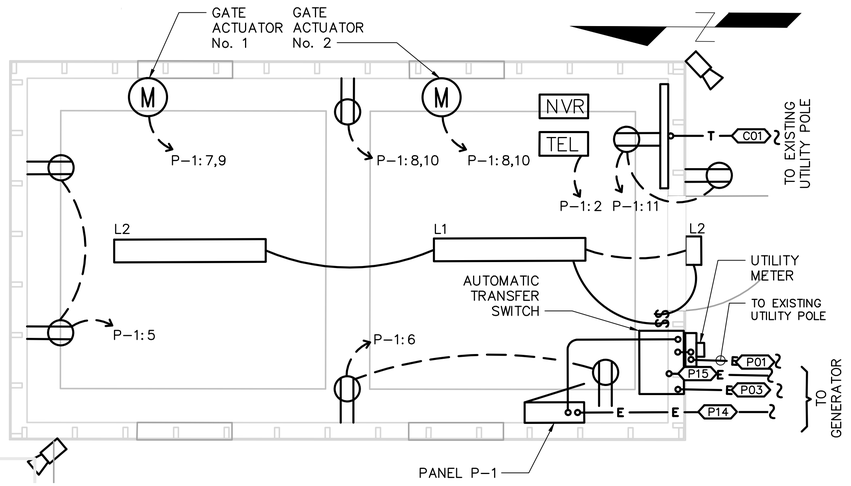
User:AOLSON, Spec:AUS-NCSMOD, File:C:\USERS\AOLSON\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\ELECTRICAL\OF-E-01.DWG
Scale:1:1 SavedDate:4/28/2025 Time:15:05 Plot Date: Olson, Aric; 4/28/2025; 15:05 ; Layout:-



1 E-03 ELECTRICAL SITE PLAN
SCALE: 1" = 5'-0"

NOTES:

1. EXISTING GATEHOUSE TO REMAIN FULLY FUNCTIONAL FOR THE DURATION OF PHASE I CONSTRUCTION. REMOVE EXISTING UNDERGROUND ELECTRIC SERVICE AND PROVIDE TEMPORARY ELECTRIC SERVICE TO ALLOW FOR PHASE I CONSTRUCTION. THE OWNER SHALL REMOVE AND RELOCATE ALL EXISTING TELEMETRY EQUIPMENT AND WIRING. AT COMPLETION OF PHASE I, REMOVE ALL EXISTING LIGHTS, OUTLETS, PANELBOARDS, LOAD CENTERS, TRANSFORMERS AND TEMPORARY ELECTRIC SERVICE TO ALLOW FOR PHASE II CONSTRUCTION.
2. EXISTING ELECTRIC PANELBOARD AND UTILITY METER TO REMAIN DURING PHASE I. COORDINATE REMOVAL OF EXISTING UNDERGROUND SERVICE (4 -1/0) AND INSTALLATION OF TEMPORARY 1/0 QUADRUPLEX ELECTRIC SERVICE WITH NATIONAL GRID DURING PHASE II.
3. EXISTING OVERHEAD TEL/COM SERVICE AND NETWORK INTERFACE TO REMAIN DURING PHASE I. COORDINATE REMOVAL WITH FRONTIER COMMUNICATIONS DURING PHASE II.
4. EXISTING OVERHEAD 1/0 QUADRUPLEX SECONDARY (UTILITY OWNED) TO REMAIN DURING PHASE I. COORDINATE REMOVAL AND INSTALLATION OF OVERHEAD 1/0 TRIPLEX SECONDARY WITH NATIONAL GRID DURING PHASE II.
5. EXISTING OVERHEAD 1/0 TRIPLEX SECONDARY (UTILITY OWNED) TO REMAIN. COORDINATE WITH NATIONAL GRID.
6. EXISTING OVERHEAD TEL/COM SERVICES (UTILITY OWNED) TO REMAIN. COORDINATE WITH FRONTIER COMMUNICATIONS.
7. UNDERGROUND TEL/COM SERVICE. PROVIDE EMPTY 1"SCHEDULE 80 PVC CONDUIT WITH PULL CORD. COORDINATE WITH FRONTIER COMMUNICATIONS.
8. UNDERGROUND ELECTRIC SERVICE TO UTILITY METER AT GATEHOUSE.
9. UNDERGROUND FEEDER TO AUTOMATIC TRANSFER SWITCH IN GATEHOUSE.
10. UNDERGROUND GENERATOR CONTROL WIRING TO AUTOMATIC TRANSFER SWITCH IN GATEHOUSE.
11. UNDERGROUND GENERATOR HEATER/CHARGER BRANCH CIRCUIT TO PANEL P-1 IN GATEHOUSE.



2 E-03 ENLARGED ELECTRICAL PLAN
SCALE: 1/2" = 1'-0"

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

DRAWINGS NOT FOR CONSTRUCTION

SEALS

STATE OF NEW YORK
JOHN I. DOMANSKI
081623
LICENSED PROFESSIONAL ENGINEER
4/29/2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-E-02
DESIGNED BY: L. BOULERICE
DRAWN BY: K. STEHLE
CHECKED BY: J. DOMANSKI

SHEET TITLE

ELECTRICAL

OLD FORGE DAM ELECTRICAL PLAN

SCALE: AS INDICATED

E-03

SHEET 3 OF 9

User:AOLSON_Spec:AUS-NCSMOD File:C:\USERS\AOLSON\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\ELECTRICAL\OF-E-02.DWG
Scale:1:1 SavedDate:4/28/2025 Time:15:06 Plot Date: Olson, Arto: 4/28/2025; 15:06 ; Layout:-

MOTOR AND EQUIPMENT SCHEDULE

UNIT		LOAD					CONTROLLER DISCONNECT				CONTROLLER						DIAG. No.	DIV. 40 INTERLOCKS	DIV. 26 INTERLOCKS	MOTOR DISCONNECT				CONDUCTORS		CONDUIT SIZE	CKT. O.C. DEVICE		POWER SOURCE	REMARKS	UNIT TAG NO.
TAG No.	LOCATION	HP	KW	AMPS	VOLTS	Ø	LOCATION	F.B.	I.B.	TYPE	LOCATION	F.B.	I.B.	TYPE	SIZE	COVER				LOCATION	F.B.	I.B.	TYPE	Ø - N	GND		C/B	FUSE			
GATE ACTUATOR No. 1	GATE HOUSE	3/4		6.9	230	1	NOTE 4				BUILT IN									NOTE 2				2 #12	#12	3/4"	2P-15A		PANEL P-1		GATE ACTUATOR No. 1
GATE ACTUATOR No. 2	GATE HOUSE	3/4		6.9	230	1	NOTE 4				BUILT IN									NOTE 2				2 #12	#12	3/4"	2P-15A		PANEL P-1		GATE ACTUATOR No. 2

NOTES:

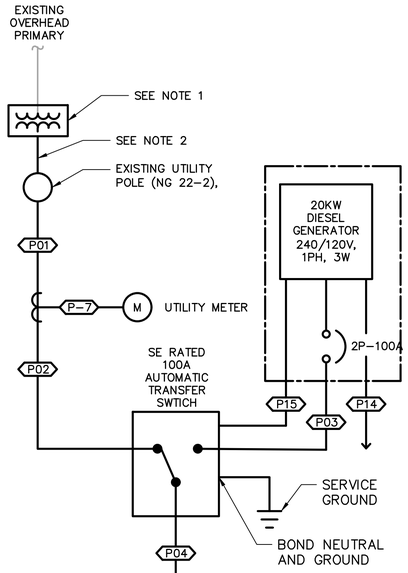
1. DISCONNECT IS INTEGRAL WITH CONTROLLER
2. CONTROLLER DISCONNECT SERVES AS MOTOR DISCONNECT
3. CONTROLLER DISCONNECT SERVES AS CIRCUIT OVERCURRENT DEVICE
4. CIRCUIT OVERCURRENT DEVICE SERVES AS CONTROLLER DISCONNECT

ABBREVIATIONS

A	AMPERE
AQST	AQUASTAT
BI	BUILT IN
CB	CIRCUIT BREAKER
C&P	CORD AND PLUG
CKT	CIRCUIT
CVFD	COMBINATION VARIABLE FREQUENCY DRIVE
COMB	COMBINATION MAGNETIC STARTER
DCOMB	DUPLEX CONTROLLER W/COMB. MAGNETIC STARTERS
DDC	DIRECT DIGITAL CONTROLLER
DM	DAMPER MOTOR
DMAG	DUPLEX CONTROLLER WITH MAGNETIC STARTERS
EMS	ENERGY MANAGEMENT SYSTEM
EMSR	ENERGY MANAGEMENT SYSTEM RELAY
FB	FURNISHED BY (NUMBER INDICATES DIVISION)
FD	FUSED DISCONNECT SWITCH
FHP	FRACTIONAL HORSEPOWER
FS	BOX COVER FUSTAT
FSR	FAN SHUTDOWN RELAY
FS/S	BOX COVER FUSTAT WITH SWITCH
GND	GROUND
HL	HIGH-LOW SELECTOR SWITCH
HOA	HAND-OFF-AUTO SELECTOR SWITCH
HP	HORSEPOWER
IB	INSTALLED BY (NUMBER INDICATES DIVISION)
KW	KILOWATT
LOC	LOCATION
LS	LIGHT SWITCH
LVT	LINE VOLTAGE THERMOSTAT
MAG	MAGNETIC STARTER
MAN	MANUAL STARTER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MSS	MULTI-SPEED SWITCH
MSW	MOTOR RATED TOGGLE SWITCH
N/A	NOT APPLICABLE
NFD	NON-FUSED DISCONNECT SWITCH
OC	OVERCURRENT
OS	OCCUPANCY SENSOR
PACK	PACKAGED CONTROLLER (FURNISHED W/UNIT)
PE	PNEUMATIC ELECTRIC SWITCH
PL	PILOT LIGHT
PNL	PANEL
SES	STACK-END SWITCH
SS	STOP-START PUSHBUTTONS
TBAL	THERMAL BALANCER
VFD	VARIABLE FREQUENCY DRIVE
2S2W	2 SPEED 2 WINDING COMBINATION STARTER
2S1W	2 SPEED 1 WINDING COMBINATION STARTER

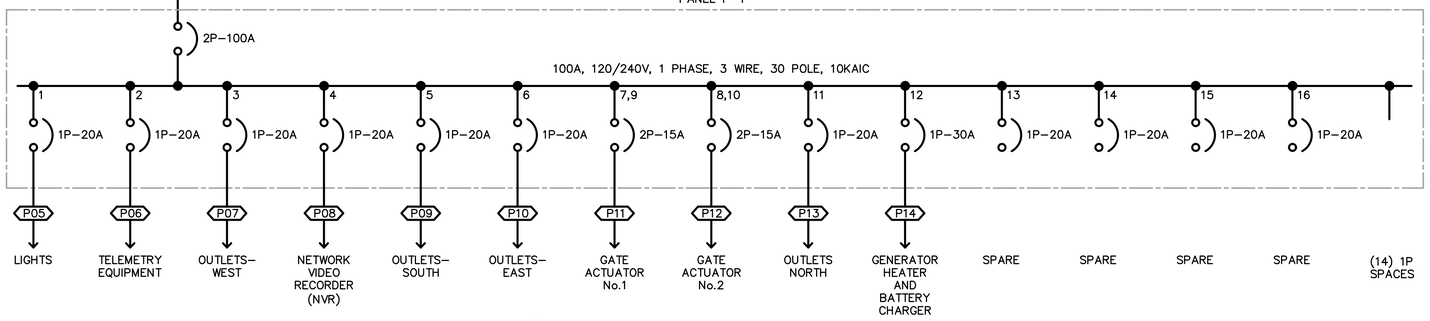
UNIT IDENTIFICATIONS

AC	AIR COMPRESSOR
ACC	AIR COOLED CONDENSER
AD	AIR DRYER
AHU	AIR HANDLING UNIT
ARU	AIR ROTATION UNIT
B	BOILER
BB	BASKETBALL BACKSTOP
BFP	BOILER FEED PUMP
C	CHILLER
CD	COILING DOOR
CF	CEILING FAN
CP	CIRCULATING PUMP
CRP	CONDENSATE RETURN PUMP
CRU	COMPUTER ROOM UNIT
CT	COOLING TOWER
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
DC	DUST COLLECTOR
EDC	ELECTRIC DUCT COIL
EF	EXHAUST FAN
ELEV	ELEVATOR
ER	ELECTRIC RADIATION
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WALL HEATER
FAC	FIRE AIR COMPRESSOR
FC	FOLDING CURTAIN
FCU	FAN COIL UNIT
FP	FUEL OIL PUMP
HAC	HEATED AIR CURTAIN
HD	HAND DRYER
HP	HEAT PUMP
HVACU	HEATING, VENTILATING, A/C UNIT
HVU	HEATING, VENTILATING UNIT
MAU	MAKE-UP AIR UNIT
OD	OVERHEAD DOOR
OW	OPERABLE WALL
PS	PROJECTION SCREEN
RB	RETRACTABLE BLEACHERS
RC	ROLL-UP CURTAIN
REF	RETURN EXHAUST FAN
RF	RETURN FAN
RTU	ROOF TOP UNIT
SB	SPRAY BOOTH
SEP	SEWAGE EJECTOR PUMP
SF	SUPPLY FAN
SP	SUMP PUMP
TC	TRASH COMPACTOR
TCAC	TEMP. CONTROL AIR COMPRESSOR
TCP	TEMP. CONTROL PANEL
TP	TRAY PUMP
UH	UNIT HEATER
UV	UNIT VENTILATOR
WF	WALL FAN
WH	WATER HEATER



NOTES:

1. EXISTING (3) 50KVA 4160Vx208Y/120V POLE MOUNTED TRANSFORMERS ON EXISTING UTILITY POLE (NG 21), TO BE REPLACED BY NATIONAL GRID WITH (1) 25KVA 4160Vx120/240V POLE MOUNTED TRANSFORMER.
2. EXISTING OVERHEAD SECONDARY CONDUCTORS (1/0 QUADRUPLEX) TO BE REPLACE BY NATIONAL GRID.
3. REFER TO MOTOR AND EQUIPMENT SCHEDULE FOR ADDITIONAL INFORMATION.
4. REFER TO CONDUIT AND CABLE SCHEDULE FOR ADDITIONAL INFORMATION.



1 ONE LINE DIAGRAM
E-04 SCALE: NONE

CONDUIT AND CABLE SCHEDULE

CONDUIT	CONDUCTORS PER CONDUIT						FROM	TO	ROUTING	REMARKS
No.	SETS			GND	CNTRL	INSTR				
P01	1	1-1/2"	3 #1	-			UTILITY TRANSFORMER	UTILITY METER	UNDERGROUND AND SURFACE MOUNTED TO UNDERSIDE OF WALKWAY	UNDERGROUND 120/240V, 1 PHASE, SERVICE LATERAL
P02	1	1-1/2"	3 #1	1 #8			UTILITY METER	AUTOMATIC TRANSFER SWITCH	THROUGH EXTERIOR WALL	120/24V, 1 PHASE, ELECTRIC SERVICE FROM UTILITY
P03	1	1-1/2"	3 #1	1 #8			20KW GENERATOR	AUTOMATIC TRANSFER SWITCH	UNDERGROUND AND THROUGH EXTERIOR WALL	120/240V, 1 PHASE, ELECTRIC FEED AND CONTROL WIRING FROM GENERATOR
P04	1	1-1/2"	3 #1	1 #8			AUTOMATIC TRANSFER SWITCH	PANEL P-1	SURFACE MOUNTED	120/240V, 1 PHASE, ELECTRIC SERVICE
P05	1	3/4"	2 #12	1 #12			PANEL P-1	LIGHTS	SURFACE MOUNTED	120V CIRCUIT
P06	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - TELEMETRY	SURFACE MOUNTED	120V CIRCUIT
P07	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - WEST	SURFACE MOUNTED	120V CIRCUIT
P08	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - CCTV	SURFACE MOUNTED	120V CIRCUIT
P09	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - SOUTH	SURFACE MOUNTED	120V CIRCUIT
P10	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - EAST	SURFACE MOUNTED	120V CIRCUIT
P11	1	3/4"	*	*			PANEL P-1	GATE ACTUATOR No. 1	SURFACE MOUNTED	240V CIRCUIT * REFER TO MOTOR AND EQUIPMENT SCHEDULE FOR CONDUCTORS
P12	1	3/4"	*	*			PANEL P-1	GATE ACTUATOR No. 2	SURFACE MOUNTED	240V CIRCUIT * REFER TO MOTOR AND EQUIPMENT SCHEDULE FOR CONDUCTORS
P13	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - NORTH	SURFACE MOUNTED	120V CIRCUIT
P14	1	3/4"	2 #10	1 #10			PANEL P-1	GENERATOR	UNDERGROUND AND SURFACE MOUNTED TO UNDERSIDE OF WALKWAY	120V CIRCUIT FOR HEATER AND BATTERY CHARGER
P15	1	3/4"			6 #14		20KW GENERATOR	AUTOMATIC TRANSFER SWITCH	UNDERGROUND, SURFACE MOUNTED TO UNDERSIDE OF WALKWAY AND THROUGH EXTERIOR WALL	DC CONTROL WIRING
C01	1	1"				SEE REMARKS	UTILITY POLE	TELEMETRY EQUIPMENT CABINET	UNDERGROUND, SURFACE MOUNTED TO UNDERSIDE OF WALKWAY AND THROUGH EXTERIOR WALL	CABLING AND MODEM PROVIDED BY FRONTIER COMMUNICATIONS

PANELBOARD SCHEDULE

P-1 — VOLTS: 120/240 — MAINS RATING: — A.I.C. RATING: 10,000 — LOCATION: GATE HOUSE
PHASE: 1 — MCB: 100A — BRKR SPACE: 30 — SOURCE: A.T.S.
WIRE: 3 — MLO: - — MTG./NEMA #: 12 — FEEDER: 100A

#	LOAD DESCRIPTION	BREAKER AMP	BREAKER POLE	CONNECTED LOAD (kVA) PH. A	PH. B		BREAKER POLE	BREAKER AMP	LOAD DESCRIPTION	#
1	LIGHTS	20	1	0.5	1.5		1	20	TELEMETRY EQUIPMENT	2
3	OUTLETS - WEST	20	1		0.18	1.5	1	20	CCTV - NVR	4
5	OUTLETS - SOUTH	20	1	0.36	0.36		1	20	OUTLETS - EAST	6
7	GATE ACTUATOR - No. 1	15	2		0.80	0.80	2	15	GATE ACTUATOR - No. 2	8
9				0.80	0.80					10
11	OUTLETS- NORTH	20	1		0.36	0.7	1	30	GENERATOR - HEATER/CHARGER	12
13	SPARE	20	1				1	20	SPARE	14
15	SPARE	20	1				1	20	SPARE	16
17	SPACE	-	-				-	-	SPACE	18
19	SPACE	-	-				-	-	SPACE	20
21	SPACE	-	-				-	-	SPACE	22
23	SPACE	-	-				-	-	SPACE	24
25	SPACE	-	-				-	-	SPACE	26
27	SPACE	-	-				-	-	SPACE	28
29	SPACE	-	-				-	-	SPACE	30
TOTAL CONNECTED LOAD PER PHASE:				2.72	2.74		NOTE:			
TOTAL CONNECTED kVA:				5.46						

ARCADIS

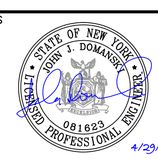
LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

DRAWINGS NOT FOR CONSTRUCTION

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER
BLACK RIVER
REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: OF-E-03
DESIGNED BY: L. BOULERICE
DRAWN BY: K. STEHLE
CHECKED BY: J. DOMANSKI

SHEET TITLE

ELECTRICAL

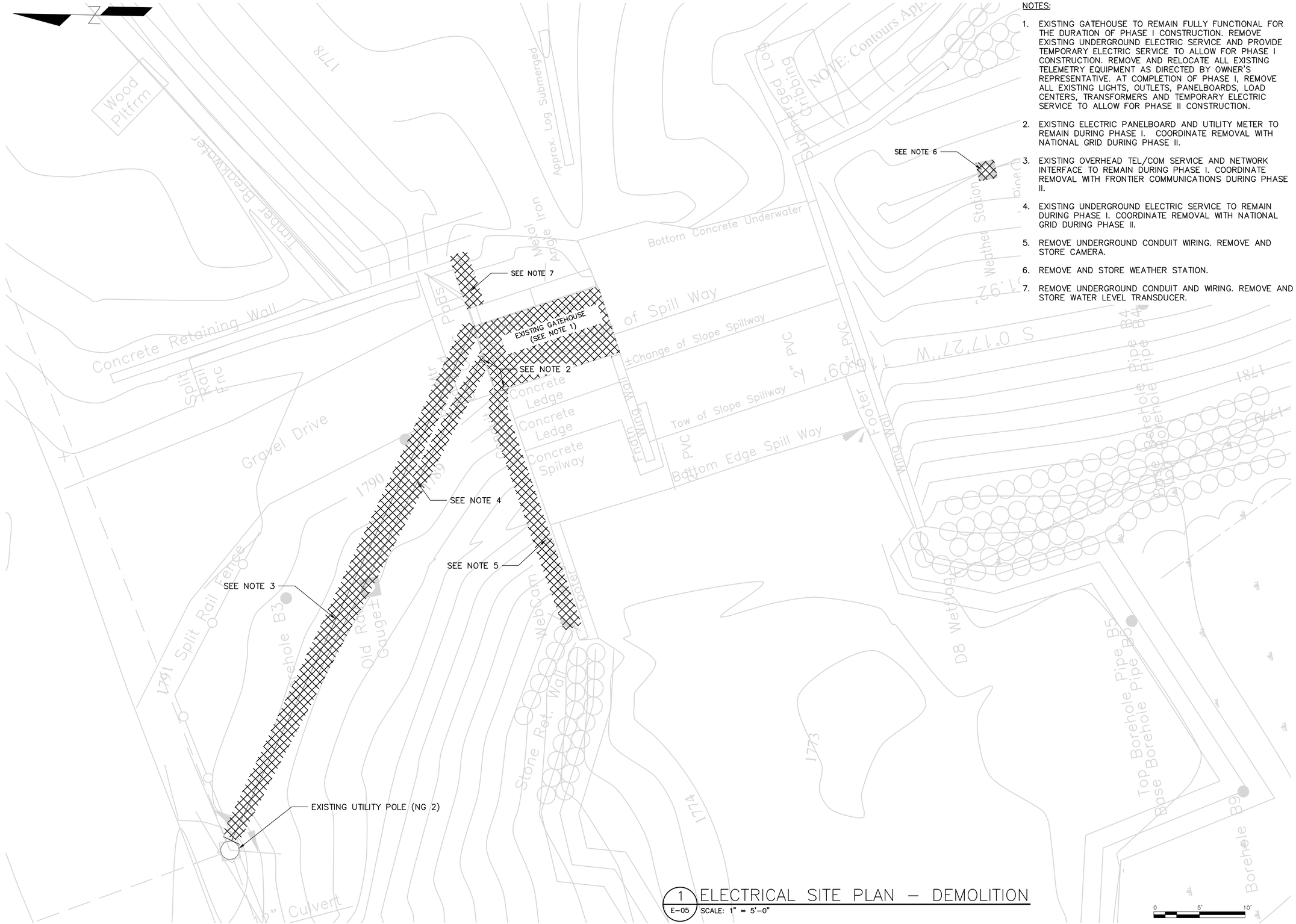
OLD FORGE DAM ONE-LINE DIAGRAM AND SCHEDULES

SCALE: AS INDICATED

E-04

SHEET 4 OF 9

User: AOLSON, Spec: AUS-NCSM00, File: C:\USERS\AOLSON\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.1 - OLD FORGE DAM CADD\03-SHEETS\ELECTRICAL\OF-E-03.DWG
Scale:1:1 Saved Date: 4/29/2025 Time: 09:33 Plot Date: Olson, Arlo; 4/29/2025 09:34 - Layout: -



NOTES:

1. EXISTING GATEHOUSE TO REMAIN FULLY FUNCTIONAL FOR THE DURATION OF PHASE I CONSTRUCTION. REMOVE EXISTING UNDERGROUND ELECTRIC SERVICE AND PROVIDE TEMPORARY ELECTRIC SERVICE TO ALLOW FOR PHASE I CONSTRUCTION. REMOVE AND RELOCATE ALL EXISTING TELEMETRY EQUIPMENT AS DIRECTED BY OWNER'S REPRESENTATIVE. AT COMPLETION OF PHASE I, REMOVE ALL EXISTING LIGHTS, OUTLETS, PANELBOARDS, LOAD CENTERS, TRANSFORMERS AND TEMPORARY ELECTRIC SERVICE TO ALLOW FOR PHASE II CONSTRUCTION.
2. EXISTING ELECTRIC PANELBOARD AND UTILITY METER TO REMAIN DURING PHASE I. COORDINATE REMOVAL WITH NATIONAL GRID DURING PHASE II.
3. EXISTING OVERHEAD TEL/COM SERVICE AND NETWORK INTERFACE TO REMAIN DURING PHASE I. COORDINATE REMOVAL WITH FRONTIER COMMUNICATIONS DURING PHASE II.
4. EXISTING UNDERGROUND ELECTRIC SERVICE TO REMAIN DURING PHASE I. COORDINATE REMOVAL WITH NATIONAL GRID DURING PHASE II.
5. REMOVE UNDERGROUND CONDUIT WIRING. REMOVE AND STORE CAMERA.
6. REMOVE AND STORE WEATHER STATION.
7. REMOVE UNDERGROUND CONDUIT AND WIRING. REMOVE AND STORE WATER LEVEL TRANSDUCER.

1 E-05 ELECTRICAL SITE PLAN – DEMOLITION
SCALE: 1" = 5'-0"

0 5' 10'

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

DRAWINGS NOT FOR CONSTRUCTION

SEALS

STATE OF NEW YORK · JOHN J. DOMANSKI · LICENSED PROFESSIONAL ENGINEER · 081623

4/29/2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-E-02
DESIGNED BY: L. BOULERICE
DRAWN BY: K. STEHLE
CHECKED BY: J. DOMANSKI

SHEET TITLE

ELECTRICAL

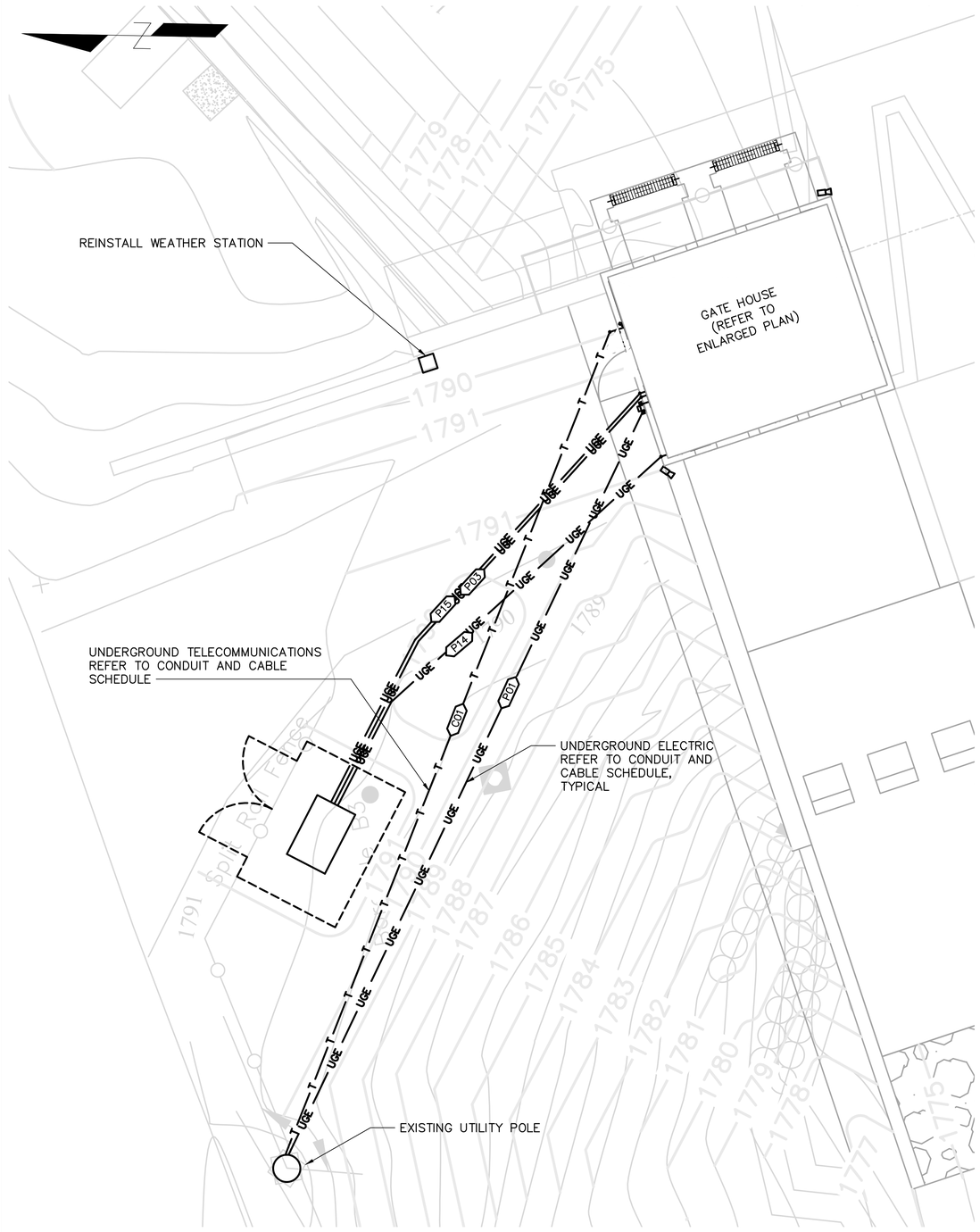
SIXTH LAKE DAM ELECTRICAL DEMOLITION PLAN

SCALE: AS INDICATED

E-05

SHEET 5 OF 9

User: AOLSON Spec: AUS-NCSMOD File: C:\USERS\AOLSON\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\ELECTRICAL\6L-E-02.DWG
Scale: 1:1 SavedDate: 4/29/2025 Time: 09:43 Plot Date: Olson, Arlo: 4/29/2025; 09:43 ; Layout: -

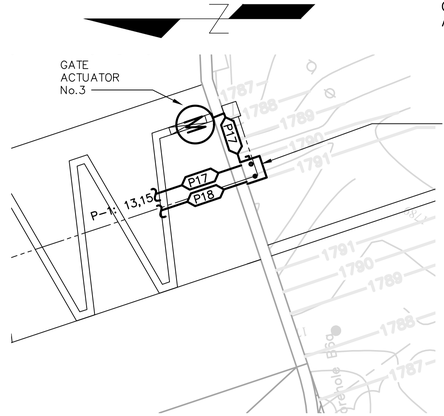


1 E-06 PARTIAL ELECTRICAL SITE PLAN

SCALE: 1" = 5'-0"

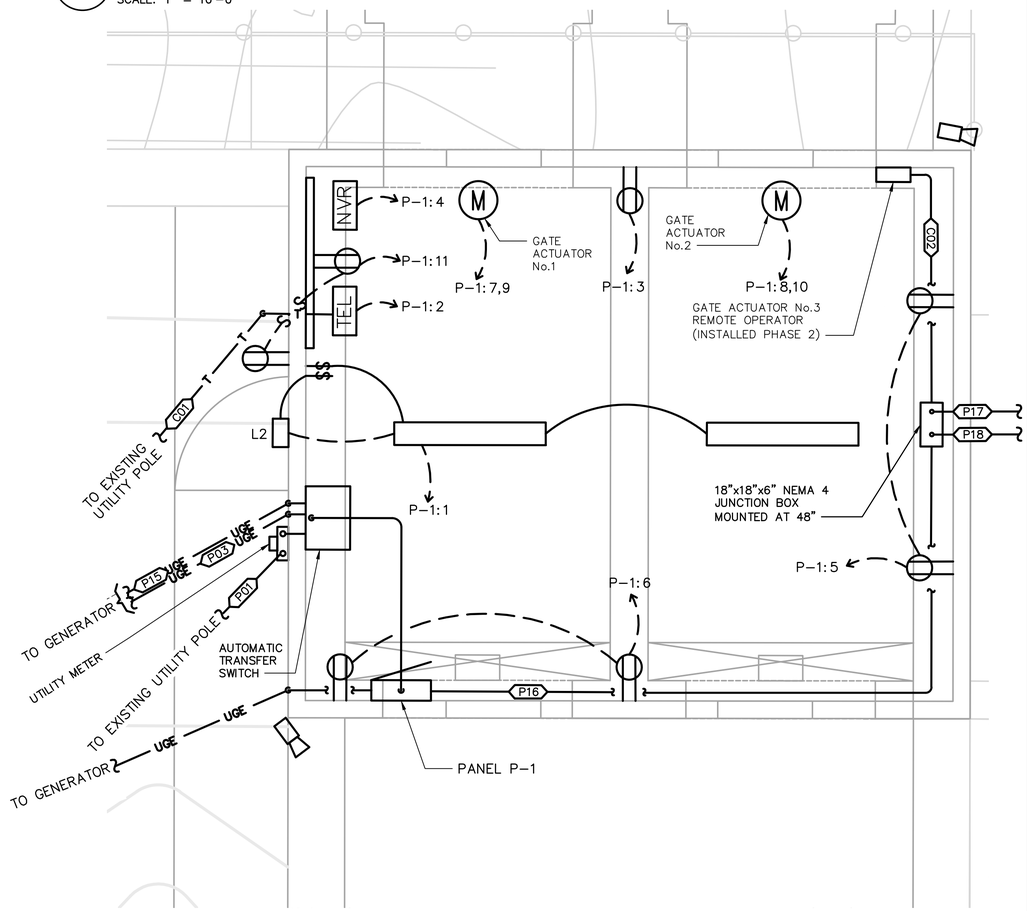
NOTES:

1. EXISTING GATEHOUSE TO REMAIN FULLY FUNCTIONAL FOR THE DURATION OF PHASE I CONSTRUCTION. PROVIDE TEMPORARY ELECTRIC SERVICE TO ALLOW FOR PHASE II CONSTRUCTION. THE OWNER SHALL REMOVE AND RELOCATE ALL EXISTING TELEMETRY EQUIPMENT.



3 E-06 PARTIAL ELECTRICAL SITE PLAN

SCALE: 1" = 10'-0"



2 E-06 ENLARGED ELECTRICAL PLAN

SCALE: 1/2" = 1'-0"

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

DRAWINGS NOT FOR CONSTRUCTION

SEALS

STATE OF NEW YORK · JOHN J. DOMANSKI · 081623 · LICENSED PROFESSIONAL ENGINEER

4/29/2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-E-03
DESIGNED BY: L. BOULERICE
DRAWN BY: K. STEHLE
CHECKED BY: J. DOMANSKI

SHEET TITLE

ELECTRICAL

SIXTH LAKE DAM ELECTRICAL PLANS

SCALE: AS INDICATED

E-06

SHEET 6 OF 9

User: AOLSON Spec: AUS-NCSMOD File: C:\USERS\AOLSON\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\ELECTRICAL\6L-E-03.DWG
Scale: 1:1 Screwdriver: 4/29/2025 Time: 4:14 Plot Date: Oliver, Alex, 4/29/2025, 4:14 PM Layout:

MOTOR AND EQUIPMENT SCHEDULE

UNIT		LOAD					CONTROLLER DISCONNECT				CONTROLLER						DIAG. No.	DIV. 40	DIV. 26	MOTOR DISCONNECT					CONDUCTORS		CONDUIT SIZE	CKT. O.C. DEVICE		POWER SOURCE	REMARKS	UNIT TAG NO.
TAG No.	LOCATION	HP	KW	AMPS	VOLTS	∅	LOCATION	F.B.	I.B.	TYPE	LOCATION	F.B.	I.B.	TYPE	SIZE	COVER		INTERLOCKS	INTERLOCKS	LOCATION	F.B.	I.B.	TYPE		∅ - N	GND		C/B	FUSE			
GATE ACTUATOR No. 1	GATE HOUSE	3/4		6.9	230	1	NOTE 4				BUILT IN									NOTE 2					2 #12	#12	3/4"	2P-15A		PANEL P-1		GATE ACTUATOR No. 1
GATE ACTUATOR No. 2	GATE HOUSE	3/4		6.9	230	1	NOTE 4				BUILT IN									NOTE 2					2 #12	#12	3/4"	2P-15A		PANEL P-1		GATE ACTUATOR No. 2

NOTES:

1. DISCONNECT IS INTEGRAL WITH CONTROLLER
2. CONTROLLER DISCONNECT SERVES AS MOTOR DISCONNECT
3. CONTROLLER DISCONNECT SERVES AS CIRCUIT OVERCURRENT DEVICE
4. CIRCUIT OVERCURRENT DEVICE SERVES AS CONTROLLER DISCONNECT

ABBREVIATIONS

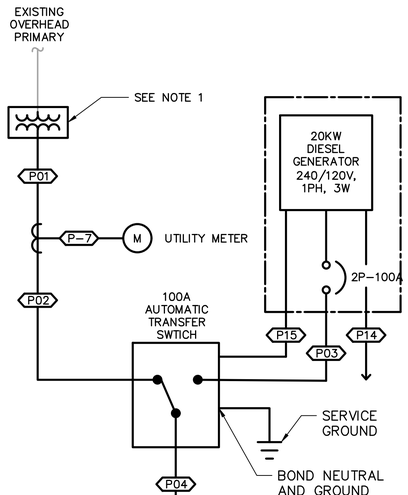
A	AMPERE
AQST	AQUASTAT
BI	BUILT IN
C/B	CIRCUIT BREAKER
C&P	CORD AND PLUG
CKT	CIRCUIT
CVFD	COMBINATION VARIABLE FREQUENCY DRIVE
COMB	COMBINATION MAGNETIC STARTER
DCOMB	DUPLEX CONTROLLER W/COMB. MAGNETIC STARTERS
DDC	DIRECT DIGITAL CONTROLLER
DM	DAMPER MOTOR
DMAG	DUPLEX CONTROLLER WITH MAGNETIC STARTERS
EMS	ENERGY MANAGEMENT SYSTEM
EMSR	ENERGY MANAGEMENT SYSTEM RELAY
FB	FURNISHED BY (NUMBER INDICATES DIVISION)
FD	FUSED DISCONNECT SWITCH
FHP	FRACTIONAL HORSEPOWER
FS	BOX COVER FUSTAT
FSR	FAN SHUTDOWN RELAY
FS/S	BOX COVER FUSTAT WITH SWITCH
GND	GROUND
HL	HIGH-LOW SELECTOR SWITCH
HOA	HAND-OFF-AUTO SELECTOR SWITCH
HP	HORSEPOWER
IB	INSTALLED BY (NUMBER INDICATES DIVISION)
KW	KILOWATT
LOC	LOCATION
LS	LIGHT SWITCH
LVT	LINE VOLTAGE THERMOSTAT
MAG	MAGNETIC STARTER
MAN	MANUAL STARTER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MSS	MULTI-SPEED SWITCH
MSW	MOTOR RATED TOGGLE SWITCH
N/A	NOT APPLICABLE
NFD	NON-FUSED DISCONNECT SWITCH
OC	OVERCURRENT
OS	OCCUPANCY SENSOR
PACK	PACKAGED CONTROLLER (FURNISHED W/UNIT)
PE	PNEUMATIC ELECTRIC SWITCH
PL	PILOT LIGHT
PNL	PANEL
SES	STACK-END SWITCH
SS	STOP-START PUSHBUTTONS
TBAL	THERMAL BALANCER
VFD	VARIABLE FREQUENCY DRIVE
2S2W	2 SPEED 2 WINDING COMBINATION STARTER
2S1W	2 SPEED 1 WINDING COMBINATION STARTER

UNIT IDENTIFICATIONS

AC	AIR COMPRESSOR
ACC	AIR COOLED CONDENSER
AD	AIR DRYER
AHU	AIR HANDLING UNIT
ARU	AIR ROTATION UNIT
AWC	ELECTRIC WATER COOLER
AWH	ELECTRIC WALL HEATER
FAC	FIRE AIR COMPRESSOR
FC	FOLDING CURTAIN
FCU	FAN COIL UNIT
FP	FUEL OIL PUMP
HAC	HEATED AIR CURTAIN
HD	HAND DRYER
HP	HEAT PUMP
HVACU	HEATING, VENTILATING, A/C UNIT
HVU	HEATING, VENTILATING UNIT
MAU	MAKE-UP AIR UNIT
OD	OVERHEAD DOOR
OW	OPERABLE WALL
EDC	ELECTRIC DUCT COIL
EF	EXHAUST FAN
ELEV	ELEVATOR
ER	ELECTRIC RADIATION
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WALL HEATER
FAC	FIRE AIR COMPRESSOR
FC	FOLDING CURTAIN
FCU	FAN COIL UNIT
FP	FUEL OIL PUMP
HAC	HEATED AIR CURTAIN
HD	HAND DRYER
HP	HEAT PUMP
HVACU	HEATING, VENTILATING, A/C UNIT
HVU	HEATING, VENTILATING UNIT
MAU	MAKE-UP AIR UNIT
OD	OVERHEAD DOOR
OW	OPERABLE WALL
PS	PROJECTION SCREEN
RB	RETRACTABLE BLEACHERS
RC	ROLL-UP CURTAIN
REF	RETURN EXHAUST FAN
RF	RETURN FAN
RTU	ROOF TOP UNIT
SB	SPRAY BOOTH
SEP	SEWAGE EJECTOR PUMP
SF	SUPPLY FAN
SP	SUMP PUMP
TC	TRASH COMPACTOR
TCAC	TEMP. CONTROL AIR COMPRESSOR
TCP	TEMP. CONTROL PANEL
TP	TRAY PUMP
UH	UNIT HEATER
UV	UNIT VENTILATOR
WF	WALL FAN
WH	WATER HEATER

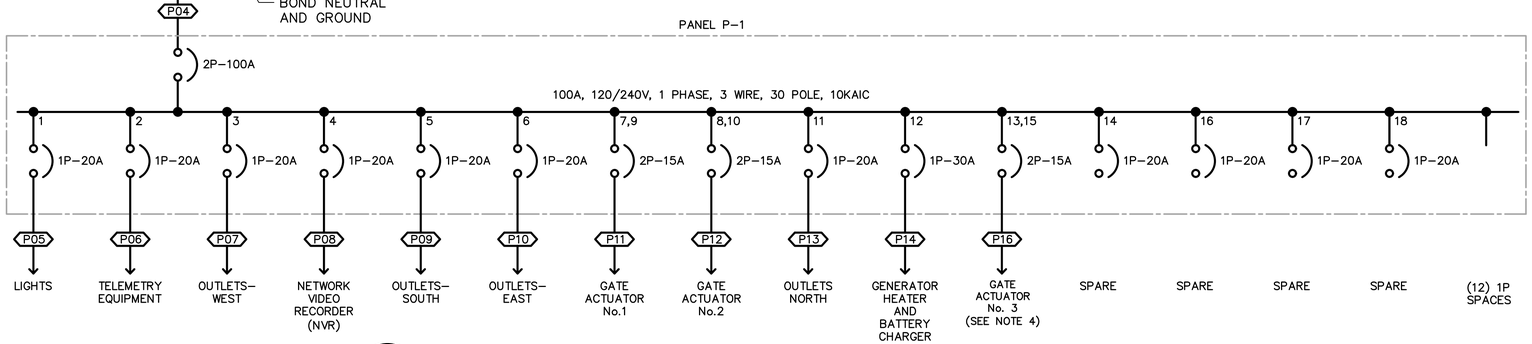
CONDUIT AND CABLE SCHEDULE

CONDUIT			CONDUCTORS PER CONDUIT				FROM	TO	ROUTING	REMARKS
No.	SETS	SIZE	POWER	GND	CNTRL	INSTR				
P01	1	1-1/2"	3 #1	-			UTILITY TRANSFORMER	UTILITY METER	UNDERGROUND	UNDERGROUND 120/240V, 1 PHASE, SERVICE LATERAL
P02	1	1-1/2"	3 #1	1 #8			UTILITY METER	AUTOMATIC TRANSFER SWITCH	THROUGH EXTERIOR WALL	120/24V, 1 PHASE, ELECTRIC SERVICE FROM UTILITY
P03	1	1-1/2"	3 #1	1 #8			20KW GENERATOR	AUTOMATIC TRANSFER SWITCH	UNDERGROUND AND THROUGH EXTERIOR WALL	120/240V, 1 PHASE, ELECTRIC FEED AND CONTROL WIRING FROM GENERATOR
P04	1	1-1/2"	3 #1	1 #8			AUTOMATIC TRANSFER SWITCH	PANEL P-1	SURFACE MOUNTED	120/240V, 1 PHASE, ELECTRIC SERVICE
P05	1	3/4"	2 #12	1 #12			PANEL P-1	LIGHTS	SURFACE MOUNTED	120V CIRCUIT
P06	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - TELEMETRY	SURFACE MOUNTED	120V CIRCUIT
P07	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - WEST	SURFACE MOUNTED	120V CIRCUIT
P08	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - CCTV	SURFACE MOUNTED	120V CIRCUIT
P09	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - SOUTH	SURFACE MOUNTED	120V CIRCUIT
P10	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - EAST	SURFACE MOUNTED	120V CIRCUIT
P11	1	3/4"	3 #12	1 #12			PANEL P-1	GATE ACTUATOR No. 1	SURFACE MOUNTED	240V CIRCUIT
P12	1	3/4"	3 #12	1 #12			PANEL P-1	GATE ACTUATOR No. 2	SURFACE MOUNTED	240V CIRCUIT
P13	1	3/4"	2 #12	1 #12			PANEL P-1	OUTLETS - NORTH	SURFACE MOUNTED	120V CIRCUIT
P14	1	3/4"	2 #10	1 #10			PANEL P-1	GENERATOR	UNDERGROUND	120V CIRCUIT FOR HEATER AND BATTERY CHARGER
P15	1	3/4"			6 #14		20KW GENERATOR	AUTOMATIC TRANSFER SWITCH	UNDERGROUND AND THROUGH EXTERIOR WALL	DC CONTROL WIRING
P16	1	*	*	*			PANEL P-1	18"X18"X6" JUNCTION BOX	SURFACE MOUNTED	240V CIRCUIT * REFER TO MOTOR AND EQUIPMENT SCHEDULE FOR CONDUCTORS
P17	1	1-1/2"	2 #10	1 #10	11 #14		18"X18"X6" JUNCTION BOX	GATE ACTUATOR No. 3	EMBEDDED IN CONCRETE SPILLWAY STRUCTURE	240V CIRCUIT AND CONTROL WIRING FOR REMOTE OPERATOR
P18	1	1-1/2"					18"X18"X6" JUNCTION BOX	GATE ACTUATOR No. 3	EMBEDDED IN CONCRETE SPILLWAY STRUCTURE	SPARE CONDUIT WITH PULL CORD
C01	1	1"				SEE REMARKS	UTILITY POLE	TELEMETRY EQUIPMENT CABINET	UNDERGROUND AND THROUGH EXTERIOR WALL	CABLING AND MODEM PROVIDED BY FRONTIER COMMUNICATIONS
C02	1	1"			11 #14		REMOTE OPERATOR (INSTALLED PHASE 2)	18"X18"X6" JUNCTION BOX	SURFACE MOUNTED	CONTROL WIRING FOR REMOTE OPERATOR



NOTES:

1. EXISTING (3) 50KVA 4160Vx208Y/120V POLE MOUNTED TRANSFORMERS ON EXISTING UTILITY POLE (NG 2), TO BE REPLACED BY NATIONAL GRID WITH (1) 25KVA 4160Vx120/240V POLE MOUNTED TRANSFORMER.
2. REFER TO MOTOR AND EQUIPMENT SCHEDULE FOR ADDITIONAL INFORMATION.
3. REFER TO CONDUIT AND CABLE SCHEDULE FOR ADDITIONAL INFORMATION.
4. PROVIDE TEMPORARY ELECTRIC SERVICE AND CONTROLS DURING CONSTRUCTION TO OPERATE GATE ACTUATOR. COORDINATE WITH OWNER'S REPRESENTATIVE AND UTILITY COMPANY. REMOVE TEMPORARY SERVICE AND CONTROLS ONCE CONSTRUCTION IS COMPLETE.



1 / E-07 ONE LINE DIAGRAM
SCALE: NONE

PANELBOARD SCHEDULE

P-1 — VOLTS: 120/240 | MAINS RATING: | A.I.C. RATING: 10,000 | LOCATION: GATE HOUSE
PHASE: 1 | MCB: 100A | BRKR SPACE: 30 | SOURCE: A.T.S.
WIRE: 3 | M.L.O. | MTG./NEMA #: 12 | FEEDER: 100A

#	LOAD DESCRIPTION	BREAKER AMP	BREAKER POLE	CONNECTED LOAD (kVA) PH. A	PH. B		BREAKER POLE	BREAKER AMP	LOAD DESCRIPTION	#
1	LIGHTS	20	1	0.5	1.5		1	20	TELEMETRY EQUIPMENT	2
3	OUTLETS - WEST	20	1		0.2	1.5	1	20	CCTV - NVR	4
5	OUTLETS - SOUTH	20	1	0.4	0.4		1	20	OUTLETS - EAST	6
7	GATE ACTUATOR - No. 1	15	2		0.8	0.8	2	15	GATE ACTUATOR - No. 2	8
9				0.8	0.8					10
11	OUTLETS- NORTH	20	1		0.4	0.7	1	30	GENERATOR - HEATER/CHARGER	12
13	GATE ACTUATOR - No. 3	15	2	0.8			1	20	SPARE	14
15					0.8		1	20	SPARE	16
17	SPARE	20	1				1	20	SPARE	18
19	SPACE	-	-				-	-	SPACE	20
21	SPACE	-	-				-	-	SPACE	22
23	SPACE	-	-				-	-	SPACE	24
25	SPACE	-	-				-	-	SPACE	26
27	SPACE	-	-				-	-	SPACE	28
29	SPACE	-	-				-	-	SPACE	30

TOTAL CONNECTED LOAD PER PHASE: 5.12 | 5.14
TOTAL CONNECTED kVA: 10.26
NOTE:

ARCADIS
LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

DRAWINGS NOT FOR CONSTRUCTION

SEALS

STATE OF NEW YORK · JOHN J. DOMANSKI · 081623 · LICENSED PROFESSIONAL ENGINEER
4/29/2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L–E–04
DESIGNED BY: L. BOULERICE
DRAWN BY: K. STEHLE
CHECKED BY: J. DOMANSKI

SHEET TITLE

ELECTRICAL

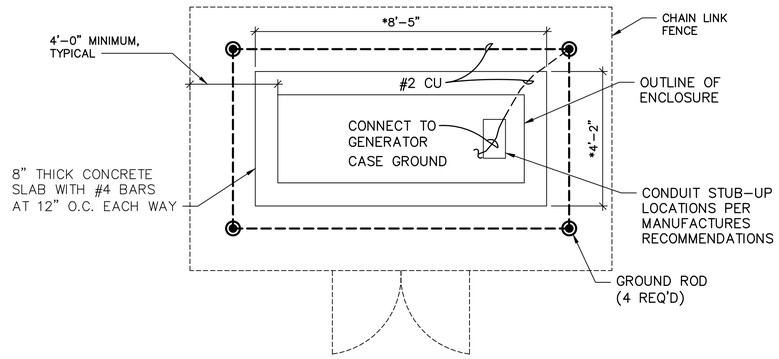
SIXTH LAKE DAM ONE–LINE DIAGRAM AND SCHEDULES

SCALE: AS INDICATED

E–07

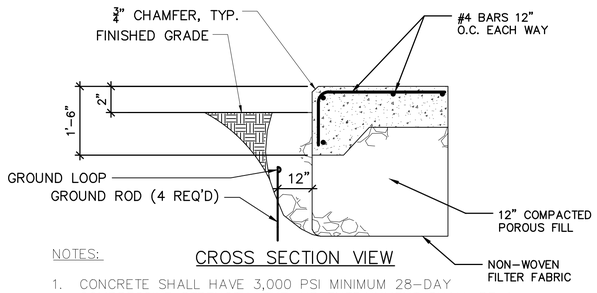
SHEET 7 OF 9

User: AGLSON Spec: AIS-NCSM0 File:C:\USERS\AGLSON\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\ELECTRICAL\6L-E-04.DWG
Scale:1:1 SavedDate:4/29/2025 Time:12:08 Plot Date: Olson, Aric; 4/29/2025; 12:08 ; Layout:-



DIMENSIONS ARE APPROXIMATE. ACTUAL DIMENSIONS SHALL BE AS A MINIMUM 6" LARGER THAN ACTUAL GENERATOR ENCLOSURES

PLAN VIEW



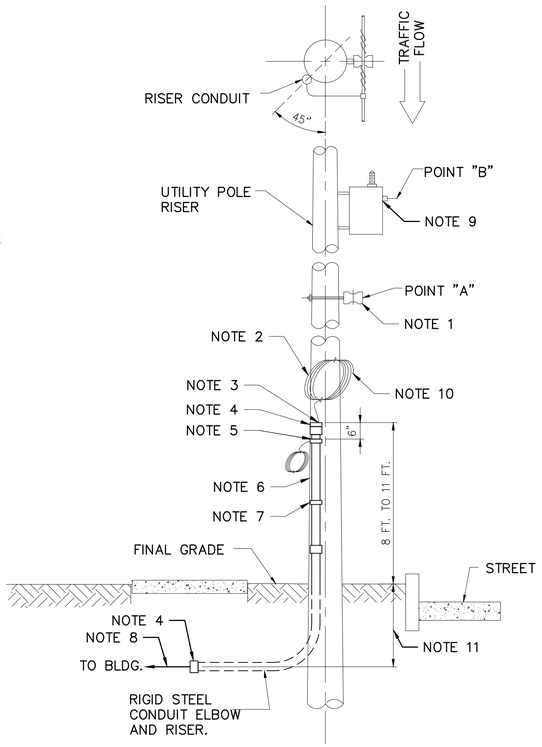
NOTES:

1. CONCRETE SHALL HAVE 3,000 PSI MINIMUM 28–DAY COMPRESSIVE STRENGTH. THE AIR ENTRAINMENT SHALL BE A MINIMUM OF 3% TO 5%
2. .
3. CONCRETE SHALL CURE FOR MINIMUM OF 30 DAYS PRIOR TO PLACEMENT OF GENERATOR SET AND FUEL STORAGE TANK.

CROSS SECTION VIEW

1 E–08 GENERATOR PAD AND GROUNDING DETAIL

SCALE: NONE

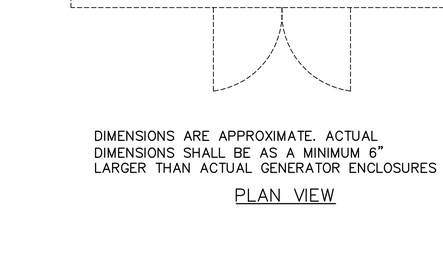


2 E–08 RISER POLE DETAIL

SCALE: NONE

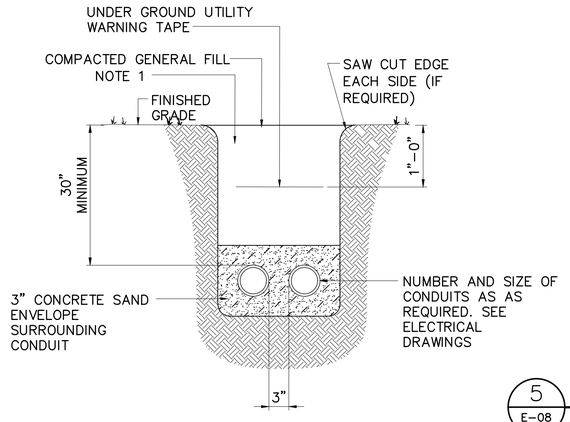
RISER NOTES

1. UTILITY COMPANY'S SECONDARY RACK–POINT "A".
2. SERVICE LATERAL CABLE TO BE FURNISHED AND INSTALLED BY CUSTOMER. IT MUST BE LONG ENOUGH TO EXTEND 3 FT. (900 MM) ABOVE POINT "A" OR "B" WITHOUT A SPLICE. IF SECONDARY RACK IS NOT ON POLE, ASK UTILITY COMPANY FOR ITS LOCATION. PENDING CONNECTION BY UTILITY COMPANY, TEMPORARILY SECURE CABLE TO POLE TO PREVENT DAMAGE.
3. PROVIDE DUCT SEAL.
4. INSULATING BUSHING.
5. FOR GALVANIZED STEEL CONDUIT ELBOWS, THEY SHALL BE GROUNDED BY BONDING TO AN APPROVED V–BOLT TYPE GROUND CLAMP 6" (150 MM) FROM TOP OF THE CONDUIT. A CONDUCTOR OF SUFFICIENT LENGTH SHALL BE PROVIDED TO EXTEND 24" (600 MM) BEYOND THE UTILITY COMPANY'S SECONDARY NEUTRAL. THE CONDUCTOR SHALL BE SIZED AS REQUIRED BY THE NATIONAL ELECTRICAL CODE, ARTICLE 250, BUT IN NO CASE SHALL IT BE SMALLER THAN #4 AWG COPPER. RECOMMEND USE OF CORROSION RESISTANT BEND IN LOCATIONS SUBJECT TO HIGHWAY SALTING.
6. PROVIDE RIGID GALVANIZED STEEL RISER CONDUIT. THE CONDUIT SHALL RISE ON THE SIDE OF THE POLE AWAY FROM TRAFFIC. CONSULT UTILITY COMPANY FOR PROPER LOCATION ON POLE.
7. PIPE STRAPS, INSTALL AT NOT MORE THAN 30" (750 MM) INTERVALS.
8. SERVICE LATERAL TO BUILDING.
9. UTILITY COMPANY'S TRANSFORMER SECONDARY TERMINALS –– POINT "B".
10. SEAL CABLE ENDS TO PREVENT ENTRANCE OF MOISTURE DURING CONSTRUCTION.
11. THE BURIAL DEPTH SHALL BE 30" MINIMUM.
12. ROUTE SPARE CONDUIT 12" ABOVE FINISHED GRADE. CAP AND SEAL WATERTHIGHT.



3 E–08 CAMERA WALL MOUNTING DETAIL

SCALE: NONE

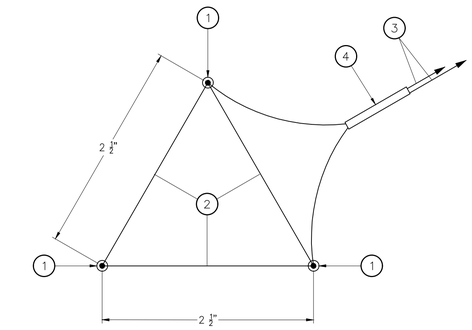


DUCT NOTES

1. REPLACE EXISTING SURFACE CONDITIONS IN KIND TO INCLUDE, BUT NOT LIMITED TO: CONCRETE, CRUSHED STONE, SELECT GRAVEL, ASPHALT, TOPSOIL AND GRASS.

4 E–08 TYPICAL DIRECT BURIED CONDUIT(S) DETAIL

SCALE: NONE



CODED NOTES

1. 3/4"x10'–0" COPPERWELD GROUND ROD. TOP OF GROUND ROD SHALL BE 12" MINIMUM BELOW FINISHED GRADE.
2. #4/0 BARE STRANDED COPPER GROUND GRID CONDUCTOR.
3. #4/0 BARE STRANDED COPPER GROUNDING ELECTRODE CONDUCTOR.
4. 2" PVC SCHEDULE 40 CONDUIT FROM GROUNDING GRID TO EQUIPMENT.

5 E–08 ELECTRICAL SERVICE GROUNDING GRID DETAIL

SCALE: NONE

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

DRAWINGS NOT FOR CONSTRUCTION

SEALS

STATE OF NEW YORK • JOHN J. DOMANSKI • 081623 • LICENSED PROFESSIONAL ENGINEER
4/29/2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L–E–05
DESIGNED BY: L. BOULERICE
DRAWN BY: K. STEHLE
CHECKED BY: J. DOMANSKI

SHEET TITLE

ELECTRICAL

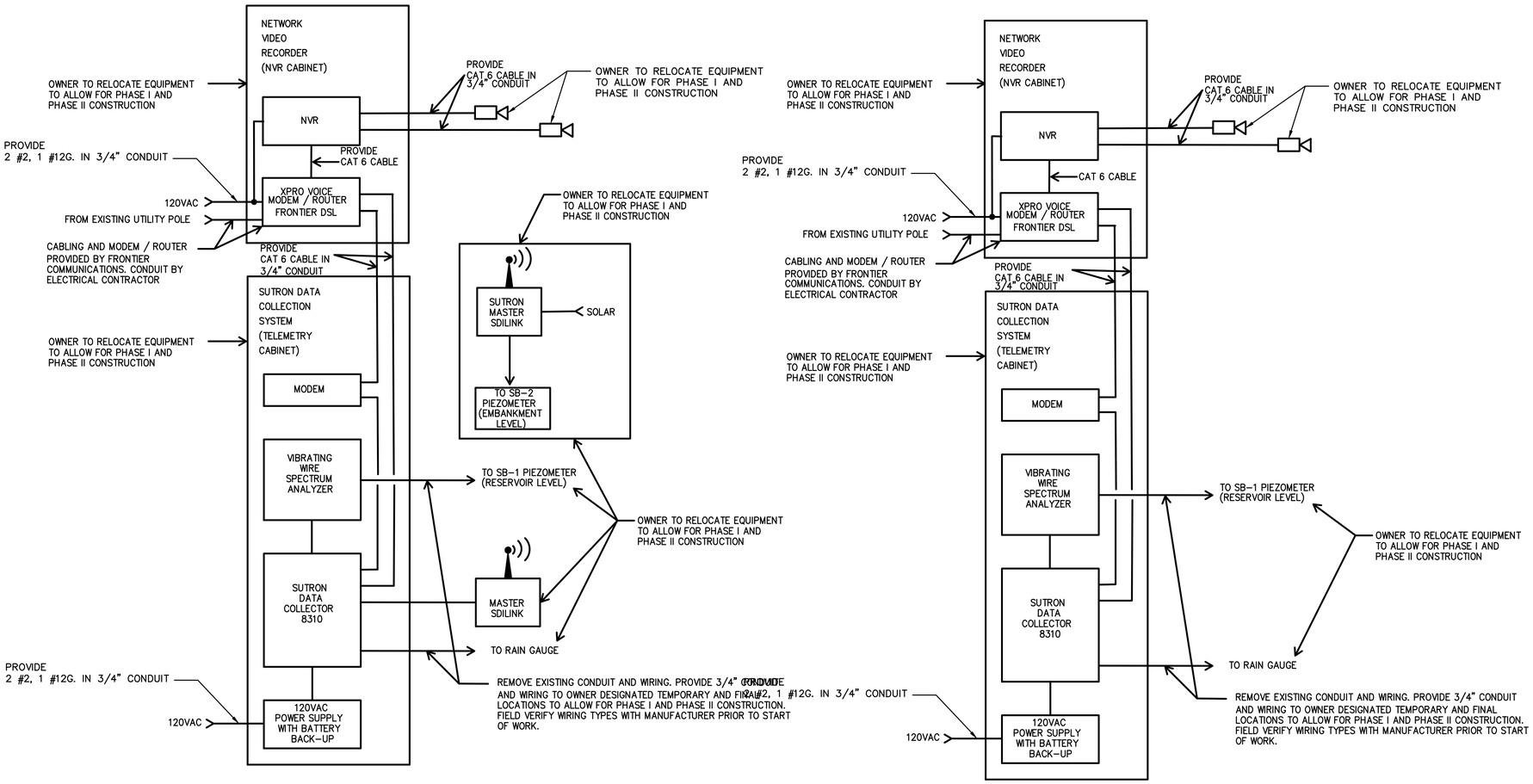
DETAILS

SCALE: AS INDICATED

E–08

SHEET 8 OF 9

User:AOLSON Spec:AUS–NCSMOD File:C:\USERS\AOLSON\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM – DOCUMENTS\6.0 CADD\6.2 – SIXTH LAKE DAM CADD\03–SHEETS\ELECTRICAL\6L–E–05.DWG
Scale:1:1 SavedDate:4/29/2025 Time:14:10 Plot Date: Olson, Aric; 4/29/2025; 14:10 ; Layout:–



1 E-09 TELEMETRY AND SECURITY CAMERA SYSTEMS BLOCK DIAGRAMS

SCALE: NONE

ARCADIS

LEGAL ENTITY:
ARCADIS OF NEW YORK, INC.

CONSULTANTS

WARNING – IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

DRAWINGS NOT FOR CONSTRUCTION

SEALS

STATE OF NEW YORK · JOHN J. DOMANSKI · LICENSED PROFESSIONAL ENGINEER · 081623

4/29/2025

HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM – REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS OF NEW YORK, INC. 2025

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME: 6L-E-06
DESIGNED BY: L. BOULERICE
DRAWN BY: K. STEHLE
CHECKED BY: J. DOMANSKI

SHEET TITLE

ELECTRICAL

BLOCK DIAGRAMS

SCALE: AS INDICATED

E-09

SHEET 9 OF 9

User:AOLSON Spec:AUS-NCSMOD File:C:\USERS\AOLSON\ARCADIS\OLD FORGE DAM & SIXTH LAKE DAM - DOCUMENTS\6.0 CADD\6.2 - SIXTH LAKE DAM CADD\03-SHEETS\ELECTRICAL\6L-E-06.DWG
Scale:1:1 SavedDate:4/29/2025 Time:14:10 Plot Date: Olson, Arlo; 4/29/2025; 14:10 ; Layout:-

ABBREVIATIONS:

ACOUS	ACOUSTICAL
ACT	ACOUSTICAL CEILING TILE
ADMIN	ADMINISTRATION
AFF	ABOVE FINISH FLOOR
ALUM	ALUMINUM
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
BM	BEAM
BTWN	BETWEEN
BLK	BLOCK
BD	BOARD
BOT	BOTTOM
BO	BOTTOM OF
BRK	BRICK
BC	BRICK COURSES
BLDG	BUILDING
CAB	CABINET
CIP	CAST IN PLACE
CLG	CEILING
CT	CERAMIC TILE
CLO	CLOSET
COL	COLUMN
CONC	CONCRETE
CMU	CONCRETE MASONRY UNIT
CONSTR	CONSTRUCTION
CONT	CONTINUOUS
CJ	CONTROL JOINT
CORR	CORRIDOR
CU	CUBIC
CLR	CLEAR
DEMO	DEMOLITION
DIA	DIAMETER
DIM	DIMENSION
DN	DOWN
DWG	DRAWING
DF	DRINKING FOUNTAIN
DFE	DESIGN FLOOD ELEVATION
EA	EACH
E	EAST
EWC	ELECTRIC WATER COOLER
ELEC	ELECTRICAL
EL	ELEVATION
EMBED	EMBEDMENT
ENGR	ENGINEER
EQ	EQUAL
EQUIP	EQUIPMENT
EX	EXISTING
EXP	EXPANSION
EJ	EXPANSION JOINT
EXT	EXTERIOR
FT	FEET
FRP	FIBER REINFORCED PLASTIC
FIN FLR	FINISH FLOOR
FE	FIRE EXTINGUISHER
FIXT	FIXTURE
FLR	FLOOR
FD	FLOOR DRAIN
FDTN	FOUNDATION
GA	GAUGE
GALV	GALVANIZED
GEN	GENERAL
GR	GRADE
GYP	GYPSUM
HDW	HARDWARE
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
HT	HEIGHT
HPT	HIGH POINT
HM	HOLLOW METAL
HORIZ	HORIZONTAL
INFO	INFORMATION
IN	INCH
ID	INSIDE DIMENSION
INSUL	INSULATION
INT	INTERIOR
JC	JANITOR'S CLOSET
JT	JOINT
LAB	LABORATORY
LAV	LAVATORY
LPT	LOW POINT
MFR	MANUFACTURER
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MTL	METAL
MEZZ	MEZZANINE
MIN	MINIMUM
MISC	MISCELLANEOUS
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
N	NORTH
NTS	NOT TO SCALE
NO	NUMBER
OC	ON CENTER
OPNG	OPENING
OPP	OPPOSITE
OD	OUTSIDE DIAMETER
OHCD	OVERHEAD COILING DOOR
PNT	PAINT(ED)
PL	PLATE
PLBG	PLUMBING
PVC	POLYVINYL CHLORIDE
PVF	POLYVINYL FLUORIDE
PCP	PORTLAND CEMENT PLASTER
PSF	POUNDS PER SQUARE FOOT
PT	PRESSURE TREATED
QUAN	QUANTITY
RAD	RADIUS
REF	REFERENCE
REINF	REINFORCING
REQD	REQUIRED
R	RISER
RM	ROOM
RO	ROUGH OPENING
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
S	SOUTH
SPECS	SPECIFICATIONS
SQ	SQUARE
SST	STAINLESS STEEL
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SYS	SYSTEM
TEMP	TEMPORARY
THK	THICK(NESS)
TOS	TOP OF SLAB/STEEL
T	TREAD
TYP	TYPICAL
UL	UNDERWRITER'S LABORATORIES
UON	UNLESS OTHERWISE NOTED
VAR	VARIES
VERT	VERTICAL
VT	VINYL TILE
VP	VISION PANEL
WC	WATER CLOSET
WT	WEIGHT
W	WEST
W/	WITH
W/OUT	WITHOUT
WD	WOOD

LEGEND OF SYMBOLS:

- A — STRUCTURAL COLUMN CENTERLINE WALL CENTERLINE IF NOT COLUMN
- # — NUMBER
- # — ACCESSORY, LAB FURNITURE & EQUIPMENT KEY
- A-0X — BUILDING ELEVATION
- 1 / A-0X — BUILDING SECTION
- 1 / A-0X — WALL SECTION
- 1 / A-0X — DETAIL CUT
- CENTERLINE
- DIAMETER
- ### — ROOM NUMBER
- ## — WINDOW NUMBER SYMBOL
- ## — DOOR NUMBER SYMBOL
- A — WALL PARTITION TYPE
- ELEVATION INDICATION
- EXISTING
- DEMOLISHED
- PROPOSED
- DEMOLISHED AREA (DEMOLITION PLANS ONLY)

LEGEND OF HATCH PATTERNS:

- GENERAL FILL
- GRATING
- STEEL
- BRICK
- CMU
- CONCRETE
- GROUT
- RIGID INSULATION
- WOOD
- WOOD FINISHED
- CHECKERED PLATE
- GRAVEL

GENERAL NOTES:

1. ALL WORK SHALL BE INSTALLED IN ACCORDANCE WITH THE 2020 BUILDING CODE OF NEW YORK STATE, AND THE FAMILY OF NEW YORK CODES.
2. CONSTRUCTION WORK SHALL BE PERFORMED IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS AND CODE AND OSHA 1926 REGULATIONS.
3. THE LEGEND AND ABBREVIATIONS LIST ON THIS SHEET IS A STANDARD GUIDE INTENDED FOR GENERAL USE ON ALL PROJECTS. THEREFORE NOT ALL THE SYMBOLS AND ABBREVIATIONS CONTAINED IN THIS LIST ARE NECESSARILY USED ON THIS PARTICULAR PROJECT AND SHOULD BE USED FOR CLARIFICATION ONLY.
4. ITEMS NOT NOTED ON SHEETS SHALL BE CONSIDERED THE SAME AS NOTED ITEMS WHICH ARE GRAPHICALLY REPRESENTED IN THE SAME MANNER.
5. FOR CONCRETE AND STEEL SIZES AND CONFIGURATIONS SEE 'S' SHEETS.
6. FOR FINAL GRADING AND BUILDING LOCATION SEE 'C' SHEETS.
7. * (ASTERISK) MEANS VERIFY DIMENSION WITH MANUFACTURER OF EQUIPMENT SUPPLIED OR IN FIELD. FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS.
8. ALL SAW CUTTING AND CORING SHALL BE BY WETTING OF THE AREA UNLESS ADJACENT TO SENSITIVE EQUIPMENT.
9. ALL DUST AND DEBRIS SHALL BE REMOVED FROM WORK AREA ON DAILY BASIS.
10. INSTALL DOOR FRAMES AS SHOWN AND SPECIFIED AS THE WORK PROGRESSES. DO NOT HANG DOORS AND INSTALL FINISH HARDWARE UNTIL ALL WORK BY ALL CONTRACTORS HAS BEEN COOPLETED IN AN AREA AND THERE ARE NO FURTHER CONSTRUCTION SCTIVITIES OR REQUIRED ENTRY BY ANY CONTRACTOR. DOORS AND FINISHED HARDWARE INSTALLED AND SUBSEQUENTLY DAMAGED IN ANY WAY FOR ANY REASON SHALL BE IMMEDIATELY REPLACED BY THE GENERAL CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. IMMEDIATELY MEANS FROM THE TIME THE DAMAGE IS OBSERVED AND REPORTED TO THE GENERAL CONTRACTOR BY CONSTRUCTION MANAGEMENT TO THE TIME OF REINSTALLATION SHALL NOT BE MORE THAN ONE MONTH.
11. DOOR FRAMES SHALL BE BOXED OUT IN WOOD TO PREVENT CONSTRUCTION DAMAGE. INSTALL TEMPORARY 3/4" PLYWOOD DOORS AND LOCKS. REMOVE WHEN CONSTRUCTION ACCESS AND ACTIVITIES ARE FINISHED IN AN AREA AT THE TIME WHEN DOORS AND FINISH HARDWARE ARE INSTALLED.
12. PAINTING - CORDINATE INSTALLATION OF PAINTING IN ORDER TO PERFORM WORK BEFORE INSTALLATION OF WORK PERFORMED UNDER OTHER TRADES.
13. CAREFULLY REMOVE EXISTING BUILDING SIGNAGE THAT IS TO BE REPLICATED ON NEW GATE HOUSE. DOCUMENT THE TEXT, FONT TYPE, FONT SIZE, SPACING BETWEEN LETTERS AND LINES, AND THE TOTAL LENGTH OF EACH LINE OF TEXT. REPLICATE EXISTING SIGNAGE AS CLOSELY AS POSSIBLE WITH NEW SIGN LETTERS.

GENERAL CODE CRITERIA	
BUILDING CODE	2020 BUILDING CODE OF NEW YORK STATE
FIRE CODE	2020 FIRE CODE OF NEW YORK STATE
PLUMBING CODE	2020 PLUMBING CODE OF NEW YORK STATE
MECHANICAL CODE	2020 MECHANICAL CODE OF NEW YORK STATE
ELECTRICAL CODE	2017 NATIONAL ELECTRICAL CODE (NFPA 70)
ENERGY CODE	2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK...
EXISTING BUILDING CODE	2020 EXISTING BUILDING CODE OF NEW YORK STATE
BUILDING/STRUCTURE #	GATE ENCLOSURES
OCCUPANCY OF BUILDING	U
CONSTRUCTION TYPE	V
NUMBER OF STORIES	1
BUILDING HEIGHT	13-FEET
FLOOR AREA	SIXTH LAKE - 270 SF / OLD FORGE - 180 SF
WIND PRESSURE (COMPONENTS AND CLADDING)	25 PSF
OCCUPANCY CATEGORY	I
SEISMIC DESIGN CATEGORY	B

ENERGY CODE NOTES:

1. 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE
2. CLIMATE ZONE - 6A
3. THE ENCLOSURES ARE NOT OCCUPIED AND DO NOT HAVE HEAT OR AIR CONDITIONAING, THEREFORE THEY ARE EXEMPT FROM ENERGY CODE REQUIREMENTS AS PER SECTION C402.1.2.

BUILDING CODE CHART: 2020 BUILDING CODE OF NEW YORK STATE				
	SIXTH LAKE DAM - INLET GATE ENCLOSURE		OLD FORGE - GATE ENCLOSURE	
NFPA 820 CLASSIFICATION	NA		NA	
BUILDING (MAIN) OCCUPANCY (CHAPTER 3)	U		U	
MIXED USE FACILITY	NO		NO	
ROOM SEPARATION RATING	NA		NA	
CONSTRUCTION CLASSIFICATION (CHAPTER...	V-B		V-B	
NUMBER OF STORIES	ALLOWABLE	ACTUAL	ALLOWABLE	ACTUAL
	1	1	1	1
BUILDING HEIGHT	ALLOWABLE	ACTUAL	ALLOWABLE	ACTUAL
	40-FEET	13-FEET	40-FEET	12-FEET
ALLOWABLE AREA PER FLOOR	ALLOWABLE	ACTUAL	ALLOWABLE	ACTUAL
	5,500 SF	270 SF	5,500 SF	180 SF
FIRE SEPARATION DISTANCE RATINGS (TABLE 602):				
	REQUIRED	PROVIDED	REQUIRED	PROVIDED
DISTANCE LESS THAN 5'	1	NA	1	NA
DISTANCE BETWEEN 5' & 10'	1	NA	1	NA
DISTANCE BETWEEN 10' & 30'	0	0	0	0
DISTANCE MORE THAN 30'	0	0	0	0
FIRE RESISTANCE RATING REQ'TS FOR BLDG ELEMENTS (TABLE 601):				
	REQUIRED	PROVIDED	REQUIRED	PROVIDED
PRIMARY STRUCTURAL FRAMING	0	0	0	0
BEARING WALLS - EXTERIOR	0	0	0	0
BEARING WALLS - INTERIOR	0	0	0	0
NON BEARING WALLS - EXTERIOR	SEE FIRE SEPARATION DISTANCE RATINGS		SEE FIRE SEPARATION DISTANCE RATINGS	
NON BEARING WALLS - INTERIOR	0	0	0	0
FLOOR CONSTRUCTION	0	0	0	0
ROOF CONSTRUCTION	0	0	0	0
INTERIOR FINISHES (TABLE 803.5) :				
VERTICAL EXITS AND EXIT PASSAGEWAYS	NR	NR	NR	NR
EXIT ACCESS CORRIDORS & OTHER...	NR	NR	NR	NR
ROOMS AND ENCLOSED SPACES	NR	NR	NR	NR
FIRE PROTECTION SYSTEMS (CHAPTER 9):				
	REQUIRED	PROVIDED	REQUIRED	PROVIDED
AUTOMATIC SPRINKLER SYSTEMS (SECTION 903)	NO	NO	NO	NO
ALT. AUTOMATIC FIRE-EXTINGUISHING SYSTEMS (SECTION 904)	NO	NO	NO	NO
STANDPIPE SYSTEMS (SECTION 905)	NO	NO	NO	NO
PORTABLE FIRE EXTINGUISHERS (SECTION...	NO	YES	NO	YES
FIRE ALARM AND DETECTION SYSTEMS(SECTION 907)	NO	NO	NO	NO
EMERGENCY ALARM SYSTEMS (SECTION 908)	NO	NO	NO	NO
EMERGENCY RESPONDER SAFETY FEATURES (SECTION 914)	NO	NO	NO	NO
MEANS OF EGRESS (CHAPTER 10):				
	REQUIRED/ ALLOWABLE	PROVIDED	REQUIRED/ ALLOWABLE	PROVIDED
OCCUPANT LOAD CHART (TABLE 1004.1.2)	1		1	
EGRESS WIDTH PER OCCUPANT LOAD - STAIRWAYS (SECTION 1005.3)	MIN 36"	NA	MIN 36"	NA
EGRESS WIDTH PER OCCUPANT LOAD - OTHER COMPONENTS (SECTION 1005.3)	MIN 36"	36"	MIN 36"	36"
STORIES WITH ONE MEANS OF EGRESS (TABLE 1021.2)	YES		YES	
SPACES WITH ONE MEANS OF EGRESS (TABLE 1015.1)	YES		YES	
EXIT ACCESS TRAVEL DISTANCE	18-FEET		18-FEET	
CORRIDOR FIRE-RESISTANCE RATING	0	NA	0	NA
ACCESSIBILITY (ANSI/ ADAAG):				
	REQUIRED	PROVIDED	REQUIRED	PROVIDED
CONSTRUCTION SITES	NO	NO	NO	NO
ACCESSIBLE ROUTE	NO	NO	NO	NO
ACCESSIBLE ENTRANCE	NO	NO	NO	NO
EQUIPMENT SPACES	NO	NO	NO	NO
PARKING	NO	NO	NO	NO
SIGNAGE	NO	NO	NO	NO
ACCESSIBILITY NOT REQUIRED PER SECTION 1103.2.4				

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER - BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM - REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS U.S., INC. 2024

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME:
DESIGNED BY: R. BELLO
DRAWN BY: D. MARTINS
CHECKED BY: E. DAWKINS

SHEET TITLE

ARCHITECTURAL

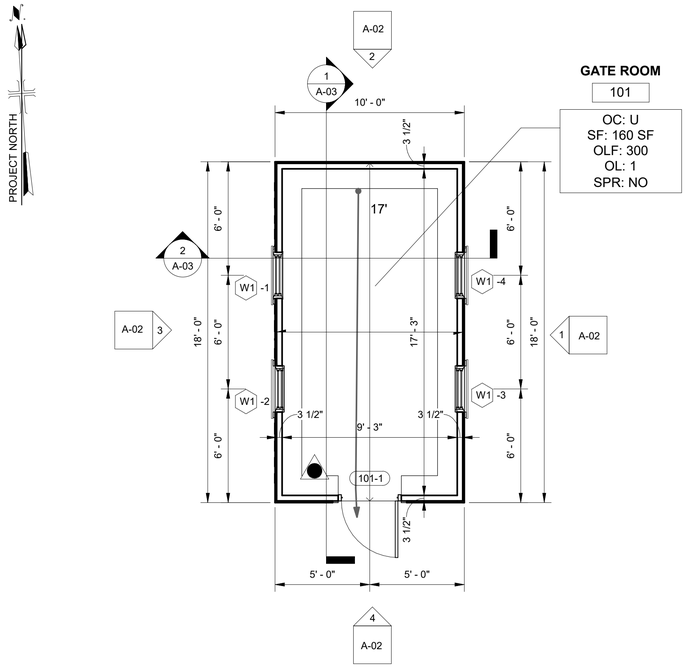
ABBREVIATIONS, LEGEND, NOTES, AND CODE CHARTS

SCALE: 12" = 1'-0"

A-01

SHEET 1 OF 7

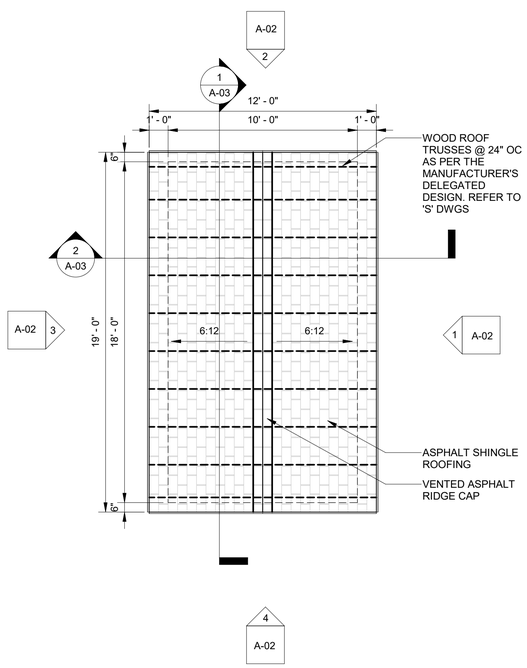
C:\Users\dmartins\OneDrive - ARCADIS\Documents\A-3D-SLD-R22_Denise.Martins@arcadis.com.rvt
4/28/2025 10:22:55 AM



OLD FORGE - FINISHED FLOOR PLAN

SCALE: 1/4" = 1'-0"

0' 2' 4' 8'



OLD FORGE - ROOF PLAN

SCALE: 1/4" = 1'-0"

0' 2' 4' 8'

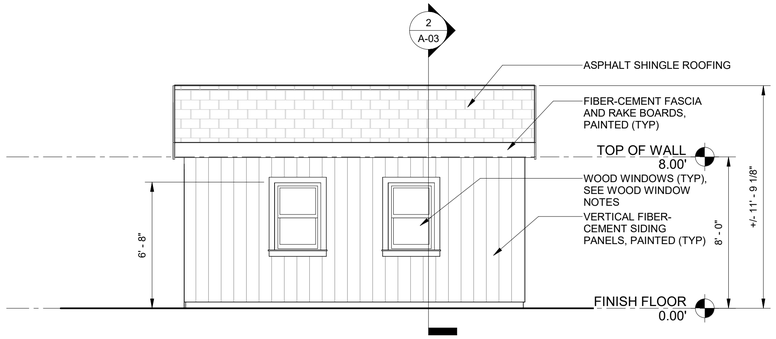
LIFE SAFETY SYMBOLS LEGEND:

	FIRE EXTINGUISHER, MULTI-PURPOSE DRY CHEMICAL
	DIRECTION OF EGRESS PATH # IS DISTANCE IN FEET TO EXIT FROM SQUARE DOT TO ARROW
SF	SQUARE FEET
OLF	OCCUPANT LOAD FACTOR
OL	OCCUPANT LOAD
SPR	SPRINKLER
OC	OCCUPANT CLASSIFICATION
NA	NOT APPLICABLE
X	SIGN TYPE

WOOD WINDOW NOTES:

PROVIDE WOOD WINDOWS AS FOLLOWS:

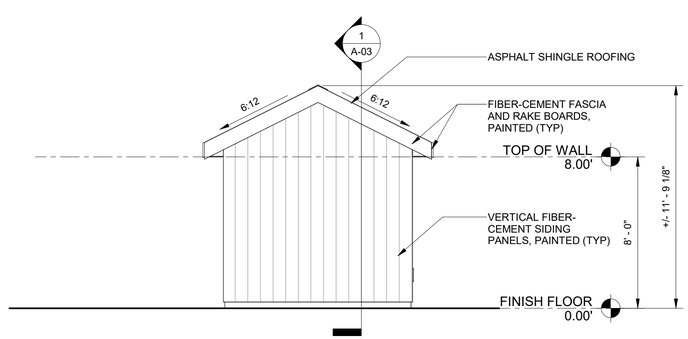
1. PRODUCT AND MANUFACTURER:
   A. A-SERIES DOUBLE-HUNG WINDOW BY ANDERSEN.
   B. OR EQUAL
2. SIZE: MATCH EXISTING WINDOW SIZES.
3. INTERIOR WOOD AND COLOR: PINE STAINED WHITE
4. GLASS: LOW-E4 GLASS.
5. HARDWARE: LOCK AND KEEPER, WHITE.
6. OPTIONAL HARDWARE: NONE.
7. GRILLE PATTERN: NONE.
8. EXTERIOR COLOR: WHITE.
9. EXTERIOR TRIM PROFILE: 3.5" FLAT WITH SILL NOSE.
10. EXTERIOR TRIM COLOR: WHITE.
11. EXTERIOR MATERIAL: WOOD PROTECTED BY FIBERGLASS AND COMPOSITE MATERIAL.



1 A-02 OLD FORGE - EAST ELEVATION

SCALE: 1/4" = 1'-0"

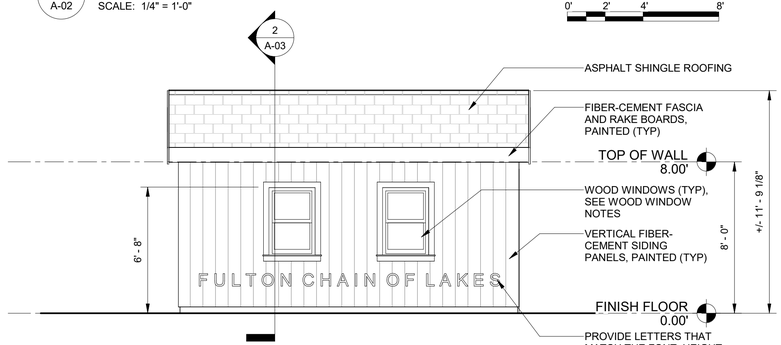
0' 2' 4' 8'



2 A-02 OLD FORGE - NORTH ELEVATION

SCALE: 1/4" = 1'-0"

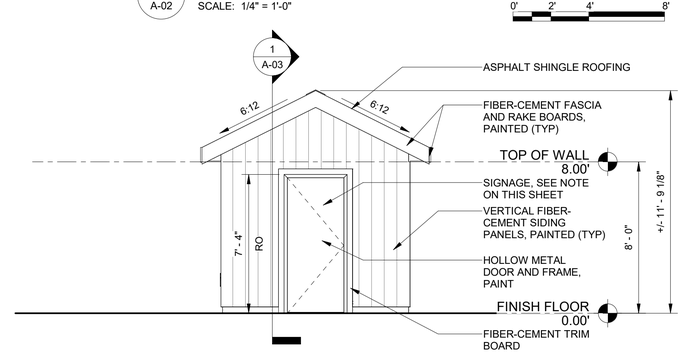
0' 2' 4' 8'



3 A-02 OLD FORGE - WEST ELEVATION

SCALE: 1/4" = 1'-0"

0' 2' 4' 8'



4 A-02 OLD FORGE - SOUTH ELEVATION

SCALE: 1/4" = 1'-0"

0' 2' 4' 8'

SIGNAGE NOTE:
1. CAREFULLY REMOVE EXISTING SIGNS, PACK SECURELY, AND TURN OVER TO OWNER FOR POTENTIAL REUSE IN THE FUTURE.

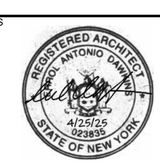
ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE

HUDSON RIVER - BLACK RIVER REGULATING DISTRICT

OLD FORGE & SIXTH LAKE DAM REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS U.S., INC. 2024

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME:
DESIGNED BY: R. BELLO
DRAWN BY: D. MARTINS
CHECKED BY: E. DAWKINS

SHEET TITLE

ARCHITECTURAL

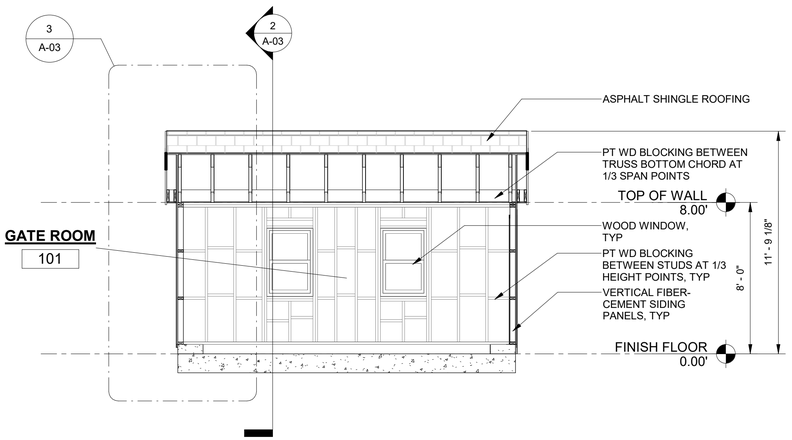
OLD FORGE - FLOOR, ROOF PLAN, AND ELEVATIONS

SCALE: 1/4" = 1'-0"

A-02

SHEET 2 OF 7

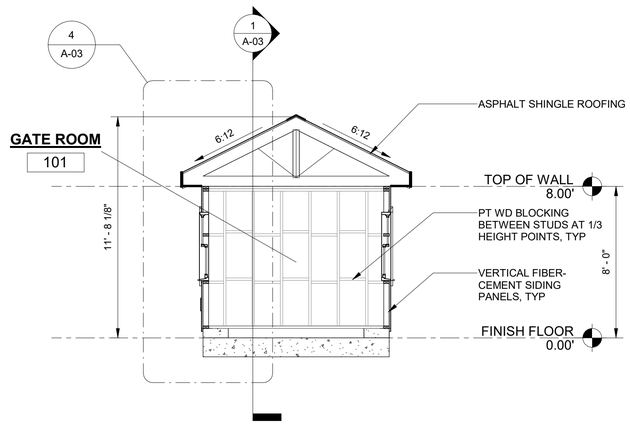
C:\Users\dmartins\OneDrive - ARCADIS\Documents\A-3D-OFD-R22_Denise.Martins@arcadis.com.rvt
4/28/2025 10:22:37 AM



1 A-02 OLD FORGE - BUILDING SECTION

SCALE: 1/4" = 1'-0"

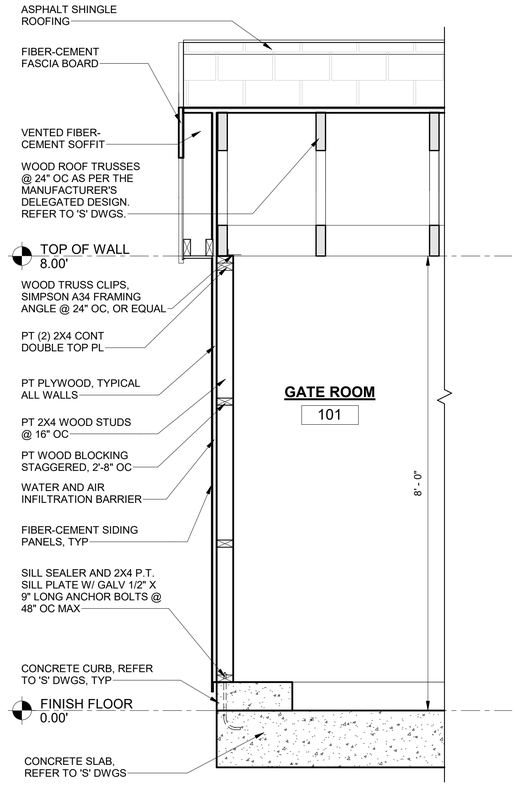
0' 2' 4' 8'



2 A-02 OLD FORGE - BUILDING SECTION

SCALE: 1/4" = 1'-0"

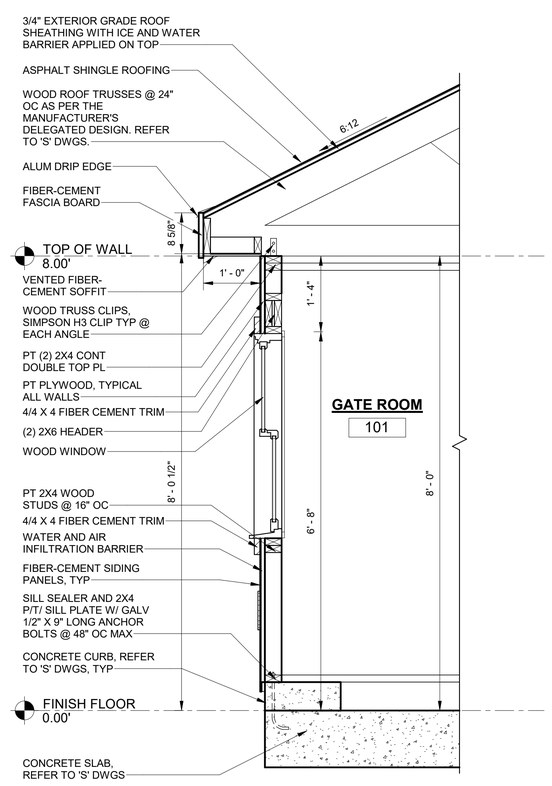
0' 2' 4' 8'



3 A-03 OLD FORGE - WALL SECTION

SCALE: 3/4" = 1'-0"

0' 1' 2' 3'



4 A-03 OLD FORGE - WALL SECTION

SCALE: 3/4" = 1'-0"

0' 1' 2' 3'

C:\Users\dmartins\OneDrive - ARCADIS\Documents\A-3D-OFD-R22_Denise.Martins@arcadis.com.rvt

4/28/2025 10:22:38 AM

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE

HUDSON RIVER - BLACK RIVER REGULATING DISTRICT

OLD FORGE & SIXTH LAKE DAM REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS U.S., INC. 2024

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME:
DESIGNED BY: R. BELLO
DRAWN BY: D. MARTINS
CHECKED BY: E. DAWKINS

SHEET TITLE

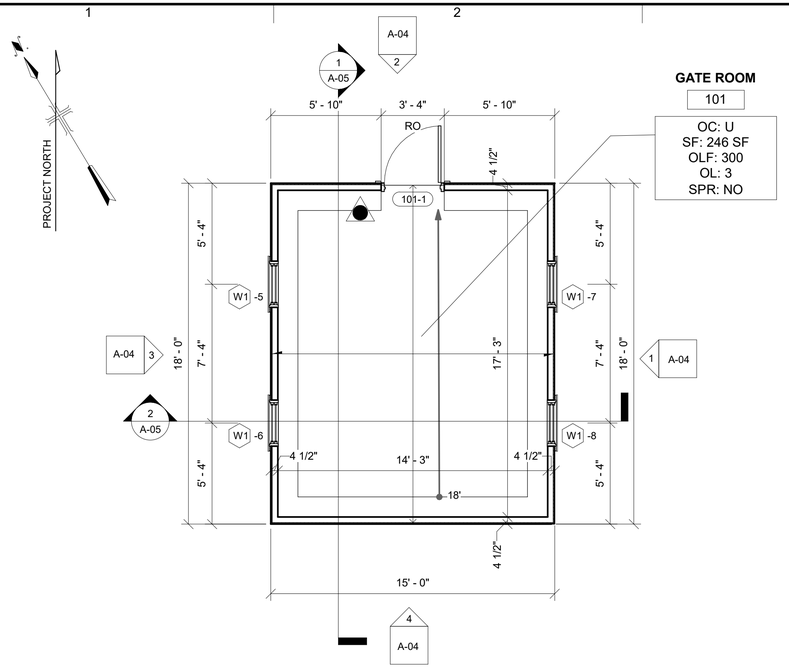
ARCHITECTURAL

OLD FORGE - BUILDING AND WALL SECTIONS

SCALE: As indicated

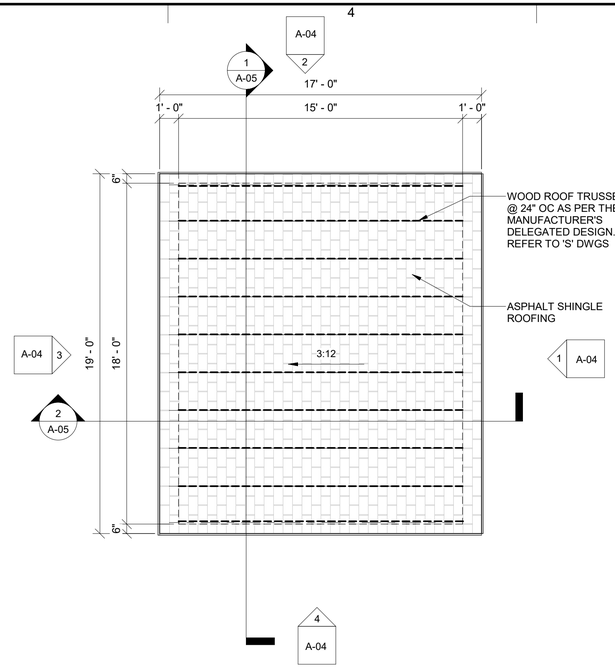
A-03

SHEET 3 OF 7



SIXTH LAKE - FINISH FLOOR PLAN

SCALE: 1/4" = 1'-0"



SIXTH LAKE - ROOF PLAN

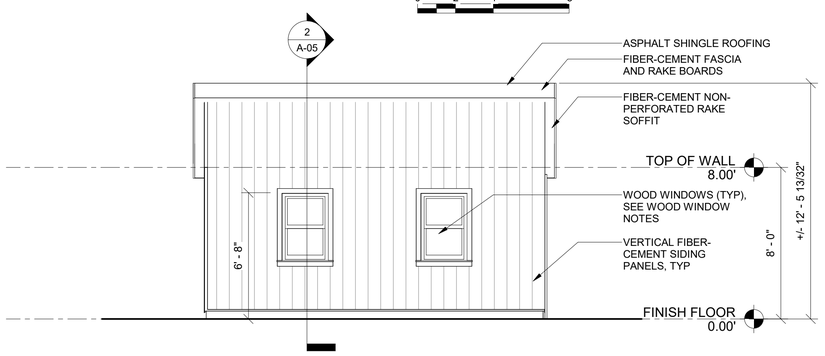
SCALE: 1/4" = 1'-0"

LIFE SAFETY SYMBOLS LEGEND:

	FIRE EXTINGUISHER, MULTI-PURPOSE DRY CHEMICAL
	DIRECTION OF EGRESS PATH # IS DISTANCE IN FEET TO EXIT FROM SQUARE DOT TO ARROW
SF	SQUARE FEET
OLF	OCCUPANT LOAD FACTOR
OL	OCCUPANT LOAD
SPR	SPRINKLER
OC	OCCUPANT CLASSIFICATION
NA	NOT APPLICABLE
X	SIGN TYPE

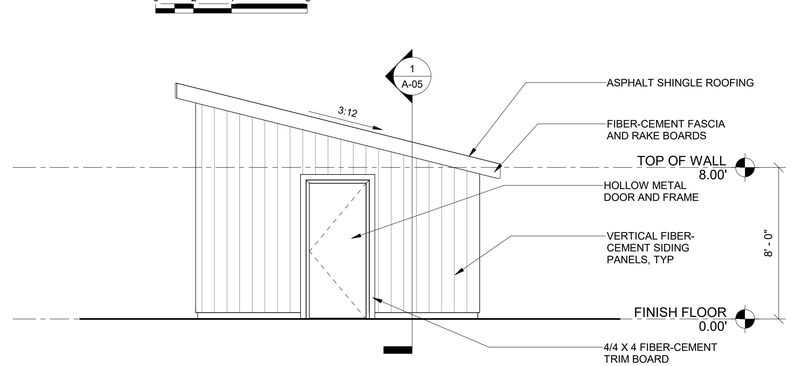
WOOD WINDOW NOTES:

PROVIDE WOOD WINDOWS AS FOLLOWS:
1. PRODUCT AND MANUFACTURER:
   A. A-SERIES DOUBLE-HUNG WINDOW BY ANDERSEN.
   B. OR EQUAL
2. SIZE: MATCH EXISTING WINDOW SIZES.
3. INTERIOR WOOD AND COLOR: PINE STAINED WHITE
4. GLASS: LOW-E4 GLASS.
5. HARDWARE: LOCK AND KEEPER, WHITE.
6. OPTIONAL HARDWARE: NONE.
7. GRILLE PATTERN: NONE.
8. EXTERIOR COLOR: WHITE.
9. EXTERIOR TRIM PROFILE: 3.5" FLAT WITH SILL NOSE.
10. EXTERIOR TRIM COLOR: WHITE.
11. EXTERIOR MATERIAL: WOOD PROTECTED BY FIBERGLASS AND COMPOSITE MATERIAL.



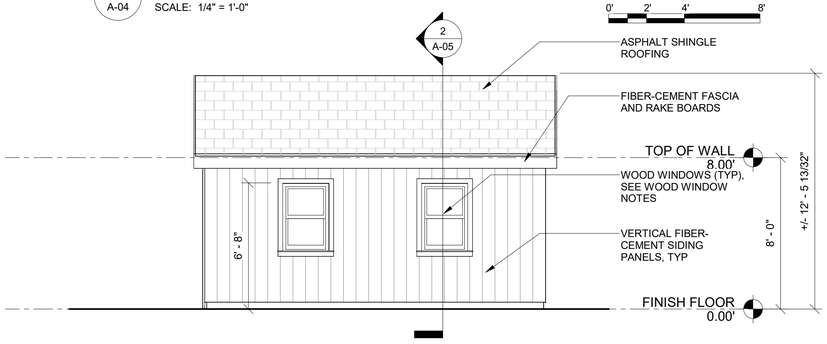
1 A-04 SIXTH LAKE - EAST ELEVATION

SCALE: 1/4" = 1'-0"



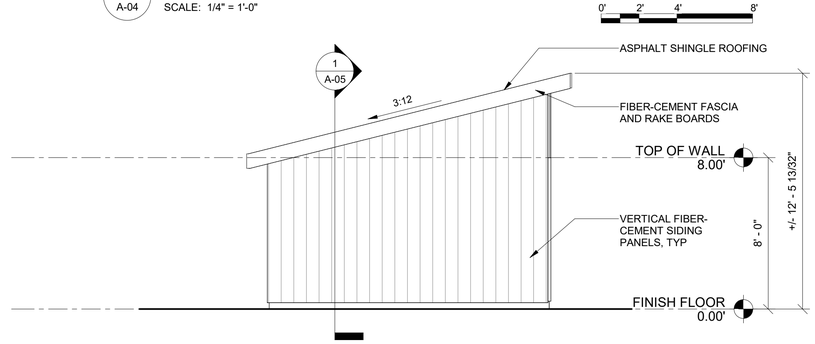
2 A-04 SIXTH LAKE - NORTH ELEVATION

SCALE: 1/4" = 1'-0"



3 A-04 SIXTH LAKE - WEST ELEVATION

SCALE: 1/4" = 1'-0"



4 A-04 SIXTH LAKE - SOUTH ELEVATION

SCALE: 1/4" = 1'-0"

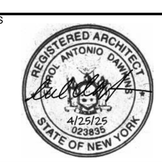
ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER - BLACK RIVER REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM - REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS U.S., INC. 2024

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME:
DESIGNED BY: R. BELLO
DRAWN BY: D. MARTINS
CHECKED BY: E. DAWKINS

SHEET TITLE

ARCHITECTURAL

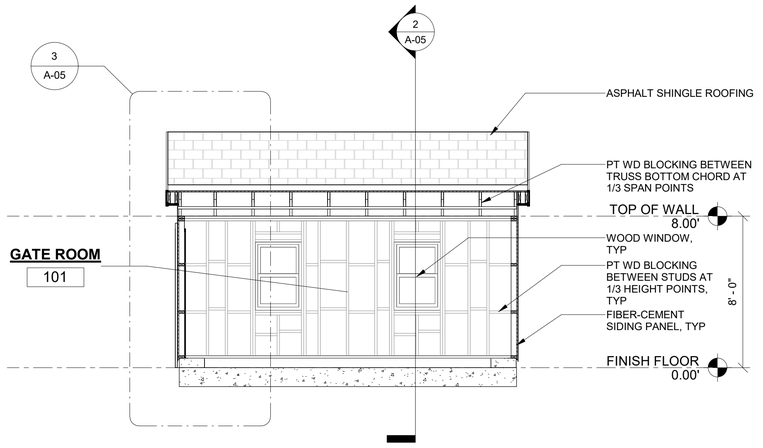
SIXTH LAKE DAM - FLOOR, ROOF PLAN, AND ELEVATIONS

SCALE: 1/4" = 1'-0"

A-04

SHEET 4 OF 7

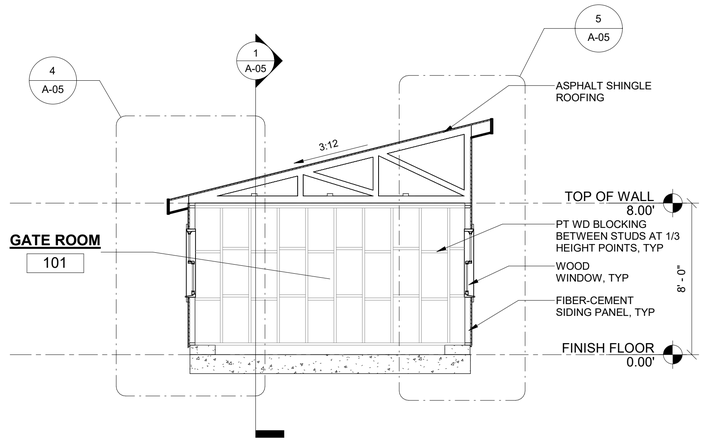
C:\Users\dmartins\OneDrive - ARCADIS\Documents\A-3D-SLD-R22_Denise.Martins@arcadis.com.rvt
4/28/2025 10:22:56 AM



1 A-04 SIXTH LAKE - BUILDING SECTION

SCALE: 1/4" = 1'-0"

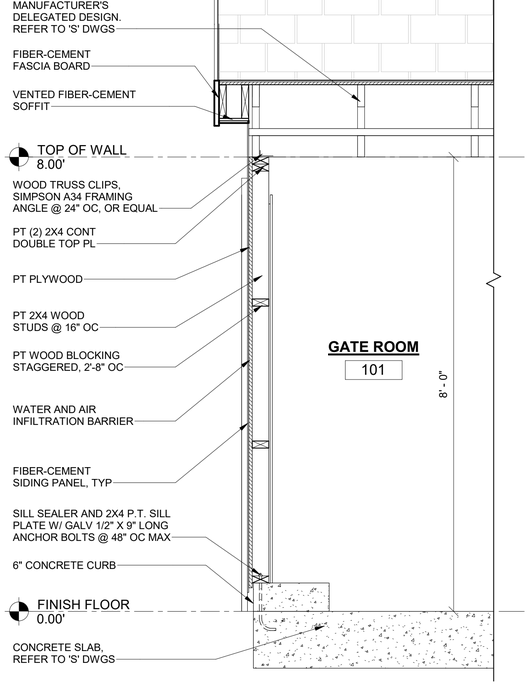
0' 2' 4' 8'



2 A-04 SIXTH LAKE - BUILDING SECTION

SCALE: 1/4" = 1'-0"

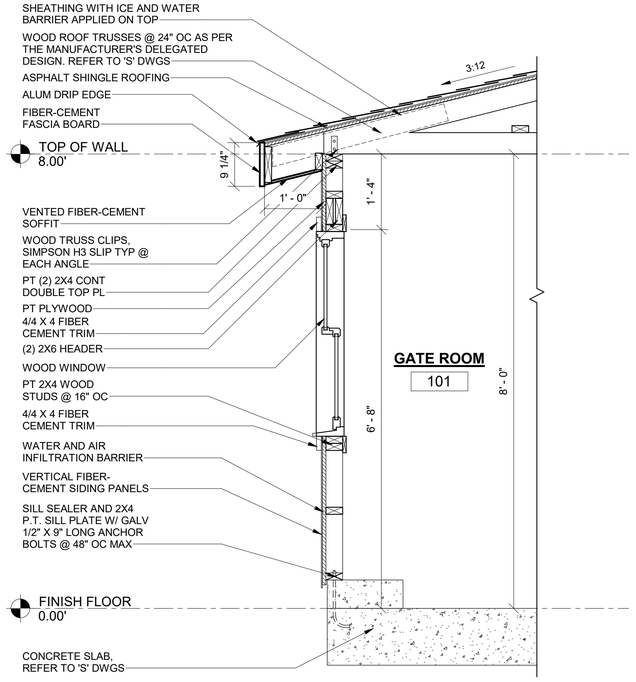
0' 2' 4' 8'



3 A-05 SIXTH LAKE - WALL SECTION

SCALE: 3/4" = 1'-0"

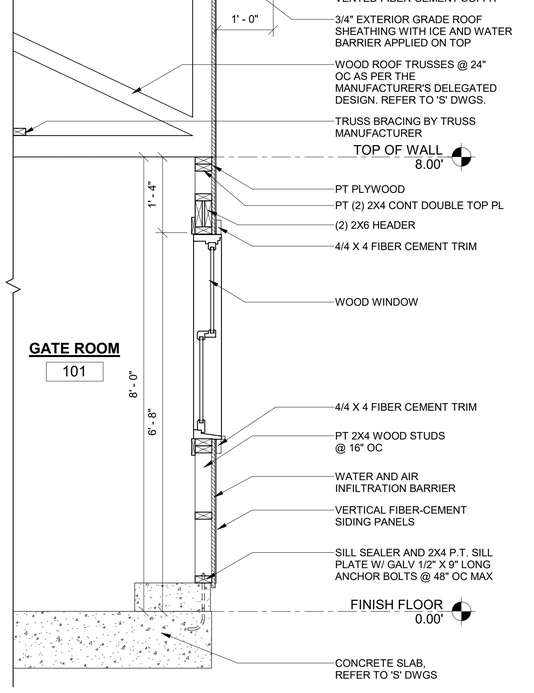
0' 1' 2' 3'



4 A-05 SIXTH LAKE - WALL SECTION

SCALE: 3/4" = 1'-0"

0' 1' 2' 3'



5 A-05 SIXTH LAKE - WALL SECTION

SCALE: 3/4" = 1'-0"

0' 1' 2' 3'

C:\Users\dmartins\OneDrive - ARCADIS\Documents\A-3D-SLD-R22_Denise.Martins@arcadis.com.rvt

4/28/2025 10:22:57 AM

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER -
BLACK RIVER
REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM - REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS U.S., INC. 2024

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME:
DESIGNED BY: R. BELLO
DRAWN BY: D. MARTINS
CHECKED BY: E. DAWKINS

SHEET TITLE

ARCHITECTURAL

SIXTH LAKE DAM - BUILDING AND WALL SECTIONS

SCALE: As indicated

A-05

SHEET 5 OF 7

ROOM FINISH SCHEDULE

BUILDING NAME	ROOM NO.	ROOM NAME	FLOOR	BASE	WALLS												CEILING			NOTES
					NORTH			SOUTH			EAST			WEST						
					MATERIAL	FINISH	COLOR	MATERIAL	FINISH	COLOR	MATERIAL	FINISH	COLOR	MATERIAL	FINISH	COLOR	MATERIAL	FINISH	COLOR	
OLD FORGE DAM	101	GATE ROOM	CH	NA	EWS	PNT	AAC	EWS	PNT	AAC	EWS	PNT	AAC	EWS	PNT	AAC	EWS	PNT	AAC	
SIXTH LAKE DAM	101	GATE ROOM	CH	NA	EWS	PNT	AAC	EWS	PNT	AAC	EWS	PNT	AAC	EWS	PNT	AAC	EWS	PNT	AAC	

DOOR AND FRAME SCHEDULE

BUILDING NAME	ROOM NAME	DOOR						FRAME			HEAD	JAMB	THRESHOLD	FIRE RATING	DOOR HARDWARE	REMARKS
		DOOR NO.	WIDTH	HEIGHT	DOOR TYPE	DOOR MATERIAL	GLAZING	WIDTH	HEIGHT	FRAME MATERIAL						
OLD FORGE DAM	GATE ROOM	101-1	3' - 0"	7' - 2"	F	HM	NA	3' - 4"	7' - 4"	HM	H1	J1	S1A	NA	1	
SIXTH LAKE DAM	GATE ROOM	101-1	3' - 0"	7' - 2"	F	HM	N/A	3' - 4"	7' - 4"	HM	H1	J1	S1B	NA	1	

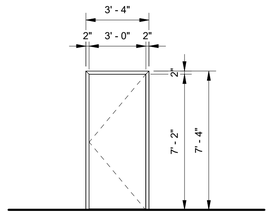
WINDOW SCHEDULE

BUILDING NAME	MARK	TYPE	SIZE		DETAILS			MATL	NOTES
			WIDTH	HEIGHT	HEAD	JAMB	SILL		
OLD FORGE DAM	1	W1	2' - 5 1/4"	3' - 7 1/4"	H2	J2	S2	WOOD*	
OLD FORGE DAM	2	W1	2' - 5 1/4"	3' - 7 1/4"	H2	J2	S2	WOOD*	
OLD FORGE DAM	3	W1	2' - 5 1/4"	3' - 7 1/4"	H2	J2	S2	WOOD*	
OLD FORGE DAM	4	W1	2' - 5 1/4"	3' - 7 1/4"	H2	J2	S2	WOOD*	
SIXTH LAKE DAM	5	W1	2' - 5 1/4"	3' - 7 1/4"	H2	J2	S2	WOOD*	
SIXTH LAKE DAM	6	W1	2' - 5 1/4"	3' - 7 1/4"	H2	J2	S2	WOOD*	
SIXTH LAKE DAM	7	W1	2' - 5 1/4"	3' - 7 1/4"	H2	J2	S2	WOOD*	
SIXTH LAKE DAM	8	W1	2' - 5 1/4"	3' - 7 1/4"	H2	J2	S2	WOOD*	

* WOOD PROTECTED BY FIBERGLASS AND COMPOSITE MATERIAL.

EXTERIOR COLOR NOTES:

1. MATCH EXTERIOR COLORS TO THE GREATEST EXTENT POSSIBLE.
2. VERTICAL FIBER CEMENT PANELS AND CORNER TRIM BOARDS ARE TO BE RED.
3. HOLLOW METAL DOORS AND FRAMES ARE TO BE RED.
4. FIBER CEMENT TRIM BOARDS AT DOORS ARE TO BE WHITE.
5. WINDOWS ARE TO BE WHITE.
6. WINDOW TRIM BOARDS AT HEAD AND JAMBS ARE TO BE WHITE.
7. EXTERIOR, FIBER CEMENT, WINDOW APRON TRIM BOARD UNDER THE SILL IS TO BE RED.
8. ROOF FASCIA, SOFFIT AND RAKE BOARDS ARE TO BE WHITE.
9. ROOF FLASHING AND DRIP EDGES ARE TO BE WHITE.



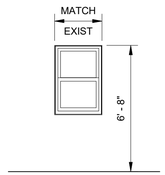
TYPE F

DOOR AND FRAME ELEVATION TYPE

SCALE: 1/4" = 1'-0"

0' 2' 4' 8'

NOTE:
1. DOOR FRAME DEPTH IS 5-3/4". STYLE IS DOUBLE RABBETED.



TYPE W1

WINDOW ELEVATION TYPE

SCALE: 1/4" = 1'-0"

0' 2' 4' 8'

NOTE:
1. WINDOW SIZE TO MATCH EXISTING AT EACH LOCATION.

MATERIAL LEGEND:

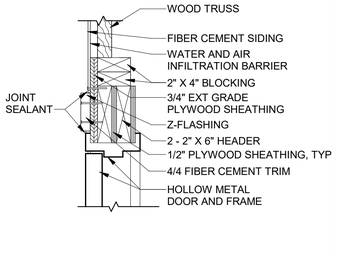
CONCRETE WITH HARDENER	CH
CAST IN PLACE CONCRETE	CIPC
EXPOSED WOOD STRUCTURE	EWS
GRATING	GT
STAINLESS STEEL	SST

FINISH LEGEND:

AWARDED AFTER CONTRACT	AAC
MATCH EXISTING	ME
NO (ADDITIONAL) FINISH, MATERIAL COLOR	NF
NOT PAINTED	NP
PAINTED	PNT
PAINTED - FLAT	PNTF
PAINTED - GLOSS	PNTG
PAINTED - SEMI-GLOSS	PNTSG
TO BE DETERMINED	TBD

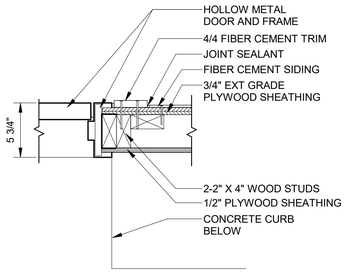
COLOR LEGEND:

AWARDED AFTER CONTRACT	AAC
EXISTING	EX
GREY	GR
MATCH EXISTING	ME
NO COLOR	NC
OFF-WHITE	OW
TAN	TAN
TO BE DETERMINED	TBD
WHITE	WH



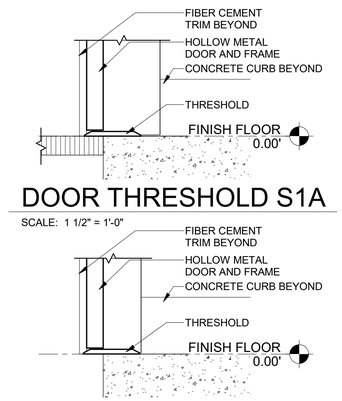
DOOR HEAD H1

SCALE: 1 1/2" = 1'-0"



DOOR JAMB J1

SCALE: 1 1/2" = 1'-0"

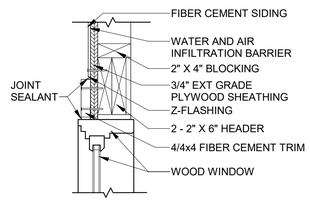


DOOR THRESHOLD S1A

SCALE: 1 1/2" = 1'-0"

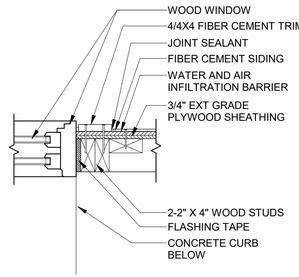
DOOR THRESHOLD S1B

SCALE: 1 1/2" = 1'-0"



WINDOW HEAD H2

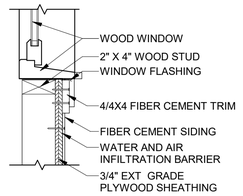
SCALE: 1 1/2" = 1'-0"



WINDOW JAMB J2

SCALE: 1 1/2" = 1'-0"

0' 1' 2'



WINDOW SILL S2

SCALE: 1 1/2" = 1'-0"

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER -
BLACK RIVER
REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM - REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS U.S., INC. 2024

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME:
DESIGNED BY: R. BELLO
DRAWN BY: D. MARTINS
CHECKED BY: E. DAWKINS

SHEET TITLE

ARCHITECTURAL

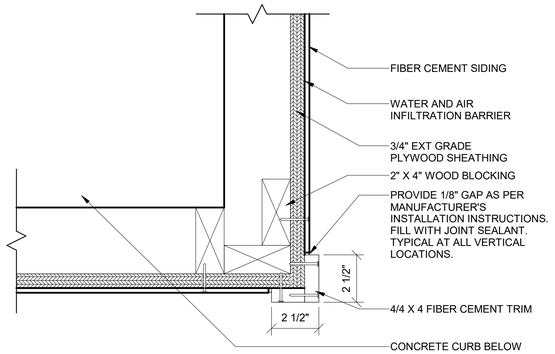
SCHEDULES

SCALE: As indicated

A-06

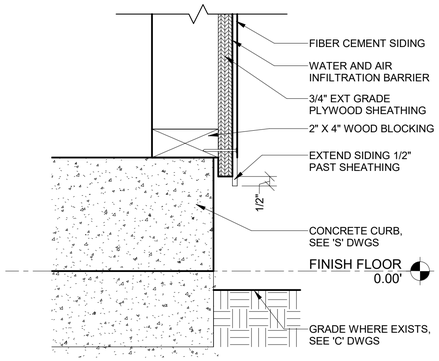
SHEET 6 OF 7

C:\Users\dmartins\OneDrive - ARCADIS\Documents\A-3D-SLD-R22_Denise.Martins@arcadis.com.rvt
4/28/2025 10:22:59 AM



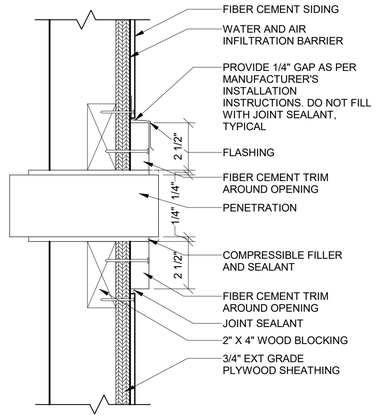
1 OUTSIDE CORNER DETAIL

SCALE: 3" = 1'-0"



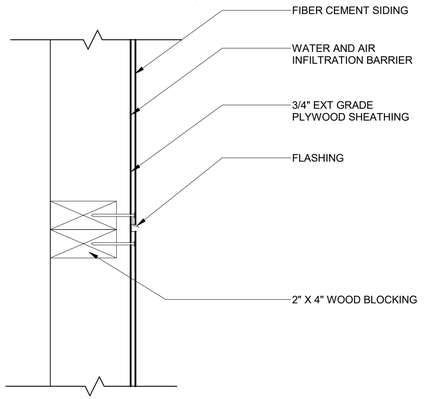
2 BOTTOM OF WALL DETAIL

SCALE: 3" = 1'-0"



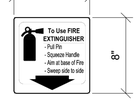
3 WALL PENETRATION

SCALE: 3" = 1'-0"



4 HORIZONTAL VIEW DETAIL

SCALE: 3" = 1'-0"



TYPE A:
FIRE EXTINGUISHER SIGNAGE
(PROVIDE ONE AT EACH FIRE EXTINGUISHER)



TYPE B:
NOTICE



TYPE C:
INDIVIDUAL LETTERS AS SPECIFIED

HORIZONTAL MOUNTING RAILS ARE NOT REQUIRED FOR NEW LETTERS

SIGNAGE NOTES:

1. FINAL SIGNAGE WORDING OF ALL SIGNS TO BE DETERMINED AFTER AWARD OF CONTRACT.
2. THE SIGNS SHOWN ON THIS SHEET ARE A COMPREHENSIVE STANDARD GUIDE INTENDED TO GRAPHICALLY INDICATE THE APPEARANCE OF THE SIGNS. THIS SHEET IS FOR GENERAL USE ON THE PROJECT. THEREFORE NOT ALL THE SIGNS CONTAINED ON THIS SHEET ARE NECESSARILY USED ON THIS PARTICULAR PROJECT AND SHOULD BE USED FOR CLARIFICATION ONLY.
3. FIELD VERIFY EXACT LOCATION OF SIGNS WITH OWNER AND ENGINEER.
4. PROVIDE ALL ACCIDENT PREVENTION, HEALTH, SAFETY AND WARNING SIGNS IN COMPLIANCE WITH ANSI Z535.1, ANSI Z535.2, ANSI Z535.3 AND OSHA 1910.44 AND 1910.145. FIELD VERIFY EXACT LOCATION OF SIGNS WITH OWNER AND ENGINEER. FLOOR DIAGRAM EXIT SIGN SHALL MEET ALL THE REQUIREMENTS OF THE CITY FIRE MARSHALL.
5. PROVIDE ENGINEER APPROVED MATERIALS AND FASTENERS TO SECURELY ATTACH AND SUSPEND THESE SIGNS. SUSP. DOUBLE SIDED SIGN - INDICATES SIGNS THAT WILL IN SOME CASES NEED TO BE SUSPENDED. THOSE THAT ARE SUSPENDED WILL BE A CUSTOM DOUBLE SIDED SIGN. FIELD VERIFY EXACT LOCATION. FIELD VERIFY DIRECTION ARROW HEADS SHOULD BE POINTING ON ALL DIRECTIONAL SIGNS.
6. VERIFY EXACT LOCATION OF SIGNS WITH OWNER AND ENGINEER. ALL SIGNS SHALL BE PLACED SO THAT THEY ARE READILY VISIBLE AND READABLE.
7. DOORS SHALL NOT BLOCK SIGNS WHEN IN OPEN POSITION. VERIFY EXACT ARRANGEMENT AND PLACEMENT OF SIGNS WITH OWNER AND ENGINEER.

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, SECTION 7209.2, FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING PERSON SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK LAW, SECTION 7209.2.

SEALS



HAMLET OF OLD FORGE
TOWN OF INLET

HUDSON RIVER -
BLACK RIVER
REGULATING DISTRICT

OLD FORGE DAM AND SIXTH LAKE DAM - REHABILITATION

ARCADIS PROJ. NO. 30001381

NO.	DATE	ISSUED FOR	BY
2	6/11	ISSUED FOR BIDDING	EL
1	4/25	REGULATORY REVIEW	EL

COPYRIGHT: ARCADIS U.S., INC. 2024

DATE: JUNE 2025
PROJECT NO.: 30001381
FILE NAME:
DESIGNED BY: R. BELLO
DRAWN BY: D. MARTINS
CHECKED BY: E. DAWKINS

SHEET TITLE

ARCHITECTURAL

MISCELLANEOUS DETAILS

SCALE: As indicated

A-07

SHEET 7 OF 7

C:\Users\dmartins\OneDrive - ARCADIS\Documents\A-3D-SLD-R22_Denise.Martins@arcadis.com.rvt
4/28/2025 10:23:00 AM