

REQUEST FOR PROPOSAL
WATER SYSTEM MODIFICATIONS AND CONSOLIDATION TO ADDRESS PFAS
AT BONNY EAGLE MIDDLE SCHOOL AND BONNY EAGLE HIGH SCHOOL
MSAD #6
WATER SYSTEM #0000147 AND #0008778
STANDISH AND BUXTON, MAINE
RFP# 2023-003

Deadline for Proposal: Friday, June 23, 2023, at 5 PM eastern

Facility address: 700 Saco Road, Standish, Maine

All requests for clarifications, changes, exceptions, deviations to the terms and conditions set forth in this RFQ should be submitted by email to: peter.mohlin@smemaine.com

On August 24, 2022, the Maine Center for Disease Control and Prevention Drinking Water Program (DWP) notified Maine School Administrative District #6 (MSAD #6) that PFAS concentrations in water samples collected from the Bonny Eagle Middle School (BEMS) water system (PWSID# ME0000147) and Bonny Eagle High School (BEHS) water system (PWSID# ME0008778) exceed the interim standard for PFAS of 20 parts per trillion (ppt), per the State of Maine rules for safe drinking water (S.P. 64 – L.D. 129). The BEMS samples collected on July 13, 2022 (692.4 ppt) and August 9, 2022 (822 ppt) had a calculated average total PFAS of 757 ppt. The BEHS samples collected on July 13, 2022 (34.2 ppt) and August 9, 2022 (30.2 ppt) had a calculated average total PFAS of 32.2 ppt.

One water supply well serves the BEHS water system. A Goulds model 25GS20 well pump provides water at a pump rate reported between 18 and 33 gpm. Water pumped from the well is piped to the high school's boiler room through an existing water pretreatment process before water distribution to the school. The water system modifications and consolidation consists of installing additional treatment and new water storage tank in the BEHS boiler room, a water main to connect the treated water supply to both the BEHS and BEMS storage tanks, a new back-up supply well, and level sensors, flow meters, actuated valves, and a programmable logic controller with necessary electrical and communications connections. Water quality data is included in the Contract Drawings and Technical Specifications.

The successful bidder shall procure and install equipment, piping, and fittings to complete the water system modifications and consolidation in accordance with the Summary of Work and Contract Drawings enclosed.

No sampling will be required by the contractor. SME is coordinating resampling of the treated water following initial start up to determine if PFAS concentrations are below the 20 ppt interim standard, and to meet the Maine Drinking Water Program's application requirements.

Attachment 1 – Contract Drawings

Attachment 2 – Technical Specifications

Attachment 3 – General Contractor Bid Form

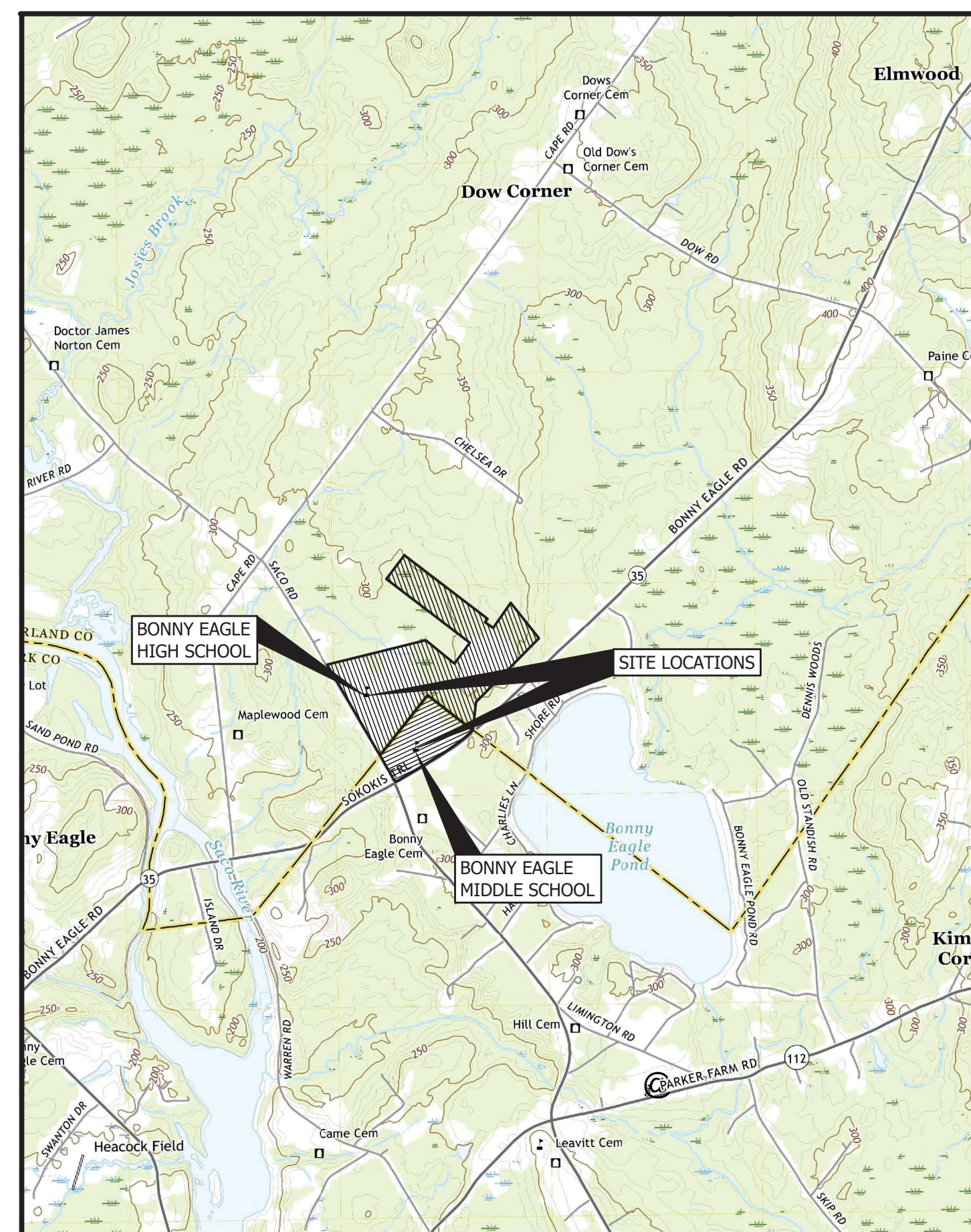
ATTACHMENT 1

CONTRACT DRAWINGS

WATER SYSTEM MODIFICATIONS AND CONSOLIDATION TO ADDRESS PFAS AT BONNY EAGLE MIDDLE SCHOOL AND BONNY EAGLE HIGH SCHOOL MSAD #6

WATER SYSTEM #0000147 AND #0008778 STANDISH/BUXTON, MAINE

LOCATION MAP



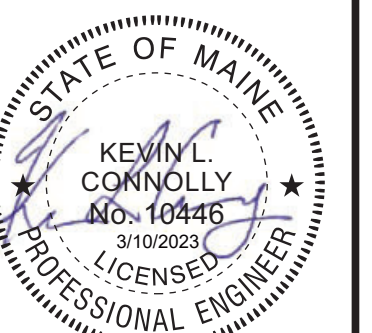
TITLE	DWG NO
COVER SHEET	
GENERAL NOTES, LEGEND, AND ABBREVIATIONS	C-100
EXISTING CONDITIONS AND DEMOLITION PLAN BONNY EAGLE HIGH SCHOOL BOILER ROOM	C-101
PROPOSED MECHANICAL PLAN AND DETAILS BONNY EAGLE HIGH SCHOOL BOILER ROOM	C-102
WATER MAIN PLAN AND PROFILE	C-200
SECTIONS AND DETAILS	C-300
DEMOLITION DETAILS	C-301
PROCESS AND INSTRUMENTATION DIAGRAM	C-302
EROSION CONTROL NOTES AND DETAILS	C-303
ELECTRICAL LEGEND AND GENERAL NOTES	E-100
ELECTRICAL PLAN, DIAGRAM, AND DETAILS	E-101

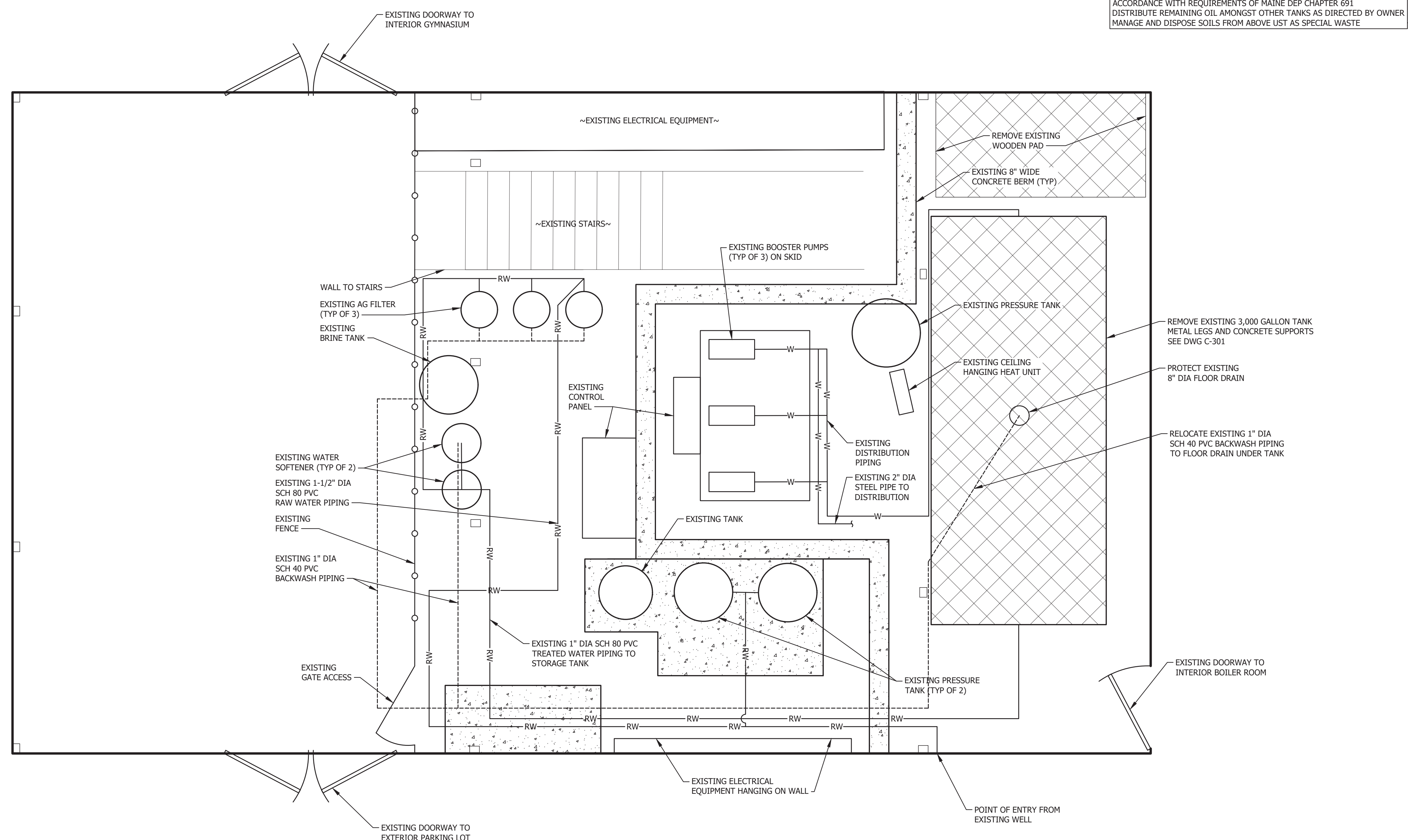
ISSUED FOR BID
MAY 2023



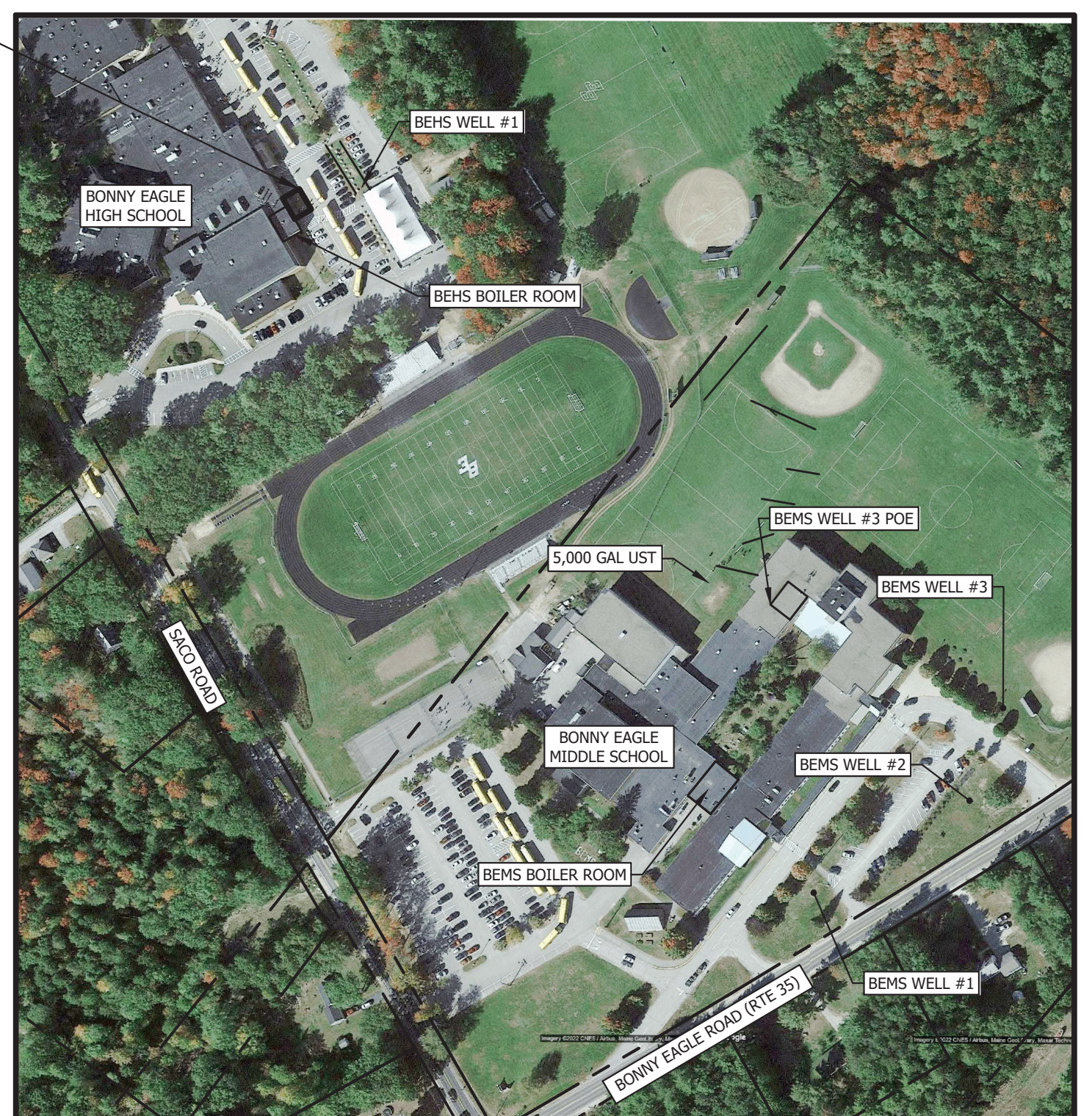
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REMOVE 10,000 GALLON FIBERGLASS TANK AND ASSOCIATED PIPING IN ACCORDANCE WITH REQUIREMENTS OF MAINE DEP CHAPTER 691. DISTRIBUTE REMAINING OIL AMONGST OTHER TANKS AS DIRECTED BY OWNER. MANAGE AND DISPOSE SOILS FROM ABOVE UST AS SPECIAL WASTE.



EXISTING CONDITIONS MAP



- NOTES:
- ABBREVIATIONS:
 AST - ABOVEGROUND STORAGE TANK
 BEHS - BONNY EAGLE HIGH SCHOOL
 BEMS - BONNY EAGLE MIDDLE SCHOOL
 POE - POINT OF ENTRY
 UST - UNDERGROUND STORAGE TANK
 - BASEMAP ADAPTED FROM GOOGLE EARTH IMAGERY, DATED 10/2021.
 - DRAWING IS TO SCALE; HOWEVER, SOME OBJECTS DIMENSIONS OR LOCATIONS ARE APPROXIMATE. CONTRACTOR TO CONFIRM INFORMATION AS NEEDED.

EXISTING CONDITIONS AND DEMOLITION PLAN
 BONNY EAGLE HIGH SCHOOL BOILER ROOM



NOTE:
 1. SEE DRAWING C-100 FOR GENERAL SITE NOTES AND PLAN REFERENCES.

REV.	BY	DATE	STATUS
ASN	5/2023	ISSUED FOR BID - PLANS FOR GENERAL CONTRACTOR	
ASN	3/2023	90% DESIGN DRAFT	
ASN	1/2023	50% DESIGN DRAFT	

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 WATER SYSTEM #0000147 AND #0008778
 STANDISH/BUXTON, MAINE

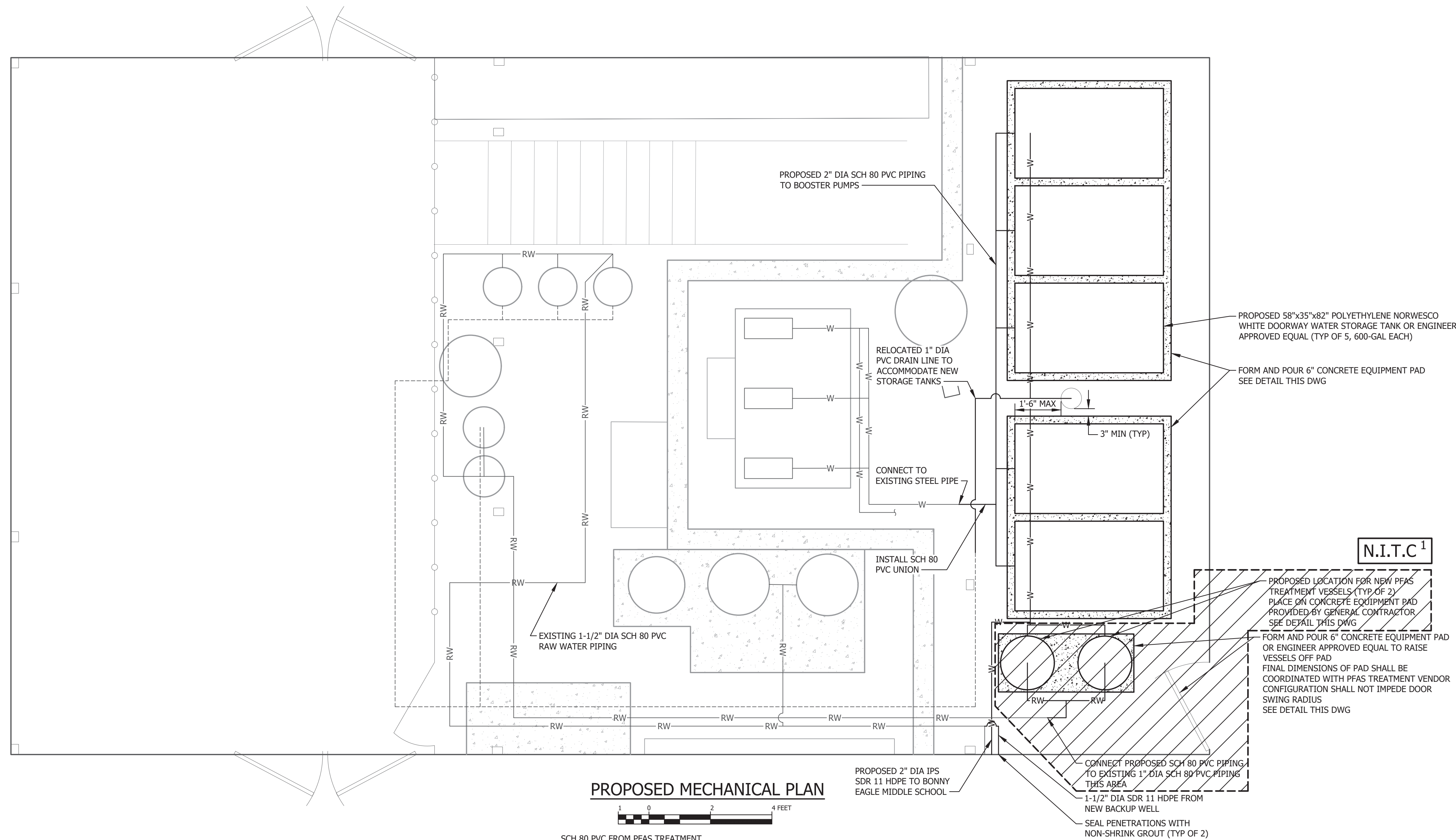
**EXISTING CONDITIONS AND DEMOLITION PLAN
 BONNY EAGLE HIGH SCHOOL BOILER ROOM**

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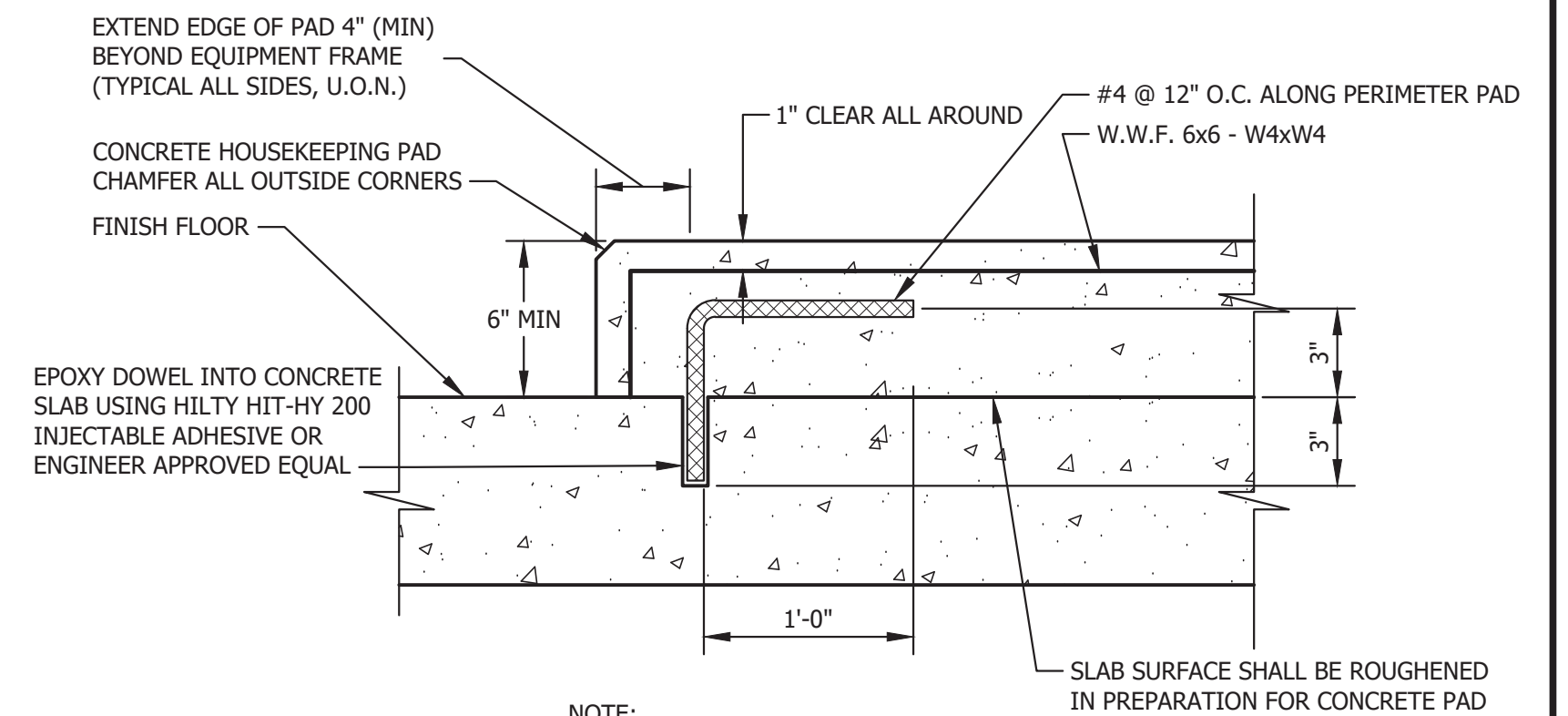
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 DRAWN BY: SJM
 DATE: 4/2023
 CHECKED BY: KLC
 LMN: EXCON-DEMO
 CTB: SME-STD.CTB

JOB NO. 220639 DWG FILE BEHS-BEMS-BASE

C-101

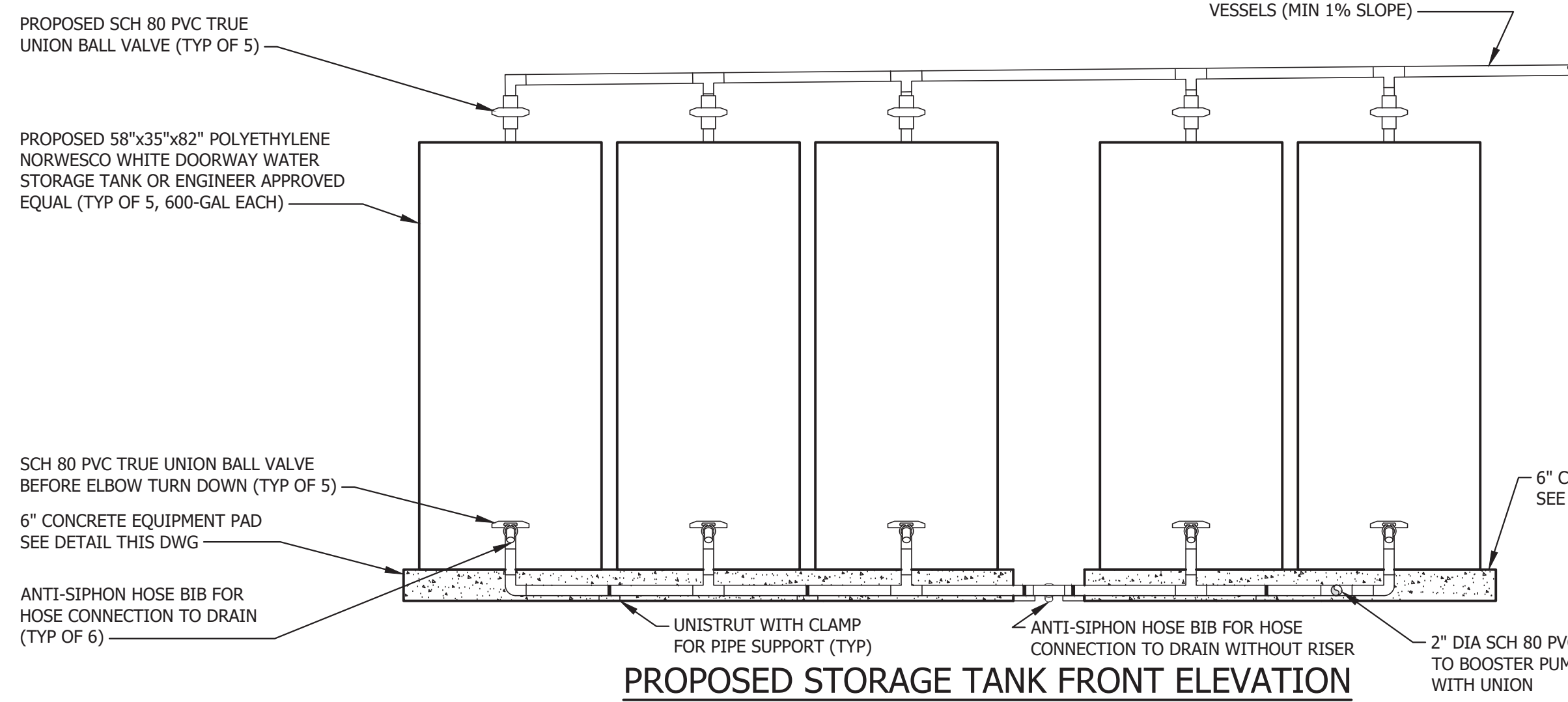


PROPOSED MECHANICAL PLAN

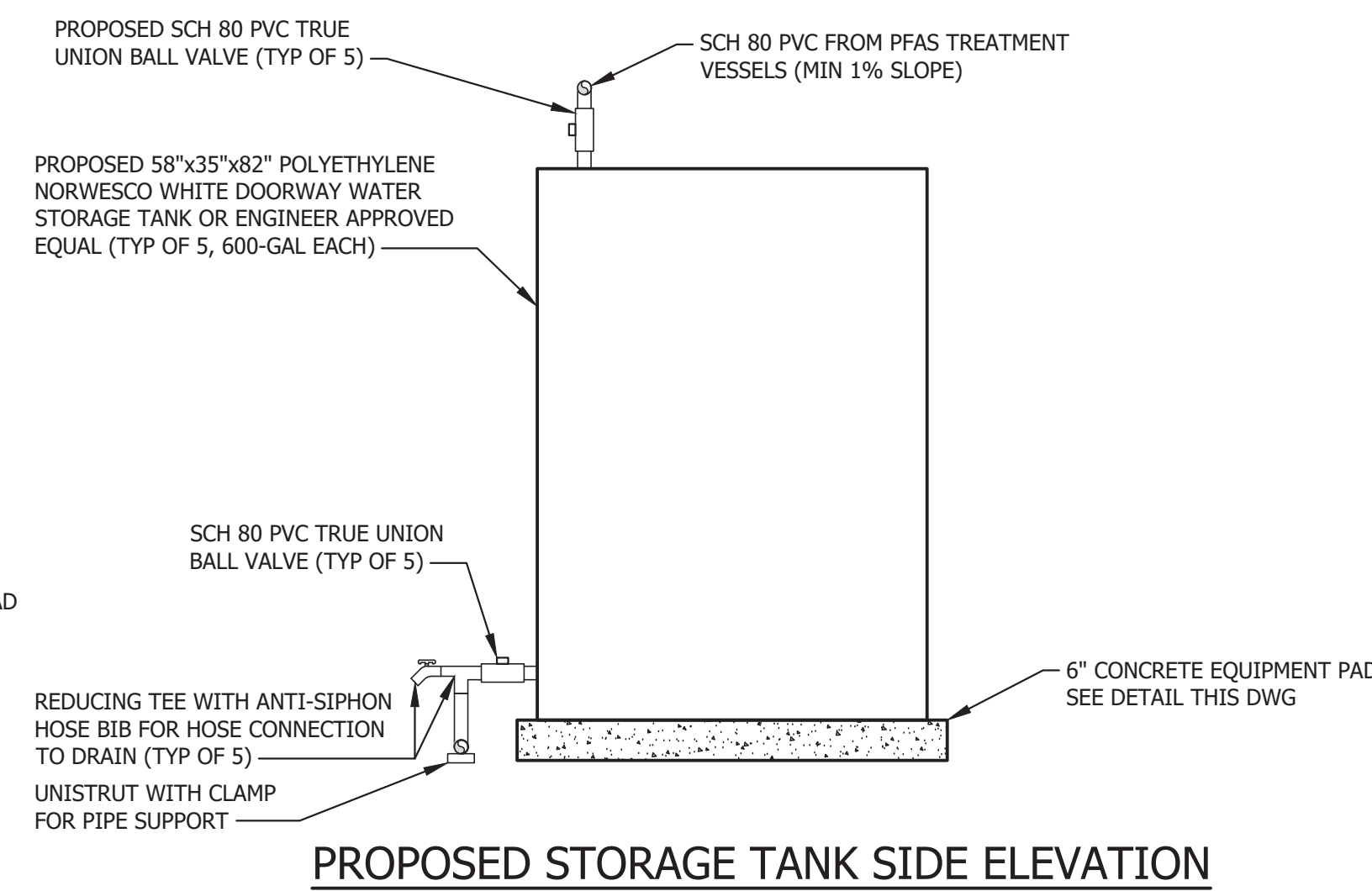


CONCRETE EQUIPMENT PAD

NTS



PROPOSED STORAGE TANK FRONT ELEVATION



PROPOSED STORAGE TANK SIDE ELEVATION



NOTES:

1. WORK MARKED AS NOT IN THIS CONTRACT (N.I.T.C) SHALL BE COORDINATED WITH THE SELECTED PFAS VENDOR AS NEEDED TO ENSURE COMPATIBILITY OF WORK.
2. SEE DRAWING C-100 FOR GENERAL SITE NOTES AND PLAN REFERENCES.
3. NEW WATER STORAGE TANK AND PFAS TREATMENT EQUIPMENT LOCATION SUBJECT TO CHANGE.

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**PROPOSED MECHANICAL PLAN AND DETAILS
 BONNY EAGLE HIGH SCHOOL BOILER ROOM**

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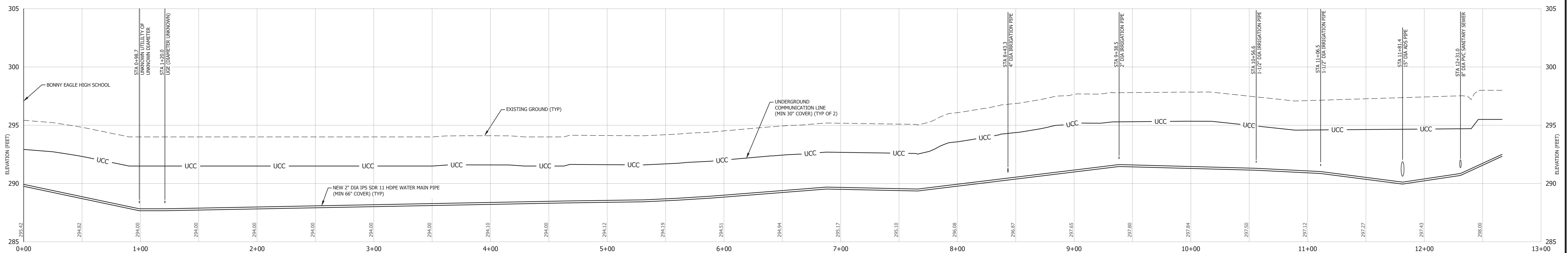
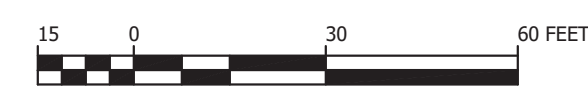
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CTB: SME-STD.CTB

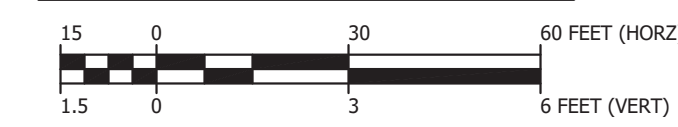
JOB NO. 220639 DWG FILE BEHS-BEMS-BASE **C-102**



WATER MAIN PLAN



WATER MAIN PROFILE



- NOTE:**
- SEE DRAWING C-100 FOR GENERAL SITE NOTES AND PLAN REFERENCES.
 - DEPTH AND LOCATION OF EXISTING UTILITIES SHOWN ARE APPROXIMATE ONLY. CONTRACTOR SHALL PERFORM UTILITY LOCATE AND FIELD VERIFY ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
 - AERIAL IMAGE FROM GOOGLE EARTH, DATED 10/2021.

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STATE OF MAINE
 KEVIN L. CONNOLLY
 No. 10446
 3/10/2023
 LICENSED PROFESSIONAL ENGINEER

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WATER MAIN PLAN AND PROFILE

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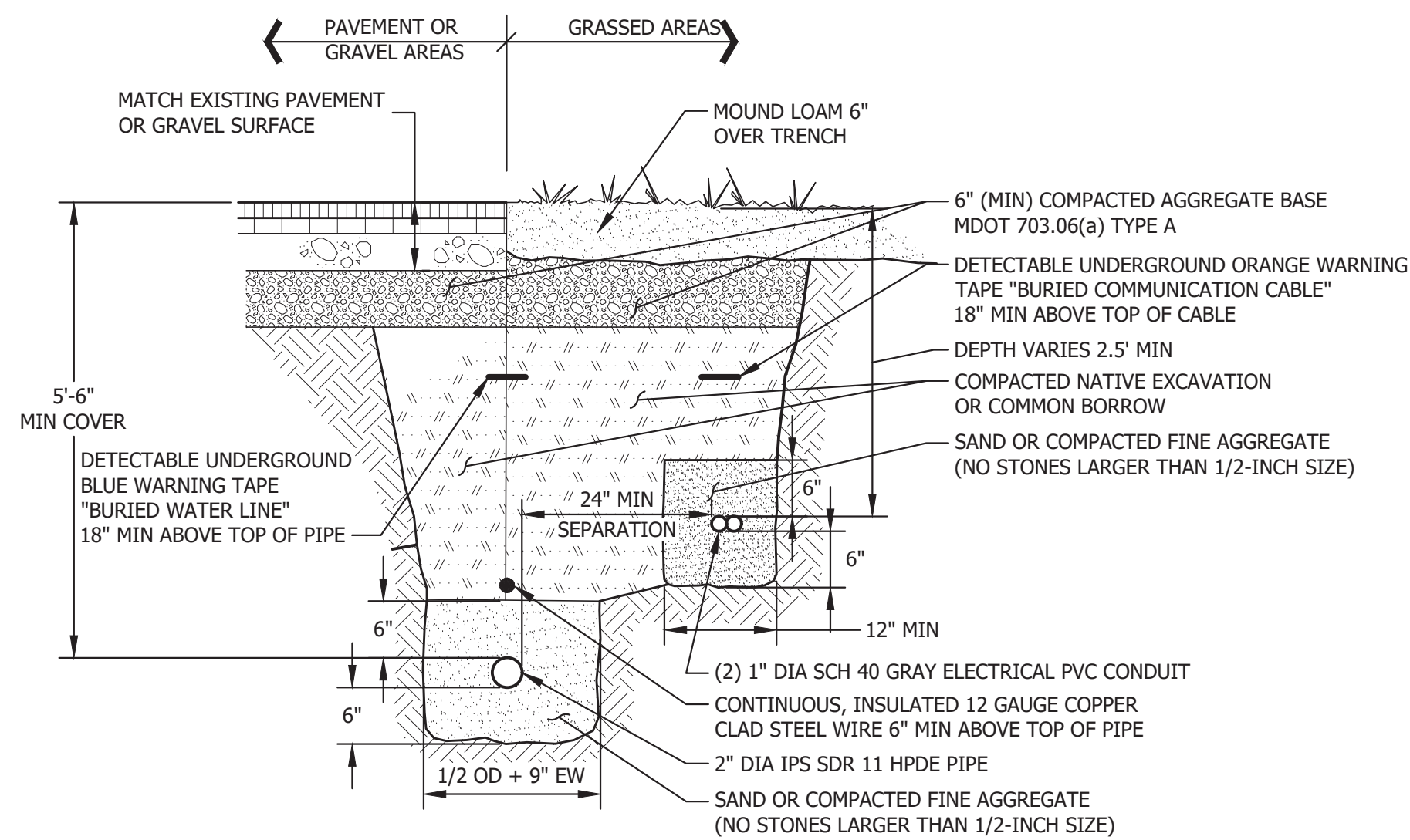
JOB NO. 220639 DWG FILE BEHS-BEMS-BASE **C-200**

CONSTRUCTION	USE
	BITUMINOUS ACCESS ROAD EQUIPMENT PATHS PARKING LOT
	GRAVEL GRAVEL ACCESS ROAD
	GRASS ALL DISTURBED AREAS

- NOTES:**
- HMA = HOT MIX ASPHALT.
MDOT = MAINE DEPARTMENT OF TRANSPORTATION.
 - ALL COURSE THICKNESS AFTER FINAL COMPACTION.

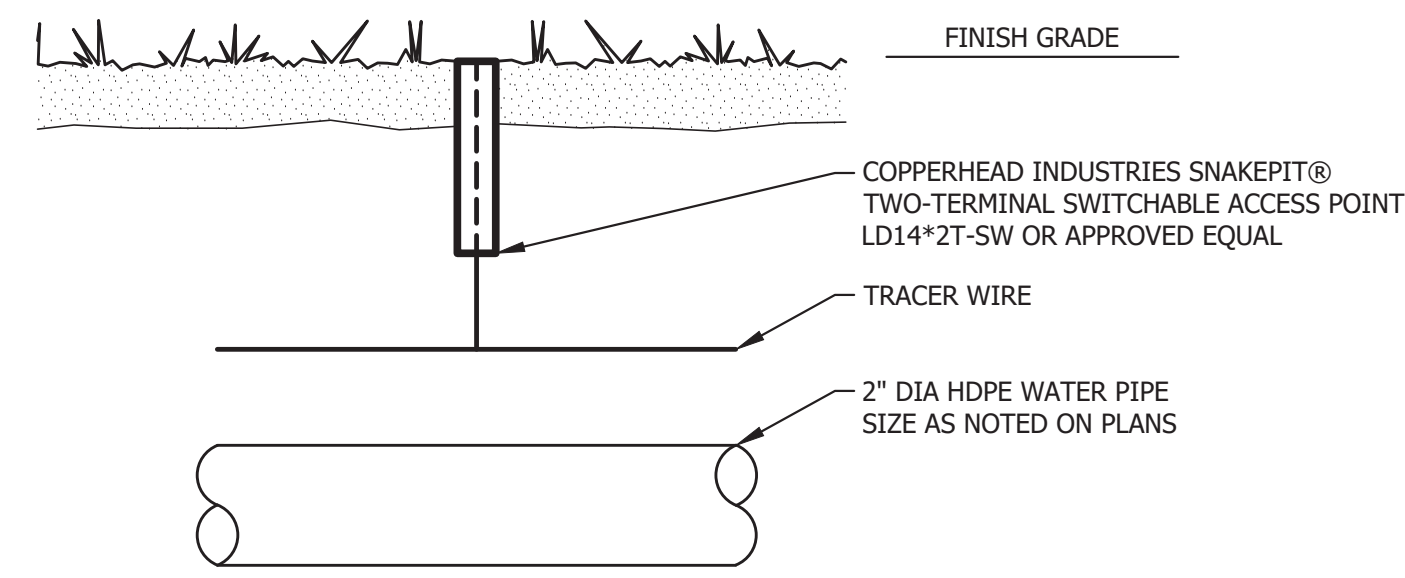
SCHEDULE OF SURFACE FINISHES

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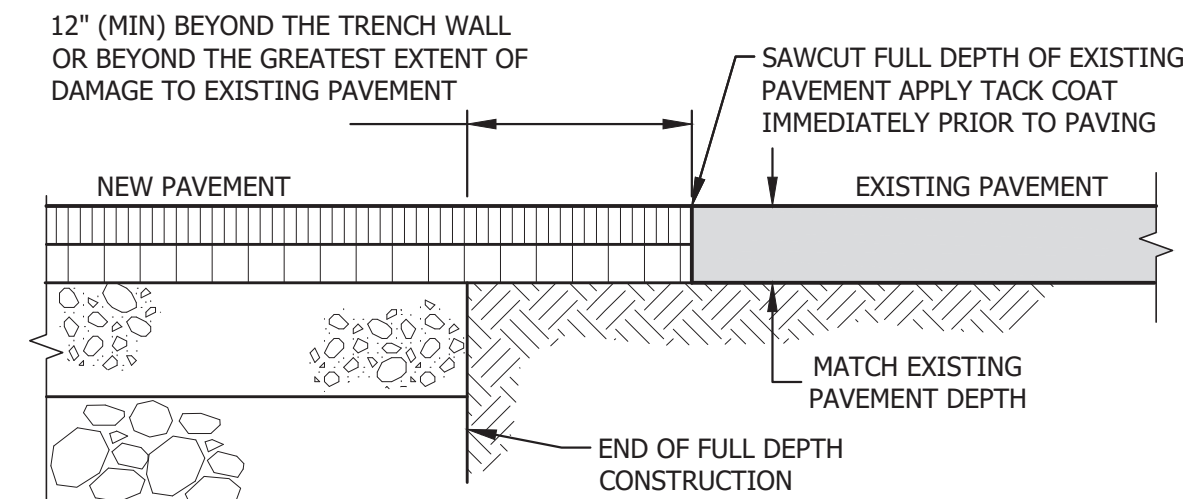
PIPE TRENCH

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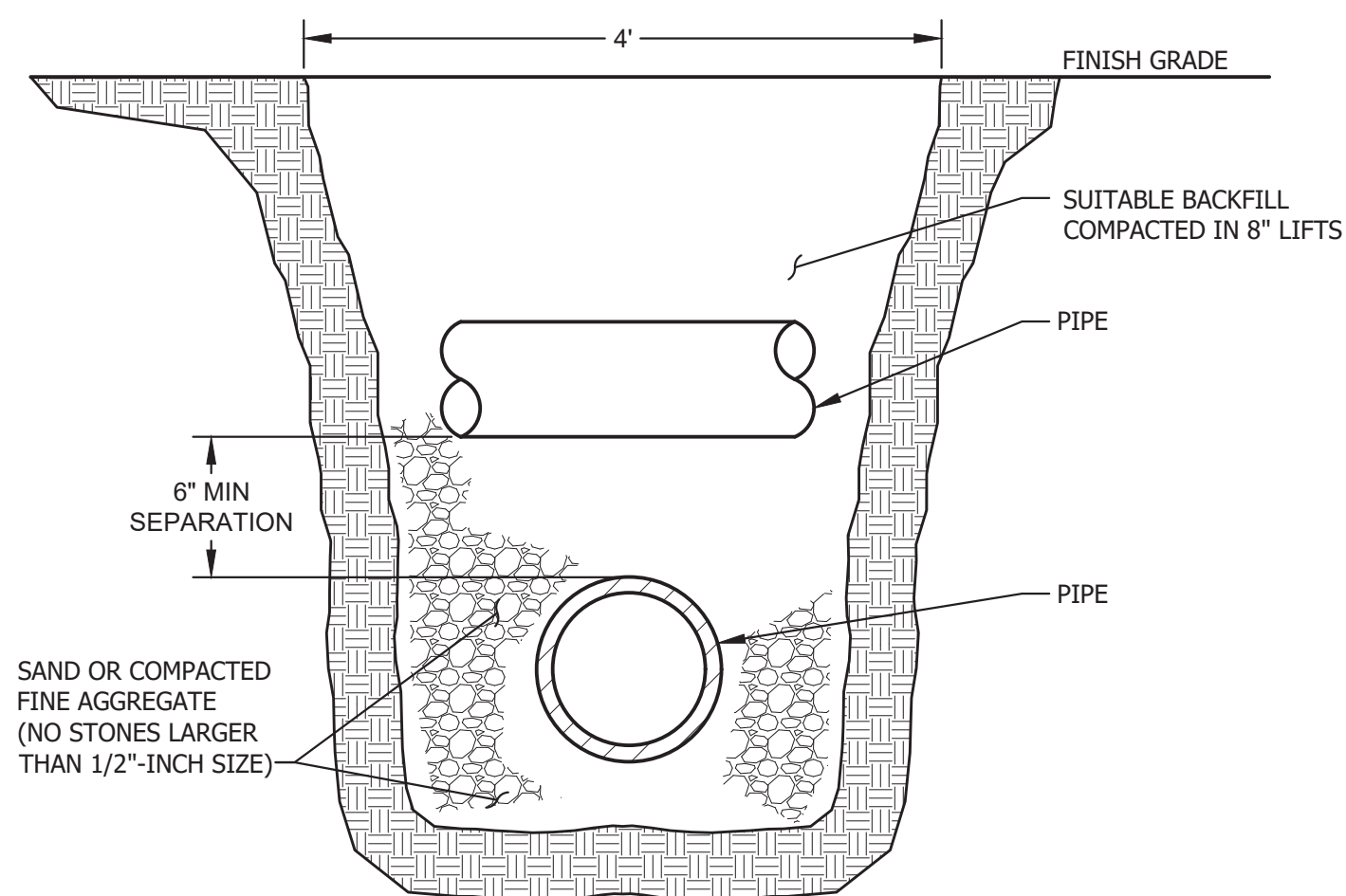
TRACER WIRE TERMINAL ACCESS

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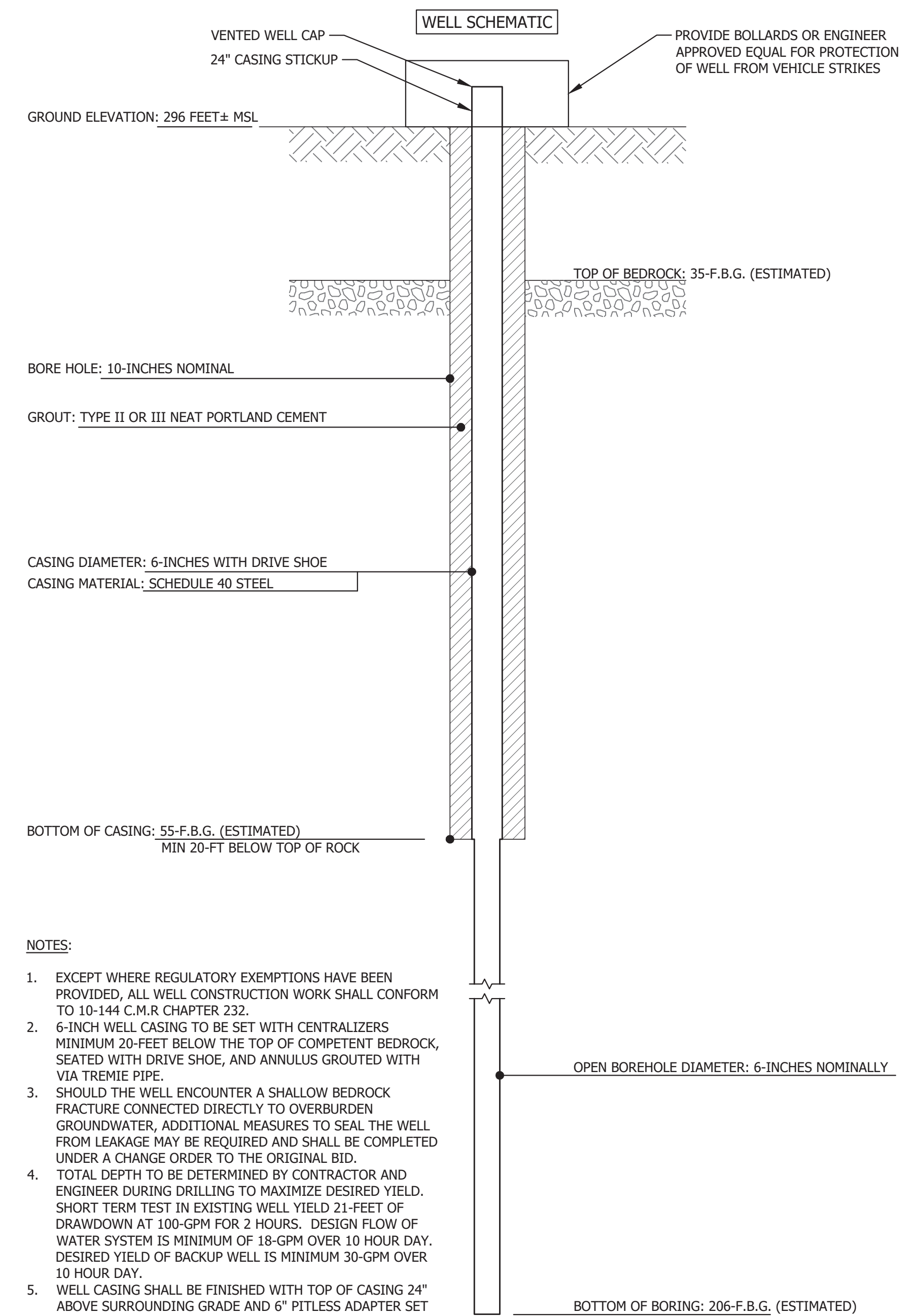
PAVEMENT SAWCUT

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TYPICAL PIPE CROSSING TRENCH DETAIL

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NOTES:

- EXCEPT WHERE REGULATORY EXEMPTIONS HAVE BEEN PROVIDED, ALL WELL CONSTRUCTION WORK SHALL CONFORM TO 10-144 C.M.R CHAPTER 232.
- 6-INCH WELL CASING TO BE SET WITH CENTRALIZERS MINIMUM 20-FEET BELOW THE TOP OF COMPETENT BEDROCK, SEATED WITH DRIVE SHOE, AND ANNULUS GROUTED WITH VIA TREMIE PIPE.
- SHOULD THE WELL ENCOUNTER A SHALLOW BEDROCK FRACTURE CONNECTED DIRECTLY TO OVERBURDEN GROUNDWATER, ADDITIONAL MEASURES TO SEAL THE WELL FROM LEAKAGE MAY BE REQUIRED AND SHALL BE COMPLETED UNDER A CHANGE ORDER TO THE ORIGINAL BID.
- TOTAL DEPTH TO BE DETERMINED BY CONTRACTOR AND ENGINEER DURING DRILLING TO MAXIMIZE DESIRED YIELD. SHORT TERM TEST IN EXISTING WELL YIELD 21-FEET OF DRAWDOWN AT 100-GPM FOR 2 HOURS. DESIGN FLOW OF WATER SYSTEM IS MINIMUM OF 18-GPM OVER 10 HOUR DAY. DESIRED YIELD OF BACKUP WELL IS MINIMUM 30-GPM OVER 10 HOUR DAY.
- WELL CASING SHALL BE FINISHED WITH TOP OF CASING 24" ABOVE SURROUNDING GRADE AND 6" PITLESS ADAPTER SET 5.5- FEET BELOW GRADE.
- PUMP DEPTH SHALL BE DETERMINED BASED ON DEPTH OF PRIMARY WATER-BEARING FRACTURES, SHORT-TERM PUMPING TEST, AND/OR OTHER MEANS, AND SHALL BE APPROVED BY ENGINEER.
- CONTRACTOR TO PROVIDE PUMP SPECIFICATION SUBMITTAL FOR APPROVAL.

PROPOSED BACKUP WELL DETAIL

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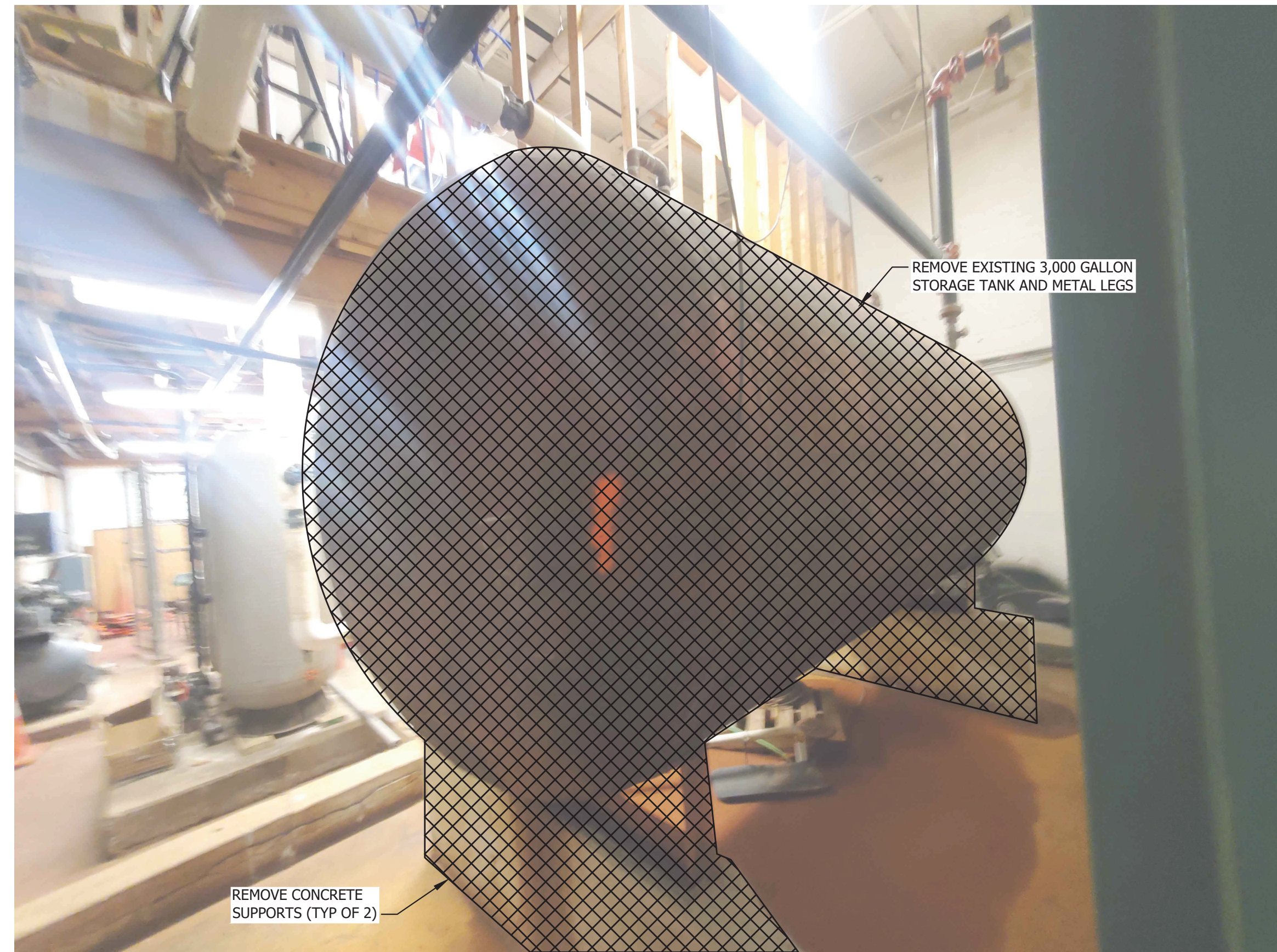
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 STANDISH/BUXTON, MAINE

SECTIONS AND DETAILS

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 LMN: NONE
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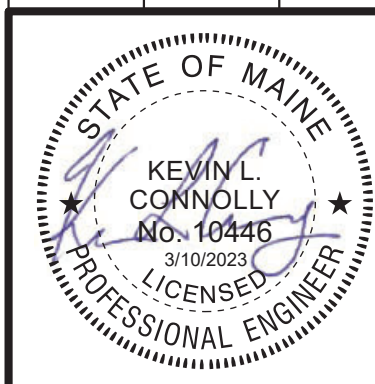
JOB NO. 220639.03 DWG FILE BEHS-BEMS-DETAILS C-300



N.I.T.C¹



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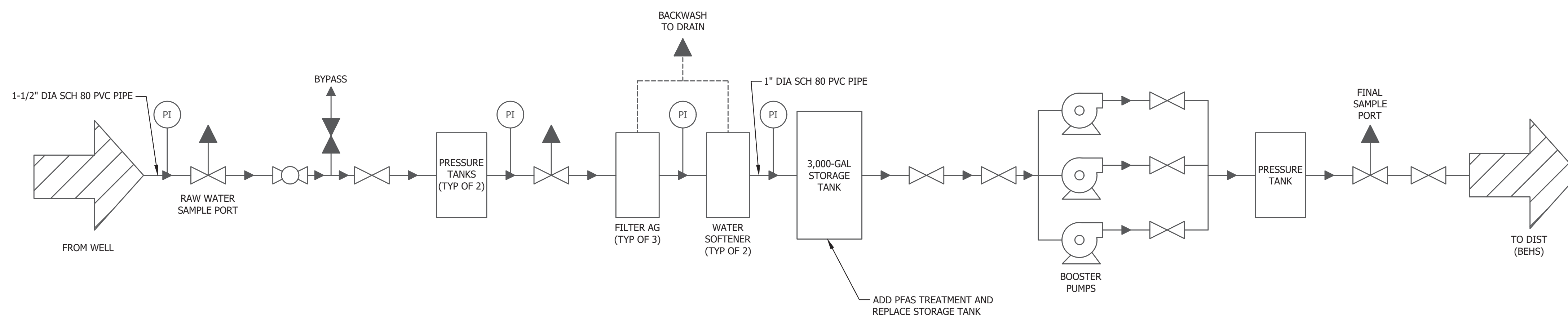
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DEMOLITION DETAILS

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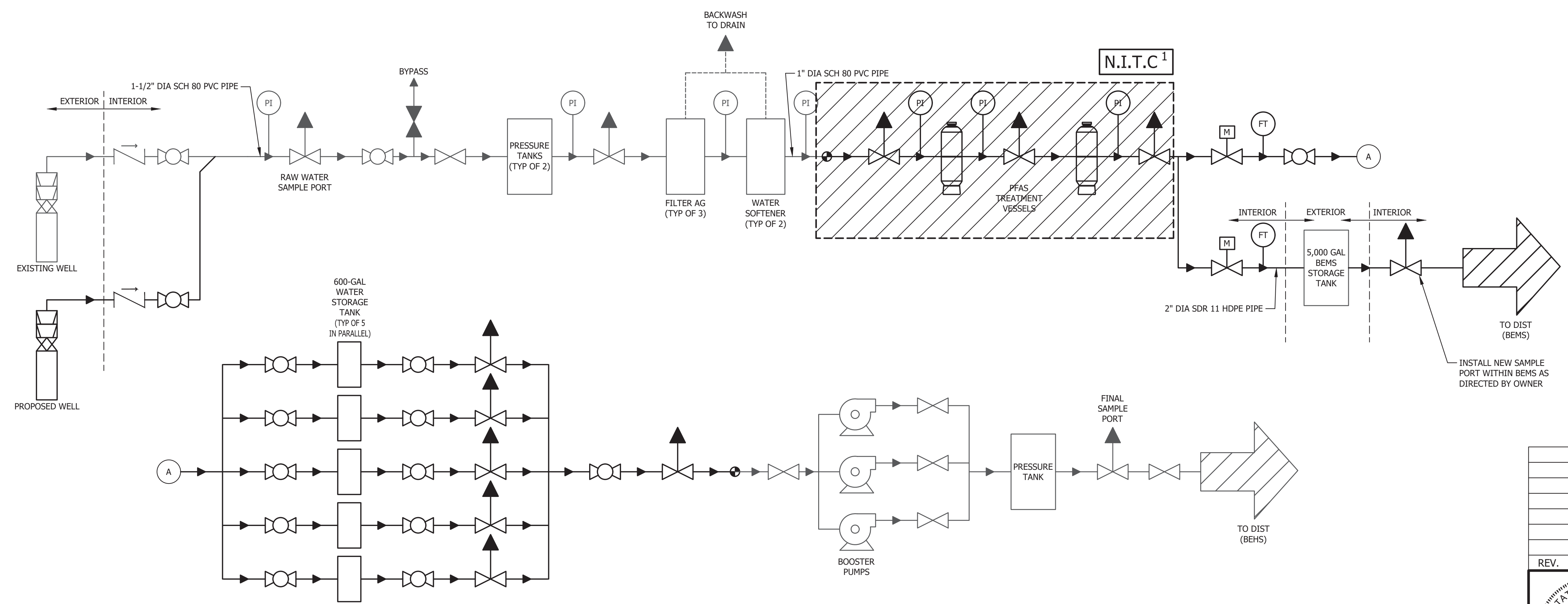
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BEHS EXISTING TREATMENT P&ID

LEGEND

EXISTING	PROPOSED
PIPING	



BEHS PROPOSED TREATMENT P&ID

- NOTES:**
1. WORK MARKED AS NOT IN THIS CONTRACT (N.I.T.C.) SHALL BE COORDINATED WITH THE SELECTED PFAS VENDOR AS NEEDED TO ENSURE COMPATIBILITY OF WORK.
 2. NEW PFAS TREATMENT EQUIPMENT INCLUDES PRESSURE VESSELS, MEDIA, PIPING, AND FITTINGS.
 3. INCLUDE TWO PRESSURE VESSELS PLUMBED IN SERIES AND VALVED FOR LEAD-LAG OPERATION.
 4. PROVIDE SAMPLE PORTS AND PRESSURE GAUGES BEFORE, BETWEEN, AND AFTER PRESSURE VESSELS.
 5. NEW PRESSURE GAUGES TO BE MIN 2-1/2" DIA LIQUID FILLED, 0-100 PSI, WITH STAINLESS STEEL CASE.
 6. NEW BALL VALVES FOR LEAD-LAG OPERATION SHALL BE TRUE UNION TYPE SCH 80 PVC BALL VALVE.
 7. NEW SAMPLE PORTS SHALL BE 1/4-INCH BALL VALVES.
 8. EXISTING TREATMENT EQUIPMENT INCLUDING BUT NOT LIMITED TO FILTER AG TANKS AND WATER SOFTENER TANKS, AND BRINE TANK, CALCIUM CARBONATE TANK, AND POST-CHLORINATION TANK AND METERING PUMP SHALL REMAIN IN PLACE.

N.I.T.C.¹

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PROCESS AND INSTRUMENTATION DIAGRAM

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JOB NO. 220639.03 DWG FILE BEHS-BEMS-DETAILS **C-302**

ABBREVIATIONS

A	AMPERE	LAN	LOCAL AREA NETWORK	RTU	ROOFTOP UNIT
AC	ALTERNATING CURRENT	LC	LIGHTING CONTACTOR	REF	REFRIGERATOR
AFF	ABOVE FINISHED FLOOR	LF	LINEAR FEET	SF	SUPPLY FAN
AFG	ABOVE FINISHED GRADE	LC	LOADCENTER	ST	SHUNT TRIP
AHU	AIR HANDLING UNIT	LCP	LIGHTING CONTROL PANEL	SPDT	SINGLE POLE, DOUBLE THROW
AIC	AMPERES INTERRUPTING CAPACITY	LED	LIGHT EMITTING DIODE	SQ	SQUARE
ATS	AUTOMATIC TRANSFER SWITCH	LTG	LIGHTING	TEL	TELEPHONE
AWG	AMERICAN WIRE GAUGE	LTS	LIGHTS	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
BAS	BUILDING AUTOMATION SYSTEM	MAX	MAXIMUM	TYP	TYPICAL
BKBD	BACKBOARD	MCB	MAIN CIRCUIT BREAKER	UF	UNDER FLOOR
C	CONDUIT	MECH	MECHANICAL	UG	UNDERGROUND
CAT	CATALOG, CATEGORY	MH	MOUNTING HEIGHT	UH	UNIT HEATER
CATV	CABLE TV	MC	MICROPHONE	UL	UNDERWRITER'S LABORATORY
CB	CIRCUIT BREAKER	MW	MICROWAVE MAIN LUG ONLY	UNO	UNLESS NOTED OTHERWISE
CCTV	CLOSED CIRCUIT TELEVISION	MT	MOUNT	UPS	UNINTERRUPTIBLE POWER SUPPLY
CM	CIRCULAR MILS	MTS	MANUAL TRANSFER SWITCH	V	VOLTS
COMM	COMMUNICATIONS	MCP	MOTOR CONTROL PANEL	VFD	VARIABLE FREQUENCY DRIVE
CU	MECH CONDENSING UNIT	MH	METAL HALIDE	W	WATT
CU	COPPER	MDP	MAIN DISTRIBUTION PANEL	WP	WEATHERPROOF
CUH	CABINET UNIT HEATER	MIN	MINIMUM	WG	WIREGUARD
DC	DIRECT CURRENT	N	NEUTRAL	XFMR	TRANSFORMER
DDC	DIGITAL DIRECT CONTROL	NC	NORMALLY CLOSED	(E)	EXISTING ITEM TO REMAIN
DN	DOWN	NEC	NATIONAL ELECTRICAL CODE	(R)	REMOVE ITEM AND DISPOSE OF PROPERLY
DW	DISHWASHER	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION	(ER)	RELOCATED ITEM AT NEW LOCATION
DWG	DRAWING	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION	(RL)	REMOVE AND RELOCATE
EF	EXHAUST FAN	NITC	NOT IN THIS CONTRACT		
ELEV	ELEVATOR	NF	NON-FUSED		
EMT	ELECTRICAL METALLIC TUBING	NO	NORMALLY OPEN		
EP	EXPLOSION PROOF	NO, #	NUMBER		
ERU	ENERGY RECOVERY UNIT	NTS	NOT TO SCALE		
EWC	ELECTRIC WATER COOLER	OC	ON CENTER		
FACP	FIRE ALARM CONTROL PANEL	OCC	OCCUPANCY		
FB	FLOOR BOX	OH	OVERHEAD		
FLA	FULL LOAD AMPS	P	POLE		
FWE	FURNISHED WITH EQUIPMENT	PA	PUBLIC ADDRESS		
G, GND	GROUND	PB	PULLBOX		
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	PH,	PHASE		
GFP	GROUND FAULT PROTECTION	PIR	PASSIVE INFRARED		
HID	HIGH INTENSITY DISCHARGE	PNL	PANELBOARD		
HOA	HAND-OFF-AUTO SELECTOR SWITCH	P/O	PART OF		
HP	HORSEPOWER	PV	PHOTOVOLTAIC		
HVAC	HEATING, VENTILATION AND COOLING UNIT	PVC	POLY-VINYL CHLORIDE		
IDS	INTRUSION DETECTION SYSTEM	REC	RECEPTACLE		
IG	ISOLATED GROUND	RECPT	RECEPT		
IMC	INTERMEDIATE METAL CONDUIT	REF	REFRIGERATOR		
IR	INFRARED	RF	RETURN FAN		
K	KILO	RGS	RIGID GALVANIZED STEEL		
KCMIL	KILO CIRCULAR MILS	RM	ROOM		
KW	KILOWATT	RMC	RIGID METAL CONDUIT		
KVA	KILO VOLT-AMPS				

POWER DISTRIBUTION

	PANELBOARD ~ SURFACE MOUNTED
	PANELBOARD ~ FLUSH MOUNTED
	FUSED DISCONNECT SWITCH
	NON-FUSED DISCONNECT SWITCH
	MOTOR STARTER ~ NUMBER INDICATES NEMA SIZE
	COMBINATION MOTOR STARTER/FUSED DISCONNECT
	MOTOR OR FAN, # INDICATES HORSEPOWER
	JUNCTION BOX
	VARIABLE FREQUENCY DRIVE
	TRANSIENT VOLTAGE SURGE SUPPRESSOR
	WIRING UNDERGROUND OR UNDERSLAB
	SINGLE POLE HOMERUN ~ (2)#12+(1)#12G UNO
	SINGLE-PHASE HOMERUN
	3-PHASE HOMERUN
	FLEXIBLE CONNECTION
	GROUNDING SYSTEM
	FLOW METER
	PAGING SPEAKER
	MOTOR-ACTUATED VALVE
	LEVEL TRANSDUCER
	FLOW TRANSMITTER

ELECTRICAL GENERAL NOTES

- WHERE LOADS ARE ADDED TO EXISTING BRANCH CIRCUITS, VERIFY THAT THE EXISTING CIRCUITS HAVE ADEQUATE CAPACITY TO SUPPORT THE ADDITIONAL LOAD WITHOUT EXCEEDING SPECIFIED MAXIMUM LOAD.
- DISCONNECT, REMOVE, RELOCATE, AND RECONNECT ELECTRICAL CONDUIT, WIRING, DEVICES, BOXES, FIXTURES, EQUIPMENT, ETC. AS INDICATED AND AS REQUIRED TO FACILITATE THE WORK OF DIVISION 26 AND OTHER DIVISIONS. THESE DRAWINGS ARE NOT INTENDED TO INDICATE ALL ITEMS TO BE REMOVED.
- DO NOT SCALE THE DRAWINGS. REFER TO EXISTING CONDITIONS FOR EXACT DIMENSIONS.
- THE LOCATION OF EQUIPMENT, OUTLETS, ETC. AS GIVEN ON THE DRAWINGS IS APPROXIMATE. IT SHALL BE UNDERSTOOD THAT THESE LOCATIONS ARE SUBJECT TO MODIFICATION AS MAY BE FOUND NECESSARY OR DESIRABLE AT THE TIME OF INSTALLATION IN ORDER TO MEET PROJECT REQUIREMENTS. SUCH CHANGES SHALL BE MADE WITHOUT EXTRA CHARGE.
- COORDINATE ALL WORK WITH OTHER DIVISIONS AND THE OWNER.
- VERIFY EXACT POWER REQUIREMENTS OF EQUIPMENT PRIOR TO ROUGH IN.
- COORDINATE LOCATIONS OF WALL MOUNTED LIGHT FIXTURES AND OTHER ELECTRICAL ITEMS WITH ARCHITECTURAL INTERIOR ELEVATIONS.

ASN	5/2023	ISSUED FOR BID - PLANS FOR GENERAL CONTRACTOR	
ASN	2/2023	90% DESIGN DRAFT	
ASN	1/2023	50% DESIGN DRAFT	
REV.	BY	DATE	STATUS

WATER SYSTEM MODIFICATIONS AND CONSOLIDATION TO ADDRESS PFAS AT BONNY EAGLE MIDDLE SCHOOL AND BONNY EAGLE HIGH SCHOOL MSAD #6

WATER SYSTEM #0000147 AND #0008778
STANDISH/BUXTON, MAINE

ELECTRICAL LEGEND AND GENERAL NOTES

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DESIGN BY: ASN

DRAWN BY: SJM

DATE: 4/2023

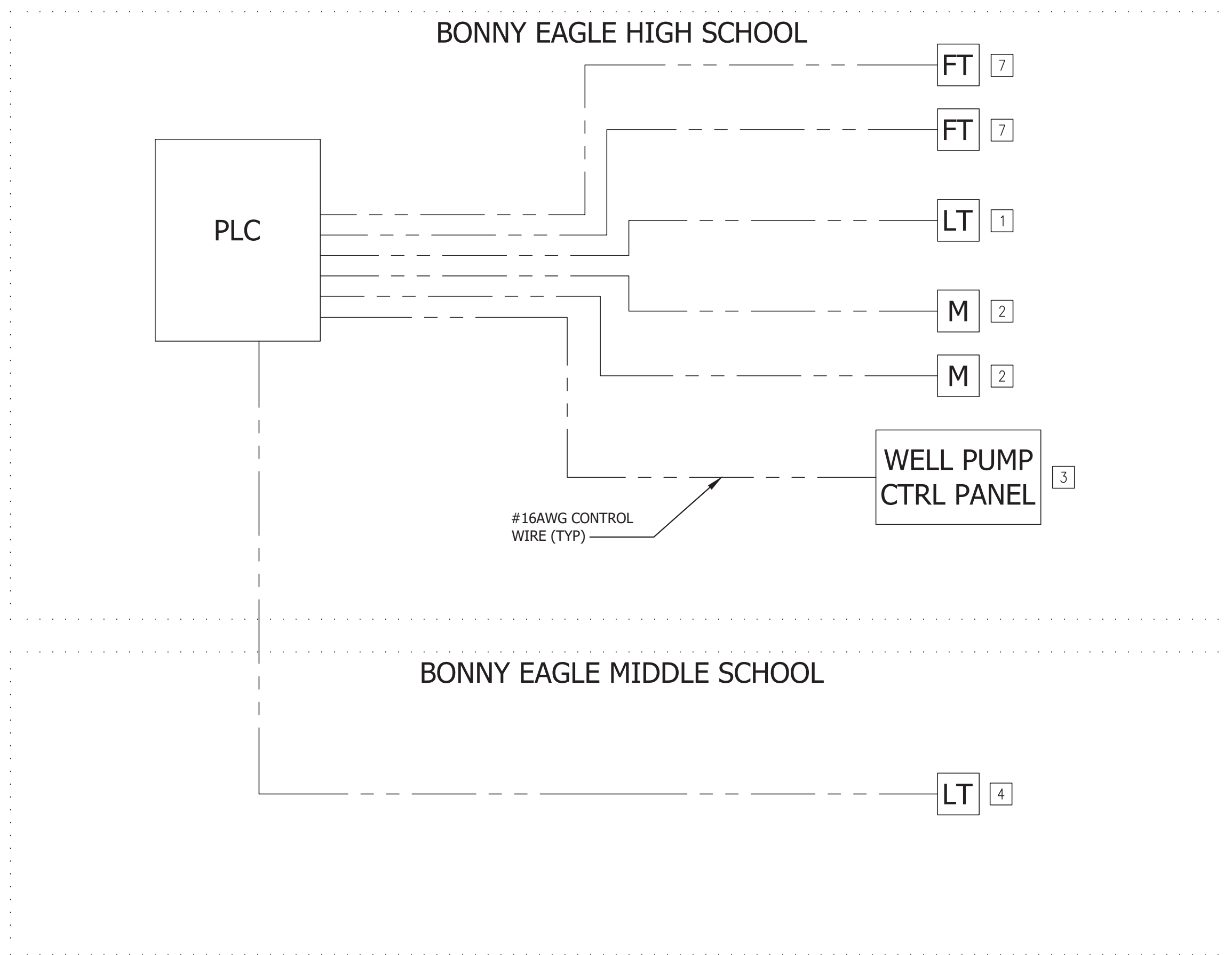
CHECKED BY: KLC

LMN: NONE

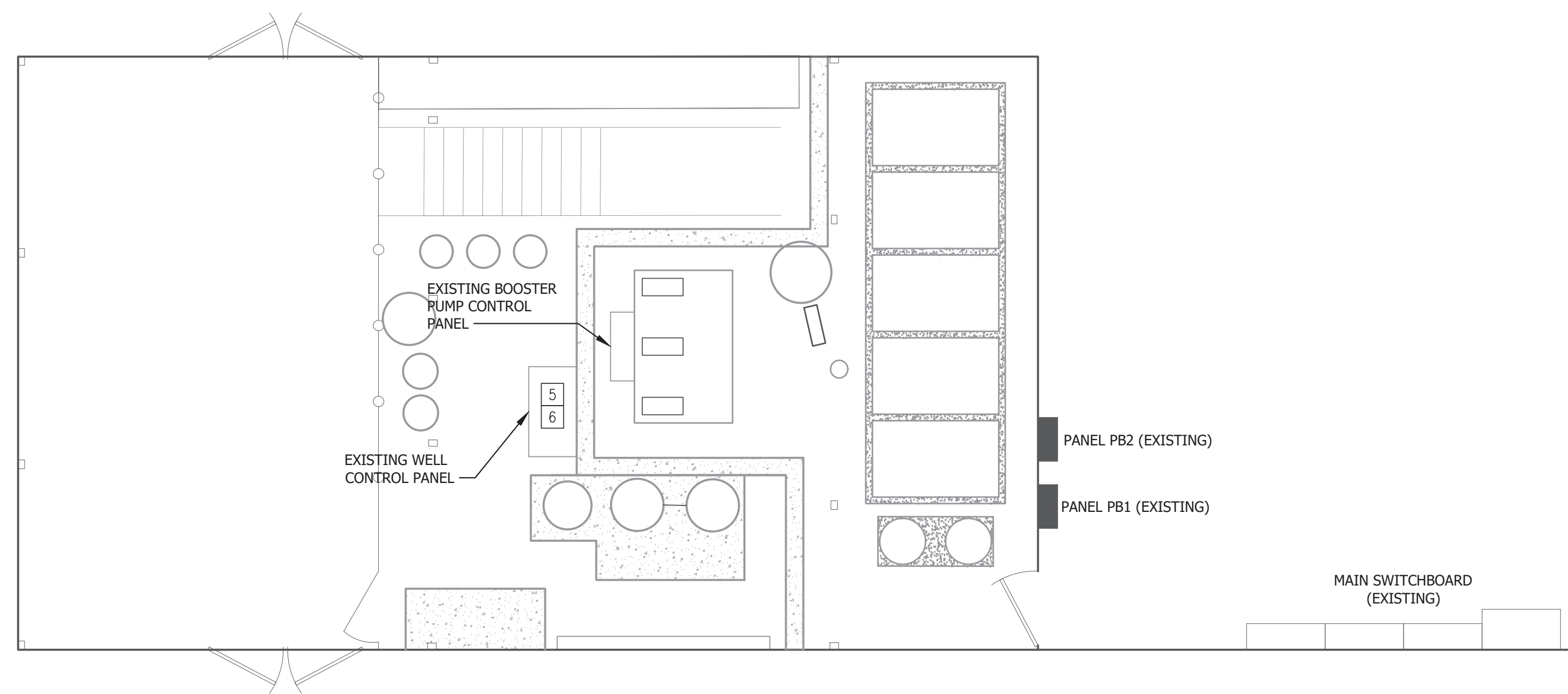
CTB: SME-STD.CTB

JOB NO. 220639 DWG FILE BEHS-BEMS-GEN-NOTES

E-100



BLOCK DIAGRAM
NTS



PROPOSED MECHANICAL ROOM PLAN (HIGH SCHOOL)



GENERAL NOTES:

- DRAWINGS ARE SCHEMATIC AND DIAGRAMMATIC. USE JUDGMENT AND CARE TO INSTALL ELECTRICAL WORK TO FUNCTION PROPERLY AND FIT WITHIN BUILDING CONSTRUCTION AND FINISHES. ELECTRICAL CONDUCTORS, CONDUIT, COMPONENTS, NOT SHOWN OR SPECIFIED, WHICH ARE REQUIRED FOR ANY DEVICE OR SYSTEM TO PRODUCE A COMPLETE AND OPERATIVE SYSTEM ARE REQUIRED TO BE FURNISHED AND INSTALLED.
- PERFORM WORK IN ACCORDANCE WITH NFPA-70, NATIONAL ELECTRICAL CODE (NEC) 2020.
- PANEL SCHEDULE INFORMATION FOR EXISTING PANELS IS BASED ON AVAILABLE INFORMATION DURING DESIGN. VERIFY THAT PANEL SCHEDULES ARE ACCURATE AND NOTIFY CONTRACTING OFFICER OF ANY DISCREPANCY PRIOR TO COMMENCING WORK.
- UNLESS OTHERWISE NOTED, FOR 20A-1P BRANCH CIRCUIT WIRING USE 2#12 AWG CONDUCTORS AND #12 GND. HOME RUNS FED FROM 20A-1P CIRCUITS IN EXCESS OF 100 FEET USE #10 AWG.
- UNLESS OTHERWISE NOTED, PROVIDE TYPE EMT CONDUIT FOR INTERIOR RACEWAY, TYPE RGS CONDUIT FOR EXTERIOR RACEWAY, TYPE PVC CONDUIT FOR BELOW GRADE RACEWAY.
- UNLESS OTHERWISE NOTED WIRING MUST BE AS FOLLOWS:
 - LOW VOLTAGE INTERIOR DISTRIBUTION AND BRANCH WIRING MUST BE 600V, COPPER WITH THHN/THWN INSULATION
 - LOW VOLTAGE EXTERIOR DISTRIBUTION AND BRANCH WIRING MUST BE 600V, COPPER WITH XHHW INSULATION.
- PLC MUST BE ABB ACS500 OR APPROVED EQUAL. PROVIDE ALL POWER SUPPLIES, MODULAR EXPANSION CARDS, TERMINAL BOARDS, AND PROGRAMMING NECESSARY TO IMPLEMENT THE SEQUENCE OF OPERATION.
- DISCONNECT AND MAKE SAFE THE CIRCUIT TO THE MIDDLE SCHOOL WELL PUMP.

KEYED NOTES:

- PROVIDE CONTINUOUS LEVEL TRANSMITTER IN NEW STORAGE TANKS.
- PROVIDE TWO MOTORIZED VALVES IN-LINE OF NEW TANK FILL PIPING. ONE VALVE FOR HIGH SCHOOL TANK AND ONE VALVE FOR MIDDLE SCHOOL TANK.
- REPLACE RELAY CONTACTS IN EXISTING WELL PUMP CONTROL PANEL WITH OUTPUT CONTACTS FROM PLC TO MAINTAIN BOOSTER PUMP CUTOFF AND RESTORE FUNCTION. REMOVE WIRING FROM EXISTING HIGH SCHOOL TANK LEVEL SENSORS.
- PROVIDE LEVEL TRANSMITTER IN EXISTING STORAGE TANK.
- PROVIDE NEW CONTROL PANEL ENCLOSURE FOR PLC, MOUNTED ABOVE EXISTING WELL CONTROL PANEL. PROVIDE POWER FOR CONTROL PANEL FROM SPARE 120V, 20A, 1-POLE CIRCUIT IN PANEL PB1.
- PROVIDE NEW 208V, 50A, 3-POLE CIRCUIT FOR NEW WELL PUMP FROM EXISTING WELL CONTROL PANEL. CIRCUIT CONDUCTORS TO BE 3#6AWG, 1#8 GND IN 1" CONDUIT. SEE CIVIL SHEETS FOR NEW WELL LOCATION.
- PROVIDE NEW FLOW TRANSMITTER TO MEASURE VOLUME OF WATER SENT TO EACH STORAGE TANK. FLOW TRANSMITTER TO HAVE INTEGRAL DISPLAY.

SEQUENCE OF OPERATION:

PLC SHALL CONTROL ONE MOTORIZED VALVE FOR CONTROL OF FLOW TO THE MIDDLE SCHOOL WATER STORAGE AND ONE MOTORIZED VALVE TO THE HIGH SCHOOL WATER STORAGE TO MAINTAIN WATER LEVELS WITHIN TANKS. TANK LEVELS TO BE MONITORED BY PLC THROUGH CONTINUOUS LEVEL TRANSMITTER.

MOTORIZED VALVE SHALL BE OPENED TO ALLOW TANK FILLING AFTER TANK VOLUME HAS DROPPED TO 90%, VALVE SHALL BE CLOSED AFTER TANK REACHES 100% FULL. ENSURE PROGRAMMING ACCOUNTS FOR GRAVITY FLOW OF WATER IN PIPING. PROVIDE INDICATOR LIGHT TO INDICATE WHEN EACH VALVE IS OPENED AND TANK IS BEING FILLED.

ONLY ONE MOTORIZED VALVE SHALL BE OPENED AT A TIME. THE FIRST TANK THAT CALLED FOR WATER WILL BE CONSIDERED THE PRIMARY TANK, THE SECOND TANK THAT CALLED FOR WATER WILL BE THE SECONDARY. THE PRIMARY TANK WILL CONTINUE FILLING UNTIL REACHING 100%, THEN SECONDARY TANK WILL BECOME PRIMARY AND START FILLING. IF THE SECONDARY TANK DROPS BELOW 50% FILLED IT WILL BECOME THE PRIMARY TANK AND START FILLING.

IF EITHER TANK LEVEL DROPS BELOW 10% FILLED A VISUAL AND AUDIBLE ALARM WILL BE TRIGGERED. IF THE HIGH SCHOOL TANK DROPS BELOW 10% FILLED THE PLC SHALL SEND A BOOSTER PUMP CUTOFF SIGNAL TO THE EXISTING WELL PUMP CONTROL PANEL.

MODIFY EXISTING WELL PUMP CONTROL PANEL TO ADD A MANUAL WELL PUMP SELECT SWITCH. SWITCH SHALL ALLOW FOR SELECTION OF WELL PUMP TO OPERATE: EXISTING WELL OR NEW WELL. BOTH WELLS SHALL OPERATE BASED ON EXISTING PRESSURE SENSOR AS SYSTEM IS CURRENTLY OPERATING.

PLC SHALL DISPLAY THE VOLUME OF WATER IN EACH SCHOOL'S TANK IN GALLONS THROUGH A DIGITAL NUMBER DISPLAY ON THE FACE OF THE CONTROL PANEL.

PLC SHALL COLLECT AND LOG THE FOLLOWING PARAMETERS:

- VOLUME OF WATER STORAGE TANKS OVER TIME.
- START AND STOP TIMES OF MOTORIZED VALVE OPEN/CLOSE.
- RUNNING TOTAL OF WATER FLOW FROM FLOW TRANSMITTERS.


LOG DATA SHALL BE MADE AVAILABLE TO OWNER THROUGH EITHER A NETWORK INTERFACE OR USB CONNECTION.

REV.	BY	DATE	STATUS
ASN	5/2023	ISSUED FOR BID - PLANS FOR GENERAL CONTRACTOR	
ASN	3/2023	90% DESIGN DRAFT	
ASN	1/2023	50% DESIGN DRAFT	

	WATER SYSTEM MODIFICATIONS AND CONSOLIDATION TO ADDRESS PFAS AT BONNY EAGLE MIDDLE SCHOOL AND BONNY EAGLE HIGH SCHOOL MSAD #6 WATER SYSTEM #0000147 AND #0008778 STANDISH/BUXTON, MAINE	
	ELECTRICAL PLAN, DIAGRAM, AND DETAILS	
<p>ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE</p> <p>4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021 Phone 207.829.5016 • Fax 207.829.5692 • sme-engineers.com</p>	DESIGN BY: ASN	
	DRAWN BY: SJM	
	DATE: 3/2023	
	CHECKED BY: KLC	
	LMN: NONE	
CTB: SME-STD		
JOB NO. 220639.03	DWG FILE DETAILS	E-101

ATTACHMENT 2

TECHNICAL SPECIFICATIONS



**TECHNICAL SPECIFICATIONS
WATER SYSTEM MODIFICATIONS AND
CONSOLIDATION TO ADDRESS PFAS AT
BONNY EAGLE MIDDLE SCHOOL
AND BONNY EAGLE HIGH SCHOOL
WATER SYSTEM #0000147 AND #0008778
STANDISH AND BUXTON, MAINE**

Prepared for

**MAINE SCHOOL ADMINISTRATIVE DISTRICT
MSAD #6**

May 2023

4 Blanchard Road
P.O. Box 85A
Cumberland, Maine 04021
Phone: 207.829.5016 sme-engineers.com

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DWSRF SUPPLEMENTAL GENERAL CONDITIONS

DAVIS BACON WAGE DECISION – YORK AND CUMBERLAND COUNTY – HEAVY CONSTRUCTION

BUILD AMERICA BUY AMERICA REQUIREMENTS

AMERICAN IRON AND STEEL REQUIREMENTS

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 11 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

These Specifications and Engineering Drawings, collectively known herein as the Contract Documents, defines the principal items of construction work for the Maine School Administrative District #6 (MSAD #6) (Owner), for water system modifications at Bonny Eagle High School (BEHS) to remove per- and poly-fluoroalkyl substances (PFAS) from drinking water and water system consolidation with Bonny Eagle Middle School (BEMS) in Standish, Maine. Any person interested in Bidding on this contract should thoroughly familiarize themselves with the Drinking Water State Revolving Fund (DWSRF) Supplemental General Conditions. Failure to comply with any of these conditions may result in the Bidder being determined non-responsive and therefore, not entitled to award of this contract.

A. Section Includes:

1. Contract description.
2. Work by Owner or others.
3. Contractor's use of premises.
4. Work sequence.
5. Owner occupancy.
6. Permits.

1.2 CONTRACT DESCRIPTION

A. Any contract awarded under this Advertisement to Bidders is expected to be funded in part by a Maine Drinking Water State Revolving Fund loan. Neither the State of Maine nor any of its departments, agencies, or employees is, or will be, party to the Contract.

B. The work of this project shall consist of furnishing all materials, labor, equipment, and supervision, and performing all work related to the Water System Modifications to Address PFAS at BEHS and BEMS (Project), as shown on the Contract Drawings, as described in the specifications contained herein, and as evidently necessary to complete the work. All materials, products, and coatings that contact drinking water shall be certified to meet NSF/ANSI Standard 61 and all plumbing components must meet the Reduction of Lead in Drinking Water Act. Work shall include, but not be limited to the following items:

1. System modifications at BEHS:

- a. Provide and install Schedule 80 PVC pipe and fittings, and transition fittings as necessary, to connect new PFAS water treatment equipment provided by others.
- b. Remove the existing 3,000-gallon aboveground storage tank (AST) and concrete supports.
- c. Remove the existing 10,000-gallon dual-wall fiberglass fuel oil underground storage tank (UST) and associated piping in accordance with requirements of Maine DEP Chapter 691. Distribute oil amongst other tanks, as directed by owner. Manage and

dispose soils excavated from above the UST as special waste. Backfill the excavated area and pave with asphalt.

- d. Provide and install five (5) new 600-gallon doorway polyethylene (PE) water tanks plumbed in parallel and new concrete pad for the tanks.
 - e. Provide and install two (2) electrically actuated ball valves, necessary electrical cable and conduit, one (1) radar or submersible level sensor in new storage, two (2) 2-inch magnetic flow meters, and one (1) programmable logic controller (PLC), with human-machine interface, to monitor flow, water level in two tanks, and modulate two actuated valves for level control.
 - f. Perform 48-hour constant rate drawdown test. Provide test pump or use existing pump, stilling well for transducer installation, and discharge piping to discharge water to ground up to 250 feet from well.
 - g. Drill new well to 206-feet below grade, install pitless adapter, furnish and install pump, and connect water and power. Assume bedrock is 35-feet below grade and casing to extend 20-feet beyond top of bedrock. Trench and install water line and electrical from new well to building and provide new manual well pump select switch at existing pump control panel. Complete 6-hour step-drawdown test on new backup well. Provide staffing for test to record water level measurements at engineer approved intervals. Provide test pump of appropriate size, power, stilling well, level transducer and discharge piping to discharge water to ground up to 250 feet away.
 - h. Provide all necessary bypass pumping or collection or diversion of flows, pipe cutting, disposal of construction debris, media, and associated pipe and pipe fittings installation including connection to existing water pre-treatment and new storage tanks and minor relocation of appurtenances to accommodate new construction, and associated restoration of building structure and utilities, etc. as needed to pre-construction conditions. Components of the completed system described herein shall meet the American Iron and Steel (AIS) requirement.
2. System consolidation with BEMS:
- a. Provide and install new 2-inch standard dimension ratio (SDR) 11 high density polyethylene (HDPE) pipe and fittings between the BEHS boiler room and the 5,000-gallon UST at BEMS as shown on the contract drawings.
 - b. Provide cleaning of 5,000-gallon UST prior to new water main connection from BEHS.
 - c. Provide and install two (2) new 1-inch PVC conduit lines between the BEHS boiler room and the BEMS UST. One line shall be used to connect communication from new equipment installed at BEMS. One line shall remain unused, with pull tape for future connection.
 - d. Provide and install one (1) radar or submersible level sensor for 5,000-gallon underground storage tank with hard-wire connection to new PLC at BEHS.
 - e. Provide all necessary utility locates, traffic control, confined space entry, bypass pumping or collection or diversion of flows, erosion control, excavation and backfill, pipe cutting, disposal of construction debris, upstream connection to BEHS water system and downstream connection to BEMS water system at the 5,000-gallon underground water storage tank, and associated restoration of building structure and

utilities, etc. as needed to pre-construction conditions. Components of the completed system described herein shall meet the American Iron and Steel (AIS) requirement.

- C. Perform work of Contract under separate Contract with Owner according to Conditions of Contract.
- D. Work of Contract is identified in the Drawings and Specifications contained herein for the Project titled as follows:

Water System Modifications and Consolidation to Address PFAS at Bonny Eagle Middle School and Bonny Eagle High School
MSAD #6
Water System #0000147 and #0008778
Standish/Buxton, Maine

1.3 WORK BY OWNER OR OTHERS

- A. If Owner-awarded contracts interfere with each other due to work being performed at the same or at the same Site, Owner will coordinate the sequence of work under all contracts according to “Contractor’s Use of Premises” and “Work Sequence” Articles in this Section.
- B. Coordinate Work with utilities of Owner and public or private agencies.

1.4 CONTRACTOR’S USE OF PREMISES

- A. Bonny Eagle Middle School and Bonny Eagle High School are active facilities. It will be the responsibility of the Contractor to coordinate with the Owner regarding the use of premises, including shut down, lock out tag out, and necessary bypasses of the existing infrastructure as required by the work described herein and shown on the Drawings. All details must be established prior to the Project’s preconstruction conference and shall be approved by the Owner and Engineer.

1.5 WORK SEQUENCE

- A. Sequencing of Construction Plan: Prior to or at the Project’s preconstruction conference, the Contractor will be required to submit a written document or construction plan detailing their planned work sequence and scheduling for approval by Owner and Engineer. This document must cover all phases of construction of the Contract. After acceptance of the plan, construction sequencing shall comply with accepted plan unless deviations are accepted by Owner and Engineer.

1.6 OWNER OCCUPANCY

- A. Schedule and substantially complete designated portions of the Work for occupancy before Substantial Completion of the entire Work.

- B. Coordinate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.7 PERMITS

- A. The Contractor shall comply fully with conditions set forth by MSAD #6 Facilities Department, as well as municipal, state, and federal laws and regulations.

1.8 DEFINITIONS

- A. Contract: The written agreement between the Owner and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the work, the furnishing of labor and materials and the basis of payment.
- B. The Contract includes the proposal, contract form and contract bonds, specifications, supplemental specifications, special provisions, general and detailed plans and notice to proceed, also any change orders and agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.
- C. A contract may include any part of a project or one or more projects.
- D. Contract Documents: The contract includes the documents contained herein, Request for Proposal (RFP), the Bid Form, Contract Drawings, and Technical Specifications.
- E. Information Precedence: In the event that any technical information presented herein conflicts with other such information, the information on the drawings will take precedence. Once such an item is found, it is the Contractor's responsibility to report said conflict to the Engineer.
- F. Bidder: An individual, firm, or corporation submitting a bid for the advertised work.
- G. Contractor: The individual, firm, or corporation contracting with the Owner for performance of prescribed work.
- H. Indicated: The term "Indicated" is a cross-reference to graphic representation, notes, or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in the contract documents. Where terms such as "shown," "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purposes of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.
- I. Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable to each instance.
- J. Install: Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site, including unloading, unpacking, assembly, erection, placing,

anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

- K. Provide: Except as otherwise defined in greater detail, term “provide” means furnish and install, completely and ready for intended use, as applicable in each instance

1.9 PROJECT CONDITIONS

- A. Temporary Utilities: The Contractor shall be responsible for all utilities necessary to execute this contract. Any labor costs associated with the extension of utilities to the work area will be borne by the Contractor. Any assumptions made by a bidder contrary to the intent of this paragraph must be explicitly detailed in his bid.
- B. Temporary Facilities: Contractor shall provide all temporary facilities including, but not limited to, structures, secured areas for materials storage, potable water, sanitary and medical facilities, etc.

1.10 SUBMITTALS REQUIRED WITH PROPOSAL

- A. Construction Schedule: Contractor shall submit a preliminary bar-chart type schedule with the Bid Documents. On the schedule, indicate a time bar for each major category or unit of work to be performed at the site, properly sequenced, and coordinated with other elements of work. Include estimated man-hours for each activity.
- B. Schedule of Rates: Laborers and mechanics employed directly upon the site of the work shall be paid at least the locally prevailing wages (including fringe benefits), listed in the Davis-Bacon wage determination in the contract, for the work performed. Contractor shall submit with the Bid Documents a Standard Schedule of Rates for Labor, Equipment, and Materials. Schedule of Rates will be used by MSAD #6 for extra work / change orders, if required.
- C. Proposed Management Personnel: The diligent, proactive management of this project and this construction contract, is extremely important to the successful execution of the project's stated objectives. Towards this end, each bidder will submit with the proposal, the proposed supervisory structure. At a minimum, it will include one full time superintendent on site, the number and type of foremen required to supervise the various activities and anticipated clerical assistance. The proposed superintendent should be identified by name, with a resume of his/her associated experience as a superintendent. This portion of the proposal will be reviewed carefully and will be a consideration in the Contractor selection process.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 20 00 – PROJECT COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

The Contractor shall be responsible for the following:

- A. Coordination of all work under this contract.
- B. Coordination of all work pertaining to shutdowns and bypasses of existing facilities with MSAD #6 facilities. Contractor shall provide the Owner and Engineer with a plan and schedule for each necessary shutdown as required to complete the work.
- C. Arranging for temporary electricity, heat, water, telephone, sanitary facilities, first aid facilities, fire protection, and storage and delivery of materials and supplies, as necessary.
- D. Assisting the Engineer as required in the review of construction, the testing of materials, and construction layout surveys.
- E. Maintaining up to date progress records, project schedule, and as-built drawings.
- F. Maintaining the project site in a neat and orderly condition. Protecting all existing mechanical, electrical, structural, plumbing, etc. from damage resulting from contract work on-site. Some areas of work for this project may require temporary stop work notices and cleanup during visitation or tour activities near those areas.
- G. Coordinating with all utilities, and notifying the appropriate owners when work is scheduled in areas that may affect existing utilities.
- H. Coordinating the work of subcontractors, equipment, and material suppliers. No extra payment shall be made to the Contractor for any delays caused by lack of progress, defective workmanship, or rescheduling of work by other contractors, subcontractors, or equipment and material suppliers.
- I. Verifying all field dimensions and notifying the Engineer of any discrepancies. No additional payment will be allowed because of differences between field dimensions and those shown on the drawings without notifying the Engineer prior to performing the work.
- J. Providing a competent and authorized supervisory representative at each work location during all working hours who shall act as the agent of the Contractor. The supervisory representative shall be capable of reading and thoroughly understanding the Drawings and Specifications, with full authority to fulfill the Contractor's duties and responsibilities on the job. If, in the opinion of the Owner, the supervisory representative or any of his successors proves incompetent, not conscientious, or not industrious, then the Contractor shall replace the supervisory representative upon written request of the Owner.

- K. Employing competent individuals on the job. Whenever the Engineer or the Owner notifies the Contractor in writing that, in their opinion, any individual on the job, whether employed by the Contractor or any of the subcontractors, imperils the safety of others or is incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such individual shall be discharged from the Contract work and shall not be employed on it, except with the written consent of the Owner.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 30 00 – ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Coordination and Project conditions
- B. Preconstruction conference
- C. Progress meetings
- D. Preinstallation meetings
- E. Closeout meeting
- F. Alteration Procedures
- G. DWSRF Supplemental General Conditions

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of Project to ensure efficient and orderly sequence and phasing of construction elements.

1.3 PRECONSTRUCTION CONFERENCE

- A. After Award of Contract and prior to the Notice to Proceed, the Contractor shall meet with the Owner and Engineer for a Preconstruction meeting at the Project Site. Owner or Engineer will schedule meeting prior to Contractor occupancy.
- B. The purpose of this meeting is to review the principal features of work and to address questions or concerns regarding the contract and work site.
- C. Attendance will be required by Engineer, Owner, Resident Project Representative Construction Manager, major Subcontractors, and Contractor.
- D. Minimum Agenda:
 - 1. Review plans and specifications
 - 2. Submission of list of products, schedule of values, and progress schedule
 - 3. Distribute and discuss list of subcontractors
 - 4. Review and discuss proposed schedule
 - 5. Designation of responsible personnel representing parties in Contract and Engineer
 - 6. Communication procedures
 - 7. Critical Work sequencing

8. Procedures and processing of requests for interpretations, field decisions, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures
 9. Bypass pumping and re-routing flows
 10. Use of premises by Owner and Contractor
 11. Owner's requirements
 12. Construction facilities and controls
 13. Temporary utilities and sequencing to maintain plant operations
 14. Procedures for testing and maintaining record documents
 15. Environment, safety, and health (ESH) concerns
 16. Handling and disposal of materials
 17. Construction waste management and disposal
 18. Requirements for startup of equipment
 19. Inspection and acceptance of equipment put into service during construction period
- E. Contractor will record minutes and distribute copies to participants within two days after meeting, to Engineer, Owner, and those affected by decisions made.

1.4 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.
- C. Attendance will be required by Job superintendent, major Subcontractors and suppliers, Owner, and Engineer as appropriate to agenda topics for each meeting.
- D. Minimum Agenda:
 1. Review minutes of previous meetings
 2. Review of Work progress
 3. Field observations, problems, and decisions
 4. Identification of problems impeding planned progress
 5. Review of submittal schedule and status of submittals
 6. Review of off-Site fabrication and delivery schedules
 7. Maintenance of Progress Schedule
 8. Corrective measures to regain projected schedules
 9. Planned progress during succeeding work period
 10. Coordination of projected progress
 11. Maintenance of quality and work standards
 12. Effect of proposed changes on Progress Schedule and coordination
 13. Other business relating to Work
- E. Contractor will record minutes and distribute copies to participants within two days after meeting, to Engineer, Owner, and those affected by decisions made.

1.5 PREINSTALLATION MEETINGS

- A. When required in individual Specification Sections, convene preinstallation meetings at Project Site before starting Work of specific Section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific Section.
- C. Notify required attendees at least three business days in advance of meeting date.
- D. Prepare agenda and preside over meeting:
 - 1. Review conditions of installation, preparation, and installation procedures
 - 2. Review coordination with related Work
- E. Contractor will record minutes and distribute copies to participants within two days after meeting, to Engineer, Owner, and those affected by decisions made.

1.6 CLOSEOUT MEETING

- A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.
- B. Attendance Required: Contractor, major Subcontractors, Engineer, Owner, and others appropriate to agenda.
- C. Notify required attendees at least three business days in advance of meeting date.
- D. Minimum Agenda:
 - 1. Inspection of Work
 - 2. Preparation of an initial "punch list"
 - 3. Procedure to request Engineer inspection to determine date of Substantial Completion
 - 4. Final Application for Payment
 - 5. Contractor's planned demobilization
 - 6. Maintenance
- E. Contractor will record minutes and distribute copies to participants within two days after meeting, to Engineer, Owner, and those affected by decisions made.

1.7 DWSRF Supplemental General Conditions

- A. A complete copy of the DWSRF Supplemental General Conditions is included as an attachment.
- B. This Project is exempt from State Sales and Use or Excise Taxes to the extent allowed by law.
- C. Bid Bond
 - 1. A certified check or bank draft payable to the Owner or a satisfactory Bid Bond executed by the Bidder and a Surety Company in the equal to 5% of the Bid shall be submitted with each bid. No bid may be withdrawn for at least 60 days after receipt of bids unless released by the owner.

- D. Disadvantaged Business Enterprise Requirements
1. Each Bidder shall take notice special notice of the Guidance for use of Disadvantaged Business Enterprises in the DWSRF Supplemental General Conditions. Failure to complete these requirements may result in finding that the Bidder is nonresponsive and therefore, not eligible to awarded this contract. Complete requirements are located in the Bid Documents.
- E. Nondiscrimination in Employment and Labor Standards
1. Bidders on this work will be required to comply with the President's Executive Order No. 11246 and amendments and supplements to that Order. The requirements for Bidders and CONTRACTORS under this Order are located in the DWSRF Supplemental General Conditions.
- F. Federal Requirements
1. The Contractor must comply with the Department of Labor Regulations relating to Copeland "Anti-Kickback Act (18 U.S.C. 874) as supplemented by 29 CFR part 3, Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by 29 CFR part 5, Occupational Safety and Health Standards (OSHA) (29 CFR part 1910), and Executive Order 14026.
 2. The Contractor must comply with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Safe Drinking Water Act, Executive Order 11738, and the Environmental Protection Agency regulations (40 CFR Part 15).
 3. The Contractor must comply with all permits, restrictions and conditions, issued for the Project by Federal Cross-cutting Authorities. SOPID #: DWP0151-L Maine Drinking Water Program.
- G. Bonding and Insurance
1. Bidders must furnish a bid guarantee equivalent to five percent (5%) of the bid price. In addition the Contractor awarded a construction contract must furnish performance and payment bonds, each of which shall be in an amount not less than 100 percent of the contract price. Contractors shall obtain such construction insurance (e.g., fire and extended coverage, workmen's compensation, public liability and property damage, and "all risk" builders risk) as is customary and appropriate.
- H. Manufacturer's Experience
1. Wherever it may be written that an equipment manufacturer must have a specified period of experience with his product or equipment, who does not meet the specified experience period, can be considered if the equipment supplier or manufacturer is willing to provide a bond or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.
- I. Safety and Health Regulations
1. This Project is subject to all the Safety and Health Regulations (CFR 29 Part 1926 and all subsequent amendments) as promulgated by the US. Department of Labor on June 24, 1974.

J. Nondiscrimination in Employment

1. Contracts for work under this proposal will obligate the Contractors and the Subcontractors not to discriminate in employment practices.
2. Bidders must submit with their initial bid a signed statement as to whether they have previously performed work subject to the President's Executive Order No. 11246, or any preceding similar Executive Order.
3. Bidders must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of the contract.
4. Successful bidders must, if requested, submit a list of all Subcontractors who will perform work on the Project, and written signed statements from authorized agents of labor pools with which they will or may deal for employees on the work together with supporting information to the effect that such labor pools' practices and policies are in conformity with Executive Order No. 11246; that they will affirmatively cooperate in or offer no hindrance to the recruitment, employment, and equal treatment of employees seeking employment and performing work under the contract or, a certification as to what efforts have been made to secure such statements when such agents or labor pools have failed or refused to furnish them prior to award of the contract.
5. Successful bidders must be prepared to comply in all respects with the contract provisions regarding nondiscrimination.

K. SRF Disadvantaged Business Enterprises (DBE) Program

1. The Contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 40 CFR part 33, Disadvantaged Business Enterprises (DBE), in the award and administration of subcontracts. Failure by the Contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.
2. The goals for this project are a minimum of 0.64% certified Minority Business Enterprise (MBE) and a minimum of 1.64% certified Women's Business Enterprise (WBE) participation. Lists of certified businesses may be found on the following internet websites: EPA Office of Small and Disadvantaged Business Utilization (OSDBU), State of Maine Department of Transportation (DOT), and the United States Small Business Administration (SBA).
3. The contractor must maintain all records documenting its compliance with the requirements of this part, including documentation of its good faith efforts (such as copies of solicitation letters and emails) and data relied upon in formulating its fair share objectives.
4. During the bidding period, the Contractor is required to make the following good faith efforts if they will be awarding subcontracts:
 - a. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. This will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
 - b. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids

- or proposals for a minimum of 30 calendar days before the bid or proposal closing date.
- c. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. This will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
 - d. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
 - e. Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.
 - f. Employ the good faith efforts described above even if the prime contractor has achieved its fair share objectives under subpart D of this part.
5. The Contractor must comply with the following provisions when submitting their bid:
- a. The contractor must complete and submit DWP Form 6100–4, ‘DBE Program Subcontractor Utilization Form’ (See Appendix) as part of the prime contractor’s bid or proposal package to the Owner. Note, only DBE subcontractors should be listed. If no DBE subcontractors are to be used, the contractor must still complete and submit the form.
 - b. The contractor must have each of its proposed DBE subcontractors complete the DWP Form 6100–3, ‘DBE Program Subcontractor Performance Form’ (See Appendix). The completed forms must be submitted as part of the prime contractor’s bid or proposal package to the Owner.
6. Prior to contract award, as the Successful Bidder, the Contractor must comply with the following provisions:
- a. The contractor must submit to the Owner documentation of its good faith efforts (such as copies of solicitation letters and emails) and data relied upon in formulating its fair share objectives. Solicitation documentation must include proof of receipt. The records must be submitted to the Owner even if the goals were met. SOPID #: DWP0151-L Maine Drinking Water Program Page 6 of 26
 - b. The contractor must submit to the Owner a bidders list of all firms that bid or quote on subcontracts, including both MBE/WBEs and non-MBE/WBEs. The purpose of a bidders list is to provide contractors who conduct competitive bidding with as accurate a database as possible about the universe of MBE/WBE and non-MBE/WBE subcontractors. The list must include the following information:
 - 1) Entity's name with point of contact;
 - 2) Entity's mailing address, telephone number, and e-mail address;
 - 3) The procurement on which the entity bid or quoted, and when; and
 - 4) Entity's status as an MBE/WBE or non-MBE/WBE.
7. Following contract award, the Contractor must comply with the following additional provisions:
- a. The contractor must provide DWP Form 6100–2, ‘DBE Program Subcontractor Participation Form’ (See Appendix) to all DBE subcontractors listed on Form 6100-4. DWP Form 6100–2 gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the prime contractor, how much the DBE subcontractor was paid and any other concerns the DBE subcontractor might have during the course of the project, for example, reasons why the DBE subcontractor believes it was terminated by the prime contractor. If DBE subcontractors choose to

complete this form, the completed form should be sent directly to the "Contract Administrator" identified in the Preconstruction Meeting.

- b. Complete the DWSRF DWP Progress Report of DBE Subcontractor Utilization Form (See Appendix) for all contractor pay applications whether or not they include invoiced amounts from DBE subcontractors. The progress report shall be attached to the corresponding pay application for processing through the Owner.
- c. Pay subcontractors for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the Owner.
- d. Notify the Owner in writing prior to any termination of a DBE subcontractor for convenience by the prime contractor.
- e. If a DBE subcontractor fails to complete work under the subcontract for any reason, the prime contractor must employ the good faith efforts described above if soliciting a replacement subcontractor. Documentation of good faith efforts shall be submitted to the Owner upon request."

L. American Iron and Steel Requirements

1. The Contractor acknowledges, to and for the benefit of the Owner and the State (Maine Drinking Water Program), that it understands the goods and services under this Agreement are being funded with monies made available by the Drinking Water State Revolving Fund (DWSRF) that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contractor pursuant to this Agreement. See Public Law 113-76, Section 436 (available in the AIS Guidelines at www.medwp.com).
2. The Contractor hereby represents and warrants, to and for the benefit of the Owner and the State, that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Owner or the State. While the Contractor has no direct contractual privity with the State, as a lender to the Owner for the funding of its project, the Owner and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.
3. The Owner shall maintain files on the project site for American Iron and Steel (AIS) manufacturer certifications. The Contractor and subcontractors shall provide step manufacturer certifications to the Owner for each AIS item delivered to the site. The files shall be made available to State and Federal officials for inspection upon request.
4. The Contractor and its subcontractors shall submit to the Owner, an AIS Compliance Certification (See Appendix) prior to the project Preconstruction Meeting. The Owner, shall in turn, submit this certification from the Contractor, with their AIS Compliance Certification (See Appendix), to the State at the project Preconstruction Meeting. The nationwide waiver to the American Iron and Steel law permits the use of products when they occur in de minimis incidental components of such projects funded by the Act that

may otherwise be prohibited under section 436(a). Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of the materials used in and incorporated into a project. It is the State's interpretation that all DWSRF projects will contain incidental components that might not comply with the law and therefore it is likely that the Owner will use the de minimis waiver. The Contractor is required to provide the necessary documentation. Owners should, in consultation with their contractors, determine the items to be covered by this waiver, must retain relevant documentation (i.e., invoices) as to those items in their project files, and must summarize in reports the types and/or categories of items to which this waiver is applied, the total cost of incidental components covered by the waiver for each type or category, and the calculations by which they determined the total cost of materials used in and incorporated into the project. The Owner shall maintain files on the project site for this documentation. The files shall be made available to State and Federal officials for inspection upon request.

5. The Contractor shall refer to the "Use of American Iron and Steel (AIS) Guidance" (available at www.medwp.com). Additional information regarding the AIS requirements can be found on this website http://water.epa.gov/grants_funding/aisrequirement.cfm

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 ALTERATION PROCEDURES

- A. Facility may be occupied for normal operations during progress of construction. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage.
 1. Perform Work not to interfere with operations of occupied areas
 2. Keep utility and service outages to a minimum and perform only after approval of Owner
 3. Clean Owner-occupied areas daily
- B. Materials: As specified in product Sections; match existing products with new and salvaged products for patching and extending Work.
- C. Employ skilled and experienced installer to perform alteration and renovation Work.
- D. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- E. Remove unsuitable material not marked for salvage. Replace materials as specified for finished Work.
- F. Remove debris and abandoned items from area and from concealed spaces.

- G. Prepare surface and remove surface finishes to permit installation of new Work and finishes.
- H. Remove, cut, and patch Work to minimize damage and to permit restoring products and finishes to specified condition.
- I. Where new Work abuts or aligns with existing Work, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- J. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Engineer for review.
- K. Finish surfaces as specified in individual product Sections.

END OF SECTION

SECTION 01 33 00 – SUBMITTAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures
- B. Construction progress schedule
- C. Proposed product list
- D. Product data
- E. Shop drawings
- F. Samples
- G. Design data
- H. Test reports
- I. Certificates
- J. Manufacturer's instructions
- K. Manufacturer's field reports
- L. Record drawings
- M. Owner Closeout Documents

1.2 SUBMITTAL PROCEDURES

- A. Transmit each submittal electronically to the Engineer on an Engineer accepted form with copy to the Owner.
- B. Sequentially number the transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing sheet and detail number(s), and Specification Section number appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.

- E. Schedule submittals to expedite Project and deliver to the Engineer. Coordinate submission of related items. The Contractor may be obligated to provide submittals as dictated in the Contract between the Owner and the Contractor.
- F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
- G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.
- H. Allow space on submittals for Contractor and Engineer review stamps.
- I. Revise and resubmit submittals as required, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate to concerned parties. Instruct parties to promptly report inability to comply with requirements.
- K. Incomplete Submittals: Engineer will not complete approval. Complete submittals for each applicable item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.
- L. All submittals shall be in the "English" language with "English" dimensions and units.

1.3 CONSTRUCTION PROGRESS SCHEDULE

- A. Contractor shall prepare and submit detailed progress schedule to the Engineer and the Owner for approval. The schedule shall be in bar graph form showing material delivery schedules and starting and completion dates for all phases of construction.

If, in the opinion of the Owner or Engineer, the Contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve their progress, which may require increasing the number of shifts, and/or overtime operations, days of work, and/or the amount of construction planned, and to submit for approval such supplementary schedule or schedules as necessary to demonstrate the manner in which the agreed rate to progress will be regained, all without additional cost to the Owner.

1.4 PROPOSED PRODUCT LIST

- A. Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

- A. Submit product data submittals via email as PDF electronic files to the Engineer with copy to Owner.

- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. The Manufacturer shall submit standard drawings or catalog cuts. The type, thickness, application procedure, and test for coatings, and non-metallic and metallic linings shall also be included. When applicable, indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. After review, produce copies and distribute according to "Submittal Procedures" Article above and for Record Documents

1.6 SHOP DRAWINGS

- A. Submit shop drawing submittals via email as PDF electronic files to the Engineer with copy to Owner.
- B. When applicable, indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. After review, produce copies and distribute according to "Submittal Procedures" Article above and for record documents.
- D. Shop drawings shall include descriptive literature, bulletins and/or catalog cuts as well as a complete bill of materials. Include the weights of all components. The Drawings shall specifically outline all required clearances for maintenance and manual operation. Shop drawings shall show layout and dimensions of equipment, major components, key alignment locations and locations of bolt holes. Drawings shall also indicate where access points for maintenance and operations are located on the equipment. Drawings shall show all critical field dimensions identified by the Manufacturer and obtained by the Contractor.

1.7 SAMPLES

- A. Submit samples to Engineer where specified to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices, and for assessing conformance with given design in Contract Documents. Coordinate sample submittals for interfacing work.
- B. Include identification on each Sample, with full Project information.
- C. Submit number of Samples specified in individual Specification Sections, one of which will be retained by Engineer.
- D. Reviewed samples that may be used in the Work are indicated in individual Specification Sections.

1.8 DESIGN DATA

- A. Submit design data for Engineer's knowledge where specified with copy to Owner.
 - B. Submit information for assessing conformance with given design in Contract Documents.
- 1.9 TEST REPORTS
- A. Submit test reports for Engineer's knowledge where specified with copy to Owner.
 - B. The Manufacturer shall submit performance test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system.
 - C. Submit test reports for information for assessing conformance with given design in Contract Documents.
- 1.10 CERTIFICATES:
- A. Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.
 - B. Indicate material or product conformance with, or exceedance of, specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.
- 1.11 MANUFACTURER'S INSTRUCTIONS:
- A. Submit manufacturer's installation instructions for Engineer's knowledge where specified, with copy to Owner.
 - B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.
 - C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- 1.12 MANUFACTURER'S FIELD REPORTS:
- A. Submit reports for Engineer's knowledge where specified, with copy to Owner.
 - B. Submit reports for information for assessing conformance with given design in Contract Documents.
- 1.13 RECORD DRAWINGS:
- A. During the course of the work, the Contractor and applicable subcontractors shall continually maintain a set of legibly marked-up prints, drawings and sketches showing any changes made during the construction process. This set of prints shall be incorporated into one complete

set of drawings by the Contractor following completion of work. The Contractor shall make any revisions required by the Engineer in order to make the drawings complete. After acceptance by the Engineer, the drawings shall be given to the Owner. The project will not be substantially complete until record drawings are submitted and approved.

- B. The record drawings shall be complete in every way and shall show the full extent of the executed work. Special attention shall be given to concealed work which would be difficult to measure at a later date. Change orders, addenda items, and field changes should be noted where applicable. Additional specific requirements relative to record drawings may be called for in the individual sections of these specifications.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 34 00 – ALTERNATIVES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Alternative equipment and/or materials must be listed in the Bid. Failure to submit information on alternative equipment and/or materials as requested by the Engineer is cause for rejection of the proposed alternative and only the specified equipment and/or materials will be permitted to be incorporated in the finished project.
- B. All alternative equipment and/or materials offered in the Bid must comply with the detailed requirements of the Drawings and Specifications and shall be covered by the specified guarantees and warranties. If it is determined that the alternative equipment and/or materials do not conform to the Specifications, such proposed alternative shall not be accepted, and the Contractor will be required to furnish and install the specified equipment and/or materials.
- C. No alternative materials and/or equipment will be incorporated in the finished project except an alternative accepted in writing by Owner pursuant to the requirements of this Section. Acceptance by Owner of any such alternative shall not relieve Contractor of responsibility for assuring that any such alternative will, after installation or incorporation in the Work, conform to performance requirements and other information given in the Contract Documents. Accepted alternatives must be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

1.2 SUBMITTALS

- A. Specified equipment and materials have been used to prepare the Drawings. Changes in piping, fittings, structure, etc., necessary to accommodate alternatives accepted by Owner shall be submitted by the Contractor to the Engineer for approval.

1.3 PAYMENT

- A. The Contractor shall pay for all installation costs necessitated by the selection of alternative equipment and material. Such costs are included in the Contract price and any modifications as stated in the Bid.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 35 29 - HEALTH AND SAFETY PLAN

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE: The Contractor's Health and Safety Plan applies to all work specified in this contract.
- 1.2 DESCRIPTION: This work shall consist of preparation of a Health and Safety Plan, submittal of the Health and Safety Plan to the Owner prior to the commencement of construction and maintaining safe working procedures and conditions during this contract.

PART 2 - EXECUTION

2.1 HEALTH AND SAFETY PLAN (HASP) REQUIREMENTS:

- A. The HASP shall conform to guidance provided by the OSHA 29 CFR Part 1926, Safety and Health Regulations for Construction.
- B. The HASP shall include, but not be limited to, the following:
 1. Identification of potential hazards
 2. Identification of a site Health and Safety Officer
 3. Confined space entry procedures
 4. Excavation safety procedures
 5. Air monitoring activities
 6. Personal protective equipment requirements
 7. Emergency and contingency planning
 8. Handling potentially hazardous material

2.2 SUBMITTALS:

- A. Contractor shall submit a Health and Safety Plan to the Owner that applies to all work specified in this contract.

2.3 WORK PROCEDURES:

- A. All work involving excavation below grade, in confined space, or otherwise involving a risk of worker exposure shall conform to the contractor's HASP as well as all municipal, State, and Federal laws and regulations.

PART 3 - PRODUCTS

Not used.

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality control.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Testing and inspection services.
- F. Manufacturers' field services.

1.2 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce the specified quality of work.
- B. Comply with specified standards as the minimum quality of work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Perform work using qualified personnel to produce specified quality.
- D. Products, materials, and equipment may be subject to inspection by Engineer and Owner at place of manufacture, fabrication, and/or installation. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.
- E. Supervise performance of work in such manner and by such means to ensure that work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce specified quality of work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.
- B. Obtain copies of standards and maintain on Site when required by product Specification Sections.
- C. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.5 LABELING

- A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
 - 1. Model number.
 - 2. Serial number.
 - 3. Performance characteristics.
- C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.6 TESTING AND INSPECTION SERVICES

- A. Employ and pay for services of an independent testing agency or laboratory acceptable to Owner to perform specified testing.
 - 1. Before starting Work, submit testing laboratory name, address, and telephone number, and names of full-time specialist and responsible officer.
 - 2. Submit copy of report of laboratory facilities' inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of deficiencies reported by inspection.
- B. Independent firm will perform tests, inspections, and other services specified in individual Specification Sections and as required by authorities having jurisdiction.
 - 1. Laboratory: Authorized to operate at Project location.
 - 2. Laboratory Staff: Maintain full-time specialist on staff to review services.

3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.
- C. Testing, inspections, and source quality control may occur on or off Project Site. Perform off-Site testing as required by Engineer or Owner.
- D. Reports shall be submitted by independent firm to Engineer, Contractor, and authorities having jurisdiction, in duplicate, indicating observations and results of tests and compliance or noncompliance with Contract Documents.
 1. Submit final report indicating correction of Work previously reported as noncompliant.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 1. Notify Engineer and independent firm 24 hours before expected time for operations requiring services.
 2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.
- F. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.
- G. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Engineer. Payment for retesting or re-inspection will be charged to Contractor by deducting testing charges from Contract Price.
- H. Agency Responsibilities may include but are not limited to the following:
 1. Test Samples submitted by Contractor.
 2. Provide qualified personnel at Site as necessary. Cooperate with Engineer and Contractor in performance of services.
 3. Perform indicated sampling and testing of products according to specified standards.
 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 5. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.
 6. Perform additional tests required by Engineer.
 7. Attend preconstruction meetings and progress meetings.
- I. Agency Reports: After each test, promptly submit two copies of report to Engineer, Contractor, and authorities having jurisdiction. When requested by Engineer, provide interpretation of test results. Include the following:
 1. Date issued.
 2. Project title and number.
 3. Name of inspector.
 4. Date and time of sampling or inspection.
 5. Identification of product and Specification Section.
 6. Location in Project.

7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

J. Limits on Testing Authority:

1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume duties of Contractor.
4. Agency or laboratory has no authority to stop the Work.

1.7 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer is subject to approval of Engineer.
- C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Refer to Section 01 33 00 - Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 42 16 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General Explanation: A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including Drawings which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in Contract Documents are defined generally in this article. Definitions and explanations of this section are not necessarily either complete or exclusive but are general for the Work to extent not stated more explicitly in another provision of the Contract Documents.
- B. General Requirements: The provisions or requirements of Division-1 sections. General Requirements apply to the entire Work of the Contract and, where so indicated, to other elements which are included in Project.
- C. Indicated: The term "Indicated" is a cross-reference to details, notes or schedules on Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.
- D. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "reviewed," "required," "accepted," and "permitted" mean "directed by Engineer," "requested by Engineer," etc. However, no such implied meaning will be interpreted to extend Engineer's responsibility into Contractor's area of construction supervision.
- E. Reviewed: Where used in conjunction with Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of terms "Reviewed" will be held to limitations of Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "Reviewed" by Engineer be interpreted as a release of Contractor from responsibilities to fulfill requirements of Contract Documents.
- F. Project Site: The space available to Contractor for performance of the Work, either exclusively or in conjunction with others performing other Work as part of the Project. The extent of Project site is shown on the Drawings and may or may not be identical with description of the land upon which Project is to be built.
- G. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
- H. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at Project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.
- I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

- J. Installer: The entity (person or firm) engaged by Contractor or its Sub-Contractor or Sub-Sub-Contractor for the performance of a particular unit of work at Project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.
- K. Testing Laboratory: An independent entity engaged to perform specific inspections or tests of the Work, either at Project site or elsewhere; and to report and (if required) interpret results of those inspections or tests.

1.2 SPECIFICATION EXPLANATIONS

- A. Overlapping and Conflicting Requirements: Where compliance with two (2) or more industry standards or sets of requirements is specified, including but not limited to Maine DOT specification standards, and requirements, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, most stringent requirement (which is generally recognized to be also most costly) is intended and will be enforced, unless specifically detailed language written into the Contract Documents (not by way of reference to an industry standard) clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently-equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to Engineer for a decision before proceeding.
- B. Contractor's Options: Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, the option is intended to be Contractor's regardless of whether specifically indicated as such.
- C. Minimum Quality / Quantity: In every instance, quality level or quantity shown or specified is intended as minimum for the Work to be performed or provided. Except as otherwise specifically indicated, actual work may either comply exactly with that minimum (within specified tolerances) or may exceed that minimum within reasonable limits. In complying with requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainty to Engineer for decision before proceeding.
- D. Specialists; Assignments: In certain instances, specification text requires (or at least implies) that specific work be assigned to specialists or expert entities, who must be engaged for performance of those units of work. These must be recognized as special requirements over which Contractor has no choice or option. These assignments must not be confused with (and are not intended to interfere with) normal application of regulations, union jurisdictions and similar conventions. One purpose of such assignments is to establish which party or entity involved in a specific unit of work is recognized as "expert" for indicated construction processes or operations. Nevertheless, final responsibility for fulfillment of entire set of requirements remains with Contractor.

1.3 INDUSTRY STANDARDS

- A. General Applicability of Standards: Applicable standards of construction industry have same force and effect (and are made a part of Contract Documents by reference) as if copied directly into Contract Documents, or as if published copies were bound herewith.
 - 1. Referenced standards (referenced directly in Contract Documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to the Work.

2. Non-referenced standards recognized in the construction industry are hereby defined, except as otherwise limited in Contract Documents, to have direct applicability to the Work, and will be so enforced for performance of the Work.

B. Copies of Standards: Provide where needed for proper performance of the Work; obtain directly from publication sources.

C. Abbreviation and Names: Where acronyms or abbreviations are used in Specifications or other Contract Documents, they are defined to mean the industry recognized name of trade association, standards generating organization, governing authority or other entity applicable to context of text provision. Refer to "Encyclopedia of Associations," published by Gale Research Co., available in large libraries.

1.4 SUBMITTALS

A. Permits, Licenses and Certificates: For the OWNER's records, submit copies of permits, licenses, certifications, inspection reports, releases, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with and in compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities:
 - 1. Temporary electricity.
 - 2. Temporary lighting for construction purposes.
 - 3. Temporary water service.
 - 4. Temporary portable restrooms.

- B. Construction Facilities:
 - 1. Field offices and sheds.
 - 2. Vehicular access.
 - 3. Parking.
 - 4. Progress cleaning and waste removal.
 - 5. Project identification.
 - 6. Fire-prevention facilities.

- C. Temporary Controls:
 - 1. Barriers.
 - 2. Security.
 - 3. Erosion and sediment control.
 - 4. Noise control.
 - 5. Pest and rodent control.
 - 6. Pollution control.

- D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

- A. Owner will pay cost of energy used where applicable. Exercise measures to conserve energy.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting for construction operations to achieve adequate lighting of work area where permanent building lighting is insufficient.

- B. Provide and maintain lighting to interior work areas, exterior staging and storage areas after dark for security purposes where applicable.

- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for specified lighting levels, installed by qualified personnel.

- D. Maintain lighting and provide routine inspection and repair as necessary.

1.4 TEMPORARY WATER SERVICE

- A. The nearest non-potable water sources vary depending on work location and shall be coordinated with Owner for use approval.
- B. Extend branch piping with outlets located so that water is available by hoses with threaded connections.

1.5 TEMPORARY PORTABLE RESTROOMS

- A. Locate as directed by Owner.
- B. Maintain orderly facilities through good housekeeping and weekly servicing.

1.6 FIELD OFFICES AND SHEDS

- A. Coordinate use of existing facilities for field offices and/or storage of products and tools with Owner.
- B. If temporary facilities (e.g. sheds, trailers, dumpsters, restrooms, etc.) are required, coordinate staging location with Owner.
- C. Size: Size to meet requirements, allowing for access and orderly provision for maintenance and inspection of products and tools.
- D. Preparation: Place temporary facilities as directed by Owner.

1.7 VEHICULAR ACCESS

- A. Vehicles not required for performance of work should be parked in marked designated parking spaces (See Section 1.8).
- B. Provide unimpeded access for emergency vehicles.
- C. Provide and maintain access to fire hydrants and control valves free of obstructions.
- D. Comply with posted speed limits and traffic signage.
- E. Tracked vehicles are not allowed on paved areas, without permission of the Owner.

1.8 PARKING

- A. Coordinate access to parking with Owner. Use of existing parking facilities is by Owner's permission only.
- B. On-site parking location to be approved by Owner.
- C. No heavy vehicles or construction equipment in parking areas unless pre-authorized.
- D. Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.

- E. Maintenance: Maintain traffic and parking areas in sound condition (free of excavated material, construction equipment, products, mud, etc.). Promptly repair breaks, potholes, and other deficiencies to maintain paving and drainage in original condition.
- F. Removal, Repair:
 - 1. Remove temporary materials and construction before Substantial Completion.
 - 2. Repair existing facilities damaged by use, to original condition.

1.9 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.
- B. Remove debris and rubbish from pipe chases and other closed or remote spaces, before enclosing spaces.
- C. Collect and remove waste materials, debris, and rubbish from Site periodically and dispose of off-Site.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.10 FIRE-PREVENTION FACILITIES

- A. Smoke only in designated areas.
- B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.
- C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.
 - 1. Provide minimum of one fire extinguisher in every construction work and storage space.

1.11 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of Site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways as required.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.12 SECURITY

- A. Protect Work and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program in coordination with Owner's existing security at Project mobilization.
- C. Maintain program throughout construction period.

1.13 EROSION AND SEDIMENT CONTROL

- A. Protect stormwater drains in parking lots from accidental spills and uncontrolled releases from vehicles and construction materials.

1.14 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise from and noise produced by construction operations.

1.15 PEST AND RODENT CONTROL

- A. Provide methods, means, and facilities to prevent pests and rodents from accessing or invading premises.

1.16 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.
- B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.17 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials before Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary Work.
- C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to original condition.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 57 00 - DUST CONTROL

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: Drawings, general provisions of contract, and Supplementary General Conditions apply to the work specified under this Section.
- 1.2 DESCRIPTION: This work shall consist of furnishing all labor, materials, and equipment for applying water for dust control in conformity with the Drawings and as specified herein, or as required by the Engineer. The Contractor shall have sole responsibility of dust control in the project area.

PART 2 - PRODUCTS

- 2.1 GENERAL: The water shall not be salt or brackish and shall be free from oil, acid, and injurious alkali or vegetable matter. Calcium chloride use is allowed with permission of the Owner.

PART 3 - EXECUTION

- 3.1 SPRINKLING: Water shall be applied by approved methods and with equipment including a tank with gauge equipped pressure pump and a nozzle-equipped spray bar.
- 3.2 SWEEPING: Roads shall be kept free of soil. Minimize equipment travel between unpaved and paved areas. Materials tracked, spilled, and/or deposited on the driveways and/or roadways shall be scraped or swept clean daily or more frequently as needed. There shall be no tracking of soils beyond the limit of work.

END OF SECTION

SECTION 01 57 19 – ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
 - 1. Adversely affect human health or welfare,
 - 2. Unfavorably alter ecological balances of importance to human life,
 - 3. Affect other species of importance to humankind, or;
 - 4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- C. Definitions of Pollutants:
 - 1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
 - 2. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 - 3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 - 4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
 - 5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.
 - 6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
 - 7. Sanitary Wastes:
 - a. Sewage: Domestic sanitary sewage and human and animal waste.
 - b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2 QUALITY CONTROL

- A. Establish and maintain quality control for the environmental protection of all items set forth herein.
- B. Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.

1.3 REFERENCE

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. U.S. National Archives and Records Administration (NARA): 33 CFR 328 Definitions

- C. EPA 530/F-93/004 (1993; Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)
- D. D.29 CFR 1910 Occupational Safety and Health Standards
- E. E.29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
- F. 40 CFR 112 Oil Pollution Prevention
- G. 40 CFR 122.26 Storm Water Discharges (Applicable to State NPDES Programs, see section 123.25)
- H. 40 CFR 241 Guidelines for Disposal of Solid Waste
- I. 40 CFR 243 Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
- J. 40 CFR 261 Identification and Listing of Hazardous Waste
- K. 40 CFR 266 Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
- L. 40 CFR 355 Emergency Planning and Notification

1.4 SUBMITTALS

- A. In accordance with Section, 01 33 00, SUBMITTAL REQUIREMENTS, furnish the following:
 - 1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the Engineer to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection.
 - a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
 - b. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
 - c. Description of the Contractor's environmental protection personnel training program.
 - d. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
 - e. Methods for protection of features to be preserved within authorized work areas including air and water quality, historical, and archeological and cultural resources.
 - f. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
 - g. Permits, licenses, and the location of the solid waste disposal area.
 - h. Environmental Monitoring Plans for the job site including land, water, air, and noise.
 - i. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas.

- B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Resident Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.
 - 1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
 - 2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
 - a. Box and protect from damage existing trees and shrubs to remain on the construction site.
 - b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
 - c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
 - 3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
 - 4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
 - a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 2 (design year) storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
 - b. Reuse or conserve the collected topsoil sediment as directed by the Resident Engineer.
 - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
 - 5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features shown on the Environmental Protection Plan. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.

6. Manage and control spoil areas to limit spoil to areas shown on the Environmental Protection Plan and prevent erosion of soil or sediment from entering nearby water courses or lakes.
 7. Protect adjacent areas from despoilment by temporary excavations and embankments.
 8. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (ex property and dispose of waste in compliance with Federal, State, and local requirements.
 9. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 10. Handle discarded materials other than those included in the solid waste category as directed by the Resident Engineer.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
 2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
 3. Monitor water areas affected by construction.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.
- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Maine DEP Air Pollution Rules, and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials at all times, including weekends, holidays, and hours when work is not in progress.
 2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
 3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Resident Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified.

1. Perform construction activities involving repetitive, high-level impact noise only during approved working hours unless otherwise permitted by local ordinance or the Resident Engineer. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
More than 12 minutes in any hour	70
Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

- a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCRAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS,	80	PNEUMATIC TOOLS	80
STATIONARY			
PUMPS	75	BLASTING	75
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

- b. Use shields or other physical barriers to restrict noise transmission.
 - c. Provide soundproof housings or enclosures for noise-producing machinery.
 - d. Use efficient silencers on equipment air intakes.
 - e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
 - f. Line hoppers and storage bins with sound deadening material.
 - g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the Resident Engineer noting any problems and the alternatives for mitigating actions.

- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.

- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

END OF SECTION

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.

1.2 PRODUCTS

- A. At minimum, comply with specified requirements and reference standards.
- B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.
- C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.
- D. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.
- E. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products according to manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products according to manufacturer's instructions.
- B. Store products with seals and labels intact and legible.

- C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.
- D. For exterior storage of fabricated products, place products on sloped supports aboveground.
- E. Provide off-Site storage and protection when Site does not permit on-Site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Alternates: Submit Request for alternatives for any manufacturer not named, according to Section 01 34 00- Alternatives.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Field engineering.
- B. Closeout procedures.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Testing, adjusting, and balancing.
- F. Project record documents.
- G. Operation and maintenance data.
- H. Manual for materials and finishes.
- I. Manual for equipment and systems.
- J. Product warranties and product bonds.
- K. Maintenance service.
- L. Examination.
- M. Execution.
- N. Cutting and patching.
- O. Protecting installed construction.
- P. Final cleaning.

1.2 FIELD ENGINEERING

- A. Locate and protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.
- B. Contractor shall confirm elevations of existing structures shown on the Drawings.
- C. Verify setbacks and easements; confirm Drawing dimensions and elevations.
- D. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.
- E. Maintain complete and accurate log of control and survey Work as Work progresses.

- F. On completion of foundations and major site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction.
- G. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.
- H. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- I. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.

1.3 CLOSEOUT PROCEDURES

- A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
 - 1. Submit operations and maintenance manuals, Project record documents, and other similar final record data in compliance with this Section.
 - 2. Complete pump station startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
 - 3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
 - 4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include operating certificates, and similar releases from authorities having jurisdiction and utility companies.
 - 5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
 - 6. Make final change-over of locks eliminating construction master-key system and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
 - 7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
 - 8. Perform final cleaning according to this Section.
- B. Substantial Completion Inspection:
 - 1. When Contractor considers Work to be substantially complete, submit to Engineer:
 - a. Written certificate that Work, or designated portion, is substantially complete.
 - b. List of items to be completed or corrected (initial punch list).
 - 2. Within seven days after receipt of request for Substantial Completion, Engineer will make inspection to determine whether Work or designated portion is substantially complete.
 - 3. Should Engineer or Owner determine that Work is not substantially complete:
 - a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
 - b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
 - c. Engineer and Owner will reinspect Work.
 - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's and Owner's inspection.
 - 4. When Engineer finds that Work is substantially complete, Engineer will:
 - a. Prepare Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).

- b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
 - 5. After Work is substantially complete, Contractor shall:
 - a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
 - b. Complete Work listed for completion or correction within time period stipulated.
- C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
 - 1. When Contractor considers Work to be complete, submit written certification that:
 - a. Contract Documents have been reviewed.
 - b. Work has been examined for compliance with Contract Documents.
 - c. Work has been completed according to Contract Documents.
 - d. Work is completed and ready for final inspection.
 - 2. Submittals: Submit following:
 - a. Final punch list indicating all items have been completed or corrected.
 - b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
 - d. Accounting statement for final changes to Contract Sum.
 - e. Contractor's affidavit of payment of debts and claims.
 - f. Contractor affidavit of release of liens.
 - g. Consent of surety to final payment.
 - 3. Perform final cleaning for Contractor-soiled areas according to this Section.
- D. Final Completion Inspection:
 - 1. Within seven days after receipt of request for final inspection, Engineer will make inspection to determine whether Work or designated portion is complete.
 - 2. Should Engineer consider Work to be incomplete or defective:
 - a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
 - b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.
 - c. Engineer will reinspect Work.
 - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.

1.4 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of lift station pumps and control systems.
- B. Notify Engineer prior to startup.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.

- F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.
- G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.

1.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instructed by qualified manufacturer's representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- G. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

1.6 TESTING, ADJUSTING, AND BALANCING

- A. Contractor will appoint, employ, and pay for services of independent firm to perform testing, adjusting, and balancing.

1.7 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, product data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.

- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates used.
 - 3. Changes made by Addenda and modifications.

- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
 - 1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
 - 2. Include locations of concealed elements of the Work.
 - 3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
 - 4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
 - 5. Identify and locate existing buried or concealed items encountered during Project.
 - 6. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 7. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 8. Field changes of dimension and detail.
 - 9. Details not on original Drawings.

- G. Submit PDF electronic files of marked-up documents to Engineer with claim for final Application for Payment.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit in PDF composite electronic indexed file.

- B. Submit data bound in 8-1/2 x 11-inch text pages, D side ring binders with durable plastic covers.

- C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.

- D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

- E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

- F. Contents: Prepare table of contents with each product or system description identified, typed on white paper, as follows:
 - 1. Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Operation and maintenance instructions, subdivided by Specification Section. Identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.

- e. Maintenance instructions for equipment and systems.
 - f. Safety precautions to be taken when operating and maintaining or working near equipment.
3. Project documents and certificates, including the following:
- a. Shop Drawings and product data.
 - b. Certificates.
 - c. Originals of warranties and bonds.

1.9 MANUAL FOR MATERIALS AND FINISHES

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes before Substantial Completion. Draft copy be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes within ten days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual within ten days after final inspection.
- F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.
- H. Additional Requirements: As specified in individual product Specification Sections.
- I. Include listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.10 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes before Substantial Completion. Draft copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes within ten days after final inspection.

- E. Submit in PDF composite electronic indexed file of final manual within ten days after final inspection.
- F. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- G. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- H. Include color-coded wiring diagrams as installed.
- I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.
- J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- K. Include servicing and lubrication schedule and list of lubricants required.
- L. Include manufacturer's printed operation and maintenance instructions.
- M. Include sequence of operation by controls manufacturer.
- N. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- O. Include control diagrams by controls manufacturer as installed.
- P. Include Contractor's coordination drawings with color-coded piping diagrams as installed.
- Q. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- R. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- S. Include test and balancing reports as specified in product Specification Sections.
- T. Additional Requirements: As specified in individual product Specification Sections.
- U. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.

1.11 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.

- B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include table of contents and assemble in D side ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time of Submittals:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
 - 2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.12 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in Specification Sections for one year from date of Substantial Completion.
- B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.
- D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing Site conditions surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Examine and verify specific conditions described in individual Specification Sections.
- C. Verify that utility services are available with correct characteristics and in correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
 - 1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
- E. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
 - 1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
 - 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- F. Adjust operating products and equipment to ensure smooth and unhindered operation.
- G. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period.

3.4 CUTTING AND PATCHING

- A. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:
 - 1. Fit the several parts together, to integrate with other Work.
 - 2. Uncover Work to install or correct ill-timed Work.
 - 3. Remove and replace defective and nonconforming Work.
 - 4. Remove samples of installed Work for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- B. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.
- C. Restore Work with new products according to requirements of Contract Documents.
- D. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

- E. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

3.5 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.
- C. Prohibit traffic from landscaped areas.

3.6 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment.
- B. Clean debris from roofs, gutters, downspouts, and drainage systems.
- C. Clean Site; sweep paved areas, rake clean landscaped surfaces.
- D. Remove waste and surplus materials, rubbish, and construction facilities from Site.
- E. Remove all erosion control measure once the site has been stabilized. One year from substantial completion the contractor shall inspect the site to ensure all erosion control devices have been removed

END OF SECTION

SECTION 01 71 13 – MOBILIZATION

PART 1 - GENERAL

1.1 GENERAL:

- A. Mobilization shall include the obtaining of all permits, insurance, and bonds; moving onto the site for all plants and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; all as required for the proper performance and completion of the work. Mobilization shall include but not be limited to the following items:
1. Moving on to the site of all Contractor's personnel and equipment required for first month operations.
 2. Installing temporary construction power, wiring, and lighting facilities as required.
 3. Developing construction water supply.
 4. Providing a field office for the Contractor, complete with all needed furnishings and utility services.
 5. Providing all on-site communication facilities, including telephones.
 6. Providing on-site sanitary facilities and potable water facilities as needed.
 7. Arranging for and erection of Contractor's work and storage area.
 8. Submittal of all required insurance certificates and bonds.
 9. Obtaining all required permits.
 10. Posting all OSHA, DWP, and other required notices and establishment safety programs.
 11. Having the Contractor's superintendent at the job site full time.
 12. Submittal of Preliminary Construction Schedule.
 13. Submittal of materials and equipment which shall include: a complete list of suppliers and/or fabricators; items to be purchased from and/or supplied by such suppliers and/or fabricators: time required for fabrication; and scheduled delivery dates for each item to be purchased and/or supplied, leased or otherwise used for performance of the Work. This report shall be submitted for review at least 14 days prior to commencement of the Work.
- B. Field Offices and Sheds:
1. The Contractor will work with the Owner to establish a temporary field office or will provide a temporary field office. The Contractor shall provide materials, equipment, and furnishings to adequately service the space.
 2. The Contractor will coordinate the office site location with the Owner and will fill and grade the site as necessary in order to provide drainage away from the building.
 3. Field office(s) shall be ready for occupancy 15 days after Notice to Proceed with the work.
 4. The office shall be a portable or mobile building constructed with the floor raised above ground and placed on a solid foundation. Steps and landings shall be provided at entrances. The building shall be structurally sound, secure, and weathertight.
 5. The office shall be provided with adequate insulation, lighting, safety devices, and environmental controls (heating and cooling). The offices shall also be provided with an adequate amount of secure storage space. The offices shall be furnished with, but not limited to, chair, drafting table, desk, filing cabinet, and bookshelves.

6. The Contractor shall make available safety equipment, which shall include at minimum, hard hats, safety glasses, and safety vest.
7. Storage areas and sheds shall be provided as necessary. Location of storage areas and sheds must be approved by the Owner.
8. The Contractor shall be responsible for maintaining office spaces, storage sheds, and storage areas in a neat and orderly manner.
9. At completion of work, remove buildings, foundations, utility services, storage sheds, and storage areas. Areas shall be restored to pre-construction condition.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Construction waste management.
 2. Construction waste recycling.
 3. Construction waste adaptive reuse.

1.2 SUBMITTALS

- A. Provide summary of construction and demolition waste totaling disposed weights and recycled weights, with name of receiving facility.
- B. Submit documentation with each application for payment substantiating construction waste management.
1. Trash: Quantity by weight deposited in landfills. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal.
 2. Salvaged Material: Quantity by weight with destination for each type of material salvaged for resale, recycling, or adaptive reuse. Include associated fees, transportation costs, container rentals, taxes for total cost of disposal, and reimbursements due to salvage resale.

1.3 CONSTRUCTION WASTE MANAGEMENT

- A. Construction Waste Landfill Diversion: minimize waste materials for duration of Project through resale, recycling, or adaptive reuse.
- B. Purchase products to prevent waste by:
1. Ensuring correct quantity of each material is delivered to Site.
 2. Choosing products with minimal or no packaging.
 3. Requiring suppliers to use returnable pallets or containers.
 4. Requiring suppliers to take or buy back rejected or unused items.

1.4 CONSTRUCTION WASTE RECYCLING

- A. Materials suggested for recycling include:
1. Packing materials including paper, cardboard, foam, plastic, and sheeting.
 2. Recyclable plastics.
 3. Organic plant debris.
 4. Earth materials.
 5. Native stone and granular fill.
 6. HDPE geomembrane liner, geotextiles.
 7. Wood with and without embedded nails and staples.
 8. Glass, clear and colored types.
 9. Metals (corrugated metal pipes).
 10. Gypsum products.
 11. Equipment oil.

1.5 CONSTRUCTION WASTE ADAPTIVE REUSE

- A. Arrange with processing facility for salvage of construction material and processing for reuse. Do not reuse construction materials on-Site except as allowed by Owner and Engineer.
- B. Materials suggested for adaptive reuse include:
 - 1. Concrete and crushed concrete.
 - 2. Masonry units.
 - 3. Miscellaneous metal and equipment.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE COLLECTION AND DISPOSAL

- A. Collect construction waste materials in marked bins or containers and arrange for transportation to waste processing facility, recycling centers, or adaptive salvage and reuse processing facility. Waste collection containers (dumpsters) shall be covered at the end of each working day and during rain events. Additionally, containers shall be labeled with the Contractor's name and contact information.
- B. Maintain recycling and adaptive reuse storage and collection area in orderly arrangement with materials separated to eliminate co-mingling of materials required to be delivered separately to waste processing facility.
- C. Store construction waste materials to prevent environmental pollution, fire hazards, hazards to persons and property, and contamination of stored materials.
- D. Cover construction waste materials subject to disintegration, evaporation, settling, or runoff to prevent polluting air, water, and soil.

END OF SECTION

DIVISION 02

EXISTING CONDITIONS

SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolishing designated building equipment and fixtures.
 - 2. Demolishing and removing designated or selected portions of structures
 - 3. Cutting and alterations for completion of the Work.
 - 4. Removing designated items for reuse and Owner's retention.
 - 5. Protecting items designated to remain.
 - 6. Removing demolished materials.
 - 7. Field Quality control

1.2 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, subsurface obstructions, and provide this information on the project record drawing.
- B. Operation and Maintenance Data: Submit description of system, inspection data, and parts lists.

1.3 QUALITY ASSURANCE

- A. Conform to applicable regulations, federal, state and local codes for demolition work, dust control, and products requiring electrical disconnection and re-connection.
- B. Conform to applicable regulations, federal, state, and local codes when hazardous or contaminated materials are discovered.
- C. Obtain required permits from authorities having jurisdiction.
- D. Perform Work in accordance with the State of Maine regulations and st

1.4 PRE-DEMOLITION MEETINGS

- A. Pre-installation meeting.
 - 1. Inspect and discuss condition of construction to be selectively demolished
 - 2. Review structural and load limitations of existing structure
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition
 - 5. Review areas where existing construction is to remain and requires protections
- B. Convene minimum one week prior to commencing work of this section.

1.5 SEQUENCING

- A. Sequence of activities and work details in active operation areas must be approved by the Owner and Engineer prior to work.
- B. Owner will conduct salvage operations before demolition begins to remove materials Owner chooses to retain.

1.6 SCHEDULING

- A. Schedule Work to coincide with new construction.
- B. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operation in adjoining spaces.
- C. Coordinate utility and building service interruptions with Owner.
 - 1. Do not disable or disrupt building fire or life safety systems without two weeks prior written notice to Owner.
 - 2. Schedule tie-ins to existing systems to minimize disruption.
 - 3. Coordinate Work to ensure fire sprinklers, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

1.7 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Protection of Persons and Property: Erect and maintain temporary shoring, bracing, lights, barricades, baffles, curtains, signs, and other measures necessary to protect the public, workers, and adjoining property from demolition work.
- C. Cease operations immediately if structure appears to be in danger and notify Engineer. Do not resume operations until directed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Prior to starting selective demolition operations, perform a thorough inspection of the building and premises and report to the Owner and Engineer any defects and structural weaknesses of the existing construction and of improvements to remain.
- B. Notify affected utility companies before starting work and comply with their requirements.
- C. Mark location and termination of utilities.

- D. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the Owner and the Owner's employees, and existing improvements indicated to remain.

3.2 SALVAGE REQUIREMENTS

- A. Coordinate with Owner to identify equipment required to be removed and delivered to Owner.
- B. Tag components and equipment Owner designates for salvage.
- C. Protect designated salvage items from demolition operations until items can be removed.
- D. Carefully remove building components and equipment indicated to be salvaged.
- E. Disassemble as required to permit removal from building.
- F. Package small and loose parts to avoid loss.
- G. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
- H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item.
- I. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

3.3 DEMOLITION

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Jackhammering will be permitted only to a limited degree with prior approval of Owner. Do not jackhammer within 2-inches of reinforcing or structural steel to remain. Remove final 2-inches of materials with a chipping gun.
- C. Cut new openings neat and as close to possible to the profiles indicated. Do not cut or alter structural members without prior written approval of the engineer. Remove concrete and masonry whenever possible by saw cutting or similar approved method.
- D. Protect existing structures, facilities, and landscaping from damage. Items damaged as a result of demolition activities shall be repaired or replaced, as required at no increase in the Contract Price.
- E. Maintain protected egress from and access to adjacent existing buildings at all times.
- F. Do not close or obstruct roadways or sidewalks without permits or Owner's permission.
- G. Cease operations immediately if structure appears to be in danger and notify Engineer and Owner.
- H. Disconnect and remove designated utilities within demolition areas.

- I. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.

- J. Disposal of Debris
 - 1. Burying of trash or debris on site will not be permitted. Burning of trash or debris will not be permitted.
 - 2. Remove trash and debris from the site at frequent intervals so that the site remains orderly, and the presence of unnecessary material does not delay the progress of work.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 REFERENCES

- A. American Concrete Institute (ACI):
 1. 117 - Specifications for Tolerances for Concrete Construction and Materials
 2. 301 - Specifications for Structural Concrete for Buildings
 3. 305R - Hot Weather Concreting
 4. 306R - Cold Weather Concreting
 5. 309R - Guide for Consolidation of Concrete
 6. 315 - Manual of Standard Practice for Detailing Reinforced Concrete
 7. 347 - Recommended Practice for Concrete Formwork
 8. 318 - Building Code Requirements for Reinforced Concrete
 9. 544.1R - State-of-the-Art Report of Fiber Reinforced Concrete
 10. 554.2R - Measurement of Properties of Fiber Reinforced Concrete

- B. American Society for Testing and Materials (ASTM):
 1. A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 2. C 33 - Concrete Aggregate
 3. C 39 - Compressive Strength of Cylindrical Concrete Specimens
 4. C 94 - Ready-Mixed Cement
 5. C 150 - Portland Cement
 6. C 260 - Air-Entraining Admixtures for Concrete
 7. C 309 - Liquid Membrane-Forming Compounds for Curing Concrete
 8. C 494 - Chemical Admixtures for Concrete
 9. C 1018 - Standard Test Method for Flexural Toughness and First-Crack Strength of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading)

10. C 1116 - Type III, Sections 4.1.3 and 4.2, and Performance Level I, Toughness Index I5 outlined in Section 21, Note 17, Standard Specification for Fiber-Reinforced Concrete and Shotcrete

C. Federal Specifications (FS):

1. TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces

D. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI - Manual of Standard Practice and Recommended Practice for Placing Reinforcing Bars (MSP-latest edition)

E. American Welding Society (AWS)

F. Scaffolding and Shoring Institute (SSI):

1. Scaffolding and Shoring Safety Rules

1.5 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Provide cement manufacturer's letter of certification and chemical content test results stating that the Portland cement is in compliance with ASTM designation C 150.
2. Indicate amounts of mix water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates.
2. Form materials and form-release agents.
3. Steel reinforcement and reinforcement accessories.
4. Admixtures.
5. Curing materials.
6. Bonding agents.
7. Adhesives.
8. Epoxy joint filler.
9. Joint-filler strips.
10. Repair materials.

F. Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Testing Agency Qualifications: An independent testing agency, approved by the Engineer and acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."
- F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
 - 1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor and Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Concrete subcontractors.
 - e. Engineer.
 - f. Owner's representative.
 - 2. Flatwork (interior and exterior slabs) Preinstallation Conference: Conduct conference at Project site to review all details and requirements for the batching, mixing, transporting, placing, finishing, and curing all interior and exterior flatwork operations. Require representatives of each entity directly concerned with flatwork operation to attend, including the following:
 - a. Contractor and Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Flatwork subcontractors.
 - e. Cement Manufacturer's factory representative
 - f. Engineer.

g. Owner's representative.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.8 PROJECT CONDITIONS

A. To prevent exterior concrete entrance slabs, pavement and walls from repeated freeze thaw cycles and deicers before adequate curing to protect concrete has occurred, placement shall meet the requirements of ACI 306R, Cold Weather Concreting. No deicers shall be used on the concrete during the project.

B. Apply surface evaporation retardant to slab surface when water loss reaches .15 lbs of water loss per square foot per hour as determined in ACI 308.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Structural 1, B-B, or better, mill oiled and edge sealed.
2. Manufactured forming system: metal or other panel system with prior review and approval.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Form-Release Agent: Commercially formulated form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
 - 1. Bars shall be clean and free from rust, scale or coatings that will reduce bond. Reinforcing steel shall be capable of bending 180 degrees and rebending to original shape without fracture.
- B. Plain-Steel Wire: ASTM A 82, galvanized.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I/II.
 - 1. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - a. At the contractor's option, slag cement may be blended with type II cement to modify specific properties of the concrete. The percentage of slag cement recommended by the supplier shall be approved by the Engineer.
 - b. At the supplier's option, slag cement may be blended with type II cement to achieve the performance of 0.60% alkali. The cement supplier shall provide a letter certifying the percentage of slag cement required to achieve the performance of low alkali cement specified.
 - c. May be used in foundation walls and footings. Not allowed for use in interior slabs-on-grade mixes.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Class: Severe weathering region, but not less than 3S.
 - 2. Nominal Maximum Aggregate Size: 3/4 inch.
- C. Lightweight Aggregate: ASTM C 330, 3/8-inch nominal maximum aggregate size.
- D. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Select chemical admixtures from paragraphs below.
- D. Water-Reducing Admixture: ASTM C 494, Type A.

- E. Retarding Admixture: ASTM C 494/C 494M, Type B.
- F. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- G. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- H. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- I. Non-Corrosive Accelerator: ASTM C 494, Type C or E.
 - 1. Non –corrosive accelerator shall have long-term test data proving its non-corrosive effect on reinforcing steel.
- J. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Catexol 1000CL; Axim Concrete Technologies.
 - b. MCI 2000 or MCI 2005; Cortec Corporation.
 - c. DCI or DCI-S; W. R. Grace & Co., Construction Products Div.
 - d. Rheocrete 222+; Master Builders, Inc.
 - e. FerroGard-901; Sika Corporation.

2.6 WATERSTOPS

- A. Chemically resistant Waterstops: Manufactured horizontal strip, at interface between existing concrete and new cast-in-place berm. Westec thermoplastic elastomeric rubber (TPER) waterstop by Sika® Corporation, or approved equal.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Clean and Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.8 RELATED MATERIALS

- A. Isolation Joint Former (Columns): 4" x 24" diameter as manufactured by Greenstreak, P.O. Box 7139, St. Louis, MO 63177, or approved equal.

- B. Perimeter Isolation Joint: 2 lb. density, cross linked polyethylene with removable strip-off equal to ISO-STRIP as manufactured for Century Floors, Topsham, Maine.
 - 1. Edge Tape: Vaporlock edge tape, pre-formed 3 inch wide two-sided adhesive.
- C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- D. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- F. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.
- G. Doweling Adhesive: A two-component, vinylester blend resin equal to HIT HY200 adhesive as manufactured by Hilti Fastening Systems, Tulsa, Oklahoma or approved equal
- H. Dowels: 18" long 1/2" diameter dowels with sawn ends (sheared bars not acceptable).
- I. Reglets: Fabricate reglets of not less than 0.0217-inch- thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- J. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water-reducing and plasticizing agents capable of minimum compression strength of 2,400 lbs. Non-shrink grout shall be equal to "Eucon N-S" (non-metallic) by the Euclid Chemical Co., "Masterflow 713" (non-metallic) by Master Builders, or Five Star Grout by U.S. Grout Corp.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.42.
 3. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement.
 4. Select slump limit from three options in subparagraph below or revise to suit Project.
 5. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 6. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
 7. Reinforcement: As noted on Drawing Plans and Details.
- D. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements.
- E. Maximum Water-Cementitious Materials Ratio: 0.50 for concrete required to have low water permeability.
- F. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
- G. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- H. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use corrosion-inhibiting admixture in concrete mixes where indicated.

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
 1. When air temperature is between 85 and 90°F (30 and 32°C), reduce mixing and delivery time from one and one-half (1-1/2) hours to seventy-five (75) minutes: when air temperature is above 90°F (32°C), reduce mixing and delivery time to sixty (60) minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
 - 1. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. Excessive deflection of forms after concrete is poured shall be sufficient cause for rejection of that portion of concrete and formwork. Excessive deflection will be considered to be that which will produce visible and noticeable waves in the finished concrete.
 - 2. Construct forms so that walls will key into each other at ends unless poured monolithically.
- B. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Surfaces exposed to view: Class A, 1/8 inch
 - 2. Surfaces not exposed Class C, 1/2 inch
- C. Construct forms tight enough to prevent loss of concrete mortar.
- D. All possible care shall be taken in the formwork to produce surfaces free from honeycomb or other defects.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 - 1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Schedule the work and notify other trades in time so that provisions for their work in the formwork can be made without delaying progress of the project. Verify that all sleeves, pipes, etc., for electrical, plumbing, heating and ventilation, or other work are installed.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Bolts, rods or other approved devices shall be used for internal ties. They shall be so arranged that when the forms are removed, no metal shall be within 1" of any surface.

- M. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- N. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- O. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Secure information about and provide for all openings, offsets, recessed nailing blocks, channel chases, anchors, ties, inserts, etc., in the formwork before concrete is poured.
 - 2. Install anchor bolts, accurately located, to elevations required.
 - a. The setting of all anchor bolts and the grouting for all structural steel base plates shall be included as part of this contract. Bolts and base plates will be furnished under Section 05500 - Metal Fabrications.
 - b. All column base plates, equipment bases, and other locations noted in the structural drawings shall be grouted with the specified non-shrink grout. All exposed grout shall be the specified non-metallic type.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.2 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Steel reinforcing shall not be bent in a manner that will injure the material or the embedding concrete. Bars with kinks or bends not shown on the plans shall not be used. Heating of reinforcement for bending will not be permitted. Bars shall be bent once only (no rebending or straightening allowed) unless shown as such on the drawings.
 - 2. All details of reinforcement not shown or indicated on the drawings or specifically called for in the specifications shall conform to ACI 315.
 - 3. Lap all bars at splices, corners and intersections a minimum of 36 bar diameters unless otherwise indicated. Laps of welded-wire fabric shall be at least two times the spacing of the members in the direction lapped but not less than twelve inches.

4. All intersecting concrete walls shall be tied with #4L bars 3'-0" long, bent 18" x 18" spaced 12" on center, outside face only unless otherwise indicated.
 5. Splices of reinforcement shall not be made at points of maximum stress. Splice lengths shall be a minimum of 36 bar diameters unless otherwise indicated and shall provide sufficient lap to transfer the stress between bars by bond and shear. Stagger splices of adjacent bars where possible. All splices and laps at corners and intersections shall be tied with wire at each end.
 6. Where obstructions (pipes, conduit, ducts, etc.) prevent the intended placement of reinforcing, provide additional reinforcing as directed by the Engineer or his Representative around the obstruction to match that reinforcing interrupted.
 7. Provide additional stirrups, ties, trim bars, etc., as directed around all openings, sleeves, pipes, and conduits, which pass through structural elements.
 8. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
1. Coverage of bars (including stirrups and column ties) shall, unless otherwise shown, be as follows:

Footings:	3" soil face, 2" top
Slabs (on grade):	2" soil face, 1-1/2" top face
Walls:	2" clear to form at exterior
 2. Misplaced Reinforcing: If any reinforcing bars are found to be misplaced after concrete has been placed, the Engineer shall be notified immediately and no correction or cutting shall be made without his direction. Misplaced bars shall not be bent or kinked. Any redesign and/or reinforcing required because of misplaced bars shall be at the Contractor's expense.
 3. All reinforcing shall be kept separate from soil, pipe, conduit ducts, etc., by approved non-metallic separators.
 4. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
- C. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - a. Wall control "V" joints shall have a depth of 1/8 times the thickness of the wall and be 1/2" wide at surface. "V" joints shall be placed as shown or as directed by the Engineer.
 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, or 3/4" minimum for soft-cut as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/4" maximum wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
 - a. Floor slab control joints shall be placed as shown on the foundation plan. Unless otherwise noted, control joints shall be spaced at intervals not to exceed 12'-0" on center in both directions.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. All intersecting slab construction joints acting as control joints shall be doweled according to the following schedule unless otherwise indicated. Dowels shall be smooth, steel grade 60 with saw cut ends. Grease, wrap or cap one end.

Dowel Schedule

	Dowel Dia.	Length	Spacing
4" Slab	1/2"	12"	12"
5" Slab	5/8"	14"	12"
6" Slab	3/4"	14"	12"
7" Slab	7/8"	14"	12"
8" Slab	1"	14"	12"

3.5 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

1. Remove all protrusions and indentations 2" or over in all areas.
2. Lay waterstop flat against concrete surface and nail every 1" to 6" with case hardened washered nails.
3. Overlap all joints a minimum of 2".

3.6 MIXING CONCRETE

- A. General: The concrete shall be mixed in the quantities required for immediate use, and any which has developed initial set or exceed the time limit of ASTM C 94 shall not be used. No retempering of mortar or concrete shall be allowed under any circumstances. Concrete shall be proportioned, mixed and placed only in the presence of the Engineer or his Authorized Representative. The Contractor shall give ample notice to the Engineer before mixing is commenced. Aggregate size will be adjusted to suit conditions of work. Pumping of concrete shall be permitted only after approval by the Engineer of the Pumping Contractor and the pumping equipment and method to be employed. The Engineer shall be notified of dates when pumping of concrete shall be performed to permit his on-the-job inspection of the operations.
- B. Final proportions shall be in accordance with approved mix designs. Adjustments to approved proportions, for whatever reason, shall be approved by the Engineer.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Remove loose dirt, mud, standing water, and foreign matter from excavations or from cavities.
- C. Thoroughly clean reinforcement and other embedded items free from loose rust and other matter. Assure reinforcing is held securely in place.
- D. Thoroughly wet wood forms (except coated plywood), bottom and sides of trenches, base underslab, and adjacent concrete or masonry at least one hour in advance of placing concrete; securely close cleanout and inspection ports; repeat wetting as necessary to keep forms damp.
- E. Equipment shall be maintained clean and of sufficient quantity and capacity to efficiently execute the work required.
- F. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- G. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- H. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - a. concrete shall be vibrated into final position in forms with an internal type vibrating machine. The vibration shall have a frequency of not less than 8,000 vibrations per minute. The mechanical vibrating equipment shall be satisfactory to the Engineer.
 - b. The vibration shall be of sufficient intensity and duration to cause flow or settlement of the concrete and complete consolidation. Over vibration, especially of mixtures that are too wet, may cause segregation and will be avoided. A sufficient number of vibrators shall be provided to permit consolidation of each batch before the next batch is delivered and without delaying the delivery.
 - c. The vibrations shall be applied directly to the concrete, and vibration through the forms shall not be permitted. Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. The concrete shall be placed in layers of uniform thickness
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
3. When conditions make puddling difficult, or where the reinforcement is congested, batches of mortar containing the same proportions of cement to sand used in the concrete shall be deposited in the forms. The operation of filling with the regularly specified mix shall be carried on at such a rate that the mix is at all times plastic and flows readily into the spaces between the bars.
4. In thin walls or inaccessible portions of the forms where rodding is impractical, the concrete shall be worked into place by tapping or hammering forms adjacent to the freshly deposited concrete.
5. The Contractor's attention is called to the importance of making the concrete dense, and he shall provide sufficient labor to the entire satisfaction of the Engineer to thoroughly consolidate the concrete, avoid air pockets and voids in exposed sections, and leave smooth, uniform surfaces after forms are removed.
6. Should any honeycombed concrete be disclosed upon removal of forms, the Contractor shall immediately cut out the said honeycombed portions back to solid concrete and shall fill the opening thus formed with a concrete of the same proportions as that specified for the section of work in which the fault occurs.
7. When placing fresh concrete upon hardened concrete, the latter shall be thoroughly roughened and cleaned of all loose material, scum or latency. The bonding compound shall be applied and the new concrete placed while the bonding compound is still tacky.
8. Joints in the concrete work shall be made only in places and the manner specified by the Engineer.
9. The Contractor's attention is called to the importance of properly and carefully placing concrete around reinforcement, as the reinforcing metal must not be exposed; and in cases where reinforcing metal becomes exposed on the surface, that portion of work must be removed and re-laid as the covering of same by plastering with cement mortar

will not be allowed. All reinforcing rods or other reinforcing material shall be lightly tapped so that they will retain their original position.

10. No concrete shall be retempered except as allowed in ASTM C 94 nor shall set concrete be used as aggregate.

- I. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 - a. Reinforcement, unless otherwise indicated, shall be placed one-half the thickness of the slab.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
 6. In addition to steel bar reinforcement, slabs shall be reinforced with fibrous concrete reinforcement which is to be added when the concrete is being batched in strict accordance with the manufacturer's recommendations.
 7. Slabs shall be monolithically placed with control joints. Sawed control joints will be located as indicated on the drawings and/or as directed by the Engineer. Floors shall be cleaned of objects before saw cutting begins. A true, continuous saw cut is what is expected as a finish result.

- J. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 1. When air temperature has fallen to or is expected to fall below 40 deg F uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
 4. Contractor shall have on the job, ready to install, adequate equipment for heating the materials and the freshly placed concrete and for enclosing the work in accordance with the requirements specified herein.

- K. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

L. Protection:

1. Concrete just placed shall be protected from rain in an approved manner until the concrete has set, or if a slab, the curing compound has dried.
2. Concrete, when placed in the forms, shall have a temperature of not less than 50 degrees F or more than 90 degrees F. Freshly placed concrete and the surrounding air shall be maintained at a temperature of 50 degrees F or greater for a period of seven days after placing. If high early strength concrete is used, the aforementioned time period may be reduced to three days. The methods of protection and curing shall be such as to prevent evaporation of moisture from the concrete and injury to the surface.
3. Should it later develop that any concrete work has become injured in any way by freezing or otherwise, the defective concrete shall be repaired or replaced as directed by the Engineer at no added expense to the Owner. Repair materials shall include all reinforcement grouts, dry pack, admixtures, epoxy and aggregates as may be necessary

3.8 PROTECTIVE COATING FOR STRUCTURAL STEEL

- A. All structural steel and columns and their bases which extend into or through concrete floors or walls shall be thoroughly brush painted with two coats of foundation coating as specified in Section 07150 - Dampproofing, and applied in accordance with the manufacturer's directions, neatly cut off one inch below finish floor.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 2. Do not apply rubbed finish to smooth-formed finish.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
 1. All concrete slabs shall be finished true and smooth by steel troweling or finishing machine. All exterior slabs, pads, ramps, stairs, and sidewalks shall be broom finished.

2. When a section of the concrete floor is completed, it shall be left entirely undisturbed until the concrete is thoroughly hardened.
 3. Adequate provisions will be made to eliminate the possibility of accidental encroachment upon the newly concreted area.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish.
 2. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 3. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
 4. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
 - a. Tolerances will be in accordance with ACI Publication #117 - Class AX. Depression in floor between high spots shall not be greater than $3/16"$ in $10'-0" \pm 1/16"$, and the measurement will be taken by the straight edge method no later than the day after the concrete floor has been poured.
- C. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment. Equipment Pads: Provide 6" thick concrete pads reinforced with 6x6 - W4xW4 welded-wire fabric doveled into concrete slab under all equipment supported on concrete floor slab unless otherwise indicated.

3.12 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, and other surfaces as indicated below.
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 4. Waterproof Paper: Apply waterproof paper in accordance with manufacturer's recommendations in widths as wide as possible. Paper shall be lapped and seams taped with reinforced tape.
 - a. For Interior Non-Exposed Concrete: Typical curing operation for all interior slabs with moisture sensitive floor coverings. Verify individual requirements with flooring manufacture.
 - 5. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written

instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling till the completion of the project. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.
- D. Install isolation joints around columns in accordance with the drawings and manufacturer's recommendations.
- E. Install perimeter isolation joints in accordance with the drawings and manufacturer's recommendations.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to

manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- D. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd. plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 7. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

- a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.
 - a. Test two field-cured specimens at 7 days and two at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi
- E. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer.

END OF SECTION

DIVISION 22

PLUMBING

SECTION 22 13 19 – VALVES AND PIPE ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY:

- A. Section Includes:
 - 1. Water treatment equipment and water main isolation valves and check valves
- B. Related Sections:
 - 1. Section 31 23 17 – Trenching
 - 2. Section 33 41 01 – PVC Pipe and Fittings
 - 3. Section 33 41 02 – HDPE Pipe and Fittings

1.2 DESCRIPTION OF WORK:

- A. Work of this Section shall consist of furnishing all labor, materials, and equipment to install valves, fittings and other appurtenances. Only the appropriate portions of this section pertaining to the specific contract work identified in Section 01 11 00 "Summary of Work" or as directed by the Engineer, will apply.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

1.3 SUBMITTALS:

- A. Product Data: Submit Manufacturers shop drawings, technical product data, installation instructions and catalog information for each valve fitting or accessory.
- B. Manufacturer's Installation Instructions: Submit hanging or support methods and joining procedures.

PART 2 PRODUCTS

2.1 BALL VALVES:

- A. General: Provide ball valves of the same type, style, and duty by a single manufacturer for the pipe size as indicated on Contract Drawings. The ball valves shall be designed for use in drinking water applications and suitable for buried service as required. The valve port area shall be full bore. The free area through the valve shall be no less than the nominal inside area of the connecting piping. The ball valves shall be capable of seating in both directions and use upstream line pressure to effectively seat the valve.
- B. Stainless Steel:
 - 1. Full port 304 stainless steel, ANSI Class 150 flanged ball valve
 - 2. The ball shall be 304 stainless steel.
 - 3. Seals and O-rings shall be constructed of Viton® where possible and applicable.
- C. PVC:
 - 1. Full port Schedule 80 PVC, true union ball valves, NSF/ANSI 61
 - 2. Viton or EPDM (or engineer approved equal) seats and double O-ring stem seals

2.2 CHECK VALVES:

- A. General: Provide check valves of the same type, style, and duty by a single manufacturer for the pipe size as indicated on the Contract Drawings. The check valves shall be designed for use in drinking water applications and suitable for buried service as required.

2.3 FITTINGS:

- A. Fittings shall be of the same type, style, and duty by a single manufacturer for the pipe material and size as indicated on the Contract Drawings.
- B. PVC:
 - 1. PVC fittings shall be Schedule 80 PVC, with socket or threaded end connections.
- C. High-density polyethylene (HDPE):
 - 1. HDPE fittings shall be iron pipe size (IPS) and meet pressure rating of standard dimension ratio (SDR) 11, and the fittings shall be welded via butt heat fusion (ASTM D3261) or be flanged connection.
- D. Plugs, caps, and blind flanges shall be stainless steel and shall conform to the weights and dimensions shown and be provided complete with all necessary gaskets and 304 stainless steel bolts.
- E. All fasteners (nuts and bolts) shall be 304 stainless steel and shall be the correct size and dimensions for the flange and pipe sizes.

2.4 TRANSITION COUPLINGS:

- A. Transition couplings for PVC to HDPE pipe shall be pipe size indicated on contract drawings and a product of Premium Manufacturing, Poly-Cam, or approved equal.

PART 3 EXECUTION

3.1 GENERAL:

- A. All materials shall be stored and handled in accordance with the manufacturer's recommendations.
- B. Verify piping system is ready for installation.
- C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- D. Install valves with stems upright, not inverted.
- E. Install valves as shown on contract drawings for shut-off and to isolate equipment, part of systems, or vertical risers.
- F. Valves and Fittings shall be braced against movement by installation of yoke and stanchions as applicable.
- G. Inspection: Pipe installation shall be subject to inspection by the Engineer for quality, adherence to line and grade, jointing, and proper backfill. Any joint not satisfactory to the

Engineer shall be removed and remade to his satisfaction at the Contractor's expense. No pipe shall be backfilled until it has been approved by the Engineer.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Building wires and cables rated 2000 V and less.
 - 2. Connectors, splices, and terminations rated 2000 V and less.
- B. Related Requirements:

1.3 DEFINITIONS

- A. VFC: Variable-frequency controller.

1.4 SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- 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. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable used in VFC circuits.
- D. Conductors: Copper, complying with NEMA WC 70/ICEA S-95-658.
 - 1. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2 and Type XHHW-2.
- E. Cable: Comply with NEMA WC 70/ICEA S-95-658.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper; Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type XHHW-2, single conductors in raceway.
- B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- C. Exposed Branch Circuits, Including in Crawlspace: Type XHHW-2, single conductors in raceway.
- D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Where required, conduit seal offs must be installed and shall be rated to meet Class I Division 1, Group D hazard classification and electrical requirements per NFPA and NEC.

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor with respect to ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable.
 - h. Uniform resistance of parallel conductors.
- B. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

26 05 19 - 3

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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 grounding and bonding systems and equipment.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- 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. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 1. Solid Conductors: ASTM B 3.
 2. Stranded Conductors: ASTM B 8.
 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- D. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- E. Conduit Hubs: Mechanical type, terminal with threaded hub.
- F. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- G. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
- H. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- I. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- J. Straps: Solid copper, copper lugs. Rated for 600 A.
- K. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- L. Water Pipe Clamps:
 1. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 4 AWG minimum.
 1. Bury at least 24 inches below grade.
- C. Conductor Terminations and Connections:
 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - a. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
 - b. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - c. Perform tests by fall-of-potential method according to IEEE 81.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed 10 ohms at any test point:

- F. Excessive Ground Resistance: If resistance to ground exceeds 10 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

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SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Boxes, enclosures, and cabinets.
- B. Related Requirements:
 - 1. Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks and underground utility construction.

1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.

1.4 SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions, where installed and including flexible external bonding jumper.

- E. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- C. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- D. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- C. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- F. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- G. Gangable boxes are prohibited.
- H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4 with continuous hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Fiberglass.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- I. Cabinets:
 - 1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed Conduit: GRC.
 2. Underground Conduit: RNC, Type EPC-40-PVC, concrete encased.
 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from RNC, Type EPC-40-PVC to GRC before rising above floor.
- J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- Q. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- R. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where an underground service raceway enters a building or structure.
 2. Where otherwise required by NFPA 70.
- S. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- T. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- 3.3 FIRESTOPPING
- A. Install firestopping at penetrations of fire-rated floor and wall assemblies.
- 3.4 PROTECTION
- A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

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. Identification of power and control cables.
 - 2. Identification for conductors.
 - 3. Underground-line warning tape.
 - 4. Warning labels and signs.
 - 5. Instruction signs.
 - 6. Equipment identification labels, including arc-flash warning labels.
 - 7. Miscellaneous identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Warning labels and signs shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.3 TAPES AND STENCILS:

- A. Underground-Line Warning Tape
 - 1. Tape:

- a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
2. Color and Printing:
- a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE".
 - c. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 - d. Width: 3 inches.
 - e. Thickness: 4 mils.
 - f. Weight: 18.5 lb/1000 sq. ft.
 - g. Tensile according to ASTM D 882: 30 lbf and 2500 psi.

2.4 SIGNS

- A. Laminated Acrylic or Melamine Plastic Signs:
- 1. Engraved legend.
 - 2. Thickness:
 - a. For signs up to 20 sq. inches, minimum 1/16-inch-.
 - b. For signs larger than 20 sq. inches, 1/8 inch thick.
 - c. Engraved legend with white letters on a black background.
 - d. Punched or drilled for mechanical fasteners.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
- 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
- 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Verify identity of each item before installing identification products.
- C. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- D. Apply identification devices to surfaces that require finish after completing finish work.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
- G. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.2 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase- Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
 - b. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - c. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.

3) Phase C: Blue.

- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- B. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
 - C. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive vinyl labels with the conductor designation.
 - D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker-tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
 - E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
 1. Install underground-line warning tape for direct-buried cables and cables in raceways.
 - F. Arc Flash Warning Labeling: Self-adhesive thermal transfer vinyl labels.
 1. Comply with NFPA 70E and ANSI Z535.4.
 - G. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
 - H. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.
 - I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.
 1. Labeling Instructions:
 - a. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - b. Fasten with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment To Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of an engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.

END OF SECTION

SECTION 26 27 26 – WIRING DEVICES

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. Receptacles, receptacles with integral GFCI, and associated device plates.
 2. Twist-locking receptacles.
 3. Weather-resistant receptacles.
 4. Snap switches and wall-box dimmers.
 5. Pendant cord-connector devices.
 6. Cord and plug sets.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 2. Retain "Cord and Plug Sets" Subparagraph below if retaining "Cord and Plug Sets" Cord and Plug Sets: Match equipment requirements.

1.5 SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
2. Hubbell Incorporated; Wiring Device-Kellems.
3. Leviton Manufacturing Co., Inc.

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

B. Provide other NEMA configurations and ratings as indicated on drawings and schedules.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A, NEMA 5-20R.

C. Provide other NEMA configurations and ratings as indicated on drawings and schedules.

2.5 TWIST-LOCKING RECEPTACLES

A. Comply with NEMA WD 1, NEMA WD 6 configurations as indicated on the drawings, and UL 498.

2.6 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations as indicated on the drawings, heavy-duty grade, and FS W-C-596.

3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.7 CORD AND PLUG SETS

- A. Description:
 1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
 3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
 1. Single Pole:
 2. Two Pole:
 3. Three Way:
 4. Four Way:
- C. Pilot-Light Switches, 20 A:
 1. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."
- D. Toggle switches that are located in the same location as low voltage switches shall match color and type/style.

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Third option in "Material for Finished Spaces" Subparagraph below is also available in Type 430 but is susceptible to rust and corrosion even in finished spaces.
 3. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
 4. Material for Unfinished Spaces: Galvanized steel.
 5. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

- C. Plates shall be Factory engraved "GENERATOR" for receptacles connected to generator-connected panels.

2.10 FINISHES

- A. Device Color:
 - 1. Wiring Devices: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install device boxes so that the cover plate does not cross a joint in wall finish materials unless the joint is troweled flush with the face of the wall.
 - 5. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 8. Tighten unused terminal screws on the device.
 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Retain first subparagraph below if the position of the ground pin is important for consistency. Trade and professional literature is inconsistent in recommending benefits of either orientation.
 2. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
1. Install dimmers within terms of their listing.
 2. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multigang wall plates.
- 3.2 GFCI RECEPTACLES
- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
- 3.3 IDENTIFICATION
- A. Comply with Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- 3.4 FIELD QUALITY CONTROL
- A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

- C. Wiring device will be considered defective if it does not pass tests and inspections.

- D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 16 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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. Fusible switches.
 2. Non-fusible switches.
 3. Shunt trip switches.
 4. Molded-case circuit breakers (MCCBs).
 5. Molded-case switches.
 6. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 1. Enclosure types and details for types other than NEMA 250, Type 1.
 2. Current and voltage ratings.
 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. 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.
- D. Comply with NFPA 70.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than five days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Owner's written permission.
 - 4. Comply with NFPA 70E.

1.9 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Square D; a brand of Schneider Electric (preferred)
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit
 - 3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 4. Siemens Energy & Automation, Inc.
- B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac as appropriate for circuit voltage, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.
 - 5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NON-FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
- B. Type HD, Heavy Duty, Single Throw, -240 or 600-V ac as appropriate for circuit voltage, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Square D; a brand of Schneider Electric. (preferred)
 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit
 3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 4. Siemens Energy & Automation, Inc.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 1. Instantaneous trip.
 2. Long- and short-time pickup levels.
 3. Long- and short-time time adjustments.
 4. Ground-fault pickup level, time delay, and I^2t response.
- D. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- E. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- F. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- G. Features and Accessories:
 1. Standard frame sizes, trip ratings, and number of poles.
 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

7. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

2.4 MOLDED-CASE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Square D; a brand of Schneider Electric.
 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit
 3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 4. Siemens Energy & Automation, Inc.
- B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Features and Accessories:
 1. Standard frame sizes and number of poles.
 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 3. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.

2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4X.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

- B. Comply with mounting and anchoring requirements specified in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems."
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges.

END OF SECTION

DIVISION 27

COMMUNICATIONS

SECTION 27 05 28 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

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. Metal conduits and fittings.
 - 2. Nonmetallic conduits and fittings.
 - 3. Boxes, enclosures, and cabinets.
 - 4. Polymer-concrete handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

- A. GRC: Galvanized rigid conduit.
- B. IMC: Intermediate metal conduit.

1.4 SUBMITTALS

- A. Product data for the following:
 - 1. Surface pathways
 - 2. Boxes, enclosures, and cabinets.
 - 3. Underground handholes and boxes.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.
- B. General Requirements for Metal Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
 - 2. Comply with TIA-569-D.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. PVC-Coated Steel Conduit: PVC-coated GRC.
 - 1. Comply with NEMA RN 1.

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- 2. Coating Thickness: 0.040 inch, minimum.
- E. EMT: Comply with ANSI C80.3 and UL 797.
- F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Set screw or compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- G. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Description: Nonmetallic raceway of circular section with manufacturer-fabricated fittings.
- B. General Requirements for Nonmetallic Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 - 2. Comply with TIA-569-D.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.
- E. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Description: Enclosures for communications.
- B. General Requirements for Boxes, Enclosures, and Cabinets:
 - 1. Comply with TIA-569-D.
 - 2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
 - 3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
 - 4. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
 - 5. Gangable boxes are prohibited.

- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- F. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

2.4 POLYMER-CONCRETE HANDHOLES

- A. Description: Molded of sand and aggregate; bound together with polymer resin; and reinforced with steel, fiberglass, or a combination of the two.
- B. General Requirements for Polymer Concrete Handholes:
 1. Boxes and handholes for use in underground systems shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 3. Comply with TIA-569-D and SCTE 77.
- C. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
- D. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 1. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 2. Cover Legend: Molded lettering, "COMMUNICATIONS".
- E. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
- F. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 1. Tests of materials shall be performed by an independent testing agency.
 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

- A. Outdoors: Apply pathway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC.
 - 2. Concealed Conduit, Aboveground: GRC.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X.

- B. Indoors: Apply pathway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 5. Damp or Wet Locations: GRC.
 - 6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
 - 7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: EMT.
 - 8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in damp or wet locations.

- C. Minimum Pathway Size: 3/4-inch trade size for copper and aluminum cables, and 1 inch for optical-fiber cables.

- D. Pathway Fittings: Compatible with pathways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use set-screw or compression, steel fittings. Comply with NEMA FB 2.10.

- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

- F. Install surface pathways only where indicated on Drawings.

- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

- A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
 2. NECA/BICSI 568.
 3. TIA-569-D.
 4. NECA 101
 5. NECA 102.
 6. NECA 105.
 7. NECA 111.
- B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- C. Comply with requirements in Division 07 for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- D. Comply with requirements in Division 26 for hangers and supports.
- E. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- F. Complete pathway installation before starting conductor installation.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.
- I. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- J. Support conduit within 12 inches of enclosures to which attached.
- K. Pathways Embedded in Slabs:
1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
 2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
 3. Arrange pathways to keep a minimum of 2 inches of concrete cover in all directions.
 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 5. Change from nonmetallic conduit and fittings to GRC and fittings before rising above floor.
- L. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for pathways.
 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

- M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
- N. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
- O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
- P. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.
- Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.
- R. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- S. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.
- T. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
 - 1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
 - 2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
 - 3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- U. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.
- V. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service pathway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- W. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

- X. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F (55 deg C), and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Z. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit.
 - 2. Install backfill as specified in Division 31.
 - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
 - 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete around conduit for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- F. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07.

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage or deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

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DIVISION 31

EARTHWORK

SECTION 31 05 13 - SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Subsoil materials.
 - 2. Vegetative growth media.

- B. Related Sections:
 - 1. Section 31 05 16 - Aggregates for Earthwork
 - 2. Section 31 22 13 - Rough Grading
 - 3. Section 31 23 17 - Trenching
 - 4. Section 31 23 23 - Fill
 - 5. Section 32 91 19 - Landscape Grading
 - 6. Section 32 92 19 - Seeding

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and a 18-in. Drop.

- B. ASTM International:
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft³.
 - 2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/ft³.
 - 3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.3 SUBMITTALS

- A. Samples: Submit sample of each type of fill to testing laboratory.

- B. Materials Source: Submit name of imported materials source.

- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Furnish vegetative growth media from single source throughout the Work.

PART 2 PRODUCTS

2.1 VEGETATIVE GROWTH MEDIA MATERIALS

- A. Vegetative Growth Media
 - 1. Imported borrow or acceptable material from on-site excavation.
 - 2. Friable loam.

3. Reasonably free of roots, rocks larger than 3 inch, subsoil, debris, large weeds, and foreign matter.
 - a. Screening: Single screened.
4. Acidity range (pH) above 3.6 before liming and less than 500 parts per million of soluble salts.
5. Containing minimum of 1.5 percent organic matter.

2.2 SOIL AMENDMENTS

- A. Lime: Natural limestone containing not less than 90 percent of total carbonates, ground so that not less than 100 percent passes a #10 sieve, not less than 90 percent passes a #20 sieve and not less than 50 percent passes a #100 sieve.
- B. Fertilizer: Fertilizer shall be a commercial type 50 percent of the elements derived from organic sources and shall conform to the recommendations of the agronomic testing.

2.3 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services Testing and analysis of soil material.
- B. Testing and Analysis of Vegetative Growth Media: An agronomic study shall be performed on all vegetative soil sources planned for use on this site. Agronomic testing shall be performed by the North Carolina Department of Agriculture soil testing laboratory or by commercial laboratories qualified to perform agronomic testing.
- C. When tests indicate materials do not meet specified requirements, change material and retest.
- D. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Excavate subsoil and vegetative growth media from areas designated. Strip vegetative growth media to full depth of vegetative growth media in designated areas.
- B. Stockpile excavated material meeting requirements for vegetative growth media.
- C. Remove excess excavated materials not intended for reuse, from site.
- D. Remove excavated materials not meeting requirements for vegetative growth media from site.

3.2 STOCKPILING

- A. Stockpile materials on site at locations designated by Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.

- D. Prevent intermixing of soil types or contamination.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- F. Stockpile hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.
- B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 05 16 - AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Coarse aggregate materials.
 - 2. Fine aggregate materials.
 - a. Pipe Bedding Material
 - 1) Stone Pipe Bedding Material
 - 3. On-Site Material.
- B. Related Sections:
 - 1. Section 01 33 00 – Submittals Requirements.
 - 2. Section 31 23 17 – Trenching.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Aggregate:
 - 1. Basis of Measurement: By cubic yard.
 - 2. Basis of Payment: Includes supplying aggregate materials, stockpiling, and installation.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
 - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
 - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
 - 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
 - 4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil - Classification System).
 - 5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal: Requirements for submittals.
- B. Samples: Submit, in air-tight containers, a sample of each type of fill to testing laboratory.
- C. Materials Source: Submit name of imported materials suppliers.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.
- B. Perform Work in accordance with State of Maine standards.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. Type
 - 1. Use graded aggregate base, subbase, or shoulder course material of uniform quality.
 - a. Obtain the graded aggregate from an approved source or deposit that will yield a satisfactory mixture meeting all requirements of this Specification.
 - b. Use material that is crushed or processed as a part of the mining operations, or, mix two grades of material so that when combined in the central mix plant, the mixture meets the specifications.
- B. Gradation
 - 1. Grade the graded aggregate base, subbase, or shoulder material as follows:

U.S. Standard Sieve Size	Percent Passing by Weight
2 inches	100
1-1/2 in (37.5 mm)	97-100
3/4 in (19.0 mm)	60-95
No. 10 (2 mm)	25-50
No. 60 (250 μm)	10-35

- C. Structural Backfill: Backfill placed within 12 inches of footing bases and/or structural slabs shall consist of compacted structural fill that has a grain size conforming to the following gradation range:

U.S. Standard Sieve Size	Percent Passing by Weight
1-1/2 in (37.5 mm)	100
1 in (25 mm)	80-100
No. 8 (2.36 mm)	0-5

- 1. Structural backfill placed more than 2-feet below the footings and/or floor slabs can have particle sizes up to 6 inches, but should otherwise conform to the structural fill gradation range specified above.
- D. Common Borrow: Shall be earth, suitable for embankment construction. It shall be free of frozen material, perishable rubbish, peat, organic matter, large rock fragments, or other unsuitable material. AASHTO M145 Classifications A-1 through A-5 may be used. Use of other materials as common borrow is at the discretion of the Owner’s Representative and only in approved areas.

- E. Gravel Borrow: Shall consist of uniformly graded granular material having no rocks with a maximum dimension of over 6 in. and that portion passing a 3-in. square mesh sieve shall contain no more than 70 percent passing a 1/4 - in. mesh sieve and not more than 10 percent passing a No. 200 mesh sieve.
- F. Crushed Stone: Shall be of quarried stone and be clean and free from organic matter graded as follows:

U.S. Standard Sieve Size	Percent Passing by Weight
2 inches	100
1-1/2 in (37.5 mm)	97-100
3/4 in (19.0 mm)	60-95
No. 10 (2 mm)	25-45
No. 60 (250 μm)	10-30
No. 200 (75 μm)	7-20

- G. Granular Pipe Bedding Material: Shall be clean and free of organic matter, silt, or clay lumps, and deleterious materials. The material shall meet the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
1/2 inch	100
No. 4	95 to 100
No. 40	20 to 45
No. 200	0 to 5

- H. Electrical/Telephone Utility Trenches: Clean sand, free from organic matter, graded to meet the following criteria for the appropriate designation:

U.S. Standard Sieve Size	Percent Passing by Weight
1 inch	95 to 100
1/2 inch	75 to 100
No. 4	50 to 85
No. 10	20 to 50
No. 60	0 to 15
No. 200	0 to 5

2.2 ON-SITE MATERIAL

- A. Material on the site is the property of the Owner and, if suitable, shall be incorporated in the contract work. The Owner's Representative shall classify the material under Article 2.01 headings. Any sample testing needed for this classification will be performed by an approved laboratory at the Owner's expense.
- B. Material not incorporated in the work because it is unsuitable will be hauled away and disposed of at the Contractor's expense in accordance with the provisions of Specification Section 01 74 19, Construction Waste Management and Disposal.
1. Material designated to be wasted by the Owner's Representative will be disposed of by the Contractor.

2. Material designated to be saved by the Owner's Representative will be stockpiled at a location shown on the drawings or designated by the Owner's Representative.
3. Unsuitable material shall consist of grubbings or other materials which contain rock of size exceeding specifications, organic materials, or other materials of a deleterious nature as deemed by the Owner's Representative.

2.3 SOURCE QUALITY CONTROL

- A. Aggregate Material - Testing and Analysis: Perform a minimum of 1 gradation in accordance with ASTM D 422 and a minimum of 1 maximum dry density in accordance with ASTM D 1557 per source, or with each change of material, or per 2,500 cubic yards.
- B. Test Reports: Two copies of the borrow source reports will be submitted directly to the Owner's Representative with copy to the Contractor. The Contractor shall schedule his operation and submissions so the Owner's Representative has sufficient time to review the test results prior to delivery and/or use of the material at the site.
- C. When tests indicate materials do not meet specified requirements, change material and retest.
- D. On-Site Testing and Inspection Service:
 1. The Owner will perform quality assurance and compaction testing of materials used in the work. The Contractor shall supply representative materials for testing as required by the Owner's Representative. The Contractor shall schedule his operation and submissions so the Owner's Representative has sufficient time to perform testing. Failing tests of material quality, gradation, or field density will be charged to the Contractor and deducted from payments.
 2. In-Place Field Quality Assurance: Allow Owner's Representative or Owner's testing service to examine and test subgrades and fill layers.
 3. If, in the opinion of the Owner's Representative, based on reports of testing service and inspection, subgrades or fills that have been placed below specified density or thickness, the Contractor shall undertake necessary corrective actions, including removal and replacement of materials or placement of additional material, and testing at no additional expense to the Owner.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Excavate aggregate materials from on-site locations indicated as specified in Section 31 23 16.
- B. Stockpile excavated material meeting requirements for common fill materials.
- C. Characterize and remove excess excavated materials not intended for reuse, from site.

3.2 STOCKPILING

- A. Stockpile materials on site at locations indicated or otherwise agreed with Owner.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- E. Stockpile unsuitable or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposal.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent freestanding surface water.

END OF SECTION

SECTION 31 10 00 - SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removing surface debris.
 - 2. Removing designated paving and curbs.
 - 3. Removing designated trees, shrubs, and other plant life.
 - 4. Removing abandoned utilities.
 - 5. Excavating topsoil.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.3 QUALITY ASSURANCE

- A. Conform to applicable code for environmental requirements and disposal of debris.
- B. Perform Work in accordance with Maine Department of Environmental Protection.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.
- C. Identify waste area for placing removed materials.

3.2 PREPARATION

- A. Call Dig Safe not less than three working days before performing on-site Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

- A. Locate, identify, and protect utilities indicated to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.

- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Clear undergrowth and deadwood, without disturbing subsoil.

3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Partially remove paving, curbs, and, as indicated on Drawings. Neatly saw cut edges at right angle to surface.
- C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- E. Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over with same material, until disposal.
- D. Do not remove topsoil from site.

END OF SECTION

SECTION 31 22 13 - ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavating vegetative growth media.
 - 2. Excavating subsoil.
 - 3. Cutting, grading, filling, rough contouring, compacting site, and fill.
- B. Related Sections:
 - 1. Section 31 05 13 - Soils for Earthwork
 - 2. Section 31 05 16 - Aggregates for Earthwork
 - 3. Section 31 10 00 - Site Clearing
 - 4. Section 31 23 17 - Trenching
 - 5. Section 31 23 23 - Fill
 - 6. Section 32 91 19 - Landscape Grading

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Samples: Submit sample of each type of fill to testing laboratory.
- C. Materials Source: Submit name of imported materials suppliers.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Vegetative Growth Media: As specified in Section 31 05 13.
- B. Coarse Aggregates: Type as specified in Section 31 05 16.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions prior to starting construction.
- B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

- A. Call Dig Safe not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum.
- C. Notify utility company to remove and relocate utilities.

- D. Protect utilities indicated to remain from damage.
- E. Protect plant life, lawns and other features remaining as portion of final landscaping.
- F. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.
- B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.
- C. When excavating through roots, perform Work by hand and cut roots with sharp axe.
- D. Remove excess subsoil not intended for reuse, from site.
- E. Benching Slopes: Horizontally bench existing slopes greater than as shown on plans to key placed fill material to slope to provide firm bearing.
 - 1. Plow, strip or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- F. Stability: Replace damaged or displaced subsoil as specified for fill.
 - 1. When existing ground surface has a density less than that specified, break up ground surface, pulverize, moisture-condition to optimum moisture content and compact to required depth and percentage of maximum density.

3.4 FILLING

- A. Fill areas to contours and elevations with unfrozen materials as promptly as work permits, but not until completion of the following:
 - 1. Acceptance of construction below finish grade including, where applicable, damproofing, waterproofing, and perimeter insulation.
 - 2. Inspection by Owner's Representative, testing, approval, and recording locations of underground utilities.
- B. Place fill material in continuous layers and compact in accordance with schedule at end of this section.
- C. Maintain optimum moisture content of fill materials to attain required compaction density.
- D. Make grade changes gradual. Blend slope into level areas.
- E. Repair or replace items indicated to remain damaged by excavation or filling.

3.5 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

END OF SECTION

SECTION 31 23 16 – EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removal of underground storage tank.
 - 2. Installation of new water main and electrical/communications conduit.
- B. Related Sections:
 - 1. Section 31 23 17 – Trenching

1.2 REFERENCES

- A. Local utility standards when working within 24 inches of utility lines.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Requirements.
- B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations (if requested) to support plan.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with plans and specifications.

1.5 QUALIFICATIONS

- A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Maine.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Notify utility company, Owner and Engineer to remove and relocate utilities.
- C. Protect utilities indicated to remain from damage.
- D. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 EXCAVATION

- A. Underpin adjacent structures which may be damaged by excavation work.
- B. Excavate subsoil to accommodate utilities and sewer pipe removal and replacement, paving, site structures, and construction operations.
- C. Excavate to working elevation for project work.
- D. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 31 23 17.
- E. Slope banks with machine to angle of repose or less until shored.
- F. Do not interfere with 45 degree bearing splay of foundations.
- G. Protect excavation to prevent surface water runoff from draining into excavation.
- H. Trim excavation. Remove loose matter.
- I. Remove larger material.
- J. Notify Engineer of unexpected subsurface conditions.
- K. Correct areas over excavated as specified for authorized excavations of same classification, unless otherwise directed by Engineer.
- L. Stockpile satisfactory excavated materials where directed, until required for backfill or fill.
 - 1. Place, grade and shape stockpiles for proper drainage.
 - 2. Cover or seed stockpiles as specified.
 - 3. Place silt fence around downstream edge of stockpile to prevent transportation of soil.
- M. Repair or replace items indicated to remain damaged by excavation.

3.3 EXCAVATION DISPOSAL

- A. Management of excess on-site soils generated by excavation shall be coordinated with Owner and Engineer. Soil awaiting characterization shall be placed on 4-mil (minimum) plastic sheeting or directly into lined, covered roll-offs.

3.4 FIELD QUALITY CONTROL

- A. Request inspection of excavation and controlled fill operations in accordance with applicable code.
- B. Request visual inspection of bearing surfaces by inspection agency before installing subsequent work.

3.5 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 31 23 17 - TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavating trenches
 - 2. Compacted fill from top of utility bedding to subgrade elevations.
 - 3. Backfilling and compaction.
- B. Related Sections:
 - 1. Section 31 23 16 – Excavation

1.2 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Requirements
- B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.
- C. Product Data: Submit data for geotextile fabric (if used) indicating fabric and construction.
- D. Materials Source: Submit name of imported fill materials suppliers.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with Maine Department of Environmental Protection.

1.5 QUALIFICATIONS

- A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.7 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Subsoil Fill: Type as specified in Section 31 05 16.
- B. Structural Fill: Type as specified in Section 31 05 16.
- C. Granular Fill: Type as specified in Section 31 05 16.

PART 3 - EXECUTION

3.1 LINES AND GRADES

- A. Lay pipes to lines and grades indicated on Drawings.
 - 1. Pipes generally to be installed to fit as direct replacement to provide positive drainage through the floor drain system.
 - 2. Owner reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
- B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

- A. Call Dig Safe not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Coordinate and obtain Dig Permit from Owner.
- C. Identify required lines, levels, contours, and datum locations.
- D. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- E. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- F. Maintain and protect above and below grade utilities indicated to remain.
- G. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

- A. Excavate subsoil required for utilities to utility service.
- B. Remove larger material and lumped subsoil, boulders, and rock up of 1/6 cubic yard, measured by volume.
- C. Perform excavation within 24-inches of existing utility service in accordance with utility's requirements.

- D. Minimize open trench areas and lengths to manage work within reason.
- E. Cut trenches to width and length indicated on Drawings and sufficiently to enable installation and allow inspection. Remove water or materials that interfere with Work.
- F. Excavate trenches to depth indicated on Drawings, or to provide a minimum 6" clearance under the pipe. Provide uniform and continuous bearing and support for bedding material and utilities.
- G. Do not interfere with 45 degree bearing splay of foundations.
- H. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.
- I. When subsurface materials at bottom of trench are loose or soft, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel, as approved by Engineer prior to installation of pipe.
- J. Cut out soft areas of subgrade not capable of compaction in place. Backfill with suitable soils and compact to density equal to or greater than requirements for subsequent backfill material.
- K. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- L. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.
- M. Stockpile excavated material in area designated on site in accordance with Section 31 23 16.

3.4 SHEETING AND SHORING

- A. Sheet, shore, and brace excavations to prevent danger to persons, structures, and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
- B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.
- C. Design sheeting and shoring to be removed at completion of excavation work.
- D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
- E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen fill materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

- C. Place fill material in continuous layers and compact in accordance with schedule in Section 31 22 13 Rough Grading.
- D. Employ placement method that does not disturb or damage utilities in trench, new or existing work.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Protect open trench to prevent danger to Owner and Owner's employees and contractors.

3.6 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1/2 inch from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

- A. Perform laboratory material tests in accordance with ASTM D1557 or ASTM D698.
- B. Perform in place compaction tests in accordance with the following:
 - 1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
 - 2. Moisture Tests: ASTM D3017.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- D. Frequency of Tests: For each 2 feet of compacted vertical fill, provide tests at a maximum horizontal spacing of 200 feet or in accordance with Chapter 17 of the International Building Code.

3.8 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 31 23 19 – DEWATERING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Surface water control system.
- B. Related Sections:
 - 1. Section 31 23 16 - Excavation
 - 2. Section 31 23 17 - Trenching

1.2 DEFINITIONS

- A. Surface Water Control and shallow groundwater control: Removal of water within open excavations.

1.3 PERFORMANCE REQUIREMENTS

- A. Design water control systems to:
 - 1. Collect and remove water and seepage entering excavation.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Requirements
- B. Product Data: Submit data for each of the following:
 - 1. Pumping equipment for control of water within excavation(s).

1.5 QUALITY ASSURANCE

- A. Comply with the Owner's direction for the following:
 - 1. Water discharge and disposal from pumping operations.

1.6 SEQUENCING

- A. Section 01 10 00 – Summary of Work: Requirements for sequencing.
- B. Sequence work to install and test surface water control systems minimum 7 days before starting excavation, trenching, tunneling or drilling.

1.7 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate work to permit the following construction operations to be completed on dry stable substrate.
 - 1. Excavation for utilities specified in Section 31 23 16.
 - 2. Trenching for utilities specified in Section 31 23 17.

PART 2 PRODUCTS

2.1 DEWATERING EQUIPMENT

- A. Surface Water Pumps: Self priming, engine or motor driven type sufficient to remove surface water from excavations.
 - 1. Furnish pumps with screened suction hose and discharge hoses as required to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 PREPARATION

- A. Protect existing adjacent buildings, structures, and improvements from damage caused by dewatering operations.

3.3 WATER CONTROL SYSTEM

- A. Provide ditches, berms, and other devices to divert and drain surface water from excavation area as specified in Section 31 23 16.
- B. Divert surface water and seepage water within excavation areas into sumps and well points, pump water into drainage channels, storm drains and settling basins in accordance with requirements of the Owner.
- C. Control and remove unanticipated water seepage into excavation.

3.4 SYSTEM OPERATION AND MAINTENANCE

- A. When dewatering system cannot control water within excavation, notify Engineer and Owner and stop excavation work.
 - 1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
- B. Modify surface water control systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.

3.5 SYSTEM REMOVAL

- A. Remove dewatering and surface water control systems after dewatering operations are discontinued.

- B. Repair damage caused by dewatering and surface water control systems or resulting from failure of systems to protect property.

END OF SECTION

SECTION 31 23 23 - FILL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Backfilling site structures to subgrade elevations.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete.
 - 2. Section 31 05 16 - Aggregates for Earthwork.
 - 3. Section 31 23 16 - Excavation.
 - 4. Section 31 23 17 - Trenching.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
 - 1. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 2. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 3. ASTM D 2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 4. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Samples: Submit, in air-tight containers, sample of each type of fill to testing laboratory.
- C. Materials Source: Submit name of imported fill materials suppliers.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with Maine Department of Environmental Protection.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Common Borrow: as specified in Section 31 05 16.

- B. Concrete: Structural concrete as specified in Section 03 30 00.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify subdrainage, damp-proofing, or waterproofing installation has been inspected.
- C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

- A. Compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify subgrade surface.
- D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Place material in continuous layers as follows:
 - 1. Subsoil Fill: Maximum 8 inches compacted depth.
 - 2. Structural Fill: Maximum 6 inches in loose depth when compacted with hand-operated tampers and 8 inches in loose depth when compacted with heavy compaction equipment.
 - 3. Granular Fill: Maximum 6 inches in loose depth when compacted with hand-operated tampers and 8 inches in loose depth when compacted with heavy compaction equipment.
- D. Employ placement method that does not disturb or damage other work.
- E. Maintain moisture content of backfill materials within +/- 2% of optimum moisture content to attain required compaction density.
- F. Backfill against supported foundation walls and site structures. Do not backfill against unsupported foundation walls.
- G. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

- H. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.
- I. Make gradual grade changes. Blend slope into level areas.
- J. Remove surplus backfill materials from site.
- K. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

- A. Top Surface of Backfilling Within Building Areas: Plus or minus 1 inch from required elevations.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.
- C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

- A. Perform laboratory material tests in accordance with ASTM D698.
- B. Perform in place compaction tests in accordance with the following:
 - 1. Density Tests: ASTM D 1556, ASTM D 2167, or ASTM D 2922.
 - 2. Moisture Tests: ASTM D 3017.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- D. Frequency of Tests: To be determined by Owner or Owners Representative.
- E. Proof roll compacted fill surfaces under slabs-on-grade, pavers and paving.

3.6 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic.

3.7 SCHEDULE

- A. Adjacent to Structures: Compact each layer backfill or fill material to at least 92 percent of maximum dry density.
- B. Lawn or Unpaved Areas: Compact each layer backfill or fill material to at least 90 percent of maximum dry density.
- C. Pavements: Compact subgrade and each layer of gravel borrow, subbase material, and base material to at least 95 percent of maximum dry density.
- D. Pipe Trenches: Compact bedding material and each layer of backfill to six (6) inches over pipe to at least 90 percent maximum dry density.

- E. Dikes and Embankments: Compact all embankments in maximum lift thicknesses of 6 inches to at least 90 percent of its maximum dry density.

END OF SECTION

SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The Drawings, general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.2 STANDARDS

The Contractor shall comply with the highest erosion and sedimentation control standards, whether Conservation District, Federal, State or local. If the Contractor is in doubt as to the applicable standard, he shall notify the Engineer and comply with the Engineer's directions.

1.3 DESCRIPTION:

- A. Work to be performed under this Section refers to temporary and permanent vegetation covers, mulching and baling at the construction site and all areas disturbed during construction, including borrow areas. In addition to the requirements of these Specifications, the Contractor shall comply with Maine Erosion and Sedimentation Control Handbook: Best Management Practices, Maine Department of Environmental Protection (MEDEP), October 2016, and all MEDEP rules, regulations, and requirements for erosion and sedimentation control.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

- A. All materials such as seeds, mulch, and bales shall conform to applicable Federal, State and local requirements.
 - 1. Contact the Owner in advance of the start of any land disturbance activities.
 - 2. Remove any sediment that may be spilled, dropped, or tracked from the project site. All paved rights-of-way adjacent to the project site must be maintained in a clean, swept condition throughout construction. If necessary, provide crushed stone pad(s) to help reduce off-site tracking of sediment.
 - 3. Control the washing or blowing of sediment from the project site. If necessary, provide sediment barriers to help reduce off-site sedimentation. Measures to control dust and wind erosion must be utilized (i.e., wetting of the site).
 - 4. The property must be graded in a manner that will not cause drainage or erosion problems on the project site, or to adjacent properties.
- B. Silt Fence:
 - 1. Siltation fence shall be preassembled fence consisting of geotextile fabric reinforced with a supporting mesh and mounted on wood or metal stakes. The geotextile shall have UV inhibitors and stabilizers to ensure six (6) month minimum life at temperatures between 0° and 120°F.
 - 2. Wire reinforcement for silt fence shall be a minimum of 14-gauge and shall have a maximum mesh spacing of six (6) inches.

3. Stakes:
 - a. If wooden stakes are utilized for silt fence construction, they must have a diameter of two inches when oak is used and four inches when pine is used. Wooden stakes must have a minimum length of four feet.
 - b. If steel posts (standard "U" or "T" section) are utilized for silt fence construction, they must have a minimum weight of 1.15 pounds per linear foot and shall have a minimum length of four feet.
4. Posts for this type of installation shall be placed a maximum of six feet apart. The wire mesh fence must be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch long, tie wires, or hog rings. The wire shall extend into the trench a minimum of two inches and shall not extend more than 34 inches above the original ground surface. The standard-strength fabric shall be stapled or wired to the fence, and eight (8) inches of the fabric shall be extended into the trench. The fabric shall not be stapled to existing trees.

PART 3 - EXECUTION

3.1 GENERAL

Permanent vegetation cover, mulching and baling shall be in accordance with the Maine Erosion and Sedimentation Control Handbook: Best Management Practices, MEDEP, October 2016

END OF SECTION

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 32 12 16 - ASPHALT PAVING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Asphalt materials.
 - 2. Aggregate materials.
 - 3. Aggregate subbase.
 - 4. Asphalt paving base course, binder course, and wearing course.
 - 5. Asphalt paving overlay for existing paving.
 - 6. Surface slurry.

- B. Related Requirement:
 - 1. Section 31 05 16 - Aggregates for Earthwork.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
 - 2. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
 - 3. AASHTO M140 - Standard Specification for Emulsified Asphalt.
 - 4. AASHTO M208 - Standard Specification for Cationic Emulsified Asphalt.
 - 5. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
 - 6. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
 - 7. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
 - 8. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

- B. Asphalt Institute:
 - 1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
 - 2. AI MS-19 - Basic Asphalt Emulsion Manual.
 - 3. AI SP-2 - Superpave Mix Design.

- C. ASTM International:
 - 1. ASTM C1371-2004a - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 - 2. ASTM C1549-2004 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 - 3. ASTM D 242 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
 - 4. ASTM D 692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
 - 5. ASTM D 946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
 - 6. ASTM D 977 - Standard Specification for Emulsified Asphalt.
 - 7. ASTM D 1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
 - 8. ASTM D 1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
 - 9. ASTM D 2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).

10. ASTM D 2397 - Standard Specification for Cationic Emulsified Asphalt.
11. ASTM D 2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
12. ASTM D 2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
13. ASTM D 3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
14. ASTM D 3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
15. ASTM D 3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
16. ASTM D 3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.
17. ASTM D 6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
18. ASTM E408-1971(1996)e1 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
19. ASTM E903-1996 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
20. ASTM E1918-1997 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
21. ASTM E1980-2001 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 1. Submit product information for asphalt and aggregate materials.
 2. Submit mix design with laboratory test results supporting design.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Mixing Plant: Conform to Maine Department of Transportation standards.
- B. Obtain materials from same source throughout.

1.5 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.

1.6 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
- B. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

- C. Place asphalt mixture when temperature is not more than 15 degrees F less than initial mixing temperature.

PART 2 PRODUCTS

2.1 ASPHALT PAVING

- A. Asphalt Binder: In accordance with Maine Department of Transportation standards.
- B. Primer: In accordance with Maine Department of Transportation standards.
- C. Tack Coat: In accordance with Maine Department of Transportation standards.
- D. Aggregate Materials: In accordance with Maine Department of Transportation standards.

2.2 MIXES

- A. Use dry material to avoid foaming. Mix uniformly.
- B. Asphalt Paving Mixtures: Designed in accordance with the Maine Department of Transportation standards.
 - 1. Base Course: HMA 19mm or Type "B."
 - 2. Surface Course: HMA 9.5mm or Type "E" or "F"

2.3 MATERIALS

- A. Adhesive: Neoprene modified asphaltic type, recommended by paver manufacturer.
- B. Primer.
- C. Joint Filler: Portland cement and clean sand.
- D. Surface Wax.
- E. Portland Cement: ASTM C150, Type I gray color.
- F. Sand: ASTM C33 clean washed river or bank sand.

2.4 ACCESSORIES

- A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

2.5 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.
- B. Verify compacted subbase is dry and ready to support paving and imposed loads.
- C. Verify gradients and elevations of base are correct.
- D. Verify manhole frames are installed in correct position and elevation.

3.2 PREPARATION

- A. Apply primer to surface of substrate.

3.3 DEMOLITION

3.4 INSTALLATION

- A. Subbase:
 - 1. Aggregate Subbase and base: Install as specified in Section 32 05 16
- B. Primer:
 - 1. Apply primer on aggregate subbase at uniform rate of 1/3 gal/sq yd.
 - 2. Use clean sand to blot excess primer.
- C. Tack Coat:
 - 1. Apply tack coat to contact surfaces of curbs and gutters.
 - 2. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt paving. Do not tack coat these surfaces.
- D. Single Course Asphalt Paving:
 - 1. Place asphalt within 24 hours of applying primer or tack coat.
 - 2. Place asphalt wearing course to thickness indicated on Drawings.
 - 3. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 - 4. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
- E. Double Course Asphalt Paving:
 - 1. Place asphalt binder course within 24 hours of applying primer or tack coat.
 - 2. Place binder course to thickness indicated on Drawings.
 - 3. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
 - 4. Place wearing course to thickness indicated on Drawings.
 - 5. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 - 6. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

- F. Asphalt Paving Overlay
 - 1. Apply tack coat to existing paving surface at rate recommended by geotextile fabric manufacturer.
 - 2. Install geotextile fabric in accordance with manufacturer's instructions to permit asphalt saturation of fabric. Lap fabric edge and end joints 4 inches.
 - 3. Place wearing course to thickness indicated on Drawings.
 - 4. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 - 5. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

- G. Surface Slurry
 - 1. Install uniform thickness surface slurry over existing paving in accordance with ASTM D 3910.
 - 2. Allow slurry to cure.
 - 3. Roll paving to achieve uniform surface.

3.5 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation from Indicated Elevation: Within 1/2 inch.

3.6 FIELD QUALITY CONTROL

- A. Asphalt Paving Mix Temperature: Measure temperature at time of placement.
- B. Asphalt Paving Thickness: ASTM D 3549; test one core sample from every 1000 square yards compacted paving.
- C. Asphalt Paving Density: ASTM D 1188 or ASTM D 2726; test one core sample from every 1,000 square yards compacted paving.

3.7 PROTECTION

- A. Immediately after placement, protect paving from mechanical injury for until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 91 13 - SOIL PREPARATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preparation of subsoil.
 - 2. Soil testing.
 - 3. Placing topsoil.
- B. Related Sections:
 - 1. Section 32 92 19 - Seeding

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.
- C. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with Maine Erosion and Sediment Control Handbook: Best Management Practices, Maine Department of Environmental Protection (MEDEP), October 2016.

1.4 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

PART 2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

- A. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.
- B. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION OF SUBSOIL

- A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.
- C. Scarify subsoil to depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

- A. Spread topsoil to minimum depth of 6 inches over area to be seeded. Rake until smooth.
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- E. Install edging at periphery of seeded areas in straight lines to consistent depth.

END OF SECTION

SECTION 32 91 19 - LANDSCAPE GRADING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Final grade vegetative growth media for finish landscaping.
- B. Related Sections:
 - 1. Section 31 05 13 - Soils for Earthwork
 - 2. Section 31 22 13 - Rough Grading
 - 3. Section 31 23 17 - Trenching
 - 4. Section 31 23 23 - Fill
 - 5. Section 32 92 19 - Seeding

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures
- B. Samples: Submit sample of each type of fill to testing laboratory.
- C. Materials Source: Submit name of imported materials source.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

- A. Furnish each vegetative growth media from single source throughout the Work.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Vegetative Growth Media: as specified in Section 32 91 13.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify building and trench backfilling have been inspected.
- C. Verify substrate base has been contoured and compacted.

3.2 PREPARATION

- A. Protect landscaping and other features remaining as final Work.

- B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

3.3 SUBSTRATE PREPARATION

- A. Eliminate uneven areas and low spots.
- B. Remove debris, roots, branches, stones, in excess of 1 inch in size. Remove contaminated subsoil.
- C. Scarify surface to depth of 3 inches where vegetative growth media is scheduled. Scarify in areas where equipment used for hauling and spreading vegetative growth media has compacted subsoil.

3.4 PLACING TOPSOIL

- A. Place vegetative growth media in areas where seeding to thickness as shown on drawings. Place vegetative growth media during dry weather.
- B. Fine grade vegetative growth media to eliminate rough or low areas. Maintain profiles and contour of subgrade. Match prior grade as nearly as possible, blend to meet existing grade.
- C. Remove roots, weeds, rocks, and foreign material while spreading.
- D. Manually spread vegetative growth media close to plant material, building, and site structures to prevent damage.
- E. Roll placed vegetative growth media.
- F. Remove surplus subsoil and vegetative growth media from site.

3.5 TOLERANCES

- A. Top of Vegetative Growth Media: Plus or minus 1/2 inch.

3.6 PROTECTION OF INSTALLED WORK

- A. Prohibit construction traffic over vegetative growth media.

END OF SECTION

SECTION 32 92 19 – SEEDING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fertilizing.
 - 2. Hydroseeding.
 - 3. Maintenance.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C 602 - Standard Specification for Agricultural Liming Materials.

1.3 DEFINITIONS

- A. Weeds: Vegetative species other than specified species to be established in given area.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Requirements Product Data: Submit data for hydroseed mix.
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height.

1.6 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.
- B. Provided commercial grade fertilizer, recommended for grass, of proportion necessary to eliminate deficiencies of topsoil.
- C. Perform Work in accordance with Maine Erosion and Sediment Control Handbook: Best Management Practices, Maine Department of Environmental Protection (MEDEP), October 2016.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.8 MAINTENANCE SERVICE

- A. Maintain hydroseeded areas immediately after placement until grass is well established and exhibits vigorous growing condition. Contractor shall be required to come back for two successive growing seasons (either spring then fall or fall then spring) to hydroseed areas that did not germinate well in the first growing season.

PART 2 PRODUCTS

2.1 HYDROSEED MIXTURE

Furnish materials in accordance with, Maine Erosion and Sediment Control Handbook guidance for seed mixtures for temporary and permanent seeding. Consideration shall be given to the season in which the grass is to be planted and the use of the area to be seeded.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify prepared soil base is ready to receive the Work of this section.

3.2 HYDROSEEDING

- A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder.
- B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.3 SEED PROTECTION

- A. Cover seeded slopes where grade is 2 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.
- C. Secure outside edges and overlaps at 36-inch intervals with stakes.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.4 MAINTENANCE

- A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.
- D. Water to prevent grass and soil from drying out.
- E. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.
- F. Immediately reseed areas showing bare spots.
- G. Repair washouts or gullies.
- H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

DIVISION 33

UTILITIES

SECTION 33 05 26.23

UTILITY IDENTIFICATION – TRACER WIRE

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes:
 - 1. Requirement for material and installation of Tracer Wire
- B. Related Sections:
 - 1. Section 01 30 00 – Submittals
 - 2. Section 33 41 02 – HDPE Pipe and Fittings

1.2 SUBMITTALS:

- A. Product Data:
 - 1. Manufacturer's descriptive data of Tracer Wire.
 - 2. Wire Break Load Strength.

1.3 PACKAGING, DELIVERY, AND HANDLING:

- A. Delivery: Deliver wire with methods to protect the wire and insulation from damage.
- B. Storage: Store wire which cannot be installed immediately after delivery in a safe, dry location.
- C. Unloading and Handling:
 - 1. Unload carefully to avoid damage.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All tracer wire and tracer wire products shall be domestically manufactured in the U.S.A. All tracer wire shall have HDPE insulation intended for direct bury, color-coded per APWA standard for the specific utility being marked.

2.2 TRACER WIRE

- A. Open Trench - Tracer wire shall be #12 AWG Copper Clad Steel, High Strength with minimum 450 lb. break load, and minimum 30 mil HDPE insulation jacket.

2.3 CONNECTORS

- A. All mainline tracer wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.
- B. Direct bury wire connectors - shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground tracer wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion, and shall be installed in a manner so as to prevent any uninsulated wire exposure.
- C. Non locking friction fit, twist on or taped connectors are prohibited.

2.4 TERMINATION/ACCESS

- A. All tracer wire termination points must utilize an approved tracer wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose.
- B. All grade level/in-ground access boxes shall be appropriately identified with "WATER" cast into the cap and be color coded.
- C. A minimum of 2 ft. of excess/slack wire is required in all tracer wire access boxes after meeting final elevation.
- D. All tracer wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the tracer wire connection and the terminal for the grounding anode wire connection.
- E. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

2.5 GROUNDING

- A. Tracer wire must be properly grounded at all stubs and dead ends.
- B. Grounding of tracer wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20 ft of #14 red HDPE insulated copper clad steel wire connected to anode (minimum 0.5 lb.) specifically manufactured for this purpose and buried at the same elevation as the force main.
- C. When grounding the tracer wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the tracer wire, at the maximum possible distance.
- D. When grounding the tracer wire in areas where the tracer wire is continuous and neither the mainline tracer wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the tracer wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to tracer wire with a mainline to lateral lug connector.
- E. Where the anode wire will be connected to a tracer wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

2.6 PROHIBITED PRODUCTS AND METHODS

- A. The following products and methods shall not be allowed or acceptable.
 - 1. Uninsulated tracer wire
 - 2. Tracer wire insulations other than HDPE
 - 3. Tracer wires not domestically manufactured
 - 4. Non locking, friction fit, twist on or taped connectors
 - 5. Brass or copper ground rods
 - 6. Wire connections utilizing taping or spray-on waterproofing
 - 7. Looped wire or continuous wire installations, that has multiple wires laid side-by-side or in close proximity to one another tracer wire wrapped around the corresponding utility
 - 8. Brass fittings with tracer wire connection lugs
 - 9. Wire terminations within the roadway, i.e. in valve boxes, cleanouts, manholes, etc.
 - 10. Connecting tracer wire to existing conductive utilities

PART 3 - INSTALLATION

3.1 GENERAL

- A. Tracer wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.
- B. Tracer wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.
- C. Any damage occurring during installation of the tracer wire must be immediately repaired by removing the damaged wire and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.
- D. Tracer wire must be properly grounded as specified.
- F. Tracer wire on all service laterals/stubs must terminate at an approved tracer wire access box located directly above the utility.
- G. At all mainline dead-ends, tracer wire shall go to ground using an approved connection to a drive-in magnesium grounding anode rod, buried at the same depth as the tracer wire.
- H. Mainline tracer wire shall not be connected to existing conductive pipes. Treat as a mainline dead-end, ground using an approved waterproof connection to a grounding anode buried at the same depth as the tracer wire.
- I. All service lateral tracer wires shall be a single wire, connected to the mainline tracer wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline tracer wire.
- J. In occurrences where an existing tracer wire is encountered on an existing utility that is being extended or tied into, the new tracer wire and existing tracer wire shall be connected using approved splice connectors and shall be properly grounded at the splice location as specified.

3.2 UNDERGROUND NON-METALLIC PIPING SYSTEMS

- A. A mainline tracer wire must be installed, with all service lateral tracer wires properly connected to the mainline tracer wire, to ensure full tracing/locating capabilities from a single connection point.
- B. Lay mainline tracer wire continuously, by-passing around the outside of manholes/structures on the North or East side.
- C. Tracer wire on all sanitary service laterals must terminate at an approved tracer wire access box color coded green and located directly above the service lateral at the edge of road right of way.

3.3 TESTING

- A. All new tracer wire installation shall be located using typical low frequency (512Hz) line tracing equipment, witnessed by the contractor, engineer and facility owner as applicable, prior to acceptance of ownership. This verification shall be performed upon completion of rough grading and again prior to final acceptance of the project. Continuity testing in lieu of actual line tracing shall not be accepted.

END OF SECTION

SECTION 33 41 01 – PVC PIPE AND FITTINGS

PART 1 GENERAL

- 1.1 RELATED DOCUMENTS: Drawings, general provisions of contract, and supplementary general conditions apply to the work specified under this section.
- 1.2 RELATED WORK SPECIFIED ELSEWHERE:
- A. Excavation: Section 31 23 16
 - B. Trenching: Section 31 23 17
- 1.3 REFERENCES:
1. ASTM D 3034, "Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings"
 2. ASTM D 1784, "Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds"
 3. ASTM D 1785, "Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120"
 4. ASTM D 2464, "Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80"
 5. ASTM D 2467, "Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80"
 6. ASTM D 2564, "Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems"
 7. ASTM D 2855, "Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings"
 8. ASTM D 3212, "Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals"
 9. ASTM D 3915, "Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Pressure Applications"
 10. ASTM F 477, "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe"
- 1.4 DESCRIPTION OF WORK:
- A. Work of this Section shall consist of furnishing all labor, materials, and equipment to install PVC pipes as shown on the Contract Drawings. Only the appropriate portions of this section pertaining to the specific contract work identified in Section 01 11 00 "Summary of Work" or as directed by the Engineer, will apply.

1.5 SUBMITTALS:

- A. The Contractor shall furnish the name of the pipe and fittings manufacturer, to the Owner's Representative prior to commencing the work. Pipe of the same manufacturer shall be used throughout the project.
- B. The Contractor shall submit manufacturer's technical product data including chemical resistance data and installation instructions for piping joints and fittings.

1.6 PACKAGING DELIVERY AND HANDLING:

The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the pipe and fittings manufacturer. Pipe and fittings shall be handled, installed and tested in accordance with manufacturer's recommendations, and the requirements of this specification.

PART 2 PRODUCTS

2.1 PVC PIPE AND FITTINGS

- A. Pipe and fittings shall be manufactured from a PVC compound which meets the requirements of Cell Classification 12454-B PVC as outlined in ASTM D 1784.
- B. Clean rework or recycle material generated by the manufacturer's own production may be used so long as the pipe or fittings produced meet all the requirements of this specification
- C. Dimensions: Pipe Size shall be Schedule 80.

PART 3 EXECUTION

3.1 PIPE HANDLING

PVC pipe and pipe fittings shall be handled according to manufacturers recommendations. Under no circumstance shall Pipe and pipe fittings be dropped or dumped.

3.2 PIPE JOINTING

- A. All pipe shall be inspected for cuts, scratches, or other damage prior to installation. Pipe with imperfections shall not be incorporated into the work.
- B. All joints shall be made in a dry area in accordance with the manufacturer's recommendations and the best practices for material and class of pipe installed. The ends of the pipe shall be wiped clean with a dry cloth before making each joint.
- C. Bell ends of pipe shall be installed uphill.

D. Solvent cemented joints:

1. Use a good grade of PVC cement which meets ASTM standard D-2564
2. Cut pipe to desired length with pipe cutters, hack saw or cross cut saw.
3. Ream pipe both internally and externally to remove burrs and ragged edges.
4. Before making solvent weld joint be sure all joining surfaces are free of dirt, dust, water, and oil.
5. The use of a primer before the application of PVC cement is recommended.
6. Apply primer to both joining surfaces.
7. Immediately apply a smooth coat of cement to the joining surfaces.
8. Immediately insert the spigot end into the bell end to the full depth of the socket.
9. Turn pipe 1/8 to 1/4 turn in the socket to insure an even spread of cement.
10. Hold firmly in position for 15 seconds.
11. Allow joint to set according to cement manufacturers instructions

E. Pipe Cutting:

1. Where required, sections of pipe may be cut to provide shorter sections of pipe necessary for the construction. The cutting of the PVC pipe shall be done in accordance with the pipe manufacturer's recommendations and subject to the approval of the Engineer.
2. In general, the PVC pipe material shall be cut by using a saw or milling process, approved by the pipe manufacturer and not by using any impact device, such as a hammer and chisel, to break the pipe. The pipe shall be cut, not broken. The cut end of the pipe shall be square to the axis of the pipe and any rough edges ground smooth.

3.3 PIPE INSTALLATION AND TESTING

Install pipe in accordance with Section 31 23 17 of these specifications.

- 3.4 PIPE SYSTEM IDENTIFICATION: All system components shall be identified in accordance with mill standards. Pipe system components shall be labeled at all accessible structures. Pipe labeling shall include labels that identify the type of fluid in the pipe and the normal flow direction of fluid in the pipe network.

END OF SECTION

fSECTION 33 41 02 – HDPE PIPE AND FITTINGS

PART 1 GENERAL

1.1 SUMMARY:

- A. Section Includes:
 - 1. BEHS to BEMS water main pipe
 - 2. Marker tape and utility tracer
- B. Related Sections:
 - 1. Section 22 13 19 – Valves and Pipe Accessories
 - 2. Section 31 23 16 – Excavation
 - 3. Section 31 23 17 – Trenching
 - 4. Section 33 05 26.23 – Tracer Wire

1.2 REFERENCES:

- 1. ASTM F-714-03, "Polyethylene Pipe SDR-PR Design"
- 2. ASTM D 638, "Standard Test Method for Tensile Properties of Plastics"
- 3. ASTM D1248-02, "Class C Polyethylene Moulding and Extrusion Materials"
- 4. ASTM F 1248, "Determination of Environmental Stress Crack Resistance (ESCR) of Polyethylene Pipe"
- 5. ASTM D 2657, "Guideline for Polyolefin Thermoplastic Butt Fusion Heat Welding"
- 6. ASTM D 2837, "Method for Obtaining Hydrostatic Design Basis for Thermal Plastic Pipe Materials"
- 7. ASTM D3035-03a, "Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter"
- 8. ASTM D 3350-02a, "Standard Specification for Polyethylene Plastics Pipe and Fittings Materials"
- 9. ASTM F 1473-01e1, "Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins"
- 10. ASTM D 4218-96(2001), "Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique"

1.3 DESCRIPTION OF WORK:

- A. Work of this Section shall consist of furnishing all labor, materials, and equipment to install and test Bonny Eagle High School to Bonny Eagle Middle School water main piping as shown on the Contract Drawings. Only the appropriate portions of this section pertaining to the specific contract work identified in Section 01 11 00 "Summary of Work" or as directed by the Engineer, will apply.

1.4 SUBMITTALS:

- A. The Contractor shall furnish the name of the pipe and fittings manufacturer, to the Engineer prior to commencing the work. Pipe of the same manufacturer shall be used throughout the project.
- B. The Contractor shall submit manufacturer's technical product data including chemical resistance data and installation instructions for piping joints and fittings.

- C. The Contractor shall submit to the Engineer documentation demonstrating the pipe welding technicians are certified by the MANUFACTURER to weld HDPE pipe. The Contractor shall provide the Engineer with butt-fusion procedures, pressures, and temperature for each size and class of pipe used. These procedures, pressures, and temperatures shall be used consistently throughout the project in accordance with the pipe manufacturer's recommendations.

1.5 MANUFACTURER'S QUALITY ASSURANCE:

- A. The pipe and fittings manufacturer shall have an established quality assurance/quality control program responsible for inspecting and testing incoming materials and outgoing product. At a minimum incoming polyethylene material shall be inspected and tested for density per ASTM D 1505, melt flow rate per ASTM D 1238, and contamination. All incoming materials shall be certified by the supplier.
- B. The pipe and fittings manufacturer shall have an established QA program responsible for assuring the long-term performance of materials and products. Representative samples of PE materials shall be tested against the physical property requirements of this specification. Each extrusion line and molding machine shall be qualified to produce pressure rated products by taking representative production samples and performing sustained pressure tests in accordance with ASTM D 1598.
- C. All outgoing products shall be inspected for diameter, wall thickness, length, straightness, out-of-roundness, concentricity, toe-in, inside and outside surface finish, markings, and end cut. Quality Control (QC) shall perform tests for density, melt flow rate, carbon content, and carbon dispersion. All fabricated fittings shall be inspected for fusion quality and alignment. The pipe and fitting manufacturer shall maintain internal QA/QC records and shall provide QA/QC information upon request of the Engineer.

1.6 PACKAGING, DELIVERY, AND HANDLING:

The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the pipe and fittings manufacturer. Pipe and fittings shall be handled, installed and tested in accordance with manufacturer's recommendations, and the requirements of this specification.

PART 2 PRODUCTS

2.1 HDPE PIPE AND FITTINGS

A. Physical Properties:

Property	Unit	Test Method	Value
Material Listing	-	PPI TR-4	PE 4710
Cell Classification	-	ASTM D 3350	PE 445574C
Density	g/cm ³	ASTM D 1505	0.941 to 0.955
Melt Index	g/10 min	ASTM D1238	<0.15
Flexural Modulus	psi	ASTM D 790	>110,000 and < 160,000
Tensile Strength (yield)	psi	ASTM D 638	3000-3500
Slow Crack Growth Resistance	hours	ASTM F 1473	100
Hydrostatic Design Basis	psi	ASTM D 2837	1600 @ 23° C
UV Stabilizer	% Carbon Black	ASTM D 1603	2 to 3
Elastic Modulus	psi	ASTM D 638	110,000 to <160,000
Thermal Expansion	1/° F	ASTM D 696	8 x 10 ⁻⁵
Molecular Weight Category	-	-	Extra High

B. General:

1. Materials used to manufacture pipe, fittings, and centralizers supplied under this specification shall be high density, extra high molecular weight polyethylene pipe. The pipe and fittings shall be designated PE 4710 using the cell classification system per ASTM D 3350. The pipe and fittings shall be made from the same resin base that meets this specification and provides a minimum Hydrostatic Design Basis (HDB) of 1,600 psi as determined by ASTM D 2837.
2. The HDPE pipe and fittings should be produced by the same manufacturer, from identical materials that meet the requirements of this specification. Exceptions shall be pre-approved by the Engineer.
3. Density of base resin shall be within the limits of 0.941 to 0.955, ASTM D-1505 (Test Methods).
4. The HDPE pipe manufactured from materials meeting the specifications of this section shall have an Environmental Stress Crack Resistance of no failures in 10,000 hours (ESCR: Fo >10,000) when tested in accordance with ASTM F 1248.
5. Outside diameter of pipe shall conform to International Standard Organization (ISO) recommendations for outside diameters (IPS pipe size).
6. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
7. HDPE Fittings, molded or fabricated, shall have the same pressure rating and strength as the pipe to which joining is intended. At the point of fusion, the outside diameter and minimum wall thickness of the fitting shall match the outside diameter and minimum wall thickness specifications of ASTM F714 for the same size pipe to which it is joined. The manufacturer shall de-rate the fittings used for this project, as necessary. Bends, tees, and wyes shall be manufactured by mitered fabrication and shall meet the pressure rating of the piping system (100 psi). The manufacturer shall have written specifications for all standard mitered fittings establishing Quality Control criteria and

tolerances. Fitting markings shall include a production code from which the location and date of manufacture can be determined. Upon request, the manufacturer shall provide an explanation of his production code.

8. Marking: Each standard and random length of pipe and fitting in compliance with this standard shall be clearly marked with the following information:
 - a. ASTM Standard Designation
 - b. Pipe Size
 - c. Class and Profile Number
 - d. Production Code
 - e. Dimension Ratio
9. Dimensions: Pipe Size and DR Rating shall be as shown on the Contract Drawings.

2.2 UNDERGROUND PIPE MARKERS

- A. Marker Tape: Blue colored, continuously printed, minimum 6 inches wide by 6 mil thick polyethylene, marked "buried water line", manufactured for direct burial service. Shall be placed in the trench backfill approximately 12 to 18-inches above the tracer wire.
- B. Utility Tracer: Continuous 12 gauge (AWG), copper-clad steel tracer wire insulated with minimum 30 mil polyethylene insulation, rated for direct burial. All underground splices and connections shall be protected with direct-bury connectors equal to 3M DBY/Y-6 Splice Kits. Service lateral stub-outs shall have the same tracer wire installation with a copper-to-copper splice connection to the main tracer wire. Provide Copperhead Industries SnakePit® Lite Duty Two-Terminal Switchable Access Points (Product No. LD14*2T-SW) or approved equal.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL:

- A. Pipe may be rejected for failure to conform to Specifications for the following:
 1. Fractures or cracks sufficient to impair strength, durability or serviceability of pipe.
 2. Defects indicating improper proportioning, mixing, or molding.
 3. Damaged ends,
 4. Contractor shall provide a pyrometer to record and verify the temperature of heating plate surface (at min of three locations) once every two hours. Maintain records of these temperature measurements including, temperature, date, time and fusing technician, for the duration of the project. Provide the Engineer with a copy of the temperature measurements.
- B. Acceptance of fittings, stubs, or other specifically fabricated pipe sections (e.g. butt-fusion joints) shall be based on visual inspection at the job site and documentation of conformance to these Specifications.
- C. Prior to backfilling, the contractor shall obtain as-built top of pipe coordinates and elevations as grade changes, fittings, and at least every 50 feet along the length of pipe.

3.2 PIPE JOINTING

- A. All materials shall be stored and handled in accordance with the manufacturer's recommendations.

- B. All joints shall be made in a dry trench or area that is protected from adverse weather or dust, and in accordance with the manufacturer's recommendations and the best practices for class of pipe installed. The ends of the pipe shall be wiped clean with a dry cloth before making each joint.
- C. Butt Fusion Joints:
1. Pipes: Join to one another and to HDPE fittings by thermal butt-fusion in accordance with ASTM D2657.
 2. The tensile strength at yield of the butt-fusion joints shall not be less than the pipe.
 3. The Contractor shall utilize fusion equipment approved by the pipe manufacturer and personnel trained by the pipe manufacturer representative for all fusion welding. Flange Jointing:
 4. Use when connecting or transitioning to flanged steel pipe in manholes or pump stations
 5. Connect slip-on type 316 stainless steel backup flanges and nuts and bolts to flange adapters
 6. Butt fuse fabricated flange adapters to pipe.
 7. Observe the following in connection of flanged joints:
 - a. Align flanges or flange valve connection to provide tight seal. Provide nitrile-butadiene gaskets if needed to achieve seal. Gaskets are required all flanged connections.
- D. Electro-Fusion Joints:
1. Electro-fusion couplings shall be installed per manufacturer's specifications.
 2. Joints using electro-fusion couplings shall be performed in the trench so as not to overstress the joint and achieve proper alignment.
- E. Stainless Steel Repair Clamp Joints:
1. Stainless steel repair clamps shall be installed per manufacturer's specifications.
 2. Joints using stainless steel repair clamps shall be performed on connections to existing leachate collection pipes when conditions have been determined to be too wet for electro-fusion coupling installation. Connections shall be in the trench so as not to overstress the joint and achieve proper alignment.
- F. General Fusion Procedures for HDPE Pipe:
1. Several important parameters need to be considered when fusing:
 - a. Temperature: The required temperature for fusing is recommended to be 500°F, $\pm 10^\circ$ (260°C, $\pm 6^\circ$). Should the temperature be less than that specified, then additional heating time should be allowed. The manufacturer's policy is to provide two 2-foot (0.6m) segments of pipe to allow a test fusion which ensures the proper fusion parameters are being utilized.
 - b. Airborne Contaminants: Airborne contaminants can settle on the polyethylene material, heating plate, and cutter. The fusion operator should use extreme care to ensure that all airborne contaminants are removed prior to the facing operation.
 - c. Cleaning of Pipe Ends: It is extremely important to remove all dirt, mud, grit, oil, water, etc. from the pipe ends. Any contamination can and will transfer to the faces of the heating iron and face plate. Avoid wiping the pipe areas after the facing operation. If shavings or other debris must be removed, use only a clean cotton cloth, as contaminated rags or use of solvents can leave harmful deposits on the fusion zone.
 - d. Chip Removal: Due to the fact that the annular space between the conductor and containment pipe allows limited area for the facing ribbons, the annular cavity should be monitored to ensure that chips do not build up and prevent proper

facing. Remove all ribbons and chips from the annular and conductor cavities prior to heating the pipe ends.

- e. Machine Clearances: The end user should take due care to ensure that clearance between obstructions and the fusion joint are sufficient to allow use of their particular machine. The varying conventional fusion machines available will require different amounts of clearance space to perform the required fusion. If any questions exist in this area, contact the manufacturer's technical services department.
- f. The heating iron configuration needs to be reviewed to ensure adequate surface area exists to heat both the inner and outer pipe. Some fusion machines do not encompass the range of inner and outer pipe diameters that are available.
- g. Maintenance of the fusion machine is the operator's responsibility. It is recommended the heating iron temperature for the entire surface be checked, at a minimum, on a daily basis with a pyrometer for uniform temperature.
- h. The fusion pressure should be calculated by using the recommended interface pressure of 75 psi (0.52 MPa) multiplied by the interfacial areas of the inner and outer pipes combined. The Contractor shall provide a calculation for proposed fusion pressure performed in accordance with the pipe manufacturer's recommendations.

G. Pipe Cutting:

- 1. HDPE Pipe is manufactured to specific lengths. Due to the extreme importance of the conductor being centralized in the containment pipe, field cutting and fitting is not recommended. In the event that the end user cannot exactly specify the required length, the manufacturer should be alerted to this fact so that they can offer special lengths that may be required to allow the final tie-in. The feature should be recognized at the job onset in order to prevent final tie-in delays.
- 2. When permitted, sections of pipe may be cut to provide shorter sections of pipe necessary for the construction. The cutting of the pipe shall be done in accordance with the pipe manufacturer's recommendations and subject to the approval of the Engineer. Pipe cutting shall be performed at the risk of the Contractor and shall not relieve the Contractor from obtaining proper fusion of the piping system.
- 3. When permitted, the pipe material shall be cut by using a saw or milling process, approved by the pipe manufacturer and not by using any impact device, such as a hammer and chisel, to break the pipe. The pipe shall be cut, not broken. The cut end of the pipe shall be square to the axis of the pipe and any rough edges ground smooth.

- H. Inspection: Pipe installation shall be subject to inspection by the Engineer for quality, adherence to line and grade, jointing, and proper backfill. Any joint not satisfactory to the Engineer shall be removed and remade to his satisfaction at the Contractor's expense. No pipe shall be backfilled until it has been approved by the Engineer.

3.3 PIPE INSTALLATION

- A. Install pipe according to Section 31 23 17 of these specifications for trench conditions.

3.4 FIELD TESTING OF PRESSURE PIPE:

- A. Hydrostatically pressure test or pneumatic pressure test pipe prior to placing into service in accordance with specification Section 33 55 07.

END OF SECTION

SECTION 33 55 07 – PIPE PRESSURE TESTING

PART 1 GENERAL

1.1 SCOPE

- A. The work of this section includes the furnishing of all labor, tools, equipment, and materials and performing all operations necessary to pressure test the pipe. Hydrostatic pressure tests shall be performed on the pipe.

1.2 JOB CONDITIONS

- A. The work of this section shall be coordinated with the Owner or Owners Representative. All work shall be in accordance with ASTM F 2164-02 Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure and PPI "Handbook of Polyethylene Pipe," Inspections, Test and Safety Concerns. Where conflicts appear between these specifications and ASTM F 2164 or PPI "Handbook of Polyethylene Pipe," the more stringent requirement shall apply. All pressure and leakage testing shall be done by the Contractor in the presence of the Owner's Representative.

1.3 RELATED WORK:

- A. HDPE Pipe and Fittings: Section 33 41 02

PART 2 PRODUCTS

2.1 MATERIALS

- A. The temporary pump connections shall be made up of components compatible with test pressures.
- B. The Contractor shall provide all necessary equipment (i.e., pumps, flanges, valves, bracing, bulkheads, gauges, etc.) to perform the hydrostatic tests.

PART 3 EXECUTION

3.1 GENERAL

- A. The Contractor shall conduct a hydrostatic pressure test for the water main pipe system. Testing may be conducted on the full system or in sections. Test section length is determined by the capacity of the testing equipment.
- B. It shall be the responsibility of the Contractor to ensure that appropriate safety precautions are observed during hydrostatic testing above-ground.
- C. Hydrostatic pressure tests shall be conducted in the presence of the Owner's Representative for acceptance.

3.2 HYDROSTATIC PRESSURE TEST PROCEDURES

- A. Air Removal: Following flushing, and before applying the specified test pressure, air shall be completely expelled from the pipes and valves. After all air has been expelled, the blowoffs can be closed, and the test pressure applied.
- B. Outside of Trench: After the pipe has been joined, fill it with water; carefully bleed off any trapped air. Subject the pipe to the hydrostatic test pressure for a maximum of three hours. During this time, add water periodically to maintain the test pressure; this compensates for the initial stretching of the pipe. The line-pressure tightness is determined by visual observation; therefore, it is not necessary to measure the make-up water. Examine every fused joint; any leakage must be repaired and then rested.

Note: It shall be the responsibility of the contractor to ensure that appropriate safety precautions are observed during hydrostatic testing above-ground.

- C. Inside of Trench: Fill the pipeline with water after it has been laid; bleed off any trapped air. Subject the lowest element in the system to the hydrostatic test pressure and check for any leakage. Test pressures shall be based on the elevation of the lowest point of the pipe in the test section and shall be corrected to the elevation of the test gauge as directed by the field representative.
- D. Procedures:
 - 1. The test procedures consist of two steps: the initial expansion and the test phase. When test pressure is applied to a water-filled pipe, the pipe expands. During the initial expansion of the pipe under test, sufficient make-up water must be added to the system at hourly intervals for three hours to maintain the test pressure. After about four hours, initial expansion should be completed, and the actual test can start.
 - 2. When the test is to begin, the pipe is full of water and is subjected to a constant hydrostatic test pressure. The test phase should not exceed three hours, after which time any water deficiency must be replaced and measured. Add and measure the amount of make-up water required to return to the test pressure and compare this to the maximum allowance shown below.
 - 3. An alternate leakage test consists of maintaining the test pressure (described above) over a period of four hours, and then dropping the pressure by 10 psi (0.69 MPa). If the pressure remains within 5 percent of the target value for one hour, there is no leakage in the system. Under no circumstances shall the total time under test exceed eight (8) hours. If the test is not complete within this time (due to leakage, equipment failure, etc.), the test section shall be permitted to “relax” for eight (8) hours prior to the next test sequence.

Nominal Pipe Size (inches)	U.S. Gals/100 feet of Pipe ²			Nominal Pipe Size (inches)	U.S. Gals/100 feet of Pipe ²		
	1-Hour	2-Hour	3-Hour		1-Hour	2-Hour	3-Hour
2	0.08	0.12	0.15	20	2.80	5.50	8.00
3	0.10	0.15	0.025	22	3.50	7.00	10.50
4	0.13	0.25	0.40	24	4.50	8.90	13.30
5	0.21	0.41	0.63	28	5.50	11.10	16.80
6	0.30	0.60	0.90	30	6.20	12.60	19.10
8	0.50	1.00	1.50	32	7.00	14.30	21.50
10	0.75	1.30	2.10	36	9.00	18.00	27.00
12	1.10	2.30	3.40	42	12.00	24.00	36.00
14	1.40	2.80	4.20	48	15.00	27.00	43.00
16	1.70	3.30	5.00	54	18.00	30.00	50.00
18	2.20	4.30	6.50				
<u>Notes</u> 1. mm = 0.03937 2. multiply by 11.53 to convert to liters/100 meters of pipe							

- E. Examination: Any exposed pipe, fittings, valves, and joints shall be carefully examined during the test. Any damaged or defective pipe, fittings, or valves discovered following, or as a result of the pressure test, shall be repaired or replaced with sound material. If faulty materials are removed and replaced, the pressure testing procedure shall be repeated until satisfactory to the Owner's Representative.
- F. Hydrostatic Test Pressure: The hydrostatic test pressure used for the force main pipe shall be 100 psi. Test pressure gauge shall have a maximum range of no more than 120 psig with minor gradations no greater than 0.5 psig.

3.3 ACCEPTANCE:

- A. The Owner reserves the right to accept the pipeline in sections after the satisfactory tests have been made and approved, and to make full use of any part or parts of the system after acceptance of those parts.
- B. Until such time as the entire contract has been accepted by the Owner, the Contractor shall be held responsible to rectify any leaks, errors, or other poor workmanship which may be discovered and shall make any necessary repairs, alterations, or adjustments as may be required to properly complete the work.

END OF SECTION

**DWSRF SUPPLEMENTAL GENERAL CONDITIONS
AND EJCDC/AWWA DOCUMENTS**



*Department of Health
and Human Services*

*Maine People Living
Safe, Healthy and Productive Lives*

Department of Health and Human Services
Maine Center for Disease Control and Prevention
286 Water Street
11 State House Station
Augusta, Maine 04333-0011
Tel: (207) 287-2070; Fax: (207) 287-4172
TTY Users: Dial 711 (Maine Relay)

DWSRF SUPPLEMENTAL GENERAL CONDITIONS FOR DISTRIBUTION PROJECTS

PURPOSE: The DWSRF Supplemental General Conditions are written to ensure that State and Federal funding and project requirements are included in DWSRF construction contract documents. Projects to utilize this General Condition set include all Distribution projects whose primary purpose is the installation, rehabilitation or replacement of water distribution or transmission mains. Other projects should utilize: DWSRF Supplemental General Conditions For Non-Distribution Projects. Note: Co-Funded projects may require an alternate General Condition set - contact your SRF Project Manager for clarification if needed.

ORIGINATOR/OWNER: DWP DWSRF Staff/Chief Engineer

PROCEDURE:

1. All contents of the DWSRF Supplemental General Conditions in this document must be included in DWSRF funded construction contract specification documents for projects and shall be put out for public bid.
2. It is helpful to incorporate the complete DWSRF Supplemental General Conditions documented here into a specification document, yet as long as all of the conditions are present in the specification document, the complete set of conditions described below do not need to be included as shown.

Specifically, when other sources are funding portions of a construction project funded also by DWSRF, as long as each item in the DWSRF supplemental general conditions is included in the specifications document, there is no need to duplicate conditions within the specifications document.

3. When questions arise regarding a component of these supplemental general conditions, the public water system or their engineer should contact their DWP DWSRF Project Manager to discuss the issue first. A DWSRF Manager will assist with decision making as needed.

ASSOCIATED DOCUMENTS:

- DWSRF Project Management Guidance Manual
- State of Maine Rules Relating to Drinking Water State Revolving Loan fund

SUPERSEDED DOCUMENTS: All previously undocumented versions of this document

RETENTION: This document is retained per DWP Record Retention Schedules

Title: DWSRF Supplemental General Conditions for Distribution Projects

SOP ID: DWP0306

Revision:

REVISION LOG:

Section	Page	Rev.	Date	Description Of Change	Approved by:
		Original	8-15-12		Norm Lamie
MBE/WBE	5	A	3-1-2013	MBE/WBE goals change from 1.3% and 3.7% to 0.64% and 1.64% respectively.	Norm Lamie
DBE, Davis Bacon, AIS, Change in Work and Work Price.	3, 11, 5-7, 9,12,14	B	7-28-15	Change WBE/MBE to DBE and added new requirements and reference to EPA documents. Modified Davis Bacon description. Added American Iron & Steel requirements. Added list of related info and forms. Removed "Bid Protest" and "Claims or Disputes" or Disputes sections which are covered by EJCDC. Included that Change Orders shall require DHHS approval.	Norm Lamie
DBE Related Info & Forms	5-6 13	C	3-18-16	Changed "EPA" to "DWP" on the titles of the 6100-2,3,4 forms described in the section on DBEs.	Nathan Saunders
Appendix A		D	3-24-16	FROMS: Added Appendix Documents: Forms 6100-4,3,2, Progress Rpt of DBE Subcontractor Utilization, Weekly Payroll Labor Stds Compliance Review, AIS Certificaton	Nathan Saunders
		E	1-24-17	Updated EJCDC document #s and names	Nathan Saunders
		F	11-28-17	Added Executive Order 12549 on Debarment and Suspension	Nathan Saunders
Appendix A and Appendix B		G	2-12-18	Change Appendix A to Appendix B to enable adding .pdf forms at the end of the document. Added Wage Rate Requirements as Appendix A.	Nathan Saunders
Appendix B		H	3-21-19	Added Deminimus Tracking Form to Appendix B	Nathan Saunders
General Conditions	15	J	1-5-2021	Added Federal requirement: "Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment"	Nathan Saunders
Appendix B		K	4-7-2021	Updated all forms to be generic SRF instead of DWSRF in order to make forms for DWP and DEP the same, specifically valuable for working MDOT projects with both DWP and DEP work involved.	Nathan Saunders
General Conditions	3, 11	L	3-23-2022	Added EO 14026	McKenzie Parker
General Conditions Appendix B Appendix C		Created separate condition set to align with BIL requirements on Equiv. projects. Sub-division of DWP0151	4-6-2023	Removed EO14026, Removed AIS Requirements, Added BABA Reqs Added BIL project Sign, Updated Definition of Equivalency	McKenzie Parker

DWSRF SUPPLEMENTAL GENERAL CONDITIONS

The provisions of the Drinking Water State Revolving Loan Fund (DWSRF) Supplemental General Conditions as described below change, amend, or supplement the General Conditions and shall supersede any conflicting provisions of the CONTRACT. These provisions shall be used in conjunction with the most recent version of EJCDC documents C-700 (Standard General Conditions) and C-520 (Agreement between Owner and Contractor), both the Funding Agency version. All provisions of the General Conditions, which are not changed, amended, or supplemented, remain in full force.

Notice to Bidders

Any person interested in Bidding on this contract should thoroughly familiarize themselves with these DWSRF Supplemental General Conditions. Failure to comply with any of these conditions may result in the Bidder being determined non-responsive and therefore, not entitled to the award of this contract.

NOTE: In the ADVERTISEMENT TO BIDDERS, the following language should be used making all Bidders aware of the DHHS Special conditions.

Bid Bond

A certified check or bank draft payable to the OWNER or a satisfactory Bid Bond executed by the Bidder and a Surety Company in the equal to five percent (5%) of the Bid shall be submitted with each bid. No bid may be withdrawn for at least 60 days after receipt of bids unless released by the owner.

Disadvantaged Business Enterprise Requirements

Each Bidder shall take notice special notice of the Guidance for use of Disadvantaged Business Enterprises in the DWSRF Supplemental General Conditions. Failure to complete these requirements may result in finding that the Bidder is nonresponsive and therefore, not eligible to awarded this contract. Complete requirements are located in the Bid Documents.

Nondiscrimination in Employment and Labor Standards

Bidders on this work will be required to comply with the President's Executive Order No. 11246 and amendments and supplements to that Order. The requirements for Bidders and CONTRACTORS under this Order are located in the DWSRF Supplemental General Conditions.

Federal Requirements

The CONTRACTOR must comply with the Department of Labor Regulations relating to Copeland "Anti-Kickback Act (18 U.S.C. 874) as supplemented by 29 CFR part 3, Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by 29 CFR part 5, Occupational Safety and Health Standards (OSHA) (29 CFR part 1910)

The CONTRACTOR must comply with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Safe Drinking Water Act, Executive Order 11738, and the Environmental Protection Agency regulations (40 CFR Part 15).

The CONTRACTOR must comply with all permits, restrictions and conditions, issued for the PROJECT by Federal Cross-cutting Authorities.

Disclaimer

Any contract awarded under this Advertisement to Bidders is expected to be funded in part by a Maine Drinking Water State Revolving Fund loan. Neither the State of Maine nor any of its departments, agencies, or employees is, or will be, party to the CONTRACT.

NOTE: The following language shall be added to the INFORMATION FOR BIDDERS section of the specifications:

Bonding and Insurance

Bidders must furnish a bid guarantee equivalent to five percent (5%) of the bid price. In addition the CONTRACTOR awarded a construction contract must furnish performance and payment bonds, each of which shall be in an amount not less than 100 percent of the contract price. CONTRACTORS shall obtain such construction insurance (e.g., fire and extended coverage, workmen's compensation, public liability and property damage, and "all risk" builders risk) as is customary and appropriate.

Manufacturer's Experience

Wherever it may be written that an equipment manufacturer must have a specified period of experience with his product or equipment, who does not meet the specified experience period, can be considered if the equipment supplier or manufacturer is willing to provide a bond or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.

Sales Tax

This PROJECT is exempt from State Sales and Use or Excise Taxes to the extent allowed by law.

Each system must determine whether or not the Sales Tax paragraph is applicable to its project.

Safety and Health Regulations

This PROJECT is subject to all the Safety and Health Regulations (CFR 29 Part 1926 and all subsequent amendments) as promulgated by the US. Department of Labor on June 24, 1974. CONTRACTORS are urged to become familiar with the requirements of these regulations.

Nondiscrimination in Employment

- a. Contracts for work under this proposal will obligate the CONTRACTORS and the SUBCONTRACTORS not to discriminate in employment practices.
- b. Bidders must submit with their initial bid a signed statement as to whether they have previously performed work subject to the President's Executive Order No. 11246, or any preceding similar Executive Order.
- c. Bidders must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of the contract.
- d. Successful bidders must, if requested, submit a list of all SUBCONTRACTORS who will perform work on the PROJECT, and written signed statements from authorized agents of labor pools with which they will or may deal for employees on the work together with supporting information to the effect that such labor pools' practices and policies are in conformity with Executive Order No. 11246; that they will affirmatively cooperate in or offer no hindrance to the recruitment, employment, and equal treatment of employees seeking employment and performing work under the contract or, a certification as to what efforts have been made to secure such statements when such agents or labor pools have failed or refused to furnish them prior to award of the contract.

- e. Successful bidders must be prepared to comply in all respects with the contract provisions regarding nondiscrimination.

SRF Disadvantaged Business Enterprises (DBE) Program

“The Contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 40 CFR part 33, Disadvantaged Business Enterprises (DBE), in the award and administration of subcontracts. Failure by the Contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

The goals for this project are a minimum of 0.64% certified Minority Business Enterprise (MBE) and a minimum of 1.64% certified Women’s Business Enterprise (WBE) participation. Lists of certified businesses may be found on the following internet websites: EPA Office of Small and Disadvantaged Business Utilization (OSDBU), State of Maine Department of Transportation (DOT), and the United States Small Business Administration (SBA).

The contractor must maintain all records documenting its compliance with the requirements of this part, including documentation of its good faith efforts (such as copies of solicitation letters and emails) and data relied upon in formulating its fair share objectives.

1. During the bidding period, the Contractor is required to make the following good faith efforts if they will be awarding subcontracts:
 - (a) Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. This will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
 - (b) Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.
 - (c) Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. This will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
 - (d) Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
 - (e) Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.
 - (f) Employ the good faith efforts described above even if the prime contractor has achieved its fair share objectives under subpart D of this part.
2. The Contractor must comply with the following provisions when submitting their bid:
 - (a) The contractor must complete and submit DWP Form 6100–4, ‘DBE Program Subcontractor Utilization Form’ (**See Appendix B**) as part of the prime contractor’s bid or proposal package to the Owner. Note, only DBE subcontractors should be listed. If no DBE subcontractors are to be used, the contractor must still complete and submit the form.

The contractor must have each of its proposed DBE subcontractors complete the DWP Form 6100–3, ‘DBE Program Subcontractor Performance Form’ (**See Appendix B**). The completed forms must be submitted as part of the prime contractor’s bid or proposal package to the Owner.
3. Prior to contract award, as the Successful Bidder, the Contractor must comply with the following provisions:
 - (a) The contractor must submit to the Owner documentation of its good faith efforts (such as copies of solicitation letters and emails) and data relied upon in formulating its fair share objectives. Solicitation documentation must include proof of receipt. The records must be submitted to the Owner even if the goals were met.

(b) The contractor must submit to the Owner a bidders list of all firms that bid or quote on subcontracts, including both MBE/WBEs and non-MBE/WBEs. The purpose of a bidders list is to provide contractors who conduct competitive bidding with as accurate a database as possible about the universe of MBE/WBE and non-MBE/WBE subcontractors. The list must include the following information:

- (1) Entity's name with point of contact;
- (2) Entity's mailing address, telephone number, and e-mail address;
- (3) The procurement on which the entity bid or quoted, and when; and
- (4) Entity's status as an MBE/WBE or non-MBE/WBE.

4. Following contract award, the Contractor must comply with the following additional provisions:

(a) The contractor must provide DWP Form 6100–2, ‘DBE Program Subcontractor Participation Form’ (See **Appendix B**) to all DBE subcontractors listed on Form 6100-4. DWP Form 6100–2 gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the prime contractor, how much the DBE subcontractor was paid and any other concerns the DBE subcontractor might have during the course of the project, for example, reasons why the DBE subcontractor believes it was terminated by the prime contractor. If DBE subcontractors choose to complete this form, the completed form should be sent directly to the “Contract Administrator” identified in the Preconstruction Meeting.

Complete the DWSRF DWP Progress Report of DBE Subcontractor Utilization Form (See **Appendix B**) for all contractor pay applications whether or not they include invoiced amounts from DBE subcontractors. The progress report shall be attached to the corresponding pay application for processing through the Owner.

Pay subcontractors for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the Owner.

d Notify the Owner in writing prior to any termination of a DBE subcontractor for convenience by the prime contractor.

e If a DBE subcontractor fails to complete work under the subcontract for any reason, the prime contractor must employ the good faith efforts described above if soliciting a replacement subcontractor. Documentation of good faith efforts shall be submitted to the Owner upon request.”

Build America, Buy America (BABA) Act Requirements

The Contractor acknowledges to and for the benefit of the Owner and the the Funding Authority that it understands the goods and services under this Agreement are being funded with federal monies and have statutory requirements commonly known as “Build America, Buy America;” that requires all of the iron and steel, manufactured products, and construction materials used in the project to be produced in the United States (“Build America, Buy America Requirements”) including iron and steel, manufactured products, and construction materials provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Owner and Funding Authority (a) the Contractor has reviewed and understands the Build America, Buy America Requirements, (b) all of the iron and steel, manufactured products, and construction materials used in the project will be and/or have been produced in the United States in a manner that complies with the Build America, Buy America Requirements, unless a waiver of the requirements is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the Build America, Buy America Requirements, as may be requested by the Owner or the Funding Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or Funding Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Owner or Funding Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Funding Authority or any damages owed to the Funding Authority by the Owner). If the Contractor has no direct contractual privity with the Funding Authority, as a lender or awardee to the Owner for the funding of its project, the Owner and the Contractor agree that the Funding Authority is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the Funding Authority.

The Owner shall maintain files on the project site for Build America, Buy America (BABA) manufacturer certifications. The Contractor and subcontractors shall provide step manufacturer certifications to the Owner for each BABA item delivered to the site. The files shall be made available to State and Federal officials for inspection upon request.

The Contractor and its subcontractors shall submit to the Owner, an BABA Compliance Certification (**See Appendix B**) prior to the project Preconstruction Meeting. The Owner, shall in turn, submit this certification from the Contractor, with their BABA Compliance Certification (**See Appendix B**), to the State at the project Preconstruction Meeting.

The nationwide waiver to the BABA law permits the use of products when they occur in de minimis components of such projects funded by the Act that may otherwise be prohibited under the Act. Funds used for such de minimis components cumulatively may comprise no more than a total of 5 percent of the total cost of the project. It is the State's interpretation that all DWSRF projects will contain components that might not comply with the law and therefore it is likely that the Owner will use the de minimis waiver. The Contractor is required to provide the necessary documentation. Owners should, in consultation with their contractors, determine the items to be covered by this waiver, must retain relevant documentation (i.e., invoices) as to those items in their project files, and must summarize in reports the types and/or categories of items to which this waiver is applied, the total cost of incidental components covered by the waiver for each type or category, and the calculations by which they determined the total cost of the project. The Owner shall maintain files on the project site for this documentation. The files shall be made available to State and Federal officials for inspection upon request.

Additional information regarding the BABA requirements can be found on this website:
<https://www.epa.gov/cwsrf/build-america-buy-america-baba>

Notice to Labor Union or Other Organization of Workers

Nondiscrimination in Employment

To: _____
(Name of Union or organization of workers)

The undersigned currently holds contract(s) with _____
(Name of Applicant)

involving funds or credit of the U.S. Government of (a) subcontract(s) with a prime CONTRACTOR holding such contract(s).

You are advised that under the provisions of the above contact(s) or subcontract(s) and in accordance with Executive Order 11246, dated September 24, 1965, the undersigned is obliged not to discriminate against any employee or applicant for employment because of race, color, creed, or national origin. This obligation not to discriminate in employment includes, but is not limited to the following:

HIRING, PLACEMENT, UPGRADING, TRANSFER, OR DEMOTION

RECRUITMENT, ADVERTISING, OR SOLICITATION FOR

EMPLOYMENT TRAINING DURING EMPLOYMENT, RATES OF

PAY OR OTHER FORMS OF COMPENSATION, SELECTION FOR TRAINING

INCLUDING APPRENTICESHIP, LAYOFF, OR TERMINATION.

This notice is furnished to you pursuant to the provisions of the above contract(s) or subcontract(s) and Executive Order 11246.

COPIES OF THIS NOTICE WILL BE POSTED BY THE UNDERSIGNED IN CONSPICUOUS PLACES AVAILABLE TO EMPLOYEES OR APPLICANT FOR EMPLOYMENT.

/s/ _____
(Contractor or Subcontractor)

(Date)

Contractor's and Subcontractor's Insurance

The CONTRACTOR shall not commence work under this contract until he has obtained all the insurance required hereunder and the OWNER has approved such insurance, nor shall the CONTRACTOR allow any SUBCONTRACTOR to commence work on his subcontract until all similar insurance required of the SUBCONTRACTOR has been so obtained and approved. Approval of the insurance by the OWNER shall not relieve or decrease the liability of the CONTRACTOR hereunder.

Operations under the CONTRACT DOCUMENTS, whether such operations be by himself or by any SUBCONTRACTOR under him, requires insurance to be written with a limit of liability of not less than \$1,000,000 for all damages arising out of bodily injury, including death, at any time resulting therefore, sustained by any one person in any one accident; and a limit of liability of not less than \$1,000,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than \$500,000 for all property damage sustained by any one person in any one accident-, and a limit of liability of not less than \$500,000 aggregate for any such damage sustained by two or more persons in any one accident.

The CONTRACTOR shall acquire and maintain, if applicable, Fire and Extended Coverage insurance upon the PROJECT to the full insurable value thereof for the benefit of the OWNER, the CONTRACTOR, and SUBCONTRACTOR as their interest may appear. This provision shall in no way release the CONTRACTOR or CONTRACTOR'S surety from obligations under the CONTRACT DOCUMENTS to fully complete the PROJECT.

The CONTRACTOR shall procure and maintain, at his own expense, during the CONTRACT TIME, in accordance with the provisions of the laws of the State of Maine, Workmen's Compensation Insurance, including occupational disease provisions, for all of his employees at the site of the PROJECT and in case any work is sublet, the CONTRACTOR shall require such SUBCONTRACTOR similarly to provide Workmen's Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the CONTRACTOR. In case any class of employees engaged in hazardous work under this contract at the site of the PROJECT is not protected under Workmen's Compensation statute, the CONTRACTOR shall provide adequate and suitable insurance for the protection of his employees not otherwise protected.

Posting Documents

The following documents must be posted and maintained by the CONTRACTOR at such place or places on the PROJECT site where employees can easily see them. The posters may be obtained, free of charge, from "Business Answers" 1-800-872-3838.

- "Notice to Labor Union or Other Organizations of Workers" (Exhibit 2)
- "Equal Employment Opportunity is the Law" poster
- "Job Safety and Health Protection" poster
- "Fair Labor Standards Act" poster
- "Employee Polygraph Protection Act" poster
- "Family and Medical Leave Act" poster (applicable to employers of 50 or more employees)
- "Notice Relative to the Regulation of Employment" (State Poster)
- "Minimum Wage" (State Poster)
- "Whistleblowers' Protection Act" (State Poster)
- "Sexual Harassment Law" (State Poster)
- "Workers Compensation" (State Poster)
- "Maine Employment Security Law" (applicable to employers who must pay unemployment tax)

“Notice to All Employees” (<http://www.dol.gov/whd/regs/compliance/posters/fedprojc.pdf>)

“Davis-Bacon” wage rates

Available from the Maine Dept. of Labor at <http://www.maine.gov/labor/posters/>.

Project Sign

The CONTRACTOR shall provide and erect PROJECT signs as detailed and specified in Appendix C (See “Project Signs for all Agencies” at www.medwp.com for sign specifications when multiple funding agencies are being utilized). The location of the signs shall be as directed by the ENGINEER. No other CONTRACTOR, SUBCONTRACTOR or material signs will be permitted on the sign. The CONTRACTOR shall maintain and keep the PROJECT signs in good condition until the work is completed when the signs will be removed. All other signs to be erected on the site shall be approved by the ENGINEER. Provide adequate supports for signs as site conditions may require and keep sign a proper distance above prevailing grade to permit public viewing. DHHS may provide an alternative method to placing a project sign for certain types of projects.

Inspection

Representatives of the OWNER and of the Department of Health and Human Services (DHHS) shall have access to the work wherever it is in preparation or progress and the CONTRACTOR shall provide proper facilities for such access and inspection.

Payment of Employees

Minimum Wages

All mechanics and laborers employed or working upon the construction site work of the PROJECT, will be paid the full amounts due at time of payment computed at wage rates not less than State or Federal Minimum Wage, whichever is higher, regardless of any contractual relationship which may be alleged to exist between the CONTRACTOR and such laborers and mechanics.

Overtime Payments

An employer is obligated to make proper wage payments under the Fair Labor Standards Act, and the Contract Work Hours Standards Act, for hours worked in excess of 40 hours in a work week. An employee must receive compensation at a rate not less than one and one-half times the regular rate of pay (basic hourly rate) for all hours worked in excess of 40 hours per week.

Davis-Bacon Wages

Davis-Bacon Wage Rates apply to projects with DWSRF funding. For Davis-Bacon wage determination purposes, work on most projects will be considered “heavy construction”. Some projects may also include work under the “building construction” category. The wage decision that is current as of ten (10) days prior to the bid opening will be applied to DWSRF funded project. The wage decision applicable to this project can be found within these project documents. It is the responsibility of the bidder to verify the applicable wage decision. For job classifications not listed in the applicable wage decision a project-specific wage determination request must be filed with the federal Department of Labor. The Drinking Water Program will provide the wage determination request application form. The Drinking Water Program must review, sign, and submit the wage determination request application. Wage determination request submittals are expected to be responded to within 30 days;

however, some responses have taken longer than this. For each job classification needed for this project not listed in the applicable wage decision the successful bidder is encouraged to identify these job classifications and notify all parties early on in the project such as during the preconstruction meeting. The contractor bears all responsibility for reimbursing workers at Davis-Bacon wage rates. This includes for job classifications not listed in the wage decision that require wage determination requests. All pay requisitions submitted that include contract expenses must include a Weekly Payroll Labor Standards Compliance Review sheet (**See Appendix**) for each week that the pay requisition covers.

For more information, see www.dol.gov/whd/govcontracts/dbra.htm

Wage Record of Contractor

The CONTRACTOR and each SUBCONTRACTOR shall keep an accurate record showing the names, social security number, and occupation of each and all laborers, workmen, and mechanics employed by them in connection with this PROJECT showing the hours worked, the title of the job, the hourly rate and the actual wages paid to each of them. A copy of such record shall be kept at the job site and shall be open at all reasonable hours to the inspection of the Bureau of Labor Standards, the OWNER, and the Department of Health and Human Services.

Retention of Payroll Records

Payroll records, including original field notes and back up material will be maintained during the course of the work by the CONTRACTOR, including payroll of each SUBCONTRACTOR for a period of three years after the completion of the PROJECT.

Violations of Labor Standards

In the event of a violation of the Overtime Payments clause the CONTRACTOR and any SUBCONTRACTOR responsible therefore shall be liable for the unpaid wages and shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of the clause in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages.

In the event of any violation by the CONTRACTOR or SUBCONTRACTOR of the labor standards provisions of their contract, the OWNER may, after notice to the CONTRACTOR, suspend further payments until such violations have ceased.

Payment to Contractor

At least ten (10) days before each progress payment falls due (but not more often than once a month), the CONTRACTOR will submit to the ENGINEER a partial payment estimate filled out and signed by the CONTRACTOR covering the WORK performed during the period covered by the partial payment estimate and supported by such data as the ENGINEER may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the WORK but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the OWNER, as will establish the OWNER'S title to the material and equipment and protect the OWNER'S interest therein, including applicable insurance. The ENGINEER will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing approval of payment, and present the partial payment estimate to the OWNER, or return the partial payment estimate to the CONTRACTOR indicating in writing the reasons for refusing to approve payment.

In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the partial payment estimate. The OWNER will, within ten (10) days of presentation of an approved partial payment estimate, pay the CONTRACTOR a progress payment on the basis of the approved partial payment estimate less the retainage. The retainage shall be an amount equal to ten percent (10%) of said estimate until fifty percent (50%) of the work has been completed. At fifty percent (50%) completion, further partial payments shall be made in full to the CONTRACTOR and no additional amounts retained unless the ENGINEER certifies that the job is not proceeding satisfactorily, but amounts previously retained shall not be paid to the CONTRACTOR. At fifty percent (50%) completion or any time thereafter when the progress of the WORK is not satisfactory, additional amounts may be retained but in no event shall the total retainage be more than ten percent (10%) of the value of the work completed. Upon substantial completion of the work the OWNER may retain an amount sufficient to cover the estimated cost of the work still to be completed.

The CONTRACTOR will indemnify and save the OWNER harmless from all claims growing out of the lawful demand of SUBCONTRACTORS, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof, equipment, tools, and all supplies incurred in the furtherance of the performance of the WORK. The CONTRACTOR shall, at the OWNER'S request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. This may be required on a monthly basis. If the CONTRACTOR fails to do so the OWNER may, after having notified the CONTRACTOR, either pay unpaid bills or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the CONTRACTOR shall be resumed in accordance with the terms of the CONTRACT DOCUMENTS, but in no event shall the provisions of this sentence be construed to impose any obligations upon the OWNER to either the CONTRACTOR, the CONTRACTOR'S Surety, or any third party. In paying any unpaid bills of the CONTRACTOR, any payment so made by the OWNER shall be considered as a payment made under the CONTRACT DOCUMENTS by the OWNER to the CONTRACTOR and the OWNER shall not be liable to the CONTRACTOR for any such payments made in good faith.

Changes in the Work

The OWNER may at any time, as the need arises, order changes within the scope of the WORK without invalidating the Agreement. If such changes increase or decrease the amount due under the CONTRACT DOCUMENTS, or the time required for performance of the WORK, an equitable adjustment shall be authorized by CHANGE ORDER.

The ENGINEER, also, may at any time, by issuing a FIELD ORDER, make changes in the details of the WORK. The CONTRACTOR shall proceed with the performance of any changes in the WORK so ordered by the ENGINEER unless the CONTRACTOR believes that such FIELD ORDER entitles the CONTRACTOR to a change in CONTRACT PRICE or TIME, or both, in which event the CONTRACTOR shall give the ENGINEER WRITTEN NOTICE thereof within seven (7) days after the receipt of the ordered change. Thereafter the CONTRACTOR shall document the basis for the change in CONTRACT PRICE or TIME within thirty (30) days.

The CONTRACTOR shall not execute such changes pending the receipt of an executed CHANGE ORDER or further instruction from the OWNER. All Change Orders shall be approved by DHHS.

Changes in Contract Price

The CONTRACT PRICE may be changed only by a CHANGE ORDER. All Change Orders shall be approved by DHHS. The value of any WORK covered by a CHANGE ORDER or of any claim for increase or decrease in the CONTRACT PRICE shall be determined by one or more of the following methods in the order of procedure listed below:

- a. Unit prices previously approved.
- b. An agreed lump sum.
- c. Time and materials

For all change order work performed under c, a fee for overhead and profit will be allowed over and above the "actual cost" of the work. For work performed by a SUBCONTRACTOR, this fee shall not exceed fifteen percent (15%) for the SUBCONTRACTOR and five percent (5%) for the general CONTRACTOR. The general CONTRACTOR'S five percent (5%) is calculated on the SUBCONTRACTOR'S actual cost before the fee is added. The total fee on "actual work" shall not exceed twenty percent (20%). For work performed by the general CONTRACTOR, this fee shall not exceed fifteen percent (15%).

The "actual cost" of work includes the reasonable cost to the CONTRACTOR of the following:

- a. materials used as part of the work;
- b. common and skilled labor and foreman only;
- c. equipment rental for the period employed directly on the work at rates not exceeding the monthly rate contained in the current "Rental Rate Blue Book for Construction Equipment (published by the Equipment Guidebook Company);
- d. additional insurance if required, to cover public liability for injury to persons and property;
- e. Workmen's Compensation Insurance, Federal Social Security and any other costs associated with payrolls and required by law.

The "actual cost" of work does not include the following:

- a. purchase or rental of small tools and buildings;
- b. CONTRACTOR'S supervision of SUBCONTRACTOR (these costs are part of fee outlined above);
- c. use of capital or premium on the bond unless the extra work includes an extension of time approved and authorized by the OWNER.
- d. overhead and profit.

Access to records

The OWNER, DHHS, Maine Municipal Bond Bank and the Comptroller General of the United States, or any of their authorized representatives, shall have the right of access to any pertinent books, documents, papers, or other records of CONTRACTORS which are pertinent to this PROJECT in order to make audits, examinations, excerpts, and transcripts.

Expiration of right of access. The rights of access shall last as long as the records are retained. The minimum retention period is three years.

Executive Order 12549--Debarment and suspension

Source: The provisions of Executive Order 12549 of Feb. 18, 1986, appear at 51 FR 6370, 3 CFR, 1986 Comp., p. 189, unless otherwise noted.

By the authority vested in me as President by the Constitution and laws of the United States of America, and in order to curb fraud, waste, and abuse in Federal programs, increase agency accountability, and ensure consistency among agency regulations concerning debarment and suspension of participants in Federal programs, it is hereby ordered that:

Section 1. (a) To the extent permitted by law and subject to the limitations in Section 1(c), Executive departments and agencies shall participate in a system for debarment and suspension from programs and activities involving Federal financial and nonfinancial assistance and benefits. Debarment or suspension of a participant in a program by one agency shall have government-wide effect.

(b) Activities covered by this Order include but are not limited to: grants, cooperative agreements, contracts of assistance, loans, and loan guarantees.

(c) This Order does not cover procurement programs and activities, direct Federal statutory entitlements or mandatory awards, direct awards to foreign governments or public international organizations, benefits to an individual as a personal entitlement, or Federal employment.

Sec. 2. To the extent permitted by law, Executive departments and agencies shall:

(a) Follow government-wide criteria and government-wide minimum due process procedures when they act to debar or suspend participants in affected programs.

(b) Send to the agency designated pursuant to Section 5 identifying information concerning debarred and suspended participants in affected programs, participants who have agreed to exclusion from participation, and participants declared ineligible under applicable law, including Executive Orders. This information shall be included in the list to be maintained pursuant to Section 5.

(c) Not allow a party to participate in any affected program if any Executive department or agency has debarred, suspended, or otherwise excluded (to the extent specified in the exclusion agreement) that party from participation in an affected program. An agency may grant an exception permitting a debarred, suspended, or excluded party to participate in a particular transaction upon a written determination by the agency head or authorized designee stating the reason(s) for deviating from this Presidential policy. However, I intend that exceptions to this policy should be granted only infrequently.

Sec. 3. Executive departments and agencies shall issue regulations governing their implementation of this Order that shall be consistent with the guidelines issued under Section 6. Proposed regulations shall be submitted to the Office of Management and Budget for review within four months of the date of the guidelines issued under Section 6. The Director of the Office of Management and Budget may return for reconsideration proposed regulations that the Director believes are inconsistent with the guidelines. Final regulations shall be published within twelve months of the date of the guidelines.

Sec. 4. There is hereby constituted the Interagency Committee on Debarment and Suspension, which shall monitor implementation of this Order. The Committee shall consist of representatives of agencies designated by the Director of the Office of Management and Budget.

Sec. 5. The Director of the Office of Management and Budget shall designate a Federal agency to perform the following functions: maintain a current list of all individuals and organizations excluded from program participation under this Order, periodically distribute the list to Federal agencies, and study the feasibility of automating the list; coordinate with the lead agency responsible for government-wide debarment and suspension of contractors; chair the Interagency Committee established by Section 4; and report periodically to the Director on implementation of this Order, with the first report due within two years of the date of the Order.

Sec. 6. The Director of the Office of Management and Budget is authorized to issue guidelines to Executive departments and agencies that govern which programs and activities are covered by this Order, prescribe government-wide criteria and government-wide minimum due process procedures, and set forth other related details for the effective administration of the guidelines.

Sec. 7. The Director of the Office of Management and Budget shall report to the President within three years of the date of this Order on Federal agency compliance with the Order, including the number of exceptions made under Section 2(c), and shall make recommendations as are appropriate further to curb fraud, waste, and abuse.

Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment

This term and condition implements 2 CFR 200.216 and is effective for obligations and expenditures of EPA financial assistance funding on or after 8/13/2020. As required by 2 CFR 200.216, EPA recipients and subrecipients, including borrowers under EPA funded revolving loan fund programs, are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities). Recipients, subrecipients, and borrowers also may not use EPA funds to purchase: a. For the purpose of public safety, security of government facilities, physical security surveillance of critical Page 4 of 29 infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities). b. Telecommunications or video surveillance services provided by such entities or using such equipment. c. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country. Consistent with 2 CFR 200.471, costs incurred for telecommunications and video surveillance services or equipment such as phones, internet, video surveillance, and cloud servers are allowable except for the following circumstances: a. Obligating or expending EPA funds for covered telecommunications and video surveillance services or equipment or services as described in 2 CFR 200.216 to: (1) Procure or obtain, extend or renew a contract to procure or obtain; (2) Enter into a contract (or extend or renew a contract) to procure; or (3) Obtain the equipment, services, or systems. Certain prohibited equipment, systems, or services, including equipment, systems, or services produced or provided by entities identified in section 889, are recorded in the System for Award Management exclusion list.

Appendix A

Wage Rate Requirements

The recipient agrees to include in all agreements to provide assistance for any construction project carried out in whole or in part with such assistance made available by a drinking water revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12), a term and condition requiring compliance with the requirements of section 1450(e) of the Safe Drinking Water Act (42 U.S.C.300j-9(e)) in all procurement contracts and sub-grants, and require that loan recipients, procurement contractors and sub-grantees include such a term and condition in subcontracts and other lower tiered transactions All contracts and subcontracts for any construction project carried out in whole or in part with assistance made available as stated herein shall insert in full in any contract in excess of \$2,000 the contract clauses as attached hereto entitled “Wage Rate Requirements Under The Clean Water Act, Section 513 and the Safe Drinking Water Act, Section 1450(e).” This term and condition applies to all agreements to provide assistance under the authorities referenced herein, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, where such agreements are executed on or after October 30, 2009.

Preamble

With respect to the Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides sub grants or loans to eligible entities within the State. Typically, the sub recipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring sub recipients’ compliance with the wage rate requirements set forth herein, those sub recipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I-5.

Occasionally, the sub recipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring sub recipients’ compliance with the wage rate requirements set forth herein, those sub recipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section II-5.

Requirements Under The Consolidated Appropriations Act , 2017 (P.L. 115-31) For Sub recipients That Are Not Governmental Entities :

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under the FY2017 Consolidated Appropriations Act with respect to sub recipients that are not governmental entities. If a sub recipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. The recipient or sub recipient may also obtain additional guidance from DOL’s web site at <http://www.dol.gov/whd/>

Under these terms and conditions , the sub recipient must submit its proposed DB wage determinations to the State recipient for approval prior to including the wage determination in

any solicitation, contract task orders , work assignments, or similar instruments to existing contractors.

1. Applicability of the Davis - Bacon (DB) prevailing wage requirements .

Under the FY 2017 Consolidated Appropriations Act, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a sub recipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the sub recipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations .

(a) Sub recipients must obtain proposed wage determinations for specific localities at www.sam.gov.

(b) Sub recipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the sub recipient shall monitor www.sam.gov on a weekly basis to ensure that the wage determination contained in the solicitation remains current. The sub recipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the sub recipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the sub recipient.

(ii) If the sub recipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the sub recipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The sub recipient shall monitor www.sam.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(c) If the sub recipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the sub recipient shall insert the appropriate DOL wage determination from www.sam.gov into the ordering instrument.

(d) Sub recipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(e) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a sub recipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the sub recipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the sub recipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The sub recipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions .

(a) The Recipient shall insure that the sub recipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2017 Consolidated and Continuing Appropriations Act, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Sub recipients may obtain wage determinations from the U.S. Department of Labor's web site, www.s

(ii)(A) The sub recipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the sub recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient(s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the sub recipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request, and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs

reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The sub recipient(s) shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment , advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the sub recipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the sub recipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this

purpose from the Wage and Hour Division Web site at <http://www.dol.gov/whd/forms/wh347instr.htm> or its successor site.

The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the sub recipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sub recipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the

work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractors registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable

predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Sub recipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The sub recipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$25 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The sub recipient shall upon the request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (a)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(c) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Sub recipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Sub recipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The sub recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the

appropriate wage rates. As provided in 29 CFR 5.6(a)(3), all interviews must be conducted in confidence. The sub recipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The sub recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Sub recipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Sub recipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence."

(c). The sub recipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The sub recipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the sub recipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Sub recipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . In addition, during the examinations the sub recipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

(d). The sub recipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Sub recipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/whd/america2.htm>

Appendix B
FORMS



State Revolving Loan Fund

Disadvantaged Business Enterprise Program (DBE) Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE¹ subcontractors² and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name	
Bid /Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Issuing/Funding Entity:			

I have identified potential DBE certified subcontractors	_____ YES	_____ NO	
If yes, please complete the table below. If no, please explain:			
Subcontractor Name/ Company Name	Company Address/Phone/Email	Est. Dollar Amt.	Currently DBE Certified?

Continue on back if needed

¹A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

²Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award or financial assistance.



State Revolving Loan Fund

Disadvantaged Business Enterprise Program (DBE) Subcontractor Utilization Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Section 33.202 (c).

Prime Contractor Signature	Print Name
Title	Date



State Revolving Loan Fund

Disadvantaged Business Enterprise Program (DBE) Subcontractor Performance Form

This form is intended to capture the DBE¹ subcontractor's² description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name		Project Name	
Bid /Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By: <input type="checkbox"/> DOT <input type="checkbox"/> SBA <input type="checkbox"/> Other: _____		Meets/exceeds EPA certification standards? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> Unknown

¹A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

²Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.



State Revolving Loan Fund

Disadvantaged Business Enterprise Program (DBE) Subcontractor Performance Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.202 (c).

Prime Contractor Signature	Print Name
Title	Date

Subcontractor Signature	Print Name
Title	Date



Disadvantaged Business Enterprise Program (DBE) Subcontractor Participation Form

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE¹ subcontractor² the opportunity to describe work received and /or report any concerns regarding the EPA-funded project (e.g. in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the DEP DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name	
Bid /Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services, Equipment or Supplies	Amount Received by Prime Contractor

¹A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

²Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.



State Revolving Loan Fund

**Disadvantaged Business Enterprise Program
(DBE) Subcontractor Participation Form**

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	Date



State Revolving Loan Fund

Disadvantaged Business Enterprise Program (DBE)

PROGRESS REPORT OF DBE SUBCONTRACTOR UTILIZATION FORM

TO ENSURE PROMPT PAYMENT THE FOLLOWING INFORMATION MUST BE SUBMITTED WITH ALL REIMBURSEMENT REQUESTS WHETHER THEY INCLUDE INVOICED AMOUNTS FROM A QUALIFYING WBE OR MBE PARTICIPANT OR NOT:

Municipality/District: _____ SRF #: _____

Name of Project: _____ Contractor: _____

Contractor's Payment Request No. _____ Period covered by the request _____

The accompanying Reimbursement Request includes the following WBE/MBE participation:

Table with 6 columns: Name & Address of WBE/MBE firm to be paid, WBE, MBE, Source of Certification, i.e., DOT, EPA or SBA, Amount to be paid this request, Type of Work. The table contains 5 empty rows for data entry.

This attachment must be signed by an authorized representative of the contractor.

Signature: _____ Date: _____

Name: _____ Title: _____

Address: _____

Phone: _____ E-Mail: _____



State Revolving Loan Fund

Owner's Davis-Bacon Compliance Report

Project Name _____ SRF Project # C230_____

Project Owner: _____

Certified Payrolls Reviewed By: _____
(Printed name of Owner's Representative)

Employee interviews have been conducted in accordance with the contract requirements. Yes No

Prime Contractor: _____

Prime Contractor's Pay Application No: _____ (Note: Only one allowed per Compliance Report)

Application Period: From _____ to _____

Check one box and sign below:

- For the application period indicated, there were no certified payrolls reported because there were no workers on the site that were subject to the Davis-Bacon and Related Acts.
- For the application period indicated, the certified payrolls are in compliance with the Davis-Bacon and Related Acts.
- For the application period indicated, the certified payrolls are not in compliance with the Davis-Bacon and Related Acts. A Compliance Report for the corrective action will be submitted ASAP.

Summary of noncompliant findings and follow up actions needed:

Owner's Representative Signature

Date



BUILD AMERICA, BUY AMERICA (BABA) ACT

In Title IX of the IIJA, Congress passed the Build America, Buy America (BABA) Act, which establishes strong and permanent domestic sourcing requirements across all Federal financial assistance programs for infrastructure.

By May 14, 2022, agencies must ensure that all applicable programs comply with section 70914 of the Act, including by the incorporation of a Buy America preference in the terms and conditions of each award with an infrastructure project. The Act requires the following Buy America preference:

- (1) All iron and steel used in the project are produced in the United States. This means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
- (2) All manufactured products used in the project are produced in the United States. This means the manufactured product was manufactured in the United States, and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation.
- (3) All construction materials are manufactured in the United States. This means that all manufacturing processes for the construction material occurred in the United States.

Waivers

When necessary, recipients may apply for, and the agency may grant, a waiver from these requirements. The agency should notify the recipient for information on the process for requesting a waiver from these requirements. When the Federal agency has made a determination that one of the following exceptions applies, the awarding official may waive the application of the domestic content procurement preference in any case in which the agency determines that:

- (1) applying the domestic content procurement preference would be inconsistent with the public interest;
- (2) the types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or
- (3) the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent.

The nationwide waiver to the BABA law permits the use of products when they occur in de minimis components of such projects funded by the Act that may otherwise be prohibited under the Act. Funds used for such de minimis components cumulatively may comprise no more than a total of 5 percent of the total cost of the project. The Contractor is required to provide the necessary documentation. Owners should, in consultation with their contractors, determine the items to be covered by this waiver, must retain relevant documentation (i.e., invoices) as to those items in their project files, and must summarize in reports the types and/or categories of items to which this waiver is applied, the total cost of incidental components covered by the waiver for each type or category, and the calculations by which they determined the total cost of the project. The Owner shall maintain files on the project site for this documentation. The files shall be made available to State and Federal officials for inspection upon request.



**CERTIFICATION BY THE OWNER
OF COMPLIANCE WITH THE
USE OF BUILD AMERICA, BUY AMERICA ACT**
enacted on May 14, 2022

(To be attached to each Utility Construction SRF requisition submitted for payment)

We, the Owner named, _____, having obtained funding from the State of Maine, State Revolving Fund (SRF), for the Utility Construction Project named _____, hereby submit to the SRF program, certification from each contractor working on the Utility Construction Project that the use of Domestic Content Procurement in the construction of the project complies with the law, or that a waiver has been obtained from the U.S. Environmental Protection Agency. Thereby, it is to the best of the Owner's knowledge that the Project is in compliance with the Build America, Buy America Act..

Signature of Official

Printed name

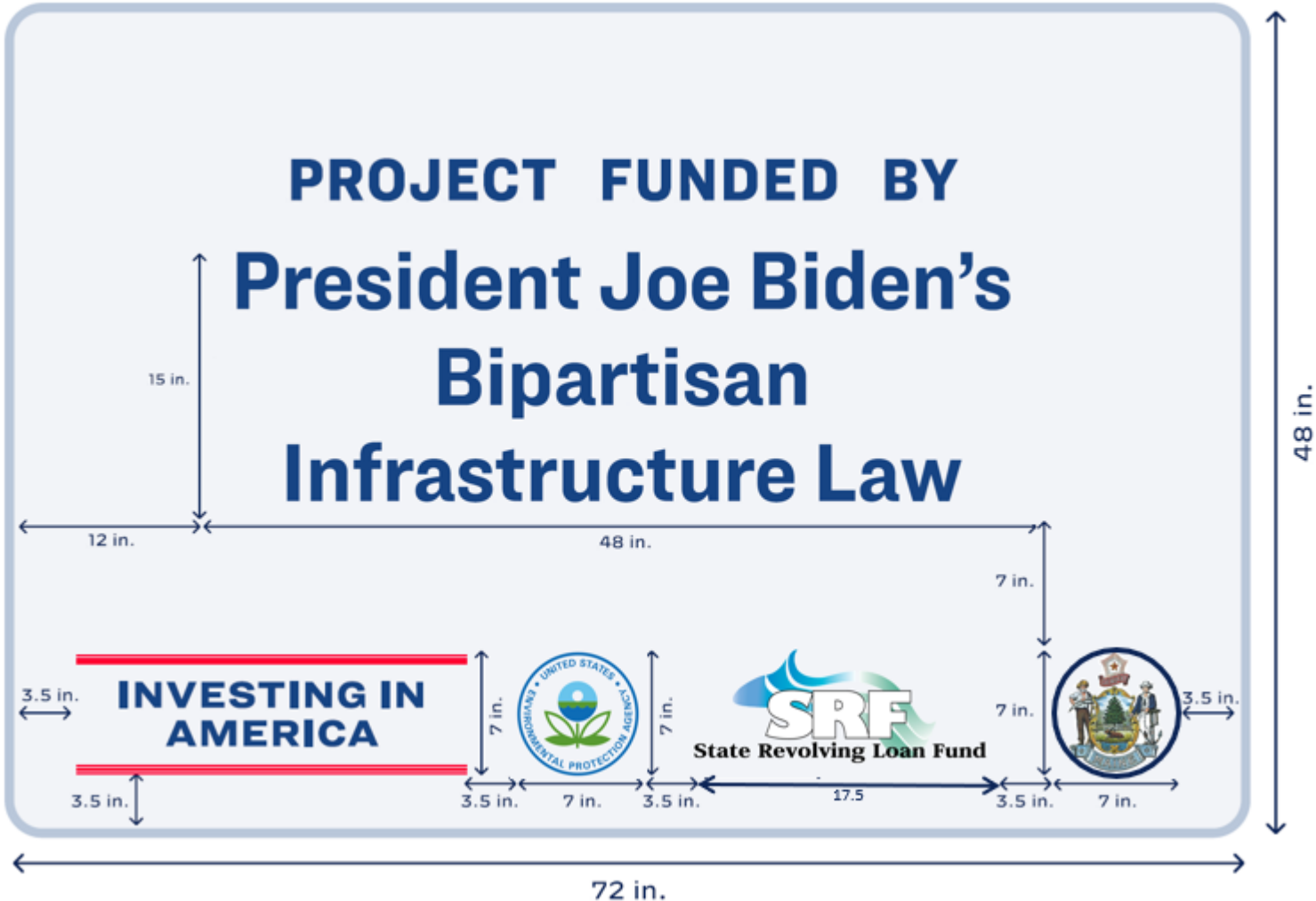
Date

Attachment: Certification by Contractor

Appendix C
PROJECT SIGNS

Bipartisan Infrastructure Law Signage

To be displayed on all projects with BIL funding






High Resolution Images

"Investing in America"

EPA Seal

SRF Logo

Maine State Seal

COLOR	CMYK	RGB	HEX	PMS
 Blue	83, 48, 0, 48	22 / 68 / 132	#164484	PMS 7687 C
 Red	0, 100, 81, 0	255 / 0 / 49	#FF0031	PMS 185 C
 White	2, 2, 0, 3	242 / 244 / 248	#F2F4F8	Bright White

Sign Dimensions: 4-ft x 6-ft x 3/4-in

Material: Exterior Plywood (A-B GRADE)

Font: **Arial Bold**

Temporary Construction Sign for DWSRF Projects

WHITE BACKGROUND

Project Title (include Town / District name)

Engineer:

Contractor:

Total Project Cost:

Financed by:

**DWSRF Program: Maine Department of Health and Human Services, and
Maine Municipal Bond Bank**



This institution is an equal opportunity provider

BLACK LETTERING

WAVE

BLUE, PMS 655 FADING TO 30% SCREEN
GREEN, PMS 627 @ 30% SCREEN DARKENING
TO 100% SCREEN THEN BACK TO 30% SCREEN

MINIMUM SIGN DIMENSIONS: 1200 x 2400 x 19 MM (4' x 8' x 3/4")

EXTERIOR PLYWOOD (A-B GRADE)

MINIMUM LETTERING SIZE: 5 CM (2-INCHES)

BLACK
LETTERING

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

Prepared By



Endorsed By



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American Council of Engineering Companies
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GUIDELINES FOR USE OF EJCDC® C-520, AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

This Agreement form is specifically intended for stipulated price (fixed price) contracts—that is, contracts in which Owner and Contractor identify specific lump sums and unit prices as Contractor’s compensation for performing the Work. For construction contracts in which the Contract Price is primarily based on costs incurred during construction, users should select EJCDC® C-525, Agreement between Owner and Contractor for Construction Contract (Cost-Plus-Fee) (2018).

In construction contracting, as a general matter the “agreement” is the legal instrument executed (signed) by the project owner and the construction contractor, binding the parties to the terms of the contract. See CSI Project Delivery Practice Guide (2011), Section 11.1.2, p. 210, and CSI Construction Specification Practice Guide (2011), Section 5.1, p. 75. This EJCDC Agreement form serves that basic function, by identifying the parties and the Contract Documents, and establishing the Contract Price and Contract Times.

This Agreement form is drafted to be flexible enough to be used on projects that are competitively bid, and for public and private contracts that are negotiated or awarded through a proposal process or otherwise. On competitively bid projects, the following documentary information would typically be made available to bidders:

- Bidding Requirements, which include the Advertisement or invitation to bid, the Instructions to Bidders, and the Bid Form that is suggested or prescribed, all of which provide information and guidance for all Bidders, and Bid Form supplements (if any) such as Bid Bond and Qualifications Statement.
- Contract Documents, which include the Agreement, performance and payment bonds, the General Conditions, the Supplementary Conditions, the Drawings, and the Specifications.
- Documents referred to in the Supplementary Conditions or elsewhere as being of interest to bidders for reference purposes, but which are not Contract Documents.

Together, the Bidding Requirements and the Contract Documents are referred to as the Bidding Documents. (The terms “Bidding Documents,” “Bidding Requirements,” and “Contract Documents” are defined in Article 1 of the General Conditions.) The Bidding Requirements are not Contract Documents because much of their substance pertains to the relationships prior to the award of the Contract and has little effect or impact thereafter. Many contracts are awarded without even going through a bidding process, and thus have no Bidding Requirements, illustrating that the bidding items are typically superfluous to the formation of a binding and comprehensive construction contract. In some cases, however, a bid or proposal will contain numerous line items and their prices; in such case the actual bid or proposal document may be attached as an exhibit to the Agreement to avoid extensive rekeying.

2.0 OTHER DOCUMENTS

As noted above, before selecting C-520 for a specific project, confirm that the Contract will be based on lump sum (stipulated price) (which may include unit prices), and not on cost plus fee—for cost plus fee contracts, use C-525.

EJCDC documents are intended to be used as a system and changes in one EJCDC document may require a corresponding change in other documents. Other EJCDC documents may also serve as a reference to provide insight or guidance for the preparation of this document.

While preparing this document for use on a specific project, the user may decide to revise or supplement some of the standard provisions. When such changes are made, the user should review whether corresponding changes are needed in the following related EJCDC documents:

EJCDC Doc. No.	Document Title	Edition
C-200	Instructions to Bidders for Construction Contract	2018
C-410	Bid Form for Construction Contract	2018
C-700	Standard General Conditions of the Construction Contract	2018
C-800	Supplementary Conditions of the Construction Contract	2018

Other documents that provide additional information or guidance for the use of this document include the following:

EJCDC Doc. No.	Document Title	Edition
C-001	Commentary on the 2018 EJCDC Construction Documents	2018

3.0 ORGANIZATION OF INFORMATION

All parties involved in a construction project benefit significantly from a standardized approach in the location of subject matter throughout the documents. Experience confirms the danger of addressing the same subject matter in more than one location; doing so frequently leads to confusion and unanticipated legal consequences. Careful attention should be given to the guidance provided in EJCDC® N-122/AIA® A521, Uniform Location of Subject Matter (2012 Edition) when preparing documents. EJCDC® N-122/AIA® A521 is available at no charge from the EJCDC website, www.ejcdc.org, and from the websites of EJCDC’s sponsoring organizations.

If CSI MasterFormat™ is used for organizing the Project Manual, consult CSI MasterFormat™ for the appropriate document number (e.g., under 00 11 00, Advertisements and Invitations), and accordingly number the document and its pages.

4.0 GUIDANCE NOTES AND NOTES TO USER

EJCDC Documents include Guidance Notes and Notes to User to provide guidance regarding the preparation of Project specific documents. These notes are intended for use by the User in the preparation of the document and are not intended to be included in the completed document. Guidance Notes and Notes to User are lightly shaded to distinguish them from the proposed text of the Agreement. As a project-specific Agreement is prepared and made ready for issuance to bidders or execution by the parties, all shaded text (Guidance Notes and Notes to Users) should be deleted.

Guidance Notes provide information regarding the paragraphs which follow, including reasons for the paragraphs, discussions of best practices, and alternate approaches for different situations.

Notes to User provide specific information for editing the document. When alternate paragraphs for different situation are presented, explanations on how to select the most appropriate alternate will be provided, with direction to delete those paragraphs not used.

5.0 EDITING THIS DOCUMENT

5.1 It is intended that this document be edited for each Contract. Guidelines for editing include:

- A. Remove the cover pages which consist of the title pages and these Guidelines for Use.
- B. Type in required information as indicated by brackets ([]). Bracketed text will usually provide instructions for what is to be inserted in place of the brackets. Delete brackets and change formatting to match existing text after project specific text has been added, e.g. change “[Project Name]” to “Peach Street Renovation” (without brackets or bold, or quotation marks).
- C. Fill in blanks, if any. It will be more common for information to be inserted by user to be indicated by a prompt in brackets, as described in Paragraph B above, rather than by an underline-style blank.
- D. Most Notes to User are presented before the text to which they apply; some Notes to Users are interspersed in the text, usually within brackets. Delete all “Notes to User” after reviewing each note and taking appropriate action. Delete all associated numbering and brackets.
- E. Complete tables.
- F. Delete Guidance Notes.

6.0 LICENSE AGREEMENT

This document is subject to the terms and conditions of the **License Agreement, 2018 EJCDC® Construction Series Documents**. A copy of the License Agreement was furnished at the time of purchase of this document, and is available for review at www.ejcdc.org and the websites of EJCDC’s sponsoring organizations.

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between **[name of contracting entity]** (“Owner”) and **[name of contracting entity]** (“Contractor”).

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **[Brief description of Work]**

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **[Brief description of Project]**

ARTICLE 3—ENGINEER

Guidance Notes—If an entity or individual other than the design engineer will serve as Owner’s representative during construction, then make appropriate revisions and additions to this Agreement, the General Conditions, the Supplementary Conditions, and other Contract Documents regarding the construction-phase roles and duties of the design engineer and such other entity or individual. Such revisions may include using a designation other than “Engineer” for the representative named in Paragraph 3.01 below, and expressly naming the design firm (for example, “ABC Engineering, Inc.”) instead of referring to “Engineer” in Paragraph 3.02.

3.01 The Owner has retained **[insert name of engineering firm]** (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by **[insert “Engineer” if an entity has been identified as such in Paragraph 3.01, and that same entity prepared the design; or indicate by name the entity other than Engineer that prepared the design]**.

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

Notes to User

Select one of the two Contract Times paragraphs (either Paragraph 4.02 or Paragraph 4.03), and delete the other. The first option, Paragraph 4.02, uses dates for the time of completion; Paragraph 4.03 uses

number of days. (References in these Notes will be to paragraph numbers as published—the final numbering will change as paragraphs, such as either 4.02 or 4.03, are deleted during the finalization process.)

1. Paragraph 4.04, which establishes binding intermediate Milestones, may be used with either Paragraph 4.02 or Paragraph 4.03; or Paragraph 4.04 may be deleted if the Contract does not impose Milestone requirements.
2. In the common case in which Owner elects to predetermine fixed dates or a fixed number of days for completion of the Work, such dates or number of days should be inserted in the selected Contract Times paragraph (either Paragraph 4.02 or Paragraph 4.03) below prior to the bidding or other contractor selection process. If the time for completion will be determined through negotiation or a bidding process that allows bidders to specify the time for completion (for example, a price-plus-time—A + B—award process), then leave the blanks below open until the Contract is finalized (typically after the Successful Bidder has been determined and its proposed completion time accepted).
3. If the Work is divided into individual sections that have differing completion dates (or number of days for completion), then the selected Contract Times paragraph (either Paragraph 4.02 or Paragraph 4.03) below should be expanded to specify the completion dates (or number of days) for each section. Such completion dates may be categorized as Milestones under Paragraph 4.04.

4.02 *Contract Times: Dates*

- A. The Work will be substantially complete on or before **[date]**, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before **[date]**.

4.03 *Contract Times: Days*

- A. The Work will be substantially complete within **[number]** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **[number]** days after the date when the Contract Times commence to run.

Notes to User

1. “Milestone” in Paragraph 4.04 is a defined term.
2. For each Milestone, indicate the event that must be attained, such as “Substantial Completion of Lift Station 1” and the date or number of days from commencement by which the event must be attained.
3. In Paragraph 4.04 use a specific date for attainment of the Milestone if Paragraph 4.02 above (Contract Times: Date) has been selected; use the number of days from commencement of Contract Times for the Milestone if Paragraph 4.03 (Contract Times: Days) has been selected.
4. If the Contract does not include Milestones, delete Paragraph 4.04.

4.04 *Milestones*

- A. Parts of the Work must be substantially completed on or before the following Milestone(s):
 1. Milestone 1 **[event & date/days]**

2. Milestone 2 [event & date/days]
3. Milestone 3 [event & date/days]

Guidance Notes—Liquidated Damages

1. Liquidated damages are commonly used to address unexcused late completion of the Work. The topic is discussed in the Commentary. Delete Paragraph 4.05, Liquidated Damages, if such damages will not be established in the specific Contract.
2. At Substantial Completion, the Owner is able to use the Work for its intended purpose, by definition. See General Conditions, Paragraph 1.01.A. Achieving Substantial Completion is typically a critical deadline, and the associated damages for missing this deadline are typically significant. Paragraph 4.05.A.1 is the location for stating a liquidated amount for such damages, usually on a per-day basis.
3. The subsequent failure to complete the punch list tasks and bring the Work to a complete close by the final completion date may also result in some degree of damages to Owner—though typically these damages are significantly less than the daily damages for not achieving Substantial Completion on time. Some users may choose to establish liquidated damages only for the failure to achieve Substantial Completion. If that is the case, delete Paragraph 4.05.A.2 below.
4. If failure to achieve a Milestone on time is of such consequence that the assessment of liquidated damages is warranted for the failure to reach the Milestone on time, then retain and complete Paragraph 4.05.A.3; if not, delete it. Add additional similar paragraphs for any additional Milestones subject to a liquidated damages assessment. Liquidated damages for Milestones might, in some cases, be additive to liquidated damages for failing to timely attain Substantial Completion; if so Paragraphs 4.05.A.3 and 4.05.A.4 should be revised accordingly.

4.05 Liquidated Damages

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
 1. *Substantial Completion*: Contractor shall pay Owner \$[number] for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 2. *Completion of Remaining Work*: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$[number] for each day that expires after such time until the Work is completed and ready for final payment.
 3. *Milestones*: Contractor shall pay Owner \$[number] for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of Milestone 1, until Milestone 1 is achieved, or until the time specified for Substantial

Completion is reached, at which time the rate indicated in Paragraph 4.05.A.1 will apply, rather than the Milestone rate.

4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

Notes to Users—If early completion would be a benefit to Owner, then consider retaining and completing the bonus clause below as Paragraph 4.05.C. The daily bonus for early completion need not be exactly the same as the daily post-Substantial Completion liquidated damages amounts, but presumably the two amounts will be reasonably compatible. If no bonus will be offered, then delete 4.05.C.

- C. *Bonus*: Contractor and Owner further recognize the Owner will realize financial and other benefits if the Work is completed prior to the time specified for Substantial Completion. Accordingly, Owner and Contractor agree that as a bonus for early completion, Owner shall pay Contractor \$[number] for each day prior to the time specified above for Substantial Completion (as duly adjusted pursuant to the Contract) that the Work is substantially complete. The maximum value of the bonus will be limited to \$[number].

Guidance Notes—Special Damages

If liquidated damages are used to address late completion by Contractor, EJCDC recommends developing daily liquidated damages amounts that comprehensively account for the full range of Owner's damages, including but not limited to loss of beneficial use; extended financing expenses; costs of additional engineering, construction observation, inspection, and administrative services; and potential fines or penalties. This comprehensive approach is well established and generally enforceable. If the recommended and conventional path is followed, and a comprehensive daily liquidated damages amount has been established in Paragraph 4.05 above, then delete the clause that follows, Paragraph 4.06, Special Damages, and rely solely on Paragraph 4.05, Liquidated Damages, to cover the full scope of damage done by late Contractor completion.

1. Some Owners prefer to charge a Contractor that has not completed the Work on schedule for Owner's additional hard-dollar costs in specified categories, such as regulatory fines and penalties, or extended engineering, construction observation, inspection, and administrative services; these charges (referred to here as "special damages") are levied on top of the daily liquidated damages amount. Those users that choose the "liquidated damages plus specified actual hard dollar costs" (special damages) approach may use the following Paragraph 4.06, Special Damages, revised as needed to reflect the intended scope of the special damages, together with the liquidated damages provisions in Paragraph 4.05, Liquidated Damages, above. It is very important if this approach is followed to be certain that the liquidated damages amount does not already include or rely in part on the potential for incurring these very same special damages costs.
2. Finally, note that Paragraph 4.06.B below does not refer to fines or penalties imposed by third parties. In the typical case, such fines and penalties are linked to Substantial Completion, and are not applicable to delays in final completion of the Work.

4.06 *Special Damages*

- A. Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.
- B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.
- C. The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.

ARTICLE 5—CONTRACT PRICE

Guidance Notes—Contract Price

1. Depending upon the particular Contract's pricing structure, use Paragraph 5.01.A alone (lump sum with no Unit Price Work items); Paragraphs 5.01.A, 5.01.B, and 5.01.C together (lump sum plus Unit Price items); Paragraph 5.01.B alone (Unit Prices for all Work); or Paragraph 5.01.D alone (price based on contents of incorporated Contractor's Bid), and delete those not used and renumber accordingly. If Paragraph 5.01.D is used, Contractor's Bid is attached as an exhibit and listed as a Contract Document in Article 7 below.
2. With respect to Paragraph 5.01.B concerning Unit Prices, if adjustment prices for variations from stipulated Base Bid or other baseline quantities have been agreed to, insert appropriate provisions.
3. Performance Requirements and Damages. In some cases, the construction contract will contain performance requirements that must be met by the equipment, systems, or facilities constructed or furnished by Contractor. Performance provisions most commonly will be located in the Specifications. On some projects the Owner and Contractor may contractually stipulate specific damages for failure to meet the performance requirements. It may be useful to provide a cross-reference to such provisions here in Article 5 of the Agreement (as a new Paragraph 5.02), or in some cases to expressly state the stipulated damages amounts here because of their importance to the pricing of the Contract, which is one of the primary subjects of the Agreement.

In addition to, or as an alternative to imposition of stipulated damages to compensate Owner for not receiving its full contractual performance entitlement, the performance provisions in the Specifications may identify other Owner remedies for Contractor's failure to meet the performance requirements, such as rejection of the items in question; correction remedies; exercise of warranty rights; recovery of actual damages; and acceptance of the underperforming items coupled with a reduction in Contract Price.

Typical damages for underperformance might be for reduced production or treatment, or for the costs of increased electricity or chemical consumption over the life of the equipment. It is important when drafting damages provisions to clarify whether the availability of underperformance damages is

meant to close off other potential remedies that will be owed in the event of specific levels of underperformance.

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

A. For all Work other than Unit Price Work, a lump sum of \$[number].

All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.

B. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item).

Unit Price Work					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
				\$	\$
				\$	\$
				\$	\$
				\$	\$
				\$	\$
Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

C. Total of Lump Sum Amount and Unit Price Work (subject to final Unit Price adjustment) \$[number].

D. For all Work, at the prices stated in Contractor’s Bid, attached hereto as an exhibit.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on the basis of Contractor’s Applications for Payment on or about the [ordinal number, such as 5th] day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the

Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

Guidance Notes—Retainage

1. In Paragraph 6.02.A.1.a, the percentage stated should be that percentage to be paid to Contractor. Thus, if retainage is 10%, indicate “90” in Paragraph 6.02.A.1.a.
2. Paragraph 6.02.A.1.a(1) provides that after the Work is 50% complete (based on value of Work completed), Owner will no longer take retainage from progress payments, if performance of the Work has been satisfactory. This practice rewards and incentivizes good work and compliance with the schedule. If Owner is not able or willing to offer this incentive, delete Paragraph 6.02.A.1.a(1).
3. Although Paragraph 6.02.A.1.a(1), if utilized, provides for retainage to be reduced after 50% of the Work is complete, the standard provisions in Paragraph 6.02 do not provide for an early return of retainage—Contractor’s first opportunity to receive retained funds occurs at Substantial Completion (see Paragraph 6.02.B). If a specific project involves partial utilization of a portion of the Work or other special factors, the user may wish to include a supplemental provision that allows for a partial early return of retainage, under specified conditions.
4. As an alternative to retainage, some Owners allow the Contractor to receive 100% of each progress payment, provided that the Contractor has provided an irrevocable letter of credit or similar instrument that allows the Owner access to the Contractor’s funds under prescribed conditions. Any such alternative mechanism requires custom drafting and participation of legal counsel.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. **[number]** percent of the value of the Work completed (with the balance being retainage).
 - 1) If 50 percent or more of the Work has been completed, as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and
 - b. **[number]** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

Notes to Users—Typical values used in Paragraph 6.02.B are 100 percent and 200 percent respectively, subject to Laws and Regulations specific to the Project.

- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to **[number]** percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less **[number]**

percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

- A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

- A. All amounts not paid when due will bear interest at the rate of **[number]** percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract Documents consist of all of the following:

Notes to Users—If any of the items listed below are not to be included as Contract Documents, remove such item from the list and renumber the remaining items.

1. This Agreement.
2. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
3. General Conditions.
4. Supplementary Conditions.
5. Specifications as listed in the table of contents of the project manual (copy of list attached).

Notes to Users—Use either Paragraph 6 or 7, delete the paragraph not used.

6. Drawings (not attached but incorporated by reference) consisting of **[number]** sheets with each sheet bearing the following general title: **[title on Drawings]**.
7. Drawings listed on the attached sheet index.

Notes to Users—In the following paragraph list the numbers and dates of those Addenda that modified the Contract Documents; do not list Addenda that only affected the Bidding Requirements, and therefore should not be Contract Documents. See EJCDC® C-001 Commentary on the 2018 EJCDC Construction Documents (2018).

8. Addenda (numbers **[number]** to **[number]**, inclusive).

Guidance Notes—Exhibits that are Contract Documents

1. In the following paragraph list exhibits (if any) to the Agreement that merit the status of Contract Documents.
2. As noted in the introduction to this Agreement, in the typical case bidding-related documents such as the Instructions to Bidders and Bid are not included as Contract Documents. Include Contractor's Bid as a Contract Document here only as a matter of necessity, for example if the Bid contains numerous line items and their prices, and rekeying such information would be burdensome and susceptible to error.
3. List other required attachments (if any), such as documentation submitted by Contractor prior to Notice of Award and documents required by funding or lending agencies.
4. If Contractor is required in this Contract to accept assignment of a procurement contract, previously entered into by Owner (as "Buyer") with a manufacturer or distributor (as "Seller") for the direct purchase of goods (most commonly equipment) and related special services, include the procurement contract as a Contract Document by listing it as a lettered item under Paragraph 7.01.A.9—"Assigned Procurement Contract between Owner (Buyer) and Seller, dated [date]." The contractual wording governing the assignment of a procurement contract should be located in the Supplementary Conditions; see Supplementary Conditions, Paragraph SC-18.08.B. For additional information on assigning a procurement contract, refer to EJCDC® P-001, Commentary on the EJCDC Procurement Documents.
5. If a Geotechnical Baseline Report or a Geotechnical Data Report is used, include these reports as Contract Documents by listing them as lettered items under Paragraph 7.01.A.9. For a further discussion of GBRs and GDRs see EJCDC® C-001, Commentary on the 2018 EJCDC Construction Documents (2018).
 9. Exhibits to this Agreement (enumerated as follows):
 - a. **[list exhibits]**
 10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
 - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

Notes to Users—Modify the following representations to suit the specific Project. For example: change or delete Paragraph 8.01.A.2 if Contractor was restricted from visiting the Site prior to entering into the Contract; change or delete Paragraph 8.01.A.4 and 5 if there are no reports or drawings of the type referred to.

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
 7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
 8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on **[indicate date on which Contract becomes effective]** (which is the Effective Date of the Contract).

Guidance Notes—Signing and Dating Agreement:

1. See Article 20 of the Instructions to Bidders and correlate procedures for format and signing of the documents.
2. The Effective Date of the Contract stated above and the dates of any construction performance bond (EJCDC® C-610, Performance Bond (2018) or other) and construction payment bond (EJCDC® C-615, Payment Bond (2018) or other) should be the same, if possible. In no case should the date of any bonds be earlier than the Effective Date of the Contract.

Owner:

(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

Contractor:

(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

(If [Type of Entity] is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

Phone: _____

Email: _____

(If [Type of Entity] is a corporation, attach evidence of authority to sign. If [Type of Entity] is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

Phone: _____

Email: _____

License No.: _____
(where applicable)

State: _____

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



Endorsed By



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GUIDELINES FOR USE OF EJCDC® C-700, STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

EJCDC® C-700, Standard General Conditions of the Construction Contract (2018), is the foundation document for the EJCDC Construction Series. The General Conditions define the basic rights, responsibilities, risk allocations, and contractual relationship of the Owner and Contractor, and establish how the Contract is to be administered.

2.0 OTHER DOCUMENTS

EJCDC documents are intended to be used as a system and changes in one EJCDC document may require a corresponding change in other documents. Other EJCDC documents may also serve as a reference to provide insight or guidance for the preparation of this document.

These General Conditions have been prepared for use with either EJCDC® C-520, Agreement Between Owner and Contractor for Construction Contract (Stipulated Price), or EJCDC® C-525, Agreement Between Owner and Contractor for Construction Contract (Cost-Plus-Fee) (2018 Editions). The provisions of the General Conditions and the Agreement are interrelated, and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC® C-800, Supplementary Conditions of the Construction Contract (2018).

The full EJCDC Construction series of documents is discussed in the EJCDC® C-001, Commentary on the 2018 EJCDC Construction Documents (2018).

3.0 ORGANIZATION OF INFORMATION

All parties involved in a construction project benefit significantly from a standardized approach in the location of subject matter throughout the documents. Experience confirms the danger of addressing the same subject matter in more than one location; doing so frequently leads to confusion and unanticipated legal consequences. Careful attention should be given to the guidance provided in EJCDC® N-122/AIA® A521, Uniform Location of Subject Matter (2012 Edition) when preparing documents. EJCDC® N-122/AIA® A521 is available at no charge from the EJCDC website, www.ejcdc.org, and from the websites of EJCDC's sponsoring organizations.

If CSI MasterFormat™ is used for organizing the Project Manual, consult CSI MasterFormat™ for the appropriate document number (e.g., under 00 11 00, Advertisements and Invitations), and accordingly number the document and its pages.

4.0 EDITING THIS DOCUMENT

Remove these Guidelines for Use. Some users may also prefer to remove the two cover pages.

Although it is permissible to revise the Standard EJCDC Text of C-700 (the content beginning at page 1 and continuing to the end), it is common practice to leave the Standard EJCDC Text of C-700 intact and unaltered, with modifications and supplementation of C-700's provisions set forth in EJCDC® C-800, Supplementary Conditions of the Construction Contract (2018). If the Standard Text itself is revised, the

user must comply with the terms of the License Agreement, Paragraph 4.0, Document-Specific Provisions, concerning the tracking or highlighting of revisions. The following is a summary of the relevant License Agreement provisions:

1. The term “Standard EJCDC Text” for C-700 refers to all text prepared by EJCDC in the main body of the document. Document covers, logos, footers, instructions, or copyright notices are not Standard EJCDC Text for this purpose.
2. During the drafting or negotiating process for C-700, it is important that the two contracting parties are both aware of any changes that have been made to the Standard EJCDC Text. Thus, if a draft or version of C-700 purports to be or appears to be an EJCDC document, the user must plainly show all changes to the Standard EJCDC Text, using “Track Changes” (redline/strikeout), highlighting, or other means of clearly indicating additions and deletions.
3. If C-700 has been revised or altered and is subsequently presented to third parties (such as potential bidders, grant agencies, lenders, or sureties) as an EJCDC document, then the changes to the Standard EJCDC Text must be shown, or the third parties must receive access to a version that shows the changes.
4. Once the document is ready to be finalized (and if applicable executed by the contracting parties), it is no longer necessary to continue to show changes to the Standard EJCDC Text. The user may produce a final version of the document in a format in which all changes are accepted, and the document at that point does not need to include any “Track Changes,” redline/strikeout, highlighting, or other indication of additions and deletions to the Standard EJCDC Text.

5.0 LICENSE AGREEMENT

This document is subject to the terms and conditions of the **License Agreement, 2018 EJCDC® Construction Series Documents**. A copy of the License Agreement was furnished at the time of purchase of this document, and is available for review at www.ejcdc.org and the websites of EJCDC’s sponsoring organizations.

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*
 - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

- requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.
- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. 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.
 - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
 - 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

- A. *Standards Specifications, Codes, Laws and Regulations*
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
3. Technical Data contained in such reports and drawings.

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 2. is of such a nature as to require a change in the Drawings or Specifications;
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
- a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

- of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

- Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.
- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
 - F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
 - G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
 - H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
 - I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
 - J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
 - K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 Contractor's Insurance

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required;
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 - 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
 - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
 2. *Samples*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Engineer's Review of Shop Drawings and Samples*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

- d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
 2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
1. Observations by Engineer;
 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. Use or occupancy of the Work or any part thereof by Owner;
 5. Any review and approval of a Shop Drawing or Sample submittal;
 6. The issuance of a notice of acceptability by Engineer;
 7. The end of the correction period established in Paragraph 15.08;
 8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 Indemnification

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 Delegation of Professional Design Services

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

- 9.05 *Lands and Easements; Reports, Tests, and Drawings*
- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
 - B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
 - C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 9.06 *Insurance*
- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.
- 9.07 *Change Orders*
- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.
- 9.08 *Inspections, Tests, and Approvals*
- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.
- 9.09 *Limitations on Owner's Responsibilities*
- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 9.10 *Undisclosed Hazardous Environmental Condition*
- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.
- 9.11 *Evidence of Financial Arrangements*
- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).
- 9.12 *Safety Programs*
- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
 - B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
- 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 6. Expenses incurred in preparing and advancing Claims.
- 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
- 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:* Contractor agrees that:
1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance:* Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 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. 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.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 2. agree with the other party to submit the dispute to another dispute resolution process; or
 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.



**American Water Works
Association**

Dedicated to the World's Most Important Resource®

ANSI/AWWA C651-14
(Revision of ANSI/AWWA C651-05)

AWWA Standard

Disinfecting Water Mains

Effective date: Feb. 1, 2015.
First edition approved by AWWA Board of Directors Sept. 30, 1947.
This edition approved June 8, 2014.
Approved by American National Standards Institute Nov. 18, 2014.
Addendum incorporated Jan. 2020.



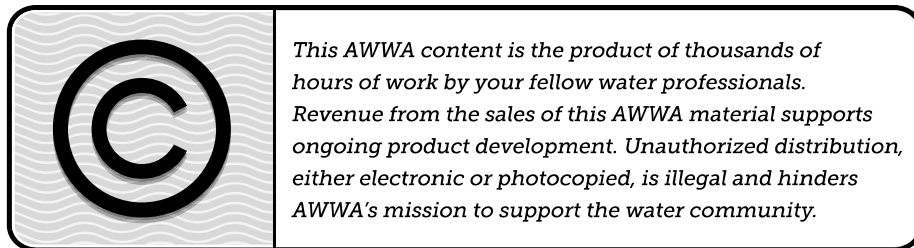
AWWA Standard

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ISBN-13, print: 978-1-62576-046-3

eISBN-13, electronic: 978-1-61300-310-7

DOI: <http://dx.doi.org/10.12999/AWWA.C651.14>

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* Liaison, nonvoting

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C651.

I. Introduction.

I.A. *Background.* This standard describes methods of disinfecting newly constructed potable water mains; mains that have been removed from service for planned repairs or for maintenance that exposes them to contamination; mains that have undergone emergency repairs because of physical failure; and mains that, under normal operation, continue to show the presence of coliform organisms. The disinfecting agents discussed in this standard are chlorine solutions that may be derived from liquid chlorine (Cl_2), calcium hypochlorite ($\text{Ca}(\text{OCl})_2$), or sodium hypochlorite (NaOCl). Combinations of free chlorine residual and contact time are provided. Chlorine dosage reference tables are provided as appendix B of this standard.

I.B. *History.* This standard was first approved on Sept. 30, 1947, by the AWWA Board of Directors and published as 7D.2-1948, A Procedure for Disinfecting Water Mains. Revisions were approved on Sept. 14, 1948; Mar. 6, 1953; May 27, 1954; June 2, 1968; and June 7, 1981. All were done under the designation ANSI/AWWA C601, Standard for Disinfecting Water Mains. In 1986, the designation of the standard was changed to ANSI/AWWA C651, and the subsequent editions were approved on Jan. 26, 1986; June 18, 1992; June 20, 1999; and Jan. 16, 2005. This edition was approved on June 8, 2014.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for direct and indirect drinking water additives. Other members of the original consortium included the Water Research Foundation (formerly AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.[†] Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

† Persons outside the United States should contact the appropriate authority having jurisdiction.

effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on Apr. 7, 1990.
2. Specific policies of the state or local agency.
3. Two standards developed under the direction of NSF*: NSF/ANSI 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.
4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,[†] and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI 60. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdictions. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, “Toxicology Review and Evaluation Procedures,” to NSF/ANSI 60 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of “unregulated contaminants” are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C651 does not address additives requirements. Thus, users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements including applicable standards.
2. Determine the status of certifications by parties offering to certify products for contact with, or treatment of, drinking water.
3. Determine current information on product certification.

II. Special Issues.

II.A. *Information on Application of This Standard.* Generally, it is easier to disinfect a new main than one that has had emergency repairs in terms of access, sanitary control, and the time available for disinfection, sampling, and testing.

* NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

† Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001.

For a new main, there is typically more time available for disinfection and testing since there is no immediate demand from customers. Given the often significant amount of time and materials involved in a new water main project, careful disinfection and testing of the main are reasonable and necessary to ensure public health protection.

Conditions for pipe repair projects vary tremendously in terms of the size of the repair, the sanitary conditions, and the time constraints resulting from immediate customer demands. It should be noted if the line is depressurized or opened to the environment prior to or during repair, the sanitary integrity of the pipe is compromised and it is critical to follow sanitary procedures throughout the repair—not just as it is being returned to service. Crews responsible for the repair of mains should be aware of the potential health hazards and be trained to carefully observe prescribed construction practices and disinfection procedures.

Because of the differences between initial installation and repair, the disinfection requirements for each situation are also different. The installation of new mains requires that two sets of samples for coliform analysis are collected at least 16 hr apart, or two sets collected 15 min apart after at least a 16-hr rest period. For repaired mains that are depressurized and/or wholly or partially dewatered, one set of samples may be required, and depending on the sanitary conditions, the line may be returned to service prior to the completion of bacteriological testing. For repaired mains that are maintained under pressurized conditions at all times, bacteriological testing is not required.

When required, samples are now specified to be collected at least 16 hr apart, or 15 min apart after a 16-hr rest period. The purpose of this change is to consider the balance between public health, improved test methods, and timely work completion. This timing is sufficient to allow bacterial regrowth within the line if there was a contamination problem and provides more flexibility in the scheduling of various work activities.

Bacteriological testing in accordance with Sec. 5.1 is used to verify the absence of coliform organisms and is generally accepted as verification that disinfection of the pipeline has been accomplished; and following sanitary practices for handling and installation of pipe, valves, fittings, and accessories, coupled with adequate flushing of the line before disinfection, is necessary to ensure the disinfected pipeline will be ready for connection to the water system. Failure to pass the bacteriological test requires that the flushing or disinfection process be repeated. It must be remembered that the final water quality test is not the primary means for certifying the sanitary condition of a main. The sanitary

handling of materials, the practices during construction, and the continual inspection of the work are the primary means for ensuring the sanitary condition of the water main.

Four methods of disinfecting newly constructed water mains are described in this standard: the tablet method, the continuous-feed method, the slug method, and the spray method. The utility should decide which of these methods is most suitable for a given situation. Factors to consider when choosing a method should include the length and diameter of the main, type of joints present, availability of materials, equipment required for disinfection, training of the personnel who will perform the disinfection, and safety concerns. For example, if gas chlorination is the chosen chemical when either continuous-feed or slug methods are being used, use only properly designed and constructed equipment; makeshift equipment is not acceptable when liquid chlorine (gas) cylinders are used.

Thorough consideration should be given to the impact of highly chlorinated water flushed into the environment. If there is any question that damage may be caused by chlorinated-waste discharge (to fish life, plant life, physical installations, or other downstream water uses of any type), then an adequate amount of reducing agent should be applied to water being disposed of in order to thoroughly neutralize the chlorine residual remaining in the water.

The tablet method cannot be used unless the main can be kept clean and dry. It cannot be used in large-diameter mains if it is necessary for a worker to enter the main to grout joints or perform inspection because the tablets may release toxic fumes after exposure to moist air. When using the tablet method, the chlorine concentration is not uniform throughout the main because the hypochlorite solution is dense and tends to concentrate at the bottom of the pipe. The use of the tablet method precludes preliminary flushing. The tablet method is convenient to use in mains having diameters up to 24 in. (600 mm), and it requires no special equipment.

The continuous-feed method is suitable for general application. Preliminary flushing removes light particulates from the main but not from the pipe-joint spaces. The chlorine concentration is uniform throughout the main.

The slug method is suitable for use in large-diameter mains where the volume of water makes the continuous-feed method impractical and difficult to achieve for short attachments. The slug method results in appreciable savings of chemicals used to disinfect long large-diameter mains. Also, this method reduces the volume of heavily chlorinated water to be flushed to waste.

The spray method is suitable for use in large-diameter transmission lines where spray equipment can be used to disinfect all surfaces of the pipe. This method reduces the volume of heavily chlorinated water to be flushed to waste.

The purpose of all four chlorination methods is to disinfect water lines, resulting in an absence of coliforms as confirmed by laboratory analysis. As noted above, the four methods attempt to provide flexibility in responding to specific situations. The tablet and continuous-feed methods both have initial chlorine concentrations of 25 mg/L and a minimum contact time of 24 hr. Because the tablet method cannot be flushed and cleaned prior to disinfection, the required free chlorine residual must be detectable (≥ 0.2 mg/L) after 24 hr. Because the continuous-feed method can be used to flush particles, a higher free chlorine residual of 10 mg/L is required after 24 hr. To meet the needs of situations requiring reduced contact times, the slug method allows only a 3-hr contact time but requires a 100-mg/L initial chlorine dosage. For larger transmission lines, spray disinfection using 200 mg/L free chlorine may be a suitable option, minimizing discharges of highly chlorinated water. While the contact times of the methods may not be identical, the end result, absence of coliforms, is the same for all four methods.

Disinfectants other than chlorine may be appropriate to use. Although this standard describes only the use of liquid chlorine (gas), sodium hypochlorite solutions, and calcium hypochlorite, the applicability of other disinfectants should be evaluated. Ozone and chemical cleaners have been used, and these warrant further investigation. Whichever disinfectant or method is selected, approval from the local regulatory agency may be required.

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. *Purchaser Options and Alternatives.* This standard is written as though the disinfection work will be performed by the purchaser's personnel. Where the work is to be performed using a separate contract or as part of a contract for installing mains,* appropriate provisions should be included in the purchase documents to ensure that the constructor is specifically instructed as to its responsibilities. The following information should be provided by the purchaser.

* Refer to other AWWA standards and manuals for design criteria and installation procedures for various pipe materials.

1. Standard used— that is, ANSI/AWWA C651, Standard for Disinfection of Water Mains, of latest revision.
2. Approval requirements before use.
3. Those procedures included in the standard that are designated as optional, that are to be included in the purchase documents.
4. Whether compliance with NSF/ANSI 60, Drinking Water Chemicals—Health Effects, is required.
5. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.
6. Details of other federal, state or provincial, and local requirements (Section 4).
7. Form of chlorine to be used (Sec. 4.1.1, 4.1.2, and 4.1.3).
8. Method of chlorination (Sec. 4.3, 4.4, 4.5, and 4.6).
9. Flushing locations, rates of flushing, and locations of drainage facilities (Sec. 4.4.2, 4.9.1, and 4.9.2).
10. Responsibility for tapping existing mains and connections to new mains (Sec. 4.4.3[1], 4.4.3[2], and 4.10).
11. The number and frequency of samples for bacteriological tests (Sec. 5.1.1, 5.1.2, and 5.2).
12. Method of taking samples (Sec. 5.1.3).

III.B. *Modification to Standard.* Any modification of the provisions, definitions, or terminology in this standard must be provided by the purchaser.

IV. Major Revisions. Major revisions made to the standard in this edition include the following:

1. Clarified differences in the requirements between new and repaired mains (foreword II.A, Sec. 1.1, and 4.11).
2. Changed the requirement for bacteriological sampling in new mains from two sets of samples 24 hr apart to add two options for two sets of samples: Option A samples are 16 hr apart, and Option B samples are 15 min apart after a 16-hr rest period (foreword II.A and Sec. 5.1).
3. The flushing rate of 2.5 ft/sec has been increased to 3.0 ft/sec for a scour flush based on testing performed under Water Research Foundation Project No. 4307, which indicates the threshold velocity of 2.5 to 3.0 ft/sec for successful flushing (2.5- to 3.0-log removal) of sand particles. Since this is a threshold velocity, 3.0 ft/sec was chosen for the standard (Sec. 4.4.2 and Table 3).
4. Added spray disinfection method for large transmission mains (Sec. 4.6).

5. Appendix C has been deleted, and instead, a reference to ANSI/AWWA C655 is made for dechlorination (Sec. 4.7 and 4.9.2).

6. Developed a rationale for evaluating risk during pipe repairs and the level of disinfection and sampling needed under those conditions (Sec. 4.11).

V. Comments. If you have any comments or questions about this standard, please call the AWWA Engineering and Technical Services at 303.794.7711, FAX at 303.795.7603; write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email the group at standards@awwa.org.

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**American Water Works
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ANSI/AWWA C651-14
(Revision of ANSI/AWWA C651-05)

AWWA Standard

Disinfecting Water Mains

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes essential procedures for the disinfection of new and repaired potable water mains. New water mains shall be disinfected before they are placed in service. Water mains taken out of service for inspection, repair, or other activities may or may not require disinfection and sampling, depending on the risk of contamination. This standard described the process for evaluating the risk under different conditions. This standard is meant to be used for water mains within public water systems and is not intended for premise plumbing systems in buildings. Premise plumbing components in building use a wide variety of materials, including some that may not be compatible with the chlorine concentrations in this standard.

Sec. 1.2 Purpose

The purpose of this standard is to define the minimum requirements for the disinfection of water mains, including the preparation of water mains, application of chlorine, and sampling and testing for the presence of coliform bacteria.

Sec. 1.3 Application

This standard can be referenced in the purchase documents for the disinfection of water mains and can be used as a guide for the preparation of water mains, application of chlorine, and sampling and testing for the presence of coliform bacteria. The stipulations of this standard apply when this document has been referenced and only to the disinfection of water mains.

SECTION 2: REFERENCES

This standard references the following documents. In their latest editions, they form a part of this standard to the extent specified within the standard. In any case of conflict, the requirements of this standard shall prevail.

ANSI*/AWWA B300—Hypochlorites.

ANSI/AWWA B301—Liquid Chlorine.

ANSI/AWWA C652—Disinfection of Water Storage Facilities.

ANSI/AWWA C655—Field Dechlorination.

APHA,[†] AWWA, and WEF.[‡] *Standard Methods for the Examination of Water and Wastewater.*

AWWA Manual M12, *Simplified Procedures for Water Examination.*

NSF/ANSI 61—Drinking Water System Components—Health Effects.

SECTION 3: DEFINITIONS

The following definitions shall apply in this standard:

1. *Available chlorine:* A measure of the amount of chlorine in chlorinated lime, hypochlorite compounds, chloramines, and other materials that are used for disinfection compared with the amount in elemental (liquid or gaseous) chlorine.

2. *Chlorine, combined:* The amount of chlorine combined with ammonia (NH₃) or other compounds in water.

3. *Chlorine, free:* Also called *free available chlorine*, the amount of chlorine available as dissolved gas (Cl₂), hypochlorous acid (HOCl), and hypochlorite (OCl⁻) that is not combined with ammonia (NH₃) or other compounds in water that is available for disinfection.

4. *Chlorine residual:* Concentration of chlorine species present in water after the oxidant demand has been satisfied.

5. *Chlorine, total:* A combination of free chlorine, combined chlorine, and organochlorine species.

6. *Constructor:* The party that provides the work and materials for placement or installation.

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

† American Public Health Association, 800 I Street NW, Washington, DC 20001.

‡ Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314.

7. *Liquid chlorine (gas)*: the commercially available form of liquefied elemental chlorine gas. (The term *liquid chlorine* is sometimes used to describe a hypochlorite solution. This use of the term is discouraged. See ANSI/AWWA B300, Hypochlorites.)

8. *Manufacturer*: The party that manufactures, fabricates, or produces materials or products.

9. *Purchaser*: The person, company, or organization that purchases any materials or work to be performed.

10. *Supplier*: The party that supplies material or services. A supplier may or may not be the manufacturer.

11. *Organochlorine*: Any organic compound containing chlorine as a constituent. Organochlorine compounds can form when chlorine reacts with organic substances.

SECTION 4: REQUIREMENTS

Materials shall comply with the requirements of the Safe Drinking Water Act and other federal regulations for potable water, wastewater, and reclaimed water systems as applicable.

Sec. 4.1 Forms of Chlorine for Disinfection

The forms of chlorine that may be used in the water main disinfection operations are liquid chlorine (gas), sodium hypochlorite solution, and calcium hypochlorite granules or tablets.

4.1.1 *Liquid chlorine (gas)*. Liquid chlorine (gas) conforming to ANSI/AWWA B301 contains 100 percent available chlorine and is packaged in steel containers usually of 100-lb, 150-lb, or 1-ton (45.4-kg, 68.0-kg, or 907.2-kg) net chlorine weight. Liquid chlorine (gas) shall be used only (1) in combination with appropriate gas-flow chlorinators and ejectors to provide a controlled high-concentration solution feed to the water to be chlorinated; (2) under the direct supervision of someone familiar with the biological, chemical, and physical properties of liquid chlorine (gas) and who is trained and equipped to handle any emergency that may arise; and (3) when appropriate safety practices are observed to protect working personnel and the public. Makeshift equipment is not acceptable when liquid chlorine (gas) cylinders are used.

4.1.2 *Sodium hypochlorite.* Sodium hypochlorite conforming to ANSI/AWWA B300 is available in liquid form in glass, rubber-lined, or plastic containers typically ranging in size from 1 qt (0.95 L) to 5 gal (18.92 L). Containers of 30 gal (113.6 L) or larger may be available in some areas. Sodium hypochlorite contains approximately 5 percent to 15 percent available chlorine, and the storage conditions and time must be controlled to minimize its deterioration. (Available chlorine is expressed as a percent of weight when the concentration is 5 percent or less, and usually as a percent of volume for higher concentrations. Percent \times 10 = grams of available chlorine per liter of hypochlorite.)

4.1.3 *Calcium hypochlorite.* Calcium hypochlorite conforming to ANSI/AWWA B300 is available in granular form or in 5-g tablets and must contain approximately 65 percent available chlorine by weight. The material should be stored in a cool, dry, and dark environment to minimize its deterioration.

CAUTION: Tablets dissolve in approximately 7 hr and must be given adequate contact time. Do not use calcium hypochlorite intended for swimming pool disinfection, as this material has been sequestered and is extremely difficult to eliminate from the pipe after the desired contact time has been achieved.

Sec. 4.2 General Considerations for All Methods of Chlorination

4.2.1 *General.* Four methods of chlorination are explained in this section: tablet, continuous feed, slug, and spray. The tablet method gives an initial chlorine dose of 25 mg/L; the continuous-feed method gives a 24-hr chlorine residual of not less than 10 mg/L; the slug method gives a 3-hr exposure of not less than 50 mg/L free chlorine; and the spray method gives a 30-min exposure of not less than 200 mg/L free chlorine. Caution should be used with highly chlorinated water when conducting hydrostatic pressure testing and with high-volume flushing of water.

4.2.2 *Flushing.* Potable water shall be used for disinfection, hydrostatic pressure testing, and flushing. Drainage should take place away from the construction or work area. Adequate drainage must be provided during flushing. If applicable, the valve(s) isolating the main from existing system should be locked out and tagged out to prevent unintentional release of the elevated chlorine residual water used for disinfection.

4.2.3 *Dechlorination.* When dechlorination is required, it is recommended that any high-velocity flushing be completed prior to disinfection. Dechlorination equipment may not be capable of handling high flows with high levels of chlorine.

Table 1 Weight of calcium hypochlorite granules to be placed at beginning of main and at each 500-ft (150-m) interval

Pipe Diameter (d)		Calcium Hypochlorite Granules	
<i>in.</i>	<i>(mm)</i>	<i>oz</i>	<i>(g)</i>
4	(100)	1.7	(48)
6	(150)	3.8	(108)
8	(200)	6.7	(190)
10	(250)	10.5	(298)
12	(300)	15.1	(428)
14 and larger	(350 and larger)	$D^2 \times 15.1$	$D^2 \times 428$

Where D is the inside pipe diameter, in feet $D = d/12$

Sec. 4.3 Tablet/Granule Method of Chlorination

4.3.1 *Tablet method.* The tablet method consists of placing calcium hypochlorite granules or tablets in the water main during installation and then filling the main with potable water to create a chlorine solution. This method may be used only if the pipes and appurtenances are kept clean and dry during construction.

WARNING: This procedure must not be used on solvent-welded plastic or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

4.3.2 *Placement of calcium hypochlorite granules during construction.* Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft (150-m) intervals. The quantity of granules at each location shall be as shown in Table 1.

4.3.3 *Placement of calcium hypochlorite tablets during construction.* Calcium hypochlorite tablets (5-grams) shall be placed in the upstream end of each section of pipe to be disinfected, including branch lines. Also, at least one tablet shall be placed in each hydrant branch and in other appurtenances. The number of 5-g tablets required for each pipe section shall be $0.0012 d^2 L$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe. Calcium hypochlorite tablets shall be attached by an adhesive meeting the requirements of NSF/ANSI 61. There shall be adhesive only on the broadside of the tablet attached to the surface of the pipe. Attach tablets inside and at the top of the main. If the tablets are attached before the pipe section is placed in

Table 2 Number of 5-g calcium hypochlorite tablets required for dose of 25 mg/L*

Pipe Diameter		Length of Pipe Section, <i>ft (m)</i>				
		13 (4.0) or less	18 (5.5)	20 (6.1)	30 (9.1)	40 (12.2)
<i>in.</i>	<i>(mm)</i>	Number of 5-g Calcium Hypochlorite Tablets				
4	(100)	1	1	1	1	1
6	(150)	1	1	1	2	2
8	(200)	1	2	2	3	4
10	(250)	2	3	3	4	5
12	(300)	3	4	4	6	7
16	(400)	4	6	7	10	13

*Based on 3.25-g available chlorine per tablet

the trench, their positions shall be marked on the pipe exterior to indicate that the pipe has been installed with the tablets at the top.

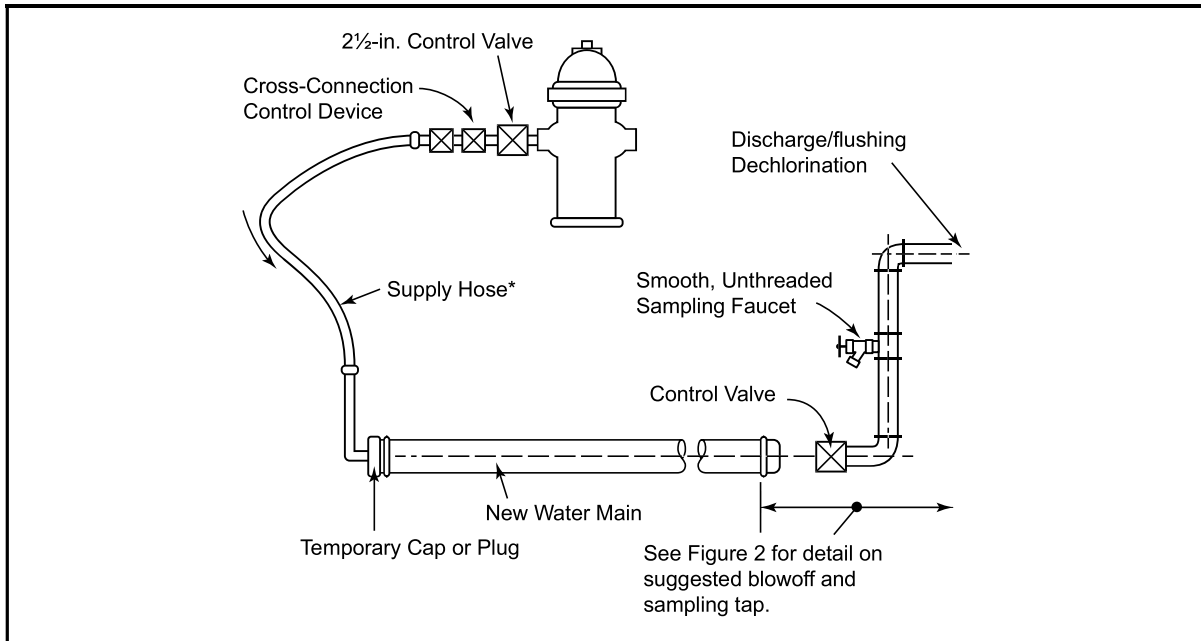
4.3.4 *Filling and contact time.* When installation has been completed, the main shall be filled with water such that the full pipe velocity is no greater than 1 ft/sec (0.3 m/sec). Fill rate must be carefully controlled to ensure tablets do not come loose from pipe. Precautions shall be taken to ensure that air pockets are eliminated. As an optional procedure, if required by the purchaser, water used to fill the new main shall be supplied through a temporary connection that shall include an appropriate cross-connection control device, consistent with the degree of hazard, for backflow protection of the active distribution system (see Figure 1).

The chlorinated water shall remain in the pipe for at least 24 hr. If the water temperature is less than 41°F (5°C), the water shall remain in the pipe for at least 48 hr. A detectable free chlorine residual (≥ 0.2 mg/L) shall be found at each sampling point after the 24- or 48-hr period.

Sec. 4.4 Continuous-Feed Method of Chlorination

4.4.1 *Continuous-feed method.* The continuous-feed method consists of completely filling the main with potable water, removing air pockets, then flushing the completed main to remove particulates, and refilling the main with potable water that has been chlorinated to 25 mg/L. After a 24-hr holding period in the main there shall be a free chlorine residual of not less than 10 mg/L.

4.4.2 *Preliminary flushing.* Before the main is chlorinated, it shall be filled with potable water to eliminate air pockets and flushed to remove particulates. The flushing velocity in the main shall not be less than 3.0 ft/sec (0.91 m/sec) unless



NOTE: Figure 1 applies to pipes with diameters 4 in. (100 mm) through 12 in. (300 mm). Larger sizes must be handled on a case-by-case basis.

*Clean potable-water hose only. Size and number of taps per Table 3. This hose must be removed during the hydrostatic pressure test.

Figure 1 Suggested temporary flushing/testing connection

Table 3 Required flow and openings (either taps or hydrants) to flush pipelines at 3.0 ft/sec (0.91 m/sec) (40 psi [276 kPa] residual pressure in water main)*

Pipe Diameter		Flow Required to Produce 3.0 ft/sec (approx.) Velocity in Main		Size of Tap Used, in. (mm)			Number of Hydrant Outlets	
				1 (25)	1½ (38)	2 (51)		
in.	(mm)	gpm	(L/sec)	Number of Taps Required on Pipe†			2½-in. (64-mm)	4½-in. (114 mm)
4	(100)	120	(7.4)	1	—	—	1	1
6	(150)	260	(16.7)	—	1	—	1	1
8	(200)	470	(29.7)	—	2	—	1	1
10	(250)	730	(46.3)	—	3	2	1	1
12	(300)	1,060	(66.7)	—	—	3	2	1
16	(400)	1,880	(118.6)	—	—	5	2	1

*With a 40-psi (276-kPa) pressure in the main with the hydrant flowing to atmosphere, a 2½-in. (64-mm) hydrant outlet will discharge approximately 1,000 gpm (63.1 L/sec); and a 4½-in. (114-mm) hydrant outlet will discharge approximately 2,500 gpm (160 L/sec).

†Number of taps on pipe based on 3.0-ft/sec discharge through 5 ft (1.5 m) of galvanized iron (GI) pipe with one 90° elbow.

the purchaser determines that conditions do not permit the required flow to be discharged to waste. Table 3 shows the rates of flow required to produce a velocity of 3.0 ft/sec (0.91 m/sec) in commonly used sizes of pipe. (NOTE: flushing is no substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity, and pigging of the main, or other suitable method acceptable to the purchaser, may be required.) Where such flow rates are not possible, flushing at the maximum expected flow rate for the line for 2–3 volumes may be acceptable. For larger mains, pigging (or other suitable method acceptable to the purchaser) is an option in place of high velocity flushing.

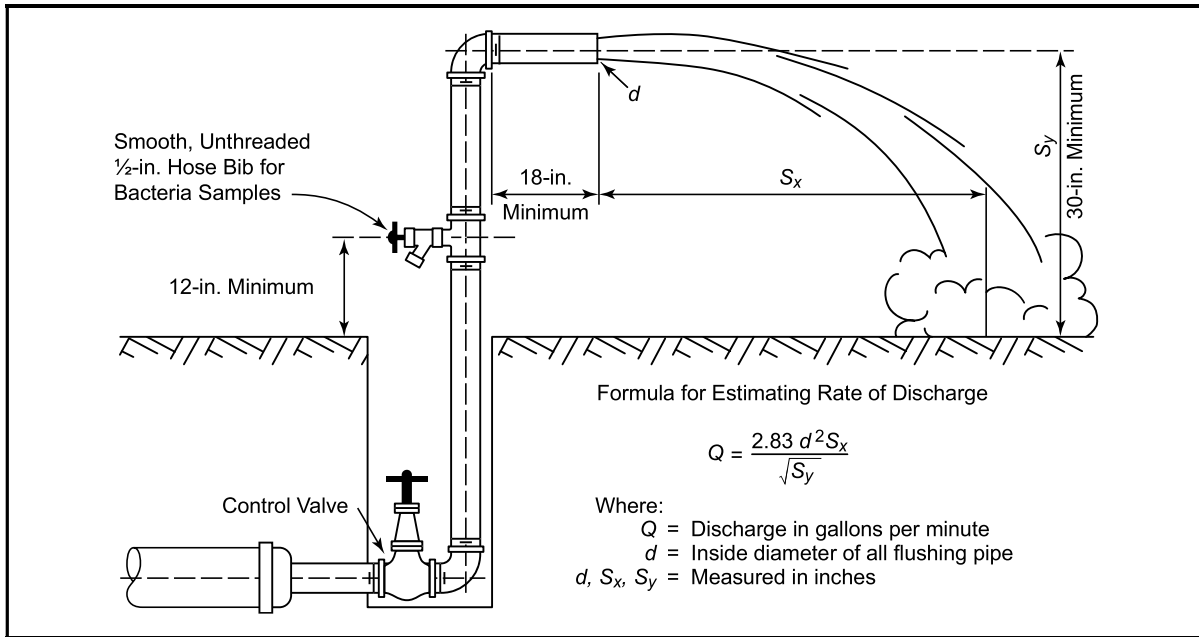
For 24-in. (600-mm) or larger diameter mains, an acceptable alternative to flushing is to broom-sweep the main, carefully removing sweepings prior to filling and chlorinating the main. WARNING: OSHA requirements for confined space need to be addressed before entering a pipeline.

4.4.3 Procedure for chlorinating the main.

1. Potable water may be supplied from a temporary backflow-protected connection to the existing distribution system or other supply source approved by the purchaser. The cross-connection control device shall be consistent with the degree of hazard for backflow protection of the active distribution system (see Figure 1). The flow shall be at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated using a Pitot gauge in the discharge, measuring the time to fill a container of known volume, or measuring the trajectory of the discharge and using the formula shown in Figure 2. The main should undergo hydrostatic testing prior to disinfection.

2. At a point not more than 10 ft (3 m) downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. To ensure that an appropriate concentration is achieved, the free chlorine concentration shall be measured at regular time intervals in accordance with the procedures described in *Standard Methods for the Examination of Water and Wastewater* or AWWA Manual M12, or using appropriate chlorine test kit (see appendix A).

Table 4 gives the amount of chlorine required for each 100 ft (30.5 m) of pipe for various pipe diameters. Solutions with a minimum 1 percent chlorine concentration may be prepared with sodium hypochlorite or calcium hypochlorite. The latter solution requires 1 lb (454 g) of calcium hypochlorite in 8 gal (30.3 L) of water.



NOTE: This figure applies to pipes up to and including 8-in. (200-mm) diameter.

Figure 2 Suggested combination blowoff and sampling tap

Table 4 Chlorine required to produce an initial 25-mg/L concentration in 100 ft (30.5 m) of pipe by diameter

Pipe Diameter		100% Chlorine		1% Chlorine Solution	
<i>in.</i>	<i>(mm)</i>	<i>lb</i>	<i>(g)</i>	<i>gal</i>	<i>(L)</i>
4	(100)	0.013	(5.9)	0.16	(0.6)
6	(150)	0.030	(13.6)	0.36	(1.4)
8	(200)	0.054	(24.5)	0.65	(2.5)
10	(250)	0.085	(38.6)	1.02	(3.9)
12	(300)	0.120	(54.4)	1.44	(5.4)
16	(400)	0.217	(98.4)	2.60	(9.8)

3. Chlorine application shall not cease until the entire main is filled with chlorinated water. The chlorinated water shall be retained in the main for at least 24 hr, during which time valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. At the end of this 24-hr period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L of free chlorine.

4. Direct-feed chlorinators, which operate solely from gas pressure in a chlorine cylinder, shall not be used for the application of liquid chlorine (gas). (The

danger of using direct-feed chlorinators is that water pressure in the main can exceed gas pressure in the chlorine cylinder. This allows backflow of water into the cylinder, resulting in severe cylinder corrosion and the escape of chlorine gas.)

The preferred equipment for applying liquid chlorine (gas) is a solution-feed, vacuum-operated chlorinator and a booster pump. The vacuum-operated chlorinator mixes the chlorine gas in solution water; the booster pump then injects the chlorine solution into the main to be disinfected. Hypochlorite solutions may be applied to the water main with a chemical-feed pump designed for feeding chlorine solutions. Feed lines shall be made of material capable of withstanding the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main.

Sec. 4.5 Slug Method of Chlorination

4.5.1 *Slug method.* The slug method consists of completely filling the main to eliminate air pockets; flushing the main to remove particulates; then slowly flowing through the main a slug of water dosed with chlorine to a concentration of 100 mg/L. The slow rate of flow ensures that all parts of the main and its appurtenances will be exposed to the highly chlorinated water for a period of not less than 3 hr.

4.5.2 *Preliminary flushing.* Same as Sec. 4.4.2.

4.5.3 *Procedure for chlorinating the main.*

1. Potable water may be supplied from a temporary backflow-protected connection to the existing distribution system or other supply source approved by the purchaser. The cross-connection control device shall be consistent with the degree of hazard for backflow protection of the active distribution system (see Figure 1). The flow shall be at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated using a Pitot gauge in the discharge, measuring the time to fill a container of known volume, or measuring the trajectory of the discharge and using the formula shown in Figure 2. The main should undergo hydrostatic testing prior to disinfection.

2. At a point not more than 10 ft (3 m) downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 100 mg/L free chlorine. To ensure that this concentration is achieved, the free chlorine concentration shall be measured at regular time intervals sufficient to guide the completion of the successful loading of the target chlorine concentration. The chlorine shall be applied

continuously and for a sufficient period to develop a solid column, or slug, of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/L for at least 3 hr.

3. The free chlorine residual shall be measured in the slug as it moves through the main. If at any time it drops below 50 mg/L, the flow shall be stopped; chlorination equipment shall be relocated at the head of the slug; and, as flow resumes, chlorine shall be applied to restore the free chlorine in the slug to not less than 100 mg/L.

4. As chlorinated water flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

Sec. 4.6 Spray Disinfection for Large Transmission Lines

For very large transmission mains (where personnel or equipment may safely enter the pipe), spray disinfection may be an appropriate and efficient means of achieving disinfection. For this method, refer to ANSI/AWWA C652, Sec. 4.3.2 (Disinfection of Water Storage Facilities; Chlorination Method 2). In general, once pipe is cleaned, spray a 200-mg/L free chlorine solution on all surfaces. After 30 min, fill line and sample as described in Sec. 5.1.

Sec. 4.7 Basic Disinfection Procedure for New Mains

The basic disinfection procedure consists of

1. Inspecting materials to be used to ensure their integrity.
2. Preventing contaminating materials from entering the water main during storage, construction, or repair and noting potential contamination at the construction site.
3. Removing, by flushing or other means, those materials that may have entered the water main or appurtenances.
4. Preventing contamination of existing mains from cross-connection during flushing, pressure testing, and disinfection.
5. Pressure testing the water main to ensure the main meets the purchaser's allowable leakage rate. Hydrostatic pressure tests should be conducted with potable water.
6. Chlorinating and adequately documenting the process used for disinfection.
7. Flushing the chlorinated water from the main. Refer to ANSI/AWWA C655 Field Dechlorination for dechlorination procedures, if dechlorination is required.

8. Determining the bacteriological quality of water samples collected from the pipe by laboratory test after disinfection.

9. Final connecting of the newly disinfected water main to the active distribution system without sacrificing sanitary practices and conditions.

Sec. 4.8 Preventive and Corrective Measures During New Construction

4.8.1 *General.* Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing these organisms. Therefore, the procedures of this section must be observed to ensure that a water main and its appurtenances have been thoroughly cleaned for the final disinfection by chlorination. Also, any connection of a new water main to the active distribution system before the receipt of satisfactory bacteriological samples may constitute a cross-connection. Therefore, the new main must be isolated until bacteriological tests described in Section 5 of this standard are satisfactorily completed.

4.8.2 *Keeping pipe clean and dry.* The interiors of pipes, fittings, and valves shall be protected from contamination.

4.8.2.1 *Openings.* Openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Rodent-proof plugs may be used when watertight plugs are not practicable and when thorough cleaning will be performed by flushing or other means.

4.8.2.2 *Stringing pipe.* Pipe delivered for construction shall be strung to minimize the entrance of foreign material.

4.8.2.3 *Delays.* Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the lower the risk of contamination.

4.8.3 *Joints.* Joints of pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is free of standing water and mud that may enter the pipe.

4.8.4 *Packing materials.* Yarning or packing material shall consist of molded or tubular rubber rings, rope of treated paper, or other approved materials. Materials such as jute or hemp shall not be used. Packing material shall be handled in a manner that avoids contamination.

4.8.5 *Sealing materials.* No contaminated material or any material capable of supporting growth of microorganisms shall be used for sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in

potable water meeting the requirements of NSF/ANSI 61 and shall not contribute odors. It shall be delivered to the job in closed containers and shall be kept clean and applied with dedicated clean applicators.

4.8.6 *Cleaning and swabbing.* If dirt enters the pipe, it shall be removed and the interior pipe surface swabbed with a minimum 1 percent free chlorine disinfecting solution. If, in the opinion of the purchaser, the dirt remaining in the pipe will not be removed using the flushing operation, the interior of the pipe shall be cleaned using mechanical means, such as a hydraulically propelled foam pig (or other suitable device acceptable to the purchaser) in conjunction with the application of a minimum 1 percent free chlorine disinfecting solution. The cleaning method used shall not force mud or debris into the interior pipe-joint spaces and shall be acceptable to the purchaser.

4.8.7 *Wet-trench construction.* If it is not possible to keep the pipe and fittings dry during installation, a scour flush at 3.0 ft/sec (0.91 m/sec) or greater for a minimum of three pipe volumes (see Table 3) followed by slug or continuous-feed chlorination and bacteria testing before release is required. For larger mains, pigging or other suitable method acceptable to the purchaser is an option in place of high-velocity flushing.

4.8.8 *Flooding by storm or accident during construction.* If the main is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the main is clean. The section exposed to the floodwater shall then be filled with a chlorinated potable water that, at the end of a 24-hr holding period, will have a free chlorine residual of not less than 25 mg/L. The chlorinated water may then be drained or flushed from the main. If chemical contamination occurs, such as a hydraulic oil leak or petroleum product spill, the pipe sections exposed to the contamination should be replaced and not reused for potable water applications. After construction is completed, the main shall be disinfected using the continuous-feed, slug, or spray methods.

4.8.9 *Backflow protection (optional).** As an optional procedure (if required by the purchaser), the new water main shall be kept isolated from the active distribution system using a physical separation (see Figure 1) until satisfactory bacteriological testing has been completed and the disinfection water flushed out.

Water required to fill the new main for hydrostatic pressure testing, disinfection, and flushing shall be supplied through a temporary connection between the

* Optional Sec. 4.8.9 is not included as part of the standard unless required by the purchaser.

distribution system and the new main or other supply source approved by the purchaser. The temporary connection shall include an appropriate cross-connection control device consistent with the degree of hazard (a double check valve assembly or a reduced pressure zone assembly) and shall be disconnected (physically separated) from the new main during the hydrostatic pressure test. It will be necessary to reestablish the temporary connection after completion of the hydrostatic pressure test to flush out the disinfectant water prior to final connection of the new main to the distribution system. NOTE: Exposure to high levels of chlorine or high pH can cause severe irritation to customers. Also, the chlorinated water can be high in disinfection by-products.

Sec. 4.9 Final Flushing for New Mains

4.9.1 *Clearing the main of heavily chlorinated water.* After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or to prevent corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main fittings, valves, and branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use.

4.9.2 *Disposing of heavily chlorinated water.* The environment to which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine (see ANSI/AWWA C655 for neutralizing chemicals). Where necessary, federal, state, local, or provincial regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

Sec. 4.10 Final Connections to Existing Mains

Water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system. Sanitary construction practices must be followed during installation of the final connection so that there is no contamination of the new or existing water main with foreign material or groundwater.

4.10.1 *Connections equal to or less than one pipe length (generally ≤ 20 ft [6 m]).* The new pipe, fittings, and valve(s) required for the connection may be spray disinfected or swabbed with a minimum 1 percent solution of chlorine just

before being installed, if the total length of the connection from the end of a new main to the existing main is equal to or less than 20 ft (6 m).

4.10.2 *Connections greater than one pipe length (generally >20 ft [6 m]).* The pipe required for the connection must be set up aboveground, disinfected, and bacteriological samples taken, as described in Section 5, if the total length of the connection from the end of a new main to the existing main is greater than 20 ft (6 m). After satisfactory bacteriological sample results have been received for the predisinfected pipe, the pipe can be used in connecting the new main to the active distribution system. Between the time the satisfactory bacteriological sample results are received and the time that the connection piping is installed, the ends of the piping must be sealed with plastic wraps, watertight plugs, or caps.

Sec. 4.11 Disinfection Procedures When Cutting Into or Repairing Existing Pipe

4.11.1 *General.* The planned, unplanned, or emergency repair of a water main or appurtenance (e.g., valve) is time sensitive—an important goal is to minimize the disruption of water service to customers. Nonetheless, the repair work needs to be accomplished using sanitary and safe procedures by well-trained crews with proper supervision and guidance. Refer to preventive and corrective measures described previously in Sec. 4.8.2, 4.8.3, 4.8.4, and 4.8.5. Follow all personal protection precautions when working with chlorine solutions.

4.11.2 *Basic disinfection.* Work should follow basic disinfection and contamination prevention procedures:

1. Preventing contaminants from entering the existing pipe during the repair such as by maintaining positive pressure in the leaking pipe until the repair site on the pipe is fully exposed, by maintaining a dewatered trench, and by keeping all pipe materials being used in the repair in a clean and sanitary condition.

2. Inspecting and cleaning, followed by disinfection of spraying or swabbing with a minimum 1 percent chlorine solution:

- Exposed portions of existing pipe interior surfaces
- Pipe materials used in the repair
- Handheld materials and tools used to make the repair

3. As appropriate, advising affected customers to adequately flush their service lines upon return to service.

4.11.3 *Selection of disinfection procedure.* The disinfection procedure selected should be determined by the conditions and severity of the main break. Many leaks or breaks can be repaired under controlled conditions without depressurizing the water main, such as when applying a clamp to a small crack or hole,

thus preventing contaminants from entering the water system. In most other situations, the water main can be maintained pressurized until the break site is secured and the pipe is fully exposed. Some circumstances (e.g., severe erosion of the local environment or icing of the roadway) that impact public safety may require that water pressure be substantially reduced prior to exposing the pipe in the area of the leak. In some cases, situations become catastrophic where there is a pipe blow-out and a loss of water pressure prior to shutdown, requiring disinfection procedures equivalent to those of a new main installation. The procedures described in Sec. 4.11.3.1 through 4.11.3.3 describe the contamination risks and the associated disinfection and sampling requirements for different scenarios of pipeline repair. Specific situations not captured below need to be evaluated and the appropriate disinfection and sampling methods followed.

Note that the procedures explained in Sec. 4.11.3.1, 4.11.3.2, and 4.11.3.3 for distribution mains may need to be modified for large transmission mains. Large mains may need additional work (such as having a valve replaced or requiring a special order on a connection), may be out of service for more than a day, or may not be able to accommodate a scour flush. These modifications need to be made on a case-by-case basis but should still take into account the procedures outlined in ANSI/AWWA C651.

4.11.3.1 Controlled pipe repair without depressurization. In this situation, activities are well controlled and a full shutdown is not needed, thus maintaining positive pressure to the area of shutdown and around the break site at all times. The repair site is exposed and the trench is adequately dewatered so that the repair site can be cleaned and disinfected by spraying or swabbing with a minimum 1 percent chlorine solution. The water main is then returned to service with flushing to obtain three volumes of water turnover, making sure that the flushed water is visually clear. No bacteriological testing is necessary. It is advisable to check for a typical system chlorine residual, and if not found, to continue flushing until residuals are restored to levels maintained in the distribution system by the water utility—if the system operates with a disinfectant residual.

4.11.3.2 Controlled pipe repair with depressurization after shutdown. In this situation, after the repair site has been exposed and secured from trench soil/water contamination, the water main is depressurized by a shutdown to complete the repair. The repair site should be cleaned and disinfected by spraying or swabbing with a minimum 1 percent chlorine solution. The water main is then returned to service with flushing to scour the pipe and obtain three volumes of water turn-

over, making sure that the flushed water is visually clear. It is advisable to check for a typical system chlorine residual, and if not found, to continue flushing until residuals are restored to levels maintained in the distribution system by the water utility—if the system operates with a disinfectant residual.

When the existing pipe has to be opened and the interior surfaces of the water system exposed to the environment, additional procedures need to be followed. The existing pipe should be inspected and cleaned with the help of flushing water into the trench, where possible, until the flush water runs visually clear. The repair site should be accessible and the trench adequately dewatered so that the repair site can be cleaned and disinfected by spraying or swabbing with a minimum 1 percent chlorine solution. Additionally, any accessible upstream and downstream interior of the existing pipe should be disinfected by swabbing or spraying with a minimum 1 percent chlorine solution. If the repair requires a full pipe section replacement, the new pipe should be inspected, cleaned, and disinfected from both ends by swabbing with a minimum 1 percent chlorine solution. The water main may then be returned to service after flushing to scour the pipe and obtain three volumes of water turnover. The flushed water should run visually clear, have a measurable chlorine residual if the system operates with a residual, and be checked with bacteriological testing. The pipeline may be returned to service prior to obtaining bacteriological results.

4.11.3.3 Uncontrolled pipe break with a likelihood of water contamination or loss of sanitary conditions during repair. In situations in which the existing main to be repaired could not be protected and kept free of contamination and there are obvious signs of contamination (e.g., muddy trench water flowing into the broken pipe and a leaking sewer pipe in the trench, or catastrophic pipe failure where pipe is open and there is a likelihood that contamination was drawn into the active system) or when a controlled repair situation turns into a situation in which the internal pipe and water have become contaminated, the procedures outlined in Sec. 4.3, 4.4, 4.5, or 4.6 should be followed where practical. These methods specify chlorine doses of 25–300 mg/L; however, such levels may present greater harm if the line or services cannot be reliably isolated or shut down and exposure of customers to high concentrations of chlorine cannot be controlled. Free chlorine residuals up to 4 mg/L (based on annual averages) are allowed by federal drinking water regulations; therefore this level is suggested as a minimum to be maintained for at least 16 hr in conjunction with flushing, coliform sampling, and associated customer education. Such situations require careful review and need to balance the public health risks of the pipeline failure as well as the repair process.

Where practical and appropriate considering the risks of public exposure to high concentrations of chlorine, in addition to the procedures previously described in this standard, the section of pipe in which the break is located shall be isolated, all service connections shut off, and the section flushed and disinfected. If the slug chlorination method is employed, the dose may be increased to as much as 300 mg/L and the contact time reduced to as little as 15 min. After chlorination and repair, perform scour flushing at 3.0 ft/sec (0.91 m/sec) or greater for a minimum of three pipe volumes and continue until discolored water is not observed and the chlorine residual is restored to the levels maintained in the distribution system by the water utility.

For larger-diameter pipe (12 in. and greater), if a water velocity of 3.0 ft/sec (0.91 m/sec) cannot be achieved, it is desirable to flush at the maximum flow for the main until three pipe volumes have been displaced before returning the main to service. The flushed water should run visually clear, and have typical system chlorine residual (if the system operates with a disinfectant residual).

For very-large-diameter pipe (where personnel may safely enter the pipe), in lieu of flushing following disinfection, the interior of the pipe at the repair site may be cleaned by sweeping or high pressure wash using potable water before disinfection. Standing water and debris from the cleaning must be removed from the pipe prior to disinfection. The affected pipe shall be disinfected by swabbing or spraying with a minimum 1 percent chlorine solution.

After following the appropriate methods above, prior to returning the pipe to service, the efficacy of the disinfection procedure shall be verified by testing for the absence of coliform bacteria. If allowed by local regulations, the pipeline may be returned to limited service prior to obtaining bacteriological results with proper notification of the affected customers.

4.11.4 Temporary service lines. Temporary water service lines to customers during main repair activities shall be disinfected prior to use. Materials shall meet the NSF/ANSI 61 certification for potable water use. Disinfection should be accomplished by the procedures in Sec. 4.4 or 4.5 followed by scour flushing at 3.0 ft/sec (0.91 m/sec) or greater for a minimum of three pipe volumes (see Table 3), or until the water runs visually clear and preferably a measurable chlorine residual is restored.

SECTION 5: VERIFICATION

Sec. 5.1 Bacteriological Tests

5.1.1 *Standard conditions for new mains.* It should be recognized that the primary means of ensuring the sanitary integrity of a main are the sanitary handling of materials, the practices during construction, and continual inspection of work. After disinfection and final flushing such that typical system chlorine residuals are present, if the system operates with a residual, samples shall be collected as follows:

5.1.1.1 For new mains, the purchaser has two options for the bacteriological testing for total coliform analysis.

Option A: Before approving a main for release, take an initial set of samples and then resample again after a minimum of 16 hr using the sampling site procedures outlined. Both sets of samples must pass for the main to be approved for release.

Option B: Before approving a main for release, let it sit for a minimum of 16 hr without any water use. Then collect, using the sampling site procedures outlined and without flushing the main, two sets of samples a minimum of 15 min apart while the sampling taps are left running. Both sets of samples must pass for the main to be approved for release.

A set of samples includes all samples collected along the length of the pipeline, as described in Sec. 5.1.1.2.

5.1.1.2 For new mains, sets of samples shall be collected every 1,200 ft (370 m) of the new water main, plus one set from the end of the line and at least one from each branch greater than one pipe length.

5.1.1.3 If trench water has entered the new main during construction or if, in the opinion of the purchaser, excessive quantities of dirt or debris have entered the new main, bacteriological samples shall be taken at intervals of approximately 200 ft (61 m), and the sampling location shall be identified (see Sec. 5.1.3 for sampling location details). Samples shall be taken of water that has stood in the new main for at least 16 hr after final flushing has been completed.

5.1.1.4 A standard heterotrophic plate count (HPC) test may be required at the option of the purchaser because new mains do not typically contain coliform bacteria but often contain HPC bacteria. If sample results show HPC greater than 500 CFU/mL, flushing should resume and another set of HPC and coliform samples collected until no coliform are present and the HPC is less than 500 CFU/mL.

5.1.2 *Standard conditions for repaired mains.* It should be recognized that the primary means of ensuring the sanitary integrity of a main are the sanitary handling of materials, the practices during repair work, and continual inspection of work. After disinfection and final flushing, samples shall be collected as follows:

5.1.2.1 For repaired mains that were depressurized and/or wholly or partially dewatered, one set of samples may be required, and depending upon the sanitary conditions, the line may be reactivated prior to the completion of bacteriological testing. Samples shall be collected downstream of the repair site and at intervals of approximately 200 ft (61 m) within the length of pipe that was shut down. If direction of flow is not known, samples shall be collected on either side of the repair site. Refer to Sec. 4.11.

5.1.2.2 For repaired mains that were maintained under pressurized conditions at all times, disinfection and/or testing may not be required. Refer to Sec. 4.11.3.

5.1.2.3 However, under either main repair scenario, it is advisable where possible to provide a scour flush to clear before the release of the repaired section.

5.1.3 *Sampling procedure.* Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate, in accordance with Section 9060—Samples of *Standard Methods for the Examination of Water and Wastewater*. Hoses and fire hydrants are not recommended for the collection of samples that will be used to make decisions on the bacteriological quality of drinking water. However, if no sampling port is available, cleaned fire hydrants that have been cleared of standing water and/or other sanitized sampling apparatus (i.e., sanitized tubing, hose, gooseneck, spigot) may be used with the understanding that they do not represent optimum access to the water main for bacteriological sampling. A suggested combination blowoff and sampling tap used for mains up to and including 8-in. (200-mm) diameter is shown in Figure 2. There should be no water in the trench up to the connection for sampling. The sampling pipe must be dedicated and clean and disinfected and flushed prior to sampling. A corporation cock may be installed in the main with a copper-tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use and the corporation cock should be capped or taped for future reuse. If corporation cocks are placed at the 12 o'clock position, they may be struck more easily during future excavations.

5.1.4 *Sample results.* Samples shall be tested for bacteriological quality in accordance with *Standard Methods for the Examination of Water and Wastewater* and shall show the absence of coliform bacteria.

In addition, it is recommended that samples be tested for acceptable aesthetic quality (e.g., chlorine residual, pH, alkalinity, specific conductance, turbidity). Levels should be as expected or typical for the water system. For new mains, a standard heterotrophic plate count test may be required at the option of the purchaser because new mains do not typically contain coliform bacteria but often contain HPC bacteria. If sample results show HPC greater than 500 CFU/mL, flushing should resume and another set of HPC and coliform samples collected until no coliform are present and the HPC is less than 500 CFU/mL.

5.1.5 *Record of compliance.* The record of compliance shall be the bacteriological test results certifying that the water sampled is free of coliform bacteria contamination.

5.1.6 *Redisinfection.* If the initial disinfection fails to produce satisfactory bacteriological results, or if other results indicate unacceptable water quality, the main may be reflushed and shall be resampled. If check samples fail to produce acceptable results, the main shall be rechlorinated by the continuous-feed or slug method until satisfactory results are obtained—that being acceptable samples taken as described in Sec. 5.1.1.1.

NOTE: In the case of new mains, high velocities in the adjacent existing system, resulting from flushing the new main, may disturb sediment that has accumulated in the existing mains. When check samples are taken, it is advisable to sample water entering the new main to determine if excessive turbidity is present that could be interfering with results.

Sec. 5.2 **Optional Sampling and Testing**

If a pipeline is not promptly returned to service, the situation should be evaluated to determine if the water quality may have been impacted and if additional testing is warranted. Test results should confirm that the water quality is appropriate for distribution. Although this assessment is unique for each system, parameters considered for testing include disinfectant residual, total coliform bacteria, HPC, turbidity, pH, alkalinity, total chlorine, odor, and specific conductance.

SECTION 6: DELIVERY

This standard has no applicable information for this section.

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APPENDIX A

Chlorine Residual Testing

This appendix is for information only and is not a part of ANSI/AWWA C651.

SECTION A.1: DPD DROP DILUTION METHOD (FOR FIELD TEST)

The N, N-diethyl-p-phenylenediamine (DPD) drop dilution method of approximating total residual chlorine is suitable for concentrations above 10 mg/L, such as those applied in the disinfection of water mains or tanks.

Sec. A.1.1 Apparatus

1. A graduated cylinder for measuring distilled water.
2. An automatic or safety pipette.
3. Two dropping pipettes that deliver a 1-mL sample in 20 drops. One pipette is for dispensing the water sample, and the other is for dispensing the DPD and buffer solutions. The pipettes should not be interchanged.
4. A comparator kit containing a suitable range of standards.

Sec. A.1.2 Reagents

1. DPD indicator solution. Prepare as prescribed in *Standard Methods for the Examination of Water and Wastewater*.

Sec. A.1.3 Procedure

1. Add 10 drops of DPD solution and 10 drops of buffer solution (or 20 drops of combined DPD-buffer solution) to a comparator cell.
2. Fill the comparator cell to the 10-mL mark with distilled water.
3. With a dropping pipette, add the water sample one drop at a time; mix until a red color is formed that matches one of the color standards.
4. Record the total number of drops used and the final chlorine reading obtained (that is, the chlorine reading of the matched standard).
5. Calculate the milligrams per liter of free residual chlorine as follows:

$$\text{mg/L chlorine} = \frac{\text{reading} \times 200}{\text{drops of sample}}$$

SECTION A.2: HIGH-RANGE CHLORINE TEST KITS

Several manufacturers produce high-range chlorine test kits that are inexpensive, easy to use, and satisfactory for the precision required.

APPENDIX B

Chlorine Dosages

This appendix is for information only and is not a part of ANSI/AWWA C651.

Table B.1 Amounts of chemicals required to produce various chlorine concentrations in 100,000 gal (378.5 m³) of water*

Desired Chlorine Concentration in Water <i>mg/L</i>	Liquid Chlorine Required <i>lb (kg)</i>		Sodium Hypochlorite Required						Calcium Hypochlorite Required	
			5% Available Chlorine		10% Available Chlorine		15% Available Chlorine		65% Available Chlorine	
			<i>gal</i>	<i>(L)</i>	<i>gal</i>	<i>(L)</i>	<i>gal</i>	<i>(L)</i>	<i>lb</i>	<i>(kg)</i>
2	1.7	(0.77)	3.9	(14.7)	2.0	(7.6)	1.3	(4.9)	2.6	(1.18)
10	8.3	(3.76)	19.4	(73.4)	9.9	(37.5)	6.7	(25.4)	12.8	(5.81)
50	42.0	(19.05)	97.0	(367.2)	49.6	(187.8)	33.4	(126.4)	64.0	(29.03)

*Amounts of sodium hypochlorite are based on concentrations of available chlorine by volume. For either sodium hypochlorite or calcium hypochlorite, extended or improper storage of chemicals may have caused a loss of available chlorine.

Table B.2 Amounts of chemicals required to produce chlorine concentration of 200 mg/L in various volumes of water*

Volume of Water		Liquid Chlorine Required		Sodium Hypochlorite Required						Calcium Hypochlorite Required	
				5% Available Chlorine		10% Available Chlorine		15% Available Chlorine		65% Available Chlorine	
				<i>gal</i>	<i>L</i>	<i>gal</i>	<i>(L)</i>	<i>gal</i>	<i>(L)</i>	<i>gal</i>	<i>(L)</i>
10	(37.9)	0.02	(9.1)	0.04	(0.15)	0.02	(0.08)	0.02	(0.08)	0.03	(13.6)
50	(189.3)	0.10	(45.4)	0.20	(0.76)	0.10	(0.38)	0.07	(0.26)	0.15	(68.0)
100	(378.5)	0.20	(90.7)	0.40	(1.51)	0.20	(0.76)	0.15	(0.57)	0.30	(136.1)
200	(757.1)	0.40	(181.4)	0.80	(3.03)	0.40	(1.51)	0.30	(1.14)	0.60	(272.2)

*Amounts of sodium hypochlorite are based on concentrations of available chlorine by volume. For either sodium hypochlorite or calcium hypochlorite, extended or improper storage of chemicals may have caused a loss of available chlorine.



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1P-2M 43651-2015 (01/15) IW



Printed on Recycled Paper

ISBN 978-1-62576-046-3



9 781625 760463

ANSI/AWWA **C653-20**
(Revision of ANSI/AWWA C653-13)

AWWA Standard

Disinfection of Water Treatment Plants

Effective date: Sept. 1, 2020.

First edition approved by Board of Directors Jan. 25, 1987.

This edition approved June 11, 2020.

Approved by American National Standards Institute May 15, 2020.

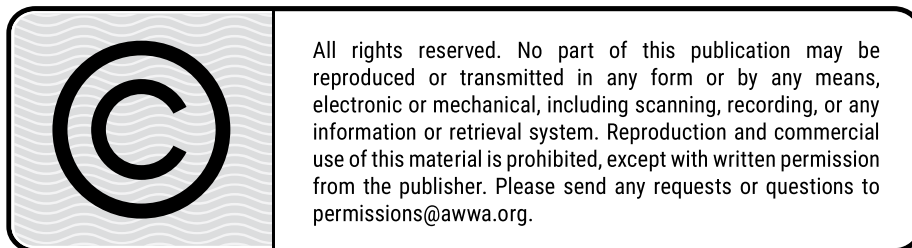
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ISBN-13, print: 978-1-64717-025-7

eISBN-13, electronic: 978-1-61300-565-1

DOI: <http://dx.doi.org/10.12999/AWWA.C653.20>

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C653.*

I. Introduction.

I.A. *Background.* This standard describes methods of disinfecting new treatment facilities before they are placed in service; existing treatment facilities before they are returned to service after construction, inspection, or other event causing potential contamination; and existing treatment facilities that, under normal operation, continue to demonstrate the presence of total coliform bacteria in the plant effluent. Because of the complexity and diversity of treatment plants, the formulation of firm rules for application of this standard is not practicable. Nevertheless, principles described in this standard do apply generally and must be followed to enable proper disinfection of treatment plant facilities. Several alternative disinfection procedures are provided for those parts of the treatment plant generally referred to as conveyance facilities (such as pipes) and storage facilities (such as basins tanks, clearwells, and so forth).

Disinfection is required for all portions of the facility that are either downstream from the filter influent, downstream from the first point of primary disinfectant application in the treatment process, or all portions of a facility if no primary disinfection is provided (for example, some groundwater systems) as described in Sec. 4.2. The section of the treatment facility handling raw water does not need to be disinfected but should be thoroughly cleaned as described in Sec. 4.1.

I.B. *History.* The first edition of ANSI/AWWA C653 was approved by the AWWA Board of Directors on Jan. 25, 1987. Subsequent editions were approved on Feb. 2, 1997; Jan. 19, 2003; and June 9, 2013. This edition was approved June 11, 2020.

II. Special Issues.

II.A. *Alternative Disinfection Procedures.* The utility should decide which of the alternative disinfection procedures is most suitable for a given situation. Choice of the procedure used should include consideration of the availability of materials and equipment for the disinfection operation, the training of personnel to perform the disinfection, and safety considerations. For example, gas chlorination should be used only where properly designed and constructed equipment is available; makeshift

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

equipment is not acceptable when liquid chlorine gas cylinders are used. Spray equipment should be used inside tanks or enclosures only when thorough ventilation is assured or when appropriate protection for personnel is provided. If a procedure is selected that requires the disposal of highly chlorinated water, then thorough consideration should be given to the impact on the environment and local regulations. If there is any question that the discharge of chlorinated waste may cause damage to aquatic life, wildlife, human health, physical installations, or other downstream water uses of any type, then a reducing agent should be applied to water being disposed of to thoroughly neutralize the chlorine residual remaining in the water. Refer to ANSI/AWWA C655, Field Dechlorination for appropriate dechlorination requirements.

Disinfection of treatment plants requires high levels of disinfectant to be applied to ensure bacteria and other potential pathogens are inactivated. It should be noted that pH and temperature are two important factors affecting the disinfection process. Above pH 9, chlorine exists primarily in the form of hypochlorite, which is not as effective a disinfectant as hypochlorous acid, which is more prevalent at pH less than 9. Water temperature also affects the disinfection process; disinfection at low temperatures is not as effective as at high temperatures.

Disinfectants other than chlorine may be appropriate to use. While this standard describes only the use of liquid chlorine, sodium hypochlorite solutions, and calcium hypochlorite, the applicability of other disinfectants should be evaluated. Ozone and chemical cleaners have been used, and these warrant further investigation. Whichever disinfectant or method is selected, approval from the local regulatory agency may be required.

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. *Purchaser Options and Alternatives.* The following information should be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C653, Disinfection of Water Treatment Plants, of latest revision.
2. Whether compliance with NSF*/ANSI/CAN† 60, Drinking Water Treatment Chemicals—Health Effects, is required.
3. Details of federal, state, and local requirements (Sec. 4.1.1).

* NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105

† Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottawa, ON K1P 6L5 Canada.

4. Form of chlorine to be used (Sec. 4.3).
5. Method of chlorination of piping (Sec. 4.4.1).
6. Precautions for disposal of chlorinated water (Sec. 4.4.3.6).
7. Bacteriological testing method to be used (Sec. 5.1).
8. Redisinfection, if required (Sec. 5.1).
9. Method of dechlorination, if required.

III.B. *Modification to Standard.* Any modification of the provisions, definitions, or terminology in this standard must be provided by the purchaser.

IV. Major Revisions. Major changes made to the standard in this revision include the following:

1. The scope was updated to include the use of disinfection on all portions of a facility if no primary disinfection is provided (Sec. I.A, Sec. 1.1, Sec. 4.2).
2. Definitions for potable water, reclaimed water, and wastewater were added (Sec. 3).
3. Sec. 4.3 *Forms of Chlorine for Disinfection* was updated to align with C652.

V. Comments. If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711, FAX at 303.795.7603, write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098, or email at standards@awwa.org.

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ANSI/AWWA C653-20
(Revision of ANSI/AWWA C653-13)

AWWA Standard

Disinfection of Water Treatment Plants

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes chlorination materials, procedures, and requirements for disinfection of new treatment facilities and existing water treatment facilities temporarily taken out of service for cleaning, inspection, maintenance, painting, repair, or any other activity or event that might lead to contamination of water. Typically, this standard applies to treatment components, including filter basins, filter media, clearwells, pump suction wells, and associated piping and appurtenances located downstream from the filter influent, or from the first point of application of disinfectant in the treatment process, or all portions of a facility if no primary disinfection is provided. The disinfection method employed is surface contact with a high-strength chlorine solution for a specific time period. The absence of total coliform bacteria in addition to the use of proper disinfection practices is confirmation that the disinfection process has been accomplished in compliance with this standard.

Sec. 1.2 Purpose

The purpose of this standard is to define the minimum requirements for the disinfection of water treatment plants, including facility preparation, application

of chlorine to the interior surfaces of water treatment units, and sampling and testing for the presence of total coliform bacteria.

Sec. 1.3 Application

This standard can be referenced in specifications for the disinfection of water treatment plants and can be used as a guide for facility preparation, application of chlorine, and sampling and testing for the presence of total coliform bacteria. The stipulations of this standard apply when this document has been referenced and then only to the disinfection of water treatment plants.

SECTION 2: REFERENCES

This standard references the following documents. In their latest editions, they form a part of this standard to the extent specified within the standard. In any case of conflict, the requirements of this standard shall prevail.

ANSI*/AWWA B100—Granular Filter Material.

ANSI/AWWA B300—Hypochlorites.

ANSI/AWWA B301—Liquid Chlorine.

ANSI/AWWA B604—Granular Activated Carbon.

ANSI/AWWA C651—Disinfecting Water Mains.

ANSI/AWWA C652—Disinfection of Water-Storage Facilities.

ANSI/AWWA C655—Field Dechlorination.

AWWA Manual M3—*Safety Management for Water Utilities*.

Chlorine Institute[†]—*Chlorine Basics*.

Safety Data Sheets for forms of chlorine used (provided by suppliers).

NSF[‡]/ANSI/CAN[§] 60—Drinking Water Treatment Chemicals—Health Effects

Standard Methods for the Examination of Water and Wastewater. APHA,[¶] AWWA, and WEF,** Washington, D.C.

Water Quality and Treatment. Prepared by AWWA. McGraw-Hill Book Co., New York.

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

† Chlorine Institute, 2001 L Street N.W., Suite 506, Washington, DC 20036.

‡ NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

§ Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottawa, ON K1P 6L5 Canada.

¶ American Public Health Association, 800 I Street NW, Washington, DC 20001.

** Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314.

SECTION 3: DEFINITIONS

The following definitions shall apply in this standard:

1. *Available chlorine:* A measure of the amount of chlorine in chlorinated lime, hypochlorite compounds, chloramines, and other materials that are used for disinfection compared to the amount in elemental (liquid or gaseous) chlorine.

2. *Chlorine, free:* Also called *free available chlorine*, the amount of chlorine available as dissolved gas (Cl_2), hypochlorous acid (HOCl), and hypochlorite (OCl^-) that is not combined with ammonia (NH_3) or other compounds in water that is available for disinfection.

3. *Chlorine residual:* Concentration of chlorine species present in water after the oxidant demand has been satisfied.

4. *Disinfectant:* Any oxidant, including, but not limited to, chlorine, chlorine dioxide, chloramine, and ozone, that is added to water in any part of the treatment or distribution process and is intended to kill or inactivate pathogenic microorganisms. For the purposes of this standard, the disinfectants to be used are chlorine solutions derived from liquid chlorine, sodium hypochlorite, or calcium hypochlorite. Other disinfectants may be appropriate to use but may require approval from the local regulatory agency.

5. *Disinfection:* A process that inactivates pathogenic microorganisms in water by chemical oxidants or equivalent agents.

6. *Liquid chlorine (gas):* The commercially available form of liquefied elemental chlorine gas as described in ANSI/AWWA B301. (The term *liquid chlorine* is sometimes used to describe a hypochlorite solution. This use of the term is discouraged. See ANSI/AWWA B300, Hypochlorites.)

7. *Potable water:* Water that is safe and satisfactory for drinking and cooking.

8. *Purchaser:* The person, company, or organization that purchases any materials or work to be performed.

9. *Reclaimed water:* Wastewater that becomes suitable for beneficial use as a result of treatment.

10. *Wastewater:* A combination of the liquid and water-carried waste from residences, commercial buildings, industrial plants, and institutions, together with any groundwater, surface water, and stormwater that may be present.

SECTION 4: REQUIREMENTS

Sec. 4.1 Materials and Cleaning

4.1.1 *Materials.* Materials shall comply with the requirements of the Safe Drinking Water Act and other federal regulations for potable water, wastewater, and reclaimed water systems as applicable.

4.1.2 *Cleaning.* The entire newly constructed treatment facility (including treatment units and piping not requiring disinfection under the provisions of this standard) shall be thoroughly cleaned before the new facility is disinfected and placed in service. Existing treatment units and piping temporarily taken out of service for inspection, maintenance, repair, or any other activity or event that might lead to contamination of the process water shall be thoroughly cleaned before being disinfected and returned to service. Cleaning agents used shall not contain hazardous substances or deleterious compounds that would cause a violation of water quality health-effects standards if subsequently introduced into the water supply during disinfection and filling operations.

Scaffolding, planks, tools, rags, and any other material not part of the structural or operating facilities of the treatment unit shall be removed. Once the materials are removed, the surfaces of the walls, floors, and attached structures shall be thoroughly cleaned with a high-pressure water jet, or by sweeping, scrubbing, or other equally effective means. Water, paint flakes, sediment, dirt, and foreign material accumulated during this cleaning operation shall be discharged, vacuumed, or otherwise removed from the unit.

Sec. 4.2 Units Requiring Disinfection

Because of the variety of water treatment plants and the components and types of treatment used, it is difficult to generalize disinfection of all treatment plants. However, the goals of the process are as follows. Disinfection is required for elements of the treatment plant that are in contact with disinfected water under normal plant operations and elements of the entire treatment plant if primary disinfection is not provided (for example, some groundwater systems). Some components may not be compatible with chlorine products (granular activated carbon [GAC], biologically active filters, some membranes, etc.); however, basins, clearwells, pump suction wells, pipes, and related appurtenances downstream of the point of disinfection during normal plant operations must be disinfected. For plants using filtration with gravel, silica, sand, anthracite, or other mixed media materials,

except GAC, disinfection of these areas is described in Sec. 4.4.3. For GAC, Sec. 4.4.3.5 applies. Areas of the plant not requiring disinfection but which must be thoroughly cleaned, as described in Sec. 4.1, include raw water inlets, chemical feed systems, components of the plant before the first point of disinfection, and areas not compatible with chlorine disinfection. It is recommended that equipment and storage facilities of chemical feed systems that inject downstream of the first point of application of process disinfection be cleaned and rinsed with disinfectant before being placed in service. It is recommended that a plan be developed identifying the areas of the plant to be disinfected before the start of the disinfection process.

Sec. 4.3 Forms of Chlorine for Disinfection

The forms of chlorine that may be used in the disinfecting operations are liquid chlorine (gas), sodium hypochlorite solution, and calcium hypochlorite granules or tablets. Appropriate personal protective equipment should be worn when using these products.

4.3.1 *Liquid chlorine (gas)*. Liquid chlorine, conforming to ANSI/AWWA B301, contains 100 percent available chlorine and is packaged in steel containers usually of 100-lb, 150-lb, or 1-ton (45.4-kg, 68.0-kg, or 907.2-kg) net chlorine weight. Liquid chlorine (gas) shall be used only (1) in combination with appropriate gas-flow chlorinators and ejectors to provide a controlled high-concentration solution feed to the water to be chlorinated; (2) under the direct supervision of a person who is familiar with chlorine's physiological, chemical, and physical properties, and who is trained and equipped to handle any emergency that may arise; and (3) when appropriate safety practices to protect working personnel and the public are observed. Makeshift equipment is not acceptable when liquid chlorine (gas) cylinders are used.

4.3.2 *Sodium hypochlorite*. Sodium hypochlorite, conforming to ANSI/AWWA B300, is available in liquid form in glass, rubber-lined, or plastic containers typically ranging in size from 1 qt (0.95 L) to 5 gal (18.92 L). Containers of 30 gal (113.6 L) or larger may be available in some areas.

Sodium hypochlorite contains approximately 5 percent to 15 percent available chlorine, and the storage conditions and time must be controlled to minimize its deterioration. Available chlorine is expressed as a percent of weight when the concentration is 5 percent or less and usually as a percent of volume for higher concentrations. Percent \times 10 = grams of available chlorine per liter of hypochlorite.

4.3.3 *Calcium hypochlorite*. Calcium hypochlorite, conforming to ANSI/AWWA B300, is available in granular form or in small tablets and contains

approximately 65 percent available chlorine by weight. Tablets dissolve in approximately 7 h, and adequate contact time must be given. The material should be stored in a cool, dry, dark environment to minimize its deterioration.

Caution: Do not use calcium hypochlorite intended for swimming pool disinfection, as this material has been sequestered and is extremely difficult to eliminate after the desired contact time has been achieved.

Sec. 4.4 Plant Disinfection Procedures

4.4.1 *Plant piping.* Plant process piping and pump stations shall be disinfected using one of three alternative methods described in ANSI/AWWA C651, including application methods, chlorine solution strengths, contact times, disposal of highly chlorinated water, and bacteriological sampling and testing.

4.4.2 *Tanks and clearwells.* Water storage tanks, clearwells, and similar receptacles shall be disinfected using one of the methods described in ANSI/AWWA C652, including application methods, chlorine solution strengths, contact times, disposal of highly chlorinated water, and bacteriological sampling and testing.

4.4.3 *Filters.* This section describes disinfection of filter basins and gravel, silica sand, anthracite, and other mixed media materials except GAC.

4.4.3.1 *Preparation.* Before any filter material is placed, the filter basin itself shall be thoroughly cleaned as described in Sec. 4.1.

4.4.3.2 *Media placement.* After the filter basin has been cleaned, the filter media shall be placed in the basin in accordance with ANSI/AWWA B100, using reasonable precautions to maintain cleanliness. Following placement, the filter media shall be backwashed and prepared for service in accordance with ANSI/AWWA B100.

4.4.3.3 *Disinfection procedure.* After all other work is completed, and before the filter is placed in service, the entire filter basin up to the maximum water level shall be disinfected by one of the following methods. Sufficient chlorine shall be injected into the backwash water to produce a free chlorine residual of at least 25 mg/L throughout the filter. The chlorinated water shall be allowed to stand in the filter for at least 12 h. At the end of the 12-h contact time, the chlorinated water shall be tested to determine the amount of free chlorine residual. If the free residual is less than 15 mg/L, the chlorination process shall be repeated. Sufficient tests should be made both from the top and bottom of the unit (and at intermediate points if feasible) to ensure the residual readings measure the lowest chlorine level

existing in the unit at the end of the 12-h contact period. If satisfactory chlorine residuals are obtained after the chlorine contact period, the filter shall be run to waste or backwashed thoroughly to remove the highly chlorinated water.

4.4.3.4 Alternative procedure. Sufficient chlorine shall be continuously injected into the filter influent water while filtering to waste to produce a free residual of at least 25 mg/L. When water with at least a 25 mg/L free residual chlorine concentration reaches the filter-to-waste, the flow of water shall be stopped, and the filter shall be held full of the chlorinated water for a period of not less than 12 h. At the end of the 12-h contact time, the chlorinated water shall be tested to determine the free residual. If the free residual is less than 15 mg/L, the chlorination process shall be repeated. Sufficient tests should be made both from the top and bottom of the unit (and at intermediate points if feasible) to ensure the residual readings measure the lowest chlorine level existing in the unit at the end of the 12-h contact period. After the chlorine contact period, if satisfactory chlorine residuals are obtained, the filter shall be run to waste or backwashed thoroughly to remove the highly chlorinated water.

4.4.3.5 GAC filters. Disinfection of GAC (see ANSI/AWWA B604) gravity filters shall be similar to Sec. 4.4.3.1, 4.4.3.2, 4.4.3.3, and 4.4.3.4 except that in Sec. 4.4.3.2, all media and support gravel (see ANSI/AWWA B100) except GAC shall be placed in the filter before disinfection. Following disinfection according to Sec. 4.4.3.3 or 4.4.3.4, the GAC may be placed in the filter. The GAC must be stored and handled to avoid any contamination. Any equipment used in placing the GAC in the filter must be cleaned and disinfected with a 200 mg/L solution of free residual chlorine immediately before use. This includes shovels, spreading devices, or other equipment that comes in contact with the GAC. In addition, workers shall wear rubber boots and gloves that have been previously disinfected with a 200 mg/L free residual chlorine solution if coming in contact with the carbon or entering the filter. Disinfection of GAC pressure filter vessels shall follow Sec 4.4.2 before placement of GAC media.

4.4.3.6 Chlorinated discharge. If there is any question that the chlorinated discharge will cause damage to the environment, a reducing agent shall be applied to the water to neutralize the residual chlorine. Federal, state or provincial, and local environmental regulations may require special provisions or permits before disposal of highly chlorinated water. Refer to ANSI/AWWA C655, Field Dechlorination for appropriate dechlorination requirements.

SECTION 5: VERIFICATION

Sec. 5.1 Bacteriological Sampling

After the disinfection procedure is completed, and before the treatment unit or facility is placed in service, two or more samples shall be taken from the unit or facility a minimum of 30 min apart and shall be tested for the presence of total coliform bacteria in accordance with the *Standard Methods for the Examination of Water and Wastewater*. If none of the samples show the presence of total coliform bacteria, the unit or facility may be placed in service.

If any of the samples show the presence of total coliform bacteria, one of the following procedures shall be followed before placing the unit or facility in service.

1. Take repeat samples of all locations at least 24 h apart until two consecutive samples do not show the presence of total coliform bacteria.
2. Chlorinate the unit or facility in accordance with Sec. 4.4 and resample.

If a disinfected facility is not immediately returned to service, any delay should be evaluated to determine if the water quality may have been adversely impacted and if additional testing is warranted. Test results should confirm that the water quality is appropriate for distribution. Although this assessment is unique for each system, suggested parameters considered for testing include disinfectant residual, total coliform bacteria, turbidity, pH, alkalinity, odor, and specific conductance.

Sec. 5.2 Record of Compliance

The report of bacteriological test results certifying that the water discharged from the treatment facility is free of total coliform bacteria shall serve as the record of compliance.

SECTION 6: DELIVERY

This standard has no applicable information for this section.

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DAVIS BACON WAGE DECISION

YORK COUNTY – HEAVY CONSTRUCTION

"General Decision Number: ME20230033 04/07/2023

Superseded General Decision Number: ME20220033

State: Maine

Construction Type: Heavy

County: York County in Maine.

HEAVY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/06/2023
1	01/27/2023
2	04/07/2023

* IRON0007-033 03/16/2023

	Rates	Fringes
IRONWORKER, STRUCTURAL AND REINFORCING.....	\$ 30.08	24.72

* SUME2014-014 01/30/2017

	Rates	Fringes
CARPENTER.....	\$ 19.66	6.13
ELECTRICIAN.....	\$ 25.24	7.01
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor.....	\$ 13.38 **	1.39
LABORER: Common or General.....	\$ 15.22 **	3.97
LABORER: Concrete Worker (includes removing forms, demolition of existing concrete, and pouring, leveling and finishing concrete).....	\$ 25.33	17.07
LABORER: Pipelayer.....	\$ 21.84	6.42
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 19.88	8.48
OPERATOR: Bulldozer.....	\$ 20.81	4.37
OPERATOR: Crane.....	\$ 24.78	8.13
OPERATOR: Loader.....	\$ 19.36	3.73
OPERATOR: Roller.....	\$ 16.61	3.44
PAINTER (Brush and Roller).....	\$ 22.18	6.33
TRUCK DRIVER: Dump Truck.....	\$ 15.41 **	3.17

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour

National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

BUILD AMERICA BUY AMERICA REQUIREMENTS



BUILD AMERICA, BUY AMERICA (BABA) ACT

In Title IX of the IIJA, Congress passed the Build America, Buy America (BABA) Act, which establishes strong and permanent domestic sourcing requirements across all Federal financial assistance programs for infrastructure.

By May 14, 2022, agencies must ensure that all applicable programs comply with section 70914 of the Act, including by the incorporation of a Buy America preference in the terms and conditions of each award with an infrastructure project. The Act requires the following Buy America preference:

- (1) All iron and steel used in the project are produced in the United States. This means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
- (2) All manufactured products used in the project are produced in the United States. This means the manufactured product was manufactured in the United States, and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation.
- (3) All construction materials are manufactured in the United States. This means that all manufacturing processes for the construction material occurred in the United States.

Waivers

When necessary, recipients may apply for, and the agency may grant, a waiver from these requirements. The agency should notify the recipient for information on the process for requesting a waiver from these requirements. When the Federal agency has made a determination that one of the following exceptions applies, the awarding official may waive the application of the domestic content procurement preference in any case in which the agency determines that:

- (1) applying the domestic content procurement preference would be inconsistent with the public interest;
- (2) the types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or
- (3) the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent.

The nationwide waiver to the BABA law permits the use of products when they occur in de minimis components of such projects funded by the Act that may otherwise be prohibited under the Act. Funds used for such de minimis components cumulatively may comprise no more than a total of 5 percent of the total cost of the project. The Contractor is required to provide the necessary documentation. Owners should, in consultation with their contractors, determine the items to be covered by this waiver, must retain relevant documentation (i.e., invoices) as to those items in their project files, and must summarize in reports the types and/or categories of items to which this waiver is applied, the total cost of incidental components covered by the waiver for each type or category, and the calculations by which they determined the total cost of the project. The Owner shall maintain files on the project site for this documentation. The files shall be made available to State and Federal officials for inspection upon request.



**CERTIFICATION BY THE OWNER
OF COMPLIANCE WITH THE
USE OF BUILD AMERICA, BUY AMERICA ACT
enacted on May 14, 2022**

(To be attached to each Utility Construction SRF requisition submitted for payment)

We, the Owner named, _____, having obtained funding from the State of Maine, State Revolving Fund (SRF), for the Utility Construction Project named _____, hereby submit to the SRF program, certification from each contractor working on the Utility Construction Project that the use of Domestic Content Procurement in the construction of the project complies with the law, or that a waiver has been obtained from the U.S. Environmental Protection Agency. Thereby, it is to the best of the Owner's knowledge that the Project is in compliance with the Build America, Buy America Act..

Signature of Official

Printed name

Date

Attachment: Certification by Contractor

AMERICAN IRON AND STEEL REQUIREMENTS



From the “Consolidated Appropriations Act, 2014”

H.R. 3547 (PL113-76, enacted 1/17/2014)

USE OF AMERICAN IRON AND STEEL

“SEC. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term “iron and steel products” means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the “Administrator”) finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency’s capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.”

ATTACHMENT 3

GENERAL CONTRACTOR BID FORM

**WATER SYSTEM MODIFICATIONS AND CONSOLIDATION TO ADDRESS PFAS
AT BONNY EAGLE MIDDLE SCHOOL AND BONNY EAGLE HIGH SCHOOL
MSAD #6
WATER SYSTEM #0000147 AND #0008778
BID FORM**

KEY	CONSTRUCTION ITEM	COST ESTIMATE			TOTAL
		UNITS	UNIT PRICE	QUANTITY	
1	<u>GENERAL</u>				\$
2	TEMPORARY FACILITIES (INCLUDING BUT NOT LIMITED TO PROJECT TRAILER, RESTROOMS, UTILITIES)	LS	\$	1	\$
3	HEALTH AND SAFETY (INCLUDING BUT NOT LIMITED TO PERSONAL PROTECTIVE EQUIPMENT AND MONITORING AND MANAGEMENT OF HAZARDS)	LS	\$	1	\$
4	MOBILIZATION/DEMOBILIZATION OF EQUIPMENT, FACILITIES, ETC.	LS	\$	1	\$
5					
6	<u>WATER MAIN INSTALLATION</u>				\$
7	PREPARATION OF SITE INCLUDING BUT NOT LIMITED TO SURVEYS, CONSTRUCTION LAYOUT, EROSION CONTROLS, AND OTHER CONTROLS AS NEEDED	LS	\$	1	\$
8	CONCRETE AND ASPHALT CUTTING AND REMOVAL AS NEEDED	LS	\$	1	\$
9	EXCAVATION AND TRENCHING FOR INSTALLATION OF WATER MAIN AND ELECTRICAL CONDUIT	LS	\$	1	\$
10	BACKFILL OF EXCAVATED MATERIAL (ASSUME RE-USE OF NATIVE SOILS) PLACED AND COMPACTED IN 6-INCH LIFTS	LS	\$	1	\$
11	2-INCH IPS SDR 11 HDPE WATER MAIN PIPE AND FITTINGS	LF	\$	1240	\$
12	1-INCH SCHEDULE 40 PVC ELECTRICAL CONDUIT	LF	\$	2480	\$
13	SITE RESTORATION OF DISTURBED AREAS INCLUDING BUT NOT LIMITED TO GRASS AND NATIVE VEGETATION, CONCRETE, AND ASPHALT	LS	\$	1	\$
14					
15	<u>SYSTEM CONSOLIDATION</u>				\$
16	DEMOLITION OF EXISTING FEATURES (INCLUDING BUT NOT LIMITED TO 3,000-GALLON ABOVE GROUND STORAGE TANK AND SUPPORTS, STEEL PIPING, AND EXISTING WOOD HOUSEKEEPING PAD)	LS	\$	1	\$
17	FORM AND POUR CONCRETE EQUIPMENT PADS INCLUDING REBAR AND DOWELS	LS	\$	1	\$
18	PROVIDE AND INSTALL NEW STORAGE WITH 3,000-GALLON TOTAL CAPACITY USING FIVE (5) DOORWAY TANKS PLUMBED IN PARALLEL (OR ENGINEER APPROVED EQUAL)	LS	\$	1	\$
19	PROVIDE AND INSTALL SCHEDULE 80 PVC PIPE AND FITTINGS (INCLUDING BUT NOT LIMITED TO CHECK VALVES, BALL VALVES, TEES, WYES, ELBOWS, REDUCERS, COUPLINGS, AND UNIONS)	LS	\$	1	\$
20	PROVIDE AND INSTALL PROGRAMMABLE LOGIC CONTROLLER (PLC) WITH LEVEL DISPLAY AND DATA LOGGING TO MONITOR FLOW AND LEVEL AND CONTROL TWO ACTUATED VALVES. PROVIDE VISUAL AND AUDIBLE ALARM EQUIPMENT	EA	\$	1	\$
21	PROVIDE AND INSTALL TWO (2) LEVEL TRANSDUCERS FOR EXISTING MIDDLE SCHOOL STORAGE AND NEW HIGH SCHOOL STORAGE (INCLUDE CABLE, CONDUIT, ETC. FOR CONNECTION TO NEW PLC)	EA	\$	2	\$
22	PROVIDE AND INSTALL TWO (2) MOTOR CONTROLLED VALVES, WITH INDICATOR LIGHTS, FOR FLOW CONTROL/SELECTION TO MIDDLE SCHOOL STORAGE AND HIGH SCHOOL STORAGE (INCLUDE CABLE, CONDUIT, ETC. FOR POWER AND CONNECTION TO NEW PLC)	EA	\$	2	\$
23	PROVIDE AND INSTALL TWO (2) ELECTROMAGNETIC FLOW METERS WITH INSTANTANEOUS AND TOTAL FLOW DISPLAY (INCLUDE CABLE, CONDUIT, ETC. FOR POWER AND CONNECTION TO NEW PLC)	EA	\$	2	\$
24	PROVIDE AND INSTALL ANCILLARY EQUIPMENT (INCLUDING BUT NOT LIMITED TO UNISTRUT AND CLAMPS FOR PIPE SUPPORT, ANTI-SIPHON HOSE BIBS, AND TRANSITION FITTINGS)	LS	\$	1	\$
25	PROVIDE CLEANING OF 5,000-GALLON UNDERGROUND WATER STORAGE TANK AT THE MIDDLE SCHOOL PRIOR TO NEW WATER MAIN CONNECTION	LS	\$	1	\$
26					

**WATER SYSTEM MODIFICATIONS AND CONSOLIDATION TO ADDRESS PFAS
AT BONNY EAGLE MIDDLE SCHOOL AND BONNY EAGLE HIGH SCHOOL
MSAD #6
WATER SYSTEM #0000147 AND #0008778
BID FORM**

KEY	CONSTRUCTION ITEM	COST ESTIMATE			TOTAL
		UNITS	UNIT PRICE	QUANTITY	
27	<u>WASTE MANAGEMENT</u>				\$
28	TRANSPORTATION AND DISPOSAL OF CONSTRUCTION WASTE	LS	\$	1	\$
29					
30	<u>EXISTING WELL EVALUATION</u>				\$
31	PERFORM 48-HOUR CONSTANT RATE DRAWDOWN TEST AT 30 GALLONS PER MINUTE USING EITHER TEST PUMP OR EXISTING PUMP. PROVIDE STILLING WELL FOR TRANSDUCER INSTALLATION, ASSUME USE OF EXISTING POWER. PROVIDE DISCHARGE PIPING TO DISCHARGE WATER TO GROUND UP TO 250 FEET FROM WELL	LS	\$	1	\$
32					
33	<u>NEW WELL INSTALLATION</u>				\$
34	DRILL WELL TO 206-FT BELOW GRADE, INSTALL PITLESS ADAPTER, FURNISH AND INSTALL PUMP, AND CONNECT WATER/POWER. ASSUME BEDROCK IS 35-FT BELOW GRADE, EXTEND CASING 20-FT BEYOND TOP OF BEDROCK.	LS	\$	1	\$
35	TRENCH AND INSTALL WATER LINE AND ELECTRICAL FROM NEW BACKUP WELL TO BUILDING. PROVIDE NEW MANUAL WELL PUMP SELECT SWITCH AT EXISTING PUMP CONTROL PANEL	LS	\$	1	\$
36	COMPLETE 6-HOUR STEP-DRAWDOWN TEST ON NEW BACKUP WELL. INCLUDES STAFFING OF TEST AND MANUAL WATER LEVEL MEASUREMENTS AT ENGINEER APPROVED INTERVALS. PROVIDE TEST PUMP OF APPROPRIATE SIZE, POWER, AND APPROPRIATE DISCHARGE LINE, AND 1-INCH STILLING WELL FOR WATER LEVEL MEASUREMENT. NUMBER OF STEPS AND FLOW RATES TO BE DETERMINED IN CONSULTATION WITH ENGINEER	LS	\$	1	\$
37					
38	<u>OIL TANK REMOVAL</u>				\$
39	REMOVE THE EXISTING 10,000-GALLON DUAL-WALL FIBERGLASS FUEL OIL UNDERGROUND STORAGE TANK (UST) AND ASSOCIATED PIPING IN ACCORDANCE WITH REQUIREMENTS OF MAINE DEP CHAPTER 691. DISTRIBUTE OIL AMONGST OTHER TANKS, AS DIRECTED BY OWNER. MANAGE AND DISPOSE SOILS EXCAVATED FROM ABOVE THE UST AS SPECIAL WASTE. BACKFILL THE AREA AND PAVE WITH ASPHALT.	LS	\$	1	\$
40					
41	<u>ADD ALTERNATES</u>				\$
42	WELL CASING - IF BEDROCK IS MORE THAN 35-FEET BELOW GRADE	LF	\$	1	\$
43	WELL RISER PIPE - IF WELL IS SET MORE THAN 206-FEET BELOW GRADE	LF	\$	1	\$
44	OTHER ADD ALTERNATES - TO BE INCLUDED BY CONTRACTOR SUBJECT TO ENGINEER'S APPROVAL		\$		\$
45					
46	<u>SUBTRACT ALTERNATES</u>				\$
47	WELL CASING - IF BEDROCK IS LESS THAN 35-FEET BELOW GRADE	LF	\$	1	\$
48	OTHER SUBTRACT ALTERNATES - TO BE INCLUDED BY CONTRACTOR SUBJECT TO ENGINEER'S APPROVAL		\$		\$
49					
50	<u>OTHER ITEMS INCLUDED IN CONTRACTOR'S BID</u>				\$
51			\$		\$
52					
53	TOTAL BASE BID				\$