

**SPECIFICATIONS
FOR
CITY OF PENDLETON, OREGON
SECONDARY CLARIFIER REHABILITATION**

2024



ANDERSON PERRY & ASSOCIATES, INC.

La Grande, Redmond, Hermiston, and Enterprise, Oregon
Walla Walla, Washington

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SPECIFICATIONS

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GENERAL REQUIREMENTS

A. SUMMARY OF WORK

The Work for this Contract involves rehabilitation of the City of Pendleton's existing east secondary clarifier, including replacement of the existing center pier, sweeps, motor, baffles, and other structural and mechanical components; installation of new groundwater floor relief valves; and extension of the non-potable utility water piping, together with all other Work required to complete the Project as shown on the Drawings and specified herein.

B. ABBREVIATIONS

The following abbreviations of Associations, units of measurement, and miscellaneous items are defined as they may be used in these Contract Documents or on the Drawings. This list may not be all-inclusive.

Associations

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGC	Associated General Contractors of America
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
APA	American Plywood Association
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
DFPA	Douglas Fir Plywood Association
DIPRA	Ductile Iron Pipe Research Association
IBC	International Building Code
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IPC	International Plumbing Code
IPCEA	Insulated Power Cable Engineers Association
ITE	Institute of Transportation Engineers
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
SAE	Society of Automotive Engineers
SDI	Steel Door Institute

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SSPC	Steel Structures Painting Council
WWPA	Western Wood Products Association

Codes and Acts

MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electrical Code
NEPA	National Environmental Policy Act
OAR	Oregon Administrative Rules
SEPA	State Environmental Policy Act
UL	UL, Inc.

Federal Agencies

BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
DOD	Department of Defense
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
LCDC	Land Conservation and Development Commission
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
OSHA	Occupational Safety and Health Administration
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

State Agencies

DEQ	Oregon Department of Environmental Quality
DSL	Oregon Department of State Lands
DWS	Oregon Health Authority - Drinking Water Services
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OWRD	Oregon Water Resources Department

Units of Measurement and Abbreviation (Partial Listing)

AC	Asbestos Cement or Asphalt Concrete
ACP	Asphalt Concrete Pavement

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BST	Bituminous Surface Treatment
C.I.	Cast Iron
CL	Centerline
C.O.	Clean Out
Cl.	Class
cfm	Cubic Feet Per Minute
Conc.	Concrete
Culv.	Culvert
CY, C.Y., or Cu.Yd.	Cubic Yard(s)
DI	Ductile Iron
Dia.	Diameter
Ea.	Each
Elev., EL, or El.	Elevation
Est.	Estimate or Estimated
Extg.	Existing
F	Fahrenheit
F.F.	Finished Floor
FLG	Flange
fps	Feet Per Second
Ft.	Foot or Feet
gpm	Gallons Per Minute
HDPE	High Density Polyethylene
HMAC	Hot-Mix Asphalt Concrete
Hp	Horsepower
HVAC	Heating, Ventilation, and Air Conditioning
I.D.	Inside Diameter
I/I	Infiltration/Inflow
In.	Inch or Inches
Incl.	Including
Inv.El.	Invert Elevation
Irr	Irrigation
L	Liter
Lb.	Pound(s)
L.F. or Lin.Ft.	Linear Foot (Feet)
LS or L.S.	Lump Sum
Max.	Maximum
MH	Manhole
MJ	Mechanical Joint
Min.	Minimum
MPH	Miles Per Hour
N.T.S.	Not to Scale
O.C.	On Center
O.D.	Outside Diameter
PL	Plate

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PVC	Polyvinyl Chloride
psi	Pounds Per Square Inch
Q	Flow Rate
R	Radius
REQD.	Required
RPM	Revolutions Per Minute
ROW	Right-of-Way
S	Sanitary Sewer
SCADA	Supervisory Control and Data Acquisition
SCH	Schedule
SD	Storm Drain
SF, S.F., or Sq.Ft.	Square Foot
Sht.	Sheet
Stl.	Steel
SWL	Static Water Level
SY, S.Y., or Sq.Yd.	Square Yard
TDH	Total Dynamic Head
TM	Test Method
Typ.	Typical
W	Water
WS	Wood Stave

C. CONSTRUCTION SEQUENCING AND TIMING OF WORK

Improvements to the east secondary clarifier may proceed at the same time as the improvements to the east return activated sludge (RAS) station slide gate; however, bypass pumping will be required whenever one of the RAS station slide gates is being worked on. All work on the east secondary clarifier and east RAS station slide gate shall be sufficiently complete and able to be used in place of the west secondary clarifier before work on the west RAS station slide gate can begin. This will allow one secondary clarifier to remain in operation at all times.

Improvements to the secondary effluent combiner box shall proceed in a manner to allow one of the secondary clarifiers to remain in operation at all times. The west secondary clarifier can remain in operation for the duration of the installation using the bypass piping and a 36-inch pig. The improvements to the secondary effluent combiner box may occur at any time that the east secondary clarifier is offline, with coordination with the Owner. The Contractor shall coordinate sequencing of the work and bypass pumping locations with the Owner.

D. COOPERATION WITH OWNER

The Project location is at the City's wastewater treatment and resource recovery facility (WWTRRF), which is an operational wastewater treatment plant. The Contractor shall coordinate their efforts and phasing of the Work with the Owner to ensure that the WWTRRF remains online throughout the duration of the Work and to ensure that the Contractor's efforts

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do not compromise the Owner's ability to maintain compliance with its NPDES permit requirements.

E. BYPASS PUMPING

Aspects of the Work will require the use of bypass pumping. The Contractor shall be responsible for providing all pipeline, plugs, pumps of adequate size to handle peak flow, alarm systems to indicate pump failure, and temporary discharge piping to ensure that the total flow can be diverted around the RAS station during installation of the new slide gates. The pumps and associated bypass pumping equipment shall be capable of pumping return activated sludge at a concentration of up to 6 percent solids by weight. It is anticipated that the bypass pumps will be required to pump up to 1400 gpm at 40 ft of head, and the bypass pumping systems may be required to operate 24 hours per day. Connection to the existing RAS station external bypass pumping ports may be facilitated via an 8-inch flanged connection.

The Contractor shall be responsible for preparing a bypass pumping plan, which shall be submitted to the Owner and Engineer for review and approval. Once the bypass pumping plan has been approved, the Contractor shall coordinate the implementation of the bypass pumping with the Owner in such a manner that will allow for continuous wastewater treatment, unless otherwise approved by the Owner.

F. PROJECT WORK MEETINGS/PROCORE

1. The Contractor and/or their superintendent shall meet with the Owner and Engineer on a regular basis to review the progress of the Work, Work schedule, Project concerns, etc., as may be appropriate. The intent of this meeting will be to keep communication channels open and to keep all parties informed as to the status of the Work. Generally, the meeting shall be held weekly; however, it may be scheduled at other times if needed. In addition to these meetings, the Contractor and resident Project Representative shall meet monthly, in a Record Drawing Review meeting, prior to submitting the monthly Application for Payment. This meeting will be used to review Record Drawings being kept on the Project by the Contractor.
2. The Contractor, Owner, and Engineer shall use the Engineer's electronic project document software (Procore) to manage construction documentation. Failure to use this software system shall be considered cause for suspension of Work.

Procore is a web-based software application and does not require the Contractor to purchase or install any software. The Contractor shall be required to log in and upload all information for submission to the Owner or Engineer.

The Contractor, Owner, and Engineer shall use this program as the main communication and data storage for the Project.

The Procore software shall be used to track items including, but not limited to:

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- a. Submittals and Shop Drawings
- b. Meeting Notifications and Minutes
- c. Request for Interpretation (RFI)
- d. Contract Schedules
- e. Memos
- f. Work Change Directives

Documents shall be uploaded in PDF format, unless otherwise approved by the Engineer. Weekly meeting documents shall be distributed through the Procore system to all attendees. The Engineer shall be responsible for preparing and distributing meeting agendas and minutes.

G. ENVIRONMENTAL REQUIREMENTS

The Contractor shall be responsible for all required erosion control procedures to minimize the impact to the surrounding areas due to construction activities. The Contractor shall use whatever means necessary to control site runoff and minimize erosion including, but not limited to, silt fencing, mulching, erosion control matting, etc. Any violations or fines assessed due to the Contractor's activities shall be borne solely by the Contractor at no cost to the Owner or Engineer.

H. MOBILIZATION/DEMOBILIZATION

- 1. Mobilization shall consist of preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the Project Site for the establishment of offices, buildings, and other facilities necessary for Work on the Project, for premiums on bond and insurance for the Project, special fees, and for other work and operations which the Contractor must perform or costs the Contractor must incur before beginning Work on the Project.
- 2. Demobilization shall consist of work and operations including, but not limited to, those necessary for the movement of personnel, equipment, and incidentals from the Project Site, as well as preparation of operation and maintenance (O&M) materials and Record Drawings, Project photos, Project closeout, etc.

I. PROJECT SAFETY

- 1. The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work, including excavation safety. The Contractor shall comply with all applicable Laws and Regulations, ordinances, rules, and orders of any public body having jurisdiction as it relates to

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- Project and Work safety. See applicable provisions of the General Conditions, as well as all other provisions of the Contract relative to Project and Work safety.
2. The Contractor shall maintain local access to area residents and emergency traffic throughout the life of the Project and coordinate construction activities closely with area residents to keep them informed of operations that may impact their use of any streets or roadways.
 3. All signs, barricades, barriers, lights, cones, trench boxes, shoring/bracing, and other such “devices” required to warn, protect, or direct the public and workmen during the life of the Contract shall be furnished, installed, moved, and removed by the Contractor. When conditions warrant their use, flagpersons shall also be provided by the Contractor. The determination of what measures are required, in addition to those specifically called for by the Drawings and Specifications, shall be solely the responsibility of the Contractor.
 4. The Engineer and Owner are not responsible for determining whether proper safety precautions, etc., are being utilized. Should the Contractor fail to furnish the necessary protective measures, the Owner or Engineer may, but shall not be required to, bring to the Contractor’s attention by written notice of such failure and the Contractor shall undertake such corrective measures as is proper.
 5. All construction Work shall be performed in accordance with the provisions of the Occupational Safety and Health Regulations of the Oregon Occupational Safety and Health Division, and other applicable regulations. It shall be the Contractor’s responsibility to meet all requirements of Chapter 437 of the State of Oregon Administrative Rules. In addition, Oregon Revised Statutes (ORS) 757.542 through 757.562 and Oregon Administrative Rules (OAR) 860-024-0007 administered by the Oregon Public Utilities Commission shall apply.
 6. The materials used for and the installation of all warning and traffic control devices shall conform to the applicable provisions of the Oregon Standard Specifications for Construction - current edition, Sections 00220 and 00225, and the Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, Federal Highway Administration, current edition.
 7. It shall be the Contractor’s sole responsibility to provide a “competent person” as defined in the regulations to be on the Project Site during all trenching operations. The “competent person” appointed by the Contractor shall fulfill all requirements of the regulations.
 8. Prior to opening an excavation, the Contractor shall arrange for field location of utility installations such as sewer, telephone, fuel, electric, gas, water lines, or any other underground installations that reasonably may be expected to be encountered during the excavation work. When excavation operations approach the estimated location of

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underground installations, the Contractor shall determine the exact location of the installations by safe and acceptable means. While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard workers.

9. The Contractor shall ensure that structural ramps that are used by workers as a means of access or egress from an excavation shall be designed by a competent person, in accordance with all requirements of the regulations.
10. Workers exposed to public vehicular traffic shall be provided with and shall wear warning vests or other suitable garments marked with, or made of, reflectorized or highly visible material. No worker shall be permitted underneath loads handled by lifting or digging equipment. Workers shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped in accordance with the regulations to provide adequate protection for the operator during loading and unloading operations.
11. The Contractor shall take adequate precautions, in accordance with the regulations, to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions. These precautions include providing proper respiratory protection or ventilation and, when controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, the Contractor shall provide testing as often as necessary to ensure that the atmosphere remains safe. The Contractor shall provide emergency rescue equipment, such as breathing apparatus, safety harness, etc., where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.
12. The Contractor shall not allow work in excavations in which there is accumulated water or in excavations where water is accumulating, unless adequate precautions have been taken to protect workers against the hazards posed by water accumulations. The precautions necessary to protect workers adequately vary with each situation, but include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and life line. If the Contractor is controlling water or preventing it from accumulating by the use of water removal equipment, the water removal equipment and operation shall be monitored by a competent person to ensure proper operation. If excavation work interrupts the natural drainage of surface water, such as streams, then diversion ditches, dikes or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.
13. In situations where the Contractor feels their trench operations pose a risk to the stability of adjoining buildings, walls, or other structures, the Contractor shall notify the Engineer and shall provide adequate support systems per the requirements of the

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- regulations. Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to workers shall not be permitted except when the Contractor has retained a Registered Professional Engineer and said Registered Professional Engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity, or said Registered Professional Engineer has approved the determination that such excavation will not pose a hazard to workers.
14. Sidewalks, pavements, and appurtenant structures shall not be undermined unless a support system or other method of protection is provided to protect workers from the possible collapse of such structures. The Contractor shall provide adequate protection to all persons from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. The Contractor shall also provide protection by placing and keeping excavated materials or equipment at least two feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations or by a combination of both, if necessary.
 15. The Contractor shall ensure that daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person appointed by the Contractor for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of Work and as needed throughout the shift. Inspection shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when worker exposure can be reasonably anticipated. Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, the Contractor shall remove workers from the hazardous area until the necessary precautions have been taken to ensure their safety.
 16. It shall be the Contractor's responsibility to provide all physical barrier protection at all excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Further, no trenches shall be left open at any time unless guarded with adequate barricades, warning lamps, and signs. Proper traffic and pedestrian control shall be provided by the Contractor.
 17. The Contractor shall ensure that each worker in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with the regulations.
 18. It shall be the Contractor's responsibility to design the sloping and benching systems for trench excavation in accordance with the requirements of the regulations stated herein. Where the Contractor takes the option to not utilize one of the standard tables or trench excavation designs contained in OAR Chapter 437, then it is the Contractor's responsibility to retain a Registered Professional Engineer to design said sloping and

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benching system. When the Contractor chooses this option, the design shall be in written form and shall include at least the following information:

- a. The magnitude of the slopes that were determined to be safe for the particular Project.
 - b. The configurations that would determine to be safe for the particular Project.
 - c. The stamp and signature of the Registered Professional Engineer approving the design.
19. At least one copy of the design shall be maintained at the Job Site while the slope is being constructed. After that time the design need not be at the Job Site, but a copy shall be made available to the Owner upon request.
20. Where the design of a support system, shield system, or other protective system is required, it shall be the Contractor's responsibility to meet all requirements of the regulations. It shall be the Contractor's responsibility to have on site at least one copy of the manufacturer's tabulated data which identifies the Registered Professional Engineer who approved the data or, when a support system or shield system or other protective system is not a standard manufactured item but is designed by a Registered Professional Engineer, at least one copy of the design shall be maintained at the Job Site during construction of the protective system. After that time, the design may be stored off the Job Site, but a copy of the design shall be made available upon request.

J. SHOP DRAWINGS AND SUBMITTALS

1. The Contractor shall submit Shop Drawings or manufacturer's data sheets in accordance with the Schedule of Shop Drawings and Sample submittals. It should be noted that the Engineer may require Shop Drawings for other items as may be deemed necessary. The Contractor should review the requirements for Shop Drawings in Section 7.16 of the General Conditions.
2. All submittals shall be submitted through Procore at a time sufficiently early to allow review of same by the Engineer and Owner's representative and to accommodate the rate of construction progress required under this Contract.
3. The Engineer and Owner's representative will return comments within 15 calendar days following receipt of the submittals. The Contractor shall make any corrections required by the Engineer and shall return the revised submittals for review. The Contractor shall direct specific attention in writing to revisions other than the corrections called for by the Engineer on previous submittals. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Engineer by the second submission of the Drawing. The Owner reserves the right to withhold monies due the Contractor to cover additional costs of the Engineer's review beyond the second submission.

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- a. If Shop Drawings are returned to the Contractor marked "NO EXCEPTIONS NOTED," formal revision and resubmittal of said Shop Drawings will not be required.
 - b. If Shop Drawings are returned to the Contractor marked "NO EXCEPTIONS, PROVIDED THE FOLLOWING CONDITIONS ARE MET," formal revision and resubmittal of said Shop Drawings will not be required.
 - c. If Shop Drawings are returned to the Contractor marked "MAKE CORRECTIONS NOTED," formal revision and resubmittal of said Shop Drawings will not be required.
 - d. If Shop Drawings are returned to the Contractor marked "REVISE AND RESUBMIT," the Contractor shall revise said Shop Drawings and shall resubmit said revised Shop Drawings to the Engineer.
 - e. If Shop Drawings are returned to the Contractor marked "REJECTED," the Contractor shall revise said Shop Drawings and resubmit said revised Shop Drawings to the Engineer.
 - f. If Shop Drawings are returned to the Contractor marked "SUBMIT SPECIFIED ITEM," the Contractor shall submit material requested but shall not be required to resubmit all previous material.
4. For each resubmittal necessary, an additional 15 calendar days shall be allowed for review. The Contractor shall include copies of all approved submittal information in the Contractor's Record Drawings and O&M Manual. A copy of each Shop Drawing and Sample shall also be kept in good order by the Contractor at the job Site and shall be available to the Engineer.

Shop Drawings requirements shall include, but are not limited to:

- a. Pipe, pipe supports, etc.
- b. Fittings, couplings, valves, actuators, gates, cleanout lids and frames, tracer wire access boxes, etc.
- c. Motor and related appurtenances
- d. Plumbing materials (pipes, fittings, drains, grates, etc.)
- e. Aggregate materials
- f. Painting systems
- g. Controls, electrical, instrumentation, and telemetry and SCADA equipment and materials

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- h. Concrete mix design and reinforcing steel
- i. Hot-mix concrete pavement mix design
- j. Railing systems
- k. Grating materials
- l. Secondary clarifier equipment
- m. Bypass pumping plan, including all pumps, piping, controls, and proposed layout

K. QUALITY CONTROL

1. The Contractor shall be responsible for providing their own construction monitoring and quality control program. The Contractor shall provide and maintain a quality control program that will ensure the quality of the Work and materials incorporated into the Project. The Contractor shall also perform all tests required by Laws and Regulations, ordinances, and orders of public authorities. The Contractor shall provide appropriate quality control personnel and testing facilities and certified testing personnel to perform the Work. A written quality control program shall be provided to the Engineer for their review prior to any Work being performed. The plan shall describe testing facilities, qualifications of quality control and testing personnel, testing frequency, and reporting schedule. Copies of all test results shall be provided to the Engineer for their review as soon as the test has been performed. This includes copies of daily worksheets. Materials, equipment, or Work which fails to meet the Contract requirements shall not be used in the Work.
2. The Engineer, Owner, and their representatives will at all times have access to the Work. In addition, authorized representatives and agents of any participating federal or state agency shall be permitted to review all Work, materials, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any review or testing thereof. The Contractor shall notify testing personnel, including testing personnel provided by the Owner or Engineer, at least 24 hours in advance of operations to allow for personnel assignments and test scheduling. All materials to be tested shall be provided by the Contractor at their expense. After tests are completed, the Contractor shall be responsible for repairing test areas to match original conditions. The Contractor shall pay for all additional reviews and retesting required because of defective Work or ill-timed notices.
3. The Contractor shall submit Samples of the material to be utilized on the Project to the Engineer for their review. The Engineer or their representative may take additional Samples and provide check tests on material being incorporated into the Work to verify compliance with the requirements of the Contract Documents. Materials or workmanship found to be outside of the specification limits shall be replaced with suitable material at no expense to the Owner.

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4. Tests or reviews by the Engineer or others shall not relieve the Contractor from their obligations to perform the Work in accordance with the requirements of the Contract Documents and does not make the Engineer, or others, an insurer of the Contractor's Work.
5. When tests are required, the technician or technicians performing any testing shall possess valid Western Alliance for Quality Transportation Construction (WAQTC) recognized certifications, Oregon Department of Transportation (ODOT) recognized certifications, or American Concrete Institute (ACI) recognized certifications in the following disciplines:
 - Aggregate Testing Technician (AgTT)
 - Asphalt Testing Technician (AsTT)
 - Concrete Testing Technician (CTT)
 - Embankment and Base Testing Technician (EBTT)
 - Density Testing Technician (DTT)
 - ACI Concrete Strength Testing Technician (CSTT)
 - ACI Concrete Field Testing Technician (CTT)
 - Certified Aggregate Technician (CAgT) (WAQTC = AgTT)
 - Certified Embankment and Base Technician (CEBT) (WAQTC = EBTT)
 - Certified Density Technician (CDT) (WAQTC = DTT)
 - Certified Asphalt Technician I (CAT-I) (WAQTC = AsTT)
 - Certified Asphalt Technician II (CAT-II)
 - Certified Mix Design Technician (CMDT)
 - Quality Control Technician (QCT)
 - Concrete Control Technician (CCT)
 - Concrete Strength Technician (CST)
 - Concrete Laboratory Testing Technician (CLTT)
6. Following are the minimum required tests and testing frequency that shall be included in the Contractor's quality control program for the materials listed. See the Technical Specifications for other testing and quality control requirements. If the Contractor fails to provide all or any part of the required quality control testing and corresponding reports for the Project after the Engineer has requested the Contractor to do so in writing, the Owner may elect to have the quality control work performed by others and withhold the actual cost of quality work plus \$100 for each test performed from payments owed the Contractor on the Project.
 - a. Trench Backfill Materials

A minimum of one ASTM D1557 laboratory density test will be performed for each testable material used as trench backfill, providing the maximum theoretical density and optimum moisture content of the material can be determined. A minimum of one nuclear gauge density test (ASTM D6938) will be

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performed every 300 feet along the trench line on each lift of material to show required density is being achieved. Once an acceptable compaction method is established and verified with field density tests, the testing interval can be reduced to 600 feet along the trench line. If backfill material or compaction equipment changes, compaction testing shall immediately be performed to verify that density is being achieved and shall continue at 300-foot intervals until a new compaction method is verified.

b. Base Rock

1) Testing required to qualify material source prior to production as outlined in Technical Specifications - "Site Work."

2) Quality control testing required during production consists of the following:

Gradation	AASHTO T 27	Start of production and one test every 1,000 tons (three tests minimum)
Fracture Face	AASHTO T 335	Start of production and one test every 3,000 tons (three tests minimum)
Sand Equivalent	AASHTO T 176	Start of production and one test every 3,000 tons (three tests minimum)

3) Compliance of base rock produced and stockpiled before the Award Date or Notice to Proceed of this Contract will be determined by the following:

a) Provide all production records for testing that was performed during production.

b) If production records are not available, provide post testing of the stockpile per AASHTO T 2 as follows:

Gradation	AASHTO T 27	One test every 1,000 tons in stockpile (three tests minimum)
Fracture Face	AASHTO T 335	One test every 3,000 tons in stockpile (three tests minimum)
Sand Equivalent	AASHTO T 176	One test every 3,000 tons in stockpile (three tests minimum)

4) Compliance of base rock delivered to the Project Site will be determined by the following:

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Gradation	AASHTO T 27	One test every 1,000 tons (three tests minimum)
Fracture Face	AASHTO T 335	One test every 3,000 tons (three tests minimum)
Sand Equivalent	AASHTO T 176	One test every 3,000 tons (three tests minimum)

- 5) A minimum of one AASHTO T 180 laboratory density test will be performed on base rock material, providing the maximum theoretical density and optimum moisture content of the material can be determined. A minimum of one nuclear gauge density test (ASTM D6938 or AASHTO T 310) will be performed every 800 square yards on each lift of base rock to show required density is being achieved. Once an acceptable compaction method is established and verified with field density tests, the testing interval can be reduced to one test each 1,600 square yards on each lift. If base rock material or compaction equipment changes, compaction testing shall immediately be performed to verify that density is being achieved and shall continue at 800 square yard intervals until a new compaction method is verified.

c. Aggregate Base Rock

- 1) Testing required to qualify material source prior to production as outlined in Technical Specifications - "Site Work."
- 2) Compliance of aggregate base rock delivered to the Project Site will be determined by visual inspection by the Engineer.

d. Portland Cement Concrete (PCC)

Aggregate testing is required to be completed with the mix design. Should additional testing of aggregate for PCC be deemed necessary by the Engineer, testing shall be performed by the Contractor as specified by ASTM C33. Samples shall be selected at random from the stockpile and tested for conformance with the Specifications. The decision to perform aggregate testing and testing frequencies shall be left to the Engineer.

Quality control testing of PCC during and following placement is as follows:

Air Content	AASHTO T 152	One test per each set of cylinders
Slump	AASHTO T 119	One test per each set of cylinders

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Concrete Temperature	AASHTO T 309 ASTM C1064	One test per each set of cylinders
Strength	ASTM C31 and ASTM C39	One set of three cylinders per 25 cubic yards (minimum one set per day); test one cylinder at seven days and one cylinder at 28 days

L. REVIEW OF WORK

It is not the intent of the Owner or Engineer to provide continuous or full-time observation of all Work. When required by the Engineer or Owner, the Contractor shall provide the Engineer and Owner a daily report of their Work progress and proposed Work schedule for the next two days. This daily communication shall be a requirement of the Contract.

M. REQUEST FOR INTERPRETATION (RFI)

The Contractor may request information or seek clarification concerning the Work from the Engineer utilizing Procore. The Engineer shall provide a response to the RFI utilizing Procore within 10 days of receipt of the RFI. If a change in the Contract requirements is necessary, the procedures in Article 11 of the General Conditions shall be followed.

N. COOPERATION WITH OTHERS

The Contractor shall cooperate with the residents and business owners in the area to provide good access to private property whenever possible. Sidewalks shall be kept clear at all times of any construction materials. Barricades, traffic cones, blinkers, and signing shall be used to direct the public through the Work area safely.

O. CONSTRUCTION STAKING

1. The Contractor shall carefully preserve benchmarks, reference points, and stakes set by others. In the case of willful or careless destruction by the Contractor, the Contractor shall be charged with the resulting expense of replacement and shall be responsible for any mistakes or liability that may be caused by the loss or disturbance.
2. Any additional staking requested by the Contractor, replacement of stakes or hubs lost or disturbed by the Contractor or due to vandalism or other reasons, or re-staking required because of improper construction will be done by the Engineer at the Contractor's expense or by a licensed professional land surveyor hired by the Contractor. The Engineer requires two business days' notice (excluding weekends and holidays) prior to the time the staking is required. The Contractor shall secure the Work area and protect all construction staking.

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3. The Contractor shall utilize the existing east secondary clarifier top of wall and launder elevations shown on the Drawings as a benchmark and reference points.

P. EXISTING SURVEY MONUMENTATION

1. The Contractor shall be responsible for the protection and perpetuation of existing land survey, property, or construction monuments shown on the Drawings, which are marked or are clearly visible on the ground.
2. The Contractor shall give the Engineer a minimum of 48 hours' notice prior to working in the vicinity of any such monument that the Contractor may disturb so the Owner can arrange for such monuments to be referenced. When proper notice is provided, the Owner shall have any disturbed monuments restored following construction. Should the Contractor fail to provide adequate notice to the Engineer, the Contractor shall be responsible for the expense of having the disturbed monument restored by a qualified surveyor.

Q. EXISTING UTILITIES

1. Contact treatment plant personnel to coordinate tie-ins and conflicts with existing utilities.
2. Known utilities and structures expected to be adjacent to or encountered in the Work are shown on the Drawings. Information on existing utilities may be provided by others and existing records may not be complete or accurate. It is expected there may be discrepancies and omissions in the location, size, and quantities of utilities and structures shown. Those shown are for convenience of the Contractor only, and no responsibility is assumed by either the Owner or Engineer for their accuracy. The Contractor shall work closely with the owner of any utilities or structures affected by the Work to avoid any damage.
3. The Contractor shall be responsible for the actual locating and protecting of existing utilities. The Contractor, prior to commencement of Work, shall contact existing Utility Companies such as water, sewer, power, telephone, gas, etc., to have the Utility Companies locate all utilities which will be affected by the Work to be performed. The Contractor shall give notification at least two business days but not more than ten business days before commencing excavation in accordance with ORS 757-557. The "call before you dig" number is 811 or 1-800-332-2344. The Contractor shall perform all necessary coordination work with the Utility Companies in performing the Work and shall be fully responsible for any damage to existing utilities caused by the Contractor's operations. The Contractor shall make any advance exploration necessary to protect all existing utilities and to properly plan the installation of pipelines or other work to the design line and grade. No payment shall be made for this work for up to two hours of advanced backhoe excavation work necessary to locate each existing utility at each specific site. The Work shall include all labor, equipment, etc., necessary to perform the

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location work. These costs shall be understood to be included in the Contract Prices. Should the Contractor be unable to locate the existing utility after its location has been marked by the appropriate utility company and diligent effort made by the Contractor to locate the utility including up to two hours of backhoe excavation work for each utility at each location site, the Contractor may be entitled to additional compensation as outlined hereafter. When prior notice has been given to the Engineer and the Engineer gives approval, the Contractor shall be paid for all additional backhoe excavation work required to locate the utility on an hourly basis under the bid item "Additional Potholing" when listed in the Bid Schedule or through an approved Change Order. Any additional potholing work performed by the Contractor without prior written approval of the Engineer will not be paid for.

4. If a conflict develops between the design line and grade of a pipeline or Project improvement and an existing utility, the Engineer may adjust the pipeline grade or have the existing utility relocated. The existing utility may be relocated by the owner of the utility or its designated representative or by the Contractor upon the approval of the utility owner and the Engineer. The Contractor shall perform all relocation work required by the Engineer. If the Contractor performs the relocation work, a Change Order shall be negotiated prior to any actual work unless payment for the work is specified otherwise.
5. The owner of the utilities shall normally be responsible for taking the utility out of service if necessary for the performance of the Work; i.e., shutting valves, etc. In the case of water valves, the owner of the water system may operate the valves or request the Contractor to do so. When the Contractor is requested to do so, the Contractor shall operate water valves as a normal part of the Work at no additional cost to the Owner. All water valves shall be operated as instructed by the owner of the valves. It can be expected that some valves may not fully operate properly which may require that additional valves be operated. This situation shall be considered a normal requirement of the Work.
6. The Contractor shall receive prior approval from the appropriate authority or utility owner before any public or private utility service is interrupted.
 - a. The Contractor shall give a minimum of four hours' notice to all utility customers who will be affected by the Contractor's operations. No utility service shall be disconnected or interrupted for more than nine hours or as required by the utility owner, whichever is less, in any 24-hour period. When disruption of service will be longer than nine hours in any one day, the Contractor shall provide safe and appropriate temporary service. All temporary service shall be coordinated with the utility owner.
 - b. When regular utility service interruption is required during the course of the Work, the Contractor shall submit a written plan to the Engineer and utility owner which details proposed Work plan notification procedures, and estimated

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extent of service interruption. The Contractor must obtain written approval of their plan from the utility owner prior to interrupting the utility service. As a minimum, notification shall include door hangers and public notification in the newspaper and radio, as appropriate. Personal contact shall be made where practical.

- c. The Contractor shall make every effort possible to provide continuous utility service to all utility customers. When special conditions exist where an interruption of utility service would create an extra hardship on the utility customer or create a hazardous condition, the Contractor shall provide continuous service. Particular care and planning must be arranged to provide continuous service of existing services or temporary services as approved by the utility owner and the Engineer.
 - d. If the Contractor inadvertently damages or interrupts an existing utility, the Contractor shall immediately notify the affected utility company, Owner, Engineer, and utility users and make arrangements to provide temporary service to the parties affected.
 - e. The Contractor shall, as requested by the Engineer, either immediately arrange for the utility company to make the needed repairs or immediately make the repair to the damaged utility.
 - f. The Contractor shall pay the full cost of repair and damages when the utility was previously located and was within four feet on either side of the marked location as required by the Call Before You Dig notification system, or where negligence of the Contractor occurred.
 - g. The Contractor will be paid for the cost of repair and damages when existing utilities encountered during the performance of the Work were not previously located by the utility as required by the Call Before You Dig notification system, where existing utilities were farther than four feet away on either side of the marked location, and where damage to the utilities occurred due to no negligence of the Contractor.
 - h. If the Contractor fails to make immediate repairs and provide service as required, the Owner may have said Work performed by others and deduct the cost of said Work from payment to the Contractor.
7. The Contractor shall support and otherwise protect all pipes, conduits, cables, poles, and other existing services where they cross the trench or are otherwise undermined or affected by their Work. The Contractor shall restore the support of an undermined existing utility using select backfill compacted to 95 percent maximum density as determined by ASTM D698.

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R. PROGRESS OF THE WORK - CLEANUP

1. The Contractor shall arrange their work schedule such that all phases of Work, once started, shall be diligently pursued until completed. The intent is that the work area shall not be disturbed for undue periods of time. Work shall not be left uncompleted. If the Engineer determines that Work is not being diligently completed, the Engineer shall request the Contractor to complete said Work.
2. Cleaning up shall be a continuing process from the start of the Work to final acceptance of the Project. The Contractor shall, at all times, at their own expense and without further order, keep property on which Work is in progress free from accumulations of waste material or rubbish caused by employees or by the Work, and at all times during the construction period shall maintain structure sites, ROWs, easements, adjacent property, and the surfaces of streets and roads on which Work is being done in a safe condition for the Contractor's workers and the public.
 - a. Accumulations of waste materials that might constitute a fire hazard will not be permitted.
 - b. Spillage from the Contractor's hauling vehicles on traveled public or private roads shall be promptly cleaned up. The Contractor shall take appropriate action to control dust caused by their operations. This shall include, but not be limited to, watering of exposed areas, cleaning of roadways, etc. This is considered a normal part of the construction Project.
 - c. Upon completion of the Work, the Contractor shall, at their own expense, remove all temporary structures, rubbish, waste material, equipment, and supplies resulting from their operations. They shall leave such lands in a neat and orderly condition that is at least as good as the condition in which they found them prior to their operations.
 - d. Should the Contractor fail to provide said cleanup upon 24-hour written notice, the Owner shall have the right to perform such Work at the expense of the Contractor and withhold the cost from the Contractor's payments.
3. The Contractor shall replace or restore, equivalent to their original condition, all surfaces or existing facilities disturbed by their Work, whether within or outside of the Work areas. Restoration work will include, but is not limited to, roadways, utilities, structures, landscaping, etc.

S. EXISTING EQUIPMENT REMOVAL AND SALVAGE

Existing equipment or materials removed by the Contractor during the course of the Work, which the Owner requests to be salvaged, shall remain the property of the Owner. The equipment and materials shall be removed with care to prevent unnecessary damage and shall be neatly stored in the solar field laydown area west of the secondary clarifiers at the WWTRRF

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site, or as directed by the Owner. Equipment or materials not to be salvaged as requested by the Owner shall be salvaged or recycled by the Contractor in accordance with ORS 279C.510(1) if feasible and cost effective.

Demolition of the RAS station slide gates shall proceed one gate at a time, so at least one clarifier remains in service at all times during the Work. The east RAS station slide gate shall be demolished and replaced prior to completion of the east secondary clarifier improvements.

The west RAS station slide gate shall be demolished after work on the east secondary clarifier and east RAS station slide gate is sufficiently complete and able to be used in place of the west secondary clarifier and RAS station slide gate. All plant processes shall be rerouted through the east secondary clarifier before demolition of the west RAS station slide gate can begin.

All interior mechanisms of the east secondary clarifier shall be removed prior to the beginning of improvement work to the clarifier. Care shall be taken that the clarifier pieces required for reuse in the improvements according to the Drawings and these Specifications are undamaged and neatly stored at a location as directed by the Engineer and Owner.

T. STARTUP AND TRAINING

It shall be the Contractor's responsibility to install all system components in accordance with the manufacturer's recommendations. All equipment shall be lubricated and adjusted as components prior to testing the system as a whole. The Contractor shall arrange with the Engineer to witness a test of the system and equipment after installation is completed. The Contractor shall provide the services of manufacturers' representatives to assist with the startup of major components and to provide training to the Owner's personnel. These tests shall demonstrate the complete facility operates in accordance with the Drawings and Specifications and the required functions. It is anticipated that minor adjustments may occur after the system has been started up. The Contractor shall make adjustments and correct deficiencies as required so the system can be kept in operation once it is placed into service. These adjustments, etc., shall be completed before final acceptance. The Contractor shall pay all costs associated with manufacturer's representatives and startup work.

As part of this Work, the Contractor shall provide startup training to the Owner and Engineer in sufficient detail so the Owner and Engineer are fully familiar with the proper operation and maintenance of Project components and systems. The startup training shall occur after the construction Work is complete and properly functioning.

U. RECORD DRAWINGS

1. The Contractor shall maintain on the Job Site an up-to-date, complete, and accurate set of Record Drawings. These Drawings shall include all Work performed by the Contractor and shall note any changes or deviations made from the details shown on the Construction Drawings. Such deviations would include, but not be limited to, dimensional changes, location, grade changes, elevation changes, material type,

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- configuration, etc. All changes shall be neatly and accurately shown on the Record Drawings. The Record Drawings shall also include all required job photos. The Engineer will provide one full-size set of prints for use by the Contractor in preparing the Record Drawings.
2. The Contractor shall provide ties to all buried service line taps from an above-ground reference point such as a valve, manhole, etc. At least two swing tie references shall be provided for all service line stubouts which will not be connected to an active service. Swing tie measurements shall be from some permanent reference point, i.e., house corner, fire hydrant, power pole, etc. All ties shall be provided in such a way that the buried service line can be accurately located after construction Work is complete. All buried improvements shall be described in detail including location, type, size, depth, brand name, model numbers, etc. Buried improvements shall include valves, fittings, repair clamps, connections to existing lines, etc. All offsets shall be appropriately noted on the Drawings.
 3. A clear color digital photo shall be taken of each improvement that will be permanently buried on the Project, such as connections to existing lines, fittings, repairs, valve configurations, etc. These photos shall become a part of the Project Record Drawings. The intent is that the Contractor shall provide good photo documentation of underground improvements that can be used in future years for maintenance or service of the buried improvement. Failure on the part of the Contractor to properly document these improvements will result in deductions described in this section. The Contractor shall provide two typical photos of repetitive type underground work such as manhole connections, cleanouts, water/sewer service connections, water meter installations, etc. Individual photos shall be taken for non-typical installations. A scale, survey rod, or similar reference device shall be included in the photo to provide a size reference when appropriate. Only digital photos will be allowed. Digital photos are to be used so the quality of the photo can be verified prior to the covering of the underground improvement. If an acceptable photo is not obtained with the first photograph, the Contractor shall take additional photos until an acceptable quality photo(s) has been obtained. A system shall be set up linking the photo with a log describing the date the photo was taken, the location of the photo, applicable Drawing sheet references, plus any appropriate information relative to what is being shown. The photo shall clearly document the underground improvement being shown, such as size of pipe fittings, etc. All details shall be clearly observable. The Contractor shall save all photos in an electronic file, with all labels and information required for each photo saved with the appropriate photo. The photos shall be uploaded via Procore or saved to a flash drive and delivered to the Owner.
 4. The Contractor shall also note the locations, types, size, depth, etc., of any existing utilities encountered during the performance of the Work. The Record Drawings shall be available for inspection during the Project by the Owner and Engineer. The Contractor

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shall keep the Record Drawings current each day to avoid loss of critical or important information.

5. Prior to submitting the monthly Application for Payment, the Contractor shall meet with the Project Representative to review, in detail, the Record Drawings and job photos prepared by the Contractor for the Project. The Contractor shall demonstrate to the Project Representative that current, up to date, accurate, and complete Record Drawings have been prepared for the Work performed to date. The Contractor and Project Representative shall compare Record Drawing information being kept by each to be sure there is consistency in the information being collected. Monthly Application for Payment requests will not be approved or processed until this meeting is held and the Contractor demonstrates that acceptable Record Drawings have been prepared by the Contractor. The Contractor shall also certify, by signing the Application for Payment, that their Record Drawings and job photos are up to date, accurate, and complete.
6. Prior to the Contractor submitting the Contractor's Notice of Substantial Completion, the Contractor shall give the Record Drawings and photographs to the Engineer and Owner.
7. IT IS INTENDED THAT THE RECORD DRAWINGS BE COMPLETE AND DETAILED. EXAMPLES OF ACCEPTABLE RECORD DRAWINGS ARE AVAILABLE FOR INSPECTION AT THE ENGINEER'S OFFICE. CONSIDERABLE EFFORT SHALL BE EXPENDED IN PREPARING THE RECORD DRAWINGS.

V. OPERATION AND MAINTENANCE MANUAL

1. Three hard copies and one electronic copy of an O&M Manual shall be submitted to the Engineer and Owner prior to the Contractor submitting the Contractor's Notice of Substantial Completion. The material shall be bound in a three-ring loose-leaf notebook with the Project name, Owner's name, Engineer's name, and Contractor's name printed on the cover. The material shall also be clearly indexed and grouped by the various systems in the Project. This data shall be supplied for all materials, equipment, and devices and components which will require maintenance, replacement of parts, and knowledge of operation. The information furnished shall pertain specifically to the materials and equipment furnished. Manufacturers' O&M manuals that deal with more than one product line shall have the non-relevant information crossed or blocked out. Also, in addition to the three bound copies due prior to final completion of the Project, the Contractor shall furnish one copy of O&M material to the Engineer for all major equipment when it arrives on the Job Site. The Contractor shall furnish a complete listing of all equipment supplied and each respective Supplier's name, address, and telephone number. The O&M data furnished shall include detailed manufacturer's O&M information on each component, function description of operation, a complete parts list, and a separate parts list for parts not readily available.

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2. For all electrical systems, in addition to other requirements listed herein, Record Drawing one-line diagrams and wiring diagrams properly labeled shall be submitted. The Contractor shall also furnish the Engineer with copies of the appropriate plan sheets marked up with "Record Drawing" locations of conduits underground, under or in concrete slabs, locations of installed equipment, and the name, address, and phone number of the electrician who installed the system.
3. For mechanical systems, in addition to other requirements listed herein, where appropriate, lubrication schedules shall be furnished or clearly identified in the manufacturer's O&M Manual. Lubricants that are not locally available shall be cross-referenced to a commonly available brand.
4. For painting systems, the Contractor shall provide either fresh labels from paint cans with a list of places used or a written description of the painting systems, locations used and application requirements, and Supplier's name, address, and phone number.
5. IT IS INTENDED THAT THE O&M MANUAL BE COMPLETE AND DETAILED. EXAMPLES OF ACCEPTABLE O&M MANUALS ARE AVAILABLE FOR INSPECTION AT THE ENGINEER'S OFFICE. CONSIDERABLE EFFORT SHALL BE EXPENDED IN PREPARING THE O&M MANUAL.
6. Included hereafter is a partial listing of items for which manufacturer's data should be included in the O&M Manual. Information such as manufacturer's name, equipment model number, size, type, instructions for installation, calibration, operation, service and parts, etc., should be indicated for the specific items that have been incorporated into the Project. Non-relevant information shall be crossed or blocked out.
 - a. Pipe - Type and Pressure Rating
 - b. Fittings
 - c. Valves
 - d. Valve Boxes
 - e. Couplings
 - f. Expansion Joints
 - g. Check Valves
 - h. Hose Reel
 - i. Electrical
 - 1) Complete Electrical Wiring Schematics with Terminal Wire Numbers
 - 2) Transformers
 - 3) Indicating Lights, Switches, Phase Failure Devices, etc.
 - 4) Control Systems
 - j. Motor Starter Panels
 - 1) Breakers
 - 2) Control Breakers

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- 3) Breaker Operators
 - 4) Transformers
 - 5) Control Transformers
 - 6) D.C. Supply Transformer
 - 7) D.C. Power Supply
 - 8) U.P.S. Batteries
 - 9) Surge - Spike Arrester
 - 10) Surge - Suppressors
 - 11) CPU
 - 12) Interface
 - 13) Front Panel
 - 14) Pilot Lights
 - 15) Switches
 - 16) Fuse Holders
 - 17) Fuses
 - 18) Phase Loss
 - 19) Phase Loss Delay Timer
 - 20) Radio Modems
 - 21) Enclosures
 - 22) Terminal Blocks
 - 23) General Purpose Relay
 - 24) Contactor
 - 25) Overload
 - 26) Motor Circuit Protector
 - 27) LED Read Out
 - 28) Start Counters
 - 29) Transducer
 - 30) Programmable Logic Controllers
- k. Secondary Clarifier Record Drawings and Details
- 1) Basic Clarifier Layout and Dimensions
 - 2) Appurtenances and Dimensions
 - 3) Piping - Location, Size, Type, etc.
 - 4) Motor
 - 5) Manufacturer's O&M Instruction Book
- l. Slide Gates
- m. Paint Systems
- n. Manufacturer's Guarantee on Materials Furnished

END OF SECTION

TECHNICAL SPECIFICATIONS

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TECHNICAL SPECIFICATIONS
SECTION 1
EXCAVATION AND BACKFILL OF TRENCHES

PART 1 - GENERAL

1.1 Summary

- A. These Specifications cover the excavation and backfill of trenches for the installation of sanitary sewer, water lines, service lines, and other underground utilities.
- B. Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of Work to be constructed. All applicable sections, as determined by the Engineer, shall control the Work outlined in the Contract Documents.

1.2 Definitions

- A. Foundation material or stabilization fabric will only be required when standard bedding requirements will not adequately support the pipe.
- B. Backfill is the filling of the trench to the existing ground level or the finish grade line shown on the Drawings.
- C. General trench excavation shall include whatever materials that are encountered (except solid rock) to the depths shown on the Drawings or as required to properly install the pipe.

1.3 Safety

- A. See requirements for Project safety in the General Conditions and General Requirements.
- B. The determination of the safe trench width is the sole responsibility of the Contractor.

1.4 Existing Utilities

See the General Conditions and General Requirements for Contract requirements for existing utilities and for preservation of survey monumentation.

1.5 Dust and Mud Control

- A. The Contractor shall take appropriate action to control dust and mud caused by their operations. This shall include, but not be limited to, watering of exposed areas, cleaning of roadways, etc. This is considered a normal part of the construction Project.
- B. No measurement or payment shall be made for this Work.

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EXCAVATION AND BACKFILL OF TRENCHES

1.6 Soil and Groundwater Conditions

- A. Soils data and groundwater conditions, when shown on the Drawings, are provided for the Contractor's information, may not be relied upon, and are a general description only. This information may or may not be shown. The Engineer assumes no responsibility for actual soil conditions.
- B. Soils data and groundwater conditions, when shown, shall not relieve the Contractor from the responsibility of making additional investigations. The Contractor shall perform investigations as they deem necessary to acquaint themselves with actual conditions to be encountered in performing the Work. Groundwater conditions in particular should be carefully considered and are subject to change.

PART 2 - MATERIALS

2.1 Foundation Material

Foundation material shall be well-graded 2-1/2"-0 or 1-1/2"-0 crushed rock.

2.2 Bedding and Select Backfill

Bedding and select backfill shall be well-graded 3/8"-0 or 3/4"-0 crushed rock or approved equal. All bedding and select backfill materials shall be subject to the approval of the Engineer.

2.3 General Backfill

- A. General backfill will consist of material excavated from the trench, or material imported by the Contractor. General backfill material shall be free of vegetative matter, boulders (4-inch plus), frozen material and any other unsuitable material, and shall have a moisture content that will allow for the required compaction of the general backfill material unless approved otherwise by the Engineer. Use of backfill material containing consolidated masses 4-inch in diameter or greater is prohibited.
- B. When necessary, the Contractor shall selectively separate suitable general backfill material from unsuitable general backfill material.
- C. When the Engineer determines that the native material excavated from the trench is unsuitable or unacceptable for use as general backfill, the Engineer may require the Contractor to remove the unsuitable material from the Project Site and import suitable general backfill material. Suitable material shall be similar in nature to native soils as approved by the Engineer. When imported general backfill must be placed in or below the groundwater, the imported general backfill shall be free draining granular material

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with less than 20 percent passing a No. 4 sieve and less than 3 percent passing a No. 200 sieve.

2.4 Anti-Flotation, Dewatering and Trench Stabilization Fabrics

- A. Fabric for anti-flotation and dewatering shall be Mirafi 500X or approved equal.
- B. Fabric for trench stabilization shall be Mirafi 140N Fabric or approved equal.

PART 3 - EXECUTION

3.1 Clearing and Grubbing

- A. Contractor shall do all clearing and grubbing and removal of structures, etc. necessary to permit proper installation of the pipeline and to eliminate the possibility of stumps, logs, brush, or rubbish being mixed with the backfill material. A sufficient amount of all stumps and stump roots shall be removed so that any future removal of any remaining parts of the stumps and/or roots will not damage the pipeline. All stumps, roots, logs, brush and rubbish shall be removed and disposed of in conformance with the requirements of local authorities controlling air pollution, and solid waste disposal.
- B. As soon as the Work is completed, all signs, guardrails, utility poles, fences, etc., that were moved for the construction operation shall be replaced undamaged in their original location. Damaged items shall be replaced by the Contractor with new items of equal quality.

3.2 Cutting of Asphalt Pavement and Concrete Curbs

- A. Where the excavation is made in a paved street, the asphalt surface shall be cut on each side of the trench prior to excavation, to provide a vertical joint in the surface. Cutting of the asphalt will be made with a saw designed for the cutting of asphalt. Pavement shall be removed to a width 12 inches wider than the width of the trench.
- B. The use of a jackhammer, wheel cutter, or other similar tool may be allowed by the Engineer only where the Contractor can demonstrate that the alternate method provides a neat straight edge.
- C. Prior to excavating across a concrete structure such as a curb, the Contractor shall cut and remove a section of the structure to provide for their excavation. The dimensions of the removed section shall be such that the Contractor's excavation will not result in undermining of the remaining structure.

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- D. The Contractor shall cut the concrete structure with a diamond saw or other equipment designed for that purpose such that a neat, straight, vertical edge is left on the remaining concrete structure. The Contractor shall similarly cut and remove any such concrete structure undermined or damaged by their construction work.
- E. Following proper backfill and compaction of their excavation, as specified herein, the Contractor shall repair streets or replace the curbs in conformance with the Drawings, or, if no Drawing is provided, equal to the condition prior to removal and in accordance with Technical Specifications - "Surface Restoration."

3.3 Trench Excavation

A. General

When solid rock is encountered in trench excavation, the Engineer shall be notified.

B. Trench Width

- 1. The maximum trench width in the pipe zone shall be 2 feet plus the O.D. of the pipe and the minimum trench width in the pipe zone shall be 1 foot plus the O.D. of the pipe. This width shall be maintained to the top of the pipe.
- 2. The maximum clear width above the top of the pipe will not be limited except in cases where excess width of excavation would cause damage to adjacent structures or utilities.

C. Unsuitable Material

- 1. When natural soil conditions exist in the bottom of the trench that are unsuitable for proper pipe installation, the Contractor shall immediately notify the Engineer. The Contractor shall then over-excavate the trench below the design grade to a depth specified by the Engineer. Such over-excavation shall be to provide for foundation material as specified herein. No additional payment will be made to the Contractor for additional excavation without prior approval of the Owner.
- 2. Foundation material or stabilization fabric, as shown on the Drawings, shall be provided by the Contractor only when specifically called for on the Drawings or in these Specifications or when required by the Engineer. No additional payment will be made to the Contractor for foundation material or stabilization fabric placed without prior written approval of the Owner of such additional payment.

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3. As an alternative to over-excavation and placement of foundation material, a geotextile fabric may be used if field use proves acceptable. The fabric material shall be placed on the bottom of the trench and the bedding material placed over the fabric to proper pipe grade. The fabric width shall be one foot wider than the trench bottom.

D. Exploratory Work

Contractor shall perform appropriate exploratory work to locate utilities when they are known to exist but the specific location is unknown or not marked accurately. Appropriate exploratory work shall be performed in these situations.

3.4 Shoring, Sheeting, and Bracing of Trenches

- A. The Contractor shall adequately sheet and brace the trench during excavation whenever necessary to satisfy trench safety standards, prevent cave-ins, or to protect adjacent structures or property. Where sheeting and bracing are used, the Contractor shall increase trench widths for the bracing material accordingly.
- B. The sheeting must be kept in place until the pipe has been placed, backfilled at the pipe zone, tested for defects, and repaired if necessary. All sheeting, shoring, and bracing of trenches shall conform to the requirements of the public agency having jurisdiction.

3.5 Dewatering Excavated Areas

- A. All groundwater, seepage, or stormwater that may occur or accumulate in the excavation during the progress of the Work shall be removed. In areas where the nature of soil and hydrostatic pressures are of such a character as to develop a quick condition in the earth mass of the trench, the dewatering operation shall be conducted so that the hydrostatic pressure will be reduced to or near zero in the immediate vicinity of the trench.
- B. All excavations shall be kept free of water during the construction or until otherwise requested by the Engineer.
- C. Contractor shall dispose of all waste and water removed from the trench. Disposal shall be in accordance with all state and local regulations.

3.6 Location of Excavated Materials

Contractor shall provide means of containing overly saturated soils, i.e., muck, or remove the muck from the Work area as it is excavated, if such soils are encountered in the excavation. The

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intent is to prevent excessive damage or disruption to street rights-of-way or easement beyond what would normally occur during such Work. Pile and maintain material from trenches so that the toe of the slope of the material excavated is at least two feet from the edge of the trench. It shall be the Contractor's responsibility, however, to determine the safe loading of all trenches.

3.7 Disposal of Excavated Materials

Contractor shall dispose of all excavated material, which is not required for, or is unsuitable for, backfill. The Contractor's method of disposal shall comply with regulations of the governing body having jurisdiction.

3.8 Trench Backfill

- A. All backfill material shall be placed into the trench so that free fall of the materials into the trench is prevented until at least two feet of cover is provided over the pipe. Under no circumstances shall sharp or heavy pieces of material be allowed to drop directly onto the pipe. Methods of backfilling, other than as specified herein, shall be used only upon the approval of the Engineer.
- B. Bedding and Select Backfill
 - 1. A minimum 6-inch depth of bedding shall be placed on the trench bottom, compacted to 95 percent of the maximum density as determined by ASTM D698 and smoothed to provide uniform bedding so the pipe is supported along its full length and not by the bells. Bell holes at each joint shall be provided to ensure support along the entire pipe length.
 - 2. It shall be understood that the 6-inch depth is a minimum depth only, not an average depth, and does not preclude the Contractor at their option from placing additional depth of bedding to facilitate their Work. Once the pipe is properly installed, the bedding material shall be brought up to 12 inches over the pipe crown in 4-inch lifts and compacted to 95 percent density. Care shall be used to ensure that the bedding material is properly worked under the haunch of the pipe for its full length. No additional payment will be made to the Contractor should they elect to use additional bedding material for their convenience. Payment for any additional bedding material used as foundation material must be approved by the Owner prior to any Work being performed.
 - 3. Select backfill shall then be brought up from the spring line to the minimum distance above the top of the pipe shown on the Drawings, leveled and compacted to 95 percent of ASTM D698 density. Compaction of the bedding and

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select backfill by hand tamping will be allowed if the 95 percent density is achieved; otherwise, mechanical tamping will be required.

4. When an open-graded material is used for bedding or foundation material to facilitate trench dewatering, the open graded material shall be placed to the spring line of the pipe. The Contractor shall make provisions to ensure that fines from the select backfill do not migrate into the open graded bedding or foundation material. To prevent soil migration the Contractor may use any of the following:
 - a. Provide a properly graded select backfill approved by the Engineer;
 - b. Provide an approved fiber/fabric between the open graded bedding material and select backfill;
 - c. Hydraulically jet select backfill fines into open graded bedding material after dewatering is complete and before general backfill is placed; or
 - d. Provide an alternative approved by the Engineer.
- C. All general backfill material shall be pushed first onto the slope of the backfill previously placed and allowed to roll down into the trench. The Contractor shall not push the backfill material directly into the trench until at least two feet of cover is provided over the pipe.
- D. Compaction
 1. In roadways, driveways, under curbs and sidewalks, as shown on the Drawings, or as required by the Engineer, general backfill shall be placed in horizontal lifts not to exceed 12 inches in depth and compacted to 95 percent of the laboratory density as determined by ASTM D1557. The method of compaction shall be selected by the Contractor. Lifts shall not exceed depths appropriate to meet 95 percent density for the compaction methods and equipment selected by the Contractor.
 2. The Contractor shall exercise extreme care to avoid damage to the pipe during compaction of the trench. Where materials consist of cobbles and coarse gravels, compaction of each lift shall be accomplished by at least five passes of an appropriate vibrating type compactor. When materials are such that meaningful in place density test cannot be run, then the Contractor and Engineer will agree on a method of compaction which will provide adequate compaction.

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3. In sections where specific compaction requirements are not specified or required by the Engineer, general backfill shall be compacted, as a minimum, to a density equal to that of the natural ground adjacent to the trench. All trenches shall be maintained for a period of one year after final acceptance of the Project. Any settlement of the trenches during the one-year guarantee period shall be remedied promptly at the request of the Engineer and at no additional cost to the Owner.

E. Anti-Flotation Fabric Placement

1. When called for on the Drawings or called for by the Engineer, the Contractor shall place geotextile fabric over the select backfill material prior to placing general backfill. This fabric will help reduce the exposure to pipeline flotation.
2. The fabric shall be placed in accordance with the requirements shown on the Drawings.

3.9 Execution of Dust and Mud Control

If the Contractor fails to properly control the dust and mud, the Engineer may request them to do so in writing. If, after 24 hours from this request, the Contractor has not corrected the dust or mud problem, the Owner may elect to have the corrective work performed and withhold the cost from the Contractor's payments.

3.10 Restoration, Finishing, and Cleanup

- A. The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, or other existing facilities disturbed by their Work unless otherwise specified. Restoration and cleanup shall be a continuing operation and shall be diligently pursued until completed.
- B. All surplus material and temporary structures as well as excess excavation shall be removed by the Contractor and the entire Site of Contractor operations shall be left in a neat and clean condition.
- C. Surface restoration shall be performed in accordance with Technical Specifications - "Surface Restoration." All other existing facilities shall be replaced or restored equal to their original condition.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 Basis of Measurement and Payment

- A. Unless specifically listed in the Bid Schedule, there will be no measurement or payment made for general trench excavation, shoring, and backfill of trenches, including bedding and select backfill. All costs shall be included in other appropriate bid items listed in the Bid Schedule. See Technical Specifications - "Measurement and Payment" for a description of the bid items for this Project.
- B. The Contractor shall make allowance in their Bid for importing up to 10 percent of the general backfill material required on the Project and shall perform this Work when, in the opinion of the Engineer, native soil conditions require removal and replacement of unsuitable material. The Engineer and the Contractor shall document all general backfill quantities removed using neat line average trench section areas and lengths to compute quantities. Should the quantity which is removed and replaced exceed 10 percent of the total general backfill required on the Project, the amount of general backfill imported over 10 percent shall be paid for under a negotiated Change Order. Material called for removal and replacement with defined material, specifically on the Drawings, shall not be considered as a part of the import allowance.
- C. Unless specifically listed in the Bid Schedule, there will be no measurement or payment made for general trench excavation, backfill of trenches, including bedding and select backfill. All costs shall be included in other appropriate bid items listed in the Bid Schedule.
- D. Payment for Work performed by the Contractor shall be paid for under the following bid items when listed in the Bid Schedule: "Repair of Unmarked Utility" and "Repair of Unmarked Sewer." When specific repair work is not listed in the Bid Schedule, required repair work will be paid for by an approved Change Order. There shall be no payment for damaged water lines or sewer lines that have been marked by the Owner prior to excavation and are within the four feet specified. When rock excavation is required to complete the Work and unit prices for rock excavation are not included in the Bid Schedule, rock excavation shall be performed by Change Order.

4.2 Foundation Material and Stabilization Fabric

- A. When foundation material or stabilization fabric is listed in the Bid Schedule, the bid price shall include payment for all excavation embankment and compaction, or fabric, etc., as required. When foundation material or stabilization fabric is required by the Engineer in areas not identified on the Drawings or in the Specifications, said Work will

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be performed by Change Order unless a unit price for said Work has been included in the Bid Schedule.

- B. When fabric is used in lieu of foundation material, it will be paid by Change Order. Payment will be on a square yard basis.

4.3 Shoring, Sheeting, and Bracing

Unless provided for in the Bid Schedule, no additional payment will be made for shoring, sheeting, or bracing of trenches.

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TECHNICAL SPECIFICATIONS

SECTION 2

SURFACE RESTORATION

PART 1 - GENERAL

1.1 Scope

- A. The Contractor shall perform all Work and furnish all materials to restore the work area including any gravel, asphalt, concrete, fences, or any other surfaces or items damaged or disturbed by their construction operation. Surface restoration shall follow as closely as possible the backfill and compaction of excavations.
- B. Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of Work to be constructed. All applicable sections, as determined by the Engineer, shall control the Work outlined in the Contract Documents.

PART 2 - MATERIALS

2.1 Base Rock

Base rock shall substantially conform to current Oregon Standard Specifications for Construction for base aggregate materials, or as otherwise approved by the Engineer. The intent is to specify a base rock which is suitable for use in the restoration of areas disturbed by the Contractor's Work. Base rock required shall generally be 3/4"-0, graded to meet the requirements of the most recent edition of the Oregon Standard Specifications for Construction unless otherwise specified or approved. The Contractor shall submit to the Engineer Samples of the base rock proposed for use on the Project.

2.2 Asphalt Concrete

Asphalt concrete shall be an approved commercial mix generally conforming to the applicable provisions of the current Oregon Standard Specifications for Construction for asphalt concrete pavement. Unless approved otherwise, the gradation of the mix shall generally conform to a 1/2-inch dense mix. The Contractor shall submit for review by the Engineer data on the asphalt concrete mix to be used. Data shall include aggregates, gradation and tolerances, aggregate suitability, asphalt concrete, mix proportions and tolerances, etc.

2.3 Portland Cement Concrete

- A. The Portland Cement concrete used for this Work shall be an approved commercial transit mix. The exact proportions of all the materials entering into the concrete shall be as established by an approved laboratory mix design and shall be changed only as directed by the Engineer or laboratory when necessary to obtain the specified strength, desired density, uniformity, or workability. Previously prepared mix designs will be

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allowed provided adequate test data is available to document the suitability of the mix and the Contractor can document that the same materials are being used.

- B. The mix shall have a maximum water-cement ratio of 0.45, a minimum 28-day compressive strength of 4,000 psi, a minimum of 564 pounds of cement per cubic yard of mix, and an air content of 4 to 7 percent. The maximum allowable slump shall be 4 inches for all structures covered under this section of the Specifications.

2.4 Hot Asphalt-Rubber Joint Sealant

Hot asphalt-rubber joint sealant shall be Roadsaver 221 as manufactured by CrafcO, Inc., or equal.

PART 3 - EXECUTION

3.1 Gravel Surface Restoration

- A. During trench and general excavation, the Contractor shall minimize the disturbance of adjacent gravel surfaces.
- B. Backfill of trenches and other work areas shall be in accordance with Technical Specifications - "Excavation and Backfill of Trenches," or other applicable requirements.
- C. In gravel surfaces disturbed by the Work, the Contractor shall resurface the areas with base rock or surface aggregate as required on the Drawings.
- D. In gravel surfaces, a 4-inch minimum compacted depth shall be required or a compacted depth equal to the existing depth of gravel plus the depth of granular subbase, if any, whichever is greater, unless otherwise specified on the Drawings or in these Specifications.
- E. The resurfacing aggregate shall be compacted to 95 percent of laboratory density as determined by ASTM D1557.

3.2 Asphalt Surface Restoration

- A. Existing asphalt surfaces shall be cut on each side of the trench prior to excavation to provide a vertical, neat, straight-line joint in the surface. Should any asphalt surface be undermined or damaged during construction, the undermined or damaged asphalt shall be similarly cut and removed prior to backfill. This work shall be performed along neat, continuously straight lines to provide a pleasing finished appearance. Irregular lines will not be allowed.

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- B. Backfill shall be made in accordance with Technical Specifications - "Excavation and Backfill of Trenches."
- C. The base rock under the asphalt pavement shall be replaced to a compacted depth equal to the existing base rock depth plus the depth of granular subbase, if any, or 6 inches, whichever is greater, unless specified otherwise on the Drawings or in these Specifications. The base rock shall be compacted to 95 percent of the laboratory density as determined by ASTM D1557.
- D. Immediately following backfill and compaction of the trench, and until the asphalt concrete is replaced, the base rock course shall be placed and compacted flush with the existing asphalt surface and maintained in a good condition.
- E. Just prior to placing the asphalt concrete, the base rock course and any temporary patch shall be excavated to the depth equal to that of the asphalt concrete to be placed.
- F. Placement of Asphalt Concrete
 - 1. Asphalt concrete for all areas, except in the State Highway, shall be 3 inches in depth after compaction or a depth equal to the existing pavement, whichever is greater, unless specified otherwise on the Drawings or in the Specifications.
 - 2. The restoration of asphalt concrete pavement in the State Highway shall be performed as described on State Highway Crossing Permits.
 - 3. Asphalt concrete shall be compacted with an 8-ton minimum steel-wheeled roller and compacted to a minimum of 91 percent of the maximum density as determined by ASTM D2041.
 - 4. Prior to placing the asphalt concrete, an asphalt tack coat shall be applied to the edges of the existing asphalt. An asphalt tack coat shall also be used between lifts should the Contractor elect to patch with multiple lifts. The Contractor shall utilize a paving machine, spreader box, or other approved mechanical equipment to place the asphalt concrete material. No lift of asphalt placed shall have a compacted thickness of less than 1/2 inch or greater than 3 inches. The finished asphalt surface shall be flush with the existing surface, uniform in appearance equal to or better than the existing pavement, and shall provide a smooth ride.
 - 5. Installation shall conform to the applicable provisions of the current Oregon Standard Specifications for Construction, Sections 00495 and 00744. Asphalt

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Concrete for temporary patches shall conform to Section 00745.50 of the Oregon Standard Specifications for Construction.

3.3 Asphalt Concrete Joint Sealing

- A. After a minimum of 30 days following completion of asphalt concrete restoration, the Contractor shall rout and clean joints between new asphalt concrete and the existing pavement.
- B. Routed joints shall be 1/2-inch wide x 3/4-inch to 1-inch deep.
- C. A hot asphalt-rubber joint sealant shall be placed in the joint flush with the surface to make a watertight seal.

3.4 Concrete Curb Restoration

- A. Existing concrete surfaces shall be saw cut on each side of the trench prior to excavation to provide a vertical, straight-line joint in the surface. Should any concrete surface be undermined or damaged during construction, the undermined or damaged concrete shall be similarly cut and removed prior to backfill. This work shall be performed along neat lines to provide a pleasing finished appearance. Irregular lines will not be allowed.
- B. Backfill shall be made in accordance with Technical Specifications - "Excavation and Backfill of Trenches."
- C. A 2-inch compacted depth leveling course of base rock shall be placed on the prepared subgrade. The base rock shall be compacted to 95 percent of the laboratory density as determined by ASTM D698.
- D. Any forms used shall be wood or metal and shall be acceptable to the Owner. They shall be suitably braced to prevent movement during placement. Joints shall be placed to match existing or as directed by the Engineer. The placement and curing of the concrete shall follow good concrete placement practices. The concrete thickness, section, finish, configuration, etc., shall match the existing structure as closely as possible.

3.5 General Surface Restoration

- A. The Contractor shall replace or restore, equivalent to their original condition, all surfaces, fences, or other existing facilities disturbed by their Work unless otherwise specified. Restoration and cleanup shall be a continuing operation and shall be diligently pursued until completed. Surface restoration shall be completed as soon as possible after the underground work is complete.

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- B. All surplus material, rock and debris, and temporary structures, as well as excess excavation, shall be removed by the Contractor and the entire Site of Contractor's operations shall be left in a neat and clean condition.

3.6 Cleanup

- A. Cleaning up shall be a continuing process from the start of the work to final acceptance of the Project. The Contractor shall, at all times, keep the area on which work is in progress free from accumulations of waste material or rubbish.
- B. Spillage from the Contractor's hauling vehicles on traveled public or private roads shall be promptly cleaned up. Upon completion of the work the Contractor shall remove all temporary structures, rubbish, and waste material, equipment and supplies, resulting from the Contractor's operations. The Contractor shall leave such lands in a neat and orderly condition which is at least as good as the condition in which the Contractor found them prior to the Contractor's operations. See specific conditions in the General Requirements.
- C. In roadways and traffic areas, the Contractor shall be responsible for maintaining a road surface suitable for travel by the public from the time of excavation until the road surface has been restored. Such work includes dust control, temporary patching, signing, grading, and filling of potholes on temporary street surfaces, etc. The Contractor shall be responsible for all Claims and damages resulting from their failure to maintain a suitable surface.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Basis

See Technical Specifications - "Measurement and Payment" for the description of the basis of measurement and payment for the Work performed under this Contract.

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TECHNICAL SPECIFICATIONS
SECTION 3
DEMOLITION AND SALVAGE WORK

PART 1 - GENERAL

1.1 Scope

- A. These Specifications cover the demolition and removal of all structures and equipment proposed for removal at the proper times during the Project construction.
- B. All Work required is not described in this section. The purpose of this section is to provide an overview of the Work required. Refer to the General Requirements for specific construction sequencing and its relationship with demolition.

PART 2 - MATERIALS - NOT USED

PART 3 - EXECUTION

3.1 Clarifier Demolition and Salvage Plan

- A. Interior Secondary Clarifier
 - 1. All interior equipment in the east secondary clarifier shall be removed as specified herein. Remove and dispose of the clarifier access bridge, center pier, center mechanism, influent well, sludge removal header, rotating scaffolding and scraper truss arm, and floor grout.
 - 2. Remove and salvage for reuse the launder brush system and anti-rotation scum baffle support beam. Remove and dispose of the stationary wiper panels from the anti-rotation scum baffle support beam.
 - 3. Protect the scum beach, fiberglass-reinforced plastic scum baffle ring, V-notch weir, clarifier sump, concrete clarifier walls, launder, and floor.
- B. Pump Station Slide Gates

Remove and dispose of the slide gates and their frames at the return activated sludge (RAS) station. Slide gate removal shall be coordinated so one secondary clarifier remains in service through the RAS station at all times. See the General Requirements for demolition and construction sequencing.
- C. Concrete Curb
 - 1. Sawcut and remove concrete curb to locations shown on the Drawings.

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2. Deliver to the Owner any salvage materials requested by the Owner. All other materials shall be disposed of by the Contractor. The Contractor shall protect adjacent structures and equipment, etc., from damage during demolition activities. Any damage to existing structures and equipment, etc., resulting from the Contractor's activities shall be repaired or replaced as required by the Owner at no cost to the Owner.

3.2 Electrical Demolition Plan

Refer to Technical Specifications - "Electrical and Control Work" and the Drawings for the electrical demolition requirements.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Basis

See Technical Specifications - "Measurement and Payment" for a description of the basis of measurement and payment for Work performed under this Contract.

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TECHNICAL SPECIFICATIONS

SECTION 4

SITE WORK

PART 1 - GENERAL

1.1 Scope

These Specifications cover the Site improvements, excavation and backfill, curbs, etc. Work shall include furnishing all equipment, materials, labor, etc., as required to complete the required improvements. Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of Work to be constructed. All applicable sections herein, as determined by the Engineer, shall control the Work outlined in the Contract Documents.

A. Construction Stakes

See the General Requirements for staking requirements.

B. Geotextile Fabric

This work consists of furnishing and placing geotextile fabrics in underdrains and at other locations as shown on the Drawings or directed by the Engineer.

1.2 Materials Certification and Testing

A. General

All testing shall be performed as per the requirements of the Drawings and Technical Specifications. Materials and work which fail to meet Contract requirements shall not be incorporated in the Work.

B. Owner's Responsibility

The Owner may provide routine testing services on materials and Work incorporated on the Project. These tests may include, but are not limited to, spot gradation checks, in place densities, concrete air, slump and compression test, extraction/gradations, etc. All routine testing services performed by the Engineer or Owner are provided solely for the Owner's information and in no way relieves the Contractor's responsibility to comply fully with the Contract requirements for "Quality Control" as noted in the General Requirements.

C. Contractor's Responsibilities

1. The Contractor shall provide, at their expense, all preliminary testing needed to determine if materials are suitable for the Project.

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- a. If aggregates are crushed for use on this Project, the Contractor shall be responsible for providing adequate quality control tests to document that the materials conform to these Specifications.
 - b. All tests required by Laws and Regulations shall also be the responsibility of the Contractor.
 - c. The results of all tests performed on materials to be used on the Project by the Contractor shall be submitted to the Engineer, prior to the use of any of these materials.
2. The Contractor shall cooperate with testing personnel and shall provide access to the work area and to manufacturer's operations.
- a. The Contractor shall notify testing and inspection personnel at least 24 hours in advance of operations to allow for personnel assignments and test scheduling.
 - b. All materials to be tested shall be provided by the Contractor at their expense. After tests are completed, the Contractor shall be responsible for repairing test areas to match original conditions.
 - c. The Contractor shall remove all defective material from the Site at their expense. The Contractor shall pay for re-inspection and retesting required because of defective work or ill-timed notices.

1.3 Construction Staking

The Owner will provide a benchmark for elevation control and a base control line for horizontal control unless otherwise stated in the General Requirements. All other construction staking shall be provided by the Contractor.

PART 2 - MATERIALS

2.1 Earthwork

A. Backfill Material

Suitable backfill material, unless shown otherwise on the Drawings, shall be the material excavated at the Site or crushed rock as approved by the Engineer. Backfill material shall be free from sod, roots, trash, large cobbles, or other debris, etc., and shall be at a proper moisture content to achieve compaction.

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B. Borrow Material

Borrow material shall be equal to or better than the on-site embankment material.

C. Water for Compaction

The Owner will allow the Contractor to use water from the Owner's existing water system at no cost when such a water system exists, provided the Contractor follows the requirements set forth by the Owner.

2.2 Geotextile Fabric

Geotextile fabric shall be Mirafi 500X or approved equal.

2.3 Aggregate Materials

A. General

All aggregate materials for aggregate base rock, base rock, or surface rock, unless called for otherwise, shall meet the following requirements:

Percent Wear (AASHTO T 96)	40% Maximum
Durability Index Coarse and Fine	35% Maximum

B. Aggregate Base Rock

The aggregate base rock shall be a well-graded 4"-0 crushed or uncrushed basalt material with the fraction passing the #200 sieve not greater than 8 percent of the total aggregate weight. Other materials may be considered by the Engineer; however, Samples must be submitted for review.

C. Base Rock

Base Rock shall substantially conform to current Oregon "Standard Specifications for Construction" for base aggregate materials, Section 02630, or as otherwise approved by the Engineer. The Contractor shall use 3/4"-0 base rock unless designated otherwise on the Drawings.

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SITE WORK

D. 3/4-inch Drain Rock

3/4-inch drain rock shall meet the following grading requirements:

Sieve	Percent Passing
1"	99 to 100
3/4"	80 to 100
3/8"	0 to 40
#4	0 to 4
#200	0 to 2

2.4 Concrete

Concrete for curbs and sidewalks shall comply with the requirements of Technical Specifications - "Reinforced Concrete."

PART 3 - EXECUTION

3.1 Geotextile Fabric Installation

Geotextile fabric shall be installed as shown on the Drawings or as directed by the Engineer. The fabric shall either be sewn together at all longitudinal and transverse edges or overlapped a minimum of two feet at all edges. Transverse overlaps shall be made in the direction of base material placement.

3.2 Placement of Aggregate Materials

- A. The construction procedure described herein shall be understood to apply to each of the courses and/or layers of aggregate materials of which the Site is to be constructed.
1. After the subgrade is brought to the proper line, cross section and compaction, the aggregate materials shall be spread and shaped as required.
 2. The spreading and shaping of the aggregate materials shall be so performed as to prevent separation of the coarser material from the finer materials including the use of adequate water.
 3. The aggregate materials shall be brought to proper moisture content as required for compaction and compacted to 95 percent of maximum density as determined by ASTM D1557.

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SITE WORK

4. The finished surface when tested with a 10-foot straightedge shall not vary from the testing edge by more than 0.05 foot at any point.
 5. Following construction of each lift, the Contractor shall do such blading, brooming, watering and other work as necessary to prevent raveling and rutting.
 6. These operations are to be continued as required until the lift is covered by a following lift or until all Work to be done under the Contract is completed.
 7. If the required compacted depth of any lift exceeds 6 inches, it shall be constructed in two or more lifts, each lift not exceeding 6 inches in depth.
- B. Upon completion of the aggregate materials placement, the Contractor shall load test the finished surface. The load test shall consist of slowly driving a loaded minimum 10 yard dump truck over the road surface.
- C. All soft areas shall be noted. The Contractor shall excavate and/or compact all soft areas in order to provide a firm base that conforms to the requirements of the Technical Specifications. This shall be done at the Contractor's expense.

3.3 Concrete Curbs

A. General

Concrete curbs and sidewalks shall be constructed in accordance with these Technical Specifications and the lines, grades and cross-sections shown on the Drawings. Curbs may be constructed with forms or with a curbing machine meeting the requirements of these Technical Specifications. Curbs located on vertical or horizontal curves shall be constructed to result in a uniform and smooth curve appearance.

B. Curbing Machine

The machine for extruding Portland Cement concrete curb shall be of the self-propelled type equipped with a material hopper, distributing screw and adjustable curb forming devices capable of placing and compacting Portland Cement concrete to the lines, grades, and cross-sections as shown in an even homogeneous manner. A grade line gauge or pointer shall be attached to the machine in such a manner that a continual comparison can be made between the curb being placed and the established curb grade as indicated by the offset guideline.

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C. Placement and Finishing

1. The top and face of finished curbs shall be true and straight and the top surface of curb shall be of uniform width free from humps, sags, honeycombs or other irregularities. When a straight edge 6 feet long is laid on the top face of the curb or on the surface of gutter, the surface shall not vary more than 0.02 foot from the edge of the straight edge except at grade changes or vertical curves. The Contractor shall construct all curb and gutter within 0.02 foot of true line, within 0.02 foot of established surface grade, cross -section and slope and within 0.02 foot of specified thickness.
2. When the curbing machine is used, the Contractor shall feed the concrete into the extruding machine at a uniform rate and operate the machine under sufficient restraint in a forward motion to produce a well compacted mass of concrete. All exposed surfaces of the curb shall be floated, followed by a light brush finish.
3. If forms are used, they shall be removed after the concrete has taken its initial set and while the concrete is still green enough to finish. Minor defects shall be repaired with mortar containing one part Portland Cement and two parts sand.
4. Honeycombed, slumped, and other structurally defective concrete shall be removed and replaced at no expense to the Owner.
5. All exposed formed surfaces shall receive a rubbed finish utilizing a Carborundum brick or other abrasive until a uniform color and texture is produced.

D. Joints

1. Expansion Joints
 - a. Expansion joints shall be provided opposite abutting expansion joints, at the end of curved sections, at connections to existing curbs or sidewalks, and adjacent to any structure.
 - b. The width of joints and thicknesses of filler shall match those of the joints and abutting or underlying concrete; elsewhere the filler thickness shall be 1/2 inch.

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- c. Each expansion joint shall be at right angles to the structure alignment, vertical to the structure surface, and shall provide complete separation of new cement concrete.
2. Transverse Contraction Joints
 - a. Transverse contraction joints of the weakened plane or dummy type shall be formed in the exposed surfaces opposite contraction joints in abutting Portland Cement concrete and at other locations in the new curb or sidewalk as required to confine the contraction joint spacing to a maximum of 10 feet.
 - b. The joints shall be formed by grooving, by insertion and removal of plates or other devices, by insertion and leaving in place of preformed bituminous filler, or by sawing.
 - c. Contraction joints shall be 3/16 inch in width and a minimum depth of 1/4 of the thickness of the concrete.
 - d. The edges of joints shall be tooled, unfilled grooves and shall be clean and neat, and joint filler shall be even and flush with the surface of the concrete. If the joints are constructed by sawing the sawing shall be performed as soon as practical after pouring and prior to the occurrence of any shrinkage cracking.

E. Adjustment of Utility Covers To Grade

The Contractor shall adjust the tops of all manholes, valve boxes and other utility covers as required to bring the covers or gratings of the structures to the grade required by the improvement involved. The Contractor shall repair any of these structures which are damaged during performance of the Work at no cost to the Owner.

3.4 Site Cleanup

The Site shall be left in a clean, neat, and presentable condition. All debris, construction materials, unsightly rocks, tree roots, or other material which detracts from the appearance of the Site shall be disposed of in a satisfactory manner.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 Basis

See Technical Specifications - "Measurement and Payment" for a description of the basis of measurement and payment for Work performed under this Contract.

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PART 1 - GENERAL

1.1 Project Scope

The Contractor shall construct improvements to the existing east secondary clarifier as specified herein and as shown on the Drawings. The Work generally consists of draining and wash-down of the clarifier; installation of a new center pier with influent well, baffles, and all associated foundational and support structures; installation of a new collector mechanism with associated support structures; installation of a new truss arm assembly, scum blade and surface skimmer assembly with associated support structures; installation of a new drive and motor assembly; installation of a new full-span access bridge and center platform; installation of drain system in the existing clarifier floor; and reinstallation of the salvaged scum baffle and launder brush assemblies. The Work shall also include painting of the existing concrete launder and painting/coating of all new steel components and appurtenances. The Work shall result in a complete and functional clarifier.

1.2 Specification References

This Specification section is written to work in conjunction with all other Specification sections. Materials and requirements not specifically mentioned in this section are to be supplied and installed as outlined on the Drawings and in the other Specification sections. Specification sections that have direct reference to the primary clarifier include, but are not limited to, the following:

- Demolition and Salvage Work
- Site Work
- Excavation and Backfill of Trenches
- Pipe, Fittings, and Valves
- Reinforced Concrete
- Electrical and Control Work
- Painting
- Measurement and Payment
- Surface Restoration

1.3 Safety and Health

The Contractor is reminded that they are solely responsible for all safety and health precautions including, but not limited to, head and face protection, ventilation, respiratory protection, sound levels, illumination, disease, temporary access equipment, and all other Occupational Safety and Health Administration requirements.

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1.4 Storage of Equipment

The Contractor shall provide indoor storage facilities for all mechanical equipment including motors and control equipment before they are installed. Any equipment that is damaged due to exposure to the weather shall be replaced at the Contractor's expense.

1.5 Design Criteria

Influent flow rates per clarifier/hydraulic loading		
Design average flow	3.18	MGD
Maximum daily flow	4.22	MGD
Peak instantaneous flow	4.96	MGD
Tank internal diameter	115	Feet
Side-water depth	11	Feet
Minimum freeboard - water surface to top of concrete wall	1.75	Feet
Floor slope	1/16:12	Inch:Foot
Center pier minimum inside diameter	36	Inches
Scum beach width	±6	Feet
Motor Hp	0.5	HP
Torque (minimum rated torque per AGMA standard)	31300	Ft-lbs
Ball race diameter	42	Inches

1.6 Submittals

- A. Clarifier equipment suppliers other than those specifically named shall not be considered. In addition to the submittal requirements listed in General Requirements, the Contractor shall submit, at a minimum, the following data for all proposed equipment/systems:
1. List of five separate project installations in the United States of equal type equipment to the unit specified. The installations must be complete systems similar to the one specified. The installation shall include, but not be limited to, the following:
 - a. Name and location of installation.
 - b. Name, address, and telephone number of person in direct responsible charge for the equipment/system.

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- c. Month and year the equipment/system was placed in operation.
 - d. Brief description of equipment/system.
2. A complete set of drawings, specifications, catalog cut-sheets, and detailed descriptive material. This information shall identify all technical and performance requirements stipulated on the Drawings and in the Technical Specifications.
 3. Detailed information shall be submitted for all items such as hardware, materials of construction, design drawings, load calculations, etc.
 4. List showing materials of construction of all components.
 5. Manufacturer's recommended spare parts.
 6. Information on equipment field erection requirements including total weight of assembled components and weight of each sub-assembly.
 7. A maintenance schedule showing the required maintenance, frequency of maintenance, lubricants, and other items required at each regular preventative maintenance period, including all buy-out items.
 8. Equipment electrical requirements and schematic diagrams.
 9. Complete list of deviations from the Drawings and Specifications.

1.7 Supplier

The clarifier equipment specified in this section shall be as designed and supplied by Evoqua Water Technologies, Siemens, or EIMCO. Equipment from alternate sources will not be allowed.

1.8 Warranty

A written supplier warranty shall be provided for the equipment specified in this section. The equipment shall be warranted for a period of two full years after final acceptance of the project by the Owner. Such warranty shall cover all defects or failures of materials or workmanship that occur as the result of normal operation and service except for normal wear parts (i.e., squeegees, skimmer wipers, etc.)

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1.9 Quality Assurance

- A. All equipment shall be furnished by manufacturers with at least 15 years' experience in the manufacture and design of secondary clarifier equipment and components as specified.
- B. Manufacturer shall have at least five successfully operating installations of similar size and complexity in actual service for a period of not less than ten years. Engineer may require evidence of these data.
- C. Manufacturer shall be International Organization for Standardization (ISO) 9001 certified.
- D. Furnish the services of a qualified manufacturer's representative to inspect the complete installation, make any necessary adjustments, participate in the startup and field testing of equipment, and place into operation.
- E. Furnish the services of a qualified manufacturer's representative to instruct plant personnel in the operation and maintenance of equipment.
- F. The manufacturer shall provide on-site verification of installation and set up as well as operator training in operation and maintenance of the systems.

PART 2 - MATERIALS

2.1 General

This Technical Specification covers furnishing and installing all components necessary for the installation of the east secondary clarifier interior mechanisms and equipment as shown on the Drawings and as specified herein. The Work includes all necessary equipment, construction, and installation required to provide a complete and operational secondary clarifier.

2.2 Corrosion Protection Requirements

All carbon steel components incorporated into the Work shall be hot-dip galvanized in accordance with ASTM A123. Field assembly of galvanized components shall be via mechanical connection or bolting. No field welding or cutting of hot-dip galvanized components shall be permitted.

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2.3 Center Pier

A. Center Pier

1. The center pier shall consist of a 36-inch diameter, cylindrical carbon steel pipe having a minimum wall thickness of 1/4 inch, which will serve as the influent pipe.
2. The pier shall be designed to support the drive unit, collector mechanism, center cage, and the access bridge.
3. Top of pier is to have a drive mounting plate set plumb with the centerline.
4. Drive is to be positioned, leveled, and grouted in place on top of the pier with a non-shrink grout.
5. Manufacturer to provide a minimum of eight 1-inch diameter anchor bolts and a steel template or grout shield to accurately locate anchors.
6. Center pier shall have a minimum of four overflow areas at its upper end to diffuse flow into the influent well at a velocity not to exceed 1.75 fps at maximum design mixed liquor flow.

B. Center Cage

1. The center cage shall be all welded construction and furnished in one section, consisting of structural steel members having a minimum thickness of 1/4 inch.
2. The center cage shall be designed to rotate and to support the truss arm and surface skimmer assemblies, collector mechanism, and cylindrical manifold.

C. Influent Well

1. The influent well shall have a 24-foot, 6-inch chordal and a 5-foot depth, fabricated of a carbon steel plate having a minimum thickness 3/16 inch, with bolted field splices. The steel plate sections shall be supported from the center cage or bridge extensions.
2. Ports shall be cut into the influent well to permit entrapped scum to escape. Ports shall be baffled to prevent short-circuiting to the weirs.

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3. The influent well shall be of adequate size to diffuse the flow into the tank at a uniform flow through velocity. The velocity is not to exceed 0.15 fps at maximum flow.

D. Cylindrical Manifold

1. The cylindrical manifold shall be of all welded construction. It shall be fabricated from carbon steel plate and fitted with two sealing rings for bolted connection to the collector mechanism and bottom of the center cage.
2. A bottom seal plate shall be furnished by the equipment manufacturer. It shall be securely anchored to the floor and grouted in place after final adjustment.
3. The cylindrical manifold shall include a deflector blade with a neoprene wiper to direct sludge to the first orifice on the collector mechanism.

2.4 Drive Mechanism

A. Design Parameters

1. The drive unit shall be designed and manufactured by the clarifier equipment supplier to ensure unit responsibility. The drive unit shall be designed for the torque values proposed by the manufacturer. It shall turn the mechanism at the design collector tip speed. The drive main bearing shall be designed for the total rotating mechanism loads with a minimum L-10 life of 200,000 hours. The drive unit shall be capable of producing and withstanding the previously listed momentary peak torque while starting.
2. All components of the drive mechanism shall be designed in accordance with AGMA Standard 6034-B92 "Practice for Enclosed Cylindrical Worm Gear Speed Reducers and Gearmotors," and Standard 2001-D04 "Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth;" for 24-hour continuous, uniform load duty and 20-year design gear life at the specified output speed. The AGMA-rated torque of the drive shall be the lowest value computed for worm gear set, spur gear, and pinion for strength and durability.
3. The drive shall be designed to a minimum AGMA rating as specified above, with a minimum service factor of 1.25.
4. Gear teeth shall be designed for proper load distribution and sharing. Stub tooth design and surface hardening of the main gear shall not be allowed. The main

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bearing shall be capable of withstanding the listed overturing moment without the aid of any underwater guides or bearing to ensure correct tooth contact for AGMA rating of the main gear. All spur gearing shall be designed to the latest AGMA spur gear standard for strength and surface durability, based on a life of 175,000 hours. The design running torque rating of the drive gearing shall be based on the smaller of the strength and durability values determined from the above AGMA standard. To ensure safety and ease of maintenance, all components of the drive shall be direct coupled.

5. No overhung pinions shall be allowed on the speed reducing unit. The lower pinion bearing shall not be located below the turntable base.

B. Physical Characteristics

The drive unit shall consist of a primary helical gear reduction, intermediate worm gear reduction unit, and enclosed final reduction units consisting of an internal spur gear and pinion in a turntable base. It is to be completely assembled and finish painted in the manufacturer's shop in accordance with Technical Specifications - "Painting."

All gearing shall be enclosed in gray cast iron ASTM A48 Class 40B housings. Fabricated steel housings, exposed gearing, and submerged bearings will not be acceptable.

The drive shall be designed to allow removal of the internal gear, balls, and strip liners without raising the walkway.

The turntable base shall be bolted on the center column and support the bridge, internal gear, and rotating load of the mechanism.

1. Primary Reduction Unit

The motor shall be NEMA design B, Class "F" Insulation, TEFC, ball bearing heavy duty unit of ample power for starting the operating mechanism without overload, with a minimum service factor of 1.15. A motor canopy shall be provided, and the bearing number shall be clearly marked on the motor name plate.

Power supply to equipment shall be 460-volt, 60-hertz, and 3 phase.

2. Intermediate Reduction Unit

All speed reducers shall be fully enclosed and running in grease. Support base for the drive shall be of welded steel to ensure rigidity. Lubricant and dust shields

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shall be provided. The drive bearing shall include a forged steel precision gear/bearing set, with fully contoured raceways hardened to a minimum 58 to 60 Rc and protected by a neoprene seal. Strip liners designed for a periodic maintenance and replacement shall not be acceptable. The drive shall be designed so the balls and nylon spacers can be replaced without removing the access walkway.

The main gear to pinion gear mesh shall be grease lubricated. Lubrication fittings shall be readily accessible. Continuous condensate drains shall be provided in the main gear housing. Oil-lubricated drives, or drive units that require large lubricant cavities requiring periodic condensate draining are not acceptable.

a. Speed-reducing Unit

The speed-reducing unit shall consist of cycloidal, helical, or planetary speed reducers directly connected to a motor and shall be keyed to the pinion.

The main ring gear of cycloidal drives shall be made of high carbon chromium bearing steel and be fixed to the drive casing. An eccentric bearing on the high speed shaft shall roll cycloidal discs of the same material around the internal circumference of this main ring gear. The lobes of the cycloid disc shall engage successively with pins in the fixed ring gear. The movement of the cycloid discs shall be transmitted then by pins to the low-speed shaft. Speed reducer efficiency shall be a minimum of 90 percent per reduction stage.

Speed reducer helical or planetary gearing shall be manufactured to AGMA standards and shall provide at least 95 percent power transmission efficiency per stage. The speed reducer shall have a minimum service factor of 1.25 based on the output torque rating of the drive.

The reducers shall be fitted with radial and thrust bearings of proper size for all mechanism loads and be grease lubricated. As a safety feature, the speed reducer shall be back drivable to release any stored energy as the result of an over torque condition.

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b. Overload Protection

An overload device shall be provided in a NEMA 4X Type 316 stainless steel enclosure. The device shall be actuated by torque generated from the main drive, which shall operate two independently adjustable switches (the alarm switch at 100 percent of design running torque and the motor shut-off switch at 120 percent off the design running torque). Devices that require the worm to float and measure the thrust of the worm gear shall not be acceptable. These two switches shall be factory adjusted to accurately calibrate the alarm torque value and the overload position. A visual torque indicator shall be provided and oriented so it may be read from the walkway. It shall be calibrated from 0 to 160 percent of design running torque.

3. Final Reduction

The final reduction unit main internal gear shall be forged of ductile iron. The pinion shall be heat-treated hardened alloy steel, from the slow speed shaft of the intermediate reduction unit.

C. Turntable

The turntable base shall have an annular bearing raceway upon which the rotating assembly rests. It shall have a maximum allowable deflection in accordance with the bearing specifications. The allowable modulus of elasticity shall be a minimum of 29×10^6 psi. The center cage shall be fastened to and supported from the gear casing. Ball bearings shall be grease lubricated and protected by elastomer seals. Felt seals that allow the entrance of moisture from outside the drive will not be allowed.

2.5 Anchors and Fasteners

- A. All anchor bolts shall be headed type or adhesive type of Type 316 stainless steel. The anchor bolts shall be furnished by the manufacturer and set by the Contractor in accordance with the manufacturer's printed instructions. All anchor bolts shall be of ample size and strength for the purpose intended.
- B. All fasteners shall be Type 316 stainless steel unless otherwise specified.

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2.6 Collector Mechanism

A. General

This Specification covers furnishing and installing all components necessary for the construction of the east secondary clarifier rotating collector mechanism as shown on the Drawings and as specified herein, including the rotating header, all associated supports, connections, etc. The Work includes all necessary equipment, construction, and installation required to provide a complete and functional collector mechanism.

B. Collector mechanism

1. The collector mechanism shall be a rectangular-shaped full tapered section, varying in size from a maximum near the tank center to a minimum at the outer edge. It shall be fabricated of carbon steel pipe with a minimum thickness of 1/4 inch and shall be hot-dip galvanized after fabrication.
2. The collector mechanism shall include draw-off orifices equally spaced along the length the of the header. The orifices shall have a smaller diameter near the tank center, and a larger diameter at the tank edge.
3. The collector mechanism shall include a neoprene wiper along the entire bottom length. The wiper shall be set to the slope of the clarifier floor and shall be designed to scrape settled sludge from the outer areas of the tank to the sump located near the center of the clarifier basin.

C. Collector Mechanism Supports

The supports for the collector mechanism shall be hot-dip galvanized steel tie bars with galvanized clevis that shall hold the header in alignment in both the vertical and horizontal planes.

2.7 Truss Arm Assembly

- A. The truss arm shall be of all welded construction consisting of structural steel members having a minimum thickness of 1/4 inch.
- B. The truss arm shall be supported from the center cage and manifold and shall be used to support the entire skimming mechanism.

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2.8 Surface Skimmer Assembly

A. Skimmer

The skimmer shall be ± 6 feet in length. It shall be hinged to ensure continuous contact and proper alignment with the scum baffle and scum beach plate. Contractor to field verify width of scum beach.

B. Scum Blade

A scum blade shall be installed, spanning the full length from the influent well to the peripheral scum baffle. The scum blade shall be supported by the fabricated A-frames supported by the truss arm.

2.9 Full-Span Access Bridge

A. Access Bridge

1. The access bridge shall be a full-diameter pony truss style bridge, diagonally braced to ensure lateral stability. It shall be all-welded construction and in accordance with clarifier equipment manufacturer specifications.
2. The walkway shall be of 6063-T6 (or equal) aluminum I-bar pressure locked grating with 1-1/4-inch bearing bars spaced on 3/16-inch centers. The crossbars shall be spaced on 4-inch centers. The grating shall have a non-skid surface.
3. All welded construction shall provide easy access to the drive mechanism.
4. The center platform shall be 8 feet wide and 10 feet long, or as required to provide minimum clearance of 2 feet around all components of the drive mechanism.
5. All removable bridge segments shall have their respective picking weights painted in a location visible from the perimeter of the clarifier.

B. Handrail

1. The structural members of the pony truss bridge shall act as the bridge handrail and toe plate. They shall meet all OSHA requirements and the standard railing requirements noted below. The handrail will extend around the drive platform. The post spacing shall not exceed 5 feet.

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2. Handrail materials shall be 1-1/2-inch Schedule 40 6063-T6 (or equal) extruded aluminum pipe. It shall have mechanical connectors with stainless steel fasteners. The toe plate shall be 4-inch high extruded aluminum channel.

C. Standard Railing, Stair Railing, and Toeboard

1. Standard railing shall consist of a top rail, intermediate rails, and posts. Rail height, post spacing, and pipe diameter shall be as shown on the Drawings, or as required by the Clarifier Equipment Manufacturer and applicable safety or building codes. Railing assembly shall be able to withstand a load of 200 pounds applied in any direction at any point on the top rail.
2. Railing shall be fabricated from Schedule 40 aluminum alloy 6063-T6 extruded pipe and shall be either a mechanical joint or a welded joint system, unless otherwise specified.
3. Mechanical joint system shall be ReynoRail II Aluminum Railing System supplied by Reynolds Metals Company, or an approved equal.
4. Toeboard shall be fabricated of 4-inch by 1/4-inch aluminum plate, unless otherwise specified.

D. Grating

1. Aluminum grating shall be sized as required by the clarifier manufacturer.
2. Grating shall have at least 1-1/4-inch bearing bars, or an equally strong I-bar, spaced on 1-3/16 inches apart and crossbars spaced 4 inches on center. Bearing bars shall span in the direction required by the clarifier manufacturer.
3. Walking surface shall be knurled or fluted to form a non-skid surface. Grating shall have a mill finish and all open edges shall be banded.

E. Treads

Stair treads shall be Reliance Steel Products Company's Aluminum DoubleLock Construction 2 feet, 6 inches long by 9-5/8 inches wide or approved equal, unless otherwise specified. Nosing shall be deep face or corrugated and treads shall be at least type 1RR4 with 1-1/4-inch by 3/16-inch bearing bars, or an equally strong I-bar, on 1-3/16-inch centers and cross bars shall be Relgrit, or surface shall be knurled or fluted. Stair treads shall have mill finish and shall be bolted to stair stringers with at least four 3/8-inch diameter bolts.

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2.10 Spare Parts

Manufacturer shall provide spare rubber seals, skirting, and scrappers, as well as any other sealing parts that see significant wear.

PART 3 - EXECUTION

3.1 Piping, Valving, and Miscellaneous Mechanical

A. General

All piping, valving, and miscellaneous mechanical work shall be completed as shown on the Drawings and specified in Technical Specifications - "Pipe, Fittings, and Valves." Any piping, valving, and miscellaneous mechanical work not shown on the Drawings but required by the clarifier equipment manufacturer shall be of the highest quality materials and conform to the clarifier equipment manufacturer's specifications.

B. Launder Brush Assembly

The launder brush assembly shall be salvaged and reinstalled in its original location and configuration at the end of the skimmer assembly. It shall be supported by the truss arm assembly and attached above the skimmer.

C. Anti-Rotation Baffle

The anti-rotation baffle shall be salvaged from the existing clarifier and reinstalled as close as possible to the original location on the secondary clarifier equipment, extending from the influent well to the entry point of the scum beach. It shall be supported by the existing clarifier wall and the full-span access bridge.

The Contractor shall coordinate with the clarifier equipment manufacturer for the connection location of the anti-rotation baffle on the bridge.

All stationary wiper panels shall be replaced with new panels as supplied by the clarifier equipment manufacturer.

3.2 Electrical and Control

All control and instrumentation work shall be completed as shown on the Drawings and specified in these Technical Specifications and Technical Specifications - "Electrical and Control Work."

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3.3 Miscellaneous Metal Work

A. Fabrication and Erection

Fabrication and erection of structural steel and miscellaneous steel items shall be in accordance with the "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction, where applicable. Structural steel and miscellaneous metal work shall be painted in accordance with Technical Specifications - "Painting."

B. Aluminum Welding

Aluminum shall be welded with gas metal arc (MIG) or gas tungsten arc (TIG) processes in accordance with the recommendations of the American Welding Society contained in the Welding Handbook, as last revised.

C. Standard Railing, Stair Railing, and Toeboard

1. Pipes shall have square and accurate pipe cuts for minimum joint gap. Joints with gaps in excess of 1/32 inch and all loose connections will be subject to rejection. All holes shall be drilled and countersunk the proper size, as required for a tight flush fit of rivets.
2. Welded joint system shall consist of shop-welded sections field connected with a mechanical joint system as specified above. Welded joint system shall have accurate joint makeup and first quality welded joints. If welding is uniform and reasonably smooth, grinding of joints will not be required. Shop-welded sections shall receive anodized coating after fabrication.
3. Stair railing shall meet all requirements of a standard railing. Rail height, post spacing, and pipe diameter shall be as shown on the Drawings, or as required by applicable safety or building codes. Clearance between the handrail and any object shall be a minimum of 3 inches.
4. Toeboard shall be securely fastened to railing posts, allowing for slippage due to expansion and contraction.

D. Minimum Embedment for Anchor Bolts

Minimum embedment for anchor bolts in concrete and masonry shall be as listed below or per clarifier manufacturer specifications, whichever is longer.

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Bolt Size	Embedment Length
1/2-inch	4 inches
5/8-inch	5 inches
3/4-inch	5 inches
7/8-inch	6 inches
1-inch	7 inches

3.4 Installation and Testing

A. General

1. Install all equipment in accordance with the manufacturer's instructions, recommendations, and approved Shop Drawings.
2. All modifications, installation, and refurbishment work shall be completed in accordance with good trade practice with respect to handling, joining, supporting, and testing. A calibrated torque wrench shall be provided and used where torque requirements are specified.
3. The Contractor assumes all responsibility for proper installation and function of the equipment.

B. Training

The Contractor shall arrange for the clarifier equipment manufacturer to provide two trips and two days of field service. One day shall be dedicated to a pre-grout inspection. After installation, a post-grout inspection shall be conducted followed by training of Owner's staff on the operation and maintenance of the secondary clarifier equipment.

C. Testing

1. The Contractor shall arrange with the Engineer to witness a test of all mechanical systems and equipment after installation is completed. These tests shall demonstrate that the complete facility operates in accordance with the Drawings and Specifications, and the required functions.
2. All defects shall be corrected at the Contractor's expense before final acceptance.

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3. Exception: Repairs necessitated due to conditions beyond the control of the Contractor or equipment supplier, such as negligence or vandalism, shall not be the Contractor's responsibility. Refer to the General Requirements for additional requirements.

3.5 Painting

The inside of the clarifier launder and all new metal equipment shall be painted in accordance with the Drawings and Technical Specifications - "Painting."

3.6 Warranty

The secondary clarifier equipment shall be warrantied for a period of two full years after final acceptance of the project by the Owner.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Basis

See Technical Specifications - "Measurement and Payment" for a description of the basis of measurement and payment for Work performed under this Contract.

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SECTION 6
PIPE, FITTINGS, AND VALVES

PART 1 - GENERAL

1.1 Scope

- A. These Specifications cover general requirements for process piping, yard piping, valves, and associated fittings. For additional requirements and related work, refer to other Technical Specifications and the Drawings.
- B. Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of Work to be constructed. All applicable sections, as determined by the Engineer, shall control the Work outlined in the Contract Documents.

PART 2 - MATERIALS

2.1 Pipe

A. General

Pipe shall be of the type called for on the Drawings and shall conform to the following Specifications. Pipe substitutions may be made only with prior approval of the Engineer.

B. Ductile Iron (DI) Pipe

- 1. DI pipe and fittings shall conform to AWWA C150, AWWA C115, AWWA C151, and AWWA C110 and shall be minimum special Class 350, unless specified otherwise. All DI pipe shall have a bituminous sealed cement mortar lining conforming to AWWA C104. All joints for buried service, unless otherwise specified, shall be push-on rubber gasket joints conforming to AWWA C111. When required for fittings, mechanical joints shall conform to AWWA C111.
- 2. When flanged pipe is required, the Contractor shall provide the DI pipe class required by the flange manufacturer to ensure the pipe and flange units are compatible. These data shall be provided to the Engineer for review prior to ordering these materials. Flanges for couplings and fittings shall conform to ANSI B16.1, 125-pound bolt hole template.

C. Polyvinyl Chloride (PVC) Pipe - Diameter 2-inch or Smaller

PVC pipe shall be the size and type called for on the Drawings and shall conform to the following applicable ASTM Standards:

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1. D 1784, PVC and CPVC plastic compounds
2. D 1785, Schedule 80 PVC pipe

2.2 Fittings

A. Fittings for Iron Pipe

1. Unless specified otherwise, all fittings such as elbows, tees, crosses, etc., for buried pipe shall be mechanical joint short-bodied compact DI fittings conforming to AWWA C153, Class 350.
2. When called for, flanged cast iron fittings shall conform to AWWA C110 with ANSI B16.1, 125-pound bolt hole template.
3. All fittings shall be cement mortar lined in accordance with AWWA C104.
4. Gaskets shall be either ring or full faced, 1/8-inch thick conforming to AWWA C111, Appendix B.

B. Restrained Joint Pipe and Fittings

1. Where called for on the Drawings, restrained joint pipe and fittings shall be:

a. Restrained Push-on Joint Pipe

When restrained joint DI pipe is required, the pipe shall be the same class and type as the DI pipe specified herein. Joints shall be Tyton Joint with Field Lok 350 gaskets, or approved equal. The restraint shall be boltless, integral restraining system, rated for 350 psi in accordance with the performance requirements of ANSI/AWWA C111/A21.11.

b. Restrained Fittings

All mechanical joint fittings called out to be restrained shall be equipped with a MEGALUG Series 1100 mechanical joint restraint system as manufactured by EBAA Iron, Inc., or approved equal.

C. PVC Fittings

PVC fittings shall be the size and type called for on the Drawings and shall conform to the following applicable ASTM standards:

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1. D 2467, Socket-type Schedule 80 PVC fittings
2. D 2564, PVC solvent cements

Male threaded PVC pipe fittings shall not be permitted. Any female threaded PVC fittings shall be reinforced fittings.

D. Pipe Taps

1. Pipe taps for accessories such as pressure gauges, flow switches, pressure switches, air release valves, hose bibs shall be made as follows:
 - a. Steel Pipe -Welded fittings or tapping saddles. If welded fittings are used, pipe must be properly coated inside and outside.
 - b. DI Pipe - Drilled and tapped or saddle tap. After drilling, tapping, or saddle tapping, all coatings in the vicinity of the penetration must be repaired.
2. All taps for accessories shall be provided with an isolation valve between the tap and accessory.

2.3 Valves

A. General

Valves shall be of the type called for on the Drawings and shall conform to the following Specifications:

B. Gate Valves

1. Gate Valves, 2 inches and smaller

Valves shall be all bronze, non-rising stem, conforming to Federal Specification MSS-SP-80, rated for a minimum working pressure of 125 psi.

C. PVC Ball Valve, 2 inches and Smaller

1. 1-inch ball valves shall be Asahi/America 1-inch PVC Type 21 True Union Ball Valve, Harrington part number 1605010. Each ball valve shall have a 2-inch square operating nut.

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2. 2-inch ball valves shall be Asahi/America 2-inch PVC Type 21 True Union Ball Valve, Harrington part number 1605020. Each ball valve shall have a 2-inch square operating nut.

D. Cast Iron Valve Box

1. All buried valves shall be equipped with an adjustable cast iron box of the sliding type with a base large enough to cover the top casing of the valve.
2. The diameter of the valve box shall be not less than 5 inches, and shall be of such length so as to provide the depth of cover over the pipe without full extension.

E. 6-inch Floor Relief Valve

Floor relief valves shall be a Troy Valve 6-inch 316 stainless steel floor relief valve, or approved equal. Valve body shall be epoxy-coated.

F. Miscellaneous Valves

Miscellaneous valves not specified herein or in the General Requirements or on the Drawings shall be of first class construction and shall be suitable for the intended purpose and shall conform to the types of valves commonly used at the WWTRRF.

G. Valve Labels

1. A valve label shall be provided for buried valves.
2. The label shall be 316 stainless steel and permanently cast into a concrete collar at each valve box. Labels shall be made from at least 1/4-inch thick 316 stainless steel plate material and of the necessary size to provide adequate area to allow the stamped or etched information to be clearly read.
3. The label shall be stamped or laser etched and shall note the valve number, if applicable, and valve function. The Engineer shall provide the Contractor with the information to include on each required label.

2.4 Saddle Tap

- A. Saddle taps shall have a DI body, wide stainless steel band, and stainless steel bolts and nuts. Service saddles shall be Ford FS101 style for 3/4-inch and 1-inch taps and Ford FS202 for all taps larger than 1 inch, or approved equal.

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- B. Saddle sizes and threads shall be compatible with the pipe type and sizes being utilized.
- C. Saddle taps are not required for DI pressure class pipe for taps 1-inch and smaller. Saddle taps are required for DI pressure class pipe for taps greater than 1-inch. Service saddles used on PVC water mains shall be specifically sized at the factory for the type of PVC water main used.

2.5 Aluminum Slide Gate

- A. General
 - 1. Slide gates shall be as specified herein and have the characteristics and dimensions shown on the Drawings.
 - 2. Handwheels shall be utilized and provide smooth, free operation from full open to close positions, be self-sealing with absence of head, and self-cleaning. The gates shall be installed to provide a smooth flow transition in the channel/pipe in which they are installed. The 2-inch operating nut tops, when required, shall be positioned below the top of the wall and within 6 inches of the bottom of the grating to provide easy access.
 - 3. Leakage shall not exceed 0.05 gpm per foot of wetted seal perimeter in seating head and unseating head conditions.
 - 4. The gate seals shall be either J, P, or self-adjusting.
 - 5. All structural components of the frame and slide shall be fabricated of stainless steel or anodized aluminum and shall have adequate strength to prevent distortion during normal handling, installation, and while in service. All other associated hardware shall consist of stainless steel, anodized aluminum, and bronze components, unless otherwise noted. All other metal work, attachments, brackets, and hardware shall either be aluminum or hot-dipped galvanized, except where noted.
 - 6. A stop nut shall be provided to limit the gate opening and prevent the slide from being removed from the frame.
 - 7. All welds shall be performed by welders with American Welding Society certification.
 - 8. Finish shall be mill finish on aluminum. Welds shall be sandblasted or physically descaled to remove weld burn and scale.

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9. Materials:

Components	Materials
Frame Assembly and Retainers	Aluminum Alloy 6061, ASTM B209 or B308
Slide and Stiffeners	Aluminum Alloy 6061, ASTM B209 or B308
Stem	Stainless Steel, Type 304, ASTM A276
Fasteners, Nuts, and Bolts	Stainless Steel, Type 304, ASTM F593 and F594
Seats/Seals and Facing	Ultra-High Molecular Weight (UHMW) Polyethylene ASTM D 4020
Lift Nuts	Bronze ASTM B584
Wall Brackets	Stainless Steel, Type 304L, ASTM A276

- 10. Stem guides shall be provided per the manufacturer's recommendation. Stem guides shall have UHMW bushings.
- 11. The gate manufacturer shall provide the anchor bolts required for mounting the gates and appurtenances.
- 12. All dissimilar metals shall be galvanically insulated from each other.

2.6 Yard Hydrant

- A. 1-inch yard hydrants shall be Woodford Manufacturing with cast iron head and bronze internal parts. Exterior hydrants shall be frost-free.
- B. 2-inch yard hydrants shall be Woodford Manufacturing, model U200M.

2.7 Locating Wire

- A. Locating wire shall be a minimum of 12 awg UF solid copper with blue colored insulation. The use of THHN wire will not be acceptable. At all splices, the connecting ends of the wires shall be stripped and connected to ensure an electrical connection and made waterproof with an approved splice kit such as 3M splice kit DBR/Y-6 or approved equal.
- B. Where location wire is to be secured to the exterior of fire hydrants, valve boxes, posts, etc., stainless steel pipe straps shall be used.

2.8 Tools

The Contractor shall supply to the Owner the following tools:

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- A. Two valve wrenches of proper length

There will be no separate measurement and payment for these tools.

PART 3 - EXECUTION

3.1 Pipe Installation and Testing

- A. General

Pipe shall be installed in accordance with good trade practice with respect to handling, joining, supporting, and testing. A calibrated torque wrench shall be provided and used where specific torque requirements are specified by the manufacturer.

- B. Pipe shall be installed with bell ends laid facing in the direction of laying unless directed otherwise by the Engineer. Each pipe shall be properly bedded so as to be supported for the full length of the pipe. A suitable foundation shall be achieved by a slight excavation under the bell at each joint. All rubber ring joints shall be lubricated and installed in accordance with the installation instructions of the pipe manufacturer, taking particular care to avoid pinching or otherwise causing damage to the rubber ring. All joints shall be free of dirt and other foreign matter prior to the joining of the next pipe. All joints shall be restrained to prevent creep and misalignment of joints.

- C. Pipes shall be installed to the minimum depths called for on the Drawings and to the lines and grades when shown.

1. It shall be recognized that pipe depths may vary from the minimum depths shown when adjustment of grade is required to avoid conflict with existing utilities.
2. Additional fittings may also be required when a grade adjustment is required.

- D. All pipe shall be installed true to line. The Contractor may install a pipeline on a curve when called for on the Drawings or when approved by the Engineer.

1. For rubber-gasketed DI pipe installed on a curve, the pipe shall be joined in a straight alignment, then deflected. The amount of deflection shall not exceed 80 percent of the recommended maximum deflection specified in AWWA C600.
2. For PVC pipe installed on a curve, deflection of the pipe shall be achieved by bending the pipe within the limitations specified by the pipe manufacturer. Joint deflection of PVC pipe is not allowed.

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E. All foreign matter and gravel shall be removed from the inside of the pipe and fittings before being installed and the pipe and fittings shall be kept clean during placement. No pipe shall be laid in water or when conditions exist that in the opinion of the Engineer are unsuitable for the placing of pipe. All pipe shall be covered or plugged at night and whenever the Work is not supervised.

F. Testing

Once piping has been installed, the Contractor shall leave the excavation open to allow the Owner or Owner's representative to visually inspect the piping for leakage.

3.2 Locating Wire

- A. A continuous solid copper locating wire shall be placed along the top of all water pipe, including service lines. This wire shall be secured to the top of the pipe at maximum 10-foot intervals using 6-inch strips of 2-inch wide duct tape. All splices shall be electrically continuous. At all splices the connecting ends of the wires shall be overlapped and tied. The ends shall be stripped and connected with a wire nut to ensure an electrical connection and made waterproof with an approved silicone splice kit. Access to terminal ends of the locating wire shall be made at all valve boxes, meter boxes, fire hydrants, vaults, etc. The result of this installation shall be a continuous wire circuit electrically isolated from ground.
- B. The Contractor shall be responsible for testing continuity and for testing isolation from ground in the wire after all Work has been completed on the test section. The Contractor is advised to do intermediate testing on their own after backfilling operations and prior to surface restoration work to be sure continuity is maintained. If there is a break or defect in the wire, it shall be the Contractor's responsibility to locate and repair the defect.
- C. The continuity of the location wire shall be tested from one test load point to the next by use of a temporary wire laid between test points in-line with an ohmmeter. Resistance shall be measured with an approved ohmmeter that has been properly calibrated. The continuity of a test section will be accepted if the resistance of the test section does not exceed 5 ohms per 500 feet of location wire being tested. Isolation from ground shall be measured with a megohmmeter and shall be a minimum of 20 megohms for any section of location wire tested. The Engineer shall witness the acceptance test. The wire and installation shall be included in the water line bid item price. No separate payment shall be made.

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3.3 Valves and Valve Boxes

- A. Valves and valve boxes shall be installed as shown on the Drawings. All valves and valve boxes shall be set plumb. The valve box shall be centered over the valve operator and free of any obstruction that would prevent operation of the valve nut.
- B. If the bury depth of the valve is greater than 4-1/2 feet, a valve operator extension shall be provided to within 1 foot of finish grade. The extension shall be permanently attached to the valve operator and a self-centering device shall be provided near the top of the valve operator extension. The box cover shall be flush with the finished grade. A concrete collar, where required, shall be installed.

3.4 Yard Hydrant

Yard hydrant shall be installed in accordance with the Drawings. Yard hydrant shall be painted purple, in accordance with Technical Specifications - "Painting."

3.5 Connections to Existing Lines

- A. Information shown on the Drawings indicating the size, type, class, and location of existing lines and associated fittings has been obtained from Record Drawings and other municipal records. It is expected that there may be some discrepancies and omissions in the information shown on the Drawings. Therefore, it shall be the responsibility of the Contractor to excavate and inspect existing lines requiring a connection to determine the exact fittings needed.
- B. In connecting to existing lines, the Contractor may select the combination of fittings they wish to use, subject to approval of the Engineer. Approved fabricated steel couplings, repair bands, transition couplings, or tapping sleeves are among the options available to the Contractor. The Contractor shall submit to the Engineer information on the type of couplings they propose to use.

3.6 Painting

All pipes, valves, and fittings shall be painted in accordance with Technical Specifications - "Painting" and the Drawings.

3.7 Restoration, Finishing, and Cleanup

- A. The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, and other existing facilities equal to their original condition.

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- B. All surplus material and temporary structures, as well as excess excavation, shall be removed and the entire Site of Contractor operations shall be left in a neat and clean condition as outlined in the General Requirements.
- C. Also see Technical Specifications - "Excavation and Backfill of Trenches" and Technical Specifications - "Surface Restoration" for specific requirements.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Basis

See Technical Specifications - "Measurement and Payment" for a description of the basis of measurement and payment for Work performed under this Contract.

4.2 Tools

There will be no direct payment for these tools; payment shall be included in other bid items.

END OF SECTION

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TECHNICAL SPECIFICATIONS

SECTION 7

REINFORCED CONCRETE

PART 1 - GENERAL

1.1 Scope

This section covers the mixing, placing, finishing, curing, and repairing of reinforced concrete. Portland cement concrete shall be composed of cement, aggregates, water, admixtures, etc., as specified or approved. The required proportions shall be assembled, well mixed, transported, placed, consolidated, finished, and cured as hereinafter specified. Concrete shall be uniformly dense and sound, free from faults, cracks, voids, honeycomb, and other imperfections.

- A. Concrete shall conform to the requirements of these Specifications and to the latest issue of the "Building Code Requirements for Reinforced Concrete" (ACI 318), "Specifications for Structural Concrete for Buildings" (ACI 301), and "Standard Specification for Ready Mixed Concrete" (ASTM C94) except as modified below.
- B. The Specifications in this section are general in nature and, therefore, some of the items outlined may not apply to the Work required. All applicable sections, as determined by the Engineer, shall control the Work outlined in the Contract Documents.

1.2 Delivery, Handling, and Storage

- A. All cement shall be stored in a suitable, weather-tight building in such a manner as to protect the cement from dampness and to permit easy access for proper inspection. Storage bins for bulk cement shall be weather-tight and constructed so that there will be no dead storage. If there is reason to believe that dead storage exists, the bins shall be emptied completely at least every four months.
- B. Fine and coarse aggregates shall be stored and measured separately. Aggregates shall be protected from contamination with dust, dirt or other foreign materials.
- C. Steel reinforcement not placed in the Work shall be stored under cover to prevent rusting, and shall be placed on blocking such that no steel touches any ground surface.

1.3 Submittals

- A. Reinforcing Steel
 - 1. Before ordering reinforcing steel, the Contractor shall submit all order lists and bending diagrams for review by the Engineer.

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2. Review of order lists and bending diagrams by the Engineer shall in no way relieve the Contractor of the responsibility for correctness of such lists and diagrams.
3. Any expense incidental to the revision of materials furnished according to such lists and diagrams to make the material comply with the Drawings shall be borne by the Contractor.

PART 2 - MATERIALS

2.1 Portland Cement

Portland cement shall conform to the requirements of ASTM C150, for Type I - II cement. The Engineer may direct the use of Portland cement of a type other than that specified in the Contract Documents, in which case the Owner will pay the additional cost, if any, for the cement required over the cost of that specified, or shall receive appropriate credit for any cement required of a lesser cost than that specified.

2.2 Aggregates

A. General

1. All aggregates for concrete shall conform to the Specification for "Concrete Aggregates" (ASTM C33). No aggregate shall be incorporated into the Work until and unless the aggregates are approved by the Engineer.
2. The decision to perform any or all tests on aggregates shall be left to the Engineer. Should testing of the aggregates be deemed necessary, Samples shall be selected at random from the stockpile and tested for conformance with the Specifications.
3. When the aggregates have been approved by the Engineer, the source shall not be changed without the written approval of the Engineer.

B. Fine Aggregate

Fine aggregate shall consist of natural sand, having hard, strong, and durable particles and which does not contain more than 2 percent by weight of such deleterious substances as clay lumps, shale, schist, alkali, mica coated grains, or soft and flaky particles. The grading of fine aggregate shall range uniformly from coarse to fine within the limits specified in ASTM C33.

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C. Coarse Aggregate

1. Coarse aggregate shall consist of clean, hard, fine grained, sound crushed rock, or washed gravel which does not contain in excess of 5 percent by weight of flat, chip-like, thin, elongated, friable or laminated pieces, or more than 2 percent by weight of shale or cherty material.
2. Any piece having a major dimension in excess of 2-1/2 times the average thickness shall be considered to be flat and/or elongated.
3. The maximum size of coarse aggregate shall not exceed 1-1/2 inches, nor 1/5 of the narrowest dimension between the forms, nor 3/4 of the clear spacing between reinforcing bars.
4. The minimum size of coarse aggregate shall be 3/4-inch unless approved otherwise.
5. Coarse aggregate shall be uniformly graded from coarse to fine within the limits specified in ASTM C33.

2.3 Water

Water for mixing shall be clean, fresh, and free from injurious amounts of oil, acid, chlorides, sulfates, alkali, organic matter, or other deleterious substances.

2.4 Concrete Admixtures

A. General

1. The use of admixtures will be allowed only when included in the mix design or as specified.
2. Admixtures used will be considered as a means of improving workability and/or placement of the concrete.
3. Admixtures shall conform to the following:

Parameter	Reference
Air-entraining	ASTM C260
Water Reducer	ASTM C494, Type A
Set Retarding	ASTM C494, Type B

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Parameter	Reference
Water Reducing/Set Retarding	ASTM C494, Type D
High Range Water Reducing (Super Plasticizer)	ASTM C494, Type F and G
Pozzolanic	ASTM C618, Type F

4. Admixtures shall be non-toxic after 30 days and shall contain no chlorides. Calcium chloride will not be permitted to be used in concrete.

B. Air-Entraining Admixtures

Provide air-entraining admixture in all concrete. Furnish manufacturer's compliance statement for these requirements.

C. Water Reducing Admixture

1. When water-reducing and/or super plasticizer admixtures are used, with the agreement of the Engineer, it shall be compatible with the air-entraining admixtures.
2. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations.
3. Furnish a compliance statement that the admixture used satisfies all requirements of this Specification.

2.5 Proportioning of Concrete Mix

A. General

The exact proportions of all materials entering into the concrete shall be as established by an approved laboratory mix design and shall be changed only as directed by the Engineer or Laboratory when necessary to obtain specified strength or desired density, uniformity, and workability. This requirement may be waived when adequate test data is available on mixes currently being used to verify the suitability of a given mix for the job, or as approved by the Engineer.

B. Mix Design

1. The mix shall meet the following requirements unless otherwise specified or approved:

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Parameter	Class A
Minimum compressive strength (at 28-day test)	4,000 psi
Maximum water-cement ratio (by weight)	0.45
Minimum cement content (per cubic yard of concrete)	630 lbs
Air Content Range	4-7%

2. All classes of concrete shall have a maximum water soluble chloride ion content of 0.06 percent of mix design cement weight.
3. A super plasticizer shall be used in all concrete which is pumped or introduced into forms over six feet in height.
4. If the class of mix for the Work is not specified in the Contract Documents, then the mix shall meet the requirements of Class A.
5. Cement content specified above may be waived if sufficient evidence can be shown to the Engineer, such as previous test results, experience with water reducing admixtures, etc., to show that a lower cement content will give the desired 28-day strength.
6. Water Content and Slump Test
 - a. In calculating the total water content in any mix, the amount of free moisture (excess of saturated surface dry) carried on the surface of the aggregate particles shall be included. The amount of water to be used shall be the minimum amount necessary to produce a plastic mixture of the strength specified and of the desired density, uniformity, and workability.
 - b. For the type of construction indicated, the slump shall be within the range indicated below unless approved otherwise:

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Allowable Slump		
Location/Type of Construction	Slump in Inches ⁽¹⁾	
	Maximum	Minimum
Reinforced foundation walls and footings	4	2
Unreinforced footings and substructure walls	3	1
Reinforced slabs, beams and walls	4	2
Building columns	4	3
Sidewalks, driveways, and slabs on ground	4	2
Heavy mass construction	2	1
Light weight concrete	3	1

⁽¹⁾Slump listed in the table is the maximum slump allowed prior to the addition of water reducing or high range water reducing admixtures. Maximum allowable slump after the addition of admixtures is 8 inches.

2.6 Reinforcing Steel

A. Steel Bars

Steel reinforcing bars shall be grade 60 billet steel, unless otherwise specified and shall conform to ASTM A615. Bars shall be deformed in accordance with ASTM A305. When called for on the Drawings, epoxy coated reinforcing bars shall conform to ASTM A775.

B. Welded Wire Fabric

Welded wire fabric, when called for on the Drawings, shall conform to ASTM A185.

2.7 Grout

A. Nonshrink Grout

1. Grout shall be fluid grout capable of satisfactorily meeting the baseplate test and shall be non-metallic, unless specified for special use hereinafter. The grout shall be a non-gas-liberating type, cement base product, premixed, requiring only the addition of water for the required consistency. All components shall be inorganic.
2. The grout product shall satisfy all of the above requirements even though the Project use calls for a dry pack consistency and use.

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3. The following listed grouts meet these requirements and are acceptable for use: UPCON High Flow, the UPCO Company, Cleveland, Ohio; Master Flow 928, The Master Builders Co., Cleveland, Ohio; or approved equal. Grout type and procedure shall be as recommended by the manufacturer for the specific application.
4. The grout used shall be cured with a curing compound sprayed on, or as recommended by the grout manufacturer.

B. Dry Pack Grout

Ordinary-type grout (Dry Pack) shall be one part Portland Cement to two parts clean concrete sand and sufficient moisture to permit packing and shaping. "Bond-Crete," or approved equal, shall be mixed with the water according to manufacturer's specifications.

C. Grout for Topping Concrete Slabs

Grout for topping concrete slabs shall conform to the following:

1. Proportions by weight: one part cement, two parts dry concrete sand, three parts aggregate (3/8-inch maximum size), and water as necessary.
2. The grout shall be cured with a curing compound sprayed on.

2.8 Concrete Bonding Agent/Admixture

For bonding new concrete to old and as an admixture for concrete finish work, use Burke Acrylic Bond-Crete or equal.

2.9 Curing Compounds

- A. Curing compounds shall conform to the requirements of ACI 308 and ASTM C309 and shall be compatible with required finishes and/or coatings.
- B. The compound shall be approved Type 2, Class B white or gray pigmented or Type 1-D clear compound with fugitive dye.
- C. Manufacturer's literature shall state quantity or coverage required to meet or exceed tests and method of application.

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2.10 Bond Breaker

Bond breaker shall be Burke Super Bond Breaker or equal.

2.11 Surface Hardener

Surface hardener shall be Saniseal as manufactured by Master Builders, or approved equal. Surface hardener shall result in a deposit of a hard, wear-resistant compound in the pores of the wearing surface to reduce absorption and arrest dusting.

2.12 Mortar for Sack Rubbing

Mortar for sack rubbing shall consist of one part cement, two parts mortar sand by volume, a concrete bonding admixture, and enough water to obtain a mortar consistency of thick cream. The sand shall pass a No. 40 screen.

2.13 Construction, Contraction, and Expansion Joints

Construction, contraction, and expansion joints are as follows or as approved by the Engineer:

A. Pre-molded Joint Filler for Expansion Joints

Bituminous type conforming to ASTM D994 or D1751, unless otherwise shown or specified.

B. Pourable Joint Fillers

1. Rubber Asphalt Filler: The specific gravity of the in-place filler after curing shall be greater than 1.0. Filler shall be No. 164.
2. Polymeric sealing compound, hot pour, or Hi-Spec Polymeric joint sealing, hot pour compound, as manufactured by W. R. Meadows, Inc., Elgin, IL; or No-Track two-component materials (Code 2323), cold applied, self-leveling filler as manufactured by A. C. Horn, Inc., North Bergen, NJ; or Gardox, two-component, cold applied compound filler, as manufactured by W. R. Meadows, Elgin, IL.
3. On sloping joints, use Gun Grade material of the above products or similar non-sag material; submit product information for approval.

C. Roofing Felt for Expansion Joints

Thirty-pound asphalt-saturated roofing felt conforming to ASTM D226, Type II; or a tar-saturated roofing felt of equal quality at the option of the Contractor.

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D. Surface-Applied Waterstop

Surface-applied waterstop shall be non-swelling preformed Henry Synco-Flex Waterstop as manufactured by the Henry Company.

E. Hydrophilic Caulk

Hydrophilic caulk shall be Adeka P-201 caulking, or approved equal.

PART 3 - EXECUTION

3.1 General

All manufactured articles, materials, and equipment specified in this section shall be applied, installed, connected, erected, used, cleaned, and conditioned as recommended by the manufacturer and approved by the Engineer.

3.2 Forming

A. General

1. The Contractor shall be responsible for the design, engineering and construction of formwork. Formwork shall conform to applicable requirements of "Recommended Practices for Concrete Formwork" (ACI 347).
2. Forms shall be used, whenever necessary, to confine the concrete to the required lines and grades, and to obtain a thoroughly compacted dense concrete through proper vibrating. Forms may be of wood, metal or other material, and shall have sufficient strength and rigidity to hold the concrete and to withstand the necessary pressure, tamping and vibration, without deflection from the prescribed lines.
3. The surface of all forms in contact with the concrete shall be smoothly finished and free from defects that might adversely affect the appearance of concrete formed against it.
4. All forms, whether prefabricated or custom made, shall be assembled and connected in such a manner that only minor mortar seepage through the joints will occur during vibration of the concrete.

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B. Form Surface Preparation

1. All dirt, chips, sawdust, mud, water, and other foreign matter shall be removed from within the forms or within the excavated areas, before any concrete is deposited therein. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being reused.
2. All wood surfaces in contact with the concrete shall be coated with an effective release agent prior to form installation. The release agent shall be non-staining and non-toxic after 30 days.
3. Mill scale, rust, and other ferrous deposits shall be sandblasted or otherwise removed from the contact surface of steel forms. All steel forms shall have the contact surfaces coated with a release agent. The release agent shall be effective in preventing discoloration of the concrete from rust, and shall be non-toxic after 30 days.
4. Proprietary panels shall be free of surface cracks, spalls, gouging, splitting or other surface damage. Patching of forms is not acceptable. Any repairs must include complete surface recondition.

C. Beveled Edges and Corners (Chamfers and Fillets)

1. Exposed sharp edges shall be eliminated from finished concrete work by means of 3/4-inch triangular fillets or chamfer strips placed in the forms.
2. Where called for on the Drawings, horizontal corners shall be tooled with a 1/2-inch radius tool.

D. Form Removal

1. All forms shall be removed before backfilling is begun.
2. Forms shall be so constructed that they can be removed without hammering on or prying against the concrete and shall be removed in such a manner as to prevent damage to the concrete and to ensure the complete safety of all parts of the structure.
3. The Contractor shall determine the time of removal of forms and shall be responsible for any damages due to early or improper form removal. In general the following periods, exclusive of days when the temperature is below 40°F, for removal of forms may be used as a guide.

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Time Period for Removal of Forms	
Location	Time Period
Support Under Beams	14 days
Supported Floor Slabs	14 days
Walls	24 hours
Columns	7 days
Side of Beams and Other Parts	24 hours

3.3 Placement of Reinforcement Steel

A. General

1. Mild steel reinforcing bars shall be furnished, cut, cold bent, tagged, marked, shipped, and placed as indicated on Drawings and in accordance with the current edition of the "Manual of Standard Practice" by the Concrete Reinforcing Steel Institute. Field bending or straightening shall be accomplished so that the steel will not be damaged. Kinked bars shall not be used.
2. Reinforcing bars shall be in position before concrete placement is begun. All reinforcing bars shall be tied together and supported in such a manner that displacement during placing of concrete will not occur. Conform to the requirements of "Placing Reinforcing Bars" published by the Concrete Reinforcing Steel Institute.

B. Minimum Bar Spacing

The clear distance between parallel bars shall not be less than 1.5 times the nominal diameter for round bars, but in no case shall the clear distance be less than 1-1/2 inches nor less than 1.33 times the maximum size aggregate.

C. Concrete Cover

1. At the time of placing concrete, all reinforcement shall be free from dirt, loose mill scale, detrimental rust, grease, oil, paint, or other foreign substances which might destroy or reduce its bond with concrete.
2. Unless stated otherwise on the Drawings, the following minimum concrete cover over reinforcement steel shall apply.

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- a. All formed surfaces exposed to water, ground, or weather shall have a minimum cover over the reinforcement steel of 2 inches.
 - b. All formed surfaces not exposed to water, ground, or weather shall have a minimum cover over the reinforcement steel of 1-1/2 inches.
 - c. All surfaces cast against and permanently exposed to earth shall have a minimum cover over the steel of 3 inches.
- D. Splicing
1. Splices at the points of maximum stress shall be avoided.
 2. Bars in horizontal members shall have a minimum lap at splices sufficient to develop the strength of the bars. Whenever possible, splices of adjacent bars shall be staggered.
 3. In circular tank walls, the location of splices in the horizontal ring tension reinforcing bars shall be staggered a distance of two times the splice length or three feet whichever is greater, and splices shall not coincide in vertical arrays more frequently than every third bar.
 4. Deformed bars shall be lapped the minimum splice length as listed in the table below, or as shown on the Drawings, whichever is greater.
 5. Furnish full length reinforcing bars the specified length or the calculated length, and for those designated "full length."
 6. Splice bars with designated splice locations at those locations or fabricate bars full length.
 7. In absence of other directions, including bars designated "continuous," furnish reinforcing bars to provide the minimum practical number of bars and splices. In lapped splices, place bars in contact and fastened together with at least three ties.

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Reinforcing Bar Splice Length Table										
for 4,000 psi Concrete and Grade 60 Non-Coated ¹ Reinforcing Bars										
Bar Size (No.)		3	4	5	6	7	8	9	10	11
Bar Orientation	Vertical and Horizontal	1'-7"	2'-1"	2'-7"	3'-1"	4'-6"	5'-2"	5'-10"	6'-7"	7'-3"
	Horizontal Top Bars	2'-1"	2'-9"	3'-5"	4'-1"	5'-11"	6'-9"	7'-7"	8'-6"	9'-6"

¹For epoxy coated bars, increase the listed splice lengths by 50 percent.

E. Supports and Ties

1. All reinforcement shall be retained in place, true to indicated lines and grades, by the use of approved galvanized metal or concrete supports, spacers, or ties. They must be completely concealed in the concrete and shall not discolor or otherwise mar the surface of the concrete.
2. Concrete blocks used to support reinforcement shall have a compressive strength of not less than the specified 28-day compressive strength of the concrete being placed. Rocks, clay bricks, masonry blocks, etc., or parts thereof, shall not be used to support reinforcement.
3. Tie bars in the top mats of footings and slabs at all intersections. Tie all other bars at all intersections except where spacing of the bars is less than 12 inches in each direction, then alternate intersections shall be tied.
4. Tie coated reinforcement with nonmetallic coated ties. Precast concrete blocks that support coated reinforcement shall have nonmetallic ties.

F. Reinforcement Around Opening

Where reinforcing steel has to be cut to permit passage of pipe or openings and should no detail be shown for extra reinforcing in such areas, at least an equivalent area of steel cut must be placed around all four sides of pipe or opening. This steel shall be extended at least 2'-0" beyond opening.

G. Inspection

The Engineer shall be notified when the reinforcing is ready for review with sufficient time for this review to occur prior to placement of the concrete. No concrete shall be placed prior to review by the Engineer.

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3.4 Mixing

A. Batch Plant

1. Adequate equipment and facilities shall be provided for accurate control and measurement of all materials within specified proportions and tolerances, and for readily changing the proportions of materials as may be necessary to meet varying conditions of the Work in order to produce concrete of the required strength, durability and workability.
2. Batch plant equipment shall be in complete working order and equipment shall conform to the requirements of Section 00540.20 of Oregon Standard Specifications for Construction, current edition.

B. Mixers

1. General

- a. Concrete shall be mixed in batch plant mixers or in a revolving drum type truck mixer.
- b. Concrete mixed in a batch plant mixer shall be hauled to the Project Site in a truck mixer.
- c. Mixers shall be equipped with a metal plate on which the manufacturer has marked the mixing and agitation speeds of the drum and the maximum mixing capacity.

2. Batch Plant Mixing

Refer to Specifications for truck mixing.

3. Truck Mixing

- a. Truck mixers shall be the revolving drum type, watertight, and constructed and maintained within tolerances of the manufacturer's specifications. Truck mixers shall be equipped and operated with a tank for carrying mixing water, a device to measure mixing water added to the mix and a device to indicate the number of drum revolutions.
- b. Before placing materials for the concrete into the mixer, empty the drum of water and reset the drum revolution counter to zero or record the

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counter number on the batch ticket. The total revolution on any load shall not exceed 300. The concrete in the truck mixer shall not exceed the manufacturer's maximum rated capacity. All materials of a batch shall be simultaneously and continuously fed into the mixer.

- c. Mixing shall commence as soon as the cement is added to the aggregate. Continue mixing before leaving the plant for not less than 70 nor more than 100 revolutions of the drum at the manufacturer's rated mixing speed. If water or additives are added to the batch at the Project Site, the concrete shall be mixed an additional 40 revolutions or more at the manufacturer's mixing speed, but the total revolution shall not exceed 300.
- d. All mixers, when fully loaded, shall mix the ingredients into a uniform mass within the required time. Only truck mixers that properly mix the concrete and are capable of discharging the concrete at a steady rate shall be used on the Project Site.
- e. During transport of the concrete, the truck mixer shall turn continuously at the rated agitation speed.

3.5 Placing Concrete

A. Conveyance

- 1. Concrete shall be conveyed from mixer to forms as rapidly as practicable by methods which will prevent segregation or loss of ingredients. It shall be deposited as nearly as practicable in its final position.
- 2. There shall be no free vertical drop greater than 6 feet, except when starting a vertical pour in which case the free vertical drop of concrete shall not be more than 2 feet.
- 3. In dropping concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs.

B. Placement

- 1. Concrete shall be placed before initial set has occurred and unless otherwise authorized by the Engineer, before it has contained its water content for more than 1-1/2 hours at 85°F. This time period may be extended provided Contractor can satisfy the Engineer that admixtures in sufficient quantity can extend the

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setting time of the concrete without adverse effects to the strength and quality of the concrete.

2. Unless otherwise specified, all concrete shall be placed upon clean, damp surfaces free from running water, and never upon soft mud, dry porous earth, or upon fills that have not been subjected to approved tamping or other compaction so that ultimate settlement has occurred.
3. Concrete shall not be placed in water nor shall water be allowed to rise over freshly placed concrete until the concrete has set sufficiently to prevent damage unless otherwise approved by the Engineer.
4. Concrete shall not be placed until all reinforcement is securely and properly fastened in its correct position, and until the form ties at construction joints have been retightened, all sleeves, hangers, pipe, bolts, waterstop, and any other items required to be embedded in the concrete have been placed and anchored.
5. Concrete shall be placed generally in horizontal layers not more than 12 inches thick except as otherwise specified. When a monolithic layer cannot be completed in one operation, it shall be terminated with a vertical bulkhead. Feathering out to less than 6 inches will not be permitted.
6. All top surfaces not covered by forms, and which are to be covered by additional concrete or backfill, shall be carried slightly above grade, struck off and given specified finish.

C. Vibration

1. Concrete shall be placed with the aid of approved mechanical vibrating equipment. Vibration shall be transmitted directly to the concrete; in no case shall it be transmitted through the forms. Vibrators shall be applied at uniformly spaced points not farther apart than the visible effectiveness of the machine.
2. The vibrator shall at all times be inserted through the newly placed layer into the next lower course, to ensure a proper integration of one course to another, and shall then be pulled up slowly, the speed of which is dependent upon mix design and type of vibrator. The vibrator operator shall vibrate the concrete systematically from one point to another without skipping any areas or without having to move backwards and forwards in any one single pass. Particular care to vibrating concrete shall be given at horizontal and vertical construction joints to eliminate any possibility of honeycomb. Extreme care shall be exercised in using

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vibrators around waterstops to avoid damage to the waterstop. Every effort shall be made to avoid any contact of vibrator to reinforcing steel. At all times, the intensity and duration of vibration shall be sufficient to accomplish thorough and uniform compaction.

3. Vibrators shall not be used to flow or transport concrete inside of forms. Where necessary, vibration shall be supplemented by forking or spading by hand adjacent to the forms on exposed faces in order to secure smooth, dense, even surfaces. The concrete shall be compacted and worked in an approved manner into all corners and angles of the forms and around reinforcement and embedded fixtures.
4. Only high frequency internal vibrators with operating speeds of preferably 21,000 vpm but not less than 14,000 vpm shall be used unless otherwise approved in writing by the Engineer. The number of vibrators employed shall be ample to consolidate the incoming concrete to the proper degree within 5 minutes after it is deposited. The number of vibrators will be predicated by the nature of the job and the ability to sufficiently consolidate the concrete within the specified time.

3.6 Repairing Concrete

A. Removal and Cleaning

All damaged, deteriorated, loose, or unbounded portions of the existing concrete or mortar shall be removed, and all loose scale, rust, or corrosion byproducts shall be removed from exposed reinforcing steel. All repair areas shall be hydro-blasted or shot blasted prior to placement of repair material. The surface shall then be pressure washed and allowed to dry thoroughly, unless the specific surface repair technique requires application of materials to a saturated surface.

B. Patch Mix Concrete Repair

Patch mix shall be mixed, placed, consolidated, finished, and cured according to the manufacturer's recommendations. Patches shall be struck off flush with the adjacent surface and all patch interfaces sealed (painted) with a 1:1 cement-water grout along the patch perimeter. In areas where the depth of the repair exceeds 3 inches, reinforcing steel shall be installed with size and spacing to match the existing reinforcing steel. New reinforcing steel shall be tied to existing, exposed steel with lap distances as required in Part 3.3 of these Specifications.

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1. Materials

Patch mix shall consist of mortar conforming to Part 2 - Materials, "Mortar for Sack Rubbing." The aggregate extender shall conform to the manufacturer's requirements with a maximum aggregate size of 3/8 inch.

2. Submittals and Mix Approval

The Contractor shall use the manufacturer's recommended proportions for the mix design to be submitted to the Engineer for the concrete patching material. The Contractor's submittal shall include the mix proportions of the prepackaged concrete patching material, water, aggregate extender, and the proposed sources for all aggregates.

3.7 Restrictions Due to Weather

A. Cold Weather

1. Concrete placement in cold weather, i.e., 40°F or less, will be permitted only under conditions which shall meet the approval of the Engineer.
2. In general, cold weather placing shall conform to "Recommended Practice for Cold Weather Concreting" (ACI 306).
3. Salts, chemicals, or other foreign materials shall not be mixed with the concrete to prevent freezing, unless such use is authorized by the Engineer in writing.
4. All concrete shall be effectively protected from frost action for a period of five days after placing, during which the temperature of the concrete does not fall below 40°F. Upon written notice from the Engineer, all concrete which may have become damaged by frost action shall be replaced by the Contractor at their own expense.

B. Hot Weather

1. For concrete placed during extremely hot weather (air temperature exceeding 95°F), the aggregate shall be cooled by frequent spraying in such a manner as to utilize the cooling effect of evaporation. During such periods, the placement schedule shall be arranged, as approved, in such a manner as to provide time for the temperature of the previously placed concrete to begin to recede.

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2. The mixing water shall be the coolest available at the Site insofar as is practicable. At no time shall the temperature of the concrete mix exceed 90°F prior to placement.

C. Low Humidity

1. Placing of concrete during periods of low humidity (below 50 percent) should be avoided when feasible and economically possible, particularly when large surface areas need to be finished.
2. In any event, finished surfaces exposed to the drying wind shall be covered up immediately with polyethylene sheets and be water cured continuously as soon as the concrete has set up.
3. Curing compounds, in lieu of water, may not be used.

3.8 Bonding Concrete

A. Bonding to New Concrete

1. Roughen the surface of the hardened concrete. Thoroughly clean and saturate with water and apply a concrete bonding agent.
2. Cover the horizontal surfaces with at least a 12-inch lift of superplasticized concrete (6-inch to 8-inch slump) and thoroughly vibrate the mix.
3. New concrete is defined as less than 60 days old.

B. Bonding to Old Concrete

1. Mechanically roughen the existing concrete surfaces to 1/4-inch amplitude using chipping guns or bushhammers, thoroughly clean, and then coat the contact surfaces with a concrete bonding agent.
2. The method of preparation and application of the bonding agent shall conform to the manufacturer's printed instructions and recommendations for specific application for this Project.
3. Obtain this recommendation in writing from the manufacturer's representative.
4. Cover horizontal surfaces with a lift of superplasticized concrete (6-inch to 8-inch slump) and thoroughly vibrate the mix.

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3.9 Finishing

A. Slabs

1. Screeding

- a. Concrete shall be deposited in the slab from a wheelbarrow, buggy, bucket, chute, conveyor, or pump hose without segregation of coarse and fine aggregates.
- b. Spreading of the concrete shall be performed with a square end shovel.
- c. The concrete shall then be screeded or struck off before any excess moisture or bleed water is present on the surface.
- d. If a vibrating screed is used, it shall be moved forward as rapidly as possible to avoid excess mortar being brought to the surface.

2. Bull Floating

- a. The purpose of bull floating is to smooth the surface and to eliminate high and low spots.
- b. Bull floating shall occur immediately after screeding or strike off and before bleed water accumulates on the surface, and shall be done in such a manner that the surface is not sealed.
- c. Bull floating shall be done with a wood or magnesium float.
- d. Do not overwork the surface.

3. Waiting Period

Upon completion of the bull floating, the concrete shall be allowed to sit until the bleeding has stopped and the water sheen disappears, and after the concrete is firm enough to permit a person to walk on the surface leaving a foot print no greater than 1/4 inch in depth.

4. Edging and Jointing

After the bleeding has stopped, sidewalks, driveways, steps, and other slabs as directed shall be edged and jointed.

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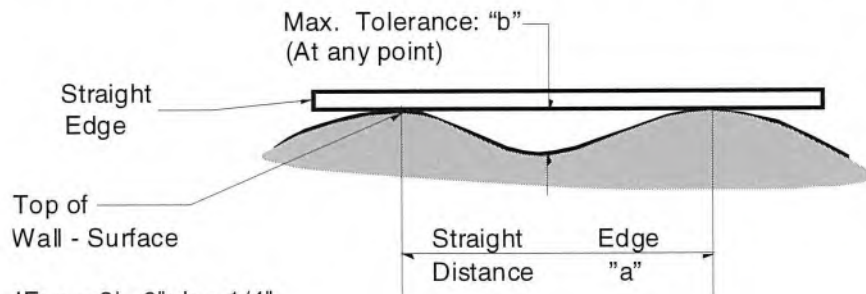
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5. Floating

- a. The purpose of floating is to embed the large aggregate just beneath the surface of the mortar; to remove slight imperfections, bumps and voids; and to compact the concrete and consolidate mortar at the surface in preparation for final finishing.
- b. After the waiting period defined above, the Contractor shall float the concrete surface using wood or magnesium hand floats or a troweling machine equipped with float shoes.

6. Surface Tolerance

The surface of all slabs shall conform to the following surface tolerance:



IF: a = 8' - 0"; b = 1/4"

IF: a = 2' - 0"; b = 1/8"

IF: a = 1' - 0"; b = 1/16"

7. Broom Finish

- a. After completion of floating and after the concrete has hardened sufficiently, all stair treads, interior and exterior, and all exterior slabs including sidewalks, driveways, etc., shall receive a broom finish unless otherwise specified.
- b. The broom shall be a stiff fiber or steel tined broom that will mark the finished concrete to a depth not to exceed 1/8th of an inch. Markings or corrugations shall be transverse to the direction of travel.

B. Unformed Surfaces

Unformed surfaces that will not be exposed in the complete Work shall be brought to required finished elevations and left smooth and regular. Sufficient screeds shall be

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installed to ensure an even concrete surface, true to grade and elevation, without unacceptable local depressions.

C. Formed Surfaces

1. Class C Finish

- a. Forms shall be removed as soon as permissible and immediately thereafter, snap tie holes, rock pockets, air pockets over 1/2-inch depth, and other defects shall be chipped, sandblasted, or wire brushed to expose sound aggregate and mortar and then shall be pointed and thoroughly tamped with dry pack grout.
- b. Surfaces that have been pointed shall be kept moist for a period of not less than 24 hours. If after the pointing sets and is rubbed, dusting occurs, the surface shall be refinished.
- c. Finished surfaces shall be free from sand streaks or other voids.
- d. All formed concrete surfaces that will not be exposed to view shall receive a Class C surface finish unless otherwise indicated.

2. Class B Finish

- a. Class B finish shall consist of a smooth finish such as can be achieved by means of plywood forms, steel forms, or form liners.
- b. After the forms are removed, the concrete surface shall first receive a Class C finish. The surface shall then be additionally finished as necessary to produce a smooth and even surface with uniform texture, lines, and appearance, free of bulges, fins, lips, undulations, depressions, or other imperfections. Chipping, grinding, or other methods may be necessary to achieve a smooth surface.
- c. All exposed formed concrete surfaces shall receive a Class B Finish unless otherwise indicated. Surfaces below water shall be considered exposed.

3. Class A Finish

- a. Class A finish shall consist of a sack rubbed finish as described herein. After the forms are removed, the surface shall first receive a Class B

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finish. Then the concrete surface shall receive a Class A sack rubbed finish.

- b. The surface to receive the Class A finish shall be thoroughly cleaned to remove any surface film. The mortar shall be rubbed thoroughly over the surfaces with clean burlap or a sponge rubber float, so as to fill all pits, and bring the surface to a uniform texture. Mortar in excess of that required for filling the pits shall be removed.
- c. Class A finished surfaces shall be kept damp for a minimum of 48 hours or until the paste has set, whichever is longer. If after the retextured surface sets and is rubbed, dusting occurs, the surface shall be refinished.
- d. Concrete surfaces shall be Class A finished to a depth of 4 inches below finish paving and sidewalk grades, 4 inches below building finish grade, and 1 foot below maximum water surfaces, unless otherwise indicated.
- e. All exposed surfaces of concrete building walls, retaining walls, concrete tanks, and other surfaces or structures indicated on the Drawings, or listed below, shall receive a Class A finish.
- f. All Class A finished surfaces shall be painted in accordance with Technical Specifications - "Painting."

3.10 Protection

Every reasonable precaution shall be taken to protect finished surfaces from abrasions or other damage. Concrete surfaces or edges likely to be injured during the construction period shall be protected by leaving the forms in place or by erecting satisfactory covers. No fire shall be permitted in direct contact with concrete at any time. Concrete shall be adequately protected from drying action by sun and wind.

3.11 Curing

A. General

1. All Portland cement concrete shall be cured by maintenance of proper moisture content and temperature for the development of desired concrete strength and durability. Curing shall be commenced immediately after placement of the concrete and initial finishing has been completed.
2. There are two systems of maintaining satisfactory moisture content:

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- a. Water curing by the continuous or frequent application of water through ponding or immersion, fog spraying or sprinkling or a saturated cover of heavy quilted cotton mats or rugs, or multiple layers of burlap.
- b. Surface sealing for the prevention of excessive loss of water from concrete slabs by use of 4-mil polyethylene sheet or reinforced bituminous kraft paper (ASTM C171); and for exterior slabs only by the application of a liquid membrane-forming curing compound to the freshly placed concrete, and for walls by leaving water proof forms in place with periodic soaking.

B. Cure Time

All concrete shall be cured for a period of not less than seven days after placement. If during the cure time the surrounding temperature falls below 45°F, the cure time shall be extended for the number of hours the temperature is below 45°F.

C. Walls

The acceptable methods of curing concrete walls are:

1. Concrete forms for walls shall be left in place and kept damp at all times during the required cure time; the wall forms may be loosened after 24 hours following the concrete placement, but water shall be flowed periodically into the space between the concrete and the form to add moisture. During the cure time, the tops of walls shall be covered with a continuously water saturated covering such as burlap or cotton mats.
2. The Contractor may remove the wall forms not less than 24 hours following the concrete placement. Curing shall then be accomplished by draping continuously water saturated heavy quilted cotton mats or rugs over the concrete walls. The water saturated coverings shall be secured to the wall to prevent air from circulating between the covering and the concrete surface.
3. After 24 hours of water cure, except as specified below, concrete curing of formed surfaces may be completed using a curing compound. However, a curing compound shall not be used on concrete surfaces that will be Class A or Class B finished, painted, waterproofed, or where other coatings or coverings are to be bonded to the surface, unless the curing compound is compatible with the final finish or the curing compound is removed by sandblasting.

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D. Slabs

The entire surface of a newly placed concrete slab shall receive one of the water curing or sealing methods described above, or a combination thereof, beginning after finishing operations have been completed and as soon as marring of the concrete will not occur.

E. Curing Compounds

1. Curing Compound shall not be used on concrete surfaces to be painted, waterproofed, moisture-proofed, Class A sack rubbed surface finished, or where other coverings are to be bonded, unless the curing compound is compatible with the final finish covering or it is to be removed by sandblasting prior to covering.
2. Generally, use of curing compounds is limited to use on concrete sidewalks, curbs, landings, driveways, catch basins, and other minor structures. Curing compound shall not be used on interior floor slabs.
3. Liquid membrane curing compounds shall be applied after finishing and as soon as the free water on the surface has disappeared and no water sheen is visible but the surface is still moist. The compound shall be applied at a uniform rate, not greater than 200 square feet per gallon using two applications (100 square feet per gallon each) at right angles to each other.

F. Curing and Protection in Cold Weather

Curing and protection in cold weather shall conform to ACI 306. Repair or replace concrete changed by cold weather.

3.12 Construction, Contraction, and Expansion Joints

A. General

Joints in concrete shall be horizontal level or vertical and shall be of the type and location as shown on the Drawings, or as approved by the Engineer. Joints shall be accurately located and constructed to produce straight joints. The concrete pour shall not commence until after the joint preparation has been reviewed by the Engineer.

B. Installation of Waterstops

1. Prior to use of the waterstop material in the field, a Sample of a fabricated cross constructed of each size or shape of material to be used shall be submitted to

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the Engineer for review. These Samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be furnished under this Specification. Field splices and joints shall be made in accordance with the waterstop manufacturer's instructions using a thermostatically controlled heating iron.

2. Join waterstops at all intersections so that a continuous seal is provided. Center the waterstop on the joint. Secure waterstop in the correct position. In the event of damage to the waterstop or improper installation of waterstop, repair the waterstop in an acceptable manner to provide a water tight seal.
3. Ensure impervious concrete in the vicinity of all joints. Make a visual inspection of the entire waterstop area during grout placement. Limit grout placement to top of waterstop in first pass, manually consolidate the grout under the waterstop, lift the waterstop to confirm full consolidation without voids, then place remaining grout to full height. Contractor shall not vibrate grout to consolidate.

C. Construction Joints

1. Construction joints, including keyways when required, shall be made as shown on the Drawings or as approved by the Engineer.
2. For construction joints without keyways, prior to placing the abutting concrete for all construction joints, the contact surface shall be cleaned by sandblasting or other approved means to remove all laitance, expose the aggregate, and roughen surface to a minimum of 1/4-inch amplitude.
3. For all joints, the exposed portion of the reinforcing steel shall be cleaned and surface roughening of all concrete. The cleaning and surface roughening method shall be conducted so as not to damage the waterstop, if one is present.
4. The surface of the hardened concrete may be roughened by one of the following methods:
 - a. Sandblasting the foundation and reinforcing dowels after the concrete has fully cured to remove all laitance and spillage, and to expose sound aggregate.

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- b. Water blasting the foundation and reinforcing dowels after the concrete has partially cured to remove all laitance and spillage, and to expose sound aggregate.
5. Horizontal Construction Joints
- a. For all horizontal construction joints with waterstop, prior to placement of the abutting concrete, thoroughly clean the concrete, exposed waterstop, and reinforcing steel, etc., and saturate with water; cover the horizontal surfaces with at least 2 inches of grout and immediately place concrete.
 - b. Limit the concrete lift immediately on top of the grout to 12 inches and thoroughly vibrate to mix and consolidate the grout and concrete together.
 - c. Provide positive measuring devices such as bucket or other device that will contain only enough grout for depositing in one place in the wall to ensure that a portion of the form does not receive too much grout.
 - d. The depositing of grout from pump hoses or large concrete buckets will not be permitted, unless inspection windows close to the joint are available to allow visual measurement of grout thickness and means are available for removal of excess grout.
 - e. For all horizontal construction joints without waterstops and all vertical construction joints, thoroughly clean and saturate the hardened concrete surface with water prior to placement of the new abutting concrete.

3.13 Grout

A. Surface Preparation

The surface to be grouted must be cleaned, roughened, and otherwise prepared per the grout manufacturer's instructions.

B. Placement

Grout shall be placed and consolidated in accordance with the grout manufacturer's instructions and in a manner to prevent air entrapment. Do not vibrate grout.

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3.14 Tolerances

A. General

Tolerance is the specified permissible variation from lines, grades, or dimensions shown. Where tolerances are not stated in these Specifications, permissible deviations will be in accordance with ACI 347. Notations on the Drawings of specific maximum and minimum tolerances shall govern if in conflict with these Specifications.

B. Permissible Tolerance

Unless otherwise indicated, all columns, beams, slabs, openings, reinforcing bars, waterstops, etc., shall be accurately located to within 1/4 inch. The permissible tolerance of the inside and outside wall surface shall be 3/16-inch plus or minus for linear walls and 3/8-inch plus or minus for circular walls. The tolerance of alignment as to the actual position of inside and outside surface is 3/8-inch plus or minus. All transitions from plus to minus shall be gradual, even and smooth, and without abrupt changes in the surfaces.

C. Failed Tolerances

Should the completed Work fail to meet the tolerances specified herein, the Contractor shall bear the expense of any remedial work required to repair or replace the defected, as directed by the Engineer. Surface defects and irregularities are defined as finished and are to be distinguished from tolerances.

3.15 Testing and Quality Control

A. General

All testing shall be performed as per the requirements of the Drawings and Specifications. Materials that fail to meet Contract requirements shall not be incorporated in the Work.

1. Owner's Responsibilities

The Owner will pay for all routine testing and inspection services required by the Engineer. Tests that determine cement content, gradation checks of fine and coarse aggregate, slump, air content of mix, and compressive strength will be paid for by the Owner.

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2. Contractor's Responsibilities

- a. The Contractor shall provide, at their expense, all preliminary testing needed to determine if materials and equipment are suitable for the Project. Once this is done, all routine testing will be as outlined above. In addition to the above tests, all other tests required by Laws and Regulations shall also be the responsibility of the Contractor. The results of all tests performed on materials to be used on the Project by the Contractor shall be submitted to the Engineer.
- b. Contractor shall cooperate with testing and inspection personnel and shall provide access to the Work area and to manufacturer's operations. The Contractor shall notify testing and inspection personnel at least 24 hours in advance of operations to allow for personnel assignments and test scheduling. All materials to be tested shall be provided by the Contractor at their expense. After tests are completed, the Contractor shall be responsible for repairing test areas to match original conditions. The Contractor shall remove all defective material from the Site at their expense. The Contractor shall pay for reinspection and retesting required because of defective work or ill-timed notices.

B. Structural Concrete

1. Cement Content

The cement content shall be tested in accordance with ASTM C85 and shall meet the requirements specified above in "Proportioning of Concrete Mix."

2. Fine and Coarse Aggregate

Aggregate size shall meet the requirements of ASTM C33.

3. Slump

Concrete shall be tested for slump in accordance with ASTM C143.

4. Air Content

Air content shall be tested in accordance with ASTM C231 and shall meet the requirements specified above in "Proportioning of Concrete Mix."

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5. Compressive Strength
 - a. Sample concrete cylinders may be taken from the Work by the Engineer or their representative. At least three identical cylinders may be taken not less than once a day, nor less than once for each 50 cubic yards of concrete placed. When the frequency of testing will provide less than five tests for a given class of concrete, tests may be made from at least five randomly selected batches or from each batch if fewer than five are used, or as required by the Engineer.
 - b. All cylinders shall be prepared and cured in accordance with ASTM C31 and tested in accordance with ASTM C39. One cylinder shall be tested at the age of seven days and two at the age of 28 days. Each strength test result shall be the average of the two cylinders from the same Sample tested at 28 days.
 - c. The strength level of the concrete will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the required minimum compressive strength and no individual strength test result falls below the required minimum compressive strength by more than 500 psi.
6. Concrete Core Samples
 - a. Samples shall be taken according to ASTM C42. Three cores shall be taken for each unsatisfactory strength test. If the concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 60° to 85°, relative humidity less than 60 percent) for seven days before test and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet.
 - b. Concrete in the area represented by the core tests may be considered structurally adequate if the average of the three cores is equal to at least 85 percent of the minimum compressive strength and if no single core is less than 75 percent of the minimum compressive strength. The decision as to whether the concrete is structurally adequate shall be at the sole discretion of the Engineer. A cost adjustment may be required as a condition of acceptance.

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7. Admixtures

Admixtures shall meet the requirements listed under Part 2 - Materials, "Concrete Admixtures."

8. Visual Inspection

The concrete shall be free of rock pockets, cracks, and other structural and water holding defects. Any defective concrete shall be repaired as approved by the Engineer. Any defective concrete with exposed reinforcing steel shall either be repaired or demolished and replaced at the sole discretion of the Engineer.

C. Defective Concrete

1. For each unsatisfactory strength test, concrete core samples shall be taken according to ASTM C42. A minimum of three cores shall be taken for each unsatisfactory strength test. If the concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 60° to 85°, relative humidity less than 60 percent) for seven days before test and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet.
2. Concrete in the area represented by the core tests may be considered structurally adequate if the average of the three cores is equal to at least 85 percent of the minimum compressive strength and if no single core is less than 75 percent of the minimum compressive strength. The Engineer may require additional core tests to determine the limits of the defective concrete. The cost of core tests shall be borne by the Contractor. The decision as to whether the concrete is structurally adequate shall be at the sole discretion of the Engineer. A cost adjustment may be required as a condition of acceptance.

D. Visual Inspection

All concrete shall be free of rock pockets, cracks, and other structural and water holding defects. Any defective concrete shall be repaired as approved by the Engineer. Any defective concrete with exposed reinforcing steel shall either be repaired or demolished and replaced at the sole discretion of the Engineer.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 Basis

See Technical Specifications - "Measurement and Payment" for a description of the basis of measurement and payment for Work performed under this Contract.

END OF SECTION

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PART 1 - GENERAL

1.1 Scope

- A. This section covers the Work necessary for all electrical and controls required by the Drawings and Specifications, including the electrical power, lighting, motor control systems, etc. This Specification section is intended to be performance based with certain minimum quality of products and services outlined. The Contractor shall provide parts, components, design, and installation services for complete and operable electrical and control systems in accordance with governing codes and the Specifications and the Drawings. The system shall be designed to be operated from an accessible panel by an individual without any special certification or licensing.
- B. The overall scope of the Work is intended to include the installation of electrical and controls for the east secondary clarifier motor as required by the clarifier equipment manufacturer and as shown on the Drawings.
- C. The Contractor shall be a responsible instrument and controls company who shall be able to demonstrate its ability to perform the Work outlined herein. The Contractor shall have factory authorized service facilities in the Pacific Northwest area to test and service the system to be provided.
- D. The Contractor shall assume undivided responsibility for the system and provide at a minimum, system design, component selection, installation supervision, startup, operating instructions, and warranty service. The Contractor shall also be able to provide follow-up maintenance and service as required by the Owner.

1.2 Intent of Drawings

- A. The Drawings are intended to show only the general location of equipment and the general requirements for system operation. Specific layout and electrical connections shall be determined by the Contractor through coordination with the Owner and clarifier equipment manufacturer to conform to the intent of the Contract Documents. The Contractor shall be responsible for the proper routing of raceways, subject to the approval of the Engineer and Owner.
- B. Because exact manufacturers of equipment are not known at the time of design, equipment sizes and types may be different from those shown on the Drawings or indicated in the Specifications. The Contractor shall make any necessary changes to the electrical rating of equipment or materials and shall provide any necessary circuits or

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added wiring to accommodate the actual equipment installed. The cost for making these changes or additions shall be included as part of the Work.

- C. The Contractor shall review all structural, architectural, mechanical, and electrical Drawings and include, as part of the Work, any costs for coordination and changes required to make system and equipment installation compatible with the other parts of the Project. Any discrepancies of design Work the Contractor believes do not meet code or will not function as intended shall be reported to the Engineer in writing prior to the Bid.

1.3 Departures from Drawings and Specifications

Any proposed departures from the Drawings and Specifications shall be requested in writing and submitted to the Engineer for review. The request shall be made as soon as practicable and within 30 days after Contract award, stating the reasons for the proposed departures.

1.4 Coordination

- A. The Work shall be coordinated with the Owner, clarifier equipment manufacturer, and Work of other trades to avoid conflicts, errors, and delays. Refer to all Drawings, Specifications, and Shop Drawings of the other trades for additional details that could affect the Work covered under this section.
- B. The Contractor shall field-verify all measurements and dimensions.
- C. Cutting of structural members will not be permitted except as noted on the plans or approved by the Engineer.
- D. The exact size of the mechanical, electrical, and other equipment varies with the manufacturer and model. This information is not always known at the time of design.
- E. It is the responsibility of the electrical Contractor to review clearances with mechanical and other Contractors and arrange equipment so that clearances relative to the electrical equipment are in accordance with NEC. Necessary changes shall be made as part of the Work at no cost to the Owner.

1.5 Record Drawings and Operation and Maintenance Manual

- A. A complete set of prints showing the final equipment layout and wiring to indicate the as-built location of equipment and raceways, plus the wire connection points, shall be given to the Engineer as soon as Work is complete. Refer to the General Requirements.

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- B. Provide Operation and Maintenance (O&M) manuals for training of the Owner's representative in operation and maintenance of systems and related equipment. Prepare a separate chapter for instruction on each class of equipment or system. Manuals shall include the following information:
1. A complete set of final and accepted equipment submittals.
 2. Contract Record Drawings.
 3. As-built Shop Drawings including installation drawing, elementary and connection diagrams, wiring diagrams, and interconnect diagrams.
 4. Manufacturers' manuals on equipment operation, installation, and maintenance.
 5. A recommended spare parts list and an index of Suppliers, listing current names, addresses, and telephone numbers of those who should be contacted for parts, information, service, and assistance.
 6. Field and factory test results.
 7. Submit copies of all material for approval. After approval, provide corrected, approved copies. Unless otherwise specified in other sections, provide three copies of the final, approved O&M manuals.

1.6 Inspection by Engineer

All materials and workmanship are subject to inspection at any time by the Engineer. Any Work or materials not in accordance with these Contract Documents or found to be deficient or defective shall be corrected in a manner satisfactory to the Engineer at no increase to the Contract amount.

1.7 Codes, Standards, Permits, and Regulations

- A. All Work, materials, and equipment shall be in full accordance with the latest applicable rules, regulations, requirements, and Specifications, including the following:
1. State and local codes
 2. National Electric Code
 3. ANSI, IEEE, NEMA, IPCEA
 4. Applicable National Fire Protection Association Publications

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5. Applicable federal Laws, including OSHA Regulations
 6. State Fire Marshal
 7. Underwriters Laboratory
 8. Serving Electrical Utility requirements
- B. All equipment and materials supplied for this job shall be UL listed and labeled.
- C. Wherever the requirements of the Specifications and Drawings exceed the above items, the requirements of the Specifications and Drawings shall govern. If there are any conflicts between the Drawings and Specifications and the applicable codes, rules, and regulations, the codes, rules, and regulations shall apply.
- D. The Contractor shall obtain all permits and pay all fees required by any government agency having jurisdiction over the Work and shall arrange all inspections required by these agencies.

1.8 Labeling

- A. All system components inside all enclosures shall be labeled with glue-on labels conforming to the wiring diagrams. All enclosures and components exterior to the enclosures, such as switches, indicating lights, gauges, etc., shall be labeled with engraved phenolic nameplates identifying the function. All fuses shall be labeled to indicate the equipment with which they are associated. All devices supplied on this Project that are fusible shall be labeled clearly, indicating proper fuse size and type to be used. Provide typewritten panelboard schedules accounting for every circuit breaker, including spares.
- B. Each control and instrumentation wire termination shall have a unique typewritten label installed on the wire at both ends in accordance with the wiring and connection diagrams.

1.9 Shop Drawings and Submittals

- A. The Contractor shall provide Shop Drawing submittals as required in the General Requirements.
- B. The approval of submittals does not relieve the Contractor of the responsibility to comply with the Contract Documents and shall not be construed as authorizing any deviations from the Specifications or Drawings unless the Contractor attaches a letter

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clearly listing the deviations. Revise, change, and/or resubmit all submittal information until acceptable to the Engineer.

- C. Obtain the Engineer's acceptance before commencing fabrication or installation of any materials or equipment.
- D. Submittals on equipment and materials shall include catalog sheets, Specification sheets, wiring diagrams, interconnection diagrams, layout and dimensions, descriptive material, performance data, and any other data required to show compliance with the Specifications and Drawings.
- E. The Contractor shall supply submittals on the following items:
- Wiring, elementary, and interconnection diagrams
 - Conduit, wire, and cable
Junction, outlet and device boxes, and conduit fittings
 - Underground boxes
 - Control and instrumentation devices
 - Any other items required by this Specification or the clarifier equipment manufacturer
- F. Drawings
1. The Contractor shall prepare detailed, CAD-generated elementary, connection, and interconnection diagrams. Minimum size of Drawings shall be 11"x17".
 2. These Drawings will show relevant information and shall include wire numbers, terminal board markings and terminal numbers, conductor color code if applicable, electrical panel, field device, and junction box identification. The diagrams shall interface with the Manufacturer's internal connection diagrams for panels. It is the intent that these Drawings accurately and clearly represent the point-to-point interconnection of all control wiring on the installation.
 3. Drawings shall be updated to represent as-built conditions at completion of the Project and shall be included in the O&M manuals.
 4. These Drawings must be provided with the initial equipment submittals.
- G. The electrical Subcontractor shall submit Record Drawings detailing the location, size, type, etc., of all conduits and wiring.

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1.10 Inspection of the Site and Existing Conditions

- A. Before submitting a Bid, the Contractor shall visit the Project Site to become familiar with the existing conditions, structures, and electrical systems that will in any way affect the Work required under this Contract. No subsequent increase in Contract cost will be allowed for additional Work required because of the Contractor's failure to fulfill this requirement.
- B. When bidding the Work, the Contractor shall visit the Project Site and verify all dimensions and include in the bid item price the cost of installation based on the actual dimensions.
- C. Prior to excavation, the Contractor shall confer with the applicable utilities and the Engineer to verify the location of existing underground utilities at each area of construction activity. The Contractor shall protect all existing underground utilities during construction. The Contractor shall repair/replace underground utilities and electrical circuits damaged during excavation or construction at no additional increase to the Contract price.

1.11 Storage and Protection of Material

The Contractor shall provide indoor dry storage for materials and assume complete responsibility for losses due to any cause. Storage shall not interfere with Owner's operation of existing systems or traffic conditions in any public thoroughfare. Protect completed Work, Work underway, and materials against loss or damage. Close circuit openings with caps or plugs during installation. Cover fixtures and equipment and protect against dirt, paint, or damage caused by water, chemicals, or mechanical accident.

1.12 Hazardous Areas

For classified hazardous areas, provide equipment, materials, and methods of installation in accordance with the code and UL approved for the hazardous classification.

1.13 Substitutes

Refer to the General Conditions and General Requirements for information related to substitute equipment.

1.14 Sequence of Work

- A. Refer to the General Requirements for the sequence of Work.

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1.15 Abbreviations

EMT	-	Electrical Metallic Tubing
GRS	-	Galvanized Rigid Steel Conduit
NEC	-	National Electric Code
PVC	-	Polyvinylchloride

1.16 Process Control Description

- A. The new control system shall operate the secondary clarifier mechanical equipment in accordance with the clarifier equipment manufacturer's requirements. It is anticipated that the system's primary function will be that of providing power to the motor that drives the clarifier collector mechanism and associated sweeps. In addition to the provision of power, the control system shall provide run statuses, torque overload status, totalize run times, and communicate these statuses and other system information to the Owner's SCADA system. The Contractor shall not be responsible for any programming of these functions; however, the Contractor shall be responsible for correctly wiring the power and controls as required by the clarifier equipment manufacturer.

1.17 Motor Control General

- A. It is anticipated that the existing MCC and associated bucket is adequately sized to be reused for the Work. Contractor shall be responsible for evaluating the existing MCC and verifying its compatibility with the Contractor's proposed clarifier equipment. Any required changes to the Owner's MCC and associated conduit that are a result of submitted equipment differences from the Evoqua H40-A-HT Tow-Bro clarifier shall be considered incidental to the Work. Refer to Technical Specifications - "Secondary Clarifier Improvements" for more information about
- B. Wiring and components shall be furnished or reused to provide a complete and operable unit and shall include, but not be limited to, the following: disconnect switches, circuit breakers, fuses, control relays, etc.

PART 2 - MATERIALS

2.1 General

- A. New Materials

It is the intent of these Specifications and of the Drawings to secure high quality equipment and materials and first class workmanship in order to facilitate trouble free

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operation and minimum maintenance of the system. Equipment and materials shall be the product of reputable, experienced manufacturers. Similar components in the Project shall be the product of the same manufacturer. All equipment and material shall be of industrial grade and standard construction and shall provide long and trouble free service. Service and replacement components for all equipment furnished shall be normally stocked and readily available from service centers and Suppliers in Oregon, Idaho, Washington, or California.

B. Product Rating

NEMA rated equipment and components are required for all applicable electrical and control components. IEC rated equipment and components will not be acceptable.

C. Standard Products

Unless otherwise indicated, materials to be furnished shall be standard products of Manufacturers regularly engaged in production of such equipment, or the intended use, and shall be Manufacturer's latest standard design that conforms to Specification requirements.

D. Equipment Finish

Electrical equipment may be installed with Manufacturer's standard finish and color, except where specific color or finish is indicated. If Manufacturer has no standard color, the equipment shall be painted ANSI 61, light gray.

E. Equipment Temperature Rating

Provide equipment and devices capable of continuous operation within an ambient temperature range of -20° to 110°F when installed in unconditioned spaces.

2.2 Raceways and Boxes

A. Unless otherwise noted, conduits shall be installed in locations as specified below:

Material	Location
GRS	<ol style="list-style-type: none"> 1. All exterior and interior aboveground exposed locations. 2. Aboveground service entrance conduit unless otherwise noted.

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Material	Location
PVC Schedule 40 to Schedule 80	1. For service entrance and conduit larger than 2 inches. 2. Buried, embedded, or encased in concrete.
EMT	Concealed interior locations only.
Liquid-tight Flexible Metallic Conduit	Final raceway connections to all equipment that require flexibility and connected with GRS conduit or installed outdoors or in wet locations.

B. Conduit Size

1. Minimum size of conduit unless otherwise noted:

Type / Location of Conduit	Diameter
GRS	3/4-inch
GRS (Lighting, Receptacle, HVAC)	1/2-inch
All Underground Conduit	1-inch
Embedded in Slab	3/4-inch

2. Burial depth over the top-most part of the conduit or cable unless otherwise noted on the Drawings:

Type / Location of Conduit	Burial Depth, Inches
PVC Conduit Under 600V	24

3. Size conduits in accordance with NEC for wires shown on the Drawings. Size conduits in accordance with NEC for vendor-furnished cables. The Contractor shall size conduits larger or install pullboxes if necessary to facilitate installation or to minimize pulling tension.

C. For exterior and interior locations, use GRS to transition from belowground or concrete encased conduit to aboveground conduit. The transition from PVC to GRS conduit shall occur 12 inches below ground and shall extend to a point 12 inches above ground.

D. In concealed, interior locations, transition from PVC 12 inches or less above ground level.

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- E. All flexible conduit shall be UL approved with continuous copper ground path. Connectors shall be grounding type.

2.3 Equipment Enclosures

Unless otherwise noted, equipment enclosures for electrical equipment shall be as follows:

- A. NEMA 1 Gasketed typical MCC enclosure.
- B. NEMA 12 For use indoors and in dry areas, unless otherwise noted.
- C. NEMA 3R For use outdoors. Meets UL for "rain-tight" enclosures.
- D. NEMA 4X Stainless steel for use in all outdoor areas, vaults, and wet locations, unless otherwise noted.

2.4 Conductors

- A. Conductors 600 Volts and Less

All conductors shall meet requirements of IPCEA, NEC, and UL. All conductors shall be Class B stranded copper. All conductors shall be appropriately rated for the voltage and service condition.

- B. Ground Wire

A copper ground wire shall be installed in all raceways and sized in accordance with the NEC.

2.5 Disconnect Switches and Enclosed Circuit Breakers

- A. Disconnect switches shall be heavy-duty safety type rated at 600V or 250V as applicable. Unless otherwise noted on the Drawings, fuses shall be dual rated, current limiting, sized to protect the equipment and circuit. The operating handle shall be an external handle capable of being padlocked in the "OFF" position and doors shall be provided with interlocks that prevent the door from opening when the operating handle is in the "ON" position. The switch shall be a positive spring-operated quick-make, quick-break mechanism and be horsepower rated for motors.
- B. Circuit breakers shall be thermal magnetic of the indicating type providing "ON," "OFF," and "TRIPPED" positions of the operating handle; mechanism shall be a quick-make, quick-break trip device and shall be non-interchangeable. All multipole circuit breakers

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shall be designed so an overload on one pole automatically causes all poles to open. Interrupting capacity, unless otherwise noted, shall be 22,000 amp RMS symmetrical. Provide an extension handle for each breaker rated above 400 amps. These shall be service entrance rated where applicable.

2.6 Underground Boxes

All underground boxes shall be traffic rated at 40,000 pounds minimum, unless otherwise shown on the Drawings.

2.7 Bedding Material

Bedding material shall be crushed rock or other suitable material that contains no rocks larger than 3/8-inch in diameter. Conduit bedding shall be placed the full width of the excavated trench. Depth of bedding shall provide a minimum of 6 inches below the conduit and 12 inches above the conduit.

2.8 Warning Tape

Provide heavy gauge yellow plastic tape, 6-inch minimum width, for use in trenches containing electric circuits. Utilize tape made of material resistant to corrosive soil. Use tape with preprinted warning that an electric circuit is located below the tape. Manufacturers and types: ITT Blackburn Type YT, Terra Tape, or equal.

PART 3 - EXECUTION

3.1 General

A. Workmanship

Work shall be performed in a workmanlike manner by craftsmen skilled in their particular trade. All Work shall present a neat and finished appearance.

B. Material and Equipment Installation

1. Materials and equipment shall be installed in a workmanlike manner, in accordance with the Manufacturer's instructions and in accordance with applicable codes and regulations.
2. Measurements and dimensions shall be verified by the Contractor at the building site.

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3. A copy of the Manufacturer's installation instructions shall be kept on the Project Site, available for review at all times.
 4. Wherever any conflict arises between the Manufacturer's instructions, codes and regulations, and these Contract Documents, the Contractor shall review the conflict with the Engineer.
- C. Cutting and Patching
1. No structural member of the building surface shall be cut or notched without specific approval of the Engineer.
 2. When cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is required for installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment, these surfaces shall be neatly restored to original condition.

3.2 Excavation and Backfill

The Contractor shall do all necessary excavation and backfilling required. All trenches near or under footings shall be cut only after approval of the Engineer. Where trenching is done through existing paving, walks, curbs, etc., the Contractor shall restore the existing structures to their original condition or better. The bottom of all trenches shall be accurately graded to provide uniform bearing and support for all sections of the conduit. Where excavation encounters boulders or soft and otherwise unsuitable foundation material, such material shall be removed and backfilled to the required depth with specified bedding material.

3.3 Demolition

- A. As part of the Work, the Contractor shall remove all conduits, wiring, devices, and equipment that are being abandoned or taken out of service. The Contractor shall relocate and add any conduit, wires, or devices necessary for connection of existing equipment to remain in service. Demolition work not specifically identified, but required for performance of the Project, shall be accomplished by the Contractor. The decision of the Engineer shall be final on all such required Work. The Contractor shall visit the Project Site prior to Bid to determine the amount of demolition work that must be accomplished.
- B. For circuits with underground conduits, the wiring shall be removed and the conduits left. Conduits above ground shall be trimmed back to a point either underground or a stub up aboveground as directed by the Engineer.

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- C. For aboveground circuits being abandoned, all conduits and wiring shall be removed.

3.4 Testing, Startup, and Troubleshooting

- A. Upon completion of the Work and adjustment of all equipment, all systems shall be tested to demonstrate that all equipment furnished and installed and/or connected under the provision of these Specifications and Drawings functions in the manner required.
- B. All trip functions, protective settings, controls, indicators, alarms, and system sequencing shall be demonstrated to the Engineer. The Contractor shall provide all test equipment necessary to test or simulate conditions that show the system is operating correctly.
- C. If a problem occurs with the electrical system prior to completion or anytime during the warranty period, it is the responsibility of the Contractor to provide personnel and any test equipment needed to identify the cause of the problem.
- D. During startup and commissioning of the equipment, the Contractor shall provide qualified personnel to assist with troubleshooting, adjustments, and minor changes needed to optimize operation. The Contractor shall coordinate with the CSS to ensure personnel are available during the time of commissioning and to resolve any interface problems between the control system and the rest of the electrical system.

- E. Testing and Startup

During checkout and startup of the various plant systems, provide a crew of skilled craftsmen to be available for checkout and troubleshooting activities as required by the Engineer. Since coordination with other crafts and Contractors will often be required, the craftsmen assigned to the checkout must be available outside normal working hours when necessary.

3.5 Cleaning Up and Touch-up Painting

The premises shall be kept free from accumulation of waste material or rubbish. The Contractor shall continually remove debris, cuttings, crates, cartons, etc. Upon completion of the Work, materials, scraps, and debris shall be removed from the premises and from the interior and exterior of all devices and equipment. Scratches, scrapes, or chips in the interior and exterior surfaces of devices and equipment shall be touched up with finishes matching, as nearly as possible, the color, consistency, and type of surface of the original finish.

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3.6 Raceways, Fittings, Boxes

- A. Generally, unless otherwise specified or indicated, wiring shall consist of insulated conductors installed in conduits of types indicated. Conduit shall be installed as a complete, continuous system, mechanically secure, and electrically connected to all metal boxes, fittings, and equipment. Blank off all unused openings using factory-made knockout seals. Indoors, use double locknuts with insulating bushing for termination of conduits at all boxes and cabinets. Outdoors, provide watertight conduit hubs at all box connections.
- B. Final connection to motors, generators, fans, unit heaters, dry type transformers, and other equipment where a flexible connection is desired or required to minimize vibration shall be made with minimum 18-inch lengths of liquid-tight PVC jacketed flexible steel conduit.
- C. All threads of galvanized conduits installed outdoors or underground shall be painted with zinc-rich paint or liquid galvanizing compound.

3.7 Wire and Cable

- A. All wire shall be continuous from outlet to outlet. All conductors shall be installed continuous with no splices unless approved by the Engineer. No underground splices are allowed. Splices for lighting and general purpose receptacle circuits shall be accomplished by means of wire nuts. For all other splices, use pressure connectors properly taped. Soldered mechanical joints will not be acceptable. Terminals or connectors shall be approved for the type of conductor material used. Stak-on connectors shall be applied to control wiring for connection to terminals.
- B. All wires in control panels and other such panels shall have all wiring terminated and connected on terminals. Splices using wire nuts and crimp connectors are not acceptable. Terminate control and instrument wires in accordance with the Control System Supplier wiring and connection diagrams.
- C. Control and instrumentation cable, when required, shall be furnished and installed with the number of conductors indicated on the Drawings. Cable shall be color-coded in accordance with IPCEA-NEMA standards. Splices, when necessary, shall be located only in readily accessible cabinets or junction boxes using terminal strips. Splices of a control cable will not be acceptable. Machine printed wire markers shall be furnished and installed at each end of individual control cables. Digital circuits shall be routed in their own conduits. Power and lighting circuits shall not be routed in the same conduit with

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instrumentation or low voltage control circuits. Install instrumentation cables to prevent electromagnetic interference, noise, or ground loops.

- D. Cable lubricants, pulling sleeves, and pull boxes shall be used to keep pulling tensions within allowable limits specified by the Manufacturer so the insulation is not damaged. Pulling lubricant shall be Polywater.
- E. Unless otherwise shown on the Drawings or specified by the Manufacturer, leave at least 6 inches of free conductor at each connected outlet (outlet connected to equipment or device) and 9 inches of free conductor at each unconnected outlet. The free ends of conductors at unconnected outlets shall be taped and coiled neatly in the outlet box.

3.8 Grounding

- A. Ground conductors shall be copper wire sized according to NEC requirements. Provide a ground wire in all conduits.
- B. Ground rods shall be copper clad steel, 3/4-inch by 10 feet. Bolted connectors shall be Burndy or equal. Exothermic connectors shall be manufactured by Cadweld or equal. Service entrance electrode grounding conductors shall be enclosed in conduit from service equipment to grounding rods. It shall be sized in accordance with NEC requirements.

3.9 Instrumentation and Controls

Instrumentation and Controls shall be installed in accordance with Control System Supplier requirements. Sturdy and suitable racks, brackets, mounting assemblies, and concrete bases shall be provided as needed. Wall mounted panels shall be mounted on suitable strut racks.

3.10 Device Plates

Plates shall be installed with all four edges in continuous contact with the finished wall surfaces without use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed vertically and with an alignment tolerance of 1/16-inch.

3.11 Training

The Contractor shall provide any training necessary to teach the Owner the operation of the systems and equipment.

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PART 4 - MEASUREMENT AND PAYMENT

4.1 Basis

See Technical Specifications - "Measurement and Payment" for a description of the basis of measurement and payment for Work performed under this Contract.

END OF SECTION

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PART 1 - GENERAL

1.1 Scope

- A. These Specifications cover the furnishing of labor, materials, and equipment necessary to provide surface preparation, coating application, and inspection for a complete coating system as specified.
- B. These Specifications also cover all work required to repair and recoat the secondary clarifier launder, including the removal of current coating, surface preparation, and repair of existing concrete surfaces to an International Concrete Repair Institute CSP 3-4. The repair area is 3 inches down the inner clarifier wall, the top of the interior launder wall, down to the launder floor, across the floor, and 2 feet up the exterior launder wall. The Contractor will remove, reinstall, and level the existing V-notch effluent weir plates. Work relating to the secondary clarifier launder coating shall be warranted for a minimum of 5 years from the completion of the project.
- C. As a general guideline, exposed improvements shall be painted unless specifically noted otherwise on the Drawings or Specifications. For piping systems above ground and in vaults, all pipe, valves, flowmeters, pumps, motors, etc., shall be painted.
- D. In general, painting finishes are not required on the following, unless specifically noted otherwise on the Drawings or in the Specifications:
 - 1. Stainless steel items of equipment, materials, and furniture having a factory finish, if the factory finish is in good condition.
 - 2. Aluminum not in contact with concrete or masonry.
 - 3. Galvanized fencing materials.
 - 4. Manholes and covers.
 - 5. Buried or concealed improvements.
- E. Items specified in these Specifications are intended to be broad in scope and may not always apply to every item of Work to be constructed. All applicable sections, as determined by the Engineer, shall control the Work outlined in the Contract Documents.

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1.2 Reference Standards

- A. Without limiting the general aspects of other requirements of these Specifications, all surface preparation, coating, and painting of interior and exterior surfaces shall conform to the applicable requirements of the National Association of Corrosion Engineers, the Steel Structures Painting Council, the Oregon Health Authority - Drinking Water Services (DWS), and the paint system manufacturer's printed instructions.
- B. The below listed standards in Table 1 are part of these Specifications as specified and modified. In case of conflict between the requirements of these Specifications and those of the listed documents, the requirements of these Specifications shall prevail. Where standards of surface preparation are described by citing SSPC specification, numbered reference is made to the "Steel Structures Painting Manual," Volume 2, published by the Steel Structures Painting Council.

Table 1 - Reference Standards	
Reference	Title
ANSI-NSF 61	Drinking Water System Components – Health Effects
SSPC-SP1	Specification for Solvent Cleaning
SSPC-SP2	Specification for Hand Tool Cleaning
SSPC-SP3	Specification for Power Tool Cleaning
SSPC-SP5	Specification for White Metal Blast Cleaning
SSPC-SP6	Specification for Commercial Blast Cleaning
SSPC-SP10	Specification for Near-White Metal Blast Cleaning
SSPC-PA2	Measurement of Dry Film Thickness with Magnetic Gages
ASTM D4060	Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM D2794	Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D4541	Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM F1249	Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
ASTM B117	Test Method of Salt Spray (Fog) Testing
ASTM D741	Method for Evaluating Degree of Blistering of Paints

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Table 1 - Reference Standards	
Reference	Title
ASTM D870	Practice for Testing Water Resistance of Coatings Using Water Immersion
ASTM D1014	Method of Conducting Exterior Exposure Tests of Paints on Steel
ASTM D1653	Test Method for Water Vapor Permeability of Organic Coating Films
ASTM D1654	Method of Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D4585	Practice for Testing the Water Resistance of Coatings Using Controlled Condensation
ASTM D5894	Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal (Alternating Exposure in a Fog/Dry Cabinet and a UV/Condensation Cabinet)

1.3 Storage and Handling

- A. Materials shall be brought to the Project Site in original sealed containers. The containers shall bear a legible product designation, batch number, and date of manufacture on the side of each container. They shall not be used until the Engineer has inspected contents and obtained data from information on containers or labels. Materials exceeding storage life recommended by the manufacturer shall be rejected. Submit paint receipts/invoices, upon request, to the Engineer.
- B. Coating materials shall be handled and stored indoors according to the manufacturer's latest published instructions, and shall be protected from damage, moisture, direct sunlight, and temperatures below 40°F or above 100°F. Flammable coatings and paints must be stored to conform with city, county, and state safety codes for flammable coating or paint materials. Water base coatings or paints shall be protected from freezing.

1.4 Submittals

- A. Submit in accordance with the General Requirements in one complete package.
- B. Prior to ordering material, submit a complete schedule of materials to be used. Include manufacturer's brand name, product name, and designation number for each coat of each system to be used. Include information indicating percent solids by volume, minimum recommended dry film thickness per coat, minimum number of coats,

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minimum application air temperature and surface temperature, recommended surface preparation, recommended thinners, application instructions, and a statement indicating that the specified prime coat is recommended by the manufacturer for use with the specified intermediate and finish coats.

- C. Prior to commencing Work, submit a detailed list of all surfaces and equipment items upon which the Contractor intends to apply protective coatings.
- D. Provide the following information on each paint product:
 - 1. Abrasion resistance, ASTM D4060, 1 kg load at 1,000 cycles, CS-1 7 wheel
 - 2. Impact resistance, ASTM D2794, direct and reverse
 - 3. Moisture vapor transmission, ASTM F1249
 - 4. Adhesion, ASTM D4541
 - 5. Salt fog, ASTM B117
 - 6. QUV, ASTM G53 (exterior finish coat only)
 - 7. Fresh water immersion, ASTM D870 (immersed coatings only)
 - 8. Humidity, ASTM D4585
- E. If materials other than those listed are submitted, submit additional information to fully define the proposed substitution. The Engineer may further require the Contractor to furnish additional test results from an independent paint laboratory comparing the proposed substitution with one of the named products, at no additional cost to the Owner. For substituted materials, provide a list of references, including contact person and phone number, where proposed substitute paint system has been used in similar exposures. Provide a minimum of five references (no duplicate owners or agencies).
- F. Provide Safety Data Sheets, manufacturer's certificates, and test data for all products.
- G. Manufacturer's Certification: That products furnished meet applicable air quality regulations as to allowable VOC content and is otherwise suitable for the place of application and use intended.
- H. Submit to the Engineer a full range of the manufacturer's standard and let down finish colors for review and selection by the Owner. After final colors have been selected,

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submit two 8-1/2 by 11-inch Samples on cardboard of each color indexed as to manufacturer and color designation. Color chips 3/4-inch by 1-1/2-inch may be used for pipe color codes.

- I. Supply information for purchase of repair products for all systems used.
- J. Furnish affidavits from the manufacturer(s) certifying installation at wastewater facilities.

1.5 Quality Assurance

- A. The Contractor shall submit to the Engineer a written detailed description of the painting Subcontractor's qualifications and experience relative to the application of the specified coating systems. Such description shall include the following minimum information:
 - 1. Name of the company that will be performing the painting work.
 - 2. Experience of the company on similar projects, including experience with sandblasting, preparation of steel structures, concrete, piping, buildings, equipment, etc., and use of the paint systems specified herein.
 - 3. List of similar projects that the company has completed (five minimum).
 - 4. List of contact persons and telephone numbers for each job reference.
 - 5. Names of personnel who will be performing the Work on this Project and their experience.
 - 6. Name of the on-the-job painting supervisor and their experience.
- B. The secondary clarifier launder epoxy coating and repair mortar shall include the following information on the label of the containers, as applicable.
 - 1. Manufacturer's name
 - 2. Type of coating
 - 3. Manufacturer's stock number
 - 4. Color

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5. Label analysis
 6. Federal specification number
- C. Coating Manufacturer's Qualifications
1. Protective coatings furnished under these Specifications shall:
 - a. Be of a manufacturer who has been regularly engaged in the manufacture of protective coatings with a minimum of ten years of successful experience.
 - b. Demonstrate to the satisfaction of the Engineer successful performance on comparable projects.
- D. Applicator's Qualifications
- Applicator shall be experienced in application of specified protective coatings for a minimum of five years, practical experience in application of the specified coatings, and successful completion of a minimum of five projects of similar size and complexity within the last three years.
- E. Coating manufacturer's authorized representative shall provide a written statement attesting that the applicator has been instructed on proper preparation, mixing, and application procedures for coatings specified as well as the applicator's qualifications.
- F. The coating system manufacturer shall provide a qualified representative to visit the Site a minimum of two times during the coating operations. The manufacturer's representative shall provide a written report at the conclusion of each site visit.

PART 2 - MATERIALS

2.1 General

- A. TNEMEC products are listed as the basis of design and quality in terms of performance and characteristics. Other manufacturers' products will be considered subject to meeting the listed quality, performance, and characteristics of the standard/product(s) for the particular application and compliance with the Specifications. Substantiating Technical Data are required. Submit requests for substitution in accordance with the General Conditions, Supplementary Conditions, and General Requirements. Substitutions that decrease the film thickness, solids by volume, or number of coats will

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not be considered. Requests for substitutions shall include test reports that demonstrate the product(s) meets or exceeds the performance and characteristics of the listed standard/product(s).

- B. The Contractor shall submit any proposed substitutions on Table 2 "Protective Coating - Substitution List" at the end of these Specifications. Colors where not specified shall be approved by the Owner.

2.2 Secondary Clarifier Launder Repair and Coating

A. General

1. Use product of single manufacturer for each system.
2. Use only mercury-free, fume-proof coatings. Coatings must be suitable for atmosphere containing hydrogen sulfide.
3. Use only lead-free coatings that do not cause discoloration in a wastewater treatment plant (sewage) atmosphere.
4. List three jobs where products were used in wastewater applications. Include contact information.

B. Concrete Launder Wall Repair System

Below are examples of repair mortar recommended for use to the Owner. If the selected mortar varies significantly from the descriptions below but is required for use with the epoxy coating system, it will be considered on a case-by-case basis.

1. Repair Mortar Alternative 1
 - a. Type: Polymer modified
 - b. Number of components: Two
 - c. Use: Leveling horizontal or vertical concrete surfaces
 - d. Compatible with thermal coefficient of expansion of concrete C-884
 - e. Compressive strength: 8,800 psi at 28 days, ASTM C-109
 - f. Flexural properties: 2,000 psi at 28 days, ASTM C-78

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- g. Tensile properties: 900 psi at 28 days, ASTM C-496
 - h. Bond strength: 2,200 psi at 28 days, ASTM C-882
 - i. Example product: SikaTop 123 Plus, or equal
2. Repair Mortar Alternative 2
- a. Type: Fiber-reinforced, silica fume modified
 - b. Number of components: One
 - c. Use: Leveling horizontal or vertical concrete surfaces
 - d. Compressive strength: 10,000 psi at 28 days, ASTM C-109
 - e. Flexural properties: 1,100 psi at 28 days, ASTM C-78
 - f. Tensile properties: 735 psi at 28 days, ASTM C-496
 - g. Bond strength: 3,000 psi at 28 days, ASTM C-882
 - h. Example product: DeGussa Emaco S88, or equal

C. Concrete Launder Wall Epoxy Coating System

Epoxy/epoxy with primer systems shall be designed for use in outdoor wastewater applications and compatible with original concrete and concrete repair mortar. Finish shall be gloss. A UV protective topcoat is required if not included in the protective coat. The UV protective topcoat shall be compatible with the epoxy coating system.

1. Coating System General Requirements
- a. Compressive strength: Greater than 13,000 psi, ASTM D 695
 - b. Flexural strength and modulus: Greater than 12,000 psi; greater than 600,000 psi, ASTM D 790
 - c. Tensile strength: Greater than 6,000 psi, ASTM D 638
 - d. Durometer hardness: Greater than 95, ASTM D 2240

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- e. Taber abrasion resistance: Less than 20 mg loss, ASTM C 501
- f. Example product: Mainstay DS-5, with UV protectant 1450

PART 3 - EXECUTION

3.1 Surface Preparation

A. General

Surfaces to be painted shall be prepared in accordance with the manufacturer's instructions in a professional manner with the objective of obtaining a smooth, clean, and dry surface. No painting shall be done before the prepared surfaces are approved by the Engineer.

B. Metal

1. Metal surfaces, including piping, not shop primed or painted shall be thoroughly cleaned by sandblasting, in accordance with the paint manufacturer's instructions, and as specified herein prior to painting. Any metal items with a paint incompatible with the specified finish shall be primed as recommended by the paint manufacturer.
2. Previously painted surfaces such as piping which are pitted, scaling, rusty, etc., or in otherwise poor condition shall have existing paint removed to bare metal or as approved by the Engineer. Oils, dirt, and other surface contaminants shall be removed so that surfaces are properly prepared for painting. Priming and painting shall then be applied in accordance with these Specifications.

C. Concrete

Concrete surfaces shall be cleaned of all dust, form oil, curing compounds, and other foreign matter. Concrete intended for immersion service shall be brush blasted prior to coating.

3.2 Application

- A. Paint shall be applied in a neat, professional manner. Finished surfaces shall be uniform and pleasing in appearance, free of runs, drips, sags, or variable texture. Defective painting shall be removed and replaced.

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- B. The painter shall apply each coating at the rate specified for application by the manufacturer. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material.
- C. Drying time shall be construed to mean "under normal conditions." Where conditions are other than normal because of the weather or because painting must be done in confined spaces, longer drying time will be necessary. Additional coats of paint shall not be applied nor shall units be put into service until paints are thoroughly dry.
- D. Where thinning is necessary, only the products of the manufacturer furnishing the paint, and for the particular purpose, shall be allowed, and all such thinning shall be done strictly in accordance with the manufacturer's instructions, as well as with the full knowledge and approval of the Engineer.
- E. No paint shall be applied in fog, snow, rain, or to wet or damp surfaces, or when air temperatures are below 40°F and surface temperatures are below 35°F or when the relative humidity exceeds 85 percent. The Contractor shall provide heaters, fans, etc., when necessary to keep moisture off of piping to be painted.
- F. Coating materials shall not be applied when the ambient air temperature, surface temperature, or humidity is outside the boundaries as stated on the product data sheets.
- G. Materials shall be evenly applied to form a smooth, continuous, unbroken film.
- H. Dirt, grease, oil, paint chalk, or any other contamination will not be permitted between coats.
- I. Welds, bolt heads, nuts, rivets, and connections shall be stripe coated by brush with primer prior to applying full coat of primer.
- J. Concrete surfaces shall be thoroughly cured and free of other surface contaminants prior to application of protective coatings. Curing compounds shall not be used where painting will be required.
- K. Each application of protective coatings, with the exception of coal tars, shall be a different shade in color than the specified finish.

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3.3 Painting Schedule

Painting schedule for the Work is given in Table 3 (end of these Specifications).

3.4 Inspection

A. Dry Film Thickness

After application of each coating in the specified system, the total dry film thickness shall be taken as follows:

1. Make five separate spot measurements spaced evenly over each section of 100 square feet in area per SSPC-PA 2. Measurements, as much as possible, should be taken at surfaces with dissimilar exposures, that is, at different angles, faces, bolts, etc., to ensure uniformity of the coatings.
2. No single spot measurement (average of 3 readings) in any section shall be less than 80 percent of the specified thicknesses.

B. Documentation

Applicator is to keep a log of ambient and surface temperature, humidity, dew point, and dry film thicknesses (paragraph 3.4.A.). These are to be logged every day at the beginning, middle, and end of each shift. This log is to be current and available at all times for the Owner, Engineer, and coatings manufacturer to verify.

3.5 Colors

A. General

Colors shall be as called for on the Drawings or as approved by the Owner and directed by the Engineer. The Contractor shall provide color charts to the Engineer when required.

B. Color Pipe Coding

1. To facilitate identification of piping in plants and pumping stations, the color scheme given in Table 4 (end of these Specifications) shall be utilized. Final color selection will be as approved by the Engineer.
2. In situations where two colors do not have sufficient contrast to easily differentiate between them, a six-inch band of contrasting color should be

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painted on one of the pipes at approximately 30-inch intervals. Identification labels shall also be painted on the pipe. Paint arrows indicating the direction of flow. For each pipe to be provided with labeling, the Engineer shall provide the Contractor with the list of identification labels.

3.6 Secondary Clarifier Launder Repair and Coating

A. Inspection and General Installation

1. Product manufacturer's authorized representative shall examine surfaces scheduled to receive repairs for conditions that will adversely affect execution, permanence, or quality of work, and which cannot be put into an acceptable condition through preparatory work as included in Preparation of Surfaces, below.
2. Do not proceed with surface preparation or product application until conditions are suitable to Owner and manufacturer's field representatives.

B. Preparation of Surfaces

1. Field verification shall include verifying the working conditions and the condition of the concrete. It shall also include a review of the proposed application with the product manufacturer's authorized representative.
2. Concrete surfaces shall be cleaned to remove all dust, laitance, grease, oils, curing compounds, waxes, impregnations, foreign particles, other coatings, disintegrated materials, and deteriorated substrate.
3. Preparation of concrete surface may be by water blasting or abrasive blasting, at Contractor's option.
4. Blasting may be water- or air-based, and free of oil. Blasting should be confined to the area being prepared. Protect nameplates, valve stems, rotating equipment, motors, or other damageable items. Plug pipe, holes, or openings before blasting, and keep covered until water, abrasive, and debris are completely removed. Do not reuse abrasive or water.

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5. Protection of Surfaces
 - a. Use drop cloths, masking tape, and other measures to protect all surfaces from accidental spraying, splattering, or spilling of coating. Contractor to repair all damage to other items caused by their actions or inaction.
 - b. Immediately remove mortar deposited on surfaces not intended to be repaired.
- C. Mixing
 1. Mix only in mixing pails, suitably sized, nonferrous or oxide metal pans.
 2. Do not add any adulterants or unauthorized thinners.
 3. Keep containers closed tightly.
- D. Application
 1. Follow manufacturer's written instructions for surface preparation, application and curing of the repair system.
 2. Repair Mortar

Surface should be saturated surface dry with no standing water. Scrub mortar into the substrate, filling all pores and voids. Trowel or screed, filling and consolidating to produce a relatively smooth, even surface covering all existing aggregate.
- E. Repair Schedule
 1. Top of weir wall.
 2. Launder side of weir wall, from top of wall to floor of launder.
- F. Field Quality Control
 1. Authorized representative of repair product manufacturer shall inspect the concrete prior to surface preparation to ensure that the specified product is suitable for the existing concrete.

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2. Authorized representative of repair product manufacturer shall inspect and approve the surface preparation of the concrete prior to the application of the product.
 3. Manufacturer's representative shall provide a minimum of eight hours field service time instructing the Contractor in the proper application and finishing of repair mortar.
- G. Inspect and Startup
1. Readiness Test: Contractor shall inspect the work prior to startup. Inspection shall ensure all surfaces requiring repair system have had it applied, weir plates reinstalled in their original locations, and all hardware has been provided and properly installed.
 2. Submit signed and certified Manufacturer's Certificate of Proper Installation.

3.7 Extra Paint

The Contractor shall provide a minimum of one gallon of extra paint for each major color and system used. A minimum of one quart of extra paint shall be provided for colors used as trim or for minor items as determined by the Engineer. The Contractor shall provide either fresh labels from paint cans with a list of places used, or a written description of painting systems, locations used, and applications requirements.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Basis

See Technical Specifications - "Measurement and Payment" for a description of the basis of measurement and payment for Work performed under this Contract.

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Table 2			
Protective Coatings – Substitution List			
System No.	Specified Coating		Substitute Coating Manufacturer's Name, Generic, Performance, Percent Solids, Surface Preparation, No. Coats, Industrial Use, Standards
	Generic	Coating Name¹	
1	Modified Aromatic Polyurethane (Primer) Aliphatic Acrylic Polyurethane (Finish)	Series 1 Series 1095	
3	Modified Aromatic Polyurethane (Primer) Polyamidoamine Epoxy (Intermediate) Polyamidoamine Epoxy (Finish)	Series 1 Series N69 Series N69	
4	Modified Aromatic Polyurethane (Primer) Polyamidoamine Epoxy (Finish)	Series 1 Series N69	
6	Epoxy Modified Cementitious Mortar (Surface Filler) Polyamidoamine Epoxy (Primer) Polyamidoamine Epoxy (Finish)	Series 218 Series N69 Series N69	

¹ All listed coating names are TNEMEC products, except System No. 10.

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Table 3 - Painting Schedule

Paint System No., Type, and Location	Surface Preparation	Prime Coat ^(1,2)	Intermediate/Finish Coat ^(1,2)
Ferrous Surfaces			
No. 1 - MC Polyurethane and Polyurethane Protective Coating - Exterior non-immersed ferrous surfaces such as exterior pipes, valves, supports, handrails, braces, covers, fabrications, etc.	New - Blast clean per SSPC-SP 6. Dry abrasive blasting performed with media that provides 1 to 2 mil anchor profile. Touchup - SSPC 1, 2, or 3	TNEMEC Series 1 Omnithane, 2.5 to 3.5 mils DFT	Finish - TNEMEC Series 1095 Endurashield, 2 to 5 mils DFT
No. 3 - Epoxy Protective Coating - Immersed or below grade ferrous surfaces that are shop primed and field finished such as flood gates, sewage plant equipment, non-potable water applications, etc.	New - Blast clean per SSPC-SP 5. Dry abrasive blasting performed with media that provides 2 to 3 mil anchor profile. Touchup - same as New.	TNEMEC Series 1 Omnithane, 2.5 to 3.5 mils DFT	Intermediate - TNEMEC Series N69 Hi Build Epoxoline, 3 to 5 mils DFT Finish - TNEMEC Series N69 Hi Build Epoxoline, 8 to 10 mils DFT
No. 4 - Epoxy Protective Coating - Immersed or below grade ferrous surfaces that are field primed and finished such as flood gates, sewage plant equipment, non-potable water applications, etc.	New - Blast clean per SSPC-SP 5. Dry abrasive blasting performed with media that provides 2 to 3 mil anchor profile. Touchup - same as New.	TNEMEC Series 1 Omnithane, 2.5 to 3.5 mils DFT	Finish - TNEMEC Series N69 Hi Build Epoxoline, 8 to 10 mils DFT
Masonry and Concrete Surfaces			
No. 6 - Epoxy Protective Coating Immersed masonry and concrete surfaces, non-potable such as storage tanks, basins, flumes, wetwells, secondary clarifier launder, etc.	Touchup - Remove dirt, grease, oil, loose masonry, efflorescence, or any other contamination by water blasting or abrasive blasting.	Repair mortar as described in these Specifications and applied as described in these Specifications. Thickness to be submitted for the Engineer's approval during the submittal process.	Finish - Epoxy coating system and UV protection coating system as described in these Specifications. Thickness to be submitted for the Engineer's approval during the submittal process.

(1) - Prime and finish coats for touch-up or spot work shall be of the same system and dry film thickness (DFT) as the specified coating system.

(2) - DFT = dry film thickness

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PAINTING

Table 4 - Color Pipe Coding	
Type of Pipe	Color
Water Lines	
Utility Water (UW)	Purple
Waste Lines	
Sewer (Sanitary or Other)	Brown

END OF SECTION

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PART 1 - GENERAL

Scope

The basis for measurement and payment for all Work performed under this Contract shall be as listed in the "Bid Schedule." Unless the Work to be performed is specifically called out to be measured and paid for in the Bid Schedule, payment for such Work shall be included in other applicable items of the Bid Schedule. There shall be no separate measurement and payment for any such Work not specifically listed in the Bid Schedule.

1.1 Method of Payment

Items listed in the Bid Schedule as lump sum shall be on a lump sum all required basis. No direct measurement will be made for lump sum bid items. Bid items calling for unit prices show estimated quantities of Work to be performed. These quantities, although shown with as much accuracy as possible, are approximate only and are for bidding purposes only. The Owner reserves the right to increase or decrease the amount of these quantities as may be deemed necessary. Payment to the Contractor shall be made on the quantity of Work actually performed by the Contractor.

The summation of all bid items under the Bid Schedule shall equal all Work required by the Drawings and Specifications regardless of whether individual items of Work are described under bid item descriptions or not. Payment shall be made at the unit or lump sum prices listed in the Bid Schedule. The prices listed therein shall be payment in full for all labor, tools, equipment, materials, etc., required to construct respective bid items according to the Contract Documents, including all Work and materials incidental thereto.

1.2 Payment for Partially Completed Work

A. General

Payment for unit price bid items and lump sum bid items only partially completed at the end of monthly pay periods shall be based on a percentage of Work completed as determined by the Engineer. An example is the construction of pipelines where the unit bid item price includes the excavation and backfill of the trenches, installation of pipe, trench compaction, flushing, and testing, although the Contractor may have installed a certain footage of pipeline, yet has not completed the testing and/or restoration work. The actual payment for that bid item will be reduced to reflect the actual amount of Work completed.

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B. Pipelines

For pipelines, partial payment for Work not complete will be as shown in the following table unless determined otherwise by the Engineer:

Partial Payment for Pipeline	
Description of Work	Percentage of Linear Feet Installed
Excavation, Backfill, and Compaction of Trench and Installation of Pipe	75%
Flushing, Pressure, and Leakage Testing and Disinfection of Pipeline when Required	15%
Surface Restoration Other than that Covered by Other Bid Items	10%
Total	100%

C. Valves, Hydrants, and Other Similar Work

For valves, hydrants, and other similar work items, the partial payment for Work not complete will be as shown in the following table unless otherwise determined by the Engineer.

Partial Payment for Valves, Meters, Manholes, Cleanouts, and Other Similar Work Items	
Description of Work	Percentage of Each Installed
Installation of Work Item	75%
Installation of Work Item to Finished Grade and Final Restoration	25%
Total	100%

1.3 Payment Items

A. Numbering

The numbering of the payment items listed below may not be the same as the numbering for bid items in the Bid Schedule.

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B. Method of Payment

1. Mobilization/Demobilization

Measurement for payment for mobilization/demobilization shall be on a lump sum all required basis. Payment shall be made at the lump sum price stated in the Bid Schedule for "Mobilization/Demobilization." Partial payments will be made as follows:

- a. When 5 percent of the original Contract Price is earned from other Contract items, excluding amounts paid for materials on hand, 50 percent of the price stated in the Bid Schedule for "Mobilization/Demobilization," or 5 percent of the original Contract Price, whichever is less, will be paid.
- b. When 10 percent of the original Contract Price is earned from other Contract items, excluding amounts paid for materials on hand, 100 percent of the price stated in the Bid Schedule for "Mobilization/Demobilization," or 10 percent of the original Contract Price, whichever is less, will be paid.
- c. When the Substantial Completion Date has been established for the Project, payment of any amount of the price stated in the Bid Schedule for "Mobilization/Demobilization" in excess of 10 percent of the total original Contract Price will be paid.

2. Demolition/Salvage

Measurement for payment for demolition/salvage shall be on a lump sum all required basis. There shall be no measurement of the Work for payment purposes. Work shall include all labor, equipment, and materials for all demolition and salvage work, along with all costs required to haul away all demolished materials for proper disposal, as needed, as shown on the Drawings, and specified in the Technical Specifications. Payment shall be made at the lump sum price stated in the Bid Schedule for "Demolition/Salvage."

3. Repair of Unmarked Sewer

Measurement for payment for repair of an unmarked sewer main shall be on a per each basis. Payment shall be made at the unit price stated in the Bid Schedule for "Repair of Unmarked Sewer."

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4. Repair of Unmarked Utility

Measurement for payment for repair of an unmarked utility shall be on a per each basis. Payment shall be made at the unit price stated in the Bid Schedule for "Repair of Unmarked Utility."

5. Gravel Surface Restoration and Asphalt Surface Restoration

Measurement for payment shall be on a square yard basis for these bid items. Area in square yards shall be computed as the length along centerline of pipe times the allowable pay width of surface restoration. Areas that may overlap, either lengthwise or widthwise, will be included only once. Double payment for overlap areas will not be made. The pay width will be limited to the actual width restored or the pay limit listed in the following table, whichever is less, unless otherwise specifically shown on the Drawings or approved in writing by the Engineer.

Trench Depth* (feet)	Pay Width Each Side of Centerline (feet)
0 to 4	2
4 to 6	3-1/2
6 to 8	5-1/2
8 to 10	7-1/2
10 to 12	9-1/2
12 to 14	11-1/2
14 to 16	13-1/2
16 to 18	15-1/2

* Trench depth is the depth from the ground surface to the invert of the pipe.

- a. Any gravel and asphalt restoration necessary due to the Contractor's operation, but outside the specified pay widths, shall be done at the Contractor's own expense and at no cost to the Owner. The pay widths listed above shall in no way limit the width of the trench as required for safety. The above widths only define pay limits.
- b. Payment shall be made at the unit price stated in the Bid Schedule for "Gravel Surface Restoration" and "Asphalt Surface Restoration." There will be no separate payment for asphalt concrete joint sealing, topsoil

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replacement, seeding, mulching, etc. These items shall be considered incidental to the Work.

6. Concrete Curb

Measurement for payment for concrete curb shall be on a linear foot basis. Length shall be measured along the curb to the nearest foot. This measurement will include any removal/demolition of existing curb as required, drop section for driveway approaches, alleys, handicap ramps, etc. Payment shall be made at the unit price stated in the Bid Schedule for "Northern Concrete Curb."

7. Non-potable Water Line

Measurement for payment for non-potable water line shall be on a lump sum all required basis. There shall be no measurement of the Work for payment purposes. This item shall include all fittings, frost-free hydrants, valves, location wire, flexible couplings and other items installed in the line as detailed on the Drawings. This item shall also include labor and other items required to connect to the existing not-potable water line and construct the non-potable water line as shown on the Drawings. There is no specified pay depth for non-potable water line. The depth shall be as shown on the Drawings and as required in the field for proper installation. No field measurement will be made for depth. Payment shall be made at the lump sum price stated in the Bid Schedule for "2-inch Non-Potable Water Line."

8. Slide Gate Installation

Measurement for payment for slide gate installation shall be on a lump sum all required basis for the various locations listed in the Bid Schedule. There shall be no measurement of the Work for payment purposes. Work shall include all labor, equipment, bypass pumping if required, appurtenances, and all other items not specified for separate payment as shown on the Drawings and called for in the Technical Specifications. Payment shall be made at the lump sum price stated in the Bid Schedule for "____ Slide Gate Installation."

9. Secondary Clarifier Rehabilitation and Equipment Installation

Measurement for payment for secondary clarifier rehabilitation and equipment installation shall be on a lump sum all required basis. There shall be no measurement of the Work for payment purposes. The Work shall include all labor, equipment, and materials for a complete and fully functional secondary

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clarifier, including the drive mechanism, center support pier, suction header and sweeps, full diameter access bridge, scum skimmer, anti-rotation baffle, clarifier grout, flocculation feed well, and all associated hardware, anchor bolts, and appurtenances as shown on the Drawings and specified in the Technical Specifications. Payment shall be made at the lump sum price stated in the Bid Schedule for "Secondary Clarifier Rehabilitation and Equipment Installation."

10. Bypass Pumping

Measurement for payment for bypass pumping shall be on a lump sum all required basis. There shall be no measurement of the Work for payment purposes. The Work shall include all labor, equipment, and materials required to develop an approved bypass pumping plan and provide bypass pumping as required to keep the wastewater treatment and resource recovery facility in operation during completion of the Work. Payment shall be made at the lump sum price stated in the Bid Schedule for "Bypass Pumping."

11. Secondary Clarifier Floor Relief Valve Installation

Measurement for payment for secondary clarifier floor relieve valve installation shall be on a per each basis for each floor relief valve installed and shall include the concrete coring, surface preparation, valve, grout, and all other work and materials required to install the floor relief valve as shown on the Drawings and as specified in the Technical Specifications. Payment shall be made at the unit price stated in the Bid Schedule for "Secondary Clarifier Floor Relief Valve Installation."

12. Secondary Clarifier Launder Coating

Measurement for payment for secondary clarifier launder coating shall be on a lump sum all required basis. There shall be no measurement of the Work for payment purposes. This item shall include all surface preparation, priming, painting, and curing, along with all labor, equipment, and materials required to coat the secondary clarifier launder as shown on the Drawings and as specified in the Technical Specifications. Payment shall be made at the lump sum price stated in the Bid Schedule for "Secondary Clarifier Launder Coating."

13. Electrical and Controls

Measurement for payment for electrical and controls shall be on a lump sum all required basis. There shall be no measurement of the Work for payment

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purposes. This item shall include all wiring, controls, component replacement, supervisory control and data acquisition integration, and installation of clarifier electrical and controls equipment, along with all labor, equipment, and materials required to supply a complete and fully functional secondary clarifier in accordance with the clarifier equipment manufacturer and as shown on the Drawings and as specified in the Technical Specifications. Payment shall be made at the lump sum price stated in the Bid Schedule for "Electrical and Controls."

PART 2 - MATERIALS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

DRAWINGS

Bound Separately