

**CONTRACT DOCUMENTS
VOLUME ONE**

**MCKINNON CREEK PUMHOUSE:
PHASE II – PUMPHOUSE BUILDING**

May 20, 2021

**Includes
Addendum #1**

**LAKE FOREST PARK
WATER DISTRICT**



(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155

**CONTRACT DOCUMENTS
FOR
MCKINNON CREEK PUMPHOUSE: PHASE II – PUMPHOUSE BUILDING**

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I. INFORMATION FOR BIDDERS

SEALED PROPOSALS CLEARLY MARKED:

McKinnon Creek Pumphouse: Phase II - Pumphouse Building

**ADDRESSED TO: ALAN KERLEY
LAKE FOREST PARK WATER DISTRICT
4029 N.E. 178TH ST.
LAKE FOREST PARK, WA 98155**

WILL BE RECEIVED UNTIL:

4:00PM. local time, June 2, 2021

AT:

**LAKE FOREST PARK WATER DISTRICT
4029 N.E. 178TH ST.
LAKE FOREST PARK, WA 98155**

THE WORK CONSISTS PRINCIPALLY OF:

- **Sitework** – excavate pumphouse site. Stockpile soil, backfill and grade to plans. Install ecology block retaining wall.
- **Concrete** - Poured concrete daylight basement foundation 18'x32', slab on grade and pre-cast suspended slab with 2-1/2" topping slab.
- **Masonry** - CMU walls with architectural facing
- **Building Structure** including wood framing, doors, windows and metal roof with skylights, stairs.
- **Mechanical** – 40hp pumps, water pipes, valves and building plumbing for office area.
- **Utilities** – Drainage pump, extend U/G piping and conduit into pumphouse, connect to ex. sanitary side sewer, install electrical wiring in conduit for pumps.
- **Electrical** – 3ph/480v distribution and controls for pumps. Step down transformer and 120/240 building wiring
- **Environmental** - including TESC, tree preservation, and other requirements. Note: post-construction mitigation activities and maintenance will be responsibility of the owner and is not part of this contract.

In accordance with the requirements of the Instruction to Bidders, the Owner reserves the right to waive informalities, correct mathematical errors in proposals, and reject non-conforming proposals. The Owner will award the contract to the lowest responsible bidder or it may reject all proposals.

The lowest proposal will not necessarily be accepted. Work to be substantially completed within **180 calendar days from Notice to Proceed – which will not be given later than June 30, 2021**. Delay in substantial completion may result in liquidated damages to the Owner as outlined in the contract documents. The successful bidder will provide a Payment and Performance Bond in accordance with Washington State law. All work must comply with Washington Prevailing Wage requirements (wage table enclosed in Contract Documents).

Proposals shall be on forms included in the Contract Documents and shall be accompanied by a certified or cashier's check, or a guaranty bid bond, payable to the order of the Lake Forest Park Water District, in an amount not less than 5 percent of the amount of the proposal, as a guaranty that the bidder will execute the Contract if awarded in conformance with the proposal. The successful bidder will be required to furnish performance and payment bonds in an amount not less than 100 percent of the contract price.

RECIPROCAL PREFERENCE FOR RESIDENT CONTRACTORS:

In accordance with RCW 39.04.380 effective March 30, 2012 the State of Washington is enforcing a Reciprocal Preference for Resident Contractors. Any public works bid received from a nonresident contractor from a state that provides an in-state percentage bidding preference, a comparable percentage disadvantage must be applied to the bid of that nonresident contractor.

A nonresident contractor from a state that provides a percentage bid preference means a contractor that:

- a. is from a state that provides a percentage bid preference to its resident contractors bidding on public works contracts.
- b. b) at the time of bidding on a public works project, does not have a physical office located in Washington.

The state of residence for a nonresident contractor is the state in which the contractor was incorporated or, if not a corporation, the state where the contractor's business entity was formed.

All nonresident contractors will be evaluated for out of state bidder preference. If the state of the nonresident contractor provides an in-state contractor preference, a comparable percentage disadvantage will be applied to their bid prior to contract award.

QUALIFICATIONS OF BIDDERS:

Mandatory Bidder Responsibility Criteria: Pursuant to RCW 57.08.050, it is the intent of Owner to award a contract to the low responsible bidder. Before award, the apparent low bidder must meet the following bidder responsibility criteria to be considered a responsible bidder. The bidder shall be required by the Owner to submit documentation demonstrating compliance with the criteria. The bidder must:

1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of bid submittal;
2. Have a current Washington Unified Business Identifier (UBI) number;
3. Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW;
4. Have a Washington Employment Security Department number, as required in Title 50 RCW;
5. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
6. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3).

Bidder shall complete the "**Statement of Bidder's Qualifications**" in the Bid Form section and submit the Checklist as part of bidder's bid.

The Contractor awarded the work shall start within **ten (10)** calendar days from the date of issuance of Notice to Proceed. Inquiries may be directed to the District Superintendent **Alan Kerley**, or District Engineer **Dan Mundall, P.E.** as indicated below:

OWNER:

LAKE FOREST PARK WATER DISTRICT
4029 N.E. 178TH ST.
LAKE FOREST PARK, WA 98155
PHONE (206) 365-3211, FAX (206) 365-3357

ENGINEER:

Dan Mundall, P.E.
MUNDALL ENGINEERING & CONSULTING
P.O. BOX 799
SUMAS, WA 98295
Cell (360) 319-1285 Office (800) 313-9705

BACKGROUND:

Lake Forest Park Water District (formerly King County Water District 83) serves well water to approximately 900 customers in Lake Forest Park, Washington. The District infrastructure includes two well fields, pumps, distribution reservoirs and over 12 miles of distribution piping. The District is working hard to replace ageing water mains and other infrastructure which were installed in the 1940's and 50's.

PROPOSED DESIGN:

Most water for the District is sourced from the 12 acre McKinnon Creek wellfield which has 4-deep wells and 8-shallow artesian wells. The pumphouse in this wellfield is obsolete, undersized and deteriorating. A new concrete/masonry pumphouse is needed to replace the obsolete and deteriorating wood structure that was constructed in the 1950's (photo →).



Ex. Pumphouse



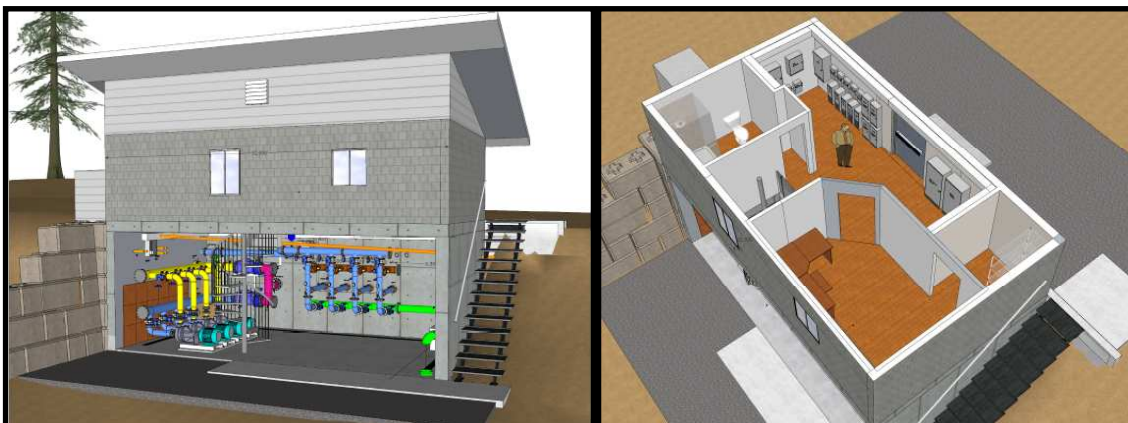
Horizon View Pumphouse

The pumphouse construction is selected for simplicity and is similar to the District's Horizon View pumphouse constructed in 2012. LFPWD is mainly concerned with getting the pumphouse up and basically functional. Other features such as telemetry and office furnishings will be completed later by District's own forces.

McKinnon Cr. Pumphouse was previously advertised for bids in July 2019 (no bids received) and subsequently in November 2019 where two bids were received but the total project cost exceeded available funding. Following this the project was split into two phases. Phase I – Site Work bid for \$739,178.33 and was completed under budget recently. Now the District has recently secured funding for Phase II – Pumphouse Building. This work has been estimated by the engineer at \$1.1 Million.

Permits are in hand for this project - these have been extended due to Covid legislation. LFPWD has spent considerable effort in design, planning and permitting for this project which impacts some wetland and steep slope buffer areas and is also impacted by City of Lake Forest Park tree ordinances.

Proposed Pumphouse Renderings



SPECIAL CONSIDERATIONS:

The District has an excellent reputation for supporting their contractors in the field. District staff and engineer work closely with our contractors to help get the job done. This project will be accomplished in a secluded, low density neighbourhood with little need for traffic control. Access to the site will be controlled by two existing gated entrances to the District wellfield.

Some special considerations are noted here:

- I. **Schedule** – work that involves moving earth such as digging and backfilling needs to be completed by October 31 – considered the end of dry season in permit conditions. (Items with the early completion date are marked with * in Bid Form.)
- II. **Lead times** – the water pumps, fabricated pump controls, fabricated pipe header pieces and some fittings may have several week delays in delivery.
- III. **Minimize disruption to critical areas** including steep slopes and wetlands. Of particular interest is storm water management to ensure that runoff to McKinnon creek is properly contained and filtered during and after construction. District will take care of runoff monitoring.

II. INSTRUCTIONS TO BIDDERS

1. SUBMISSION OF PROPOSALS

Sealed Proposals in a plain envelope clearly marked:

CONTRACT DOCUMENTS

McKINNON CREEK PUMPHOUSE: PHASE II – PUMHOUSE BUILDING

**ADDRESSED TO: ALAN KERLEY
LAKE FOREST PARK WATER DISTRICT
4029 N.E. 178TH ST.
LAKE FOREST PARK, WA 98155**

Not later than:

DATE

4:00 PM local time, June 2, 2021

Proposals must be signed by the bidder and shall be on the form set forth herein. If the bidder is a corporation, a duly authorised officer must sign the Proposal.

Proposals received after such date and time will not be considered. No bidder may withdraw its proposal after such time and date unless the award is delayed beyond such date for a period of sixty (60) days.

2. SITE, LOCATION AND CONDITIONS

Before submitting their Proposal, each bidder shall carefully examine the contract documents and the site. They shall inform themselves fully as to the intent, difficulties, facilities and local conditions to be encountered in performing the work including the nature of subsurface conditions. No claims for extra work will be entertained subsequent to submission of Proposals on the basis that there was any misunderstanding as to the scope, extent, difficulty, facilities or local conditions which may be encountered in performing the Work including weather. No claims for extra Work will be allowed based on differences determined in actual soil conditions on the site.

There will be a site visit with the District on Wednesday, May 19, 2021. Bidders are invited to meet in front of the District office by 10:00 am

3. DISCREPANCIES AND OMISSIONS

If a bidder finds discrepancies in, or omissions from the drawings, specifications, or other documents, or has any doubt as to the meaning or intent of any part therein, it shall at once inform the Engineer. The Engineer will make the necessary changes, which may be sent in a written instruction or explanation to all of the bidders. All requests for interpretations shall be made in writing, addressed and forwarded to the District by personal delivery, mail, or facsimile transmission.

4. REQUEST FOR AMENDMENTS

Bidders are advised that no requests for suggested amendments to the Proposal documents, i.e. extension of the scheduled closing date, the completion date and the like, can be entertained unless the request is received at least seven (7) days before the time set for the closing of Proposals.

All requests for alternative materials, equipment or methods of construction shall be submitted in writing and directed to the Engineer prior to the date of the Proposal closing, and allowing sufficient time for evaluation and approval or rejection of the alternatives by the Engineer.

5. ADDENDA

If there are any changes in the work or in the Proposal procedures, the bidders will be informed prior to the bid closing by means of an addendum, a written communication issued by the Engineer.

6. SUB-CONTRACTORS & MATERIAL SUPPLIERS

Bidders shall at the time of submitting proposal list the names of all sub-contractors and material suppliers proposed for the work, and the Engineer must approve any changes to these in writing.

7. ACCEPTANCE OR REJECTION OF PROPOSALS

The Owner reserves the right to accept or reject any or all Proposals and waive any irregularities and formalities at its discretion and to determine the lowest responsible bidder. Apparent mathematical errors may be corrected. The lowest Proposal will not necessarily be accepted. Non-conforming proposals may be rejected.

Without limiting the generality of the foregoing, some of the conditions under which a Proposal may be rejected are:

- (a) Failure of the bidder to submit a Proposal in accordance with all instructions contained herein.
- (b) Failure of the bidder to include supplemental Proposals where these are required.
- (c) Failure of the bidder's qualifications to meet with the owner's satisfaction.
- (d) Incomplete price sheets.
- (e) Obscure or irregular erasures in the price sheets.
- (f) Unbalanced price sheets.
- (g) Insufficient or irregular proposal guarantees.
- (h) Proposal total which exceeds the Engineer's estimate of total costs, whether the said estimate is made public or not.
- (i) Failure of the bidder to complete the contractor's questionnaire section of the Proposal.

If any discrepancy is found between the unit prices and the total amount, the unit prices shall be considered as representing the intention of the bidder and the Engineer shall re-calculate the total amount, which shall be used in determining the Proposal amount.

III. BID FORM

1 CONDITIONS OF PROPOSAL

Proposal of :

(hereinafter called the "BIDDER")

to: **LAKE FOREST PARK WATER DISTRICT**

(hereinafter called the "OWNER")

The undersigned has carefully examined all contract documents and other requirements necessary to complete the work, including:

- **Part I - Information for Bidders**
- **Part II - Instructions to Bidders**
- **Part III - Bid Form**
- **Part IV - Agreement and Contract Forms**
- **Part V - General Conditions and Supplemental Conditions, if any**
- **Part VI - Plans and Drawings and Detailed Specifications**
- **Part VII – Attached Documents**
- **Addenda_____ , if any**
- **Site Conditions.**

CONDITIONS OF PROPOSAL – cont.

The Contractor shall furnish all labor and deliver all materials, provide the necessary equipment and perform the work in accordance with the contract documents for the prices stated in the schedule of quantities and unit prices in the Bid Form.

The undersigned bidder also agrees as follows:

Where quantities are included in the Proposal and unit prices are requested, it is understood that,

- a) The estimates of quantities shown in the unit price tables, which are an integral part of this Bid Form are approximate only and for the sole purpose of comparing Proposals. The actual quantities involved in carrying out the work may be greater or less than the said estimates of quantities set forth in this Bid Form.
- b) Payment of work carried out on a unit price basis will be made on the basis of actual quantities as determined by the Engineer at the unit prices set forth in this Bid Form for each respective item of unit price work, which shall be compensation in full for such work notwithstanding variations between actual and estimated quantities.
- c) No claim will be made on account of any loss of anticipated profits, for delays in the completion of the work or any portion of the work or for any other matter or thing arising from or related, directly or indirectly, to any variation between the estimated quantities set forth in this Bid Form and the actual quantities as determined by the Engineer.
- d) In arriving at the unit prices set forth in this Bid Form, the bidder has made his own estimates of the respective quantities involved and has not relied upon the estimates shown in the unit price tables.
- e.) Any Work called for in the specifications or shown or implied on the drawings, or which is necessary for the completion of the work, which is not specifically listed as a separate item in the Bid Form, shall be considered incidental to the purposes of the contract and the cost of such work shall be included in the unit prices or lump sum to which the work is most applicable. Unit prices Proposed shall include the supply of all materials, labor, supervision and equipment, overhead, plant and profit, and shall represent the entire cost for the completed work as specified and shown on the drawings.
- f.) Within seven days of issuance of notice of acceptance and prior to executing the contract documents, the successful bidder shall submit to the Engineer in a form acceptable to the Owner, certified copies of all insurance coverage called for in the contract documents.
- g.) The Owner may reject any or all Proposals.
- h.) That this Proposal includes addenda numbered ____*

* To be completed by the bidder

2 UNIT PRICE TABLES

Schedule "A" - Pumphouse Building

McKinnon Cr. Pumphouse

Project Location: 18460 47th PL NE, Lake Forest Park, WA 98155

Item	Description	Unit qty	Unit	Unit Price \$\$	Extended \$\$
1	*Excavate and backfill building site , and prepare for concrete pour with slope back and/or temporary slope retention as required for construction. Includes temporary and permanent stockpile.	450	cu-yd		
2	*Reinforced concrete foundation per plans including footing and slab on grade with 6" pre-sloped gutter drain in floor. Includes water resistant membrane on outside wall for moisture.	1	LS		
3	*Precast hollow core suspended slab 12" Ultraspan by Concrete Technology Corporation or approved equivalent with 2-1/2" topping concrete surface pour on-site. Engineer stamped structural plan for slab modules.	1	LS		
4	Concrete Masonry Unit (CMU) cinder block exterior wall 8" with split face and reinforcement as indicated on plans. Confirm architectural finish option with owner.	1	LS		
5	Pump Starters and Controls (PP1 & PP2) as required for 3-40hp transfer pumps with VFD and 3-25hp well pumps and 5hp sump pump. Includes cabinets. See electrical plans.	1	LS		
6	Pumphouse Electrical includes electrical mains, stepdown dry transformer, ducting, panels including lighting, heat, receptacles including transfer switch and standby power connections (local and remote see plans).	1	LS		
7	*Pump Gallery Mechanical including stainless sch 40 and HDPE DR17 pipe headers, valves and supports as shown in plans except as included in other items. Note: some items provided by owner including provision and startup of all pressure reducing/altitude valves and all 6" GrvGrv BFV. (Core drill wall and pass-thru pipe spools separate items.)	1	LS		
8	40hp Pentair/Aurora Mdl. #3804 Pump. Frame mounted end suction type c/w 3x4x13.5 volute, 460v/3ph/60cy includes grouted base pad & floor anchors. Note: Impeller trim max size.	3	ea		
9	Circular Stair - 12ft high/66" diameter c/w railing inside. Ref. Paragon 66" or approved equivalent. Upstair floor opening min. 72" x 72"	1	LS		
10	Building Ventilation Fan/Louvers - Ref. DWG# A5	1	LS		
11	Pumphouse internal framing and construction including partitions, ceiling, rafters, windows, internal/external doors, plywood sheathing, standing seam roof, skylights, insulation, alum drop down attic stair, per plans. Note: separate items for CMU exterior wall, electrical, plumbing and other items described	1	LS		
12	*Piping pass-through spools 72" nominal length, Stainless, Sch 40, FLxGrv as indicated in plans, 10" and 8" pipe includes core drilling and Link-Seal or approved equivalent packing to achieve watertight seal. See details sheet in plans.	4	ea		
13	*Piping pass-through spools 96" nominal length, Stainless Sch 40, FLxGrv as indicated in plans 6" pipe, includes core drilling and Link-Seal or approved equivalent packing to achieve watertight seal. See details sheet in plans.	5	ea		
14	*Locate and connect to existing buried pipe with HDPE spool. Length/size and DR rating to match. FLxFL may have reducer one end.	9	ea		

15	Pumphouse domestic plumbing - water pipes and drains for bathroom, shower, washer/dryer including 30gal H/W heater, and fixtures: sink, toilet, shower as indicated in plans and meeting plumbing codes.	480	Sq-ft		
16	Pumphouse stairs - outside , OSHA compliant, Fabricated galvanized metal with bar grating tread and railing both sides, 48" wide tread. Ref. FS Industries IIBC48140-G or approved equivalent. Includes concrete slab landings.	1	LS		
17	*Pumphouse retaining wall - Ecology Block construction per plans, details - ref. Geotech Report by Robinson Noble Saltbush	26	ea		
18	*2" Railroad Ballast, un-compacted - place on west side of pumphouse as indicated 10'x39'x12".	24	ton		
19	*Perimeter drain with 4" double pipe and filter socks three sides of building footing to daylight west slope (see site plan, details), includes pea gravel backfill.	115	lin-ft		
20	*Pre-cast Drain Sump OldCastle 5106-LA without knockouts . With manhole cover 5106-TL-42E. Place MH lid to final gravel grade. 6" drain connection to pump sump (see detail).	1	LS		
21	*Sump Pump and removable slide rails, controls with discharge piping outside pumphouse . Includes 48" diameter x 120" deep sump with access hatch and vent. 5hp/460v/3ph/60cy ITT Goulds #4SD52J4AAF pump (345GPM @ 32ft) + A10-40 Slide or approved equivalent. (see details)	1	LS		
22	Piping and Fittings inside pumphouse for sump pump including drain piping and valves/fittings for regulated discharge to sanitary side sewer pipe (see detail) and includes oversize core drill pass through wall with polyurethane sealant.	1	LS		
23	Main Control Panel (MCP) Cabinet and PLC with two pressure sensors, minimum logic coding for basic function of well pumps and transfer pumps as indicated on DWG# E-10. Note: further SCADA System integration will be accomplished by owner following completion of this contract.	1	LS		
24	Flow meter to Low Zone Tank - magmeter type 8" Ref. Seametrics "iMAG" Series or approved equivalent with remote readout 4-20ma flow, pulse totalizer, grounding rings.	1	ea		
25	*Imported granular fill material in case of over-excavation to un-disturbed earth, estimated quantity	50	yd		
26	*Building side sewer . Locate and connect to existing LFP City side-sewer with c/o location estimated as indicated on plans and includes oversize core drill pass through wall with polyurethane sealant for water tight.	1	LS		
27	Conduit pass-through core drilling and extension through concrete wall in various locations as indicated in plans with polyurethane sealant for watertight seal.	30	each		
28	3C (3-phase) electric main wires in conduit for 4-deep well pumps and shallow well, NUD pumps install in buried ducting placed by others from pumphouse to Vault#2, DW#3, DW#4 and connect to existing wiring. See electrical design plans.	1480	LF		
Sub-Total Items this Schedule (NOT incl. Local Sales & Use Tax)					Sub-total

*** Items to be partially or fully completed by October 31**

Schedule "A" - Pumphouse Building

McKinnon Cr. Pumphouse

Project Location: 18460 47th PL NE, Lake Forest Park, WA 98155

Item	Description	Unit qty	Unit	Unit Price \$\$	Extended \$\$
1	*Excavate and backfill building site , and prepare for concrete pour with slope back and/or temporary slope retention as required for construction. Includes temporary and permanent stockpile.	450	cu-yd		
2	*Reinforced concrete foundation per plans including footing and slab on grade with 6" pre-sloped gutter drain in floor. Includes water resistant membrane on outside wall for moisture.	1	LS		
3	*Precast hollow core suspended slab 12" Ultraspun by Concrete Technology Corporation or approved equivalent with 2-1/2" topping concrete surface pour on-site. Engineer stamped structural plan for slab modules.	1	LS		
4	Concrete Masonry Unit (CMU) cinder block exterior wall 8" with split face and reinforcement as indicated on plans. Confirm architectural finish option with owner.	1	LS		
5	Pump Starters and Controls (PP1 & PP2) as required for 3-40hp transfer pumps with VFD and 3-25hp well pumps and 5hp sump pump. Includes cabinets. See electrical plans.	1	LS		
6	Pumphouse Electrical includes electrical mains, stepdown dry transformer, ducting, panels including lighting, heat, receptacles including transfer switch and standby power connections (local and remote see plans).	1	LS		
7	*Pump Gallery Mechanical including stainless sch 40 and HDPE DR17 pipe headers, valves and supports as shown in plans except as included in other items. Note: some items provided by owner including provision and startup of all pressure reducing/altitude valves and all 6" GrvxGrv BFV. (Core drill wall and pass-thru pipe spools separate items.)	1	LS		
8	40hp Pentair/Aurora Mdl. #3804 Pump. Frame mounted end suction type c/w 3x4x13.5 volute, 460v/3ph/60cy includes grouted base pad & floor anchors. Note: Impeller trim max size.	3	ea		
9	Circular Stair - 12ft high/66" diameter c/w railing inside. Ref. Paragon 66" or approved equivalent. Upstair floor opening min. 72" x 72"	1	LS		
10	Building Ventilation Fan/Louvers - Ref. DWG# A5	1	LS		
11	Pumphouse internal framing and construction including partitions, ceiling, rafters, windows, internal/external doors, plywood sheathing, standing seam roof, skylights, insulation, alum drop down attic stair, per plans. Note: separate items for CMU exterior wall, electrical, plumbing and other items described	1	LS		
12	*Piping pass-through spools 72" nominal length, Stainless, Sch 40, FLxGrv as indicated in plans, 10" and 8" pipe includes core drilling and Link-Seal or approved equivalent packing to achieve watertight seal. See details sheet in plans.	4	ea		
13	*Piping pass-through spools 96" nominal length, Stainless Sch 40, FLxGrv as indicated in plans 6" pipe, includes core drilling and Link-Seal or approved equivalent packing to achieve watertight seal. See details sheet in plans.	5	ea		
14	*Locate and connect to existing buried pipe with HDPE spool. Length/size and DR rating to match. FLxFL may have reducer one end.	9	ea		
15	Pumphouse domestic plumbing - water pipes and drains for bathroom, shower, washer/dryer including 30gal H/W heater, and fixtures: sink, toilet, shower as indicated in plans and meeting plumbing codes.	480	Sq-ft		
16	Pumphouse stairs - outside , OSHA compliant, Fabricated galvanized metal with bar grating tread and railing both sides, 48" wide tread. Ref. FS Industries IIBC48140-G or approved equivalent. Includes concrete slab landings.	1	LS		
17	*Pumphouse retaining wall - Ecology Block construction per plans, details - ref. Geotech Report by Robinson Noble Saltbush	26	ea		
18	*2" Railroad Ballast, un-compacted - place on west side of pumphouse as indicated 10'x39'x12".	24	ton		
19	*Perimeter drain with 4" double pipe and filter socks three sides of building footing to daylight west slope (see site plan, details), includes pea gravel backfill.	115	lin-ft		
20	*Pre-cast Drain Sump OldCastle 5106-LA without knockouts. With manhole cover 5106-TL-42E. Place MH lid to final gravel grade. 6" drain connection to pump sump (see detail).	1	LS		
21	*Sump Pump and removable slide rails, controls with discharge piping outside pumphouse. Includes 48" diameter x 120" deep sump with access hatch and vent. 5hp/460v/3ph/60cy ITT Goulds #4SD52J4AAF pump (345GPM @ 32ft) + A10-40 Slide or approved equivalent. (see details)	1	LS		
22	Piping and Fittings inside pumphouse for sump pump including drain piping and valves/fittings for regulated discharge to sanitary side sewer pipe (see detail) and includes oversize core drill pass through wall with polyurethane sealant.	1	LS		
23	Main Control Panel (MCP) Cabinet and PLC with two pressure sensors, minimum logic coding for basic function of well pumps and transfer pumps as indicated on DWG# E-10. Note: further SCADA System integration will be accomplished by owner following completion of this contract.	1	LS		
24	Flow meter to Low Zone Tank - magmeter type 8" Ref. Seametrics "iMAG" Series or approved equivalent with remote readout 4-20ma flow, pulse totalizer, grounding rings.	1	ea		
25	*Imported granular fill material in case of over-excavation to un-disturbed earth, estimated quantity	50	yd		
26	*Building side sewer. Locate and connect to existing LFP City side-sewer with c/o location estimated as indicated on plans and includes oversize core drill pass through wall with polyurethane sealant for water tight.	1	LS		
27	Conduit pass-through core drilling and extension through concrete wall in various locations as indicated in plans with polyurethane sealant for watertight seal.	30	each		
28	3C (3-phase) electric main wires in conduit for 4-deep well pumps and shallow well, NUD pumps install in buried ducting placed by others from pumphouse to Vault#2, DW#3, DW#4 and connect to existing wiring. See electrical design plans.	1480	LF		
	Sub-total				
	Sub-Total Items this Schedule (NOT incl. Local Sales & Use Tax)				

* Items to be partially or fully completed by October 31

Schedule "B" - General

McKinnon Cr. Pumphouse: Phase I - Site Work

Project Location: 18460 47th PL NE, Lake Forest Park, WA 98155

Item	Description	Unit qty	Unit	Unit Price \$\$	Extended \$\$
1	*Mobilize/demobilize (not greater than 4% of project cost)	1	LS		
2	Redline Drawings with "as-built" information	1	LS		
3	*Temporary Erosion and Sediment Control throughout project (TESC). Includes BMP measures to control runoff from project site as required by LFPMC. Sampling/monitoring of runoff by District.	1	LS		
4	*Excavation Safety System throughout project - includes shoring and safety fencing of excavated areas where required	1	LS		
5	*Proctor Density Backfill Compaction Tests - pumphouse sub-grade and as directed.	2	LS		
6	*Disinfect and pressure test per specifications (estimated number of piping sections).	4	LS		
Sub-Total Items this Schedule (not including Local Sales & Use Tax)					

* Items to be partially or fully completed by October 31
Edit: 06/May/21

Project Totals

Contract Total By Schedule		Item Value
Schedule "A" - Pumphouse Building		
Schedule "B" - General		
Sub-total Before Local Sales & Use Tax		
Local Sales & Use Tax 10.1%		
Total Project Cost including SST		

The bidder shall provide the following information:

3 PROJECT SCHEDULE

Activity

Date

Note 1: Major Critical Areas Permit conditions limit earthwork in critical areas and buffer zones to the “months of May through October”. Delay in completion of work in these areas beyond October 2021 may result in liquidated damages payable to the Owner of \$100 per day until the work is complete. **(Delay in completing some items may be allowed by Engineer for good cause).**

Note 2: Delay in overall completion of the work beyond **180 calender days** allowed may result in liquidated damages payable to the Owner of \$50 each day for the first fourteen (14) days and \$200 each day beyond this until the work is complete. **(Delay in completing some items may be allowed by Engineer for good cause).**

4. STATEMENT OF MATERIAL SUPPLIERS

The list of material suppliers to be used on the work is as follows:

5. STATEMENT OF EQUIPMENT

The list of equipment to be used on the work is as follows:

6. STATEMENT OF SUB-CONTRACTORS

The list of sub-contractors to be used on the work is as follows:

The average number of workers that will be employed and maintained on the project is: _____

The name of the superintendent who will be placed on the project and his previous experience on this type of construction. _____

List of bidder's senior staff and their previous experience on similar projects.

7. FORCE ACCOUNT RATES FOR EQUIPMENT AND LABOUR

A. EQUIPMENT COMPLETE WITH OPERATOR

<u>Description</u>	<u>Model and Size</u>	<u>Regular Rate</u>	<u>O/T Rate</u>
_____	_____	_____	
_____	_____	_____	
_____	_____	_____	

B. PERSONNEL

<u>Occupation</u>	<u>Regular Rate</u>	<u>O/T Rate</u>
_____	_____	
_____	_____	
_____	_____	

8. BIDDER'S INFORMATION AND QUALIFICATIONS

Each Bidder shall prepare and submit the data requested on the following schedule of information. These data must be included in and made a part of the bid document.

1. Name of Bidder: _____

Address: _____

Phone: _____

2. How many years have you been engaged in the contracting business under the present firm name?

3. Is your business a (Check one):
Corporation , Partnership (State), or Sole Proprietorship.

4. Bond Registration No. _____ Worker's Comp. Acct. No.: _____

5. Industrial Ins. Acct No. _____ Employment Security Dept. No.: _____

6. Contractor on L&I Infraction List ? O Yes O No

www.lni.wa.gov/tradeliicensing/contractors/hirecon/infractions/

7. Contractor on L&I "Contractor's Not Allowed to Bid" List? O Yes O No

8. Washington State Registration Number: _____

9. L&I Account Number: _____

10. Contracts now in hand. Gross Amount \$ _____

11. General character of Work performed by your company.

12. Similar projects completed

Project / Date _____

Similar aspects _____

Gross amount _____

Project / Date _____

Similar aspects _____

Gross amount _____

Project / Date _____

Similar aspects _____

Gross amount _____

14. References:

Signature of Bidder

Date

IV. AGREEMENT AND CONTRACT FORMS

AGREEMENT

State of Washington (County of King)

THIS AGREEMENT ("Agreement") by and between the Lake Forest Park Water District, a municipal corporation, hereinafter designated as the "Owner,"

and _____ hereinafter designated as the "Contractor," shall be effective upon the execution of this Agreement by the Owner.

In consideration of the mutual covenants, agreements, terms and conditions contained in this Agreement and in the Contract Documents (as defined in the General Conditions) which are attached hereto and made part of this Agreement for:

McKinnon Creek Pumphouse: Phase II Pumphouse Building

1. The Contractor agrees to complete the work, furnish all labor, tools, materials and equipment necessary on the terms and conditions specified in the Contract Documents. The Contractor further agrees to assume and perform all of the covenants and conditions required of the Contractor pursuant to

the Contract Documents, for the price of \$_____ base bid plus

applicable State & Local Use tax \$_____, for total Contract Price of

\$_____

2. Lake Forest Park Water District agrees to pay the Contractor for fulfillment of the work and performance of the covenants set forth in the Contract Documents in accordance with the Contractor's bid and the Contract Documents.

3. Except as expressly provided in the Contract Documents, no liability shall attach to the District by reason of entering into this Agreement.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed,

LAKE FOREST PARK WATER DISTRICT

CONTRACTOR

By:_____

By:_____

Title:_____

Title:_____

Date:_____

Date:_____

FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____, as Principal, and _____, as Surety, are held and firmly bound unto Lake Forest Park Water District, hereinafter called Owner, in the sum of _____ Dollars, (not less than 5 percent of the total amount of the bid) for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said Principal has submitted a bid to said Owner to perform all work required for the Owner's project entitled: _____ as contained in the Contract Documents so entitled and dated _____

NOW THEREFORE, if said Principal is awarded a contract by said Owner and, within the time and in the manner required in "Information for Bidders" in said Contract Documents, enters into a written contract on the form of agreement bound with said Specifications and furnishes the required performance and payment bonds, then this obligation shall be null and void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond by said Owner and judgment is recovered, said Surety shall pay all costs incurred by said Owner in such suit, including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this _____ day of _____, 2019

_____(SEAL) _____(SEAL)
(Principal) (Surety)

By: _____ By: _____
(Signature) (Signature)

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF POWER OF ATTORNEY)

PERFORMANCE AND PAYMENT BOND

(CONTRACTOR)

BOND NUMBER

KNOW ALL BY THESE PRESENTS:

That we, _____
as Principal, and, as Surety, a corporation legally doing business in the State of Washington, are held and firmly bound and obligated unto the State of Washington and Lake Forest Park Water District ("Owner"), pursuant to Chapter 39.08 RCW, in the full sum of the Contract Amount of _____ \$ **DOLLARS** (\$ _____) for the faithful performance of the Agreement referenced below, and for the payment of which sum we do bind ourselves, and each of our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, THE CONDITIONS OF THIS OBLIGATION ARE SUCH THAT the Principal entered into a certain Agreement with the Owner for the **McKinnon Creek Pumphouse: Phase II Pumphouse Building** incorporating herein by this reference all of the Contract Documents, as now and as hereinafter amended and modified.

NOW, THEREFORE, if the Principal shall faithfully perform all provisions of such Agreement and all duly authorized modifications of said Contract that may hereafter be made; notice of which modifications to the Surety being hereby waived, and pay all laborers, mechanics and subcontractors and materialmen, and all persons who shall supply such person or persons, or subcontractors, with provisions and supplies for the carrying on of such work, then this obligation is void, otherwise to remain in full force and effect.

IT IS FURTHER DECLARED AND AGREED that whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety, at the request of the Owner, shall promptly remedy the default in a manner acceptable to the Owner.

SIGNED this _____ day of _____, 20__

Principal: _____

Surety: By: _____

Title: _____

Title: _____

Address: _____

Address: _____

City/Zip: _____

City/Zip: _____

Telephone: () _____

Telephone: () _____

Note: A power of attorney must be provided which appoints the Surety's true and lawful attorney-in-fact to make, execute, seal and deliver this performance and payment bond.

CERTIFICATE OF INSURANCE

TO: Lake Forest Park Water District

Return this certificate to:

Lake Forest Park Water District
4029 N.E. 178th Street
Lake Forest Park, WA 98155

This certifies to Lake Forest Park Water District that the following described policies have been issued to the Insured named below and are in force at this time:

Insured_____

Address_____

Description of operations/locations/products (show contract name and/or number, if any)

Policies and Insureds	Limits		Policy Number	Expiration Date	Best's Rating
	Bodily Injury	Property Damage			

GENERAL LIABILITY ENDORSEMENT

Lake Forest Park Water District
4029 N.E. 178th St.
Lake Forest Park, WA 98155

A Policy Information

Insurance Company _____ Policy
Number _____

Policy Term: From _____ To Effective Date _____

Named Insured _____

Address of Named Insured _____

Limit of Liability Any One Occurrence /Aggregate \$ _____

Deductible of Self-Insured Retention \$ _____
(Nil unless otherwise specified)

B. Policy Amendments

1. This endorsement is issued in consideration of the policy premium. Notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto, it is agreed as follows:
2. **INSURED.** Owner, its elected or appointed officials, employees or volunteers are included as insureds with regard to damages and defense of claims arising from (a) activities performed by or on behalf of the Named Insured, (b) products and completed operations of the Named Insured, or (c) premises owned, leased or used by the Named Insured. **The City of Lake Forest Park shall be an additional insured and a copy of the completed liability endorsement shall be deposited with the City upon completion.**
3. **CONTRIBUTION NOT REQUIRED.** As respects (a) work performed by the Named Insured for or on behalf of Owner, or (b) products sold by the Named Insured to Owner; or (c) premises leased by the Named Insured from Owner, the insurance afforded by this policy shall be primary insurance respects Owner, its elected or appointed officials, employees or volunteers; or stand in an unbroken chain of coverage excess of the Named insureds scheduled underlying primary coverage. In either event, any other insurance maintained by Owner, its elected or appointed officials, employees or volunteers shall be excess of this insurance and shall not contribute with it.
4. **SCOPE OF COVERAGE.** This policy: (1) if primary, affords coverage at least as broad as Insurance Services Office form number CG 0001 (Ed. 07/98), Comprehensive General Liability Insurance (2) if excess, affords coverage which is at least as broad as the primary insurance forms referenced in the preceding section (1).
5. **SEVERABILITY OF INTEREST.** The insurance afforded by this policy applies separately to each insured who is seeking coverage or against whom a claim is made or a suit is brought, except with respect to the Company's limit of liability.

6. PROVISIONS REGARDING THE INSURED'S DUTIES AFTER ACCIDENT OR LOSS. Any failure to comply with reporting of the policy shall not affect coverage provided to Owner, its elected or appointed officials, employees or volunteers.
7. CANCELLATION NOTICE. The insurance afforded by this policy shall not be suspended, voided, canceled, reduced in coverage or in limits except after forty-five (45) days prior written notice by Certified Mail Return Receipt requested has been given to Owner. Such notice shall be addressed as shown in the heading of this endorsement.

C. Signature of Insurer or Authorized Representative of the Insurer

I, _____ (print/type), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

Signature of _____
Authorized Representative (original signature required on endorsement furnished to the Lake Forest Park Water District.)

Organization _____

Address_ Telephone _____

AUTOMOTIVE LIABILITY ENDORSEMENT

Lake Forest Park Water District
4029 N.E. 178th St,
Lake Forest Park, WA 98155

A. Policy Information

1 Insurance Company_____

Policy Number_____

Policy Term: From_____ To _____ Effective Date_____

Named Insured _____

Address of Named Insured_____

Limit of Liability Any One Occurrence/Aggregate : \$_____

Deductible of Self-Insured Retention \$_____
(Nil unless otherwise specified)

B. Policy Amendments

This endorsement is issued in consideration of the policy premium, Notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto, it is agreed as follows:

1. **INSURED.** Owner, its elected or appointed officials, employees or volunteers are included as insureds with regard to damages and defense of claims arising from (a) activities performed by or on behalf of the Named Insured, (b) products and completed operations of the Named Insured, or (c) premises owned, leased or used by the Named Insured.
2. **CONTRIBUTION NOT REQUIRED.** As respects (a) work performed by the Named Insured for or on behalf of Owner, or (b) products sold by the Named Insured to Owner; or (c) premises leased by the Named Insured from Owner, the insurance afforded by this policy shall be primary insurance respects Owner, its elected or appointed officials, employees or volunteers; or stand in an unbroken chain of coverage excess of the Named Insured's scheduled underlying primary coverage. In either event, any other insurance maintained by Owner, its elected or appointed officials, employees or volunteers shall be excess of this insurance and shall not contribute with it.
3. **SCOPE OF COVERAGE.** This policy requires Insurance Service Office form number CA 0001 (07-97) or equivalent covering automobile liability, symbol I (any automobile'.
4. **SEVERABILITY OF INTEREST.** The insurance afforded by this policy applies separately to each insured who is seeking coverage or against whom a claim is made or a suit is brought, except with respect to the Company's limit of liability.

5. PROVISIONS REGARDING THE INSURED'S DUTIES AFTER ACCIDENT OR LOSS. Any failure to comply with reporting of the policy shall not affect coverage provided to Owner, its elected or appointed officials, employees or volunteers.

6. CANCELLATION NOTICE. The insurance afforded by this policy shall not be suspended, voided, canceled, reduced in coverage or in limits except after forty-five (45) days' prior written notice by Certified Mail Return Receipt requested has been given to Owner. Such notice shall be addressed as shown in the heading of this endorsement.

C. Signature Of Insurer or Authorized Representative Of the Insurer

I, _____(print/type), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

Signature of _____
Authorized Representative (original signature required on endorsement furnished to Lake Forest Park Water District.)

Organization _____

Title _____

Address _____

PREVAILING WAGE RATES

State of Washington
Department of Labor & Industries
 Prevailing Wage Section - Telephone 360-902-5335
 PO Box 44540, Olympia, WA 98504-4540

Washington State Prevailing Wage

The PREVAILING WAGES listed here include both the hourly wage rate and the hourly rate of fringe benefits. On public works projects, worker's wage and benefit rates must add to not less than this total. A brief description of overtime calculation requirements are provided on the Benefit Code Key.

Journey Level Prevailing Wage Rates for the Effective Date: 5/6/2021

<u>County</u>	<u>Trade</u>	<u>Job Classification</u>	<u>Wage</u>	<u>Holiday</u>	<u>Overtime</u>	<u>Note</u>	*Risk Class
King	Asbestos Abatement Workers	Journey Level	\$52.39	<u>5D</u>	<u>1H</u>		View
King	Boilermakers	Journey Level	\$70.79	<u>5N</u>	<u>1C</u>		View
King	Brick Mason	Journey Level	\$60.57	<u>7E</u>	<u>1N</u>		View
King	Brick Mason	Pointer-Caulker-Cleaner	\$60.57	<u>7E</u>	<u>1N</u>		View
King	Building Service Employees	Janitor	\$26.28	<u>5S</u>	<u>2F</u>		View
King	Building Service Employees	Traveling Waxer/Shampooer	\$26.63	<u>5S</u>	<u>2F</u>		View
King	Building Service Employees	Window Cleaner (Non-Scaffold)	\$29.98	<u>5S</u>	<u>2F</u>		View
King	Building Service Employees	Window Cleaner (Scaffold)	\$30.98	<u>5S</u>	<u>2F</u>		View
King	Cabinet Makers (In Shop)	Journey Level	\$22.74		<u>1</u>		View
King	Carpenters	Acoustical Worker	\$64.94	<u>7A</u>	<u>4C</u>		View
King	Carpenters	Carpenter	\$64.94	<u>7A</u>	<u>4C</u>		View
King	Carpenters	Carpenters on Stationary Tools	\$65.07	<u>7A</u>	<u>4C</u>		View
King	Carpenters	Creosoted Material	\$65.07	<u>7A</u>	<u>4C</u>		View
King	Carpenters	Floor Finisher	\$64.94	<u>7A</u>	<u>4C</u>		View
King	Carpenters	Floor Layer	\$64.94	<u>7A</u>	<u>4C</u>		View
King	Carpenters	Scaffold Erector	\$64.94	<u>7A</u>	<u>4C</u>		View
King	Cement Masons	Application of all Composition Mastic	\$64.84	<u>7A</u>	<u>4U</u>		View
King	Cement Masons	Application of all Epoxy Material	\$64.34	<u>7A</u>	<u>4U</u>		View
King	Cement Masons	Application of all Plastic Material	\$64.84	<u>7A</u>	<u>4U</u>		View
King	Cement Masons	Application of Sealing Compound	\$64.34	<u>7A</u>	<u>4U</u>		View
King	Cement Masons	Application of Underlayment	\$64.84	<u>7A</u>	<u>4U</u>		View

King	Cement Masons	Building General	\$64.34	7A	4U		View
King	Cement Masons	Composition or Kalman Floors	\$64.84	7A	4U		View
King	Cement Masons	Concrete Paving	\$64.34	7A	4U		View
King	Cement Masons	Curb & Gutter Machine	\$64.84	7A	4U		View
King	Cement Masons	Curb & Gutter, Sidewalks	\$64.34	7A	4U		View
King	Cement Masons	Curing Concrete	\$64.34	7A	4U		View
King	Cement Masons	Finish Colored Concrete	\$64.84	7A	4U		View
King	Cement Masons	Floor Grinding	\$64.84	7A	4U		View
King	Cement Masons	Floor Grinding/Polisher	\$64.34	7A	4U		View
King	Cement Masons	Green Concrete Saw, self-powered	\$64.84	7A	4U		View
King	Cement Masons	Grouting of all Plates	\$64.34	7A	4U		View
King	Cement Masons	Grouting of all Tilt-up Panels	\$64.34	7A	4U		View
King	Cement Masons	Gunite Nozzleman	\$64.84	7A	4U		View
King	Cement Masons	Hand Powered Grinder	\$64.84	7A	4U		View
King	Cement Masons	Journey Level	\$64.34	7A	4U		View
King	Cement Masons	Patching Concrete	\$64.34	7A	4U		View
King	Cement Masons	Pneumatic Power Tools	\$64.84	7A	4U		View
King	Cement Masons	Power Chipping & Brushing	\$64.84	7A	4U		View
King	Cement Masons	Sand Blasting Architectural Finish	\$64.84	7A	4U		View
King	Cement Masons	Screed & Rodding Machine	\$64.84	7A	4U		View
King	Cement Masons	Spackling or Skim Coat Concrete	\$64.34	7A	4U		View
King	Cement Masons	Troweling Machine Operator	\$64.84	7A	4U		View
King	Cement Masons	Troweling Machine Operator on Colored Slabs	\$64.84	7A	4U		View
King	Cement Masons	Tunnel Workers	\$64.84	7A	4U		View
King	Divers & Tenders	Bell/Vehicle or Submersible Operator (Not Under Pressure)	\$118.80	7A	4C		View
King	Divers & Tenders	Dive Supervisor/Master	\$81.98	7A	4C		View
King	Divers & Tenders	Diver	\$118.80	7A	4C	8V	View
King	Divers & Tenders	Diver On Standby	\$76.98	7A	4C		View
King	Divers & Tenders	Diver Tender	\$69.91	7A	4C		View
King	Divers & Tenders	Manifold Operator	\$69.91	7A	4C		View
King	Divers & Tenders	Manifold Operator Mixed Gas	\$74.91	7A	4C		View
King	Divers & Tenders	Remote Operated Vehicle Operator/Technician	\$69.91	7A	4C		View
King	Divers & Tenders	Remote Operated Vehicle Tender	\$65.19	7A	4C		View
King	Dredge Workers	Assistant Engineer	\$70.62	5D	3F		View

King	Dredge Workers	Assistant Mate (Deckhand)	\$70.07	5D	3F		View
King	Dredge Workers	Boatmen	\$70.62	5D	3F		View
King	Dredge Workers	Engineer Welder	\$71.97	5D	3F		View
King	Dredge Workers	Leverman, Hydraulic	\$73.41	5D	3F		View
King	Dredge Workers	Mates	\$70.62	5D	3F		View
King	Dredge Workers	Oiler	\$70.07	5D	3F		View
King	Drywall Applicator	Journey Level	\$64.94	5D	1H		View
King	Drywall Tapers	Journey Level	\$65.31	5P	1E		View
King	Electrical Fixture Maintenance Workers	Journey Level	\$31.99	5L	1E		View
King	Electricians - Inside	Cable Splicer	\$92.57	7C	4E		View
King	Electricians - Inside	Cable Splicer (tunnel)	\$99.46	7C	4E		View
King	Electricians - Inside	Certified Welder	\$89.44	7C	4E		View
King	Electricians - Inside	Certified Welder (tunnel)	\$96.02	7C	4E		View
King	Electricians - Inside	Construction Stock Person	\$44.78	7C	4E		View
King	Electricians - Inside	Journey Level	\$86.30	7C	4E		View
King	Electricians - Inside	Journey Level (tunnel)	\$92.57	7C	4E		View
King	Electricians - Motor Shop	Journey Level	\$47.53	5A	1B		View
King	Electricians - Powerline Construction	Cable Splicer	\$82.39	5A	4D		View
King	Electricians - Powerline Construction	Certified Line Welder	\$75.64	5A	4D		View
King	Electricians - Powerline Construction	Groundperson	\$49.17	5A	4D		View
King	Electricians - Powerline Construction	Heavy Line Equipment Operator	\$75.64	5A	4D		View
King	Electricians - Powerline Construction	Journey Level Lineperson	\$75.64	5A	4D		View
King	Electricians - Powerline Construction	Line Equipment Operator	\$64.54	5A	4D		View
King	Electricians - Powerline Construction	Meter Installer	\$49.17	5A	4D	8W	View
King	Electricians - Powerline Construction	Pole Sprayer	\$75.64	5A	4D		View
King	Electricians - Powerline Construction	Powderperson	\$56.49	5A	4D		View
King	Electronic Technicians	Journey Level	\$53.57	7E	1E		View
King	Elevator Constructors	Mechanic	\$100.51	7D	4A		View
King	Elevator Constructors	Mechanic In Charge	\$108.53	7D	4A		View
King	Fabricated Precast Concrete Products	All Classifications - In-Factory Work Only	\$18.25	5B	1R		View
King	Fence Erectors	Fence Erector	\$44.40	7A	4V	8Y	View
King	Fence Erectors	Fence Laborer	\$44.40	7A	4V	8Y	View
King	Flaggers	Journey Level	\$44.40	7A	4V	8Y	View
King	Glaziers	Journey Level	\$69.26	7L	1Y		View
King	Heat & Frost Insulators And	Journeyman	\$79.43	5J	4H		View

	Asbestos Workers						
King	Heating Equipment Mechanics	Journey Level	\$89.61	7F	1E		View
King	Hod Carriers & Mason Tenders	Journey Level	\$54.01	7A	4V	8Y	View
King	Industrial Power Vacuum Cleaner	Journey Level	\$13.69		1		View
King	Inland Boatmen	Boat Operator	\$61.41	5B	1K		View
King	Inland Boatmen	Cook	\$56.48	5B	1K		View
King	Inland Boatmen	Deckhand	\$57.48	5B	1K		View
King	Inland Boatmen	Deckhand Engineer	\$58.81	5B	1K		View
King	Inland Boatmen	Launch Operator	\$58.89	5B	1K		View
King	Inland Boatmen	Mate	\$57.31	5B	1K		View
King	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Cleaner Operator, Foamer Operator	\$31.49		1		View
King	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Grout Truck Operator	\$13.69		1		View
King	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Head Operator	\$24.91		1		View
King	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Technician	\$19.33		1		View
King	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Tv Truck Operator	\$20.45		1		View
King	Insulation Applicators	Journey Level	\$64.94	7A	4C		View
King	Ironworkers	Journeyman	\$76.78	7N	1O		View
King	Laborers	Air, Gas Or Electric Vibrating Screed	\$52.39	7A	4V	8Y	View
King	Laborers	Airtrac Drill Operator	\$54.01	7A	4V	8Y	View
King	Laborers	Ballast Regular Machine	\$52.39	7A	4V	8Y	View
King	Laborers	Batch Weighman	\$44.40	7A	4V	8Y	View
King	Laborers	Brick Pavers	\$52.39	7A	4V	8Y	View
King	Laborers	Brush Cutter	\$52.39	7A	4V	8Y	View
King	Laborers	Brush Hog Feeder	\$52.39	7A	4V	8Y	View
King	Laborers	Burner	\$52.39	7A	4V	8Y	View
King	Laborers	Caisson Worker	\$54.01	7A	4V	8Y	View
King	Laborers	Carpenter Tender	\$52.39	7A	4V	8Y	View
King	Laborers	Cement Dumper-paving	\$53.35	7A	4V	8Y	View
King	Laborers	Cement Finisher Tender	\$52.39	7A	4V	8Y	View
King	Laborers	Change House Or Dry Shack	\$52.39	7A	4V	8Y	View
King	Laborers	Chipping Gun (30 Lbs. And Over)	\$53.35	7A	4V	8Y	View
King	Laborers	Chipping Gun (Under 30	\$52.39	7A	4V	8Y	View

		Lbs.)					
King	Laborers	Choker Setter	\$52.39	7A	4V	8Y	View
King	Laborers	Chuck Tender	\$52.39	7A	4V	8Y	View
King	Laborers	Clary Power Spreader	\$53.35	7A	4V	8Y	View
King	Laborers	Clean-up Laborer	\$52.39	7A	4V	8Y	View
King	Laborers	Concrete Dumper/Chute Operator	\$53.35	7A	4V	8Y	View
King	Laborers	Concrete Form Stripper	\$52.39	7A	4V	8Y	View
King	Laborers	Concrete Placement Crew	\$53.35	7A	4V	8Y	View
King	Laborers	Concrete Saw Operator/Core Driller	\$53.35	7A	4V	8Y	View
King	Laborers	Crusher Feeder	\$44.40	7A	4V	8Y	View
King	Laborers	Curing Laborer	\$52.39	7A	4V	8Y	View
King	Laborers	Demolition: Wrecking & Moving (Incl. Charred Material)	\$52.39	7A	4V	8Y	View
King	Laborers	Ditch Digger	\$52.39	7A	4V	8Y	View
King	Laborers	Diver	\$54.01	7A	4V	8Y	View
King	Laborers	Drill Operator (Hydraulic, Diamond)	\$53.35	7A	4V	8Y	View
King	Laborers	Dry Stack Walls	\$52.39	7A	4V	8Y	View
King	Laborers	Dump Person	\$52.39	7A	4V	8Y	View
King	Laborers	Epoxy Technician	\$52.39	7A	4V	8Y	View
King	Laborers	Erosion Control Worker	\$52.39	7A	4V	8Y	View
King	Laborers	Faller & Bucker Chain Saw	\$53.35	7A	4V	8Y	View
King	Laborers	Fine Graders	\$52.39	7A	4V	8Y	View
King	Laborers	Firewatch	\$44.40	7A	4V	8Y	View
King	Laborers	Form Setter	\$52.39	7A	4V	8Y	View
King	Laborers	Gabian Basket Builders	\$52.39	7A	4V	8Y	View
King	Laborers	General Laborer	\$52.39	7A	4V	8Y	View
King	Laborers	Grade Checker & Transit Person	\$54.01	7A	4V	8Y	View
King	Laborers	Grinders	\$52.39	7A	4V	8Y	View
King	Laborers	Grout Machine Tender	\$52.39	7A	4V	8Y	View
King	Laborers	Groutmen (Pressure) Including Post Tension Beams	\$53.35	7A	4V	8Y	View
King	Laborers	Guardrail Erector	\$52.39	7A	4V	8Y	View
King	Laborers	Hazardous Waste Worker (Level A)	\$54.01	7A	4V	8Y	View
King	Laborers	Hazardous Waste Worker (Level B)	\$53.35	7A	4V	8Y	View
King	Laborers	Hazardous Waste Worker (Level C)	\$52.39	7A	4V	8Y	View
King	Laborers	High Scaler	\$54.01	7A	4V	8Y	View
King	Laborers	Jackhammer	\$53.35	7A	4V	8Y	View

King	Laborers	Laserbeam Operator	\$53.35	7A	4V	8Y	View
King	Laborers	Maintenance Person	\$52.39	7A	4V	8Y	View
King	Laborers	Manhole Builder-Mudman	\$53.35	7A	4V	8Y	View
King	Laborers	Material Yard Person	\$52.39	7A	4V	8Y	View
King	Laborers	Motorman-Dinky Locomotive	\$53.35	7A	4V	8Y	View
King	Laborers	Nozzleman (Concrete Pump, Green Cutter When Using Combination Of High Pressure Air & Water On Concrete & Rock, Sandblast, Gunite, Shotcrete, Water Blaster, Vacuum Blaster)	\$53.35	7A	4V	8Y	View
King	Laborers	Pavement Breaker	\$53.35	7A	4V	8Y	View
King	Laborers	Pilot Car	\$44.40	7A	4V	8Y	View
King	Laborers	Pipe Layer Lead	\$54.01	7A	4V	8Y	View
King	Laborers	Pipe Layer/Tailor	\$53.35	7A	4V	8Y	View
King	Laborers	Pipe Pot Tender	\$53.35	7A	4V	8Y	View
King	Laborers	Pipe Reliner	\$53.35	7A	4V	8Y	View
King	Laborers	Pipe Wrapper	\$53.35	7A	4V	8Y	View
King	Laborers	Pot Tender	\$52.39	7A	4V	8Y	View
King	Laborers	Powderman	\$54.01	7A	4V	8Y	View
King	Laborers	Powderman's Helper	\$52.39	7A	4V	8Y	View
King	Laborers	Power Jacks	\$53.35	7A	4V	8Y	View
King	Laborers	Railroad Spike Puller - Power	\$53.35	7A	4V	8Y	View
King	Laborers	Raker - Asphalt	\$54.01	7A	4V	8Y	View
King	Laborers	Re-timberman	\$54.01	7A	4V	8Y	View
King	Laborers	Remote Equipment Operator	\$53.35	7A	4V	8Y	View
King	Laborers	Rigger/Signal Person	\$53.35	7A	4V	8Y	View
King	Laborers	Rip Rap Person	\$52.39	7A	4V	8Y	View
King	Laborers	Rivet Buster	\$53.35	7A	4V	8Y	View
King	Laborers	Rodder	\$53.35	7A	4V	8Y	View
King	Laborers	Scaffold Erector	\$52.39	7A	4V	8Y	View
King	Laborers	Scale Person	\$52.39	7A	4V	8Y	View
King	Laborers	Sloper (Over 20")	\$53.35	7A	4V	8Y	View
King	Laborers	Sloper Sprayer	\$52.39	7A	4V	8Y	View
King	Laborers	Spreader (Concrete)	\$53.35	7A	4V	8Y	View
King	Laborers	Stake Hopper	\$52.39	7A	4V	8Y	View
King	Laborers	Stock Piler	\$52.39	7A	4V	8Y	View
King	Laborers	Swinging Stage/Boatswain Chair	\$44.40	7A	4V	8Y	View
King	Laborers	Tamper & Similar Electric, Air & Gas Operated Tools	\$53.35	7A	4V	8Y	View

King	Laborers	Tamper (Multiple & Self-propelled)	\$53.35	7A	4V	8Y	View
King	Laborers	Timber Person - Sewer (Lagger, Shorer & Cribber)	\$53.35	7A	4V	8Y	View
King	Laborers	Toolroom Person (at Jobsite)	\$52.39	7A	4V	8Y	View
King	Laborers	Topper	\$52.39	7A	4V	8Y	View
King	Laborers	Track Laborer	\$52.39	7A	4V	8Y	View
King	Laborers	Track Liner (Power)	\$53.35	7A	4V	8Y	View
King	Laborers	Traffic Control Laborer	\$47.48	7A	4V	9C	View
King	Laborers	Traffic Control Supervisor	\$50.31	7A	4V	9C	View
King	Laborers	Truck Spotter	\$52.39	7A	4V	8Y	View
King	Laborers	Tugger Operator	\$53.35	7A	4V	8Y	View
King	Laborers	Tunnel Work-Compressed Air Worker 0-30 psi	\$129.67	7A	4V	9B	View
King	Laborers	Tunnel Work-Compressed Air Worker 30.01-44.00 psi	\$134.70	7A	4V	9B	View
King	Laborers	Tunnel Work-Compressed Air Worker 44.01-54.00 psi	\$138.38	7A	4V	9B	View
King	Laborers	Tunnel Work-Compressed Air Worker 54.01-60.00 psi	\$144.08	7A	4V	9B	View
King	Laborers	Tunnel Work-Compressed Air Worker 60.01-64.00 psi	\$146.20	7A	4V	9B	View
King	Laborers	Tunnel Work-Compressed Air Worker 64.01-68.00 psi	\$151.30	7A	4V	9B	View
King	Laborers	Tunnel Work-Compressed Air Worker 68.01-70.00 psi	\$153.20	7A	4V	9B	View
King	Laborers	Tunnel Work-Compressed Air Worker 70.01-72.00 psi	\$155.20	7A	4V	9B	View
King	Laborers	Tunnel Work-Compressed Air Worker 72.01-74.00 psi	\$157.20	7A	4V	9B	View
King	Laborers	Tunnel Work-Guage and Lock Tender	\$54.11	7A	4V	8Y	View
King	Laborers	Tunnel Work-Miner	\$54.11	7A	4V	8Y	View
King	Laborers	Vibrator	\$53.35	7A	4V	8Y	View
King	Laborers	Vinyl Seamer	\$52.39	7A	4V	8Y	View
King	Laborers	Watchman	\$40.36	7A	4V	8Y	View
King	Laborers	Welder	\$53.35	7A	4V	8Y	View
King	Laborers	Well Point Laborer	\$53.35	7A	4V	8Y	View
King	Laborers	Window Washer/Cleaner	\$40.36	7A	4V	8Y	View
King	Laborers - Underground Sewer & Water	General Laborer & Topman	\$52.39	7A	4V	8Y	View
King	Laborers - Underground Sewer & Water	Pipe Layer	\$53.35	7A	4V	8Y	View
King	Landscape Construction	Landscape Construction/Landscaping Or Planting Laborers	\$40.36	7A	4V	8Y	View

King	Landscape Construction	Landscape Operator	\$72.28	7A	3K	8X	View
King	Landscape Maintenance	Groundskeeper	\$17.87		1		View
King	Lathers	Journey Level	\$64.94	5D	1H		View
King	Marble Setters	Journey Level	\$60.57	7E	1N		View
King	Metal Fabrication (In Shop)	Journey Level	\$41.70	15F	11A		View
King	Millwright	Journey Level	\$66.44	7A	4C		View
King	Modular Buildings	Cabinet Assembly	\$13.69		1		View
King	Modular Buildings	Electrician	\$13.69		1		View
King	Modular Buildings	Equipment Maintenance	\$13.69		1		View
King	Modular Buildings	Plumber	\$13.69		1		View
King	Modular Buildings	Production Worker	\$13.69		1		View
King	Modular Buildings	Tool Maintenance	\$13.69		1		View
King	Modular Buildings	Utility Person	\$13.69		1		View
King	Modular Buildings	Welder	\$13.69		1		View
King	Painters	Journey Level	\$45.40	6Z	2B		View
King	Pile Driver	Crew Tender	\$69.91	7A	4C		View
King	Pile Driver	Crew Tender/Technician	\$69.91	7A	4C		View
King	Pile Driver	Hyperbaric Worker - Compressed Air Worker 0- 30.00 PSI	\$80.76	7A	4C		View
King	Pile Driver	Hyperbaric Worker - Compressed Air Worker 30.01 - 44.00 PSI	\$85.76	7A	4C		View
King	Pile Driver	Hyperbaric Worker - Compressed Air Worker 44.01 - 54.00 PSI	\$89.76	7A	4C		View
King	Pile Driver	Hyperbaric Worker - Compressed Air Worker 54.01 - 60.00 PSI	\$94.76	7A	4C		View
King	Pile Driver	Hyperbaric Worker - Compressed Air Worker 60.01 - 64.00 PSI	\$97.26	7A	4C		View
King	Pile Driver	Hyperbaric Worker - Compressed Air Worker 64.01 - 68.00 PSI	\$102.26	7A	4C		View
King	Pile Driver	Hyperbaric Worker - Compressed Air Worker 68.01 - 70.00 PSI	\$104.26	7A	4C		View
King	Pile Driver	Hyperbaric Worker - Compressed Air Worker 70.01 - 72.00 PSI	\$106.26	7A	4C		View
King	Pile Driver	Hyperbaric Worker - Compressed Air Worker 72.01 - 74.00 PSI	\$108.26	7A	4C		View
King	Pile Driver	Journey Level	\$65.19	7A	4C		View
King	Plasterers	Journey Level	\$61.67	7Q	1R		View
King	Playground & Park Equipment Installers	Journey Level	\$13.69		1		View

King	Plumbers & Pipefitters	Journey Level	\$92.19	6Z	1G		View
King	Power Equipment Operators	Asphalt Plant Operators	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Assistant Engineer	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Barrier Machine (zipper)	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Batch Plant Operator: concrete	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Bobcat	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Brokk - Remote Demolition Equipment	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Brooms	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Bump Cutter	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Cableways	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Chipper	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Compressor	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Concrete Finish Machine - Laser Screed	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Concrete Pump - Mounted Or Trailer High Pressure Line Pump, Pump High Pressure	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Concrete Pump: Truck Mount With Boom Attachment Over 42 M	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Concrete Pump: Truck Mount With Boom Attachment Up To 42m	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Conveyors	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Cranes friction: 200 tons and over	\$75.72	7A	3K	8X	View
King	Power Equipment Operators	Cranes: 100 tons through 199 tons, or 150' of boom (including jib with attachments)	\$74.22	7A	3K	8X	View
King	Power Equipment Operators	Cranes: 20 Tons Through 44 Tons With Attachments	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Cranes: 200 tons- 299 tons, or 250' of boom including jib with attachments	\$74.99	7A	3K	8X	View
King	Power Equipment Operators	Cranes: 300 tons and over or 300' of boom including jib with attachments	\$75.72	7A	3K	8X	View
King	Power Equipment Operators	Cranes: 45 Tons Through 99 Tons, Under 150' Of Boom (including Jib With Attachments)	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Cranes: A-frame - 10 Tons And Under	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Cranes: Friction cranes through 199 tons	\$74.99	7A	3K	8X	View

King	Power Equipment Operators	Cranes: through 19 tons with attachments, A-frame over 10 tons	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Crusher	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Deck Engineer/Deck Winches (power)	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Derricks, On Building Work	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Dozers D-9 & Under	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Drill Oilers: Auger Type, Truck Or Crane Mount	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Drilling Machine	\$74.22	7A	3K	8X	View
King	Power Equipment Operators	Elevator And Man-lift: Permanent And Shaft Type	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Finishing Machine, Bidwell And Gamaco & Similar Equipment	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Forklift: 3000 Lbs And Over With Attachments	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Forklifts: Under 3000 Lbs. With Attachments	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Grade Engineer: Using Blue Prints, Cut Sheets, Etc	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Gradechecker/Stakeman	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Guardrail Punch	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Hard Tail End Dump Articulating Off- Road Equipment 45 Yards. & Over	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Hard Tail End Dump Articulating Off-road Equipment Under 45 Yards	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Horizontal/Directional Drill Locator	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Horizontal/Directional Drill Operator	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Hydralifts/Boom Trucks Over 10 Tons	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Hydralifts/Boom Trucks, 10 Tons And Under	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Loader, Overhead 8 Yards. & Over	\$74.22	7A	3K	8X	View
King	Power Equipment Operators	Loader, Overhead, 6 Yards. But Not Including 8 Yards	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Loaders, Overhead Under 6 Yards	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Loaders, Plant Feed	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Loaders: Elevating Type Belt	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Locomotives, All	\$72.84	7A	3K	8X	View

King	Power Equipment Operators	Material Transfer Device	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Mechanics, All (leadmen - \$0.50 Per Hour Over Mechanic)	\$74.22	7A	3K	8X	View
King	Power Equipment Operators	Motor Patrol Graders	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Mucking Machine, Mole, Tunnel Drill, Boring, Road Header And/or Shield	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Oil Distributors, Blower Distribution & Mulch Seeding Operator	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Outside Hoists (Elevators And Manlifts), Air Tuggers, Strato	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Overhead, Bridge Type Crane: 20 Tons Through 44 Tons	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Overhead, Bridge Type: 100 Tons And Over	\$74.22	7A	3K	8X	View
King	Power Equipment Operators	Overhead, Bridge Type: 45 Tons Through 99 Tons	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Pavement Breaker	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Pile Driver (other Than Crane Mount)	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Plant Oiler - Asphalt, Crusher	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Posthole Digger, Mechanical	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Power Plant	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Pumps - Water	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Quad 9, Hd 41, D10 And Over	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Quick Tower - No Cab, Under 100 Feet In Height Based To Boom	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Remote Control Operator On Rubber Tired Earth Moving Equipment	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Rigger and Bellman	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Rigger/Signal Person, Bellman (Certified)	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Rollagon	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Roller, Other Than Plant Mix	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Roller, Plant Mix Or Multi-lift Materials	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Roto-mill, Roto-grinder	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Saws - Concrete	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Scraper, Self Propelled Under 45 Yards	\$72.84	7A	3K	8X	View

King	Power Equipment Operators	Scrapers - Concrete & Carry All	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Scrapers, Self-propelled: 45 Yards And Over	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Service Engineers - Equipment	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Shotcrete/Gunite Equipment	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Shovel, Excavator, Backhoe, Tractors Under 15 Metric Tons	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Shovel, Excavator, Backhoe: Over 30 Metric Tons To 50 Metric Tons	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Shovel, Excavator, Backhoes, Tractors: 15 To 30 Metric Tons	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Shovel, Excavator, Backhoes: Over 50 Metric Tons To 90 Metric Tons	\$74.22	7A	3K	8X	View
King	Power Equipment Operators	Shovel, Excavator, Backhoes: Over 90 Metric Tons	\$74.99	7A	3K	8X	View
King	Power Equipment Operators	Slipform Pavers	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Spreader, Topsider & Screedman	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Subgrader Trimmer	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Tower Bucket Elevators	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Tower Crane Up To 175' In Height Base To Boom	\$74.22	7A	3K	8X	View
King	Power Equipment Operators	Tower Crane: over 175' through 250' in height, base to boom	\$74.99	7A	3K	8X	View
King	Power Equipment Operators	Tower Cranes: over 250' in height from base to boom	\$75.72	7A	3K	8X	View
King	Power Equipment Operators	Transporters, All Track Or Truck Type	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Trenching Machines	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Truck Crane Oiler/driver - 100 Tons And Over	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Truck Crane Oiler/Driver Under 100 Tons	\$72.28	7A	3K	8X	View
King	Power Equipment Operators	Truck Mount Portable Conveyor	\$72.84	7A	3K	8X	View
King	Power Equipment Operators	Welder	\$73.49	7A	3K	8X	View
King	Power Equipment Operators	Wheel Tractors, Farmall Type	\$69.12	7A	3K	8X	View
King	Power Equipment Operators	Yo Yo Pay Dozer	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-	Asphalt Plant Operators	\$73.49	7A	3K	8X	View

	Underground Sewer & Water						
King	Power Equipment Operators- Underground Sewer & Water	Assistant Engineer	\$69.12	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Barrier Machine (zipper)	\$72.84	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Batch Plant Operator, Concrete	\$72.84	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Bobcat	\$69.12	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Brokk - Remote Demolition Equipment	\$69.12	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Brooms	\$69.12	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Bump Cutter	\$72.84	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Cableways	\$73.49	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Chipper	\$72.84	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Compressor	\$69.12	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Concrete Finish Machine - Laser Screed	\$69.12	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Concrete Pump - Mounted Or Trailer High Pressure Line Pump, Pump High Pressure	\$72.28	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Concrete Pump: Truck Mount With Boom Attachment Over 42 M	\$73.49	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Concrete Pump: Truck Mount With Boom Attachment Up To 42m	\$72.84	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Conveyors	\$72.28	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Cranes friction: 200 tons and over	\$75.72	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Cranes: 100 tons through 199 tons, or 150' of boom (including jib with attachments)	\$74.22	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Cranes: 20 Tons Through 44 Tons With Attachments	\$72.84	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Cranes: 200 tons- 299 tons, or 250' of boom including jib with attachments	\$74.99	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Cranes: 300 tons and over or 300' of boom including jib with attachments	\$75.72	7A	3K	8X	View

King	Power Equipment Operators-Underground Sewer & Water	Cranes: 45 Tons Through 99 Tons, Under 150' Of Boom (including Jib With Attachments)	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Cranes: A-frame - 10 Tons And Under	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Cranes: Friction cranes through 199 tons	\$74.99	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Cranes: through 19 tons with attachments, A-frame over 10 tons	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Crusher	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Deck Engineer/Deck Winches (power)	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Derricks, On Building Work	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Dozers D-9 & Under	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Drill Oilers: Auger Type, Truck Or Crane Mount	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Drilling Machine	\$74.22	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Elevator And Man-lift: Permanent And Shaft Type	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Finishing Machine, Bidwell And Gamaco & Similar Equipment	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Forklift: 3000 Lbs And Over With Attachments	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Forklifts: Under 3000 Lbs. With Attachments	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Grade Engineer: Using Blue Prints, Cut Sheets, Etc	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Gradechecker/Stakeman	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Guardrail Punch	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Hard Tail End Dump Articulating Off- Road Equipment 45 Yards. & Over	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Hard Tail End Dump Articulating Off-road Equipment Under 45 Yards	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Horizontal/Directional Drill Locator	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Horizontal/Directional Drill Operator	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Hydralifts/Boom Trucks Over 10 Tons	\$72.28	7A	3K	8X	View

King	Power Equipment Operators-Underground Sewer & Water	Hydralifts/Boom Trucks, 10 Tons And Under	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Loader, Overhead 8 Yards. & Over	\$74.22	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Loader, Overhead, 6 Yards. But Not Including 8 Yards	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Loaders, Overhead Under 6 Yards	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Loaders, Plant Feed	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Loaders: Elevating Type Belt	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Locomotives, All	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Material Transfer Device	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Mechanics, All (leadmen - \$0.50 Per Hour Over Mechanic)	\$74.22	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Motor Patrol Graders	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Mucking Machine, Mole, Tunnel Drill, Boring, Road Header And/or Shield	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Oil Distributors, Blower Distribution & Mulch Seeding Operator	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Outside Hoists (Elevators And Manlifts), Air Tuggers, Strato	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Overhead, Bridge Type Crane: 20 Tons Through 44 Tons	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Overhead, Bridge Type: 100 Tons And Over	\$74.22	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Overhead, Bridge Type: 45 Tons Through 99 Tons	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Pavement Breaker	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Pile Driver (other Than Crane Mount)	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Plant Oiler - Asphalt, Crusher	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Posthole Digger, Mechanical	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Power Plant	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Pumps - Water	\$69.12	7A	3K	8X	View

King	Power Equipment Operators-Underground Sewer & Water	Quad 9, Hd 41, D10 And Over	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Quick Tower - No Cab, Under 100 Feet In Height Based To Boom	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Remote Control Operator On Rubber Tired Earth Moving Equipment	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Rigger and Bellman	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Rigger/Signal Person, Bellman (Certified)	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Rollagon	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Roller, Other Than Plant Mix	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Roller, Plant Mix Or Multi-lift Materials	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Roto-mill, Roto-grinder	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Saws - Concrete	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Scraper, Self Propelled Under 45 Yards	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Scrapers - Concrete & Carry All	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Scrapers, Self-propelled: 45 Yards And Over	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Service Engineers - Equipment	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Shotcrete/Gunite Equipment	\$69.12	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoe, Tractors Under 15 Metric Tons	\$72.28	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoe: Over 30 Metric Tons To 50 Metric Tons	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoes, Tractors: 15 To 30 Metric Tons	\$72.84	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoes: Over 50 Metric Tons To 90 Metric Tons	\$74.22	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoes: Over 90 Metric Tons	\$74.99	7A	3K	8X	View
King	Power Equipment Operators-Underground Sewer & Water	Slipform Pavers	\$73.49	7A	3K	8X	View
King	Power Equipment Operators-	Spreader, Topsider &	\$73.49	7A	3K	8X	View

	Underground Sewer & Water	Screedman					
King	Power Equipment Operators- Underground Sewer & Water	Subgrader Trimmer	\$72.84	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Tower Bucket Elevators	\$72.28	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Tower Crane Up To 175' In Height Base To Boom	\$74.22	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Tower Crane: over 175' through 250' in height, base to boom	\$74.99	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Tower Cranes: over 250' in height from base to boom	\$75.72	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Transporters, All Track Or Truck Type	\$73.49	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Trenching Machines	\$72.28	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Truck Crane Oiler/driver - 100 Tons And Over	\$72.84	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Truck Crane Oiler/Driver Under 100 Tons	\$72.28	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Truck Mount Portable Conveyor	\$72.84	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Welder	\$73.49	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Wheel Tractors, Farmall Type	\$69.12	7A	3K	8X	View
King	Power Equipment Operators- Underground Sewer & Water	Yo Yo Pay Dozer	\$72.84	7A	3K	8X	View
King	Power Line Clearance Tree Trimmers	Journey Level In Charge	\$55.03	5A	4A		View
King	Power Line Clearance Tree Trimmers	Spray Person	\$52.24	5A	4A		View
King	Power Line Clearance Tree Trimmers	Tree Equipment Operator	\$55.03	5A	4A		View
King	Power Line Clearance Tree Trimmers	Tree Trimmer	\$49.21	5A	4A		View
King	Power Line Clearance Tree Trimmers	Tree Trimmer Groundperson	\$37.47	5A	4A		View
King	Refrigeration & Air Conditioning Mechanics	Journey Level	\$87.01	6Z	1G		View
King	Residential Brick Mason	Journey Level	\$60.57	7E	1N		View
King	Residential Carpenters	Journey Level	\$36.44		1		View
King	Residential Cement Masons	Journey Level	\$46.64		1		View
King	Residential Drywall Applicators	Journey Level	\$64.94	7A	4C		View
King	Residential Drywall Tapers	Journey Level	\$36.36		1		View
King	Residential Electricians	Journey Level	\$48.80		1		View
King	Residential Glaziers	Journey Level	\$28.93		1		View

King	Residential Insulation Applicators	Journey Level	\$28.18		1		View
King	Residential Laborers	Journey Level	\$29.73		1		View
King	Residential Marble Setters	Journey Level	\$27.38		1		View
King	Residential Painters	Journey Level	\$23.47		1		View
King	Residential Plumbers & Pipefitters	Journey Level	\$92.19	6Z	1G		View
King	Residential Refrigeration & Air Conditioning Mechanics	Journey Level	\$87.01	6Z	1G		View
King	Residential Sheet Metal Workers	Journey Level	\$89.61	7F	1E		View
King	Residential Soft Floor Layers	Journey Level	\$51.91	5A	3J		View
King	Residential Sprinkler Fitters (Fire Protection)	Journey Level	\$53.04	5C	2R		View
King	Residential Stone Masons	Journey Level	\$60.57	7E	1N		View
King	Residential Terrazzo Workers	Journey Level	\$55.71	7E	1N		View
King	Residential Terrazzo/Tile Finishers	Journey Level	\$24.39		1		View
King	Residential Tile Setters	Journey Level	\$21.04		1		View
King	Roofers	Journey Level	\$57.30	5A	3H		View
King	Roofers	Using Irritable Bituminous Materials	\$60.30	5A	3H		View
King	Sheet Metal Workers	Journey Level (Field or Shop)	\$89.61	7F	1E		View
King	Shipbuilding & Ship Repair	New Construction Boilermaker	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Carpenter	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Crane Operator	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Electrician	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Heat & Frost Insulator	\$79.43	5J	4H		View
King	Shipbuilding & Ship Repair	New Construction Laborer	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Machinist	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Operating Engineer	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Painter	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Pipefitter	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Rigger	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Sheet Metal	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Shipfitter	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Warehouse/Teamster	\$38.54	7V	1		View
King	Shipbuilding & Ship Repair	New Construction Welder / Burner	\$38.54	7V	1		View

King	Shipbuilding & Ship Repair	Ship Repair Boilermaker	\$47.35	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Carpenter	\$47.35	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Crane Operator	\$45.06	7Y	4K		View
King	Shipbuilding & Ship Repair	Ship Repair Electrician	\$47.42	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Heat & Frost Insulator	\$79.43	5J	4H		View
King	Shipbuilding & Ship Repair	Ship Repair Laborer	\$47.35	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Machinist	\$47.35	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Operating Engineer	\$45.06	7Y	4K		View
King	Shipbuilding & Ship Repair	Ship Repair Painter	\$47.35	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Pipefitter	\$47.35	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Rigger	\$47.35	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Sheet Metal	\$47.35	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Shipwright	\$47.35	7X	4J		View
King	Shipbuilding & Ship Repair	Ship Repair Warehouse / Teamster	\$45.06	7Y	4K		View
King	Sign Makers & Installers (Electrical)	Journey Level	\$51.56	0	1		View
King	Sign Makers & Installers (Non-Electrical)	Journey Level	\$33.20	0	1		View
King	Soft Floor Layers	Journey Level	\$51.91	5A	3J		View
King	Solar Controls For Windows	Journey Level	\$13.69		1		View
King	Sprinkler Fitters (Fire Protection)	Journey Level	\$85.89	5C	1X		View
King	Stage Rigging Mechanics (Non Structural)	Journey Level	\$13.69		1		View
King	Stone Masons	Journey Level	\$60.57	7E	1N		View
King	Street And Parking Lot Sweeper Workers	Journey Level	\$19.09		1		View
King	Surveyors	Assistant Construction Site Surveyor	\$72.28	7A	3K	8X	View
King	Surveyors	Chainman	\$69.12	7A	3K	8X	View
King	Surveyors	Construction Site Surveyor	\$73.49	7A	3K	8X	View
King	Telecommunication Technicians	Journey Level	\$53.57	7E	1E		View
King	Telephone Line Construction - Outside	Cable Splicer	\$37.40	5A	2B		View
King	Telephone Line Construction - Outside	Hole Digger/Ground Person	\$25.04	5A	2B		View
King	Telephone Line Construction - Outside	Telephone Equipment Operator (Light)	\$31.22	5A	2B		View
King	Telephone Line Construction - Outside	Telephone Lineperson	\$35.34	5A	2B		View
King	Terrazzo Workers	Journey Level	\$55.71	7E	1N		View
King	Tile Setters	Journey Level	\$55.71	7E	1N		View
King	Tile, Marble & Terrazzo	Finisher	\$46.54	7E	1N		View

	Finishers						
King	Traffic Control Stripers	Journey Level	\$49.13	7A	1K		View
King	Truck Drivers	Asphalt Mix Over 16 Yards	\$64.55	5D	4Y	8L	View
King	Truck Drivers	Asphalt Mix To 16 Yards	\$63.71	5D	4Y	8L	View
King	Truck Drivers	Dump Truck	\$63.71	5D	4Y	8L	View
King	Truck Drivers	Dump Truck & Trailer	\$64.55	5D	4Y	8L	View
King	Truck Drivers	Other Trucks	\$64.55	5D	4Y	8L	View
King	Truck Drivers - Ready Mix	Transit Mix	\$64.55	5D	4Y	8L	View
King	Well Drillers & Irrigation Pump Installers	Irrigation Pump Installer	\$17.71		1		View
King	Well Drillers & Irrigation Pump Installers	Oiler	\$13.69		1		View
King	Well Drillers & Irrigation Pump Installers	Well Driller	\$18.00		1		View

V. GENERAL CONDITIONS

These are general conditions to a public works contract issued by the District.

DEFINITIONS AND ABBREVIATIONS

1. **DEFINITIONS.** The following terms used in this Contract shall be defined and interpreted as follows:
 - a. "Contract" means this Contract executed by the Contractor and the District, of which these General Conditions are an integral part.
 - b. "Contract Documents" means all component parts of the Contract as described in paragraph 3 hereafter set forth.
 - c. "Contractor" means the person, partnership, firm or corporation to whom this Contract is awarded by the District and who is a party thereto.
 - d. "Subcontractor" means any person, firm or corporation, other than an employee of the Contractor, supplying and under agreement, either with the Contractor or any other Subcontractor of the Contractor, labor or materials, or both at the site of the project in connection with this Contract.
 - e. "District" or "Owner" means Lake Forest Park Water District of King County, Washington.
 - f. "Engineer" means the consulting engineer employed by the District, acting either directly or through his properly authorized assistants, including inspectors or such assistants acting severally within the scope of the particular duties assigned to consulting engineer.
 - g. "Project" means the system of water mains and appurtenances or other water system improvements to be constructed in whole or in part through the performance of this Contract.
 - h. "Plans" means the plans shall mean all official drawings or reproductions of drawings made or to be made pertaining to the work provided for in the Contract, or to any structure connected therewith and which have been approved by the District, including the plans appended hereto.
 - i. "Specifications" means the part of this Contract containing prescribed directions, requirements, explanations, terms and provisions pertaining to the various features of the work to be done, or manner and method of performance and the manner and method of measurements and payments. They also include directions, requirements and explanations as set forth on the Plans. Where federal, A.P.W.A., A.W.W.A., A.S.T.M. or any other standard

specifications are referred to or included by reference, the latest issue and/or amendment thereto published at the date of applications shall be incorporated in the Contract by said reference as though set forth in full herein.

j. "Proposal" means the approved proposal form upon which the bidder is to submit, or has submitted, his proposal or bid for performing the work contemplated.

k. "Work" means the work necessary to construct and install the water system improvements including the furnishing and installing of all machinery, equipment and material and/or the furnishing of all labor, tools, material, equipment, construction equipment, working drawings where required and other necessities for the construction and installation of the water system extension shown and called for in the Plans and Specifications and this Contract, and the act of constructing and installing said water system improvements.

l. "Item" means a convenient subdivision of work under these specifications, as herein separately described.

m. "Material or Materials" shall be construed to cover machinery, manufactured articles, materials of construction (fabricated or otherwise) and any other classes of material to be furnished in connection with the Contract.

n. "Equipment" means the machinery, accessories, appurtenances and manufactured articles to be furnished and/or installed under the Contract.

o. "Contractor's Equipment" means all items of materials or equipment remaining in the Contractor's ownership and removed from the site upon completion of the project.

p. "Or Equal" means any manufactured article, material, method or work which in the opinion of the Engineer is equally desirable or suitable for the purpose intended in these Specifications and Contract, as compared with similar articles specifically mentioned herein.

q. "Contract Drawings" or "Drawings" means all details or drawings or plans prepared by the Engineer and approved by the applicable state (or federal, as the case may be) agencies as the case may be as part of or in addition to the plans described in paragraph h.

r. "Details" or "Additional Drawings" means all details or drawings prepared and issued by the Engineer prior to the construction for further explanation or amplification of the Contract Drawings, or for the revision of the same, all as herein provided.

s. "Supplemental Drawings and Instructions" means additional instructions by means of drawings or documents necessary in the opinion of the Engineer for the proper execution of the work. All such drawings and instructions shall be consistent with the Contract Documents and shall be a part of the Contract Documents.

t. "Shop Drawings" means all shop details necessary for the fabrication and installation of structural steel, pipe, machinery, equipment, including schedules and bending diagrams of reinforcing steel and other detailed drawings, to be furnished by the Contractor as required and provided in the Contract Documents.

u. Words and Phrases. Whenever the words, "as directed," "as required," "as permitted," or words of like effect are used, it shall be understood that the direction, requirement or permission of the District and Engineer is intended. The words, "sufficient," "necessary," "proper," and the like shall mean sufficient, necessary or proper, in the judgment of the District and Engineer. The words "approved," "acceptable," "satisfactory" or words of like import shall mean approved by or acceptable to the District and Engineer.

v. "Surety" means a duly qualified and licensed firm or corporation executing a surety bond or bonds payable to the District, securing the performance of the Contract either in whole or in part.

w. "Time Limits" means all time limits stated in the Contract Documents are of the essence of the Contract.

x. "Laws" means the laws of the State of Washington and the ordinances of King County which govern this construction contract.

y. "Line and Grade" means the horizontal and vertical control for all work carried from the Engineer's points.

z. "Points" means all marks, bench marks, reference points, stakes, hubs, tacks, etc., established by the Engineer for maintaining horizontal and vertical control of the work.

2. ABBREVIATIONS. Whenever the following abbreviations are used on the Plans, Specifications, Proposals and Contracts, they shall be construed to mean the words and terms listed below:

Ac.	Acre
A.C.	Asbestos Cement
Adj.	Adjust
Adj. W.M.	Adjust Water Mains
Asp. Pav.	Asphalt Pavement
Asp. Conc. Pave	Asphaltic Concrete Pavement
A.S.T.M.	American Society for Testing Material
Ave.	Avenue
B.D.	Box Drain
B1.F1.	Blind Flange
B.O.	Blow Off
Blvd.	Boulevard
C.B.	Catch Basin

C.B. (etc.) Note	C.B. (etc.) moved to position shown
Cb. Inl.	Curb Inlet
C.I.P.	Cast Iron Pipe
C.I.V.B.	Cast Iron Valve Box
C.L.	Center Line
Conc.	Concrete
Conc. Cb.	Concrete Curb
Conc. Pav.	Concrete Pavement
Conc. Ret. Wall	Concrete Retaining Wall
Conc. Sew.	Concrete Sewer
Cond.	Conduit
Conn.	Connect
Cr.	Cross
C.R.	Curb Radius
C. to C.	Center to Center
C.W.	Concrete Sidewalk
C.X.W.	Concrete Cross Walk
Dr.	Drive or Driveway
E.	East
Elev.	Elevation
Ex.	Existing
Exc.	Excavation
F.	Flange
Ft.	Foot or Feet
G.I.P.	Galvanized Iron Pipe
G.V.	Gate Valve
H.	Hub
H.H.	Handhole
Hyd.	Hydrant
Hyd. Ext.	Hydrant Extension
In.	Inch
Inl.	Inlet
Lbs.	Pounds
Loc.	Location
L.P.	Lamp Post
Mgn.	Margin
M.C.	Monument Case
M.H.	Manhole
M.J.	Mechanical Joint
N.	North
No.	Number
Pav.	Pavement
P.B.T.	Post Base Transformer
P.C.	Point of Curvature

P.J.M.	Premoulded Expansion Joint Material
Pl.	Place
Pri.	Primary
Prop.	Proposed
P.T.	Point of Tangency
Pvt. Dr.	Private Driveway
R.	Radius
R.C. Wire	Rubber Covered Wire
Reb.	Rebuild
Reconn.	Reconnect
S.	South
Sec.	Secondary
Sew.	Sewer
Sp.	Special
Std.	Standard
Stl.	Steel
Trans.	Transformers
V.C.	Vertical Curve
V. Ch.	Valve Chamber
W.	West
W.M.	Water Main
W.P.	Working Point
W.S.P.	Wood Stave Pipe
X. Walk	Cross Walk
Yd.	Yard

CONTRACT DOCUMENTS

3. **COMPONENT PARTS.** The Contract Documents shall consist of the following listed component parts and all approved revisions thereto:

- a. Agreement
- b. Change Orders
- c. Detail Drawings and Written Instructions
- d. Addenda
- e. Plans
- f. Forms and Legal and Procedural Documents
- g. General Conditions
- h. Special Provisions
- i. Detail Specifications
- j. Performance Bond; Payment Bond
- k. Advertisement for Proposals or Bid
- l. Proposal or Bid Form
- m. Information for Bidders
- n. Instructions to Bidders
- o. Attached Documents (See Section VII)

4. **CONFLICT OF PROVISIONS.** In the event of any conflicting provisions or requirements between the component parts of this Contract, the component parts shall take precedence in the order established in paragraph 3.

5. **CORRELATION AND INTENT OF DOCUMENTS.** The Contract Documents are complementary, and what is called for by any one shall be binding as if called for by all. The intention of the Contract Documents is to include, unless otherwise specifically stated, all labor, materials and equipment for the proper execution of the work, which will result in a complete facility between the contract limits specified, regardless of whether or not every detail has been set forth in the Contract Documents. The omission of any detail shall not be cause for its omission by the Contractor, to jeopardize in any way, the completeness of the project. The cost of such details shall be included in the prices bid and set forth in the proposal items. When materials or work are described in words which have a well known or technical trade meaning, these descriptions shall refer to such recognized standards.

6. **ADDITIONAL INSTRUCTIONS.** In the event the Contract Documents are not sufficiently clear to permit the Contractor to proceed with the work, the Engineer, either upon his own initiative or upon request from the Contractor, may furnish additional instructions in writing,

as necessary. When a request is made by the Contractor, it must be made with ample time for the preparation of the additional instructions by the Engineer, before the work described is undertaken. Such additional instructions shall be consistent with the Contract Documents and shall have the same force and effect as if contained in the Contract Documents.

7. EXISTING FACILITIES. Existing facilities, specifically utilities, shown on the drawings are plotted from information available to the Engineer. This information generally comes from "As-Built" drawings for the convenience of the Contractor and unless otherwise stated the Engineer does not guarantee its completeness, precision or dimensions. This shall not relieve the Contractor from any responsibility under this Contract.

Contractor shall not undertake any excavation work without fully complying with "One Call System" requirements.

8. SOILS AND SUBSURFACE CONDITIONS. Data on soils and conditions shown in the Contract Documents are based on available information and there is no guarantee regarding completeness, accuracy or precision.

9. UNFORESEEN CONDITIONS.

a. Contractor acknowledges that it has inspected the Project site and investigated the character, quality and quantity of surface and subsurface materials and facilities which may be encountered, including the results of exploratory work performed by the Owner or Engineer, if any, as well as information presented by the Plans and Specifications. Contractor acknowledges that the accuracy of the Plans and Specifications and other information furnished by the Owner or Engineer as to location or existence of underground structures, subsurface conditions, character of the soil, composition and quantity of surface and groundwater are not guaranteed by the Owner. The Contractor assumes the risks of uncertainties due to adverse weather, ground, hydrological or similar conditions at the Project site. Unforeseen conditions shall not constitute a claim for additional payment under the terms of this contract or constitute a basis for the cancellation thereof.

b. Contractor has satisfied himself as to the nature and location of the work, the general and local conditions including those bearing upon the transportation, disposal, handling and storage of materials and the availability of water, electric power, access, labor and equipment needed for the prosecution of the work.

c. Pursuant to RCW 19.122, an act relating to underground utilities and prescribing penalties, the Contractor shall:

(i) Call the utilities underground location center for field location of the utilities; and

(ii) Not begin excavation until all known underground facilities in the vicinity of the proposed excavation have been located and marked. Location and dimensions shown on the Plans and Specifications for existing facilities are in accordance with available information without uncovering, measuring or other verification. If a utility is known or suspected of having underground facilities within the area of the proposed excavation, and that utility is not a subscriber to the utilities underground location center, then the contractor shall give individual notice to that utility.

10. ERRORS AND OMISSIONS. If the Contractor, in the course of the work, becomes aware of any errors or omissions in the Contract Documents, or in the layout as given by survey points and instructions, or if he becomes aware of any discrepancy between the Contract Documents and the physical conditions of the work, he shall immediately inform the Engineer, and the Engineer, if he deems it necessary, shall rectify the matter and advise the Contractor accordingly. Any work done after such discovery, until authorized, will be done at the Contractor's expense and risk.

11. CONTRACTOR'S COPIES OF CONTRACT DOCUMENTS. At least one set of Contract Documents shall be kept on the site in good condition, and at all times shall be available to the District and Engineer.

12. AS-BUILT DRAWINGS. Upon completion of the Work, Contractor shall furnish District a complete and accurate set of "As-Built" drawings showing locations of all facilities and appurtenances to within 0.5 feet of actual location in the event of variances greater than such tolerances, or lack of adequate marking, District will not make connections until the Contractor deposits with District an amount equal to the costs which District estimates will be incurred in locating the facilities and added costs of making the connection as a result of such departure from the "As-Built" plans.

13. DOCUMENT OWNERSHIP. All Contract Documents are the property of the District, and shall not be used for any other work.

LEGAL RELATIONS AND RESPONSIBILITY

14. INDEMNITY. To the maximum extent permitted by law, the Contractor shall defend, indemnify and hold harmless District, its Board of Commissioners, employees and agents from any and all liability, claims, demands and/or judgments whatsoever for any injuries, loss or damage to persons or property arising out of the performance of this Contract other than that resulting solely from the negligence of District. In the event of concurrent negligence of District and Contractor, Contractor shall be liable hereunder only to the extent of its negligence.

Contractor's obligation under this paragraph shall not be limited by any workers' compensation, benefits or disability laws, and Contractor waives any immunity that Contractor may have under the Industrial Insurance Act, Title 51 RCW and similar workers compensation, benefit or disability laws. The foregoing waiver was mutually negotiated by the parties.

15. COMPLIANCE WITH LAWS.

a. Federal, State and Local Laws. The Contractor shall fully comply with all federal, state and local laws, regulations and ordinances governing, controlling or limiting, in any way, the work or the persons engaged in the work. The method of compliance with certain specific statutes and regulations are set forth in the paragraphs below, however, said paragraphs are not exclusive.

b. Compliance With Environmental Laws. During construction the Contractor shall comply with all applicable requirements of federal, state and local environmental laws and regulations, including, but not limited to, the Federal Clean Air Act, Federal Clean Water Act, state and local noise ordinances, construction site erosion control regulations, and if applicable, shoreline construction requirements.

c. Compliance With Prevailing Wage Laws. Pursuant to RCW chapter 39.12, among its other requirements, the Contractor shall pay prevailing wages and shall not allow any subcontractor or materialman to be engaged as an offsite manufacturer of nonstandard items to be used in performance of this Contract unless such subcontractors and materialman pay prevailing wages to the extent required by such chapter.

d. Notice to Engineer. If the Contractor observes that the Contract Documents, or any part thereof, are inconsistent or at variance with any law, regulation or ordinance, he shall promptly notify the Engineer in writing, and any necessary changes shall be made by instruction or change order. If the Contractor performs any work contrary to such laws, regulations or ordinances, or prior to obtaining permits, permission under franchises, licenses or bonds as required to be furnished by or obtained by the District, he does so at his own risk and his own expense.

e. Conditions of Permits described in attached documents – See Section VII

16. FRANCHISES, PERMITS AND LICENSES. Permits and licenses of a temporary nature necessary for, and effective during, the prosecution of the work and subsequent guaranty period shall be secured and paid for by the Contractor.

17. ROYALTIES AND PATENTS. The Contractor shall pay all royalties and license fees, and shall hold the District harmless from liability of any nature or kind, including all costs and

legal expenses, for, or on account of, any patented invention, process article or appliance, manufactured for or used in the performance of the Contract, including its use by the District, unless specifically stipulated in the Contract.

18. PUBLIC SAFETY AND CONVENIENCE. The Contractor shall conduct his work with proper consideration for public safety and convenience. This requirement shall include, but is not limited to the maintenance of traffic, access to fire hydrants, use of sidewalks and public and private driveways, and the proper functioning of existing private and public facilities such as gutters, drains, ditches, natural water courses and the like.

Where construction consists of replacement of or modification to existing facilities such as existing sewer or water lines, pumping facilities or treatment works, the Contractor shall provide for the normal maintenance and operation of such facilities²¹ during construction.

The Contractor shall obtain prior approval from the Engineer, the affected owners and the proper governmental authority to obstruct traffic, or to disturb any existing private or public facility.

19. PROTECTION OF PUBLIC AND PRIVATE PROPERTY. The Contractor shall adequately protect public and private property adjoining or affected by the work, including lawns, trees, shrubs, sidewalks, curbs, pavements, utilities, vehicles and structures. Repair of such property resulting from damage by the Contractor's operations shall be the responsibility and expense of the Contractor.

Whenever it is necessary in the course of the Work, to remove or disturb such property or improvements, without limiting the generality thereof, and whether on private or public property, the disturbed property or improvement shall be replaced to a condition equal to that existing prior to the disturbance.

20. PROTECTION OF WORK. The Contractor shall be responsible for the care and protection of the Work, including all materials delivered, all work performed and all loss or damage thereto, until completion and final acceptance by the District.

21. SAFETY AND HEALTH STANDARDS AND ACCIDENT PREVENTION. The Contractor shall comply with the safety standards of applicable building and construction laws and codes, including the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, and United States Department of Labor (Occupational Safety and Health Administration) Safety and Health Regulations for Construction, as published in the Federal Register of December 16, 1972. The Contractor shall be solely and completely responsible for working conditions on or near the jobsite, including safety of all persons and property during performance of work. These requirements shall apply continuously and shall not be limited to normal working hours.

The Contractor shall maintain at a well known place at the jobsite all articles necessary for giving first aid to the injured and, before employees shall be permitted to work at the jobsite, the Contractor shall make standing arrangements for the immediate removal to a hospital or to a doctor's care of persons, including employees, who may be injured on the jobsite.

The duty of the Engineer to review the Contractor's construction performance does not include review of the adequacy of the Contractor's safety measures.

22. **CONTRACTOR'S INSURANCE.** Prior to commencing work, Contractor agrees to obtain and continuously carry during the period this Agreement remains in force including warranty period, such public liability and property damage insurance as the District considers necessary for the proper protection of the parties hereto, on forms approved by the District. **District, Engineer, and the City of Lake Forest Park shall be named as additional insured on such policy.**

Minimum amounts and units of insurance coverage required shall be as follows:

a. **Comprehensive General Liability.** Comprehensive General Liability insurance shall be an occurrence policy with Broad Form Property Damage, Broad Form Contractual, Personal Injury, including other coverages on broadening endorsement, XCU Coverage; products and Completed Operations, and Owners and Contractors Protective, and shall have the following minimum limits:

Bodily Injury Liability	\$1,000,000 each person \$1,000,000 each occurrence
Property Damage Liability	\$1,000,000 each occurrence

b. **Automobile Liability.** Automobile Liability insurance shall cover owned automobiles under long-term lease, hired automobile and nonowned automobiles, and shall have the following minimum limits:

Bodily Injury Liability	\$1,000,000 each person \$1,000,000 each occurrence
Property Damage Liability	\$1,000,000 each occurrence

c. **Workers' Compensation and Employer's Liability.** Statutory for State of Washington, and in compliance with Longshore and Harbor Workers Act if work performed under jurisdiction of said Act as determined by the District.

d. **Protection and Indemnity Liability.** Protection and Indemnity Liability, including Crew Liability for watercraft if applicable as determined by the district. Minimum limits shall be \$1,000,000 each occurrence if work performed under jurisdiction of Jones Act.

e. **Excess Liability Policy.** The policy will follow above coverage and not be limited to items a, b, c and d. Minimum limit of liability shall be \$2,000,000.

Contractor shall pay all premiums and costs in connection with all insurance which contractor shall be required to furnish or provide hereunder.

Contractor shall require all insurance companies issuing any policies of insurance to Contractor and which Contractor is required to procure hereunder, to provide a copy or facsimile of insurance policies required hereunder and to certify to the District in writing that such policies have been issued and are in force and will not be canceled or annulled or materially reduced except upon thirty (30) days' notice in writing to District. Contractor shall not cancel any policies of insurance required hereunder either before or after completion of the work without the consent in writing of the District.

In the event any work to be performed under this Agreement is performed by subcontractor(s), Contractor shall require that they shall comply with the insurance requirements heretofore stated.

CONTROL OF WORK

23. **AUTHORITY OF THE ENGINEER.** The Engineer shall represent the District in an advisory and consulting capacity in engineering matters relating to the Contract. Nothing contained herein or elsewhere in the Contract Documents shall be construed as requiring the Engineer to direct the method or manner of performing any work by the Contractor under this contract. In such capacity, the Engineer:

- a. Shall determine the amount, quality, acceptability and fitness of the work, materials and equipment which are to be paid for under the Contract.
- b. Shall decide all questions relative to the true construction, meaning and intent of the Contract documents.
- c. Shall decide all questions relative to the classification and measurement of quantities and materials, and the fulfillment of this Contract.
- d. Shall have the power to reject or disapprove of Work or material which does not conform to the Contract Documents.
- e. Shall have authority to stop the Work, whenever, in his opinion such stoppage may be necessary to ensure the proper execution of the Contract.
- f. May direct the sequence of Work where such direction is for the purpose of avoiding conflict with other work being performed by the District or by others in the same general locality.

The decision of the Engineer in the matters described above shall be final. However, nothing herein contained shall be taken to relieve the Contractor of any of his obligations or

liabilities under the Contract, nor does Engineer have authority to waive any term, condition or provision of the contract or the obligation of the Contractor to fully perform the Contract.

24. SUGGESTIONS TO THE CONTRACTOR. At various times the District or Engineer may offer suggestions to the Contractor which may or may not be followed at the Contractor's discretion. Any suggestions by the District or the Engineer, if followed by the Contractor, in whole or in part, shall be used at the sole risk and responsibility of the Contractor. The District and the Engineer shall neither assume nor have any responsibility for the consequences of Contractor following such suggestions, and the Contractor shall not be relieved of any obligations under the Contract.

25. NOTICES TO THE CONTRACTOR. Any notice or other communication, given by the District to the Contractor under this Contract, shall be considered properly served upon the Contractor, if deposited in the U.S. Mail postage prepaid in any post office, to the Contractor at his address given in the Contract Documents.

26. COORDINATION. The Contractor shall coordinate the Work with that of the District or any other party employed by the District in proper sequence, to avoid conflicts, to the satisfaction of the Engineer.

27. ASSIGNMENT OF CONTRACT The Contractor shall not assign this Contract, or any part thereof, or any moneys due thereunder, without the prior written consent of the District and the Surety. Consent of the surety will not be required if the Surety has waived its right to notice of assignment. No assignment of this Contract shall be valid unless it contains a provision that the funds to be paid to the party receiving the assignment of contract are subject to a prior lien for services rendered, or material supplied for performance of the Work under the Contract, in favor of all persons, firms or corporation, rendering such services, or supplying such materials.

28. SUBCONTRACTS. The Contractor shall not sublet this Contract or any part thereof, without the prior written consent of the District, which shall be obtained at least five days prior to the start of a proposed subcontractor's work.

No subcontractor will be recognized by the District, and all persons engaged in the work will be considered by the District as employees or agents of the Contractor, and their work shall be fully subject to the provisions of the Contract. The Contractor shall be fully responsible to the District for all work, and all acts and omissions, of the Subcontractor and persons either directly or indirectly employed by Subcontractor.

The District's consent to subcontracting any part of the work shall not relieve the Contractor of any of his obligations under this Contract, or from any responsibility for performance of the work.

29. CONFORMITY TO PLANS AND SPECIFICATIONS. All Work shall be done in strict conformity to the Plans and Specifications, to the exact lines and grades fixed by the Engineer, and to such instructions with reference thereto as the Engineer may give from time to time.

The District shall have the right to make reasonable changes in dimensions and location of pipe and/or other materials and equipment, if said action will expedite the work or result in a better constructed and more easily operable facility without incurring any liability to Contractor or Contractor's subcontractor.

30. SUPERVISION OF WORK BY CONTRACTOR. The Contractor shall give full and proper supervision to the work, using his best skill and attention. The Contractor shall keep on the work during its progress, a competent superintendent and necessary assistants, all of whom shall be satisfactory to the Engineer. The Superintendent shall represent the Contractor in his absence and all directions given to him shall be binding as if given to the Contractor.

31. WORKMANSHIP AND MATERIALS. The Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation and all other facilities necessary for the execution and completion of the work.

The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the work any unfit person nor any one not skilled in the work assigned to him.

All workmanship, equipment, materials and articles incorporated in the work shall be new, shall be the best available grade, and shall be of a quality equal to, or better than, that specified.

Whenever in the Contract Documents, any materials, articles, type of construction or process are specified by patent or proprietary name, by name of the manufacturer, or by catalogue number, such specification shall be considered used for the purpose of establishing a standard of quality for describing the material or process desired, and shall be deemed to be followed by the words "or equal" whether or not such words appear.

The Contract shall file three (3) copies of a materials and equipment list with the Engineer prior to proceeding with construction. This list shall include the quantity, manufacturer and model number (if applicable) of materials and equipment to be installed under the Contract. This list will be checked with reasonable promptness by the Engineer regarding conformity with the plans and specifications. The Engineer shall be sole judge in the question of "or equal" of any materials and equipment proposed by the Contractor. The Contractor shall pay to the District the cost of tests and evaluations by the Engineer to determine acceptability of any alternate proposed by the Contractor,

in accordance with the established rates of Engineer for time and expense work, the total cost of which may be charged by the district as additional fees.

The Contractor shall make any required corrections and file two (2) corrected copies with the Engineer within one week of notification of deficient or unacceptable items. The Engineer's review and acceptance of the lists shall not relieve the Contractor of his obligations under paragraph 10.

32. WARRANTY OF TITLE FOR MATERIALS. No material, supplies or equipment for the work shall be purchased where an interest in any part thereof is retained by the seller or supplier. The Contractor warrants full title to all material, supplies and equipment installed or incorporated in the work, and upon completion agrees to deliver the work to the Owner free from any claims, liens or charges. He further agrees that neither he, nor any person, firm or corporation furnishing any materials or labor for any work covered by this Contract, shall have any right to a lien upon the premises or any improvement or any appurtenances thereon. It is provided that this shall not preclude the Contractor from installing metering and other similar equipment belonging to utility companies or to municipalities. In the event of installation of such metering devices or equipment, the Contractor shall advise the owner of the ownership thereof. Nothing contained in this paragraph shall impair the rights of persons furnishing materials or labor under any bond given by the Contractor for their protection, or impair any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontracts and materials contracts, and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

33. MATERIALS AND EQUIPMENT FURNISHED BY DISTRICT. Contractor shall receive, inspect, store and accept all District furnished items of material and equipment, subject only to latent defects. Claim shall be made in writing within five (5) days after discovery of any latent defect. Damages or loss shall be limited to the cost of and labor for replacement of any such damaged item. In any event, the liability of District for furnishing an item having a latent defect is limited to damage or loss resulting from use thereof, only to the extent that such loss or damage is recoverable by the District against the supplier. District shall include in its claim to the supplier the amount of damage claimed to the Contractor or Contractor's contractor or District may assign to Contractor any claim which District would otherwise have against any such suppliers, and the sole remedy of Contractor shall be by suit or action on such assigned claim. District agrees to cooperate with Contractor in furnishing facts or data to assist Contractor in prosecuting any action on an assigned claim.

34. STORAGE OF MATERIALS AND EQUIPMENT. Materials and equipment shall be safely stored by the Contractor to ensure the preservation of their quality and fitness for the work. Stored equipment and materials shall be placed so as to facilitate inspection. The Contractor shall be responsible for all loss and/or damage that may occur to all materials and equipment until the same are incorporated in the work and until the completion and final acceptance of the work by the District.

35. SHOP DRAWINGS. The Contractor shall submit with such promptness as to cause no delay in his own work or in that of any other Contractor, three (3) copies of all shop or setting drawings, and schedules required for the work of the various trades in the performance of the work, or where requested by the Engineer.

The Engineer shall pass on the shop drawings with reasonable promptness. If corrections are required, the Contractor shall make the corrections and within one week shall file with the Engineer three (3) corrected copies and furnish such other copies as may be needed. The Engineer will return at least one (1) set of approved drawings to the Contractor. No material shall be fabricated until the shop drawings have been approved by the Engineer.

The Engineer's approval of any shop drawing is understood to be an acceptance of the character and sufficiency of the details and not a check on any dimension, and will not relieve the Contractor from responsibility for errors of any sort in shop drawings or schedules, whether or not such errors are found by the Engineer in his checking or such details.

No charges shall be made in any shop drawing after it has been approved except by the consent or the direction of the Engineer in writing.

The Contractor shall be responsible for all changes in adjacent or related work necessitated by changes in shop details, whether or not these changes are shown in shop drawings.

36. LAND FOR WORK. The Owner will furnish all lands and rights-of-way necessary for carrying out the work, and will use diligence in acquiring said lands and rights-of-way as speedily as possible.

In the event that all lands and rights-of-ways are not obtained before construction begins, the Contractor shall begin his work upon such land rights-of-way as the Owner may have previously acquired. No claim for damages whatever will be allowed by reason of delay in obtaining the remaining lands and rights-of-way.

Should the Owner be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the giving of notice to proceed, by reason of any litigation, or by reason of his inability to procure any lands or rights-of-way for said work, the

Contractor shall not be entitled to make or assert claim for damage by reason of said delay or to withdraw from the Contract except by consent of the Owner.

Time for completion of the work will be extended to such time as the Owner determines will compensate for the time lost by such delay, such determination to be set forth in writing; provided that in any event, the Contractor may terminate in accordance with paragraph 54.

37. ENGINEER TO GIVE LOCATION. Contractor shall not proceed with the work until timely demand in writing has been made upon Engineer for points, instructions and construction staking, and until Contractor has received said points instructions, and construction staking.

The Engineer will provide construction staking for location of the various parts of the work and give such lines and grades as necessary in his opinion, for the proper construction of the work. Working operations may be suspended by the Engineer for such brief and reasonable time, as may be required, for the giving of lines and grades and taking of measurements for the location of work. No claim shall be made by the Contractor for extra compensation due to such delays of work. The decision of the Engineer shall be final as to the reasonableness and necessity of the aforesaid operations.

The Contractor shall transfer said lines, grades and measurements, from the points given, to his own work at his own expense.

38. STAKES AND MARKS TO BE PRESERVED. All stakes, bench marks and reference points established by the Engineer shall be carefully preserved by the Contractor. In the case of their destruction by the Contractor or Contractor's subcontractor or any of his employees such stakes and marks will be replaced by the Engineer at the Contractor's expense.

All stakes, bench marks, reference points and official monuments, owned by others, shall be carefully preserved or replaced. In the event any such markers are disturbed as a result of the Contractor's operations, the cost of replacement shall be borne by the Contractor. Replacement markers shall be of a type and quality equal to that originally existing and satisfactory to the Engineer. Replaced markers shall be located so as to clear existing utilities or any other interferences and placed in a manner consistent with recognized engineering and surveying practice.

39. ENGINEER TO HAVE ACCESS. The Engineer at all times shall have access to the work and to the locations where the work is in preparation. The Contractor at all times shall maintain proper facilities for such access.

Where applicable, the Contractor shall also provide proper facilities for access to all sites of contract work for representatives of federal, state and local regulatory agencies, such as the U.S.

Environmental Protection Agency, the State Water Pollution Control Agency and Health Departments.

40. INSPECTION AND TESTS.

a. General. Inspection and test of work and materials shall be strictly for the benefit of the District and nothing contained herein shall be construed to relieve the Contractor of his obligations under the Contract.

b. Scheduled Inspections and Tests. The following scheduled inspections and tests shall be conducted by the Engineer:

- (i) Start of construction inspection.
- (ii) Test inspections.
- (iii) Final inspection.
- (iv) End of Warranty Period inspection.

Other scheduled inspections and tests may be required to comply with other sections of these contract documents, Engineer's instructions, laws or ordinances. Some inspections and tests may be conducted by an authority other than the Engineer.

c. Requests For Inspections and Tests. The Contractor shall give the Engineer timely notice when the state of the work is such that a scheduled inspection and test can be conducted. When the inspection and test is to be conducted by authorities other than the Engineer, the Contractor shall make all arrangements through the Engineer.

d. Intermediate Inspections and Tests. Intermediate inspections and tests during construction will be conducted as deemed necessary by the Engineer and other governing authorities.

e. Examination of Materials. The Contractor shall furnish such samples, testing and labor as may be required for the Engineer to make a thorough inspection and examination of materials to be used in the work. The neglect or failure on the part of the Engineer to condemn or reject inferior material or work shall not be construed to be acceptance of the materials or the work.

f. Certification of Materials. At the request of the Engineer, the Contractor's material suppliers may be required to furnish a certification from a recognized testing laboratory, to certify that the material supplied, and for which the certification was requested, is in full compliance with the Contract Documents.

g. Reflection of Materials and Workmanship. The Engineer shall have the right to reject materials and workmanship which are defective or to require their correction.

Rejected workmanship shall be corrected and rejected materials shall be removed from the premises.

h. Questionable Work. Should it be necessary for the Engineer, prior to final acceptance of the work, to make an inspection or reinspection of work already completed by removing or tearing out any portion thereof, the Contractor shall on request, promptly furnish all necessary facilities, labor and materials to do so.

- i. Responsibility For Costs. The following inspection and testing costs shall be incurred by the Contractor:
 - (i) Costs of material samples and testing.
 - (ii) Costs of labor, equipment and materials to perform required tests of the work.
 - (iii) Costs of uncovering and correcting work for inspections or testings that were covered without approval or consent of the Engineer.
 - (iv) Costs of uncovering questionable work and corrections thereof prior to final acceptance when such work is found to be defective in any respect.
 - (v) All costs incurred by the District for all further inspections and tests of materials and work rejected at scheduled inspections.
 - (vi) Costs for overtime inspection in accordance with definition of overtime inspection given in paragraph 48.

41. CORRECTION OF DEFECTIVE WORK. The Contractor shall promptly remove from the construction site all work or materials condemned by the Engineer as failing to conform to the Contract, whether or not incorporated in the Work. The Contractor shall promptly replace and reexecute such defective work in accordance with the intent of the Contract and without expense to the District and shall bear the expense of making good all work of others destroyed or damaged by such removal or replacement. Failure or omission on the part of the Engineer or its representatives to condemn unsuitable, inferior or defective work and/or labor or material or equipment furnished under the Contract shall not release the Contractor or his bond from performing the work in accordance with the Contract Documents.

In the event the Contractor does not accomplish corrections and/or repairs after reasonable notice at or within the time specified, the work will be otherwise accomplished by District and the Cost thereof shall be borne by the Contractor.

If, as a result of the failure of Contractor to make corrections, and/or repairs, or in the event of an emergency and time does not permit the District to give notice to the Contractor before m

making corrections and/or repairs such as where damage may result from delay in making of corrections and/or repairs or where loss of service to customers will result, temporary needed corrections and/or repairs may be made by the District and the cost thereof shall be borne by the Contractor.

When corrections and/or repairs of defects are made, the Contractor shall warrant such corrections and/or repairs for one year after acceptance of the corrections and/or repairs by the District.

The Contractor shall be responsible for any loss, damage, costs and expenses incurred by the District, resulting from defects in the work, including actual damages, costs of materials and labor expended by District in making emergency corrections and/or repairs, costs of engineering, inspection, legal services and District's administrative overhead costs.

42. UTILIZATION OF DEFECTIVE WORK. In the event that the Owner decides that the defective work can be utilized, he may elect to make an equitable deduction rather than require correction. If corrections are ordered, such corrections of defective work shall be made to the Owner's satisfaction before final payment is made, but the final payment shall not be construed as a waiver of the Owner's right to demand correction of faulty workmanship or material which becomes apparent during the guarantee period stipulated in the Contract Documents.

43. GUARANTY. For a period of one (1) year from the date of final acceptance of the work, all parts of the work shall be guaranteed by the Contractor to remain in proper working order and condition except where abused or neglected by the Owner, the Contractor shall work to repair or replace, at his own expense, any work or material that may prove to be defective during the period of this guarantee. Said repairs and replacement work shall be completed within a reasonable time.

In the event the Contractor does not accomplish corrections at the time specified, the work will be otherwise accomplished and the cost shall be borne by the Contractor.

In emergencies, where damage may result from delay, or where loss of service may result, such corrections may be made by the Owner, in which case the cost shall be borne by the Contractor.

When corrections of defects are made, the Contractor shall warrant such corrections for one year after acceptance of the corrections by the Owner.

The Contractor shall be responsible for any expenses incurred by the Owner, resulting from defects in the work, including actual damages, costs of materials and labor extended by Owner in making emergency repairs, costs of engineering, inspection, legal services and Owner's overhead.

PROSECUTION AND PROGRESS OF WORK

44. **NOTICE TO PROCEED.** Unless another date is specified by District or Engineer within twenty (20) days after the execution of the Contract, written notice to proceed will be given by the Owner to the Contractor. The Contractor shall begin construction within 10 days after the date of delivery of the notice to proceed. Notwithstanding any other provision of the Contract, the Owner shall not be obligated to accept or to pay for any work furnished by the Contractor prior to delivery of notice to proceed whether or not the owner has knowledge of the furnishing of such work.

45. **CONTRACT TIME.** Time shall be strictly of the essence of the Contract. The Contractor shall promptly begin the work under the Contract and all portions of the project made the subject of the Contract shall be started and so prosecuted that they shall be completed and ready for full use in the time stated in the Special Provisions or other Contract documents. It is the responsibility of the Contractor to complete the work within the Contract time. The Owner makes no promise or representation that this can or will be done.

46. **CONSTRUCTION SCHEDULE.** Before beginning the work, the Contractor shall submit a proposed construction schedule indicating the various subdivisions of the work, the dates of commencing and finishing each. The schedule shall show the time allowed for testing and other required procedures prior to the works being put into operation. No later than the 5th day of each calendar month, the Contractor shall submit a copy of the construction schedule with notes thereon indicating the percentage completion of each subdivision of the work on the last day of the previous month.

47. **HOURS OF LABOR.** Pursuant to the Revised Code of Washington 49.28.010 and 49.28.030, eight hours of labor shall constitute a legal day's work, and the Contractor shall not require more than eight hours of labor in a day from any person employed by him in the performance of the work under the Contract. Failure of the Contractor to perform the work in accordance with this policy of the State of Washington shall be deemed to be a failure on his part to comply with the provisions of the Contract within the meaning of paragraph 53, "Termination of Work By Owner."

48. **OVERTIME WORK AND OVERTIME INSPECTION.** Overtime and shift work may be established by the Contractor upon the giving of written notice to the Engineer. No work other than overtime and shift work so established shall be done during hours other than normal working hours or Saturdays, Sundays or legal holidays, except work that is necessary for the proper care and protection of the work already performed or except in case of an emergency.

Overtime inspection shall include inspection performed during other than normal working hours on any weekday, and all inspection performed on Saturdays, Sundays and legal holidays. All costs of overtime inspection shall be paid each month by the Contractor to the engineer for engineering, inspection, general supervision, and other overhead expenses which are directly chargeable to the overtime work. In the event the Contractor fails to pay such costs by the 20th day of the month following the furnishing of such service, such payment shall be deducted from payments due the Contractor.

49. UNFAVORABLE WEATHER AND OTHER CONDITIONS. During unfavorable weather and other conditions the Contractor shall prosecute only those portions of the work that will not be damaged thereby. No work whose quality or efficiency will be unfavorably affected shall be constructed while these conditions remain unless the Contractor can overcome said conditions by special means or precautions acceptable to the Engineer.

50. DELAYS IN COMPLETION OF WORK AND EXTENSIONS OF TIME. If the Contractor is delayed at any time in the progress of the work by any of the following causes, the Contract time shall be extended for such reasonable time as the engineer shall determine. The Contractor agrees to complete the work within the Contract time as thus extended. Such extensions shall postpone the beginning of period for payment of liquidated damages, if provided for, but they and the events producing them shall not be ground for claim by the Contractor of damages or for additional costs, expenses, overhead or profit or other compensation.

- a. Floods, fire, strikes, lockouts, war, acts of the public enemy, acts of God.
- b. Change Orders.
- c. Acts of performance or delays in performance by other Contractors employed by Owner or their subcontractors.
- d. Causes beyond the control of the Contractor, the delays from which could not have been avoided through the exercise of reasonable care, prudence, foresight and diligence on his part and that of his subcontractors.

All claims for extension of time shall be made in writing to the engineer no more than fifteen (15) days after the Contractor knows or by reasonable diligence should know of the event causing or likely to cause the delay; otherwise they shall be waived. In the case of a continuing cause of delay only one claim is necessary. In the case of change order work he must make the claim for extension within fifteen (15) days after receiving from the engineer the notice to proceed with the change order work.

51. SUSPENSION OF WORK. The Owner may at any time suspend the work, or any part thereof, by giving five (5) days' written notice to the Contractor. The work shall be resumed by the Contractor within ten (10) days of the Owner's written notice to the Contractor to resume work.

Suspension of the work shall not furnish any grounds for claims by the Contractor for damages or for additional costs, expenses, overhead, profit or other compensation, but the period of such suspensions shall be taken into consideration in determining the revised date for completion. The Contractor shall not suspend work under the Contract without the written order of the Owner. Contractor shall take every precaution to prevent any damage or unreasonable deterioration of the work during the time it is suspended.

Upon failure of the Contractor to perform work under the Contract in accordance with its provisions, the Owner may suspend the work for such period as he may deem necessary. Time lost by reason of such failure or in replacing improper work or material shall not furnish any ground to the Contractor for claiming an extension of time or extra compensation, and shall not release the Contractor from damages or liability from failure to complete the work.

52. TERMINATION OF CONTRACT BY OWNER. The Owner may terminate the Contract and take possession of the premises and of all materials thereon and finish the work by whatever methods he may deem expedient, upon the occurrence of any one or more events hereafter specified, and receipt of the certificate by the Engineer that sufficient cause exists to justify such action:

- a. If the contractor should be adjudged a bankrupt.
- b. If the Contractor should make a general assignment for the benefit of his creditors.
- c. If a receiver should be appointed on the account of insolvency of Contractor.
- d. If Contractor should persistently or repeatedly refuse or fail to supply a sufficient number of properly skilled workmen or proper materials for completion of the work.
- e. If the Contractor should fail to complete the work within the time specified in the Contract.
- f. If the Contractor should fail to make prompt payment to Subcontractors or for material or labor.
- g. If Contractor should persistently disregard laws, ordinances or regulations of federal, state or municipal agencies or subdivisions thereof.
- h. If the Contractor should persistently disregard instructions of Engineer, or otherwise be guilty of a substantial violation of the Contract.

Owner shall give Contractor five (5) days' written notice to cure the default, and if not cured to the satisfaction of Owner as certified by Engineer, the Owner may, upon three (3) days' written notice, elect to so terminate. Any such termination shall be without prejudice to any other right or remedy which Owner may have against Contractor.

In the event of the failure of Contractor to cure the default of which notice is given as above provided, or if the Contractor abandons the work undertaken under the Contract, Owner may, at his option, with such written notice to the surety and without any written notice to Contractor, transfer the employment of said work from Contractor to surety. Upon receipt of such notice, the surety shall enter upon the premises and take possession of all materials, tools and appliances thereon for the purpose of completing the work included under this Contract and employ, by contract or otherwise, any person or persons to finish the work and provide the material therefor, without termination of the continuing full force and effect of the Contract. In case of transfer of such employment to the surety, the surety shall be paid in its own name on estimates covering the work subsequently performed under the terms of the Contract and according to the terms hereof, without any right of Contractor to make any claims for the same or any part thereof.

In case of termination of Contract by Owner as aforesaid, Contractor shall not be entitled to receive any balance of the amount to be paid under this Contract until the work shall have been fully furnished. At such time, if the unpaid balance of the amount to be paid under this Contract exceeds the expense incurred by Owner in finishing the work together with all damages sustained or which may be sustained by Owner by reason of such refusal, neglect, failure or discontinuance of employment, such excess shall be paid by Owner to Contractor. If such expense and damages shall exceed the unpaid balance, Contractor and his surety and each thereof shall be jointly and severally liable therefor to Owner and shall pay the difference to Owner. Such expense and damage shall include all reasonable legal costs incurred by Owner in the employment of attorneys to protect the rights and interests of Owner under the Contract.

53. TERMINATION OF CONTRACT BY CONTRACTOR. The Contractor may stop work and terminate this Contract upon the occurrence of any one or more of the events hereafter specified.

a. If the work should be stopped by order of any court, or other public authority for a period of ninety (90) working days, through no act or fault of the Contractor, anyone employed by him, or any of his Subcontractors.

b. If the Owner suspends the work for any reason other than act or neglect of the Contractor for a period of one hundred and eighty (180) consecutive calendar days.

c. If payments due the Contractor under this Contract are unreasonably delayed. Contractor shall give Owner ten (10) days' written notice of termination of Contract.

Upon termination of the Contract, the Engineer shall estimate all of the work done up to the time of such termination and the Contractor shall be entitled to receive payment therefor in the manner provided in the Contract.

The Owner will pay the Contractor a termination payment of five (5) percent of the difference between the Contract price and the sum of the payments made to the Contractor for work done up to the termination date of the Contract. This payment shall be full settlement for the Contractor's inconvenience, loss of anticipated profits, cost of removing his equipment from the site, and all other expenses whatsoever. The Contractor shall be entitled to no further payment whatsoever for the work.

54. USE OF COMPLETED PORTIONS OF WORK. The Owner shall have the right to take possession of and use any completed or partially completed portions of the work; ~~notwithstanding that the time may not have expired for completing the entire work.~~ Such taking possession and use shall not be deemed to be completion of the Contract in respect to such work nor shall the same be deemed to be any acceptance of any work not completed in accordance with the Contract Documents.

55. CLEANUP AND RESTORATION. From time to time, the Contractor shall clean up all refuse, rubbish, scrap material and debris caused by his operations, so that the site of the work shall at all times be neat, orderly and presentable.

Upon completion of the work the Contractor shall remove all equipment, unused materials and refuse, and shall leave the work area in a neat and orderly condition. All damaged or otherwise affected areas and items shall be restored to a condition equal to or better than that originally existing.

Cleanup and restoration shall be subject to the approval of the Engineer and must be accomplished before the Contract will be considered complete and final payment made.

56. COMPLETION TIME AND LIQUIDATED DAMAGES. The work shall be completed within **150 calendar days**, following issuance of notice to proceed.

Failure to complete the work within the specified time, except for reasons specified in paragraphs 50 and 51 of the General Conditions, shall subject the Contractor to liquidated damages in the amount of **fifty dollars (\$50) per calendar day for each day beyond the completion date for the first 14 days and \$200 per day thereafter (some items may qualify for delay at the discretion of the Engineer)**. The parties agree that Owner's damages in the event of delays in performance of this Contract are difficult to forecast but nevertheless such amounts represent a reasonable compromise and estimate of such damages. Contractor agrees to pay such liquidated damage amounts as calculated by Owner. Alternatively, liquidated damages may be deducted from the Contract Price and any payment due hereunder.

PAYMENT

57. **GENERAL.** The Contractor shall pay, and cause his Subcontractors to pay, any and all accounts for labor, services and material, used by him and his Subcontractors during the fulfillment of the Contract, as and when such accounts become due. Said payments shall include worker's compensation premiums, state unemployment, Federal social security payments and all other wage and salary deductions required by law.

The Contractor shall furnish the Owner proof of payment of such accounts in the form designated by the Owner, as often as requested. Should payment of such accounts not be made when and as they become due, the Owner shall have the right to make the payments on behalf of the Contractor and to deduct the amounts paid from payments due the Contractor.

The Contractor shall indemnify and hold harmless the Owner from any liability or expense, including legal expenses, arising out of claims or subcontractors, material, men or those furnishing labor or services in connection with the fulfillment of this Contract.

58. **CHANGES IN THE QUANTITIES OF CONTRACT ITEMS.** The Owner reserves the right to make changes in the Work within the general scope of the Contract, the Contract amount and the Contract time being adjusted accordingly. Such changes shall be made in writing by the Engineer and shall not be considered a waiver of any condition of the Contract nor invalidate any of the provisions thereof.

It is provided however, that a supplemental agreement shall be executed by both parties of the Contract before any change is made which involves:

- a. An extension or shortening of the length of the project by more than twenty-five percent (25%).
- b. An increase or decrease of more than twenty-five percent (25%) of the total cost of the work calculated from the original proposal quantities and the unit contract prices.

59. **EXTRA WORK AND ALTERATIONS.** The Owner reserves the right to order extra work or to alter the work without invalidating the Contract. Except for emergencies and minor changes not inconsistent with the purposes of the work, all extra work or alterations shall be preceded by a supplemental agreement executed by both parties of the Contract. All extra work or alterations shall be subject to the conditions of the original Contract.

The value of any extra work shall be determined in one or more of the following ways:

- a. By agreement on a lump sum.
- b. By unit prices named in the Contract or subsequently agreed upon.

c. By time and expense basis. Payment will be made for the actual cost of labor, payroll taxes, material, equipment rental and field supervision required, with the addition of fifteen percent (15%) to cover profit, overhead, use of small tools, taxes, insurance, bookkeeping and all other incidental costs.

In such cases the Contractor shall keep and present in such form as the Engineer may direct a correct account of such costs, together with supporting time cards and vouchers. The Engineer shall certify the amount due the Contractor and pending determination of final value, payments on account shall be made on the Engineer's estimate.

60. APPLICATION FOR PAYMENT. At least five (5) working days before each payment falls due, Contractor shall submit to Engineer two (2) copies of an itemized application for payment, supported to the extent required by Engineer by receipts or other vouchers showing payment for materials and labor, payments to Subcontractors, and such other evidence of Contractor's right to payment as Engineer may direct.

Contractor shall be entitled to monthly progress payments corresponding to the stage of the work. Progress estimates will be prepared by Engineer not later than thirty (30) days after commencing work, and every thirty (30) days thereafter, if so entitled, for the duration of construction. These shall be based upon an approximate estimate of quantities of work completed and considered acceptable, multiplied by the unit prices established in the Contract. Deduction from each monthly progress payment in the amount of the retained percentage as required by law will be made. Cost of materials properly stored, protected and insured at the site of the work will be paid on monthly estimates only when provided for in the special provisions and then only for the specific materials listed therein for partial payment. In preparing the monthly estimates, advancement will be made therein for ninety-five percent (95%) of the cost of such materials, as evidenced by invoices to Contractor. Advances will not be made for any item of material amounting to less than five hundred dollars (\$500.00). All materials must conform to the requirements of these specifications. However, advancement may have been made for same in the estimates. Deductions at the same rates, and equal in amount to the advancements, will be made on the estimates as the material is used.

Quantities used for progress estimates shall be considered only as approximate and provisional, and shall be subject to recalculation, adjustment and correction by Engineer in subsequent progress estimates and in final estimates. Inclusion of any quantities in progress estimates, or failure to disapprove the work at the time of progress estimates, shall not be construed as acceptance of corresponding work or materials.

61. CHARGES TO THE CONTRACTOR. All cost charges to the Contractor under the terms of the Contract shall be paid by the Contractor to the Owner on demand. The Owner shall have the right to deduct such charges from payments due the Contractor or to recover such charges from the Contractor or his surety.

62. PAYMENT OF TAXES. The Contractor shall pay promptly when due all excises, license fees, industrial insurance premiums and all state and local sales and use taxes accruing during this Contract in a manner as required by the laws and statutes of the state and political subdivisions where the project is located. The Contractor shall withhold and pay any and all withholding taxes, whether state or federal, and pay all social security charges and also all state unemployment compensation charges, and pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws.

In the event of the Contractor's default on the payment of taxes, excises and license fees, the Owner shall have the authority to withhold from any payment due the Contractor under this Contract, the estimated amount of such accrued and accruing taxes, excises, premiums and license fees for the benefit of all taxing authorities to which said Contractor is liable.

Owner shall have the right, but not the obligation, to inspect Contractor's records to determine or confirm that Contractor has made all payments required by this section. Owner may rely upon written statements and certifications by Owner and state agencies attesting to all such payments.

63. PAYMENTS WITHHELD. Notwithstanding the issuance of any payment certificate, Owner may withhold any payment, or portion of payment, or recover any payment theretofore made, to such extent as may be necessary to protect himself from loss on account of:

- a. Defective work not remedied.
- b. Claims filed or written notice that valid claims will be filed.
- c. Failure of Contractor to make payments properly to subcontractors or supplies of material or labor, industrial insurance premiums or taxes due the State of Washington.
- d. Reasonable doubt that the contract can be completed for the balance then unpaid.
- e. Liquidated damages or other claims against Contractor by Owner.
- f. Damage to another Contractor.
- g. Failure of Contractor to furnish invoices to support application for payment for materials not incorporated in the work but delivered and suitably stored at the site.

64. RELEASE OF LIENS OR CLAIMS. Before the Owner pays the Contractor his final payment for the work, the Contractor shall sign and deliver to the Owner a release of liens or claims sworn to under oath and duly notarized. The release shall state that the Contractor has satisfied all claims and indebtedness of every nature in any way connected with the work, including (but not limiting the generality of the foregoing) all taxes, payrolls, amounts due to Subcontractors, accounts for labor performed and materials furnished, incidental services, liens and judgments.

If any lien or claim remains unsatisfied after all payments to the Contractor are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such a lien or claim, including all costs and a reasonable attorney's fee.

65. FINAL PAYMENT. Upon completion of all work under this contract, the Contractor shall notify the Engineer, in writing, that he has completed his part of the Contract, provide a Public Works Tax Release, and shall request final payment. If the work has been completed to the extent of the Contract Documents, the Engineer will recommend acceptance of the completed work and submit a final estimate of the amount due the Contractor under this Contract. Upon approval of this final estimate by the Owner and compliance with provisions in paragraph 64, "Release of Liens or Claims," and other provisions as may be applicable, the Owner shall pay to the Contractor all moneys due him under the provisions of these Contract Documents.

Written notice by the Contractor to Engineer that he has completed his part of the Contract, together with his request for final payment, shall be deemed to constitute and shall constitute a certification by the Contractor of complete compliance by Contractor with all pertinent statutes in connection with all work pertaining to all claims for payment on this Contract.

Payment and release of the retainage to the Contractor shall not occur until full compliance with Ch. 60.28 occurs and the Contractor provides legally sufficient evidence of payment of industrial insurance premiums, unemployment insurance taxes, payment of prevailing wages and payment of all taxes due the State of Washington arising out of the work

66. ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE. The acceptance by the Contractor of the final payment shall release the Owner and the Engineer, as agent of the Owner, from all claims and all liability to the Contractor for all things done or furnished in connection with the work, and every act of the Owner and others relating to or arising out of the work. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from obligations under this Contract and the performance, payment and other bonds and warranties as herein provided.

VI. DETAILED SPECIFICATIONS

The following section specifies the use of materials and methods of construction acceptable to the District. The work may also be required to meet other applicable Washington State and local codes including:

- Washington Department of Health standards
- Washington Labor and Industries (L&I). All work is to be completed in accordance with Washington State Prevailing Wage standards. A current copy of prevailing wage rates is included in Part IV AGREEMENT AND CONTRACT FORMS.
- Specific instructions not identified here shall meet City of Seattle Standard Specifications for Road Bridge and Municipal Construction 2017 or later

SECTION VI.1. WATERWORKS MATERIALS

VI.1.a GENERAL

All contractor supplied materials shall be new and undamaged. Unless otherwise approved by the Inspector, the same manufacturer of each item shall be used throughout the Work. All reference specifications herein shall be of the latest revision.

VI.1.b PIPE

1. Ductile Iron Pipe (Preferred)

- a. Standard: AWWA C151
- b. Cement lining: AWWA Standard C104
- c. Exterior Coating: Bituminous coated per AWWA C104
- d. Class: Class 52 or as specified in the Special Provisions/Contract Drawings
- e. Type of Joint: Tyton joint or as specified in the Special Provisions/Contract Drawings

2. HDPE (High Density PolyEthylene)

- a. Standard: AWWA C906 and NSF 61.
- b. Class: DR 11
- c. Standard Dimension Ratio: DR 11
- l. d. Joints: Flange ends by fusion
Fusion joints to be carried out by trained technicians in accordance with manufacturer's requirements. Submittal required of fusion records to include date, temperature, personnel and other as recommended by manufacturer.

3. Copper Service Pipe

Type "K" annealed, use standard brass compression fittings.

4. Poly Water Service Tube (HDPE)

- a. Standards: High molecular weight polyethylene (AWWA C901, ASTM 1248) type 3, grade 3 (PE3408) DRISCO, of all virgin material (CS-255-63). Must carry NSF seal of approval. Two sizes will be permitted for permanent piping: 1" and 2" size. 1" pipe shall be iron pipe size and 2" pipe shall be iron pipe size.
- b. Type of Joint: Standard brass compression fittings.
- c. Working pressure: 200 psi at 73.4°F.

VI.1.c FITTINGS

1. Cast or Ductile Iron

- a. Standard: AWWA C110
- b. Compact (Ductile Iron): Per AWWA C153.
- c. Class: At least equal to class of pipe.
- d. Type of Joints: Compatible with pipe or with an adapter or as specified in the Special Provision/Contract Drawings
- e. Lining: Cement lining per AWWA C104.

2. Fittings for PVC Pipe

"Ring Tite" as manufactured by Tifco or equal.

3. Special

Special fittings shall be as specified in the Special Provisions/Contract Drawings

VI.1.d VALVES

1. Gate Valves

- a. Standard: AWWA C515
- b. Description: Gate valves shall be ductile iron body, resilient wedge valves. Stem nuts shall be identical with District's existing equipment. All valves shall open counter-clockwise and be of the non-rising stem type.
- c. Working pressure: 150 psi unless specified otherwise.
- d. Type of Joint: Unless otherwise noted valves shall be flanged with machined flange faces or mechanical joint.

2. Butterfly Valves

Butterfly valves shall in design, material, and workmanship, conform to the standards of AWWA C504. All other specifications shall be provided in the Special Provisions/Contract Drawings.

3. Double Check Valves (Back Flow Prevention)

All back flow prevention devices shall meet Washington State Department of Health "Approved Cross-Connection Control Devices" Listings. They shall be tested and certified at time of installation.

4. Air and Vacuum Release Valves

Air and vacuum release valves shall be Rennselear Figure 372, or equal, as approved by the Engineer.

5. Control Valves

Pressure Reducing, Pressure Relief, Pump Control and other controlling Globe Valves shall be CLA-VAL Automatic Valve or approved equal.

- a. Pressure reducing and pressure sustaining valves shall be CLA-VAL Model 92-01 BCS (Auxiliary valve 92-01 BCS) with epoxy coating, a valve position indicator, open & close speed control, a sight gage, spring range 30 - 300 psi.

VI. Valve Boxes

Valve boxes and tops shall be cast iron City of Seattle standard cover with drop handle. Bottom section length shall be 42" minimum adjusted to fit field condition for the particular project or as specified in the Special Provision/Contract Drawings.

VI.1.e FIRE HYDRANT ASSEMBLIES

1. Hydrant

Standard: AWWA C502

2. Description (See also Detail for Fire Hydrant)

Hydrants shall be American Darling or Mueller 5-1/4" type or other approved equal, with MJ end. Operating nuts shall be identical with District's existing equipment. **Connection on pumper ports shall match the standards of Northshore Fire District.** The hydrants shall be equipped with one (1) 5" pumper nozzle including 4" Stortz Fitting, two (2) 2½" hose ports NS . thread, 1¼" pentagon operating nuts, and open by turning counter clockwise. Hydrant valve diameter shall be a minimum of 5-1/4". Hydrants shall be flanged at ground line. Hydrant shall be so constructed that the direction of pumper connection may be rotated to face the roadway. Hydrant shall be of traffic type with designed replaceable break points and shall have a variable length riser. All nozzles shall be equipped with bronze nipples screwed into the hydrant and locked in place. Minimum depth of clear cover over the pipe shall be three (3) feet. An area of minimum 5' radius behind the hydrant shall be kept clear of all natural or man-made obstructions.

3. Piping

- a. All hydrant laterals shall be thickness class 52 ductile iron (Or approved equal).
- b. Lateral pipelines to Hydrants under 50' in length shall be a minimum of 6" diameter. Laterals over 50' in length shall be a minimum of 8" in diameter.
- c. MEGALUG retainer glands required at all lateral pipe to fitting or approved equal.
- d. Pipe to pipe shall be mechanical joint with Field-Lok gaskets or approved equal. Where Field-Lok gaskets are used, paint bell blue for future identification.

4. Auxiliary Valve

- a. For piping, the auxiliary valve shall conform to D1.d.

VI.1.f SERVICE CONNECTION EQUIPMENT

1. Water Meters

Meters shall be furnished by the District.

2. Corporation Stops

Corporation stops shall be bronze alloy, ball valve type with 1" I.P. thread inlet and 1" IPS Pac Joint Ford, Mueller, or equal, as approved by the Inspector.

3. Saddles

Pipe saddles shall be bronze or ductile iron, suitable for installation on the type and class of pipe being used. Bands shall be flattened and properly formed to fit the outside diameter of the pipe. Bands, bolts, and nuts shall be hot-dip or electro-galvanized. Double bands shall be employed on pipe 8" and larger. Single wide flat bands shall be used on pipe 6" and smaller. Gaskets shall be good quality red rubber, or neoprene. (Ford 202 for 1" service preferred.)

4. Oversized Service Connections

Where the District deems it necessary, 2" copper tube size poly pipe, single service lines, a 2" resilient seat gate valve with a valve box shall be utilized.

5. Tracer Wire

Tracer wire shall be stripped and laid with a positive connection at the corp, spiraled around pipe and brought to surface at termination of service. Wire shall be 12 gauge copper solid strand

VI.1.g JOINTING MATERIALS

1. Rubber Gaskets

- a. Standard: AWWA C111

VI.1.h GUARD POSTS

1. Hydrant Guard Post

- a. Standard: State of Washington Department of Transportation "Standard Specifications," 1998, Section 9-30.5(6).
- b. Description: 9" diameter by 6 feet long precast concrete. Exposed surfaces shall be free from honeycomb or other serious defects.

VI.1.i CONCRETE

1. Bedding Concrete

Concrete for pipe bedding shall be Portland cement concrete containing not less than four (4) sacks of cement per cubic yard. The water/cement ratio shall be 8.2 gallons per sack of cement. The fine aggregate shall not be less than 30% or more than 50% of the total weight of the aggregate.

2. Miscellaneous Concrete Structures

Concrete for encasement, blocking and other structures shall be Portland cement concrete containing not less than six (6) sacks of cement per cubic yard and produce a 28-day compressive strength of not less than 3,000 psi. The fine aggregate shall not be less than 30% or more than 50% of the total weight of the aggregate. The concrete shall have a maximum slump of five (5) inches.

Core samples and testing of the concrete may be required as directed by the Inspector.

VI.1.j GRAVEL

1. Foundation Gravel

a. General

Foundation gravel to be used shall be a type and gradation to provide a solid compact bedding in the trench. Since trench conditions vary, foundation gravel requirements will change. Bedding requirements for two trench bottom conditions are described as follows:

b. Condition One

Where silty soil or fine sandy soil is encountered that will flow in a stream of water, the gravel should consist of clean bank run sand and gravel, free from dirt, topsoil, and debris, and containing not less than 35% retained on a 3" mesh sieve and 100% passing a 2" screen. This foundation gravel shall be used only in a dry trench bottom, free from quick and/or running sand.

c. Condition Two

Where clay, peat or other soft materials are encountered which may be saturated with water but which will not break down into fine particles and flow as silt or sand will, the trench shall be over excavated 24" and foundation gravel used. The foundation gravel shall be of such gradation that 100% will pass a 3" screen with at least 90% retained on a 1" screen.

The foundation thus stabilized shall be leveled to provide a uniform pipe foundation by using a well-graded gravel ranging in size from 1/4" to 3/4".

2. Bedding Material

Bedding material (other than CDF) shall consist of clean, granular, well graded sand and gravel material as approved by the District Engineer. Imported bedding material will have the following properties:

- 100% will pass the U.S. Standard 3/4" opening
- not more than 3% will pass the U.S. No. 200 (wet sieve),
- minimum sand equivalent of 50 per the test methods of the Materials Laboratory of the Department of Highways, Olympia, Washington (unless otherwise approved by the District Engineer).

Controlled Density Fill (CDF) shall be used in right-of-way crossings and other locations as required by City of Lake Forest Park.

3. Backfill Material

Backfill material will vary depending on the location and availability of suitable approved granular fill material. Unless noted otherwise on the plans, backfill material shall be 100% 3" diameter or less, and may be bank run which has been passed through a 3" screen with a binder content of not more than 20% and reasonable grading from fine to coarse (unless otherwise approved by Engineer).

SECTION VI.2 WATERWORKS CONSTRUCTION

VI.2.a GENERAL

Except as otherwise noted herein, all work shall be accomplished as recommended in applicable American Water Works Association (AWWA) Specifications, and according to the recommendations of the manufacturer of the material or equipment used.

VI.2.b CLEARING AND GRUBBING

Clearing and grubbing work shall be performed within the confines of the area indicated on the plans, and as staked out in the field. All resulting debris shall be disposed of by the Contractor and the right-of-way cleaned up in a neat and workmanlike manner. No logs, stumps, rocks, etc., shall be left lying in the right-of-way or an adjacent property without specified written approval by the District, or the Engineer, and the affected adjacent property owner.

VI.2.c EXCAVATION

1. Normal Conditions

Trenches shall be excavated to the line and depth designated by the Inspector to provide a minimum cover of 36" for pipe 12" and less and 48" for pipe over 12", over the top of the pipe unless otherwise specified in the plans. Except where approved by the Inspector, the trench sides shall be excavated vertically. Trench widths shall be only as necessary for adequate working space. The maximum trench width at the top of the pipe shall normally be the outside diameter of the pipe barrel plus 16 inches. The top width of the trench shall not exceed the outside diameter of the pipe plus 30 inches. All excavation and shoring shall conform to WAC 296.

No more than 500 feet of open ditch will be permitted unless so authorized in writing by the Engineer. All trenches shall be backfilled at the end of each work day, or as otherwise secured, as approved by the Inspector.

2. Special Conditions

- a. Pavement Cutting (per appropriate governmental agency standards):

In trenching through an existing pavement, the open cut shall be a neat-line cut by either saw cutting or jack hammering a continuous line.

- 1) Concrete - pavement shall be cut one foot outside the edge of the trench on each side. The concrete shall be cut on a straight line

and shall be beveled so that the cut will be approximately 1-1/2 inches wider at the top than at the bottom.

2) Asphalt -. Pavement shall be cut ahead of the trenching equipment to prevent excessive tearing up of the surface and to eliminate ragged edges.

b. Rock Excavation:

All ledge rock that requires systematic drilling and blasting for its removal, and boulders exceeding one-half cubic yard in volume, shall be removed to provide a minimum clearance of six inches (6") under the pipe.

c. Dewatering:

Pipe trenches shall be kept free from water, during excavation, pipe laying, and jointing, and the pipe embedment, in a manner acceptable to the Inspector. Surface water shall be diverted, and ground water shall be kept pumped down, or otherwise removed, to the extent necessary to keep the trench free from water and the bottom stable.

Before trenching operations begin, the Contractor shall have available on the site of the Work sufficient pumping equipment and/or other machinery to insure that the provisions of the above paragraph can be maintained.

d. Shoring and Movable Shields

The Contractor shall provide shoring and movable shields as necessary to protect workmen, the Work, and existing structures, utilities and other properties in accordance with title 296 WAC. Trench excavation shall be in compliance with OSHA and WISHA regulations and requirements.

e. Tunneling:

When tunneling is required, tunnels shall not be less than 4 feet high and 2 feet wide and not less than 1 foot wider than the outside diameter of the pipe. Tunnels shall be backfilled with materials acceptable to the Inspector and backfill shall be mechanically compacted. When tunneling is used under pavements, subsequent low pressure grouting may be required.

f. Highway Crossing:

The Contractor may use any method which provides satisfactory results and is acceptable to the Inspector and the governmental agency having control of the highway, provided that the Contractor restores the roadway to a condition acceptable to the governmental agency having control of the road and the Inspector.

Normally, highway crossings require the placing of a steel, cast iron or concrete pipe casing by jacking or tunneling and laying the water pipe within this casing.

g. Over-Excavation:

Over-excavation for purposes of these specifications will be deemed to include the loosening of subgrade material below the grade of the pipe or appurtenance, as well as the physical removal of material below the grade of the pipe or appurtenance. In the event of over-excavation, the Contractor shall when required, provide at this own expense, suitably compacted bedding and foundation material (VI.2.d), in place, to the required grade.

VI.2.d FOUNDATION AND BEDDING

1. General

Proper preparation of foundation, placement of foundation material where required, and placement of bedding material shall precede the installation of all pipe. This shall include necessary leveling of the native trench bottom or the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade. The entire length of pipe will rest firmly on a well compacted material.

2. Foundation

Where over-excavation has been necessary, foundation material shall be placed and compacted to form a suitable base for the replacement of the required thickness of bedding material. Imported foundation material may be required in some instances at the direction of the site inspector or engineer..

3. Bedding

Bedding shall consist of the leveling of the bottom of the trench or the top of the foundation material and the furnishing, placing, and compaction of bedding materials under the pipe and along the sides to a minimum depth of six (6) inches over the top of the pipe or as required by the Inspector. If imported bedding is required the minimum thickness of the layer of bedding material required is 4 inches for all pipe sizes. Bedding material shall be thoroughly rammed and tamped around the pipe with the proper tools, so as to provide firm and uniform support over the full length of all pipe and fittings. Care shall be taken to prevent any damage to the pipe or its protective coating.

VI.2.e INSTALLATION OF PIPE AND FITTINGS

1. Alignment

Alignment shall be within 0.5 feet of the specified alignment.

2. Pipe Laying

Pipe laying shall be done in accordance with the specifications and instructions of the manufacturer of the kind of pipe used, subject to the approval of the Inspector.

Tools designed especially for installing each particular type and kind of pipe shall be used. All pipe ends shall be square with the longitudinal axis of the pipe, maximum 2" out of square as measured across the diameter of the pipe, and shall be reamed and otherwise smoothed so that good connections can be made. All operations for any special type of pipe, joint or connection shall be carefully done in accordance with the manufacturer's instructions.

Any installation, or repair which involves Asbestos-Cement pipe shall be in accordance with Puget Sound Air Pollution Control Agency guidelines for handling, removal and disposal of asbestos materials.

3. Contamination Prevention

Dirt or other foreign material shall be prevented from entering the pipe or appurtenances during handling or laying operations. Any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and relayed. The open ends of pipe and fittings shall be plugged with a temporary watertight plug whenever work is stopped and/or whenever water in the trench threatens to enter the pipe.

4. Blocking or Bracing

Concrete for Blocking or Bracing shall:

- 1) Be in accordance with the Standard Details.
- 2) Be placed in back of all fittings having unbalanced thrust.
- 3) Be placed so as to secure bearing on undisturbed earth.
- 4) Bear against fittings only, shall be clear of joints and have plastic wrapping so as to permit taking up or dismantling joint.
- 5) Be formed with lumber or timber.
- 6) Be free of entrapped air pockets, removal method as approved by District/Engineer.
- 7) Shall have a smooth finish.

Precast blocking shall not be used without prior written approval from the Inspector. Blocking shall not be covered up without approval of the Inspector.

VI.2.f INSTALLATION OF AUXILIARY EQUIPMENT

1. Valves

a. General

Valves shall be set at places designated by the District Engineer. Before placing in the trench in a vertical position, each valve shall be carefully inspected for defects. The stuffing boxes shall be packed with good quality of packing and adjusted so as to permit easy operation and at the same time show leakage. The valve shall be bedded similar to pipe and fittings.

b. Valve Box

Cast iron valve boxes shall be set so they will be in a vertical alignment to the gate valve operating stem. The operating stem shall extend such that the operating nut is no more than 36" from finished grade. The lower casting of the unit is to be installed using ETHAFOAM pad ring, and shall not rest directly upon the body of the gate valve or upon the water main. The upper casting of the unit is to be placed in proper alignment and to such an elevation that its top will be at final grade.

c. Air and Vacuum Relief Valve Assemblies

Installation shall be as shown in the Standard Detail. The assembly shall be set at the high point of the line. A valve guard post shall be placed where there is danger of damage. The relief valve shall be suitable for installation by direct burial.

d. Blow-off Valve Assemblies

Installation shall be as shown in the Standard Detail. The valve shall be enclosed in a standard valve box. The blow-off shall be installed in such a position and location that waste water can be disposed of without damage to surrounding property.

2. Fire Hydrant Assemblies

a. Hydrant

Fire hydrant assemblies shall be made and installed according to Standard Details. Special attention shall be directed to construction of the drainwell

and silt barrier. Each hydrant assembly shall be inspected and adjusted as above specified for valves. Hydrant trenches shall be excavated to not more than two (2) feet beyond the back side of the hydrant. The stuffing boxes shall be packed with good quality packing and shall be adjusted as above specified for valves.

b. Piping

Hydrant laterals shall consist of a section of thickness class 52 D.I. (or approved equal) 6 or 8 inch pipe from the main to the hydrant and shall include an auxiliary gate valve set vertically and placed in the line as indicated in the standard drawing for hydrant settings.

c. Auxiliary Gate Valve

See VI.2.f.

d. Retainer Glands

Use MEGALUG retainer glands or Field-Loc gaskets at all joints within hydrant lateral. Where Field-Loc gaskets are used, paint bell blue for future identification.

e. Hydrant Guard Posts

Hydrant guard posts to be used only as directed by District Inspector

3. Service Connection Equipment

All service connections to water mains shall be made using saddles of the size and type suitable for use with the pipe being installed. Care shall be exercised to assure that the main is not damaged by installation of the saddle.

Service pipe shall be polyethylene (HDPE) water service tube as specified in Paragraph VI.1.b. The depth of trenching for service connection piping shall provide 24 inches of cover over the top of the pipe for that portion of the service connection located in public rights-of-way. That portion of the service connection located on private property shall also have a minimum of 24 inches of cover. All connections to conform to the Uniform Plumbing Code, individual pressure reducing valves are recommended if supply pressure exceeds 80 psi. Connections of di-similar metals must be approved by the inspector prior to installation.

VI.2.g CONNECTION TO EXISTING SYSTEM

1. General

Where connections to the existing system are to be made in existing pipes, the Work shall be conducted at such a time and in such a manner as to minimize the interruption of service. Necessary pipe, fittings, and valves shall be assembled at the site ready for installation prior to shutting-off of water in the existing main. Once the water has been cut-off, the Work shall be prosecuted vigorously and shall not be halted until the line is restored to service. Installation shall be as shown in the Standard Details.

No direct connections to the existing system will be allowed without an approved backflow prevention device until the newly constructed mains have been tested for pressure and purity and approved in accordance with District Standards.

The Contractor shall discuss the proposed interruption schedule with the District Superintendent a minimum of 48 hours prior to the requested time of interruption. The Contractor shall notify each of the affected water users in writing a minimum of 24 hours prior to the interruption.

2. “Cut-in” Connection

The cut-in shall be as shown in the Standard Details, and shall be made only with the approval of and under direct inspection by the Inspector. The tee shall be cast or ductile iron with mechanical joint. The couplings shall be Romac 501 12” long center ring or equal or as approved by the District/Engineer.

3. “Tapping” Connection

The tap shall be as shown in the Standard Details. a standard Cast Iron or Stainless Steel Standard split Tapping Sleeve shall be used. For 12” and larger main diameters a neoprene gasketed joint shall be used. For 10” and smaller main diameters a mechanical joint type shall be used (for tapping connection to AC mains, use split cast iron MJ tapping sleeve). The gate valve shall be resilient seat with “O” rings, non-rising stem, mechanical joint one end, other as required, per AWWA Specifications 7 F 1 (Tapping Valve). The Tapping Sleeve, connected and tested (normal main pressure), in place with valve connected to tee shall be completed before tap is started in existing main.

VI.2.h BACKFILLING

1. General

Compaction and restoration must be done as detailed below and immediately after the trench is backfilled, so as to cause least disruption to traffic. Backfilling of trenches can be made with the same materials excavated from the trenches unless these materials are found to be unsuitable by the Engineer or Inspector or where CDF is required. Prior to the backfilling, all form of lumber and debris shall be removed from the trench. Care shall be exercised to see that large rock, stumps, logs, etc., are excluded from material used for backfill. Machine backfilling shall be carried on so that the trench is continually filled from the end.

2. Consolidation, Grading, and Compaction

At locations where paved streets, driveways, or sidewalk will be constructed or reconstructed over the trench, or where the trench is greater than four (4) feet deep, or where provided for in the Special Provisions or directed by the Inspector, the backfill shall be mechanically compacted to 95% of maximum density. Throughout the length of any pipe run, backfill at depths over 4 feet shall be compacted to 90% maximum density by mechanical compaction. The top 4 feet of the trench line shall then be mechanically compacted to 95%. All densities shall be determined by testing specified in Section 2-03.3(14)D of WSDOT 2002 Standard Specifications. Contractors shall provide weekly reports to the District and the Engineer verifying the required compaction, prepared by a civil engineer registered in the State of Washington. **A minimum of one compaction test shall be taken for each 1000 linear feet of main line trench, or as designated by the District Engineer; one test at subgrade and one at 50% of trench depth.**

In any trench in which 95% density cannot be achieved with existing backfill, the top 4 feet shall be replaced with gravel base as specified in the WSDOT 2002 Standard Specifications, Section 9-03.10. This new material shall then be mechanically compacted to 95%.

Restoration of asphalt pavement shall include a minimum of 6-1/2 inches of crushed surfacing material and 4 inches of asphalt concrete Class B or comparable surfacing approved by the Engineer. Concrete pavement shall be restored consistent with Section 5-05 of the WSDOT 2002 Standard Specifications.

3. Cuts Across Road Alignment

In general, utility trenching through existing pavement across the road alignment will be discouraged, except for service lines.

Trenches in the traveled roadway shall be backfilled with a minimum 24" Controlled Density Fill (CDF), with formulation as directed by City of Lake

Forest Park unless directed otherwise by the Engineer (see trench detail).

On asphalt pavement, a permanent hot mix patch the same thickness as the original asphalt or a minimum of 4 inches, whichever is greater, shall be placed and sealed with a paving grade asphalt within 30 calendar days. Cement concrete pavement shall be restored with a 8-sack mix, using either Type II or Type III cement, within 30 calendar days.

4. Excess or Insufficient Material

In all cases where it is not necessary to re-establish original ground level, excess material shall be heaped over the trench as additional mounding. Where necessary, excess material shall be removed and disposed of at the Contractor's expense and in a manner satisfactory to the District and the Engineer.

Imported materials required to properly complete backfilling shall be hauled in and placed by the Contractor at his own expense.

5. Holding Backfill on Steep Slopes

Where, in the opinion of the Inspector, there is a danger of backfill being washed away due to steepness of the slope in the direction of the trench, material will be held in place with hill holders.

6. Barricades

Newly backfilled and/or soft areas shall be immediately and adequately barricaded and marked to warn motorists and pedestrians. All driveways and road crossings shall be graveled when necessary. Proper and sufficient warning signs shall be so placed as to adequately warn the public away from hazardous areas. See Standard Details – Traffic Plans.

VI.2.i PAVEMENT RESTORATION

1. General

Pavement restoration requirements will vary depending on the specific project and location. In general, open trenches shall be backfilled and immediately covered with a temporary patch. The temporary patch to seal the surface until settlement and final paving. Asphalt pavement shall be restored consistent with the WSDOT 2002 Standard Specifications.

2. Time Interval

Final re-paving shall not be attempted until after the backfill has been mechanically compacted and allowed to settle to a degree of compaction satisfactory to the Inspector. During the period of settlement, the trench surface shall be sealed with

a temporary asphalt patch and maintained by the Contractor in such a manner as may be necessary to safely accommodate traffic.

3. Base Course

Where asphaltic concrete pavement has been cut for trenching, backfill shall be removed the width of the trench and to such depth as required to permit installation of six and one-half (6-1/2) inch compacted depth of sub-grade gravel. The top surface shall be rolled or tamped to proper elevation to receive the final paving as called for. Where Portland Cement concrete paving has been cut for trenching, backfill shall be removed the width of the trench and to such depth as required to permit the installation of sub-grade material as may be required by the authority having jurisdiction.

4. Paving

a. Bituminous (Asphalt)

Bituminous paving shall be of the same type and quality as the original pavement. Materials and method of construction shall be subject to approval by the Inspector. Cold patch asphalt shall be immediately placed in traveled areas with minimum thickness 2" to seal surface until favourable conditions exist for final pavement patch. Final pavement patch shall be applied with minimum thickness 4" or as required to match existing pavement. Application of final pavement patch may be delayed for favorable weather conditions.

b. Portland Cement Concrete

Concrete repavement shall be undertaken at such time as may be fixed by the authority having jurisdiction. Temporary repavement shall be six and one-half (6-1/2) inches of crushed rock with a "Light Bituminous Surface Treatment" placed as soon after completion of backfill as the Inspector may direct. Final concrete repavement shall be made using Hi-early strength cement in the concrete, and shall provide the full original thickness. The surface shall be finished to match the existing pavement. Headers shall be installed at the junction with all existing pavement and expansion and contraction joints constructed where directed by the Inspector.

VI.2.k RECOMMEND STANDARD AESTOS CEMENT PIPE WORK PRACTICE, PROCEDURES AND TRAINING REQUIREMENTS

All personnel on any asbestos project who directly handles asbestos/cement water pipe or asbestos-containing waste materials will be certified per Chapter 296-65 WAC. Provide proof of certification to Owner prior to work on asbestos cement pipe.

SECTION VI.3. WATERWORKS TESTING

VI.3.a GENERAL

All pipe and appurtenances shall be cleaned, disinfected and flushed, and shall be tested for leakage after backfill has been completed as specified. The Contractor shall furnish all labor, tools, equipment and materials necessary to make the tests and to perform any work incidental thereto.

The Contractor shall conduct preliminary tests and assure himself that the section to be tested is in an acceptable condition before requesting the Inspector to witness the test.

The District/Engineer at all times shall have access to the Work and to the locations where the Work is in preparation. The Developer at all times shall maintain proper facilities for such access.

Inspection and testing shall be in accordance with Control of Work Section of the Contract Documents.

Note: Due to the recent Endangered Species Act the sequence in which the various steps of Waterworks Testing are to occur has been revised. In particular, the pressure testing is to occur after the pipe has been flushed of all chlorinated water to assure that, in the event of a pressure failure, no chlorinated water will be released from the system into the environment.

VI.3.b DISINFECTION OF WATER MAINS

1. Procedure During Construction

In addition to the procedures for preventing contamination during pipe laying described in paragraph VI.2.e.3, the following procedures shall be maintained:

- a. The interior of all pipe, fittings, and auxiliary equipment stockpiled on the project shall be kept free of dirt and other foreign matter at all times.
- b. Prior to lowering the pipe or auxiliary equipment into the trench each item shall be carefully inspected inside and thoroughly cleaned of any dirt or foreign matter.

- c. Cleaning shall consist of brushing or sweeping of fittings and the use of tight-fitting swabs for pipe cleaning.
- d. Water used for rinsing or lubricating during construction shall contain 50 ppm chlorine.
- e. A tight stopper or bulkhead shall be placed at the open end of the pipe at all times when pipe is not being inserted into the section already laid.

2. Procedure Prior to Operation

Before being placed into service, all new mains and repaired portions of, or extensions to existing mains shall be disinfected by chlorination. Dosage shall not be less than 50 ppm of available chlorine. A chlorine residual of not less than 10 ppm free chlorine shall remain in the water after standing 24 hours in the pipe. The chlorine shall be applied by placement of dry crystals directly in the pipe or the following method:

- a. A solution containing approximately 5 percent available chlorine by weight shall be prepared by first making a paste of a chlorine-bearing compound and water and then thinning to the proper proportions with water to insure that all active ingredients are dissolved.

If HTH or Perchlomen is used at 70 percent available chlorine, the proportions shall be six (6) pounds of compound per ten (10) gallons of water.

If Clor is used at 15 percent available chlorine, the proportions shall be one (1) part Clor per two (2) parts water.

- b. The solution shall be applied through a corporation cock inserted in the horizontal axis of the pipe located at the beginning of the Extension or any valved section thereof. Injection of the solution shall be by means of a hypochlorinator, hand operated pump or motor operated pump approved by the District/Engineer.
- c. Water from the existing distribution system, or other source of supply approved by the District/Engineer, shall be controlled to flow very slowly into the newly laid pipe line during application of the chlorine. A color comparator set will be used to determine the chlorine residual of the entering water.
- d. No connections shall be made between the existing distribution system and the pipelines not pressure tested and approved for purity constructed under this Contract without a Washington State Department of Health approved backflow prevention device installed in the connecting line. Any connection must be witnessed by the District/Engineer.
- e. In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with chlorinating agent and under normal operating pressure.

- f. After the twenty-four hour detention period, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows, upon test, the absence of chlorine in excess of that carried in source of supply for flushing. All flushing methods shall conform to District standard D3.c.1.

VI.3.c FLUSHING

1. Flushing Mains

After disinfection of all new mains and repaired portions of, or extension to existing mains, all pipes shall be thoroughly flushed through all hydrants, blow-offs or other approved means to assure that all solids and contaminated materials have been removed. Water required for the flushing will be paid for by the District.

When flushing after disinfection, the Contractor shall be responsible for the disposal of treated water flushed from the mains, and shall completely neutralize the wastewater for protection of aquatic life in the receiving water before disposal into any natural drainage channel. Neutralize implies removal of available chlorine by chemical means. The preferred method of chlorine removal is with Ascorbic Acid, which will be supplied by the District). The Contractor shall be responsible for disposing of disinfecting solution to the satisfaction of state and local authorities. Should the Contractor choose to flush to the sewage collection system, these activities must be approved by the District.

Clear, clean, uncontaminated water used in flushing shall be directed to approved storm water runoff conveyance systems. Contractor shall use care to minimize erosion caused by flushing procedures.

Flushing shall be accomplished as follows:

- a. The Contractor shall schedule and organize his work so as to use flushing water during off-peak hours only.
- b. The District and the Engineer shall be notified a minimum of 48 hours prior to the time of water main flushing.
- c. Flushing shall be done only in the presence of a representative of the District.
- d. Flushing shall be done through hydrant ports. Where hydrant ports are not available (dead ends) then a tap shall be provided large enough to develop a velocity of at least 2.5 fps in the main.
- e. Each section of newly laid pipes between valves or dead ends shall be flushed independently.
- f. Fire hydrants and other dead end appurtenances shall be flushed simultaneously with the main line.

VI.3.d HYDROSTATIC PRESSURE TEST

1. General

After the water mains have been disinfected and flushed, they shall be hydrostatically tested. Water mains shall be tested in lengths not to exceed 1000-ft. plus the additional length of main to the nearest valve or to the closest valve.

The mains shall be pressure tested prior to achieving purity after completion of flushing of highly chlorinated water as approved by the Inspector. The system to be tested must be physically separated from the District's Water System during such tests.

Hydrostatic pressure test equipment shall be cleaned, disinfected and flushed prior to connection to pipe system to be tested. Test equipment shall be kept clean of dirt and foreign matter at all times. The test equipment shall be rinsed or swabbed as necessary using a water solution containing a minimum of 50 ppm chlorine. Following disinfection the pressure test equipment shall be flushed with potable water prior to connection to system to be tested. A potable water source shall be used to pump system to test pressure. Potable water shall also be used throughout the hydrostatic test procedure and to serve as a source of make-up water between hydrostatic pressure tests.

2. Equipment

The pumps, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished by the Contractor. The District will provide the gauge for the witnessed pressure test. Water meters used to measure water used to re-pressurize the line shall be positive displacement with a sweep unit hand registering 1 gallon per revolution as approved by the Inspector. Also water used to re-pressurize shall be pumped from a container sized and graduated appropriately to measure the amount of water used.

Where the District has water available for testing, it will be furnished without charge. Where water is not available from the District, the Contractor shall provide water for testing from a source approved by the Inspector.

3. Procedure

a. Preparation

- 1) Tests shall be made after corporation stops and service lines are installed.
- 2) Insofar as is practicable, tests shall be made prior to backfilling over any joints or fittings.
- 3) At points where pressure reaction and movement may occur, the pipe shall be properly blocked or braced. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after testing.

- 4) Prior to calling out the Inspector to witness the pressure test, the Contractor shall have all equipment set up completely ready for operation and shall have successfully performed the test to assure himself that the pipe is in a satisfactory condition.

b. Test

- 1) The mains shall be filled with water and all air removed prior to starting the test.
- 2) The main shall then be pumped up to a hydrostatic pressure equal to 250 psi at all elevations tested. In no case shall the test pressure exceed 200 percent of the safe working pressure of the class of pipe tested.
- 3) The pump shall then be stopped for a period of 15 minutes.
- 4) The main shall then be pumped up again to the test pressure.
- 5) The quantity of water required to restore the pressure shall then be recorded.

4. Acceptance

Acceptability of the test will be determined by two factors:

- a. The quantity of water lost from the main during the 15 minute test period shall not exceed the quantities shown in the following table:

Pipe Diameter (inches)	6	8	10	12	14	16
Water Loss (GPH/1000 L.F. Pipe)	0.71	0.95	1.19	1.42	1.66	1.90
Water Loss/1000 L.F. Pipe (15 minute test)	0.18	0.24	0.30	0.36	0.42	0.48

These figures are established by the Ductile Iron Pipe Research Association and apply only to ductile iron pipe. Specific testing requirements will apply to other materials as directed by the Engineer.

- b. There shall not be an appreciable or abrupt loss in pressure during the fifteen (15) minute test period.

VI.3.e PURITY TESTING

1. Sampling

After acceptance of pressure testing, the Inspector will arrange for taking samples for bacterial tests.

2. Laboratory testing

The Inspector shall arrange with the District to perform the laboratory testing for purity, which normally takes 2 to 5 working days.

3. Unsatisfactory test results

Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination and flushing procedure shall be repeated by the Contractor until satisfactory results are obtained. Failure to get a satisfactory result on the bacterial test shall be considered as a failure of the Contractor to keep the pipe clean during construction, or to properly chlorinate the main, and Contractor shall be required to clean, repair or replace the newly constructed main until a satisfactory test is achieved. Water required for retesting and flushing shall be paid for by the developer.

VI.3.f SITE CLEANUP

1. Schedule

Final cleanup work shall be completed as closely behind the construction work as it is physically possible to do so.

2. Materials disposal

All excess material, rocks, logs, etc., shall be disposed of by the Contractor to the satisfaction of the Inspector. No debris shall be disposed of by dumping on private property without permission.

3. Drainage ditches

Drainage ditches affected by the construction operation shall be left in as good or better condition than what existed prior to beginning work.

4. Cleanup Completion

Upon completion of all cleanup work, the entire site shall have a neat and workmanlike appearance.

VI.3.g OPERATIONAL TEST

After the Extension has been disinfected, passed the hydrostatic test and before final acceptance, the entire system shall be operated by the Contractor at normal pressure for a period of not less than ten (10) days. Any leaks or defects discovered in the system shall be repaired and the operational test continued until the system is satisfactory to the Inspector. Contractor shall verify that all service lines are active prior to final acceptance. No provision of this section shall be construed as waiving any provision of the Contractor's guarantee.

**SECTION VI.4. WATERWORKS CONSTRUCTION STANDARD DETAILS PROVIDED ON
PLANS**

Please refer to the project plans for Standard Details.

SECTION VI.5. HDPE PIPE SPECIFICATION

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. This specification covers the material (pipe and fittings), joining methods and general installation practice for high density polyethylene pipe (HDPE) piping systems for water utility use as indicated on the Drawings.

1.02 SUBMITTALS

A. Submit product data to the Engineer for review for all pipe, fittings, and appurtenances.

B. Contractor shall also submit the following to the Engineer for approval:

1. As-built or red-lined drawings/profile of all installed pipe, specials and fittings.
2. Details of fittings and specials such as elbows, tees, outlets, connections, test bulkheads, nozzles or other special items where shown on the Construction Drawings. All connections to jointed gasketed pipe materials, valves or fire hydrants must be restrained and supported independently to withstand the pressure transients, soil settlement, and external loading conditions.
3. The Supplier of the material shall submit, through the Contractor, a Certificate of Compliance that the HDPE pipe and fittings furnished for this project are FM approved materials that meet or exceed the standards set forth in this specification. The Contractor shall submit these certificates to the Engineer prior to installation of the pipe materials.
4. Provide a statement that personnel responsible for fusing the pipe have been trained and qualified.

C. For items that do not meet all of the requirements of this specification, the bid/submittal shall include a written description of the deviations, along with data that show the magnitude and the justification for the deviation from the specification. The decision to accept material deviating from this specification shall be the responsibility of the specifying engineer and must be approved in writing.

1.03 REFERENCE DOCUMENTS AND STANDARDS

The standards and documents listed below may apply to the materials and practices in this specification. In the event of a conflict, the requirements of this specification prevail. Unless otherwise specified, references to documents shall mean the latest published edition of the referenced document in effect at the project bid date.

ANSI/AWWA

- ANSI/AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm) for Water Service
- ANSI/AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission
- ANSI/AWWA C651 Standard for Disinfecting Water Mains
- AWWA M55 Manual of Water Supply Practices, PE Pipe—Design and Installation

Plastics Pipe Institute, PPI

- PPI Handbook of Polyethylene Pipe – 2009 (2nd Edition)
- PPI Municipal Advisory Board (MAB) Generic Electrofusion Procedure for Field Joining of 12 Inch and Smaller Polyethylene (PE) Pipe
- PPI Material Handling Guide for HDPE Pipe and Fittings
- PPI TR-33 Generic Butt Fusion Joining Procedure for Polyethylene Gas Pipe
- PPI TR-34 Disinfection of Newly Constructed Polyethylene Water Mains
- PPI TR-38 Bolt Torque for Polyethylene Flanged Joints
- PPI TN-42 Recommended Minimum Training Guidelines for PE Pipe Butt Fusion Joining Operators for Municipal and Industrial Projects
- PPI TR-46 Guidelines for Use of Mini-Horizontal Directional Drilling for Placement of High Density Polyethylene Pipe

ASTM

- ASTM F 585 Standard Guide for Insertion of Flexible Polyethylene Pipe Into Existing Sewers
- ASTM F 714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
- ASTM F 905 Standard Practice for Qualification of Polyethylene Saddle-Fused Joints
- ASTM F 1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and
- ASTM F 1290 Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings
- ASTM F 1962 Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles, Including River Crossings
- ASTM F 2164 Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
- ASTM F2206 Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock, or Block Stock
- ASTM D 2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- ASTM F 2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
- ASTM D 2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter- Controlled Polyethylene Pipe and Tubing
- ASTM D 2737 Standard Specification for Polyethylene (PE) Plastic Tubing
- ASTM D 2774 Standard Practice for Underground Installation of Thermoplastic Pressure Piping
- ASTM F 2880 Standard Specification for Lap-Joint Type Flange Adapters for Polyethylene Pressure Pipe in Nominal Pipe Sizes ¾ in. to 65 in.
- ASTM F 3124 Standard Practice for Data Recording the Procedure Used to Produce Heat Butt Fusion Joints
- ASTM D 3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- ASTM D 3035 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
- ASTM D 3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

PART 2 – PRODUCTS

2.01 HIGH DENSITY POLYETHYLENE MATERIALS

A. Resin and Material Requirements

1. All material shall be manufactured from a PE 4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D 3350 with a minimum cell classification of 445474C. HDPE pipe and fittings shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. HDPE products shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

B. HDPE Pipe

1. Pipe shall be made of HDPE material with a minimum material designation code of PE4710 and with a minimum Cell Classification as noted in 2.01.A. The polyethylene compound shall be suitably protected against degradation by ultraviolet light by means of carbon black of not less than 2 percent. The manufacture of the HDPE resin shall certify the cell classification indicated.

2. Pipe sizes 3" and large shall have a manufacturing standard of ASTM F 714, while pipe smaller than 3" shall be manufactured to the dimensional requirements listed in ASTM D 3035. Dimension Ratio (DR) and Outside Diameter (IPS/DIPS) shall be as specified on plans.

3. Pipe shall meet AWWA C901 (1/2" to 3") or AWWA C906 (4" to 63"), and shall be listed as meeting NSF-61.

4. When required by the owner, pipe shall be color coded for the intended service. The color coding shall be permanently co-extruded stripes on the pipe outside surface as part of the pipe's manufacturing process. Color coding shall be **Blue** for Water.

C. HDPE Fittings

1. Butt Fusion Fittings- Fittings shall be made of HDPE material with a minimum material designation code of PE4710 and with a minimum Cell Classification as noted in 2.01.A. Fittings shall have a minimum pressure rating equal to or greater than the pipe to which they are joined unless otherwise specified on the plans or accepted by owner/engineer. All fittings shall meet the requirements of AWWA C901 or C906.

a. Molded fittings shall comply with the requirements of ASTM D 3261.

b. All fabricated elbows, tees, reducing tees and end caps shall be produced and meet the requirements of ASTM F 2206, as manufactured by ISCO Industries, Inc or other approved manufacturer holding an ISO 9001 quality system certificate. Each fitting will be marked per ASTM F 2206 section 10 including the nominal size and fitting EDR, which will meet or exceed the pipe DR identified for the project. Fabricated fittings shall be manufactured using a McElroy DataLogger to record fusion pressure and temperature, and shall be stamped with unique joint number that corresponds to the joint report. A graphic representation of the temperature and pressure data for all fusion joints made producing fittings shall be maintained for a minimum of 5 years as part of the quality control and will be available upon request of owner. Test results to validate ASTM F 2206 section 7.3 and 9 shall be provided to owner or owner's representative upon request.

c. Socket fittings shall meet ASTM D 2683.

2. Electrofusion Fittings - Fittings shall be made of HDPE material with a minimum material designation code of PE 4710 and with a minimum Cell Classification as noted in 2.01.A. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a minimum pressure rating equal to or greater than the pipe to which they are joined unless otherwise specified on the plans. For potable water systems, all electrofusion

fittings shall have AWWA approval.

3. Bolted Connections- Flanges and MJ Adapters shall be fused onto the pipe and have a minimum pressure rating equal to or greater than the pipe unless otherwise specified on the plans.

a. Metallic back-up rings (Van-Stone style lap joint flanges), shall have a radius on the inside diameter of the bore so as to be compatible with HDPE Flanges. Back up rings shall have bolt pattern that will mate with AWWA C207 Class D (generically known as 150 pound patterns).

b. Flange assemblies shall be assembled and torqued according to PPI TN-38, "Bolt Torque for Polyethylene Flanged Joints."

c. Where shown on the drawings, 4" and larger transitions to mechanical joint fittings and valves shall be accomplished using a MJ Adapter with kit. The D.I./HDPE mechanical joint adaptor shall consist of an HDPE mechanical joint transition fitting, rubber gasket, a mechanical joint backup drive ring, and Corten mechanical joint tee bolts.

D. Mechanical Fittings: The use of mechanical coupling and saddles shall be approved by the owner or engineer prior to installation. Mechanical Fittings shall be designed for use and compatible with HDPE pipe, including SS stiffeners when required by manufacturer. Mechanical fittings shall have a pressure rating equal to or greater than the pipe.

E. Fusion Equipment Requirements

1. Butt fusion equipment must be in satisfactory working order and the hydraulic system must be leak free. Heater plates shall be free from scrapes, gouges, and have a consistent clean coated surface. The pressure gage and thermometer should be checked for accuracy. When requested by the owner, records showing a maintenance service/inspection within 3 months prior to use for this project shall be provided.

2. Rental Butt Fusion Equipment must be maintained by a McElroy Authorized Service and Repair Center with at least one McElroy Certified Master Mechanic on staff and inspected within 3 months prior to arrival at jobsite will be provided.

3. Electrofusion Processors shall be maintained and calibrated per manufacturer's requirements and recommendations.

F. Approved Suppliers

1. All Pipe, Fittings, and Fusion Equipment shall be provided by one supplier. Approved suppliers are ISCO Industries, Inc. or approved equal.

2.02 PIPELINE LOCATING MATERIALS

A. Detectable Marker Tape- Plastic marker tape shall be 5 mil minimum thickness with a solid aluminum core of .35mil minimum thickness and a minimum width of 2". The background of the tape shall be colored based on pipe service with black lettering continuously printed. Marker tape shall have a minimum 35 lbs./inch tensile strength. The installation of the tape shall be at 18 inches below finish grade.

B. Tracer Wire- All HDPE pipe 4" and greater shall be installed with an extra high-strength, copper clad steel tracer wire including 45 mil HDPE jacket that has a minimum average break load of at least 1150 lbs. The jacket shall be colored based on pipe service, with blue for potable water or green for sewer. Tracer wire gauge shall be 12 AWG, 10 AWG, or 8 AWG depending upon application and installation procedure. This wire shall to be continuous and brought up in the valve boxes at the ends of each line segment with splices made only by methods per the equipment manufacturer's recommendation. All miscellaneous splicing components shall be furnished and installed by the Contractor.

PART 3 – EXECUTION

3.01 GENERAL

A. All HDPE pipe and fittings shall be cut, joined, and installed in accordance with the manufacturer's recommendations. Joining, laying, and pulling of polyethylene pipe shall be accomplished by personnel experienced in working with polyethylene pipe systems.

3.02 TRANSPORTATION, UNLOADING, HANDLING, AND STORAGE

A. The manufacturer shall package product in a manner designed to deliver the pipe and fittings to the project neatly, intact and without physical damage. During transportation each pipe shall rest on suitable pads, strips skids, or blocks securely wedged or tied in place.

B. During loading, transportation, and unloading, every precaution should be taken to prevent damage to the pipe. The handling of the pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Cuts or gouges that reduce the wall thickness by more than 10% are not acceptable and must be cut out and discarded.

C. Handle the pipe in accordance with the PPI Handbook of Polyethylene Pipe (2nd Edition), Chapter 2. All pipe and accessories shall be loaded and unloaded by lifting with hoists or by skidding in order to avoid shock or damage. Under no circumstances shall materials be dropped. Pipe handled on skidways shall not be rolled or skidded against pipe on the ground. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior surface or interior of the pipe. All pipe and fittings shall be subjected to visual inspection at time of delivery and before they are lowered into the trench to be laid.

D. Materials, if stored, shall be kept safe from damage and shall not be stacked higher than the limits recommended by the manufacturer. The bottom tiers shall be kept off the ground on timbers, rails, or concrete. Pipe shall not be stored close to heat sources. The contractor shall be responsible for all security, damage and loss of pipe, excluding Acts of God.

E. The interior of the pipe as well as all sealing surfaces of mating components (i.e. flange faces) shall be kept free from dirt or foreign matter at all times. The open ends of all sections of joined and/or installed pipe (not in service) shall be plugged to prevent insects, animals, or foreign material from entering the pipe line or pipe section. The practice of stuffing cloth or paper in the open ends of the pipe will not be permitted. Use waterproof nightcaps to prevent the entrance of any type of natural precipitation into the carrier or containment pipe and will be secured to the pipe in such a manner that the wind cannot blow them loose. Where possible, the pipe shall be raised and supported at a suitable distance from the open end such that the open end will be below the level of the pipe at the point of support.

3.03 RECEIPT INSPECTION

A. All pipe and fittings shall be subjected to visual inspection at time of delivery and before they are installed or lowered into the trench to be laid. Defective, damaged, or unsound pipe will be rejected. Cuts, punctures, or gouges that penetrate or reduce the wall thickness by 10% or more are not acceptable and must be removed and discarded.

3.04 FUSION AND JOINING

A. Fusion Joining Requirements:

1. All HDPE pipe shall be joined to itself by the heat fusion process which produces homogeneous, seal, leak tight joints. Tie-ins between sections of HDPE pipe shall be made by butt fusion whenever possible.

2. Butt Fusion: The pipe shall be joined by the butt fusion procedure outlined in ASTM F 2620 or PPI TR-33. A record or certificate of training for the fusion operator must be provided that documents training to the fundamentals of ASTM F 2620. Considerations should be given to and provisions made for adverse weather conditions, such as temperatures below freezing, precipitation, or wind, which is accepted by the owner/engineer.

3. Electrofusion: Electrofusion joining shall be done in accordance with the manufacturers recommended procedure. Other sources of electrofusion joining information are ASTM F 1290, PPI TN 34, and PPI Municipal Advisory Board (MAB) Generic Electrofusion Procedure for Field Joining of 12 Inch and Smaller Polyethylene (PE) Pipe. The electrofusion processor must be capable of reading and storing the input parameters and the fusion results for later download to a record file. Qualification of the fusion technician shall be demonstrated by evidence electrofusion training within the past year on the equipment to be utilized for this project.

B. Fusion Operators:

1. The employer of the fusion machine operator is responsible for the fusion joint quality of the fusion weld made by that individual. The employer is responsible for documenting all training and qualification records for that individual, including compliance to any code requirements for fusion/bonder operators.

2. All HDPE fusion equipment operators shall be qualified to the procedure used to perform pipe joining. Fusion equipment operators shall have current, formal training on all fusion equipment employed on the project. Training received more than two years prior to operation with no evidence of activity within the past 6 months shall not be considered current.

3. For Projects with at least 5,000 feet or with pipe larger than 24 inches, operators or their supervisor must have a current McElroy Fusion Training Certificate for the equipment to be used on the project

C. Butt Fusion Equipment:

1. For 6" and larger pipe sizes, the pipe butt fusion machine shall be a hydraulic fusion machine capable of butt fusing HDPE pipe. The carriage must be removable from the chassis for in-ditch use. The machine must be compatible with an electronic data recording device, McElroy DataLogger or equal. Accessories will include all butt fusion inserts for the specified range of pipe sizes, a pyrometer kit for checking the surface temperature of the heater, extension cord of appropriate gauge (25' minimum), and hydraulic extension hoses (minimum of four). The butt fusion machine will be McElroy, or approved equivalent.

3.05 INSTALLATION

A. Direct Burial

1. Buried HDPE pipe and fittings shall be installed in accordance with ASTM D 2321 or ASTM D 2774 for pressure systems and AWWA Manual of Water Supply Practices M55 Chapter 8. The Design Window identified in AWWA M55 Chapter 5 (page 65 of 2006 version) shall be considered acceptable design and installation conditions.

2. Unless required by the owner's engineer, no thrust blocks shall be placed in the HDPE pipe system since the fused system is fully restrained.

B. Trenchless or Pull-in Installation Methods

1. For Horizontal Directional Drilling (HDD), refer to ASTM F1962, PPI TR-46, PPI PE Handbook (Chapter 12) and www.PPIBoreAid.com. See Section XXXXX of this Specification.

2. For sliplining, refer to ASTM F585, PPI PE Handbook (Chapter 11) and www.HDPEapp.com.

3. For pipe bursting, refer to PPI PE Handbook (Chapter 16)

C. Appurtenances

1. All appurtenances (tees, elbows, services, valves, air relief valves, fire hydrants, etc.), must be independently supported and shall not rely on the pipeline and its connections for this support. Excessive stresses may be encountered when appurtenances are inadequately supported.

2. Hydrant Assemblies shall be installed and field tested according to the requirements of AWWA M17.

3. Installation of Tracer Wire. When tracer wire is required, the Contractor shall install along the entire section of pipeline per local and manufacturer's requirements.. The tracer wire shall be installed simultaneously with the polyethylene piping system. Tracer wire shall be installed by the Contractor once backfill has been placed and compacted to at least 12 inches above the top of the pipe and not more than 18 inches above the top of the pipe. Tracer wire shall be properly spliced at each end connection and each service connection. Care should be taken to adequately wrap and protect wire at all splice locations. No bare tracer wire shall be accepted. Provide magnesium alloy anode for cathodic protection that conforms to the requirements of ASTM B843

3.06 FLUSHING, CLEANING, AND DISINFECTING

A. All mains shall be cleaned and flushed to remove all dirt, sand, debris and foreign matter.

B. Disinfection:

1. Cleaning and disinfecting of potable water systems shall be in accordance with AWWA C651 and AWWA M55 Chapter 9, and PPI Handbook of Polyethylene Pipe Chapter 2 (2nd Edition). The disinfection chemicals should be limited to less than 12% active chlorine. The duration of the disinfection should not exceed 24 hours. Chlorine tablets and powders are not permitted. Upon completion, the system should be thoroughly flushed with fresh water, and sampled to verify the disinfectant chlorine level has been reduced to potable drinking water concentrations in all service water tubing and branch lateral pipes.

3.07 TESTING AND LEAKAGE

A. The contractor shall insure testing can be accomplished in a safe manner, including protection of personnel, equipment, and public in the event of a failure during testing. The contractor shall restrain pipe, components, and test equipment as required. All pumps, valves, temporary connections, meters, gauges and other measuring devices shall be furnished, installed and operated by the Contractor and all such equipment and devices and their installation shall be approved by the Owner's Engineer.

B. The test pressure shall be 1.5 times the operating pressure, based on the lowest point in elevation in the test section.

C. Test pressures require consideration of thermal conditions. Polyethylene piping materials are typically pressure rated at 73°F (23°C) and PE piping at temperatures greater than 80°F (26°C) require reduced test pressures. (Note that higher pipe temperatures should consider both ambient temperatures and radiant solar heating of exposed black HDPE pipe) Guidance for elevated temperatures can be found in the appendix of Chapter 3 (Material Properties) of the PPI Handbook of PE Pipe.

D. Pressure Pipelines-Pressure testing shall be conducted in accordance with requirements and recommendations of ASTM F 2164 (Field Leak Testing of Polyethylene Pressure Piping Systems Using Hydrostatic Pressure), AWWA M55 Chapter 9, and PPI Handbook of Polyethylene Pipe Chapter 2 (2nd Edition). Pneumatic (compressed air) leakage testing of HDPE pressure piping is prohibited for safety reasons.

1. The section of pipe to be tested shall be filled with potable or generally clean water (uncontaminated river/lake water) approved by the Owner/Engineer. While the system is being filled with water, air shall be carefully and completely exhausted.

2. If the Contractor elects to perform hydrostatic testing against valves in an existing distribution system, it does so at his own risk and will bear the cost of any damages to the existing valve, piping system, private or public property, or the new pipeline under test.

3. The test procedure for HDPE pipe consists of two steps: 1) the initial phase or expansion phase and 2) the test phase. During the initial/expansion phase, sufficient make-up water shall be added hourly for 3 hours to return to the test pressure. During the test phase, the expansion phase pressure is reduced by 10 psi to test phase pressure and monitored for at least one hour (3 hours maximum).

4. Under no circumstances shall the total time under test exceed eight (8) hours. If the test is not completed due to leakage, equipment failure or any other reason, depressurize the test section and permit the system to "relax" for eight (8) hours prior to the next testing sequence.

5. In accordance with section 9.8 of ASTM F 2164, the pipe shall pass if the final pressure is within 5% of the test phase pressure for the testing period (3 hours maximum). If the test section fails this test, the Contractor shall repair or replace all defective materials and/or workmanship at no additional cost to the Owner.

END OF SECTION

SECTION VI.6. PUMP SPECIFICATION

Pentair/Aurora SERIES 3800 Specification

HORIZONTAL FRAME MOUNTED END SUCTION CENTRIFUGAL PUMPS

PART I – GENERAL

1.01 DESCRIPTION

The Contractor shall furnish materials, equipment and labor to furnish, install and test the pumping system complete with the pumps, motors, mounting bases, piping, valves and appurtenances, as indicated on the contract drawings and as herein specified.

1.02 INSTALLATION

The Contractor shall insure that the pumps and motors are properly installed with no pipe strain transmitted to the pump casing.

1.03 RESPONSIBILITY

To assure a properly integrated and compatible system, all equipment described in this section shall be furnished by the Pump Manufacturer, who shall assume full responsibility for the proper operation of the pumps and associated equipment.

1.04 SUPERVISION

The Contractor shall arrange for the Pump Manufacturer to provide a factory-trained representative as required for the purpose of supervising installation, start-up, final field acceptance testing, and providing instruction to the owner's operating personnel in the proper operation and maintenance of the equipment in this section.

1.05 REFERENCE STANDARDS

The work in this section is subject to the requirements of applicable portions of the following standards:

- Hydraulic Institute Standards
- IEEE Standards
- NEMA Standards
- OSHA Rules and Regulations

PART II - PRODUCTS

2.01 GENERAL DESCRIPTION

The pump shall be a centrifugal horizontal flexible-coupled end suction pump, Aurora Model 3804 or pre-approved equal. Pre-approval must be obtained a minimum of 5 days before bid date.

2.02 MATERIALS OF CONSTRUCTION

Casing.....Cast Iron (ASTM A48)
Impeller.....316 Stainless Steel (ASTM A276)
Shaft.....Steel (AISI C1045)
Shaft Sleeve.....Bronze (ASTM B62)

2.03 CASING

The casing will be of the end suction design with tangential discharge outlet. For suction piping diameters of 2" or less and discharge piping diameters of 1.5" or less, the suction and discharge connections shall be NPT threaded. For suction piping diameters of 2" or greater, the suction inlet and the discharge outlet shall be a bolt through flange connection, and tapped for pressure gages. Flange connections shall be ANSI 125# rated. The casing shall have tapped and plugged holes for priming and draining. The casing bore shall be large enough to allow "back pullout" of the impeller without disturbing the casing or suction and discharge piping. The casing shall have integral cast feet.

2.04 IMPELLER

The impeller shall be of the enclosed type, and investment cast. It shall be finished all over, the exterior being turned and the interior being finished smooth and cleaned of all burrs, trimmings, and irregularities. The impeller shall be dynamically balanced. The impeller will be keyed to the shaft, and fastened with a washer, gasket and capscrew.

2.05 MOTOR BRACKET AND SEAL PLATE

The seal plate and motor bracket shall be of a two piece design, and shall provide an adequate area for internal recirculation of the pumped fluid around the sealing medium.

2.06 MECHANICAL SEAL

Shaft sealing shall be accomplished by means of a mechanical seal with a Ceramic seat, carbon washer, Buna-N elastomers, and stainless steel metal parts.

2.07 SHAFT

The impeller shall be direct-coupled to the motor shaft. The motor shaft shall be machined to provide a keyway, and drilled and tapped to accept the impeller fastener. Stub shafts are not acceptable. The outboard shaft extension shall be machined with a keyway to accept a coupling to the driving unit. Lip seals shall be furnished on both the inboard and outboard shaft extensions, and a water slinger shall be furnished on the inboard shaft extension closest to the mechanical seal.

2.08 SHAFT SLEEVE

The pump shaft shall be fitted with a shaft sleeve to minimize shaft wear. The sleeve shall be sealed to the impeller hub by an O-ring, and shall be positively driven by a pin to the keyway. The use of adhesive compounds to fasten the sleeve to the shaft shall not be accepted.

2.09 POWER FRAME

The power frame shall house a single-row outboard regreaseable thrust bearing. Both bearings shall be selected for a 3 year minimum life at maximum load. The outboard bearing shall be locked in place by a retaining ring. The inboard bearing shall not be locked in order to accommodate thermal expansion of the shaft. Lubrication fittings shall be provided in convenient location. A bearing cartridge end cap shall be provided on the outboard side of the power frame to allow inspection of the thrust bearing without the need for disassembling the power frame housing.

2.10 FOOT SUPPORTS

The pump unit shall be supported from feet cast into the casing and a bracket mounted to the power frame.

2.11 BASEPLATE

The pump and motor shall be mounted on a groutable formed steel baseplate or a drip-rim baseplate with integral drip channels incorporated on each side. Each channel shall include an NPT drain connection and plug. The base shall be sufficiently rigid to support the pump and the motor without the use of additional supports or members.

2.12 COUPLING

A flexible coupling shall be provided to connect the pump shaft to the motor shaft. The coupling shall be of an all metal type with a flexible rubber insert. The entire rotating coupling assembly shall be enclosed by a coupling guard.

2.13 MOTOR

The motor shall be a NEMA configuration in accordance with the latest NEMA Standards, and shall have the following characteristics:

Enclosure.....Open Drip Proof/TEFC/X-Proof

Number of Phases.....Three

Cycles.....60 Hz.- capable of VFD

Voltages.....460 Volt

Speed.....1770 RPM

Horsepower.....40 hp

Each motor shall have a sufficient horsepower rating to operate the pump at any point within the manufacturer's recommended operating range on the pump's head-capacity curve without overloading the nameplate horsepower rating of the motor, regardless of service factor. The motor shall have a service factor of at least 1.15. The service factor is reserved for variations in voltage and frequency.

PART III - PERFORMANCE

3.01 CONDITIONS OF SERVICE

The following conditions of service shall be strictly adhered to:

Number of Units.....3
Type of Drive..... VFD
Discharge Size.....3 in, minimum
Suction Size.....4 in, minimum
Design Capacity.....600 US gpm
Design Head.....164 ft
Efficiency at Design.....81%, minimum
Rotative Speed.....1800 RPM, maximum
Shut-off Head.....187 ft, minimum
Driver Horsepower..... 40hp, minimum
NPSHR at Design..... 8.94ft, maximum

3.02 INSPECTION AND FACTORY TESTS

Each centrifugal pump furnished under these specifications shall be tested at the factory to verify individual performance (VIP). Certified copies of all test reports shall be submitted to the Engineer for approval prior to shipment. Each unit shall be hydrostatically tested in accordance with the Hydraulic Institute Standards.

3.03 INSTALLATION AND ACCEPTANCE TESTS

A. The pumping units shall be installed in accordance with the instructions of the manufacturer and as shown on the drawings by the Contractor.

B. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations.

Additional information is available from any Pentair Aurora authorized distributor.

Pentair reserves the right to make revisions to its products and their specifications without notice.

SECTION VI.7. ELECTRICAL SPECIFICATION

CSI SECTION 16010 ELECTRICAL GENERAL

FOLLETT ENGINEERING, PLLC 425-765-6304

1. GENERAL

A) SCOPE:

- a. This section specifies general requirements for electrical work. Detailed requirements for specific electrical items are specified in other sections but are subject to the general requirements of this section. The electrical drawings and schedules included in this project manual are functional in nature and do not specify exact locations of equipment or equipment terminations.

B) DEFINITIONS:

- a. The word "**provide**" shall be interpreted to mean furnish and install.
- b. "**Owner**".Lake Forest Park Water District
- c. "**Contractor**" is the party who furnishes and installs all materials and equipment. This includes the Prime Contractor, Electrical Contractor, Control System Integrator, and all other Contractors and Sub Contractors.
- d. "**Control System Integrator**" also referred to as the System Integrator or Integrator or control system manufacturer is the Party that furnishes all control components including motor controls, VFDs and motor control centers and designs the detailed control wiring diagrams plus the layout and assembly of the custom control panels.
- e. "**Control System**" includes all equipment, instruments, computers and wiring for control and monitoring of all operating pumps and equipment. This includes custom control panels, motor control center, packaged control panels, and control equipment furnished with other systems and mechanical equipment. All sensing, transmitting, indicating, control and recording of all functions as specified and shown are also included in the control system.
- f. "**System Programmer**" – Provides all programming and related service – has been pre-selected for this project to be furnished by the Owner.

C) GENERAL DESCRIPTION OF WORK:

- a. The Contractor shall:
 - (1) Provide all labor, material, tools, equipment and services required to complete the furnishing, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical equipment, devices and components as indicated and implied by the plans and these specifications.

- (2) Provide identification (nameplates and wire tags) of all electrical equipment and wiring.
- (3) Complete the wiring to, connection to, adjustment and calibration of, testing of equipment having electric motors and/or built-in or furnished electrical components. Install electrical components that are furnished with mechanical equipment.
- (4) Complete the procurement, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical devices, components, accessories and equipment which is not shown or specified but which is nonetheless required to make the systems shown and specified function properly.
- (5) Provide the size, type and rating of motor control devices, equipment and wiring necessary to match the ratings of motors furnished with mechanical equipment.
- (6) Provide adequate space for the electrical installation, including but not limited to, determination of access-ways and doorways, shipping sections, wall and floor space, and space occupied by mechanical equipment. Provide electrical equipment that fits in the areas shown on the drawings. All equipment shall be readily accessible for maintenance, shall have electrical clearances in accordance with NEC and shall be installed in locations that will provide adequate cooling.
- (7) Provide detailed wiring diagrams showing all equipment and instrumentation connections and terminations.
- (8) Check electrical equipment prior to installation so that defective equipment is not installed. Acceptance testing for electrical equipment shall be performed as discussed in Section 16921.
- (9) Provide start-up, follow-up and training of the Owner's personnel for electrical systems. Make all corrective measures required during start-up. See specific requirements for training and start-up in other specification sections.
- (10) Provide field services of qualified technicians to supervise and check out the installation of the equipment, to supervise and check out interconnecting wiring, to conduct start-up of operation of the equipment, and to correct any problems, which occur during start-up.
- (11) The VFDs, motor control, control panels, and instrumentation shall be supplied through the Control System Integrator and shop tested in the integrator's shop.

D) EQUIPMENT COORDINATION

- a. The Contractor is responsible to coordinate the equipment supplied from other manufacturers. This includes but is not limited to:
 - (1) Obtaining specific information on equipment ratings and sizes and verifying the electrical components supplied meet, or match the requirements such as voltage, phase, frequency, starter types, etc.
 - (2) Verifying the equipment supplied will fit within the space allocated.

- (3) Coordination of equipment and the electrical power and control requirements. Provided in all sections of the specifications and drawings.
 - (4) Providing power and control equipment, wiring, and raceways to meet the requirements of the mechanical equipment supplied.
 - (5) Providing all necessary control wiring and components for any special requirements from an equipment manufacturer.
- b. The Contractor shall verify as a minimum:
 - (1) Correct voltage, phase and frequency
 - (2) Size and space requirements
 - (3) Mounting requirements
 - (4) Correct motor starter type
 - (5) Proper coordination with the controls and control system Integrator.
- c. Any discrepancies between the electrical and other equipment shall be brought to the immediate attention of the Engineer.
- d. The Contractor shall take precautions to minimize instrumentation or control interferences that are created by the variable frequency drives (VFD's) or power wiring. All parallel runs of power wiring shall be separated from instrumentation and control wiring by a minimum of 12" and 18" to any VFD power wiring.

E) PROJECT DESCRIPTION:

- a. In general the project consists of construction of a new booster pump station.
- b. The following statements highlight the main portion of the electrical work:
 - (1) Coordinate with the local power utility and provide power service to the site and temporary service for construction power and power for the existing pump station during construction.
 - (2) Demolish existing equipment at the site and re-use instrumentation and other equipment as shown on the plans.
 - (3) Provide service entrance equipment and metering equipment per the serving utility's requirements
 - (4) Provide automatic transfer switch
 - (5) Re-use existing generator receptacle for the Districts existing trailer mounted generator connection.
 - (6) Provide motor control panels with power distribution equipment VFDs and motor starters.
 - (7) Provide a MCP – Main Control Panel with PLC for control and monitoring and alarming of all equipment.
 - (8) Provide new instrumentation.
 - (9) Provide lighting and receptacles, heating and ventilation equipment.
 - (10) Provide wire and raceways for all equipment power and control circuits.

F) TEMPORARY OPERATION AND CONSTRUCTION POWER:

1. CONSTRUCTION POWER:

- a. Provide a separately metered temporary power service for construction power. Provide power for operation of all equipment during testing. Provide power for operation of the existing pump station during construction. All coordination with the utility and associated construction costs for temporary construction power shall be paid for by the Contractor.
- b. The Owner shall pay the for the energy costs as billed by the utility on this "new" meter.

G) STANDARDS AND CODES:

- a. Permits, licenses, approvals and other arrangements for work shall be obtained and paid for by the Contractor and included in the bid price.
- b. Electrical work shall be executed in strict accordance with the latest edition of the National Electrical Code and local ordinances and regulations.
- c. All electrical equipment, materials, construction methods, tests and definitions shall be in strict conformity with the established standards of the following in their latest adopted revision:
 - (1) Underwriters' Laboratories, Inc. (UL)
 - (2) National Electrical Manufacturers Association (NEMA)
 - (3) Canadian Standards Association (CSA)
 - (4) Electrical Testing Laboratories (ETL)
 - (5) Factory Mutual (FM)
 - (6) All applicable Washington State Codes and local City Codes.
- d. All materials and equipment specified herein shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.
- e. All materials shall be new, free from defects, of current manufacture, of quality specified or shown. Each type of material shall be of the same manufacturer throughout the work.

H) CONTRACT DOCUMENTS:

- a. The electrical layouts are generally diagrammatic. The location of equipment is approximate unless dimensioned. Exact locations and routing of conduits shall be governed by structural conditions and physical interference's and by locations of electrical terminations on equipment.

I) REFERENCE DOCUMENTS:

- a. The Contractor shall refer to the drawings, project data and shop drawings of other trades for additional details, which affect the proper installation of the work. Diagrams and symbols showing electrical connections are diagrammatic only, and so do not necessarily show the exact physical arrangement of the equipment.

J) SITE FAMILIARIZATION:

- a. Before submitting a bid, the Electrical Contractor shall become familiar with all features of the site, which may affect the execution of the work. The Contractor shall take all field measurements necessary for the work and shall assume full responsibility for their accuracy. The Contractor shall take full responsibility for locating and avoiding all substructures. Any damage to existing equipment shall be repaired or replaced by the Contractor at a cost negotiated with the Owner.

K) GROUND SYSTEM

- a. Provide grounding and ground system per the NEC.
- b. Provide a minimum of two 10 foot x ¾" copper coated steel ground rods or more if required by the drawings. Use pressure type connectors for underground connections and bolted type for exposed.
- c. Construct metallic raceways to provide a continuous ground path
- d. Connect all electrical equipment enclosures to the ground system.
- e. Nonelectrical equipment with metallic enclosures and metallic piping shall be connected to the grounding system as required by NEC.
- f. Ground system shall be tested per IEEE standard 81. If greater than 2 ohms then additional ground rods shall be added and paid for as extra work
- g. Bond ground system to metallic piping as required by NEC.
- h. Bond ground system to building steel in at least one location and at other locations as shown on the drawings.

L) SUBMITTALS:

- a. Project data shall be submitted in accordance with the general requirements and the following:
- b. In the front of each submittal document, provide a list of any deviations to the contract documents: materials/products, or installation method that are different than specified.
- c. Submittal documents shall be submitted via E-mail in PDF format. Separate Submittal e-mails shall be provided for each spec section. All products for each spec section shall be included in a single PDF document including the cover sheet

and index in **one single document**. Submittals shall be indexed and identified as follows:

- (1) Email subject line shall be "*project name*, EI&C submittal *submittal #*, *spec section# - description*."
 - (2) Cover sheet with:
 - (a) The project name and submittal #
 - (b) Contractor's and sub-contractor's name, phone number, and email address.
 - (c) Index sheet showing each product being submitted.
 - (3) PDF index tabs per the electrical specifications by section and paragraph or equipment name e.g. provide a minimum of one tab section for each piece of equipment in all of the PART 2 PRODUCT Sections 2.01 - 2.**.
 - (4) Label each equipment submittal sheet with equipment name and number. Indicate location where each item of equipment submitted will be used on the job. Use equipment numbers when available.
 - (5) Identify specific options and cross hatch out any information that is not a part of the specific information for the submitted component.
- d. Submittals shall include the manufacturer's name, address, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference. Include other information necessary to establish contract compliance of each item proposed to furnish.
 - e. Long lead items may be submitted separately – if pre-approved by the Engineer.
 - f. Each item shall be clearly marked and provided with adequate sales and technical information to clearly show conformance with all aspects of the specification. Packages not provided as described above or largely incomplete shall be returned to the Contractor, without comment.
 - g. I&C (Instrument & Control) submittals shall be provided with a Bill of Materials showing quantity, manufacturer's name, catalog number, and supplier name and phone number.
 - h. Certify on all submittals that the material being proposed conforms to the contract requirements. In the event of any variance, state specifically which portions vary and request a variance in writing.
 - i. Certify that all furnished equipment is able to be installed in the allocated spaces by stating on each item:
"This equipment will be able to be installed in the spaces allocated"
 - j. Shop Drawings shall be provided on 11" x 17" sheets maximum size, and shall be scaled using standard engineering or architectural scales. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment.

- k. NOTE: submittals received that do not meet the requirements outlined above and in the individual spec sections will be returned without review.
- l. Contractor should anticipate in the schedule that submittals will take a minimum of 4 weeks for comments to return.
- m. The engineer will have a minimum of 2 weeks to review submittals and a minimum of 3 weeks to review I&C submittals.

2. PRODUCTS

A) NAMEPLATES:

- a. Nameplates shall be provided on all electrical devices, (including but not limited to motor control equipment, MCC cubicles, control stations, junction boxes, panels, motors, instruments, solenoids, switches, indicating lights, meters, and all electrical equipment enclosures.)
- b. Nameplates shall also be provided on all electrical panel interior equipment, including but not limited to: relays, circuit breakers, power supplies, terminals, contactors, and other devices.)
- c. All nameplates shall include the equipment name and number (circuit number and function, if applicable).
- d. Nameplates of all powered equipment (including instruments, motors, control panels, HVAC, etc.) and all switches, disconnects, and receptacles shall have included on the nameplate the power source (circuit and panel number, MCP/control pnl and circuit #, or MCC and unit number, etc.) that the equipment is fed from.
- e. Nameplates on light switches and receptacles shall include the panel and circuit and also include application such as outdoor lights, computer receptacle, etc. if relevant. Nameplates on switches and receptacles can be printed thermal tape.
- f. All motors shall have nameplates secured to the terminal box with 1/2" lettering or larger.
- g. Nameplates shall be made of 1/16" thick machine engraved laminated phenolic having black letters not less than 3/16" high on white background or as shown on the drawings or other sections of the specifications. Nameplates on the interior of panels and on light switches and receptacles shall be White Polyester with printed thermal transfer lettering and permanent pressure sensitive acrylic; TYTON 822 or equal.
- h. All nameplates shall include the equipment name and number (and function, and circuit number if applicable).
- i. Provide warning nameplates on all panels and equipment, which contain multiple power sources. Lettering shall be white on red background.

- j. Provide information or warning nameplates as required by the NEC or electrical inspector for identification of service disconnects, multiple service disconnects etc
- k. Nameplates shall be secured to equipment with stainless steel screws/fasteners/straps. Epoxy glue may be used where fasteners are not practical if first approved by the Engineer.

B) WIRE MARKERS

- a. Each power and control conductor shall be identified at each terminal to which it is connected. Conductors size No. 10 AWG or smaller shall have identification sleeves. Conductors shall be identified in accordance with Section 16145.
- b. The letters and numbers that identify each wire shall be machine printed on sleeves with permanent black ink. The figures shall be 1/8 inch high. Sleeves shall be white tubing, sized to fit the conductor insulation. The sleeves shall be shrunk to fit the conductor with hot air after installation.
- c. Wire markers shall be TMS Thermofit Marker System by Raychem Co., sleeve style wire marking system by W. H. Brady Co., or equal. Adhesive strips are not acceptable. Conductors No. 8 AWG and larger shall use cable markers of the locking tab type. Tabs shall be white plastic with conductor identification number permanently embossed.

C) RACEWAY MARKERS

- a. Raceway markers shall be non metallic with raceway number stamped in 3/16-inch minimum height characters. Tags shall be attached to the raceway with 316 stainless steel wire.

D) THERMAL (TEMPERATURE) RATINGS OF EQUIPMENT TERMINATIONS:

- a. Wiring and circuit breakers on this project are designed for 75°C operation above 30 amperes; 60°C for 30 amperes and below.
- b. All products furnished on this project shall have electrical terminations rated for 60°C for ampacities of 30 amperes or less and rated for 75°C for ampacities above 30 amperes.

3. EXECUTION

A) STORAGE AND INSTALLATION ENVIRONMENT:

- a. All electrical equipment shall be stored in a dry environment free from dust, moisture, sprays or vapors, which may be detrimental to their new condition. After installation of equipment, care shall be taken to protect all equipment from all dust,

moisture, paint and other spray, harmful vapors, etc. until final acceptance and certificates of occupancy have been obtained.

- b. Equipment shall not be installed in indoor areas until the area is covered, dry and finished to the point that other work will not create dust, vapors, or moisture. Equipment with integral heaters and fans shall not be installed until power is available at the location and the heater and fan shall be energized within 6 hours of the equipment being installed.

B) SITE INSPECTIONS

- a. Prior to final acceptance the Engineer will perform one or more site observation trips to develop a "punch list" of items deemed incomplete
- b. Each punch list item shall be completed by the Contractor and checked off of the list. When all of the items on the list are completed or commented on, the list shall be signed by the Contractor and returned to the Engineer for verification.

C) FINAL ACCEPTANCE:

- a. When all work is complete, the Contractor shall call the Engineer for the final acceptance testing inspections. The Electrical Contractor and System Integrator shall be present while these inspections are taking place and shall be available for opening cabinets and operating and adjusting the system as is necessary for the Engineer to verify all equipment is installed and operates to the requirements of the contract documents.
- b. The contractor shall anticipate a minimum of 4 hours to complete the final acceptance testing.
- c. Prior to the Contractor calling for this observation, the Contractor shall have completed all items of work, including wire markers, nameplates, final tests and final test reports. All equipment shall be checked for proper operation and all signals verified for correct calibration and wiring.
- d. Final acceptance will not be given until:
 - (1) All work is complete
 - (2) All "site inspection" punch-lists are checked off and returned to the Engineer
 - (3) All test reports are received
 - (4) All O&M manuals are received
 - (5) All spare parts are received
 - (6) All instrument test forms are received
 - (7) All project record drawings are received.

D) PROJECT RECORD DRAWINGS:

- a. A set of drawings shall be maintained at the job site (by the Electrical Contractor) showing any deviations in the electrical systems from the original design.

- b. This set of drawings shall be readily available for inspection by the Engineer at all times.
- c. Another complete set of drawings shall be marked up in the office showing the changes made on the field set of drawings. All changes shall be clearly marked in red on the drawings. Drawings shall be submitted to the Engineer at the completion of the project.
- d. A set of electrical drawings marked in red to indicate the routing of conduit runs, shall be submitted to the Engineer for review at the completion of conduit rough-in and prior to cover or pouring of concrete.

E) GUARANTEE:

- a. The Contractor shall guarantee his work and all components thereof, excluding fuses, incandescent, LED and fluorescent lamps for a period of 1 year from date of acceptance of the installation. The Contractor shall remedy any defects in workmanship and repair or replace any faulty equipment that shall appear within the guarantee period without additional cost to the Owner.

F) CLEANUP:

- a. The premises must be kept free of accumulated materials, rubbish and debris at all times. Surplus material, tools and equipment must not be stored at the job site. At the completion of the job, all equipment and fixtures shall be left clean and in proper condition for their intended use.
- b. All motor control equipment and control panels shall be cleaned inside and out at the completion of the project.

G) TESTS:

- a. Testing for installed feeder cables and motors is required as specified in other Sections. Test reports shall be submitted to the Engineer prior to final acceptance. All tests shall be performed in accordance with the applicable sections of NETA.
- b. Where specified in the individual product specification section, factory tests shall be performed at the place of fabrication and performed on completion of manufacture or assembly. The costs of factory tests shall included in the contract price.

H) MAINTAINED OPERATION REQUIREMENTS:

- a. The existing pump station is an existing and operating facility. The pump station must remain fully operational during construction.
- b. The Contractor shall submit a detailed plan with timelines and dates for the transition of the power system and any other anticipated interruptions of the existing pump station's operation.

- c. All changes in pump stations operations shall be directly coordinated with the Owner. All power outages shall be coordinated with the Owner and the Utility.

END OF SECTION

SECTION 16145

MISCELLANEOUS ELECTRICAL

A ☐ GENERAL

1 ☐ DESCRIPTION OF WORK:

- a ☐ This section covers furnishing and installing miscellaneous electrical devices and equipment and other wiring devices indicated on the drawings.

2 ☐ STANDARDS AND CODES:

- a ☐ All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.
- b ☐ All materials and equipment specified herein shall conform to all applicable NEMA, ANSI and IEEE standards.
- c ☐ All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, N.E.C.

3 ☐ COORDINATION

- a ☐ The Contractor is responsible for coordination of mechanical equipment, fans, louvers, heaters, motors, starters, etc. and the electrical power and control requirements. Provided in this section and other sections of the specifications and drawings.
- b ☐ The Contractor shall provide power and control equipment, wiring, and raceways to meet the requirements of the mechanical equipment supplied.
- c ☐ The Contractor shall verify as a minimum:
 - ☐ 1 ☐ Correct voltage, phase and frequency
 - ☐ 2 ☐ Correct motor starter type
 - ☐ 3 ☐ Proper coordination with the controls and control system Integrator.
- d ☐ The Contractor shall provide all necessary control wiring and components for any special requirements from an equipment manufacturer.
- e ☐ Any discrepancies between the electrical and mechanical equipment shall be brought to the immediate attention of the Engineer.

4 ☐ SUBMITTALS:

- a ☐ In accordance with the “submittals” requirements in Section 16010, submit catalog data showing material information and conformance with specifications. The intended use of each item shall be indicated.
- b ☐ Submittal documents shall be submitted via E-mail in PDF format. Separate Submittal e-mails shall be provided for each spec section. All products for each spec section shall be included in a single PDF document including the cover sheet and index in one single document. submittals shall be indexed and identified as follows:
 - ☐ 1 ☐ Email subject line shall be “*project name*, EI&C submittal *submittal #*, *spec section# - description*.”
 - ☐ 2 ☐ Cover sheet with:
 - ☐ a ☐ The project name and submittal #
 - ☐ b ☐ Contractor's and sub-contractor's name, phone number, and email address.
 - ☐ c ☐ Index sheet showing each product being submitted.
 - ☐ 3 ☐ PDF index tabs per the electrical specifications by section and paragraph or equipment name e.g. provide a minimum of one tab section for each piece of equipment in all of the PART 2 PRODUCT Sections 2.01 - 2.**.
- c ☐ A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
- d ☐ Provide all electrical information – wire diagrams, terminal information and numbering and electrical / power data.
- e ☐ Submit verification that stainless steel hardware will be used as required by this specification.

B□ PRODUCTS

1□ RACEWAYS

? GENERAL

a□ All wiring shall be installed in raceways

b□ Ground Conductor:

- 1□ All raceways shall contain a minimum of one continuous copper equipment grounding conductor sized in accordance with the N.E.C.

? AREA CLASSIFICATIONS:

a□ The following classification of areas shall be used as a reference in determining application of material covered by this Section unless specifically shown otherwise on the drawings. Areas which fall under two or more of the following classifications shall conform to the minimum requirements of all of the area classifications listed for that area.

b□ Outdoor and Damp Areas:

- 1□ All outdoor areas, pump room

- a□ Raceway indoors shall be EMT,.

- b□ Exposed raceways outdoors shall be IMC or Sch 40 PVC

- c□ Threaded fastening hardware and rods shall be 316 stainless steel. Raceway supports such as channel, clamps, and brackets shall be 316 stainless steel or aluminum or non-metallic.

- d□ Panels and boxes shall be NEMA 3R - aluminum, stainless steel or non-metallic (or as shown on the drawings).

c□ General Purpose Areas: All other areas not described above.

- 1□ Raceway indoors shall be EMT.

- 2□ Raceway concealed in walls or ceilings for general purpose lighting and receptacle circuits may be EMT.

- 3□ Exposed boxes shall be NEMA 12. Concealed boxes may be NEMA 1. Boxes poured in concrete shall be Cast.

? **RACEWAY APPLICATION:**

- a ☐ Unless otherwise shown on the drawings, CONDUITS shall meet the requirements of the "area classification" listed above and shall be:
 - ☐ a ☐ PVC for all underground raceways and all raceways entering vaults and underground structures.
 - ☐ b ☐ EMT for all exposed and concealed raceways inside the pump building
- b ☐ Unless otherwise shown on the drawings, CONDUITS BELOW GRADE shall be:
 - ☐ a ☐ Schedule 40 PVC:
 - ☐ i ☐ Sweeps and risers for transition of PVC from below grade to above grade that penetrates the floor slab shall be IMC.
- c ☐ ALL CONNECTIONS TO VIBRATING EQUIPMENT or motors shall be:
 - ☐ a ☐ liquidtight flexible metallic conduit for indoor, non corrosive areas and all motor leads from VFD's.
- d ☐ All raceways materials, sizes, etc. for UTILITY SERVICE shall be per the serving utilities requirements.

? **CONDUIT:**

- a ☐ Galvanized Rigid Steel Conduit (GRC):
 - ☐ 1 ☐ Rigid conduit shall be steel, galvanized. Terminations shall be by means of threaded hubs or double locknuts and insulating grounding type bushings.
- b ☐ Intermediate metal conduit (IMC):
 - ☐ 1 ☐ Intermediate metal conduit shall be of steel and shall be galvanized. Fittings shall be threaded.
- c ☐ Flexible Conduit (LFS):
 - ☐ 1 ☐ Flexible conduit shall be interlocking single strip, galvanized and shall have a polyvinyl chloride jacket extruded over the outside to form a flexible watertight raceway. Non-metallic flexible conduit shall have non metallic threaded fittings.
- d ☐ Nonmetallic Conduit(PVC):
 - ☐ 1 ☐ Nonmetallic conduit shall be rigid PVC, Schedule 40 or 80. PVC installed above grade shall be UV resistant schedule 80. Fittings shall be of the same material as the raceway and installed with solvent per the manufacturer's instructions. Conduit, fittings and solvent shall all be manufactured by the same manufacturer.
- e ☐ PVC Coated Rigid Steel Conduit (PGRC):
 - ☐ 1 ☐ Coating: A Polyvinyl Chloride (PVC) coating shall be bonded to the galvanized outer surface of rigid steel conduit. The bond between the PVC coating and the conduit surface shall be greater than the tensile strength of the

plastic. The thickness of the PVC coating shall be a minimum of .035" (35 mil) (40 mil nominal).

f□ Aluminum Conduit:

□1□ Shall be rigid aluminum conduit: ANSI C80.5; aluminum, threaded.

g□ Electric Metallic Tubing (EMT) shall be rigid galvanized steel

? **BOXES AND FITTINGS:**

a□ General

□1□ Materials for fittings shall be chosen to satisfy the requirements of - Area Classification described above.

□2□ Junction boxes, terminal boxes, device boxes, fixture support boxes, oblong, round and rectangular conduit fittings (condulets) shall be of the same material as required by the Area Classification for the raceway.

□3□ Boxes larger than 9"x9" shall be hinged.

□4□ Cast fittings and boxes shall be:

□a□ zinc electroplated cast ferrous alloy:.

□b□ Integrally cast threaded hubs or bosses shall be provided for all conduit entrances and shall provide for full 5 thread contact on tightening. Drilling and threading shall be done before finishing.

□c□ The cover plate shall be of similar cast ferrous alloy material and finish. A full body neoprene gasket shall be provided with the cover. Stainless steel screws shall be provided for all covers.

□5□ All screws, nuts, bolts, straps, rods and other hardware used with supports, fittings and boxes shall be 316 stainless steel.

? **HANDHOLES AND VAULTS:**

a□ **Handholes and vaults** are specified on the civil plans

? **CONDUIT & CABLE SUPPORTS:**

a□ Rivet-type or Zamac fasteners are not allowed. All fasteners between channel, strut, etc. and walls shall be removable with a screwdriver.

b□ Support materials in general purpose areas may be hot-dip or electro-galvanized. All support materials used in damp areas, pump rooms, or outdoor, or corrosive areas shall be NEMA 4x Aluminum, Stainless steel, or non-metallic.

c□ All screws, nuts, bolts and other hardware used with conduit and cable supports shall be 316 stainless steel.

2☐ CONDUCTORS:

- a☐ All conductors shall be stranded copper. Insulation shall be THW, THWN, or THHN, chosen to satisfy environmental conditions. Conductors used for power circuits shall not be smaller than No. 12. Control conductors may be No. 14.

3☐ SHIELDED SIGNAL CABLE:

- a☐ Signal conductor cable shall be AWG #16 individually twisted, shielded pairs. BELDEN #8719, or equal. Conductors shall be tinned copper with color coded 90 degrees C PVC insulation and individual conductor jacket of nylon. Shielding shall be aluminum polyester 100% shield coverage with drain wire. The cable shall have an overall PVC jacket. The insulation system shall be rated for 300 volts.
- b☐ For applications where 600 volt insulation is required, use
 - ☐1☐ BELDEN 1120A
 - ☐2☐ #18 TWSP, stranded wire.
- c☐ 600 volt insulated signal wire shall only be used where required by Code.

4☐ CONNECTORS

- a☐ All wiring shall be continuous from point to point – no splices of any kind are allowed. All control and signal wire shall land on numbered terminals.
- b☐ Ideal Industries "Wing Nut" or 3M Company "SCOTCHLOCK" pre-insulated connectors may be used for general purpose lighting and receptacle circuits for splices and taps in conductors No. 10 AWG and smaller. For No. 8 AWG and larger conductors, utilize T&B compression connectors. Compress using recommended die and tools.
- c☐ For connections of wire to cord to removable equipment provided with integral cords (such as floats, transmitters, limit switches, aerators, submersible pump motors, etc.) Provide junction box with terminals and spade/lug type terminations and coat with liquid insulation – Performix Liquid Tape or equal.
- d☐ For connections of wire to cord to Submersible motors of all size wire use a water proof motor stub insulator. Thomas and Betts multi splice insulator MSLT112-4 or equal.

5☐ SPLICE INSULATION:

- a☐ Splice insulation shall be equal to the conductor utilized.
- b☐ Insulate all permanent splices that are underground or in damp or corrosive environments with cast epoxy type insulation which covers the jacket of all cords and the insulation on all wire. Epoxy splice shall be Scotch #3570 or equal.

6☐ MOTOR TERMINAL SPLICE INSULATION:

- a☐ Provide motor terminal splice insulation in the motor connection box that will withstand constant vibration and abrasion without degrading the insulation of the splice. A product shall be used that is specifically designed for the purpose of motor terminations

7☐ WIRE MARKERS:

- a☐ Field installed wire markers shall be pre-printed, heat shrink type sleeves, Thomas&Betts Type HVM, Tyton Type THS or approved equal. See paragraph below for marking requirements.

8☐ SWITCHES AND RECEPTACLES:

- a☐ Standard wall switches shall be single-pole, or double-pole, three-way, as shown on the drawings or as required for the application. Switches shall be AC quiet type rated 20 amp, 125/277 volt with screw terminals. Wiring devices shall be ivory colored for general use office areas, and black when installed in mechanical rooms or when mounted on dark walls. Receptacles on emergency or backup power shall be labeled or color coded. ARROW HART, BRYANT, HUBBELL, P&S or equal.
- b☐ Weather proof switches for use in damp, corrosive or outdoor applications shall be
 - ☐i☐ Die cast aluminum housing with lever type switch CROUSE-HINDS, DS185
 - ☐ii☐ or non metallic, UL marine listed, CARLON, E98TSC or equal.
- c☐ Weather proof receptacles for use in damp, corrosive or outdoor applications shall be
 - ☐i☐ Die cast aluminum with spring and gasketed covers CROUSE-HINDS, WL series
 - ☐ii☐ or non metallic, CARLON or equal.
- d☐ Provide GFI receptacles where required by the NEC.
- e☐ Per the nameplate requirements, provide circuit and panel data labels on all switches and receptacles and label all light switches with function.
- f☐ Wall switches for areas classified as hazardous per NEC, as described herein or shown on the drawings shall be tumbler type, front operated, CROUSE-HINDS Type EFS or approved equal.

? PLATES:

- a☐ Scope: Provide plate for each wiring device, for each signal or communication outlet.
- b☐ Device plates on flush devices, in general, shall be satin finish stainless steel Sierra 302 stainless steel line or approved equal, modern classic design, corrosion

resistant. Special finish plates shall be provided to match special paneled walls as directed by Architect.

- c□ Device plates for switches and receptacles in outdoor areas shall have weatherproof plates with hinged cover and stainless steel screws. Sierra Electric WP series or equal.
- d□ Plates on exposed wiring shall be of metal, of the same manufacture as the conduit fittings; specifically suited for device and fitting used.
- e□ Blank, Bushed or Special Outlet Plates: Provide for all signal communication system outlets as required.

? **SPECIAL ACCESSORIES**

- 1□ Provide accessories such as junction boxes, outlet boxes, etc. necessary to mount switches and receptacles in a proper and approved method.

9□ **DRY TYPE TRANSFORMERS**

- a□ Dry type transformers shall be constructed of heavy gauge sheet steel. Coil and terminal chamber shall be constructed with guarded opening for ventilation and convection cooling. Transformer shall be connected for the application. Unless otherwise shown or required for the application, primary coil shall be delta connected, secondary coil wye connected.
- b□ Separate primary and secondary windings shall have Class H insulation and shall be rated for continuous operation at rated kVA with temperature rise of not over 150 degrees C above a 40 degree C ambient, with a maximum hot spot temperature of 220 degrees C. Windings, core and coil assembly shall be treated and built to resist the effects of dirt and moisture.
- c□ Unless otherwise noted or shown, transformers shall be provided with a minimum of four full capacity taps, minimum of two 2-1/2 percent above and two 2-1/2 percent below normal (rated) primary voltage.
- d□ Transformers furnished shall have a continuous rating of not less than the size noted on the drawings.
- e□ The secondary neutral terminal on three-phase K-rated transformers shall be sized for 200% of secondary phase current.
- f□ Provisions for external connections shall be made by means of a terminal board employing lugs compatible for the external conductors to be installed.
- g□ The core of the transformer shall be grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE ANSI standards.
- h□ Provide grounding per NEC.

- i□ Provide enclosures per the requirements of the area installed – NEMA 3R for outdoor and damp areas, NEMA 12 for indoor areas
- j□ Acceptable manufacturers for dry type transformers shall be General Electric, Cutler Hammer, Square D, Heavy Duty and approved equals.

10□ **PANELBOARDS**

- a□ Panelboards shall be rated at proper voltage and current for intended use with bus bars of tin plated copper or aluminum. Panels shall have phases, voltage and current ratings as shown on the drawings. Panels shall have 100 percent neutral, with equipment ground bar, unless noted otherwise. Panelboards shall be dead front.
- b□ Panels shall have as a minimum the number of circuits shown on the panel schedules on the drawings.
- c□ The following interrupting capacity shall be considered minimum. Other ratings shall be as specified on the drawings.
 - 1□ 240V and 208Y/120V – sub-fed Panelboards 10,000 AIC symmetrical
 - 2□ 240V and 208Y/120V – Service Panelboards 20,000 AIC symmetrical
 - 3□ 480V Panelboards 25,000 AIC symmetrical
- d□ Provide service entrance rated panelboards where shown on the plans or required by the NEC.
- e□ Provide enclosures per the requirements of the area installed – NEMA 3R for outdoor and damp areas, NEMA 1 for indoor areas or as shown on the drawings.
- f□ Mount breakers in all panelboards so that breaker handles operate in a horizontal plane. Circuit breakers shall be bolt-type only. Provide common trip on all multiple pole breakers.
- g□ Where noted, provide spare breakers, complete for future connection of wiring circuits. Where "Space Only" is indicated for breakers, provide all bussing and breaker mounting hardware in the panelboard; provide steel knockouts in dead front metal closure of unused part of panel. If any steel knockouts are removed, provide breakers in such spaces or approved cover plates. Open spaces are not permitted.
- h□ Panelboards shall be flush or surface as indicated; tight closing doors without play when latched. Where two cabinets are located adjacent to each other in finished areas, provide matching trim of the same height.
- i□ Provide cabinets of sufficient dimensions to allow for future expansion and addition of circuit breakers within the panelboards as indicated on drawings.
- j□ Provide lock for each cabinet door. All Electrical distribution equipment locks to be keyed identically.
- k□ Fasten panelboard with machine screws with oval countersunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible

only when dead front door is open are acceptable. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall have trim hinged at right side in addition to hinged door over dead front.

- l ☐ Provide factory standard lacquer or enamel finish, ASA #49 gray.
- m ☐ Provide Surge arrestors , with indicators, where shown on the one-line diagrams to protect against overvoltage transients. JOSLYN J9200 series with protective capacitor GE model 9L18 or equal. Select proper components for the application as shown on the drawings.
- n ☐ Numbering and buss arrangement shall be as shown on the Panel Schedules on the drawings.
- o ☐ Provide a type written circuit directory card for each panelboard with the load name, number, location and kVA.
- p ☐ Provide engraved (color layer - engraved through outer layer) plastic name plate with 1/2 inch high characters for panel identification (for panel name); attached with stainless steel screws to each panelboard front. Emergency system - white on red; Normal system - black letters on white. Include voltage, phase and wire (i.e., 208Y/120V, 3 phase, 4 wire) in 3/8 inch characters.
- q ☐ Secure in place with top of cabinet at 6' - 6", unless otherwise noted. Top of cabinet and trim shall be level.
- r ☐ For each branch circuit panelboard: Provide neatly type written as-built information for each panelboard by circuit with its proper load designation. Mount the panelboard circuit directory inside the door of each panelboard in a clear plastic sleeve. Provide one spare blank card for each card used.
- s ☐ Close all openings in dead front with closures manufactured for the purpose or install spare breakers.

11 ☐ **SURGE SUPPRESSION:**

- ☐ 1 ☐ Where surge suppressor (SPD or TVSS) is specified or shown on the drawings, provide integral surge suppression device with the following minimum characteristics:
 - ☐ a ☐ Surge Current per phase – 120kA
 - ☐ b ☐ Surge Current L – N 60kA
 - ☐ c ☐ IEEE C3 Wave (10kA) – 9,000
- ☐ 2 ☐ Unit shall have overcurrent protection, infrared and thermal detection - Include diagnostic package and direct bus bar connection and 10 year warranty – Cutler Hammer Clipper CPS-S or equal.

12 ☐ **FUSES:**

- a ☐ Fuses shall be of the type and amperage indicated on the drawings. The voltage rating shall be appropriate for the application indicated. The fuse types indicated on

the drawings imply a certain set of fuse characteristics. No substitutions of fuse types will be allowed without written approval from the Engineer.

- b□ All fuses used on the project shall be provided with “blown fuse” indicators.
- c□ Where fuses in motor circuits are indicated but not sized, provide Manufacturer's recommended fuse size based on actual motor installed.
- d□ Provide in-line or integrally-mounted fuse clips on control power or low-voltage transformer.
- e□ Provide fuse puller or pullers for fuse sizes used.
- f□ Provide surface mounted cabinet, sized to store required spare fuses at location coordinated with Owners Representative.
- g□ Provide a minimum of two spare fuses for each fuse used.
- h□ Acceptable Manufacturers:
 - 1□ BUSSMAN
 - 2□ GOULD SHAWMUT
 - 3□ LITTLEFUSE
 - 4□ RELIANCE

13□ MOLDED CASE CIRCUIT BREAKERS:

- a□ Molded case circuit breakers shall be quick-make and quick-break type. They shall have wiping type contacts. Each shall be provided with arc chutes and individual trip mechanisms on each pole consisting of both thermal and magnetic trip elements. Two and three pole breakers shall be common trip. All breakers shall be calibrated for operation in an ambient temperature of 40 degrees C. Molded case circuit breakers shall be trip-free. Each breaker shall have trip indication independent of the ON or OFF positions.
- b□ Breakers shall have lugs UL listed for both copper and aluminum.
- c□ Circuit breakers shall be capable of accepting the cable shown on the drawings. Circuit breakers not capable of accepting the cable shown shall not be acceptable.
- d□ Breakers shall have the interrupting rating and trip rating indicated on the drawings.
- e□ All breakers that serve motor loads shall be provided with disconnect handle mechanism to lock out the circuit in the open position

14□ DISCONNECTS:

- a□ Provide local equipment disconnects only if required by the manufacturer or NEC.
- b□ Disconnect's rating shall be chosen by the Contractor to meet the requirements of the equipment served.

- c□ Switch shall be heavy duty type, shall be quick-make quick-break and shall be horsepower rated. Switch shall have blades as required to open all ungrounded conductors and shall be single throw unless noted.
- d□ Enclosure shall be suitable for location in which mounted.
 - 1□ Enclosures located outdoors or in damp or corrosive areas shall be NEMA 4X, aluminum or stainless steel.
- e□ Fusible disconnects shall be as above with addition of fuse space and clips to accept Class R fuses. Use only where required by equipment manufacturer to meet UL installation requirements.
- f□ Disconnects for motor loads shall be lockable in the open position

15□ MOTORS

? GENERAL

- a□ Unless specifically accepted, all motors shall be of the "energy efficient" or "energy saver" type which meet the minimum efficiencies required by the Washington State energy codes.
 - 1□ All Motors shall be suitable both electrically and mechanically to drive the connected equipment under any and all modes of operation without exceeding the FLA (Full Load Amps) rating of the motor.
- b□ All motors shall be suitable for the environment in which they are to be installed. The environment in which motors will be installed in this project will be 100% humidity continuously.
- c□ Motor voltages shall be chosen to meet the requirements of the electrical system. The Contractor shall choose the motor voltages to meet what is shown on the plans.
- d□ Motor enclosures shall be totally enclosed fan cooled (TEFC) unless otherwise specified or required by the environment installed. Provide explosion proof non-ventilated - (XPNV) or fan cooled (XPFC) motors in hazardous areas.
- e□ All single-phase motors shall be self-protected. Single phase motors shall be provided with start capacitors if necessary for proper operation of the motor. The start capacitors shall be located within the motor housing.
- f□ Enclosed Motors: Provide drain plugs for non-explosion proof motors and drain and breather for explosion proof motors.
- g□ Finish: Provide a prime and final finish of the manufacturer's standard colors.
- h□ Provide imbedded thermostats for thermal alarm or motor cut out for all motors 40 Hp and above unless otherwise shown.

- i□ Provide a terminal connection box two sizes larger than normal to allow extra room for motor feeder splices. Refer to Motor Terminal Splice Insulation requirements.
- j□ Provide NEMA Class B insulation, minimum, with additional nonhygroscopic moisture protection which will maintain a minimum resistance of 1.0 megohms after 168 hours of exposure at 100% humidity.
- k□ Provide motors with a 1.15 service factor at maximum motor operating load.

? **MOTORS ON VFDs**

- a□ Motors on VFD's shall be inverter duty and rated for use with VFD's. Insulation rating shall be 2100 volts minimum. The Contractor shall coordinate between the VFD and motor manufacturers to provide a motor/VFD combination suitable for the application.
- b□ Provide motors with adequate cooling for the lowest expected speed for load served.
- c□ Any line terminators, filtering devices, harmonic filters, line reactors, or other devices required for proper operation of the motor/VFD combination shall be provided and installed by the Contractor at no extra cost to the Owner.
 - 1□ For motors on VFD's, Provide proof of inverter duty rating and insulation rating as specified.

16□ HARDWARE

- a□ The Contractor shall provide any necessary hardware for mounting equipment and devices. The mounting hardware shall be made of materials suitable for the environment installed. Provide materials made from aluminum, non-metallic, or stainless steel in outdoor, damp, or corrosive areas.

B□ EXECUTION

1□ GENERAL

- a□ Provide services of an authorized representative of manufacturer to visit site of work and inspect, check, adjust if necessary, and approve equipment installation.
- b□ Assure that equipment manufacturer's representative is present when equipment is placed in operation.
- c□ Verify that equipment representative revisits job site as often as necessary until all trouble is corrected and equipment installation and operation are satisfactory, in opinion of Engineer.
- d□ Verify that motor overcurrent protection is in accordance with the N.E.C.

- e□ Verify the motor protection and control is in accordance with the equipment manufacturers requirements.

2□ WIRE & RACEWAY SIZING

- a□ The contractor shall size wire per NEC for the load being served. Raceways shall be sized per NEC for the wire or cables installed. Scheduled raceways and wire sizes are minimum size and contractor shall upsize if required for installation per the NEC.
- b□ Size pull and terminal boxes per NEC. Pull box sizes, if shown on the drawings, are minimum size and the contractor shall upsize if required by NEC.

3□ OUTLETS AND SWITCHES:

? GENERAL

- a□ For all receptacles, switches, and other related devices of the lighting and receptacle system, provide all necessary raceway and wire for a complete installation.
- b□ Center all outlets with regard to building lines, furring and trim. Symmetrically arrange outlets in the room. Satisfactorily correct outlets improperly located or installed.
- c□ Set outlets plumb and extend flush outlets to the finished surface of the wall, ceiling or floor without projecting beyond same.
- d□ Install symmetrically all receptacles, switches and outlets shown on the trim and where necessary, set the long dimension of the plate horizontal or gang in tandem.
- e□ Outlets in outdoor areas or wet areas shall be GFI – provide GFI outlets in other areas as required by Code.

? MOUNTING HEIGHTS:

- a□ Unless otherwise noted, wall mounted outlet devices shall generally be 24 inches above the floor, 18" in architecturally treated areas. In basement, underground or in areas subject to flooding, outlets shall be 36" above the floor.
- b□ Switches shall be mounted 48 inches above the floor.
- c□ Outlets mounted over work tables, desks and counters shall be 2"- 6" above the work surface.

4□ GENERATOR RECEPTACLES

- a□ Where receptacles or plugs are called out for portable generator connections, coordinate the mounting location with the owner prior to installation.

5 ☐ **RACEWAYS**

? **GENERAL**

- a ☐ Not all conduits/raceways are scheduled. Wire diagrams and oneline diagrams show wiring requirements. Provide all necessary raceways for wiring as shown on the drawings.
- b ☐ For all power and control equipment, provide all necessary raceways and wire per plans and specifications even if not specifically shown on the plans.
- c ☐ Raceway routing shown on plans is general in nature, unless otherwise indicated on the drawings, the Contractor shall be responsible for determining conduit routing that conforms to the installation requirements required by the plans and specifications.
- d ☐ The number of directional changes of a conduit shall be limited to 270 degrees in any run between pull boxes.
- e ☐ Conduit runs shall be limited to a maximum of 400 feet, less 100 feet or fraction thereof, for every 90 degrees of change in direction.
- f ☐ In general, conduit inside structures shall be exposed unless otherwise specified or indicated on the drawings. No conduit shall be exposed in water chambers unless so indicated on the drawings.
- g ☐ Provide raceways/conduits per the conduit and wire schedule and additional as necessary to meet the requirements of the wiring.
- h ☐ Scheduled conduit sizes are minimum. Contractor shall upsize conduits if necessary or if required by the NEC.
- i ☐ Non scheduled conduits shall be a minimum of $\frac{3}{4}$ " or sized per the NEC for the wiring installed plus 20%.
- j ☐ Conduit across structural joints where structural movement is allowed shall have an O-Z "Type DX" or Crouse-Hinds "Type XD," bonded, weathertight expansion and deflection fitting of that conduit size.
- k ☐ Separate conduits of different voltages by a minimum of 2" – separate signal wire conduits from all other types of conduits by a minimum of 6".
- l ☐ All conduits shall be a minimum of $\frac{3}{4}$ ".
- m ☐ Conduits entering underground structures shall be made water tight – see "handholes and Vaults" for more requirements.

? **HANDHOLES AND VAULTS:**

- a ☐ Conduits entering energized equipment shall have both conduit ends sealed with a waterproof duct sealing compound - WATERGUARD Industrial Encapsulant or equal. Where conduits enter through sides of handholes the penetration shall be made watertight.

- b□ Provide a minimum of 12 inches deep of ¾ to 1" drainage gravel under entire surface and extending 12 inches beyond the outside edge of the structure in all directions - of all vaults and handholes.
- c□ All wire installed in handholes and vaults shall be neatly bundled and racked to the handhole or vault side walls.

6□ **WIRE AND CABLE INSTALLATION**

- a□ Splices in power and control and signal wires or cables is not allowed. All wire transitions shall be done on terminals.
- b□ Keep all conductors within the allowable tension limits during installation. Lubricants for wire pulling, if used, shall be approved for the insulation and raceway material. Observe cable manufacturer's and industry standard cable bending radius recommendations.

7□ **WIRE AND CABLE TERMINATION:**

? **GENERAL**

- a□ Power conductors, No. 8 AWG and larger may be terminated directly in box-type lugs.
- b□ Solid conductors (when allowed for lighting and receptacle circuits) of #10 and #12 may be directly terminated to screw terminals.
- c□ For any power, control, or signal wire terminating on screw type terminals; provide spade or ring tongue type terminations.
- d□ Stranded control conductors may be directly terminated in box type terminals at control panels. Insulated terminals shall be used also on all stranded instrumentation wiring.
- e□ Terminal boxes shall be provided at instrument cable splices. If cable is buried or in raceway below grade at splice, an instrument stand shall be provided as specified with terminal box mounted approximately 3 feet above grade.
- f□ Special instrumentation cables shall be terminated in accordance with the recommendations of the manufacturer of the equipment and subject to review by the Engineer.
- g□ No splices shall be used in power, control and/or signal wiring. The wiring shall be continuous from point-to-point. Extending existing cables will not be allowed except where shown on the drawings.

? **TERMINAL MARKING:**

- a□ All terminals in instrument and relay compartments, motor control centers, in control panels, instrument panels, field panels and control stations, as well as

connections to mechanical equipment shall have reference number and letter in accordance to the following.

- ☐ i ☐ h = Control power hot (usually 120v or 24v)
- ☐ ii ☐ n = neutral
- ☐ iii ☐ g = ground
- ☐ iv ☐ c = control (use if none of the above letters apply)
- ☐ v ☐ p = power (usually 480v)
- ☐ vi ☐ s = signal (usually 4-20ma or 1-5v) (use if none of the above letters apply)
- ☐ vii ☐ B = DC + and –

- b ☐ PLC input or output (S=slot number and I = card input number: for example slot 3 input 7 = 3-07)

? **WIRE MARKING:**

- a ☐ All power and control conductors shall be tagged; including conductors in instrument and relay compartments of motor control centers, in control panels, instrument panels, field panels and control stations, as well as connections to mechanical equipment, shall be tagged at each end with legible, permanently coded tight fitting wire-marking sleeve showing the complete wire designation.
- b ☐ Wire marking lettering shall be bold and type written.
- c ☐ Wiring within a single enclosure shall be marked with the basic wire and terminal number at each end.
- d ☐ Control and signal wires that interface to PLC I/O shall be marked so that the number relates to the PLC slot and I/O number – this is the same number as the terminal number.
- e ☐ All field wiring shall have wire labels at each end. The labels shall be marked with the output terminal number at the original equipment (control panel, MCP, RCP, LCP or MCC) or remote device terminal # (if applicable).
- f ☐ For wire that terminates in at a control panel at both ends or a control panel and an MCC, the priority for the numbering shall be as follows
 - ☐ 1 ☐ MCP 2. RCP 3. MCC 4. LCP

END OF SECTION

ATTACHMENT: ELECTRICAL SYSTEM TEST REPORTS

ELECTRICAL SYSTEM
DESCRIPTION DATA

SERVICE DESCRIPTION:

nominal voltage, phase to phase
phase to neutral - single or three phase-
number of conductors

SERVICE CONDUCTORS:

phase size and insulation type
neutral size and insulation type
ground size and insulation type

SERVICE DISCONNECT DESCRIPTION:

circuit breaker or disconnect switch
size (amps)
fuse (amps)

MEASURED CONDITIONS		DATA
Operating Load Voltage	Volts	Vab_____Vbc_____Vca_____
		Van_____Vbn_____Vcn_____
Operating Load Feeder Current	Amps	Ia_____Ib_____Ic_____
Conductor Insulation Megohms Resistance (record the indicated measurement for each of the following circuits:)		a-b_____b-c_____c-a_____
	Megohms	a-g_____b-g_____c-g_____
1. Service Feeder		
2. Pump Feeders		

16145 - MOTOR DATA AND TEST REPORT

EQUIPMENT NAME AND NUMBER: _____

EQUIPMENT SPECIFICATION SECTION: _____

MOTOR STARTER LOCATION _____

CONTRACTORS REPRESENTATIVE, DATE _____

MOTOR NAMEPLATE DATA

MFR Name/Model No.	_____
Voltage/Phase/HP	_____
FLA/LRA	_____
Service Factor	_____
Efficiency Index (or percent)	_____
NEMA Design	_____
Code Letter	_____
Insulation Type	_____
Temperature Rise	_____
Ambient Temperature	_____
RPM	_____
Enclosure	_____
Thermal Trip Setting	_____
Space HTR: Watts/Volts	_____
Other Data	_____

MOTOR STARTER INFORMATION

Manufacturer/Type	_____
Overload Heater No	_____

* RECORDED FULL LOAD DATA	VOLTS	A-G	B-G	C-G
FULL LOAD OPERATING VOLTAGE	VOLTS	A-B	B-C	C-A
FULL LOAD OPERATING CURRENT	AMPS	A	B	C

INSULATION RESISTANCE (deenergized)	MEGOHMS	A-G	B-G	C-G
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MOTOR CIRCUIT RESISTANCE	OHMS	A-B	B-C	C-A
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* VOLTAGE & CURRENT READINGS SHALL BE TAKEN AT THE CLOSEST
ACCESSIBLE POINT TO THE LOAD

END OF SECTION

PART I. SECTION 16145
LOAD TRANSFER SWITCHES (ATS)

1. GENERAL

A) DESCRIPTION OF WORK

- a. This section provides equipment and installation for load transfer switches automatic transfer switch (ATS).
- b. Transfer switch shall be well documented with clear wiring diagrams and submittals shall include wiring diagram showing clearly all connections for field wiring with terminal numbering.
- c. Provide indicating lights, switches, meters, nameplates, and controls as shown on the drawings and specified herein.

B) STANDARDS AND CODES

- a. All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label. They shall be listed at the AIC ratings where installed on this project.
- b. All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.
- c. All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, N.E.C..

C) SUBMITTALS

- a. Submittal documents shall be submitted via E-mail in PDF format. All products for each spec section shall be included in a single PDF document including the cover sheet and index in one single document. submittals shall be indexed and identified as follows:
 - (1) Email subject line shall be "project name, EI&C submittal - submittal #, spec section# - description."
 - (2) Cover sheet with:
 - (a) the project name and submittal #
 - (b) Contractor's and sub-contractor's name, phone number, and email address.
 - (c) index sheet showing each product being submitted.

- (3) PDF index tabs per the electrical specifications by section and paragraph or equipment name e.g. provide a minimum of one tab section for each piece of equipment in all of the PART 2 PRODUCT Sections 2.01 - 2.**.
 - (4) Label each equipment submittal sheet with equipment name and number. Indicate location where each item of equipment submitted will be used on the job. Use equipment numbers when available.
 - (5) Identify specific options and cross hatch out any information that is not a part of the specific information for the submitted component.
- b. Submittals shall include the manufacturer's name, address, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference. Include other information necessary to establish contract compliance of each item proposed to furnish.
 - c. Each item shall be clearly marked and provided with adequate sales and technical information to clearly show conformance with all aspects of the specification. Packages not provided as described above or largely incomplete shall be returned to the Contractor, without comment.
 - d. After review by the ENGINEER, the CONTRACTOR shall submit the Shop Drawings of the service section to the utility company for approval prior to fabrication.

D) COORDINATION OF EQUIPMENT

- a. It is the Contractor's responsibility to coordinate equipment information with the transfer switch manufacturer so that the correct type of equipment is provided and sized properly for the devices being served and to supply such equipment with the proper protection.
- b. The Contractor shall verify that all equipment will fit physically within the space allotted per the contract drawings.

E) ACCEPTABLE MANUFACTURERS (AUTOMATIC TRANSFER SWITCHES)

- a. Acceptable manufacturers are.
 - (1) ONAN Corporation
 - (2) ASCO
 - (3) SQUARE D
 - (4) KOHLER
 - (5) CUTLER HAMMER/WESTINGHOUSE
 - (6) ZENITH
 - (7) RUSSELL
 - (8) Or Equal
- b. The equipment of the manufacturer selected must fit within the space restrictions as shown on the plans.

F) O&M DATA

- a. Provide O&M data for all transfer switch and related equipment in accordance to the general requirements in Section 16010.

2. PRODUCTS

A) GENERAL REQUIREMENTS

- a. The transfer switches shall be equipped with three poles for normal and emergency service of 480 volts, 60 hertz, 3 phase. The transfer switches shall be rated **400** amperes.
- b. The transfer switch shall be mechanically and electrically held and rated to 600 volts for all classes of load and continuous inductive duty.
- c. The transfer switch shall conform to UL 1008 Revision 4 provisions for Withstand Current Ratings and Closing Ratings. The switch shall be rated for a minimum RMS symmetrical fault current (AIC rating) of
 - i) 25,000 A for switches rated 400 amps and below,
- a. The automatic transfer switch shall, open transition type with a minimum adjustable pause in neutral capability of 10 seconds, incorporating isolating switching unit mechanisms and overcurrent protection on the utility supply with number of poles as specified on the drawings.
- b. The switch shall be double throw inherently interlocked mechanically and electrically to prevent supplying the load from both sources simultaneously. The operating current shall be obtained from the source to which the load is to be transferred. The transfer mechanism shall be of the double break design with solid silver cadmium surface contacts and individual heat resistant arc chambers.
- c. Single break contacts will also be acceptable if arc barriers and magnetic blow out coils are used. The contacts shall be capable of carrying 20 times the continuous rating for interrupting current.
- d. All contacts, coils, etc. shall be readily accessible for replacement from front of panel without major disassembly of associated parts.
- e. The transfer switch shall have UL 1008 label and listing.

B) AUTOMATIC TRANSFER SWITCHES

1. CONTROLS HARDWARE

- a. All wiring shall be numbered at each end with basic wiring numbering scheme.

- b. All terminals shall be clearly labeled
- c. All internal equipment shall be labeled
- d. All external devices shall be clearly labeled
- e. Provide nameplate on transfer switch as shown on the drawings
- f. Provide transfer switch with solid state logic
- g. Provide transfer switch with LED status annunciator showing graphic display of source availability and switch position.

2. CONTROLS FEATURES

- a. Automatic transfer switches shall include the following accessories:
 - (1) Undervoltage Sensor: Adjustable solid state low voltage sensing relays (pick up at 85 to 98 percent of normal voltage - set at 98%; drop out at 75 to 100 percent - set at 90% of pickup setting). Provide for each phase.
 - (2) Time Delay Start and Stop on Drop Out: Solid state adjustable time delay on start (0 to 15 seconds). Set start delay for 15 seconds. Timer will send start signal to gen. set CP, where louver timer will allow 15 second delay for louvers to open prior to starting genset.
 - (3) Time Delay Stop: Solid state adjustable time delay (0 to 10 minutes) to allow generator cool down after normal power is restored and retransfer occurs. Set at 5 minutes.
 - (4) Time Delay Transfer & Retransfer: Solid state time delay relay adjustable 2 to 120 seconds for transfer to emergency and 0 to 30 minutes for retransfer to normal. Set at 5 minutes for retransfer to normal. Set at 5 seconds for transfer to emergency.
 - (5) With or Without Load Selector Switch: Switch to select exercise with or without load.
 - (6) Normal-Test Switch: Switch such that in the "Normal" mode the transfer switch will operate automatically and in the "Test" mode the generator will start for test purposes. This switch shall work in conjunction with the "With" or "Without" load switch. An extra contact block shall be provided on the normal-test switch for wiring to the Programmable Controller, if one is required.
 - (7) Exercise Clock: An exerciser clock shall be provided which shall be programmable to exercise the generator set. The exerciser shall be adjustable from 15 to 60 minutes once each week. The exercise shall be either with or without load. If power fails during the exercise cycle, the load shall automatically pick up.
 - (8) Programmed Transition: The load transfer control shall be capable of remaining in the neutral position for an adjustable time of .5 to 60 seconds when transferring from one line power source to the other to allow residual voltages to decay before application of the source.

- (9) Provide the following dry contacts each with terminals for field connection, 2 amp rated at 120 VAC.
 - (a) Two separate normally open dry auxiliary contacts, one indicating transfer switch is in NORMAL position and one indicating switch is in EMERGENCY position,
 - (b) Four separate normally open dry contacts two indicating "commercial power / normal power" available and two indicating generator / emergency power available.
 - (c) Normally open dry contact indicating generator called to run.
- (10) Position lights for normal and emergency position indication
- (11) Two indication lights, one for emergency power available and one for normal power available
- (12) Note: provide LED type lights for all indication lights.

2. EXECUTION

A) GENERAL

- a. The transfer switch shall be delivered to the site ready for external connections to field equipment. Transfer switch shall be leveled and securely anchored to the floor and / or wall.
- b. All assembly and wiring not completed by the manufacturer or Integrator, due to shipping sections, multiple suppliers, etc. shall be the responsibility of the Contractor.

B) TESTING

- a. Automatic transfer switches shall be configured by the Contractor and field tested along with the control system and the generator per the requirements in this section and 16921
- b. Testing and inspection of the automatic transfer switch shall include all components. .
- c. After completion of initial testing, Contractor shall conduct subsequent testing for inspection by the Engineer. All control functions and all status and alarm monitoring and indication shall be demonstrated under simulated operating conditions.

C) INSTALLATION

- a. The transfer switch equipment shall not be shipped to the site until a suitable environment is available for installation of the equipment. A suitable environment for the purposes of this contract for the automatic transfer switch shall be dry, covered and heated Prior to shipment of electrical equipment, the Contractor shall contact the Engineer for field verification of a suitable environment.

- b. The transfer switch shall be installed in accordance with the installation drawings and instructions. Installation shall be performed by workers who are skilled and experienced in the installation of motor control equipment. It is the contractors responsibility to provide sufficient space for the equipment and size of equipment to fit within the space requirements and meet all code requirements.

D) WIRING

- a. Refer to Section 16145-Wire and Cable Termination.
- b. Separately bundle all signal and low voltage wiring from 120V and 480V wiring and maintain a minimum of 2 inches separation of conductors.

END OF SECTION

SECTION 16400
UTILITY POWER SERVICE & METERING

1. GENERAL

Description of Work:

- a. Work consists of:
 - (1) Installation of new service 480Y/277V 3 phase 400 amps to the new pump station building.
 - (2) Installation of a temporary service and service pole panels and transformers for:
 - (a) 480Y/277V 3 phase 200 amp service to the existing pump station.
 - (b) 120/240V 1 phase 100 amp panel for temporary power and construction power.
 - (3) The removal of the existing service and temporary service to the existing pump station after the new pump station is complete.

B) SCHEDULING WORK WITH THE UTILITY COMPANY:

- a. The Contractor shall be responsible for all scheduling and coordination with the utility company. The Contractor shall coordinate and schedule power outages, power service for operation and construction, and power service as may be required by the facility prior to Certificate of Occupancy.
- b. The Owner will make all necessary applications for service with the utility. The Contractor shall notify the owner in writing of any obligations that the owner must fulfill for service to be started, installed, or modified.

C) CONTRACTOR/UTILITY INTERFACE RESPONSIBILITIES:

- a. The requirements shown on the drawings for power service to the site is general in nature and the Contractor shall meet all of the serving utilities requirement to deliver a complete electric service.
- b. During design contact was made with Seattle City Light Contact Mundall Engineering for name and contact information.
- c. The contractor shall coordinate and provide all required work and equipment to provide service to the site as required by the serving utility.
- d. UTILITY CHARGES
 - (1) All direct serving utility charges for the permanent service will be paid for by the Owner and shall not be included in the Contractor's bid price.

- (2) The Contractor is required to coordinate work with the power utility and other utilities as necessary for installation of new service and service entrance requirements.
- (3) Utility charges, including all costs associated with utility meter and/or transformer changes, for permanent service shall be paid directly by the Owner. Contractor is to submit Utility invoices for such work, without markup, to the Owner.

D) QUALITY ASSURANCE

- a. Comply with all serving utility company standards and requirements.

E) STANDARDS AND CODES

- a. Work involving service installation shall be done in accordance with the serving utility's standards and the National Electric Code.
- b. Service equipment shall be listed and labeled by UL as "suitable for use as service equipment".

F) SUBMITTALS

- a. In conformance with the submittal requirements of Section 16010, submit catalog data showing material information and conformance with specifications on the following:
- b. Prior to submittal to the Engineer, the Contractor shall submit all equipment and construction details (such as size, mounting height, materials, location of equipment, etc.) to the serving utility for verification of compliance to the utility's requirements.

2. PRODUCTS

A) METER ENCLOSURE

- a. Meter enclosure shall be as required to meet the requirements of the serving utility. Installation shall be per the utility requirements.
- b. Contractor shall coordinate with Utility. on type of metering required and shall provide all labor and material necessary to meet Utility requirements.
- c. Provide disconnect ahead of the meter if required by the Utility. Disconnect shall meet Utility standards.

B) C.T. ENCLOSURE

- a. Utility metering CT enclosures shall meet all requirements of the serving Utility and shall be located as shown on the drawings.

C) LIGHTNING ARRESTOR:

- a. Where lightning arrestors are shown on the oneline diagram provide an MOV type lightning/surge arrestor in combination with a surge capacitor rated for the service voltage to protect against overvoltage transients. Minimum 100KA rating for the surge arrestor. Delta lightning arresters, Inc. 600 series and CA603 capacitors or equal. Select proper components for the application as shown on the drawings.

3. EXECUTION

A) GROUND ELECTRODE SYSTEM

- a. The grounded conductor and ground bus shall be connected to the grounding electrode system, via the grounding electrode conductor as indicated on system one-line diagram.
- b. The system shall be as indicated in Article 250-81 of the National Electrical Code.

B) SERVICE COMPONENTS

- a. Install all service components (service raceways, transformers, primary raceways, conductors, handholes, vaults, etc.) in accordance with the utility requirements, the NEC, and section 16145.
- b. Provide service handholes and vaults as required by the serving utility even if not shown on the plans.

C) UTILITY REQUIREMENT VERIFICATION

- a. The contractor shall coordinate and submit all equipment, materials, etc. related to the utility work to the serving utility to verify conformance to the Utility's requirements for service. The contractor shall also submit any plans for the installation of the primary and secondary service for approval by the Utility prior to excavation. Any discrepancy between the Utility requirements and the Contract documents shall be brought to the immediate attention of the Owner & Engineer.
- b. Contractor shall obtain permit and obtain L&I inspection prior to connection of power.

END OF SECTION

SECTION 16500
LIGHTING

1. GENERAL

A) DESCRIPTION OF WORK

- a. This section covers furnishing and installation of all light fixtures and lamps indicated on the drawings or specified herein.

B) STANDARDS AND CODES

- a. All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.
- b. All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.
- c. All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, N.E.C..

C) SUBMITTALS

- a. Submit catalog data showing material information and conformance with specifications. The intended use of each item shall be indicated.

2. PRODUCTS

A) LIGHT FIXTURES

- a. Fixture Schedule - Provide in accordance with Lighting Fixture Schedule & notes as shown on plans.
- b. The fixture catalog numbers listed in the fixture schedule indicate manufacturer, fixture design, quality of design and manufacture, appearance, features and options required. Lighting fixtures specified will be the basis for comparison in the consideration of fixtures of other manufacturers. Fixtures of lesser quality shall not be considered equivalent.
- c. Contractor shall investigate ceiling construction and other mounting locations and supply fixtures designed for the application.
- d. Contractor shall investigate possible interferences of equipment, hatches, overhead cranes, etc. and supply fixtures (size and profile) that will not interfere.

- e. All fixture component parts shall be manufactured and/or assembled at the manufacturing plant for shipment. The shipment from the fixture manufacturer shall include integrally mounted and/or remote mounted ballasts where ballasts are required for the proper operation of the fixture lamps.

B) HARDWARE

- a. The Contractor shall provide any necessary hardware for mounting fixtures. The mounting hardware shall be made of materials suitable for the environment installed. Provide materials made from aluminum, non-metallic, or 316 stainless steel in outdoor, damp, or corrosive areas.

C) BALLASTS

- a. Ballasts shall be of the high power factor type. All ballasts shall be rated for 0 degree C operation and be equipped with automatic resetting protective devices in accordance with UL requirements.
- b. Ballasts shall be energy efficient GE Maxi-Miser II ballasts or equal.

D) LAMPS

- a. Provide all lamps as specified. Refer to the Lighting Fixture Schedule.
- b. Provide all fixtures with an LED lamps. Lamps shall be DLC qualified. Manufactured by LEDIZ, Greencreative, Sylvania or equal. Lamps shall be provided for all lighting fixtures

E) SPECIAL ACCESSORIES

- a. Provide accessories such as junction boxes, plastic frames, stem, hangers, canopies, couplings, cords, toggle bolts, etc., necessary to mount fixture in a proper and approved method.

3. EXECUTION

A) RACEWAY & WIRE

- a. For all lights, switches, and other related devices of the lighting system, provide all necessary raceway and wire per section 16110, 16120 or 16145 for a complete installation.

B) FIXTURE MOUNTING

- a. The fixture supplier shall provide all necessary hanging or mounting devices for all fixtures and shall be responsible for checking the type needed for various ceiling conditions.
- b. The Contractor shall see that all lighting fixtures designed to be installed throughout the project shall be of the correct size and design to properly suit the requirements of each area prior to ordering fixtures.
- c. Contractor shall install fixtures to avoid access hatches, sky lights, rails, hoists, mechanical equipment, etc.
- d. Any additional hardware needed for installation of fixtures shall be provided by the Contractor; including poles, clamps, brackets, screws, bolts, etc.
- e. Fixtures and other equipment installed in hazardous areas shall be rated for the environment. Provide fittings and seals per NEC.
- f. Pendant mounted lighting fixtures shall be supported by a flexible fixture hanger CROUSE-HINDS Type "AI" and shall have locking couplings, CROUSE-HINDS Type "COUP".
- g. Where fixtures are indicated for installation on low-density ceiling material, mount on 1 1/2" ceiling spacers unless UL approved for mounting directly to ceiling material.
- h. Properly support and align fixtures and provide all necessary steel shapes for support of the fixtures. Coordinate complete fixture installation with the facility construction. Clean and mount all lighting fixtures with new lamps immediately prior to final inspection.
- i. Square and rectangular fixtures shall be mounted with sides parallel to building lines and parallel with ceiling lines.
- j. Install fixtures as recommended by the manufacturer or as necessary to provide exact horizontal alignment, preventing horizontal or vertical deflection or angular jointing of fixtures installed in continuous rows.

END OF SECTION

SEE LIGHTING AND FIXTURE SCHEDULE & NOTES ON THE DRAWINGS

SECTION 16921 INSTRUMENTATION AND CONTROLS

1. GENERAL

A) DESCRIPTION OF WORK

- a. This spec section is intended to specify the components of the instrumentation and control system including: control panel(s) and the general requirements for the construction and arrangement of the associated equipment and field instrumentation.
- b. Work and materials specified in this section include:
 - (1) PLC control cabinet(s) (MCP), I/O, and associated equipment and instrumentation.
 - (2) Power equipment (starters, VFDs) - Motor Controls
 - (3) Motor starters and power distribution equipment
 - (4) Field Instrumentation, installation and calibration requirements
 - (5) Shop and field testing, and calibration of power & control system components and equipment.

B) SYSTEM DESCRIPTION

- a. Provide Control panels for all equipment control, monitoring and alarming.
- b. Provide power equipment in power panels (PP1 and PP2) with VFDs, motor starters and controls, etc.
- c. Provide field instrumentation and control devices and installation details

C) SYSTEM INTEGRATOR

- a. The System Integrator shall be responsible for the final design and assembly of the instrumentation and control system and control panels.
- b. All programming of the PLC and operator interface shall be by the Owner.
- c. The System Integrator shall be responsible for the final design and assembly of the entire I&C system. The system shall be designed to provide the control capabilities and functions indicated and implied by the plans and these specifications and to provide trouble-free operation with minimum maintenance. The system shall readily enable manual operation of any and all functions in the event of failure of any one component.
- d. Only pre-approved integrators shall provide equipment under this contract

- e. The following are pre-approved System Integrators for this project
 - (1) Quality Controls - Lynwood, Washington
 - (2) Technical Systems, Inc. - Lynnwood, Washington
 - (3) Taurus Controls, Kent, Washington
 - (4) Evolution Controls – Everett, Washington
 - (5) Superior Custom Controls – Seattle, Washington
- f. Other alternate System Integrators may obtain pre-approval if they meet the following minimum requirements.
 - (1) Factory trained and certified for the controller provided on this project, or have a minimum of 3 years of field experience and at least four applicable projects with configuration and installation of this equipment. Integrator shall provide resumes for individuals performing the work showing successful completion of factory training and field experience.
 - (2) Factory trained and certified for the drives provided on this project, Integrator shall provide resumes for individuals performing the work showing successful completion of factory training.
 - (3) Integrator shall provide UL 508A certification for control panels.
 - (4) Field service technicians shall have a minimum of 2 years of field experience with the components, controllers, and instruments provided on this project.
 - (5) Integrators shop shall be within 50 miles of the project site

D) STANDARDS AND CODES

- a. All equipment and materials shall conform to the latest revised editions of applicable standards published by the following organizations:
 - (1) American National Standards Institute (ANSI).
 - (2) Institute of Electrical and Electronic Engineers (IEEE).
 - (3) National Electrical Manufacturer's Association (NEMA)
 - (4) Underwriters' Laboratories (U/L).
 - (5) Instrument Society of America (ISA).
- b. All electrical equipment and materials, and the design, construction, installation, and application thereof shall comply with all applicable provisions of the National Electrical Code (NEC), the Occupational Safety and Health Act (OSHA), and any applicable Federal, State, and local ordinances, rules and regulations.
- c. All materials and equipment specified herein shall within the scope of UL examination services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

- d. All control panels shall bear a label by UL or by an approved testing authority for the completed assembled panel.

E) SHOP DRAWINGS

- a. The System Integrator shall develop any shop drawings required for design, fabrication, assembly and installation of the power and control panels. Shop drawings shall include all drawings required in manufacture of specialized components and for assembly and installation of them. Shop drawings shall include detailed “end-to-end” control wiring diagrams showing all interface of field equipment and instrumentation. In addition the following drawings shall be provided:

- b. **CONTROL CABINET LAYOUT DRAWINGS**

- (1) The System Integrator shall develop shop drawings for the control cabinets and wiring and terminals within the control cabinets to show all details of the control system. Drawings shall include scaled drawings of both interior and exterior elevation views. All components shall be identified by both the nameplate information and also the component number related to the bill of materials.

- c. **EQUIPMENT AND INSTRUMENT WIRING DIAGRAMS (LOOP DWGS)**

- (1) The System Integrator shall provide individual wiring diagrams (one drawing) for each field instrument and for each controlled motor load. All wiring interface for each instrument or equipment shall be shown on a single drawing* and the drawing shall be titled with the equipment or instrument name and number. Each drawing shall include field devices, PLC I/O and motor control, etc. associated with that instrument or equipment Include all terminals – terminal numbers, wirenumbers (both internal and field), PLC I/O and memory address, and equipment TAG number. See example drawings

** for instruments of the same type - if space allows then more than one instrument of the same exact type may be shown on a single drawing. This exception applies for instruments only, not for equipment.*

- a. **CARD DRAWINGS**

- (1) The System Integrator shall provide the information for each input and each output of the PLC on “PLC Card drawings”. All details of each card must be shown on a single drawing – one I/O card per drawing*.. Example drawings are included at the end of this section. Each I/O point shall be designated with the memory address, point id tag number, point description and wiring diagram reference drawing number

** cards of the same type – if space allows, then more than one card of the same exact type may be shown on a single drawing.*

TERMINAL ARRANGEMENT DRAWINGS

Provide terminal layout drawings that show the layout of all terminals in the cabinet.

- a. Shop drawings shall be drawn in AutoCAD 2008 or earlier version and include the following:
 - (1) Technical data sheets for all components with the complete part number of the component clearly designated with all required options.
 - (2) Arrangement drawings of all cabinet front-mounted and internal-mounted instruments, switches, devices, and equipment indicated. Show all panel mounting details required. Include outer dimensions of all panels on the drawing. Deviations from approved arrangements require resubmittal and approval prior to installation.
 - (3) Arrangement drawings shall be drawn to scale using standard Architectural or Engineering scales.
 - (4) Shop drawings shall be provided on 11" X 17". Shop drawings shall include specific product detail such as rating, size, and number of contacts, etc. Wiring diagrams shall be included for all components in the system including control equipment supplied with mechanical devices.
 - (5) For shop drawing packages provide the drawings in a separate 11" X 17" binder with an index for the drawings at the front.
- b. Installation details shall include the size, number, type and location of interconnecting wiring and conduit, installation of cabinets and enclosures, installation of sensors, instruments, limit switches, and other installation requirements. Shop drawings shall be submitted to Engineer for review and approval.

B) SUBMITTALS

SUBMITTAL REQUIREMENTS

Submittal documents shall be submitted via E-mail in PDF format.

I&C submittals shall be provided in two complete separate documents one with all product data and a second with all shop drawings as follows:

All products shall be included in a single PDF document including the cover sheet and index and bill of materials (BOM) in one single document. – Index the PDF document to show each individual product in the index column.

Shop drawings shall be included in a single PDF document including the cover sheet and index in one single document.

Submittals shall be indexed and identified as follows:

Email subject line shall be "*project name*, EI&C submittal *submittal #*, *spec section# - description*."

Cover sheet with:

the project name and submittal #

Contractor's and sub-contractor's name, phone number, and email address.

BOM bill of materials showing each product being submitted.

List of deviations from specified components

PDF index tabs per the electrical specifications by section and paragraph or equipment name e.g. provide a minimum of one tab section for each piece of equipment in all of the PART 2 PRODUCT Sections 2.01 - 2.**.

Per the general submittal requirements in other sections of this specification and the following. The System Integrator shall develop and shall submit to the Engineer the following project data:

A detailed project schedule relating specifically to I&C - showing submittals, review time, long lead equipment, panel fabrication, expected site delivery date - startup, etc. highlight any anticipated critical path tasks. Provide a copy with the submittal and e-mail in PDF.

All shop drawings: (provide an electronic copy, in AutoCAD of all shop drawings on CD ROM to the Engineer with the submittals, revised submittals, and with final as-built drawings).

Cut sheets for all products with a BOM - Bill of materials showing quantity, Manufacturer, catalog number, and the supplier name and phone number and relevant spec. paragraph number. Number each item in the bill of materials and relate the bill of materials to the submitted product index.

I/O checklist that verifies that all control and status/indication points in the control panels both implemented and spare have been tested. One copy of the I/O Checklist shall be submitted for the start of the Factory Test. One copy of the I/O Checklist shall be submitted prior to the Control system startup. The PLC Card drawings shall be used for this purpose.

Provide reference numbering on all cut sheets to relate them to the bill of materials. Provide same reference numbering by the equipment shown on the shop drawings.

Provide a listing of all spare parts to be provided.

NOTE; submittals received by the Engineer that are incomplete or not organized or do not conform to the specifications or do not have complete drawings as specified shall REJECTED and returned without review. Contractor should anticipate that submittals and re-submittals can take up to 3 weeks from the date mailed to the date returned with review comments if using standard submittal procedures.

A) COORDINATION WITH OTHER EQUIPMENT

- a. The System Integrator shall be responsible for obtaining all necessary information/product data (wiring diagrams, load data, etc.) for other equipment and instrumentation used in the project that requires integration into the power and control system – even for equipment and instrumentation outside the System Integrator's scope of supply. This may include, but is not limited to (standby generator, ATS, flow transmitters and other instrumentation, control valves, motor data, etc.)

- b. System wiring diagrams shall include information from other equipment.
- c. See PART 4 of this specification for additional requirements

B) NAMEPLATES

- a. Nameplates shall be provided on all electrical devices – (equipment, instruments, boxes, etc.)
- b. Nameplates shall also be provided on all electrical panel interior and exterior equipment (including but not limited to: relays, I/O cards, circuit breakers, power supplies, terminals, contactors, switches, indicating lights, buttons, meters, and other devices.)

Equipment nameplates shall have both the equipment name and number and equipment circuit number (if applicable).

INSTRUMENT NAMEPLATES: Provide nameplates for all instruments with instrument name, number, and the ckt breaker, or fuse location for the power source. – for nameplates that cannot be attached to the instrument provide a stainless steel cable ring to attach it to the instrument.

- a. Nameplates shall be made of 1/16" thick machine engraved laminated phenolic having black letters not less than 3/16" high on white background or as shown on the drawings or other sections of the specifications. Nameplates on the interior of panels shall be White Polyester with printed thermal transfer lettering and permanent pressure sensitive acrylic; TYTON 822 or approved equal. All nameplates shall include the equipment name and number (and function, if applicable).
- b. Relays shall be provided with 2 nameplates, one on the backpan by the relay base and one on the face of the relay.
- c. Provide warning nameplates on all panels and equipment which contain multiple power sources. Provide nameplates describing locations of power sources and disconnects. Provide any other warning or information nameplates as required by NEC or UL.
- d. Nameplates shall be secured to equipment with stainless steel screws/fasteners. Epoxy glue or other quality adhesive may be used where fasteners are not practical if first approved by the Engineer.

2. PRODUCTS

A) GENERAL

1. DESIGN AND ASSEMBLY

- a. All equipment and materials utilized in the system shall be the products of reputable, experienced manufacturers with at least five (5) years experience in the manufacture of similar equipment. Similar items in the system shall be the products of the same manufacturer.
- b. All equipment shall be of industrial grade and of standard construction, shall be capable of long, reliable, trouble-free service, and shall be specifically intended for control and monitoring of operation of motor-driven pumps and equipment.
- c. All equipment shall be of modular design to facilitate interchangeability of parts and to assure ease of servicing. All equipment, where practical, shall be of solid state, integrated circuit design.
- d. The system shall be completely assembled in the shop by the System Integrator. All components and equipment shall be prewired to the maximum extent possible.
- e. All components, including both internally and face-mounted instruments and devices, shall be clearly identified with phenolic nameplates of black background with white letters. Nameplates on the interior of panels shall be White Polyester with printed thermal transfer lettering and permanent pressure sensitive acrylic; TYTON 822 or approved equal.

2. INTERCONNECTING WIRING/TERMINALS

- a. All conductors shall be stranded wire with thermoplastic insulation and shall be cabled to groups and supported so as to prevent breaking and to present an orderly arrangement and neat appearance. All outgoing wiring shall be terminated on a marked terminal strip capable of connection of at least 2 No. 14 wires and all terminal connections shall be numbered throughout the system.

TERMINAL NUMBERING –

All field terminals shall have UNIQUE TERMINAL NUMBERS. This also includes NEUTRAL and LINE terminals shall be individually identified. (example NU1, NU2 ..etc. for UPS neutrals N1, N2 etc for normal power neutral terminals.

Terminal numbers and wire numbers shall relate to the equipment or component number or drawing number.

- a. In general: all field control wiring shall be #14 AWG. Internal wiring may be smaller #16 or #18 is acceptable as long as it is sized for the load and circuit protection. PLC I/O wiring between the PLC cards and the terminal strips shall be pre manufactured bundled cables wire size shall be #18 - #22.
- b. **WIREWAYS**
 - (1) Provide wire ways as necessary in the enclosure to contain all internal wiring and all field wiring that exists on this contract with consideration given to future space and the future wiring. Size wireways such that there is ample room for the

numbers of wires that will be wired to the terminals or terminal space in the cabinet plus room for an additional 30% future wire.

- (2) Provide corner wireways in the cabinet corners or as shown on the drawings
- (3) Low voltage DC control and signal conductors shall be bundled separately from alternating current circuits. Separate raceways and wire gutters shall be dedicated for AC and DC wiring, and labeled as such on the shop drawings. Wiring may cross at right angles if necessary. Special caution shall be used for PLC I/O card wiring and field terminations to accommodate the separation of AC and DC circuits. Intrinsically safe wiring shall be physically separated from non intrinsically safe wiring.
- (4) Internal wiring shall be in separate wireways from the field wiring.
- c. All wiring and tubing crossing hinges shall be installed in a manner to prevent chafing. Bundles of similar conductors shall be clamped securely to the door and to the panel, and the bundles shall run parallel to the hinge for at least 12 inches. Spiral nylon cable wrap shall be provided in the hinge section of the bundle to fully protect the conductors or tubing against chafing.

B) PROGRAMMABLE CONTROL EQUIPMENT

1. PROGRAMMABLE LOGIC CONTROLLER (PLC)

- a. The PLC shall be Allen-Bradley CompactLogix. Selection shall be based on the number of I/O required.
- b. Provide PLC processors with on board Ethernet communications.
- c. Provide all PLCs with EEPROMS
- d. PLC rack w/ spare slots – if applicable
- e. 24VDC digital input cards
- f. 24VDC digital output cards. All digital outputs shall interface with the output relay terminals
- g. Analog input cards with individually isolated points
- h. Analog output cards with individually isolated points
- i. Note combination cards are not allowed except with special permission from the Engineer
- j. Provide power supplies as required and recommended by the manufacturer.
- k. Spare and empty slots in the PLC rack shall be covered with a blank slot filler.
- l. Provide all necessary power supplies as required and recommended by the manufacturer.

- m. Provide isolated fused circuit for power to PLC
- n. Spare and empty slots in the PLC rack shall be covered with a blank slot filler.

2. ADDITIONAL I/O

- a. System Integrator shall provide all I/O necessary for the operations of the equipment and instrumentation for the project and as shown on the wire diagrams.

3. SPARE AND FUTURE I/O

- a. **INSTALLED SPARE:** Provide all necessary analog and digital I/O for the project plus 10% installed spare, (round up to the nearest whole number) in each cabinet,. Provide terminals for all installed PLC I/O cards (including spares) to match the number of points in the card. For all spare I/O provide interface wiring to terminals.
- b. Provide 1 spare fused disconnect for every 4 spare digital input terminals.
- c. Spare digital outputs shall all be provided with interposing relays with one form C output wired to two terminals for a normally open contact interface.
- d. For each spare analog input provide one fused, and two non fused wired for a loop powered instrument input. Provide one shield ground terminal for every two spare analog inputs.
- e. **FUTURE:** Provide spare space to the right of the PLC for at least five additional I/O cards in each PLC cabinet. Provide spare din rail for the additional terminals associated with the additional I/O cards (minimum of 24" for digital and 24" for analog terminals) and also account for the additional room in the wireways for the future wire.

C) COMMUNICATIONS EQUIPMENT

1. ETHERNET COMMUNICATION MODULE

- a. Provide Ethernet communications on the PLC processor for communications.

2. ETHERNET COMMUNICATIONS SWITCH

- (1) All Ethernet switches used for this project shall be made by the same manufacturer.
- (2) Provide an Ethernet switch with ports as required as shown on the drawings plus 1 spare port. Ethernet switches shall be din rail mountable. The switch ports shall be configurable for either 10 or 100 base T. Siemens, Allen-Bradley, Hirschmann or N-Tron, or equal. Provide mounting and power circuits as required for the equipment.

D) PROGRAMMING OF PROGRAMMABLE CONTROLLER

1. GENERAL

- a. The programmable controller equipment shall be programmed by others and the programming cost shall not be included in the bid.

EQUIPMENT ENCLOSURES

1. CABINET SIZE

- a. Sizes of enclosures for the power and control cabinets shall be chosen by the System Integrator to provide ample space for the installed components and still fit within the given space in the structure.
- b. The enclosures minimum size shall be as shown on the drawings. With Engineer's approval, the Integrator shall upsize the cabinets if necessary to fit in the components.

2. CONTROL CABINETS

- a. Indoor Control cabinets shall be NEMA 12 – powder coated steel construction.
- b. Control cabinets in corrosive or damp areas shall be stainless steel or non-metallic.
- c. Cabinets shall be hinged with stainless steel pins.
- d. Cabinets shall be provided with a stainless steel 3 point latch.
- e. Provide all control cabinets with a data pocket and insert the cabinet drawings in the pocket when shipped to the site.
- f. Enclosure shall be manufactured by Hoffman Products, Inc. or approved equal.

3. ENCLOSURE DOOR LATCHES

- a. Door latches on all enclosures shall be fast operating type 3-point latch stainless steel lockable door handle.
- b. Small boxes and control stations shall have 2 stainless steel screw driver or hand operated latches.

4. WIREWAYS

- a. Provide molded plastic wireways, slotted for wire connections for all wiring in the panels. They shall be complete with covers. Wireways shall be manufactured by Panduit or Taylor, or approved equal.

B) TERMINALS

1. GENERAL

- a. Provide terminals blocks arranged per the examples drawings and as described in this specification.

PLC card – I/O terminal blocks shall be grouped together to match the terminal arrangement of the PLC card that they are connected to.

TERMINAL NUMBERING –

Provide unique terminal numbers for all field wired terminals.

Terminal numbers and wire numbers shall relate to the shop drawing number.

Provide clear references on all wires that connect between drawings or are shown on more than one drawing.

Provide terminals for all wire connections to field wiring and internal power distribution. For all terminals (including line voltage and neutral terminals) that are used for wiring out to field devices provide unique terminal numbers.

Provide spare din rail space and spare terminals as indicated by the drawings or these specifications.

For all energized circuits (power and control) powered from the panel and extend outside of the panel provide an individual fused terminal with appropriate fast blow fuse (1/2 amp for PLC inputs) and “blown fuse” indicator light for each circuit and unique terminal number.

For all signal circuits that extend outside of the panel provide an individual fused terminal with appropriate fusing and integral blown fuse indication. All 4 to 20 mA circuits shall be individually fused with a 1/16 amp fast blow fuse; and blown fuse indicator.

For all energized circuits powered outside of the panel which extend into the panel, provide a disconnecting terminal to isolate each individual circuit.

Provide fusing of all DC circuits with appropriately sized fuses and blown fuse indicators.

Analog loops that are 24 VDC powered shall have a knife switch to disable the loop.

Connections shall have compression terminals capable of terminating 2 #14 AWG stranded wires. Terminals shall be DIN rail strip mounted Provide number strips for terminal blocks that are referenced by the wire marker. Provide bridge bars for jumpering between terminal blocks. Provide end clamps to separate and terminate terminal block groups. Provide end covers for groups of terminal blocks in sets to match the number points associated with individual I/O cards in the PLC rack.

Provide Separation Plates on each side of terminals that are at a different potential or polarity than surrounding terminals.

Provide clear plastic DIN rail mounted nametag stanchions for each block of terminations. Each nametag shall hold a preprinted label designating the PLC rack and PLC card (slot) that terminates to that set of terminals.

Terminals shall be mounted such that there is a minimum of 2 inches of clear space on both sides of the terminal (between the terminals and the wireway); for ease of wiring and so that the entire wire tag will be visible outside the wireway.

Mount all terminals strips on 2" standoffs from backpan.

Provide wired terminals to match the number of points supplied on each I/O card in a cabinet.

GENERAL PURPOSE AND DIGITAL INPUT TERMINALS

Terminal Blocks for general purpose and digital input terminations shall be Phoenix Contact UK 5, or equal. Provide UKK5 Double Hi, or equal, if space is limited.

ANALOG INPUT TERMINALS

Terminal Blocks for use in analog input terminations shall be knife disconnect type, Phoenix UK 5-MTK , or equal.

Provide one ground terminal for every two analog inputs for grounding the shield.

Provide a fused terminal with a ¼ amp fuse and blown fuse indicator for all analog inputs for loop power.

ANALOG OUTPUT TERMINALS

UKK 5 Terminal blocks for analog outputs shall be fused, double hi with a separate ground terminal, or equal.

DIGITAL OUTPUT RELAY TERMINALS

Provide interface/interposing relays for all digital outputs that extend out of the control panel and for all spare and future digital outputs. Relays shall be individual form C relays, or equal. Interface to digital output cards or relays as required to interface I/O module to DIN rail mounted relays, or equal.

Relay output cards are not to be used unless specifically allowed by the Engineer. All digital outputs shall interface with individual output relays. Panel mounted devices may be directly powered by the output card if approved by the Engineer.

Provide relays to match the number of points supplied on each digital output card in a cabinet.

Provide two descriptive labels for all relays. – One label on the backpan and one label on the relay.

FUSED TERMINALS

Fuse terminal blocks shall be hinged disconnect level type with "blown fuse" indicators. PHOENIX CONTACT UK 5 HESI series, or equal

TEST AND CALIBRATION

Provide 1 set for each Cabinet supplied plus 1 spare set consisting of:
Short Circuit Plug, 1 pair of Reducing Plugs, 1 pair of Test Adapters.

OPERATOR INTERFACE DEVICES

All operator interface devices mounted on the panel front shall be rated for the environment in which they will be located. In general, devices mounted on indoor panels shall be NEMA 13 rated. Operator devices mounted outdoors, or in wet or corrosive environments shall be NEMA 4X rated.

SELECTOR SWITCHES

Selector switches shall be for use on 120 volt control circuits. Contacts shall have a continuous current rating of 10 amperes both inductive and resistive. Selector switches shall be of the heavy duty oil tight type. Allen Bradley 800T, 800H, GE CR104P, Square D Type K or approved equal.

PUSH BUTTONS

Push buttons and illuminated push buttons shall be for use on 120 volt control circuits. and shall have continuous current rating of 10 amperes both inductive and resistive. Pushbuttons for "emergency" "help" applications shall have maintained contacts and red mushroom head operators. Allen Bradley Bulletin 800T, 800H or approved equal.

INDICATING LIGHTS

Indicating lights shall be push-to-test LED type. Illuminated pushbutton type with the pushbutton wired for the push-to-test function required. Appropriate lens caps shall be provided as shown..

OPERATOR INTERFACE

Provide an operator interface. provide a minimum 10" inch color graphic display and resistive touch screen. Interface shall be capable of color graphic displays. Software shall be RS View Studio Machine. Provide with Ethernet communications module. Operator Interface shall be Allen-Bradley panelview plus 1000, Maple Systems, or equal.

Provide all necessary software and hardware for a complete system.

Programming of the operator interface shall be done by others.

CABINET POWER DISTRIBUTION

CONTROL PANEL CIRCUIT BREAKERS

Control panel circuit breakers shall be thermal-magnetic type, supplementary overcurrent devices. Circuit breakers shall be snap mountable on rails. Circuit breakers shall be sized for actual circuit load. or as shown on the drawings.

Provide 2 spare installed 5amp circuit breakers or the number of spares shown on the drawings, whichever is greater. Wire breakers out to terminals and provide number of spare neutral terminals to match number of hot terminals.

Provide 2 spare "hot" terminals wired to the output of each spare breaker and 3 spare neutral terminals wired to the appropriate neutral.

Control panel circuit breakers shall be Allen-Bradley 1492-CB, or equal.

In all control panels, provide a laminated drawing of the panel power distribution circuit breakers for referencing all circuit breakers in the panel.

GROUNDING

Provide 3 spare ground terminals in each cabinet

Provide a ground bus in each cabinet – minimum 6" long with screw terminals for grounding equipment and instrumentation.

FUSES

Provide, fuse pullers; (one for each type of fuse), for removal of fuses.

Provide blown fuse indicators on all fuses.

POWER SUPPLIES

Power supplies shall be switching type, voltage, & sized to be able to supply the demand. Units shall be closed frame DIN rail type and have overvoltage and overcurrent protection. Units shall have LED power on light and 2 sets of output terminals. Power supplies shall be sized for the load plus an additional 30% IDEC, Power Supply or equal.

Provide one fused and one non fused terminal for all DC circuits that extend outside the cabinet. Provide spare DC terminals for a minimum of 2 additional DC circuits or 10% whichever is the greater amount.

24VDC UNINTERRUPTIBLE POWER SUPPLY (UPS)

24VDC uninterruptible power supply (UPS) shall be a continuously on-line. Unit shall be 24VDC and maintain on battery backup for a minimum of 10 minutes. Unit shall be din rail mounted wired to control system power. The UPS capacity/rating shall be chosen by the System Integrator for the load being served plus 20%. .

PULS, Allen-Bradley 1606.XLS series, size chosen for the application or equal.

Provide UPS alarm module and provide all necessary wiring and relays for connection to the UPS to provide 2 normally closed contacts which open upon loss of power for the PLC digital inputs for: a) loss of input power to the UPS and b) for a battery alarm.

Provide labeling to differentiate UPS power circuits vs. non UPS powered circuits by adding a "U" suffix on the terminal name.

Provide 2 spare installed 5amp UPS circuit breakers or the number of spares shown on the drawings, whichever is greater.

Provide 3 spare "hot" terminals wired to the output of each spare UPS breaker and the same number of spare neutral terminals wired to the appropriate neutral.

RELAYS

RELAY LABELS

Provide two labels for all relays one label on the backpan and one label on the front surface of the relay.

RELAYS FOR GENERAL PURPOSE

Relays for general purpose shall have appropriate coil voltage for the application, contacts (amp and voltage) shall be rated for the application, minimum 2 amps. All relays shall have an integral indicating light to show if there is coil voltage present. They shall have pin/blade base and matching socket. Units shall be Allen-Bradley 700 type HA, HB, or equal.

Appropriate relay (coil voltage and contact load ratings) shall be selected based on application from the control wiring diagrams and load served.

TIME DELAY RELAYS

Time delay relays shall be multi-function, multi-range with plug-in base ,pin style terminations timing and timed out LED indicators, and calibrated scales. Relays shall have minimum 0.5 seconds to 60 minutes, 8 selectable timing ranges, 5 amp contacts. Select coil voltage for the application. Minimum accuracy requirements (plus or minus) shall be as follows: 1) Repeat accuracy 1/2% 2) Timing change over full voltage range 1/2% change over full temperature range 2% 3) Scale tolerance 5%. Allen-Bradley Bulletin 700 type HR series; or equal.

DIGITAL OUTPUT RELAYS

All digital outputs shall be provided with interposing relays wired out to terminals - including spares. Relays shall be group mounted with connecting cable to the PLC output card. Output relays can be single pole, N.O. or N.C. for the application – all Spare DO relays shall be form C with the N.O. contact wired to terminals.

MOTOR STARTERS / VFDS

Motor starter units shall be of the combination type with components as indicated on the drawings. Magnetic contactors shall be heavy duty IEC or NEMA rated, All contactors shall be provided with two field convertible auxiliary contacts. Motor starters and associated equipment shall be provided to match or exceed the load being served.

If IEC contactors are used, then the amp rating of the contactor shall be a minimum of 1.25 times the amp rating of the motor.

Provide interface options for control, monitoring, and alarming as shown on the drawings and the wire diagrams. Manufacturer shall select the size and rating as required for the application.

OVERLOAD RELAYS

Overload relays on starters shall be adjustable, solid state type with a minimum adjustment range of 3 to 1. Overload relays shall have selector for either auto or manual reset. .

Overload Relays shall monitor all energized conductors and shall trip on phase fail and ground fault. A Separate N.O. overload contact shall be provided in addition to standard N.C. overload contact. Overload relay shall be provided with a circuit test button which shall simulate an overload trip, trip indication, and reset pushbutton. Overload which trip on phase/power fail shall automatically reset upon normal power restoration. - Siemens 3RB12, Allen-Bradley E-1 or equal.

Provide interface options for control, monitoring, and alarming as shown on the drawings and the wire diagrams. Manufacturer shall select the size and rating as required for the application.

CONTROL POWER TRANSFORMERS

Each of the power panels. Shall be equipped with its own individual control circuit transformer, 120 VAC secondary with primary and secondary fuses and blown fuse indicators. The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads. The transformer size shall also accommodate any devices connected or shown on the drawings (both existing and future) as being served by the control circuit transformer.

VFD control wiring shall be source wiring – control power shall be from the VFD source output. – typically 24VDC source output from the VFD

TRANSIENT SUPPRESSORS

Provide all contactor coils with transient suppressors to limit the high voltage transients produced when power is removed from the coil. CUTLER HAMMER - C320AS1 or equal.

VARIABLE FREQUENCY DRIVES (VFD)

VFDs shall be Allen-Bradley Power flex with full function HIM module mounted on the outer door or as shown on the drawings– VFD manufacturer shall select the size and rating as required for the application. Provide interface options for control, monitoring, and alarming as shown on the drawings and the wire diagrams. – Allen Bradley, Siemens, Schneider Electric, or equal.

Provide DC bus chokes and 3% line and load reactors on all VFDs

Provide with Ethernet communications.

Provide control features as shown on the plans.

Provide VFD control wiring for SOURCE control selection – SINKING inputs are not allowed.

For VFDs furnished with fans – provide controls or thermostats so that the fans do not operate unless the equipment is running or the temperature is high.

Provide VFDs with the following:

- HOA switch and speed pot – in HAND speed will be controlled by the speed pot, In AUTO the VFD speed will be controlled from a remote 4-20mA input.

- Provide a programmable VFD input such that (with the switch in AUTO) when a remote dry contact connected to the input closes the VFD will start and operate at a pre set speed.

Configure VFDs so that any “bad power” (line side) fault will automatically reset when normal power returns and the VFD will automatically restart if called.

Provide source power for control of VFD directly from the VFD or from a dedicated CPT for each individual VFD. Configure such that for the Drive to operate in HAND requires only the power source to the VFD.

Provide relays as necessary for run, fail and other contacts for input to the PLC, indicator lights, louver/fan/heater controls etc.

Configure the line side “faults” to maximum so that only major line side issues will shut down the VFD. Turn off any line side faults that are not required for protection of the VFD. Configure so that once line side faults clear and normal power returns the VFD will automatically reset and resume operation.

Configure VFD for operation on both generator power and utility power so that the difference in line side power from the two sources will not fault the VFD.

SERVICES OF MANUFACTURER

General: An authorized service representative of the manufacturer shall be present at the Site for two 1/4 Days to furnish the services listed below. For the purpose of this paragraph, a 1/4 Day is defined as an 2 hour period excluding travel time.

Inspection, Startup, Field Adjustment: The authorized service representative shall supervise the following and certify the equipment and controls have been properly installed, aligned, and readied for operation.

Installation of the equipment

Inspection, checking, and adjusting the equipment

Startup and field testing for proper operation

Performing field adjustments such that the equipment installation and operation comply with requirements.

Instruction of OWNER's Personnel: The authorized representative shall instruct the OWNER's personnel in the operation and maintenance and configuration of the equipment, including step by step troubleshooting with test equipment. Instruction shall be specific to the equipment models provided. Training shall be scheduled a minimum of 3 weeks in advance of the first session. Training session shall be 1 hour minimum. Proposed training materials shall be submitted for review, and comments shall be incorporated. Training materials shall remain with the trainees. The OWNER may videotape the training for later use with the OWNER's personnel.

CIRCUIT BREAKERS

Circuit breakers shall be molded case thermal-magnetic type, or where allowed by code may be Magnetic Only type with adjustable trip. Circuit breakers other than those mounted in the panelboard shall be capable of being padlocked in the open position. Circuit breakers shall be quick-make and quick-break type. They shall have wiping type contacts. Each shall be provided with arc chutes, individual trip mechanisms on each pole. Two and three pole breakers shall be common trip. All breakers shall be calibrated for operation in an ambient temperature of 40°C. Molded case circuit breakers shall be trip-free. Each breaker shall have separate trip indication independent of the ON or OFF positions.

Breakers shall have lugs UL listed for both copper and aluminum.

Breakers shall have the interrupting rating and trip rating indicated on the drawings.

Provide service entrance rated breakers if required for the application by NEC.

Provide interface options for control, monitoring, and alarming as shown on the drawings and the wire diagrams. Manufacturer shall select the size and rating as required for the application.

DRY TYPE TRANSFORMERS

Provide dry type transformers in accordance to applicable requirements of Section 16145 or 16460.

Where the one-line diagram calls out for isolation transformers; provide noise suppresser isolation transformers, Square D/Topaz Class 7610 or equal.

SURGE ARRESTORS

Provide Surge arrestors , with indicators, where shown on the one-line diagrams to protect against overvoltage transients. JOSLYN J9200 series with protective capacitor GE model 9L18 or equal. Select proper components for the application as shown on the drawings.

WIRE MARKERS:

Field installed wire markers shall be T&B, SHRINK-KON HVM or approved equal.

SPARE PARTS

In addition to spare parts mentioned elsewhere in this section, the Contractor shall supply the following spare parts for use by the Owner: All spare parts shall be shipped with the equipment.

Qty 1 Relay of each type used.

Qty 2 lamps of each type used.

Qty 200% spare fuses (two spare fuses for each fuse supplied).

EXECUTION

INSTALLATION

GENERAL

The instrumentation and control system shall be installed, in accordance with the contract drawings, installation details, and also instructions prepared by the System Integrator, and per special instruction from equipment or instrumentation Manufacturers.

The Integrator shall provide detailed installation drawings and wiring diagrams for this purpose.

Installation shall include all elements and components of the I&C system and all conduit and interconnecting wiring between all elements, components, and sensors.

WIRE AND CABLE TERMINATION:

Stranded control conductors may be directly terminated using compression type terminals at control panels. Special instrumentation cables shall be terminated in accordance with the recommendations of the Manufacturer of the equipment and subject to review by the Engineer.

No splices shall be used in power, control and/or signal wiring. The wiring shall be continuous from point-to-point.

Terminals and connectors shall be installed with the compression tool recommended by the terminal Manufacturer.

Any control or signal wire landing on a screw terminal shall be terminated with a spade or loop connector.

All wire and cable shall be provided with a wire tag at each termination in accordance with the wire tagging requirements in the specification.

Terminals shall be installed such that there is a minimum of 2" clear space between the terminal strip and the wireway on both sides of the terminal; for ease of wiring.

CONTROL PANEL DESIGN & FABRICATION

GENERAL

Panels shall not be fabricated until Engineer has reviewed and approved the submittals or the integrator has written authorization from the Engineer to construct the panels. It shall be the integrator's responsibility to inform the Engineer in writing if there are limited time constraints that need to be met to start the panel fabrication to meet contract deadlines.

GENERAL LAYOUT

Provide separate wire ways for field wiring and for internal wiring. Provide separate wireways for 120V and DC circuits. Mount PLC at top of control section, Mount digital input and output wireways and terminals on the left hand side and analog I/O terminals and wireways on the right side with power distribution down the middle of the control area. See drawings.

For control panels that contain motor control power equipment: In general the power distribution shall be located toward the left side of the cabinet and the PLC and other control components shall be separate and located in the right side of the cabinet. If power and controls are in the same cabinet, then provide at least 4" of separation between any 480V power wiring or components and the signal wireway, or provide a steel barrier between the power and controls sections.

If panel has intrinsic safe component area – provide space below the UPS in the center of the cabinet at the bottom.

OPERATING DEVICE LOCATION

Operating devices shall be mounted no higher than 6' - 4" and no lower than 4' - 0" above finished floor when panel is installed unless otherwise approved by the Engineer. Operating devices with displays (such as PLC interface, VFD interface, and power monitoring devices) shall be mounted so that the center of the display is between 4'-6" and 5'-0" above finished floor unless otherwise approved by the Engineer.

POWER COMPONENTS

Provide lockable breakers for all motor load circuits to meet NEC lockout tagout requirements.

Provide cabinet power disconnect / door interlocking mechanism as required by UL, NEC, and any other authority.

Provide service entrance rated breaker if required for the application.

Provide each of the motor starters and VFD cabinets with their own electrically isolated 120V control power transformer (CPT) or 120V control power circuit. Control power circuit for hand control shall be from the CPT so that motor loads can be run manually when auto control power circuits have failed.

CONTROL CABINETS

Install PLC I/O card to terminal interface wiring with pre-manufactured, multi-conductor or bundled wire.

Install all terminals on 1" standoffs.

Terminals shall be installed to allow a minimum of 2" of clear space between the terminal and the wireway or any other components.

Coordinate terminals and wireway locations to account for the location of the conduit entrances into the cabinet.

Wire ways shall be 3" deep, width shall be chosen for the application.

Provide separate wire ways for internal and field wiring.

The UPS shall be din rail or shelf mounted – maintain at least 2" space between the bottom of the UPS and the bottom of the cabinet for field wiring.

Provide right angle connectors on cables if the cable connection prevents closing of access doors on equipment within the cabinet or on the control cabinet itself.

FACTORY TESTING & INSPECTION

Prior to delivery to the site, the power and control equipment: (control panels, MCCs, motor starters, VFDs etc.) shall be tested by the System Integrator, all control devices shall be operated and the cabinet shall be powered with rated incoming voltage for at least 2 days. Simulating equipment shall be provided and wired into the control cabinet system for this testing. The entire control system shall be interconnected as it will be installed in the field if the actual equipment is not available, then simulation equipment shall be provided to fully demonstrate the functionality of the system. The System Integrator shall test all functionality of the system and verify proper operation of the hardware and software

Following the System Integrators testing, the power & control equipment shall be tested and inspected by the Design Engineer prior to shipment to the project site. The testing shall include, but not be limited to, operation of all input and output (I/O) points, control devices and motor controllers and demonstration of all control functions with the actual equipment or via a simulation. The System Integrator shall revise, modify,

adjust the system as required by the Engineer during the testing period. . The System Integrator shall inform and coordinate the time of the testing with the Engineer at least 4 weeks prior to the testing date.

The System Integrator shall provide working space, a 6 foot table and 2 office/desk chairs for the test Engineers.

STARTUP AND TESTING

All components of the control system shall be calibrated by the Manufacturer's rep and the Integrator after completion of installation. Each component shall be adjusted to be within the Manufacturer's required range and for the specific application.

Components that cannot be properly calibrated or that are found to exceed the Manufacturer's specified range or accuracy shall be removed and replaced at no additional cost to the Owner.

The control system shall be placed into operation by the Contractor and System Integrator.

All components shall be tested and recorded on check-off forms and shall be witnessed by the Engineer.

FIELD TESTING OF THE CONTROL SYSTEM

GENERAL

When the installation is substantially complete, the Contractor shall commence field testing of the control system. This shall determine that all system components connect up correctly to each other so that the system works as designed.

Field testing of the control system shall take place in 4 phases.

Continuity Testing,
I/O Testing,
Program Testing
System Validation Testing.

CONTINUITY TESTING

As equipment wiring is completed, the Contractor and Hardware Integrator shall perform a continuity test for every control to determine terminal to terminal continuity and verify all control and signal wiring is installed in accordance to the Hardware Integrators wiring diagrams.

I/O TESTING

The entire I&C system shall be I/O tested.

Prior to calling for I/O testing the Contractor shall:

Complete the continuity testing.

Label all wire at both ends.

Submit all associated test and calibration forms (Instrument, motor, wire, etc.)

Run all motors (in HAND) to verify correct operation and rotation

Provide all equipment and instrument labels per spec.

Test operation of "packaged sub systems"

Prior to any equipment to be put into automatic operation, every digital and analog input and output shall be tested for correct operation and witnessed by the Electrical Engineer. The contractor shall provide a set of the PLC Card drawings and instrument and control wiring diagrams on 8 1/2x11" sheets for a check-off list of all inputs and outputs. If a point cannot be verified within 5 minutes of starting the check that point shall be noted as a punch list item to be corrected and re-tested at a later time.

Definition: Successfully I/O Tested. A piece of equipment of system shall be considered "successfully I/O tested" when all of the I/O for that equipment has been tested and verified by both the programmer and the Electrical Engineer and checked off of the wiring diagrams or PLC I/O card drawings. Note: The Electrical Engineer must witness and verify all I/O testing.

Once all I/O associated with a piece of equipment of system has been **successfully tested**, then the equipment or system will be deemed ready for program testing.

INPUTS:

The Contractor shall simulate an actual field condition whenever possible to provide both the digital and analog signal inputs into the PLC and these will be verified by the programmers. Where an actual field simulation is not practical, then the Contractor shall jumper the digital inputs at a point closest to the field device as possible and shall use an analog loop simulator for analog inputs.

Analog inputs shall be tested at 0,25%, 50%, and 100% of full range.

OUTPUTS:

The programmer will simulate outputs from the PLC and the Contractor shall verify the field operation of the output. The field operation verification shall be by actual operation of equipment when possible. When actual field operation of equipment is not practical for verification, then the Contractor shall use volt and amp metering to verify digital and signal outputs.

Analog outputs shall be tested at 0,25%, 50%, and 100% of full range.

PROGRAM TESTING

The Contractor and Integrator shall provide field support to the programmer for testing of the program. The Contractor shall provide field simulation of equipment as needed by

the programmer to test all monitoring and alarm functions of the programming. The Contractor and Integrator shall anticipate that the program testing will require up to a total of 4 hours of field support time for this project. The cost for this time shall be included in the bid.

SYSTEM VALIDATION TESTING

After the program testing is complete, validation testing shall be by the Hardware and Software Engineer and Contractor, with the Owner and Engineer present. Validation testing shall include operation and verification of all control components and features of the entire control system.

The Contractor shall simulate various field conditions to test all control operations, monitoring and alarms for all systems and equipment.

The Contractor shall inform the Engineer of the testing schedule at least one week prior to the commencement of testing. Validation testing shall be considered complete when the Owner and Engineer have determined that all of the original system requirements have been met.

The System Integrator shall revise, modify, adjust the system as required during and following start-up to provide the operation required by the contract documents.

Note: the Engineer shall not be called out by the Contractor for validation testing on equipment until all components are installed, all wiring points have been checked, and operation **has been tested and verified** by the Contractor.

COMMISSIONING

Once all systems have passed validation testing, then the facility will be operated for 2 weeks or time period as determined in the documents to verify all component and system operations prior to final acceptance.

SYSTEM MAINTENANCE

The System Integrator shall be responsible for maintenance of the system from time of start-up to the date of acceptance, by formal action of the Owner, of all work under the contract. The System Integrator shall correct deficiencies and defects and make any and all repairs, replacements, modifications, and adjustments as malfunctions or failures occur. The System Integrator shall perform all such work required or considered to be required by the Owner to cause and maintain proper operation of the system and to properly maintain the system.

SERVICES OF SYSTEM INTEGRATOR

General: An authorized service representative of the control panel System Integrator shall be present at the Site for two ½ days to furnish the services listed below. For the

purpose of this paragraph, a 1/2 Day is defined as a 4 hour period excluding travel time.

Inspection, Startup, Field Adjustment: The authorized service representative shall supervise the following and certify the equipment and controls have been properly installed, aligned, and readied for operation.

- Installation of the equipment

- Inspection, checking, and adjusting the equipment

- Startup and field testing for proper operation

- Performing field adjustments such that the equipment installation and operation comply with requirements.

Instruction of Owner's Personnel: The authorized representative shall instruct the Owner's personnel in the operation and maintenance of the equipment, including step by step troubleshooting with test equipment. Instruction shall be specific to the equipment models provided. Training shall be scheduled a minimum of 2 weeks in advance of the session. Training shall a minimum of 1 hour.

Proposed training materials shall be submitted for review, and comments shall be incorporated. Training materials shall remain with the trainees. The Owner may videotape the training for later use with the Owner's personnel. The Hardware Integrator shall conduct specifically organized training sessions in operation and maintenance of the control system for personnel employed by the Owner. The training sessions shall be conducted to educate and train the personnel in maintenance and operation of all components of the control system. Training shall include, but not be limited to, the following:

- Preventative maintenance procedures

- Trouble-shooting

- Calibration

- Testing

- Replacement of components

- Automatic mode operation

- Manual mode operation

OPERATION AND MAINTENANCE DATA

The System Integrator shall prepare and assemble detailed operation and maintenance manuals in accordance with the project general requirements . The manuals shall include, but not be limited to, the following:

- Preventative maintenance procedures

- Trouble-shooting

Calibration

Testing

Replacement of components

Automatic mode operation

Manual mode operation

System schematics / shop drawings

Electronic copy on CD ROM of all shop drawings in AutoCAD version 2000 or newer

As-built wiring diagrams of cabinet and enclosure contained assemblies

Catalog data and complete parts list for all equipment and control devices

Listing of recommended spare parts

Listing of recommended maintenance tools and equipment.

1 copy of the entire O&M manual shall be provided in electronic PDF format on CD ROMs.

RECORD DRAWINGS

The System Integrator shall be responsible to provide a clean and neatly marked up set of record drawings showing any changes from the submittal and contract drawings. These drawings shall be provided prior to final approval of the project and release of the retainage.

WIRING DIAGRAM EXAMPLES

GENERAL

The wiring diagrams shall be drawn and submitted in accordance with the following example drawings. These drawings are for drawing formatting reference only and do not necessarily have any actual application to the facility control system.

EQUIPMENT WIRING DIAGRAMS (LOOP DWGS)

Provide one page wiring diagram for each motor / equipment load showing all of the control wiring associated with that load. Drawing shall show the motor control center wiring , field wiring, PLC I/O, and control panel wiring all on one sheet; complete with terminal numbers and wire numbers. Include PLC Card information rack and slot and I/O designation for each point.

INSTRUMENT WIRING DIAGRAMS (LOOP DWGS)

Show all wiring associated with each instrument on one page – including power supply location and signal wiring. Show all terminals numbers and wire numbers. Designate boundaries between field and control panels and etc.

NETWORK DIAGRAM

Provide detailed drawings showing all of the components of the communications network – include all terminals and wire numbering. Designate equipment locations.

PLC I/O CARD DRAWINGS

Provide I/O card drawings for all PLC I/O cards per the example drawing. Drawings shall show details specific to each I/O card, name of each input or output, reference drawing number for associated EQUIPMENT AND INSTRUMENT WIRING DIAGRAM, card number, slot number, control panel terminal and wire numbers, etc.

END OF SECTION

SECTION VI.8. MEASUREMENT AND PAYMENT SCHEDULE "A"

It is the intention of these specifications that the performance of all work under the bid for each item shall result in the complete construction of the improvements identified in the Contract Documents. Work and material not specifically listed in the proposal, but required according to the contract plans, specifications, and general practice shall be included in the contractor's bid price. No separate payment of any kind will be made for these incidental items.

Bid Items – Excavate and Backfill Building Site

- A1

The respective lump sum price shall be full compensation for excavation and backfill of pumphouse building site as required for construction. Includes slope back and temporary slope retention as may be required for construction. The respective price per cubic yard shall be full compensation for excavation, haul and placement at on-site stockpile area as well as backfill and compaction following construction.

Bid Items - Reinforced concrete foundation and slab on grade

- A2

The respective lump sum price shall be full compensation for leveling and constructing reinforced concrete foundation and slab as outlined in plans. Work under this item shall include but is not limited to: leveling, forms, reinforcing steel, block outs, anchor bolts and concrete placement, form removal, trimming, waterproofing, sealing as required.

Bid Items – Precast hollow core suspended slab

- A3

Precast hollow core suspended slab 12" Ultraspan by Concrete Technology Corporation or approved equivalent with 2-1/2" topping concrete surface pour on-site. The respective Lump Sum price shall be full compensation for all work relating to construction of a suspended slab as described in plans and specifications including but not limited to – provision of engineer stamped structural shop drawing, supply and placement of pre-cast hollow core slab units and construction of concrete topping surface and reinforcement.

Bid Items – Concrete Masonry Unit (CMU) cinder block exterior wall 8"

- A4

Concrete Masonry Unit (CMU) cinder block exterior wall 8" with split face and reinforcement as indicated on plans. The respective Lump Sum price shall include all elements related to wall construction including provision of CMU block, reinforcement, placement and coatings according to plans and specifications.

Bid Items – Concrete Masonry Unit (CMU) cinder block exterior wall 8"

Bid Items – Pump Starters and Controls

- A5

Pump Starters and Controls as required for 3-40hp transfer pumps with VFD and 3-25hp well pumps and 5hp sump pump. Includes cabinets and PLC with two level sensors as indicated. The respective Lump Sum price shall include but is not limited to supply and installation of controls, sensors, cabinets, conduit and other hardware as indicated in plans and specifications.

Bid Items – Pumphouse Electrical

- A6

Pumphouse Electrical – includes electrical mains in building, stepdown dry transformer, ducting, panels including lighting, heat, receptacles including transfer switch and standby power connection. The respective Lump Sum price shall be full compensation for furnishing and installing all building wiring, transformers and fixtures in pumphouse to support pumps as well as accessory electrical for lighting, heat, telemetry, and accessory outlets as shown in plans except as described in other items here. Also includes wiring, fixtures and transfer switch for full building backup power generator connection.

Bid Items – Pump Gallery Mechanical

- A7

Pumphouse Mechanical including all pipe headers, valves as shown in plans except as included in other items. The respective Lump Sum price shall be full compensation for fabrication, supply and installation of pipe headers, valves, fittings, pressure gauges, support brackets in accordance with plans and specifications for the pumphouse.

Note: Provision and startup of pressure reducing/altitude valves and 6” Grv x Grv butterfly valves is by Owner. Core drill wall and stainless pass-thru pipe spools are separate items.

Bid Items – 40hp Pentair/Aurora Mdl. 3804 Pumps

- A8

Provision and installation of 40hp Pentair/Aurora Mdl. #3804 Pump. Frame mounted end suction type c/w 3x4x13.5 volute, 460v/3ph/60cy. The respective price each includes provision and installation of pump and motor on frame with grouted base pad & floor anchors according to manufacturer directions.

Bid Items – Circular Stair

- A9

Provision and installation of 12ft high 66” diameter circular stair with railing. Reference Paragon 66” galvanized heavy use stair or approved equivalent model meeting local and State building codes and Federal requirements for worker safety. The respective Lump Sum price shall include shop drawing, provision, assembly, mounting of stairway and associated hardware as indicated in plans and specifications.

Bid Items – Building Ventilation Fan/Louvers

- A10

Provision and installation of building ventilation fans and louvers as indicated in drawings and specifications. Includes variable speed thermostat control for fans. The respective Lump Sum price shall include provision, assembly, mounting and connection of fans to building electrical.

Bid Items – Pumphouse Internal Framing and Construction

- A11

Construction of internal framing in the pumphouse upper level including partitions, ceiling, rafters, windows, internal/external doors, plywood sheathing, standing seam roof, skylights, insulation, aluminum drop down attic stair. Note: CMU exterior wall is separate item. The respective Lump Sum price shall include provision of all materials except as noted, shop drawings as needed, construction, sealing as described in plans and specifications.

Bid Items – Piping Pass-thru Spools

- A12, A13

Pass-thru spools for pipes below grade as indicated in plans and specifications. The respective price for each shall include shop drawings, fabrication, supply, core drilling, Link-Seal or approved equivalent packing to achieve watertight seal. See details sheet in plans.

Bid Items – Locate and connect to existing buried pipe with HDPE spool

- A14

HDPE spools for pipes below grade as indicated in plans and specifications. The respective price for each shall include locate and expose existing flange, connect with HDPE fabricated flange x flange of matching size and DR rating. May include size reducer.

Bid Items – Pumphouse Domestic Plumbing

- A15

Domestic plumbing including water pipes and drains for bathroom, shower, washer/dryer including 30gal H/W heater, and fixtures: sink, toilet, shower as indicated in plans and meeting plumbing codes. The respective Lump Sum price shall include shop drawings, submittals, provision of all materials, and installation in accordance with applicable plumbing codes.

Bid Items – Pumphouse Stairs Outside

- A16

OSHA compliant heavy duty, concrete cast-in-place or optional galvanized metal stair with bar grating tread and railing both sides. 48" wide tread. The respective Lump Sum price shall include shop drawing, provision, assembly, mounting of stairway and associated hardware as indicated in plans and specifications and meeting building codes.

Bid Items – Ecology Block Pumphouse Retaining Wall

- A17

Pumphouse retaining wall - Ecology Block construction per plans, details - ref. Geotech Report by Robinson Noble Saltbush. The respective price each shall include ground preparation as well as provision, unloading, placement of ecology block wall units as indicated in plans and specifications.

Bid Items – Railroad Ballast, un-compacted

- A18

Crushed rock 2” clear crush, placed on west side of pumphouse to grade indicated. The respective price per ton shall be full compensation for delivery and placement of clear crush as indicated.

Bid Items – Perimeter Drain

- A19

Perimeter drain with 4" double pipe and filter socks three sides of building footing to daylight west slope (see site plan, details), includes pea gravel backfill. The respective price per linear foot shall include supply and preparation of pea-gravel bedding, dual drain pipes, pea-gravel cover and backfill.

Bid Items – Pre-cast Drain Sump

- A20

The respective Lump Sum price shall be full compensation for provision and installation of Pre-cast Drain Sump and related fittings, manhole covers etc. as indicated in plans.

Bid Items – Sump Pump and Removable Slide Rails, Controls

- A21

The respective Lump Sum price shall be full compensation for provision and installation of 48” diameter x 120” deep sump with access hatch and vent as well as 5hp submersible pump and slide as indicated in plans. Note: 6” HDPE/PVC discharge piping to 12,000 gal above ground holding tank (tank provided by Owner) is separate item in Schedule “A”.

Bid Items – Drain, piping and Fittings inside pumphouse for sump pump

- A22

The respective Lump Sum price shall be full compensation for provision and installation of 10” PVC drainage fitting and pipe to receive drain water from air gap (see detail). Also includes fittings in pumphouse to throttle discharge water from above ground holding tank to municipal side sewer (see detail).

Bid Items – Main Control Panel (MCP) Cabinet and PLC and related conduit in building.

- A23

The respective Lump Sum price shall include provision and installation of **Main Control Panel cabinet and PLC** as indicated in plans and specifications and shall include programming as directed in plans and specifications (electrical drawings).

Bid Items – Flow Meter to Low Zone Tank.

- A24

The respective Lump Sum price shall be full payment for provision, installation and testing of Seametrics “iMAG” Series or approved equivalent with remote readout 4 – 20ma flow, pulse totalizer, grounding rings.

Bid Items – Imported Granular Fill Material in case of over-excavation to un-disturbed earth

- A25

The price per cubic-yard in place shall be full compensation for supply, placement and compaction of approved granular fill material to replace over-excavation to undisturbed earth as directed by engineer.

Bid Items – Building Side Sewer

- A26

The Lump Sum price shall include location of existing 4” side sewer stub and excavation and leveling of trench from pumphouse to side sewer stub as well as supply of all fittings as indicated in plans and specifications.

Bid Items – Conduit pass-through extensions through foundation wall

- A27

The unit price per each conduit shall be full compensation for supply and installation of all materials required to extend electrical or communications conduit into the pumphouse as indicated on plans. Shall include oversize core drilled holes with polyurethane sealant grout for watertight seal.

Bid Items – 3-phase electric main wires in Conduit

- A28

The unit price per lineal foot of multi-conductor cable shall be full compensation for supply and installation of all materials required to extend three phase 480 volt service to each pump as indicated on plans. Multi-conductor cables size and type as specified in electrical plans. May include loops in pull boxes for payment.

Bid Item - Mobilize/Demobilize

- B1

The Lump Sum price shall cover the complete cost of providing, furnishing, and installing all work and materials necessary to move or organize equipment and personnel onto and off of the site, provide and maintain support facilities, obtain all necessary permits, licenses, and bonds. **Lump sum not to exceed 4% of total bid.**

Bid Item - Redline “As-Built” Drawings

- B2

Lump Sum price shown shall cover the complete cost of providing all mark-up drawings necessary for the Owner to create accurate as-built records as detailed in the specifications. The work includes surveying all structures and utilities to determine their as-constructed locations and elevations

Bid Item - Temporary Erosion and Sediment Control

- B3

The lump sum (LS) price shall constitute complete compensation for furnishing all labor, materials, and equipment necessary to install the filter fence, straw bales, straw wattle dams, Visqueen, hydroseeding, street cleaning, dust control and other temporary erosion and sedimentation control measures as required by King County and other agencies. Turbidity monitoring shall be completed by District.

Bid Item - Excavation Safety

- B4

The lump sum (LS) price bid for this item shall be full compensation for providing safe trench environment, in compliance with Washington Industrial Safety Standards for Construction Work (Chapter 296-155 WAC), General Safety and Health Standard (Chapter 296-24 WAC), General Occupational Health Standard (Chapter 296-22 WAC), and any other appropriate safety and health codes.

Bid Item – Proctor Density Backfill Compaction Test

- B5

The item price for each shall include all labor and professional services for collection of sample, submission to approved soils testing laboratory and analysis.

Bid Items - Disinfect and Pressure Test











- B6

The unit bid for disinfecting and pressure testing of the water main and appurtenances in accordance with the drawings and specifications shall include disinfecting materials and testing appurtenances and temporary connections as required. The District will provide chlorine neutralizer (Ascorbic Acid) for disinfection of water.

**CONTRACT DOCUMENTS
MCKINNON CREEK PUMPHOUSE: PHASE II –
PUMPHOUSE BUILDING**

CONTENTS VOLUME TWO

VII. ATTACHED DOCUMENTS

-  • **Critical Areas Study and Mitigation Plan by Watershed Company update Mar. 26, 2019, incl. plan sheets.**
-  • **Arborist Assessment by Watershed Company Updates July 25, 2019**
-  • **US Army Core of Engineers Permit & Cond., Mar. 19, 2017 with conditions noted**
-  • **City of Lake Forest Park – Hearing Examiner decision, Aug. 12, 2016 – with conditions noted**
-  • **Geotechnical Report – Robinson Noble, Rev. 3, July 2018**
-  • **Major Critical Areas Permit, City of Lake Forest Park, May 13, 2019 with conditions noted**
-  • **Building Permit, City of Lake Forest Park August 28, 2019**
-  • **Major Land Clearing & Grading Permit, City of Lake Forest Park August 27, 2019**
-  • **Tree Permit & Conditions August 28, 2019**
-  • **Washington State Department of Health – Approval to construct letter May 30, 2019**