SPANISH FORK & MAPLETON WRF

Bid Clarification #3

1. Bid Date and Time Remain the Same: August 30, 2022, 3:00 pm
2. Copy of SMK Scope and Fee Schedule
3. Responses to several RFIs received to date are attached.
4. Revised Specification 43 11 33 Positive Displacement Blower
5. Revised Specification 43 30 62 Stainless Steel Slide Gates and Weir Gates

Please acknowledge this clarification on your bid proposal.

If you have any questions or wish to discuss further, please give me a call or send an e-mail.

Val Martin
Project Manager

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Spanish Fork City Corporation
Spanish Fork and Mapleton WRF Project
August 2022

Appendix

Revision 1 (90%)

Estops/Hand Switches/ and Local Control Panels

The following estops, hand switches and local control panels are being provided as part of this bid:

Area 10 – Headworks

- Class I Division 1 Local Control Stations with Estop and Forward/Reverse Hand Switch (10-LCS-1103, 10-LCS-1203, 10-LCS-1111, 10-LCS-1121)
  - QTY four (4)
- Unclassified Estop Enclosures (10-HS-2102A, 10-HS-2202A, 10-HS-2105, 10-HS-2205, 10-HS-2111, 20-HS-2211, 10-HS-4105, 10-HS-4305, 10-HS-4405, 10-HS-4605, 10-HS-4110A, 10-HS-4310, 10-HS-4410, 10-HS-4610)
  - QTY fourteen (14)
- NEMA 4 Enclosure Emergency Pump Control Panel 10-LCP-3100
  - QTY (1)

Area 20 – BNR Trains

- Unclassified Estop Enclosures (20-LCS-1110, 20-LCS-1112, 20-LCS-1114, 20-LCS-1116, 20-LCS-2105, 20-LCS-2205, 20-LCS-1210, 20-LCS-1212, 20-LCS-1214, 20-LCS-1216, 20-LCS-2305, 20-LCS-2405)
  - QTY twelve (12)

Area 30 – MBR Basins

- Unclassified Estop Enclosures (30-HS-2101, 30-HS-2201)
  - QTY two (2)

Area 35 – MBR Permeate

- NEMA 4X Chemical Fill Station LCPs (35-LCP-5100, 35-LCP-5300)

    - QTY two (2)
- NEMA 4X Bulk Storage Tank Chemical LCP (35-I-614)
    - QTY one (1)
- NEMA 4X Sodium Hypo Tote Chemical LCP (35-I-615)
    - QTY one (1)
- NEMA 4X Alum Chemical LCP (35-I-619)
    - QTY one (1)
- MBR System Permeate Analyzer Panel (Turbidity)
    - QTY six (6)
- MBR System Combined Permeate Analyzer Panel (with instruments)
    - QTY (1)

Area 55 – Utility Water System

- Unclassified Estop Enclosures (55-HS-2101, 55-HS-2201, 55-HS-2301)
    - QTY three (3)

Area 60 – Reaeration Basin

- Unclassified Estop Enclosures (60-HS-1100, 60-HS-1200)
    - QTY two (2)

Area 70 – Solids Handling

- NEMA 4X Outdoor Panel for existing plant lift station (70-LCP-1000)
    - QTY one (1)

Beacons and Horns

The following beacons and horns are being provided as part of this bid:

Area 10 – Headworks

- Outdoor Beacons (10-ME-6110A, 10-ME-6110B)
    - QTY two (2)
- Indoor Beacons and Horns (10-ME-6102, 10-ME-6104, 10-ME-6106, 10-ME-6108)
    - QTY four (4)

Instruments

The following instruments are being provided as part of this bid:

Area 05 – Plant Drains and Metering Vault

- Ultrasonic Flowmeter with Remote Transmitter (05-FE/FIT-1001)
    - QTY one (1)

Area 10 – Headworks

- Float Level Switches (10-LSH-1201, 10-LSLL-3101, 10-LSHH-3101, 10-LSLL-3102, 10-LSHH-3102)
    - QTY five (5)
- Flood Level Switch (10-LSH-3005)
    - QTY one (1)
- Radar Level Transmitters (10-LIT-2120A, 10-LIT-2120B, 10-LT/LI-3101, 10-LT/LI-3102, 10-LIT-4120A, 10-LIT-4120B)
    - QTY six (6)
- Flow Switches (10-FSL-8311, 10-FSL-8321)
    - QTY two (2)
- Rotameters (10-FI-8202, 10-FI-8206)
    - QTY two (2)
- Magnetic Flowmeters (10-FE/FIT-4101, 10-FE/FIT-4301, 10-FE/FIT-4401, 10-FE/FIT-4601)
    - QTY four (4) 16-inch mag meters
- Pressure Gauges (10-PI-8101, 10-PI-8210, 10-PI-8215)
    - QTY two (2)
- Pressure Gauges and Pressure Switches on 4-inch Annular Rings (10-PI-2105A and 10-PSL-2105, 10-PI-2105B and 10-PSH-2105, 10-PI-2205A and 10-PSL-2205, 10-PI-2205B and 10-PSH-2205)
    - QTY four (4)
- Pressure Gauges with Diaphragm Seals (10-PI-3105A, 10-PI-3105B, 10-PI-3205A, 10-PI-3205B, 10-PI-3305A, 10-PI-3305B, 10-PI-3405A, 10-PI-3405B, 10-PI-3701, 10-PI-3801, 10-PI-8001, 10-PI-8111, 10-PI-8125A, 10-PI-8125B, 10-PI-8225A, 10-PI-8225B, 10-PI-8325A, 10-PI-8325B)
    - QTY eighteen (18)
- Pressure Switches with Diaphragm Seals (10-PSL-3105, 10-PSH-3105, 10-PSL-3205, 10-PSH-3205, 10-PSL-3305, 10-PSH-3305, 10-PSL-3405, 10-PSH-3405)
    - QTY eight (8)
- Pressure Transmitters with Diaphragm Seals (10-PIT-3701, 10-PIT-3801, 10-PIT-8002)
    - QTY three (3)
- Auto Sampler (10-SMP-1000)
    - QTY one (1)
- pH/Temperature Sensor and Controller (10-AE/AIT-1001)
    - QTY one (1)
- Combined Gas Sensors and Controllers with Sample Gas (10-AE/AIT-6102, 10-AE/AIT-6104, 10-AE/AIT-6106, 10-AE/AIT-6108)
    - QTY four (4)
- H2S Gas Sensors and Controllers with Sample Gas (10-AE/AIT-6101A, 10-AE/AIT-6103A, 10-AE/AIT-6105A, 10-AE/AIT-6107A)
    - QTY four (4)

- O2 Gas Sensors and Controllers with Sample Gas (10-AE/AIT-6101B, 10-AE/AIT-6103B, 10-AE/AIT-6105B, 10-AE/AIT-6107B)
    - QTY four (4)

Area 20 – BNR Trains

- Radar Level Transmitters (20-LE/LIT-1125, 20-LE/LIT-1225)
    - QTY two (2)
- Flow Switches (20-FSL-2006, 20-FSL-2107, 20-FSL-2111, 20-FSL-2121, 20-FSL-2211, 20-FSL-2221, 20-FSL-2311, FSL-2321)
    - QTY eight (8)
- Magnetic Flowmeters (20-FE/FIT-2021, 20-FE/FIT-2111)
    - QTY two (2) 16-inch mag meters
- Thermal Mass Flowmeters (20-FE/FIT-2502, 20-FE/FIT-2512, 20-FE/FIT-2522, 20-FE/FIT-2602, 20-FE/FIT-2612, 20-FE/FIT-2622)
    - QTY six (6)
- Pressure Gauges (20-PI-2006, 20-PI-2107)
    - QTY two (2)
- ORP Sensors and Controllers with Ball Float Mounting Kit (20-AE/AIT-1113, 20-AE/AIT-1117, 20-AE/AIT-1213, 20-AE/AIT-1217)
    - QTY four (4)
- TSS Sensors and Controllers with Pole Mounting Kit (20-AE/AIT-1119, 20-AE/AIT-1219)
    - QTY two (2)

Area 30 – MBR Basins

- Radar Level Transmitters (30-LE/LIT-2005, 30-LE/LIT-2009)
    - QTY two (2)
- Magnetic Flowmeter (30-FE/FIT-2107)
    - QTY one (1) 4-inch mag meter
- Pressure Transmitter with 4-inch Annular Ring (30-PIT-2105)
    - QTY one (1)

Area 35 – MBR Permeate

- Flood Level Switches (35-LSH-5100, 35-LSH-5300)
    - QTY two (2)
- Tuning Fork Level Switches (35-LSHH-5101, 35-LSHH-5102, 35-LSHH-5301, 35-LSHH-5302)
    - QTY four (4)
- Ultrasonic Level Sensors and Remote Displays (35-LE/LIT-5101, 35-LE/LIT-5102, 35-LE/LIT-5301, 35-LE/LIT-5302)
    - QTY four (4)

- Magnetic Flowmeters (35-FE/FIT-1105, 35-FE/FIT-1205, 35-FE/FIT-1305, 35-FE/FIT-1405, 35-FE/FIT-1505, 35-FE/FIT-1605, 35-FE/FIT-4101, 35-FE/FIT-4201, 35-FE/FIT-5310, 35-FE/FIT-5320)
    - QTY six (6) 8-inch mag meters
    - QTY two (2) 24-inch mag meters
    - QTY two (2) 1/2-inch mag meters
- Pressure Gauges with Diaphragm Seals (35-PI-1105A, 35-PI-1105B, 35-PI-1205A, 35-PI-1205B, 35-PI-1305A, 35-PI-1305B, 35-PI-1405A, 35-PI-1405B, 35-PI-1505A, 35-PI-1505B, 35-PI-1605A, 35-PI-1605B, 35-PI-5310, 35-PI-5320)
    - QTY fourteen (14)
- Pressure Switches with Diaphragm Seals (35-PSH-1105A, 35-PSH-1105B, 35-PSH-1205A, 35-PSH-1205B, 35-PSH-1305A, 35-PSH-1305B, 35-PSH-1405A, 35-PSH-1405B, 35-PSH-1505A, 35-PSH-1505B, 35-PSH-1605A, 35-PSH-1605B, 35-PSH-5310, 35-PSH-5320)
    - QTY fourteen (14)
- Pressure Transmitter (35-PIT-4005)
    - QTY one (1)
- TSS Sensors and Controllers with Pole Mounting Kit (35-AE/AIT-3105, 35-AE/AIT-3205)
    - QTY two (2)
- NH3 Chlorometric Analyzer for MBR System Combined Permeate Analyzer Panel (35-AE/AIT-4013)
    - QTY one (1)
- NO3 Analyzer for MBR System Combined Permeate Analyzer Panel (35-AE/AIT-4015)
    - QTY one (1)
- TSS Analyzer for MBR System Combined Permeate Analyzer Panel (35-AE/AIT-4017)
    - QTY one (1)
- UVT Analyzer for MBR System Combined Permeate Analyzer Panel (35-AE/AIT-4019)
    - QTY one (1)

Area 50 – UV System

- Auto Sampler (60-SMP-1000)
    - QTY one (1)

Area 55 – Utility Water System

- Float Level Switch (55-LSLL-2002)
    - QTY one (1)
- Radar Level Transmitter (55-LE/LIT-2001)
    - QTY one (1)
- Magnetic Flowmeter (55-FE/FIT-2004)
    - QTY one (1) 12-inch mag meter
- Pressure Gauges (55-PI-2007, 55-PI-2101, 55-PI-2201, 55-PI-2301)
    - QTY four (4)

- Pressure Switches (55-PSH-2101, 55-PSH-2201, 55-PSH-2301)
    - QTY three (3)
- Pressure Transmitter (55-PIT-2006)
    - QTY one (1)

Area 60 – Reaeration Basin

- Magnetic Flowmeter (60-FE/FIT-2005)
    - QTY one (1) 30-inch mag meter
- Thermal Mass Flowmeter (60-FE/FIT-1100)
    - QTY one (1)
- Pressure Gauge (60-PI-1100)
    - QTY one (1)
- Dissolved Oxygen Sensor and Controller with Pole Mount Kit (60-AE/AIT-2002)
    - QTY one (1)
- pH/Temperature Sensor and Controller with Ball Float Mounting Kit (60-AE/AIT-2001)
    - QTY one (1)

Area 70 – Solids Handling

- Float Level Switches (70-LSLL-1001, 70-LSHH-1001)
    - QTY two (2)
- Radar Level Transmitter (70-LE/LIT-1201)
    - QTY one (1)
- Ultrasonic Level Sensor and Remote Display (70-LE/LIT-1001)
    - QTY one (1)
- Sludge Blanket Level Transmitter (70-LE/LIT-1202)
    - QTY one (1)
- Magnetic Flowmeter (70-FE/FIT-1105)
    - QTY one (1) 8-inch mag meter
- Pressure Transmitter (70-PIT-3303)
    - QTY one (1)

General

- Manufacturer Startup Services for Magnetic Flowmeters – 3 days
- Manufacturer Startup Services for Thermal Mass Flowmeters – 2 days
- Manufacturer Startup Services for Level Detection – 3 days
- Manufacturer Startup Services for Analytical Instruments – 1 day

City of Spanish Fork
WRF SKM Fee Proposal
05 Generators

Task ID	Task Description	Principle/Project Manager ($195)	Electrical Engineer ($175/Hr)	Interface/Controls Engineer ($155/Hr)	Senior Programmer ($145/Hr)	Draftsman ($125/Hour)	Controls Electrician ($125/Hour)	Administrative Support ($95/Hr)	Total	Sub-Total Price
Task #1 - Control Panel Engineering Project Management										
1.2	Client Meetings								0	$0
1.3	Contractor Construction Meetings								0	$0
1.4	Interdiscipline Coordination								0	$0
1.5	Clerical								0	$0
Task #1 - Totals		0	0	0	0	0		0	0	$0
Task #2 - Control Panel Engineering										
2.1	LCP Design								0	$0
2.2	Control Panel Engineering Submittal (CPES)								0	$0
Task #2 - Totals		0	0	0	0	0		0	0	$0
Task #3 - Control Panel O&M Manuals										
3.1	As-Builts								0	$0
3.2	O&M Manual Preparation								0	$0
3.3	O&M Submittal and Revisions								0	$0
Task #3 - Totals		0	0	0		0		0	0	$0
Task #4 - Training										
4.1	PLC Panel Training								0	$0
4.2	Documentation Training								0	$0
4.3	System Troubleshooting Training								0	$0
Task #4 - Totals		0	0	0	0	0		0	0	$0
	Control Panel Labor Totals:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**$0**
Task #5 - Control Panel, Network, Computer, Hardware										
5.1	PLC Components									$0
5.2	Network Hardware									$0
5.3	Computer/Server Hardware									$0
5.4	PLC Panels/Backpans and Associated Components									$0
5.5	UPS Equipment									$0
5.6	Panel Construction									$0
Task #5 - Totals										$0
	Equipment SubTotals:									$0
	Sales Tax (7.25%):									$0.00
	Control Panel Equipment Total									**$0**
Task #6 - Instrumentation										
6.1	Instruments									$3,451
6.2	Submittal Labor									$1,160
6.3	Startup and Calibration Labor									$290
6.4	O&M Labor									$580
6.5	Storage									
6.6										
Task #6 - Totals										$5,481
	Instrument Labor Totals:									$2,030
	Instrumentation Equipment Totals:									$3,451
	Sales Tax (7.25%):									$397.39
	Instrument Total with Labor									**$5,878.61**
	Control Panel/Instrument/Hardware Total									**$5,878.61**
Task #7 -System Integration Project Management										
7.1	Client Meetings	1							1	$195
7.2	Contractor Construction Meetings	1							1	$195
7.3	Interdiscipline Coordination	1							1	$195
7.4	Clerical								0	$0
Task #7 - Totals		3	0	0	0	0		0	3	$585
Task #8 - System Integration										
8.1	PLC Programming								0	$0
8.2	HMI Database			2	2				4	$600
8.3	HMI Screen Development			2	2				4	$600
8.4	HMI Testing			2	2				4	$600
8.5	SCADA Client Hardware Setup								0	$0
8.6	Witness Testing			2	2				4	$600
Task #8 - Totals		0	0	8	8	0		0	16	$2,400
Task #9 - Startup and Commissioning										
9.1	Equipment Coordination								0	$0
9.2	Instrument Calibration Assistance								0	$0
9.3	Network Switches Setup			4					4	$620
9.4	Oversee Electrical Terminations								0	$0
9.5	Computer/Server/Client Install								0	$0
9.6	Functional Loop Testing			6					6	$930
9.7	Commissioning								0	$0
Task #9 - Totals		0	0	10	0	0	0	0	10	$1,550
Task #10 - Training										
10.1	SCADA O&M								0	$0
10.2	PLC Panel Training								0	$0
10.3	HMI System Training								0	$0
10.4	Documentation Training								0	$0
10.5	System Troubleshooting Training								0	$0
Task #10 - Totals		0	0	0	0	0	0	0	0	$0
	System Integration Labor Total	**3**	**0**	**18**	**8**	**0**	**0**	**0**	**29**	**$4,535**

City of Spanish Fork WRF SKM
Fee Proposal 10 Headworks

Task ID	Task Description	Principle/Project Manager ($195)	Electrical Engineer ($175/Hr)	Interface/Controls Engineer ($155/Hr)	Senior Programmer ($145/Hr)	Draftsman ($125/Hour)	Controls Electrician ($125/Hour)	Administrative Support ($95/Hr)	Total	Sub-Total Price
Task #1 - Control Panel Engineering Project Management										
1.2	Client Meetings	8	8						16	$2,960
1.3	Contractor Construction Meetings	8	8						16	$2,960
1.4	Interdiscipline Coordination	8	8						16	$2,960
1.5	Clerical							4	4	$380
Task #1 - Totals		24	24	0	0	0		4	52	$9,260
Task #2 - Control Panel Engineering										
2.1	Headworks PLC LCP Design	10	30			40			80	$12,200
2.2	Control Panel Engineering Submittal (CPES)	4	39			27			70	$10,980
Task #2 - Totals		14	69	0	0	67		0	150	$23,180
Task #3 - Control Panel O&M Manuals										
3.1	As-Builts	4	12			12			28	$4,380
3.2	O&M Manual Preparation	2	8						10	$1,790
3.3	O&M Submittal and Revisions	2	8						10	$1,790
Task #3 - Totals		8	28	0		12		0	48	$7,960
Task #4 - Training										
4.1	PLC Panel Training	1	2		2				5	$835
4.2	Documentation Training	1	2						3	$545
4.3	System Troubleshooting Training	1	2		2				5	$835
Task #4 - Totals		3	6	0	4	0		0	13	$2,215
	Control Panel Labor Totals:	**49**	**127**	**0**	**4**	**79**	**0**	**4**	**263**	**$42,615**
Task #5 - Control Panel, Network, Computer, Hardware										
5.1	PLC Components									$53,939
5.2	Network Hardware									$59,440
5.3	Computer/Server Hardware									$2,130
5.4	PLC Panels/Backpans and Associated Components									$24,100
5.5	UPS Equipment									$41,400
5.6	Panel Construction									$26,000
5.7	Estops/Hand Switches and Panels									$42,120
5.8	Beacons and Horns									$11,360
5.9	Control Station Furniture and Consoles									$10,000
Task #5 - Totals										$270,489
	Equipment SubTotals:									$270,489
	Sales Tax (7.25%):									$19,610.45
	Control Panel Equipment Total									**$290,099**
Task #6 - Instrumentation										
6.1	Instruments									$250,973
6.2	Submittal Labor									$9,232
6.3	Startup and Calibration Labor									$10,078
6.4	O&M Labor									$4,698
6.5	Storage									$2,400
6.6										
Task #6 - Totals										$277,381
	Instrument Labor Totals:									$26,408
	Instrumentation Equipment Totals:									$250,973
	Sales Tax (7.25%):									$20,110.12
	Instrument Total with Labor									**$297,491.12**
	Control Panel/Instrument/Hardware Total									**$630,205.58**
Task #7 -System Integration Project Management										
7.1	Client Meetings	8		8					16	$2,800
7.2	Contractor Construction Meetings	8		8					16	$2,800
7.3	Interdiscipline Coordination	12		12					24	$4,200
7.4	Clerical								0	$0
Task #7 - Totals		28	0	28	0	0		0	56	$9,800
Task #8 - System Integration										
8.1	PLC Programming	6		24	24				54	$8,370
8.2	HMI Database	6		60	60				126	$19,170
8.3	HMI Screen Development	8		70	70				148	$22,560
8.4	HMI Testing			60	60				120	$18,000
8.5	SCADA Client Hardware Setup			4	4				8	$1,200
8.6	Witness Testing			8	8				16	$2,400
Task #8 - Totals		20	0	226	226	0		0	472	$71,700
Task #9 - Startup and Commissioning										
9.1	Equipment Coordination		8						8	$1,400
9.2	Instrument Calibration Assistance			8					8	$1,240
9.3	Network Switches Setup			8					8	$1,240
9.4	Oversee Electrical Terminations						18		18	$2,250
9.5	Computer/Server/Client Install			4					4	$620
9.6	Functional Loop Testing			20	20				40	$6,000
9.7	Commissioning			24	24				48	$7,200
Task #9 - Totals		0	8	64	44	0	18	0	134	$19,950
Task #10 - Training										
10.1	SCADA O&M			16					16	$2,480
10.2	PLC Panel Training			4					4	$620
10.3	HMI System Training			4					4	$620
10.4	Documentation Training			4					4	$620
10.5	System Troubleshooting Training			2					2	$310
Task #10 - Totals		0	0	30	0	0	0	0	30	$4,650
	System Integration Labor Total	**48**	**8**	**348**	**270**	**0**	**18**	**0**	**692**	**$106,100**

City of Spanish Fork WRF SKM Fee Proposal 20 BNR

Task ID	Task Description	Principle/Project Manager ($195)	Electrical Engineer ($175/Hr)	Interface/Controls Engineer ($155/Hr)	Senior Programmer ($145/Hr)	Draftsman ($125/Hour)	Controls Electrician ($125/Hour)	Administrative Support ($95/Hr)	Total	Sub-Total Price
Task #1 - Control Panel Engineering Project Management										
1.2	Client Meetings	16	12						28	$5,220
1.3	Contractor Construction Meetings	16	12						28	$5,220
1.4	Interdiscipline Coordination	8	12						20	$3,660
1.5	Clerical							4	4	$380
Task #1 - Totals		40	36	0	0	0		4	80	$14,480
Task #2 - Control Panel Engineering										
2.1	BNR/MBR PLC LCP Design	10	48			60			118	$17,850
2.2	Control Panel Engineering Submittal (CPES)	8	21			12			41	$6,735
Task #2 - Totals		18	69	0	0	72		0	159	$24,585
Task #3 - Control Panel O&M Manuals										
3.1	As-Builts	4	20			28			52	$7,780
3.2	O&M Manual Preparation	2	8						10	$1,790
3.3	O&M Submittal and Revisions	2	8						10	$1,790
Task #3 - Totals		8	36	0		28		0	72	$11,360
Task #4 - Training										
4.1	PLC Panel Training	1	2		2				5	$835
4.2	Documentation Training	1	2						3	$545
4.3	System Troubleshooting Training	1	2		2				5	$835
Task #4 - Totals		3	6	0	4	0		0	13	$2,215
	Control Panel Labor Totals:	**69**	**147**	**0**	**4**	**100**	**0**	**4**	**324**	**$52,640**
Task #5 - Control Panel, Network, Computer, Hardware										
5.1	PLC Components									$83,676
5.2	Network Hardware									$156,880
5.3	Computer/Server Hardware									$20,430
5.4	PLC Panels/Backpans and Associated Components									$31,000
5.5	UPS Equipment									$103,600
5.6	Panel Construction									$30,000
5.7	Estops/Hand Switches/Local Control Panels									$7,480
5.8	Beacons and Horns									$0
5.9	Control Room Furniture and Console									$50,000
Task #5 - Totals										$483,066
	Equipment SubTotals:									$483,066
	Sales Tax (7.25%):									$35,022.29
	Control Panel Equipment Total									**$518,088**
Task #6 - Instrumentation										
6.1	Instruments									$264,530
6.2	Submittal Labor									$2,513
6.3	Startup and Calibration Labor									$13,075
6.4	O&M Labor									$1,871
6.5	Storage									$2,400
6.6										
Task #6 - Totals										$284,389
	Instrument Labor Totals:									19858.83
	Instrumentation Equipment Totals:									$264,530
	Sales Tax (7.25%):									$20,618.19
	Instrument Total									**$305,007.02**
	Control Panel/Instrument/Hardware Total									**$875,735.31**
Task #7 -System Integration Project Management										
7.1	Client Meetings	12		12					24	$4,200
7.2	Contractor Construction Meetings	12		12					24	$4,200
7.3	Interdiscipline Coordination	16		16					32	$5,600
7.4	Clerical								0	$0
Task #7 - Totals		40	0	40	0	0		0	80	$14,000
Task #8 - System Integration										
8.1	PLC Programming	10		40	40				90	$13,950
8.2	HMI Database			36	36				72	$10,800
8.3	HMI Screen Development			48	48				96	$14,400
8.4	HMI Testing			12	20				32	$4,760
8.5	SCADA Client Hardware Setup			6	6				12	$1,800
8.6	Witness Testing			12	12				24	$3,600
Task #8 - Totals		10	0	154	162	0		0	326	$49,310
Task #9 - Startup and Commissioning										
9.1	Equipment Coordination		12						12	$2,100
9.2	Instrument Calibration Assistance			16					16	$2,480
9.3	Network Switches Setup			24					24	$3,720
9.4	Oversee Electrical Terminations						75		75	$9,375
9.5	Computer/Server/Client Install			24					24	$3,720
9.6	Functional Loop Testing			30	30				60	$9,000
9.7	Commissioning			36	36				72	$10,800
9.8	Allen Bradley Rep On Site for 5 Days									$15,000
Task #9 - Totals		0	12	130	66	0	75	0	283	$56,195
Task #10 - Training										
10.1	SCADA O&M			32					32	$4,960
10.2	PLC Panel Training			6					6	$930
10.3	HMI System Training			6					6	$930
10.4	Documentation Training			6					6	$930
10.5	System Troubleshooting Training			4					4	$620
Task #10 - Totals		0	0	54	0	0	0	0	54	$8,370
Task #11 - Software										
11.1	Ignition (Primary and Redundant with Perspective)								1	$45,000
11.2	FactoryTalk View Studio ME Subscription 1 year								1	$400
11.3	Cisco Admin and Product Support								1	$7,000
11.4	Cloud Backup Software Supscription (1 year-Server)								3	$2,400
11.5	VPN Subscription (1 year)								1	$2,500
Task #11 - Totals		0	0	54	0	0	0	0	56	$57,300
	System Integration Labor/Software Total	**50**	**12**	**378**	**228**	**0**	**75**	**0**	**743**	**$185,175**

City of Spanish Fork WRF SKM Fee Proposal
30 and 35 MBR

Task ID	Task Description	Principle/Project Manager ($195)	Electrical Engineer ($175/Hr)	Interface/Controls Engineer ($155/Hr)	Senior Programmer ($145/Hr)	Draftsman ($125/Hour)	Controls Electrician ($125/Hour)	Administrative Support ($95/Hr)	Total	Sub-Total Price
Task #1 - Control Panel Engineering Project Management										
1.2	Client Meetings	4							4	$780
1.3	Contractor Construction Meetings								0	$0
1.4	Interdiscipline Coordination								0	$0
1.5	Clerical								0	$0
Task #1 - Totals		4	0	0	0	0		0	4	$780
Task #2 - Control Panel Engineering										
2.1	PLC LCP Design								0	$0
2.2	Control Panel Engineering Submittal (CPES)		14			16			30	$4,450
Task #2 - Totals		0	14	0	0	16		0	30	$4,450
Task #3 - Control Panel O&M Manuals										
3.1	As-Builts								0	$0
3.2	O&M Manual Preparation								0	$0
3.3	O&M Submittal and Revisions								0	$0
Task #3 - Totals		0	0	0		0		0	0	$0
Task #4 - Training										
4.1	PLC Panel Training								0	$0
4.2	Documentation Training								0	$0
4.3	System Troubleshooting Training								0	$0
Task #4 - Totals		0	0	0	0	0		0	0	$0
	Control Panel Labor Totals:	**4**	**14**	**0**	**0**	**16**	**0**	**0**	**34**	**$5,230**
Task #5 - Control Panel, Network, Computer, Hardware										
5.1	PLC Components									
5.2	Network Hardware									
5.3	Computer/Server Hardware									
5.4	PLC Panels/Backpans and Associated Components									
5.5	UPS Equipment									
5.6	Panel Construction									
5.7	Local Control Stations and Hardware									$42,000
Task #5 - Totals										$42,000

Equipment SubTotals:	$42,000
Sales Tax (7.25%):	$3,045.00
Control Panel Equipment Total	**$45,045**

Task #6 - Instrumentation		
6.1	Instruments	$256,327
6.2	Submittal Labor	$5,433
6.3	Startup and Calibration Labor	$14,745
6.4	O&M Labor	$3,857
6.5	Storage	$2,400
6.6	Wet Panels Place Holder	$298,305
Task #6 - Totals		$581,067

Instrument Labor Totals:	$26,435
Instrumentation Equipment Totals:	$554,632
Sales Tax (7.25%):	$42,127.33
Instrument Total with Labor	**$623,193.99**
Control Panel/Instrument/Hardware Total	**$673,468.99**

Task #7 -System Integration Project Management										
7.1	Client Meetings	8		8	8				24	$3,960
7.2	Contractor Construction Meetings	8		12	12				32	$5,160
7.3	Interdiscipline Coordination	12		12	12				36	$5,940
7.4	Clerical								0	$0
Task #7 - Totals		28	0	32	32	0		0	92	$15,060
Task #8 - System Integration										
8.1	PLC Programming								0	$0
8.2	HMI Database	18		64	64				146	$22,710
8.3	HMI Screen Development	18		90	120				228	$34,860
8.4	HMI Testing	18		60	64				142	$22,090
8.5	SCADA Client Hardware Setup								0	$0
8.6	Witness Testing			8	8				16	$2,400
Task #8 - Totals		54	0	222	256	0		0	532	$82,060
Task #9 - Startup and Commissioning										
9.1	Equipment Coordination		16						16	$2,800
9.2	Instrument Calibration Assistance								0	$0
9.3	Network Switches Setup			24					24	$3,720
9.4	Oversee Electrical Terminations								0	$0
9.5	Computer/Server/Client Install								0	$0
9.6	Functional Loop Testing								0	$0
9.7	Commissioning								0	$0
Task #9 - Totals		0	16	24	0	0	0	0	40	$6,520
Task #10 - Training										
10.1	SCADA O&M				8				8	$1,160
10.2	PLC Panel Training								0	$0
10.3	HMI System Training				6				6	$870
10.4	Documentation Training								0	$0
10.5	System Troubleshooting Training				6				6	$870
Task #10 - Totals		0	0	0	20	0	0	0	20	$2,900

	System Integration Labor Total	**82**	**16**	**278**	**308**	**0**	**0**	**0**	**684**	**$106,540**

City of Spanish Fork WRF SKM Fee Proposal
50 UV

Task ID	Task Description	Principle/Project Manager ($195)	Electrical Engineer ($175/Hr)	Interface/Controls Engineer ($155/Hr)	Senior Programmer ($145/Hr)	Draftsman ($125/Hour)	Controls Electrician ($125/Hour)	Administrative Support ($95/Hr)	Total	Sub-Total Price
Task #1 - Control Panel Engineering Project Management										
1.2	Client Meetings								0	$0
1.3	Contractor Construction Meetings								0	$0
1.4	Interdiscipline Coordination								0	$0
1.5	Clerical								0	$0
Task #1 - Totals		0	0	0	0	0		0	0	$0
Task #2 - Control Panel Engineering										
2.1	LCP Design								0	$0
2.2	Control Panel Engineering Submittal (CPES)								0	$0
Task #2 - Totals		0	0	0	0	0		0	0	$0
Task #3 - Control Panel O&M Manuals										
3.1	As-Builts								0	$0
3.2	O&M Manual Preparation								0	$0
3.3	O&M Submittal and Revisions								0	$0
Task #3 - Totals		0	0	0		0		0	0	$0
Task #4 - Training										
4.1	PLC Panel Training								0	$0
4.2	Documentation Training								0	$0
4.3	System Troubleshooting Training								0	$0
Task #4 - Totals		0	0	0	0	0		0	0	$0
	Control Panel Labor Totals:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**$0**
Task #5 - Control Panel, Network, Computer, Hardware										
5.1	PLC Components									$0
5.2	Network Hardware									$0
5.3	Computer/Server Hardware									$0
5.4	PLC Panels/Backpans and Associated Components									$0
5.5	UPS Equipment									$0
5.6	Panel Construction									$0
Task #5 - Totals										$0
	Equipment SubTotals:									$0
	Sales Tax (7.25%):									$0.00
	Control Panel Equipment Total									**$0**
Task #6 - Instrumentation										
6.1	Instruments									$12,443
6.2	Submittal Labor									$580
6.3	Startup and Calibration Labor									$290
6.4	O&M Labor									$435
6.5	Storage									
6.6										
Task #6 - Totals										$13,748
	Instrument Labor Totals:									1305
	Instrumentation Equipment Totals:									$12,443
	Sales Tax (7.25%):									$996.74
	Instrument Total with Labor									**$14,744.92**
	Control Panel/Instrument/Hardware Total									**$14,744.92**
Task #7 -System Integration Project Management										
7.1	Client Meetings	4		4					8	$1,400
7.2	Contractor Construction Meetings								0	$0
7.3	Interdiscipline Coordination	4							4	$780
7.4	Clerical								0	$0
Task #7 - Totals		8	0	4	0	0		0	12	$2,180
Task #8 - System Integration										
8.1	PLC Programming								0	$0
8.2	HMI Database			20	20				40	$6,000
8.3	HMI Screen Development			20	20				40	$6,000
8.4	HMI Testing			5	5				10	$1,500
8.5	SCADA Client Hardware Setup								0	$0
8.6	Witness Testing								0	$0
Task #8 - Totals		0	0	45	45	0		0	90	$13,500
Task #9 - Startup and Commissioning										
9.1	Equipment Coordination								0	$0
9.2	Instrument Calibration Assistance								0	$0
9.3	Network Switches Setup			6					6	$930
9.4	Oversee Electrical Terminations								0	$0
9.5	Computer/Server/Client Install								0	$0
9.6	Functional Loop Testing			4					4	$620
9.7	Commissioning								0	$0
Task #9 - Totals		0	0	10	0	0	0	0	10	$1,550
Task #10 - Training										
10.1	SCADA O&M								0	$0
10.2	PLC Panel Training								0	
10.2	HMI System Training								0	$0
10.3	Documentation Training								0	$0
10.4	System Troubleshooting Training								0	$0
Task #10 - Totals		0	0	0	0	0	0	0	0	$0
	System Integration Labor Total	**8**	**0**	**59**	**45**	**0**	**0**	**0**	**112**	**$17,230**

City of Spanish Fork WRF SKM Fee Proposal 55 and 60 UW

Task ID	Task Description	Principle/Project Manager ($195)	Electrical Engineer ($175/Hr)	Interface/Controls Engineer ($155/Hr)	Senior Programmer ($145/Hr)	Draftsman ($125/Hour)	Controls Electrician ($125/Hour)	Administrative Support ($95/Hr)	Total	Sub-Total Price
Task #1 - Control Panel Engineering Project Management										
1.2	Client Meetings	8	8						16	$2,960
1.3	Contractor Construction Meetings	8	8						16	$2,960
1.4	Interdiscipline Coordination		8						8	$1,400
1.5	Clerical							4	4	$380
Task #1 - Totals		16	24	0	0	0		4	44	$7,700
Task #2 - Control Panel Engineering										
2.1	UW PLC LCP Design	10	24			32			66	$10,150
2.2	Control Panel Engineering Submittal (CPES)	4	15			6			25	$4,155
Task #2 - Totals		14	39	0	0	38		0	91	$14,305
Task #3 - Control Panel O&M Manuals										
3.1	As-Builts	4	8			8			20	$3,180
3.2	O&M Manual Preparation	2	8						10	$1,790
3.3	O&M Submittal and Revisions	2	8						10	$1,790
Task #3 - Totals		8	24	0		8		0	40	$6,760
Task #4 - Training										
4.1	PLC Panel Training	1	2		2				5	$835
4.2	Documentation Training	1	2						3	$545
4.3	System Troubleshooting Training	1	2		2				5	$835
Task #4 - Totals		3	6	0	4	0		0	13	$2,215
	Control Panel Labor Totals:	**41**	**93**	**0**	**4**	**46**	**0**	**4**	**188**	**$30,980**
Task #5 - Control Panel, Network, Computer, Hardware										
5.1	PLC Components									$48,012
5.2	Network Hardware									$41,560
5.3	Computer/Server Hardware									$2,130
5.4	PLC Panels/Backpans and Associated Components									$21,500
5.5	UPS Equipment									$103,600
5.6	Panel Construction									$18,000
5.7	Local Control Stations and Hand Switches									$3,200
5.8	Beacons and Horns									$0
5.9	Control Station Furniture and Consoles									$5,000
Task #5 - Totals										$243,002
	Equipment SubTotals:									$243,002
	Sales Tax (7.25%):									$17,617.65
	Control Panel Equipment Total									**$260,620**
Task #6 - Instrumentation										
6.1	Instruments									$199,373
6.2	Submittal Labor									$2,620
6.3	Startup and Calibration Labor									$2,393
6.4	O&M Labor									$1,863
6.5	Storage									
6.6										
Task #6 - Totals										$206,248
	Instrument Labor Totals:									$6,875.42
	Instrumentation Equipment Totals:									$199,373
	Sales Tax (7.25%):									$14,953.01
	Instrument Total with Labor									**$221,201.43**
	Control Panel/Instrument/Hardware Total									**$512,801.08**
Task #7 -System Integration Project Management										
7.1	Client Meetings	4		4					8	$1,400
7.2	Contractor Construction Meetings	4		4					8	$1,400
7.3	Interdiscipline Coordination	6		6					12	$2,100
7.4	Clerical								0	$0
Task #7 - Totals		14	0	14	0	0		0	28	$4,900
Task #8 - System Integration										
8.1	PLC Programming			10	10				20	$3,000
8.2	HMI Database			10	10				20	$3,000
8.3	HMI Screen Development			16	16				32	$4,800
8.4	HMI Testing			6	12				18	$2,670
8.5	SCADA Client Hardware Setup			4	4				8	$1,200
8.6	Witness Testing			8	8				16	$2,400
Task #8 - Totals		0	0	54	60	0		0	114	$17,070
Task #9 - Startup and Commissioning										
9.1	Equipment Coordination		8						8	$1,400
9.2	Instrument Calibration Assistance			8					8	$1,240
9.3	Network Switches Setup			8					8	$1,240
9.4	Oversee Electrical Terminations						10		10	$1,250
9.5	Computer/Server/Client Install			4					4	$620
9.6	Functional Loop Testing			8	8				16	$2,400
9.7	Commissioning			8	8				16	$2,400
Task #9 - Totals		0	8	36	16	0	10	0	70	$10,550
Task #10 - Training										
10.1	SCADA O&M			8					8	$1,240
10.2	PLC Panel Trianing			4					4	$620
10.2	HMI System Training			4					4	$620
10.3	Documentation Training			4					4	$620
10.4	System Troubleshooting Training			2					2	$310
Task #10 - Totals		0	0	22	0	0	0	0	22	$3,410
	System Integration Labor Total	**14**	**8**	**126**	**76**	**0**	**10**	**0**	**234**	**$35,930**

City of Spanish Fork WRF SKM Fee Proposal 70 Solids Handling

Task ID	Task Description	Principle/Project Manager ($195)	Electrical Engineer ($175/Hr)	Interface/Controls Engineer ($155/Hr)	Senior Programmer ($145/Hr)	Draftsman ($125/Hour)	Controls Electrician ($125/Hour)	Administrative Support ($95/Hr)	Total	Sub-Total Price
Task #1 - Control Panel Engineering Project Management										
1.2	Client Meetings	4			2				6	$1,070
1.3	Contractor Construction Meetings	4			2				6	$1,070
1.4	Interdiscipline Coordination	4			2				6	$1,070
1.5	Clerical								0	$0
Task #1 - Totals		12	0	0	6	0		0	18	$3,210
Task #2 - Control Panel Engineering										
2.1	LCP Design								0	$0
2.2	Control Panel Engineering Submittal (CPES)								0	$0
Task #2 - Totals		0	0	0	0	0		0	0	$0
Task #3 - Control Panel O&M Manuals										
3.1	As-Builts			4		8			12	$1,620
3.2	O&M Manual Preparation								0	$0
3.3	O&M Submittal and Revisions								0	$0
Task #3 - Totals		0	0	4		8		0	12	$1,620
Task #4 - Training										
4.1	PLC Panel Training								0	$0
4.2	Documentation Training								0	$0
4.3	System Troubleshooting Training								0	$0
Task #4 - Totals		0	0	0	0	0		0	0	$0
	Control Panel Labor Totals:	**12**	**0**	**4**	**6**	**8**	**0**	**0**	**30**	**$4,830**
Task #5 - Control Panel, Network, Computer, Hardware										
5.1	PLC Components									$900
5.2	Network Hardware									$1,600
5.3	Computer/Server Hardware									$0
5.4	PLC Panels/Backpans and Associated Components									$0
5.5	UPS Equipment									$0
5.6	Panel Construction									$0
5.7	Local Control Panels and Hardware									$70,000
Task #5 - Totals										$72,500
	Equipment SubTotals:									$72,500
	Sales Tax (7.25%):									$5,256.25
	Control Panel Equipment Total									**$77,756**
Task #6 - Instrumentation										
6.1	Instruments									$30,611
6.2	Submittal Labor									$735
6.3	Startup and Calibration Labor									$1,015
6.4	O&M Labor									$471
6.5	Storage									
6.6										
Task #6 - Totals										$32,832
	Instrument Labor Totals:									$2,220.92
	Instrumentation Equipment Totals:									$30,611
	Sales Tax (7.25%):									$2,380.31
	Instrument Total with Labor									**$35,212.13**
	Control Panel/Instrument/Hardware Total									**$117,798.38**
Task #7 -System Integration Project Management										
7.1	Client Meetings	4		4					8	$1,400
7.2	Contractor Construction Meetings	4		4					8	$1,400
7.3	Interdiscipline Coordination								0	$0
7.4	Clerical								0	$0
Task #7 - Totals		8	0	8	0	0		0	16	$2,800
Task #8 - System Integration										
8.1	PLC Programming			8	14				22	$3,270
8.2	HMI Database			20	20				40	$6,000
8.3	HMI Screen Development			28	28				56	$8,400
8.4	HMI Testing			12	12				24	$3,600
8.5	SCADA Client Hardware Setup								0	$0
8.6	Witness Testing			4	4				8	$1,200
Task #8 - Totals		0	0	72	78	0		0	150	$22,470
Task #9 - Startup and Commissioning										
9.1	Equipment Coordination			4	8				12	$1,780
9.2	Instrument Calibration Assistance			10	6				16	$2,420
9.3	Network Switches Setup								0	$0
9.4	Oversee Electrical Terminations						8		8	$1,000
9.5	Computer/Server/Client Install								0	$0
9.6	Functional Loop Testing			4	4				8	$1,200
9.7	Commissioning			4	4				8	$1,200
Task #9 - Totals		0	0	22	22	0	8	0	52	$7,600
Task #10 - Training										
10.1	SCADA O&M				8				8	$1,160
10.2	PLC Panel Training								0	$0
10.3	HMI System Training								0	$0
10.4	Documentation Training								0	$0
10.5	System Troubleshooting Training								0	$0
Task #10 - Totals		0	0	0	8	0	0	0	8	$1,160
	System Integration Labor Total	**8**	**0**	**102**	**108**	**0**	**8**	**0**	**226**	**$34,030**

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Spanish Fork Project 90% Cost Overview

	05 Gens	10 Headworks	20 BNR	30 & 35 MBR	50 UV	55 & 60 UW	70 SH	Totals
Control Panels/Hardware	$0	$270,489	$483,066	$42,000	$0	$243,002	$72,500	$1,111,057
Tax (7.25%)	$0	$19,610	$35,022	$3,045	$0	$17,618	$5,256	$80,552
Integration	$4,535	$106,100	$185,175	$106,540	$17,230	$35,930	$34,030	$489,540
Instrumentation	$3,451	$250,973	$264,530	$554,632	$12,443	$199,373	$30,611	$1,316,013
Tax (7.25%)	$397	$20,110	$20,618	$42,127	$997	$14,953	$2,380	$101,583
Instrumentation Labor	$2,030	$26,408	$19,859	$26,435	$1,305	$6,875	$2,221	$85,133
Loop Drawings	$1,595	$50,050	$73,800	$14,020	$1,720	$18,150	$6,880	$166,215
Sub Total	$12,009	$743,741	$1,082,070	$788,799	$33,695	$535,901	$153,878	$3,350,093
10% Contingency	$1,201	$74,374	$108,207	$78,880	$3,369	$53,590	$15,388	$335,009
Total	$13,209	$818,115	$1,190,277	$867,679	$37,064	$589,491	$169,266	$3,685,102

Project Grand Total **$3,685,102**

Deduct for Carbon Steel Flanges for Magmeters (instead of quoted stainless steel)	$0	$39,872	$19,936	$43,411	$0	$41,150	$828	$145,197

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Spanish Fork City Corporation
Spanish Fork and Mapleton WRF Project
August 2022

System Integration Scope of Work

Revision 1 (90%)

1. Introduction

Spanish Fork City Corporation will require System Integration Services for the Spanish Fork and Mapleton WRF Project. This document summarizes the scope of work associated with these services.

1.1.1. Clarifications

The following clarifications are listed:

- The Cisco network gear as spec'd currently have a 6 month lead time. Some of the PLC equipment currently has a 6 month to 1 year lead time, and several instruments have long lead times
- All wiring and communication terminations will be performed by the electrical contractor
- All control and communication cabling not internal to SKM supplied panels will be provided by the electrical contractor
- HVAC and controls and monitoring systems are by others

2. Project Goals

This Scope of Work has been developed to achieve the following goals:

- Design, submit for approval, perform factory testing and provide:
  - 10-LCP-1000 Headworks LCP PLC Control Panel
  - 30-MCP-1000 Plant MCP PLC Control Panel
  - 50-LCP-1000 UV LCP PLC Control Panel
  - 30-NET-1000 Control System Servers and Communication Cabinet (including server and network gear)
  - Thin Client workstations for headworks building, MBR support room control room, and UV Building
- Provide PLC programming for 10-LCP-1000, 30-MCP-1000, 50-LCP-1000

- Provide configuration and setup for network gear in 30-NET-1000, as well as provide network gear configuration for endpoint switches at 10-LCP-1000, 30-MCP-1000, and 50-LCP-1000
- Develop new HMI screens for the project, this includes integrating vendor PLCs into SCADA
- Provide SCADA software
- Provide all instrumentation (including startup and submittal work) not listed as vendor provided in the P&IDs (See Instrumentation List)
- Provide local control panels and alarms and beacons not listed as vendor provided in the P&IDs
- Participate in I/O and Loop Testing for each physical I/O point and each control loop (excluding vendor PLC loops)
- Participate in plant startup and commissioning activities
- Provide Loop Drawings
- Provide training for the control system at each of the substantial completion milestones

3. Scope of Services and Equipment

The Scope of Services has been divided into the following tasks (each task is further described below):

1. Task 1 – Control Panel Engineering Project Management
2. Task 2 – Control Panel Engineering
3. Task 3 – Control Panel O&M Manuals
4. Task 4 – Control Panel Training
5. Task 5 – Control Panel, Network, and Computer Hardware
6. Task 6 – Instrumentation
7. Task 7 – System Integration Project Management
8. Task 8 – System Integration
9. Task 9 – Startup and Commissioning
10. Task 10 – HMI/Software Training
11. Task 11 – Loop Drawings
12. Task 12 – Software

3.1. Task 1 – Control Panel Engineering Project Management

This task includes client and contractor meetings and coordination. The project management team will identify format and schedules for progress meetings, project deliverables, and quality control. This task includes coordinating team responsibilities, project communications, quality management procedures, budget tracking, project schedule, and accountability reporting.

3.2. Task 2 – Control Panel Engineering

This task includes control and network panel design. A complete Control Panel Engineering Submittal (CPES) will be submitted for review and approval prior to panel construction.

3.3.Task 3 – Control Panel O&M Manuals

The O&M shall include the as-built panel drawings and manuals for all hardware provided.

3.4.Task 4 – Control Panel Training

Utilizing the O&M documents provided in Task 3, provide training to the plant staff. The training shall be broken up into the following sessions as a minimum:

- Session No. 1 – SCADA System Documentation – This session shall go through the P&ID's, and PLC Drawings
- Session No. 2 – PLC System Hardware – This session shall go through the hardware associated with the PLC Panels and their functions. System Troubleshooting Training will also be part of this session and will include walking operators through typical control panel troubleshooting scenarios.

3.5 Task 5 – Control Panel, Network, and Computer Hardware

3.5.1 Subtask 5.1 – PLC Components

- Allen Bradley ControlLogix Hardware

	Processor 1756-L83E	Ethernet 1756-EN2T	Ethernet Rng 1756-EN2TR	16 DC DI 1756-IB16I	8 Iso AI 1756-IF8I	16 Relay DO 1756-OW16I	8 Iso AO 1756-OF8I	PS Red 1756-PB75R	PS 1756-PB75	17 Chass 1756-A17	36 pin term 1756-TBCH
10-LCP-1000	1	4	0	1	3	2	0	1	1	1	6
30-MCP-1000	1	7	0	5	6	3	2	2	1	2	16
50-LCP-1000	1	3	0	2	2	1	0	1	1	1	5
Spares	1	2	0	1	2	1	1	1	1	1	3
Totals	4	16	0	9	13	7	3	5	4	5	30

3.5.2 Subtask 5.2 – Network Hardware

- PLC Panels

	IE-3300-8T2S-E	IE-3300-8P2 SE	IEM-3300-14T-2S	MIPP/LD/2L3N	MIPP/cue4	GLC-SX-MM-RGD	Cameras
	8c/2s Switch	8c/2s POE Switch	14c/2s expansion	DIN24 Fiber Patch	4 copper patch	singlemode SFPs	Outdoor PTZ Cam
10-LCP-1000	2	1	2	1	8	8	2
30-MCP-1000	2	1	4	1	24	20	0
50-LCP-1000	2	0	2	1	6	8	0
Spares	1	1	1	1	4	5	1
Totals	**7**	**3**	**9**	**4**	**42**	**41**	**3**

- Network Rack

	Netshelter SX42U	SRFANROOF	DUMV30	Rack Fiber Patch	Rack Copper Patch	9000 Series Cisco	GLC-SX-MM-RGD	VPN	SWRV55	Cisco Aleronet	DVR	NAS	KVM
	Network Rack	Rack Fans	Rack PDUs	Fiber Patch	Copper Patch	Man Rack Switch	singlemode SFPs	vpn appliance	SMS Modem	WAP	Cam Vid Rec	net attach Stor	KVM/Console
30-NET-1000	1	1	2	1	1	2	16	1	2	2	1	1	1
Totals	**1**	**1**	**2**	**1**	**1**	**2**	**16**	**1**	**2**	**2**	**1**	**1**	**1**

3.5.3 Subtask 5.3 – Computer and Server Hardware

	Mini PC	Server	Printer	Tower PC	Workstation	24" Wide	65" TV
					Monitor	Wall Monitor	
Headworks Building	0	0	0	1	1	0	
MBR Building	1	3	1	1	2	1	
UV Building	0	0	0	1	1	0	
Totals	1	3	1	3	4	1	

3.5.4 Subtask 5.4 – PLC Panels/Backpans and Associated Components

This subtask includes the following:

- DC power supply equipment and redundancy diodes
- Surge protection devices, breakers, fused terminal blocks and fuses, terminal blocks and end stops, analog signal isolators, and control relays
- LSAs (lightning surge arrestors) as shown on P&IDs- electrical contractor to provide junction boxes
- 304 stainless steel NEMA 12 enclosures with key-locking handle, panel light fixtures and outlet receptacles, DIN rail, backpans, labels (engraved, adhesive, wire, and terminal blocks), control wire, and wire duct with covers
- Heat strip and thermostat driven ventilation fans and exhaust vents as required, panel interior high temperature alarm switch, and panel intrusion switch

3.5.5 Subtask 5.5 UPS Equipment

Appropriately sized tower-style UPSs (Eaton Ferrups, Vertiv Liebert APS, Schneider APC) will be provided:

	Tower UPS
Headworks Building	1
MBR Building	1
UV Building	1
Totals	3

3.5.6 Subtask 5.6 – Panel Construction

- Panels will be fabricated and made ready for factory acceptance testing in a UL508A panel shop

3.5.7 Subtask 5.7 – Estops/Hand Switches/ and Local Control Panels

- SKM to provide all field Estops, Hand Switches, Local Control Panels (including fill stations) that are not shown on the P&ID as vendor provided. See Appendix for detailed list.

3.5.8 Subtask 5.8 – Beacons and Horns

- SKM to provide all field Beacons and Horns that are not shown on the P&ID as vendor provided. See Appendix for detailed list.

3.5.9 Subtask 5.9 – Control Station Furniture and Consoles

- Provide desk and chair for SCADA workstation in the headworks building
- Provide custom console and office furniture for control room in the MBR building
- Provide desk and chair for SCADA workstation in the UV building

3.6 Task 6 – Instrumentation

- SKM to provide all instruments that are not shown on the P&ID as vendor provided. See Appendix for detailed list.

3.7 Task 7 – System Integration Project Management

This task includes client and contractor meetings and coordination. The project management team will identify format and schedules for progress meetings, project deliverables, and quality control. This task includes coordinating team responsibilities, project communications, quality management procedures, budget tracking, project schedule, and accountability reporting.

3.8 Task 8 – System Integration

3.8.1 Subtask 8.1 – PLC Programming

- Based upon the P&ID's, PLC panel drawings, loop descriptions, specifications and control philosophy, program 10-LCP-1000 (Plant Headworks PLC), 30-MCP-1000 (Plant BNR/MBR Support PLC), and 50-LCP-1000 (Plant UV PLC). Submit the programming to the engineer & district for review. Implement any modifications to the programming based upon the review.
- Participate and play a role in the factory acceptance testing of the new PLC panel as it is assembled by the panel shop. Demonstrate that the programming has been completed prior to the delivery of the panel to the site.
- Coordinate PLC communications and logic that will be required for vendor PLC's.

3.8.2,3,4 Subtasks 8.2,8.3,8.4 – HMI Programming

- Utilizing the P&ID's, loop descriptions, PLC programs, and controls philosophy as outlined in the engineer's specifications, program HMI database and visualization screens for the entire greenfield plant. Use programming standards.
- Test each database point and each screen for accuracy before implementation
- Build alarming, historical visualization and reports
- Participate in graphics meetings for vendor provided HMIs
- Cross check vendor provided operator interface panels with HMI, and ensure operators have all they need to securely control, and accurately monitor vendor supplied equipment

3.8.5 Subtask 3.5 SCADA Client Hardware setup

- Configuring SCADA Clients in Headworks, MBR Building, and UV Building

3.8.6 Subtask 3.6 – Witness Testing

- When the PLC panel has been fabricated and programmed, schedule witness testing and invite the Engineer and City to attend
- Simple problems that might be found should be corrected immediately. If there are more complex problems that require more time to correct, make these corrections and then provide notice to the City that the items have been corrected

3.9 Task 9 – Startup and Commissioning

Following a successful factory acceptance test, the PLC and network panels will be delivered to the Contractor for installation. Once installed, it will be necessary to perform I/O tests, loop tests and to startup and commission the Control System.

3.9.1 Subtask 9.1 – Equipment Coordination

- Provide assistance and support to the Contractor for the installation of the PLC panel

3.9.2 Subtask 9.2 – Panel and Instrumentation and Calibration Assistance

- Provide assistance to the Contractor with 4-20mA signals in and out of the PLC to verify that the instruments are properly calibrated (calibration/configuration by SKM if the instrument was provided by SKM)

3.9.3 Subtask 9.3 – Network Switches Setup

- Programming of the managed switches for the SCADA network
- Testing the SCADA network and verifying trunk and port settings, redundancy functionality and network security

3.9.4 Subtask 9.4 – Electrical Terminations

- Oversee/verify wire terminations in 10-PLC-1000 (Headworks Plant PLC), 30-MCP-1000 (MBR/BNR Plant PLC), and 50-LCP-1000 (UV Plant PLC). Actual terminations to be performed by electrical contractor.

3.9.5 Subtask 9.5 – SCADA Client Installation

Install 1 SCADA client in the headworks building, 2 SCADA clients in the MBR control room, and 1 SCADA client in the UV building

3.9.6 Subtask 9.6 – Functional Loop Testing

Based upon the PLC panel drawings, loop drawings and factory acceptance test, the Electrical Contractor will be responsible to install all field wiring and will be in charge of point-to-point testing, I/O testing and ultimately loop testing with the System Integrator's assistance. This subtask includes the following:

- Provide support to the Contractor for solving discrepancies that are found in the field that require modifications to the loop drawings. The Contractor shall markup the loop drawings and the System Integrator shall revise and re-issue the loop drawing on an as-needed basis.
- Following point-to-point tests and instrumentation commissioning/calibration, participate in I/O and Loop Testing. Provide I/O and Loop Testing forms to be signed off by the Contractor, Owner and System Integrator and witnessed by the CM team. Verify the proper display and control of each loop from the HMI.
- Following successful I/O and Loop Tests, submit the resulting forms as part of the O&M Manual.

3.9.7 Subtask 9.7 – Commissioning

Following successful I/O and Loop Testing, components of the Control System may be started up and commissioned as required. This subtask includes the following:

- SKM shall be on site for commissioning activities and shall coordinate with the Contractor the scheduling of the activities
- Following commissioning, SKM shall be available to provide support should issues arise

3.10 Task 10 Training

To appropriately conclude the work, provide an O&M manual for SCADA. This can be combined with the control panel and Instrumentation O&M if desired. The O&M shall include all programming files including screen shots, tag lists and logic.

- Utilizing the O&M documents, provide training to the plant staff. The training shall be broken up into the following sessions as a minimum:

- Session No. 1 – SCADA System Documentation – This session shall go through the P&ID's, PLC Drawings, Loop Drawings and Loop Descriptions
- Session No. 3 – HMI System Hardware and Software – This session shall go over the various hardware and software components of the HMI System.
- Session No. 4 – SCADA System Maintenance – This session shall discuss maintaining the SCADA System over time, as well as discuss system troubleshooting

3.11 Task 11 Software

- Inductive Automation Ignition SCADA (Perspective)- Primary and Backup
    - Includes web ready visualization- device (screen size responsive)
    - Reporting
    - Historization
    - Alarm notification
    - No SCADA clients or tag limits
- FactoryTalk View ME (if required)
- VPN software (first year subscription)
- Cloud Backup Software for Historian and SCADA Servers (one year)
- MySQL Software for SCADA History
- Camera Software for 2 Outdoor Cameras at Headworks
- NAS (network attached storage software)

3.12 Task 12 – Loop Drawings

- SKM to provide loop drawings for all instrumentation SKM provides, as well as loop drawings for hardwire and network IO points to 10-LCP-1000 (Headworks Plant PLC), 30-MCP-1000 (Plant MBR PLC), and 50-LCP-100 (Plant UV PLC). SKM will also provide loop drawings for vendor network connections to the plant network. Loop drawings will be verified and as-builts during the loop test process. Vendors will provide loop drawings the equipment they provide.

RFI #19

1. On sheet 05-E-601 it calls out 6" MV feeders as a single conduit "05-E-xx". On the duct bank schedule, it shows the conduits as 05-E-xxA conduit and a 05-E-xxB conduit. Are the "B" conduit to be considered to be a spare conduit or is this an error? *The MV conduits are single. The duct banks schedule will be updated in the 100% Design drawings and the "B" conduits removed.*
2. Are there any spare conduits needed on the primary side or the transformers? None are shown. *No.*
3. SHEET 05-E-602 shows that the 2 fiber lines are run between duct bank 7 and duct bank 1. They are not showing as being run in duct bank 1 to the existing switch at the road. Were these runs done in the previous contract or do they need to be installed now? *The two fiber conduits (05-S-01A and 05-S-01B) are empty conduits and to be connected to the two fiber conduits installed as part of the early work package. The city will install the fiber in these conduits from offsite to the network cabinet in the MBR support building.*
4. Sheet 05-E-602 Indicates that the fiber lines are terminated in the existing plant. Is there a drawing showing where in the existing plant they need to be terminated and how we are to route the duct bank across 200 east? *These fibers are to be installed by the city and not the contractor*
5. The Fiber Optics is called out in Spec. 40 95 10.2.8. The Spec or the drawings do not indicate the number of strands wanted. Please advise. *The design is based on 12 pair, so 24-count fiber. This will be clarified in the 100% design drawings.*

RFI #21

Are there any specs for the disconnects on this project? We need more information to make sure we get what is required for the project. *Please reference Section 26 05 15 - 2.1.F*

Are there any specs for the "Special Receptacles"? We need more information to be sure we cover what is required on this project. *Receptacles are covered in Section 26 05 36 except for those used as disconnect type which are covered in Section 26 05 15.*

Drawing 35-E-401 indicates a transformer (35-XFMR-04) in the electrical room of the MBR Support Building. This transformer is not shown anywhere else in the drawings, including the one-lines. What size transformer is this, where is it fed from, and what does it feed? *This note has been removed from the Design Drawing. Please reference the updated electrical drawings under separate RFI response.*

Drawings 20-I-606 through 608 indicate the the aeration blower VFDs as separate of the aeration blower skids, and drawing 20-E-603 indicate the VFDs as part of the aeration blower skids. Are the VFDs located on the skids? Are the VFDs vendor provided or contractor provided? *The VFDs for the aeration blowers are included with the blower pre-purchase package and are integral to the blower enclosures.*

What is the location of 30-MOV-2110? It is shown on the conduit development (30-E-602), but is not located anywhere else in the drawings. *This valve was removed from the Design Drawings. Please reference the updated drawings under separate RFI response.*

What is the amp rating of 38-SWGR-1A and 1B*? It is unclear where the referenced SWGR is found as there is no Area 38 in the design. The only switchgear as part of the design is in Area 50.*

Will the RVSS be integrated in the switchgear or are they stand alone? *All RVSS are included in the motor control centers, none are stand alone.*

Specification 26 05 33, 3.2 C states that analog control or instrumentation conduit shall be RGS. Does that apply to all installations including in process areas, chemical areas, hazardous locations, outdoor areas, and encased in concrete duct banks or slabs? *That is only applicable to conduits encased in concrete. This will be clarified in the 100% Design Documents.*

Do all underground raceways need to be concrete encased? *No, duct banks are not to be concrete encased.*

Do concrete encased duct banks need to be steel reinforced? *Duct banks are not to be concrete encased. For MV duct banks, refer to SFP&L details as indicated.*

What type of concrete mix shall be used for underground raceway encasement? *Duct banks are not to be concrete encased.*

Can underground raceways/ductbanks under a building slab be direct buried or do they need to be concrete encased? *Duct banks are not to be concrete encased.*

Drawing 35-E-605 indicates a fifth unit heater for the MBR Support Bldg (35-UH-05), but the panel schedule (35-E-611) and the mechanical schedules (35-M-601) do not show a fifth unit heater. Are there five unit heaters? If so, where is the fifth heater located? *Unit heaters to be per mechanical design, 5th heater to be removed from drawing. This will be clarified in the 100% Design Drawings.*

Part 4 states: no conduits to be encased in the "floor slabs" of water bearing structures.

Can the walls of the water bearing structures (BNR & MBR) have conduits encased in the concrete. Also, can the walkways of the basins have conduit encased in the concrete?
Conduit embedded withing any slab will follow the spec outlined in part 3.2 Part I. *Conduits shall not be embedded in the floors or walls of water bearing structures. Conduits can be embedded in the walkways of the basins.*

From the MBR Support Building there are (2) 2" conduits (05-S-01A & 05-S-01B) shown connecting to the existing plant fiber panel. There isn't any route shown on any of the Site Drawings indicating where this is. Could you please show where this is and provide a route on the site plan? *These conduits are routed in duct banks with the MV conduits from the MBR support building down to the south of the plant where they are to connect with the fiber conduits provided as part of the early work package.*

There aren't any details for the ductbanks included in the plan set. Could you provide a typical detail for ductbanks showing duct spacing, encasement, backfill and compaction, counterpoise, steel reinforcement requirements? *Duct banks with conduits for MV cables are to be provided per SFP&L detail E-604 as provided on *NEW* Sheet E-911. See revised drawings from subsequent RFI response. Other duct banks shall be provided with select backfill or sand and spacers as indicated on details and in specs. This will be clarified in the 100% Design Drawings.*

RFI #31

There appears to be a spec bust for BFV-1 butterfly valves. The spec calls for AWWA but the 3 manufacturers models specified are not AWWA compliant. Will AWWA valves be required for BFV-1? *Butterfly Valve Type 1 (BFV-1) shall satisfy the AWWA C504 standards as a minimum. We understand some butterfly valve manufacturers do not specifically state compliance with AWWA C504. However, if a valve manufacturer can provide documentation that they meet or exceed this standard, then the valve will be considered. Note that the Bray series valves (which are listed in the specification) are acceptable as documentation has already been provided to Engineer regarding their valves are designed and tested to meet or exceed the AWWA C504 standard.*

RFI #33

In regards to the blowers, is a LCP required? The blower spec mentions a blower LCP but the P&ID only shows switches and E-stop, no LCP. We can't provide gauges/switches and a LCP, it will have to be one or the other. *LCP is not required. See attached revised blower spec (43 11 33 REV A).*

Is WEG acceptable motor manufacturer? The blower spec calls out Siemens IEC motor but Section 26 05 10 Electric Motors call out WEG NEMA as an acceptable motor. I would recommend against going with an IEC motor since this is a European motor. *WEG motor is acceptable. See attached revised blower spec (43 11 33 REV A).*

RFI #34

On sheet 10-E-410 it indicates that there are 4 — E3 fixtures. Only 3 are shown What is the location of the 4t/ one? *There are only three (3) type E3 fixtures*.
On sheet 10-E-411 it indicates that there are 4 — X3 fixtures. Only 2 are shown What is the location of the other two? *There are only two (2) type X3 fixtures.*
On sheet 20-E-410 it indicates that there are 14 — P fixtures. 15 are shown. Are there 14 or 15? *This should be drawing 20-E-407 and there should be 15 fixtures.*
Please verify the grid line location and dimensions on the UV building. The storage and electrical rooms do not correspond with the structural drawings. *Noted. This will be corrected on 100% Design drawings.*
In the Headworks building the control panels labeled 10-ATC-01 Thru 04 seem to be the rooftop MAU unit control panels. Will these be supplied by the HVAC contractor? Is there any other conduits and wiring required by the electrical contractor other than those shown on the conduit development sheet 10-E-605 clarification #2. It only shows us powering the panel with 120v power. No conduits or conductors are shown between the panels and the MAU units. *These are the MAU control panels supplied by the HVAC contractor. The HVAC contractor is responsible for all cable and conduit for the HVAC system not shown on the electrical drawings.*

In clarification #2 it stated that the fiber optic cable would be installed by the owner and the 2-2" conduits are to be changed to conduit only. This would indicate that the 2 -2" conduits need to be installed under this contract. Can you give us the routing of the conduits from the new plant to the old plant. *The 2-2" conduits from the city's fiber system are being provided as part of the early work and stop near switch 05-PMSW-01. The contractor is to extend the conduits from near switch 05-PMSW-01 to 35-FPP-1 via duct banks DB-07, DB-06 and DB-15 as indicated. There is no work related to the fiber optic system at the existing plant. This will be clarified on the 100% Design drawings.*

Sheet 70-E-101 shows TKR-MCC in the wrong location. It is in the south east corner of the dewatering building running east and west parallel with the south wall. Noted. This will be corrected on 100% Design drawings.

On the blowers we are installing as part of the solids handling contract, we added a 1" conduit with 3 #8 conductors to power the cooling fans on top of the blowers. Will this conduit be necessary for blower #3? The drawings show 6 - #12 wires form the MCP to the blower are these to supply power for the 6 Individual fans on the roof of the blower? Can you supply a diagram on how the fans need to be wired. *The design as included in the Contract Documents is 12#12 for each blower from the MCP, with the fans split into a group of three on each 20A breaker. This same approach is anticipated for blower #3.*

Device FIT 2107 exists in two locations, one on each drawing. Please confirm which location is correct. *FIT-2107 should not show on 30-E-103. This will be corrected in the 100% Design documents.*

Please provide locations for the following devices: 30-SOV-XXXX

1103, 1104, 1203, 1204, 1303, 1304, 1403, 1404, 1503, 1504, 1603, 1604 *SOV-1103 and POV-1104 are located halfway between 30-DS-1101 and the stairs up to the influent channel with the valves for the other basins located similarly. This will be corrected on 100% Design drawings.*

"Please provide locations for the following devices:

FIT/FE 3105, 3205

AIT/AE 3001, 3002, 3003

With Bid Clarification #2 and updated drawings, these devices either got renamed or removed. Please advise. " *Tags were changed but not clouded with the Rev A changes since there was no cost impact. The analyzers and flow meters are all shown on 30-E-102.*

The following devices are not found on conduit development:

AIT/AE 3105, 3106, 3107

FIT/FE 3107, 3207

Are these mislabeled with the devices listed on 35-E-603? With Bid Clarification #2 and updated drawings these devices are on DWG's but not on conduit development schedule. Please advise. *Tags were changed but not clouded with the Rev A changes since there was no cost impact. The analyzers and flow meters are all shown on 30-E-102.*

Key Note 20 stipulates to install 100% spare conduits in ductbanks 24, 24B, 24D, 26. Wouldn't we need the spare conduits also in DB-23? DB-23 runs from MH-3 into the building to the source and PLC, this would all have to be ran exposed in the future costing far more than it would underslab now. *The spare conduits are for the future BNR/MBR basins which will be located to the east of the current basins. Those conduits will extend to the new MBR support building in the future.*

RFI #35

Just need clarifications that all miscellaneous steel for the roof structure will be galvanized: Specifically, perimeter support angle, bridging, HVAC and opening support steel, wide angle beams for roof support, and crane rail support beams. Currently I am assuming all support steel will be galvanized and not requiring painting and crane support beams, with the exemption of the membrane basin structure, will be factory primed and field coated.

The design approach is for all miscellaneous steel for the roof structure to be hot dipped galvanized.

RFI #36

On the 10K water tank, it looks in the drawings to be above ground however the spec calls it out to be underground. I don't see burial depts. Of the actual tank or the extension heights, whether to include anchoring for the high water table, fill connections or vertical drop pipes. I need more details to be able to quote properly. Do you have or can you reference the drawing that show the tank configuration details?

The design approach is a buried tank. The design invert elevation is 4521.17-ft, the design fill-point connection elevation is 4528.00-ft, and the design top of tank elevation is 4529.67-ft. Section 43 40 11.2.2.A requires anchor straps. The language in the spec will be updated noting bury depths, and requirements to design to mitigate buoyancy with anchor straps. A profile view will be added to the 100% Design package showing finished grade, fill connection and bury depths.

SECTION 43 11 33
POSITIVE DISPLACEMENT BLOWERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section covers the work necessary to furnish and install positive displacement blowers, motors, and related equipment.

1. Process Reaeration Blowers: 60-BLW-1100 and 60-BLW-1200

1.2 RELATED SECTIONS

A. Section 01 22 00 – Measurement and Payment

B. Section 01 33 00 – Submittal Procedures

C. Section 01 40 00 – Quality Requirements

D. Section 01 75 16 – Starting Procedures

E. Section 01 78 23 – Operation and Maintenance Data

F. Division 3 – Concrete

G. Section 09 96 00 – Protective Coatings

H. Division 26 – Electrical

I. Section 46 51 29 – Diffusers, Fine Bubble

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 01 33 00, Submittal Procedures. The following information shall be provided:

1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements and are suitable for the use intended. Motors specified for variable speed operation through a variable frequency controller shall be capable of operating at low reduced speed for extended periods of time without overheating and can operate without excessive vibrations or harmonies at any speed.

2. Manufacturer's catalog data and shop drawings confirming dimensions, weight, construction, and installation details of blower and all associated equipment.

3. Performance data curves showing the following:

   a. Pressure, capacity, horsepower demand, and compressor efficiency over the entire operating range of blower and all associated equipment; and

   b. Indicating separately the pressure, capacity, horsepower demand, and overall efficiency at the guarantee point.

4. Operating noise levels shall be provided for the blower and for the motor operating together. Noise shall be expressed as sound pressure level in decibels as read on the "A" weighting network of a standard sound level meter (dBA); all measurements shall be made in relation to a reference pressure of 0.0002 microbar.

5. Detailed structural, mechanical, and electrical drawings showing equipment dimensions, sizes, locations of connections and weights.

6. Factory finish system.

7. Provide written copies of manufacturer's warranties on products described in this specification section.

8. Provide Equipment Operation and Maintenance Manuals to the Owner per Section 01 78 23.

9. Submit a copy of this specification section, with addendum updates included, with each paragraph clearly marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. If deviations from the specifications are indicated and therefore requested by the Contractor, the submittal shall be accompanied by a detailed, written justification for each deviation. Failure to include a copy of the marked-up specification sections, along with justification for any requested deviations to the specification requirements, with the submittal shall be cause for rejection of the entire submittal with no further consideration. The Owner retains the right to reject any proposed deviations in favor of this specification, as written.

1.4 QUALITY ASSURANCE

A. Like items of equipment specified herein shall be the end products of one manufacturer in order to achieve standardization of appearance, performance, operation, maintenance, spare parts, and manufacturer's service.

B. The Manufacturer must be regularly engaged in the design and manufacture of similar equipment for a minimum of ten years.

1.5 WARRANTY

A. The Blower installed in the Package shall be warranted to be free from defects in materials and defects in workmanship for a period of five years from the date the Manufacturer's Representative certifies the installation.

B. All other Packaged Blower components shall be warranted to be free of defects in material and defects in workmanship for a period of one year from the date the Manufacturer's Representative certifies the installation.

1.6 MANUFACTURER'S SERVICES

A. The contractor shall provide a manufacturer's representative for the equipment specified herein for the person-days listed for the services hereunder, travel time excluded:

1. ½ person-day for functional testing, certification of the installation with written documentation, and plant startup.
2. ½ person-day for training.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturers: Provide positive displacement blowers with integrated control panel meeting the requirements of this specification from one of the following manufacturers. Manufacturers meeting the requirements of this specification but not listed here may be considered in accordance with the Contract Documents and the Instructions to Bidders.

1. Aerzen USA, Coatesville, Pennsylvania.
2. Or approved equal.

2.2 GENERAL

A. The rotary positive displacement blowers provided in this section shall be furnished as a completely assembled, skid-mounted package, including, but not limited to, the blower, motor, ~~on-board microprocessor-based control panel and integrated variable frequency drive (VFD),~~ V-belt drive, baseplate, inlet air filter/silencer, inlet and discharge silencer, relief valve, flexible connectors, and miscellaneous spare parts and appurtenances. All components are to be mounted, piped, and wired requiring only a single point electrical connection for power and single point piping connections for inlet and discharge air.

2.3 SERVICE CONDITIONS

A. Elevation. 4,534 feet above mean sea level.

B. Ambient Temperature. -20°F to 104°F.

1. A temperature of 104°F shall be used to determine blower and motor requirements.

C. Humidity. 15 percent to 70 percent.

1. A humidity of 50 percent shall be used to determine blower and motor requirements.

2.4 PERFORMANCE REQUIREMENTS

A. Reaeration process blowers (60-BLW-1100 and 60-BLW-1200) shall be designed for the following operating conditions:

Quantity of blowers	2 (duty, standby)
Motor Rated Power (maximum, per blower)	20 hp
Maximum Free Field Noise Pressure @ 3 Ft	70 dB(A)
Design Inlet Temperature	100 °F
Site Elevation	4534 ft
Design Relative Humidity	80%
Design Point	
Minimum air flow (per blower)	50 scfm
Average air flow (per blower)	75 scfm
Maximum air flow (per blower)	300 scfm
Discharge pressure	6.34 psig

B. Final scfm and hp requirements for the blowers to be coordinated with diffuser supplier.

C. ~~Each blower shall be equipped with an on-board control panel.~~ Controls and Instrumentation shall be in accordance with the P&IDs and Div. 40 specifications.

~~C.~~D. A variable frequency drive (VFD) ~~shall~~ will be ~~installed by the Manufacturer outside of the blower package~~furnished and installed by the CM/GC ~~in the adjacent electrical room so the air capacity can be adjusted to meet the demands of the process via analog input signal from the supervisory control and data acquisition (SCADA) system.~~and networked to the plant SCADA system.

~~D.~~E. Factory calculated free field sound pressure levels for each blower and motor combination shall be measured in accordance with American National Standards Institute (ANSI) S51, latest edition.

~~E.~~F. Each blower shall meet the rated performance and sound level when operating at a maximum gear tip speed of 4,500 feet per minute.

~~F.~~G. Blower casing and components shall be designed and tested to supply up to a 13.0 pounds per square inch gauge (psig)pressure rise.

~~G.~~H. Blower shall be designed to deliver air free of contaminating lubricants and shall be compatible with the fine bubble membrane (EPDM) type diffused air systems.

~~H.~~I. Blower shall be selected so as not to exceed 85 perccent of its maximum speed rating.

2.5 EQUIPMENT DESCRIPTION

A. General

1. Blowers shall be rotary lobe, dynamically and statically balanced, tri-lobe design with an equalization chamber integral to the blower housing. With the combination of three lobes and the “equalization” chamber the pulsations are greatly reduced by the principle of wave interference resulting in a 20 to 35 dB attenuation of the fundamental frequency.
2. Blowers and appurtenances shall be supplied by a blower manufacturer with a Quality Control System certified in accordance with ISO 9001. Units shall be furnished as a complete system.

B. Housing

1. Close grained, high strength cast iron construction with DIN inlet and outlet connections. An adapter can be provided for transition from DIN to National Pipe Thread (NPT) or ANSI flange as required.
2. Adequately ribbed to prevent distortion.
3. Provided with a built-in "equalization" chamber.
4. Drive end head-plate is integral to the casing.

C. Rotors

1. Stiff-shaft design with the first lateral critical speed shall be at least 120 percent of the maximum allowable speed.
2. Any torsional natural frequency shall be at least 10 percent above or 10 percent below the operating speed range of the blower.
3. The rotor and shaft assembly shall be a one-piece design constructed of ductile iron.
4. Rotors shall be solid or have closed ends.
5. Rotors shall have an integral sealing strip for improved efficiency.

D. Timing Gears

1. Spur type, AGMA Grade 12 equivalent quality with minimum service factor of 1.7 at the maximum operating point.
2. Gears shall be secured by an interference fit on ground tapered shaft ends.

E. Bearings

1. Type: Cylindrical Roller Bearings.
2. L-10 Life of at least 80,000 hours under constant maximum load.
3. Bearings and gears shall be splash lubricated.

F. Seals at Rotor Chamber

1. Non-rubbing, vented labyrinth seals each containing four (4) hardened steel piston rings, oil deflector, and grooved, multiple labyrinth bushing. There are a total of sixteen (16) piston ring seals.

2. Any lip seal inside the machine is not acceptable.

G. Blower Package: The packaged blowers are to be standard engineered designs of a CE certified manufacturer regularly engaged in the production of packaged blowers to ensure single source accountability and shall include the following listed standard features:

1. The packages shall be driven through V-belts and sheaves. The drive assembly shall be of the high capacity type, oil, and heat resistant, with a minimum service factor of 1.5.

2. Automatic tensioning of the V-belts by use of a pivoting, swing frame motor base with adjustable spring assistance and visual indication of V-belt tension shall be provided to ensure the V-belts remain properly tensioned with minimal maintenance and to extend V-belt, sheave, and bearing life. Adjustment of the tensioning device shall be accomplished without removal of the guard or loosening of the motor mounting bolts.

3. The drive guard shall be the manufacturer's standard sheet metal with provision for ventilation. The installed guard shall be fully enclosed, easily removable, and designed to meet current Occupational Safety and Health Administration (OSHA) recommendations and CE standards.

4. The base shall be an elevated, rigid, fabricated steel design with a solid sub-base. The absorptive type discharge silencer shall be integral to the frame in order to minimize space requirements. The blower shall be mounted horizontally for a compact frame.

5. To prevent transmission of vibration and noise, as well as secure the package to the foundation, the base shall include vibration isolators made of rubber in a steel footing equipped with mounting holes for anchoring purposes.

6. Oil drains from the blower drive-end and gear-end lubricating oil sumps shall be piped to the front of the base for ease of maintenance. The drain valves shall be a ball valve with a fully retained and gasketed threaded cap.

7. The inlet filter shall be integral to the inlet silencer and shall include a washable and reusable polyester element for minimal pressure drop.

8. The inlet air filter/silencer shall be of the absorptive type with tube connection for a piped inlet and shall draw air from outside the building. The inlet air filter shall be capable of supplying air to the blower at its maximum rated capacity with a clean pressure drop no greater than three inches water column.

9. The discharge silencer shall be of the absorptive type with an integral pulsation dampener and directly connected to the outlet port of the blower. The discharge silencer shall be mounted horizontally and shall be integral to the

base frame. Pressure loss through the silencer at the discharge flow rate shall be less than six inches water column.

10. The relief valve shall be spring loaded, and factory installed in a location to protect the blower from excessive differential pressures. The relief valve exhaust shall be piped out of the enclosure. The safety relief valve shall be field adjustable and initially set at 8.4 psig.

11. An elastomeric compensator/flex connector shall be provided for connection of the packaged blower to the system piping to reduce transmission of structure borne noise as well as prevent unacceptable loading of the silencer connection and blower casing. The flexible connector shall be rated for 350°F operating temperature.

12. A sound enclosure shall be provided. The sound enclosure shall be sheet steel construction with powder coat finish. It shall have acoustic foam insulation and shall provide sound attenuation of up to 20 dB(A). The enclosure shall have a hinged panel on top and a removable panel on the front of the package to allow maintenance access. Panels shall incorporate locking closures. An installed, integral ventilation fan, sized to provide adequate cooling of the package, shall be provided.

~~13. An instrument panel shall monitor inlet pressure, inlet temperature, discharge temperature, discharge pressure, filter differential, enclosure temperature, emergency stop, and motor overloads (motors and fans).~~

~~14.~~13. The blower package shall be designed to allow all preventive maintenance to be performed from the front of the package. All utility connections and process connections shall be at the rear of the package.

~~15.~~14. The blower package shall be capable of being installed directly adjacent to another blower packages of similar design and shall be capable of mounting next to the wall without maintenance interference.

H. Discharge Piping

1. Pipe insulation shall be installed, for each unit, for all discharge piping inside the building, from blower connection to building outlet.

2.6 MOTORS

A. General

1. Refer to Division 26 for the basic requirements that apply to the motors supplied under this section.

B. Motor Type

1. Blower motors shall be WEG manufactured ~~Siemens~~ TEFC, 230/460 ~~volt~~VAC, ~~460 volt~~, 3-phase, 60-hertz, meeting or exceeding Energy Independence and Security Act (EISA) 2007 standards for motor efficiency.

2. ~~Motors shall be compact International Electrotechnical Commission (IEC) frame with a top conduit box.~~ All frame sizes shall be NEMA standard, suitable for

overhung belt drive and with the conduit box location on top of the motor. IEC frame motors shall not be allowed.

~~2.~~

3. 1.15 Service Factor.

4. Supplied, mounted and aligned by the blower package supplier.

5. The motor nameplate horsepower rating shall not be exceeded at any point on the operating curve.

6. Duty cycle continuous.

7. Inverter duty, compatible with variable frequency drive service.

2.7 ACCESSORIES

A. Equipment Identification Plate. A 16-gauge, stainless steel identification plate shall be securely mounted on the equipment in a readily visible location. The plate shall bear, in ¼-inch die-stamped lettering, the equipment identification name and number indicated in this specification.

B. Lifting Lugs. Equipment weighing over 100 pounds.

C. Anchor Bolts. ASTM A193, Type 316 stainless steel, sized by equipment manufacturer, ½-inch diameter minimum. Anchor bolts shall be supplied by Contractor.

D. Other Accessories

1. Check valve–Technocheck Model 5050 with viton elastomers, or equal suitable to 350°F air service

2. Inlet Filter/Silencer for outdoor air intakes:

   a. Connection: Flanged, 125/150# ANSI. Size as shown on Drawings

   b. Element: Stainless Steel

   c. Pressure Drop: <0.2 psig at maximum rated flow

   d. Finish: Epoxy or Baked-On Enamel Coating for Outdoor Use

   e. Operating Temperature: -20°F to 105°F

   f. Manufacturer: Endustra P09

2.8 BLOWER ~~PACKAGE CONTROL PANEL~~INSTRUMENTATION AND CONTROLS

A. It is intended that each blower package will include all of the instrumentation, safeties, and controls necessary to protect the Blower and the operators.

B. ~~Each Blower Package shall include an integrated controller to process and transmit signals to/from the blower unit instrumentation and to/from the plant SCADA system. The controller shall include an OIT with an integrated keypad and display~~.

C. The Blower ~~Package Control Panel~~ shall include an Emergency Stop button and ~~a digital~~ analog readouts of the monitored pressures and temperatures.

~~C.~~D. Provide integral terminal block for ease of connection for plant SCADA monitoring/control instrumentation as indicated on the P&IDs.

~~D. The Blower Package Control Panel shall permit local start/stop of the individual Packaged Blower as well as remote start/stop.~~

~~Each Blower Package shall include speed monitoring to provide feedback to the integrated controller/SCADA system regarding system flow.~~

~~F. The Packaged Blower Control shall include, as a minimum, the following listed functions:~~

~~1. Maintenance Interval Alarm~~

~~2. Filter Differential Alarm~~

~~3. Inlet Temperature Alarm~~

~~4. Emergency Stop Shutdown~~

~~5. Frequency Control Fault Shutdown~~

~~6. Blower Discharge Pressure Shutdown~~

~~7. Blower Pressure Rise Shutdown~~

~~8. Blower Discharge Temperature Shutdown~~

~~9. Blower Temperature Rise Shutdown~~

~~10. Loss of Analog Input Shutdown~~

~~11. Enclosure Air Temperature Shutdown~~

2.9 SPARE PARTS AND SPECIAL TOOLS

A. The following spare parts shall be furnished for each unit:

Item	Quantity
Oil	Sufficient for first two oil changes
V-belts	1 set
Inlet Filter Elements	1 set

B. The Manufacturer shall furnish one (1) set of special tools required for maintenance.

2.10 FINISHING

A. Provide blower units with the manufacturer's standard factory finish.

PART 3 EXECUTION

3.1 INSTALLATION

A. In accordance with manufacturer's written instructions.

B. Align, adjust, and lubricate in accordance with the manufacturer's instructions and leave in proper working condition.

3.2 FIELD QUALITY CONTROL

A. Functional Tests

1. Alignment. Prior to facility startup, test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.

B. Performance Test

1. Conduct on each unit to verify operating range satisfies the specifications.

END OF SECTION

SECTION 43 30 62
STAINLESS STEEL SLIDE GATES AND WEIR GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section covers stainless steel slide gates, stop gates, weir gates and operators as shown on the plans, listed in the gate schedules and as specified herein.

B. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer.

C. Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified, or otherwise required for a complete, properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of fabricated gates.

1.2 REFERENCES

A. ASTM International (ASTM) A-276 – Stainless steel bars and shapes

B. American Water Works Association (AWWA) C561 - latest edition

C. ASTM D-2000 – Rubber products in automotive applications

~~C.~~D. ASTM D4020 – Standard Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials

1.3 DEFINITIONS

A. A weir gate is a downward opening slide gate with flow over the top.

1.4 DESIGN REQUIREMENTS

A. Gate configuration, components and accessories shall be of the size and type shown on the drawings and gate schedule and specified herein.

B. Gates shall be designed for continuous immersion in raw wastewater.

C. Except as modified or supplemented herein, all gates and operators shall conform to the applicable requirements of AWWA-C561 standards.

D. Leakage: Gates shall be substantially watertight under the design head conditions. Under the design seating head, the leakage shall not exceed 0.05 US gallons per minute per foot of seating perimeter. Under the design unseating head, leakage shall not exceed 0.05 US gallons per minute per foot of perimeter.

1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 00 and Divisions 43, 46 with the following additional information:

1. Fabrication drawings with full dimensions, construction and installation details, and materials used on all parts of the gate, operator, lift, and appurtenances. General arrangement drawings and cut sheets are not considered acceptable drawings.

2. Plan, cross section, and details showing proposed mounting for each size and typical application of gate.

3. Applicable operation and maintenance information as specified in Section 01 78 23.

4. Complete engineering design calculations in compliance with AWWA standards, latest edition.

1.6 WARRANTY

A. Equipment supplied under this section shall be warranted to be free from defects in workmanship, design and materials for a period of one (1) year from the date of Substantial Completion. If any part of the equipment should prove to be defective during the warranty period, the Manufacturer shall replace the part at no expense to the Owner.

1.7 QUALITY ASSURANCE

A. The gate manufacturer shall have a minimum of five (5) years of experience producing equipment substantially similar to that required and shall be able to submit documentation of at least fifteen (15) independent installations using the same size or larger equipment as detailed below. Each installation must have been in satisfactory operation for at least five (5) years.

B. The contract documents represent the minimum acceptable standards for the equipment. All equipment shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. The entire unit shall be Manufacturer's standard product, but shall be modified, redesigned, furnished with special features or accessories, made of materials or provided with finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the specification.

C. Fabrication shall be done in compliance with all applicable ASTM standards or equivalent international standards.

D. The manufacturer's shop welds, welding procedures, and welders shall be qualified and certified in accordance with the requirement of the latest edition of American Welding Society (AWS) Sections D1.1, 1.2, and 1.6.

E. The Contractor or Subcontractor responsible for the installation of the gates shall have five or more years of experience in the installation of similar type gates.

F. All fully assembled gates shall be shop inspected, tested for operation and leakage, and adjusted before shipping. There shall be no assembling or adjusting on the job sites other than for the lifting mechanism.

1.8 DESIGN REQUIREMENTS

A. Gate configuration, components, and accessories shall be of the size and type shown on the Drawings and gate schedule and specified herein.

B. Gate, frame, and yoke design shall be such that the flexural stress does not exceed 10,000 pounds per square inch (psi) or that the minimum safety factor is 5-to-1 based on the ultimate strength of the material used.

C. Gate shall be designed for continuous immersion in raw wastewater. Fluid temperature is expected to range from 35°F to 90°F.

D. Except as modified or supplemented herein, gate and operators shall conform to the applicable requirements of AWWA-C561 standards.

E. Leakage: Gate shall be substantially watertight under the design head conditions. Under the design seating and unseating heads, the leakage shall not exceed 0.05 US gallons per minute per foot of seating perimeter.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. In order to ensure uniform quality, ease of maintenance and minimal parts storage, all gates supplied under this section shall be supplied by a single manufacturer unless noted otherwise.

1. Golden Harvest, Inc.
2. Whipps
3. RW Gate Company
4. Waterman
5. Rodney Hunt
6. Approved Equal

2.2 MATERIALS AND CONSTRUCTION

A. General Design

1. Gates shall be either self-contained or non self-containted of the rising stem or non-rising configuration as indicated on the gate schedule.

2. All parts of the gate shall have a minimum thickness of ¼-inch.

B. Frame

1. Gate frame shall conform to the safety factors specified in AWWA C561.

2. Gate frame shall be designed for embedding, in-channel or face mounting as showing on the drawings or gate schedule.

~~1.~~

~~2.~~3. The gate frame shall be stainless steel and designed for maximum rigidity.

~~3.~~4. The frame configuration shall be of the flush-bottom type and shall allow the replacement of the top and side seals without removing the gate frame from the wall.

~~4.~~5. Lifting Lugs shall be provided on frame styles.

C. Slide

1. Gate slide shall conform to the safety factors specified in AWWA C561 but shall, in no case, be less than ¼-inch thick. The slide shall consist of a stainless-steel plate that is reinforced with stiffeners. The stem connector clips or stem block pocket shall be welded to the slide. Horizontal reinforcement members welded to side vertical members. The slide shall consist of stainless-steel plate reinforced to limit its deflection. The limits of deflection shall be:

   a. Slide Gate: L/720 of the gate's span under the design head or 1/16 inch, whichever is less.

   b. Weir Gate: L/720 of the gate's span under the design head or 1/16 inch, whichever is less.

D. Guides and Seals

1. The guides shall be provided with ultra-high molecular weight polyethylene seats on both sides of the slide and shall be of such length as to retain and support at least two thirds (2/3) of the vertical height of the slide in the fully open position.

2. Guide frame shall not weigh less than 13 pounds per foot.

~~3. Seals shall be frame mounted. Seals shall be J-bulb type with a stainless-steel retainer bar. All seals shall be mechanical and fully adjustable in the field.~~

~~4.~~3. Slide gate shall incorporate a flush-bottom seal that is attached to the bottom frame invert member. The seal shall be of the materials listed in “Materials of Construction” and shall meet the material test requirements specified in AWWA C561.

   a. The design of the seal shall be such as to provide resistance against leakage, as specified in AWWA C561.

~~5.~~4. Top and side seals shall be self-adjusting ultra-high-molecular-weight polyethylene (UHMWPE) with compression cord and securely fastened to the

frame with formed stainless-steel retainers and shall be replaceable and adjustable in the field without disassembly of the frame and removing the gate from the installed position. The corners of the seals shall be vulcanized. Bottom seal only to be elastomeric material.

a. When required for shutoff purposes, a neoprene top seal shall be mounted to the top member.

E. Yoke and Pedestal

1. The yoke, to support the operating bench stand, shall be formed by two structural members welded at the top of the guides to provide a one-piece rigid frame.

2. Self-contained gates shall be provided with a yoke to support the operating bench stand. The yoke shall be formed by two structural members welded at the top of the guides to provide a one-piece rigid frame. The maximum deflection of the yoke shall be L/360 of the gate's span.

2.3 LIFTING ASSEMBLIES

A. Stem and Couplings

1. The operating stem shall be of stainless steel designed to transmit in compression at least two times the rated output of the operating manual mechanism with a 40 pound effort on the crank. The operating stem shall be rising and shall be designed to withstand both tension and compression loads. For manual actuators the tension and compression design loads shall be those caused by the application of an 80-lb effort on the crank or handwheel or a 100- pound-foot torque on a wrench nut. The tension design load shall not exceed one-fifth of the ultimate tensile strength of the stem material. The compression design load shall be less than the critical buckling load as determined by AWWA C561.

2. Threads: Stems shall have rolled or machine cut American Standard general purpose full depth dual lead Acme type threads with a maximum roughness of 16 micro-inches. ~~Stem to be a minimum 3-inch diameter.~~ The stem shall be supported by angle guides or cast iron stem guides with a two piece cast bronze guide collar, spaced to provide an L/R ratio of 200 or less. ~~Contractor shall specify thread pitch and stem diameter so it is compatible with the existing actuator.~~

3. Where a hydraulic, pneumatic or electric operator is used, the stem design force shall not be less than 1.25 times the output thrust of the hydraulic or pneumatic cylinder with a pressure equal to the maximum working pressure of the supply, or 1.25 times the output thrust of the electric motor in the stalled condition.

4. Coupling: Stem lengths requiring more than one piece shall be joined together by stainless steel or bronze solid couplings. The couplings shall be threaded and keyed, threaded and bolted, or bolted only when one of the pieces is made of tubing and shall be of greater strength than the stem.

5. Gates having a width equal to or greater than two times their height shall be provided with two lifting mechanisms connected by a tandem shaft. The connection shaft shall be provided with a cover for safety.

6. Rising-stem gates with manual actuators shall be provided with a stop collar to be field adjusted according to the manufacturer's instructions at the time of gate installation to prevent over-closing the gate.

B. Stem Guides

1. Stem guides shall be fabricated from stainless steel. Stem guides shall be equipped with a UHMWPE bushing. Guides shall be adjustable and spaced in accordance with the manufacturer's recommendation. The L/R ratio shall not be greater than 200.

2. Stem guide brackets shall be provided as required to meet the stem design requirements specified in this section and may be mounted on the gate guides or yoke or may be wall mounted. Wall-mounted guides shall provide lateral adjustment between the wall and the guide bracket and between the guide bracket and the guide for field alignment. Guides which are mounted on the gate assembly shall be designed and fabricated to ensure proper alignment. Stem guide assemblies and their anchor bolts shall be designed to maintain the alignment under operating loads. Stem guides shall be equipped with a UHMWPE bushing with maximum diametral clearance of 1/8-inch.

C. Stem Cover

1. Rising stem gates shall be provided with a clear polycarbonate stem cover. The stem cover shall have a cap and condensation vents and a clear Mylar position indicating tape. The tape shall be field applied to the stem cover after the gate has been installed and positioned.

2.4 LIFTING MECHANISM

A. Operators of the types listed in the schedule shall be provided by the gate manufacturer.

B. Electric actuators are specified in Division 26.

C. Each manual operator shall be designed to operate the gate under the maximum specified seating and unseating heads by using a maximum effort of 40 pounds on the crank, and shall be able to withstand, without damage, an effort of 80 pounds.

D. Gearboxes shall be provided when required to maintain the operating force below 40 pounds. All bearings and gears shall be totally enclosed in a weather tight housing. Operator housing shall be cast steel or cast iron. The pinion shaft of crank-operated mechanisms shall be supported by roller bearings. The operating shaft shall be fitted with a 2-inch square operating nut and removable crank. The crank shall be fitted with a corrosion-resistant rotating handle. The maximum crank radius shall be 15 inches and the maximum handwheel diameter shall be 24 inches.

2.5 ACCESSIBILITY

A. Crank or handwheel shall be located 36 inches to 42 inches above the walking surface. When required provide enclosed chain and sprocket drive to lower the actuator.

B. When crank is not accessible from the walkway provide horizontal extension and supports.

C. Grease zerks that are not easily accessible shall be extend to an easily accessible location.

2.6 MATERIALS

Part	Material
Slide, Spigot, Frame, Stiffeners, Yoke, Guide angles	Stainless Steel, AISI 316L
Side and Top seals	~~Neoprene or~~ Ultra High Molecular Weight Polyethylene (UHMWPE) ~~(UHMW) Polymer~~, ASTM D2000, Grade 1BE625
Invert seal	~~Neoprene or~~ Ultra High Molecular Weight Polyethylene (UHMWPE) ~~) Polymer~~, ASTM D2000, Grade 1BE625
Bearing bars, Guides, Stem guide liner	Ultra-High Molecular Weight Polyethylene (UHMWPE) ASTM D4020
Bottom seal	Ultra High Molecular Weight Polyethylene (UHMWPE), ASTM D2000, Grade 1BE625~~Neoprene ASTM D-2000~~
Threaded stem, Stem guides, tandem shafts, extension shafts	Stainless Steel, AISI 316L
Seal retainer	Stainless Steel, AISI 316L
Fasteners	Stainless Steel, ASTM F593/F594, Alloy Group 1
Pedestal/wall bracket	Stainless Steel, AISI 316L or Cast Iron ASTM A126, Class B or Mild Steel, ASTM A36/A36M
Stem cover	Polycarbonate ASTM A-707
Lift and stop nut	Manganese Bronze ASTM B584, UNS-C86500

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify the gates and all appurtenances meet the requirements of these Specifications.

3.2 INSTALLATION

A. The Contractor shall employ qualified competent personnel for the installation and testing.

B. Unless otherwise specified, gates shall be installed in accordance with manufacturer's instructions and AWWA C561.

C. Place concrete so that no voids occur around the frames or thimble, if present.

D. Securely anchor all materials embedded in concrete. Anchor bolts shall be carefully placed in templates for proper gate alignment. Use epoxied anchor where risk of spalling exists.

E. Verify that each guide is securely installed, and the gate operates smoothly. After gates have been properly installed, adjusted, and properly lubricated, each slide shall be operated for one complete cycle, open-close-open or close-open-close. Check for proper alignment and for indications of binding throughout a complete cycle. Gates showing excessive leakage shall be removed, remedied, and reinstalled until the excess leakage is no longer present.

F. Adjust and lubricate gate after installation.

G. After installation, perform a field leakage test to verify that the gate performs within the allowable leakage requirements of these Specifications.

H. Touch-up factory coatings damaged during shipping and construction.

3.3 FIELD SERVICE

A. One trip, one day: Inspection training and leakage testing.

END OF SECTION