

**WATER TREATMENT PLANT IMPROVEMENTS**  
**City of Wahpeton, Iowa**

**CONTRACTOR'S BID DATE:** Thursday, June 19, 2025, at 10:00 AM CT

**FILE BIDS:** Online bid submission  
[www.questcdn.com](http://www.questcdn.com)  
Quest Number: 9674659

**ADDENDUM NO. 1**

June 5, 2025

**TO ALL PLANHOLDERS:**

The following changes, clarifications, additions, and/or deletions are hereby made a part of the contract documents for the above-referenced project, as fully and completely as if the same were fully set forth therein. This addendum takes precedence over any items that may conflict.

**GENERAL QUESTIONS**

1. Pre-bid meeting was conducted on-site June 3, 2025. Meeting minutes from this meeting are attached.
2. Project funding does not require compliance with Build America, Buy America act (BABA). Multiple bidders or suppliers have asked if BABA applies.
3. Davis Bacon Wage Rates: Wage Determinations are attached to this addendum. Multiple construction types apply, the wage determinations attached include Building, Heavy and Highway, and Heavy Sewer/Water Treating Plant. Davis Bacon compliance during construction includes posting the wage decision and employee rights poster, submitting weekly payrolls, and contractor's staff participating in at least two wage interviews. The U.S. Department of Labor provides a sample form for payrolls:  
<https://www.dol.gov/agencies/whd/government-contracts/construction/payroll-certification>

**SPECIFICATIONS**

4. Refer to Agreement, Article 3. Liquidated Damages.  
Liquidated Damages shall be \$1,800 per day.
5. Refer to Section 01 5000 – Temporary Facilities and Controls

Replace paragraph 1.13.C with the following:

“C. Provide at a minimum, 6-ft desk space and office chair in the field office for use by the Engineer and Owner. Make contractor's utilities and facilities available to the Engineer and Owner in the field office. Provide including internet service, heat, and air conditioning in the field office. ”

6. Refer to Section 04 2000 – Unit Masonry

Add the following to paragraph 2.1.A:

“3. County Materials block.”

Add the following to paragraph 2.1.B:

“3. Endicott Clay Products.”

7. Refer to Section 22 0523.05 Butterfly Valves

Add the following to paragraph 2.01.D.  
“or Nickel Aluminum Bronze.”

8. Refer to Section 22 0523.60 Valve and Gate Operators

Replace paragraph 2.01.C.3.b with the following:  
“b. Motors shall be 120 volt, 60 cycle, single phase for open/closed and modulating service, as shown in the valve schedule or on the drawings.”

9. Refer to Section 22 0610.01 Valve Schedule

Replace with attached. This clarifies open/close service vs. modulating service for electric actuators.

10. Refer to Section 23 3300 – Air Duct Accessories – Control Dampers

Add the following to paragraph 2.04.A:  
“8. Tamco”  
“9. United Enertech”

11. Refer to Section 23 3423 – HVAC Power Ventilators

Add the following to paragraph 2.01:  
“H. FlowAire”  
“I. Jenco”

12. Refer to Section 23 3700 – Air Outlets and Inlets

Add the following to paragraph 2.04.A.:  
“7. United Enertech”

13. Refer to Section 23 5533 – Fuel Fired Unit Heaters

Add the following to paragraph 2.02.A.:  
“8. Advanced Radiant Systems”

14. Refer to Section 23 8101 – Terminal Heat Transfer Units

Add the following to paragraph 2.01.A.:  
“12. Redd-I”

15. Refer to Section 23 8126.13 – Small-Capacity Split-System Air Conditioners

Add the following to paragraph 2.01.A.:  
“I. Samsung”

16. Refer to Section 23 8216 – Air Coils

Add the following to paragraph 2.01.A.:  
“7. Neptronic”

17. Refer to Section 25 1300 Instrumentation and Control Integration

Add the following paragraph to 1.01:

“C. Additional remote instruments are included in equipment packages and this section is intended to supplement and be in addition to those instruments. Manufacturer control panels shall be connected to and integrated with the overall plant control system. For instance, section Ozone System 46 3153 includes instruments and control panels that must be connected via communication to the water treatment plant control system. “

18. Refer to Section 25 3100 – Remote Instruments

Replace section 25 3100 Remote Instruments with the attached specification.

19. Refer to Section 26 3213 Engine Generators

Add the following to paragraph 2.01.B:

“3. MTU. “

20. Refer to Section 43 1123 Rotary Positive Displacement Aeration Blower:

Add the following to paragraph 2.01 Manufacturers:

“F. Universal Blower Pac”

Add the following to the end of paragraph 2.02.F:

“Helical gears are also acceptable.”

Add the following to the end of paragraph 2.03.D.3:

“Shaft driven cooling fan is also acceptable.”

Replace paragraph 2.06.A with the following:

“A. Blower shall be factory tested per ISO 1217 Annex B performance test to verify flow, Bhp, and slip at design conditions as well as blower maximum conditions. The acceptance criteria are +5% tolerance on power and -5% tolerance on flow. “

Replace paragraph 3.03.A with the following:

“A. Quantity: 1”

21. Refer to Section 44 4256.01 – Vertical Turbine Pumps

Add the following to paragraph 2.01 Manufacturers:

“G. Flowserve”

Add the following to paragraph 2.02 General

“H. Pump shall include NSF certification.”

Add the following to paragraph 2.09 Impeller:

“C. Impeller shall be 316 stainless steel.”

Replace paragraph 3.02.A.2 with the following:

“2. Maximum Shut-off head (feet). 240 ft.”

Replace paragraph 3.02.A.8 with the following:

“8. Motor Horsepower (hp) 40 hp maximum.”

22. Refer to Section 44 4256.02 – Submersible Well Pumps

Add the following to paragraph 2.01.A Manufacturers:

“4. Flowserve”

23. Refer to Section 44 4256.03 – Horizontal Split Case Centrifugal Pumps

Add the following to paragraph 2.01 Manufacturers:

“D. Flowserve

E. Grundfos/Paco”

Add the following to paragraph 2.02 General

“G. Pump shall include NSF certification. “

Replace the following paragraphs in Paragraph 2.03.B.

“2. Casing Wearing Ring: 416 stainless steel.”

“3. Impeller: Nickel Aluminum Bronze”

“4. Impeller Wearing Ring: 416 stainless steel.”

“6. Shaft: Stainless steel”

“10. Mechanical Seal: Durametallic “Type RO” or John Crane “Type 21”.”

24. Refer to Section 44 4436.03 – Horizontal Paddle Wheel Flocculators

This is to match the intent of the plan notes that indicate “Flocculator equipment to be provided by common plate settler/flocculator supplier.” :

Add the following to paragraph 1.08.C:

“3. Jim Meyers & Sons, Inc.

4. Monroe Environmental Corp.”

25. Refer to Section 46 3153.04 Ozone System

Replace section 46 3153.04 Ozone System with the attached specification.

26. Refer to Section 46 6123.02 – Gravity Filtration System

Replace paragraph 2.09.B.1 with the following:

“There shall be two (2) fiberglass or stainless steel backwash troughs per filter, eight (8) total for the project, each of dimensions as shown on the plans.

Replace paragraph 2.09.B.2 with the following:

“Adjustable straight edge weir plates, if required, shall be of fiberglass or stainless steel.

Add paragraph 2.09.B.4:

“Each backwash trough shall be provided with media separator baffles to prevent loss of media during combined air and water backwash. Baffles shall be attached to the troughs using stainless steel bolts and supports. The baffle system shall be fiberglass or stainless steel. The baffle system shall include air relief piping for air release during air scour.”

## **PLANS**

27. Refer to sheet C100

Replace sheet C100 in its entirety with the attached sheet with Addendum 1 reference.

28. Refer to Sheet A402

Stair Tread Note in Detail 6/A402: Revise stair tread note to the following:  
"SEE STRUCTURAL SHEET S512 FOR STAIR DETAILS."

29. Refer to Sheet P403

Replace keynote #4 with the following:  
"4" HDPE CONDUIT FOR CHEMICAL FEED LINE. INSTALL (1) CHEMICAL FEED LINE FOR CHLORINE FEED AND (1) SPARE CHEMICAL FEED LINE."

Replace pipe fitting schedule Note #2 with the following:  
"4" HDPE CONDUIT FOR CHEMICAL FEED LINES"

30. Refer to Sheet PD100

Add the following General Note #6:  
"OUTAGES / CUT-OVERS MUST BE DONE AT LOW FLOW TIMES OCTOBER - APRIL. THE WATER TREATMENT PLANT CAN BE OFFLINE FOR 8-HOURS AT A TIME DURING OUTAGES. WATER TREATMENT PLANT CANNOT BE OFFLINE DURING HIGH FLOW SUMMER MONTHS MAY THROUGH SEPTEMBER. IF A LONGER OUTAGE IS REQUIRED, THE CONTRACTOR SHALL COORDINATE WITH WATER TREATMENT PLANT STAFF TO PURCHASE WATER FROM THE CITY OF MILFORD. CONTRACTOR SHALL BE RESPONSIBLE FOR COST OF WATER PURCHASED FROM THE CITY OF MILFORD."

31. Refer to Sheet P501, Detail 2

Replace detail title with the following:  
"SLIDE GATE SELF-CONTAINED, STAINLESS STEEL"

32. Refer to Sheet E100

Add the following to Keynote 11:  
"INSTALL CONDUIT VIA TRENCHLESS BORE."

33. Refer to Sheet EP101

Replace sheet EP101 in its entirety with the attached sheet with Addendum 1 reference.

34. Refer to Sheet E600

Revise Panel DP with the following:  
Circuit #1 - High Service Pump #1, P-8400: 41,400 VA, 90A Trip  
Circuit #2 - High Service Pump #2, P-8500: 41,400 VA, 90A Trip



35. Refer to Sheet E601

Revise circuit numbers P203A, P203B, P203C, P204A, P204B, P204C with the following:  
Conductors: (3)- #4, (1) #6 GND, (2)-#14

36. Refer to Sheet E602

Revise Disconnect Schedule with the following:  
DS-8400: 40 HP  
DS-8500: 40 HP

All bidders shall acknowledge receipt and acceptance of ADDENDUM NO. 1 in the bidding process.

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.	
		Date: 6/5/2025
	<hr/>	
	MARK A. HARDIE, P.E.	
	License No. 14057	
	My renewal date is <b>December 31, 2026</b>	
	Pages or sheets covered by this seal:	
	<u>Entire Document</u>	
	<hr/>	

# Pre-Bid Meeting Minutes

Meeting notes in red text

June 3, 2025– 2:00 p.m.

## Water Treatment Plant Improvements City of Wahpeton, Iowa

### I. BID INFORMATION

A. BID DATE: Thursday, June 19, 2025 - 10:00 a.m.

PLACE TO FILE BIDS: Online bid submission  
www.questcdn.com  
Quest Number: 9674659

### II. PROJECT TEAM - OWNER

Owner: City of Wahpeton, Iowa

HR GREEN, INC

Project Manager: Mark Hardie

Project Engineer: Sam Cotter  
[scotter@hrgreen.com](mailto:scotter@hrgreen.com)  
(605) 221-2659

### III. PROJECT OVERVIEW

#### A. Description

1. The project consists of improvements to the water treatment plant, including construction of additional buildings and process equipment. The new treatment plant building includes two new flocculation / sedimentation tanks, ozone contact basin, ozone generation equipment, filters and supporting laboratory space. Work includes masonry and concrete structures, pipe process equipment, electrical, instrumentation, controls, and mechanical systems. The work includes replacement of the existing high service pumps and construction of a building over the high service pumps. The work includes replacement of the existing raw water pumps. The existing filtration equipment will be removed with this project. A backwash supply pump and piping will be constructed in the existing building. Site improvements include underground utilities, grading, and access road to support the improvements.

- B. Review of bid documents and bidding procedures -
  - 1. Bidding through Quest CDN
  - 2. Section 450 – Questionnaire (Equipment suppliers)
  - 3. Lump Sum bid
  - 4. City building permits and inspections are required, but the permit fees will be waived.
- C. Project Completion
  - 1. Substantial completion date is **April 30, 2027**. Final completion date is **June 30, 2027**.
- D. SRF Bidding Discussion –
  - 1. MBE/DBE subcontractor solicitation.
  - 2. Comply with all SRF requirements:
    - a. Davis Bacon wage rates
    - b. American Iron & Steel. No BABA requirements.
- E. Coordination with Existing WTP Facility:
  - 1. Keep existing facility in operation during construction.
  - 2. Coordinate outages with WTP operators.
- F. Addenda –addendum 1 is to be issued soon. Incorporates substitution requests and clarifications, as well as responses to questions received at this pre-bid meeting.
- G. Staging/storage: Contractor storage and staging may be placed at west end of site.
- H. Site utilities. Discuss availability of site utilities for Contractor's use:
  - 1. Electrical service -- Alliant Energy
  - 2. Gas utility is Black Hills Energy
- I. Permits – City building permit required, but the permit fees will be exempted.
- J. Discussion of Plans
  - 1. Existing utilities on-site: Existing gravity sewer lines, raw water, finished water, gas, electric.
  - 2. Construction Staking – Contractor responsible for detailed construction staking.
  - 3. Testing – Construction testing – City Contract (to be completed by CTS).
  - 4. Construction Staging: Refer to sheet PD100
    - a. Owner has first rights to salvage items.
    - b. Remove filters 1, 2, and 3 first. Removal is necessary for electrical improvements in existing WTP building.
    - c. Removal of filters 4, 5, and 6 to occur after start up of new WTP building.



#### IV. QUESTIONS AND ANSWERS

- Question regarding Builders Risk Insurance:
  - Refer to Specification C-700 Standard General Conditions: Section 6.04 Builders Risk and Other Property Insurance. Excerpt below, refer to specification for full text.
  - *“Builder’s Risk: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder’s risk insurance upon the Work on a completed value basis, in the amount of the Work’s full insurable replacement cost ...”*
- Question regarding working hours:
  - Specification C-800 Supplementary Conditions Article 7 discusses working hours and holidays.
  - Working days are Monday through Friday, 7:00 am to 5:00 pm.
- Question regarding the Field Office:
  - Specification 01 5000 Temporary Facilities and Controls discusses requirements for the field office.
  - The field office should have, at a minimum, a desk space for use by the Engineer and Owner.
- Clearing in temporary easement
  - Clarification after meeting: For site clearing: refer to keynotes on sheet C100.
  - Keynote 8: *Limit tree removal to only trees needed for construction access in temporary construction easement. Coordinate with City staff and adjacent property owner.*
  - Protect existing oak tree on Water Treatment Plant property at Manhattan Blvd.
- Question regarding Treatment Plant Outages:
  - Outages / cut-overs must be done at low flow times October - April. The Water Treatment Plant can be offline for 8-hours at a time during outages. Water Treatment Plant cannot be offline during high flow summer months May through September. If a longer outage is required, the contractor shall coordinate with Water Treatment Plant staff to purchase water from the City of Milford. Contractor shall be responsible for cost of water purchased from the City of Milford.

#### V. SITE TOUR

PRE-BID MEETING ATTENDANCE SIGN-IN SHEET  
WATER TREATMENT PLANT IMPROVEMENTS  
WAHPETON, IOWA  
June 3, 2025 - 2:00 p.m.

Name (Please Print)	Representing	Phone #	E-Mail Address
Sam Cotter	HR GREEN	605-650-2134	scotter@hgreen.com
Scott Nath	John T Jones Const	701- <del>888</del> <sup>232</sup> -3358	estimating@jtconst.com
Will Widmer	"	"	"
Scott Stephenson	JTM Insulation	515-729-8187	scotts@jtminsulation.com
Bob Rude	Holstein Elec	712-368-2212	holsteinelectric.com
Jason Behrendson	Christian Construction	712-261-1007	JBaaccpender.biz
Chris Gilson	Christiansen Construction	402-385-3020	chris@cccpender.biz
Joel Doeden	CWSuter	712-389-1704	jdoeden@cwsuter.com
Randy Schachar	Mueske Electric	712-260-4112	r.schacker@hotmail.com
Mark Bisenius	MUESKE ELECTRIC	712-730-3737	mbisenius@mueskeelectric.com
Wyatt Reisz	RP Constructors	712-644-6610	wyatt@rpconstructors.com
Adam Batschelt	RP	712-260-6519	adam@rpconstructors.com
Kevin Larsen	WCC	712-299-0136	kevin@wccdruff.biz
Michael Feste	Journey	847-305-9463	mfeste@mbowce.com
Ben Loukwood	Christiansen Construction	712-225-8431	bl@ccpender.biz

"General Decision Number: IA20250003 01/03/2025

Superseded General Decision Number: IA20240003

State: Iowa

Construction Type: Heavy Sewer/Water Treating Plant

Counties: Iowa Statewide.

EXCEPT SCOTT COUNTY

SEWER AND WATER TREATMENT PLANTS ONLY

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none"> <li>. Executive Order 14026 generally applies to the contract.</li> <li>. The contractor must pay all covered workers at least \$17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.</li> </ul>
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none"> <li>. Executive Order 13658 generally applies to the contract.</li> <li>. The contractor must pay all covered workers at least \$13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.</li> </ul>

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number      Publication Date  
0                              01/03/2025

SUIA2002-004 12/01/2014

	Rates	Fringes
Carpenters (ALL OF THE STATE OF IOWA, except the named cities and counties listed below:)	\$ 27.26	13.68
Carpenters (BURLINGTON AND KEOKUK)	\$ 29.53	17.49
Carpenters (CLINTON COUNTY, City of Clinton)	\$ 29.53	17.49
Carpenters (CLINTON, DUBUQUE, JOHNSON, LOUISA, MUSCATINE, DES MOINES, CEDAR and LEE COUNTIES, Except any of the previously named cities)	\$ 25.45	15.49
Carpenters (COUNCIL BLUFFS)	\$ 33.33	13.68
Carpenters (DUBUQUE COUNTY (City of Dubuque))	\$ 29.53	17.49
Carpenters (FORT MADISON)	\$ 29.53	17.49
Carpenters (IOWA CITY)	\$ 29.53	17.49
Carpenters (LINN COUNTY)	\$ 33.58	17.49
Carpenters (MUSCATINE COUNTY, City of Muscatine)	\$ 27.97	18.50
Carpenters (POLK COUNTY)	\$ 37.53	13.54
Carpenters (SIOUX CITY)	\$ 33.33	13.68
Carpenters (WATERLOO/CEDAR FALLS)	\$ 29.53	17.49
Cement mason (ALL OF THE STATE OF IOWA, except for the named cities and counties listed below:)	\$ 27.40	11.05
Cement mason (BURLINGTON AND KEOKUK)	\$ 36.89	11.05
Cement mason (CLINTON COUNTY, City of Clinton)	\$ 36.89	11.05
Cement mason (CLINTON, DUBUQUE, JOHNSON, LOUISA, MUSCATINE, DES MOINES, CEDAR and LEE COUNTIES, Except any of the previously named cities)	\$ 31.53	11.05
Cement mason (COUNCIL BLUFFS)	\$ 33.55	11.05
Cement mason (DUBUQUE COUNTY (City of Dubuque))	\$ 36.98	11.05

Cement mason (FORT MADISON).....\$ 35.45	11.05
Cement mason (IOWA CITY).....\$ 36.89	11.05
Cement mason (LINN COUNTY).....\$ 36.89	11.05
Cement mason (MUSCATINE COUNTY).....\$ 36.89	11.05
Cement mason (POLK COUNTY).....\$ 36.89	11.05
Cement mason (SIOUX CITY).....\$ 34.17	11.05
Cement mason (WATERLOO/CEDAR FALLS).....\$ 31.68	11.05
IRONWORKER (ALL OF THE STATE OF IOWA, except for the named cities or counties listed below:.....\$ 23.75	16.37
IRONWORKER (BURLINGTON AND KEOKUK).....\$ 28.58	16.37
IRONWORKER (CLINTON COUNTY, City of Clinton).....\$ 35.04	16.37
IRONWORKER (CLINTON, DUBUQUE, JOHNSON, LOUISA, MUSCATINE, DES MOINES, CEDAR and LEE COUNTIES, Except any of the previously named cities).....\$ 23.75	16.37
IRONWORKER (COUNCIL BLUFFS).....\$ 24.15	16.37
IRONWORKER (DUBUQUE COUNTY (City of Dubuque)).....\$ 27.53	16.37
IRONWORKER (FORT MADISON).....\$ 28.58	16.37
IRONWORKER (IOWA CITY).....\$ 27.53	16.37
IRONWORKER (LINN COUNTY).....\$ 27.53	16.37
IRONWORKER (MUSCATINE COUNTY)....\$ 35.04	16.37
IRONWORKER (POLK COUNTY).....\$ 27.37	16.37
IRONWORKER (SIOUX CITY).....\$ 18.57	16.37
IRONWORKER (WATERLOO/CEDAR FALLS).....\$ 27.53	16.37
LABORERS (ALL OF THE STATE OF IOWA, except for the named cities and counties listed below:.....\$ 25.14	9.38
LABORERS (BURLINGTON AND KEOKUK).....\$ 30.11	9.38
LABORERS (CLINTON COUNTY, City of Clinton).....\$ 29.52	9.38

LABORERS (CLINTON, DUQUETTE, JOHNSON, LOUISA, MUSCATINE, DES MOINES, CEDAR and LEE COUNTIES, Except any of the previously named cities).....	\$ 26.89	9.38
LABORERS (COUNCIL BLUFFS).....	\$ 26.89	9.38
LABORERS (DUBUQUE COUNTY (City of Dubuque)).....	\$ 26.89	9.38
LABORERS (FORT MADISON).....	\$ 30.11	9.38
LABORERS (IOWA CITY).....	\$ 28.35	9.38
LABORERS (LINN COUNTY).....	\$ 30.87	9.38
LABORERS (MUSCATINE COUNTY (City of Muscatine)).....	\$ 30.35	9.38
LABORERS (POLK COUNTY).....	\$ 30.77	9.38
LABORERS (SIOUX CITY).....	\$ 26.89	9.38
LABORERS (WATERLOO/CEDAR FALLS).....	\$ 26.89	9.38
OPERATOR: Power Equipment (POLK, WARREN, DALLAS, STORY & JASPER COUNTIES)		
SEWER		
Class A.....	\$ 36.00	14.55
Class B.....	\$ 34.30	14.55
Class C.....	\$ 31.91	14.55
WATER		
Class A.....	\$ 35.73	14.55
Class B.....	\$ 34.03	14.55
Class C.....	\$ 31.65	14.55
Power Equipment Operator (ALL OF THE STATE OF IOWA, except for the named cities and counties listed below:)		
Class A.....	\$ 35.73	14.55
Class B.....	\$ 34.03	14.55
Class C.....	\$ 31.65	14.55
Power Equipment Operator (BURLINGTON AND KEOKUK)		
Class A.....	\$ 34.50	31.85
Class B.....	\$ 31.85	31.85
Power Equipment Operator (CLINTON COUNTY, City of Clinton)		
Class A.....	\$ 34.50	31.85
Class B.....	\$ 31.85	31.85
Power Equipment Operator (CLINTON, LOUISA, MUSCATINE, DES MOINES, CEDAR and LEE COUNTIES, Except any of the previously named cities)		
Class A.....	\$ 34.50	31.85
Class B.....	\$ 31.85	31.85



Power Equipment Operator  
(COUNCIL BLUFFS)

SEWER

Class A.....	\$ 36.00	14.55
Class B.....	\$ 34.30	14.55
Class C.....	\$ 31.91	14.55

WATER

Class A.....	\$ 35.73	14.55
Class B.....	\$ 34.03	14.55
Class C.....	\$ 31.65	14.55

Power Equipment Operator  
(DUBUQUE COUNTY (Including  
City of Dubuque) and JOHNSON  
COUNTY)

SEWER

Class A.....	\$ 36.00	14.55
Class B.....	\$ 34.30	14.55
Class C.....	\$ 31.91	14.55

WATER

Class A.....	\$ 35.73	14.55
Class B.....	\$ 34.03	14.55
Class C.....	\$ 31.65	14.55

Power Equipment Operator  
(FORT MADISON)

Class A.....	\$ 34.50	31.85
Class B.....	\$ 31.85	31.85

Power Equipment Operator  
(IOWA CITY)

SEWER

Class A.....	\$ 36.00	14.55
Class B.....	\$ 34.30	14.55
Class C.....	\$ 31.91	14.55

WATER

Class A.....	\$ 35.73	14.55
Class B.....	\$ 34.03	14.55
Class C.....	\$ 31.65	14.55

Power Equipment Operator  
(LINN COUNTY)

SEWER

Class A.....	\$ 36.00	14.55
Class B.....	\$ 34.30	14.55
Class C.....	\$ 31.91	14.55

WATER

Class A.....	\$ 35.73	14.55
Class B.....	\$ 34.03	14.55
Class C.....	\$ 31.91	14.55

Power Equipment Operator  
(MUSCATINE COUNTY)

Class A.....	\$ 34.50	31.85
Class B.....	\$ 31.85	31.85

Power Equipment Operator  
(SIOUX CITY)

SEWER

Class A.....	\$ 36.00	14.55
Class B.....	\$ 34.30	14.55
Class C.....	\$ 31.91	14.55

WATER

Class A.....	\$ 35.73	14.55
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Class B.....	\$ 34.03	14.55
Class C.....	\$ 31.91	14.55
Power Equipment Operator (WATERLOO/CEDAR FALLS)		
SEWER		
Class A.....	\$ 36.00	14.55
Class B.....	\$ 34.30	14.55
Class C.....	\$ 31.91	14.55
WATER		
Class A.....	\$ 35.73	14.55
Class B.....	\$ 34.03	14.55
Class C.....	\$ 31.91	14.55
Truck drivers (ALL OF THE STATE OF IOWA, except for the named cities and counties listed below:)		
.....	\$ 21.66	10.50
Truck drivers (BURLINGTON AND KEOKUK)		
.....	\$ 24.59	10.50
Truck drivers (CLINTON COUNTY, City of Clinton)		
.....	\$ 25.03	10.50
Truck drivers (CLINTON, DUBUQUE, JOHNSON, LOUISA, MUSCATINE, DES MOINES, CEDAR and LEE COUNTIES, Except any of the previously named cities)		
.....	\$ 22.76	10.50
Truck drivers (COUNCIL BLUFFS)		
.....	\$ 25.68	10.50
Truck drivers (DUBUQUE COUNTY (City of Dubuque))		
.....	\$ 24.06	10.50
Truck drivers (FORT MADISON)		
.....	\$ 24.59	10.50
Truck drivers (IOWA CITY)		
.....	\$ 26.34	10.50
Truck drivers (LINN COUNTY)		
.....	\$ 27.10	10.50
Truck drivers (MUSCATINE COUNTY)		
.....	\$ 24.59	10.50
Truck drivers (POLK COUNTY)		
.....	\$ 25.68	10.50
Truck drivers (SIOUX CITY)		
.....	\$ 23.28	10.50
Truck drivers (WATERLOO/CEDAR FALLS)		
.....	\$ 24.21	10.50

## POWER EQUIPMENT OPERATOR CLASSIFICATIONS

CLASS A: Asphalt laydown machine, Asphalt Plant Operator, Asphalt heater-planer unit, Backhoe, Bulldozer, Central Mix Plant, Concrete Pump, Crawler Tractor Pulling Scraper, Dredge Engineer, Dredge Leverman, Front-end Loader (over 2 yds), Group Equipment Greaser (unsupervised), Horizontal boring machine, Master Mechanic, Milling Machine, Motor Patrol, Portland Concrete Paver, Power Shovel, Crane & Dragline, Pushcat, Scraper (10 yards & over or finish), Self-propelled Elevation Grader or Similar Machine, Sideboom Tractor, Subgrader (or equivalent), Tow Push Boat



or Work Boat, Trenching Machine (Cleveland 80 or similar capacity).

CLASS B: Asphalt Distributor, Asphalt Finish Roller, Asphalt Screed, Belt Loader or Similar Machine, Bullfloat, Churn or Rotary Drill, Concrete Widening Machine, Concrete Curbing Machine, Conveyor, Crawler Tractor - Pulling ripper, Disc, Sheepsfoot or Roller, Deckhand/Oiler, Finishing Machine (on concrete), Flex-plane, forklift, Form Grader, Front-end Loader (under 2 yards), Group greaser (supervised), Haiss loader or similar, Mechanic-welder, Offroad articulated hauler, Paving breaker pumps (over 3"), Screening & wash plant, Skid loader, Spreader Operator, Self-propell Roller (other than asphalt), Self-propelled vibrating compactor, shoulder machine, Trenching Machine (other than above), Water wagon on compaction.

CLASS C: Asphalt Roller (other than finish), Boiler, Boom & Winch Truck, Compressor, Concrete Spreader, Belt Placer, Farm Type or Utility Tractor with attachments (under 50 hp), Group Greaser Light plant, Mechanical Broom, Mechanical Heater, Oiler, Pile Hammer Power Unit, Pump (Other than Dredge), Pumps (3" and under), Pumps on well points & deep wells for dewatering, Safety Boat, Truck Crane combination Driver Oiler, Welding Machine.

FOOTNOTE:

IRONWORKERS: (Setting of all structural steel and reinforcing steel installation)

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

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The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

#### Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

#### Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

#### Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the

discretion to update such rates under 29 CFR 1.6(c)(1).

#### State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

#### ----- WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

- a) a survey underlying a wage determination
- b) an existing published wage determination
- c) an initial WHD letter setting forth a position on a wage determination matter
- d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to [davisbaconinfo@dol.gov](mailto:davisbaconinfo@dol.gov) or by mail to:

Branch of Wage Surveys  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to [BCWD-Office@dol.gov](mailto:BCWD-Office@dol.gov) or by mail to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to [dba.reconsideration@dol.gov](mailto:dba.reconsideration@dol.gov) or by mail to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210.

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END OF GENERAL DECISION"

"General Decision Number: IA20250042 03/14/2025

Superseded General Decision Number: IA20240042

State: Iowa

Construction Type: Building

County: Dickinson County in Iowa.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none"> <li>. Executive Order 14026 generally applies to the contract.</li> <li>. The contractor must pay all covered workers at least \$17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.</li> </ul>
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none"> <li>. Executive Order 13658 generally applies to the contract.</li> <li>. The contractor must pay all covered workers at least \$13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.</li> </ul>

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/03/2025
1	01/31/2025

2 02/07/2025  
3 03/14/2025

BOIL0083-009 01/01/2025

	Rates	Fringes
BOILERMAKER.....	\$ 48.48	33.91

BRIA0003-007 05/01/2024

	Rates	Fringes
BRICKLAYER.....	\$ 28.36	16.73

\* ELEV0033-002 01/01/2025

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 56.30	38.435+a+b

#### FOOTNOTES:

A. Employer contributes 8% of regular basic hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for employees with less than 5 years of service.

B. PAID HOLIDAYS: New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day; Day after Thanksgiving; & Christmas Day.

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ENGI0234-020 05/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR Class 1 Forklift (On steel erection and machinery moving).....	\$ 32.05	17.28
Class 2 Forklift (Other than the above).....	\$ 31.50	17.28

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IRON0089-001 05/01/2024

	Rates	Fringes
IRONWORKER (Structural).....	\$ 33.41	23.88

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IRON0577-001 06/01/2024

	Rates	Fringes
IRONWORKER (Ornamental).....	\$ 34.05	25.30

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LAB00620-008 05/01/2023

	Rates	Fringes
LABORER (Mason Tender - Brick)...	\$ 20.40	16.20

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PLUM0033-010 06/01/2024

	Rates	Fringes
PLUMBER.....	\$ 43.20	23.25
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PLUM0033-011 06/01/2024		
	Rates	Fringes
PIPEFITTER (Includes HVAC Pipe Installation).....	\$ 43.20	23.25
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SFIA0669-002 01/01/2025		
	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers).....	\$ 43.04	26.06
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SHEE0045-004 07/01/2024		
	Rates	Fringes
SHEET METAL WORKER (Includes HVAC Duct and Unit Installation).....	\$ 33.82	21.58
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* SUIA2016-015 07/19/2016		
	Rates	Fringes
CARPENTER.....	\$ 17.93	4.10
CEMENT MASON/CONCRETE FINISHER...	\$ 13.00 **	0.00
DRYWALL FINISHER/TAPER.....	\$ 17.50 **	3.39
DRYWALL HANGER.....	\$ 16.59 **	2.86
ELECTRICIAN.....	\$ 22.02	6.36
INSULATOR: Mechanical (Duct, Pipe and Mechanical System Insulation).....	\$ 16.35 **	2.88
IRONWORKER, REINFORCING.....	\$ 24.43	16.24
LABORER: Common or General.....	\$ 12.50 **	3.76
LABORER: Pipelayer.....	\$ 18.00	2.70
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 26.64	14.47
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 25.14	18.26
OPERATOR: Bulldozer.....	\$ 22.31	8.36
OPERATOR: Crane.....	\$ 21.51	6.41
OPERATOR: Loader.....	\$ 25.36	15.62
PAINTER (Brush and Roller).....	\$ 19.31	4.96

ROOFER.....\$ 15.53 \*\* 4.57

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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\*\* Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$17.75) or 13658 (\$13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

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#### WAGE DETERMINATION APPEALS PROCESS

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- a) a survey underlying a wage determination
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Branch of Wage Surveys  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

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U.S. Department of Labor  
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Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to [dba.reconsideration@dol.gov](mailto:dba.reconsideration@dol.gov) or by mail to:

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U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210.

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END OF GENERAL DECISION"

"General Decision Number: IA20250081 01/03/2025

Superseded General Decision Number: IA20240081

State: Iowa

Construction Types: Heavy and Highway

Counties: Adair, Adams, Allamakee, Appanoose, Audubon, Benton, Black Hawk, Boone, Bremer, Buchanan, Buena Vista, Butler, Calhoun, Carroll, Cass, Cedar, Cerro Gordo, Cherokee, Chickasaw, Clarke, Clay, Clayton, Clinton, Crawford, Dallas, Davis, Decatur, Delaware, Des Moines, Dickinson, Dubuque, Emmet, Fayette, Floyd, Franklin, Fremont, Greene, Grundy, Guthrie, Hamilton, Hancock, Hardin, Harrison, Henry, Howard, Humboldt, Ida, Iowa, Jackson, Jasper, Jefferson, Johnson, Jones, Keokuk, Kossuth, Lee, Linn, Louisa, Lucas, Lyon, Madison, Mahaska, Marion, Marshall, Mills, Mitchell, Monona, Monroe, Montgomery, Muscatine, O'Brien, Osceola, Page, Palo Alto, Plymouth, Pocahontas, Polk, Pottawattamie, Poweshiek, Ringgold, Sac, Shelby, Sioux, Story, Tama, Taylor, Union, Van Buren, Wapello, Warren, Washington, Wayne, Webster, Winnebago, Winneshiek, Woodbury, Worth and Wright Counties in Iowa.

#### HIGHWAY CONSTRUCTION PROJECTS and HEAVY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none"> <li>◆ Executive Order 14026 generally applies to the contract.</li> <li>◆ The contractor must pay all covered workers at least \$17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.</li> </ul>
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none"> <li>◆ Executive Order 13658 generally applies to the contract.</li> <li>◆ The contractor must pay all covered workers at least \$13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours performing on that contract in 2025.</li> </ul>

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the

Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number      Publication Date  
0                              01/03/2025

SUIA2023-001 02/01/2023

	Rates	Fringes
BRICKLAYER (BRICKLAYER/STONE MASON)		
ZONE 1.....	\$ 34.00	17.62
ZONE 2.....	\$ 34.00	17.62
ZONE 3.....	\$ 34.00	17.62
ZONE 4.....	\$ 32.75	16.09
ZONE 5.....	\$ 29.65	16.09
Carpenter & Piledrivermen		
ZONE 1.....	\$ 31.27	15.83
ZONE 2.....	\$ 29.80	15.98
ZONE 3.....	\$ 29.68	15.98
ZONE 4.....	\$ 29.20	13.30
ZONE 5**.....	\$ 28.15	11.70
CONCRETE FINISHER		
ZONE 1.....	\$ 29.55	13.10
ZONE 2.....	\$ 29.55	13.10
ZONE 3.....	\$ 29.55	13.10
ZONE 4.....	\$ 27.70	9.20
ZONE 5.....	\$ 26.65	9.20
ELECTRICIAN (STREET AND HIGHWAY LIGHTING AND TRAFFIC SIGNALS)		
ZONE 1, 2, AND 3.....	\$ 36.40	14.80
ZONE 4.....	\$ 35.10	13.80
ZONE 5.....	\$ 33.45	13.05
IRONWORKER (SETTING OF STRUCTURAL STEEL)		
ZONE 1.....	\$ 32.25	14.85
ZONE 2.....	\$ 30.16	15.30
ZONE 3.....	\$ 30.16	15.45
ZONE 4.....	\$ 28.00	14.50
ZONE 5**.....	\$ 26.15	13.70
LABORER		
ZONE 1, 2 AND 3		
GROUP A.....	\$ 24.82	12.01
GROUP AA.....	\$ 27.20	12.01
GROUP B.....	\$ 22.97	12.01
GROUP C.....	\$ 19.89	12.01
ZONE 4		
GROUP A.....	\$ 23.12	11.32
GROUP AA.....	\$ 25.12	11.32
GROUP B.....	\$ 21.55	11.32
GROUP C.....	\$ 18.92	11.32

## ZONE 5

GROUP A.....	\$ 23.52	9.87
GROUP AA.....	\$ 25.52	9.87
GROUP B.....	\$ 20.78	9.87
GROUP C.....	\$ 19.93	9.87

## POWER EQUIPMENT OPERATOR

## ZONE 1

GROUP A.....	\$ 35.50	16.50
GROUP B.....	\$ 33.95	16.50
GROUP C.....	\$ 31.45	16.50
GROUP D.....	\$ 31.45	16.50

## ZONE 2

GROUP A.....	\$ 35.30	16.50
GROUP B.....	\$ 33.70	16.50
GROUP C.....	\$ 31.15	16.50
GROUP D.....	\$ 31.15	16.50

## ZONE 3

GROUP A.....	\$ 32.50	28.20
GROUP B.....	\$ 30.70	28.20
GROUP C.....	\$ 29.70	28.20
GROUP D.....	\$ 29.70	28.20

## ZONE 4

GROUP A.....	\$ 32.85	16.95
GROUP B.....	\$ 31.71	16.95
GROUP C.....	\$ 29.63	16.95
GROUP D.....	\$ 29.63	16.95

## ZONE 5

GROUP A.....	\$ 30.87	13.25
GROUP B.....	\$ 29.83	13.25
GROUP C.....	\$ 28.10	13.25
GROUP D.....	\$ 27.10	13.25

TRUCK DRIVER (AND PAVEMENT  
MARKING DRIVER/SWITCHPERSON)

ZONE 1.....	\$ 26.26	12.59
ZONE 2		
.....	\$ 26.26	12.59
ZONE 3.....	\$ 26.26	12.59
ZONE 4.....	\$ 26.26	9.04
ZONE 5		
.....	\$ 24.50	9.04

## ZONE DEFINITIONS

ZONE 1 The Counties of Polk, Warren, and Dallas for all Crafts, and Linn County Carpenters only.

ZONE 2 The Counties of Dubuque for all Crafts and Linn County for all Crafts except Carpenters.

ZONE 3 The Cities of Burlington (including West Burlington), Clinton, Fort Madison, Keokuk, and Middleton (including the Iowa Army Ammunition Plant) and Muscatine (and abutting municipalities of any such cities).

ZONE 4 Story, Black Hawk, Cedar, Jasper, Jones, Jackson, Louisa, Madison, and Marion Counties; Clinton County (except the City of Clinton), Johnson County, Muscatine County (except the City of Muscatine), the City of Council Bluffs, Lee County and Des Moines County.

ZONE 5 All areas of the state not listed above.

## LABORER CLASSIFICATIONS - ALL ZONES

GROUP AA - Skilled pipelayer (sewer, water, and conduits) and tunnel laborers; asbestos abatement worker

GROUP A - Carpenter tender on bridges and box culverts; CCTV\* sewer inspection operator; curb machine (without a seat);

deck hand; diamond & core drills; drill operator on air tracs, wagon drills, and similar drills; form setter/stringman on paving work; gunnite nozzleman; joint sealer kettleman; laser operator; mason tender (brick/stone), powderman tender; powderman/blaster; sign erector; saw operator; {(Zones 4 and 5) Skilled pipelayer (sewer, water, and conduits); tunnel laborer; asbestos abatement worker}. \*new labor classification (CCTV: closed circuit television)

GROUP B - Air, gas, electric tool operator; barco hammer; carpenter tender; caulker; chain sawman; compressor (under 400 cfm); concrete finisher tender; concrete processing materials and monitors; cutting torch on demolition; drill tender; dumpmen; electric drills; fence erectors; form line expansion joint assembler; form tamper; general laborer; grade checker; handling and placing metal mesh, dowel bars, reinforcing bars and chairs; hot asphalt laborer; installing temporary traffic control devices; jackhammerman; mechanical grouter; painter (all except stripers); paving breaker; planting trees, shrubs and flowers; power broom (not self-propelled); power buggyman; rakers; rodman (tying reinforcing steel); sandblaster; seeding and mulching; sewer utility topman/bottom man; spaders; stressor or stretcherman on pre or post tensioned concrete; stringman on re/surfacing/no grade control; swinging stage, tagline, or block and tackle; tampers; timberman; tool room men and checkers; tree climber; tree groundman; underpinning and shoring caissons over twelve feet deep; vibrators; walk behind trencher; walk behind paint stripers; walk behind vibrating compactor; water pumps (under three inch); work from bosun chair.

GROUP C - Scale weigh person; traffic control/flagger, surveillance or monitor; water carrier.

#### POWER EQUIPMENT OPERATOR CLASSIFICATIONS - ALL ZONES

GROUP A - All terrain (off road) forklift; asphalt breakdown roller (vibratory); asphalt laydown machine; asphalt plant; asphalt screed; bulldozer (finish); central mix plant; concrete pump; crane; crawler tractor pulling scraper; directional drill (60,000 (lbs) pullback and above); dragline and power shovel; dredge engineer; excavator (over 1 cu. yd.); front end loader (4 cy and over); horizontal boring machine; master mechanic; milling machine (over 350 hp); motor grader (finish); push cat; rubber tired backhoe (over 1 cu. yd.); scraper (12 cu. yd. and over or finish); Self-propelled rotary mixer/road reclaimer; sidebroom tractor; slipform portland concrete paver; tow or push boat; trenching machine (Cleveland 80 or similar)

GROUP B - Articulated off road hauler, asphalt heater/planer; asphalt material transfer vehicle; asphalt roller; belt loader or similar loader; bulldozer (rough); churn or rotary drill; concrete curb machine; crawler tractor pulling ripper, disk or roller; deck hand/oiler; directional drill (less than 60,000 (lbs) pullback); distributor; excavator (1/2 cu. yd. and under); form riding concrete paver; front end loader (2 to less than 4 cu. yd.); group equipment greaser; mechanic; milling machine (350 hp. and less); paving breaker; portland concrete dry batch plant; rubber tired backhoe (1/2 cu. yd. and under); scraper (under 12 cu. yd.); screening, washing and crushing plant (mobile, portable or stationary); shoulder machine; skid loader (1 cu. yd. and over); subgrader or trimmer;

trenching machine; water wagon on compaction.

GROUP C - Boom & winch truck; concrete spreader/belt placer; deep wells for dewatering; farm type tractor (over 75 hp.) pulling disc or roller; forklift; front end loader (under 2 cu. yd.); motor grader (rough); pile hammer power unit; pump (greater than three inch diameter); pumps on well points; safety boat; self-propelled roller (other than asphalt); self-propelled sand blaster or shot blaster, water blaster or striping grinder/remover; skid loader (under 1 cu. yd.); truck mounted post driver.

GROUP D - Boiler; compressor; cure and texture machine; dow box; farm type or utility tractor (under 75 hp.) pulling disk, roller or other attachments; group greaser tender; light plants; mechanic tender; mechanical broom; mechanical heaters; oiler; pumps (under three inch diameter); tree chipping machine; truck crane driver/oiler.

**\*\* CARPENTERS AND PILEDRIVMEN, or IRONWORKERS (ZONE 5)**

Setting of structural steel; any welding incidental to bridge or culvert construction; setting concrete beams.

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

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The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.



## Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

## Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

## Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

## State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME



refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

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#### WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

- a) a survey underlying a wage determination
- b) an existing published wage determination
- c) an initial WHD letter setting forth a position on a wage determination matter
- d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to [davisbaconinfo@dol.gov](mailto:davisbaconinfo@dol.gov) or by mail to:

Branch of Wage Surveys  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to [BCWD-Office@dol.gov](mailto:BCWD-Office@dol.gov) or by mail to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to [dba.reconsideration@dol.gov](mailto:dba.reconsideration@dol.gov) or by mail to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative

Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210.

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END OF GENERAL DECISION"

HR Green, Inc.  
Project No. 2202712.01

Water Treatment Plant Improvements  
Wahpeton, Iowa

**SECTION 22 0610.01  
VALVE SCHEDULE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

**1.02 DESCRIPTION**

- A. In the following valve schedule(s), below each valve number, the type of service, the valve size and comments about the individual valve are described.
- B. All electric operated valve actuators shall have open-stop-close push buttons, opened and closed indicating lights, and a local-off-remote selector switch.
- C. See Division 22 for individual valve specifications.

**PART 2 WATER TREATMENT PLANT PROCESS VALVE SCHEDULE**

**END OF SECTION 22 0610.01**

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VALVE NO.	LOCATION	SPECIFICATION	SERVICE	DIA. (in)	MOUNTING	ACTUATOR
GTV1130	INTAKE Raw Water Pump 1110	22 0523.01		3	FL	MAN
CHV1120	INTAKE Raw Water Pump 1110	22 0523.12		4	FL	MAN
GTV1230	INTAKE Raw Water Pump 1210	22 0523.01		3	FL	MAN
CHV1220	INTAKE Raw Water Pump 1210	22 0523.12		4	FL	MAN
BFV2110	EXISTING VALVE - DO NOT REPLACE RAW WATER CONTROL VALVE	22 0523.40	MOD	6	FL	EA
BFV2140	EXISTING VALVE - DO NOT REPLACE INLINE MIXER DISCHARGE	22 0523.40		6	FL	MAN
BFV2210	EXISTING VALVE - DO NOT REPLACE INLINE MIXER BYPASS	22 0523.40		6	FL	MAN
PLV4135	BASIN #1 DRAIN	22 0523.15		4	FL	MAN
PLV4180	SLUDGE BLOWDOWN VALVE #1	22 0523.15	O/C	4	FL	EA
PLV4235	BASIN #2 DRAIN	22 0523.15		4	FL	MAN
PLV4280	SLUDGE BLOWDOWN VALVE #2	22 0523.15	O/C	4	FL	EA
BFV5020	OZONE BYPASS	22 0523.40		8	FL	MAN
BFV5505	OZONE BASIN INFLUENT VALVE	22 0523.40		8	FL	MAN
BFV5551	OZONE BASIN DRAIN - STAINLESS STEEL	22 0523.40 STAINLESS STEEL		6	FL	MAN
BFV5595	OZONE BASIN EFFLUENT VALVE - STAINLESS STEEL	22 0523.40 STAINLESS STEEL		10	FL	MAN
BFV7110	FILTER #1 INFLUENT	22 0523.40	O/C	10	FL	EA
BFV7120	FILTER #1 BACKWASH WASTE EFFLUENT	22 0523.40	O/C	10	FL	EA
BFV7160	FILTER #1 EFFLUENT	22 0523.40	MOD	10	FL	EA
BFV7170	FILTER #1 AIR SCOUR	22 0523.40	O/C	4	FL	EA
BFV7180	FILTER #1 BACKWASH SUPPLY	22 0523.40	O/C	10	FL	EA
BFV7190	FILTER #1 FILTER TO WASTE	22 0523.40	MOD	6	FL	EA
BFV7210	FILTER #2 INFLUENT	22 0523.40	O/C	10	FL	EA
BFV7220	FILTER #2 BACKWASH WASTE EFFLUENT	22 0523.40	O/C	10	FL	EA
BFV7260	FILTER #2 EFFLUENT	22 0523.40	MOD	10	FL	EA
BFV7270	FILTER #2 AIR SCOUR	22 0523.40	O/C	4	FL	EA
BFV7280	FILTER #2 BACKWASH SUPPLY	22 0523.40	O/C	10	FL	EA
BFV7290	FILTER #2 FILTER TO WASTE	22 0523.40	MOD	6	FL	EA
BFV7310	FILTER #3 INFLUENT	22 0523.40	O/C	10	FL	EA
BFV7320	FILTER #3 BACKWASH WASTE EFFLUENT	22 0523.40	O/C	10	FL	EA
BFV7360	FILTER #3 EFFLUENT	22 0523.40	MOD	10	FL	EA
BFV7370	FILTER #3 AIR SCOUR	22 0523.40	O/C	4	FL	EA
BFV7380	FILTER #3 BACKWASH SUPPLY	22 0523.40	O/C	10	FL	EA
BFV7390	FILTER #3 FILTER TO WASTE	22 0523.40	MOD	6	FL	EA
BFV7410	FILTER #4 INFLUENT	22 0523.40	O/C	10	FL	EA
BFV7420	FILTER #4 BACKWASH WASTE EFFLUENT	22 0523.40	O/C	10	FL	EA
BFV7460	FILTER #4 EFFLUENT	22 0523.40	MOD	10	FL	EA
BFV7470	FILTER #4 AIR SCOUR	22 0523.40	O/C	4	FL	EA

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VALVE NO.	LOCATION	SPECIFICATION	SERVICE	DIA. (in)	MOUNTING	ACTUATOR
BFV7480	FILTER #4 BACKWASH SUPPLY	22 0523.40	O/C	10	FL	EA
BFV7490	FILTER #4 FILTER TO WASTE	22 0523.40	MOD	6	FL	EA
BFV7505	BACKWASH STORAGE TANK	23 0523.40	O/C	6	FL	EA
BFV7510	COMBINED FILTER EFFLUENT	22 0523.40	O/C	10	FL	EA
BFV8010	BACKWASH WASTE TANK ISOLATION VALVE	22 0523.40		8	FL	MAN
CHV8110	BACKWASH SUPPLY PUMP	22 0523.12		8	FL	MAN
GTV8120	BACKWASH SUPPLY PUMP	22 0523.01		8	FL	MAN
BFV8280	SECONDARY BACKWASH SUPPLY	22 0523.40	MOD	8	FL	EA
PLV7901	GAC FILTER PIPING, 7/P501	22 0523.15		4	FL	MAN
PLV7902	GAC FILTER PIPING, 7/P501	22 0523.15		4	FL	MAN
PLV7903	GAC FILTER PIPING, 7/P501	22 0523.15		4	FL	MAN
PLV7904	GAC FILTER PIPING, 7/P501	22 0523.15		4	FL	MAN
PLV7905	GAC FILTER PIPING, 7/P501	22 0523.15		4	FL	MAN
PLV7906	GAC FILTER PIPING, 7/P501	22 0523.15		4	FL	MAN
BLV7911	GAC PIPING VALVE	DETAIL 8/P501		2.5	FL	MAN
BLV7912	GAC PIPING VALVE	DETAIL 8/P501		2.5	FL	MAN
BLV7913	GAC PIPING VALVE	DETAIL 8/P501		2.5	FL	MAN
BLV7914	GAC PIPING VALVE	DETAIL 8/P501		2.5	FL	MAN
CHV8410	EXISTING VALVE - DO NOT REPLACE HIGH SERVICE PUMP #1 DISCHARGE	22 0523.12		8	FL	MAN
GTV8420	EXISTING VALVE - DO NOT REPLACE HIGH SERVICE PUMP #1 DISCHARGE	22 0523.01		8	FL	MAN
CHV8510	EXISTING VALVE - DO NOT REPLACE HIGH SERVICE PUMP #2	22 0523.12		8	FL	MAN
GTV8520	EXISTING VALVE - DO NOT REPLACE HIGH SERVICE PUMP #2	22 0523.01		8	FL	MAN
GTV8610	EXISTING VALVE - DO NOT REPLACE FLOW METER INFLUENT	22 0523.01		8	FL	MAN
GTV8630	EXISTING VALVE - DO NOT REPLACE FLOW METER EFFLUENT	22 0523.01		8	FL	MAN
GTV8640	EXISTING VALVE - DO NOT REPLACE FLOW METER BYPASS	22 0523.01		8	FL	MAN

**Diameter:**

Nominal pipe diameter (inches)

**Service:**

MOD-Modulating

O/C-Open/Close

**Mounting:**

FL-Flange

**Actuator:**

EA-Electric actuator

Man-Manual handwheel actuator

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## **SECTION 25 3100 REMOTE INSTRUMENTS**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Process Instruments (Electrical/Electronic)
  - 1. Analyzer, Chlorine (colorimetric)
  - 2. Analyzer, pH, Potable Water
  - 3. Analyzer, Turbidity, Low Range
  - 4. Flow, Liquid, Magnetic Flow Tube, Large Diameter
  - 5. Level, Liquid, Float Switch, Standard Duty
  - 6. Level, Liquid, Microwave
  - 7. Pressure, Transducer/Transmitter -- Gauge/Absolute
  - 8. Pressure, Transducer/Transmitter, Fluid Level Specific
- B. Ambient Instruments (Electrical/Electronic)
  - 1. Switch, Liquid Level, Flood Float
  - 2. Temperature, Air, Room
- C. Additional remote instruments are included in equipment packages and this section is intended to supplement and be in addition to those instruments. Manufacturer control panels shall be connected to and integrated with the overall plant control system. For instance, section Ozone System 46 3153 includes instruments and control panels that must be connected via communication to the water treatment plant control system.

#### **1.02 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Submit legible printed text, high quality drawings, and manufacturer's catalog data bound in notebooks with index tabs that identify major sections of the document.
- C. The submittal shall address all hardware and software to be supplied.
- D. The submittal shall contain:
  - 1. Identification of the respective responsibilities of each party to the project, including what is provided by the system manufacturer, what is to be subcontracted, etc.
  - 2. Description of the major user related features and operating characteristics of the proposed system.
  - 3. Description of all master site hardware and software, including examples of digital displays, control loops, reports, and how the operator will interface with the system to achieve each specified function.
  - 4. Description and operation of all master configuration features of the I/O and local control loop characteristics.
  - 5. Description of the training program. An outline shall be provided that covers the basic software and hardware training, operator training, system maintenance training, and programming training. Identify the course content and the time spent on each subject area.
  - 6. Description of the startup implementation plan, participants' responsibilities and a schedule of events.
  - 7. All significant equipment to be supplied shall be listed, followed by descriptive data sheets. The equipment list shall include each component name, manufacturer, model number, a description of the operation, quantity supplied, and any special setup and operation and maintenance characteristics.
  - 8. Drawings of equipment to be supplied shall include as a minimum, overall dimensions and details for each unit, including installation arrangements, door mounted operator devices, and instruments. Wiring diagrams of all system components, including field device connections, shall be included and specific installation wiring responsibilities identified.
- E. Submit operations and maintenance manuals.

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### 1.03 SERVICE REPRESENTATIVE

- A. Provide qualified Service Representative to perform functions described in Section 01 4000, and to sign the Certification of Proper Installation attached at the end of Section 01 4000.

### 1.04 WARRANTY

- A. Full warranty against defects in materials and workmanship for two years after substantial completion, including all parts, labor, and expenses.

## PART 2 PRODUCTS

### 2.01 PROCESS INSTRUMENTS (ELECTRICAL/ELECTRONIC)

- A. ANALYZER, CHLORINE (colorimetric)
  - 1. General
    - a. Function: Continuously measure, indicate, and transmit chlorine residual concentration, as specified below.
    - b. Type: Separate element and transmitter device using measurement methods as specified below.
    - c. Parts: Analyzer, transmitter unit, mounting hardware, sample line conditioning/regulating/interconnecting hardware, reagent bottle(s), and expendables.
  - 2. Service.
    - a. Type: multiple installations and conditions; see schedule
    - b. Pressure range: multiple installations and conditions; see schedule
    - c. Temperature range: multiple installations and conditions; see installation schedule
    - d. Flow: multiple installations and conditions; see schedule
  - 3. Performance Requirements
    - a. Operating range: 0 - 5 mg/L
    - b. Accuracy: +/- 5% of scale
    - c. Resolution: 0.01 mg/L.
    - d. Minimum operating time without requiring reagent replenishment: 30 days, minimum
  - 4. Required Features
    - a. Measurement process: colorimetric
    - b. Measurement results: free or total chlorine
  - 5. Ambient Environment
    - a. Location: Indoors
    - b. Mounting: wall mounted unless otherwise noted.
    - c. Temperature: perform as specified within 45 to 100 degrees F.
    - d. Humidity: up to 90%, noncondensing.
    - e. Enclosure: NEMA 12/ IP-62 minimum.
  - 6. Transmitter
    - a. Local indicator and operator interface:
      - 1) At least 3 1/2 inch TFT color display with capacitive touchpad, capable of displaying the measured process variable, indicators for alarm(s) activated, all necessary functions to allow for initial setup, and calibration without need for an additional hand-held programming device.
      - 2) Alarms: a minimum of two programmable alarms for high/low process set points or instrument warning/fail, which activate discrete outputs -- see "Electrical".
      - 3) Transmit linear signal proportional to the measured process variable, see "Electrical".
      - 4) Stored operating parameters and calibration data shall not be lost on interruption of the power source.
    - b. Ambient Environment
      - 1) Location: Indoors
      - 2) Mounting: handrail mounted unless otherwise noted.
      - 3) Temperature: perform as specified with -4 to 113 F.

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- 4) Humidity: 0 to 95% non-condensing.
    - 5) Enclosure: NEMA 4X
  - c. Electrical
    - 1) Compliance/Certification/Listing: manufacturer's standard
    - 2) Power Source: 120 VAC, 50/60 Hz.
    - 3) Discrete Outputs: minimum of two SPDT, 5A resistive, 240 VAC.
  - d. Accessories and Options
    - 1) 5 Analog outputs or Ethernet IP, see schedule.
  - e. Approved Manufacturers.
    - 1) Hach Company, Model SC4500
- 7. Accessories
  - a. Provide pressure reducing/isolating valve, strainer, and other possible elements to ensure proper operation of the instrument for the service conditions described.
- 8. Expendables
  - a. Provide a 6 months supply of reagents/buffer solutions required to operate the instrument.
  - b. Provide a calibration kit and the necessary expendables.
- 9. Approved Manufacturers.
  - a. Hach Company, Model CL 17.
  - b. Engineer Approved Equivalent.
- B. ANALYZER, PH
  - 1. General:
    - a. Function: Continuously measure, indicate, and transmit, pH and temperature.
    - b. Type: Electrometrically measure pH without requiring electrolyte flow.
    - c. Parts: Element, transmitter, interconnecting cable, and expendables.
  - 2. Service.
    - a. Type: potable, raw surface water
    - b. Pressure range: 6.9 bar
    - c. Temperature range: 23 to 158 deg F
    - d. Flow: continuous
  - 3. Performance:
    - a. Operating range: -2 to 14 pH
    - b. Accuracy: +/- 0.02 pH
    - c. Sensitivity: +/- 0.01 pH
  - 4. Element
    - a. Type: Combination probe unit assembly with measuring and reference electrodes, and a temperature sensing electrode including integral temperature compensation and preamplifier.
      - 1) Element Body: PEEK, PPS, Stainless Steel, CPVC, Ryton, LCP, Epoxy, or ABS
      - 2) Reference Electrode: Double junction ceramic, field replaceable
      - 3) Measuring Electrode: spherical glass
      - 4) Element wetted metallic parts: if applicable, 316L stainless steel
      - 5) Process installation type: Sample line (flow through to drain)
  - 5. Accessories:
    - a. Flow Cell Assembly, Product #9180100 (1" NPT Sensor)
  - 6. Expendables (for each unit provided)
    - a. Salt Bridge: one salt bridge and fill solution for future field replacement.
    - b. Chemicals: one liter each of pH buffer solutions for pH of: 4, 7, and 10.
  - 7. Approved Manufacturers:
    - a. Hach Company, Model: with pHD-SC probe, flow-thru cell, and mounting accessories
    - b. Engineer Approved Equivalent.
- C. ANALYZER, TURBIDITY (LOW RANGE)



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1. General
  - a. Function: Continuously measure, indicate and transmit turbidity.
  - b. Type: light scattering measurement through non-contacting methods.
  - c. Parts: Analyzer, transmitter unit, sensor/flow conditioning unit, mounting hardware, element to transmitter interconnecting cable, and calibration kit.
2. Service.
  - a. Type: potable, raw surface water
  - b. Flow: continuous
3. Performance Requirements
  - a. ES EPA Approved Hach Method 10258
    - 1) Operating Range: 0-700 NTU
  - b. Accuracy: +/-2 % From 0-40 NTU, +/- 10% from 40-1000 NTU
  - c. Resolution: 0.0001 NTU.
4. Required Features
  - a. Measurement process: right angle light scattering measurement.
  - b. Measurement results: based on nephelometric turbidity unit standards.
  - c. Auto correction/compensation: manufacturers standard
  - d. Certifications:
    - 1) CE Compliant
    - 2) US FDA accession number: 1420493-001 EPA version, 1420492-001 ISO version. Complies with IEC/EN 60825-1 and to 21 CFR 1040.10 in accordance with Laser Notice No. 50)
5. Transmitter
  - a. Local indicator and operator interface:
    - 1) At least 3 1/2 inch TFT color display with capacitive touchpad, capable of displaying the measured process variable, indicators for alarm(s) activated, all necessary functions to allow for initial setup, and calibration without need for an additional hand-held programming device.
    - 2) Alarms: a minimum of two programmable alarms for high/low process set points or instrument warning/fail, which activate discrete outputs -- see "Electrical".
    - 3) Transmit linear signal proportional to the measured process variable, see "Electrical".
    - 4) Stored operating parameters and calibration data shall not be lost on interruption of the power source.
  - b. Ambient Environment
    - 1) Location: Indoors
    - 2) Mounting: handrail mounted unless otherwise noted.
    - 3) Temperature: perform as specified with -4 to 113 F.
    - 4) Humidity: 0 to 95% non-condensing.
    - 5) Enclosure: NEMA 4X
  - c. Electrical
    - 1) Compliance/Certification/Listing: manufacturer's standard
    - 2) Power Source: 120 VAC, 50/60 Hz.
    - 3) Discrete Outputs: minimum of two SPDT, 5A resistive, 240 VAC.
  - d. Accessories and Options
    - 1) 5 Analog outputs or Ethernet IP, see schedule.
  - e. Approved Manufacturers.
    - 1) Hach Company, Model SC4500
    - 2) Engineer Approved Equivalent.
6. Ambient environment:
  - a. Location: Indoors
  - b. Mounting: wall mounted unless otherwise noted.
  - c. Temperature: within 45 - 100 F.

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- d. Humidity: up to 90% non-condensing.
- 7. Accessories
  - a. Provide pressure reducing/isolating/flow control valve and interconnecting piping to ensure proper operation of the instrument in the service conditions described.
  - b. Provide all necessary ancillary power supply, communications, transmitters/indication modules and specialized cables (if required) to make a minimum number of complete system(s) as described in the schedule.
  - c. Provide manufacturer's cable for interconnection between the element and the transmitter.
  - d. Provide calibration kit and necessary expendables (if required) for at least 6 calibration tests.
- 8. Instrument Accessories
  - a. Flow Sensor, see schedule.
  - b. Automatic Cleaning Module, see schedule.
  - c. Stablcal primary standards set with RFID (10 NTU, 20 NTU, 600 NTU) Calibration Standards with Turbidimeter calibration cap.
- 9. Approved Manufacturers:
  - a. Hach Company - TU 5300sc turbidimeter with options specified herein and applicable as specified in 25 9110.
  - b. Engineer Approved Equivalent.
- D. FLOW, LIQUID MAGNETIC FLOW TUBE AND TRANSMITTER (large diameter)
  - 1. General
    - a. Function: Measure, indicate and transmit liquid process flow in a closed full pipe.
    - b. Type: Pulsed DC magnetic field into a conductive process liquid by means of a manufacturer's flow tube.
    - c. Parts: Flow element and transmitter with interconnecting cables, mounting hardware, and hand-held field calibrator/configurator.
  - 2. Service.
    - a. Type: multiple installations and conditions; see schedule
    - b. Type: multiple installations and conditions; see schedule
    - c. Pressure range: multiple installations and conditions; see schedule
    - d. Temperature range: multiple installations and conditions; see installation schedule
    - e. Process pipe size: multiple installations and conditions; see installation schedule
    - f. Process pipe material: metallic lined
    - g. Special conditions: NSF Certification.
  - 3. Performance:
    - a. Flow range: multiple installations and conditions; see installation schedule
    - b. Accuracy: +/- 0.5%
    - c. Repeatability: +/- 0.2% of span
    - d. Minimum accurate flow velocity: 1.6 ft/sec.
  - 4. Element
    - a. Type: flow tube with liner, electrodes, ground rings, adapter flanges, flange gaskets, seals, and flange bolts as required.
      - 1) Flow tube size: multiple installations, see schedule.
      - 2) Flow tube material: manufacturer's standard
      - 3) Flow tube liner: polyurethane or hard rubber.
      - 4) Flow tube electrodes: 316 Stainless Steel.
      - 5) Flow tube process connection type: flanged, ANSI Class 150.
      - 6) Flow tube flange bolt material: plated steel.
      - 7) Enclosure electrical rating: NEMA 4X/IP67.
      - 8) Enclosure safety rating: General Purpose, no approval.
  - 5. Transmitter

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- a. Type of physical installation: multiple installations, see schedule.
  - b. Required Features
    - 1) Measurement results: flow rate in programmable engineering units.
    - 2) Local indicator and operator interface.
      - (a) At least a two line LCD display with keypad; field capable of programming, diagnostic evaluation, and flow display (in chosen engineering units) without the requirement of an additional hand held programming device.
      - (b) Alarms: at least two discrete alarms separately programmable for flow high/low and flow direction -- see "Electrical".
      - (c) Transmit a linear signal proportional to the measured signal as scaled by programmable zero and span engineering units -- see "Electrical".
      - (d) Stored operating parameters and calibration data shall not be lost on interruption of power source.
    - 3) Ambient environment:
      - (a) Location: Indoors
      - (b) Mounting: wall mounted unless otherwise noted.
      - (c) Temperature: within 45 - 110 F.
      - (d) Humidity: up to 90% non-condensing.
      - (e) Controller Enclosure: NEMA 4X/ IP67
    - 4) Electrical
      - (a) Compliance/Certification/Listing: manufacturer's standard.
      - (b) Power Source: 120 VAC 60 Hz, 25 VA max.
      - (c) Discrete outputs: at least one output capable of sinking up to 150 mA @ 30 Vdc max.
      - (d) Analog output(s): minimum of one isolated 4-20 mA output capable of driving at least a 500 ohm external load.
  - 6. Acceptable Manufacturers
    - a. Rosemount: Series 8750W flow tube with Series 8732 transmitter with ODVA Compliant Ethernet IP Communication.
    - b. Endress + Hauser Promag 400W Series with ODVA Compliant Ethernet IP Communication.
    - c. ABB Processmaster Series - FEP6/FEW6 model with native Ethernet IP Protocol
- E. LEVEL, LIQUID, FLOAT SWITCH, STANDARD DUTY
- 1. General
    - a. Function: Measure discrete level.
    - b. Type: Submerged or floating in process liquid.
    - c. Parts: Float switch, connecting electrical cable, weight, and suspension bracket with fasteners, anchors, and float cable grips.
  - 2. Service
    - a. Type: potable water.
    - b. Temperature range: 32 - 100 F
    - c. Special conditions: NSF certification.
  - 3. Performance
    - a. Control differential: no less than +/- 1" from horizontal.
    - b. Not affected by float rotation.
  - 4. Required Features:
    - a. Non-mercury mechanical switch.
    - b. Displace a minimum of 25 cubic inches.
    - c. Water resistant SJOW electrical cord, 18 GA. minimum conductor size.
    - d. External weight of corrosion resistant material -- plated steel not acceptable.
  - 5. Electrical
    - a. N.O. or N.C. contacts rated @ 3A, 120/240 VAC minimum.

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6. Accessories
  - a. Stainless steel mounting bracket capable of supporting a group of float switches (as required in 25 9110 Schedule).
  - b. Include with mounting bracket, strain-relief, field-adjustable, cable clamps for field height adjustment.
7. Acceptable Manufacturers
  - a. Anchor Scientific, Eco-Float series.
  - b. Conery, 2900 series.
  - c. SJE Rhombus, SignalMaster series.
  - d. Engineer approval
- F. LEVEL, LIQUID, MICROWAVE
  1. General
    - a. Function: Continuously measure, indicate, and transmit distance to liquid level surface.
    - b. Type: Frequency-modulated, Continuous-wave microwave transceiver.
    - c. Parts:
      - 1) Element
      - 2) Transmitter
      - 3) Antenna
  2. Service:
    - a. Process Temperature: approx. 40 - 85 F.
    - b. Process Pressure: atmospheric
    - c. Process Humidity: near 100%
  3. Performance:
    - a. Operating Range: 9 - 25 feet.
    - b. Minimum Range: 5.5'
    - c. Maximum Range: 25'
    - d. Range Accuracy: +/- 1"
  4. Element:
    - a. Mounting Type: Manufacturer's Bracket
      - 1) Material: 316 Stainless Steel.
    - b. Antenna Type: Parabolic (or other means to narrow beam angle)
      - 1) Material: 304 Stainless Steel
      - 2) Mounting: field removable to ease installation.
    - c. Operating frequency: 6GHz < Freq. < 30 GHz.
    - d. Beam Angle: < = 10 degrees
  5. Transmitter:
    - a. Required Features:
      - 1) Measured results: Distance between top of tank and liquid level.
      - 2) Transmitter/analyzer algorithms shall have the capabilities to:
        - (a) Calculate and transmit flow.
        - (b) Automatic false echo reducing algorithms.
        - (c) Manual capability to adapt gain and other signal processing parameters.
      - 3) Transmit a linear signal proportional to the measured distance -- see "Electrical".
      - 4) Stored operating parameters and configuration data shall not be lost on interruption of power source.
      - 5) Ambient Environment:
        - (a) Location: Indoors
        - (b) Mounting: Integral mounting to element.
        - (c) Temperature: perform as specified from 40 to 122 F
        - (d) Humidity: 5 to 95% non-condensing.
        - (e) Enclosure: NEMA 4X
      - 6) Electrical

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- (a) Compliance/Certification/Listing: manufacturer's standard
  - (b) Power Source: Loop-Powered, 50/60 Hz, 120 VA max.
  - (c) Discrete Outputs: none required
  - (d) Analog output: passive, 4-20mA, capable of driving at least 500 ohms.
- 6. Acceptable Manufacturers
  - a. Endress + Hauser series FMR20 with 80 mm (3 in) antenna.
  - b. VEGA PULS C21.
  - c. No Substitutions.
- G. PRESSURE TRANSDUCER/TRANSMITTER (GAUGE/ABSOLUTE)
  - 1. General
    - a. Function: Measure and transmit process pressure
    - b. Type: Loop-powered, two-wire transmitter with piezo-resistive sensor
    - c. Parts: Transmitter, sensor, and process connections accessories.
  - 2. Service.
    - a. Type: potable, raw surface water
    - b. Working Pressure: 0-150 psig
    - c. Temperature range: 32-120 Deg. F.
    - d. Special conditions: NSF Certification
  - 3. Performance:
    - a. Pressure range: multiple installations and conditions; see installation schedule
    - b. Accuracy: +/- 0.2%
    - c. Stability: +/- 0.05% of span per year.
    - d. Maximum Withstand Pressure (without damage): not less than 150 PSI and not less than 150% of the URL.
    - e. Turndown not to exceed: 20:1
  - 4. Element
    - a. Type: Isolating diaphragm type, fill fluid, adapter flanges, flange seals, flange bolts, block, bleed, drain/vent and isolation valves, mounting type, and mounting bolts as required.
      - 1) All wetted parts including body, flange, diaphragm, valves, etc. 316L SS.
        - (a) Process connection type: direct connection, 1/2" (MPT or FPT).
        - (b) Process connection interface: Combination block and bleed valve -- material same as wetted parts.
      - 2) Isolating diaphragm fill fluid: Silicone Oil.
  - 5. Transmitter
    - a. Type of physical installation: integral mount to element
    - b. Required Features
      - 1) Measurement results: passive linear output proportional to pressure.
      - 2) Electronics: Microprocessor based w/ non-volatile memory
      - 3) Local indicator and operator interface.
        - (a) At least a one line LCD display with keypad capable of programming, diagnostic evaluation, and pressure display (in engineering units) without the requirement of an additional hand held programming device
        - (b) Communications protocol: None
        - (c) Transmit a linear signal proportional to the measured signal as scaled by programmable zero and span engineering units -- see "Electrical".
    - 4) Ambient environment:
      - (a) Location: Indoors
      - (b) Mounting: 2" pipe-mount/wall-mount universal bracket assembly, 304 SS.
      - (c) Temperature: within -20 to 180 F.
      - (d) Humidity: up to 95% non-condensing.
      - (e) Controller Enclosure: NEMA 4X/ IP66

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- 5) Electrical
  - (a) Compliance/Certification/Listing: manufacturer's standard.
  - (b) Power Source: minimum -- not less than 12 Vdc; maximum -- no greater than 40 Vdc
  - (c) Loop impedance requirements: regulated 4-20 mA output capable of performing within specifications for a range of 250 to 500 ohm external load @ 24 Vdc supply voltage.
6. Acceptable Manufacturers
  - a. Endress+Hauser Cerabar S -- PMC or PMP 731 series.
  - b. Foxboro IGP or IAP 10 series
  - c. Rosemount 3051T series.
  - d. ABB 2600T series, model 266HSH.
  - e. No Substitutions
- H. PRESSURE, TRANSDUCER/TRANSMITTER, FLUID LEVEL SPECIFIC
  1. Furnish and install pressure transducer/transmitters as indicated on drawings and in the instrumentation and controls schedule.
  2. The pressure transducer/transmitter is intended for measuring pressure and transmitting a linear 4-20 mA DC output for use in a standard two (2) wire DC supply voltage system.
  3. The controls system manufacturer shall provide the power supply for this two-wire device in the control panel. The specifications for this transducer/transmitter are as follows:
    - a. Accuracy: + or - 0.10% of span.
    - b. Supply Voltage: 24 V dc (4-20 mA).
    - c. RFI Protection: 0.1% error between 27 and 500 MHz at 120 V/m field intensity.
    - d. Housing Finish: Epoxy.
    - e. Enclosure: IEC IP65 (NEMA Type 4X).
    - f. Mounting: Direct to process.
    - g. Process Connection: flanged 3" 150# ANSI.
    - h. Electronics: Encapsulated and enclosed in housing sealed with O-rings for double protection against moisture or other contaminants.
    - i. Input Span: 0 psi minimum, 1000 "H<sub>2</sub>O psi maximum
    - j. Connector: 150# ANSI carbon steel flange.
    - k. Diaphragm: AISI Type 316L SS.
    - l. Sensor Fill Fluid: Dow Corning dimethyl siloxane (DC200) or equal.
    - m. Ambient Temp. Limits: -40 degrees F to 185 degrees F.
    - n. NSF Certification
    - o. Options:
      - 1) Local LCD digital process meter
      - 2) Flushing ring with 1/2" NPT flush connection.
  4. Approved Manufacturers:
    - a. Foxboro, Model: IGP10 Intelligent Series with options specified.
    - b. Rosemount, Model 3051L.
    - c. ABB 2600T series, model 266xRH/S26RA.
    - d. Engineer Approved Equivalent.

## 2.02 AMBIENT INSTRUMENTS

- A. SWITCH, LIQUID LEVEL, FLOOD FLOAT
  1. Furnish and install non-mercury float flood switch as shown in plans and as listed in Section 25 9110 - Instrumentation Schedule.
  2. Unit shall contain a normally open switch which shall close when the float is in the elevated position.
  3. Hysteresis within the switch closing mechanism shall prevent rapid on-off cycles.
  4. Float switch shall be wall mount type and be capable of sensing rising water level within 1/2" of rise.

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5. It is the responsibility of the systems integrator to insure compatibility with submitted PLC input type and voltage. Include local relay and power supply in a stainless steel junction box if required.
  6. Mount assembly such that float is approximately one inch above floor..
  7. Use Consolidated Electric Model 101G or Engineer approved equivalent.
  8. Acceptable Manufacturers:
    - a. Gems LS-270.
    - b. Evoqua Model 101G
    - c. Engineer approved equivalent.
- B. TEMPERATURE, AIR, ROOM
1. General:
    - a. Provide room temperature sensors listed in Section 25 9110 - Instrument Schedule..
    - b. Sensor to contain transmitter capable of transmitting a 4-20mA signal proportional to temperature when supplied with an external DC supply.
    - c. Measurement Range: -58 - 212 F (-50 to 100 C).
    - d. Accuracy: +/- 1°F.
    - e. Voltage Requirements: 10 - 30 Vdc.
    - f. Surface Mount.
  2. Approved Manufacturer:
    - a. Omega #EWSA-PT100-TX
    - b. Engineer approved equivalent.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install units in accordance with manufacturer's recommendations and as indicated on drawings.
- B. Units shall be installed and programmed by well qualified and experienced craftsmen and engineers/technicians.
- C. Locations, orientations, and quantities as indicated on drawings.
- D. Units shall be properly interfaced with the input and output devices.
- E. Electrical and control wiring, cabling, conduits, connections shall be according to Division 26 and this Section.
- F. Include all required-related items for a complete installation.
- G. Contractor shall be responsible for compatibility of manufacturer's shop coating and final finish.
- H. Support and anchor all units as per the manufacturer's recommendations and as indicated on drawings.

**END OF SECTION 25 3100**



**SECTION 46 3153.04  
OZONE SYSTEM**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. This section covers the furnishing of all labor, materials, and equipment necessary to design, fabricate, and test the Ozone Generation and Feed Systems. Ozone oxidation system is for the purpose of treatment of the effluent of the flocculation/sedimentation basins, before filtration by GAC gravity filters.
- B. The Ozone Systems shall include the oxygen generation system, ozone generation equipment, ozone dissolution equipment, off-gas ozone destruction equipment, control panels, instrumentation and controls, safety, ozone system integration, monitoring and control equipment, and start-up services to provide a complete and functional system.
- C. The Ozone System shall be furnished by a single Ozone System Supplier (OSS) who shall provide all of the services, equipment, and appurtenances required to achieve a complete, fully integrated and operational system meeting all the design conditions, testing requirements, performance guarantees, and warranties as specified herein.
- D. The equipment indicated below shall be furnished by the OSS and installed by the general contractor and shall comply with the overall system requirements and performance guarantees specified under this section. System shall include interconnecting piping and related appurtenances
- E. All ozone system piping, valves, electrical gear, conduit, wires, instrumentation components, control system components, and other components not specified to be supplied by the OSS will be supplied by the installation contractor.
- F. The OSS shall supply all labor, materials, equipment, and incidentals required to design and furnish the specified instrumentation and control system hardware and software specific to the ozone system. The OSS shall perform start-up and commissioning of the ozone system, coordinating with the general contractor and Owner during submittal review, installation, and start-up to. The OSS shall design and supply all components necessary for the successful automatic operation of the System to ensure a complete functional system.

**1.02 REFERENCES**

- A. ASME Section VIII - Rules for Construction of Pressure Vessels.
- B. ASTM E591 - Safety and Health Requirements Relating to Occupational Exposure to Ozone.
- C. CGA G-4.1 - Cleaning Equipment for Oxygen Service.
- D. IEEE 519 - Guide for Harmonic Control and Reactive Compensation of Static Power Converters.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association; 2002.

**1.03 DESIGN REQUIREMENTS**

- A. The Ozone System shall have a capacity, using oxygen generated on-site to produce ozone as specified below.
  - 1. Installed Ozone Capacity:
    - a. Maximum Unit Capacity @ 10%: 19.0 lb/day
    - b. Design Basis System Capacity @ 10%: 14.4 lb/day with one module out of service
- B. Such capacity shall be provided at the maximum closed-loop cooling water temperature of 80°F, and an ozone-in-oxygen concentration of 10 to 13 percent by weight at standard temperature and pressure conditions which are defined as 68°F at 0 percent relative humidity and 1 atmosphere (14.7 psi), respectively.
- C. Ozone shall be added to the water through venturi injectors.
- D. All components of the ozone system in contact with potable water shall be NSF / ANSI Standard 61 certified.



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- E. Ozone production shall be configured to deliver a specific pound-per-day demand of ozone. Ozone production shall be controlled based upon an input ozone gas concentration, mass flow rate, or by the dissolved ozone concentration in the contact basin. PID logic control of the dissolved ozone concentration signal shall be included as an internal function of the ozone generator PLC.
  - 1. A high concentration ozone gas monitor shall monitor and be used as feed back for the control of the ozone gas concentration in the outlet piping from the ozone generator.
  - 2. The setpoint controller shall vary power levels to generator in order to maintain the desired (operator input setpoint) ozone concentration at the generator outlet.
  - 3. A second control mode shall permit the operator to select a percent power level.
  - 4. Ozone shall be produced at the selected power percentage at a constant gas flow rate.
- F. The oxygen generation system should be designed to meet the required oxygen gas flow rate at the rated ozone production capacity.
- G. Ozone gas flow rates to contactor basin shall be controlled by the ozone system control panel. Ozone system shall include mass flow controller to dose ozone at specified rate.
- H. Off-gas collected above the water surface within each contactor basin shall be drawn through the off-gas ozone destruction system and discharged to atmosphere via off-gas blowers and the vent stack.
- I. Ozone System shall generally consist of the following equipment:
  - 1. Pressure swing adsorption oxygen generation system, including associated piping, fittings, valves, and accessories for a complete operational oxygen generation system.
  - 2. Modular ozone generator for continuous use in municipal water applications.
  - 3. Chiller system for equipment cooling.
  - 4. One off-gas ozone heat-assisted catalytic destruction unit.
  - 5. One high concentration ozone analyzer.
  - 6. Two (2) ambient air ozone analyzers located in the ozone generator room and filter room.
  - 7. One (1) ozone off-gas analyzer located at ozone vent.
  - 8. One dewpoint analyzer.
  - 9. Two (2) dissolved ozone analyzers.
  - 10. All controls and control panels as specified herein and as recommended by the equipment manufacturers to ensure a complete and properly operating Ozone System.
  - 11. All skid or cabinet-mounted piping, valves, and appurtenances for complete operating Ozone System.
  - 12. Manufacturer-recommended safety equipment for the Ozone Generation Room.
  - 13. Ozone System Automatic Control System.
    - a. The ozone generator shall have its own power supply unit mounted on a common skid, or within a single cabinet, with the generator, consisting of transformer, frequency inverter, all associated electrical and electronic equipment, and local control panel. The logic control shall be performed by the use of an Allen-Bradley programmable logic controller (PLC) installed in the local control panel.
    - b. The ozone generator system shall include a master control panel for the entire ozone system. This control panel shall interface with all other local control panels within the ozone system either by hand-wired I/O connection or by a local communications network. This control panel shall also be able to communicate to the plant control system.
    - c. The master ozone control panels shall be capable of and shall provide all the necessary functions to operate in a manual or an automatic mode.
    - d. The ozone dose required shall be established by the WTP control panel.

#### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

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- B. The OSS shall provide with the fixed sum equipment submittal a listing or drawings indicating all necessary power connections, capacity requirements, and all interconnecting circuits to be installed by the installing contractor.
- C. Shop Drawings showing:
  - 1. Arrangement, dimensions and materials.
  - 2. Equipment performance data and operating characteristics.
  - 3. Manufacturer's catalog data, marked to indicate materials being furnished.
  - 4. Operating weights and foundation loads, including anchor bolt loads.
- D. Operation and maintenance manuals shall be provided as described in Section 01 7800.
- E. Startup documentation: Submit certification that equipment meets operating points specified. Complete as-built documentation to reflect the installed equipment and accessories.
- F. Manufacturer's Certificate: Upon startup, OCertify that products meet or exceed specified requirements and was installed correctly.

#### **1.05 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver products in accordance with construction schedules and allow inspection prior to installation.
- B. Coordinate deliveries to avoid conflict with conditions at site.
- C. Deliver products in undamaged condition in original containers or packaging, with identifying labels intact and legible.
- D. Clearly mark to identify partial deliveries of component parts to facilitate assembly.
- E. Store products immediately on delivery and protect until installed. Store according to manufacturer's instructions with seals and labels intact and legible.
- F. Provide platforms, blocking, skids, or coverings required to protect products from deterioration or damage.
- G. Arrange storage in a manner to provide easy access for inspection.
- H. Maintain storage conditions to prevent deterioration or damage.
- I. Protect products after installation to prevent damage from subsequent operations. Remove when no longer needed.
- J. Provide equipment and personnel necessary to handle products by methods to prevent damage to products or packaging.
- K. Handle products by methods to prevent bending or over stressing.

#### **1.06 WARRANTY**

- A. Full warranty against defects in materials and workmanship for two years after substantial completion, including all parts, labor, and expenses.
- B. If any parts of the OSS scope of supply fail during the warranty period, replacement of parts and installation of parts shall be provided at no expense to the Owner to restore equipment to a fully operational system.

#### **1.07 SERVICE REPRESENTATIVE**

- A. Provide qualified service representative to perform functions described in Section 01 4000 and to sign the Certification of Proper Inspection attached to Section 01 4000.
- B. Provide necessary trips by the Manufacturer's representative to provide startup and training of operations personnel.
- C. Any additional trips required by the Contractor before or after final start-up and training will not be at the Owner's expense.

### **PART 2 - PRODUCTS**

#### **2.01 OZONE EQUIPMENT - GENERAL DESCRIPTION**

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- A. Ozone System shall consist of:
  - 1. Ozone generation system
  - 2. Oxygen generation system
  - 3. Cooling water system for cooling of ozone generation system
  - 4. Ozone destruct unit for off-gas from ozone contact basin
  - 5. Instruments related to the Ozone System
  - 6. Ozone System Control Panel
  - 7. Spare parts.

## **2.02 SYSTEM MANUFACTURERS**

- A. Primozone
- B. Pinnacle Ozone Solutions
- C. Engineer approved equal.

## **2.03 OZONE EQUIPMENT - GENERAL**

- A. DEWPOINT ANALYZER
  - 1. OSS shall provide (1) dewpoint analyzer. Dewpoint analyzers shall consist of an in-line sensing element and remote mounted transmitter. Dewpoint analyzer shall be in the compressed air line upstream of the oxygen generator.
  - 2. The sensor shall be an aluminum oxide type moisture sensor designed to measure the dewpoint of the sample gas. The sensor shall communicate with the transmitter module over cables provided with the unit. Sensor housing shall be stainless steel.
  - 3. The sensors shall be designed for direct insertion into a pressurized gas pipeline.
  - 4. Transmitters shall be microprocessor based units, housed in a wall mounted, NEMA Type 4X enclosure.
  - 5. The transmitter electronics shall accept the signal input from the sensor system and produce an isolated 4-20mA dc signal linearly proportional to the measured dewpoint temperature. Dewpoint range: -112°F to +68°F
  - 6. Transmitter output shall be automatically pressure and temperature compensated.
  - 7. The transmitter shall also be provided with a serial output for instrument diagnostics and process monitoring.
  - 8. The transmitter shall be provided with a minimum of two contact outputs, configurable to close at adjustable dewpoint temperature values.
  - 9. Each analyzer system shall be provided with all required mounting hardware. Mounting and installation hardware shall be AISI Type 316L stainless steel or other material approved by the analyzer system manufacturer.
  - 10. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. Length of cable shall be a minimum of 30 feet or as indicated on the drawings.
  - 11. Transmitter shall be loop-powered. Transmitter shall communicate with Ozone System control panel.
- B. AMBIENT OZONE ANALYZERS & OZONE OFF-GAS ANALYZER
  - 1. OSS shall supply two (2) ambient ozone analyzers and one (1) ozone off-gas analyzer. Ozone analyzer systems shall be utilized for the following services:
    - a. Ambient ozone detection system - ozone generator room.
    - b. Ambient ozone detection system - filter room.
  - 2. The analyzer element shall be built of ozone resistant materials and shall utilize UV absorption methods and the Beer-Lambert law to determine ozone concentrations in air.
  - 3. The sensor shall consist of a UV light source and sample chamber.
  - 4. Integral zero gas and sample gas controls shall be provided.
  - 5. Each sensor shall be suitable for ozone detection over a range of 0-10 ppm.
  - 6. The transmitter electronics shall be microprocessor based and shall be integrally mounted with the sensor system in a NEMA Type 4X, wall mounted enclosure.

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7. The transmitter shall be provided with an integral 3-1/2 digit LCD indicator, calibrated in parts per million (ppm).
8. The transmitter electronics shall accept the signal input from the sensor system and produce an isolated 4-20mA dc signal linearly proportional to the measured ozone concentration. Transmitter shall communicate directly with the Ozone System control panel.
9. Transmitter output shall be automatically temperature compensated.
10. The transmitter shall be provided with a minimum of three contact outputs, configurable to close at adjustable ozone concentration values.
11. For ambient ozone detection applications, the transmitter shall be configured to send a dry contact output to the control system upon a concentration of 0.1 ppm.
12. At 0.3 ppm, the transmitter shall send a dry contact output to shutdown the ozone generators (hardwired to generator control panel).
13. At 0.3 ppm, the transmitter shall send a dry contact output to activate the alarm light(s) (provided by the installing contractor) located outside the equipment rooms.
14. Calibration of the analyzers without causing an ozone system shutdown.
15. Each analyzer system shall be provided with all required mounting hardware. Mounting and installation hardware shall be AISI Type 316L stainless steel or other material approved by the analyzer system manufacturer.
16. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. Length of cable shall be a minimum of 30 feet or as indicated on the drawings.
17. Each analyzer system requiring periodic field calibration shall be provided with a suitable gas calibration kit and sample gases. The kit shall contain all necessary fittings, gauges, regulators, and hoses required to properly connect calibration gas canisters to the analyzer system.
18. The analyzers shall be powered by 120 VAC, 60 Hz.

#### C. AMBIENT OXYGEN ANALYZER

1. OSS shall supply one (1) ambient oxygen analyzers and one (1) ozone off-gas analyzer. Ozone analyzer systems shall be utilized for the following services:
  - a. Ambient oxygen detection system - ozone generator room.
2. Integral zero gas and sample gas controls shall be provided.
3. Each sensor shall be suitable for oxygen detection over a range suitable for room occupancy.
4. The transmitter electronics shall be microprocessor based and shall be integrally mounted with the sensor system in a NEMA Type 4X, wall mounted enclosure.
5. The transmitter shall be provided with an integral 3-1/2 digit LCD indicator.
6. The transmitter electronics shall accept the signal input from the sensor system and produce an isolated 4-20mA dc signal linearly proportional to the measured oxygen concentration. Transmitter shall communicate directly with the Ozone System control panel.
7. At oxygen concentration outside of acceptable range, the transmitter shall send a dry contact output to shutdown the ozone generators (hardwired to generator control panel).
8. Each analyzer system shall be provided with all required mounting hardware. Mounting and installation hardware shall be AISI Type 316L stainless steel or other material approved by the analyzer system manufacturer.
9. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. Length of cable shall be a minimum of 30 feet or as indicated on the drawings.
10. Each analyzer system requiring periodic field calibration shall be provided with a suitable gas calibration kit and sample gases. The kit shall contain all necessary fittings, gauges, regulators, and hoses required to properly connect calibration gas canisters to the analyzer system.
11. The analyzers shall be loop powered.

#### D. HIGH CONCENTRATION OZONE ANALYZERS

1. High concentration ozone analyzer systems shall be utilized for the following services:

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- a. Ozone feed-gas analyzer system (ozone generator outlet).
  2. The analyzer sensing element shall be built of ozone resistant materials and shall utilize UV absorption methods and the Beer-Lambert law to determine ozone concentrations in air.
  3. The sensor shall consist of a UV light source and sample chamber.
  4. Integral zero gas and sample gas controls shall be provided. An integral ozone destruct chamber shall be provided on the sample discharge tubing.
  5. The transmitter electronics shall be microprocessor based and shall be integrally mounted with the sensor system in a NEMA Type 4X enclosure. High concentration ozone analyzer shall be integral to the ozone generation system or wall-mounted nearby the ozone generator system.
  6. The transmitter electronics shall accept the signal input from the sensor system and produce an isolated 4-20mA dc signal linearly proportional to the measured ozone concentration.
  7. Transmitter output shall be automatically temperature compensated.
  8. The transmitter shall also be provided with a serial output for instrument diagnostics and process monitoring.
  9. The transmitter shall be provided with an integral 3-1/2-digit LCD indicator, calibrated in percent ozone by weight.
  10. Each analyzer system shall be provided with all required mounting hardware. Mounting and installation hardware shall be AISI Type 316L stainless steel or other material approved by the analyzer system manufacturer.
  11. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. Length of cable shall be a minimum of 30 feet or as indicated on the drawings.
  12. Each analyzer system requiring periodic field calibration shall be provided with a suitable gas calibration kit and sample gases. The kit shall contain all necessary fittings, gauges, regulators, and hoses required to properly connect calibration gas canisters to the analyzer system.
  13. The analyzer shall be powered by 120 VAC, 60 Hz or 24VDC, with power supply and wiring to the device to be coordinated and provided by the ozone generator system supplier.
- E. DISSOLVED OZONE ANALYZER
1. General.
    - a. Furnish and install (2) ozone analyzers to continuously measure dissolved ozone residual, as indicated on drawings and in the specifications. Dissolved ozone analyzer shall be pre-assembled on a panel with isolation ball valves for ozone sample points, strainer, and associated pipe fittings. All materials in contact with ozone or ozonated water shall be 316 stainless steel or PTFE.
    - b. Range: 0-50 mg/l ozone.
    - c. Sample Temp Range: 35-80° F.
    - d. Accuracy:  $\pm 2\%$  of reading.
    - e. Temperature Compensation: Automatic from 32 to 122° F.
    - f. Sensor to Analyzer Distance: 30 feet maximum.
    - g. Power Requirement: 120 VAC, 60 Hz.
    - h. Provide 4 to 20 mA output proportional to ozone residual. This signal shall be capable of automatic control/setpoint of the ozone generator. Ozone analyzer shall communicate with Ozone System control panel. PID logic control of this signal shall be included as an internal function of the ozone generator PLC.
    - i. Enclosure: NEMA 4X.
    - j. Sensor Membrane Assembly: membrane-covered amperometric monitor, with 316 stainless steel membrane holding ring.
    - k. Sensor Protection Rap Assembly: Tefzel washers, stainless steel grill, Dacron mesh, and silicon washer.
    - l. Display: Graphic LCD display with backlighting.
    - m. Function Modes:

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- 1) Control: Settings for high/low phasing, setpoint, deadband, overfeed timer, off delay, and on delay.
- 2) Alarm: Settings for low alarm pt., low alarm pt. deadband, high alarm pt., high alarm pt. deadband, off delay, and on delay.
- 3) Status: Not configurable; relay only activates when a sensor or analyzer "fail" diagnostic WARNING condition exists.
- 4) Timer: Relay is activated by user-entered interval and time duration values.

## 2.04 OZONE GENERATORS AND POWER SUPPLY UNITS

### A. DESCRIPTION

1. Provide one (1) high efficiency ozone generator suitable for continuous operation in municipal water applications with power supply unit(s) (PSU), controls, and local control panels.
2. Instrumentation and controls. Conduit and wire between the generator, the PSU, and their component parts including instrumentation and control system and status wiring and instrumentation power wiring.

### B. GENERAL DESIGN

1. Ozone generation unit shall be of modular dielectric barrier discharge type design which shall be comprised of an ozone generator enclosure which contains multiple fully independent ozone generator modules.
2. Ozone generator shall be a water-cooled fitted with necessary valves, piping, equipment, controls, panels, etc. as needed for the prescribed cooling water system configuration. Cooling system furnished shall be closed-loop and designed by ozone system supplier.
3. Electrical power to the ozone generator shall consist of one 480 volt, three-phase, 60 Hz feeder circuit from the plant electrical distribution system. The ozone generator shall be equipped with a main disconnect and overcurrent device.
4. The ozone generator electrical equipment shall be designed in such a way that the power factor shall not be less than 0.95 from 50%-100% of design production rate.
5. The ozone generators and associated power package shall be designed to provide a 3 phase balanced electrical load.

### C. OZONE GENERATOR

1. Ozone Generator Rated Capacity:
  - a. Maximum Unit Capacity: 19 lb/day @ 10% by weight
  - b. Design Capacity: 14.4 lb/day @ 10% by weight with 1 module out-of-service.
2. Maximum Oxygen Flow Rate at rated capacity, scfh: 84.4.
3. Concentration at rated and average capacities, percent by weight: 10.
4. Maximum Generator Power Consumption, KWH: 7.2.
5. Minimum Ozone Generator working pressure, gas side, psig: 15.
6. Maximum Ozone Pressure Drop Across Generator at Maximum Flow, psig: 15.
7. Maximum Cooling Water Temperature, °F: 80.
8. Maximum Cooling Water Temperature Rise, °F: 10.
9. Maximum Cooling Water Flow Per Generator and PSU pair, gpm: 25.
10. Maximum Cooling water inlet pressure, psig: 35.
11. All ozone generator metal parts which come in contact with ozone or cooling water shall be constructed of Type 316L stainless steel or anodized aluminum.
12. Each ozone generator shell shall be provided with an AISI Type 316 stainless steel, ASME Code stamped safety valve with ozone-resistant gasket material, with a capacity as required to provide thermal relief protection for the shell side of the generator due to a condition where the cooling water inlet and outlet valves are closed and the generator is operating at maximum applied power.
13. Overpressure protection for the ozone generator shall be provided by a separate safety valve located on the generator.



14. Ozone generation system shall have a vent with stainless steel ball valve for depressurizing and purging the ozone generator prior to maintenance. The vent shall be provided with a lock to prevent vent gas from being accidentally opened during normal operation.
15. Each generator shall be capable of varying the ozone output from a nominal 10 to 100 percent of the rated capacity.

D. COOLING WATER SYSTEM

1. Cooling water system shall consist of a chiller, interconnecting piping connections to and from the cooling water system, and insulation of all interconnecting piping.
2. The OSS shall be responsible for the design of the cooling water system serving the ozone generator and power supply units for proper heat dissipation.
3. The system shall consist of an air-cooled closed loop cooling water system serving the OSS supplied equipment with heat rejection.
4. The closed loop cooling water shall be plant finished water at a maximum temperature of 50°F with ambient air temperature of 100°F.
5. Controls: Cooling water system shall include a local control panel to communicate with Ozone System control panel.

E. POWER SUPPLY UNITS

1. Electrical power supply units (PSU) shall be furnished for each ozone generator module, containing all electrical and control components needed to supply each individual module.
2. The power supply unit design and components shall provide for complete operation of the ozone generating module.
3. All necessary high-voltage wiring and protection devices shall be furnished and installed in the package.
4. All components designed to limit surface temperature to a maximum of 120° F when the ozone generator is operating at rated power capacity.
5. All power supply units shall be housed in a single sound and environmentally enclosed cabinet.
6. Ozone generation cooling equipment shall be designed to dissipate heat Generated from the power supply units.
7. Internal Protective Devices. The PSUs shall be provided with appropriate protection against damage to the PSUs and generator under reasonably foreseeable events and shall include, as a minimum:
  - a. An automatic current limitation device to limit the current controlled by the PSU under any operating condition, including surge or short circuit condition, to the maximum combined design current of the PSU and generator.
  - b. An automatic ramp-up control limiting the speed of rate of change from one power setting to another.
  - c. Overvoltage protection of the rectifier and inverter.
  - d. Overvoltage protection at the generator, at the smoothing capacitor and at the low voltage resonant circuit capacitor (if applicable).
  - e. Overcurrent protection.
  - f. Automatic shutdown on high temperature in the incoming isolation and high voltage transformers.
  - g. Fail-safe control circuits to maintain last control settings upon failure of control logic.
  - h. A safety interlock shall be provided on the power supply cabinet to prevent ozone generator operation while the power supply door is open.
  - i. The use of a parallel-type inverter will be acceptable. Appropriate internal protection devices, comparable to those specified above, shall be provided to ensure the specified protection.
8. Voltage Distortion Protection and Line Notching. Each PSU shall be designed and provided with all necessary equipment to protect the PSU and the power system ahead of the PSU from voltage distortion and line notching.

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9. Each PSU shall be designed to operate from a power bus that may contain up to 5 percent voltage distortion and 22,800 volt microsecond line notches as defined by IEEE Standard 519.

F. CONTROL SYSTEM & INSTRUMENTS

1. Refer to Division 25 specification section for schedule of instruments that are under the OSS scope of supply. Division 25 also includes basis of design for control system components.
2. The ozone generator shall utilize a state-of-the-art PLC program to allow for safe and efficient operation. The ozone system control panel shall coordinate sequence and control of the ozone generator and related systems. The ozone system control panel shall communicate with main WTP control system.
3. The ozone system master control panel shall perform as the master control panel for the entire ozone system, monitoring, controlling and interfacing with all other local control panels of the equipment specified in this section.
4. The OSS shall employ trained individuals experienced in the proper application and programming of PLC systems, and program control logic.
5. Programmers shall be available for program additions or changes if required by the design engineer.
6. The program shall be factory tested and demonstrated prior to delivery of equipment.
7. Generator shall utilize Allen-Bradley CompactLogix PLC's and Allen Bradley operator interface (touch screen PanelView Plus 15" minimum size) control panels.
8. The PLC control system shall be capable of interfacing with ozone related instruments.
9. The programmable controller shall be provided with the necessary communication cards and hardware such that it is capable of allowing remote display of all generator functions within the plant main control system (specified in Section 25 9100).
10. The ozone generator shall include, as standard equipment, the capability to be operated locally by the operator, or, controlled remotely via communication to increase or decrease (generator) power and proportion ozone output.
11. The ozone generator shall be furnished with a local control panel utilizing a programmable, touch-pad screen such as an Allen-Bradley Panelview.
12. The control panel shall be built and assembled to UL 508A standards and bear the UL 508A Industrial Control Panel label. The panel shall be assembled directly by the ozone system supplier.
  - a. Enclosure: NEMA 12 or IP44.
13. All control wiring and equipment is to be designed to be shielded or separated from the high voltage equipment.
14. Ozone control system shall monitor ozone room ventilation system. Ventilation system is specified to include current threshold relays and shall output a control signal to the ozone control system. Upon ventilation system failure, ozone control system shall shut down the ozone generator and related systems such as the air compressor and oxygen generator.
15. Alarm beacons shall be included in OSS scope of supply. Alarm beacons shall be connected to Ozone System control panel. Control panel shall illuminate based on alarm conditions.
16. The ozone system control panel shall be able to display, as a minimum, the following:
  - a. Power on.
  - b. Local/Off/Remote display switch.
  - c. Automatic (remote) operation indication.
  - d. Feed gas flow indicator, and low flow alarm with automatic shutdown.
  - e. Feed gas pressure indicator and low flow alarm with automatic shutdown.
  - f. Cooling water no-flow, or low-flow alarm with automatic shutdown.
  - g. Inlet cooling water temperature indicator.
  - h. Cooling water discharge temperature indicator.
  - i. Ozone output indicator (in ppday) and transmitter.
  - j. Alarm with automatic shutdown if high voltage panel door (of the generator) is opened.
  - k. Manual control for ozone production (power).



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- I. Instantaneous power indication in kW.
17. All indicators and data that is provided on the Ozone System Control Panel shall be provided via communication to the main plant control system for remote control/indication.
  - a. Power (ozone generation) On/Off indication.

## **2.05 OZONE DISSOLUTION SYSTEM – MASS TRANSFER SKID**

### **A. DESCRIPTION**

1. The OSS shall provide a skid-mounted mass transfer injection system. All equipment shall be factory mounted and factory assembled on the skid.
2. The ozone dissolution system will consist of an injector to introduce the ozone gas into a gas/liquid mixture that a side stream of the main flow and is jetted back into the main flow.
3. The ozone injector uses the side stream water to create a vacuum for the ozone gas.
4. The injector will form a gas/liquid mixture with tiny gas bubbles to transfer the ozone from the gas to liquid phase.
5. The gas/liquid mixture will then be injected back into the main flow using specially designed nozzles to ensure a complete mixing of the highly concentrated sidestream and the main flow.

### **B. OZONE INJECTORS**

1. The Ozone System Supplier (OSS) shall furnish the side stream venturi injectors for the ozone gas dissolution system installed integral to the Mass Transfer Skid. The venturi injection shall be selected by the OSS as required to meet the design and operations parameters of this application.
2. Furnish two (2) injectors:
  - a. Low-flow injector: Designed for low range WTP flows, minimum WTP flow of 150 gpm
  - b. High-flow injector: Designed for high range WTP flow of up to 500 gpm, with typical flow of 400 gpm.
  - c. OSS shall supply control valves at mass transfer system to be controlled by ozone control panel. Control valves shall be open/close service to select low-flow or high-flow injector based on WTP flow.
3. The injectors shall employ longitudinally angled vanes in the inlet area that impart a radial mixing component and straight vanes in the discharge to increase mixing.
4. Each ozone injector shall be followed by ozone flash reactor to further increase ozone dissolution.
5. The pressure to the inlet of the injector will be provided by the distribution system static pressure which will provide treated water at 70 psig minimum to the injector.
6. The maximum gas flow per injector shall be determined assuming one injector is in service for each contacting point for oxygen fed ozone production.
7. In all cases the ozone gas pressure from the generator will be available at a pressure of 15 psig or higher at the upstream side of a pressure sustaining valve, and the maximum gas flow from the operating conditions listed in this section. Ozone system supplier shall provide pressure sustaining valve.
8. Each injector shall be supplied with a single component check valve assembly that shall have a standard a stainless-steel check valve and ball valve. This component shall be installed on the gas inlet of each injector.
9. The locations of the mass transfer skid, side stream injectors, and the serpentine contact basin are shown on the drawings. Venturi injector shall be manufactured from 316L stainless steel.
10. Manufacturers:
  - a. Mazzei Injector Corporation, Bakersfield, CA.
  - b. Engineer approved equivalent.

### **C. BOOSTER PUMP**

1. The booster pump shall be sized and selected by the OSS as required to meet the design and operational parameters outlined within this specification.

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2. All wetted components shall be manufactured from 316L stainless steel.
  3. The booster pump shall be supplied with ANSI Class 150 flanges.
  4. The booster pump shall be factory wired to a disconnect switch local to the pump skid.
  5. The booster pump shall be manufactured by Grundfos, or engineer approved equal. Booster pump basis of design is 5 HP and controlled by a VFD.
- D. PIPELINE FLASH REACTOR (PFR)
1. The PFR shall be constructed of 316L stainless steel.
  2. The PFR shall be flanged at both ends. Flanges shall be ANSI Class 150.
  3. The PFR shall be shipped loose and installed by the installation contractor.
- E. NOZZLES AND OZONE INJECTION PIPING
1. Each injector that is in service will operate two nozzles which will discharge the ozone gas/side stream water mixture back into the main line at high velocity in order to achieve thorough mixing with the main stream.
  2. Ozone System Supplier shall provide stainless steel spool pipe with (4) ozone solution injectors for mixing ozone side stream with the main plant flow before the ozone contact basin.
  3. Injection pipe shall be provided by OSS and installed by installing contractor.

## 2.06 OZONE DESTRUCTION SYSTEM

### A. DESCRIPTION

1. Ozone off gas thermal catalytic destruction units, local control panels and associated appurtenances.
2. Each unit shall be skid mounted, including preheater, catalyst chamber, off gas blower, control panel, all piping, valves, fittings, instruments, wiring, and accessories as specified or otherwise required.

### B. GENERAL DESIGN

1. Each off-gas ozone destruction unit shall consist of one electric resistance heater, catalyst trays and containment vessel, and one centrifugal blower.
2. The blower shall draw the off-gases from the contactor through the mist eliminator pad, heating chamber and catalyst trays before passing through the blower and being exhausted to the atmosphere via the vent gas stack.

### C. OZONE DESTRUCTION UNITS

1. Each ozone destruction unit shall have the design capacity to reduce the ozone concentration of the off-gas to less than 0.08 parts per million by volume from zero flow to the design maximum off gas flow rate.
2. Normal operation is defined as an off-gas flow rate equal to the design maximum off-gas flow rate and an average off-gas ozone concentration of 1 percent by weight.
  - a. A constant preset vacuum will be maintained in the ozone contactor basin.
  - b. If the vacuum in the off-gas collection piping at the destruct unit reaches a pre-determined set-point, an automatic pressure relief valve will open to allow ambient air to enter the off-gas piping.
  - c. A pressure (vacuum) monitor shall be provided for the off-gas piping from each contactor.
3. Each ozone off-gas destruction catalyst units shall have a design rating to satisfy the following conditions:
  - a. Maximum Off-Gas Flow Rate, scfm: 15
  - b. Maximum Pressure Drop Through Catalyst Bed, mm. of WC: 305.
  - c. Off-Gas Relative Humidity, percent: 100.
  - d. Off-Gas Inlet Temperature, degrees F:
    - 1) Maximum: 80.
    - 2) Minimum: 35.
  - e. Preheating Unit Outlet Temperature (min) degrees F Above Inlet Temperature: 30.

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- f. Catalyst Chamber Minimum Face Velocity, m/sec.: 0.305.
  - g. Catalyst Chamber Minimum Empty Bed Contact Time, seconds: 0.75.
  - h. Maximum Internal Pressure, kPa: 6.9.
  - i. Maximum Internal Vacuum, in. WC: 25.
- 4. Electric Heaters.
  - a. Gas tight electric resistance gas heater constructed of Type 316L stainless steel with non asbestos synthetic gaskets to resist the inlet moist ozone oxygen off-gas.
  - b. Design capacity to increase the temperature of the incoming off-gas over the full flow and temperature range as specified to a minimum of 30 degrees Fahrenheit above the inlet temperature.
  - c. The heating elements shall be low density type .
  - d. Gas tight design to prevent leakage of gas into terminal housing.
  - e. Specifically designed for use with moist ozone-in-oxygen gas.
  - f. Each heater shall incorporate a thermocouple welded to the element sheath surface and wired to a terminal block for overheating protection.
- 5. Destruction Unit Construction.
  - a. Catalytic destruction units shall be designed and installed to prevent any ozone gas from bypassing the catalyst bed.
  - b. The catalyst containment vessel, ductwork or piping, and other metallic components shall be AISI Type 316L stainless steel.
  - c. Gaskets and seals shall be ozone, oxygen, and heat resistant.
  - d. The containment vessels shall be designed and fabricated to withstand the maximum internal pressure and vacuum to which they may be exposed under any operating condition.
  - e. The vessel shall be designed for easy inspection and changeout of the catalyst, by incorporating catalyst trays, or a removable access panel in addition to fill and drain ports.
  - f. The unit shall be designed for catalyst changeout without disassembling piping or other components.
  - g. The catalyst shall be non hazardous manganese dioxide based material suitable for catalytic ozone destruction at 55.04 degrees Fahrenheit.
  - h. The low point on the inlet piping on the skid upstream of the containment vessel shall be tapped and provided with an automatic drain trap. All wetted components of the drain trap shall be constructed of materials suitable for use with ozone and oxygen gas.
  - i. Each ozone destruction unit shall be equipped with an integrally mounted panel or the following values shall be reported on the control panel HMI. The panel shall monitor the following parameters:
    - 1) Inlet off-gas temperature.
    - 2) Heated off-gas temperature.
    - 3) Catalytic unit differential pressure.
- D. OZONE DESTRUCTION CONTROL PANEL
  - 1. Each ozone destruction unit and blower shall be provided with one Ozone Destruction Control Panels (ODCP).
  - 2. The ODOP shall include all control and protective devices and functions as recommended by the equipment manufacturer for a complete and operational system.
  - 3. Interior of panel shall be equipped with strip heater.
  - 4. Each ODOP shall be provided with the face panel mounted devices with the following devices:
    - a. Control power "ON/OFF" selector switch.
    - b. Destruction unit outlet temperature indicating controller.
    - c. Off-gas blower elapsed run time meter.
    - d. Main panel circuit breaker disconnect.
    - e. Common control power transformer with primary and secondary fusing.

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- f. Power controllers with circuit breaker type input power protection (one for each heater).
- g. Local alarm annunciator through indicating lights or alarm messages on the panel.

## **2.07 PRESSURE SWING ABSORPTION OXYGEN GENERATION SYSTEM**

### **A. DESCRIPTION**

1. The equipment furnished by the Ozone System Supplier (OSS) shall include, but not be limited to, the following:
  - a. A PSA train consisting of one air compressor with refrigerated dryer and appurtenances, one set of adsorbent vessels equipped with automatic switching valves, one oxygen surge tank, and one process controller with local control panel.
  - b. All instrumentation and controls required for a complete and operable system.
  - c. All vessel support structures, valves.
  - d. Motor control equipment and power monitors for all PSA equipment.
2. The PSA system shall separate oxygen from air, and the oxygen will be used as supply gas to the ozone generators. System suction will be from outside air. The PSA system will supply the total oxygen requirement throughout the year.

### **B. DESIGN REQUIREMENTS**

1. The PSA equipment shall be designed for the following operating conditions:
  - a. Ambient temperature, °F.
    - 1) Maximum: 115.
    - 2) Minimum: -30.
    - 3) Maximum relative humidity at maximum ambient temperature, percent: 90.
  - b. Dew point, deg F: -100.
  - c. Installed elevation above mean sea level, ft: 1,398.
  - d. Rated system capacity, scfh of oxygen: as needed to meet maximum ozone generation capacity requirement.
  - e. Minimum oxygen concentration, percent: 93.
  - f. System turndown capacity, percent of rated capacity: 10.
  - g. Minimum pressure at system outlet, psi gauge: 45.
  - h. Maximum temperature at system outlet, deg F: 100.
2. The PSA system shall be sized by the OSS to supply clean, dry, oil-free gaseous oxygen over the specified production range to satisfy the specified requirements of the ozone equipment at the minimum specified pressure. The PSA system shall be designed for automatic operation utilizing a two bed system with both pressure equalization and gas purging to meet the oxygen flow requirements of the ozone generator which it serves.
3. The product gas from the PSA system shall meet the specified quality requirements at the specified minimum pressure as measured at the outlet from the oxygen system.
4. The PSA system shall be provided with a pressure reducing valve station to regulate the oxygen supply pressure to the ozone generators. The PSA system shall operate automatically to maintain a steady oxygen delivery to the ozone generators.

### **C. AIR COMPRESSOR AND REFRIGERATED DRYER**

1. General.
  - a. Each compressed air system shall include an inlet air filter, compressor, motor, V-belt drive, cooling system, refrigerated dryer, controls, control panel, sound enclosure, base, valves, piping, and unloading system.
  - b. Compressor shall be rotary screw compressor type.
  - c. Bearings shall be regreasable.
  - d. The compressor housing shall be cast iron.
  - e. Air seals shall be self adjusting carbon type.
  - f. Oil seals shall be labyrinth type designed to induce an air flow through the seal toward the bearings.
  - g. The area between the air seals and oil seals shall be vented to atmosphere.

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- h. Rotors and housings shall be precision machined for accurate bearing positioning and running clearances.
- i. Rotors and shafts shall be one piece stainless steel and shall be dynamically balanced.
- j. Manufacturer: Compressor shall be Kaeser Compressors, Inc. or Engineer Approved Equal.
  - 1) Basis of design: Kaeser model SK
  - 2) Operating pressure: 125 psi
  - 3) As required to meet the ozone generation system, maximum power: 15 - HP
  - 4) 480V / 3ph / 60 Hz
- 2. Air filter assembly
  - a. Air filter assembly shall be mounted together in a single panel configuration with 1.0-micron filter, 0.01-micron filter, and 0.01-micron vapor adsorbing filter.
  - b. Two filter systems shall be provided, lead / standby.
  - c. The following valves shall be provided:
    - 1) Inlet isolation valve (each system).
    - 2) Outlet isolation valve (each system).
- 3. Air receiver tank:
  - a. The specification for the feed air volume is 71 Standard Cubic Feet per Minute (SCFM) on average, and requires that it be available from an Air Storage Tank, located immediately before the Oxygen Generator, with a minimum storage capacity of 100 gallons.
  - b. Receiver tank shall have the following:
    - 1) Inlet isolation ball valve.
    - 2) Outlet isolation ball valve.
    - 3) Manual bleed ball valve.
    - 4) Pressure safety relief valve.
    - 5) Automatic condensate drain valve.
    - 6) Pressure gauge.
- 4. Control Equipment.
  - a. All control equipment for each air compressor module shall be furnished as required for a complete installation.
  - b. Include a control panel containing all control switches, circuits breaker combination magnetic motor starters, and other accessories required for control of the compressor and refrigerated dryer.
  - c. All control equipment for the compressor module shall be housed in a control panel mounted on the compressor module package.
  - d. All system wiring shall be shop installed to terminal blocks in the control panel. All field connections shall be made to the fittings at the panel.
  - e. Each compressor shall be furnished with a control system to automatically maintain receiver air pressure within preset limits.
  - f. Each compressor shall be provided with a "Hand-Off-Auto" selector switch or equivalent controls within the solid state compressor controller.
  - g. Capacity shall be controlled automatically to maintain a constant receiver pressure equal to the operating unit's stop pressure.
  - h. In the "Auto" position, the system shall operate in the "Load/No-load" mode as controlled by receiver pressure.
  - i. After the compressor has operated in the "No-load" mode for 15 continuous minutes, it shall be automatically stopped. The time period for unloaded operation shall be adjustable from 5 minutes to at least 30 minutes.
  - j. A protection control system shall be provided to stop the compressor on abnormal running conditions as determined by the manufacturer.

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- k. Additional equipment installed in or on the control panel shall include module discharge air temperature indicator, module discharge air pressure indicator, and a service indicator gauges for the inlet air filter.
  - l. Indicators shall be provided on the control panel and clearly identified to indicate the following alarm conditions:
    - 1) Motor overload.
    - 2) High discharge air temperature.
    - 3) Low discharge or receiver pressure.
  - m. A common "Reset" shall be provided so the alarm indicators are displayed until manually reset. Controls shall be designed to allow testing of the alarm indicators without actuating the remote alarm.
  - n. Two normally open contacts which close under alarm conditions shall be provided for each compressor for remote alarm. Both contacts shall close when any alarm occurs for the compressor. Contacts shall be rated 10 amperes at 120 volts, 60 Hz, single phase.
  - o. Each compressor shall be provided with an elapsed time hour indicator, which cannot be reset, located on the front of the control panel.
  - p. Electrical power to the compressor and refrigeration dryer shall each consist of a 460 volt, three-phase, 60 Hz feeder circuit from the plant electrical distribution system. The compressor and the refrigeration dryer each shall have a main disconnect and overcurrent device.
- D. PSA ABSORBENT VESSEL AND OXYGEN SURGE TANK SYSTEM
  - 1. General.
    - a. The PSA vessel system shall consist of adsorbent vessels, oxygen surge tank, vessel switching valves, vessel interconnecting piping, vessel supporting structure, pipe supports, instrumentation, and controls.
    - b. Adsorbent containing vessels shall be supplied for the PSA system. Each vessel shall be supplied with sufficient adsorptive materials to generate the required oxygen production, purity, and dewpoint.
  - 2. Design Requirements.
    - a. Each PSA vessel system shall include automatic process valves and instrumentation for control and monitoring of the oxygen separation process.
    - b. Single or multiple component adsorbents are acceptable with silica gel or alumina for water adsorption and molecular sieve for air separation.
    - c. Sufficient adsorbent material to effect the required oxygen production shall be provided.
    - d. Adsorbent vessels shall be loaded with adsorptive material in the factory.
    - e. Each vessel shall include a service port located near the top to permit access for loading and unloading adsorptive material.
  - 3. Control Equipment.
    - a. All instruments and controls for the PSA equipment shall be routed to the PSA equipment control panel or the ozone system master control panel.
    - b. The ozone system control panel shall have the following readouts as a minimum:
      - 1) Volumetric percent oxygen purity.
      - 2) Oxygen flow.
      - 3) Oxygen temperature.
      - 4) Oxygen pressure.
    - c. A pushbutton for emergency shutdown of the entire PSA train, regardless of positions of the local/remote hand switches, shall be provided.
    - d. The system shall be powered by a single 120 VAC , 60 Hz feeder circuit. Provide a main disconnect and overcurrent device.
- E. PSA SYSTEM ACCESSORIES
  - 1. Duplex coalescing prefilter.
    - a. Capable of removing 100 percent of all aerosols 0.75 micron and larger and 100 percent of 0.3 micron and larger particles.



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- b. An automatic float drain with valve shall be included.
  - c. Provide with isolation valves, bypass valve, and changeout indicators.
- 2. Duplex particulate filter.
  - a. Capable of removing 100 percent of 1 micron and larger particles.
  - b. An automatic float drain with valve shall be included.
  - c. Provide with isolation valves, bypass valve, and changeout indicators.
- 3. Vent silencer.
  - a. A purge air vent line silencer shall be provided to limit sound pressure levels to 85 dBA at 1.09 yard in any direction in a free field under all conditions.
- 4. Oxygen receiver tank:
  - a. Oxygen receiver tank minimum storage capacity of 60 gallons.
  - b. Receiver tank shall have the following:
    - 1) Inlet isolation ball valve.
    - 2) Outlet isolation ball valve.
    - 3) Manual bleed ball valve.
    - 4) Pressure safety relief valve.
    - 5) Automatic condensate drain valve.
    - 6) Pressure gauge.
- 5. Pressure gauges.
  - a. Pressure gauges for the PSA system, including those for oxygen and air shall be provided by the OSS.
  - b. AISI Type 316 stainless steel movement and stainless steel case.
  - c. AISI Type 316 stainless steel snubber adapter, and a shutoff valve.
  - d. Dial shall be 4.53 inch diameter minimum, white with black numerals.
  - e. Accuracy shall be plus or minus 1 percent.
  - f. The range shall extend to 150 percent of the normal pipe or vessel operating pressure.
  - g. Gauges shall be pulsation dampened and shock resistant, and suitable for oxygen service at the working temperature range.

#### F. OZONE PIPING

- 1. All piping for conveyance of oxygen and ozone shall be stainless steel pipe, pipe fittings, and tubing.
- 2. Oxygen service: ASTM A312 or ASTM A778, longitudinal seamed; Grade TP304L for all interior gaseous oxygen piping and f. Grade TP316L for all other services.
- 3. Ozone service: ASTM A312 or ASTM A778, longitudinal seamed; Grade TP316L for all ozone service piping and fittings.
- 4. Fittings:
  - a. Buttwelding: ASTM A774, wrought stainless steel, Grade TP304L or TP316L to match pipe; with beveled ends and Schedule 10S wall thickness.
  - b. Flanged: ASTM A774, wrought stainless steel, Grade TP304L or TP316L to match pipe, with angle face rings and stainless steel backing flanges.
- 5. Backing Flanges: AISI Type 304 or 316 stainless steel plate, with ANSI/ASME B16.5, Class 150 diameter and drilling; with the following thickness:
- 6. Flange Bolts: ASTM A193, AISI Type 304, ANSI B18.2.1. heavy hex head, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.
- 7. Nuts: ASTM/ASME A194, AISI Type 304, ANSI/ASME B18.2.2. heavy hex pattern.
- 8. Flange Gaskets
  - a. Raised Face Flanges: Flexitalic "Style CG I", spiral wound, AISI Type 304 stainless steel, PTFE filler, 3/16 inch nominal thickness, with 304 stainless steel inner and outer compression rings 1/8 inch thick to match required flange dimensions. Durable Durion "Style 9000" with PTFE filled 1/6" thick, Garlock Gylon "Style 3503" 1/16" thick.
  - b. Flat Face Flanges: Ring type, 1/8 inch thick, of TFE sheets; John Crane "Style 68C" TFE sheet packing; or 1/8 inch silicone rubber, DuPont Fairprene No. 555570, or Viton No. 10,000 B15 with 70+ Shore A hardness.

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9. 3-1. LENGTH TOLERANCE. Standard and special sections shall be within 1/8 inch (plus or minus) of the specified or theoretical lengths. All pipe to be connected with mechanical couplings shall be fabricated so that space between pipe ends within the couplings will not exceed the allowable as recommended by the coupling manufacturer but will be at least 1/8 inch.
  10. FIELD JOINTS. Unless otherwise required, skid or cabinet connections to field piping shall be welded or flanged.
    - a. Flanged joints shall be provided at all connections to valves, equipment, and specialties.
  11. FLANGED JOINTS. Blind flanges shall conform in diameter, drilling, and thickness to the flanges to which they attach and shall be reinforced as required to produce an airtight joint.
  12. THREADED JOINTS. Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be full and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed, after threading and before assembly, to remove all burrs.
    - a. Threaded joints shall be made up with Teflon threaded tape applied to all male threads.
  13. WELDED JOINTS. All welds shall be sound and free from embedded scale or slag, shall have tensile strength across the weld not less than that of the thinner of the connected sections, and shall be airtight. Butt welds shall be used for all welded joints in line pipe assemblies.
    - a. All welding shall be in accordance with the "Chemical Plant and Petroleum Refinery Piping Code", ANSI B31.3.
    - b. Welders for all skid-mounted piping shall be qualified per ASME Code Section IX for welding carbon steel and stainless steel piping, positions 2G and 5G. All welders will be required to current qualification papers.
    - c. The Engineer shall have the right to perform any additional inspection of shop or field welds, at no additional cost to the OSS, provided the welds pass the inspection. The OSS shall repair all OSS welds that fail inspection and burden the cost of retesting of any failed welds.
  14. SMALL BRANCH CONNECTIONS. Branch connections smaller than 50 mm shall be made using welding fittings with threaded outlets. Where there is some doubt as to the exact outlet size desired, but it is known that the size will be less than 1 inch, a 1 inch outlet shall be provided and reducers used as required.
    - a. Branch connections 50 mm and larger shall be made using pipe nipples or with welding fittings. Pipe nipples and welding fittings shall be welded to the pipe shell and reinforced as required to meet design and test requirements.
    - b. Small branch connections shall be located so as not to interfere with joints, supports, or other details.
  15. PICKLING. After shop fabrication, all stainless steel pipe, fittings, and appurtenances shall be completely immersed for a minimum of 15 minutes in a pickling solution of 6 percent nitric acid and 3 percent hydrofluoric acid at 60°C. Parts shall be free from iron particles or other foreign material. A complete neutralizing operation, by immersion in a continuous fresh water bath, shall be required after the pickling operation.
  16. INSULATION. All piping in the ozone and oxygen systems with an operating temperature of 60°C or greater shall be insulated in accordance with the mechanical insulation section. It shall be the responsibility of the OSS to determine all pipe in the ozone and oxygen systems meeting this criterion and to insulate all such pipe.
  17. CLEANING. All pipe to be used in ozone or oxygen service shall be furnished, cleaned, sealed, and protected as specified in the cleaning for oxygen service section.
- G. Ozone System Valves
1. BALL VALVES. Unless otherwise indicated or specified, all 2-inch and smaller shutoff valves shall be ball valves.



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2. Two inch and smaller ball valves for air and water service shall be of bronze or brass construction with two-piece end entry body, bronze or brass ball, teflon or Viton stem seal, reinforced teflon seats and thrust washer, a removable operating lever, and threaded ends. Each ball valve in gauge isolation service shall be furnished with a round handle. Valves shall be rated not less than 3450 kPa (500 psi) nonshock cold WOG and shall be driptight in both directions. Valves shall be Conbraco Industries "Apollo 70-100 Series", Powell "Fig 4210T", Stockham "S-216", AVCO, Inline Valve, GEMU, or engineer approved equal.
3. Two inch and smaller ball valves installed in stainless steel piping for ozone/oxygen service shall be of AISI Type 316 stainless steel construction with two-piece end entry body, stainless steel ball, teflon or Viton stem seal, reinforced teflon seats and thrust washer, a removable operating lever, and threaded ends. Each ball valve in gauge isolation service shall be furnished with a round handle. Valves shall be rated not less than 5515 kPa (800 psi) nonshock cold WOG and shall be driptight in both directions. Valves shall be Conbraco Industries "Apollo 76-100 Series", Neles-Jamesbury "Series 300", Nibco "580 Series", AVCO, Inline Valve, GEMU, or engineer approved equal.

## 2.08 SPARE PARTS

- A. Provide the following spare parts, at a minimum:

Sub-System	Component	Quantity
Ozone Generator	Ozone Generation Reactor	One (1) Module
Ozone Generator	Power Supply	One (1) Power Supply
Ozone Generator	Gas Flow Proportional Valve	One (1)
Ozone Generator	Temperature Sensor	One (1)
Ozone Generator	Pressure Sensor (Gas)	One (1)
Ozone Generator	Flow Sensor (Water)	One (1)
Compressed Air System	Filter Elements	One (1) set
Oxygen Generation System	Filter Elements	One (1) set
Ozone Destruct Unit	Heating Element	One (1)
Ozone Destruct Unit	Destruct Catalyst Media	One (1) set

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions and Section 46 0500, as indicated on drawings, by qualified craftsmen.
- B. Location, orientation, and quantities as indicated on Drawings.
- C. Include all required related items necessary for a complete installation.
- D. Coordinate for compatibility of manufacturer's shop coating and final finish.
- E. Support and anchor as indicated on drawings.
- F. Start upStart up in presence of manufacturer's service representative.
  1. Start up in presence of manufacturer's service representative.
  2. The OSS shall provide a qualified representative for startup services. Prior to arriving on-site, the installing contractor shall confirm the Ozone System is installed complete per manufacturer's requirements.
  3. Start up and commissioning shall test the full range of anticipated ozone set points and feed rates based on minimum and maximum plant flow capabilities.
  4. Startup and commissioning shall assume a start up period of five (5) days on-site. Costs for startup shall be included in the bid price of the contract.
  5. Startup documentation shall be submitted following start up activities. Refer to paragraph 1.04 Submittals.

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6. Startup services shall include operator training. A qualified representative shall train operator staff on-site following successful system startup. Training shall consist of two (2) eight-hour training for operation and maintenance of the equipment. Owner may record training.
- G. Leak testing.
  1. The oxygen generation system, ozone generators, ozone destruction units, off-gas blowers, and pumps shall be subjected to a leak test of both gas and water sides (as applicable) prior to shipment.
  2. Any leaks discovered during the test shall be repaired and the unit retested until there is no leakage.
- H. A field test report on each ozone generator and power supply unit, including a test data sheet and ozone production computations, shall be submitted to the Owner for acceptance at least 90 days prior to testing the equipment. After all equipment has been completely installed, each unit shall be tested by the OSS in the presence of the Owner as follows:
  1. Test each ozone generator and electrical power supply system under actual operating conditions, to determine that the operation is satisfactory and the power consumption and ozone production characteristics are completely developed. Three consecutive readings at each power loading or production level shall be taken and recorded at 15-minute intervals for each ozone generator, after steady-state ozone production conditions are attained. Standby equipment shall not be used when conducting the power consumption tests.
  2. For each generator the test data shall indicate, as a minimum, the time, oxygen flow rate, inlet oxygen pressure and temperature, ozone-in-oxygen concentration, ozone production, power consumption, power factor, cooling water flow rate, and cooling water inlet and outlet high temperatures.
  3. Prior to testing, the ozone generators shall be thoroughly cleaned and dried, including the inside of all pipes, valves, and fittings.
  4. Prior to testing, the ozone generators, all associated process and safety monitoring equipment and instrumentation, including ambient leak detection, process piping, dissolution system, contactors, and destruction system, shall be completed, tested and functional. Sufficient charges of ozone destruction catalyst shall be installed prior to testing to ensure the specified ozone destruction.
- I. After all equipment has been completely installed by the Installation contractor, each ozone destruction unit shall be tested in the presence of the Engineer as follows:
  1. Each ozone destruction system shall be tested under actual operating conditions, including minimum and maximum gas flow rates as specified without ozone being produced, and the actual ozone oxygen flow being produced when the plant is operational, to determine that the operation is satisfactory and the equipment, including heater, heating chamber, catalyst and blower, provide the specified ozone destruction, temperature differential, and maintain the specified negative pressure above the water level in the contactor.
  2. The test data shall indicate, as a minimum, the oxygen flow rate, contactor off-gas pressure and ozone concentration, inlet off-gas temperature, off-gas temperature in heating chamber, ozone concentration in vent gas exhaust from blowers, for the specified minimum and maximum oxygen flow rates. Readings shall be taken and recorded at 30 minute intervals over the duration of the test for the specified minimum and maximum flow rates. A minimum of four consecutive readings shall be taken and recorded for each unit.

**END OF SECTION 46 3153.04**

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