WATER TREATMENT PLANT IMPROVEMENTS
GREENFIELD MUNICIPAL UTILITIES
2026

BID DATE: Tuesday, November 3, 2026 - 2:00 p.m. CST

PLACE TO FILE FOR PROJECT BIDS: GMU Downtown Generation Plant
116 SE Jackson Street
Greenfield, IA 50849

ADDENDUM NO. 1

October 26, 2026

TO ALL PLANHOLDERS:

The following changes, 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. All Bidders submitting a Bid on the above Contract shall carefully read this Addendum and give it consideration in the preparation of their Bid.

This Addendum No. 1 consists of the following:

- Addendum No. 1 pages AD1-1 through AD1-9 (9 pages)
- Pre-bid Meeting Minutes, Attendees List, and Plan Holders List (6 pages)
- Attachment A – MIOX system proposal (23 pages)
- Specification Section 22 0610.01 – Valve Schedule Attachment (3 pages)
- Specification Section 31 6613 – Rammed Aggregate Piers (6 pages)
- Specification Section 25 3100 – Remote Instruments (13 pages)

PART I – CLARIFICATIONS

1. Pre-Bid Meeting Minutes, Attendees List, and Plan Holders List – See the attached pre-bid meeting minutes including associated attendees list and current plan holders list.

PART II – SPECIFICATIONS

2. Table of Contents – Add the following division:

   "DIVISION 31 – EARTHWORK
   31 6613 Rammed Aggregate Piers"

3. Table of Contents – Revise the following SUDAS Section references:

   Replace "Section 4020 and 4030" with "Section 4020, 4030, and 4060".

   Replace "Section 6010" with "Section 6010 and 6030".

4. Section 01 1000, paragraph 1.12.B – Revise the first sentence to read "The proposal in the Manufacturer's attachment following this section, as referenced in Section 46

0076, for the preselected equipment is for reference only and is not part of the Contract."

5. Section 01 1000 (paragraph 1.12) Attachment A – Replace Attachment A in its entirety with the updated attached Attachment A.

6. Section 07 4213.01, paragraph 2.01.B.4 – Replace paragraph 2.01.B.4 with the following:

   "4. MBCI – Superlok - https://www.mbci.com/products/superlok/"

7. Section 07 4213.02, paragraph 2.01.B – Add the following to paragraph 2.01.B:

   "5. MBCI – Empire Series: Concealed Fastening System - https://www.mbci.com/products/empire-series-architectural-wall-panels/"

8. Section 08 4313, paragraph 2.02.A – Add the following to paragraph 2.02.A:

   "3. Manko Window System, Inc."

9. Section 22 0523.15, paragraph 2.01 – Add the following to paragraph 2.01:

   "E. Valmatic."

10. Section 22 0610.01– Replace the valve schedule with the attached updated valve schedule identifying the following general changes:
    - GV-4821: Valve size revised to 8 in.
    - GV-4822: Valve size revised to 10 in.
    - BFV 4800: Valve size revised to 8 in.
    - BFV-4802: Valve size revised to 6 in.
    - BFV-4803: Valve size revised to 6 in.
    - BFV-4810: Valve size revised to 8 in
    - BFV-4812: Valve size revised to 6 in.
    - BFV-4813: Valve size revised to 6 in.
    - BFV-1533: Modified seat and disc components for compatibility with ozonated water.
    - BFV-1550: Modified seat and disc components for compatibility with ozonated water.
    - BFV-3021: Modified seat and disc components for compatibility with ozonated water.
    - BFV-3040: Modified seat and disc components for compatibility with ozonated water.
    - Replaced Spec Section references to "46 1353" with "46 3153.04".
    - SOL-3042: Valve description changed to "Basin #2 Effluent ORP Analyzer Valve"

11. Section 23 3300, paragraph 2.05.A – Add the following to paragraph 2.05.A:

    "8. Tamco
    9. United Enertech"

12. Section 23 3423, paragraph 2.01 – Add the following to paragraph 2.01:

    "I. JencoFan"

13. Section 23 8101, paragraph 2.01.A – Add the following to paragraph 2.01.A:

    "12. TPI Corp - Raywall"

14. Section 23 8128, paragraph 2.01 – Add the following to paragraph 2.01:

    "F. Samsung"

15. Section 23 8216, paragraph 2.01.A – Add the following to paragraph 2.01.A:

    "7. Neptronic"

16. Section 25 1316, paragraph 2.03.A.3 – Change paragraph 2.03.A.3 from "One Ethernet Switch of each type supplied" to "<Not Used.>".

17. Section 25 1316, paragraph 2.11 – Revise paragraph 2.11 to read "ETHERNET SWITCHES – PROVIDED BY OWNER, INSTALLED BY SYSTEM INTEGRATOR" and delete all subparagraphs under paragraph 2.11.

18. Section 25 1316, paragraph 2.18.B.2 – Revise paragraph 2.18.B.2. to read "The exterior of the enclosure shall be phosphatized, then finished in baked enamel inside and outside. Except stainless steel enclosures, which shall not be coated (unless otherwise noted in Section 25 9110)."

19. Section 25 3100 – Replace in its entirety with the attached revised 25 3100 Specification Section.

20. Section 25 9100, paragraph 2.10.B.2.e – Delete paragraph 2.10.B.2.e for the serial communication card and replace it with "<Not Used.>".

21. Section 25 9100, paragraph 2.12.A.2 – Add the following to paragraph 2.12.A.2:

    "k. Server Hardware/Monitors/Accessories"

22. Section 25 9100, paragraph 2.12.A.3 – Add the following to paragraph 2.12.A.3:

    "h. Network/Server Racks and Accessories"

23. Section 25 9110, paragraph 2.01.R.4 – Change paragraph 2.01.R.4 from "LSH-2300A – Residual EQ Basin Flood Level" to "<Not Used>".

24. Section 25 9110, paragraph 2.02.G.4.a – Revise paragraph 2.02.G.4.a. to read "Medium PLC with I/O and Modbus TCP/IP communication card for actuator communications (Prosoft PLX31-EIP-MBTCP or eq)."

25. Section 25 9110, paragraph 2.02.S.4.e – Revise paragraph 2.02.S.4.e to read "RJ-45 Patch Panel (ports for all cables coming from outside the panel plus 10 spare ports)."

26. Section 25 9110, paragraph 2.02.S.4.j – Revise paragraph 2.02.S.4.j. to read “Space for mounting breaker panel LP-CP (50"Hx20"Wx5.5"D). LP-CP supplied and installed by Electrical Contractor.”

27. Section 44 4256.03, paragraph 2.03.B.5 – Revise paragraph 2.03.B.5 to read “5. Shaft: Type 316 Stainless Steel Gr CF8M, or AISI Type 416 Stainless Steel.”

28. Section 44 4256.03, paragraph 2.03B.8 – Revise paragraph 2.03.B.8. to read “8. Mechanical Seal: Durametallic ‘Type RO’ or John Crane ‘Type 1’ or ‘Type 21’.”

29. Section 44 4256.04, paragraph 2.01 – Add the following to paragraph 2.01:

    “I. Grundfoss/PACO.”

30. Section 44 4256.04, paragraph 2.03.A.1 – Change paragraph 2.03.A.1 from “The volute shall be matched to the impeller and made of ductile iron.” to “<Not Used>”.

31. Section 44 4256.04, paragraph 2.04 – Replace paragraph 2.04 with the following:

    “A. Casing, Casing Covers, and Frame: Cast Iron, ASTM A48.
    B. Casing Wearing Ring: ASTM A351 Type 316 Stainless Steel Gr CF8M, or AISI Type 416 Stainless Steel.
    C. Impeller: Type 316 stainless steel A351 Gr CF8M.
    D. Impeller Wearing Rings: Type 316 Stainless Steel Gr CF8M, or AISI Type 416 Stainless Steel.
    E. Shaft: Carbon Steel, AISI 1045, Type 316 Stainless Steel Gr CF8M, or AISI Type 416 Stainless Steel
    F. Shaft Sleeve: AISI Type 316 Stainless Steel.
    G. Mechanical Seal: Durametallic "Type RO" or John Crane "Type 1" or ‘"Type 21".
    H. Flexible Coupling: Falk "Steelflex"; spacer type.
    I. Bearings: Antifriction.
    J. Baseplate: Cast Iron or Fabricated Steel.
    K. Anchor Bolts, Nuts, and Washers: Type 304 stainless steel.”

32. Section 44 4436.04, paragraph 2.03.B.5 – Change paragraph 2.03.B.5 from “Sprockets shall be a split polyurethane resin toothed.” to “<Not Used>”.

33. Section 44 4436.04, paragraph 2.03.C.4 – Change paragraph 2.03.C.4 from “Standard ANSI 150 lb flanges shall be used with ½” neoprene gasket…” to Standard ANSI 150 lb flanges shall be used with minimum ¼” neoprene gasket…”.

34. Section 44 4436.04, paragraph 2.20.D – Revise paragraph 2.02.D to read “D. Minimum rated size of Drive Motor shall be: 1/5 HP”.

35. Section 44 4436.04, paragraph 3.01.B – Add the following sentence to the end of paragraph 3.01.B:

    “Dry testing should only be run for a maximum of 15 minutes to protect normally wetted components.”

36. Section 46 3153.04 – Add the following new paragraph to paragraph 1.03.J.15:

    "e. A Master Ozone Control Panel may be provided as a standalone panel (as indicated on the drawings) or combined with the Ozone Generator."

37. Section 46 3153.04, paragraph 2.04.C – Add the following new paragraph to paragraph 2.04.C:

    "16. Target ozone dosing rate to Ozone Basins #1 and #2 is 3.0 mg/L to each basin."

38. Section 46 3383, paragraph 2.02.E – Change paragraph 2.02.E from "Sodium Hypochlorite" to "Ozone Analyzer Discharge / Quenching Tank"

39. Section 46 3383, paragraph 2.02.E.3 – Add the following paragraph to paragraph 2.02.E.3

    "d. One 1-inch diameter drain line connection"

40. Section 46 3383, paragraph 2.04.A – Add the following new paragraph to paragraph 2.04.A.

    "4. Albin Pump; Model: KM Series."

41. Section 46 3383, paragraph 2.14.D – Remove and replace paragraph 2.14.A with the following:

    "A. Bronze or Brass Corporation stop and Polypropylene or SCH 80 PVC nozzle assembly."

42. Section 46 3383, paragraph 2.14.D – Add the following new paragraph to paragraph 2.14.D:

    "3. SAF-T-FLO."

43. Section 46 4376, paragraph 2.03.H.2 – Replace paragraph 2.03.H.2 with the following:

    "2. Settling plates shall be provided with plate stiffeners if needed to meet the structural design loadings."

44. Section 46 4376, paragraph 2.03.J.1 – Replace the second sentence of paragraph 2.03.J.1 with the following:

    "Gaskets used between the troughs and plate packs and elsewhere shall be NSF approved."

45. Section 46 6123.02, paragraph 2.01 – Add the following to paragraph 2.01:

    "D. Johnson Screens, Triton Underdrain"

46. Section 46 6123.02, paragraph 2.03.B.7 – Change paragraph 2.03.B.7 from "7. Air Scour Rate: 3.0 scfm/sq.ft." to "7. Air Scour Rate: Minimum 3.0 scfm/sq.ft."

PART III – DRAWINGS

47. Sheet D-102 – Add the following note pointing to the "10" Finished Water To Distribution System" pipe located just south of the "PAC Bulk Storage Tank":

    "CUT, REMOVE, AND CAP EXIST 10" FINISHED WATER AS SHOWN ON SHEET P-101 TO ACCOMMODATE NEW CONNECTING 10" PIPING"

48. Sheet D-102 – Add the following general note:

    "6. EACH EXISTING FILTER CONTAINS APPROXIMATELY 83 CU FT OF SAND AND 100 CU FT OF GRANULAR ACTIVATED CARBON."

49. Sheet C-105 – Add the following note pointing to the utility transfer housekeeping pad (see Sheet E-102 for reference location):

    "CONCRETE HOUSEKEEPING PAD, SEE DETAIL 9/S-504"

50. Sheet C-105 – Add the following note pointing to the make-up air handling unit (MAU-8001) and ozone generator chiller (OCH-3145) housekeeping pads (see Sheet M-108 for reference location):

    "CONCRETE HOUSEKEEPING PAD, SEE DETAIL 9/S-504"

51. Sheet S-101 – Add the following to the "Foundation Plan Notes":

    "18. USE RAMMED AGGREGATE PIERS TO STABILIZE SUBGRADE SOILS AND TO ACHIEVE MINIMUM BEARING CAPACITY OF 3000 PSF PER GEOTECHNICAL ENGINEER RECOMMENDATION."

52. Sheet A-002 – Under "Life Safety Systems" change wording from "Not Sprinkled" to "Not Sprinkled, Except Permanganate Room 104".

53. Sheet P-104, PLAN 2 – Change the note from "DAVIT CRANE ACCESS MANWAY (TYP OF 2)" to "ACCESS MANWAY (TYP OF 2)". In addition, label this note with a Keynote 4.

54. Sheet P-104, KEYNOTE 4 – Add the following Keynote:

    "4. ACCESS MANWAY SHALL BE 30" DIA CONSISTING OF A 30" FLGxWSxPE STAINLESS STEEL WALL PIPE W/SS BLIND FLANGE AND TEFLON GASKET, AND HINGED DAVIT-ARM. MANWAY SHALL EXTEND 30" ABOVE TOP OF BASIN ROOF. PIPING SHALL BE PER SPECIFICATION SECTION 22 1119. HINGED DAVIT-ARM MAY BE FABRICATED AND ATTACHED TO FLANGES."

55. Sheet P-301, SECTION 1 – Revise note pointing to the wall sleeve on the pump discharge into Floc Basin 2 shown in Section 1/P-301 to "8" FLG X WS X PE SS PIPE (TYP)."

56. Sheet P-302 – Add the following general note:

    "ALL PIPING INSIDE FLOCULLATION BASINS AND PLATE SETTLER BASINS INCLUDING WALL SLEEVES SHALL BE STAINLESS STEEL PER SPECIFICATION SECTION 22 1119. INSULATED FLANGES FOR DIELECTRIC SEPARATION SHOULD BE INSTALLED BETWEEN SS WALL SLEEVES AND CONNECTING DI PIPES/VALVES LOCATED DIRECTLY OUTSIDE OF BASINS. WALL SLEEVES FOR BASIN DRAINS SHALL BE DUCTILE IRON."

57. Sheet P-313 – Add the following general notes:

    "1. 8" OZONE BASIN #1 OVERFLOW PIPING SHALL BE STAINLESS STEEL PER SPECIFICATION SECTION 22 1119.
    2. 8" PIPING FROM ALLUVIAL WELLS SHALL BE STAINLESS STEEL PER SPECIFICATION SECTION 22 1119 DOWNSTREAM OF BFV-1522. PIPING UPSTREAM OF BFV-1522 SHALL BE DUCTILE IRON.
    3. SEE SHEET P-407 FOR ORIFICE HOLES TO BE PLACED ON THE ALLUVIAL WELL DISTRIBUTION HEADER INSIDE OZONE BASIN #1 AND THE TWO 16" OZONE BASIN EFFLUENT HEADERS. ORIFICE HOLES SHALL BE INSTALLED ON THE TWO 12" OZONE BASIN INFLUENT DISTRIBUTION HEADERS IDENTICAL IN SIZE AND NUMBER TO THOSE INSTALLED ON THE 16" EFFLUENT HEADERS."

58. Sheet P-313 – Add the following note pointing to the termination flange of the 8" Basin #1 Overflow pipe located on the outside of the building:

    "INSTALL 24 MESH SS SCREEN BETWEEN FLANGE AND SS RETAINING RING."

59. Sheet P-313 – Increase the length of the wall sleeve on the 8" piping From Alluvial Wells so the flanged connection is located 6-inches from the face of the interior 4" CMU facing wall.

    "INSTALL 24 MESH SS SCREEN BETWEEN FLANGE AND SS RETAINING RING."

60. Sheet P-313 – Delete the note reading "1" HOLES ON TOP AND BOTTOM OF PIPE SPOOLS SPACED 3"OC. (HOLES SHALL NOT BE DRILLED ON TEE)".

61. Sheet P-313 – Change the note pointing to the base elbow on Ozone Basin #1 from "8" DIP 90 BEND WITH BASE SEE 3 / P-502" to "8" SS 90 BEND WITH BASE, OR EQUIVALENT SUPPORT SEE 3 / P-502".

62. Sheet P-313 – Change the note pointing to the elbow on Ozone Basin #1 just outside of the building from "8" DIP 90 BEND (TYP)" to "8" SS 90 BEND (TYP)".

63. Sheet P-313 – Show a 30" FLGxWSxPE Wall Pipe extending below the two access hatches to a point equal to the interior ceiling elevation of each Ozone Basin.

64. Sheet P-402 – Add the following note pointing to the two 6" Stainless Steel flocculation basin overflow pipes:

    "OVERFLOW PIPING SHALL BE STAINLESS STEEL PER SPECIFICATION SECTION 22 1119. PIPING SHALL TERMINATE WITH A 24" MESH SCREEN AND

6” RUBBER FLANGED CHECK VALVE SIMILAR TO CLEARWELL OVERFLOW (DETAIL 9/P-501) LOCATED 2'-0” ABOVE FINISHED GRADE OUTSIDE THE BUILDILNG (TYP 2 OVERFLOW PIPES). INSTALL TWO SS VERTICAL PIPE SUPPORTS PER OVERFLOW PIPE ON EXTERIOR OF BUILDING TO SUPPORT VERTICAL LEG OF PIPING.”

65. Sheet P-406 – Tag numbering is incorrect and should be replaced with the tag numbering shown on Sheet E-402.

66. Sheet P-407 – Add the following general note:

    “3. PIPING MATERIAL FOR OZONE CONTACT BASINS #1 AND #2 INFLUENT PIPES SHALL BE STAINLESS STEEL PER SPECIFICATION SECTION 22 1119 DOWNSTREAM OF FLOW METERS FE-1532 AND FE-3020. INSULATED FLANGES FOR DIELECTRIC SEPARATION SHOULD BE INSTALLED BETWEEN SS PIPING AND CONNECTING FLOW METERS.
    4. PIPING MATERIAL FOR OZONE CONTACT BASINS #1 AND #2 EFFLUENT PIPES SHALL BE STAINLESS STEEL PER SPECIFICATION SECTION 22 1119 UPSTREAM OF BUTTERFLY VALVES BFV-1550 AND BFV-3040. INSULATED FLANGES FOR DIELECTRIC SEPARATION SHOULD BE INSTALLED BETWEEN SS PIPING AND CONNECTING VALVES.”
    5. PIPING MATERIAL FOR THE OZONE CONTACT BASIN ACCESS HATCHES SHALL BE STAINLESS STEEL PER SPECIFICATION SECTION 22 1119 WITH TEFLON GASKETS. HINGED DAVIT-ARM MAY BE FABRICATED AND ATTACHED TO FLANGES.”

67. Sheet P-407 – Show an additional 3” Dia Orifice Hole on each of the “16” SS Discharge Headers” located 2’-0” from the orifice hole located adjacent to the center flow channel of each basin. The intent is to have six 3” Dia Orifice Holes on the top of each header pipe and six 3” Dia Orifice Holes on the bottom of each header pipe for a total of twelve orifice holes per header.

68. Sheet E-111 - Ozone Building Power Plan: Add circuit tag LPF-7 to MCP-3100.

69. Sheet E-502 - One Line Diagram: In MCC-3001, remove circuit P403 to MCP-3100 from one line and change 70A breaker to 30A "Spare".

70. Sheet E-602 - In Panelboard LPF, change 20A single pole circuit #7 from "SPARE" to "OZONE SYSTEM CONTROL PANEL MCP-3100".

71. Sheet E-605 – Cable & Raceway Schedule: Revise circuit P403 to "Not Used".

72. Sheet IC-503 – Add asterisk to AIT-2113/2213.

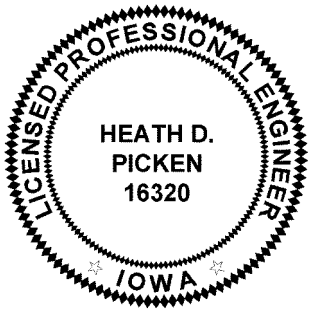
73. Sheet IC-503 – Add asterisk to FIT-2231.

74. Sheet IC-504 – Delete asterisk for PIT-1542.

75. Sheet IC-507 – Add GV-4823 to P&ID where shown on Sheet C-104 and Detail 5/C-501.

76. Sheet IC-507 – Delete Keynote #1 for flow meter FIT/FE-5508 located on the discharge header of the high service pumps. This is intended to be a new flow meter.

77. Sheet IC-511 – Delete asterisk for LT-6411.



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.

10/26/2026

HEATH D. PICKEN, P.E.

License No. **16320**

My renewal date is **December 31**, **2027**

Pages or sheets covered by this seal:

Entire Addendum No. 1.

ALL BIDDERS SHALL ACKNOWLEDGE RECEIPT AND ACCEPTANCE OF ADDENDUM NO. 1 BY INCLUDING ITS NUMBER IN THE SPACES PROVIDED IN THE BID FORM.

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PRE-BID CONFERENCE MEETING MINUTES
Water Treatment Plant Improvements
Greenfield Municipal Utilities
October 15, 2026 – 2:00 p.m.

1. Introductions

a. Client/Owner: Greenfield Municipal Utilities (GMU)
b. Engineering Consultant: HR Green, Inc.
c. Geotechnical Consultant: Terracon
d. Attendees: Sign Attendance sheet.

HR Green Contacts

Heath Picken
Project Manager
5525 Merle Hay Road, Suite 200
Johnston, Iowa 50131
(515) 657-5256
hpicken@hrgreen.com

Shanna Flint
Staff Engineer
(515) 657-5276
shanna.flint@hrgreen.com

2. Project Description

Furnish all labor, materials, and equipment necessary for the Greenfield Municipal Utilities Water Treatment Plant Improvements including but not limited to the following: installation of approximately 860 linear feet of new 12-inch raw water main; installation of new paved driveway and access drive and associate grading and site improvements; installation of new generator, utility main disconnect, automatic transfer switch, and distribution panel for the treatment facilities; removal of existing Trident process units; construction of a new treatment building including flocculation basins, plate settlers, granular activated carbon filters, clearwells, chemical feed equipment, pumps, and associated process, electrical, controls, and mechanical components; and construction of a new ozone building including contact basins, an ozone feed system, and associated process, electrical, controls, and mechanical components.

3. Bid Documents and Bidding Procedures

a. **Bids Due** – **November 3, 2026 before 2:00 p.m.** at the GMU Downtown Generation Plant, 116 SE Jackson Street, Greenfield, IA 50849.

b. **Bid Documents Required**:
   1) 1st Envelope:
      - Bid Bond (5% of Bid amount).
   2) 2nd Envelope:
      - Bid Form
        - "Project" & "Total Project" amounts filled out. "Total Project" amount includes $120,000 allowance.
        - Signature and date of person who inspected site.
        - Acknowledge addenda. *No addenda currently issued.*
      - Attachments:
        - Bidder Status Form and Worksheet
        - Section 00450 – Questionnaire
        - SRF Attachments (Attachments 2, 3, 4, 5, and 10)

c. **Project Requirements**:
   1) Sales tax exempt – Project is sales tax exempt and therefore Contractor should **not** include sales tax in bid.
   2) Wage Rates – Project is subject to Davis-Bacon Wage Rates. Refer to rates included at the end of the SRF attachments.
   3) Material Requirements – Project is subject to American Iron and Steel (AIS) requirements. Refer to SRF Attachment 9.
   4) Allowance – Project includes a $120,000 allowance for SCADA Hardware and Software (see Bid Form and Specification Section 25 9100, Article 2.12)
   5) Pre-Selected Equipment – On-site Sodium Hypochlorite Generation System (see Specification Sections 01 1000, Article 1.12 and 46 0076). Attachment A – Manufacturer's proposal will be updated via addendum.

Bidding documents are available from HR Green at (515) 489-0084 or chelsea.sullivan@hrgreen.com as well as at various plan rooms in the region.

4. Project Review

a. **Project Schedule:**
   1) Substantial Completion - March 16, 2029
   2) Final Completion - September 14, 2029

b. **Work Sequencing and Plant Operations** (refer to Section 01 1000, Article 1.13).
   1) Tree Removal – Tree removal is to occur after September 30th and before April 1st.
   2) Sodium Permanganate Line – Complete installation of new sodium permanganate dosing lines and associated 2" HDPE conduit during early earthwork on site. Existing sodium permanganate dosing lines and associated conduit goes through the footprint of the new WTP building.
   3) Phase 1 – Complete installation of new treatment facilities
   4) Phase 2 – Complete startup and commissioning of new treatment facilities (Per Specification Section C-800, Article SC-15.03.G, Phases 1 and 2 must be complete for the project to be considered Substantially complete.)
   5) Phase 3 – Owner to operate new facilities for 30 days to allow proof of operation
   6) Phase 4 – Demolish existing treatment facilities, modify existing treatment building, modify existing treatment building piping, electrical, and controls, modify remaining buried piping, and modify and clean existing Ground Storage Reservoir (GSR)
   7) GMU Water Treatment Plant facilities must remain operational throughout construction. Note required sequencing, available facilities, temporary/bypass provisions, allowable outage durations, and advance coordination requirements.

c. **Work by Owner** (refer to Section 01 1000, Article 1.08):
   1) Owner will provide VOIP Phones and Wireless Access Points (WAPs), cameras, and access control. Cabling and rough in for cameras and access control are to be by Contractor.

2) Utility transformer and associated conductors from existing sectionalizing cabinet, and Fiber Optic Cabling as identified on the drawings.
3) Ethernet Switches as identified on the drawings and specified.

d. **Owner Occupancy**: Existing GMU Water Treatment Plant will remain in continuous operation throughout construction.

e. **Independent Testing Services**: By contractor (Section 01 4000, Article 1.08)

f. **Working hours**: Per Specification Section 00800, Article SC-7.03: Regular working hours will be Monday – Friday 7:00 am to 5:00 pm

g. **Permits**:
1) Owner will obtain IDNR Construction Permit and City of Greenfield building permit.
2) Contractor is to obtain NPDES General Permit #2 for a SWPPP (Sheet C-102), State of Iowa Electrical Permit and any other permits required.

5. **Addendum**

a. **Addenda**: Addendum No. 1 will be issued to include Pre-Bid Meeting agenda and notes, current Plan Holder list, and any applicable modifications to the drawings and specifications.

b. **Substitute or "Or Equal" Items**: Procedure for the submittal of substitute or "Or Equal" products is specified in Section 01 6000 – Product Requirements (Article 3.01) and Section 01 2500 – Substitution Procedures. In general, application for review of substitute or "or-equal" materials or equipment will not be considered until after the Effective Date of the Agreement. Engineer will be the sole judge of the acceptability of proposed substitute or "or-equal" items.

c. **Questions**: Questions regarding discrepancies, conflicts, ambiguities, or requested clarifications of the Contract Documents shall be submitted to the Engineer in writing no later than 12:00 PM on Monday, October 26, 2026, for consideration in the final pre-bid addendum.

6. **Engineer's Opinion of Probable Construction Cost** = $21,000,000.

7. **Owner Comments**

GMU will not have a full-time presence on site during construction. Contractor shall preemptively communicate issues and questions to allow time for coordination.

8. **Questions and comments** from contractors and suppliers.

HR Green will have a resident construction observer on site most days during active construction.

9. **Site Visit**

Pre-Bid Conference Attendance
Greenfield Water Treatment Plant Improvements
October 15, 2026, 2:00 p.m.

NAME	COMPANY	PHONE	CELL	EMAIL
Jordan Richey	Wendler	319-622-3816		jrichey@wendlerinc.com
Ryan Hemann	Wendler	319-415-5204		rhemann@wendlerinc.com
Cody Cotton	JTJ	701-232-3358		estimating@JtJconst.com
Travis Ruth	Story	515-817-2621	~~515~~	[redacted]
Mike Toupin	Mellen	712-322-9333	712-561-0856	Mtoupin@melleninc.com
Eric Lawrence	Vossco	5158641003		elawrence@vossco.com
Chase Bartlett	Hanson	515-480-0601		estimaiting@hansoncompany.com
				Tturner@storyCon.com
Scott Tonderum	GMU			
Sam Groves	GMU			
Corbin Bond	GMU			
David Cooper	GMU Board			
Heath Picken	HR Green	515-657-5256		
Shanna Flint	HR Green	515-657-5276		

Will & Scott JTJ were Here on Wed.

List of Contractors for
Water Treatment Plant Improvements
Greenfield, IA

Engineer's Opinion of Probable Cost = $21,000,000

Bid Date:November 3rd, 2026 at 2:00 P.M. **HRG Job #2304102**

Spec.	Contractor Name/Address	Date Sent	Addendum 1	
	Master Builders of Iowa Source 1 source1@mbi.build	10/2/26		
	Construct Connect	10/2/26		
1	**JETCO** 1050 9th ST. NE, ALTOONA, IA 50009	10/1/26		
2	**Crossland** 10711 Chandler Road, Suite 200 La Vista, NE 68128	10/1/26		
3	**ThompsonSolutionsGroup**	10/1/26		
4	**OTC Industrial Technologies**	10/1/26		
5	**Story Construction** 2810 Wakefield Circle, Ames, IA 50010	10/2/26		
6	**Wendler**	10/2/26		
7	**Gurney and Associates** 4428 S. 108th Street, Omaha, NE 68137	10/2/26		
8	**VESSCO Inc.** 2740 Ford Street, Ames, IA 50010	10/5/26		
9	**Jensen Builders Ltd**	10/6/26		
10	**Mellen & Associates, Inc** 3404 South 11th St., Council Bluffs, IA 51501	10/6/26		
11	**Hansen** 5665 Greendale Road, Johnston, IA, 50131	10/6/26		
12	**Midwest Pump Works** 825 SW Ordnance Road Ankeny, IA 50023	10/6/26		
13	**Wiremann Electric** 113 W Iowa St. Greenfield, IA 50849	10/6/26		
14	**Building Crafts Inc.** 2300 N. 8th Street PO Box 96 Red Oak, Iowa 51566	10/6/26		
15	**Patriots Choice Contracting**	10/8/26		
16	**Inside Sales | Great Plains and Midwest** 21932 Fowler Dr. Gretna, NE 68028	10/8/26		
17	**Dodge Construction Network**	10/8/26		
18	**Direct Companies** 1305 Lew Ross Rd, Council Bluffs, IA 51501	10/9/26		
19	**Utility Equipment Company** PO Box 1290, Bettendroff, IA 52722	10/12/26		
20	**John T. Jones Construction** 2213 7th street North Fargo, ND 58102	10/13/26		

21	**Caliber Concrete**	10/13/26		
22	**Architectural Products, Inc.** 535 S 18 Street West Des Moines, IA 50265	10/13/26		
23	**Caliber Concrete** 309 Audubon St. PO Box 248 Adair, IA 50002	10/14/26		
24	**BRB Contractors, Inc.** PO Box 750940 Topeka,KS 66675-0940 4646 NW Fielding Road, Topeka,KS 66618	10/14/26		
25	**Keul Electric**	10/14/26		
26	**The Driller**	10/15/26		
27	**Electric Pump**	10/16/26		
28	**On Track** PO Box 524 1435 West F Avenue Nevada, Iowa 50201	10/16/26		
29	**Quality Flow Systems, Inc.** 800 6th St NW New Prague, MN 56071	10/16/26		
30	**McCarthy Trenching, LLC** 922 N Walnut St. PO Box 506 | Avoca, IA 51521	10/20/26		
31	**Camblin Mechanical, Inc.** 714 W 7th St., Atlantic, IA 50022	10/23/26		



MIOX

On-site Mixed Oxidant Generation System

FIRM Proposal Prepared For:

Greenfield Municipal Utilities

Model: MIOX 60-V (480 V)
Project Name: Greenfield IA New WTP
Proposal Number: P-161140 Q-34194 Rev.5
Date: October 21, 2026

DE NORA

De Nora Water Technologies, LLC
1110 Industrial Blvd.
Sugar Land, TX 77478
United States of America
Tel: +1 281 240 6770

Date:	October 21, 2026
Customer Name:	Greenfield Municipal Utilities
Project Name:	Greenfield IA New WTP
Project Location:	Iowa
RFQ Reference:	E-Mail
Proposal No:	P-161140 Q-34194 Rev.

Attn: To whom it may concern,

On behalf of De Nora Water Technologies, LLC we are pleased to present our proposal for the Greenfield IA New WTP project. De Nora Water Technologies - MIOX technology has been effectively implemented worldwide and we are excited for the opportunity to provide our on-site mixed oxidant generation system for this project.

We are proposing our MIOX 60-V (480 V) mixed oxidant generator producing a minimum of 60 lbs/day solution at 0.45% FAC. The unit enclosure is the same for all De Nora MIOX generator in this series - only the electrolytic cell and program parameters differ from one capacity/version to the other. This particular unit capacity range is from 15 lbs/d FAC to 60 lbs/d FAC depending on the electrolytic cell installed.

We have enclosed a detailed proposal for your review and evaluation that has been prepared per your bid request and technical specifications. Please feel free to contact me should you have any questions.

Sincerely,

Ashok Gokul
Application Engineer
ashok.gokul@denora.com

Shahroz Khan
Regional Sales Manager
shahroz.khan@denora.com

DE NORA WATER TECHNOLOGIES, LLC
1110 Industrial Blvd, Sugar Land, TX 77478, United States - ph +1 281 240 6770 - fax +1 281 240 6762
Mail info.dnwt@denora.com **Web** www.denora.com

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This proposal is provided to the Buyer for confidential use in connection with the evaluation of this project. The information provided herein is limited to the specific purpose for which it is submitted. It may not be disclosed to any third parties or be reproduced in any form, without the written permission of the Seller.

It is understood that all of the technical details, specifications and other features of the process and equipment described in this proposal are of a preliminary nature only. The Seller reserves the right to modify, delete, or add to them during completion of detailed engineering. These changes shall be incorporated in the final designs at Buyer's cost, and further provided that the overall performance and guarantees are maintained.

This proposal will not constitute a binding obligation of Seller until it is accepted by Buyer and a formal agreement is reached between Buyer and Seller and entered into force by written instruments duly signed by the legal representative of each party. This Offer shall be subject to the conditions precedent that: (i) a satisfactory due diligence is carried out by DN on the client, the end user of the products as well as on the other persons and entities involved in the transaction, in adherence with EU and US legislation applicable to business transaction with [name of the country] and (ii) DN receives satisfactory legal advice on the absence of EU and US export control restrictions on the products to be supplied by our company

1. Scope of Supply

Equipment Description – MIOX 60-V (480 V) System

Equipment Scope of Supply

Qty	Description
On-Site Generator (OSG) unit	
Two (2)	MIOX 60-V (480 V) self cleaning, wall-mount system rated at 60 lb/day FAC. Each On-Site Generation (OSG) system includes the following components: • One (1) 60 lbs/day electrolytic cell with power supplies and variable speed brine pump and filter located in a high-density polyethylene (HDPE) enclosure with power supply and controls mounted in a powder-coated cabinet with HDPE panels. • Each unit operating voltage: **380-530 VAC (WYE), 3 Phase, 14 Amp** with AC to DC converters • Electrical service: **35 amp (For 3 Ph)** • Each De Nora MIOX Vault™ series On-Site Generator is controlled by an Allen-Bradley MicroLogix 1400 PLC controller complete with an Allen-Bradley PanelView Plus 600 with a 6" color touch screen. • The OSG is supplied pre-installed on a unistrut wall-mounted frame. • One (1) integrated brine filter, pre-installed on side of bottom enclosure.
Water Softener	
Two (2)	**Kinetico Model CP208s Softener system** Softener system complete with the following items: • Two (2) softener tank • One (1) top mount mechanical control valve • Two (2) manual PVC isolation valves • One (1) check valve
Brine Tank/Generator	
One (1)	**360-gallons, open top Polyethylene tank with lid** Tank is designed for indoor installation. Each tank is designed to be refilled manually by hand using 50 lbs salt bags. Tank is complete with the following items: • One (1) mechanical float assembly for level control • One (1) set of inlet and discharge manual PVC isolation valves • One (1) Brine Guard (bottom PVC slotted discharge pipe)
Oxidant Tank	
One (1)	**500-gallons dome top cylindrical, single wall, solution storage tank.** Each tank is designed for indoor use and is complete with the following items: • One (1) Gems dual float level switch, CPVC wetted material • One (1) Hydrogen Vent Liquid Barrier System **Hydrogen Safety & Handling Internal Liquid Barrier Hydrogen Vent System** comprised of PVC down tube in each of the tank(s), with a tee at the top of the down tube connected to a CPVC vent pipe to outside of building. This item requires no electricity, fans, blowers or controls.
Oxidant Tank Venting	

One (1)	**Hydrogen Safety & Handling Internal Liquid Barrier Hydrogen Vent System** comprised of PVC down tube in each of the tank(s), with a tee at the top of the down tube connected to a CPVC vent pipe to outside of building. This item requires no electricity, fans, blowers or controls.	
Water Heater		
One (1)	**Tankless Water Heater, Wall Mounted**	
Spare parts		
Two (2)	• One (1) brine dilution pump assembly • Six (6) 5-micron filter cartridges	• One (1) set assorted fuses • One (1) acid wash kit

Service

Services	
One (1)	**One (1) trip for a total of four (4) days on site for:** • Inspect equipment installation, piping and wiring to ensure proper installation. • Start-up & testing services • Customer/operator training **Included in service:** Local transportation & lodging included. Air fare excluded. Additional days or trips required will be charged at $1,500 per day plus travel (air & local) and accommodation expenses.

Technical Services

Engineering & Documentation

- One (1) electronic set of shop drawing & product data submittals.
- One (1) electronic copy of Operation & Maintenance Manual.

Installation Inspection, Start-up & Training

- This proposal excludes any pre-start up or pre-installation consulting. If such service is required, it will be priced separately upon request.
- Proposed services are based on one (1) trip. Should additional trip(s) be required due to circumstances out of ClorTec control, such as uninstalled equipment, lack of power, lack of water, etc., a cost adder will apply.
- The above listed services must be provided by a De Nora, ClorTec factory trained technician or a factory authorized third party. Failure to comply will void the warranty. A list of such authorized third parties is available upon request.

Installation Services

- This proposal is for equipment Inspection, Start-up & Training only and does not include Installation services.

IMPORTANT NOTE

In the event that the performance of a contractual obligation hereunder by either party hereto is prevented, restricted, hindered, delayed or interfered with directly or indirectly in connection with the COVID-19 (“Coronavirus”) pandemic or similar pandemic or epidemy and/or any measures introduced by any government authority to address such pandemics/epidemies, the party so affected shall be excused from such performance to the extent and for the duration of such prevention, restriction, hindrance, delay or interference, and shall not be liable for any costs or damages.

Each party shall exercise reasonable efforts to resolve any impediment, however, neither Party shall be obligated to incur additional costs of more than 5% of the order value. The party affected should give notice to the other party as soon as practicable of the prevention, restriction, hindrance, delay or interference with its performance.

2. Pricing

Design Notes, Clarifications and Exceptions

We have proposed our standard on-site generator unit with our standard materials of construction and our standard warranty as listed in this proposal. Our system designs have been developed over years of experience in the marketplace. We have selected robust, industry proven mechanical and electrical components for which replacement and/or spare parts are readily available. In addition, all our systems are factory tested before leaving our facility reducing the time required for commissioning and start-up. De Nora ensures that the performance requirements of this application will not be compromised. Our proposal is the most expedient and economical approach for the system required.

A. Base Price

Item	Qty.	Description	Total Price US$
1	2	60 lbs/d On-Site Sodium Mixed Oxidant System System scope of supply is as described in SECTION 1A above. Any items or services not specifically listed in SECTION 1A are excluded.	$ 285,549.00
2	1	Engineering & Documentation Basic standard documentation.	Included
3	1	Crating and Freight	Included
4	1	Startup & Training as per description above Service scope of supply is as described in SECTION 1B above.	$ 14,948.00
		TOTAL PRICE:	**$ 300,497.00**

**Note: Please note that an acceptable purchase order will need to include a separate line for start-up/ training services as noted above.*

3. Items Not Included in De Nora Proposal

- Freight/shipping of De Nora-supplied equipment to customer site unless agreed upon in this proposal.
- Loading/unloading of De Nora equipment at customer's site.
- Installation of all De Nora supplied equipment, start-up and training.
- Supply and installation of interconnect piping, power and control wiring between De Nora-supplied equipment.
- Ongoing operation and maintenance of De Nora-supplied equipment.
- Services do not include construction of building enclosure, concrete, civil or site work, obtaining permits, installation of new power distribution, or water service, sewer, or other utility modifications needed to accommodate the system requirements. De Nora service visit (if included in this proposal) should be scheduled when all building site, equipment installation, and other preparation work have been completed and prior to our service engineer's arrival at the job site.
- Pump motor starters if required, unless indicated otherwise on scope of supply description in SECTION 1.
- Dosing/injection system to be powered and controlled by others.
- Clean municipal feed water source. Please refer to the attached OSG specification sheet for feed water flow rate, pressure and temperature requirement. Inlet water and salt must meet the guidelines attached to this proposal for proper electrode operation and efficiency.
- Feed water for water softener regeneration. Consult De Nora for volume of water required for regeneration per day.
- Dedicated power supply to each OSG system. Please refer to the attached specifications sheet for power supply requirements.
- Electrical transformer if site power supply is different than the power supply requirements by De Nora supplied equipment.
- Floor drain to accommodate periodic water softener recharge wastewater.
- PVC/CPVC vent vertical piping from each solution tank's dome to the outside of the facility.
- PVC/CPVC vent vertical piping from each solution tank's Liquid Barrier Down Tube Hydrogen Vent Inlet to the outside of the facility.
- Insulation and heat tracing for De Nora supplied outdoor brine generator and oxidant storage tanks.
- Consumable items including salt, electrical power, and feed water to offered system.
- Heated/cooled facility or building for enclosure of system. Please refer to the attached specifications sheet for ambient temperature requirements.
- Any equipment or service not specifically listed in De Nora scope of supply section of this proposal.
- Federal, state or local sales, use or other taxes are not included in this proposal.
- Import duties, taxes or other related costs.

4. Terms of Equipment Sale

The price(s) offered in this proposal is/are based on the following terms:

Pricing:	Price(s) offered in this proposal are firm. All prices quoted are in $USD
Proposal Validity:	This proposal is valid for 30 days from date of submission.
Payment terms:	The pricing quoted in this proposal is based on the following payment terms, subject to approval of Customer's credit. • **15% of equipment value**, Net 30 days upon order acceptance. • **25% of equipment value**, Net 30 days upon submission of primary approval documents. • **25% of equipment value**, Net 30 days upon issuance of PO for major materials • **35% of equipment value**, Net 30 days upon shipment. • **100% of commissioning/start-up value**, NET 30 days upon completion of start-up, not to exceed 60 days after delivery. Equipment release for shipment is contingent on receipt of all due payments.
Shipping Terms:	CPT Jobsite (INCOTERMS 2020)
Submittals:	Scheduled delivery of submittals (if required): 6 - 8 weeks after the effective date of the purchase order. The effective date of the purchase order is the date by which the buyer and DNWT have signed the purchase order.
Delivery of Equipment:	22 - 24 weeks for shipping after approval of submittals or after authorization to proceed. Weekly minimum storage fee may apply if shipment is not authorized within 2 weeks after agreed scheduled shipment. Delivery dates and prices set forth in this proposal are the best estimate of Seller based on the current situation facing the U.S. and other countries due to the spread of COVID-19. Accordingly, delivery dates are approximate, and prices offered may have to be increased due to the negative effects of COVID-19 on international trade, the global supply chain, and the business activities of Seller, its affiliated companies, and its suppliers/partners. Seller expressly reserves the right to modify delivery dates and prices upon prior written notice to Buyer.
Taxes:	Federal, State or local sales, use or other taxes are not included in this proposal.
Terms & Conditions:	De Nora Water Technologies, LLC and Customer agree that the General Terms and Conditions of Sales set forth at http://www.denora.com/products.html ("The Terms") shall exclusively govern the transactions described or contemplated in this Proposal and any other sales or related transaction between the parties herein, and such Terms are expressly incorporated by reference herein and to any related transaction between the parties. Any additional or different terms or conditions which may appear in any communication from Customer, including, without limitation, in any printed form provided, are hereby expressly objected to and rejected in full and shall not be effective or binding in any capacity unless expressly

accepted in an authorized writing by De Nora Water Technologies, LLC, regardless of, and fully notwithstanding, De Nora Water Technologies, LLC supply of any goods and services or the execution of any document or acceptance by any person other than an officer or authorized agent of De Nora Water Technologies, LLC.

Notwithstanding any other provision of these Terms or the Seller's Documentation, unless otherwise expressly stated in the Seller's Documentation, if, at any time during the course of Seller's performance of the sale of the Products or Services, there is an unforeseen and material increase in the price of raw materials, materials, labor, or other costs of Seller associated with the Products or Services, Seller shall have the right to reasonably adjust the prices set forth in the Seller's Documentation upon written notice to the Purchaser setting forth the amount of such price adjustment and reasonably setting forth the cost changes associated therewith.

5. De Nora ClorTec / MIOX National Service Center

Location:	De Nora Water Technologies, LLC. 1110 Industrial Boulevard Sugar land, TX 77478
Service Hours:	24 hours/day, 7 days/week
	P +1 800 524 6542
Spare Parts Department:	8-5 pm CST
	P +1 800 524 6542
	F +1 281 240 6770

6. Disclaimers

This proposal contains proprietary or confidential information of De Nora Water Technologies, LLC (DNWT) regarding patent protected proprietary technologies and their implementation in the field, recommended uses and costs. Any such proprietary or confidential information disclosed herein is provided at buyer's request and solely for the purpose of enabling buyer to evaluate this proposal.

In receiving and reading this proposal, buyer agrees that it will not reveal or otherwise distribute its contents to any third party without DNWT's prior written consent. The foregoing limitation shall not preclude buyer from disclosing the contents of this proposal to its employees, on a need to know basis, who have the responsibility to evaluate and/or implement the program set forth in this proposal. This proposal shall at all times remain the exclusive property of DNWT until accepted by the party to which it was tendered.

This proposal is made under the DNWT standard terms and conditions of sale.

7. Supporting Documents

The documents listed below form an integral part of this offer.

- Warranty Rider for De Nora Electrolytic Cell
- DNWT Field Service Rate Schedule
- OSG Specification Sheet
- OSG General Arrangement drawing
- Salt Quality Specification
- Water Quality Specification

8. Signatures

In the event that this Proposal P-161140 Q-34194 Rev. is executed by **Greenfield Municipal Utilities**'s duly authorized representative and/or signatory, then all terms and conditions of this Proposal, including but not limited to all matters pertaining to pricing and specification, commercial terms and the Standard Terms and Conditions of Sale as included herein, are deemed to be accepted by **Greenfield Municipal Utilities**. In the event that **Greenfield Municipal Utilities** issues a Purchase Order containing any other terms and conditions, such terms shall be of no effect unless expressly agreed to in writing by a duly authorized representative of De Nora Water Technologies LLC This proposal is executed by:

This proposal is executed by:

Greenfield Municipal Utilities

Name: _____

Title: _____

Signature: _____

Date: _____

Purchase Order Number: _____

Shipping Address: _____

De Nora Water Technologies LLC, 1110 Industrial Blvd., Sugar Land, Texas 77478

Name: _____

Title: _____

Signature: _____

Date: _____

De Nora Water Technologies, LLC.
1110 Industrial Blvd.
Sugar Land, TX 77478
United States of America

T: +1 281 240 6770
F: +1 281 240 6762

www.denora.com

MIOX SALT GUIDELINES

Revised June 17, 2014

SALT GUIDELINES FOR MIOX GENERATORS

General Information

MIOX Corporation (MIOX) places importance on the quality of salt used in operating on-site generation equipment. High quality salt minimizes expense and customer equipment maintenance issues while maximizing the quality of the water treated using MIOX equipment. MIOX recommends food grade salt to help optimize MIOX system performance. Because contaminants can vary widely, even within the same mine, it is vital to request the most recent site specific contaminant analysis. The contaminant analysis should document the date that quality control was performed and the physical location where the salt was mined and processed. MIOX recommends that our customers regularly request salt product data sheets from the manufacturer to ensure consistent quality control. A reputable supplier will include the date of the quality analysis on the specification sheet in addition to the salt mine location. Please note, higher quality salt alone will not ensure reduced maintenance. Water used by the MIOX system must be softened adequately as well.

Warranty

MIOX continually strives to review and address all warranty claims in an equitable manner. It is important for our customers to understand that the use of poor quality salt may impact warranty claims. MIOX does not accept liability for any salt selected by the customer for use in MIOX equipment. MIOX reserves the right to deny any claims that could be considered under warranty if the equipment or electrolytic cell is performing below specification or is damaged due to contamination caused by, but not limited to, calcium, magnesium and insoluble material in a salt selected by the customer. NOTE: self-cleaning MIOX systems require the use of salt with a purity of 99.5% NaCl or greater (typically food grade) as described in the “Salt Purity” section below or the warranty is void.

Salt Purity

For all **self-cleaning systems,** only salt with a purity greater than 99.5% may be used (typically food grade) or the warranty is void. For all **non-self-cleaning systems,** MIOX recommends salt with a purity level of 99.5% NaCl or greater. Below is a table depicting what MIOX recommends for **non-self-cleaning systems** and what MIOX requires to keep the warranty intact for **self-cleaning systems.**

Component	Percent Minimum
NaCl (dry)	99.5
Impurity	**Percent Maximum**
Calcium (in all forms)	0.01
Magnesium (in all forms)	0.01
Manganese	0.00002
Iron (as Fe)	0.0005
Insolubles	0.005
Additives	0.0001

For several reasons, salt quality is highly variable and MIOX cannot control the quality processes at salt manufacturing sites. Typically, salts with fewer contaminants are more expensive because of additional purification steps during processing. Salt manufacturers usually provide salt product data sheets that list contaminants of concern in each type of salt they sell. Customers assume that the delivered salt will meet the specifications provided by the manufacturers. However, not all contaminants of concern for a specific application will be listed. For example, bromide in salt used for electrolysis can elevate the concentration of bromate in the treated water. Bromate is a water quality concern in drinking water applications, but not necessarily industrial applications.

There are three primary contaminants commonly listed in a salt product data sheet that impact the electrolytic cell; calcium (Ca), magnesium (Mg) and insoluble material. High calcium and magnesium salt concentrations cause accumulation of calcium/magnesium carbonate and magnesium hydroxide in the electrolytic cell. Fouling by these deposits in the cell is the single largest cause of maintenance issues. Insoluble material or solids present in the salt that do not dissolve in water can also deposit in the cell along with carbonates. This co-deposition tends to reduce the effectiveness of acid to remove the carbonates. As a result, longer acid wash times and sometimes physical scrubbing of the cell plates is required to remove the deposit. Other contaminants, such as manganese (Mn) and iron (Fe), are known to affect cell performance by producing an oxide layer that increases the degradation rate of the plates. MIOX recommends that the manganese and iron concentrations in salt not exceed 20 parts per billion in the electrolyte solution entering the cell. Manganese and iron are not included in MIOX's salt specification maintenance worksheet because they are not often reported on salt product data sheets. However, low concentrations of Mg and Ca are associated with low concentrations of Mn and Fe.

MIOX's Salt Specification Maintenance Worksheet versus Salt Manufacturer's Product Data Sheets

Although MIOX makes recommendations on the ideal salt for use in the on-site generation process, it is the customer's responsibility to obtain a salt quality analysis (salt specification or product data sheet) from the supplier and determine its suitability for their situation, region and application.

The salt manufacturer's product data sheet should contain information regarding the amount of calcium, magnesium and insoluble material in the salt at a minimum. MIOX and its customers use this standard information to estimate the amount of maintenance that is associated with these contaminants. This salt specification maintenance table is shown below.

	Lower Limit	Upper Limit	Maintenance
Calcium (Ca) (%)	0	0.020%	Acid wash for 20 min at 3000 hrs / quarterly
	0.020%	0.05%	Acid wash for 20 min at 750 hrs / monthly
	0.050%	0.08%	Acid wash twice for 20 min each at 24 hrs / daily
	0.080%	---	Calcium too high
Magnesium (Mg) (%)	0	0.020%	Acid wash for 20 min at 3000 hrs / quarterly
	0.020%	0.05%	Acid wash for 20 min at 750 hrs / monthly
	0.05%	0.08%	Acid wash twice for 20 min each at 24 hrs / daily
	0.08%	---	Magnesium too high
Insolubles (%)	0	0.01%	Change brine filter at 750 hrs / monthly
	0.010%	0.05%	Change brine filter at 325 hrs / biweekly
	0.050%	0.1%	Change brine filter at 24 hrs / daily
	0.10%	---	Insolubles too high

Please note that the manufacturer's product data sheets do not always give these contaminant concentrations in a standard form and the listing may refer to a brand of salt sourced from different salt mines. Different salt mines have different quality parameters. Be sure to request the salt product data sheet that is specific to the salt you will use in the MIOX system, including the mine location. For drinking water applications, the amount of bromide that may be present in certain salts should be evaluated because bromide can be converted to bromate in the cell.

Additives

Most salts have four basic types of additives:

- Hardening agent (Sodium Hexametaphosphate or SHMP)
- Cleanser (Citric Acid based)
- Free flowing/anti-caking agent (Yellow Prussiate of Soda or YPS)
- Detergents/surfactants

MIOX does not recommend the use of salt with additives. However, some customers have successfully used salts with these additives. Note that detergents/surfactants in the salt may cause foaming in the oxidant tank and reduce the effectiveness of the hydrogen venting system due to foam. It may be necessary to increase the vent pipe size. Organic additives such as citric acid can also be a source for additional trihalomethanes and haloacetic acids.

Physical Salt Size

Salt that is coarse or extra coarse is preferred. Granular or pelletized salt can be used equally well but requires some extra attention. Pellets that are larger than about ½ inch in size dissolve

slowly and can contribute to poor brine concentration in the brine tank, particularly when the salt level is low in the tank. For this reason, it is important to keep the brine generator filled at all times. Also, pelletized salt is too heavy to be pneumatically blown into large bulk brine generators.

Brine Filtration

Higher purity salt is often table quality, or food grade salt, in granular form. While this salt will work well, it requires an adaptation for both types of brine generators sold by MIOX, including the ton-sized bulk brine generators and the smaller brine generators with up to 1,000 gallons capacity. The large bulk brine generators must be filled with a two-layer washed quartz rock bed to avoid clogging of the brine intake port. The bottom layer should be 7 inches of quartz rock deep, using rock sizes between ¼ and ½ inch. The top layer should be 5 inches of quartz rock deep, using rock sizes between 1/8 and ¼ inch in size.

For smaller brine generators that utilize granular (fine grain) salt, a special in-tank roughing filter assembly must be used. Contact MIOX for details on this filter assembly. External to the brine generator and prior to the MIOX on-site generator cabinet, a 5-micron filter is required. This usually takes the form of a 10-inch standard filter housing with a 5-micron pleated filter cartridge element. A dual filter housing arrangement is also available to facilitate filter change-out while the systems are operational.

NSF Standard 60 Salt

Several state regulatory agencies are now requiring that the source material feeding on-site generators (i.e., salt) must be NSF-60 listed to ensure that no hazardous materials ultimately enter the drinking water supply. NSF-60 ensures that chemicals in contact with drinking water are safe and non-toxic to the drinking water supply. For a list of salt suppliers that offer NSF-60 listed salt, refer to the NSF web site at www.nsf.org. Product and service listings may be found at http://www.nsf.org/business/search_listings/.

DE NORA

DE NORA WATER TECHNOLOGIES, LLC

FIELD SERVICE RATE SCHEDULE

DOMESTIC RATES ($USD)

Service	Rate	Unit	Comments
Onshore Daily Rate	$1800.00	Day	Up to 8 hours Monday-Friday. Including total time (portal-to-portal) plus expenses.
Engineering Rate	$250.00	Hour	Up to 8 hours Monday-Friday. Including total time (portal to portal) plus expenses.
Onshore Overtime/ Weekend/Holiday Rate	$337.50	Hour	Monday - Friday after 8 hours and all weekend time. Total time not to exceed 16 hours per day including total travel time (portal-to-portal) plus expenses.
Onshore Travel, Standby and Holdover Time	$1800.00	Day	Travel exceeding 4 hours one-way, standby and holdover time (considered as waiting or on-call). Charged to retain a technician at the service jobsite or area in lieu of incurring additional expenses by returning to home base due to local jobsite conditions.
Offshore Daily Rate	$3000.00	Day	Up to 12 hours Monday - Friday. Including total time (portal-to-portal) plus expenses.
Offshore Overtime/ Weekend/Holiday Rate	$375.00	Hour	Monday - Friday after 12 hours and all day Saturday, Sunday and U.S. holidays. Total time not to exceed 16 hours per day including total time (portal-to-portal) plus expenses.
Offshore Travel, Standby and Holdover Time	$3000.00	Day	Travel exceeding 4 hours one-way, standby and holdover time (considered as waiting or on-call). Charged to retain a technician at the service jobsite or area in lieu of incurring additional expenses by returning to home base due to local jobsite conditions.

INTERNATIONAL RATES ($USD)

Service	Rate	Unit	Comments
Onshore Daily Rate	$3300.00	Day	Up to 10 hours Monday-Friday. Including total time (portal-to-portal) plus expenses.
Onshore Overtime/ Weekend/Holiday Rate	$495.00	Hour	Monday - Friday after 10 hours and all weekend time. Total time not to exceed 16 hours per day including total travel time (portal-to-portal) plus expenses.
Onshore Travel, Standby and Holdover Time	$3300.00	Day	Travel, standby and holdover time (considered as waiting or on-call). Charged to retain a technician at the service jobsite or area in lieu of incurring additional expenses by returning to home base due to local jobsite conditions.
Offshore Daily Rate	$3500.00	Day	Up to 12 hours Monday - Friday. Including total time (portal-to-portal) plus expenses.
Offshore Overtime/ Weekend/Holiday Rate	$437.50	Hour	Monday - Friday after 12 hours and all day Saturday, Sunday and U.S. holidays. Total time not to exceed 16 hours per day including total time (portal-to-portal) plus expenses.

Offshore Travel, Standby and Holdover Time	$3500.00	Day	Travel, standby and holdover time (considered as waiting or on-call). Charged to retain a technician at the service jobsite or area in lieu of incurring additional expenses by returning to home base due to local jobsite conditions.

NOTES:

1. These charges apply to all products manufactured by De Nora Water Technologies, LLC (DNWT).
2. A purchase order must be issued to DNWT prior to dispatching a Field Service Engineer.
3. All rates are net unless prior arrangements have been negotiated beforehand.
4. Travel time is defined as roundtrip travel from home base to jobsite and is considered service time and rendered at prevailing service day rates.
5. Rates for field engineering will be at prevailing rates in effect at time work is performed.
6. A field service engineer is an authorized representative dispatched by DNWT to provide the service required.
7. Parts and materials supplied in connection with field service work will be provided in accordance with DNWT published Warranty Terms and Conditions.
8. Portal-to-portal rates for travel time and expenses will be charged regardless of warranty/non-warranty decision.
9. A warranty decision means that DNWT published Warranty Terms and Conditions apply.
10. Standby/holdover time is not considered part of the quoted and agreed startup costs and will be added to the startup costs pre-paid as determined by the above rate and terms and conditions.
11. DNWT reserves the right to determine the qualifications of the field service engineer to fulfill the service obligations.
12. The rates above are in U.S. Dollars.
13. Payment conditions shall be indicated in the proposal in consideration of the consistency of the service to be rendered.
14. Expenses including but not limited to, airfare, meals, lodging and local transportation will be billed at cost plus up to 15% (max).

Note: Service rates are valid through 31 Dec 2026

Warranty Rider for ClorTec, MIOX, and SeaClor Electrodes

De Nora Water Technologies, LLC, (henceforth referred to as DNWT) provides this Warranty Rider for ClorTec and MIOX Electrodes (this "Rider") in conjunction with DNWT's General Terms and Conditions of Sale, as amended from time to time, a copy of which is available at https://denora.com/info/Sales-Terms---Conditions.html (the "Terms").

This Rider electrodes modifies and supplements the duration of the warranty period as set forth in Article 8 of the Terms and applies only to DNWT- provided ClorTec, MIOX, or SeaClor electrodes. DNWT warrants the provided ClorTec, MIOX, or SeaClor electrodes against material defects in materials and workmanship for the time period listed below provided that the ClorTec, MIOX, or SeaClor equipment is operated strictly under normal use and service as defined in the ClorTec Standard Operating Conditions, the MIOX Standard Operating Conditions, or the SeaClor Standard Operating Conditions, as applicable, copies of which are available upon request (the "Standard Conditions") . At its sole and exclusive option, DNWT will repair, provide replacement or refurbish components deemed defective by DNWT, in its discretion, pursuant to this Warranty rider.

This warranty solely covers the bare DNWT-provided electrode and specifically excludes the housing and any ancillary components. The bare electrodes are warranted for seven (7) years that begins at transfer of title. Should a covered electrode fail during the first two (2) years, that electrode will be repaired, refurbished or replaced by DNWT, at its sole discretion. Should a covered electrode prove to be defective during years three (3) to seven (7), the repair, replacement or refurbishment of that bare electrode will be provided by DNWT, at its sole discretion, on a prorated basis based on the number of years (out of seven) remaining since the transfer of title on the respective component. The applicablity of this warranty shall inure solely to the initial purchaser of the system or an expressly authorized end-user, and shall be expressly contingent upon such warranty claimant not being in default of any payment or other obligation to DNWT of any kind or type. This warranty further expressly excludes any and all costs related to shipping, transportation, and labor and expenses for access to, removal, and reinstallation of warranty parts, which shall be at the sole cost and responsibility of the warranty claimant. This warranty also expressly excludes, and DNWT will have no liability or obligation regarding, any consequential, indirect, and/or secondary damages, or loss of any kind sustained directly or indirectly as a result of a defect in any equipment, material, repair, or installation. Any repair or replacement conducted under this Rider shall not extend the term or duration of any warranty for any Electrodes, which shall remain based on the initial transfer of title.

In the event that DNWT determines, pursuant to the terms hereof, that any claimed defect or failure to not be covered by this Rider or the Terms, Buyer shall pay DNWT DNWT's then-customary charges for any repair or replacement made by DNWT.

Exclusions

This warranty will be voided, does not cover, and will be of no effect in relation to any damages caused, in whole or in part, by:

1. "Acts of God" or unavoidable natural disasters including but not limited to floods, storms, lightning, power outages, weather, earthquakes, etc.
2. Theft, vandalism, or other damaging acts, whether or not intentional or negligent.
3. Abuse, misuse, or neglect, whether or not intentional or negligent.

4. Failures or repairs resulting from the failure (whether or not intentional or negligent) to perform preventative maintenance and/or operational procedures in strict accordance with the Standard Conditions.
5. Damages or defects in any DNWT product or compontent, which were caused by initial start-up, repairs or attempted repairs, improvements or attempted improvements, or any other alterations of any kind performed by anyone other than a DNWT-authorized service provider.
6. Normal wear and tear or depreciation.

7. Abnormal system conditions including but not limited to temperature, chemical, debris, or other conditions in excess of those expressly stated in the Standard Conditions.
8. Goods that have not been stored by the buyer, end-user, or their representatives prior to installation and start-up in strict compliance with the storage conditions stated in the Standard Conditions.
9. Equipment/programming which has been revised, altered, improved, modified, repaired, or otherwise changed in any way by anyone other than a DNWT-authorized service provider.



MIOX®
On-site Chemical Generator

15 to 60 lb/day (6.8 - 27.2 kg/day)

MIOX® Overview

The De Nora MIOX® 15 - 60 systems are designed for high efficiency, low lifecycle cost, durability and reliability. Specialized engineering and design gives the MIOX® systems flexibility to easily expand capacity 4X in the same enclosure.

Systems range from 15 - 60 lb/day. Using just water, salt and power to generate chemicals on site eliminates the storage and handling of hazardous disinfection chemicals while providing chlorine residual.

- Self-cleaning feature
- Available in 200/240 V 1 ph or 380/530 V 3 ph
- Remote monitoring and communication options available
- Unique cell design and flow control features for simplified maintenance and operation
- NSF/ANSI 61 and CE Markings

DE NORA



15 - 60 lb/day FAC

Product Specifications

	MIOX® 15	MIOX® 30	MIOX® 45	MIOX® 60
Rated FAC Capacity	15 lb/day 6.8 kg/day	30 lb/day 13.6 kg/day	45 lb/day 20.4 kg/day	60 lb/day 27.2 kg/day
12.5% Bleach Equivalent	15 gal/day 57 L/day	30 gal/day 113.5 L/day	45 gal/day 170 L/day	60 gal/day 227 L/day
Additional cell increments to meet higher capacity	15 lb 6.8 kg	15 lb 6.8 kg	15 lb 6.8 kg	---
Water Treatment Capacity (at 1 ppm FAC)	1.8 mgd 6,813 m^3/day	3.6 mgd 13,626 m^3/day	5.4 mgd 20,439 m^3/day	7.2 mgd 27,252 m^3/day
Salt Conversion (SCE)**	3.0 lb salt/lb FAC 3.0 kg salt/kg FAC	3.0 lb salt/lb FAC 3.0 kg salt/kg FAC	3.0 lb salt/lb FAC 3.0 kg salt/kg FAC	3.0 lb salt/lb FAC 3.0 kg salt/kg FAC
Energy Conversion (ECE)**	3.0 kW-hr/lb FAC 6.6 kW-hr/kg FAC	3.0 kW-hr/lb FAC 6.6 kW-hr/kg FAC	3.0 kW-hr/lb FAC 6.6 kW-hr/kg FAC	3.0 kW-hr/lb FAC 6.6 kW-hr/kg FAC
FAC Concentration**	4,500 mg/L ± 1,000 mg/L	4,500 mg/L ± 1,000 mg/L	4,500 mg/L ± 1,000 mg/L	4,500 mg/L ± 1,000 mg/L
Electrical Service Requirement (OSG only)	200 - 240 VAC, 1 ph, 30A, 50/60 Hz*	200 - 240 VAC, 1 ph, 30A, 50/60 Hz*	200 - 240 VAC, 1 ph, 30A, 50/60 Hz*	200 - 240 VAC, 1 ph, 30A, 50/60 Hz*
Flow Rate (± 15%)	19 gal/hr 72 L/hr	38 gal/hr 144 L/hr	57 gal/hr 216 L/hr	76 gal/hr 288 L/hr

*Available in 3 ph, Wye 380 - 530 VAC, 15A, 25A, 35A, 45A, 50/60Hz
** Performance may vary depending on salt quality, water quality and water temperature

www.denora.com

DE NORA discover more

760.0002.2 AUG/2022

VALVE SCHEDULE							
Tag No.*	Location	Size (IN)	Valve Type	Spec. Section	Mounting	Actuator Type	Comments
Yard							
GV-1501	Raw Water Isolation	12	GV	22 0523.01	MJ	WN	
GV-1502	Raw Water Isolation	8	GV	22 0523.01	MJ	WN	
GV-1503	Temporary Raw Water Isolation	8	GV	22 0523.01	MJ	WN	
GV-1508	Raw Water Isolation	12	GV	22 0523.01	MJ	WN	
GV-1510	Raw Water Isolation	12	GV	23 0523.01	MJ	WN	
GV-1511	Raw Water Isolation	8	GV	24 0523.01	MJ	WN	
GV-1512	Raw Water Isolation	8	GV	25 0523.01	MJ	WN	
GV-1515	Pre-Ozonation Bypass	12	GV	22 0523.01	MJ	WN	
GV-1520	Alluvial Wells - Influent Isolation	8	GV	22 0523.01	MJ	WN	
GV-1530	Ozone Basin #1 - Influent Isolation	12	GV	22 0523.01	MJ	WN	
GV-1552	Ozone Basin #1 - Effluent Isolation	12	GV	22 0523.01	MJ	WN	
GV-1560	Ozone Basin #1 - Drain	6	GV	22 0523.01	MJ	WN	
GV-3050	Ozone Basin #2 - Drain	6	GV	22 0523.01	MJ	WN	
Existing WTP Building							
GV-5510	HSP Discharge - HSP Isolation	10	GV	22 0523.01	FL	HW	
New WTP Building							
ARV-2000	Raw Water Pump Suction - Automatic Air Release Valve	2	ARV	22 0523.21	FL	N/A	
GV-2010	Raw Water Pump #1 - Suction Isolation	6	GV	22 0523.01	FL	HW	
CKV-2012	Raw Water Pump #1 - Discharge Check	6	CKV	22 0523.11	FL	N/A	
GV-2013	Raw Water Pump #1 - Discharge Isolation	6	GV	22 0523.01	FL	HW	
GV-2020	Raw Water Pump #2 - Suction Isolation	6	GV	22 0523.01	FL	HW	
CKV-2022	Raw Water Pump #2 - Discharge Check	6	CKV	22 0523.11	FL	N/A	
GV-2023	Raw Water Pump #2 - Discharge Isolation	6	GV	22 0523.01	FL	HW	
GV-2030	Raw Water Pump #3 - Suction Isolation	6	GV	22 0523.01	FL	HW	
CKV-2032	Raw Water Pump #3 - Discharge Check	6	CKV	22 0523.11	FL	N/A	
GV-2033	Raw Water Pump #3 - Discharge Isolation	6	GV	22 0523.01	FL	HW	
GV-2040	Raw Water Pump #4 - Suction Isolation	6	GV	22 0523.01	FL	HW	
CKV-2042	Raw Water Pump #4 - Discharge Check	6	CKV	22 0523.11	FL	N/A	
GV-2043	Raw Water Pump #4 - Discharge Isolation	6	GV	22 0523.01	FL	HW	
GV-2050	Raw Water Pump #5 - Suction Isolation	6	GV	22 0523.01	FL	HW	
CKV-2052	Raw Water Pump #5 - Discharge Check	6	CKV	22 0523.11	FL	N/A	
GV-2053	Raw Water Pump #5 - Discharge Isolation	6	GV	22 0523.01	FL	HW	
GV-2060	Raw Water Pump #6 - Suction Isolation	6	GV	22 0523.01	FL	HW	
CKV-2062	Raw Water Pump #6 - Discharge Check	6	CKV	22 0523.11	FL	N/A	
GV-2063	Raw Water Pump #6 - Discharge Isolation	6	GV	22 0523.01	FL	HW	
BFV-2100	Floc Basin #1 – Influent Flow Control Valve	6	BFV	22 0523.05	FL	MOD-Elec	
MV-2105	Floc Basin #1 - Drain Valve	6	MV	22 0523.17	FL	HW	
BFV-2112	Plate Settlers #1 - Effluent Isolation	16	BFV	22 0523.05	FL	CW	
PV-2115	Plate Settler #1 – Sludge Blowdown	6	PV	22 0523.15	FL	OC-Elec	Hardwired Open/Close Control
MV-2116	Plate Settlers #1 - Drain Valve	6	MV	22 0523.17	FL	HW	
BFV-2200	Floc Basin #2 – Influent Flow Control Valve	6	BFV	22 0523.05	FL	MOD-Elec	
MV-2205	Floc Basin #2 - Drain Valve	6	MV	22 0523.17	FL	HW	
BFV-2212	Plate Settlers #2 - Effluent Isolation	16	BFV	22 0523.05	FL	CW	
PV-2215	Plate Settler #2 – Sludge Blowdown	6	PV	22 0523.15	FL	OC-Elec	Hardwired Open/Close Control
MV-2216	Plate Settlers #2 - Drain Valve	6	MV	22 0523.17	FL	HW	
BFV-2230	Plate Settler Effluent - Ozone Bypass Valve	16	BFV	22 0523.05	FL	CW	
PV-2232	Plate Settler Waste Manual Throttling Valve	6	PV	22 0523.15	FL	HW	
BFV-2240	Plate Settlers - Effluent Isolation	16	BFV	22 0523.05	FL	CW	
BFV-4100	Filter #1 - Influent	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4101	Filter #1 – Backwash Waste	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4102	Filter #1 – Air Supply	6	BFV	22 0523.05	FL	OC-Elec	
BFV-4103	Filter #1 – Backwash Supply	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4107	Filter #1 – Effluent Isolation	8	BFV	22 0523.05	FL	MOD-Elec	
BFV-4108	Filter #1 – Filter-To-Waste Valve	8	BFV	22 0523.05	FL	MOD-Elec	
BFV-4200	Filter #2 - Influent	12	BFV	22 0523.05	FL	OC-Elec	

VALVE SCHEDULE							
Tag No.*	**Location**	**Size (IN)**	**Valve Type**	**Spec. Section**	**Mounting**	**Actuator Type**	**Comments**
BFV-4201	Filter #2 – Backwash Waste	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4202	Filter #2 – Air Supply	6	BFV	22 0523.05	FL	OC-Elec	
BFV-4203	Filter #2 – Backwash Supply	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4207	Filter #2 – Effluent Isolation	8	BFV	22 0523.05	FL	MOD-Elec	
BFV-4208	Filter #2 – Filter-To-Waste Valve	8	BFV	22 0523.05	FL	MOD-Elec	
BFV-4300	Filter #3 - Influent	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4301	Filter #3 – Backwash Waste	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4302	Filter #3 – Air Supply	6	BFV	22 0523.05	FL	OC-Elec	
BFV-4303	Filter #3 – Backwash Supply	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4307	Filter #3 – Effluent Isolation	8	BFV	22 0523.05	FL	MOD-Elec	
BFV-4308	Filter #3 – Filter-To-Waste Valve	8	BFV	22 0523.05	FL	MOD-Elec	
BFV-4400	Filter #4 - Influent	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4401	Filter #4 – Backwash Waste	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4402	Filter #4 – Air Supply	6	BFV	22 0523.05	FL	OC-Elec	
BFV-4403	Filter #4 – Backwash Supply	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4407	Filter #4 – Effluent Isolation	8	BFV	22 0523.05	FL	MOD-Elec	
BFV-4408	Filter #4 – Filter-To-Waste Valve	8	BFV	22 0523.05	FL	MOD-Elec	
BFV-4500	Filter #5 - Influent	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4501	Filter #5 – Backwash Waste	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4502	Filter #5 – Air Supply	6	BFV	22 0523.05	FL	OC-Elec	
BFV-4503	Filter #5 – Backwash Supply	12	BFV	22 0523.05	FL	OC-Elec	
BFV-4507	Filter #5 – Effluent Isolation	8	BFV	22 0523.05	FL	MOD-Elec	
BFV-4508	Filter #5 – Filter-To-Waste Valve	8	BFV	22 0523.05	FL	MOD-Elec	
ARV-4520	Filter #5 - Filter Backwash Supply Air Release Valve	1	ARV	22 0523.21	FL	N/A	
BFV-4602	Clearwell #1 - Influent	12	BFV	22 0523.05	FL	CW	
GV-4603	Interior Clearwell Isolation Valve	12	GV	22 0523.01	FL	WN	
BFV-4604	Clearwell #2 - Influent	12	BFV	22 0523.05	FL	CW	
BFV-4609	Clearwell Effluent - Butterfly Valve	16	BFV	22 0523.05	FL	HW	
BFV-4610	Clearwell #1 - Effluent	16	BFV	22 0523.05	FL	HW	
BFV-4611	Clearwell #2 - Effluent	16	BFV	22 0523.05	FL	HW	
CKV-4613	Clearwell Effluent - Check Valve	16	CKV	22 0523.11	FL	N/A	
BFV-4618	Clearwell #3 - Influent Isolation	12	BFV	22 0523.05	FL	CW	
BFV-4619	Clearwell #2- Effluent To GSR	12	BFV	22 0523.05	FL	CW	
BFV-4700	Backwash Supply Pump #1 - Suction Isolation	16	BFV	22 0523.05	FL	HW	
CKV-4702	Backwash Supply Pump #1 - Discharge Check	12	CKV	22 0523.11	FL	N/A	
BFV-4703	Backwash Supply Pump #1 - Discharge Isolation	12	BFV	22 0523.05	FL	HW	
BFV-4710	Backwash Supply Pump #2 - Suction Isolation	16	BFV	22 0523.05	FL	HW	
CKV-4712	Backwash Supply Pump #2 - Discharge Check	12	CKV	22 0523.11	FL	N/A	
BFV-4713	Backwash Supply Pump #2 - Discharge Isolation	12	BFV	22 0523.05	FL	HW	
BFV-4800	HSP #3 - Suction Isolation	*8*	BFV	22 0523.05	FL	HW	
BFV-4802	HSP #3 - Discharge Isolation	*6*	BFV	22 0523.05	FL	CW	
CKV-4803	HSP #3 - Discharge Check	*6*	CKV	22 0523.11	FL	N/A	
ARV-4805	HSP #3 - Discharge Air/Vaccuum Release Valve	1	ARV	22 0523.21	FL	N/A	
BFV-4810	HSP #4 - Suction Isolation	*8*	BFV	22 0523.05	FL	HW	
BFV-4812	HSP #4 - Discharge Isolation	*6*	BFV	22 0523.05	FL	CW	
CKV-4813	HSP #4 - Discharge Check	*6*	CKV	22 0523.11	FL	N/A	
ARV-4815	HSP #4 - Discharge Air/Vaccuum Release Valve	1	ARV	22 0523.21	FL	N/A	
ARV-4817	HSP 3/4 - Discharge Air/Vaccuum Release Valve	1	ARV	22 0523.21	FL	N/A	
GV-4818	HSP - Discharge Isolation Connecting to Ext. 16"	16	GV	22 0523.01	FL	WN	
GV-4821	HSP - Discharge Isolation Connecting to Ext. 8"	*8*	GV	22 0523.01	FL	WN	
GV-4822	HSP - Discharge Isolation Connecting to Ext. 12"	*10*	GV	22 0523.01	FL	WN	
GV-4823	HSP - Discharge Isolation Connecting to Ext. 10"	10	GV	22 0523.01	FL	WN	
BFV-4830	Clearwell #3 - Effluent Isolation	12	BFV	22 0523.05	FL	HW	
BFV-4835	Clearwell to GSR	12	BFV	22 0523.05	FL	CW	
Ozone Building							
BFV-1522	Alluvial Wells - Influent Isolation	8	BFV	22 0523.05	FL	HW	

VALVE SCHEDULE

Tag No.*	Location	Size (IN)	Valve Type	Spec. Section	Mounting	Actuator Type	Comments
BFV-1533	Ozone Basin #1 - Influent Isolation	12	BFV	22 0523.05	FL	HW	*EPDM full body lining w/ full 316 SS shaft and disc*
SOL-1535	Basin #1 Influent Ozone Analyzer Valve	1/2"	SOL	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
SOL-1539	Mid Basin #1 ORP Analyzer Valve	1/2"	SOL	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
PRV-1546	Ozone Basin #1 - Ozone Off Gas	2	PRV	22 0523.20	FL	N/A	
BFV-1550	Ozone Basin #1 - Effluent Isolation	16	BFV	22 0523.05	FL	CW	*EPDM full body lining w/ full 316 SS shaft and disc*
SOL-1553	Basin #1 Effluent ORP Analyzer Valve	1/2"	SOL	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
BFV-3021	Ozone Basin #2 - Influent Isolation	12	BFV	22 0523.05	FL	HW	*EPDM full body lining w/ full 316 SS shaft and disc*
SOL-3023	Basin #2 Influent Ozone Analyzer Valve	1/2"	SOL	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
SOL-3029	Mid Basin #2 ORP Analyzer Valve	1/2"	SOL	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
PRV-3034	Ozone Basin #2 - Ozone Off Gas	2	PRV	22 0523.20	FL	N/A	
BFV-3040	Ozone Basin #2 - Effluent Isolation	16	BFV	22 0523.05	FL	CW	*EPDM full body lining w/ full 316 SS shaft and disc*
SOL-3042	Basin *#2* Effluent ORP Analyzer Valve	1/2"	SOL	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
GV-3101	Air Compressor/Dryer - Isolation	TBD	GV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
GV-3103	Air Filter - Isolation	TBD	GV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
SOL-3106	Air Receiver Tank - Drain	TBD	SOL	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
GV-3115	Air Receiver Tank - Isolation	TBD	GV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
GV-3125	Oxygen Generator - Isolation	TBD	GV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
SOL-3121	Oxygen Generator - Drain	TBD	SOL	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
GV-3135	Oxygen Receiver Tank - Isolation	TBD	GV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
GV-3142	Ozone Generator Chiller - Cooling Water to Generator Isolation	TBD	GV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
GV-3147	Ozone Generator Chiller - Cooling Water from Generator Isolation	TBD	GV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
CHK-3150	Ozone Generator - Check	TBD	CKV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
GV-3151	Ozone Generator - Isolation	TBD	GV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
BFV-3211	Ozone Injection #1 – Flow Control	TBD	BFV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
BV-3214	Ozone Injection Pump #1 - Suction Isolation	TBD	BV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
CKV-3216	Ozone Injection Pump #1 - Check	TBD	CKV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
BV-3217	Ozone Injection Pump #1 - Discharge Isolation	TBD	BV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
BFV-3221	Ozone Injection #2 – Flow Control	TBD	BFV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
BV-3224	Ozone Injection Pump #2 - Suction Isolation	TBD	BV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
CKV-3226	Ozone Injection Pump #2 - Check	TBD	CHV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER
BV-3227	Ozone Injection Pump #2 - Discharge Isolation	TBD	BV	*46 3153.04*	TBD	TBD	BY OZONE MANUFACTURER

NOTE:
COMBINATION AIR VALVES, MECHANICAL AND PLUMBING VALVES 3" AND LESS ARE NOT SHOWN.

KEY

*** Valve Designation**

PV	Plug Valve
CV	Check Valve
BV	Ball Valve
MV	Mud Valve
GV	Gate Valve
BFV	Butterfly Valve
ARV	Air/Vacuum Relief Valve
PRV	Pressure/Vacuum Relief Valve
SOL	Solenoid Valve

Diameter:

Mounting:

FL	Flange
MJ	Mechanical Joint
NPT	Threaded

**** Pipe Designation**

Actuator Type:

OC-Elec	Open/Close - Electric
OC-Pneu	Open/Close - Pneumatic
MOD-Elec	Modulating - Electric
MOD-Pneu	Modulating - Pneumatic
N/A	Not Applicable
CW	Chainwheel Operator
HW	Handwheel Operator
ML	Manual/Lever
WN	Wrench Nut

SECTION 31 6613
RAMMED AGGREGATE PIERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of the contract, including general and supplementary conditions and other Division 00 and Division 01 specification sections, apply to this section.

1.02 DESCRIPTION: Work shall consist of designing, furnishing and installing materials, and constructing a ground improvement system under all foundation footings and mat foundation slabs, at any other locations noted on the drawings, and as specified herein. Ground improvement system shall be rammed aggregate piers. “Aggregate piers” referenced in these specifications or on the drawings refer to rammed aggregate piers.

1.03 WORK INCLUDED:

A. Provision of all equipment, material, labor, and supervision to design and install aggregate pier elements. Design shall rely on subsurface information presented in the project geotechnical report. Removal of spoils from the site (which result from aggregate pier construction), removal of spoils off the working pad, footing excavation, and subgrade preparation following aggregate pier installation shall be by the Contractor.

B. Drawings and General Provisions of the Contract, including General and Supplemental Conditions, and Division 1 Specifications, apply to the work in this specification.

1.04 APPROVED INSTALLERS:

A. Hayward Baker

B. Subsurface Contractors, Inc.

C. Contractor licensed by Geopier to install Geopier “Rammed Aggregates”.

D. Installers of aggregate pier foundation systems having a minimum of 5 years of experience with the installation of aggregate piers and at least 50 projects.

1.05 RELATED WORK:

A. Section 03 3000 - Cast in Place Concrete.

B. Geotechnical Report and Recommendations.

1.06 REFERENCE STANDARDS:

A. Design: The ground improvement installer shall be responsible for design of a rammed pier ground improvement system that meets the global stability, allowable bearing capacity, and settlement requirements stated on the contract plans. Industry recognized standards or design methods specific to the installer’s equipment and construction methods shall be used.

B. Modulus and Uplift Testing:
   1. ASTM D-1143 - Pile Load Test Procedures.
   2. ASTM D-1194 - Spread Footing Load Test.
   3. ASTM-D-3689 - Uplift Load Test.

C. Materials and Inspection:
   1. ASTM D-1241 - Aggregate Quality.
   2. ASTM STP 399 - Dynamic Penetrometer Testing.
   3. ASTM D-422 - Gradation Soils.

1.07 CONFLICTS IN SPECIFICATIONS/REFERENCES: Where specifications and reference documents conflict, the Engineer shall make the final determination of the applicable document.

1.08 CERTIFICATIONS AND SUBMITTALS:

A. The installer shall submit detailed design calculations and construction drawings to the Engineer for review at least three (3) weeks prior to the start of construction. All plans shall be sealed by a Professional Engineer in the State of Iowa (referred in this specification as “the Designer”).

B. The Aggregate Pier engineer shall have Errors and Omissions design insurance for the work. The insurance policy should provide a minimum coverage of $2 million per occurrence.

C. Modulus and uplift test data - The Installer shall furnish the General Contractor a description of the installation equipment, installation records, complete test data, analysis of the test data and recommended design parameter values based on the modulus test results. The report shall be prepared under supervision of a registered professional engineer.

D. Daily Progress Reports - The Installer shall furnish a complete and accurate record of aggregate pier installation to the General Contractor. The record shall indicate the pier location, length, average lift thickness and final elevations of the base and top of piers. The record shall also indicate the type and size of the densification equipment used. The Installer shall immediately report any unusual conditions encountered during installation to the General Contractor, to the Designer and to the Testing Agency.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Aggregate used for piers constructed above the water table shall be Type I Grade B in accordance with ASTM D-1241, or shall be other graded aggregate selected by the Installer and successfully used in the modulus test. It shall be compacted to a densification and strength, which provides resistance to the dynamic penetration test (ASTM STP 399) of a minimum average of 15 blows per 1.75-inch vertical movement.

B. For aggregate used for piers constructed below the water table, the gradation shall be the same as Type I Gradation B, except that particles passing the No. 40 sieve shall be eliminated. Alternatively, No.57 stone or other stone selected by the Stone Columns or Aggregate Pier Installer may be used. Dynamic penetration resistance testing is inappropriate for this material.

C. Potable water or other suitable source shall be used to increase aggregate moisture content where required. Access to water on site shall be provided to the Installer.

D. Installer to coordinate adequate and suitable marshalling areas on the project site for the use of the Installer for the storage of aggregate and equipment.

PART 3 - DESIGN REQUIREMENTS

3.01 AGGREGATE PIER DESIGN:

A. The Aggregate Pier design stiffness modulus value shall be verified by the results of the modulus test, described in this specification.

B. Aggregate piers shall be designed in accordance with generally-accepted engineering practice and the methods described in Section 1 of these Specifications. The design shall meet the following criteria.
   1. Minimum Allowable Bearing Pressure for Aggregate Pier Reinforced Soils: 3,000 psf.
   2. Minimum Aggregate Pier Area Coverage (for square Spread Footings): 30%.
   3. Estimated Total Long-Term Settlement for Footings: =1-inch.
   4. Estimated Long-Term Differential Settlement of Adjacent Footings: = ½-inch.

C. The design submitted by the Installer shall consider the bearing capacity and settlement of all footings supported by aggregate piers, and shall be in accordance with acceptable engineering

practice and these specifications. Total and differential settlement shall be considered. The design life of the structure shall be 50 years.

D. The Aggregate Pier system shall be designed to preclude plastic bulging deformations at the top-of-pier design stress and to preclude significant tip stresses as determined from the shape of the telltale test curve from telltales installed in modulus test piers. The results of the modulus test shall be used to verify the design assumptions.

3.02 DESIGN SUBMITTAL: The installer shall submit detailed design calculations, construction drawings, and shop drawings, (the design submittal), for approval at least three (3) weeks prior to the beginning of construction. A detailed explanation of the design parameters for settlement calculations shall be included in the design submittal. Additionally, the quality control test program for aggregate piers, meeting these design requirements, shall be submitted. All computer-generated calculations and drawings shall be prepared and sealed by a professional engineer, licensed in the State of Iowa.

PART 4 - CONSTRUCTION

4.01 RAMMED PIERS:

A. All Aggregate Pier elements shall be pre-augered using mechanical drilling or excavation equipment. Installation of piers without pre-augering shall not be allowed because this technique results in significant disturbance and remolding of the matrix soils surrounding the piers.

B. If cave-ins occur during excavation such that the sidewalls of the hole are deemed to be unstable, steel casing or a drilling slurry shall be used to stabilize the excavation.

C. If cave-ins occur on top of a lift of aggregate such that the volume of the caved soils is greater than 10 percent of the volume of the aggregate in the lift, then the aggregate shall be considered contaminated and shall be removed and replaced with uncontaminated aggregate.

D. Special high-energy impact densification apparatus shall be employed to densify the Aggregate Pier elements during installation. The apparatus shall apply direct downward impact energy to each lift of aggregate.

E. A minimum tamper energy level of 250,000 foot-pounds of force per minute shall be applied by the energy source.

F. The bottom of the excavation shall be densified prior to the placement of the aggregate. If wet, soft or sensitive soils are present, open-graded aggregate, such as ASTM No.57 stone or other, shall be placed at the bottom of the excavation and compacted to stabilize the element bottom and may serve as the initial lift.

G. Densification shall be performed using a beveled tamper. The beveled tamper foot is required to adequately increase the lateral earth pressure in the matrix soil during installation.

H. Downward pressure shall be applied to the tamper shaft during tamping.

I. Each lift of aggregate shall be tamped for a minimum of 15 seconds.

J. Lift thickness shall not exceed 12-inches.

4.02 PLAN LOCATION AND ELEVATION OF AGGREGATE PIER ELEMENTS: The center of each pier shall be within six inches of the design locations. The final measurement of the top of piers shall be the lowest point on the aggregate in the last compacted lift. Piers installed outside of the above tolerances and deemed not acceptable shall be rebuilt at no additional expense to the owner.

4.03 REJECTED AGGREGATE PIER ELEMENTS: Aggregate pier elements improperly located or installed beyond the maximum allowable tolerances shall be abandoned and replaced with new piers, unless the designer approves other remedial measures. All material and labor required to replace rejected piers shall be provided at no additional cost to the owner.

PART 5 - QUALITY CONTROL

5.01 QUALITY CONTROL REPRESENTATIVE:

A. The Installer shall have a full-time Quality Control (QC) representative to verify and report all QC installation procedures. The Installer shall immediately report any unusual conditions encountered during installation to the Design Engineer, the Contractor, and to the Testing Agency. The QC procedures shall include the preparation of Aggregate Pier Progress Reports completed during each day of installation and containing the following information:
   1. Footing and Aggregate Pier location.
   2. Aggregate Pier length and drilled diameter.
   3. Planned and actual Aggregate Pier elevations at the top and bottom of the element.
   4. Average lift thickness for each Aggregate Pier.
   5. Soil types encountered at the bottom of the Aggregate Pier and along the length of the element.
   6. Depth to groundwater, if encountered.
   7. Documentation of any unusual conditions encountered.
   8. Type and size of densification equipment used.

5.02 QUALITY CONTROL VERIFICATION PROGRAM:

A. The installer shall be responsible for design of a verification program to assure the quality of the construction. The program shall verify that the installed ground improvement system satisfies the performance requirements noted on the contract plans and the design requirements determined by the ground improvement system designer. As a minimum, the verification program shall include the following:
   1. Program to monitor performance of the ground improvement system during and after construction of the proposed structure or embankment to be supported. This program may include installation of settlement plates, monitoring points, inclinometers, piezometers, or other instrumentation.
   2. Proposed means and methods for verification that the installed aggregate piers meet the strength and/or stiffness criteria required by the design. This may include, but shall not be limited to, modulus or load tests on individual elements and/or groups, soil borings, and other methods as approved by the Engineer.
   3. Quality control program to verify that the ground improvement system is installed in accordance with the designer’s specifications and the requirements in this special provision. The quality control program shall include testing and observations by qualified personnel employed by the ground improvement installer or an independent testing laboratory.

PART 6 - QUALITY ASSURANCE

6.01 INDEPENDENT ENGINEERING TESTING AGENCY: The Contractor is responsible for retaining an independent engineering testing firm to provide quality assurance services.

6.02 RESPONSIBILITIES OF INDEPENDENT ENGINEERING TESTING AGENCY:

A. The Testing Agency shall monitor the installation of aggregate pier elements to verify that all work is performed in accordance with the approved Design Submittal.

B. The Testing Agency shall observe footing excavations and densification of aggregate piers and provide written reports per section 7.3.D.

C. The Testing Agency shall report any discrepancies to the Installer and Contractor immediately.

PART 7 - RESPONSIBILITIES OF GENERAL CONTRACTOR

7.01 PREPARATION:

A. The Installer shall locate and protect underground and aboveground utilities and other structures from damage during installation of the Aggregate Pier elements.

B. The Contractor shall provide the site to the Installer, after earthwork in the area has been completed.

C. Site subgrade shall be established by the Contractor within 6 inches of final design subgrade, as approved by the Design Engineer.

7.02 UTILITY EXCAVATIONS:

A. The Contractor shall coordinate all excavations made subsequent to Aggregate Pier installations so that at least five feet of horizontal distance remains between the edge of any installed Aggregate Pier and the excavation. In the event that utility excavations are required at horizontal distances of less than five feet from installed Aggregate Piers, the Contractor shall notify the Aggregate Pier Designer to develop construction solutions to minimize impacts on the installed Aggregate Piers.

B. Recommended procedures may include:
   1. Using cement-treated base to construct portions of the Aggregate Piers subject to future excavations.
   2. Replacing excavated soil with compacted crushed stone in the portions of excavations where the Aggregate Piers have been disturbed. The placement and compaction of the crushed stone shall meet the following requirements.
      a. The crushed stone shall meet the gradation specified by the Designer.
      b. The crushed stone shall be placed in a controlled manner using motorized impact compaction equipment.
      c. The aggregate should be compacted to 95% of the maximum dry density as determined by the modified Proctor method (ASTM D-1557).
      d. The Testing Agency shall be on site to observe placement, compaction, and provide density testing. The test results shall be submitted to the Designer and the Contractor. The subcontractor shall provide notification to the Testing Agency and the Designer when excavation, placement, and compaction will occur and arrange for construction observation and testing.

7.03 FOOTING BOTTOMS:

A. Excavation and surface compaction of all footings shall be the responsibility of the Contractor.

B. Foundation excavations to expose the tops of Aggregate Pier elements shall be made in a workmanlike manner, and shall be protected until concrete placement, with procedures and equipment best suited to (1) prevent softening of the matrix soil between and around the Aggregate Pier elements before pouring structural concrete, and (2) achieving direct and firm contact between the dense, undisturbed Aggregate Pier elements and the concrete footing.

C. Recommended procedures for achieving these goals are to:
   1. Limit over-excavation below the bottom of the footing to 3-inches (including disturbance from the teeth of the excavation equipment,
   2. Compaction of surface soil and top of Aggregate Pier elements shall be prepared using a motorized impact compactor (“Wacker Packer,” “Jumping Jack,” or similar). Sled-type tamping devices shall not be used. Compaction shall be performed over the entire footing bottom to compact any loose surface soil and loose surface pier aggregate.
   3. Place footing concrete immediately after footing excavation is made and approved, preferably the same day as the excavation. Footing concrete must be placed on the same day if the footing is bearing on expansive or sensitive soils.

4. If same day placement of footing concrete is not possible, place a minimum 3-inch thick lean concrete seal (‘mud mat”) immediately after the footing is excavated and approved.

D. The following criteria shall apply, and a written inspection report sealed by a qualified Geotechnical Engineer retained by the Contractor shall be furnished to the Installer to confirm:
   1. That water (which may soften the unconfined matrix soil between and around the Aggregate Pier elements, and may have detrimental effects on the supporting capability of the Aggregate Pier reinforced subgrade) has not been allowed to pond in the footing excavation at any time.
   2. That all Aggregate Pier elements designed for each footing have been exposed in the footing excavation.
   3. That immediately before footing construction, the tops of all the Aggregate Pier elements exposed in each footing excavation have been inspected and recompacted as necessary with mechanical compaction equipment, and that the tops of any Aggregate Pier elements which may have been disturbed by footing excavation and related activity have been recompacted to a dry density equivalent to at least 95% of the maximum dry density obtainable by the modified Proctor method (ASTM D-1557).
   4. That no excavations or drilled shafts have been made after installation of Aggregate Pier elements within horizontal distance of five feet from the edge of any pier, without the written approval of the Installer or Designer.

END OF SECTION

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 Switch, Liquid Thermal Dispersion
   5. Flow, Liquid, Magnetic Flow Tube, Small Diameter
   6. Flow, Liquid, Magnetic Flow Tube, Large Diameter
   7. Level, Liquid, Float Switch, Standard Duty
   8. Level, Liquid, Microwave
   9. Level, Liquid, Submersible
   10. Pressure, Transducer/Transmitter -- Gauge/Absolute
   11. Pressure, Transducer/Transmitter, Fluid Level Specific

B. Ambient Instruments (Electrical/Electronic)
   1. Flood, Chemical Spill
   2. Switch, Liquid Level, Flood Float
   3. Temperature, Air, Room

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.

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: Seperate 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.

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)

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 nephleometric 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.

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 calibartion 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, FLOW SWITCH, thermal dispersion
1. General
   a. Function: Measure discrete flow.
   b. Type: Thermal dispersion, field adjustable.
   c. Parts: Sensor-316 SS, 8" insertion length, spherical probe tip; Enclosure; cast aluminum with viewing window.
2. Service
   a. Type: potable drinking water
   b. Temperature range: 32 - 100 F
   c. Pressure range: 0 - 150 psig
3. Process Connection
   a. 3/4" male NPT.
4. Electrical
   a. Power: 19.2 to 28.8 VDC.
   b. DPDT relay contacts rated @ 8 A, 125/250 VAC minimum and 8 amp at 28.8 VDC.
   c. Conduit connection: 1/2" female NPT.
5. Acceptable Manufacturers
   a. Magnetrol TD2-8D01-030/TEA-A110-008
   b. Engineer approved equivalent.

E. FLOW, LIQUID MAGNETIC FLOW TUBE AND TRANSMITTER (small diameter) - CHEMICAL FEED
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. Pressure range: multiple installations and conditions; see schedule
   c. Temperature range: multiple installations and conditions; see installation schedule
   d. Process pipe size: multiple installations and conditions; see installation schedule

e. Process pipe material: non-metallic
f. 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: 0.67 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 body: manufacturer's standard.
      3) Flow tube liner: PFA
      4) Flow tube electrodes: Platinum-iridium or Hastelloy C-22 as recommended by manufacturer for chemical type.
      5) Flow tube process connection type: flanged, ANSI Class 150.
      6) Enclosure electrical rating: NEMA 4X/IP67.
      7) Enclosure safety rating: General Purpose, no approval.
5. Transmitter
   a. Type of physical installation: remote mounted.
   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 H 300 Series with ODVA Compliant Ethernet IP Communication.
   c. ABB Processmaster Series - FEP6/FEW6 model with native Ethernet IP Protocol Communication.

F. 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
      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
   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 Communication.

G. 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: municipal wastewater
      b. Temperature range: 32 - 100 F
      c. Special conditions:hazardous locations require intrinsically safe circuits.
   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.
      e. NSF compliant materials.
   5. Electrical
      a. N.O. or N.C. contacts rated @ 3A, 120/240 VAC minimum.
   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. No Substitutes.

H. LEVEL, LIQUID, MICROWAVE
   1. General
      a. Function: Continuously measure , indicate, and transmit distance to liquid level surface.
      b. Type: Frequency-modulated, Continuous-wave microwave tranceiver.
      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 meassured 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
            (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.

I. LEVEL, LIQUID, SUBMERSIBLE
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. Performance:
        1) Pressure Range: See Section 25 9110 for application range.
        2) Static Accuracy: ± 0.25% FS BSL.

3) Thermal Error: 1.5% FS worst case.
4) Proof Pressure: 1.5 X rated pressure.
5) Burst Pressure: 2.0 X rated pressure.
6) Resolution: Infinitesimal.

b. Environmental:
1) Compensated. Temperature Range: 0 degrees C to 50 degrees C.
2) Operating Temperature Range: -10 degrees C to 60 degrees C.

c. Electrical:
1) Excitation: 24 Volts.
2) Input Current: 20 mA maximum.
3) Output: 4-20 mA (2 wire):
4) Insulation Resistance: 100 megohms at 50 VDC.

d. Physical:
1) Cable: Polyurethane jacketed shielded cable with polyethylene vent tube assembly capable of supporting transducer. Provide termination box for cable with desiccant dryer/filter. Do not splice cable.
2) Provide recommended cable grip assembly for supporting cable.
3) Wetted Materials: 316 Stainless Steel, fluorocarbon or titanium.
4) NSF Cerification.

4. Desiccant Dryer/Filter:
a. Visual indication of gel renewal required.
b. Provide physical connection for dryer air inlet to an outside source.
c. Cable termination.
d. All connections/terminations to be inside NEMA 4X rated enclosure.

5. Approved Manufacturers:
a. KPSI: 720 Series.
b. Endress+Hauser: Waterpilot FMX 11 series.
c. Engineer approved equivalent.

J. 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 a 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: Microrocessor based w/ non-volitile 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
      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 imedance 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. No Substitutions

K. 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 mADC 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 "H2O 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. Engineer Approved Equivalent.

2.02 AMBIENT INSTRUMENTS

A. FLOAT, CHEMICAL SPILL/DAY TANK HIGH LEVEL
1. Omega LVN-61, GEMS LS-1700TFE, or approved equivalent.
2. See plans for mounting locations and mounting details.
3. Provide NEMA 4X non-metalic mounting box with conduit connection.
4. Provide mounting accessories as required.

B. 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.
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.

C. 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