March 23, 2020

TO THE PROSPECTIVE BIDDER:

RE: WRF Clarifier Improvements- Phase 1
Activity ID: 04-2020-002

We are issuing Addendum No. 3 on the above-referenced project. This Addendum No. 3 modifies, supplements, or replaces information contained in the contract documents. This addendum is hereby made a part of the contract documents.

The original proposal shall be used to bid this project.

Each bidder shall acknowledge receipt of each addendum in its proposal in order to have its bid read and considered. Acknowledgment of the receipt of each addendum shall be made by inserting the number of each addendum in the appropriate blank provided for such acknowledgment in the proposal.

The current bidders list is available on our web page:
https://www.dsm.city/ProjectBidInfo

If you have any questions regarding this Addendum No. 3, please contact the Project Manager, Patrick Brown at 515-323-8027.

Sincerely,

[Signature]

Steven L. Naber, P.E.
City Engineer
ADDENDUM NO. 3
TO THE
BIDDING DOCUMENTS FOR THE DES MOINES METROPOLITAN
WASTEWATER RECLAMATION AUTHORITY
WRF CLARIFIER IMPROVEMENTS - PHASE 1 PROJECT
ACTIVITY ID NO. 04-2020-002

Date: March 23, 2020

TO ALL BIDDERS BIDDING ON THE ABOVE PROJECT: All Bidders submitting a Bid on the above Contract shall carefully read this addendum and give it consideration in the preparation of their Bid.

1.0 SCOPE:

This Addendum No. 3 consists of pages 1 through 7 with attachments including revisions to the Front-End Documents under Item 2.0, Technical Specifications under Item 3.0 and Drawings under Item 4.0.

2.0 The following revisions are to the Front-End Documents:

1. INSTRUCTIONS TO BIDDERS:
   a. Page 1, header: DELETE “March 31, 2020” and REPLACE with “April 21, 2020”.

2. NOTICE TO BIDDERS:
   a. Page 1, paragraph 1: DELETE “March 31, 2020” and REPLACE with “April 21, 2020”.
   b. Page 1, paragraph 3: DELETE “March 31, 2020” and REPLACE with “April 21, 2020”.

3. NOTICE OF PUBLIC HEARING:
   a. Page 1, paragraph 1: DELETE “April 21, 2020” and REPLACE with “May 19, 2020”.

4. SPECIAL PROVISION BIDDING REQUIREMENTS:
   a. Page 1, paragraph 1: DELETE “April 17, 2020” and REPLACE with “May 15, 2020”.
   b. Page 1, paragraph 1: DELETE “April 21, 2020” and REPLACE with “May 19, 2020”.
   c. Page 1, paragraph 2: DELETE “April 17, 2020” and REPLACE with “May 15, 2020”.
3.0 The following are revisions to the Technical Specifications:

1. Section 01 04 00: SPECIAL PROVISIONS

1) ADD the following definition to Part 1.2.E:

"Substantial Completion - The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof."

2) ADD the following after Part 1.5.B:

"C. Delete Paragraph 1.14 from SUDAS Division 1 Section 1050 in its entirety and replace with the following:

"1.14 Project Completion and Acceptance
A. Substantial Completion:
1. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
2. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
3. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's
objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

4. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

5. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

6. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

B. Final Inspection and Acceptance:

1. Upon written notice from Contractor that the entire Work is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

2. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents, and other documents, Contractor may make application for final payment.

3. If, on the basis of Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been
completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable.”

3) ADD the following after Part 1.7.A:

“B. Delete Paragraph 1.05 from SUDAS Division 1 Section 1070 in its entirety and replace with the following:

"1.05 Partial Use or Occupancy
A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified as a Project Classified System in Section 01 75 00 of the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Section 1050, 1.14.A.1 through 5 for that part of the Work.
2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Section 1050. 1.14 will apply with respect to certification of Substantial Completion of that part of the Work, the division of responsibility in respect thereof and access thereto, and identifying start date of associated equipment warrantee.”
2. Section 01 45 33: SPECIAL INSPECTIONS AND TESTING PROGRAM
   1) DELETE entire section and REPLACE with attached SECTION 01 45 33-AD3.

3. Section 01 75 00: SYSTEM START-UP
   1) DELETE entire section and REPLACE with attached SECTION 01 75 00-AD3.

4. Section 03 35 00: CONCRETE FINISHING AND REPAIR OF SURFACE DEFECTS
   1) DELETE entire section and REPLACE with attached SECTION 03 35 00-AD3.

5. Section 04 22 00: CONCRETE MASONRY
   1) DELETE entire section and REPLACE with attached SECTION 04 22 00-AD3.

6. Section 05 52 06: ROOFTOP GUARDRAIL
   1) DELETE entire section and REPLACE with attached SECTION 05 52 06-AD3.

7. Section 10 14 00: IDENTIFICATION DEVICES
   1) DELETE "1-1/2 IN" from Part 2.2.A.2.a and REPLACE with "3 IN".
   2) DELETE "White with black lettering or as specified." from Part 2.2.G.4 and
      REPLACE with "Coordinate with Owner."
   3) DELETE "Type G – Stenciling System." from Part 2.2.J.6.a.1 and REPLACE with
      "Type D - Self-Adhesive."
   4) DELETE "Type G – Stenciling System." from Part 2.2.J.6.a.2.b.
   5) DELETE "Per ASME A13.1." from Part 2.2.J.6.c and REPLACE with "Per
      Owner."
   6) DELETE "Single arrow." from Part 2.2.J.6.d.4 and REPLACE with "Single row
      arrow tape wrapped around pipe on each side of label."

8. Section 26 05 19: WIRE AND CABLE - 600 VOLT AND BELOW
   1) DELETE "FC" from Part 2.2.F.2.n and REPLACE with "LC".

9. Section 40 05 59: FABRICATED STAINLESS STEEL SLUICE GATES
   1) DELETE "30 FT of seating head and 30 FT of unseating head." in Part 2.2.C.2
      and REPLACE with "21.33 FT of seating head and 21.33 FT of unseating head."

10. Section 43 23 57: PUMPING EQUIPMENT - PROGRESSIVE CAVITY
    1) DELETE entire section and REPLACE with attached SECTION 43 23 57-AD3.

11. Section 46 43 23: SLUDGE COLLECTION - CIRCULAR PLOW-TYPE
    1) DELETE entire section and REPLACE with attached SECTION 46 43 23-AD3.
4.0 The following are revisions to the Drawings:

1. SHEET 00A601, ARCHITECTURAL SCHEDULES AND DETAILS
   1) REPLACE entire sheet with attached reissued sheet. Summary of changes includes revising Room Finish Schedule to “EF” for floors and revising Door Schedule to have one leaf be at least 32 inches.

2. SHEET 15A10*, PRIMARY CLARIFIERS (#1-#6) STAIR REPLACEMENT
   1) REPLACE entire sheet with attached reissued sheet. Summary of changes includes modifications to the Stair Section B/15A101 and Walkway Section C/15A101.

3. SHEET 20A10*, PRIMARY SLUDGE PUMP STATION NO. 1 FLOOR PLAN, ROOF PLAN, SECTIONS AND DETAILS
   1) REPLACE entire sheet with attached reissued sheet. Summary of changes include modifications to guardrail.

4. SHEET 20A102, PRIMARY SLUDGE PUMP STATION NO. 1 SPLITTER STRUCTURE PLAN, SECTIONS AND DETAILS
   1) REPLACE entire sheet with attached reissued sheet. Summary of changes include modifications to the Crossover Plan and Crossover Section A/20A102.

5. SHEET 20D301, PRIMARY SLUDGE PUMP STATION NO. 1 PROCESS SECTIONS AND DETAILS
   1) REPLACE entire sheet with attached reissued sheet. Summary of changes include modifications to the Seal Water Station Detail 1.

6. SHEET 21A101, PRIMARY SLUDGE PUMP STATION NO. 2 FLOOR PLAN, ROOF PLAN, SECTIONS AND DETAILS
   1) REPLACE entire sheet with attached reissued sheet. Summary of changes include modifications to guardrail.

7. SHEET 21A102, PRIMARY SLUDGE PUMP STATION NO. 2 SPLITTER STRUCTURE PLAN, SECTIONS AND DETAILS
   1) REPLACE entire sheet with attached reissued sheet. Summary of changes include modifications to the Crossover Plan and Crossover Section A/21A102.

5.0 Supplemental Information: NONE.
THIS ADDENDUM IS MADE PART OF THE CONTRACT DOCUMENTS AND SHALL BE NOTED ON THE PROPOSAL.

HDR ENGINEERING, INC.

[Signature]
Ronald J. Sova, P.E.

END OF ADDENDUM NO. 3
INSTRUCTIONS TO BIDDERS

Activity ID: 04-2020-002
Project Name: WRF Clarifier Improvements – Phase 1
Fed/St. Project No.

The work comprising the above referenced project shall be constructed in accordance with the SUDAS Standard Specifications, 2019 Edition; and as further modified by the supplemental specifications and special provisions included in the contract documents. The Des Moines City Engineer is the Engineer. The terms used in the contract documents are defined in said SUDAS Standard Specifications. The Des Moines Metropolitan Wastewater Reclamation Authority is the Contracting Authority on this project and shall hereinafter be referred to as the "Jurisdiction". Before submitting your bid, please review the SUDAS Standard Specifications, in particular, Division 1 - General Provisions and Covenants, including the sections regarding proposal requirements, bonding, contract execution and insurance requirements. Please be certain that all documents have been properly completed and submit them to the City Clerk, 1st Floor, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa, 50309.

I. BID SECURITY

The bid security must be in the minimum amount of 10% of the total bid amount including all add alternates (do not deduct the amount of deduct-alternates). Bid security shall be as defined in Section 26.8 of the Iowa Code and shall be in the form of a cashier's check or certified check drawn on a state-chartered or federally chartered bank, or a certified share draft drawn on a state-chartered or federally chartered credit union, or a bid bond executed by a corporation authorized to contract as a surety in Iowa or satisfactory to the Jurisdiction. The bid bond must be submitted on the enclosed Bid Bond form (DSM Urban 04/20/98) as no other bid bond forms are acceptable. All signatures on the bid bond must be original signatures in ink; facsimile (fax) of any signature on the bid bond is not acceptable. Bid security other than said bid bond shall be made payable to the Des Moines Metropolitan Wastewater Reclamation Authority. "Miscellaneous Bank Checks", and personal checks, as well as "Money Orders" and "Traveler's Checks" issued by persons, firms or corporations licensed under Chapter 533B of the Iowa Code, are not acceptable bid security. NOTE: If the Bidder submits Bid Security in the form of a Bid Bond, and the Bidder wishes to have their Bid Bond returned to them after an approved contract and bond has been executed or after there is a rejection of all bids (in accordance with Iowa Code 26.10), the Bidder shall include a self-addressed envelope with the Bid Bond.

II. SUBMISSION OF THE PROPOSAL AND IDENTITY OF BIDDER

A. The proposal shall be sealed in an envelope, properly identified as the Proposal with the project title and the name and address of the bidder, and deposited with the Jurisdiction at or before the time and at the place provided in the Notice to Bidders. It is the sole responsibility of the bidder to see that its proposal is delivered to the Jurisdiction prior to the time for opening bids, along with the appropriate bid security sealed in the separate envelope identified as Bid Security and attached to the outside of the bid proposal envelope. Any proposal received after the scheduled time for the receiving of proposals will be returned to the bidder unopened and will not be considered. Bidders must either utilize the two envelopes provided with the Bidding documents, or Bidders provide their own two envelopes, for their proposals and bid security for submission of their bids.

Sales Tax: The bidder should not include sales tax in the bid pursuant to Iowa Code. A sales tax exemption certificate will be available for all material purchased for incorporation in the project.

Accessibility for individuals with disabilities. The City of Des Moines is pleased to provide accommodations to individuals with disabilities or groups and encourages participation in City government. To better serve you, please notify us at least three business days in advance when possible at 515-283-4209, should special accommodations be required.
NOTICE TO BIDDERS

DES MOINES METROPOLITAN WASTEWATER RECLAMATION AUTHORITY PUBLIC IMPROVEMENT

Time and Place for Filing Sealed Proposals. Sealed bids for the work comprising each improvement as stated below must be filed at or before 11:00 a.m. on April 21, 2020, in the office of the City Clerk, 1st Floor, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa, 50309.

Accessibility for individuals with disabilities. The City of Des Moines is pleased to provide accommodations to individuals with disabilities or groups and encourages participation in City government. To better serve you, please notify us at least three business days in advance when possible at 515-283-4209, should special accommodations be required.

Time and Place Sealed Proposals Will be Opened and Considered. Sealed proposals will be opened and bids tabulated at 11:00 a.m., on April 21, 2020, in the City Council Chambers, 2nd Floor, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa, for consideration by the Des Moines Metropolitan Wastewater Reclamation Authority Board (WRA Board) at its meeting on May 19, 2020. The Des Moines Metropolitan Wastewater Reclamation Authority (Jurisdiction) reserves the right to reject any and all bids.

Time for Commencement and Completion of Work. Work on each improvement shall be commenced upon approval of the contract by the WRA Board, and completed as stated below.

Bid Security. Each bidder shall accompany its bid with bid security as defined in Section 26.8 of the Iowa Code and as specified by the Jurisdiction.

Contract Documents. Copies of the contract documents will be available after February 18, 2020, from the City Engineer's Office, 2nd Floor, City Hall, 400 Robert D. Ray Drive, Des Moines, Iowa 50309, at no cost, phone (515) 283-4573.

Preference for Iowa Products and Labor. By virtue of statutory authority, preference will be given to products and provisions grown and coal produced within the State of Iowa, and to Iowa domestic labor, to the extent lawfully required under Iowa statutes.

Sales Tax. The bidder should not include sales tax in the bid. A sales tax exemption certificate will be available for all material purchased for incorporation in the project.

General Nature of Public Improvement.
WRF Clarifier Improvements – Phase 1, 04-2020-002
The improvement includes phased removal and replacement of six primary clarifier mechanisms and rehabilitation of Primary Sludge Pump Buildings No. 20 and 21, including new pumps, piping, HVAC, electrical, controls and associated work. Phased repairs to the existing primary influent channel and removal and replacement of HVAC equipment and primary scum pump controls for Primary Scum Pump Station Buildings No. 26, 27 and 28 are also included. All areas will include HVAC, plumbing and electrical improvements, including all necessary materials, equipment, labor, miscellaneous associated work, and cleanup; all in accordance with the contract documents, including Plan File Nos. 602-149/201, located at the Wastewater Reclamation Facility, 3000 Vandalia Road, Des Moines, Iowa.

This project shall be fully completed not later than May 12, 2023.

Engineer's Construction Estimate, $13,410,000.00

Preletting Conference. A preletting conference will be held at 1:00 p.m. on March 16, 2020 at the Wastewater Reclamation Facility, Administrative Building Conference Room, 3000 Vandalia Road, Des Moines, Iowa.
NOTICE OF PUBLIC HEARING

DES MOINES METROPOLITAN WASTEWATER RECLAMATION AUTHORITY PUBLIC IMPROVEMENT

Public Hearing on Proposed Contract Documents and Estimated Costs for Improvement. A public hearing will be held by the Des Moines Metropolitan Wastewater Reclamation Authority Board on the proposed contract documents (plans, specifications and form of contract) on file in the City Engineer’s Office, and estimated cost for each improvement at its meeting on May 19, 2020, at 1:30 p.m., in the Des Moines Area Metropolitan Planning Organization, 420 Watson Powell Jr. Way, Suite #200, Des Moines, Iowa. The Des Moines Metropolitan Wastewater Reclamation Authority Board Meetings are open to all individuals regardless of disability. To better serve you, please notify the Board Secretary at least three business days in advance, when possible, should special accommodations be required.

General Nature of Public Improvement

WRF Clarifier Improvements – Phase 1, 04-2020-002
The improvement includes phased removal and replacement of six primary clarifier mechanisms and rehabilitation of Primary Sludge Pump Buildings No. 20 and 21, including new pumps, piping, HVAC, electrical, controls and associated work. Phased repairs to the existing primary influent channel and removal and replacement of HVAC equipment and primary scum pump controls for Primary Scum Pump Station Buildings No. 26, 27 and 28 are also included. All areas will include HVAC, plumbing and electrical improvements, including all necessary materials, equipment, labor, miscellaneous associated work, and cleanup; all in accordance with the contract documents, including Plan File Nos. 602-49/201, located at the Wastewater Reclamation Facility, 3000 Vandalia Road, Des Moines, Iowa

Published in the Des Moines Register
April 28, 2020
ENGINEERING DEPARTMENT
CITY OF DES MOINES, IOWA

SPECIAL PROVISION
BIDDING REQUIREMENTS
ON
WRF CLARIFIER IMPROVEMENTS PHASE 1
ACTIVITY ID 04-2020-002

1) AWARD OF CONTRACT

The apparent low Bidder on this project will be required to furnish executed contract; Performance, Payment, and Maintenance Bond; and Certificate of Insurance; and NPDES Certification Statements, if required, in substantial compliance with the contract documents to the City of Des Moines Engineering Department before 12:00 noon on Friday, May 15, 2020. Completed documents in accordance with the contract documents and acceptable to the City of Des Moines Engineering and Legal Departments will be presented to the Des Moines Metropolitan Wastewater Reclamation Authority Board for award of this contract on Tuesday, May 19, 2020. This would allow construction to begin upon issuance of the Notice to Proceed in accordance with the Special Provisions.

By submission of a bid, the Bidder agrees that if the Bidder fails to furnish said executed contract; Performance, Payment, and Maintenance Bond; and Certificate of Insurance; and NPDES Certification Statements, if required, in substantial compliance with the contract documents to the Des Moines Engineering Department before 12:00 noon on Friday, May 15, 2020; the amount of the Bidder’s bid security may become the property of the Des Moines Metropolitan Wastewater Reclamation Authority and may be retained—not as a penalty but as liquidated damages. The award of the contract may then, at the discretion of the Des Moines Metropolitan Wastewater Reclamation Authority Board, be made to the next-lowest responsible Bidder, or the work may be readvertised or may be constructed by the Des Moines Metropolitan Wastewater Reclamation Authority Board in any legal manner. Notice to Proceed will not be issued until the Contractor’s insurance is in compliance with the specifications.

The Bidder is reminded that all subcontractors must be approved by the Des Moines Metropolitan Wastewater Reclamation Authority Board at the time the contract is awarded, if possible. The Bidder should submit a letter requesting approval of any subcontractors along with the subcontractor’s NPDES Certification Statement, if required, at the time its executed contracts are submitted for approval.

2) BIDDING AND CONTRACT PROCESS INCLUDING CONTRACT COMPLIANCE PROGRAM

On February 12, 2007, under Roll Call Number 07-291, the Des Moines City Council approved bidding and contracting process changes for construction of public improvements. In accordance with the Initial Operating Contract with the City of Des Moines approved by the WRA Board under WRA Board Resolution Number 04-017, the City of Des Moines Engineering Department shall utilize its standard Bidding/Contracting Process for construction of WRA Improvements. The standard Bidding/Contracting Process included with said Roll Call 07-291 shall apply on this WRA project except of the following:

- The Change Order Process revisions shall not apply as the WRA Board has previously approved its own change order policy.
- The Equal Employment Opportunity (EEO) Program included in the Des Moines Contract Compliance Program shall apply to all WRA projects as state and federal law
SECTION 01 45 33
SPECIAL INSPECTIONS AND TESTING PROGRAM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Contractor responsibilities for special inspection and testing.
   2. Special Inspection program and reporting requirements.
   3. Attachment A to this Specification Section includes the Submittal of Special Inspections.
   4. Attachment B to this Specification Section includes Special Inspector qualifications, reporting requirements, and material specific inspections and tests.
      a. The information in Attachments A and B is for the Contractor reference only and is not part of the Contract Documents.
      b. It is included to assist the Contractor in understanding the Owner-provided Services so that those services may be factored into the Contractor’s pricing and schedule.
      c. The Service Provider(s) responsible for the Owner-provided Services will be selected after Contract award.

B. Purpose:
   1. This Document was developed to address the requirements of the 2015 International Building Code IBC, section 1704.1, including:
      a. One or more special inspectors will be hired by the Owner or the Owner’s Agent to provide inspections during constructions on the types of work listed under Section 1704.
   2. A Statement of Special Inspections will be submitted to the Building Code Official as a condition for permit issuance. This statement is included as Attachment A to this Specification. Attachment B includes a complete list of materials and work requiring special inspections, the inspections to be performed and a list of the minimum qualifications of the individuals, approved agencies, or firms intended to be retained for conducting such inspections.

C. Related Specification Sections include but are not necessarily limited to:
   1. SUDAS Division 1.
   2. Section 01 04 00 - Special Provisions.

1.2 DEFINITIONS

A. Special Inspector: Representative of the Owner approved inspection agency designated for that portion of the work.

B. Testing Agency: Approved agency, not affiliated or hired by the Contractor, which is responsible for the materials testing requirements of the project including but not limited to concrete cylinder breaks, soils testing, and masonry materials testing.

C. Statement of Special Inspections: Document provided to the Building Code Official outlining special inspections and tests to be done on the project and frequency of required test.

D. Soils Engineer or Geotechnical Engineer: For the purposes of Special Inspection "Soils Engineer," "Geotechnical Engineering," and "Special Inspector" shall be interchangeable as pertaining to the Division 31 specifications.

1.3 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with testing agency personnel, special inspector, and agents of the Building Code
   Official and provide access to the work.
   1. Providing access to the work shall include all labor and facilities to perform inspections and
      tests as listed in the Specifications for the duration of the inspections or tests involved.
   2. Provide means to obtain and handle samples taken on site.

B. Attend a pre-construction meeting to coordinate and clarify inspection and testing procedures,
   requirements.

C. Notify special inspector and/or testing agency of work to be inspected/tested minimum of 24
   HRS prior.

D. Work for which special inspections are required shall remain accessible and exposed for the
   purposes of special inspections until completion of required special inspections.

E. Any portion of work that is not in conformance shall be corrected and re-inspected. Such
   portions of the work shall not be covered or concealed until authorized by Owner's
   Representative.

F. Work to be inspected should be complete at time of inspector's arrival on-site.

G. Payment for Special Inspection services will be in accordance with the following:
   1. Payment described below is for the Testing Agency and Special Inspector costs and does
      not include the Contractor's costs listed in Paragraph 1.3 A.
   2. After Contractor notification, inspector arrives at site and performs inspection within the
      timeframe defined in Item 4 below.
      a. Inspection reveals work is satisfactory.
      b. Owner pays all costs associated with this inspection.
   3. After Contractor notification, inspector arrives at site and performs inspection within the
      timeframe defined in Item 4 below.
      a. Inspection reveals work is deficient.
      b. Contractor corrects deficiencies within timeframe defined in Item 4 below.
      c. Work is re-inspected and work is satisfactory.
      d. Owner pays all costs associated with this inspection.
   4. After Contractor notification, inspector arrives at site and work is not ready for inspection
      when inspector arrives.
      a. Inspector will remain on-site for a maximum of 2 HRS awaiting the completion of the
         work.
      b. If work is not ready for inspection at the end of this period, inspector will be dismissed
         until Contractor requests re-inspection.
      c. All costs associated with this inspection trip will be charged to the Contractor.
   5. After Contractor notification, inspector arrives at site and performs inspection within the
      timeframe defined above.
      a. Inspection reveals work is deficient.
      b. Contractor attempts to correct deficiencies within 2 HR timeframe and calls for re-
         inspection.
      c. Work is re-inspected and found to still be deficient.
      d. Inspector will be dismissed.
      e. All costs associated with this inspection trip will be charged to the Contractor.
   6. Owner will pay for "passing" soils on the Project. Costs of corrective actions and cost of
      failed test areas requiring retesting are the sole responsibility of the Contractor. For
      additional specific payment requirements for soils see the respective Division 31 Section.
H. Special Inspection is intended to be an Independent Quality Assurance.
   1. Special Inspections shall not relieve the Contractor of any quality assurance, quality control, workmanship, or warranty responsibilities. Contractor’s own personnel shall review all work to be inspected for conformance with Contract Documents prior to calling for inspection.

1.4 REPORTING DUTIES AND AUTHORITY

A. A pre-construction meeting to coordinate and clarify inspection, testing, and procedural requirements will be held per Section 01 31 19.
   1. The meeting is to be attended by:
      a. Owner.
      b. Engineer.
      c. Building Code Official or designee.
      d. Testing Agency and Special Inspectors.
      e. General Contractor.
      f. Appropriate Sub-contractor(s).

B. Special Inspector shall report all deficient work to the Contractor as soon as possible.
   1. Deficient work that has been covered up or concealed prior to re-inspection shall be reported to the Engineer and the Building Code Official.

C. Special Inspector does not have authority to stop work or modify the requirements of the Contract Documents.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

END OF SECTION
A pre-construction meeting with the parties involved may be required to review the special inspection requirements and procedures.

**STATEMENT OF SPECIAL INSPECTIONS**

In accordance to Section 1704 of the International Building Code (IBC), the owner, or the registered design professional in responsible charge acting as the owner’s agent, is required to hire an independent testing/inspection agency to perform required special inspections. The design professional shall complete the attached forms and submit them to the Permit and Development Center (PDC) at the time construction plans are submitted for plan review. The special inspectors assigned to any project within the jurisdiction shall be identified by the design professional, and certified for the disciplines assigned.

**A. Owner Responsibilities**
1. The owner or the design professional in responsible charge acting as the owner’s agent shall fund special inspection services. The owner is responsible for seeing that these requirements are met.

**B. Registered Design Professional Responsibilities**
1. The registered design professional in responsible charge (engineer, or architect), shall include special inspection requirements and specifications on the plans.
2. Provide structural observation Per IBC Section 1704.6 requirements and specifications on the plans.
3. Prepare the Statement of Special Inspections in accordance with IBC section 1704.2.3. The statement of special inspections shall identify items fabricated on the premises of an approved fabricator where special inspections are not required by section 1704.2.1.
4. Review the special inspection reports and provide corrective action for work that may not conform to the approved plans.

**C. Contractor’s Responsibilities**
1. Notify the agency. The contractor is responsible for notifying both the special inspector and the Building Official in sufficient time for scheduling personnel to perform required inspections.
2. Written statement of responsibility.
3. Provide access to city approved plans. The approved plans shall be readily accessible at the job site.
4. Provide access to work. The contractor shall provide reasonable access to all work requiring special inspection.
5. Retaining special inspection reports at the job site. The contractor is also responsible for retaining at the job site all special inspection records submitted by the special inspector, and providing these records for review by the Building Official upon request.
6. Notify the Building Official of special inspections prior to scheduled inspection time.
7. Provide a copy of special inspector’s credentials when requested by the Building Official.

**D. Duties of the Special Inspector**
1. Observe the work. The inspector shall observe the work for compliance with the jurisdiction approved plans, specifications, and applicable provisions of the IBC. The architect/engineer’s reviewed shop drawings, and/or placement drawings, may be used only as an aid to inspections.
   - **Continuous Special Inspection** – The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
   - **Periodic Special Inspection** – The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed and at the completion of the work.
2. Report non-conforming items. The special inspector shall bring non-conforming items to the immediate attention of the contractor, and note all such items in the daily report. If any item is not resolved in a timely manner and is about to be incorporated in the work, the special inspector shall immediately notify the engineer or architect of record. Where an appropriate action is not taken by either the contractor or the engineer or architect of record to correct the non-conforming item(s), the special inspector shall immediately notify the Building Official.

3. Furnish daily reports. The special inspector shall complete a daily report for each day's inspections. The daily reports shall remain at the job site with the contractor for the Building Official. The reports shall include the following:
   a. Name of special inspector.
   b. Description of the inspections, with locations and tests performed.
   c. Listing any non-conforming items.
   d. Indicate how items were resolved or unresolved.
   e. List any changes or corrections to non-conforming issues authorized by the engineer, architect, or Building Official.

4. Furnish weekly reports. The inspection agency shall furnish weekly reports of the tests and inspections performed directly to the Building Official, project engineer, architect, and/or others as designated.

5. Furnish final report. The inspection agency shall submit a final signed report to the Building Official stating that all items requiring special inspections and testing were fulfilled, all discrepancies were corrected or resolved, and all work requiring special inspections is in compliance with the approved design drawings and specifications. Any items unresolved or discrepancies in coverage (i.e., missed inspections, periodic inspections when continuous was required, etc.) shall be specifically itemized in this report.

E. Jurisdiction (Building Official)
The jurisdiction will review the implementation of Structural Tests and Special Inspection requirements.

1. Review special inspections. The Building Official shall review all special inspections and special inspection requirements found in IBC Chapter 17.

2. Monitor special inspections. Work requiring special inspections, and the performance of special inspectors, may be monitored by the Building Official. The Building Official's approval must be obtained prior to placement of concrete or other similar activities in addition to that of the special inspector.

3. Issue Certificate of Occupancy. The Building Official will only issue a Certificate of Occupancy after all special inspection reports and the final special inspection report, have been submitted and accepted.

ACKNOWLEDGMENTS

I have read and understand my responsibilities regarding special inspections. (Electronic signatures are acceptable)

Registered Design Professional in Responsible Charge:

By: ___________________________ Date: ___________________________

Owner:

Patrick Brown, Des Moines WRA

By: ___________________________ Date: ___________________________

Contractor:

TBD

By: ___________________________ Date: ___________________________

Special Inspector/ Special Inspection Agency:

TBD

By: ___________________________ Date: ___________________________

Others as required by the Building Official:

By: ___________________________ Date: ___________________________

ACCEPTED FOR THE BUILDING DEPARTMENT

By: ___________________________ Date: ___________________________ 2 of 10
<table>
<thead>
<tr>
<th>PROJECT ADDRESS</th>
<th>3000 Vandalia Road</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MATERIAL / ACTIVITY</td>
<td>1794.3.1 Special Cases (work unusual in nature, not shown but not limited to alternate materials and systems; unusual design applications, materials and systems with special manufacturer's requirements)</td>
<td></td>
</tr>
<tr>
<td>SERVICE</td>
<td>Y/N</td>
<td>EXTENT</td>
</tr>
<tr>
<td>Verify fabrication; quality control procedures</td>
<td>in-plant review</td>
<td>N</td>
</tr>
<tr>
<td>1794.3 Special Cases</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>1. Fabricator and erector documents (Verify reports and/or certifications as listed in ASME Section II, chapter II, paragraph 3.2 for compliance with construction documents)</td>
<td>Submittal Review</td>
<td>Each submittal</td>
</tr>
<tr>
<td>2. Material verification of structural steel</td>
<td>Field Inspection</td>
<td>N</td>
</tr>
<tr>
<td>3. Embedments (Verify diameter, grade, type, length, embedment. See 1794.3 for anchor)</td>
<td>Field Inspection</td>
<td>N</td>
</tr>
<tr>
<td>4. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents</td>
<td>Field Inspection</td>
<td>N</td>
</tr>
<tr>
<td>5. Structural steel welding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Inspection tasks Prior to Welding (Observe, or perform for each welded joint or member; the QA tasks listed in ASME Section II, Table NS-1)</td>
<td>Field Inspection</td>
<td>N</td>
</tr>
<tr>
<td>b. Inspection tasks During Welding (Observe, or perform for each welded joint or member, the QA tasks listed in ASME Section II, Table NS-1)</td>
<td>Field Inspection</td>
<td>N</td>
</tr>
<tr>
<td>c. Inspection tasks After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in ASME Section II, Table NS-1)</td>
<td>Field Inspection</td>
<td>N</td>
</tr>
<tr>
<td>d. Nondestructive testing (NDT) of welded joints: as necessary</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>1) Complete penetration groove welds S10 or greater in risk category III or IV</td>
<td>Field ultrasonic testing</td>
<td>N</td>
</tr>
<tr>
<td>2) Complete penetration groove welds 5/16 or greater in risk category II</td>
<td>Field ultrasonic testing</td>
<td>N</td>
</tr>
<tr>
<td>3) Thermally cut surface of excess welds when material thickness = 2&quot;</td>
<td>Field magnetic Particle or Penetrant testing</td>
<td>N</td>
</tr>
<tr>
<td>4) Welded joints subject to fatigue when required by ASME Section II</td>
<td>Field radiographic or Ultrasonic testing</td>
<td>N</td>
</tr>
<tr>
<td>5) Fabricator's NDT reports when fabricator performs NDT</td>
<td>Verify reports</td>
<td>N</td>
</tr>
<tr>
<td>6. Structural steel setting</td>
<td>Field inspection</td>
<td></td>
</tr>
</tbody>
</table>
### SCHEDULE OF SPECIAL INSPECTION SERVICES

Per IBC Section 1704 of the 2016 International Building Code the following items require Special Inspections. Special Inspectors must be employed by the Owner or registered design professional in responsible charge acting as the owner's agent.

<table>
<thead>
<tr>
<th>PROJECT ADDRESS</th>
<th>3000 Vandalia Road</th>
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</table>

**APPLICABLE TO THIS PROJECT**

<table>
<thead>
<tr>
<th>MATERIAL / ACTIVITY</th>
<th>SERVICE</th>
<th>Y/N</th>
<th>EXTENT</th>
<th>AGENT*</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Inspection tests Prior to Bolting (observe, or perform tests for each bolted connection, in accordance with QA tasks listed in AISC 360, Table N5.6.4-1)</td>
<td>N</td>
<td>Observe or Perform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Inspection tests During Bolting (Observe the QA tasks listed in)</td>
<td>N</td>
<td>Observe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Pre-tensioned and slip-off joints</td>
<td>N</td>
<td>Periodic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Turn-off nut with matching markings</td>
<td>N</td>
<td>Periodic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Direct tension indicator</td>
<td>N</td>
<td>Periodic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Twist-off type tension control hold</td>
<td>N</td>
<td>Periodic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Turn-off nut without matching markings</td>
<td>N</td>
<td>Continuous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Calibrated wrench</td>
<td>N</td>
<td>Continuous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Slug-tight joints</td>
<td>N</td>
<td>Periodic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Inspection tests After Bolting (Perform tests for each bolted connection in accordance with QA tasks listed in AISC 360, Table M5.9.9-1)</td>
<td>N</td>
<td>Perform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Reposition of steel elements of composite construction prior to concrete placement in accordance with QA tasks listed in AISC 360, Table N6.1</td>
<td>Field Inspection and testing</td>
<td>N</td>
<td>Observe or Perform</td>
<td></td>
</tr>
</tbody>
</table>

**TYPE OF Steel Construction Other Than Structural Steel**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Inspection and testing</td>
</tr>
<tr>
<td>N/A</td>
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</tbody>
</table>

**1. Material verification of cold-formed steel decks**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Inspection</td>
</tr>
<tr>
<td>N/A</td>
</tr>
</tbody>
</table>

**2. Manufacturer's certified test reports**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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</thead>
<tbody>
<tr>
<td>N/A</td>
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</table>

**3. Connection of cold-formed steel deck to supporting structure**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Inspection</td>
</tr>
<tr>
<td>N/A</td>
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</table>

**4. Welding**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
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**5. Other features (in accordance with AISC 360, Section N8)**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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<tbody>
<tr>
<td>N/A</td>
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<table>
<thead>
<tr>
<th>PERIODICITY</th>
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<tbody>
<tr>
<td>Periodic</td>
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**6. Verify fasteners are in conformance with approved submittal**

<table>
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<tr>
<th>PERIODICITY</th>
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<tr>
<td>Periodic</td>
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</table>

**7. Verify fastener installation is in conformance with approved submittal and manufacturer's recommendations**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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<tbody>
<tr>
<td>Periodic</td>
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**8. Reinforcing steel**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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</thead>
<tbody>
<tr>
<td>Field Inspection</td>
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<tr>
<td>N/A</td>
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</table>

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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<tbody>
<tr>
<td>N/A</td>
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</table>

**9. Verification of weldability of steel other than ASTM A706**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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<tbody>
<tr>
<td>N/A</td>
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<table>
<thead>
<tr>
<th>PERIODICITY</th>
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<tbody>
<tr>
<td>Periodic</td>
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</table>

**10. Reinforcing steel meeting flexural and axial force in intermediate and special moment frames, boundary elements of seismic concrete structural walls and shear reinforcement**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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<tbody>
<tr>
<td>N/A</td>
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</table>

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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<tbody>
<tr>
<td>Continuous</td>
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</table>

**11. Shear reinforcement**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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</thead>
<tbody>
<tr>
<td>N/A</td>
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</table>

<table>
<thead>
<tr>
<th>PERIODICITY</th>
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<tbody>
<tr>
<td>Continuous</td>
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</table>

**12. Other reinforcing steel**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PERIODICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periodic</td>
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</tbody>
</table>

**13. Cold-rolled steel massive spanning 60 feet or greater**

<table>
<thead>
<tr>
<th>PERIODICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PERIODICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
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</tbody>
</table>

**Permit and Development Center**

July 2017
### SCHEDULE OF SPECIAL INSPECTION SERVICES

Per ISC Section 1704 of the 2016 International Building Code the following items require Special inspection. Special inspectors must be employed by the Owner or registered design professional to responsible charge acting as the owner's agent.

<table>
<thead>
<tr>
<th>PROJECT ADDRESS</th>
<th>3000 Vandalia Road</th>
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<tbody>
<tr>
<td>MATERIAL / ACTIVITY</td>
<td>SERVICE</td>
<td>Y/N</td>
</tr>
<tr>
<td>a. Verify temporary and permanent restraint/wiring are installed in accordance with the approved temporary restraint package</td>
<td>Field Inspection</td>
<td>N/A</td>
</tr>
<tr>
<td>1706.3 Concrete Construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Inspection of reinforcing steel installation (see Exhibit J.2 for welding)</td>
<td>Field Inspection</td>
<td>Y</td>
</tr>
<tr>
<td>2. Inspection of posttensioning steel installation</td>
<td>Field Inspection</td>
<td>N/A</td>
</tr>
<tr>
<td>3. Inspection of anchors cast in concrete where allowable loads have been increased per Section 1905.6 or where strength design is used</td>
<td>Field Inspection</td>
<td>Y</td>
</tr>
<tr>
<td>4. Inspection of anchors and reinforcing steel post-installed in hardened concrete. Per research reports including verification of anchor type, anchor dimensions, hole dimensions, hole drilling procedures, anchor spacing, edge distances, concrete minimum thickness, anchor embedment and tamperless torque</td>
<td>Field Inspection</td>
<td>Y</td>
</tr>
<tr>
<td>5. Verify use of approved design mix</td>
<td>Field Inspection</td>
<td>Y</td>
</tr>
<tr>
<td>6. Fresh concrete sampling, perform slump and air content tests and determine temperature of concrete</td>
<td>Field Inspection</td>
<td>Y</td>
</tr>
<tr>
<td>7. Inspection of concrete and reinforcing steel placement for proper application techniques</td>
<td>Field Inspection</td>
<td>Y</td>
</tr>
<tr>
<td>8. Inspection for maintenance of specified curing temperature and techniques</td>
<td>Field Inspection</td>
<td>Y</td>
</tr>
<tr>
<td>9. Inspection of posttensioned concrete</td>
<td>Field Inspection</td>
<td>N/A</td>
</tr>
<tr>
<td>a. Application of posttensioning force</td>
<td>N/A</td>
<td>Continuous</td>
</tr>
<tr>
<td>b. Grouting of tendon posttensioning tendons in the tendon-force resisted system</td>
<td>N/A</td>
<td>Continuous</td>
</tr>
<tr>
<td>10. Erection of prestressed concrete members</td>
<td>N/A</td>
<td>In accordance with construction documents</td>
</tr>
<tr>
<td>a. Inspect in accordance with construction documents</td>
<td>Field Inspection</td>
<td>N/A</td>
</tr>
<tr>
<td>b. Perform inspections of welding and bolting in accordance with Section 1706.3</td>
<td>Field Inspection</td>
<td>N/A</td>
</tr>
<tr>
<td>11. Verification of neliu concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shoring and forms from beams and structural slabs</td>
<td>Review field testing and laboratory reports</td>
<td>N/A</td>
</tr>
<tr>
<td>12. Inspection of reinforcement for shape, sizes, location and dimensions</td>
<td>Field Inspection</td>
<td>Y</td>
</tr>
</tbody>
</table>

Permit and Development Center
July 2017

5 of 10
<table>
<thead>
<tr>
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</table>

**SCHEDULE OF SPECIAL INSPECTION SERVICES**

Per ISC Section 1704 of the 2015 International Building Code the following items require Special Inspections. Special Inspectors must be employed by the Owner or registered design professional in responsible charge acting as the owner's agent.

<table>
<thead>
<tr>
<th>MATERIAL / ACTIVITY</th>
<th>SERVICE</th>
<th>Y/N</th>
<th>EXTENT</th>
<th>AGENT*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a. Concrete strength testing and verification of conformance with design documents</td>
<td>Field testing and review of laboratory reports</td>
<td>N/A</td>
<td>Periodic</td>
<td></td>
</tr>
</tbody>
</table>

**17.6.4 Masonry Construction**

(A) Level A, B and C Quality Assurance:

<table>
<thead>
<tr>
<th>1. Verify compliance with approved submittals</th>
<th>Field Inspection</th>
<th>N/A</th>
<th>Periodic</th>
</tr>
</thead>
</table>

(B) Level B Quality Assurance:

<table>
<thead>
<tr>
<th>1. Verification of f’m and f’AC prior to construction</th>
<th>Testing by uniaxial stress method or prism test method</th>
<th>N/A</th>
<th>Periodic</th>
</tr>
</thead>
</table>

(C) Level C Quality Assurance:

<table>
<thead>
<tr>
<th>1. Verification of f’m and f’AC prior to construction</th>
<th>Testing by uniaxial stress method or prism test method</th>
<th>N/A</th>
<th>Periodic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Verify proportions of materials in precast or precasted masonry, prestressed masonry, and cast-in-place masonry as delivered to the project site</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Continuous</td>
</tr>
<tr>
<td>3. Verify placement of masonry units</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Periodic</td>
</tr>
</tbody>
</table>

(D) Levels B and C Quality Assurance:

<table>
<thead>
<tr>
<th>1. Verification of Slump Flow and Visual Stability Index (VSI) of self-consolidating masonry as delivered to the project site</th>
<th>Field testing</th>
<th>N/A</th>
<th>Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Verify compliance with approved submittals</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Periodic</td>
</tr>
<tr>
<td>3. Verify proportions of site-mixed mortar, grout and precasted masonry, prestressed masonry and cast-in-place masonry as delivered to the project site</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Periodic</td>
</tr>
<tr>
<td>4. Verify material type, size of reinforcement and anchors, and prestressing tendons and anchors</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Periodic</td>
</tr>
<tr>
<td>5. Verify construction of masonry units</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Periodic</td>
</tr>
<tr>
<td>6. Verify placement of reinforcement, connections, and prestressing tendons and anchors</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Level B - Periodic</td>
</tr>
<tr>
<td>7. Verify masonry prior to grouting</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Level C - Continuous</td>
</tr>
<tr>
<td>8. Verify placement of grout and prestressing grout for bonded tendons</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Level C - Continuous</td>
</tr>
<tr>
<td>9. Verify size and location of structural masonry elements</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Periodic</td>
</tr>
<tr>
<td>10. Verify type, size, and location of anchors, including details of anchorage of masonry in structural members, fixtures, or other construction</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Level C - Continuous</td>
</tr>
</tbody>
</table>

Permit and Development Center
July 2017

6 of 10
<table>
<thead>
<tr>
<th>MATERIAL / ACTIVITY</th>
<th>SERVICE</th>
<th>Y/N</th>
<th>EXTENT</th>
<th>AGENT*</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Verify welding of reinforcement bars (see 1705.2.2)</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>12. Verify preparation, construction, and protection of masonry during cold weather (temperature below 49°F) or hot weather (temperature above 80°F)</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Periodic</td>
<td></td>
</tr>
<tr>
<td>13. Verify application and measurement of pressureing foam</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>14. Verify placement of AAC masonry units and construction of thin-bed mortar joints (first 5000 sq. ft. of AAC masonry)</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>15. Verify placement of AAC masonry units and construction of thin-bed mortar joints (after the first 5000 sq. ft. of AAC masonry)</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Level 3 - Periodic</td>
<td></td>
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<tr>
<td>16. Verify properties of thin-bed mortar for AAC masonry (first 5000 sq. ft. of AAC masonry)</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Continuous</td>
<td></td>
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<tr>
<td>17. Verify properties of thin-bed mortar for AAC masonry (after the first 5000 sq. ft. of AAC masonry)</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Level 3 - Periodic</td>
<td></td>
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<tr>
<td>18. Prepare grout and mortar specimens</td>
<td>Field testing</td>
<td>N/A</td>
<td>Level 2 - Continuous</td>
<td></td>
</tr>
<tr>
<td>19. Observe preparation of prime</td>
<td>Field Inspection</td>
<td>N/A</td>
<td>Level 2 - Periodic</td>
<td></td>
</tr>
</tbody>
</table>

1706.5 Wood Construction

1. Inspection of the fabrication process of wood structural elements and assemblies in accordance with Section 1704.2.5
   - In-plant review
     - N/A
     - Periodic

2. For high-load deflection, verify grade and thickness of structural panel adhesives with approved building plans
   - Field inspection
     - N/A
     - Periodic

3. For high-load deflection, verify nominal size of framing members at adorning panel edges, nail or staple diameter and length, number of fastener lines, and that spacing between fasteners in each line and at edge margins agree with approved building plans
   - Field inspection
     - N/A
     - Periodic

4. Metal-clad-connected wood trusses spanning 80 feet or greater; verify temporary and permanent metal fasteners are installed in accordance with the approved truss submitted package
   - Field inspection
     - N/A
     - Periodic
<table>
<thead>
<tr>
<th>MATERIAL / ACTIVITY</th>
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<th>Y/N</th>
<th>EXTENT</th>
<th>AGENT*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity</td>
<td>Field inspection</td>
<td>Y</td>
<td>Periodic</td>
<td></td>
</tr>
<tr>
<td>2. Verify excavations are extended to proper depth and base reached proper materials.</td>
<td>Field inspection</td>
<td>Y</td>
<td>Periodic</td>
<td></td>
</tr>
<tr>
<td>3. Perform consolidation and healing of controlled fill materials.</td>
<td>Field inspection</td>
<td>Y</td>
<td>Periodic</td>
<td></td>
</tr>
<tr>
<td>4. Verify use of proper materials, sealants, and joint thickness during placement and compaction of controlled fill</td>
<td>Field inspection</td>
<td>Y</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>5. Prior to placement of controlled fill, observe or grade and verify that site has been prepared properly</td>
<td>Field inspection</td>
<td>Y</td>
<td>Periodic</td>
<td></td>
</tr>
<tr>
<td><strong>1708.2 Driven Deep Foundations</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1. Verify element net size, size and lengths comply with requirements</td>
<td>Field inspection</td>
<td>N/A</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>2. Determine capacities of test elements and conduct additional load tests, as required</td>
<td>Field inspection</td>
<td>N/A</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>3. Observe driving operations and maintain complete and accurate records for each element</td>
<td>Field inspection</td>
<td>N/A</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>4. Verify placement locations and alignment, concrete type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any response to foundation element</td>
<td>Field inspection</td>
<td>N/A</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>5. For steel elements, perform additional inspections per Section 1708.2</td>
<td>See Section 1708.2</td>
<td>N/A</td>
<td>See Section 1708.2</td>
<td></td>
</tr>
<tr>
<td>6. For concrete elements and concrete-filled elements, perform additional inspections per Section 1708.3</td>
<td>See Section 1708.3</td>
<td>N/A</td>
<td>See Section 1708.3</td>
<td></td>
</tr>
<tr>
<td>7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge</td>
<td>Field inspection</td>
<td>N/A</td>
<td>In accordance with construction documents</td>
<td></td>
</tr>
<tr>
<td>8. Perform additional inspections and tests in accordance with the construction documents</td>
<td>Field inspection and testing</td>
<td>N/A</td>
<td>In accordance with construction documents</td>
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<tr>
<td><strong>1708.8 Cast-in-Place Deep Foundations</strong></td>
<td></td>
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<tr>
<td>1. Observe drilling operations and maintain complete and accurate records for each element</td>
<td>Field inspection</td>
<td>N/A</td>
<td>Continuous</td>
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</table>

Permit and Development Center
July 2017

HDR Project No. 100984:4 Des Moines Municipal Wastewater Reclamation Authority
WRF Clarifier Improvements - Phase 1
SPECIAL INSPECTIONS AND TESTING PROGRAM
01 45 33 - 14

March 2020
Addendum No. 3
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<th>EXTENT</th>
<th>AGENT</th>
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<tr>
<td>2. Verify placement locations and</td>
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<tr>
<td>pluminess, confirm element</td>
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<td>diameters, bolt diamaters (if</td>
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<td>applicable), lengths, embedment into</td>
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<td>bedrock (if applicable) and adequate</td>
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<td>end-bearing static capacity. Record</td>
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<tr>
<td>concrete or grout volumes</td>
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<tr>
<td>3. For concrete elements, perform</td>
<td>See Section 1705.3</td>
<td>N/A</td>
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<td>additional inspections in accordance</td>
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<tr>
<td>with Section 1705.3</td>
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<tr>
<td>4. Perform additional inspections and</td>
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<td>Field inspection</td>
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<tr>
<td>1. Verify installation equipment, pin</td>
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<td>depth, final installation torque and</td>
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<td>tests in accordance with the</td>
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<td>2. Inspection of rolling, bolting,</td>
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<td>N/A</td>
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<td>anchoring and other fastening of</td>
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<td>1706.10.2 Cold-formed Steel</td>
<td>Field inspection</td>
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<tr>
<td>Resistance</td>
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<td>1. Inspection during welding</td>
<td>Field inspection</td>
<td>N/A</td>
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<td>2. Inspection for proper attachment,</td>
<td>Field inspection</td>
<td>N/A</td>
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<tr>
<td>bolting, anchoring and other fastening</td>
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<td>of components within the main</td>
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<tr>
<td>wind-force-resisting system</td>
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<td>1706.11.3 Wind-resisting</td>
<td>Field inspection</td>
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<tr>
<td>Components</td>
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<tr>
<td>1. Roof covering</td>
<td>Field inspection</td>
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<td>2. Wall cladding</td>
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<td>1706.14 Sprayed Fire-resistant</td>
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<tr>
<td>Materials</td>
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<tr>
<td>1. Verify surface condition</td>
<td>Field inspection</td>
<td>N/A</td>
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<tr>
<td>preparation of structural members</td>
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</tbody>
</table>

Permit and Development Center
July 2017

HDR Project No. 100984:4
Des Moines Municipal Wastewater Reclamation Authority
WRF Clarifier Improvements - Phase 1
SPECIAL INSPECTIONS AND TESTING PROGRAM
01 45 33 - 15

March 2020
Addendum No. 3
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<tr>
<td>1. Verify average thickness of sprayed fire-resistant materials applied to</td>
<td>Field inspection</td>
<td>N</td>
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<tr>
<td>structural members</td>
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</tr>
<tr>
<td>2. Verify density of the sprayed fire-resistant material concord with approved</td>
<td>Field inspection and testing</td>
<td>N</td>
<td>Per IBC Section 1705.13.6</td>
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<tr>
<td>fire-resistant design</td>
<td></td>
<td></td>
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<tr>
<td>3. Verify the cohesive/abrasive bond strength of the cured sprayed fire-</td>
<td>Field inspection and testing</td>
<td>N</td>
<td>Per IBC Section 1705.13.6</td>
<td></td>
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<tr>
<td>resistant material</td>
<td></td>
<td></td>
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<td>1705.19 Masonry and Intumescent Fire-Resistant Coatings</td>
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<tr>
<td>Inspect masonry and intumescent fire-resistant coatings applied to</td>
<td>Field inspection</td>
<td>N</td>
<td>Periodic</td>
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<tr>
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<td></td>
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<tr>
<td>1705.18 Exterior Insulation and Finish Systems (EIFS)</td>
<td></td>
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<tr>
<td>1. Verify materials, details and installations are per the approved</td>
<td>Field inspection</td>
<td>N</td>
<td>Periodic</td>
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</tr>
<tr>
<td>construction documents</td>
<td></td>
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<tr>
<td>2. Inspection of water-resist barrier over sheathing substrate</td>
<td>Field inspection</td>
<td>N</td>
<td>Periodic</td>
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<tr>
<td>1705.17 Fire-Resistant Penetration and Joints</td>
<td></td>
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<tr>
<td>1. Inspect penetration test system</td>
<td>Field testing</td>
<td>N</td>
<td>Per ASTM E2174</td>
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<tr>
<td>2. Inspect fire-resistant joint systems</td>
<td>Field testing</td>
<td>N</td>
<td>Per ASTM E2203</td>
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<tr>
<td>1705.16 Smoke Control Systems</td>
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<tr>
<td>1. Leakage testing and recording of device locations prior to concealment</td>
<td>Field testing</td>
<td>N</td>
<td>Periodic</td>
<td></td>
</tr>
<tr>
<td>2. Prior to occupancy and after sufficient completion, pressure</td>
<td>Field testing</td>
<td>N</td>
<td>Periodic</td>
<td></td>
</tr>
<tr>
<td>difference testing, flow measurements, and detection and control verification</td>
<td></td>
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</tbody>
</table>

**Special Inspection Procedures**

Special inspections are to be kept on the job for building inspector verification. Send report bi-monthly to specialinspection@library.com

**Please include the address of the project in the subject line of the email**

All discrepancies must be brought to the immediate attention of the contractor for correction. If not corrected, discrepancies must be brought to the immediate attention of the building official, and design professional in responsible charge before completion of that stage of work.

A final special inspection report, from the special inspector(s), documenting the required special inspections were performed, correction of discrepancies, and compliance with construction documents shall be submitted before a Certificate of Occupancy is issued.

* INSPECTION AGENTS

<table>
<thead>
<tr>
<th>FIRM</th>
<th>ADDRESS</th>
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<tbody>
<tr>
<td>1.</td>
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Permit and Development Center
July 2017

END OF ATTACHMENT A
ATTACHMENT B TO SECTION 01 45 33
SPECIAL INSPECTIONS, INSPECTOR QUALIFICATIONS AND REPORTING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY
A. Related Specification Sections include but are not necessarily limited to:
   1. SUDAS Division 1.
   2. Section 01 04 00 - Special Provisions.
   3. Section 03 09 00 - Concrete.
   4. Section 04 22 00 - Concrete Masonry.
   5. Section 05 50 00 - Metal Fabrications.
   6. Section 31 23 00 - Earthwork.
   7. Section 32 13 13 - Concrete Pavement.

1.2 QUALIFICATIONS
A. Qualifications stated here are the minimum recommended by the Engineer. If the Building Code Official has more stringent qualifications, the more stringent qualifications will take precedence.

B. All Special Inspections and Testing to be done under the direction of a Professional Engineer or Registered Architect registered in the State of Iowa herein referred to as Registered Professional for Special Inspections (RPSI).

C. Soil, concrete, masonry, mortar, grout, steel, and aluminum related testing.
   1. The Testing Agency shall have a minimum of 10 years experience in the testing of these materials.
   2. The Testing Agency’s technician(s) conducting this testing:
      a. Shall have a minimum of five years experience in the testing of soil, concrete, mortar, grout, steel and aluminum as appropriate.
   3. Concrete related work:
      a. International Code Council certification for Reinforced Concrete and American Concrete Institute Concrete Field Testing Technician – Grade 1.

D. Special Structural Inspections:
   1. Professional Engineers or Architects, licensed in the State of Iowa, may perform special inspections in accordance with their license qualifications.
   2. Other individuals, working under the direct supervision of a licensed engineer and meeting the following qualifications, may perform special inspections.
   3. Soils related work:
      a. NICET Level II Certification in geotechnical engineering technology/construction; or
      b. Registered Geologist; or
      c. Engineer Intern under the direct supervision of a Licensed Professional Engineer.
   4. Concrete related work:
      a. International Code Council certification for Reinforced Concrete Special Inspector or American Concrete Institute Concrete Construction Special Inspector.
      b. Alternatively, may be an Engineer Intern under the direct supervision of a Licensed Professional Engineer.
   5. Masonry related work:
      a. Shall be certified by the International Code Council or American Concrete Institute for structural masonry and one year of related experience.
      b. Alternatively, may be an Engineer Intern with a minimum of two years appropriate training.
6. Steel and aluminum related work:
   a. Frame and material verification: ICC Structural Steel and Bolting Special Inspector S1 or approved equal.
   b. Welding:
      1) American Welding Society as a Certified Welding Inspector; or
      2) International Code Council Structural Steel and Welding Certification and American Welding Society Qualified and one year of related experience; or
      3) NDT Level II or II Certificate (for non-destructive testing only).
   c. High strength bolting:
      1) International Code Council Structural Steel and Welding Certification and one year related experience.
      2) Alternatively, may be an Engineer Intern with appropriate training.

7. Other equivalent certifications will not be acceptable unless approved by the Engineer.

1.3 REPORTING DUTIES AND AUTHORITY

A. Reporting requirements for special inspector per IBC 2015 for Building System Related Work.
   1. Comply with requirements of IBC Section 1704.2.4.
   2. Provide written documentation of all inspections and testing.
      a. Include exact location of work.
      b. If testing of specimens is included, include detailed information on storage and curing of specimens prior to testing.
   3. Furnish inspection and test reports to the Contractor, the Engineer’s Project Manager and the Owner’s on-site representative.
      a. Indicate that work inspected was done in conformance with approved construction documents.
      b. Immediately report any discrepancies to the Contractor for correction.
      c. If the discrepancies are not corrected in a timely fashion, notify the Engineer’s Project Manager and Owner’s on-site representative.
   4. Issue an electronic report summarizing all inspections, corrective action notifications, and resolution of discrepancies and non-conforming work every two weeks (14 calendar days).
      a. Copy will be available to:
         1) Engineer’s Project Manager.
         2) Owner.
         4) General Contractor.
   5. At the end of the Project, the RPSI shall compile all test reports for each inspected material and for each Special Inspector and summarize into a single PDF and submit to the Engineer and Building Code Official.
      a. Final summary report to be signed and sealed by a Registered Professional for Special Inspections stating:
         1) The required Special Inspections have been performed.
         2) All discrepancies have been resolved except as specifically stated in the summary report.

B. Special Inspector shall report all deficient work to the Contractor as soon as possible.
   1. Deficient work that has been covered up or concealed prior to re-inspection shall be reported to the Engineer and the Building Code Official.

C. Special Inspector does not have authority to stop work or modify the requirements of the Contract Documents.

1.4 MATERIAL SPECIFIC SPECIAL INSPECTIONS AND TESTS

A. Material specific requirements for special inspection and testing are listed in the technical specifications listed below. Special inspection and testing requirements will be located in each appropriate technical specification under "SOURCE QUALITY CONTROL", "FIELD QUALITY CONTROL" and/or "QUALITY ASSURANCE" as appropriate for each material.
1.5 SOILS

A. Special Inspection/testing will be provided per IBC Section 1705.6. See City of Des Moines Schedule of Special Inspection services.

B. Inspection/testing requirements are listed separately in Specification Division 31 and are indicated as the work to be done by the Geotechnical Engineer, Testing Agency, or Special Inspections and Testing Provider.

1.6 CONCRETE

A. Special Inspection/testing will be provided per IBC Section 1705.3. See City of Des Moines Schedule of Special Inspection services.

B. Inspection and testing requirements are listed separately in Specification Section 03 09 00 and Specification Section 32 13 13 and are indicated as the work to be done by the Special Inspector or Testing Agency.

1.7 ALUMINUM

A. Special Inspection will be provided for aluminum, for the following:
1. Verify fabrication/quality control procedures: In-plant review, periodic.
2. Weld material.
3. Weld size and type.
4. Fasteners marked in accordance with ASTM requirement.
5. Document acceptance or rejection of bolted connections.
6. Material verification: Field inspection, periodic.

B. Inspection/testing requirements are listed separately in Section 05 50 00 and are indicated as the work to be done by the Special Inspector. Inspection requirements listed are applicable to aluminum, stainless steel, and structural steel.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS ATTACHMENT)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS ATTACHMENT)

END OF ATTACHMENT B
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Procedures and actions, required of the Contractor, which are necessary to achieve and
demonstrate Substantial Completion.
   2. Requirements for Substantial Completion Submittals.

B. Related Sections include but are not necessarily limited to:
   1. SUDAS Division I.
   2. Section 01 04 00 - Special Provisions.
   3. Section 01 33 00 - Submittals.
   4. Section 01 33 04 - Operation and Maintenance Manuals.
   5. Section 01 61 03 - Equipment: Basic Requirements.

1.2 DEFINITIONS

A. Project Classified System (PCS): A defined part of the Project, consisting of an arrangement of
   items, such as equipment, structures, components, piping, wiring, materials, or incidentals, so
   related or connected to form an identifiable, unified, functional, operational, safe, and
   independent system.

B. Pre-Demonstration Period: The period of time, of unspecified duration after initial construction
   and installation activities during which Contractor, with assistance from manufacturer's
   representatives, performs in the following sequence:
   1. Finishing type construction work to ensure the Project or each PCS has reached a state of
      Substantial Completion.
   2. Equipment start-up.
   3. Personnel training.

C. Demonstration Period: A period of time, of specified duration, following the Pre-Demonstration
   Period, during which the Contractor initiates process flow through the facility or PCS and starts
   up and operates the facility or PCS, without exceeding specified downtime limitations, to prove
   the functional integrity of the mechanical and electrical equipment and components and the
   control interfaces of the respective equipment and components comprising the facility or PCS as
   evidence of Substantial Completion.

D. Substantial Completion: Section 01 04 00.

1.3 PROJECT CLASSIFIED SYSTEMS (PCS)

A. Project Classified Systems (PCS) are established as follows:
   1. PCS No. 1 through PCS No. 6 (Primary Clarifiers No. 1 through No. 6): Each Primary
      Clarifier is a separate PCS and includes the following work.
      a. Installation of new Primary Clarifier sludge collection mechanism, access bridge, and
         scum collection components.
      b. CCTV inspection of influent pipe and sludge pipe.
      c. Remove and replace 2 IN topping grout.
      d. Concrete surface repair and crack repair.
      e. Installation and laser leveling of weirs and scum baffles.
      f. Sludge Blanket level transmitter.
      g. Primary Clarifier Control Panel.
2. PCS No. 7: Primary Sludge Pump Station No. 1.
   a. Electrical Room.
   b. Installation of sludge piping and valves.
   c. 26-PSL-P-1 pump, motor and VFD
   d. 26-PSL-P-2 pump, motor and VFD
   e. 26-PSL-P-3 pump, motor and VFD
   f. 26-PSL-P-4 pump, motor and VFD
   g. 26-PSL-P-5 pump, motor and VFD
   h. 26-PSL-MCC-1
   i. 26-PSL-MCC-2
   j. New Natural Gas service.
   k. Remove and Replace Roofing.
   l. Install Crossover Bridge from Splitter Box No. 1.
   m. Install Roof Guardrail System.
   n. Remove and Replace Sluice Gate and Gate Operators at Splitter Box No. 1.
   o. Architectural modifications and finishes.
   p. Associated Mechanical, Electrical, and Controls systems to support the Primary Sludge Pump Station No. 1 and Primary Clarifiers No. 1 through No. 4.
   q. A1 incidentals necessary for a complete system.

3. PCS No. 8: Primary Sludge Pump Station No. 2.
   a. Electrical Room.
   b. Installation of sludge piping and valves.
   c. 21-PSL-P-1 pump, motor and VFD
   d. 21-PSL-P-2 pump, motor and VFD
   e. 21-PSL-P-3 pump, motor and VFD
   f. 21-PSL-P-4 pump, motor and VFD
   g. 21-PSL-P-5 pump, motor and VFD
   h. 21-PSL-MCC-1
   i. 21-PSL-MCC-2
   j. New Natural Gas service.
   k. Remove and Replace Roofing.
   l. Install Crossover Bridge from Splitter Box No. 2.
   m. Install Roof Guardrail System.
   n. Remove and Replace Sluice Gate and Gate Operators at Splitter Box No. 1.
   o. Architectural modifications and finishes.
   p. Fiber optic replacement to Building 5 and associated modifications to PLC.
   q. Associated Mechanical, HVAC, Electrical, and Controls systems to support the Primary Sludge Pump Station No. 2 and Primary Clarifiers No. 5 and No. 6.
   r. Remove and Replace Sluice Gates and Gate Operators at Splitter Box No. 2.
   s. A1 incidentals necessary for a complete system.

4. PCS No. 9 (Primary Scum Pump Station No. 1), PCS No. 10 (Primary Scum Pump Station No. 2), and PCS No. 11 (Primary Scum Pump Station No. 3): Each Primary Scum Pump Station is a separate PCS and includes the following work.
   a. HVAC, Electrical, and Controls systems modifications.
   b. Install Fiber optic cable to Building 5 and Building 12 for PCS No. 9 (Building 12 only for PCS No. 10 and No. 11) and complete associated modifications to PLC.
   c. A1 incidentals necessary for a complete system.

1.4 SUBMITTALS

A. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
B. The following information shall be submitted for review in accordance with the requirements of Section 01 33 00 and Section 01 33 04. Additional requirements impacting scheduling of submittals are noted below.

1. Subject of each training session, identity, and qualifications of individuals to be conducting training, and tentative training schedule including date and time of each training session shall be submitted 30 days prior to date scheduled for the individual training session.

2. Completed Preliminary O & M Manuals with “Approved” review rating. These manuals will be used as reference information for the training, but the Training shall not be limited to reviewing the manuals during the Training session. The approved operation and maintenance manuals shall be available at least 30 days prior to the date scheduled for the individual training session.

3. The Owner reserves the right to video record all training sessions.

C. One complete set of original lesson plans, training materials, handouts, visual aids, and reference materials shall be the property of the Owner and shall be submitted in electronic format (i.e., pdf) with searchable text. This shall be uploaded to Submittal Exchange under the Training Tab, at least 30 days prior to each training session. It is not intended that this material will be reviewed and approved prior to the training event. However, if during the training event, additional information is requested, the Contractor shall provide that information via additional uploads to Submittal Exchange, Training Tab.

D. The Contractor shall furnish fifty (50) bound copies of necessary training manuals, handouts, visual aids and reference materials, unless otherwise coordinated with the Owner. This training material shall be delivered to Owner at least 7 days prior to each training session to allow time for staff review of information prior to training session. The Contractor shall submit notification via Submittal Exchange upon delivery of these bound copies to the Owner in order to track that the delivery was completed.

E. Submit in the chronological order listed below prior to the completion of the Pre-Demonstration Period.

1. Master operation and maintenance training schedule:
   a. Submit 30 days (minimum) prior to first training session for Owner’s personnel.
   b. Schedule to include:
      1) Target date and time for Owner witnessing of each system initial start-up.
      2) Target date and time for Operation and Maintenance training for each system, both field and classroom.
      3) Target date for initiation of Demonstration Period.
   c. Submit for review and approval by Owner.
   d. Include holidays observed by Owner.
   e. Attend a schedule planning and coordination meeting 90 calendar days prior to first anticipated training session.
      1) Provide a status report and schedule-to-complete for requirements prerequisite to manufacturer’s training.
      2) Identify initial target dates for individual manufacturer’s training sessions.
   f. Owner reserves the right to insist on a minimum seven (7) days’ notice of rescheduled training session not conducted on master schedule target date for any reason.
   g. Schedule to be resubmitted until approved.

2. Pre-Demonstration Start-up Plan for each PCS:
   a. Schedule for Manufacturer’s installation certification and start-up of equipment or systems.
      1) Submit at least 21 days prior to first system start-up.
      2) Indicate plan, procedures, checklist, and log format.
   b. Include plan for Management of Water Used for Pre-Demonstration Start-up as required in this Section.
      1) Describe use of non-potable water or treated effluent for start-up of various systems and how water will be provided, handled, and disposed.
c. Include log/documentation format.
   1) Documentation shall include:
      a) Log and description of problems, outages, failures, and alarms.
      b) Description of any corrective action taken.
      c) Log of calibration settings.
      d) Any calculations or pertinent information.
      e) Other information requested by Owner during review.
   2) See Section 40 61 13 for additional instrumentation and controls requirements.

d. Include scheduling and sequencing plan that meets the requirements of this Section.

3. Pre-Demonstration Period Equipment Start-up Notices:
   a. Provide written request to Owner to witness each system Pre-Demonstration Start-up.
      1) Request to be received by Owner minimum 1 week before start-up activities.

4. Notice of Completion of Pre-Demonstration Period for each PCS:
   a. File Contractor's Notice that all Pre-Demonstration Period tasks are completed and
      PCS is ready for Demonstration Period.
      1) Notice represents that Contractor certifies that the PCS has reached a state of
         tentative Substantial Completion and will be Substantially Completed after
         successful completion of Demonstration Period.
      2) Notice shall represent that all Pre-Demonstration tasks have been completed,
         specifically including the following:
         a) Pre-Demonstration start-up of PCS.
         (1) Notice given to Owner for each PCS start-up.
         b) Personnel training.
         c) Quality Control Submittals.
         d) Approval and submission of all Shop Drawings, O&M Manuals, and
            Miscellaneous submittals.
         e) Receipt of all specified items from manufacturers or suppliers as final items
            prior to initiation of Demonstration Period.
            (1) Includes any spare parts and special tools.

5. Substantial Completion Submittal:
   a. File Contractor's Notice of Substantial Completion and Request for Inspection for each
      PCS.
   b. Approved Operation and Maintenance manuals received by Engineer minimum 30 days
      prior to scheduled training.
   c. Equipment installation and pre-demonstration start-up certifications.
   d. Letter verifying completion of all pre-demonstration start-up activities including receipt
      of all specified items from manufacturers or suppliers as final item prior to initiation of
      Demonstration Period.

6. Quality Control Submittals:
   a. Manufacturer's Certificate of Proper Installation:
      1) When specified in the individual Specifications, submit certificate certifying:
         a) The product or system has been installed in accordance with the
            manufacturer's recommendations, inspected by the manufacturer's authorized
            representative, and serviced with the proper lubricants.
         b) Necessary safety equipment has been properly installed.
         c) Electrical and mechanical connections have been made meeting quality and
            safety standards as required.
         d) Free from undue stress imposed by exterior connection or loads.
         e) Adjustments have been made and the product or system is ready for testing,
            system start-up, and operation.
   b. Certificate of Successful Start-up:
      1) Prepare and submit upon completion of successful testing and start-up of respective
         equipment system, subsystem or component.
   c. Log of manufacturer's representative present.
   d. Completed log/checklists for start-up of each system.
e. Certifications of calibration for analytical instruments and testing equipment.

7. Demonstration Period Plan for each PCS:
   a. Functional and performance test plan and schedule for testing and demonstration of equipment, units, and systems.
   b. Integrate major activities required for demonstration of instrumentation and control systems as described in Section 40 61 13.
   c. Submit at least 21 days prior to start of related testing.
      1) Indicate test plan, procedures.
   d. Include plan for Management of Water Used for Demonstration Period as required in this Section.
   e. Include log/documentation format.
      1) Documentation shall include:
         a) Operational scenarios utilized or simulated during demonstration.
         b) Log and description of problems, outages, failures, and alarms.
         c) Description of any corrective action taken.
         d) Log of changes in operations, settings, flows, etc.
         e) Any calculations or pertinent information.
         f) Contractor's written certification that the equipment or system performs as specified.
         g) Other information required by Owner during review.
   f. See Section 40 61 13 for additional instrumentation and controls requirements.

1.5 TRAINING REQUIREMENTS

A. Training shall be conducted after all specific components are functional and all operational testing and troubleshooting events are complete. Training shall be completed prior to the commissioning periods. Classes shall be scheduled such that classroom sessions are interspersed with field instruction in logical sequence.

B. No hard or software equipment jumpers shall be allowed to operate equipment. All equipment shall function properly in both manual and applicable automatic modes before training is to be commenced.

C. Separate training sessions shall be provided for operations and maintenance staff for each piece of equipment requiring training. Morning and afternoon sessions are to cover the same material.

D. The Contractor shall arrange to have the training conducted on consecutive days if necessary to cover the material and train multiple shifts, with no more than 3 HRS of classes scheduled for any given session (no more than 8 HRS per day for 2 operations sessions). Training shall be certified on a form to be provided by the Owner.

E. The following services shall be provided for each item of equipment or system as required in individual Specification Sections. Additional services shall be provided, where specifically required in individual Specification Sections.

   1. As a minimum, classroom equipment training for operations personnel shall include:
      a. Using slides and Drawings, discuss the equipment's specific location in the plant and an operational overview.
      b. Purpose and plant function of the equipment.
      c. A working knowledge of the operating theory of the equipment
      d. Start-up, shutdown, normal operation, and emergency operating procedures, troubleshooting, identification and alarms and their setpoint resets (manual and automatic), written standard operating procedures, including a discussion on system integration and electrical interlocks, if any, and lock out tag requirements.
      e. Identify and discuss safety items and procedures.
      f. Routine preventative maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.
      g. Operator detection, without test instruments, of specific equipment trouble symptoms.
      h. Required equipment exercise procedure and intervals.
i. Routine disassembly and assembly of equipment, if applicable, (as judged by Owner on a case-by-case basis) for purposes such as operator inspection of equipment.

2. As a minimum, hands-on equipment training for operations personnel shall include:
   a. Identifying location of equipment and review the purpose.
   b. Identifying piping and flow options.
   c. Identifying valves and their purpose.
   d. Identifying instrumentation:
   e. Location of primary element.
   f. Location of instrument readout.
   g. Discuss purpose, basic operation, and informational interpretation.
   h. Discuss, demonstrate, and perform standard operating procedures and round checks.
   i. Discuss and perform the preventative maintenance activities.
   j. Discuss and perform start-up and shutdown procedures.
   k. Perform the required equipment exercise procedures.
   l. Perform routine disassembly and assembly of equipment, if applicable.
   m. Identify and review safety items and perform safety procedures, if feasible.

3. Classroom equipment training for maintenance and repair personnel shall include:
   a. Theory of operation.
   b. Description and function of equipment.
   c. Start-up and shutdown procedures.
   d. Normal and major repair procedures.
   e. Equipment inspection and troubleshooting procedures including use of applicable test instruments and the “pass” and “no pass” test instrument readings.
   f. Routine and long-term calibration procedures.
   g. Safety procedures.
   h. Preventative maintenance such as lubrication; normal maintenance such as belt, seal, and bearing replacement; and up to major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.

4. Hands-on equipment training for maintenance and repair personnel shall include:
   a. Locate and identify equipment components.
   b. Review the equipment function and theory of operation.
   c. Review normal repair procedures.
   d. Perform start-up and shutdown procedures.
   e. Review and perform the safety procedures.
   f. Perform Owner approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems.

5. Review contents of Maintenance Manual with Owner’s personnel in detail to explain aspects of operation, maintenance, and repair.

6. Prepare and insert additional data in the Maintenance Manuals when need for additional data becomes apparent during training instruction.

F. Scheduling
1. The Des Moines Metropolitan Wastewater Reclamation Facility training sessions shall be according to the daily sessions as summarized in the table below. There shall be one morning and one afternoon session for operations training and one morning session for maintenance training. Depending on the details or complexity of equipment, some operation and maintenance training sessions may be combined at the pre-approval of the WRA.

<table>
<thead>
<tr>
<th>Training Type</th>
<th>Session</th>
<th>Hours</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>1</td>
<td>Begin at 7:30 AM</td>
<td>Monday through Friday</td>
</tr>
<tr>
<td>Operation</td>
<td>2</td>
<td>End at 3:00 PM</td>
<td>Monday through Friday</td>
</tr>
<tr>
<td>Maintenance</td>
<td>1</td>
<td>Begin at 9:00 AM</td>
<td>Monday through Friday</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Begin at 7:30 AM</td>
<td>(if combined session)</td>
</tr>
</tbody>
</table>

HDR Project No. 10098434  Des Moines Municipal Wastewater Reclamation Authority  March 2020
WRF Clarifier Improvements - Phase I  SYSTEM START-UP  Addendum No. 3
2. Training instruction shall take place during normal work hours Monday through Friday for each session identified. Training sessions with estimated training times shall occur as listed in the table below. Contractor shall provide an updated table for training requirements.
   a. Operations Training: Each session as listed below shall be conducted twice per shift during Shift A on same or two different days.
   b. Maximum length of training session is 3 HRS.
   c. Schedule start/stop times for training sessions that shall last longer than 1 HR.
3. Training schedule
   a. Minimum training schedule is included in the following table, additional training sessions may be required.
   b. Combined operation and maintenance sessions may be permitted for some trainings with approval or request of WRA.

<table>
<thead>
<tr>
<th>Description</th>
<th>Minimum Length of Training Session (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operation</td>
</tr>
<tr>
<td></td>
<td>Morning Session</td>
</tr>
<tr>
<td>Primary Sludge Pumps (See Div. 43)</td>
<td>2</td>
</tr>
<tr>
<td>Primary Clarifier Mechanisms (See Div. 46)</td>
<td>3</td>
</tr>
<tr>
<td>HVAC Equipment (See Div. 23)</td>
<td>2</td>
</tr>
<tr>
<td>Electrical (See Div. 26)</td>
<td>2</td>
</tr>
<tr>
<td>Total Hours</td>
<td>9</td>
</tr>
</tbody>
</table>

1.6 COST OF START-UP
A. Contractor to pay all costs associated with System start-up.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

PART 3 - EXECUTION

3.1 GENERAL
A. System Start-up Divided into Two Periods:
   1. Pre-Demonstration Period including:
      a. Completion of construction work to bring Project or PCS to a state of Substantial Completion.
      b. Start-up of Equipment.
      c. Training of Personnel.
      d. Completion of the filing of all required submittals.
      e. Filing of Contractor's Notice of Substantial Completion and Request for Inspection.
   2. Demonstration Period including:
      a. Demonstration of functional integrity of facility.

3.2 PRE-DEMONSTRATION PERIOD
A. Completion of Construction Work:
   1. Complete the work to bring the Project or each PCS to a state of substantial completion.
B. Equipment Start-up:
   1. Requirements for individual items of equipment are included in Divisions 01 through 46 of these Specifications.
2. Prepare the equipment so it will operate properly and safely and be ready to demonstrate functional integrity during the Demonstration Period.
3. Perform Equipment Start-up per individual equipment specification.
4. Procedures include but are not necessarily limited to the following:
   a. Test or check and correct deficiencies of:
      1) Power, control, and monitoring circuits for continuity prior to connection to power source.
      2) Voltage of all circuits.
      3) Phase sequence.
      4) Cleanliness of connecting piping systems.
      5) Alignment of connected machinery.
      6) Vacuum and pressure of all closed systems.
      7) Lubrication.
      8) Valve orientation and position status for manual operating mode.
      9) Tankage for integrity using product flow.
     10) Pumping equipment using product flow.
     11) Instrumentation and control signal generation, transmission, reception, and response.
         a) See Specification Section 40 61 13.
     12) Tagging and identification systems.
     13) All equipment: Proper connections, alignment, calibration, and adjustment.
   b. Calibrate all safety equipment.
   c. Manually rotate or move moving parts to assure freedom of movement.
   d. "Bump" start electric motors to verify proper rotation.
   e. Perform other tests, checks, and activities required to make the equipment ready for Demonstration Period.
   f. Documentation:
      1) Prepare a log showing each equipment item subject to this paragraph and listing what is to be accomplished during Equipment Start-up.
      2) Provide a place for the Contractor to record date and person accomplishing required work.
      3) Submit completed document before requesting inspection for Substantial Completion certification.
5. Obtain certifications, without restrictions or qualifications, and deliver to Engineer:
   a. Manufacturer's equipment installation check letters (sometimes referred to as Manufacturer's Field Services report).
   b. Instrumentation Supplier's Instrumentation Installation Certificate.

C. Personnel Training:
1. See individual equipment specification sections.
2. Conduct all personnel training after completion of Equipment Start-up for the equipment for which training is being conducted.
   a. Personnel training on individual equipment or systems will not be considered completed unless:
      1) All pre-training deliverables are received and approved before commencement of training on the individual equipment or system.
      2) No system malfunctions occur during training.
      3) All provisions of field and classroom training specifications are met.
   b. Training not in compliance with the above will be performed again in its entirety by the manufacturer at no additional cost to Owner.
3. Field and classroom training requirements:
   a. Hold classroom training on-site.
   b. Notify each manufacturer specified for on-site training that the Owner reserves the right to video record any or all training sessions.
      1) Organize each training session in a format compatible with video recording.
c. Training instructor qualification: Factory trained and familiar with giving both classroom and "hands-on" instructions.
d. Training Instructors:
   1) Be at classes on time.
   2) Session beginning and ending times to be coordinated with the Owner and indicated on the master schedule.
   3) Normal time lengths for class periods can vary, but brief rest breaks should be scheduled and taken.
e. Organize training sessions into maintenance verses operation topics and identify on schedule.
f. Plan for minimum class attendance of ten (10) people at each session and provide sufficient classroom materials, samples, and handouts for those in attendance.
g. Instructors to have a typed agenda and well prepared instructional material.
   1) The use of visual aids, e.g., films, pictures, and slides is recommended for use during the classroom training programs.
   2) Deliver agendas to the Engineer a minimum of seven (7) days prior to the classroom training.
   3) Provide equipment required for presentation of films, slides, and other visual aids.
h. Training instruction shall take place during normal working hours Monday through Friday for each session. Contractor shall provide an updated table for training requirements.
   1) Operations training: Each session that will include training for plant operators shall be conducted twice per shift during Shift A on same or two different days.
   2) Electrical training: Each session that will include training for plant electrical staff shall be conducted once.
   3) Maximum length of training session in 3 HRS.
   4) Schedule start/stop times for training sessions that are longer than 2 HRS.
i. In the on-site training sessions, cover the information required in the Operation and Maintenance Manuals submitted according to Specification Section 01 33 04 and the following areas as applicable to the facility.
   1) Operation of equipment.
   2) Lubrication of equipment.
   3) Maintenance and repair of equipment.
   4) Troubleshooting of equipment.
   5) Preventive maintenance procedures.
   6) Adjustments to equipment.
   7) Inventory of spare parts.
   8) Optimizing equipment performance.
   9) Capabilities.
   10) Operational safety.
      11) Emergency situation response.
      12) Takedown procedures (disassembly and assembly).
j. Address above Paragraphs 1), 2), 8), 9), 10), and 11) in the operation sessions. Address above Paragraphs 3), 4), 5), 6), 7), and 12) in the maintenance sessions.
k. Maintain a log of classroom training provided including: Instructors, topics, dates, time, and attendance.

D. Complete the filing of all required submittals:
   1. Shop Drawings.
   2. Operation and Maintenance Manuals.
   3. Training material.

E. Filing of Contractor's Notice of Substantial Completion and Request for Inspection of Project or PCS:
   1. File the notice when the following have been completed:
      a. Construction work (brought to state of Substantial Completion).
b. Equipment Start-up.
c. Personnel Training.
d. Submittal of required documents.

2. Engineer will review required submittals for completeness within 7 calendar days of Contractor's notice. If complete, Engineer will complete inspection of the Work, within 14 calendar days of Contractor's notice.

3. Engineer will inform Contractor in writing of the status of the Work reviewed, within 14 calendar days of Contractor's notice.
   a. Work determined not meeting state of Substantial Completion:
      1) Contractor: Correct deficiencies noted or submit plan of action for correction within 5 days of Engineer's determination.
      2) Engineer: Re-inspect work within 5 days of Contractor's notice of correction of deficiencies.
      3) Re-inspection costs incurred by Engineer will be billed to Owner who will deduct them from final payment due Contractor.
   b. Work determined to be in state of tentative Substantial Completion: Engineer to prepare tentative "Engineer's Certificate of Substantial Completion."
   c. Engineer's Certificate of Substantial Completion:
      1) Certificate tentatively issued subject to successful Demonstration of functional integrity.
      2) Issued for Project as a whole or for one or more PCS.
      3) Issued subject to completion or correction of items cited in the certificate (punch list).
      4) Issued with responsibilities of Owner and Contractor cited.
      5) Identification of equipment placed in service and the start date of equipment warranty.
      6) Executed by Engineer.
      7) Accepted by Owner.
      8) Accepted by Contractor.
   d. Upon successful completion of Demonstration Period, Engineer will endorse certificate attesting to the successful demonstration, and citing the hour and date of ending the successful Demonstration Period of functional integrity as the effective date of Substantial Completion.

3.3 DEMONSTRATION PERIOD

A. General:
   1. Demonstrate the functional integrity of the mechanical, electrical, and control interfaces of the respective equipment and components comprising each PCS as evidence of Substantial Completion.
   2. Duration of Demonstration Period: 120 consecutive hours.
   3. If, during the Demonstration Period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceed 10 percent of the Demonstration Period, the demonstration of functional integrity will be deemed to have failed. In the event of failure, a new Demonstration Period will recommence after correction of the cause of failure. The new Demonstration Period shall have the same requirements and duration as the Demonstration Period previously conducted.
   4. Conduct the demonstration of functional integrity under full operational conditions.
   5. Owner will provide operational personnel to provide process decisions affecting plant performance. Owner's assistance will be available only for process decisions. Contractor will perform all other functions including but not limited to equipment operation and maintenance until successful completion of the Demonstration Period.
   6. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic and manual backup systems and alternate operating modes.

HDR Project No. 10098434  Des Moines Municipal Wastewater Reclamation Authority
WRF Clarifier Improvements - Phase I  March 2020
SYSTEM START-UP  Addendum No. 3
01 75 00 - 10
7. Time of beginning and ending any Demonstration Period shall be agreed upon by Contractor, Owner, and Engineer in advance of initiating Demonstration Period.

8. Throughout the Demonstration Period, provide knowledgeable personnel to answer Owner's questions, provide final field instruction on select systems and to respond to any system problems or failures which may occur.

9. Provide all labor, supervision, utilities, chemicals, maintenance, equipment, vehicles or any other item necessary to operate and demonstrate all systems being demonstrated.

END OF SECTION
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SECTION 03 35 00
CONCRETE FINISHING AND REPAIR OF SURFACE DEFECTS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Concrete finishing and repair of surface defects.
   2. Polymer Modified Cementitious Coating.
   3. Resurfacing Mortar.
B. Related Specification Sections include but are not necessarily limited to:
   1. SUDAS Division 1.
   2. Section 01 04 00 - Special Provisions.
   3. Section 03 09 00 - Concrete.
   4. Section 09 67 00 - Epoxy Flooring System.
   5. Section 09 96 00 - High Performance Industrial Coatings.

1.2 QUALITY ASSURANCE
A. Referenced Standards:
   1. American Concrete Institute (ACI):
      a. CT-13, Concrete Terminology.
      b. 117, Specification for Tolerances for Concrete Construction and Materials.
      c. 303R, Guide to Cast-in-Place Architectural Concrete Practice.
      d. 398, Standard Practice for Curing Concrete.
   2. ASTM International (ASTM):
      g. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
      h. D4258, Standard Practice for Surface Cleaning Concrete for Coating.
      i. D4259, Standard Practice for Abrading Concrete.
   3. International Concrete Repair Institute (ICRI):
      a. 310.1R, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.
      b. 310.2R, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
   4. The Society for Protective Coatings/NACE International (SSPC/NACE):
      a. SP 13/NACE No. 6, Surface Preparation of Concrete.
B. Mock-Ups.
   1. General:
      a. Construct additional mock-ups as required until accepted.
      b. Mock-ups constitute minimum standard of quality for actual construction.
      c. Maintain mock-up during construction.
      d. Remove when directed by Engineer.
   2. Construct mock-up for each type of wall finish specified for review and acceptance by Engineer.
      a. Minimum 4 x 4 FT area for each different wall finish specified.
      b. Mock-ups shall include:
         1) Sample of patched tie hole.
         2) Sample of all jointery being used in the walls.
      c. Include mock-up of wall having polymer modified cementitious coating.
         1) Mock-up shall be stepped to show surface preparation, repairs and coating in all stages of application.

1.3 DEFINITIONS

A. Vertical Surface Defects:
   1. Any void in the face of the concrete deeper than 1/8 IN, such as:
      a. Tie holes.
      b. Air pockets (bug holes).
      c. Honeycombs.
      d. Rock holes.
   2. Scabbing:
      a. Scabbing is defect in which parts of the form face, including release agent, adhere to concrete.
   3. Foreign material embedded in face of concrete.
   4. Fins 1/16 IN or more in height.

B. Installer or Applicator:
   1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
   2. Installer and applicator are synonymous.

C. Other words and terms used in this Specification Section are defined in ACI CT-13.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
   3. Certifications:
      a. Certification of aggregate gradation.
      b. Certification of manufacturer experience qualifications and performance history.

B. Informational Submittals:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's recommendations and requirements for materials used.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Bonding Agents:
      a. BASF Master Builders Solutions.
      b. Euclid Chemical Co.
      c. Laticrete - L&M Construction Chemicals.
   2. Polymer Modified Cementitious Coating:
      a. Aquafin International.
      b. BASF Master Builders Solutions.
      c. Euclid Chemical Co.
   3. Patching Mortar:
      a. BASF Master Builders Solutions.
      b. Euclid Chemical Co.
      c. Laticrete - L&M Construction Chemicals.
      d. Sika Corporation.

B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MATERIALS

A. Patching Mortar: Trowelable cementitious repair mortar for vertical, overhead, and horizontal repairs.
   1. Portland cement-based, rapid set repair mortar for interior or exterior use.
   2. Compressive Strength, ASTM C109:
      a. Minimum 3000 PSI at 7 days.
      b. Minimum 5000 PSI at 28 days.
   3. Freeze Thaw Durability, ASTM C666: 96.75 PCT at 300 Cycles.
   4. Shrinkage, ASTM C157: 0.069 PCT.
   5. Euclid Chemical Speed Crete Red Line.

B. Bonding Agents:
   1. For use only on concrete surfaces not receiving liquid water repellent coating:
      a. High solids acrylic latex base liquid for interior or exterior application as a bonding agent to improve adhesion and mechanical properties of concrete patching mortars.
         1) BASF Master Builders MasterEmaco A 660.
         2) Euclid Chemical Co. Flex-Con.
         3) Laticrete L&M Everbond.
   2. For use only on concrete surface receiving liquid water repellent:
      a. Non-acrylic base liquid for interior or exterior application as a bonding agent to improve adhesion and mechanical properties of concrete patching mortars.

C. Cement:
   1. ASTM C150, Type II Portland for areas exposed to sewage.
   2. ASTM C150, Type I Portland elsewhere.

D. Aggregate:
   1. Sand: Maximum size #30 mesh sieve.
   2. For exposed aggregate finish surfaces: Same as surrounding wall.

E. Water: Potable.

F. Polymer Modified Cementitious Coating:
   1. Polymer modified Portland cement based coating for concrete and masonry.
      a. Waterproof.
      b. Resistant to both positive and negative hydrostatic pressure.
      c. Breathable.
2. BASF MasterSeal 581 or Euclid Chemical Tamoseal.
   a. Color:
      1) Exterior surfaces: Custom color to match existing.
   b. Texture: Fine.

G. Non-Shrink Grout: See Specification Section 03 09 00.

2.3 MIXES

A. Bonding Grout: One (1) part cement to one (1) part aggregate.

B. Patching Mortar:
   1. One (1) part cement to two and one-half (2.5) parts aggregate by damp loose volume.
      a. Substitute white Portland cement for a part of gray Portland cement to produce color
         matching surrounding concrete.

PART 3 - EXECUTION

3.1 PREPARATION

A. For methods of curing, see Specification Section 03 09 00.

B. Surface Preparation:
   1. Clean surfaces in accordance with ASTM D4258 to remove dust, dirt, form oil, grease, or
      other contaminants prior to abrasive blasting, chipping, grinding, or wire brushing.
   2. Prepare surfaces in accordance with ASTM D4259 and SSPC SP 13/NACE No. 6 to
completely open defects down to sound concrete and remove laitance.
      a. Provide concrete surface profile (CSP) in accordance with ICRI 310.2:
         i) Areas to receive Repair Mortar:
            a) Areas larger than 1 SF or deeper than 1/4 IN Abrasive blast, scarify or needle
               scale to CSP No. 6-8.
            b. If additional chipping or wire brushing is necessary, make edges perpendicular to
               surface or slightly undercut.
            c. No featheredges will be permitted.
            d. Rinse surface with clean water to remove all dust, dirt, debris, loosened concrete,
               laitance, and other contaminants.

C. Preparation of Bonding Grout Mixture:
   1. Mix cement and aggregate.
   2. Mix bonding agent and water together in separate container in accordance with
      manufacturer's instructions.
   3. Add bonding agent/water mixture to cement/aggregate mixture.
   4. Mix to consistency of thick cream.
   5. Bonding agent itself may be used as bonding grout if approved by manufacturer and
      Engineer.

D. Preparation of Patching Mortar Mixture:
   1. Mix specified patching mortar per manufacturer's published recommendations.
   2. For repairs exceeding 2 IN in depth, mix with clean, pre-dampened 3/8 IN pea gravel in
      accordance with the manufacturer's recommendations.

E. Polymer Modified Cementitious Coating:
   1. Mix in accordance with manufacturer's recommendations using bonding agent acceptable to
      coating manufacturer.
3.2 INSTALLATION AND APPLICATION

A. Do not repair surface defects or apply wall or floor finishes when temperature is or is expected to be below 50 DEGF.
   1. If necessary, enclose and heat area to between 50 and 70 DEGF during repair of surface defects and curing of patching material.
      a. Use only clean fuel, indirect fired heating apparatus.
      b. Exhaust combustion byproducts outside of work area.

B. Repairing Surface Defects:
   1. This method is to be used on vertical concrete surfaces as indicated in the Concrete Finishes for Vertical Wall Surfaces paragraph of this Specification Section and similar concrete surfaces not otherwise specified to receive another finish or coating.
      a. For surfaces indicated to receive finish or coating other than those specified herein; refer to the applicable Specification Section for surface preparation requirements:
         1) Epoxy Flooring System: See Specification Section 09 67 00.
         2) High Performance Industrial Coatings: See Specification Section 09 96 00.
   2. Fill and repair surface defects and tie-holes using patching mortars mix specified in the MATERIALS Article in PART 2.
      a. Prime exposed reinforcing steel, embeds or other steel surfaces with primer as recommended by patching mortar manufacturer.
      b. Scrub bond coat:
         1) Wet substrate to a saturated surface dry (SSD) condition.
         2) Mix patching mortar to a scrub coat or slurry consistency per manufacturer’s published recommendations and apply to entire area.
      c. As an alternate to the scrub bond coat, concrete may be primed with manufacturer’s recommended epoxy primer.
      d. Patching Mortar Application:
         1) Mix and apply Patching Mortar per manufacturer’s recommendations within the open time of the product scrub coat or any bonding agents.
         2) Finish to level of surrounding concrete surface utilizing techniques recommended by manufacturer.
   3. Consolidate patching mortar into place and strike off so as to leave patch slightly higher than surrounding surface.
   4. Leave undisturbed until mortar has stiffened before finishing level with surrounding surface.
      a. Do not use steel tools in finishing a patch in a formed wall which will be exposed to view.
   5. Cure patching mortar in accordance with ACI 308.

C. Concrete Finishes for Vertical Wall Surfaces:
   1. General:
      a. Give concrete surfaces finish as specified below after removal of formwork and repair of surface defects.
      b. Finish numbers not listed are "Not Used".
   2. Finish #1 - As cast rough finish:
      a. Selected forming materials are not required.
      b. Prepare surface in accordance with the PREPARATION Article in PART 3 of this Specification Section.
      c. Repair the following surface defects using patching mortar specified in PART 2:
         1) Tie holes.
         2) Honeycombs deeper than 1/4 IN.
         3) Air pockets deeper than 1/4 IN.
         4) Rock holes deeper than 1/4 IN.
      d. Chip or rub off fins exceeding 1/4 IN in height.
      e. Provide at unexposed surfaces such as:
         1) Foundations.
         2) Below-grade walls not to be waterproofed.
3. Finish #2 - As cast form finish:
   a. Form facing material shall produce a smooth, hard, uniform texture.
   b. Prepare surface in accordance with the PREPARATION Article in PART 3 of this
      Specification Section.
      1) Chip or rub off fins exceeding 1/8 IN in height.
      2) Abrasive blast surfaces in accordance with ASTM D4259 and SSPC SP 13/NACE
         No. 6 to completely open defects down to sound concrete and remove laitance.
         a) Provide ICR 310.2 Concrete Surface Profile (CSP) No. 3, minimum across
            the entire surface.
            (1) For contiguous repair areas larger than 1 SF or deeper than 1/4 IN
                Abrasive blast, scarify or needle scale to CSP No. 6-8.
            b) If additional chipping or wire brushing is necessary, make edges perpendicular
                to surface or slightly undercut.
            c) No feather edges will be permitted.
   3) Rinse surface with clean water and allow surface water to evaporate prior to
      repairing surface defects.
   4) Repair the following surface defects using patching mortar specified in PART 2:
      a) Tie holes.
      b) Honeycombs deeper than 1/4 IN or larger than 1/4 IN DIA.
      c) Air pockets deeper than 1/4 IN or larger than 1/4 IN DIA.
      d) Rock holes deeper than 1/4 IN or larger than 1/4 IN DIA.
      e) Scabbing.
   5) Brush blast repaired areas to match adjacent surface texture.
   c. Provide this finish for:
      1) Underside of horizontal elements adjacent to the finished surface.
      2) Exposed surfaces not specified to receive another finish.

4. Finish #3 - Polymer modified cementitious coating:
   a. Form facing material shall produce a smooth, hard, uniform texture.
      b) Comply with ACI 303R for formwork accuracy and form joint handling to prevent
         grout leakage.
   b. Prepare surface in accordance with the PREPARATION Article in PART 3 of this
      Specification Section.
      1) Chip or rub off fins exceeding 1/8 IN in height.
      2) Abrasive blast and repair surface defects in accordance with Concrete Finish #2.
   c. Apply decorative coating to entire surface.
      1) As a mixing liquid for the coating, use bonding agent and water mixture as
         recommended by coating manufacturer.
      2) Apply two (2) coats at 2 LBS/SF per coat.
         a) During application of first coat, complete fill all voids, depressions or other
            surface imperfections.
   d. When second coat is set, float to a uniform texture with a sponge float.
   e. Provide this finish on all exposed to view:
      1) Exterior concrete surfaces.
   f. Construct mock-up per the Mock-Ups paragraph in the QUALITY ASSURANCE
      Article in PART 1 of this Specification Section.

D. Related Unformed Surfaces (Except Slabs):
1. Strike smooth and level tops of walls or buttresses, horizontal offsets, and similar unformed
   surfaces occurring adjacent to formed surfaces after concrete is placed.
2. Float surface to a texture consistent with that of formed surfaces.
   a. If more than one (1) finish occurs immediately adjacent to unformed surface, provide
      surface with most stringent formed surface requirement.
3. Continue treatment uniformly across unformed surfaces.
E. Concrete Finishes for Horizontal Slab Surfaces:

1. General:
   a. Tamp concrete to force coarse aggregate down from surface.
   b. S-agreed with straightedge, eliminate high and low places, bring surface to required finish elevations; slope uniformly to drains.
   c. Dusting of surface with dry cement or sand during finishing processes not permitted.

2. Unspecified slab finish:
   a. When type of finish is not indicated, use following finishes as applicable:
      1) Floors: Troweled finish.
      2) Exterior slabs, sidewalks, platforms, steps and landings, and ramps, not covered by other finish materials: Broom or belt finish.
      3) All slabs to receive a floated finish before final finishing.

3. Scratched slab finish: After concrete has been placed, consolidated, struck off, and leveled to a Class B tolerance, roughen surface with stiff brushes or rakes before final set.

4. Floated finish:
   a. After concrete has been placed, consolidated, struck off, and leveled to a Class B tolerance, do no further work until ready for floating.
   b. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operations.
      1) Use wood or cork float.
   c. During or after first floating, check planeness of entire surface with a 10 FT straightedge applied at not less than two (2) different angles.

5. Cut down all high spots and fill all low spots to produce a surface with Class B tolerance throughout.
   a. Refloat slab immediately to a uniform texture.

6. Troweled finish:
   a. Float finish surface to true, even plane.
   b. Power trowel, and finally hand trowel.
   c. First troweling after power troweling shall produce a smooth surface which is relatively free of defects, but which may still show some trowel marks.
   d. Perform additional trowelings by hand after surface has hardened sufficiently.
   e. Final trowel when a ringing sound is produced as trowel is moved over surface.
   f. Thoroughly consolidate surface by hand troweling.
   g. Finish in accordance with the FIELD QUALITY CONTROL Article in PART 3 of this Specification Section.
      1) Leave finished surface essentially free of trowel marks, uniform in texture and appearance.
   h. On surfaces intended to support floor coverings, remove any defects that would show through floor covering.

7. Broom or belt finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom or burlap belt across surface.

8. Underside of concrete slab finish:
   a. Match finish as specified for adjacent vertical surfaces.
   b. If more than one (1) finish occurs immediately adjacent to underside of slab surface, provide surface with most stringent formed surface requirement.

3.3 FIELD QUALITY CONTROL

A. Tolerances:

1. Finished floor slabs:
   a. Provide Floor Flatness (Ff) and Floor Levelness (Fl) in accordance with ACI 117.
      1) Measure in accordance with ASTM E1155.
   b. Slabs not indicated to be sloped:
      1) Ff: Equal or greater than 35.
      2) Fl: Equal or greater than 25.
c. Slabs indicated to be sloped or curved:
   1) Measure in accordance with ASTM E1486.
   2) Provide slopes or curves as indicated on the Drawings.

d. Slabs indicated to receive polished concrete floor:
   1) Fv: Equal or greater than 45.
   2) Fl: Equal or greater than 35.
   3) Refer to Room Finish Schedule on Drawings.

2. Horizontal surfaces other than finished floor slabs, including but not limited to, top of footings, top of walls, concrete fill in tankage, channels, and similar applications:
   a. Gap between a 10 FT straightedge placed anywhere and the finished surface shall not exceed:
      1) Class A tolerance: 1/4 IN.
      2) Class B tolerance: 3/8 IN.
      3) Class C tolerance: 1/2 IN.
   b. Accumulated deviation from intended true plane of finished surface shall not exceed 1/2 IN

B. Unacceptable finishes shall be replaced or, if approved in writing by Engineer, may be corrected provided strength and appearance are not adversely affected.
   1. High spots to be removed by grinding and/or low spots filled with a patching compound or other remedial measures to match adjacent surfaces.

END OF SECTION
SECTION 04 22 00
CONCRETE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete masonry construction (CMU), including:
      b. Precast concrete lintels.
   2. Masonry special inspection.

B. Related Specification Sections include but are not necessarily limited to:
   1. SUDAS Division 1.
   2. Section 01 04 00 - Special Provisions.
   3. Section 03 09 00 - Concrete.
   4. Section 04 05 13 - Masonry Mortar and Grout.
   5. Section 04 05 23 - Masonry Accessories.
   6. Section 04 05 50 - Cold and Hot Weather Masonry Construction.
   7. Section 07 92 00 - Joint Sealants.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. ASTM International (ASTM):
      c. C90, Standard Specification for Loadbearing Concrete Masonry Units.
      d. C140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
      e. C426, Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.
   2. Masonry Standard Joint Committee (MSJC):
      a. Specification for Masonry Structures (ACI 530.1/ASCE 6/TMS 602); referred to herein as MSJC Specification.
   3. National Concrete Masonry Association (NCMA):
      a. TEK 2-3A, Architectural Concrete Masonry Units.
      b. TEK 3-4B, Bracing Concrete Masonry Walls During Construction.
      c. TEK 8-2A, Removal of Stains from Concrete Masonry.
      d. TEK 8-3A, Control and Removal of Efflorescence.
   4. Building Code:
      a. International Code Council (ICC):

B. All masonry units of any one (1) particular type, color or face style shall be from the same production run.
   1. Special shapes shall be factory fabricated unless noted otherwise.

1.3 DEFINITIONS

A. Definition: to be in accordance with Standard Unit Nomenclature Table 1, NCMA TEK 2-3A.
1.4 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Manufacturer's information on aggregate and cement type used in manufacture.
      b. Data sheet on each type of masonry unit.
   3. Drawings:
      a. Sealed (minimum 1/8 IN per foot) plans showing proposed locations of masonry control joints.
      b. Detail Drawings for:
         1) Precast concrete lintels.
            a) Show profiles, cross-sections, reinforcement, and steel components.
   4. Certifications:
      a. Certification that concrete masonry units meet or exceed requirements of standards referenced.
   5. Qualifications of testing lab and technician.
   6. Test results for all masonry testing.

B. Informational Submittals:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver units on pallets with tight covers or deliver in cubes and store on dunnage.

B. Protect units from damage.

C. Inspect units upon delivery for damage, to assure color match with existing masonry, dimensional quality, and trueness of unit.
   1. Remove damaged or otherwise unacceptable units from the Project Site.

D. Store units in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cement: Type I or II Portland, ASTM C150.

B. Aggregate: ASTM C33.

C. Reinforcing Bars: Refer to Specification Section 03 09 00.

D. Mortar: Refer to Specification Section 04 05 13.

E. Masonry Grout: Refer to Specification Section 04 05 13.

F. Masonry Accessories: Refer to Specification Section 04 05 23.

G. Insulation:
   1. Extruded Polystyrene: ASTM C578, Type IV
      a. Water vapor transmission: ASTM E96/E96M, 1.1 perm-IN maximum.
      b. Water absorption: ASTM C272/C272M, 0.3 PCT maximum.
      c. Thermal resistance: ASTM C518 at 75 DEGF mean temperature, 5.0/IN.
      d. Compressive Strength: ASTM D1621, 25 PSI.
   2. Dow "STYROFOAM Square Edge".

H. Sealants: Refer to Specification Section 07 92 00.
2.2 MANUFACTURED UNITS

A. General:
   1. Fabricated in the manufacturing plant.
   2. Provide bullnose corners to match existing.

B. Concrete Masonry Units:
   1. Modular units: ASTM C90.
      a. Normal weight units: Minimum of 125 LB/CF.
      b. Light weight or medium weight units are not acceptable.
   2. Concrete bricks:
         1) Same material, texture and density as modular units.
   3. Color:
      a. Interior units: Standard gray.
   4. Design compressive strength: f’m=1,500 PSI minimum.
      a. Determine in accordance with MSJC Specification.
      1) Unit strength method, sampled and tested in accordance with ASTM C140.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that anchors and flashings are correct.

B. Lay out walls in advance for uniform and accurate spacing of bond patterns and joints.

3.2 INSTALLATION

A. General:
   1. Build in flashing, reinforcing, and related accessory items.
      a. See Specification Section 04 05 23 for installation of accessory items.
   2. Perform all cutting using masonry saw blades.
   3. Drill holes using masonry drill bits or core drill.
      a. Holes made by chipping unit will not be accepted.
   4. Install field units in running bond, unless noted otherwise.
      a. Provide special coursing where indicated on the Drawings.
   5. Cut as required to maintain bond pattern.
   6. Use solid units where cutting or laying would expose holes and as noted on Drawings.
   7. Avoid use of less than half size units, whenever possible.
   8. Do not use chipped, cracked, spalled, stained, or imperfect units exposed in finish work.
   9. Provide units of uniform color, within the range demonstrated on the approved mock-up.
  10. Do not wet concrete masonry units.

B. Concrete Masonry Units:
   1. Grout solid all cells containing steel reinforcing and as indicated on Drawings.
      a. Refer to Specification Section 04 05 13 for grouting.

C. Laying and Tooling:
   1. Lay masonry units with completely filled bed and head joints.
      a. Provide full mortar bed on all block cross webs and completely fill head joints.
         1) Do not slush head joints.
         2) Protect cells requiring grout fill from mortar droppings.
         3) Omit mortar from head joint at weep joint opening.
      a. Cut joints flush where concealed.
      b. Tool exposed joints concave.
c. Where masonry sits on top of steel support omit the mortar joint on top of the support and sit masonry directly on top of the thru wall flashing or the steel support member unless a mortar joint is required to maintain coursing.

3. During tooling of joints, enlarge any voids or holes except weeps, and completely fill with mortar.

4. Point-up all joints at corners, openings, and adjacent work to provide neat, uniform appearance.

5. Remove masonry disturbed after laying.
   a. Clean and relay in fresh mortar.
   b. Do not pound units to fit.
   c. If adjustments are required, remove units, clean, and reset in fresh mortar.

6. Where work is stopped and later resumed, rack back 1/2 masonry unit length in each course.
   a. Remove loose units and mortar prior to laying fresh masonry.

7. As work progresses, build in items indicated on Drawings and specified.
   a. Fill in solidly with mortar around built-in items.
   b. Where built-in items are to be embedded in cores of hollow masonry units, place grout screen in joint below and fill core solid with mortar.

D. Cavity Insulation:
   1. Do not proceed with installation until subsequent work which conceals insulation is ready to be performed.
   2. Set each piece of insulation flush with the abutting piece to eliminate ledges in the face of the insulation.
   3. Install mastic on face of concrete or masonry back-up in accordance with mastic and insulation manufacturer's recommendation.
   4. Press courses of insulation between wall ties (horizontal reinforcing) with edges butted tightly both ways.
   5. Install so that completed installation is vapor tight.
      a. Seal all joints.
      b. Seal to abutting materials to maintain vapor retarder integrity.
      c. Provide manufacturer's recommended solvent-free sealant compatible with insulation board.
         1) Tape is not acceptable.

E. Control Joints and Sealants:
   1. Provide vertical expansion, control and isolation joints where indicated on Drawings.
   2. Where not indicated on Drawings, submit proposed control joint locations in accordance with the following requirements:
      a. Provide at all T intersections.
      b. Locate joints so as to allow lintels and bond beams above and below openings to extend beyond the opening as indicated on the Drawings without control joints thru the lintel or bond beam.
      3. Rake out mortar in joint.
   4. Refer to Specification Section 07 92 00 for sealant installation requirements.
      a. Seal control and expansion joints.

F. Tolerances:
   1. Maximum variation from plumb in vertical lines and surfaces of columns, walls, and arises:
      a. 1/4 IN in 10 FT.
      b. 3/8 IN in a story height not to exceed 20 FT.
      c. 1/2 IN in 40 FT or more.
   2. Maximum variation from plumb for external corners, expansion joints, and other conspicuous lines:
      a. 1/4 IN in any story or 20 FT maximum.
      b. 1/2 IN in 40 FT or more.
3. Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
   a. 1/4 IN in any bay or 20 FT.
   b. 1/2 IN in 40 FT or more.
4. Maximum variation from plan location of related portions of columns, walls, and partitions:
   a. 1/2 IN in any bay or 20 FT.
   b. 3/4 IN in 40 FT or more.
5. Maximum variation in cross-sectional dimensions of columns and thicknesses of walls from dimensions shown on Drawings:
   a. Minus 1/4 IN.
   b. Plus 1/2 IN.
6. Maximum variation in mortar joint widths:
   a. Bed joints: 3/32 IN in 10 FT.
   b. Head joints:
      1) Minus 1/8 IN.
      2) Plus 1/8 IN.

G. Protect against weather when work is not in progress.
   1. During inclement weather conditions, cover top of walls with translucent waterproof membrane.
   2. See Specification Section 04 05 50.

H. Protect against cold/hot weather as specified in Specification Section 04 05 50.

3.3 FIELD QUALITY CONTROL

A. Bracing Concrete Masonry Walls During Construction:
   1. At a minimum, provide bracing in accordance with NCMA TEK 3-4B.
   2. Contractor is responsible for adequately bracing all masonry during construction.

B. Remove and replace loose, stained, damaged, and other unacceptable units as directed by Engineer.
   1. Provide new units to match.
   2. Install in fresh mortar.
   3. Point to eliminate evidence of replacement.

3.4 CLEANING

A. Clean concrete masonry as the wall is being constructed using fiber brushes, wooden paddles and scrapes.
   1. Do not use metal tools or wire brushes.
   2. No acid-based cleaning solutions shall be used unless approved in writing by Engineer.

B. Remove dirt and stains in accordance NCMA TEK 8-2A.

C. Remove primary efflorescence in accordance with NCMA TEK 8-3A.

END OF SECTION
SECTION 05 52 06
ROoftop guardrail

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-penetrating rooftop guardrail system.

B. Related Sections include but are not necessarily limited to:
   1. SUDAS Division 1.
   2. Section 01 04 00 - Special Provisions.
   3. Section 03 15 19 - Anchorage to Concrete.
   4. Section 07 57 13 - Sprayed Polyurethane Foam Roofing.

C. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Architectural Manufacturers Association (AAMA):
      a. 2604, Voluntary Specification, Performance Requirements and Test Procedures for
         High Performance Organic Coatings on Aluminum Extrusions and Panels.
   2. American Society of Civil Engineers (ASCE):
   3. ASTM International (ASTM):
      c. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated,
         Welded and Seamless.
         and Steel Products.
      e. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel
         Hardware.
      f. F1789, Standard Terminology for F16 Mechanical Fasteners
      a. D1.1, Structural Welding Code - Steel.
   5. National Association of Architectural Metal Manufacturers (NAAM):
   6. Occupational Safety and Health Administration (OSHA):
      a. 29 CFR 1910, Occupational Safety and Health Standards, referred to herein as OSHA
         Standards.
   7. Building code:
      a. International Code Council (ICC):
            amendments, referred to herein as Building Code.

1.3 DEFINITIONS

A. Fasteners: As defined in ASTM F1789.

B. Galvanizing: Hot-dip galvanizing per ASTM A123/A123M or ASTM A153/A153M with
   minimum coating of 2.0 OZ of zinc per square foot of metal (average of specimens) unless noted
   otherwise or dictated by standard.
C. Guardrail: A system of building components located near the open sides of elevated walking surfaces for the purpose of minimizing the possibility of an accidental fall from the walking surface to the lower level.

D. Hardware: As defined in ASTM A153/A153M.

1.4 **WARRANTY**

A. Furnish manufacturer's two(2) year warranty for defects in materials or workmanship.

1.5 **SUBMITTALS**

A. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

B. Shop Drawings:
   1. Fabrication and/or layout drawings:
      a. Plans and elevations showing location and dimension of components.
      b. Details of connections, design elements, and relation to adjacent items.
      c. Acknowledgement that products submitted meet requirements of standards referenced.
         1) Any deviation from the specifications must be noted in submittal.
   2. Product Data:
      a. Manufacturer's literature specific to the product(s) being submitted.
      b. Acknowledgement that products submitted meet requirements of standards referenced.
   3. Manufacturer's installation instructions.
   4. Certifications.

**PART 2 - PRODUCTS**

2.1 **MANUFACTURERS**

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Dakota Safety.

B. Submit request for substitution in accordance with Section 01 25 13.

2.2 **DESIGN CRITERIA**

A. Basis of Design: Dakota Safety "SafetyRail 2000 Architectural Series".

B. System shall consist of top rail, intermediate rail(s), vertical posts, weighted base and accessories.

C. No portion of railing system shall penetrate or cause damage to roof system.

D. Design guardrail system in accordance with NAAMM AMP 521 and ASCE 7 to meet or exceed the loading requirements of Building Code and OSHA Standards.
   1. Structural load: Railing system shall withstand minimum 200 pounds in any direction to all components in accordance with OSHA Standards.

E. Contractor shall field verify all dimensions.

2.3 **MATERIALS**

A. Carbon Steel: ASTM A36.


D. Fittings and hardware: Hot-dip galvanized per A123.

E. Fasteners: Stainless Steel.
2.4 COMPONENTS

A. Weighted mounting bases: Gray Cast Iron.
   1. Weighted mounting bases shall be located directly beneath guardrail posts.
      a. Contractor shall provide weighted outriggers at termination points of railing.
         1) No other counterbalance weights shall be permitted.
   2. Weight per manufacturer recommendation to meet design criteria.
   3. Receiver posts shall have positive locking system into slots that allow rails to be mounted in any direction.
      a. Friction locking system shall not be permitted.
      b. Receiver posts shall have drain hole.
   4. Provide resilient pads and additional materials as needed under mounting bases to protect roof from damage.
      a. Verify compatibility of resilient pad material with sprayed foam roofing per Section 07 57 13.

B. Posts and Rails:
   1. Minimum 1-1/4 IN schedule 40 pipe.
   2. Provide minimum two horizontal rails.
      a. Top rail to be uniform and level at nominal 42 IN above roofing high point.
      b. Intermediate rail(s) shall be spaced as necessary to prevent the passage of a 21 IN sphere.
   3. Vertical posts to be spaced at 8 FT maximum.

C. Fittings:
   1. Manufacturer's standard fittings with stainless steel fasteners.
      a. Corrosion resistant aluminum alloy.

D. Finish:
   1. Posts and bases: Powder coated:
      a. AAMA 2604.
      b. Color: Black or Bronze.
         1) Final color selection to be

PART 3 - EXECUTION

3.1 PREPARATION:

A. Field verify roof dimensions and locations of equipment, roof drains, roof access ladders, and similar items that may affect the railing installation.

3.2 INSTALLATION

A. Install railing system in accordance with manufacturer's instructions.

B. Provide sacrificial piece of minimum 60 mil resilient membrane at each point of contact with the roofing system.

C. Fit connections to form tight joints.

D. Contractor shall repair damage to roof, equipment, or other materials to pre-construction condition.

E. Repair damage to roof in accordance with roof manufacturer's warranty requirements.

END OF SECTION
SECTION 43 23 57
PUMPING EQUIPMENT - PROGRESSIVE CAVITY

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Material, design, fabrication and installation requirements for progressive cavity pumps.
B. Related Sections include but are not necessarily limited to:
   1. SUDAS Division 1.
   2. Section 01 04 00 - Special Provisions.
   3. Section 01 61 03 - Equipment: Basic Requirements.
   4. Section 40 71 00 - Flow Instrumentation.
   5. Section 40 73 00 - Pressure Instrumentation.
   6. Section 43 21 00 - Pumping Equipment: Basic Requirements.

1.2 QUALITY ASSURANCE
A. Referenced Standards:
   1. American Bearing Manufacturers Association (ABMA).
   2. American Iron and Steel Institute (AISI):
   4. ASTM International (ASTM):
   5. Hydraulic Institute (HI).

1.3 SUBMITTALS
A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of
      the submittal process.
   2. Requirements in Specification Section 43 21 00.
   3. Source quality control test reports.
B. Operation and Maintenance Manuals:
   1. See Specification Section 01 33 04 for requirements for:
      a. The mechanics and administration of the submittal process.
      b. The content of Operation and Maintenance Manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Subject to compliance with the Contract Documents, the following Manufacturers are
   acceptable:
   1. Progressive cavity pumps:
      a. Netzsch.
      b. No like, equivalent, or "or-equal" item or substitution is permitted.
   2. Mechanical seals:
      a. Chesterton.
      b. John Crane.
c. A3SEAL.
d. Submit request for substitution in accordance with Specification Section 01 25 13.

3. Seal water station:
a. Chesterton.
b. John Crane.
c. A3SEAL.
d. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MATERIALS

   1. Pump body: Cast iron, ASTM A48 Class 30, 35, or 40B.
   2. Rotor: AISI 4140 or 4150 steel with chrome plating.
   3. Drive Shaft: Carbon steel, ASTM A519, Grade MT1020 with yield strength of 32,000 psi or stainless steel.
   4. Stator:
      a. Buna-N or nitrile rubber.
   5. Base plate: Cast Iron, ASTM A48, Class 35 or fabricated steel.
   6. Stuffing box gland: Ductile iron or carbon steel.
   7. Shaft Seal: Double mechanical seal.
      a. Metal parts materials: 316 stainless steel.
      b. Rotary faces materials: Silicon carbide.
      c. Stationary faces materials: Silicon carbide.
      d. Springs material: Hastelloy C.
      e. Elastomers: Ethylene propylene or fluorocarbon.
      f. Integral flushing ports for water flush connections between seal faces.

2.3 EQUIPMENT

A. Performance and Configuration Requirements:
   1. Each pump shall be designed and constructed to operate satisfactorily within a minimum of
      noise, vibration, cavitation and a reasonable long service life when operated continuously or
      intermittently. Pumps shall be located and connected as shown on the Drawings.
   2. Pumps shall be designed for the operating conditions as indicated below. The operating
      range of the pump shall include rated head and maximum head conditions. The pump shall
      be non-overloading throughout this operating range.
   3. Primary Sludge Pumps (20-PSL-P-1, 20-PSL-P-2, 20-PSL-P-3, 20-PSL-P-4, 20-PSL-P-5,
      21-PSL-P-1, 21-PSL-P-3, 21-PSL-P-5):
      a. Design condition:

<table>
<thead>
<tr>
<th>Service</th>
<th>Primary Sludge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Solids, PCT</td>
<td>3-10</td>
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<tr>
<td>Number of Stages</td>
<td>1</td>
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<tr>
<td>Rated Capacity, GPM</td>
<td>85</td>
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<tr>
<td>Rated Head, FT</td>
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<tr>
<td>Minimum Capacity, GPM</td>
<td>15</td>
</tr>
<tr>
<td>Minimum Head, FT</td>
<td>50</td>
</tr>
<tr>
<td>Speed Range, RPM</td>
<td>51 – 215</td>
</tr>
</tbody>
</table>

c. Drive type: Variable frequency.
d. Drive configuration: Direct coupled.
e. Suction 6 IN DIA minimum, discharge 4 IN DIA minimum.
f. Pump shall operate on the principal of a single helical rotor surrounded by a double helical stator.

g. The connecting rod shall be designed to protect against the accumulation of rags and stringy material.

2.4 ACCESSORIES

A. See Section 43 21 00.

B. Provide run dry protection for each pump consisting of a temperature probe installed in the pump stator for switching off the pump upon high temperature.

C. Provide protection against overpressurization by furnishing and installing an isolator ring and adjustable pressure switch at the pump discharge for switching off the pump upon high discharge pressure.
   1. Reference Section 40 73 00.

D. Seal Water Station (SWS):
   1. Features:
      a. Solenoid valve.
      b. Pressure regulating.
      c. Variable Area Flow Meter (0.10 to 2.5 GPM)
      d. Flow regulating.
      e. Flow Switch.
      f. Pressure gage.
   2. Materials of construction:
      c. Pressure gage: 316 stainless steel case and wetted parts.
      d. Pressure regulating valve: 316 stainless steel.
      e. Flow regulating valve: 316 stainless steel.
      g. Tube fittings: 316 stainless steel.
      h. Mounting brackets: 316 stainless steel.
   3. Service:
      a. Temperatures up to 100 DEGF.
      b. Pressure up to 125 PSIG.
   4. Connection:
      a. Type 304 Stainless Steel Braid with PTFE Inner Hose Material or equal.
         1. Minimum size: 1/2 IN ID.
         2. 316 stainless steel fittings.
   5. Shut-off valve:
      a. Stainless steel type ball valve.
   6. Solenoid Valves:
      a. Provide for seal water supply.
      b. Materials:
         2. Seat: Buna-N.
         3. Insulation: Class F
      c. Design requirements:
         1. 110 Vac.
         2. Two-way, normally open.
         3. Working pressure: 125 PSIG.
   7. Mounting:
      a. Utilize 316 stainless steel brackets and hardware.
2.5 FABRICATION

A. Design Features:
1. Pump shall be full service in place design.
2. The rotor and stator shall be capable of being removed and replaced without disturbing or removing the suction and discharge pipe connections. This shall also apply to the removal/replacement of the connecting rod, driveshaft, and mechanical seal.

B. Pump Body:
1. Provide body containing two (2) inspection ports 180 DEG apart, and one (1) additional port to allow access and inspection of both coupling rod joints.
2. Cradle mount pump to permit suction port to be rotated at 90 DEG increments perpendicular to pump centerline.
3. The pump shall be supplied with adequate NPT connections for stuffing box drainage, pump drainage, flushing, vents/air purge, and suction/discharge pressure gauge connections. Connections shall always be at the highest and lowest points of the housing regardless of housing orientation.

C. Rotor:
1. Harden to minimum Rockwell C-57.
2. Plate with a layer of chromium nitride with a minimum thickness of 0.008 IN and a minimum hardness of Rockwell C-70.

D. Stator:
1. Construct by bonding rubber-type material to inside of a steel tube.
2. Minimum 65 Durometer hardness (Shore A).

E. Drive Train:
1. Include crown gear-type universal joints, seals, connecting rod, driveshaft, and shaft bearings.
2. Connect rotor drive shaft by a connecting rod equipped with two (2) crowned gear-type double-sealed with oil lubrication universal joints.
   a. Joint unconditionally guaranteed by manufacturer to meet 10,000 HR operation at the required performance conditions.
3. Use universal joints to transmit thrust and torque while allowing the rotor to move through an eccentric path.
4. Joint shall be positively double-sealed and encased in a Series 300 stainless steel cover to protect it from trap metal and glass.
5. Mount drive shaft in two (2) ball or tapered roller bearings.
6. Bearing ABMA L-10 life: 50,000 HRS at design operating conditions specified.
7. Provide fittings for grease or oil lubrication of bearings.
8. Stuffing box:
   a. Designed for water seal.
   b. Designed for double mechanical seal.

F. Suction and Discharge: Provide ANSI, Class 150, 125 LB rated flanged.

G. Base Plate: Provide common base plate for pump, drive, and motor.

2.6 SOURCE QUALITY CONTROL

A. Testing:
1. Perform Level I test for each pump as defined by HI standards to assure conformance to manufacturer's commercial performance criteria.
2. Perform hydrostatic test for each pump in compliance with HI standards.

2.7 MAINTENANCE MATERIALS

A. Furnish Owner the following extra parts for each pump category:
1. Two (2) rotors.
2. Two (2) stators.
3. Two (2) connecting rods.
4. Two (2) sets of connecting rod gear joint assemblies.
5. Two (2) Mechanical Seals.

PART 3 - EXECUTION

3.1 INSTALLATION
   A. See Section 43 21 00.

3.2 FIELD QUALITY CONTROL
   A. See Section 43 21 00.

END OF SECTION
SECTION 46 43 23
SLUDGE COLLECTION - CIRCULAR PLOW-TYPE

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Design, fabrication, installation, and testing requirements for:
      a. Primary clarifier equipment to be installed in an existing primary clarifier.

B. Related Sections include but are not necessarily limited to:
   1. SUDAS Division 1.
   2. Section 01 04 00 - Special Provisions.
   3. Section 01 61 03 - Equipment: Basic Requirements.
   4. Section 03 15 19 - Anchorage to Concrete.
   5. Section 05 50 00 - Metal Fabrications.
   6. Section 05 52 02 - Aluminum Railing.
   7. Division 09 - Finishes.
   8. Section 10 14 00 - Identification Devices.

1.2 QUALITY ASSURANCE
A. Referenced Standards:
   1. Aluminum Association (AA):
      a. ASD 1, Aluminum Standards and Data.
   2. American Bearing Manufacturers Association (ABMA):
      a. ABMA 9, Load Ratings and Fatigue Life for Ball Bearings.
   3. American Gear Manufacturers Association (AGMA):
      b. 2001-D04 (Revision of ANSI/AGMA 2001--C95), Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth
      d. 5013-A06, Standard for Industrial Enclosed Gear Drives.
      e. 5034-B92, Practice for Enclosed Cylindrical Wormgear Speed Reducers and Gearmotors.
   4. American Institute of Steel Construction (AISC):
   5. American Iron and Steel Institute (AISI).
   6. ASTM International (ASTM):
   7. American Welding Society (AWS):
      a. D1.1, Structural Welding Code - Steel.
      b. D1.6, Structural Welding Code - Stainless Steel.
   8. NACE International (NACE).
   9. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
      b. MG 1, Motors and Generators.
   a. 70, National Electrical Code (NEC).
11. Occupational Safety and Health Administration (OSHA).
12. Society of Automotive Engineers (SAE):
   a. AMS 6440M, Steel, Bars, Forgings, and Tubing 1.45Cr (0.98-1.10C) (SAE 52100) For Bearing Applications.

B. Comply with AWS D1.1 and AWS D1.6 procedures and practices.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. See Section 01 61 03 Equipment: Basic Requirements.
   3. Product technical data including:
      a. Evidence to show compliance with manufacturer’s coordination requirements specified in 1.5.B.
      b. Acknowledgement that products submitted meet requirements of standards referenced.
      c. Manufacturer, model, and type.
      d. Complete erection, installation, operation, and maintenance information provided by the manufacturer.
      e. Complete construction details, materials of construction, Drawings of mechanisms, gears, gear reducers, bridge, electrical wiring diagrams, control wiring diagrams, and other pertinent information.
      f. Catalog cut sheets for purchased subcomponents.
      g. Submit evidence of compliance with Article 2.6 requirements, including:
         1. Reference standards.
         2. Welder certifications.
         3. Structural design requirements.
      h. Main drive speeds.
      i. Size, make, and type of electric motors and drive systems.
      j. Drive motor rated running torque.
      k. AGMA rated alarm, stall, and ultimate torque capabilities.
      l. Details of any revision necessary to adapt the piping, structural, electrical and instrumentation design to the equipment proposed.
      m. Manufacturer, model, and certification of compliance to ABMA 9 bearing life.
      n. Certification of the AGMA drive rating calculations signed by a Registered Professional Engineer.
      o. Statement signed by a Professional Engineer registered in the State of Iowa that all members have been designed to support the loadings as specified.
      p. For information-only calculations as follows:
         1) Center column and bridge support calculations.
         2) Complete process calculations substantiating the size of the center column ports and influent feedwell.
      q. Calculations and details must bear the stamp of a Professional Engineer registered in the State of Iowa.
      r. Local control panel data sheets.
         1) Catalog sheets on all components.
         2) Wiring diagrams.
         3) Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70. Include any required calculations per Section 01 61 03.

B. Contract Closeout Information:
   1. Operation and Maintenance Data:
      a. See Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
   2. Certified As-Built Drawings (general arrangement and general arrangement details).
3. Erection Drawings.
4. Complete bill of materials for the equipment, including the weights of all structural steel components.
5. Installation and maintenance instructions for the specific equipment including:
   a. Erection sequence.
   b. Maintenance and trouble-shooting check points.
   c. Complete lubrication procedures with recommended grades of lubricants.
6. Cut sheets for all equipment items purchased from sub-vendors.
7. Clarifier manufacturer’s recommended spare parts, specifically denoting:
   a. Wear items.
   b. Long-delivery items.
   c. All items convenient for stock as optional replacement items.

C. Informational Submittals:
   1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Manufacturer's certification regarding installation and startup.
   3. Submit copy of field torque test results to Engineer.
   4. Submit copy of laser level results for weirs, baffles, and scum system for each clarifier to Engineer and Owner.
   5. Submit copy of report verifying completion of startup and related field services.
   6. Contractor to provide all material testing and inspection reports to the Engineer within 5 days of testing and/or inspections performed by the Contractor.

1.4 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 65 50.

B. Factory Assembly:
   1. Assemble each mechanism in factory to ensure proper fit of parts. Annotate parts with erection marks.
   2. Disassemble mechanism into largest sections allowed by carrier regulations for shipment.

1.5 SYSTEM COORDINATION

A. Provide single source supply and coordination responsibility through the collection mechanism manufacturer for the complete primary clarifier mechanism construction, including scum skimming system.

B. Equipment is to be installed in existing concrete tanks. The collection mechanism manufacturer shall coordinate collection mechanism dimensions, configuration, and orientations at each basin. The collection mechanism manufacturer shall provide written confirmation of this coordination being completed with the submittal information of the equipment specified herein.

C. New aluminum stairs and walkways to the clarifiers are to be installed as shown on the Drawings. The Contractor shall provide that information to the collection mechanism manufacturer to ensure proper coordination of elevations of the landings and walkways between the two systems. The collection mechanism manufacturer shall provide written confirmation of this coordination being completed with the submittal information of the equipment specified herein.

1.6 PROJECT CONDITIONS

A. Clarifiers: Equipment suitable for installation in raw sewage inside existing circular concrete tanks.

B. Equipment to be installed in existing 130± FT DIA concrete primary clarifier basins.

C. Wastewater Temperature: 45 to 80 DEGF.

D. Ambient Temperature: -20 to 120 DEGF.
PART 2 - PRODUCTS
2.1 MANUFACTURERS
A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Evoqua.
   2. Ovivo.
B. No like, equivalent or "or-equal" item or substitution is permitted.

2.2 MATERIALS
A. General:
   1. All welding shall conform to AWS D1.1 and AWS D1.6.
   2. All stainless steel components shall be provided with Bead Blast passivation.
B. Bridge and Access Platform:
   2. Deductive Bid Alternate: Steel, ASTM A36, Grade B.
C. Center Column: 316L Stainless Steel, ASTM A276.
D. Plate: 316L Stainless Steel, ASTM A276.
E. Structural Shapes: 316L Stainless Steel, ASTM A276.
F. Tube: 316L Stainless Steel, ASTM A276.
G. Influent Feedwell: 316L Stainless Steel, ASTM A276.
H. Drive Mechanism:
   1. Main Spur Gear:
      a. Ductile iron: ASTM A536, Grade 80-55-06, 80-60-03, 100-70-03, or 120-80-02.
      b. Cast iron: ASTM A48, Class 60 or 50A.
      c. Forged steel: AISI Grade 4140, 4150, 4340, or 8620.
   3. Worn and Worm Shaft:
      a. Ductile iron: ASTM A536, Grade 80-55-06.
      b. Steel: AISI Grade 8620.
   5. Pinion and Pinion Shaft:
      a. Ductile iron: ASTM A536, 80-55-06.
      b. Steel: AISI Grade 4140/4142.
   6. Gear Housing: Gray iron, ASTM A48, Class 40B.
   7. Shear Pins: 2017-T4, AA ASD 1, aluminum screw machine stock or CD1018 steel.
   11. Drive Dust Shield: Steel, ASTM A36.
   12. Drive Seal: Felt or neoprene.
   14. Oil Drain: equipped with stainless steel ball valve including handle and hardware.
I. Plow Squeegees: 316 stainless steel.
J. Fasteners and attachment hardware including anchor bolts:
   1. ASTM A276, 316 Stainless Steel.
      a. For both base and deductive bids unless explicitly noted otherwise.
   2. Comply with Division 5.
K. Scum Skimmer Wiper: Neoprene.

L. Skimming Equipment.

M. Weirs and Baffles:

2.3 EQUIPMENT

A. Primary Clarifier Performance Requirements:
   1. Tank dimensions: 130 FT 0 IN DIA. (to be field verified at each basin)
   2. Sidewall depth: 12 FT 1 IN. (to be field verified at each basin)
   3. Side wall depth: 13 FT 4 IN. (to be field verified at each basin)
   4. Inboard concrete launder.
   5. Influent column inside diameter: 4 FT 6 IN.
   6. AGMA 20 year continuous rated running torque applied at output of drive unit: 50,700 FT-LBS minimum.
   7. Stall or motor cut-out torque: 60,850 FT-LBS.
   8. AGMA yield torque applied at output of drive unit: 65,900 FT-LBS minimum.
   9. Rotation:
      a. Clockwise for Primary Clarifier No. 2, No. 4, and No. 6.
      b. Counter Clockwise for Primary Clarifier No. 1, No. 3, and No. 5.
   10. Influent Feedwell:
       a. Minimum Diameter: 20 FT DIA by 5 FT 6IN high.
       b. Depth below water surface: 5 FT 0 IN.
       c. Number of outlets: 4 minimum.
   11. Maximum or peak influent flow: 37.0 MGD.
   12. Maximum Month Flow: 17.33 MGD
   13. Average influent flow: 9.33 MGD.
   14. Minimum turntable ball race diameter: 55 IN.
   15. Minimum internal spur gear pitch diameter: 50 IN.
   17. Maximum drive motor speed: 1800 RPM.
   18. Drive output speed: (0.020 to 0.029) RPM.

B. Structural Design:
   1. Maximum ratio of unbraced length to least radius of gyration (slenderness ratio):
      a. Compression members: 120.
      b. Tension members: 240 (for angle about Z-Z axis).
   2. Maximum unit stress at all structural members when subject to twice the drive motor running torque: 130 PCT of AISC allowable stresses.

2.4 CONTROLS

A. Overload Monitoring and Protection System:
   1. Furnish an electrical-mechanical overload control system for each clarifier drive mechanism. The overload system shall be actuated by the movement of the worm shaft in the intermediate wormgear speed reducer.
      a. Amperage and current sensing devices shall not be acceptable for the overload sensing system.
   2. Provide factory calibrated torque switches rated 5 amps at 120 VAC minimum.
   3. Provide normally open contacts, which close at 100 PCT of the design running torque for alarm activation.
4. Provide normally closed contacts, which open at 120 PCT of the design running torque for motor shutdown.
5. Alarm and motor cutout loads shall be independently field adjustable, with initial setting to be made by manufacturer.
6. Provide time delay relays with timers to prevent alarms on start-up and shutdown.
7. Provide all necessary current transformers, relays and other appurtenances for a complete system.
8. Overload system enclosure constructed to meet NEMA 4X.
9. Mechanism loading indicator:
   a. Separate device, suitable for outdoor mounting.
   b. Mechanism loading indicated on a 0-160 PCT graduated scale at all times during operation.
   c. Oriented so that torque may be read from the platform area around gear.

B. Shear Pins:
   1. Shear pin device: Set for 125 PCT of AGMA rated torque.
   2. Provide straight, non-tapered shear pins with bushings.

C. Local Control Panel for Operating the Clarifier Mechanisms, including:
   1. Each clarifier mechanism shall be provided with a control panel that allows control from the center drive mechanism location. The control panel and components shall comply with Division 26, including:
      a. 3-pole magnetic starter switch providing overload and under voltage protection for each motor.
      b. All auxiliary components necessary for a complete and functioning system.
      c. NEMA 4X, stainless steel, local control panel.
   2. The panel shall contain the following face mounted items:
      a. Local-Off-Remote selector switch. Contacts for remote position indication to PLC shall also be provided.
         1) In Local, mechanism shall operate unless prevented by overload protection system.
         2) In Remote, the mechanism shall accept a remote start and stop signal.
      b. Initial alarm high torque overload indicating light. Contacts for remote alarm indication to PLC shall also be provided.
      c. Shutdown high torque overload indicating light. Contacts for remote alarm indication to PLC shall also be provided.
      d. Run indicating light. Contacts for remote run indication to PLC shall also be provided.
      e. Off indicating light. Contacts for remote off indication to PLC shall also be provided.
      f. Disconnect switch.
      g. Alarm horn.
      h. Horn Silence Pushbutton.
      i. Shutdown Reset.
      j. Alarm Light Fixture with Red Globe to remain illuminated until alarm condition is cleared.
   3. Provide 4-20mA analog output indicating motor running amps.
   4. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes. See Section 01 61 03 for information on how to determine the available fault current, such that the SCCR rating meets or exceeds the available fault current.

2.5 FABRICATION
   A. See Section 01 61 03.
   B. General:
      1. Welds on submerged or partially-submerged components shall be continuous.
      2. Dull sharp corners of cut or sheared edges by at least two (2) passes of a power grinder.
   C. Center Pier:
      1. Cylindrical stainless steel, 54 IN DIA minimum by minimum 1/4 IN wall thickness.
2. Flanged base for anchor bolting to concrete base of clarifier.
   a. Water tight connection seal.
3. Minimum of eight (8) anchor bolts of at least 1 IN DIA. Provide flanged top and stiffeners for supporting the sludge collection mechanism, the drive mechanism, drive-mounting plate, access platform, and the access bridge.
4. Provide a drive mechanism mounting plate set plumb with the centerline of the center pier.
5. Provide center pier which serves as an influent pipe and has a minimum of 4 equally-spaced ports at the upper end to direct the flow into the Influent Feedwell at a velocity less than 1 FPS at average flow and less than 2.8 FPS at maximum month flow.
6. Provide easily accessible and removable plate near the bottom of the center pier for draining center pier.
   a. Opening shall be large enough to insert a submersible pump to dewater the clarifier influent pipe.
   b. Removable plate shall provide a clear square opening not less than 18 IN by 18 IN.
   c. The opening shall be reinforced as needed to support the imposed loads on the center pier.

D. Influent Feedwell:
1. Fabricate from 3/16 IN minimum stainless steel plates with welded connections.
2. Reinforcing rim angles, angle stiffeners and supporting brackets shall be structural stainless steel members of minimum thickness 1/4 IN.
3. Provide baffled openings in feedwell at liquid level to allow release of scum in a tangential direction.
   a. Minimum four openings.
4. Support the feedwell from drive cage. Feedwell structural members to be on outside of the feedwell to provide smooth interior.
5. Influent Feedwell shall project 6 IN above water surface.
6. Maximum headloss: Maximum headloss through center pier and influent feed well shall be 5 IN at peak flow.

E. Center Drive Cage:
1. Provide an all-welded stainless steel box truss construction.
2. Drive cage shall transmit and/or carry all torques (including stall torque) without over stressing members.
   a. Do not transmit any torque to the access bridge.
3. Design drive cage to encompass center column.
   a. Design cage to withstand 200 PCT of design torque.
4. Design adjustable connection between drive unit and drive cage to provide for proper alignment and allowance for structural tolerance.

F. Sludge Scraper Truss Arms and Scrapers:
1. Truss arms and scrapers shall be all-welded stainless steel construction.
2. Truss arms shall be rigidly braced structural truss arms and rigidly supported by the center drive cage.
3. Tie rods and/or turnbuckle supports from the center drive cage to scraper truss arms are not acceptable.
4. Provide plows under truss arms.
   a. Provide smooth, unobstructed face of plow.
5. Sludge plows provided with adjustable squeegees to scrape settled sludge to the hopper area near the center of the tank.
6. Squeegees:
   a. Project squeegees 1-1/2 IN below blades.
   b. Squeegees shall have a minimum thickness of 22 gauge.
   c. Squeegees shall have 1 IN slots to allow 1 IN vertical adjustment downward to account for wear.
7. Arrange sludge plows to sweep the entire tank twice for each revolution of the collector.
8. Design truss arms to transmit all torques (including test torque and stall torque of 130 PCT of the AGMA rated running torque) to the center cage without ever-stressing members.
9. Truss arms shall be fabricated to parallel the bottom of tank.

G. Scum Skimming and Removal:
1. Provide clarifier with two (2) rotating skimming arms consisting of scum blade and hinged wiper assembly.
   a. The skimming arm shall collect scum the full distance between the influent well or feedwell and the scum baffle. The skimmer arm shall be tangential to the influent feedwell and form an angle of at least 12 DEG with the center line of the truss arm at the end of the scum blade. The entire weight of the arm shall be supported by the rotating machine and make allowance for 3 IN vertical adjustment of the skimming arm. Designs which rely on the scum baffle for support will not be acceptable. Scum blade shall have a minimum height of 6 IN.
   b. Mount a hinged wiper assembly on the end of the scum arm to form a pocket for trapping scum. The wiper assembly shall maintain continual contact and proper alignment between scum blade, outer scum baffle and scum trough. The wiper blade shall have a wearing strip on its outer edge which contacts the scum baffle and neoprene strip on its inner and lower edges which contact the scum trough.
   c. All springs, pivot points, and threaded fasteners shall be constructed of 316 stainless steel. The hinged wiper assembly shall 316L stainless steel. The wiper blade shall be 1/2 IN neoprene with Durometer of 60. The wiper assembly shall be the same dimension of the scum trough.
   d. Provide a manual lockout mechanism on hinged skimmer assembly to allow for flexible independent operation for surface ice. Lockout mechanism shall raise hinged skimmer assembly above water surface without removal.

2. Provide one (1) scum trough 6 FT wide from scum baffle with inclined beach of 1/4 IN thick 316L stainless steel plate, supported from the tank wall.
   a. Scum trough shall have a minimum overall length of 4 FT-9 IN along the scum baffle consisting of beach plate, submerged shelf, inner radius baffle, and the fabricated scum flume.
      1. The existing primary clarifiers have a fabricated scum flume that passes through the launder wall and into the scum pit that shall be replaced. Fabricate replacement scum flume as shown on the Drawings and attach beach plate.
   b. Beach plate to slope at a nominal incline of 1-3/4 IN/FT to a point 5 IN below the maximum water elevation. The beach plate shall be provided with a submerged shelf extension spanning an additional 4 FT-0 IN along the scum baffle.
   c. An inner radius baffle extending 9 IN below and 3 IN above maximum water level shall run from the scum flume to the end of the submerged shelf.

H. Drive Mechanism:
1. Provide drive mechanism, completely factory assembled, consisting of a primary gear reduction unit, an intermediate reduction unit, plus a final reduction unit consisting of a pinion and internal gear enclosed in a turntable base.
2. Enclose all gearing in a cast iron ASTM A48, Class 40B housing.
   a. Exposed gearing is not acceptable.
3. Provide all bearings of anti-friction type and running in oil.
4. Fabricate drive components in accordance with AGMA 2001-D04, 2001-C95 and 6034-392 for 24 HRS continuous duty and 20-year design life based on rated AGMA torque. Design bearings for a B-10 ABMA 9 life of 200,000 HRS.
5. Provide main drive unit with lifting lugs.
6. Provide a turntable assembly designed so that the internal gear, balls, and strip liners may be removed without raising the access bridge.
7. Motor:
   a. Provide totally enclosed motor of ample power for starting and continuously operating the mechanism without overloading.
b. The motor shall conform to NEMA standards and be name plated for operation on 230/460 V, 3 PH, 60 Hz current.

c. Motor shall be a minimum of 1-1/2 HP and service factor of 1.15.

d. Motor shall comply with NEMA MG 1, Design B, and shall be totally enclosed with Class B insulation designed for continuous duty outdoor service.

e. See Section 01 61 03 - Equipment: Basic Requirements, for additional requirements.

8. Primary reduction unit:
   a. Provide a primary reduction unit which drives the intermediate reduction unit through a chain and sprocket arrangement.
   b. Heavy-duty parallel shaft helical type.
   c. Conform to AGMA 6013-A06, “Standard for Industrial Enclosed Gear Drives,” and shall have a minimum service factor of 1.25.
   d. Furnish drive chain of #80L self-lubricated roller chain and OSHA approved removable chain guard of fiberglass, molded polyethylene or 304 stainless steel.
   e. The driven sprocket shall include a shear pin overload system to provide overload protection of the drive train. The shear pin assembly shall be easily accessible by removal of the chain guard.
   f. Provide an adjustable steel base mounted on the intermediate reduction unit for chain tension adjustments.

9. Intermediate reduction unit:
   a. Shall consist of a worm gear driven by an integral straddle mounted worm and shaft, supported by heavy-duty rolling element bearings running in an oil bath.
   b. Housing shall be cast iron, Class 40B, ASTM A48. Provide with oil fill/drain lines and oil level sight gauge.
   c. All bearings shall have a minimum L10 life of 20 years, based on the continuous torque rating.
   d. Service factor of 2.0.
   e. Mount the unit on a machined face on the top of the final reduction unit and properly aligned to maintain accurate centers for the final reduction gearing.
   f. Overload protection as described in Section 2.4.

10. Final reduction unit and turntable base:
   a. The final gear reduction unit shall consist of a pinion, split internal spur gear, anti-friction ball bearing assembly and housing/base.
   b. The pinion shall be single piece, without an intermediate coupling, extending from the worm gear to the spur gear, straddle mounted between anti-friction ball or roller bearings to maintain accurate pinion to spur gear alignment and contact.
   c. The pinion shall be manufactured to have a minimum AGMA quality class 8.
   d. Provide ductile iron internal gear of AGMA quality six (6) minimum.
   e. Provide internal gear design to support center cage, collector, and all other rotating components.
   f. Provide turntable base with annular raceway to contain balls on which the internal gear rotates.
   g. Furnish ball race without guide shoes and steady bearings.
   h. Furnish ball bearings bearing vertically and horizontally on four removable liner strips pressed into annular raceways in turntable base and internal gear.
      1) Replaceable liner strips shall be minimum 1/4 IN thickness.
   i. Protect internal gear, pinion, and ball race by a seal and dust shield.
   j. Internal gear, pinion, and ball race is to run in oil bath.
   k. Furnish turntable base bolted to the center column and designed to support the internal gear with rotating mechanism, access platform, and one (1) end of the access bridge.
   l. Provide a pipe attached to bottom of turntable base for condensate removal.
   m. Furnish plugged or capped oil piping which terminates within the center of the base.
      1) Provide oil level sight glass and oil drain equipped with stainless steel ball valve including handle and hardware.
   n. Provide a turntable assembly designed so that the internal gear, balls, and strip liners may be removed without raising the access bridge.
o. Underwater bearings carrying any part of the load are not acceptable.

I. Access Platforms:
   1. Minimum 8 FT by 8 FT.
      a. 3 FT minimum clearance around drive unit assembly for maintenance and service, and access from walkway.
   2. Fabricate for uniform live load of 100 LBS per SQ FT.
   3. Construct of 1/4 IN aluminum checker plate attached to minimum 1/4 IN structural stainless steel frame (minimum 1/4 IN structural steel frame if Alternate Bid material is selected), with any necessary stiffeners and supports
   4. Include lift-out sections where required for routine maintenance of equipment.
   5. Provide access platform in compliance with OSHA standards.
   6. Provide handrail and toe plate on access platform in compliance of OSHA standards and Section 05 52 02 - Aluminum Railings.

J. Bridge and Walkways:
   1. Provide beam-type access bridge to support walkway. Truss-type access bridge not acceptable.
      a. Provide 3 FT wide walkways constructed from 1-1/2 IN deep serrated aluminum grating.
   2. Support walkway and access platform from the center column and the tank wall.
   3. Provide at locations and orientation shown on Drawings.
   4. Walkway design:
      a. Fabricate walkways with a uniform live load of 100 LBS per SQ FT with a maximum deflection of 1/360 of the span.
      b. Walkway shall be braced against lateral movement using wind load of 50 LBS/SF.
   5. Provide handrail and toe plate on walkway in compliance of OSHA standards and Section 05 52 02, Aluminum Railings.
      a. Fabricate handrail of triple rail, 1-1/2 IN DIA Schedule 40 aluminum, 42 IN in height.
      b. Fabricate toe plate of 3/16 IN thick by 4 IN high aluminum.
   6. Provide 3 FT wide clarifier access gate in handrail with ladder support and davit crane mounting base at locations and orientation shown on Drawings.
   7. Walkway shall extend to center of clarifier.
   8. Support beams on stainless steel or ultra-high molecular weight (UHMW) slide plates at the tank wall.
   9. Provide aluminum mounting plate for controls and necessary mounting brackets to support electrical conduit.

K. Anchorage:
   1. ASTM A276, 316 stainless steel anchor bolts complete with nuts and washers.
   2. Bolt diameter: As required by manufacturer’s design, but 1 IN minimum.
   3. Provided by the equipment manufacturer.

L. Fasteners:
   1. All fasteners shall be Type 316 stainless steel.
   2. Bolts shall be 1/2 IN DIA minimum.

M. Weir and Scum Baffle.
   1. Weir:
      a. Provide around periphery of tank on launder.
      b. Weir shall be adjustable to allow leveling.
      c. Weir shall be 3/16 IN thick by 10 IN deep 304 stainless steel plate.
      d. Provide with 3 IN deep 90 DEG V-notches at 6 IN intervals.
      e. Weir shall be curved and fastened to tank launder wall with large washers, adhesive anchor bolts, and nuts to allow vertical adjustment.
      f. Level tolerance: ±0.01 FT.
   2. Scum baffle:
      a. Provide around interior face of effluent launderers and mounted on bracket.
b. Space the mounting brackets to prevent sagging, deformation or buckling of scum baffle.
   1) Not more than 4 FT OC.

c. Install mounting bracket as shown on Drawings.

d. Baffle shall be 1/8 IN by 18 IN wide 304 stainless steel plate.

e. Individual baffle section shall be bolted to the adjacent section to form a continuous baffle around periphery of tank.

N. Shop or Factory Finishing:
1. Surface preparation and shop painting is required for all ferrous metals, equipment, and accessories and shall be as specified under Section 09 96 00.
2. All cast iron and steel components of clarifier drive mechanisms shall have surface preparation and finish coating performed in factory.
3. If steel bridge and access platform bid alternate is selected, factory NACE 1 surface preparation and a “hold” primer compatible with final epoxy intermediate coating and UV resistant finish coating field applied before parts are assembled.
4. Apply a heavy application of a rust-resistant coating to gears, bearing surfaces, and other unpainted surfaces.
   a. Maintain coating during storage and until the equipment is placed into operation.
5. All aluminum in contact with dissimilar materials shall be coated as specified in Division 9.

2.6 SOURCE QUALITY CONTROL

A. Provide evidence of compliance with PART 1 requirements for the following:
1. Referenced standards.
2. Welder certifications.

B. Provide evidence of compliance with PART 2 requirements, signed by a Registered Professional Engineer, for the following:
1. Structural members and connections are designed so that unit stresses do not exceed 130 PCT of AISI allowable stresses.
2. Compression and tension member slenderness ratios do not exceed 120 and 240 respectively.

2.7 MAINTENANCE MATERIALS

A. Spare Parts:
1. One (1) motor and primary helical gear reducer.
2. Three (3) sets of all seals for spur gear drive units.
3. Six (6) shear pins.
4. Two (2) complete sets of gaskets for drive units.
5. Six (6) sets of neoprene skimmer wipers.
6. Two (2) sets of spare sight glass or oil gage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install clarifier equipment according to manufacturer's written recommendations.
1. Manufacturer's service technician shall observe the equipment installation.
2. Manufacturer's representative shall certify that mechanism has been installed in accordance with manufacturer's recommendations.

B. Laser Level:
1. Contractor shall laser level the weirs, baffles, and scum system of each clarifier.
2. Contractor shall provide the services of a licensed surveyor to certify and submit the laser level results for each clarifier to Engineer and Owner.
C. Grout:
   1. Utilize clarifier mechanism to install a 2 IN finished grout floor in the tank floor by
temporary screeds attached to the collector arms and the mechanism.
      a. Contractor shall follow clarifier mechanism manufacturer’s procedure for using
         mechanism for installing grout.
      b. Tolerance of finished floor to be -0.0 to -0.10 IN.

3.2 FIELD QUALITY CONTROL

A. See Section 01 61 03, Equipment: Basic Requirements.

B. Provide training of Owner’s personnel as specified in Section 01 75 00.

C. General:
   1. Employ and pay for services of equipment manufacturer's field service representative(s) to:
      a. Inspect equipment covered by this Specification.
      b. Supervise adjustments and installation checks.
      c. Provide test equipment, tools, and instruments necessary to accomplish equipment
         testing.
      d. Conduct initial startup of equipment, perform operational checks, and supervise
         acceptance testing.
      e. Provide through Contractor a written statement certifying that manufacturer's
         equipment has been installed properly, started up and is ready for operation by Owner's
         personnel.
   2. Provide the following:
      a. For equipment inspections: 4 HRS minimum, or as needed, for each clarifier.
      b. For equipment startup and testing: 8 HRS minimum for each clarifier.

D. Field Weld Inspection:
   1. Owner’s Testing Service Provider will conduct inspections and testing of field welds.
      Contractor shall inform Engineer when field welding is complete and ready for weld
      inspection.

E. Torque Test:
   1. Load test the entire collector mechanism by anchoring collector arms individually, one at a
      time. In successive tests, demonstrate the collection mechanism's (including drive unit,
      cage, gears and structures) capability to withstand not less than 130 PCT of the specified
      rated running torque.
   2. Each clarifier mechanism shall be field torque tested. The testing shall be carried out under
      the supervision of the equipment manufacturer's representative before the mechanisms are
      approved and placed into operation.
   3. The torque test shall consist of securing the rake arms by cables to anchor bolts installed by
      the contractor in the tank floor at locations recommended by the manufacturer and
      acceptable to the Engineer. A torque load shall be applied to the truss arm by means of a
      ratchet lever and cylinder connected to the cable assembly.
   4. The magnitude of the applied load shall be measured by calculating the torque from the
      distance of the line of action of each cable to the center line of the mechanism. Readings
      shall be taken at 100 PCT and 120 PCT of the AGMA rated torque. The test load shall be
      applied and noted on the torque overload device.
   5. The manufacturer's service representative shall certify that the alarm and motor cutout
      torque of the drives as calibrated in the manufacturer's shop are in proper operation to shut
      down the units as specified.

F. Operation Tests:
   1. Following successful completion of the Torque Tests.
   2. Dry Tank Operational Test: Operate the collector mechanism in a dry tank for a minimum
      of four continuous hours.
      a. At no time during the test shall the equipment exceed the rated torque or exhibit
         indications of binding or uneven operation.
b. Record torque values as registered on the drive mechanism torque indicator and motor amperage (all three phases) at hourly intervals.

c. If the mechanism exceeds rated torque, motor amperages or the mechanism exhibits indications of binding or improper adjustment:
   1) Immediately halt the test and remedy the problem.
   2) After completion of necessary repairs or adjustments, repeat the tests.

3. Fully Submerged Operational Test: After successful completion of the Dry Tank Operational Test, fill clarifier with water to its operating level and operate mechanism continuously at its maximum speed for 48 HRS.
   a. At no time during the test shall the equipment exceed the rated torque or exhibit indications of binding or uneven operation.
   b. Record torque values as registered on the drive mechanism torque indicator and motor amperage (all three phases) at 3 HR intervals.
   c. If the mechanism exceeds rated torque or the mechanism exhibits indications of binding or improper adjustment:
      1) Immediately halt the test and remedy the problem.
      2) After completion of necessary repairs or adjustments, repeat the tests.
      3) Failure to successfully complete the test in three attempts is sufficient cause for rejection and for Owner to require that the equipment be removed from the Project.

4. Skimming System Operation Test:
   a. Following start-up of the clarifier, the Contractor, under the supervision of the manufacturer's representative, shall test and demonstrate the effectiveness of the skimming system to sweep the clarifier surface and remove material.
   b. Owner will observe test and Contractor shall adjust skimming system as required to obtain Owner acceptance.

END OF SECTION