PWC

Fayetteville's HOMETOWN UTILITY

REQUEST FOR PROPOSAL

REPLACE MECHANISMS IN SECONDARY CLARIFIERS #9-1 AND #9-2 AT THE CROSS CREEK WATER RECLAMATION FACILITY

Prepared By

Fayetteville Public Works Commission
Water Resources Engineering Department

JUNE 2021

RFP FOR REPLACE MECHANISMS IN SECONDARY CLARIFIERS #9-1 AND #9-2 AT THE CROSS CREEK WATER RECLAMATION FACILITY

FAYETTEVILLE PUBLIC WORKS COMMISSION

TABLE OF CONTENTS

FAYETTEVILLE PUBLIC WORKS COMMISSION

RFP FOR REPLACE MECHANISMS IN SECONDARY CLARIFIERS #9-1 AND #9-2 AT THE CROSS CREEK WATER RECLAMATION FACILITY

GENERAL TERMS AND CONDITIONS

A. Scope of Work

The Fayetteville Public Works Commission is currently seeking qualified contractors to perform the following work:

Part 1 – Final Clarifier Re-paint (Partial): The Contractor shall furnish all materials, labor, equipment, mobilization and incidentals required for the removal of existing coatings, surface preparation and painting necessary to refurbish the mechanisms integral to the existing Secondary Clarifiers #9-1 and #9-2 at the Cross Creek WRF. This will be a partial re-paint to include the following components:

- Drive Mechanisms and Motors
- Access Bridge Frames and Supports
- Piping

Refer to the Technical Specifications, PART 1 – Final Clarifier Re-paint (Partial) for detailed requirements.

Part 2 – Final Clarifier Demolition and Equipment Re-installation (Partial): The Contractor shall remove and re-install both existing and new equipment as indicated below:

Remove and Re-install Existing:

- Access Bridge Frames and Supports
- Drive Assemblies
- Electrical Equipment and materials (as needed)

Demolish and Replace with New Equipment (refer to items shown on Envirex drawings attached herein):

- Center Pier
- Center Cage / Energy Dissipating Tub
- Influent Well
- A-frame Supports
- Rotating Scum Trough
- Skimmer Assembly
- Scum Box
- Truss Arms and Plow Blades
- Manifold
- Unitube Header

All replacement equipment and parts shall be furnished by the PWC. See Appendix for materials inventory list provided by EVOQUA Water Technologies, LLC.

Contractor shall perform all work to include testing and startup of new clarifier equipment per manufacturer's recommended practices. Refer to the Technical Specifications, PART 2 – Final Clarifier Demolition and Replacement for the detailed requirements of the work.

B. Bid Proposal

Prospective bidders should complete the enclosed bid proposal, sign and date where indicated, and return the completed proposal to the Fayetteville Public Works Commission. All proposals shall be sealed in an envelope and addressed to:

RFP – Replace Mechanisms in Secondary Clarifiers #9-1 & #9-2 at the Cross Creek WRF
Fayetteville Public Works Commission
Attention: Nikole Subject, Procurement Advisor
955 Old Wilmington Road
Fayetteville, NC 28301

All proposals must be received by **5:00 p.m., Monday, July 12, 2021**, in order to be considered. The successful contractor will be notified in writing at the earliest possible date after the bid opening. Late bids will not be considered and will be returned to the Bidder unopened. This is an informal bid; therefore, there will be no formal bid opening. Bids will be opened the next business day and a bid tabulation will be provided to all bidders.

Bids will be examined promptly after opening and an award will be made at the earliest possible date. Bids must be held firm for acceptance by the Fayetteville Public Works Commission for a period of ninety (90) days after bid opening date.

All questions regarding this project shall be submitted in writing to Nikole Subject, PWC Procurement Advisor e-mail to nikole.subject@faypwc.com . All questions shall be submitted no later than **Tuesday, June 29, 20201**, in order to be considered. Oral explanations and interpretations made prior to bid opening shall not be binding.

The Fayetteville Public Works Commission will provide all bidders with the questions and answers. If the questions result in revisions to the plans and/or this Request for Proposal, an addendum will be issued. It is anticipated that the responses to the questions and any necessary addendum will be issued on or before **Thursday, July 1, 2021**.

Bidders are expressly prohibited from contacting any Fayetteville Public Works Commission official or employee associated with this Request for Proposals, except as noted above. Violation of this prohibition is grounds for the immediate disqualification of the bidder.

C. General Conditions

a. Award of Contract – It is the intent of the Owner to recommend the award of this contract to the lowest, responsive, responsible bidder provided the Bid has been submitted in accordance with the requirements of the bidding documents and does not exceed the funds available. For the purpose of determining the lowest responsive Bidder, the Basis of Award shall be the total of the Bid Proposal.

PWC may consider the operating costs, maintenance considerations, performance date, and guarantees of materials and equipment. PWC may conduct such investigations as deemed necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Bidders, as well as other considerations, to include but not limited to resources available to the Bidder to perform the work effectively, proposed Subcontractors and other persons and organizations to do the work in accordance with the Contract Documents to PWC's satisfaction within the prescribed time.

PWC reserves the right to reject the Bid of any Bidder who does not pass any such evaluation to PWC's satisfaction.

If the Contract is to be awarded, PWC will give the Successful Bidder a Notice of Award within 90 calendar days after the day of the Bid Opening. PWC will review all of the bids and qualification data to determine the lowest responsive, responsible Bidder. PWC reserves the right to not award the Contract to the lowest bidder if the information provided is not complete, does not meet the satisfaction of PWC, or has been falsified. PWC will not request any additional information in order to allow the Contractor to complete bid.

During the evaluation phase, bid proposals will be reviewed to ascertain which proposals technically and otherwise address all the requirements of these Contract Documents. Proposals determined to be technically non- responsive or not sufficiently responsive may be disqualified. Once qualified proposals have been determined, PWC may interview selected Bidders to clarify specific matters presented in the proposals. These discussions will allow both the Bidder to elaborate on his/her proposal and for PWC to request other pertinent information. PWC will use information gained during such discussions, if any, together with information presented in the proposal to determine the lowest responsive, responsible bidder.

PWC may conduct such investigations/verifications as deemed necessary to establish the responsibility, qualification, and financial ability of the Bidder. Should PWC adjudge that the apparent low bidder is not the lowest responsive, responsible bidder by virtue of the information furnished, said apparent low bidder will be so notified. Failure or refusal to furnish any items of information requested by PWC shall be considered as nonresponsive and therefore basis for rejection of the bid.

After all bid packages have been reviewed, PWC will select the lowest, responsive, responsible bidder as successful bidder and will issue a Notice of Award letter and Contract Documents.

Upon receipt of the Notice of Award and Contract Documents, the successful bidder shall furnish the appropriate bonds and insurance certificates to PWC's Procurement Department within ten (10) business days unless otherwise stated in the Notice of Award letter. If the successful bidder fails to provide such requested information within this time, the Fayetteville Public Works Commission reserves the right to cancel the Contract Documents and proceed with awarding the contract to the next lowest, responsive, responsible bidder. This time may be extended at the sole discretion of PWC.

b. The Fayetteville Public Works Commission will issue a written Notice to Proceed to the Contractor upon receipt of the Contractor's bonds and insurance information.

c. The Contractor must be licensed as a General Contractor in the State of North Carolina pursuant to NCGS Chapter 87, Article 1 and 1A.

d. The Contractor's attention is directed to the fact that all applicable State Laws, Municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they are deemed to be included in the contract the same as though herein.

e. The Fayetteville Public Works Commission reserves the right to request tests on any or all materials and workmanship by a certified testing firm. Initial tests shall be completed at the expense of the Fayetteville Public Works Commission. Re-inspections and re-testing required due to failure of previous tests shall be at the Contractor's expense.

f. All prices submitted herein shall be firm against any increase for the contract period.

g. The Fayetteville Public Works Commission reserves the right to delete any single item or combination of items from the successful bidder's proposal.

h. All work required on the plans, specified herein or as directed by the Fayetteville Public Works Commission in the field to satisfactorily complete the above project is the Contractor's responsibility. The Contractor shall be responsible for performing any excavation and grading, furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work, leaving the site in a neat and satisfactory condition.

i. Payment shall be monthly estimates approved by the Fayetteville Public Works Commission on the work completed. The Contractor shall review all pay application quantities with the Fayetteville Public Works Commission's Project Coordinator,

prior to submitting an official application for payment. The monthly estimates shall be based on the work completed as of the last Friday of the month.

j. The Fayetteville Public Works Commission shall make monthly payment to the Contractor on the basis of a duly certified and approved estimate for the work performed during the preceding month under the Contract. In accordance with N.C.G.S. 143-134.1, the Fayetteville Public Works Commission will retain 5% of the amount of each monthly periodic payment. The Fayetteville Public Works Commission may, after 50% of the work has been completed, consider waiving further retainage on the project upon the following conditions: (1) Written consent of surety is received; (2) Satisfactory progress is being made on the Project; and (3) Prior to 50% completion, any nonconforming work identified in writing by the Fayetteville Public Works Commission has been corrected by the Contractor and accepted by the Fayetteville Public Works Commission. If retainage is discontinued or reduced, the Fayetteville Public Works Commission reserves the right to reinstate retainage up to the 5% level if the Contractor performs unsatisfactorily. Furthermore, the Fayetteville Public Works Commission reserves the right to continue to retain payment, even in the event the Contractor's work is satisfactory, in order to ensure a total of 2.5% retainage over the life of the project. The Fayetteville Public Works Commission reserves the right to withhold additional payments for unsatisfactory job progress, defective construction not remedied, disputed work, or third-party claims filed against the Fayetteville Public Works Commission or reasonable evidence that a third-party claim will be filed.

k. The Contractor is charged with the responsibility of actually inspecting and examining the site prior to submitting the bid, as no additional allowances for extra compensation will be allowed as a result of the work being of a different nature than contemplated by the Contractor.

l. The Contractor shall commence work to be performed under this agreement on a date specified in a written Notice to Proceed from the Fayetteville Public Works Commission and shall fully complete all work hereunder within **60** consecutive calendar days from said date. For each calendar day in excess of the above number of days, the Contractor shall pay to the Fayetteville Public Works Commission the sum of five hundred dollars ($250) as liquidated damages reasonably estimated in advance to cover any losses incurred by the Fayetteville Public Works Commission by reason of failure of said Contractor to complete the work within the time specified. Time extensions must be requested in writing for the Fayetteville Public Works Commission Project Engineer's approval, based on valid excessive delays caused by weather or other conditions not the fault of the Contractor.

m. The Contractor shall guarantee all workmanship and methods of construction for a period of one (1) year from the date of final payment.

n. The Contractor shall indemnify and hold harmless the Fayetteville Public Works Commission and its agents and employees from and against all claims, damages,

losses and expenses, including reasonable attorney's fees, arising out of, or resulting from the performance of the work, caused by an act or omission of the Contractor, any subcontractor, and anyone for whose acts any of them may be liable. In cases of concurring fault, each party shall bear his share of the loss. In any and all claims against the Fayetteville Public Works Commission or any of its agents or employees by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone of whose acts any of them may be liable, the indemnification obligation under the preceding paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for Contractor or any subcontractor under Worker's Compensation Acts, disability benefit acts or other employee benefit acts.

o. Statutory Requirements for Contracting with PWC:

- LICENSING: The Contractor shall be licensed as a North Carolina Public Utilities Contractor, Unlimited, pursuant to NCGS Chapter 87, Article 1 and 1A;

- E-VERIFY: The Contractor shall verify the work authorization of his employees using the Federal E-Verify program and shall comply with all requirements of the E-Verify program pursuant to Federal law and in accordance with NCGS Chapter 64, Article 2. The Contractor shall ensure that all his subcontractors, whether currently employed or subsequently hired, comply with all E-Verify requirements. Failure to comply with these requirements shall be considered a breach of Contract;

- IRAN DIVESTMENT ACT: As mandated by NCGS. 147-86.59(a), Contractor hereby certifies that he is not listed on the Final Divestment List created by the North Carolina State Treasurer pursuant to NCGS 147-86.58. Contractor/Vendor further certifies that in accordance with NCGS 146-86.58(b) that it shall not utilize any subcontractor found on the State Treasurer's Final Divestment List. Contractor/Vendor certifies that the signatory to this Contract is authorized by the Contractor/Vendor to make the foregoing statement.

p. Termination – The Fayetteville Public Works Commission reserves the right to immediately terminate this contract, if during the progress of the work or during the warranty period, the Contractor:

- Persistently fails to prosecute the work properly and in accordance with this contract (to include failure to provide sufficient crews, equipment, or resources, failure to adhere to the schedule, etc.);
- Demonstrates disregard for the policies, procedures, and requirements of the Fayetteville Public Works Commission;
- Demonstrates complete disregard of the authority of the Fayetteville Public Works Commission and their designated representative, or;
- Violates in any substantial way the provisions and requirements of this contract.

Such termination shall be made in writing, upon providing seven (7) calendar days' notice to the Contractor and their surety.

Additionally, the Fayetteville Public Works Commission may terminate the contract for their convenience. In such instance, the Contractor will be notified seven (7) calendar days prior, and will be paid for all work completed, plus other expenses as mutually agreed upon with the Fayetteville Public Works Commission.

D. Insurance

The insurance required for this contract order is as follows:

(a) Commercial General Liability ISO #CG 00 01 10 93: The Contractor shall take out and maintain during the life of this contract commercial general liability insurance with limits of $1,000,000 per occurrence; $2,000,000 aggregate other than products/completed operations; $2,000,000 aggregate for products/completed.

(b) Automobile Liability ISO #CA 00 01 12 93: The Contractor shall take out and maintain during the life of this contract automobile liability insurance in an amount not less than $1,000,000 combined single limit per accident for bodily injury and property damage from owned, non-owned, and hired automobiles.

(c) Workers' Compensation and Employers' Liability Insurance: The Contractor shall take out and maintain during the life of this contract workers' compensation insurance as required by the laws of the State of North Carolina and Employers' Liability with limits of $100,000 each accident, $500,000 policy limit and $100,000 each employee for all employees employed on the project. In case any employee(s) engaged in work under this contract is or are not protected under the Workers' Compensation Statute, the Contractor shall provide adequate coverage for the protection of employees not otherwise protected.

(d) Property Insurance: If contracted to construct a building, the Contractor shall purchase and maintain "Builder's Risk" insurance. This insurance shall include the interests of the Fayetteville Public Works Commission, the Contractor and Subcontractors and shall be written on a one hundred percent (100%) completed value basis (full value as of the date that all construction is finished and includes the Contractor's total cost plus profit), and to remain in force until the project is completed and accepted by the Fayetteville Public Works Commission. Regardless of the nature of the work to be performed, coverage must also be provided for the theft or damage of building materials and supplies, which are not permanently attached and stored on site for any period of time. This coverage shall be an "Installation Floater," and where no building construction is involved, the amount of the coverage shall equal the value of the materials stored on site.

It is the responsibility of the Contractor to inform the policy provider of any and all change orders which increase the building's value. Any penalties or losses incurred due to the Contractor's failure to adequately ensure the building during construction will be the Contractor's responsibility.

(e) Owner's and Contractor's Protective Liability I.S.O. #CG 00 09 10 93: The Contractor shall secure and maintain during the life of the contract, an Owner's and Contractor's Protective Liability insurance policy for the Fayetteville Public Works Commission, with minimum limits of $1,000,000 per occurrence/$2,000,000 aggregate.

Acceptability of Insurance

All insurance policies shall be written by insurers licensed to do business in North Carolina. It is realized that certain business activities may not be readily insurable by admitted carriers. If insurance is written by non-admitted carriers whose names appear on the current listing of approved and non-admitted carriers prepared by the North Carolina Department of Insurance, such carriers will be favorably considered assuming they meet all other requirements. Non-admitted carriers should be so identified on the Certificate of Insurance form. The Fayetteville Public Works Commission reserves the right to reject any and all certificates or policies issued by insurers with a Best's rating less than A.

Indemnity Provision

Contractor assumes entire responsibility and liability for losses, expenses, demands and claims in connection with or arising out of any injury, or alleged injury (including death) to any person, or damage, or alleged damage, to property of the Fayetteville Public Works Commission or others sustained or alleged to have been sustained in connection with or to have arisen out of or resulting from the negligence of the Contractor, his subcontractors, agents, and employees, in the performance of the work/service set forth these contract documents, and any changes, addenda, or modifications including losses, expenses or damages sustained by the Fayetteville Public Works Commission, and agrees to indemnify and hold harmless the Fayetteville Public Works Commission, its officials, employees or volunteers from any and all such losses, expenses, damages, demands and claims and agrees to defend any suit or action brought against them, or any of them, based on any such alleged injury or damage, and to pay all damages, cost and expenses in connection therewith or resulting there from. As an integral part of this agreement Contractor agrees to purchase and maintain during the life of this contract contractual liability insurance in the amount required in the general liability insurance requirements and to furnish proper evidence thereof.

Other Provisions:

(1) Any deductible or self-insured retention must be declared to and approved by the Fayetteville Public Works Commission.

(2) The policies are to contain, or be endorsed to contain, the following provisions:

(a) Commercial General Liability Coverage

1) The Fayetteville Public Works Commission, its officials, employees and volunteers are to be covered as additional insured as respects: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, leased or used by the Contractor; or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the Fayetteville Public Works Commission, its officials, employees, or volunteers.

2) The Contractor's insurance coverage shall be primary insurance as respects the Fayetteville Public Works Commission, its officials, employees, and volunteers. Any insurance or self-insurance maintained by the Fayetteville Public Works Commission, its officials, employees, or volunteers shall be excess of Contractor's insurance and shall not contribute with it.

3) Coverage shall state that Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

(b) All Coverages

Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) calendar days prior written notice by certified mail, return receipt requested, has been given to:

Fayetteville Public Works Commission
Attn: Trent Ensley, Procurement Manager
P.O. Box 1089
Fayetteville, NC 28302-1089

Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the Fayetteville Public Works Commission, its officials, employees, and volunteers. In the event the Fayetteville Public

Works Commission is damaged by the failure of the Contractor to maintain such insurance and to so notify the Fayetteville Public Works Commission, the Contractor shall bear all reasonable costs properly attributable thereto.

(c) Subcontractors

Contractor shall include all subcontractors as insurers under its policies OR shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

(d) No Waiver of Immunity

Any insurance coverage required by the terms of this contract shall not be deemed a contract of insurance purchased by the Fayetteville Public Works Commission nor a waiver of the Fayetteville Public Works Commission's immunity pursuant to NCGS 160A-485.

E. Performance and Payment Bonds

a. The Contractor, at the time of the execution of the Contract/Purchase Order shall be required to furnish a Performance Bond and Payment Bond in an amount equal to at least one-hundred percent (100%) of the Contract price as security for the faithful performance of this Contract and as security for the payment of all persons performing labor and furnishing materials and equipment in connection with this Contract in accordance with N.C.G.S. Chapter 44A, Article 3.

b. The corporate surety furnishing the bonds shall be authorized to do business in the state of North Carolina and shall be acceptable to the Fayetteville Public Works Commission. All contract payment bonds and contract performance bonds shall be executed on “Performance Bond” and “Payment Bond” forms provided in this Proposal and be countersigned by a regularly authorized agent of the corporate surety who is resident in North Carolina and who is licensed by the North Carolina Department of Insurance.

c. In all Performance and Payment Bonds, the provision that no suit, action, or proceeding by reason of any default whatsoever shall be brought on this Bond after a specified number of months shall be fixed at twelve (12) months. The face value of the Bond shall be one-hundred percent (100%) of the Contract price for a period of twelve (12) months following the day when the last of the labor was performed, or equipment was furnished, or final settlement was made with the Contractor, whichever occurs last.

d. Whenever the Surety or Sureties on the bond so furnished shall be deemed by the Fayetteville Public Works Commission to be insufficient or unsatisfactory, the

Contractor, within ten (10) business days after notice to that effect shall furnish and deliver a new bond to the Fayetteville Public Works Commission in the same penalty and on the same conditions with Surety satisfactory to the Fayetteville Public Works Commission and this duty shall continue on the part of the Contractor, whenever and so often as the Fayetteville Public Works Commission shall require a new bond with a satisfactory Surety or Sureties. If the Contractor shall fail to furnish such bond, within ten (10) business days after said notice is mailed to his address, the Fayetteville Public Works Commission through its proper agent or agents, may stop all further work under said Contract and complete the unfinished work at the expense of the Contractor.

F. Project Specifications

The project specifications are hereby incorporated into these Construction Documents and are included in the appendix.

G. Project Location

All work described in the Contract Documents shall be performed in the confines of the Cross Creek Water Reclamation Facility.

H. Project Drawings

The attached Contract Drawings are hereby incorporated into these Contract Documents and are included in the appendix.

I. Special Conditions

These Special Conditions are intended to supplement and amplify the requirements of this Contract. Where any article or item of this Contract is modified or deleted by this section, the remaining unaltered provisions of that article, paragraph, subparagraph, or clause shall remain in effect. In the event of a conflict, these Special Conditions shall take precedence.

1. Facility Operation

   The Cross Creek Water Reclamation Facility will be maintained in continuous operation at all times during the construction period. The Contractor shall schedule and conduct his work such that it will not impede the quality of any treatment process, create potential hazards to operating equipment and/or personnel, reduce the quality of the plant effluent, or cause odor or other nuisance.

2. Pre-Construction Conference

   There will be a Pre-Construction conference following the issuance of Notice of Award. The purpose of the conference is to discuss general project items, including, but not limited to:

a. Contractor's responsible person and contact information
b. Emergency contact information
c. Submittal schedule
d. Contract issues
e. Safety / Covid-19
f. Project schedule (including Notice to Proceed)
g. Sales Tax Certificate/Pay Applications
h. Warranty requirements
i. Site restoration and clean-up

3. Sequencing of the Work

The Contractor shall commence work with Final Clarifier #1 and complete the full rehabilitation before beginning operations at Final Clarifier #2. The Contractor shall schedule and conduct his work such that it will not impede operations for the clarifier not being currently refurbished, create potential hazards to operating equipment and/or personnel, or cause other nuisance.

4. Basin De-watering

The Contractor shall be aware that the project site's normal groundwater elevation may be higher that the clarifier basin floor elevations. Both primary clarifiers are equipped with an underdrain system that includes twelve hydrostatic basin relief valves that open as the basin is drained for maintenance, allowing them to partially flood. These relief valves shall be maintained in normal operating condition throughout the course of the work. The clarifier basin drain piping will not be available for use in de-watering the clarifier basins during construction. Hence, the Contractor shall provide, maintain, and operate pumping equipment of sufficient capacity to preserve a dry work area environment throughout the duration of the project.

5. RAS / WAS Basin Drain Piping

The Contractor shall employ all precautions necessary to prohibit the accumulation of debris in the clarifier sump basins and hence prevent any foreign materials from being drawn into the Return Activated Sludge (RAS) / Waste Activated Sludge suction piping.

6. Clarifier Scum Trough and Scum Box

The Contractor shall employ all precautions necessary to prohibit the accumulation of debris in the scum trough and scum box during the course of surface preparation and painting operations. Should the scum pit become clogged despite these efforts, the Contractor shall be responsible for all pumping, and cleaning required to remove any accumulation of blast material or other debris resulting from the work.

7. On-Site Debris Stockpiling and Disposal

The PWC shall provide the Contractor with area on-site that may be used for the stockpiling of debris during the work. The Contractor shall be responsible for the ultimate disposal of all debris resulting from their operations, in accordance with applicable Federal, State, and local laws, regulations, and rules.

8. Scrap Materials

All salvageable steel materials demolished in the course of the work shall remain the property of PWC. The Contractor shall demolish all materials to be retained into a size small enough to fit into the dumpster provided by PWC.

9. Electrical Work

The Contractor shall coordinate with PWC Maintenance personnel regarding the disconnection all power sources prior to beginning demolition operations. All electrical equipment removed shall be re-installed with all power sources restored as part of the testing and start-up procedures.

10. Reconnection Hardware

PWC shall provide all re-connection hardware, mounting angles etc. Embedded anchors, however, are not provided, and should not be demolished. If they are deemed unusable, the Contractor shall cut off, grind smooth to the wall with no sharp edges and use an epoxy type anchor as a replacement.

11. Safe Operating Procedures for Working Near Water

The Contractor shall adhere to all OSHA regulations and the Fayetteville Public Works Commission safety procedures as they pertain to water safety. The Contractor's Safety Plan shall include provisions for safely working near water. The Contractor shall employ a competent person that will assess potential hazards associated with working near water, such as bank destabilization. Before beginning work in a particular area, the Contractor's competent person shall evaluate the area for hazard associated with working near water and shall keep a log of each evaluation. Upon request from the PWC Project Engineer or the PWC Project Coordinator, the Contractor shall submit the log for inspection by PWC.

12. COVID-19

As North Carolina and the nation continues to deal with the COVID 19 pandemic, we must all take necessary steps to ensure the health and safety of employees, coworkers, family, friends, associates and people that we come in contact with on a daily basis. At PWC we implemented measures including requiring our employees to conduct temperature and wellness checks, wear a face covering or mask, whenever possible, maintain proper social

distancing (minimum or 6 feet) and take other actions such as washing their hands, using approved sanitizer and wiping down surfaces, especially commonly shared equipment or tools. This applies to employees working in our facilities, working in public or at field sites. For firms who are under contract with PWC or working under purchase orders, those firms are expected to comply with all OSHA/EPA guidelines, CDC recommendations including any applicable North Carolina Executive Orders regarding the performance of work under COVID 19 conditions. Examples of such guidance can be found at the following:

OSHA COVID-19 Overview
https://www.osha.gov/SLTC/covid-19/
OSHA COVID-19 – Control and Prevention / Construction Work
https://www.osha.gov/SLTC/covid-19/construction.html#:~:text=Keep%20in%2Dperson%20meetings%20(including,Fill%20hand%20sanitizer%20dispensers%20regularly.

https://www.osha.gov/Publications/OSHA4000.pdf

North Carolina COVID-19 Executive Orders
https://www.nc.gov/covid-19/covid-19-executive-orders
Center for Disease Control
https://www.cdc.gov/coronavirus/2019-ncov/index.html
Implementing Safety Practices for Critical Infrastructure Workers
https://www.cdc.gov/coronavirus/2019-ncov/community/critical-workers/implementing-safety-practices.html
Essential Staff- Do's & Dont's
https://www.cdc.gov/coronavirus/2019-ncov/downloads/Essential-Critical-Workers_Dos-and-Donts.pdf
NC Licensing Board for General Contractors
https://www.nclbgc.org/2020/07/02/board-buzz-summer/
NC Association of General Contractors
https://www.cagc.org/CAGC/SafetyHR/CAGC/Safety/SafelyHomeInitiative.aspx?hkey=e3439388-0c36-4755-91bd-4c8fc6d22a41
NC Department of Health and Human Services
https://covid19.ncdhhs.gov/
Cumberland County Health Department
https://www.co.cumberland.nc.us/departments/public-health-group/public-health
Department of Homeland Security
https://www.ready.gov/pandemic
Cape Fear Valley- What to do if you have COVID symptoms
https://www.youtube.com/watch?time_continue=1&v=tD0D7Apa_vw&feature=emb_logo
FAYPWC COVID Response
https://www.faypwc.com/covid-19-update/
Small Business Administration
https://www.sba.gov/page/coronavirus-covid-19-small-business-guidance-loan-resources

As an additional step to ensure the health and safety of contractor employees and PWC employees, should a contractor's employee test positive for COVID 19 the contractor must immediately inform the PWC project manager/supervisor or their primary point of contact at PWC and the employee should be performing work at PWC facilities or field sites until medically cleared. This is necessary so PWC can inform our employees, conduct or own method of contact tracing for our employees and take any measures necessary such as quarantining PWC employees who may have been in contact with the individual who tested positive.

These actions are necessary to ensure the health and safety of all and to ensure that contract performance can be achieved under the conditions of this pandemic.

Contractor must provide a plan with their proposal that describes their plan for working under COVID-19 conditions. The plan should address the Contractors approach to protect their employees, PWC employees, along with any other Contractor's working on PWC's locations. This may include the Contractor's approach towards employee use of PPE, such as face masks, sanitizing commonly shared tools or equipment, practicing social distancing as work conditions permit, and working within close proximity of others. The plan may also address any other actions that the Contractor will be taking, such as conducting daily temperature checks, conducting symptom checks and trackers, and any other actions the Contractor deems appropriate to protect the health and safety of their employees, PWC employees, and any other Contractor's working on PWC's locations.

13. Resolving Discrepancies

Except as may be otherwise specifically stated in these Contract Documents, the following order of precedence shall be adhered to for resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents:

1. Any addendum issued prior to the opening of Bids
2. Special Conditions
3. Measurement and Payment
4. Approved Contract Drawings
5. Fayetteville Public Works Commission Standard Details
6. Fayetteville Public Works Commission Technical Specifications

14. Guarantee

Part 1 – Secondary Clarifiers Re-paint (Partial): The Contractor shall guarantee the said work against any defect in materials or workmanship for a period of five (5) years from the date of completion. In case any such defect shall appear and is reported in writing to the Contractor during the guarantee period, the Contractor shall make necessary repairs without charge to the PWC.

Part 2 – Secondary Clarifiers Demolition and Equipment Re-installation (Partial): All work completed under these Contract Documents shall be guaranteed by the Contractor

for a period of one (1) year from the date of final acceptance. During that period, all serious defects discovered in the work, as determined by the Fayetteville Public Works Commission, shall be removed, and replaced in a satisfactory manner by the Contractor at no cost to the Fayetteville Public Works Commission. The Fayetteville Public Works Commission may conduct an independent inspection, at their sole expense, of the completed work prior to the completion of the one (1) year guarantee period.

Should the Fayetteville Public Works Commission's inspection determine that the work is not in accordance with these Contract Documents; the Contractor shall mobilize and make all necessary repairs at no expense to the Fayetteville Public Works Commission. The Contractor will receive written notification from the Fayetteville Public Works Commission and be allowed the chance to review any available inspection pictures or other documentation. The Contractor shall respond to the Fayetteville Public Works Commission with a plan of action within 30 calendar days of receiving notification. Failure to respond to the Fayetteville Public Works Commission's notification may result in the Fayetteville Public Works Commission withholding payments to the Contractor. Alternatively, the Fayetteville Public Works Commission reserves the right to contract with another party to complete the warranty work, at the sole expense of the Contractor.

15. Working Times

The Contractor shall limit its operations to Monday through Friday, during normal business hours. Regular working hours shall not exceed 40 hours per week, 8 hours per day (between 7:00 a.m. and 5:00 p.m.), Monday through Friday. No Work is permitted on legal Holidays (to include weekends). No Work, unless otherwise required due to an emergency and authorized by the Fayetteville Public Works Commission, shall be performed on weekends or after hours without prior written approval from the Fayetteville Public Works Commission. Requests to work other than regular working hours must be submitted in writing to the Fayetteville Public Works Commission a minimum of two (2) business days in advance in order to arrange for appropriate personnel to be at the site of the Work. Requests shall only be approved if the Fayetteville Public Works Commission determines that the work is necessary in order to meet the contract completion date. The written request shall include a proposed schedule for the Work to be completed.

During the course of construction, it may be necessary to complete portions of the Work outside of the normal working hours, to accommodate the utility owner's operations, traffic, and/or public convenience. The Contractor, the Fayetteville Public Works Commission, and the utility owner will determine an acceptable schedule required for Work during such hours. The costs for such Work shall be considered incidental to the Project and no additional payment will be made.

Legal holidays observed by the Fayetteville Public Works Commission include New Year's Day, Martin Luther King's Birthday, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving (2 days), and Christmas (2 days).

The Contractor shall plan their activities in order to maintain compliance with the requirements set forth in this section. Failure of the Contractor to properly plan and complete their activities within the times indicated, shall result in the Fayetteville Public Works Commission issuing a Non-Compliance Notice.

16. Equipment

The Contractor shall be equipped with equipment perfectly adaptable for the type of construction required; all such equipment shall be of sufficient capacity to handle the work in an expeditious and safe manner. The Fayetteville Public Works Commission reserves the right to deny the use of inadequate equipment or of equipment not capable of performing the work in an acceptable manner.

With respect to the foregoing, it is the intent of the Fayetteville Public Works Commission to require that the Contractor be equipped to perform the work shown and specified, expeditiously and in accordance with the best modern practice.

17. Materials

All materials to be utilized are to be in new condition. Materials are to be stored in strict accordance with the manufacturer's directions. Materials are to be of the type and brand specified within these Contract Documents, including Technical Specifications. **No alternative or substitute materials shall be considered.**

The Contractor shall be responsible for providing all of the specified products, along with required documentation necessary for the Fayetteville Public Works Commission to review and verify that the products specified are being used.

18. Emergency Response

The Contractor shall maintain a construction crew capable of performing emergency maintenance work 24 hours a day, seven (7) days a week, including all holidays. As a minimum, phone numbers shall be furnished for at least three (3) individuals in responsible charge (capable of making company binding decisions) to be available 24 hours a day, seven (7) days a week, including holidays. The emergency phone numbers, and responsible individual's names shall be furnished to the Fayetteville Public Works Commission at the pre-construction conference. The Contractor's designated emergency personnel shall be expected to respond and perform emergency maintenance work immediately, in less than two (2) hours, or the work will be performed by others and all associated costs shall be deducted from the Contractor's payment.

The Contractor shall notify the Fayetteville Public Works Commission Dispatcher (910-678-7400 or 910-223-4494) of the problem, the anticipated response time, and the estimated time required to complete the repair work. If the Contractor does not notify the Dispatcher when the work will be completed, a Fayetteville Public Works Commission

crew will make the necessary repairs or alternate measures will be taken at the Contractor's expense.

19. Warranty Against License Agreements

The Contractor shall warrant to the Fayetteville Public Works Commission that the equipment used on this Contract, where covered by patents or license agreements, is furnished in accordance with such agreements and that the prices included herein cover all applicable royalties and fees in accordance with such license agreements. The Contractor shall defend, indemnify, and hold the Fayetteville Public Works Commission harmless from and against any and all costs, loss, damage, or expense arising out of or in any way connected with any claim of infringement of patent, trademark, or violation of license agreement.

20. Site Restoration

Once construction is completed, the Contractor shall be responsible for restoring the site to as good as, or better than, existing conditions. All exposed areas are to be replaced with seed or sod and mulch (to include erosion control matting) to insure against erosion, in accordance with the Soil Erosion and Sedimentation Control requirements and as outlined in these Contract Documents.

21. Water

The Fayetteville Public Works Commission will allow the Contractor to use water from its existing water system. The Contractor shall utilize proper backflow prevention devices when obtaining water from the Fayetteville Public Works Commission's system. The Contractor shall contact the Fayetteville Public Works Commission's Environmental System Protection Department at 910-223-4699 to determine the required backflow prevention devices, and to obtain a bulk water use permit. The Contractor shall be responsible for payment of the bulk water permit fee. The Contractor shall provide documentation on the amount of water used for their operations and provide a monthly statement to the Fayetteville Public Works Commission.

22. Final Inspection/Acceptance of Work

When the Project Coordinator deems the project completed and ready for final inspection, the Project Coordinator shall notify the Project Engineer. During the final inspection any items documented shall be compiled in a final punch list and provided to the Contractor within five (5) business days. The Contractor shall be required to complete each item in the final inspection punch list within 30 calendar days of receipt. Failure to complete the punch list in that time may result in liquidated damages being assessed. The project will not be considered complete until all punch list items are completed and accepted, unless otherwise determined by the Project Engineer. All punch list items shall be completed prior to release of final payment. Once the deficiencies have

been addressed to the Fayetteville Public Works Commission's satisfaction, a final acceptance letter will be issued to the Contractor.

FINAL COMPLETION DOCUMENTATION

Prior to receiving final payment, the Contractor shall complete and/or provide the following:

- Complete all punch list items to the satisfaction of the Project Engineer.
- Satisfactorily resolve all customer complaints and obtain the required releases.
- Provide all labor and manufacture warranties required.

J. Measurement and Payment

The total bid price shall be full compensation for the work required in both Secondary Clarifier #9-1 and Secondary Clarifier #9-2 which shall include all incidental costs relative thereto.

REPLACE MECHANISMS IN SECONDARY CLARIFIERS #9-1 AND #9-2 AT THE CROSS CREEK WATER RECLAMATION FACILITY

FAYETTEVILLE PUBLIC WORKS COMMISSION

PROPOSAL

The Contractor shall furnish all superintendence, labor, skill, materials, equipment, and other items necessary to rehabilitate Secondary Clarifiers #9-1 and #9-2 at the Cross Creek Water Reclamation Facility. Work includes but is not limited to mobilization, demolition and installation of new equipment, surface preparation, painting, debris containment and site restoration. **All replacement equipment and parts shall be furnished by the PWC.**

All work and materials shall be in accordance with the requirements of the project General Terms and Conditions, Special Provisions and Technical Specifications attached herein, complete, and ready for use.

(1) Replace Mechanism in Secondary Clarifier #9-1 $_____

(2) Replace Mechanism in Secondary Clarifier #9-2 $_____

TOTAL BID: **$_____**

(_____)
(Write out Total Bid LUMP SUM PRICE in words)

BIDDER INFORMATION

Name of Company_____

Address:_____

_____

Phone No. _____ Fax No. _____

E-Mail Address:_____

Federal I.D. No._____

DBE, Minority or Woman Owned Business Enterprise _____Yes _____No

Bid Submitted by: _____
(Name Printed Out)

_____
(Signature)

Title:_____

Date: _____

CERTIFICATE(S) OF INSURANCE

FAYETTEVILLE PUBLIC WORKS COMMISSION
FAYETTEVILLE, NORTH CAROLINA

NOTICE OF AWARD

TO: _____
_____
_____
_____

PROJECT DESCRIPTION: RFP FOR REPLACE MECHANISMS IN SECONDARY CLARIFIERS #9-1 AND #9-2 AT THE CROSS CREEK WRF

The OWNER has considered the BID submitted by you for the above described work in response to its Advertisement for Bids dated June 16, 2021 and information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of $CONTRACT AMOUNT.

You are required by the Instructions to Bidders to execute the Agreement and furnish the required Performance Bond, Payment Bond, and Certificates of Insurance within ten (10) calendar days from the date of this NOTICE to you.

If you fail to execute said Agreement and to furnish said Bonds within ten (10) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your Bid Bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____day of _____, 2021.

OWNER: FAYETTEVILLE PUBLIC WORKS COMMISSION

BY: Trent K. Ensley

TITLE: Procurement Manager

FAYETTEVILLE PUBLIC WORKS COMMISSION
FAYETTEVILLE, NORTH CAROLINA

ACCEPTANCE OF AWARD

RFP FOR REPLACE MECHANISMS IN SECONDARY CLARIFIERS #9-1 AND #9-2 AT THE CROSS CREEK WRF

Receipt of the preceding NOTICE OF AWARD is hereby acknowledged this the_____ day of _____, 2021.

CONTRACTOR

By:_____

Title:_____

CONTRACT

THIS CONTRACT, made this ___day of _____, 2021, by **CONTRACTOR** hereinafter called CONTRACTOR, and the **Fayetteville Public Works Commission,** hereinafter called COMMISSION.

WITNESSETH

THAT WHEREAS, a Contract for **RFP FOR REPLACE MECHANISMS IN SECONDARY CLARIFIERS #99-1 AND #9-2 AT THE CROSS CREEK WRF** has recently been awarded to Contractor by Commission, at and for a sum equal to the aggregate cost of the work to be done and labor, materials, equipment, apparatus, and supplies furnished at the prices and rates respectively named therefore in the Bid Form in the amount of **$CONTRACT AMOUNT** attached hereto:

AND WHEREAS, it was provided in said award that a formal Contract would be executed by and between Contractor and Commission, evidencing the terms of said award, and that Contractor would commence the work to be performed under this agreement on a date to be specified in a written order by the Commission and will fully complete all work thereunder within **60** consecutive calendar days after the start date specified on the Notice to Proceed;

NOW, THEREFORE, Contractor doth hereby covenant and agree with Commission that it will well and faithfully perform and execute such work and furnish all labor, materials, equipment, apparatus and supplies, in accordance with the Plans, at and for a sum equal to the aggregate cost of the work done and labor, materials, equipment, apparatus and supplies furnished at the prices and rates respectively named therefore in the Bid Form attached hereto, and will well and faithfully comply with and perform each and every obligation imposed upon it by said Plans and Specifications and terms of said award.

Contractor shall promptly make payments to all persons supplying materials in the prosecution of the work, and to all laborers and others employed thereon.

Contractor shall be responsible for all damages to the property of the City of Fayetteville, North Carolina, that may be consequent upon the normal procedure of its work or that may be caused by or result from the negligence of Contractor, its employees or agents, during the progress of or connected with the prosecution of the work, whether within the limits of the work or elsewhere. Contractor must restore all property so injured to a condition as good as it was when Contractor entered upon the work.

Contractor shall furthermore be responsible for and required to make good at its expense any and all damages of whatever nature to persons or property, arising during the period of the Contract, caused by carelessness, neglect or workmen. Contractor shall also indemnify and save harmless Commission and The City of Fayetteville, North Carolina, and the Officers and agents thereof from all claims, suits, and proceedings of every name and description which may be brought against Commission or The City of Fayetteville, North Carolina, or the Officers and agents thereof, for or on account of any injuries or damages to persons or property received or sustained by any person or persons, firm, or corporation, or by or in consequence of any materials used in said work or by or on account of any improper material or workmanship in its construction, or by or on account of any accident, or of any other act of omission of Contractor, its agents, employees, servants or workmen.

It is agreed and understood that the Advertisement for Bids, Definitions, Instructions to Bidders, General Conditions, Supplementary Conditions, General Specifications, Material Specifications, Detail Specifications, the accepted Bid Form, and the enumerated Addenda and drawings are parts and parcels of this Contract, to the same as it incorporated herein in full.

It is further mutually agreed that, if, at any time after the execution of this agreement and the Surety Bond hereto attached for its faithful performance and payment, Commission shall deem the Surety or Sureties upon such Bond to be unsatisfactory, or if for any reason, such Bond ceases to be adequate to cover the performance and/or payment of the work, Contractor shall, at its expense, within five (5) days after the receipt of notice from Commission so to do, furnish an additional Bond or Bonds in such form and amount, and with such Surety or Sureties as shall be satisfactory to Commission. In such event no further payment to Contractor shall be deemed to be due under this agreement until new or additional security for the faithful performance and payment of the work shall be furnished in manner and form satisfactory to Commission.

And Commission doth hereby covenant and agree with Contractor that it will pay to Contractor, when due and payable under the terms of said Specifications and said award, the above mentioned sum, and that it will well and faithfully comply with and perform each and every obligation imposed upon it by said Specifications and the terms of said award.

It is further agreed that the Contractor shall, upon each pay request under this Contract, furnish to Commission invoices or copies of invoices for all materials purchased for said work within pay request period, and such invoices shall state the amount of North Carolina Sales Tax paid for said materials; and Contractor shall also furnish Commission an affidavit certifying the total costs of materials purchased for all work performed within pay request period under this Contract and the total amount of North Carolina Sales Tax paid for said materials.

Contractor hereby acknowledges that "E-Verify" is the federal E-Verify program operated by the US Department of Homeland Security and other federal agencies which is used to verify the work authorization of newly hired employees pursuant to federal law and in accordance with Article 2, Chapter 64 of the North Carolina General Statutes. Contractor further acknowledges that all employers, as defined by Article 2, Chapter 64 of the North Carolina General Statutes, must use E-Verify and after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with G.S. 64-26(a). Contractor hereby pledges, attests and warrants through execution of this Agreement that Contractor complies with the requirements of Article 2, Chapter 64 of the North Carolina General Statutes and further pledges, attests and warrants that any subcontractors currently employed by or subsequently hired by Contractor shall comply with any and all E-Verify requirements. Failure to comply with the above requirements shall be considered a breach of this Agreement. Contractor hereby further acknowledges that the execution and delivery of this Agreement constitutes Contractor's certification to Commission and to the North Carolina State Treasurer that, as of the date of the Effective Date, Contractor is not listed on (a) the Final Divestment List created and maintained by the North Carolina Department of State Treasurer pursuant to the Iran Divestment Act of 2015, Chapter 147, Article 6E of the General Statutes of North Carolina (the "Iran Divestment Act"); or (b) the list of companies that the North Carolina State Treasurer determines to be engaged in a boycott of Israel in accordance with Article 6G of Chapter 147 of the General Statutes of North Carolina. Contractor represents and warrants to Commission that Contractor, and all persons and entities owning (directly or indirectly) an ownership interest in it: (i) are not, and will not become, a person or entity with whom a party is restricted from doing business with under regulations of the Office of Foreign Asset Control ("OFAC") of the Department of the Treasury (including, but not limited to, those named on OFAC's Specially Designated and Blocked Persons list) or under any statute, executive order (including, but not limited to, the September 24, 2001, Executive Order 13224 Blocking Property and Prohibiting

Transactions with Persons Who Commit, Threaten to Commit, or Support Terrorism), or other governmental action; and (ii) are not knowingly engaged in, and will not knowingly engage in, any dealings or transactions or be otherwise associated with such persons or entities described in clause (i) above. Contractor also shall at all times during the term of this Agreement comply with Executive Order 11246, including but not limited to the Equal Opportunity Clause requirements set forth in 41 C.F.R. § 60-1.4. Contractor shall abide by the requirements of 41 CFR 60–300.5(a) and 60–741.5(a). These regulations prohibit discrimination against qualified individuals on the basis of protected veteran status or disability, and require affirmative action by covered prime contractors and subcontractors to employ and advance in employment qualified protected veterans and individuals with disabilities. Contractor shall conduct all activities in regard to this Agreement without respect to the race, color, religion, sex, national origin, handicap or familial status of any party or prospective party to the agreement. For the purposes of this Agreement, the term "familial status" shall be defined as it is in G.S. 41A-3(1b).

Whenever used herein, the singular shall include the plural, the plural singular, and the use of any genders shall be applicable to all genders as the context may require.

IN TESTIMONY WHEREOF, Contractor and Commission have duly signed and sealed this Contract.

(Corporate Seal)

CONTRACTOR

(SEAL)

BY:_____

ATTEST:

TITLE:_____

_____
Secretary

FAYETTEVILLE PUBLIC WORKS COMMISSION

ATTEST:

By:_____
Elaina L. Ball, CEO/General Manager

_____
Clerk

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

_____
Chief Financial Officer

PERFORMANCE BOND

Date of Execution: _____

Name of Principal: _____
(Contractor)

Name of Surety: _____

Name of Contracting
Body: Fayetteville Public Works Commission, N.C.

Amount of Bond: _____

PROJECT: Replace Mechanisms in Secondary Clarifiers #9-1 and #9-2 at the Cross Creek Water Reclamation Facility

KNOW ALL MEN BY THESE PRESENTS, That We, the Principal and Surety above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these present.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal entered into a certain Contract with the Contracting Body, identified as shown above and hereto attached.

NOW, THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions there of that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any Guaranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under the several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

_____
(Proprietorship of Partnership)

ATTEST:

By: _____

Title: _____
(Corporate Secretary or
Assistant Secretary, Only)

Witness:

_____

Countersigned:

_____

_____
N.C. Licensed Resident Agent

_____
Name and Address-(Surety Agent)

_____

_____
Surety Company Name and N.C.
Regional or Branch Office Address

CONTRACTOR:

_____
(Trade or Corporate Name)

By: _____

Title: _____
(Owner, Partner, Corporate President or
Vice-President, Only)

(CORPORATE SEAL)

SURETY COMPANY:

_____

By: _____

Title: _____
(Attorney in Fact)

(SURETY CORPORATE SEAL)

PAYMENT BOND

Date of Execution: _____

Name of Principal: _____
(Contractor)

Name of Surety: _____

Name of Contracting Body: Fayetteville Public Works Commission, N.C.

Amount of Bond: _____

PROJECT: Replace Mechanisms in Secondary Clarifiers #9-1 and #9-2 at the Cross Creek Water Reclamation Facility

KNOW ALL MEN BY THESE PRESENTS, that We, the PRINCIPAL and Surety above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal entered into a certain Contract with the Contracting Body, identified as shown above and hereto attached.

NOW, THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions there of that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under the several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

_____
(Proprietorship or Partnership)

ATTEST:

By: _____

Title: _____
(Corporate Secretary or
Assistant Secretary, Only)

Witness:

_____

Countersigned:

_____

_____
N.C. Licensed Resident Agent

_____

_____
Name and Address-Surety Agent

_____

_____
Surety Company Name and N.C.
Regional or Branch Office Address

CONTRACTOR:

_____
(Trade or Corporate Name)

By: _____

Title:_____
(Owner, Partner, or Corporate
President or Vice-President, Only)

(CORPORATE SEAL)

SURETY COMPANY:

_____

By: _____

Title: _____
(Attorney in Fact)

(SURETY CORPORATE SEAL)

NOTICE TO PROCEED

TO: _____ DATE: _____

_____

_____

PROJECT: Replace Mechanisms in Secondary Clarifiers #9-1 and #9-2 at the Cross Creek Water Reclamation Facility

You are hereby notified to commence work in accordance with the Contract dated _____, 2021, on _____, 2021, and you are to complete the WORK by _____, 2021.

FAYETTEVILLE PUBLIC WORKS COMMISSION

BY: _____
Trent Ensley
Procurement Manager

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged this the _____ day of _____, 2021.

CONTRACTOR

BY: _____

TITLE: _____

TECHNICAL SPECIFICATIONS

PART 1: PARTIAL RE-PAINT OF SECONDARY CLARIFIERS #9-1 AND #9-2

RE-PAINT SECONDARY CLARIFIER MECHANISMS

PART 1 – GENERAL

1.1 Scope of Work: The Contractor shall furnish all materials, labor, equipment, mobilization, and incidentals required to perform all the surface preparation and painting necessary to complete this project in its entirety as specified herein. The mechanisms to be refurbished are integral to the Secondary Clarifiers #9-1 and #9-2 at the Cross Creek Water Reclamation Treatment Facility:

Cross Creek WRF Secondary Clarifiers #9-1 / #9-2	
Inside Diameter:	130-feet
Side Water Depth:	17.57-feet
Tank Bottom Slope:	1/16:12

Prepare all surfaces and paint all exposed structural and miscellaneous steel; mechanical and electrical equipment; metal walkways, posts and supports; infill materials to match existing adjacent materials as approved; all as specified, and all other work obviously required to be painted unless otherwise noted. Minor items not specifically referred to that shall be included where they come within the general intent of this bid as stated herein. This will be a partial re-paint to include the following Final Clarifier components:

- Drive Mechanisms and Motors (Non-Immersion Service)
- Access Bridge Frames and Supports (Non-Immersion Service)
- Piping (Immersion Service)

The following items will not be painted:

- Concrete
- Aluminum handrails and grating
- Finish hardware unless specifically noted otherwise
- Non-ferrous metals and stainless steel
- Packing glands and other adjustable parts
- Nameplates of mechanical equipment

Extreme care must be taken to avoid any overspray onto non-specified equipment, machinery, handrails, walkways, buildings, vehicles, etc. In the event that overspray does occur the Contractor shall furnish all materials, labor, equipment, and incidentals to remove all overspray and restore to the manufacturer specifications of the affected item and to the satisfaction of the PWC. All work to remove overspray shall be conducted at no expense to the PWC.

1.2 Related Specifications: The following standards are incorporated by reference into this specification. The latest edition of the reference shall be used.

A. SSPC – The Society for Protective Coatings

1. SSPC SP1 – Solvent Cleaning

2. SSPC SP3 – Power Tool Cleaning

3. SSPC SP5/NACE No. 1 – White Metal Blast Cleaning

4. SSPC SP10/NACE No. 2 – Near White Metal Blast Cleaning

5. SSPC SP6/NACE No. 3 – Commercial Blast Cleaning

6. SSPC TG No. 6 "Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations"

7. SSPC TG No. 7 "Guide to the Disposal of Lead-Contaminated Surface Preparation Debris"

B. NACE – National Association of Corrosion Engineers

1. NACE RP0178 "Design, Fabrication and Surface Finish of Metal Tanks and Vessels to be Lined for Chemical Immersion Service"

2. NACE RP0188 "Discontinuity Holiday Testing of Protective Coatings"

3. NACE RP 6F-164 "Curing of Interior Tank Linings"
4. NACE RP 6F-166 "Recommended Practice for Inspection of Linings on Steel and Concrete"

C. ASTM – American Society for Testing and Materials

1. E 337 - Test Method for Measuring Humidity with a Psychrometer

2. D 4414 - Standard Practice for Measurement of Wet Film Thickness by Notch Gages

3. D 4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

4. D 5162 - Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates

5. Committee D01.23 – "Test Method for Non-Destructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Gauge"

PART 2 – PRODUCTS

2.1 Paint Materials: The paints and primers named below are specified as the standard of quality. The usual "or equal" clause shall apply. No request for substitution will be considered which decreases the film thickness designated and, or the number of coats to be applied or which offers a change from the generic type of coating specified. Requests for substitution shall contain the full name of each product; descriptive literature and directions for use; its generic type, its non-volatile content by volume and a list of at least ten (10) clarifier mechanisms where each of the coatings has been used on new construction and has rendered satisfactory service for at least three years. Only new paint materials shall be used. No paint materials containing lead will be allowed.

2.2 Coating System (Immersion Service): The surfaces of the Final Clarifier mechanisms shall be refurbished with a two-coat, high build epoxy system, suitable for immersion service and resistant to the chemical concentrations, temperatures, duration of exposure, impact, wear and abrasive conditions typical of wastewater treatment service.

The following materials are provided as the basis for the paint schedule:

A. Sealants / Filler

1. Carbogard 501

2. Thiokol 2235M

B. Stripe Coat / Primer Coat / Finish Coat

1. Sherwin-Williams, Dura-Plate UHS Primer (stripe / primer coat)
   Dura-Plate UHS (finish)

2. Carboline, Carbogard 890

3. TNEMEC, Hi-Build Epoxyline II (N69 or V69)

4. Devoe, Bar-Rust 236

2.3 Coating System (Non-Immersion Service): The non-immersed surfaces shall be refurbished with a two-coat system as follows:

A. Spot Prime

1. TNEMEC Series 135 Chembuild or Series 1 Omnithane

B. Full Prime Coat

1. TNEMEC Series 135 Chembuild

C. Finish Coat

1. TNEMEC Series 73U Color Endurashield

2.4 Submittals: The Contractor shall submit to the PWC five (5) copies of product data for each component specified including data substantiating that the proposed materials comply with specified requirements and recommendations by the manufacturer covering all materials. If requested by the PWC, the manufacturer of materials, equipment, or product shall submit evidence of having consistently produced materials of satisfactory quality and performance for a period of at least two (2) years.

PART 3 – EXECUTION

3.1 Delivery Storage and Handling: Deliver products to the job site in manufacturer's original, unopened containers bearing manufacturer's name and label and the following information:

A. Product name

B. Product description (generic product classification)

C. Manufacturer's lot number

D. Color

All materials shall be subject to inspection by PWC. Store all materials in a protected area out of direct sunlight. Keep containers clean and undamaged. Adhere to manufacturer's published storage temperature and shelf life recommendations. Protect all materials from freezing.

3.2 Surface Preparation: All surfaces to be painted shall be dry, clean, and prepared as specified herein. Contractor shall strictly adhere to manufacturer's recommendations for surface preparation before painting:

A. All metal welds, blisters, etc. shall be ground and sanded smooth. All pits and dents shall be filled, and all imperfections shall be corrected so as to provide a smooth surface for painting.

B. All exposed carbon steel in immersed service shall be full abrasive blast cleaning per SSPC SP #10 Near White Blast Cleaning. All blasted surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Cleaned surfaces shall be primed within 8 hours of cleaning and prior to any surface rusting.

C. All galvanized and carbon steel in non-immersed service shall be power washed, 3,500 psi with a rotating turbo nozzle to remove all loose paint, rust, dirt, scale,

and foreign matter. Power tool clean all rust, corrosion, and feather smooth rough edges per SSPC SP3. Spot prime all cleaned areas.

D. Remove all rust, loose scale, oil, tar, and asphalt bearing coatings, grease and dirt using wire brush, grinding, or sanding or by manufacturers approved solvents per SSPC-SP1.

E. Inaccessible areas such as back-to-back angles, skip welds, gaps between pipe and pipe straps, bolted flange connections, etc. for proper surface preparation and coatings application shall be sealed just prior to the application of the topcoat with Thiokol 2235M Polysulfide Sealant, or approved equal.

3.3 Painting Schedule: Comply with manufacturers written installation procedures and individual product data sheet application bulletins. The coating system shall be allowed to properly cure between applications. After each application, and prior to the next coat, the Contractor shall inspect and verify that the mil thickness meets manufacturer's requirements. Testing shall be conducted by qualified personnel according to accepted industrial methods, standards, and instrumentation.

A. Immersion Service: Apply two-coat, high-build epoxy system as specified below.

1. Stripe Coats: Apply a stripe coat on all sharp edges, angles, outside corners, nuts, and bolts prior to applying the full primer and full finish coats over the entire surface.

2. Primer Coat: One (1) complete primer coat shall be applied to achieve a dry film thickness of 8 to 12 mils.

3. Finish Coat: One (1) complete finish coat shall be applied to achieve a dry film thickness of 8 to 12 mils.

4. Contrasting Color: Each coat of epoxy paint shall be of contrasting color for ease of visual inspection.

5. Total System: Apply two (2) full coats plus stripe coat to a total minimum dry film thickness of 16 to 24 mils.

6. Additional Coats: Brush & Roller applications may require additional coats to achieve the specified dry film thicknesses.

B. Non-Immersion Service:

1. Spot Prime: Apply 3 to 4 mils in all power tool cleaned areas.

2. Primer Coat: One (1) complete primer coat shall be applied to achieve a dry film thickness of 3 to 4 mils.

3. Finish Coat: One (1) complete finish coat shall be applied to achieve a dry film thickness of 2 to 3 mils.

4. Contrasting Color: Each coat of paint shall be of contrasting color for ease of visual inspection.

5. Total System: Apply two (2) full coats plus stripe coat to a total minimum dry film thickness of 5 to 7 mils.

6. Additional Coats: Brush & Roller applications may require additional coats to achieve the specified dry film thicknesses.

3.4 Workmanship: All painting shall be done according to Steel Structures Painting Council Paint Application 1-64 "Shop, Field and Maintenance Painting" by skilled and experienced craftsmen and shall be of the highest quality workmanship.

A. Painting shall be done only at such times as approved by the PWC or their representative. All painting shall be done strictly in accordance with the manufacturer's instructions and in a manner satisfactory to the PWC or their representative. Each coat shall be allowed to dry thoroughly before the next coat is applied.

B. Paint shall not be applied during wet or foggy weather or when the air temperature is below 35-degrees Fahrenheit or less than five points above the dew point. No paint shall be applied when the temperature of the surface to be painted is below 35-degrees F. Paint shall not be applied to wet or damp surfaces and shall not be applied in rain, snow, fog, or mist or when the relative humidity exceeds 85%. No paint shall be applied when it is expected that the relative humidity will exceed 85% or that the air temperature will drop below 40-degrees F. within 18 hours after the application of the paint. Paint shall not be applied when precipitation or frost is anticipated within 6 hours of application.

C. Dew or moisture condensation should be anticipated, and if such conditions are prevalent, painting shall be delayed until mid-morning to be certain that the surfaces are dry. Further, the day's painting should be completed well in advance of the probable time when condensation will occur in order to permit the film an appreciable drying time prior to the formation of moisture.

D. Mask all machinery nameplates and all machined parts not receiving a paint finish. Dripped or splattered paint shall be promptly removed. Lay drop cloths in all areas where preparation work and painting are being done to protect flooring and other work from all damage during the operation and until the finished job is accepted.

E. Finish coats shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with the type paper appropriate for the undercoats to remove defects and provide a smooth even surface.

3.5 Quality Control / Inspection: The PWC or their representative will monitor clarifier repainting during the course of the work and following completion to ensure the work is in accordance with approved specifications. The PWC reserves the right to stop any work during surface preparation and coating application so that the PWC or their representative may monitor workmanship. At a minimum, the various "hold points" for inspection shall be:

A. After surface preparation and prior to the primer coating application

B. During application of the primer coat

C. After each coat to verify film thickness and an overall visual inspection

D. After the finish coat to verify film thickness and conduct an overall visual inspection

No renovation is considered complete until the PWC or their representative approves the work.

The Contractor shall maintain an in-house quality control program that includes a staff inspector that has successfully completed the NACE Session II CIP or shall provide a qualified third-party coatings inspector.

3.6 Cleanup: Contractor shall at all times keep the premises free from accumulation of waste material and rubbish caused by employees or work. Upon completion of the painting, remove all tools, scaffolding, surplus materials, and all rubbish from and about the structures and site and leave the work area "broom cleaned" unless more exactly specified. Remove all paint where it has been spilled, splashed, or splattered on all surfaces, including floors, fixtures, equipment, furniture, etc., leaving the work area ready for final inspection.

3.7 Debris Containment and Disposal: The Contractor shall properly dispose of all debris resulting from their operations, in accordance with applicable Federal, State, and local laws, regulations, and rules. The Contractor shall maintain all necessary documentation regarding the chain of custody and proper disposal of the debris. Copies of the required documentation shall be furnished to the Public Works Commission prior to release of final payment. All documentation shall be in accordance with the applicable Federal, State, and local laws, regulations, and rules. The cost for compliance and preparation of the necessary documentation shall be incidental to the Contract.

3.8 Guarantee: The Contractor shall guarantee the said work against any defect in materials or workmanship for a period of five (5) years from the date of completion. In case any

such defect shall appear and is reported in writing to the Contractor during the guarantee period, the Contractor shall make necessary repairs without charge to the PWC.

TECHNICAL SPECIFICATIONS

PART 2: REPLACE MECHANISMS IN SECONDARY CLARIFIERS #9-1 AND #9-2

PROVIDED BY

EVOQUA WATER TECHNOLOGIES, LLC

O AND M
H60 ALT Tow Bro Clarifier

FOR

THE CITY OF FAYETTEVILLE NORTH CAROLINA

Evoqua Project 982312

June 17, 2020 2019

N19W23993 Ridgeview Pkwy, Suite 200
Waukesha, WI 53188

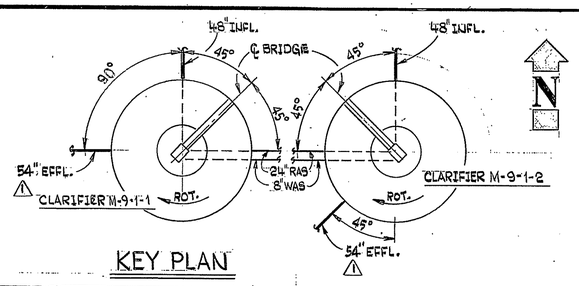
Tel: +1 (262) 547-0141
Fax: +1 (262) 547-4120

www.evoqua.com

Section 1

Mechanical Drawings

DRAWING NO. 10090-201



KEY PLAN

DESIGN DATA (FOR ONE TANK)	RAW FLOW (MGD)	MIXED LIQUOR FLOW (MGD)	MIXED LIQUOR SOLIDS (MG/L)	RETURN SLUDGE FLOW (MGD)	RETURN SLUDGE SOLIDS (%)	UNITUBE HEADER HEADLOSS (FT.)	UNITUBE HEADER VELOCITY (FPS)	HEADLOSS AT MANIFOLD DISCHARGE (FT.)
MAXIMUM						.998	3.30	1.17
MINIMUM	3.00	4.25		1.25		@	@	@
AVERAGE (DESIGN)	6.67	9.17		2.50		MAX.	MAX.	MAX.
HYDRAULIC PEAK	20.0	27.5		7.50				

TYPICAL PLAN VIEW
CLARIFIER M-9-1-2 SHOWN
M-9-1-1 SIMILAR
SEE KEY PLAN

DIRECTION OF ROTATION
ONE REV. IN 32.47 MIN.
TIP SPEED 12.58 FT./MIN.

℄ 8" WAS LINE
℄ 24" RAS LINE
STARTER TRUSS ASSY
TIP TRUSS ASSY
70'-10" ℄ ANCHOR BOLTS – ℄ TANK
8'-0" WIDE SKIMMER ASSY.
SPRAY SYSTEM (NOT BY ENVIREX)
UNITUBE HEADER (HOT-DIP GALVANIZED)
SCUM BLADE
5'-0"
10'-0" PLATFORM
130'-0" ±2" INSIDE TANK DIA. (MUST BE CONCENTRIC WITH CENTER PIER)
8'-0" WIDE SCUM TROUGH SEE DETAIL "F"
3/8" ALUMINUM FLOOR PLATE
2" WIDE STRIP ON FLOOR PLATE PAINTED W/OSHA YELLOW
5
7'-4"
2'-8"
12' DIA., 4 SEGMENT INNER WELL, 3/16" PL
WELL SUPPORTS
31 HEOLT DRIVE ASSY
35' DIA., 16 SEGMENT CHORDAL OUTER WELL, 3/16" PL, ONE BAFFLED SCUM PORT PER SEGMENT
℄ 48" EFFLUENT
STARTER TRUSS ASSY
SCUM BLADE
8'-0" WIDE SKIMMER ASSY
TIP TRUSS ASSY
128'-7 1/2" ± 1/2" INSIDE SCUM BAFFLE DIA.
COUNTERWEIGHTS

6
MAJOR REPLACEMENT OF TOW-BRO SECONDARY CLARIFIERS
130-FT DIAMETER, DUAL SKIMMING

PER SALES ORDER 982312 (MAR 2020), NEW REPLACE-IN-KIND CLARIFIER COMPONENTS SUPPLIED TO REPLACE ORIGINAL CONTRACT 10090-02 (1989). REFER TO NEW PROPOSAL V19-350577.

BRIDGE, PLATFORM, GRATING TO BE RE-USED.

(68)(69) 16GA. STL. STL ID PLATE W/1/4" LETTERS BEARING THE EQUIPMENT ID NUMBERS

TOP OF TANK ELEV. 91.50
TOP OF WALKWAY ELEV. 91.74

(65) PLATFORM HANDRAIL
(55) CENTER PLATFORM (HDG)
(56) WALKWAY EXTENSION (HDG)
TRUSS BRIDGE (H.D.G.)
SEE DET. "G"
DRIVE TO CENTER PIER SEE DETAIL "D"
DRIVE TO CENTER CAGE SEE DETAIL – "E"
BRIDGE MOUNTING SEE DET. "A"
115 8'-0" WIDE SCUM TROUGH
TOP OF WEIR WALL ELEV. 83.40
7'-4 3/4" CLEARANCE
25'-1 1/4"
2'-8"

(8) EQUALLY SPACED FLOW TARGET BAFFLES (73) SEE DETAIL "B"
PEAK WATER SURFACE ELEV. 84.10
125 8'-0" WIDE SKIMMER ASSY
HEADER SUPPORT TRUSS TIP SECTION
SCUM BLADE
HEADER SUPPORT STARTER TRUSS SECTION (100)
FLUSHING DEVICE (127)
TOP OF CONC. ELEV. 80.33
6" SCUM LINE
4'-0" REF.
1'-6" REF.
1'-2" REF.
1/8" NEOPRENE GASKET (TYP.) 2/138
A-FRAME SUPPORTS (117)
SHIMS IF REQ'D
TIE CHORD A-FRAME (99)
WELL FLOOR (71)(72)
CENTER CAGE (38)
48" CENTER PIER (36)
7'-0" (37) MANIFOLD
(12) 4" FLAP VALVES INV. ELEV. 67.00 (NOT BY ENVIREX)
TOP OF CONC. ELEV. 66.00
TOP OF GROUT AT TANK SIDEWALL ELEV. 66.17
17'-11 1/4" BWD
(23) EQUALLY SPACED ORIFICES AT 2'-6" CENTERS
UNITUBE HEADER (HOT-DIP GALVANIZED) (132) 2
UNITUBE HEADER (134) 2
WORK THIS DWG WITH 10090-202, -203, -204, -205

WEIRS & BAFFLES (NOT BY ENVIREX)
SCUM BLADE
SKIMMER SUPPORT TOWER (118) F.S. (119) N.S.
TIP TRUSS SECTION (105)
STARTER TRUSS SECTION (104)
(18) 4" FLAP VALVES INV. ELEV. 67.00 (NOT BY ENVIREX)
TOP OF CONC. ELEV. 66.00
COUNTERWEIGHTS (107)
TIP PLOW BLADE & BRASS SQUEEGEE (112)(113)
2" GROUT - TO BE SCREEDED AFTER TOW-BRO EQUIPMENT HAS BEEN ERECTED TO OBTAIN 0" CLEARANCE BETWEEN FINISHED FLOOR AND UNITUBE HEADER NEOPRENE WIPER
TYPICAL PLOW BLADES & BRASS SQUEEGEES (110)(111) SEE DETAIL "J"
SHIMS IF REQ'D (102)(103)
℄ 24" SLUDGE RETURN PIPE, INV. EL. 60.00
TOP OF CONCRETE BASE ELEV. 65.66
48" INFLUENT INV. EL. 55.83
(98) DEFLECTOR BLADE W/ NEOPRENE WIPER
8" WAS LINE INV. EL. 61.66

ECN NO.	REV. NO.	MICRO FILMED	DESCRIPTION OF REVISION	REV. BY	DATE
	3		REVISED PER CUST. CHANGE	MWD	12/21/89
	2		REVISED PER HEADER REDESIGN	MWD	11/27/89
	1		ADDED ITEM NUMBERS - FINAL	KN	10-26-89
			REVISED PER CUST. REQUEST		

LOCATION OF REVISIONS

6	ADD CLARIFIER REPLACEMENT NOTE	JTH	3-3-20
5	ADDED OSHA YELLOW PAINT AT BRIDGE APPROACH END	TDP	5-22-90
4	DELETED ITEMS 57 THRU 64	TDP	4-16-90

CUSTOMER	MARTIN K. EBY CONSTRUCTION
LOCATION	FAYETTEVILLE, N.C.
EST. NO.	
ENGINEER	CH2M HILL

CONFIDENTIAL – ALL RIGHTS RESERVED – PROPERTY OF
Envirex, a Rexnord Company, Waukesha, WI 53186
DIST'N.

TOLERANCES UNLESS OTHERWISE SPECIFIED

ONE PLACE DEC.	±.060	STRUCTURAL DIMENSIONS	± 1/16
TWO PLACE DEC.	±.020	MACHINED SURFACES	250
THREE PLACE DEC.	±.005		

SCALE
DRAWING MADE FROM

DR'N. AR	PROJ. ENGR. TDP	DATE ISSUED 8/17/89	
CK'D. DK	APP'D. JS	PROD. CODE	

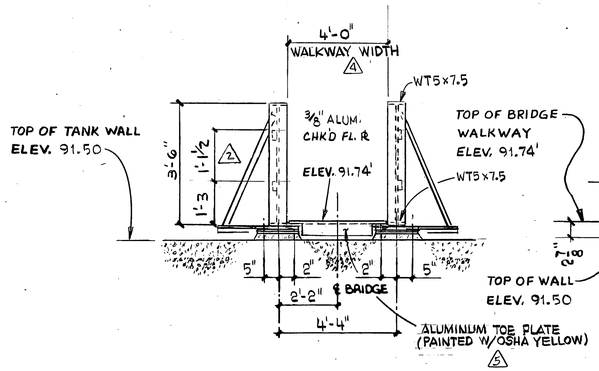
TITLE: GENERAL ARRANGEMENT FOR (2) 130'-0" DIA, HEOLT DRIVE TOW-BRO, SECONDARY CLARIFIERS (DUAL SKIMMING)

PART OR ORDER NO.	DRAWING NO.
10090	10090-201

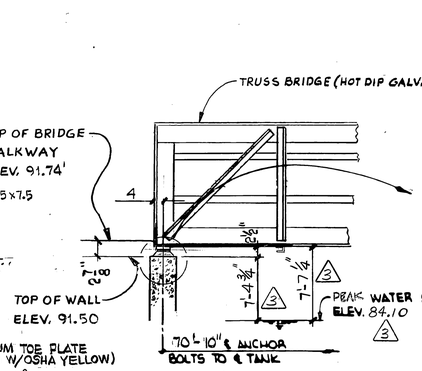
REV 6

TELEDYNE POST N24329

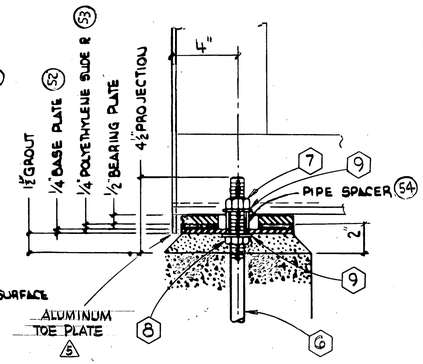
DRAWING NO. 10090-202



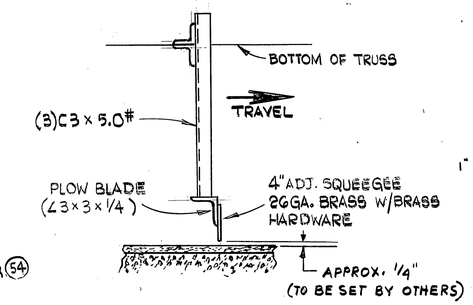
END VIEW (A/201)



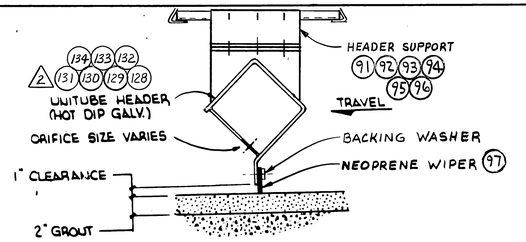
DETAIL (A/201)
BRIDGE MOUNTING



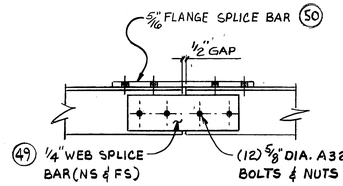
ENLARGED DETAIL
BRIDGE ANCHORS



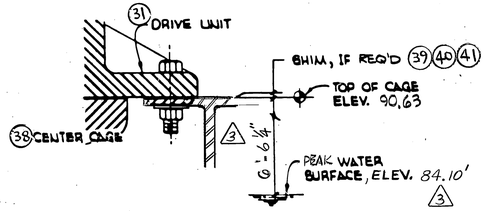
DETAIL (J/201)



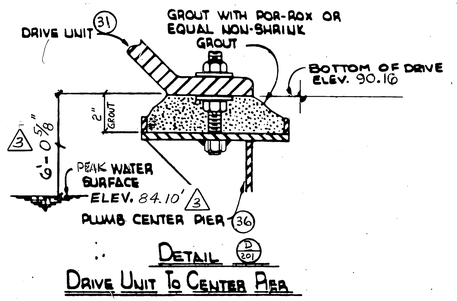
SECTION (G/201)
UNITUBE HEADER DETAIL



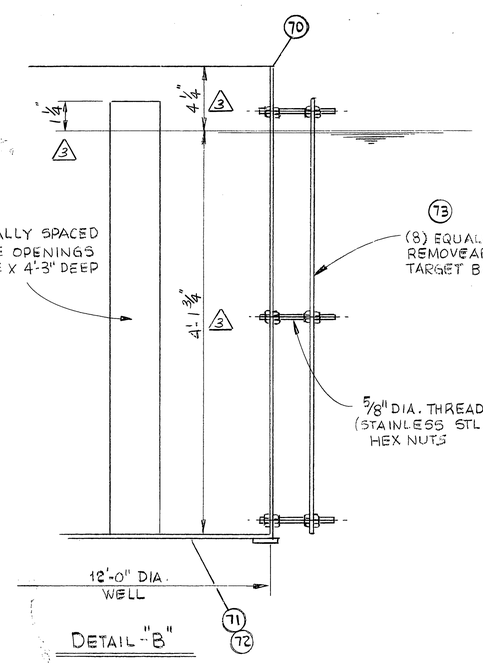
DETAIL (G/201)
BRIDGE SPLICE



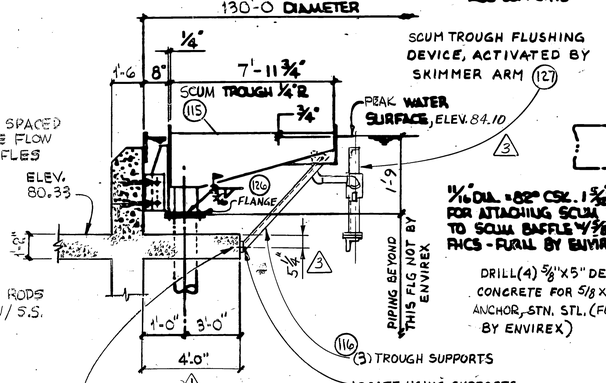
DETAIL (B/201)
DRIVE UNIT TO CENTER CAGE



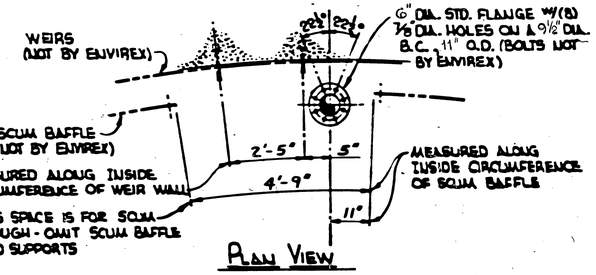
DETAIL (D/201)
DRIVE UNIT TO CENTER PIER



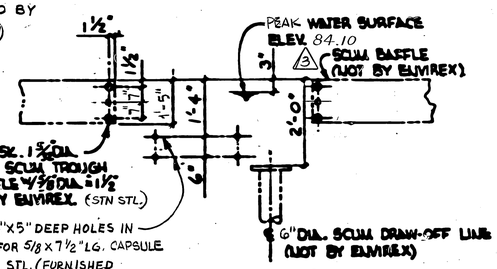
DETAIL "B"



DETAIL (F/201)



PLAN VIEW



SIDE VIEW - DETAIL (F/201)
(TROUGH NOT SHOWN FOR CLARITY)

ECN NO.	REV. NO.	MICRO FILMED	DESCRIPTION OF REVISION	REV. BY	DATE
	5	M	ADDED TOE PLATE AT APPROACH END OF BRIDGE	TDP	5-22-90
	4		WALKWAY WIDTH WAS 3'-9" WALKWAY	TDP	4-16-90
	3		REVISED PER CUST. CHANGE	MWD	12-21-89
	2		REVISED PER HEADER REDESIGN	MWD	11-29-89
	1		ADDED ITEM NUMBERS-FINAL	KN	10-26-89
			REVISED PER CUST. REQUEST		

LOCATION OF REVISION

WORK THIS DRAWING 10090-201, -203, -204, -205

EST. NO.

DIMENSIONS IN INCHES UNLESS SPECIFIED — MICRO FILMED

CUSTOMER MARTIN K. EBY CONSTRUCTION
LOCATION FAYETTEVILLE, N.C.
ENGINEER CH2M HILL

Envirex a Rexnord Company WAUKESHA WI. 53187

DIST'N

TOLERANCES UNLESS OTHERWISE SPECIFIED
TWO PLACE DEC. ± .06
THREE PLACE DEC. ± .005
ANGULAR ± .50°
STRUCTURAL DIMENSIONS ± 1/16
MACHINED SURFACES 250
SCALE 3/4"
DRAWING NAME FROM

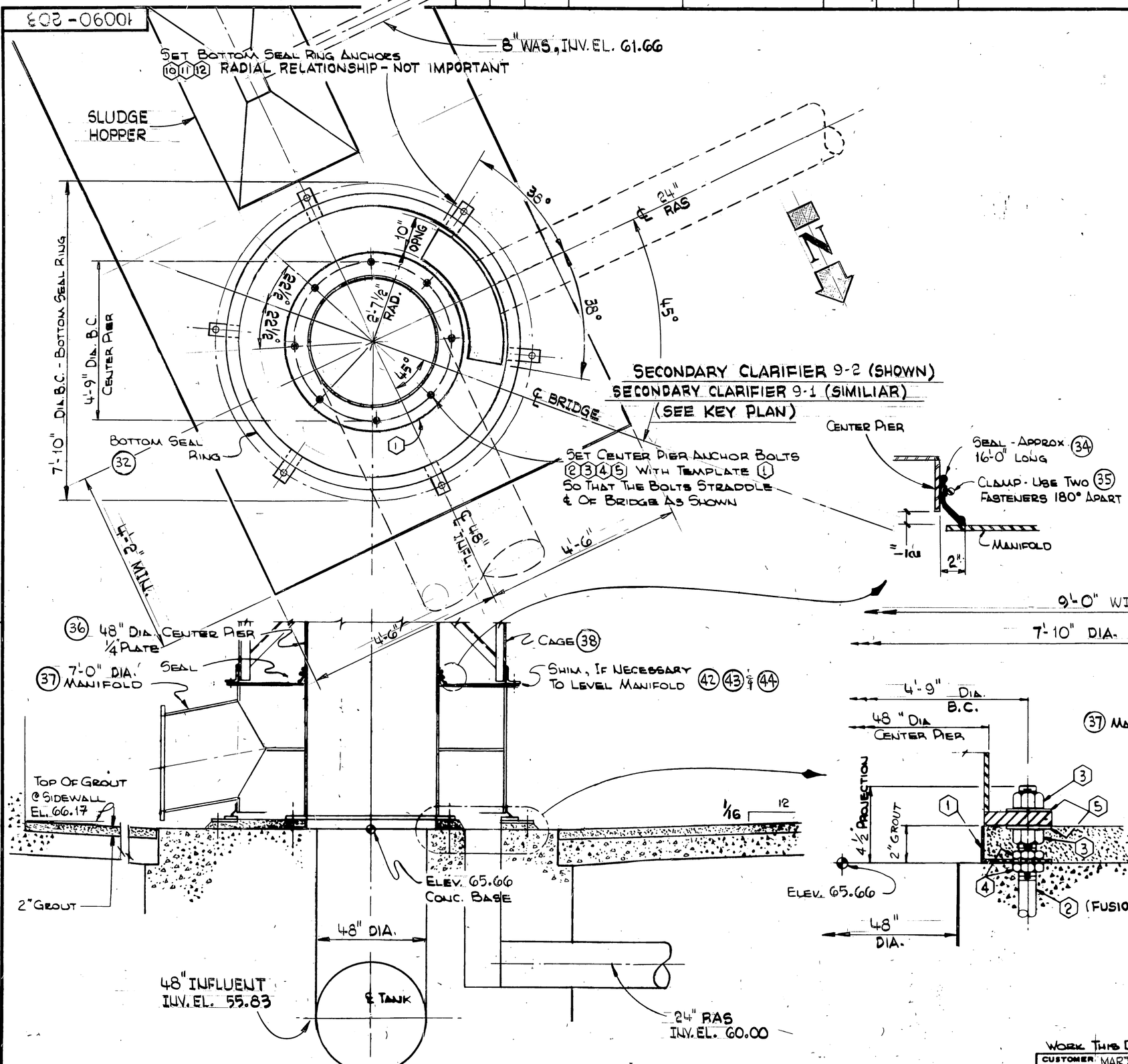
DR'N JR | PROJ. ENGR. TDP | DATE ISSUED 8/17/89
CK'D DK | APP'D JG | PROG. CODE

TITLE
GENERAL ARRANGEMENT
MISC. SECTIONS & DETAILS
FOR (2) 130'-0" DIAMETER
HYDLT TOW BRO CLARIFIERS
SECONDARY CLARIFIERS -

PART OR ORDER NO. 10090
DRAWING NO. 10090-202

TELEDYNE POST 3

10090-203



CENTER PIER BASE DETAIL

FORM NO. 12-14A

LIST OF COMPONENTS

WEIGHT	DRAWING NO.
	10090-203

TITLE: GENERAL ARRANGEMENT CTR PIER ANCHOR LOCATIONS

UNIT | ITEM | REV | ORDER NO.

NOTE: REFERENCE SYMBOLS WHERE SHOWN ARE TO ASSIST IN LOCATING COMPONENTS IN DIFFERENT VIEWS OF THIS DRAWING ONLY. ALL LENGTHS ARE FINAL LENGTHS UNLESS SPECIFIED AS ROUGH (RGH).

REFERENCE DRAWING NOS

ADVANCE ORDER	REF SYMBOL	QUANTITY	PART NUMBER	PART NAME OR MATERIAL SIZE AND DESCRIPTION	MATERIAL SPEC ENGR STD NO	LENGTH FEET	LENGTH INCHES
			TEMPLATE & 316 S.S. ANCHORS - FURN. BY ENVIREX, SET BY OTHERS				
922-1	1	2	103-10602-89	CENTER PIER BOLT TEMPLATE			
922-2	2	16	10095-106 MK 102	1"Ø x 16" LG. HOOKED ANCHOR BOLT			
922-3	3	32	841-20565	1" FULL HEX NUT			
922-4	4	32	841-21195	1" JAM NUT			
922-5	5	32	841-22220	1" CUT WASHER			
922-6	6	8	103-50387-16	¾"Ø x 9" LG. HOOKED ANCHOR BOLT			
922-7	7	8	841-20385	¾" FULL HEX NUT			
922-8	8	8	841-21085	¾" JAM NUT			
922-9	9	16	841-22090	¾" CUT WASHER			
922-10	10	12	10095-106 MK 100	½"Ø x 7" LG. HOOKED ANCHOR BOLT			
922-11	11	24	841-20225	½" FULL HEX NUT			
922-12	12	24	841-21930	½" CUT WASHER			

ENGR. CHANGE NOTICE NO.	REV. NO.	MICRO FILMED	DESCRIPTION OF REVISION	REV. BY	DATE
	1		ADDED ITEM NUMBERS	KN	10-26-89
			FINAL		

LOCATION OF REVISIONS

WORK THIS DWG WITH 10090-201, -202, -204, -205

CUSTOMER: MARTIN K. EBY CONSTRUCTION
LOCATION: FAYETTEVILLE, N.C. — CUST. ORDER NO.
ENG'R.: CH2M HILL — EST NO.

Envirex, a Rexnord Company — Water Quality Control Division, Waukesha WI 53186

DIST'N. — MADE FROM MASTER

SCALE — DIM IN INCHES IF NOT SPECIFIED
DR'N. JR
CK'D. DK
APP'D. dS
PROJ ENGR. TDP
DATE ISSUED 8/17/89
PROJ CODE

GENERAL ARRANGEMENT
CENTER PIER ANCHOR LOCATION
FOR (2) HEXBOLT, 130'-0" DIAMETER
TOW-BRO CLARIFIERS

UNIT 2

ORDER NO.	DRAWING NO.
10090	10090-203

FORM NO. 12-12D4

ENVIREX SERIES "H-60LT" TOW-BRO CLARIFIER SPECIFICATION

DRIVE MECHANISM

PRIMARY REDUCTION:

EURODRIVE PARALLEL HELICAL GEARMOTOR.
FRAME SIZE: R60DT80K4 RATIO: 78.81:1
OUTPUT RPM: 22.20 SERVICE FACTOR: 1.72
CASES ARE CAST IRON
AND ARE MOUNTED ON ALL ADJUSTABLE STEEL
BASE FOR CHAIN TENSION ADJUSTMENT.

MOTOR: EURODRIVE "SEW" SEVERE DUTY. FRAME: DT80K4
.75 HORSEPOWER. 1800 RPM. TOTALLY ENCLOSED-FAN COOLED
230/460 VOLT. 3 PHASE. 60 HERTZ. NEMA DESIGN B. CLASS F
INSULATION. 40°C AMBIENT TEMPERATURE. 1.15 SERVICE
FACTOR. BALL BEARING TYPE MOTOR.

SECONDARY REDUCTION:

SPROCKETS: FABRICATED STEEL.
CHAIN: #80L "REDI-LUBE" STEEL ROLLER. SELF LUBRICATING
GUARD: O.S.H.A. STYLE. COMPLETELY ENCLOSED.
MOLDED POLYETHELENE.

INTERMEDIATE REDUCTION:

HOUSING: GREY IRON. CLASS 40B. A.S.T.M. A48
SHAFTING: H.R. STEEL. A.I.S.I. 4142 HEAT TREATED.
WORM: A.I.S.I. 8620. HARDENED TEETH.
WORM GEAR: DUCTILE IRON. A.S.T.M. A536.
BEARINGS: ANTI-FRICTION TYPE
LUBRICATION: OIL BATH AND GREASE WITH OIL SEALS ON SHAFTING.
HOUSING IS PROVIDED WITH OIL FILL/DRAIN PIPES
AND OIL LEVEL SIGHT GLASS

FINAL REDUCTION:

HOUSING: GREY IRON. CLASS 40B A.S.T.M. A48.
PINION: A.I.S.I. 4142 H.R. HARDENED TEETH.
INTERNAL SPUR GEAR: DUCTILE IRON. A.S.T.M. A536.
TURNTABLE BEARING:
BALL RACE DIAMETER: 59.625 INCHES.
QUANTITY AND TYPE OF BALL: 149 - 1.25 DIA. BALLS.
A.I.S.I. 52100 CHROME STEEL HARDENED TO
63-66 ROCKWELL "C"
RENEWABLE STRIP LINERS: C.F. A.I.S.I. C1050 HARDENED
TO 38-42 ROCKWELL "C"
LUBRICATION:
OIL BATH WITH FELT SEAL AND DUST SHIELD
AUTOMATIC CONDENSATE DRAIN.
HOUSING IS PROVIDED WITH AN OIL FILL/DRAIN PIPES.
AND OIL LEVEL SIGHT GLASS.

THE TURNTABLE ASSEMBLY IS DESIGNED SUCH THAT THE SPLIT INTERNAL GEAR, BALLS AND STRIP LINERS MAY BE REMOVED WITHOUT REMOVING THE MECHANISM ACCESS BRIDGE.

OVERLOAD DEVICE:

MICRO SWITCHES (SEE OVERLOAD SYSTEM DIAGRAM AT RIGHT)
SHEAR PIN.

DESIGN STANDARDS:

INTERMEDIATE REDUCTION GEARING: A.G.M.A. 440.04
SINGLE AND DOUBLE REDUCTION OF CYLINDRICAL WORM
AND HELICAL REDUCERS.
FINAL REDUCTION GEARING: A.G.M.A. 218.01 RATING THE PITTING
RESISTANCE AND BENDING STRENGTH OF SPUR AND HELICAL
INVOLUTE GEAR TEETH.

ALL BEARINGS ARE DESIGNED FOR A B-10 LIFE OF OVER 500,000 HOURS.
AGMA DESIGN GEAR LIFE: 20 YEARS

FINAL OUTPUT SPEED: .03 R.P.M.

DRIVE MECHANISM TORQUE RATINGS:

RATED TORQUE PER A.G.M.A. STANDARD:	33,300	FT.LBS.
ALARM TORQUE:	33,300	FT.LBS.
MOTOR SHUT OF TORQUE:	39,960	FT.LBS.
SHEAR PIN TORQUE:	43,290	FT.LBS.
ULTIMATE/MOMENTARY PEAK TORQUE:	76,125	FT.LBS.

CENTER PIER

48" DIAMETER CYLINDRICAL STEEL. 1/4 THICK. DESIGNED TO SUPPORT THE DRIVE UNIT. COLLECTOR MECHANISM. AND THE ACCESS BRIDGE.

INFLUENT WELL (INNER WELL)

12'-0" DIA. X 4'-6" DEPTH. FABRICATED OF 3/16" THICK STEEL PLATE WITH BOLTED FIELD SPLICES. DESIGNED SUCH THAT THE FLOW THROUGH VELOCITY DOES NOT EXCEED .38 FPS AT MAXIMUM FLOW. WELL IS PROVIDED WITH(8) EQUALLY SPACED REMOVABLE TARGET BAFFLES. EACH BAFFLE OPENING SHALL HAVE AN OPENING OF 5.6 SQ.FT. WELL IS FITTED WITH A 1/4" THK BOTTOM PLATE WITH 1" DIA DRAIN HOLES AND FURNISHED WITH NEOPRENE SEAL BETWEEN THE CENTER PIER AND BOTTOM PLATE.

ECN NO.	REV. NO.	MICRO FILMED	DESCRIPTION OF REVISION	REV. BY	DATE
	3		DELETED SENT-UP FLOOR PLATE. ADDED SS FASTENERS AND PAINTING REQMT.	TDP	5-24-90
	2		ADDED SPEC. HEADER PAINT NOTE	JR	11-29-89
	1		REVISED PER CUST. REQUEST-FINAL	TDP	10-26-89

LOCATION OF REVISION

CYLINDRICAL MANIFOLD

ALL WELDED CONSTRUCTION. FABRICATED FROM 3/8" THICK STEEL PLATE AND FITTED WITH TWO (2) SEALING RINGS. MANIFOLD TO INCLUDE A DEFLECTOR BLADE WITH A NEOPRENE WIPER TO DIRECT SLUDGE TO THE FIRST ORIFICE ON THE UNITUBE HEADER.

UNITUBE HEADER

A RECTANGULAR SHAPED FULL TAPERED SECTION. VARYING IN SIZE FROM A MAXIMUM NEAR THE TANK CENTER TO A MINIMUM AT THE OUTER END TO PROVIDE UNIFORM SLUDGE DRAW-OFF VELOCITIES. FABRICATED OF 1/4" THICK STEEL PLATE.
INCLUDES DRAW-OFF ORIFICES EQUALLY SPACED ALONG THE LENGTH WITH THE SMALLER DIAMETER NEAR THE TANK CENTER. THE LARGER AT THE OUTER END. TO INSURE HYDRAULIC BALANCE. THE HEADER IS TO INCLUDE A NEOPRENE WIPER ALONG THE ENTIRE BOTTOM LENGTH.

△2 THE UNITUBE HEADER SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION AND SOLVENT CLEANED USING TNEMEC "MEK" (METHYL ETHYL KETONE) FOLLOWED BY BLAST CLEANING PER SSPC-SP7-63. AFTER BLAST CLEANING THE INTERIOR AND EXTERIOR SURFACES OF THE HEADER, APPLY ONE COAT OF TNEMEC 66-1211 POLYAMIDE EPOXY PRIMER TO A DRY FILM THICKNESS OF 3.0 MILS FOLLOWED BY (2) TWO COATS OF TNEMEC 46-413 TNEME-TAR COAL TAR EPOXY, 8.0 MILS DFT EACH COAT. (16 MILS TOTAL DFT)

TRUSS ARM

SUPPORTED FROM THE CENTER CAGE AND MANIFOLD AND USED FOR SUPPORT OF THE ENTIRE SKIMMING MECHANISM AND PLOW BLADES.
THE TRUSS ARM WILL BE OF ALL WELDED CONSTRUCTION CONSISTING OF STRUCTURAL STEEL MEMBERS HAVING A MINIMUM THICKNESS OF 1/4".

PLOW BLADES

APPROXIMATELY 3" DEEP. SPACED SUCH THAT THE ENTIRE TANK FLOOR IS SCRAPED ONCE/REVOLUTION, INCLUDED WILL BE BRASS SQUEEGEES (26GA.) APPROX. 4" DEEP AND ATTACHED TO PLOW BLADES WITH BRASS HARDWARE.

ACCESS BRIDGE

THE TRUSS BRIDGE WILL BE OF ALL WELDED CONSTRUCTION CONSISTING OF STRUCTURAL STEEL MEMBERS HAVING A MINIMUM THICKNESS OF 1/4". THE MINIMUM CLEAR WALKWAY WIDTH BETWEEN GUARDRAILS SHALL BE 48". WALKWAY MATERIAL WILL BE 3/8" ALUMINUM CHECKERED FLOOR PLATE WITH 1/4" DIA. DRAIN HOLES SPACED AT APPROXIMATELY 3'-0" CENTERS. THE TRUSS TOP CHORD AND INTERMEDIATE L2 x 1 1/2 x 1/4 WILL ACT AS HANDRAILING ALONG WALKWAY. A CENTER PLATFORM WILL PROVIDE A MINIMUM 2'-0" CLEARANCE ALL AROUND DRIVE MECHANISM. FLOOR MATERIAL WILL BE 3/8" ALUM-FLOOR PLATE. HANDRAILING WILL BE FURNISHED AROUND CENTER PLATFORM AND WILL MEET ALL OSHA REQUIREMENTS. THIS 3-RAIL DESIGN WILL BE MADE FROM 1 1/2" SCH.40 ALUM. PIPE BY "WEBRAIL" OR EQUAL. THE WALKWAY FLOORPLATE △3 WILL BE SECURED TO BRIDGE AND PLATFORM USING SS FASTENERS, TOE PLATE AROUND PLATFORM WILL BE A 4" ALUMINUM CHANNEL.

△1 ALL SUPPORTING SURFACES FOR ALUMINUM FLOOR PLATE WILL BE COATED WITH TNEMEC 46H-413 HI-BUILD TNEME-TAR 10.0 MILS DRY THICKNESS.

SURFACE SKIMMER ASSEMBLY (2 PROVIDED)

HINGED TO INSURE CONTINUAL CONTACT AND PROPER ALIGNMENT WITH SCUM BAFFLE AND BEACH PLATE.
OVERALL LENGTH OF SKIMMER IS 8'-0". SKIMMER IS SUPPORTED BY A "FULL LENGTH" SCUM BLADE. EXTENDING FROM THE INFLUENT WELL TO THE PERIPHERAL SCUM BAFFLE. SCUM BLADE IS SUPPORTED BY FABRICATED STRUCTURAL STEEL A-FRAMES SUPPORTED BY THE SCRAPER ARMS.

RAMP AND SCUM TROUGH

ALL WELDED CONSTRUCTION. ADEQUATELY SUPPORTED FROM THE TANK WALL.
LENGTH OF TROUGH: 4'-9" MEASURED ALONG SCUM BAFFLE
WIDTH OF TROUGH: 8'-0".
SIZE OF PIPE FLANGE: 6" DIA.

THE SCUM TROUGH SHALL BE SUPPLIED WITH A MECHANICAL OPERATING FLUSHING VALVE INCLUDING A LEVER ARM, HINGED FLAPPER VALVE WITH SEAL AND COUNTERWEIGHTS TO SERVE AS A WATER FLUSHING DEVICE ACTIVATED BY THE SKIMMER FOR EACH HALF REVOLUTION.

INFLUENT WELL (OUTER WELL)

35'-0" DIA x 8'-6" DEPTH. FABRICATED OF 3/16" THK STEEL PLATE WITH BOLTED FIELD SPLICES. DESIGNED SUCH THAT THE FLOW THROUGH VELOCITY DOES NOT EXCEED .15 FPS AT PEAK FLOW. WELL IS PROVIDED WITH (1) BAFFLED SCUM PORT PER WELL SEGMENT.

WEIR PLATES

NOT BY ENVIREX
(PROVIDED BY THOMPSON FABRICATING)
△1

SCUM BAFFLE

NOT BY ENVIREX
(PROVIDED BY THOMPSON FABRICATING)
△1

NOTE:

SCUM BAFFLE TO BE CONCENTRIC WITH CENTER OF TANK.
ALL JOINTS MUST BE BUTT CLOSELY AND INSIDE OF BAFFLE MUST NOT HAVE ANY PROJECTIONS SUCH AS WELDS. BOLT HEADS. ETC.

CUSTOMER'S NOTE:

UNLESS OTHERWISE SPECIFIED. ENVIREX WILL NOT FURNISH ANY OF THE FOLLOWING: ELECTRICAL. HYDRAULIC OR PNEUMATIC CONTROLS. WIRING OF MOTORS OR CONTROLS. CONTROL PANELS OR SUPPORTS. PIPING. VALVES. WALL SLEEVES. GATES OR DRAINS. GRATING STAIRWAYS. LADDERS. CONCRETE. GROUT. MASTIC. OR SEALING COMPOUNDS. GUIDES. WEIRS OR SCUM BAFFLES. LUBRICANTS FOR DRIVES OR BEARINGS. GREASE PIPING OR GREASE GUN. SETTING OF ANCHOR BOLTS (WHETHER FURNISHED BY ENVIREX OR OTHERS). DETAIL SHOP FABRICATION DRAWINGS. TOOLS OR SPARE PARTS. AND MODIFICATIONS TO EXISTING EQUIPMENT OR STRUCTURES.

CONCRETE DESIGN

ENVIREX IS NOT RESPONSIBLE FOR CONCRETE DESIGN. REINFORCING STEEL FOR TANKS TO BE FURNISHED BY OTHERS WHO WILL ALSO SIZE THE WALLS AND FOOTINGS TO SUIT LOCAL GROUND CONDITIONS. FOR DIMENSIONS NOT SHOWN. REFER TO ENGINEER'S DRAWINGS.

ERECTION NOTE

CORRECTIONS OF MINOR MISFITS AND A REASONABLE AMOUNT OF CUTTING AND REAMING ARE CONSIDERED A PART OF ERECTION. ANY ERROR WHICH PREVENTS ASSEMBLY BY MODERATE USE OF DRIFT PINS. CUTTING. OR WELDING. IS TO BE REPORTED AND APPROVAL OF CORRECTION OR CHANGE IS TO BE RECEIVED IN WRITING BEFORE PROCEEDING. FAILURE TO COMPLY WILL RELIEVE ENVIREX OF ALL OPERATIONAL AND MONETARY RESPONSIBILITY.

SUPERVISION AND/OR INSPECTION OF ERECTION:

SERVICES OF A FACTORY REPRESENTATIVE WILL BE FURNISHED IN ACCORDANCE WITH THE TERMS OF OUR CONTRACT.

PAINT NOTE

SHAFTING AND EXPOSED MACHINED SURFACES WILL RECEIVE ONE COAT OF MOBIL-ARMA #633. WOOD, NON-FERROUS MATERIAL AND GALVANIZED SURFACES WILL REMAIN UNPAINTED. DRIVE UNITS AND CONTROLS WILL REMAIN THE MANUFACTURER'S STANDARD PAINT.
SUBMERGED STEEL PLATES AND SHAPES WILL RECEIVE(1) ONE COAT OF TNEMEC 66-1211 POLYAMIDE EPOXY PRIMER △1 TO A DRY FILM THICKNESS OF 3.0 MILS △1 AFTER BEING PREPARED BY BLAST CLEANING PER SSPC-SP -5- 63. △1
NON SUBMERGED STEEL PLATES AND SHAPES WILL BE HOT-DIP GALVANIZED AFTER FABRICATION.

△2 REFER TO "UNITUBE HEADER" SECTION FOR SPECIAL HEADER COATING REQUIREMENTS.

TOUCH-UP AND ALL ADDITIONAL COATS TO BE FURNISHED AND APPLIED BY OTHERS IN THE FIELD.

DESIGN DATA

BRIDGE LIVE LOAD: 50 LBS/SQ.FT.
BRIDGE DEFLECTION: NOT TO EXCEED 1/360 OF THE SPAN UNDER DEAD AND LIVE LOADS.

STRUCTURAL SHAPES SHALL CONFORM TO ASTM A36.
WELDING SHALL CONFORM TO AWS-D1.1.
ALL SUBMERGED STEEL PLATES AND SHAPES TO HAVE A MINIMUM THICKNESS OF 1/4" UNLESS OTHERWISE SPECIFIED.

LIFTING LUGS SHALL BE PROVIDED FOR ANY PARTS OVER 100 LBS.

ALL ANCHOR BOLTS AND WEDGE △2 BOLTS TO BE: 316 STN.STL.
ALL SUBMERGED ANCHORS SHALL BE FUSION BONDED WITH 100% SOLIDS EPOXY OR POLYURETHANE, 1 OR 2 COATS, 7.0 MDFT. WEDGE △2 ANCHORS SHALL NOT BE USED BELOW A POINT 1'-6" ABOVE THE PEAK WATER SURFACE. 316 STN.STL. CAPSULE ANCHORS WILL BE USED INSTEAD OF WEDGE △2 ANCHORS IN THESE INSTANCES.

ALL EQUIPMENT FASTENERS WILL BE: 316 STAINLESS STEEL.

PROVIDE A CONTINUOUS SEAL WELD AT ALL CONNECTION POINTS. IN ADDITION, MATING SURFACES SHALL BE COMPLETELY SEALED BY WELDING TO PREVENT CREVICE CORROSION.

ALL SHARP EDGES SHALL BE ROUNDED TO A 1/8" MINIMUM RADIUS. ALL WELDS SHALL BE GROUND SMOOTH, BUT NOT NECESSARILY FLUSH W/BASE METAL.

CENTER CAGE

ALL WELDED CONSTRUCTION FURNISHED IN (1) ONE SECTION CONSISTING OF STRUCTURAL STEEL MEMBERS HAVING A MINIMUM THICKNESS OF 1/4".

TORQUE OVERLOAD SYSTEM

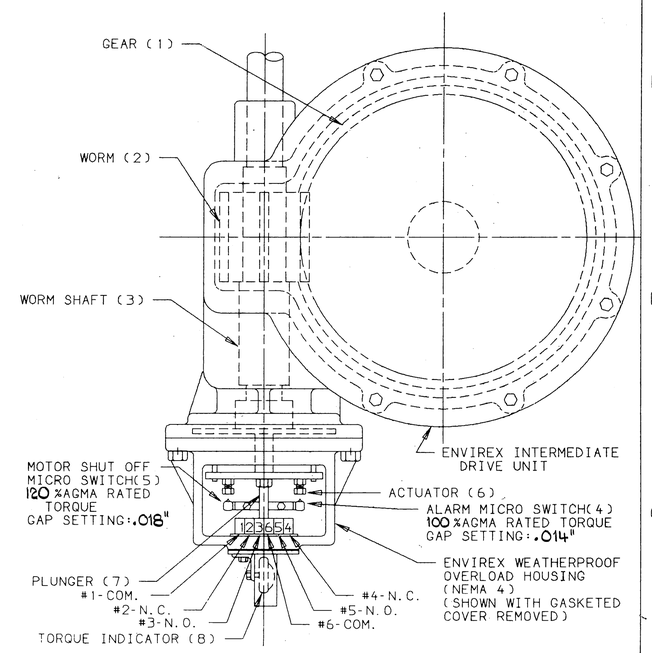
DRAWING NO. 10090-204

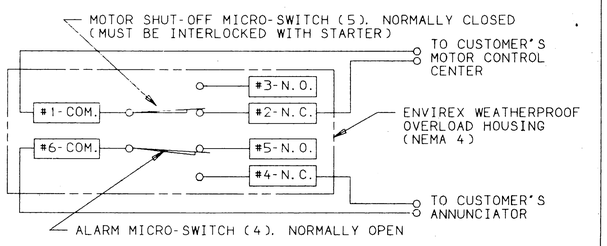
SEQUENCE OF OPERATION

AS TORQUE IS APPLIED TO THE GEAR (1). THE WORM (2) & WORM SHAFT (3). ARE FORCED TOWARD THE MICRO-SWITCHES (4) & (5). AS THE WORM SHAFT (3) MOVES. THE GAP CLOSES BETWEEN THE MICRO-SWITCH ACTUATOR (6) & THE MICRO-SWITCHES (4) & (5). WHEN THE TORQUE LOAD REACHES 100 % OF THE AGMA RATED TORQUE. THE MICRO SWITCH (4) CONTROLLING THE ALARM SYSTEM CLOSES AND THE ALARM CIRCUIT IS ACTIVATED THUS SOUNDING AN ALARM AND/OR HORN (BY OTHERS). WHEN THE TORQUE LOAD REACHES 120 % OF THE AGMA RATED TORQUE THE MICRO-SWITCH(5) INTERLOCKED WITH THE STARTER. OPENS & DE-ENERGIZES THE MAGNETIC STARTER COIL. WHICH IN TURN. OPENS A HOLDING CIRCUIT INTERLOCK. OPENING THE CIRCUIT AND STOPPING THE MOTOR.
THE MOVEMENT OF THE WORM SHAFT (3). ALSO PUSHES AGAINST THE PLUNGER (7). IN THE TORQUE INDICATOR (8). CAUSING MOVEMENT OF THE POINTER.

NOTES:

TORQUE OVERLOAD SYSTEM IS OPERATIONAL ONLY WHEN EQUIPMENT ROTATES AS SHOWN ON THE GENERAL ARRANGEMENT DRAWING.
MICRO-SWITCH RATING: 15 AMPS @ 125 VOLTS 250 VOLTS AND 480 VOLTS.
ALL "AC" CURRENT.





SUGGESTED WIRING DIAGRAM

WORK THIS DRAWING WITH 10090-201, -202, -203, -205

CUSTOMER	MARTIN K. EBY CONSTRUCTION
LOCATION	FAYETTEVILLE, N.C.
ENGINEER	CH2M HILL

Envirex a Rexnord Company WAUKESHA WI. 53187

DIST'N

EST. NO.

DIMENSIONS IN INCHES UNLESS SPECIFIED — MICRO FILMED

TOLERANCES UNLESS OTHERWISE SPECIFIED
TWO PLACE DEC. ±.06
THREE PLACE DEC. ±.005
ANGULAR ±.50°
STRUCTURAL DIMENSIONS ± 1/16
MACHINED SURFACES 250

SCALE .25
DRAWING MADE FROM 703-1185

DR'N	PROJ. ENGR.	DATE ISSUED	PART OR ORDER NO.	DRAWING NO.
JR	TDP	8/17/89	10090	10090-204
CK'D DK	APP'D JS	PROD. CODE 4003		

TITLE: GENERAL ARRANGEMENT "H-60LT" SERIES TOW-BRO CLARIFIER SPECIFICATION

10090-205 ON DRAWING NO.

FORM NO. 12-14

LIST OF COMPONENTS

DRAWING NO. 10090-205

TITLE: GENERAL ARRANGEMENT TORQUE TEST DEVICE

UNIT | ITEM | REV.

ORDER NO.

NOTE: REFERENCE SYMBOLS, WHERE SHOWN, ARE TO ASSIST IN LOCATING COMPONENTS IN DIFFERENT VIEWS OF THIS DRAWING, ONLY. ALL LENGTHS ARE FINAL LENGTHS UNLESS SPECIFIED AS ROUGH ("RGH").

REFERENCE DRAWING NOS.

REF SYMBOL	QUANTITY	PART NUMBER	PART NAME OR MATERIAL SIZE AND DESCRIPTION	MATERIAL SPEC. ENGR. STD. NO.	LENGTH FEET	LENGTH INCHES
MAT'L. FOR ONE FIELD TEST						
1	8	841-19640	S56 PHILLIPS FLUSH SHELL-5/8"			
2	8	841-09940	5/8 ϕ x 1 1/2 LG. HEX CAPSCR,			
3						

(1) COLLECTOR TO BE RUN UNDER POWER BEFORE TEST EQUIPMENT IS INSTALLED.

(2) TEST EQUIPMENT TO BE INSTALLED AS NOTED AND SHOWN ON THIS DRAWING.

(3) CYLINDERS TO BE IN FULLY RETRACTED POSITION BEFORE STARTING TEST.

(4) THE DRIVE SHALL BE STARTED AND SHALL CONTINUE TO RUN UNTIL THE DESIRED TORQUE IS DEVELOPED. THE TORQUE LOAD SHALL BE CALCULATED FROM THE HYDRAULIC PRESSURE READ AT THE HYDRAULIC CYLINDERS, THE AREA OF THE CYLINDERS, AND THE DISTANCE FROM THE CENTER OF THE TANK.

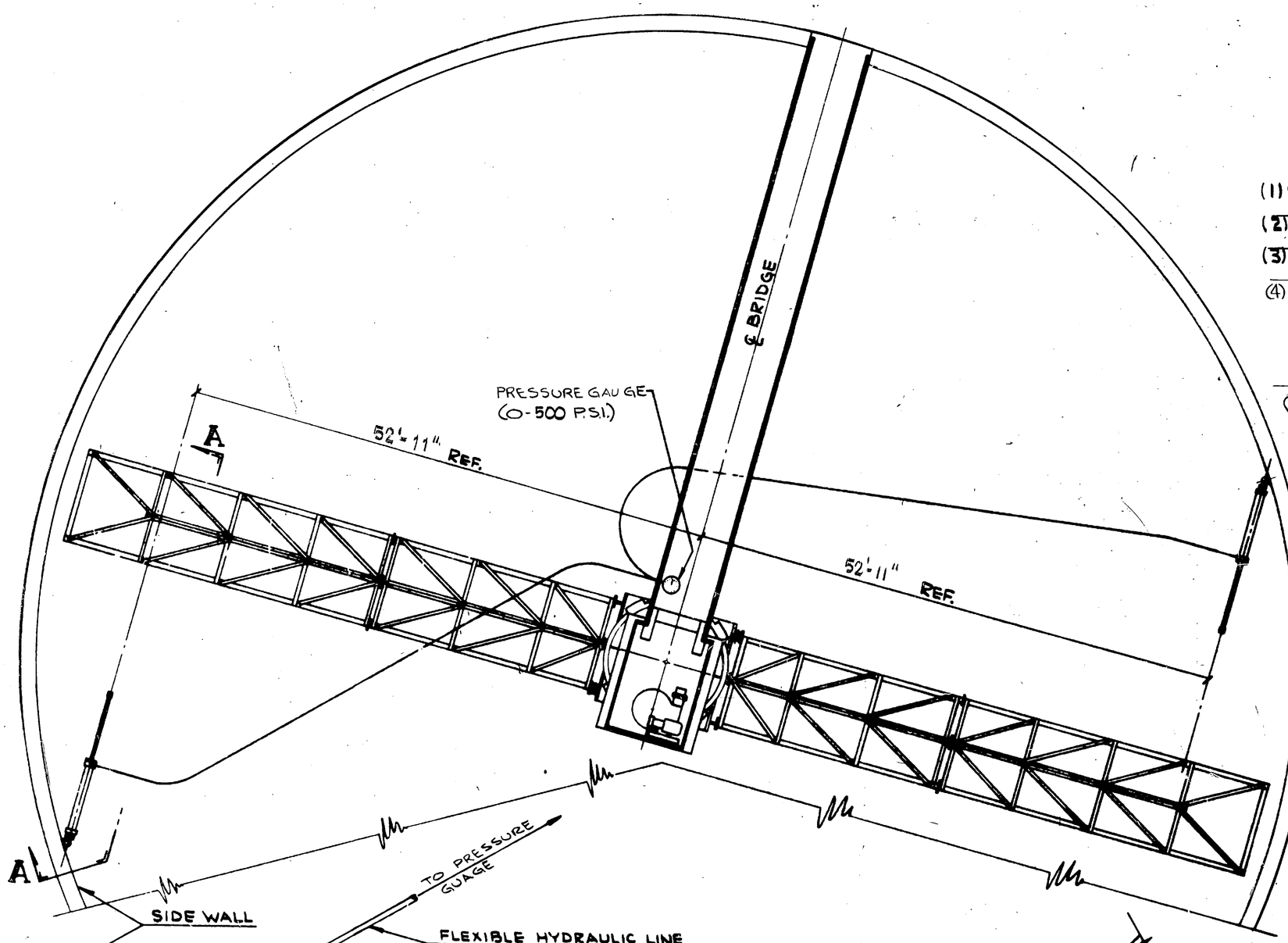
(5) THE DRIVE SHALL BE REVERSED BY USING A REVERSING SWITCH, OR BY SWITCHING THE MOTOR LEADS. THE TEST CAN BE REPEATED TO VERIFY THE SAME OR DIFFERENT TORQUE RATINGS

△2 (6) MECHANISM WILL TRAVEL APPROXIMATELY SIX (6) INCHES BEFORE THE PREDETERMINED GUAGE PRESSURES ARE ACHIEVED

(7) USE A REBAR LOCATOR TO AVOID DAMAGING WALL REBAR WHEN INSTALLING ANCHOR BOLTS FOR HYDRAULIC CYLINDER.

(8) ANCHOR BOLTS FOR HYDRAULIC CYLINDER MUST BE PLACED SO THAT, WHEN THE TORQUE TEST IS COMPLETED AND THE ANCHOR BOLTS ARE REMOVED, NO STEEL (INCLUDING SLEEVE) IS LEFT WITHIN ONE (1") OF THE CONCRETE SURFACE. FILL THE ENTIRE VOID WITH NONSHRINK GROUT.

△



TORQUE TEST SETTING	TORQUE (Ft. Lbs.)	PULL@ CYLINDER (Lbs.)	GAUGE PRESSURE * (PSI)
RUNNING 100%	33300	315	216
ALARM 100%	33300	315	216
SHUT-OFF 120%	39960	378	259
SHEAR PIN 130%	43290	409	280

* GAUGE PRESSURE BASED ON AN EFFECTIVE PISTON AREA OF 1.46 Sq. INCHES. (1½" DIA BORE - ⅝ DIA. ROD)

★ MOTOR SHUT-OFF MICROSWITCH MUST BE SET AT .025" GAP IN ORDER TO PERFORM SHEAR PIN TEST. RESET SWITCH TO .018" GAP AFTER TEST.

TOLERANCES UNLESS OTHERWISE SPECIFIED			
TWO PLACE DEC.	± .06	STRUCTURAL	± 1/16
THREE PLACE DEC.	± .005	DIMENSIONS	
ANGULAR	± .50°	MACHINED SURFACES	250

WORK THIS DRAWING WITH 10090-201, -202, -203, -204

REV.						
#6	JS	7/26/90	△2			
ADDED NOTES 6,7&8	TDP	5/21/90	△1	ORIGINAL ISSUE		
FINAL	TDP	10/26/89	ENGR. CHANGE NOTICE NO.	CHANGE NO. (INCL.)	MICRO FILMED	

LOCATION OF CHANGES

PAINT SPECIFICATION: ALL STRUCTURAL ITEMS TO RECEIVE COATS

MAT'L SPEC. | ENGR. STD. NO.

PROCESS SPEC. | ENGR. STD. NO.

SCALE: —

DIMENSIONS IN INCHES IF NOT SPECIFIED

DATE 8/17/89

DR'N AR

CK'D DK

IN CHARGE TDP

ESTIMATE NO.

CUST. ORDER NO.

APP'D

APP'D JS

CUSTOMER MARTIN K. EBY CONSTRUCTION

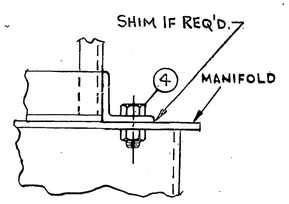
LOCATION FAYETTEVILLE, N.C.

ENGINEER CH₂M HILL

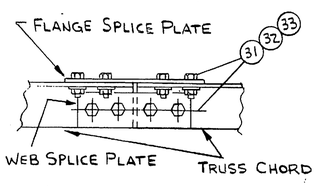
TITLE GENERAL ARRANGEMENT TORQUE TEST DEVICE FOR (2) 130'-0 DIA. HIGOLT TOW-BRO CLARIFIERS

Envirex a Rexnord Company — Water Quality Control Division, Waukesha, WI 53186

UNIT	ORDER NO.	DRAWING NO.
2	10090	10090-205

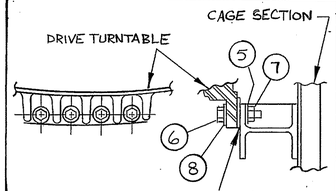


CAGE TO MANIFOLD 1

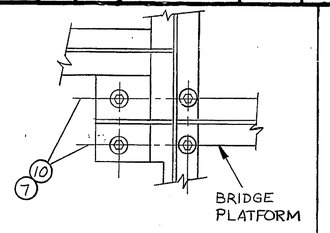


(BRIDGE TRUSS SECTIONS ARE MATCH MARKED)

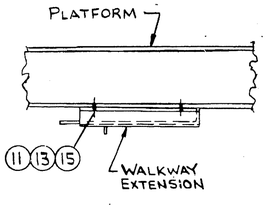
BRIDGE TRUSS CHORD 2



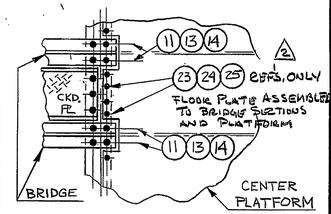
DRIVE TURNTABLE TO CAGE 3



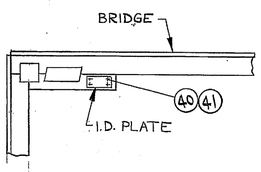
PLATFORM TO DRIVE HOUSING 4



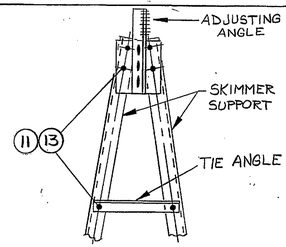
BRIDGE EXTENSION TO PLATFORM 5



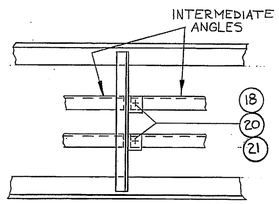
CENTER PLATFORM TO BRIDGE FLOOR PL TO BRIDGE AND PLATFORM 6



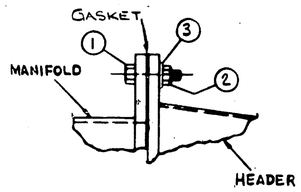
IDENTIFICATION PLATE TO TRUSS BRIDGE. 7



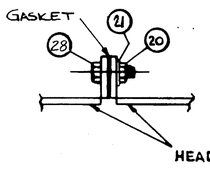
SKIMMER SUPPORT FRAME 8



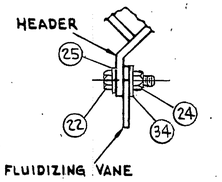
BRIDGE INTERMEDIATE ANGLE 9



UNITUBE HEADER TO MANIFOLD 10

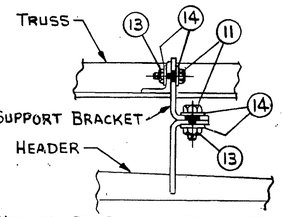


UNITUBE HEADER TO HEADER 11

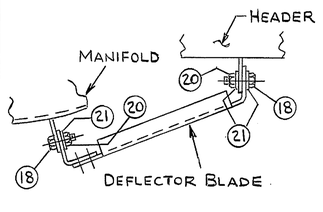


4

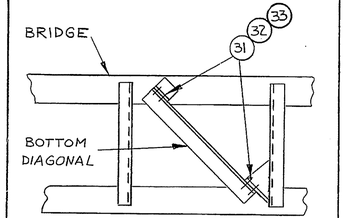
FLUIDIZING VANE TO HEADER 12



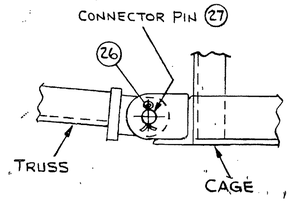
HEADER TO SUPPORT BRACKET AND BRACKET TO TRUSS 13



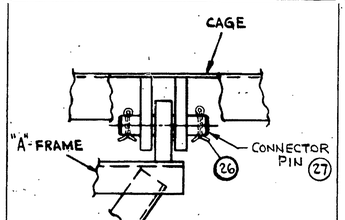
DEFLECTOR BLADE TO MANIFOLD AND HEADER 14



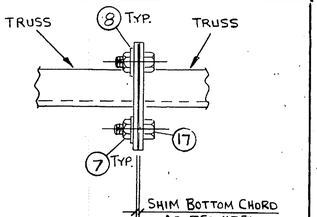
BRIDGE BOTTOM DIAGONAL 15



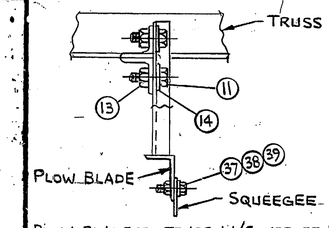
TRUSS TO CAGE 16



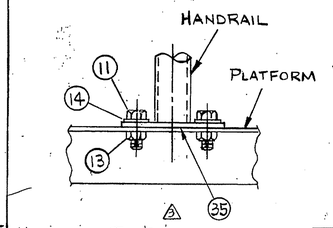
TIE CHORD "A" FRAME TO CAGE 17



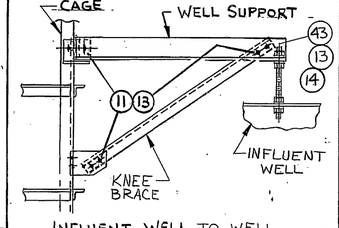
TRUSS TO TRUSS 18



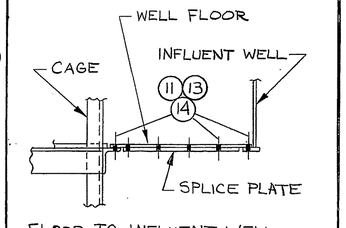
PLOW BLADE TO TRUSS W/SQUEEGEE 19



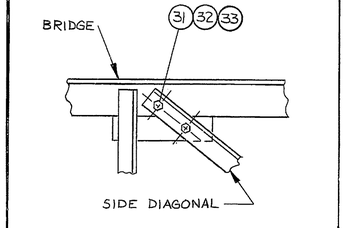
HANDRAIL TO BRIDGE PLATFORM 20



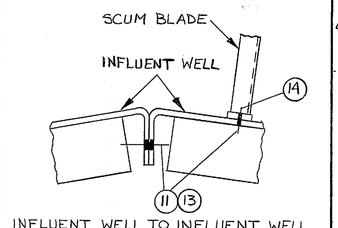
INFLUENT WELL TO WELL SUPPORT & WELL SUPPORT TO CAGE 21



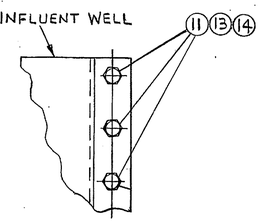
FLOOR TO INFLUENT WELL AND CAGE 22



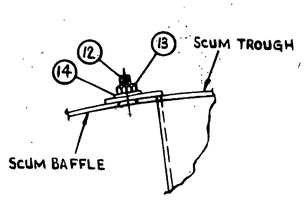
BRIDGE TRUSS DIAGONAL 23



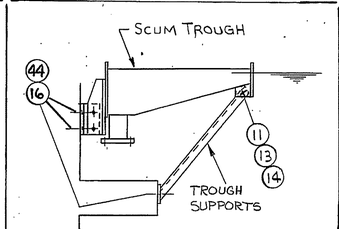
INFLUENT WELL TO INFLUENT WELL & SCUM BLADE TO INFLUENT WELL 24



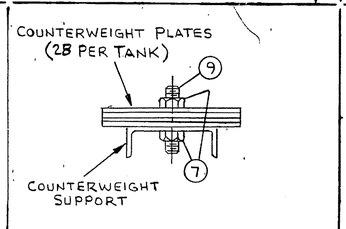
INFLUENT WELL TO INFLUENT WELL 25



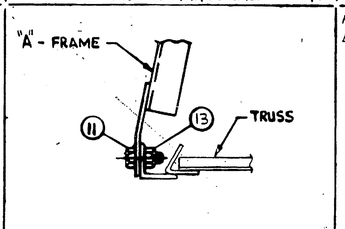
SCUM BAFFLE TO SCUM TROUGH 26



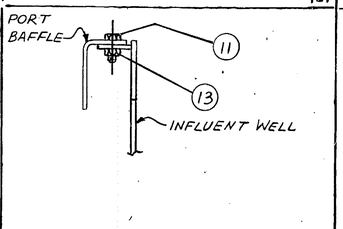
SCUM TROUGH TO SUPPORTS AND TANK WALL 27



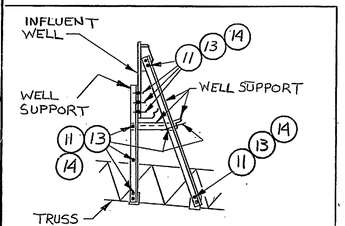
COUNTERWEIGHT PLATES TO SUPPORT 28



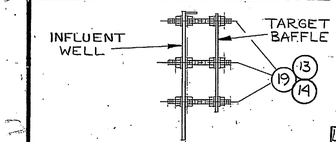
"A" FRAME TO TRUSS 29



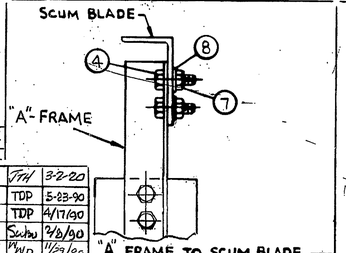
PORT BAFFLE TO INFLUENT WELL 30



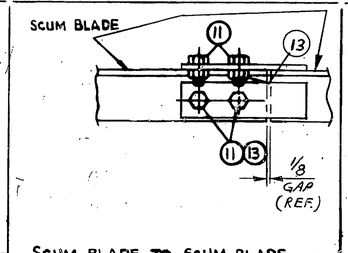
INFLUENT WELL TO TRUSS 31



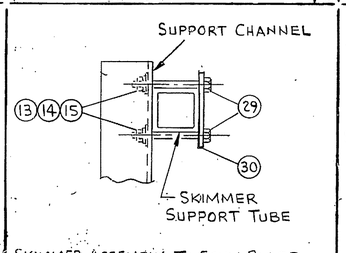
TARGET BAFFLE TO INFLUENT WELL 32



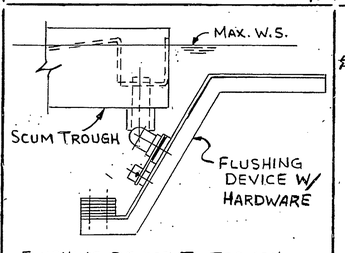
"A" FRAME TO SCUM BLADE 33



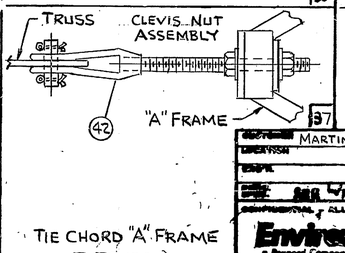
SCUM BLADE TO SCUM BLADE 34



SKIMMER ASSEMBLY TO SCUM BLADE 35



FLUSHING DEVICE TO TROUGH 36



TIE CHORD "A" FRAME TO TRUSS 37

LIST OF COMPONENTS

WEIGHT # 1125

TITLE: BOLTED CONNECTIONS

DRAWING NO. 10090-209

NOTE: REFERENCE SYMBOLS, WHERE SHOWN, ARE TO ASSIST IN LOCATING COMPONENTS IN DIFFERENT VIEWS OF THIS DRAWING, ONLY. ALL LENGTHS ARE FINAL LENGTHS UNLESS SPECIFIED AS STOCK ("BOM").

ASSEMBLY SYMBOL	REF SYMBOL	QUANTITY	PART NUMBER	PART NAME OR MATERIAL SIZE AND DESCRIPTION	MATERIAL SPEC. GRADE, ETC. NO.	LENGTH FIRST	LENGTH THICKNESS
				FIELD BOLTS - SHIP LOOSE (2-TANKS)			
	1	32		7/8 x 2 3/4 LG. CAP SC.	316 S.S.		
	2	32		7/8 HEX NUT	316 S.S.		
	3	32		7/8 LOCKWASHER	316 S.S.		
	4	48		3/4 x 1 3/4 LG CAP SC.	316 S.S.		
	5	32		3/4 LOCKWASHER	316 S.S.		
	6	32		3/4 x 3" LG CAP SC.	316 S.S.		
	7	112	841-20385	3/4 HEX NUT	S.S.		
	8	92		3/4 C.W	316 S.S.		
	9	4		3/4 x 1'-5 LG. THREADED ROD	316 S.S.		
	10	16		3/4 x 1 1/4 LG. CAP SC.	316 S.S.		
	11	1454		5/8 x 1 3/4 LG. CAP SC.	316 S.S.		
	12	12		5/8 x 1 1/2 LG. F.H.M.S.	316 S.S.		
	13	1,930	841-20305	5/8 HEX NUT	S.S.		
	14	1,872		5/8 C.W.	316 S.S.		
	15	40		5/8 LOCKWASHER	316 S.S.		
	16	14		5/8" x 7 1/2" LG. MOLLY PARABOND STUD Z588-M16	316 S.S.		
	17	28		3/4 x 2 1/2 LG. CAP SC.	316 S.S.		
	18	24		1/2 x 1 1/2 LG. CAP SC.	316 S.S.		
	19	96		5/8 x 12" LG. THREADED ROD	316 S.S.		
1	20	198	841-20225	1/2 HEX NUT	S.S.		
1	21	198		1/2 C.W.	316 S.S.		
	22	154		3/8 x 1 1/4 LG. CAP SC.	316 S.S.		

10090-209

2	23			3/8 x 1 1/2 LG. CARR. BOLT	316 S.S.		
1	24	154	841-20125	3/8 HEX NUT	S.S.		
1	25	154		3/8 FLAT WASHER	316 S.S.		
	26	64	841-19221	1/4 x 2 1/2 LG. COTTER PIN	S.S.		
	27	32	103-50824-10	1 1/2 Φ x 4 1/2 CONNECTOR PIN	S.S.		
1	28	174		1/2 x 2 LG. CAP SC.	316 S.S.		
	29	16		5/8 x 4 LG. CAP SC.	316 S.S.		
	30	8	503-81920-89	ATTACHMENT PLATE	GALV.		
	31	120		5/8 x 1 3/4 A325 BOLT	HOT DIP GALV.		
	32	120		5/8 NUT A194 GR 2H	HOT DIP GALV.		
	33	120		5/8 WASHER A325	HOT DIP GALV.		
	34	154	103-81482-1	3/8 FENDER WASHER	S.S.		
2 2	35	2-ROLLS	841-29110	INSULATING TAPE 2" 3M-#21 BLACK	"		
	36						
	37	216	841-08650	3/8 x 7/8 LG. CAP SC.	BRASS		
	38	216	841-20140	3/8 HEX NUT	BRASS		
	39	216	841-21860	3/8 C.W.	BRASS		
	40	16		#10-24 x 3/4 LG. R.H.M.S.	316 S.S.		
	41	16		#10-24 HEX NUT	316 S.S.		
	42	8	603-30975-83	#5 CLEVIS NUT ASS'Y.	S.S.		
	43	16		5/8 x 1'-6" LG. THREADED ROD	316 S.S.		
4	44	14		MOLLY PARABOND CAPSULE (MIG-58) FOR 5/8"			

5 REFER TO NEW FIELD MATERIAL DRAWING 10090-250 ASSOCIATED TO MAJOR REPLACEMENT OF BOTH TOW-BRO SECONDARY CLARIFIERS PER SO 982312 (MAR 2020)

5		ADD NOTE → NEW FM DRAWING	JTH	3-2-20
4	4/1	ITEM 16 WAS RAWL STUDS, ADDED ITEM 44	TDP	5-23-90
3	3	ADDED QTY OF 2-ROLLS FOR ITEM 35	TDP	4/17/90
2	2	BOLTS - NUTS - WASHERS MOVE DETS. CALLED OUT ON DRAWING	Subtw	4/6/90
1	1	REVISED PER HEADER REDESIGN	PMD	11/29/89
ORIG. DRAWING 439.00 SO.	REV. NO.	DESCRIPTION OF REVISION	REV. BY	DATE

MFG. STATION OF ORIGIN

Martin K. Eby Construction

Envirex — A Rexnord Company — Water Quality Control Division — Waukesha, WI 53186

H12L430-306

SCALE: WHEN PRINTED 22" WIDE AT FULL SCALE

DES. KR

DFT. Subtech

APP'D JS

DATE 10/08/89

CHK'D TDP

DATE 10/08/89

TITLE: BOLTED CONNECTIONS FOR 130'-0 DIA. TANK H60LT DRIVE TOW BRO (2) TANKS

DRAWING NO. 10090

SHEET NO. 2 OF 2 SHTS.

10090-209

REV. 5

Section 2
Tow-Bro H Drive Manual

TOW-BRO® CLARIFIER
H-DRIVE

MANUAL .082

TABLE OF CONTENTS

SECTION 1 CONTENTS

TOW-BRO® CLARIFIER, H-DRIVE

The instructions and recommendations in this manual are intended to assist the Erecting Contractor, the Plant Operator and Maintenance Personnel.

Because plant design varies according to Engineer's specifications, State and Local codes and Insurance and Underwriters' requirements, the instructions are necessarily general in nature. If more specific information is required or if questions of a technical nature arise, please contact your local **Evoqua** representative or the factory. (See the GENERAL INFORMATION section.)

Recommendations on the storage of this equipment are included in the GENERAL INFORMATION section of this manual.

All drawings submitted are to be found in the manual pocket. These include General Arrangement Drawings specifically for erection.

SAFETY PRECAUTIONS

General Safety Precautions to be used in erecting, operating and maintaining this equipment are included in the GENERAL INFORMATION section of this manual. Precautions that are specific to Circular Clarifiers are included within the text of this manual. A caption of CAUTION, WARNING or DANGER indicates the severity of the hazard and a graphic symbol indicates the nature of the hazard. Recommended precautions are included in the text, adjacent to the symbol.

The primary hazards associated with installing circular sludge clarification equipment are identified below.

HANDLING HEAVY EQUIPMENT

Circular clarifiers have large and heavy parts, which must be lifted and located during assembly.

Cranes, hoists and lifting gear must have a load capacity greater than the loads to be lifted. Lifting points should be selected with care and lifting harness should be stabilized. **Avoid hand lifting of heavy parts**.

PERSONNEL PROCEDURES

Installation procedures will require working in elevated positions. Secure ladders before use. Safety harness should be worn when there is danger of falling. **Do not use bridge without handrails in place. Do not work outside of the handrails.**

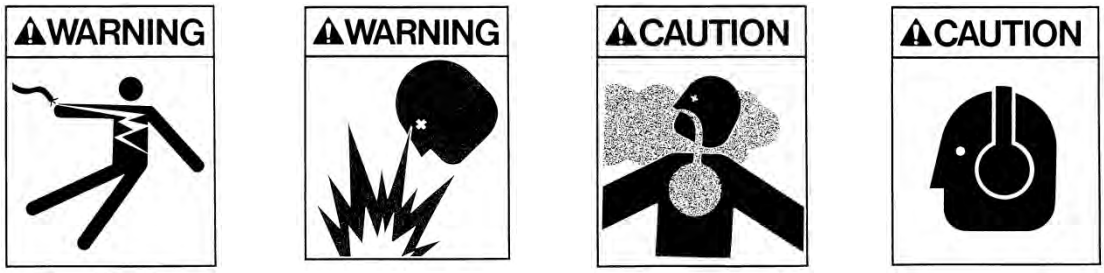
The access area for drive maintenance is below the bridge deck level. The difference in level will depend on the bridge design. A falling hazard exists. Use caution when in or near the access area.

FIRE HAZARDS

The use of welding equipment and cutting torches may be required in the erection of Circular Collectors. Some components may be made from polymeric materials. These materials are combustible. Metallic equipment is frequently coated with combustible substances. A fire can grow quickly, sometimes emitting toxic gases. Move combustible materials away from an area in which welding or cutting is being done. **Keep combustible materials away from heat and open flame. If a fire occurs, do not breathe fumes.**

Fire extinguishers and plant water must be available in the area. Workmen must be able to leave the tank quickly.

WELDING HEALTH HAZARDS



Since **Evoqua does** not know what welding processes and filler materials will be used for field welding, the following general welding health hazard data should be conveyed to welding personnel.

Arc rays can injure eyes and burn skin. **Heat rays** (infrared radiation from flame or hot metal) can injure eyes.

Overexposure to electric arc welding or oxy-fuel gas processes may create one or more of the following hazards. **Carbon Steels** - Excessive inhalation of metallic fumes and dusts may result in irritation of eyes, nose and throat. **Stainless Steels** -Cancer hazard (contains chromium and nickel). Excessive inhalation of metallic fumes and dusts may cause sensitation dermatitis, inflammation and/or ulceration of the upper respiratory tract and possible cancer of nasal passages and lungs.

Electric shock can cause injury or death.

Noise can damage hearing.

Read and understand the welding materials manufacturer's instructions and precautionary label on the product being used. For further health hazard details, consult the welding materials manufacturer's Material Safety Data Sheets.

GUARDS

Guards cover several points on Circular Clarifiers to prevent personal injury from moving parts. If guards are not in place during installation procedures, use caution when operating equipment and put guards in place when these procedures are complete.

STANDARD ERECTING PRACTICES

EVOQUA FABRICATED STEEL EQUIPMENT

Fabricated steel equipment manufactured by **Evoqua** should pose no unusual erecting problems. Due to the nature of such equipment and the condition of the containing structure (over which we have no control), a reasonable amount of fitup and adaptation is considered standard erection practice. The use of tools, such as "come-alongs", welding and cutting torches, drift pins and reamers, is to be expected.

When new units are tied into existing units, a major amount of fit-up may be required. Accumulated tolerances in the existing equipment usually require detail fit-up for tie-in and alignment.

Standard erecting practice, as defined by the AISC "Code of Standard Practice (3/05)," Section 7.14., specifically states that:

> "The correction of minor misfits by moderate amounts of reaming, grinding, welding or cutting, and the drawing of elements into line with drift pins, shall be considered to be normal erection operations. Errors that cannot be corrected using the foregoing means, or that require major changes in member or connection configuration, shall be promptly reported to the Owner's designated representatives for design and construction and the Fabricator by the Erector, to enable the responsible entity to either correct the error or approve the most efficient and economical method of correction to be used by others."

If a problem is traceable to fabrication or engineering, backcharges for replacing or correcting materials require prior written approval of an authorized **Evoqua** representative and will only be considered with prompt, complete cost documentation based on standard, direct field labor hours and material. Profit, overhead and all other charges will not be allowed. Payment may be refused for corrective work that is done without the above-mentioned approval and documentation.

FASTENER INSTALLATION

It is important to install fasteners so that they adequately connect the parts they are to join without loosening and without causing damage to the parts in the joint. In joints where there is a possibility of fatigue, or where a connection has been designed as slip-critical, proper pretension of the fastener must be provided.

Evoqua equipment is manufactured from traditional materials (metals) as well as materials that are on the leading edge of technology. Using the following instructions for fastener tightening will insure that your equipment is properly installed.

METAL TO METAL CONTACT

Evoqua uses common bolts and screws in the majority of joints where all plies in the joint are metal. Common fasteners are made from materials such as ASTM A307 steel and SAE grade 2 steel. In applications where corrosion is a concern, fasteners made from 300 series stainless steel are used. For these joints, the fasteners can be installed in the "snug-tightened" condition. From the Specification for Structural Joints Using ASTM A325 or A490 Bolts (June 23, 2000): "The snug-tightened condition is the tightness that is attained with a few impacts of an impact wrench or the full effort of an ironworker using an ordinary spud wrench to bring the connected plies into firm contact."

Unless a connection is made up with High strength bolts (A325, A490 or SAE grade 5 or grade 8) no pre-load is required.

For joints made up with high strength fasteners, the Research Council on Structural Connections (RCSC) of the American Institute of Steel Construction (AISC) recognizes three types of joints, snug-tight, pre-tensioned, and slip-critical. If a joint was designed as slip-critical, or requiring pre-tension, it will be indicated as so on the drawings. Use the procedures found in Section 8 of the Specification for Structural Joints Using ASTM A325 or A490 Bolts (2000, Research Council on Structural Connections c/o AISC) to properly preload the fasteners in the joint if preload is required.

NON-METAL CONTACT

For joints that involve one or more items that are not made from metal, there may be special instructions for the tightening of fasteners. Carefully read the instructions in the Operation and Maintenance Manual and the notes on the drawings where non-metal parts are used. There may be special fastener torque tables or other notes about making up the connection.

If the fasteners in a connection that involves a non-metal part are over torqued, there is the likelihood that the non-metal parts will be deformed or put into a failure mode. Because of the tendency of non-metal parts to exhibit high rates of material creep under load, there may also be requirements for retightening the fasteners after a period of time. Follow their instructions carefully.

If there are no specific instructions for tightening a fastener in a joint that has one or more non-metal parts, then it is sufficient to tighten the fastener until the parts are in complete contact, the fastener is tight and there is no deformation of the parts or of any washers that are included.

ANCHORS

Evoqua supplies many types of concrete anchors with our equipment. When a proprietary anchor is provided, whether it is adhesive style, wedge style or other, follow the anchor manufacturer's instructions to torque the nuts or bolts used with these anchors.

ERECTOR'S CHECKLIST

If your contract includes a factory pre-grout check by a **Evoqua** field service technician, the following should be completed before arranging the first site visit:

1. Install and plumb the center pier.
2. Grout in the center pier.
3. Install the entire mechanism including the bridge, handrail and grating or floor plate per these manual's instructions.
4. **DO NOT** grout under the drive at this time.
5. **DO NOT** operate the drive under power. This will damage the drive since there is NO oil in either the worm gear or the spur gear housings. The protective overloads are not set at the factory. They will be set by the technician.
6. A surveying level will be required for the technician to check the horizontal plane of rotation.

The technician will check the equipment installation on the pre-grout trip. After the equipment has been checked, the drive should be grouted.

A final mechanical start-up trip will be made by the **Evoqua** technician. Prior to this trip, permanent power will be required along with connections made to the torque overload switches. It is MANDATORY that the overloads be in service at this time. If a torque test is to be performed, the tank needs to be cleared of all debris. A witness will be needed for the test. If required, the equipment will be certified by the Field Service Manager after the technician's report has been submitted.

Operation and maintenance instructions will also be provided at this time.

FIELD BOLTS

Clarifiers utilize a hardware kit that contains the usual and customary hardware for a standard mechanism. Please note that some of the connections supplied in this kit may not be required on the furnished mechanism. The kit also contains hardware unique to the furnished mechanism. This kit is ordered from the Field Connection Drawings, located in this manual. The kit can be furnished from several different suppliers and can arrive at the job site in multiple shipments, usually at a different time than the equipment. The contractor should be aware of this and set aside a safe storage area for the hardware until it is required for erection.

SITE PREPARATION

Before actual erection of equipment has begun, a thorough inspection of the site is necessary. **Evoqua** assumes no responsibility for site preparation. We recommend that the site be cleared of all excess material to allow for safe and easy movement of the erection crew and their equipment. All foundation anchor bolts and other steel work embedded in concrete must be checked for cleanliness and accuracy of location. Continual referral to General Assembly Drawings and/or Anchor Bolt Layout Drawings will insure accuracy when equipment is erected. In the event of an error in location of the steel work or anchor bolts, they must be correctly positioned by the party(s) responsible before erection has begun.

If stainless steel bolts and nuts are used in the installation of the equipment, the bolt threads should be coated with a non-seizing compound such as "Never-Seez" or an equivalent.

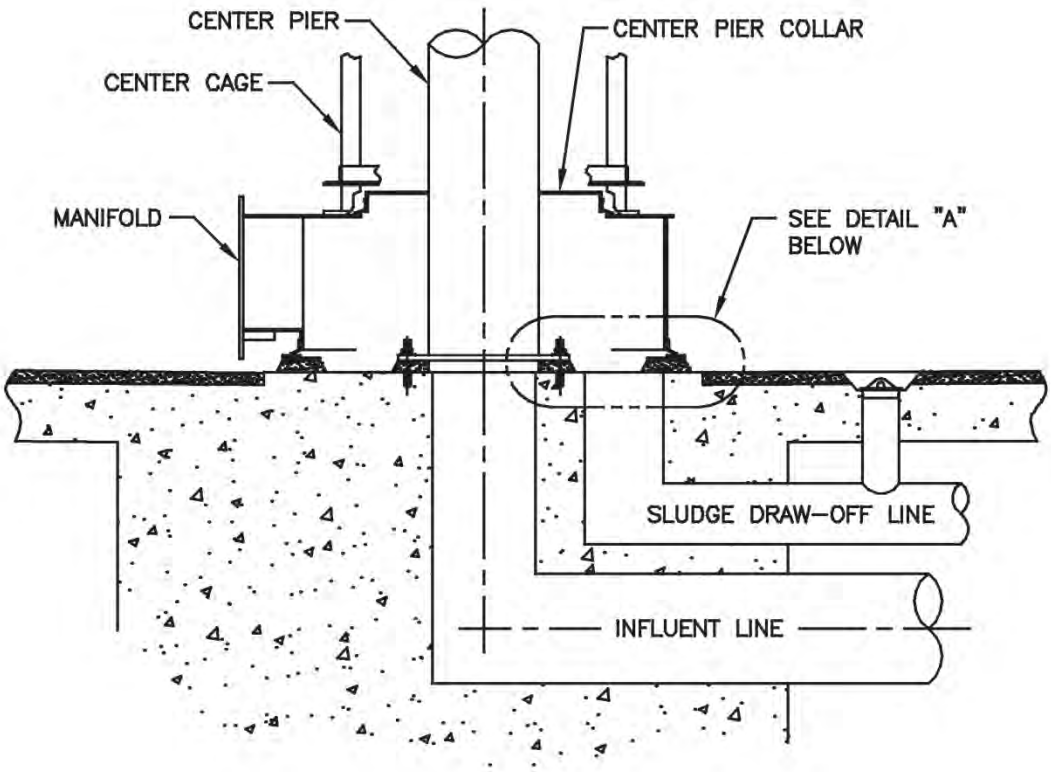
SETTING OF ANCHOR BOLTS - REFER TO *Figure 1*

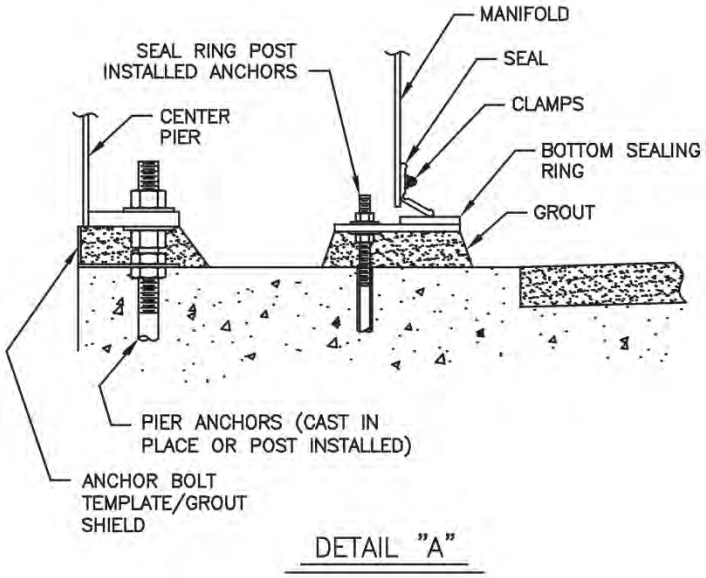
When constructing the tank, it will be necessary to locate and set the combination anchor bolt template and grout shield **exactly** in the center of the tank. Orient the bolt pattern with the centerline of the bridge as shown on the General Arrangement Drawings. This template locates the anchor bolts for the center pier. Set the anchor bolts as shown on the General Arrangement Drawings. Note that the lower jam nuts are used for setting the template at the design elevation. Secure the template with another jam nut before pouring the concrete base. Allow sufficient thread on the anchors to project above the concrete surface to plumb and grout the center pier at a later time. Refer to the General Arrangement Drawings.

SETTING OF MANIFOLD BOTTOM SEALING RING

NOTE: THE BOTTOM SEALING RING IS SHIPPED WITH THE MECHANISM AND MUST BE THE NEXT ITEM INSTALLED.

Locate and set the bottom sealing ring exactly in the center of the tank in relation to the center pier anchor bolt template and grout shield. Orient the anchor bolt pattern properly with the centerline of the sludge pit as shown on the General Arrangement Drawings. Drill and install the anchors. The lower jam nuts are used for setting the bottom sealing ring at the design elevation. The bottom sealing ring must be set level. Secure the bottom sealing ring with plain washers and hex nuts on the anchor bolts. *See Figure 1*.





TYPICAL CENTER COLUMN BASE WITH ANCHORS
Figure 1

CENTER PIER INSTALLATION

Check the bolt circle of the center pier top flange drive mounting studs to verify concentricity with the center pier. If the bolt circle is not concentric, call Evoqua Customer Service. (See the contact list in the GENERAL INFORMATION section.)

After the concrete around anchor bolts has cured, run a full hex leveling nut and cut washer down on each bolt of the center pier anchor bolts. Adjust the level of these washers and nuts to the design elevation of the center pier bottom flange, within +/- 1/16" (1.5 mm).

Although the anchor bolts are now ready to receive the center pier, some comparative measurements will have to be made to determine which components must enter tank first, the center pier or the center cage assembly. Generally, the center pier will be placed first; occasionally the top of the center pier will be too wide for the manifold or cage to be dropped over it.

REFER TO THE GENERAL ARRANGMENT DRAWINGS FOR SPECIAL SEQUENCE OF INSTALLATION OR SPECIAL INSTRUCTIONS, IF REQUIRED, FOR THE CENTER PIER, MANIFOLD AND CENTER CAGE.

NOTE: H30 and H30A units require the center pier to be set per the detail on the General Arrangement Drawings (the top drive mountings are unsymmetrical).

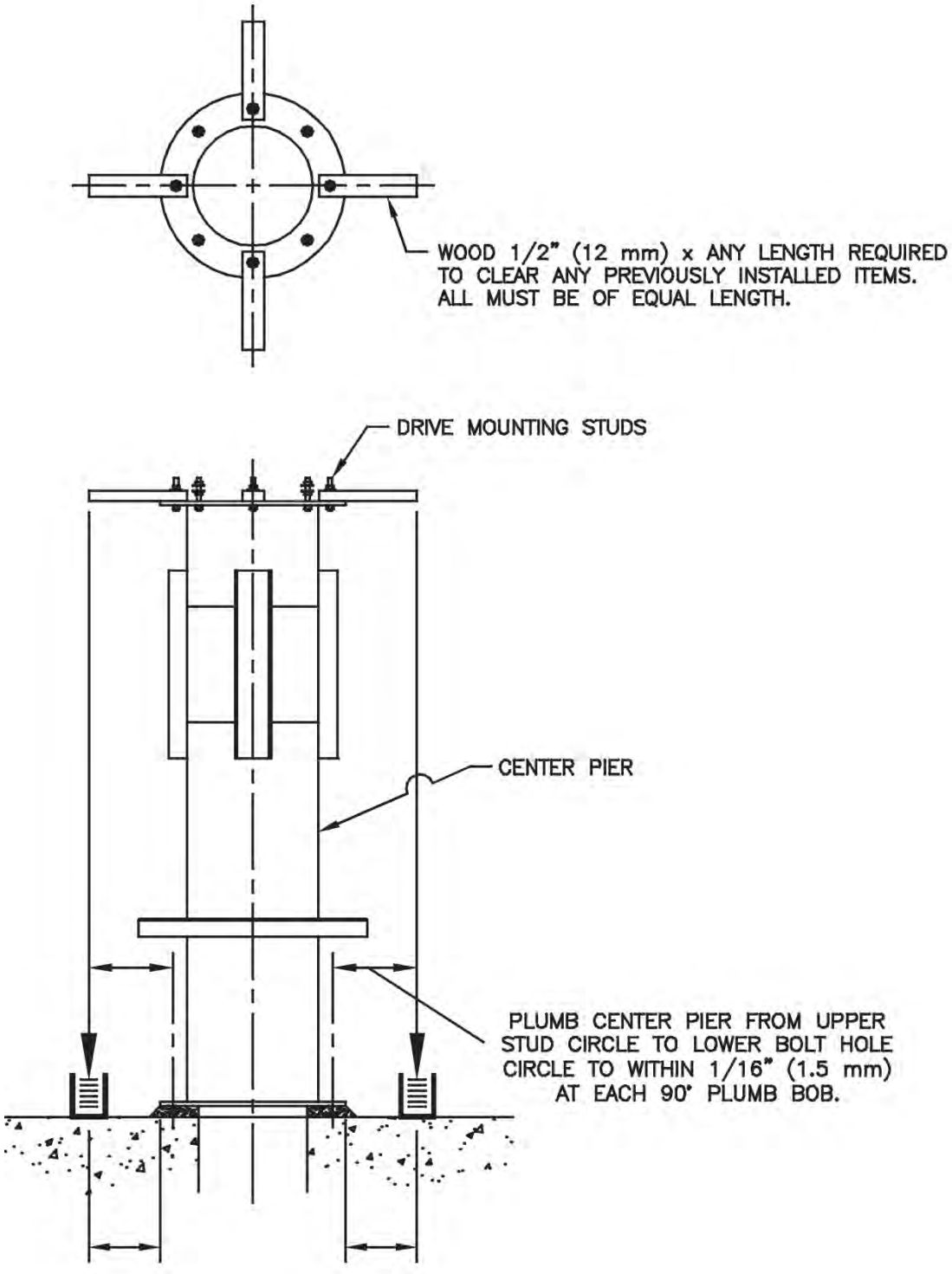
PLUMBING THE CENTER PIER

Important Note: If the center pier is not plumb to within 1/16 inch (1.5mm), the remainder of the rotating equipment and the drive will not function optimally. **Double check the pier for plumbness before placing the grout under the base flange.**

Drop four (4) plumb lines 90° apart and of equal distance from the top studs of the center pier. (See *Figure 2).* Let the plumb bobs hang in a can of water or oil to stabilize them. Measure in from each plumb line to the lower flange bolt holes. Adjust the leveling nuts under the pier until two measurements 180° apart from each other are the same to within 1/16" (1.5 mm). Then adjust the leveling nuts so the measurements are equal for the two remaining plumb lines. Tighten down the hold-down nuts per the Fastener Installation Instructions.

Adjust the bottom sealing ring for concentricity with the pier at this time. Measure from the four (4) plumb lines to the sealing ring. Measurements should be equal within 1/16" (1.5 mm). If any adjustment is necessary, re-level the sealing ring and then secure. (See *Figure 1).*

The center pier and bottom sealing ring should now be grouted in place with a non-shrink grout and allowed to cure for 24 hours.



PLUMBING THE CENTER PIER
Figure 2

ASSEMBLY SEQUENCE OF CENTER CAGE AND MANIFOLD

If the manifold or center cage assembly were not first in the tank, proceed as follows when center pier grout has cured:

1. Lower the manifold over center pier, taking care not to disturb the pier setting. Rest the manifold on 1/4" (6 mm) thick supports (anything but steel) so that the seal bearing plate is not gouged.

2. Lower center cage section(s) over the center pier and bolt to the manifold.

   NOTE: The manifold inlet(s) are to be in line with the truss lugs located on the cage. If not in line, rotate cage and align before bolting.

3. Cage and manifold can be bolted together outside of tank and lowered in one piece.

4. If influent well is furnished in one piece, place it over center pier/cage before drive unit is installed.

NOTE: The manifold seals are to be installed after the true plane of rotation has been established.

SETTING THE DRIVE ON THE CENTER PIER

Run a leveling nut and washer down each stud on the top flange of the center pier. The washers are to be at the bottom of drive elevation shown on the General Arrangement Drawing. Set with a machinist's level and straight edge long enough to reach diametrically opposed washers and level all washers.

Orient the bridge mounting pads on the top of the drive unit with respect to the bridge anchor bolts in the tank wall and lower the drive onto the center pier leveling washers. Check to see that all washers bear against underside of the drive base. Run a washer and full hex nut down each projecting stud and turn the nuts finger-tight. The drive elevation may have to be altered in subsequent final adjusting. *See Figure 3*

DO **NOT** GROUT THE DRIVE UNTIL THE ASSEMBLED MACHINERY HAS BEEN ADJUSTED TO RUN IN A TRUE PLANE.

DRIVE UNIT MAIN HOUSING ON CENTER PIER

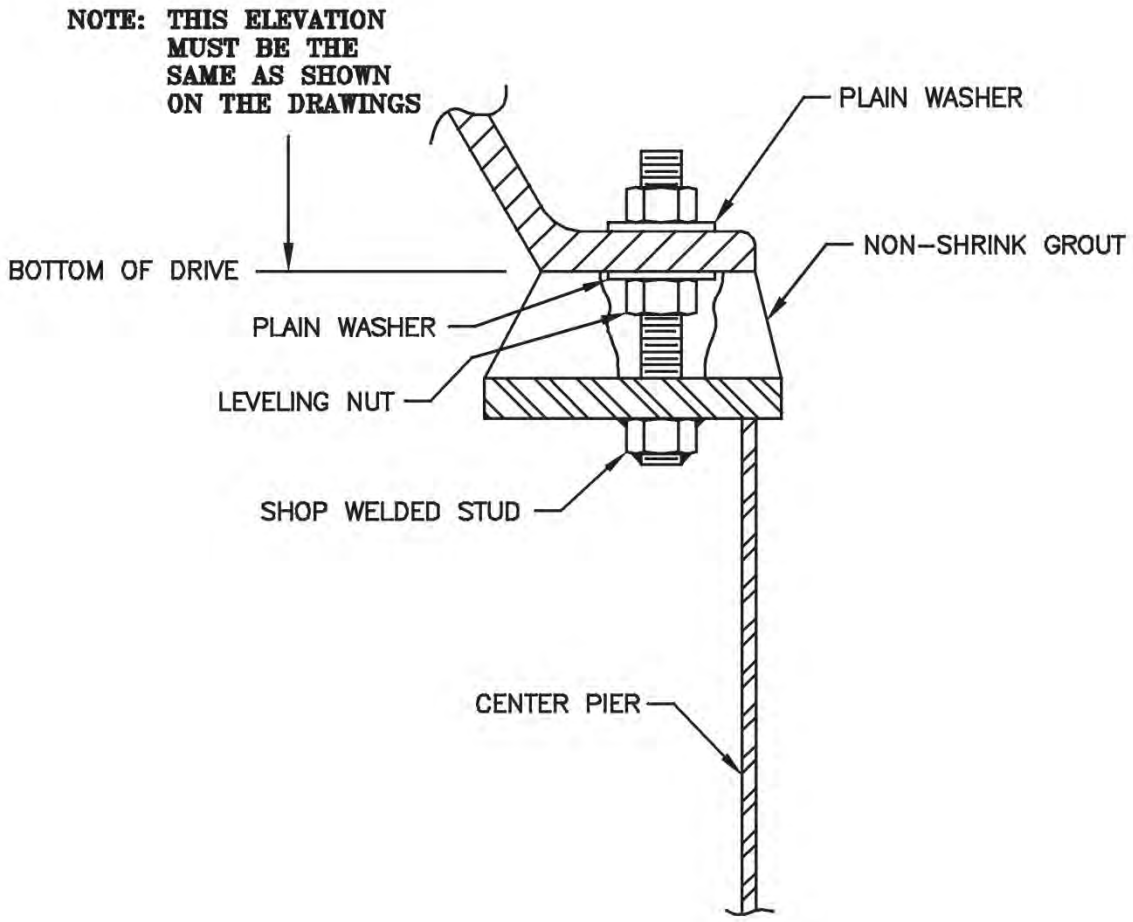


Figure 3

ASSEMBLING THE CENTER CAGE TO DRIVE

Lift the center cage up and secure to the lugs on the final drive ring gear. Hand tighten the nuts at this time.

NOTE: Standard cage lengths are detailed and fabricated in one-inch increments. Shim packs for the cage-to-drive connection have been furnished to compensate. It may be necessary to shim to obtain proper clearance between unitube header and the finished floor and to obtain concentricity at the manifold seals.

INSTALLING MANIFOLD ON TOW-BRO UNITS

Raise the manifold and secure it to the bottom of center cage if not already completed. Note that the bottom of the manifold is to be horizontal and must clear top surface of the bottom sealing ring by no less than 1/2" (13 mm.). Measure this vertical distance around perimeter of manifold. If it is not constant within +/- 1/16" (1.5 mm), shim between the top of the manifold and the center cage to attain that condition.

Check concentricity between center pier and the clearance hole in the top plate of the manifold. Measure either to the pier itself or to the seal ring and verify that the two are concentric to 0.25 in (6mm) on the diameter. If not, make a note and recheck after the unit has been adjusted to rotate in a horizontal plane (horizontal plane is set later in the installation). If at that time concentricity is not within 0.25 in (6mm) call Evoqua Customer Service, see the contact list at the front of this manual.

Do not install the manifold seals at this time.

BRIDGE INSTALLATION

There are several types of access bridges that can be furnished depending on the individual unit's requirements. Refer to the Field Bolt Connection Drawing for details and hardware requirements.

BEAM BRIDGE, WITH OR WITHOUT PLATFORM

Using a transit, sight in the center of drive, center pier and center pier anchors. Move the transit to the tank wall, locate and install bridge anchors. After anchors have cured, level and adjust the bridge base plate to the correct elevation. Place the bridge slide plate over the base plate. **Using care not to knock the center pier out of plumb**, install bridge on to the drive and tank wall slide plates. Install bolts at the drive and pipe spacers with nuts and washers at the wall anchors. Do Not clamp the bridge to the tank wall; it must be free to expand or contract with changes in temperature.

TRUSS BRIDGE, WITHOUT PLATFORM

Install as per the beam bridge instructions listed above. Check Field Bolt Connection Drawing for plate washer requirements.

TRUSS BRIDGE, WITH PLATFORM

Using a transit, sight in the center of drive, center pier and center pier anchors. Carry this to the tank wall, locate and install bridge anchors. After anchors have cured, level and adjust the bridge base plate to the correct elevation. Place the bridge slide plate over the base plate. **Using care not to knock the center pier out of plumb**, install center platform to drive using the required hardware **and plate washers** as indicated on the Field Connection Drawing. Install truss over slide plates at the tank wall and bolt to platform. Use pipe spacers provided with the nuts and washers at the wall anchors. Do Not clamp the bridge to the tank wall; it must be free to expand or contact with changes in temperature.

TRUSS BRIDGE, WITH WELL SUPPORTING PLATFORM

Using a transit, sight in the center of drive, center pier and center pier anchors. Carry this to the tank wall, locate and install bridge anchors. After anchors have cured, level and adjust the bridge base plate to the correct elevation. Place the bridge slide plate over the base plate**. Using care not to knock the center pier out of plumb**, install center platform to drive using the required hardware **and plate washers** as indicated on the Field Connection Drawing.

H40 CLARIFIER ONLY: Install pony truss over slide plates at the tank wall and bolt to platform. Use pipe spacers provided with the nuts and washer at the wall anchors. Do Not clamp the bridge to the tank wall; it must be free to expand or contact with changes in temperature. The well support beams can then be mounted to the platform/bridge.

H60 CLARIFIER ONLY: After installing the platform, mount the influent well support beams. Bolt platform supports to well support beams before installing the pony truss bridge.

BRIDGE INSTALLATION NOTES

1. The bridge is rigidly secured to the drive unit/platform, but has a sliding “expansion” joint at the tank wall. The wall anchors must have pipe spacers installed to prevent binding of the bridge during expansion/contraction. Insure there is sufficient space at end of bridge for expansion. If, due to misalignment of the anchor bolts, sufficient room does not exist, the slotted holes will have to be enlarged. If stairs or other appurtenances are attached to the bridge, then provisions for expansion/contraction must be made by the supplier of those items.

   The bridge must be level within +/- 1/4" (6 mm) and the bridge beams/chords should be level to each other within +/- 1/8" (3 mm).

2. Bridges with Floor Plates. Floor plates should be laid on bridge loose, per item numbers indicated on the General Arrangement Drawing. Adjust gaps between plates for even spacing. The plates are furnished with a standard hole spacing to minimize field drilling of attachment holes. It is anticipated some field drilling will be required. Contractor is to install minimum amount of clips required to secure floor plate and eliminate possible tripping hazards. If required, floor plate can be bolted directly to bridge structure, but should be limited to one connection per plate so as not to inhibit expansion/contraction of floor plate.

3. Bridges with Grating. Grating panels should be laid on bridge loose, per item numbers indicated on the General Arrangement Drawing. Adjust gaps between panels for even spacing. Fasten with clips and stainless steel, self-drilling screws.

4. Install the handrail per the Field Connection Drawings and the vendor's instructions.

FEDWA BAFFLE OR INFLUENT WELL SUPPORT INSTALLATION

Install well support channels to cage per General Arrangement Drawings and Well Fabrication Drawing. Support channels and cross support beams of larger wells are cambered and care should be taken when installing.

FEDWA BAFFLE INSTALLATION (If supplied)

Install the FEDWA baffles per the General Arrangement, Detail, and Field Connection Drawings.

INFLUENT WELL INSTALLATION

ROTATING TYPE, CAGE SUPPORTED

Attach hanger rods to supports. Hang well sections in an alternating, counterbalancing progression. Note; some larger wells require having well stiffener splices field drilled or welded to maintain concentricity. These wells should be assembled on the tank floor and adjusted for concentricity before hanging.

NOTE: It is important to hang the well in an alternating, counterbalancing progression. If two cranes are not available to support one well section while the other is being placed, then a method of tie-down or counterweights must be used. Failure to do so could damage platform to drive connection.

FIXED TYPE, BRIDGE/PLATFORM SUPPORTED

Follow platform/bridge installation instructions. Hang all cross support beams, hanger rods and knee braces, if required. Note; some larger wells require having well stiffener splices field drilled or welded to maintain concentricity. These wells should be assembled on the tank floor and adjusted for concentricity before hanging.

NOTE: It is important to hang the well in an alternating, counterbalancing progression. If two cranes are not available to support one well section while the other is being placed, then a method of tie-down or counterweights must be used. Failure to do so could damage platform to drive connection.

ASSEMBLING THE SCRAPER AND /OR SKIMMER TRUSS OPPOSITE TOW-BRO HEADER

Lower all the truss sections and plow blades into the tank and locate and assemble these components in the position shown on the General Arrangement and Bolted Connection Drawings.

NOTE: Assemble scraper trusses or skimmer support trusses opposite the header at the same time the header is installed so that when all of the necessary components are assembled and tensioned and supports are removed, an equal load is acting on both sides of the unit.

It is imperative that the lower chord members of the trusses are parallel to the slope of the tank floor **unless the drawings specify otherwise**.

NOTE: The General Arrangement Drawings and Bolted Connection Drawing indicate that shims can be placed between the flanges of the lower joints of adjoining truss sections. Use shims to keep the truss parallel to the tank floor if necessary.

Shimming should result in the lower chord angles all being **in line**. If, after shimming, any are cambered downward, start with the **section** joint nearest the pier, **jack up** the low end of the truss section and add shims. Once the lower chord angles have been brought into line, they must then be made parallel to the floor. Jack up and support each section directly under the joint until the lower chords are parallel to the slope of the floor. When this is accomplished, **then** make adjustments at the TIE CHORD "A"-FRAME CLEVIS to **maintain** the new position. This clevis **is not** intended to be used as a jack. It is only an adjustable supporting device.

If supplied, **do not** assemble the squeegees to the plow blades at this time. Assemble them **after** the unit has been balanced, adjusted for true plane of rotation and the floor has been finish grouted. **Do not** apply the finished tank floor grout at this time.

ASSEMBLING UNITUBE HEADER (S) - TIE BAR SUPPORTED UNITS

Lower all header(s) and truss sections into the tank and locate these components in the approximate positions shown on the General Arrangement Drawing.

If two or more unitube headers are used on a Tow-Bro Clarifier, each header section that comprises a completed header assembly will be match-marked so that sections from one (1) header cannot be inadvertently assembled to sections of another.

Block up header sections so that they can be joined to the manifold and to each other without putting any load into the manifold.

Assemble scraper trusses or skimmer support trusses opposite the header at the same time so that when all of the necessary components are assembled and tensioned and supports are removed; an equal load is acting on both sides of the unit.

The following general rules apply to the relationship of the rotating equipment and the tank floor:

1. Unitube header **should always** be set **parallel** to the finished floor.

2. Truss opposite header for skimmer support only **should always** be installed **parallel** to the finished floor.

3. Truss opposite header for skimmer and scraper blade support should always be set **parallel** to the finished floor.

The Tow-Bro header(s) and tie bars can now be assembled. Use silicone caulk, furnished, when bolting the sections together. Bolt sections in place using suitable blocking between header and tank floor, so that no strain exists at the manifold. Erect tie bars (if furnished) and tighten. The header must be straight and must not be pulled out of line by unequal tension on the bars. The header should be checked for proper height at all points. The header lip will slope toward the manifold. It should be higher at the outer end to conform to the design slope of the tank floor.

ASSEMBLING UNITUBE HEADER (S) - TRUSS SUPPORTED UNITS

Lower all header(s) and truss sections into the tank and locate these components in the approximate positions shown on the General Arrangement Drawings.

If two or more unitube headers are used on a Tow-Bro Clarifier, each header section which comprises a completed header assembly will be match-marked so that sections from one (1) header cannot be inadvertently assembled to sections of another.

Block up header sections so that they can be joined to the manifold, to each other and to the support truss without putting any load into the manifold, maintaining proper floor clearance. Leave all nuts finger-tight at this time.

The following general rules apply to the relationship of the rotating equipment and the tank floor:

1. Unitube header should always be set parallel to the finished floor.

2. Header support truss should always be installed parallel to the floor.

3. Truss opposite header for skimmer support and scraper blade support (if scraper blades are provided) should always be installed **parallel** to the floor.

After the header sections have been blocked up into position, the support trusses can be mounted, starting with the section, which attaches to the center cage.

Locate unitube header mounting plates and attach header support hanger pipe to each plate. Slide header support angle through support truss, resting on the double angle bottom chords. The header support angle has holes for both 4' (1,219 mm) and 5' (1,524 mm) trusses. Center angle on truss and locate using the header hanger pipes. Either drill and bolt or weld support angle to truss arm. Assemble U-bolts, to pipe hangers.

Once all of the header sections are bolted together and the entire unitube header is bolted to the support truss, the bolts, which attach the header flange to the manifold flange, can be assembled.

If this flange-to-flange connection cannot be made with relative ease, contact the factory.

All attachment bolts can now be tightened, moving outward from the tank center. After all final adjustments, tack weld header hanger pipes to support angle.

NOTE: The General Arrangement Drawings and Bolted Connection Drawing indicate that shims can be placed between the flanges of the lower joints of adjoining truss sections when more than one (1) truss section is provided.

The shimming should result in the lower chord angles all being in line. If, after assembling, any are cambered downward, start with the section joint nearest the pier, **jack up** the low end of the truss section and add shims. Once the lower chord angles have been brought into line, they must then be made parallel to the floor. Jack up and support each section directly under the joint until the lower chords are in line. When this is accomplished, then make adjustments at the TIE CHORD A-FRAME CLEVIS to maintain the new position. This clevis is not intended to be used as a jack. It is only an adjustable supporting device.

SCUM TROUGH INSTALLATION

Install the weirs and scum baffles first, and then attach the scum trough to the scum baffles. Connecting bolts for this assembly should not be torqued to final values; this will allow later adjustment to obtain concentricity with the hinged skimmer.There must be no bolt heads, weld beads or other projections on the inboard surface of the scum baffle that could interfere with the rotating scum skimmer.

FLUSHING DEVICE

Install flushing device per the General Arrangement and Field Connection Drawings. Also Refer to the Flushing Device Operation Drawing.

SCUM BLADE INSTALLATION

Scum blades are usually supported by "A"-frames bolted to the scraper trusses. Various designs are furnished. The type for your unit is shown on the following: General Arrangement, Surface Skimmer and Bolted Connection Drawings.

When installing the scum blade, the following sequence is suggested.

1. Locate and field drill or weld "A"-frame support clips to truss arms per General Arrangement Drawings.
2. Bolt the "A"-frames to the truss, temporarily blocking them in position until the assembly becomes self-supporting. Install pipe supports loosely to "A"-frames.
3. Clamp the scum blade to "A"-frame pipe supports. Locate clamps so "A"-frames are vertical. Set scum blade elevation as indicated on General Arrangement Drawing. If well is rotating, field drill or weld scum blade to well. Continue to snug all bolts as adjustments are made.
4. Tack weld vertical pipe supports to U-bolts after all final adjustments are made and verified.

HINGED SKIMMER INSTALLATION (*Figure 4*)

To install the hinged skimmer assembly **1**, rotate the fixed scum blade **2** to a position in line with the scum beach. Bolt the tube support **3** of the hinged skimmer assembly to the long upright pipe supports of the A-frame **4**. The skimmer blade and side wipers **5** must be free to move through the scum trough without any binding. Level the skimmer blade **6** using the adjusting bolts. The skimmer blade should be set with 3" (76 mm) (4" [102 mm] including wiper) submergence below the maximum water level unless indicated otherwise on the General Arrangement Drawings. The spring loaded hinged guide **7** should contact the inner side plate of the scum beach as the skimmer travels through the beach. Positive contact can be maintained by preloading the hinged guide spring or by adjusting the location of the mounting plate on the skimmer support tube **3**. Rotate the collector and adjust the spring loading if necessary.

After final adjustments are made, tack weld all U-bolts to vertical pipe supports.

Some of the following adjustments may be needed after the tank is filled and the actual operation observed.

1. Horizontal adjustment of the hinged guide and adjustment of the guide spring to insure constant contact with the inner wiper.

2. Lateral skimmer blade movement through adjustment of the spring tension.

3. Skimmer setscrew adjustment to regulate the depth of the blade after passing over the scum trough. The blade should extend 3" (76 mm) (4" [102 mm] including wiper) below the maximum water surface.

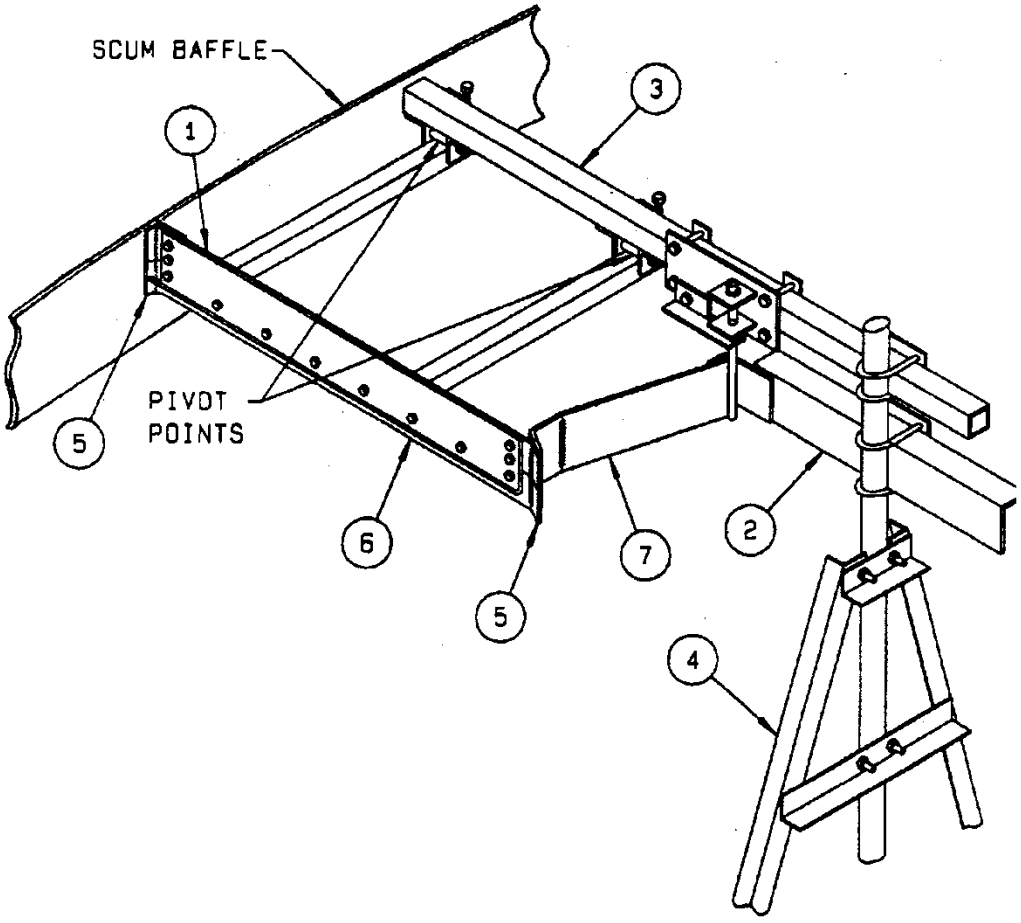


Figure 4

COUNTERWEIGHT INSTALLATION

Most mechanisms are not symmetrically loaded and, therefore, counterweights are required to balance the rotating portion of the unit. The location and quantity of counterweight plates is indicated on the first sheet of the General Arrangement Drawings. If the quantity is not indicated, the total number of plates shipped divided by the number of clarifiers is the quantity of weight per tank. The mounting arrangement and hardware is illustrated on the Field Connection Drawing.

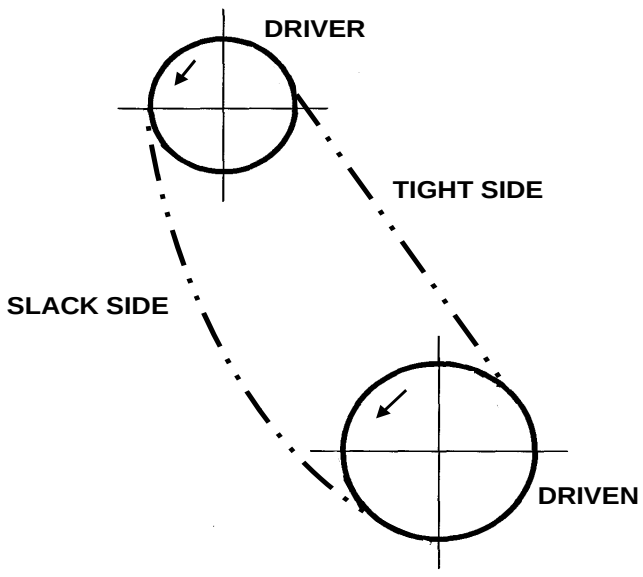
DRIVE CHAIN INSTALLATION

Proper installation of power drive chains is important.

The correct amount of slack is essential to the proper operation of chain. See *Figure 5*. Unlike belts, chain requires no initial tension and should not be tightened around the sprockets. Properly adjusted chain drive should permit slight flexure by hand in the slack strand.

When chain is too tight, the working parts carry a much heavier load than is necessary. This causes rapid chain wear because of increased pressures in the joints. In addition, this condition overloads and accelerates wear in the shaft bearings.

Check the alignment of sprockets with a straight edge applied to the machined surface of the sprockets.



CW COLLECTOR ROTATION
Figure 5

ADJUSTING FOR TRUE PLANE ROTATION

Now that the unit is assembled, it should be in static balance. With the unit in static balance, you can proceed to adjust the machinery to rotate in a true horizontal plane.

Before the drive can be grouted to the center pier or the tank floor can be finish grouted, the scraper arms must be adjusted to revolve in a true plane. Refer to *Figure 6.* At this time, all rotating machinery, including surface skimmers, counterweights, etc., should have been assembled and the machinery checked for balance. In the following procedure, you will be working with the unitube header to establish true plane rotation. After the drive mechanism has been adjusted, the rotating members are merely adjusted for slope parallel to the floor.

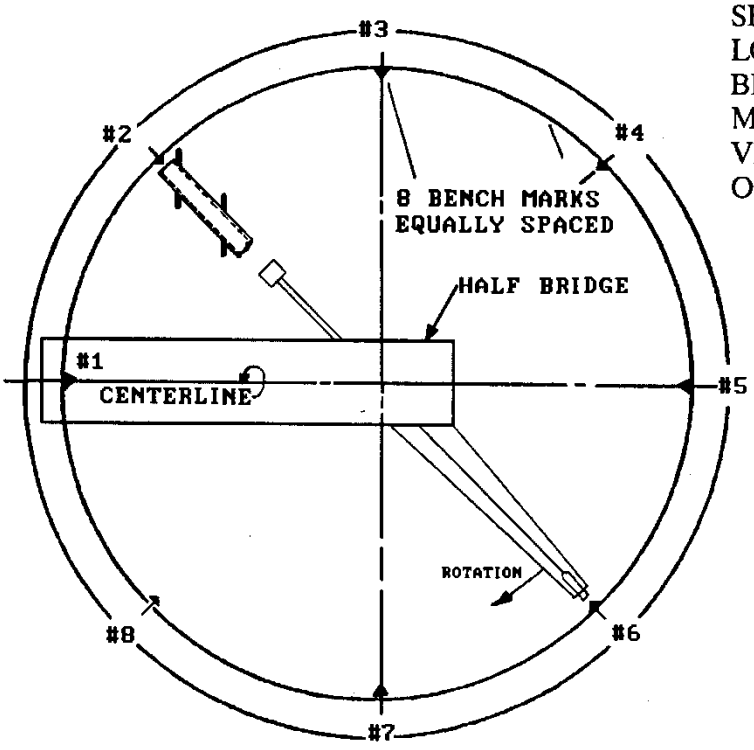
1. Using a transit, establish benchmarks on the tank wall at four (4) compass points at a convenient elevation (*Figure 6*). If the tank is very large in diameter, establish six (6) or eight (8) benchmarks; see *Table 1.*

2. Note the relationship between a point on the top of the arm and the benchmark at compass point 0°.

3. Rotate the arm through 360° and note the above-mentioned relationship at each of the benchmarks. The variations from true plane rotation should all be within the tolerances shown in *Table 1.*

   CAUTION: Do not turn the unit by pushing on the truss arm or unitube header. Hand turn the worm shaft to avoid damage to the drive. (If **Evoqua** service personnel are scheduled to assist in the check-out, have temporary power available. The service technician can safely run the drive without the torque overload devices completely installed.)

4. If the variations exceed the tolerance, change the plane of rotation by adjusting the leveling nuts under the drive housing on top of the center pier. Be sure all leveling washers bear against the underside of the drive housing before retightening the top nuts.



PLAN VIEW OF TYPICAL HALF BRIDGE TOW BRO SHOWING SUGGESTED LOCATION OF EIGHT (8) BENCHMARKS TO BE MARKED AT ANY CONVENIENT ELEVATION ON THE TANK WALL.

Figure 6

5. Recheck variations through full 360° rotation. If they now fall within tolerance, secure the top nuts per the Fastener Installation Instructions. **DO NOT** grout the drive at this time.

6. If, in making the final adjustment (#4 above), the opposite arm is no longer parallel to the floor elevation, change its slope by adjusting the tie chord A-frame clevis between the center cage and truss arm. Use jacks to raise the scraper truss section and adjust the tie chord A-frame clevis nut. **DO NOT** use the turnbuckle on the A-frame as a jack.

7. Check that the center cage revolves concentrically with the center pier; make four horizontal measurements, one from the outside surface of the pier to the inside vertical leg of each horizontal angle at the bottom of the center cage. If those measurements are the same within 1/8" (3 mm), torque the center cage/drive connection nuts per the Fastener Installation Instructions.

   If two of the four measurements differ from the other two by more than 1/8" (3 mm), it will be necessary to add filler plates between final drive gear attachment lugs and center cage attaching plates on the side(s) opposite smallest measurements.

   Recheck the measurements after shimming. If they are now within 1/8" (3 mm) of each other, torque fasteners per the Fastener Installation Instructions. The center cage is now concentric with center pier. **Do no more shimming at these four joints throughout the balance of erection.**

8. Recheck the influent well for level and designed elevation if it is attached to the cage.

After true plane of rotation has been established, grout the drive base. (See *Figure 2*) If check-out by a **Evoqua** service technician is included in your contract, **DO NOT** grout the drive base until after the installation is checked.

PLANE OF ROTATION TOLERANCE TABLE

TANK DIAMETER	NUMBER OF BENCHMARKS	VARIATION FROM TRUE PLANE
UP TO 75' (22.7 M) DIAMETER	4	+/- 1/4" (6 mm)
76' (23 M) DIAMETER TO 119' (36 M) DIAMETER	8	+ /- 1/2" (12 mm)
120' (36.4 M) DIAMETER AND OVER	8	+ /- 3/4" (19 mm)

Table 1

MANIFOLD SEALS

Install the manifold seals. The seals should contact the manifold top and bottom sealing ring at approximately 45° to form a resistive fit, as shown in *Figure 7*. Lap the ends of the seal material 6 to 8 inches (152 to 203 mm) and trim off excess.

The manifold seals are held in place by several band clamps. Multiple clamps can exert stronger pressure at more points around the seal than one single continuous clamp. The clamps have a T-Bolt on one end and a T-shaped socket on the other. Loosely connect the T-bolt from one clamp to another until all the required clamps are connected and have formed a circle. Tighten the nuts on the T-bolts in an alternating pattern until the seal is firmly clamped in place. The suggested torque for the nuts on the band clamp T-bolts is 6.0 lb.-ft. (8.2 N-m)

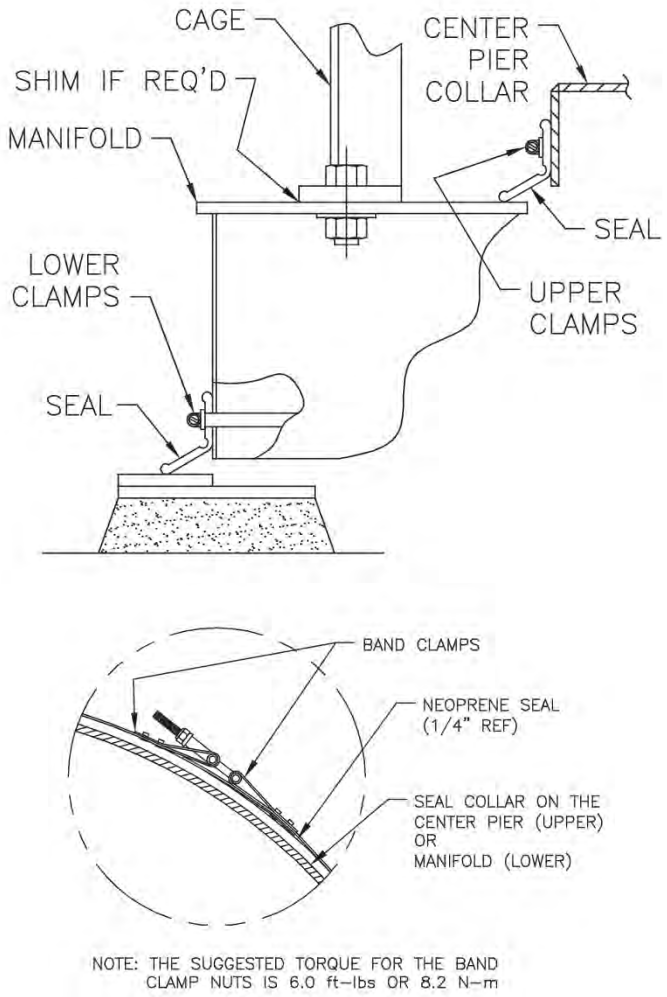


Figure 7

TYPICAL MANIFOLD AND SEAL ASSEMBLY

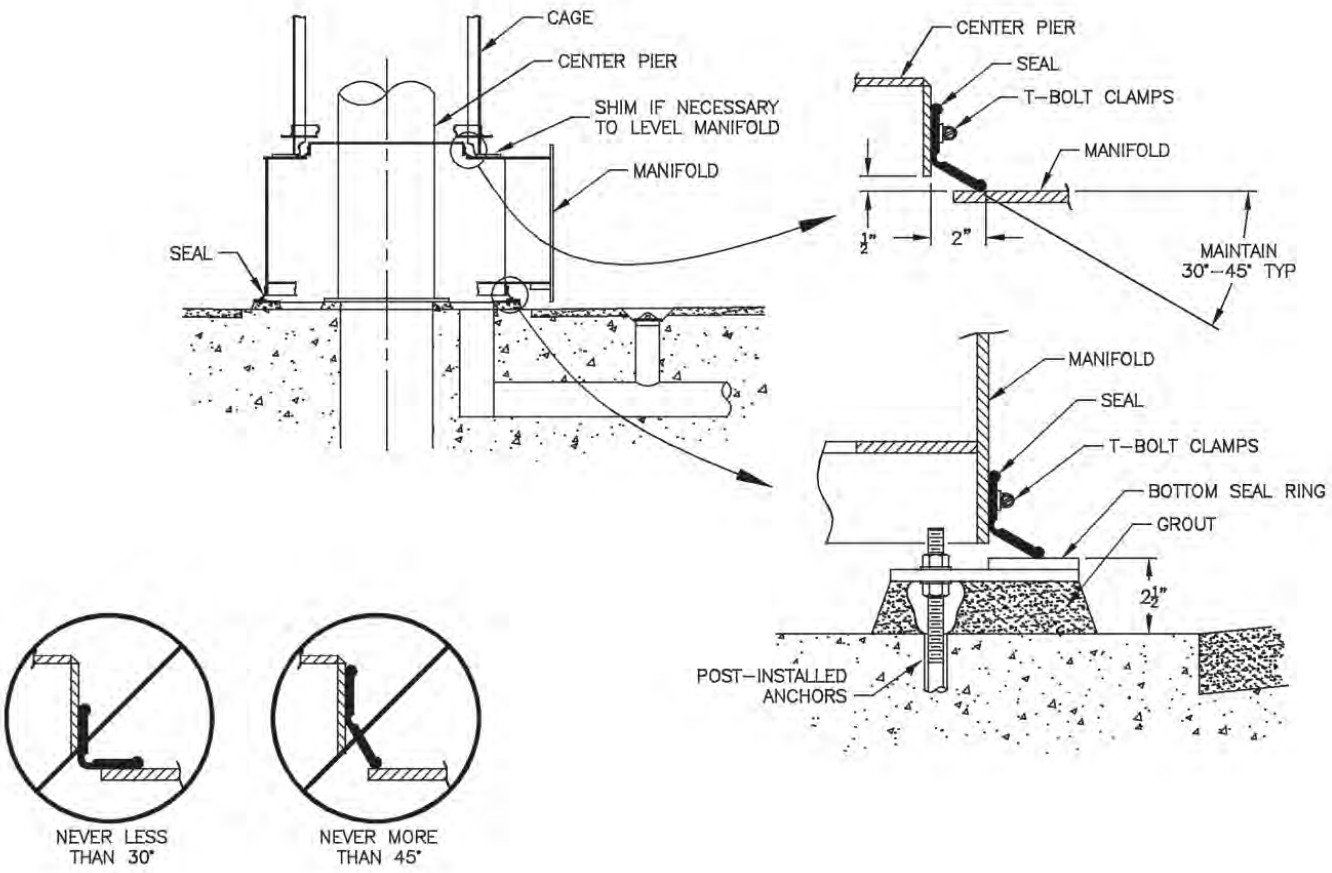
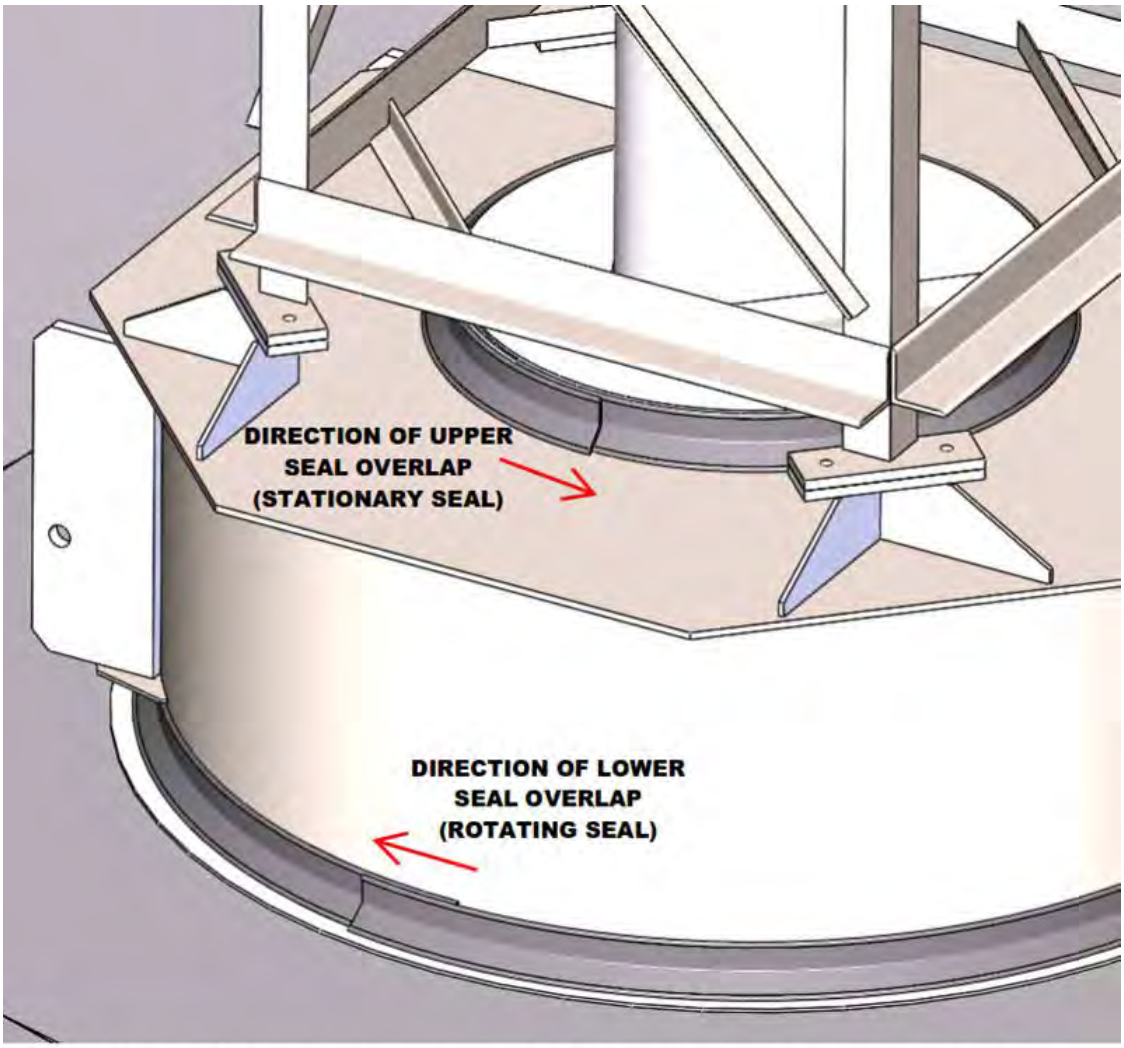


Figure 8a



MANIFOLD SEAL OVERLAPS SHOWN ARE FOR A CLARIFIER WITH A CLOCKWISE ROTATION. A COUNTER-CLOCKWISE ROTATING CLARIFIER SHOULD HAVE THE OVERLAPS GOING IN THE OPPOSITE DIRECTION.

RECOMMENDED OVERLAP FOR THE SEAL IS AT LEAST 6" (BUT NO MORE THAN 8") PAST THE JOINT.

NOTE: THE BAND CLAMPS HAVE BEEN REMOVED FOR CLARITY.

Figure 8b
Manifold Seal Wrap

DRIVE UNIT PROTECTION FOR BLAST CLEANING

If it is necessary to blast clean the equipment in preparation for painting, the drive must be sealed against the entrance of grit. Grit in the drive will cause premature wear. Refer to *Figure 7* and take the following steps before blast cleaning.

1. Remove the primary gear reducer, motor, chain, sprockets and chain guard.

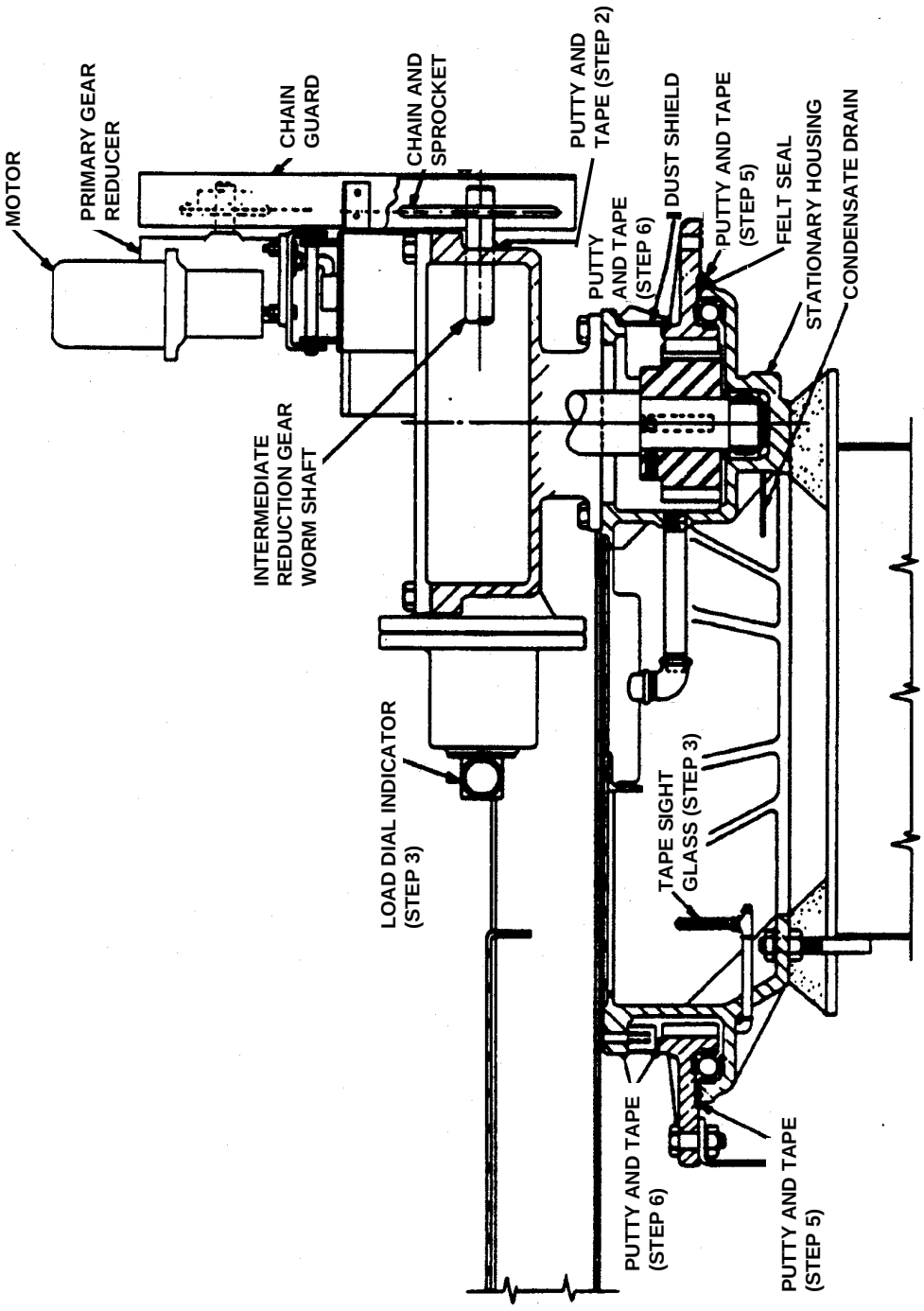
2. Apply plumber's putty, followed by two layers of duct tape, at the worm shaft seal of the intermediate reduction unit. Also, protect the shaft itself with two layers of duct tape. This sealing system will stand up under misdirected blasting and is relatively easy to remove.

3. Protect all oil sight glasses, air vent, grease fittings and drive load dial indicator with two layers of duct tape.

4. A felt seal between the stationary housing and the rotating turntable protects the turntable bearing during operation. The felt seal cannot withstand blasting and must be protected with plumber's putty and two layers of duct tape.

5. The upper and lower edges of the dust shield must be sealed with plumber's putty and two layers of duct tape.

After blast cleaning, remove the tape and putty from the shaft, felt seal joint and dust shield. Solvent clean the surfaces which have been puttied before painting the surface. Duct tape can remain on the other protected areas until painting has been completed.



TYPICAL H-DRIVE
Figure 9

PREPARING DRIVE UNIT FOR OPERATION

1. Drain the primary reducer oil to proper level per the manufacturer's recommendation in the **VENDOR INFORMATION** section of this manual.

2. Drain any condensation and site-added oil from the intermediate and final reduction units. Drain plugs are in worm gear drive (upper) housing street elbow and in the final drive (lower) sight gauge tee. See the Drive Assembly Drawings in the manual pocket to facilitate locating all fill and drain plugs. Flush the secondary and final drives with a mixture of 5% Mobil Oil Corp. Mobil System Cleaner and 95% 10W-30 motor oil. Drain and refill to sight gauge levels with seasonably appropriate lubricant. See the MAINTENANCE section of this manual for recommended oils and greases. **NOTE: Overfilling of oil will result in oil leaking into the clarifier.**

3. Refer to the Drive Assembly Drawings to locate fittings and re-grease all bearings sparingly. Use a low pressure, high volume gun (3 or 4 pumps) to purge all bearings. It is not necessary to regrease electric motor bearings unless they have been stored for more than 6 months - if necessary, regrease sparingly. Use the method and lubricant in accordance with manufacturer's bulletin found in the VENDOR INFORMATION section of this manual to lubricate the electric motor.

   CAUTION: After removing the chain from the drive unit, determine the proper rotation once temporary power is available.

4. Microswitches in the worm gear drive (upper) unit can be set now so that the unit can be safely power driven in subsequent erecting procedures. See the Specification and Torque Overload System Drawing for settings for your drive. Refer to the detailed setting instructions in the following pages for making these adjustments.

5. If power is not available, remove the drive chain so the circular drive can be turned by hand in subsequent erecting procedures.

   CAUTION: DO NOT TRY TO TURN THE DRIVE BY PUSHING ON THE TRUSSES--HAND TURN THE WORM SHAFT. If Evoqua Field Service personnel are present, temporary power may be used to rotate the mechanism.

   CAUTION: Drive unit should never be operated in reverse rotation. Torque overload protection is not functional and damage could occur to both structure and drive unit.

TORQUE OVERLOAD MICROSWITCH DEVICE (*Figure 10*)

CAUTION: **DO NOT operate** the equipment unless the torque overload switches have been **checked** and **electrically connected** to the drive. If your contract includes check-out by a **Evoqua** Service Technician, do not operate the mechanism until the field check-out is completed.

CAUTION: The torque overload device is **only** operational when the equipment is operating in the designed direction of rotation. Reversing the mechanism can severely damage the drive unit and/or structure.

CAUTION: **DO NOT** adjust microswitch gaps at time of overload condition or without first consulting factory.

The torque overload unit is located in a separate housing opposite the driven end of the worm shaft. The device consists of two microswitches **1** mechanically actuated by lineal movement of the worm shaft **2** riding against a spring plate **3**.

One microswitch - normally OPEN - should be connected to activate an alarm when a predetermined load is reached. The other microswitch - normally CLOSED - should be connected to shut off the motor if torque loading continues to increase. The torque loadings have been determined for your equipment and related feeler gauge settings for both microswitches are given on the Specification and Torque Overload System Drawing. Also refer to the sectional views in *Figure 11* for component positions.

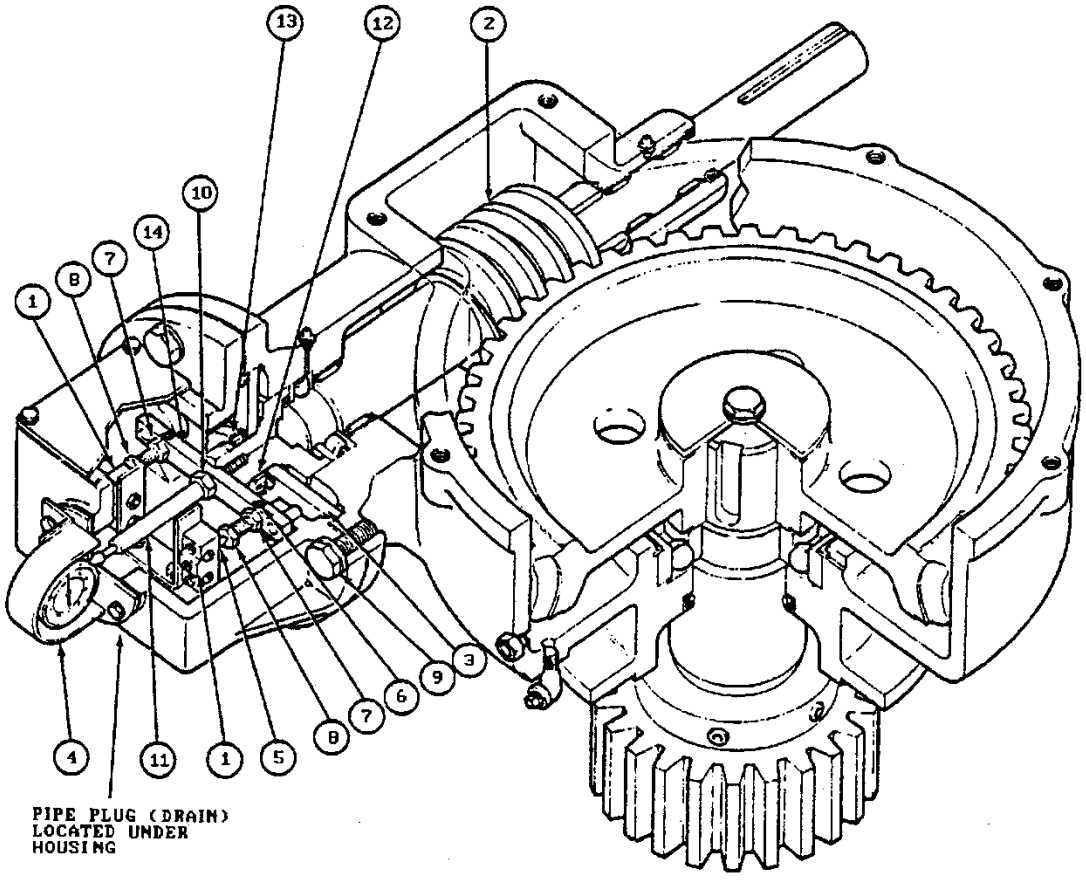
A dial indicator **4** is attached to the outside of the microswitch housing. It reads inches of spring plate deflection, which relates to torque. It has "ALARM" and "STOP" decals attached to its face. Noting the position of the dial pointer relative to the markings on the decal will give the operator an indication of fluctuations in torque.

TOOLS REQUIRED TO SET MICROSWITCHES

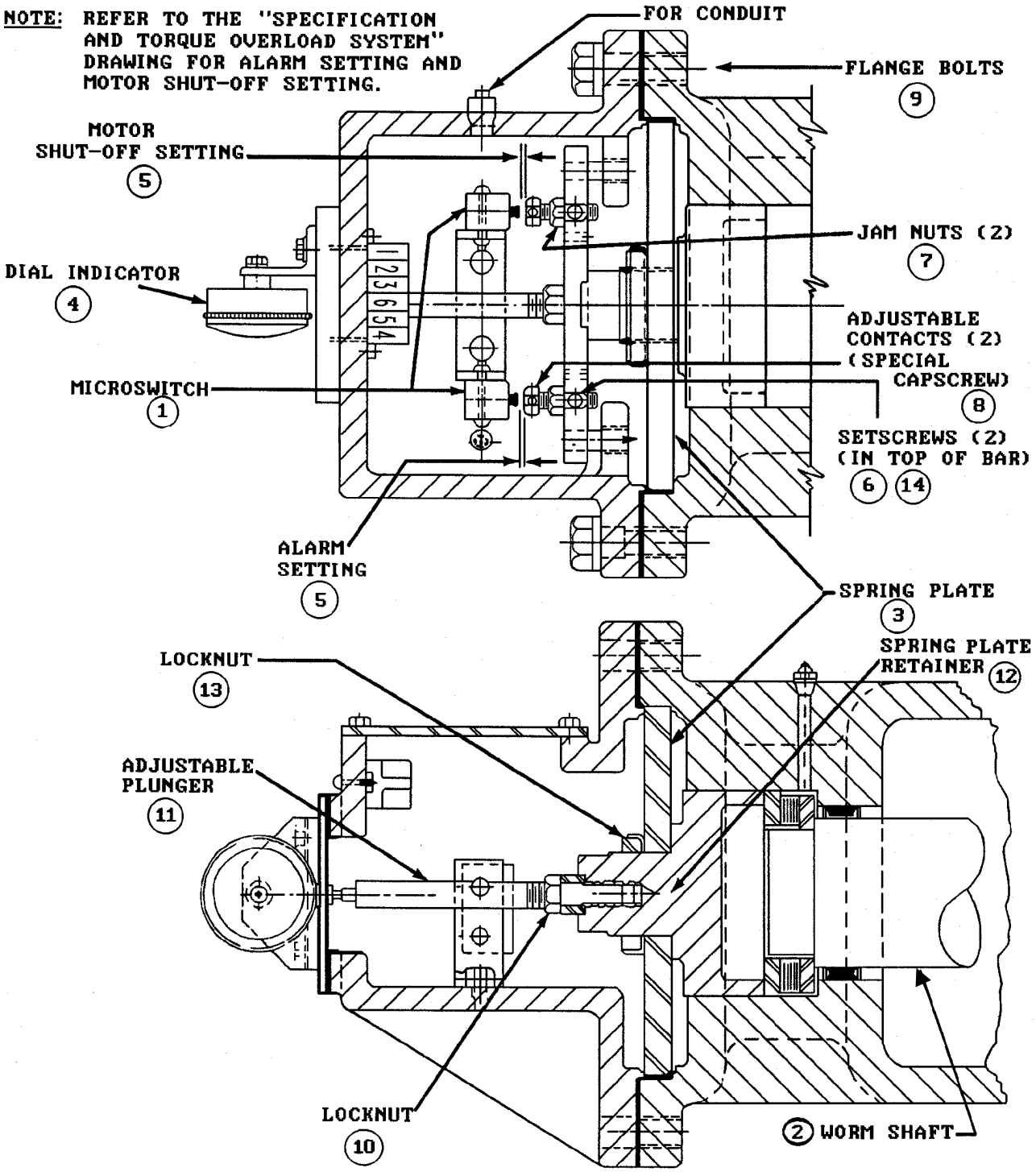
1. Test light
2. Set of feeler gauges
3. Set of Allen wrenches
4. Set of small open end wrenches

Electrical circuits may be energized in the torque overload control box even though the main power is off. Always check for live contacts before making adjustments within the box.

1. Microswitch
2. Worm
3. Spring Plate
4. Dial Indicator
5. Gap/Switch Pre-Travel
6. Setscrew
7. Jam Nut
8. Capscrews - Switch Trips
9. Flange Bolts
10. Locknut
11. Plunger
12. Spring Plate Retainer
13. Locknut
14. Trip Bar



TYPICAL TORQUE OVERLOAD DEVICE
Figure 10



ADJUSTING TORQUE OVERLOAD SWITCHES
Figure 11

PROCEDURE FOR SETTING THE MICROSWITCH GAPS (*Figures 10* and *11*)

1. Pre-travel in microswitches varies considerably, so it should be understood beforehand that, after either switch is properly adjusted, no air gap may exist after the feeler gauge is withdrawn. Because of the pre-travel variation, use of a test light is a necessity, as the click from a microswitch is not always audible.
2. Refer to the drawings and connect the test light to alarm microswitch **1** leads. The test light should be OFF.
3. Refer to the General Arrangement Drawings for proper size feeler gauge for setting the alarm gap **5**.
4. Loosen setscrew **6** on top of bar **14**; loosen jam nut **7** on the adjusting capscrew and turn the capscrew **8 IN** until the feeler gauge will slide easily between the microswitch plunger and the head of the capscrew. Now, turn capscrew **8 OUT** (while the feeler gauge is still between the microswitch plunger and capscrew head) until the test light turns **ON**. While holding capscrew **8**, tighten setscrew **6**; also tighten jam nut **7** to the bar. Do not overtighten the jam nut as it could upset the adjustment.
5. To check the setting, proceed as follows:
    a. Insert a feeler gauge that is .002" (.05 mm) less than the original gauge used; the test lamp should not light up. Once again, insert the original size feeler gauge and the lamp should light; if not, readjust.
6. Go to Step 1 and repeat the procedure to set the motor shut-off switch. (The test light is ON, but turns OFF when shut-off torque is reached.)

ZEROING THE DIAL INDICATOR (*Figures 10* and *11*)

The dial indicator **4** may have to be reset to zero several times during installation and initial operation. It should be checked after microswitch adjustment, drive wear in and shortly after the equipment has been rotating in a full tank.

To zero the indicator **4**, simply rotate the dial.

WHEN A TORQUE OVERLOAD CONDITION OCCURS (*Figures 10* and *11*)

If a torque overload develops that is severe enough to sound an alarm and shut down the drive unit, several steps must be followed to reset the dial indicator and microswitches.

First, use a proper lock-out tag-out procedure to disconnect power to the drive. Reverse the motion of the worm shaft in the drive by either removing the motor fan cover and rotating the fan in reverse or by removing the motor and rotating the coupler in reverse. **Do not use power to reverse the drive. Perform this reverse rotation by hand only.** Continue to rotate in reverse until the surface skimming arm moves backwards several inches and the dial indicator **4** reads zero. Care must be taken when moving the skimming assembly backward. If it is near the scum trough and beach, lift the skimmer over the trough if interference occurs.

After the mechanism has been reversed and the dial indicator reads zero, the load on the spring plate will be released and the microswitches should return to their normal positions. Power can be reconnected to the drive and the unit should be run forward under normal power. If the overloads trip again or if the unit cannot be manually reversed, it will be necessary to look for the cause.

There are numerous causes for drive overloads. The most common are high sludge loading or skimmer problems. Skimmers can hang up on the trough/ramp due to loosening of mounting hardware, misalignment or ice build-up on the trough or ramp. Other less common causes are from the mechanism jamming against pressure relief valves in the floor or walls of the tank. Loosened floor grout can jam the mechanism. In cold weather, the freezing of accumulated condensate in the unit's oil reservoir can jam the lower drive unit. If no cause for the overload can be determined, call **Evoqua** Field Service Department for assistance.

If, after identifying and correcting the cause of the overload, the dial indicator would not return to zero, the spring plate **3** may be damaged. **DO NOT adjust the microswitch gaps without first inspecting the spring plate.**

DISASSEMBLY AND SPRING PLATE INSPECTION (*Figures 10* and *11*)

Remove flange bolts **9** and carefully withdraw the unit. The unit can now be further disassembled using the following steps.

1. Remove the dial indicator **4** from the housing.

2. Loosen nut **10** on adjustable plunger **11** and remove plunger from the spring plate retainer **12**.

3. Spring plate retainer **12** and spring plate **3** can now be removed from the housing.

4. Remove spring plate retainer **12** and locking nut **13**, and disassemble the spring plate from the spring plate retainer.

5. Check the spring plate for flatness; if deformed, replace it.

REASSEMBLY

Reverse the preceding procedure to reassemble. One test must be made before resetting the microswitches. This test is to be made with the drive under no load. When all but the dial indicator have been reassembled and installed, observe the dial needle. It should move at least a quarter turn as the indicator is being tightened down. If the needle does not move off the peg, loosen the nut on the adjustable plunger and screw the plunger out of the plate retainer until it moves the pointer one-quarter revolution. Hold the plunger while retightening the locking nut against the bar. The air gaps should now be reset as previously outlined.

OVERLOAD HOUSING VENT

The overload housing is equipped with a vent at the bottom. The vent allows condensation to drain from the housing to prevent corrosion.

NOTE: If the drive unit is explosion-proof, no vent is provided; the unit continuously drains through conduit access holes.

TORQUE OVERLOAD DEVICE

The unit is equipped with a shear pin sprocket. The shear pin number will be identified on the Drive Assembly Drawing or the List of Materials. The shear pin number will include a dash number and a series letter, e.g. CA1943-22E, CA680-1A, etc.; the last number and letter are marked on the end of the pin *(Figure 12*). Examine the shear pin end and compare the dash number and letter with the drawing. If a discrepancy occurs, contact the factory representative or the factory at once. Under NO circumstances should a shear pin of different value be substituted. **Failure to comply with this could severely damage the equipment and void any factory warranty.** Grease the sprocket bore and shear pin faces before operating the drive under load. Any major brand of Lithium based #2 may be used.

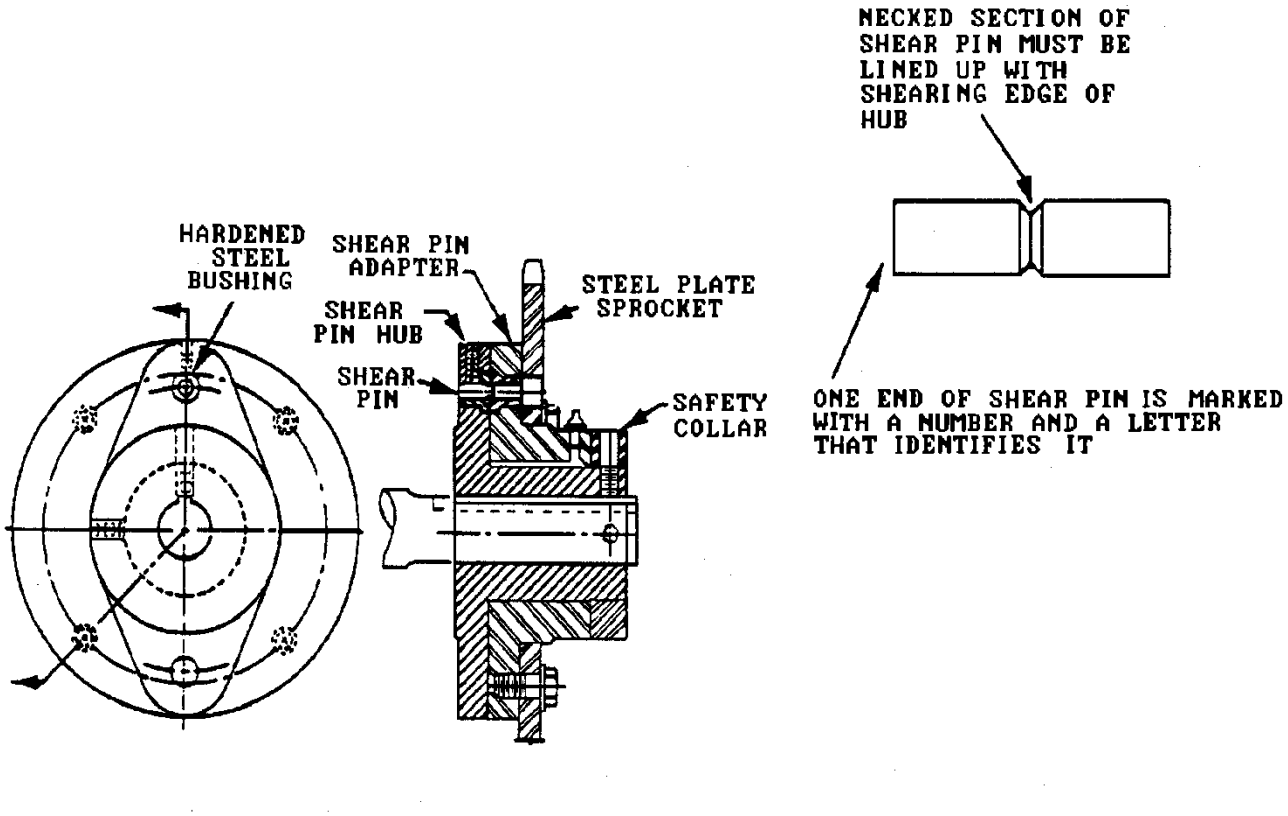


Figure 12

PRE-OPERATIVE CHECK

CAUTION: Even if running under temporary power, **do not bypass the overload devices of the unit.** Verify that the drive unit has been properly lubricated and that the housings are filled to the proper level with oil.

If power is available, we suggest operating the unit in a dry tank for at least two complete revolutions, or if possible, for a period of four hours, then check to see if the arm(s) are still operating on the same plane.

Lightly grease the flexible seal contact surfaces during dry tank operation.

During the dry tank run-in, check out the unit for the following:

1. Smooth operation - no stopping or jerking movement.
2. Overheating - the temperature of the reducer should not be uncomfortable to the hand. Motors must be protected by proper heaters in the starter.
3. Oil leaks through reducer seals or drain plugs.
4. Oil leaks through main drive unit drain plugs or level gauges.
5. Action of the surface skimmer as it traverses the scum beach.

GROUTING THE TANK FLOOR

Introduction

The purpose of the layer of grout on the floor of a tank is to provide a finished surface that conforms more closely to the scraper or suction header to promote better sludge removal. The instructions below are general in nature and should be used only as a guide.

Note: Evoqua is not responsible for grouting the tank floor. Tank grouting is covered by the consulting engineer's specification; refer to the specification for information on grout material, and placement. **Evoqua** does not have responsibility for approval of the floor grouting.

The clarifier equipment may be used as either a **screed** or a **screed guide**. From "Concrete Terminology", 2010 American Concrete Institute, the definition of **screed** is "1) to strike off a cementitious mixture lying beyond the desired plane or shape; 2) a tool for striking off the cementitious mixture surface, sometimes referred to as a strikeoff". A **Screed guide** is a "firmly established grade strip … for unformed concrete that guides the strikeoff in producing the desired plane or shape".

Based on the definition of a screed **the header or scraper truss are not to be used to plow the grout layer into place on the tank floor**. Rather they are to be used to smooth out the very surface of the grout to create a flat floor surface at the proper slope and elevation. Following the definitions, a unitube header cannot be used as a screed as it will

deflect upward from the resistance of high spots in the grout and the floor will be uneven. If the header is supported by a truss, the additional weight and stiffness from the truss will permit it to be used as a screed. Headers that are not truss-supported can be used as a screed-guide.

PREPARING THE TANK

Prior to placing grout:

1. Remove any debris from the bottom of the tank, if necessary sweep up small loose material like sand and gravel.
2. If permanent power is available to the drive, the overload devices must be wired and operational.
3. The **Evoqua** Service Technician checkout must be performed.
4. The drive should be grouted.
5. The drive should be serviced and all parts should be properly lubricated with the proper weight and amount of oil in the housings.
6. Horizontal plane of operation must be set for the rotating machinery.

Important: The rotating mechanism is used as a guide for proper placement of the floor grout. **The trusses and other steel components will be affected by changes in ambient temperature and solar gain. It is best to perform floor grouting when temperatures will remain relatively constant and the sun will not heat up the steel. Evoqua** recommends doing this work on a cloudy day, or to begin very early in the morning.

NOTE : If you plan on using power to sweep in the finish grout, be advised that under no circumstance should the drive be run in reverse. The torque overload system is inoperative when the drive is reversed.

Header as Screed Guide

To use the header as a screed guide follow these steps:

1. Clean the tank floor thoroughly. Cover any sludge pit with plywood sheet. Cover any other holes in the tank floor that need to remain free of grout. Cover all of the orifice holes in the header.
2. Be prepared to wet down the floor area to be worked and ahead of the area being worked to help the grout bond to the floor.
3. Begin pouring the grout at the outside of the tank. Working inward in a spiral pattern to the tank center. **SPREAD AND TROWEL THE GROUT BY HAND.**
4. **Use the fluidizing blade** (the lip that projects from the bottom of the header) as the screed guide. Maintain the design clearance between the fluidizing blade and the finished floor.

5. Jog the clarifier drive to move the header forward as the grout is being spread. **Do not allow additional weight to rest on the header as it rotates.**
6. Grind down any high spots that may interfere with the fluidizing blade or the rubber extension.
7. Hand-trowel the areas around the sludge pit and the base of the tank wall.
8. Remove any grout splatters from the header and uncover the header orifices prior to operation of the clarifier.
9. When the grout has cured install the neoprene rubber fluidizing blade extension. Adjust the header deflector blade and the rubber extension to just touch the floor. *See Figure 13*

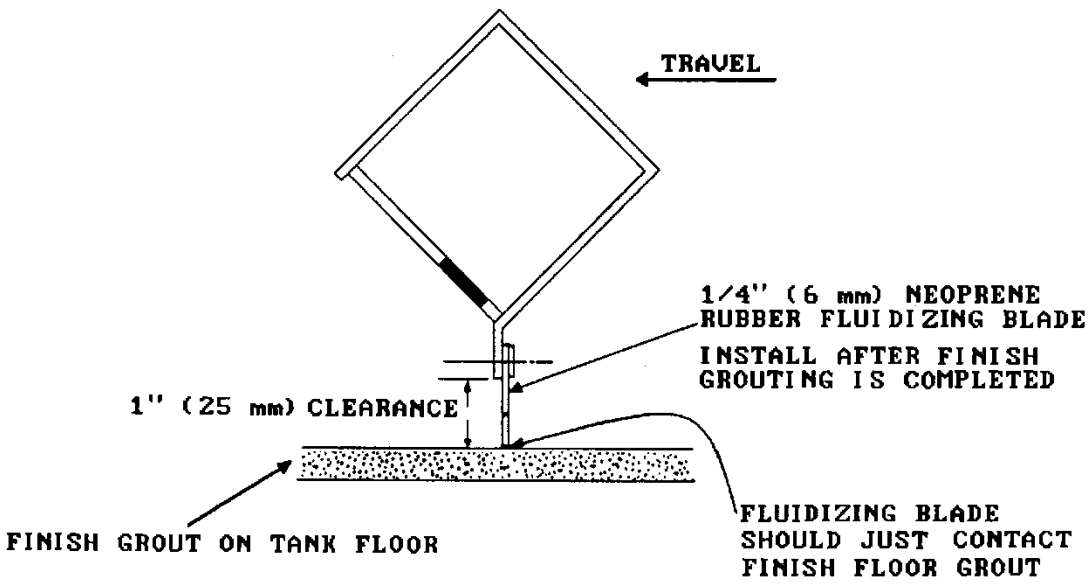
Header as Screed

Important Note: When the header is modified to add the screed/guide, the weight added to the mechanism on one side will change the plane that the mechanism rotates in. This must be compensated for by adding temporary counterweights on the side opposite. Details for this are in the following instructions.

To use the header as a screed follow these steps:

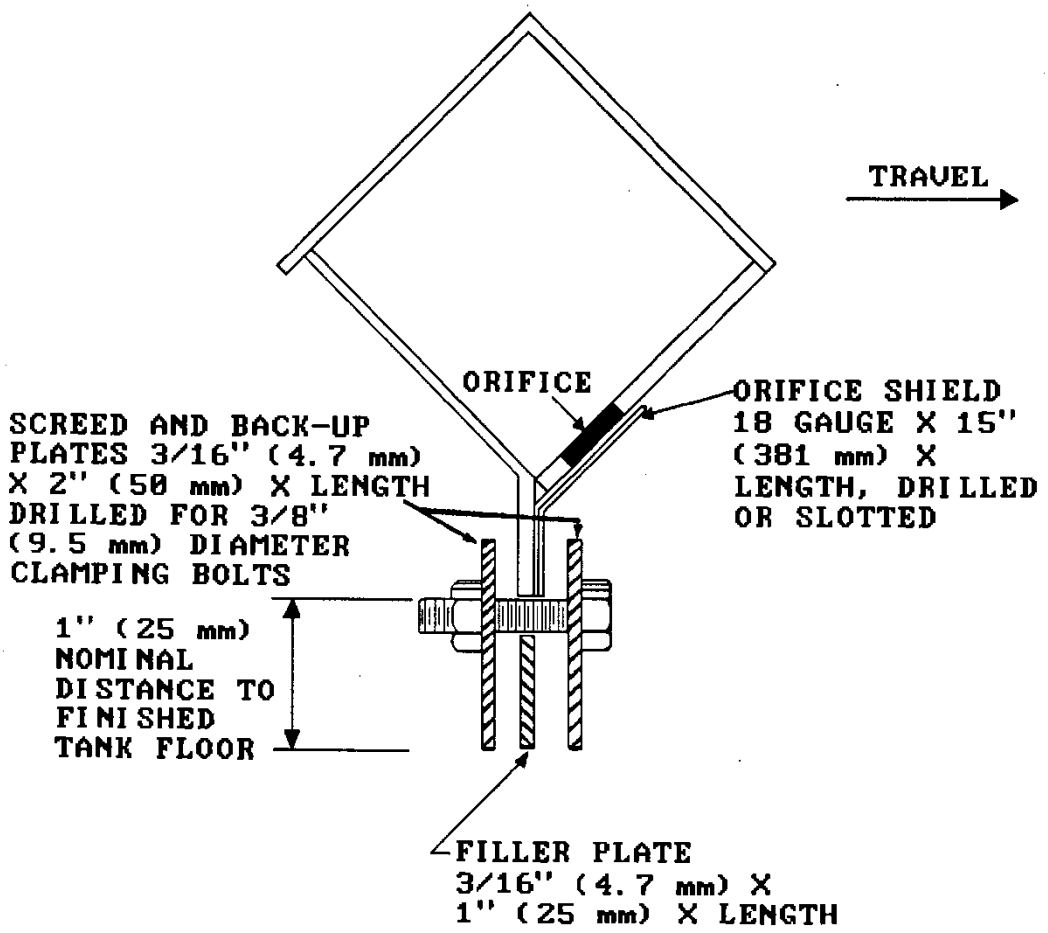
1. See *Figure 14* for a suggested method to construct and attach a screed to the header. Note that an orifice shield can be included with the screed. Other construction can be used that will work just as well.
2. Determine if the weight added to the header by the screed unbalances the machine. Add a pointer to the end of either truss at the elevation of the benchmarks used to adjust the machine to operate in a true plane of rotation. After the screed is installed, add counterweight to the opposite truss to bring the pointer to the proper elevation. An observer should walk behind the header during screeding to immediately alert workers if the pointer rises or falls. If this happens it must be corrected or the finished floor surface will be incorrect.
3. Clean the tank floor thoroughly. Cover any sludge pit with plywood sheet. Cover any other holes in the tank floor that need to remain free of grout. Cover all of the orifice holes in the header.
4. Be prepared to wet down the floor area to be worked and ahead of the area being worked to help the grout bond to the floor.
5. Begin pouring the grout at the outer wall of the tank. Working inward in a spiral pattern to the center of the tank. **SPREAD AND TROWEL THE GROUT BY HAND.**

6. Jog the clarifier drive to move the header forward as the grout is being spread. **Do not allow additional weight to rest on the header as it rotates. The drive overload device must not be bypassed for any reason.**
7. Grind down any high spots that may interfere with the fluidizing blade or the rubber extension.
8. Hand-trowel the areas around the sludge pit and the base of the tank wall.
9. Remove any grout splatters from the header and uncover the header orifices prior to operation of the clarifier.
10. When the grout has cured remove the screed and install the neoprene rubber fluidizing blade extension. Adjust the header deflector blade and the rubber extension to just touch the floor. *See Figure 13.* Remove any additional counterweights that may have been added.



NOTE: REFER TO THE BOLTED CONNECTION DRAWING FOR EXACT LOCATIONS OF HEX HEAD CAPSCREW, FLAT WASHERS, FENDER WASHERS AND HEX NUTS.

TYPICAL SECTION THROUGH ASSEMBLED UNITUBE HEADER
Figure 13



CAUTION: Take care not to damage the galvanized finish on the header as this can lead to premature corrosion.

SUGGESTED SCREED
Figure 14

TORQUE TESTING PROCEDURE

If a torque test is required per the contract documents, a **Evoqua** service technician will perform the following recommended torque test procedure.

Verify the circular equipment to be tested has been inspected for proper installation and the tank floor is free of debris. The overload switches MUST be wired into the alarm/shut-off circuit as required by the General Arrangement Drawings. With permanent power connected, operate the drive under power for a minimum of one full rotation and check for free and quiet operation of drive and structural components.

Inspect the torque test kit and verify all items are accounted for and undamaged.

Locate the attachment points on the truss/header per the dimensions indicated on the Torque Test General Arrangement Drawing. At those points, attach a polyester strap to the trailing bottom chord of the truss arm or header. Connect a hydraulic cylinder to the other end of each strap.

NOTE: The hydraulic cylinder should be in the fully retracted position. Locate each cylinder back away from the truss/header so the strap/cylinder is 90 degrees to the centerline of the truss. Mark and install anchors for the cylinder mounting brackets into the floor or the wall as required. The location of the attachment points and mounting of cylinders is very important and must coincide with the Torque Test General Arrangement Drawing.

Connect the hydraulic hose to the rod end port of the cylinder and the common tee/gauge assembly. Repeat the procedure with the other cylinder. Locate the pressure gauge assembly up on the bridge near the drive unit. Fill the cylinders and hose assemblies with hydraulic fluid at the gauge assembly, allowing trapped air to escape. Wire in the start/stop toggle switch into the motor circuit (**NOTE**: Lock out electrical power when connecting toggle switch).

The following procedure is required before the actual testing to properly set the spring plate into the overload housing. Start the drive and with the use of the start/stop toggle switch, gradually increase the torque, as indicated by the pressure gauge assembly, to operating pressure. Stop the drive and reverse the motor leads (**NOTE**: Lock out electrical power when reversing motor leads) to remove all load from the cylinders and truss arms/header.

TORQUE OVERLOAD CONTROL BOX

Electrical circuits are energized in the torque overload control box. Always check for live contacts before making adjustments within the box.

At this point, check and adjust, if required, the microswitch gaps per the Specification General Arrangement Drawing. Zero the torque/deflection dial indicator. Remove shear pin and verify it matches the size indicated on the Specification General Arrangement Drawing. Verify the shear pin hub is free to rotate before reinstalling the shear pin.

The torque test is now ready to be performed. Start the drive, and with the use of the start/stop toggle switch, gradually increase torque and pressure in the hydraulic cylinders. When the pressure gauge indicates a test point has been reached, verify the protective action, alarm sounding or motor shut-off has occurred. If not, adjust the designated microswitch setting to actuate at that point. Continue testing until the last test point has been reached.

The drive motor rotation should be reversed to remove the truss arm/header loading. Lock out electrical power when reversing motor leads. Be careful that the cylinder rod is retracted during the reversal to prevent any damage. **NOTE**: Drive overload protection is not functional when operating in reverse from normal rotation.

The **Evoqua** service technician may repeat the test to verify the overload settings by reversing the drive to remove loading to the mechanism and restarting the test as described above.

Reverse the drive to remove loading to the mechanism before disassembling the torque test kit equipment.

After testing is completed, check that the motor is wired for proper rotation as indicated on the General Arrangement Drawings.

Remove or grind off the anchors that were holding the cylinder mounting brackets. This area must be smooth and not cause interference with rotating equipment.

SECTION 2 CONTENTS

TOW-BRO® CLARIFIER, H-DRIVE

SAFETY PRECAUTIONS

The primary hazards associated with operating circular clarifying equipment are unsafe procedures used by personnel.

OPERATING ENVIRONMENT

Circular clarifying equipment is usually exposed to the elements. The bridge and other access points may become slippery when wet or icy. Handrails and other safeguards must be in place when operating the equipment. Use care when access is necessary.

The access area for drive maintenance is below the bridge deck level. The difference in level will depend on the bridge design. A falling hazard exists. Use caution when in or near the access area

CHAIN GUARDS

Chain guards must be in place when operating **Evoqua** equipment**.**

TORQUE OVERLOAD CONTROL BOX

Electrical circuits may be energized in the torque overload control box even though the main power is off. Always check for live contacts before making adjustments within the box.

START-UP

If the unit has been sitting idle for some time, either before initial start-up or after a winter shut-down, the following should be checked before filling the tank.

1. When tank is equipped with pressure relief plugs or valves in the floor, be sure these are closed.

2. Check the position of valves that control the hydraulics of the unit.

3. Check the position of the weirs. On initial start-up, they should be set at maximum height, so that after the tank is filled, they can be evenly adjusted to the design bottom of V-notch weir elevation. Tighten down the weir bolts after making this adjustment.

4. Check oil level in the reducers, note its condition and drain and refill if necessary. Be sure it is the correct viscosity for anticipated ambient temperatures in which the reducers will operate. Grease all fittings.

5. Be sure the dial indicator is set at zero, then start the unit.

   NOTE: If your unit is equipped with an LVDT, Linear Voltage Differential Transmitter, be sure that the meter is zeroed out at this time.

   CAUTION: When raw sewage is flowing or present in tank, operation of the unit should not be stopped for a long period of time without first draining the tank. This especially holds true when there is a large percentage of solids in the flow. A dense build-up of sludge on the tank floor can overload the drive, making it impossible to start up the unit.

TANK FILL-UP

1. Observe the action of the surface skimmer. Scum should move toward the hinged skimmer blade. The hinged skimmer blade should smoothly wipe the scum beach and carry the scum into the scum trough. It should be submerged no more than 3" (76 mm). As the scum blade enters, passes over and leaves the scum trough, there should be no tendency to hang up at any position if it is properly adjusted.

2. When the tanks are full, note and record the dial indicator reading. A normal pattern of readings should be established so that an overload condition can be anticipated and corrected.

WINTER OPERATION

Normally, the unit should operate the same during the winter as it does in other seasons. When ambient temperature falls below freezing, it is necessary that sewage flow to the unit is continuous.

When the weather becomes extremely cold, particular attention should be given to the scum beach and all skimming equipment. Torque overload devices are rated and set for the loading requirements of the submerged rotating equipment. Skimmer construction is based on lighter load requirements and can be damaged without activating the torque overload device.

CAUTION: The skimming equipment might be damaged from a build-up of frost, ice or snow. Temporarily remove the skimming equipment or tie it up so that it will clear any possible build-up.

It is imperative that all ice has melted from the tank before a start-up. The tank should be probed in as many areas as possible to determine whether any ice is present under the melted surface water. If it is possible to draw the tank down before start-up, break up all ice beforehand and then drain. Hose down the equipment in the tank and the tank itself. Examine the equipment for any ice damage. Repair or replace any damaged equipment. Check the tank floor for surface irregularities, which might have occurred due to heaving.

NOTE: **EVOQUA** ASSUMES NO RESPONSIBILITY FOR DAMAGE TO EQUIPMENT WHICH IS SUBJECT TO WEATHER CONDITIONS THAT MAY REQUIRE THE PROCEDURES SUGGESTED ABOVE. ONLY THE PLANT OPERATORS ARE IN A POSITION TO DETERMINE THE DEGREE OF EQUIPMENT PROTECTION REQUIRED. DAMAGE TO THE STRUCTURAL MEMBERS CAN RESULT IF ICE IS PRESENT AND THE TANK IS EMPTIED, PERMITTING ICE TO FALL OR LAY ON ROTATING MEMBERS OR ON THE TANK FLOOR.

EVOQUA DOES NOT RECOMMEND the use of fuel conditioning products such as "Diesel Heat" to thin or modify the gear oil in **Evoqua** circular drives during extremely cold weather. This product sufficiently dilutes the oil (lowers viscosity) and inhibits the ability of the oil to maintain an oil film between moving parts. The gearing and ball bearings operate so slowly that a true hydrodynamic film cannot be developed and thus the thinned oil is literally "crushed" under the contact areas. When this occurs, the oil actually reaches its flash point and ceases to lubricate.

Also, it is not recommended flushing bull gears with oil during operation. The reasons for not doing it are the same as in the previous paragraph. Flushing with oil **while the unit is shut down is approved.**

SHUT-DOWN

When a shut-down is expected, the following procedure is recommended.

1. Drain the tank down, then turn off and lock out the drive.

2. Hose down the tank and all submerged equipment.

3. Inspect the submerged equipment for any damaged or missing parts. Fix and replace as needed.

4. Fill all reducers with the proper type lubricant, close vents and grease all fittings on the drives. Remove the motor and store it in a warm, dry place. Cover the reducer "C"-faced motor mount with a tarp. The motor and all reducer shafts should be rotated by hand 1-1/3 turns every 60 days.

5. If the tank floor is equipped with pressure relief plugs or valves, open them and also open the tank drain. If the tank is not so equipped, it will have to be sufficiently filled with water to prevent it from heaving. When prolonged freezing weather is expected during a shut-down, the tank should have continuous flow.

CAUTION: When raw sewage is flowing or present in tank, operation of the unit should not be stopped for a long period of time without first draining the tank. This especially holds true when there is a large percentage of solids in the flow. A dense build-up of sludge on the tank floor can overload the drive, making it impossible to start up the unit.

EMERGENCY OPERATING SHUT-DOWN PROCEDURES

If the equipment malfunctions, it cannot be permitted to continue to run. Follow the sequence of operation of the controls for the equipment and turn off and lock out the drive(s). Follow the Lock-Out procedures shown under the Safety Precautions in the MAINTENANCE section of this manual. Determine the reason for the malfunction and take corrective action. If a shut-down period is required to repair the situation, follow the plant procedures for taking the equipment off line.

SECTION 3 CONTENTS

TOW-BRO® CLARIFIER, H-DRIVE

SAFETY PRECAUTIONS

The primary hazards associated with maintaining circular collectors are identified below.

POWER SOURCE LOCK-OUT

Failure to lock out all sources of power during maintenance procedures may result in serious personal injury. Following are the steps of a typical lock-out procedure that can be used by maintenance and repair crews:

1. Alert the operator and supervisor.
2. Identify all sources of residual energy.
3. Before starting work, place padlocks on the switch, lever or valve, locking it in the "off" position, installing tags at such locations to indicate maintenance in progress.
4. Insure that all power sources are off and “bleed off” hydraulic or pneumatic pressure or “bleed off” any electrical current (capacitance), as required, so machine components will not accidentally move.
5. Test operator controls.
6. After maintenance is completed, all machine safeguards that were removed should be replaced, secured and checked to be sure they are functioning properly.
7. Only after ascertaining that the machine is ready to perform safely should padlocks be removed and the machine cleared for operation.

(From Concepts and Techniques of Machine Safeguarding, 1980; U.S. Dept. of Labor OSHA).

TORQUE OVERLOAD CONTROL BOX

Electrical circuits may be energized in the torque overload control box even though the main power is off. Always check for live contacts before making adjustments within the box.

CHAIN GUARDS

Guards cover several points on circular collectors to prevent personal injury from moving parts. If guards must be removed during maintenance procedures, use caution when operating equipment and replace guards when maintenance has been completed.

OPERATING ENVIRONMENT

Circular collectors are usually exposed to the elements. The bridge and other access points may become slippery when wet or icy. Handrails and other safeguards must be in place when working on the equipment. Use care when access is necessary. **Do not work outside of the bridge handrails.** Wipe up grease and oil spills.

The access area for drive maintenance is below the bridge deck level. The difference in level will depend on the bridge design. A falling hazard exists. Use caution when in or near the access area.

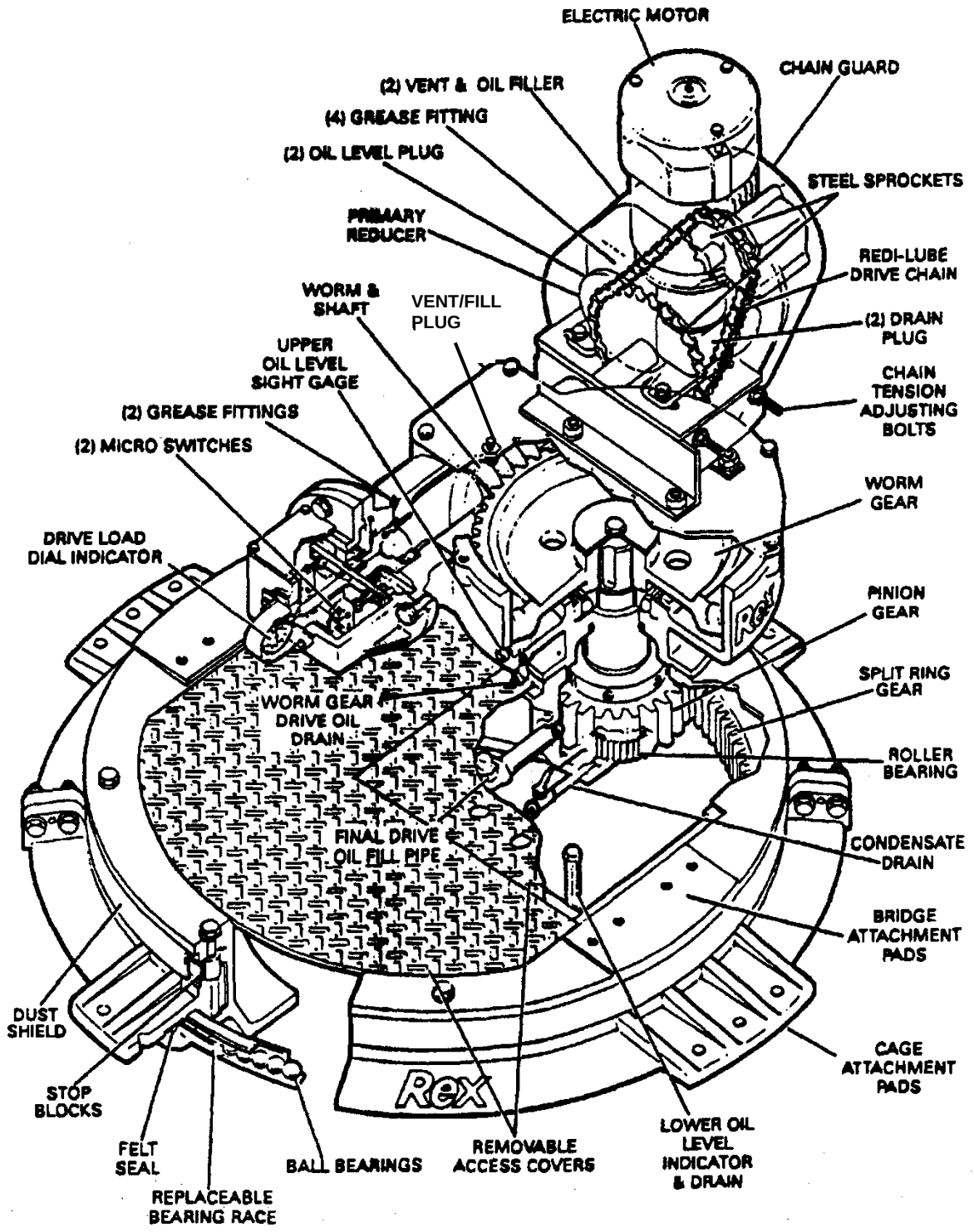
VENTILATION

Noxious fumes can be generated by septic sewage. Provide forced ventilation and exhaust facilities when workmen are in a drained tank.

FIRE

Torch cutting, welding and the use of solvents present fire hazards. Use care in these operations and provide fire control equipment in the working area.

NOTE: If field painting or touch-up is required, refer to "Drive Unit Protection for Blast Cleaning" in the INSTALLATION section.



H-DRIVE
Figure 15

GENERAL PRECAUTIONS

To obtain maximum equipment life, it is necessary to perform the preventive maintenance services outlined in this section. Maintenance requirements are a guide for average operating conditions. Conditions, which impose greater wear, loads or strain on the equipment, may dictate increased maintenance. If needed, develop a revised schedule for site-specific requirements. Refer to the manufacturers' bulletins for equipment not manufactured by **Evoqua.** These instructions take precedence over those in this manual should any discrepancy be noted.

The maintenance instructions incorporated throughout this manual are meant to be used by qualified service personnel only. Do not attempt to adjust or repair any components without thorough knowledge of this equipment. Read this manual completely. Practice preventive maintenance.

RECOMMENDED LITHIUM BASED GREASES

Any major brand of Lithium based grease No. 2 is recommended unless other lubricants are defined for specific applications in the INSTALLATION or MAINTENANCE sections of this manual.

For vendor-supplied components (i.e. reducer, motor, etc.), see VENDOR INFORMATION section of this manual for suggested lubricant type and frequency.

LUBRICATION SUMMARY

Recommended lubricants for **Evoqua** upper housing (worm gear section of main drive) and lower housing (final section of main drive).

SUMMER: 40°F. (4° C.) or higher, Mobil Co. Mobil SHC-630* or equal
WINTER: 40°F. (4° C.) or lower, Mobil Co. Mobil SHC-629** or equal

Recommended lubricants for the primary reducer are in their bulletin in the VENDOR INFORMATION section of this manual.

Evoqua Drive Size	Approximate Oil Capacity Upper Housing (Worm Gear)	Approximate Oil Capacity Lower Housing(Final Drive)
H30A LT & HT	3-1/2 Quarts(3.3 Liters)	6 Quarts(5.7 Liters)
H40A LT & HT	5 Quarts (4.7 Liters)	8-1/2 Quarts (8 Liters)
H40 HD	10-1/2 Quarts (9.9 Liters)	4 Quarts (3.8 Liters)
H60A LT & HT	6 Quarts (5.7 Liters)	16 Quarts (15.1 Liters)
H60A HD	12 Quarts (11.4 Liters)	16 Quarts (15.1 Liters)
H80 LT & HT	6 Quarts (5.7 Liters)	10 Quarts (9.5 Liters)
H80A LT & HT	6 Quarts (5.7 Liters)	16 Quarts (15.1 Liters)
H90 LT & HT	13 Quarts (12.3 Liters)	19 Quarts (18 Liters)
HD90 (2 Upper Housings and 1 Lower Housing)	13 Quarts (each) (12.3 Liters) Upper Housing	19 Quarts (18 Liters)
H90A LT & HT	13 Quarts (12.3 Liters)	24 Quarts (22.7 Liters)
HD90A (2 Upper Housings and 1 Lower Housing)	13 Quarts (each) (12.3 Liters) Upper Housing	24 Quarts (22.7 Liters)

NOTE: Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the clarifier.

*Viscosity: 1045/1165 SUS @ 100° F. (38° C.) - ISO Viscosity Grade 220

**Viscosity: 710/790 SUS @ 100° F. (38° C.) - ISO Viscosity Grade 150

ROUTINE MAINTENANCE

ITEM	DESCRIPTION	INTERVAL
SURFACE SKIMMER	Check for smooth action on scum beach and reentry into tank. Check for binding against scum baffle. During winter months, when icing becomes prevalent, place skimmer in lock-out position.	D
	Hose off the skimmer assembly and inspect. Tighten all loose connections; adjust for proper skimmer assembly blade submergence (3" (76mm) below maximum water surface or as indicated on the General Arrangement Drawings). The spring loaded hinged guide should just contact the inner wall of the scum beach.	SA
	Replace any lost or worn parts, such as neoprene wipers, polywear block or springs, if necessary.	SA
WORM GEAR SUBASSEMBLY	Check oil level at sight gauge located on side of worm gear housing	W*
	If low, check for leaking shaft seals at worm shaft near sprockets or remove torque overload housing cover and inspect inside for oil. Replace seals as required. Add oil to proper level. **	
	If high, check for evidence of condensate (water) in oil. Drain small amount of oil from housing and inspect. If clear water is present, drain until oil is draining. Refill to sight gauge with proper grade of oil. ** Check for damaged gasket, air vent, loose or missing cover bolts.	

*Or after severe weather or wash-down procedures.

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the clarifier.

D - Daily W - Weekly M - Monthly SA - Semi-Annually

ITEM	DESCRIPTION	INTERVAL
WORM GEAR SUBASSEMBLY (Continued)	Inspect and clean, if necessary, worm gear housing air vent.	M
	Grease worm gear bearings with Lithium based #2 grease. Two fittings are located over worm gear on top of housing. Clean fittings; add approximately two pumps from grease gun to each fitting.	M
	Check condition of oil for condensate or other contaminants by draining a small amount, and visual inspection. If clear water is present, drain until oil becomes present and refill oil to proper level. ** Check for damaged gasket, air vent, loose or missing cover bolts. If oil is milky in color, drain, flush and refill with fresh oil. ** Check for damaged gasket, air vent, loose or missing cover bolts. If metal contaminants are present, remove chain guard, chain, primary gear reducer and worm gear housing cover and inspect for damaged or worn parts. Flush, per procedure at end of this section, and clean housing, replace parts as necessary, reassemble. Add oil to proper level. **	M

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the clarifier.

D - Daily W - Weekly M - Monthly SA - Semi-Annually

ITEM	DESCRIPTION	INTERVAL
WORM GEAR SUBASSEMBLY (Continued)	Seasonal change of oil. In preparation for changing the oil, drain out approximately 5% (1 quart [.94 Liters]) and replace with Mobil Oil Corp. Mobil System Cleaner. Run the drive unit at minimum load condition (reduce sludge blanket) for approximately 48 hours. Shut off drive unit and drain. Replace with oil with proper viscosity for anticipated seasonal conditions. ** Summer: Mobil SHC-630 Winter: Mobil SHC-629 Drain by removing plug in street elbow located in underside of worm gear housing. Air vent/filler plug is located in cover plate.	SA
TORQUE OVERLOAD SWITCHES	Remove cover and inspect inside of housing for signs of condensate or oil. Inspect switches for signs of corrosion. Trip microswitch by placing screw driver in gap to verify alarm/shut-off systems are functional. Review warnings listed on next page.	SA

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the clarifier.

D - Daily W - Weekly M - Monthly SA - Semi-Annually

ITEM	DESCRIPTION	INTERVAL
TORQUE OVERLOAD SWITCHES (Continued)	DO NOT ADJUST GAPS WITHOUT CONSULTING FACTORY. Gap settings can only be verified after residual load against spring, plate has been neutralized. This can be accomplished by draining the tank and removing any impediments or if draining is not possible, then by removing motor and rotating the input shaft of the primary reducer, releasing tension on drive chain. Continue to rotate input shaft until final gear starts to move opposite of normal rotation. Stop. Further rotation of input shaft will cause damage. Gap settings are indicated on the inside of the torque overload housing cover or on the General Arrangement Specification Drawing. **WARNING**: DO NOT OPERATE DRIVE IN THE REVERSE ROTATION. Torque overload switches are NOT operative during reverse rotation. Severe damage can occur to mechanism's structure and drive unit. Use reversing switch, if furnished, only for momentary jog to dislodge the rake arm from hang-up or to unload the drive unit.	
DRIVE CHAIN SPROCKETS	Check for loose bolts, setscrews or keys. If necessary, retorque to the correct torque value. Check teeth for wear. Replace when tooth wear presents an observable hooked profile.	M
DRIVE CHAIN	Check chain for excessive slack. Shift primary gear reducer or remove link when required. Check sprocket alignment by placing a straight edge across the machined surfaces of the sprockets. Check chain for wear.	M

D - Daily W - Weekly M - Monthly SA - Semi-Annually

ITEM	DESCRIPTION	INTERVAL
SHEAR PIN SPROCKET	Grease fitting located on hub of shear pin sprocket. Check safety collar. Check for loose setscrews or loose key. Check teeth for wear. Replace when tooth wear presents an observable hooked profile.	M
	Remove chain and shear pin. Rotate hub to expose shear faces. Clean faces and swab with Lithium based #2 grease. Reassemble pin and chain.	SA
	CAUTION: When reinstalling shear pin, necked down portion must be aligned in the shear plane.	
FINAL DRIVE ASSEMBLY	Check oil level at sight gauge located under floor plate cover. Final gear/oil condensate drain is the 1-1/2" (38 mm) ball valve located below sight gauge. Pinion oil/condensate drain is the 3/8" (9.5 mm) ball valve located at the pinion bearing hub. **NOTE**: Condensate can accumulate at all drain points, therefore, both final gear and pinion drain must be checked.	D*
	If low, check for leaks in oil or condensate drain piping and final drive housing. Add oil to proper level. **	
	If high, check for evidence of condensate (water) in oil. Drain small amount of oil through the oil and condensate drain valves and inspect. If clear water is present, drain until oil is draining. Refill to sight gauge with proper grade of oil. ** Check for loose or damaged dust shield	

*Or after severe weather or wash-down procedures.

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the clarifier.

D - Daily W - Weekly M - Monthly SA - Semi-Annually

ITEM	DESCRIPTION	INTERVAL
FINAL DRIVE ASSEMBLY (Continued)	Check condition of oil for condensate or other contaminants by draining a small amount from both oil and condensate drains and visual inspection. If clear water is present, drain until oil becomes present and refill oil to proper level. ** Check for damaged dust shield. If oil is milky in color, drain, flush and refill with fresh oil. ** Check for damaged dust shield. Some metal contaminants (fine particles, visual with the eye) are expected in the first six to twelve months of service due to initial groove formation of bearing races. If contaminates are high in concentration or if large metallic chips are present, take clarifier out of service. After locking out drive starter, inspect stop blocks by pulling back edge of neoprene drive dust seal. If bottoms of stop blocks show signs of contact with the top portion of the main gear or if a stop block is missing, CALL FACTORY	M*
	Seasonal change of oil.	SA

*Or after severe weather or wash-down procedures.

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the clarifier.

D - Daily W - Weekly M - Monthly SA - Semi-Annually

ITEM	DESCRIPTION	INTERVAL
FINAL DRIVE ASSEMBLY (Continued)	In preparation for changing the oil, drain out approximately 5% (1 quart [.94 Liters]) and replace with Mobil Oil Corp. Mobil System Cleaner. Run the drive unit at minimum load condition (reduce sludge blanket) for approximately 48 hours. Shut off drive unit and drain. Replace with oil with proper viscosity for anticipated seasonal conditions. ** Summer: Mobil SHC-630 Winter: Mobil SHC-629 Drain by opening 1-1/2" (38 mm) ball valve located under floor plate cover. Also, drain each condensate line. Filler plug is located in elbowed pipe located in pinion hub.	
	Check bearing race wear. Every third annual clarifier shut-down, lock out drive starter, inspect final drive by pulling back edge of neoprene drive dust seal to inspect the gap between the stop blocks and the gear. Please refer to "H-Drive Bearing Check Points" page at the end of this section.	Three Years
MOTOR	Refer to manufacturer's bulletins in VENDOR INFORMATION section.	M
PRIMARY REDUCER	Refer to manufacturer's bulletins in VENDOR INFORMATION section	M

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the clarifier.

D - Daily W - Weekly M - Monthly SA - Semi-Annually

ITEM	DESCRIPTION	INTERVAL
BRIDGE COMPONENTS	Check for and tighten any loose fasteners per the Fastener Installation Instructions of this manual. Special attention should be given to locating loose handrail and/or grating/floor plate connections. **NOTE**: Inspect and verify bridge base plate expansion connection is free to allow movement for the thermal expansion/contraction of the bridge structure	M
SCUM TROUGH, SCUM BAFFLES, WEIRS	Before tank drain-down, inspect weirs for consistent water depth. Inspect one full rotation of skimmer assembly, checking if any binding occurs. At tank drain-down, hose off all components. Make any necessary adjustments. Replace and tighten any missing or loose bolts. Any mastic sealer or grouting that has cracked or come loose should be replaced.	SA
TOW-BRO UNITUBE HEADER	When tank is drained for semi-annual inspection, remove all slime or sludge with a high pressure hose. Examine all bolted connections for loose or missing bolts or shims. Tighten and replace as necessary. Inspect neoprene fluidizing blade. Replace as necessary. If the clearance between the lip of the unitube header and the floor has changed, we suggest conducting a true plane of rotation check as described in the INSTALLATION section of the manual. If out of plane, CALL FACTORY	SA

D - Daily W - Weekly M - Monthly SA - Semi-Annually

ITEM	DESCRIPTION	INTERVAL
SCRAPER ARMS (if scraping is provided opposite the header)	When tank is drained for semi-annual inspection, remove all slime or sludge with a high pressure hose.	SA
	Examine all bolted connections for loose or missing bolts or shims. Tighten and replace as necessary	SA
	Inspect plow blades and squeegees. Replace any that are missing, badly bent or worn.	
MANIFOLD SEALS	Hose off manifold seals and verify they are making full contact with the sealing surfaces as the mechanism revolves the full 360°. Replace seals when the material becomes cracked or brittle.	SA
OIL FLUSHING PROCEDURE FOR **EVOQUA** INTERMEDIATE AND FINAL HOUSING ONLY	Reduce loading on clarifier mechanism by lowering sludge blanket as a minimum; it is preferred to drain and clean tank. Stop and lock out drive motor. Drain existing oil. Refill with a mixture of 50% Mobil Oil Corp. Mobil System Cleaner and 50% of any gear lube oil. Run unit for 4 hours. Stop and drain. Refill with proper viscosity oil for anticipated weather. ** For other gear reducers, see manufacturer's bulletins in VENDOR INFORMATION section.	AS NEEDED

**Due to the viscosity of the oil, it can take several hours for a true reading to occur at the sight gauge. Overfilling of oil will result in oil leaking into the clarifier.

D - Daily W - Weekly M - Monthly SA - Semi-Annually

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
DRIVE OVERHEATING	Oil level too low.	Fill to correct level.
	Oil level too high	Check for condensation or water present in oil reservoirs.
	Low oil level in high speed gear case.	Fill to proper level
BROKEN SHEAR PINS OR ALARM BEING SET OFF	Solids build-up in tank.	Drain tank and clean.
	Large debris in tank	Drain tank and remove.
	Grout on tank floor raised	Drain tank, repair floor and re-grout.
	Damaged/missing stop blocks.	Refer to H-Drive Bearing Check Point sheet.
	Scraper making contact with tank floor.	Drain tank and adjust properly. Check for proper rotation of scraper for correct clearance.
	Bridge being locked down.	Loosen and check expansion slots for movement.
SKIMMER NOT SKIMMING PROPERLY	Blade not adjusted correctly.	Adjust blade so it makes full contact with beach.
	Build-up of material on beach.	Clean and remove fibrous material.

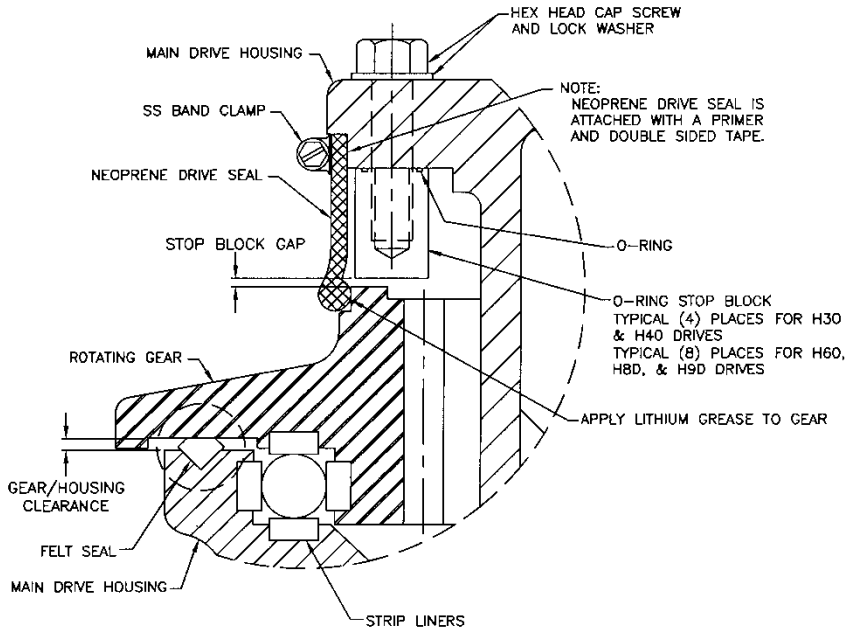
PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
HIGH SLUDGE BUILD-UP	Header tube or sludge pit clogged.	Drain and clean.
LOW CONCENTRATION OF SOLIDS, LOWER THAN NORMAL	Bad manifold seals.	Drain and replace seals.

H-DRIVE BEARING CHECK POINTS

DRIVE	BALL DIAMETER	STOP BLOCK GAP	MAXIMUM STOP BLOCK GAP	GEAR / HOUSING CLEARANCE
H30, H30A	1.00” 25.4 mm	0.07” 1.778 mm	.225” 5.715 mm	0.25” 6.35 mm
H40, H40A, H40HD	1.00” 25.4 mm	0.07” 1.778 mm	.225” 5.715 mm	0.25” 6.35 mm
H60, H60A, H60HD, H60AHD	1.25” 31.74 mm	0.093” 2.362 mm	.225” 5.715 mm	0.25” 6.35 mm
H80, H80A, H90, H90A, HD90, HD90A	1.50” 38.1 mm	0.093” 2.362 mm	.225” 5.715 mm	0.25” 6.35 mm

NOTES:

1. When stop block gap approaches 0.200" (5.08 mm), replacement of strip liners is suggested.
2. If stop block gap reaches the maximum allowable gap indicated, drive rebuild is recommended.
3. If top of main gear and underside of stop blocks are scored or worn, a detailed inspection of the drive/mechanism by an **Evoqua** Field Technician is recommended.
4. If a stop block is missing, STOP the drive immediately, and contact sales representative or **Evoqua** Field Service Manager.



SECTION 4 CONTENTS

TOW-BRO® CLARIFIER, H-DRIVE

SAFETY PRECAUTIONS

The safety precautions, which apply to overhaul procedures, are the same as those involved in installing, operating and maintaining circular clarifiers. No overhaul procedure should begin before the safety precautions in the GENERAL INFORMATION section and those precautions listed at the beginning of the INSTALLATION, OPERATION and MAINTENANCE sections of this manual have been carefully reviewed.

GENERAL OVERHAUL PRECAUTIONS

1. Drain the tank or well, hose down the equipment and the tank so that noxious fumes are at a minimum and surfaces afford good footing.

2. Have a small crane or portable hoist available. Many components are heavy and some procedures require lifting before timber supports are placed.

3. Use cable in first class condition when parts are to be lifted.

4. Provide a dry area for storing parts prior to reassembly.

5. Have this Service Manual available to you. Refer to the General Arrangement and Assembly Drawings for locating dimensions when questions arise. Included in the manual are other manufacturers' maintenance guides and re-lubrication instructions.

6. **Evoqua** equipment, other than motor reducers and electrical components, do not require special tools for disassembly. Care must be taken, however, when removing cast iron or semi-steel sprockets and bearings or set collars. Clean up shafts before attempting to slide sprockets, bearings or set collars off the shafts. Use rust solvents to loosen setscrews. Use a solvent like Toluol to dissolve bitumastic coatings. **Provide adequate ventilation.**

7. Take care when burning off nuts or bolt heads that adjacent accumulations of oil, grease or paint do not start to burn. **Have fire control equipment handy.**

8. If it is necessary to use a torch to help remove a sprocket, do not attempt to burn completely through the hub. Burn a groove into the hub and use chisels to split the hub.

9. Be sure to use a proper ground when doing any welding so that arcing across any bearing in adjacent machinery is avoided. Be especially careful when welding near motors and reducers.

10. Grind all welds smooth in areas where some other part has to cross the weld.

11. Use the Fastener Installation Instructions furnished when reassembling structural components. Refer to the separate motor and reducer manufacturers' bulletins for reassembly instructions concerning torque values.

OVERHAULING THE DRIVE

We suggest the services of an **Evoqua** Service and Erection Technician, if a complete overhaul of your drive is proposed. However, the following instructions will enable qualified on-site maintenance personnel to overhaul the final drive.

Before disassembly of any equipment, refer to the pocket in this manual for the drawings, which can serve as a guide during overhaul.

The drive is designed so that most of the overhaul is possible without removing the bridge. However, it will be necessary to drain the tank and hose down the submerged equipment. Rotating machinery (center cage, truss header, etc.) must be blocked securely and safely in place before the bolts that hold the cage to the final drive can be removed. It is only necessary to remove the bridge if the housing of the final drive is to be removed from the center pier.

DO NOT begin overhaul without first disconnecting the power. See the procedure on Page 3-1.

1. Disconnect and lock out the drive electrically.

2. Drain the final drive. We recommend that the primary and secondary worm gear drives be removed, drained, flushed and re-lubricated at this time.

3. Block the truss arms and the cage in place on the tank floor using wooden blocks and hydraulic jacks or screw jack.

4. Secure the upper center cage to the center support pier with "come-alongs".

5. Using a chain hoist, remove the intermediate worm gear housing and primary motor/reducer assemblies. There are eight (8) bolts connecting the worm gear housing to the final drive housing.

   When removing the pinion shaft assembly, the outer race of the lower pinion bearing will stay in the housing, as this is a "press fit". A puller will need to be used to remove this outer race, if necessary. Use caution when installing a new race to insure no damage occurs.

6. Remove the dust shield from the outer periphery of the final gear. This will expose the stop blocks.

7. Remove the stop block capscrews and round stop blocks.

8. Remove the bolts connecting the drive attachment pads to the upper cage.

9. The main gear is split. Secure each gear half from dropping before removing the hardware at the gear splice.

10. Remove the capscrews and tapered pins joining the final gear halves at the connecting flanges, then lift and remove the halves. The internal gear halves are heavy and will require block and tackle or small hoist to lift them up and over the handrail. The 38” (965 mm) diameter final gear assembly weighs approximately 400 pounds (180 Kg), with each gear half weighing 200 pounds (90.8 Kg). A temporary wood plank platform mounted on the cage or walkway can provide additional work space.

11. Remove the existing ball bearings, races and felt seal strip from the housing. Thoroughly clean the housing, gear halves, bearings and races with a good commercial solvent. If races cannot be pried out, drill a small hole through the drive casting and punch from behind. Tap and plug hole before reassembly.

12. Examine and count the ball bearings and check the bearings and races for galling, pitting or any other roughness. Replace as needed.

13. Check the condition of the interior of the housing for rust and loose paint. If needed, scrape out and repaint non-machined surfaces.

14. Thoroughly clean the sump of the lower pinion shaft bearing driven by the intermediate worm gear.

15. Remove the existing races from the final gear halves; clean the housing, gear and other components as much as possible.

ASSEMBLY PROCEDURE

16. Stake the new ball races in place. Lay out each set of four (4) races: upper, lower, inner and outer. Trimming is necessary to remove flat ends or for proper length. Note: Ball races are hardened and if excessive saw speed is used, the race could overheat and lose its temper. Care should be taken.

    Races can be individually fit with the gear halves turned upside down. The gear holds the inner and upper races. The main housing holds the lower and outer races. Position the races with "C" clamps, butt races tight to each other and peen at main gear or housing as necessary to keep races in place during reinstallation of the gear.

17. If the lower pinion bearing is replaced, the outer race of this bearing must be press fit into the lower cast iron housing before installing the pinion shaft assembly. Use caution to avoid damage when installing the shaft assembly.

18. Using Permatex or equal, cement a new felt strip in the housing "V" groove. Cut splices at 45° with top of splice pointing in direction of rotation.

19. Install the ball bearings in the housing, setting them in beads of grease to hold them in position until the gear halves are reinstalled. Recount the balls to be sure all are reinstalled.

20. Reinstall the gear halves, reversing the procedure used in disassembly. Use care when setting the halves in position so as not to upset the ball bearings or newly installed felt seal.

21. Bolt up the gear halves finger-tight, then drive the taper pins into the flanges of the gear halves.

22. Torque bolts per SAE Grade 5.

23. Reinstall the stop blocks and check for clearance between the stop block and the gear.

24. Attach the dust shield.
    The instructions for installing the neoprene dust seal to the main drive housing can be found on the "Turntable Subassembly" drawing included with this manual. Follow all instructions carefully. If parts of the dust shield are worn or missing refer to the contact list at the front of the manual to order replacements through the **Evoqua** Parts Dept. Apply grease to the contact area between the bottom of the dust shield and the top of the rotating gear per the instructions on the drawing before starting the drive.

25. Replace any drain plugs that were removed and fill with proper lubricant to operating level.

26. Reconnect the final drive to the rotating cage. Remove support blocks and jacks. Set secondary worm gear drive and reconnect to electrical service. Recheck the alarm and shut off microswitch settings for proper gap. Realign for horizontal plane per **Evoqua** service manual.

ROTATING EQUIPMENT ALIGNMENT

After overhauling the final drive, the rotating equipment will need to be reconnected to the drive. The equipment will have to be realigned in the same manner as when it was installed. Refer to the INSTALLATION section of this manual for these procedures.

RECOMMENDED SPARE PARTS

PART NAME	QUANTITY REQUIRED	
	DOMESTIC – ONE TO THREE UNITS	DOMESTIC – MORE THAN THREE OR OVERSEAS
Shear Pins	Twelve	Twenty-Four

Note: Evoqua does not recommend purchasing lists of spare parts. At the time a spare is needed it may have deteriorated from aging or improper storage. If spare parts are required, refer to the contact list at the front of this manual and call the **Evoqua** Parts Department.

SECTION 5 CONTENTS

APPENDIX

SEE DWG. NO. Y-6 | E 9500 | E9600 | E9700 , MATCH LINE- SEE DWG. NO. Y-7 | E 9800 | E 9900 | E10000

N5300 | N5200 | N5100 | N5000

MATCH LINE - SEE DWG. NO. Y-3

MATCH LINE - SEE DWG. NO. Y-5

AERATION BASINS (6)

PLANT NORTH

1"=20'

60"SE PROFILE "R"

30" NRCY PROFILE "G"

FOR CHANNEL CROSSING, SEE D 6-M-10

AERATED CHANNEL

RECYCLE PUMP STATION (8)

D1 D-4.2

D1 D-3.1

MH D-3

CI D-3.2

MH D-2

MH D-1

CI D-1.1

CI D-1.3

D1 D-1.4

D1 D-2.1

D1 B-5.1

MH D/O SEE DWG. NO. 6-S-7

MH D/O

PH-1

SECONDARY CLARIFIER NO. 9-1 (9)

SECONDARY CLARIFIER NO. 9-2 (9)

SECONDARY CLARIFIER NO. 9-B (9)

85' DIA. SECONDARY CLARIFIER NO. 12-1 (12)

85' DIA. SECONDARY CLARIFIER NO. 12-2 (12)

CONNECT TO EXST 18" DI PIPE INVT. 66.12±

CONNECT TO EXST. 16" CI PIPE INVT. 88.12±

CONNECT TO EXST. 16" CI PIPE, INVT. 84.00±

16LF-12" CULVERT W/ FLARED END SECTIONS, SEE NOTE 8

16LF-12" CULVERT W/ FLARED END SECTIONS SEE NOTE 8

SEE NOTE 9

SEE NOTE 1

INVT. 70.90

INVT. 61.70

INVT. 65.13

INVT. 81.00

INVT. 55.83

INVT. 86.0

INVT. 70.80

INVT. 60.00

INVT 61.66

INVT 75.93

INVT. 89.20

INVT. 87.45

INVT. 89.10

INVT. 64.67

INVT. 83.70

IE 76.40

INVT. 55.83

INVT. 89.90

INVT. 10.00

INVT 64.67

N5076.68 E9449.32 INV 75.69

N5008.00 E9518.00 INN 75.79

N5008.00 E.9642.91 INV 75.90

MH S-4 N5004.00 E9501.77 IN 80.40 OUT 80.30

MH B-6 N4996.00 E9522.13 IN 75.61 OUT 75.58

MH S-4A N5004.00 E 9727.50 IN 81.47 OUT 81.38

MH S-5

MH B-7 N4996.00 E9891.00 IN 76.08 OUT. 76.05

MH B-8

ARV-1 SEE (382)

TO WATER METER HOUSE

60"x60"x54" WYE

54" SE PROFILE "R"

24" RAS PROFILE "I"

24" RAS PROFILE "J"

48" ML PROFILE "N"

24" RAS PROFILE "K"

48" ML PROFILE "O"

48" ML PROFILE "P"

48" ML PROFILE "Q"

24" RAS PROFILE "L"

24" RAS PROFILE "M"

PLUG INVT. 55.83

V330 NOTE 1

(TYP)

RECORD DRAWINGS

Revisions Drawn by S.AREUDSEN Date 9-28-92

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

Y-9	Y-10	Y-11
Y-6	Y-7	Y-8
Y-3	Y-4	Y-5

NOTES:

1. DELETE ABOVE GRADE CS AND INSTALL VALVE BOX AT END OF LINE W/ V330 VALVE ON END OF CS LINE. PLUG THE VALVE.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 8146 6-30-88 REGISTERED NEW YORK

CH2M HILL

DSGN K. CHRISTMAN
DR T. SURRENCY K. CHRISTMAN
CHK B. LUKE
APVD C. CRANDALL

NO.	DATE	REVISION	BY	APVD
3	8-21-92	RECORD DRAWING	SWA	RHF
2	4-10	ADD PIPE & NOTE	HEL	GNC

REUSE OF DOCUMENTS

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL.

©CH2M HILL

VERIFY SCALES

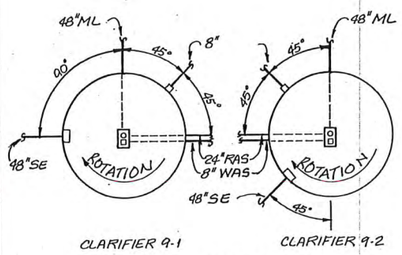
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

PUBLIC WORKS COMMISSION
FAYETTEVILLE, N.C.
UPGRADE AND EXPANSION OF CROSS CREEK WWTP

GENERAL CONSTRUCTION CONTRACT
YARD PIPING
UNDERGROUND PLAN

SHEET 74
DWG NO. Y-4
DATE JULY, 1988
PROJ NO. SA21229.X1

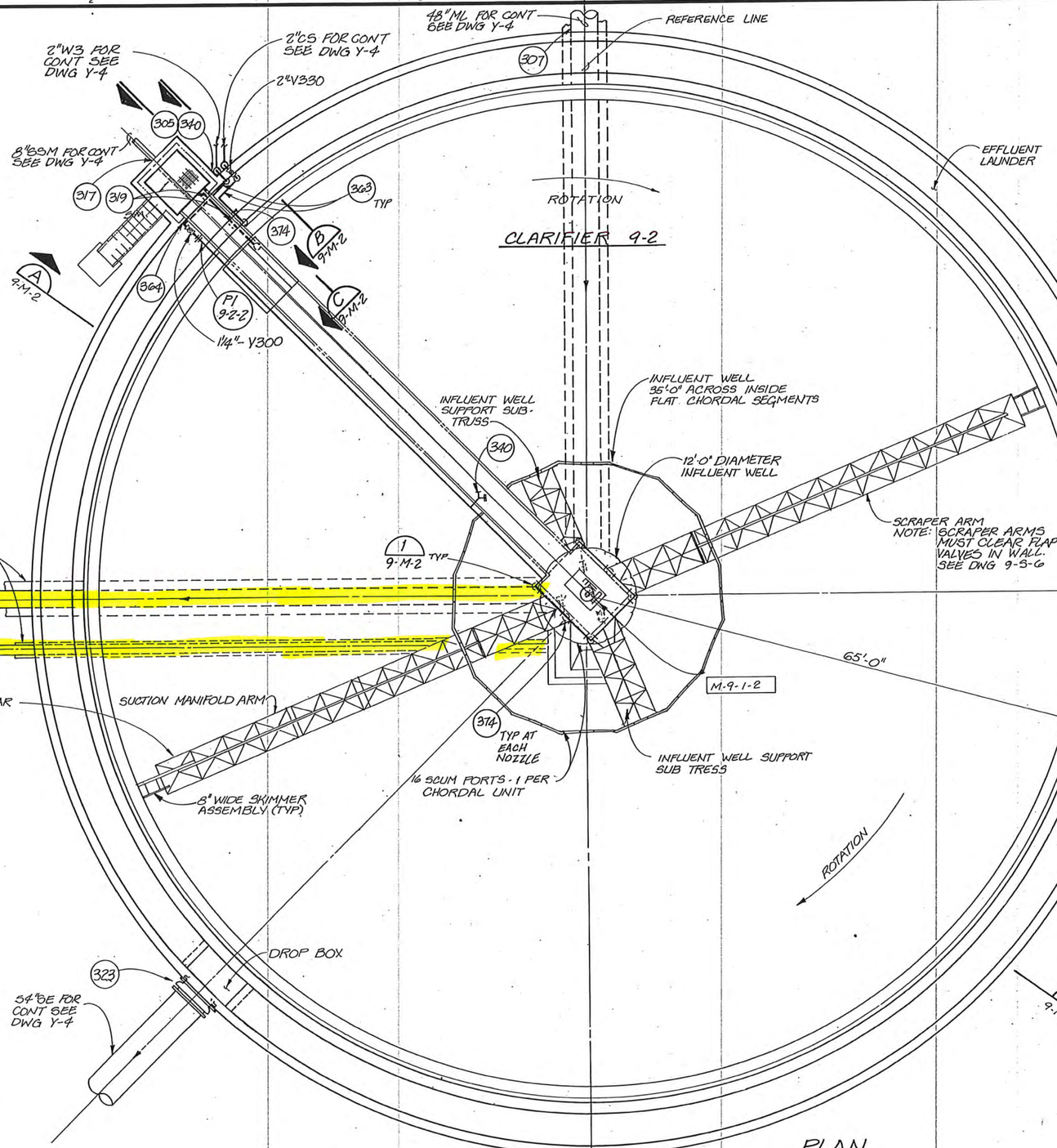


CLARIFIER 9-1 CLARIFIER 9-2

PIPING ORIENTATION

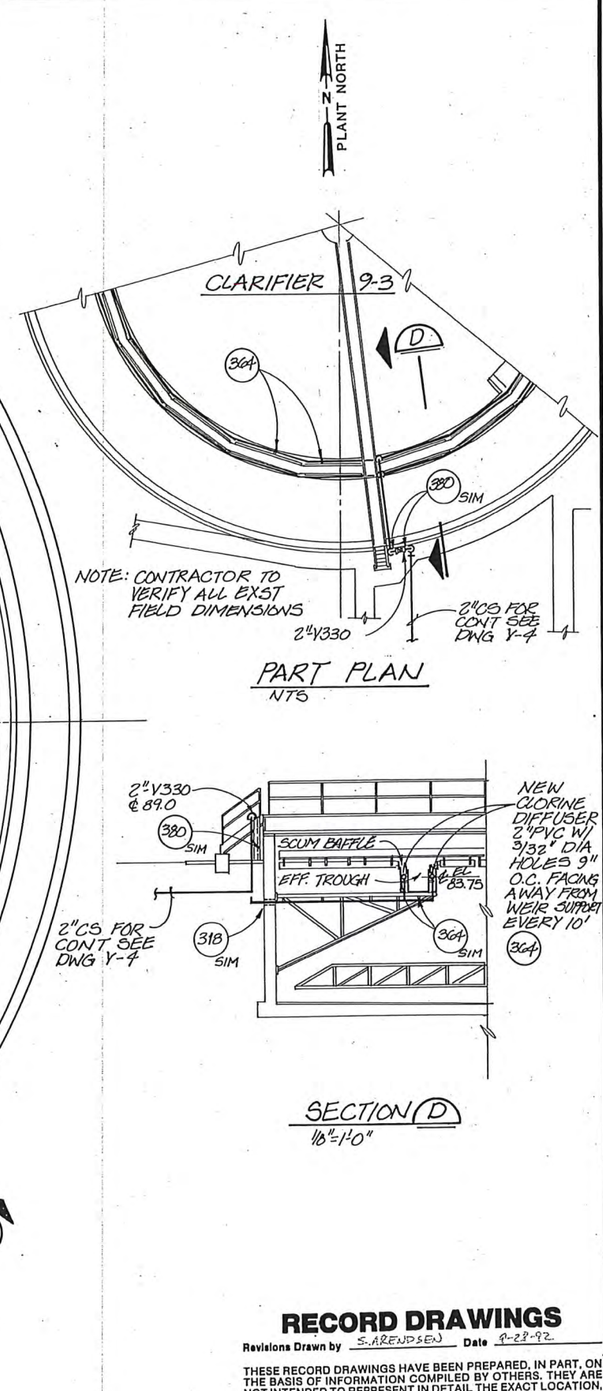
NTS

IE'S	9-1	9-2
48" ML	55.83	55.83
24" RAS	60.00	60.00
8" WAS	61.66	61.66
8" SSM	70.00	70.80
54" SE	75.64	75.93



NOTE:
CLARIFIER 9-1 SIMILAR EXCEPT AS SHOWN

PLAN
1/8" - 1'-0"



PART PLAN
NTS

SECTION D
1/8"=1'-0"

RECORD DRAWINGS

Revisions Drawn by S.ARENDSEN Date 9-28-92

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER SEAL 8146 6-25-88 CHARLES NEWTON PARRILL

CH2M HILL

DSGN	K DUCHON
DR	D THOMPSON
CHK	MCLEOD
APVD	

NO.	DATE	REVISION	BY	APVD
1	7-6-92	RECORD DRAWING	SWA	RHF

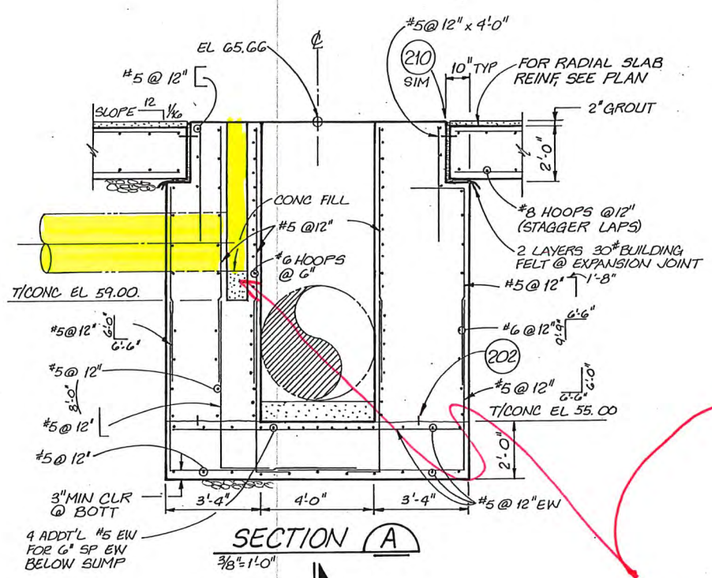
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

PUBLIC WORKS COMMISSION
FAYETTEVILLE, N.C.
UPGRADE AND EXPANSION OF CROSS CREEK WWTP

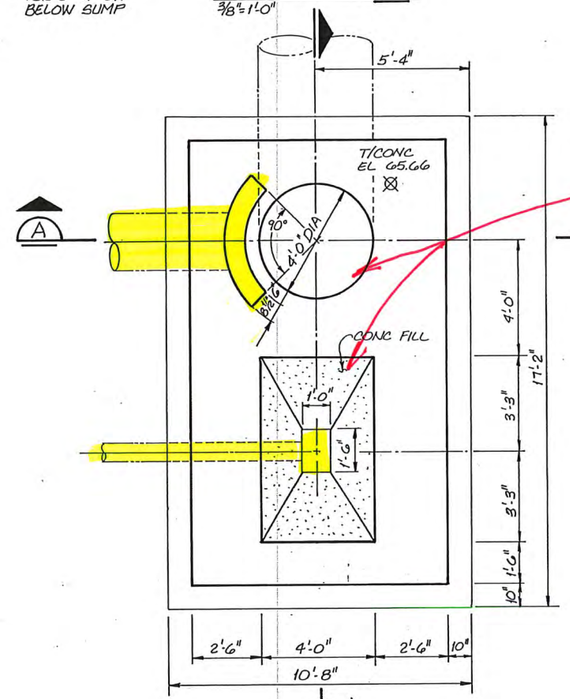
GENERAL CONSTRUCTION CONTRACT
SECONDARY, CLARIFICATION
MECHANICAL

TYPICAL PLAN

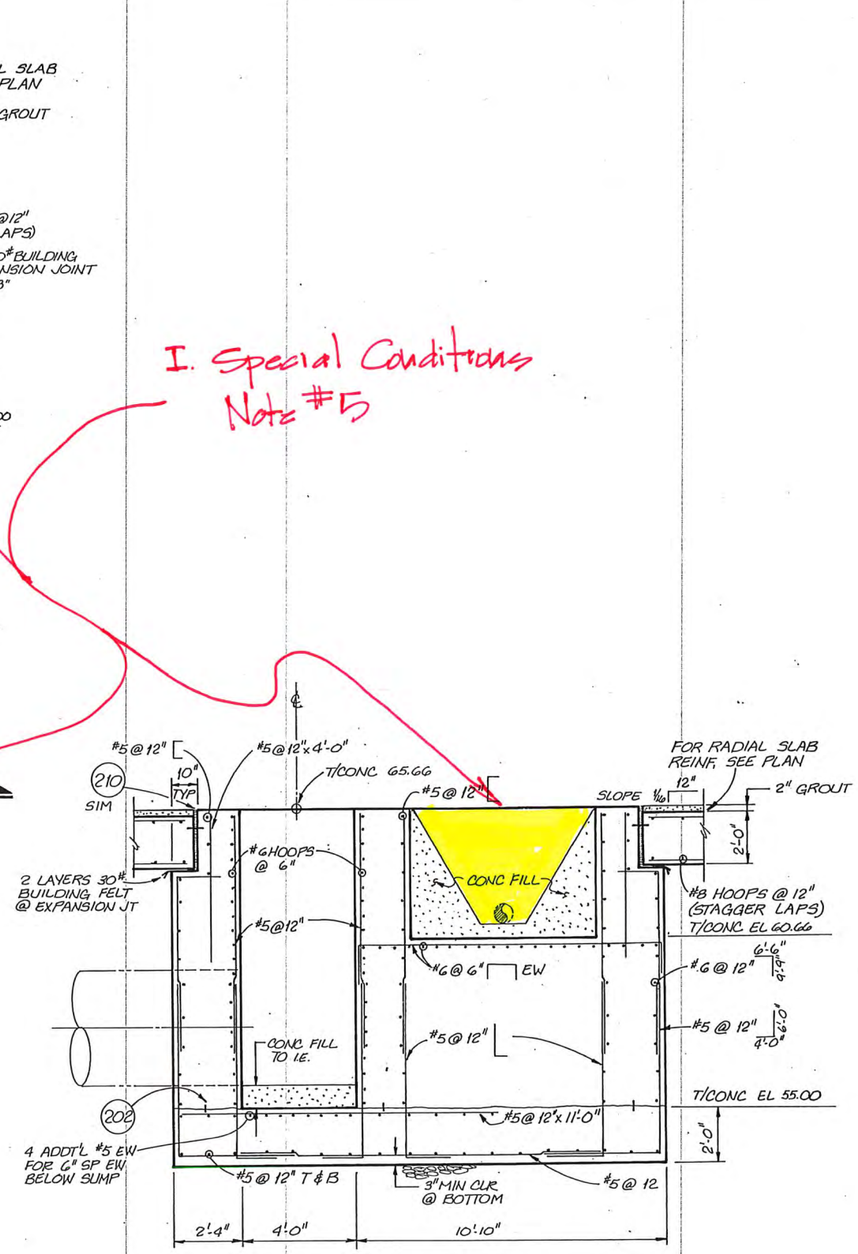
SHEET	196
DWG NO.	9-M-1
DATE	JULY, 1988
PROJ NO.	SA21229.X1



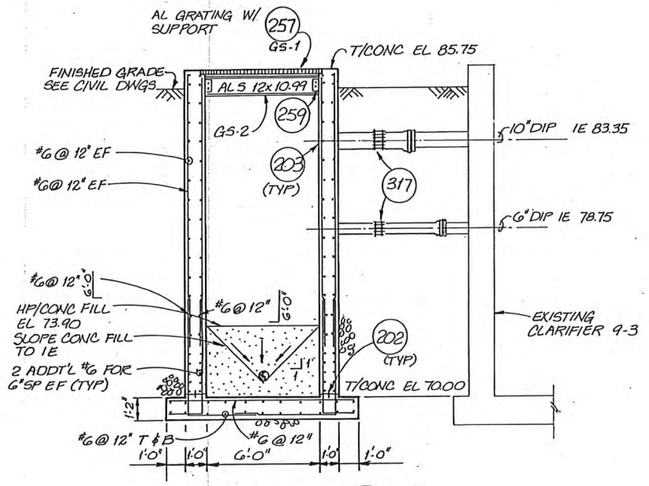
SECTION A
3/8"=1'-0"



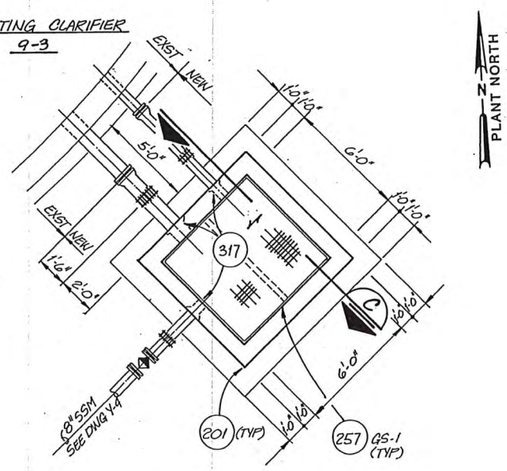
DETAIL 3
3/8"=1'-0"
LA 9-S-1



SECTION B
3/8"=1'-0"



SECTION C
1/4"=1'-0"



PLAN
1/4" = 1'-0"

RECORD DRAWINGS

Revisions Drawn by S.ANDERSEN Date 8-28-92

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

I. Special Conditions
Note #5

NORTH CAROLINA PROFESSIONAL SEAL 8146 ENGINEER CHARLES NEWTON RANDALL

CH2M HILL

DSGN	M C STREIT
DR	D THOMPSON
CHK	B.E. JOHNSON
APVD	CN Crandall

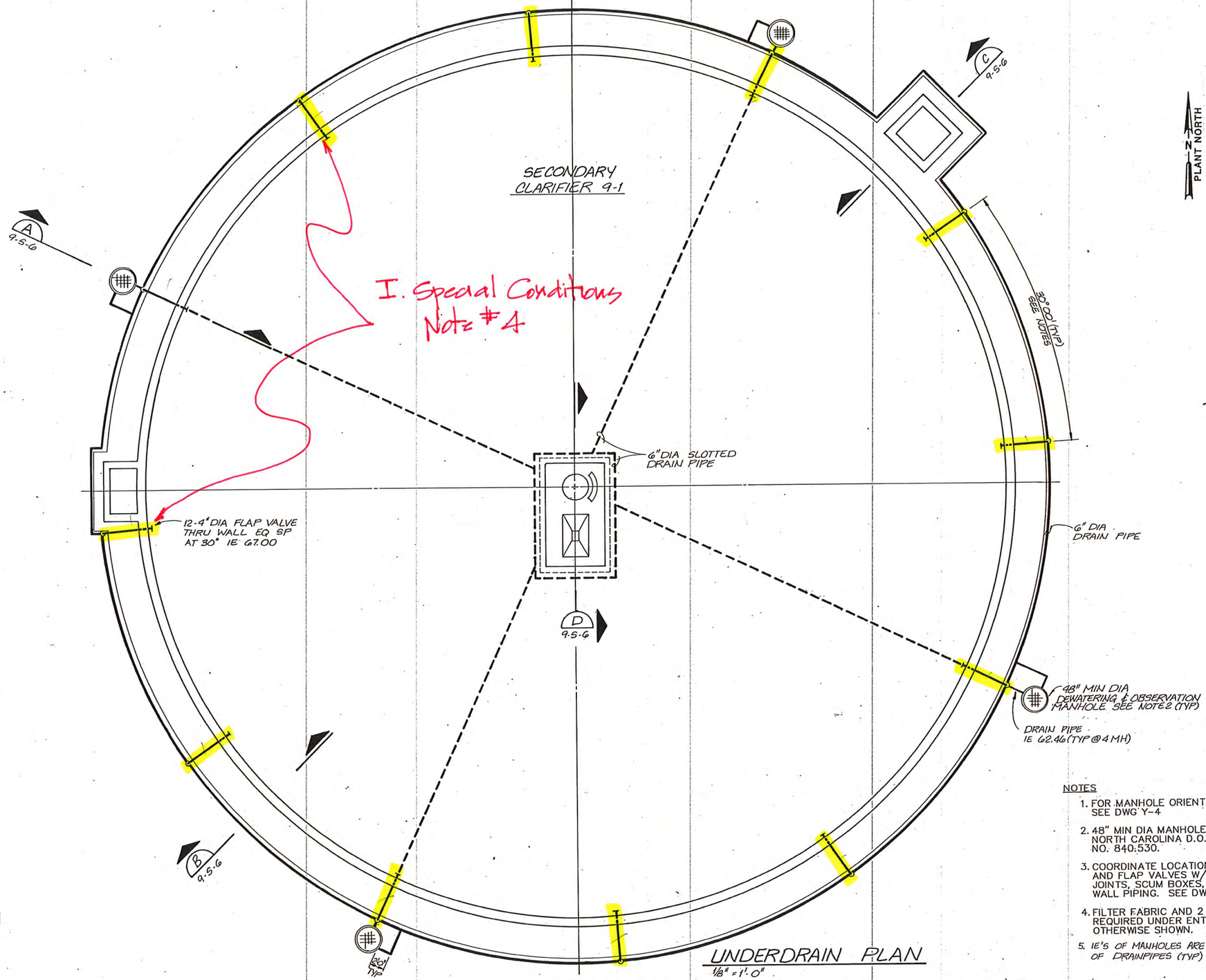
NO.	DATE	REVISION	BY	APVD
1	7-6-92	RECORD DRAWING	SWA	RHF

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

PUBLIC WORKS COMMISSION
FAYETTEVILLE, N.C.
UPGRADE AND EXPANSION OF
CROSS CREEK WWTP

GENERAL CONSTRUCTION CONTRACT
SECONDARY CLARIFICATION
STRUCTURAL
SECTIONS AND DETAILS

SHEET	193
DWG NO.	9-S-4
DATE	JULY,1988
PROJ NO.	SA21229.X1



UNDERDRAIN PLAN
1/8" = 1'-0"

NOTES

1. FOR MANHOLE ORIENTATION OF CLARIFIER 9-2, SEE DWG Y-4
2. 48" MIN DIA MANHOLES SHALL BE AS SHOWN ON NORTH CAROLINA D.O.T. STANDARD DETAIL NO. 840.530.
3. COORDINATE LOCATIONS OF UNDERDRAIN PIPING AND FLAP VALVES W/LOCATIONS OF CONSTRUCT JOINTS, SCUM BOXES, DROP BOXES, AND THRU-WALL PIPING. SEE DWG 9-S-1
4. FILTER FABRIC AND 2 FEET OF DRAIN GRAVEL REQUIRED UNDER ENTIRE STRUCTURE UNLESS OTHERWISE SHOWN.
5. IE'S OF MANHOLES ARE TO BE 6" BELOW IE'S OF DRAINPIPES (TYP)

RECORD DRAWINGS

Revisions Drawn by S. ARENDSEN Date 9-28-92

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 8146 9-20-88 CHARLES NEWTON FRANKLIN

CH2M HILL

DSGN	M. EVANS
DR	D THOMPSON
CHK	W HUBBELL
APVD	

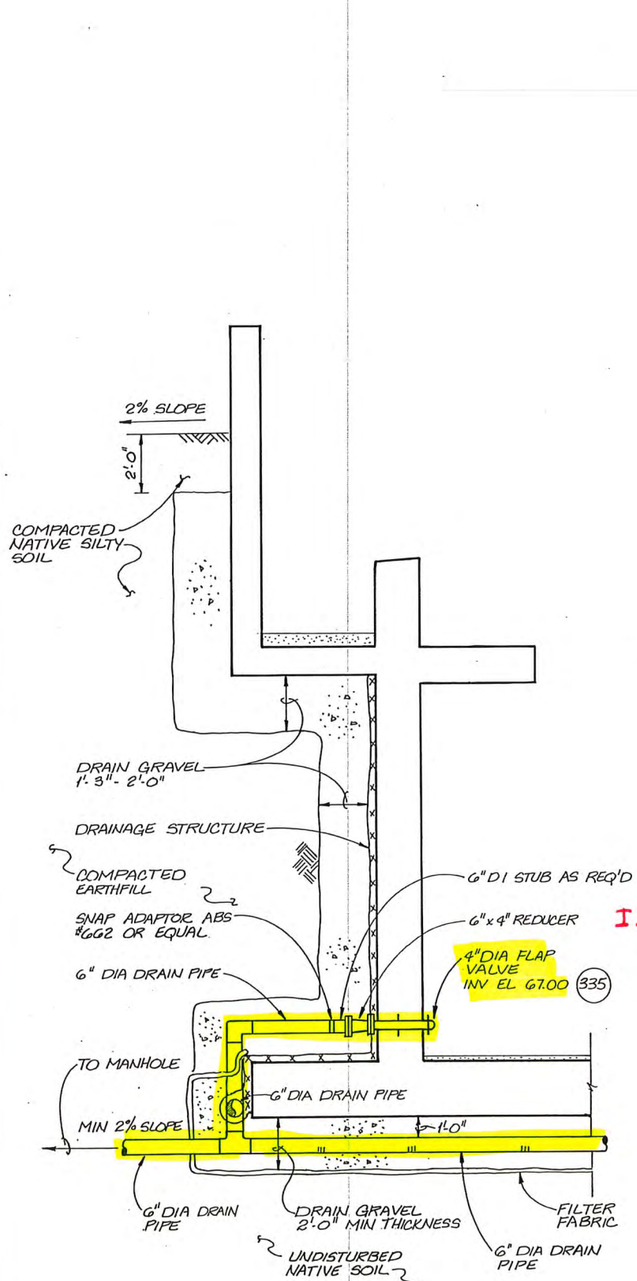
NO.	DATE	REVISION	BY	APVD
1	9-2-92	RECORD DRAWING	SWA	RHF

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

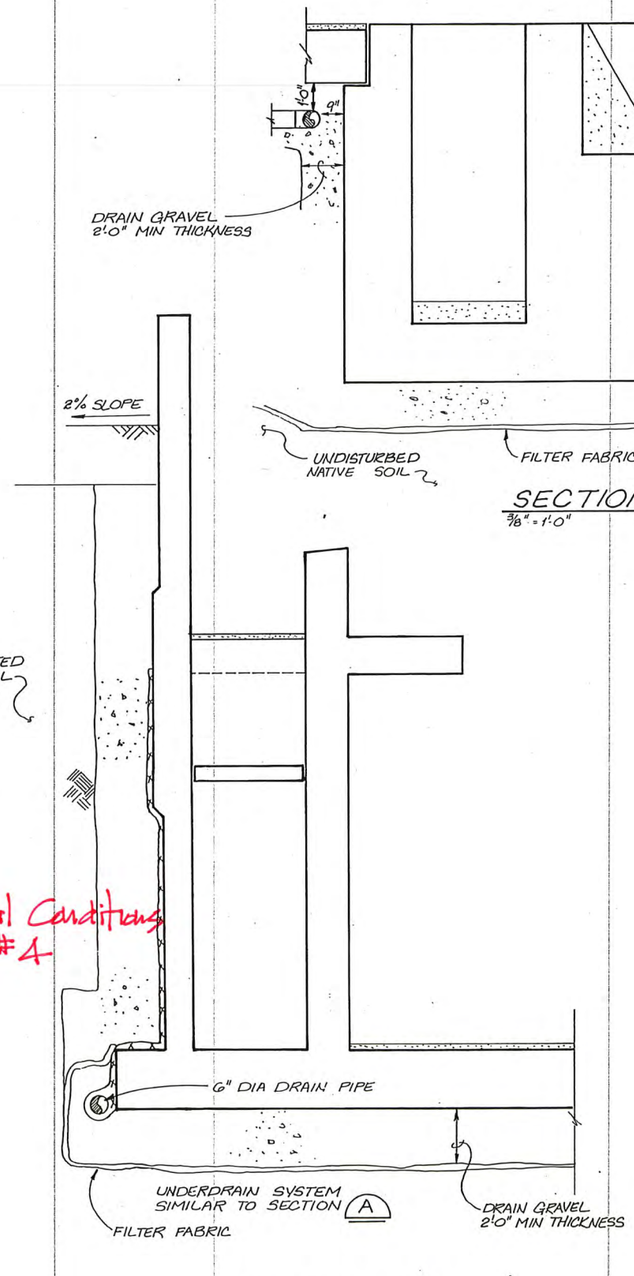
PUBLIC WORKS COMMISSION
FAYETTEVILLE, N.C.
UPGRADE AND EXPANSION OF
CROSS CREEK WWTP

GENERAL CONSTRUCTION CONTRACT
SECONDARY CLARIFICATION
STRUCTURAL
PLAN
UNDERDRAINS

SHEET	194
DWG NO.	9-S-5
DATE	JULY, 1988
PROJ NO.	SA21229.X1

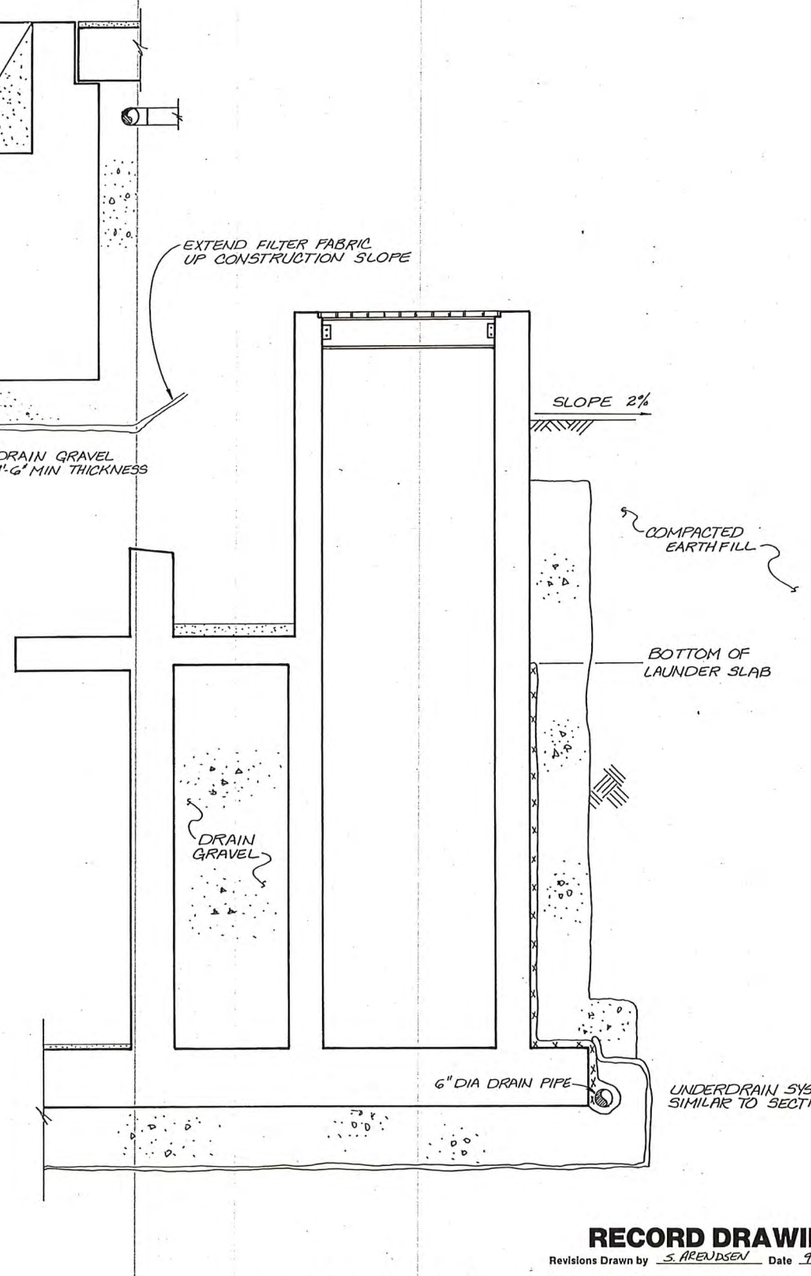


SECTION A
3/8" = 1'-0" 9-S-5



SECTION B
3/8" = 1'-0" 9-S-5

SECTION D
3/8" = 1'-0" 9-S-5



SECTION C
3/8" = 1'-0" 9-S-5

I. Special Conditions Note #4

RECORD DRAWINGS

Revisions Drawn by S. ARENDSEN Date 9-21-92

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 8165 CHARLES KEVIN CRAWFORD 6-30-93

CH2MHILL

DSGN	M EVANS
DR	D THOMPSON
CHK	W. HUBBELL
APVD	C.K. Crawford

NO.	DATE	REVISION	BY	APVD
1	9-2-92	RECORD DRAWING	SWA	RHF

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

PUBLIC WORKS COMMISSION
FAYETTEVILLE, N.C.
UPGRADE AND EXPANSION OF
CROSS CREEK WWTP

GENERAL CONSTRUCTION CONTRACT
SECONDARY CLARIFICATION
STRUCTURAL
UNDERDRAINS SECTIONS AND DETAILS

SHEET	195
DWG NO.	9-S-6
DATE	JULY, 1988
PROJ NO.	SA21229.X1