Hart Engineering Corporation

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11327-02

PROJECT: 9950. - Veolia/Taunton WWTP Improvements Phase 2 **DATE: 05/11/2023**

SUBMITTAL: 11327-02 - Final Clarifier - O&M Manual
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STATUS: Eng
SPEC #: 11327

TO:
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FROM:
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Item	Revision	Description	Status	Date Sent	Date Returned
11327-02	0	Final Clarifier - O&M Manual	Eng	05/11/2023	
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Additional Notes:

Status Codes
1-APP – No Exceptions Taken
2-ANR – Make Corrections Noted
3-R&R – Revise and Resubmit
4-REJ – Rejected
5-IPO – For Information Purposes Only
6-NRR – Not Required for Review
ENG – Submitted to Engineer

Sincerely,
Hart Engineering Corporation

_____ DATE: 05/11/2023

AMWELL®
A DIVISION OF McNISH CORPORATION

161 S. LINCOLNWAY ST., STE. 310
NORTH AURORA, ILLINOIS 60542
PHONE (630) 898-6900
E-MAIL amwell@amwell-inc.com

May 10, 2023

VIA E-mail: info@totalmech.net
jdeluca@aquasolutionsinc.net

Total Mechanical Services Corporation
1 Park Place
Plymouth, MA 02360

Attention: Katryna Nilson

Subject: Taunton, MA
WWTF Improvements Phase II
Spec. Section 11327 – Final Clarifier Eq1uipment
Model "HVS" Circular Clarifier
Your P.O.# 2022-13 & Dated 07/05/2022
AMWELL S.O. A23011 – One (1) Model "HVS" Clarifier #1
A23012 – One (1) Model "HVS" Clarifier #2
A23013 – One (1) Model "HVS" Clarifier #3
A23014 – One (1) Model "HVS" Clarifier #4
Final Installation, Operation & Maintenance Instructions

Dear Ms. Nilson:

We are pleased to submit a PDF of the Instillation, Operation & Maintenance Manual for the Model "HVS" Circular Clarifiers equipment.

Feel free to call if you have any questions or if we can be of any further assistance.

Sincerely,

AMWELL®
A Division of McNish Corporation

Arthur L. Benner
Engineering Manager

cc: ALB/File
Jim Deluca – Aqua Solutions

ALB/jlb

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A DIVISION OF McNISH CORPORATION

161 S. LINCOLNWAY ST., STE 310
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INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

PROJECT ..... WWTF IMPROVEMENTS PHASE II
TAUNTON, MA

ENGINEER ..... BETA, INC.

CUSTOMER/CONTRACTOR ..... TOTAL MECHANICAL SERVICES CORP.
1 PARK PLACE
PLYMOUTH, MA 02360

CONTACT: KATRYNA NILSON
PHONE: (508) 746-1183
E-MAIL: INFO@TOTALMECH.NET

P.O. 2022-13 & DATED 7/5/2022

AREA REPRESENTATIVE ..... AQUA SOLUTIONS, INC.
154 WEST GROVE STREET
MIDDLEBORO, MA 02346

CONTACT: JIM DELUCA
PHONE: (508) 947-5777
FAX: (508) 861-0733

SPECIFICATION REFERENCE ..... SECTION 11327 – FINAL CLARIFIER EQUIPMENT

AMWELL IDENTIFICATION NO. ..... S.O. A23011-1 – ONE (1) MODEL “HVS” FINAL CLARIFIER #1

S.O. A23012-1 – ONE (1) MODEL “HVS” FINAL CLARIFIER #2

S.O. A23013-1 – ONE (1) MODEL “HVS” FINAL CLARIFIER #3

S.O. A23013-1 – ONE (1) MODEL “HVS” FINAL CLARIFIER #4

SUBMITTED ..... MAY 10, 2023

TABLE OF CONTENTS

No. of Pages/Dwg No.

SECTION D - LUBRICATION AND MAINTENANCE

SECTION E - ASSEMBLY & DISASSEMBLY INSTRUCTIONS

SECTION F - TROUBLESHOOTING

SECTION G - SPARE PARTS INFORMATION

SECTION H - INSTALLATION INSTRUCTIONS & DRAWINGS

SECTION H - INSTALLATION INSTRUCTIONS & DRAWINGS – (Continued)

Sludge PVC Suction Pipe Mounting Erection Diagram..... B605-50673-292
Sludge Box Seal and Sludge Control Pipes to Truss Arms Erection Diagram B605-50672-292
Walkway Plate – Bridge Platform Erection Diagram..... B605-64268-292
Truss Bridge Splice Connection Erection Diagram..... B605-61463-292
Miscellaneous Erection Diagrams..... In Numerical Order
↑(Refer to Installation Instructions & Master Erection Diagram)
Handrail Manufacturer's Erection Drawings..... C405-85813-412
Grating Manufacturer's Erection Drawing..... 19412 (G1)
Expansion Anchor Information..... 1 thru 11
Adhesive Anchor Information..... 1 thru 9

SECTION I - SPECIFICATIONS & GENERAL ARRANGEMENT DRAWINGS

Equipment Specifications..... 1 thru 8
General Arrangement Drawing (Tanks 1 & 2)..... D205-85649-167A
Anchor Location Drawing (Tanks 1 & 2) D105-85650-166A
General Arrangement Drawings (Tanks 3 & 4)..... D205-85652-167A
Anchor Location Drawings (Tanks 3 & 4) D105-85653-166A

SECTION J - TORQUE TEST

Field Torque Test Procedures ..... 1 of 1
Torque Test Arrangement Drawing..... B605-18828-870

SECTION A

GENERAL INFORMATION

ALL EQUIPMENT

PARTS SUPPLIER

If a problem is encountered in installing or operating the equipment which cannot be solved by referring to the available material, please contact:

AMWELL
A Division of McNish Corporation
161 S. Lincolnway St., Suite 310
North Aurora, Illinois 60542

Phone: (630) 898-6900

Attention: Customer Service Department

PROCESS EQUIPMENT

GENERAL INFORMATION

All instructions are written as an aid to the erector and user. It is important to thoroughly read and study these instructions before erecting or operating the equipment. A few minutes spent reading these instructions might save unnecessary hours of re-doing some part of the erection of this equipment.

The procedures outlined are recommended by **AMWELL** and are a compilation of many years of experience. Should additional information not contained in this manual be needed, do not hesitate to contact our offices.

PROCESS EQUIPMENT

SPECIAL INSTRUCTIONS TO EQUIPMENT ERECTORS

A. RECEIVING SHIPMENT

All material has been thoroughly checked and inspected prior to shipment. We have taken precautions to protect the equipment against damage or losses during shipment. If the equipment is received in bad condition or the number of pieces are not as listed on the bill-of-lading or attached packing list, make sure you note this on the bill-of-lading and have the driver sign and acknowledge same. This enables you to place the proper claims against the freight company.

It is also strongly recommended that you give the itemized packing list to one person and have them verify upon receipt that all nuts, bolts, washers, etc. are received. This person should be held responsible for their storage and distribution as needed.

B. STORAGE

Proper storage of the equipment before and during installation is the responsibility of the erector. Specific storage instructions are covered elsewhere.

C. INSTRUCTIONS

Drawings and erection or installation instructions must be followed to assure proper sequences. In case of minor discrepancies, the drawings should govern. In the event of major discrepancies, notify AMWELL immediately.

D. FIELD INSTALLATION

As we do not anticipate problems with the installation of our equipment, we assume the erector will follow the guidelines of the AISC "Code of Standard Practice". Specifically, Section 5-7.12. Because of the nature of an engineered fabricated product, a certain amount of fit-up and adapting must be done by the erector and is considered a normal part of installation, as well as any special tools needed for installation.

E. FIELD CHARGES

AMWELL will not accept any charge for modification, servicing, adjustment or for any other item without written authority in the form of a PURCHASE ORDER issued from the home office at Aurora, Illinois IN ADVANCE of doing the work. This authority will only be given when satisfactory proof is submitted and the authority will only then be issued providing the price is agreed upon and the authority is given as outlined above BY OUR CLAIMS MANAGER.

ANY BACKCHARGE SUBMITTED CONTRARY TO THIS AGREEMENT WILL BE REJECTED IN TOTAL WITHOUT CONSIDERATION.

PROCESS EQUIPMENT

STORAGE INSTRUCTIONS & PROTECTIVE PRECAUTIONS

If materials and equipment are to be stored or not used for 30 days, precautions should be taken to protect against corrosion and assure operating condition.

GENERAL STORAGE PRECAUTIONS

1. Be sure drive units are stored in normal operating position.

2. If possible, store drive units and all other parts in a dry, well-ventilated building with a constant temperature.

3. When drive units are not installed, but must be stored outdoors:

    a. Place units on wooden blocks elevated above ground. Usually shipping crates or skids will often do. Be sure units are even and on firm supports. Do not store where water can collect.

    b. If shipping covers have been damaged or removed, cover with canvas or tarpaulin. Allow for adequate ventilation. Do not totally enclose with visqueen or plastic covers.

    c. Locate in an area out of the way of traffic. If possible, store in a shaded area protected against the elements.

4. Apply a corrosion inhibitive agent to all unpainted metals such as drive shafts. For short periods, a coat of oil is sufficient.

SHORT TERM STORAGE - DRIVE

If equipment is to be installed upon receipt but will not operate for two months or less, leave power connected. Fill drive unit per the Lubrication Instructions in this manual. Operate equipment about twice a week for 5 minutes to lubricate moving parts. If motors are furnished with space heaters, leave connected throughout the non-operative period.

LONG TERM STORAGE - DRIVE

1. Store spur gear units in a sheltered location away from chemical vapors and moisture.

2. Avoid storage in direct sunlight. This will prevent ultra-violet damage to the seals, paint, and installation labels. This will also minimize the formation of condensation within the primary, intermediate and final gearboxes.

LONG TERM STORAGE - DRIVE (CONTINUED)

3. Primary drive reducers and gearmotors lubricant levels should be checked. Long term storage preparations should be completed in accordance with the motor and primary reducer manufacturer's recommendations, found in this manual. Remove breather plugs (if provided) and replace with breather vents to prevent leakage due to pressure build-up. Tag units "Service and fill to normal lubricant level before placing into service, see manufacturer's instructions."

4. Coat primary drive input shaft and seal (if applicable), output seal, output shaft with petrolateum (Cosmoline), a water-resistant grease or commercial rust inhibiting coating such as Nox Rust X-110, Daubert Chemical Company, Inc. or RUST VETO 344, Houghton Fluid Technology & Service Worldwide, or equal, that can be readily removed with solvent.

5. Unpainted machined surfaces should be coated with petrolateum, a water-resistant grease, or a commercial coating.

6. The drive unit is shipped without any lubricating oils. Fill the intermediate worm gear and final spur gear sumps with proper grades and types of lubricants to normal oil levels in accordance with Lubrication Instructions found in this manual, and add a vapor phase rust inhibitor such as Nox Rust Motorstor VCI-10 Oil, Daubert Chemical Company, Inc. or equal. Do not remove the worm gear breather vent. The worm gear requires functional breather vents to avoid pressure buildups caused by changes in ambient temperatures. The drive should then be resealed. Tag units "drain, flush & refill to normal oil levels before placing into service."

7. Temporary power should be connected and the drive run for eight (8) hours to warm and distribute the oil to the gears and allow the Nox Rust Motorstor VCI-10 to properly mix. After rotating drive, disconnect temporary power.

8. Remove chain guard and coat drive chain with grease. Coat sprockets and shear pin hubs (if provided) with petrolateum (Cosmoline), a water-resistant grease or rust inhibiting coating such as Nox Rust X-110, Daubert Chemical Company, Inc. or RUST VETO 344, Houghton Fluid Technology & Service Worldwide. Reinstall chain guard.

9. The drive unit greaseable bearing has been filled at the factory, at the lubrication fitting – provide 2 or 3 shots of #2 soft bearing grease. Lubricate motor bearings in accordance with manufacturer's recommendations.

10. Connect temporary power and rotate drive through at least one (1) full revolution of the spur gear output to distribute lubrication every 4 weeks if stored indoors, and every 2 weeks if stored outdoors. Disconnect temporary power after drive has been rotated.

LONG TERM STORAGE - DRIVE (CONTINUED)

11. Visually inspect the motor and primary reducer/gearmotor, intermediate worm gear, and final spur gear weekly. Drain any condensate from the primary reducer, worm gear and spur gear oil sumps weekly. The amount of condensate drained will dictate increased or reduced frequency of this check. Top off oil levels with the appropriate lubricants as necessary.

12. Replenish vapor phase rust inhibitor in gear sumps at least every three (3) months of long-term storage.

13. Recoat all machined surfaces previously coated with petrolateum (Cosmoline), a water-resistant grease or commercial rust inhibiting coating such as Nox Rust X-110, Daubert Chemical Company, Inc. or RUST VETO 344, Houghton Fluid Technology & Service Worldwide, as necessary and at least every six (6) months of long-term storage.

14. Refer to Lubrication and Maintenance Instructions found in this manual for winterizing procedures.

LONG TERM STORAGE - STRUCTURAL STEEL

Inspect painted surfaces for deterioration of primer paint. Remove corrosion and rust. Re-paint as necessary with identical type of primer. Shop primed surfaces should be finish-coated within the time specified by the paint manufacturer. When in doubt apply finish coats as soon as possible.

AMWELL cannot accept responsibility for shop primer coats that have deteriorated due to exposure and time.

SHOP PRIMER DURABILITY - STRUCTURAL STEEL

Shop primer paints are to serve as a minimal protective finish. **AMWELL** will not be responsible for condition of primed or finished painted surfaces after the equipment leaves its shop. Purchasers are invited to inspect painting in our shops for proper preparation and application prior to shipment. **AMWELL** assumes no responsibility for field surface preparation or touch-up of shipping damage to paint. Painting of fasteners and other touch-up to painted surfaces to be by purchaser's painting contractor after mechanism erection.

IMPORTANT NOTE: If, for any reason, **AMWELL's** paint job is rejected after installation, **AMWELL** will bear no costs associated with the removal or installation of the equipment to make modifications.

PROCESS EQUIPMENT

STORAGE INSTRUCTIONS & PROTECTIVE PRECAUTIONS

GALVANIZED COATINGS - STRUCTURAL STEEL

Galvanized coatings are designed to serve as a final protective finish. **AMWELL** will not be responsible for condition of coated surfaces after the equipment leaves its shop. **AMWELL** assumes no responsibility for field touch-up of shipping damage to coatings.

IMPORTANT NOTE: If, for any reason**, AMWELL's** galvanizing job is rejected after installation, **AMWELL** will bear no costs associated with the removal or installation of the equipment to make modifications.

PROCESS EQUIPMENT

HAZARDOUS MATERIAL WARNING

Effective May 25, 2015, the Federal Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CRF 1910, 1200) requires all manufacturers and importers of hazardous chemicals to provide Safety Data Sheets (SDS) to all customers with initial shipment. Steel products, as supplied by AMWELL, in their usual physical form do not pose any health hazards. However, when subject to processing such as welding, burning, grinding, cutting, abrasive blasting, heat treatment, pickling or similar operations potentially hazardous fumes or dust may be emitted. Prolonged, repeated exposure to these processes may cause adverse health effects. When performing any processing, precautions should be taken including use of a dust-fume respirator and eye protection. Gloves are recommended for abrasion.

If you have any questions concerning the content of this letter, please contact us at any time.

PROCESS EQUIPMENT

TO ORDER SPARE OR REPAIR PARTS

To assure the correct parts are received it is most important that the following information is included in your correspondence.

A. SERIAL NUMBER

The serial number is also referred to as the “S.O.” number OR sales order number. This is a 5-or 6-digit number which appears on the equipment nameplate and all related written correspondence to this order. If this cannot be found, we will need to know the site location (project name), approximate years the equipment has been installed or the type of equipment for which parts are needed.

B. PART NUMBERS

Show the part name and number if at all possible. If taken from a drawing, include drawing number.

C. SIZES

Include sizes, if available, such as shaft lengths, diameters, thickness, etc.

D. MODIFIED EQUIPMENT

If the equipment has been modified or altered, please notify us as to what extent. We can only replace parts which were originally manufactured and supplied by **AMWELL**. We cannot accept responsibility if parts do not fit because of altered equipment.

E. ADDRESSES

Include "bill to" and "ship to" addresses. Also include a phone number and person to contact should further information be needed.

PROCESS EQUIPMENT

TO ORDER SPARE OR REPAIR PARTS

F. REQUEST FOR QUOTATION

As the majority of equipment are engineered products, please contact us with all pertinent information for current pricing and availability.

Send your inquiries and purchase order to:

AMWELL
A Division of McNish Corporation
161 S. Lincolnway St., Suite 310
North Aurora, Illinois 60542

Phone: (630) 898-6900

ATTENTION: PARTS DEPARTMENT

Your equipment is identified as follows:
Please include this number on all correspondence.

SERIAL NUMBER	TYPE OF EQUIPMENT
A23011	ONE (1) HVS CIRCULAR CLARIFIER
A23012	ONE (1) HVS CIRCULAR CLARIFIER
A23013	ONE (1) HVS CIRCULAR CLARIFIER
A23014	ONE (1) HVS CIRCULAR CLARIFIER
	Refer To Section “G” for Ordering Spare Parts

BACKCHARGES

AMWELL, A Division of McNish Corporation reserves the right to replace or repair in any manner or by any means, any part proven to be defective in material or workmanship provided buyer given prompt written notice of each defect to **AMWELL**.

If any equipment is received in bad or damaged condition or if any packages are broken, make a bad order notation to this effect on the shipping papers. This will enable you to place the proper claims against the carrier. Please notify **AMWELL** immediately, in writing, if any parts are found damaged or broken during shipment.

Correction of minor misfits such as hole misalignment that can be corrected in the field by reaming, cutting, or trimming and any fit up as is customarily done in the field is considered a legitimate part of installation and charges therefore, will not be honored by **AMWELL**.

Any major discrepancies in fabrication or fit up that could affect the structural integrity of the equipment or prevent proper assembly must be reported immediately and in writing to **AMWELL**. **AMWELL** will not honor any invoice for corrective work performed by the buyer unless prior written approval has been obtained from **AMWELL**, before commencement of any work by the buyer. Such approval shall contain a description of the nature and extent of the work to be performed and a firm fixed price based upon a written quotation from the buyer. Invoices that exceed the price authorized will not be honored.

NO BACKCHARGES WILL BE ACCEPTED WITHOUT PRIOR WRITTEN APPROVAL BY **AMWELL**.

WARRANTY POLICY

All equipment furnished by **AMWELL**, A Division of McNish Corporation is warranted to be free from defects in material and workmanship.

Items not manufactured by **AMWELL** are warranted or guaranteed to the extent of the manufacturer's warranty.

All storage, assembly and/or installation must be followed explicitly as stated in this manual.

Removal of condensation and lubrication of gear boxes must be as prescribed in this manual.

Prior to being placed in operation, all equipment supplied by **AMWELL** must be inspected and certified to be in proper operational order. This must be done by an Authorized Field Service Representative of **AMWELL** after all equipment is completely installed.

Before the inspection can be done, all drive units must be operational with full permanent electrical power and all overload switches must be wired and functional.

The inspection will be limited to reasonably accessible items and does not relieve the installer's responsibility for proper assembly and adjustment.

Unless otherwise specifically authorized in writing, any deviations from the instructions given in this manual and/or operation of the equipment prior to inspection and certification by a Representative of **AMWELL** will render all equipment warranties, both specific and implied, null and void.

FIELD SERVICE

The erection aids material provided by **AMWELL** should enable you to install, operate and maintain the equipment. This instruction is provided to help you to help yourself and therefore to save you time and expense. If a problem is encountered in installing or operating the equipment which cannot be solved by referring to the available material, please feel free to contact us. Address your inquiry to our **Customer Service Department, AMWELL**, A Division of McNish Corporation, 161 S. Lincolnway St., Suite 310, North Aurora, IL 60542, or call us at (630) 898-6900.

SECTION B

SAFETY INSTRUCTIONS AND PRECAUTIONS

CIRCULAR CLARIFIERS

SAFETY INSTRUCTIONS AND PRECAUTIONS

SAFETY CONSIDERATIONS

Safety is the basic factor to consider at all times in operation of the collector equipment. Through, the use of proper clothing and tools, with proper applications and methods of handling, you can prevent serious accidents and injury to yourself and your fellow workers.

Drives are to be operated at proper speed, not any higher, or loaded any heavier than shown on nameplate data. Failure to comply could result in personal injury or machinery damage.

Do not work over tanks full of liquid without some form of throwable lifesaving device.

Always think safety first! Caution must be taken with any piece of equipment and especially with moving pieces of equipment and electrical devices.

Appropriate safety procedures and common sense must be used at all times by everyone involved during equipment installation, operation and maintenance.

The installation, operation and maintenance instructions provided in this manual are not a substitute for the installing contractor's or the equipment operator's safety procedures.

SAFETY EQUIPMENT:

- Limit Switch
- Lock-out Switch at Drive Location and Also Remote Location to Turn Off Power to Drive Motor.
- Guards - **DO NOT OPERATE EQUIPMENT WITHOUT SAFETY GUARDS!**

PRE-START SAFETY CHECK AND PRECAUTIONS:

Check to see that nothing is left in the tank, such as ladders, tools, hoses or other foreign objects. Also, make sure there are no workmen or any personnel in the tank before turning it on. Make sure all guards are in place. Make sure overload limit switches are in good condition and have not been bent or damaged.

If they have been damaged in any way, they should be replaced before trying to operate the machinery.

WARNING!: Be sure clarifiers operate in a clockwise direction. Do not allow drive to operate in a counter-clockwise direction for longer than a momentary period of time (2 seconds max.) or serious damage to the drive will result.

Make sure that all electrical lock-outs work properly both at the drive location and remote locations at the control panel.

Make sure that starting procedure is followed. When starting up new equipment, proceed cautiously, the possibility of errors always exists.

When performing work such as welding, burning, grinding, cutting, blasting, or painting it is recommended that dust/fume respirators, safety eyeglasses and gloves be used.

CIRCULAR CLARIFIERS

SAFETY INSTRUCTIONS AND PRECAUTIONS

PRE-START SAFETY CHECK AND PRECAUTIONS: (Continued)

Work in pairs and have ready a lifesaving preserver or ring when work is being done over a tank full of liquid.

SHUT-DOWN PROCEDURE

If possible, turn off flow to the tank and run the clarifier until all sludge has been removed. Then, drain the tank and turn the power off to the drive motor and lock out the drive at the drive location. Turn the power off and lock out the power at the main control panel and tag it "OUT OF SERVICE".

WHEN WORKING ON EQUIPMENT FOR MAINTENANCE

Make sure the unit is shut down and locked out, both at the location of the drive unit to be worked on and locked out at the main control panel and tagged **"OUT OF SERVICE".**

SHUT-DOWN PROCEDURE IN CASE OF A BREAKDOWN

It is necessary to drain the tank to determine the problem, if it is continually going into an overload condition. The unit should be locked out electrically and tagged "Out Of Service". At that time, all the water should be pumped from the tank, so that the inspection can be made and find the cause of the problem for the binding or failure of the mechanism.

WARNING!: Never work on the drive unit or mechanism unless it is locked out and tagged **"OUT OF SERVICE".**

ELECTRICAL CONNECTIONS

Do not connect motor without making sure power supply is disconnected. Failure to comply can cause injury to personnel and/or damage to equipment. Do not connect motor without first determining that the power supply, voltage, frequency, and phase correspond with the motor nameplate specifications. Wiring, controls, and overload devices must comply with a National Electrical Code, local and OSHA requirements.

After determining the compatibility of a motor, connect motor as shown on diagram of nameplate.

Check direction of rotation.

Drives which are not lubricated may be operated only a few seconds without causing damage. To change rotation of 3 phase motors, interchange any two-line leads. Refer to motor manufacturer's instructions for more detailed information.

Make sure proper loading is applied to drive, do not exceed the capacity as shown on the nameplate.

SECTION C

OPERATING INSTRUCTIONS

OPERATING INSTRUCTIONS

MODEL "HVS" CIRCULAR CLARIFIERS

OPERATING INSTRUCTIONS

PURPOSE

This machine has been designed as a secondary clarifier installed for the purpose of continuously removing substantially all settleable solids from a flow of sewage or trade waste.

The final step of any sewage or waste treatment process requires that solids be separated from liquids. In activated sludge plants it is necessary that the separated solids be removed as rapidly as possible from the clarification tank and recirculated. This insures that the sludge in the secondary clarifier will not become septic and result in poor clarifier overflow quality and create the need for high air requirements in further processing.

PRINCIPLE

The feed to this unit is diffused through the center column outlet ports located below the liquid surface at the tank center into a rotating circular feedwell. The random currents present in the influent flow are dissipated within the feedwell and the flow then proceeds under the well and radially across the tank towards the peripheral overflow weir. During this travel solids are settling out and collecting on the floor. By the time the flow reaches the weir, a clear liquid, free from the majority of the solids, overflows into the effluent channel.

A "V"-notched weir on the overflow launder is used to overcome the effect of the wind which, with a notchless weir plate, may force most of the effluent to overflow at one side of the tank.

The effluent channel preferably should slope toward the outlet or outlets which must be of sufficient capacity to take care of maximum flow conditions.

The sludge which accumulates on the tank floor is picked up by the rake blades mounted on the rotating rake arms and is directed to a series of plastic sludge withdrawal pipes located along the length of each arm. The sludge is forced up through the sludge withdrawal pipes by means of differential head between the tank liquid level and the discharge height of the individual sludge control devices. The flow valve devices are adjustable so that varying rates of sludge return may be obtained.

The sludge return from the rotating sight box flows into the center discharge pipe through which the sludge is removed from the clarifier.

Normally the flow from the sludge withdrawal pipes is called return sludge and will be recirculated. The individual uptake pipes should be adjusted so that a good quality of sludge is being removed from the entire area of the tank bottom.

SKIMMING MECHANISM

The skimming mechanism continually skims floatable material from the surface of the clarifier and sweeps it into a scum box for discharge from the basin. By its very nature, the scum box is a source of build-up of greasy matter, which can cause odors as well as objectionable appearances. Therefore, the scum box should be hosed down on a regularly scheduled program.

SKIMMING MECHANISM – (Continued)

WARNING!

THE SKIMMING MECHANISM IS NOT DESIGNED TO RESIST THE FULL TORQUE CAPACITY OF THE DRIVE UNIT. SERIOUS DAMAGE TO THE MECHANISM MAY RESULT IF THE SKIMMER HANGS UP ON THE SCUM BOX. IT IS RECOMMENDED THAT THE SKIMMER BE OBSERVED ONCE EACH DAY AS IT PASSES OVER THE SCUM BOX. ANY BINDING, HESITATION OR MISALIGNMENT OF THE SKIMMER SHOULD BE CORRECTED IMMEDIATELY.

In northern climates where freezing conditions occur, should ice develop on a surface of a circular clarifier equipped with a skimming mechanism, damage to the skimmer and mechanism can be avoided by removing all parts of the skimmer in contact with the liquid surface. It is necessary to completely dismantle the scum deflector and remove it from the tank. This may most easily be accomplished by stopping the mechanism so that the deflector is located at the access bridge, which will then serve as a working platform.

After removing the scum deflector, and with the skimmer in the same position relative to the bridge for ease of access, simply rotate the skimmer arm assembly 180° to the opposite stop on the stop collars. The skimmer assembly is now repositioned above the liquid level so that it cannot make contact with ice on the clarifier surface.

The above procedures must be followed at the first sign of freezing.

STARTING OPERATION

It is assumed that the machine has been properly installed and thoroughly lubricated, all parts are in alignment and proper clearance exists between the mechanism and concrete at all times.

The bottom of the clarifier has been screeded in, checked for high spots and arms adjusted so that there is proper clearance between blades and the tank bottom at all points throughout the complete revolution of the raking mechanism.

There should be minimum clearance between each squeegee and the finished tank floor at all times during a complete revolution of the raking mechanism. The clearance between the finished tank floor and the flight squeegee should not exceed 1/2" over any appreciable area.

There should be minimum clearance between each sludge suction pipe and the finished tank floor at all times during a complete revolution of the raking mechanism. The clearance between the finished tank floor and each sludge suction pipe should not exceed 3” over any appreciable area.

The mechanism should be run before allowing any feed to enter the clarifier and any discrepancies noted and corrected. After operating the mechanism in the dry tank for several hours, the flow may be admitted.

Initially the adjustable flow valve devices should be in a closed position so that no return sludge is being withdrawn. The effluent weir should be checked for level. This can be done visually; the weir elevation should be corrected, if necessary, to provide a uniform overflow rate throughout its length.

STARTING OPERATION - (Continued)

After the weir has been leveled, the adjustable flow valve uptake pipe should be turned to cause flow into the sludge well. This regulation should be such that the uptake pipes closest to the center of the machine will handle more flow than the pipes further out, and a total flow amounting to the desired return rate.

Initially, it may be necessary to make several adjustments until the sludge process is stabilized, after which only infrequent readjustments will be required to compensate for seasonal or other changes in process requirements. The adjustment of the flow valve devices should be done so that 50% of the sludge removal will take place within the outer 30% of the tank diameter, as the sludge concentration is higher in this area. Adjusting the device is very simple, just turn the outer piece with the tool supplied. Should an uptake pipe become plugged due to a power outage or some other condition causing a heavy sludge blanket, it can be unplugged by placing a water hose in the top and letting water under pressure flow downward through the pipe until the plug is removed. The flow valve device should be placed in the position required to return the sludge in a fresh condition, and to maintain the desired level of mixed liquor solids concentration.

Heavy sludge should be pumped from the sludge pocket at a minimum of once per day and at more frequent intervals as required, to meet the necessary sludge wasting schedule or to prevent septicity. Normally, this waste sludge is returned to the influent of the primary clarifier or to a thickener.

NORMAL OPERATION

The clarifier mechanism and the sludge pumps should be operated continuously in order that a sludge build-up will not occur to the point where it begins to overflow with the effluent.

NORMAL OPERATING CHARACTERISTICS

1) Inspect drive unit for any unusual sound or physical damage.

2) Drive torque indicator reading at 75% or lower.

3) There should be no visible oil leaks from gearmotor or spur gear drive.

4) There should be no grinding, chattering or squealing noises from gearmotor.

5) There should be no loud "clicking" noises from drive chain.

6) Amperage draw of motor should be below nameplate rating.

7) Visually inspect skimmer operation as it passes over scum trough for proper operation.

8) There should be no pulsating or jerking movement of skimmer anywhere during complete rotation.

9) Inspect effluent for any unusual solids passing over weirs.

NORMAL OPERATING CHARACTERISTICS - (Continued)

10) Remove any built-up scum from inside influent well area with garden hose spray.

11) Inspect tank surface for any potentially damaging floating debris.

12) Inspect tank surface for rising solids from tank bottom.

13) There should be no floating or bulking sludge on tank surface.

14) There should be withdrawal of heavy sludge from sludge hopper.

OPERATING PROBLEMS AND CORRECTIONS

If foreign objects, such as rocks, tools, etc., are dropped into the clarifier, the mechanism should be stopped immediately and not started again until such objects are removed.

1. Underflow Line Becomes Plugged

If sludge is allowed to become too thick, it may plug the low volatile sludge pipe, or some foreign material may have gotten into the line to cause the plugging. To correct this, turn high pressure water back through the underflow line until the line is cleared.

2. Overload Alarm Sounds or Stops Motor - (Ref. Dwg. D705-48638-171)

The purpose of the overload alarm is to warn the operator when the drive unit reaches a preset output torque. The most common cause of high torque is excessive depth of settled solids in the clarifier. The cause of any alarm or shutdown should be thoroughly investigated and eliminated as any attempt to operate the mechanism in this condition may seriously damage the machine.

The overload system is designed to cut power to the drive when a predetermined torque is reached by the gear. It has no ability to sense misalignment or damage occurring to the mechanism caused by continued rotation. If a misalignment occurs, such as a skimmer hang-up, the gear will continue to rotate without regard to damage and will stop only if the torque sensed at the gear reaches the cut-out torque.

If an overload alarm sounds or cuts the power, there may be an accumulation of sludge in the tank which has been gradually building up due to the sludge being discharged at an average rate less than the rate of introduction of solids with the feed. It will then be necessary to increase the rate of sludge draw-off in order to bring the sludge level to the appropriate value. Should the sludge load become so heavy that torque build-up occurs in the machine, the increased torque will force the worm shaft (Ref. 9) towards the spring housing (Ref. 21) depressing the spring (Ref. 20) and forcing the thrust rod (Ref. 19) to actuate the first limit switch sounding the alarm (Set at **35,750** ft. lbs.) and the operator will then know that something is causing an overload on the mechanism. If the overload continues to increase, forcing the worm shaft (Ref. 9) to depress the spring (Ref. 20) still further until the cut-out torque of **42,900** ft. lbs. is reached, the drive control will cut electrical power to the drive unit thereby stopping the mechanism rotation.

2. Overload Alarm Sounds or Stops Motor - (Continued)

Should this occur, it will be necessary to somehow remove the sludge from the tank. This is possible by draining the sludge, or draining the tank and sluicing out the sludge. It is also possible that some foreign object may have dropped into the tank accidentally. If this occurs the mechanism may become overloaded and sound the alarm and stop. If this occurs, the object should be removed which is causing the obstruction and overload.

Additional protection is provided by means of a third back-up safety switch set to stop the drive at a torque of 53,625 ft. lbs.

It might be necessary to bypass the influent if the obstruction cannot be located rather quickly, as it may be necessary to drain the tank. Resetting of the overload device is not required. The spring automatically returns the shaft to its pre-overload position when the drive is stopped.

IMPORTANT SAFETY NOTES:

It is very important that once the cut-out limit switch has shut the drive down, it stays down until restarted manually. Design electrical system so that drive cannot restart by simply releasing pressure on cut-out limit switch.

Also, if a very gradual increase in the torque load is noted on the drive control indicator, it is possible that grit or silt is being introduced with the influent. Since there is no way for this material to be removed normally, it will gradually overload the mechanism until the alarm sounds. It will then be necessary to remove the cause of the overload.

Usually, provision is made to insure that grit and silt are removed from influent to a clarifier of this construction and it is very unlikely that this kind of load will occur. In the event that an overload does occur, due to any reason, it is necessary to observe the following guidelines:

DO NOT ATTEMPT TO KEEP RUNNING WHEN AN OVERLOAD IS INDICATED!

FIND THE TROUBLE AND CORRECT IT!

DO NOT START UP WITH A LOAD OF SLUDGE IN THE TANK!

DO NOT TAMPER WITH THE OVERLOAD ALARM SWITCH ADJUSTMENTS IN AN ATTEMPT TO KEEP THE MACHINE RUNNING UNDER OVERLOAD CONDITIONS!

MODEL "HVS" CIRCULAR CLARIFIERS

OPERATING INSTRUCTIONS

ATTENTION:

1. All bolts and nuts should be kept tight and original alignments and adjustments maintained. Inspection should be made at regular intervals.

2. Check that all sludge withdrawal pipes are clear; Back flush with water if necessary.

3. Check the adjustable flow valves to make sure that they rotate freely.

4. Inspect the seal between center column and drive cage.

5. Wherever possible, examine gears and all wearing parts periodically to determine whether excessive wear is taking place.

6. Test the overload alarm and shutdown mechanisms monthly to make sure that the mechanism is protected.

7. If the power is shut off, or if the mechanism is stopped for any reason longer than an hour, bypass the flow until the machine is again started.

8. Keep the machine and surroundings clean and touch up all rust spots with paint frequently.

9. The entire mechanism above and below water line should be painted once per year.

SHUTDOWN OF THE CLARIFIER - (Also refer to separate "Shutdown Procedures" provided in this section)

Before a tank is drained or dewatered to correct any operating problem, every effort should be made to correct the problem first. The sludge pipe should be cleared, if possible, with a plumber's snake or by applying high pressure water. Foreign objects should be fished out, if possible, with hooks. Also, causes of operating problems should be determined and corrected if possible.

Draining the tank to correct problems or to recondition the mechanism should be done preferably in the winter when biological growth would at a minimum, rather than in the warmer weather of summer. It should also be planned so that down time is kept to a minimum and at a time when the flow into the plant is at its lowest point.

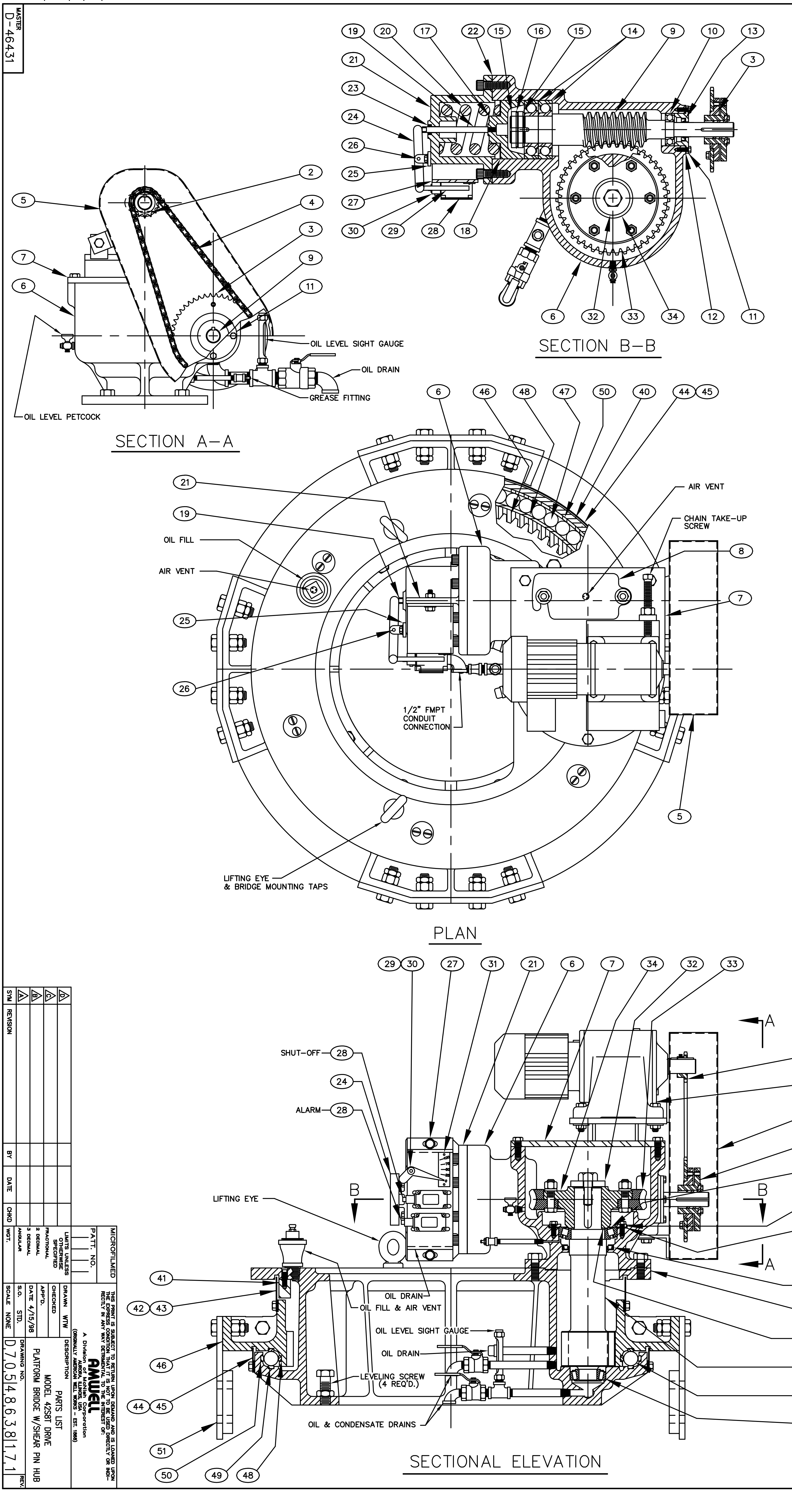
LUBRICATION

The lubrication of the center mechanism and drive unit is covered in Section “D” of this manual.

DRIVE ASSEMBLY
PARTS LIST DRAWING

CAD FILE: C:\DETAIL\171\AMW\D48638 PLOT SCALE=0.25

MASTER
D-46431



REF	DESCRIPTION
1	GEARMOTOR
2	DRIVE SPROCKET – KEYED
3	DRIVEN SPROCKET – SHEAR PIN
4	ROLLER CHAIN
5	CHAIN GUARD
6	WORM GEAR HOUSING
7	WORM GEAR HOUSING COVER
8	INSPECTION & OIL FILL COVER
9	WORM SHAFT
10	BEARING
11	BEARING CAP
12	BEARING CAP GASKET
13	OIL SEAL – LIP IN
14	BEARING
15	LOCKNUT
16	LOCKWASHER
17	THRUST RING
18	SHIM
19	THRUST ROD
20	SPRING
21	SPRING HOUSING
22	SPRING HOUSING GASKET
23	OIL SEAL – LIP OUT
24	PIVOT ARM
25	PIVOT BRACKET
26	PIVOT PIN
27	SWITCH BRACKET
28	LIMIT SWITCH
29	POINTER
30	COLLAR
31	LOAD INDICATOR SCALE
32	WORM GEAR RETAINER
33	WORM GEAR
34	WORM GEAR HUB – KEYED
35	PINION SHAFT
36	BEARING
37	BEARING RETAINER
38	OIL SEAL – LIP IN
39	BEARING
40	SPUR GEAR HOUSING
41	SPUR GEAR HOLD-DOWN BLOCK
42	DUST SHIELD – SPLIT
43	DUST SHIELD SEAL
44	DUST SHIELD – SPLIT
45	DUST SHIELD SEAL
46	SPUR GEAR
47	BEARING BALL
48	REPLACEABLE BEARING RACE
49	REPLACEABLE BEARING RACE
50	REPLACEABLE BEARING RACE
51	DRIVE CAGE ATTACHMENT LUG
52	RETAINER SHIM SET
53	HUB SHIM SET

SYM	REVISION	BY	DATE	CHKD
A				
B				
C				
D				

MICROFILMED

PATT. NO.

LIMITS UNLESS OTHERWISE SPECIFIED
FRACTIONAL
2 DECIMAL
3 DECIMAL
ANGULAR
WGT.

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

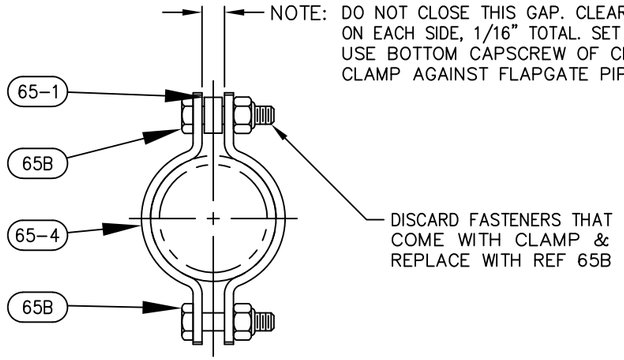
DRAWN WTW
CHECKED
APP'D.
DATE 4/15/98
S.O. STD.
SCALE NONE

DESCRIPTION
PARTS LIST
MODEL 42S8T DRIVE
PLATFORM BRIDGE W/SHEAR PIN HUB

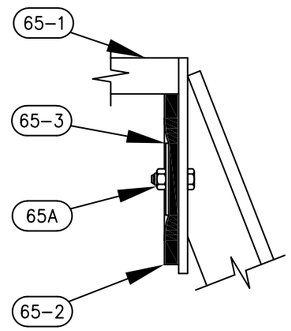
DRAWING NO.
D,7,0,5|4,8,6,3,8|1,7,1

REV.

TORQUE INDICATOR BOX ASSEMBLY

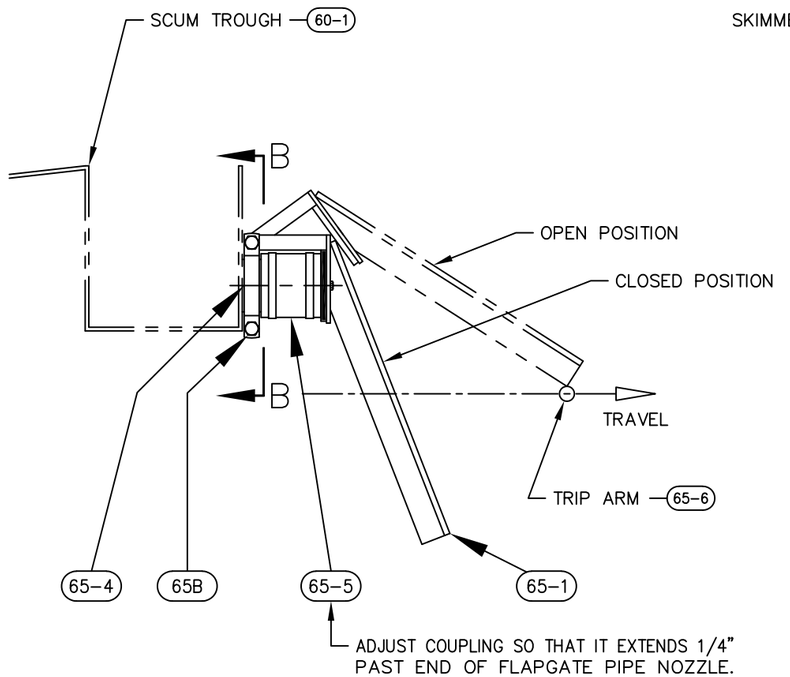


SECTION B–B

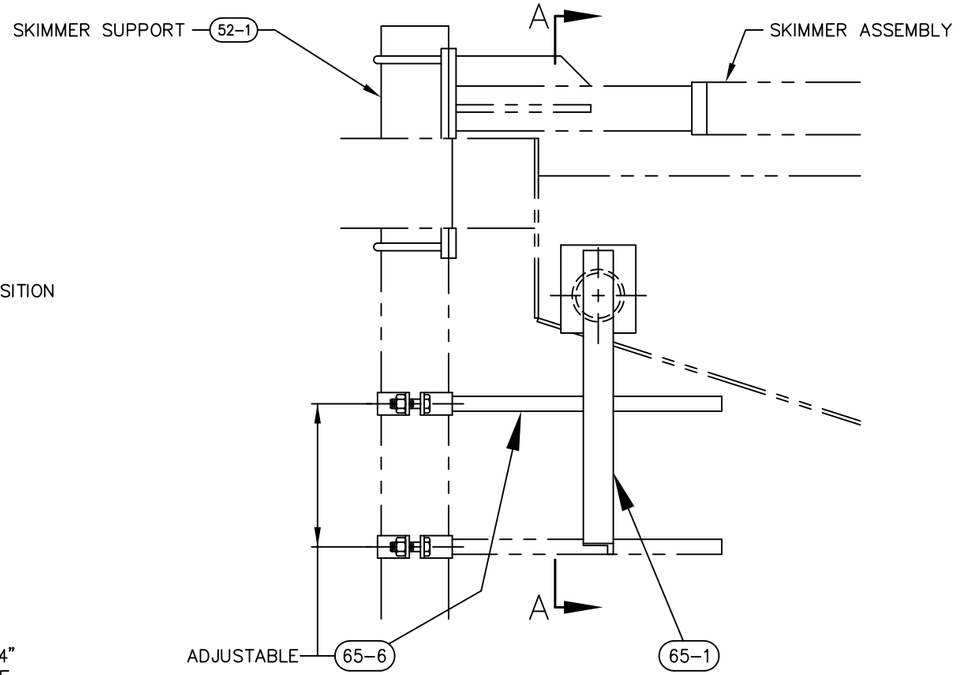


FLAP GATE ASSEMBLY

REF	DESCRIPTION	QTY
65–1	FLAP GATE	1
65–2	NEOPRENE SEAL	1
65–3	2" DIA WASHER	1
65–4	PIPE CLAMP	1
65–5	FLEXIBLE COUPLING	1
65–6	TRIP ARM	1
65A	HEX LOCK NUT 1/4"–20NC	1
65B	CAPSCREW 1/2"–13NC X 2 1/4" LG	2
	HEX LOCK NUT 1/2"–13NC	2



VIEW A–A



CAD FILE: C70108

MASTER C-70108

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

AMWELL DOES NOT FURNISH PIPING (EXCEPT AS NOTED) FLOOR RAILS, TROUGHS, GRATINGS, WEIR PLATES, OIL OR GREASE FOR LUBRICATION, ANY WIRING OR CONDUITS BETWEEN MOTORS, CONTROLS AND ALARMS OR ANY ELECTRICAL EQUIPMENT OF ANY KIND EXCEPT AS SPECIFICALLY STATED IN AMWELL SPECIFICATIONS.

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

DRAWN	RES
CHECKED	
APP'D.	
DATE	1–11–11
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
SCUM TROUGH FLUSHING GATE

DRAWING NO. C,6,0,5|7,0,1,0,8|2,9,2 REV.

OPERATION & MAINTENANCE OF SHEAR PIN OVERLOAD

CIRCULAR CLARIFIERS

OPERATION & MAINTENANCE OF SHEAR PIN OVERLOAD

OPERATION

This device serves as a backup overload device to the normal limit switch overload system.

If the shear pin should break the cause of the overload should be determined and corrected also an investigation should be made as to why the alarm and shut-down limit switches did not function properly.

MAINTENANCE

Semi-Annually: Remove chain and sprocket and smear grease on the keyed hub to ensure freedom of operation in case of shear pin failure.

BROKEN SHEAR PIN REMOVAL

1. Remove chain guard.
2. Remove drive chain.
3. Loosen setscrews locking shear pin in place.
4. Manually rotate sprocket until the broken pin lines up with hole "C" (see drawing) so that the broken pin can be driven out. Continue to rotate sprocket until either hole "A" or "B" lines up with the broken pin in the keyed hub so it can also be driven out.
5. Inspect shear pin liners for damage or "rounding" of shear faces.

SHEAR PIN INSTALLATION

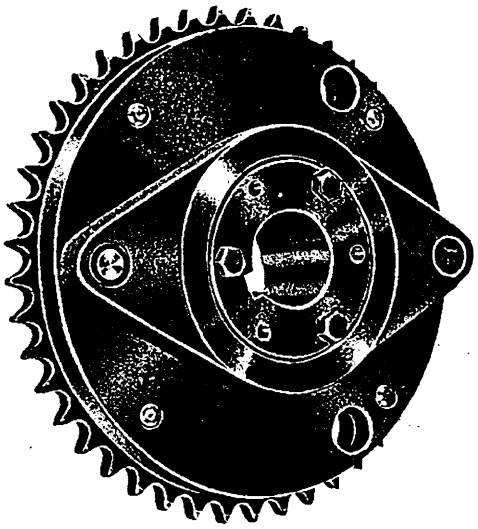
1. With drive chain removed, manually rotate sprocket until shear pin liners line up.
2. Install shear pin making sure neck of pin is centered between shear faces of shear pin liners.
3. Install and securely tighten setscrews locking pin in place.
4. Install drive chain.
5. Replace chain guard.

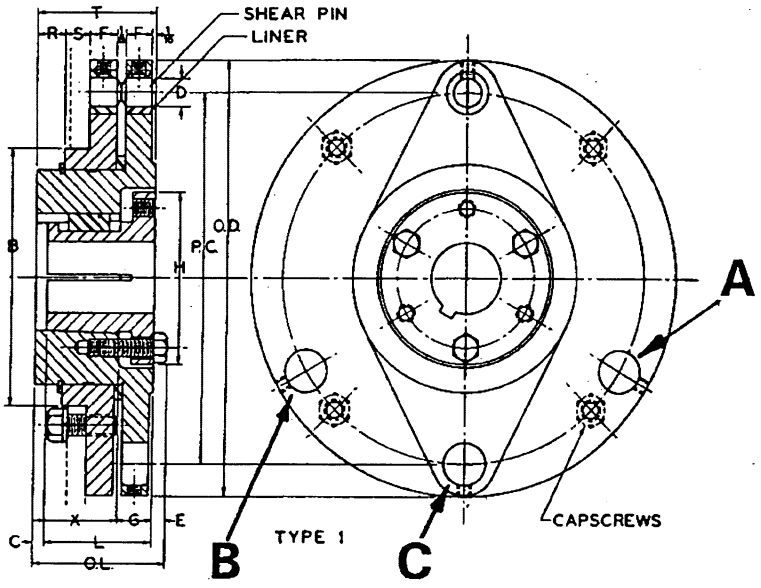
AMWELL A Division of McNish Corporation	INSTRUCTION / SERVICE MANUAL	SHEET NO. PAGE 2 OF 2
PRODUCT CODE	CIRCULAR CLARIFIERS	ISSUED 3/27/90
SUBJECT	OPERATION & MAINTENANCE OF SHEAR PIN OVERLOAD	SUPERSEDES 7/2/87

Shear Pin Hubs are designed to prevent damage to machinery due to sudden overload or jamming, by shearing the necked pin at a predetermined load. The inner part of the hub is keyed to the shaft and remains stationary while the outer part, to which the sprocket is bolted, rotates freely after pin breakage, allowing the drive to idle.

Shear Pin Hubs and Sprockets consist of three separate stock parts:

1. Steel Sprockets
2. Hub Assembly
3. Malleable Bushing





Stock Shear Pin Hubs—Specifications

Part No.	Type	Dimensions																Capscrews	
		O.D.	O.L.	P.C.	B	C	D	E	F	G	H	L	P	R	S	T	X	No.	Size
~~SHH1~~	1	5½"	2¼"	4.500"	3.250"	1 3/16"	¼"	3/16"	½"	7/16"	2½"	1¼"	—	½"	5/16"	2 1/16"	1 5/8"	3	⅜
SHP1	1	7⅝	2⅜	6.500	4.500	3/16	3/8	¼	½	5/8	3	1 15/16	—	½	7/16	2⅛	1½	3	½
~~SHQ1~~	1	10	3 3/32	8.625	6.000	½	½	9/32	¾	¾	4⅛	2½	—	1 1/16	⅜	3	2¼	4	½
SHR1	1	13	3 11/32	11.250	7.500	3/16	½	9/32	¾	⅞	5⅜	2⅞	—	5/8	¾	3 1/16	2 3/16	4	⅝

Stock Shear Pins

Shear Pin Neck Diameter	Shear Pin Hub Number															
	~~SHH1~~				SHP1				~~SHQ1~~				SHR1			
	Pin Part No.	In. Lbs. Torque	H.P.@ 100 R.P.M.	Minimum Recommended Shaft Dia.	Pin Part No.	In. Lbs. Torque	H.P.@ 100 R.P.M.	Minimum Recommended Shaft Dia.	Pin Part No.	In. Lbs. Torque	H.P.@ 100 R.P.M.	Minimum Recommended Shaft Dia.	Pin Part No.	In. Lbs. Torque	H.P.@ 100 R.P.M.	Minimum Recommended Shaft Dia.
3/32"	1H	930	1.4	¾"	1P	1340	2.1	⅞"								
⅛	2H	1660	2.6	⅞	2P	2390	3.8	1								
5/32	3H	2590	4.1	1	3P	3740	5.9	1⅛								
3/16	4H	3730	5.9	1⅛	4P	5380	8.5	1⅜	1Q	7140	11.3	1 7/16"	1Q	9310	14.7	1 9/16"
7/32					5P	7330	11.6	1 7/16	2Q	9720	15.4	1⅝	2Q	12690	20.1	1¾
¼					6P	9570	15.1	1 9/16	3Q	12700	20.1	1¾	3Q	16570	26.2	1 15/16
9/32					7P	12100	19.2	1¾	4Q	16060	25.4	1⅞	4Q	20950	33.2	2 1/16
5/16					8P	14950	23.7	*1¾	5Q	19840	31.4	2	5Q	25880	41.0	2¼
11/32									6Q	24010	38.0	2⅛	6Q	31320	49.6	2⅜
⅜									7Q	28590	45.3	2¼	7Q	37290	59.1	2½
13/32									8Q	33530	53.2	2 7/16	8Q	43740	69.4	2⅝
7/16									9Q	38890	61.7	2½	9Q	50720	80.4	2¾

SHUTDOWN & EMERGENCY SHUTDOWN PROCEDURES

CIRCULAR CLARIFIER (With Skimmers)

SHUTDOWN PROCEDURES

SHUTDOWN PROCEDURES

It is recommended that unit not be shut down until after the skimmer has just passed over scum through and dumped its skimmings.

Activate "OFF" selector switch.

Put in place all electrical lockouts and tag **"OUT OF SERVICE - DO NOT START"** at all control stations.

EMERGENCY SHUTDOWN PROCEDURES

1. Push "STOP" button.
2. Lock out unit electrically and tag **"OUT OF SERVICE"**.
3. Stop flow to tank as soon as possible.
4. Correct reason for shutdown.
5. Do not start flow to tank again until equipment is capable of being run continuously.

WARNING!

NEVER WORK ON DRIVE OR COLLECTOR MECHANISM UNLESS IT IS LOCKED OUT ELECTRICALLY AND TAGGED **"OUT OF SERVICE"**.

ENVIRONMENTAL AND LIMITING CONDITIONS AND SEASONAL OPERATIONS

CIRCULAR CLARIFIERS (With Skimmers)

ENVIRONMENTAL AND LIMITING CONDITIONS AND SEASONAL OPERATIONS

ENVIRONMENTAL AND LIMITING CONDITIONS

This equipment is designed for continuous operation under all normal weather conditions.

We do not recommend operation of the equipment under the following conditions:

1) Flooding where parts of drive unit are submerged.

2) Icing where all moving parts and ventilation openings have been made inoperable.

3) Extremely dusty conditions where airborne dirt, sand or ash can plug ventilation openings.

4) Humidity is not a factor in the operation of this equipment.

5) Suggested temperature operating range: Maximum = 110°F
Minimum = -20°F

SEASONAL OPERATIONS

SUMMER MONTHS

There should be little or no operational change required during the summer months from a mechanical standpoint.

1) It should be noted however, that a lengthy series of hot, sunny days will promote algae growth and may require additional operator clean-up in order to keep the weirs free-flowing.

2) Areas of the country that are subject to heavy thunderstorms and flash flood conditions may, on occasion, experience excessive water intrusion that will result in peak flow rates that directly effect effluent quality.

WINTER MONTHS

1) Normally, operating the unit during the winter should be no different than during the other seasons. However, when the weather becomes extremely cold particular attention should be given to influent raceways, scum trough beaches and all skimming equipment.

2) Torque overload devices are rated and set for the loading requirements of the submerged rotating equipment.

WARNING!

Skimmer construction is based on lighter load requirements and can be damaged without activating the torque overload device.

CIRCULAR CLARIFIERS (With Skimmers)

ENVIRONMENTAL AND LIMITING CONDITIONS AND SEASONAL OPERATIONS

SEASONAL OPERATIONS - (Continued)

WINTER MONTHS - (Continued)

3) **WARNING!**

IF THE POSSIBILITY EXISTS THAT THE SKIMMING EQUIPMENT CAN BE DAMAGED FROM A BUILD UP OF FROST, ICE OR SNOW WE SUGGEST TEMPORARILY REMOVING THIS EQUIPMENT FROM OPERATION.

4) When ambient temperature falls below freezing it is necessary that sewage flow to the unit be continuous.

SECTION D

LUBRICATION AND MAINTENANCE

LUBRICATION AND MAINTENANCE INSTRUCTIONS

CIRCULAR CLARIFIER DRIVES PIER MOUNTED, CAST IRON SPLIT SPUR GEAR TYPE

LUBRICATION AND MAINTENANCE INSTRUCTIONS (REFER TO DATA SHEET D905-62758-215)

A) GENERAL

AMWELL drive units are shipped with the worm gear housing filled to the proper level and the lower pinion bearing pocket of the spur gear housing with AGMA lubricant #4, ISO 150 oil. The worm and spur gear housings must be filled to the appropriate levels upon receipt. See drive long term storage instructions in Section A of this manual.

Prior to initial start-up, the oil reservoirs and sumps must be drained, flushed, and refilled to the operating levels with the appropriate lubricants for the service conditions.

Lubricants recommended in these instructions are typical only and any lubricant of another manufacturer may be substituted provided it is of equal grade and composition.

The American National Standards Institute, ANSI, and the American Gear Manufacturers Association, AGMA, have issued ANSI/AGMA 9005, Industrial Gear Lubrication, which provides a reference criteria for the selection of gear lubricants.

B) GEAR REDUCERS

Refer to separate manufacturer's instructions.

C) SPUR GEAR DRIVE ASSEMBLY

Extreme pressure (EP) lubricants are petroleum-based oils with chemical additives to produce a protective film on the wearing surface.

Lower Split Spur Gear Housing

Fill thru oil fill to the level pipe with one of the following oils. Drain oil thru valves.

APPROXIMATE LUBRICANT QUANTITIES

~~No. 28H Drive - 5 Qts.~~ ~~No. 42H Drive - 10 Qts.~~ No. 42S Drive - 10 Qts.
~~No. 60H Drive - 4 Gals.~~ ~~No. 80H Drive - 6 Gals.~~

AGMA NUMBER	4EP	6EP	7EP	8EP
ISO GRADE	150	320	460	680
AMBIENT TEMP. ºF	-20 to 30	15 to 50	30 to 125	50 to 125+
OILS				
AMOCO	Permagear EP 150	Permagear EP 320	Permagear EP 460	Permagear EP 680
EXXON	Humble Gear Oil 150	Humble Gear Oil 320	Humble Gear Oil 460	Humble Gear Oil 680
MOBIL	Mobilgear 600 XP 150	Mobilgear 600 XP 320	Mobilgear 600 XP 460	Mobilgear 600 XP 680
SHELL	Omala 150	Omala 320	Omala 460	Omala 680
TEXACO	Meropa 150	Meropa 320	Meropa 460	Meropa 680
LUBRIPLATE	Lubriplate 163	APG80W-140	APG-140	APG-250

CIRCULAR CLARIFIER DRIVES PIER MOUNTED, CAST IRON SPLIT SPUR GEAR TYPE

LUBRICATION AND MAINTENANCE INSTRUCTIONS (REFER TO DATA SHEET D905-62758-215)

C) SPUR GEAR DRIVE ASSEMBLY (Continued)

**IMPORTANT: It is recommended that a flexible long-necked funnel be used to add oil to the spur gear oil bath. The neck of the funnel should be bent so that the oil, to be added, is directed at the wall of the spur gear housing instead of allowing it to splash on top of the spur gear. This procedure will help prevent the oil from overflowing the dust shields.

Fill unit slowly using approximately 2/3 the required quantity of oil. Rotate drive to settle oil and add remainder of oil or until oil begins to emerge from the oil level pipe. When filled too fast, the viscosity of the oil will cause an overfill and spill out over the dust shield.

Check oil level monthly, if condensation appears in oil sight gauge, drain off with oil drains and add equal amount of oil.

Flushing oil must be clean and compatible with the operating oil. The flushing oil may be operating oil, a compatible oil of lower viscosity, or an oil specifically blended for flushing. The use of solvents is not recommended and should be avoided unless the gear drive contains deposits of contaminated or oxidized solvents, the drive should be flushed with oil to remove all traces of the solvent from the system. Solvents may damage seals and paint, and are usually highly flammable.

Used lubricant, solvents and flushing oils should be completely removed from the system to avoid contaminating the new oil charge and disposed of properly. Disposal requirements imposed by Federal, State, or local authorities must be followed.

D) UPPER WORM GEAR ASSEMBLY

Lubricants recommended in these instructions are typical only and any lubricant of another manufacturer may be substituted provided it is of equal grade and composition. Rust and oxidating inhibited gear lubricants, typically called R & O oils, are petroleum-based oils with chemical additives which provide rust protection and oil oxidation resistance. Steam cylinder oils and non-foaming circulating oils are normally found in this category. Rust and oxidation inhibited, compounded or synthetic oil is recommended for use in all worm gearing.

Fill thru inspection and oil fill cover located on top of base plate until oil begins to emerge thru petcock. Drain oil thru oil drain pipe.

CIRCULAR CLARIFIER DRIVES PIER MOUNTED, CAST IRON SPLIT SPUR GEAR TYPE

LUBRICATION AND MAINTENANCE INSTRUCTIONS (REFER TO DATA SHEET D905-62758-215)

APPROXIMATE LUBRICANT QUANTITIES

~~6F Drive - 2 Qts.~~ → 8F Drive - 4 Qts. ← ~~10F Drive - 5 Qts.~~ ~~12F Drive - 6 Qts.~~

AGMA NUMBER	4	6	7	8
ISO GRADE	150	320	460	680
AMBIENT TEMP.	-20 to 30	15 to 50	30 to 125	50 to 125+
OILS				
AMOCO	Industrial Oil 150	Industrial Oil 320	Industrial Oil 460	Cylinder Oil No. 680
EXXON	Esstic Grade 150	Teresstic Grade 320	Teresstic Grade 460	Cylesstic TK 680
MOBIL	---	---	600W Super Cylinder	Extra Hecla Super Cylinder
SHELL	Morlina Oil 150	Morlina Oil 320	Morlina Oil 460	Valvata Oil 680
TEXACO	Regal Oil R & O 150	Regal Oil R & O 320	Regal Oil R & O 460	Pinnacle Cylinder Oil 680
LUBRIPLATE	SPO-224	SPO-266	SPO-277	SPO-288

E) PINION SHAFT BEARING

Lubricate once a month thru grease fitting 5 with one of the following greases:

Chevron - Rykon Premium #2
Mobil - Mobilgrease XHP222 Special
Wolf's Head - Multi-Duty & Wheel Lube
Gulf - Gulf High Temp. #1
Arco - Litholine Hep 2
Lubriplate - 1200-2
Shell - Darina Grease 2
Texaco - Molytex EP 2

Quantity Approx. 14 1/2 Oz. Initial Fill, 1 1/2 Oz. thereafter.

F) DRIVE CHAIN

Chain is a self-lubricating type which should not require lubricant. If chain is replaced with another type, lubricate monthly with SAE 30 oil or equal.

G) ADJUSTING DRIVE CHAIN TENSION

(Reference drive parts list drawing in this brochure)

1) Remove chain guard.
2) Loosen gearmotor mounting bolts.
3) Loosen locknut on chain take-up screw.
4) Turning screw clockwise, adjust chain so that with moderate pressure to the slack side of the chain, the chain can be depressed approximately 1/2".

WARNING: Do not overtension as this will cause unnecessary wear on the chain and sprockets and put undue loads on the drive bearings.

CIRCULAR CLARIFIER DRIVES PIER MOUNTED, CAST IRON SPLIT SPUR GEAR TYPE

LUBRICATION AND MAINTENANCE INSTRUCTIONS (REFER TO DATA SHEET D905-62758-215)

G) ADJUSTING DRIVE CHAIN TENSION – (continued)

5) Adjust locking nut on take-up screw so that screw is locked into position.
6) Retighten gearmotor mounting bolts.
7) Replace chain guard.

H) SUMMARY

Monthly:

1. Check oil levels, add as required.
2. Grease all fittings.
3. Check operation of overload switches, alarm and shut-off.
4. Open the drain valve under the worm housing (upper reservoir) and open valves (lower reservoir) and draw off a small quantity of oil to remove any accumulated water or foreign matter. This is especially important in cold climates where freezing of water can cause damage to the unit.
5. Lubricate drive chain with SAE 30 oil or equal.

Annually:

1. Change gear motor lubricant if recommended by manufacturer.
2. Drain and flush drive unit.
3. Adjust drive chain tension (if required).
4. Clean and paint equipment.

SPUR GEAR DRIVE CONDENSATE REMOVAL - MAINTENANCE INSTRUCTIONS

CIRCULAR CLARIFIERS & THICKENERS

SPUR GEAR DRIVE CONDENSATE REMOVAL MAINTENANCE INSTRUCTIONS

CONDENSATE REMOVAL

It is necessary to periodically remove any condensate which may have settled in the oil sumps. Inspection for and removal of condensate is achieved by draining a small quantity of fluid from the oil reservoir through the drain cocks into a transparent container. Any condensate which has entered the oil reservoir will drain out and settle to the bottom of the container. The lines should be drained until all signs of condensate have been removed. After condensate, if any, has been removed, check and add oil if necessary. Initially, a weekly inspection of the drain lines for condensate is recommended. The operator should continue with weekly inspections until he has sufficient experience to select his own inspection interval.

WINTERIZING

Operation of this gear in regions subject to subfreezing weather warrants the use of antifreeze in the drain lines to prevent accumulated condensate from freezing. Antifreeze should be added during normal maintenance procedures for winterizing the gear. After draining the summer weight oil, add any commercially available ethyleneglycol product (antifreeze), such as Prestone or Xerex, through the oil fill pipe. Also add antifreeze to the oil sump in the worm gear housing. If at any time a significant amount of condensate is removed (several ounces), then the antifreeze should be recharged in the oil reservoir where condensate has been removed.

Refer to chart for amount of antifreeze to winterize, dependent upon size of spur gear.

SPUR GEAR AND WORM GEAR
ANTIFREEZE ADDED FOR WINTERIZING

SPUR GEAR SIZE	ADD TO OIL SUMP ON WORM GEAR	ADD TO OIL FILL PIPE ON SPUR GEAR
~~28~~	~~0.5 oz.~~	~~1.0 oz.~~
42	1.0 oz.	1.5 oz.
~~60~~	~~1.5 oz.~~	~~2.0 oz.~~

PREVENTATIVE MAINTENANCE PLAN AND SCHEDULE

MODEL "HVS" CIRCULAR CLARIFIERS – (With Skimmers)

PREVENTATIVE MAINTENANCE PLAN AND SCHEDULE

SUMMARY

DAILY:

1. Visual inspection of tank and drive unit.
2. Check operation of skimmer mechanism as it passes over the scum box.

WEEKLY:

1. Keep drive platform and walkway free from oil, debris or tools. Make sure all guards are in place.
2. Inspect gearmotor ventilation openings to be sure they are clear of dust, dirt or other debris.

MONTHLY:

1. Check oil levels, add as required.
2. Grease all fittings.
3. Check operation of overload switches, alarm and shut-off.
4. Drain condensate. This is especially important in cold climates where freezing of water can cause damage to the unit.
5. Lubricate drive chain with SAE 30 oil or equal.
6. Adjust drive chain tension.
7. Check for loose bolts and nuts or for broken welds.

SEMI-ANNUALLY:

1. Remove chain and sprocket and smear grease on the keyed hub to ensure freedom of operation in case of shear pin failure.

ANNUALLY:

1. Check for loose bolts and nuts or for broken welds.
2. Change gearmotor lubricant if recommended by manufacturer.
3. Drain and flush drive unit.
4. Check connections between arms and drive cage.
5. Check connections between drive and drive cage.
6. Inspect visual sludge well seals.
7. Inspect flights and replace if required.
8. Inspect arm squeegee and replace if required.
9. Inspect arm suction pipe openings – clean if required.
10. Inspect skimmer wipers and replace if required.
11. Clean and paint equipment.

PREVENTATIVE MAINTENANCE PROCEDURES

CIRCULAR CLARIFIERS / THICKENERS

PREVENTATIVE MAINTENANCE PROCEDURES

TO CHECK OIL LEVELS:

Refer to Data Sheet D905-62758-215, note location of oil level sight gages. Oil levels for both the worm gear and spur gear oil baths should be at proper levels.

a) To check oil level in gearmotor, remove oil level plug.

TO ADD OIL:

a) To worm gear oil bath: remove inspection cover over worm gear and slowly add oil until correct level is obtained. Replace inspection cover.

b) To spur gear oil bath: remove pipe plug in oil fill fitting and slowly** add oil until correct level is obtained. Replace plug.

** IMPORTANT: It is recommended that a flexible long-necked funnel be used to add oil to the spur gear oil bath. The neck of the funnel should be bent so that the oil, to be added, is directed at the wall of the spur gear housing instead of allowing it to splash on top of the spur gear. This procedure will help prevent the oil from overflowing the dust shields.

Fill unit slowly using approximately 2/3 the required quantity of oil. Rotate drive to settle oil and add remainder of oil or until oil begins to emerge from the oil level pipe. When filled too fast, the viscosity of the oil will cause an overfill and spill out over the dust shield.

c) To gearmotor: remove breather fitting and oil level plug. Slowly add oil until oil begins to flow from oil level plug opening. Replace breather fitting and oil level plug. See gearmotor data sheets for location of oil level and drain plugs.

TO CHECK OPERATION OF OVERLOAD SWITCHES:

a) Manually depress limit switch actuator buttons, on first the alarm switch and then the shut-off switch.

b) If switches operate properly, the “Check Operation” procedure is complete.

TO DRAIN CONDENSATE:

Refer to drawing D905-62758-215.

a) For worm gear oil bath open drain valve.

b) For spur gear oil bath open drain valve.

TO DRAIN CONDENSATE: (Continued)

c) Draw off all condensate until oil appears.

d) Close valves.

TO LUBRICATE DRIVE CHAIN:

NOTE: AMWELL furnished chain is self-lubricating and does not require lubrication. If chain is replaced with a non-self-lubricating type, then the following procedures should be performed monthly.

a) Remove guard.

b) Swab with SAE #30 oil or equal.

c) Replace guard.

NOTE: We recommend that drive chain tension be checked and changed, if required, before guard is replaced. See "To Tension Drive Chain" below.

TO TENSION DRIVE CHAIN:

a) Remove chain guard.

b) Loosen gearmotor mounting bolts.

c) Loosen locknut on chain takeup adjustment screw.

d) Turning screw clockwise adjust chain so that with moderate pressure to the slack side of the chain the chain can be depressed approximately 1/2".

e) Adjust locking nut on takeup screw so that screw is locked into position.

f) Retighten gearmotor mounting bolts.

g) Replace chain guard.

WARNING: Do not over tension as this will put undue loads on drive shafts and bearings.

CIRCULAR CLARIFIERS / THICKENERS

PREVENTATIVE MAINTENANCE PROCEDURES

TO CHANGE GEARMOTOR LUBRICANT:

Refer to Eurodrive catalog sheet titled "Mounting Positions" for location of all oil drain plugs.

a) Remove drain plug.

b) Drain oil completely.

c) Replace drain plug.

d) Remove breather and oil level plugs.

e) Fill unit slowly with oil thru breather tap until oil can be seen in oil level plug opening.

f) Replace oil level and breather plugs.

TO DRAIN AND FLUSH DRIVE UNIT:

Refer to Data Sheet Drawing D905-62758-215.

a) Open valves.

b) Drain all oil completely.

NOTE: The amount of time required to accomplish this function will vary depending on the ambient temperature.

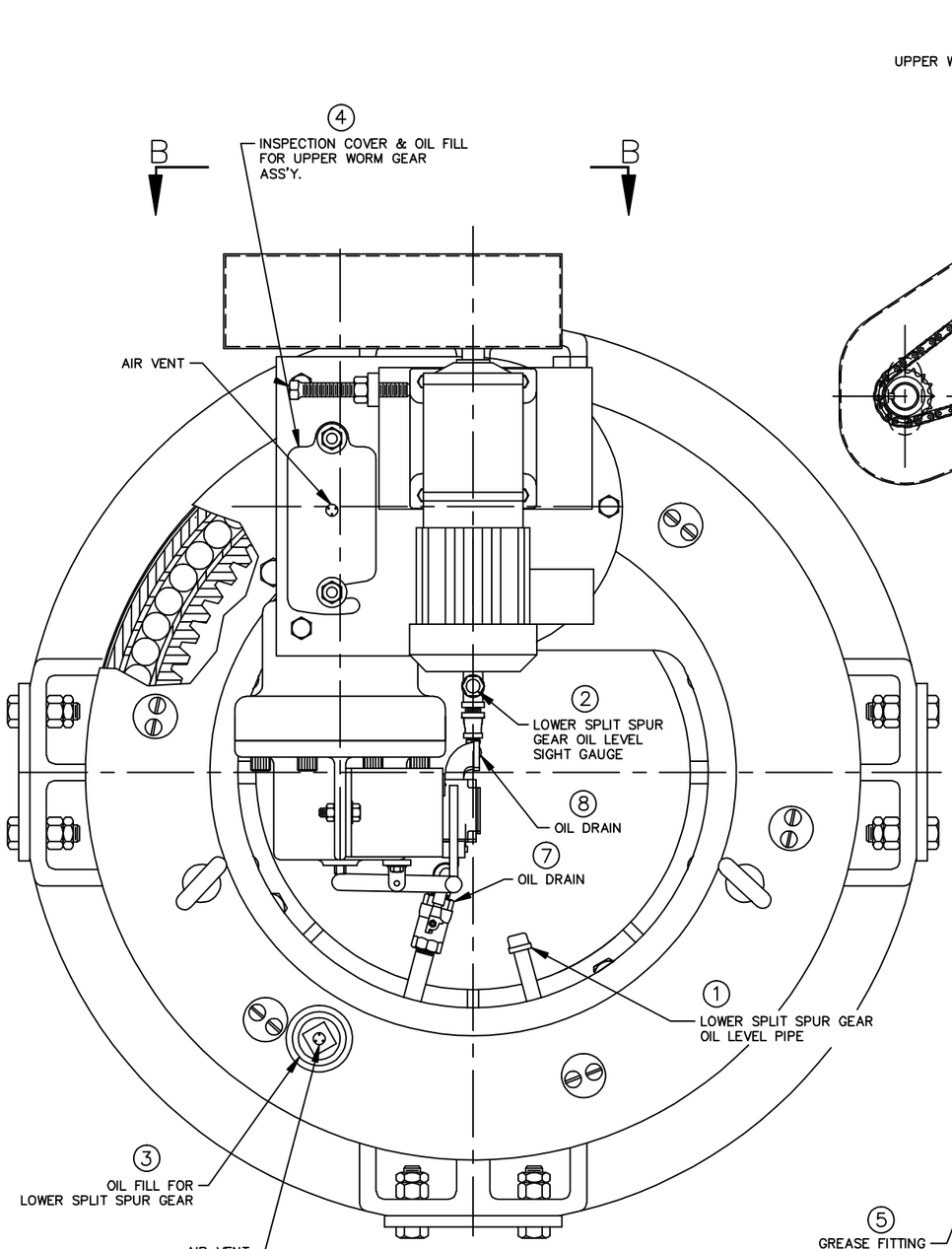
c) Remove inspection cover and oil fill plug.

d) Flush drive unit with a lightweight oil such as an SAE 5 weight or linseed oil or equal.

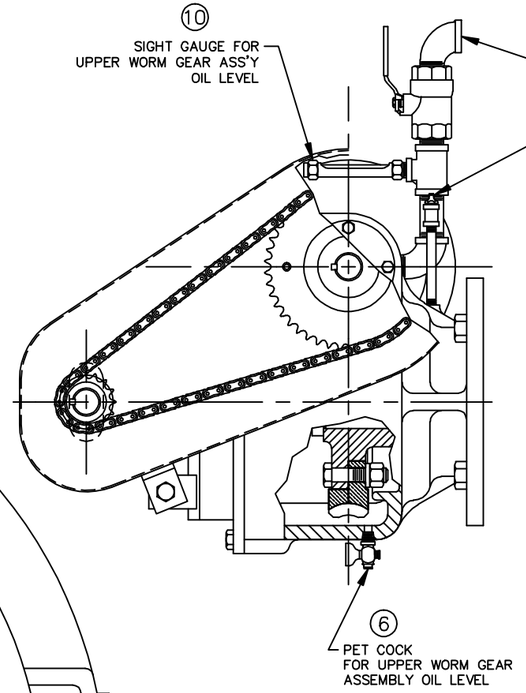
e) Close valves.

f) Replace oil per procedure "To Add Oil".

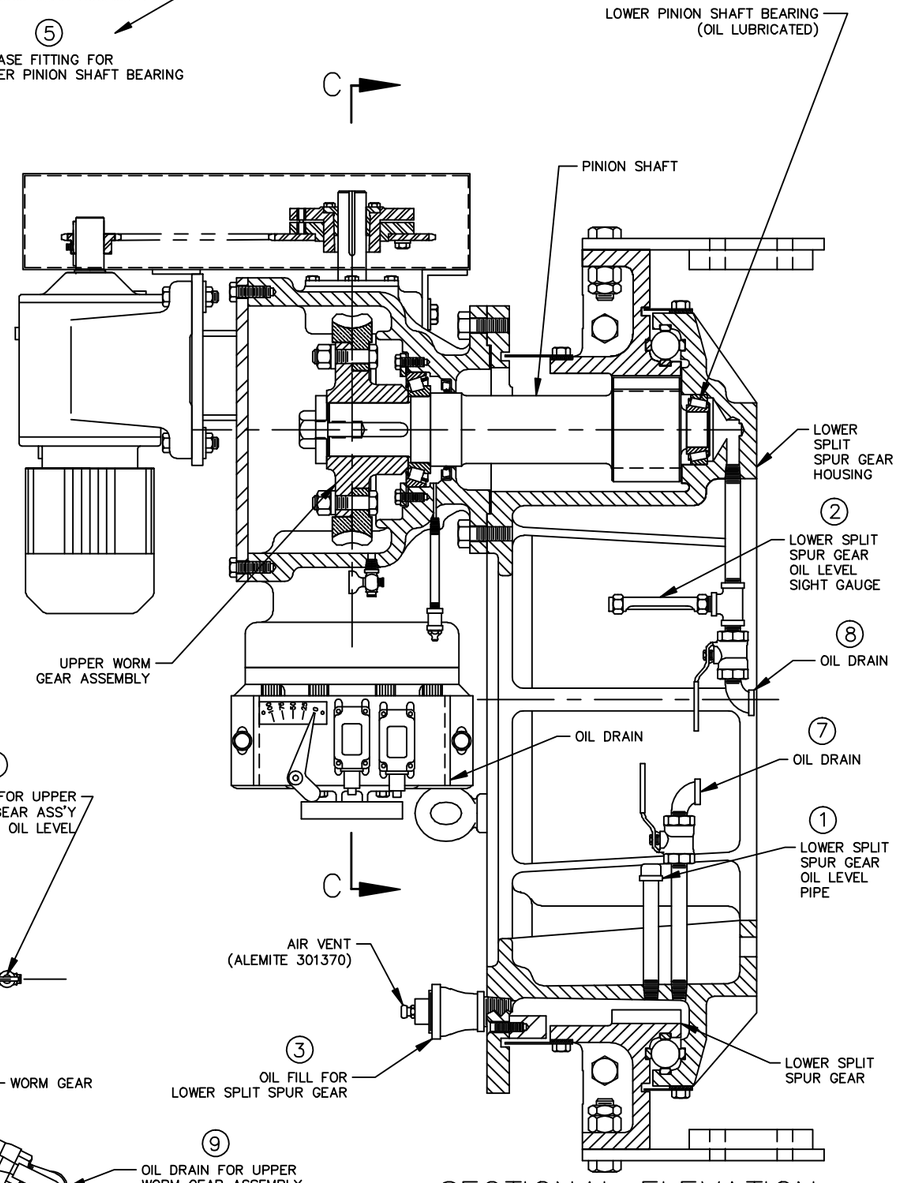
DATA SHEET FOR LUBRICATION DRAWING



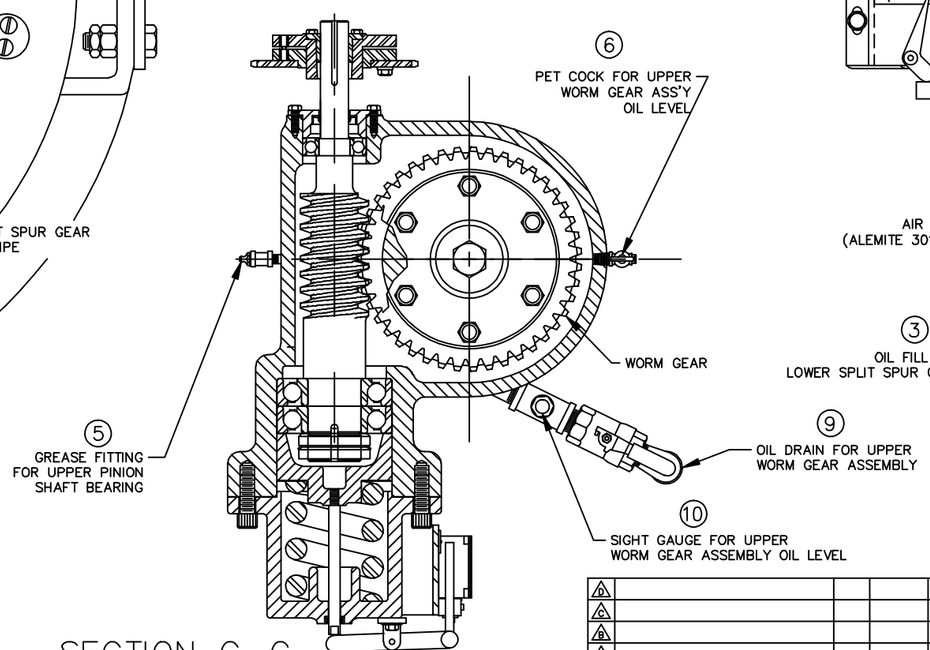
PLAN



SECTION B–B



SECTIONAL ELEVATION



SECTION C–C

CAD FILE: D62758 PLOT SCALE = 0.25

MASTER D-62758

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

AMWELL DOES NOT FURNISH PIPING (EXCEPT AS NOTED) FLOOR RAILS, TROUGHS, GRATINGS, WEIR PLATES, OIL OR GREASE FOR LUBRICATION, ANY WIRING OR CONDUITS BETWEEN MOTORS, CONTROLS AND ALARMS OR ANY ELECTRICAL EQUIPMENT OF ANY KIND EXCEPT AS SPECIFICALLY STATED IN AMWELL SPECIFICATIONS.

MICROFILMED

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

DRAWN	WTW
CHECKED	
APP'D.	
DATE	11/6/06
S.O.	STD.
SCALE	NONE

DESCRIPTION

DATA SHEET FOR LUBRICATION 42" CLARIFIER DRIVES

DRAWING NO. D,9,0,5|6,2,7,5,8|2,1,5 REV.

GEARMOTOR INFORMATION

1. Importance of the operating instructions

These operating instructions are intended to provide general information and safety guidelines. It is the responsibility of the buyer, machine builder, installer and user of the NORD product to make sure that all the proper safetynotes and operating instructions have been reviewed and understood. If the contents of this instruction or any applicable operating instructions are not understood, please consult NORD.

⚠ *WARNING*

Electric motors, gearmotors, electrical brakes, variable frequency drives, and gear reducers contain potentially dangerous high-voltage, rotating-components and surfaces that may become hot during operation. All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians.

2. Inspect incoming freight

Before accepting shipment from the freight company, thoroughly inspect the NORD equipment for any shipping and handling damage. If any goods called for in the bill of lading or express receipt are damaged, or if the quantity is short, do not accept until the freight express agent makes an appropriate notation on your freight bill or express receipt. If any concealed loss or damage is discovered later, notify your freight carrier or express agent at once, and request a formal review of your claim.

Claims for loss or damage in shipment must not be deducted from the NORD invoice, nor should payment of the NORD invoice be withheld awaiting adjustment of such claims, as the carrier guarantees safe delivery. NORD will try to assist in collecting claims for loss or damage during shipment; however, this willingness on our part does not remove the transportation company's responsibility in reimbursing you for collection of claims or replacement of material.

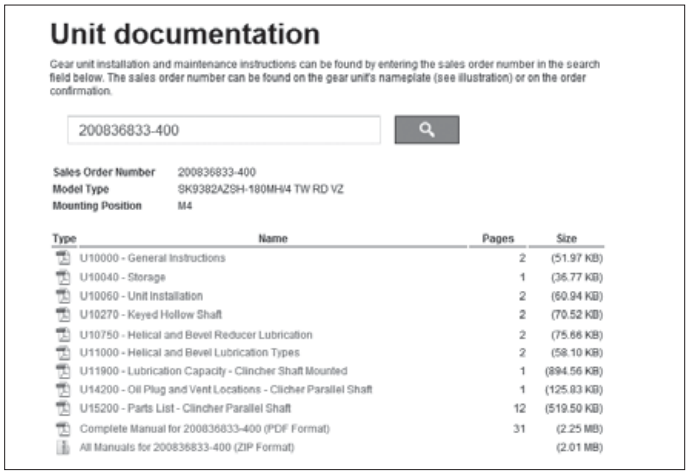
3. Obtaining detailed operating instructions

One can receive the detailed installation and maintenance instructions by entering a serial number (or NORD order number) at the appropriate location on the NORD web site.

i. Record the serial number from your gearmotor, gear reducer, or motor nameplate, or record the serial number found on your order confirmation.

ii. Go to **www.nord.com/docs** to download the appropriate operating instructions.

EXAMPLE: www.nord.com/docs



Unit documentation

Gear unit installation and maintenance instructions can be found by entering the sales order number in the search field below. The sales order number can be found on the gear unit's nameplate (see illustration) or on the order confirmation.

200836833-400

Sales Order Number	200836833-400
Model Type	SK9382AZSH-180MH/4 TW RD VZ
Mounting Position	M4

Type	Name	Pages	Size
	U10000 - General Instructions	2	(51.97 KB)
	U10040 - Storage	1	(36.77 KB)
	U10060 - Unit Installation	2	(60.94 KB)
	U10270 - Keyed Hollow Shaft	2	(70.52 KB)
	U10750 - Helical and Bevel Reducer Lubrication	2	(75.66 KB)
	U11000 - Helical and Bevel Lubrication Types	2	(58.10 KB)
	U11900 - Lubrication Capacity - Clincher Shaft Mounted	1	(894.56 KB)
	U14200 - Oil Plug and Vent Locations - Clicher Parallel Shaft	1	(125.83 KB)
	U15200 - Parts List - Clincher Parallel Shaft	12	(519.50 KB)
	Complete Manual for 200836833-400 (PDF Format)	31	(2.25 MB)
	All Manuals for 200836833-400 (ZIP Format)		(2.01 MB)

4. Intended use

NORD is a supplier of electric motors, gearmotors, reducers, electromechanical brakes, mechanical variators, and electrical variable frequency drives that are intended for commercial installations on larger systems and machines.

⚠ *WARNING*

NORD does not accept any liability for damage or injury caused by:

- Inappropriate use, operation or adaptation of the drive system.
- Unauthorized removal of housing covers, safety and inspection covers, guarding, etc.
- Unauthorized modifications to the drive system.
- Improper servicing or repair work on the drive system.
- Damage caused during shipment or transportation.
- Disregard of the important Safety Notes or Operating Instructions.

5. Notes concerning warranty and liability

All units are supplied according to the terms described in our standard "Conditions of Sale." The unit limited warranty is also defined in our "Conditions of Sale" and is located in the back of our product catalogs as well as the back of your order invoice.

All NORD Safety Notes and all related NORD Operating instructions shall be considered up-to-date at the time in which they were compiled by the buyer, machine builder, installer or user. NORD reserves the right to incorporate technical modifications and information updates to any safety/operating instructions that are within the scope of providing additional knowledge or clarification, communicating design changes, or product enhancements. Information updates may include any NORD product, or subsequent products purchased and supplied by NORD; No specific claims can be derived from the information or illustrations and descriptions contained in the safety notes or related operating instructions.

⚠ *WARNING*

NORD assumes no liability for personal injury, equipment damage or malfunctions resulting from failure to comply with any installation safety notes. The applicable national, regional, and local work regulations and safety requirements must also be complied with. Failure to comply with any safety notes or regulations may result in serious injury, damage to property, or even death.

6. Checklist for installation and operation

- ☑ Verify that the purchased NORD product has been supplied with the expected accessories & options. Check the received goods and packing slip to make sure items are properly received.
- ☑ Make sure that you have all of the required Operating Instructions for your NORD electric motor, gearmotor, reducer, electromechanical brake, mechanical variable speed drives, or electrical variable frequency drives.
- ☑ Consult NORD if you feel you are missing any documentation or if you have questions.

1. Safety & information symbols

All work including transportation, storage, installation, electrical connection, commissioning, servicing, maintenance and repair must be performed **only by qualified specialists or personnel**. It is recommended that repairs to NORD Products are carried out by the NORD Service Department. Instructions related to operational safety will be emphasized as shown.

Symbol	Meaning
⚠	**Danger, Caution or Warning -** Severe risk or danger of personal injury or death by working around dangerously high electrical voltage or moving machinery. Proper safety precautions must be taken.
NOTICE	**Notice -** Care must be taken to avoid the possibility of damaging the drive unit, driven machine, or the environment.
ℹ	**Important Note -** Useful note or tip to help assure trouble-free operation.
♻	**Material Disposal Note -** Important note concerning suggested material disposal.

2. Safety warnings

⚠ DANGER

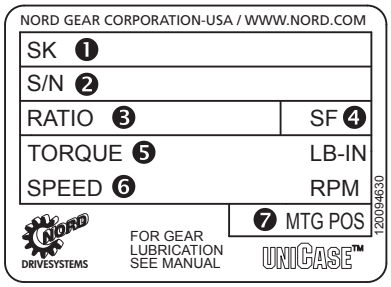
- All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians. All applicable national, regional, and local work regulations and safety requirements must also be complied with. **NORD assumes no liability for personal injury, accidental death, or equipment damage and malfunctions resulting from failure to comply with installation or operating instructions, safety notes, or any work regulations and laws!**
- Gear unit installation and maintenance work may only be performed when no power is available to the prime mover or motor. Electric motors, electrical brakes, and variable frequency drives, contain potentially dangerous high-voltage. Prior to installation or maintenance, shut down the power at the circuit breaker or power switch. **While working on the drive, make sure the power from the prime mover is isolated or secured on "lock-out" to prevent accidental start-up and to safeguard against injury!**
- Surfaces of motors and gear units may become hot during operation or shortly after start-up. In some instances additional protection against accidental contact may be necessary. **Use caution to avoid burns or serious injury!**

3. Observe published performance range & nameplate data

NOTICE

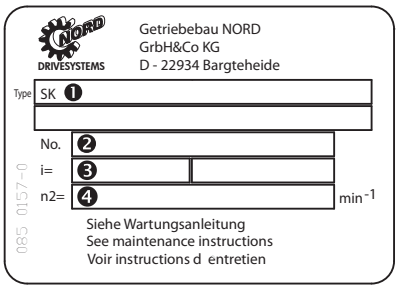
Observe the data on all reducer nameplates and verify published ratings for the NORD item/s in question. Do not operate any NORD equipment outside the published performance range. Failure to comply may result in damage to the drive unit, driven machine, or the environment.

U.S. Nameplate



❶ Model/Type
❷ Serial Number
❸ Gear Ratio
❹ Service Factor
❺ Torque Rating
❻ Output Speed RPM
❼ Mounting Position

European Nameplate



❶ Model/Type
❷ Serial Number
❸ Gear Ratio
❹ Speed

4. Transportation and handling

Make sure that all eyebolts and lifting lugs are tight and lift only at designed points. Protect the mounting surface from possible damage during transportation.

⚠ WARNING

Do not attach other machinery or loads to the NORD assembly, the supplied lifting bolts are not designed for this purpose and may result in drive damage or personal injury.

If the gearmotor or assembly is equipped with two suspension eye bolts, then both locations should be used for transportation and placement of the unit; in this case the tension force of the slings must not exceed a 45° angle.

In some instances it may be appropriate to use additional lifting straps or slings in order to assure safe transportation of the assembly. Always use sufficiently rated handling equipment and ensure that adequate safety measures are taken to protect personnel from injury during transportation. Once the NORD assembly is properly installed, remove the transportation fixtures.

7. DISPOSAL

MATERIAL DISPOSAL

Properly dispose of all used gear units and internal parts in accordance with all local regulations. In particular, all lubricants must be properly collected and disposed.

For confirmation of specific materials used in a specific reducer or gearmotor assembly, please consult NORD with the appropriate unit identification or serial number.

Components	Material
Gear wheels, shafts, rolling bearings, parallel keys, snap rings, spacers, shims, etc.	Steel
Gear housing and housing components	Cast iron or Aluminum (depending on type and size)
Worm gears	Bronze alloy
Radial seals, sealing caps, and rubber components	Elastomers with some steel
Coupling components	Plastic or Elastomer with Steel
Housing gaskets and flat oil seals	Asbestos-free sealing or gasket material (various types used)
Gear Oil	Mineral, SHC-Synthetic or PG-Synthetic (can vary)

1. Storage

IMPORTANT NOTE

For storage periods longer than 9 months, or for storage in less than desirable conditions, please consult NORD for recommendations.

Storage for up to 9 months is possible, so long as the following conditions are observed:

- Store the gear unit in its actual mounting position in accordance with the specified oil fill-level, in a clean and dry temperature controlled area. Avoid temperature fluctuations within the range of 0°C and 40°C (32°F to 104°F) and avoid relative humidity conditions in excess of 60%.
- Protect all exposed or unpainted shaft and flange surfaces with an anti-corrosion agent or grease.
- Store in a location free from shock and vibration, to avoid false brinelling of bearing elements and raceways.
- Whenever possible, rotate the shafts periodically, by hand if necessary, to help prevent brinelling (bearing damage) and to help keep the shaft seals pliable.
- Avoid direct exposure to the sun or UV light and aggressive or corrosive materials in the environment (ozone, gases, solvents, acids, caustic solutions, salts, radioactivity, etc.

2. Commissioning

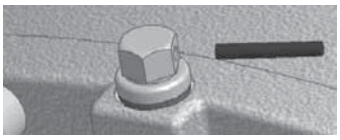
Prior to gear unit start-up, complete the following:

- Please check your gear unit for a vent and if applicable to your product, remove the sealing plug to activate.

NOTICE

To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start up. Excessive pressure may cause damage to internal gearbox components and leakage.

Sealed vent



Activated vent

- Check the lubricant and be sure the gear unit is filled with the proper oil type, to the proper level, as determined by the mounting position.

IMPORTANT NOTE

Some smaller gear units are supplied as maintenance free/ lubricated for life gear units. Oil level may not be checked on some of these units.

- Check the condition of all shaft seals and all assembled flange gasket areas. If any change is detected in the shape, color, hardness or permeability, or if any leaks are detected, the corresponding shaft seals and/or gaskets must be replaced.
- Remove all anti-corrosive metal protectant from otherwise bare metal surfaces. Follow product manufacturers directions and warnings during surface protection removal.
- Check the resistance of all motor and brake windings to verify the integrity of the winding insulation and inspect all terminal box openings and wire connection areas to verify that all components are dry and free of corrosion.

3. Long-Term Storage

By taking special precautions, problems such as seal leakage and reducer failure due to the lack of lubrication, improper lubrication quantity, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage:

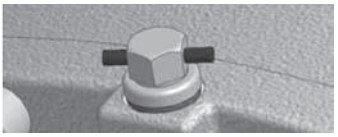
- Store the gear unit in its actual mounting position in accordance with the specified oil fill-level, in a clean and dry temperature controlled area. Avoid temperature fluctuations within the range of 0°C and 40°C (32°F to 104°F) and avoid relative humidity conditions in excess of 60%.
- Fill the reducer full with oil that is compatible with the product normally used or recommended during service.
- Apply grease to all unpainted or unprotected shafts, bores, keyways, flange surfaces, tapped holes, and to the exterior of all oil seals.
- Store in a location free from shock and vibration, to avoid false brinelling of bearing elements and raceways.
- Once every few months rotate the input shaft approximately 10-20 revolutions to redistribute the weight of gears and shafts and to prevent brinnelling of the bearings and drying of the seal track.
- Avoid direct exposure to the sun or UV light and aggressive or corrosive materials in the environment (ozone, gases, solvents, acids, caustic solutions, salts, radioactivity, etc.)

4. Commissioning After Long-Term Storage

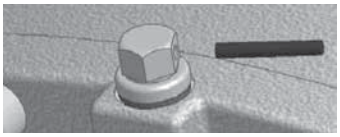
• Please check your gear unit for a vent and if applicable to your product, remove the sealing plug to activate.

NOTICE

To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start up. Excessive pressure may cause damage to internal gearbox components and leakage.



Sealed vent



Activated vent

- Remove all anti-corrosive metal protectant from otherwise bare metal surfaces. Follow product manufacturers directions and warnings during surface protection removal.
- Drain the reducer and refill it with the proper type and amount of lubricant.
- Observe start-up and initial operation to make sure there are no seal or gasket leaks, or unusual sounds, vibration or heat rise during operation.
- Check the resistance of all motor and brake windings to verify the integrity of the winding insulation and inspect all terminal box openings and wire connection areas to verify that all components are dry and free of corrosion.

1. Installation site

Drives must be properly installed if they are to produce the rated torque. Improper installation may lead to oil leaks, reduced life, or even catastrophic failure. NORD gear drives and motors are intended to be installed at a suitable mounting site under the following conditions:

- Unimpeded airflow to and around the units.
- Accessibility to oil drain, level and breather plugs.
- On brakemotors, allow adequate space for removing the fan guard and replacing and adjusting the brake.
- Mounting surfaces must be flat, torsionally rigid, and dampened against vibration.
- Unless special measures are taken, the immediate vicinity around the gear drive or motor should not be exposed to any aggressive or corrosive substances, contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity, etc.

2. Mounting position

Reducer mounting position charts illustrate the standard mounting positions for horizontal and vertical mounting. All gear units are assembled with the oil fill-level, oil-drain and vent plugs installed in their proper locations, **according to the customer-specified mounting position**. For mounting orientations other than shown consult NORD Gear.

NOTICE

Improper oil levels may lead to premature component wear and diminished service life. The gear reducer may not receive proper lubrication if the unit is not mounted in the position for which it is designed. Observe the mounting position designated on the reducer nameplate, or specified in the order acknowledgement. Consult NORD prior to changing mounting position in the field. While it is often possible to simply relocate the oil fill-level and vent locations, and adjust the oil fill amount, in some cases, different mounting positions may lend themselves to different internal construction features.

3. Reducer mounting

- The support foundation must be straight, level and flat. Whether the gear unit is foot-mounted or flange-mounted, NORD recommends that the straightness and flatness of the customer-supplied support foundation follow **Table 1**.
- The gear unit must be properly aligned with the driven shaft of the machine in order to prevent additional stress or load forces from being imposed upon the gear unit.
- To facilitate oil drainage it may be desirable to elevate the gear box foundation above the surrounding support structure.
- All bolting surfaces must be clean and free from contamination and corrosion.

Table 1: Recommended Straightness and Flatness of Customer-Supplied Support Foundation

Above (in)	To & Including (in)	General Tolerance on Straigtness & Flatness ISO 2768-2, Tolerance Class K
0.00	0.39	+/- 0.002 in
0.39	1.18	+/- 0.004 in
1.18	3.9	+/- 0.008 in
3.9	11.8	+/- 0.016 in
11.8	39	+/- 0.024 in
39	118	+/- 0.031 in

Above (mm)	To & Including (mm)	General Tolerance on Straigtness & Flatness ISO 2768-2, Tolerance Class K
0	10	+/- 0.05 mm
10	30	+/- 0.1 mm
30	100	+/- 0.2 mm
100	300	+/- 0.4 mm
300	1000	+/- 0.6 mm
1000	3000	+/- 0.8 mm

Straightness: Based upon the length of the corresponding line.

Flatness: Based upon the longer lateral surface or the diameter of the circular surface.

IMPORTANT NOTE

The responsibility for the design and construction of the support foundation is with the user. The foundation must be adequate to withstand normal operating loads and possible overloads while maintaining alignment to attached system components under such loads. ***Motors and drive components mounted on prefabricated base plates can become misaligned during shipment. Always check alignment after installation.***

4. Steel foundation

An engineered structural steel foundation should be designed to provide adequate rigidity and prevent loads from distorting the housing or causing misalignment of internal gears and shafts. When foot-mounting the gear reducer, a base plate or sole plate with suitable thickness (generally equal or greater than the thickness of the drive feet) should be securely bolted to steel supports and extend under the entire gear drive assembly. When flange-mounting the gear unit, the bulk head plate must be engineered to minimize buckling distortions and support the cantilevered weight of the gear unit or gear motor.

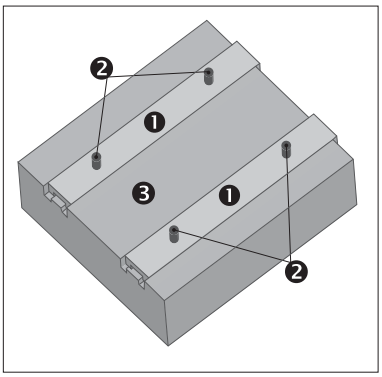
NOTICE

Do not weld on the gear unit or use the gear unit as an earth or ground connection for any welding procedure as this may cause permanent damage to the bearings and gears.

5. Concrete foundation

If a concrete foundation is used, allow the concrete to set firmly before bolting down the gear drive. Grout structural steel mounting pads and bolts of sufficient size into the concrete, to adequately distribute the load stress onto the concrete foundation.

Figure 1: Concrete Foundation



❶ Grouted Structural Steel Mounting Pads
❷ Mounting Bolts
❸ Concrete Foundation

6. Bolt connections for footed & flange mounted units

NORD footed reducers and flange-mount reducers (with B5 flange) have clearance designed into the mounting holes to allow for some minor adjustments in alignment. Bolt size, strength and quantity should be verified to insure proper torque reaction capacity whatever the mounting arrangement. Tightening torque for gear reducer mounting bolts, and recommended fastener grades, are provided in Table 2.

Table 2A: Tightening Torque for Inch Reducer Mounting Bolts

Thread Size	Grade SAE 5 / ASTM A449		Grade SAE 8	
(in)	(lb-ft)	(Nm)	(lb-ft)	(Nm)
1/4-20	7.1	9.6	10.0	13.6
5/16-18	16	21	22	30
3/8-16	28	37	39	53
1/2-13	69	93	98	132
5/8-11	138	188	195	264
3/4-10	247	334	348	472
7/8-9	396	537	558	757
1-8	592	802	833	1,130
1 1/8-7	-	-	1,233	1,672
1 1/4-7	-	-	1,717	2,327
1 3/8-6	-	-	2,267	3,073
1 1/2-6	-	-	2,983	4,045
1 3/4-5	-	-	4,458	6,045

- Calculated tightening torques are based a conventional 60°, clean and dry (un-lubricated) thread, with thread-friction and head-friction equal to 0.15.
- When using inch-fasteners, NORD recommends a minimum Grade SAE 5 (ASTM A-449) for sizes up to 1-8 UNC, and Grade SAE 8 for all larger sizes.

Table 2B: Tightening Torque for Metric Reducer Mounting Bolts

Above	ISO Grade 8.8		ISO Grade 10.9		ISO Grade 12.9	
(mm)	(lb-ft)	(Nm)	(lb-ft)	(Nm)	(lb-ft)	(Nm)
M4	2.4	3.2	3.5	4.7	4.1	5.5
M5	4.7	6.4	6.9	9.3	8.1	11
M6	8	11	12	16	14	19
M8	20	27	29	39	34	46
M10	39	53	58	78	67	91
M12	68	92	100	135	110	155
M14	107	145	159	215	180	250
M16	170	230	247	335	290	390
M18	240	325	343	465	400	540
M20	339	460	487	660	570	770
M22	465	630	664	900	770	1,050
M24	583	790	848	1,150	960	1,300
M27	848	1,150	1,217	1,650	1,440	1,950
M30	1,180	1,600	1,660	2,250	1,950	2,650
M36	2,050	2,780	2,884	3,910	3,470	4,710
M42	3,297	4,470	4,639	6,290	5,560	7,540
M48	4,940	6,700	7,010	9,500	8,260	11,200

- Calculated tightening torques are based on a conventional 60°, clean and dry (un-lubricated) thread, with thread-friction and head-friction equal to 0.15.
- When using metric-fasteners, NORD recommends a minimum ISO Grade 8.8 bolt.

7. Mounting the prime mover

When the motor is not flange mounted or integrally mounted to the gearbox, it is important to properly secure and align the gear drive with respect to the driven machine before attempting to align the prime mover or motor.

A. After the main gear drive is properly aligned and bolted in place, align the prime mover with respect to the reducer input shaft.

B. Use shims under the feet of the prime mover as needed, and secure in place with the proper mounting bolts. Dowel pins may be field-installed to help prevent misalignment and ensure proper realignment if removed for service.

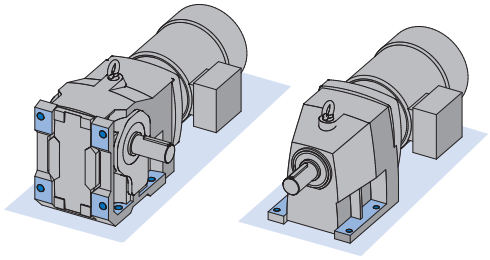
IMPORTANT NOTE

When using a high speed coupling connection between the prime mover and the reducer, check alignment per the coupling manufacturers recommendations. If the coupling is misaligned, the reducer alignment or shimming is incorrect. Re-align the gear reducer and re-check the high-speed coupling alignment before re-aligning the motor.

REDUCER MOUNTING
FOOTED & FLANGE MOUNT GEAR UNITS

1. Foot-mounted reducers

When installing the foot-mounted gear unit, observe the flatness specifications and bolt tightening torque guidelines provided in U10060 and make sure the mating mounting surface and reducer feet are clean and free of debris. Use of shims under the feet of the gear unit may be required in order to align the output shaft to the driven equipment. Make sure that all feet are supported so that the housing will not distort when it is bolted down. Improper shimming will cause mis-alignment and may reduce the life of the gear unit or cause component failure. Dowel pins may be field-installed to help prevent misalignment and ensure proper realignment if removed for service.



IMPORTANT NOTE

Gear units may be subjected to radial loads or side pull, caused by external chain drives or belt drives. In these instances it is recommended that the mounting base be designed with a slide-plate adjustment to accommodate extra slack in the chain or the belt after the feet are loosened. When using an external chain or belt drive, make sure the reducer is sized so that the shaft and bearings have adequate capacity.

2. Flange-mounted reducers (with B5 flange)

When using the B5 flange to mount the gear unit, the bulk head plate must be engineered to minimize buckling distortions and support the cantilevered weight of the gear reducer or gearmotor. When the mating hole is designed with the proper fit, the flange pilot tenon provides a means of accurately positioning the reducer while the hold-down bolts are properly secured; once the reducer is secured, the tenon helps prevent movement of the reducer and it helps locate the center of the reducer output shaft. The flange centering shoulder tolerance for standard units is listed in table 1. For units with NSD Tuph please see table 2 on the following page.

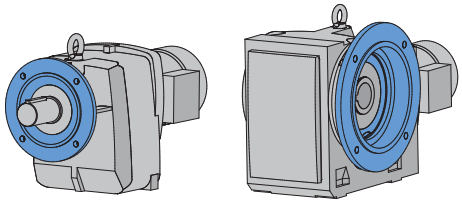


Table 1 : Flange Centering Shoulder Tolerance

Above ø (in)	To & Including ø (in)	Tolerance (in)	ISO 286-2 Fit Class
1.969	3.150	+0.0005 / -0.0003	j6
3.150	4.724	+0.0005 / -0.0004	j6
4.724	7.087	+0.0006 / -0.0004	j6
7.087	9.055	+0.0006 / -0.0005	j6
9.055	9.843	+0.0000 / -0.0011	h6
9.843	12.402	+0.0000 / -0.0013	h6
12.402	15.748	+0.0000 / -0.0014	h6
15.748	19.685	+0.0000 / -0.0016	h6
19.685	21.654	+0.0000 / -0.0017	h6

Above ø (mm)	To & Including ø (mm)	Tolerance (mm)	ISO 286-2 Fit Class
50	80	+0.012 / -0.007	j6
80	120	+0.013 / -0.009	j6
120	180	+0.014 / -0.011	j6
180	230	+0.016 / -0.013	j6
230	250	+0.000 / -0.029	h6
250	315	+0.000 / -0.032	h6
315	400	+0.000 / -0.036	h6
400	500	+0.000 / -0.040	h6
500	550	+0.000 / -0.044	h6

When installing the flange mounted gear unit, observe the flatness specifications and bolt tightening torque guidelines provided in U10060. Make sure the mating mounting surface and reducer flange are clean and free of debris. Use a straight edge or parallel bar to check for high spots on the mating mounting surface and remove any raised material around the mounting holes.

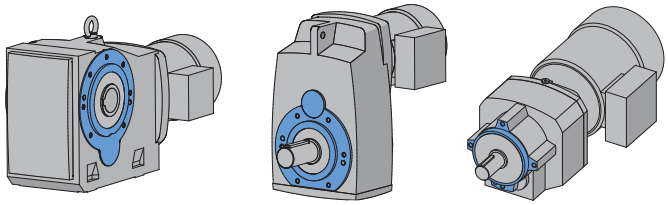
Set the gear unit into place and tighten the bolts until they are snug. Before final bolt-tightening check for any material gaps between the mating surfaces and if shimming is required, use “U” shaped shims at least 2 times the width of the bolt. Avoid over shimming a very irregular surface as this will make it very difficult to achieve proper alignment.

IMPORTANT NOTE

For heavy shock applications, it is advisable to field-install dowel pins through the mounting flange connection (in addition to the mounting bolts). This will help control flange movement or flange rotation and relieve the mounting bolts from this additional stress.

3. Flange-mounted reducers (with B14 flange)

When using the B14 flange to mount the gear unit, the bulk head plate must be engineered to minimize buckling distortions and support the cantilevered weight of the gear reducer or gearmotor. When properly installed, the output flange of the reducer housing is designed to enable the permissible torques and radial forces to be reliably transmitted by the bolt connections. The flange centering shoulder tolerance for standard units is listed in table 1 on the previous page. For units with NSD Tuph please see table 2 below.



IMPORTANT NOTE

When using the B14 flange-face for mounting, if dowel pin holes are provided in addition to the threaded holes, then it is advisable to also use the proper dowel pins, to help control flange movement or flange rotation and relieve the mounting bolts from this additional stress This is especially important for heavy shock applications.

Table 2 : Flange Centering Shoulder Tolerance on NSD Tuph Units

Above ø (in)	To & Including ø (in)	Tolerance (in)
1.969	3.150	+0.0020 / +0.0013
3.150	4.724	+0.0021 / +0.0012
4.724	7.087	+0.0021 / +0.0011
7.087	9.055	+0.0022 / +0.0011

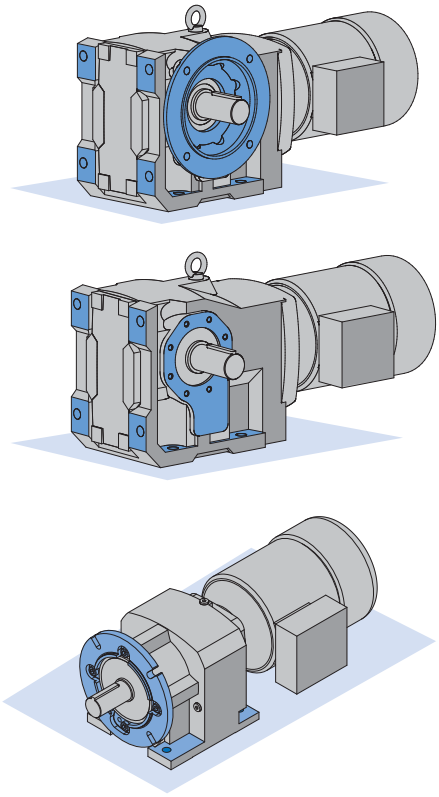
Above ø (mm)	To & Including ø (mm)	Tolerance (mm)
50	80	+0.052 / +0.033
80	120	+0.053 / +0.031
120	180	+0.054 / +0.029
180	230	+0.056 / +0.027

4. Foot & flange reducer housings

Some gear reducer housings are available with a foot and an output flange. Units with a foot and a B5 Flange are designated with the suffix XF after the primary model number and units with a B14 face-flange are designated with the suffix XZ after the primary model number. When a gear unit is provided with both a foot and a flange, the foot is consider the primary mounting surface. The flange is generally considered to be the secondary mounting option and it is intended that this surface be used for auxiliary add on elements that place minimal load stress on the reducer housing.

NOTICE

To prevent overstress on the main gear unit housing, never tighten the reducer mounting feet and the mounting flange against one-another. Auxiliary add-on elements that are mounted to the reducer flange, must not transmit excessive force, torque or vibration to the main gear housing.



HELICAL & BEVEL REDUCER LUBRICATION TYPES

Lubrication Tables – Helical and Bevel Gear Units

Standard Oil Lubricants

ISO Viscosity	Oil Type	Ambient Temperature Range	Manufacturer Brand/Type	Notes
VG220	MIN-EP	0 to 40°C (32 to 104°)	Mobilgear 600XP220	♦❶
	PAO-EP	-35 to 60°C (-31 to 140°F)	Mobil SHC Gear 220	♦❷
	FG	-5 to 40°C (23 to 104°F)	Fuchs FM220	♦

Optional Oil Lubricants

ISO Viscosity	Oil Type	Ambient Temperature Range	Manufacturer Brand/Type	Notes
VG460	PAO-EP	-35 to 80°C (-31 to 176°F)	Mobil SHC Gear 460	-
	FG-PAO	-35 to 80°C (-31 to 176°F)	Mobil SHC Cibus 460	-
VG220	FG-PAO	-35 to 60°C (-31 to 140°F)	Mobil SHC Cibus 220	S
VG150	PAO-EP	-35 to 25°C (-31 to 77°F)	Mobil SHC Gear 150	-

Grease Options (applied to greased bearings and seal cavities)

NLGI Grade	Grease Thickener	Grease Base Oil	Ambient Temperature Range	Manufacturer Brand/Type	Notes
NLGI 2	Li-Complex	MIN	-30 to 60°C (-22 to 140°F)	Mobil Grease XHP222	♦❶
	Li-Complex	PAO	-40 to 80°C (-40 to 176°F)	Mobil / Mobilith SHC 220	♦❷
	Polyurea	FG-PAO	-30 to 80°C (-22 to 176°F)	Mobil SHC Polyrex 222	♦

♦ Stocked Lubricants

❶ Standard product on serviceable gear units

❷ Standard product on maintenance free gear units

IMPORTANT NOTE

- The "Ambient Temperature" is intended to be an operation guideline based upon the typical properties of all the lubricant. The viscosity and other properties of the lubricant change based upon load, speed, ambient conditions, and reducer operating temperatures. The user should consult with their lubrication supplier & NORD gear before considering changes in oil type or viscosity.
- To prevent reducer overheating, observe the maximum operating oil temperature limits:
  Mineral Oil: 80-85 °C (176 – 180 °F).
  Synthetic Oil: 105 °C (225 °F).
- In the following instances, please consult NORD for specific recommendations:
  - √ Gear units will operate in high ambient temperature conditions exceeding 40 °C (104 °F).
  - √ Gear units will operate in cold ambient temperature conditions approaching 0 °C (32 °F) or lower.
  - √ Lower than an ISO VG100 viscosity oil is being considered for a cold-temperature service.
  - √ Fluid grease is required for lubricating the gear unit.
- Observe the general lubrication guidelines outlined in user manual U10750.

Oil Formulation Codes

MIN-EP - Mineral Oil with EP Additive
PAO-EP - Synthetic Polyalphaolefin Oil with EP Additive
PAO - Synthetic Polyalphaolefin Oil
PG - Synthetic Polyglycol Oil
FG - Food-Grade Oil
FG-PAO - Food-Grade, Synthetic Poyalphaolefin Oil
FG-PG - Food-Grade, Synthetic Polyglycol Oil

Lubrication Notes

- Avoid using (EP) gear oils in worm gears that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not to mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral oil or polyalphaolefin (PAO) synthetic oil.

HELICAL & BEVEL REDUCER LUBRICATION TYPES

Oil Cross-reference Chart

ISO Viscosity	Oil Type	Ambient Temperature Range	Mobil	Shell	Castrol	FUCHS	KLÜBER LUBRICATION
VG150	MIN-EP	0 to 25°C (32 to 77°F)	Mobilgear 600XP150	Omala S2 G 150	Alpha SP150	Renolin EP150	Klüberoil GEM 1-150N
	PAO-EP	-30 to 25 °C (-22 to 77 °F)	Mobil SHC Gear 150	Omala S4 GX 150	Alphasyn EP150	Gearmaster SYN150/NA	Klübersynth EG 4-150
	PAO	-30 to 25°C (-22 to 77°F)	Mobil SHC629	Morlina S4 B 150	Alphasyn T150	N/A	Klübersynth GEM 4-150N
	PG	-25 to 25°C (-13 to 77°F)	Mobil Glygoyle 150	Omala S4 WE 150	Alphasyn PG150	Renolin PG150	Klübersynth GH 6-150
	FG	0 to 25°C (32 to 77°F)	Mobil DTE FM 150	N/A	N/A	N/A	N/A
	FG-PAO	-15 to 25°C (5 to 77°F)	Mobil SHC Cibus 150	N/A	N/A	Cassida GL150	Klüberoil 4 UH 1-150N
	FG-PG	-25 to 25°C (-13 to 77°F)	Mobil Glygoyle 150	N/A	N/A	N/A	Klübersynth UH1 6-150
VG220	MIN-EP	0 to 40°C (32 to 104°)	Mobilgear 600XP220	Omala S2 G 220	Alpha SP220	Renolin EP220	Klüberoil GEM 1-220N
	PAO-EP	-30 to 60 °C (-22 to 140 °F)	Mobil SHC Gear 220	Omala S4 GX 220	Alphasyn EP220	Gearmaster SYN220/NA	Klübersynth EG 4-220
	PAO	-30 to 60°C (-22 to 140°F)	Mobil SHC630	Morlina S4 B 220	Alphasyn T220	N/A	Klübersynth GEM 4-220N
	PG	-25 to 60°C (-13 to 140°F)	Mobil Glygoyle 220	Omala S4 WE 220	Alphasyn PG220	Renolin PG220	Klübersynth GH 6-220
	FG	0 to 40°C (32 to 104°F)	Mobil DTE FM 220	N/A	N/A	Fuchs FM220	N/A
	FG-PAO	-25 to 60°C (-13 to 140°F)	Mobil SHC Cibus 220	N/A	N/A	Cassida GL220	Klüberoil 4 UH 1-220N
	FG-PG	-25 to 60°C (-13 to 140°F)	Mobil Glygoyle 220	N/A	N/A	Cassida WG220	Klübersynth UH1 6-220
VG460	MIN-EP	0 to 40°C (32 to 104°F)	Mobilgear 600XP460	Omala S2 G 460	Alpha SP460	Renolin EP460	Klüberoil GEM 1-460N
	PAO-EP	-20 to 80°C (-4 to 176°F)	Mobil SHC Gear 460	Omala S4 GX 460	Alphasyn EP460	Gearmaster SYN460/NA	Klübersynth EG 4-460
	PAO	-20 to 80°C (-4 to 176°F)	Mobil SHC 634	Morlina S4 B 460	Alphasyn T460	N/A	Klübersynth GEM 4-460N
	PG	-20 to 80°C (-4 to 176°F)	Mobil Glygoyle 460	Omala S4 WE 60	Alphasyn PG460	N/A	Klübersynth GH 6-460
	FG	0 to 40°C (32 to 104°F)	Mobil DTE FM460	N/A	N/A	Fuchs FM460	N/A
	FG-PAO	-20 to 80°C (-4 to 176°F)	Mobil SHC Cibus 460	N/A	N/A	Cassida GL460	Klüberoil 4 UH 1-460N
	FG-PG	-20 to 80°C (-4 to 176°F)	Mobil Glygoyle 460	N/A	N/A	Cassida WG460	Klübersynth UH1 6-460

Low-end service temperature limit may vary for a specific lubricant; Please also see the important notes on Page 1.

NORDBLOC®.1 FOOTED OIL FILL QUANTITIES

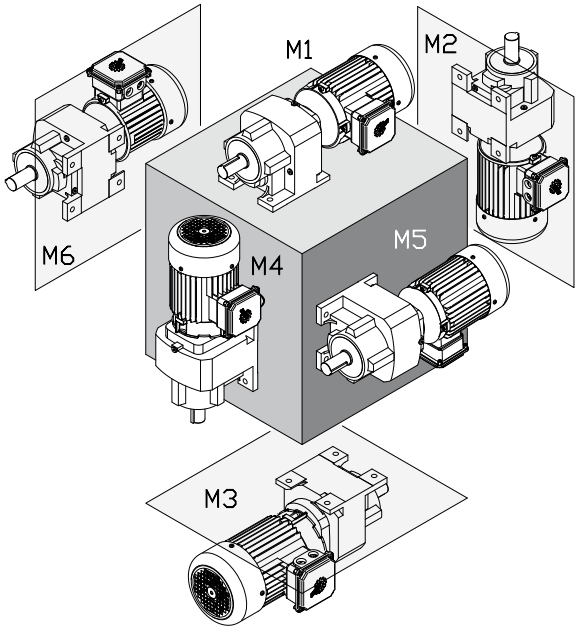
NORDBLOC®.1 Fill Quantities (Footed)

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For oil plug & vent locations please see U14700.

IMPORTANT NOTE

Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add addition oil as needed. The correct oil level should be located at the lower edge of the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.

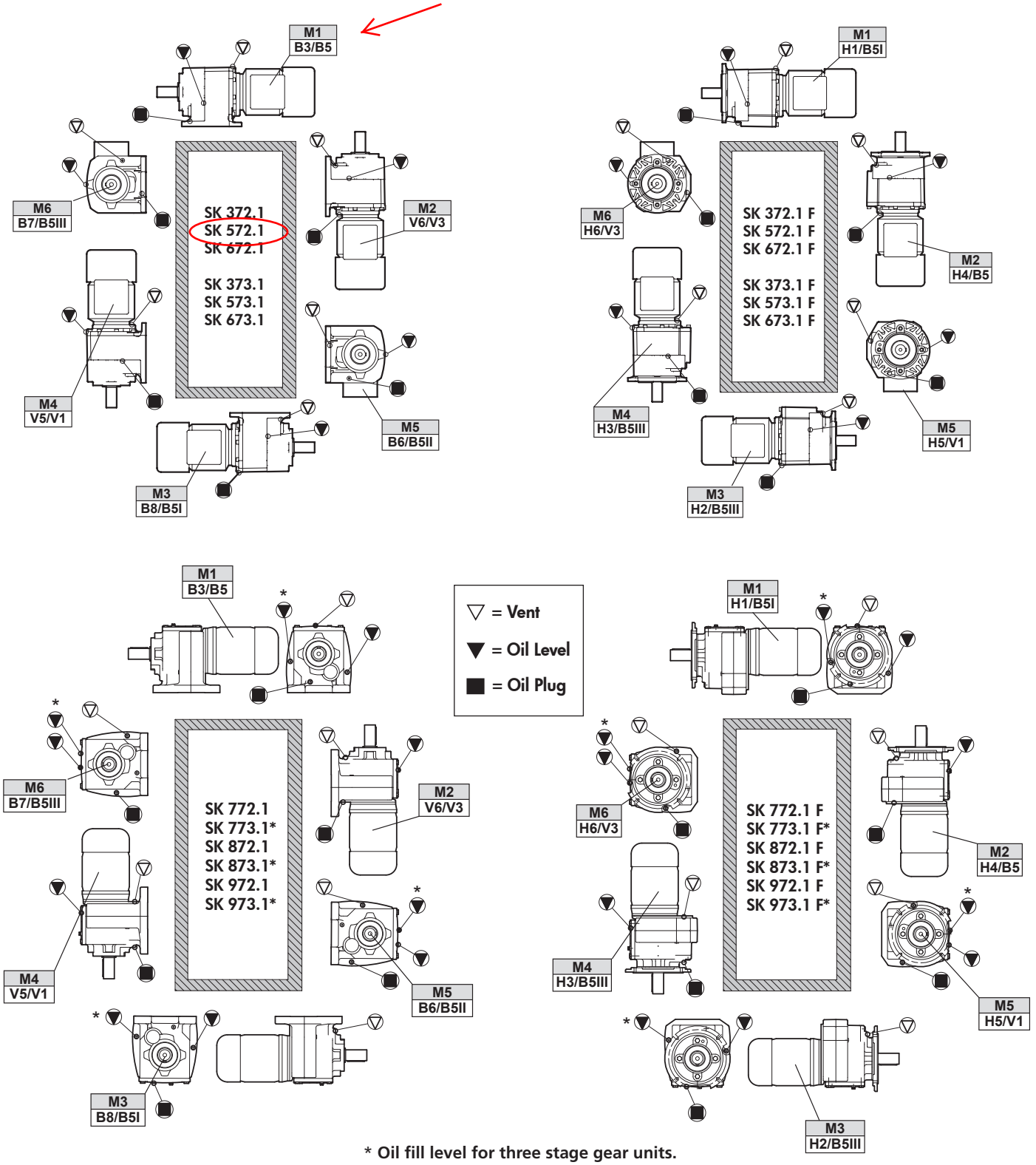


Type	M1		M2		M3		M4		M5		M6	
	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters
SK 071.1	0.19	0.18	0.42	0.40	0.40	0.38	0.42	0.40	0.32	0.30	0.32	0.30
SK 072.1	0.17	0.16	0.34	0.32	0.22	0.21	0.24	0.23	0.19	0.18	0.21	0.20
SK 171.1	0.23	0.22	0.42	0.40	0.38	0.36	0.42	0.40	0.35	0.33	0.35	0.33
SK 172.1	0.29	0.27	0.62	0.59	0.44	0.42	0.48	0.45	0.34	0.32	0.41	0.39
SK 371.1	0.37	0.35	0.61	0.58	0.58	0.55	0.61	0.58	0.52	0.49	0.52	0.49
SK 372.1	0.48	0.45	1.10	1.05	0.79	0.75	1.10	1.00	0.63	0.60	0.69	0.65
SK 373.1	0.48	0.45	1.10	1.05	0.79	0.75	1.10	1.00	0.63	0.60	0.69	0.65
SK 571.1	0.51	0.48	0.91	0.86	0.85	0.80	0.97	0.92	0.72	0.68	0.72	0.68
SK 572.1	0.79	0.75	2.00	1.90	1.60	1.50	2.10	2.00	1.20	1.10	1.20	1.15
SK 573.1	0.79	0.75	2.00	1.90	1.60	1.50	2.10	2.00	1.20	1.10	1.20	1.15
SK 672.1	1.20	1.10	2.70	2.60	2.30	2.15	2.90	2.70	1.60	1.55	1.70	1.65
SK 673.1	1.20	1.10	2.70	2.60	2.30	2.15	2.90	2.70	1.60	1.55	1.70	1.65
SK 771.1	0.95	0.90	1.60	1.50	1.30	1.20	1.80	1.70	1.20	1.16	1.20	1.16
SK 772.1	1.40	1.30	4.00	3.80	2.50	2.40	3.40	3.20	1.70	1.60	2.60	2.50
SK 772.1 VL	2.10	2.00	4.00	3.80	2.50	2.40	3.40	3.20	1.70	1.60	2.60	2.50
SK 773.1	2.40	2.30	4.00	3.80	3.50	3.30	3.40	3.20	2.50	2.40	3.30	3.10
SK 773.1 VL	2.40	2.30	4.00	3.80	3.50	3.30	3.40	3.20	2.50	2.40	3.30	3.10
SK 871.1	1.59	1.5	3.38	3.2	3.38	3.2	2.75	2.6	2.43	2.3	2.43	2.3
SK 872.1	3.10	2.90	8.20	7.80	4.90	4.60	6.80	6.40	2.60	2.50	4.20	4.00
SK 872.1 VL	5.30	5.00	8.20	7.80	4.90	4.60	6.80	6.40	2.60	2.50	4.20	4.00
SK 873.1	4.40	4.20	8.20	7.80	6.20	5.90	6.80	6.40	4.30	4.10	6.20	5.90
SK 873.1 VL	4.40	4.20	8.20	7.80	6.20	5.90	6.80	6.40	4.30	4.10	6.20	5.90
SK 971.1	2.01	1.9	4.12	3.9	4.12	3.9	3.59	3.4	3.28	3.1	3.28	3.1
SK 972.1	4.80	4.50	13.00	12.00	7.90	7.50	12.00	11.50	4.40	4.20	7.90	7.50
SK 972.1 VL	9.00	8.50	13.00	12.00	7.90	7.50	12.00	11.50	4.40	4.20	7.90	7.50
SK 973.1	7.90	7.50	13.00	12.00	11.00	10.50	12.00	11.50	7.90	7.50	11.00	10.50
SK 973.1 VL	7.90	7.50	13.00	12.00	11.00	10.50	12.00	11.50	7.90	7.50	11.00	10.50

NORDBLOC®.1
OIL PLUG & VENT LOCATIONS

Oil plug connections

Prior to commissioning the reducer, check the oil-fill level using the reducer's oil-level plug and drain or add additional oil as needed. The correct oil level should be located at the lower edge of the oil level hole. ***For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.***



*** Oil fill level for three stage gear units.**

1. Overview

This user manual applies to NORD Motor products and it provides general information for motor operation, installation, maintenance, inspection, repair, and trouble shooting, which is relevant to most of the motor products shipped by NORD. Information and instructions provided in this manual, safety and commissioning information and all other manuals applicable to any items supplied by NORD must be observed.

This instruction manual is not intended to include comprehensive details and information related to all possible design variations or accessories options available with NORD motors. If there is any uncertainty about specific procedures, instructions or motor details, then please refer these questions to NORD for additional information or clarification.

Before installing, operating, or performing maintenance on any electrical motor become familiar with the following:

- The detailed operating instructions and wiring diagrams.
- All applicable national, local and system-specific regulations, codes and practices.
- The national / regional regulations governing safety and accident prevention.
- The proper use of any tools, transportation or hoisting equipment, and safety equipment needed to complete the installation.
- To avoid serious injury or possible damage to the equipment or machine, compliance with all safety and information notes is mandatory!

⚠ *WARNING*

All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians. All applicable national, regional, and local work regulations and safety requirements must also be complied with. NORD assumes no liability for personal injury, accidental death, or equipment damage and malfunctions resulting from failure to comply with installation or operating instructions, safety notes, or any work regulations and laws!

⚠ *DANGER*

To avoid electrocution, injury or death, make certain the motor is properly grounded, completely de-energized and brought to a no-voltage condition prior to working on any electrical connections.

2. Motor Types

NORD AC electric induction motors described in this manual generally include the following types:

- Single speed or two-speed design.
- Three phase alternating current or single phase design.
- Enclosure types: TEFC, TENV, and TEBC.

3. Enclosure Types

Totally enclosed fan cooled (TEFC).

TEFC motor designs rely on fan that is mounted on the motor's rotor shaft so the cooling capacity can vary based upon the motor's operating speed.

Totally enclosed, non-ventilated (TENV)

The TENV motor designs rely purely on convection cooling and they have no fan. Often TENV designs are labeled for intermittent or periodic duty or at a lower power rating than is typical for the given motor frame size.

Totally enclosed, blower cooled (TEBC)

The TEBC design uses separate blower or ventilator fan, with its own low wattage motor and a separate power supply, to provide continuous airflow and cooling. The blower can be used to extend the speed range of the motor and allow extreme slow speed operation without causing a concern for overheating. Blower data is provided in Table 6, page 11.

4. Voltage and Frequency Variation

Voltage and frequency variations are based upon the assumption that the nameplate horsepower will not be exceeded and that the motor temperature may increase. Standard allowable deviations are based upon the type of motor labeling.

NEMA and CSA Labeled Motors

Variations are based upon the nominal utilization voltage, and not the service (supply) voltage as per ANSI C84.1.

Service Voltages	Utilization Voltages
120V, 208V, 240V, 480V, 600V	115V, 200V, 230V, 460V, 575V

- Voltage variation at rated frequency = ±10%.
- Frequency variations at rated voltage = ±5%.
- Combined voltage/frequency variation = ±5%.

CE Labeled Motors

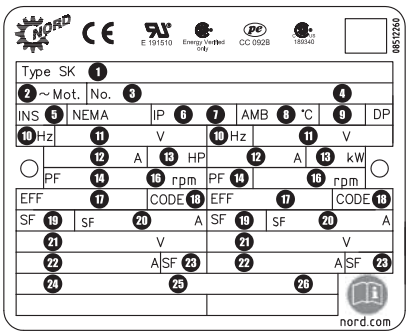
Per IEC 60038, allowable service voltage variations on in the current system, compared to the previous system, are as indicated.

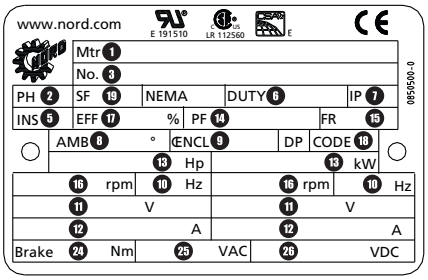
Previous Service Voltages	Current Service Voltages
220V, 380V, 660V	230V, 400V, 690V +6/-10%
240V, 415V	230V, 400V +10/-6%

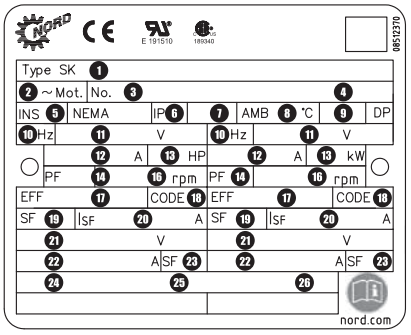
- Per EN 60034-1 a ±5% voltage variation and a ±2% frequency variation can be tolerated.
- The allowed variations are based upon the voltage (or voltage range) indicated on the motor nameplate.

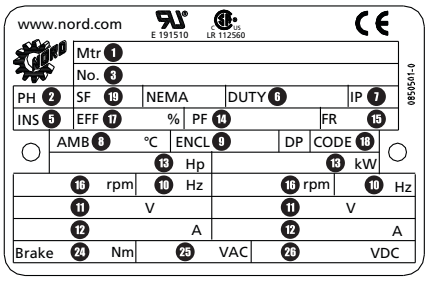
5. Motor Nameplate Information

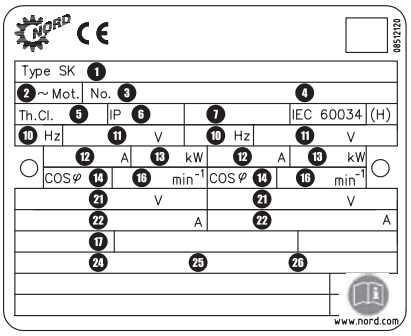
The motor nameplate and the display of technical information may vary slightly depending upon the global standard/s that the motor conforms to and the efficiency level. Please reference the examples below.











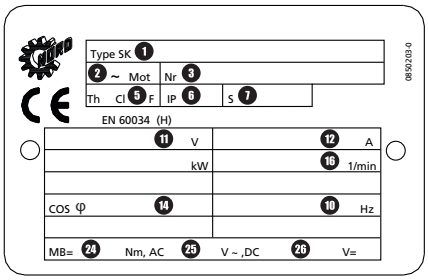


Table 1. Nameplate Data

Field	Definition
1	Model / Type
2	Number of Phases
3	Order Number
4	Serial Number
5	Insulation Class
6	IP (Ingress Protection) Enclosure Rating
7	Duty Cycle
8	Ambient Temperature Rating (°C)
9	Enclosure Type
10	Motor Frequency (Hz)
11	Voltage Rating (V)
12	Current Rating (A)
13	Rated Power (HP or kW)

Field	Definition
14	Power Factor
15	Motor Frame Size
16	Full Load Speed (rpm or 1/min^2)
17	Efficiency
18	NEMA Code Letter
19	Service Factor
20	Current Rating (If Service Factor ≥ 1.15)
21	Operating Voltage Rage (A)
22	Current Rating at Operating Voltage Range (A)
23	Service Factor at Operating Voltage Range (A)
24	Brake Rating (Nm)
25	Brake Supply Voltage (VAC)
26	Brake Coil Voltage (VDC)

6. Motor Options And Nomenclature

NORD offers many options for its motors. The option code will be shown in the motor nomenclature. Below are commonly used options.

Code	Description
AICM	Additional Internal Insulation Coating Applied
BRE	With Brake
EAR	Single Phase, Start Cap/Run Cap
ECR	Single Phase, Start Cap/Run Cap Increased SF
EHB	Single Phase, Run Capacitor Only
EP	Epoxy Dipped Windings
F	Blower Cooling Fan - 3ph & 1ph
FC	Blower Cooling Fan - 1ph
FHL	Brake – Lockable Manual Release
H	Energy Efficient
HL	Brake – Manual Hand Release
IG	Incremental Encoder
IP66	IP66 Environmental Protection
IR	Brake – Current Sensing Relay
KB	Condensation Holes - Removable Plugs
KD	Condensation Holes - Open
MIK	Brake – Microswitch
MS	Power Plug Connector

Code	Description
OL	TENV Motor – Without Fan / With Cover
OL/H	TENV Motor - Without Fan & Cover
P	Premium Efficient Motors
RD	Canopy Cover
RDD	Double Canopy Cover
RG	Brake – Corrosion Protected
RLS	Backstop
SH	Motor Space Heater
SR	Brake – Dust Protected
TF	Thermistor
TW	Thermostat
VN	10:1 Constant Torque Rated Motor
VR	5:1 Constant Torque Rated Motor
VW	20:1 Constant Torque Rated Motor
VZ-F	1000+:1 Constant Torque Rated Motor
WE	2nd Motor Shaft End
WU	High Slip Rotor
Z	High Inertia Motor Fan

Motor Nomenclature

100LP / 4 BRE 40 ...

- **...** — Other Options
- **40** — Brake Size Nm
- **BRE** — Brake
- **4** — Number of Poles
- **100LP** — Frame Size

Ordering Examples

100LP / 4 BRE 100 HL RG

- **RG** — Corrosion Protection
- **HL** — Hand Release Lever
- **100** — 100 Nm Brake Torque
- **BRE** — Brake
- **4** — 4 Poles
- **100LP** — Motor Frame Size

100 Frame Motor with 4 poles, Brake, 100 Nm with a hand release lever, corrosion protected brake, and a current sensing relay.

63L / 4 BRE 40 FHL SR

- **SR** — Dust & Corrosion Prot.
- **FHL** — Locking Hand Release Lever
- **40** — 40 Nm Brake Torque
- **BRE** — Brake
- **4** — 4 Poles
- **63L** — Motor Frame Size

63 Frame motor with 4 poles, a 40 Nm Brake with a locking hand release lever and dust & corrosion protection.

7. Application Conditions

Standard NORD motors are designed to operate in dusty or moist environments and have anti-fungal, thermal class F insulation.

- Enclosure Protection Rating = IP55 (minimum).
- Maximum Installation Height = 3300 ft (1000 m).
- Ambient Temperature = -4 to 104°F (-20 to 40 °C).
- Tropical-proof, Thermal Class F insulation.

The protection level and maximum ambient temperature are stated on the motor nameplate.

IMPORTANT NOTE

NORD can provide motors for an expanded range of applications and service conditions including higher protection levels, extreme ambient conditions and, higher altitudes.

IMPORTANT NOTE

Consult NORD for recommendations if motors are operated under extreme loading conditions, exposed to high inertia loads, or need to operate under unusually high cycling conditions with high starting and stopping frequency.

DANGER

Special design and assembly considerations are needed if NORD motors are subject to any of the following conditions. Environmental conditions may lead to premature damage and/or failure without the proper protective features. Consult NORD for design considerations:

- Outdoor installation with motor in a vertical position.
- Direct contact with aggressive or corrosive materials (acids, bases, salts, certain gases, etc.).
- Exposure to extreme high or low temperatures, high relative humidity, condensation moisture or very wet environments.
- Subject to extreme material build-up on the unit (dirt, dust, sand, etc.).
- Hazardous Locations (risk of fire or explosion).

8. Transportation

During transportation observe the following:

- Make sure that all eyebolts and lifting lugs are tight and firmly against their supporting surface.
- Use all the lifting eyes that are intentionally supplied with the motor.
- Lift only at designed points.
- Protect the mounting surface from possible damage during transportation.
- Always use sufficiently rated handling equipment, lift mechanisms and lifting straps.
- With heavier objects or unbalanced loads, it may be appropriate to use more than one lifting point or an additional strap or sling to assure safe transportation of the assembly. This is especially true of assembled gearmotors and motorized reducers.
- Once the NORD motor or assembly is properly installed, remove the transportation fixtures completely or make certain they are properly re-secured and tightened.

WARNING

Transportation – Use of Lifting Devices

To avoid death, serious injury or equipment damage…

- Hoisting lugs or lifting eyes attached to the motor are designed for the weight of the motor only! Do not attach any additional loads!
- The motor must only be transported and lifted using the lifting eyes, in a position that is appropriate for its type of construction. Otherwise, it could fall over or slip in the lifting tackle.
- During suspended transport, two straps must be able to carry the entire load weight safely.
- When required use additional, suitable means of support for transportation, installation or removal.
- Always secure the support equipment to prevent it from slipping.

9. Storage

If the motor is not in service, store it according to the following conditions:

- Store the motor in a clean, dry, dirt-free, vibration free area.
- Storage temperatures of 10°C (50°F) to 50°C (120°F) must be maintained.
- Relative humidity must not exceed 60%.
- If vibration in the area exceeds 0.002 inch (0.05 mm) at 60 hertz, then vibration isolation pads are suggested to prevent brinelling of the bearings.
- Treat the unprotected shaft end and mating flange surfaces with a corrosion inhibitor that can be cleaned off prior to commissioning.
- Before placing the motor into service, visually inspect the motor exterior for evidence of deterioration during storage. Turn the motor shaft by hand to make sure the shaft turns freely.
- Motor space heaters, when provided, are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional. Remove motor from the storage container when the heater is energized.
- If the motor needs to be stored for extended periods, or if it is stored in less than favorable conditions, it is recommend that the winding insulation resistance be checked prior to commissioning (page 7).
- Even if stored in favorable conditions, the antifriction motor bearings and motor shaft seals may need to be replaced if the storage period is more than 4 years.

10. Safety Considerations

When installing, servicing or replacing electric motors it is important to be working in a “voltage-free” state. Observe the following safety rules.

Safety Rules

1. Disconnect the system. Disconnect the auxiliary circuits (brakes, space heaters, etc.).
2. Prevent reconnection (follow safe lock-out/tag-out practices).
3. Make sure that the equipment is at zero voltage.
4. Make certain the equipment is properly grounded and short-circuited.
5. Cover or isolate nearby components that are still electrically live.

To energize the system, apply the measures in reverse order.

Qualified Personnel

All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians.

For the purpose of this documentation, a qualified personnel is taken to mean a person or people who fulfill the following requirements:

- Through appropriate training and experience, they are able to recognize and avoid risks and potential dangers in their particular field of activity.
- They have been instructed to carry out work on the machine by the appropriate person responsible.
- They are responsible for knowing and complying with all applicable national, regional, and local work regulations and safety requirements.

10. Safety Considerations Ctd.

General Warnings and Cautions

⚠ DANGER

To avoid electrocution, injury or death, make certain all electrical devices (motors, brakes, variable frequency drives, etc.) are properly grounded, completely de-energized, and brought to a no-voltage condition prior to working on any electrical connections. Remember that most of these devices carry potentially dangerous energy levels for a period of time after power is removed. Always follow proper lock-out/tag-out procedures.

⚠ DANGER

Electrical machines contain dangerous voltage levels, electrically live parts, rotating surfaces and hot surfaces. To prevent injury, death or possible equipment damage always observe the following:

- Keep all safety covers and guards in place during operation. Remove and replace covers in compliance with the applicable safety regulations.
- Allow the machine to cool down before starting any work on it.
- Operate the machines properly.
- Perform regular maintenance on the machine.
- Secure and guard free-standing shaft extensions.

⚠ DANGER

Electrically Live Parts

Electrical machines contain electrically live parts. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.

⚠ WARNING

Rotating Parts

Electrical machines contain dangerous rotating parts. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.

⚠ WARNING

Hot Surfaces

Electrical machines have hot surfaces. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly. Allow the machine to cool down before starting any work on it.

⚠ WARNING

Maintain Proper Cooling

Operating the motor without the intended cooling fan may cause overheating and result in very hot surfaces, personal injury and material damage. Never commission a motor intended to be fan cooled when it is missing the shaft-driven fan or external blower assembly.

⚠ DANGER

Condensation Drain Holes (Optional)

Inserting objects into the condensation drain holes can damage the winding and can result in death, serious injury and damage to property!

- Before opening sealed drain holes, make sure the motor is in a no-voltage condition. Close the condensation drain holes before re-commissioning.
- Exercise caution around drain holes that are intended to be left open, especially when the motor is energized.

IMPORTANT NOTE

Before start-up check the following:

- All electrical connections are secure, well grounded and properly made.
- The motor is rotating in the correct direction (when de-coupled from the driven load).
- There are no temperature-sensitive parts (cables etc.), in contact with motor enclosure.
- Condensation drain holes are always located at the lowest point of the motor.

11. Checking the Insulation

Before putting the motor into operation for the first time, after a lengthy period of storage or standstill (approx. 6 months), the insulation resistance of the winding should be checked.

⚠ WARNING

During or directly after measurement the motor connection terminals carry hazardous voltages. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.

A. Control

The insulation resistance of new, cleaned, or repaired motor windings against the grounded housing and against one another should be > 200 Mega-Ohms.

B. Measurement

Using a Mega-Ohm meter apply a DC voltage of 500 VDC to the motor winding for a period of 60 seconds and record the winding insulation resistance compared to ground.

- The 500 VDC test voltage is applicable to low voltage motors up to 1000 VAC.
- When performing this test the temperature of the windings should be 25°C ± 15°C (77°F ± 27°F).

C. Verification

- If the insulation resistance of the winding is less than 50 Mega-Ohms, the cause may be moisture. The windings should be dried and the test should be repeated.
- After any lengthy period of operation the insulation resistance may drop. So long as the measured value does not fall below the critical value of 50 Mega-Ohm, the motor may continue to be operated.
- If the measured value falls below the critical 50 Mega-Ohm level, the cause must be established and the windings or winding sections must be cleaned, dried, repaired, or replaced as needed.

12. Bearing Lubrication

NORD motor frame sizes 63 up to and including 225 are normally supplied with internally grease lubricated bearings and require no lubrication during normal operation.

NORD motor frame sizes 250 and larger are supplied with grease fittings for re-greasing the motor bearings.

IMPORTANT NOTE

Motors with grease fittings are normally supplied with a label indicating the grease type used, the suggested re-lubrication interval, and the amount of new grease to be applied. General bearing maintence guidelines are listed in Table 3.

Typical motor bearing grease is an NLGI No. 2 consistency, high grade product with a polyurea base thickener, synthetic or blended mineral/synthetic oil, and stabilizing agents to protect against heat and oxidation.

Table 3 – Motor Bearing Maintence Guidelines

Frame Size	Power	Poles	Re-greasing Interval
63-225	0.16-60 HP (0.12-45 kW)	All	Maintence Free
250 to 280	75-125 HP (55-75 kW)	2	4000 h
		4 to 8	8000 h
315	150-250 HP (132-200 kW)	2	3000 h
		4 to 8	6000 h

NOTICE

When re-greasing motor bearings do not to mix different greases without verifying the compatibility with a reputable grease lubrication supplier. Mixing incompatible products can lead to bearing failure.

13. Mechanical Installation

Integral motors, NEMA C-face motors, and IEC flange mounted motors must be rigidly secured to their mating connection surface using all fastening screws tightened to the proper bolt torque. It is good practice to apply a medium strength thread- locking agent (Loctite® 242) to the mounting screws.

Foot mounted motors must be securely installed to a rigid and level foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. All mounting hole locations must be utilized. Tighten all hold down screws or bolts to the proper bolt torque.

NOTICE

Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Accurate alignment and proper balancing of output devices (couplings, belts, pulleys, etc.) is required to assure quite, low vibration, trouble free operation. When the motor is directly coupled to a gear drive or a driven machine make sure that the motor shaft and driven machine shaft are aligned with one another axially.

NOTICE

Inaccurate alignment may lead to bearing damage, excessive vibrations and shaft breakage.

IMPORTANT NOTE

For motor replacement guidelines see section 20 on page 15 and section 21 on page 16.

14. Electrical Connections

⚠ DANGER

To avoid electrocution, injury or death, make certain all electrical devices (motors, brakes, variable frequency drives, etc.) are properly grounded, completely de-energized, and brought to a no-voltage condition prior to working on any electrical connections. Remember that most of these devices potentially dangerous energy levels for a period of time after power is removed. Always follow proper lock-out/tag-out procedures.

IMPORTANT NOTE

External motor brakes have their own connection requirements as indicated in the appropriate brake instruction manuals.

⚠ WARNING

If the motor has an integral brake, make certain there is no load connected to the driven equipment before releasing the brake. Otherwise serious injury, death, or damage to the equipment may result.

- The supply voltage and frequency must agree with the motor nameplate data.
- Always feed the connecting leads into the terminal box using appropriate mating cable glands. The mating connection cables and cable glands should be suitable for temperatures ≥ 194°F (90°C).
- Provide the ends of the connecting leads and ground lead with cable lugs or curved ring eyelets before connecting them to the terminal board.
- Make certain that the wiring connections and arrangement of the terminal board jumpers conform to the appropriate wiring diagram as provided in the motor terminal box and/or page 9 of this manual.
- Tighten the terminal board screw connections on the on the main terminal board per the table below.

Table 4 – Tightening Torque: Terminal Board and Grounding Screws

Thread Size	Nut Size [mm]	Tightening Torque [lb-ft]	Tightening Torque [Nm]
M4	7	0.6-0.9	0.8-1.2
M5	8	1.3-1.8	1.8-2.5
M6	10	2.0-3.0	2.7-4
M8	13	4.0-5.9	5.5-8
M10	17	6.6-9.6	9-13
M12	19	11.8-14.8	16-20

- Upon final assembly, the terminal box cover must be sealed so that it is dust-tight and water-tight.

Table 5 – Tightening Torque: Terminal Box Cover Screws

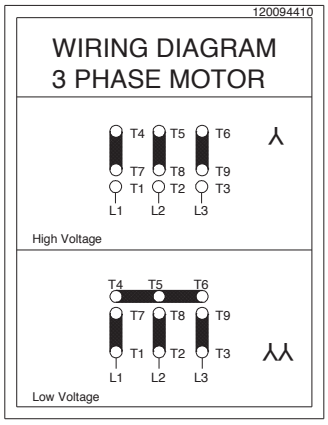
Thread Size	Tightening Torque [lb-ft]	Tightening Torque [Nm]
M4	0.6-0.9	0.8-1.2
M5	0.9-1.3	1.2-1.8
M6	1.1-1.8	1.5-2.5
M8	2.2-3.7	3.0-5.0

15. Direction of Rotation

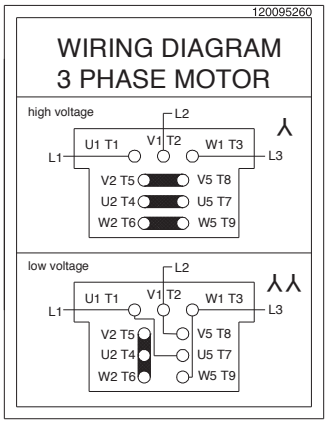
The motor shaft rotation is defined per IEC 600034, Part 8. The motor shaft rotation can be controlled by the way the incoming line power is connected. When connecting the incoming line power in phase order to the terminal block posts, T1 (U1), T2 (V1), and T3 (W1) respectively, the motor shaft rotation will be clockwise when viewing the motor shaft at the drive-end.

15. Wiring Diagrams - Motor & Motor Option Connection Diagrams

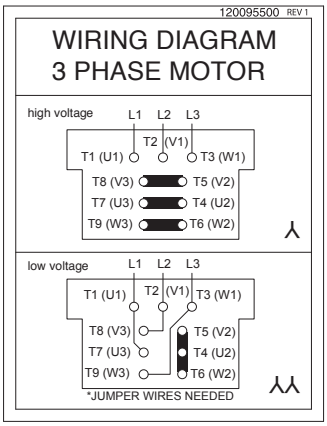
NORD Frames 63-225
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø



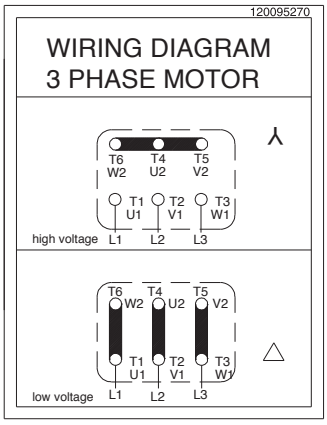
NORD Mfg by Siemens - Frames 200+
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø



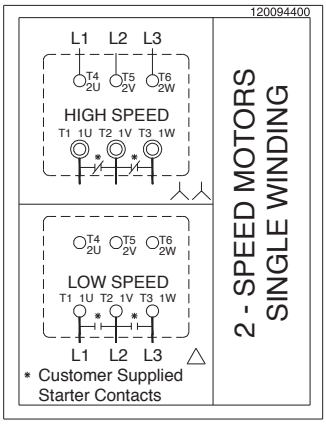
NORD Mfg by Siemens - Frames 200+
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø



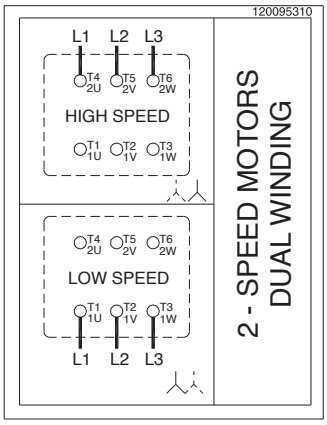
NORD Frames 63-225
460 / 800V, 60Hz, 3Ø | 230 / 400V, 50Hz, 3Ø
208 / 360V, 60Hz, 3Ø | 400 / 690V, 50Hz, 3Ø
332 / 575V, 60Hz, 3Ø

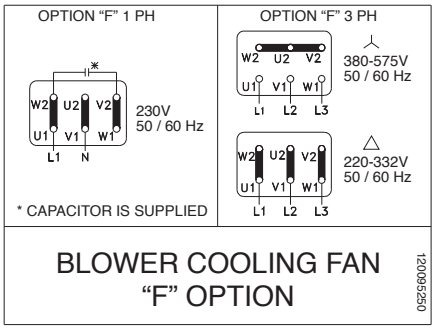


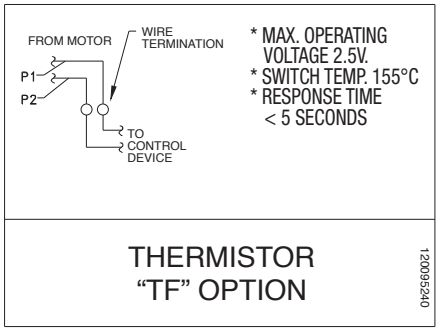
NORD 2 - SPEED MOTORS
SINGLE WINDING (4-2 & 8-4 POLE)

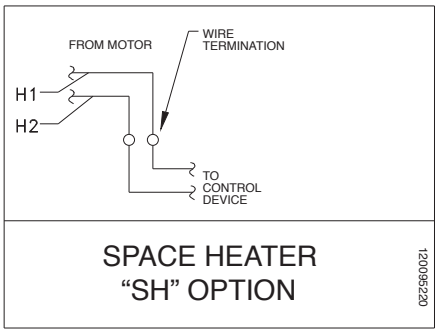


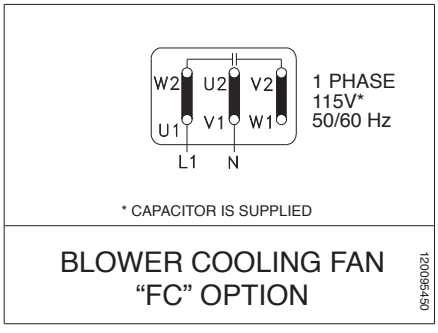
NORD 2 - SPEED MOTORS
DUAL WINDING (8-2 POLE)

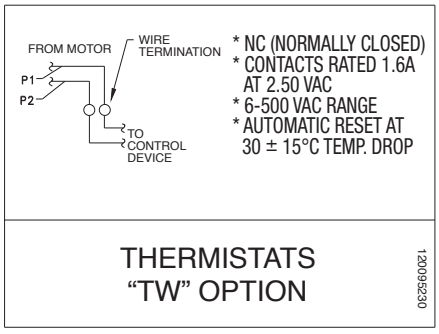












17. Inspection

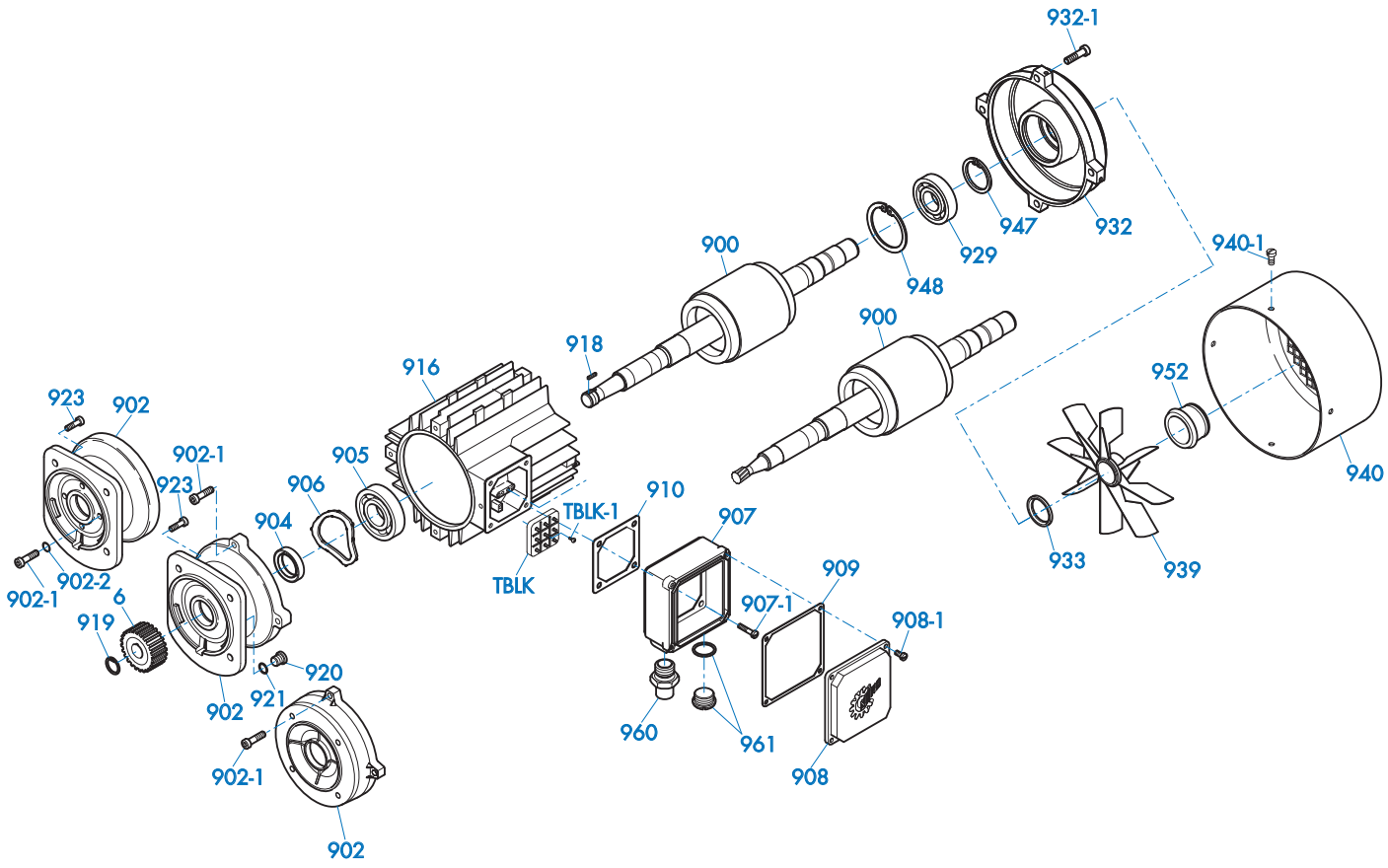
Inspect the motor after every 500 operating hours. Please use table 12 below for inspection guidelines.

⚠ CAUTION

If it is necessary to clean the motor exterior, do not use shop air. Shop air can force contaminents into the motor and may cause parts damage or result in blowing debris causing injury.

Table12. - Motor Inspection Guidelines

Inspect	Check	Action
Motor Exterior	Check the external surfaces for contamination. Accumulation of dirt and fibrous deposits must be removed.	Clean the motor external surfaces using clean, lint-free cloths.
		Clean deposits from between cooling fins using a vacuum cleaner and a stiff-bristled nylon brush.
	Check the external surfaces for oil film and greasy deposits.	Clean the oil film and greasy deposits from the motor surface using clean, lint-free cloths.
		If necessary, moisten the cloth with an approved non-flammable, residue-free solvent. Do not pour solvent on the motor.
	Check for evidence of damage or overheating.	If the motor has physical damage, replace the motor.
Motor Mountings	Make sure the mounting hardware is secure.	If the mounting hardware is not secure, check the motor/gearbox alignment, and tighten the mounting hardware.
Motor Electrical Connections	Check that all electrical connections are secure.	If the electrical connections are not secure, tighten them.
	Check the electrical connections for evidence of arcing.	Loose electrical connections can cause arcing, which is evident by discoloration and charring. If you find evidence of arcing, replace the damaged connections.
Insulation Resistance	Using an ohmmeter, check and record the resistance of motor winding insulation.	Compare the current resistance reading to previous readings. If the resistance drops significantly, perform an internal inspection for insulation damage or deterioration.
Motor Brake	On motors that have a brake, use a feeler gauge to check the air gap in between the brake pad and the rotor according to the appropriate user manual.	If the air gap exceeds the maximum allowed for that brake configuration provided in the manual, adjust the air gap or replace the brake pad according to user manual U35000.



Part Number	Part Description	Qty per Assembly
6	Input Pinion	1
900	Rotor Assembly	1
902	A-Endbell	1
902-1	Screw	4
902-2	Dubo Seal	4
904	Oil Seal	1
905	Bearing	1
906	Preload Spring	1
907	Terminal Box Frame	1
907-1	Screw	4
908	Terminal Box Cover	1
908-1	Screw	4
909	Gasket - Terminal Box Frame	1
910	Gasket - Terminal Box Cover	1
916	Stator	1
918	Key	1
919	Retaining Ring	1
920	Oil Plug	1

Part Number	Part Description	Qty per Assembly
921	Gasket	1
923	Screw	4
929	Bearing	1
932	B-Endbell	1
932-1	Screw	4
933	Oil Seal	1
939	Fan	1
940	Fan Cover	1
940-1	Screw	4
947	Retaining Ring	1
948	Retaining Ring	1
952	Fan Clip	1
960	NPT Thread Adapter	1
961	Plug (includes O-ring)	1
TBLK	Terminal Block	1
TBLK-1	Screw, Terminal Block Mounting	2
	Jumper Bar (not illustrated)	AR

19. Repair

Reference the parts list drawing on page 14 for clarification.

A. Disassemble the motor according to the general exploded view in PARTS INFORMATION. Disassemble only as far as necessary to replace the failed parts.

B. Whenever the motor is disassembled, clean all dust and contamination from the motor interior using a vacuum cleaner and a soft-bristled nylon brush.

C. The following parts must be replaced if they are removed:

- Oil seal (904), Oil seal (933)
- Gasket (909), Gasket (910), Gasket (921)
- Gasket on plug (961)
- Self-locking screws (907-1, 908-1, 923, 932-1, 940-1)
- Dubo Seals (902-2)

D. If the following parts are removed, inspect them, and replace them if they are deformed or damaged:

- Retaining ring (919), Retaining ring (947), Retaining ring (948)
- Fan clip (952)

20. Removing and Replacing Integral Motors

Reference the parts list on Page 14 for clarification.

A. Disconnect the power to the electric motor. Make certain the motor is properly grounded, de-energized and secured with a lock-out/tag-out device.

B. Drain the oil from the mating gearbox, or rotate the motor/gearbox assembly so that the motor is up, to prevent oil from spilling from the gearbox when the motor is removed.

C. Support the motor and prepare it for removal. Steady the motor and support it. For larger motors, use of mechanical lifting or support devices to may be appropriate.

D. Remove the fastening screws that hold the motor to the reducer input.

IMPORTANT NOTE

Most integral motor installations have mounting bolts accessible from the motor exterior. If the bolts are not clearly visible, unbolt the input flange from the gearbox. Remove the bolts securing the motor to the reducer input flange, and discard the old DUBO sealing rings that were under the screw heads.

E. Maintain motor shaft alignment and move the motor directly away from its mounting surface until the motor shaft and mating input gear clear both the internal gear mesh and reducer input.

F. Remove and discard the old flange gasket.

G. Clean the gasket faces on the motor and gearbox, making sure no cleaning debris enters the gearbox.

H. Check the replacement motor to make sure the motor flange, motor shaft, and motor pinion are identical to the motor that was removed.

I. Place a new gasket between the gearbox and new motor.

J. Position the motor on the gearbox, making sure the input pinion meshes with the input gear. Rotate the motor as necessary to align the bolt holes and seat the motor flange. Make sure the gasket remains properly aligned and seated

K. Apply a medium strength thread locking compound to the bolt threads. Install the bolts and tighten them to the appropriate torque.

IMPORTANT NOTE

If the motor/gearbox installation uses an input flange, first mount the input flange to the motor using the four mounting bolts and NEW DUBO sealing rings under the head of each fastening screw. Make sure the fastening screws are clean and apply new thread sealant if necessary.

L. Check the gearbox oil level in accordance with the appropriate User Manual/s. If necessary fill or add oil to the gearbox.

NOTICE

Do not mix oil types. Mixing oil types may lead to component damage and diminished performance. Consult NORD for assistance or reference oil type listed on gearbox tag.

M. Re-establish the electrical connection to the motor.

N. Observe the subsequent start-up closely to make certain the equipment is operating properly and there are no seal or gasket leaks.

21. Removing and Replacing NEMA C-Face or IEC Fange-Mounted Motors

For further clarification of these instructions, reference the parts list on Page 14 of this manual.

A. Disconnect the power to the electric motor. Make certain the motor is properly grounded, de-energized and secured with a lock-out/tag-out device.

B. Support the motor and prepare it for removal. Steady the motor and support it. For larger motors, use of mechanical lifting or support devices to may be appropriate.

C. Remove the fastening screws that hold the motor to the C-face or IEC mounting flange.

D. Maintain motor shaft alignment, and move the motor directly away from its mounting surface until the motor shaft and mating coupling clear the mounting flange surface of the driven equipment.

E. Measure and record the proper placement of the motor shaft coupling prior to removing it from the old motor.

F. Make sure the new motor shaft, key and key slot are free of all nicks, burrs, and lubrication or grease.

G. Install the new shaft key on the new motor. If the shaft key is not captured or if an open-ended key slot is utilized it is good practice to secure the key into the key slot with a medium strength thread locking agent or alternatively one may stake the key in place.

H. Re-install the coupling on the new motor shaft, making sure the placement of the coupling is in the same location as it was on the old motor (See Step E).

I. Clean all old gasket material, sealants, contamination, and corrosion from the flange surface on the driven equipment.

J. If the motor is utilized in a wet or wash down environment apply a sealing gasket or gasket eliminating compound to the mating flange surface, as would seem most appropriate for the application.

K. Support the new motor and mount it flush against the mating flange surface of the driven equipment.

L. Apply a medium strength thread locking agent to the bolt threads.

M. Install the bolts and tighten them to the appropriate torque.

N. Re-establish the electrical connection to the motor.

O. Observe the subsequent start-up closely to make certain the equipment is operating properly.

22. Testing

IMPORTANT NOTE

NORD electric motors do not require periodic testing. However, if a motor is removed from its installation, NORD recommends that the motor be checked according to the following static and dynamic testing procedures before it is reinstalled. Finding a condition that will require future repair before the motor is reinstalled decreases the overall maintenance time.

This section provides general test information and functional checks for the types of motors covered by this manual. Read and understand the tests and checks before performing them on your motor.

Record and date all measurements taken.

If the motor fails any of the test procedures provided below, use the troubleshooting guide to determine the motor problem.

Static Testing

A. The motor can only be static tested if it is disconnected from the component it drives and securely mounted on a fixture or mounting plate. These tests are usually conducted when a motor has been removed for any reason other than failure

B. Turn the motor shaft slowly by hand. Feel and listen for evidence of a failed bearing, which is indicated by a rough feel as the shaft rotates, and by noise.

C. Check for smooth rotation, with no evidence of binding or catching. If the shaft does not rotate smoothly, or binds or catches, the bearings are worn or failing, lack lubrication, or are contaminated.

D. Check the motor shaft for side play by applying pressure at right angles to the shaft in several places around the circumference. If the shaft moves perceptibly, the front bearing may be worn.

Dynamic Testing

A. Find the motor voltage and rated load current values as listed on the motor nameplate.

B. Using a volt-ohmmeter, verify that the motor power supply is in the correct range.

C. Run the motor with no load. As the motor is operating, listen for unusual motor noise and check for excessive vibration. Vibration and motor noise are indications of bearing contamination, lack of lubrication, damage, or failure.

D. Use an ammeter to measure the no-load current. Record the no-load current for comparison with previous readings, and for reference during future testing.

E. If the motor passes the no-load test, operate the motor at rated load and check and record the current.

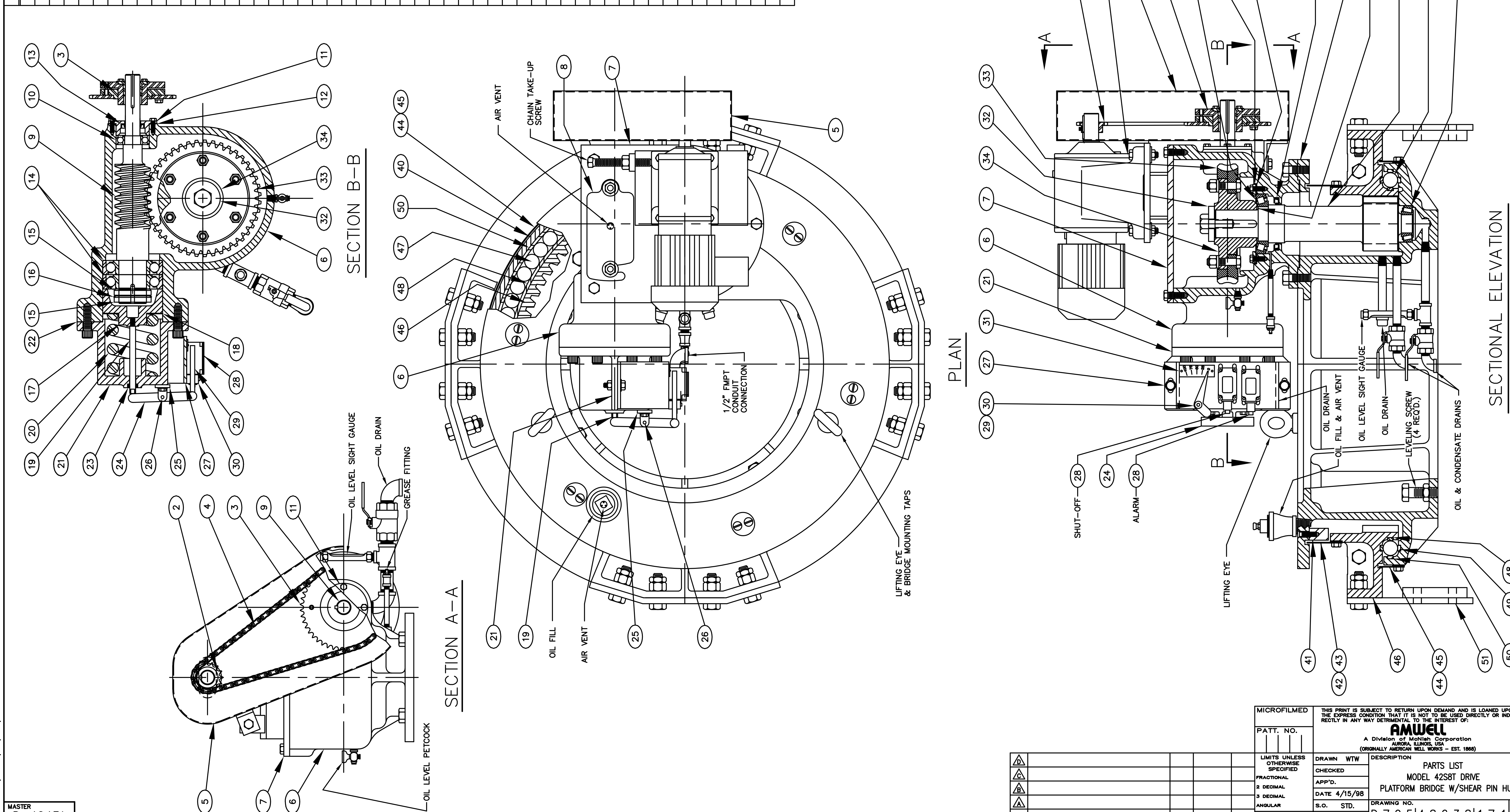
F. Check the motor operating temperature at rated load. If the motor operates at a higher than normal temperature, the motor may be damaged, overloaded or failing.

23. Troubleshooting

Fault	Likely Cause	Corrective Action
Motor fails to start.	• Motor is mis-wired • Brake is may not be releasing. • Fan guard damaged and contacting fan. • Motor protection device has tripped or does not switch • 1-Ph Capacitor or start switch has failed.	• Verify and correct motor wiring. • Troubleshoot brake per User Manual U35000. • Replace damaged fan guard. • Check motor protection device for correct setting and correct error. • Discharge capacitor and use a volt-ohm meter to check the capacitor for an open circuit - replace if needed. Inspect switch and connections. Replace if contacts look burned or pitted.
Fuses blow or motor protection faults immediately.	• Short circuit in line. • Lines connected incorrectly. • Fuse or circuit breaker tripped. • Motor is overloaded or equipment jammed. • Stator is shorted or went to ground.	• Rectify short circuit. • Check circuit diagram and make corrections. • Replace fuse or circuit breaker. • Make sure load is free. Verify motor amp draw compared to nameplate rating. • A damaged or blown stator will show a burn mark. Stator must be repaired or replaced.
Motor hums and has high current consumption	• Brake may not be releasing. • Rotor may be rubbing stator. • Defective or incorrect stator winding.	• Troubleshoot brake per User Manual U35000. • Send motor to a repair specialist.
Severe speed loss under load or excessive acceleration time.	• Overload. • Excessive voltage drop. • Damaged or failing motor bearings. • Damaged or worn gear unit. • 1-Ph Capacitor or start switch has failed.	• Check load conditions and make certain system is unobstructed. Reduce load or consider a larger motor. • Verify service voltage is within specification. Check if nearby equipment is affecting incoming power. Make sure connection harness and wiring is adequate. • Replace motor bearings. • Replace or repair damaged gear unit. • See instructions under “Motor fails to start”.
Motor runs the incorrect direction.	• Incorrect wiring.	• Rewire motor according to system schematic and/or switch two incoming motor phases.
Motor heats up excessively or thermal overload protection trips	• Overload. • Ambient temperature is too high. • Inadequate cooling. • Operation is outside the allowed duty cycle. • Motor protection device may be defective. • Excessive supply voltage. • System short or damaged stator.	• Make sure load is free. Verify motor amp draw compared to nameplate rating. Reduce load or consider a larger motor. • Do not operate above the rated conditions. • Correct cooling air supply. Open and clear cooling air passages. Retrofit with forced ventilator fan if needed. • Adjust operating duty cycle or contact a specialist to select a suitable motor or drive. • Replace motor protection device. • Adapt motor supply voltage. • Check for loose, cut or damaged wires. Check stator winding for defects or burn damage.
Excessive Noise or Vibration	• Motor bearings contaminated or damaged. • Excessive motor shaft end play. • Misaligned or imbalanced load.	• Test motor by itself. If bearings are bad noise may be heard or roughness detected. Replace bearings. Add lubrication if bearings have grease fittings. • Check shaft endplay with motor and system power disconnected. If shaft movement is excessive replace motor shaft bearings. • Check all mating shaft connections for proper alignment and correct all imbalanced load conditions.
1 Ph Start Capacitor Failures	• Motor is not coming up to speed quickly enough. • Motor is being cycled frequently • Start switch is defective or damaged.	• Verify motor size to load conditions. Motor should come up to speed in no more than 2-3 seconds. • Verify duty cycle and consult specialist for recommendations. • Replace start switch.
1 Ph Run Capacitor Failures	• Possible power surge to motor caused by transient voltage or lightening. • Excessive ambient temperature.	• Install proper surge protection. • Verify ambient conditions do not exceed nameplate value.

DRIVE ASSEMBLY
PARTS LIST DRAWING

REF	DESCRIPTION
1	GEARMOTOR
2	DRIVE SPROCKET – KEYED
3	DRIVEN SPROCKET – SHEAR PIN
4	ROLLER CHAIN
5	CHAIN GUARD
6	WORM GEAR HOUSING
7	WORM GEAR HOUSING COVER
8	INSPECTION & OIL FILL COVER
9	WORM SHAFT
10	BEARING
11	BEARING CAP
12	BEARING CAP GASKET
13	OIL SEAL – LIP IN
14	BEARING
15	LOCKNUT
16	LOCKWASHER
17	THRUST RING
18	SHIM
19	THRUST ROD
20	SPRING
21	SPRING HOUSING
22	SPRING HOUSING GASKET
23	OIL SEAL – LIP OUT
24	PIVOT ARM
25	PIVOT BRACKET
26	PIVOT PIN
27	SWITCH BRACKET
28	LIMIT SWITCH
29	POINTER
30	COLLAR
31	LOAD INDICATOR SCALE
32	WORM GEAR RETAINER
33	WORM GEAR
34	WORM GEAR HUB – KEYED
35	PINION SHAFT
36	BEARING
37	BEARING RETAINER
38	OIL SEAL – LIP IN
39	BEARING
40	SPUR GEAR HOUSING
41	SPUR GEAR HOLD-DOWN BLOCK
42	DUST SHIELD – SPLIT
43	DUST SHIELD SEAL
44	DUST SHIELD – SPLIT
45	DUST SHIELD SEAL
46	SPUR GEAR
47	BEARING BALL
48	REPLACEABLE BEARING RACE
49	REPLACEABLE BEARING RACE
50	REPLACEABLE BEARING RACE
51	DRIVE CAGE ATTACHMENT LUG
52	RETAINER SHIM SET
53	HUB SHIM SET



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MASTER D–46431

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PATT. NO.

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

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DESCRIPTION: PARTS LIST MODEL 42S8T DRIVE PLATFORM BRIDGE W/SHEAR PIN HUB

DRAWING NO. D705 48638 171

REV.

SECTION E

ASSEMBLY & DISASSEMBLY INSTRUCTIONS

CIRCULAR CLARIFIERS/THICKENERS

ASSEMBLY & DISASSEMBLY INSTRUCTIONS
CHAIN DRIVES

DESIGN

The drive assembly consists of a drive head, gearmotor, motor base, motor base support arrangement, chain drive and a chain guard. The motor supports are designed to allow adjustment of drive tension and alignment for long sprocket and chain life.

ASSEMBLY - (Reference Drawing D705-48638-171)

During assembly, reference should be made to the drive assembly drawing.

With the drive head level, install the base plate support arrangement.

Lower the housing cover onto the worm gear housing. Bolt the gearmotor on the motor support, but do not tighten at this time.

Slip the large driven sprocket onto the worm shaft. Do not install sprockets by driving them on the shafts with a hammer as this may cause damage to the bearings.

Turn the worm shaft in the direction of normal rotation until the worm gear begins to move. This allows the worm shaft bearing housing to contact the overload alarm and places it in its final operating position.

IMPORTANT - Do not locate the driven sprocket less than 3/8" from the bolt heads or other projection and secure it by tightening the setscrew. This is necessary to allow for any future deflection in the overload alarm system.

Install the small drive sprocket on the gearmotor shaft; do not tighten setscrews.

The driven sprocket should be located forward of the drive sprocket to allow for overload alarm system deflection. Tighten setscrews to fasten the drive sprocket to the gearmotor shaft.

Install the roller chain. Adjust chain tension. The roller chain should be adjusted fairly tight and with little slack.

Install the chain guard.

CIRCULAR CLARIFIERS/THICKENERS

ASSEMBLY & DISASSEMBLY INSTRUCTIONS
CHAIN DRIVES

MAINTENANCE

The chain should be checked periodically for alignment and tension. Misalignment is indicated by wear on the sides of sprocket teeth or inside surfaces of roller link plates. The chain should be kept snug. Immediate steps must be taken to correct all misalignment.

Refer to operating instructions for information on chain lubrication.

Electric motors or gearmotors should be lubricated in accordance with the manufacturer's instructions, attached to the unit at the time of shipment.

DISASSEMBLY

Remove chain guard. To remove the chain, find the connecting link. On 5/8" and smaller pitches, it is of the spring clip type and may be removed with a screwdriver. The removable plate has a slip fit on the pins.

For 3/4" and larger pitches, cotter pin connecting links are provided. The removable plate has a drive fit on the pins.

Sprockets may be located on the shafts for realignment or removal by loosening the setscrews over the keyways.

GENERAL

Occasionally, check the tightness of all nuts and bolts.

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Supersedes 5/16/08

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Division of McNish Corporation
Aurora, Illinois, USA

HALF BRIDGE CIRCULAR CLARIFIERS

ASSEMBLY AND DISASSEMBLY INSTRUCTIONS
WORM & WORM GEARS (MODEL ~~42H8~~T, 42S8T, ~~42S10~~T)

DESIGN

Should it be necessary to replace either member of the worm gear set, generally both members should be replaced. If one member has worn, there is a possibility that the other member has had its tooth form changed due to the wearing action. This could cause excessive wear on the new gear being replaced which would lead to premature failure.

DISASSEMBLY OF WORM GEAR & WORM SHAFT

When the worm gear and worm shaft are to be replaced, the oil should be drained from the worm gear housing in accordance with the Operating Instructions. On a spur gear drive it is not generally necessary to drain the oil from the lower reservoir which lubricates the internal gear, pinion, and ball race. This would only be necessary if an excessive amount of grit or metallic particles were present in the oil. In that case, the unit should be cleaned out with a light oil such as SAE 5.

To remove the worm gear set, it is first necessary to remove the gearmotor, chain guard, chain, sprockets, and gear housing cover.

Next, remove gear retainer from top of pinion shaft. Remove key connecting worm gear hub to pinion. This will allow worm gear to turn freely on pinion shaft in preparation for removal of worm shaft.

Next, remove spring house, spring, and shims. Pull out thrust ring 17 and thrust rod.

Remove bearing cap from other end of worm shaft.

Worm shaft and bearings can now be removed as an assembly by taking a 2" x 2" x 18" long piece of hardwood and a ballpeen hammer and driving out the worm shaft.

The worm gear and hub can now be lifted straight up and out of the worm gear housing.

The seal on the worm shaft drive end and all gaskets should be inspected at this time to determine if they are in good condition. If not, replacement parts should be obtained.

ASSEMBLY OF WORM GEAR AND WORM SHAFT

The hub shim set is located between the upper pinion bearing inner race and worm gear hub. The hub shim set may need adjustment when installing new components. Assemble the worm gear and worm gear hub assembly to the pinion. Do not install the key or worm gear retainer at this time.

HALF BRIDGE CIRCULAR CLARIFIERS

ASSEMBLY AND DISASSEMBLY INSTRUCTIONS
WORM & WORM GEARS (MODEL ~~42H8~~T, 42S8T, ~~42S10~~T)

ASSEMBLY OF WEAR GEAR AND WORM SHAFT (continued)

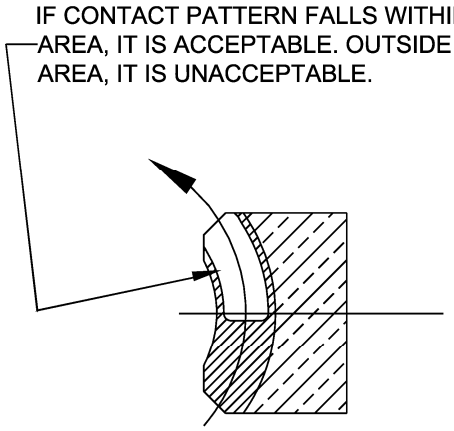
Mount two (2) bearings on worm shaft locking into position with locknut and lockwasher and cocking worm shaft as required, thread worm shaft through worm gear 33 teeth until bearings can be seated. Install bearing into position. Install thrust ring. Install shims between thrust ring and spring. Install spring. Install spring housing thrust rod and oil seal.

Install oil seal into bore of bearing cap.

Install bearing cap assembly and gasket over worm shaft and bolt to worm gear housing. Install the key in the pinion and worm gear hub. Use the worm gear retainer and capscrew to secure pinion and worm gear hub. Paint worm shaft with white marking compound to check contact pattern between worm gear. Turn worm shaft so that worm gear turns in clockwise direction to transfer white marking compound from worm shaft to worm gear. See below for acceptable/non-acceptable contact patterns.

If the pattern is unacceptable, the assembly will need to be broken down and the hub shim set adjusted to bring the worm shaft and worm gear into the acceptable contact area. Add shims to lower pattern, remove shims to raise pattern. When the correct contact pattern is achieved, install housing cover, and mount gear reducer, drive and driven sprockets, drive chain and chain guard.

Securely tighten all fasteners.



WORM GEAR NO LOAD CONTACT PATTERN

WHEN VIEWED FROM SPRING END OF WORM GEAR HOUSING.

Issued 5/16/08
Supersedes 11/13/01

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Aurora, Illinois, USA

HALF BRIDGE CIRCULAR CLARIFIERS

ASSEMBLY AND DISASSEMBLY INSTRUCTIONS PINION SHAFT AND BEARINGS (MODEL ~~28H, 42H~~ & 42S)

DESIGN

The pier supported type clarifier drive mechanism includes a pinion shaft and bearings that transmit rotation and speed reduction from the worm gear assembly 33 to the spur gear.

DISASSEMBLY

Before the pinion shaft and pinion bearings can be replaced, follow the procedure 1M-1-100 for disassembly of the worm gear and worm shaft.

Remove and save the hub shim set. Unbolt and remove the bearing retainer from the worm gear housing. Remove and save the retainer shim set. Unbolt the worm gear housing 6 from the spur gear housing. Lift the worm gear housing straight up off the spur gear housing. The pinion should stay in the spur gear housing but use caution if it comes out with the worm gear housing as it is free to drop if not secured. The upper bearing and oil seal should have stayed attached to the worm gear housing. They should be removed, inspected, and replaced if necessary. The pinion shaft can now be pulled up and out of the spur gear housing. Access to the lower pinion bearing in the spur gear housing can be made through the opening and can now be removed, inspected, and replaced if necessary. Note that the inner race of the lower bearing may have remained attached to the lower pinion journal and will need to be removed for replacement. The pinion should be inspected and replaced if necessary. The bore of the spur gear housing should be cleaned with a light oil, such as SAE 5, then inspected to assure the reassembly of the lower pinion bearing cup can be correctly made.

ASSEMBLY

Clean the joint of the worm gear and spur gear housings of old sealant.

Assemble the outer race (cup) of the lower pinion bearing into the bore of the spur gear housing. Press the inner race (cone) of the lower pinion bearing onto the pinion shaft. Place the pinion shaft into spur gear housing and lower pinion bearing. Insert the oil seal, lip up, into the worm gear housing. Apply a bead of waterproof sealant to the top of the spur gear housing at the worm gear housing mounting area. Mount and bolt the worm gear housing over the pinion shaft to the spur gear housing. The upper pinion bearing inner race (cone) should now be assembled to the pinion shaft.

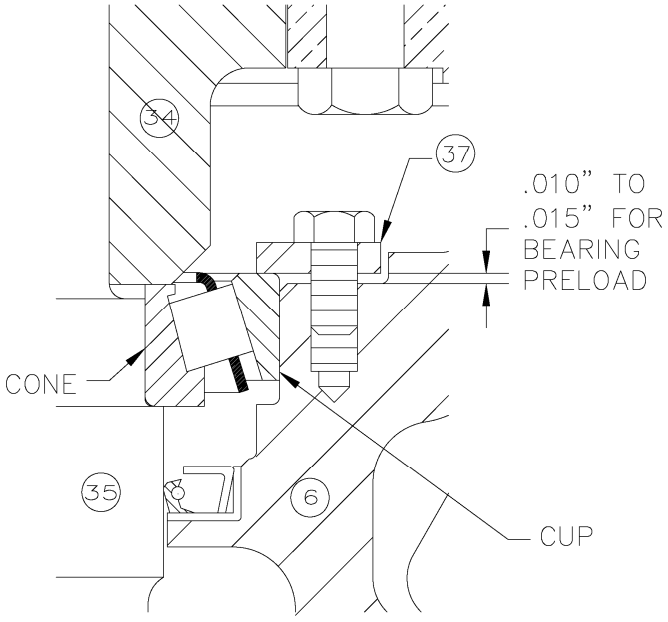
HALF BRIDGE CIRCULAR CLARIFIERS

ASSEMBLY AND DISASSEMBLY INSTRUCTIONS
PINION SHAFT AND BEARINGS (MODEL ~~28H, 42H~~ & 42S)

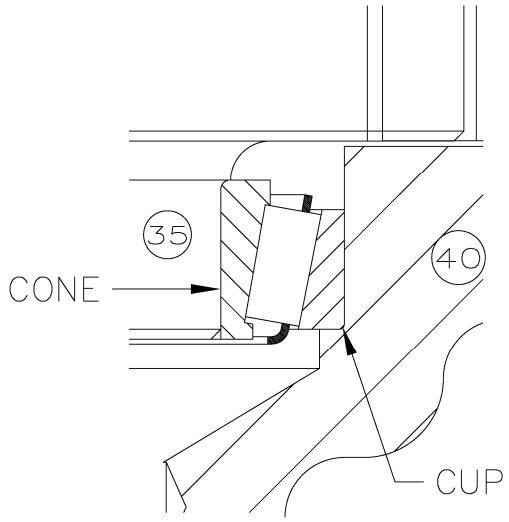
ASSEMBLY – (Continued)

Install the upper pinion bearing outer race (cup) into the worm gear housing. In order to properly preload the bearings and, the top of the outer race of the upper pinion bearing should be .010" to .015" higher than the adjacent machined surface on the worm gear housing. Shims should be added on top of the outer race of the upper pinion bearing or under the bearing retainer to maintain the .010" to .015" preload on the bearings. Install the bearing retainer into the worm gear housing using three (3) cap screws. A preloaded bearing requirement is necessary for a smooth rolling condition. Check the pinion shaft for wobble, smooth rolling action and end play. Adjust the retainer shim pack as necessary until a smooth rolling action is obtained and the pinion shaft has no wobble or end play. Tap the end of the pinion shaft to make sure the bearing rollers are seated. Check again for end play and adjust the retainer shim pack as necessary to remove end play. Once satisfied the pinion shaft is correctly installed, install and tighten all bearing retainer cap screws.

Remainder of assembly of the drive is per the worm gear and shaft assembly instructions, 1M-1-100.



DETAIL OF UPPER BEARING (36)



DETAIL OF LOWER BEARING (39)

AMWELL®
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Aurora, Illinois, USA

HALF BRIDGE CIRCULAR CLARIFIERS

ASSEMBLY AND DISASSEMBLY INSTRUCTIONS
SPUR GEARS, BEARING BALLS & STRIP LINERS
(MODELS ~~28HT~~, ~~42HT~~ & 42ST)

The Pier Supported Type Clarifier Drive mechanism includes a spur gear housing which is mounted to the center column. At its periphery it carries an annular ball bearing on which the internal gear rotates. The spur gear supports the machines underwater mechanism.

The balls in the annular bearing ride on four replaceable hardened steel strips set into grooves, two (2) each in turntable base and spur gear.

DISASSEMBLY

Replacement of the spur gear and strip liners is a simple matter once the clarifier mechanism has been disconnected from the drive. The spur gear is split and therefore will not require the removal of the bridge.

To move the clarifier mechanism from the drive it will be necessary to block up the arms at the cage and remove the bolts attaching the cage to the drive lugs.

First, drain all oil from housing. Remove dust shields. Remove spur gear hold-down blocks. Remove drive lugs.

Remove bolts connecting gear halves together. The gear can now be raised straight up and out over the lip of the spur gear housing.

Replacement of the hardened strip liners is a simple matter, once the gear mechanism has been disassembled. The hardened strips are in two circular pieces with the ends butted together. After long operation it will be difficult or impossible to insert a tool to pry the old strip liner out of its groove. Welding a rod to the strip liner will aid in pulling the end of the strip liner out of its groove. If welding equipment is not available, use a small chisel, cutting into the casting parallel to the strip liner, and adjacent to the butted joint. Only enough material should be removed to insert a screw driver to pry the end of the strip out of its groove. Once the end is out, work the prying tool or screw driver completely around the ball race, until the strip is free.

AMWELL®
A Division of McNish Corporation
Aurora, Illinois, USA

HALF BRIDGE CIRCULAR CLARIFIERS

ASSEMBLY AND DISASSEMBLY INSTRUCTIONS
SPUR GEARS, BEARING BALLS & STRIP LINERS
(MODELS ~~28HT~~, ~~42HT~~ & 42ST)

ASSEMBLY

The turntable base should be thoroughly cleaned with a solvent. Insert the new strip liner, placing one end in the groove, and tap firmly with a wooden block or plastic hammer, to be sure it is seated all the way down in the groove. Work around the full circumference of the casting, until the circle is complete. It may be necessary to cut off the end of the strip liner with a hacksaw since the strip is occasionally slightly too long. The ends should be dressed to remove sharp edges. After the entire strip liner is in place and has been tapped down all around, use a center-punch to peen the turntable base casting on both sides of the strip liner at about 12" intervals. This will aid in holding the insert firmly into the groove. Repeat this procedure for all strip liners.

When re-assembling the spur gear, a thin bed of petroleum jelly will aid in keeping the balls in the annular raceway in the housing. Pack the balls into the petroleum jelly and carefully lower each half of the spur gear into place being sure to line up position of driving lug attachment holes with holes in gear.

Bolt gear halves together. Install hold-down blocks. Install dust shields. Install drive cage attachment lugs. Insert bolts (ASTM A325) connecting drive to cage lugs.

Remove blocks under arms.

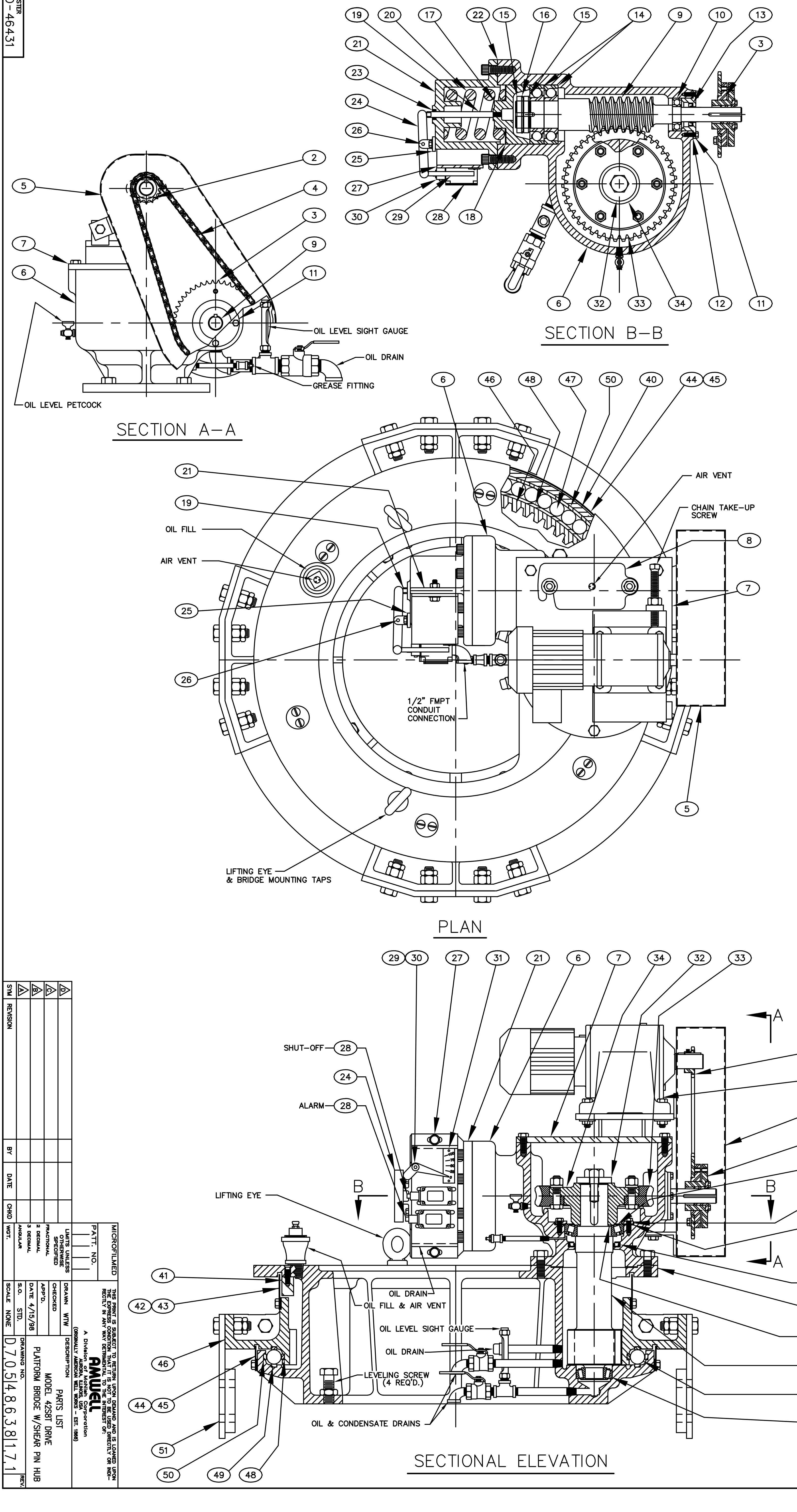
Check level of drive and plumbness of cage. Re-level and plumb if necessary.

Fill spur gear housing with oil and grease all fittings.

DRIVE ASSEMBLY
PARTS LIST DRAWING

CAD FILE: C:\DETAIL\171\AMW\D48638 PLOT SCALE=0.25

MASTER D-46431



REF	DESCRIPTION
1	GEARMOTOR
2	DRIVE SPROCKET – KEYED
3	DRIVEN SPROCKET – SHEAR PIN
4	ROLLER CHAIN
5	CHAIN GUARD
6	WORM GEAR HOUSING
7	WORM GEAR HOUSING COVER
8	INSPECTION & OIL FILL COVER
9	WORM SHAFT
10	BEARING
11	BEARING CAP
12	BEARING CAP GASKET
13	OIL SEAL – LIP IN
14	BEARING
15	LOCKNUT
16	LOCKWASHER
17	THRUST RING
18	SHIM
19	THRUST ROD
20	SPRING
21	SPRING HOUSING
22	SPRING HOUSING GASKET
23	OIL SEAL – LIP OUT
24	PIVOT ARM
25	PIVOT BRACKET
26	PIVOT PIN
27	SWITCH BRACKET
28	LIMIT SWITCH
29	POINTER
30	COLLAR
31	LOAD INDICATOR SCALE
32	WORM GEAR RETAINER
33	WORM GEAR
34	WORM GEAR HUB – KEYED
35	PINION SHAFT
36	BEARING
37	BEARING RETAINER
38	OIL SEAL – LIP IN
39	BEARING
40	SPUR GEAR HOUSING
41	SPUR GEAR HOLD-DOWN BLOCK
42	DUST SHIELD – SPLIT
43	DUST SHIELD SEAL
44	DUST SHIELD – SPLIT
45	DUST SHIELD SEAL
46	SPUR GEAR
47	BEARING BALL
48	REPLACEABLE BEARING RACE
49	REPLACEABLE BEARING RACE
50	REPLACEABLE BEARING RACE
51	DRIVE CAGE ATTACHMENT LUG
52	RETAINER SHIM SET
53	HUB SHIM SET

MICROFILMED

PATT. NO.

AMWELL

A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

SYM	REVISION	BY	DATE	CHKD
A				
B				
C				
D				

LIMITS UNLESS OTHERWISE SPECIFIED	DRAWN WTW	DESCRIPTION	
FRACTIONAL	CHECKED	PARTS LIST	
2 DECIMAL	APP'D.	MODEL 42S8T DRIVE	
3 DECIMAL	DATE 4/15/98	PLATFORM BRIDGE W/SHEAR PIN HUB	
ANGULAR	S.O. STD.	DRAWING NO.	REV.
WGT.	SCALE NONE	D,7,0,5|4,8,6,3,8|1,7,1	

SECTION F

TROUBLESHOOTING GUIDE

CIRCULAR CLARIFIERS

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
1. Overload alarm sounds or drive operates at high torque for several days.	A. Torque build-up on drive and mechanism.	A1. Stop feed to clarifier and check for operating problem. Refer to Operating Instructions. A2. Check for foreign object in tank. Stop drive if pointer is jumping.
	B. Heavy build up of solids due to shutdown.	B1. Increase sludge withdrawals and reduce sludge depth. B2. Agitate sludge in front of arms with rods or air. B3. Shutdown clarifier and drain tank. Check for grit.
2. Drive Stops.	A. Loss of electrical power.	A1. Check power source. A2. Check control fuse.
	B. Drive control cutout.	B1. If pointer on control is at maximum cutout, drain tank to locate problem. Do not by-pass control. B2. If pointer is not at maximum torque, check control.
	C. Motor drive(s) cutout.	C1. Check for overheating. Refer to manufacturer's instructions. C2. Check for broken chain.
3. Sludge too thin.	A. Sludge withdrawal rate too high.	A1. Decrease removal of sludge.
	B. Overflow rate is too high.	B1. Decrease feed rate.
	C. Flow through tank has been short circuited.	C1. Adjust weirs for even overflow or convergent leakage.

CIRCULAR CLARIFIERS

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
4. Excessive floating sludge.	A. Septic conditions on bottom of tank (pieces of floating sludge and objectionable odor).	A1. Check for clogged discharge line. See Operating Instructions.
		A2. Overflow rate is too low. Increase influent.
		A3. Sludge blanket depth too high. Increase sludge removal.
		A4. Check sludge removal schedule, may require more frequent intervals of removal.
		A5. Squeegees need replacement.
	B. Poor Skimmer Operation.	B1. Check operation of skimmer.
5. Excessive suspended matter in effluent.	A. Excessive turbulence.	A1. Reduce turbulence.
	B. Too long sludge retention time.	B1. Increase sludge wasting.
	C. Short-circuiting of flow.	C1. Check weir level, adjust as required.
		C2. Check baffles in influent well. Adjust as required.
	D. Too high a sludge blanket.	D1. Increase sludge wasting to lower blanket.
6. Excessive growth on weirs.	A. Accumulation of solids causes algae.	A1. Increase frequency of cleaning.
7. Leaking scum box flushing valve.	A. Damaged gasket seal.	A1. Check gasket for damage. Repair or replace as required.

SECTION G

SPARE PARTS INFORMATION

AMWELL®
A Division of McNish Corporation
Aurora, Illinois, USA

Issued 2/5/87
Supersedes NONE

ALL EQUIPMENT

PROCEDURE FOR ORDERING SPARE OR REPAIR PARTS

1. Identify your equipment using the **AMWELL** S.O. number shown below.

2. Identify the part by name and give the number of the drawing on which this part or assembly appears. If it is a part for a motor, pump, electrical control, or any other part not manufactured by **AMWELL**, the information will be found in the manufacturer's reference data included in this manual, or on the manufacturer's nameplate.

3. Show the part number. (Information can be gained in the same manner).

4. Show the size and include all pertinent dimensions (such as diameter, length, thickness, bore, pitch, etc.) whenever possible.

5. If parts being ordered are electrical in nature, give all pertinent data; voltage, amperage, wattage, hertz, speed, power factor or other information given on a nameplate or in the brochure.

6. Submit your written purchase order or request for quotation, both signing and printing your full name so that we will know whom to contact should further clarification of the order be necessary. All verbal orders must be confirmed in writing.

7. Give return and shipping address.

8. Give preferred method of shipping: Parcel Post, Truck Freight, Rail Freight, Air Express, etc.

9. Show quantity desired.

10. Give instructions on where to send invoice.

11. All spare or repair part orders are subject to a minimum order charge.

12. Send all inquires to: **AMWELL**, A Division of McNish Corporation
161 S. Lincolnway St., Suite 310, Aurora, IL 60542
Phone: (630) 898-6900 / Fax: (630) 898-6901

YOUR EQUIPMENT IS IDENTIFIED AS FOLLOWS:

S.O. NUMBER:	NAME OF EQUIPMENT:
A23011	One (1) Model "HVS" Circular Clarifier Mechanism with Model “42S8T” Drive Unit - #1
A23012	One (1) Model "HVS" Circular Clarifier Mechanism with Model “42S8T” Drive Unit - #2
A23013	One (1) Model "HVS" Circular Clarifier Mechanism with Model “42S8T” Drive Unit - #3
A23014	One (1) Model "HVS" Circular Clarifier Mechanism with Model “42S8T” Drive Unit - #4

CIRCULAR CLARIFIERS

RECOMMENDED SPARE PARTS

RECOMMENDED SPARE PARTS LIST		
QUANTITY	ITEM	PART NO.
Five (5)	Shear Pin	03-003-01-04
One (1)	Set of Scum Wipers	50-04

FURNISHED SPARE PARTS LIST		
QUANTITY	ITEM	PART NO.
Five (5)	Shear Pins Per Tank	03-003-01-04-02
Two (2)	Skimmer Wipers Per Tank	50-04

PRICES QUOTED UPON REQUEST.

SECTION H

INSTALLATION INSTRUCTIONS & DRAWINGS

PARTS LIST
A23011

IOM PARTS LIST	Contract: A23011 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' DIA. - FINAL #1)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		DRIVE ASSEMBLY		
1	03	DRIVE ASSEMBLY 42S8T		
5	03-003-01-04-02	SHEAR PIN SPECIAL (SPARE)		STL
		ANCHORAGE - HB (BMAN02)		
4	BRIDGE	WEDGE ANCHOR POWER-STUD 304 SS .75 X 5.5 7342		304
1	CENTER COL	TEMPLATE	55	STL
3	CNTR COL	ADHESIVE HIT-RE 500 V3 11.1 oz, HILTI N° 2123401		
16	CNTR COL	NUT HEX FINISHED 304 SS 1		304
8	CNTR COL	THREADED ROD 304 SS 1 X 13.5 IN LG		304
16	CNTR COL	WASHER STD PL 304 SS 1		304
5	SCUM TR	POWERS EXPANSION ANCHOR 304 SS .625 X 4.5 7332		304
		BRIDGE ASSEMBLY		
1	10-01	TRUSS BRIDGE	3,458	STL
2	10-02	SLIDE PLATE	6	304
4	10-04	SLIDE PAD		NYLON
2	10-10	SPLICE PLATE - UPPER	2	STL
2	10-11	SPLICE PLATE - LOWER	3	STL
2	10-12	DIAGONAL SPLICE	37	STL
2	10A	CAPSCREW HEX HD 304 SS .875 X 2.5		304
2	10A	NUT HEX FINISHED 304 SS .875		304
2	10A	WASHER STD PL 304 SS .875		304
24	10F	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
24	10F	NUT HEX FINISHED 304 SS .625		304
8	10G	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
8	10G	NUT HEX FINISHED 304 SS .5		304
4	10J	CAPSCREW HEX HD 304 SS .5 X 2		304
4	10J	NUT HEX FINISHED 304 SS .5		304
		PLATFORM ASSEMBLY		
1	11-01	PLATFORM	707	STL
4	11A	CAPSCREW HEX HD 304 SS .75 X 1.5 FULL		304
4	11A	WASHER STD PL 304 SS .75		304
		HANDRAIL		
1	12-01	HANDRAIL		ALUM
18	12A	CAPSCREW HEX HD 304 SS .5 X 1.75		304
18	12A	NUT HEX FINISHED 304 SS .5		304
18	12A	WASHER STD PL 304 SS .5		304
		GRATING		
1	13-01	GRATING		ALUM
		WALKWAY		
2	14-01	WALKWAY PLATE - END	22	ALUM
2	14-02	WALKWAY PLATE - SIDE	67	ALUM
32	14A	FLOOR FASTENERS GALV MI W/SS SCREWS		GALV

IOM PARTS LIST	Contract: A23011 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' DIA. - FINAL #1)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		DRIVE COVER		
1	15-01	COVER - DRIVE UNIT	34	ALUM
		CENTER COLUMN		
1	16-01	CENTER COLUMN	2,594	STL
1	16-04	DRAWBAND COUPLING - 16" D.I. PIPE		GALV
1	16-05	GASKET - 1/2" THK X 3" WIDE X 4'-5" LG		NEOP
8	16A	CAPSCREW HEX HD 304 SS 1 X 3.5		304
8	16A	NUT HEX FINISHED 304 SS 1		304
		DRIVE CAGE		
1	17-01	DRIVE CAGE	1,817	STL
4	17-02	DRIVE CAGE HANGER	52	STL
16	17A	CAPSCREW HEX HD 304 SS .625 X 2		304
16	17A	NUT HEX FINISHED 304 SS .625		304
16	17A	NUT JAM 304 SS .625		304
16	17B	CAPSCREW HEX HD 304 SS .625 X 3.5		304
16	17B	NUT HEX FINISHED 304 SS .625		304
		SLUDGE BOX		
2	19-01	SLUDGE BOX HALF	839	STL
10	19-02	CONTROL PIPE		PVC
40	19A	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
40	19A	NUT HEX FINISHED 304 SS .5		304
		CENTER COLUMN SEAL		
1	20-01	CENTER COLUMN SEAL		NEOP
2	20-04	SEAL RING HALF	16	STL
12	20-05	BAR, 14 GA X 4" X 4.6875" LG		BRASS
1	20-06	SEAL CLAMP	31	STL
12	20C	CAPSCREW HEX HD 304 SS .375 X 1.5		304
12	20C	NUT HEX FINISHED 304 SS .375		304
2	20D	CAPSCREW HEX HD 304 SS .5 X 1.75		304
2	20D	NUT HEX FINISHED 304 SS .5		304
2	20D	NUT JAM 304 SS .5		304
		DIFFUSION WELL		
1	21-01	DIFFUSION WELL	3,005	STL
4	21-03	INFLUENT WELL SUPPORT CHANNEL	115	STL
16	21A	CAPSCREW HEX HD 304 SS .75 X 2.5		304
16	21A	NUT HEX FINISHED 304 SS .75		304
16	21A	NUT JAM 304 SS .75		304
16	21A	WASHER STD PL 304 SS .75		304
20	21B	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
20	21B	NUT HEX FINISHED 304 SS .5		304
		INFLUENT WELL		
1	22-01	INFLUENT WELL	5,681	STL

IOM PARTS LIST	Contract: A23011 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' DIA. - FINAL #1)				
Total Ship Pcs	Mark	Description	Weight /EA	Material
4	22-02	INFLUENT WELL SUPPORT CHANNEL	341	STL
4	22-10	SCUM PORT BAFFLE	14	STL
16	22A	CAPSCREW HEX HD 304 SS .75 X 2.5		304
16	22A	NUT HEX FINISHED 304 SS .75		304
16	22A	NUT JAM 304 SS .75		304
16	22A	WASHER STD PL 304 SS .75		304
70	22B	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
70	22B	NUT HEX FINISHED 304 SS .5		304
8	22C	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
8	22C	NUT HEX FINISHED 304 SS .5		304
8	22C	WASHER STD PL 304 SS .5		304
CLEVIS ROD ASSEMBLY ZPS 1.25 DIA				
4	23-01	CLEVIS ROD - 1.25" DIA X 2'-9.5" LG C-C - STL	20	STL
TRUSS ARM				
2	24-01	TRUSS ARM	1,869	STL
4	24A	CAPSCREW HEX HD 304 SS 1.5 X 4.5		304
4	24A	NUT HEX FINISHED 304 SS 1.5		304
FLIGHTS				
2	25-01	FLIGHT - INNER	12	STL
10	25-02	FLIGHT	105	STL
2	25-03	FLIGHT - OUTER	47	STL
38	25A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
38	25A	NUT HEX FINISHED 304 SS .625		304
38	25A	WASHER SAE PL 304 SS .625		304
SQUEEGEES				
2	26-01	SQUEEGEE - 20 GA X 3" X 21" LG - 304SS	1	304
10	26-02	SQUEEGEE - 20 GA X 3" X 10'-5" LG - 304SS	2	304
2	26-03	SQUEEGEE - 20 GA X 3" X 6'-6" LG - 304SS	2	304
98	26A	CAPSCREW HEX HD 304 SS .375 X 1 FULL		304
98	26A	NUT HEX FINISHED 304 SS .375		304
98	26A	WASHER STD PL 304 SS .375		304
PVC PIPE				
1	40-00	1 GALLON PVC ADHESIVE		
1	40-00	1/2 GALLONG PVC ADHESIVE PRIMER		
18	40-01	PVC PIPE, 6" SCH 40 X 20'-0" LG		PVC
PVC PIPE FITTINGS				
20	41-01	ELBOW - 6" 90 DEGREE SOCKET TYPE		PVC
8	41-03	COUPLING - 6" SOCKET TYPE		PVC
10	41-04	COUPLING - FERNCO FLEXIBLE #1002-66		RUBBER
PVC PIPE SUPPORTS				
10	42-01	ANGLE	4	STL
1	42-02	TOOL	5	ALUM

IOM PARTS LIST	Contract: A23011 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' DIA. - FINAL #1)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
2	42-05	BRACKET - 10"	3	304
4	42-06	BRACKET - 18"	3	304
6	42-07	BRACKET - 2'-3"	3	304
8	42-08	BRACKET - 3'-0"	4	304
20	42A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
20	42A	NUT HEX FINISHED 304 SS .625		304
20	42A	WASHER STD PL 304 SS .625		304
60	42D	NUT HEX FINISHED 304 SS .5		304
30	42D	U-BOLT, .5 X 6"	1	304
60	42D	WASHER STD PL 304 SS .5		304
SKIMMER ASSY 4 FT (HB)				
2	50	SKIMMER ASSY 4 FT - HALF BRIDGE		
2	50-07	DEFLECTOR BRONZE FOR SKIMMERS #39049	3	BRONZE
8	50A	NUT HEX FINISHED 304 SS .5		304
4	50A	U-BOLT 304 SS 4	1	304
8	50A	WASHER STD PL 304 SS .5		304
2	50-04S	SQUEEGEE - .25" X 3" X 4'-3" LG - NEOP (SPARE)	2	NEOP
SCUM DEFLECTOR				
2	51-01	SCUM DEFLECTOR	83	STL
2	51-01-OUT	SCUM DEFLECTOR - OUTER	149	STL
4	51A	CAPSCREW HEX HD 304 SS .5 X 1.5 FULL		304
4	51A	NUT HEX FINISHED 304 SS .5		304
4	51A	WASHER STD PL 304 SS .5		304
2	51B	CAPSCREW HEX HD 304 SS .625 X 10		304
2	51B	NUT HEX FINISHED 304 SS .625		304
SKIMMER SUPPORT - STD SKIMMER				
2	52-01	SKIMMER SUPPORT	169	STL
4	52-02	MOUNTING ANGLE	6	STL
16	52A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
16	52A	NUT HEX FINISHED 304 SS .625		304
16	52A	WASHER STD PL 304 SS .625		304
SCUM DEFLECTOR SUPPORT				
2	53-01	SCUM DEFLECTOR SUPPORT ANGLE	53	STL
2	53-02	SCUM DEFLECTOR SUPPORT ANGLE	57	STL
12	53A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
12	53A	NUT HEX FINISHED 304 SS .625		304
12	53A	WASHER STD PL 304 SS .625		304
SCUM TROUGH - STD SKIMMER (B/M 'E')				
1	60-01	SCUM TROUGH	432	STL
1	60-02	BACK STRAP	6	STL
2	60-03	CONNECTION PLATE	3	STL
1	60-04	BRACKET - LOWER (SCUM TROUGH)	3	STL

IOM PARTS LIST	Contract: A23011 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' DIA. - FINAL #1)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
1	60-05	BRACKET - UPPER (SCUM TROUGH)	5	STL
10	60A	MACH SCREW FLAT HD 304 SS .375 X 1.25		304
10	60A	NUT HEX FINISHED 304 SS .375		304
2	60B	NUT HEX FINISHED 304 SS .5		304
2	60B	WASHER STD PL 304 SS .5		304
1	60C	CAPSCREW HEX HD 304 SS .75 X 2 FULL		304
1	60C	NUT HEX FINISHED 304 SS .75		304
2	60C	WASHER STD PL 304 SS .75		304
FLAP GATE ASSEMBLY - HB - STD				
1	65	FLAP GATE ASSEMBLY		
1	65-04	CLAMP PIPE 3" STD GALV ANVIL INT'L FIG 212 OR EQ		GALV STL
1	65-05	COUPLING FLEX W/2 SS CLAMPS DFW-56-33		
2	65-06	TRIP ARM		STL
2	65B	CAPSCREW HEX HD 316 SS .5 X 2.25		316
2	65B	NUT HEX LOCK 316 SS .5 NYLON INSERT		316
NAMEPLATE - AMWELL				
1	95-01	AMWELL NAMEPLATE ALUMINUM WHITE ON BLUE		
2	95A	MACH SCREW RD HD 304 SS 10-24 X .5		304
2	95A	NUT HEX FINISHED 304 SS 10-24		304
2	95A	PIPE RING MC-CARR #3225T31,2 FOR 1.5		

PARTS LIST
A23012

IOM PARTS LIST	Contract: A23012 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' - FINAL #2)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		DRIVE ASSEMBLY		
1	03	DRIVE ASSEMBLY 42S8T		
5	03-003-01-04-02	SHEAR PIN SPECIAL		STL
		ANCHORAGE - HB (BMAN02)		
4	BRIDGE	WEDGE ANCHOR POWER-STUD 304 SS .75 X 5.5 7342		304
1	CENTER COL	TEMPLATE	55	STL
3	CNTR COL	ADHESIVE HIT-RE 500 V3 11.1 oz, HILTI N° 2123401		
16	CNTR COL	NUT HEX FINISHED 304 SS 1		304
8	CNTR COL	THREADED ROD 304 SS 1 X 13.5 IN LG		304
16	CNTR COL	WASHER STD PL 304 SS 1		304
5	SCUM TR	POWERS EXPANSION ANCHOR 304 SS .625 X 4.5 7332		304
		BRIDGE ASSEMBLY		
1	10-01	TRUSS BRIDGE	3,458	STL
2	10-02	SLIDE PLATE	6	304
4	10-04	SLIDE PAD		NYLON
2	10-10	SPLICE PLATE - UPPER	2	STL
2	10-11	SPLICE PLATE - LOWER	3	STL
2	10-12	DIAGONAL SPLICE	37	STL
2	10A	CAPSCREW HEX HD 304 SS .875 X 2.5		304
2	10A	NUT HEX FINISHED 304 SS .875		304
2	10A	WASHER STD PL 304 SS .875		304
24	10F	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
24	10F	NUT HEX FINISHED 304 SS .625		304
8	10G	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
8	10G	NUT HEX FINISHED 304 SS .5		304
4	10J	CAPSCREW HEX HD 304 SS .5 X 2		304
4	10J	NUT HEX FINISHED 304 SS .5		304
		PLATFORM ASSEMBLY		
1	11-01	PLATFORM	707	STL
4	11A	CAPSCREW HEX HD 304 SS .75 X 1.5 FULL		304
4	11A	WASHER STD PL 304 SS .75		304
		HANDRAIL		
1	12-01	HANDRAIL		ALUM
18	12A	CAPSCREW HEX HD 304 SS .5 X 1.75		304
18	12A	NUT HEX FINISHED 304 SS .5		304
18	12A	WASHER STD PL 304 SS .5		304
		GRATING		
1	13-01	GRATING		ALUM
		WALKWAY		
2	14-01	WALKWAY PLATE - END	22	ALUM
2	14-02	WALKWAY PLATE - SIDE	67	ALUM
32	14A	FLOOR FASTENERS GALV MI W/SS SCREWS		GALV

IOM PARTS LIST	Contract: A23012 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' - FINAL #2)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		DRIVE COVER		
1	15-01	COVER - DRIVE UNIT	34	ALUM
		CENTER COLUMN		
1	16-01	CENTER COLUMN	2,594	STL
1	16-04	DRAWBAND COUPLING - 16" D.I. PIPE		GALV
1	16-05	GASKET - 1/2" THK X 3" WIDE X 4'-5" LG		NEOP
8	16A	CAPSCREW HEX HD 304 SS 1 X 3.5		304
8	16A	NUT HEX FINISHED 304 SS 1		304
		DRIVE CAGE		
1	17-01	DRIVE CAGE	1,817	STL
4	17-02	DRIVE CAGE HANGER	52	STL
16	17A	CAPSCREW HEX HD 304 SS .625 X 2		304
16	17A	NUT HEX FINISHED 304 SS .625		304
16	17A	NUT JAM 304 SS .625		304
16	17B	CAPSCREW HEX HD 304 SS .625 X 3.5		304
16	17B	NUT HEX FINISHED 304 SS .625		304
		SLUDGE BOX		
2	19-01	SLUDGE BOX HALF	839	STL
10	19-02	CONTROL PIPE		PVC
40	19A	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
40	19A	NUT HEX FINISHED 304 SS .5		304
		CENTER COLUMN SEAL		
1	20-01	CENTER COLUMN SEAL		NEOP
2	20-04	SEAL RING HALF	16	STL
12	20-05	BAR, 14 GA X 4" X 4.6875" LG		BRASS
1	20-06	CLAMP	31	STL
12	20C	CAPSCREW HEX HD 304 SS .375 X 1.5		304
12	20C	NUT HEX FINISHED 304 SS .375		304
2	20D	CAPSCREW HEX HD 304 SS .5 X 1.75		304
2	20D	NUT HEX FINISHED 304 SS .5		304
2	20D	NUT JAM 304 SS .5		304
		DIFFUSION WELL		
1	21-01	DIFFUSION WELL	3,005	STL
4	21-03	INFLUENT WELL SUPPORT CHANNEL	115	STL
16	21A	CAPSCREW HEX HD 304 SS .75 X 2.5		304
16	21A	NUT HEX FINISHED 304 SS .75		304
16	21A	NUT JAM 304 SS .75		304
16	21A	WASHER STD PL 304 SS .75		304
20	21B	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
20	21B	NUT HEX FINISHED 304 SS .5		304
		INFLUENT WELL		
1	22-01	INFLUENT WELL	5,681	STL

IOM PARTS LIST	Contract: A23012 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' - FINAL #2)				
Total Ship Pcs	Mark	Description	Weight /EA	Material
4	22-02	INFLUENT WELL SUPPORT CHANNEL	341	STL
4	22-10	SCUM PORT BAFFLE	14	STL
16	22A	CAPSCREW HEX HD 304 SS .75 X 2.5		304
16	22A	NUT HEX FINISHED 304 SS .75		304
16	22A	NUT JAM 304 SS .75		304
16	22A	WASHER STD PL 304 SS .75		304
70	22B	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
70	22B	NUT HEX FINISHED 304 SS .5		304
8	22C	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
8	22C	NUT HEX FINISHED 304 SS .5		304
8	22C	WASHER STD PL 304 SS .5		304
CLEVIS ROD ASSEMBLY ZPS 1.25 DIA				
4	23-01	CLEVIS ROD - 1.25" DIA X 2'-9.5" LG C-C - STL	20	STL
TRUSS ARM				
2	24-01	TRUSS ARM	1,869	STL
4	24A	CAPSCREW HEX HD 304 SS 1.5 X 4.5		304
4	24A	NUT HEX FINISHED 304 SS 1.5		304
FLIGHTS				
2	25-01	FLIGHT - INNER	12	STL
10	25-02	FLIGHT	105	STL
2	25-03	FLIGHT - OUTER	47	STL
38	25A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
38	25A	NUT HEX FINISHED 304 SS .625		304
38	25A	WASHER SAE PL 304 SS .625		304
SQUEEGEES				
2	26-01	SQUEEGEE - 20 GA X 3" X 21" LG - 304SS	1	304
10	26-02	SQUEEGEE - 20 GA X 3" X 10'-5" LG - 304SS	2	304
2	26-03	SQUEEGEE - 20 GA X 3" X 6'-6" LG - 304SS	2	304
98	26A	CAPSCREW HEX HD 304 SS .375 X 1 FULL		304
98	26A	NUT HEX FINISHED 304 SS .375		304
98	26A	WASHER STD PL 304 SS .375		304
PVC PIPE				
1	40-00	1 GALLON PVC ADHESIVE		
1	40-00	1/2 GALLONG PVC ADHESIVE PRIMER		
18	40-01	PVC PIPE, 6" SCH 40 X 20'-0" LG		PVC
PVC PIPE FITTINGS				
20	41-01	ELBOW - 6" 90 DEGREE SOCKET TYPE		PVC
8	41-03	COUPLING - 6" SOCKET TYPE		PVC
10	41-04	COUPLING - FERNCO FLEXIBLE #1002-66		RUBBER
PVC PIPE SUPPORTS				
10	42-01	ANGLE	4	STL
1	42-02	TOOL	5	ALUM

IOM PARTS LIST	Contract: A23012 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' - FINAL #2)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
2	42-05	BRACKET - 10"	3	304
4	42-06	BRACKET - 18"	3	304
6	42-07	BRACKET - 2'-3"	3	304
8	42-08	BRACKET - 3'-0"	4	304
20	42A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
20	42A	NUT HEX FINISHED 304 SS .625		304
20	42A	WASHER STD PL 304 SS .625		304
60	42D	NUT HEX FINISHED 304 SS .5		304
30	42D	U-BOLT, .5 X 6"	1	304
60	42D	WASHER STD PL 304 SS .5		304
SKIMMER ASSY 4 FT (HB)				
2	50	SKIMMER ASSY 4 FT - HALF BRIDGE		
2	50-07	DEFLECTOR BRONZE FOR SKIMMERS #39049	3	BRONZE
8	50A	NUT HEX FINISHED 304 SS .5		304
4	50A	U-BOLT 304 SS 4	1	304
8	50A	WASHER STD PL 304 SS .5		304
2	50-04S	SQUEEGEE - .25" X 3" X 4'-3" LG - NEOP (SPARE)	2	NEOP
SCUM DEFLECTOR				
2	51-01	SCUM DEFLECTOR	83	STL
2	51-01-OUT	SCUM DEFLECTOR - OUTER	149	STL
4	51A	CAPSCREW HEX HD 304 SS .5 X 1.5 FULL		304
4	51A	NUT HEX FINISHED 304 SS .5		304
4	51A	WASHER STD PL 304 SS .5		304
2	51B	CAPSCREW HEX HD 304 SS .625 X 10		304
2	51B	NUT HEX FINISHED 304 SS .625		304
SKIMMER SUPPORT - STD SKIMMER				
2	52-01	SKIMMER SUPPORT	169	STL
4	52-02	MOUNTING ANGLE	6	STL
16	52A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
16	52A	NUT HEX FINISHED 304 SS .625		304
16	52A	WASHER STD PL 304 SS .625		304
SCUM DEFLECTOR SUPPORT				
2	53-01	SCUM DEFLECTOR SUPPORT ANGLE	53	STL
2	53-02	SCUM DEFLECTOR SUPPORT ANGLE	57	STL
12	53A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
12	53A	NUT HEX FINISHED 304 SS .625		304
12	53A	WASHER STD PL 304 SS .625		304
SCUM TROUGH - STD SKIMMER (B/M 'E')				
1	60-01	SCUM TROUGH	432	STL
1	60-02	BACK STRAP	6	STL
2	60-03	CONNECTION PLATE	3	STL
1	60-04	BRACKET - LOWER (SCUM TROUGH)	3	STL

IOM PARTS LIST	Contract: A23012 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' - FINAL #2)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
1	60-05	BRACKET - UPPER (SCUM TROUGH)	5	STL
10	60A	MACH SCREW FLAT HD 304 SS .375 X 1.25		304
10	60A	NUT HEX FINISHED 304 SS .375		304
2	60B	NUT HEX FINISHED 304 SS .5		304
2	60B	WASHER STD PL 304 SS .5		304
1	60C	CAPSCREW HEX HD 304 SS .75 X 2 FULL		304
1	60C	NUT HEX FINISHED 304 SS .75		304
2	60C	WASHER STD PL 304 SS .75		304
FLAP GATE ASSEMBLY - HB - STD				
1	65	FLAP GATE ASSEMBLY		
1	65-04	CLAMP PIPE 3" STD GALV ANVIL INT'L FIG 212 OR EQ		GALV STL
1	65-05	COUPLING FLEX W/2 SS CLAMPS DFW-56-33		
2	65-06	TRIP ARM		STL
2	65B	CAPSCREW HEX HD 316 SS .5 X 2.25		316
2	65B	NUT HEX LOCK 316 SS .5 NYLON INSERT		316
NAMEPLATE - AMWELL				
1	95-01	AMWELL NAMEPLATE ALUMINUM WHITE ON BLUE		
2	95A	MACH SCREW RD HD 304 SS 10-24 X .5		304
2	95A	NUT HEX FINISHED 304 SS 10-24		304
2	95A	PIPE RING MC-CARR #3225T31,2 FOR 1.5		

PARTS LIST
A23013

IOM PARTS LIST	Contract: A23013 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #3)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		DRIVE ASSEMBLY		
1	03	DRIVE ASSEMBLY 42S8T		
5	03-003-01-04-02	SHEAR PIN SPECIAL		STL
		ANCHORAGE - HB (BMAN02)		
4	BRIDGE	WEDGE ANCHOR POWER-STUD 304 SS .75 X 5.5 7342		304
1	CENTER COL	TEMPLATE	55	STL
3	CNTR COL	ADHESIVE HIT-RE 500 V3 11.1 oz, HILTI N° 2123401		
16	CNTR COL	NUT HEX FINISHED 304 SS 1		304
8	CNTR COL	THREADED ROD 304 SS 1 X 13.5 IN LG		304
16	CNTR COL	WASHER STD PL 304 SS 1		304
5	SCUM TR	POWERS EXPANSION ANCHOR 304 SS .625 X 4.5 7332		304
		BRIDGE ASSEMBLY		
1	.	PAINT		
1	10-01	TRUSS BRIDGE	3,458	STL
2	10-02	SLIDE PLATE	6	304
4	10-04	SLIDE PAD		NYLON
2	10-10	SPLICE PLATE - UPPER	2	STL
2	10-11	SPLICE PLATE - LOWER	3	STL
2	10-12	DIAGONAL SPLICE	37	STL
2	10A	CAPSCREW HEX HD 304 SS .875 X 2.5		304
2	10A	NUT HEX FINISHED 304 SS .875		304
2	10A	WASHER STD PL 304 SS .875		304
24	10F	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
24	10F	NUT HEX FINISHED 304 SS .625		304
8	10G	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
8	10G	NUT HEX FINISHED 304 SS .5		304
4	10J	CAPSCREW HEX HD 304 SS .5 X 2		304
4	10J	NUT HEX FINISHED 304 SS .5		304
		PLATFORM ASSEMBLY		
1	11-01	PLATFORM	707	STL
4	11A	CAPSCREW HEX HD 304 SS .75 X 1.5 FULL		304
4	11A	WASHER STD PL 304 SS .75		304
		HANDRAIL		
1	12-01	HANDRAIL		ALUM
18	12A	CAPSCREW HEX HD 304 SS .5 X 1.75		304
18	12A	NUT HEX FINISHED 304 SS .5		304
18	12A	WASHER STD PL 304 SS .5		304
		GRATING		
1	13-01	GRATING		ALUM
		WALKWAY		
2	14-01	WALKWAY PLATE - END	22	ALUM
2	14-02	WALKWAY PLATE - SIDE	67	ALUM

IOM PARTS LIST	Contract: A23013 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #3)				
Total Ship Pcs	Mark	Description	Weight /EA	Material
32	14A	FLOOR FASTENERS GALV MI W/SS SCREWS		GALV
		DRIVE COVER		
1	15-01	COVER - DRIVE UNIT	34	ALUM
		CENTER COLUMN		
1	16-01	CENTER COLUMN	2,594	STL
1	16-04	DRAWBAND COUPLING - 16" D.I. PIPE		GALV
1	16-05	GASKET - 1/2" THK X 3" WIDE X 4'-5" LG		NEOP
8	16A	CAPSCREW HEX HD 304 SS 1 X 3.5		304
8	16A	NUT HEX FINISHED 304 SS 1		304
		DRIVE CAGE		
1	17-01	DRIVE CAGE	1,817	STL
4	17-02	DRIVE CAGE HANGER	52	STL
16	17A	CAPSCREW HEX HD 304 SS .625 X 2		304
16	17A	NUT HEX FINISHED 304 SS .625		304
16	17A	NUT JAM 304 SS .625		304
16	17B	CAPSCREW HEX HD 304 SS .625 X 3.5		304
16	17B	NUT HEX FINISHED 304 SS .625		304
		SLUDGE BOX		
2	19-01	SLUDGE BOX HALF	839	STL
10	19-02	CONTROL PIPE		PVC
40	19A	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
40	19A	NUT HEX FINISHED 304 SS .5		304
		CENTER COLUMN SEAL		
1	20-01	CENTER COLUMN SEAL		NEOP
2	20-04	SEAL RING HALF	16	STL
12	20-05	BAR, 14 GA X 4" X 4.6875" LG		BRASS
1	20-06	CLAMP	31	STL
12	20C	CAPSCREW HEX HD 304 SS .375 X 1.5		304
12	20C	NUT HEX FINISHED 304 SS .375		304
2	20D	CAPSCREW HEX HD 304 SS .5 X 1.75		304
2	20D	NUT HEX FINISHED 304 SS .5		304
2	20D	NUT JAM 304 SS .5		304
		DIFFUSION WELL		
1	21-01	DIFFUSION WELL	3,005	STL
4	21-03	INFLUENT WELL SUPPORT CHANNEL	115	STL
16	21A	CAPSCREW HEX HD 304 SS .75 X 2.5		304
16	21A	NUT HEX FINISHED 304 SS .75		304
16	21A	NUT JAM 304 SS .75		304
16	21A	WASHER STD PL 304 SS .75		304
20	21B	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
20	21B	NUT HEX FINISHED 304 SS .5		304

IOM PARTS LIST	Contract: A23013 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #3)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		INFLUENT WELL		
1	22-01	INFLUENT WELL	5,681	STL
4	22-02	CHANNEL	341	STL
4	22-10	SCUM PORT BAFFLE	14	STL
16	22A	CAPSCREW HEX HD 304 SS .75 X 2.5		304
16	22A	NUT HEX FINISHED 304 SS .75		304
16	22A	NUT JAM 304 SS .75		304
16	22A	WASHER STD PL 304 SS .75		304
70	22B	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
70	22B	NUT HEX FINISHED 304 SS .5		304
8	22C	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
8	22C	NUT HEX FINISHED 304 SS .5		304
8	22C	WASHER STD PL 304 SS .5		304
		CLEVIS ROD ASSEMBLY ZPS 1.25 DIA		
4	23-01	CLEVIS ROD - 1.25" DIA X 2'-9.5" LG C-C - STL	20	STL
		TRUSS ARM		
2	24-01	TRUSS ARM	1,869	STL
4	24A	CAPSCREW HEX HD 304 SS 1.5 X 4.5		304
4	24A	NUT HEX FINISHED 304 SS 1.5		304
		FLIGHTS		
2	25-01	FLIGHT - INNER	12	STL
10	25-02	FLIGHT	105	STL
2	25-03	FLIGHT - OUTER	47	STL
38	25A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
38	25A	NUT HEX FINISHED 304 SS .625		304
38	25A	WASHER SAE PL 304 SS .625		304
		SQUEEGEES		
2	26-01	SQUEEGEE - 20 GA X 3" X 21" LG - 304SS	1	304
10	26-02	SQUEEGEE - 20 GA X 3" X 10'-5" LG - 304SS	2	304
2	26-03	SQUEEGEE - 20 GA X 3" X 6'-6" LG - 304SS	2	304
98	26A	CAPSCREW HEX HD 304 SS .375 X 1 FULL		304
98	26A	NUT HEX FINISHED 304 SS .375		304
98	26A	WASHER STD PL 304 SS .375		304
		PVC PIPE		
1	40-00	1 GALLON PVC ADHESIVE		
1	40-00	1/2 GALLONG PVC ADHESIVE PRIMER		
18	40-01	PIPE, 6" SCH. 40 X 20'-0" LG.		PVC
		PVC PIPE FITTINGS		
20	41-01	ELBOW - 6" 90 DEG SOCKET TYPE		PVC
8	41-03	COUPLING - 6" SOCKET TYPE		PVC
10	41-04	COUPLING - FERNCO FLEXIBLE #1002-66		RUBBER

IOM PARTS LIST	Contract: A23013 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #3)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		PVC PIPE SUPPORTS		
10	42-01	ANGLE	4	STL
1	42-02	TOOL	5	ALUM
2	42-05	BRACKET - 10"	3	304
4	42-06	BRACKET - 18"	3	304
6	42-07	BRACKET - 2'-3"	3	304
8	42-08	BRACKET - 3'-0"	4	304
20	42A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
20	42A	NUT HEX FINISHED 304 SS .625		304
20	42A	WASHER STD PL 304 SS .625		304
60	42D	NUT HEX FINISHED 304 SS .5		304
30	42D	U-BOLT, .5 X 6"	1	304
60	42D	WASHER STD PL 304 SS .5		304
		SKIMMER ASSY 4 FT (HB)		
2	50	SKIMMER ASSY 4 FT - HALF BRIDGE		
2	50-07	DEFLECTOR BRONZE FOR SKIMMERS #39049	3	BRONZE
8	50A	NUT HEX FINISHED 304 SS .5		304
4	50A	U-BOLT 304 SS 4	1	304
8	50A	WASHER STD PL 304 SS .5		304
2	50-04S	SQUEEGEE - .25" X 3" X 4'-3" LG - NEOP (SPARE)	2	NEOP
		SCUM DEFLECTOR		
2	51-01	SCUM DEFLECTOR	83	STL
2	51-01-OUT	SCUM DEFLECTOR - OUTER	149	STL
4	51A	CAPSCREW HEX HD 304 SS .5 X 1.5 FULL		304
4	51A	NUT HEX FINISHED 304 SS .5		304
4	51A	WASHER STD PL 304 SS .5		304
2	51B	CAPSCREW HEX HD 304 SS .625 X 10		304
2	51B	NUT HEX FINISHED 304 SS .625		304
		SKIMMER SUPPORT - STD SKIMMER		
2	52-01	SKIMMER SUPPORT	170	STL
4	52-02	MOUNTING ANGLE	6	STL
16	52A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
16	52A	NUT HEX FINISHED 304 SS .625		304
16	52A	WASHER STD PL 304 SS .625		304
		SCUM DEFLECTOR SUPPORT		
2	53-01	SCUM DEFLECTOR SUPPORT ANGLE	53	STL
2	53-02	SCUM DEFLECTOR SUPPORT ANGLE	57	STL
12	53A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
12	53A	NUT HEX FINISHED 304 SS .625		304
12	53A	WASHER STD PL 304 SS .625		304
		SCUM TROUGH - STD SKIMMER (B/M 'E')		
1	60-01	SCUM TROUGH	432	STL

IOM PARTS LIST	Contract: A23013 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #3)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
1	60-02	BACK STRAP	6	STL
2	60-03	CONNECTION PLATE	3	STL
1	60-04	BRACKET - LOWER (SCUM TROUGH)	3	STL
1	60-05	BRACKET - UPPER (SCUM TROUGH)	5	STL
10	60A	MACH SCREW FLAT HD 304 SS .375 X 1.25		304
10	60A	NUT HEX FINISHED 304 SS .375		304
2	60B	NUT HEX FINISHED 304 SS .5		304
2	60B	WASHER STD PL 304 SS .5		304
1	60C	CAPSCREW HEX HD 304 SS .75 X 2 FULL		304
1	60C	NUT HEX FINISHED 304 SS .75		304
2	60C	WASHER STD PL 304 SS .75		304
FLAP GATE ASSEMBLY - HB - STD				
1	65	FLAP GATE ASSEMBLY		
1	65-04	CLAMP PIPE 3" STD GALV ANVIL INT'L FIG 212 OR EQ		GALV STL
1	65-05	COUPLING FLEX W/2 SS CLAMPS DFW-56-33		
2	65-06	TRIP ARM		STL
2	65B	CAPSCREW HEX HD 316 SS .5 X 2.25		316
2	65B	NUT HEX LOCK 316 SS .5 NYLON INSERT		316
NAMEPLATE - AMWELL				
1	95-01	AMWELL NAMEPLATE ALUMINUM WHITE ON BLUE		
2	95A	MACH SCREW RD HD 304 SS 10-24 X .5		304
2	95A	NUT HEX FINISHED 304 SS 10-24		304
2	95A	PIPE RING MC-CARR #3225T31,2 FOR 1.5		

PARTS LIST
A23014

IOM PARTS LIST	Contract: A23014 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #4)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		DRIVE ASSEMBLY		
1	03	DRIVE ASSEMBLY 42S8T		
5	03-003-01-04-02	SHEAR PIN SPECIAL		STL
		ANCHORAGE - HB (BMAN02)		
4	BRIDGE	WEDGE ANCHOR POWER-STUD 304 SS .75 X 5.5 7342		304
1	CENTER COL	TEMPLATE	55	STL
3	CNTR COL	ADHESIVE HIT-RE 500 V3 11.1 oz, HILTI N° 2123401		
16	CNTR COL	NUT HEX FINISHED 304 SS 1		304
8	CNTR COL	THREADED ROD 304 SS 1 X 13.5 IN LG		304
16	CNTR COL	WASHER STD PL 304 SS 1		304
5	SCUM TR	POWERS EXPANSION ANCHOR 304 SS .625 X 4.5 7332		304
		BRIDGE ASSEMBLY		
1	..	PAINT		
1	10-01	TRUSS BRIDGE	3,458	STL
2	10-02	SLIDE PLATE	6	304
4	10-04	SLIDE PAD		NYLON
2	10-10	SPLICE PLATE - UPPER	2	STL
2	10-11	SPLICE PLATE - LOWER	3	STL
2	10-12	DIAGONAL SPLICE	37	STL
2	10A	CAPSCREW HEX HD 304 SS .875 X 2.5		304
2	10A	NUT HEX FINISHED 304 SS .875		304
2	10A	WASHER STD PL 304 SS .875		304
24	10F	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
24	10F	NUT HEX FINISHED 304 SS .625		304
8	10G	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
8	10G	NUT HEX FINISHED 304 SS .5		304
4	10J	CAPSCREW HEX HD 304 SS .5 X 2		304
4	10J	NUT HEX FINISHED 304 SS .5		304
		PLATFORM ASSEMBLY		
1	11-01	PLATFORM	707	STL
4	11A	CAPSCREW HEX HD 304 SS .75 X 1.5 FULL		304
4	11A	WASHER STD PL 304 SS .75		304
		HANDRAIL		
1	12-01	HANDRAIL		ALUM
18	12A	CAPSCREW HEX HD 304 SS .5 X 1.75		304
18	12A	NUT HEX FINISHED 304 SS .5		304
18	12A	WASHER STD PL 304 SS .5		304
		GRATING		
1	13-01	GRATING		ALUM
		WALKWAY		
2	14-01	WALKWAY PLATE - END	22	ALUM
2	14-02	WALKWAY PLATE - SIDE	67	ALUM

IOM PARTS LIST	Contract: A23014 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #4)				
Total Ship Pcs	Mark	Description	Weight /EA	Material
32	14A	FLOOR FASTENERS GALV MI W/SS SCREWS		GALV
		DRIVE COVER		
1	15-01	COVER - DRIVE UNIT	34	ALUM
		CENTER COLUMN		
1	16-01	CENTER COLUMN	2,594	STL
1	16-04	DRAWBAND COUPLING - 16" D.I. PIPE		GALV
1	16-05	GASKET - 1/2" THK X 3" WIDE X 4'-5" LG		NEOP
8	16A	CAPSCREW HEX HD 304 SS 1 X 3.5		304
8	16A	NUT HEX FINISHED 304 SS 1		304
		DRIVE CAGE		
1	17-01	DRIVE CAGE	1,817	STL
4	17-02	DRIVE CAGE HANGER	52	STL
16	17A	CAPSCREW HEX HD 304 SS .625 X 2		304
16	17A	NUT HEX FINISHED 304 SS .625		304
16	17A	NUT JAM 304 SS .625		304
16	17B	CAPSCREW HEX HD 304 SS .625 X 3.5		304
16	17B	NUT HEX FINISHED 304 SS .625		304
		SLUDGE BOX		
2	19-01	SLUDGE BOX HALF	839	STL
10	19-02	CONTROL PIPE		PVC
40	19A	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
40	19A	NUT HEX FINISHED 304 SS .5		304
		CENTER COLUMN SEAL		
1	20-01	CENTER COLUMN SEAL		NEOP
2	20-04	SEAL RING HALF	16	STL
12	20-05	BAR, 14 GA X 4" X 4.6875" LG		BRASS
1	20-06	CLAMP	31	STL
12	20C	CAPSCREW HEX HD 304 SS .375 X 1.5		304
12	20C	NUT HEX FINISHED 304 SS .375		304
2	20D	CAPSCREW HEX HD 304 SS .5 X 1.75		304
2	20D	NUT HEX FINISHED 304 SS .5		304
2	20D	NUT JAM 304 SS .5		304
		DIFFUSION WELL		
1	21-01	DIFFUSION WELL	3,005	STL
4	21-03	INFLUENT WELL SUPPORT CHANNEL	115	STL
16	21A	CAPSCREW HEX HD 304 SS .75 X 2.5		304
16	21A	NUT HEX FINISHED 304 SS .75		304
16	21A	NUT JAM 304 SS .75		304
16	21A	WASHER STD PL 304 SS .75		304
20	21B	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
20	21B	NUT HEX FINISHED 304 SS .5		304

IOM PARTS LIST	Contract: A23014 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #4)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		INFLUENT WELL		
1	22-01	INFLUENT WELL	5,681	STL
4	22-02	CHANNEL	341	STL
4	22-10	SCUM PORT BAFFLE	14	STL
16	22A	CAPSCREW HEX HD 304 SS .75 X 2.5		304
16	22A	NUT HEX FINISHED 304 SS .75		304
16	22A	NUT JAM 304 SS .75		304
16	22A	WASHER STD PL 304 SS .75		304
70	22B	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
70	22B	NUT HEX FINISHED 304 SS .5		304
8	22C	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304
8	22C	NUT HEX FINISHED 304 SS .5		304
8	22C	WASHER STD PL 304 SS .5		304
		CLEVIS ROD ASSEMBLY ZPS 1.25 DIA		
4	23-01	CLEVIS ROD - 1.25" DIA X 2'-9.5" LG C-C - STL	20	STL
		TRUSS ARM		
2	24-01	TRUSS ARM	1,869	STL
4	24A	CAPSCREW HEX HD 304 SS 1.5 X 4.5		304
4	24A	NUT HEX FINISHED 304 SS 1.5		304
		FLIGHTS		
2	25-01	FLIGHT - INNER	12	STL
10	25-02	FLIGHT	105	STL
2	25-03	FLIGHT - OUTER	47	STL
38	25A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
38	25A	NUT HEX FINISHED 304 SS .625		304
38	25A	WASHER SAE PL 304 SS .625		304
		SQUEEGEES		
2	26-01	SQUEEGEE - 20 GA X 3" X 21" LG - 304SS	1	304
10	26-02	SQUEEGEE - 20 GA X 3" X 10'-5" LG - 304SS	2	304
2	26-03	SQUEEGEE - 20 GA X 3" X 6'-6" LG - 304SS	2	304
98	26A	CAPSCREW HEX HD 304 SS .375 X 1 FULL		304
98	26A	NUT HEX FINISHED 304 SS .375		304
98	26A	WASHER STD PL 304 SS .375		304
		PVC PIPE		
1	40-00	1 GALLON PVC ADHESIVE		
1	40-00	1/2 GALLONG PVC ADHESIVE PRIMER		
18	40-01	PIPE, 6" SCH. 40 X 20'-0" LG.		PVC
		PVC PIPE FITTINGS		
20	41-01	ELBOW - 6" 90 DEG SOCKET TYPE		PVC
8	41-03	COUPLING - 6" SOCKET TYPE		PVC
10	41-04	COUPLING - FERNCO FLEXIBLE #1002-66		RUBBER

IOM PARTS LIST	Contract: A23014 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #4)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
		PVC PIPE SUPPORTS		
10	42-01	ANGLE	4	STL
1	42-02	TOOL	5	ALUM
2	42-05	BRACKET - 10"	3	304
4	42-06	BRACKET - 18"	3	304
6	42-07	BRACKET - 2'-3"	3	304
8	42-08	BRACKET - 3'-0"	4	304
20	42A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
20	42A	NUT HEX FINISHED 304 SS .625		304
20	42A	WASHER STD PL 304 SS .625		304
60	42D	NUT HEX FINISHED 304 SS .5		304
30	42D	U-BOLT, .5 X 6"	1	304
60	42D	WASHER STD PL 304 SS .5		304
		SKIMMER ASSY 4 FT (HB)		
2	50	SKIMMER ASSY 4 FT - HALF BRIDGE		
2	50-07	DEFLECTOR BRONZE FOR SKIMMERS #39049	3	BRONZE
8	50A	NUT HEX FINISHED 304 SS .5		304
4	50A	U-BOLT 304 SS 4	1	304
8	50A	WASHER STD PL 304 SS .5		304
2	50-04S	SQUEEGEE - .25" X 3" X 4'-3" LG - NEOP (SPARE)	2	NEOP
		SCUM DEFLECTOR		
2	51-01	SCUM DEFLECTOR	83	STL
2	51-01-OUT	SCUM DEFLECTOR - OUTER	149	STL
4	51A	CAPSCREW HEX HD 304 SS .5 X 1.5 FULL		304
4	51A	NUT HEX FINISHED 304 SS .5		304
4	51A	WASHER STD PL 304 SS .5		304
2	51B	CAPSCREW HEX HD 304 SS .625 X 10		304
2	51B	NUT HEX FINISHED 304 SS .625		304
		SKIMMER SUPPORT - STD SKIMMER		
2	52-01	SKIMMER SUPPORT	170	STL
4	52-02	MOUNTING ANGLE	6	STL
16	52A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
16	52A	NUT HEX FINISHED 304 SS .625		304
16	52A	WASHER STD PL 304 SS .625		304
		SCUM DEFLECTOR SUPPORT		
2	53-01	SCUM DEFLECTOR SUPPORT ANGLE	53	STL
2	53-02	SCUM DEFLECTOR SUPPORT ANGLE	57	STL
12	53A	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304
12	53A	NUT HEX FINISHED 304 SS .625		304
12	53A	WASHER STD PL 304 SS .625		304
		SCUM TROUGH - STD SKIMMER (B/M 'E')		
1	60-01	SCUM TROUGH	432	STL

IOM PARTS LIST	Contract: A23014 Job Name: TAUNTON, MA WWTP - PHASE 2			
A1100 (1) CIRCULAR CLARIFIER HALF BRIDGE (HVS 100' FINAL #4)				
Total Ship Pcs	**Mark**	**Description**	**Weight /EA**	**Material**
1	60-02	BACK STRAP	6	STL
2	60-03	CONNECTION PLATE	3	STL
1	60-04	BRACKET - LOWER (SCUM TROUGH)	3	STL
1	60-05	BRACKET - UPPER (SCUM TROUGH)	5	STL
10	60A	MACH SCREW FLAT HD 304 SS .375 X 1.25		304
10	60A	NUT HEX FINISHED 304 SS .375		304
2	60B	NUT HEX FINISHED 304 SS .5		304
2	60B	WASHER STD PL 304 SS .5		304
1	60C	CAPSCREW HEX HD 304 SS .75 X 2 FULL		304
1	60C	NUT HEX FINISHED 304 SS .75		304
2	60C	WASHER STD PL 304 SS .75		304
FLAP GATE ASSEMBLY - HB - STD				
1	65	FLAP GATE ASSEMBLY		
1	65-04	CLAMP PIPE 3" STD GALV ANVIL INT'L FIG 212 OR EQ		GALV STL
1	65-05	COUPLING FLEX W/2 SS CLAMPS DFW-56-33		
2	65-06	TRIP ARM		STL
2	65B	CAPSCREW HEX HD 316 SS .5 X 2.25		316
2	65B	NUT HEX LOCK 316 SS .5 NYLON INSERT		316
NAMEPLATE - AMWELL				
1	95-01	AMWELL NAMEPLATE ALUMINUM WHITE ON BLUE		
2	95A	MACH SCREW RD HD 304 SS 10-24 X .5		304
2	95A	NUT HEX FINISHED 304 SS 10-24		304
2	95A	PIPE RING MC-CARR #3225T31,2 FOR 1.5		

INSTALLATION INSTRUCTIONS

MODEL "HVS" CIRCULAR CLARIFIERS

INSTALLATION INSTRUCTIONS

GENERAL

IMPORTANT - When unloading structural steel make sure slings are equally spaced and secured to the heavier members to prevent slippage. Heavier boxes and crates should be lowered by crane or other means and placed on timbers on high ground away from possible flooded areas.

Electrical equipment such as magnetic starters, push button stations etc. should be transferred immediately to a covered area.

The drive assembly should be kept above ground level and covered.

These instructions and all drawings furnished should be thoroughly examined before starting the installation. Installation time will be minimized with a clear understanding of these instructions.

Concrete work should be carefully checked to agree with the dimensions and arrangement shown on the concrete drawing, specifically, the location, elevation and projection of all anchor bolts.

During installation of the machine correcting of minor misfits by reasonable amounts of reaming or cutting is considered a legitimate part of installation. Any error in steel work or hole location which prevents the proper assembling or fitting of parts should be reported immediately to the nearest AMWELL representative. Approval and method of such correction work must be obtained from AMWELL.

SEQUENCE OF INSTALLATION

1. Center Column
2. Drive Cage
3. Sludge Box
4. Drive Assembly
5. Diffusion Well
6. Influent Well
7. Truss Arms
8. Sludge Piping
9. Bridge
10. Weir Plates (Not by AMWELL)
11. Scum Trough
12. Scum Baffle (Not by AMWELL)
13. Skimmer Assembly
14. Checking the Machine for Level
15. Flights & Squeegees
16. Sludge Box Seal
17. Diffusion Well seal Ring
18. Nameplate
29. Special Coating Note
20. Start-up Procedure

REFER TO MASTER ERECTION DIAGRAM D605-85837-292 (Tanks 1 & 2) & D605-85849-292 (Tanks 3 & 4)

NOTE: It is a good idea to consult the lubrication and maintenance instructions at this point, determine the lubricants necessary for start-up and order them now so they will be available when required, particularly when the job site is in a remote area.

1. CENTER COLUMN - (Ref. Dwgs. D605-85837-292 or D605-85849-292, A605-55037-292 & A605-65778-292)

Put one (1) nut on each anchor bolt and place one (1) washer on top of each nut. These will be used to plumb the center column.

Set the center column on the anchor bolts and place one washer and loosely screw one nut on each anchor bolt. Raise the center column to the proper elevation, plumb it accurately and secure, but do not place grout beneath the column at this step-in installation.

Install the drawband coupling to join the tank sludge return pipe to the sludge pipe in the center column.

After final alignment install the access port covers.

2. DRIVE CAGE

Place drive cage over center column and rest on floor.

3. SLUDGE BOX - (Ref. Dwgs. B605-50672-292 & B605-50170-292)

NOTE: The pipes in the sludge box must be located above the truss arm connections at the bottom of the drive cage.

Bolt the sludge box halves together.

Lower the sludge box on to the extended angles of the drive cage.

Bolt the sludge box to the drive cage.

4. DRIVE ASSEMBLY - (Ref. Dwgs. A605-85834-292 & A605-44286-292)

Place pre-assembled drive assembly on center column making certain that tapped holes in the gear housing are oriented properly to mount the bridge on the correct centerline. Bolt the drive assembly in place.

IMPORTANT - Exercise care in handling this assembly so as not to damage bearings and seals. Do not attach slings to the internal gear.

Bolt four (4) cage hangers to top of drive cage.

Raise the drive cage and bolt securely to the drive cage attachment lugs on the internal gear.

Check to make certain the drive assembly is level and the drive cage hangs plumb. Further adjustment may be required.

IMPORTANT NOTE: If unit is to be field sandblasted the drives are to be remove from the sandblast are to avoid contamination of the internal drive parts. See separate instructions for "Drive Unit Protection for Blast Cleaning" provided in this section.

5. DIFFUSION WELL - (Ref. Dwg. A605-85835-292)

Bolt the diffusion well hanger supports to the drive cage.

Locate each half of the diffusion well on the extended angles of the drive cage.

Bolt the diffusion well sections together and to the hanger supports and to the drive cage.

6. INFLUENT WELL - (Ref. Dwgs. A605-45241-292 & A605-40169-292)

Bolt the influent well hangers to the drive cage.

Bolt the influent well segments together around center column.

Raise the influent well into position and bolt securely to the influent well supports making sure that the scum deflector mounting tab is orientated over the truss arm that supports the skimmer assembly.

Bolt the influent well scum port baffles in place.

7. TRUSS ARMS - (Ref. Dwg. A605-38971-292)

Bolt truss arms to the drive cage.

Attach clevis rod to cage and truss arm and adjust as required to put bottom of truss arm parallel with the tank floor.

IMPORTANT - At this point in installation, make certain that the bottom of the truss arms are parallel with the floor throughout so that the squeegees will follow the floor properly.

8. SLUDGE PIPING - (Ref. Dwgs. D605-85837-292, or D605-85849-292, B605-50673-292 & B605-50170-292)

Slide the PVC control pipes over the sludge box pipes.

Install the sludge suction piping and PVC couplings to each truss arm and connect to the sludge box pipes with a flexible rubber coupling.

NOTE: Pipe is supplied in 20'-0" lengths and is to be cut to lengths shown on General Arrangement Drawing D605-85837-292 or D605-85849-292.

9. ACCESS BRIDGE - (Ref. Dwgs. D605-85837-292 or D605-85849-292, A605-85833-292, A605-72692-292, A605-38949-292, B605-61463-292, B605-64268-292, Grating Manufacturer's Erection Diagram & Handrail Manufacturer's Erection Diagrams.)

Place bridge slide plates over mounting bolts and shim to proper elevation.

Bolt bridge sections together and install splice angles.

Lower platform into position onto drive unit and secure in place.

Lower bridge into position onto platform and slide plate and secure in place.

Install grating and walkway plate.

Assemble handrailing to platform.

10. WEIR PLATES - (Not by **AMWELL**)

Install weirs plates.

11. SCUM TROUGH - (Ref. Dwgs. C205-48779-200 & C605-70108-292)

Bolt scum trough securely to the tank wall.

Install flushing gate.

Connect scum pipe to scum trough.

12. SCUM BAFFLE - (Not by **AMWELL**)

Install scum baffles.

13. SKIMMER ASSEMBLIES - (Ref. Dwgs. D205-31914-201, A605-85836-292, A605-43990-292, A605-38973-292 & C605-70108-292)

Attach pre-assembled skimmer mechanisms to skimmer booms.

Attach skimmer supports to truss arms as shown on erection drawings. Plumb skimmer supports and secure to truss arms.

Attach skimmer booms to skimmer supports. Position booms as shown on drawing. Level booms with spirit level and bolt securely.

Rotate mechanisms to bring skimmer blades over the ramp. Adjust skimmer assemblies to bring skimmer blades on radial line with the scum trough openings.

Adjust the elevation of the skimmer blades to the dimension shown on the erection drawing in relation to the established water level and secure lock collars.

Install scum deflectors and supports, one end attached to influent well and one end to skimmer assembly.

Adjust scum deflectors to elevation shown on the erection drawing in relation to the established water level and fasten securely.

Be sure the skimmer blades ride freely up the ramp and over the skimmer guide.

Some minor adjustments may be required on the skimmer mechanism after the tank is filled due to slight variations in water level. This should be checked after the tank is filled and in operation.

14. CHECKING THE MACHINE FOR LEVEL

IMPORTANT - The drive assembly must be level to insure that each arm will revolve in a horizontal plane. Bolts securing drive assembly to center column must be loosened before attempting to make adjustments with the leveling bolts.

See separate "Leveling Instructions" provided in this Section.

Level influent well.

Place grout under center column and tighten all bolts securely.

Level bridge and grout under bridge slide plates.

15. FLIGHTS AND SQUEEGEES - (Ref. Dwgs. D605-85837-292 or D605-85849-292 & A605-35022-292)

Bolt the flights to the truss arms.

Clean the tank floor thoroughly and bolt squeegees to the flights finger tight using fasteners provided.

Rotate the arms to see that squeegee clear the high spots in the tank floor. Adjust where necessary and tighten nuts firmly.

The recommended clearance between the squeegees and the finished tank bottom is 1/2".

16. SLUDGE BOX SEAL - (Ref. Dwg. B605-50672-292)

After final alignment of clarifier mechanism, install the sludge box seal.

17. DIFFUSION WELL SEAL RING - (Ref. Dwg. A605-58035-292)

After final alignment of clarifier mechanism, install the diffusion well seal ring.

18. NAMEPLATE - (Ref. Dwg. A605-48120-292)

Install nameplate on handrail as shown on above drawing.

19. SPECIAL PAINTING NOTE:

After all final alignments and adjustment procedures have been performed, the exposed threads of all truss rods, sway braces and submerged adjusting screws should be painted with a minimum of 4.0 mils of finish paint to prevent rust through.

20. START-UP PROCEDURE - (Also Refer to "Starting Procedure" on pages 2 & 3 of the "Operating Instructions" found in Section "C")

Make necessary electrical connections to the motor and overload devices. Connect the motor so that the collector mechanism rotates clockwise looking down on it.

WARNING!: **Be sure clarifiers operate in a clockwise direction. Do not allow drive to operate in a counter-clockwise direction for longer than a momentary period of time (2 seconds max.) or serious damage to the drive will result.**

Lubricate the drive assembly in accordance with separate lubrication instructions provided.

Refer to drive manufacturer's instruction sheets and check lubrication and oil level of all drive components.

The machine is now ready for operation. Fill the tank and adjust the weirs in order to provide proper operating liquid level and equal discharge along entire length of weir.

Any further information required may be obtained from:

AMWELL®
A Division of McNish Corporation
161 S. Lincolnway St., Suite 310
North Aurora, Illinois 60542

Phone: (630) 898-6900
Fax: (630) 898-1647
E-Mail: amwell@amwell-inc.com

DRIVE UNIT PROTECTION FOR BLAST CLEANING DRAWING

CIRCULAR CLARIFIERS

DRIVE UNIT PROTECTION FOR BLAST CLEANING

Refer to Sketch on Page 2 of 2

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. 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 exposed worm shaft itself with two layers of duct tape. This sealing system will stand up under misdirected blasting and is relatively easy to remove.

3. Apply plumber's putty followed by two layers of duct tape at the thrust rod seal.

4. Protect all oil sight glasses, air vent, grease fittings, drive load indicator scale and overload switches with two layers of duct tape.

5. Plug the condensate drain in the lower housing.

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

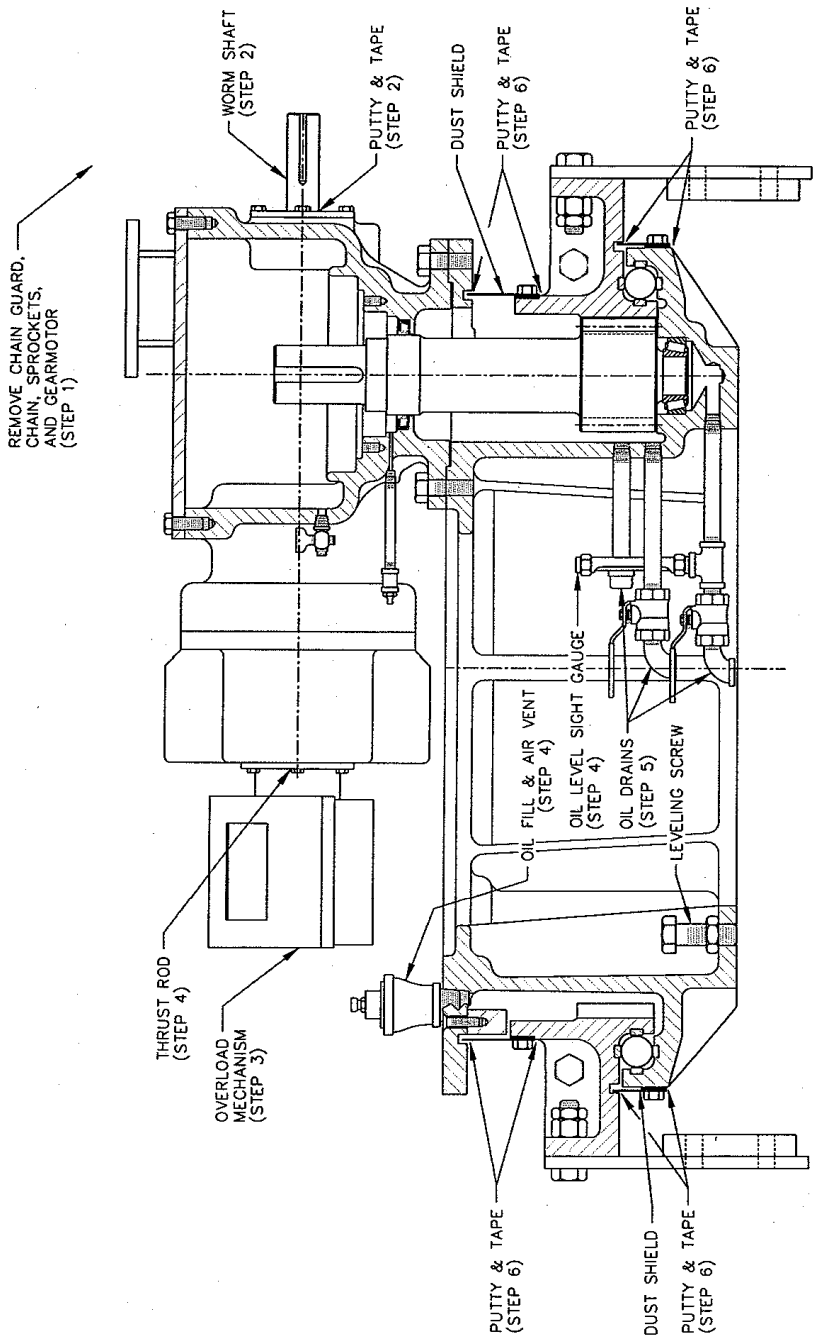
After blast cleaning, remove the tape and putty from the worm shaft, thrust rod and dust shields. Solvent clean the surfaces which have been puttied before painting the surface. Duct tape can remain on the other protected areas until painting has been completed.

Remove the condensate drain plug when blasting is complete. Condensate can freeze and damage drive components.

On some units a dual drive is furnished to drive both a flocculator and a bottom collector. The primary flocculator drive will be a variable speed unit and should be covered with heavy duty plastic rather than removed. The steps listed above should be followed with dual drives. There will be four dust shields, one worm shaft and one thrust rod to protect with plumber's putty and duct tape.

CIRCULAR CLARIFIERS

DRIVE UNIT PROTECTION FOR BLAST CLEANING



LEVELING INFORMATION

CIRCULAR CLARIFIERS

LEVELING INSTRUCTIONS

LEVELING INSTRUCTIONS

REQUIREMENTS: Two (2) Men
Builders Level (Transit)
4 Foot Level, Tape Rule

The most important part of the clarifier assembly is the leveling process. This process sets the pace and activity of the remaining erection. These instructions hold true for all circular clarifiers.

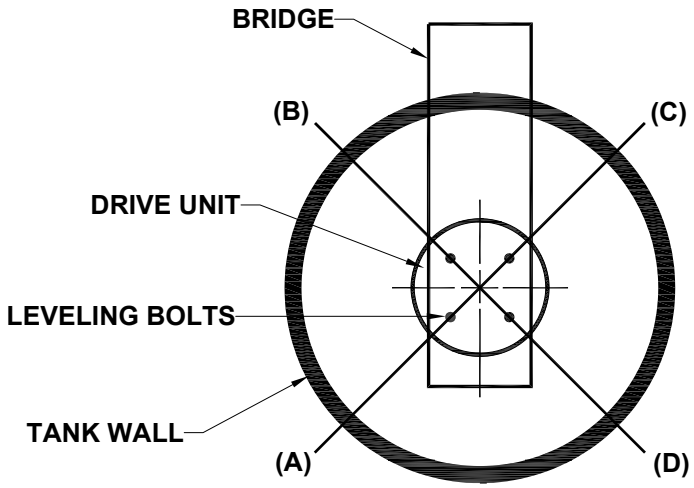
The clarifier must be completely assembled (skimmer, skimmer blade, scraper blades, scraper piping, etc.) for balancing purposes.

ALWAYS USE ONLY ONE (1) SCRAPER ARM DURING THE LEVELING PROCESS.
Setting the opposite scraper arm is covered later in these instructions.

LEVELING STEP #1

Transit shoot four (4) marks on the tank walls at 90° points approximately three (3) feet above the floor.

NOTE: The marks should be in line with the leveling screws in the drive unit or in other words diagonally in relation to the clarifier bridge. (See Sketch Below).



CIRCULAR CLARIFIERS

LEVELING INSTRUCTIONS

LEVELING STEP #2

Move one (1) scraper arm to mark (A) on the tank wall. Using the 4 foot level, measure the distance to the level mark and record. Now, move the same scraper arm to marks (B), (C) and (D) and repeat the same procedure.

If the measurements you recorded are within 3/16" at all four (4) points you are within a tolerable level. If not, you will have to relevel the clarifier.

EXAMPLE:

MARK (A) 25 7/16"	MARK (A) 25 3/4"
MARK (B) 25 5/8"	MARK (B) 25 5/8"
MARK (C) 25 5/8"	MARK (C) 24 7/8"
MARK (D) 25 7/16"	MARK (D) 25"
O.K.	**RELEVEL CLARIFIER**

RELEVELING STEP #3

REMINDER - You will still be using only one (1) scraper arm during the releveling process.

To level the clarifier, you must first understand what you are going to accomplish. The clarifier leveling system works on the same principle as a see-saw. When you raise the scraper arm on MARK (A), you lower the scraper arm on MARK (C).

To determine how much to adjust the leveling screws use this example:

MARK (A)	25 3/4"	MARK (B)	25 5/8"
MARK (C)	24 7/8"	MARK (D)	25"
Difference Between (A) (C)	7/8"	Difference Between (B)(D)	5/8"

Now divide the difference by 2, because raising one side will lower the opposite side an equal amount.

With the scraper arm at MARK (A), loosen the leveling screw at position (C) at the drive unit until the measurement at MARK (A) is 25 5/16". This should make the measurement at MARK (C) 25 5/16" also.

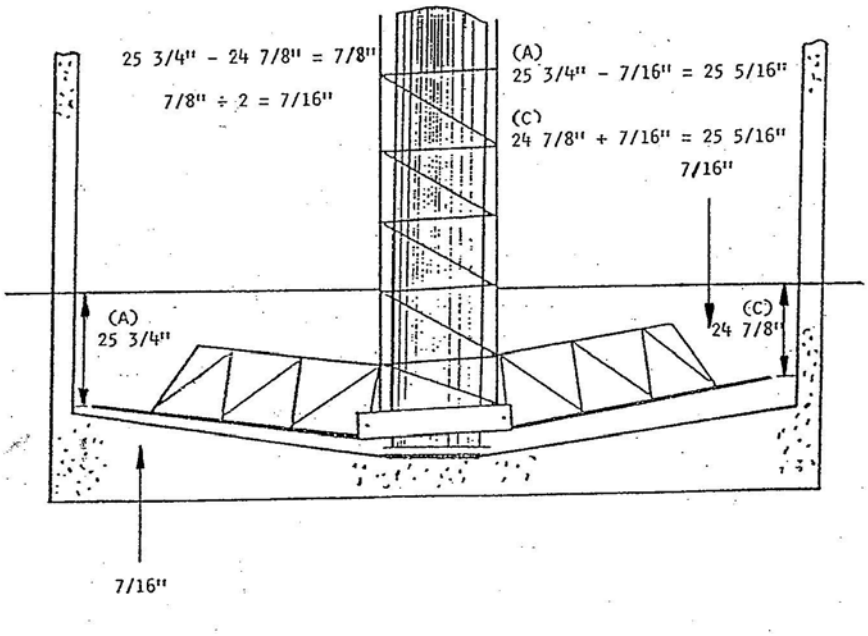
Move the same scraper arm to MARK (B) and repeat this same leveling procedure.

NOTE: It may take a couple of times of performing this procedure before you are within a tolerable level.

(See Sketch Next Page)

CIRCULAR CLARIFIERS

LEVELING INSTRUCTIONS



LEVELING STEP #4

Now that your clarifier is in level, shim the gap between the drive unit and center column. (See Diagram Below).

NOTE: Shims (Not by **AMWELL**) must measure 3" x 3" minimum.

After the shim material has been installed, recheck the levelness of the mechanism once more. You may find that the measurements are off. Care should be taken while installing shim stock to prevent throwing the clarifier out of level.

LEVELING STEP #5

After shimming at least eight (8) points around the drive unit, back off the leveling screws, tighten the hold-down bolts and recheck for levelness once again.

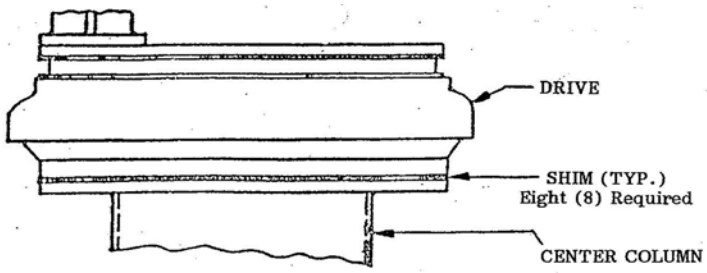
NOTE: The leveling screws should be completely loose after the shim material has been installed, and the hold-down bolts have been tightened.

LEVELING STEP #6

The scraper arms must be set to the same measurement prior to installing shim material at the scraper arm and drive cage connection (See Scraper Arm Mounting Assembly Detail).

CIRCULAR CLARIFIERS

LEVELING INSTRUCTIONS



HAND OPERATION OF THE CLARIFIER

Clarifier drive mechanisms operate at a very slow speed due to various gear reductions. Therefore, it is an advantage to rotate the clarifier drive unit by hand to speed up the leveling process.

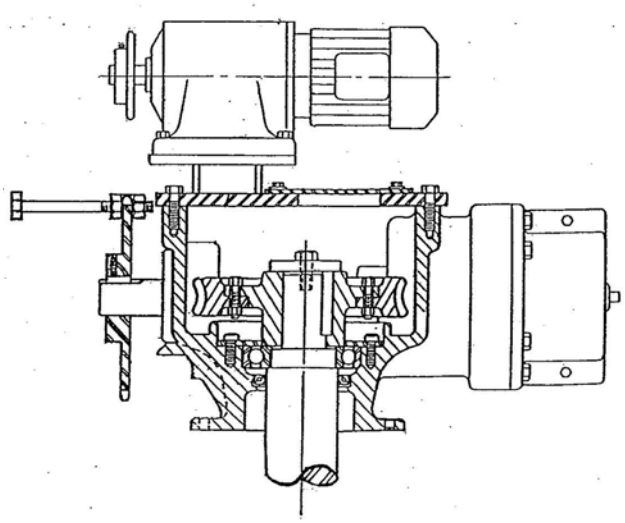
CONVERTING CLARIFIER DRIVE UNIT TO HAND OPERATION:

1) Remove chain guard.

2) Locate connecting link and remove roller chain.

3) Place a 1/2" x 6" long bolt with two (2) nuts and washers between the gear teeth on the driven sprocket and tighten the nuts.

The handle is sufficient enough to turn the clarifier mechanism.



FLOOR GROUTING INFORMATION

CIRCULAR CLARIFIERS

FLOOR GROUTING INSTRUCTIONS

REVIEW FLOOR GROUTING WITH ENGINEER PRIOR TO BEGINNING THIS PHASE OF WORK, SO THAT ANY SPECIAL REQUIREMENTS ARE MET.

IMPORTANT: The drive unit overload system must be operable.

Do not proceed with floor grouting until the entire clarifier mechanism has been properly assembled, leveled, (See leveling instructions) adjusted and all necessary field welding has been completed.

SUGGESTED PROCEDURE:

Screed boards shall be placed on flights of arms by the following method.

NOTE: An equal amount of material must be fastened to arms located 180° degrees apart for proper balance.

All material required for screeding not furnished by **AMWELL**.

NOTE #1: IMPORTANT: Dimension from bottom of screed board to rough concrete floor should be distance Engineer specifies as grouting thickness. This dimension is also shown on an **AMWELL** assembly detail.

SCREED PROCEDURE:

1. Knock off all high spots that may exist on rough floor.
2. Broom tank bottom clean, or clean with a strong jet of water.
3. Wet down tank bottom.
4. Use a grout with sufficient slump to spread evenly and easily.
5. Spread grout in front of one screed at a time. Starting at center of tank.
6. Have sufficient manpower to keep grout from piling up in front of screed.
7. When grouting is completed, let the mechanism rotate several revolutions, keeping the cement wet ahead of the screed board, either by use of bucket of water and broom, or intermittent application with a very fine spray of water from a hose. The metal covered screed will do a good job of toweling.
8. As soon as a man can get on the grout with knee boards, the outside edge, and center of tank can be hand finished.

CIRCULAR CLARIFIERS

FLOOR GROUTING INSTRUCTIONS

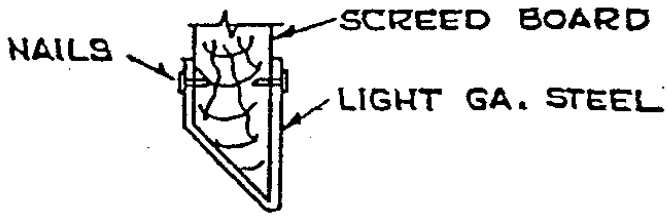
IMPORTANT NOTES:

1. Do not use mechanism to push grout. This is extremely hard on mechanism, it also tends to raise truss arms, leaving an uneven floor.

2. Watch second arm do not allow excess grout pile up in front of its screed board.

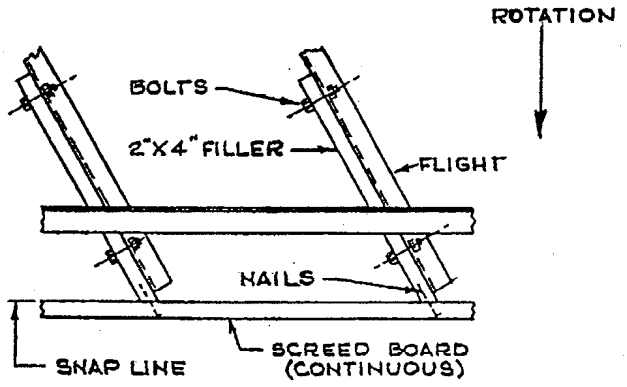
3. Care must be taken to prevent any weight from being applied to arm during placement of grout.

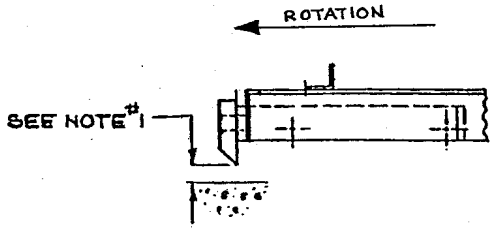
Most contractors have found that a protective piece of light gauge steel formed over beveled edge of screed board will more than pay for itself.



Bolt 2" x 4" filler to flights, so that it projects several inches beyond the leading edge of the flight, and flush with flight bottom. Snap a chalk line across the ends of filler parallel to truss arm. Saw fillers on this line.

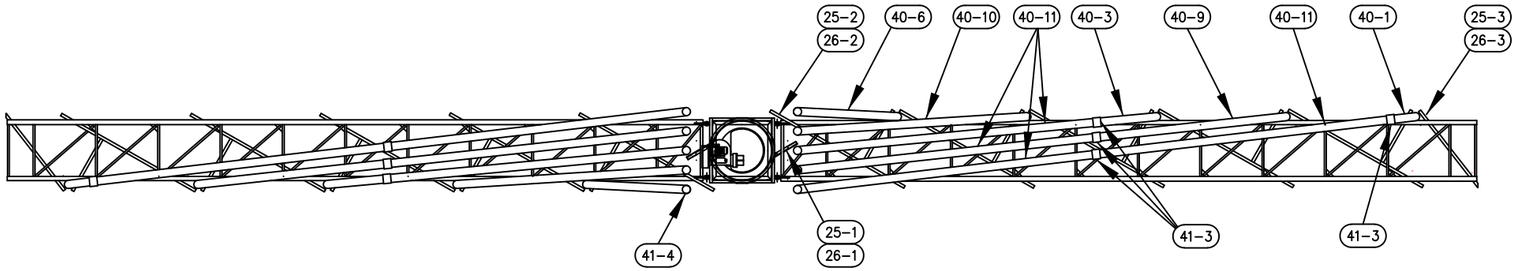
Nail screed board (2" x 8" normally) to cut-off face. (See Note #1).



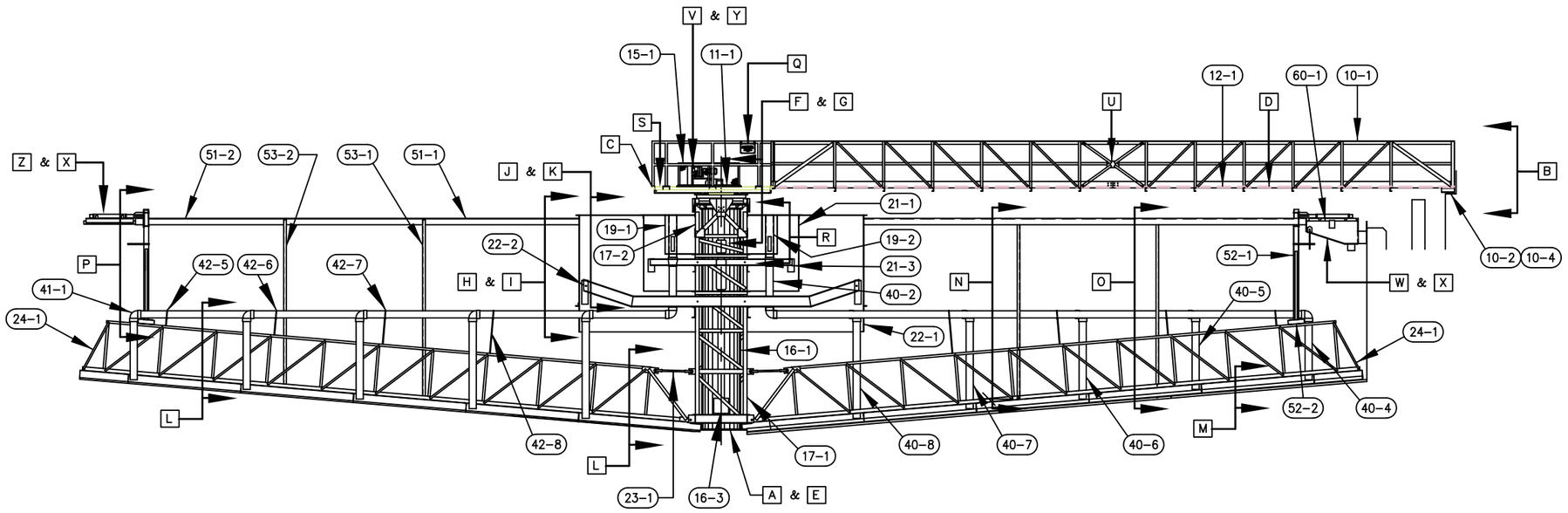


GENERAL ASSEMBLY DRAWING (ERECTION DIAGRAM)

LETTER	ERECTION DIAGRAM DRAWING NUMBER	LETTER	ERECTION DIAGRAM DRAWING NUMBER
A	A605-55037-292	N	A605-85836-292
B	A605-85833-292	O	A605-43990-292
C	A605-38949-292	P	A605-38973-292
D	A605-72692-292	Q	A605-48120-292
E	A605-65778-292	R	B605-50672-292
F	A605-85834-292	S	B605-64268-292
G	A605-44286-292	T	B605-50673-292
H	A605-40169-292	U	B605-61463-292
I	A605-45241-292	V	C605-46818-171
J	A605-58035-292	W	C605-48779-200
K	A605-85835-292	X	C605-70108-292
L	A605-38971-292	Y	D705-48638-171
M	A605-35022-292	Z	D605-31914-201



PARTIAL PLAN



SECTIONAL ELEVATION

REF	DESCRIPTION	QTY
10-1	TRUSS BRIDGE - 2 SECTIONS	1
10-2	SLIDE PLATE	2
10-4	SLIDE PAD (2 PER BEAM)	4
11-1	PLATFORM	1
12-1	GRATING	1
15-1	DRIVE COVER	1
16-1	CENTER COLUMN	1
16-3	CENTER COLUMN ACCESS COVER	2
17-1	DRIVE CAGE	2
17-2	DRIVE CAGE HANGER	4
19-1	SLUDGE BOX - 2 SECTIONS	1
19-2	CONTROL PIPE	10
21-1	DIFFUSION WELL - 2 SECTIONS	1
21-3	DIFFUSION WELL SUPPORT CHANNEL	4
22-1	INFLUENT WELL - 10 SECTIONS	1
22-2	INFLUENT WELL SUPPORT CHANNEL	4
23-1	CLEVIS ROD	4
24-1	TRUSS ARM	2
25-1	FLIGHT - INNER	2
25-2	FLIGHT	10
25-3	FLIGHT - OUTER	2
26-1	SQUEEGEE - INNER	2
26-2	SQUEEGEE	10
26-3	SQUEEGEE - OUTER	2
40-1	PIPE, 6" SCH. 40 X 16 5/8" LG.	2
40-2	PIPE, 6" SCH. 40 X 3'-7 1/4" LG.	10
40-3	PIPE, 6" SCH. 40 X 3'-8 3/4" LG.	2
40-4	PIPE, 6" SCH. 40 X 4'-8" LG.	2
40-5	PIPE, 6" SCH. 40 X 5'-5" LG.	2
40-6	PIPE, 6" SCH. 40 X 6'-2" LG.	4
40-7	PIPE, 6" SCH. 40 X 6'-11" LG.	2
40-8	PIPE, 6" SCH. 40 X 7'-8" LG.	2
40-9	PIPE, 6" SCH. 40 X 12'-10 1/2" LG.	2
40-10	PIPE, 6" SCH. 40 X 14'-10" LG.	2
40-11	PIPE, 6" SCH. 40 X 20'-0" LG.	18
41-1	ELBOW, 6" - 90° SCH. 40 X - SOCKET TYPE	20
41-3	COUPLING, 6" SCH. 40 - SOCKET TYPE	8
41-4	RUBBER COUPLING	10
42-5	PIPE SUPPORT BRACKET - 10" LG.	2
42-6	PIPE SUPPORT BRACKET - 18" LG.	4
42-7	PIPE SUPPORT BRACKET - 2'-3" LG.	6
42-8	PIPE SUPPORT BRACKET - 3'-0" LG.	8
51-1	SCUM DEFLECTOR - INNER	2
51-2	SCUM DEFLECTOR - OUTER	2
52-1	SKIMMER SUPPORT	2
52-2	MOUNTING ANGLE	4
53-1	SCUM DEFLECTOR SUPPORT ANGLE - 13'-10 1/2" LG.	2
53-2	SCUM DEFLECTOR SUPPORT ANGLE - 12'-11 1/2"	2
60-1	SCUM TROUGH	1

* P.V.C. PIPE IS FURNISHED IN 20'-0" LENGTHS AND WILL NEED TO BE CUT TO LENGTHS SHOWN.

MASTER
D-XXXX

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

AMWELL DOES NOT FURNISH PIPING (EXCEPT AS NOTED) FLOOR RAILS, TROUGHS, GRATINGS, WEIR PLATES, OIL OR GREASE FOR LUBRICATION, ANY WIRING OR CONDUITS BETWEEN MOTORS, CONTROLS AND ALARMS OR ANY ELECTRICAL EQUIPMENT OF ANY KIND EXCEPT AS SPECIFICALLY STATED IN AMWELL SPECIFICATIONS.

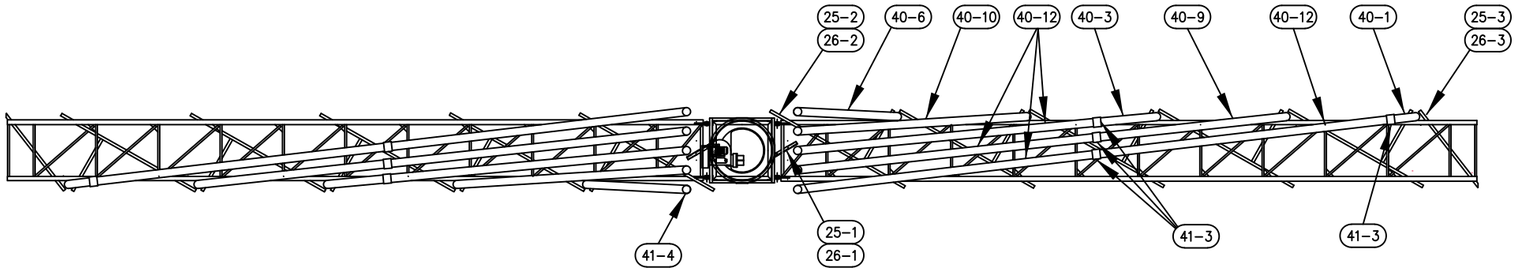
AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS - EST. 1868)

DRAWN	Walt
CHECKED	
APP'D.	
DATE	12-13-22
S.O.	
SCALE	NONE

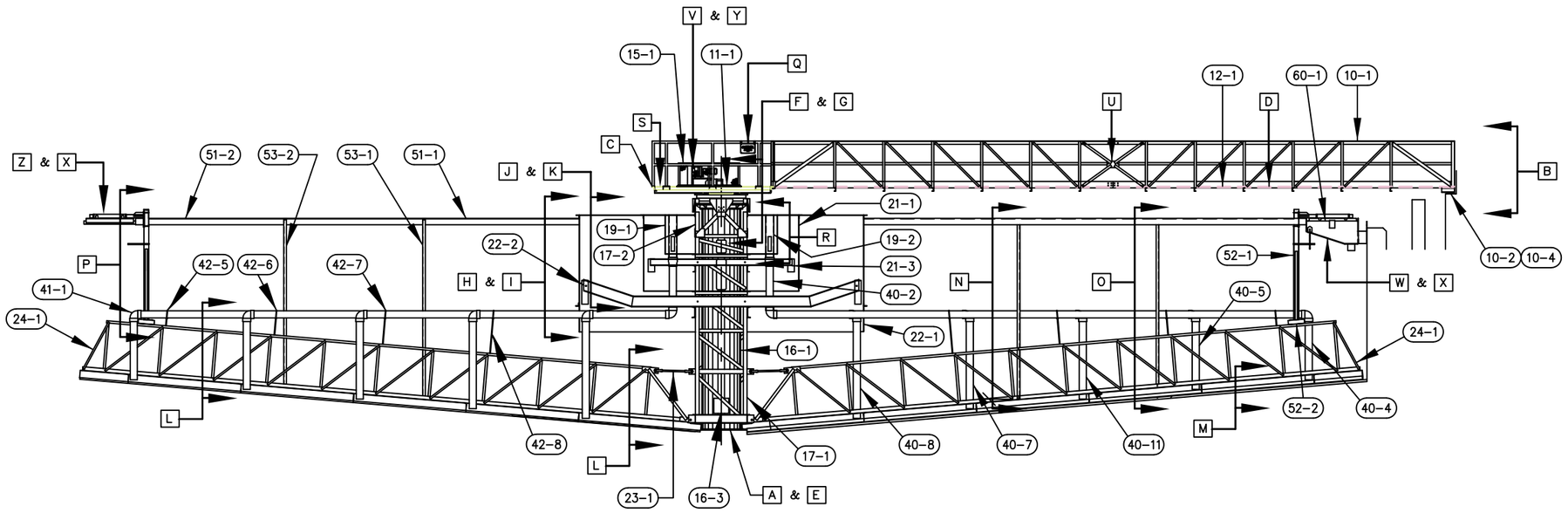
DESCRIPTION
GENERAL ASSEMBLY
100'-0" DIA. CLARIFIER - TYPE 'HVS'
TAUNTON, MA. CLARIFIER # 1 & 2

DRAWING NO. D605-85837-292 REV.

LETTER	ERECTION DIAGRAM DRAWING NUMBER	LETTER	ERECTION DIAGRAM DRAWING NUMBER
A	A605-55037-292	N	A605-85836-292
B	A605-85833-292	O	A605-43990-292
C	A605-38949-292	P	A605-38973-292
D	A605-72692-292	Q	A605-48120-292
E	A605-65778-292	R	B605-50672-292
F	A605-85834-292	S	B605-64268-292
G	A605-44286-292	T	B605-50673-292
H	A605-40169-292	U	B605-61463-292
I	A605-45241-292	V	C605-46818-171
J	A605-58035-292	W	C605-48779-200
K	A605-85835-292	X	C605-70108-292
L	A605-38971-292	Y	D705-48638-171
M	A605-35022-292	Z	D605-31914-201



PARTIAL PLAN



SECTIONAL ELEVATION

REF	DESCRIPTION	QTY
10-1	TRUSS BRIDGE – 2 SECTIONS	1
10-2	SLIDE PLATE	2
10-4	SLIDE PAD (2 PER BEAM)	4
11-1	PLATFORM	1
12-1	GRATING	1
15-1	DRIVE COVER	1
16-1	CENTER COLUMN	1
16-3	CENTER COLUMN ACCESS COVER	2
17-1	DRIVE CAGE	2
17-2	DRIVE CAGE HANGER	4
19-1	SLUDGE BOX – 2 SECTIONS	1
19-2	CONTROL PIPE	10
21-1	DIFFUSION WELL – 2 SECTIONS	1
21-3	DIFFUSION WELL SUPPORT CHANNEL	4
22-1	INFLUENT WELL – 10 SECTIONS	1
22-2	INFLUENT WELL SUPPORT CHANNEL	4
23-1	CLEVIS ROD	4
24-1	TRUSS ARM	2
25-1	FLIGHT – INNER	2
25-2	FLIGHT	10
25-3	FLIGHT – OUTER	2
26-1	SQUEEGEE – INNER	2
26-2	SQUEEGEE	10
26-3	SQUEEGEE – OUTER	2
40-1	PIPE, 6" SCH. 40 X 16 5/8" LG.	2
40-2	PIPE, 6" SCH. 40 X 3'-7 1/4" LG.	10
40-3	PIPE, 6" SCH. 40 X 3'-8 3/4" LG.	2
40-4	PIPE, 6" SCH. 40 X 4'-8" LG.	2
40-5	PIPE, 6" SCH. 40 X 5'-5" LG.	2
40-6	PIPE, 6" SCH. 40 X 6'-2" LG.	2
40-7	PIPE, 6" SCH. 40 X 6'-11" LG.	2
40-8	PIPE, 6" SCH. 40 X 7'-8" LG.	2
40-9	PIPE, 6" SCH. 40 X 12'-10 1/2" LG.	2
40-10	PIPE, 6" SCH. 40 X 14'-10" LG.	2
40-11	PIPE, 6" SCH. 40 X 6'-3" LG.	2
40-12	PIPE, 6" SCH. 40 X 20'-0" LG.	18
41-1	ELBOW, 6" – 90° SCH. 40 X – SOCKET TYPE	20
41-3	COUPLING, 6" SCH. 40 – SOCKET TYPE	8
41-4	RUBBER COUPLING	10
42-5	PIPE SUPPORT BRACKET – 10" LG.	2
42-6	PIPE SUPPORT BRACKET – 18" LG.	4
42-7	PIPE SUPPORT BRACKET – 2'-3" LG.	6
42-8	PIPE SUPPORT BRACKET – 3'-0" LG.	8
51-1	SCUM DEFLECTOR – INNER	2
51-2	SCUM DEFLECTOR – OUTER	2
52-1	SKIMMER SUPPORT	2
52-2	MOUNTING ANGLE	4
53-1	SCUM DEFLECTOR SUPPORT ANGLE – 13'-10 1/2" LG.	2
53-2	SCUM DEFLECTOR SUPPORT ANGLE – 12'-11 1/2"	2
60-1	SCUM TROUGH	1

* P.V.C. PIPE IS FURNISHED IN 20'-0" LENGTHS AND WILL NEED TO BE CUT TO LENGTHS SHOWN.

MASTER
D-XXXX

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

AMWELL DOES NOT FURNISH PIPING (EXCEPT AS NOTED) FLOOR RAILS, TROUGHS, GRATINGS, WEIR PLATES, OIL OR GREASE FOR LUBRICATION, ANY WIRING OR CONDUITS BETWEEN MOTORS, CONTROLS AND ALARMS OR ANY ELECTRICAL EQUIPMENT OF ANY KIND EXCEPT AS SPECIFICALLY STATED IN AMWELL SPECIFICATIONS.

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

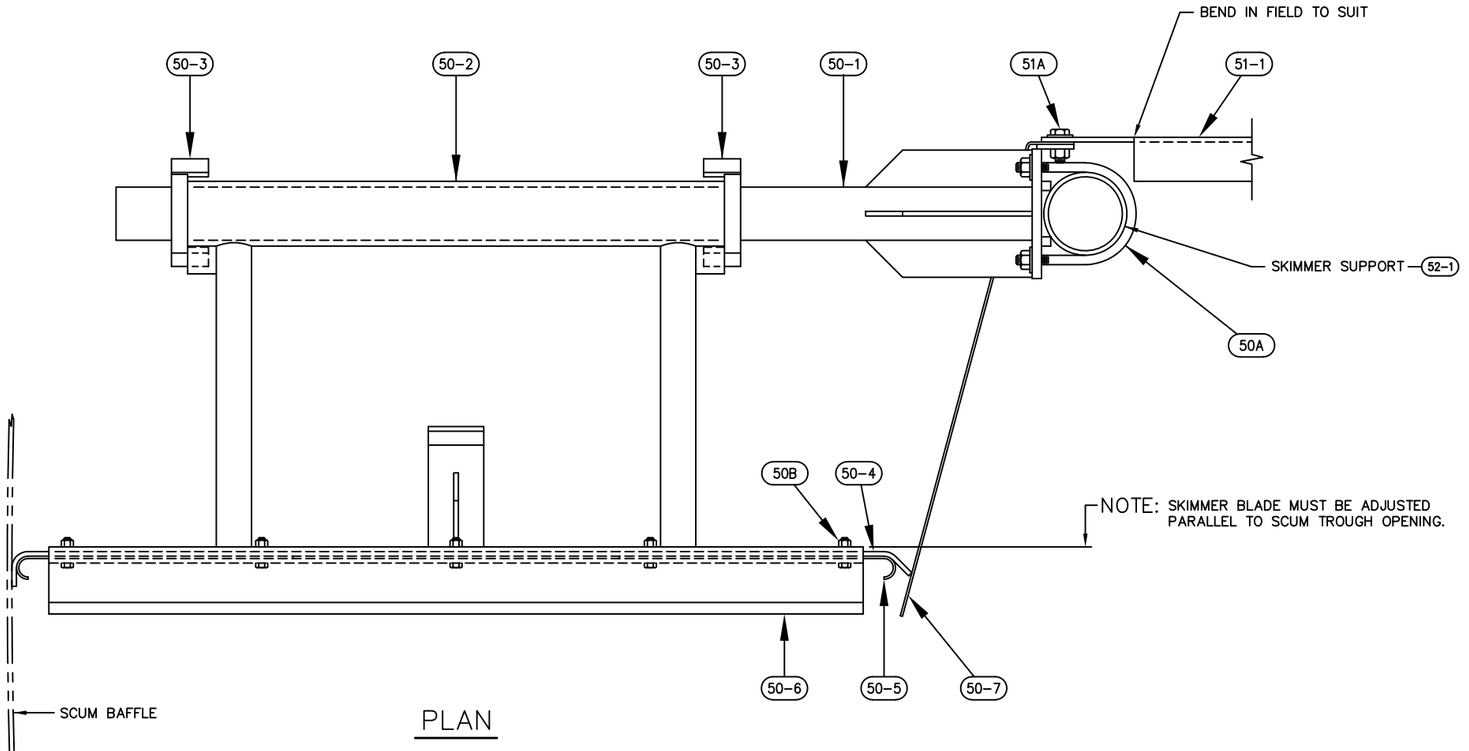
DRAWN	Walt
CHECKED	
APP'D.	
DATE	12-28-22
S.O.	
SCALE	NONE

DESCRIPTION
GENERAL ASSEMBLY
100'-0" DIA. CLARIFIER – TYPE 'HVS'
TAUNTON, MA. CLARIFIER # 3 & 4

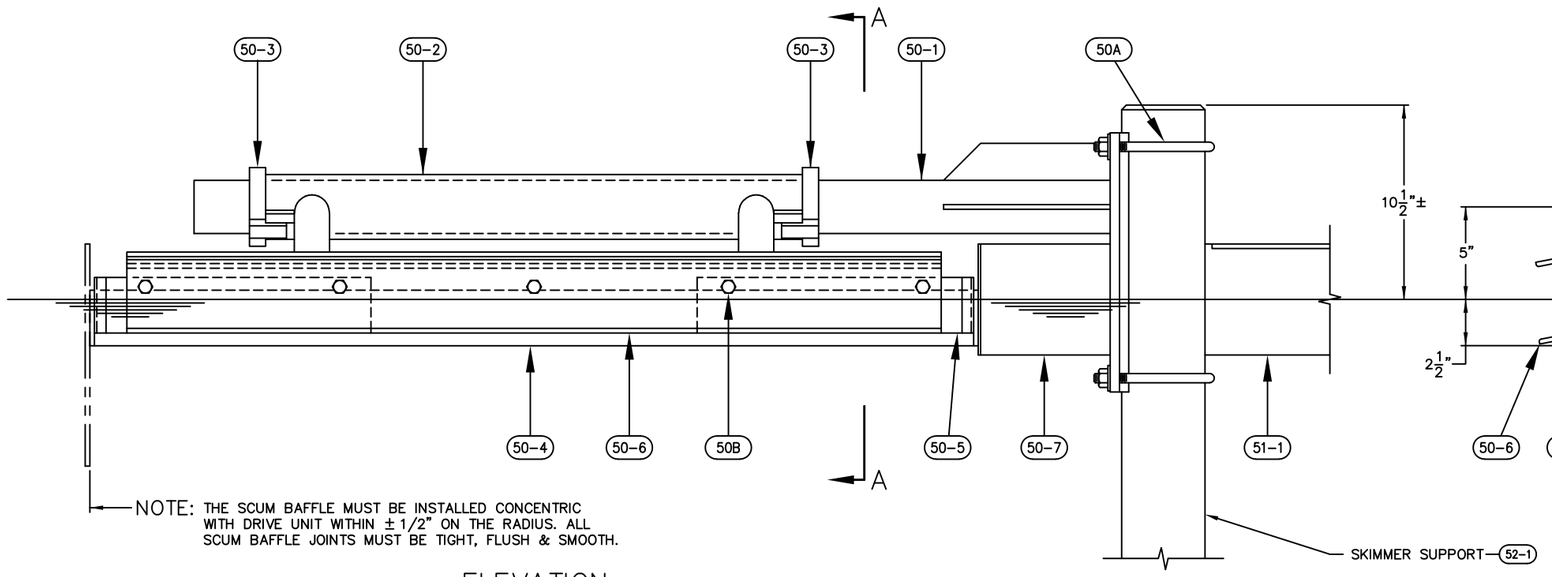
DRAWING NO. D605-85849-292 REV.

SKIMMER ASSEMBLY ERECTION DRAWING

REF	DESCRIPTION	QTY
50–1	SKIMMER BOOM	1
50–2	SKIMMER ARM	1
50–3	STOP COLLAR	2
50–4	SQUEEGEE	1
50–5	SPRING BLADE	1RH&1LH
50–6	CLAMP ANGLE	1
50–7	DEFLECTOR	1
51–1	SCUM DEFLECTOR	1
50A	U–BOLT	2
	HEX NUT 1/2"–13NC	4
	WASHER 1/2" STD	4
50B	CAPSCREW 3/8"–16NC X 1 1/4" LG	5
	HEX NUT 3/8"–16NC	5
51A	CAPSCREW 1/2"–13NC X 1 1/2" LG	2
	HEX NUT 1/2"–13NC	2
	WASHER 1/2" STD	2

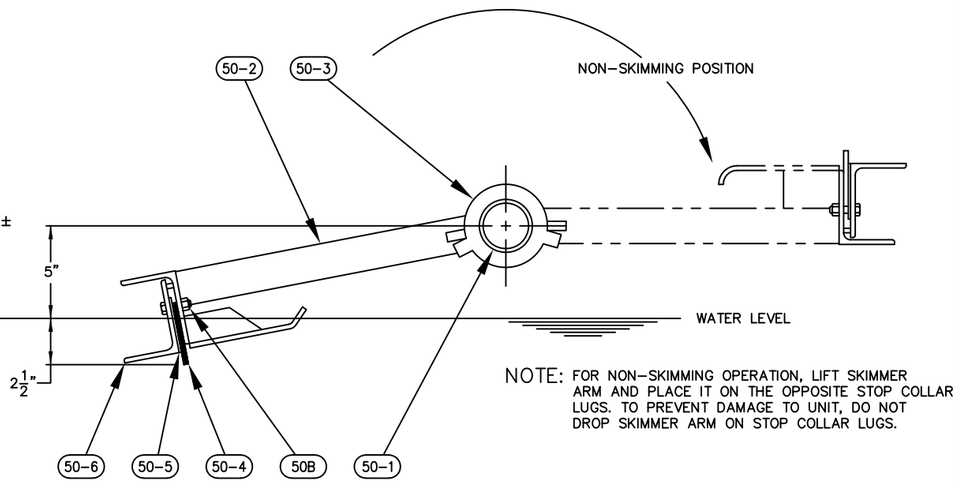


PLAN



NOTE: THE SCUM BAFFLE MUST BE INSTALLED CONCENTRIC WITH DRIVE UNIT WITHIN ± 1/2" ON THE RADIUS. ALL SCUM BAFFLE JOINTS MUST BE TIGHT, FLUSH & SMOOTH.

ELEVATION



NOTE: FOR NON–SKIMMING OPERATION, LIFT SKIMMER ARM AND PLACE IT ON THE OPPOSITE STOP COLLAR LUGS. TO PREVENT DAMAGE TO UNIT, DO NOT DROP SKIMMER ARM ON STOP COLLAR LUGS.

SECTION A–A

MASTER
D–31914

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

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MICROFILMED

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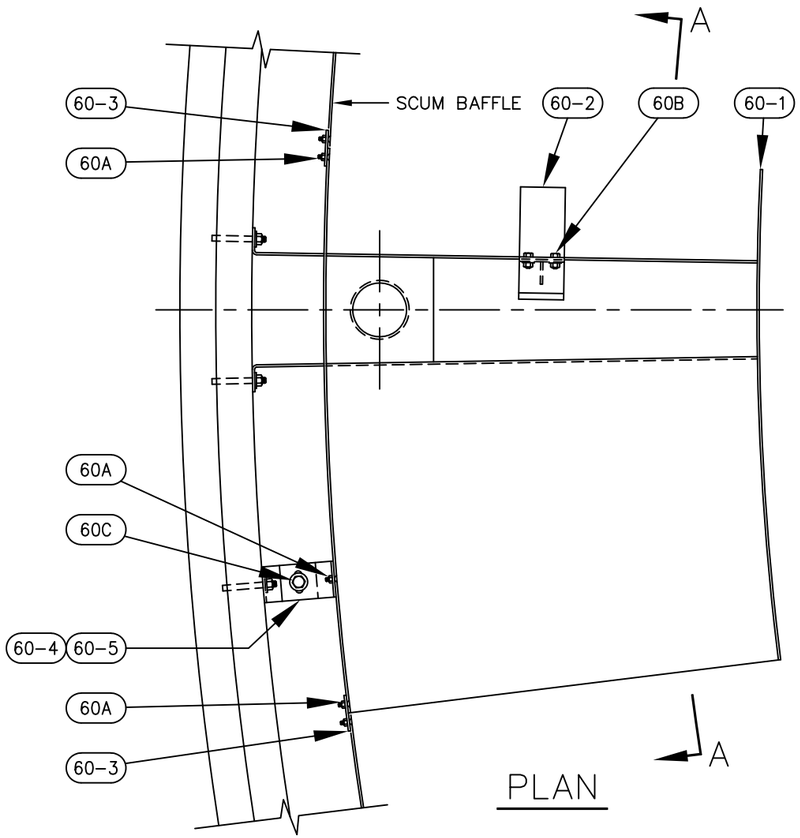
DRAWN	RES
CHECKED	
APP'D.	
DATE	11–30–87
S.O.	STD
SCALE	NONE

DESCRIPTION
ERECTION DIAGRAM
HALF BRIDGE SKIMMER – 4'–0"

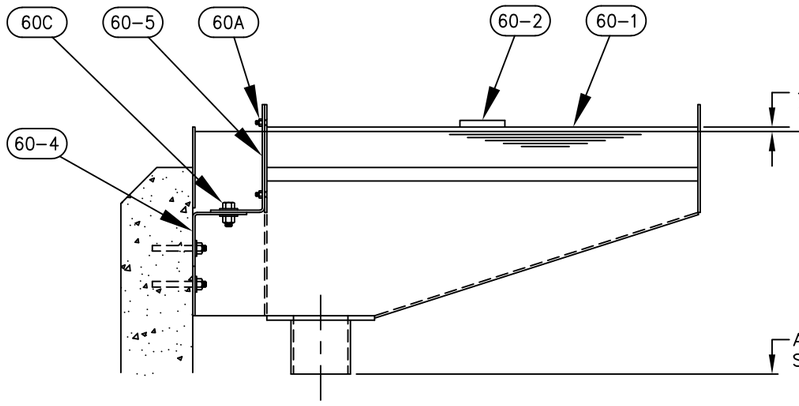
DRAWING NO.
D205–31914–201

REV.

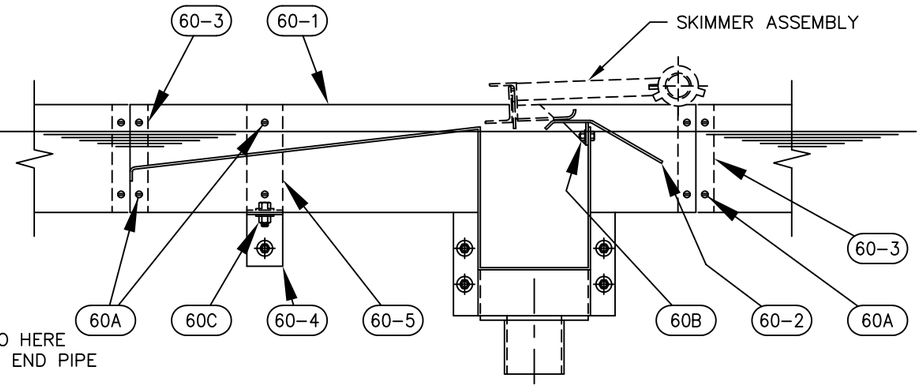
SCUM TROUGH ERECTION DRAWING



PLAN



ELEVATION



SECTION A–A

REF	DESCRIPTION		QTY
60-1	SCUM TROUGH		1
60-2	BACK STRAP		1
60-3	CONNECTION PLATE		2
60-4	BRACKET – LOWER		1
60-5	BRACKET – UPPER		1
60A	FLAT HD SCREW 3/8"–16NC X 1 1/4" LG		10
	HEX NUT 3/8"–16NC		10
60B	HEX NUT 1/2"–13NC		2
	WASHER 1/2" STD		2
60C	CAPSCREW 3/4"–10NC X 2" LG		1
	HEX NUT 3/4"–10NC		1
	WASHER 3/4" STD		2

NOTE: ADJUST BACK STRAP ELEVATION SO THAT THE SKIMMER ARM MOVES SMOOTHLY ACROSS THE SCUM TROUGH OPENING.

C605-48779-200

CAD FILE: C48779

MASTER C-48779

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

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MICROFILMED

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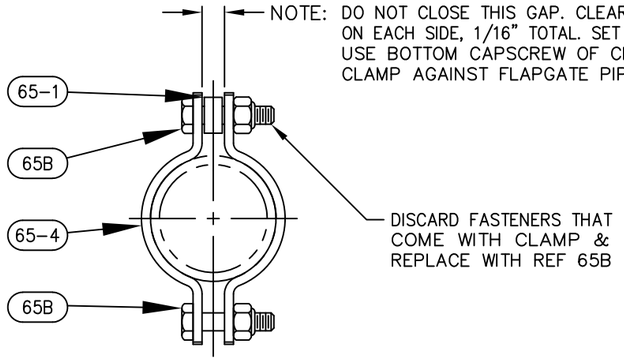
DRAWN	RES
CHECKED	
APP'D.	
DATE	5-8-98
S.O.	STD
SCALE	NONE

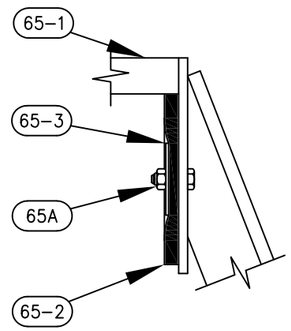
DESCRIPTION
ERECTION DIAGRAM
SCUM TROUGH
2'–0", 2'–6" 3'–0" & 4'–0"

DRAWING NO. C,6,0,5|4,8,7,7,9|2,0,0 REV.

SCUM TROUGH FLUSHING GATE ERECTION DIAGRAM

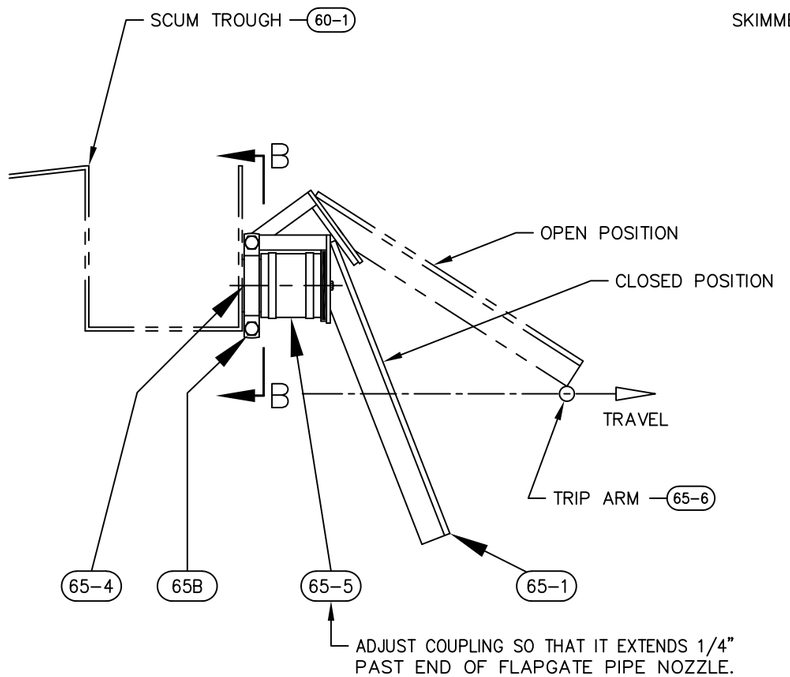


SECTION B–B

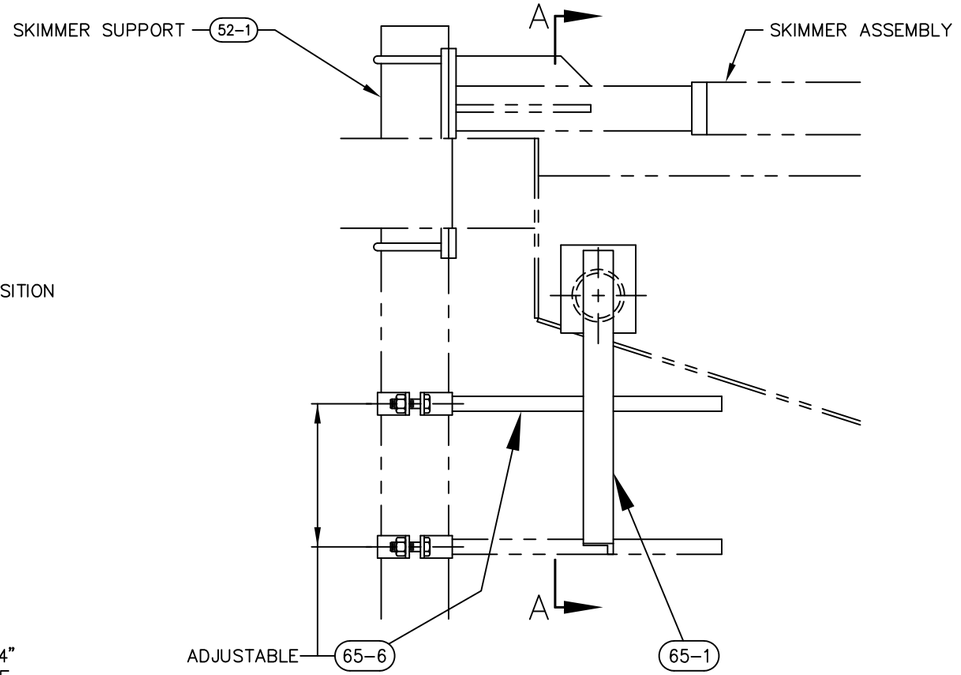


FLAP GATE ASSEMBLY

REF	DESCRIPTION	QTY
65–1	FLAP GATE	1
65–2	NEOPRENE SEAL	1
65–3	2" DIA WASHER	1
65–4	PIPE CLAMP	1
65–5	FLEXIBLE COUPLING	1
65–6	TRIP ARM	1
65A	HEX LOCK NUT 1/4"–20NC	1
65B	CAPSCREW 1/2"–13NC X 2 1/4" LG	2
	HEX LOCK NUT 1/2"–13NC	2



VIEW A–A



CAD FILE: C70108

MASTER C-70108

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

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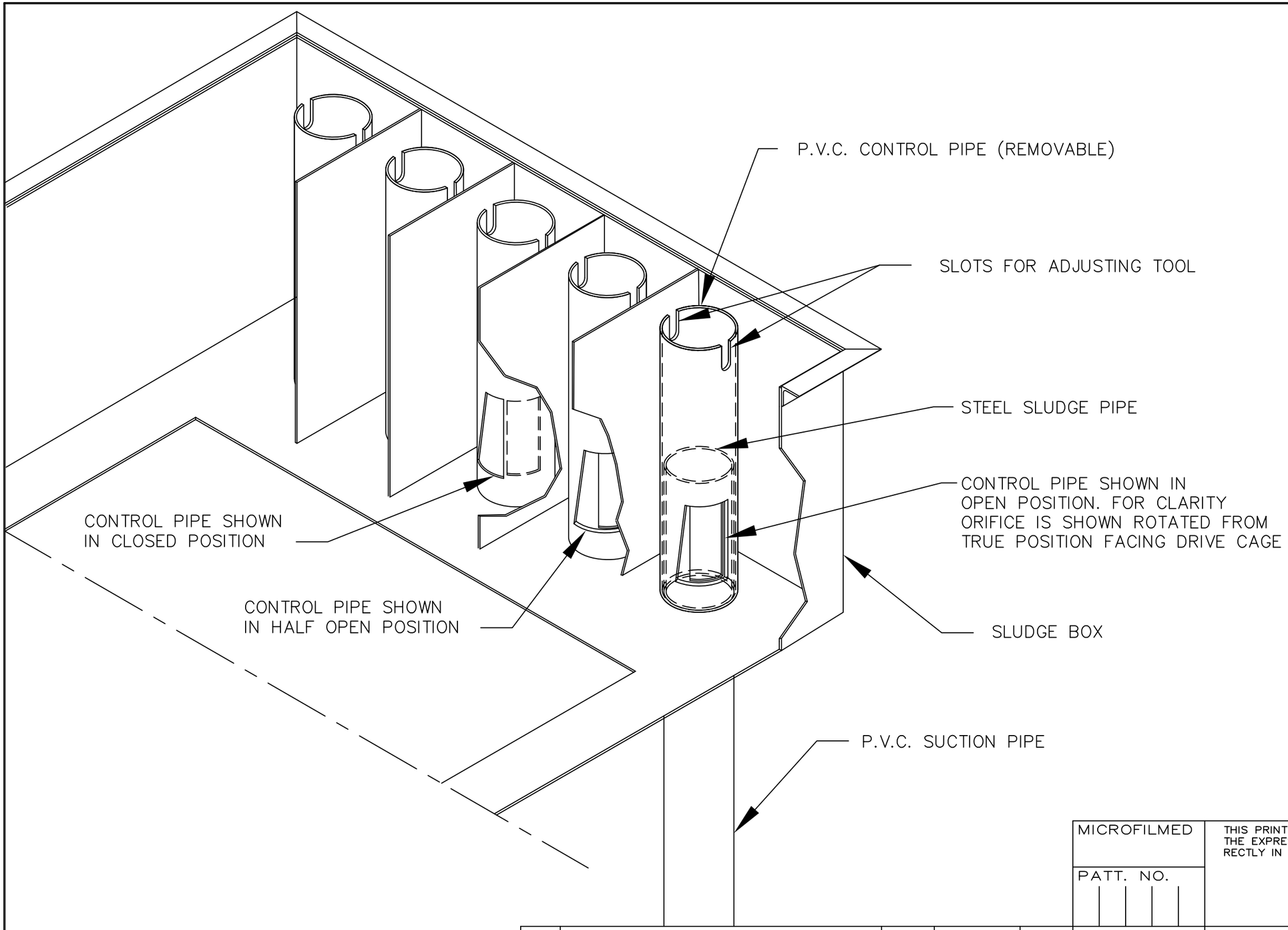
DRAWN	RES
CHECKED	
APP'D.	
DATE	1–11–11
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
SCUM TROUGH FLUSHING GATE

DRAWING NO. C,6,0,5|7,0,1,0,8|2,9,2 REV.

SLUDGE VALVE ASSEMBLY ERECTION DIAGRAM



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PATT. NO.

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AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

LIMITS UNLESS OTHERWISE SPECIFIED
FRACTIONAL
2 DECIMAL
3 DECIMAL
ANGULAR

WGT. WGT

DRAWN Walt
CHECKED
APP'D.
DATE 2–22–99
S.O. STD.
SCALE NONE

DESCRIPTION

ERECTION DIAGRAM
SLUDGE VALVE ASSEMBLY

DRAWING NO. B,6,0,5|5,0,1,7,0|2,9,2

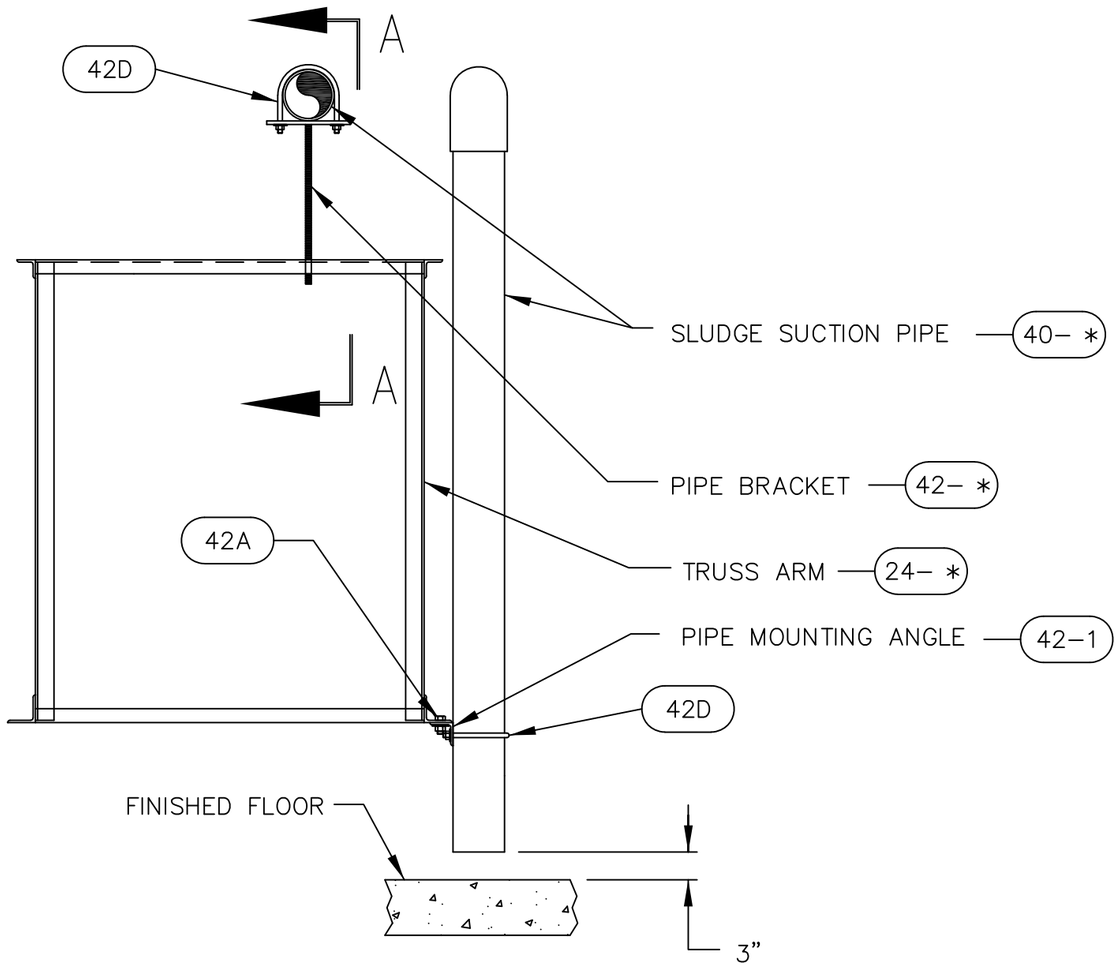
REV.

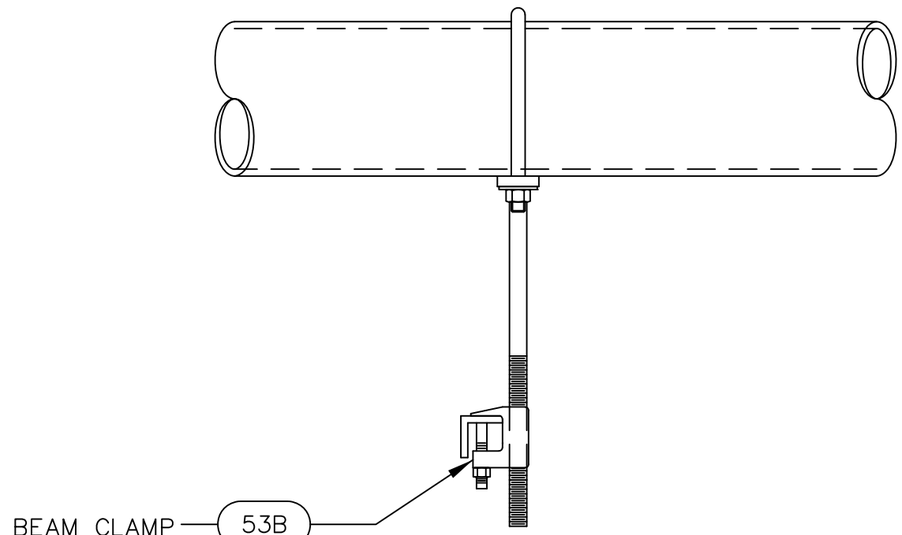
MASTER
B-50170

CAD FILE: \B50170\PLOT SCALE: 1"

PVC SLUDGE SUCTION PIPE MOUNTING TO TRUSS ARM ERECTION DIAGRAM

REF	DESCRIPTION	QTY
42A	CAPSCREW 5/8"–11NC X 1 1/2" LG	2
	NUT 5/8"–11NC	2
	WASHER 5/8" STD.	2
42D	U–BOLT	AS REQ'D
	NUT 1/2"–13NC	AS REQ'D
	WASHER 1/2" STD.	AS REQ'D





SECTION A–A

MICROFILMED

PATT. NO.

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AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

LIMITS UNLESS OTHERWISE SPECIFIED
FRACTIONAL
2 DECIMAL
3 DECIMAL
ANGULAR
WGT.

DRAWN Walt
CHECKED
APP'D.
DATE 5–5–99
S.O. STD
SCALE NONE

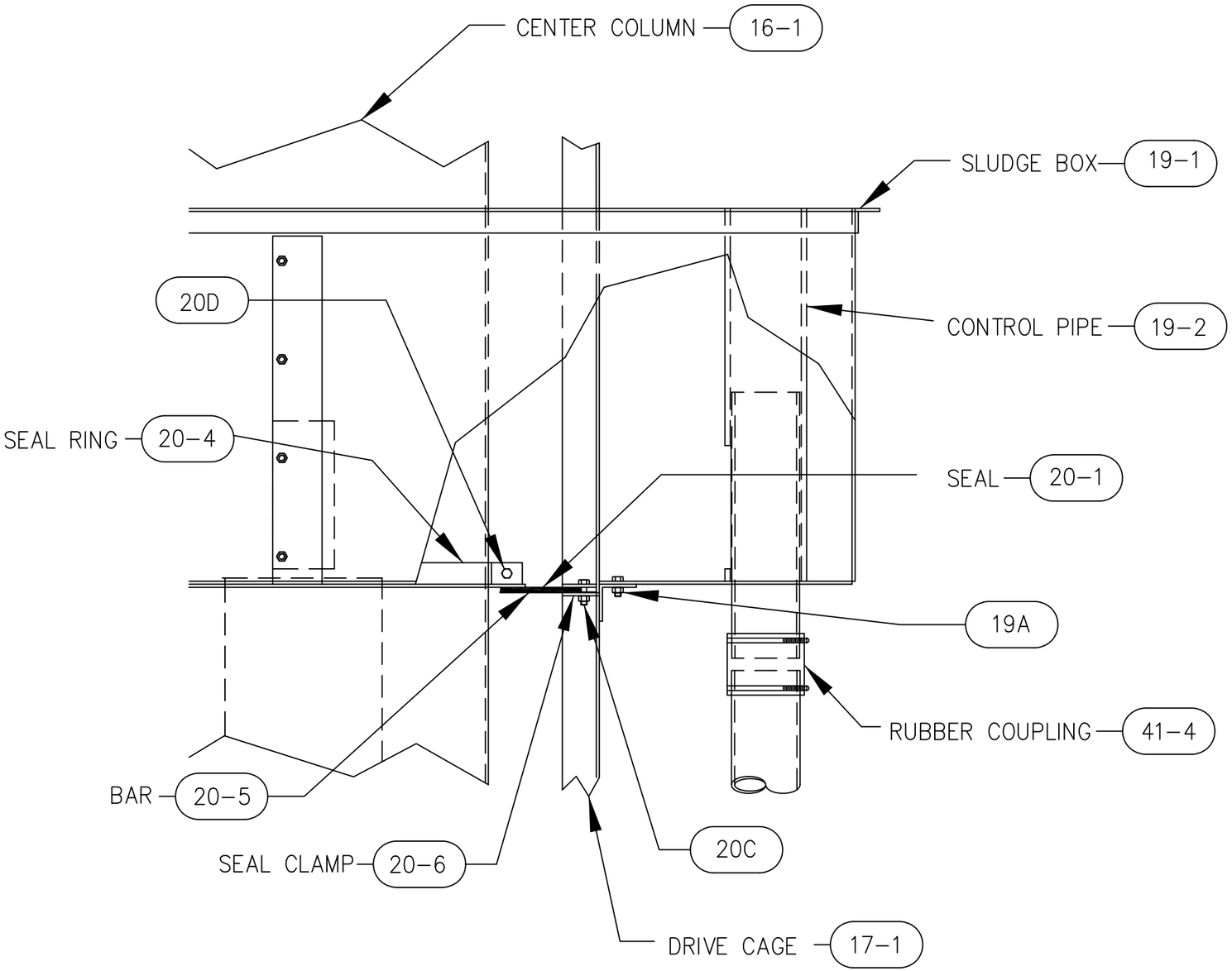
DESCRIPTION
ERECTION DIAGRAM
PVC SLUDGE SUCTION PIPE
MOUNTING TO TRUSS ARM

DRAWING NO. B.6.0.5|5.0.6.7.3|2.9.2

REV.

MASTER
B-50673

SLUDGE BOX SEAL & SLUDGE CONTROL PIPES ERECTION DIAGRAMS



REF	DESCRIPTION	QTY
19A	CAPSCREW 1/2"-13NC X 1 1/4" LG	AS REQ'D.
	NUT 1/2"-13NC	AS REQ'D.
20C	CAPSCREW 3/8"-16NC X 1 1/2" LG	AS REQ'D.
	NUT 3/8"-16NC	AS REQ'D.
20D	CAPSCREW 1/2"-13NC X 1 3/4" LG	2
	NUT 1/2"-13NC	2
	JAM NUT 1/2"-13NC	2

MICROFILMED

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SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

LIMITS UNLESS OTHERWISE SPECIFIED
FRACTIONAL
2 DECIMAL
3 DECIMAL
ANGULAR
WGT.

DRAWN Walt
CHECKED
APP'D.
DATE 5-5-99
S.O. STD
SCALE NONE

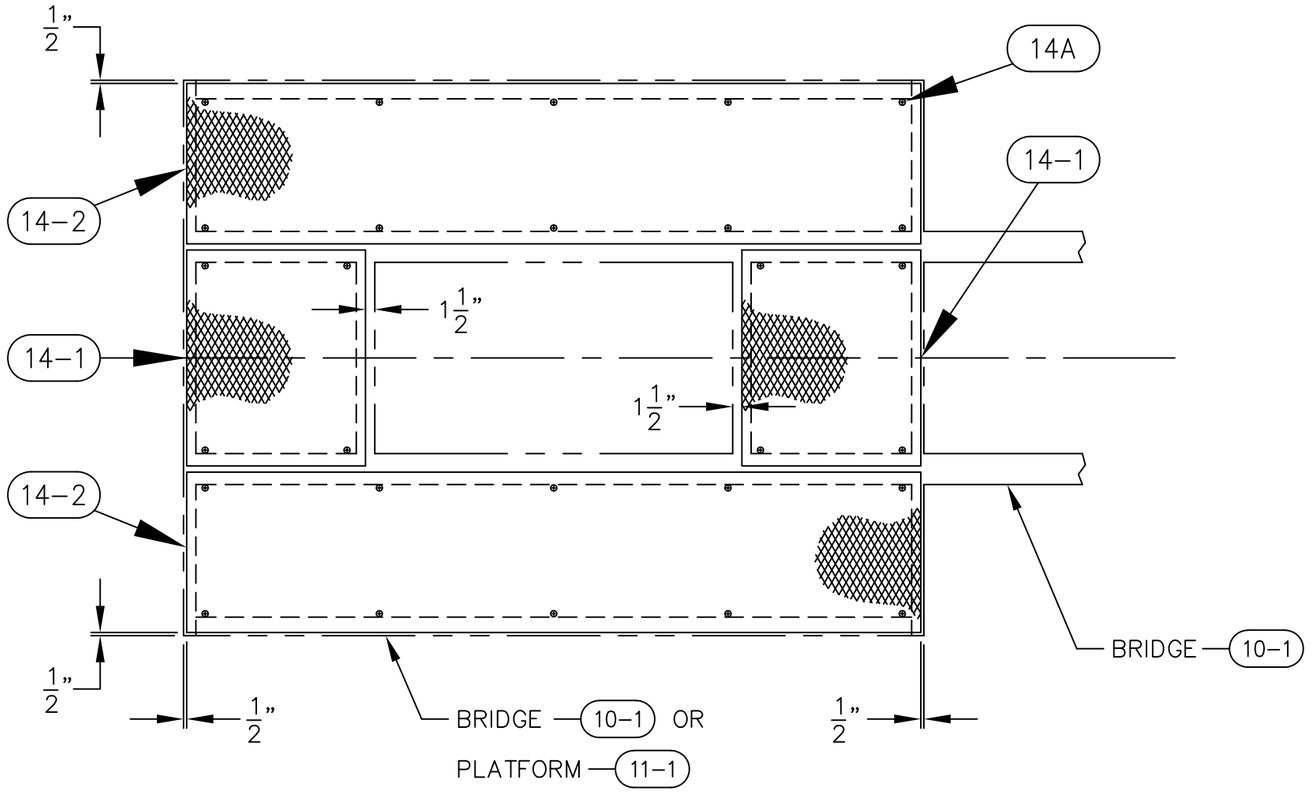
DESCRIPTION
ERECTION DIAGRAM
SLUDGE BOX SEAL AND
SLUDGE CONTROL PIPES

DRAWING NO. B.6.0.5|5.0.6.7.2|2.9.2 REV.

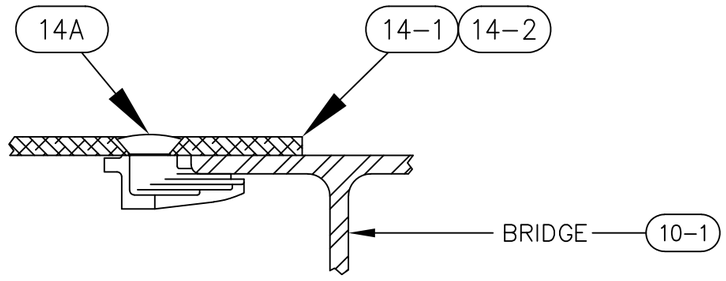
MASTER
B-50672

WALKWAY PLATE BRIDGE PLATFORM ERECTION DIAGRAM

REF	DESCRIPTION	QTY
14–1	WALKWAY PLATE – PLATFORM END	2
14–2	WALKWAY PLATE – PLATFORM SIDE	2
14A	FLOOR–FAST FASTENER W/ SCREW	AS REQ'D



PLAN – BRIDGE PLATFORM



MOUNTING DETAIL

CAD FILE: B64268

MASTER
B-58186

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

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DRAWN	RES
CHECKED	
APP'D.	
DATE	2–7–08
S.O.	STD
SCALE	NONE

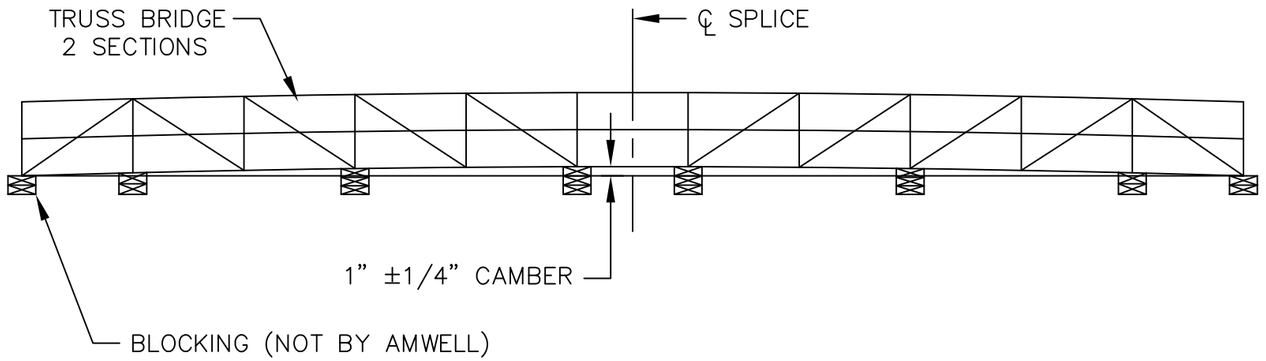
DESCRIPTION

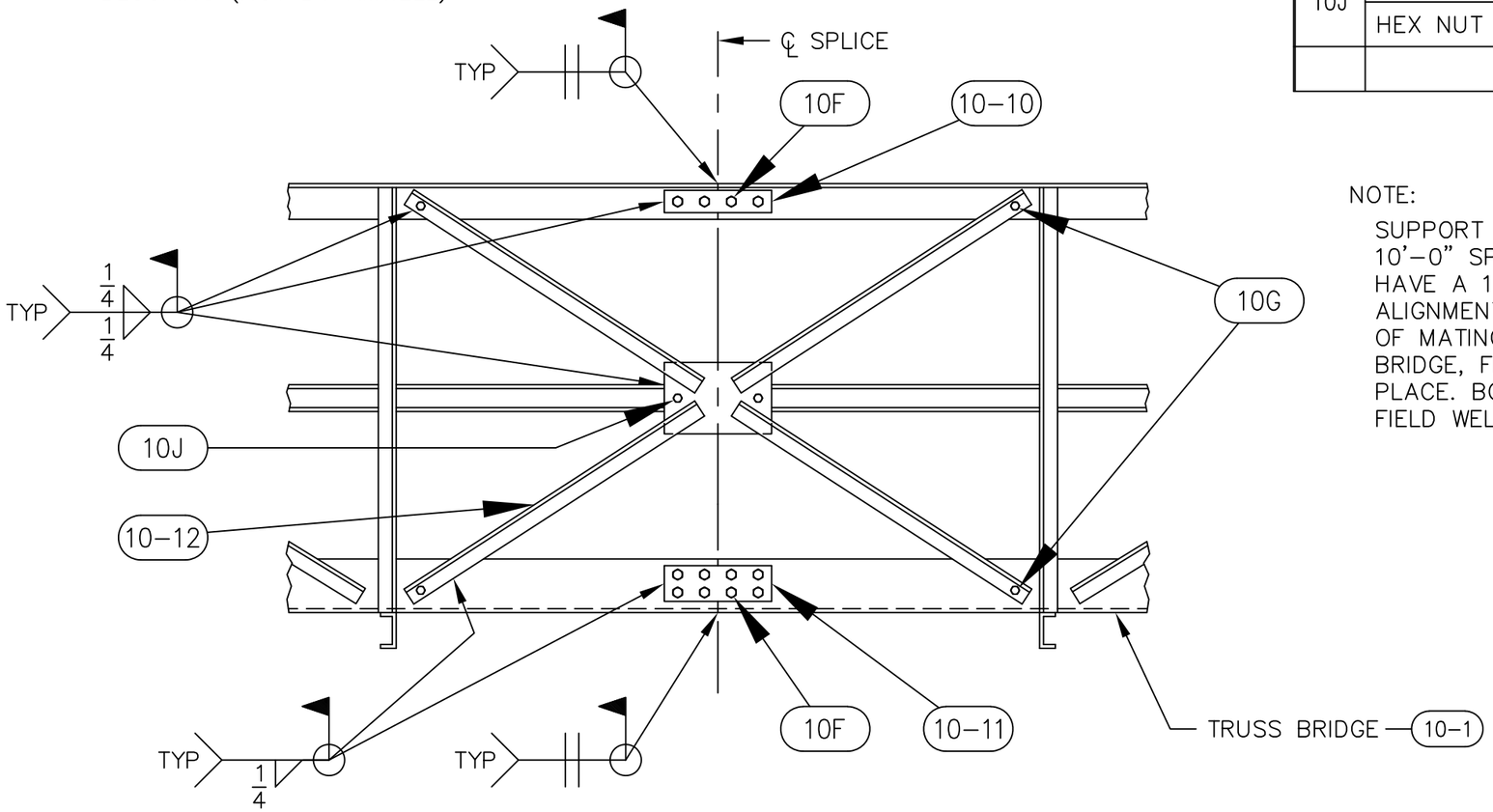
ERECTION DIAGRAM
WALKWAY PLATE – BRIDGE PLATFORM

DRAWING NO. B.6.0.5|6.4.2.6.8|2.9.2

REV.

TRUSS BRIDGE
SPLICE CONNECTION
ERECTION DIAGRAM





ELEVATION

REF	DESCRIPTION		QTY
10–10	SPLICE PLATE – UPPER		2
10–11	SPLICE PLATE – LOWER		2
10–12	SPLICE DIAGONAL		2
10F	CAPSCREW 5/8"–11NC X 1 1/2" LG		24
	HEX NUT 5/8"–11NC		24
10G	CAPSCREW 1/2"–13NC X 1 1/4" LG		8
	HEX NUT 1/2"–13NC		8
10J	CAPSCREW 1/2"–13NC X 2" LG		4
	HEX NUT 1/2"–13NC		4

NOTE:

SUPPORT THE BRIDGE SECTIONS ON BLOCKING (AT APPROX 10'–0" SPACES) TO INSURE THAT THE BRIDGE SECTIONS HAVE A 1" ±1/4" CAMBER AT THE CENTER. AFTER PROPER ALIGNMENT, BOLT SPLICE PLATES (10–10) & (10–11) TO EACH SET OF MATING ANGLES.AFTER RECHECKING LEVEL OF BRIDGE, BRIDGE, FIELD WELD MATING ANGLES AND SPLICE PLATES IN PLACE. BOLT THR SPLICE DIAGONALS (10–12) IN PLACE AND FIELD WELD.

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SYM	REVISION	BY	DATE	CHKD
B				
A				

DRAWN	RES
CHECKED	
APP'D.	
DATE	1–17–06
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
TRUSS BRIDGE SPLICE CONNECTION
47'–0" THRU 57'–0"

DRAWING NO. B60561463292 REV.

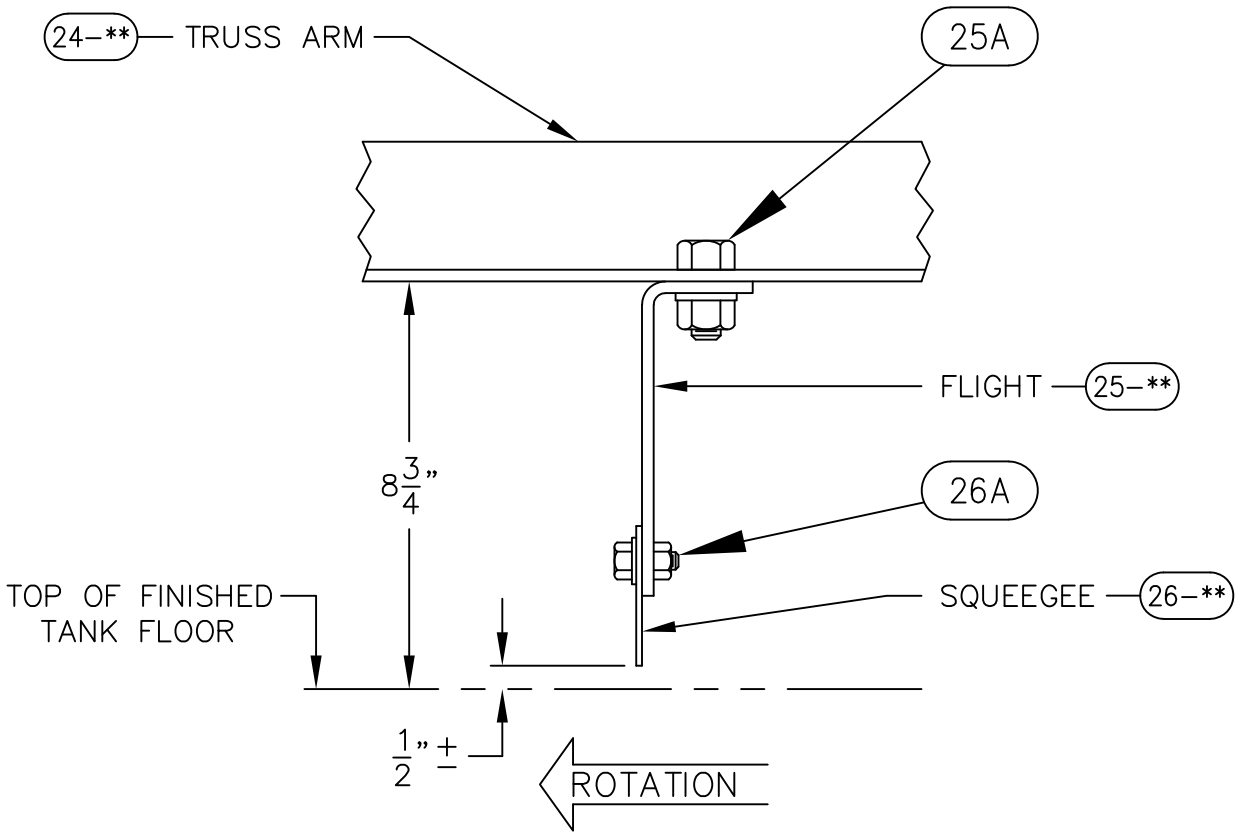
MASTER B-61463

CAD FILE: B61463

ERECTION DIAGRAMS

(In Numerical Order By Middle Five Digits)
Example: A605-***10010***-292
A605-***10011***-292
A605-***10012***-292
Refer to Installation Instructions and
Master Erection Diagram for Corresponding
Drawing Numbers

SYM	REVISION	BY	DATE	CHKD
A				



* QUANTITY PER FLIGHT

REF	DESCRIPTION	* QTY
26A	WASHER 3/8" STD	AS REQD
	HEX NUT 3/8"-16NC	AS REQD
	CAPSCREW 3/8"-16NC X 1" LG	AS REQD
25A	WASHER 5/8" (S.A.E.)	2
	HEX NUT 5/8"-11NC	2
	CAPSCREW 5/8"-11NC X 1 1/2" LG	2

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DRAWN RES
CHECKED
APP'D.
DATE 12-5-91

DESCRIPTION

ERECTION DIAGRAM
FLIGHT & SQUEEGEE

MASTER
A-35022

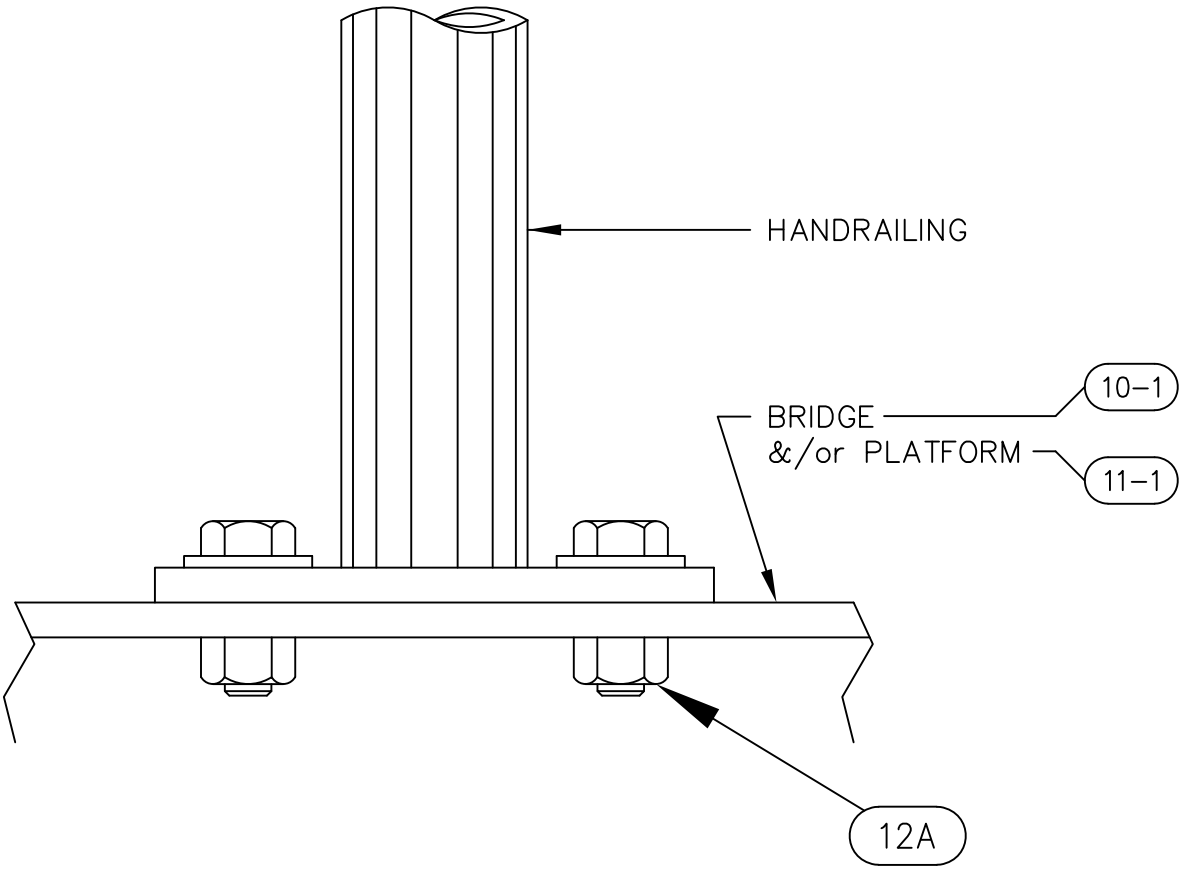
S.O. STD
SCALE NONE

DRAWING NO. A605|35022|292

REV.

CAD FILE: A35022

SYM	REVISION	BY	DATE	CHKD
A				



* QUANTITY PER FLANGE

REF	DESCRIPTION	* QTY
12A	WASHER 1/2" STD	2
	HEX NUT 1/2"-13NC	2
	CAPSCREW 1/2"-13NC X 1 3/4" LG	2

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DRAWN RES
CHECKED
APP'D.
DATE 2-24-78

DESCRIPTION

ERECTION DIAGRAM
HANDRAIL MOUNTING

MASTER
A-38949

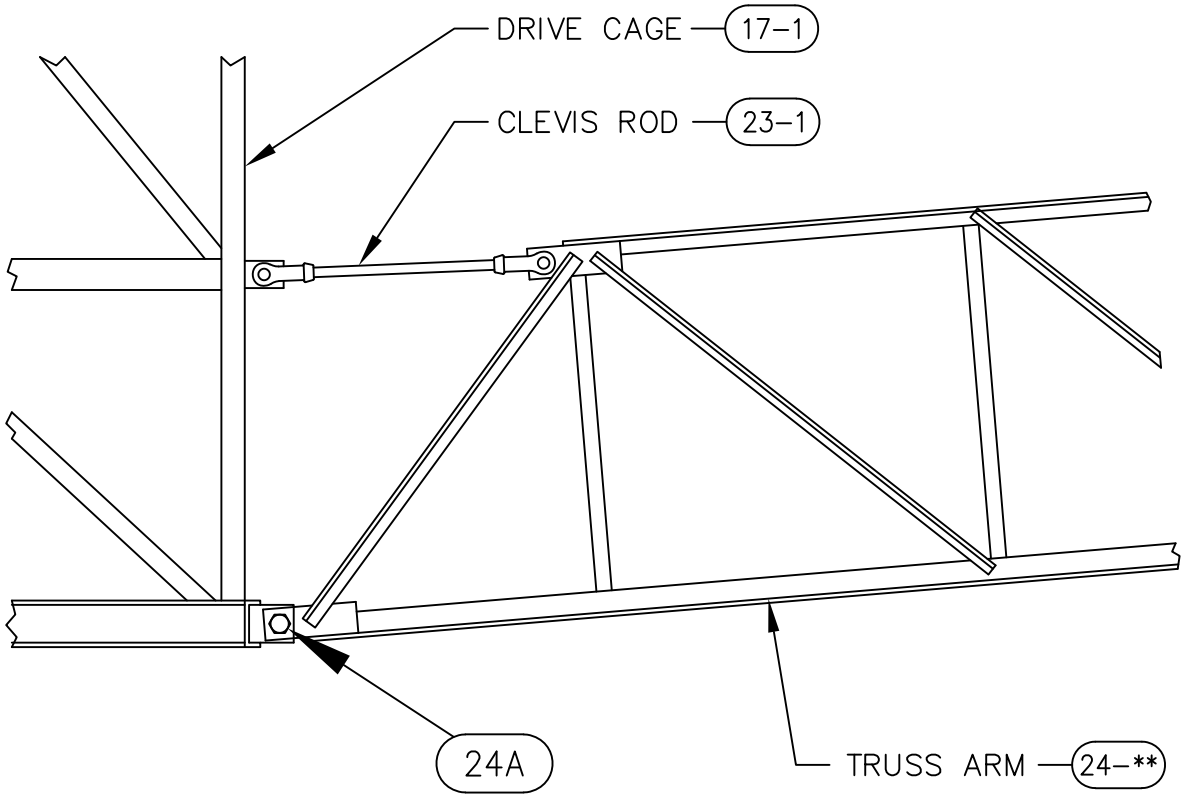
S.O. STD
SCALE NONE

DRAWING NO. A605|38949|292

REV.

CAD FILE: A38949

SYM	REVISION	BY	DATE	CHKD
A				



* QUANTITY PER TRUSS ARM

REF	DESCRIPTION	* QTY
24A	HEX NUT 1 1/2"-6NC	2
	CAPSCREW 1 1/2"-6NC X 4 1/2" LG	2

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DRAWN RES
CHECKED
APP'D.
DATE 12-5-91

DESCRIPTION

ERECTION DIAGRAM
TRUSS ARM

MASTER
A-38971

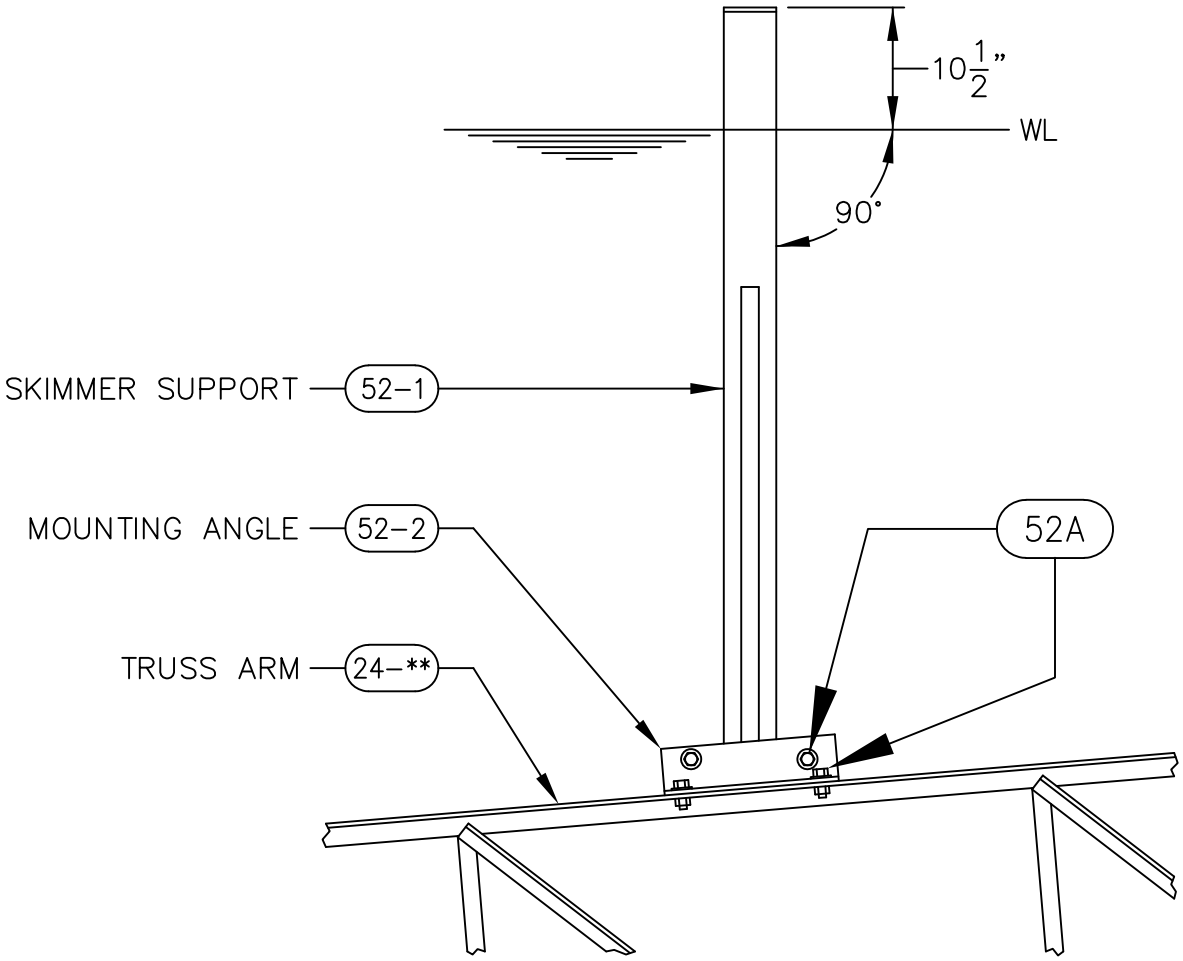
S.O. STD
SCALE NONE

DRAWING NO. A605|389|712|92

REV.

CAD FILE: A38971

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION	QTY
52A	WASHER 5/8" STD	8
	HEX NUT 5/8"-11NC	8
	CAPSCREW 5/8"-11NC X 1 1/2" LG	8

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DRAWN RES
CHECKED
APP'D.
DATE 8-31-92

DESCRIPTION

ERECTION DIAGRAM
SKIMMER SUPPORT

MASTER
A-38973

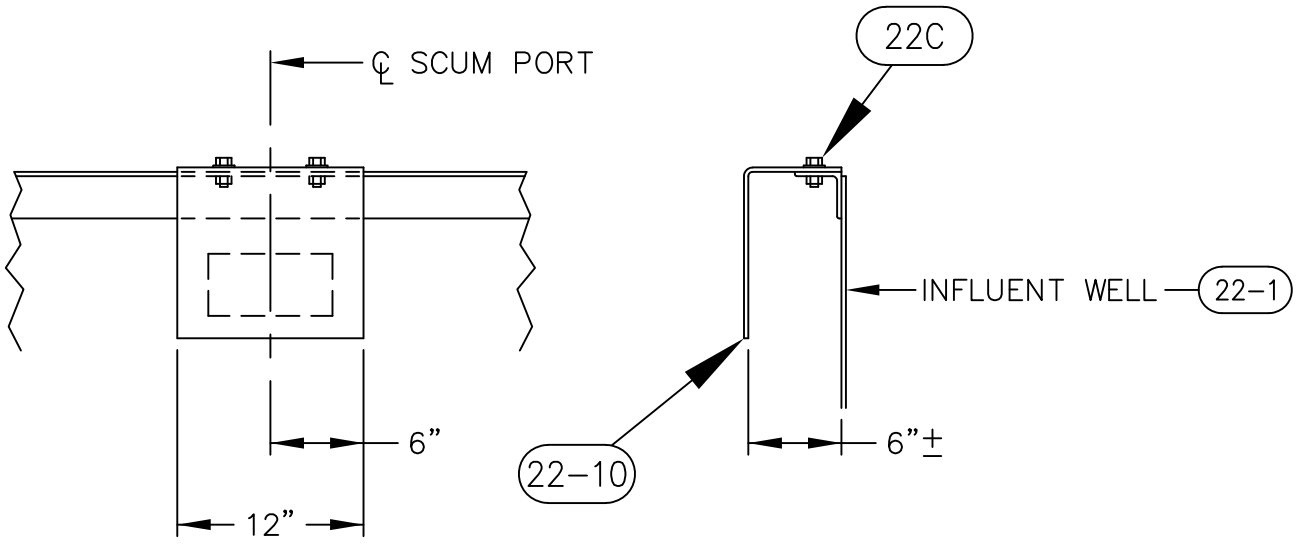
S.O. STD
SCALE NONE

DRAWING NO. A605|38973|292

REV.

CAD FILE: A38973

SYM	REVISION	BY	DATE	CHKD
A				



* QUANTITY PER BAFFLE

REF	DESCRIPTION	QTY
22C	WASHER 1/2" STD	* 2
	HEX NUT 1/2"–13NC	* 2
	CAPSCREW 1/2"–13NC X 1 1/4" LG	* 2
22–10	BAFFLE	AS REQD

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DRAWN RES
CHECKED
APP'D.
DATE 5–1–91
S.O. STD
SCALE NONE

DESCRIPTION

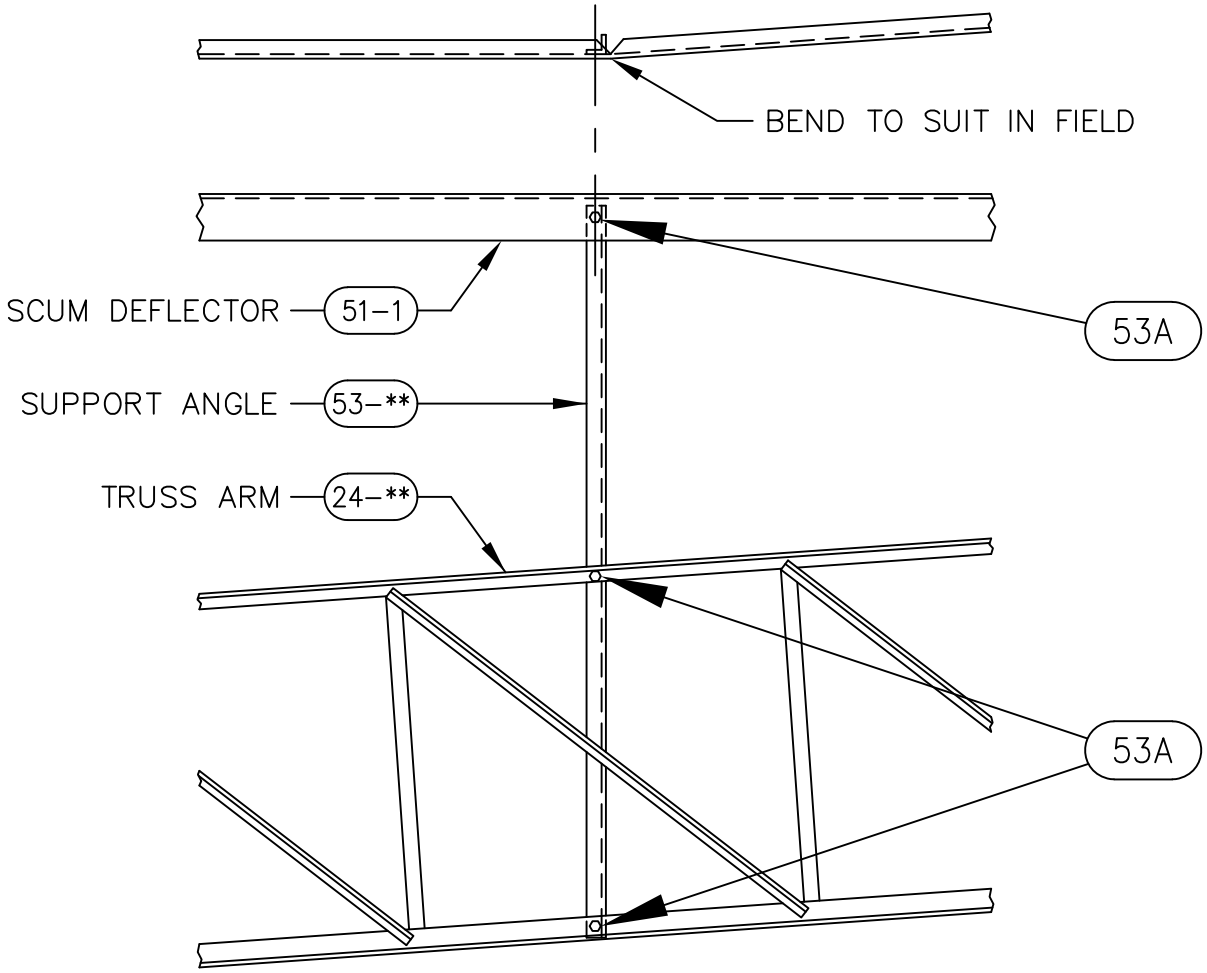
ERECTION DIAGRAM
INFLUENT WELL SCUM PORT BAFFLE

MASTER
A-40169

DRAWING NO. A605|401692|92 REV.

CAD FILE: A40169

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION	QTY
53A	WASHER 5/8" STD	3
	HEX NUT 5/8"-11NC	3
	CAPSCREW 5/8"-11NC X 1 1/2" LG	3

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

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DRAWN RES
CHECKED
APP'D.
DATE 7-24-95
S.O. STD
SCALE NONE

DESCRIPTION

ERECTION DIAGRAM
SCUM DEFLECTOR SUPPORT – MID

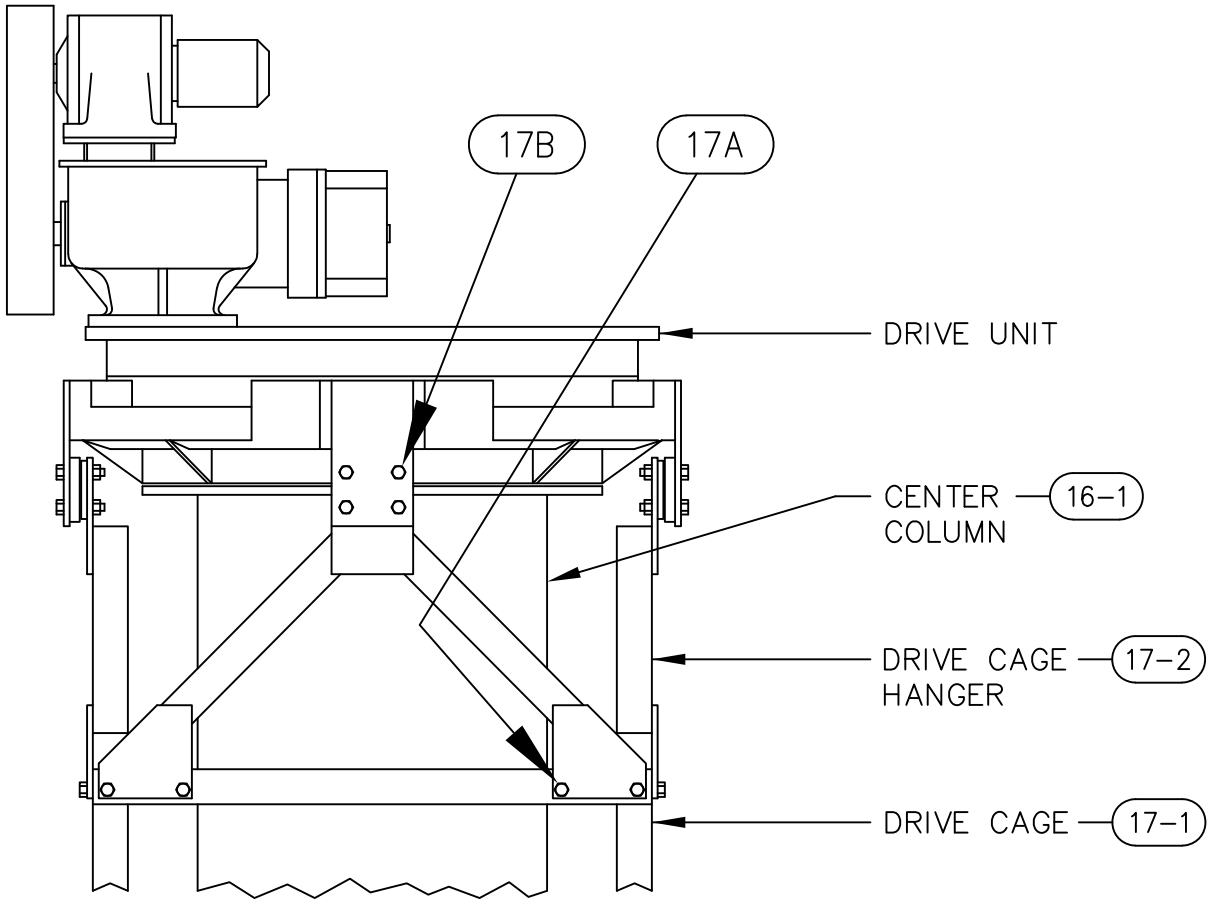
MASTER
A-43990

DRAWING NO. A605|43990|292

REV.

CAD FILE: A43990

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION		QTY
17B	HEX NUT 5/8"-11NC		16
	CAPSCREW 5/8"-11NC X 3 1/2" LG		16
17A	JAM NUT 5/8"-11NC		16
	HEX NUT 5/8"-11NC		16
	CAPSCREW 5/8"-11NC X 2" LG		16

DRIVE: 42 (A)
CAGE: 4'-0"

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AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS - EST. 1868)

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DRAWN RES
CHECKED
APP'D.
DATE 8-28-92

DESCRIPTION

ERECTION DIAGRAM
DRIVE, CAGE & HANGERS

MASTER
A-44286

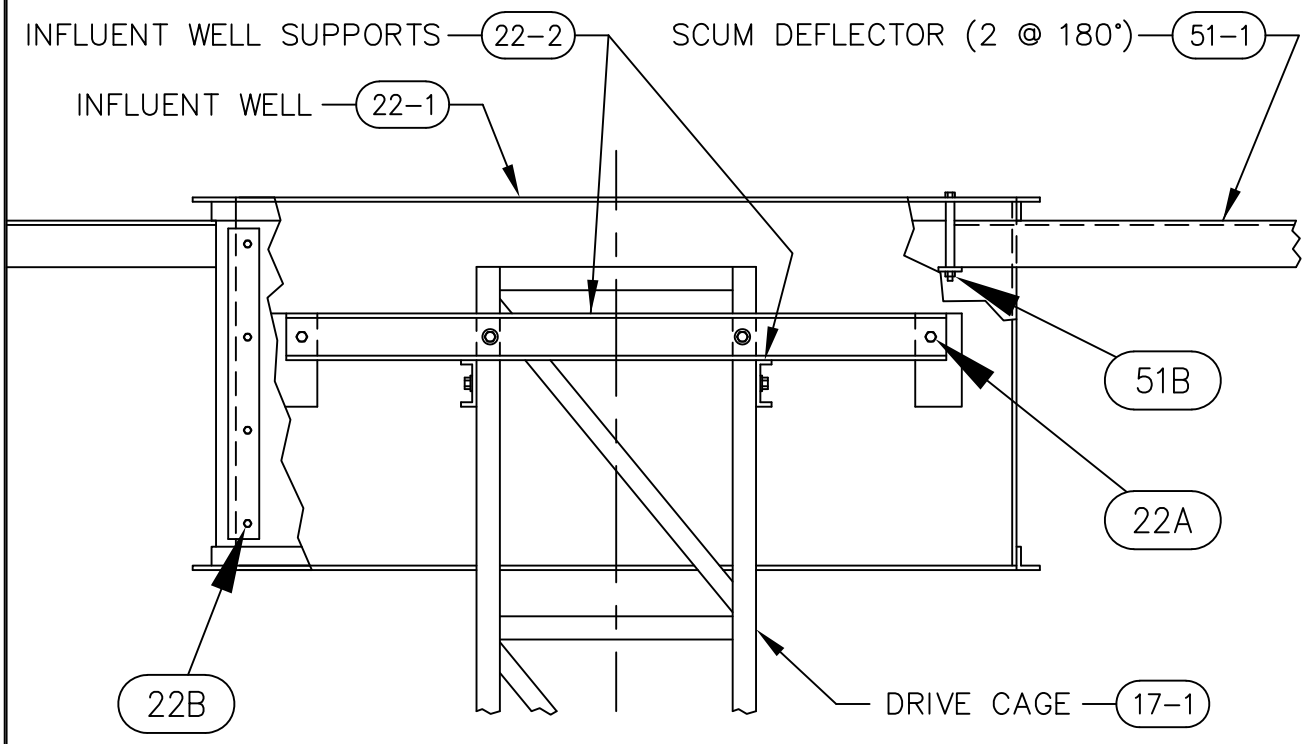
S.O. STD
SCALE NONE

DRAWING NO. A605|44286|292

REV.

CAD FILE: A44286

NOTE: MOUNT INFLUENT WELL SO THAT THE SCUM DEFLECTOR MOUNTING HOLES ARE ON THE SAME SIDE AS THE SKIMMERS.



REF	DESCRIPTION	QTY
51B	HEX NUT 5/8"–11NC	2
	CAPSCREW 5/8"–11NC X 10" LG	2
22B	HEX NUT 1/2"–13NC	AS REQD
	CAPSCREW 1/2"–13NC X 1 1/4" LG	AS REQD
22A	WASHER 3/4" STD	16
	JAM NUT 3/4"–10NC	16
	HEX NUT 3/4"–10NC	16
	CAPSCREW 3/4"–10NC X 2 1/2" LG	16

WITH TWO (2) SKIMMERS
14'–0" THRU 26'–0" DIA

AMWELL
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AURORA, ILLINOIS, USA
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DRAWN RES
CHECKED
APP'D.
DATE 4–25–96

DESCRIPTION
ERECTION DIAGRAM
INFLUENT WELL

MASTER
A-45241

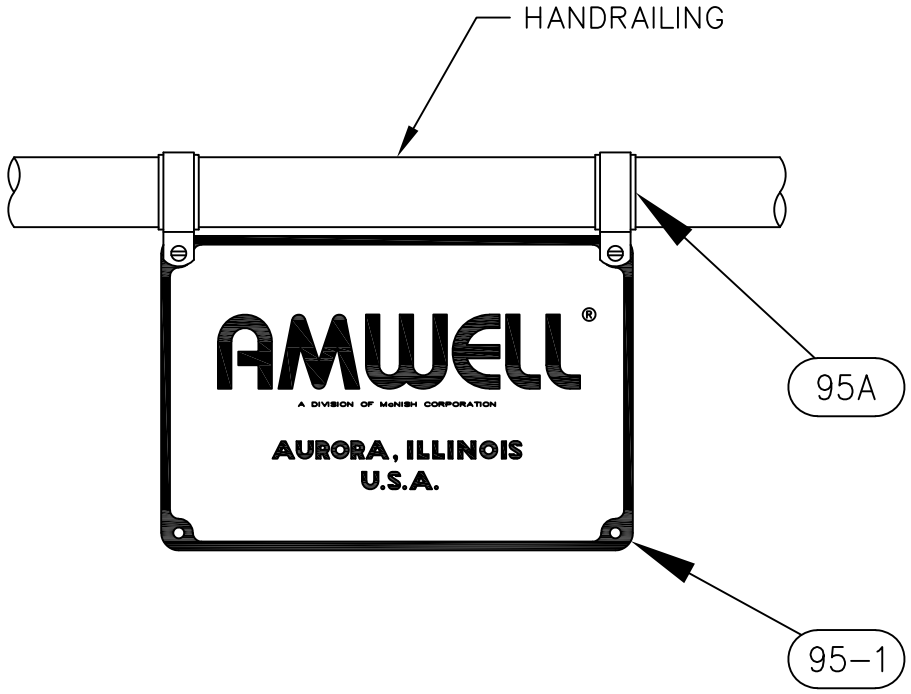
S.O. STD
SCALE NONE

DRAWING NO. A605|45241|292

REV.

CAD FILE: A45241

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION	QTY
95A	HEX NUT #10–24NC	2
	RD HD SCREW #10–24NC X 1/2" LG	2
	PIPE RING CLAMP	2
95–1	NAMEPLATE	1

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

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DRAWN RES
CHECKED
APP'D.
DATE 1–14–98
S.O. STD
SCALE NONE

DESCRIPTION

ERECTION DIAGRAM
NAMEPLATE

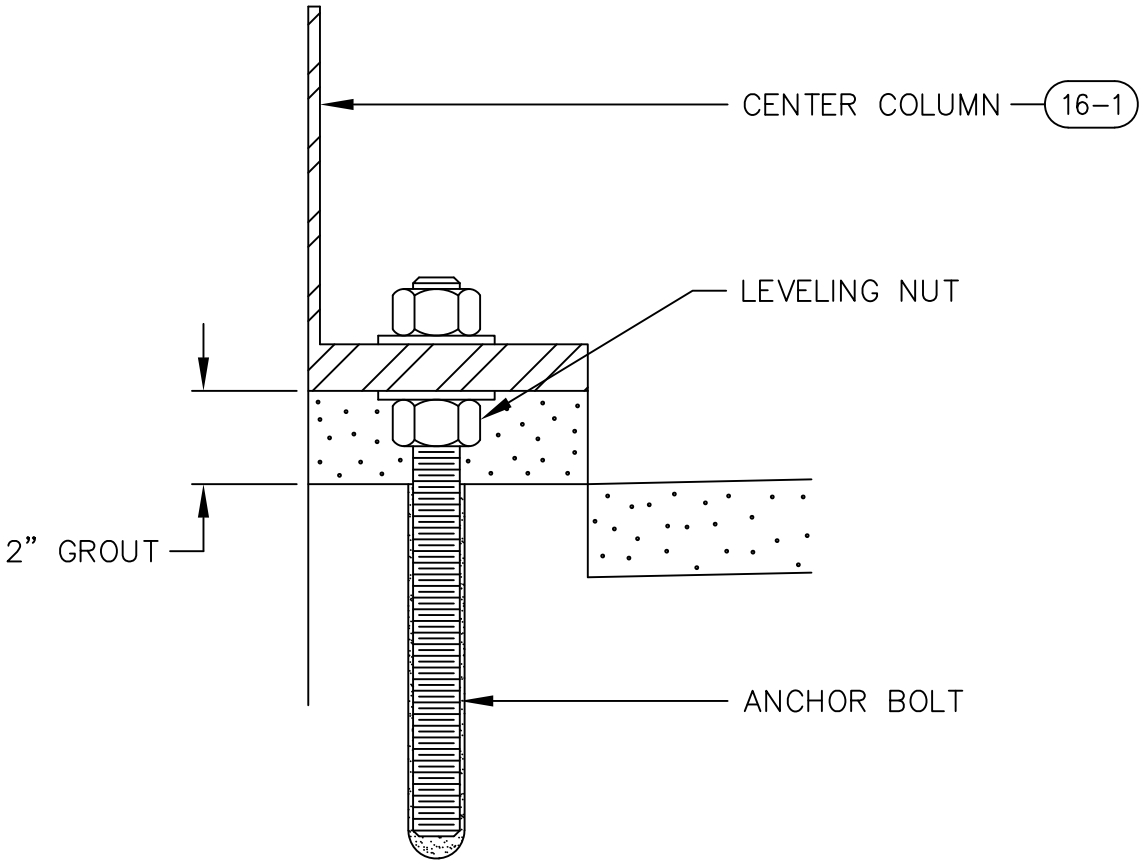
MASTER
A-48120

DRAWING NO. A605|48120|292

REV.

CAD FILE: A48120

SYM	REVISION	BY	DATE	CHKD
A				



AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

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DRAWN	RES
CHECKED	
APP'D.	
DATE	1–14–02
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
CENTER COLUMN MOUNTING

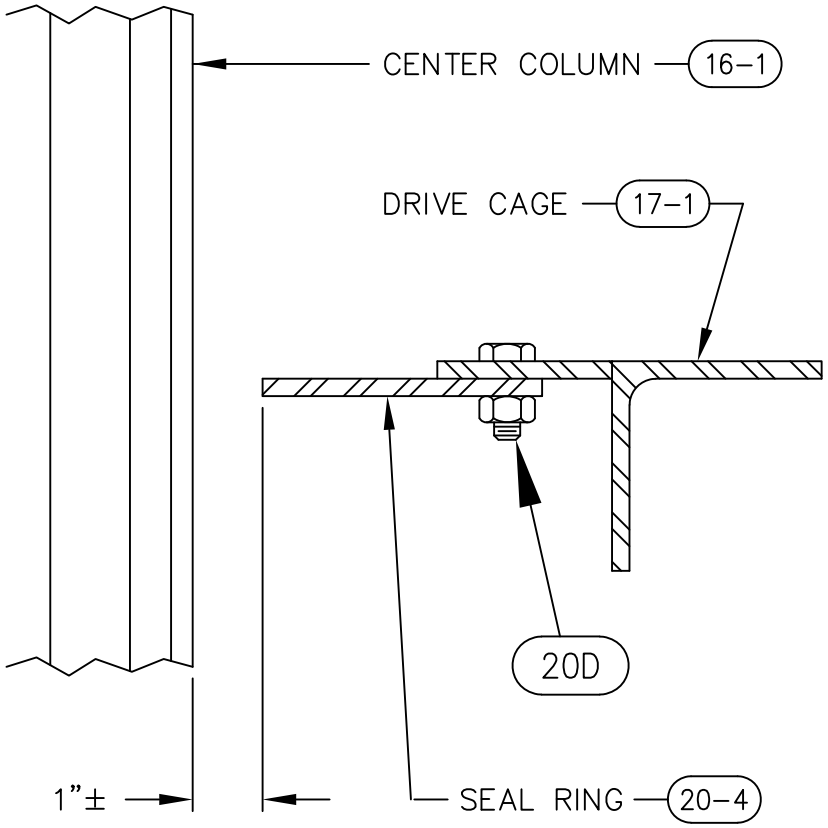
MASTER
A-55037

DRAWING NO. A605|55037|292

REV.

CAD FILE: A55037

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION	QTY
20D	HEX NUT 3/8"-16NC	12
	CAPSCREW 3/8"-16NC X 1" LG	12

4'-0" DRIVE CAGE

AMWELL
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DRAWN RES
CHECKED
APP'D.
DATE 12-8-03

DESCRIPTION

ERECTION DIAGRAM
SEAL RING

MASTER
A-58035

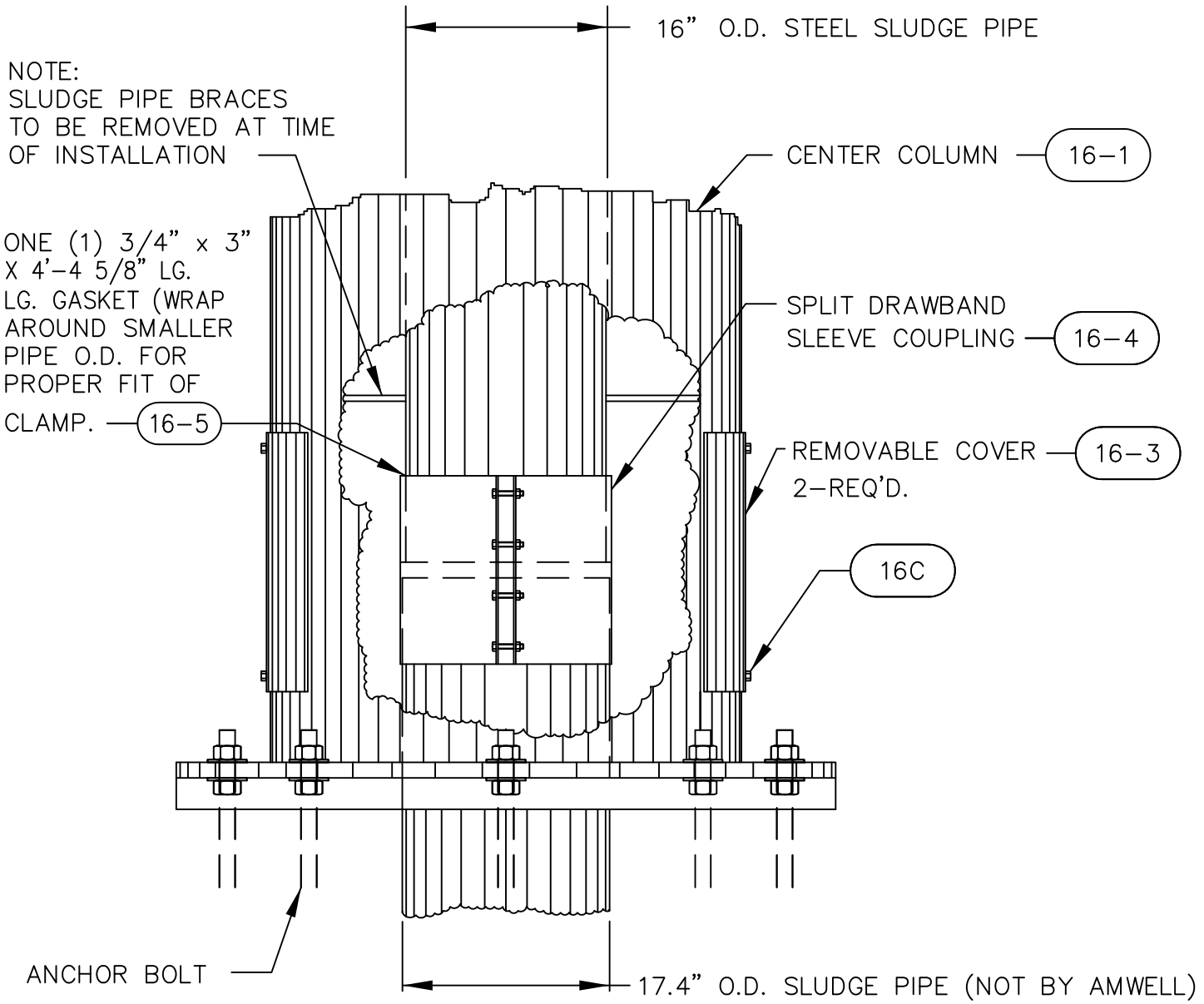
S.O. STD
SCALE NONE

DRAWING NO. A605|58035|292

REV.

CAD FILE: A58035

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION	QTY
16C	CAPSCREW 3/8"-16NC X 3/4" LG.	16

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DRAWN	Walt
CHECKED	
APP'D.	
DATE	12-4-08
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
CENTER COLUMN & 16" SLUDGE
DRAW-OFF PIPE MOUNTING

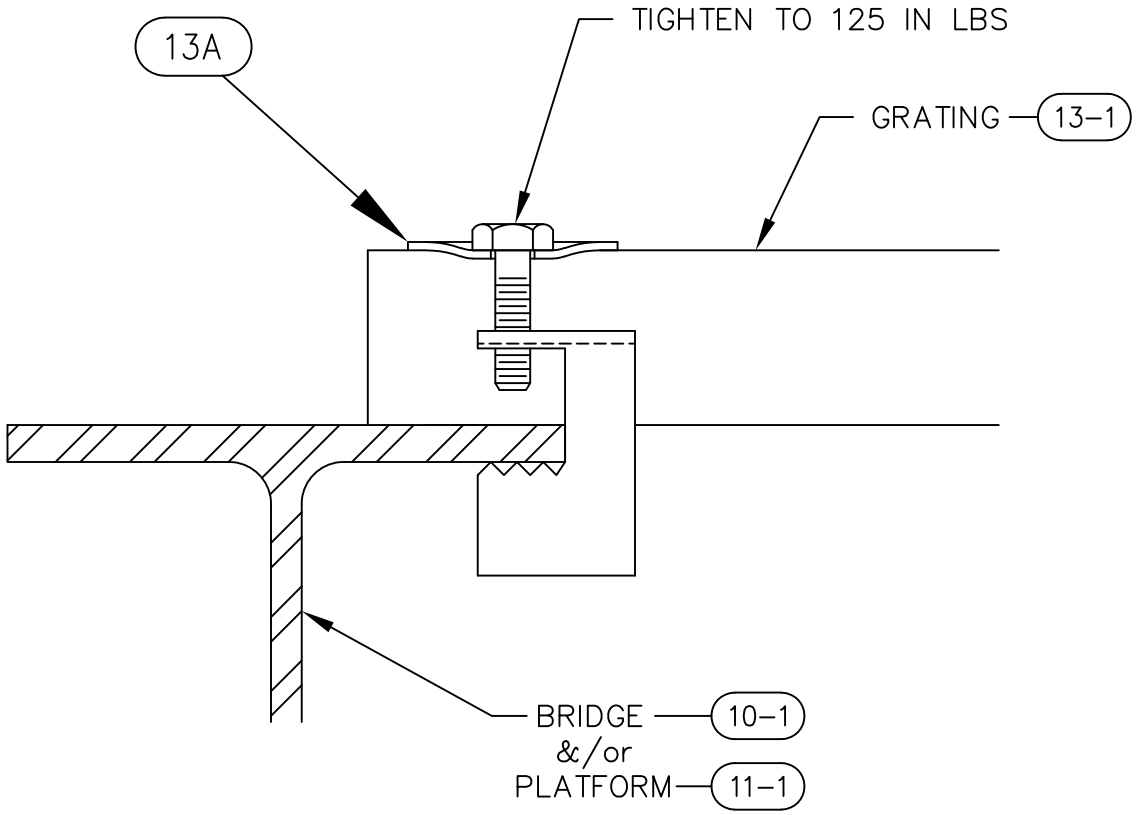
MASTER
A-19247

DRAWING NO. A 6 0 5 6 5 7 7 8 2 9 2

REV.

CAD FILE: A65778\PLOT SCALE: 10.67

SYM	REVISION	BY	DATE	CHKD
A				



MOUNTING DETAIL

REF	DESCRIPTION	QTY
13A	GRATING CLAMP	AS REQD

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

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DRAWN WTW
CHECKED
APP'D.
DATE 5/25/12

DESCRIPTION
ERECTION DIAGRAM
GRATING

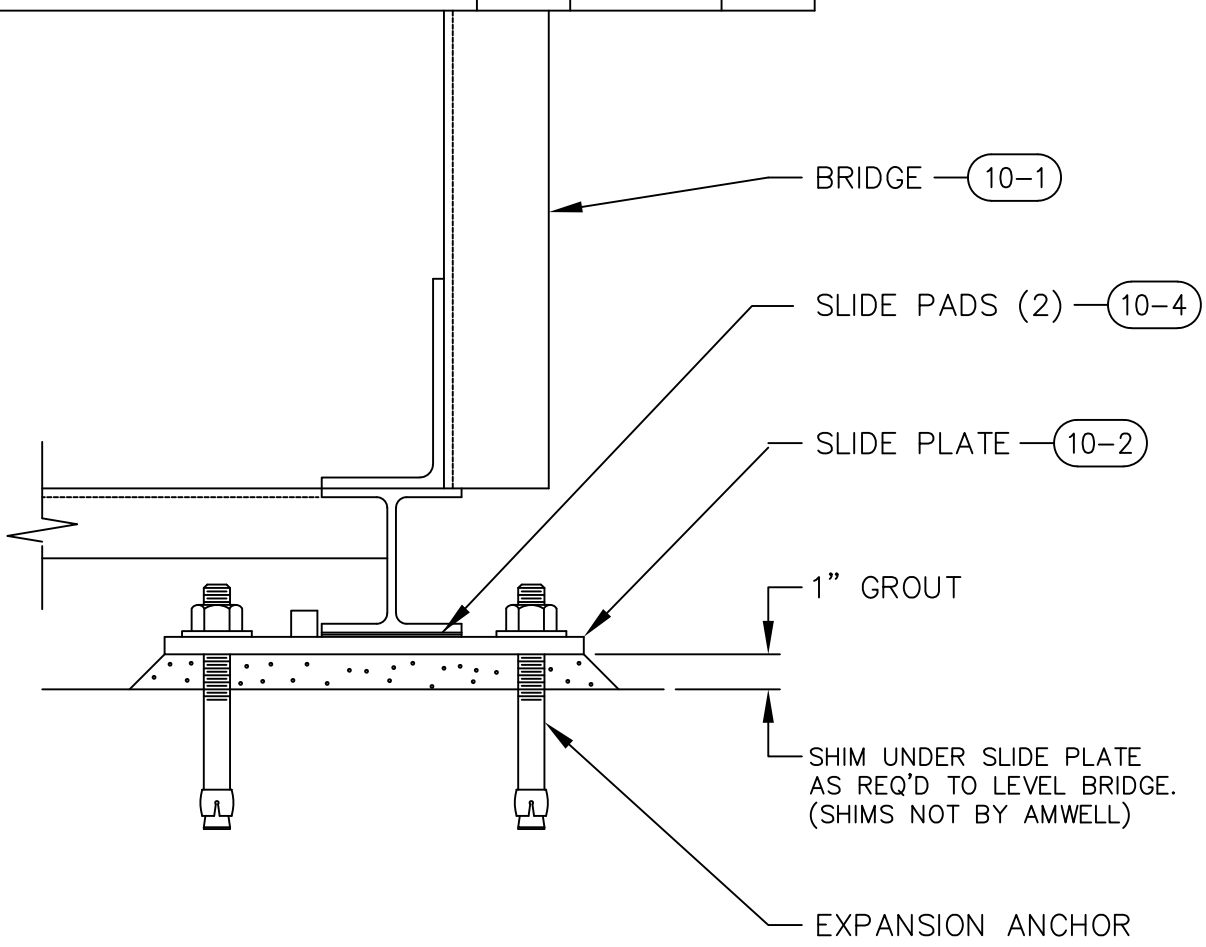
MASTER
A-53926

S.O. STD
SCALE NONE

DRAWING NO. A605726922 REV.

CAD FILE: A72692

SYM	REVISION	BY	DATE	CHKD
A				



NOTE: THIS END MUST ALWAYS BE FREE TO SLIDE, DUE TO THERMAL EXPANSION AND CONTRACTION OF THE BRIDGE. ANY CONDUIT OR PIPING THAT IS ATTACHED TO THE BRIDGE MUST END IN A FLEXIBLE CONNECTION AT THE ACCESS END OF THE BRIDGE. CONCRETE WALLS AND/OR STEPS MUST BE A MINIMUM OF 1" AWAY FROM THE BRIDGE END.

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DRAWN Walt
CHECKED
APP'D.
DATE 12-13-22
S.O. STD
SCALE NONE

DESCRIPTION

ERECTION DIAGRAM
BRIDGE MOUNTING – SLIDE PLATE

MASTER
A-46406

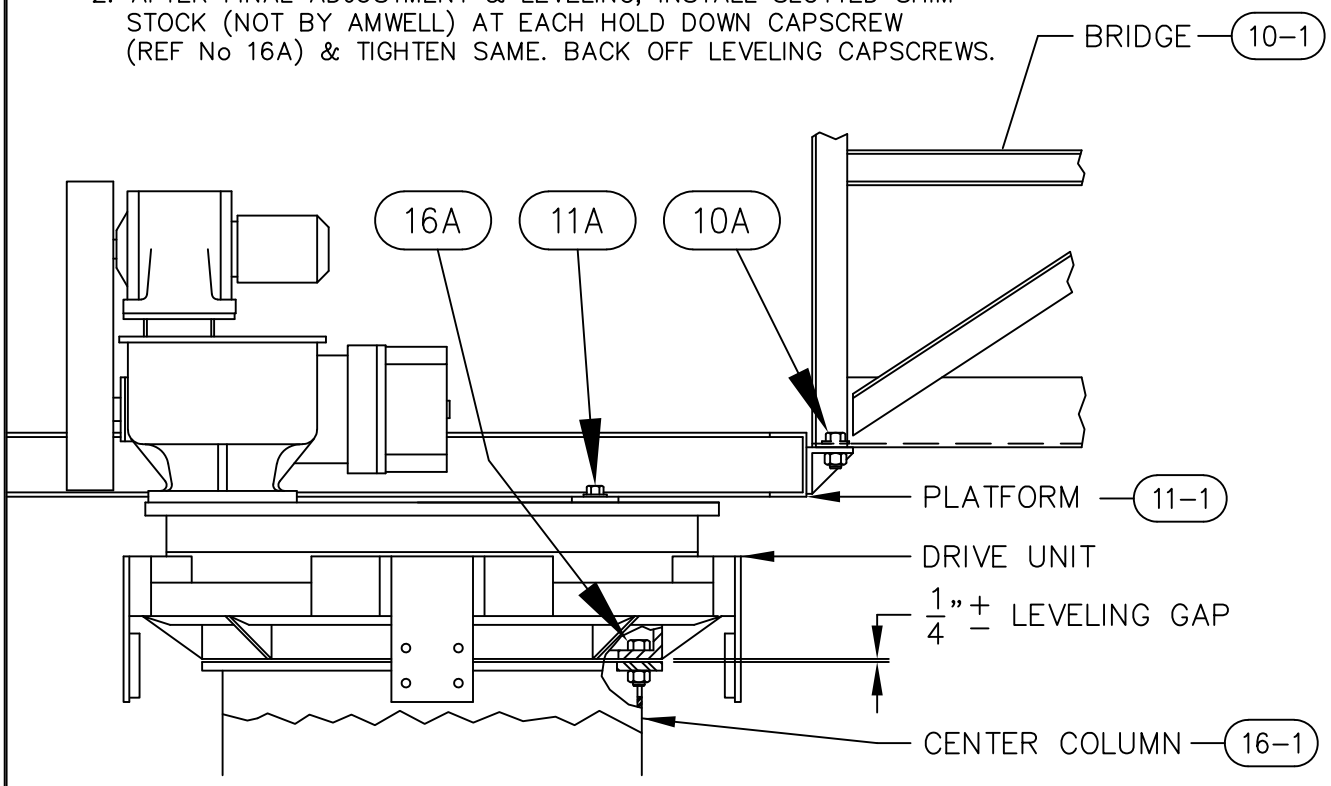
DRAWING NO.
A605-85833-292

REV.

NOTES:

1. MOUNT CENTER COLUMN SO THAT THE TOP FLANGE MOUNTING HOLES STRADDLE THE BRIDGE CENTERLINE.

2. AFTER FINAL ADJUSTMENT & LEVELING, INSTALL SLOTTED SHIM STOCK (NOT BY AMWELL) AT EACH HOLD DOWN CAPSCREW (REF No 16A) & TIGHTEN SAME. BACK OFF LEVELING CAPSCREWS.



REF	DESCRIPTION	QTY
16A	NUT 1"-8NC	8
	CAPSCREW 1"-8NC X 3 1/2" LG	8
11A	WASHER 3/4" STD	4
	CAPSCREW 3/4"-10NC X 1 1/2" LG	4
10A	WASHER 7/8" STD	4
	NUT 7/8"-9NC	2
	CAPSCREW 7/8"-9NC X 2 1/2" LG	2

DRIVE: 42 (A)
COL: 3'-0"

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AURORA, ILLINOIS, USA
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DRAWN Walt
CHECKED
APP'D.
DATE 12-13-22
S.O. STD
SCALE NONE

DESCRIPTION

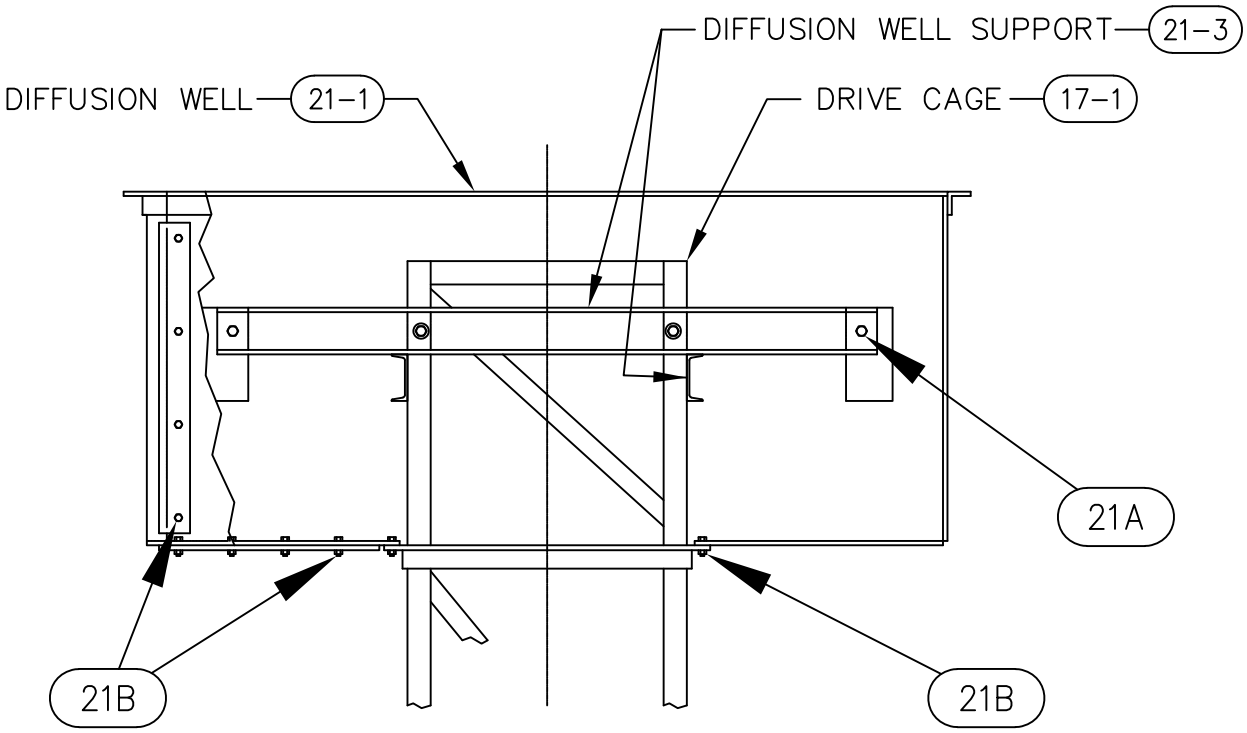
ERECTION DIAGRAM
DRIVE, COLUMN, PLATFORM & BRIDGE

MASTER
A-55440

DRAWING NO.
A605-85834-292

REV.

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION	QTY
21B	HEX NUT 1/2"-13NC	AS REQD
	CAPSCREW 1/2"-13NC X 1 1/4" LG	AS REQD
21A	WASHER 3/4" STD	16
	JAM NUT 3/4"-10NC	16
	HEX NUT 3/4"-10NC	16
	CAPSCREW 3/4"-10NC X 2 1/2" LG	16

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DRAWN Walt
CHECKED
APP'D.
DATE 12-13-22
S.O. STD
SCALE NONE

DESCRIPTION

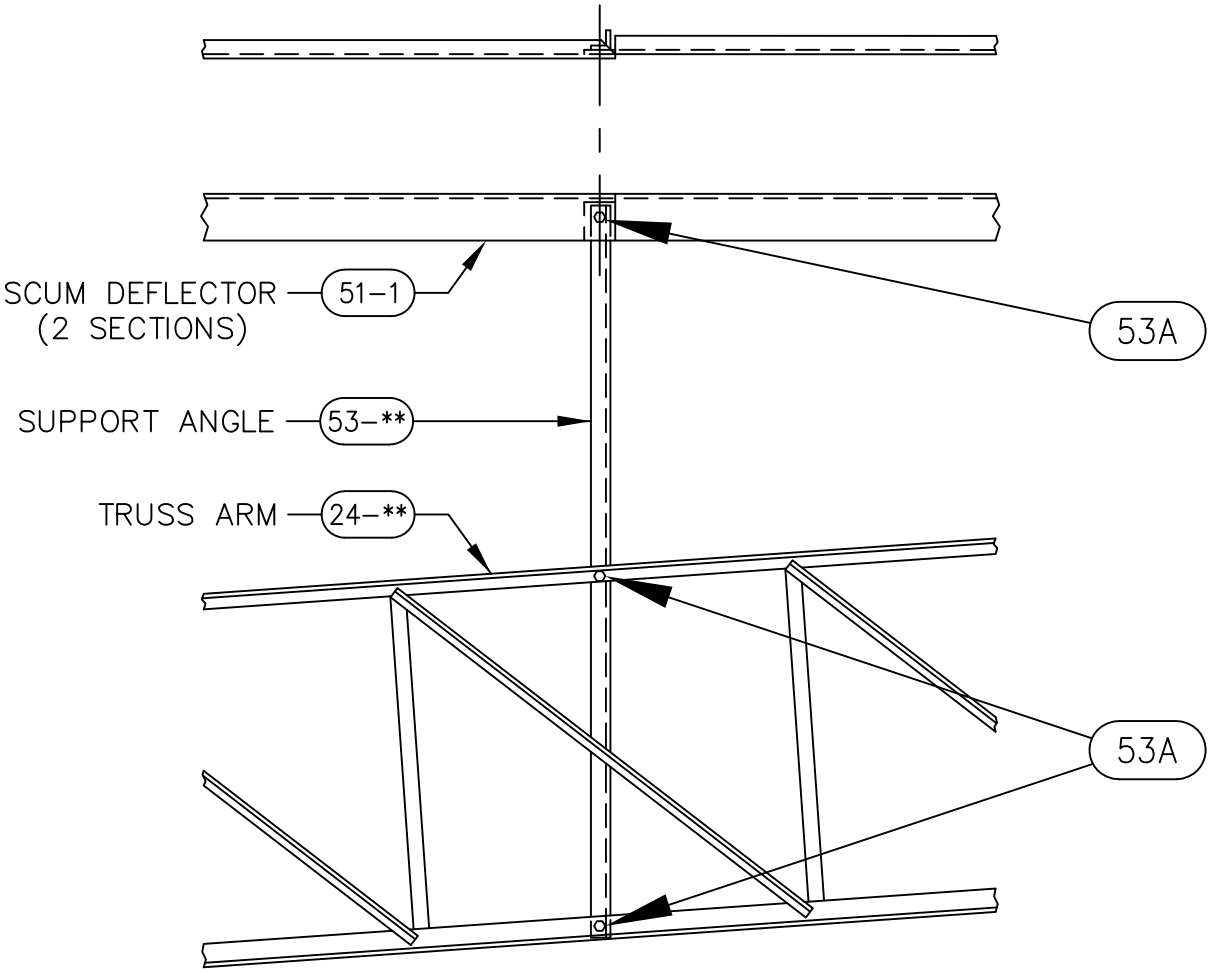
ERECTION DIAGRAM
DIFFUSION WELL

MASTER
A-49590

DRAWING NO.
A605-85835-292

REV.

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION	QTY
53A	WASHER 5/8" STD	3
	HEX NUT 5/8"-11NC	3
	CAPSCREW 5/8"-11NC X 1 1/2" LG	3

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DRAWN	Walt
CHECKED	
APP'D.	
DATE	12-13-22
S.O.	STD
SCALE	NONE

DESCRIPTION

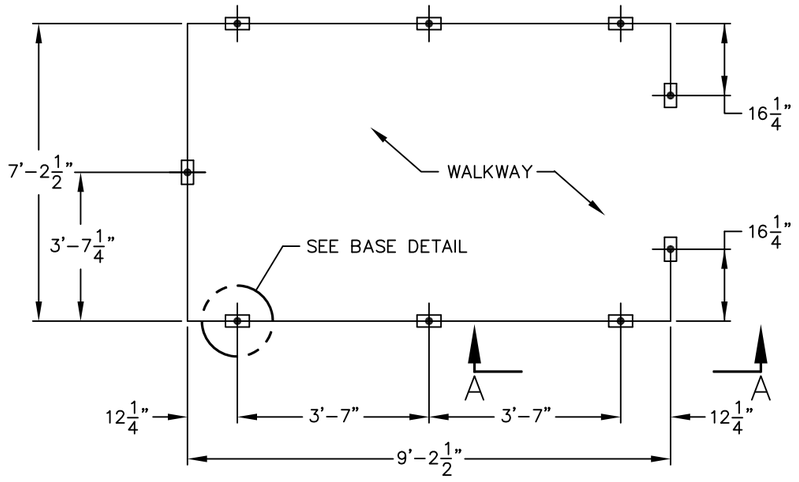
ERECTION DIAGRAM
SCUM DEFLECTOR SUPPORT – SPLICE

MASTER
A-43864

DRAWING NO.
A605-85836-292

REV.

HANDRAIL INFORMATION



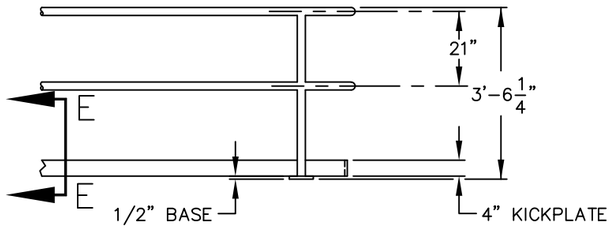
PLAN

NOTES:

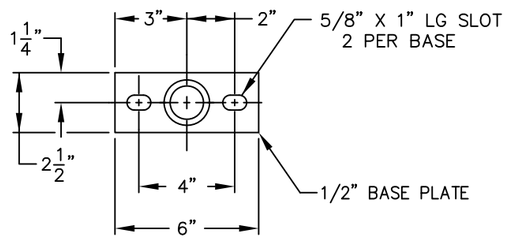
1. RAILING AS SHOWN SHALL BE GOLDEN RAILINGS GRI STANDARD RIVETED RAIL SYSTEM.
2. ALL RAILS, POSTS AND FORMED ELBOWS SHALL BE 1 1/2" SCHEDULE 40 ANODIZED 6063 ALUMINUM PIPE.
3. ALL FASTENERS SHALL BE STAINLESS STEEL.
4. KICKPLATE SHALL BE 4" ALUMINUM 6061-T6 ATTACHED TO THE POSTS ON THE WALKWAY SIDE.
5. THE MANUFACTURER SHALL PROVIDE AMWELL WITH ONE (1) FIELD ERECTION DRAWING.

   THE FIELD ERECTION DRAWING MUST CONTAIN ALL PERTINENT INFORMATION REQUIRED FOR FIELD ASSEMBLY.

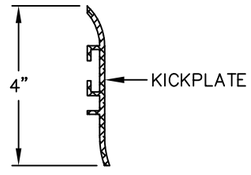
THE HANDRAILING SHALL BE SHIPPED TO THE JOB SITE SUB-ASSEMBLED WITH THE POSTS PRE-FABRICATED



VIEW A-A



BASE DETAIL



SECTION E-E

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS - EST. 1868)

SYM	REVISION	BY	DATE	CHKD
B				
A				

LIMITS UNLESS OTHERWISE SPECIFIED
FRACTIONAL
2 DECIMAL
3 DECIMAL
ANGULAR
WGT.

DRAWN Walt
CHECKED
APP'D.
DATE 12-13-22
S.O. A23011
SCALE NONE

DESCRIPTION: HANDRAIL

DRAWING NO. C405-85813-412

REV.

MASTER C-0757

GRATING INFORMATION

STANDARD OHIO GRATINGS INC. PANEL WIDTHS DRAWN!

CUTOUTS ARE CUT BACK TO NEXT BEARING BAR PER OHIO GRATINGS INC. STANDARDS. THIS IS BASED ON LOCATION OF CUTOUTS BETWEEN BEARING BARS.

OHIO GRATINGS, INC.

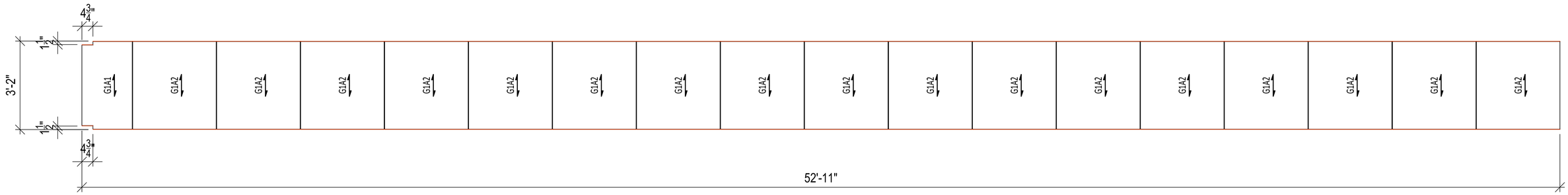
Bill of Materials

19SGI4 (1 1/4") Striated

Mill, Swaged I-Bar Bar Grating, Aluminum

Qty	Mark	Finish Width	Finish Length	EG	Status
4	G1A1	1'-9 5/8"	3'-2"	13/16"	Rel1 02/09/23
68	G1A2	2'-11 7/8"	3'-2"	13/16"	Rel1 02/09/23

Extras Table		
Band 1 1/4" x 3/16" Aluminum		
Clip, XSSGG1B, SS, 19 Spaced for 1/4" to 3/4" flange (HDW.CLIP.G.S.1-1/4) (shipped loose)		
Totals	72 pcs	1,606 lbs



GRATING LAYOUT

N.T.S.

Ref. Dwg #: A405-85814-375

(4 Req'd)

Revisions Record

Rev	Date	By	Ckd	Description
A	2/8/2023	MM		Issued For Approval
0	2/9/2023	MM		Issued For Fabrication

General Notes

Lay all grating panels out in an entire area with a loose fit prior to fastening down in order to ensure a proper fit and uniform gaps between panels. Gaps between panels can range from a tight fit to a size equal to the space between two adjacent bearing bars in a panel. A typical gap is approximately 3/8".

Supporting steel with flanges greater than 1/4" in thickness may need to be pre-drilled in field prior to fastening down with a standard tek screw. Cutting cross bars in the field may be necessary in some locations for fastener clearance.

The ends of all bearing bars within a grating panel must be properly supported at ends of panels and within cutouts. Ohio Gratings recommends 1" of bearing surface for grating bearing bar depths up to 2¼" and 2" of bearing surface for grating bearing bar depths 2½" and over. Bearing bars should not be cantilevered beyond their supports.

Cutout sizes may be smaller or larger than the intended design due to the nature of grating and the standard locations of bearing bars.

Drawing Legend

- Indicates banding
- Indicates toeplate
- Indicates nosing
- (EG) Indicates the tagged end of panels for aligning cross rods
- Indicates the span direction of load carrying bars

OHIO GRATINGS, INC.

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5299 Southway St SW
Canton, OH 44706
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Ridgeland, SC 29936
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Project	TAUNTON, MA.		
Customer	AMWELL	OGi Q:	982530
PO	P0061792	OGi SO:	19412
Job #		Seq:	Rel:
Dwg:	19412	Sht:	G1

EXPANSION ANCHOR INFORMATION

GENERAL INFORMATION

POWER-STUD®+ SD4/SD6

Stainless Steel Wedge Expansion Anchors

PRODUCT DESCRIPTION

The Power-Stud+ SD4 and Power-Stud+ SD6 anchors are fully threaded, torque-controlled, stainless steel wedge expansion anchors which are designed for consistent performance in cracked and uncracked concrete. Suitable base materials are normal-weight, sand-lightweight concrete, and grouted concrete masonry (CMU). The anchor is manufactured with a stainless steel body and expansion clip. Nut and washer are included.

GENERAL APPLICATIONS AND USES

- Structural connections, i.e., beam and column anchorage
- Safety-related and common attachments
- Interior and exterior applications
- Tension zone applications, i.e., cable trays and strut, pipe supports, fire sprinklers

FEATURES AND BENEFITS

+ Knurled mandrel design provides consistent performance in cracked concrete and helps prevent galling during service life.
+ Nominal drill bit size is the same as the anchor diameter
+ Anchor can be installed through standard clearance fixture holes
+ Length ID code and identifying marking stamped on head of each anchor
+ Anchor design allows for follow-up expansion after setting under tensile loading
+ Corrosion resistant stainless steel anchors
+ Domestically manufactured by request

APPROVALS AND LISTINGS

- International Code Council Evaluation Service (ICC-ES), ESR-2502 for cracked and uncracked concrete
- Code compliant with the 2015 IBC, 2015 IRC, 2012 IBC, 2012 IRC, 2009 IBC, and 2009 IRC
- Tested in accordance with ACI 355.2/ASTM E 488 and ICC-ES AC193 for use in structural concrete under the design provisions of ACI 318-14 Chapter 17 or ACI 318-11/08 Appendix D
- Evaluated and qualified by an accredited independent testing laboratory for recognition in cracked and uncracked concrete including seismic and wind loading (Category 1 anchors)

GUIDE SPECIFICATIONS

CSI Divisions: 03 16 00-Concrete Anchors, 04 05 19.16 - Masonry Anchors and 05 05 19 Post-Installed Concrete Anchors. Expansion anchors shall be Power-Stud+ SD4 and Power-Stud+ SD6 as supplied by DEWALT, Towson, MD. Anchors shall be installed in accordance with published instructions and the Authority Having Jurisdiction.

SECTION CONTENTS

POWER-STUD+ STAINLESS STEEL ASSEMBLY

THREAD VERSION

- UNC threaded stud

ANCHOR MATERIALS

- Stainless steel body and expansion clip, nut and washer

ANCHOR SIZE RANGE (TYP.)

- 1/4" diameter through 3/4" diameter

SUITABLE BASE MATERIALS

- Normal-weight concrete
- Sand-lightweight concrete
- Grouted Concrete Masonry (CMU)

TENSION ZONE CRACKED CONCRETE

SEISMIC REGION QUALIFICATION

CODE LISTED
ICC-ES ESR-2502
CONCRETE

DDA
DEWALT DESIGN ASSIST

DUST X+
ANCHOR INSTALLATION SYSTEM

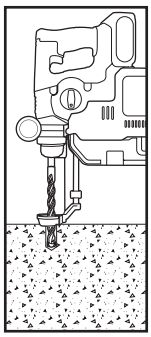
MATERIAL SPECIFICATIONS

Anchor component	Specification	
	SD4[1]	SD6[1]
Anchor body	Type 304 Stainless Steel	Type 316 Stainless Steel
Washer	300 Series Stainless Steel	Type 316 Stainless Steel
Hex Nut	Type 316 Stainless Steel	
Expansion wedge (clip)	Type 316 Stainless Steel	

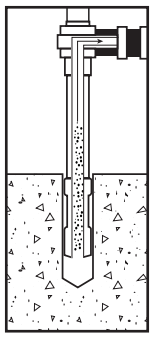
1. Domestically manufactured anchors are available upon request (made to order, see ordering information for details).

INSTALLATION INSTRUCTIONS

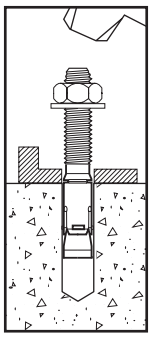
Installation Instructions for Power-Stud+ SD4 and Power-Stud+ SD6



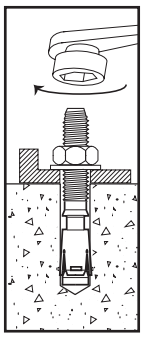
Step 1
Using the proper drill bit size, drill a hole into the base material to the required depth. The tolerances of the drill bit used should meet the requirements of ANSI Standard B212.15.



Step 2
Remove dust and debris from the hole during drilling, (e.g. dust extractor, hollow bit) or following drilling (e.g. suction, forced air) to extract loose particles created by drilling.



Step 3
Position the supplied washer on the anchor and thread on the supplied nut. If installing through a fixture, drive the anchor through the fixture into the hole. Be sure the anchor is driven to the minimum required embedment depth.

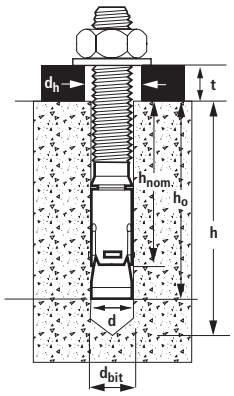


Step 4
Tighten the anchor with a torque wrench by applying the required installation torque, T_{inst}.

Length Identification

Mark	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
From	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	4-1/2"	5"	5-1/2"	6"	6-1/2"	7"	7-1/2"	8"	8-1/2"	9"	9-1/2"	10"
Up to but not including	2"	2-1/2"	3"	3-1/2"	4"	4-1/2"	5"	5-1/2"	6"	6-1/2"	7"	7-1/2"	8"	8-1/2"	9"	9-1/2"	10"	11"
Length identification mark indicates overall length of anchor.																		

Anchor Detail



Nomenclature

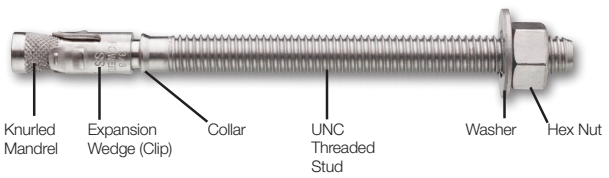
d = Diameter of anchor
d_{bit} = Diameter of drill bit
d_h = Diameter of fixture clearance hole
h = Base material thickness
The minimum value of h should be $1.5h_{nom}$ or 3" whichever is greater
h_{nom} = Minimum embedment depth

Head Marking

Legend

Letter Code = Length Identification Mark
'+' Symbol = Strength Design Compliant Anchor (see ordering information, symbol not on 1/4" diameter anchors)
Number Code = Stainless Steel Body Type (4 or 6)

Anchor Assembly



REFERENCE DATA (ASD)

Installation Specifications Table for Power-Stud+ SD4 and Power-Stud+ SD6 in Concrete

Anchor Property/Setting Information	Notation	Units	Nominal Anchor Diameter (inch)				
			1/4	3/8	1/2	5/8	3/4
Anchor outside diameter	d	in. (mm)	0.250 (6.4)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)	0.750 (19.1)
Thread Size (UNC)	-	in.	1/4-20	3/8-16	1/2-13	5/8-11	3/4-10
Nominal drill bit diameter	d_{bit}	in.	1/4 ANSI	3/8 ANSI	1/2 ANSI	5/8 ANSI	3/4 ANSI
Minimum diameter of hole clearance in fixture	d_h	in. (mm)	5/16 (7.9)	7/16 (11.1)	9/16 (14.3)	11/16 (17.5)	13/16 (20.6)
Minimum embedment depth	h_{nom}	in. (mm)	1-1/8 (29)	1-3/8 (41)	1-7/8 (48)	2-1/2 (64)	3-3/8 (86)
Minimum hole depth	h_o	in. (mm)	1-1/4 (32)	1-1/2 (38)	2 (51)	2-5/8 (67)	3-1/2 (89)
Installation torque	T_{inst}	ft.-lbf. (N-m)	6 (8)	25 (34)	40 (54)	60 (81)	110 (149)
Torque wrench/socket size	-	in.	7/16	9/16	3/4	15/16	1-1/8
Nut height	-	in.	7/32	21/64	7/16	35/64	41/64
For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.							

Ultimate Load Capacities for Power-Stud+ SD4 and Power-Stud+ SD6 in Normal-Weight Concrete[1,2]

Nominal Anchor Diameter in.	Minimum Embedment Depth h_{nom} in. (mm)	Minimum Concrete Compressive Strength									
		f'c = 2,500 psi (17.3 MPa)		f'c = 3,000 psi (20.7 MPa)		f'c = 4,000 psi (27.6 MPa)		f'c = 6,000 psi (41.4 MPa)		f'c = 8,000 psi (55.2 MPa)	
		Tension lbs (kN)	Shear lbs (kN)	Tension lbs (kN)	Shear lbs (kN)	Tension lbs (kN)	Shear lbs (kN)	Tension lbs (kN)	Shear lbs (kN)	Tension lbs (kN)	Shear lbs (kN)
1/4	1-1/8 (29)	1,095 (4.9)	2,135 (9.5)	1,200 (5.3)	2,135 (9.5)	1,390 (6.2)	2,135 (9.5)	1,455 (6.5)	2,135 (9.5)	1,680 (7.5)	2,135 (9.5)
	1-3/4 (44)	1,890 (8.4)	2,135 (9.5)	2,070 (9.2)	2,135 (9.5)	2,390 (10.6)	2,135 (9.5)	2,480 (11.0)	2,135 (9.5)	2,480 (11.0)	2,135 (9.5)
3/8	1-3/8 (41)	1,530 (6.8)	2,745 (12.2)	1,680 (7.5)	2,745 (12.2)	1,940 (8.6)	2,745 (12.2)	2,520 (11.2)	2,745 (12.2)	2,910 (12.9)	2,745 (12.2)
	1-7/8 (48)	2,790 (12.4)	2,745 (12.2)	3,060 (13.6)	2,745 (12.2)	3,530 (15.7)	2,745 (12.2)	4,195 (18.7)	2,745 (12.2)	4,840 (21.5)	2,745 (12.2)
	3 (76)	4,700 (20.9)	2,745 (12.2)	4,895 (21.8)	2,745 (12.2)	4,895 (21.8)	2,745 (12.2)	4,895 (21.8)	2,745 (12.2)	4,895 (21.8)	2,745 (12.2)
1/2	1-7/8 (48)	2,745 (12.2)	5,090 (22.6)	3,010 (13.4)	5,090 (22.6)	3,475 (15.5)	5,090 (22.6)	4,525 (20.1)	5,090 (22.6)	5,230 (23.3)	5,090 (22.6)
	2-3/8 (60)	5,370 (23.9)	5,090 (22.6)	5,880 (26.2)	5,090 (22.6)	6,790 (30.2)	5,090 (22.6)	6,790 (30.2)	5,090 (22.6)	7,845 (34.9)	5,090 (22.6)
	3-3/4 (95)	8,840 (39.3)	5,090 (22.6)	9,300 (41.4)	5,090 (22.6)	9,300 (41.4)	5,090 (22.6)	9,300 (41.4)	5,090 (22.6)	9,300 (41.4)	5,090 (22.6)
5/8	2-1/2 (64)	5,015 (22.3)	9,230 (41.1)	5,495 (24.4)	9,230 (41.1)	6,345 (28.2)	9,230 (41.1)	7,250 (32.2)	9,230 (41.1)	8,370 (37.2)	9,230 (41.1)
	3-1/4 (83)	6,760 (30.1)	9,230 (41.1)	7,405 (32.9)	9,230 (41.1)	8,560 (38.1)	9,230 (41.1)	9,615 (42.8)	9,230 (41.1)	11,105 (49.4)	9,230 (41.1)
	4-3/4 (121)	10,550 (46.9)	9,230 (41.1)	11,555 (51.4)	9,230 (41.1)	13,345 (59.4)	9,230 (41.1)	14,560 (64.8)	9,230 (41.1)	14,560 (64.8)	9,230 (41.1)
3/4	3-3/8 (86)	6,695 (29.8)	11,255 (50.1)	7,330 (32.6)	12,625 (56.2)	8,465 (37.7)	14,580 (64.9)	9,705 (43.2)	15,440 (68.7)	11,210 (49.9)	15,440 (68.7)
	4-1/2 (114)	10,800 (48.0)	15,440 (68.7)	11,830 (52.6)	15,440 (68.7)	13,575 (60.4)	15,440 (68.7)	17,110 (76.1)	15,440 (68.7)	19,760 (87.9)	15,440 (68.7)
	5-5/8 (143)	11,730 (52.2)	15,440 (68.7)	12,850 (57.2)	15,440 (68.7)	13,575 (60.4)	15,440 (68.7)	19,710 (87.7)	15,440 (68.7)	21,705 (96.5)	15,440 (68.7)

1. Tabulated load values are for anchors installed in uncracked concrete with no edge or spacing considerations. Concrete compressive strength must be at the specified minimum at the time of installation.
2. Ultimate load capacities must be reduced by a minimum safety factor of 4.0 or greater to determine allowable working loads.

Allowable Load Capacities for Power-Stud+ SD4 and Power-Stud+ SD6 in Normal-Weight Concrete[1,2,3,4]

Nominal Anchor Diameter in.	Minimum Embedment Depth h_{nom} in. (mm)	Minimum Concrete Compressive Strength									
		f'c = 2,500 psi (17.3 MPa)		f'c = 3,000 psi (20.7 MPa)		f'c = 4,000 psi (27.6 MPa)		f'c = 6,000 psi (41.4 MPa)		f'c = 8,000 psi (55.2 MPa)	
		Tension lbs (kN)	Shear lbs (kN)	Tension lbs (kN)	Shear lbs (kN)	Tension lbs (kN)	Shear lbs (kN)	Tension lbs (kN)	Shear lbs (kN)	Tension lbs (kN)	Shear lbs (kN)
1/4	1-1/8 (28)	275 (1.2)	535 (2.4)	300 (1.3)	535 (2.4)	350 (1.6)	535 (2.4)	365 (1.6)	535 (2.4)	420 (1.9)	535 (2.4)
	1-3/4 (44)	475 (2.1)	535 (2.4)	520 (2.3)	535 (2.4)	600 (2.7)	535 (2.4)	620 (2.8)	535 (2.4)	620 (2.8)	535 (2.4)
3/8	1-3/8 (41)	385 (1.7)	685 (3.0)	420 (1.9)	685 (3.0)	485 (2.2)	685 (3.0)	630 (2.8)	685 (3.0)	730 (3.2)	685 (3.0)
	1-7/8 (60)	700 (3.1)	685 (3.0)	765 (3.4)	685 (3.0)	885 (3.9)	685 (3.0)	1,050 (4.7)	685 (3.0)	1,210 (5.4)	685 (3.0)
	3 (60)	1,175 (5.2)	685 (3.0)	1,225 (5.4)	685 (3.0)	1,225 (5.4)	685 (3.0)	1,225 (5.4)	685 (3.0)	1,225 (5.4)	685 (3.0)
1/2	1-7/8 (57)	685 (3.0)	1,275 (5.7)	755 (3.4)	1,275 (5.7)	870 (3.9)	1,275 (5.7)	1,130 (5.0)	1,275 (5.7)	1,310 (5.8)	1,275 (5.7)
	2-3/8 (64)	1,345 (6.0)	1,275 (5.7)	1,470 (6.5)	1,275 (5.7)	1,700 (7.6)	1,275 (5.7)	1,700 (7.6)	1,275 (5.7)	1,960 (8.7)	1,275 (5.7)
	3-3/4 (95)	2,210 (9.8)	1,275 (5.7)	2,325 (10.3)	1,275 (5.7)	2,325 (10.3)	1,275 (5.7)	2,325 (10.3)	1,275 (5.7)	2,325 (10.3)	1,275 (5.7)
5/8	2-1/2 (70)	1,255 (5.6)	2,310 (10.3)	1,375 (6.1)	2,310 (10.3)	1,585 (7.1)	2,310 (10.3)	1,815 (8.1)	2,310 (10.3)	2,095 (9.3)	2,310 (10.3)
	3-1/4 (86)	1,690 (7.5)	2,310 (10.3)	1,850 (8.2)	2,310 (10.3)	2,140 (9.5)	2,310 (10.3)	2,405 (10.7)	2,310 (10.3)	2,775 (12.3)	2,310 (10.3)
	4-3/4 (117)	2,640 (11.7)	2,310 (10.3)	2,890 (12.9)	2,310 (10.3)	3,335 (14.8)	2,310 (10.3)	3,640 (16.2)	2,310 (10.3)	3,640 (16.2)	2,310 (10.3)
3/4	3-3/8 (86)	1,675 (7.5)	2,815 (12.5)	1,835 (8.2)	3,155 (14.0)	2,115 (9.4)	3,645 (16.2)	2,425 (10.8)	3,860 (17.2)	2,805 (12.5)	3,860 (17.2)
	4-1/2 (114)	2,700 (12.0)	3,860 (17.2)	2,960 (13.2)	3,860 (17.2)	3,395 (15.1)	3,860 (17.2)	4,280 (19.0)	3,860 (17.2)	4,940 (22.0)	3,860 (17.2)
	5-5/8 (143)	2,935 (13.1)	3,860 (17.2)	3,215 (14.3)	3,860 (17.2)	3,395 (15.1)	3,860 (17.2)	4,930 (21.9)	3,860 (17.2)	5,425 (24.1)	3,860 (17.2)

1. Tabulated load values are for anchors installed in uncracked concrete. Concrete compressive strength must be at the specified minimum at the time of installation.
2. Allowable load capacities listed are calculated using and applied safety factor of 4.0.
3. Allowable load capacities must be multiplied by reduction factors when anchor spacing or edge distances are less than critical distances.
4. Linear interpolation may be used to determine allowable loads for intermediate embedments and compressive strengths.

SPACING DISTANCE AND EDGE DISTANCE ADJUSTMENT FACTORS FOR NORMAL WEIGHT CONCRETE - TENSION (F_{NS}, F_{NC})

Spacing Reduction Factors - Tension (F_{NS})

Diameter (in)		1/4	3/8	1/2	5/8	3/4
Nominal Embed. h_{nom} (in)		1-3/4	1-7/8	2-1/2	3-1/4	4-1/2
Minimum Spacing, s_{min} (in)		2	3	3	5	5
Spacing Distance (inches)	1-3/4	-	-	-	-	-
	2	0.79	-	-	-	-
	2-1/4	0.81	-	-	-	-
	2-1/2	0.83	-	-	-	-
	2-3/4	0.85	-	-	-	-
	3	0.87	0.87	0.82	-	-
	3-1/2	0.91	0.91	0.85	-	-
	4	0.96	0.96	0.88	-	-
	4-1/2	1.00	1.00	0.91	-	-
	5	1.00	1.00	0.94	0.85	0.76
	5-1/2	1.00	1.00	0.97	0.87	0.78
	6	1.00	1.00	1.00	0.90	0.80
	6-1/2	1.00	1.00	1.00	0.92	0.82
	7	1.00	1.00	1.00	0.94	0.84
	7-1/2	1.00	1.00	1.00	0.97	0.86
	8	1.00	1.00	1.00	0.99	0.87
	8-1/4	1.00	1.00	1.00	1.00	0.88
	8-1/2	1.00	1.00	1.00	1.00	0.89
	9	1.00	1.00	1.00	1.00	0.91
	9-1/2	1.00	1.00	1.00	1.00	0.93
	10	1.00	1.00	1.00	1.00	0.95
	10-1/2	1.00	1.00	1.00	1.00	0.97
	11	1.00	1.00	1.00	1.00	0.99
	11-1/4	1.00	1.00	1.00	1.00	1.00

Edge Distance Reduction Factors- Tension (F_{NC})

Diameter (in)		1/4	3/8	1/2	5/8	3/4
Nominal Embed. h_{nom} (in)		1-3/4	1-7/8	2-1/2	3-1/4	4-1/2
Critical Edge Distance, c_{ac} (in)		5	5	7-1/2	9-1/2	9
Min. Edge Distance, c_{min} (in)		1-3/4	3	3	4-1/2	5
Edge Distance (inches)	1-1/2	-	-	-	-	-
	1-3/4	0.35	-	-	-	-
	2	0.40	-	-	-	-
	2-1/4	0.45	-	-	-	-
	2-1/2	0.50	-	-	-	-
	2-3/4	0.55	-	-	-	-
	3	0.60	0.60	0.40	-	-
	3-1/2	0.70	0.70	0.47	-	-
	4	0.80	0.80	0.53	-	-
	4-1/2	0.90	0.90	0.60	0.47	-
	5	1.00	1.00	0.67	0.53	0.56
	5-1/2	1.00	1.00	0.73	0.58	0.61
	6	1.00	1.00	0.80	0.63	0.67
	6-1/2	1.00	1.00	0.87	0.68	0.72
	7	1.00	1.00	0.93	0.74	0.78
	7-1/2	1.00	1.00	1.00	0.79	0.83
	8	1.00	1.00	1.00	0.84	0.89
	8-1/2	1.00	1.00	1.00	0.89	0.94
	9	1.00	1.00	1.00	0.95	1.00
	9-1/2	1.00	1.00	1.00	1.00	1.00

SPACING DISTANCE AND EDGE DISTANCE ADJUSTMENT FACTORS FOR NORMAL WEIGHT CONCRETE - SHEAR (F_{VS}, F_{VC})

Spacing Reduction Factors - Shear (F_{VS})

Diameter (in)		1/4	3/8	1/2	5/8	3/4
Nominal Embed. h_{nom} (in)		1-3/4	1-7/8	2-1/2	3-1/4	4-1/2
Minimum Spacing, s_{min} (in)		2	3	3	5	5
Spacing Distance (inches)	1-3/4	-	-	-	-	-
	2	0.87	-	-	-	-
	2-1/4	0.88	-	-	-	-
	2-1/2	0.90	-	-	-	-
	2-3/4	0.91	-	-	-	-
	3	0.92	0.92	0.89	-	-
	3-1/2	0.95	0.95	0.91	-	-
	4	0.97	0.97	0.93	-	-
	4-1/2	1.00	1.00	0.95	-	-
	5	1.00	1.00	0.96	0.91	0.84
	5-1/2	1.00	1.00	0.98	0.93	0.85
	6	1.00	1.00	1.00	0.94	0.86
	6-1/2	1.00	1.00	1.00	0.95	0.88
	7	1.00	1.00	1.00	0.97	0.89
	7-1/2	1.00	1.00	1.00	0.98	0.90
	8	1.00	1.00	1.00	0.99	0.92
	8-1/4	1.00	1.00	1.00	1.00	0.92
	8-1/2	1.00	1.00	1.00	1.00	0.93
	9	1.00	1.00	1.00	1.00	0.94
	9-1/2	1.00	1.00	1.00	1.00	0.95
	10	1.00	1.00	1.00	1.00	0.97
	10-1/2	1.00	1.00	1.00	1.00	0.98
	11	1.00	1.00	1.00	1.00	0.99
	11-1/4	1.00	1.00	1.00	1.00	1.00

Edge Distance Reduction Factors - Shear (F_{VC})

Diameter (in)		1/4	3/8	1/2	5/8	3/4
Nominal Embed. h_{nom} (in)		1-3/4	1-7/8	2-1/2	3-1/4	4-1/2
Min. Edge Distance, c_{min} (in)		1-3/4	3	3	4-1/2	5
Edge Distance (inches)	1-1/2	-	-	-	-	-
	1-3/4	0.39	-	-	-	-
	2	0.44	-	-	-	-
	2-1/4	0.50	-	-	-	-
	2-1/2	0.56	-	-	-	-
	2-3/4	0.61	-	-	-	-
	3	0.67	0.67	0.50	-	-
	3-1/2	0.78	0.78	0.58	-	-
	4	0.89	0.89	0.67	-	-
	4-1/2	1.00	1.00	0.75	0.55	-
	5	1.00	1.00	0.83	0.61	0.44
	5-1/2	1.00	1.00	0.92	0.67	0.49
	6	1.00	1.00	1.00	0.73	0.53
	6-1/2	1.00	1.00	1.00	0.79	0.58
	7	1.00	1.00	1.00	0.85	0.62
	7-1/2	1.00	1.00	1.00	0.91	0.67
	8	1.00	1.00	1.00	0.97	0.71
	8-1/4	1.00	1.00	1.00	1.00	0.73
	8-1/2	1.00	1.00	1.00	1.00	0.76
	9	1.00	1.00	1.00	1.00	0.80
	9-1/2	1.00	1.00	1.00	1.00	0.84
	10	1.00	1.00	1.00	1.00	0.89
	10-1/2	1.00	1.00	1.00	1.00	0.93
	11	1.00	1.00	1.00	1.00	0.98
	11-1/4	1.00	1.00	1.00	1.00	1.00

PERFORMANCE DATA

Ultimate Load Capacities for Power-Stud+ SD4 and Power-Stud+ SD6 installed into the Face of Grout Filled Concrete Masonry[1,2]

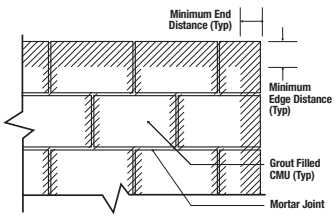
Nominal Anchor Diameter in.	Minimum Embedment h_{nom} in. (mm)	Minimum Edge Distance in. (mm)	Minimum End Distance in. (mm)	Ultimate Tension Load lb (kN)	Direction of Shear Loading	Ultimate Shear Load lb (kN)
1/2	2-3/8 (60)	3 (76.2)	3 (76.2)	1,695 (7.5)	Any	2,080 (9.3)
		12 (304.8)	12 (304.8)	2,425 (10.8)	Any	4,905 (21.8)
5/8	3-1/4 (83)	12 (304.8)	12 (304.8)	5,565 (24.8)	Any	7,944 (35.3)

1. Tabulated load values are for anchors installed in minimum 8 inch wide, minimum Grade N, Type II, normal-weight concrete masonry units conforming to ASTM C 90. Mortar must be minimum Type N. Masonry compressive strength must be at the specified minimum at the time of installation.
2. Ultimate load capacities must be reduced by a minimum safety factor of 5.0 or greater to determine allowable working loads.

Allowable Load Capacities for Power-Stud+ SD4 and Power-Stud+ SD6 installed into the Face of Grout Filled Concrete Masonry[1,2,3,4,5]

Nominal Anchor Diameter in.	Minimum Embedment h_{nom} in. (mm)	Minimum Edge Distance in. (mm)	Minimum End Distance in. (mm)	Allowable Tension Load lb (kN)	Direction of Shear Loading	Allowable Shear Load lb (kN)
1/2	2-3/8 (60)	3 (76.2)	3 (76.2)	340 (1.5)	Any	415 (1.8)
		12 (304.8)	12 (304.8)	485 (2.2)	Any	980 (4.4)
5/8	3-1/4 (83)	12 (304.8)	12 (304.8)	1,115 (5.0)	Any	1,590 (7.1)

1. Tabulated load values are for anchors installed in minimum 8 inch wide, minimum Grade N, Type II, normal-weight concrete masonry units conforming to ASTM C 90. Mortar must be minimum Type N. Masonry compressive strength must be at the specified minimum at the time of installation.
2. Allowable load capacities listed are calculated using an applied safety factor of 5.0. Consideration of safety factors of 10 or higher may be necessary depending upon the application such as life safety.
3. The tabulated values are applicable for anchors installed in grouted masonry wall faces at a critical spacing distance, s_{cr}, between anchors of 16 times the anchor diameter. The spacing distance between two anchors may be reduced to a minimum distance, s_{min}, of 8 times the anchor diameter provided the allowable tension loads are multiplied a reduction factor of 0.80 and allowable shear loads are multiplied by a reduction factor of 0.90. Linear interpolation for calculation of allowable loads may be used for intermediate anchor spacing distances.
4. Anchors may be installed in the grouted cells and in cell webs and bed joints not closer than 1-3/8" from head joints. The minimum edge and end distances must also be maintained.
5. Allowable tension values for anchors installed into bed joints of grouted masonry wall faces with a minimum of 12" edge and end distance may be increased by 20 percent for the 1/2-inch diameter and 10 percent for the 5/8-inch diameter.



Wall Face
Permissible Anchor Locations
(Un-hatched Area)

STRENGTH DESIGN (SD)

Strength Design Installation Table for Power-Stud+ SD4 and Power-Stud+ SD6[1,4]

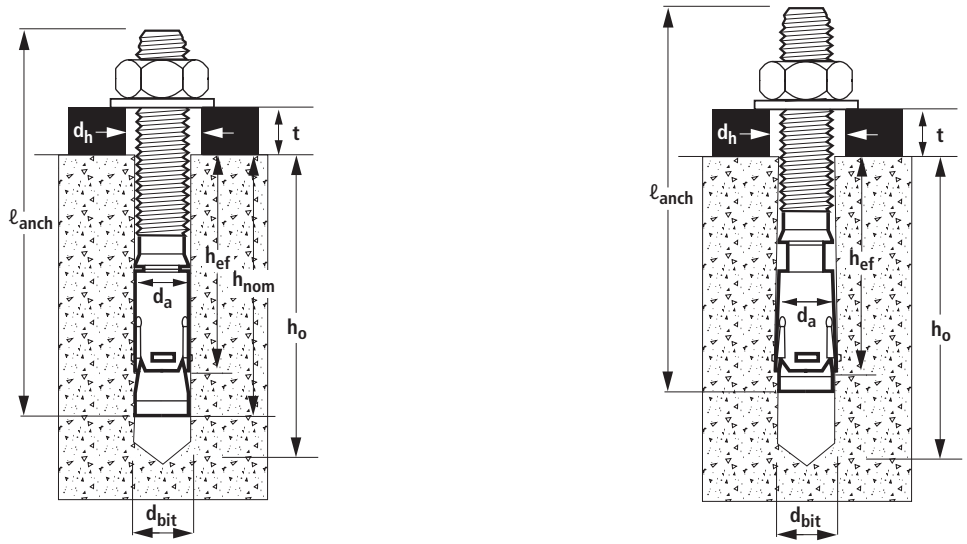
CODE LISTED
ICC-ES ESR-2502

Anchor Property/Setting Information	Notation	Units	Nominal Anchor Diameter									
			1/4	3/8		1/2		5/8		3/4		
Anchor outside diameter	d_a	in. (mm)	0.250 (6.4)	0.375 (9.5)		0.500 (12.7)		0.625 (15.9)		0.750 (19.1)		
Thread Size (UNC)	-	in.	1/4-20	3/8-16		1/2-13		5/8-11		3/4-10		
Minimum diameter of hole clearance in fixture	d_h	in. (mm)	5/16 (7.9)	7/16 (11.1)		9/16 (14.3)		11/16 (17.5)		13/16 (20.6)		
Nominal drill bit diameter	d_{bit}	in.	1/4 ANSI	3/8 ANSI		1/2 ANSI		5/8 ANSI		3/4 ANSI		
Minimum nominal embedment depth[2]	h_{nom}	in. (mm)	1-3/4 (44)	1-7/8 (48)		2-1/2 (64)		3-1/4 (83)		4-1/2 (114)		
Effective embedment	h_{ef}	in. (mm)	1.50 (38)	1.50 (38)		2.00 (51)		2.75 (70)		3-3/4 (95)		
Minimum hole depth	h_o	in. (mm)	1-7/8 (48)	2 (51)		2-5/8 (67)		3-1/2 (89)		4-3/4 (121)		
Minimum member thickness	h_{min}	in. (mm)	3-1/4 (83)	3-1/4 (83)	4 (102)	4 (102)		5 (127)		6 (152)		
Minimum overall anchor length[3]	ℓ_{anch}	in. (mm)	2-1/4 (57)	2-3/4 (70)		3-3/4 (95)		4-1/2 (114)		5-1/2 (140)		
Minimum edge distance	c_{min}	in. (mm)	1-3/4 (44)	3 (76)	3-1/2 (89)	6 (152)	3 (76)	4-1/2 (114)	8-1/2 (216)	5 (127)	9 (229)	
Minimum spacing distance	s_{min}	in. (mm)	2 (51)	5-1/2 (140)	3 (76)	3 (76)	6 (152)	8-1/2 (216)	5 (127)	9 (229)	5 (127)	
Critical edge distance	c_{ac}	in. (mm)	5 (127)	5 (127)		7-1/2 (191)		9-1/2 (241)		9 (229)		
Installation torque	T_{inst}	ft.-lbf. (N-m)	6 (8)	25 (34)		40 (54)		60 (81)		110 (149)		
Torque wrench/socket size	-	in.	7/16	9/16		3/4		15/16		1-1/8		
Nut height	-	in.	7/32	21/64		7/16		35/64		41/64		

For SI: 1 inch = 25.4 mm; 1 ft-lbf = 1.356 N-m.

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, as applicable.
2. The embedment depth, h_{nom}, is measured from the outside surface of the concrete member to the embedded end of the anchor prior to tightening.
3. The listed minimum overall anchor length is based on anchor sizes commercially available at the time of publication compared with the requirements to achieve the minimum nominal embedment depth and possible fixture attachment.
4. The anchors may be installed in the topside of concrete-filled steel deck floor and roof assemblies in accordance with the following: the 1/4-inch diameter anchors must be installed in uncracked normal-weight or sand-lightweight concrete; 3/8-inch to 3/4-inch diameter anchors must be installed in cracked and uncracked normal-weight or sand-lightweight concrete over steel deck having a minimum specified compressive strength, f'c, of 3,000 psi (20.7 MPa) provided the concrete thickness above the upper flute meets the minimum thickness specified in this table.

Power-Stud+ SD4 and Power-Stud+ SD6 Anchor Detail



Application of Installation Torque

Tension Design Information for Power-Stud+ SD4 and Power-Stud+ SD6 Anchors in Concrete (For use with load combinations taken from ACI 318-14, Section 5.3 or ACI 318-11, Section 9.2)[1,8]

CODE LISTED
ICC-ES ESR-2502

Design Characteristic		Notation	Units	Nominal Anchor Diameter				
				1/4	3/8	1/2	5/8	3/4
Anchor category		1,2 or 3	-	1	1	1	1	1
Nominal embedment depth		h_{nom}	in.	1-3/4	1-7/8	2-3/8	3-1/4	4-1/2
STEEL STRENGTH IN TENSION (ACI 318-14 17.4.1 or ACI 318-11 D.5.1)								
Minimum specified yield strength (neck		f_y	ksi (N/mm^2)	60 (414)	60 (414)	60 (414)	60 (414)	60 (414)
Minimum specified ultimate tensile strength (neck)		f_{uta}	ksi (N/mm^2)	90 (621)	90 (621)	90 (621)	90 (621)	90 (621)
Effective tensile stress area (neck)		$A_{se,N}$	in^2 (mm^2)	0.0249 (16.1)	0.0530 (34.2)	0.1020 (65.8)	0.1630 (105.2)	0.2380 (151)
Steel strength in tension		N_{sa}	lb (kN)	2,240 (10.0)	4,780 (21.3)	9,160 (40.8)	14,635 (65.1)	21,380 (95.1)
Reduction factor for steel strength[2,3]		ϕ	-	0.75				
CONCRETE BREAKOUT STRENGTH IN TENSION (ACI 318-14 17.4.2 or ACI 318-11 D.5.2)[8]								
Effective embedment		h_{ef}	in. (mm)	1.50 (38)	1.50 (38)	2.00 (51)	2.75 (70)	3.75 (95)
Effectiveness factor for uncracked concrete		k_{uncr}	-	24	24	24	24	24
Effectiveness factor for cracked concrete		k_{cr}	-	Not Applicable	17	21	21	21
Modification factor for cracked and uncracked concrete		$\psi_{c,N}$	-	1.0 See Note 5	1.0 See Note 5	1.0 See Note 5	1.0 See Note 5	1.0 See Note 5
Critical edge distance (uncracked concrete only)		c_{ac}	in. (mm)	5 (127)	5 (127)	7-1/2 (191)	9-1/2 (241)	9 (229)
Reduction factor for concrete breakout strength[4]		ϕ	-	0.65 (Condition B)				
PULLOUT STRENGTH IN TENSION (ACI 318-14 17.4.3 or ACI 318-11 D.5.3)[8]								
Characteristic pullout strength, uncracked concrete (2,500 psi)[5]		$N_{p,uncr}$	lb (kN)	1,510 (6.7)	See Note 7	See Note 7	See Note 7	8,520 (37.8)
Characteristic pullout strength, cracked concrete (2,500 psi)[5]		$N_{p,cr}$	lb (kN)	Not Applicable	See Note 7	See Note 7	See Note 7	See Note 7
Reduction factor for pullout strength[3]		ϕ	-	0.65 (Condition B)				
PULLOUT STRENGTH IN TENSION FOR SEISMIC APPLICATIONS (ACI 318-14 17.2.3.3 or ACI 318-11 D.3.3.3)[8]								
Characteristic pullout strength, seismic (2,500 psi)[6,9]		$N_{p,eq}$	lb (kN)	Not Applicable	1,645 (7.3)	See Note 7	See Note 7	See Note 7
Reduction factor for pullout strength[4]		ϕ	-	0.65 (Condition B)				
Mean axial stiffnes values for service load range	Uncracked concrete	β	lbf/in (kN/mm)	171,400 (30,060)	490,000 (86,000)	459,000 (80,500)	234,000 (41,000)	395,000 (69,300)
	Cracked concrete	β	lbf/in (kN/mm)	Not Applicable	228,000 (40,000)	392,000 (68,800)	193,000 (33,800)	76,600 (13,400)

For SI: 1 inch = 25.4 mm; 1 ft-lbf = 1.356 N-m; 1 ksi = 6.894 N/mm^2; 1 lb = 0.0044 kN.

1. The data in this table is intended to be used with the design provisions of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, as applicable; for anchors resisting seismic load combinations the additional requirements of ACI 318-14 17.2.3 or ACI 318-11 D.3.3, as applicable, shall apply.
2. The tabulated value of ϕ for steel strength applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2, as applicable, are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ for steel strength must be determined in accordance with ACI 318-11 D.4.4.
3. The anchors are ductile steel elements as defined in ACI 318-14 2.3 or ACI 318-11 D.1, as applicable.
4. The tabulated value of ϕ for concrete breakout strength and pullout strength applies when both the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2, as applicable, are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3, for Condition B are satisfied. If the load combinations of Section 1605.2 of the IBC ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2, as applicable, are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3, for Condition A are satisfied, the appropriate value of ϕ for concrete breakout strength and pullout strength must be determined in accordance with ACI 318-14 17.3.3 or ACI 318-11 D.4.3. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ for concrete breakout strength and pullout strength must be determined in accordance with ACI 318-11 D.4.4.
5. For all design cases $\psi_{c,N}$ =1.0. The appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) must be used.
6. For all design cases $\psi_{c,P}$ =1.0. For concrete compressive strength greater than 2,500 psi, N_{pn} = (pullout strength value from table)*(specified concrete compressive strength/2,500)$^{0.5}$.
7. Pullout strength does not control design of indicated anchors. Do not calculate pullout strength for indicated anchor size and embedment.
8. Anchors are permitted to be used in lightweight concrete provided the modification factor λ_a equal to 0.8λ is applied to all values of $\sqrt{f'c}$ affecting N_n and V_n. λ shall be determined in accordance with the corresponding version of ACI 318.
9. Tabulated values for characteristic pullout strength in tension are for seismic applications and are based on test results per ACI 355.2, Section 9.5.
10. Actual stiffness of the mean value varies depending on concrete strength, loading and geometry of application.

Shear Design Information for Power-Stud+ SD4 and Power-Stud+ SD6 Anchors in Concrete (For use with load combinations taken from ACI 318-14, Section 5.3 or ACI 318-11, Section 9.2)[1,7]

CODE LISTED
ICC-ES ESR-2502

Design Characteristic	Notation	Units	Nominal Anchor Diameter				
			1/4	3/8	1/2	5/8	3/4
Anchor category	1, 2 or 3	-	1	1	1	1	1
Nominal embedment depth	h_{nom}	in.	1-3/4	1-7/8	2-3/8	3-1/4	4-1/2
STEEL STRENGTH IN SHEAR (ACI 318-14 17.5.1 or ACI 318-11 D.6.1)[4]							
Minimum specified yield strength (threads)	f_y	ksi (N/mm²)	60 (414)	60 (414)	60 (414)	60 (414)	60 (414)
Minimum specified ultimate strength (threads)	f_{uta}	ksi (N/mm²)	90 (621)	90 (621)	90 (621)	90 (621)	90 (621)
Effective tensile stress area (threads)	$A_{se,V}$ [A_{se}][8]	in² (mm²)	0.0318 (20.5)	0.078 (50.3)	0.142 (91.6)	0.226 (145.8)	0.334 (212)
Steel strength in shear[6]	V_{sa}	lb (kN)	1,115 (5.0)	1,470 (6.6)	3,170 (14.3)	7,455 (33.6)	11,955 (53.2)
Reduction factor for steel strength[2,3]	ϕ	-	0.65				
CONCRETE BREAKOUT STRENGTH IN SHEAR (ACI 318-14 17.5.2 or ACI 318-11 D.6.2)							
Load bearing length of anchor (h_{ef} or $8d_a$, whichever is less)	ℓ_e	in. (mm)	1.50 (38.1)	1.50 (38.1)	2.00 (50.8)	2.75 (69.9)	3.75 (95)
Nominal anchor diameter	d_a	in. (mm)	0.250 (6.4)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)	0.750 (19.1)
Reduction factor for concrete breakout[4]	ϕ	-	0.70 (Condition B)				
CONCRETE PRYOUT STRENGTH IN SHEAR (ACI 318-14 17.2.3.3 or ACI 318-11 D.6.3)							
Coefficient for pryout strength (1.0 for $h_{ef} < 2.5$ in., 2.0 for $h_{ef} \geq 2.5$ in.)	k_{cp}	-	1.0	1.0	1.0	2.0	2.0
Effective embedment	h_{ef}	in. (mm)	1.50 (38.1)	1.50 (38.1)	2.00 (50.8)	2.75 (69.9)	3.75 (95)
Reduction factor for pryout strength[5]	ϕ	-	0.70 (Condition B)				
STEEL STRENGTH IN SHEAR FOR SEISMIC APPLICATIONS (ACI 318-14 17.2.3.3 or ACI 318-11 D.3.3.3)							
Steel strength in shear, seismic[8]	$V_{sa,eq}$	lb (kN)	Not Applicable	1,305 (5.9)	2,765 (12.3)	5,240 (23.3)	7,745 (34.5)
Reduction factor for steel strength in shear for seismic[2]	ϕ	-	0.65				

For SI: 1 inch = 25.4 mm; 1 ft-lbf = 1.356 N-m; 1 ksi = 6.894 N/mm²; 1 lb = 0.0044 kN.

1. The data in this table is intended to be used with the design provisions of ACI 318-14 Chapter or ACI 318-11 Appendix D, as applicable; for anchors resisting seismic load combinations the additional requirements of ACI 318-14 17.2.3 or ACI 318-11 D.3.3, as applicable, shall apply.
2. The tabulated value of ϕ for steel strength applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11Section 9.2, as applicable, are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ for steel strength must be determined in accordance with ACI 318-11 D.4.4.
3. The anchors are ductile steel elements as defined in ACI 318-14 2.3 or ACI 318-11 D.1, as applicable.
4. The tabulated value of ϕ for concrete breakout strength applies when both the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2, as applicable, are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3, for Condition B are satisfied. If the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2, as applicable, are used and the requirements of ACI 318-14 14.3.3 or ACI 318-11 D.4.3, for Condition A are satisfied, the appropriate value of ϕ for concrete breakout strength must be determined in accordance with ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ for concrete breakout strength must be determined in accordance with ACI 318-11 D.4.4.
5. The tabulated value of for pryout strength applies if the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ for pryout strength must be determined in accordance with ACI 318-11 D.4.4, Condition B.
6. Tabulated values for steel strength in shear must be used for design.
7. Anchors are permitted to be used in lightweight concrete provided the modification factor λ_a equal to 0.8λ is applied to all values of $\sqrt{f'c}$ affecting N_n and V_n. λ shall be determined in accordance with the corresponding version of ACI 318.
8. Tabulated values for steel strength in shear are for seismic applications are based on test results per ACI 355.2, Section 9.6.

STRENGTH DESIGN PERFORMANCE DATA

Factored design strength ϕN_n and ϕV_n
Calculated in accordance with ACI 318-14 Chapter 17
Compliant with the International Building Code

STRENGTH DESIGN TABLES

Tension and Shear Design Strengths Installed in Cracked Concrete[1-6]

Nominal Anchor Diameter (in.)	Nominal Embed. h_{nom} (in.)	Minimum Concrete Compressive Strength									
		f'c = 2,500 psi		f'c = 3,000 psi		f'c = 4,000 psi		f'c = 6,000 psi		f'c = 8,000 psi	
		ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)
1/4	-	-	-	-	-	-	-	-	-	-	-
3/8	1-7/8	1,015	955	1,110	955	1,285	955	1,570	955	1,815	955
1/2	2-1/2	1,930	2,060	2,115	2,060	2,440	2,060	2,990	2,060	3,455	2,060
5/8	3-1/4	3,110	4,520	3,410	4,845	3,935	4,845	4,820	4,845	5,570	4,845
3/4	4-1/2	4,955	5,270	5,430	5,770	6,270	6,665	7,680	7,770	8,865	7,770

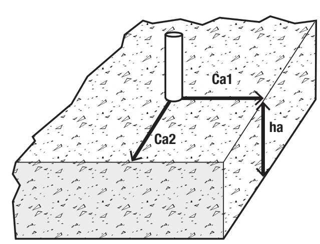
☐ - Anchor Pullout/Pryout Strength Controls ☐ - Concrete Breakout Strength Controls ■ - Steel Strength Controls

Tension and Shear Design Strengths Installed in Uncracked Concrete[1-6]

Nominal Anchor Diameter (in.)	Nominal Embed. h_{nom} (in.)	Minimum Concrete Compressive Strength									
		f'c = 2,500 psi		f'c = 3,000 psi		f'c = 4,000 psi		f'c = 6,000 psi		f'c = 8,000 psi	
		ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{sa}, ϕN_{cb} or ϕN_{cp} Tension (lbs.)	ϕV_{sa}, ϕV_{cb} or ϕV_{cp} Shear (lbs.)
1/4	1-3/4	980	725	1,075	725	1,240	725	1,520	725	1,680	725
3/8	1-7/8	1,435	955	1,570	955	1,815	955	2,220	955	2,565	955
1/2	2-1/2	2,205	2,060	2,415	2,060	2,790	2,060	3,420	2,060	3,945	2,060
5/8	3-1/4	3,555	4,845	3,895	4,845	4,500	4,845	5,510	4,845	6,365	4,845
3/4	4-1/2	5,540	7,375	6,065	7,770	7,005	7,770	8,580	7,770	9,905	7,770

☐ - Anchor Pullout/Pryout Strength Controls ☐ - Concrete Breakout Strength Controls ■ - Steel Strength Controls

1- Tabular values are provided for illustration and are applicable for single anchors installed in normal-weight concrete with minimum slab thickness, $h_a = h_{min}$, and with the following conditions:
   - c_{a1} is greater than or equal to the critical edge distance, c_{ac} (table values based on $c_{a1} = c_{ac}$).
   - c_{a2} is greater than or equal to 1.5 times c_{a1}.
2- Calculations were performed according to ACI 318-14 Chapter 17. The load level corresponding to the controlling failure mode is listed. (e.g. For tension: steel, concrete breakout and pullout; For shear: steel, concrete breakout and pryout). Furthermore, the capacities for concrete breakout strength in tension and pryout strength in shear are calculated using the effective embedment values, h_{ef}, for the selected anchors as noted in the design information tables. Please also reference the installation specifications for more information.
3- Strength reduction factors (ø) were based on ACI 318-14 Section 5.3 for load combinations. Condition B is assumed.
4- Tabular values are permitted for static loads only, seismic loading is not considered with these tables.
5- For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318-14 Chapter 17.
6- Interpolation is not permitted to be used with the tabular values. For intermediate base material compressive strengths please see ACI 318-14 Chapter 17. For other design conditions including seismic considerations please see ACI 318-14 Chapter 17.



ORDERING INFORMATION

Power-Stud+ SD4 (Type 304 Stainless Steel Body) and Power-Stud+ SD6 (Type 316 Stainless Steel Body)

Cat. No.				Anchor Size	Thread Length	Box Qty.	Carton Qty.	Suggested ANSI Carbide Drill Bit Cat. No.				
Type 304 SS		Type 316 SS										
Standard	Domestic	Standard	Domestic					Full Head SDS-Plus	SDS-Plus	SDS-Max	Hollow Bit SDS-Plus	Hollow Bit SDS-Max
7300SD4	-	7600SD6	-	1/4" x 1-3/4"	3/4"	100	600	DW5517	DW5416	-	-	-
7302SD4	-	7602SD6	-	1/4" x 2-1/4"	1-1/4"	100	600	DW5517	DW5417	-	-	-
7304SD4	7304SD4USA	7604SD6	-	1/4" x 3-1/4"	2-1/4"	100	600	DW5517	DW5417	-	-	-
-	7310SD4USA	7610SD6	7610SD6USA	3/8" x 2-1/4"	7/8"	50	300	DW5527	DW5427	-	-	-
-	7312SD4USA	7612SD6	7612SD6USA	3/8" x 2-3/4"	1-3/8"	50	300	DW5527	DW5427	-	-	-
7313SD4	7313SD4USA	7613SD6	7613SD6USA	3/8" x 3"	1-5/8"	50	300	DW5527	DW5427	-		
-	7314SD4USA	7614SD6	7614SD6USA	3/8" x 3-1/2"	2-1/8"	50	300	DW5527	DW5427	-	-	-
7315SD4	7315SD4USA	7615SD6	7615SD6USA	3/8" x 3-3/4"	2-3/8"	50	300	DW5527	DW5427	-	-	-
7316SD4	7316SD4USA	7616SD6	7616SD6USA	3/8" x 5"	3-5/8"	50	300	DW55300	DW5429	-	-	-
-	7317SD4USA	7617SD6	7617SD6USA	3/8" x 7"	5-5/8"	50	200	DW55300	DW5429	-	-	-
-	7320SD4USA	7620SD6	7620SD6USA	1/2" x 2-3/4"	1"	50	200	DW5537	DW5437	DW5803	DWA54012	-
7322SD4	7322SD4USA	7622SD6	7622SD6USA	1/2" x 3-3/4"	2"	50	200	DW5537	DW5437	DW5803	DWA54012	-
7323SD4	7323SD4USA	7623SD6	7623SD6USA	1/2" x 4-1/2"	2-3/4"	50	200	DW5539	DW5438	DW5803	DWA54012	-
7324SD4	7324SD4USA	7624SD6	7624SD6USA	1/2" x 5-1/2"	3-3/4"	50	150	DW5539	DW5438	DW5803	DWA54012	-
7326SD4	7326SD4USA	7626SD6	7626SD6USA	1/2" x 7"	5-1/4"	25	100	DW5539	DW5438	DW5803	DWA54012	-
-	7330SD4USA	7630SD6	7630SD6USA	5/8" x 3-1/2"	1-1/2"	25	100	-	DW5446	DW5806	DWA54058	DWA58058
-	7332SD4USA	7632SD6	7632SD6USA	5/8" x 4-1/2"	2-1/2"	25	100	-	DW5446	DW5806	DWA54058	DWA58058
7333SD4	7333SD4USA	7633SD6	7633SD6USA	5/8" x 5"	3"	25	100	-	DW5446	DW5806	DWA54058	DWA58058
7334SD4	7334SD4USA	7634SD6	7634SD6USA	5/8" x 6"	4"	25	75	-	DW5446	DW5806	DWA54058	DWA58058
-	7336SD4USA	7636SD6	7636SD6USA	5/8" x 7"	5"	25	75	-	DW5447	DW5806	DWA54058	DWA58058
7338SD4	7338SD4USA	7638SD6	7638SD6USA	5/8" x 8-1/2"	6-1/2"	25	50	-	DW5447	DW5809	DWA54058	DWA58058
-	7340SD4USA	7640SD6	7640SD6USA	3/4" X 4-1/4"	1-7/8"	20	60	-	DW5453	DW5810	DWA54034	DWA58034
-	7341SD4USA	7641SD6	7641SD6USA	3/4" X 4-3/4"	2-3/8"	20	60	-	DW5453	DW5810	DWA54034	DWA58034
7342SD4	7342SD4USA	7642SD6	7642SD6USA	3/4" X 5-1/2"	3-1/8"	20	60	-	DW5453	DW5810	DWA54034	DWA58034
-	7344SD4USA	7644SD6	7644SD6USA	3/4" X 6-1/4"	3-7/8"	20	60	-	DW5455	DW5810	DWA54034	DWA58034
-	7346SD4USA	7646SD6	7646SD6USA	3/4" X 7"	4-5/8"	20	60	-	DW5455	DW5810	DWA54034	DWA58034
7348SD4	7348SD4USA	7648SD6	7648SD6USA	3/4" X 8-1/2"	6-1/8"	10	40	-	DW5455	DW5812	DWA54034	DWA58034
-	7349SD4USA	7649SD6	-	3/4" x 10"	7-5/8"	10	40	-	DW5455	DW5812	DWA54034	DWA58034

Domestically manufactured Power-Stud+ SD4 and Power-Stud+ SD6 anchors (assembled in the USA with foreign and domestic components) are made to order. Call for details.

Shaded catalog numbers denote sizes which are less than the minimum standard anchor length for strength design.

The published size includes the diameter and the overall length of the anchor.

All anchors are packaged with nuts and washers.

A manual hand pump is available (Cat. No. 08280).

Hollow drill bits must be used with a dust extraction vacuum (Cat. No. DW012).

ADHESIVE ANCHOR INFORMATION

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

Listings/Approvals

ICC-ES (International Code Council)
ESR-3814

NSF/ANSI Std 61
certification for use of HIT-RE 500 V3 in potable water

City of Los Angeles
Research Report No. 26028

Independent Code Evaluation

IBC®/IRC® 2015 (ICC-ES AC308/ACI 355.4)

IBC®/IRC® 2012 (ICC-ES AC308/ACI 355.4)

IBC®/IRC® 2009 (ICC-ES AC308)

IBC®/IRC® 2006 (ICC-ES AC308)

FBC 2014 w/ HVHZ

The Leadership in Energy and Environmental Design (LEED) Green

Building Rating system™ is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings.

Department of Transportation

Contact Hilti to get a current list of State Departments of Transportation that have added HIT-RE 500 V3 to their qualified product listing.

3.2.4.1 Product description

The new HIT-RE 500 V3 adhesive anchoring system is an injectable two-component epoxy adhesive. The two components are kept separate by means of a dual-cylinder foil pack attached to a manifold.

The two components combine and react when dispensed through a static mixing nozzle attached to the manifold.

HIT-RE 500 V3 adhesive anchoring system may be used with continuously threaded rod, HIS-N and HIS-RN internally-threaded inserts or deformed reinforcing bar installed in cracked or uncracked concrete. The primary components of the Hilti adhesive anchoring system are:

- HIT-RE 500 V3 adhesive packaged in foil packs
- Adhesive mixing and dispensing equipment
- Equipment for hole cleaning and adhesive injection

Product Features

- Superior bond performance in both cracked and uncracked concrete
- Seismic qualified in accordance with ICC-ES Acceptance Criteria AC308 and ACI 355.4
- Use in diamond cored holes with roughening tool for cracked and uncracked concrete in all seismic zones
- Use underwater up to 165 ft (50 m)
- Meets requirements of ASTM C881-14, Type I, II, IV, and V, Grade 3, Class A, B, and C except linear shrinkage
- Meets requirements of AASHTO specification M235, Type I, II, IV, and V, Grade 3, Class A, B, and C except linear shrinkage
- Mixing tube provides proper mixing, eliminates measuring errors and minimizes waste
- Contains no styrene and virtually odorless
- Extended installation temperature range from 23°F to 104°F (-5°C to 40°C)
- Excellent weathering resistance and resistant to elevated temperature.
- Hilti technical data available for larger diameters, oversized holes, and deeper embedments. Contact Hilti Technical Services for additional information.

HIT-RE 500 V3 adhesive can be installed using two cleaning options:

1. Traditional cleaning methods comprised of steel wire brushes and air nozzles,
2. Self-cleaning methods using the Hilti TE-CD or TE-YD hollow carbide drill bits used in conjunction of a Hilti vacuum cleaner that will remove drilling dust, automatically cleaning the hole.

Elements that are suitable for use with this system are as follows: threaded steel rods, Hilti HIS-(R)N steel internally threaded inserts, and steel reinforcing bars.

HIT-RE 500 V3 is approved for use with the TE-YRT roughening tool. The tool is used for hole preparation in conjunction with holes core drilled with a diamond core bit to allow diamond coring in cracked and uncracked concrete in all seismic zones.

HIT-RE 500 V3 Epoxy Adhesive Anchoring System 3.2.4

Guide Specifications

Master Format Section:

Previous	**2004 Format**	
03250	**03 16 00**	Concrete Anchors

Related Sections:

03200	**03 20 00**	Concrete Reinforcing
05050	**05 50 00**	Metal Fabrications
05120	**05 10 00**	Structural Metal Framing

Injectable adhesive shall be used for installation of all reinforcing steel dowels or threaded anchor rods and inserts into existing concrete. Adhesive shall be furnished in side-by-side refill packs which keep component A and component B separate. Side-by-side packs shall be designed to compress during use to minimize waste volume. Side-by-side packs shall also be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection directly into drilled hole. Only injection tools and static mixing nozzles as recommended by manufacturer shall be used. Manufacturer's instructions shall be followed. Injection adhesive shall be formulated to include resin and hardener to provide optimal curing speed as well as high strength and stiffness. Typical curing time at 68°F (20°C) shall be approximately 6.5 hours.

Injection adhesive shall be HIT-RE 500 V3, as furnished by Hilti.

Anchor rods shall be end stamped to show the grade of steel and overall rod length. Anchor rods shall be manufactured to meet the following requirements:

1. HAS-E carbon steel
2. ASTM A193, Grade B7 high strength carbon steel anchor
3. AISI Type 304 or AISI Type 316 stainless steel meeting the requirements of ASTM F593 condition CW

Special order HAS rods may vary from standard product.

Nuts and washers of other grades and styles having specified proof load strength greater than the specified grade and style are also suitable. Nuts must have specified proof load strength equal to or greater than the minimum tensile strength of the specified threaded rod.

3.2.4.2 Material specifications

Table 1 - Material properties of fully cured Hilti HIT-RE 500 V3

Bond Strength ASTM C882-13A[1] 2 day cure 14 day cure	 10.8 MPa 11.7 MPa	 1,560 psi 1,690 psi
Compressive Strength ASTM D695-10[1]	82.7 MPa	12,000 psi
Compressive Modulus ASTM D695-10[1]	2,600 MPa	0.38 x 10^6 psi
Tensile Strength 7 day ASTM D638-14	49.3 MPa	7,150 psi
Elongation at break ASTM D638-14	1.1%	1.1%
Heat Deflection Temperature ASTM D648-07	50°C	122°F
Absorption ASTM D570-98	0.18%	0.18%
Linear Coefficient of Shrinkage on Cure ASTM D2566-86	0.008	0.008

1 Minimum values obtained as the result of tests at 35°F, 50°F, 75°F and 110°F.

Material specifications for Hilti HIT-V threaded rods, Hilti HAS threaded rods, and Hilti HIS-N inserts are listed in section 3.2.8.

3.2.4.3 Technical data

3.2.4.3.1 ACI 318-14 Chapter 17 design

The load values contained in this section are Hilti Simplified Design Tables. The load tables in this section were developed using the strength design parameters and variables of ESR-3814 and the equations within ACI 318-14 Chapter 17. For a detailed explanation of the Hilti Simplified Design Tables, refer to Section 3.1.8. Data tables from ESR-3814 are not contained in this section, but can be found at www.icc-es.org or at www.hilti.com.

HIT-RE 500 V3 Epoxy Adhesive Anchoring System 3.2.4

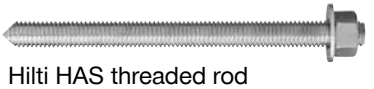
Table 7 - Steel design strength for US rebar[1]

Rebar size	ASTM A 615 Grade 40[2]			ASTM A 615 Grade 60[2]			ASTM A 706 Grade 60[2]		
	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	Seismic Shear[5] $\phi V_{sa,eq}$ lb (kN)	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	Seismic Shear[5] $\phi V_{sa,eq}$ lb (kN)	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	Seismic Shear[5] $\phi V_{sa,eq}$ lb (kN)
#3	4,290 (19.1)	2,375 (10.6)	1,665 (7.4)	6,435 (28.6)	3,565 (15.9)	2,495 (11.1)	6,600 (29.4)	3,430 (15.3)	2,400 (10.7)
#4	7,800 (34.7)	4,320 (19.2)	3,025 (13.5)	11,700 (52.0)	6,480 (28.8)	4,535 (20.2)	12,000 (53.4)	6,240 (27.8)	4,370 (19.4)
#5	12,090 (53.8)	6,695 (29.8)	4,685 (20.8)	18,135 (80.7)	10,045 (44.7)	7,030 (31.3)	18,600 (82.7)	9,670 (43.0)	6,770 (30.1)
#6	17,160 (76.3)	9,505 (42.3)	6,655 (29.6)	25,740 (114.5)	14,255 (63.4)	9,980 (44.4)	26,400 (117.4)	13,730 (61.1)	9,610 (42.7)
#7	23,400 (104.1)	12,960 (57.6)	9,070 (40.3)	35,100 (156.1)	19,440 (86.5)	13,610 (60.5)	36,000 (160.1)	18,720 (83.3)	13,105 (58.3)
#8	30,810 (137.0)	17,065 (75.9)	11,945 (53.1)	46,215 (205.6)	25,595 (113.9)	17,915 (79.7)	47,400 (210.8)	24,650 (109.6)	17,255 (76.8)
#9	39,000 (173.5)	21,600 (96.1)	15,120 (67.3)	58,500 (260.2)	32,400 (144.1)	22,680 (100.9)	60,000 (266.9)	31,200 (138.8)	21,840 (97.1)
#10	49,530 (220.3)	27,430 (122.0)	19,200 (85.4)	74,295 (330.5)	41,150 (183.0)	28,805 (128.1)	76,200 (339.0)	39,625 (176.3)	27,740 (123.4)

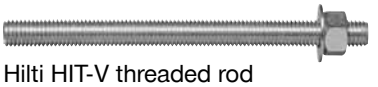
1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 ASTM A706 Grade 60 rebar are considered ductile steel elements. ASTM A 615 Grade 40 and 60 rebar are considered brittle steel elements.
3 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17
4 Shear = ϕ 0.60 $A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17
5 Seismic Shear = $\alpha_{V,seis} \phi V_{sa}$: Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

3.2.4.3.4 HIT-RE 500 V3 adhesive with HAS/HIT-V threaded rod



Hilti HAS threaded rod



Hilti HIT-V threaded rod

Figure 4 - Hilti HAS/HIT-V threaded rod installation conditions

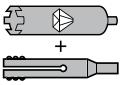
Cracked or uncracked concrete	Permissible drilling methods	Permissible concrete conditions
  Cracked and uncracked concrete	 Hammer drilling with carbide-tipped drill bit	 Dry concrete  Water-saturated concrete  Water-filled holes  Submerged (underwater)
	 Hilti TE-CD or TE-YD hollow drill bit and VC 20/40 Vacuum  Diamond core drill bit with Hilti TE-YRT roughening tool	 Dry concrete  Water-saturated concrete
 Uncracked concrete	 Diamond core drill bit	 Dry concrete  Water-saturated concrete

Table 24 - Hilti HAS/HIT-V threaded rod installation specifications

Setting information		Symbol	Units	Nominal rod diameter, d						
				3/8	1/2	5/8	3/4	7/8	1	1-1/4
Nominal bit diameter		d_o	in.	7/16	9/16	3/4	7/8	1	1-1/8	1-3/8
Effective embedment	minimum	$h_{ef,min}$	in.	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	5
			(mm)	(60)	(70)	(79)	(89)	(89)	(102)	(127)
	maximum	$h_{ef,max}$	in.	7-1/2	10	12-1/2	15	17-1/2	20	25
			(mm)	(191)	(254)	(318)	(381)	(445)	(508)	(635)
Diameter of fixture hole	through-set		in.	1/2	5/8	13/16[1]	15/16[1]	1-1/8[1]	1-1/4[1]	1-1/2[1]
	preset		in.	7/16	9/16	11/16	13/16	15/16	1-1/8	1-3/8
Installation torque		T_{inst}	ft-lb	15	30	60	100	125	150	200
			(Nm)	(20)	(40)	(80)	(136)	(169)	(203)	(271)
Minimum concrete thickness		h_{min}	in.	h_{ef}+1-1/4		h_{ef}+2d_o				
			(mm)	(h_{ef}+30)						
Minimum edge distance[2]		c_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(143)
Minimum anchor spacing		s_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(143)

1 Install using (2) washers. See Figure 5.

2 Edge distance of 1-3/4-inch (44mm) is permitted provided the installation torque is reduced to 0.30 T_{inst} for 5d < s < 16-in. and to 0.5T_{inst} for s >16-in.

Figure 4 - Hilti HAS/HIT-V threaded rods

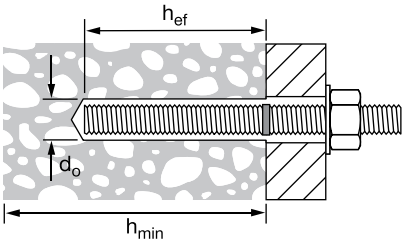


Figure 5 - Installation with (2) washers

Table 25 - Hilti HIT-RE 500 V3 adhesive design strength with concrete / bond failure for threaded rod in uncracked concrete[1,2,3,4,5,6,7,8,9,11]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — ΦN_n				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)
3/8	2-3/8 (60)	2,855 (12.7)	3,125 (13.9)	3,610 (16.1)	4,425 (19.7)	3,075 (13.7)	3,370 (15.0)	3,890 (17.3)	4,765 (21.2)
	3-3/8 (86)	4,835 (21.5)	5,300 (23.6)	6,115 (27.2)	7,490 (33.3)	10,415 (46.3)	11,410 (50.8)	13,175 (58.6)	16,135 (71.8)
	4-1/2 (114)	7,445 (33.1)	8,155 (36.3)	9,225 (41.0)	10,210 (45.4)	16,035 (71.3)	17,570 (78.2)	19,865 (88.4)	21,985 (97.8)
	7-1/2 (191)	13,670 (60.8)	14,305 (63.6)	15,375 (68.4)	17,015 (75.7)	29,440 (131.0)	30,815 (137.1)	33,110 (147.3)	36,645 (163.0)
1/2	2-3/4 (70)	3,555 (15.8)	3,895 (17.3)	4,500 (20.0)	5,510 (24.5)	7,660 (34.1)	8,395 (37.3)	9,690 (43.1)	11,870 (52.8)
	4-1/2 (114)	7,445 (33.1)	8,155 (36.3)	9,420 (41.9)	11,535 (51.3)	16,035 (71.3)	17,570 (78.2)	20,285 (90.2)	24,845 (110.5)
	6 (152)	11,465 (51.0)	12,560 (55.9)	14,500 (64.5)	17,535 (78.0)	24,690 (109.8)	27,045 (120.3)	31,230 (138.9)	37,775 (168.0)
	10 (254)	23,485 (104.5)	24,580 (109.3)	26,410 (117.5)	29,230 (130.0)	50,580 (225.0)	52,940 (235.5)	56,885 (253.0)	62,955 (280.0)
5/8[10]	3-1/8 (79)	4,310 (19.2)	4,720 (21.0)	5,450 (24.2)	6,675 (29.7)	9,280 (41.3)	10,165 (45.2)	11,740 (52.2)	14,380 (64.0)
	5-5/8 (143)	10,405 (46.3)	11,400 (50.7)	13,165 (58.6)	16,120 (71.7)	22,415 (99.7)	24,550 (109.2)	28,350 (126.1)	34,720 (154.4)
	7-1/2 (191)	16,020 (71.3)	17,550 (78.1)	20,265 (90.1)	24,820 (110.4)	34,505 (153.5)	37,800 (168.1)	43,650 (194.2)	53,455 (237.8)
	12-1/2 (318)	34,470 (153.3)	36,900 (164.1)	39,655 (176.4)	43,885 (195.2)	74,245 (330.3)	79,480 (353.5)	85,405 (379.9)	94,520 (420.4)
3/4[10]	3-1/2 (89)	5,105 (22.7)	5,595 (24.9)	6,460 (28.7)	7,910 (35.2)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	17,040 (75.8)
	6-3/4 (171)	13,680 (60.9)	14,985 (66.7)	17,305 (77.0)	21,190 (94.3)	29,460 (131.0)	32,275 (143.6)	37,265 (165.8)	45,645 (203.0)
	9 (229)	21,060 (93.7)	23,070 (102.6)	26,640 (118.5)	32,625 (145.1)	45,360 (201.8)	49,690 (221.0)	57,375 (255.2)	70,270 (312.6)
	15 (381)	45,315 (201.6)	49,640 (220.8)	55,035 (244.8)	60,905 (270.9)	97,600 (434.1)	106,915 (475.6)	118,535 (527.3)	131,180 (583.5)
7/8[10]	3-1/2 (89)	5,105 (22.7)	5,595 (24.9)	6,460 (28.7)	7,910 (35.2)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	17,040 (75.8)
	7-7/8 (200)	17,235 (76.7)	18,885 (84.0)	21,805 (97.0)	26,705 (118.8)	37,125 (165.1)	40,670 (180.9)	46,960 (208.9)	57,515 (255.8)
	10-1/2 (267)	26,540 (118.1)	29,070 (129.3)	33,570 (149.3)	41,115 (182.9)	57,160 (254.3)	62,615 (278.5)	72,300 (321.6)	88,550 (393.9)
	17-1/2 (445)	57,100 (254.0)	62,550 (278.2)	71,740 (319.1)	79,395 (353.2)	122,990 (547.1)	134,730 (599.3)	154,520 (687.3)	171,005 (760.7)
1[10]	4 (102)	6,240 (27.8)	6,835 (30.4)	7,895 (35.1)	9,665 (43.0)	13,440 (59.8)	14,725 (65.5)	17,000 (75.6)	20,820 (92.6)
	9 (229)	21,060 (93.7)	23,070 (102.6)	26,640 (118.5)	32,625 (145.1)	45,360 (201.8)	49,690 (221.0)	57,375 (255.2)	70,270 (312.6)
	12 (305)	32,425 (144.2)	35,520 (158.0)	41,015 (182.4)	50,230 (223.4)	69,835 (310.6)	76,500 (340.3)	88,335 (392.9)	108,190 (481.3)
	20 (508)	69,765 (310.3)	76,425 (340.0)	88,245 (392.5)	99,635 (443.2)	150,265 (668.4)	164,605 (732.2)	190,070 (845.5)	214,595 (954.6)
1-1/4[10]	5 (127)	8,720 (38.8)	9,555 (42.5)	11,030 (49.1)	13,510 (60.1)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)
	11-1/4 (286)	29,430 (130.9)	32,240 (143.4)	37,230 (165.6)	45,595 (202.8)	63,395 (282.0)	69,445 (308.9)	80,185 (356.7)	98,205 (436.8)
	15 (381)	45,315 (201.6)	49,640 (220.8)	57,320 (255.0)	70,200 (312.3)	97,600 (434.1)	106,915 (475.6)	123,455 (549.2)	151,200 (672.6)
	25 (635)	97,500 (433.7)	106,805 (475.1)	123,330 (548.6)	142,175 (632.4)	210,000 (934.1)	230,045 (1023.3)	265,630 (1181.6)	306,220 (1362.1)

1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in Tables 30-41 as necessary to the above values. Compare to the steel values in Table 29. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry or water saturated concrete conditions.
For water-filled drilled holes multiply design strength by 0.51.
For submerged (under water) applications multiply design strength by 0.45.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength (factored resistance) by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. For diamond core drilling, except as indicated in note 10, multiply above values by 0.55.
Diamond core drilling is not permitted for water-filled or underwater (submerged) applications.
10 Diamond core drilling with Hilti TE-YRT roughening tool is permitted for 5/8", 3/4", 7/8", 1", and 1 1/4" diameter anchors for dry and water-saturated concrete conditions. See Table 27.
11 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

Table 26 - Hilti HIT-RE 500 V3 adhesive design strength with concrete / bond failure for threaded rod in cracked concrete[1,2,3,4,5,6,7,8,9,11]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — ΦN_n				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)
3/8	2-3/8 (60)	2,020 (9.0)	2,215 (9.9)	2,500 (11.1)	2,655 (11.8)	2,180 (9.7)	2,385 (10.6)	2,690 (12.0)	2,860 (12.7)
	3-3/8 (86)	3,310 (14.7)	3,400 (15.1)	3,550 (15.8)	3,770 (16.8)	7,125 (31.7)	7,325 (32.6)	7,645 (34.0)	8,125 (36.1)
	4-1/2 (114)	4,410 (19.6)	4,535 (20.2)	4,735 (21.1)	5,030 (22.4)	9,500 (42.3)	9,765 (43.4)	10,195 (45.3)	10,835 (48.2)
	7-1/2 (191)	7,350 (32.7)	7,555 (33.6)	7,890 (35.1)	8,385 (37.3)	15,835 (70.4)	16,275 (72.4)	16,990 (75.6)	18,055 (80.3)
1/2	2-3/4 (70)	2,520 (11.2)	2,760 (12.3)	3,185 (14.2)	3,905 (17.4)	5,425 (24.1)	5,945 (26.4)	6,865 (30.5)	8,405 (37.4)
	4-1/2 (114)	5,275 (23.5)	5,780 (25.7)	6,260 (27.8)	6,655 (29.6)	11,360 (50.5)	12,445 (55.4)	13,485 (60.0)	14,330 (63.7)
	6 (152)	7,780 (34.6)	7,995 (35.6)	8,350 (37.1)	8,870 (39.5)	16,755 (74.5)	17,220 (76.6)	17,980 (80.0)	19,110 (85.0)
	10 (254)	12,965 (57.7)	13,325 (59.3)	13,915 (61.9)	14,785 (65.8)	27,930 (124.2)	28,705 (127.7)	29,970 (133.3)	31,850 (141.7)
5/8[10]	3-1/8 (79)	3,050 (13.6)	3,345 (14.9)	3,860 (17.2)	4,730 (21.0)	6,575 (29.2)	7,200 (32.0)	8,315 (37.0)	10,185 (45.3)
	5-5/8 (143)	7,370 (32.8)	8,075 (35.9)	9,325 (41.5)	10,315 (45.9)	15,875 (70.6)	17,390 (77.4)	20,080 (89.3)	22,215 (98.8)
	7-1/2 (191)	11,350 (50.5)	12,395 (55.1)	12,940 (57.6)	13,755 (61.2)	24,440 (108.7)	26,695 (118.7)	27,875 (124.0)	29,620 (131.8)
	12-1/2 (318)	20,100 (89.4)	20,660 (91.9)	21,570 (95.9)	22,920 (102.0)	43,295 (192.6)	44,495 (197.9)	46,460 (206.7)	49,370 (219.6)
3/4[10]	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,575 (20.4)	5,605 (24.9)	7,790 (34.7)	8,535 (38.0)	9,855 (43.8)	12,070 (53.7)
	6-3/4 (171)	9,690 (43.1)	10,615 (47.2)	12,255 (54.5)	14,735 (65.5)	20,870 (92.8)	22,860 (101.7)	26,395 (117.4)	31,740 (141.2)
	9 (229)	14,920 (66.4)	16,340 (72.7)	18,490 (82.2)	19,650 (87.4)	32,130 (142.9)	35,195 (156.6)	39,820 (177.1)	42,320 (188.2)
	15 (381)	28,715 (127.7)	29,510 (131.3)	30,815 (137.1)	32,745 (145.7)	61,850 (275.1)	63,565 (282.7)	66,370 (295.2)	70,530 (313.7)
7/8[10]	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,575 (20.4)	5,605 (24.9)	7,790 (34.7)	8,535 (38.0)	9,855 (43.8)	12,070 (53.7)
	7-7/8 (200)	12,210 (54.3)	13,375 (59.5)	15,445 (68.7)	18,915 (84.1)	26,300 (117.0)	28,810 (128.2)	33,265 (148.0)	40,740 (181.2)
	10-1/2 (267)	18,800 (83.6)	20,590 (91.6)	23,780 (105.8)	26,530 (118.0)	40,490 (180.1)	44,355 (197.3)	51,215 (227.8)	57,140 (254.2)
	17-1/2 (445)	38,775 (172.5)	39,850 (177.3)	41,605 (185.1)	44,215 (196.7)	83,510 (371.5)	85,825 (381.8)	89,610 (398.6)	95,230 (423.6)
1[10]	4 (102)	4,420 (19.7)	4,840 (21.5)	5,590 (24.9)	6,845 (30.4)	9,520 (42.3)	10,430 (46.4)	12,040 (53.6)	14,750 (65.6)
	9 (229)	14,920 (66.4)	16,340 (72.7)	18,870 (83.9)	23,110 (102.8)	32,130 (142.9)	35,195 (156.6)	40,640 (180.8)	49,775 (221.4)
	12 (305)	22,965 (102.2)	25,160 (111.9)	29,050 (129.2)	34,650 (154.1)	49,465 (220.0)	54,190 (241.0)	62,570 (278.3)	74,630 (332.0)
	20 (508)	49,415 (219.8)	52,045 (231.5)	54,340 (241.7)	57,750 (256.9)	106,435 (473.4)	112,100 (498.6)	117,045 (520.6)	124,385 (553.3)
1-1/4[10]	5 (127)	6,175 (27.5)	6,765 (30.1)	7,815 (34.8)	9,570 (42.6)	13,305 (59.2)	14,575 (64.8)	16,830 (74.9)	20,610 (91.7)
	11-1/4 (286)	20,850 (92.7)	22,840 (101.6)	26,370 (117.3)	32,295 (143.7)	44,905 (199.7)	49,190 (218.8)	56,800 (252.7)	69,565 (309.4)
	15 (381)	32,095 (142.8)	35,160 (156.4)	40,600 (180.6)	49,725 (221.2)	69,135 (307.5)	75,730 (336.9)	87,445 (389.0)	107,100 (476.4)
	25 (635)	69,060 (307.2)	75,655 (336.5)	80,800 (359.4)	85,865 (381.9)	148,750 (661.7)	162,945 (724.8)	174,030 (774.1)	184,945 (822.7)

1 See Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 30-41 as necessary to the above values. Compare to the steel values in table 29. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry or water saturated concrete conditions.
For water-filled drilled holes multiply design strength by 0.51.
For submerged (under water) applications multiply design strength by 0.44.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted in cracked concrete conditions except as indicated in note 10.
10 Diamond core drilling with Hilti TE-YRT roughening tool is permitted for 5/8" 3/4", 7/8", 1", and 1 1/4" diameter anchors for dry and water-saturated concrete conditions. See Table 28
11 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} indicated below.
See section 3.1.8.7 for additional information on seismic applications.
3/8-in. diameter - α_{seis} = 0.69
1/2-in. diameter - α_{seis} = 0.70
5/8-in. diameter - α_{seis} = 0.71
3/4-in. diameter and larger - α_{seis} = 0.75

HIT-RE 500 V3 Epoxy Adhesive Anchoring System 3.2.4

Table 27 - Hilti HIT-RE 500 V3 for Core Drilled Holes with TE-YRT Roughening Tool adhesive design strength with concrete / bond failure for threaded rod in uncracked concrete[1,2,3,4,5,6,7,8,9]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — ΦN_n				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)
5/8	3-1/8 (79)	4,310 (19.2)	4,720 (21.0)	5,450 (24.2)	6,675 (29.7)	9,280 (41.3)	10,165 (45.2)	11,740 (52.2)	14,380 (64.0)
	5-5/8 (143)	10,405 (46.3)	11,400 (50.7)	13,165 (58.6)	15,865 (70.6)	22,415 (99.7)	24,550 (109.2)	28,350 (126.1)	34,170 (152.0)
	7-1/2 (191)	16,020 (71.3)	17,550 (78.1)	20,265 (90.1)	21,155 (94.1)	34,505 (153.5)	37,800 (168.1)	43,650 (194.2)	45,565 (202.7)
	12-1/2 (318)	34,470 (153.3)	35,255 (156.8)	35,255 (156.8)	35,255 (156.8)	74,245 (330.3)	75,940 (337.8)	75,940 (337.8)	75,940 (337.8)
3/4	3-1/2 (89)	5,105 (22.7)	5,595 (24.9)	6,460 (28.7)	7,910 (35.2)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	17,040 (75.8)
	6-3/4 (171)	13,680 (60.9)	14,985 (66.7)	17,305 (77.0)	21,190 (94.3)	29,460 (131.0)	32,275 (143.6)	37,265 (165.8)	45,645 (203.0)
	9 (229)	21,060 (93.7)	23,070 (102.6)	26,640 (118.5)	29,360 (130.6)	45,360 (201.8)	49,690 (221.0)	57,375 (255.2)	63,235 (281.3)
	11-1/4 (286)	29,430 (130.9)	32,240 (143.4)	36,700 (163.2)	36,700 (163.2)	63,395 (282.0)	69,445 (308.9)	79,045 (351.6)	79,045 (351.6)
7/8	3-1/2 (89)	5,105 (22.7)	5,595 (24.9)	6,460 (28.7)	7,910 (35.2)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	17,040 (75.8)
	7-7/8 (200)	17,235 (76.7)	18,885 (84.0)	21,805 (97.0)	26,705 (118.8)	37,125 (165.1)	40,670 (180.9)	46,960 (208.9)	57,515 (255.8)
	10-1/2 (267)	26,540 (118.1)	29,070 (129.3)	33,570 (149.3)	38,275 (170.3)	57,160 (254.3)	62,615 (278.5)	72,300 (321.6)	82,435 (366.7)
	17-1/2 (445)	57,100 (254.0)	62,550 (278.2)	63,790 (283.8)	63,790 (283.8)	122,990 (547.1)	134,730 (599.3)	137,390 (611.1)	137,390 (611.1)
1	4 (102)	6,240 (27.8)	6,835 (30.4)	7,895 (35.1)	9,665 (43.0)	13,440 (59.8)	14,725 (65.5)	17,000 (75.6)	20,820 (92.6)
	9 (229)	21,060 (93.7)	23,070 (102.6)	26,640 (118.5)	32,625 (145.1)	45,360 (201.8)	49,690 (221.0)	57,375 (255.2)	70,270 (312.6)
	12 (305)	32,425 (144.2)	35,520 (158.0)	41,015 (182.4)	48,030 (213.6)	69,835 (310.6)	76,500 (340.3)	88,335 (392.9)	103,445 (460.1)
	20 (508)	69,765 (310.3)	76,425 (340.0)	80,050 (356.1)	80,050 (356.1)	150,265 (668.4)	164,605 (732.2)	172,410 (766.9)	172,410 (766.9)
1-1/4	5 (127)	8,720 (38.8)	9,555 (42.5)	11,030 (49.1)	13,510 (60.1)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)
	11-1/4 (286)	29,430 (130.9)	32,240 (143.4)	37,230 (165.6)	45,595 (202.8)	63,395 (282.0)	69,445 (308.9)	80,185 (356.7)	98,205 (436.8)
	15 (381)	45,315 (201.6)	49,640 (220.8)	57,320 (255.0)	68,535 (304.9)	97,600 (434.1)	106,915 (475.6)	123,455 (549.2)	147,615 (656.6)
	25 (635)	97,500 (433.7)	106,805 (475.1)	114,225 (508.1)	114,225 (508.1)	210,000 (934.1)	230,045 (1023.3)	246,025 (1094.4)	246,025 (1094.4)

1 See Section 3.1.8 for explanation on development of load values.

2 See Section 3.1.8.6 to convert design strength value to ASD value.

3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

4 Apply spacing, edge distance, and concrete thickness factors in tables 30-41 as necessary to the above values. Compare to the steel values in table 29. The lesser of the values is to be used for the design.

5 Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

6 Tabular values are for dry or water saturated concrete conditions. Water-filled and submerged (under water) applications are not permitted for this hole preparation method.

7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.

8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis}=0.75. See section 3.1.8.7 for additional information on seismic applications.

3.2.4 HIT-RE 500 V3 Epoxy Adhesive Anchoring System

Table 28 - Hilti HIT-RE 500 V3 for Core Drilled Holes with TE-YRT Roughening Tool adhesive design strength with concrete / bond failure for threaded rod in cracked concrete[1,2,3,4,5,6,7,8,9]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — ΦN_n				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)
5/8	3-1/8 (79)	3,050 (13.6)	3,345 (14.9)	3,510 (15.6)	3,510 (15.6)	6,575 (29.2)	7,200 (32.0)	7,560 (33.6)	7,560 (33.6)
	5-5/8 (143)	6,320 (28.1)	6,320 (28.1)	6,320 (28.1)	6,320 (28.1)	13,605 (60.5)	13,605 (60.5)	13,605 (60.5)	13,605 (60.5)
	7-1/2 (191)	8,425 (37.5)	8,425 (37.5)	8,425 (37.5)	8,425 (37.5)	18,145 (80.7)	18,145 (80.7)	18,145 (80.7)	18,145 (80.7)
	12-1/2 (318)	14,040 (62.5)	14,040 (62.5)	14,040 (62.5)	14,040 (62.5)	30,240 (134.5)	30,240 (134.5)	30,240 (134.5)	30,240 (134.5)
3/4	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,575 (20.4)	4,690 (20.9)	7,790 (34.7)	8,535 (38.0)	9,855 (43.8)	10,100 (44.9)
	6-3/4 (171)	9,045 (40.2)	9,045 (40.2)	9,045 (40.2)	9,045 (40.2)	19,485 (86.7)	19,485 (86.7)	19,485 (86.7)	19,485 (86.7)
	9 (229)	12,060 (53.6)	12,060 (53.6)	12,060 (53.6)	12,060 (53.6)	25,975 (115.5)	25,975 (115.5)	25,975 (115.5)	25,975 (115.5)
	11-1/4 (286)	15,075 (67.1)	15,075 (67.1)	15,075 (67.1)	15,075 (67.1)	32,470 (144.4)	32,470 (144.4)	32,470 (144.4)	32,470 (144.4)
7/8	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,575 (20.4)	5,440 (24.2)	7,790 (34.7)	8,535 (38.0)	9,855 (43.8)	11,720 (52.1)
	7-7/8 (200)	12,210 (54.3)	12,240 (54.4)	12,240 (54.4)	12,240 (54.4)	26,300 (117.0)	26,365 (117.3)	26,365 (117.3)	26,365 (117.3)
	10-1/2 (267)	16,320 (72.6)	16,320 (72.6)	16,320 (72.6)	16,320 (72.6)	35,155 (156.4)	35,155 (156.4)	35,155 (156.4)	35,155 (156.4)
	17-1/2 (445)	27,205 (121.0)	27,205 (121.0)	27,205 (121.0)	27,205 (121.0)	58,595 (260.6)	58,595 (260.6)	58,595 (260.6)	58,595 (260.6)
1	4 (102)	4,420 (19.7)	4,840 (21.5)	5,590 (24.9)	6,845 (30.4)	9,520 (42.3)	10,430 (46.4)	12,040 (53.6)	14,750 (65.6)
	9 (229)	14,920 (66.4)	15,990 (71.1)	15,990 (71.1)	15,990 (71.1)	32,130 (142.9)	34,440 (153.2)	34,440 (153.2)	34,440 (153.2)
	12 (305)	21,320 (94.8)	21,320 (94.8)	21,320 (94.8)	21,320 (94.8)	45,920 (204.3)	45,920 (204.3)	45,920 (204.3)	45,920 (204.3)
	20 (508)	35,530 (158.0)	35,530 (158.0)	35,530 (158.0)	35,530 (158.0)	76,530 (340.4)	76,530 (340.4)	76,530 (340.4)	76,530 (340.4)
1-1/4	5 (127)	6,175 (27.5)	6,765 (30.1)	7,815 (34.8)	9,570 (42.6)	13,305 (59.2)	14,575 (64.8)	16,830 (74.9)	20,610 (91.7)
	11-1/4 (286)	20,850 (92.7)	22,840 (101.6)	23,690 (105.4)	23,690 (105.4)	44,905 (199.7)	49,190 (218.8)	51,025 (227.0)	51,025 (227.0)
	15 (381)	31,590 (140.5)	31,590 (140.5)	31,590 (140.5)	31,590 (140.5)	68,035 (302.6)	68,035 (302.6)	68,035 (302.6)	68,035 (302.6)
	25 (635)	52,645 (234.2)	52,645 (234.2)	52,645 (234.2)	52,645 (234.2)	113,390 (504.4)	113,390 (504.4)	113,390 (504.4)	113,390 (504.4)

1 See Section 3.1.8 for explanation on development of load values.

2 See Section 3.1.8.6 to convert design strength value to ASD value.

3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

4 Apply spacing, edge distance, and concrete thickness factors in tables 30-41 as necessary to the above values. Compare to the steel values in table 29. The lesser of the values is to be used for the design.

5 Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 0.69.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

6 Tabular values are for dry or water saturated concrete conditions. Water-filled and submerged (under water) applications are not permitted for this hole preparation method.

7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.

8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis}=0.75. See section 3.1.8.7 for additional information on seismic applications.

Table 29 - Steel design strength for Hilti HIT-V and HAS threaded rods[1]

Nominal anchor diameter in.	HIT-V ASTM A307 Grade A[2]			HAS-E ISO 898 Class 5.8[2]			HAS-E-B ASTM A193 B7[3]			HAS-R stainless steel ASTM F593 - AISI 304/316 SS[2]		
	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)
3/8	3,025 (13.5)	1,675 (7.5)	1,175 (5.2)	3,655 (16.3)	2,020 (9.0)	2,020 (9.0)	7,265 (32.3)	3,775 (16.8)	3,775 (16.8)	5,040 (22.4)	2,790 (12.4)	2,230 (9.9)
1/2	5,535 (24.6)	3,065 (13.6)	2,145 (9.5)	6,690 (29.8)	3,705 (16.5)	3,705 (16.5)	13,300 (59.2)	6,915 (30.8)	6,915 (30.8)	9,225 (41.0)	5,110 (22.7)	4,090 (18.2)
5/8	8,815 (39.2)	4,880 (21.7)	3,415 (15.2)	10,650 (47.4)	5,900 (26.2)	5,900 (26.2)	21,190 (94.3)	11,020 (49.0)	11,020 (49.0)	14,690 (65.3)	8,135 (36.2)	6,510 (29.0)
3/4	13,045 (58.0)	7,225 (32.1)	5,060 (22.5)	15,765 (70.1)	8,730 (38.8)	8,730 (38.8)	31,360 (139.5)	16,305 (72.5)	16,305 (72.5)	18,480 (82.2)	10,235 (45.5)	8,190 (36.4)
7/8	-	-	-	21,755 (96.8)	12,050 (53.6)	12,050 (53.6)	43,285 (192.5)	22,505 (100.1)	22,505 (100.1)	25,510 (113.5)	14,125 (62.8)	11,300 (50.3)
1	23,620 (105.1)	13,085 (58.2)	9,160 (40.7)	28,540 (127.0)	15,805 (70.3)	15,805 (70.3)	56,785 (252.6)	29,525 (131.3)	29,525 (131.3)	33,465 (148.9)	18,535 (82.4)	14,830 (66.0)
1-1/4	-	-	-	45,670 (203.1)	25,295 (112.5)	25,295 (112.5)	90,850 (404.1)	47,240 (210.1)	47,240 (210.1)	53,540 (238.2)	29,655 (131.9)	23,725 (105.5)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 HIT-V, HAS-E, and HAS-R threaded rods are considered brittle steel elements. HIT-V does not comply with % elongation requirements of ASTM A307 Grade A steel. HAS-E does not comply with % elongation requirements of ISO 898-1.
3 HAS-E-B7 rods are considered ductile steel elements.
4 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318 Chapter 17.
5 Shear = $\phi\ 0.60 A_{se,V} f_{uta}$ as noted in ACI 318 Chapter 17.
6 Seismic Shear = $\alpha_{V,seis} \phi V_{Vsa}$: Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

SECTION I

SPECIFCATIONS & GENERAL
ARRANGEMENT DRAWINGS

EQUIPMENT SPECIFICATIONS

APPROVAL SPECIFICATIONS
FOR
FINAL CLARIFIERS #1, #2, #3 & #4

Project.....WWTF Improvements Phase II
Taunton, MA.

***Date**.....September 7, 2022 (*May 9, 2023)

Number of Units.....Four (4)

Type.....“HVS”

***Submittal Drawings**.....

D205-85649-167A	General Arrangement – 1 & 2
D205-85652-167A	General Arrangement – 3 & 4
C205-85650-166A	Anchor Location – 1 & 2
D105-85653-166A	Anchor Location – 3 & 4
D705-48638-171	Drive Assembly Parts List
C505-46818-171	Torque Indicator Box Assembly
D205-31914-201	Skimmer Assembly
C605-48779-200	Scum Trough Assembly
C605-70108-292	Scum Trough Flushing Gate
B605-18828-870	Torque Test Arrangement
B605-50170-292	Sludge Valve Assembly

Tank Size.....100’-0” Diameter x 12’-2” S.W.D.

Clarifier Hydraulics (Per Basin) MGD	**AVERAGE**	**MAXIMUM**
Influent Flow	2.6 MGD	6.3 MGD

MATERIAL SPECIFICATIONS:

All items will conform to the requirements of the specifications listed below, except as noted on the equipment specifications.

Walkway.....Swaged locked I-Bar design aluminum grating with 1 1/4” bearing bars spaced on 1 3/16” centers and cross bars spaced on 4” centers. The panel ends and all openings to be banded.

Platform..... Platform to be ¼” aluminum checkered plate

Handrailing.....The handrailing around platform shall be mechanical joint system, 2 rail, anodized aluminum 1 1/2" SCH 40 rails and posts. Truss bridge to serve as handrail along walkway

Steelwork .....All fabricated steel conforms to ASTM A36. All structural steel to be 1/4" minimum thickness and all plate to be 1/4" minimum thickness unless otherwise noted.

Anchorage .....All anchor bolts shall conform to AISI 304 stainless steel.

***Fasteners** .....All capscrews, nuts and washers shall conform to AISI 304 stainless steel.

Pipe .....All steel pipe to conform to ASTM A53.

Aluminum .....All aluminum plate shall be 6061-T651 and all aluminum structural members, bars and tubing shall be 6061-T6.

Stainless Steel.....All stainless steel shall be AISI 304.

Field Welding.....Not Required

GENERAL DESIGN, FABRICATION AND MANUFACTURING SPECIFICATIONS:

Design .....The ratio of unbraced length to least radius of gyration shall not exceed 200 for compression members or 300 for tension members.

Fabrication.....Welding shall comply with the requirements of the specifications of the American Institute of Steel Construction and of the American Welding Society for the type of material to be welded.

Exposed sharp edges and sharp corners of sheared, burned, sawed, drilled, punched and/or cut material shall be dulled.

Assembly .....Connections of major components to be shop assembled or checked or made with jig fixtures to ensure proper fit for field assembly.

Spare Parts .....The following items shall be boxed or created for long term storage and marked:

"SPARE PARTS – S.O. A23011-1, A23012-1, A23013-1 & A23014-1"

Five (5) Shear Pins
One set of scum wipers

Paint Specifications .....Gearmotor to have manufacturer's standard paint.

Drive unit to have manufacturer's standard finish paint system.

Interior surfaces of castings, worm gear, worm shaft and spur gear to be given one (1) coat of rust preventative.

Regreaseable bearings to be packed with grease.

All non-submerged steel shall be blasted per SSPC-SP-10 and receive one prime coat of Tnemec Series 94-H20, 2.5-3.0 mils DFT, followed by an intermediate coat of Tnemec Series V69 Epoxoline, 4.0-6.0 mils DFT, followed by one finish coat of Tnemec Series V69 Epoxoline, 4.0-6.0 mils DFT, color to be determined by owner.

All submerged steel shall be blasted per SSPC-SP-10 and receive one prime coat of Tnemec Series V69 Epoxoline 3.0-3.5 mils DFT, followed by an intermediate coat of Tnemec Series 104 HS, 6.0-10.0 mils DFT, followed by one finish coat of Tnemec Series 104 HS, 6.0-10.0 mils DFT, color to be determined by owner.

Coatings and/or surface preparations shown above are in full compliance with the contract documents, or our interpretation of them. The contractor is responsible for the compatibility of the finish coatings with the primer coat.

All field touch-up of mars, scratches, bruises, etc., received by equipment during shipment, storage or erection and field prime coats on field weld seams are not by AMWELL.

No shop coatings are used by AMWELL on aluminum, stainless steel or other non-ferrous metals or on galvanized metal unless specifically designated.

EQUIPMENT SPECIFICATIONS:

DRIVE UNIT SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:

Model.....42S8T
Continuous Torque Rating.....35,750 ft. lbs.
Alarm Torque Setting .....35,750 ft. lbs.
Motor Shut-Off Torque Set.....42,900 ft. lbs.
Shear Pin Torque Setting .....53,625 ft. lbs. (approximately)
Momentary Peak Torque Rating .....71,500 ft. lbs.
Output Speed .....0.038 RPM (approximately)
Tip Speed.....12 FPM (approximately)
Rotation .....Clockwise

AGMA Design .....The drive unit has been designed and rated in accordance with ANSI/AGMA Standards 2001-D04, "Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth"; and 6034-B92, "Practice for Enclosed Cylindrical Worm Gear Speed Reducers and Gearmotors" for 24-hour continuous duty loading and a 20-year design life.

Load distribution factor (km) shall be no less than 1.28.

All bearings are designed for an L-10 minimum life of 20 years based upon the continuous torque rating of the drive mechanism. The drive main bearing was designed for an L-10 life of 50 years

Drive .....One (1) Model 42S8T drive unit consisting of the following:

NORD Model SK572.1-80LP/4 CUS IP66 TW parallel, helical gearmotor, AGMA II 1.7 service factor, ratio 54.41:1, 32 RPM output speed, with a 1 HP, 3 phase, 60 hertz, 230/460 volt, T.E.F.C., B.B., continuous duty, 40°C ambient 1.15 service factor, NEMA Design 'B', Class 'F' insulation 1800 R.P.M., severe duty motor for outdoor service.

The reducer shall conform to ANSI/AGMA 6019-889. The reducer and motor are mounted on a fabricated steel base with provisions for taking up slack in the drive chain.

5/8" pitch steel sprockets with No. 50SB sidebow steel roller chain enclosed in a weatherproof stainless steel removable guard between gearmotor and the worm reduction unit. Chain guard shall meet OSHA requirements and recommendations. Chain S.F. at continuous torque is 7:1.

Drive (continued) .....Intermediate worm reduction unit (8" centers) with centrifugally cast manganese bronze worm gear (12.79" P.D.) and hardened, 58 RC, and ground AISI 8620H alloy steel worm driving a forged AISI 4150 alloy, 321 BHN, 12 tooth steel pinion (6" P.D.) 2.56" face width and keyed to the worm gear, with anti-friction bearings, enclosed in an ASTM A48 Class 40B cast iron housing.

Pinion design based on a 20-year life rating.

The main spur gear of 120,000 PSI 120-90-02 ductile iron, 277 BHN, to ASTM A536 specifications, 84 tooth, 42" P.D. 2.56" face with and is driven by the steel pinion. Spur gear and the entire clarifier mechanism is supported on a ball bearing assembly comprised of ninety-seven (97) SAE 52100 chrome alloy steel balls, 1 1/2" dia., running in an oil bath on replaceable heat treated, 43 RC Min., alloy steel inserts in annular raceways. Bearing race diameter is 46". The complete unit is encased in an ASTM A48, Class 40B, cast iron gear case complete with neoprene seals and dust shields.

NOTE: Drive is designed to permit removal of two-piece spur gear, bearing balls and raceway liners without removing bridge or walkway.

Drive is equipped with an overload protection system to sound an alarm and shut off the gearmotor in the event of an overload. System consists of two (2) limit switches in a NEMA 4X stainless steel enclosure and operated by a spring-loaded actuator from the worm shaft on the primary reduction unit. One (1) switch (N.O. contact) will sound an alarm when the drive reaches the alarm torque of **35,750 ft. lbs**. One (1) switch (N.C. contact) will stop the drive when it reaches the cut-out torque of **42,900 ft. lbs**.

The protection system is also equipped with a graduated scale operated by the spring-loaded actuator. Indicator can be read from walkway.

Additional protection is provided by means of a shear pin hub assembly. Shear pin is designed to shear at approximately **53,625** ft. lbs. output torque.

CLARIFIER COMPONENTS SHALL CONFORM TO THE FOLLOWING SPECIFICAITONS:

Access Bridge .....Fabricated steel truss construction, 3' wide, extending across one half of the tank diameter supported on the main spur gear housing and the tank wall. The top and intermediate horizontal members serve as handrail. Handrailing along both sides and around the platform. A 7'-0" wide x 9'-0" long platform shall be provided at the tank center. The platform shall provide a 2'-0" clearance around the drive assembly. Platform area to have a 4" high aluminum kickplate.

The bridge will be designed for the dead load and a live load of 50 pounds per square foot. Live load and dead load deflection shall not exceed 1/360 of the span.

If shipping regulations prevent the bridge from being shipped in one (1) section, it will be fabricated and shipped in sections and provided with necessary splice connection members which will be field assembled with bolts and nuts.

NOTE: The access end of the bridge must always be free to slide, due to thermal expansion and contraction of the bridge. Any conduit and/or piping that is attached to the bridge must end in a flexible connection at the access end of the bridge. Concrete walls and/or steps must be a minimum of 1" away from the bridge end.

Center Column .....A 36" O.D. x 1/4" minimum wall thickness steel center pier shall be provided for supporting the bridge, drive assembly and clarifier mechanism. The lower end is flanged for bolting to the foundation anchors and the upper end is flanged for the mounting of the drive assembly. Four (4) 9" wide x 28" deep openings are provided in the upper end to allow unrestricted passage of flow into the feedwell.

A 16" schedule 30 steel sludge withdrawal pipe is provided inside the center column and will connect to the existing pipe. An 18" x 18" covered port is provided at the bottom of the center column for access to the draw-band coupling connection of the sludge draw-off pipe.

The draw-band coupling shall be provided with a gasket.

Drive Cage .....The drive cage shall be of an all-welded construction, made up of structural steel members having a minimum thickness of 1/4" and shall be 4'-0" square. The drive cage shall be designed to withstand 150% of the running torque of the drive assembly.

Diffusion Well .....A 11'-0" dia. X 5'-8" deep diffusion well, fabricated from 3/16" steel plate with structural steel angle reinforcing shall be supported from and rotate with the drive cage. The well shall have six (6) – 9" wide X 12" high ports with directional baffles to move the flow in the same tangential direction. The top of the ports shall be above the maximum water level. The well is provided with a full bottom extending to within 1" of the center column. Two (2) - 1" diameter drain holes shall be provided in the floor of the well.

***Influent Well**.....A 22'-0" diameter x 9'-0" deep influent well, fabricated from 3/16" steel plate with structural steel angle reinforcing, shall be supported from and rotate with the drive cage. The influent well shall diffuse the influent flow into the tank and be provided with four (4) 4" x12" baffled scum outlet ports at water level.

Truss Arms .....The truss arms shall be of an all-welded construction made up of structural steel members having a minimum thickness of 1/4", and shall be a minimum of 3'-6" wide x 4'-0" high. The truss arms shall be rigidly connected to the drive cage and designed to withstand 150% of the running torque. The truss arms shall be equipped with ¼" steel flights, so arranged to scrape the settled sludge from the tank bottom to the inlet of the sludge suction pipes and also remove the remaining sludge to a sludge removal sump located near the tank center. Fixed to the flights are adjustable 20-gauge 304 stainless steel squeegees.

The flights shall be arranged to provide a complete scraping of the floor twice every revolution.

If shipping regulations prevent the truss arms from being shipped in one (1) section, they will be fabricated and shipped in two (2) sections and provided with necessary splice connection plates and angles which will be field assembled with bolts and nuts.

***Sludge Suction Piping** .....The suction piping carries the sludge from a collection point at the flights to the sludge box located at the drive cage. Each truss arms to have five (5) suction lines consisting of 6" diameter SCH 40, PVC piping with PVC elbows and socket type couplings. The piping is supported from the truss arm with adjustable stainless steel supports to allow for the effects of thermal expansion and contraction. Solvent and cleaner are provided for field erection of the PVC piping.

***Sludge Box** .....Sludge for each suction line is hydrostatically displaced into the sludge box through a slotted pipe with a slotted PVC control sleeve pipe which when rotated will control the sludge flow. An aluminum removable operator handle is provided for adjusting the flow rate of each suction pipe. The sludge box is fabricated form 3/16" steel plate and is attached to the drive cage. The sludge box is provided with a replaceable seal to allow movement of the sludge from the sludge box into the center column draw-off pipe.

Skimmer Assembly .....The surface skimmers shall consist of a rotating scum deflector blade of 1/4" steel plate, fastened to and supported by the influent well and the truss arm, to move the floating scum outward to the scum baffle and extending to the skimmer assembly. A 4'-0" simmer assembly, fabricated from aluminum and non-corrosive material, shall be constructed to form a pocket for trapping the scum. The hinged skimmer blade, with an adjustable neoprene wiper shall be the width of the scum trough.

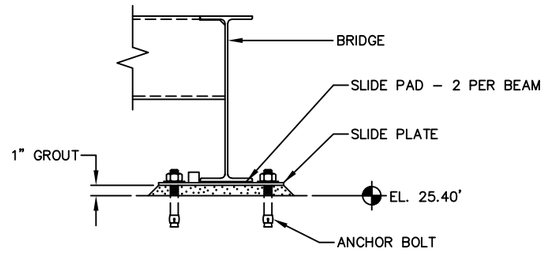
***Scum Trough** .....A 4'-0" wide scum box, fabricated of 1/4" steel plate, shall have a 8" plain end pipe for the scum discharge and shall be self-flushing with an adjustable trip arm to activate a 3" flap gate.

Anchorage .....One (1) set of epoxy type 304 SS anchor bolts with a steel template for locating the center column anchors and one (1) lot of 304 SS expansion anchors for the bridge and scum trough.

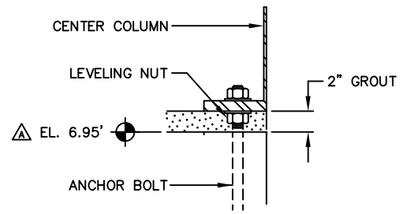
THE FOLLOWING ITEMS ARE NOT FURNISHED BY AMWELL:

Piping, valves and wall fittings except as noted on equipment specifications and/or approval drawings. All wiring, conduits, electrical controls and alarm horn, light or bell except as noted on equipment specifications and/or approval drawings. Handrailing other than on the clarifier bridge and/or clarifier bridge platform. Access stairs, ladders or platforms except as noted on equipment specifications and/or approval drawings. Grout, field paint and painting and lubricants. Weir plates and required mounting anchors. Scum baffles and launder brackets and required mounting anchors. Feedwell spray water system.

GENERAL ARRANGEMENT DRAWING



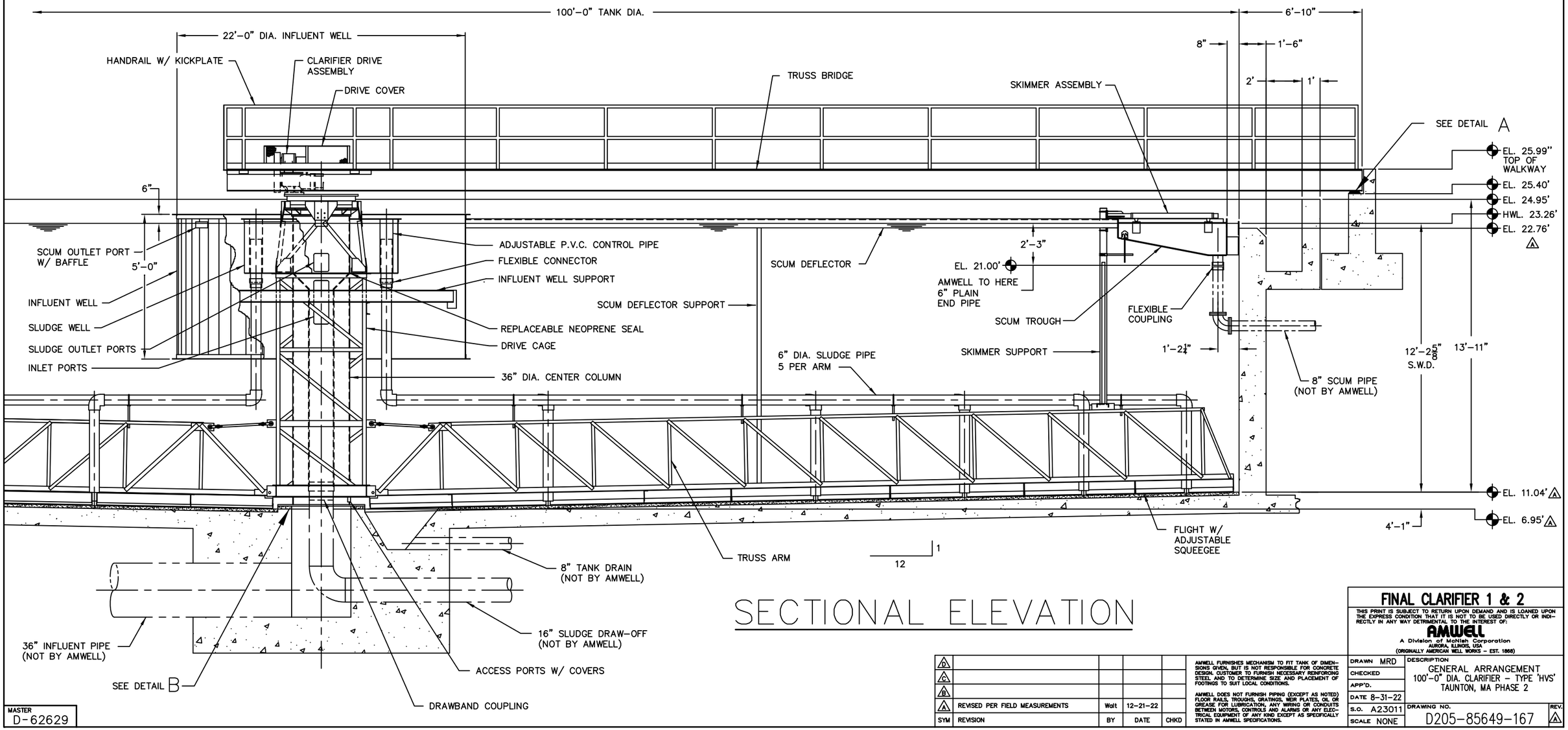
DETAIL A



DETAIL B

** AMWELL REQUIRES THIS ELEVATION OR DIMENSION

AMWELL REQUIRES ALL TANK DIMENSIONS & ELEVATIONS BE CONFIRMED OR REVISED



SECTIONAL ELEVATION

MASTER D-62629

SYM	REVISION	BY	DATE	CHKD
A	REVISED PER FIELD MEASUREMENTS	Walt	12–21–22	
B				
C				
D				

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

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FINAL CLARIFIER 1 & 2

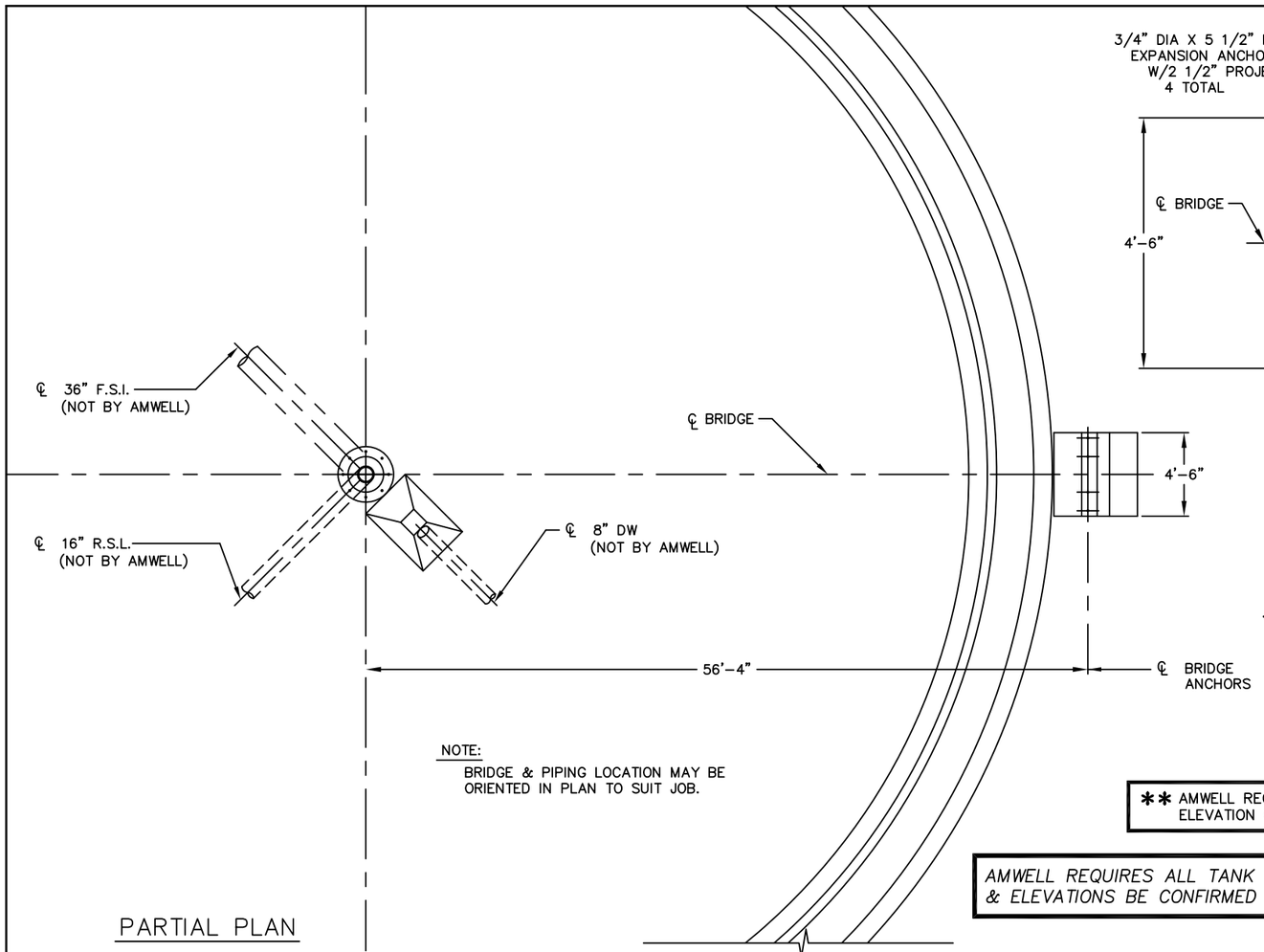
AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

DRAWN	MRD
CHECKED	
APP'D.	
DATE	8–31–22
S.O.	A23011
SCALE	NONE

DESCRIPTION: GENERAL ARRANGEMENT 100'–0" DIA. CLARIFIER – TYPE 'HVS' TAUNTON, MA PHASE 2

DRAWING NO. D205–85649–167 REV. A

ANCHOR LOCATION DRAWING



PARTIAL PLAN

NOTE:
BRIDGE & PIPING LOCATION MAY BE ORIENTED IN PLAN TO SUIT JOB.

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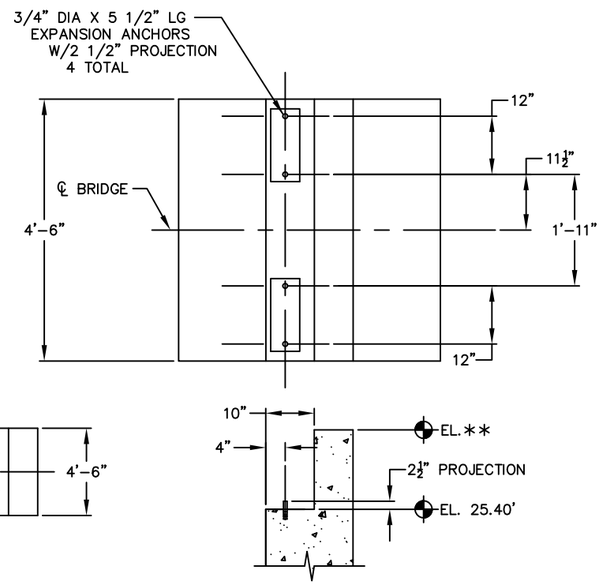
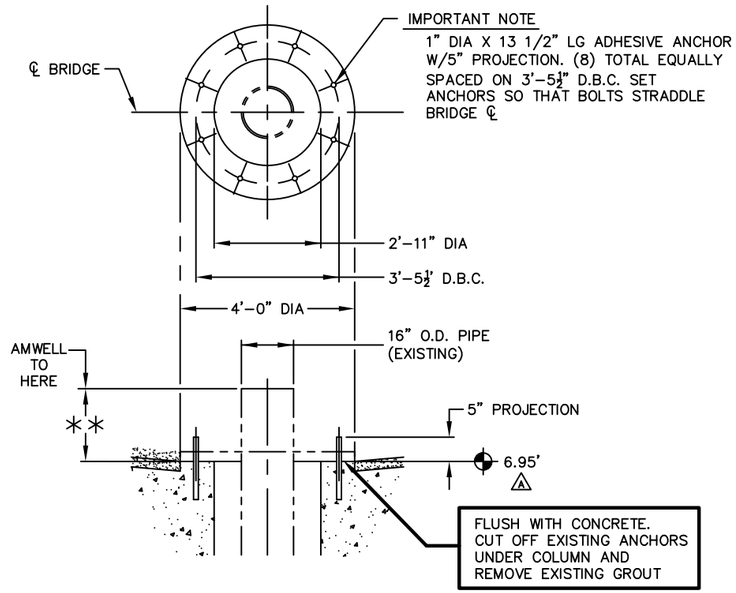
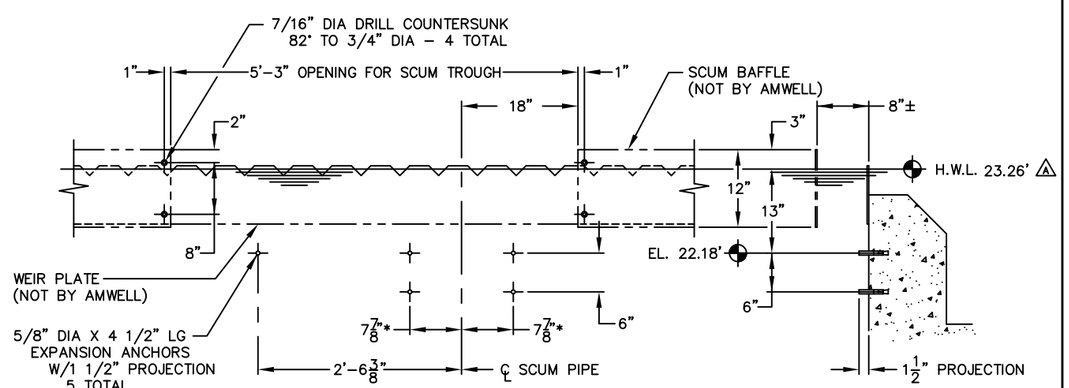


BRIDGE ANCHOR DETAIL

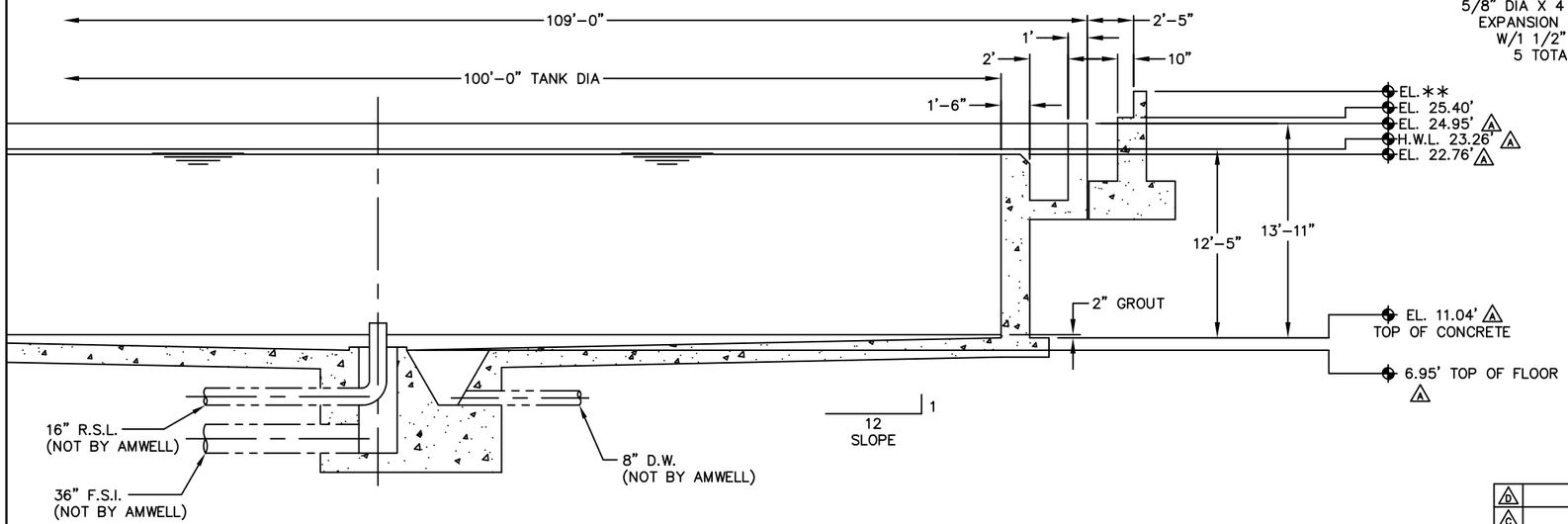


CENTER COLUMN ANCHOR DETAIL

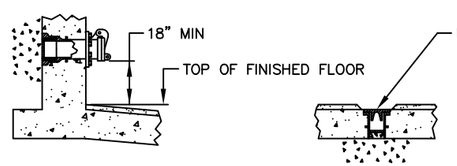


SCUM TROUGH ANCHOR DETAIL

* MEASURED ON INSIDE CIRCUMFERENCE OF EFFLUENT TROUGH WALL.



SECTIONAL ELEVATION



WALL TYPE

FLOOR TYPE

INSTALLATION OF PRESSURE RELIEF VALVES – IF REQ'D
(NOT FURNISHED BY AMWELL)

MASTER
D-0346

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A	REVISED PER FIELD MEASUREMENTS	Walt	12–20–22	

AMWELL FURNISHES MECHANISM TO FIT TANK OF DIMENSIONS GIVEN, BUT IS NOT RESPONSIBLE FOR CONCRETE DESIGN. CUSTOMER TO FURNISH NECESSARY REINFORCING STEEL AND TO DETERMINE SIZE AND PLACEMENT OF FOOTINGS TO SUIT LOCAL CONDITIONS.

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MICROFILMED

FINAL CLARIFIER 1 & 2

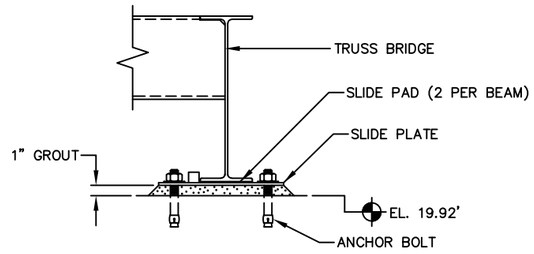
AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

DRAWN	MRD
CHECKED	
APP'D.	
DATE	8–31–22
S.O.	A23011
SCALE	NONE

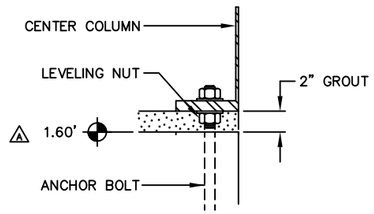
DESCRIPTION
ANCHOR LOCATION
100'–0" DIA CLARIFIER – TYPE 'HVS'
TAUNTON, MA PHASE 2

DRAWING NO. D105–85650–166 REV. A

GENERAL ARRANGEMENT DRAWING

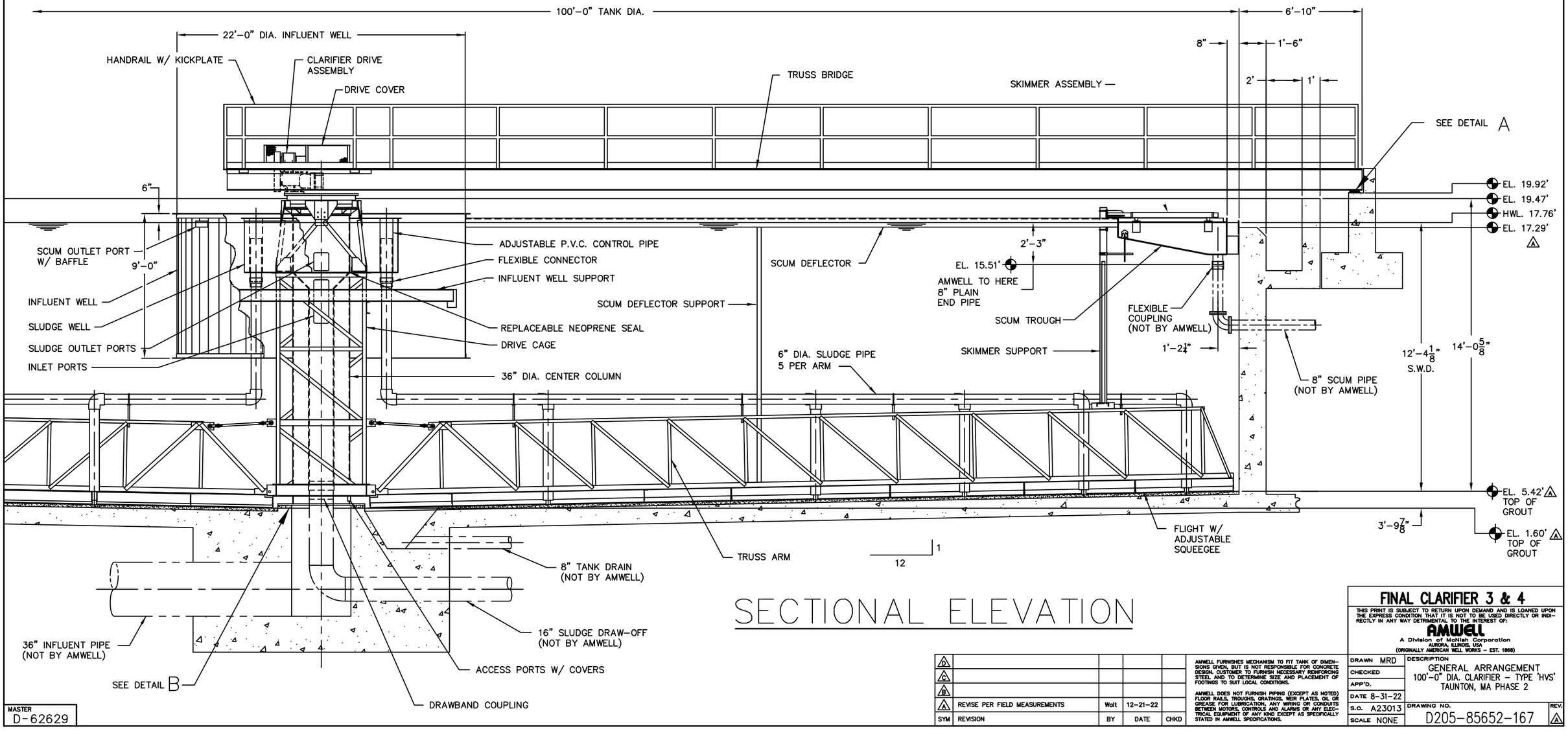


DETAIL A



DETAIL B

AMWELL REQUIRES ALL TANK DIMENSIONS & ELEVATIONS BE CONFIRMED OR REVISED



SECTIONAL ELEVATION

SYM	REVISION	BY	DATE	CHKD
A	REVISE PER FIELD MEASUREMENTS	Walt	12-21-22	
B				
C				
D				

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FINAL CLARIFIER 3 & 4

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS - EST. 1868)

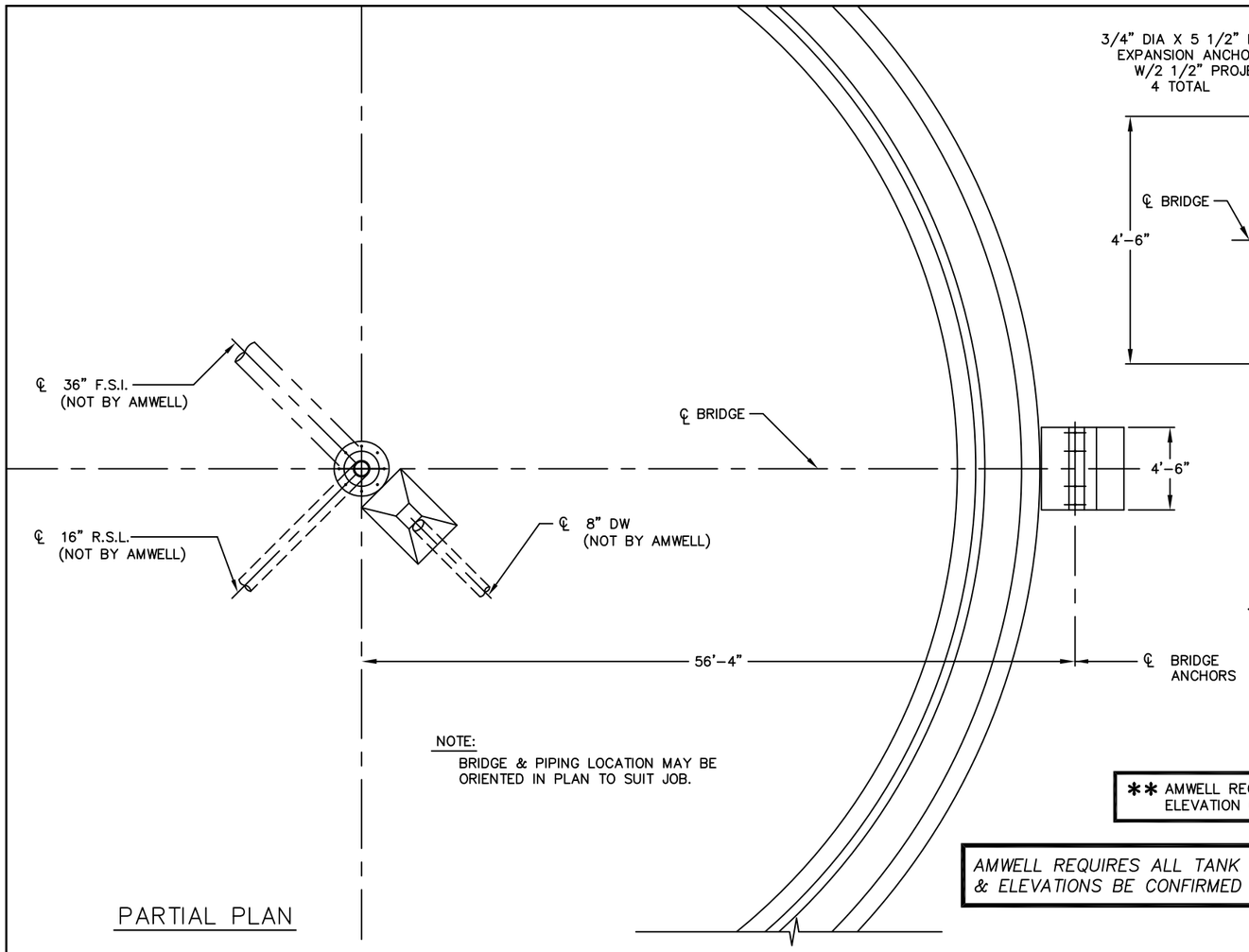
DRAWN	MRD
CHECKED	
APP'D.	
DATE	8-31-22
S.O.	A23013
SCALE	NONE

DESCRIPTION: GENERAL ARRANGEMENT
100'-0" DIA. CLARIFIER - TYPE 'HVS'
TAUNTON, MA PHASE 2

DRAWING NO. D205-85652-167 REV. A

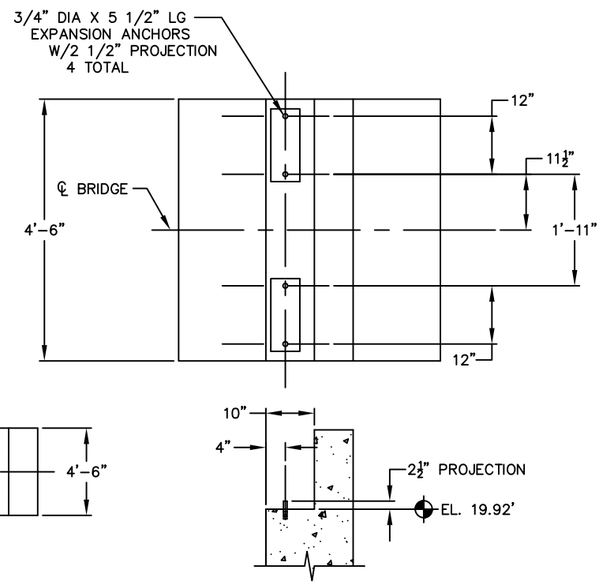
MASTER D-62629

ANCHOR LOCATION DRAWING

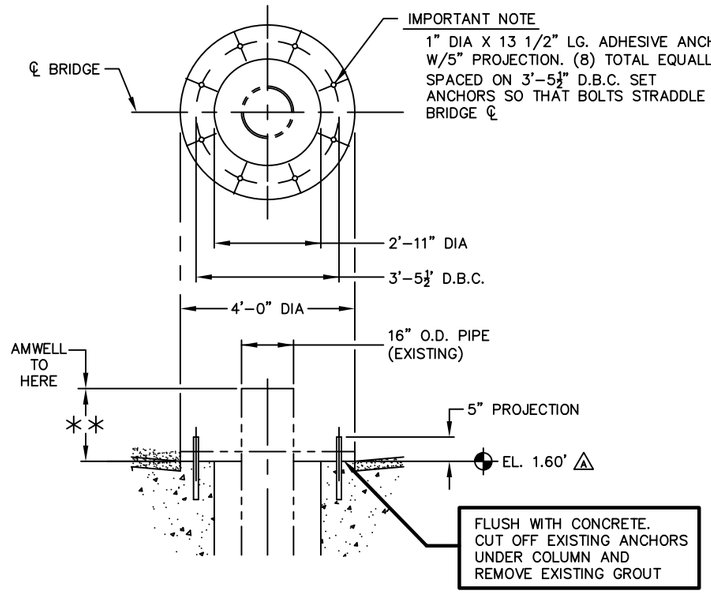


NOTE:
BRIDGE & PIPING LOCATION MAY BE ORIENTED IN PLAN TO SUIT JOB.

PARTIAL PLAN



BRIDGE ANCHOR DETAIL



CENTER COLUMN ANCHOR DETAIL

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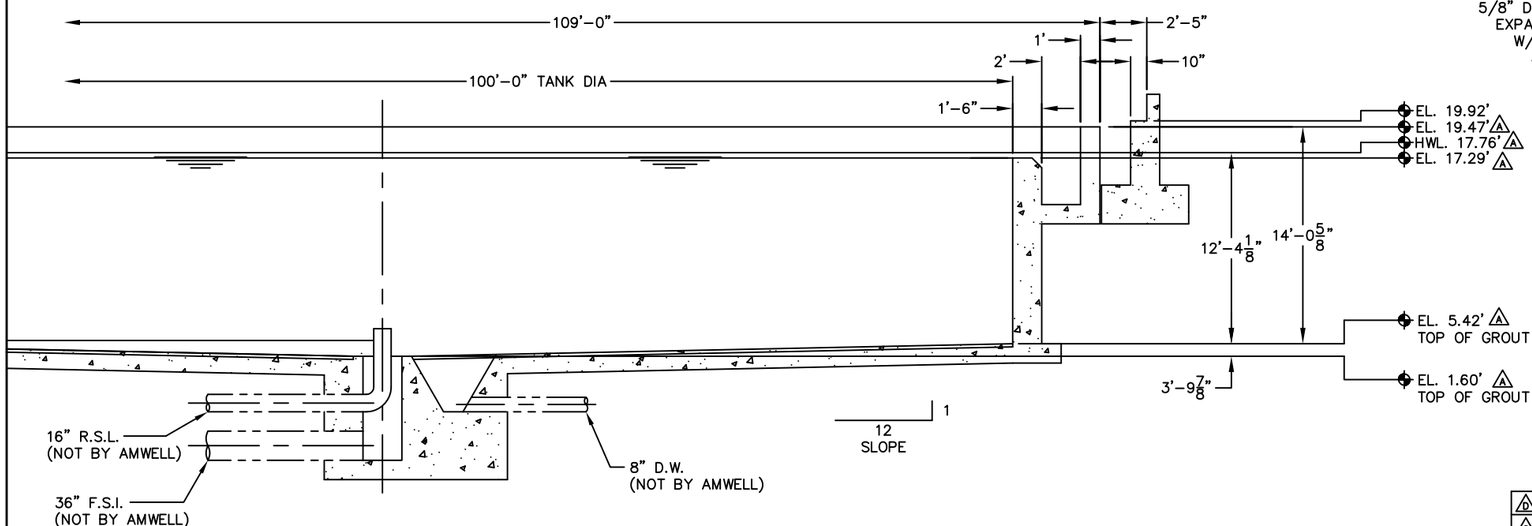
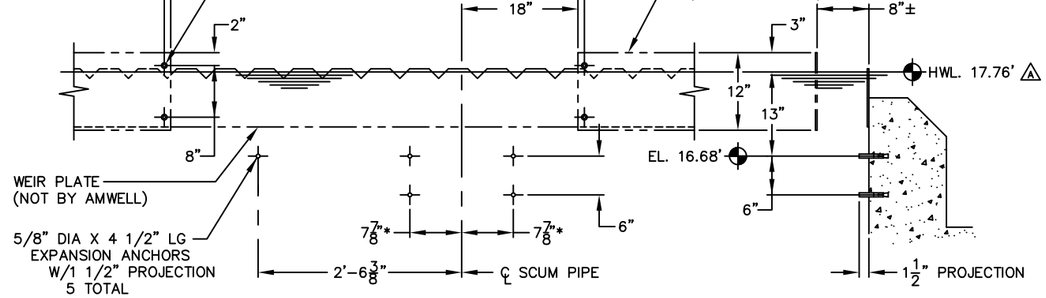
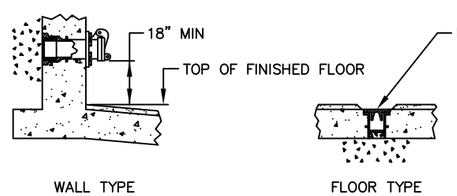


SECTIONAL ELEVATION



SCUM TROUGH ANCHOR DETAIL

* MEASURED ON INSIDE CIRCUMFERENCE OF EFFLUENT TROUGH WALL.



WALL TYPE FLOOR TYPE

INSTALLATION OF PRESSURE RELIEF VALVES - IF REQ'D
(NOT FURNISHED BY AMWELL)

MASTER
D-0346

SYM	REVISION	BY	DATE	CHKD
△D				
△C				
△B				
△A	REVISED PER FIELD DIMENSIONS	Walt	12-21-22	

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MICROFILMED

FINAL CLARIFIER 3 & 4

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS - EST. 1868)

DRAWN	MRD
CHECKED	
APP'D.	
DATE	8-31-22
S.O.	A23013
SCALE	NONE

DESCRIPTION
ANCHOR LOCATION
100'-0" DIA CLARIFIER - TYPE 'HVS'
TAUNTON, MA PHASE 2

DRAWING NO. D105-85653-166 REV. △A

SECTION J

TORQUE TEST INFORMATION

CIRCULAR CLARIFIERS

FIELD TORQUE TEST PROCEDURES

REFERENCE DRAWING

B605-18828-870

EQUIPMENT REQUIRED

Two (2) Drill-in Anchors (Furnished by AMWELL)

Two (2) Dynamometers (Furnished by AMWELL)

Two (2) Come-a-longs (By Contractor)

Two (2) Sets Connecting Chains and Shackles (By Contractor)

1) Anchor bolts to be embedded in the tank wall at points 180° apart. Refer to drawing B605-18828-870 in submittals for size and location.

2) Connect chains, puller and scales.

3) Load scales evenly with come-a-longs to specified alarm torque, set switch, load to cut-out torque, set switch.

Gauge readings determined by the following formula:

$$P = \frac{T}{D \times 2}$$

P = Gauge reading in pounds

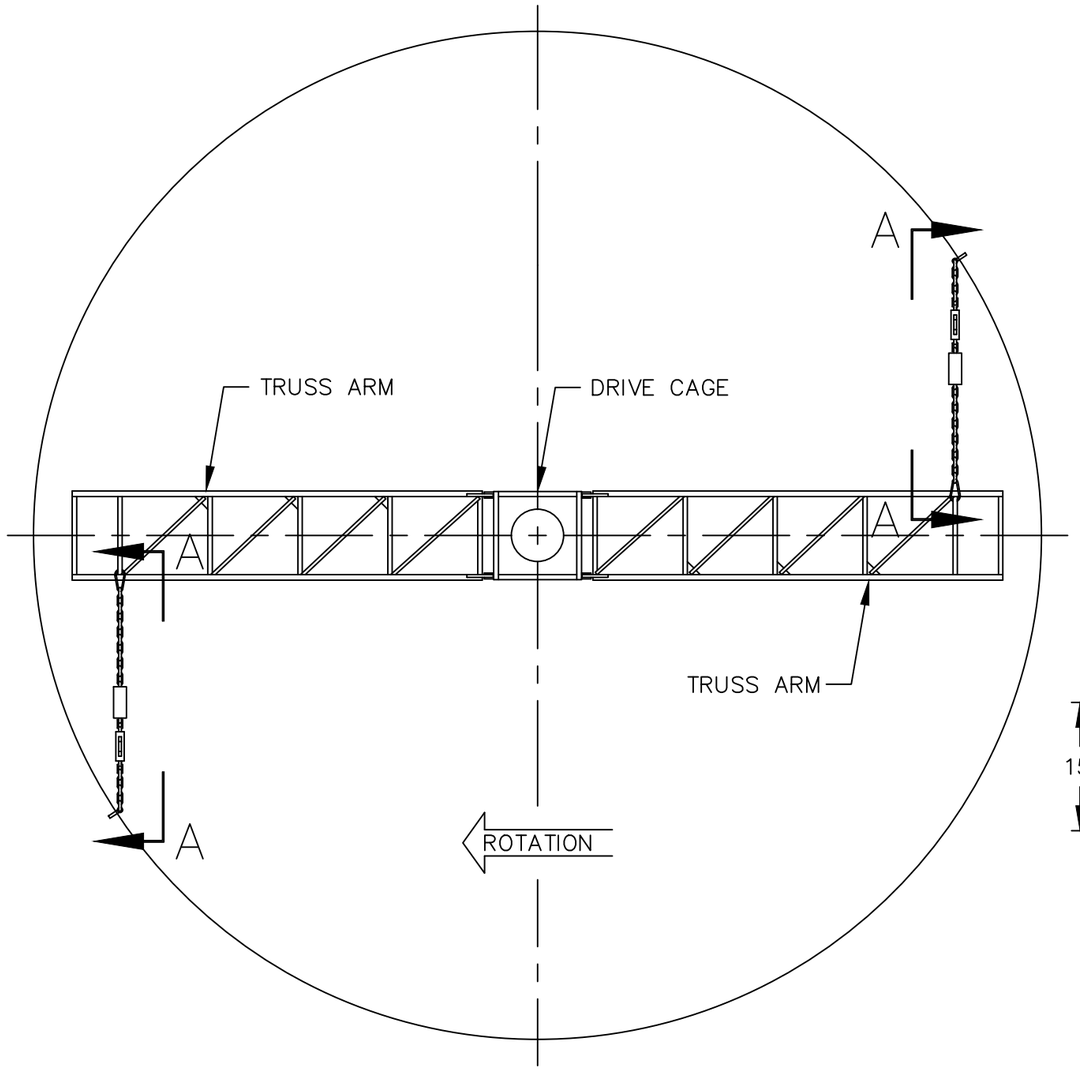
T = Torque in ft. lbs.

D = Distance from center line of tank to gauge connection on arm in feet.

NOTE:

Field torque test switch settings take precedence over factory set switch settings if different.

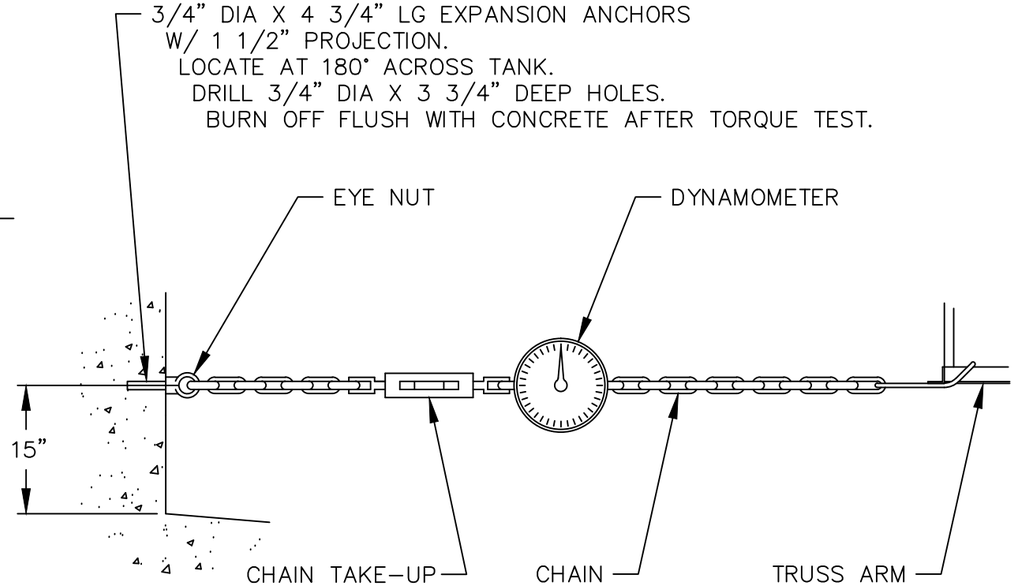
TORQUE TEST ARRANGEMENT



TANK FLOOR PLAN

NOTE:

CHAIN SHALL BE ATTACHED TO ANCHOR BOLT BY MEANS OF AN EYE NUT AND TO THE ARM BY WRAPPING CHAIN AROUND A VERTICAL MEMBER AND ATTACHING TO ITSELF AS SHOWN BELOW. TAKE–UP SHALL BE USED TO ELIMINATE ANY SLACK IN CHAIN. THE DYNAMOMETER SHALL THEN BE SET AT ZERO AND THE UNIT WILL BE READY TO TORQUE TEST.



VIEW A–A

AMWELL
A Division of McNish Corporation
AURORA, ILLINOIS, USA
(ORIGINALLY AMERICAN WELL WORKS – EST. 1868)

CAD FILE: B18828

MASTER
B-18828

SYM	REVISION	BY	DATE	CHKD
D				
C				
B				
A				

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DRAWN	Walt
CHECKED	
APP'D.	
DATE	7–29–77
S.O.	STD
SCALE	NONE

DESCRIPTION

TORQUE TEST ARRANGEMENT

DRAWING NO. B 6 0 5 1 8 8 2 8 8 7 0

REV.