Weaver
CONSTRUCTION MANAGEMENT
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Phone: (303) 789-4111 FAX: (303) 789-4310

SUBMITTAL TRANSMITAL

September 05, 2012
WCM Submittal No: 11361-002.A

PROJECT: **Harold Thompson Regional WRF**
Birdsall Rd.
Fountain, CO 80817
Job No. 2908

ENGINEER: **GMS, Inc.**
611 No. Weber St., #300
Colorado Springs, CO 80903
719-475-2935 Roger Sams

OWNER: **Lower Fountain Metropolitan Sewage Disposal District**
901 S. Santa Fe Ave.
Fountain, CO 80817
719-382-5303 James Heckman

CONTRACTOR: **Walker Process Equipment**
840 N Russell Ave
Aurora, IL 60506-2853
630-892-7921 x 5401 Linda Woods / Nikki Wagner

SUBJECT: Revised Preliminary O&M for (2) 60 RSMTP Collectors with FRP W&B

SPEC SECTION: 11361 – Circular Clarifier Sludge Collection Equipment

PREVIOUS SUBMISSION DATES: 12/7/11

DEVIATIONS FROM SPEC: ___ YES _X_ NO

CONTRACTOR'S STAMP: This submittal has been reviewed by Weaver Construction Management and, unless indicated otherwise, has been found to be in conformance with the intent of the contract documents.

Contractor's Stamp:	Engineer's Stamp:
Date: 9/5/12 Reviewed by: Leslie Brown (X) Reviewed Without Comments ( ) Reviewed With Comments	

ENGINEER'S COMMENTS:_____
_____

FOUNTAIN, COLORADO
HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY

SPEC. SECTION 11361 - CIRCULAR CLARIFIER SLUDGE COLLECTION EQUIPMENT

MODEL "RSMTP" CIRCULAR CLARIFIERS

W.P.E. CONTRACT NO. Q10600A

WALKER PROCESS EQUIPMENT
Division McNish Corporation

840 North Russell Avenue
Aurora, Illinois
(630) 892-7921

Dedicated to the
Water and Wastewater
Industry

WALKER PROCESS EQUIPMENT
A DIVISION OF MCNISH CORPORATION
840 NORTH RUSSELL AVENUE
AURORA, ILLINOIS 60506
PHONE: (630) 892-7921

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

PROJECT	FOUNTAIN, COLORADO HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY
ENGINEER	GMS, INC.
CONTRACTOR/ PURCHASER	WEAVER GENERAL CONSTRUCTION CO. 3679 S. HURON STREET, SUITE 404 ENGLEWOOD, CO 80110 PHONE: (303) 789-4111 FAX: (303) 789-4310 P.O. #2908-11190 & DATED 3/14/11
AREA REPRESENTATIVE	WATER CONTROL CORP. 2460 W. 26TH AVENUE, SUITE 215-C DENVER, CO 80211 CONTACT: BILL PERETTI PHONE: (303) 477-1970 FAX: (303) 477-1981
SPECIFICATION REFERENCE	SECTION 11361 – CIRCULAR CLARIFIER SLUDGE COLLECTION EQUIPMENT
W.P.E. CONTRACT NO	***Q10600A*** – TWO (2) MODEL "RSMTP" CIRCULAR CLARIFIER MECHANISMS
SUBMITTED	NOVEMBER 10, 2011

TABLE OF CONTENTS

No. of Pages/Dwg. No.

SECTION D - LUBRICATION AND MAINTENANCE

SECTION E - ASSEMBLY & DISASSEMBLY INSTRUCTIONS

SECTION G - SPARE PARTS INFORMATION

SECTION H - INSTALLATION INSTRUCTIONS & DRAWINGS

No. of Pages/Dwg. No.

SECTION H - INSTALLATION INSTRUCTIONS & DRAWINGS – (Continued)

Master Erection Diagram (General Assembly)	D605-70593-292
Skimmer Erection Diagram	D205-62171-201
Scum Trough Erection Diagram	C605-71001-200
Scum Trough Flushing Gate Erection Diagram	C605-70108-292
Miscellaneous Erection Drawings	In Numerical Order
↑ (Refer to Installation Instructions & Master Erection Diagram)	
Weir & Baffle Instructions	1 thru 7
Weir & Baffle Drawing	5523-1, Rev. 2
	6304-E & 6305-D
Grating Manufacturer's Erection Drawing	475612
Expansion Anchor Instructions	1 thru 4

SECTION I - SPECIFICATIONS & GENERAL ARRANGEMENT DRAWINGS

Equipment Specifications	1 thru 8
Paint Specifications	1 and 2
General Arrangement Drawing - PLAN	D205-70549-167
General Arrangement Drawing - ELEV	D205-70550-167A
Anchor Location Drawing	D105-70551-166A
Tank Loads	B205-71000-167

SECTION J – START UP INFORMATION

Field Pre-Start-up Report
Training/Attendees
Certification of Installation, Inspection & Start-up Services
Manufacturer's Certification of Instructional Services
Equipment Maintenance Summary Sheet
Preventative Maintenance Summary Sheet

SECTION A

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:

WALKER PROCESS EQUIPMENT
A DIVISION OF MCNISH CORPORATION
840 NORTH RUSSELL AVENUE
AURORA, ILLINOIS 60506

PHONE: (630) 892-7921

ATTENTION: PROJECT MANAGEMENT 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 **WALKER PROCESS EQUIPMENT** 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 **WALKER PROCESS EQUIPMENT** 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

WALKER PROCESS EQUIPMENT 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.

WALKER PROCESS EQUIPMENT 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. **WALKER PROCESS EQUIPMENT** 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. **WALKER PROCESS EQUIPMENT** 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, **WALKER PROCESS EQUIPMENT's** paint job is rejected after installation, **WALKER PROCESS EQUIPMENT** will bear no costs associated with the removal or installation of the equipment to make modifications.

GALVANIZED COATINGS - STRUCTURAL STEEL

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

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

PROCESS EQUIPMENT

HAZARDOUS MATERIAL WARNING

Effective November 25, 1985, 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 Material Safety Data Sheets (MSDS) to all customers with initial shipment. Steel products, as supplied by WALKER PROCESS EQUIPMENT, 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. CONTRACT NUMBER

The serial number is also referred to as the Contract number. This is a 6 or 7 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 **WALKER PROCESS EQUIPMENT**. 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:

WALKER PROCESS EQUIPMENT
A Division of McNish Corporation
840 North Russell Avenue
Aurora, Illinois 60506

Phone: (630) 892-7921

ATTENTION: PARTS DEPARTMENT

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

SERIAL NUMBER	TYPE OF EQUIPMENT
Q10600A	Two (2) Model "RSMTP" Circular Clarifier Mechanism w/Model 28H6T Drive
	Refer to Section "G" for Spare Parts Information.

PROCESS EQUIPMENT

GENERAL INFORMATION

BACKCHARGES

WALKER PROCESS EQUIPMENT, 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 **WALKER PROCESS EQUIPMENT**.

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 **WALKER PROCESS EQUIPMENT** 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 **WALKER PROCESS EQUIPMENT**.

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 **WALKER PROCESS EQUIPMENT**. **WALKER PROCESS EQUIPMENT** will not honor any invoice for corrective work performed by the buyer unless prior written approval has been obtained from **WALKER PROCESS EQUIPMENT**, 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 **WALKER PROCESS EQUIPMENT**.

WARRANTY POLICY

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

Items not manufactured by **WALKER PROCESS EQUIPMENT** 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 **WALKER PROCESS EQUIPMENT** must be inspected and certified to be in proper operational order. This must be done by an Authorized Field Service Representative of **WALKER PROCESS EQUIPMENT** 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 **WALKER PROCESS EQUIPMENT** will render all equipment warranties, both specific and implied, null and void.

FIELD SERVICE

The erection aids material provided by **Walker Process** 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 Project Management Department, **Walker Process Equipment, A Division of McNish Corporation, 840 North Russell Avenue, Aurora, IL 60506, or call us at 630/892-7921.**

SECTION B

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 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

MODEL 'RSMTP" CIRCULAR CLARIFIERS

OPERATING INSTRUCTIONS

PURPOSE

This machine has been designed to continuously remove substantially all settleable solids from sewage or wastewater after prior treatment and to discharge these solids or sludge in a highly active state for either further use in the process or disposal, while at the same time discharging an effluent with minimum settleable solids content.

PRINCIPLE

This machine consists of rotating arms attached to a driving unit containing an integral bearing for supporting the mechanism and with the sludge discharge near the center of the mechanism. The influent is introduced through the center column, entering from beneath the tank and is discharged through submerged ports at the influent well. The influent, upon exiting from the center column has its entering velocity dissipated by means of an influent well surrounding the center column and supporting cage for the mechanism. The clarified effluent leaves the influent well at its bottom in a uniform radial pattern and flows outward and upward to the effluent overflow weir.

The effluent overflows a V-notched weir extending around the outside of the tank into a collection launder and then flows to the effluent discharge pipe and then to outfall.

Sufficient time has been allowed in the sizing of the mechanism so that the solids in the influent will settle out to the tank bottom along a flow path from center column to outer wall.

It is essential that the weirs be absolutely level in order that a steady and uniform liquid flow will discharge at all points. Irregularity in this level will cause more flow at the low points, and consequent increase in velocity will likely carry fine suspended solids into the effluent. V-notched weirs are used to minimize the effect of wind across the liquid surface which might produce unequal weir loading.

A feature of this clarifier design is its ability to rapidly and continuously remove the settled sludge and discharge it in a biologically active state for reintroduction into the process.

It is economically necessary to return this activated sludge in as highly concentrated form as is consistent with the freshness required, the one being inversely proportional to the other. As such, it will probably be desirable to operate with a sludge blanket depth over the tank bottom of approximately two feet. This will not retain the sludge in the clarifier more than two hours while allowing a much higher concentration than would be possible if the bottom were "swept clean".

Bottom sludge is continuously "sucked up" through orifices into a rectangular hollow duct collection arm and then discharged. Each orifice transports sludge from an annular area of the tank bottom. Sludge is then withdrawn from the rotating sludge collection manifold through an opening near the tank center which connects with a sludge discharge pipe.

MODEL 'RSMTP" CIRCULAR CLARIFIERS

OPERATING INSTRUCTIONS

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.

⚠ CAUTION: 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 PROCEDURE

It is assumed that the machine is properly installed and thoroughly lubricated, that all parts are in alignment and proper clearance exists between the mechanism, and concrete at all points, that the bottom of the clarifier has been screeded in, and that the arms have been adjusted so that there is proper clearance between arms and the tank bottom at all points throughout the complete revolution of the raking mechanism. The clearance between the tank bottom and the squeegee should not exceed 1/2 inch 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 a dry tank for several hours, flow may be admitted while the mechanism continues to operate.

STARTING PROCEDURE - (Continued)

The tank should be completely filled before sludge recirculation is started. In this way, all sludge removal conduits will be filled, and a starting of the sludge recirculation system will then result in the complete sludge recirculation system being operative.

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 overload 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.

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

Although provision has been made to minimize damage resulting from objects such as tools, rocks, rags and other foreign bodies being dropped into the tank, it is imperative that these objects be removed immediately before continuing the mechanism operation.

1. SLUDGE SUCTION PIPE BECOMES PLUGGED

If the sludge suction pipe appears to have become plugged due to a rag or other foreign material, it will become evidenced by a radical change in sludge removal. It will be necessary to clear the line by reversing the flow with a high pressure water hose, or by unplugging with a flexible pipe rod. It may be necessary to drain the tank and find the reason for plugging. At any rate the obstruction should be located and removed before continuing with normal operation.

2. OVERLOAD ALARM SOUNDS/STOPS MOTOR (Ref. Dwgs. C505-46818-171 & D705-46884-171)

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 be necessary to increase the rate of sludge draw off in order to bring a 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 **7,560** 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 **8,820** ft. lbs. is reached, the drive control will cut electrical power to the drive unit thereby stopping the mechanism rotation. 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. 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-overloaded position when the drive is stopped.

Additional protection is provided by means of a shear pin sprocket with a shear value of approximately **13,000** ft. lbs.

IMPORTANT NOTE: 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. See wiring diagram on drawing AM40811TLC.

2. OVERLOAD ALARM SOUNDS/STOPS MOTOR - (Continued)

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 the influent to a clarifier of this design 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 IN 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!

ATTENTION:

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

2. Whenever possible, examine gear and all wearing parts periodically to determine whether excessive wear is taking place. Open all condensate drains on the drive unit periodically to prevent accumulation of moisture in the drive unit bearing.

3. Test the overload alarm at least once per week to make certain that the mechanism is protected.

4. 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 started again.

5. Keep the machine and surroundings clean and touch up all rust spots or other paint damage frequently.

6. The entire mechanism above and below water line should be inspected once every year and painted as required.

SHUTDOWN OF THE CLARIFIER

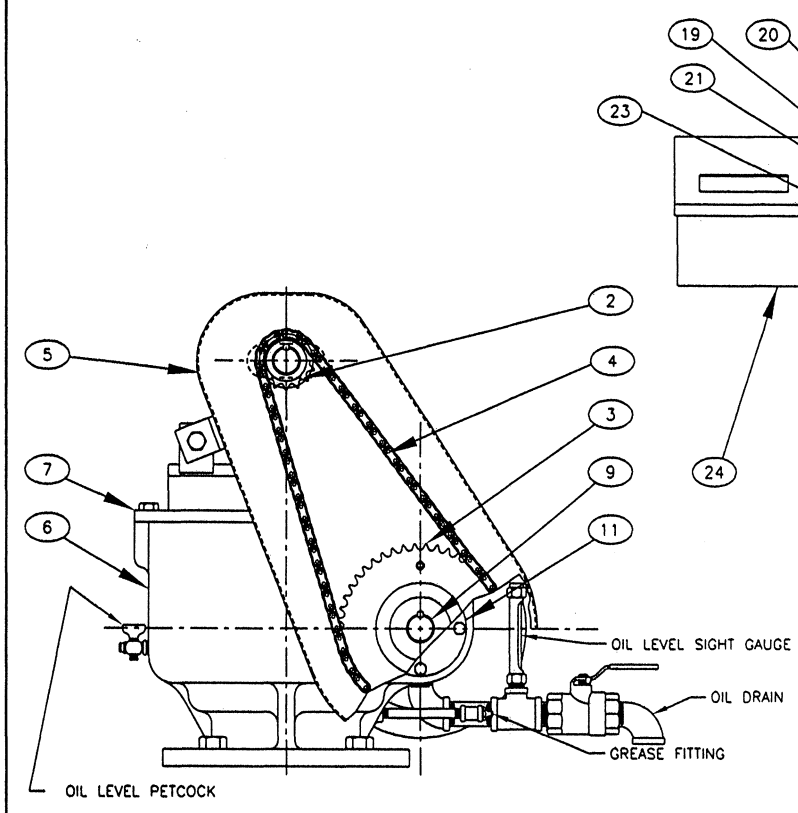
(Also refer to separate "Shutdown Procedures" provided in this section).

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.

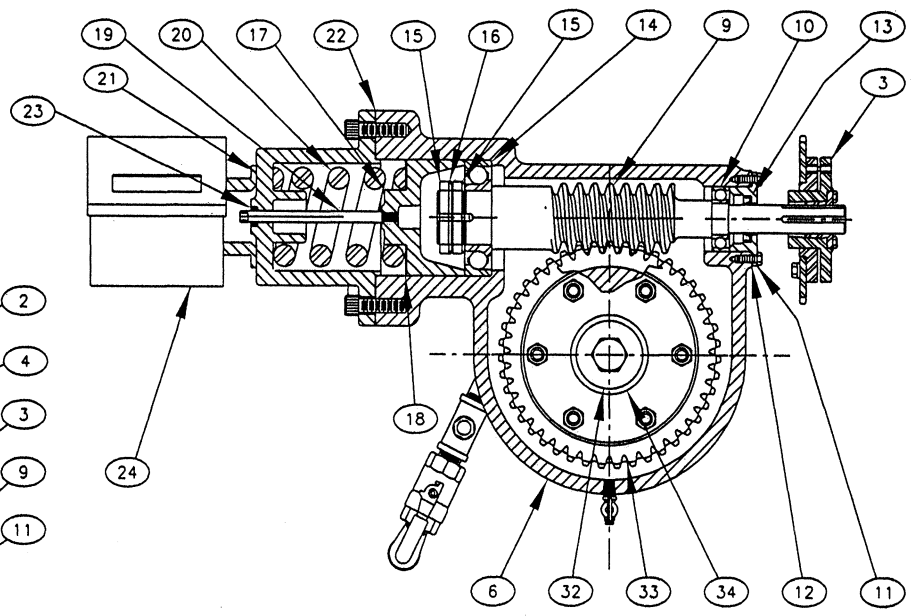
Draining the tank to correct problems or to recondition the mechanism should be done preferably in the winter when biological growth would at a minimum, rather than in the warmer weather of summer. It should also be planned so that down time is kept to a minimum and at a time when the flow into the plant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

LUBRICATION

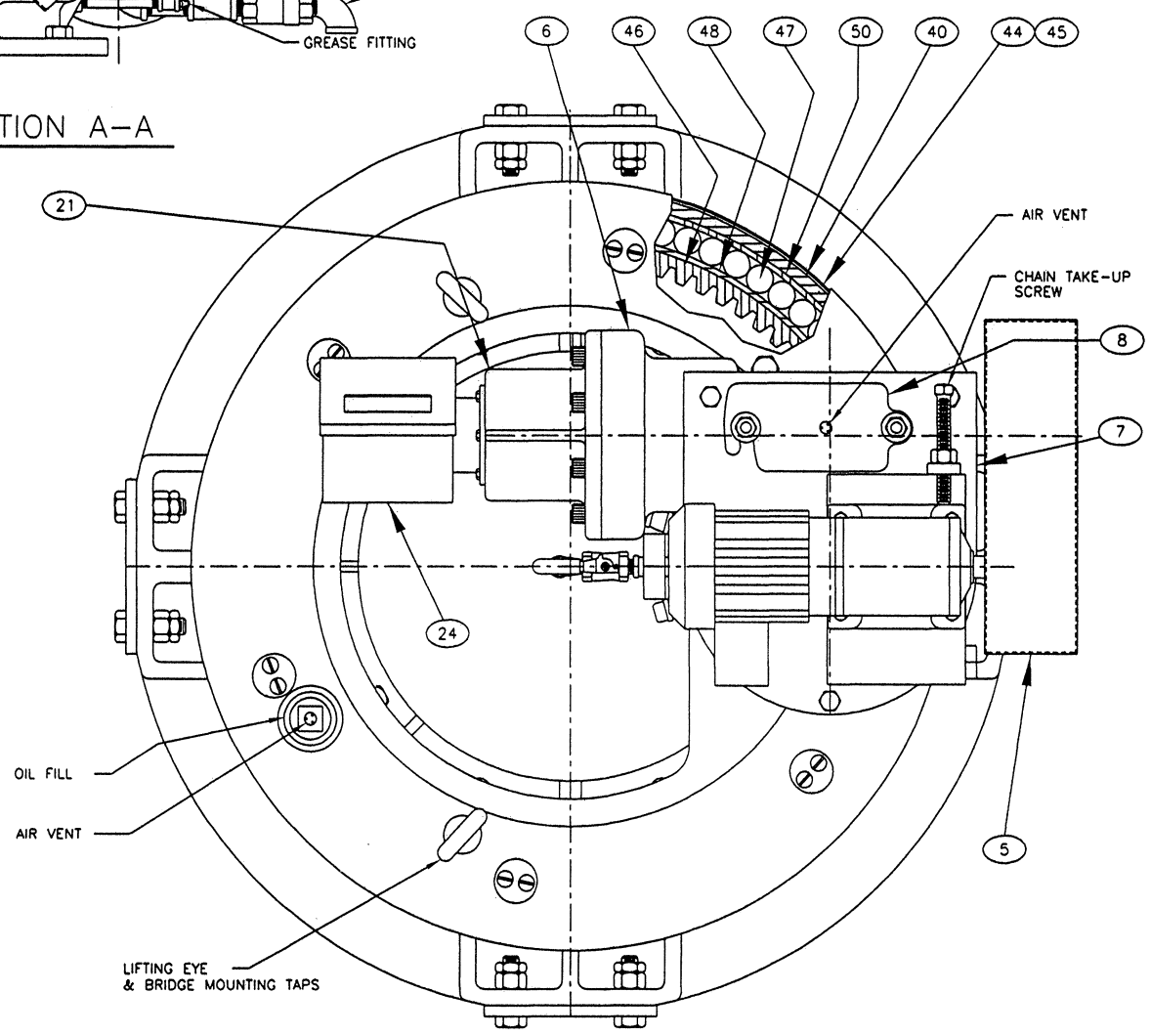
Lubrication instructions and recommended lubricants are provided in Section “D” of this manual.



SECTION A–A



SECTION B–B



PLAN

SECTIONAL ELEVATION

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	TORQUE OVERLOAD ASSEMBLY
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

REVISIONS

BY	CHKD	DATE

REMARKS

DRAWN	DATE	BY
	5/7/97	WTW

CHECKED

APPR.

SCALE: NONE

FILE REFERENCE

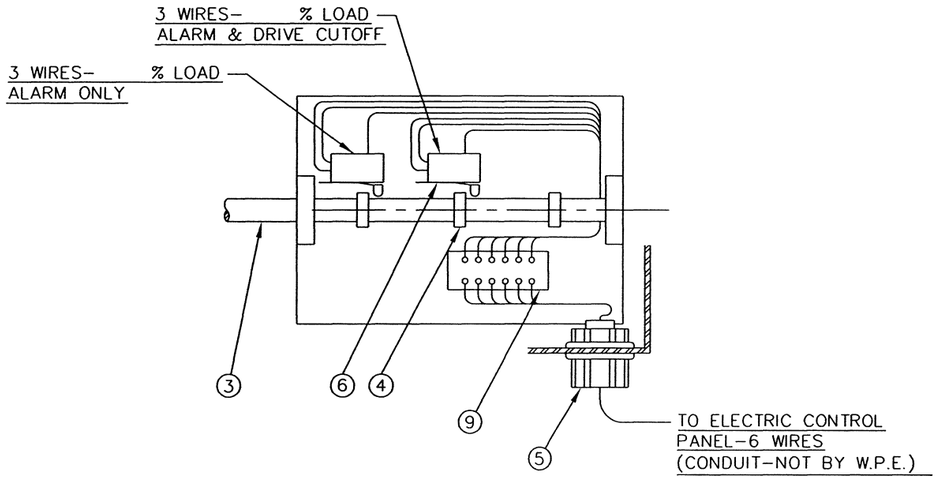
Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

PARTS LIST
MODEL 28H6T DRIVE
PLATFORM BRIDGE W/SHEAR PIN HUB

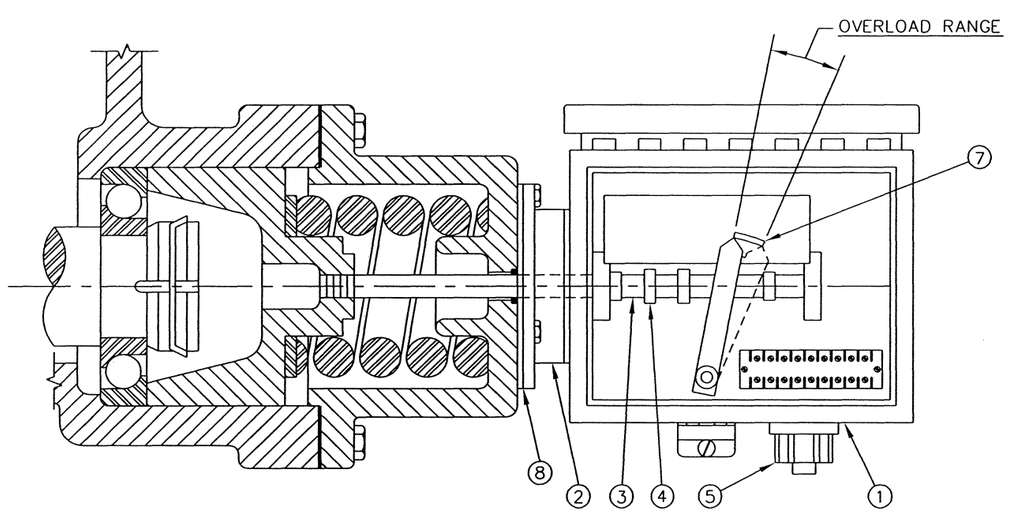
CONTRACT: STD.

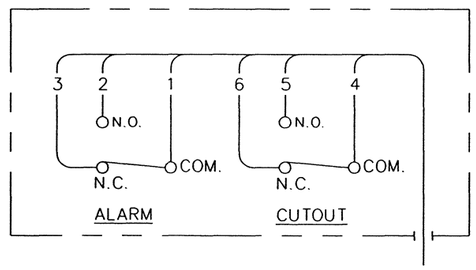
DRAWING NO.: D,7,0,5|4,6,8,8,4|1,7,1

REV.



NO.	DESCRIPTION	MAT'L	QTY	PART NO.
1	ENCLOSURE NEMA 4X	S.S.	1	
2	ATTACHMENT RING	A–519	1	
3	THREADED ROD 1/4"–28 UNF	304 S.S.	1	
4	CLAMP COLLAR 1/4"–28 UNF	CAD PL	3	
5	CONDUIT HUB RIGID 1/2"	GALV.	1	
6	MICRO SWITCH		2	
7	RANGE MARKER	PAPER	1	
8	OVERLOAD DIAPHRAGM	NEOP.	1	
9	TERMINAL BLOCK		1	





1–REMOTE ALARM SYSTEM
A–NORMALLY OPEN ALARM CONTACT–TERMINALS 1 & 2
B–NORMALLY CLOSED ALARM CONTACT–TERMINALS 1 & 3

2–MOTOR OVERLOAD CUTOUT
A–NORMALLY OPEN CONTACT–TERMINALS 4 & 5
B–NORMALLY CLOSED CONTACT–TERMINALS 4 & 6

3–REFER TO CONTRACT DRAWINGS FOR OVERLOAD & ALARM CIRCUITRY.

4–FOR MAINTAINED CONTACT CONTROL SYSTEM, LOCKOUT DEVICE IS RECOMMENDED.

CAD FILE: r:\C46818W PLOT SCALE=1

SYM	REVISION	BY	DATE	CHKD
E				
D				
C				
B				
A				

MASTER C-41184

	DATE	BY
DRAWN	4/29/97	WTW
CHECKED		
APPR.		

SCALE NONE

FILE REFERENCE

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

PARTS LIST
TORQUE INDICATOR BOX ASSEMBLY

CONTRACT	DRAWING NO.	REV.
STD	C,5,0,5|4,6,8,1,8|1,7,1	

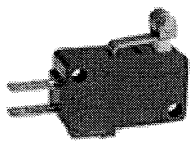
10/10/2011 9:50:18 AM - myang - FOUNTAIN, CO Q10600A

LIMIT SWITCH INFORMATION

Honeywell

Honeywell Sensing and Control

V7-7B17D8-201



V7 Series Miniature Basic Switch, Single Pole Double Throw Circuitry, 11 A at 277 Vac, Roller Lever Actuator, 2,78 N [10.0 oz] Maximum Operating Force, Silver Contacts, Quick Connect Termination

Actual product appearance may vary.

V7 Series Features

- World-wide package size acceptance
- Current rating ranges from 0.1 A to 25 A
- Wiping contact action
- Temperature range to 177 °C [350 ° F]
- Long mechanical life
- Elongated mounting holes for easier, more accurate mounting
- UL/CSA recognized, ENEC (European) approval available
- Choice of actuation, termination and operating characteristics

Potential Applications

- Appliances
- Vending machines
- Timing devices
- Office equipment
- Computer/business equipment
- Test instruments
- Medical/dental equipment
- Communications equipment
- HVAC equipment
- Manually operated devices
- Valves
- Gaming equipment
- Pressure switches

Description

MICRO SWITCH™ V5 and V7 Series basic switches are used for simple or precision on/off, end of limit, presence/absence, pressure, temperature and manual operator interface application needs.

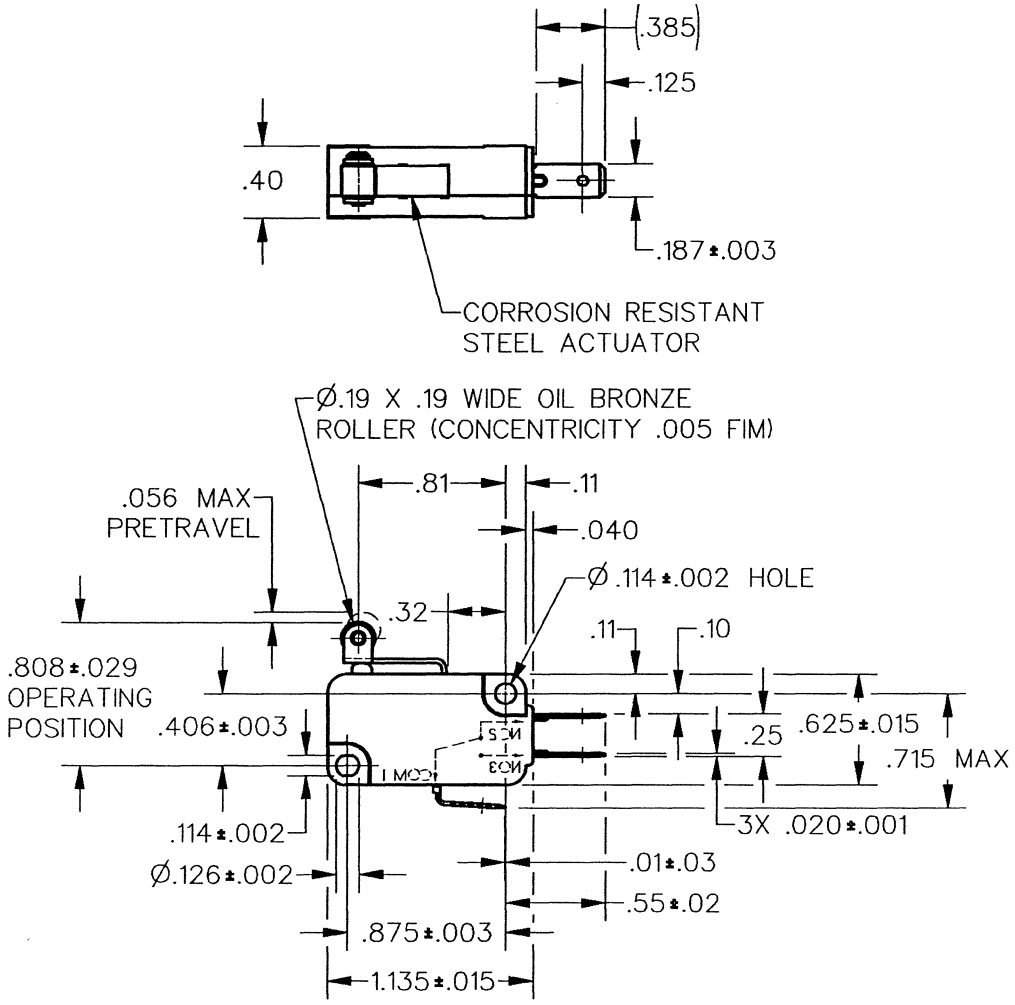
Product Specifications	
Switch Type	MICRO SWITCH™ Miniature 15,9 mm H x 10,2 mm W x 28,8 mm L [0.63 in H x 0.4 in W x 1.14 in L]
Sealed	No
Ampere Rating	11 A
Circuitry	Single Pole Double Throw (SPDT)
Actuator	Roller Lever
Termination	Quick Connect
Operating Temperature Range	-40 °C to 85 °C [-40 °F to 185 °F]
Voltage	277 Vac

Approvals	CSA,UL,ENEC
Actuator Length	20,6 mm [0.81 in]
Contact Type	Silver
Operating Force (O.F.)	2,78 N [10.0 oz] max.
Release Force (R.F.)	0,28 N [1.0 oz] min.
Pretravel (P.T.)	1,42 mm [0.056 in] max.
Overtravel (O.T.)	0,86 mm [0.034 in] min.
Differential Travel (D.T.)	0,33 mm [0.013] max.
Operating Position (O.P.)	20,5 ± 0,736 mm [0.808 ± 0.029 in]
Housing Material	PCT PolyesterThermoplastic
High Temperature	85 °C [185 °F]
CE mark	61058-1
UL File #	E12252
CSA File #	LR41370
Agency Approvals and Standards	1054
Mounting Centers	22,2 mm [0.88 in]
Maximum Tightening Torque	0,56 N m [5.0 in lb]
Weight	8 g [0.3 oz]
Package Height	16 mm [0.63 in]
Package Width	10,2 mm [0.40 in]
Package Length	27,7 mm [1.09 in]
Availability	Global
UNSPSC Code	30211905
UNSPSC Commodity	30211905 Snap switches
Series Name	V7

MICRO SWITCH
a Honeywell Division
FED.MFG.CODE 91929

SWITCH – BASIC

CATALOG LISTING
V7–7B17D8–201
CW–C6117



ANSI Y14.5M–1982 APPLIES

THIRD ANGLE PROJECTION

CHARACTERISTICS	ELECTRICAL DATA	SCALE FULL — DO NOT SCALE PRINT
OPERATING FORCE — — — — 10 OZ MAX	CONTACT ARRANGEMENT S P D T	UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
RELEASE FORCE — — — — — 1 OZ MIN	L156 11A 1/3HP 125, 250 OR 277 VAC 1/2A 125 VDC, 1/4A 250 VDC 4A 125 VAC "L"	ONE PLACE (.0) ±.030
DIFFERENTIAL TRAVEL — — — .013 MAX		TWO PLACE (.00) ±.015
OVERTRAVEL — — — — — — .034 MIN		THREE PLACE (.000) ±.005
RELEASE TRAVEL — — — — .007 MIN		ANGLES ±
		WEIGHT

REVISIONS
A PR23389 TSM 17 APR 98

CATALOG LISTING V7–7B17D8–201 PAGE 1 OF 1
ISSUE 2
REPLACES X102350–V7
RELEASE NO. PR–23389
CHECK
CHECK
17 APR 98 JAF
CHECK
TSM 17 APR 98 DDM/CAD
DRAWN

CONTROL PANEL INFORMATION

TLC CONTROLS INC.
553 W. CARBOY ROAD
MT. PROSPECT, IL. 60056

8/8/11

TAG: FOUNTAIN, CO

DRAWING: AM40811TLC

TAG	QTY	DESCRIPTION	MANUFACTURER	CATALOG NUMBER
-	1	24 X 20 X 8 NEMA 4X STAINLESS STEEL CABINET	HOFFMAN	C-SD24208SS
-	1	CABINET SUB PANEL	HOFFMAN	C-P2420
CB	1	CIRCUIT BREAKER	EATON	HMCP003A0C
-	1	CIRCUIT BREAKER HANDLE	EATON	HM1R12X
M	1	MOTOR STARTER	ALLEN-BRADLEY	509-BOD
OL	1	OVERLOAD RELAY	ALLEN-BRADLEY	A2E
-	1	OVERLOAD RESET BUTTON	CONTROL CONCEPTS	RPB-B
CT	1	CONTROL TRANSFORMER	SOLA HEVI/DUTY	E150
TFU	2	TRANSFORMER FUSE	LITTELFUSE	CCMR-1/2
CFU	1	CONTROL FUSE	LITTELFUSE	FLM-1.6
CR	7	CONTROL RELAY	IDEC	RH2BUL-AC120V + SH2B-05
LR	1	HIGH TORQUE SHUTDOWN LATCHING RELAY	DIVERSIFIED	SPM-120-ADA
CM	1	CURRENT MONITOR	EMOTRON	EL-FI M20 + CTM010
E	1	ELAPSED TIME METER	ENM	T50
PL	7	PILOT LIGHT	IDEC	HW1P-1FQD-G,R & W-120
-	7	PILOT LIGHT BULB	IDEC	LSTD-H2 –G, R & W
SS	1	SELECTOR SWITCH	IDEC	HW1S-3TF20
PB1	1	PUSH BUTTON	IDEC	HW1B-M1F01-B
PB2	1	EMERGENCY PUSH BUTTON	IDEC	HW1B-V4F01-R
-	20	TERMINAL	ENTRELEC	011511607

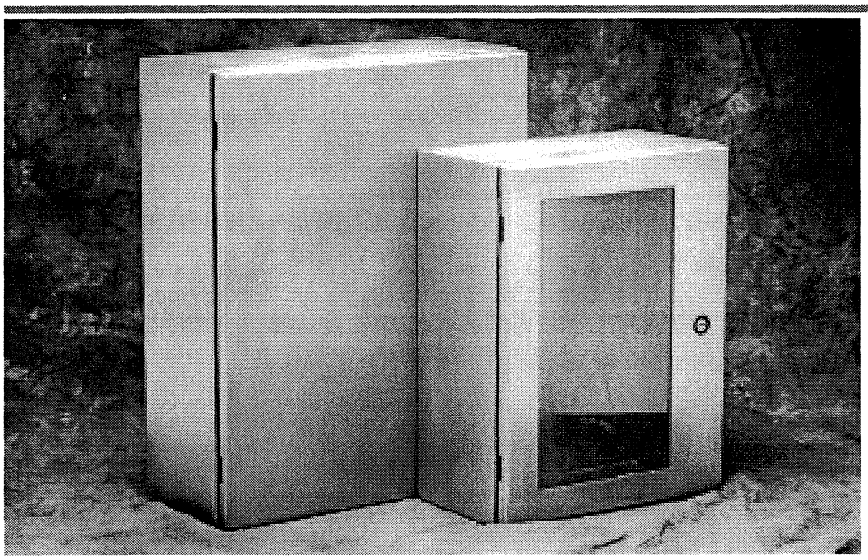
NOTE: ALL PARTS SUBJECT TO CHANGE DEPENDING UPON AVAILABILITY.

ph

Hoffman®
A Pentair Company

CONCEPT® Stainless Steel Wall-Mount Enclosures

Rev C January 2002



Application

The CONCEPT® stainless steel enclosure, with its streamlined design and UL Type 4X rating, is a perfect fit for mounting electrical or high-tech electronic equipment in a variety of indoor and outdoor settings. It is typically used in the following areas where corrosion-resistant protection is needed: food processing plants, pharmaceutical manufacturing facilities, petrochemical plants, pulp and paper processing, and waste water treatment facilities.

Patents:
Combined Handle and Lock Unit
360,345 (U.S.)
DEM 9405854.7 (Germany)
Enclosure Latch 5,509,703 (U.S.)
Hinge System 5,666,695 (U..S.)

Other patents pending.

Construction

- Manufactured from 16 or 14 gauge Type 304 or Type 316L stainless steel
- Seams continuously welded and ground smooth
- Minimum width body flange provides maximum door opening
- Body flange trough excludes liquids and contaminants
- Panel mounting studs fit optional CONCEPT panels and other accessories
- Mounting holes in back of body for direct mounting or for optional external mounting feet
- Type 304 stainless steel hidden hinges promote clean aesthetic appearance
- Standard full access 170° opening
- Doors are interchangeable and easily removable by pulling captive hinge pins
- For extra rigidity, door bars and center stiffener furnished on doors 36.00 x 36.00 and larger
- Provision on door (except window door style) for thermoplastic data pocket
- Provision on door (except window door style) for optional doorstop kit
- Quarterturn latches (or a 3-point latch system on larger enclosures) furnished with flush slotted insert. Optional handles or inserts are available.
- Window door enclosures have a clear polycarbonate window mounted flush with door surface
- Hinge mounting brackets for wire management or optional accessories
- Seamless foam-in-place one piece gasket provides oil-tight and dust-tight seal against contaminants
- Self-grounding latch system with double seal provides maximum protection against leakage
- Integral body grounding stud
- Furnished hardware kit consists of panel mounting nuts, grounding hardware, and sealing washers for wall mounting holes
- Installation instructions for enclosure and accessories are provided

Finish

Enclosures are unpainted. Cover and body have smooth brushed finish.

- Optional CONCEPT panels are white painted or zinc plated.
- Optional NEMA panels are white painted, zinc plated, aluminum or stainless steel.

Industry Standards

NOTE: Mounting feet required to maintain UL/CSA ratings. Some models also require internal panel; see order table.

UL508, File No. E61997: Type 4, Type 4X and Type 12
NEMA/EEMAC Type 4, Type 4X, Type 12, and Type 13
CSA File No. LR42186: Type 4, Type 4X and Type 12
VDE IP66
IEC 60529, IP66

Accessories

See General Accessories: CONCEPT® Enclosure Accessories, pages 11.66-11.71

Corrosion Inhibitors
Data pocket (except window door style)
Door Stop Kit (except window door style)
Lighting Kits
Panels (See table)
Panels, NEMA
Terminal Kit Assembly
Wiring Duct

Modification Services Program

You can customize this product to your unique requirements by specifying from these options:

- Enclosure height, width, depth
- Holes and cutouts in body, doors, subpanels
- Tapped holes, fasteners, mounting channel in enclosure and subpanel
- Mounting (adds and deletes)
- Doors
- Subpanels
- Thermal management (louvers, fans, filters)
- Windows
- Standard accessories
- Drip shield

For details, see Modification Services at hoffmanonline.com.
To order, contact your local Hoffman sales representative.

Hoffman®
A Pentair Company

CONCEPT® Stainless Steel Wall-Mount Enclosures

Rev B February 2001

Standard Sizes CONCEPT Stainless Steel Single-Door Wall-Mount Enclosures

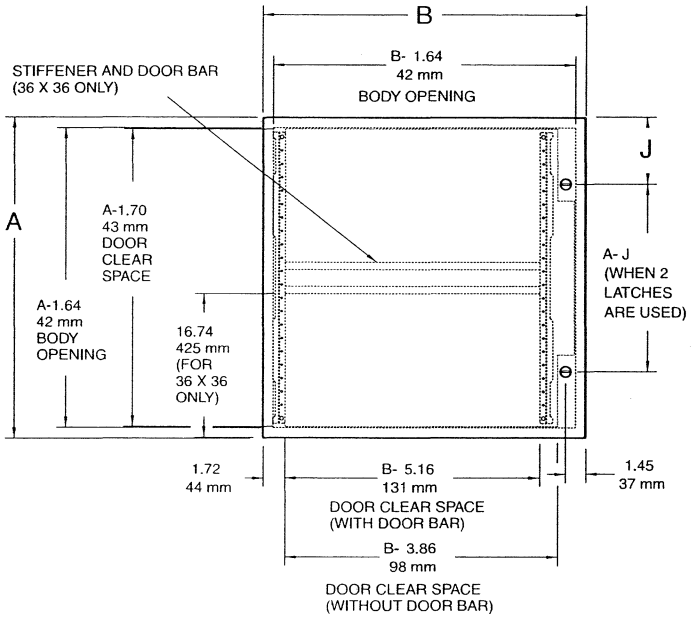
Type 304 Catalog Number	Type 316L Catalog Number	Door Gauge	Body Gauge	Enclosure Size A x B x C	* CONCEPT Panel Catalog Number	Panel Size D x E	Mounting G x H	Latches qty	style	J
C-SD12126SS	C-SD12126SS6	16	16	12.00 x 12.00 x 6.00 (305 x 305 x 152)	C-P1212	10.20 x 10.20 (259 x 259)	10.50 x 10.50 (267 x 267)	1	Quarterturn	6.00 (152)
C-SD16126SS	C-SD16126SS6	16	16	16.00 x 12.00 x 6.00 (406 x 305 x 152)	C-P1612	14.20 x 10.20 (361 x 259)	14.50 x 10.50 (368 x 267)	1	Quarterturn	8.00 (203)
C-SD16166SS	C-SD16166SS6	16	16	16.00 x 16.00 x 6.00 (406 x 406 x 152)	C-P1616	14.20 x 14.20 (361 x 361)	14.50 x 14.50 (368 x 368)	1	Quarterturn	8.00 (203)
C-SD20166SS	C-SD20166SS6	16	16	20.00 x 16.00 x 6.00 (508 x 406 x 152)	C-P2016	18.20 x 14.50 (462 x 361)	18.50 x 14.50 (470 x 368)	1	Quarterturn	10.00 (254)
C-SD20206SS	C-SD20206SS6	16	16	20.00 x 20.00 x 6.00 (508 x 508 x 152)	C-P2020	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	1	Quarterturn	10.00 (254)
C-SD16128SS	C-SD16128SS6	16	16	16.00 x 12.00 x 8.00 (406 x 305 x 203)	C-P1612	14.20 x 10.20 (361 x 259)	14.50 x 10.50 (368 x 267)	1	Quarterturn	8.00 (203)
C-SD16168SS	C-SD16168SS6	16	16	16.00 x 16.00 x 8.00 (406 x 406 x 203)	C-P1616	14.20 x 14.20 (361 x 361)	14.50 x 14.50 (368 x 368)	1	Quarterturn	8.00 (203)
C-SD16208SS	C-SD16208SS6	16	16	16.00 x 20.00 x 8.00 (406 x 508 x 203)	C-P2016	18.20 x 14.20 (462 x 361)	14.50 x 18.50 (368 x 470)	1	Quarterturn	8.00 (203)
C-SD20168SS	C-SD20168SS6	16	16	20.00 x 16.00 x 8.00 (508 x 406 x 203)	C-P2016	18.20 x 14.20 (462 x 361)	18.50 x 14.50 (470 x 368)	1	Quarterturn	10.00 (254)
C-SD20208SS	C-SD20208SS6	16	16	20.00 x 20.00 x 8.00 (508 x 508 x 203)	C-P2020	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	1	Quarterturn	10.00 (254)
C-SD24168SS	C-SD24168SS6	16	16	24.00 x 16.00 x 8.00 (610 x 406 x 203)	C-P2416	22.20 x 14.20 (564 x 361)	22.50 x 14.50 (572 x 368)	1	Quarterturn	12.00 (305)
C-SD24208SS	C-SD24208SS6	16	16	24.00 x 20.00 x 8.00 (610 x 508 x 203)	C-P2420	22.20 x 18.20 (564 x 462)	22.50 x 18.50 (572 x 470)	1	Quarterturn	12.00 (305)
† C-SD24248SS	† C-SD24248SS6	14	16	24.00 x 24.00 x 8.00 (610 x 610 x 203)	C-P2424	22.20 x 22.20 (564 x 564)	22.50 x 22.50 (572 x 572)	2	Quarterturn	5.00 (127)
† C-SD30248SS	† C-SD30248SS6	14	16	30.00 x 24.00 x 8.00 (762 x 610 x 8.00)	C-P3024	28.20 x 22.20 (716 x 564)	28.50 x 22.50 (724 x 572)	2	Quarterturn	5.00 (127)
† C-SD30308SS	† C-SD30308SS6	14	14	30.00 x 30.00 x 8.00 (762 x 762 x 203)	C-P3030	28.20 x 28.20 (716 x 716)	28.50 x 28.50 (724 x 724)	2	Quarterturn	5.00 (127)
† C-SD36248SS	† C-SD36248SS6	14	16	36.00 x 24.00 x 8.00 (914 x 610 x 203)	C-P3624	34.20 x 22.20 (869 x 564)	34.50 x 22.50 (876 x 572)	2	Quarterturn	5.00 (127)
† C-SD36308SS	† C-SD36308SS6	14	14	36.00 x 30.00 x 8.00 (914 x 762 x 203)	C-P3630	34.20 x 28.20 (869 x 716)	34.50 x 28.50 (876 x 724)	2	Quarterturn	5.00 (127)
C-SD202012SS	C-SD202012SS6	14	14	20.00 x 20.00 x 12.00 (508 x 508 x 305)	C-P2020	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	1	Quarterturn	10.00 (254)
† C-SD242412SS	† C-SD242412SS6	14	14	24.00 x 24.00 x 12.00 (610 x 610 x 305)	C-P2424	22.20 x 22.20 (564 x 564)	22.50 x 22.50 (572 x 572)	2	Quarterturn	5.00 (127)
† C-SD302412SS	† C-SD302412SS6	14	14	30.00 x 24.00 x 12.00 (762 x 610 x 305)	C-P3024	28.20 x 22.20 (716 x 564)	28.50 x 22.50 (724 x 572)	2	Quarterturn	5.00 (127)
† C-SD362412SS	† C-SD362412SS6	14	14	36.00 x 24.00 x 12.00 (914 x 610 x 305)	C-P3624	34.20 x 22.20 (869 x 564)	34.50 x 22.50 (876 x 572)	2	Quarterturn	5.00 (127)
† C-SD363012SS	† C-SD363012SS6	14	14	36.00 x 30.00 x 12.00 (914 x 762 x 305)	C-P3630	34.20 x 28.20 (869 x 716)	34.50 x 28.50 (876 x 724)	2	Quarterturn	5.00 (127)
† C-SD363612SS	† C-SD363612SS6	14	14	36.00 x 36.00 x 12.00 (914 x 914 x 305)	C-P3636	34.20 x 34.20 (869 x 869)	34.50 x 34.50 (876 x 876)	2	Quarterturn	5.00 (127)
† C-SD423612SS	† C-SD423612SS6	14	14	42.00 x 36.00 x 12.00 (1067 x 914 x 305)	C-P4236	40.20 x 34.20 (1021 x 869)	40.50 x 34.50 (1029 x 876)	1	3-point	21.00 (533)
† C-SD483612SS	† C-SD483612SS6	14	14	48.00 x 36.00 x 12.00 (1219 x 914 x 305)	C-P4836	46.20 x 34.20 (1173 x 869)	46.50 x 34.50 (1181 x 876)	1	3-point	24.00 (610)
† C-SD603612SS	† C-SD603612SS6	14	14	60.00 x 36.00 x 12.00 (1524 x 914 x 305)	C-P6036	58.20 x 34.20 (869 x 462)	58.50 x 34.50 (1486 x 876)	1	3-point	30.00 (762)

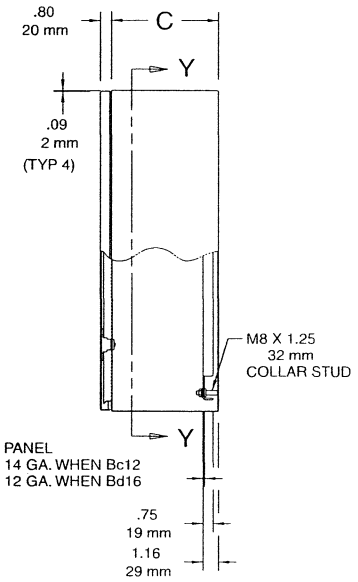
Millimeter dimensions ( ) are for reference only; do not convert metric dimensions to inch.

* Panels must be ordered separately. Optional zinc-plated CONCEPT panels available for most sizes. Optional NEMA size steel and stainless steel panels require conversion kit catalog number C-CPM4 (see section 11, General Accessories).

† Internal panel required to maintain UL/CSA ratings.

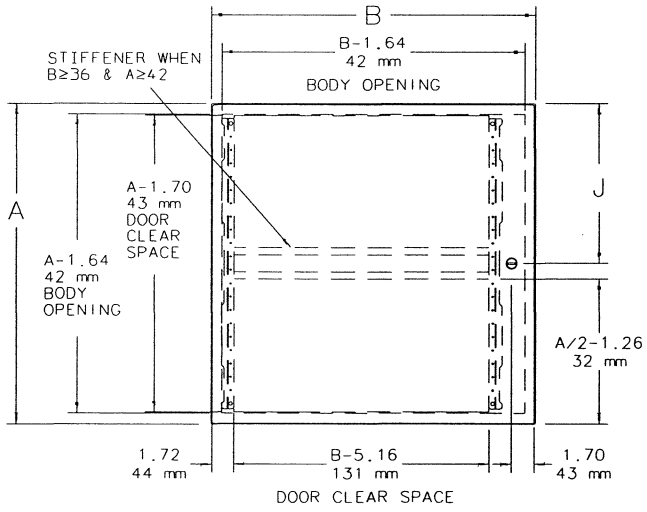
CONCEPT® Stainless Steel Single-Door Wall-Mount Enclosures

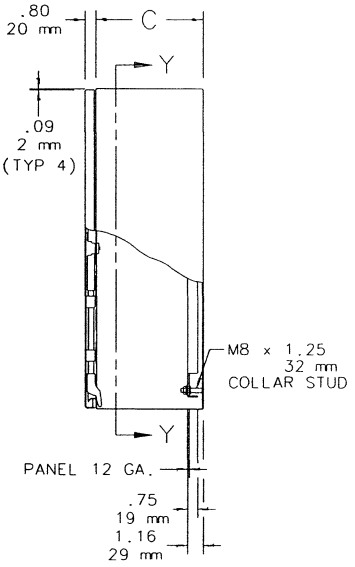




Single-Door Enclosure with Quarterturn Latching

NOTE:
1. Door has provision for data pocket. Use large data pocket provision when A = 30.00 (762) or more and B = 20.00 (508) or more. No data pocket provision when B = 12.00 (305).
2. Panels more than 22.0 inches (564) long have flanges along sides, except C-P2420 and C-P2424 which have flanges on two sides.





C2502

Inch
Millimeter

Single-Door Enclosure with 3-Point Latching

For Section Y-Y see following page.

F-Frame

Table 12-287. 600 Vac Maximum, 250 Vdc Maximum

NEMA Starter Size	Cont. Amps	Cam Setting	Motor Full Load Current Amperes (FLA) ①	MCP Trip Setting ②	MCP Catalog Number	Price U.S. $
0	3	A	.69 – .91	9	HMCP003A0C	
		B	.92 – 1.0	12		
		C	1.1 – 1.2	15		
		D	1.3 – 1.5	18		
		E	1.6 – 1.7	21		
		F	1.8 – 1.9	24		
		G	2.0 – 2.2	27		
		H	2.3 – 2.5	30		
0	7	A	1.5 – 2.0	21	HMCP007C0C	
		B	2.1 – 2.5	28		
		C	2.6 – 3.1	35		
		D	3.2 – 3.6	42		
		E	3.7 – 3.9	49		
		F	4.3 – 4.7	56		
		G	4.8 – 5.2	63		
		H	5.3 – 5.7	70		
0	15	A	3.4 – 4.5	45	HMCP015E0C	
		B	4.6 – 5.6	60		
		C	5.7 – 6.8	75		
		D	6.9 – 7.9	90		
		E	8.0 – 9.1	105		
		F	9.2 – 10.3	120		
		G	10.4 – 11.4	135		
		H	11.5 – 12.6	150		
1	30	A	6.9 – 9.1	90	HMCP030H1C	
		B	9.2 – 11.4	120		
		C	11.5 – 13.7	150		
		D	13.8 – 16.0	180		
		E	16.1 – 18.3	210		
		F	18.4 – 20.6	240		
		G	20.7 – 22.9	270		
		H	23.0 – 25.2	300		
2	50	A	11.5 – 15.2	150	HMCP050K2C	
		B	15.3 – 19.1	200		
		C	19.2 – 22.9	250		
		D	23.0 – 26.8	300		
		E	26.9 – 30.6	350		
		F	30.7 – 34.5	400		
		G	34.6 – 38.3	450		
		H	38.4 – 42.1	500		

Table 12-288. 600 Vac Maximum, 250 Vdc Maximum (Continued)

NEMA Starter Size	Cont. Amps	Cam Setting	Motor Full Load Current Amperes (FLA) ①	MCP Trip Setting ②	MCP Catalog Number	Price U.S. $
2	70	A	16.1 – 21.4	210	HMCP070M2C	
		B	21.5 – 26.8	280		
		C	26.9 – 32.2	350		
		D	32.3 – 37.5	420		
		E	37.6 – 42.9	490		
		F	43.0 – 48.3	560		
		G	48.4 – 53.7	630		
		H	53.8 – 59.1	700		
3	100	A	23.0 – 30.6	300	HMCP100R3C	
		B	30.7 – 38.3	400		
		C	38.4 – 46.0	500		
		D	46.1 – 53.7	600		
		E	53.8 – 61.4	700		
		F	61.5 – 69.1	800		
		G	69.2 – 76.8	900		
		H	76.9 – 84.5	1000		
4	150	A	34.6 – 46.0	450	HMCP150T4C	
		B	46.1 – 57.5	600		
		C	57.6 – 69.1	750		
		D	69.2 – 80.6	900		
		E	80.7 – 92.2	1050		
		F	92.3 – 103.7	1200		
		G	103.8 – 115.2	1350		
		H	115.3 – 126.7	1500		
4	150	A	57.0 – 75.0	750	HMCP150U4C	
		B	76.0 – 95.0	1000		
		C	96.0 – 114.0	1250		
		D	115.0 – 130.7	1500		
		E	③	1750		
		F	③	2000		
		G	③	2250		
		H	③	2500		

① Motor FLA ranges are typical. The corresponding trip setting is at 13 x the minimum FLA value shown. Where a 13 x setting is required for an intermediate FLA value, alternate Cam settings and/or MCP ratings should be used.

② For dc applications, actual trip levels are approximately 40% higher than values shown.

③ Settings above 130 amperes are for special applications. NEC Article 430-110(a) requires the ampere rating of the disconnecting means to be not less than 115% of the motor full load ampere rating.

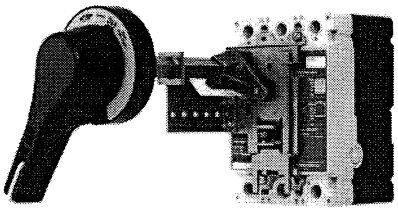
Note: HMCP 3 – 100 A come with line and load steel body terminals, 3T100FB. HMCP 150 A come with line and load steel body terminals, 3T150FB.

Through-the-Door Handle Mechanisms

Eaton's Cutler-Hammer through-the-door handle mechanisms mount on the front of an enclosure or cabinet door and externally operate the circuit breaker via a variable depth shaft or a linear operator (Type MC). Each rotary type handle mechanism includes a handle, base operating mechanism and shaft that can be cut to various lengths.

Series C Rotary and Universal Rotary handle mechanisms are for use with Molded Case Circuit Breakers (G, F, J, K, L, MDL), Molded Case Switches and Motor Circuit Protectors.

Series C Rotary and Universal Rotary, are UL listed and meet CSA requirements. Universal Rotary also meets IEC947-1/2 for international compliance. Rotary UL File Number is E64983.



Series C Rotary

Type 4/4X handles are similar to standard handles except they include an internal neoprene gasket. Type 4/4X handle style number is 6648C22G03. Due to gasketing effect between the handle and the housing, the handle may not indicate a tripped position.

Series C Rotary Accessories

As an option, an auxiliary switch is offered so that the control panel builder may electrically indicate the status of the breaker. This accessory would be mounted on the mechanism and comes with 24-inch (609.6 mm) pigtail leads.

Table 12-271. Series C Auxiliary Switch

Catalog Number	Price U.S. $
5108A61G01	

Table 12-272. Series C Rotary Ordering Information

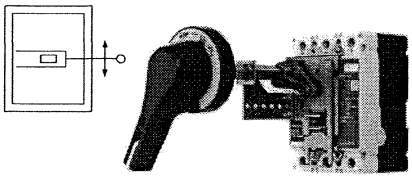
Shaft Length Inches (mm)	Complete Catalog Number ①	Price U.S. $	Separate Catalog Number						Catalog Number			
			Standard Handle ②	Price U.S. $	Breaker Mechanism ③	Price U.S. $	Shaft ④	Price U.S. $	IEC IP65 ⑤⑥	Price U.S. $	IEC IP66 ⑤⑥	Price U.S. $
F-Frame												
6 (152.4)	~~HM1R06~~		6648C22G01		6648C23G11		4217B37G04		WHM1R06		WHM1R06X	
12 (304.8)	HM1R12		6648C22G01		6648C23G11		4217B37G01		WHM1R12		WHM1R12X	
16 (406.4)	~~HM1R16~~		6648C22G01		6648C23G11		4217B37G02		WHM1R16		WHM1R16X	
24 (609.6)	HM1R24		6648C22G01		6648C23G11		4217B37G03		WHM1R24		WHM1R24X	
J-Frame												
6 (152.4)	HM2R06		6648C22G01		6648C23G21		4217B37G04		WHM2R06		WHM2R06X	
12 (304.8)	HM2R12		6648C22G01		6648C23G21		4217B37G01		WHM2R12		WHM2R12X	
16 (406.4)	HM2R16		6648C22G01		6648C23G21		4217B37G02		WHM2R16		WHM2R16X	
24 (609.6)	HM2R24		6648C22G01		6648C23G21		4217B37G03		WHM2R24		WHM2R24X	
K-Frame												
6 (152.4)	HM3R06		6648C22G01		6648C23G25		4217B37G04		WHM3R06		WHM3R06X	
12 (304.8)	HM3R12		6648C22G01		6648C23G25		4217B37G01		WHM3R12		WHM3R12X	
16 (406.4)	HM3R16		6648C22G01		6648C23G25		4217B37G02		WHM3R16		WHM3R16X	
24 (609.6)	HM3R24		6648C22G01		6648C23G25		4217B37G03		WHM3R24		WHM3R24X	
L- and MDL-Frame												
6 (152.4)	HM4R06		6648C22G11		6648C23G19		4217B37G04		WHM4R06		WHM4R06X	
12 (304.8)	HM4R12		6648C22G11		6648C23G19		4217B37G01		WHM4R12		WHM4R12X	
16 (406.4)	HM4R16		6648C22G11		6648C23G19		4217B37G02		WHM4R16		WHM4R16X	
24 (609.6)	HM4R24		6648C22G11		6648C23G19		4217B37G03		WHM4R24		WHM4R24X	
MD/MDS												
6 (152.4)	HM7R06		6648C22G21		6648C23G17		4217B37G04		—		—	
12 (304.8)	HM7R12		6648C22G21		6648C23G17		4217B37G01		—		—	
16 (406.4)	HM7R16		6648C22G21		6648C23G17		4217B37G02		—		—	
24 (609.6)	HM7R24		6648C22G21		6648C23G17		4217B37G03		—		—	
N-Frame												
6 (152.4)	HM5R06		6648C22G21		6648C23G08		4217B37G04		WHM5R06		WHM5R06X	
12 (304.8)	HM5R12		6648C22G21		6648C23G08		4217B37G01		WHM5R12		WHM5R12X	
16 (406.4)	HM5R16		6648C22G21		6648C23G08		4217B37G02		WHM5R16		WHM5R16X	
24 (609.6)	HM5R24		6648C22G21		6648C23G08		4217B37G03		WHM5R24		WHM5R24X	

① Complete catalog number includes the standard handle, mechanism, shaft and support brace/bracket.
② Handle is designed suitable for NEMA Types 1, 3R and 12 enclosures. Use style number **6648C22G03** for Type 4/4X handle or add **X** Suffix to complete catalog number. Handle is cast aluminum.
③ Breaker mechanism includes a shaft support bracket and its parts. Shaft is .50-inch (12.7 mm).
④ Longer shafts,16-inch (406.4 mm) and 24-inch (609.6 mm), include an adjustable support extension.
⑤ IEC Handle Mechanism supplied with Metric thread mounting hardware.
⑥ Complete catalog number includes a handle, mechanism and shaft.

Discount Symbol **CB-2**

Series C F-Frame External Accessories

SERIES C ROTARY HANDLE MECHANISM



Ordering Information

Breaker Frame	Shaft Length (inches)	COMPLETE CATALOG NUMBER①	SEPARATE STYLE NUMBERS		
			Standard Handle②	Breaker③ Mechanism	Shaft④
F	6	HM1R06	6648C22G01	6648C23G11	4217B37G04
	12	HM1R12	6648C22G01	6648C23G11	4217B37G01
	16	HM1R16	6648C22G01	6648C23G11	4217B37G02
	24	HM1R24	6648C22G01	6648C23G11	4217B37G03

The Westinghouse general purpose Rotary handle mechanisms are suitable for use with NEMA 1, 3R, 4, and 12 fabricated enclosures. They are designed for use with Series C F-Frame Circuit Breakers, Molded Case Switches, and Motor Circuit Protectors (HMCP).

Required for a standard application are the operating handle, shaft, and mechanism.

The operating handle has been designed to meet NFPA 79 requirements. It may be mounted in either the horizontal or the vertical direction. The handle was ergonomically designed with extra clearance for a "gloved hand" to operate. It may be padlocked in the OFF position utilizing 3 padlocks.

The standard label on the operating handle indicates ON/Tripped/OFF/Reset.

UL File E64893

To meet the various enclosure depths, four variable depth shafts are offered (6 inch, 12 inch, 16 inch, and 24 inch). Each shaft includes a support brace to ensure proper alignment. In addition, the 16 inch and 24 inch extra long shafts include an adjustable support bracket.

The standard mechanism located on the breaker does include means for internally locking the breaker in the "OFF" position with up to 3 padlocks each with a maximum diameter of .312 inch.

NEMA 4/4X handles are similar to standard handles except they include an internal neoprene gasket. NEMA 4/4X handle style number is 6648C22G03. Due to gasketing effect between the handle and the housing, the handle may not indicate a tripped position.

Accessories
As an option, an auxiliary switch is offered so that the control panel builder may electrically indicate the status of the breaker. This accessory would be mounted on the mechanism and comes with 24-inch pigtail leads.

Microswitch
(Includes 24-inch Pigtail leads)

STYLE NUMBER
5108A61G01

Refer to Technical Data 29-121 or Catalog 26-000 for replacement type Vari-depth and AMT handle mechanisms.

① Complete catalog number includes the standard handle, mechanism, shaft, and support brace/bracket.
② Handle is designed suitable for NEMA 1, 3R, and 12 enclosures.
③ Breaker mechanism includes a shaft support bracket and its parts.
④ Longer shafts (16 in. and 24 in.) include an adjustable support extension.

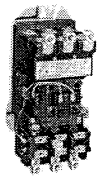
Cutler-Hammer

Five Parkway Center
Pittsburgh, Pennsylvania, U.S.A. 15220

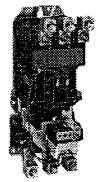
EATON

Printed in U.S.A.

October 1997



Bulletin 509, Size 3
with Eutectic Alloy
Overload Relay,
Open Type without Enclosure



Bulletin 509, Size 5
with Solid-State
Overload Relay,
Open Type without Enclosure

Heater Elements — Starters with eutectic alloy overload relay require 3 heater elements. See page 1-177 for heater element selection tables.

3-Phase • 600V AC Maximum • 60 Hz • With 3-Pole Overload Protection

NEMA Size	Continuous Ampere Rating [A]	Maximum Horsepower Rating Full Load Current Must Not Exceed "Continuous Ampere Rating" — Motor Voltage: 200V	230V	50 Hz: 380...415V	460...575V	Open Type Without Enclosure	Type 1 General Purpose Enclosure Surface Mounting	Type 3R/12 Rainproof, Dusttight Industrial Use Enclosure	Type 4/4X Watertight Corrosion-Resistant Enclosures Stainless Steel	Type 4X Watertight Corrosion-Resistant Enclosure Fiberglass-Reinforced Polyester
						Cat. No.	Cat. No.	Cat. No.	Cat. No.✶	Cat. No.❄
00	9	1-1/2	1-1/2	2	2	509-TO⊗-✪	509-TA⊗-✪	Use Size 0 starter		
0	18	3	3	5	5	509-AO⊗-✪	509-AA⊗-✪	509-AJ⊗-✪	509-AC⊗-✪	509-AS⊗-✪
1	27	7-1/2	7-1/2	10	10	509-BO⊗-✪	509-BA⊗-✪	509-BJ⊗-✪	509-BC⊗-✪	509-BS⊗-✪
2	45	10	15	25	25	509-CO⊗-✪	509-CA⊗-✪	509-CJ⊗-✪	509-CC⊗-✪	509-CS⊗-✪
3	90	25	30	50	50	509-DO⊗-✪	509-DA⊗-✪	509-DJ⊗-✪	509-DC⊗-✪	
4	135	40	50	75	100	509-EO⊗-✪	509-EA⊗-✪	509-EJ⊗-✪	509-EC⊗-✪	
5	270	75	100	150	200	509-FO⊗-✪	509-FA⊗-✪	509-FJ⊗-✪	509-FC⊗-✪	
6‡	540	150	200	300	400	509-GO⊗-✪	§ 509-GA⊗-✪	§ 509-GJ⊗-✪	§ 509-GC⊗-✪	—
7‡	810	—	300	600	600	509-HO⊗-✪	509-HA⊗-✪	509-HJ⊗-✪	—	
8‡	1215	—	450	900	900	509-JO⊗-✪	509-JA⊗-✪	509-JJ⊗-✪	—	
9	2250	—	800	1600	1600	509-KO⊗-✪	509-KA⊗-✪	509-KJ⊗-✪	—	

⊗ Coil Voltage Code

The cat. no. as listed is incomplete. Select a coil voltage code from the table below to complete the cat. no. Example: **Cat. No. 509-BA⊗-✪** becomes **Cat. No. 509-BAD-✪**. For other voltages, please consult your local Rockwell Automation sales office or Allen-Bradley distributor.

[V]		24♣	110-115	115-120	200-208	220-230	230-240	240	277	380	380-400	415	440-460	460-480	500	550	575-600
Common Control➢	AC, 50 Hz	—	—	—	–	P✣	—	T	—	N	KN	I	Q	—	M	R	—
	AC, 60 Hz	—	—	—	H	—	A♠	—	—	—	—	U	—	B	—	—	C
Transformer Control	AC, 60 Hz	—	—	—	H	—	A	—	—	—	—	—	—	B	—	—	C
Separate Control (without transformer)	AC, 50 Hz	K	S⌘	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	AC, 60 Hz	J	—	D+	—	—	—	—	F	—	—	—	—	—	—	—	—

✪ Overload Relay Code

Use to order solid-state overload relay. Do not use when ordering eutectic alloy overload relay. The cat. no. as listed is incomplete. Select an overload relay code from page 1-169 to complete the cat. no. Example: **Cat. No. 509-BAD-✪** becomes **Cat. No. 509-BAD-A2D**.

✶ Sizes 6...8 are painted enclosures.
❄ Fiberglass reinforced polyester hubs are included with each starter.
‡ Does not include line and load lugs, see page 1-122 for kits.
§ Price includes control current transformer.
♣ Only available on sizes 00...5. When using 24V coils on size 4 or 5, an interposing relay may be required. See coil VA values on page 1-139.
➢ When selecting a factory-installed control circuit transformer (see Modifications page 1-116), use the common control coil voltage code to denote the transformer primary voltage. The starter coil and transformer secondary voltage will both be 120V by default. Example: **Cat. No. 509-BAB-6P** will have a transformer with a 480V primary/120V secondary voltage and a 120V starter coil. If a starter coil voltage other than 120V is desired, a second coil voltage code must be added to denote the coil/transformer secondary voltage. Example: **Cat. No. 509-BABJ-6P** will have a transformer with a 480V primary/24V secondary and a 24V starter coil.
⌘ This coil is optimized for 110...115V, 50 Hz applications, but can be used at 120V, 60 Hz nominal.
+ This coil is optimized for 115...120V, 60 Hz applications, but can be used at 110V, 50 Hz nominal.
✣ This coil is optimized for 220...230V, 50 Hz applications, but can be used at 240V, 60 Hz nominal.
♠ This coil is optimized for 230...240V, 60 Hz applications, but can be used at 220V, 50 Hz nominal.

Accessories — page 1-121
Modifications — page 1-116
Specifications — page 1-136
Approximate Dimensions — page 1-146, page 1-147

Overload Relay Code Selection

For Application on Bulletin 500 Line Starters and NEMA Pump Panels

Starters Without Overload Relays for Field Assembly of Starters Using Bulletin 592 Overload Relays ✦❖♠[11]

These products are intended for field installation of Bulletin 592 Eutectic, or 592 solid-state overload relays. (Select Bulletin 592 overload relays from page 1-180...page 1-182.) They ship in a starter carton with provisions for mounting the overload relay (includes a starter mounting plate, screws/bolts and instructions).

Eutectic Alloy Overload Relays — Overload relay codes do not apply. Use Cat. No. as listed in product selection tables. Select heater elements from page 1-188. Starter Cat. Nos. marked in blue with eutectic alloy overload relays are part of the AB Express Program. Starters with solid-state overload relays are not presently part of the AB Express Program.

✦ All Sizes — No overload relay.

❖ Bulletins 520, 522, and 523 require two overload relays.

♠ Bulletins 530, 1282, and 1283 require two overload relays. When selecting the proper solid-state overload relay or heater, divide motor nameplate full load amperes by 2.00. Use this value to select the proper overload relays.

[11]Bulletins 540, 1242, and 1243 have one overload relay. When selecting the proper solid-state overload relay or heater, divide motor nameplate full load amperes by 1.73. Use this value to select the proper overload relays.

E1 Plus Solid-State Overload Relay (Selectable Class 10, 20, or 30) (Automatic/Manual Reset)

For use with Bulletins 505, 505V, 506, 507, 509, 512, 512M, 513, 520, 522, 523, 530, 532, 533, 540, 542, 543, 570, 572, 573, 1232X, 1233X, 1242, 1243, 1272, 1273, 1282, and 1283.♣➢⌘

NEMA Size	Full Load Current Adjustment Range (A)	Overload Relay Code
		Class 20
00	0.1...0.5	A2A
	0.2...1.0	A2C
	1.0...5.0	A2D
	1.0...5.0	A2E
	3.2...16	A2F
0, 1 1PW 1YD	0.2...1.0	A2B
	0.2...1.0	A2C
	1.0...5.0	A2D
	1.0...5.0	A2E
	3.2...16	A2F
	5.4...27	A2G
1	9...45	A2H
2 2PW 2YD	5.4...27	A2G
	9...45	A2H
	9...45	A2J
3 3PW 3YD	9...45	A2J
	18...90	A2K
	18...90	A2L
4 4PW 4YD	30...150	A2K
	30...150	A2L
	30...150	A2M
5 5PW 5YD	60...300	A2N
6 6PW 6YD	120...600	A2R
7✦	256...810	§
8✦	384...1215	
9✦	800...2250	

♣ Bulletins 520, 522, and 523 require two overload relay codes to complete the Cat. No. The first code will denote the high speed overload relay and the second code will denote the low speed overload relay.

➢ Bulletins 530, 532, 533, 1282, and 1283 have two overload relays and require two overload relay codes to complete the Cat. No. When selecting the proper SMP overload relay, divide motor nameplate full load amperes by 2.00. Use this value to select the proper overload relay codes.

⌘ Bulletins 540, 542, 543, 1242, and 1243 have one overload relay. When selecting the proper SMP overload relay, divide motor nameplate full load amperes by 1.73. Use this value to select the proper overload relay code.

✦ These solid-state overload relays have an interposing relay with a 120V AC coil.

§ Order by description.

E3 Solid-State Overload Relay: 2 Inputs/1 Output

For use with Bulletins 505, 505V, 506, 507, 509, 512, 512M, 513, 520, 522, 523, 530, 532, 533, 540, 542, 543, 570, 572, 573, 1232X, 1233X, 1242, 1243, 1272, 1273, 1282, and 1283.*

NEMA Size	Full Load Current Adjustment Range (A)	Overload Relay Code❄
00	1...5	EC1A
	3...15	EC1B
0...2	1...5	EC1A
	3...15	EC1B
	5...25	EC1C
	9...45	EC1D
3	9...45	EC1D
	18...90	EC1E
4	28...140	EC1F
5	60...302	EC1H
6	125...630	EC1K

E3 Plus Solid-State Overload Relay: 4 Inputs/2 Outputs, Built-In Ground Fault Sensor, PTC Thermistor Input

For use with Bulletins 505, 505V, 506, 507, 509, 512, 512M, 513, 520, 522, 523, 530, 532, 533, 540, 542, 543, 570, 572, 573, 1232X, 1233X, 1242, 1243, 1272, 1273, 1282, and 1283.*

NEMA Size	Full Load Current Adjustment Range (A)	Overload Relay Code❄
00	1...5	EC2A
	3...15	EC2B
0...2	1...5	EC2A
	3...15	EC2B
	5...25	EC2C
	9...45	EC2D
3	9...45	EC2D
	18...90	EC2E
4	28...140	EC2F
5	60...302	EC2H

* Bulletin 520 requires two overload relay codes to complete the cat. no. The first code will denote the high speed overload relay and the second code will denote the low speed overload relay.

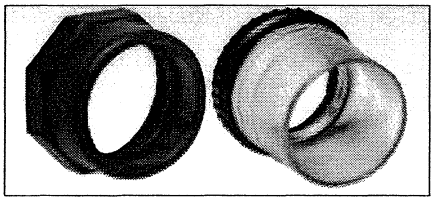
❄ Rockwell Automation recommends using 120 or 240V AC coils on all NEMA Starters with E3 solid-state overload relays. When using coil voltages other than 120 or 240V AC, consult your local Rockwell Automation distributor.

ACCESSORIES

FEATURES INCLUDE

- Alternate action block provides push-on push-off function
- EECR clamp ring provides guard on illuminated push buttons
- Lock off permits padlocking operators in depressed position

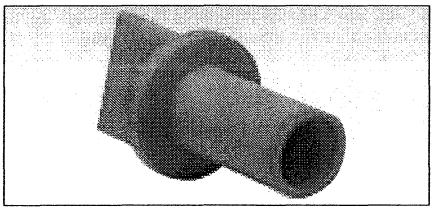
Extended Clamp Ring



Description	Catalog Number
Extended Clamp Ring	ECR
Guarded Clear Clamp Ring	EECR
Large Extended Clamp Ring	LECR

Use ECR with flush cap to offer additional protection. Use EECR with illuminated push buttons. Use LECR with flush or extended caps for easier access to button than ECR.

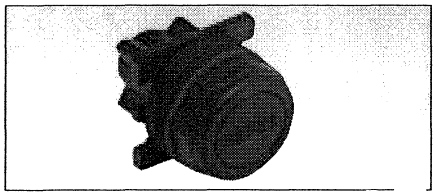
Lamp Removal Tool



Description	Catalog Number
Lamp Removal Tool	LRT

Used to facilitate the removal of lamps particularly in illuminated push button and push-to-test operators

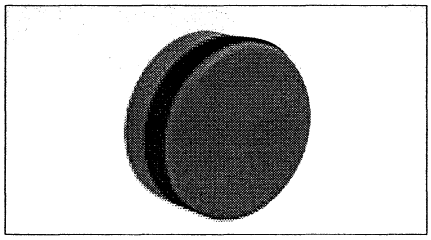
Reset Push Button



Description	Parts Included	Catalog Number
Reset Pushbutton	None	RPB
Reset Pushbutton	2 Bolts	RPB-B
Reset Pushbutton	Washer Set	RPB-W
Reset Pushbutton	1 3/4, 3	RPB-BW
Bolts only (1/4-20 x 1 3/4" & 3")		RPBB
Washer Set	None	RPBW

Unit mounts in standard 1 13/64" hole and accepts either 20 hex head bolts or 20 thread rod to provide adjustable extension. Universal styles include two bolts to cover 1" to 3" space from cover to overload reset rod. Other bolt lengths available upon request.

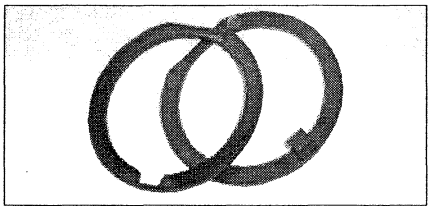
Hole Plug



Description	Catalog Number
Hole Plug	HP

Use to close unused panel holes. Supplied with sealing panel gaskets. Hole plug is NEMA 4X rated.

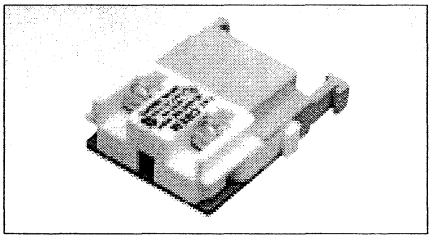
Thrust and Trim Washer



Description	Catalog Number
Anti-Rotation Washer for 30MM Product	TTW

Anti-rotation device for use with 30MM push-buttons, selector switches and pilot lights. Provides additional protection from rotation.

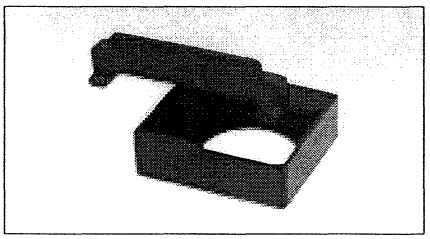
Alternate Action Block



Description	Catalog Number
Alternate Action Block	AABEM

Block mounts in position of a standard contact block to provide alternate contact action (push-on push-off). May be used with any push button or illuminated push button operator. Should be used with early make contact blocks (CBEM) only.

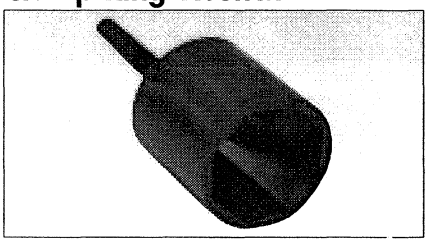
Mechanical Interlock



Description	Catalog Number
Mechanical Interlock	MI

Use to interlock two adjacent operators. May also be used to interlock a two unit maintained/momentary assembly.

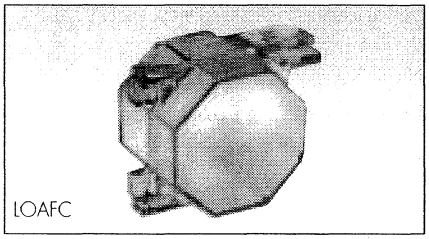
Clamp Ring Wrench



Description	Catalog Number
Clamp Ring Wrench	CRW

To simplify tightening and loosening of standard and aluminum 1 3/8" octagonal clamp ring.

Lock Off Attachment

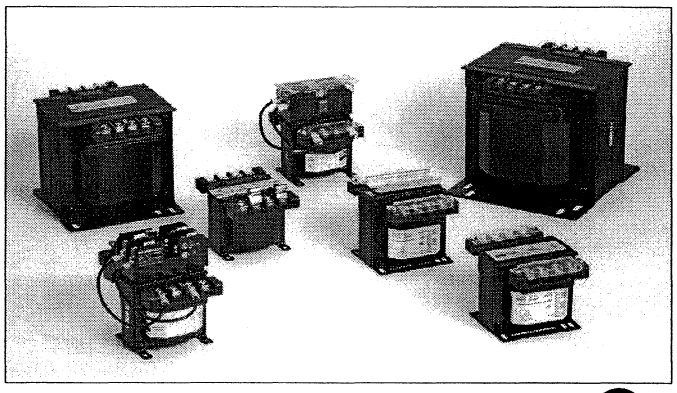


LOAFC

Use With	Catalog Number
Standard Extended Cap	LOAX
Standard Mushroom Cap	LOAM
PPMC or PXMC Cap	LOAP
Maintained Pushbuttons	PPGD
All Products	LOAFC

The SBE -- Encapsulated Series

The SBE Encapsulated industrial control transformers are epoxy encapsulated to seal the transformer windings against moisture, dirt and industrial contaminants. Extra deep, molded terminal barriers reduce the chance of electrical failure as the result of arcing or frayed lead wires. The rugged construction and proven reliability of the SBE design is uniquely suited for all industrial environments.



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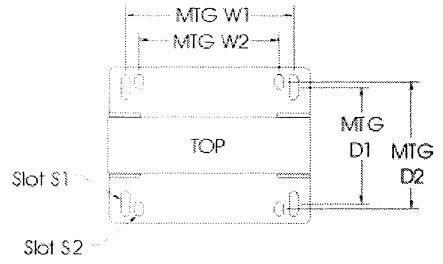
Features

- 50 - 1000 VA, 50/60 Hz – suitable for world wide applications.
- Interleaved copper windings reduce I^2R losses and maximize efficiency.
- 55°C Rise, 105°C insulation system to minimize heat.
- Epoxy encapsulated to protect cores and coils against moisture, dirt, and other contaminants.
- Meets or Exceeds NEMA Standard ST 1 and ANSI C89.1 for load inrush capability.
- Integrally molded, flame retardant (IEC 707 / ISO Class 1210) Terminal Blocks provide greater terminal contact area and improved conductivity.
- Heavy gauge steel mounting plate.
- Mounting dimensions are compatible with similar control transformers.
- ***Secondary fuse holders (FB2X) included for 13/32 x 1- 1/2 cartridges (fuses not included).***
- ***Factory-installed fuse holders are available (See WA & WB options).***
- 10 + 2 year warranty.

Related Products

- Linear Power Supplies
- DIN Rail DC Power Supplies
- Constant Voltage Transformers
- Line Reactors

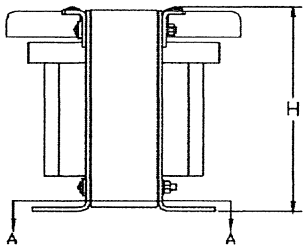
SBE Mounting Profiles



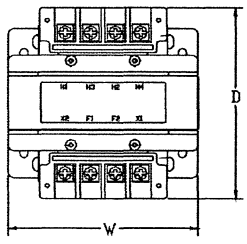
Mounting Dimensions

Accessories

Catalog Number	Description
FBP	Primary "CC" Rejection Type Fuse Holder (Finger Safe covers not available)
FB2	Secondary Fuse Holder only (Glass or Ceramic, ¼" x 1¼" fuse).
FB2X	Secondary Fuse Holder only (Midget Cartridge Type, 13/32" x 1½" fuse).
FBPC1	Primary "CC" Rejection Type Fuse Holder and Finger Safe Cover Kit
IP20	IEC Touchproof Cover Kit
SBEDIN	IEC Fuse Holder Adaptor Kit
WA & WB	Factory installed Fuse Holder



Profile



Top View

Visit our website at www.solaheviduty.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

BE Encapsulated Series Selection Tables

Group 2 – 220 x 440 Volt Primary, 110 Volt Secondary, 50/60 Hz
230 x 460 Volt Primary, 115 Volt Secondary, 50/60 Hz
240 x 480 Volt Primary, 120 Volt Secondary, 60 Hz

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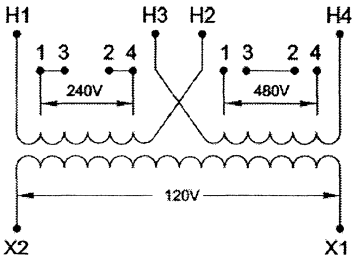
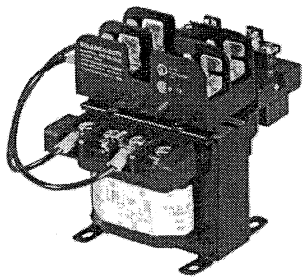
VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size S1 / S2	Approx. Ship Weight (lbs)
50	E050	2.72	3.01	3.99	2.51 / NA	2.02 / NA	.20 x .33 / .20 x .33	3
75	E075	2.96	3.39	4.36	2.81 / 2.50	2.10 / NA	.20 x .50 / .20 x .50	3
100	E100	2.96	3.39	4.61	2.81 / 2.50	2.37 / NA	.20 x .50 / .20 x .50	4
150	E150	3.89	4.5	4.48	3.74 / 3.12	2.56 / 2.87	.20 x .65 / .20 x .33	6
200	E200	3.89	4.5	4.79	3.74 / 3.12	2.87 / 3.18	.20 x .65 / .20 x .33	8
250	E250	3.89	4.5	5.21	3.74 / 3.12	3.29 / 3.61	.20 x .65 / .20 x .33	9
300	E300	4.53	5.25	5.09	4.38 / 3.75	3.10 / NA	.31 x .71 / .31 x .71	10
350	E350	4.53	5.25	5.53	4.38 / 3.75	3.54 / NA	.31 x .71 / .31 x .71	13
500	E500	4.53	5.25	6.31	4.38 / 3.75	4.33 / NA	.31 x .85 / .31 x .85	17
750	E750	5.56	6.38	6.93	5.32 / 4.37	4.25 / 5.75	.31 x .85 / .31 x .85	25
1000	E1000	5.56	6.38	7.36	5.32 / 4.37	4.68 / 6.18	.31 x .85 / .31 x .85	32



Note: *Includes FB2X Secondary fuse holder.*

Group 2A – Factory installed Primary Fuse Holder Class "CC" and Secondary Fuse Holder (Glass or Ceramic, ¼" x 1¼" fuse type).

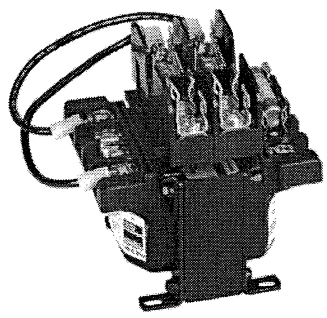
VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size S1 / S2	Approx. Ship Weight (lbs)
50	E050WA	4.18	3.01	3.99	2.51 / NA	2.02 / NA	.20 x .33 / .20 x .33	3
75	E075WA	4.41	3.39	4.36	2.81 / 2.50	2.10 / NA	.20 x .50 / .20 x .50	4
100	E100WA	4.41	3.39	4.61	2.81 / 2.50	2.37 / NA	.20 x .50 / .20 x .50	8
150	E150WA	5.36	4.5	4.48	3.74 / 3.12	2.56 / 2.87	.20 x .65 / .20 x .33	11
200	E200WA	5.36	4.5	4.79	3.74 / 3.12	2.87 / 3.18	.20 x .65 / .20 x .33	10
250	E250WA	5.36	4.5	5.21	3.74 / 3.12	3.29 / 3.61	.20 x .65 / .20 x .33	15
300	E300WA	5.99	5.25	5.09	4.38 / 3.75	3.10 / NA	.31 x .71 / .31 x .71	13
350	E350WA	5.99	5.25	5.53	4.38 / 3.75	3.54 / NA	.31 x .71 / .31 x .71	15
500	E500WA	5.99	5.25	6.31	4.38 / 3.75	4.33 / NA	.31 x .85 / .31 x .85	30
750	E750WA	7.01	6.38	6.93	5.32 / 4.37	4.25 / 5.75	.31 x .85 / .31 x .85	30
1000	E1000WA	7.01	6.38	7.36	5.32 / 4.37	4.68 / 6.18	.31 x .85 / .31 x .85	34



Note: *Includes Finger Safe covers.*

Group 2B – Factory installed Primary Fuse Holder Class "CC" and Secondary Fuse Holder (Midget Cartridge, 13/32" x 1½" fuse type).

VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size S1 / S2	Approx. Ship Weight (lbs)
50	E050WB	4.18	3.01	3.99	2.51 / NA	2.02 / NA	.20 x .33 / .20 x .33	3
75	E075WB	4.41	3.39	4.36	2.81 / 2.50	2.10 / NA	.20 x .50 / .20 x .50	4
100	E100WB	4.41	3.39	4.61	2.81 / 2.50	2.37 / NA	.20 x .50 / .20 x .50	8
150	E150WB	5.36	4.5	4.48	3.74 / 3.12	2.56 / 2.87	.20 x .65 / .20 x .33	11
200	E200WB	5.36	4.5	4.79	3.74 / 3.12	2.87 / 3.18	.20 x .65 / .20 x .33	10
250	E250WB	5.36	4.5	5.21	3.74 / 3.12	3.29 / 3.61	.20 x .65 / .20 x .33	15
300	E300WB	5.99	5.25	5.09	4.38 / 3.75	3.10 / NA	.31 x .71 / .31 x .71	13
350	E350WB	5.99	5.25	5.53	4.38 / 3.75	3.54 / NA	.31 x .71 / .31 x .71	15
500	E500WB	5.99	5.25	6.31	4.38 / 3.75	4.33 / NA	.31 x .85 / .31 x .85	30
750	E750WB	7.01	6.38	6.93	5.32 / 4.37	4.25 / 5.75	.31 x .85 / .31 x .85	30
1000	E1000WB	7.01	6.38	7.36	5.32 / 4.37	4.68 / 6.18	.31 x .85 / .31 x .85	34



Note: *Includes Finger Safe covers.*

Visit our website at www.solaheviduty.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

CCMR Series POWR-PRO® CC Fuses

600 VAC ▪ Dual-Element, Time-Delay ▪ 2/10 – 60 Amperes

Littelfuse
POWR-GARD™ Products

SPECIFICATIONS

Voltage Ratings: AC: 600 Volts
DC: 250 Volts (CCMR 2/10 — 2A)
(CCMR 4 1/2 — 10A)
(CCMR 35 — 60A)
300 Volts (CCMR 2 1/4 — 4A)
500 Volts (CCMR 12 — 30A)

Interrupting Ratings: AC: 200,000 amperes rms symmetrical
300,000 amperes rms symmetrical
(Littelfuse self-certified)
DC: 20,000 amperes

Ampere Range: 2/10 — 60 amperes

Approvals: AC: Standard 248-4, Class CC
UL Listed 2/10 – 30 amps (File No: E81895)
Standard 248, Class CD
UL Listed 35 – 60 amps (File No: E71611)
CSA Certified 2/10 – 60 amps
(File No: LR29862)
DC: Littelfuse self-certified

AMPERE RATINGS

2/10	1	2	3½	6¼	12	35
¼	1¼	2¼	4	7	15	40
3/10	1 4/10	2½	4½	7½	17½	45
½	1½	2 8/10	5	8	20	50
6/10	1 6/10	3	5 6/10	9	25	60
8/10	1 8/10	3 3/10	6	10	30	

Example part number (series & amperage): CCMR 40

RECOMMENDED FUSE BLOCKS

L60030C series (CCMR 2/10 — 30A)
L60060C series (CCMR 35 — 60A)

Refer to Fuse Block section of this catalog for additional information.

For space-saving protection of motor circuits up to 40 HP*, we recommend Littelfuse POWR-PRO® CCMR series fuses. These fuses are the only true dual-element, time-delay fuses in a package this small that are specifically engineered for motor branch circuit protection. They provide Type 2 protection (no damage) to both NEMA-rated and the more sensitive IEC (International Electrotechnical Commission) type motor circuit components.

Because CCMR fuses are the most current limiting rating for rating, and because their time-delay characteristics permit the use of smaller fuse ratings in motor circuits than would be possible with fast-acting fuses, CCMR fuses provide superior short-circuit protection. Furthermore, they provide this superior protection in a fraction of the space required by other fuse classes. For example, when 600V three-pole, 30 ampere Class R fuse blocks are replaced by Littelfuse Class CC fuse blocks, mounting space requirements may be reduced 70% or more. This is especially important when a panel contains control devices for many motors.

In addition to the UL Listed smaller sizes, Littelfuse CCMR series fuses are now available in larger sizes — from 35 to 60 amperes! ***No other fuse is available with this current carrying capacity in a package this small. As a matter of fact, the 60 ampere CCMR fuse is the smallest 60A fuse available which is rated at 600 volts.***

*Consult the Motor Protection Tables in the Fuseology section for specific motor sizing information

APPLICATIONS

CCMR series fuses are specifically designed to withstand sustained starting currents of small motors

Provide short-circuit protection for motor branch circuits

Use with IEC- and NEMA-rated motor controllers and contactors

General purpose circuits up to 60 amps

FEATURES/BENEFITS

- **Space savings** — No other fuse class approved for branch-circuit protection has a 600 volt rating and 300,000 A.I.R. in a package this small.
- **Extremely current-limiting** — Reduces damage caused by heating and magnetic effects of short-circuit currents — stops damaging short-circuit currents faster than any mechanical protective device.
- **Excellent time delay** — Eliminates needless downtime caused by power surges or equipment demands . . . permits selection of fuse sizes closer to actual load conditions — provides better protection.
- **300kA Interrupting Rating** — Littelfuse self-certified to 300,000 amperes as standard. Meets future trend towards higher available short circuit currents.

250 Volt Slo-Blo® Type Fuse FLM Series

UL CSA QPL

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
135%	1/10-30	1 hour, **Max**imum
	32/10–30	12 seconds, **Min**imum
200%	0–3	5 seconds, **Min**imum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA.

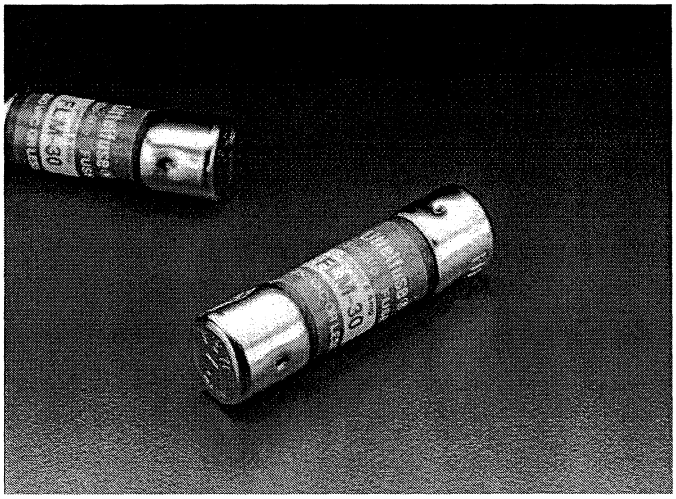
INTERRUPTING RATING: 10,000 amperes at 250 VAC.

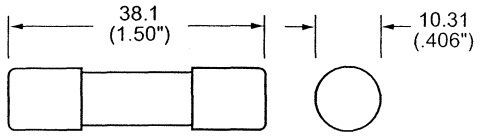
FUSES TO MIL SPEC: See F09B type in Military Section.

PATENTED

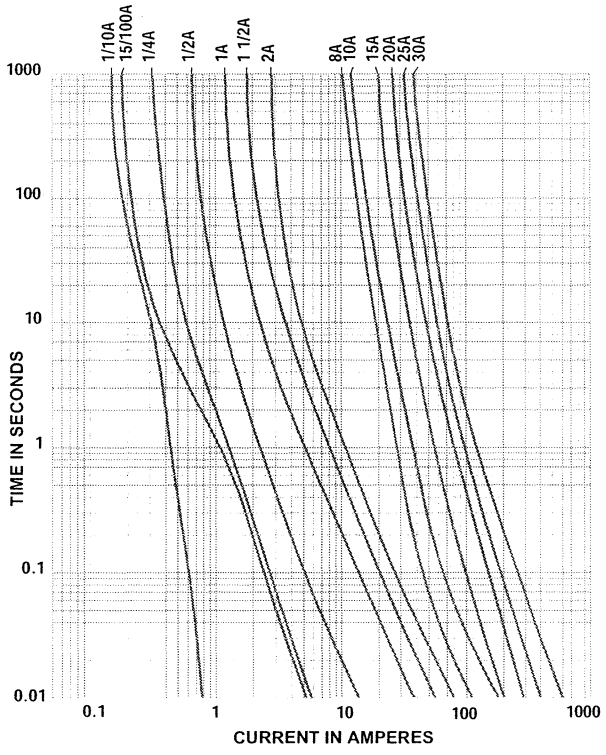
ORDERING INFORMATION:

Cartridge Catalog Number	Ampere Rating	AC Voltage Rating	Nominal Resistance Cold Ohms
FLM 1/10	.100	250	188.0
FLM 15/100	.150	250	87.0
FLM 2/10	.200	250	35.109
FLM 1/4	.250	250	5.413
FLM 3/10	.300	250	3.79
FLM 4/10	.400	250	2.10
FLM 1/2	.500	250	1.54
FLM 6/10	.600	250	1.024
FLM 8/10	.800	250	.623
FLM 1	1	250	.395
FLM 1 1/8	1.125	250	.356
FLM 1 1/4	1.25	250	.286
FLM 1 4/10	1.4	250	.253
FLM 1 1/2	1.5	250	.219
FLM 1 6/10	1.6	250	.184
FLM 1 8/10	1.8	250	.162
FLM 2	2	250	.125
FLM 2 1/4	2.25	250	.102
FLM 2 1/2	2.5	250	.0904
FLM 2 8/10	2.8	250	.0735
FLM 3	3	250	.0700
FLM 3 2/10	3.2	250	.0576
FLM 3 1/2	3.5	250	.0517
FLM 4	4	250	.0426
FLM 4 1/2	4.5	250	.0360
FLM 5	5	250	.0413
FLM 5 6/10	5.6	250	.0326
FLM 6	6	250	.0280
FLM 6 1/4	6.25	250	.0277
FLM 7	7	250	.02133
FLM 8	8	250	.01247
FLM 9	9	250	.01066
FLM 10	10	250	.00903
FLM 12	12	250	.00698
FLM 15	15	250	.00530
FLM 20	20	250	.00385
FLM 25	25	250	.00275
FLM 30	30	250	.00226





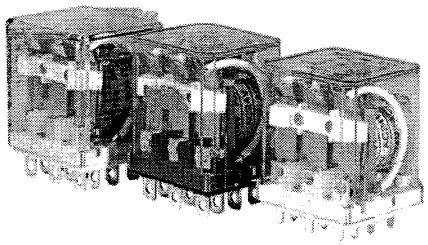
Average Time Current Curves



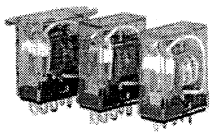
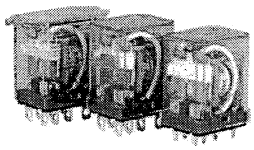
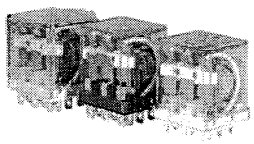
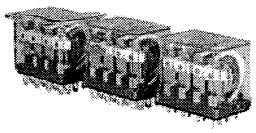
RH Series Compact Power Relays

SPDT through 4PDT, 10A contacts
Compact power type relays

The RH series are miniature power relays with a large capacity. The RH relays feature 10A contact capacity as large as the RR series but in a miniature package. The compact size saves space.



Part Number Selection

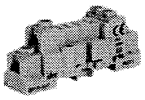
Contact	Model	Part Number: Blade Terminal	Part Number: PCB Terminal	Coil Voltage Code (Standard Stock in bold)
SPDT 	Basic	RH1B-U	RH1V2-U	AC6V, AC12V, **AC24V**, AC110V, **AC120V**, AC220V, **AC240V** DC6V, **DC12V**, **DC24V**, DC48V, DC110V
	With Indicator	RH1B-UL	—	
	With Check Button	RH1B-UC	—	
	With Indicator and Check Button	RH1B-ULC	—	
	Top Bracket Mounting	RH1B-UT	—	
	With Diode (DC coil only)	RH1B-UD	RH1V2-UD	DC6V, **DC12V**, **DC24V**, DC48V, DC110V
	With Indicator and Diode (DC coil only)	RH1B-ULD	—	**DC12V**, **DC24V**, DC48V, DC110V
DPDT 	Basic	RH2B-U	RH2V2-U	AC6V, AC12V, **AC24V**, **AC110-120V**, **AC220-240V** DC6V, **DC12V**, **DC24V**, DC48V, DC100-110V
	With Indicator	RH2B-UL	RH2V2-UL	
	With Check Button	RH2B-UC	—	
	With Indicator and Check Button	RH2B-ULC	—	
	Top Bracket Mounting	RH2B-UT	—	
	With Diode (DC coil only)	RH2B-UD	RH2V2-UD	DC6V, **DC12V**, **DC24V**, DC48V, DC100-110V
	With Indicator and Diode (DC coil only)	RH2B-ULD	—	
3PDT 	Basic	RH3B-U	RH3V2-U	AC6V, AC12V, **AC24V**, AC110V, **AC120V**, AC220V, **AC240V** DC6V, **DC12V**, **DC24V**, DC48V, DC110V
	With Indicator	RH3B-UL	RH3V2-UL	
	With Check Button	RH3B-UC	—	
	With Indicator and Check Button	RH3B-ULC	—	
	Top Bracket Mounting	RH3B-UT	—	
	With Diode (DC coil only)	RH3B-D*	RH3V2-D*	DC6V, DC12V, DC24V, DC48V, DC110V
	With Indicator and Diode (DC coil only)	RH3B-LD*	—	
4PDT 	Basic	RH4B-U	RH4V2-U	AC6V, AC12V, **AC24V**, AC110V, **AC120V**, AC220V, **AC240V** DC6V, **DC12V**, **DC24V**, DC48V, DC110V
	With Indicator	RH4B-UL	RH4V2-UL	
	With Check Button	RH4B-UC	—	
	With Indicator and Check Button	RH4B-ULC	—	
	Top Bracket Mounting	RH4B-UT	—	
	With Diode (DC coil only)	RH4B-UD	RH4V2-UD	DC6V, DC12V, DC24V, DC48V, DC110V
	With Indicator and Diode (DC coil only)	RH4B-LD*	—	

1. *Carries no UL recognition mark.
2. PCB terminal relays are designed to mount directly to a circuit board without any socket.

Ordering Information
When ordering, specify the Part No. and coil voltage code:
(example) **RH3B-U** **AC120V**
Part No. — Coil Voltage Code

Sockets (for Blade Terminal Models)

Relays	Standard DIN Rail Mount [1]	Finger-safe DIN Rail Mount [1]	Through Panel Mount	PCB Mount
RH1B	SH1B-05	SH1B-05C	SH1B-51	SH1B-62
RH2B	SH2B-05	SH2B-05C	SH2B-51	SH2B-62
RH3B	SH3B-05	SH3B-05C	SH3B-51	SH3B-62
RH4B	SH4B-05	SH4B-05C	SH4B-51	SH4B-62

1. DIN Rail mount socket comes with two horseshoe clips. Do not use unless you plan to insert pullover wire spring. Replacement horseshoe clip part number is Y778-011.

Hold Down Springs & Clips

Appearance	Description	Relay	For DIN Mount Socket	For Through Panel & PCB Mount Socket	Min Order Qty
	Pullover Wire Spring	RH1B	SY2S-02F1 [2]	SY4S-51F1	10
		RH2B	SY4S-02F1 [2]		
		RH3B	SH3B-05F1 [2]		
		RH4B	SH4B-02F1 [2]		
	Leaf Spring (side latch)	RH1B, RH2B, RH3B, RH4B	SFA-202 [3]	SFA-302 [3]	20
	Leaf Spring (top latch)	RH1B, RH2B, RH3B, RH4B	SFA-101 [3]	SFA-301 [3]	

2. Must use horseshoe clip when mounting in DIN mount socket. Replacement horseshoe clip part number is Y778-011.
3. Two required per relay.

AC Coil Ratings

Voltage (V)	Rated Current (mA) ±15% at 20°C								Coil Resistance (Ω) ±10% at 20°C				Operation Characteristics (against rated values at 20°C)		
	AC 50Hz				AC 60Hz										
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	Max. Continuous Applied Voltage	Pickup Voltage	Dropout Voltage
6	170	240	330	387	150	200	280	330	330	9.4	6.4	5.4	110%	80% maximum	30% minimum
12	86	121	165	196	75	100	140	165	165	39.3	25.3	21.2			
24	42	60.5	81	98	37	50	70	83	83	153	103	84.5			
110	9.6	—	18.1	21.6	8.4	—	15.5	18.2	18.2	—	2,200	1,800			
110-120	—	9.4-10.8	—	—	—	8.0-9.2	—	—	—	—	—	—			
120	8.6	—	16.4	19.5	7.5	—	14.2	16.5	16.5	—	10,800	7,360			
220	4.7	—	8.8	10.7	4.1	—	7.7	9.1	9.1	—	10,800	7,360			
220-240	—	4.7-5.4	—	—	—	4.0-4.6	—		—	18,820	—	—			
240	4.9	—	8.2	9.8	4.3	—	7.1	8.3	8.3	—	12,100	9,120			

DC Coil Ratings

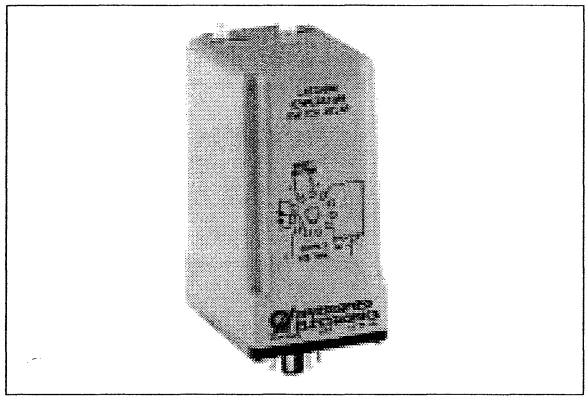
Voltage (V)	Rated Current (mA) ±15% at 20°C				Coil Resistance (Ω) ±10% at 20°C				Operation Characteristics (against rated values at 20°C)		
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	Max. Continuous Applied Voltage	Pickup Voltage	Dropout Voltage
6	128	150	240	250	47	40	25	24	110%	80% maximum	10% minimum
12	64	75	120	125	188	160	100	96			
24	32	36.9	60	62	750	650	400	388			
48	18	18.5	30	31	2,660	2,600	1,600	1,550			
100-110	—	8.2-9.0	—	—	—	12,250	—	—			
110	8	—	12.8	15	13,800	—	8,600	7,340			

Standard coil voltages are in **BOLD**.

SPM SERIES

DIVERSIFIED ELECTRONICS

Temperature Switch Relay
SPM-120-ACA/-ADA



c UL us

OPERATION

The non-volatile latching temperature switch relay monitors a normally-closed-low temperature switch. It incorporates a bistable relay that retains its state during power failures. LEDs indicate the status of the relay, and connections for an external reset button are provided for manual control. The reset inputs of multiple units may be connected to a single push button as long as proper polarity is observed when making the connections. Under normal conditions the temperature switch is closed and the relay is de-energized. When the temperature switch opens, the relay energizes and latches on until the temperature switch recloses and the reset button is pressed. The unit will function properly with zero to 2 k Ω of resistance in series with the temperature switch.

SPECIFICATIONS

SUPPLY VOLTAGE: 120 VAC, 50/60 Hz

TEMPERATURE SWITCH
- Voltage: 12 VDC
- Current: 2 mA max.

CONTACT RATING
- SPM-120-ACA: SPDT, 10 A @ 250 VAC, Resistive, 360 VA Ind.
- SPM-120-ADA: DPDT, 10 A @ 250 VAC, Resistive, 360 VA Ind.

POWER CONSUMPTION: 2 VA

TEMPERATURES
- Operate: -4° to 131°F (-20° to +55°C)
- Storage: -40° to 185°F (-40° to +85°C)

RESPONSE TIMES
- Operate: 10 ms (approximately)
- Release: 1 sec (approximately)

LIFE EXPECTANCY
- Mechanical: 30 Million Operations
- Electrical: 50,000 Operations @ Rated Load

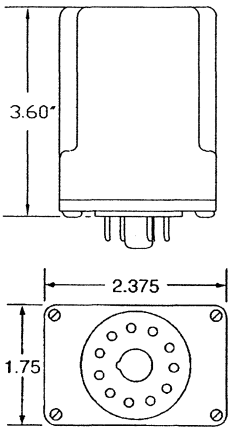
DUTY CYCLE: Continuous

INDICATORS
- SPM-120-ACA: Green LED illuminates under normal conditions
  Red LED illuminates under fault conditions
- SPM-120-ADA: None

PACKAGE: 11-Pin Plug-In extended "A" style enclosure

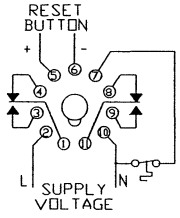
DIMENSIONS
INCHES

ACA and ADA



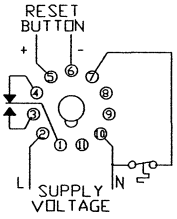
WIRING

ADA



RB-11/PF113A

ACA



RB-11/PF113A

ORDER INFORMATION

~~SPM-120-ACA~~

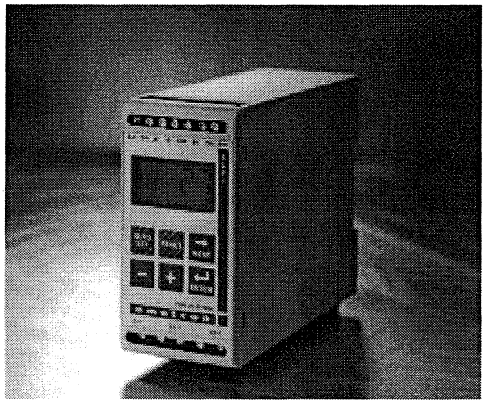
SPM-120-ADA

SPECIAL CONTROLS

NEW! Emotron EL-FI M20 Shaft Power Monitor

Protection for machines and processes.

EL-FI M20 prevents break downs by supervising the motor load (shaft power measurement). Over- and underload is detected before the motor is damaged.

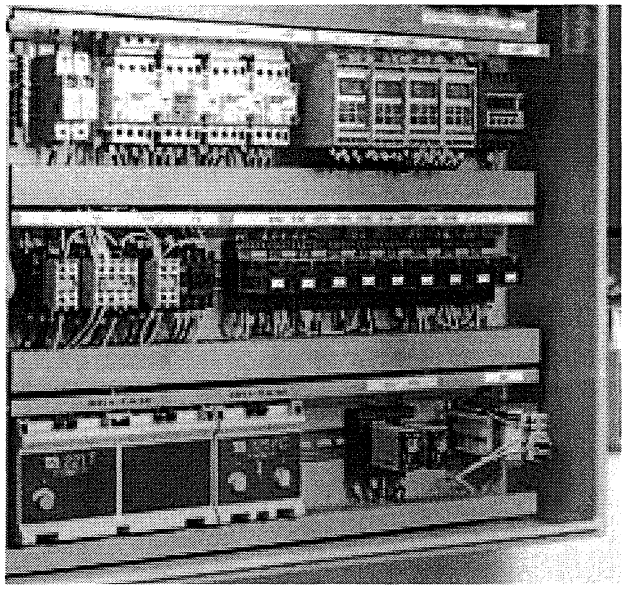


Improved Control and Protection
The EL-FI M20 replaces the EL-FI DLM with updated and improved possibilities to supervise and protect machines and pumps. As the EL-FI DLM, the EL-FI M20 uses the motor as a sensor. Over- and underload is detected as the instantaneous shaft power is supervised by measuring the input power and by calculating the motor power losses with an unique algorithm. The value of the real motor shaft power is indicated in the display in % of rated power, kW or HP.
The principle of measuring the instantaneous shaft power is calculated according to a unique method developed by Emotron.

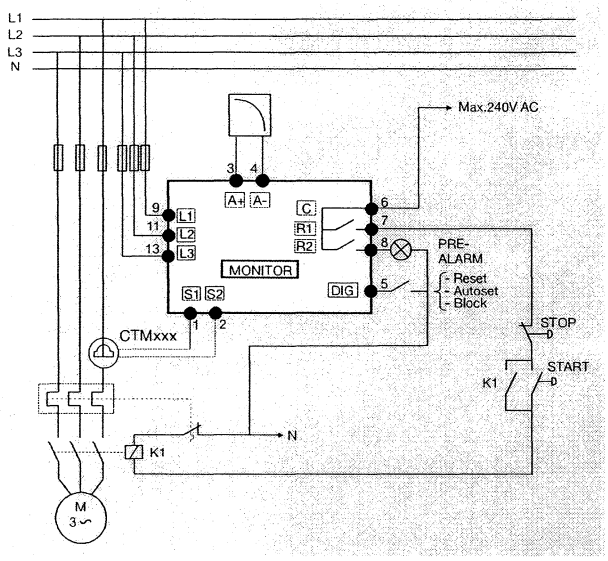
Preventive Measures
As other load monitors from Emotron is the EL-FI M20 used as a preventive measure. By supervising the equipment can expensive repairs be avoided and loss of valuable production time be prevented.

Easy Installation
The installationen is simple. The Auto Set function can automatically set the alarm levels. Press the Auto Set key during normal work load and in three seconds are the appropriate levels set. In addition to the fast and easy set of alarm levels is the need for mecanical safety devices, external transmitters and cabling minimized. The cost of installation and maintenance is hereby decreased.
The product can be installed on both new and older equipment.

Connection of the Emotron EL-FI M20



The Emotron EL-FI M20 is easily installed in the motor contactor cabinet.



Connection example.

Technical Data

Dimensions/Weight (WxHxD)	45x90x115mm (1.77"x3.54"x4.53")/0,3kg (10.5oz)
Protection class/Mounting	IP20/NEMA 1/35 mm DIN-rail 46277
Power consumption/Fuse	Max 6VA/max 10Amp
Supply Voltage	1x100-240 or 3x100-240 (optional) 3x380-500, 525-600, 600-690 VAC +/-10%
Frequency	50 or 60Hz
Relay output	Main Alarm Relay R1, Pre-Alarm Relay R2 5A/240VAC Resistive, 1,5A/240VAC Pilot duty/AC12
Analogue Output	0-20, 4-20, 20-0 or 20-4 mA, Scalable analogue signal Max load 500 ohm
Current Input	Up to 100Amp with current transformer CTM010, CTM025, CTM050 or CTM100 (over 100Amp CTM010 + additional standard current transformer)
Digital input	External Auto Set, Reset or Blocking Alarm (optional) Max 240VAC or 48VDC, High: >24VAC/DC, Low<1VAC/DC
Approved	CE (up to 690VAC) and cUL (up to 600VAC)

Emotron is developing and supplying equipment for control and protection of industrial processes and machines driven by electrical motors, featuring the following product groups:

- **Shaft power monitors**
- **Softstarters**
- **Frequency inverters**
- **Custom designed drives and power electronics**

emotron®

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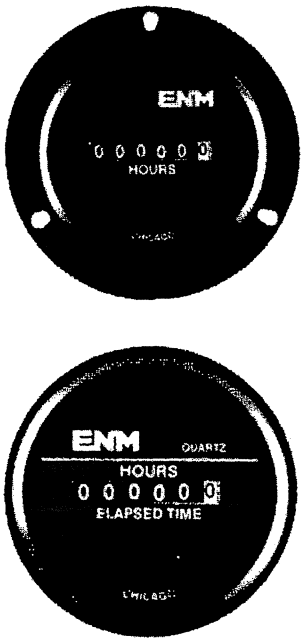
Phone +46 42 16 99 00, fax +46 42 16 99 49

www.emotron.com

01-2577-01 r2 EI-FI M20

Electronic Hour Meter Technical Data

AC Hour Meter, Series T50 211



Series T50

ENM's Series T50 electronic AC hour meter is a low cost reliable hour meter incorporating the latest state-of-the-art in electonics. It's quartz-crystal time base insures accurate long term time-keeping.

A reliable electromechanical wheel-type indicator is used to store accumulated hours.

This compact tamperproof meter is sealed against the environment to provide years of service.

The T50 elapsed time indicator was designed for use on test and recording equipment, for providing maintenance control, for establishing warranty programs, for measuring machine utilization and production time, or for any application where time-in-use is to be determined.

FEATURES:

- Solid State Electronic Circuit
- Quartz-Crystal for Accurate Timing
- Absolutely Will Not Lose Count
- High Impact, Tamperproof Plastic Case
- Sealed Against Moisture and Dirt
- UL and CSA Recognized
- Indicates Operating Time in Hours and Tenths
- Frequency Insensitive Design
- With Optional Gasket, complies to NEMA 4X and 12
- **MADE IN THE USA**

SPECIFICATIONS:

Time Scale:	6-digits 99,999.9 Hours Automatic recycle to zero
Figures:	Hours — White on black Tenths — Red on White Height — 0.140"
Operating Voltage:	230,115,24V AC+10% Other Voltage available
Frequency:	50 or 60 Hz
Power Consumption:	Less than 0.4 Watts
Accuracy:	Better than ±0.02% over entire range
Temperature:	From -30° C to 65°
Vibration Resistance:	Withstands 10 to 75 hz at 1 to 8 g's
Termination:	1/4" male blade terminals
Configuration:	Round 3-hole Bezel Round SAE Bezel with new push-on retaining ring

E-MAIL
ENM Co. @ AOL.COM
Toll Free (888) 372-0465

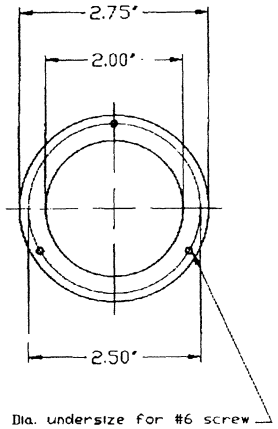
ENM Company
5617 Northwest Highway
Chicago, IL 60646-6135
(773) 775-8400 Fax: (773) 775-5968

Series T50 AC — Dimensional Data

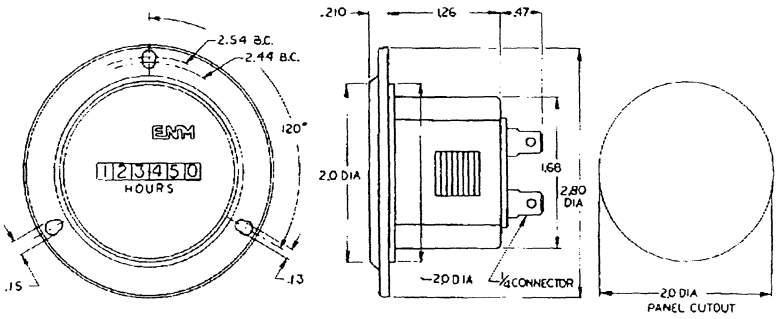
Panel Gasket
UL/NEMA 4X,12

Description	Part No.
NEMA Gasket	A40047-S

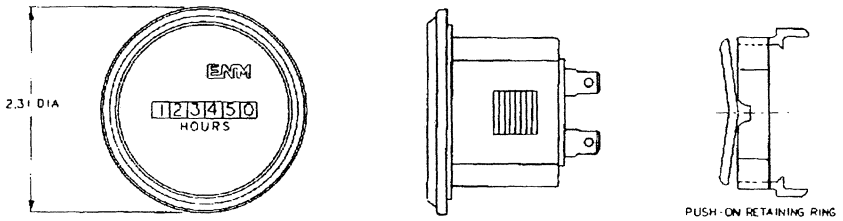
NEMA Gasket
w/ Mounting Hardware B20017



Round 3-Hole Bezel

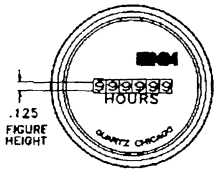


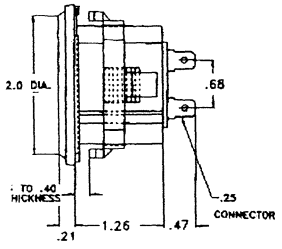
Round SAE Bezel

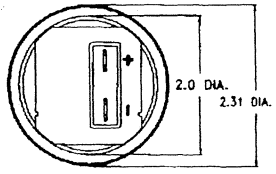


Power: Less than 0.4 Watts

Voltage	Part No.
230 AC	T50A1
115 AC	T50A2
24 AC	T50A4



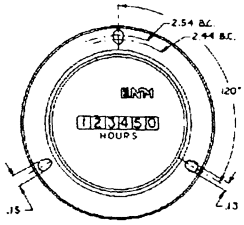


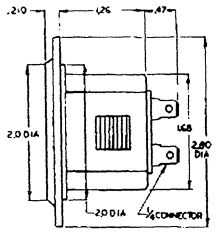


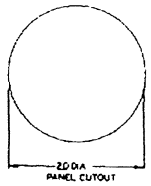
Technical Data Sheet #211

Power: Less than 0.4 Watts

Voltage	Part No.
230 AC	T50B1
115 AC	T50B2
24 AC	T50B4







Technical Data Sheet #211

Limited Warranty/Hour Meters

ENM Company hour meters are warranted to the consumer to be free from defects in material and workmanship for a period of 10,000 operating hours or for a period of 3 years, whichever first occurs.

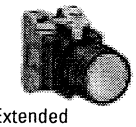
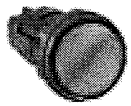
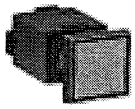
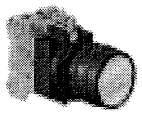
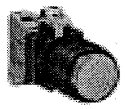
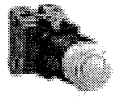
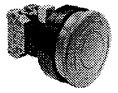
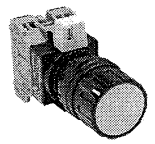
All ENM products which fall within the warranty period due to defects in material or workmanship will be repaired or replaced, at ENM's option, without charge to the consumer when returned with proof of purchase to any authorized ENM dealer in the United States, transportation charges prepaid, provided there is no evidence of improper installation, tampering, or other abuse.

All implied warranties, including any implied warranty of merchantability or fitness for a particular purpose, shall be limited in duration to the express warranty period specified above.

ENM disclaims any liability for consequential damages due to breach of any written or implied warranty on its hour meters.

ENM Company
5617 Northwest Highway
Chicago, IL 60646-6135
(773) 775-8400 Fax: (773) 775-5968

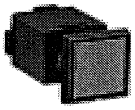
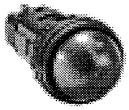
HW Series Oiltight Switches and Pilot Devices Ø 7/8" (22mm)

Series Model	HWΔB–	HWΔP–	HWΔL–	HW1B, HW1E	HW1S, HW1K, HW1F–	HW1R and HW1M–
Appearance	Flush  Extended  40mm Mushroom  Square Flush  Square Extended  Jumbo Mushroom 	Dome Lens  Flush Lens  Square Flush 	Flush  Extended  Extended/Shroud  40mm Mushroom  Square Extended 	Push–Pull  Pushlock Turn Reset  Pushlock Turn Reset  Pushlock Key Reset  Jumbo Pushlock Turn Reset  Unibody E-Stop  Illuminated Unibody E-Stop 	Knob Operator  Key Operator  Illuminated 	HW1M  HW1R 
See Page	*A-77*	*A-84*	*A-87*	*A-75*	*A-91, A-95, A-98*	*A-110 and A-108*
Operator Types	Non-illuminated: • Momentary • Maintained	Pilot Lights • LED/Incandescent	Illuminated Pushbuttons: • Momentary • Maintained • LED/Incandescent	• Modular or Unibody • Non-Illuminated • Illuminated (unibody only) (all units meet EN418)	Selector Switches • Non-Illuminated • Illuminated • LED/Incandescent • 2, 3, 4, 5- position (key & illum. 2 or 3-position only)	HW1R Selector Pushbutton • 2 position selector • Momentary HW1M Monolever • 2 or 4 position • Maintained or Spring return
Contact Configuration	Modular: (NO, NC, NO-EM, NC-LB (maximum 6 contacts)	—	Modular: NO, NC, NO-EM, NC-LB (maximum 6 contacts)	2NO, 1NO/1NC (Unibody)	Modular: NO, NC, NO-EM, NC-LB (maximum 6 contacts)	Modular: NO, NC, NO-EM, NC-LB (maximum 6 contacts)
Electrical Reliability	MTBF < 1 fault in 10 million operation cycles (3V DC, 5mA)					
Mechanical Life	Momentary Pushbuttons: 5,000,000 operations minimum (900 operations per hour) All other switches: 500,000					
Degree of Protection	IP65 (from front of the panel) IP20 (type HW-F contact blocks) (conforming to IEC60529) NEMA Type 1, 2, 3, 3R, 3S, 4, **4X**, 5, 12, 13 (conforming to NEMA ICS-110)					HW1R: IP65, IP20 NEMA 1, 2, 3, 3R, 3S, 4, 4x, 5, 12, 13 HW1M: IP40, IP20
Termination	M3.5 screw terminals (fingersafe/spring up/exposed screw) with captive sems plate					
Approvals	UL File No. E68961 CSA File No. LR92374 CE TÜV Rheinland					Registration No. R9551089 (E-stops) Registration No. J9551458 (all other switches) Registration No. J9650511 (Pilot Lights)

A

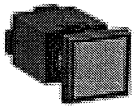
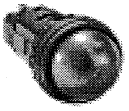
Pilot Lights (Assembled)

Part Numbers: LED Pilot Lights

Style			Part Number
Round Flush 	Full Voltage		HW1P-1FQD-②-③
	Transformer	120V 240V 480V	HW1P-1FH2D-② HW1P-1FM4D-② HW1P-1FT8D-②
Square Flush 	Full Voltage		HW2P-1FQD-②-③
	Transformer	120V 240V 480V	HW2P-1FH2D-② HW2P-1FM4D-② HW2P-1FT8D-②
Dome 	Full Voltage		HW1P-2FQD-②-③
	Transformer	120V 240V 480V	HW1P-2FH2D-② HW1P-2FM4D-② HW1P-2FT8D-②

1. In place of ②, specify the Lens/LED color code, in place of ③specify the full voltage code from table below.
2. Other voltages available, contact IDEC for details.
3. For nameplates and accessories,see page A-89.
4. For dimensions, see page A-92.

Part Numbers: Incandescent Pilot Lights

Style			Part Number
Round Flush 	Full Voltage		HW1P-1FQ-②-③
	Transformer	120V 240V 480V	HW1P-1FH2-② HW1P-1FM4-② HW1P-1FT8-②
Square Flush 	Full Voltage		HW2P-1FQ-②-③
	Transformer	120V 240V 480V	HW2P-1FH2-② HW2P-1FM4-② HW2P-1FT8-②
Dome 	Full Voltage		HW1P-2FQ-②-③
	Transformer	120V 240V 480V	HW1P-2FH2-② HW1P-2FM4-② HW1P-2FT8-②

1. In place of ②, specify the lens color code, in place of ③ specify the full voltage code. from tables below.
2. Other voltages available, contact IDEC for details.

② Lens/LED Color Code

Color	Code
Amber	A
Green	G
Red	R
Blue*	S
White	W
Yellow†	Y

* Blue LEDs are available in 24V only. Add $10.00 to list for blue.
† Yellow available in LED only.

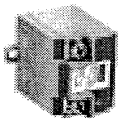
③ Full Voltage Code

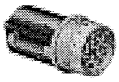
LED	Incandescent
6 = 6V DC	6 = 6V AC/DC
12 =12V AC/DC	12 =12V AC/DC
24 = 24V AC/DC	24 = 24V AC/DC
120 = 120V AC*	—

* Add $1.50 to list price for 120V LED.

E-Stops (Sub-Assembled)

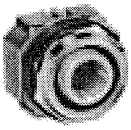
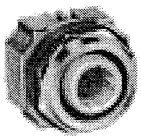
Transformer* + **Operator** + **Lamp** + **Button/Lens** = **Complete Part**





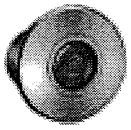
*Not required for full voltage units (full voltage clips used instead).

Part Numbers: Operators

	Style		Part Number
Ø 40mm Pushlock Turn Reset			AVD-300
Illuminated Ø 40mm Pushlock Turn Reset			AVLD3-0600N
Ø 40mm Push-Pull			AYD-3100
Illuminated Ø 40mm Push-Pull		2 pos	AYLD-0600
		3 pos	AYLD22TK962-0B01*

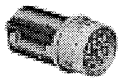
*1. *Includes red lens (40mm mushroom with red insert).*

Part Numbers: Buttons and Lenses

	Style		Part No.
Ø 40mm Pushlock Turn Reset Button (available in red only)			AVN3B-R
Ø 40mm Pushlock Turn Reset Lens (available in red only)			AVLN3LU-R
Ø 40mm Push-Pull button			AYD3BN-①
Ø 40mm Push-Pull Lens (Incandescent or LED)		2 pos*	AYLD3L-②
		3 pos	AYLD2L-②

1. In place of ①, specify the Button Color Code. (See table below)
2. In place of ②, specify the LED Color Code.
*3. *Not available in blue.*

Part Numbers: Lamps

Type	Voltage	Part Number
LED 	6V AC/DC	LSTD-6②
	12V AC/DC	LSTD-1②
	24V AC/DC	LSTD-2②
	120V AC	LSTD-H2②
	240V AC	LSTD-M4②
Incandescent 	6V AC/DC	IS-6
	12V AC/DC	IS-12
	24V AC/DC	IS-24
	120VAC	L-120L

1. In place of ②, specify the LED color code.
2. The LED contains a current-limiting resistor and a protection diode.

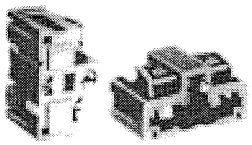
① Button Color Code

Color	Code
Black	B
Green	G
Red	R
Blue	S
Yellow	Y

② LED Color Codes

Color	Code
Amber	A
Green	G
Red	R
Blue	S
White	W

Part Numbers: Contact Blocks

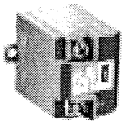
Description	Part Number	
	1NO	1NC
All Control Units 	BST-010	BST-001
	BST-010S (early make)	BST-001S (late break)
Dummy Blocks	BST-D	

1. Dummy blocks (no contacts) are used with an odd number of contact blocks.
2. Combining BST-010S and BST-001S result in overlapping contacts (remain on, or closed, when switch is moved between two positions).

Part Numbers: Full Voltage Clips

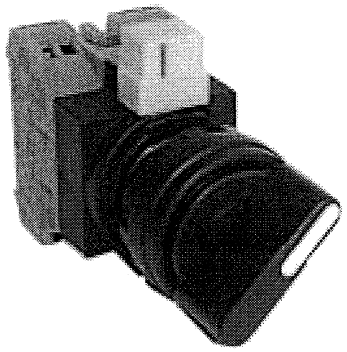
Primary Voltage (50/60Hz)	Part Number
Full Voltage Clips (2 req'd for each unit) 	APD-F

Part Numbers: Transformers

Description	Primary Voltage (50/60Hz)	Part Number
	120V AC	TWD-0126
	240V AC	TWD-0246
	480V AC	TWD-0486

6V secondary voltage (uses 6V lamp).

Selector Switches (Assembled)



A

Part Numbers: 2–Position Selector Switches

Contact	Mounting	Operator Position L	Operator Position R	Maintained	Spring Return from Right
				L R	L R
				Part Number	Part Number
1NO	1	0	X	HW1S-2TF10	HW1S-21TF10
	2	0	0		
1NO-1NC	1	0	X	HW1S-2TF11	HW1S-21TF11
	2	X	0		
2NO	1	0	X	HW1S-2TF20	HW1S-21TF20
	2	0	X		

Part Numbers: 3–Position Selector Switches

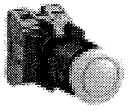
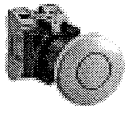
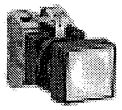
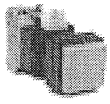
Contact	Mounting	L	C	R	Maintained	Spring Return from Right	Spring Return from Left	Spring Return Two-Way
					L C R	L C R	L C R	L C R
					Part Number	Part Number	Part Number	Part Number
2NO	1	X	0	0	HW1S-3TF20	HW1S-31TF20	HW1S-32TF20	HW1S-33TF20
	2	0	0	X				
2NO-1NC	1	X	0	0	HW1S-3JTF21N1	—	—	—
	2	0	0	X				
	3	0	X	0				

1. Mounting refers to contact location on operator. See page A-83.
2. For nameplates, see page A-89.
3. Custom contact arrangements available. Contact IDEC for details.

Non-Illuminated Pushbuttons (Assembled)

A

Part Numbers: Non-Illuminated Pushbuttons

Style	Contact	Momentary Part Number	Maintained (Latching) Part Number
Flush 	1NO	~~HW1B-M1F10-①~~	HW1B-A1F10-①
	1NC	HW1B-M1F01-①	HW1B-A1F01-①
	1NO-1NC	~~HW1B-M1F11-①~~	HW1B-A1F11-①
	2NO	HW1B-M1F20-①	HW1B-A1F20-①
	2NC	HW1B-M1F02-①	HW1B-A1F02-①
	2NO-2NC	HW1B-M1F22-①	HW1B-A1F22-①
Extended 	1NO	HW1B-M2F10-①	HW1B-A2F10-①
	1NC	HW1B-M2F01-①	HW1B-A2F01-①
	1NO-1NC	HW1B-M2F11-①	HW1B-A2F11-①
	2NO	HW1B-M2F20-①	HW1B-A2F20-①
	2NC	HW1B-M2F02-①	HW1B-A2F02-①
	2NO-2NC	HW1B-M2F22-①	HW1B-A2F22-①
Mushroom 1-5/32" (29mm) 	1NO	HW1B-M3F10-①	HW1B-A3F10-①
	1NC	HW1B-M3F01-①	HW1B-A3F01-①
	1NO-1NC	HW1B-M3F11-①	HW1B-A3F11-①
	2NO	HW1B-M3F20-①	HW1B-A3F20-①
	2NC	HW1B-M3F02-①	HW1B-A3F02-①
	2NO-2NC	HW1B-M3F22-①	HW1B-A3F22-①
Mushroom 1-9/16" (40mm) 	1NO	HW1B-M4F10-①	HW1B-A4F10-①
	1NC	HW1B-M4F01-①	HW1B-A4F01-①
	1NO-1NC	HW1B-M4F11-①	HW1B-A4F11-①
	2NO	HW1B-M4F20-①	HW1B-A4F20-①
	2NC	HW1B-M4F02-①	HW1B-A4F02-①
	2NO-2NC	HW1B-M4F22-①	HW1B-A4F22-①
Square Flush 	1NO	HW2B-M1F10-①	HW2B-A1F10-①
	1NC	HW2B-M1F01-①	HW2B-A1F01-①
	1NO-1NC	HW2B-M1F11-①	HW2B-A1F11-①
	2NO	HW2B-M1F20-①	HW2B-A1F20-①
	2NC	HW2B-M1F02-①	HW2B-A1F02-①
	2NO-2NC	HW2B-M1F22-①	HW2B-A1F22-①
Square Extended 	1NO	HW2B-M2F10-①	HW2B-A2F10-①
	1NC	HW2B-M2F01-①	HW2B-A2F01-①
	1NO-1NC	HW2B-M2F11-①	HW2B-A2F11-①
	2NO	HW2B-M2F20-①	HW2B-A2F20-①
	2NC	HW2B-M2F02-①	HW2B-A2F02-①
	2NO-2NC	HW2B-M2F22-①	HW2B-A2F22-①
Jumbo Mushroom 2-3/8"" (60mm) New 	1NO	HW1B-M5F10-①	—
	1NC	HW1B-M5F01-①	
	1NO-1NC	HW1B-M5F11-①	
	2NO	HW1B-M5F20-①	
	2NC	HW1B-M5F02-①	
	2NO-2NC	HW1B-M5F22-①	

① Button Color Code

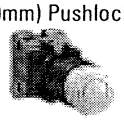
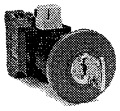
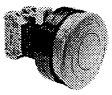
Color	Code
Black	B
Blue	S
Green	G
Red	R
Yellow	Y
White	W

1. In place of ①, specify the button color code.
2. Jumbo mushroom available only in red, green, and black.
3. For nameplates and accessories, see page A-89.
4. For dimensions, see page A-92.
5. For sub-assembly part numbers, see next page.

Emergency Stop Pushbuttons (Assembled)

A

Part Numbers: Special Function Non-Illuminated Pushbuttons

Style	Contact	Part Number
1-9/16" (40mm) Push–Pull 	1NO 1NC 1NO-1NC 2NC 2NO	HW1B-Y2F10-①† HW1B-Y2F01-①† HW1B-Y2F11-①† HW1B-Y2F02-①† HW1B-Y2F20-①†
1-5/32" (29mm) Pushlock Turn Reset 	1NO 1NC 1NO-1NC 2NO 2NC	HW1B-V3F10-R* HW1B-V3F01-R* HW1B-V3F11-R* HW1B-V3F20-R* HW1B-V3F02-R*
1-9/16" (40mm) Pushlock Turn Reset 	1NO 1NC 1NO-1NC 2NO 2NC	~~HW1B-V4F10-①†~~ HW1B-V4F01-①† ~~HW1B-V4F11-①†~~ HW1B-V4F20-①† HW1B-V4F02-①†
1-9/16" (40mm) Pushlock Key Reset 	1NO 1NC 1NO-1NC 2NO 2NC	HW1B-X4F10-R* HW1B-X4F01-R* HW1B-X4F11-R* HW1B-X4F20-R* HW1B-X4F02-R*
2-3/8" (60mm) Pushlock Turn Reset 	1NO 1NC 1NO-1NC 2NO 2NC	HW1B-V5F10-R* HW1B-V5F01-R* HW1B-V5F11-R* HW1B-V5F20-R* HW1B-V5F02-R*
1-9/16" (40mm) Unibody Pushlock Turn Reset 	1NO-1NC 2NC 1NO-2NC	HW1E-BV4F11-R* HW1E-BV4F02-R* HW1E-BV412-R-TK2093

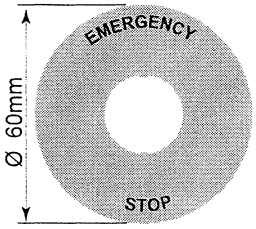
** Available only in Red.*
† Available in red or yellow (insert color code in place of ①)

Part Numbers: Illuminated Unibody Emergency Stop

Style	Illumination Type	Contact	Part Number
	LED	1NO-1NC 2NC 2NC (with active lamp circuit) 1NO-1NC (with active lamp circuit)	HW1E-LV4F11QD-R*-③ HW1E-LV4F02QD-R*-③ HW1E-TV4F02QD-R-③ HW1E-TV4F11QD-R*-③
	Incandescent	1NO-1NC 2NC 1NO-1NC (with active lamp circuit) 2NO (with active lamp circuit)	HW1E-LV4F11Q-R*-③ HW1E-LV4F02Q-R*-③ HW1E-TV4F11Q-R*-③ HW1E-TV4F02Q-R*-③

Part Numbers: Nameplates

HWAV–Yellow Plastic



	Part Number
60mm Diameter "Emergency Stop" Engraved	HWAV-27†
60mm Diameter Blank	HWAV-0Y
Engraved 80mm Diameter Emergency Stop (for jumbo mushroom use)	HWAV-527

† HWAV-27 comes engraved "Emergency Stop" as shown in drawing.

Part Number: E-Stop Shroud

Style	Part Number
	HW9Z-KG1-TK2120

Not applicable for 60mm mushroom.

③ Full Voltage Code

Voltage	Code
6VAC/DC	6
12VAC/DC	12
24VAC/DC	24

1. ** Available in Red only.*
2. *In place of ③, specify full voltage code.*
3. *With single unit construction, the positive action contacts are integrated in the body of the switch. This provides an extra degree of safety and reliability for critical emergency stop functions.*
4. *In the illuminated version, the light is independent of the switch action.*
5. *For nameplates and accessories, see page A-114.*
6. *For dimensions, see page A-117.*
7. *For sub-assembly part numbers, see next page.*
8. *All HW series E-stops comply with EN418, the IEC "E-Stop Addendum to the Low Voltage Directive," this includes "tamper proof" operation whereby a change of contact state is not possible by "teasing" or "floating" the operator.*
9. *"Active Lamp Circuit" consists of a built-in Normally Open contact in series with the lamp. This allows the lamp to illuminate only when the button is pressed and eliminates the need for external jumpering.*

Standard terminal blocks

Compression clamp

DIN 1 - 3

Test connector : See Accessories section

End stop	th. 9 mm	BADL V0	0199 408.02
End stop	th. 9,1 mm	BAM	0103 002.26
Rail	35 x 7,5 x 1	PR30 prepunched	0173 220.05
Rail	35 x 15 x 2,3	PR4	0168 500.12
Rail	35 x 15 x 1,5	PR5 prepunched	0101 598.26
Rail	32 x 15 x 1,5	PR1Z2	0163 050.04

Other end stops and rails : See Accessories section

Characteristics

Wire size

		IEC NFC DIN	UL	CSA
Compression clamp	Solid wire	0,2-4 mm²	24-10 AWG	24-10 AWG
	Stranded wire	0,22-4 mm²	24-10 AWG	24-10 AWG

Voltage			
Rated	800 V	600 V	600 V
Pulse	8 kV		
Pollution degree	3		
Current			
Rated	32 A	30 A	25 A
Wire size			
Rated / Gauge	4 mm² / A4	10 AWG	10 AWG

Wire stripping length	Recomm. Screwdriver	Recomm. torque	Protection
9,5 mm	4 mm	0,5-0,8 Nm	IP 20
.37"	.157"	4.4-7 lb.in.	NEMA 1

Notes

The use of some accessories may decrease the block's voltage rating. For more information, consult us.

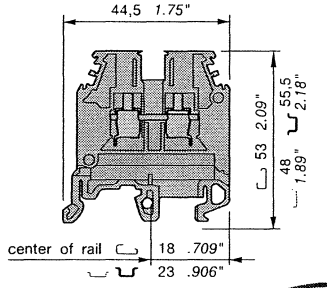
***BJDP1** permits the interconnection with a terminal block series "M" spacing 16 mm.*

***BJDP3** permits the interconnection with a terminal block series "M" spacing 12 mm.*

***BJDP4** permits the interconnection with a terminal block series "D" spacing 8 mm or a terminal block series "M" spacing 8 or 10 mm.*

M 4/6...

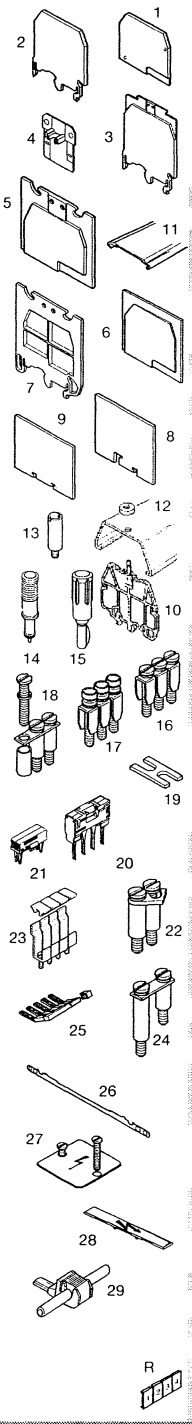
Spacing 6 mm + 0,05 *(.238")*



Standard 6 mm block **0115 116.07**

Color		Type	Part numbers
Standard blocks			
Grey		**M 4/6**	**0115 116.07**
Blue		**M 4/6.N**	**0125 116.01**
Orange		**M 4/6**	**0105 002.20**
Yellow		**M 4/6**	**0105 116.16**
Green		**M 4/6**	**0105 001.27**
Red		**M 4/6**	**0105 032.15**
Black		**M 4/6**	**0105 031.14**
White		**M 4/6**	**0105 051.20**
Brown		**M 4/6**	**0105 209.14**
Beige V0		**M 4/6.V0**	**0195 116.00**
Blue V0		**M 4/6.N.V0**	**0199 002.26**

Accessories



			Type			Part numbers
1	End section	grey	**FEM6**		th. 2,8 mm	**0118 368.16**
		blue	**FEM6**		th. 2,8 mm	**0128 368.10**
		orange	**FEM6**		th. 2,8 mm	**0103 126.16**
		yellow	**FEM6**		th. 2,8 mm	**0103 062.21**
		green	**FEM6**		th. 2,8 mm	**0103 125.15**
		white	**FEM6**		th. 2,8 mm	**0103 312.20**
		beige	**FEM6 V0**	V0	th. 2,8 mm	**0198 368.17**
		blue	**FEM6 V0**	V0	th. 2,8 mm	**0199 302.07**
		yellow	**FEM6 V0**	V0	th. 2,8 mm	**0199 305.02**
2	End section	grey	**FEM61**	(3)	th. 3,0 mm	**0114 776.23**
3	End section	grey	**FEM6C**	(3)	th. 3,0 mm	**0114 777.24**
4	Circuit separator	grey	**SCM6**			**0113 003.10**
		blue	**SCM6**			**0123 003.12**
		beige	**SCM6 V0**	V0		**0193 003.11**
5	Separator end section	grey	**SCF6**		th. 3,0 mm	**0118 707.03**
		blue	**SCF6**		th. 3,0 mm	**0128 707.05**
		beige	**SCF6 V0**	V0	th. 3,0 mm	**0198 707.04**
6	Separator end section	grey	**SCF61**		th. 3,0 mm	**0114 202.25**
7	Separator end section	grey	**SCFM6**	(3)	th. 3,0 mm	**0114 825.05**
8	Separator end section	grey	**SCFEX1**	(3) ⊂⊃	th. 2,4 mm	**0103 619.04**
9	Separator end section	grey	**SCFEX3**	(3) ⊔	th. 2,4 mm	**0103 620.01**
10	Separator end section (for cover CPV)	grey beige	**SCFCV1-2**	(3)	th. 3,0 mm	**0116 795.11**
			SCFCV1-2 V0	(3)V0	th. 3,0 mm	**0196 795.12**
11	Protective cover		**CPM**		(for FEM6C, SCF6(V0) and SCFM6)	**0187 312.14**
12	Protective cover		**CPV1-2**		(for SCFCV1-2...)	**0176 816.12**
13	Test socket		**AL2**	(1)	DIA. 2 mm	**0163 043.21**
			AL3	(1)	DIA. 3 mm	**0163 261.00**
14	Test device		**DCJ**		yellow	**0173 059.03**
15	Test plug		**FC2**		DIA. 2 mm	**0007 865.26**
			FC4		DIA. 4 mm	**0167 860.01**
16	Assembled jumper bar (without IP20 protection)	32 A	**BJM6**	(1)	2 poles	**0168 516.25**
		32 A	**BJM6**	(1)	3 poles	**0168 517.26**
		32 A	**BJM6**	(1)	4 poles	**0168 518.07**
		32 A	**BJM6**	(1)	5 poles	**0168 519.00**
		32 A	**BJM6**	(1)	10 poles	**0168 973.07**
17	Assembled jumper bar (with IP20 protection)	32 A	**BJMI6**	(1)	2 poles	**0176 663.00**
		32 A	**BJMI6**	(1)	3 poles	**0176 664.01**
		32 A	**BJMI6**	(1)	4 poles	**0176 665.02**
		32 A	**BJMI6**	(1)	5 poles	**0176 666.03**
		32 A	**BJMI6**	(1)	10 poles	**0176 667.04**
18	Jumper bar not assembled Post + screw + washer	32 A	**BJS6**	(1)	20 poles	**0174 784.20**
			EV6			**0168 604.16**
19	Connector plate	35 A	**EL6**			**0173 627.21**
20	Screwless jumper bar orange IP 20	32 A	**BJE6.2**	(4)	2 poles	**0299 694.04**
		32 A	**BJE6.3**	(4)	3 poles	**0299 695.05**
		32 A	**BJE6.4**	(4)	4 poles	**0299 696.06**
		32 A	**BJE6.5**	(4)	5 poles	**0299 697.07**
		32 A	**BJE6.10**	(4)	10 poles	**0299 702.14**
21	Jumper		**BJB**			**0199 466.23**
22	Pivoting jumper bar	35 A	**BJP6**	(1)		**0174 413.14**
23	Alternated jumper bar	35 A	**BJA6**	(1)	10 poles	**0116 541.12**
24	Universal jumper bar	50 A	**BJDP1**	(1)(2)	spacing 6 <-> spacing 16	**0179 623.03**
		70 A	**BJDP3**	(1)(2)	spacing 6 <-> spacing 12	**0179 625.05**
		50 A	**BJDP4**	(1)(2)	spacing 6 <-> spacing 8 or 10	**0174 781.25**
25	Comb-type jumper bar	35 A	**PC6**	(4)	2 poles	**0113 546.14**
		35 A	**PC6**	(4)	10 poles	**0113 548.26**
	Insulating tip		**EIP**			**0113 550.24**
26	Shield connector		**CBM5**		th. 0,5 mm	**0178 745.14**
			CBM8		th. 0,8 mm	**0178 746.15**
27	Protection label		**EP6**		4 blocks	**0163 427.17**
	Screw for protection label		**VSP6**			**0163 433.15**
28	Protection label		**EPU6**			**0107 038.25**
29	IDC jumper		**AD2,5**			**0114 205.20**

R See section on markers method ⑪ ⑫

Note : (1) A circuit separator SC may be required with the use of these accessories.
(2) See "Notes". (3) End sections and separators snapped on rails.
(4) See section : "Accessories" for other configurations of poles.

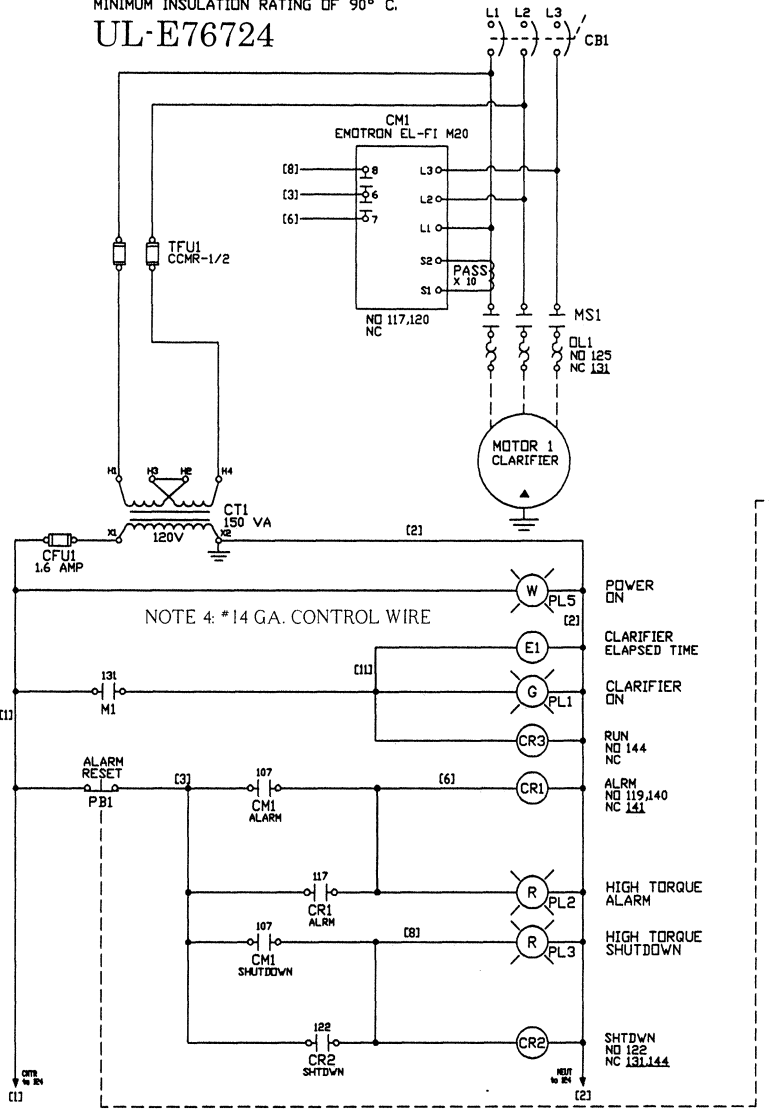
460 VOLTS 3 PH 60 HZ 1/2 HP 1.0 FLA CLARIFIER MOTOR (QTY 2)

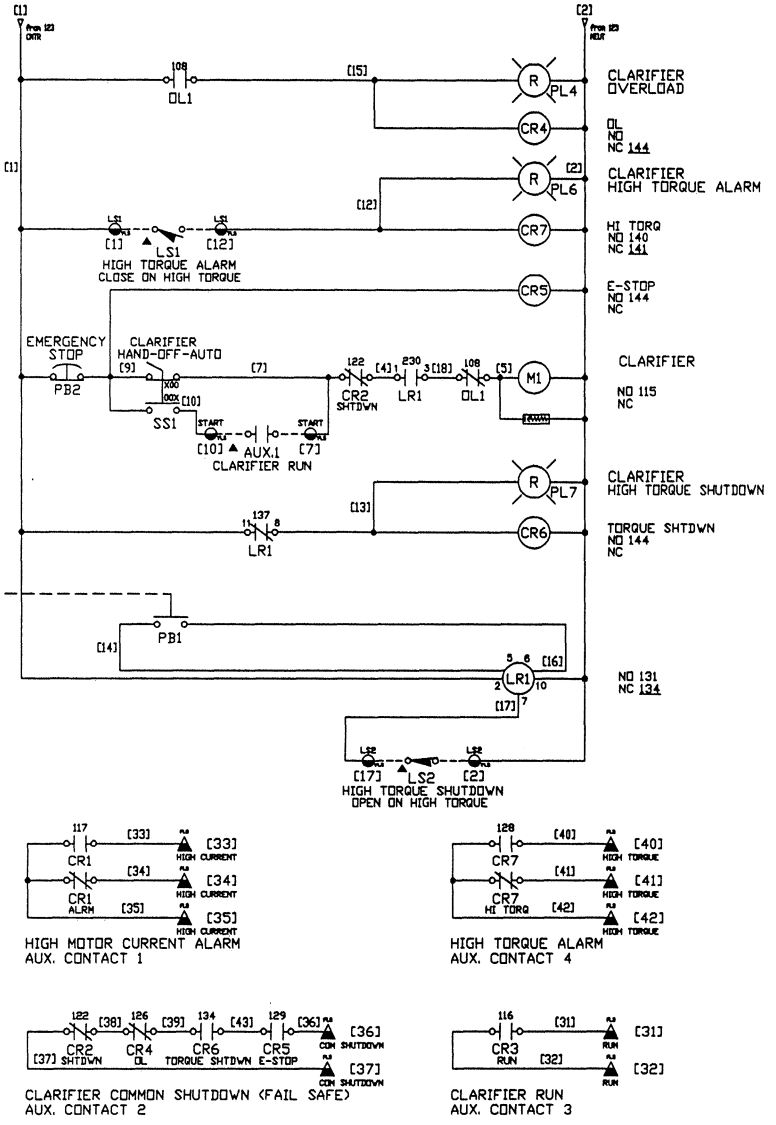
SHORT CIRCUIT CURRENT 65 KA RMS SYMMETRICAL, 460V MAXIMUM

NOTE 1: SERVICE ENTRANCE DISCONNECT SWITCH MUST BE INSTALLED BETWEEN POWER SUPPLY AND THIS PANEL

NOTE 2: THIS PANEL SHALL BE INSTALLED OBSERVING ALL APPLICABLE STATE AND LOCAL CODES AND AS PER LATEST REVISION OF NEC. USE ONLY COPPER CONDUCTOR WITH A MINIMUM INSULATION RATING OF 90° C.

UL-E76724





SYM	REVISION	BY	DATE	CHKD
E				
D				
C				
B				
A				

	DATE	BY
DRAWN	4/8/11	PH
CHECKED		
APPR.		
SCALE	NONE	

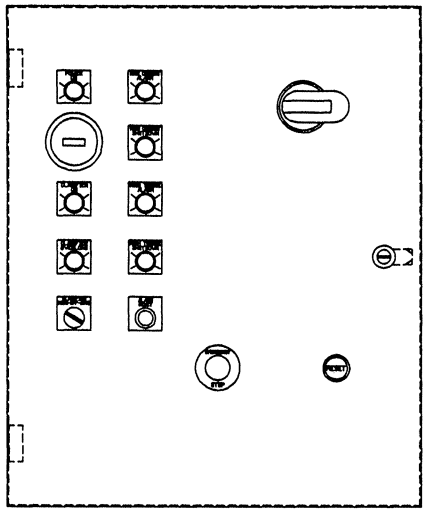
MASTER B -XXXX

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

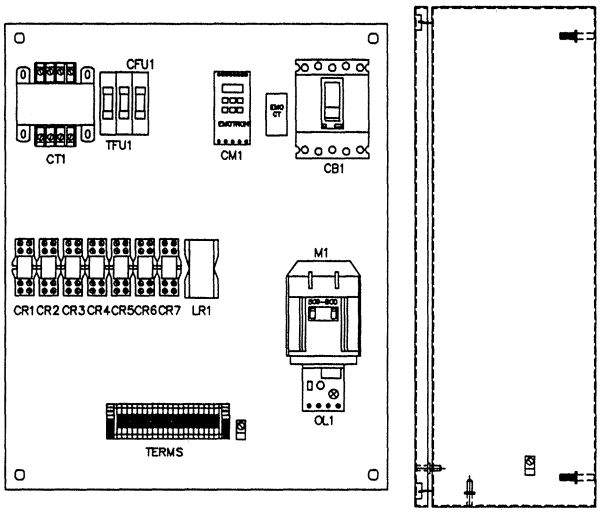
CLARIFIER CONTROL
FOUNTAIN, CO

CONTRACT | DRAWING NO. B 9 0 | AM40811TLC 1 OF 2 | X X X | REV. A

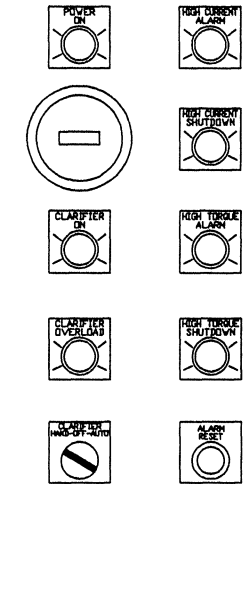
TAG	QTY	DESCRIPTION	MANUFACTURER	CATALOG NUMBER
-	1	24 X 20 X 8 NEMA 4X STAINLESS STEEL CABINET	HOFFMAN	C-SD24208SS
-	1	CABINET SUB PANEL	HOFFMAN	C-P2420
CB	1	CIRCUIT BREAKER	EATON	HMCP003A0C
-	1	CIRCUIT BREAKER HANDLE	EATON	HM1R12X
M	1	MOTOR STARTER	ALLEN-BRADLEY	509-BOD
OL	1	OVERLOAD RELAY	ALLEN-BRADLEY	A2E
-	1	OVERLOAD RESET BUTTON	CONTROL CONCEPTS	RPB-B
CT	1	CONTROL TRANSFORMER	SOLA HEVI/DUTY	E150
TFU	2	TRANSFORMER FUSE	LITTELFUSE	CCMR-1/2
CFU	1	CONTROL FUSE	LITTELFUSE	FLM-1.6
CR	7	CONTROL RELAY	IDEC	RH2BUL-AC120V + SH2B-05
LR	1	HIGH TORQUE SHUTDOWN LATCHING RELAY	DIVERSIFIED	SPM-120-ADA
CM	1	CURRENT MONITOR	EMOTRON	EL-FI M20 + CTM010
E	1	ELAPSED TIME METER	ENM	T50
PL	7	PILOT LIGHT	IDEC	HW1P-1FQD-G,R & W-120
-	7	PILOT LIGHT BULB	IDEC	LSTD-H2 -G, R & W
SS	1	SELECTOR SWITCH	IDEC	HW1S-3TF20
PB1	1	PUSH BUTTON	IDEC	HW1B-M1F01-B
PB2	1	EMERGENCY PUSH BUTTON	IDEC	HW1B-V4F01-R
-	20	TERMINAL	ENTRELEC	011511607



24 X 20 X 8 NEMA 4X STAINLESS STEEL CABINET



SUB PANEL



WIRENO	INST	LOC	REF
[7]	START	FLD	132
[10]	START	FLD	132
[1]	LS1	FLD	128
[12]	LS1	FLD	128
[2]	LS2	FLD	139
[17]	LS2	FLD	139
[31]	RUN	FLD	144
[32]	RUN	FLD	145
[33]	HIGH CURRENT	FLD	140
[34]	HIGH CURRENT	FLD	141
[35]	HIGH CURRENT	FLD	142
[36]	COM SHUTDOWN	FLD	144
[37]	COM SHUTDOWN	FLD	145
[40]	HIGH TORQUE	FLD	140
[41]	HIGH TORQUE	FLD	141
[42]	HIGH TORQUE	FLD	142

SEQUENCE OF OPERATION

HAND POSITION – CLARIFIER WILL RUN CONTINUOUSLY
OFF POSITION – CLARIFIER WILL BE OFF
AUTO POSITION – CLARIFIER WILL STOP AND START FROM REMOTE SOURCE

HIGH TORQUE SHUTDOWN, HIGH CURRENT SHUTDOWN AND OVERLOAD WILL STOP CLARIFIER IN ANY POSITION AND WILL REQUIRE MANUAL RESET.
CLARIFIER WILL STOP WHEN EMERGENCY STOP BUTTON IS PRESSED
CLARIFIER CAN BE RE-STARTED BY PULLING BACK EMERGENCY STOP BUTTON

[11] WIRE NUMBER
WIRE COLOR – BLK–POWER / RED–120V CONTROL / WHT–NEUTRAL / YEL–REMOTE / GRN–GROUND
FIELD TERMINAL
TERMINAL POWERED FROM REMOTE SOURCE
REMOTE DEVICE

SYM	REVISION	BY	DATE	CHKD
E				
D				
C				
B				
A				

MASTER
B -XXXX

	DATE	BY
DRAWN	4/8/11	PH
CHECKED		
APPR.		
SCALE	NONE	

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

CLARIFIER CONTROL
FOUNTAIN, CO

CONTRACT	DRAWING NO.	REV.
	B.9.0. | AM40811TLC 2 OF 2 | X.X.X	△

CIRCULAR CLARIFIERS (W/ SKIMMER)

SHUTDOWN PROCEDURES

SHUTDOWN PROCEDURES

It is recommended that unit not be shut down until after skimmer has just passed over scum trough 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"**.

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.

CIRCULAR CLARIFIERS (WITH SKIMMERS)

ENVIRONMENTAL AND LIMITING CONDITIONS AND SEASONAL OPERATIONS

SEASONAL OPERATIONS - (Continued)

WINTER MONTHS - (Continued)

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.

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

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

LUBRICATION AND MAINTENANCE INSTRUCTIONS (REFER TO DATA SHEET D905-64199-215)

A) GENERAL

Walker Process Equipment drive units are shipped without 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.

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 (3) to the level pipe (1) with one of the following oils. Drain oil thru valves (7) & (8) .

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. °F	-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 D905-64199-215)

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 (1). When filled too fast, the viscosity of the oil will cause an overfill and spill out over the dust shield.

Check oil level monthly with oil level dipstick (2), drain off condensation with oil drain (8) and add equal amount of oil.

Drain and flush annually with lightweight oil such as, SAE 5, linseed oil or equal.

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 (4) located on top of base plate until oil begins to emerge thru petcock (6). Drain oil thru oil drain pipe (9).

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. °F	-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

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

LUBRICATION AND MAINTENANCE INSTRUCTIONS (REFER TO DATA SHEET D905-64199-215)

E) PINION SHAFT BEARING

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

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

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

5) Adjust locking nut on take-up screw so that screw is locked into position.

6) Retighten gearmotor mounting bolts.

7) Replace chain guard.

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

LUBRICATION AND MAINTENANCE INSTRUCTIONS (REFER TO DATA SHEET D905-64199-215)

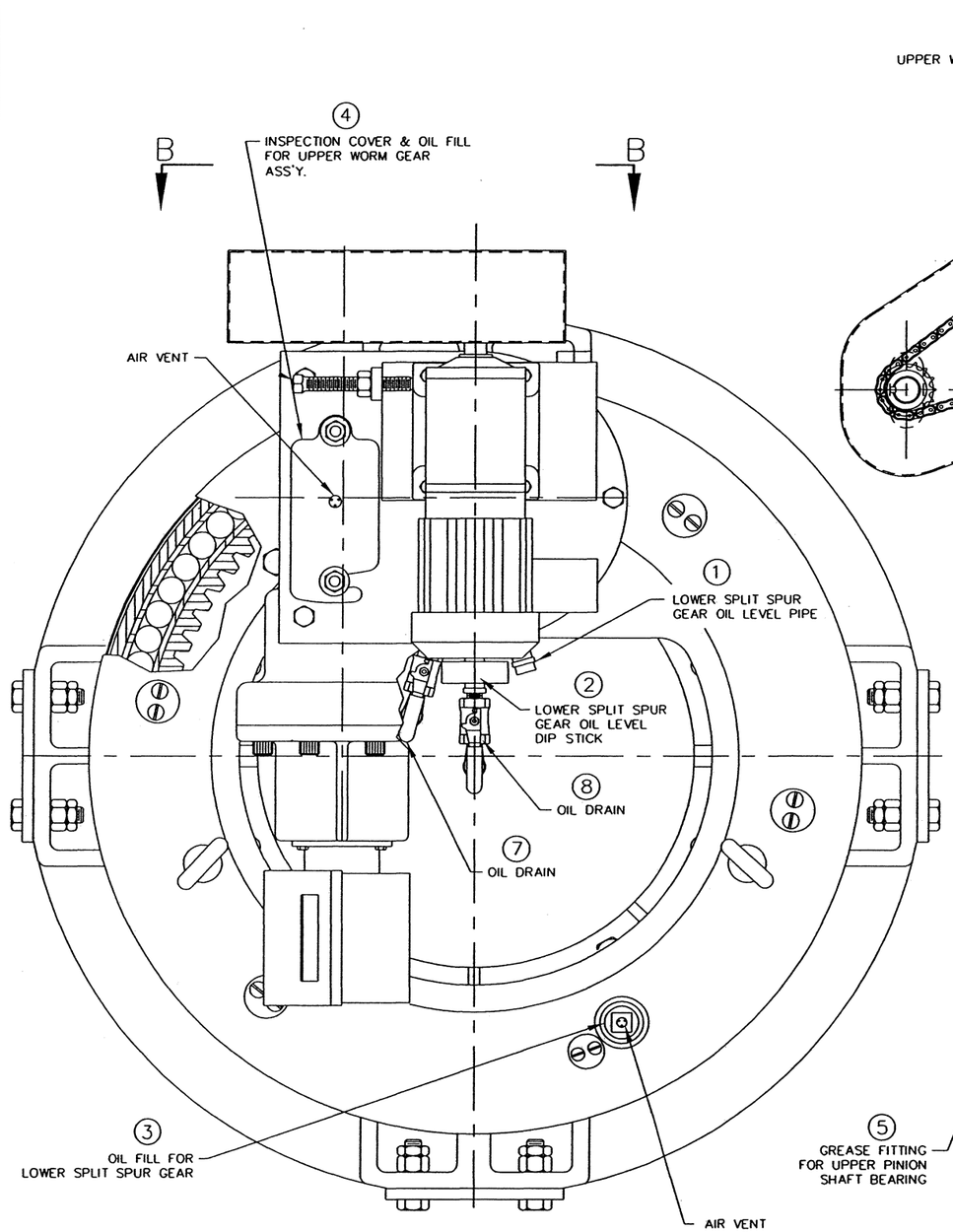
H) SUMMARY

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 (9) under the worm housing (upper reservoir) and open valves (7) & (8) (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. **NOTE:** Walker Process Equipment furnished chain is self-lubricating and does not require lubrication. If chain is replaced with a non self-lubricating type then lubricate monthly 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.



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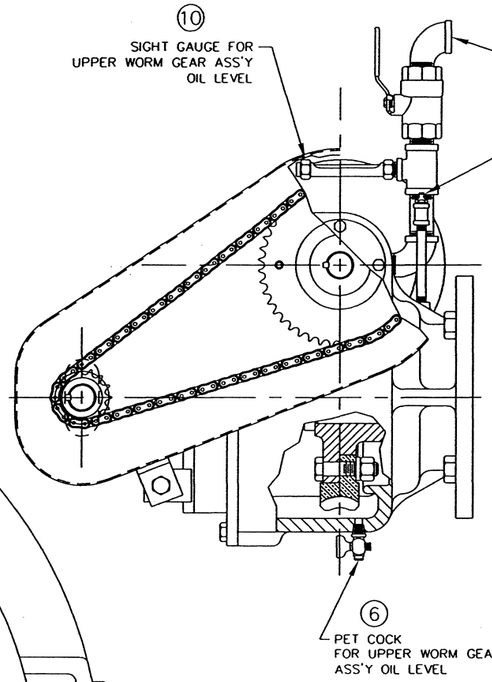

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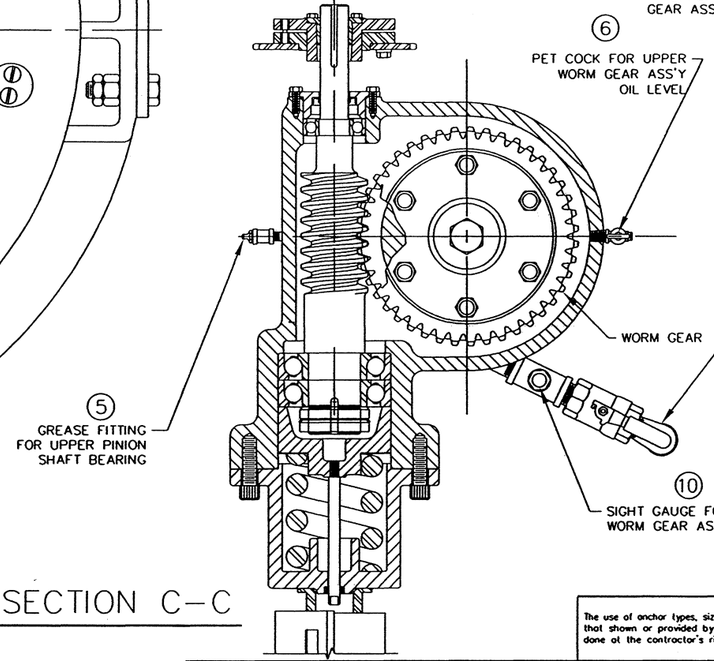

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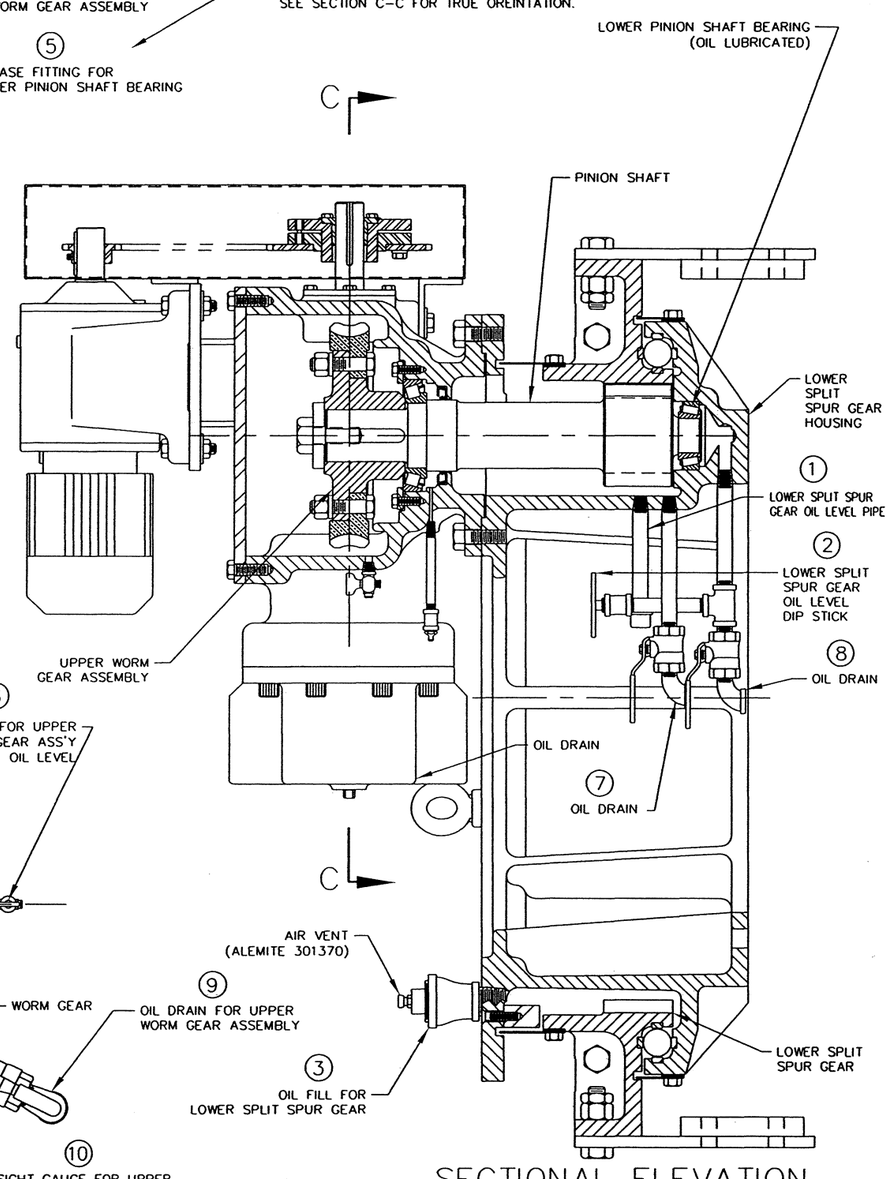

SECTIONAL ELEVATION

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SCALE NONE

FILE REFERENCE

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

DATA SHEET
FOR LUBRICATION
28' CLARIFIER DRIVES

CONTRACT | DRAWING NO. D,9,0,5|6,4,1,9,9|2,1,5 | REV.

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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.~~

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.
   NOTE: Walker Process furnished chain is self-lubricating and does not require lubrication. If chain is replaced with a non self-lubricating type then lubricate monthly 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. Clean and paint equipment.
7. Inspect flights and replace if required.
8. Inspect arm orifice openings - Clean if required.
9. Inspect arm squeegee and replace if required.
10. Inspect skimmer wipers and replace if required.

CIRCULAR CLARIFIERS

PREVENTATIVE MAINTENANCE PROCEDURES

TO CHECK OIL LEVELS:

Refer to Data Sheet D905-64199-215, 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 [4] 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 [3] 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.

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) Open overload housing cover.

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

c) If switches operate properly, close the overload housing cover.

TO DRAIN CONDENSATE:

Refer to drawing D905-64199-215.

a) For worm gear oil bath open drain valve [9].

b) For spur gear oil bath open drain valves [7] & [8].

c) Draw off all condensate until oil appears.

d) Close valves [7], [8] and [9].

CIRCULAR CLARIFIERS

PREVENTATIVE MAINTENANCE PROCEDURES

TO LUBRICATE DRIVE CHAIN:

NOTE: **Walker Process** 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.

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.

TO CHANGE GEARMOTOR LUBRICANT: (Continued)

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 D905-64199-215.

a) Open valves [7], [8] and [9].

b) Drain all oil completely.

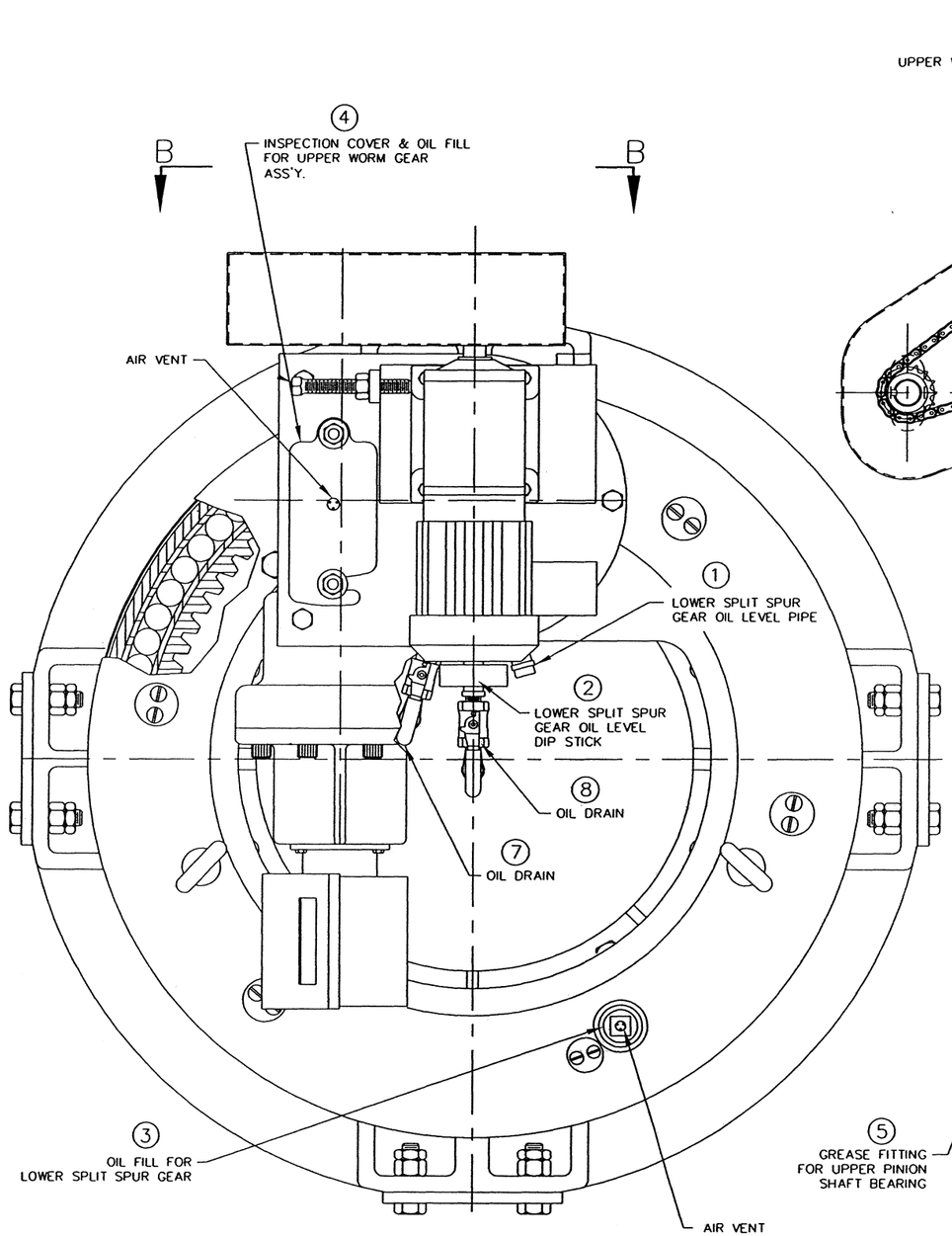
NOTE: The amount of time required to accomplish this function will vary depending on the ambient temperature.

c) Remove inspection cover [4] and oil fill plug [3].

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

e) Close valves [7], [8] and [9].

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



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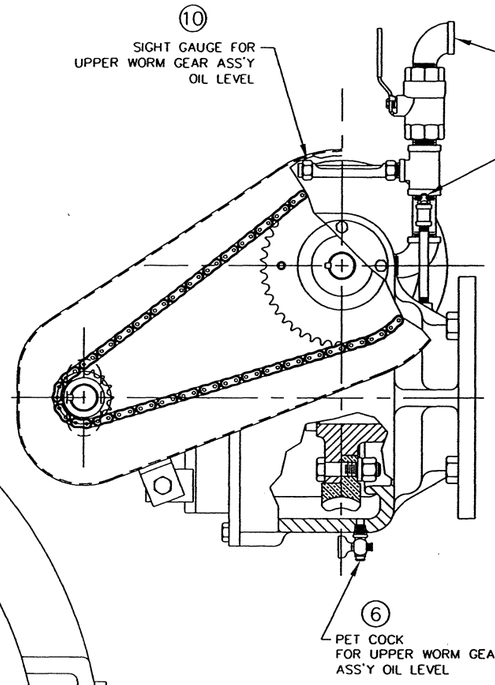

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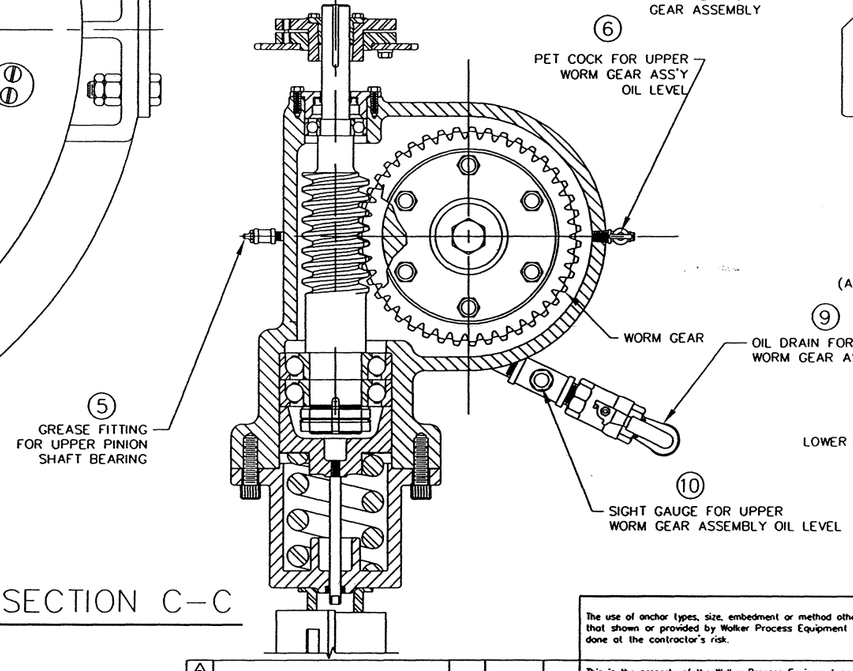

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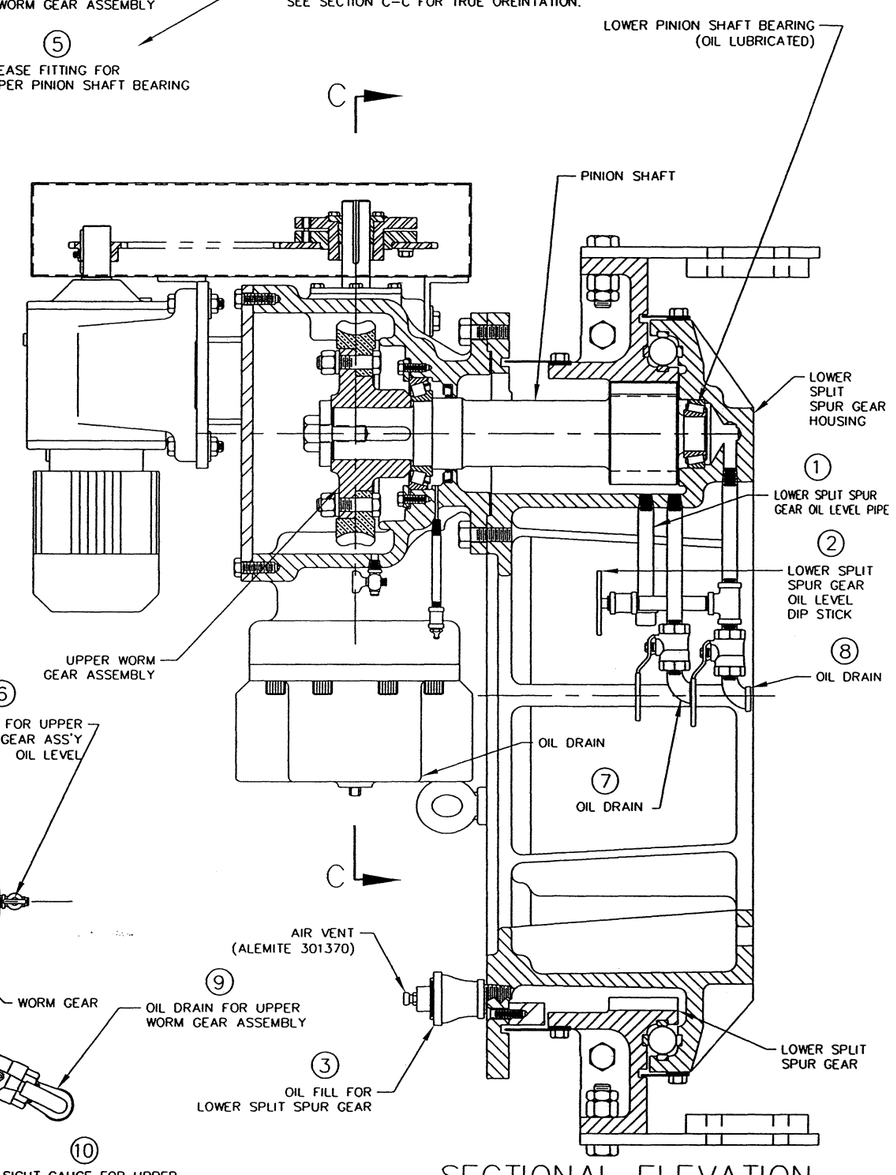

SECTIONAL ELEVATION

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SCALE	NONE	
FILE REFERENCE		

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

DATA SHEET
FOR LUBRICATION
28' CLARIFIER DRIVES

CONTRACT | DRAWING NO. D,9,0,5|6,4,1,9,9|2,1,5 | REV.

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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.

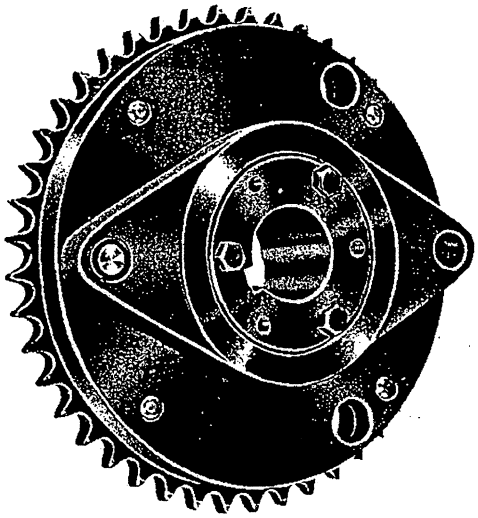
SHEAR PIN INSTALLATION

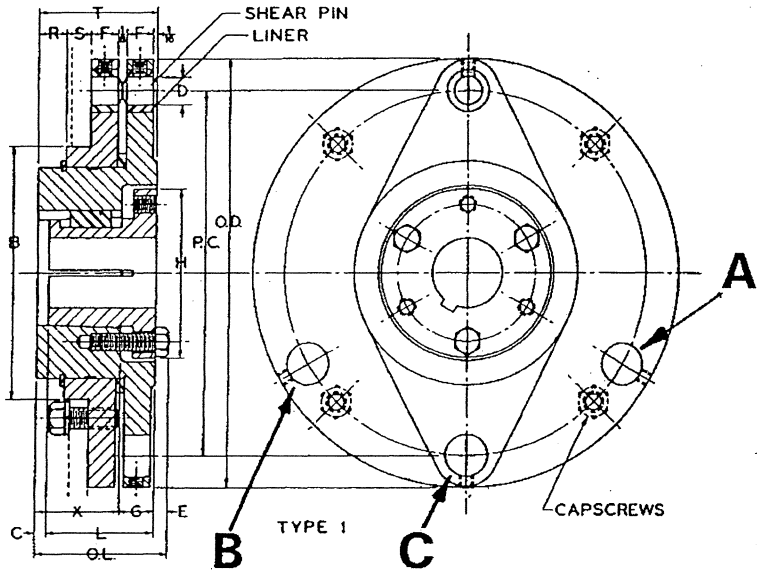
1. With drive chain removed, manually rotate sprocket until shear pin liners line up.
2. Install shear pin making sure neck of pin is centered between shear faces of shear pin liners.
3. Install and securely tighten setscrews locking pin in place.
4. Install drive chain.
5. Replace chain guard.

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"	1¾₁₆"	¼"	3/16"	½"	7/16"	2½"	1¼"	—	½"	5/16"	2 1/16"	1⅝"	3	⅜

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"								
1/8					2P	2390	3.8	1								
5/32					3P	3740	5.9	1⅛								
3/16					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	1½	2Q	12690	20.1	1¾
1/4					6P	9570	15.1	1⅝	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	[illegible]	*1¾	5Q	19840	31.4	2	5Q	[illegible]580	41.0	2¼
11/32									6Q	24010	38.0	2⅛	6Q	313[illegible]	49.6	2⅜
3/8									7Q	28590	45.3	2¼	7Q	37290	[illegible].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	[illegible]

GEARMOTOR INSTRUCTIONS

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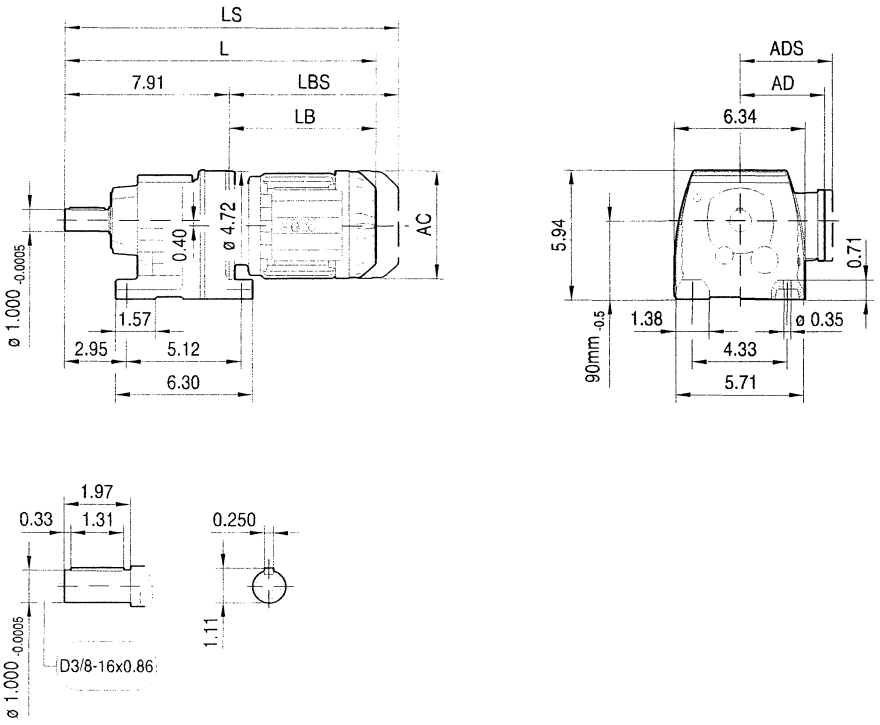

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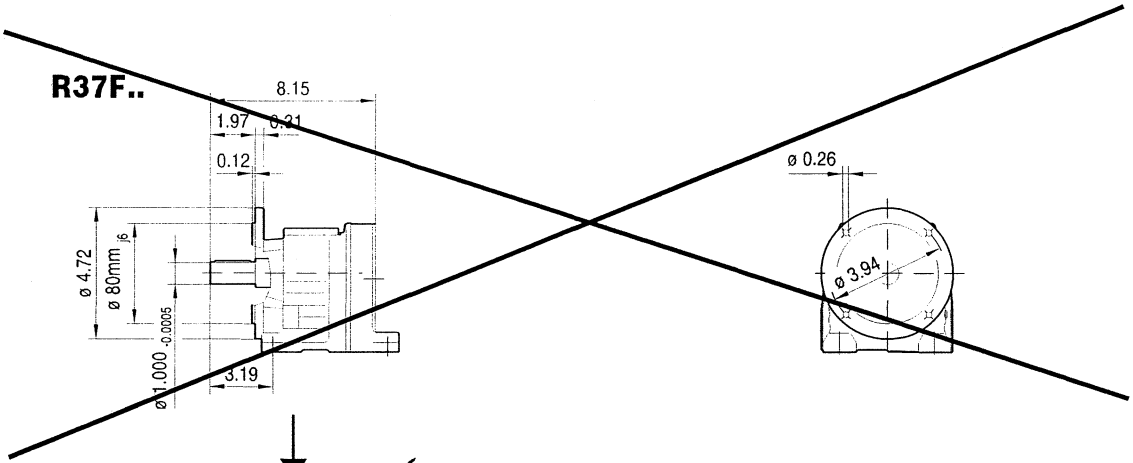

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AC	5.20	5.47	5.47	6.14	6.14	7.05	7.05	7.76	7.76
AD	4.13	4.69	4.69	5.04	5.04	5.51	5.51	6.18	6.18
ADS	4.13	5.08	5.08	5.47	5.47	5.91	5.91	6.22	6.22
L	15.43	15.91	16.89	17.24	18.46	18.62	19.41	20.59	21.77
LS	17.60	18.58	19.57	20.43	21.65	22.28	23.07	24.25	25.43
LB	7.52	7.99	8.98	9.33	10.55	10.71	11.50	12.68	13.86
LBS	9.69	10.67	11.65	12.52	13.74	14.37	15.16	16.34	17.52

ATTENTION!!

FOR LONG TERM STORAGE PURPOSES, THE OIL RESERVOIRS ON ALL EURODRIVE GEARBOXES PROVIDED ARE SHIPPED TO THE PROJECT SITE COMPLETELY FULL OF LUBRICANT. IT WILL BE REQUIRED THAT ALL OIL RESERVOIRS BE DRAINED DOWN TO THEIR DESIGNED OPERATING LEVELS AND BREATHERS INSTALLED BEFORE START-UP. FAILURE TO COMPLY MAY CAUSE OIL LEAKS AND POSSIBLY DAMAGE THE SHAFT SEALS.

SEE THE FOLLOWING INFORMATION SHEETS FOR THE LOCATION OF THE OIL LEVEL AND DRAIN PLUGS AND FOR THE LOCATION OF THE BREATHERS.

Gearmotors and Gear Reducers

OPERATING INSTRUCTIONS

01 805 52 US

GENERAL
These operating instructions are intended to help you install and operate the drive. For trouble free service, proper installation and operation are essential. Additionally, these instructions contain important recommendations on maintenance.

Before shipment, every SEW-Eurodrive gear unit is tested, checked and properly packed. However, please inspect the drive immediately upon arrival for shortage or transit damage. Note the damage or shortage on the freight bill of lading and file a claim with the carrier. Also, notify SEW-Eurodrive of the shortage or damage.

LUBRICANTS
All gearmotors and gear reducers are supplied with the correct grade and quantity of lubricating oil for the specified mounting position. Exceptions include reducers shipped without input assemblies. The recommended lubricants are found on page 2.

LONG TERM STORAGE
If the drive is not installed immediately, it should be stored in a dry, protected area. If the drive is to be stored for an extended period of time and was not ordered from SEW for long term storage, contact your nearest SEW assembly plant for information on Long Term Storage or request **Document #2115**.

Drives which are used for standby service should be stored as a sealed gearcase.

INSTALLATION OF COMPONENTS ON DRIVE SHAFTS
Do not hammer on the shafts. Hammering can cause brinelling of the reducer's bearings shortening the bearing life. We recommend heating the components to approximately 175°F (when possible) and sliding them on the shaft. This will reduce possible damage to the reducer's bearings. **Document #2116**.

For both standard and metric SEW shaft tolerances, refer to the SEW Catalog or request **Document #2154.**

Shaft couplings should be properly aligned to prevent vibration, coupling wear, and premature failure of the shaft bearings.

To prevent the output shaft and bearings from being subjected to excessive loads, the maximum overhung load, as shown in SEW-Eurodrive catalogs, should not be exceeded. Please consult our engineering department if the load may exceed the recommended figure given or where there are combined radial and axial loads. In such cases, the exact operating conditions must be stated including speed, direction of rotation, position, magnitude and direction of the external radial and axial loads being applied.

SHAFT MOUNTED REDUCERS
SEW-Eurodrive supplies the recommended hollowshaft mounting paste with every hollowshaft reducer. The mounting paste is to be applied on the keyed output shaft. The mounting paste is to aid in the prevention of rusting and fretting corrosion between the reducer hollowshaft and the shaft of the driven machine. The mounting paste will aid in shaft removal when necessary.

Warning! Always ensure exposed, rotating parts are properly covered to ensure safety.

For additional information on shaft mounted reducers, drive shaft configuration and tolerances, refer to the SEW-Eurodrive Catalog or request **Documents #2201 and #2202**.

INSTALLATION AND OPERATION
The drive installation site should be selected to ensure:

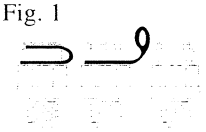
- Ambient temperatures below 40°C (104°F).
- Unimpeded flow of air to the motor and variable speed units.
- Accessibility to the drain, level and breather plugs.
- Adequate space for the removal of brakemotor fanguard for brake adjustment and maintenance.

The drive unit should be mounted on a flat, vibration damping, and torsionally rigid structure. Careful alignment is critical. Mounting to an uneven surface will cause housing distortion. The flatness tolerance of the supporting surface should not exceed:

- For gear units size 80 and smaller — 0.004 inch.
- For gear units above size 80 — 0.008 inch.

For transportation, the units are supplied with the breather plug already mounted. After the unit is installed, the black rubber seal located on the breather MUST BE REMOVED (Fig. 1). In addition, the oil level should be checked. Remove the plated (non-painted) oil level plug. The oil level is correct when the surface of the oil is level with the lowest point of that tapped hole, the exception is S37. Units W10, W20 and W30 are sealed in any position.

Fig. 1



After installation, the actual mounting position should be confirmed against the mounting postion shown on the gear reducer nameplate. Adequate lubrication is only guaranteed if the unit is mounted in the specific nameplated mounting position.

Refer to the SEW Catalog or request **Document #2111, #2112, #2113, or #2114 (R, F, K, or S, respectively)** if a specific mounting position diagram is needed.

MAINTENANCE
Warning! Always ensure equipment is secure and electrical power is off before removing or performing maintenance on the drive assembly. Oil levels and oil quality should be checked at regular intervals, determined by usage and the environment. Grease and oil should be changed per the recommendations on page 2. Check coupling alignment, chain or belt tension, and mounting bolt torque periodically. Keep the drive relatively free of dust and dirt.

For additional information, call the SEW FAXline, 1-800-601-6195, and request document number shown.

SEW EURODRIVE

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1295 Old Spartanburg Hwy, Lyman, SC 29365
(864) 439-7537 Fax: (864) 439-7830

SOUTHWEST ASSEMBLY CENTER
3950 Platinum Way, Dallas, TX 75237
(214) 330-4824 Fax: (214) 330-4724

MIDWEST ASSEMBLY CENTER
2001 West Main Street, Troy, OH 45373
(937) 335-0036 Fax: (937) 332-0038

EAST COAST ASSEMBLY CENTER
200 High Hill Road, Bridgeport, NJ 08014
(856) 467-2277 Fax: (856) 330-4724

WEST COAST ASSEMBLY CENTER
30599 San Antonio Road, Hayward, CA 94544
(510) 487-3560 Fax: (510) 487-6381

EURODRIVE RECOMMENDED LUBRICANT CHANGE INTERVALS:

Oil levels and oil quality should be check at frequent intervals, depending on usage. Oil changes are required at intervals of 10,000 operating hours or every two years, whichever comes first. If a synthetic oil lubricant is used, then this period can be extended to 20,000 operating hours or every four years, whichever comes first. In applications where hostile operating conditions exit, such as high humidity, corrosive environment, or large temperature changes, the lubricant should be changed at more frequent intervals.

Grease packed bearings should be cleaned and regreased every 10,000 hours or 20,000 hours for synthetic grease. Input (high speed) bearings should not be overgreased. They should be filled with grease not to exceed 1/3 of the bearing's free volume. For output bearings and bearings with replaceable grease shields, fill to 2/3 of their free volume.

ATTENTION:

When the recommended lubricant is not available, it is permissible to use a lubricant having equivalent characteristics but we do not recommend that lubricants of different brands be mixed. Under no circumstances should synthetic lubricants be mixed with one another or with one having a mineral base.

10 Design and Operating Notes

10.1 Lubricants

General information

Unless a special arrangement is made, SEW-EURODRIVE supplies the drives with a lubricant fill adapted for the specific gear unit and mounting position. The decisive factor is the mounting position (M1 – M6, → Sec. "Mounting positions and important order information" in the Gearmotor catalog) specified when ordering the drive. You must adapt the lubricant fill in case of any subsequent changes made to the mounting position (→ Lubricant fill quantities).

Lubricant table

The lubricant table on the following page shows the permitted lubricants for SEW-EURODRIVE gear units. Please refer to the following legend for the lubricant table.

Legend for the lubricant table

Abbreviations, meaning of shading and notes:

CLP	= Mineral oil
CLP PG	= Polyglycol (W gear units, NSF certified H1)
CLP HC	= Synthetic hydrocarbons
E	= Ester oil (water hazard class 1 (German regulation))
HCE	= Synthetic hydrocarbons + ester oil (NSF certified H1)
HLP	= Hydraulic oil
	= Synthetic lubricant (= synthetic-based anti-friction bearing grease)
	= Mineral lubricant (= mineral-based anti-friction bearing grease)
1)	Helical-worm gear units with PG oil: please contact SEW-EURODRIVE.
2)	Special lubricant for Spiroplan® gear units only
3)	SEW-$f_B \geq 1.2$ required
4)	Pay attention to critical starting behavior at low temperatures!
5)	Ambient temperature
	Lubricant for the food industry (food grade oil)
	Biodegradable oil (lubricant for agriculture, forestry, and fisheries)

Anti-friction bearing greases

The anti-friction bearings in gear units and motors are given a factory-fill with the greases listed below. SEW-EURODRIVE recommends regreasing anti-friction bearings with a grease fill at the same time as changing the oil or replacing the anti-friction bearings.

	Ambient temperature	Manufacturer	Type
Anti-friction bearing in gear unit	-10 °C ... +60°C	ExxonMobil	Mobilux EP2
	-40 °C ... +80 °C	ExxonMobil	Mobilith SHC 100
Anti-friction bearing in motor[1)2)]	-20 °C ... +80 °C	ExxonMobil	Polyrex EM
	+20 °C ... +100 °C	Klüber	Barrierta L55/2
	-40 °C ... +40 °C	ExxonMobil	Mobilith SHC 100[3)]
Special greases for anti-friction bearings in gear units:			
	-25 °C ... +80 °C	Shell	Shell Cassida Grease EPS 2
	-35 °C ... +60 °C	Klüber	Klübersynth UH1 14-151
	-15 °C ... +80 °C	Klüber	Klübersynth UH1 14-222
	-20 °C ... +40 °C	Klüber	Klüberbio M 32-82

1) The motor anti-friction bearings are covered on both sides and cannot be regreased.

2) Greases providing equivalent performance are acceptable

3) Recommended for continuous operation at ambient temperature below 0°C, example in a cold storage.

The following grease quantities are required:

- For high-rpm bearings (gear unit input end): Fill the cavities between the rolling elements one-third full with grease.
- For low-rpm bearings (in gear units and at gear unit output end): Fill the cavities between the rolling elements two-thirds full with grease.

Lubricant table

01 805 09 92US

	5)	DIN (ISO)	ISO,NLGI	ExxonMobil	Shell	Klüber	ARAL	bp	Tribol	TEXACO	Optimol	FUCHS	TOTAL
R...	°C -50 0 +50 +100	CLP(CC)	VG 220	Mobilgear 600XP 220	Shell Omala 220	Klüberoil GEM 1-220 N	Aral Degol BG 220	BP Energol GR-XP 220	Tribol 1100/220	Meropa 220	Optigear BM 220	Renolin CLP 220	Carter EP 220
	Standard -10 +40	CLP PG	VG 220	Mobil Glygoyle 30	Shell Tivela S 220	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP 220	Tribol 800/220	Synlube CLP 220	Optiflex A 220		Carter SY 220
	-25 +80		VG 220	Mobil SHC 630	Shell Omala HD 220	Klübersynth GEM 4-220 N	Aral Degol PAS 220		Tribol 1510/220	Pinnacle EP 220	Optigear Synthetic A 220	Renolin Unisyn CLP 220	
K...(HK...)	4) -40 +80	CLP HC	VG 150	Mobil SHC 629	Shell Omala HD 150	Klübersynth GEM 4-150 N				Pinnacle EP 150			Carter SH 150
	-20 +25	CLP (CC)	VG 150 VG 100	Mobilgear 600XP 100	Shell Omala 100	Klüberoil GEM 1-150 N	Aral Degol BG 100	BP Energol GR-XP 100	Tribol 1100/100	Meropa 150	Optigear BM 100	Renolin CLP 150	Carter EP 100
F..	-30 +10	HLP (HM)	VG 68-46 VG 32	Mobil D.T.E. 13M	Shell Tellus T 32	Klüberoil GEM 1-68 N	Aral Degol BG 46		Tribol 1100/68	Rando EP Ashless 46	Optigear 32	Renolin B 46 HVI	Equivis ZS 46
	4) -40 +10	CLP HC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32				Cetus PAO 46			Dacnis SH 32
	4) -40 -20	HLP (HM)	VG 22 VG 15	Mobil D.T.E. 11M	Shell Tellus T 15	Isoflex MT 30 ROT		BP Energol HLP-HM 15		Rando HDZ 15			Equivis ZS 15
	Standard 0 +40	CLP (CC)	VG 680	Mobilgear 600XP 680	Shell Omala 680	Klüberoil GEM 1-680 N	Aral Degol BG 680	BP Energol GR-XP 680	Tribol 1100/680	Meropa 680	Optigear BM 680	Renolin CLP 680	Carter EP 680
	-20 +60	CLP PG	VG 680 1)		Shell Tivela S 680	Klübersynth GH 6-680		BP Enersyn SG-XP 680	Tribol 800/680	Synlube CLP 680			
S...(HS...)	4) -30 +80	CLP HC	VG 460	Mobil SHC 634	Shell Omala HD 460	Klübersynth GEM 4-460 N				Pinnacle EP 460			
	4) -40 +10		VG 150	Mobil SHC 629	Shell Omala HD 150	Klübersynth GEM 4-150 N				Pinnacle EP 150			Carter SH 150
	-20 +10	CLP (CC)	VG 150 VG 100	Mobilgear 600XP 100	Shell Omala 100	Klüberoil GEM 1-150 N	Aral Degol BG 100	BP Energol GR-XP 100	Tribol 1100/100	Meropa 150	Optigear BM 100	Renolin CLP 150	Carter EP 100
	-25 +20	CLP PG	VG 220 1)	Mobil Glygoyle 30	Shell Tivela S 220	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP 220	Tribol 800/220	Synlube CLP 220	Optiflex A 220		Carter SY 220
	4) -40 0	CLP HC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32				Cetus PAO 46			Dacnis SH 32
R...,K...(HK...), F...,S...(HS...)	Standard -20 +40	CLP PG	VG 460 1)			Klübersynth UH1 6-460							
	-30 +40 4)	HCE	VG 460		Shell Cassida Fluid GL 460	Klüberoil 4UH1-460 N	Aral Eural Gear 460				Optileb GT 460		
	-20 +40	E	VG 460			Klüberbio CA2-460	Aral Degol BAB 460				Optisynt BS 460		
W...(HW...)	Standard -20 +40	SEW PG	VG 460 2)			Klüber SEW HT-460-5							
	-40 +10 4)	API GL5	SAE 75W90 (~VG 100)	Mobilube SHC 75W90-LS									
	-20 +40	CLP PG	VG 460 3)			Klübersynth UH1 6-460							

LUBRICANTS

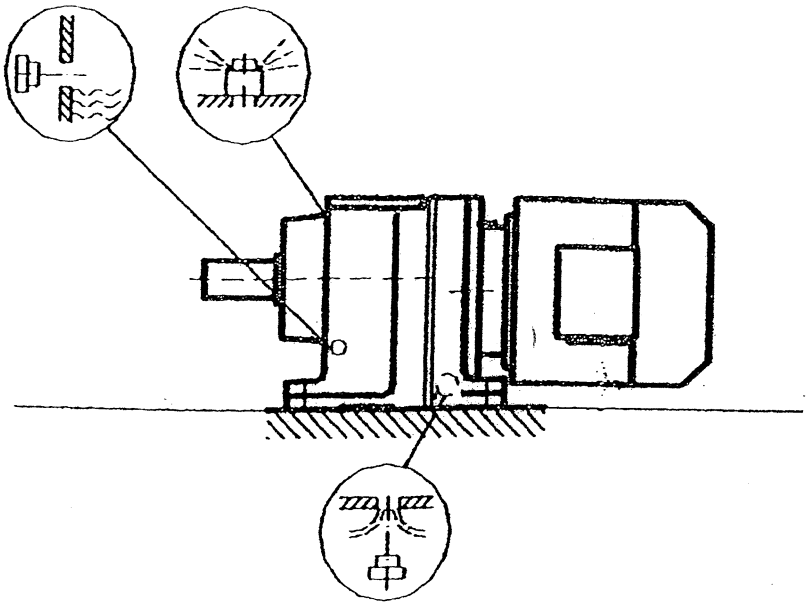
The approximate lubricant in US **gallons and liters** per mounting position is as follows:

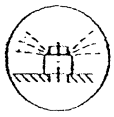
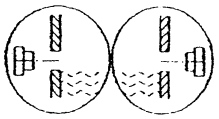
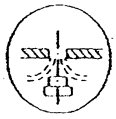
Gear Unit	Mounting Positions											
	M1 [1]		M2 [1]		M3		M4		M5		M6	
	Gallons	Liters	Gallons	Liters	Gallons	Liters	Gallons	Liters	Gallons	Liters	Gallons	Liters
RX57	0.16	0.60	0.21	0.80	0.34	1.30	0.34	1.30	0.24	0.90	0.24	0.90
RX67	0.21	0.80	0.21	0.80	0.45	1.70	0.50	1.90	0.29	1.10	0.29	1.10
RX77	0.29	1.10	0.40	1.50	0.69	2.60	0.71	2.70	0.42	1.60	0.42	1.60
RX87	0.45	1.70	0.66	2.50	1.25	4.80	1.25	4.80	0.77	2.90	0.77	2.90
RX97	0.55	2.10	0.90	3.40	1.95	7.4	1.85	7.0	1.25	4.80	1.25	4.80
RX107	1.05	3.90	1.50	5.6	3.05	11.6	3.15	11.9	2.05	7.7	2.05	7.7
RXF57	0.13	0.50	0.21	0.80	0.29	1.10	0.29	1.10	0.18	0.70	0.18	0.70
RXF67	0.18	0.70	0.21	0.80	0.40	1.50	0.37	1.40	0.26	1.00	0.26	1.00
RXF77	0.24	0.90	0.34	1.30	0.63	2.40	0.53	2.00	0.42	1.60	0.42	1.60
RXF87	0.42	1.60	0.51	1.95	1.30	4.90	1.05	3.95	0.77	2.90	0.77	2.90
RXF97	0.55	2.10	0.98	3.70	1.85	7.1	1.65	6.3	1.25	4.80	1.25	4.80
RXF107	0.82	3.10	1.50	5.7	2.95	11.2	2.45	9.3	1.90	7.2	1.90	7.2
R07	0.032	0.12	0.055	0.20	0.055	0.20	0.055	0.20	0.055	0.20	0.055	0.20
R17/R17F	0.065	0.25	0.15	0.55	.090	0.35	0.15	0.55	0.09	0.35	0.11	0.40
R27/R27F	0.065 (0.11)	0.25 (0.40)	0.18	0.70	0.13	0.50	0.18	0.70	0.13	0.50	0.13	0.50
R37/~~R37F~~	0.080	0.30	0.22	0.85	0.25	0.95	0.28	1.05	0.20	0.75	0.25	0.95
R47/R47F	0.18 (0.40)	0.70 (1.50)	0.42	1.60	0.40	1.50	0.44	1.65	0.40	1.50	0.40	1.50
R57/R57F	0.21 (0.45)	0.80 (1.70)	0.50	1.90	0.45	1.70	0.55	2.10	0.45	1.70	0.45	1.70
R67/R67F	0.29 (0.61)	1.10 (2.30)	0.69 (0.92)	2.60 (3.50)	0.74	2.80	0.84	3.20	0.48	1.80	0.53	2.00
R77/R77F	0.32 (0.79)	1.20 (3.00)	1.00 (1.10)	3.80 (4.10)	0.95	3.60	1.10	4.10	0.66	2.50	0.90	3.40
R87/R87F	0.61 (1.60)	2.30 (6.0)	1.75 (2.15)	6.7 (8.2)	1.90	7.2	2.05	7.7	1.65	6.3	1.70	6.5
R97	1.20 (2.60)	4.60 (9.8)	3.10 (3.70)	11.7 (14.0)	3.10	11.7	3.55	13.4	3.00	11.3	3.10	11.7
R107	1.60 (3.60)	6.0 (13.7)	4.30	16.3	4.45	16.9	5.1	19.2	3.50	13.2	4.20	15.9
R137	2.65 (6.6)	10.0 (25.0)	7.4	28.0	7.8	29.5	8.3	31.5	6.6	25.0	6.6	25.0
R147	4.05 (10.6)	15.4 (40.0)	12.3	46.5	12.7	48.0	13.7	52.0	10.4	39.5	10.8	41.0
R167	7.1 (18.5)	27.0 (70.0)	21.6	82.0	20.6	78.0	23.2	88.0	17.4	66.0	18.2	69.0
RF07	0.032	0.12	0.055	0.20	0.055	0.20	0.055	0.20	0.055	0.20	0.055	0.20
RF17	0.065	0.25	0.15	0.55	.090	0.35	0.15	0.55	0.09	0.35	0.11	0.40
RF27	0.065 (0.11)	0.25 (0.40)	0.18	0.70	0.13	0.50	0.18	0.70	0.13	0.50	0.13	0.50
RF37	0.090 (0.25)	0.35 (0.95)	0.24	0.90	0.25	0.95	0.28	1.05	0.20	0.75	0.25	0.95
RF47	0.17 (0.40)	0.65 (1.50)	0.42	1.60	0.40	1.50	0.44	1.65	0.40	1.50	0.40	1.50
RF/RM57	0.21 (0.45)	0.80 (1.70)	0.48	1.80	0.45	1.70	0.53	2.00	0.45	1.70	0.45	1.70
RF/RM67	0.32 (0.66)	1.20 (2.50)	0.71 (0.95)	2.70 (3.60)	0.71	2.70	0.69	2.60	0.50	1.90	0.55	2.10
RF/RM77	0.32 (0.69)	1.20 (2.60)	1.00 (1.10)	3.80 (4.10)	0.87	3.30	1.10	4.10	0.63	2.40	0.79	3.00
RF/RM87	0.63 (1.60)	2.40 (6.0)	1.80 (2.10)	6.8 (7.9)	1.85	7.1	1.85	7.0	1.65	6.3	1.70	6.4
RF/RM97	1.35 (2.70)	5.1 (10.2)	3.15 (3.70)	11.9 (14.0)	2.95	11.2	3.70	14.0	2.95	11.2	3.10	11.8
RF/RM107	1.65 (3.95)	6.3 (14.9)	4.20	15.9	4.50	17.0	5.1	19.2	3.45	13.1	4.20	15.9
RF/RM137	2.50 (6.6)	9.5 (25.0)	7.1	27.0	7.7	29.0	8.6	32.5	6.6	25.0	6.6	25.0
RF/RM147	4.35 (11.1)	16.4 (42.0)	12.4	47.0	12.7	48.0	13.7	52.0	11.1	42.0	11.1	42.0
RF/RM167	6.9 (18.5)	26.0 (70.0)	21.6	82.0	20.6	78.0	23.2	88.0	17.2	65.0	18.7	71.0

[1] Standard level (increased oil level) - The larger gear unit of a multi-stage unit must be filled with the larger oil volume.

For additional information on R-Series mounting positions, refer to the SEW Catalog or call the SEW FAXline, 1-800-601-6195, and request Document #2111.

MI MOUNTING POSITION



Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

NOTE:

Breather Valve, Oil Level Plug & Oil Drain Plug not provided on R17 & R27 units for the MI Mounting Position.

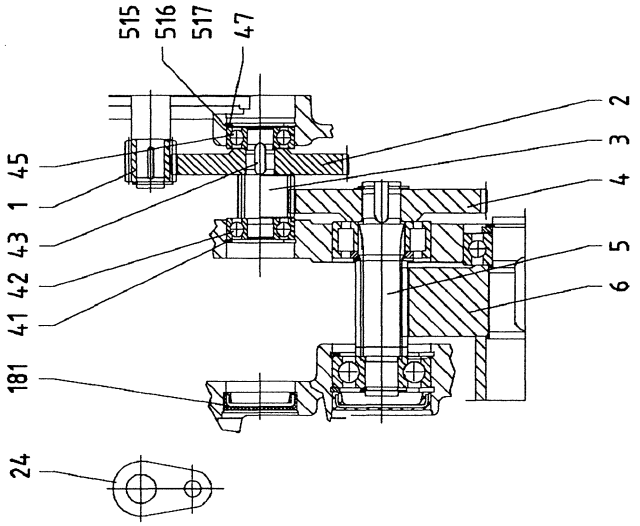
Parts List

Helical gear unit
R37

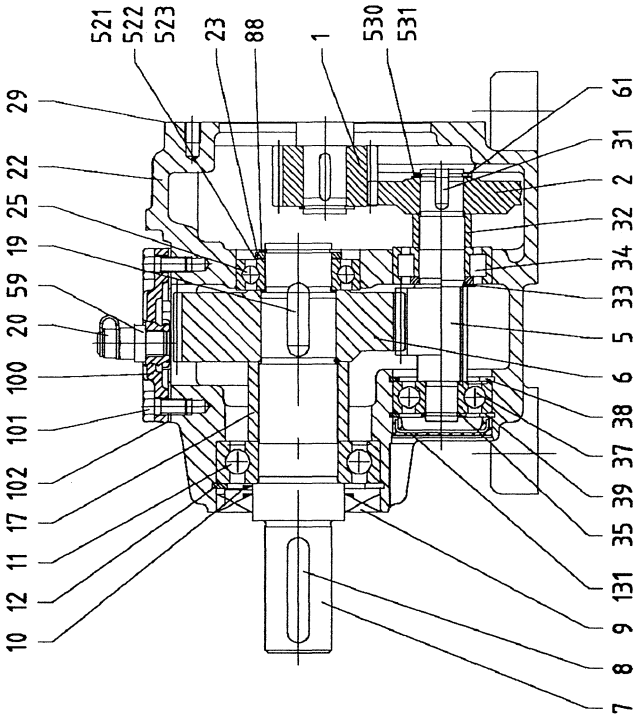
01 263 08 97

EN Page 1 / 3
EG 23.09.2010

3-stage



2-stage



Mount-on gear units have motors, variable speed gear units or special input shaft assemblies mounted on the drive end. For parts see appropriate parts list.
When ordering spare parts always quote nameplate data with serial number and designation with part number!

No.	Description	Additional specifications	SEW standard label	Part No.	Qty.
1	Pinion			*	1
2	Gear			*	1
3	Pinion shaft			*	1
4	Gear			*	1
5	Pinion shaft			*	1
6	Gear			*	1
7	Output shaft		Ø 25x50 mm	06413889	1
7	Output shaft	stainless; ASEPTICplus	Ø 25x50 mm	00452521	1
7	Output Shaft (inch)		Ø 1,000x1,97 in.	06413897	1
8	Key		DIN6885 A8x7x40-C45K	00100226	1
8	Key	stainless; ASEPTICplus	DIN6885 A8x7x40-Niro	13228188	1
8	Key (inch)		W4190 1/4x1/4x1-5/16 IN.	08069212	1
9	Oil seal		W4560 BA-SF35x62x8/6-NBR	00177598	1
9	Oil seal	optional oil seal in FKM (Viton); ATEX model according to category II2G, II2D, II3G, II3D; ASEPTICplus	W4561 BA-SF35x62x8/6-FKM	00176125	1
10	Oil seal	Double sealing; ATEX model according to category II2G, II2D, II3G, II3D; ASEPTICplus	W4562 B1-SF 35x57x6/8-FKM	00174335	1
11	Deep groove ball bearing		DIN625 6206-Z-J	00104965	1
12	Circlip		DIN472 62x2	00103217	1
17	Spacer tube		Ø30xØ38x32 mm	06413927	1
19	Key		DIN6885 B8x7x20-55HRC	00115991	1
20	Breather valve		W4087 M10x1-MS	00130303	1
20	Breather valve	stainless; ASEPTICplus	W4087 M10x1-NIRO	00136239	1
22	Gear Housing			06413366	1
23	Supporting disc		DIN988 S25x33x2-FST	00124036	1
24	Eyebolt			01675966	1
25	Deep groove ball bearing		DIN625 6005-J	00117374	1
29	Sealing compound			09102558	X)
31	Key		DIN6885 B5x5x10-55HRC	00114839	1
32	Spacer tube		Ø17xØ22x12,5 mm	06413935	1
33	Circlip	For i 7,97 to 134,82	DIN471 17x1	00102695	1
34	Cylindrical roller bearing		F55418501.01 NUPT INA	13241265	1
35	Circlip		DIN471 12x1	00102652	1
37	Deep groove ball bearing		DIN625 6301-J	00105058	1
37	Deep groove ball bearing	Only for mounting positions M2, MX	DIN625 6301-Z-J	13295128	1
38	Circlip		DIN472 37x1,5	00103152	1
39	Circlip		DIN472 37x1,5	00103152	1
41	Circlip		DIN472 26x1,2	00130087	1
42	Deep groove ball bearing		DIN625 6000-J	00104744	1
43	Key		DIN6885 B4x4x8-55HRC	00134899	1
45	Deep groove ball bearing		DIN625 6000-J	00104744	1
47	Circlip		DIN472 26x1,2	00130087	1
59	Screw plug		W4085 M10x1-ST-A2L	0011426X	5
61	Circlip	2-stage	DIN471 16x1	00102687	1
61	Circlip	3-stage	DIN471 14x1	00102660	1
88	Circlip		DIN471 25x1,2	00102741	1
100	Gearcase cover			06413951	1
101	Hex head screw		ISO4017 M6x12-8.8	00110221	6
102	Gasket			0641396X	1
131	Closing cap		W4300 37x7	00124966	1
181	Closing cap		W4300 28x7	00106887	1

* Gearing parts have embossed part numbers. These must always be quoted!
X) if required
Mount-on gear units have motors, variable speed gear units or special input shaft assemblies mounted on the drive end. For parts see appropriate parts list.
When ordering spare parts always quote nameplate data with serial number and designation with part number!

No.	Description	Additional specifications	SEW standard label	Part No.	Qty.
515	Shim		DIN988 19x26x0,1-ST	00113301	X)
516	Shim		DIN988 19x26x0,3-ST	00113433	X)
517	Shim		DIN988 19x26x0,5-ST	00104140	X)
521	Shim		DIN988 25x35x0,1-ST	00103691	X)
522	Shim		DIN988 25x35x0,3-ST	00103934	X)
523	Shim		DIN988 25x35x0,5-ST	00104167	X)
530	Shim	2-stage	DIN988 16x22x0,1-ST	00123439	X)
531	Shim	2-stage	DIN988 16x22x0,3-ST	00123447	X)

X) if required
Mount-on gear units have motors, variable speed gear units or special input shaft assemblies mounted on the drive end. For parts see appropriate parts list.
When ordering spare parts always quote nameplate data with serial number and designation with part number!

Motors [redacted]

[redacted]

OPERATING INSTRUCTIONS

09 793 77 US

General

Every SEW-Eurodrive motor is thoroughly tested, checked, and properly packed prior to shipment. However, please check immediately upon arrival for shortage of parts or transit damage. Note the damage or shortage on the freight bill of lading and file a claim with the carrier. Also, notify SEW-Eurodrive of the shortage or damage.

Typical Installation

For motors mounted integrally to a gear unit, please refer to the Operating Instructions for Gearmotors and Gear Reducers for proper installation of the drive. The drive installation site should be selected to ensure:

- Ambient temperatures between 0-40°C (32-104°F).
- Unimpeded flow of air to the motor and variable speed units.
- Accessibility to gear unit, oil plugs.
- Adequate space for the removal of the brakemotor fanguard for brake adjustment and maintenance.

The drive unit should be mounted on a flat, vibration damping, and torsionally rigid structure. The flatness tolerance of the supporting surface should not exceed:

For motor size 180 and smaller — 0.004 inch
For motor size above 180 — 0.008 inch

Do not hammer on the shafts to install couplings, sheaves, etc. Hammering can cause brinelling of the bearings and a reduction in bearing life. We recommend heating the components to approximately 175°F and sliding them on. This will reduce possible damage to the bearings. In addition, there is a metric tapped hole in the center of the motor shaft that can be utilized with a tool to press on or remove the coupling, sheaves, etc.

The motor shaft diameters are metric and have tolerances as listed in the SEW-Eurodrive catalogs. Shaft couplings should be properly aligned to prevent vibration, coupling wear and premature failure of the shaft bearings.

Maximum Parallel Offset — 0.003 inch
Maximum Angular Offset — 0.030°

To prevent the output shaft and bearings from being subjected to excessive loads, the maximum overhung loads, as shown in SEW-Eurodrive catalogs, should not be exceeded. Please consult our engineering department if the load may exceed the recommended figure given or where there are combined radial and axial loads. In such cases, the exact operating conditions must be stated including speed, direction of rotation, position, magnitude and direction of the external radial and axial loads being applied.

Long Term Storage

If the motor must be stored for a long period of time without operating, the motor must be stored in a dry, protected area, and in the mounting position indicated on the unit nameplate. In order to ensure that the motor has not been damaged by moisture after a prolonged storage, the insulation resistance should be checked. An insulation tester with a measurement voltage of at least 500V (e.g. magneto generator) should be used for this purpose. The insulation resistance is sufficient if it has an ohmic value of at least 1000 x V_N (e.g. at V_N = 230VAC: $R_{insul} \geq 230000$ ohms = 0.23M ohms). If the measured value is smaller, the motor should be dried before use (for example, with hot air up to a maximum of 90°C or by resistance heating with an auxiliary AC voltage of 10% of V_N via an isolating transformer). Care should be taken to ensure that the motor is heated with not more than 20% of its rated current and that the rise in temperature is not more than 90°C. The drying procedure can be stopped when the insulation resistance has reached 500000 = 0.5M ohms.

Severe Duty Units

Severe Duty Units are indicated with the letters "-KS" at the end of the motor type on the motor nameplate. Severe Duty units include drain holes in the motor end bells and conduit box at the lowest points allowing condensation to drain out of the motor.

CAUTION!

The drain holes are installed for the mounting position listed on the gearbox nameplate. Installing a unit in a mounting position other than what is shown on the nameplate will reposition the condensation drain holes. As a result, the drain holes may not be located at the lowest point and may not allow water to drain. This can cause premature drive failure.

Electrical Connection

The motor must be installed and connected by a qualified electrician who is knowledgeable with the NEC article 430 and local regulations. He must make sure that the voltage and frequency of the electrical supply correspond with the data stamped on the motor nameplate before connecting the motor in accordance with the wiring diagram, which can be found in the terminal box. For brake connections, see the following pages.

At installation the electrician must make sure that the terminal block jumpers are positioned correctly and that all electrical connections including the ground connection are secure. In order to effectively protect the motor from overloads, appropriate motor protection must be provided. Fuses do not always provide adequate motor protection. For motors which are required to operate with a very high start-stop frequency, the overload heater type motor protection is insufficient. It is advisable in such applications to provide the motor with temperature sensors (thermistors) in the windings. Monitor the thermistors by means of an external trip device. In this way, the motor will be fully protected against practically all possible overloads.

When using motors outdoors or in washdown applications the cable entries into the terminal box must be directed downward to prevent water from entering the conduit box. The unused cable entries must be closed off properly.

Lubrication and Maintenance

WARNING! **Always ensure equipment is secure and electrical power is off before removing or performing maintenance on the drive assembly.** The motor bearings are sealed and the grease content is adequate for the life of the bearing.

SEW EURODRIVE

SOUTHEAST MANUFACTURING & ASSEMBLY CENTER
1295 Spartanburg Highway/Lyman SC 29365
(864) 439-7537 Fax: (864) 439-7830

SOUTHWEST ASSEMBLY CENTER
3950 Platinum Way/Dallas TX 75237
(214) 330-4824 Fax: (214) 330-4724

MIDWEST ASSEMBLY CENTER
2001 West Main Street/Troy OH 45373
(937) 335-0036 Fax: (937) 332-0038

EAST COAST ASSEMBLY CENTER
200 High Hill Road/Bridgeport NJ 08014
(856) 467-2277 Fax: (856) 845-3179

WEST COAST ASSEMBLY CENTER
30599 San Antonio Road/Hayward CA 94544
(510) 487-3560 Fax: (510) 487-6381

Troubleshooting Chart

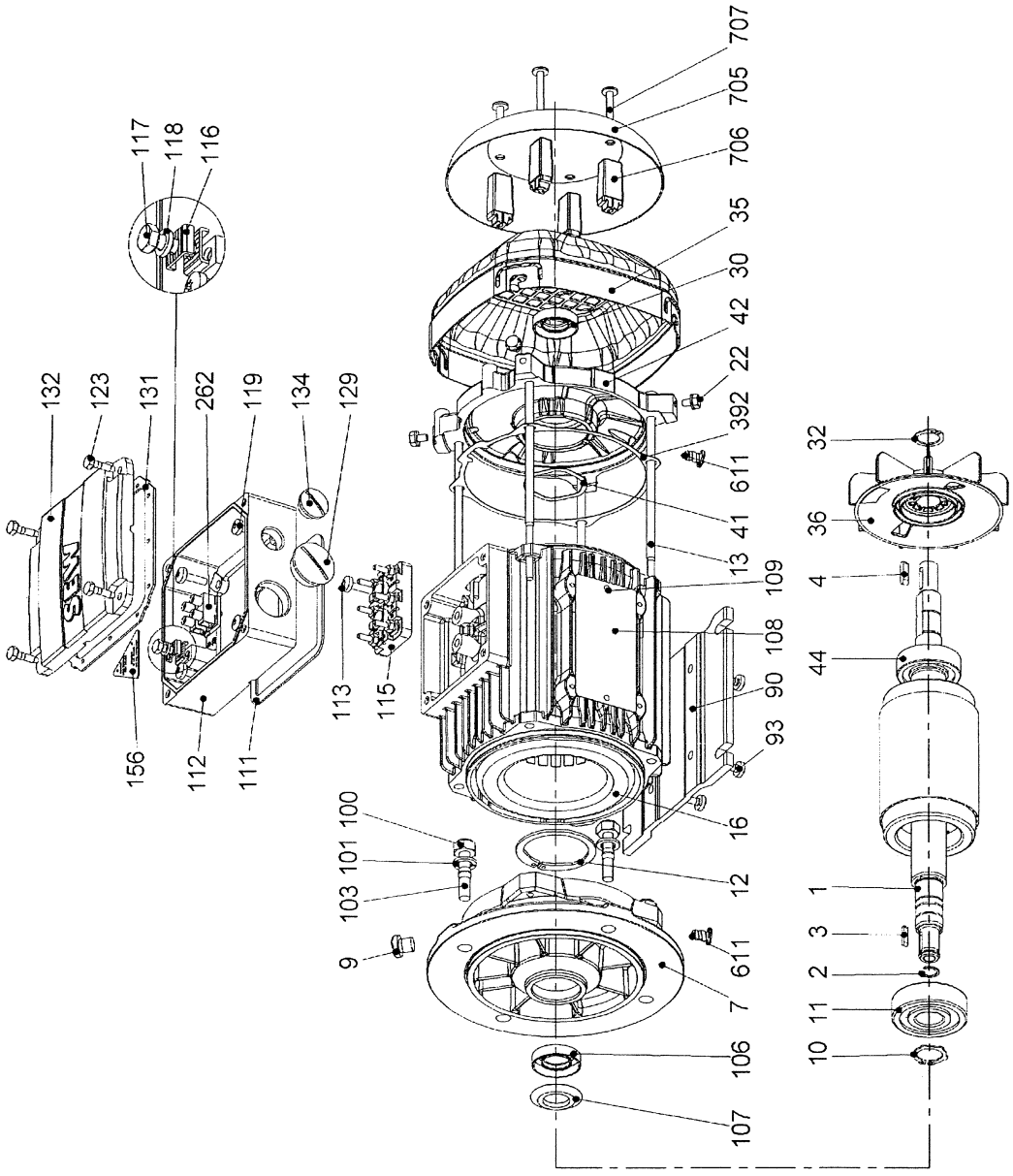
PROBLEM	CAUSE	REMEDY
Motor Overheats (Check temperature with instrumentation)	Motor not connected for proper supply voltage	Check connection diagram on conduit box cover and correct the wiring.
	Supply voltage varies outside the allowable tolerance causing an undervoltage or overvoltage condition.	Assure correct supply voltage.
	Insufficient cooling air volume due to: a.Low frequency operation on variable frequency drive. b.Obstructed air flow.	Increase air flow: a.Continuous running auxiliary fan. b.Ensure unobstructed air flow.
	Ambient temperature is too high.	Ensure cool air gets to the motor. Ducting may be required.
	Overload at rated voltage. Unit will draw current in excess of nameplate rating and run below rated speed.	Select a larger unit.
	Motor's allowable duty cycle is exceeded (too many starts per hour required).	The problem may or may not be solved with a larger motor. Contact SEW-Eurodrive.
	Single phasing due to break or loose connection in supply line or blown fuse.	Repair supply lines. Replace fuses.
Motor does not run.	Blown fuse.	Determine and correct cause of failure and replace fuse.
	Motor protection device activated.	Reset protective device. Identify and correct cause for device activation.
	Motor protection device faulty or will not reset.	Check protection device for faults.
Motor will not start or starts sluggishly.	Motor not connnected for proper voltage.	Check connection diagram in conduit box cover and correct the wiring.
	Large voltage and/or frequency fluctuation at starting.	Ensure stable power supply.
For reduced voltage starting, motor will not start in Star Connection but will start in Delta connection.	Insufficient torque in Star Connection.	Start motor directly in Delta Connection if possible. Otherwise use a larger motor.
	Faulty contact in Star/Delta starter.	Correct fault condition.
Motor hums and draws high current.	Faulty or defective winding.	Have motor repaired by qualified service shop.
	Rotor dragging.	
Fuses blow or motor overcurrent protection trips immediately.	Short circuit in power supply conductors or in the motor.	Correct the fault condition.
	Motor has ground fault or winding to winding short circuit.	Have motor repaired by qualified service shop.
	Motor improperly connected.	Check connection diagram in conduit box cover and correct the wiring.
Motor runs in wrong direction.	Motor supply leads misconnected.	Switch two supply leads.

Note: If, after proceeding through the Troubleshooting Chart, the motor is found to be defective, contact your nearest SEW-Eurodrive Assembly Center for warranty assistance or replacement parts.

Parts List

08 114 05 05

AC motor
DR.71S+M/FG/FM/2W/C/AL/LN/Z
Gear unit version



a) not necessary with W20/W30/R07/R17
b) not necessary with W20/W30
When ordering spare parts always quote nameplate data with serial number and designation with part number!

No.	Description	Additional specifications	SEW standard label	Part No.	Qty.
1	Rotor	pinion shaft end 10	DR71S4	13720457	1
1	Rotor	pinion shaft end 10	DR71M4	13720546	1
1	Rotor	pinion shaft end 12	DR71M4	13720562	1
1	Rotor	pinion shaft end 10; 2W 11x23	DR71S4	13720465	1
1	Rotor	pinion shaft end 10; 2W 11x23	DR71M4	13720554	1
1	Rotor	pinion shaft end 12; 2W 11x23	DR71M4	13720570	1
2	Snap ring	for pinion shaft end 10 b)	W4173 SW10x1-FSt	00115193	1
2	Snap ring	for pinion shaft end 12 b)	W4173 SW11x1-FSt	00115207	1
3	Key	for pinion shaft end 10	DIN6885-1 A2x2x12 +C	00100005	1
3	Key	for pinion shaft end 12	DIN6885-1 A3x3x14 +C	00100692	1
4	Key	2W	DIN6885-1 A4x4x16 +C	00135232	1
7	Flange	AL; a)	FG100 D120	01844768	1
7	Flange	GG; a)	FG100 D120	13613014	1
7	Flange	AL; a)	FG130 D160	01844784	1
7	Flange	GG; a)	FG130 D160	13613030	1
7	Flange	a)	FG165 D200	13615106	1
7	Flange	a)	FG215 D250	13612662	1
7	Flange	a)	FG265 D300	13615122	1
9	Screw plug	for flange FG100, FG130 a)	W4085 M10x1-St-ADC3K	0011426X	1
9	Screw plug	for flange FG165, FG215 a)	W4085 M12x1,5-St-ADC3K	00114308	1
9	Screw plug	for flange FG265 a)	W4085 M22x1,5-St-ADC3K	00114316	1
10	Circlip	a)	DIN983 17x1	0011460X	1
11	Deep groove ball bearing	a)	DIN625 6303-2Z-J-C3-K08	13236563	1
12	Circlip	a)	DIN472 47x1,75	00103187	1
13	Machine screw	DR71S	W4018 M5x131-6.8-ADB3	13237160	4
13	Machine screw	DR71M	W4018 M5x156-6.8-ADB3	13237179	4
16	Stator			*	1
22	Hex head screw		EN1665 M5x10-8.8-A2F	13237616	4
30	Oil seal	with Item no. 998	W BAOFSF16x28x6/7-NBR	13262041	1
30	Oil seal	with Item no. 998; for 2-pole version	W BAOFSF16x28x6/7-FKM	13262351	1
32	Circlip		DIN471 15x1	00102679	1
35	Fan Guard			13610503	1
35	Fan Guard	2W		13614487	1
35	Fan Guard	LN		13611690	1
36	Fan		D=101	13611550	1
36	Aluminum fan	AL	D=112	13611968	1
36	High Inert.Flywheel	Z	J=0,00213 kgm²	13611593	1
41	Equalizing ring		W4253 33x39,1x0,5	00115894	1
42	B bearing end shield	AL		13626132	1
42	B bearing end shield	GG, only for Production in Brazil		13611615	1
44	Deep groove ball bearing		DIN625 6203-2Z-J-C3-K08	13236601	1
90	Bed plate	DR71S FM	H=71; AxB=112x90	13610341	1
90	Bed plate	DR71M FM	H=71; AxB=112x90	13618024	1
90	Bed plate	DR71M FM80M	H=80; AxB=125x100	13610376	1
93	Pan head screw	FM	W4046 M5x14-TX-ADB3-GM1	13237144	4
100	Hexagon nut	for flange FG100 a)	ISO4032 M6-8-St-A2F	00101982	4
100	Hexagon nut	for flange FG130 a)	ISO4032 M8-8-St-A2F	00101990	4
100	Hexagon nut	for flange FG165 a)	ISO4032 M10-8-St-A2F	00102008	4
100	Hexagon nut	for flange FG215, FG265 a)	ISO4032 M12-8-St-A2F	00102016	4
101	Disc	only for flange FG100 AL; a)	ISO7090 6-200HV-A2F	00129089	4
101	Disc	only for flange FG130 AL; a)	ISO7090 8-200HV-A2F	00129127	4
103	Stud	for flange FG100 a)	DIN939 M6x18-8.8-A2F	00134074	4
103	Stud	for flange FG100 gear unit size 27, W37	W4061 M6x16-8.8-A2F	00131687	4
103	Stud	for flange FG130 a)	DIN939 M8x20-8.8-A2F	00100749	4

* order-dependently
a) not necessary with W20/W30/R07/R17
b) not necessary with W20/W30
When ordering spare parts always quote nameplate data with serial number and designation with part number!

No.	Description	Additional specifications	SEW standard label	Part No.	Qty.
103	Stud	for flange FG130 gear unit size W47	DIN835 M8x20-8.8-A2F-MV	13262572	4
103	Stud	for flange FG165 a)	DIN939 M10x22-8.8-A2F	00118451	4
103	Stud	for flange FG215, FG265 a)	DIN939 M12x30-8.8-A2F	00100811	4
106	Oil seal	a)	W A17x30x7-NBR	00106062	1
106	Oil seal	a) for 2-pole version	W A17x30x7-FKM-FKO	13225820	1
107	Oel finger	a)	W4291 17-ST-A2F	00116602	1
108	Nameplate			*	1
109	Grooved Pin		ISO8746 2x4-A-Niro	00107646	2
111	Gasket for lower part			01355635	1
112	Terminal box lower part		1x M25x1,5 ; 1x M16x1,5	13610570	1
112	Terminal box lower part		2x NPT 1/2"-14	13612018	1
113	Pan head screw	parts included in stator complete	W4046 M5x16-TX-A2F-GM1	00130591	1
115	Terminal block with Stocko	parts included in stator complete	W4723 KTM4-4.08	13226193	1
116	Terminal clip		DIN46282 C10-MS-VN	00104426	2
117	Hex head screw		W4044 M5x16-A2F-GM1	13237136	1
118	Lock washer		W4146 5-A2F	00118206	1
119	Pan head screw		W4046 M5x16-TX-SZ-A2F-GM1	00130591	4
123	Hex head screw		W4044 M5x16-A2F-GM1	13237136	4
129	Screw plug		W4411 M25x1.5-FS-gy-NBR-	00131385	1
129	Screw plug	for NPT thread 1/2"	W4411 M20x1.5-FS-ye-NBR-	13256300	2
131	Gasket for cover			01355627	1
132	Terminal Box Cover			13611763	1
134	Screw plug		W4411 M16x1.5-FS-gy-NBR-	00131334	1
156	Reference Plate	for TF version	W4499 - TF	01366815	1
262	Terminal clip	2 pole		01823183	1
392	Gasket			13740369	1
611	Closing Piece	DH		13618865	*
705	Protection canopy	C		13611623	1
706	Distance support	C		13618598	4
707	Pan head screw	C	W4036 REMFORM 6,0x35-TX-VZ	13262599	4
998	Synthetic grease	for Item no. 30		04963458	X)

* order-dependently
X) if required
a) not necessary with W20/W30/R07/R17
b) not necessary with W20/W30
When ordering spare parts always quote nameplate data with serial number and designation with part number!

14 AC Brakemotors – Technical Data

14.1 Key to the data tables

The following table lists the short symbols used in the "Technical Data DR AC Brakemotors" tables.

P_N	Rated power
T_N	Rated torque
n_N	Rated speed
I_N	Rated current
cosφ	Power factor
$\eta_{100\%}$	Efficiency at 100% of the rated power
I_A/I_N	Starting current ratio
T_A/T_N	Starting torque ratio
T_H/T_N	Ramp-up torque ratio
Code Letter	NEMA code letter
J_{Mot}	Mass moment of inertia of the motor
~~J_{Mot_BE}~~	~~Mass moment of inertia of the brakemotor~~
~~BE..~~	~~Standard brake size~~
~~Z_0 BG~~	~~Switching frequency for operation with BG brake controller~~
~~Z_0 BGE~~	~~Switching frequency for operation with BGE brake controller~~
~~T_B~~	~~Standard brake torque~~
m	Mass of the motor
~~m_{BE}~~	~~Mass of the brakemotor~~

14.4 Technical data of 4-pole high efficiency motors

1800 rpm - S1

Motor type	P_N T_N [HP] [lb-in]	n_N [rpm]	I_N 230V [A]	I_N 460V [A]	I_N 575V [A]	cosφ	$\eta_{100\%}$ [%][1]	I_A/I_N	T_A/T_N T_H/T_N	Code Letter	J_{Mot} [10^{-3} lb-ft^2]	m [lb][2]
DRS71S4[3]	0.25 8.93	1700	0.9	0.45	0.36	0.69	72.0	4.2	1.9 1.9	G	11.6	17.2
~~DRS71S4[3]~~	~~0.33 12.3~~	~~1700~~	~~1.24~~	~~0.62~~	~~0.49~~	~~0.69~~	~~72.0~~	~~4.2~~	~~1.9 1.9~~	~~G~~	~~11.6~~	~~17.2~~
DRS71S4[3]	0.5 18.5	1700	1.84	0.92	0.74	0.69	72.0	4.2	1.9 1.9	G	11.6	17.2
~~DRS71M4[3]~~	~~0.75 27.4~~	~~1690~~	~~2.5~~	~~1.25~~	~~1.0~~	~~0.71~~	~~74.0~~	~~4.3~~	~~2.2 2.1~~	~~G~~	~~16.8~~	~~20.1~~
DRE80M4	1 36.2	1740	2.9	1.44	1.15	0.78	82.5	7.1	3 2.1	K	51	31.5
DRE90M4	1.5 53.1	1740	4.5	2.25	1.8	0.73	84.0	7.7	3.6 2.9	L	84.3	40.6
DRE90L4	2 72.5	1740	5.7	2.85	2.3	0.77	85.5	7.5	3.4 3.0	K	103	47.4
DRE100L4	3 107	1735	8.0	4.0	3.2	0.79	87.5	8.1	4 3.3	K	161	63.9
DRE100LC4	5 177	1750	12.9	6.5	5.2	0.83	87.5	7.6	2.5 2.3	J	213	68.4
DRE132S4	5.4 190	1765	13.8	6.9	5.5	0.81	88.5	8.7	2.9 2.5	K	451	102
DRE132M4	7.5 265	1755	18	9	7.2	0.85	89.5	8.1	2.5 1.6	J	605	132
DRE132MC4	10 358	1770	24.5	12.3	9.8	0.82	89.5	8.7	2.1 1.6	K	807	138
DRE160M4	12.5 438	1770	31	15.4	12.3	0.82	91.0	8	3 2.2	J	1068	196
DRE160MC4	15 522	1780	36.5	18.3	14.6	0.82	91.7	8.2	2.9 2	J	1401	207
DRE180M4	20 716	1775	47.5	24	19	0.86	91.7	7.4	2.6 1.9	H	2636	304
DRE180L4	25 885	1775	60	30	24	0.84	93.0	8.1	2.9 2.2	J	3087	335
DRE180LC4	30 1044	1780	71	35.5	28.5	0.84	93.0	7.6	2.4 1.8	J	3990	355
DRE200L4	40 1424	1780	99	49.5	39.5	0.82	93.0	7.4	2.6 2.1	J	5605	573
DRE225S4	50 1761	1775	119	59	47.5	0.84	93.0	7.2	2.7 2.0	H	6958	650
DRE225M4	60 2124	1780	142	71	57	0.85	93.6	7.3	2.8 1.9	H	8146	694

1) Efficiency levels according to IEC 60034-2-1 Ed. 1 (2007) / PLL from Residual Losses, NEMA MG1 and/or DoE

2) Applies for foot-mounted motor (DRS and DRE.../FL..)

3) Standard efficiency motor

US DoE CC056A applies to DRE, DRP and DVE motors

2 Important notes

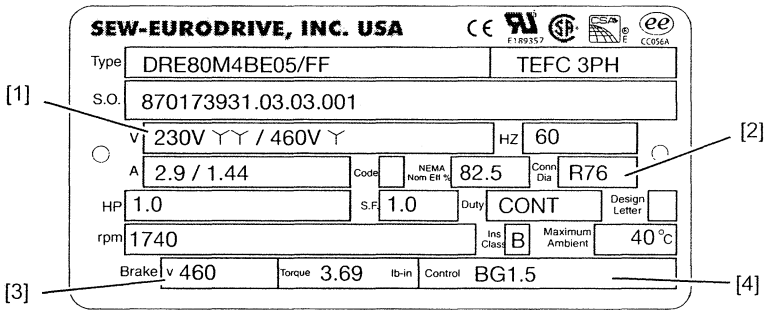
2.1 Safety notes

Refer to the Operating Instructions for safety and installation information. The latest version can be found at www.seweurodrive.com.

Installation, startup and service work may only be performed by trained personnel observing applicable accident prevention regulations and operating instructions.

2.2 Motor nameplate

Refer to the motor nameplate for information that describes the motor data. Some of the important fields related to the connection are listed below.



[1] Motor Voltage - Lists the motor voltage and configuration. Example: 230V ⋎⋎ / 460V ⋎.

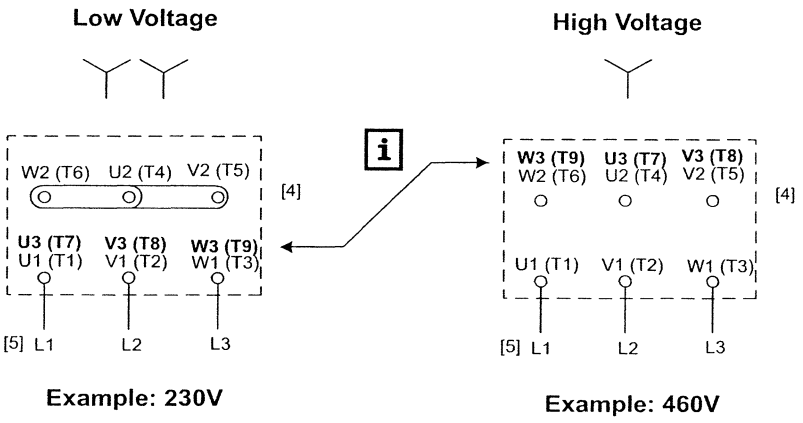
[2] Connection Type - Lists the basic type of connection indicating the type of internal motor windings, ⋎⋎, ⋎, △, etc. Example: R76. This value may also be followed by a series of letters and/or numbers.

[3] Brake Voltage - Lists the brake voltage required to operate the brake. Example: 460V.

[4] Brake Control - Lists the brake control type. Example: BG, BGE, BSR, etc. These maybe followed by additional characters.

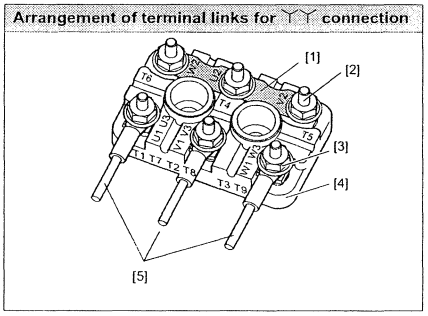
3 R76

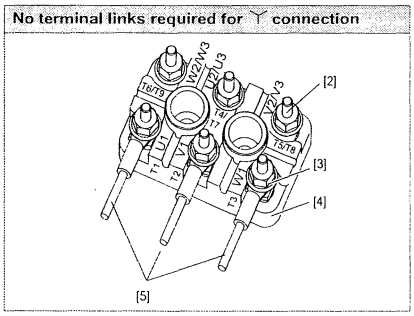
Connection Type R76
Single Speed, Dual Voltage
Example: 230V ⋎⋎ / 460V ⋎



Example: 230V

Example: 460V





[1] Terminal link
[2] Terminal stud
[3] Flange nut
[4] Terminal board
[5] Voltage supply (Customer connection)

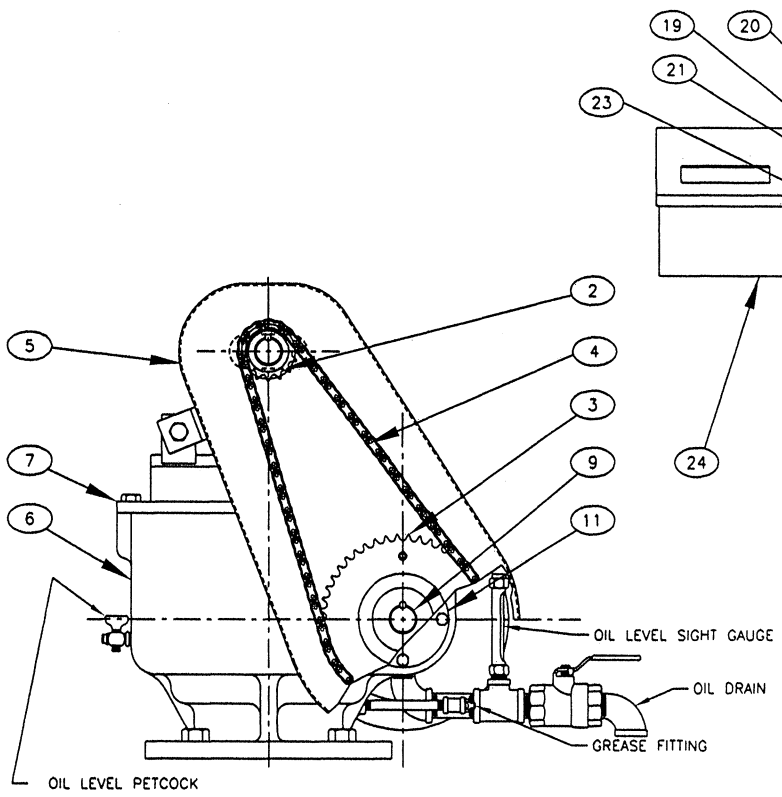
VOLTAGE CHANGE

Three wires must be relocated and terminal links added to change from high to low voltage.

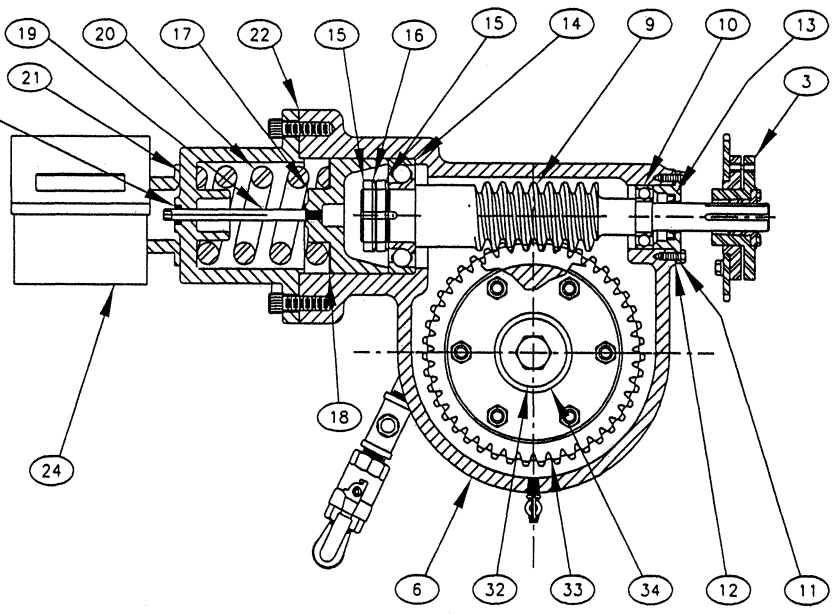
The wires designated U3 (T7), V3 (T8) and W3 (T9) must be reconnected and terminal links added as shown in the diagram.

Changing from low to high voltage is carried out in reverse order.

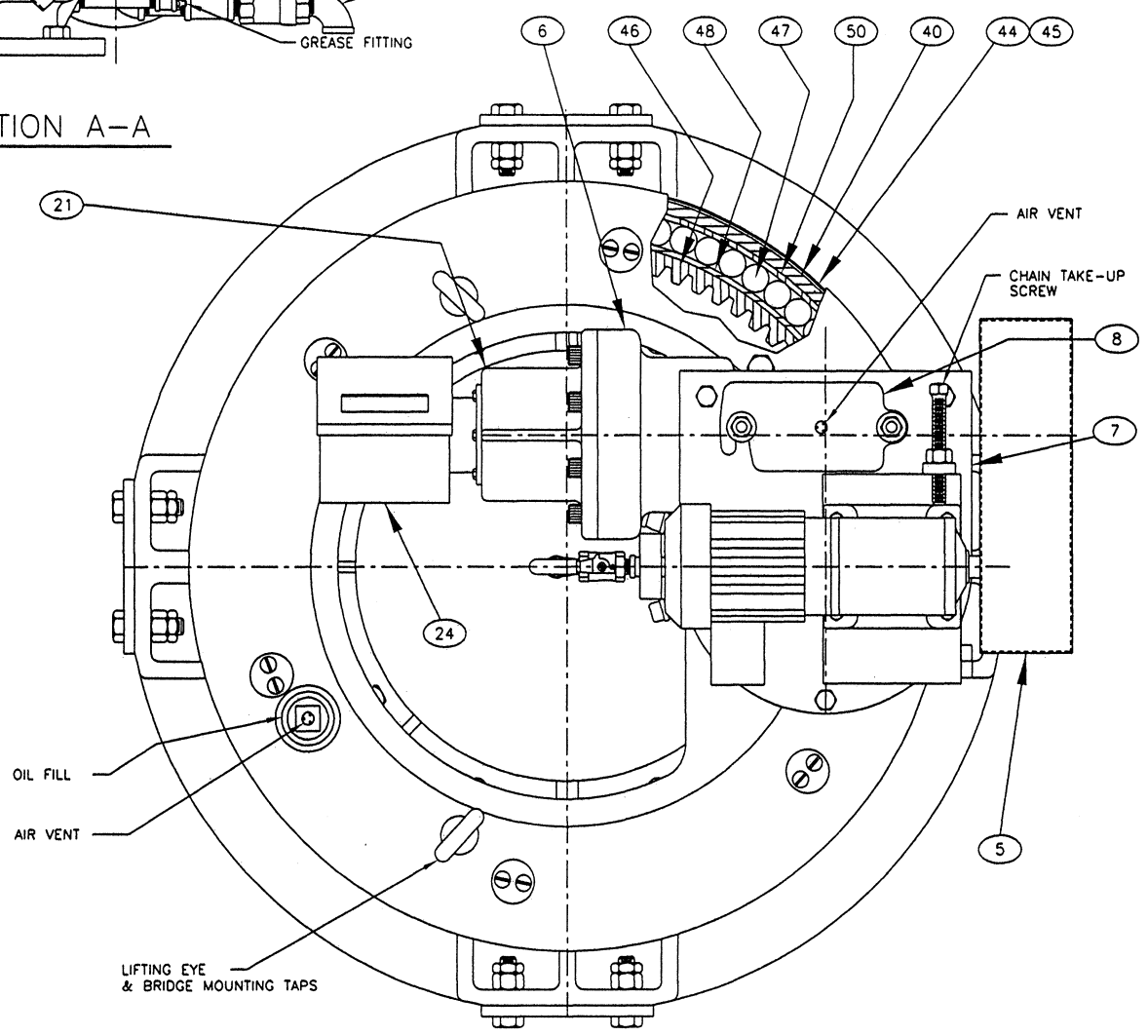
In both cases, the supply voltage is connected to U1 (T1), V1 (T2) and W1 (T3). The direction of rotation is changed by exchanging two wires.



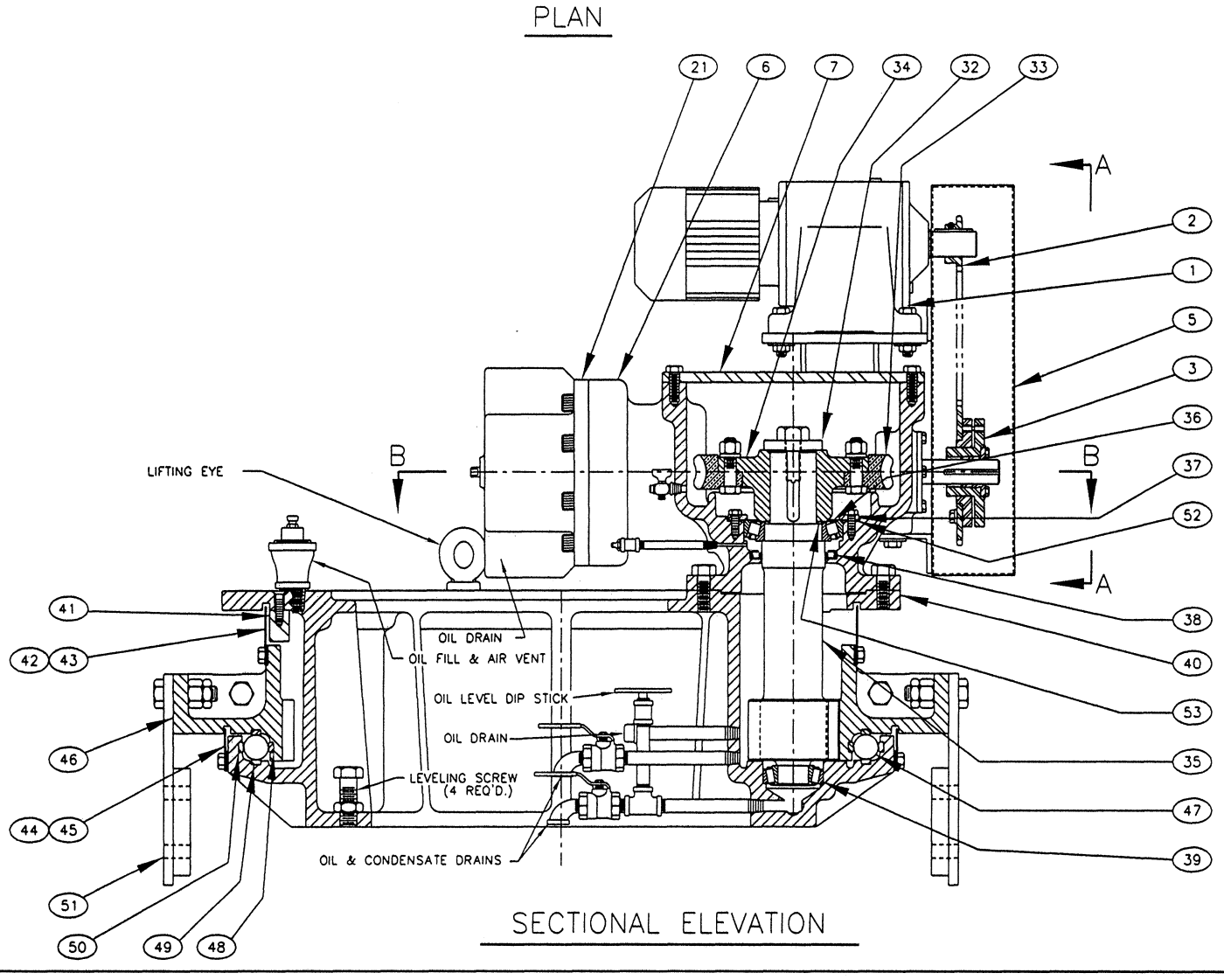
SECTION A–A



SECTION B–B



PLAN



SECTIONAL ELEVATION

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	TORQUE OVERLOAD ASSEMBLY
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

REVISIONS

	BY	DATE	CHKD

REMARKS

DRAWN	5/7/97	WTW	
CHECKED			
APPR.			
SCALE	NONE	FILE REFERENCE	

WALKER PROCESS EQUIPMENT

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

PARTS LIST
MODEL 28H6T DRIVE
PLATFORM BRIDGE W/SHEAR PIN HUB

CONTRACT: STD.

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

REV.

SECTION E

Walker Process Equipment
A Division of McNish Corporation
Aurora, Illinois, USA

CIRCULAR CLARIFIERS

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

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 (7) onto the worm gear housing (6). Bolt the gearmotor on the motor support, but do not tighten at this time.

Slip the large driven sprocket (3) 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.

Align the faces of both sprockets with a straight edge. 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

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 (5). 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.

Walker Process Equipment
Division of McNish Corporation
Aurora, Illinois, USA

HALF BRIDGE CIRCULAR CLARIFIERS

ASSEMBLY AND DISASSEMBLY INSTRUCTIONS WORM & WORM GEARS (MODEL 28H6T, ~~42H6T~~)

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 (33) and worm shaft (9) are to be replaced, the oil should be drained from the worm gear housing (6) 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 (1), chain guard (5), chain (4), sprockets (2) (3) and gear housing cover (7).

Next, remove gear retainer (32) from top of pinion shaft (35). Remove key connecting worm gear hub (34) to pinion (35). This will allow worm gear (33) to turn freely on pinion shaft (35) in preparation for removal of worm shaft (9).

Next, remove spring housing (21), spring (20) and shims. Pull out thrust ring (17) and thrust rod (19).

Remove bearing cap (11) from other end of worm shaft (9).

Worm shaft (9) and bearings (10) (14) 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 (9).

The worm gear (33) and hub (34) can now be lifted straight up and out of the worm gear housing (6).

The seal (13) 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 (53) is located between the upper pinion bearing (36) inner race and worm gear hub (34). The hub shim set (53) may need adjustment when installing new components. Assemble the worm gear (33) and worm gear hub (34) assembly to the pinion (35). Do not install the key or worm gear retainer (32) at this time.

Walker Process Equipment
Division of McNish Corporation
Aurora, Illinois, USA

HALF BRIDGE CIRCULAR CLARIFIERS

ASSEMBLY AND DISASSEMBLY INSTRUCTIONS
WORM & WORM GEARS (MODEL 28H6T, ~~42H6T~~)

ASSEMBLY OF WORM GEAR AND WORM SHAFT – (Continued)

Mount bearing (14) on worm shaft (9) locking into position with locknut (15) and lockwasher (16) and cocking worm shaft (9) as required, thread worm shaft through worm gear (33) teeth until bearing (14) can be seated. Install bearing (10) into position. Install thrust ring (17). Install shims between thrust ring (17) and spring (20). Install spring (20) . Install spring housing (21) thrust rod (19) and oil seal (23).

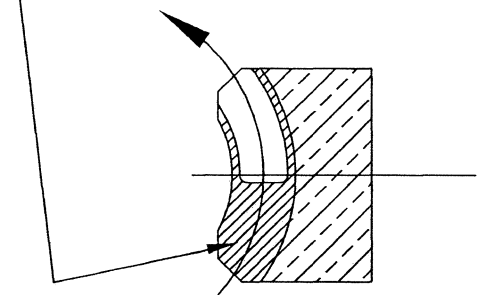
Install oil seal (13) into bore of bearing cap (11) .

Install bearing cap (11) assembly and gasket (12) over worm shaft (9) and bolt to worm gear housing (6) . Install the key in the pinion (35) and worm gear hub (34) . Use the worm gear retainer (32) and capscrew to secure pinion and worm gear hub (34) . Paint worm shaft (9) with white marking compound to check contact pattern between worm gear (33) . Turn wormshaft (9) so that worm gear (33) turns in clockwise direction to transfer white marking compound from worm shaft (9) to worm gear (33) . 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 (53) adjusted to bring the worm shaft (9) and worm gear (33) 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 (7) , and mount gear reducer (1) , drive (2) and driven sprockets (3) , drive chain (4) and chain guard (5) .

Securely tighten all fasteners.

IF CONTACT PATTERN FALLS WITHIN THIS AREA, IT IS ACCEPTABLE. OUTSIDE THIS AREA, IT IS UNACCEPTABLE.



WORM GEAR NO LOAD CONTACT PATTERN

WHEN VIEWED FROM SPRING (20) END OF WORM GEAR HOUSING.

Issued 5/16/08
Supersedes – 11/13/01

Walker Process Equipment
Division of McNish Corporation
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 (35) and bearings that transmit rotation and speed reduction from the worm gear assembly (33) to the spur gear (46) .

DISASSEMBLY

Before the pinion shaft (35) and pinion bearings (36) (39) 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 (53) . Unbolt and remove the bearing retainer (37) from the worm gear housing (6) . Remove and save the retainer shim set (52) . Unbolt the worm gear housing (6) from the spur gear housing (40) . Lift the worm gear housing (6) straight up off the spur gear housing (40) . The pinion (35) should stay in the spur gear housing (40) but use caution if it comes out with the worm gear housing (6) as it is free to drop if not secured. The upper bearing (36) and oil seal (38) should have stayed attached to the worm gear housing (6) . They should be removed, inspected, and replaced if necessary. The pinion shaft (35) can now be pulled up and out of the spur gear housing (40) . Access to the lower pinion bearing (39) in the spur gear housing (40) 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 (39) may have remained attached to the lower pinion (35) 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 (40) should be cleaned with a light oil, such as SAE 5, then inspected to assure the reassembly of the lower pinion bearing cup (39) can be correctly made.

ASSEMBLY

Clean the joint of the worm gear (6) and spur gear (40) housings of old sealant.

Assemble the outer race (cup) of the lower pinion bearing (39) into the bore of the spur gear housing (40) . Press the inner race (cone) of the lower pinion bearing (39) onto the pinion shaft (35) . Place the pinion shaft (35) into spur gear housing (40) and lower pinion bearing (39) . Insert the oil seal (38), lip up, into the worm gear housing (6) . Apply a bead of waterproof sealant to the top of the spur gear housing (40) at the worm gear housing (6) mounting area. Mount and bolt the worm gear housing (6) over the pinion shaft (35) to the spur gear housing (40) . The upper pinion bearing inner race (cone) (36) should now be assembled to the pinion shaft (35) .

Install the upper pinion bearing outer race (cup) (36) into the worm gear housing (6) . In order to properly preload the bearings (36) and (39), the top of the outer race of the upper pinion bearing (36) should be .010" to .015" higher than the adjacent machined surface on the worm gear housing (6) .

Walker Process Equipment
Division of McNish Corporation
Aurora, Illinois, USA

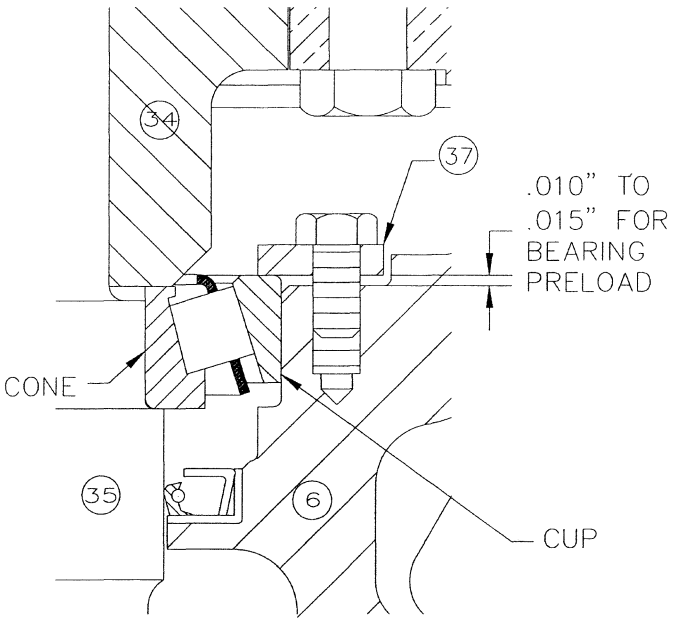
HALF BRIDGE CIRCULAR CLARIFIERS

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

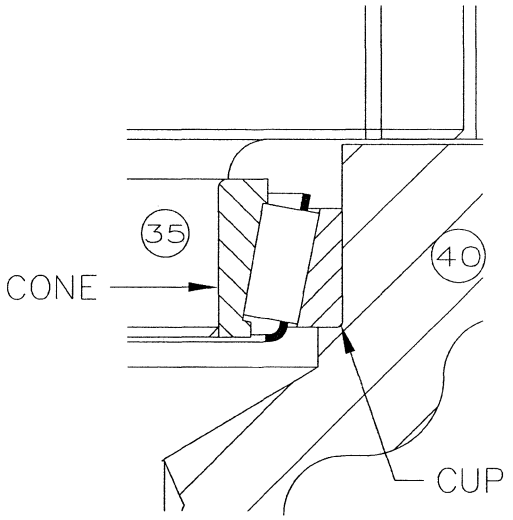
ASSEMBLY – (Continued)

Shims (52) should be added on top of the outer race of the upper pinion bearing (36) or under the bearing retainer (37) to maintain the .010" to .015" preload on the bearings. Install the bearing retainer into the worm gear housing (6) using three (3) cap screws. A preloaded bearing requirement is necessary for a smooth rolling condition. Check the pinion shaft (35) for wobble, smooth rolling action and end play. Adjust the retainer shim pack (52) as necessary until a smooth rolling action is obtained and the pinion shaft (35) has no wobble or end play. Tap the end of the pinion shaft (35) to make sure the bearing rollers (36) (39) are seated. Check again for end play and adjust the retainer shim pack (52) as necessary to remove end play. Once satisfied the pinion shaft (35) is correctly installed, install and tighten all bearing retainer (37) 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)

Walker Process Equipment
A Division of McNish Corporation
Aurora, Illinois, USA

CIRCULAR CLARIFIERS/THICKENERS

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

The Pier Supported Type Clarifier Drive mechanism includes a spur gear housing (40) which is mounted to the center column. At its periphery it carries an annular ball bearing on which the internal gear (46) rotates. The spur gear supports the machines underwater mechanism.

The balls (47) in the annular bearing ride on four replaceable hardened steel strips (48) (49) (50) set into grooves, two (2) each in turntable base and spur gear.

DISASSEMBLY

Replacement of the spur gear (46) and strip liners (48) (49) (50) 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 (51).

First, drain all oil from housing (40). Remove dust shields (42) (44). Remove spur gear hold-down blocks (41). Remove drive lugs (51).

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.

ASSEMBLY AND DISASSEMBLY INSTRUCTIONS SPUR GEARS, BEARING BALLS & STRIP LINERS (MODEL 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.

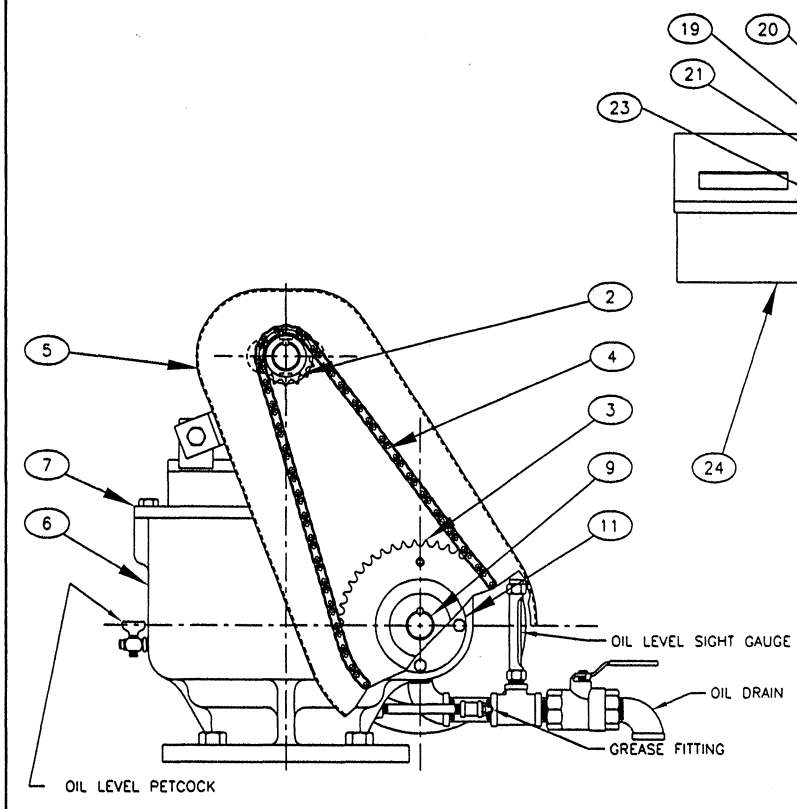
When re-assembling the spur gear (46), a thin bed of grease will aid in keeping the balls in the annular raceway in the housing (40). Pack the balls into the grease and carefully lower each half of the spur gear (46) into place being sure to line up position of driving lug attachment holes with holes in gear.

Bolt gear halves together. Install hold-down blocks (41). Install dust shields (42)(44). Install drive cage attachment lugs (51). Insert bolts (ASTM A325) connecting drive to cage lugs (51).

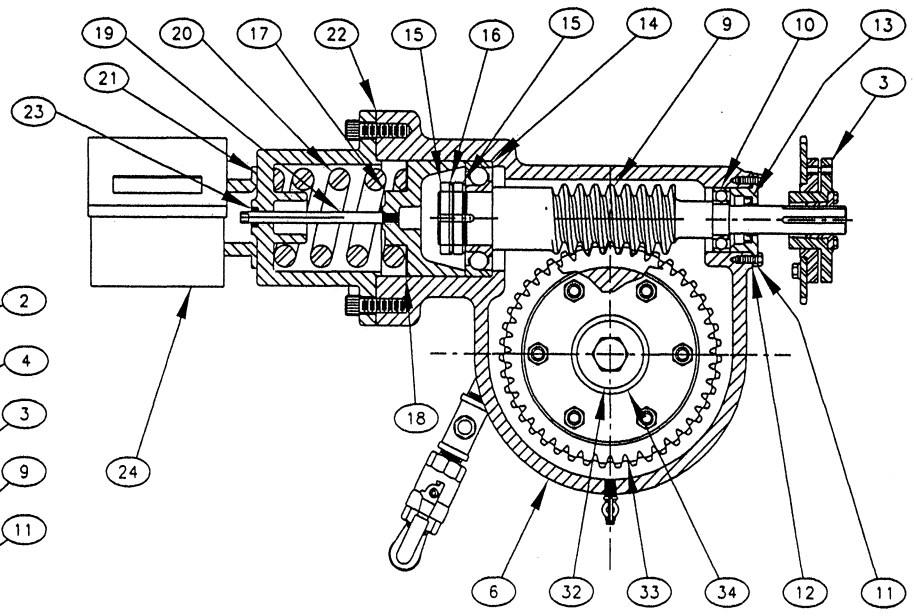
Remove blocks under arms.

Check level of drive and plumbness of cage. Relevel and plumb if necessary.

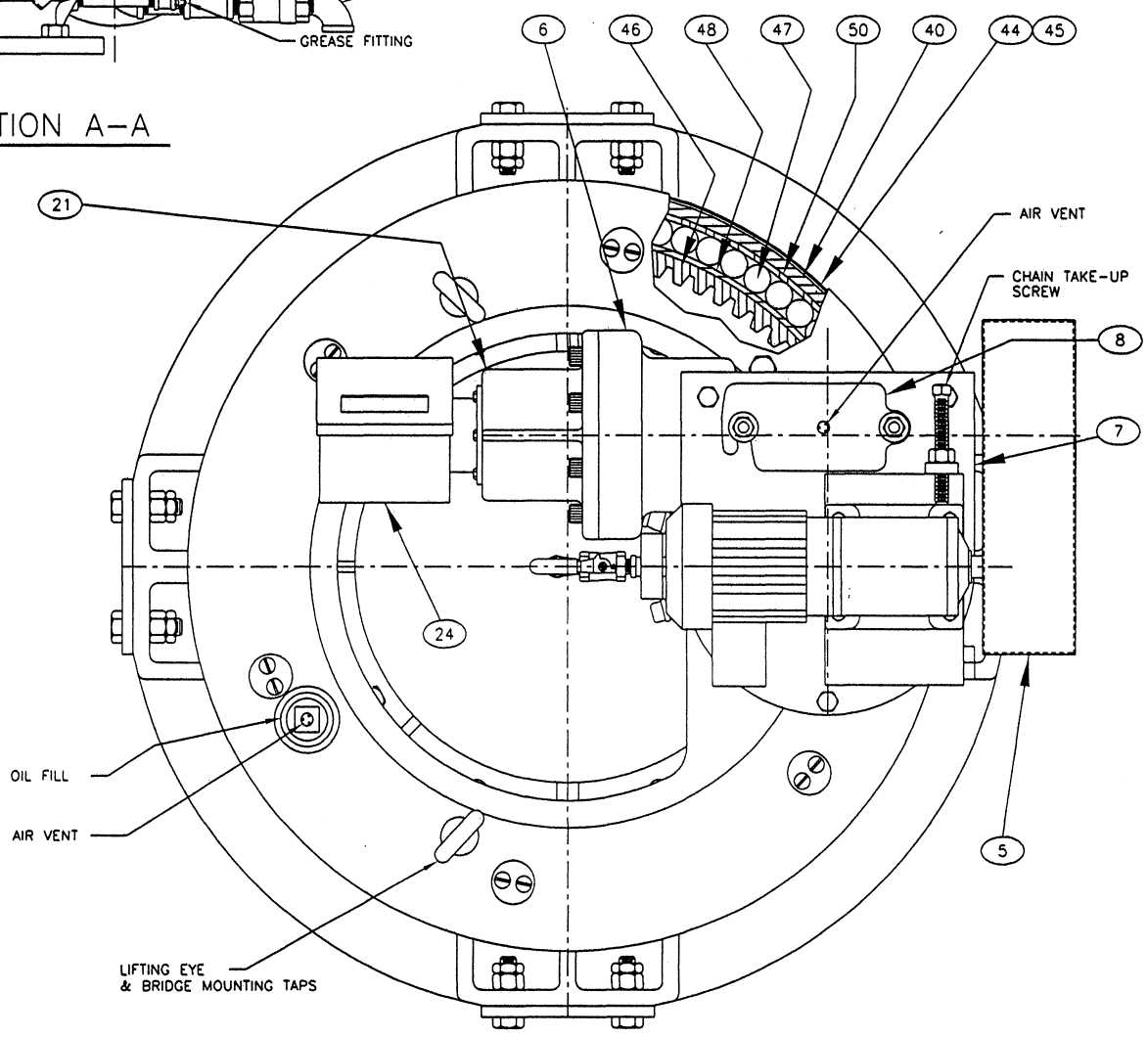
Fill spur gear housing (40) with oil and grease all fittings.



SECTION A–A



SECTION B–B



PLAN

SECTIONAL ELEVATION

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	TORQUE OVERLOAD ASSEMBLY
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

REVISIONS

	BY	CHKD	DATE

REMARKS

	BY	DATE
DRAWN	WTW	5/7/97
CHECKED		
APPR.		

SCALE: NONE

FILE REFERENCE

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

PARTS LIST
MODEL 28H6T DRIVE
PLATFORM BRIDGE W/SHEAR PIN HUB

CONTRACT: STD.

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

REV.

SECTION F

MODEL "RSMTP" 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.
	C. Scraper making contact with floor.	C1. Drain tank and adjust mechanism.
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 is too short.	C1. Adjust weirs for even overflow.
	D. Damaged or missing manifold seals.	D1. Drain tank and replace seals.

MODEL "RSMTP" 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. A6. Arm orifices are plugged. A7. Sludge manifold seals are leaking.
5. Excessive floating scum.	A. Skimmer mechanism not operating properly.	A1. Adjust skimmer mechanism as required.
6. 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. D2. Check arm orifices. D3. Check condition of lower manifold seals.
7. Excessive growth on weirs.	A. Accumulation of solids causes algae.	A1. Increase frequency of cleaning.
8. Leaking scum box flushing valve.	A. Damaged gasket seal.	A1. Check gasket for damage. Repair or replace as required.

SECTION G

PROCEDURE FOR ORDERING

SPARE OR REPAIR PARTS

Please feel free to contact us. Address your inquiry to Walker Process Equipment, 840 North Russell, Aurora, Illinois 60506, ATTN: Repair Sales; or call us at 630-892-7921.

1. Identify your equipment using the Walker Process Contract Number shown below.

2. Identify the part by mark number as shown in the description block of the drawing on which this part or assembly appears. If it is a part for a motor, pump, electrical control, or any part not manufactured by Walker Process, this information will be found in the Manufacturer's reference data included in this manual, or on the Manufacturer's nameplate.

3. Show the part name and description (information can be gained in the same manner as 2 above).

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, cycle, 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:

Walker Process Equipment
840 North Russell Avenue
Aurora, IL 60506
Phone: (630) 892-7921 / Fax: (630) 844-9590

YOUR EQUIPMENT IS IDENTIFIED AS FOLLOWS:

Contract Number	Name of Equipment
Q10600A	Two (4) Model "RSMTP" Circular Clarifier Mechanisms with Model "28H6T" Drive

CIRCULAR CLARIFIERS

RECOMMENDED SPARE PARTS

REFERENCE: 28H6T SPUR GEAR ASSEMBLY DRAWING PROVIDED IN THIS BROCHURE.

RECOMMENDED SPARE PARTS LIST		
QUANTITY	ITEM	PART NO.
One (1)	Chain Sprocket – Drive	2
One (1)	Chain Sprocket – Driven	3
One (1)	Drive Chain w/Connecting Links	4
Two (2)	Oil Level Sight Gauges	03-006-10
Ten (10)	Shear Pins	03-003-01-04
Two (2) (4 Halves)	Upper Manifold Seals	20-1
Two (2)	Lower Manifold Seals	32-1

FURNISHED SPARE PARTS LIST		
QUANTITY	ITEM	PART NO.
Ten (10)	Shear Pins	03-003-01-04
Four (4)	Oil Level Sight Gauges	03-006-10
Two (2)	Inspection Hole Gasket	03-008-02
Two (2)	Bearing SKF 6207	03-010-01
Two (2)	Bearing Cap Gaskets	03-012-01
Two (2)	Oil Seal C/R 12456	03-013-01
Two (2)	Bearing SKF 7312-BE	03-014-01
Four (4)	Nut Lock SKF-N-12	03-015-01
Two (2)	Lock Washer SKF W-12	03-016-01
Two (2)	Gasket Spring Housing	03-022-01
Two (2)	Oil Seal C/R 4931	03-023-01
Two (2)	Bearing Timken Cone & Cup 30215M	03-036-01
Two (2)	Oil Seal C/R 32501	03-038-01
Two (2)	Bearing Timken Cone 26880	03-039-01
Two (2)	Bearing Timken Cup 26822	03-039-02
Three (3)	Strip Adhesive-Back Sponge – Each 50 ft. long	03-043/045-01
Fourteen (14)	Flight Arm Squeegee	26-01
Four (4)	Suction Arm Squeegee	37-01
Two (2)	Suction Arm Squeegee	37-02

PRICES QUOTED UPON REQUEST.

CIRCULAR CLARIFIERS

RECOMMENDED SPARE PARTS

REFERENCE: SKIMMER ASSEMBLY / ERECTION DIAGRAM PROVIDED IN THIS BROCHURE.

RECOMMENDED SPARE PARTS LIST		
QUANTITY	ITEM	PART NO.
Four (4)	Neoprene Squeegees/Wipers	50-04

FURNISHED SPARE PARTS LIST		
QUANTITY	ITEM	PART NO.
Four (4)	Neoprene Squeegees/Wipers	50-04

PRICES QUOTED UPON REQUEST.

CIRCULAR CLARIFIERS w/SKIMMERS

PREDICTED COMPONENT LIFE

COMPONENT	PREDICTED LIFE (Min. Years) (Based on 24 Hour Continuous Duty)
Gearmotor	20
Drive and Driven Sprockets	10
Roller Chain	10
Worm Gear	20
Worm Shaft	20
Pinion Shaft	20
Spur Gear	20
Drive Bearings	20
Oil Seals	10
Arm Squeegees	10
Skimmer Wipers	10
Upper and Lower Manifold Seals	10

* Predicted life is based on 24 hour continuous duty and that all maintenance procedures and schedules as required in this O & M manual have been performed.

SECTION H

IOM PARTS LIST	Contract: Q10600A Job Name: FOUNTAIN, CO - HAROLD D. THOMPSON WATER REC. FAC.	FOUNTAIN, CO
	A1200 (2) 60' DIA RSMTP COLLECTORS W/ FRP WEIRS & BAFFLES	CUST PO: 2908-11190

Rev	Total Ship Pcs	Mark	Total Assy Pcs	Description	Weight /EA	Material	Item
				CONTROL PANEL ASSEMBLY			
R1	2		2	TLC CONTROLS CLARIFIER CONTROL PANEL			NOTES
				DRIVE ASSEMBLY - 28H6T WALKER			
	2	03-.000-00	2	28H6T DRIVE ASSEMBLY			WPE-28H6T_01
				WEIR PLATES/SCUM BAFFLE ASSEMBLY			
R1	2		2	LOT OF MFG WEIRS AND BAFFLES		FGLASS	NOTES
				ANCHORAGE - HB (BMAN01)			
	8	BRIDGE ANCHORS	8	WEDGE ANCHOR POWER-STUD 304 SS .75 X 5.5 7342		304	D7342
	10	SCUM TR ANCHORS	10	POWERS EXPANSION ANCHOR 304SS .625 X 4.5 LG 7332		304	AM7332
				SPARE PARTS			
	10	03-003-01-04	10	SHEAR PIN BROWNING #1H .0937 (SPARE)		STL	AM27-0020
	4	03-006-10	4	GAUGE LUBE DEVICE OIL SIGHT .375 G306-3 (SPARE)			AM22-0013
	2	03-008-02	2	INSPECTION HOLE COVER GASKET (SPARE)		NEOP	900116
	2	03-010-01	2	BEARING SKF 6207 (OR EQUAL) (SPARE)			AM26-0002
	2	03-012-01	2	BEARING CAP GASKET (SPARE)		SHT PACK	900122
	2	03-013-01	2	OIL SEAL C/R #12456 (SPARE)			AM42-0020
	2	03-014-01	2	BEARING SKF 7312-BE (OR EQUAL) (SPARE)			AM26-0013
	4	03-015-01	4	NUT LOCK SKF N-12 (SPARE)			AM22-0009
	2	03-016-01	2	LOCK WASHER SKF (OR EQUAL) #W-12 (SPARE)			AM22-0004
	2	03-022-01	2	GASKET SPRING HOUSING (SPARE)		SHT PACK	900128
	2	03-023-01	2	OIL SEAL C/R 4931 (SPARE)			AM42-0006
	2	03-036-01	2	BEARING TIMKEN CONE & CUP 30215M (SPARE)			AM26-0019
	2	03-038-01	2	OIL SEAL C/R 32501 (SPARE)			AM42-0015
	2	03-039-01	2	BEARING TIMKEN CONE 26880 (SPARE)			AM26-0021
	2	03-039-02	2	BEARING TIMKEN CUP 26822 (SPARE)			AM26-0020
	3	03-043/045-01	3	STRIP .125 X 1 ADHESIVE-BACK SPONGE X 50' (SPARE)		NEOP	45928
	14	26-01	14	SQUEEGEE (SPARE)	2	BRASS	AM-32259-778
	4	37-01	4	SQUEEGEE (SPARE)	3	NEOP	AM-42555-778
	2	37-02	2	SQUEEGEE (SPARE)	1	NEOP	AM-42557-778
	4	50-04	4	SQUEEGEE - .25 THICK X 3 X 51 IN LG (SPARE)		NEOP	AM1102
				BRIDGE ASSEMBLY			
	2	10-01	2	BRIDGE	1,460	STL	AM-057
	4	10-02	4	SLIDE PLATE	6	STL	AM-595
	4	10A	4	CAPSCREW HEX HD 304 SS .75 X 1.5 FULL		304	7373
	4	10A	4	WASHER STD PL 304 SS .75		304	25105
				PLATFORM ASSEMBLY			
	4	11-01	4	PLATFORM	179	STL	AM1316
	64	11A	64	CAPSCREW HEX HD 304 SS .625 X 2		304	7284
	64	11A	64	JAM NUT 304 SS .625		304	16644
	64	11A	64	NUT HEX 304 SS .625		304	16756

HANDRAIL							
	2	12-01	2	HANDRAIL	326	ALUM	AM1309
	76	12A	76	CAPSCREW HEX HD 304 SS .5 X 1.75		304	7108
	76	12A	76	NUT HEX 304 SS .5		304	16733
	76	12A	76	WASHER STD PL 304 SS .5		304	25080
GRATING							
	2	13-01	2	GRATING	393	ALUM	AM1310
	152	13A	152	ANCHOR CLIP - GRATING		GALV STL	AM1321
CENTER COLUMN							
	2	16	2	CENTER COLUMN ASSEMBLY			AM1328
	16	16A	16	CAPSCREW HEX HD 304 SS .875 X 3		304	7568
	16	16A	16	NUT HEX HVY 304 SS .875		304	D900854
DRIVE CAGE							
	2	17-01	2	DRIVE CAGE	954	STL	AM1329
	8	17-02	8	DRIVE CAGE HANGER	39	STL	AM-38941-429
	32	17A	32	CAPSCREW HEX HD 304 SS .625 X 2		304	7284
	32	17A	32	JAM NUT 304 SS .625		304	16644
	32	17A	32	NUT HEX 304 SS .625		304	16756
	32	17B	32	CAPSCREW HEX HD 304 SS .625 X 3.5		304	7321
	32	17B	32	NUT HEX 304 SS .625		304	16756
CENTER COLUMN SEAL							
	4	20-01	4	SEAL HALF	3	NEOP	AM1362
	2	20-02	2	MOUNTING RING	40	STL	AM1363
	2	20-03	2	BACKING RING	5	STL	AM1364
	32	20A	32	CAPSCREW HEX HD 304 SS .375 X 1 FULL		304	6913
INFLUENT WELL							
	2	22-01	2	INFLUENT WELL	1,874	STL	AM1333
	4	22-02	4	INFLUENT WELL SUPPORT	119	STL	AM1334
	4	22-10	4	BAFFLE	14	STL	AM1335
	16	22A	16	CAPSCREW HEX HD 304 SS .75 X 2.5		304	7427
	16	22A	16	JAM NUT 304 SS .75		304	16650
	16	22A	16	NUT HEX 304 SS .75		304	16762
	16	22A	16	WASHER STD PL 304 SS .75		304	25105
	20	22B	20	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304	7077
	20	22B	20	NUT HEX 304 SS .5		304	16733
	8	22C	8	CAPSCREW HEX HD 304 SS .5 X 1.25 FULL		304	7077
	8	22C	8	NUT HEX 304 SS .5		304	16733
	8	22C	8	WASHER STD PL 304 SS .5		304	25080
CLEVIS ROD ASSEMBLY ZPS 1.25 DIA							
	4	23-01	4	CLEVIS ROD	25	STL	AM-52832-703
TRUSS ARM							
	2	24-01	2	TRUSS ARM	904	STL	AM1339
	4	24A	4	CAPSCREW HEX HD 304 SS 1.5 X 4.5		304	AM1047
	4	24A	4	NUT HEX 304 SS 1.5		304	16816

FLIGHTS							
	14	25-01	14	FLIGHT	43	STL	AM1656
	28	25A	28	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304	7261
	28	25A	28	NUT HEX 304 SS .625		304	16756
	28	25A	28	WASHER SAE PL 304 SS .625		304	38969
SQUEEGEES							
	14	26-01	14	SQUEEGEE	2	BRASS	AM-32259-778
	98	26A	98	CAPSCREW HEX HD 304 SS .375 X 1 FULL		304	6913
	98	26A	98	NUT HEX 304 SS .375		304	16727
	98	26A	98	WASHER STD PL 304 SS .375		304	25074
SLUDGE MANIFOLD							
	2	30-01	2	SLUDGE MANIFOLD	1,045	STL	AM-531
	2	30-02	2	COVER	7	STL	AM-156
	40	30A	40	NUT HEX 304 SS .625		304	16756
	12	30B	12	CAPSCREW HEX HD 304 SS .375 X 1 FULL		304	6913
SEAL PLATE							
	2	31-01	2	SEAL PLATE	352	STL	AM-70579-595
MANIFOLD LOWER SEAL - 6 FT							
	2	32-01	2	LOWER SEAL	19	NEOP	AM-38917-761
	4	32-02	4	SEAL CLAMP HALF	2	304	AM-38916-154
	8	32A	8	NUT HEX 304 SS .375		304	16727
	4	32A	4	THREADED ROD 304 SS .375 X 4.5 IN LG		304	AM1351
	8	32A	8	WASHER STD PL 304 SS .375		304	25074
	68	32B	68	SCREW SELF-TAPPING .25 X 1.25 LG		SS	AM1354
OUTRIGGER							
	4	33-01	4	OUTRIGGER	86	STL	AM1344
	4	33-02	4	BRACE	36	STL	AM1345
	8	33A	8	CAPSCREW HEX HD 304 SS .75 X 1.75 FULL		304	7396
	8	33A	8	NUT HEX 304 SS .75		304	16762
	8	33A	8	WASHER STD PL 304 SS .75		304	25105
	8	33B	8	CAPSCREW HEX HD 304 SS .75 X 1.75 FULL		304	7396
	8	33B	8	NUT HEX 304 SS .75		304	16762
SUCTION HEADER							
	2	34-01	2	SUCTION HEADER - SECTION 'A'	561	STL	AM-415
	2	34-02	2	SUCTION HEADER - SECTION 'B'	425	STL	AM-415
	2	34-03	2	SUCTION HEADER - SECTION 'C'	109	STL	AM-415
	2	34-11	2	GASKET - 'A'		NEOP	AM-362
	2	34-12	2	GASKET - 'B'		NEOP	AM-362
	2	34-13	2	GASKET - 'C'		NEOP	AM-362
	12	34A	12	CAPSCREW HEX HD 304 SS .75 X 2.5		304	7427
	12	34A	12	NUT HEX 304 SS .75		304	16762
	4	34B	4	CAPSCREW HEX HD 304 SS .75 X 1.5 FULL		304	7373
	28	34C	28	CAPSCREW HEX HD 304 SS .625 X 2		304	7284
	28	34C	28	NUT HEX 304 SS .625		304	16756

TRUSS ROD							
	4	35-01	4	TRUSS ROD - .5 IN X 11 FT 9 IN C-C	9	304	AM-70585-703
	4	35-02	4	TRUSS ROD - .5 IN X 12 FT 4 IN C-C	9	304	AM-70586-703
	4	35-03	4	TRUSS ROD - .5 IN X 22 FT 6.5 IN C-C	16	304	AM-70587-703
	4	35-04	4	TRUSS ROD - .75 IN X 12 FT 6.5 IN C-C	21	304	AM-70588-703
	4	35-05	4	TRUSS ROD - .75 IN X 22 FT 8.5 IN C-C	36	304	AM-70589-703
	12	35A	12	CAPSCREW HEX HD 304 SS .5 X 1.75		304	7108
	12	35A	12	NUT HEX 304 SS .5		304	16733
	12	35A	12	WASHER STD PL 304 SS .5		304	25080
	12	35B	12	CAPSCREW HEX HD 304 SS .5 X 2		304	7114
	12	35B	12	NUT HEX 304 SS .5		304	16733
	16	35D	16	CAPSCREW HEX HD 304 SS .75 X 3		304	7456
	16	35D	16	NUT HEX 304 SS .75		304	16762
INSIDE FLIGHT							
	2	36-01	2	FLIGHT - 6 FT MANIFOLD	40	STL	AM-38920-311
	2	36-02	2	INSIDE SQUEEGEE	4	NEOP	AM-38921-778
	2	36-03	2	RETAINER	6	STL	AM-38922-704
	4	36A	4	CAPSCREW HEX HD 304 SS .625 X 2		304	7284
	4	36A	4	NUT HEX 304 SS .625		304	16756
	8	36A	8	WASHER SAE PL 304 SS .625		304	38969
	14	36B	14	CAPSCREW HEX HD 304 SS .375 X 1.25		304	AM33-0005
	14	36B	14	NUT HEX 304 SS .375		304	16727
	14	36B	14	WASHER STD PL 304 SS .375		304	25074
SUCTION HEADER SQUEEGEE							
	4	37-01	4	SQUEEGEE	3	NEOP	AM-42555-778
	2	37-02	2	SQUEEGEE	1	NEOP	AM-42557-778
	4	37-05	4	SQUEEGEE RETAINER	6	STL	AM-42556-704
	2	37-06	2	SQUEEGEE RETAINER	2	STL	AM-42558-704
	66	37A	66	CAPSCREW HEX HD 304 SS .375 X 1.25		304	AM33-0005
	66	37A	66	NUT HEX 304 SS .375		304	16727
SKIMMER ASSY 4 FT (HB)							
	2	50	2	SKIMMER ASSEMBLY - 4'-0"			AM-62171-201
	2	50-07	2	DEFLECTOR BRONZE FOR SKIMMERS #39049	3	BRONZE	AM39049-F
	8	50A	8	NUT HEX 304 SS .5		304	16733
	4	50A	4	U-BOLT - 4"	1	304	AM-41552-901
	8	50A	8	WASHER STD PL 304 SS .5		304	25080
SCUM DEFLECTOR							
	2	51-01	2	SCUM DEFLECTOR	113	STL	AM1271
	4	51A	4	CAPSCREW HEX HD 304 SS .5 X 1.5 FULL		304	7083
	4	51A	4	NUT HEX 304 SS .5		304	16733
	4	51A	4	WASHER STD PL 304 SS .5		304	25080
	2	51B	2	CAPSCREW HEX HD 304 SS .625 X 10 LG		304	AM1054
	2	51B	2	NUT HEX 304 SS .625		304	16756

SKIMMER SUPPORT - STD SKIMMER							
	2	52-01	2	SKIMMER SUPPORT ARM	185	STL	AM1278
	4	52-02	4	MOUNTING ANGLES	6	STL	AM-41532-002
	16	52A	16	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304	7261
	16	52A	16	NUT HEX 304 SS .625		304	16756
	16	52A	16	WASHER STD PL 304 SS .625		304	25097
SCUM DEFLECTOR SUPPORT							
	2	53-01	2	SUPPORT ANGLE	56	STL	AM1727
	6	53A	6	CAPSCREW HEX HD 304 SS .625 X 1.5 FULL		304	7261
	6	53A	6	NUT HEX 304 SS .625		304	16756
	6	53A	6	WASHER STD PL 304 SS .625		304	25097
SCUM TROUGH - STD SKIMMER (B/M 'F')							
	2	60-01	2	SCUM TROUGH	446	STL	AM1283
	2	60-02	2	BACK STRAP	8	STL	AM-781
	4	60-03	4	CONNECTION PLATE	3	STL	AM-31298-595
	2	60-04	2	BRACKET - LOWER	3	STL	AM-051
	2	60-05	2	BRACKET - UPPER	7	STL	AM-051
	20	60A	20	MACH SCREW FLAT HD 304 SS .375 X 1.25		304	56713
	20	60A	20	NUT HEX 304 SS .375		304	16727
	4	60B	4	NUT HEX 304 SS .5		304	16733
	4	60B	4	WASHER STD PL 304 SS .5		304	25080
	2	60C	2	CAPSCREW HEX HD 304 SS .75 X 2 FULL		304	7404
	2	60C	2	NUT HEX 304 SS .75		304	16762
	4	60C	4	WASHER STD PL 304 SS .75		304	25105
FLAP GATE ASSEMBLY - HB - STD							
	2	65	2	FLAP GATE ASSEMBLY			AM-70108-292
	2	65-04	2	PIPE CLAMP 3" STD ANVIL INT'L FIG 212 or EQUAL		GALV STL	AM1800
	2	65-05	2	FLEXIBLE COUPLING W/2 SS CLAMPS FOR A 3.50 PIPE		SS	DFW56-33
	2	65-06	2	TRIP ARM	5	STL	AM-44390-003
	4	65B	4	CAPSCREW HEX HD 316 SS .5 X 2.25		316	200132
	4	65B	4	NUT HEX LOCK 316 SS .50 NYLON INSERT		316	AM1104
COUNTERWEIGHT							
	2	90-01	2	COUNTERWEIGHT	292	STL	AM-32281-178
NAMEPLATE - WALKER							
	2	95-01	2	NAMEPLATE 9" X 13.5 WALKER PROCESS		ALUM	18749
	4	95A	4	MACH SCREW RD HD 304 SS 10-24 X .5		304	190449
	4	95A	4	NUT HEX 304 SS 10-24		304	190455
	4	95A	4	PIPE RING MC-CARR #3225T31,2 FOR 1.5		SS	190432
DRIVE COVER							
	2	15-01	2	DRIVE COVER	26	ALUM	AM1319

MODEL "RSMTP" 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. The concrete should be firmly set before any equipment is installed.

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 W.P.E. Representative. Approval and method of such correction work must be obtained from W.P.E.

SEQUENCE OF INSTALLATION

1. Center Column
2. Seal Plate
3. Drive Cage & Sludge Manifold
4. Drive Assembly
5. Influent Well
6. Suction Header
7. Truss Arm
8. Bridge
9. Weir Plates
10. Scum Trough
11. Scum Baffle
12. Skimmer Assembly
13. Checking the Machine for Level
14. Grouting Tank Bottom
15. Squeegees
16. Sludge Manifold Seals
17. Nameplate
18. Special Painting Note
19. Start-up Procedure

REFER TO MASTER ERECTION DIAGRAM D605-70593-292

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. D605-70593-292, A605-38947-292, A605-38956-292 & A505-40168-292)

Place seal plate down in center of tank.

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

Set the center column on the anchor bolts and place one washer and loosely screw one nut on each anchor bolt. IMPORTANT - Raise the center column to the proper elevation, plumb it accurately and tighten nuts. Place grout beneath the column after plumbing.

2. SEAL PLATE - (Ref. Dwg. A605-38956-292)

Put nut and washer on each anchor bolt. These will be used to level seal plate. Set seal plate on anchor bolts, raise to proper elevation as shown on assembly drawing, level accurately and tighten nuts.

IMPORTANT - Seal plate should be concentric with center column. Do not grout under plate at this time.

3. DRIVE CAGE & SLUDGE MANIFOLD - (Ref. Dwg. A605-38957-292)

Lower sludge manifold down over center column onto seal plate.

Lower drive cage over center column and rest on manifold. Bolt manifold to drive cage making sure the truss arm connections to the drive cage are in the correct position with the manifold suction header flange.

4. DRIVE ASSEMBLY - (Ref. Dwgs. A605-38950-292 & A605-43636-292)

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.

4. DRIVE ASSEMBLY - (Continued)

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 removed or protected from the sandblast area to avoid contamination of the internal drive parts. **Refer to Separate Instructions for "Drive Unit Protection for Blast Cleaning" found in this Section.**

5. INFLUENT WELL - (Ref. Dwgs. A605-40161-292 & 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 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.

6. SUCTION HEADER - (Ref. Dwgs. A605-40163-292, A605-40164-292, A605-40165-292 & A605-42301-292)

Place gaskets between manifold, suction header and suction header sections and bolt together.

Attach truss rods and sway bracing to suction header and drive cage.

Place counterweight on suction header.

7. TRUSS ARM - (Ref. Dwgs. A605-35022-292 & A605-38957-292)

Bolt truss arms to the sludge manifold.

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

Bolt the flights to the truss arm.

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

8. BRIDGE - (Ref. Dwgs. D605-70593-292, A605-38948-292, A605-38950-292, A605-38949-292, A605-48227-292, A605-53926-292, Grating Manufacturer' s Erection Diagram & Handrail Manufacturer' s Erection Diagrams.)

Securely bolt side platforms to bridge.

Place bridge slide plates over anchor bolts at wall and shim to proper elevation.

Lower access bridge into position onto internal gear housing and tank wall and secure in place.

Install grating.

Assemble handrailing to bridge.

9. WEIR PLATES - (MFG Dwg. 5523-1, Rev. 2)

Install weir plates per manufacturer' s drawing.

10. SCUM TROUGH - (Ref. Dwgs. C205-71001-200 & C605-70108-292)

Bolt scum trough securely to the tank wall.

Bolt scum trough support angles to tank wall and scum trough, making sure scum trough is level before tightening fasteners.

Install flushing gate.

Connect scum pipe to scum trough.

11. SCUM BAFFLES - (MFG Dwg. 5523-1, Rev. 2)

Install scum baffles per Manufacturer' s drawing.

12. SKIMMER ASSEMBLY - (Ref. Dwgs. D205-62171-201, A605-40161-292, A605-50019-292, A605-43990-292 & C605-70108-292)

Attach pre-assembled skimmer mechanism to skimmer boom.

Attach skimmer support to truss arm as shown on erection drawings. Plumb skimmer support and secure to truss arm.

12. SKIMMER ASSEMBLY - (Continued)

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

Rotate mechanism to bring skimmer blade over the ramp. Adjust skimmer assembly to bring skimmer blade on radial line with the scum box opening.

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

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

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

Be sure the skimmer blade rides 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.

13. 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. Use only the suction arm during the leveling process. SEE SEPARATE "LEVELING INSTRUCTIONS" PROVIDED IN THIS SECTION.

Level influent well.

Grout beneath sludge manifold seal plate.

Level bridge and grout under bridge slide plates.

14. GROUTING TANK BOTTOM

Refer to separate "Floor Grouting Instructions" Provided in this Section.

The machine must be checked for clearance and everything in good working order before the floor is grouted. Carefully move the arm with the drive through several revolutions to make sure that the flights clear all obstructions.

14. GROUTING TANK BOTTOM - (Continued)

After the machine has been checked for clearances and it is found that there are no obstructions, the floor may be grouted. This is done with the arm used only as a guide. Do not attempt to spread grout with the clarifier arm.

CAUTION: Perform the above operation under close observation to prevent any unnecessary damage to the drive or equipment.

15. SQUEEGEES - (Ref. Dwgs. A605-35022-292, A605-38959-292 & A605-38962-292)

Clean the tank floor thoroughly and bolt the neoprene squeegees and retainers to the suction header finger tight.

Bolt the inside flight to the suction header and the sludge manifold. Bolt the inside squeegee and retainer to the inside flight finger tight.

Bolt the squeegees to the flights on the truss arm finger tight.

Rotate the arms to see that squeegee clears 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 MANIFOLD SEALS - (Ref. Dwgs. A605-38955-292 & A605-38956-292)

After final alignment of clarifier mechanism, install the upper and lower manifold seals.

17. NAMEPLATE - (Ref. Dwg. A605-48121-292)

Install nameplate on handrail as shown on above drawing.

18. 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.

19. 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 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:

Walker Process Equipment
A Division of McNish Corporation
840 North Russell Avenue
Aurora, Illinois 60506

Phone: (630) 892-7921
Fax: (630) 892-7951
e-mail: walker.process@walker-process.com

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.

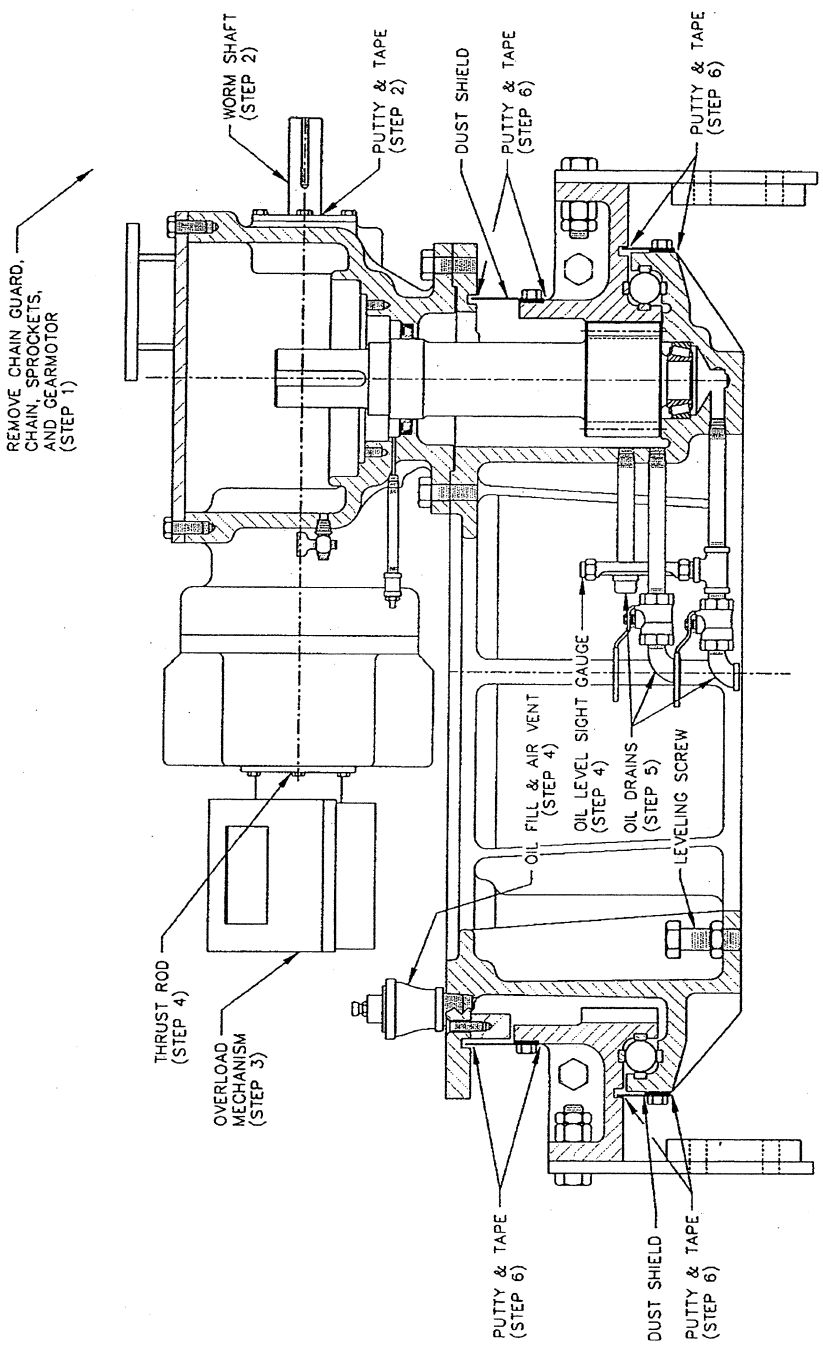
After blast cleaning, remove the tape and putty from the worm shaft, thrust rod and dust shields. Solvent clean the surfaces which have been puttied before painting the surface. Duct tape can remain on the other protected areas until painting has been completed.

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



"RSMTP" 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.

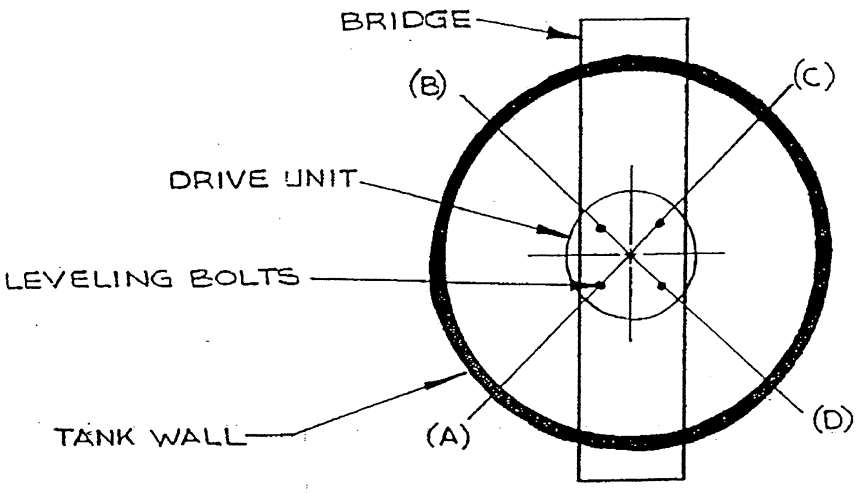
The clarifier must be completely assembled (skimmer, skimmer blade, scraper blades (if any), counterweight, arm squeegees, etc.) for balancing purposes.

ALWAYS USE ONLY THE SUCTION ARM DURING THE LEVELING PROCESS.
Setting the opposite 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).



"RSMTP" CIRCULAR CLARIFIERS

LEVELING INSTRUCTIONS

LEVELING STEP #2

Move the suction 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 suction 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 the suction 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 suction arm on MARK (A), you lower the suction 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 suction 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.

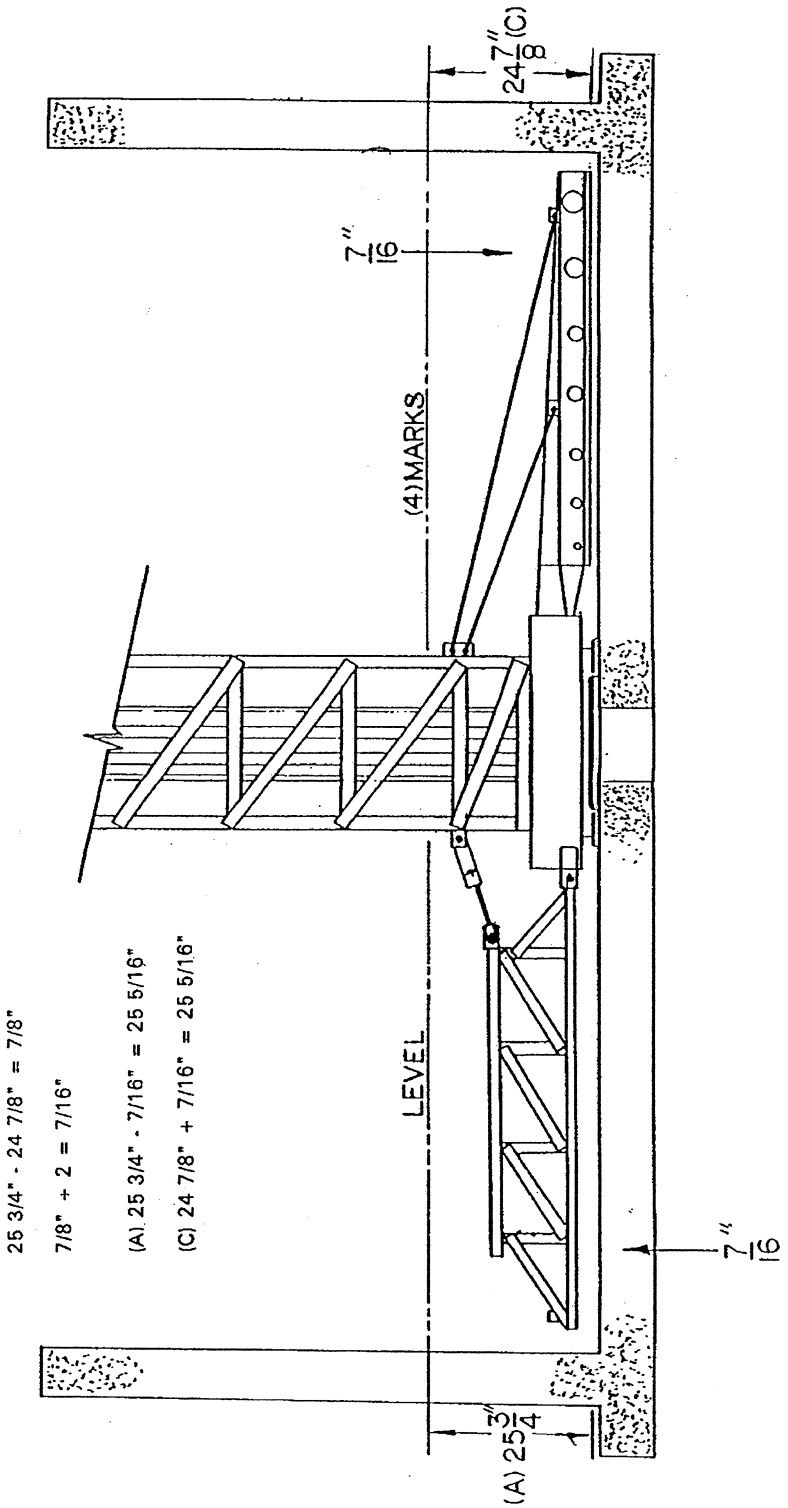
Move the same suction arm to MARK (B) and repeat this same leveling procedure.

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

(See Sketch Next Page)

"RSMTP" CIRCULAR CLARIFIERS

LEVELING INSTRUCTIONS



"RSMTP" 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).

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.

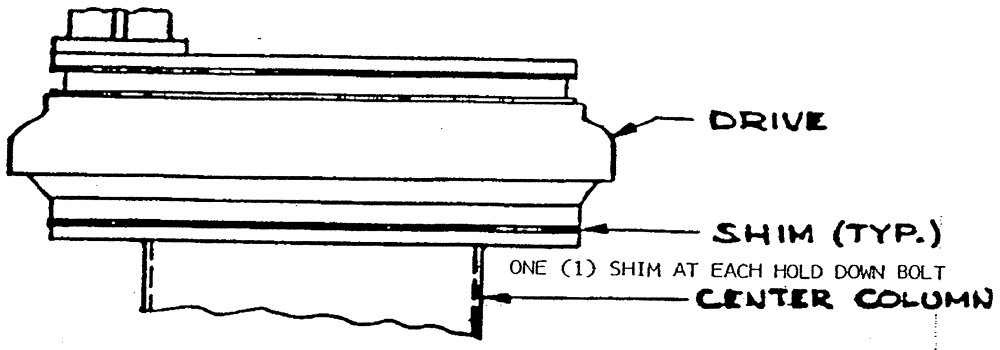
LEVELING STEP #5

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 suction/scraper arms should be set to the correct slop as found on the General Arrangement Drawing.



"RSMTP" CIRCULAR CLARIFIERS

LEVELING INSTRUCTIONS

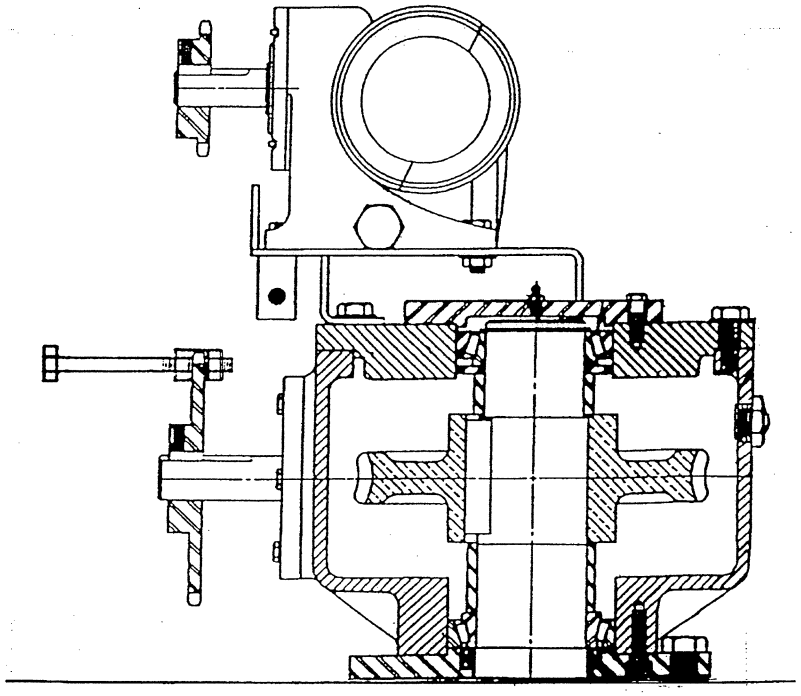
HAND OPERATION OF THE CLARIFIER

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 and grouting processes. Listed below are instructions to convert the clarifier into hand operation.

1) Remove drive chain cover.

2) Remove chain from drive and driven sprockets.

3) Place a 1/2" x 6" long bolt with two (2) nuts and washers between the gear teeth on the drive sprocket and tighten the nuts. This makes a handle sufficient enough to turn the clarifier mechanism.



MODEL "RSMTP" CIRCULAR CLARIFIERS

FLOOR GROUTING INSTRUCTIONS

PRE-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.

GROUTING INSTRUCTIONS:

1. Screed boards shall be fastened to the suction header by the following method. See suggested screed board mounting arrangement shown on Pages 3, 4 & 5 of this instruction.

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

   All material required for screeding not furnished by **WALKER PROCESS.**

2. Knock off all high spots that may exist on rough floor.

3. Broom tank bottom clean, or clean with a strong jet of water.

4. Wet down tank bottom.

5. Use a grout with sufficient slump to spread evenly and easily.

6. Spread grout in front of one screed at a time. Starting at center of tank.

7. Have sufficient manpower to keep grout from piling up in front of screed.

8. 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 very fine spray of water from a hose. The metal covered screed will do a good job of troweling.

9. As soon as a man can get on the grout with knee boards, the outside edge and center of tank can be hand finished.

MODEL "RSMTP" CIRCULAR CLARIFIERS

FLOOR GROUTING INSTRUCTIONS

GROUTING INSTRUCTIONS: - (Continued)

IMPORTANT NOTES:

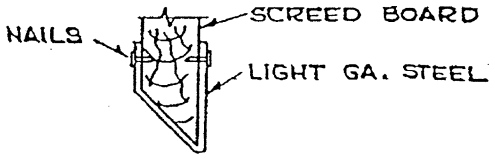
1. **IMPORTANT** - Dimension from bottom of screed board to rough concrete floor should be distance Engineer specified as grouting thickness. This dimension is also shown on WALKER PROCESS drawings.

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

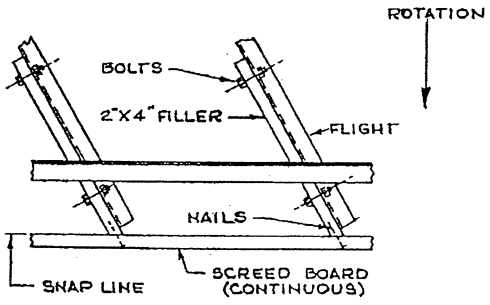
3. Watch second arm. Do not allow excess grout pile up in front of its screed board.

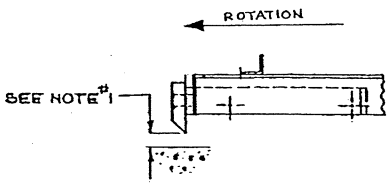
4. Care must be taken to prevent any weight from being applied to arm during placement of grout.

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.



TRUSS ARM SCREED BOARD



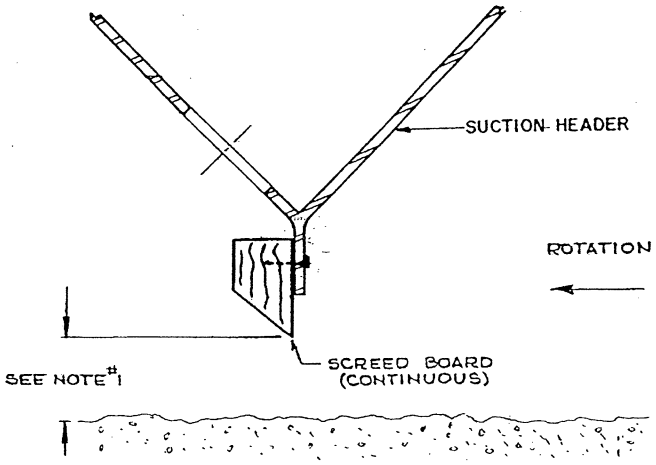


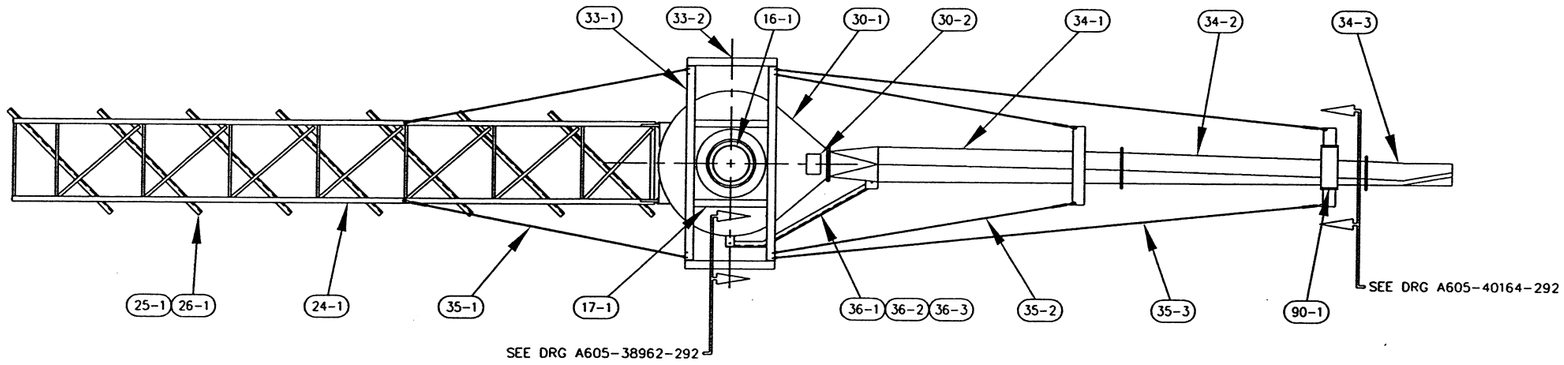
MODEL "RSMTP" CIRCULAR CLARIFIERS

FLOOR GROUTING INSTRUCTIONS

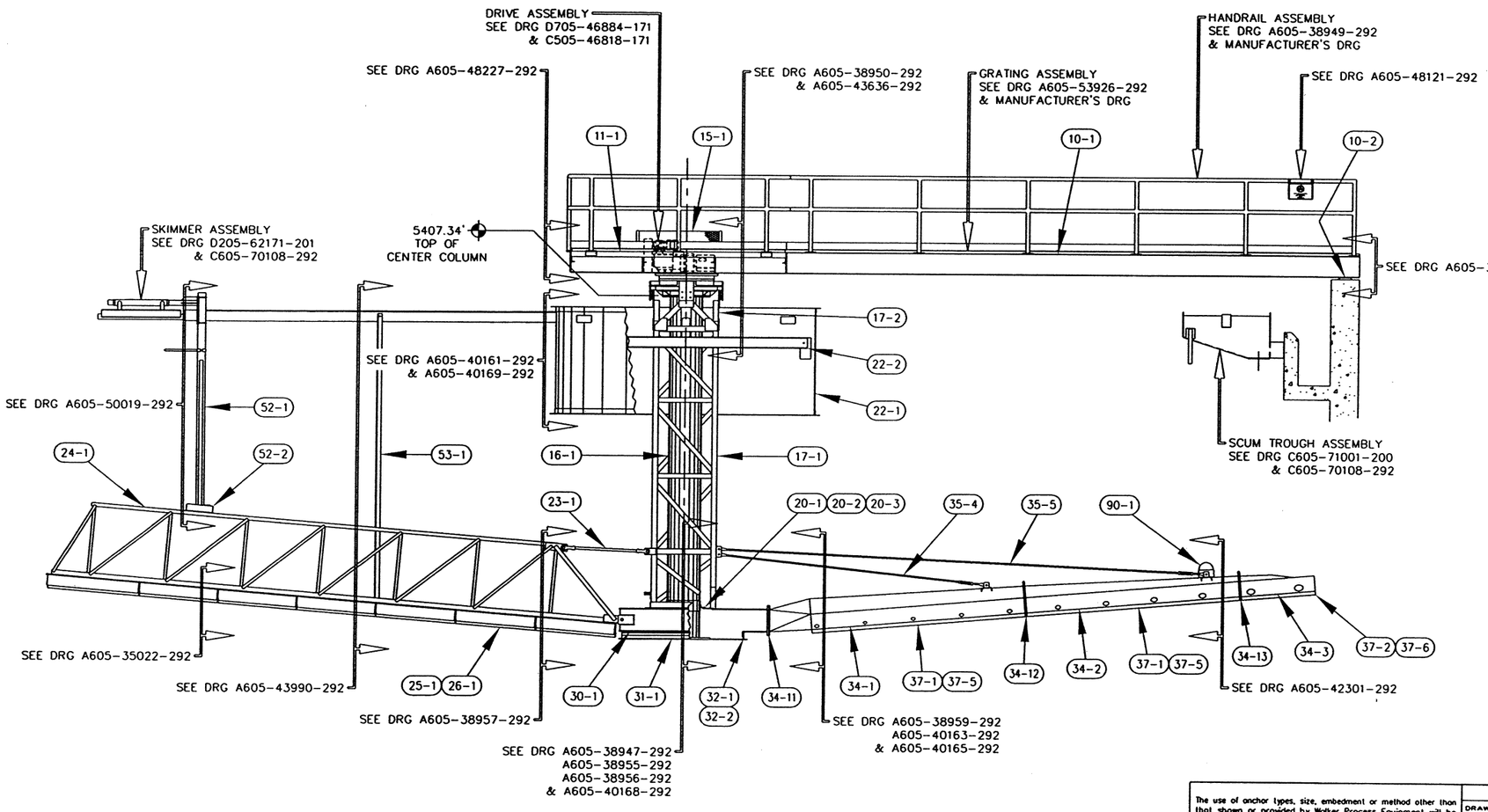
SUCTION ARM SCREED BOARD

Utilizing holes for mounting squeegee to the suction header, fasten 2" x 3" screed board to the suction header with screws or bolts.





PARTIAL PLAN



SECTIONAL ELEVATION

REF	DESCRIPTION		QTY
10-1	BRIDGE		1
10-2	SLIDE PLATE		2
11-1	PLATFORM		2
15-1	DRIVE COVER		1
16-1	CENTER COLUMN		1
17-1	DRIVE CAGE		1
17-2	DRIVE CAGE HANGER		4
20-1	CENTER COLUMN SEAL - 2 HALVES		1
20-2	MOUNTING RING - 2 SECTIONS		1
20-3	BACKING RING - 4 SECTIONS		1
22-1	INFLUENT WELL - 2 SECTIONS		1
22-2	INFLUENT WELL SUPPORT		2
23-1	CLEVIS ROD		2
24-1	TRUSS ARM		1
25-1	FLIGHT		7
26-1	SQUEEGEE		7
30-1	SLUDGE MANIFOLD		1
30-2	COVER		1
31-1	SEAL PLATE		1
32-1	MANIFOLD LOWER SEAL		1
32-2	SEAL CLAMP - 2 SECTIONS		1
33-1	OUTRIGGER		2
33-2	OUTRIGGER BRACE		2
34-1	SUCTION HEADER - SECTION 'A'		1
34-2	SUCTION HEADER - SECTION 'B'		1
34-3	SUCTION HEADER - SECTION 'C'		1
34-11	GASKET - 'A'		1
34-12	GASKET - 'B'		1
34-13	GASKET - 'C'		1
35-1	TRUSS ROD - 1/2" DIA X 11'-9" C-C		2
35-2	TRUSS ROD - 1/2" DIA X 12'-4 1/2" C-C		2
35-3	TRUSS ROD - 1/2" DIA X 22'-6 1/2" C-C		2
35-4	TRUSS ROD - 3/4" DIA X 12'-6 1/2" C-C		2
35-5	TRUSS ROD - 3/4" DIA X 22'-8 1/2" C-C		2
36-1	INSIDE FLIGHT		1
36-2	INSIDE SQUEEGEE		1
36-3	SQUEEGEE RETAINER		1
37-1	SUCTION HEADER SQUEEGEE - LONG		2
37-2	SUCTION HEADER SQUEEGEE - SHORT		1
37-5	SQUEEGEE RETAINER - LONG		2
37-6	SQUEEGEE RETAINER - SHORT		1
52-1	SKIMMER SUPPORT		1
52-2	MOUNTING ANGLE		2
53-1	SCUM DEFLECTOR SUPPORT ANGLE		1
90-1	COUNTERWEIGHT		1

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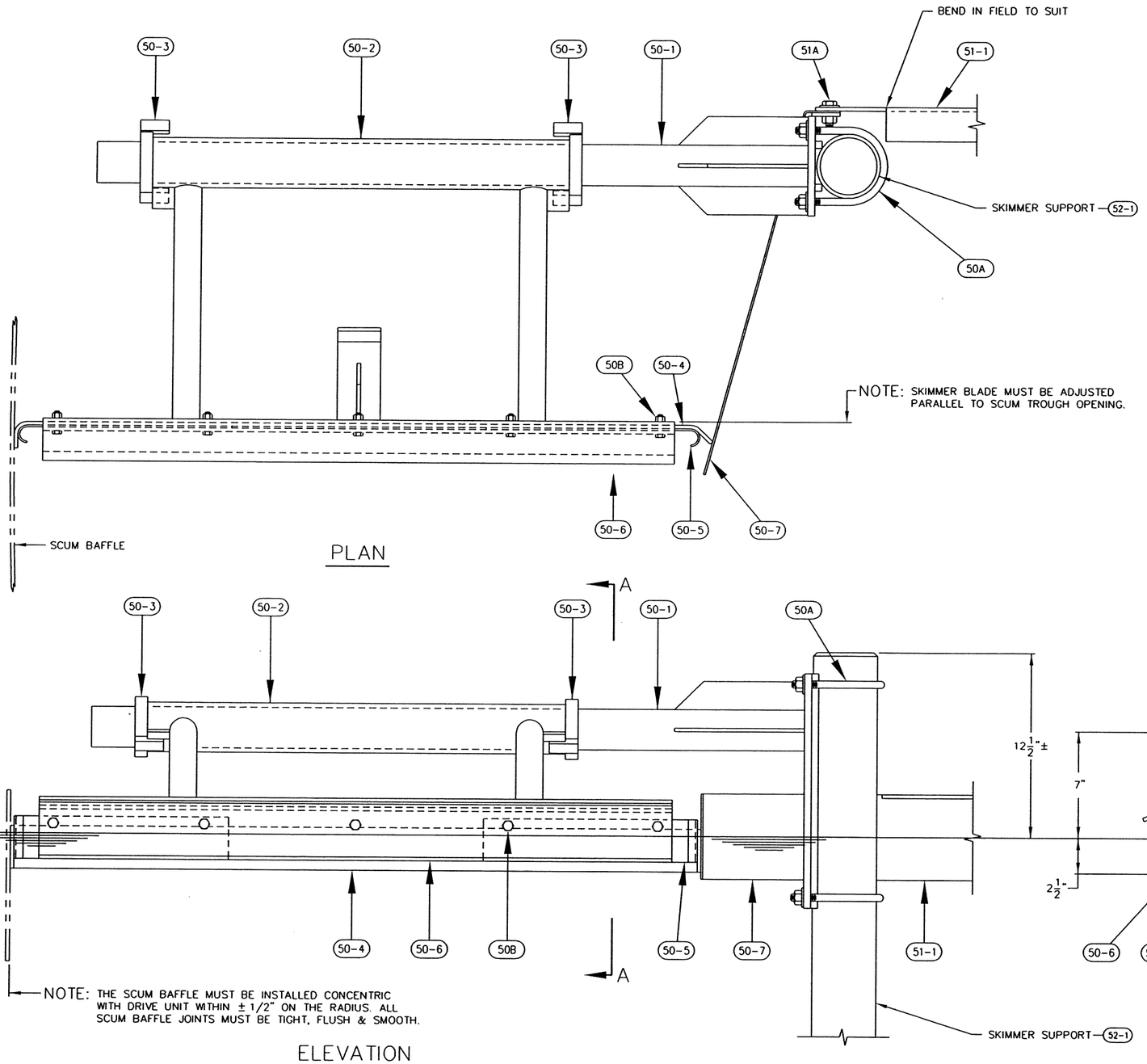
SECONDARY CLARIFIERS
No. 1 & No. 2

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

GENERAL ASSEMBLY
60'-0" DIA CLARIFIER - TYPE 'RSMTP'
FOUNTAIN, COLORADO

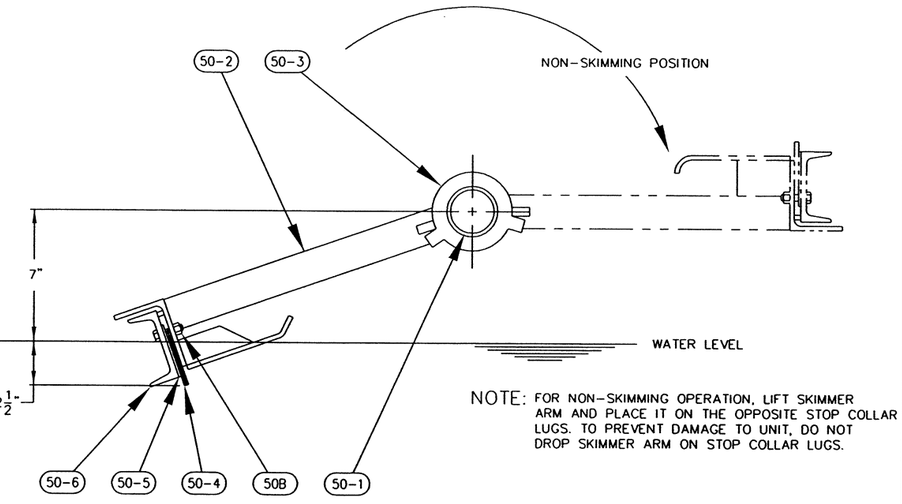
CONTRACT Q10600A
DRAWING NO. D,6,0,5|7,0,5,9,3|2,9,2
REV.

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 CHANNEL		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

ELEVATION



SECTION A-A

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The use of anchor types, size, embedment or method other than that shown or provided by Walker Process Equipment will be done at the contractor's risk.

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APPR.		

SCALE NONE

FILE REFERENCE

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

ERECTION DIAGRAM
HALF BRIDGE SKIMMER - 4'-0"

CONTRACT STD

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

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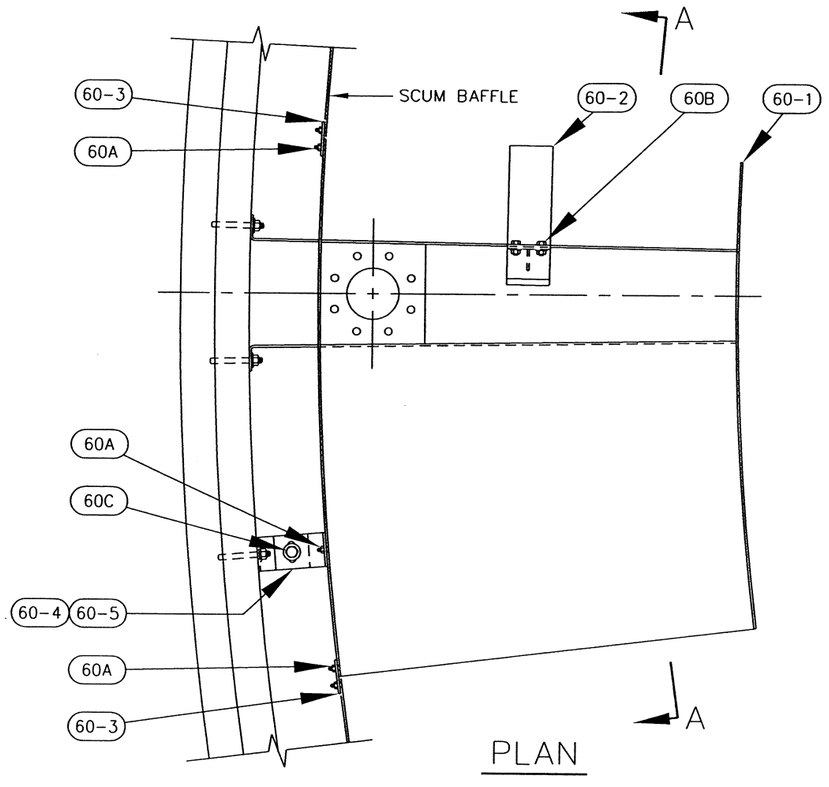

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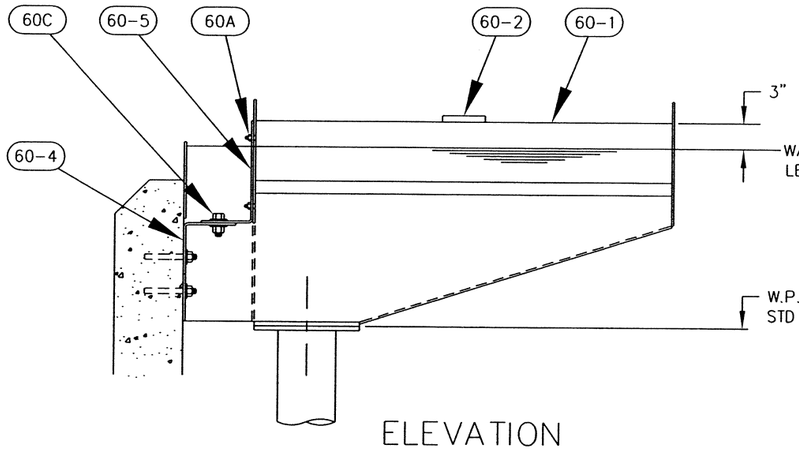
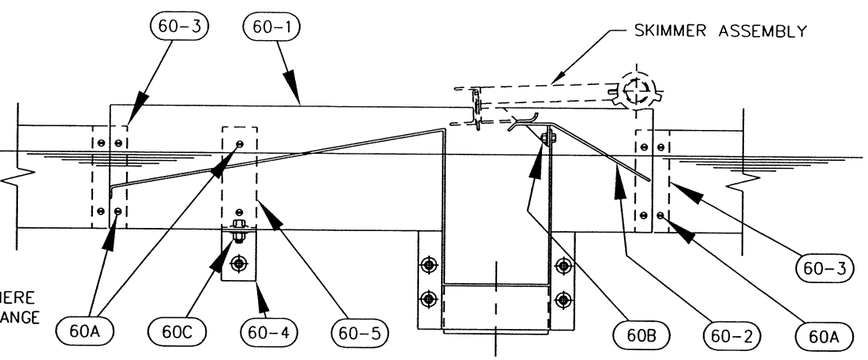


ELEVATION



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		2
	WASHER 3/4" STD		2

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

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The use of anchor types, size, embedment or method other than that shown or provided by Walker Process Equipment will be done at the contractor's risk.

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DRAWN	7-27-11	RES
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SCALE NONE

FILE REFERENCE

WALKER PROCESS EQUIPMENT

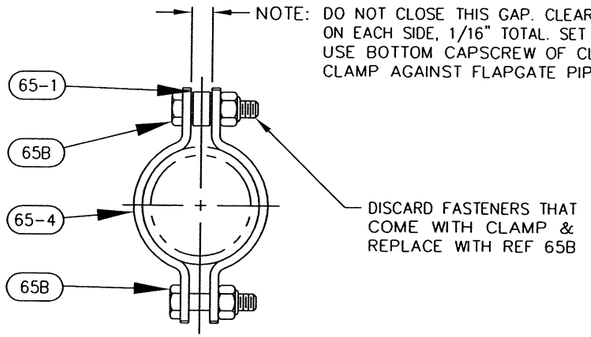
Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

ERECTION DIAGRAM
SCUM TROUGH
2'-0", 3'-0" & 4'-0"

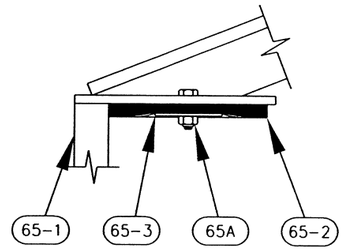
CONTRACT STD

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

REV.

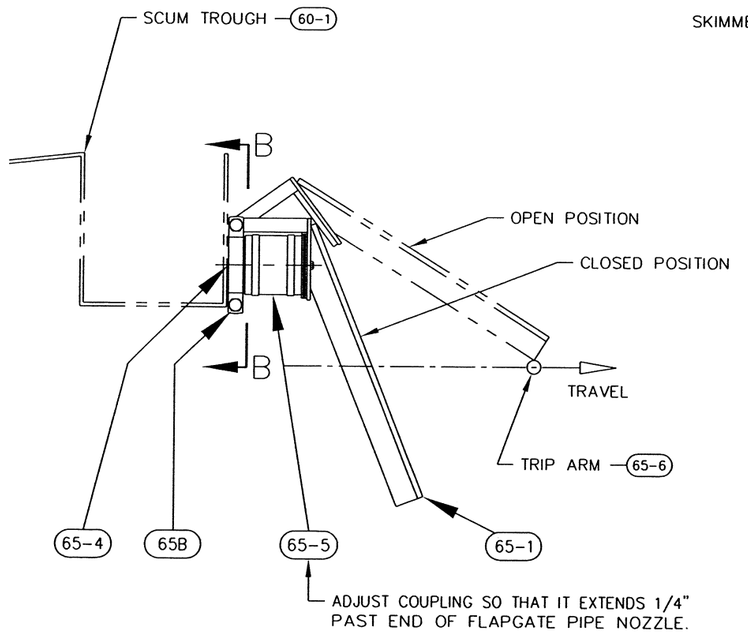


SECTION B–B

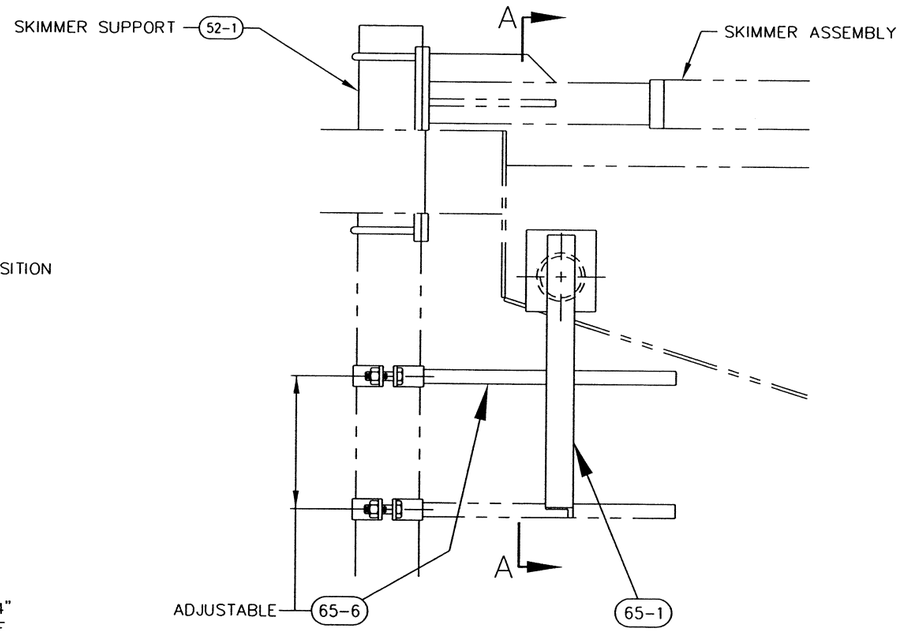


FLAP GATE ASSEMBLY

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



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MASTER C-70108

CAD FILE: C70108

The use of anchor types, size, embedment or method other than that shown or provided by Walker Process Equipment will be done at the contractor's risk.

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	DATE	BY
DRAWN	1-11-11	RES
CHECKED		
APPR.		
SCALE	NONE	
FILE REFERENCE		

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

ERECTION DIAGRAM
SCUM TROUGH FLUSHING GATE

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

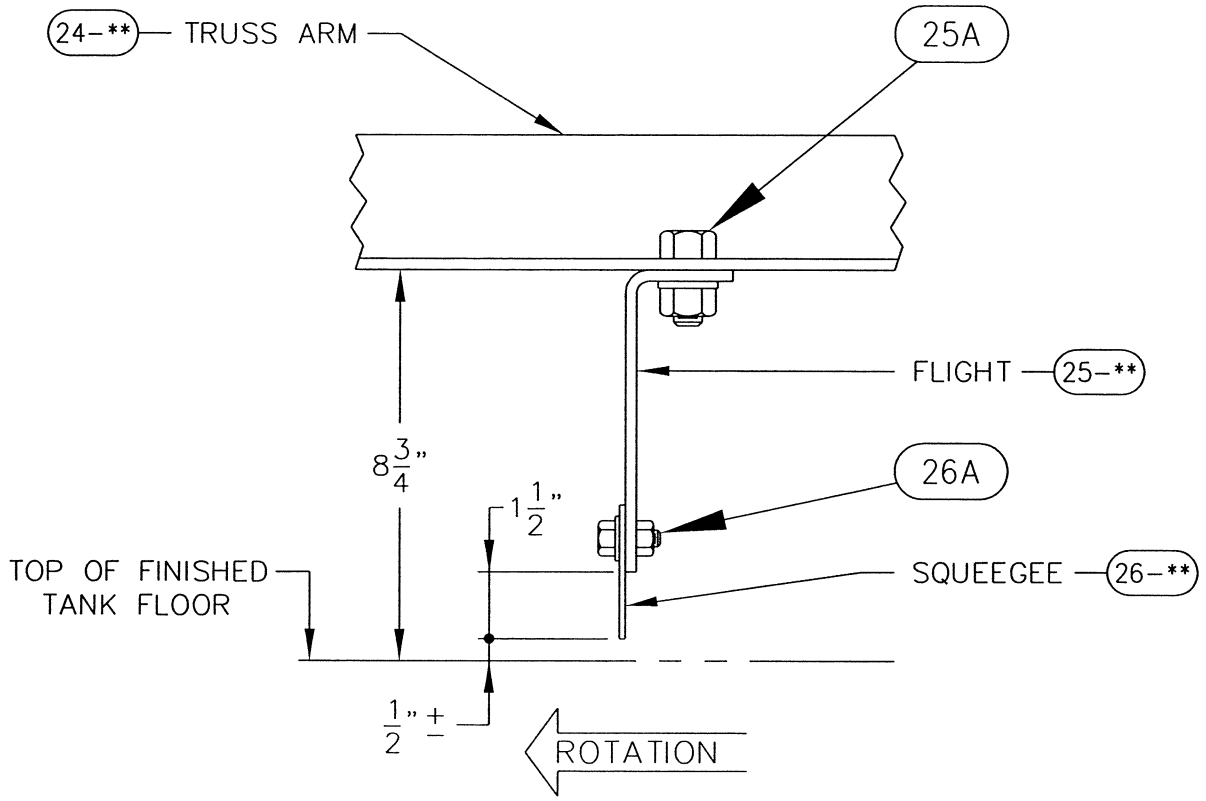
ERECTION DIAGRAMS

(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

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-35022

WALKER PROCESS EQUIPMENT

DRAWN	RES
CHECKED	
APP'D.	
DATE	12-5-91
S.O.	STD
SCALE	NONE

DESCRIPTION

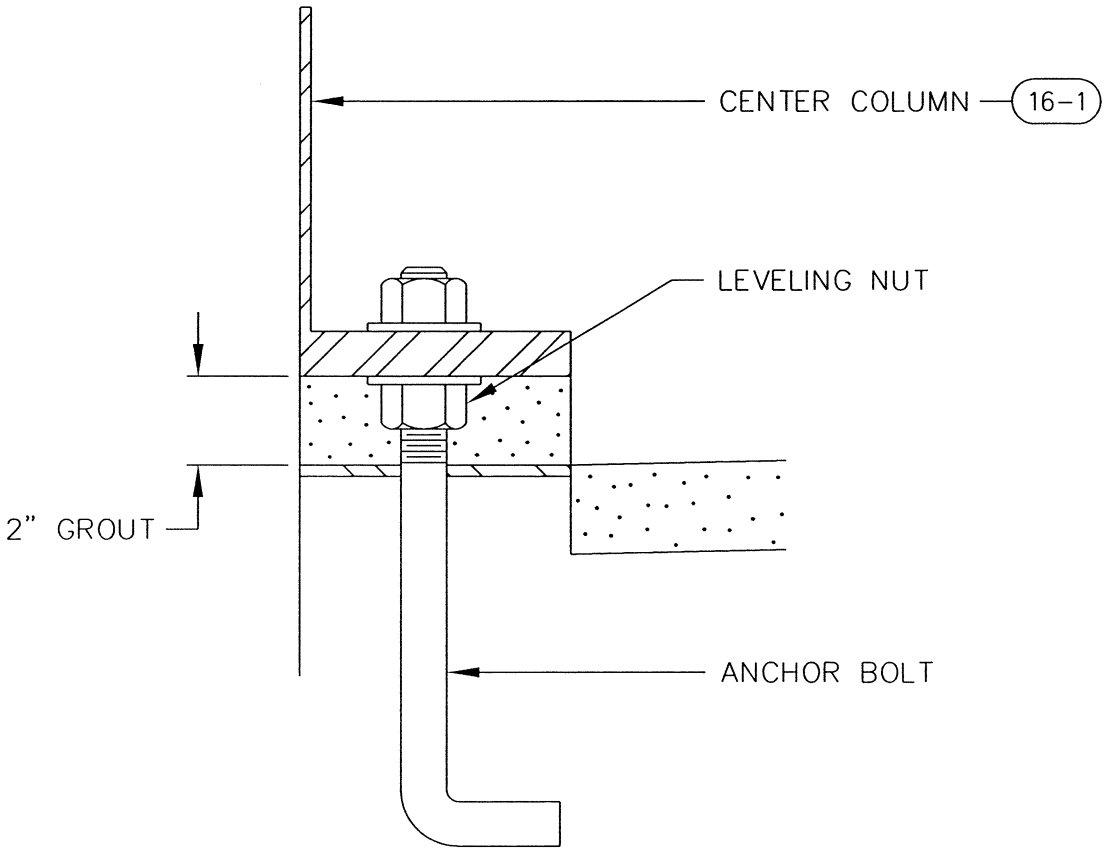
ERECTION DIAGRAM
FLIGHT & SQUEEGEE

DRAWING NO. A 6 0 5 3 5 0 2 2 2 9 2

REV.

CAD FILE: A35022

SYM	REVISION	BY	DATE	CHKD
A				



Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-38947

DRAWN	RES
CHECKED	
APP'D.	
DATE	8-26-91
S.O.	STD
SCALE	NONE

DESCRIPTION

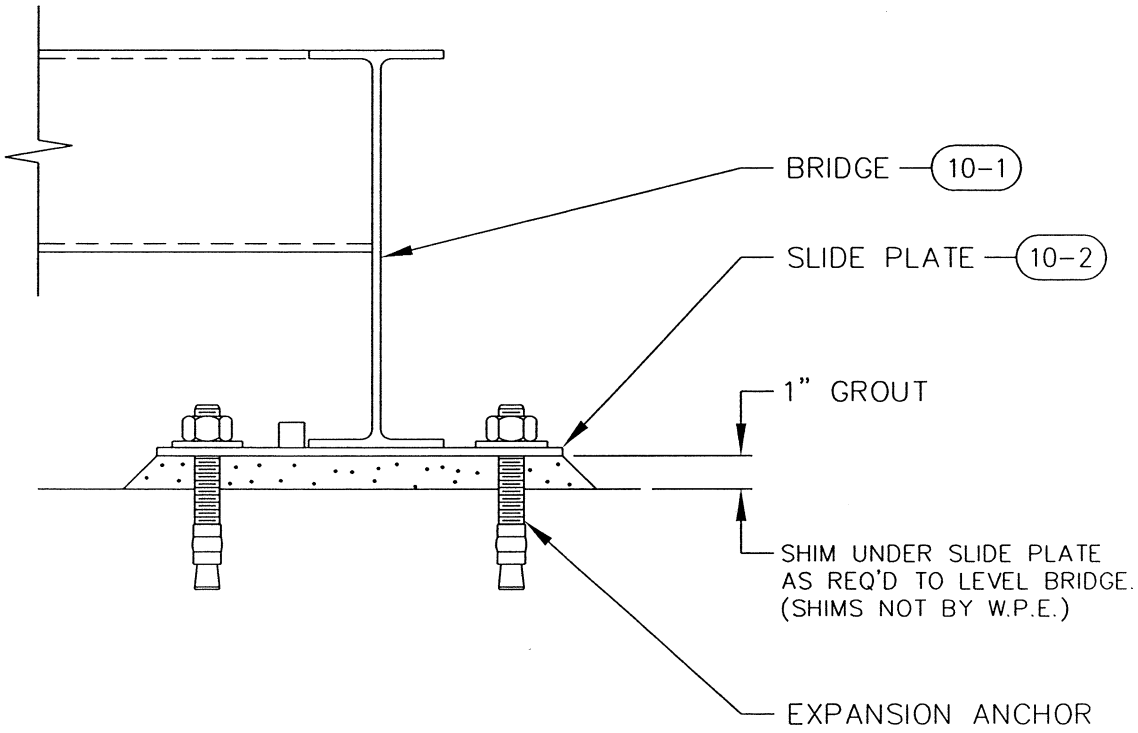
ERECTION DIAGRAM
CENTER COLUMN MOUNTING

DRAWING NO. A 6 0 5 3 8 9 4 7 2 9 2

REV.

CAD FILE: A38947

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.

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

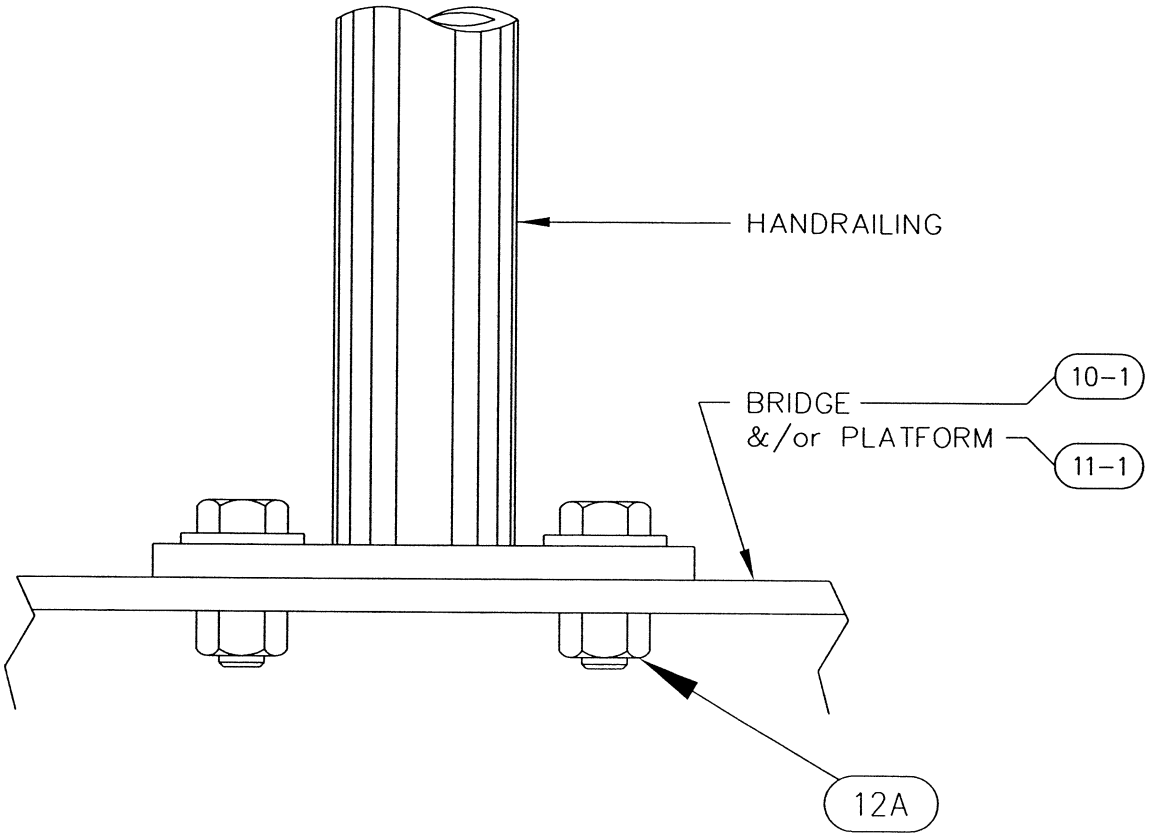
MASTER
A-38948

DRAWN RES	DESCRIPTION
CHECKED	ERECTION DIAGRAM BRIDGE MOUNTING – SLIDE PLATE
APP'D.	
DATE 4-16-93	
S.O. STD	DRAWING NO. A 6 0 5 3 8 9 4 8 2 9 2
SCALE NONE	REV.

CAD FILE: A38948

10/10/2011 9:49:16 AM - myang - FOUNTAIN, CO Q10600A

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

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-38949

DRAWN	RES
CHECKED	
APP'D.	
DATE	2-24-78
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
HANDRAIL MOUNTING

DRAWING NO. A605|389492|92

REV.

CAD FILE: A38949

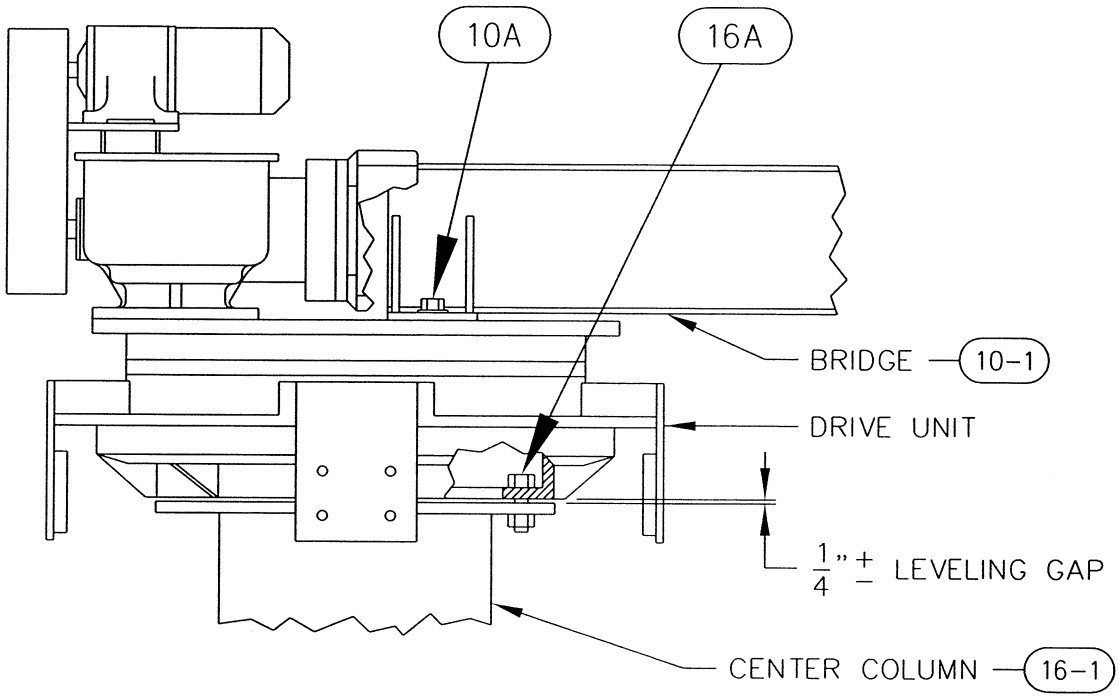
10/10/2011 9:49:19 AM - myang - FOUNTAIN, CO Q10600A

SYM	REVISION	BY	DATE	CHKD
A				

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 W.P.E.) AT EACH HOLD DOWN CAPSCREW (REF 16A) & TIGHTEN SAME. BACK OFF LEVELING CAPSCREWS.



REF	DESCRIPTION		QTY
16A	HEX NUT 7/8"-9NC		8
	CAPSCREW 7/8"-9NC X 3" LG		8
10A	WASHER 3/4" STD		2
	CAPSCREW 3/4"-10NC X 1 1/2" LG		2

DRIVE: 28 (A)
COL: UP TO 20"

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-38950

DRAWN	RES
CHECKED	
APP'D.	
DATE	9-23-92
S.O.	STD
SCALE	NONE

DESCRIPTION

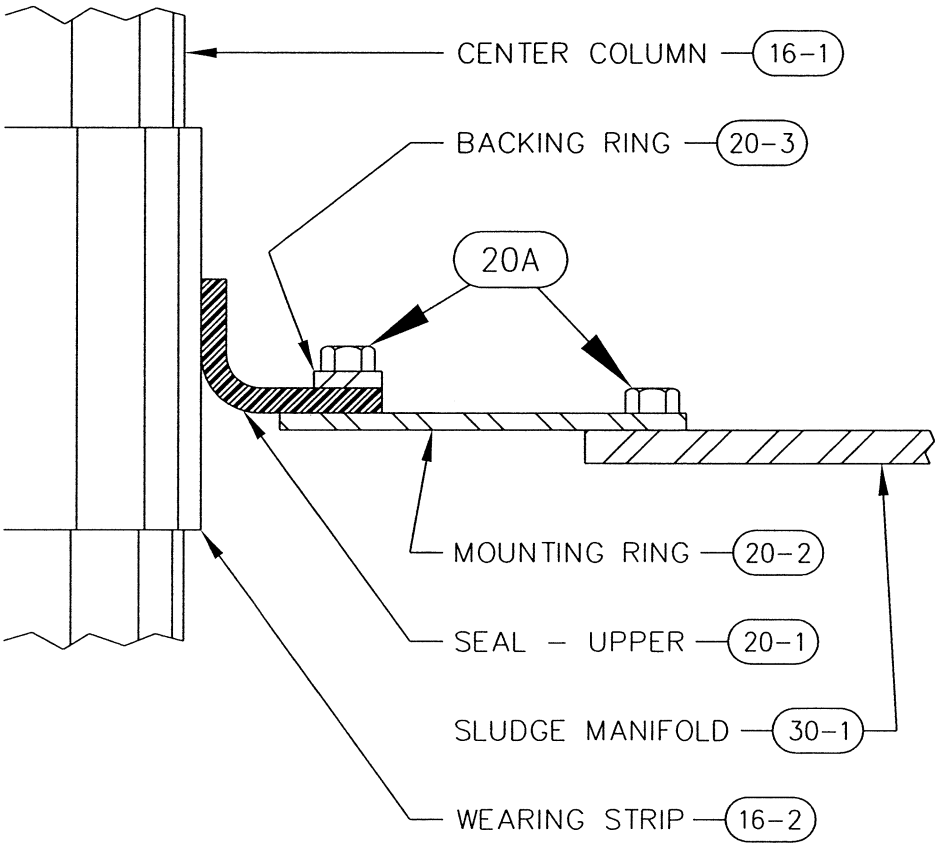
ERECTION DIAGRAM
DRIVE, COLUMN & BRIDGE

DRAWING NO. A605|38950|292

REV.

CAD FILE: A38950

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION		QTY
20A	CAPSCREW 3/8"-16NC X 1" LG		16

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-38955

WALKER PROCESS EQUIPMENT

DRAWN	RES
CHECKED	
APP'D.	
DATE	4-27-92
S.O.	STD
SCALE	NONE

DESCRIPTION

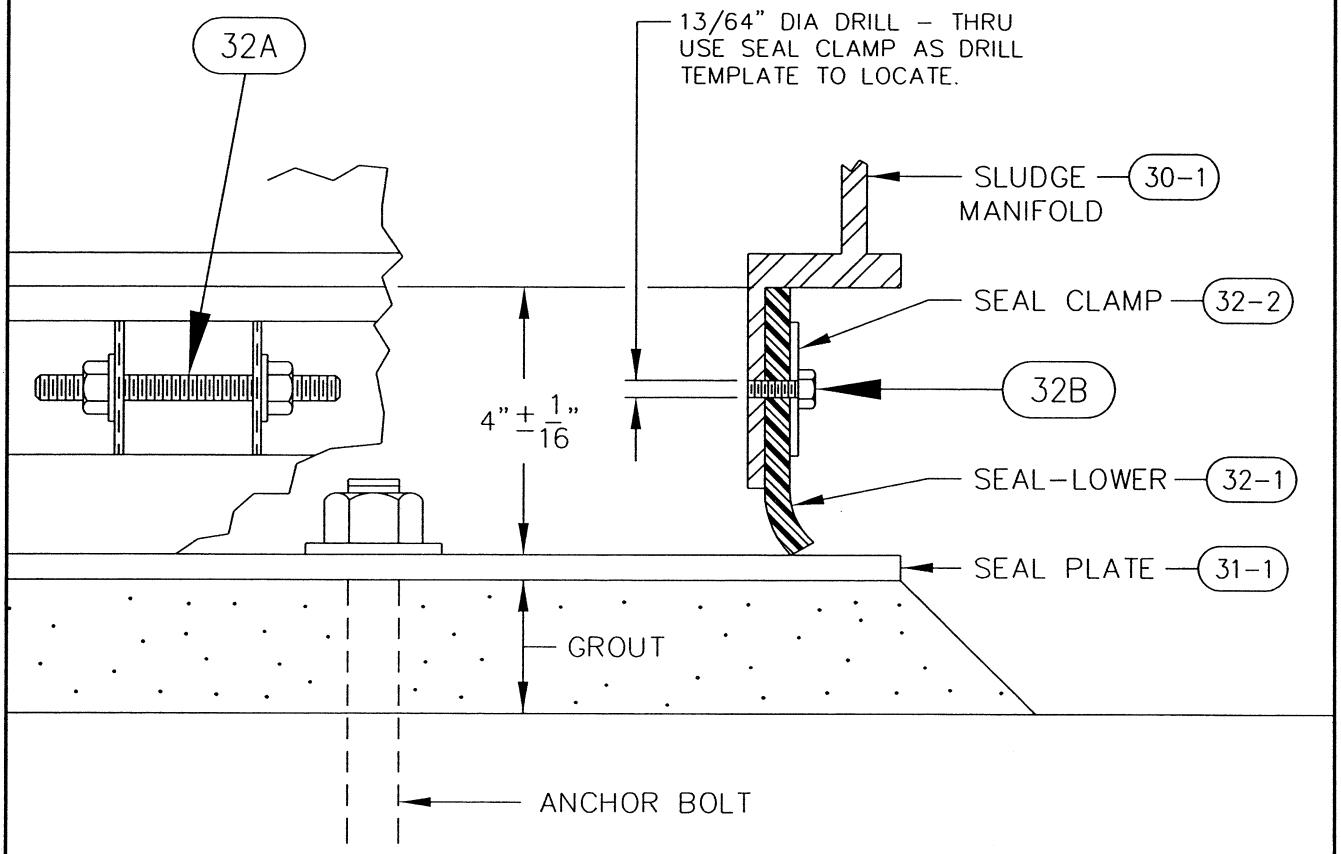
ERECTION DIAGRAM
SLUDGE MANIFOLD SEAL - UPPER

DRAWING NO. A 6 0 5 3 8 9 5 5 2 9 2

REV.

CAD FILE: A38955

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION		QTY
32B	SELF TAPPING CAPSCREW 1/4" X 1 1/4" LG		34
32A	WASHER 3/8" STD		4
	HEX NUT 3/8"-16NC		4
	THREADED ROD 3/8"-16NC X 4 1/2" LG		2

MANIFOLD: 6'-0"

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-38956

DRAWN	RES
CHECKED	
APP'D.	
DATE	4-28-92
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
SLUDGE MANIFOLD SEAL – LOWER

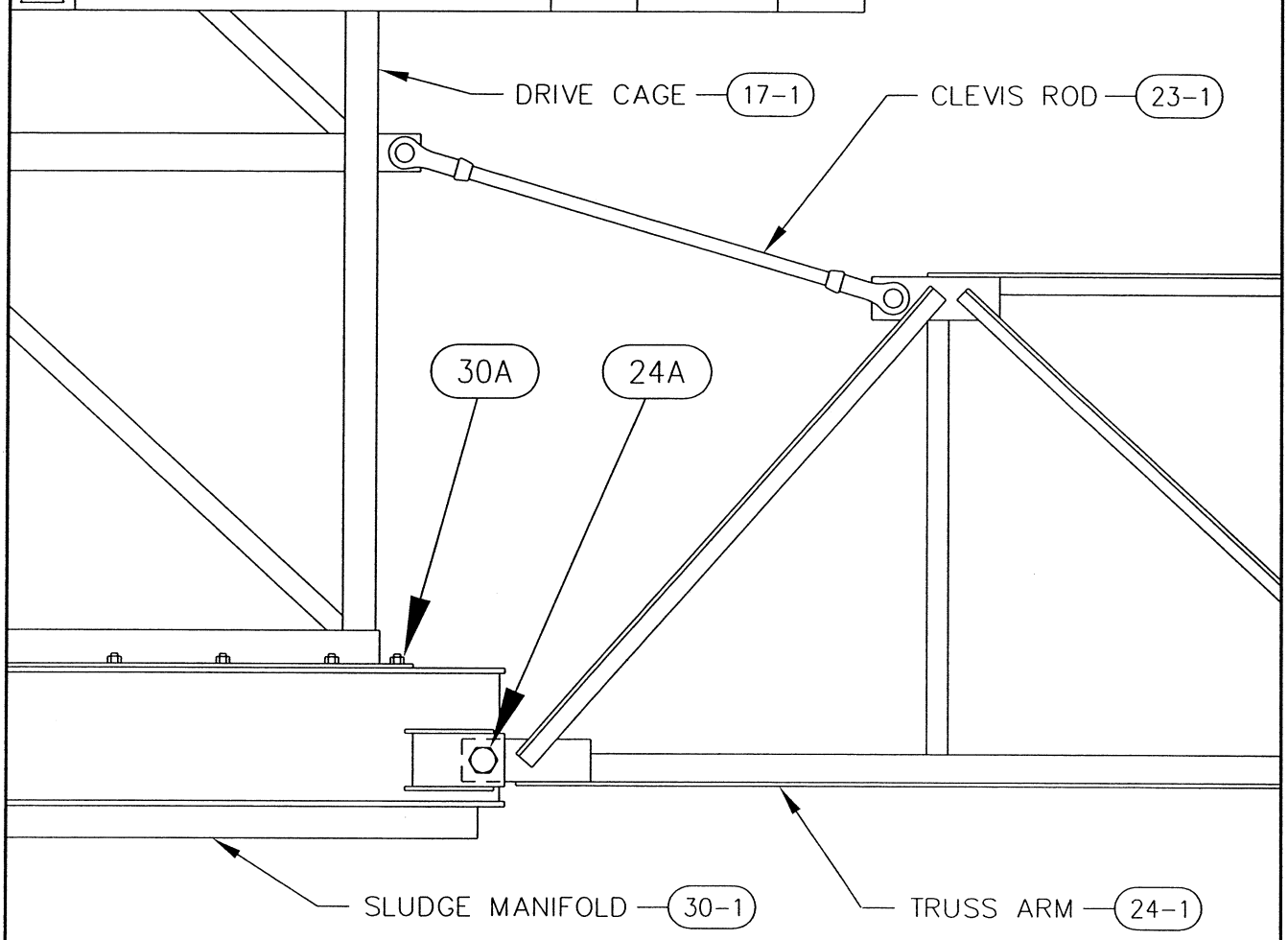
DRAWING NO. A 6 0 5 | 3 8 9 5 6 | 2 9 2

REV.

CAD FILE: A38956

10/10/2011 9:49:27 AM - myang - FOUNTAIN, CO Q10600A

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION		QTY
30A	HEX NUT 5/8"-11NC		20
24A	HEX NUT 1 1/2"-6NC		2
	CAPSCREW 1 1/2"-6NC X 4 1/2" LG		2

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-38957

DRAWN RES
CHECKED
APP'D.
DATE 8-28-92
S.O. STD
SCALE NONE

DESCRIPTION
ERECTION DIAGRAM
TRUSS ARM

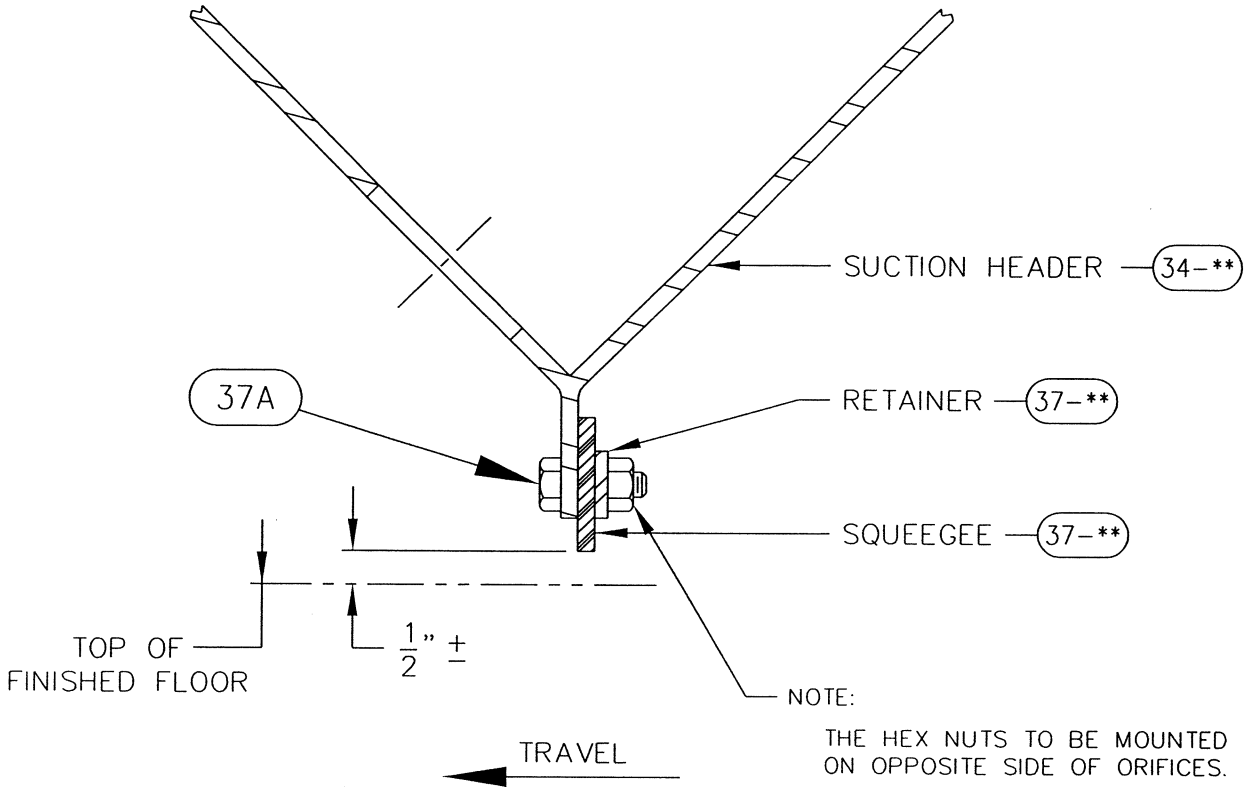
DRAWING NO. A 6 0 5 3 8 9 5 7 2 9 2

REV.

CAD FILE: A38957

10/10/2011 9:49:29 AM - myang - FOUNTAIN, CO Q10600A

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION		QTY
37A	HEX NUT 3/8"-16NC		AS REQD
	CAPSCREW 3/8"-16NC X 1 1/4" LG		AS REQD

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-38959

DRAWN	RES
CHECKED	
APP'D.	
DATE	4-5-84
S.O.	STD
SCALE	NONE

DESCRIPTION

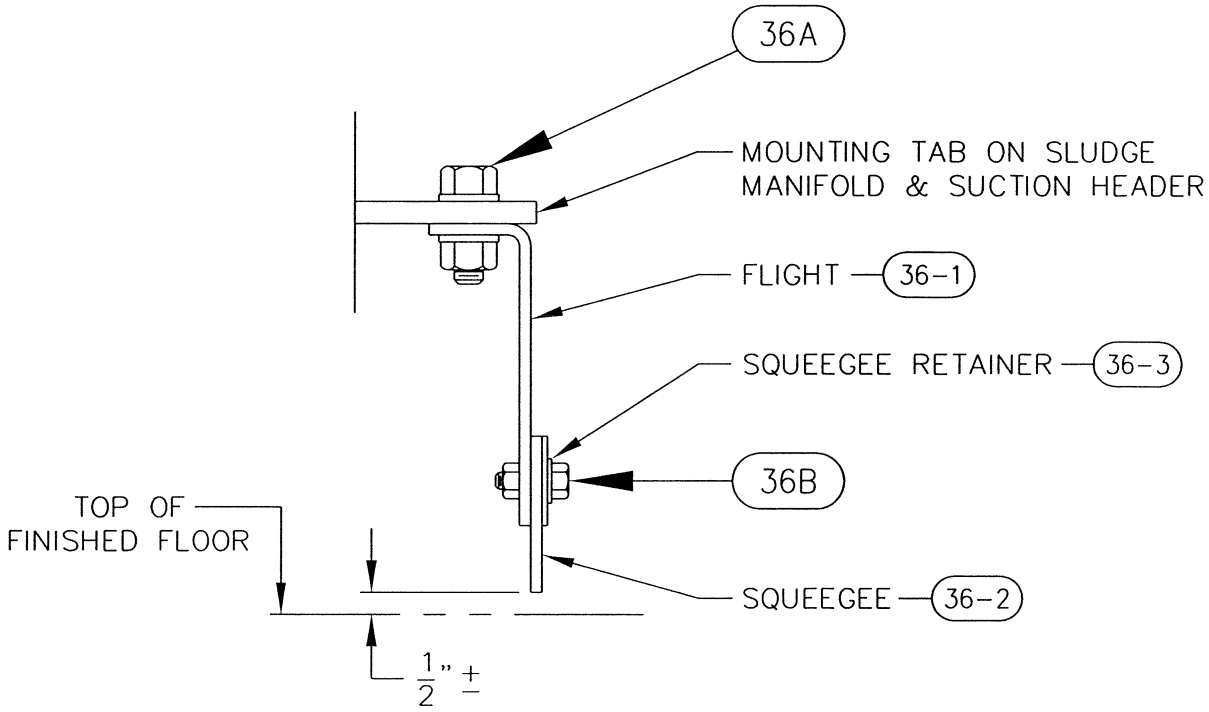
ERECTION DIAGRAM
SUCTION HEADER SQUEEGEE

DRAWING NO. A 6 0 5 3 8 9 5 9 2 9 2

REV.

CAD FILE: A38959

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION		QTY
36B	WASHER 3/8" STD		AS REQD
	HEX NUT 3/8"-16NC		AS REQD
	CAPSCREW 3/8"-16NC X 1 1/4" LG		AS REQD
36A	WASHER 5/8" (S.A.E.)		4
	HEX NUT 5/8"-11NC		2
	CAPSCREW 5/8"-11NC X 2" LG		2

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-38962

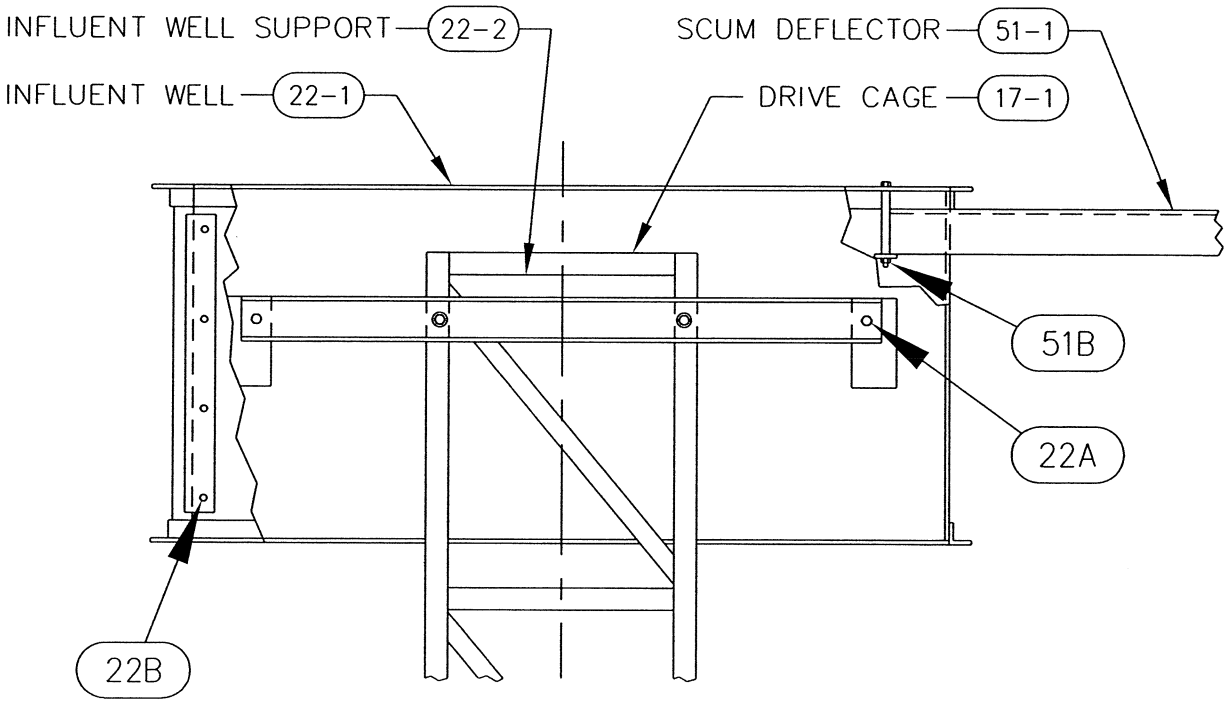
DRAWN RES
CHECKED
APP'D.
DATE 2-9-84
S.O. STD
SCALE NONE

DESCRIPTION
ERECTION DIAGRAM
FLIGHT & SQUEEGEE

DRAWING NO. A 6 0 5 3 8 9 6 2 2 9 2 REV.

CAD FILE: A38962

NOTE: MOUNT INFLUENT WELL SO THAT THE SCUM DEFLECTOR MOUNTING HOLES ARE ON THE SAME SIDE AS THE SKIMMER.



REF	DESCRIPTION		QTY
51B	HEX NUT 5/8"-11NC		1
	CAPSCREW 5/8"-11NC X 10" LG		1
22B	HEX NUT 1/2"-13NC		AS REQD
	CAPSCREW 1/2"-13NC X 1 1/4" LG		AS REQD
22A	WASHER 3/4" STD		8
	JAM NUT 3/4"-10NC		8
	HEX NUT 3/4"-10NC		8
	CAPSCREW 3/4"-10NC X 2 1/2" LG		8

WITH SKIMMER
8'-0" THRU 12'-0" DIA

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-40161

WALKER PROCESS EQUIPMENT

DRAWN	RES
CHECKED	
APP'D.	
DATE	11-15-94
S.O.	STD
SCALE	NONE

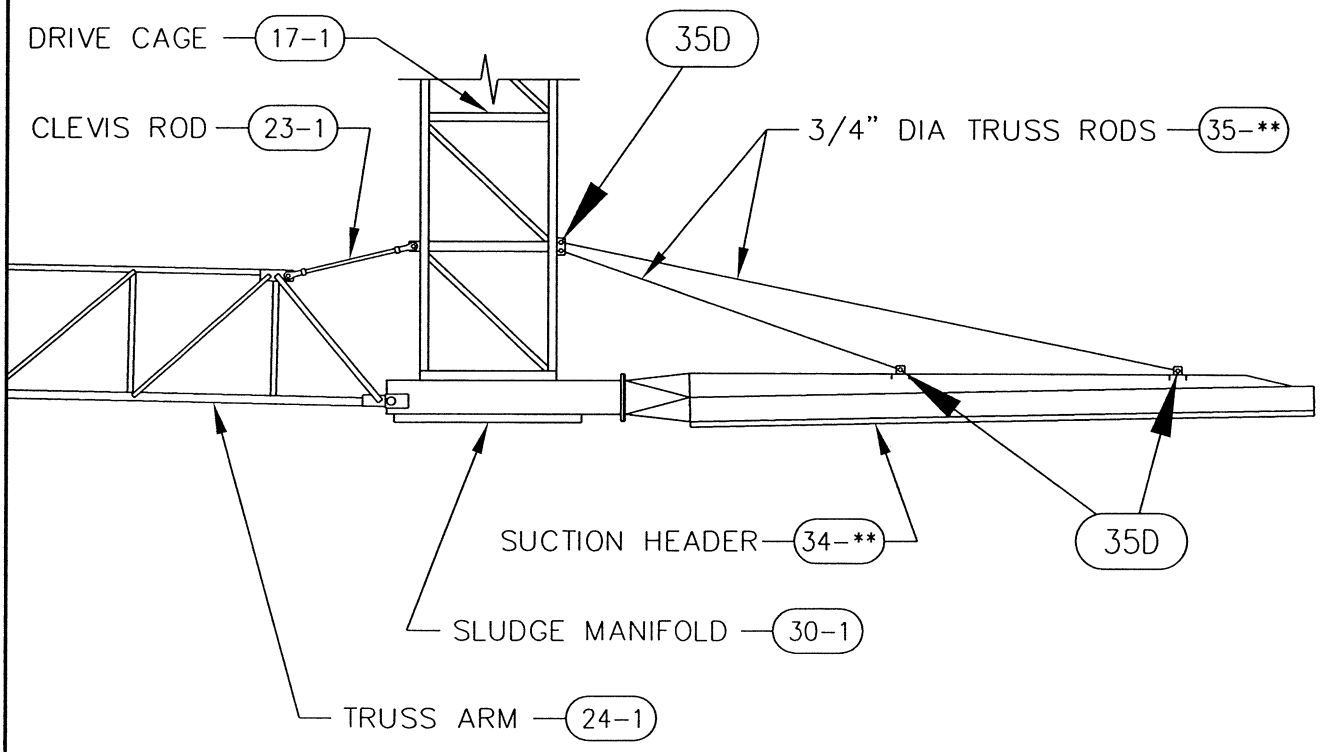
DESCRIPTION
ERECTION DIAGRAM
INFLUENT WELL

DRAWING NO. A60540161292 REV.

CAD FILE: A40161

10/10/2011 9:49:37 AM - myang - FOUNTAIN, CO Q10600A

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION		QTY
35D	HEX NUT 3/4"-10NC		8
	CAPSCREW 3/4"-10NC X 3" LG		8

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-40163

DRAWN RES
CHECKED
APP'D.
DATE 10-14-88
S.O. STD
SCALE NONE

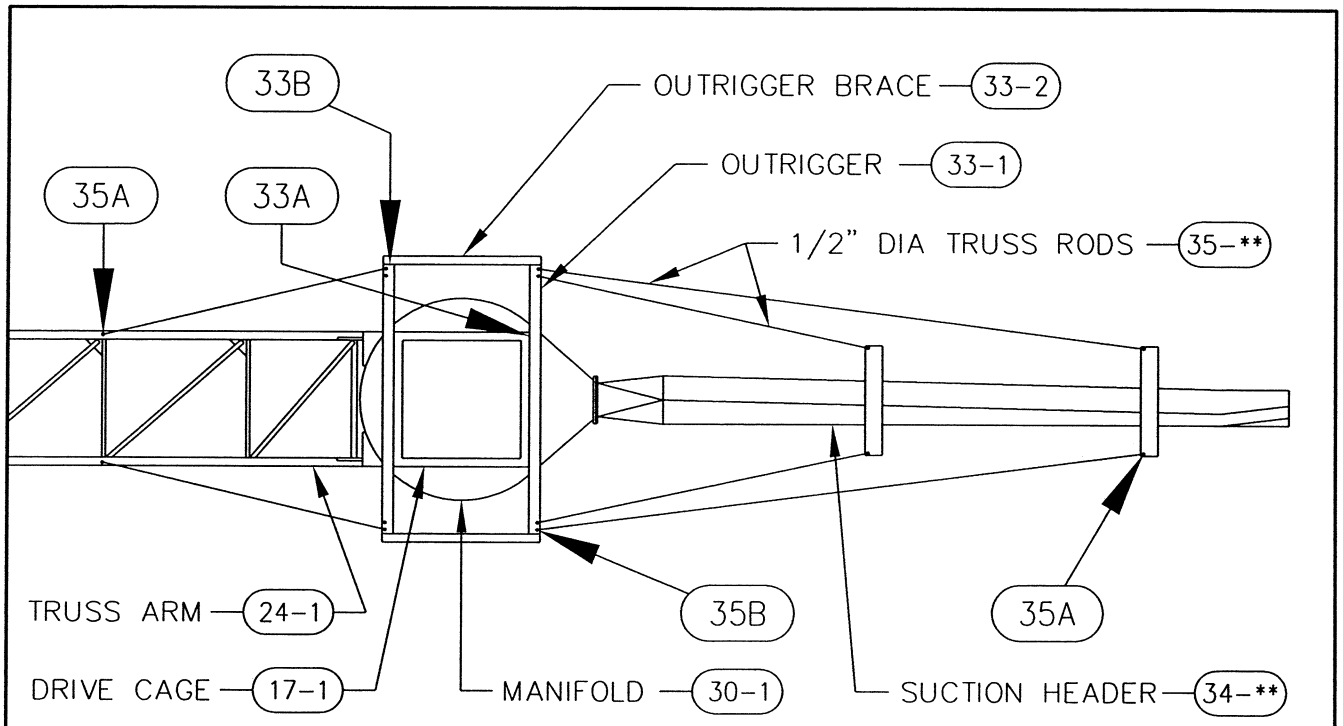
DESCRIPTION
ERECTION DIAGRAM
SUCTION HEADER SUPPORT RODS

DRAWING NO. A,6,0,5|4,0,1,6,3|2,9,2

REV.

CAD FILE: A40163

10/10/2011 9:49:39 AM - myang - FOUNTAIN, CO Q10600A



REF	DESCRIPTION		QTY
35B	HEX NUT 1/2"-13NC		6
	CAPSCREW 1/2"-13NC X 2" LG		6
35A	WASHER 1/2" STD		6
	HEX NUT 1/2"-13NC		6
	CAPSCREW 1/2"-13NC X 1 3/4" LG		6
33B	HEX NUT 3/4"-10NC		4
	CAPSCREW 3/4"-10NC X 1 3/4" LG		4
33A	WASHER 3/4" STD		4
	HEX NUT 3/4"-10NC		4
	CAPSCREW 3/4"-10NC X 1 3/4" LG		4

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-40164

DRAWN RES
CHECKED
APP'D.
DATE 11-16-94
S.O. STD
SCALE NONE

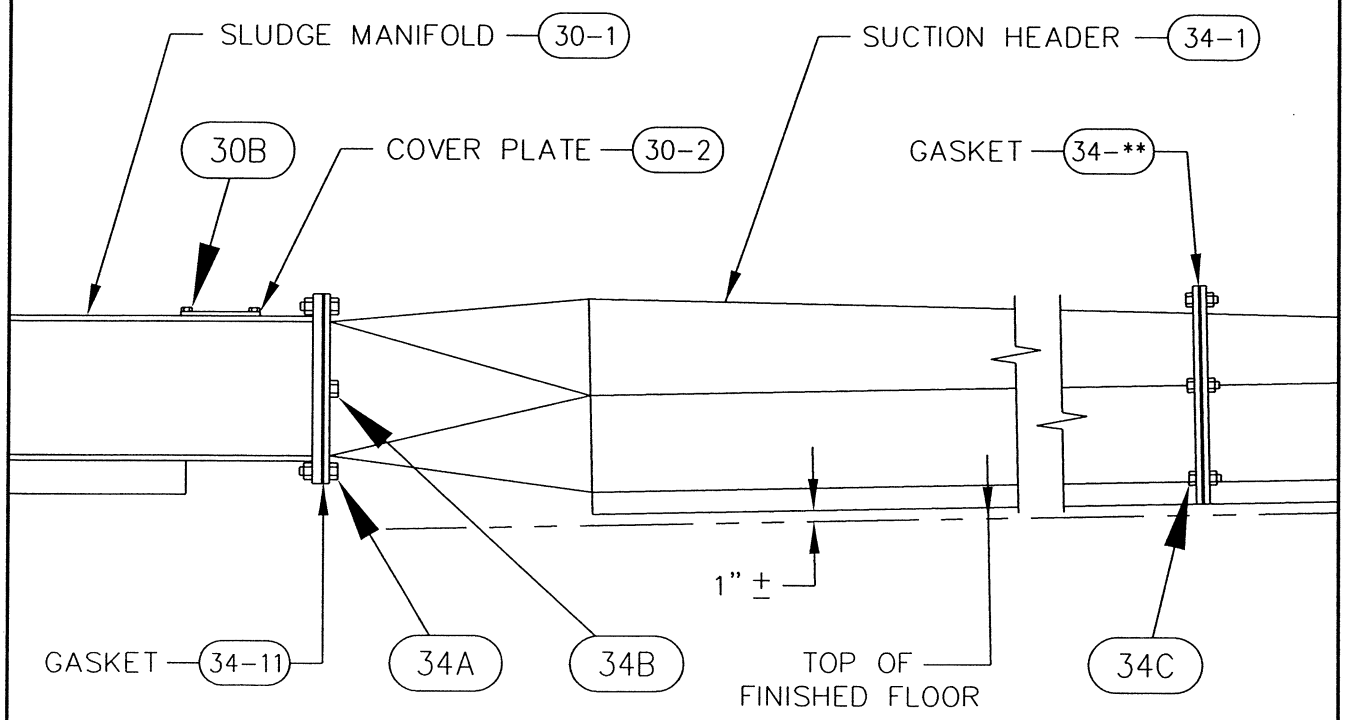
DESCRIPTION
ERECTION DIAGRAM
SUCTION HEADER SWAY BRACING

DRAWING NO. A605|40164|292
REV.

CAD FILE: A40164

10/10/2011 9:49:42 AM - myang - FOUNTAIN, CO Q10600A

SYM	REVISION	BY	DATE	CHKD
A				



REF	DESCRIPTION		QTY
34C	HEX NUT 5/8"-11NC		AS REQD
	CAPSCREW 5/8"-11NC X 2" LG		AS REQD
34B	CAPSCREW 3/4"-10NC X 1 1/2" LG		2
34A	HEX NUT 3/4"-10NC		6
	CAPSCREW 3/4"-10NC X 2 1/2" LG		6
30B	CAPSCREW 3/8"-16NC X 1" LG		6

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-40165

DRAWN RES
CHECKED
APP'D.
DATE 2-9-84
S.O. STD
SCALE NONE

DESCRIPTION

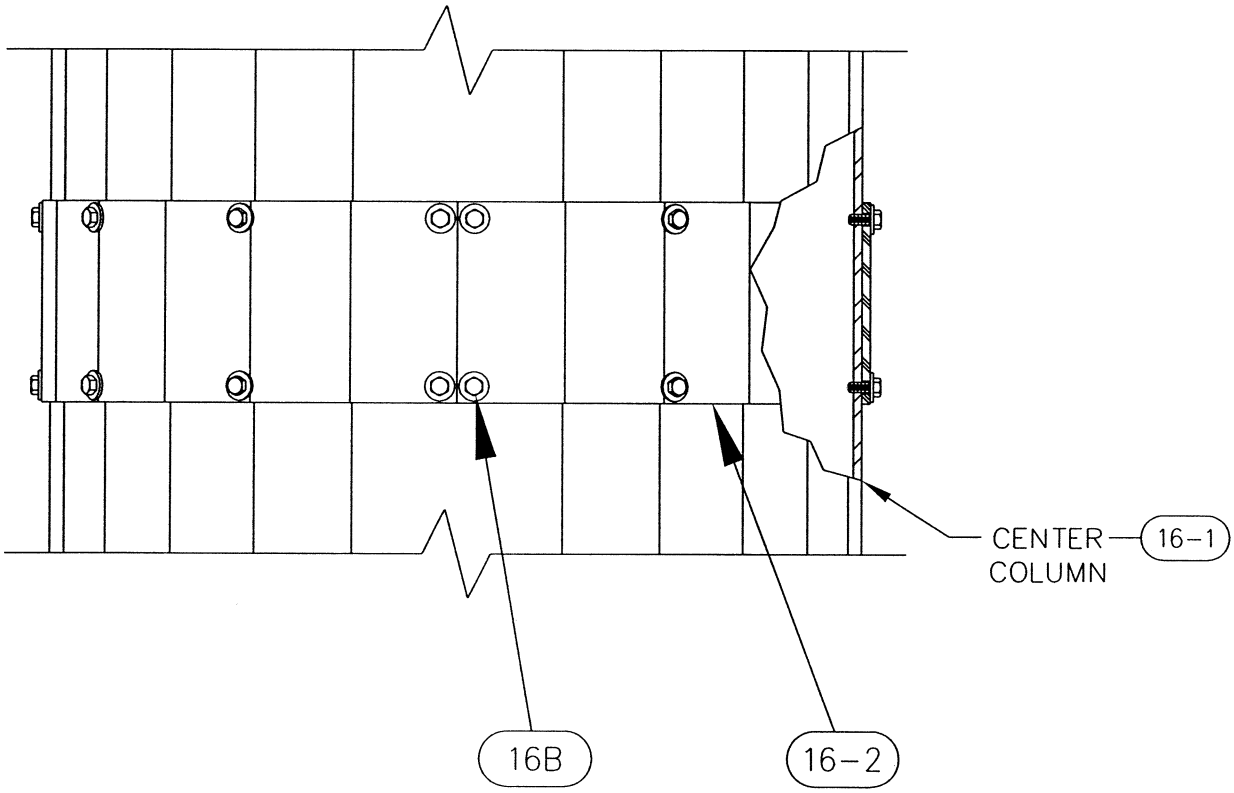
ERECTION DIAGRAM
SUCTION HEADER

DRAWING NO. A 6 0 5 4 0 1 6 5 2 9 2

REV.

CAD FILE: A40165

SYM	REVISION	BY	DATE	CHKD
A				



16B	WASHER 5/16" STD		AS REQD
	CAPSCREW 5/16"-18NC X 5/8" LG		AS REQD
16-2	WEARING STRIP		1
REF	DESCRIPTION		QTY

CENTER COLUMN DIA:
UP TO 3'-0"

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-40168

DRAWN	RES
CHECKED	
APP'D.	
DATE	9-3-92
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
WEARING STRIP - CENTER COLUMN

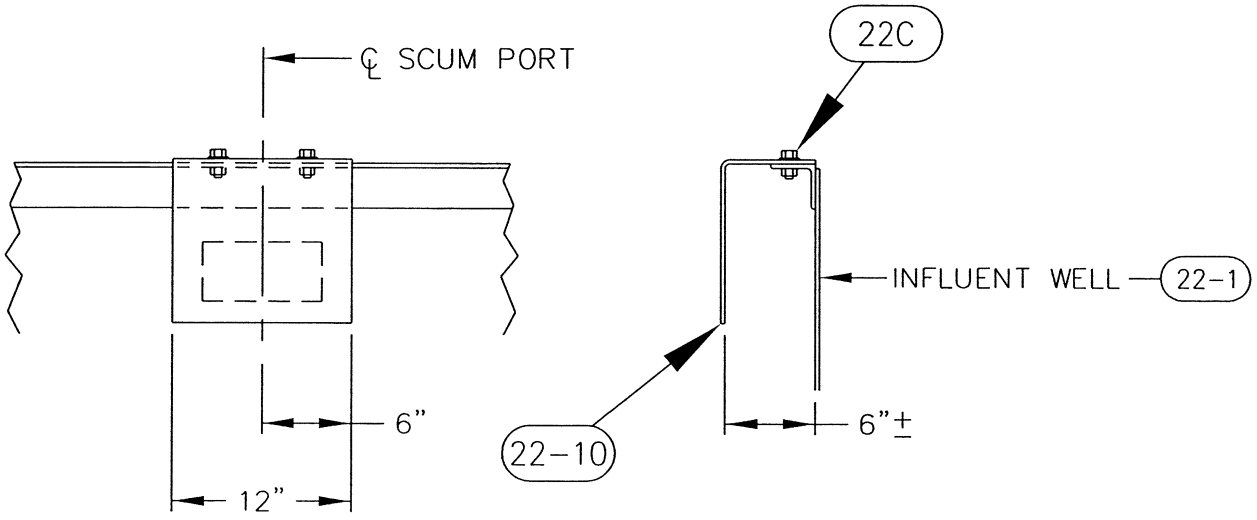
DRAWING NO. A505|40168|292

REV.

CAD FILE: A40168

10/10/2011 9:49:47 AM - myang - FOUNTAIN, CO Q10600A

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

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-40169

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

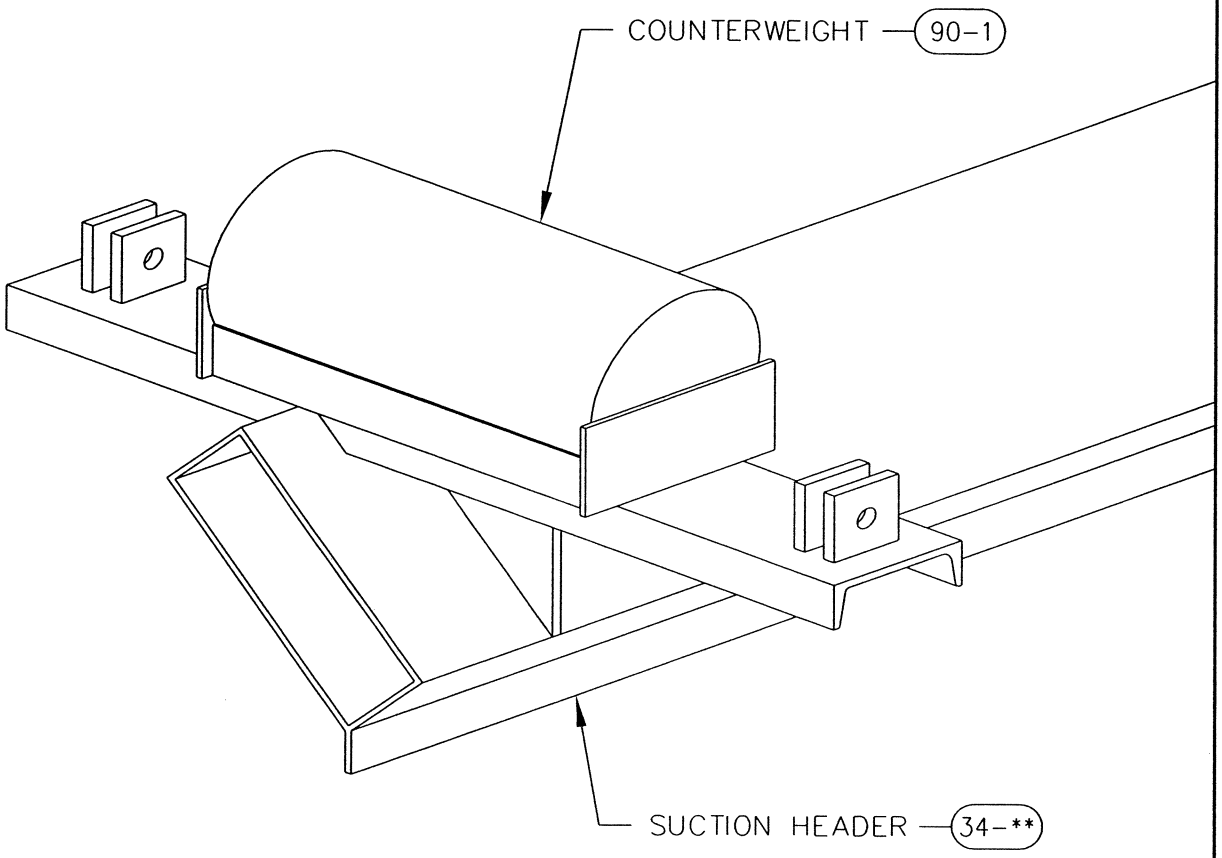
DESCRIPTION
ERECTION DIAGRAM
INFLUENT WELL SCUM PORT BAFFLE

DRAWING NO. A605|40169|292

REV.

CAD FILE: A40169

SYM	REVISION	BY	DATE	CHKD
A				



Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

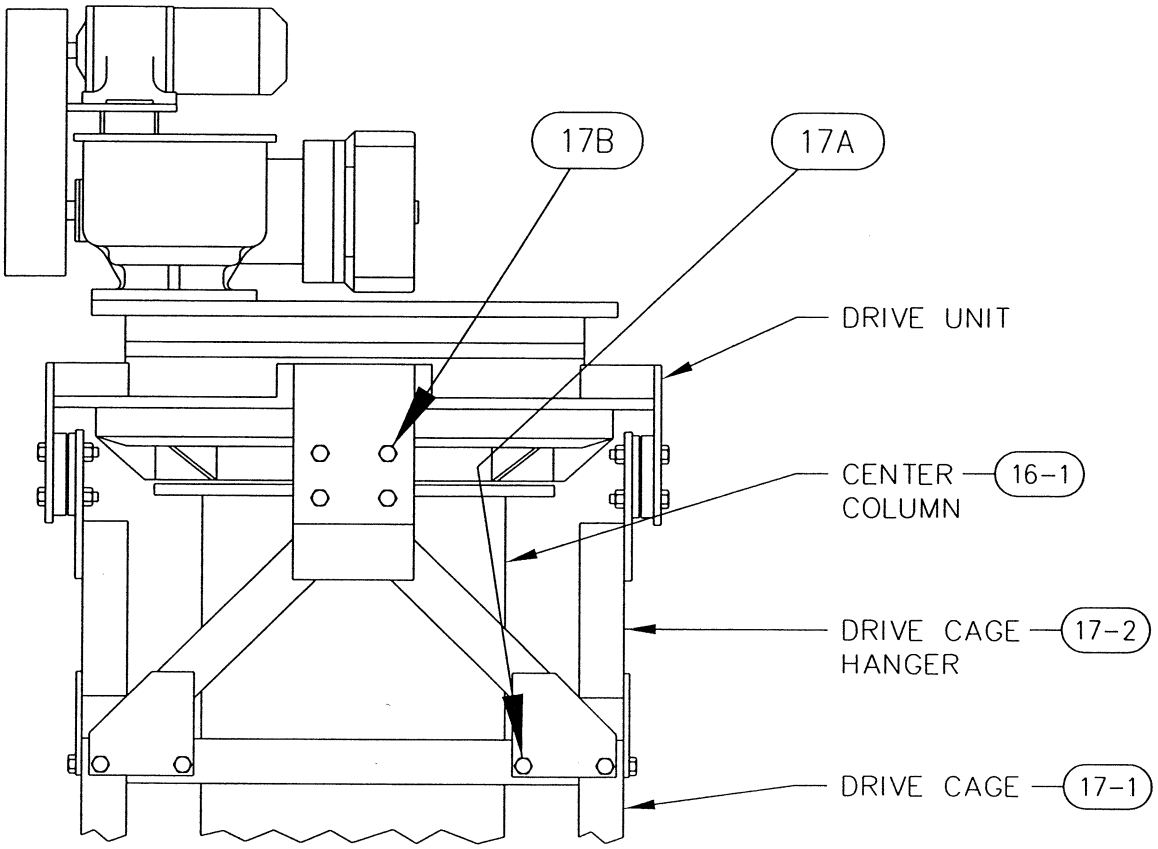
MASTER
A-42301

DRAWN RES	DESCRIPTION
CHECKED	ERECTION DIAGRAM COUNTERWEIGHT
APP'D.	
DATE 4-30-92	
S.O. STD	DRAWING NO. A,6,0,5,4,2,3,0,1,2,9,2 REV.
SCALE NONE	

CAD FILE: A42301

10/10/2011 9:49:52 AM - myang - FOUNTAIN, CO Q10600A

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: 28 (A)
CAGE: 3'-0"

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-43636

DRAWN RES
CHECKED
APP'D.
DATE 9-23-92
S.O. STD
SCALE NONE

DESCRIPTION

ERECTION DIAGRAM
DRIVE, CAGE & HANGERS

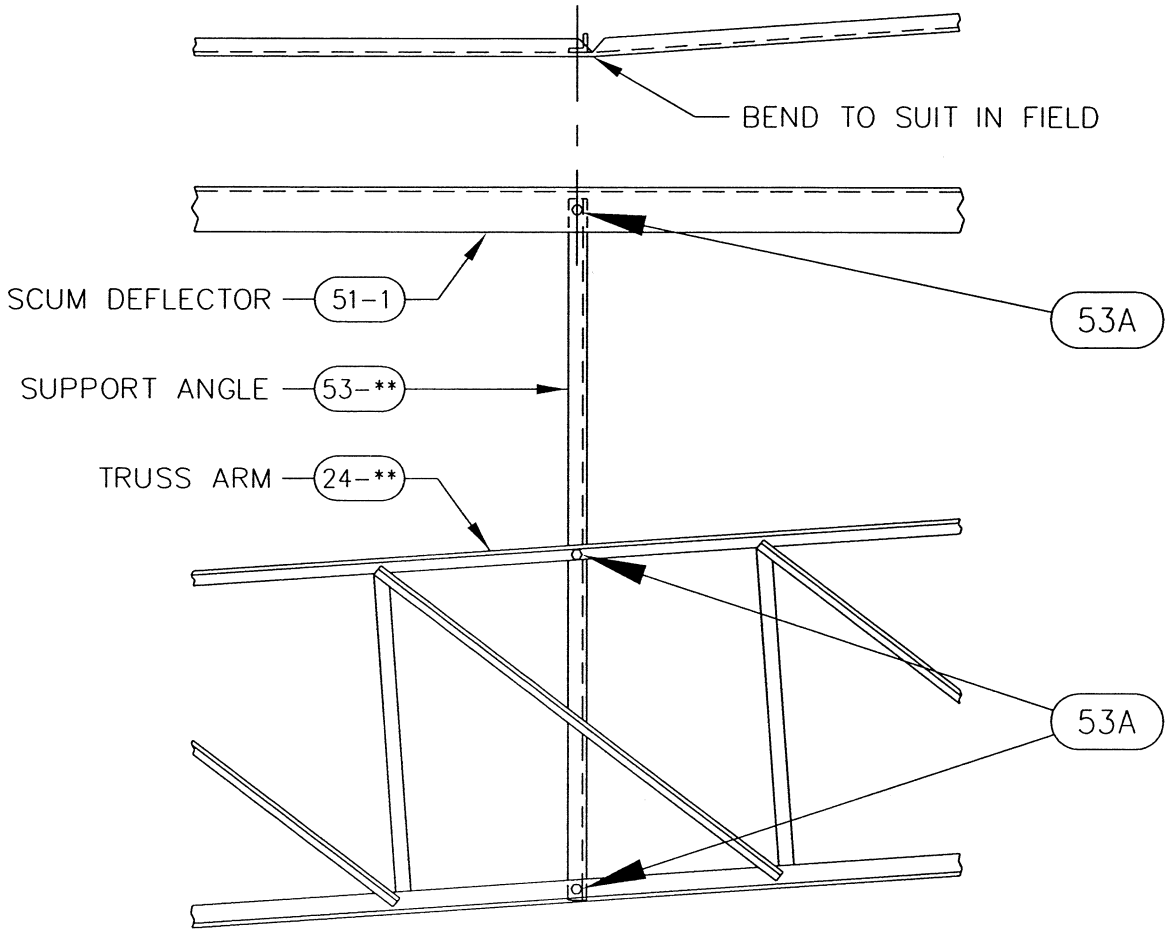
DRAWING NO. A605436362 92

REV.

CAD FILE: A43636

10/10/2011 9:49:54 AM - myang - FOUNTAIN, CO Q10600A

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

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-43990

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

DESCRIPTION

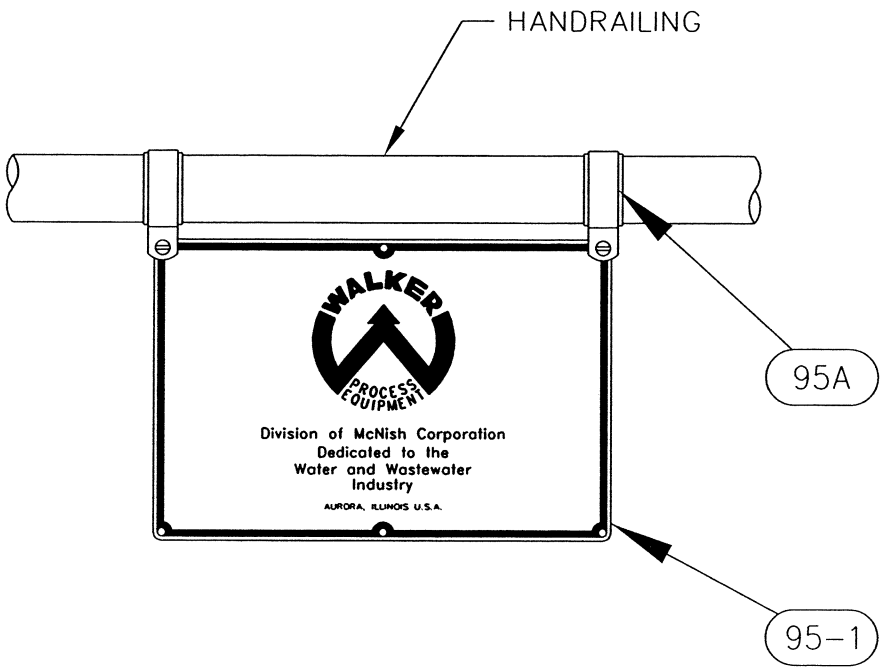
ERECTION DIAGRAM
SCUM DEFLECTOR SUPPORT - MID

DRAWING NO. A605|43990|292

REV.

CAD FILE: A43990

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

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-48121

DRAWN	RES
CHECKED	
APP'D.	
DATE	1-14-98
S.O.	STD
SCALE	NONE

DESCRIPTION

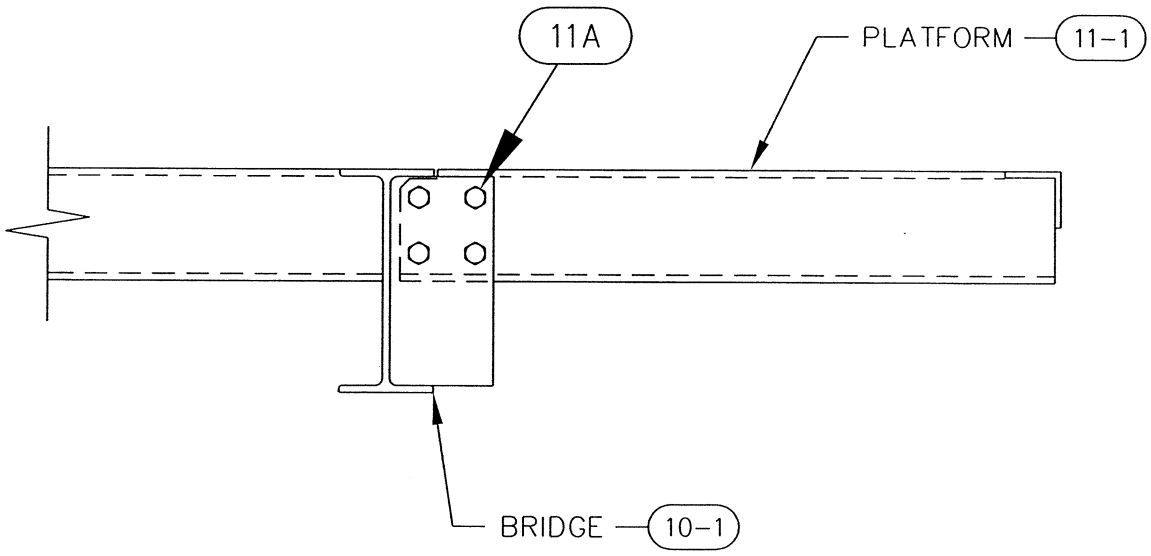
ERECTION DIAGRAM
NAMEPLATE

DRAWING NO. A 6 0 5 4 8 1 2 1 2 9 2

REV.

CAD FILE: A48121

SYM	REVISION	BY	DATE	CHKD
A				



11A	JAM NUT 5/8"-11NC		AS REQ'D
	HEX NUT 5/8"-11NC		AS REQ'D
	CAPSCREW 5/8"-11NC X 2" LG		AS REQ'D
REF	DESCRIPTION		QTY

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-48227

DRAWN	RES
CHECKED	
APP'D.	
DATE	1-29-98
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
BRIDGE PLATFORM

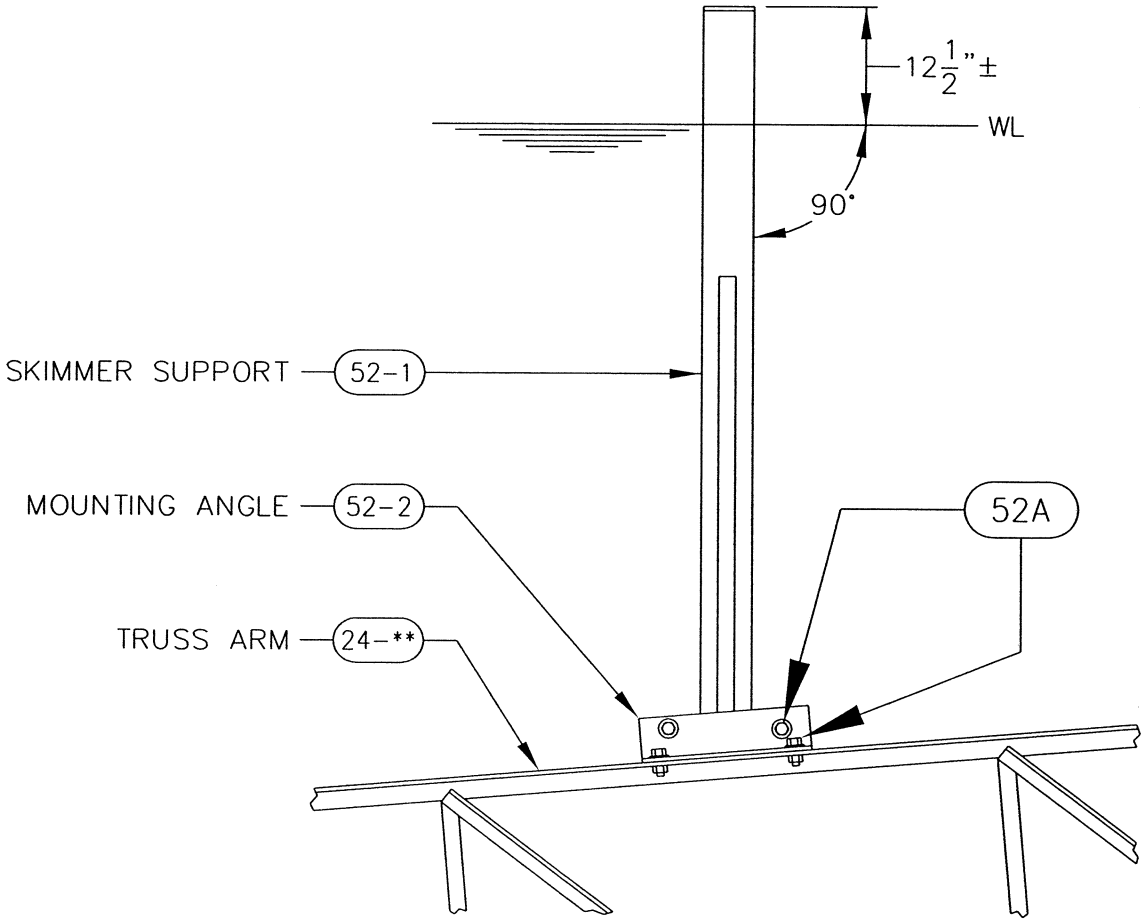
DRAWING NO. A 6 0 5 4 8 2 2 7 2 9 2

REV.

CAD FILE: A48227

10/10/2011 9:50:02 AM - myang - FOUNTAIN, CO Q10600A

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

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-50019

DRAWN	RES
CHECKED	
APP'D.	
DATE	2-2-99
S.O.	STD
SCALE	NONE

DESCRIPTION

ERECTION DIAGRAM
SKIMMER SUPPORT

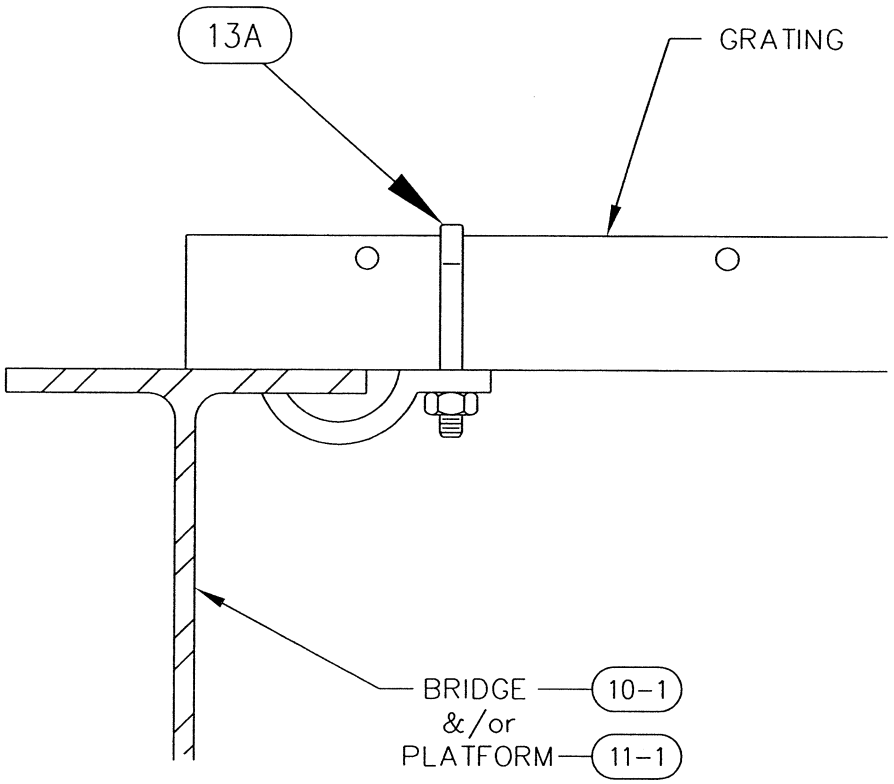
DRAWING NO. A605|50019|292

REV.

CAD FILE: A50019

10/10/2011 9:50:10 AM - myang - FOUNTAIN, CO Q10600A

SYM	REVISION	BY	DATE	CHKD
A				



MOUNTING DETAIL

REF	DESCRIPTION		QTY
13A	GRATING ANCHOR CLIP		AS REQD

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

MASTER
A-53926

DRAWN RES
CHECKED
APP'D.
DATE 3-6-01
S.O. STD
SCALE NONE

DESCRIPTION
ERECTION DIAGRAM
GRATING

DRAWING NO. A,6,0,5|5,3,9,2,6|2,9,2

REV.

CAD FILE: A53926

10/10/2011 9:50:13 AM - myang - FOUNTAIN, CO Q10600A

WEIR & BAFFLE INSTRUCTIONS

Molded Fiber Glass
Water Treatment Products Company
P.O. Box 458, 55 Fourth Avenue • Union City, PA 16438-0458
Toll Free: 877.826.2509 • Ph: 814.438.3959 • Fax: 814.438.8538

Operation & Maintenance Manual

For:

Fiberglass Weir and Baffle System

Molded Fiber Glass
Water Treatment Products Company
P.O. Box 458, 55 Fourth Avenue • Union City, PA 16438-0458
Toll Free: 877.826.2509 • Ph: 814.438.3959 • Fax: 814.438.8538

Date:

WARRANTY

MFG Water Treatment Products Company warrants the products supplied for the facility know as for a period of one (1) year from the date of installation.

This warranty applies to defects in materials and workmanship only. It does not cover errors in fit-up or installation. If it is determined that defects exist in the product it shall be the option of MFG Water Treatment Products Company to repair or replace the defective product. However, MFG Water Treatment Products Company shall not be obligated beyond the replacement of such goods, as prove to be defective. MFG Water Treatment Products Company shall have no further liability and no claim for consequential or incidental damages will be allowed.

MFG Water Treatment Products Company makes no warranty that the goods sold hereunder are fit for any particular purpose and buyer agrees to indemnify and hold MFG Water Treatment Products Company harmless for any and all claims resulting from any defective designs, specifications, or instructions which are provided by the buyer.

Any item felt to be a defect by the customer should be brought to the attention of MFG Water Treatment Products Company personnel as soon as it is discovered.

MFG Water Treatment Products Company may be contacted by phone at 814-438-3959 or by fax at 814-438-8538.

MFG Water Treatment Products Company

Molded Fiber Glass
Water Treatment Products Company
P.O. Box 458, 55 Fourth Avenue • Union City, PA 16438-0458
Toll Free: 877.826.2509 • Ph: 814.438.3959 • Fax: 814.438.8538

Fiberglass Weir & Baffle Operation Instructions

The fiberglass weirs and baffles provided for this project do not require any operation.

The weir and baffle system is a stationary fixed system that has no moving parts.

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Water Treatment Products Company
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Toll Free: 877.826.2509 • Ph: 814.438.3959 • Fax: 814.438.8538

Fiberglass Weir and Baffle Maintenance Instructions

The only maintenance requirements that apply should be done as a regular part of general plant maintenance, they are:

1) Clean surfaces of weirs and baffles by hosing them off, special attention should be paid to the v-notch area of the weir plate. This area should be free of foreign materials to ensure proper flow rates.

2) Check anchors and fasteners to ensure that they are secure.

3) Visual inspection of surfaces.

If any problems are found during the maintenance procedures they should be brought to the attention of MFG Water Treatment Products Company ***IMMEDIATELY***.

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Water Treatment Products Company
P.O. Box 458, 55 Fourth Avenue • Union City, PA 16438-0458
Toll Free: 877.826.2509 • Ph: 814.438.3959 • Fax: 814.438.8538

Fiberglass Weir and Baffle Installation Guidelines

The information supplied in this document are general guidelines only, based on standard use and installation of MFG Water Treatment Products Company fiberglass weirs and baffles. The approved drawings and project specifications are the controlling documents. The information supplied does not address deviations due to special materials or installation situations. OBSERVE PROPER SAFETY PRACTICES DURING THE USE AND INSTALLATION OF THIS PRODUCT, INCLUDING OSHA REGULATIONS AND ANY OTHER APPLICABLE STANDARDS. IMPROPER USE OR FAILURE TO OBSERVE SAFE WORK PRACTICES CAN RESULT IN INJURY.

1) Locate and identify all materials needed for installation. The packing list or bill of lading that accompanied the shipment of the weirs and baffles will be helpful in this process. The bill of material is also listed on the shop drawings supplied for the weirs and baffles.

2) Locate and verify all necessary tools and equipment are available. Most standard installations can be completed with standard carpenter and mechanics tools supported by construction site items such as a transit.

3) The installation should begin at the scum box. Refer to the equipment manufacturers scum box drawings for exact location.

4) Start by setting the weir plate anchors with a transit as noted on the shop drawings provided. Be certain that the correct elevation and spacing are used.

5) Mount the weir plates to the wall with the anchors, 5" diameter washers, weir butt plates, and stainless steel flat washers and nuts as shown on the shop drawings.

6) After weir plates are installed, install necessary baffle support bracket anchors, again being careful to ensure that the correct elevation and spacing are used. Use of a transit is recommended.

7) Mount the lower baffle support to the wall with these anchors.

8) Assemble the upper and lower baffle support brackets using the hardware provided. This step may be done prior to setting the anchors or after the lower baffle support is mounted to the wall.

9) Once the baffle supports have been mounted assemble the baffle to the supports using the hardware provided. The baffle butt plate will be assembled at this time also, to the wall side of the baffle plates.

10) Continue the assembly around the tank.

11) Upon reaching the scum box the last weir and baffle plates assembly will need to be field cut. Once the anchors are set for both the weir and baffle plate, field measure the distance from the last weir to the first. Field cut this weir and resin seal the cut edge with the resin kit included. The baffle plate must also be measured, however take care to measure the distance on a radius, do not measure a cord length. Once the measurement is found follow the same instructions given for the weir. Instructions for mixing and applying the resin seal mix are included with the resin kit. A circular saw with a carbide grit blade is recommended for making the cuts.

12) Once all components have been installed level the system to the elevations indicated with a transit.

IF ANY QUESTIONS ARRISE BEFORE, DURING OR AFTER THE INSTALLATION CONTACT MFG WATER TREATMENT PRODUCTS COMPANY.

CONTACT: *MFG Water Treatment Products Company*
Toll Free: 877.826.2509
Ph: 814.438.3959
Fax: 814.438.8538

Molded Fiber Glass
Water Treatment Products Company

MANUFACTURERS INSTRUCTIONS

Unloading, Storage, & Protection of Products Prior to Installation

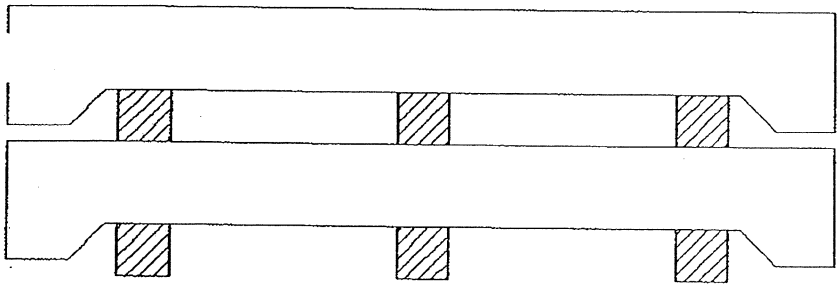
!!IMPORTANT!!

Carefully examine each shipment to verify all listed articles are accounted for and that no transporting damage has occurred.

Unloading & Storage of FRP Troughs

Cherry Picker or crane should be used to unload troughs. Two (2) straps should be placed to equalize pressure and balance troughs while unloading.

Troughs should be stored in an inverted position, open side down, supported in a level position on at least three (3) bearing points starting at 18" from the ends and one in the middle. Support structures should be at least 5". For long term storage it is recommended to install three spreader bars to maintain proper form and width. Stacking should be an alternate position (see sketch below). Cover with black polyethylene.



FRP Weir & Baffle Plates

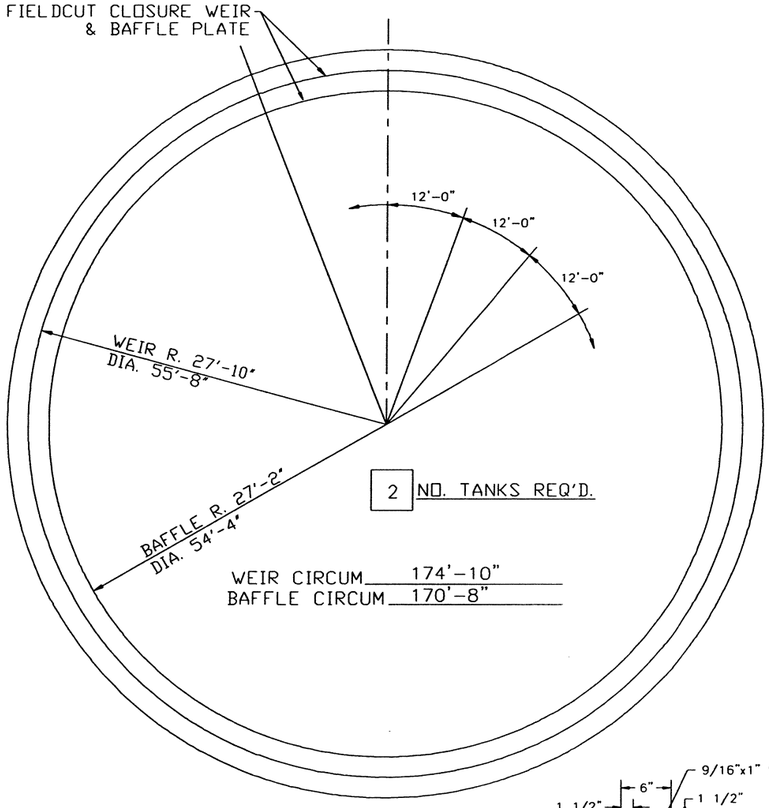
Weirs & Baffles should be stored in a flat, level position to prevent warping.

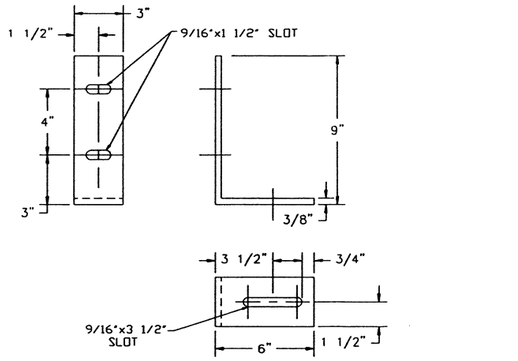
Unloading & Storage of all other products

Fork lift truck/tow motor should be used to lift materials banded to skids or support structures. Care should be taken to extend as much support as possible under the skid prior to lifting.

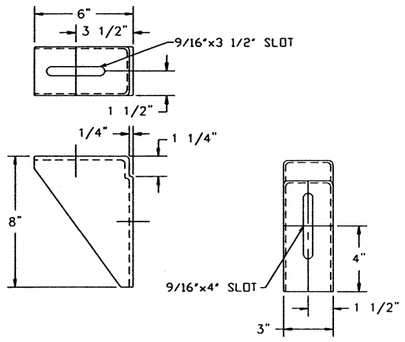
The ideal storage location would be inside, however if this is not possible, after following instructions listed by each item, they should be covered with a black polyethylene cover.

55 Fourth Ave P.O. Box 458 • Union City, PA 16438-0458 • Toll Free: 877-826-2509 • Ph: 814-438-3959 • Fax: 814-438-8538
Web Site Address: www.mfgwtp.com • E-mail Address: info@mfgwtp.com

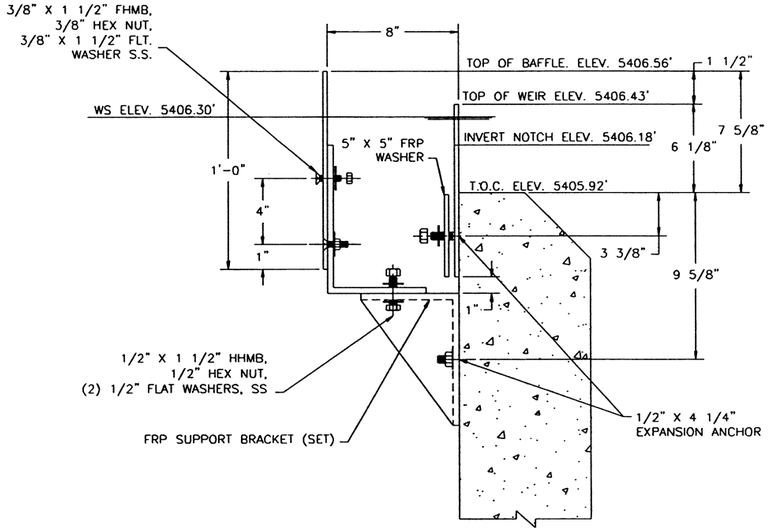




UPPER BAFFLE
SUPPORT BRACKET



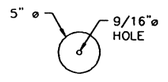
LOWER BAFFLE
SUPPORT BRACKET



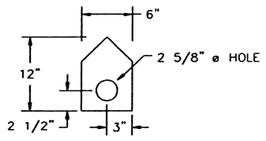
WALL MOUNTING DETAIL
SCALE – 2 : 1

MATERIAL LIST – TWO TANKS

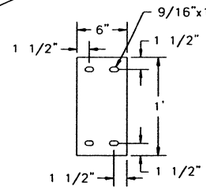
QTY.	MAT'L	DESCRIPTION	SIZE
30	FRP	WEIR PLATES	12" x 1/4" x 12'-0" (3" ON 6")
30	FRP	WEIR BUTT PLATES	12" x 1/4" x 6"
180	FRP	5"ø WASHERS	
30	FRP	BAFFLE PLATES	12" x 1/4" x 12'-0"
30	FRP	BAFFLE BUTT PLATES	12" x 1/4" x 6"
90	FRP	BAFFLE SUPPORT BRACKETS (UPPER)	3/8" THICK / L-SHAPED
90	FRP	BAFFLE SUPPORT BRACKETS (LOWER)	3/8" THICK / STANDARD
90	316 S.S.	HHMB	1/2" x 1 1/2"
90	316 S.S.	HEX NUTS	1/2"
180	316 S.S.	FLAT WASHERS	1/2"
300	316 S.S.	FHMB	3/8" x 1 1/2"
300	316 S.S.	HEX NUTS	3/8"
300	316 S.S.	FLAT WASHERS	7/16" ID x 1 1/2" OD
270	316 S.S.	EXPANSION ANCHORS	1/2" x 4 1/4"



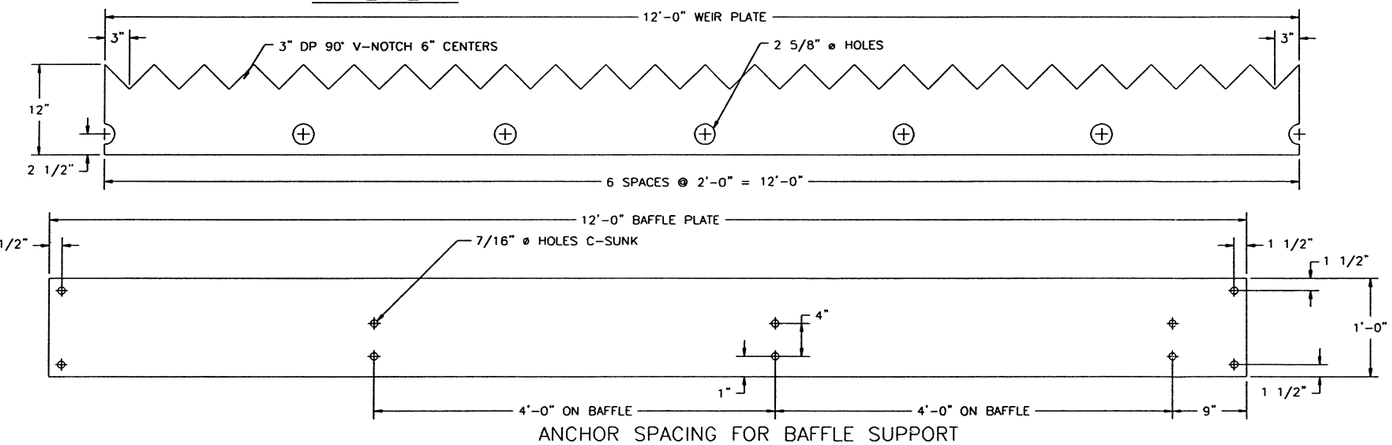
5" Ø WASHER
9/16"ø HOLE



WEIR BUTT
PLATE



BAFFLE BUTT
PLATE



ANCHOR SPACING FOR BAFFLE SUPPORT
ON CONCRETE WALL TO BE 4'-1 1/8"

MFG WATER TREATMENT ("WATRE") has no responsibility for the contract design of the product or the contract specifications. WATRE has been selected to manufacture this product, the customer agrees to indemnify and hold WATRE harmless from and against all liability relating to this product, its preformance, merchantability and fitness for purpose (including all liability for claims, suits, judgements and expenses) , unless the product as manufactured by WATRE does not conform to the contract design and specifications set or WATRE'S shop drawings approved by the customer.

FOUNTAIN, CO

NO.	REVISIONS	DATE
1	REVISED PER COMMENTS	8-5-11
2	REVISED NOTCH SPACING	9-16-11

MFG WATER TREATMENT PRODUCTS COMPANY
55 4th AVENUE UNION CITY, PA 16438 PHONE: (814) 438.3538 FAX: (814) 438.8538

SCALE: REF.
TITLE: WEIR & BAFFLE DETAILS – TWO TANKS
FOUNTAIN, CO –

DIVISION : MFG/WTP
DRAWN BY : J. COLLINS
CHECKED BY :
APPROVED :
DATE : 4-14-11

SHEET NO.
5523-1

MANUFACTURER'S ERECTION DRAWINGS FOR HANDRAIL

Hollaender®

Structural Engineering Group

SPEED RAIL® SYSTEM
INTERNA RAIL® SYSTEM
SUBMITTAL DRAWINGS

FOR

WALKWAY RAILING

MANUFACTURER:

Hollaender Manufacturing Company
10285 Wayne Avenue
Cincinnati, OH 45215
(800) 772-8800

NOTES:

1.) RAILS TO BE MADE FROM 1-1/2" SCH. 40, 6063-T6 ALUMINUM PIPE. MILL FINISH.

2.) POSTS TO BE MADE FROM 1-1/2" SCH. 40, 6063-T6 ALUMINUM PIPE. MILL FINISH.

3.) BENT RAILS TO BE MADE FROM 1-1/2" SCH. 40, 6063-T6 ALUMINUM PIPE. MILL FINISH.

4.) ALL FITTINGS TO BE ALUMINUM. MILL FINISH.

5.) ALL HARDWARE TO BE STAINLESS STEEL.

6.) INFILL PANELS - NOT USED.

7.) MOUNTING ANCHORS SUPPLIED BY OTHERS.

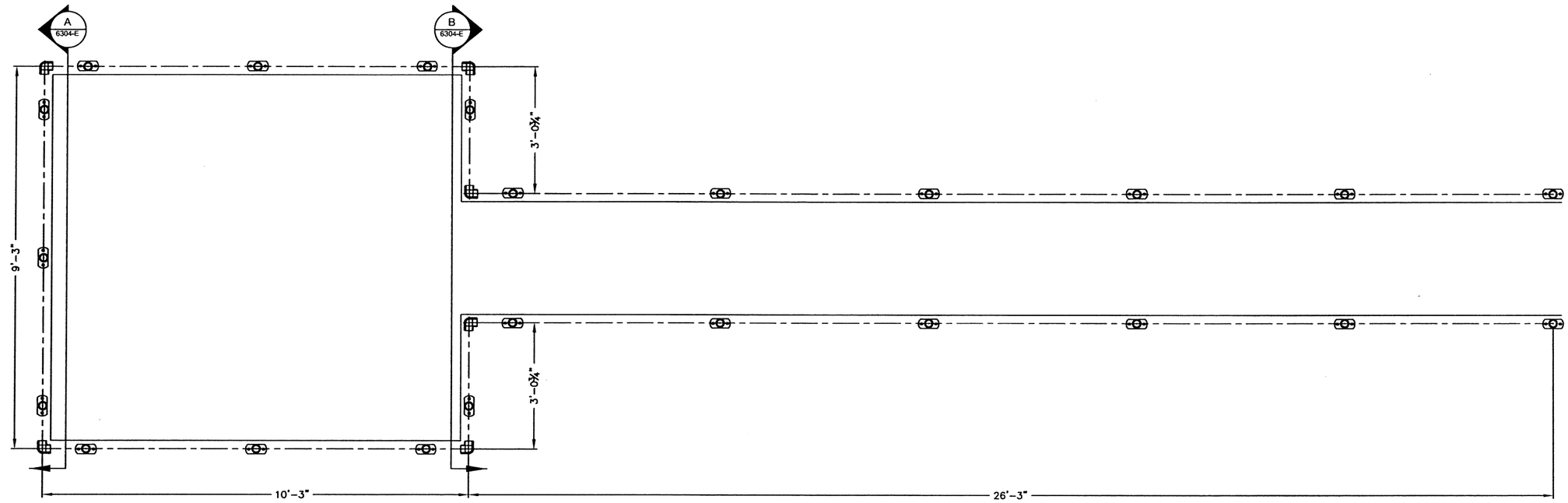
8.) TOEPLATE TO BE 1/4" x 4" 6063-T6 ALUMINUM. ANODIZED 215-R1, AA-M10-C22-A41.

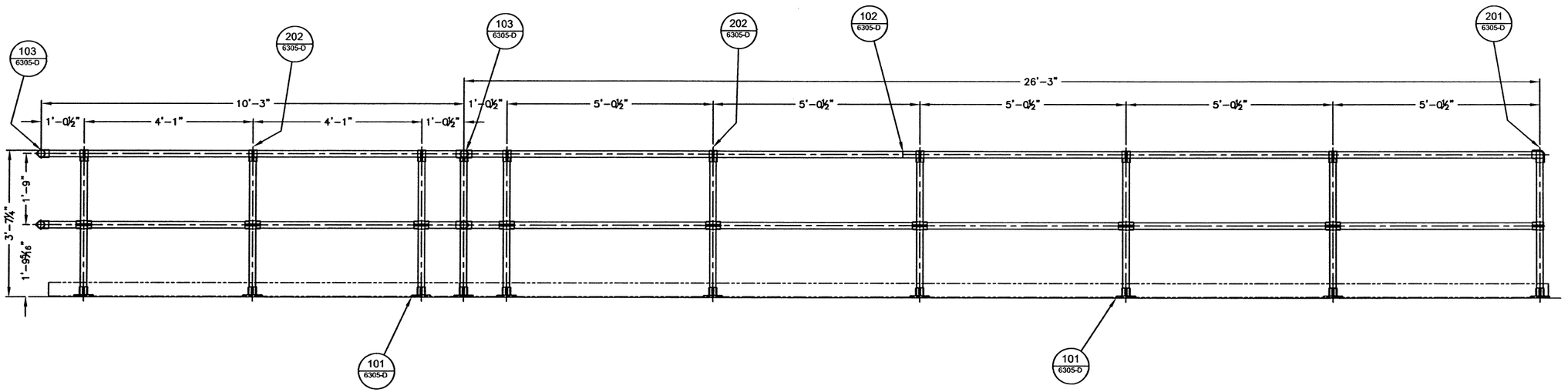
NO.	REVISIONS	DATE	APPROVED
0	RELEASED FOR APPROVAL	11-9-11	BW

Hollaender®
STRUCTURAL ENGINEERING GROUP
10285 WAYNE AVENUE
CINCINNATI, OH 45215-6399
PHONE: (800) 772-8800 FAX: (800) 772-8806
WWW.HOLLAENDER.COM

PROJECT	CUSTOMER	DESCRIPTION
WALKWAY RAILING		SPEED RAIL SUBMITTAL AND APPROVAL DRAWINGS

DRAWN BY: GG	APPROVED BY: BW	DATE: 10-28-11	
PROJECT NO.: 133739		SCALE: NTS	
FINISH: See Notes		DRAWING NO.: 6302-T	
MATERIAL: See Notes		SHEET 1 OF 4	





WALKWAY
PLAN - ELEVATION (1 SHOWN - 1 OPP)

NO.	REVISIONS	DATE	APPROVED
0	RELEASED FOR APPROVAL	11-9-11	BW

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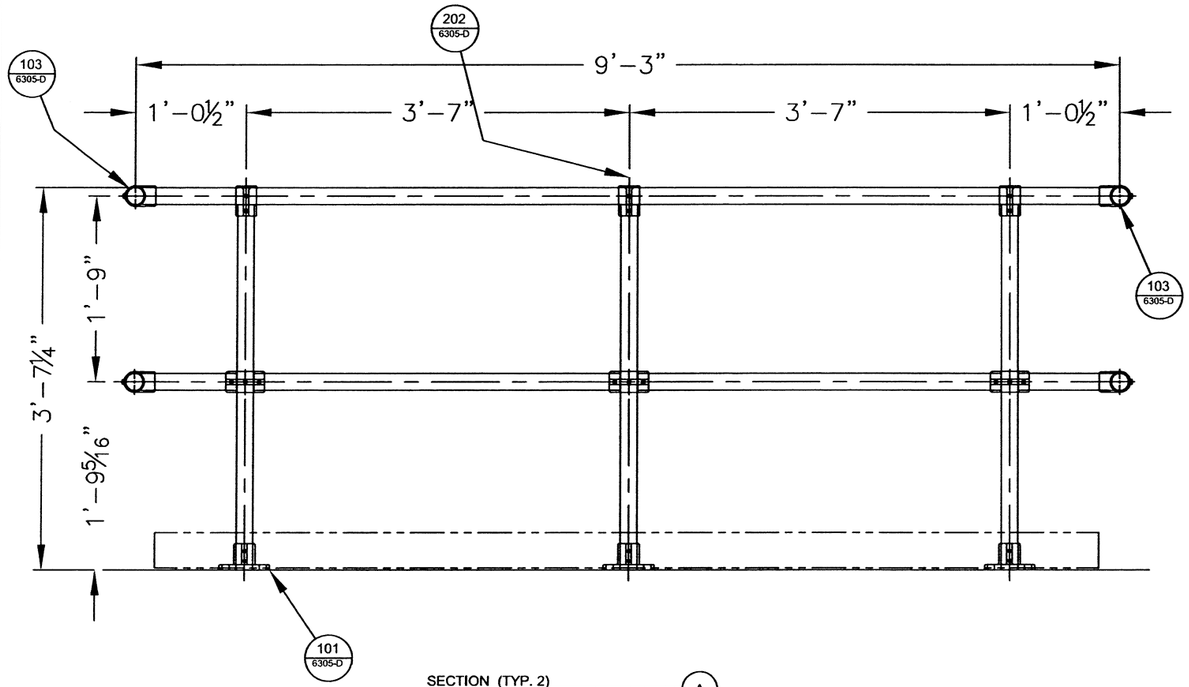
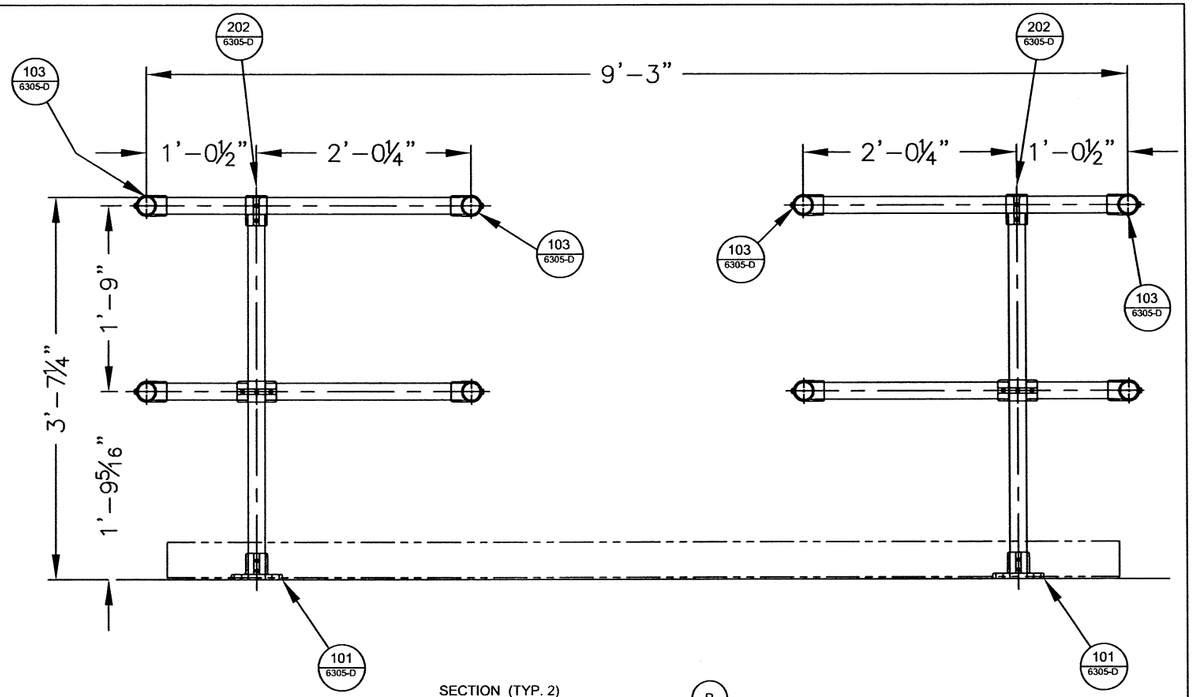
10285 WAYNE AVENUE
CINCINNATI, OH 45215-6399
PHONE: (800) 772-8800 FAX: (800) 772-8806
WWW.HOLLAENDER.COM

PROJECT	CUSTOMER	DESCRIPTION
WALKWAY RAILING		SPEED RAIL SUBMITTAL AND APPROVAL DRAWINGS

DRAWN BY: GG	APPROVED BY: BW	DATE: 11-28-11
PROJECT NO.: 133739		SCALE: 3/4"=12"
FINISH: See Notes		DRAWING NO.: 6303-P
MATERIAL: See Notes		SHEET 2 OF 4



SECTION (TYP. 2)
ELEVATION VIEW — A



SECTION (TYP. 2)
ELEVATION VIEW — B

NO.	REVISIONS	DATE	APPROVED
0	RELEASED FOR APPROVAL	11-9-11	BW

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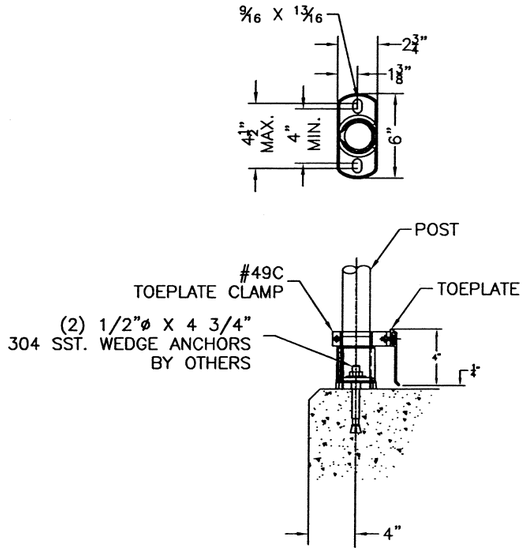
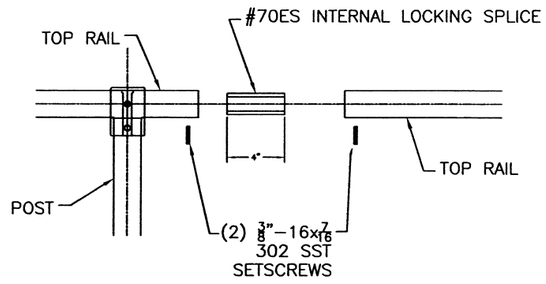
STRUCTURAL ENGINEERING GROUP
10285 WAYNE AVENUE
CINCINNATI, OH 45215-6399
PHONE: (800) 772-8800 FAX: (800) 772-8806
WWW.HOLLAENDER.COM

PROJECT	CUSTOMER	DESCRIPTION
WALKWAY RAILING		SPEED RAIL SUBMITTAL AND APPROVAL DRAWINGS

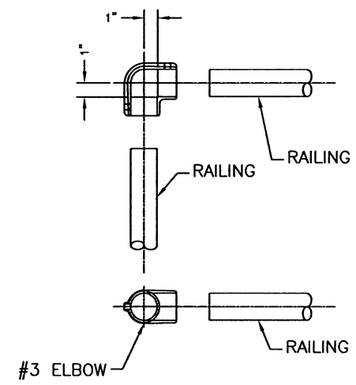
DRAWN BY: GG	APPROVED BY: BW	DATE: 10-28-11
PROJECT NO.: 133739		SCALE: NTS
FINISH: See Notes		DRAWING NO.: 6304-E
MATERIAL: See Notes		SHEET 3 OF 4



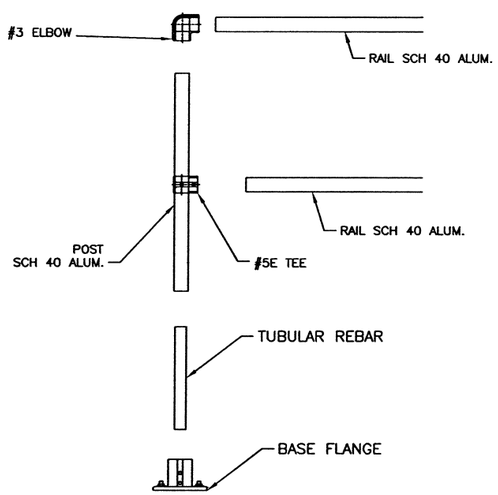
#46 BASE FLANGE w/ TOEPLATE — 101



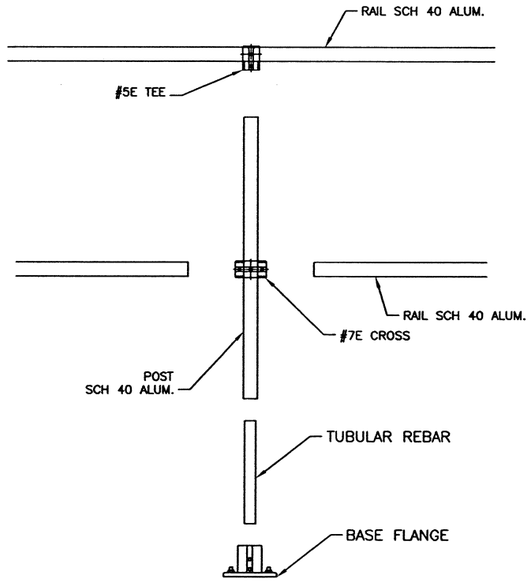
#70ES INTERNAL LOCKING SPLICE — 102



#3 ELBOW — 103



END POST — 201



LINE POST — 202

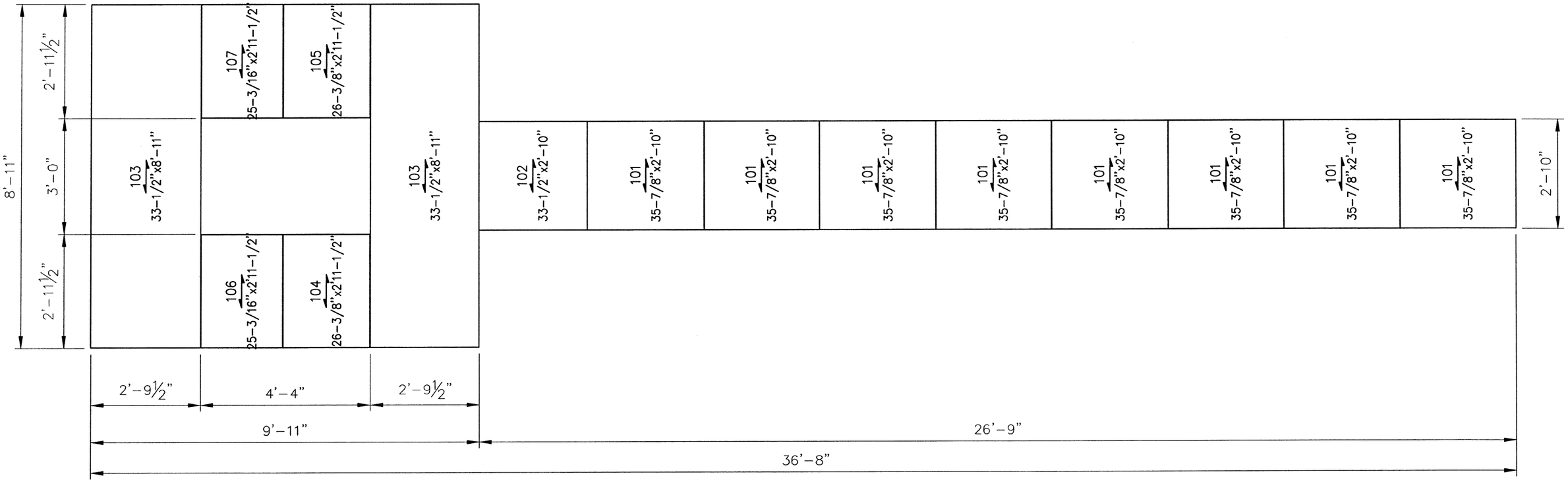
NO.	REVISIONS	DATE	APPROVED
0	RELEASED FOR APPROVAL	11-9-11	BW

Hollaender®
STRUCTURAL ENGINEERING GROUP
10285 WAYNE AVENUE
CINCINNATI, OH 45215-6399
PHONE: (800) 772-8800 FAX: (800) 772-8806
WWW.HOLLAENDER.COM

PROJECT	CUSTOMER	DESCRIPTION
WALKWAY RAILING		SPEED RAIL SUBMITTAL AND APPROVAL DRAWINGS

DRAWN BY:	APPROVED BY:	DATE:
GG	BW	10-28-11
PROJECT NO.: 133739		SCALE: NTS
FINISH: See Notes		DRAWING NO.: 6305-D
MATERIAL: See Notes		SHEET 4 OF 4

MANUFACTURER'S ERECTION DRAWING FOR GRATING



(2) AREAS REQUIRED
REF: ITEM# M07661-1GRAT
REF: DWG# B40570571375
19SGI4 1-1/2" Mill Aluminum I-Bar Swaged Grating CB: 5/16" SQ.
6063-T6
Panel ends to be trim banded

RELEASED FOR FABRICATION
DATE: Oct. 5, 2011
FIELD & FILE COPY

REVISION 0	10/5/11

"E.D." Dimension at end of panels is the location of the first cross bar. E.D.

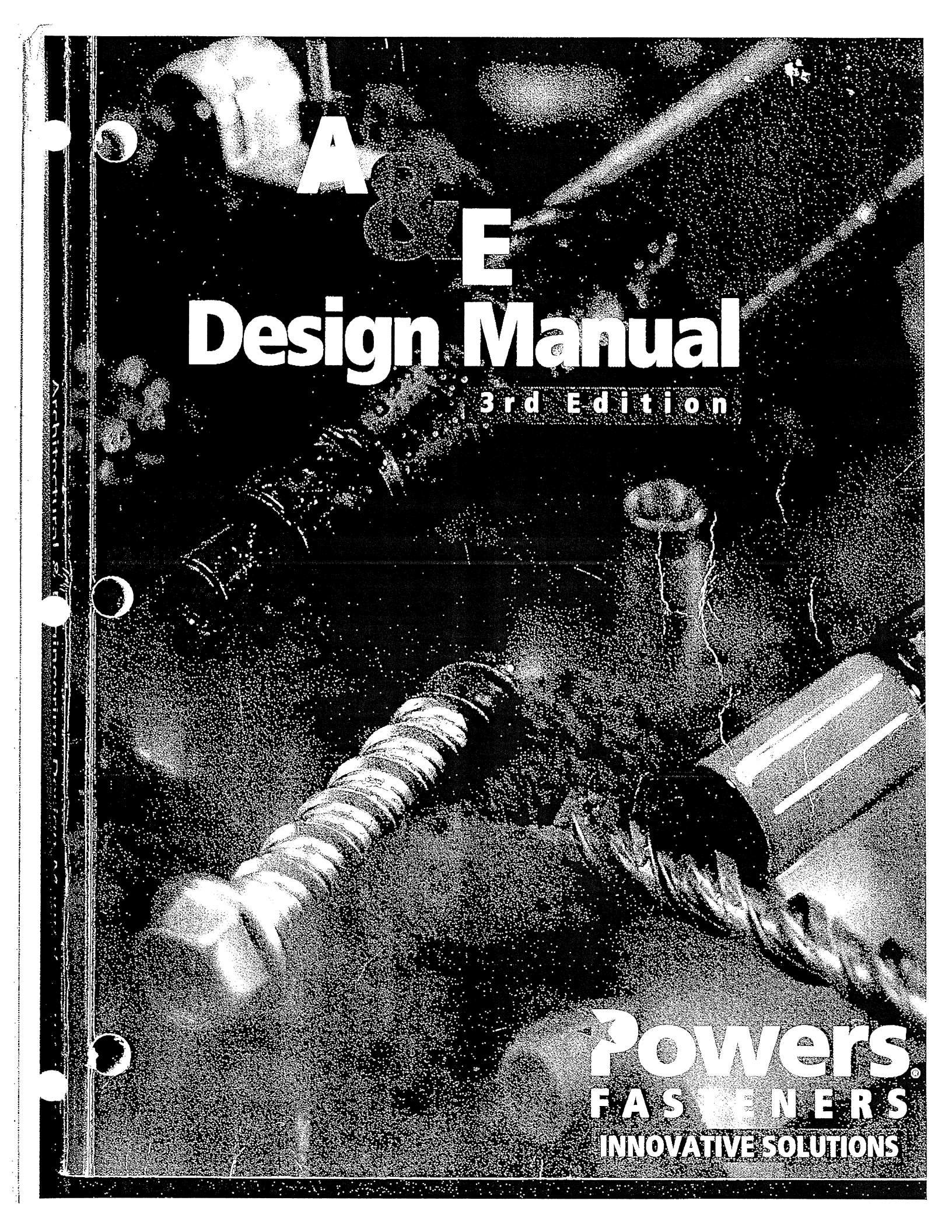
Ck'd:

OHIO GRATINGS, INC.
5299 Southway St., S.W. Canton, OH 44706
(330) 477-6707 FAX (330) 477-7872

JOB: Fountain, CO
MASTER QUOTE #:
CUSTOMER:

Scale: N.T.S.	Dwn: MM	Date: 10/5/2011
P.O.:	DWG: 475612	

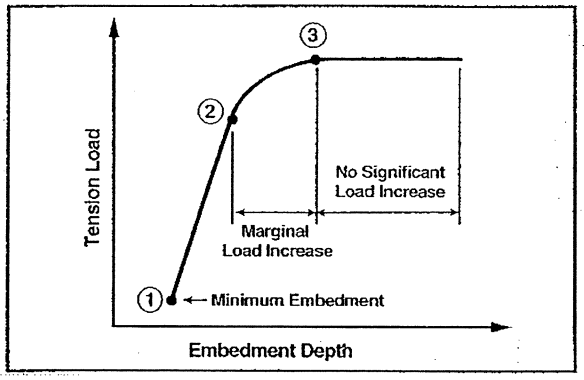
EXPANSION ANCHOR INSTRUCTIONS


A
E
Design Manual
3rd Edition
Powers
FASTENERS
INNOVATIVE SOLUTIONS

22.6.3 Depth Of Embedment

The depth of embedment published for each anchor in the load capacity charts is critical to achieving the expected load capacities. This depth is measured from the surface of the base material to the bottom of the anchor. For mechanical expansion anchors, this would be the depth measured to the bottom of the anchor prior to actuation. For each anchor type, a minimum embedment depth is specified. This depth is typically the minimum required for proper anchor installation and reliable functioning. Attempting to install an anchor at less than the minimum required may overstress the base material causing it to fail when the anchor is expanded. In some masonry materials, the minimum depth may be decreased depending upon the anchor style as noted in the load tables.

As noted in Section 2.8, the load capacity of some anchor types will increase with deeper embedments. For anchors which exhibit this behavior, multiple embedment depths and the corresponding load capacity are listed. As the embedment depth is increased, the load capacity will increase up to a transition point. This point is usually the maximum embedment depth listed. At this point, mechanical anchors may experience material failure or localized failure of the base material around the expansion mechanism. Adhesive type anchors may reach the capacity of the bond, the anchor rod material, or the capacity of the base material. The following diagram shows the typical performance of a mechanical anchor installed in concrete.



At the minimum embedment depth, the mode of failure at the ultimate load capacity is typically a concrete shear cone. As the anchor is installed at a deeper embedment depth, the size of the theoretical concrete shear cone increases, resulting in an increased load capacity. As the embedment depth is increased towards point 2, the mode of failure changes from a concrete shear cone to localized failure around the expansion mechanism. Beyond this point, marginal load capacity increases can be expected until the capacity of the expansion mechanism or anchor material is reached at embedment depths corresponding to point 3. The load capacity will not increase significantly for anchors installed at embedment depths beyond this point. This point is usually the deepest embedment listed in the anchor load capacity tables and is the maximum recommended. Applications which require an embedment deeper than those published should be tested to verify proper anchor performance.

For applications requiring installation at embedment depths between those published, linear interpolation is permitted.

22.7 Installation Criteria

As with any building component, proper installation is the key to a successful application once the anchor has been properly selected.

22.7.1 Drilled Hole

A properly drilled hole is a critical factor both for ease of installation and optimum anchor performance. The anchors selected and the drill bits to be used should be specified as part of the total anchoring system. Powers *Rawl* anchors are designed to be installed in holes drilled with carbide tipped bits meeting the requirements of the American National Standards Institute (ANSI) Standard B212.15 unless otherwise specified. If alternate bit types are used, the tip tolerance should be within the ANSI range. The following table lists the nominal drill bit diameter along with the tolerance range established by ANSI for the carbide tip.

Nominal Drill O.D.	ANSI Standard	Nominal Drill O.D.	ANSI Standard
1/8"	0.134-0.140"	11/16"	0.713-0.723"
5/32"	0.165-0.171"	3/4"	0.775-0.787"
11/64"	0.181-0.187"	27/32"	0.865-0.881"
3/16"	0.198-0.206"	7/8"	0.905-0.917"
7/32"	0.229-0.237"	15/16"	0.968-0.980"
1/4"	0.260-0.268	1"	1.030-1.042"
9/32"	0.296-0.304"	1-1/8"	1.160-1.175"
5/16"	0.327-0.335"	1-1/4"	1.285-1.300"
3/8"	0.390-0.398"	1-3/8"	1.410-1.425"
7/16"	0.458-0.468"	1-1/2"	1.535-1.550"
1/2"	0.520-0.530"	1-5/8"	1.655-1.675"
9/16"	0.582-0.592"	1-3/4"	1.772-1.792"
5/8"	0.650-0.660"	2"	2.008-2.028"

When drilling an anchor hole using a carbide tipped bit, the rotary hammer or hammer drilled used transfers impact energy to the bit which forms the hole primarily due to a chiseling action. This action forms an anchor hole which has roughened walls. If diamond tipped core bits are used, the expansion portion of mechanical anchors should not be installed in holes drilled with this type of bit unless testing has been conducted to verify performance. Adhesive anchors should also be tested. A diamond tipped bit drills a hole which has very smooth walls causing some anchor types to slip and fail prematurely.

During the drilling operation, bit wear should be monitored to insure that the carbide tip does not wear below the following limits to insure proper anchor functioning. This is especially important when using mechanical anchors. Generally, mechanical anchors can be installed in holes drilled with bits which have worn to the lower limit and proper functioning can be expected. However, this may vary depending upon the base material so these values should be used as a guide.

Nominal Drill O.D.	Lower Wear Limit	Nominal Drill O.D.	Lower Wear Limit
3/16"	0.190"	5/8"	0.639"
1/4"	0.252"	3/4"	0.764"
5/16"	0.319"	7/8"	0.897"
3/8"	0.381"	1"	1.022"
1/2"	0.510"	1-1/4"	1.270"

Anchor holes should be drilled to the proper depth which is based on the anchor style. The recommended drilling depth is listed in the installation instructions for the individual products. For one-step style anchors such as the Power-Stud, Power-Bolt, or SPIKE, the depth of the hole should be at least 1/2" or one anchor diameter deeper than the embedment depth to which the anchor will be installed. For example, the hole depth for a 3/4" diameter Power-Stud anchor which will be installed at a 4" embedment should be drilled at least 4-3/4" deep. When a one-step anchor such as a wedge style is installed, the expansion mechanism scrapes the walls of the anchor hole. This scraping action pushes concrete dust particles ahead of the anchor. When using this style of anchor, the purpose of drilling the anchor hole to the recommended depth is to allow a place for the dust to settle as the anchor is installed.

Anchor holes should be thoroughly cleaned prior to installation of the anchor. This procedure is easily accomplished using compressed air or a vacuum. Dust and other debris must be removed from the hole to allow an anchor to be installed to the required embedment and to insure that the expansion mechanism can be properly actuated. Extra care should be taken when using adhesives including brushing of the anchor hole to insure that a proper bond is developed.

22.7.2 Anchor Alignment

Anchors should be installed perpendicular to the surface of the base material. Within the industry, +/- 6° is typically used as the permissible deviation from perpendicular. If anchors are installed beyond this point, calculations to insure that a bending load has not been created may need to be performed. Job site tests may be required to determine actual load capacities if anchors are not installed perpendicular to the surface of the base material.

22.7.3 Clearance Holes

Powers *Rawl* anchors are designed to be installed in holes drilled in concrete and masonry base materials with carbide tipped drill bits meeting the requirements of ANSI Standard B212.15 as listed in the previous section. The actual hole diameter drilled in the base material using an ANSI Standard carbide tipped bit is larger than the nominal diameter. For example, a 1/2" nominal diameter drill bit has an actual O.D. of 0.520" to 0.530". When selecting the diameter of the hole to be pre-drilled in a fixture, the diameter of the hole selected should allow for proper anchor installation.

For through fixture installations, it is necessary to predrill a minimum clearance hole in the fixture which is large enough to allow the carbide tipped bit and the anchor to pass through.

One-step mechanical expansion anchors require a predrilled hole in the fixture which is large enough for the expansion mechanism to be driven through. Normally, for mechanical expansion anchor sizes up to 7/8", the minimum clearance hole required is the anchor diameter plus 1/16". For sizes 1" and larger, the minimum clearance hole is the anchor diameter plus 1/8". This clearance hole should be adjusted to allow for any coating applied to the fixture.

As in all applications, the design professional responsible for the installation should determine the clearance hole to be used based on the anchor selected and relevant code requirements.

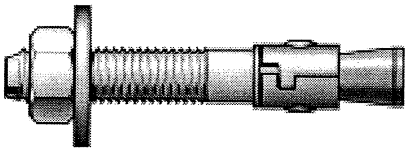
22.7.4 Installation Torque

Certain anchor styles, sometimes referred to as torque controlled anchors, are actuated by tightening a bolt or nut. For typical field installations, the commonly recommended tightening procedure for anchors such as the Power-Stud or Power-Bolt is to apply 3 to 4 turns to the head of the bolt or nut from the finger tight position. This is usually sufficient to initially expand the anchors and is standard industry practice.

In some cases, it may be desirable to specify an installation torque for an anchor. The frictional characteristics which govern the torque-tension relationship for an anchor will vary depending upon the anchor type and the base material. Other factors which may effect the relationship are the effects of fixture coatings or platings, lubrication of the anchor components due to the use of sealants around the anchor hole, and the anchor material. Powers *Rawl* publishes guide installation torque values for anchors which are actuated by tightening a bolt or nut. These values are based on standard product installations and should be used as a guideline since performance may vary depending upon the application. For other anchor types, a maximum torque may be published for use as a guide to prevent overloading when applying a clamping force to a fixture. These values may have to be reduced for installations in masonry materials.

To establish application specific installation torque values, a job site test is recommended. A typical procedure includes the following. Install the anchor duplicating the actual application. Using a torque wrench, apply the recommended number of full turns from the finger tight position. The number of turns may vary depending upon the base material strength. Upon completion of the final turn, record the torque reading from the wrench. This should be performed on a minimum sample of 5 anchors averaging the results to establish an installation torque range.

If previously installed anchors are to be inspected using a torque wrench, it should be noted that anchors experience a relaxation of preload which begins immediately after tightening due to creep within the concrete or masonry material. This phenomena is discussed in Section 2.5.4. The torque value measured after installation is typically 50% of that initially applied to set the anchor.



Power-Stud™

WEDGE TYPE EXPANSION ANCHOR

BASE MATERIAL

Concrete, Stone

SIZE RANGE

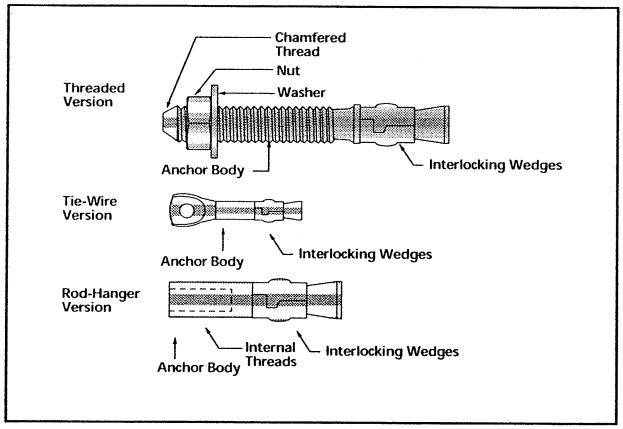
1/4" x 1-3/4" to 1-1/4" x 12"

ANCHOR MATERIAL

Carbon Steel & Type 304 or ~~316~~ Stainless Steel

PRODUCT DESCRIPTION

The Power-Stud anchor (formerly known as the Rawl-Stud) is a one piece, wedge type expansion anchor available in carbon steel and stainless steel. Threaded, Rod Hanger and Tie-Wire versions are designed for use in solid concrete. The drill bit diameter needed for proper installation is the same as the anchor diameter.



LENGTH IDENTIFICATION

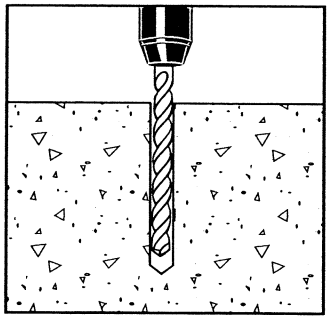
The threaded Power-Stud anchor has a length identification mark stamped on the head of the anchor as shown below.

MARK	A	B	C	D	E	F	G	H
From	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5
Up to	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2

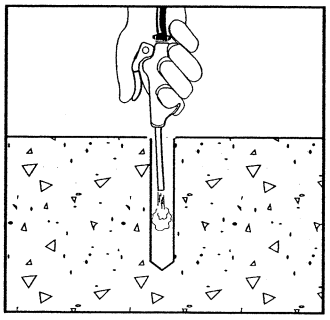
MARK	I	J	K	L	M	N	O	P
From	5-1/2	6	6-1/2	7	7-1/2	8	8-1/2	9
Up to	6	6-1/2	7	7-1/2	8	8-1/2	9	9-1/2

MARK	Q	R	S	T
From	9-1/2	10	11	12
Up to	10	11	12	13

INSTALLATION PROCEDURES

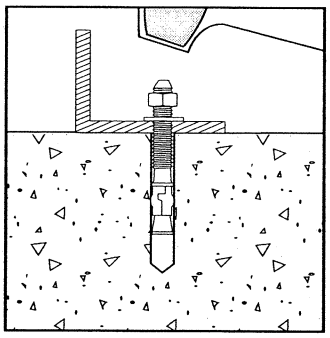


Using the proper diameter bit, drill a hole into the base material to a depth of at least 1/2" or one anchor diameter deeper than the embedment required. The tolerances of the drill bit used should meet the requirements of ANSI Standard B212.15.

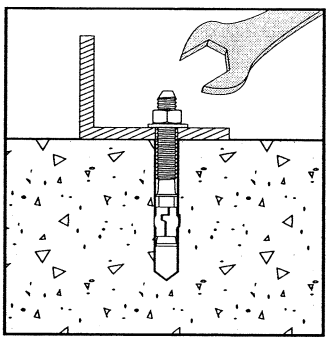


Blow the hole clean of dust and other material.

THREADED VERSION



Position the washer on the anchor and thread on the nut.
Drive the anchor through the fixture into the anchor hole until the nut and washer are firmly seated against the fixture. Be sure the anchor is driven to the required embedment depth.



Tighten the anchor by turning the nut 3 to 5 turns past finger tight or by applying the guide installation torque from the finger tight position.

SECTION I

W.P.E.

Contract Q10600A
(*Revised 8/9/11)

APPROVAL SPECIFICATIONS
FOR
SECONDARY CLARIFIERS NO. 1 & NO. 2

Project ..... Harold D. Thompson Regional Water Reclamation Facility
Fountain, Colorado

* **Date** ..... May 5, 2011 **(*Revised August 8, 2011)**

Number of Units ..... Two (2)

Type ..... 'RSMTP'

* **Submittal Drawings** .....

D205-70549-167	–	General Arrangement - PLAN
D205-70550-167A	–	General Arrangement - ELEV
D105-70551-166A	–	Anchor Location
D705-46884-171	–	Drive Assembly
C505-46818-171	–	Torque Indicator Box
D205-62171-201	–	Skimmer Assembly
C605-71001-200	–	Scum Trough Assembly
C605-70108-292	–	Scum Trough Flushing Gate
A605-35022-292	–	Flight and Squeegee
A605-40165-292	–	Suction Header/Manifold
A605-38955-292	–	Manifold Seal - Upper
A605-38956-292	–	Manifold Seal - Lower
A605-40168-292	–	Wearing Strip - Center Column
D405-70590-854	–	Scum Trough Detail Drawing
B205-71000-167	–	Tank Loads

* **Tank Size** ..... 60'-0" Dia. x 13'-0" S.W.D.

Clarifier Hydraulics (Per Basin)	**MINIMUM**	**DESIGN**	**MAXIMUM**
Sludge Return	0.42 MGD	0.69 MGD	1.89 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 1/2" bearing bars spaced on 1 3/16" centers and cross bars spaced on 4" centers. The panel ends and all openings shall be banded.

* **Handrailing** ..... The handrailing shall be external mechanical joint system, 2-rail, aluminum, 1 1/2" sch. 40 rails and posts. The posts shall be at a maximum 6'-0" centers.

MATERIAL SPECIFICATIONS: (Continued)

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 except as noted.

Anchorage ..... All anchor bolts shall conform to AISI 304 stainless steel.

Fasteners ..... All capscrew, 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 120 for compression members or 240 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.

All welds on submerged or partially submerged surfaces to be continuous.

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 insure proper fit for field assembly.

SPARE PARTS ..... The following items shall be boxed or crated for long term storage and marked **"SPARE PARTS – S.O. Q10600A"**.

Four (4)	Oil level sight glasses
One (1)	Set of scraper arm squeegees overload.
One (1)	Set of suction header squeegees
Two (2)	Neoprene skimmer wipers
Two (2)	Sets of seals, gaskets and bearings for the drive mechanism
Ten (10)	Shear pins.

PAINTING SPECIFICATIONS .....Gearmotor to have manufacturer's standard paint.

Exterior surfaces of the drive to be solvent cleaned per SSPC specifications SP-1-63 and given one (1) shop coat of Tnemec Series N69-1211 Hi-Build Epoxoline II red primer, 2.0 to 10.0 mils dry film thickness.

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 steel products will be hot-dipped galvanized after fabrication in accordance with ASTM designation A-123, "Zinc (hot galvanized) coatings on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips".

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 W.P.E.

All finish coats are not by W.P.E. It is recommended that finish coats be of same type and by same coatings manufacturer as prime coat to insure optimum compatibility.

No shop coatings are used by W.P.E. on aluminum, stainless steel or other non-ferrous metals or on galvanized metal unless specifically designated.

Electrical Controls.....Each clarifier to be furnished with a control panel in a 304 stainless steel enclosure. Please reference the control panel tab for specific details.

EQUIPMENT SPECIFICATIONS:

EACH DRIVE UNIT SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:

Model.....28H6T

Design Running Torque..... 6,300 ft. lbs.
Spur Gear Continuous Torque Rating .....14,700 ft. lbs. (approximately)
Momentary Peak Torque Rating.....43,400 ft. lbs. (approximately)
Alarm Torque Setting..... 7,560 ft. lbs. (120% of design running torque)
Motor Shut-off Torque Setting..... 8,820 ft. lbs. (140% of design running torque)
Shear Pin Torque Setting.....13,000 ft. lbs. (approximately)

DRIVE UNIT SPECIFICATIONS: (Continued)

Output Speed.....0.04 RPM (approximately)
Tip Speed.....8 FPM (approximately)

Rotation.....Clockwise

AGMA Design.....The drive unit has been designed and rated in accordance with ANSI/AGMA Sections 2001-D04, "Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth"; and 6034-B92, "Practice for Enclosed Cylindrical Wormgear Speed Reducers and Gearmotors" for 24-hour continuous duty loading and a 20 year design life.

All bearings are designed for a L-10 minimum life of 20 years based on the continuous torque.

Drive.....1/2 HP, Eurodrive frame size R37DRS71S4/DH, parallel-helical gearmotor; AGMA Class III, 38 RPM (ratio 44.81:1) output speed with 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 RPM, severe duty motor for outdoor service. The gearmotor is mounted on a fabricated steel base with provision for taking up slack in the drive chain.

1/2" pitch steel sprocket with No. 40 self-lubricated steel roller chain enclosed in a weatherproof 12 gauge OSHA approved, removable, steel guard between gearmotor and the worm reduction unit. Chain S.F. at continuous torque is 16:1.

Intermediate worm reduction unit (6" centers) with centrifugally cast manganese bronze worm gear and hardened and ground AISI 8620 alloy steel worm driving a forged 4150 alloy, 12 tooth steel pinion 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 per ASTM A536 Grade 120-90-02 ductile iron, 84 tooth, 28" P.D. is driven by the steel pinion.

Spur gear and the entire clarifier mechanism is supported on a ball bearing assembly comprised of seventy-nine (79) SAE 52100 chrome alloy steel balls, 1 1/4" dia., running in an oil bath on replaceable heat treated (min. 43RC) alloy steel inserts in annular raceways.

Bearing race diameter is 31". The complete unit is encased in a cast iron gear case complete with neoprene seals and dust shields.

DRIVE UNIT SPECIFICATIONS: (Continued)

Drive (Continued)..... **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 located in a NEMA 4X stainless steel enclosure and operated by a spring loaded actuator from the worm on the primary worm reduction unit. One (N.O. contact) switch will sound an alarm when the drive reaches the alarm torque of 7,560 ft. lbs. The other switch (N.C. contact) will stop the drive when it reaches the cut-out torque of 8,820 ft. lbs.

The protection system is also equipped with a graduated scale and operated by the spring loaded actuator. Indicator can be read from walkway. Enclosure is also furnished with a terminal block.

Additional protection has been provided by a shear pin sprocket which is designed to shear at approximately 13,000 ft. lbs.

CLARIFIER COMPONENTS SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS

* **Access Bridge** .....Two (2) W12 X 14 structural steel beams on 3'-0" centers, interlaced with structural members for rigidity, extending across one half of the tank diameter, supported on the main spur gear housing and the tank wall. The bridge shall have a 3'-0" wide walkway with handrailing along both sides and around the platform. A 9'-0" wide x 10'-0" long platform shall be provided at the tank center. The platform shall provide a 36" clearance around the drive assembly. The walkway and platform area to have a 1/4" x 4" high aluminum kickplate.

The bridge will be designed for the dead load and a live load of 150 pounds per lineal foot accordance with AISC allowable stress. Total dead load plus live load deflection shall not exceed 1/360 of the span.

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.

CLARIFIER COMPONENTS: (Continued)

Center Column.....An 18" O.D. x 1/4" minimum wall thickness steel center column 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) 4 1/2" wide x 14 1/2" deep openings are provided in the upper end to allow unrestricted passage of flow into the feedwell. The total area of the ports shall equal 100% of the cross sectional area of the center column. The velocity thru the openings shall be approximately 1.60 fps at average flow.

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 3'-0" square. The drive cage shall be designed to transmit twice the shear pin torque capacity of the drive assembly to the truss arms.

Influent Well.....A 12'-0" diameter x 5'-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 two (2) baffled scum outlet ports at water level.

Truss Arm.....The truss arm 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'-0" wide x 3'-6" high. The truss arm shall be rigidly connected to the drive cage and is designed to transmit twice the shear pin torque capacity of the drive mechanism. The truss arm shall be equipped with 1/4" steel flights so set and spaced to scrape the settled sludge from the tank bottom to a sludge pocket located near the tank center. Fixed to the flights are adjustable brass squeegees. The flights shall be arranged to provide a complete scraping of the floor once every revolution.

Sludge Manifold.....The sludge manifold shall be fabricated from 3/8" minimum thickness steel plate and rigidly mounted to the bottom of the drive cage. The sludge manifold shall have an upper replaceable neoprene seal which contacts the center column wearing ring and a lower replaceable neoprene seal which contacts the bottom seal plate.

The center column wearing ring material is Tivar-88 UHMW polyethylene.

The manifold directs the sludge from the suction header arm into the sludge draw-off sump located in the floor near the center of the tank. A bottom seal plate shall be securely anchored to the concrete floor and grouted in place after proper alignment.

CLARIFIER COMPONENTS: (Continued)

Inside Flight & Squeegee.....A 1/4" steel flight with a neoprene squeegee shall be provided to clean the tank bottom around the sludge manifold and direct the sludge to the first orifice.

Suction Header.....A rectangular shaped tapered suction header, varying in size from a maximum near the tank center to a minimum at the outer end and fabricated from 1/4" minimum thick steel plate, shall be rigidly mounted to the sludge manifold and supported with stainless steel tie rods and turnbuckles in both the horizontal and vertical plane. The longitudinal cross section axis of the header shall be mounted at an angle of 45° to the tank floor with the leading edge extended downward 2" to provide a fluidizing vane and direct the sludge into the area of influence of the orifices.

A neoprene squeegee with a steel backing plate is attached to the vane.

Inlet orifices shall be provided at regular intervals, not exceeding 30" C-C, varying in size from a minimum near the tank center to a maximum at the outer end, to provide a uniform sludge draw-off velocity throughout and to have each orifice size proportionate to the volume of sludge withdrawn. The minimum orifice size shall be 2" diameter. The design of the suction header and orifices shall be such as to insure hydraulic balance in the tank and a uniform sludge withdrawal from the entire tank bottom.

The suction header shall be designed for a sludge return of 480 gpm (0.69 MGD Average) and a maximum headloss of 1.25 feet for a sludge return of 1310 gpm (1.89 MGD Maximum). The minimum velocity through the suction header shall be 0.5 FPS at 290 gpm (0.42 MGD Minimum).

The suction header shall be hot dipped galvanized after fabrication.

Skimmer Assembly.....The surface skimmer shall consist of a rotating scum deflector bade 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" skimmer 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.

CLARIFIER COMPONENTS: (Continued)

Scum Trough.....A 4'-0" wide scum trough, fabricated of 1/4" steel plate, shall have a 6" standard 125# pipe flange connection for the scum discharge pipe and shall be supported from the tank wall. The scum trough shall be self-flushing with an adjustable trip arm to activate a 3" flap gate.

* **Weir Plates**.....The effluent weirs shall consist of 1/4" by 12" fiberglass sections with 3" deep v-notches space on 6" centers. The effluent weir sections shall be furnished with round washers and splice plates for mounting to the tank wall.

Scum baffles.....The scum baffles shall consist of 1/4" by 12" fiberglass sections. The scum baffle sections shall be furnished with adjustable mounting brackets for mounting to the tank wall.

* **Anchorage**.....One (1) set of hook type anchor bolts set in a steel template for the center column, one (1) set of hook type anchor bolts for the seal plate and one (1) lot of expansion anchors for the bridge, scum trough, scum baffles and weir plates.

Note: Hook anchors for center column and seal plate were supplied by contractor per W.P.E. drawings.

THE FOLLOWING ITEMS ARE NOT FURNISHED BY W.P.E:

Piping, valves and wall fittings except as noted on equipment specifications and/or submittal drawings.

All wiring, conduits, electrical controls and alarm horn, light or bell except as noted on equipment specifications and/or submittal 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 submittal drawings.

Grout, field paint and painting and lubricants.

Scum spray system.

PAINT SPECIFICATIONS

TNEMEC

PRODUCT DATA SHEET

HI-BUILD EPOXOLINE II N69 or V69

PRODUCT PROFILE

GENERIC DESCRIPTION Polyamidoamine Epoxy

COMMON USAGE An advanced generation epoxy for protection and finishing of steel and concrete. It has excellent resistance to abrasion and is suitable for immersion as well as chemical contact exposure. Contact your local Tnemec representative for a list of chemicals. This product can also be used for lining storage tanks that contain demineralized, deionized or distilled water. **Note:** Series V69 conforms with air pollution regulations limiting Volatile Organic Compounds (VOC) to a maximum of 250 grams/litre (2.08 lbs/gal) in areas requiring less than 100 grams/litre VOC, please refer to the Series L69 data sheet.

COLORS Refer to Tnemec Color Guide. **Note:** Epoxies chalk with extended exposure to sunlight. Lack of ventilation, incomplete mixing, miscatalyzation or the use of heaters that emit carbon dioxide and carbon monoxide during application and initial stages of curing may cause yellowing to occur.

FINISH Satin

SPECIAL QUALIFICATIONS A two-coat system at 4.0-6.0 dry mills (100-150 dry microns) per coat passes the performance requirements of **MIL-PRF-4556F** for fuel storage.

PERFORMANCE CRITERIA Extensive test data available. Contact your Tnemec representative for specific test results.

COATING SYSTEM

PRIMERS **Steel:** Self-priming or Series 1, 27, 37H, 66, 90E-92, 90-97, 90-1K97, 91-H_2O, 94-H_2O, 135, 161, 394, 530
Galvanized Steel and Non-Ferrous Metal: Self-priming or Series 66, 161
Concrete: Self-priming or Series 130, 218
CMU: Self-priming or 54-562, 130, 215, 216, 218

TOPCOATS 46H-413, 66, L69, N69, 73, 84, 104, 113, 114, 161, 175, 1028, 1029, 1070, 1071, 1072, 1074, 1074U, 1075, 1075U, 1077, 1078. Refer to COLORS on applicable topcoat data sheets for additional information. **Note:** The following recoat times apply for Series N69/V69: Immersion Service—Surface must be scarified after 60 days. Atmospheric Service—After 60 days, scarification or an epoxy tie-coat is required. Contact your Tnemec representative for specific recommendations.

SURFACE PREPARATION

PRIMED STEEL **Immersion Service:** Scarify the Series 66, N69/V69 or 161 prime coat surface by abrasive blasting with fine abrasive before topcoating if it has been exterior exposed for 60 days or longer and N69/V69 is the specified topcoat.

STEEL **Immersion Service:** SSPC-SP10/NACE 2 Near-White Blast Cleaning
Non-Immersion Service: SSPC-SP6/NACE 3 Commercial Blast Cleaning

GALVANIZED STEEL & NON-FERROUS METAL Surface preparation recommendations will vary depending on substrate and exposure conditions. Contact your Tnemec representative or Tnemec Technical Services.

CAST/DUCTILE IRON Contact your Tnemec representative or Tnemec Technical Services.

CONCRETE Allow new concrete to cure 28 days. For optimum results and/or immersion service, abrasive blast referencing SSPC-SP13/NACE 6, ICRI CSP 2-4 Surface Preparation of Concrete and Tnemec's Surface Preparation and Application Guide.

CMU Allow mortar to cure for 28 days. Level protrusions and mortar spatter.

PAINTED SURFACES **Non-Immersion Service:** Ask your Tnemec representative for specific recommendations.

ALL SURFACES Must be clean, dry and free of oil, grease, chalk and other contaminants.

TECHNICAL DATA

VOLUME SOLIDS 67.0 ± 2.0% (mixed) †

RECOMMENDED DFT 2.0 to 10.0 mils (50 to 255 microns) per coat. **Note:** MIL-PRF-4556F applications require two coats at 4.0-6.0 mils (100-150 microns) per coat. Otherwise, the number of coats and thickness requirements will vary with substrate, application method and exposure. Contact your Tnemec representative.

CURING TIME AT 5 MILS DFT Without 44-700 Accelerator

Temperature	To Handle	To Recoat	Immersion
90°F (32°C)	4 hours	7 hours	6 days
80°F (27°C)	5 hours	8 hours	7 days
70°F (21°C)	7 hours	10 hours	7 days
60°F (16°C)	8 hours	12 hours	9 days
50°F (10°C)	12 hours	16 hours	12 days

Curing time varies with surface temperature, air movement, humidity and film thickness. **Note:** For faster curing and low-temperature applications, add No. 44-700 Epoxy Accelerator; see separate product data sheet.

VOLITILE ORGANIC COMPOUNDS
N69 - **Unthinned:** 2.40 lbs/gallon (285 grams/litre)
Thinned 10% (No. 4 Thinner): 2.80 lbs/gallon (334 grams/litre)
Thinned 10% (No. 60 Thinner): 2.80 lbs/gallon (335 grams/litre)
V69 - **Unthinned:** 1.95 lbs/gallon (234 grams/litre)
Thinned 2.5%: 2.08 lbs/gallon (250 grams/litre) †

HAPS
N69 - **Unthinned:** 2.40 lbs/gal solids
Thinned 10% (No. 4 Thinner): 3.25 lbs/gal solids
Thinned 10% (No. 60 Thinner): 2.40 lbs/gal solids
V69 - **Unthinned:** 2.05 lbs/gal solids
Thinned 2.5%: 2.30 lbs/gal solids)

THEORETICAL COVERAGE 1,074 mil sq ft/gal (26.4 m²/L at 25 microns). See APPLICATION for coverage rates. †

HI-BUILD EPOXOLINE II | N69 or V69

NUMBER OF COMPONENTS Two: Part A (amine) and Part B (epoxy)

PACKAGING 5 gallon (18.9L) pails and 1 gallon (3.79L) cans — Order in multiples of 2.

NET WEIGHT PER GALLON N69: 13.67 ± 0.25 lbs (6.10 ± .11 kg) (mixed) V69: 14.01 ± 0.25 lbs (6.36 ± .11 kg) (mixed) †

STORAGE TEMPERATURE Minimum 20°F (-7°C) Maximum 110°F (43°C)

TEMPERATURE RESISTANCE (Dry) Continuous 250°F (121°C) Intermittent 275°F (135°C)

SHELF LIFE Part A: 24 months; Part B: 12 months at recommended storage temperature.

FLASH POINT - SETA N69 & V69 Part A: 82°F (28°C) N69 Part B: 93°F (34°C) V69 Part B: 86°F (30°C)

HEALTH & SAFETY Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product.
Keep out of the reach of children.

APPLICATION

COVERAGE RATES

	Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
Suggested (1)	6.0 (150)	9.0 (230)	179 (16.6)
Minimum	2.0 (50)	3.0 (75)	537 (49.9)
Maximum	10.0 (250)	15.0 (375)	107 (10.0)

Dense Concrete & Masonry: From 100 to 150 sq ft (9.3 to 13.9 m²) per gallon.
CMU: From 75 to 100 sq ft (7.0 to 9.3 m²) per gallon.
(1) Note for Steel: Roller or brush application requires two or more coats to obtain recommended film thickness. Also, Series N69 can be spray applied to an optional high-build film thickness range of 8.0 to 10.0 dry mils (205 to 255 dry microns) or 11.5 to 14.5 wet mils (209 to 370 wet microns). Allow for overspray and surface irregularities. Film thickness is rounded to the nearest 0.5 mil or 5 microns. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance. †

MIXING
1. Start with equal amounts of both Parts A & B.
2. Using a power mixer, separately stir Parts A & B.
3. (For accelerated version. If not using 44-700, skip to No. 4.)
Add four (4) fluid ounces of 44-700 per gallon of Part A while Part A is under agitation.
4. Add Part A to Part B under agitation, stir until thoroughly mixed.
5. Both components must be above 50°F (10°C) prior to mixing. For application of the unaccelerated version to surfaces between 50°F to 60°F (10°C to 16°C) or the accelerated version to surfaces between 35°F to 50°F (2°C to 10°C), allow mixed material to stand 30 minutes and restir before using.
6. For optimum application properties, the material temperature should be above 60°F (16°C).
Note: The use of more than the recommended amount of 44-700 will adversely affect performance.

THINNING Use No. 4 or No. 60 Thinner. For air spray, thin up to 10% or 3/4 pint (380 mL) per gallon. For airless spray, roller or brush, thin up to 5% or 1/4 pint (190 mL) per gallon. **Note:** When using Series V69, a maximum of 2.5% of No. 4 Thinner may be used to comply with VOC regulations.

POT LIFE Without 44-700 15 hours at 50°F (10°C) 5 hours at 77°F (25°C) 3 hours at 100°F (38°C)
With 44-700 8 hours at 35°F (2°C) 4 hours at 77°F (25°C) 1 hour at 100°F (38°C)

APPLICATION EQUIPMENT

Air Spray ‡

Gun	Fluid Tip	Air Cap	Air Hose ID	Mat'l Hose ID	Atomizing Pressure	Pot Pressure
DeVilbiss JGA	E	765 or 704	5/16" or 3/8" (7.9 or 9.5 mm)	3/8" or 1/2" (9.5 or 12.7 mm)	75-100 psi (5.2-6.9 bar)	10-20 psi (0.7-1.4 bar)

Low temperatures or longer hoses require higher pot pressure.

Airless Spray ‡

Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
0.015"-0.019" (380-485 microns)	3000-4800 psi (207-330 bar)	1/4" or 3/8" (6.4 or 9.5 mm)	60 mesh (250 microns)

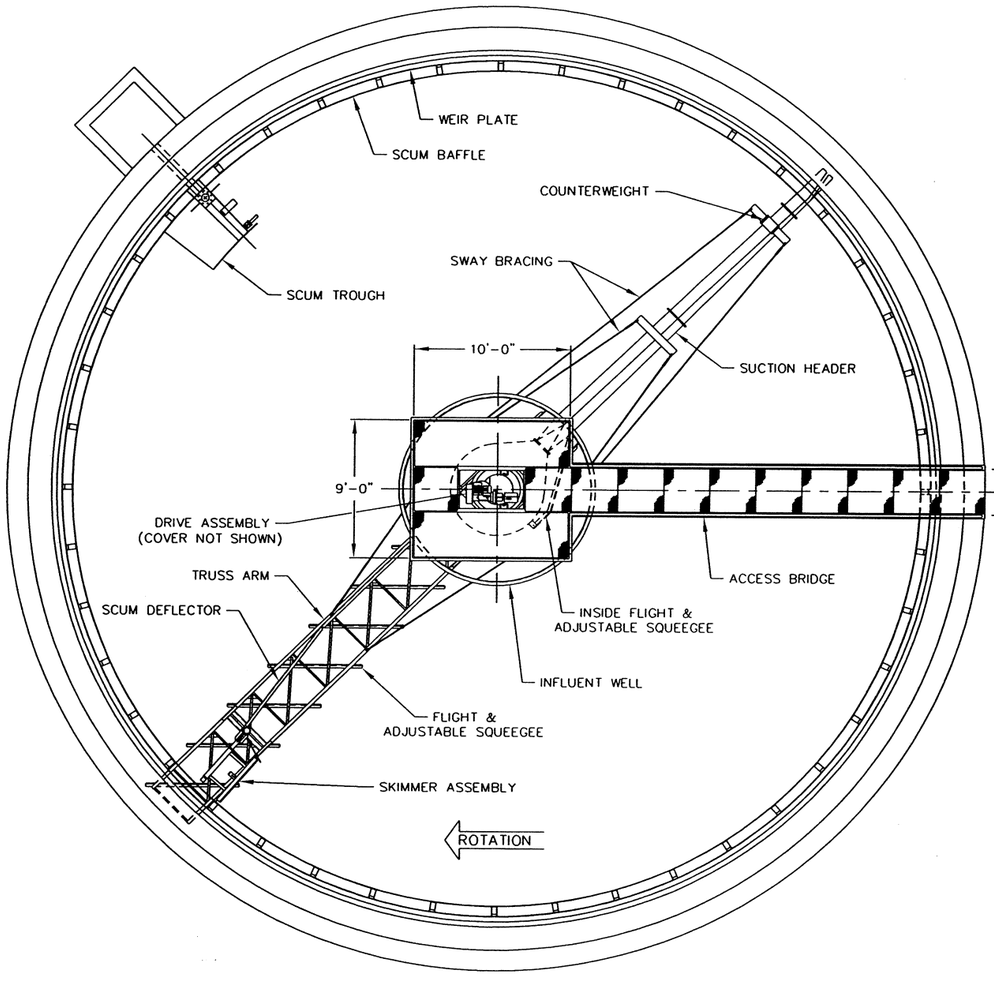
Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.
‡ Spray application of first coat on CMU should be followed by backrolling. **Note:** Application over inorganic zinc-rich primers: Apply a wet mist coat and allow tiny bubbles to form. When bubbles disappear in 1 to 2 minutes, apply a full wet coat at specified mil thickness.
Roller: Use 3/8" or 1/2" (9.5 mm or 12.7 mm) synthetic woven nap roller cover. Use longer nap to obtain penetration on rough or porous surfaces.
Brush: Recommended for small areas only. Use high quality natural or synthetic bristle brushes.

SURFACE TEMPERATURE Minimum 50°F (10°C) Maximum 135°F (57°C)
The surface should be dry and at least 5°F (3°C) above the dew point. Coating will not cure below minimum surface temperature.

CLEANUP Flush and clean all equipment immediately after use with the recommended thinner or MEK.

† Values may vary with color.

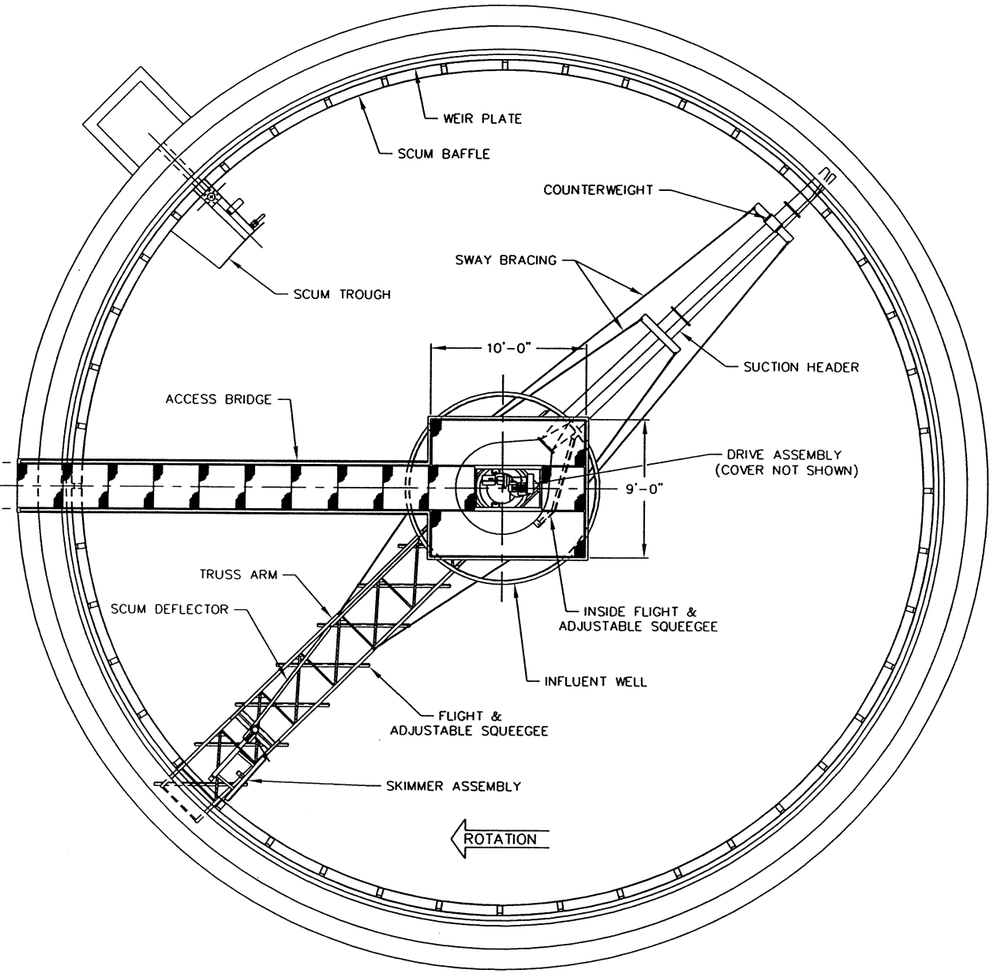
6800 Corporate Drive Kansas City, Missouri 64120-1372 1-800-TNEMEC1 Fax: 1-816-483-3969 www.tnemec.com



SECONDARY CLARIFIER No. 1

3'-0" C-C

3'-0" C-C



SECONDARY CLARIFIER No. 2

PLAN NORTH

CAD FILE: L .9

MASTER
D-70549

SYM	REVISION	BY	DATE	CHKD
B				
A				

The use of anchor types, size, embedment or method other than that shown or provided by Walker Process Equipment will be done at the contractor's risk.

This is the property of the Walker Process Equipment and is to be used only in connection with the performance of work by Walker Process. Reproduction in whole or part for any other purpose is expressly forbidden.

	DATE	BY
DRAWN	4-4-11	RES
CHECKED		
APPR.		

SCALE NONE

FILE REFERENCE

WALKER PROCESS EQUIPMENT

SECONDARY CLARIFIERS
No. 1 & No. 2

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

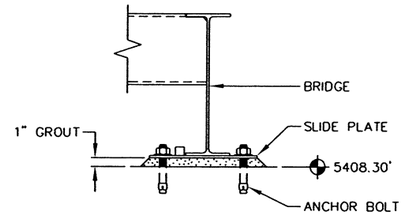
GENERAL ARRANGEMENT - PLAN
60'-0" DIA CLARIFIER - TYPE 'RSMTP'
FOUNTAIN, COLORADO

CONTRACT Q10600A

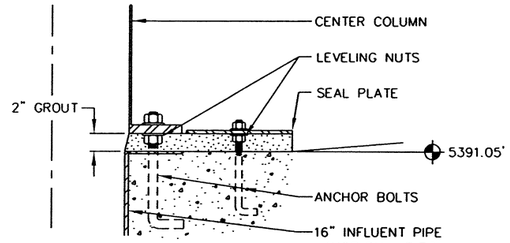
DRAWING NO. D,2,0,5|7,0,5,4,9|1,6,7

REV.

10/10/2011 9:50:36 AM - myang - FOUNTAIN, CO Q10600A



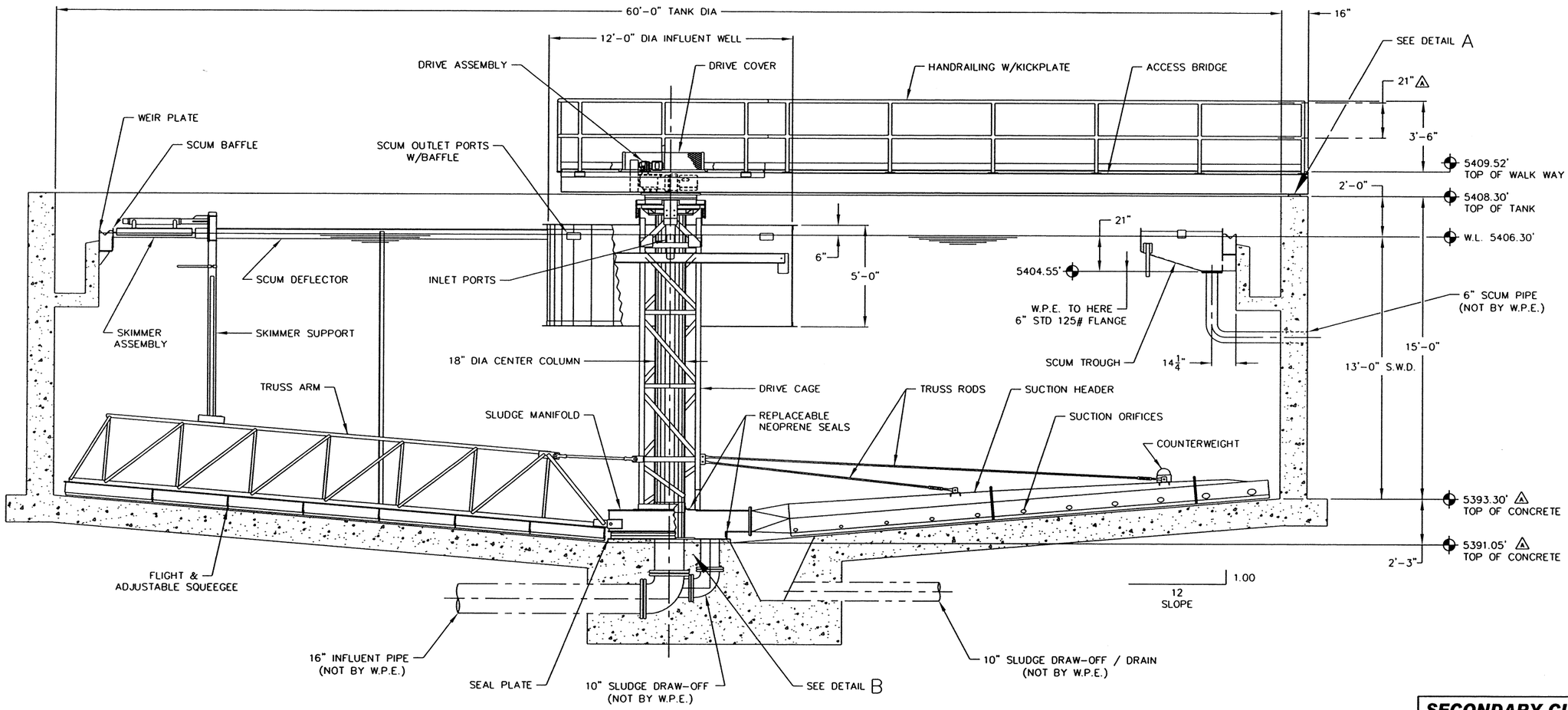
DETAIL A



DETAIL B ⚠

NOTES:

1. DO NOT USE THIS DRAWING FOR ERECTION PURPOSES.
2. FIELD WELDING - APPROX 50 LINEAL FEET OF 1/4" FILLET TYPE REQ'D.
3. FOR PLAN - SEE DRAWING D205-70549-167



SECTIONAL ELEVATION ⚠

SYM	REVISION	BY	DATE	CHKD
⚠	GROUT REMOVED FROM TANK FLOOR, DETAIL 'B' REVISED & 21" WAS 18".	RES	7-26-11	

	DATE	BY
DRAWN	4-4-11	RES
CHECKED		
APPR.		

SCALE NONE

FILE REFERENCE

SECONDARY CLARIFIERS No. 1 & No. 2

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

GENERAL ARRANGEMENT - ELEV
60'-0" DIA CLARIFIER - TYPE 'RSMTP'
FOUNTAIN, COLORADO

CONTRACT	DRAWING NO.	REV.
Q10600A	D,2,0,5,7,0,5,5,0,1,6,7	A

MASTER D-70550

CAD FILE: D,...,50

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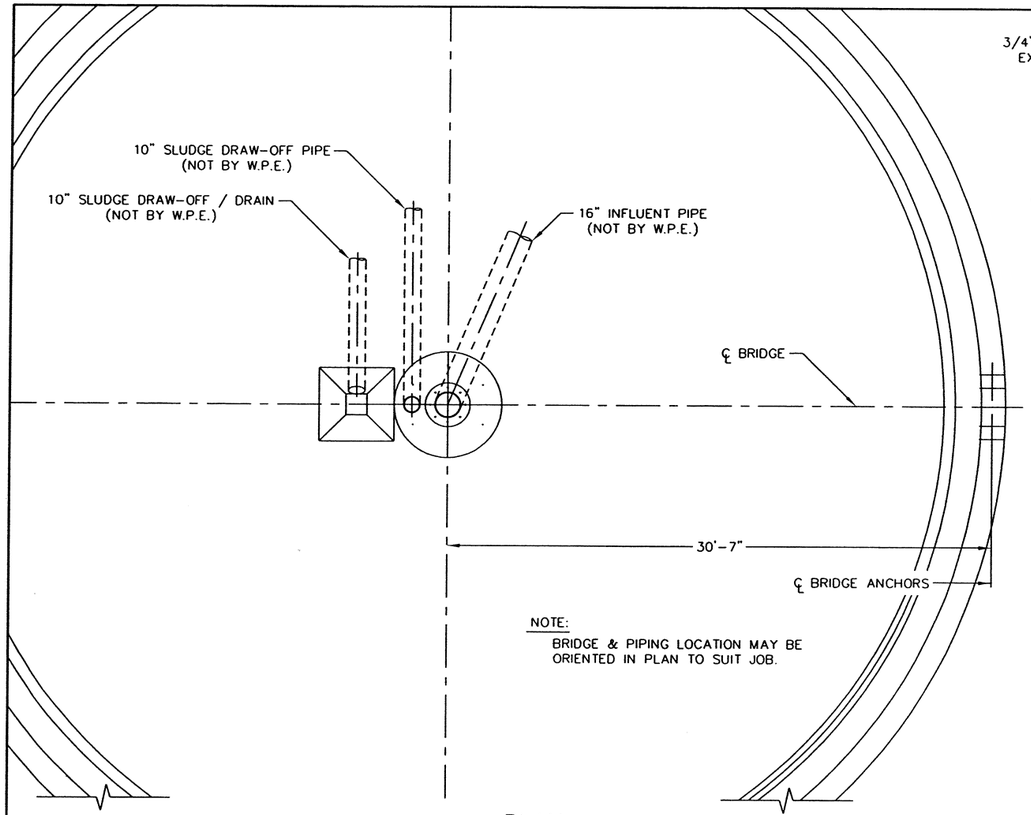
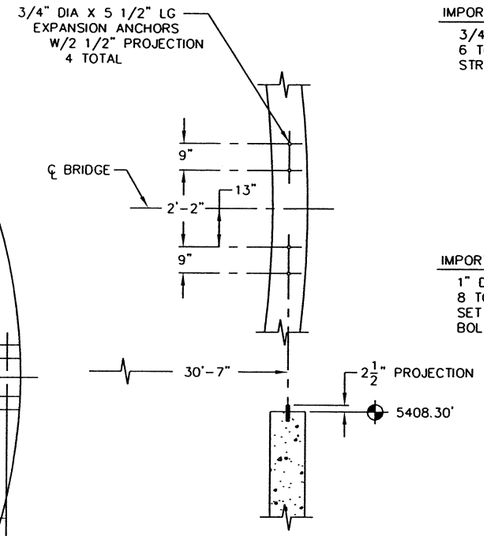


PLAN

NOTE:
BRIDGE & PIPING LOCATION MAY BE ORIENTED IN PLAN TO SUIT JOB.

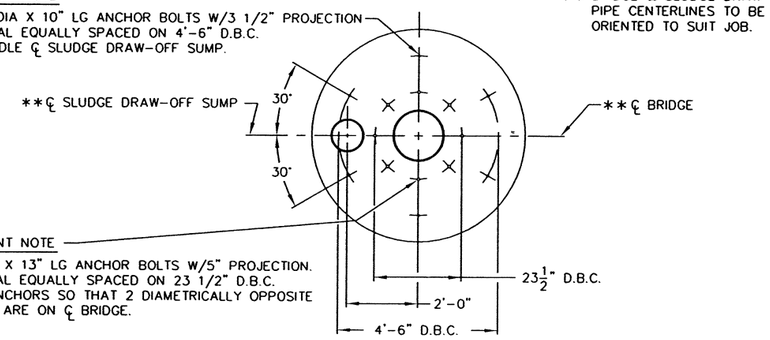


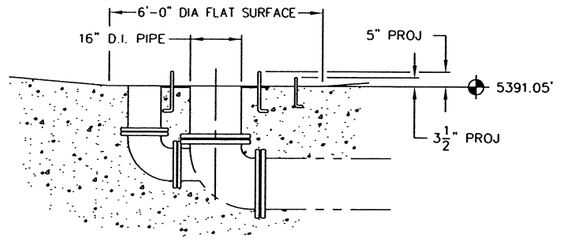
BRIDGE ANCHOR DETAIL

IMPORTANT NOTE
3/4" DIA X 10" LG ANCHOR BOLTS W/3 1/2" PROJECTION
6 TOTAL EQUALLY SPACED ON 4'-6" D.B.C.
STRADDLE ℄ SLUDGE DRAW-OFF SUMP.

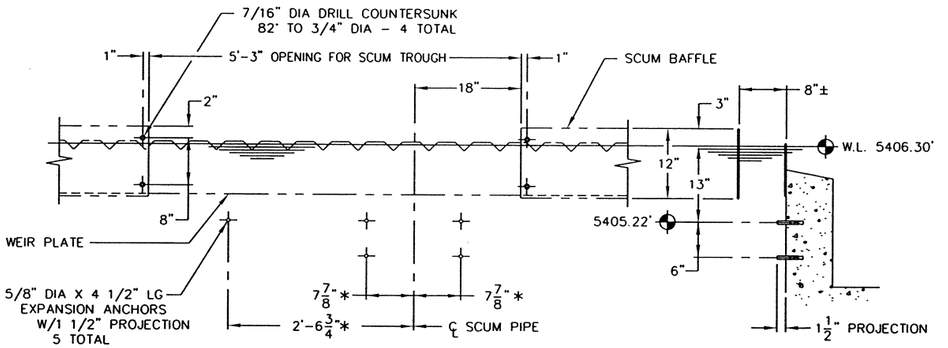
IMPORTANT NOTE
1" DIA X 13" LG ANCHOR BOLTS W/5" PROJECTION.
8 TOTAL EQUALLY SPACED ON 23 1/2" D.B.C.
SET ANCHORS SO THAT 2 DIAMETRICALLY OPPOSITE BOLTS ARE ON ℄ BRIDGE.

** BRIDGE & SLUDGE DRAW-OFF PIPE CENTERLINES TO BE ORIENTED TO SUIT JOB.



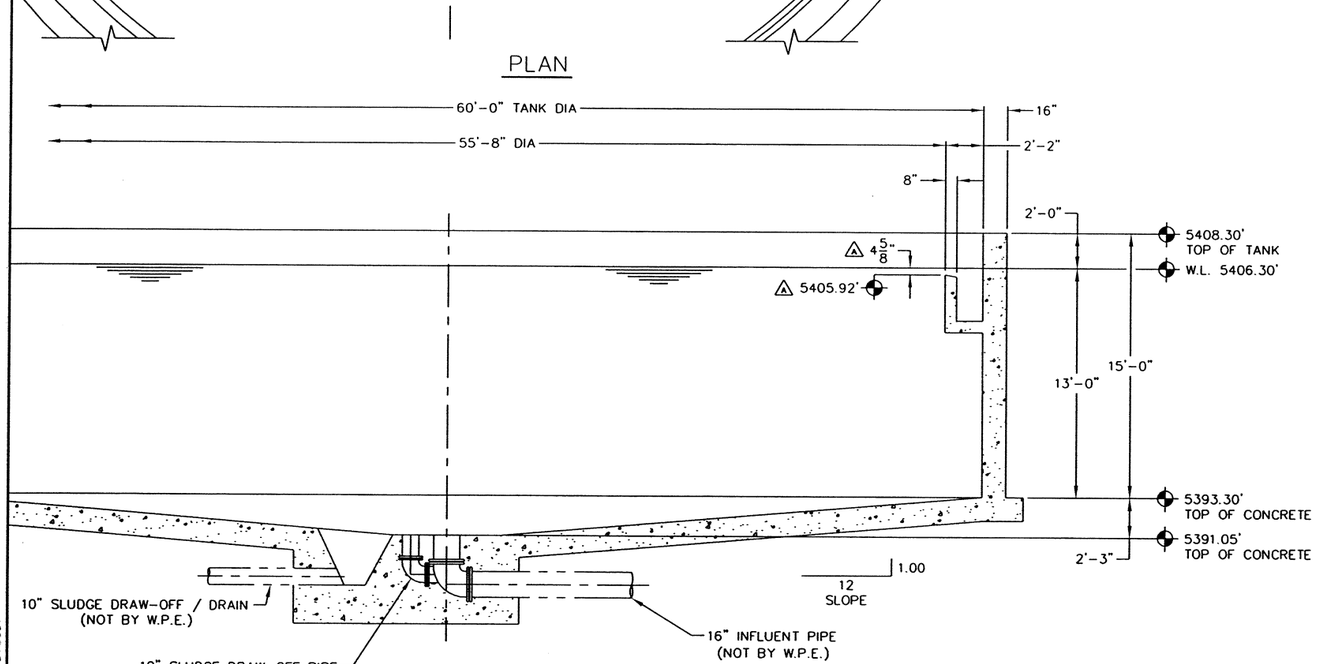


CENTER COLUMN & SEAL PLATE ANCHOR DETAIL

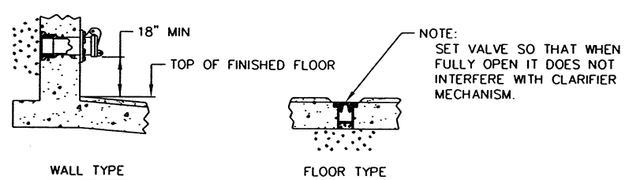


SCUM TROUGH ANCHOR DETAIL

* MEASURED ON INSIDE CIRCUMFERENCE OF EFFLUENT TROUGH.



SECTIONAL ELEVATION △



INSTALLATION OF PRESSURE RELIEF VALVES - IF REQ'D
(NOT BY W.P.E.)

SYM	REVISION	BY	DATE	CHKD
△	EL 5405.92' WAS 5405.80' & 4 5/8" WAS 6".	RES	7-26-11	
△				

	DATE	BY
DRAWN	4-1-11	RES
CHECKED		
APPR.		
SCALE	NONE	
FILE REFERENCE		

SECONDARY CLARIFIERS No. 1 & No. 2

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

ANCHOR LOCATION
60'-0" DIA CLARIFIER - TYPE 'RSMTP'
FOUNTAIN, COLORADO

CONTRACT	DRAWING NO.	REV.
Q10600A	D,1,0,5,7,0,5,5,1,1,6,6	A

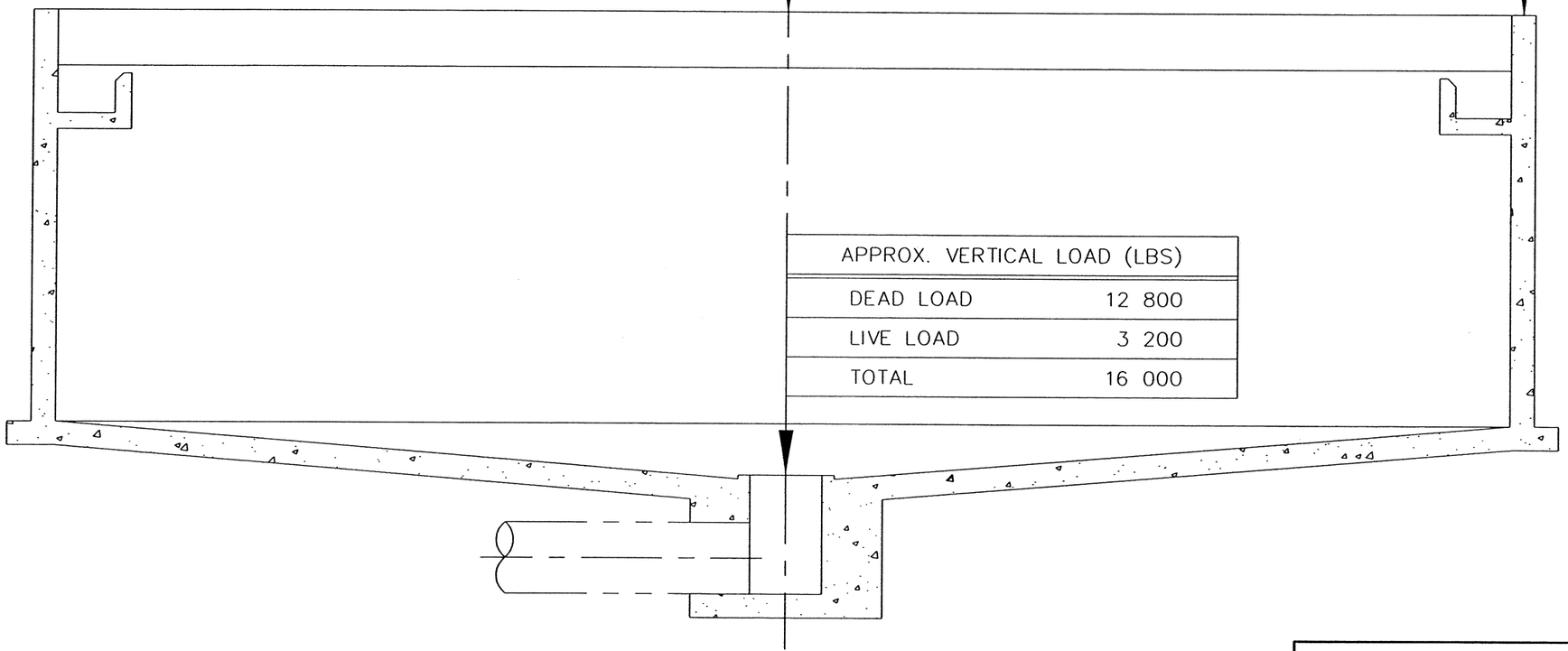
MASTER D-0782

CAD FILE: D:...\1

10/10/2011 9:50:43 AM - myang - FOUNTAIN, CO Q10600A

MAXIMUM ALLOWABLE OVER TURNING MOMENT
38 100 LB–FT

APPROX. VERTICAL LOAD (LBS)	
DEAD LOAD	1 100
LIVE LOAD	2 350
TOTAL	3 450



APPROX. VERTICAL LOAD (LBS)	
DEAD LOAD	12 800
LIVE LOAD	3 200
TOTAL	16 000

SECONDARY CLARIFIERS No. 1 & No. 2

SYM	REVISION	BY	DATE	CHKD
E				
D				
C				
B				
A				

	DATE	BY
DRAWN	7–27–11	RES
CHECKED		
APPR.		
SCALE	NONE	

Walker Process Equipment
Division of McNish Corporation
AURORA, ILLINOIS U.S.A.

TANK LOADS
60'–0" DIA CLARIFIER – TYPE 'RSMTP'
FOUNTAIN, COLORADO

MASTER	CONTRACT	DRAWING NO.	REV.
B-0615	Q10600A	B205 7100 0167	

CAD FILE: B71000

SECTION J

FIELD SERVICE REPORT

PLEASE KEEP THIS MOVING TO AVOID BEING "LOST" ON SOMEONE'S DESK

Date: 6/20/12

Job: Fountain, CO MWWT

Contract #: Q10600A

Lloyd Cates	_____	Elaine Anderson	_____
Tom Patsch	_____	Randy Stevenson	_____
Bill Patsch	_____	Dick Beebe	_____
Randy Winders	_____	Mike Fowler	_____
Craig Everhart	_____	Dan Harker	_____
Chris Padilla	_____	Lane Sheldon	_____
George Stalker	_____	Jeff Thomas	_____
William Mak	_____	Bob St. Germain	_____
Daniel Schmitz	_____	Jim Barbel	_____
Mike McFarland	_____	Al Wagner	_____
Ritch Dornfeld	_____	Arn Johnson	_____
Phil Groom	_____	John Edwards	_____
Brian Davids	_____	Hank Olney	_____
Ryan Wietholter	_____		

LAST PERSON PLEASE DISCARD

cc: Art Benner (Pass Thrus Only)
Gail Schnirer (Pass Thrus Only)
Marilyn Dvorak / Helen Wexell / Linda Woods / Dana Strzalka
Lori Rock / Jim McNish
Field Service File
Correspondence File (original)
Sales Rep: Water Control Corp. (16)

REQUEST AND INSTRUCTIONS
FOR FIELD SERVICE INSPECTION

TO: FIELD SERVICE DEPARTMENT FROM: _____ DATE: _____

Date Customer Made Contact for Service: _____
Date Customer Requested Service Be Performed: _____
Date Service Scheduled To Be Performed: _____

FOUNTAIN, CO
FOUNTAIN, CO MWWT
Contract Name / Location

GMS, INC.
Consulting Engineer

WATER CONTROL CORP. (16)
WPE Sales Office

JCT
WPE Sales Manager

LLW
WPE Project Manager

Company Name: WEAVER GENERAL CONSTR. CO.
Customer Order #: 2908-11190

Office Address: 3679 S. HURON ST.
SUITE 404
ENGLEWOOD, CO 80110-3498

Office Phone: (303) 789-4111
Office Fax: (303) 789-4310

Field Name: HAROLD D. THOMPSON WATER REC. FAC.
Field Address:
FOUNTAIN, CO 808817

Field Contact: Tyler
Field Phone: 303 908 1229
Field Fax: _____

		SOLD		EST.		QUANTITY & DESCRIPTION		GREAT
Contract #	CE	T	D	T	D	OF EQUIPMENT	Prod.Cls.	PLAINS #
Q10600A		1	2	1	2	2-60' DIA RSMTP COLLECTORS W/ FRP W&B	6096	M06186

Specific Description of Service to be Performed: (Pregrout Check) (Torque Testing) (Inspection) (Start Up) (Training) (Mechanical Checkout) **CK, START, TRAIN (2) 60' RSMTP**

Specific Equipment Req'd (Yes) (No) _____
Torque Test Equipment Req'd (Yes) (No) Static/Sled Dynamometer Rating: _____
Enerpac Test Equipment Req'd (Yes) (No) Worm Gear Size: _____
Parts Req'd: _____
Photographs Req'd: _____

This Field Service is to be charged to the Account Number: **Q10600A** Great Plains: _____

Service Performed By: Jamie Banbury Date: 6/19/2012

Trip # 1 ***Days Used*** _____

F:\WP51\FIELDSERVICE.XLS

McNISH **PROJECT LOCATION**: Q10600A
CORPORATION Fountain, CO

AMWELL	E & I CORPORATION	WALKER PROCESS EQUIPMENT
600 N. Commons Dr.,Ste.116	2599 Tiller Lane, Suite B	840 North Russell Avenue
Aurora, IL 60504	Columbus, OH 43231	Aurora, IL 60506
PH (630)898-6900	PH (614)899-2282	PH (630)892-7921
FAX(630)898-1647	FAX(614)899-0304	FAX(630)8444-9590

CORPORATE ACTION ITEMS

Contract No.: Q10600A Unit No.: 2-60' DIA RSMTP Collectors
Fountain, CO

GENERAL JOB COMMENTS

I arrived on the job site and met with Jerry, the superintendent, took me over to the collectors and he stayed and worked with me. I checked the worm gear oil level and spur gear oil level and they were at the correct. I drained Eurodrive reducer to the proper level. I checked the chain for tension. I rotated the suction header around in a clockwise rotation. I checked for "level" and it was within a ¼" tolerance. I checked the skimmer broom and it went across the scum box properly. Bridging was complete except slide plates need to be grouted. Squeeges were set to the proper height. I adjusted the limit switches to 5/16" for the alarm to go off and 7/16" for the shut down switch. I left a punch list with the contractor. I gave training. Name plate .92 Unit 1 Amp readings were as follows: A=.66; B=.67; C=.72. Unit 2 Amp readings were as follows: A=.68; B=.68; C=.72. Units are ready to run.

Note: After training on Wednesday, the engineer wanted a torque TEST to be done. I didn't have the dynameters with me because I was not, initially, scheduled to perform a torque test. They would like a torque test to be scheduled.

NOT REQUIRED in SPEC JC

James Bonbrey
McNish Field Service Representative

6-22-12
Date

McNISH CORPORATION

PROJECT LOCATION: [redacted] FOUNTAIN, CO

AMWELL
600 N. Commons Dr.
Aurora, IL 60504
PH (630) 898-6900
FAX (630) 898-1647

E & I COPORATION
2599 Tiller Lane, Suite B
Columbus, OH 43231
PH (614) 899-2282
FAX (614) 899-0304

WALKER PROCESS EQUIPMENT
840 North Russell Avenue
Aurora, IL 60506
PH: (630) 892-7921
FAX: (630) 844-9590

CONTRACTOR EQUIPMENT INSTALLATION PUNCH LIST

Contract No.: Q 10600 A Unit No.: 1 and 2 COLLECTORS

1. NEED TO GROUT CENTER PIER
2. NEED TO GROUT UNDER SLIDE PLATE
3.
4.
5.
6.
7.
8.

James Bamby 6-20-12 6-20-12

McNish Field Service Representative Date | Contractor Date

EQUIPMENT

Section: 11361– Circular Clarifier Sludge Collection Equipment

Tag No. CC-01 & CC-02

TRAINING

HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY
Lower fountain Metropolitan Sewage Disposal District

Date 6-20-12 Attendees:

Name	Position
James Banbury	Field Service
Logan Mayer	Waste Water Operator
Tim Lantz	Operations Manager
Wayne Ortega	Collections Tech

McNISH
CORPORATION

PROJECT LOCATION: FOUNTAIN, CO.

AMWELL
600 N. Commons Dr.
Aurora, IL 60504

PH (630) 898-6900
FAX (630) 898-1647

E & I COPORATION
2599 Tiller Lane, Suite B
Columbus, OH 43231

PH (614) 899-2282
FAX (614) 899-0304

WALKER PROCESS EQUIPMENT
840 North Russell Avenue
Aurora, IL 60506

PH: (630) 892-7921
FAX: (630) 844-9590

ATTENDANCE LOG FOR TRAINING

DATE: 6-20-12

LOCATION: FOUNTAIN, CO

WPE/AMWELL CONTRACT #(S): Q10600A

INSTRUCTOR: JAMES BANBURY

TYPE OF EQUIPMENT: 60' RSMT COLLECTORS W/ FRP W+B

PLANT PH: 719-382-5303 PLANT SUPT. _____

PLANT E-MAIL: _____

	Printed Name	Signature	Company
1.	Logan Mayer		FSD
2.	Tim Long		fsd
3.	Wayne Ortega		FSD
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			

FIELD SERVICE REPORT

PLEASE KEEP THIS MOVING TO AVOID BEING "LOST" ON SOMEONE'S DESK

Date: 8/8/12

Job: Fountain, CO

Contract #: Q10600A

Lloyd Cates	_____	Elaine Anderson	_____
Tom Patsch	_____	Randy Stevenson	_____
Bill Patsch	_____	Dick Beebe	_____
Randy Winders	_____	Mike Fowler	_____
Craig Everhart	_____	Dan Harker	_____
Chris Padilla	_____	Lane Sheldon	_____
George Stalker	_____	Jeff Thomas	_____
William Mak	_____	Bob St. Germain	_____
Daniel Schmitz	_____	Jim Barbel	_____
Mike McFarland	_____	Al Wagner	_____
Ritch Dornfeld	_____	Arn Johnson	_____
Phil Groom	_____	John Edwards	_____
Brian Davids	_____	Hank Olney	_____
Ryan Wietholter	_____		

LAST PERSON PLEASE DISCARD

cc: Art Benner (Pass Thrus Only)
Gail Schnirer (Pass Thrus Only)
Marilyn Dvorak / Helen Wexell / Linda Woods / Dana Strzalka
Lori Rock / Jim McNish
Field Service File
Correspondence File (original)
Sales Rep: WATER CONTROL CORP. (16)

REQUEST AND INSTRUCTIONS
FOR FIELD SERVICE INSPECTION

TO: FIELD SERVICE DEPARTMENT FROM: _____ DATE: 7/30/2012

Date Customer Made Contact for Service: _____
Date Customer Requested Service Be Performed: _____
Date Service Scheduled To Be Performed: _____

FOUNTAIN, CO
FOUNTAIN, CO MWWT
Contract Name / Location

GMS, INC.
Consulting Engineer

WATER CONTROL CORP. (16)
WPE Sales Office

JCT
WPE Sales Manager

LLW
WPE Project Manager

Company Name: WEAVER GENERAL CONSTR. CO.
Customer Order #: 2908-11190

Office Address: 3679 S. HURON ST.
SUITE 404
ENGLEWOOD, CO 80110-3498

Office Phone: (303) 789-4111
Office Fax: (303) 789-4310

Field Name: HAROLD D. THOMPSON WATER REC. FAC.
Field Address: 9001 BIRDSALL ROAD
FOUNTAIN, CO 808817

Field Contact: JEFF BURST 303-503-1877
Field Phone: 719 382-7909 MATT
Field Fax:

Contract #	CE	SOLD T	SOLD D	EST. T	EST. D	QUANTITY & DESCRIPTION OF EQUIPMENT	Prod.Cls.	GREAT PLAINS #
Q10600A		1	2	1	2	2-60' DIA RSMTP COLLECTORS W/ FRP W&B	6096	M06186

Specific Description of Service to be Performed: (Pregrout Check) (Torque Testing) (Inspection) (Start Up) (Training) (Mechanical Checkout) **COURTESY CALL - T/T ONE (1) UNIT**

Specific Equipment Req'd (Yes) (No) **YES**
Torque Test Equipment Req'd (Yes) (No) Static/Sled Dynamometer Rating: **YES**
Enerpac Test Equipment Req'd (Yes) (No) Worm Gear Size: _____
Parts Req'd: _____
Photographs Req'd: **YES**

This Field Service is to be charged to the Account Number: **Q10600A** Great Plains: _____

Service Performed By: **RICK MARTIN** Date: 8/9/2012

Trip # 2 ***Days Used*** _____

F:\WP51\FIELDSERVICE.XLS

McNISH CORPORATION

PROJECT LOCATION: Fountain,CO

AMWELL
600 N. COMMONS DRIVE,SUITE 116
AURORA, IL 60504

PH: (630) 898-6900

WALKER PROCESS
840 N. RUSSELL AVE.
AURORA, IL 60506

(630) 892-7921

CORPORATE ACTION ITEMS

CONTRACT No: Q10600A **UNIT NO.: 1 & 2 (RSMTP COLLECTORS)**

1. PLEASE SEND COPY OF REPORT ASAP

2.

3.

4.

5.

6.

Rickey D Martin **8-8-12**
McNish field service representative Date Contractor Date

McNish Corporation

Project Location:Fountain,CO

JOB COMMENT

The purpose of this trip is to do Courtesy Call to Torque Test on (2) Two 60' RSMTP Collectors. The units have been inspected and serviced on 6-22-12 by James Banbury. When I arrived I met with Jeff Burst Superintendent and Matt from Weaver Construction also Jerry Miller from GMS Consulting Engineer. We went out to the collectors and started to check everything to be ready to do the Torque Test . The units DO NOT HAVE ANY PERMANENT POWER NOW. Torque test has been completed on both units see attached Torque Test Sheets. The limit switches have been checked and set in the correct location.

Most of the Squeegees are installed correctly and are ½" off the floor the inside flight and squeegee needs to be installed (Floor has been grouted). The lower seal plate needs to be grouted under on both units. Both units need the upper center column seal and mounting plates installed(see attached punch list). After punch list is complete units are ready for service.

Rickey D Martin
Mcnish field service representative

8-8-12
Date

Contractor

Date

McNish Corporation

Project Location:Fountain,CO

CONTRACTOR EQUIPMENT INSTALLATION PUNCH LIST

CONTRACT NO.: Q10600A

UNIT NO.: 1 & 2 (RSMTP COLLECTORS)

1. GROUT UNDER SEAL PLATE

2. INSTALL ALL FLIGHTS AND SQUEEGEES

3. IF UNIT IS NOT GOING INTO SERVICE THEY SHOULD RUN ABOUT 20-30 MIN. EVERY MONTH

4. CONNECT TO PERMANENT POWER

5. UNIT IS READY FOR SERVICE AFTER PUNCH LIST IS COMPLETE

Rickey D Martin
McNish field service representative

8-8-12
Date

Contractor

Date

WALKER PROCESS EQUIPMENT McNish Corporation — Dedicated to the Water and Wastewater Industry	STATIC TORQUE TEST PROCEDURE Q 10600 A FOUNTAIN, CO	IOM-6423-5 PAGE 7 OF 7 ISSUED Jan. '03
PRODUCT UNIT #1 CIRCULAR COLLECTORS, SPUR GEAR DRIVES		SUPERSEDES Feb. '02

NOTE: Dynamometer readings are to be balanced within ± 5% (between stations 1 & 2)

TEST CONDITION	% OF CONTINUOUS TORQUE	REQUIRED TORQUE FT-LBS	WTI READING % LOAD	STATION #1 DYNAMOMETER READING LBs (L1)	STATION #1 RADIUS FT (R1)	STATION # 2 DYNAMOMETER READING LBs (L2)	STATION #2 RADIUS FT (R2)	APPLIED TORQUE FT-LBs (L1 X R1) + (L2 X R2)	
CONT. TORQUE									CALCULATED
									ACTUAL
1ST SET PT ALARM	120%	7,560	120%	290	26'0"			7,560	CALCULATED
				330	23'10"			7623	ACTUAL
SET PT CUT OFF	140%	8,820	140%	340	26'0"			8,820	CALCULATED
				385	23'10"			8,893	ACTUAL
									CALCULATED
									ACTUAL
									CALCULATED
									ACTUAL

WITNESS BY: Rickey D. Martin 8-8-12
WALKER PROCESS EQUIPMENT DATE

CONTRACTOR/ENGINEER 8-8-12
DATE

Jerry L Miller 08-08-12

WALKER PROCESS EQUIPMENT McNish Corporation Dedicated to the Water and Wastewater Industry	STATIC TORQUE TEST PROCEDURE Q 10600A FOUNTAIN, CO	IOM-6423-5 PAGE 7 OF 7 ISSUED Jan. '03	
PRODUCT CIRCULAR COLLECTORS, SPUR GEAR DRIVES	UNIT #2	SUPERSEDES Feb. '02	

NOTE: Dynamometer readings are to be balanced within ± 5% (between stations 1 & 2)

TEST CONDITION	% OF CONTINUOUS TORQUE	REQUIRED TORQUE FT-LBS	WTI READING % LOAD	STATION #1 DYNAMOMETER READING LBs (L1)	STATION #1 RADIUS FT (R1)	STATION # 2 DYNAMOMETER READING LBs (L2)	STATION #2 RADIUS FT (R2)	APPLIED TORQUE FT-LBs (L1 X R1) + (L2 X R2)	
CONT. TORQUE									CALCULATED
									ACTUAL
1ST SET PT ALARM	120%	7,560	120%	290	26'-0"			7560	CALCULATED
				330	23'-10"			7623	ACTUAL
SET PT CUT OFF	140%	8,820	140%	340	26'-0"			8,820	CALCULATED
				385	23'-10"			8,873	ACTUAL
									CALCULATED
									ACTUAL
									CALCULATED
									ACTUAL

WITNESS BY: Rickey D. Martin 8-8-12
WALKER PROCESS EQUIPMENT DATE

CONTRACTOR/ENGINEER 8-8-12 DATE

Jerry L Miller 08-08-12

Weaver
CONSTRUCTION MANAGEMENT
3679 S. Huron St. Suite 404
Englewood, Colorado 80110
Phone (303) 789-4111

CERTIFICATE of INSTALLATION, INSPECTION & START-UP SERVICES

PROJECT: Harold D. Thompson Regional Water Reclamation Facility.
EQUIPMENT: Walker TSMTP Circular Clarifiers, Tag No's. CC-01 & CC-02

SECTION: 11361 – Circular Clarifier Sludge Collection Equoipment

CONSTRUCTION MANAGERS: Weaver Construction Managment, Inc.

ENGINEER: GMS, Inc. 611 North Weber St. # 300, Colorado Springs, CO 80903.

MANUFACTURER'S EQUIPMENT CERTIFICATION:

I hereby certify that the named equipment has been inspected, adjusted and operated by the Manufactures' representative and further certify that:

1. The equipment is installed in accordance with the manufacturer's recommendations, approved shop drawings and the contract Documents. Completed on – Date: 6/20/12
2. The equipment has been lubricated, and operated meeting the start-up criteria and is ready for the owner's Operation. Completed on – Date: 6/20/12
3. Nothing in the installation voids any warranty. Completed on – Date: 6/20/12
4. The equipment has been operated in the presence of the manufacturer's representative. Completed on – Date: 6/20/12
5. The Equipment, as installed, is ready to be operated by others. Date: 6/20/12
6. The manufacturer's start-up report. Completed on – Date: 6/20/12
7. The equipment is ready for Start-Up and Operator Training. Scheduled on Date: 6/20/12
8. . Completed on – Date: 6/20/12

MANUFACTURER'S Equipment Certification: Walker Process Equipment, 840 North Russell Ave. Aurora, Illinois 60506; Phone. 630-892-7921

Signature James Banbury Title Field Service Date: 6/20/12
Name (print) JAMES BANBURY

OWNER:: Lowwer Fountain Metropolitan Sewage Disposal District. 901 S. Santa Fe Ave. Fountain Co 80817; 719-491-6862

Signature _____ Title _____ Date: _____

RECEIVED: _____ Date: _____

Complete and submit three (3) copies of this form with the detailed start-up report to Weaver Construction Management, Inc.

SUB 11361- 002.OM.

WEAVER GENERAL CONSTRUCTION CO.
3679 S. Huron St., Suite 404
Englewood, Colorado 80110
303-789-4111 & 303-789-4310 Fax

Date 6/20/12

CERTIFICATE of INSTALLATION, INSPECTION & COMMISIONING SERVICES
PRE-OPERATION SYSTEM READINESS CHECK-OFF
Lower Fountain Metropolitan Sewage Disposal district
HAROLD THOMPSON WATER RECLAMATION FACILITY

EQUIPMENT: Walker Circular Clarifiers Section 11361 Circular Clarifier Sludge Collection Equipment

		Tag _____.	CC-01.	CC-02.	_____.
1.	The equipment is installed in accordance with the manufacturer's recommendations, approved shop drawings and Contract Documents.		X	X	
2.	The equipment has been lubricated, and operated meeting the start-up criteria of the manufacturer.		X	X	
3.	Nothing in the installation voids any warranty		X	X	
4.	The Equipment has been operated in the presence of the Engineer's representative.				
5.	The equipment, as installed, is ready to be operated by others.		X	X	
6.	The manufacturer's start-up report is completed.		X	X	
7.	The equipment is ready for Start-up and Training		X	X	
8.	The primary sensing elements are operational.		X	X	
9.	_____				
10.	_____				

Weaver
CONSTRUCTION MANAGEMENT
3679 S. Huron St. Suite 404
Englewood, Colorado 80110
Phone (303) 789-4111

11361-002.OM

MANUFACTURER'S CERTIFICATE of INSTRUCTIONAL SERVICES

Section 11361 – Circular Claririer sludge Collection Equipment.

Lower Fountain Metropolitan Sewage Disposal District
Harold D. Thompson Water Reclamation Facility

PROJECT: Harold D. Thompson Water Reclamation Facility, Fountain CO -

EQUIPMENT: Walker TSMTP Circular Clarifiers – Tag No's CC-01 & CC-02
CONTRACTOR: Walker Process Equipment, 840 North Russell Ave. Aurora, Illinois 60506; Phone 630-892-7921
SPECIFICATION SECTION: #11361 - Circular Clarifier Sludge Collection Equiipmnet

ENGINEER: GMS, Inc. 611 North Weber Street # 300, Colo. Springs, CO 80903

MANUFACTURER'S TRAINING CERTIFICATION:
The undersigned manufacturer certifies that a Service Technician has instructed the treatment plant operating personnel in the proper maintenance and operation of the equipment designated herein, and that the Training included, but was not limited to the following:

Operation Check List:

1. X Start-up and operation in accordance with the Manufacturers' O&M manual.
2. X Shutdown procedure reviewed in accordance with the O&M manual.
3. X Normal operation procedure reviewed.
4. X Primary sensing elements, vibration, oil level, temperature, filter, pressure, etc.
5. _____

Maintenance Check List:

1. X Described maintenance of this equipment as required by the O&M manual
2. X Described lubrication and periodic inspection as recommended by the Manufacturer.
3. X Described preventive maintenance instructions
4. X Described normal items to be reviewed for wear
5. X Described special tools required, if any
6. X Described preventive maintenance instructions
7. X Safety and safe operation of this equipment as recommended by the Manufacturer.
8. X Trouble-Shooting information and instruction.
9. X Hands on training - operation of the equipment by the City Operators.
10. _____ Review of the Training as specified in the Contract Documents.
11. _____
12. _____

MANUFACTURER Certificate of Instructional Services: Walker Process Equipment, 840 N. Russell Ave. Aurora, Illinois 60506, Phone 630-892-7921
Signature James Banbury Tile Field Service Date: 6/20/12

ENGINEER: GMS Inc.. Representative, confirms the Training as presented is in compliance with the Contract Documents

Signature _____ Title _____ Date: _____

OWNER: Lower Fountain Metropolitan S.D. District Representative – Acceptance of the Training as presented by the Manufacturers' Representative.
Signature _____ Title _____ Date: _____

CONTRACTOR: Weaver C. M. 3679 S. Huron St. Suite 404, Englewood, CO 80110; 303-789-4111

Signature _____ Title _____ Date: _____

EQUIPMENT MAINTENANCE SUMMARY SHEET
Harold D. Thompson Regional Water Reclamation Facility

Equipment: Circular Secondary Clarifiers (W.P.E. No. Q10600A) Tank 60'-0"dia. x 15'-0" side wall, (13'-0" W.L).	Equipment Number CC-01 &CSC-02
ɔcation: Harold D. Thompson Regional Water Reclamation Facility	Section: 11361 –Circular Clarifiers Sludge Collection Equipment
Mfr: **Walker Process Equipment**, 840 North Russell Avenue, Aurora, Illinois W.P.E. Contract No. Q10600A (2-RSMTP)	Phone: 630-892-7921
Area Rep: **Water Control Corp.** 2460 West 26th Ave. Suite 215-C Denver, Colorado, 80211 – Bill Peretti	Phone: 303-477-1970

ELECTRICAL NAMEPLATE DATA

Serial No.:		ID No.: W.P.E. Q 106000A		Model No.: **DRS71S4**			Frame No.: R37DRS71S4/DH	
Mfr. No.: SEW ER71S	HP: 0.5 Hp.	V: 230/460 V	AMP: 0.92 Amp	HZ: 60 Hz	Phase: 3 Phase	RPM: 1700 rpm	SF:1.15 SF	Duty: Continuous
Cat No :	Code:	Insl. "F":	Design: "B"	Type:	°C Amp: 40° C	NEMA "B"	Rating: T.E.F.C.	Ratio: 44.81;1 38 RPM
ᶜlass: III,		Group: n.a.		Shaft End Brg: #13236563			Opposite End Brg: #13236601	

Miscellaneous Nameplate Data: Design Torque: 6,300 ft. lbs. <> Alarm Torque Setting 7,600 ft. lbs. <> Motor Shut-off Torque 8,820 ft. lbs. <> Shear Pin Torque Setting 13,000 ft. lbs.± <> Output Speed: 0.04 RPM ± <>Tip Speed * FPM ± <> Rotation: Clockwise. (79 chrome alloy steel balls, 1 ¼" dia.)

Recommended Spare Parts: n.a.

MECHANICAL EQUIPMENT NAMEPLATE DATA

Serial No.:	ID No.: Q10600A		Model No.: **28 H 6 T-** Drive Platform Bridge w/ Shear Pin Hub..			Frame No.: n.a.
Mfr. No.: W.P.E. Q 106000A	HP 0.5 Hp.	RPM: 1800 rpm	Capacity: 0.69 mgd	Size: 60' dia.x15'	Code:	Case No.:
Cat No.: SEW DR71S	TDH: na n.a.	Imp Sz: n.a.	Ratio: n.a.	Max RPM: 1800 rpm	Min RPM: 0.04 rpm 8 FPM Tip	Lube Inst.: See "D"
Roller Chain: ½" Pitch – No. 40 self-lubricated roller chain.	CFM: n.a.	Form: n.a.	Press: n.a.	Const n.a.:	Assy No n.a..:	Order No.: n.a.

Recommended Spare Parts: Oil Level Sight Glasses - 4 ea. <>Set of Scraper Arm Squeegees Overload – 1 ea.<> Set of Suction Header Squeegees 1 ea.<> Neoprene Skimmer Wipers, 2 ea. <> Sets of Seals, Gaskets & Bearings for the Drive Mechanism, 2 ea. <> Shear Pins, 10 ea. See Tab "G"

ricants:

Summer:_____. Winter: _____.

Preventative Maintenance Summary Sheet

Lower fountain Metropolitan Sewage Disposal District
HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY

Section 11361 – Circular Clarifier Sludge Collection Equipment -

Task No.	Description Walker "RSMTP" Circular Clarifiers	Frequency	Hours
	Tag No's. CC-01 & CC-02 (30 ft. dia)		
	Spur Gear Drive - No. 28H Drive Maintenance Instruction - Tab "D"		
1.	**Condensate Removal:** Periodically remove any condensate which may have settled in the oil sumps. • Inspection for and removal of condensate; by draining a small quantity of fluid from the oil reservoir into a transparent container. • After condensate, if any has been removed, check and add oil if necessary. • Initially; weekly inspection for condensate removal. Until experience is sufficient to select a new inspection interval.	As Necessary	
2.	**Winterizing:** Subfreezing weather warrants the use of antifreeze in the drain lines to prevent accumulated condensate from freezing. • After draining the summer weight oil, add ethyleneglycol antifreeze, (Prestone or Xerex) • If at any time a significant amount of condensate is removed, then the antifreeze should be recharged. • See Maintenance Instructions Tab "D"	Sessional.	
3.	**Preventative Maintenance Plan and Schedule:** • Visual inspection of tank and drive unit. • Check operation of shimmer mechanism as it passes over the scum box.	Daily	
4.	Keep drive platform and walkway free from oil, debris or tools. • Make sure all guards are in place. • Inspect gerarmotor ventilation openings to bed sure they are clear of dust, dirt or other debris.	Weekly	
5.	• Check oil levels, add oil as required; • Grease all fittings. • Check operation of overload switches, alarm and shut-off. • Drain condensate; This is important in cold climates where freezing of water can cause damage to the unit. • Lubricate drive chain. o Note: Walker Process furnished chain is self-lubricating and does not require lubrication. o If chain is replaced with a non self-lubricating type then lubricate monthly with SAE 30 oil or equal. • Adjust drive chain tension (if required) • Check for loose bolts and nuts or for broken welds.	Monthly	
6.	• Remove chain and sprocket and smear grease on the keyed hub to ensure freedom of operation in case of shear pin failure.	Semi-Annually	
7.	• Check for loose bolts and nuts or for broken welds. • Change gearmotor lubricant if recommended by manufacture. Eurodrive Recommended Lubricant Change Intervals:	Annually	
8.	• **Eurodrive Recommended Lubricant Change Intervals**: o Oil changes are required at intervals of 10,000 operating hours.<> Or every two years.	Annually or 2 years.	10,000 Hrs.

9.	• If a synthetic oil lubricant is used	4 Years	20,00 Hrs.
10.	• Grease packed bearings should be cleaned and greased regreased every 10,000 hours • Input bearings should not be over-greased. o They should be filled with grease not to exceed 1/3 of the bearing's free volume. o For output bearings and bearings with replaceable grease shields, fill to 2/3 of their free volume.	Annually	10,000 Hrs.
11.	**Preventative Maintenance Plan and Schedule:** ***Continued*** • Drain and ;flush drive unit • Check connections between arms and drive cage. • Check connections between drive and dreive cage. • Clean and paint equipment. • Inspect flights and replace if required. • Inspect arm orifice openings – Clean if required. • Inspect arm squeegee and replace if required. • Inspect skimmer wipers and replace if required.	Annually	
	AC Motors – Operating Instructions – Tab "D" **SEW Eurodrive – Lubrication and Maintenance.**		
12.	The motor bearing are sealed and the grease content is adequate for the life of the bearing.	As Necessary	

D = Daily W = Weekly M = Monthly Q = Quarterly S = Semi-Annually A = Annually

Preventative Maintenance Summary Sheet

Lower fountain Metropolitan Sewage Disposal District
HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY

Section 11361 – Circular Clarifier Sludge Collection Equipment -

Task No.	Description Walker "RSMTP" Circular Clarifiers	Frequency	Hours
	Fiberglass Weir and Baffle Maintenance Instructions – Section "H"		
	The only maintenance requirements that apply should be done as a regular part of general plant maintenance, they are:		
1.	• **Clean** surfaces of weirs and baffles by hosing them off. o Special attention should be paid to the V-notch area of the weir plate. o This area should be free of foreign materials to ensure proper flow rates.	As Necessary	
2.	• Check anchors and fasteners to ensure that they are secure.	As Necessary	
3.	• Visual inspection of surfaces. o Note and record apparent damage or problems. o Contact MFG Water Treatment Products for assistance. (877-826-2509 or 814-438-8538 fax)	As Necessary	
4.	• .It is recommended that the weir and baffle be inspected daily; • Observing the weir plate (V-notch) flow patterns for variation that would indicate cleaning requirement is necessary.	Daily	

D = Daily W = Weekly M = Monthly Q = Quarterly S = Semi-Annually A = Annually

WCM Sub No._11361-002.OM.a