MONROE ENVIRONMENTAL
Liquid Clarification & Air/Gas Cleaning Systems

Installation, Operation, & Maintenance Manual

Vertical Clarifier

VC-300 | 105 GPM

Serial Number
19-7706-1

Job Number
7706

P.O. Number
PO-0056

Ship to
Crow Wing Co. Landfill
HTX Solutions
15728 Highway-210
Brainerd, MN 56401 USA

End User
Crow Wing Co. Landfill

www.mon-env.com

810 West Front St., Monroe, Michigan 48161 USA • Phone: **1-800-992-7707** • sales@mon-env.com

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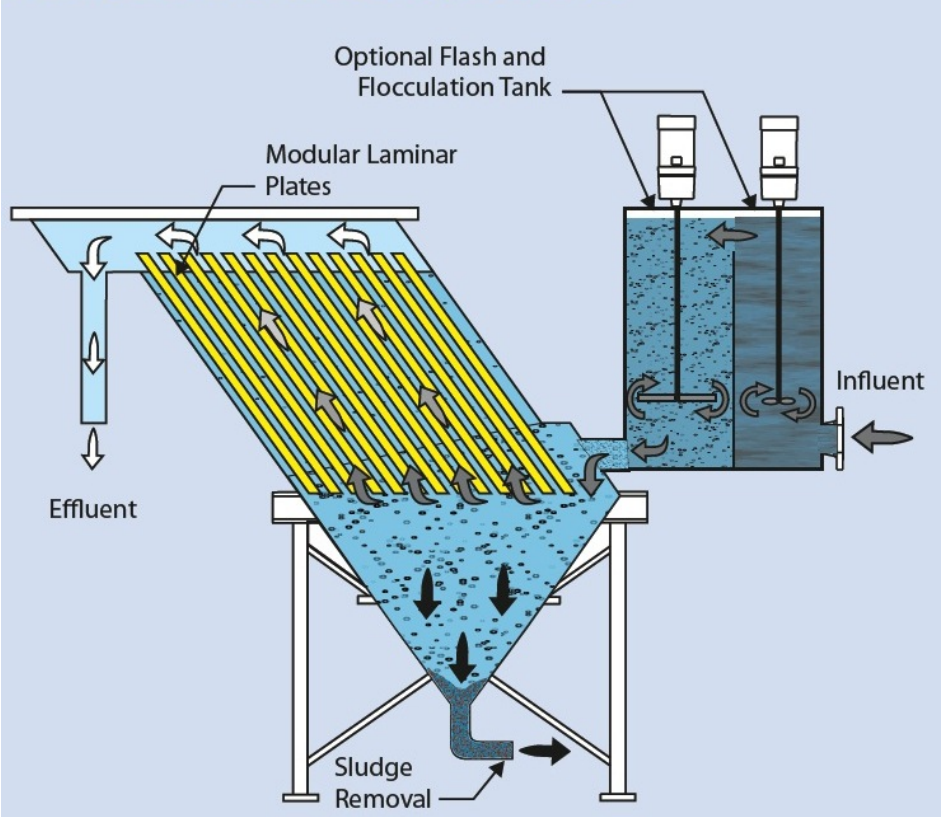


The above is a generic configuration intended to show typical components and design options, and may not reflect the specific design of your purchased equipment. Please refer to the system drawings in Appendix C as well as for your project specific design information.

SECTION 1

GENERAL INFORMATION

This manual contains recommended procedures for installation, operation, and maintenance for a Monroe Environmental Corp (MEC) Vertical Clarifier. It is important that these instructions be followed to ensure that the Vertical Clarifier performs properly and continues to operate with sustained performance with a minimal amount of maintenance.

The MEC Vertical Clarifier is designed to efficiently remove or reduce solids in the influent water. The unit is an inclined plate gravity separator composed of four basic elements: flash mix tank, flocculation tank, separator tank and pyramid sludge hopper.

- **Flash Mix Tank (If purchased)**

  The Influent is fed into the tank first in which coagulants are mixed with the liquid.

- **Flocculation Tank (If purchased)**

  The mixed liquid is then passed to the flocculation tank where floc formation is enhanced by a flocculation mechanism.

- **Separator Tank and Sludge Hopper**

  The supernatant exits the top of the plates while solids are collected in the sludge compartment of the tank. The sludge exits the sludge compartment through an underflow flanged discharge pipe.

SECTION 2

DELIVERY INSPECTION

As soon as the unit is received, inspect for any evidence of damage in transit.

This inspection should be more than a visual once-over of the exterior. The interior sections of all units should be examined for breakage.

All damage claims must be made known at once to both the **Transportation Company and Monroe Environmental.** If any damages are noted, a copy of your inspection documentation must to be signed, dated and attached to the freight receipt. For minor damage, the notation can be written directly on the freight receipt. If there is attachment made to the freight receipt, note directly on the freight receipt that an attachment is included. Be sure to keep a copy of all documents given to the freight company. The vertical clarifier was shipped as fully assembled as possible. Some components may be installed while others are shipped loose. Please refer to the shipping form, for complete shipping information. Care should be used when unloading and installing the Vertical Clarifier. Lifting lugs are provided on each section of the clarifier for handling and lifting. Straps should be used whenever possible. If chains are used, care should be taken to not drag the chain over the equipment. Spreader bars should be used to prevent deformation of the clarifier.

SECTION 3

INSTALLATION AND ASSEMBLY GUIDELINES

The Monroe Environmental Vertical Clarifier is shipped in three major structural components, three platform components, a ladder assembly and platform bracing. The separator plates and mixers are also shipped loose to prevent damage in shipment. The following drawings must be referred to for proper assembly.

7706-01-A01 Cover Sheet
7706-01-A02 General Arrangement
7706-01-A03 General Assembly
7706-01-A04 Assembly
7706-01-A05 Mixer /Flocculation Tank Shipping Assembly
7706-01-A06 Platform/Handrail Assembly Shipping Sections
7706-01-A07 Sludge Discharge Hopper Shipping Assembly
7706-01-A08 Ladder Assembly
7706-01-E01 460V Power Wiring
Bolt Torque Specification Sheet

1. After determining location and orientation of the vertical clarifier, position the Sludge Discharge Hopper Assembly (A07A) in the correct location and mark concrete floor for drilling to install epoxy anchors. Provisions have been made for 5/8" diameter anchors. Move sludge discharge hopper assembly to allow for installation of the anchor bolts. Allow sufficient anchor bolt projection to allow for shimming to level structure plus a washer and double nuts.
2. After anchor bolts have been set, install sludge discharge hopper assembly (A07A). Level assembly in both direction using full shims beneath base plate as required. Install washer and one nut on each anchor bolt and only lightly tighten at this time.
3. Assemble Mix Tank supports (W15A) to the sludge hopper (A07A) and repeat process for the anchors.

4. Position gasket (W16A) on flange of sludge hopper. It is helpful to adhere gasket to sludge hopper flange with a gasket adhesive to prevent gasket from moving out of position when installing the main clarifier section.
5. Install Upper Clarifier Section Assembly (A04A) on top of sludge discharge hopper assembly. Lifting lugs have been provided and should be used to prevent damaging the clarifier section. Lower the clarifier section slowly aligning flange bolts holes and column bolt holes. The flanges are joined using 304 SS hardware and the columns are joined using ASTM A325 structural bolts. All structural bolts can now be fully torqued. The flange bolts can be lightly tightened at this time.
6. Attach gasket (16WB) to the flange of the Mixer/Flocculation Tank. Gasket can best be held in position with a gasket adhesive.
7. The Mixer/Flocculation Tank Assembly (A05A) can now be set into position. Align mating flanges and bolt together using 304SS hardware provided. Lightly tighten at this time. Install all structural ASTM A325 hardware to attach Mixer/Flocculation Tank Assembly (A05A) to Upper Clarifier Section Assembly (A04A) and to Sludge Discharge Hopper Assembly (A07A). Fully torque the structural bolts between the Mixer/Flocculation Tank Assembly (A05A) and the Sludge Hopper Assembly (A07A). Do not torque the bolts in the slotted holes where the Mixer/Flocculation Tank Assembly (A05A) attaches to the Upper Clarifier Section Assembly (A04A). These will be tightened fully after the flange connections have been properly tightened.
8. The platform arrangement can now be installed. Platform section (A06A) can be lifted into position and attached to the main structure. Knee braces have been provided and must be installed. Lightly tighten the structural bolts at this time. The remaining platform sections can now be installed and joined to section (A06A) and main structure. Knee braces have been provided for these sections also must be installed. With the entire platform assembly installed, fully torque all structural bolts for the entire platform assembly.
9. Install the ladder assembly (A08A) to platform section (W06C) and anchor to concrete floor.

10. To install separator plates (If required), the launder on the section to be loaded must be swung open to allow access to the separator compartment. Slowly lower one plate a time until 17 separator plates have been installed. Swing launder back into normal operating and latch. Proceed to next section and repeat procedure.
11. Install flash mixer and flocculation mixer. See IOM manuals in Appendix B for detailed installation instructions. Be certain the correct mixer is installed in the correct tank.
12. Fully torque the bolts between the Flocculation Tank Assembly (A05A) and the Upper Clarifier Section (A04A).
13. Fully tighten anchor bolts at this time and install second nut. Grout base plates if required due to shimming.
14. Verify that all structural connections are fully torqued.
15. After sludge lines have been installed, the clarifier can be filled. Fill the clarifier with clean water and observe rubber gasketed flanges for leaks. If leaks appear, tighten bolts joints. Never tighten just one bolt but rather tighten several bolts on both sides of leak to apply a uniform clamping action on the gasket. Continue to observe for 24 hours to assure no leaks are likely to occur.
16. Electrical to mixers can now be installed. The entire clarifier must also be grounded for safety reasons. Grounding should be in accordance with the National Electrical Code and all local codes.

MONROE ENVIRONMENTAL
Liquid Clarification & Air/Gas Cleaning Systems

Bolt Torque Specifications, Lb-Ft

Fastener size, inches	Grade 2	Grade 5	Grade 8	A-307	A-325	A-490	Socket Head	304 S. St'l	316 S. St'l	1/8"-1/4" Rubber Gasket Joints
3/8"	20	30	45	15		55	50	20	20	4
1/2"	45	75	115	35	100	140	120	45	45	10
5/8"	95	150	225	65	200	270	240	90	95	20
3/4"	150	250	370	120	355	444	395	125	130	35
7/8"	200	430	595	170	525	790	625	195	200	50
1"	250	640	900	250	790	1075	950	255	270	75
1 1/8"	355	785	1290	355	1060	1700	1500	390	405	
1 1/4"	500	1120	1875	500	1495	2360		480	505	
1 1/2"	870	1950	3150	870	2600	3780		705	730	
1 3/4"		2285	4990	1500						
2"		3435	7500	2250						
2 1/4"		5025		3150						
2 1/2"		6875		4380						

Note: Standard unmarked bolts should be considered GRADE 2
3 radial lines on bolt head is GRADE 5
5 radial lines on bolt head is Grade 8

Note: Anchor bolts should be considered A-307 material unless known otherwise.

Note: Values are based on dry, clean, unlubricated bolts.

Note: The values shown can be used for mechanically galvanized bolts.
No values are available for hot dipped galvanized bolts.

Note: For FRP flange to FRP flange or steel flat face mating flange; do not exceed the values shown under the column titled " Rubber Gasket Joints". Flange bolts must be torqued in an alternating fashion, increasing torque in 5 lb-ft increments. If mating flange is raised face, a filler ring must be used. In any case, do not torque the bolts more than is required to achieve a good seal.

Revised 11-20-2017

SECTION 4

START-UP

CAUTION:
Before servicing equipment, shut off power and lockout system.

CAUTION:
Before entering clarifier tank, shut off power, lock out electrical system, close, and lock out influent water supply.

CAUTION:
Never enter clarifier tank alone.

CAUTION:
Entering clarifier tank may be a biological hazard; wear appropriate eye and body protection.

Before Starting Unit

1) Make certain unit is **properly assembled** and all nuts, bolts, and piping are secured.
2) Be certain all equipment is firmly anchored.
3) Check to make sure all instruments are properly installed and properly wired.
4) Check to make sure all utilities are connected and are live.
5) Check for proper motor rotation per manufacturer's instructions.
6) Place all drive guards on unit.
7) Check to make sure all joints have a properly fitted gasket.
8) Make sure tanks are clean and free of debris and temporary construction material.
9) Make sure unit is electrically grounded per NEC.

Operational Check

1) Make sure tanks are clean and free of debris.
2) Fill the tanks with influent or clean water.

3) Check for leaks at all joints.

4) Calibrate all instrumentation as required. See instrument manufacturer's manuals. (If required)

5) Start flow of influent and monitor operation for several hours.

6) The unit should operate unattended except for periodic inspections and maintenance.

SECTION 5

GENERAL MAINTENANCE

The Monroe Vertical Clarifier is designed for continuous operating conditions and will maintain its performance if periodic maintenance procedures are followed. After a period depending on the type of sludge, the plates will need to be cleaned.

CAUTION:

Before any maintenance is performed on the Vertical Clarifier, shut down and lockout all energy sources.

Lubricate Motor (If applicable)

Lubricate motors in accordance with motor manufacturer's O&M manual in Appendix B. Do not attempt to grease motors without removing vent plugs. If bearing grease seals are broken by excessive pressure, the motor can be severely damaged. Be careful to not over grease.

Lubricate Mixer Gear (If applicable)

Lubricate gear in accordance with motor manufacturer's O&M manual in Appendix B.

Clean Tanks

Periodically, it may be necessary to clean the tanks to maintain the performance. The frequency of cleaning depends upon the operation. Access doors are provided on the unit for inspection below the plates. Be sure tank is drained prior to opening. Remove bolts and break gasket free prior to removing safety chain.

Clean Mixers (If applicable)

Check the impellers of the mixers for buildup of solids. If surface build-up has occurred, clean the impeller. **Monroe Environmental highly recommends reviewing the attached manufacturer's documents in Appendix B.**

Clean Plates

Check the face of the plates for build-up of solids. If surface build-up has occurred, clean the plates. We highly recommend use of the Monroe Plate Cleaning Wand to ensure proper cleaning of Plates. If the Monroe Plate Cleaning Wand is not accessible, a power washer may be used. **Note: Do not apply too much pressure, as the plates may get damaged.**

Removal and reinstallation of the plates:

Inside of the tank, the plates are supported by one another as well as from below by a support/guide rack. Care must be taken in re-installing the separation plates back into the system. Place plates gently into each cavity in the clarifier separation section. Allow the plate to slide into the bottom support/guide rack before installing the next plate.

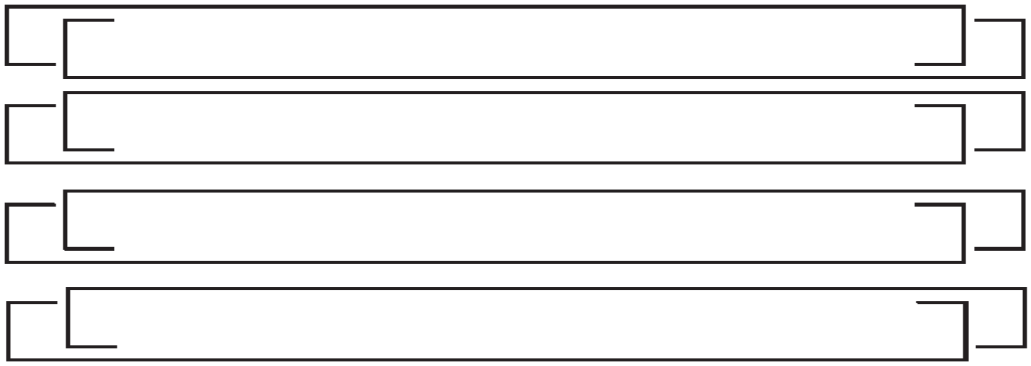
How to remove the separator plates: (reference assembly drawings)

1. Lockout and Tag out the equipment per site procedures.
2. Drain the equipment.
3. Remove the effluent launders by removing the bolts/clamps on each end. The 1/2" diameter rods can be used for lifting and handling.
4. In place cleaning may be considered to ease the removal of the plates.
   CAUTION: Excessive water pressure may damage plates
5. Remove the separator plates and carefully stack in a secure location. Each separator plate has a 1" diameter hole near the top for lifting. ***We recommend to flip every other plate to stack in an interlocking pattern with only 30 total in each stack (Reference Figure 1 sketch on next page)***

How to install the separator plates: (reference assembly drawings)

1. Install the separator plates ***The plates have rectangular cutouts on the sides that go toward the bottom when installed.
   CAUTION: Installing the separator plates can damage internal coating (optional) if they are slid into place.
2. Install the effluent launders and secure with supplied hardware on each end.
3. System can now be put into service.

Figure 1



SECTION 6

PREVENTIVE MAINTENANCE

INSPECTION SCHEDULE

Description	Inspect	Interval
Flash/Flocculation Rapid Mixer Motors (If applicable)	Clean cooling fins	6 Months
Flash/Flocculation/Rapid Mixer Blades and Shafts (If applicable)	Check for build-up	6 Months
Plates	Check for plugging/build-up	3 Months
Flash/Flocculation/Sludge Tank	Check for build-up and debris	6 Months
Tank Material and/or Coating system	Check for thickness and areas of corrosion	1 Year
All motors	Lubricate per MFG's Manual	

SECTION 7

TROUBLESHOOTING CHART

Problem	Possible Cause	Remedy
Effluent Not Clean	Chemical flow rate	Adjust chemical feed rate based on the flow rate
	Influent rate is too high	Adjust influent rate
	Improper chemicals added	Check composition
	Build-up of contaminants	Drain tank, clean plates w/Monroe's Plate Cleaning Wand; refill
	Flocculation tank not forming flocs	Check mixer speed
Sludge Concentration is Low	Chemical flow rate	Check the mix and floc tank for proper chemical addition
	Sludge rate too high	Adjust sludge rate
No Sludge	Sludge line is blocked	Connect a hose to the sludge line and back flush into the sludge outlet port.
	Sludge tank is plugged	Clean out tank
Liquid Overflows Tank	Influent rate too high	Adjust Influent rate
	Effluent line is blocked	Clean out effluent line and remove blockage
Corrosion	Worn/damaged coating or stainless steel oxide layer	Re-coat/patch per paint manufacturer recommendation or passivate for stainless steel

Appendix A Component List

Replacement Parts may be ordered from:

Monroe Environmental Corporation

810 West Front Street

Monroe, MI 48161

(800) 992-7707

sales@mon-env.com

CONTACT MONROE ENVIRONMENTAL AT 800-992-7707 OR SALES@MON-ENV.COM FOR PRICING AND AVAILABILITY

RSP = RECOMMENDED SPARE PARTS 7706-1

RSP	No.	QTY	DESCRIPTION	PART #
	A	1	FLASH MIXER	7198
	B	1	FLASH MIXER SHAFT	7200
	C	1	FLASH MIXER IMPELLER	7199
	D	1	FLOCCULATION MIXER	7201
	E	1	FLOCCULATION MIXER SHAFT	7203
	F	1	FLOCCULATION MIXER IMPELLER	7202
	G	1	FLOCCULATION MIXER VFD	7263
	H	4	DRAW LATCH, ADJUSTABLE 304 STAINLESS STEEL	6377
	J	1	MIX TANK GASKET	W16B
	K	1	ACCESS DOOR GASKET	S1440-1D
	M	1	SLUDGE HOPPER GASKET	W16A
	N	2	1/2" NPT BALL VALVE STAINLESS STEEL	6006
	P	1	WALK-THRU LADDER	7268
	Q	34	304SS. SEPARATOR PLATES, 23" X 96"	7346

Appendix B

Manufacturers' Auxiliary Information

Flash Mixer Manual

SPX
WHERE IDEAS MEET INDUSTRY

INSTRUCTION MANUAL

i-Series Mixer Model Mi5Q1

Ship To: Swanton Welding & Machining Company
Customer: MONROE ENVIRONMENTAL CORP
PO Number: 33598-7706

Order: 0002889047 Line: 000010

READ AND UNDERSTAND THIS DOCUMENT PRIOR TO OPERATING OR SERVICING THIS PRODUCT.

Lightnin®

SPX®
WHERE IDEAS MEET INDUSTRY

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Lightnin®

SAFETY CHECK LIST

IMPORTANT WARNINGS

All ***LIGHTNIN*** **NETTCO** Mixers are provided with proper safety covers to avoid potential injury. The following SAFETY CHECK LIST should be THOROUGHLY REVIEWED AND ADHERED TO before installing, operating or performing maintenance on the mixer. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS INJURY. Ensure the use of qualified, quality trained and safety conscious personnel.

1. Use only the lifting device, if provided, on your unit to install the mixer. We strongly recommend that the hoist rings be of safety swivel type with 360° rotational capability. Lift per instructions in the instruction manual.
2. DO NOT connect the motor to the power source until all components are assembled, the mixer is installed, and all hardware is tightened to the proper torque, which is specified in the operation and maintenance manuals supplied by ***LIGHTNIN***.
3. DO NOT operate shaft sealing devices at temperatures or pressures higher than those specified in the manual or on the nameplates.
4. DO NOT service the mixer until you have followed your “Control of Hazardous Energy Sources” (lockout, tagout procedure) as required by OSHA 29 CFR Part 1910.
5. DO NOT touch rotating mixer parts or any part of mixer that has the potential of having a hot surface including motor, gear drive housing, seal, shafting and flange.
6. DO NOT operate mixer for service other than its intended use, that being fluid mixing with the mixer attached to a rigid structure and connected to a power source appropriate to operate the drive motor.
7. DO NOT make any field changes or modifications (horsepower, seal material components, output speed, shaft lengths, impellers, etc.) without reviewing the changes with your ***LIGHTNIN*** Sales Representative or the ***LIGHTNIN*** Customer Service Department.
8. DO NOT install an aftermarket Variable Frequency Drive without first consulting your ***LIGHTNIN*** Sales Representative or the ***LIGHTNIN*** Customer Service Department to determine the compatibility of the existing motor with the Variable Frequency Drive.
9. DO NOT operate mixer until you have checked the following items:
    A. Make sure the mixer is properly grounded.
    B. Ensure all protective guards and covers are installed. Guarding of the mixer shaft below mixer mounting surface is the responsibility of the customer.
    C. Ensure all detachable components are securely coupled to the mixer.
    D. Thoroughly REVIEW and ADHERE TO the mixer operating instructions supplied by ***LIGHTNIN***.
    E. Ensure the mixer output shaft rotates freely by hand.
    F. Ensure all personnel and equipment are clear of rotating parts.
    G. Ensure all external connections (electrical, hydraulic, pneumatic, etc.) have been completed in accordance with all applicable codes and regulations.
10. DO NOT enter the mixing vessel UNLESS:
    A. The mixer power supply is locked out (follow Item number 4).
    B. The mixer shaft is firmly attached to the mixer drive or the shaft is supported securely from below.
    C. You have followed applicable confined space regulations.

CE COMPLIANCE

Equipment furnished conforms to the following directives:

98/37/EC Machinery Directive
89/336/EEC Electro-Magnetic Compatibility
73/23/EEC Low Voltage

Any CE marking and/or associated documentation applies to the mixer only. This has been supplied on the basis that the mixer is a unique system. When the mixer is installed, it becomes an integral part of a larger system which is not within the scope of supply and CE marking is the responsibility of others.

ENVIRONMENTAL NOTICES

NOTICE: THERE ARE NO USER RE-USABLE COMPONENTS WITHIN THIS EQUIPMENT. ALL MATERIALS ARE RECYCLABLE. DISPOSE OF EQUIPMENT RESPONSIBLY AT THE END OF ITS SERVICE.

NOTICE: REFER TO THE MSDS DATA SHEET FOR THE GREASE FOR DISPOSAL. DATA SHEET FOR THE GREASE SUPPLIED WITH THE UNIT IS SUPPLIED IN THE MACHINE BOOK. IF GREASE TYPE IS UNKNOWN TO THE USER DISPOSE OF THE MATERIAL IN ACCORDANCE WITH LOCAL LAWS AND DIRECTIVES.

IMPORTANT: DISPOSE OF THIS EQUIPMENT RESPONSIBLY. CORRECT DISPOSAL IS THE RESPONSIBILITY OF THE END USER. IF IN DOUBT, CONSULT WITH LOCAL ENVIRONMENTAL AGENCIES FOR ADVICE ON THE BEST METHOD OF DISPOSAL. FAILURE TO DISPOSE OF THIS EQUIPMENT CORRECTLY COULD RESULT IN PROSECUTION.

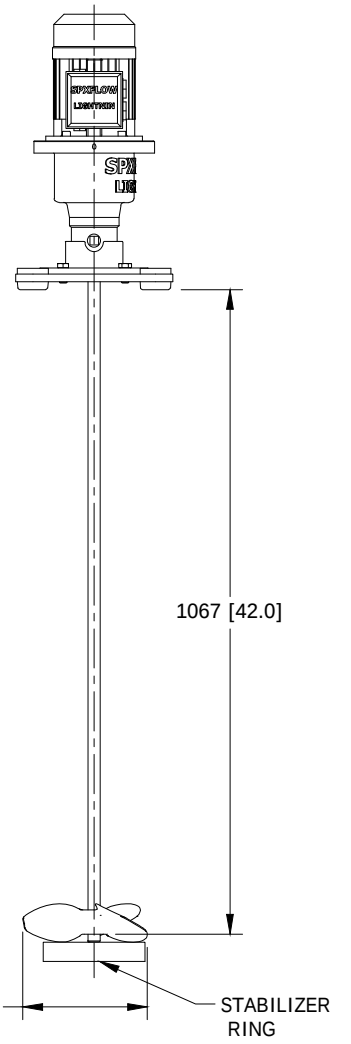
IMPORTANT: THIS EQUIPMENT DOES NOT PRODUCE HIGH NOISE OR VIBRATION. HOWEVER, THE OPERATOR MAY EXPERIENCE HIGH NOISE OR VIBRATION IN THE LOCATION OF THIS EQUIPMENT DUE TO ANOTHER SOURCE. ENSURE THAT ALL ENVIRONEMENTS ARE CORRECTLY LABELED SUCH THAT ANY OPERATOR OR BYSTANDER IS INFORMED AS TO THE POTENTIAL RISKS AND THE CORRECT ACTION HE SHOULD TAKE TO PREVENT INJURY.

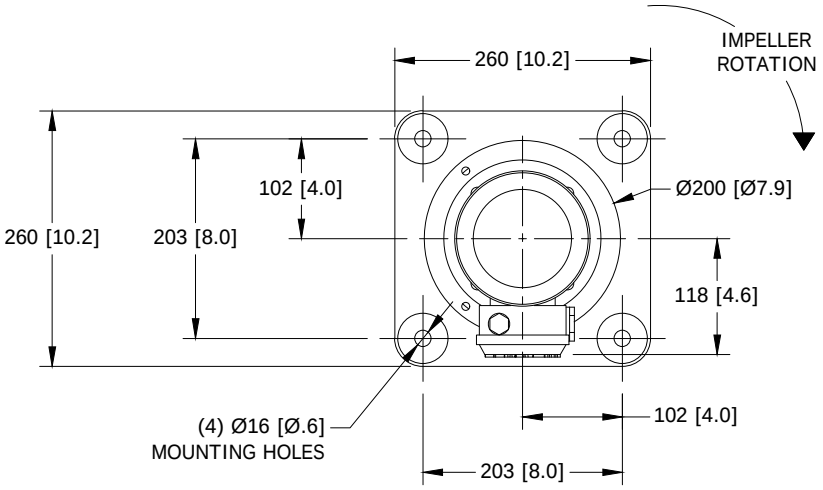
NOISE LEVELS

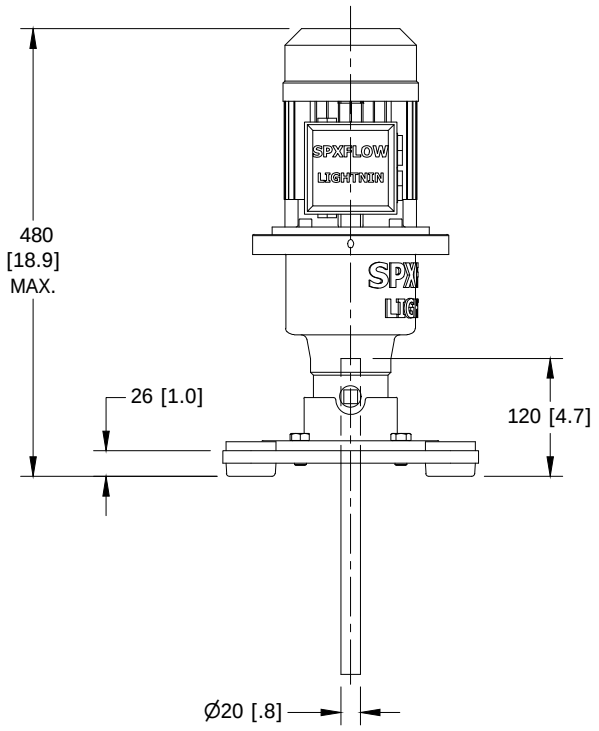
SOUND PRESSURE LEVELS
Maximum 85 dBa @ 1 meter

THIS PRODUCT MAY BE COVERED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS:

5427450	5454986	5470152	5478149	5480228	5501523
5511881	5560709	5568975	5568985	5655780	5720286
5746536	5758965	5779359	5842377	5925293	5951162
5972661	5988604	6089748	6109449	6142458	6158722
6250797	6299776	6334705	6386753	6457853	6634784
6715913	6742923	6746147	6789314	6796707	6796770
6808306	6843612	6860474	6877750	6935771	6986507
6997444	7001063	7056095	7168641	7168848	7168849
7328809					







NOTES:
1. ALL DIMENSIONS ARE IN mm [INCHES].
2. DIMENSIONS ARE FOR REFERENCE ONLY UNLESS CERTIFIED.
3. MATERIAL OF IN-TANK PARTS IS 316L STAINLESS STEEL.
4. MIXER MOUNTING DATA: PLATE
5. MOUNTING HARDWARE IS FURNISHED BY OTHERS.
6. MOTOR DATA: POWER: 0.37 kW [0.50 HP]
   VOLTS: 120 R.P.M.: 1800 Hz: 60 PHASE: 1
   DUTY: STANDARD - WASHDOWN ENCLOSURE: TEFC
7. IMPELLER DATA:
   TYPE: FP100 NO. OF BLADES: 3
   IMPELLER R.P.M.: 350
   THE IMPELLER IS ATTACHED TO THE SHAFT WITH SET SCREWS.
   THE IMPELLER IS FURNISHED WITH A STABILIZER RING.
8. MIXER WEIGHT IS 21.82 KG [48 LBS.]
   SHAFT WEIGHT IS 3.03 KG [6.7 LBS.]
   IMPELLER WEIGHT IS 1.35 KG [3 LBS.]

SPXFLOW
Lightnin Plenty

ISO 9001 CERTIFIED

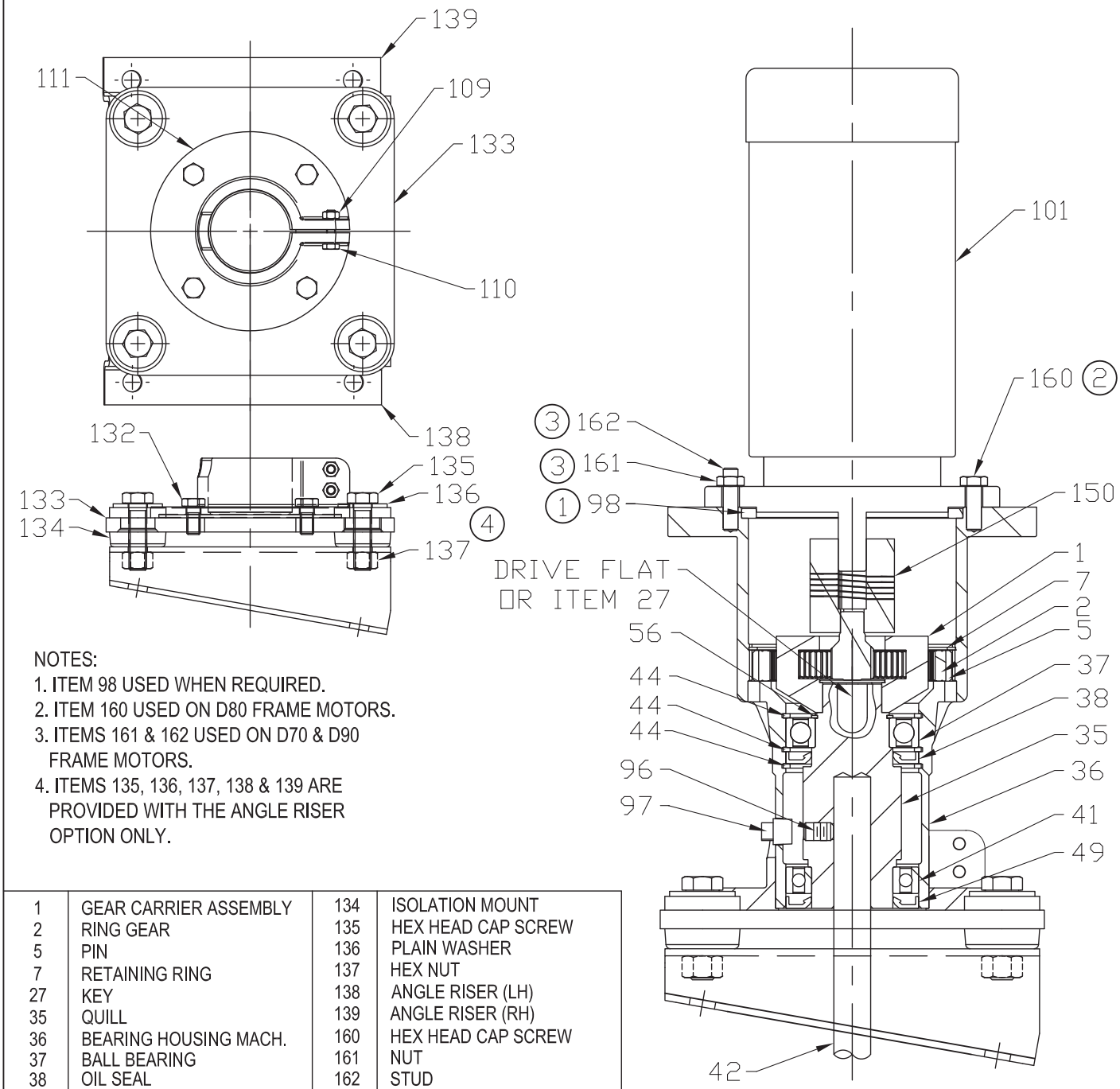
BY:
DATE: 05-21-2019

GENERAL ARRANGEMENT
FOR: MONROE ENVIRONMENTAL CORP

S.O. NO.: 2889047 LINE NO.: 10
MIXER MODEL: Mi5Q1 QUANTITY: 1
CUST. P.O. NO.: 33598-7706 RATIO: 5:1
TAG NO.: None
SERIAL NO.: 1000003721760

CERTIFIED BY: _____ DATE:

DRAWING NO.:2889047000010-A



NOTES:
1. ITEM 98 USED WHEN REQUIRED.
2. ITEM 160 USED ON D80 FRAME MOTORS.
3. ITEMS 161 & 162 USED ON D70 & D90 FRAME MOTORS.
4. ITEMS 135, 136, 137, 138 & 139 ARE PROVIDED WITH THE ANGLE RISER OPTION ONLY.

ITEM	PART NAME
1	GEAR CARRIER ASSEMBLY
2	RING GEAR
5	PIN
7	RETAINING RING
27	KEY
35	QUILL
36	BEARING HOUSING MACH.
37	BALL BEARING
38	OIL SEAL
41	BALL BEARING
42	IMPELLER SHAFT
44	INTERNAL RETAINING RING
49	OIL SEAL
56	EXTERNAL RETAINING RING
96	HEX SOC SET SCREW
97	SQ HD PIPE PLUG
98	MOTOR SPACER RING
101	MOTOR
109	HEX NUT
110	HEX HEAD CAP SCREW
111	PEDESTAL
132	HEX HEAD CAP SCREW
133	Q PLATE

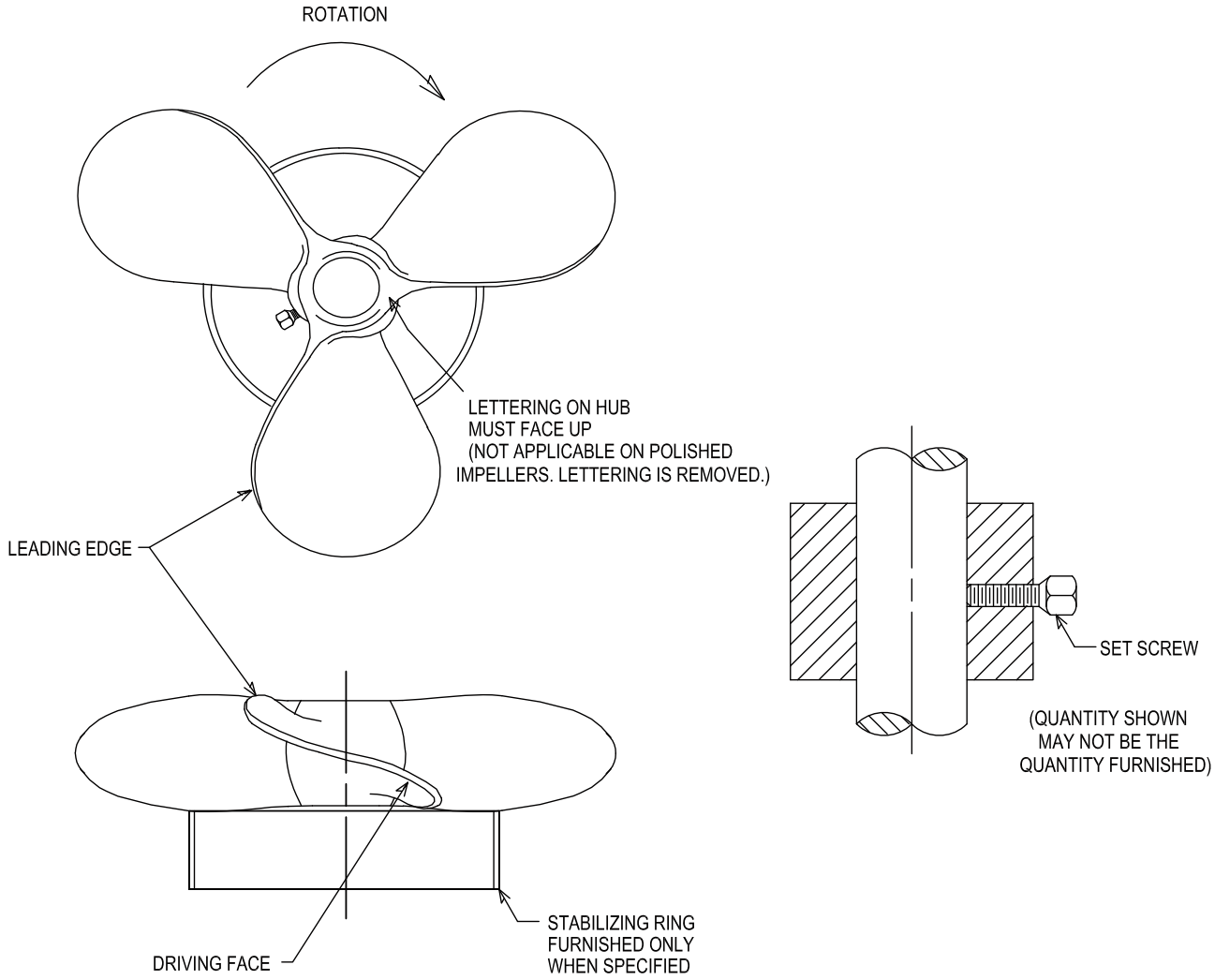
ITEM	PART NAME
134	ISOLATION MOUNT
135	HEX HEAD CAP SCREW
136	PLAIN WASHER
137	HEX NUT
138	ANGLE RISER (LH)
139	ANGLE RISER (RH)
160	HEX HEAD CAP SCREW
161	NUT
162	STUD

LIGHTNIN
AN SPX BRAND

ISO 9001 CERTIFIED

ASSEMBLY DRAWING
NETTCO MODELS
Mi5Q1 - Mi5Q6 W/ ISOLATION MNTS
Mi6Q1 - Mi6Q6 W/ ISOLATION MNTS
GEAR DRIVE
ELECTRIC MOTOR

DRAWING NO. L-18412



WHEN ORDERING PARTS, SPECIFY:
DRAWING NUMBER, PART NAME, AND
SERIAL NUMBER

LIGHTNIN
AN SPX BRAND

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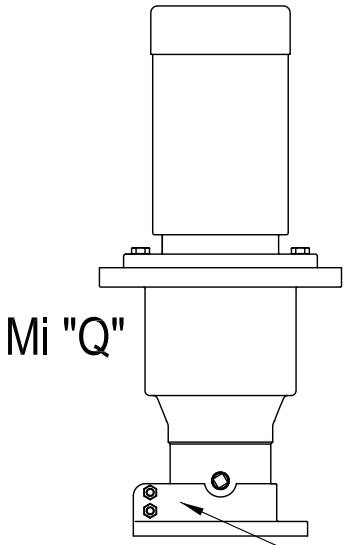
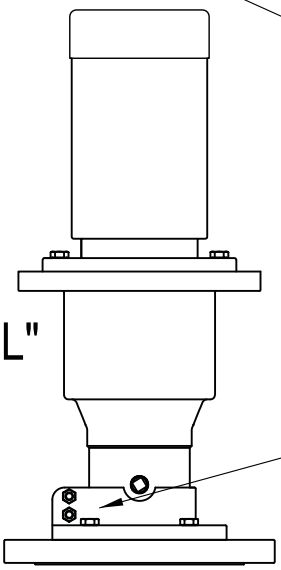
ASSEMBLY DRAWING

NETTCO
FP100
IMPELLER

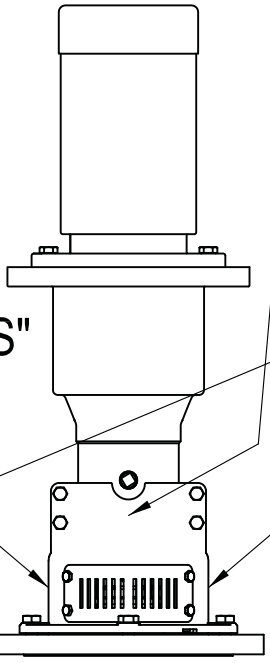
DRAWING NO. L-18318



Mi "Q"



Mi "L"

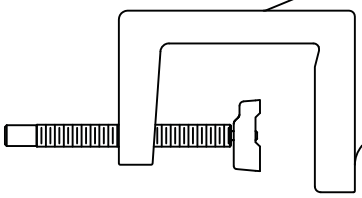


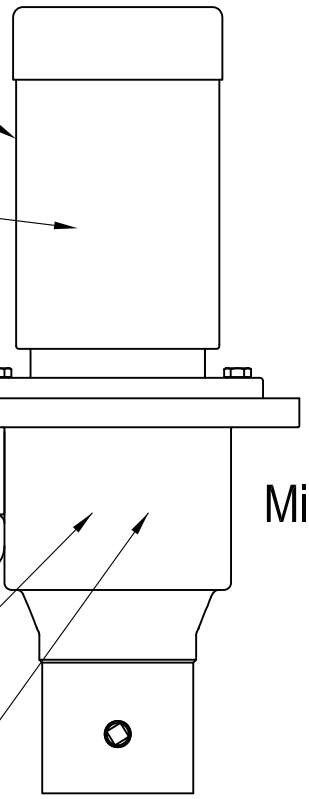
Mi "S"

279378PSP - LOCATE ON MOTOR CONDUIT BOX

279439PSP - LOCATE ON MOTOR BODY

274918PSP - LOCATE ON BEARING HOUSING FLANGE O.D.



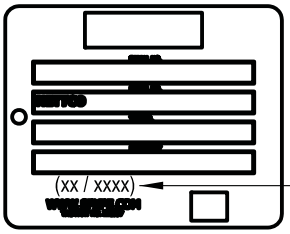


Mi "P"

279598PSP - LOCATE ON BEARING HOUSING ABOVE SHAFT SET SCREW ACCESS HOLE

227331PSP - LOCATE ON PEDESTALS OF THE "Q", "L", & "S" UNITS AS SHOWN

279599PSP - LOCATE ON BEARING HOUSING ABOVE SHAFT SET SCREW ACCESS HOLE



226997PSP - ATTACHED BY LANYARD TO UNIT. UNDER REPAIR KIT FIELD, LASER ETCH (MONTH / YEAR) OF MANUFACTURE. EX: (xx / xxxx)

IN ADDITION TO THE LABELS PRESENT ON ALL OF THE BASE MODULES, THE "S" UNITS HAVE TWO LOCATED ON THE PEDESTAL AS SHOWN.

ISO 9001 CERTIFIED

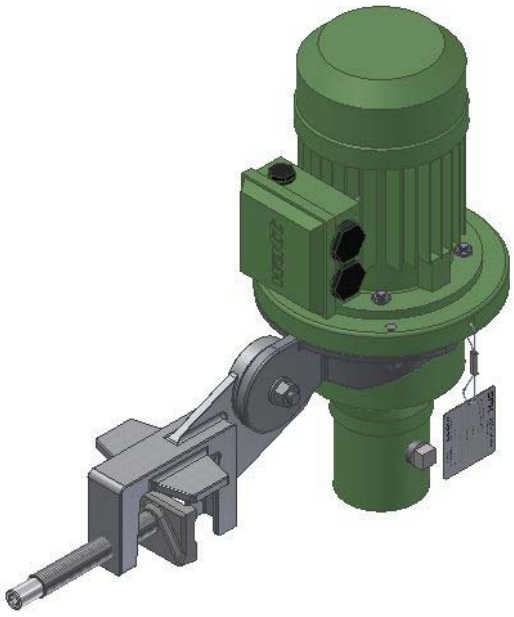
LIGHTNIN
AN SPX BRAND

ASSEMBLY DRAWING

NETTCO "Mi" MODELS LABEL LOCATIONS

DRAWING NO. L-18344

OPERATING AND MAINTENANCE INSTRUCTIONS FOR NETTCO i-SERIES



SECTION 1 - INITIAL INSPECTION, SHIPPING ARRANGEMENTS AND STORAGE

1.1 Check the shipping crates and your ***LIGHTNIN®*** equipment for possible shipping damage. Report any damage immediately to the carrier and our factory.

1.2 The mixer and impellers are packed together. The impeller shaft, if over 48 inches (1200mm) long, is packed in a separate container.

1.3 Do not remove any protective coatings or wrappings until the mixer is ready to be put into service. If the mixer is to be stored, **store ONLY in the vertical position, indoors and in a clean, dry location with controlled temperatures of 59° F to 104° F (15° C to 40° C).** When gear drive models have been stored for more than one year, the gear lubricant should be replaced (see lubrication instructions). Motor shafts are to be rotated manually every month, at least 10 to 15 revolutions.

1.4 Lift the mixer from its crate using one of the follow lifting methods, dependent on mixer mounting style. The “P” units, which are clamp mounted to the side of the tank, are lifted as shown with a single sling, choker method. The “Q”, “L”, and “S” fixed mounted units should be lifted in a similar fashion using two slings directly across from each other to vertically lift the mixer. Refer to Figure 1.

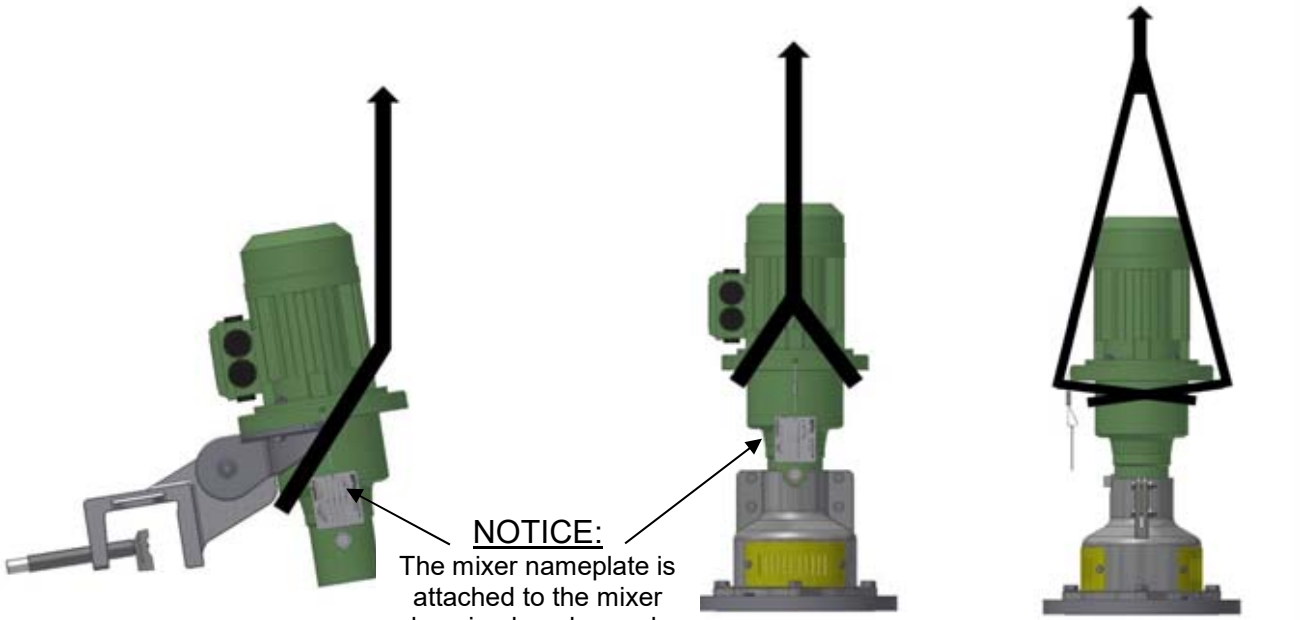


FIGURE 1

WARNING: EYE PROTECTION MUST BE WORN AT ALL TIMES WHILE SERVICING THIS MIXER.

SECTION 2 - MIXER MOUNTING CONFIGURATIONS

2.1 Refer to Dimension Drawing for mounting configuration.

a. Impeller Position Recommendations:

	Single Impeller	Dual Impeller
Basic	Position Impeller Mid Batch	Lower Impeller: 1D Off Bottom Upper Impeller: 1D Spacing
Alternate	0.75D < = OB < = 1.5D	Lower Impeller: 0.75D < = OB < = 1.5D Upper Impeller: 0.75D < = SP < = 1.5D

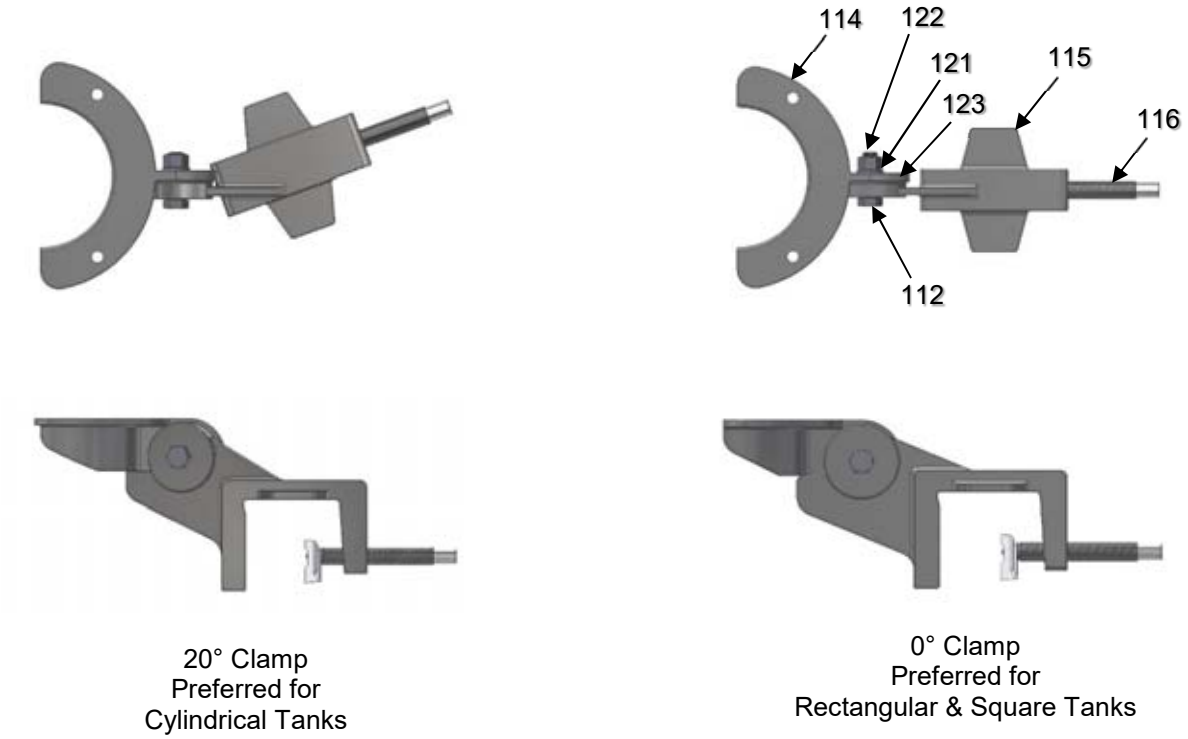
D: Impeller Diameter

OB: Impeller Off Bottom

SP: Impeller Spacing

2.2 Lock-out power before positioning mixer, and review safety instructions before starting mixer.

2.3 “P” Units - Clamp Mounting Module - The clamps are cast offset at recommended 20° horizontal plane and adjustable 0-10° in the vertical plane. Clamps are also available with zero degree offset in the horizontal plane and adjustable 0-10° in the vertical plane. The clamp assembly (115) is fastened by hex head cap screw (112), flat washer (121), and hex nut (122) to the yoke (114). There is an anti-rotation insert (123) between the pivoting faces of the yoke (114) and clamp assembly (115). Refer to Figure 3. The yoke is bolted directly to the mixer housing module with two hex head cap screws (113).



20° Clamp
Preferred for
Cylindrical Tanks

0° Clamp
Preferred for
Rectangular & Square Tanks

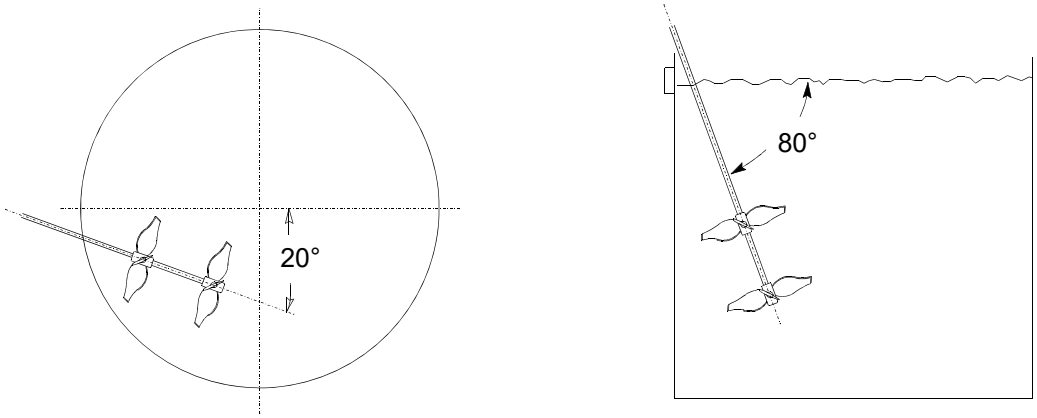
FIGURE 3

2.4 Loosen the clamp screw (116) sufficiently so that the clamp base will engage the tank lip or rim when the mixer is mounted. Set the clamp (115) squarely on the mounting surface so that the clamp rests on the lip of the tank, if a lip is present. Tighten the clamp screw (116) making sure the travel plate (118) is parallel to the tank lip when it

contacts the tank wall. Using an M8 or 5/16” hex wrench, tighten the clamp screw to 40-50 ft-lbs (54-61 N-m) so that the mixer is held securely to the tank. **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.**

2.5 Refer to Figure 4 for recommended angular positions.

FIGURE 4



2.6 Mixer Positioning Data for fixed mounted “Q”, “L”, & “S” Units on unbaffled tanks. Refer to Figure 5 and Table 1.

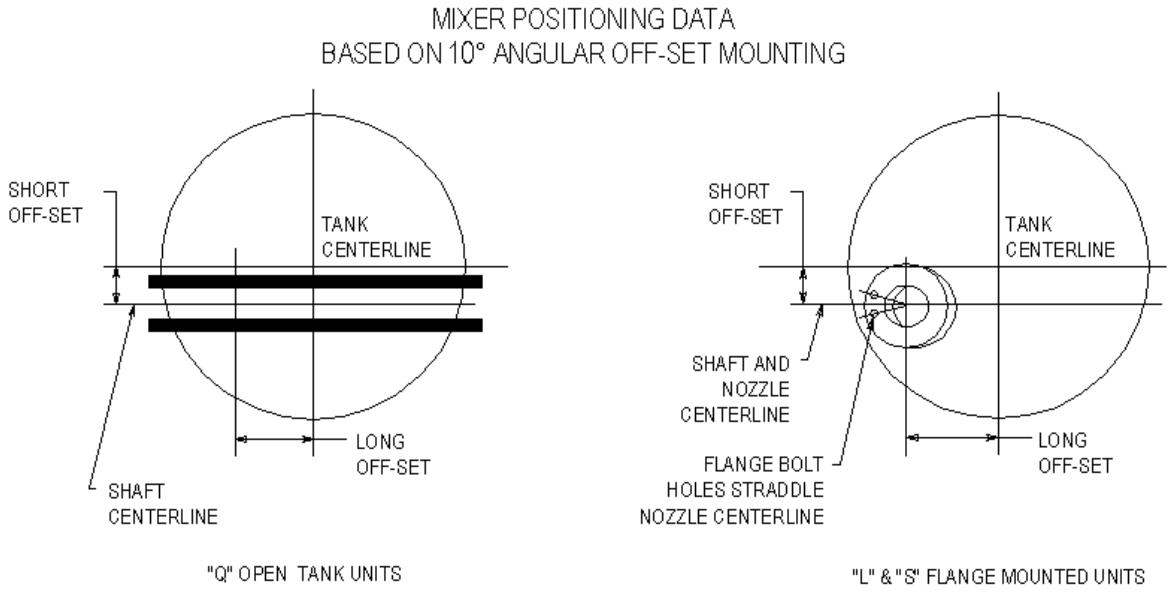


FIGURE 5

TABLE 1
10° OFFSET – FOR TANKS WITH A Z/T LESS THAN 1.2

TANK DIA.		MAXIMUM TANK DEPTH		MINIMUM LONG OFFSET		MINIMUM SHORT OFFSET	
INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM
24	610	36	915	6.75	170	3.88	100
27	685	41	1040	7.63	195	4.38	110
30	760	45	1145	8.31	210	4.75	120
36	915	54	1370	9.88	250	5.75	145
42	1065	63	1600	11.50	290	6.63	170
48	1220	72	1830	13	330	7.50	190
54	1370	81	2055	14.50	370	8.50	215
60	1525	90	2285	16.13	410	9.31	235
66	1675	100	2540	17.88	455	10.31	260
72	1830	108	2745	19.25	490	11.13	280
78	1980	117	2970	20.75	525	12	305
84	2135	126	3200	22.38	570	13	330
90	2285	135	3430	24	610	13.75	350
96	2440	144	3660	25.50	650	14.75	375
102	2590	154	3910	27.25	690	15.75	400
108	2745	162	4115	28.63	730	16.56	420
114	2895	171	4345	30.19	765	17.44	445
120	3050	180	4575	31.75	810	18.31	465

Z: Tank Depth
T: Tank Diameter

2.7 “Q” Units – Q Plate Mounting Module – The standard “Q” Plate mounting configuration is shown in Figure 6. The Q Pedestal (111) is bolted to the Q Plate (133) with four hex head cap screws (132). There are four isolation mounts (134) in the plate. Figure 6A shows the same configuration with the angle riser option added. There is a left hand angle riser (138) and right hand angle riser (139) that make up the assembly. The risers are bolted thru the isolation mounts (134) using hex head cap screws (135), washers (136) and hex nuts (137). The angle riser option is available in 7° and 10° vertical offsets. The mixer housing module mounts in the bore of the pedestal (111) and is secured by tightening the hex head cap screws (110) and hex nuts (109). Tighten to 75 in. lbs. (8.5 N-m) maximum torque. Do not over tighten. Damage to equipment may result.

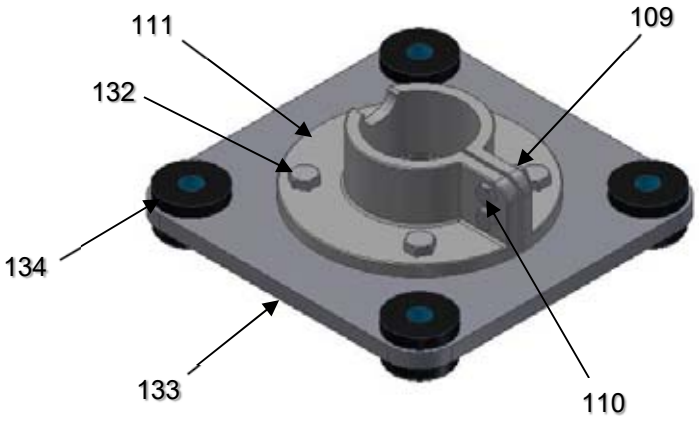


FIGURE 6

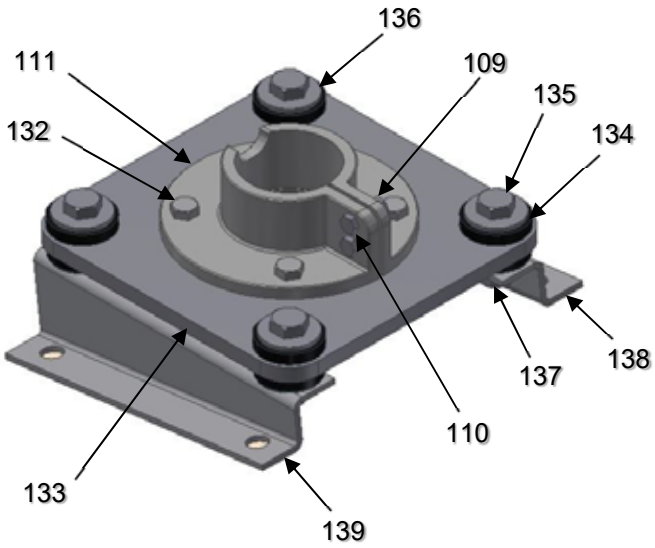


FIGURE 6A

“Q” Units – Bung Adapter Mounting Module – Figure 6B shows the bung adapter option. Pipe nipple (112) is threaded in to a barrel drum bung, then the bung machine (111) is mounted on to it. The mixer housing module mounts in the bore of the bung machined (111) and is secured by tightening the hex head cap screws (110) and hex nuts (109). Tighten to 9 ft. lbs. (12.2 N-m) maximum torque. Do not over tighten. Damage to equipment may result.

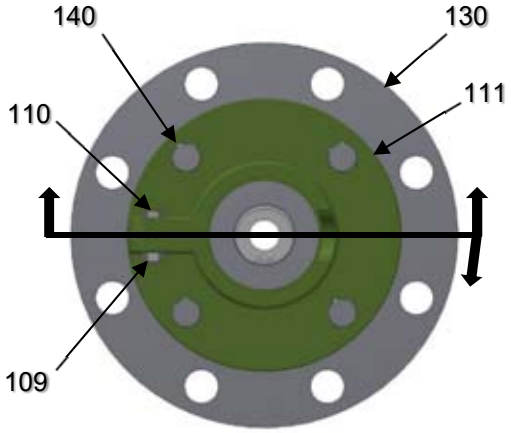
FIGURE 6B

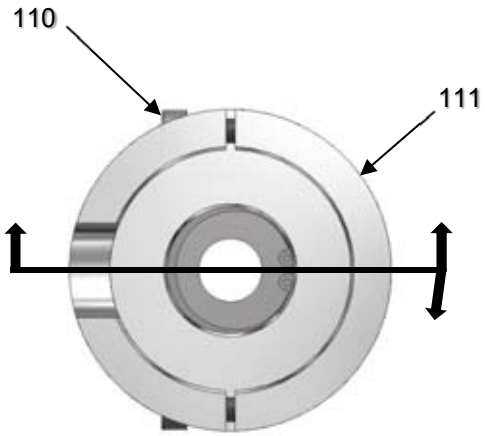
2.8 “L” Units – Closed Tank, Flange (ANSI / DIN) Mounted Lip Seal Module – The mixer housing module mounts in the bore of the Pedestal (111) for the ANSI / DIN option, which is secured by tightening the two hex head cap screws (110) and hex nuts (109), as shown in Figure 7. Tighten to 75 in. lbs. (8.5 N-m) maximum torque. Do not over tighten. Damage to equipment may result. The pedestal (111) then bolts to the mounting flange (130) with four hex head cap screws (140).

“L” Units – Closed Tank, Sanitary Flange, Pedestal Mounted Lip Seal Module – The mixer housing module mounts in the bore of the Sanitary Flange Pedestal (111), which is secured by tightening the four socket head cap screws (110), as shown in Figure 7A. Tighten to 9 ft. lbs. (12.2 N-m) maximum torque. Do not over tighten. Damage to equipment may result. The Sanitary Flange Pedestal (111) connects to the sanitary nozzle on a customer tank using a customer supplied gasket and sanitary clamp. There is a relief valve (114) in the Sanitary Flange Pedestal (111) that prevents any tank pressure from entering the mixer housing.

Tank contents are sealed off by the flange or pedestal mounted lip seal (209), which is retained by one or two retaining rings (208), dependent on mounting type.

Note: If the mounting pedestal (111) overlaps the flange (130) mounting holes (seen with 4” flange configuration), it is necessary to remove the unit from the flange and bolt the flange to the tank independently. The unit can then be re-assembled to the flange.





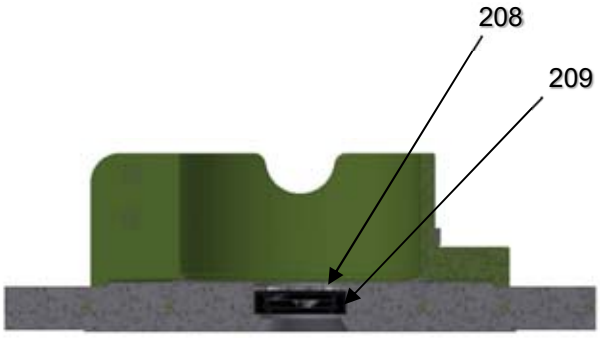


FIGURE 7

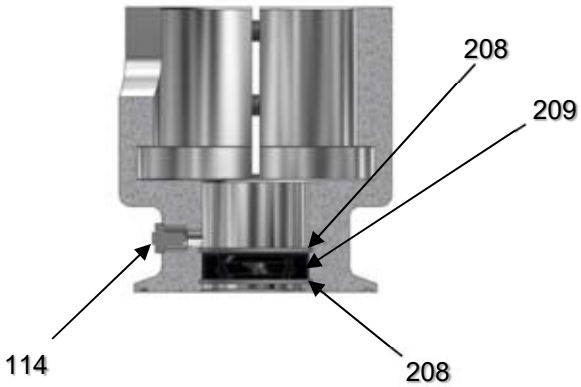
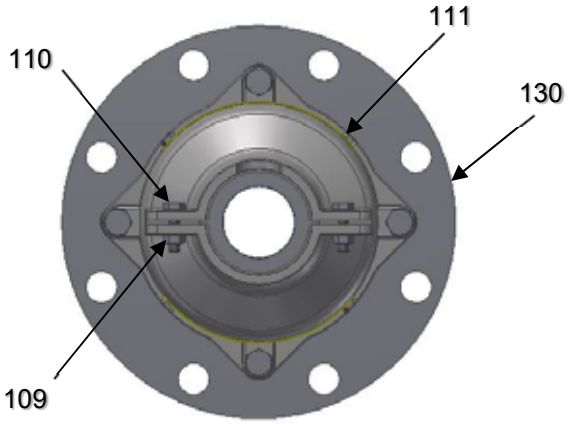
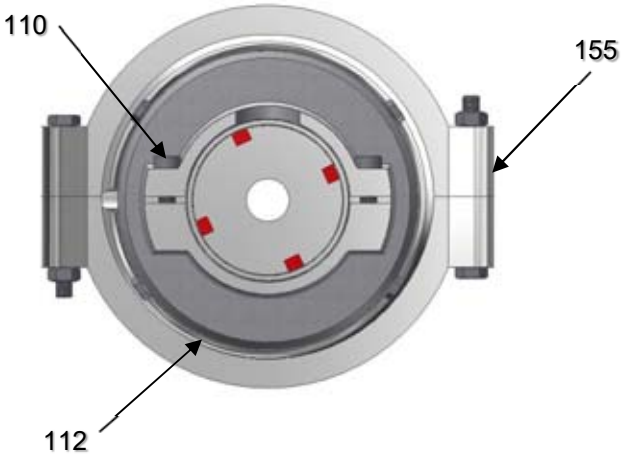


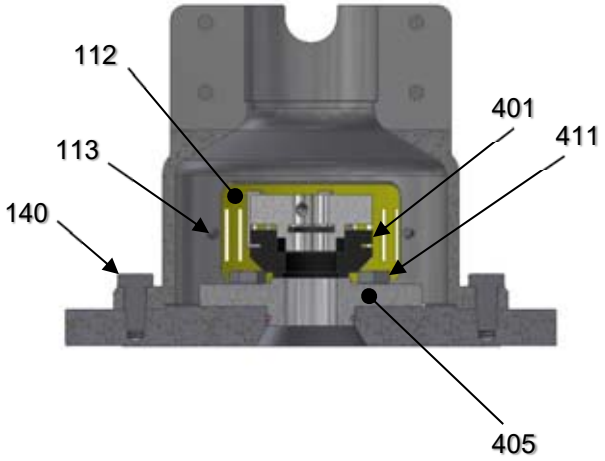
FIGURE 7A

2.9 “S” Units – Closed Tank, Flange (ANSI / DIN) Mounted Mechanical Seal Module - The mixer housing module mounts in the bore of the Pedestal (111) and is secured by tightening the four hex head cap screws (110) and hex nuts (109). Tighten to 75 in. lbs. (8.5 N-m) maximum torque. Do not over tighten. Damage to equipment may result. The pedestal (111) bolts to the mounting flange (130) with four hex head cap screws (140). Tank contents are sealed off by the ***LIGHTNIN*** Mechanical Seal (401). Access to the ***LIGHTNIN*** Mechanical Seal (401) is achieved by loosening the eight captive hex head cap screws (113) then removing the two safety covers (112). Refer to Figure 8.

“S” Units – Closed Tank, Sanitary Flange Mounted Mechanical Seal Module - The mixer housing module mounts in the bore of the Pedestal (111) and is secured by tightening the four socket head cap screws (110). Tighten to 75 in. lbs. (8.5 N-m) maximum torque. Do not over tighten. Damage to equipment may result. The sanitary pedestal (111) is secured to the sanitary bottom flange (131) with a bolted sanitary clamp (155). There is a stationary retainer (117) and sanitary gasket (156), between the sanitary pedestal (111) and sanitary bottom flange (131). These components together, secure the stationary sealing face (405) in the assembly once the bolted sanitary clamp (155) is installed. The sanitary bottom flange (131) connects to the sanitary nozzle on a customer tank using a customer supplied gasket and sanitary clamp. Tank contents are sealed off by the ***LIGHTNIN*** Mechanical Seal (401). Access to the ***LIGHTNIN*** Mechanical Seal (401) is achieved by loosening the eight captive hex head cap screws (113) then removing the two safety covers (112). Refer to Figure 8A.







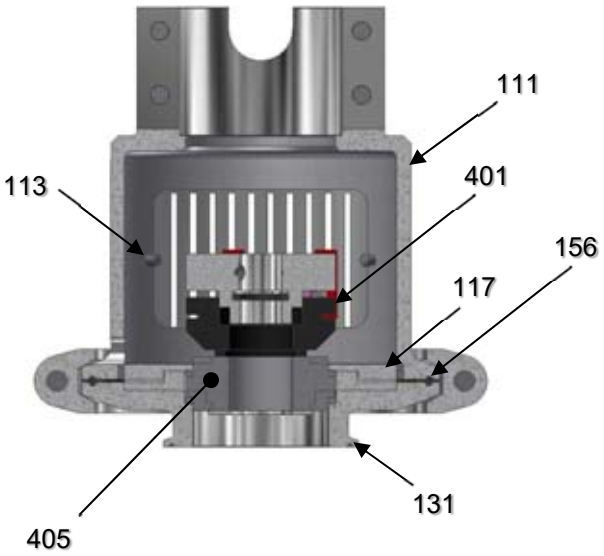


FIGURE 8

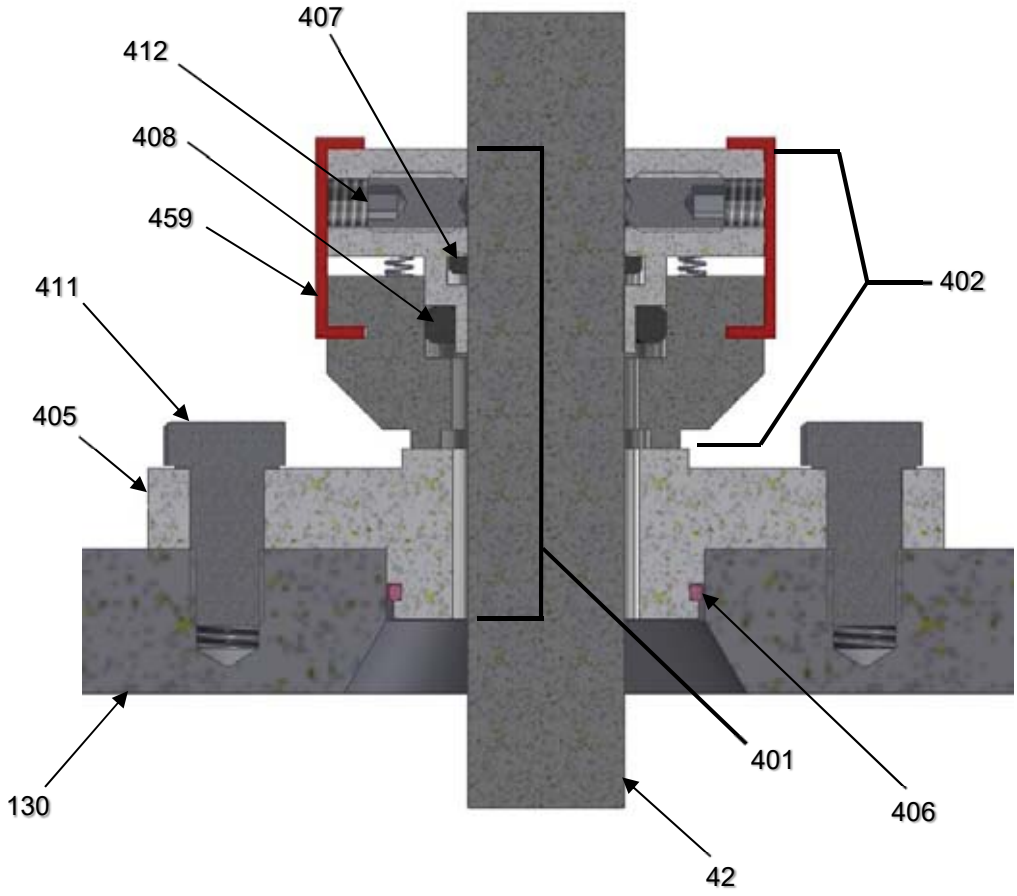
FIGURE 8A

Assemble the ***LIGHTNIN*** Mechanical Seal as follows.

WARNING: EYE PROTECTION MUST BE WORN AT ALL TIMES WHILE SERVICING THIS MIXER.

REFER TO THE SEAL ASSEMBLY DRAWING FURNISHED IN THIS MANUAL FOR THE TYPE OF SEAL FURNISHED WITH THIS MIXER.

CAUTION: THE SEALING SURFACE OF THE STATIONARY SEALING FACE (405) AND ROTARY SEALING FACE 403) IS LAPPED AND POLISHED TO A MIRROR FINISH. IT IS IMPERATIVE THAT THESE TWO FACES BE HANDLED WITH CARE AND KEPT PERFECTLY CLEAN.



Mechanical Seal Installation:

WARNING: DISCONNECT MOTOR LEADS OR USE POWER SUPPLY LOCK-OUT PROCEDURES BEFORE SERVICING THIS MIXER.

2.10 “S” Units – Closed Tank, Flange (ANSI / DIN) Mounted Mechanical Seal Module. Style 10 Seal, Refer to Drawing L-18309.

a. Install the O-ring (406) in the groove in the bottom of the stationary sealing face (405).
b. Assemble the stationary sealing face (405) onto mounting flange (130). This must be done prior attaching the mixer assembly to the mounting flange.
c. Align the mounting holes in the stationary sealing face with the holes in the mounting flange (130) then secure it to the mounting flange with four hex head cap screws (411).
d. Lightly lubricate sealing ring (407) with silicone grease.
e. Insert the rotary seal head (402) in thru the access window of the seal pedestal (111).
f. Insert the mixer shaft (42), up through the mounting flange (130).
g. CAREFULLY slide the shaft (42), through the rotary seal head (402).
h. Refer to Section 5 for mixer shaft installation.
i. Slide the rotary seal head (402) down into position until it just touches the face of the stationary seal face (405). Care should be taken to avoid getting silicone grease on the sealing faces.
j. Evenly tighten spring holder set screws (412). Remove seal setting tabs (459) and store for use during seal removal.
k. Install the two safety covers (112) and tighten the eight captive hex head cap screws (113).

Mechanical Seal Removal:

WARNING: DISCONNECT MOTOR LEADS OR USE POWER SUPPLY LOCK-OUT PROCEDURES BEFORE SERVICING THIS MIXER.

l. Loosen the eight captive hex head cap screws (113) and remove the two safety covers (112).
m. Install seal setting tabs (459), then loosen spring holder set screws (412).
n. Refer to Sections 10 or 11 for mixer shaft (42) removal procedure.
o. Slide the mixer shaft (42) down through the rotary seal head (402).
p. CAREFULLY remove the rotary seal head assembly (402).
q. If removal of the stationary seal face (405) becomes necessary, remove the four hex head cap screws (140) and remove the complete mixer / pedestal assembly. The stationary seal face (405) can then be removed by removing the four hex head cap screws (411).

Mechanical Seal Installation:

2.11 “S” Units – Closed Tank, Sanitary Flange Mounted Mechanical Seal Module. Style 10T Seal, Refer to Drawing L-18360.

a. Install the O-rings (406) on the top and bottom step of the stationary sealing face (405).
b. Assemble the stationary sealing face (405) in to the sanitary bottom flange (131).
c. Place the stationary retainer (117) over the stationary sealing face (405) as shown on the drawing.
d. Install the sanitary gasket (155) and lower the mixer / pedestal assembly on to the sanitary bottom flange (131).
e. Install and tighten the bolted sanitary clamp (155).
f. Lightly lubricate sealing ring (407) with silicone grease.

g. Insert the rotary seal head (402) in thru the access window of the sanitary pedestal (111).

h. Insert the mixer shaft (42), up through the sanitary bottom flange (131).

i. CAREFULLY slide the shaft (42), through the rotary seal head (402).

j. Refer to Section 5 for mixer shaft installation.

k. Slide the rotary seal head (402) down into position until it just touches the face of the stationary seal face (405). Care should be taken to avoid getting silicone grease on the sealing faces.

l. Evenly tighten spring holder set screws (412). Remove seal setting tabs (459) and store for use during seal removal.

m. Install the two safety covers (112) and tighten the eight captive hex head cap screws (113).

Mechanical Seal Removal:

WARNING: DISCONNECT MOTOR LEADS OR USE POWER SUPPLY LOCK-OUT PROCEDURES BEFORE SERVICING THIS MIXER.

n. Loosen the eight captive hex head cap screws (113) and remove the two safety covers (112).

o. Install seal setting tabs (459), then loosen spring holder set screws (412).

p. Refer to Sections 10 or 11 for mixer shaft (42) removal procedure.

q. Slide the mixer shaft (42) down through the rotary seal head (402).

r. CAREFULLY remove the rotary seal head assembly (402).

s. If removal of the stationary seal face (405) becomes necessary, remove the bolted sanitary clamp (155), separate the mixer / pedestal assembly from the sanitary bottom flange (131), remove the stationary retainer (117), then remove the stationary seal face (405).

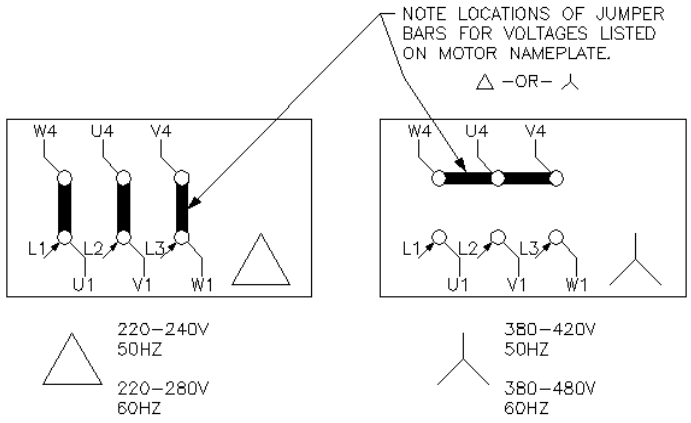
t.

SECTION 3 – ELECTRIC MOTOR CONNECTIONS

3.1 Three Phase Motors:

a. All three phase motors must be field wired for proper rotation. If rotation does not agree with nameplate, reverse any two line leads.

b. Dual voltage motors can be wired for the desired voltage. Refer to the connection diagrams provided on the motor nameplate and inside the conduit box cover. Refer to diagram showing required jumper bar locations for desired voltages.



SECTION 4 – AIR MOTOR REQUIREMENTS AND LUBRICATION

4.1 Be sure your compressor has capacity for both pressure and proper cubic feet per minute air displacement. The air supply must be clean and relatively dry with 1-3% moisture. Instrument air or other dry gasses are not suitable. Wet air and low pressure will cause sticking of the motor. An air line filter/lubricator should be fitted in the air supply line, and located before the first control valve in the system. The air line filter should be drained regularly, and the element examined for clogging. ***LIGHTNIN*** has a complete line of filter/regulators/lubricators. Contact your ***LIGHTNIN*** Representative for price and delivery.

General Air Pressure / Air Consumption Guide for Air Motor Driven Mixers (Air Motor Operating at and not exceeding 1800 RPM)						
Mixer Model	kW	HP	Air Motor #	Shaft RPM	Air Motor Required Pressure Consumption	
					● PSIG	●● CFM Free Air
Mi1(P,Q,L,S)8 Mi5(P,Q,L,S)8 Mi6(P,Q,L,S)8	.37	.50	4	1750 350 280	80	40
Mi1(P,Q,L,S)9 Mi5(P,Q,L,S)9 Mi6(P,Q,L,S)9	.55 – 1.5	.75 - 2.0	6	1750 350 280	60	60
Mi1(P,Q,L,S)10 Mi5(P,Q,L,S)10 Mi6(P,Q,L,S)10	2.2	3.0	8	1750 350 280	70	100

● Line Pressure should be at least 1-1/2 times the operating pressure of the air motor. The full line pressure will then be available for overloads and startup.

●● CFM Free Air refers to air at atmospheric conditions, measured at the inlet of the compressor.

4.2 If the rated performance of the motor is to be obtained, all valves and pipework of the air supply must be of adequate size. Valves should be sited as close as possible to the motor. For short pipe runs, up to 6 feet (2 meters), lines should be the same as the inlet and exhaust ports, and larger for longer runs.

4.3 Before final connection to the motor, blow out the air lines to remove any loose scale or abrasive dust that may be present, and squirt a few drops of oil into the inlet port.

Once the air motor is installed, ensure that any condensations cannot run back into the motor port.

4.3 Use only a high detergent lubricant of the recommended viscosity. Recommended oils are shown in the table following the lubrication rates.

4.4 For continuous duty, or high speed operation, it is recommended that an automatic lubricating device in the air line be provided to replenish lubricant to the motor per the following lubrication rates (drop rate / min.). ***LIGHTNIN*** has a complete line of filter/regulators/lubricators. Contact your ***LIGHTNIN*** Representative for price and delivery.

Air Motor Lubrication Rates (drop rate / min.)					
Mixer Model	kW	HP	Air Motor #	Continuous Operation	Intermittent Operation
Mi1(P,Q,L,S)8 Mi5(P,Q,L,S)8 Mi6(P,Q,L,S)8	.37	.50	4	4 - 5	8 - 12
Mi1(P,Q,L,S)9 Mi5(P,Q,L,S)9 Mi6(P,Q,L,S)9	.55 – 1.5	.75 - 2.0	6	5 - 6	10 - 12
Mi1(P,Q,L,S)10 Mi5(P,Q,L,S)10 Mi6(P,Q,L,S)10	2.2	3.0	8	6 - 7	12 - 15

4.5 For manual oiling, disconnect the air line and add one squirt of oil into the needle valve at the end of each 8 hours of operation.

Lubricant Manufacturer	Ambient Temperature	Product
SHELL	32° F to 100° F	TELLUS 37
B.P.		ENERGOL HL65
REGENT		RANDO "A"
CASTROL		HYSPIN 70
MOBIL		ALMAOIL No. 1

SECTION 5 - MIXER IMPELLER AND SHAFT INSTALLATION

WARNING: EYE PROTECTION MUST BE WORN AT ALL TIMES WHILE SERVICING THIS MIXER.

WARNING: DISCONNECT MOTOR LEADS OR USE POWER SUPPLY LOCK-OUT PROCEDURES BEFORE SERVICING THIS MIXER.

5.1 Position the impeller(s), if a welded assembly is not provided, on the mixer shaft. Refer to the Section 2 for recommended dual impeller spacing.

a. FP100 impeller - "Motor End" is cast on the upper side of the impeller. Figure 13 shows how to determine the upper face of the impeller in the event the printing becomes illegible. Note: Lettering is removed on polished impellers. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.

b. HYDROFOIL impeller - The larger wedge shaped portion of the hub body must face up towards the mixer. The bottom of the hub is stamped "Down". Note: Stamping is not present on polished impellers. Refer to Figure 13 for general orientation reference. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.

c. PBT impeller – Impeller orientation is not a concern since this impeller is symmetrical. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.

d. Folding Propeller – Used with the "Q" Bung Adapter units. Attached to the end of the mixer shaft and is available in set screwed connection only.

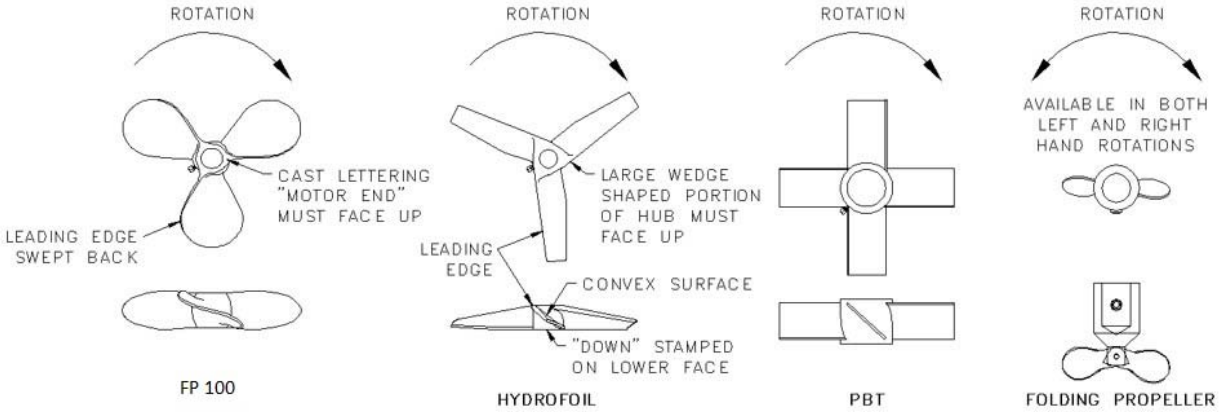


FIGURE 13

Shaft Installation:

Models: Mi1, Mi5 & Mi6 (P,Q,L)

5.2 Before installing the mixer shaft (42), clean the mixer shaft end and drive quill (35) thoroughly. To install the mixer shaft, remove the access plug (97), and orient the drive quill so that the set screw (96) aligns with the access hole. Align the drive quill by inserting the mixer shaft (42) into the quill and rotate quill manually. Insert the mixer shaft into the quill bore as far as it will go. Draw up the set screw, rotating the shaft slightly back and forth to make sure the set screw (96) seats against the flat of the shaft. Tighten the set screw (96) to 29 ft-lbs (39 Nm). **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.** Re-install the access plug (97).

NOTE: A safety feature is provided by a slight taper in the flat on the impeller shaft. The shaft cannot drop out unless the set screw is intentionally loosened.

Models: Mi5 & Mi6S

5.3 Loosen the eight captive hex head cap screws (113) that secure the two safety covers (112) to the pedestal (111), then remove the safety covers (112). Before installing the mixer shaft (42), clean the mixer shaft end and drive quill (35) thoroughly. To install the mixer shaft, remove the access plug (97), and orient the drive quill so that the set screw (96) aligns with the access hole. Align the drive quill by inserting the mixer shaft (42) into the quill and rotate quill manually. Remove the mixer shaft (42) from the drive quill (35). Lightly lubricate sealing ring (407) in the rotary seal head (402) with silicone grease. Insert the rotary seal head (402) in thru the access window of the seal pedestal (111). CAREFULLY slide the shaft (42), through the rotary seal head (402). Insert the mixer shaft into the quill bore as far as it will go. Draw up the set screw, rotating the shaft slightly back and forth to make sure the set screw (96) seats against the flat of the shaft. Tighten the set screw (96) to 29 ft-lbs (39 Nm). **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.** Re-install the access plug (97). Slide the rotary seal head (402) down into position until it just touches the face of the stationary seal face (405). Care should be taken to avoid getting silicone grease on the sealing faces. Evenly tighten spring holder set screws (412). Remove seal setting tabs (459) and store for use during seal removal. Install the two safety covers (112) and tighten the eight captive hex head cap screws (113).

NOTE: A safety feature is provided by a slight taper in the flat on the impeller shaft. The shaft cannot drop out unless the set screw is intentionally loosened.

SECTION 6 - MIXER OPERATION

6.1 This ***LIGHTNIN*** mixer is designed for continuous operation, and normally needs no additional maintenance.

6.2 Variable speed units have specified critical speed ranges where the unit should not be operated during draw off condition or operated in air.

CAUTION: THESE CONDITIONS MUST BE AVOIDED WHEN THE UNIT IS BEING OPERATED WITH A VARIABLE SPEED DRIVE. IT IS ALSO NOT RECOMMENDED TO OPERATE THE MIXER WITH EXTREME VORTEXING OR SURGING OF THE LIQUID BEING MIXED.

6.3 All bolts should be retightened 12 hours after assembly, and at each scheduled shut down thereafter.

6.4 Turn on the mixer. Allow time for the mixing pattern to be established, then make any required adjustments of position as outlined in Section 2 of these instructions.

SECTION 7 - LUBRICATION

7.1 Your ***LIGHTNIN*** mixer has been lubricated at the factory with the correct type and amount of high quality lubricants. Lubricant cleanliness is protected by properly designed closures.

7.2 All mixer bearings are sealed type and are pre-packed with lubricant. Re-lubrication of these bearings is not necessary.

7.3 The gear chamber in ***LIGHTNIN*** Mi5(P,Q,L, or S) & Mi6(P,Q,L, or S) Series mixers has been factory filled with a grease suitable for ambient temperature ranges of -4° F to +122° F (-20° C to +50° C). Under normal operating conditions, this lubricant need not be changed until the unit has been dismantled for some reason. Refer to Table 3 for lubricant specifications.

7.4 Under adverse operating conditions, periodic changes of lubricant may be necessary. Adverse conditions are defined as operating in very humid, dust laden, chemical atmospheres, or where wide variations in ambient temperatures occur. Such adverse conditions can lead to deterioration of lubricant compounds and additives, and it is recommended that the condition of the grease be checked within six months of start-up.

Refer to Section 10 for instructions on disassembling the gear drive.

NOTE: THE GEAR CHAMBER SHOULD BE FILLED PER TABLE 15 CAPACITIES. ALL SEALING SURFACES SHOULD BE CLEANED AND NEW GASKET ELIMINATOR APPLIED. LOCTITE® GASKET ELIMINATOR 518 SEALANT AND LOCTITE® 7649 PRIMER IS RECOMMENDED BY THE FACTORY.

MODELS	RECOMMENDED GREASE		GREASE CAPACITY	
	STANDARD	FOOD GRADE	LBS.	kg
Mi5 & Mi6 (P,Q,L,S) 1 & 8	***LIGHTNIN*** SHC 0	BEL-RAY NO-TOX HD 0	.9	.4
Mi5 & Mi6 (P,Q,L,S) 2 – 6 & 9 - 10			1.6	.7

TABLE 15

LIGHTNIN STANDARD GREASE (PART NUMBER 293101PSP – 2 LB. CONTAINER) AND FOOD GRADE GREASE (PART NUMBER 275255PSP – 14 OZ. TUBE) ARE AVAILABLE.

7.5 An alternate method to achieve the proper amount of grease required, is to measure from the top of the mixer housing (36) down to the grease level as shown in Figure 16.

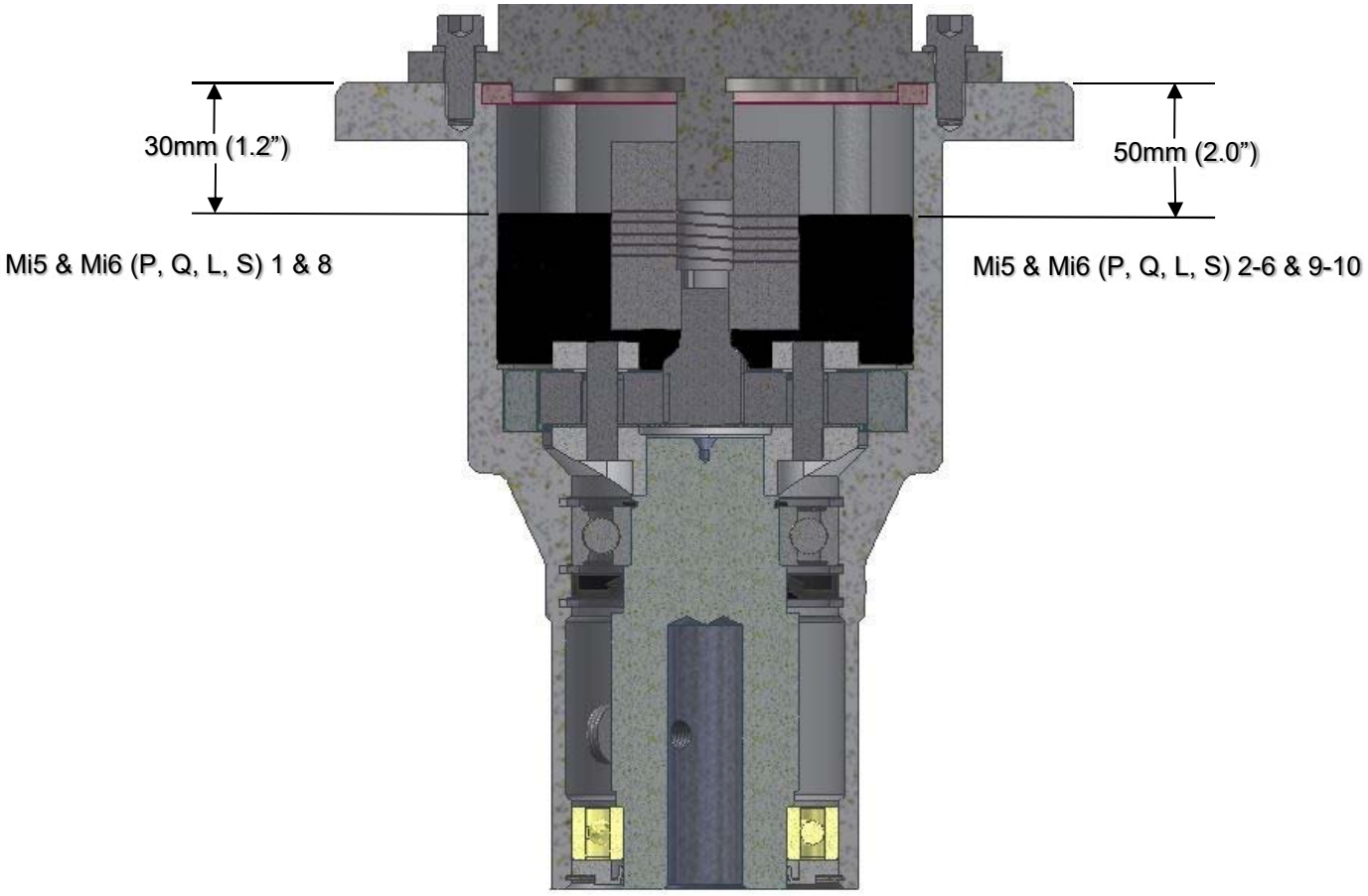


FIGURE 16

7.6 CHANGING GEAR LUBRICANT

Standard Grease: Gear sets are initially lubricated at the factory with ***LIGHTNIN*** SHC 0 grease. This is the optimum lubricant. It will give the best performance, and is available from ***LIGHTNIN***. An alternate grease, Mobilith SHC 007 can be used, but assembly and disassembly will be more difficult due to the fluid nature of the grease. Greater care must be taken during assembly and disassembly to ensure the grease remains in the gear chamber.

Food Grade Grease: Gear sets are initially lubricated at the factory with Bell-Ray No-Tox HD 0 grease. This is the optimum lubricant. **NO OTHER FOOD GRADE GREASE IS ALLOWED.** It will give the best performance, with no derate necessary, and is available from ***LIGHTNIN***.

a. Make sure the gear housing is vertical to prevent spillage.

b. Remove all old grease from the gear chamber and wipe the gear chamber clean.

c. Pack the gear chamber with fresh grease (see Table 3 or Figure 9). Paddle the grease to fill voids and remove air pockets, rotating the shaft and shaking the housing while paddling.

d. Check for free movement of all components by rotating the drive shaft. If satisfactory, refer to Section 11 and complete assembly.

SECTION 8 - PREPARATION FOR DISASSEMBLY AND ASSEMBLY

WARNING: DISCONNECT MOTOR LEADS OR OTHERWISE LOCK-OUT POWER SUPPLY BEFORE SERVICING THIS MIXER. EYE PROTECTION MUST BE WORN.

8.1 GENERAL - ***LIGHTNIN*** mixers are precision manufactured and assembled to provide long, trouble free service when properly maintained. If it becomes necessary to disassemble the unit, careful, precise reassembly is necessary.

Refer to the assembly drawing for location of parts. Equipment that will be required to service the mixer, in addition to standard mechanics tools, is a rubber mallet, retaining ring pliers, arbor press and torque wrench.

When disassembling the mixer, clean adjacent external surfaces to prevent dirt from entering the housings.

It is recommended that oil seals be replaced and gasket eliminator sealer be reapplied when the mixer is disassembled.

8.2 SEAL REPLACEMENT

New oil seals should always be used. Drive out all old oil seals and remove accumulations of sealing compound. When replacing seals:

a. Coat the lips of seals with bearing grease.

b. Install oil seals with the lip facing in the direction indicated on the assembly drawing.

c. Coat the section of the shaft sealing surface with oil. If the oil seal must pass over a keyway, wrap the shaft with thin paper or tape, coat with grease, and pass the seal over.

8.3 BEARING REPLACEMENT

Inspect the bearings carefully and replace if necessary.

a. Old bearings can be removed with a puller or an arbor press.

b. New bearings can be pressed onto the shafts. Be careful to apply load only to the inner race.

c. Make sure the bearings are tightly seated against the shaft or housing shoulder with no clearance.

SECTION 9 - DISASSEMBLY AND ASSEMBLY OF DIRECT DRIVE UNITS

DISASSEMBLY:

9.1 MOTOR REMOVAL

Models: Mi1(P,Q,L)

a. Remove set screw access plug (97) from the mixer housing (36).

b. Remove the impeller shaft (42) from the drive quill (35), by loosening the set screw (96) enough to release the impeller shaft. The impeller shaft is now free from the chuck and can be removed.

"P" Units: Turn the clamp screw counterclockwise to loosen the clamp assembly (116). Remove the mixer from the tank. Remove the yoke / clamp assembly (114 / 115), from the housing (36) by removing the two hex head cap screws 113).

"Q" & "L" Units: Hold the two hex head cap screws (110) and loosen the two hex nuts (109). Remove the mixer from the pedestal (111). On "L" units with the Sanitary Flange Pedestal, loosen the four socket head cap screws (110).

f. Set the mixer upright on a workbench.

g. Remove the four hex head cap screws (160), (or four nuts 161 on D70 and D90 motors) holding the motor (101) to the housing (36).

h. Separate and remove the motor (101) from the housing (36). One half of the motor coupling (150) will remain attached to the motor shaft.

i. Loosen the set screw, and remove the motor coupling half (150) and key (106).

j. Loosen the set screw, remove the quill shaft coupling half, and coupling insert.

9.2 QUILL SHAFT & HOUSING DISASSEMBLY

a. Place the housing (36) upright on a workbench and remove the retaining rings (44 & 56).

b. Place the housing upright in a press, and press out the quill shaft (35), bearing (41) and oil seal (49).

c. Press the lower bearing (41) off the shaft.

d. Turn the housing over and press out the upper bearing (37).

e. Remove lower retaining ring (44), only if necessary.

f. Inspect the bearings (37 & 41). Replace if there is excessive wear.

ASSEMBLY:

9.3 PREPARING FOR ASSEMBLY

a. Clean all parts thoroughly.

b. Inspect for the following defects:

1. Cracks or damage of the housing.
2. Dents, gouges or scoring of the drive shaft, housing bore, and particularly the mating faces of the motor and housing.

c. Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore, and around the oil seal lip to provide lubrication and make the seal more effective.

d. Replace the bearings if they show indications of wear.

9.4 QUILL SHAFT ASSEMBLY

a. Press the lower bearing (41) onto the quill shaft (35). The bearing must seat against the shoulder with no visible gap.

9.5 QUILL SHAFT AND HOUSING ASSEMBLY

a. Install the lower retaining ring (44), if removed, in the housing (36).

b. Mount the housing (36) in an arbor press, large end up.

c. Press the bearing (37) on its outer race to seat against retaining ring (44).

d. Install the upper retaining ring (44).

e. Support the housing, large end down, by resting the inner race of the bearing on a suitable sleeve.

f. Press the quill shaft (35) into the bearing until the shoulder of the shaft registers against the inner race of the bearing.

g. Install the upper retaining ring (56) in the shaft groove.

h. Turn the housing large end down, and press the lower oil seal (49) until it is flush with the end of the housing.

9.6 MOTOR COUPLING ASSEMBLY

a. Position the motor coupling hub (150) as shown in Figure 18.

b. Tighten the set screws.

c. Place the drive coupling half and key onto the end of the quill shaft. The drive coupling half on the quill on Models Mi1(P,Q,L) 1, 4, 5, 8 & 10 are seated directly against the shaft shoulder. Model Mi1(P,Q,L) 6 is set 3mm (.12”) off the shoulder and models Mi1(P,Q,L)2, 3 & 9 are 4.5mm (.18”) off the shoulder. Tighten the set screw.

d. Install the coupling insert into the quill shaft coupling half.

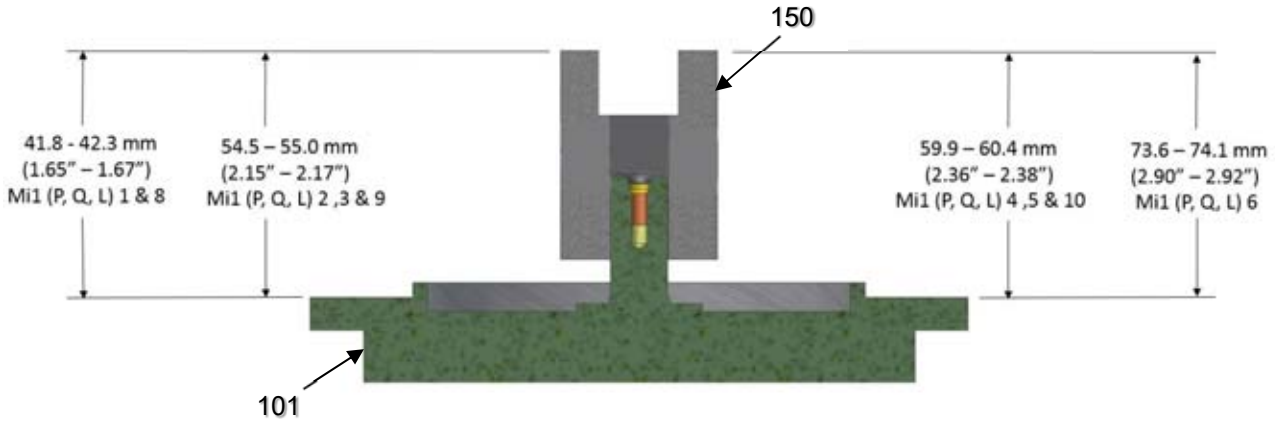


FIGURE 18 – MOTOR COUPLING PLACEMENT

9.7 MOTOR ASSEMBLY

a. Apply LOCTITE GASKET ELIMINATOR 518 SEALANT on the motor mounting face of the housing (36).

b. Align the housing so the set screw access hole is to the right. Orient the motor, so the conduit box (or junction box) of the motor is facing you.

c. Move the motor, over the housing (36) and align the motor coupling (150) with the coupling insert on the quill shaft coupling half.

d. Once the coupling halves engage, align the housing rabbets, screw holes, and conduit box (or junction box) of the motor, with the set screw access hole in the housing, to the right.

Note: Units using D80 and D90 frame motors will use a spacer ring (98) on motor rabbet to mixer housing rabbet connection.

e. Install the housing cap screws (160) (or four nuts 161 on D70 and D90 motors) and tighten evenly.

9.8 MIXER MOUNTING

a. Refer to Section 2 for attachment of applicable mounting configuration.

SECTION 10 - DISASSEMBLY AND ASSEMBLY OF GEAR DRIVE UNITS

DISASSEMBLY:

10.1 MOTOR REMOVAL

Models: Mi5 & Mi6(P,Q,L)

a. Remove set screw access plug (97) from the mixer housing (36).

b. Remove the impeller shaft (42) from the drive quill (35) by loosening the set screw (96) enough to release the impeller shaft. The impeller shaft is now free from the chuck and can be removed.

Models: Mi5 & Mi6S

c. Loosen the eight captive hex head cap screws (113) that secure the two safety covers (112) to the pedestal (111) to gain access to the mechanical seal (401). Remove the safety covers (112).

d. Install seal setting tabs (459), then loosen spring holder set screws (412).

e. Remove set screw access plug (97) from the mixer housing (36).

f. Remove the impeller shaft (42) from the drive quill (35) by loosening the set screw (96) enough to release the impeller shaft. The impeller shaft is now free from the chuck and can be withdrawn.

g. Slide the mixer shaft (42) down through the rotary seal head (402).

h. CAREFULLY remove the rotary seal head assembly (402).

i. The impeller shaft can be removed.

"P" Units: Turn the clamp screw counterclockwise to loosen the clamp assembly (116). Remove the mixer from the tank. Remove the yoke / clamp assembly (114 / 115), from the housing (36) by removing the two hex head cap screws 113).

"Q" & "L" Units: Hold the two hex head cap screws (110) and loosen the two hex nuts (109). Remove the mixer from the pedestal (111). On "L" units with the Sanitary Flange Pedestal, loosen the four socket head cap screws (110).

"S" Units: Hold the four hex head cap screws (110) and loosen the four hex nuts (109). Remove the mixer from the pedestal (111).

u. Set the mixer upright on a workbench.

v. Remove the four hex head cap screws (160) (or four nuts 161 on D70 and D90 motors) holding the motor (101) to the mixer housing (36).

w. Separate and remove the motor (101) from the mixer housing (36). The helical coupling (150) and sun gear will remain attached to the motor shaft.

x. Move the mixer housing over a suitable container, remove the old lubricant and dispose of properly.

y. Remove the sun gear (9) and motor coupling (150).

z. Remove the gear carrier assembly (1), retaining ring (7), ring gear (2), four dowel pins (5) and any remaining old lubricant.

10.2 QUILL SHAFT & HOUSING DISASSEMBLY

a. Place the housing (36) upright on a workbench and remove the retaining rings (44 & 56).

b. Place the housing upright in a press, and press out the quill shaft (35), bearing (41) and oil seal (49).

c. Press the lower bearing (41) off the shaft.

d. Turn the housing over and press out the upper bearing (37).

e. Turn the housing over, remove middle retaining ring (44).

f. Turn the housing over and press the oil seal (38), from the housing (36).

g. Inspect the bearings (37 & 41). Replace if there is excessive wear.

ASSEMBLY:

10.3 PREPARING FOR ASSEMBLY

a. Clean all parts thoroughly.

b. Inspect for the following defects:

1. Cracks or damage of the housing.
2. Dents, gouges or scoring of the quill shaft, housing bore, and particularly the mating faces of the motor and housing.

c. Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore, and around the oil seal lip to provide lubrication and make the seal more effective.

d. Replace the bearings if they show indications of wear.

10.4 QUILL SHAFT ASSEMBLY

a. Press the lower bearing (41) onto the quill shaft (35). The bearing must seat against the shoulder with no visible gap.

10.5 QUILL SHAFT AND HOUSING ASSEMBLY

a. Install the lower retaining ring (44) in the housing (36).

b. Mount the housing (36) in an arbor press, large end up.

c. Press the oil upper seal (38) into the housing (36) with the seal cavity facing the large end of the housing.

d. Install the middle retaining ring (44) in the housing (36).

e. Press the bearing (37) on its outer race to seat against the middle retaining ring (44).

f. Install the upper retaining ring (44).

g. Support the housing, large end down, by resting the inner race of the bearing on a suitable sleeve.

h. Press the quill shaft (35) into the bearing until the shoulder of the shaft registers against the inner race of the bearing.

i. Install the upper retaining ring (56) in the shaft groove.

j. Turn the housing large end down, and press the lower oil seal (49) until it is flush with the end of the housing.

10.6 GEAR ASSEMBLY

a. Install the ring gear retaining pins (5).

b. Install the ring gear (2) in the bearing housing (36).

c. Install the retaining ring (7) in the groove above the ring gear.

d. **PACK THE GEAR CARRIER (1) WITH GREASE** and rotate the gears several times to distribute the grease to the needle bearings (13). Refer to Section 6 of these instructions for lubricant recommendations.

e. Models Mi5 & Mi6 (P,Q,L,S) 1, 2, 3, 4, 5, 8 & 9: Align the flats on the inside of the gear carrier (1) with the flats on the quill shaft (35).

f. Models Mi5 & Mi6 (P,Q,L,S) 6 &10: Install the key (27) in the quill shaft (35). Align the keyway in the gear carrier (1) with the keyway on the quill shaft (35).

g. Place the gear carrier assembly onto the quill shaft.

10.7 MOTOR COUPLING ASSEMBLY

a. Assemble the sun gear (9), the drive coupling (150) and key (107), (Item 107 – On all models except Mi5 & Mi6 (P,Q,L,S) 1 & 8, until the sun gear shoulders against the drive coupling. Tighten the set screws.

b. Set the elevation of the sun gear to the dimension shown in Figure 21, and tighten the remaining set screws.

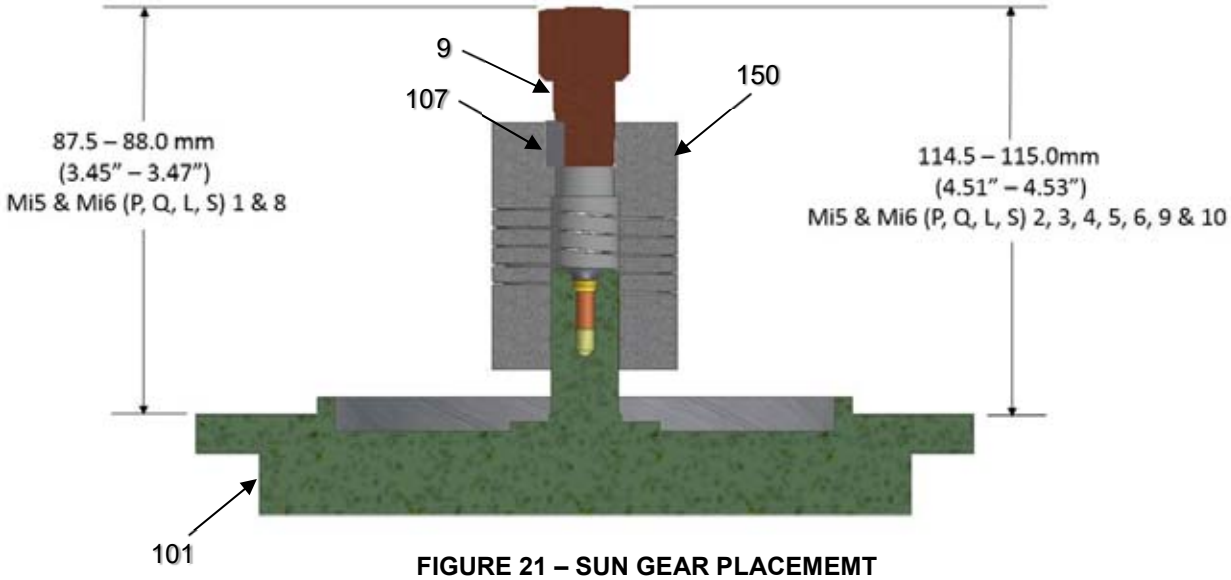


FIGURE 21 – SUN GEAR PLACEMEMT

c. Fill the gear housing with lubricant. Refer to Section 7 of these instructions for lubricant recommendations.

10.8 MOTOR ASSEMBLY

a. Apply LOCTITE GASKET ELIMINATOR 518 SEALANT on the motor mounting face of the housing (36).

b. Align the housing so the set screw access hole is to the right. Orient the motor, so the conduit box (or junction box) of the motor is facing you.

c. Move the motor, over the housing (36) and align the sun gear (9) in the center of the gear carrier so it meshes with the planet gears.

d. Once the gears engage, align the housing rabbets, screw holes, and conduit box (or junction box) of the motor, with the set screw access hole in the housing, to the right.

Note: Units using D80 and D90 frame motors will use a spacer ring (98) on motor rabbet to mixer housing rabbet connection.

e. Install the housing cap screws (160) (or four nuts 161 on D70 and D90 motors) and tighten evenly.

10.9 MIXER MOUNTING

a. Refer to Section 2 for attachment of applicable mounting configuration.

LIGHTNIN
AN SPX BRAND

ELECTRIC MOTOR INSTRUCTIONS

SECTION 1 - INITIAL INSPECTION

1.1 Care is taken at the factory to assure that the motor arrives at its destination in first class condition. If there is evidence of rough handling or damage in shipment, file a claim at once with the carrier and notify our factory.

Examine the outside of the motor carefully for damage, with particular attention to the conduit box, fans and covers. Check nameplate for correct speed, kilowatt, voltage, hertz and phase for conformance with power supply.

1.2 GENERAL DATA:

a. Single phase totally enclosed motors are wired at our factory for correct rotation.

b. All three phase must be field wired for proper rotation. If rotation does not agree with nameplate, reverse any two line leads.

c. Dual or multiple voltage motors must be wired for the desired voltage. Connection diagrams for the motors are located inside the conduit box cover.

Certain motor manufacturer's require using motor nameplate information in conjunction with the connection diagrams to determine the proper wiring configuration. Dependant on voltage requirements, in may be necessary to change lead and / or jumper bar locations.

d. Refer to Section 2 for motor maintenance and storage instructions.

1.3 WARNING

- If the thermal protector continues to trip, some abnormal condition exists. This condition must be corrected before motor will operate normally.
- **ALWAYS DISCONNECT POWER LINE BEFORE SERVICING ANY PART OF THE MIXER**. Unexpected motor start–up may occur after the thermal protection circuit trips.

1.4 After unpacking and inspection to see that all parts are in good condition, turn the shaft by hand to be sure there are no obstructions to free rotation. Equipment which has been in storage should be tested prior to being put into service.

a. It is best to check the insulation resistance of the stator winding with a megohmeter. If resistance is lower than one megaohm, consult ***LIGHTNIN***.

b. Motors are shipped from the factory with bearings properly packed with grease and ready to operate.

1.5 WIRING - Examine the nameplate data to see that it agrees with the power circuit to which the motor is to be connected. The motor is guaranteed to operate successfully with frequency not more than 5% and voltage not more than 10% above or below the nameplate data, or combined variation of voltage and frequency of not more than 10% above or below nameplate data. Efficiency, power factor and current may vary from nameplate data.

1.6 Connect the motor leads to a power source that matches the line voltage and wiring diagram specified on the motor nameplate.

1.7 Check impeller shaft rotation by jogging the motor until it is determined that rotation is correct.

1.8 **CAUTION**

Repeated trial starts can overheat the motor (particularly for across–the–line starting). If repeated trial starts are made, allow sufficient time between trials to permit heat to dissipate from the windings or rotor to prevent

overheating. Starting currents are several times running currents, and heating varies as the square of the current. Do not exceed 12 starts per hour.

1.9 **WARNING**

The frames and other metal exteriors of motors should be grounded to limit their potential to ground in the event of accidental connection or contact between live electrical parts and the metal exteriors. All motors should be grounded through the conduit box.

1.10 **WARNING**

Before starting motor, remove all unused shaft keys and loose rotating parts to prevent them from flying off.

1.11 Start motor and operate at minimum load prior to filling the tank or basin. Look for any unusual condition.

The motor should run smoothly with little noise. If the motor should fail to start and produces a decided hum, it may be that the load is too great for the motor or that it has been connected improperly. Shut down immediately and investigate for trouble.

SECTION 2 - MOTOR MAINTENANCE AND STORAGE

Electric motors or other prime movers are not prepared by ***LIGHTNIN*** for indoor storage beyond 12 months in a dry ambient atmosphere with controlled temperatures, or 6 months in a dry ambient atmosphere with no temperature control. OUTDOOR STORAGE OF ELECTRIC MOTORS IS NOT RECOMMENDED BY ANY MOTOR MANUFACTURER. For information on storage periods beyond those shown, consult ***LIGHTNIN***.

2.1 To insure continued reliable operation of electric motors, the following basic rule applies: **KEEP THE MOTOR CLEAN AND DRY.** Motors should be inspected, and output shaft rotated, at a minimum of 6 month intervals with increased frequency as needed depending upon the type of motor and the service.

2.2 Terminal connections and assembly hardware may loosen from vibration during service and should be tightened.

2.3 Insulation resistance should be checked at operative temperature and humidity conditions to determine possible deterioration of insulation due to excessive moisture or extremes in operating environment. If wide variations are detected, motors should be reconditioned.

2.4 LUBRICATION – Each motor manufacturer has a specific method for regreasing the bearings. Refer to the motor manufacturer's instruction manual for complete details.

2.5 **STORAGE REQUIREMENTS FOR MOTORS -** These extended storage requirements must be followed to allow the submission of a valid warranty claim.

a. The motors, if not mounted, are to be stored in the original containers in a clean, dry, protected warehouse.

b. The storage area is to be free from any vibration and from extremes in temperature.

c. Windings to be megged at the time equipment is put in storage. At the time of removal from storage, the resistance reading must not have dropped more than 50% from the initial reading. Any drop below this point, consult ***LIGHTNIN***.

d. All external parts and motors subjected to corrosion should be protected by a corrosive resistant coating.

LIGHTNIN
AN SPX BRAND

Care of Stainless Steel

Stainless Steel Corrosion

Corrosion resistance is greatest when a layer of oxide film is formed on the surface of stainless steel. If film is disturbed or destroyed, stainless steel becomes much less resistant to corrosion and may rust, pit or crack.

Corrosion pitting, rusting and stress cracks may occur due to chemical attack. Use only cleaning chemicals specified by a reputable chemical manufacturer for use with 300 series stainless steel. Do not use excessive concentrations, temperatures or exposure times. Avoid contact with highly corrosive acids such as hydrofluoric, hydrochloric or sulfuric. Also avoid prolonged contact with chloride-containing chemicals, especially in presence of acid. If chlorine-based sanitizers are used, such as sodium hypochlorite (bleach), do not exceed concentrations of 150 ppm available chlorine, do not exceed contact time of 20 minutes, and do not exceed temperatures of 104°F (40°C).

Corrosion discoloration, deposits or pitting may occur under product deposits or under gaskets. Keep surfaces clean, including those under gaskets or in grooves or tight corners. Clean immediately after use. Do not allow equipment to set idle, exposed to air with accumulated foreign material on the surface.

Corrosion pitting may occur when stray electrical currents come in contact with moist stainless steel. Ensure all electrical devices connected to the equipment are correctly grounded.

Elastomer Seal Replacement Following Passivation

Passivation chemicals can damage product contact areas of ***LIGHTNIN*** equipment. Elastomers (rubber components) are most likely to be affected. Always inspect all elastomer seals after passivation is completed. Replace any seals showing signs of chemical attack. Indications may include swelling, cracks, loss of elasticity or any other noticeable changes when compared with new components.

SPX. Lightnin®

BOLT TIGHTENING TORQUE RECOMMENDATIONS

Inadequately or improperly tightened hardware can loosen due to vibration or the load reactions imposed by fluid forces. This can result in reduced equipment service life or damage and failure.

Recommended torques for tightening ANSI bolts and screws on ***LIGHTNIN*** Mixers and Aerators and their mounting structures are listed below for your general reference. These average torque values should be considered only as guides and not as absolute values.

The amount of torque required to maintain a tight connection can vary considerably for bolts of the same size under different operating conditions. Variations such as basic joint design, compression factors, type and strength of base and hardware material, surface finish of mating parts and lubrication are only some of the factors that influence the tightness of bolted connections for given bolt torques.

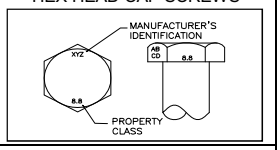
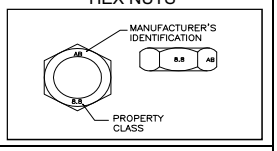
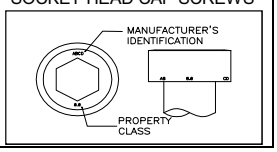
UNLESS SPECIFICALLY LISTED ELSEWHERE IN THE DETAILED INSTRUCTIONS, TIGHTEN THE MIXER AND MOUNTING HARDWARE TO THE RECOMMENDED VALUES SHOWN. A torque wrench must be used to ensure compliance with these torque requirements.

Certain assembly connections may require special torques that are not listed in the table. These torques can be found in the detailed assembly and disassembly sections of your manual. REVIEW YOUR MANUAL CAREFULLY TO DETERMINE WHERE SPECIAL TORQUES ARE REQUIRED.

For severe duty service, torques higher than listed, to tighten a bolt to maximum capacity, can often be used. However, due to the many variables previously mentioned, the only absolute method to determine optimum torque is to deliberately yield a bolt under actual conditions. If a bolt does yield or shear, 75% of the torque applied in yielding the bolt can be used to obtain a tight connection that is satisfactory.

ALL BOLTS SHOULD BE RETIGHTENED 12 HOURS AFTER ASSEMBLY, AND AT EACH SCHEDULED SHUT DOWN THEREAFTER.

RECOMMENDED TIGHTENING TORQUES FOR *LIGHTNIN*
GRADE 5.6 & 8.8 STEEL, 304 & 316 STAINLESS STEEL HARDWARE (1) (2) (4)

BOLT THREAD SIZE	Tightening Torque (ft-lbs) Grade 5.6 or 304/316 SS (5) Lubricated (4)	Tightening Torque (ft-lbs) Grade 8.8 Lubricated (4)	Tightening Torque (N-m) Grade 5.6 or 304/316 SS (5) Lubricated (4)	Tightening Torque (N-m) Grade 8.8 Lubricated (4)	ISO MARKING REFERENCE GUIDE (2)
M5	1.9	3.9	2.5	5.3	HEX HEAD CAP SCREWS
M6	3.2	6.6	4.3	8.9	
M7	5	11	7	15	
M8	8	16	10	22	
M10	15	32	21	43	
M12	27	55	36	75	
M14	42	88	57	119	HEX NUTS
M16	66	137	89	186	
M18	91	195 (3)	123	265 (3)	
M20	129	277	174	375	
M22	175	377	237	511	
M24	222	479	301	649	
M27	245 (3)	700	382 (3)	950	SOCKET HEAD CAP SCREWS
M30	332	951	450	1 290	
M33	452	1 294	618	1 755	
M36	581	1 662	787	2 254	
M39	752	2 151	1 019	2 917	
M42	930	2 661	1 261	3 608	

(1) ALL BOLTS SHOULD BE COATED WITH OIL, GREASE OR AN ANTI-SEIZE COMPOUND WHENEVER POSSIBLE. THE THREADS AND BEARING FACE OF BOLT HEADS AND/OR NUTS SHOULD BE LUBRICATED.

(2) TORQUE VALUES SHOWN SUPERSEDE PREVIOUS TABLES THAT MAY HAVE ALLOWED LOWER VALUES. IT IS RECOMMENDED THAT ONLY FASTERNERS BE USED THAT ARE PROPERLY MARKED, INCLUDING MANUFACTURER'S TRADE MARKING. ONLY FASTENERS MARKED AS SHOWN ARE GUARANTEED TO MEET SPECIFICATION AND PERFORMANCE REQUIREMENTS.

(3) ALLOWABLE BOLT STRESS VALUES CHANGE AT THESE LOCATIONS AND IS REFLECTED IN THE SUGGESTED TORQUE VALUES.

(4) CONVERSION FACTORS:

DRY VALUES: MULTIPLY LUBRICATED VALUE BY 1.33.

METRIC VALUES IN N-m 1FT-LB = 1.3558 N-m

(5) APPLICABLE MATERIAL GRADES FOR SPECIFIED TORQUE VALUES:

TORQUE VALUES ARE BASED ON THE LOWER OF GRADE 5.6 STEEL OR STAINLESS STEEL:

A2/A4 CLASS 70 FOR BOLTS LESS THAN OR EQUAL TO M24

A2/A4 CLASS 50 FOR BOLTS LARGER THAN M24

MIXER PARTS **UNIT SIZE: NETTCO - i Series**

For service and repair: www.lightninmixers.com 888-649-2378

ITEM NO.	IDENTITY CODE #		DESCRIPTION	QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
Note: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier.							
101			**ELECTRIC MOTOR SELECTIONS:**				
			.37kW (.5 HP), 3 Phase, TEFC, D71 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227222GRPSP		
			60Hz, 1800RPM, 575 volts	1	227266GRPSP		
			.37kW (.5 HP), 1 Phase, TEFC, D71 Frame w/ Switch, Cord & Plug	1	227228GRPSP		
			.55kW (.75 HP), 3 Phase, TEFC, D80 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227223GRPSP		
			60Hz, 1800RPM, 575 volts	1	227267GRPSP		
			.75kW (1.0 HP), 3 Phase, TEFC, D80 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227224GRPSP		
			60Hz, 1800RPM, 575 volts	1	227268GRPSP		
			1.1kW (1.5 HP), 3 Phase, TEFC, D90 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227225GRPSP		
			60Hz, 1800RPM, 575 volts	1	227269GRPSP		
			1.5kW (2.0 HP), 3 Phase, TEFC, D90 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227226GRPSP		
			60Hz, 1800RPM, 575 volts	1	227270GRPSP		
			2.2kW (3.0 HP), 3 Phase, TEFC, D100 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227227GRPSP		
			60Hz, 1800RPM, 575 volts	1	227271GRPSP		
			AIR MOTOR SELECTIONS:				
			.37 kW (.5 HP), D71 Frame	1	227674PSP		
			.55 - 1.5 kW (.75 - 2.0 HP), D80 Frame	1	227675PSP		
			2.2 kW (3.0 HP), D90 Frame	1	227676PSP		

\# **IDENTITY CODE:**

(1)

Blank Code denotes common parts.

* Recommended spare parts

MIXER PARTS **UNIT SIZE: NETTCO - i Series**

For service and repair: www.lightninmixers.com 888-649-2378

ITEM NO.	IDENTITY CODE #		DESCRIPTION		QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
Note: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier.								
			AIR MOTOR REPAIR KITS: Includes: Seal, Bearings, Vanes, Push Pins, Vane Springs and Gaskets.		**AVAILABLE AS A KIT, ONLY**			
			1 Size, D71 Motor Frame		1	227663PSP		
			2 Size, D80 Motor Frame		1	227664PSP		
			2 Size, D90 Motor Frame		1	227665PSP		
			REBUILD KITS: for Direct Drive Mixers Includes items: 37, 41, 44, 49, 56, 96 and 150		**AVAILABLE AS A KIT, ONLY**			
			1 Size, D71 Motor Frame		1	873318PSP		
			2 Size, D80 Motor Frame		1	873321PSP		
			2 Size, D90 Motor Frame		1	873324PSP		
			3 Size, D100 Motor Frame		1	873327PSP		
			REBUILD KITS: for Gear Drive Mixers Includes items: 1, 2, 5, 7, 37, 38, 41, 44, 49, 56, 96 and 150		**AVAILABLE AS A KIT, ONLY**			
			1 Size, D71 Motor Frame	5:1 Ratio	1	873319PSP		
				6:1 Ratio	1	873320PSP		
			2 Size, D80 Motor Frame	5:1 Ratio	1	873322PSP		
				6:1 Ratio	1	873323PSP		
			2 Size, D90 Motor Frame	5:1 Ratio, Elec.	1	873325PSP		
				5:1 Ratio, Air	1	873401PSP		
				6:1 Ratio, Elec.	1	873326PSP		
				6:1 Ratio, Air	1	873402PSP		
			3 Size, D100 Motor Frame	5:1 Ratio	1	873328PSP		
				6:1 Ratio	1	873329PSP		

IDENTITY CODE:

(1)

Blank Code denotes common parts.

* Recommended spare parts

MIXER PARTS **UNIT SIZE: NETTCO - i Series**

For service and repair: www.lightninmixers.com 888-649-2378

ITEM NO.	IDENTITY CODE #		DESCRIPTION		QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
Note: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier.								
120			**MECHANICAL SEAL - Style 10**		**AVAILABLE AS COMPLETE SEAL, ONLY.**			
			1 Size (20mm Shaft)	for ANSI or DIN Flange	1	226945PSP		
			2 & 3 Size (25mm Shaft)	for ANSI or DIN Flange	1	226946PSP		
			MECHANICAL SEAL - Style 10T		**AVAILABLE AS COMPLETE SEAL, ONLY.**			
			1 Size (20mm Shaft)	for Sanitary Flange	1	227376PSP		
			2 & 3 Size (25mm Shaft)	for Sanitary Flange	1	227377PSP		
134			**Q PLATE ISOLATION MOUNT**					
			All Sizes	Flex Mount	4	138317PSP		
209			**LIP SEAL**					
			1 Size (20mm Shaft)	for ANSI or DIN Flange	1	226968PSP		
				for Sanitary Flange				
			2 & 3 Size (25mm Shaft)	for ANSI or DIN Flange	1	226937PSP		
				for Sanitary Flange				
			LUBRICANT					
			1 Size, D71 Motor Frame	Standard - 2 LB. Can	1	293101PSP		
				Food Grade - 14 OZ. Tube	1	275255PSP		
			2 Size, D80 or D90 Motor Frame	Standard - 2 LB. Can	1	293101PSP		
				Food Grade - 14 OZ. Tube	2	275255PSP		
			3 Size, D100 Motor Frame	Standard - 2 LB. Can	1	293101PSP		
				Food Grade - 14 OZ. Tube	2	275255PSP		

IDENTITY CODE:

(1)

Blank Code denotes common parts.

* Recommended spare parts

Notes

LIMITED WARRANTY

Unless otherwise noted on the face hereof, SPX Flow goods, auxiliaries and parts thereof are warranted to the original purchaser against defective workmanship and material for a period of twelve (12) months from date of installation or (18) months from date of shipment from factory, whichever expires first. If the goods or services do not conform to the warranty stated above, then as Buyer's sole remedy, SPX Flow shall, at SPX Flow's option, either repair or replace the defective goods or re-perform defective services. Third party goods furnished by SPX Flow will be repaired or replaced as Buyer's sole remedy, but only to the extent provided in and honored by the original manufacturer's warranty. Unless otherwise agreed to in writing, SPX Flow shall not be liable for breach of warranty or otherwise in any manner whatsoever for: (i) normal wear and tear; (ii) corrosion, abrasion or erosion; (iii) any good or services which, following delivery or performance by SPX Flow, has been subjected to accident, abuse, misapplication, improper repair, alteration, improper installation or maintenance, neglect, or excessive operating conditions; (iv) defects resulting from Buyer's specifications or designs or those of Buyer's contractors or subcontractors other than SPX Flow; or (v) defects resulting from the manufacture, distribution, promotion or sale of Buyer's products.
THE WARRANTIES CONTAINED HEREIN ARE THE SOLE AND EXCLUSIVE WARRANTIES AVAILABLE TO BUYER AND SPX FLOW HEREBY DISCLAIMS ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE FOREGOING REPAIR, REPLACEMENT AND REPERFORMANCE OBLIGATIONS STATE SPX FLOW'S ENTIRE AND EXCLUSIVE LIABILITY AND BUYER'S EXCLUSIVE REMEDY FOR ANY CLAIM IN CONNECTION WITH THE SALE AND FURNISHING OF SERVICES, GOODS OR PARTS, THEIR DESIGN, SUITABILITY FOR USE, INSTALLATION OR OPERATIONS.

SPX®
WHERE IDEAS MEET INDUSTRY

TECHNICAL SERVICES

The Lightnin brand dedicated after sales support teams are on hand to offer advice and support. With more than 85 years' experience in the manufacture and supply of agitation equipment, we know what parts need to be on hand to support our customer base so that your downtime is minimized. Our team of highly experienced field service technicians is on call to support the on-site servicing of equipment, or supervise and train your maintenance staff in best practice care of equipment.

INSTALLATION AND COMMISSIONING

Proper installation of your Lightnin mixer is critical to its long term performance and reliability. To ensure that installation procedures are followed, a certified technician will:

- Audit the equipment
- Supervise job-site contractors
- Perform a final inspection

SERVICE SUPPORT & REFURBISHMENT

The equipment audit is specifically designed to identify potential mechanical problems before they occur. Using many forms of modern technology and drawing on our mixer manufacturing experience, our technicians can identify the onset of bearing and gear failures, misalignment and system problems without the need to interrupt production. Factory gearbox exchange and refurbishment programs offer a fast and cost-effective route to extending equipment life.

SPX FLOW TECHNOLOGY
135 Mt. Read Blvd.
Rochester, NY 14611
P: (888) 649-2378 (MIX-BEST) or +1 (585) 436-5550
F: (585) 436-5589
E: lightnin@spx.com ▪ www.lightninmixers.com

ISSUED 2012

Flocculation Mixer Manual

SPX®
WHERE IDEAS MEET INDUSTRY

INSTRUCTION MANUAL

i-Series Mixer Model Mi6Q2

Ship To: Swanton Welding & Machining Company
Customer: MONROE ENVIRONMENTAL CORP
PO Number: 33598-7706

Order: 0002889047 Line: 000020

READ AND UNDERSTAND THIS DOCUMENT PRIOR TO OPERATING OR SERVICING THIS PRODUCT.

Lightnin®

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Table of Contents

Lightnin®

SAFETY CHECK LIST

IMPORTANT WARNINGS

All ***LIGHTNIN*** **NETTCO** Mixers are provided with proper safety covers to avoid potential injury. The following SAFETY CHECK LIST should be THOROUGHLY REVIEWED AND ADHERED TO before installing, operating or performing maintenance on the mixer. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS INJURY. Ensure the use of qualified, quality trained and safety conscious personnel.

1. Use only the lifting device, if provided, on your unit to install the mixer. We strongly recommend that the hoist rings be of safety swivel type with 360° rotational capability. Lift per instructions in the instruction manual.
2. DO NOT connect the motor to the power source until all components are assembled, the mixer is installed, and all hardware is tightened to the proper torque, which is specified in the operation and maintenance manuals supplied by ***LIGHTNIN***.
3. DO NOT operate shaft sealing devices at temperatures or pressures higher than those specified in the manual or on the nameplates.
4. DO NOT service the mixer until you have followed your “Control of Hazardous Energy Sources” (lockout, tagout procedure) as required by OSHA 29 CFR Part 1910.
5. DO NOT touch rotating mixer parts or any part of mixer that has the potential of having a hot surface including motor, gear drive housing, seal, shafting and flange.
6. DO NOT operate mixer for service other than its intended use, that being fluid mixing with the mixer attached to a rigid structure and connected to a power source appropriate to operate the drive motor.
7. DO NOT make any field changes or modifications (horsepower, seal material components, output speed, shaft lengths, impellers, etc.) without reviewing the changes with your ***LIGHTNIN*** Sales Representative or the ***LIGHTNIN*** Customer Service Department.
8. DO NOT install an aftermarket Variable Frequency Drive without first consulting your ***LIGHTNIN*** Sales Representative or the ***LIGHTNIN*** Customer Service Department to determine the compatibility of the existing motor with the Variable Frequency Drive.
9. DO NOT operate mixer until you have checked the following items:
    A. Make sure the mixer is properly grounded.
    B. Ensure all protective guards and covers are installed. Guarding of the mixer shaft below mixer mounting surface is the responsibility of the customer.
    C. Ensure all detachable components are securely coupled to the mixer.
    D. Thoroughly REVIEW and ADHERE TO the mixer operating instructions supplied by ***LIGHTNIN***.
    E. Ensure the mixer output shaft rotates freely by hand.
    F. Ensure all personnel and equipment are clear of rotating parts.
    G. Ensure all external connections (electrical, hydraulic, pneumatic, etc.) have been completed in accordance with all applicable codes and regulations.
10. DO NOT enter the mixing vessel UNLESS:
    A. The mixer power supply is locked out (follow Item number 4).
    B. The mixer shaft is firmly attached to the mixer drive or the shaft is supported securely from below.
    C. You have followed applicable confined space regulations.

CE COMPLIANCE

Equipment furnished conforms to the following directives:

98/37/EC Machinery Directive
89/336/EEC Electro-Magnetic Compatibility
73/23/EEC Low Voltage

Any CE marking and/or associated documentation applies to the mixer only. This has been supplied on the basis that the mixer is a unique system. When the mixer is installed, it becomes an integral part of a larger system which is not within the scope of supply and CE marking is the responsibility of others.

ENVIRONMENTAL NOTICES

NOTICE: THERE ARE NO USER RE-USABLE COMPONENTS WITHIN THIS EQUIPMENT. ALL MATERIALS ARE RECYCLABLE. DISPOSE OF EQUIPMENT RESPONSIBLY AT THE END OF ITS SERVICE.

NOTICE: REFER TO THE MSDS DATA SHEET FOR THE GREASE FOR DISPOSAL. DATA SHEET FOR THE GREASE SUPPLIED WITH THE UNIT IS SUPPLIED IN THE MACHINE BOOK. IF GREASE TYPE IS UNKNOWN TO THE USER DISPOSE OF THE MATERIAL IN ACCORDANCE WITH LOCAL LAWS AND DIRECTIVES.

IMPORTANT: DISPOSE OF THIS EQUIPMENT RESPONSIBLY. CORRECT DISPOSAL IS THE RESPONSIBILITY OF THE END USER. IF IN DOUBT, CONSULT WITH LOCAL ENVIRONMENTAL AGENCIES FOR ADVICE ON THE BEST METHOD OF DISPOSAL. FAILURE TO DISPOSE OF THIS EQUIPMENT CORRECTLY COULD RESULT IN PROSECUTION.

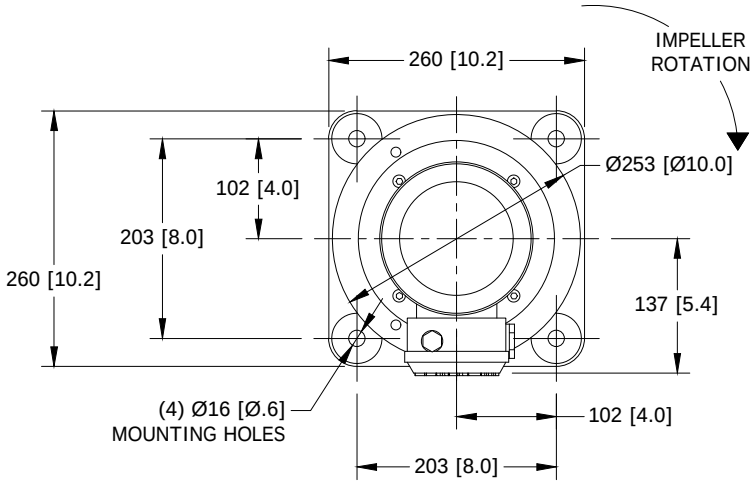
IMPORTANT: THIS EQUIPMENT DOES NOT PRODUCE HIGH NOISE OR VIBRATION. HOWEVER, THE OPERATOR MAY EXPERIENCE HIGH NOISE OR VIBRATION IN THE LOCATION OF THIS EQUIPMENT DUE TO ANOTHER SOURCE. ENSURE THAT ALL ENVIRONEMENTS ARE CORRECTLY LABELED SUCH THAT ANY OPERATOR OR BYSTANDER IS INFORMED AS TO THE POTENTIAL RISKS AND THE CORRECT ACTION HE SHOULD TAKE TO PREVENT INJURY.

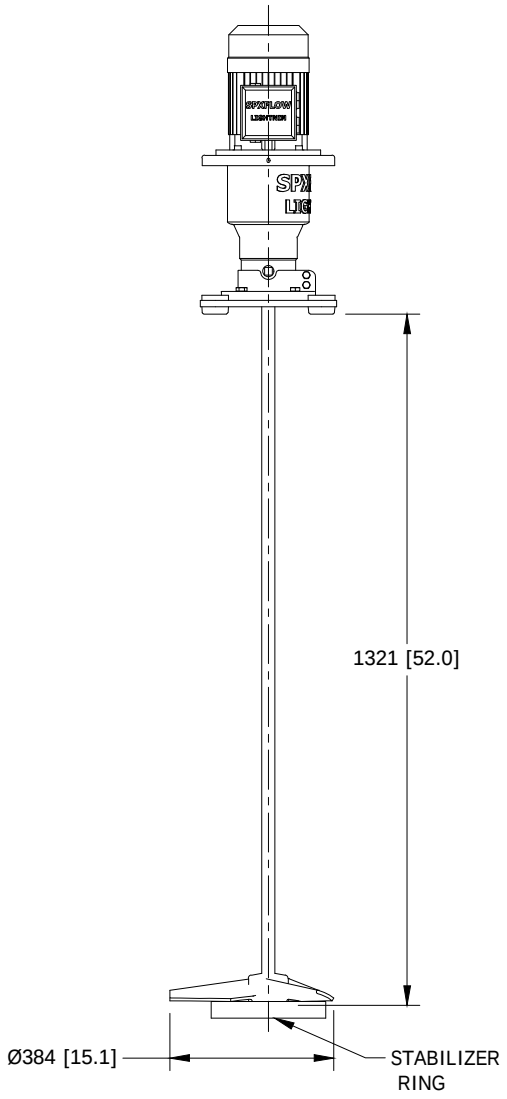
NOISE LEVELS

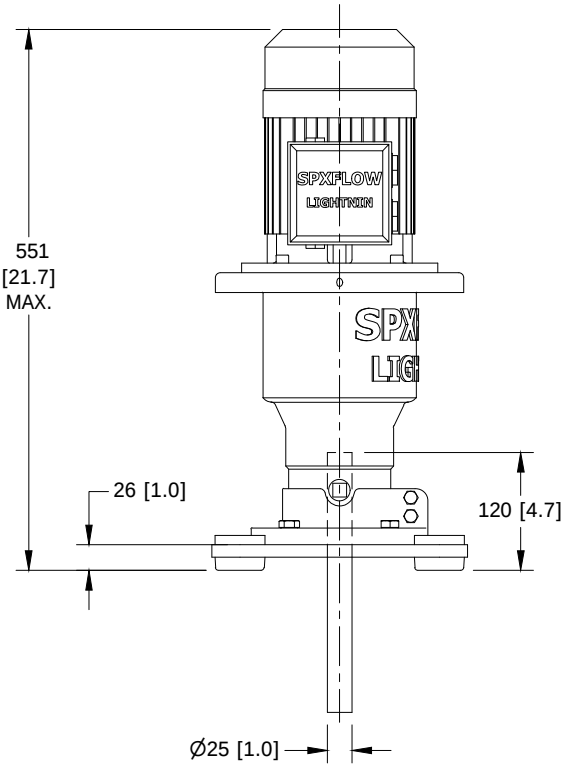
SOUND PRESSURE LEVELS
Maximum 85 dBa @ 1 meter

THIS PRODUCT MAY BE COVERED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS:

5427450	5454986	5470152	5478149	5480228	5501523
5511881	5560709	5568975	5568985	5655780	5720286
5746536	5758965	5779359	5842377	5925293	5951162
5972661	5988604	6089748	6109449	6142458	6158722
6250797	6299776	6334705	6386753	6457853	6634784
6715913	6742923	6746147	6789314	6796707	6796770
6808306	6843612	6860474	6877750	6935771	6986507
6997444	7001063	7056095	7168641	7168848	7168849
7328809					







NOTES:
1. ALL DIMENSIONS ARE IN mm [INCHES].
2. DIMENSIONS ARE FOR REFERENCE ONLY UNLESS CERTIFIED.
3. MATERIAL OF IN-TANK PARTS IS 316L STAINLESS STEEL.
4. MIXER MOUNTING DATA: PLATE
5. MOUNTING HARDWARE IS FURNISHED BY OTHERS.
6. MOTOR DATA: POWER: 0.55 kW [0.75 HP]
   VOLTS: 208-230/460 R.P.M.: 1800
   Hz: 60 PHASE: 3 ENCLOSURE: TEFC
7. IMPELLER DATA:
   TYPE: HYDROFOIL NO. OF BLADES: 3
   IMPELLER R.P.M.: 292
   THE IMPELLER IS ATTACHED TO THE SHAFT WITH SET SCREWS.
   THE IMPELLER IS FURNISHED WITH A STABILIZER RING.
8. MIXER WEIGHT IS 25 KG [55 LBS.]
   SHAFT WEIGHT IS 5.74 KG [12.6 LBS.]
   IMPELLER WEIGHT IS 3.44 KG [7.6 LBS.]

SPXFLOW
Lightnin Plenty

ISO 9001
CERTIFIED

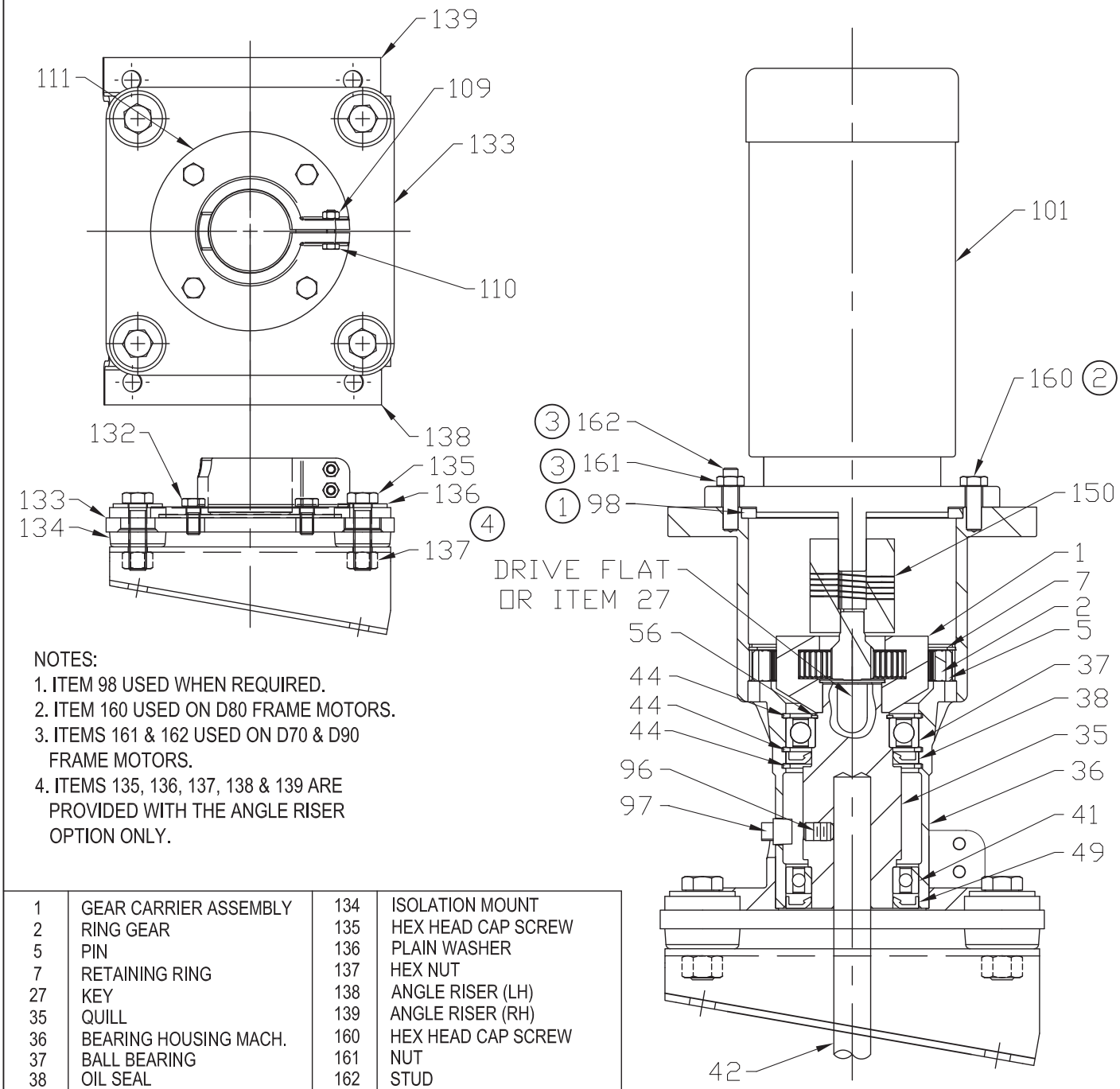
BY:
DATE: 05-21-2019

GENERAL ARRANGEMENT
FOR: MONROE ENVIRONMENTAL CORP

S.O. NO.: 2889047 LINE NO.: 20
MIXER MODEL: Mi6Q2 QUANTITY: 1
CUST. P.O. NO.: 33598-7706 RATIO: 6:1
TAG NO.: None
SERIAL NO.: 1000003721761

CERTIFIED BY: _____ DATE:

DRAWING NO.:2889047000020-A



NOTES:
1. ITEM 98 USED WHEN REQUIRED.
2. ITEM 160 USED ON D80 FRAME MOTORS.
3. ITEMS 161 & 162 USED ON D70 & D90 FRAME MOTORS.
4. ITEMS 135, 136, 137, 138 & 139 ARE PROVIDED WITH THE ANGLE RISER OPTION ONLY.

ITEM	PART NAME
1	GEAR CARRIER ASSEMBLY
2	RING GEAR
5	PIN
7	RETAINING RING
27	KEY
35	QUILL
36	BEARING HOUSING MACH.
37	BALL BEARING
38	OIL SEAL
41	BALL BEARING
42	IMPELLER SHAFT
44	INTERNAL RETAINING RING
49	OIL SEAL
56	EXTERNAL RETAINING RING
96	HEX SOC SET SCREW
97	SQ HD PIPE PLUG
98	MOTOR SPACER RING
101	MOTOR
109	HEX NUT
110	HEX HEAD CAP SCREW
111	PEDESTAL
132	HEX HEAD CAP SCREW
133	Q PLATE

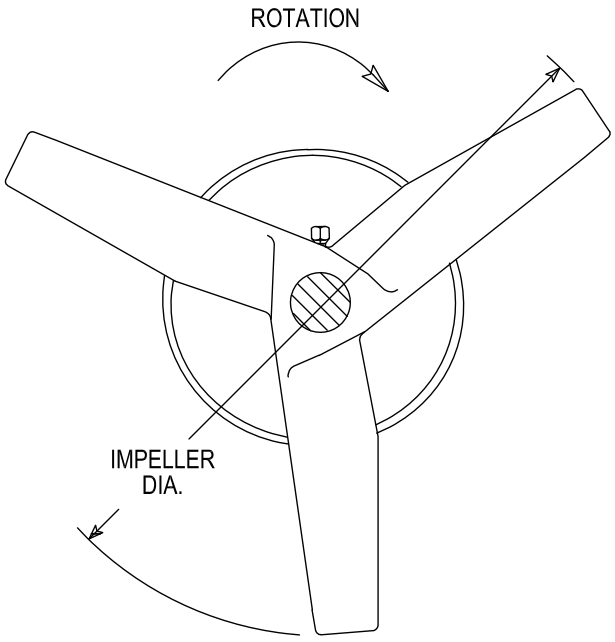
ITEM	PART NAME
134	ISOLATION MOUNT
135	HEX HEAD CAP SCREW
136	PLAIN WASHER
137	HEX NUT
138	ANGLE RISER (LH)
139	ANGLE RISER (RH)
160	HEX HEAD CAP SCREW
161	NUT
162	STUD

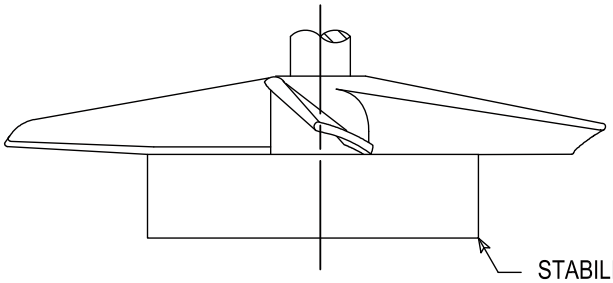
LIGHTNIN
AN SPX BRAND

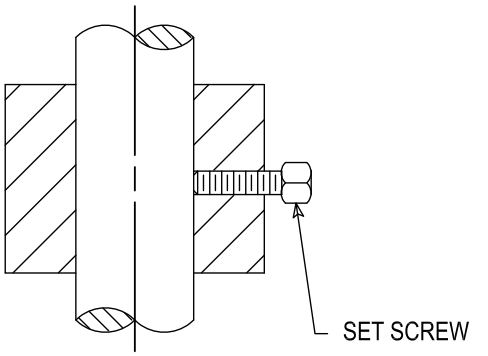
ISO 9001 CERTIFIED

ASSEMBLY DRAWING
NETTCO MODELS
Mi5Q1 - Mi5Q6 W/ ISOLATION MNTS
Mi6Q1 - Mi6Q6 W/ ISOLATION MNTS
GEAR DRIVE
ELECTRIC MOTOR

DRAWING NO. L-18412







WHEN ORDERING PARTS, SPECIFY:
DRAWING NUMBER, PART NAME AND
SERIAL NUMBER

LIGHTNIN
AN SPX BRAND

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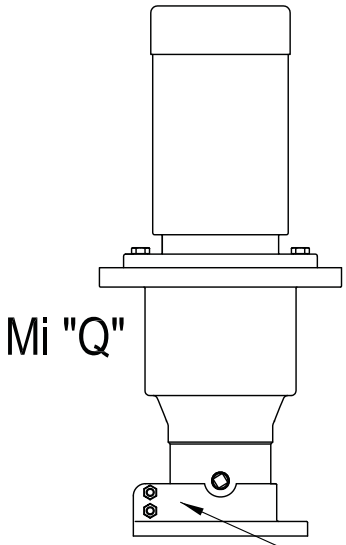
CERTIFIED

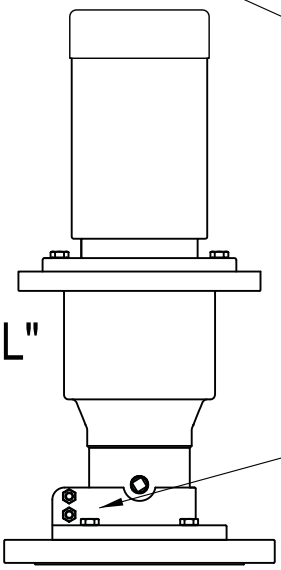
ASSEMBLY DRAWING

NETTCO HYDROFOIL IMPELLER

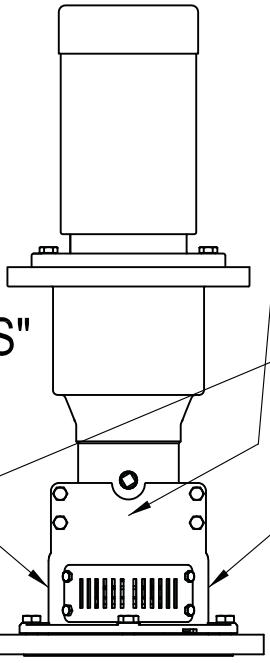
DRAWING NO. L-18319



Mi "Q"



Mi "L"

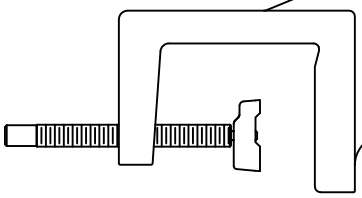


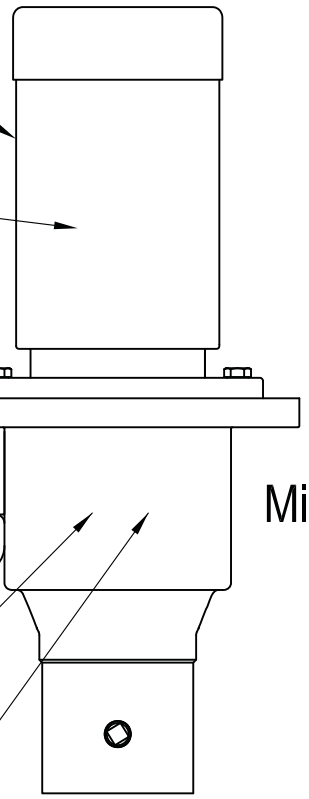
Mi "S"

279378PSP - LOCATE ON MOTOR CONDUIT BOX

279439PSP - LOCATE ON MOTOR BODY

274918PSP - LOCATE ON BEARING HOUSING FLANGE O.D.



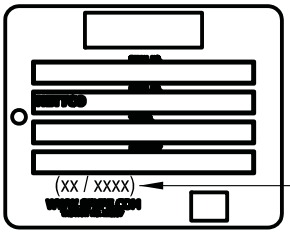


Mi "P"

279598PSP - LOCATE ON BEARING HOUSING ABOVE SHAFT SET SCREW ACCESS HOLE

227331PSP - LOCATE ON PEDESTALS OF THE "Q", "L", & "S" UNITS AS SHOWN

279599PSP - LOCATE ON BEARING HOUSING ABOVE SHAFT SET SCREW ACCESS HOLE



226997PSP - ATTACHED BY LANYARD TO UNIT. UNDER REPAIR KIT FIELD, LASER ETCH (MONTH / YEAR) OF MANUFACTURE. EX: (xx / xxxx)

IN ADDITION TO THE LABELS PRESENT ON ALL OF THE BASE MODULES, THE "S" UNITS HAVE TWO LOCATED ON THE PEDESTAL AS SHOWN.

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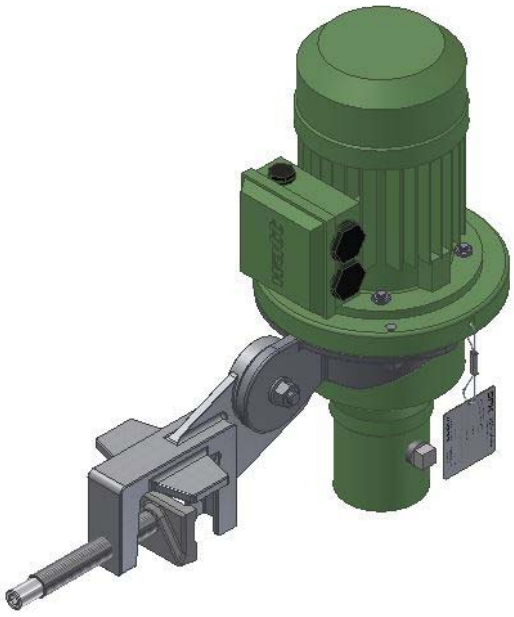
ASSEMBLY DRAWING

NETTCO "Mi" MODELS LABEL LOCATIONS

DRAWING NO. L-18344

OPERATING AND MAINTENANCE INSTRUCTIONS FOR NETTCO i-SERIES



SECTION 1 - INITIAL INSPECTION, SHIPPING ARRANGEMENTS AND STORAGE

1.1 Check the shipping crates and your ***LIGHTNIN®*** equipment for possible shipping damage. Report any damage immediately to the carrier and our factory.

1.2 The mixer and impellers are packed together. The impeller shaft, if over 48 inches (1200mm) long, is packed in a separate container.

1.3 Do not remove any protective coatings or wrappings until the mixer is ready to be put into service. If the mixer is to be stored, **store ONLY in the vertical position, indoors and in a clean, dry location with controlled temperatures of 59° F to 104° F (15° C to 40° C).** When gear drive models have been stored for more than one year, the gear lubricant should be replaced (see lubrication instructions). Motor shafts are to be rotated manually every month, at least 10 to 15 revolutions.

1.4 Lift the mixer from its crate using one of the follow lifting methods, dependent on mixer mounting style. The “P” units, which are clamp mounted to the side of the tank, are lifted as shown with a single sling, choker method. The “Q”, “L”, and “S” fixed mounted units should be lifted in a similar fashion using two slings directly across from each other to vertically lift the mixer. Refer to Figure 1.

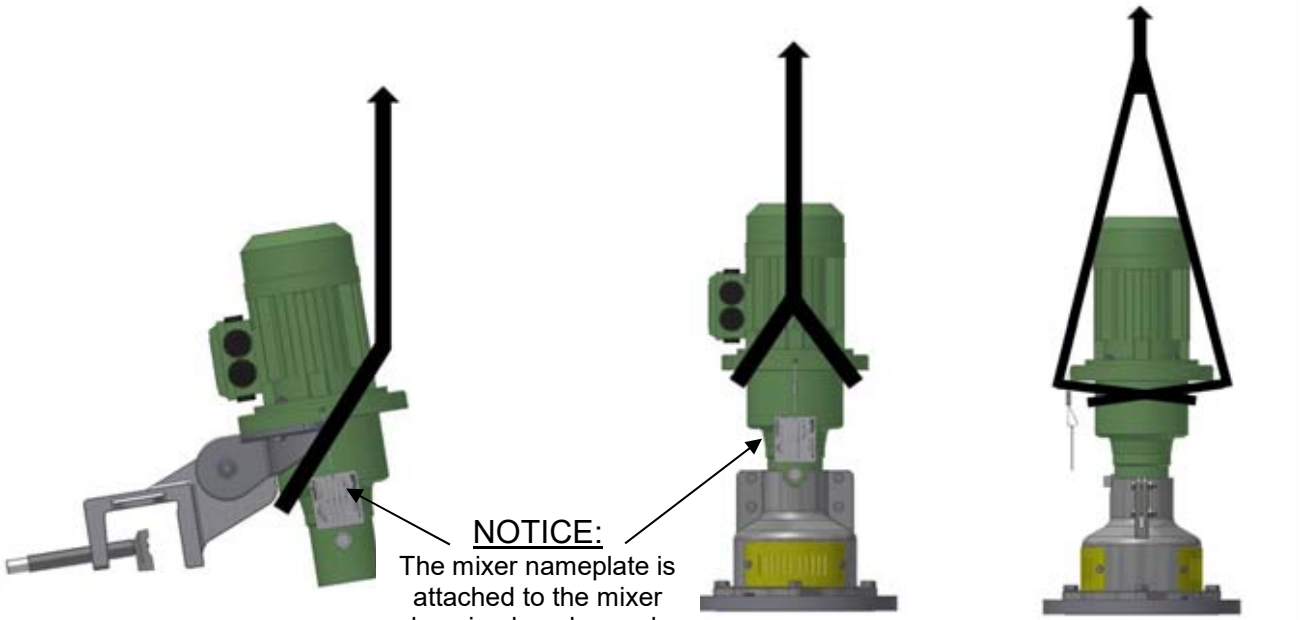


FIGURE 1

WARNING: EYE PROTECTION MUST BE WORN AT ALL TIMES WHILE SERVICING THIS MIXER.

SECTION 2 - MIXER MOUNTING CONFIGURATIONS

2.1 Refer to Dimension Drawing for mounting configuration.

a. Impeller Position Recommendations:

	Single Impeller	Dual Impeller
Basic	Position Impeller Mid Batch	Lower Impeller: 1D Off Bottom Upper Impeller: 1D Spacing
Alternate	0.75D < = OB < = 1.5D	Lower Impeller: 0.75D < = OB < = 1.5D Upper Impeller: 0.75D < = SP < = 1.5D

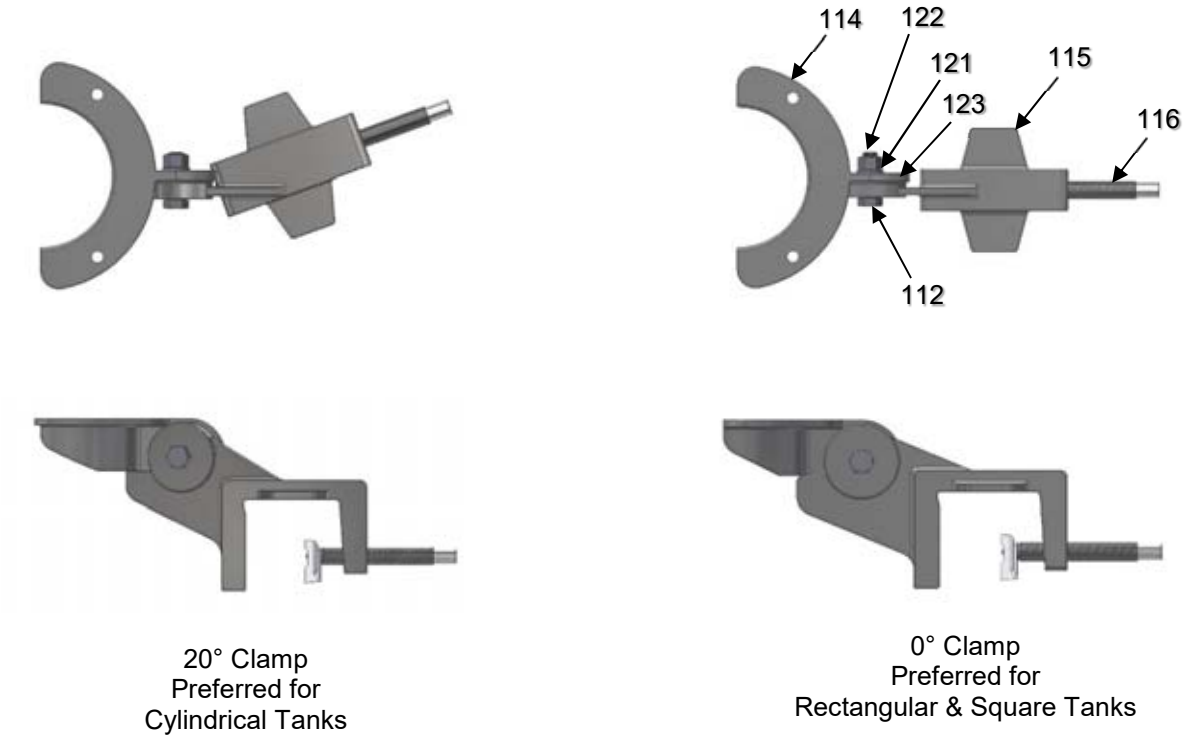
D: Impeller Diameter

OB: Impeller Off Bottom

SP: Impeller Spacing

2.2 Lock-out power before positioning mixer, and review safety instructions before starting mixer.

2.3 “P” Units - Clamp Mounting Module - The clamps are cast offset at recommended 20° horizontal plane and adjustable 0-10° in the vertical plane. Clamps are also available with zero degree offset in the horizontal plane and adjustable 0-10° in the vertical plane. The clamp assembly (115) is fastened by hex head cap screw (112), flat washer (121), and hex nut (122) to the yoke (114). There is an anti-rotation insert (123) between the pivoting faces of the yoke (114) and clamp assembly (115). Refer to Figure 3. The yoke is bolted directly to the mixer housing module with two hex head cap screws (113).



20° Clamp
Preferred for
Cylindrical Tanks

0° Clamp
Preferred for
Rectangular & Square Tanks

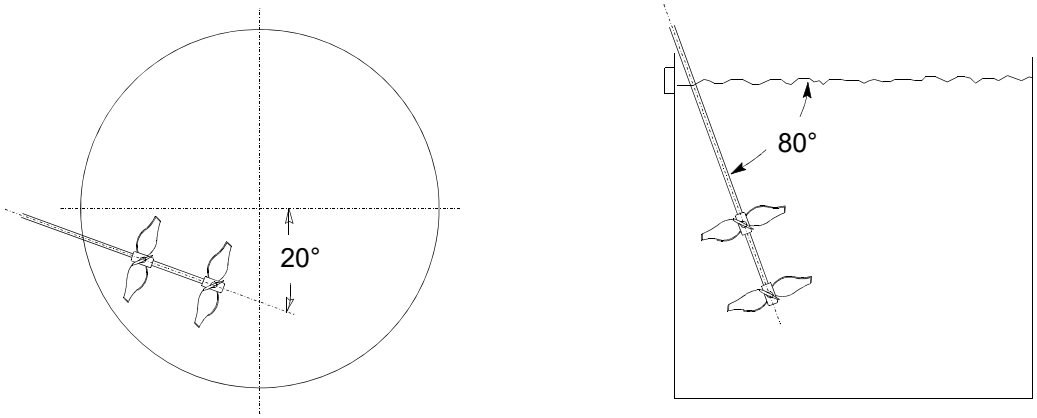
FIGURE 3

2.4 Loosen the clamp screw (116) sufficiently so that the clamp base will engage the tank lip or rim when the mixer is mounted. Set the clamp (115) squarely on the mounting surface so that the clamp rests on the lip of the tank, if a lip is present. Tighten the clamp screw (116) making sure the travel plate (118) is parallel to the tank lip when it

contacts the tank wall. Using an M8 or 5/16” hex wrench, tighten the clamp screw to 40-50 ft-lbs (54-61 N-m) so that the mixer is held securely to the tank. **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.**

2.5 Refer to Figure 4 for recommended angular positions.

FIGURE 4



2.6 Mixer Positioning Data for fixed mounted “Q”, “L”, & “S” Units on unbaffled tanks. Refer to Figure 5 and Table 1.

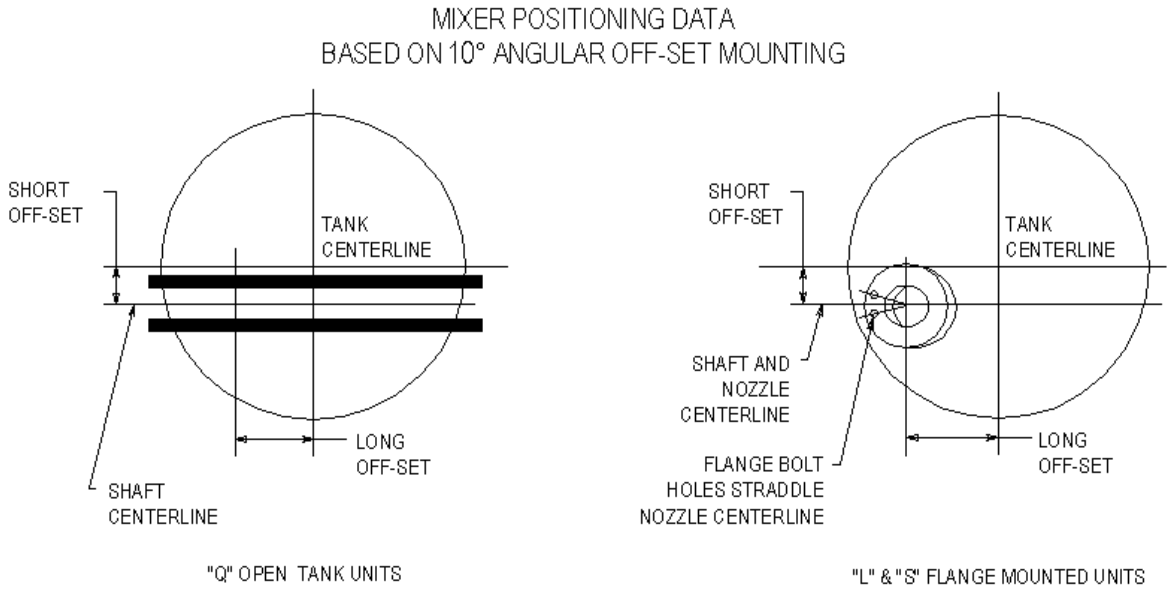


FIGURE 5

TABLE 1
10° OFFSET – FOR TANKS WITH A Z/T LESS THAN 1.2

TANK DIA.		MAXIMUM TANK DEPTH		MINIMUM LONG OFFSET		MINIMUM SHORT OFFSET	
INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM
24	610	36	915	6.75	170	3.88	100
27	685	41	1040	7.63	195	4.38	110
30	760	45	1145	8.31	210	4.75	120
36	915	54	1370	9.88	250	5.75	145
42	1065	63	1600	11.50	290	6.63	170
48	1220	72	1830	13	330	7.50	190
54	1370	81	2055	14.50	370	8.50	215
60	1525	90	2285	16.13	410	9.31	235
66	1675	100	2540	17.88	455	10.31	260
72	1830	108	2745	19.25	490	11.13	280
78	1980	117	2970	20.75	525	12	305
84	2135	126	3200	22.38	570	13	330
90	2285	135	3430	24	610	13.75	350
96	2440	144	3660	25.50	650	14.75	375
102	2590	154	3910	27.25	690	15.75	400
108	2745	162	4115	28.63	730	16.56	420
114	2895	171	4345	30.19	765	17.44	445
120	3050	180	4575	31.75	810	18.31	465

Z: Tank Depth
T: Tank Diameter

2.7 “Q” Units – Q Plate Mounting Module – The standard “Q” Plate mounting configuration is shown in Figure 6. The Q Pedestal (111) is bolted to the Q Plate (133) with four hex head cap screws (132). There are four isolation mounts (134) in the plate. Figure 6A shows the same configuration with the angle riser option added. There is a left hand angle riser (138) and right hand angle riser (139) that make up the assembly. The risers are bolted thru the isolation mounts (134) using hex head cap screws (135), washers (136) and hex nuts (137). The angle riser option is available in 7° and 10° vertical offsets. The mixer housing module mounts in the bore of the pedestal (111) and is secured by tightening the hex head cap screws (110) and hex nuts (109). Tighten to 75 in. lbs. (8.5 N-m) maximum torque. Do not over tighten. Damage to equipment may result.

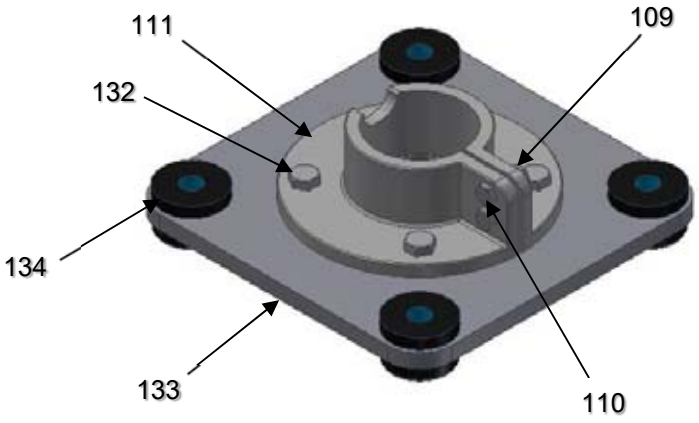


FIGURE 6

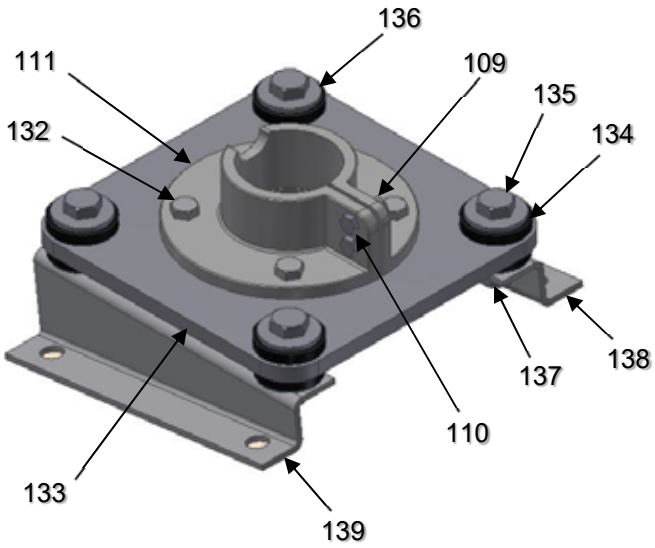


FIGURE 6A

“Q” Units – Bung Adapter Mounting Module – Figure 6B shows the bung adapter option. Pipe nipple (112) is threaded in to a barrel drum bung, then the bung machine (111) is mounted on to it. The mixer housing module mounts in the bore of the bung machined (111) and is secured by tightening the hex head cap screws (110) and hex nuts (109). Tighten to 9 ft. lbs. (12.2 N-m) maximum torque. Do not over tighten. Damage to equipment may result.

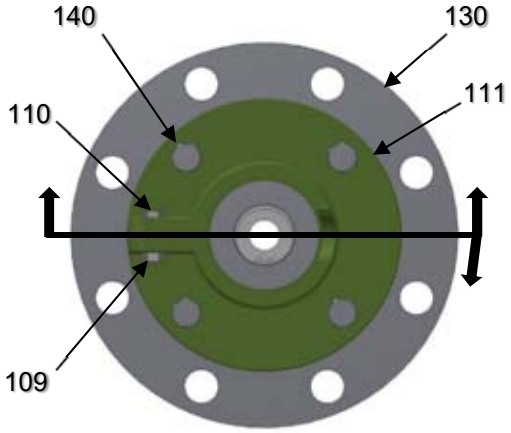
FIGURE 6B

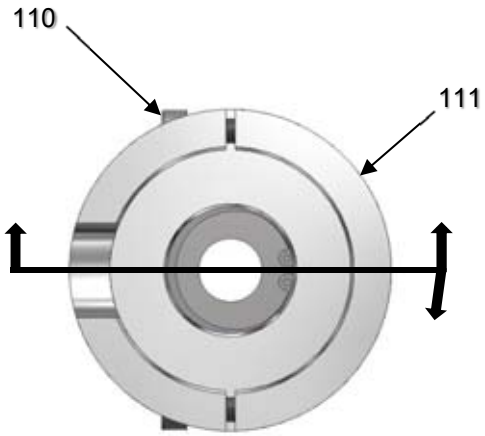
2.8 “L” Units – Closed Tank, Flange (ANSI / DIN) Mounted Lip Seal Module – The mixer housing module mounts in the bore of the Pedestal (111) for the ANSI / DIN option, which is secured by tightening the two hex head cap screws (110) and hex nuts (109), as shown in Figure 7. Tighten to 75 in. lbs. (8.5 N-m) maximum torque. Do not over tighten. Damage to equipment may result. The pedestal (111) then bolts to the mounting flange (130) with four hex head cap screws (140).

“L” Units – Closed Tank, Sanitary Flange, Pedestal Mounted Lip Seal Module – The mixer housing module mounts in the bore of the Sanitary Flange Pedestal (111), which is secured by tightening the four socket head cap screws (110), as shown in Figure 7A. Tighten to 9 ft. lbs. (12.2 N-m) maximum torque. Do not over tighten. Damage to equipment may result. The Sanitary Flange Pedestal (111) connects to the sanitary nozzle on a customer tank using a customer supplied gasket and sanitary clamp. There is a relief valve (114) in the Sanitary Flange Pedestal (111) that prevents any tank pressure from entering the mixer housing.

Tank contents are sealed off by the flange or pedestal mounted lip seal (209), which is retained by one or two retaining rings (208), dependent on mounting type.

Note: If the mounting pedestal (111) overlaps the flange (130) mounting holes (seen with 4” flange configuration), it is necessary to remove the unit from the flange and bolt the flange to the tank independently. The unit can then be re-assembled to the flange.





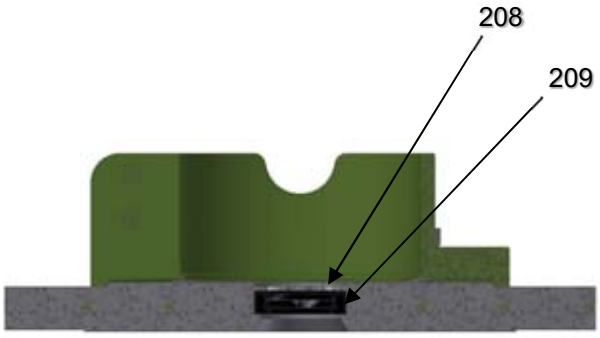


FIGURE 7

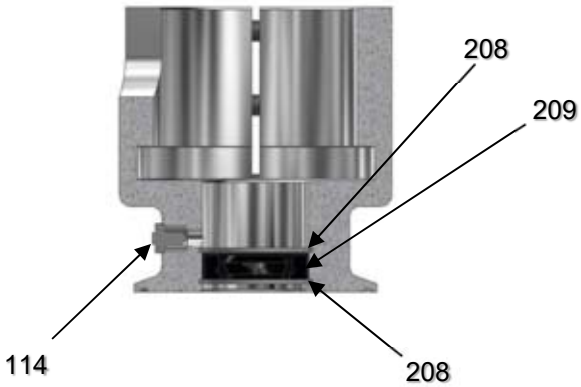
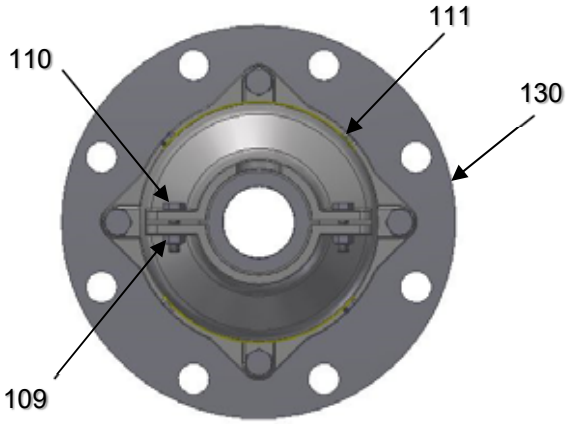
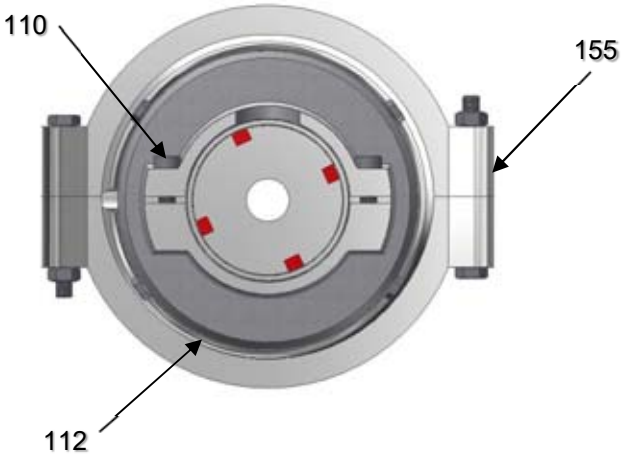


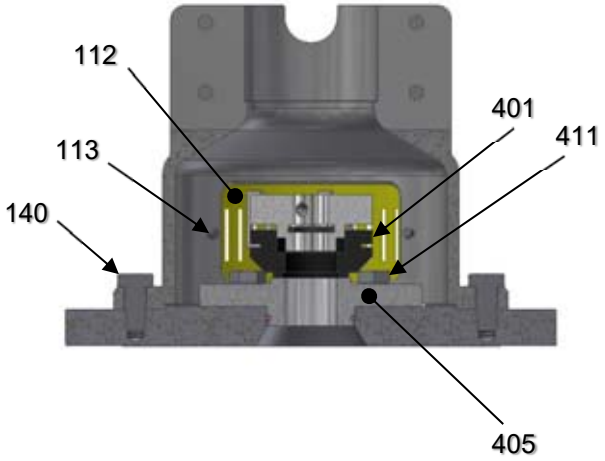
FIGURE 7A

2.9 “S” Units – Closed Tank, Flange (ANSI / DIN) Mounted Mechanical Seal Module - The mixer housing module mounts in the bore of the Pedestal (111) and is secured by tightening the four hex head cap screws (110) and hex nuts (109). Tighten to 75 in. lbs. (8.5 N-m) maximum torque. Do not over tighten. Damage to equipment may result. The pedestal (111) bolts to the mounting flange (130) with four hex head cap screws (140). Tank contents are sealed off by the ***LIGHTNIN*** Mechanical Seal (401). Access to the ***LIGHTNIN*** Mechanical Seal (401) is achieved by loosening the eight captive hex head cap screws (113) then removing the two safety covers (112). Refer to Figure 8.

“S” Units – Closed Tank, Sanitary Flange Mounted Mechanical Seal Module - The mixer housing module mounts in the bore of the Pedestal (111) and is secured by tightening the four socket head cap screws (110). Tighten to 75 in. lbs. (8.5 N-m) maximum torque. Do not over tighten. Damage to equipment may result. The sanitary pedestal (111) is secured to the sanitary bottom flange (131) with a bolted sanitary clamp (155). There is a stationary retainer (117) and sanitary gasket (156), between the sanitary pedestal (111) and sanitary bottom flange (131). These components together, secure the stationary sealing face (405) in the assembly once the bolted sanitary clamp (155) is installed. The sanitary bottom flange (131) connects to the sanitary nozzle on a customer tank using a customer supplied gasket and sanitary clamp. Tank contents are sealed off by the ***LIGHTNIN*** Mechanical Seal (401). Access to the ***LIGHTNIN*** Mechanical Seal (401) is achieved by loosening the eight captive hex head cap screws (113) then removing the two safety covers (112). Refer to Figure 8A.







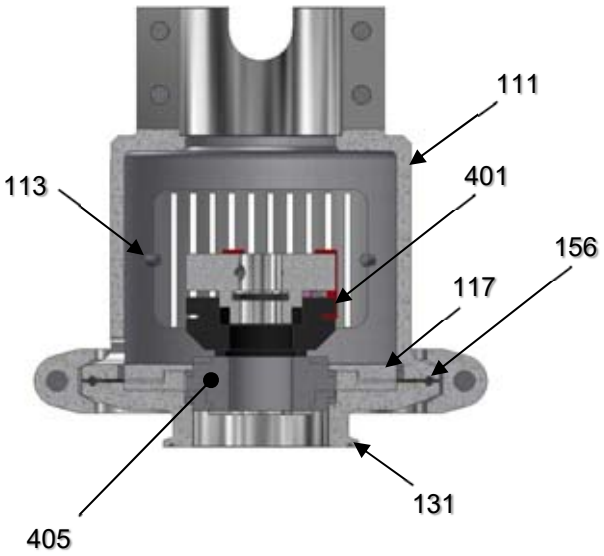


FIGURE 8

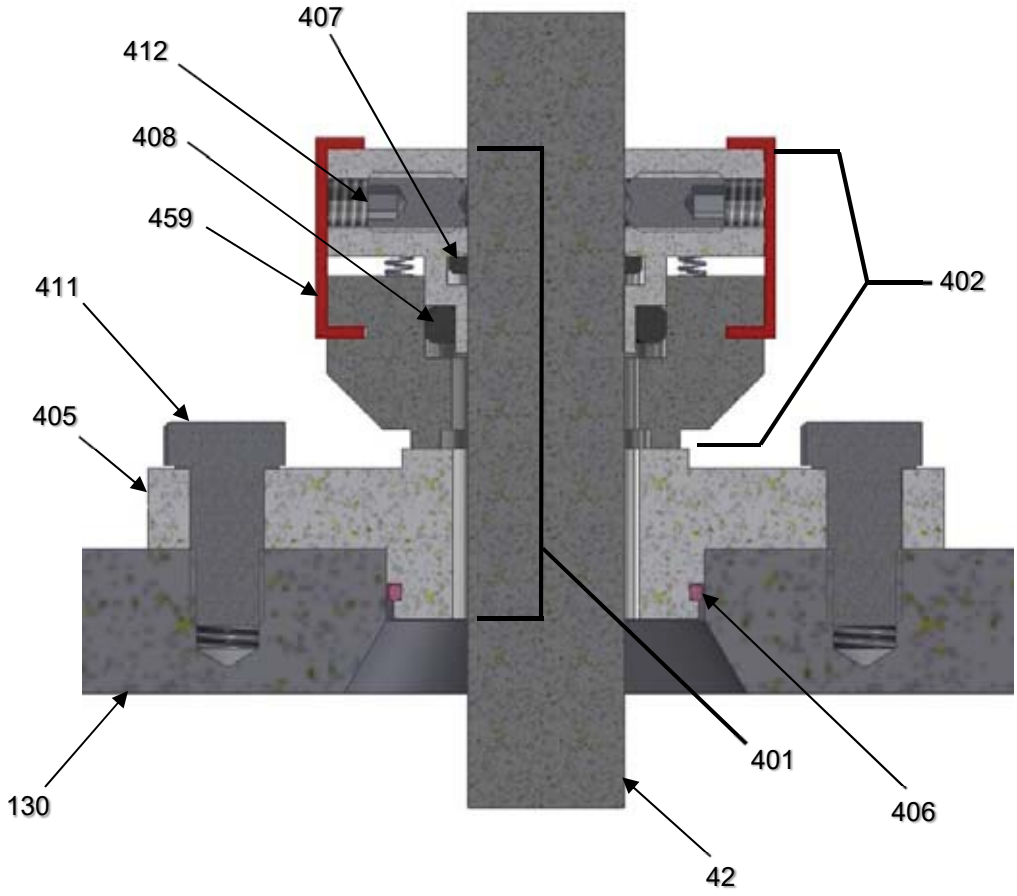
FIGURE 8A

Assemble the ***LIGHTNIN*** Mechanical Seal as follows.

WARNING: EYE PROTECTION MUST BE WORN AT ALL TIMES WHILE SERVICING THIS MIXER.

REFER TO THE SEAL ASSEMBLY DRAWING FURNISHED IN THIS MANUAL FOR THE TYPE OF SEAL FURNISHED WITH THIS MIXER.

CAUTION: THE SEALING SURFACE OF THE STATIONARY SEALING FACE (405) AND ROTARY SEALING FACE 403) IS LAPPED AND POLISHED TO A MIRROR FINISH. IT IS IMPERATIVE THAT THESE TWO FACES BE HANDLED WITH CARE AND KEPT PERFECTLY CLEAN.



Mechanical Seal Installation:

WARNING: DISCONNECT MOTOR LEADS OR USE POWER SUPPLY LOCK-OUT PROCEDURES BEFORE SERVICING THIS MIXER.

2.10 “S” Units – Closed Tank, Flange (ANSI / DIN) Mounted Mechanical Seal Module. Style 10 Seal, Refer to Drawing L-18309.

a. Install the O-ring (406) in the groove in the bottom of the stationary sealing face (405).
b. Assemble the stationary sealing face (405) onto mounting flange (130). This must be done prior attaching the mixer assembly to the mounting flange.
c. Align the mounting holes in the stationary sealing face with the holes in the mounting flange (130) then secure it to the mounting flange with four hex head cap screws (411).
d. Lightly lubricate sealing ring (407) with silicone grease.
e. Insert the rotary seal head (402) in thru the access window of the seal pedestal (111).
f. Insert the mixer shaft (42), up through the mounting flange (130).
g. CAREFULLY slide the shaft (42), through the rotary seal head (402).
h. Refer to Section 5 for mixer shaft installation.
i. Slide the rotary seal head (402) down into position until it just touches the face of the stationary seal face (405). Care should be taken to avoid getting silicone grease on the sealing faces.
j. Evenly tighten spring holder set screws (412). Remove seal setting tabs (459) and store for use during seal removal.
k. Install the two safety covers (112) and tighten the eight captive hex head cap screws (113).

Mechanical Seal Removal:

WARNING: DISCONNECT MOTOR LEADS OR USE POWER SUPPLY LOCK-OUT PROCEDURES BEFORE SERVICING THIS MIXER.

l. Loosen the eight captive hex head cap screws (113) and remove the two safety covers (112).
m. Install seal setting tabs (459), then loosen spring holder set screws (412).
n. Refer to Sections 10 or 11 for mixer shaft (42) removal procedure.
o. Slide the mixer shaft (42) down through the rotary seal head (402).
p. CAREFULLY remove the rotary seal head assembly (402).
q. If removal of the stationary seal face (405) becomes necessary, remove the four hex head cap screws (140) and remove the complete mixer / pedestal assembly. The stationary seal face (405) can then be removed by removing the four hex head cap screws (411).

Mechanical Seal Installation:

2.11 “S” Units – Closed Tank, Sanitary Flange Mounted Mechanical Seal Module. Style 10T Seal, Refer to Drawing L-18360.

a. Install the O-rings (406) on the top and bottom step of the stationary sealing face (405).
b. Assemble the stationary sealing face (405) in to the sanitary bottom flange (131).
c. Place the stationary retainer (117) over the stationary sealing face (405) as shown on the drawing.
d. Install the sanitary gasket (155) and lower the mixer / pedestal assembly on to the sanitary bottom flange (131).
e. Install and tighten the bolted sanitary clamp (155).
f. Lightly lubricate sealing ring (407) with silicone grease.

g. Insert the rotary seal head (402) in thru the access window of the sanitary pedestal (111).

h. Insert the mixer shaft (42), up through the sanitary bottom flange (131).

i. CAREFULLY slide the shaft (42), through the rotary seal head (402).

j. Refer to Section 5 for mixer shaft installation.

k. Slide the rotary seal head (402) down into position until it just touches the face of the stationary seal face (405). Care should be taken to avoid getting silicone grease on the sealing faces.

l. Evenly tighten spring holder set screws (412). Remove seal setting tabs (459) and store for use during seal removal.

m. Install the two safety covers (112) and tighten the eight captive hex head cap screws (113).

Mechanical Seal Removal:

WARNING: DISCONNECT MOTOR LEADS OR USE POWER SUPPLY LOCK-OUT PROCEDURES BEFORE SERVICING THIS MIXER.

n. Loosen the eight captive hex head cap screws (113) and remove the two safety covers (112).

o. Install seal setting tabs (459), then loosen spring holder set screws (412).

p. Refer to Sections 10 or 11 for mixer shaft (42) removal procedure.

q. Slide the mixer shaft (42) down through the rotary seal head (402).

r. CAREFULLY remove the rotary seal head assembly (402).

s. If removal of the stationary seal face (405) becomes necessary, remove the bolted sanitary clamp (155), separate the mixer / pedestal assembly from the sanitary bottom flange (131), remove the stationary retainer (117), then remove the stationary seal face (405).

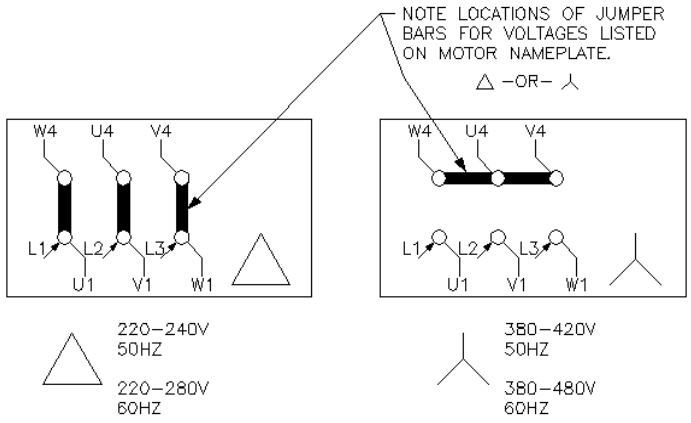
t.

SECTION 3 – ELECTRIC MOTOR CONNECTIONS

3.1 Three Phase Motors:

a. All three phase motors must be field wired for proper rotation. If rotation does not agree with nameplate, reverse any two line leads.

b. Dual voltage motors can be wired for the desired voltage. Refer to the connection diagrams provided on the motor nameplate and inside the conduit box cover. Refer to diagram showing required jumper bar locations for desired voltages.



SECTION 4 – AIR MOTOR REQUIREMENTS AND LUBRICATION

4.1 Be sure your compressor has capacity for both pressure and proper cubic feet per minute air displacement. The air supply must be clean and relatively dry with 1-3% moisture. Instrument air or other dry gasses are not suitable. Wet air and low pressure will cause sticking of the motor. An air line filter/lubricator should be fitted in the air supply line, and located before the first control valve in the system. The air line filter should be drained regularly, and the element examined for clogging. ***LIGHTNIN*** has a complete line of filter/regulators/lubricators. Contact your ***LIGHTNIN*** Representative for price and delivery.

General Air Pressure / Air Consumption Guide for Air Motor Driven Mixers (Air Motor Operating at and not exceeding 1800 RPM)						
Mixer Model	kW	HP	Air Motor #	Shaft RPM	Air Motor Required Pressure Consumption	
					● PSIG	●● CFM Free Air
Mi1(P,Q,L,S)8 Mi5(P,Q,L,S)8 Mi6(P,Q,L,S)8	.37	.50	4	1750 350 280	80	40
Mi1(P,Q,L,S)9 Mi5(P,Q,L,S)9 Mi6(P,Q,L,S)9	.55 – 1.5	.75 - 2.0	6	1750 350 280	60	60
Mi1(P,Q,L,S)10 Mi5(P,Q,L,S)10 Mi6(P,Q,L,S)10	2.2	3.0	8	1750 350 280	70	100

● Line Pressure should be at least 1-1/2 times the operating pressure of the air motor. The full line pressure will then be available for overloads and startup.

●● CFM Free Air refers to air at atmospheric conditions, measured at the inlet of the compressor.

4.2 If the rated performance of the motor is to be obtained, all valves and pipework of the air supply must be of adequate size. Valves should be sited as close as possible to the motor. For short pipe runs, up to 6 feet (2 meters), lines should be the same as the inlet and exhaust ports, and larger for longer runs.

4.3 Before final connection to the motor, blow out the air lines to remove any loose scale or abrasive dust that may be present, and squirt a few drops of oil into the inlet port.

Once the air motor is installed, ensure that any condensations cannot run back into the motor port.

4.3 Use only a high detergent lubricant of the recommended viscosity. Recommended oils are shown in the table following the lubrication rates.

4.4 For continuous duty, or high speed operation, it is recommended that an automatic lubricating device in the air line be provided to replenish lubricant to the motor per the following lubrication rates (drop rate / min.). ***LIGHTNIN*** has a complete line of filter/regulators/lubricators. Contact your ***LIGHTNIN*** Representative for price and delivery.

Air Motor Lubrication Rates (drop rate / min.)					
Mixer Model	kW	HP	Air Motor #	Continuous Operation	Intermittent Operation
Mi1(P,Q,L,S)8 Mi5(P,Q,L,S)8 Mi6(P,Q,L,S)8	.37	.50	4	4 - 5	8 - 12
Mi1(P,Q,L,S)9 Mi5(P,Q,L,S)9 Mi6(P,Q,L,S)9	.55 – 1.5	.75 - 2.0	6	5 - 6	10 - 12
Mi1(P,Q,L,S)10 Mi5(P,Q,L,S)10 Mi6(P,Q,L,S)10	2.2	3.0	8	6 - 7	12 - 15

4.5 For manual oiling, disconnect the air line and add one squirt of oil into the needle valve at the end of each 8 hours of operation.

Lubricant Manufacturer	Ambient Temperature	Product
SHELL	32° F to 100° F	TELLUS 37
B.P.		ENERGOL HL65
REGENT		RANDO "A"
CASTROL		HYSPIN 70
MOBIL		ALMAOIL No. 1

SECTION 5 - MIXER IMPELLER AND SHAFT INSTALLATION

WARNING: EYE PROTECTION MUST BE WORN AT ALL TIMES WHILE SERVICING THIS MIXER.

WARNING: DISCONNECT MOTOR LEADS OR USE POWER SUPPLY LOCK-OUT PROCEDURES BEFORE SERVICING THIS MIXER.

5.1 Position the impeller(s), if a welded assembly is not provided, on the mixer shaft. Refer to the Section 2 for recommended dual impeller spacing.

a. FP100 impeller - "Motor End" is cast on the upper side of the impeller. Figure 13 shows how to determine the upper face of the impeller in the event the printing becomes illegible. Note: Lettering is removed on polished impellers. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.

b. HYDROFOIL impeller - The larger wedge shaped portion of the hub body must face up towards the mixer. The bottom of the hub is stamped "Down". Note: Stamping is not present on polished impellers. Refer to Figure 13 for general orientation reference. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.

c. PBT impeller – Impeller orientation is not a concern since this impeller is symmetrical. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.

d. Folding Propeller – Used with the "Q" Bung Adapter units. Attached to the end of the mixer shaft and is available in set screwed connection only.

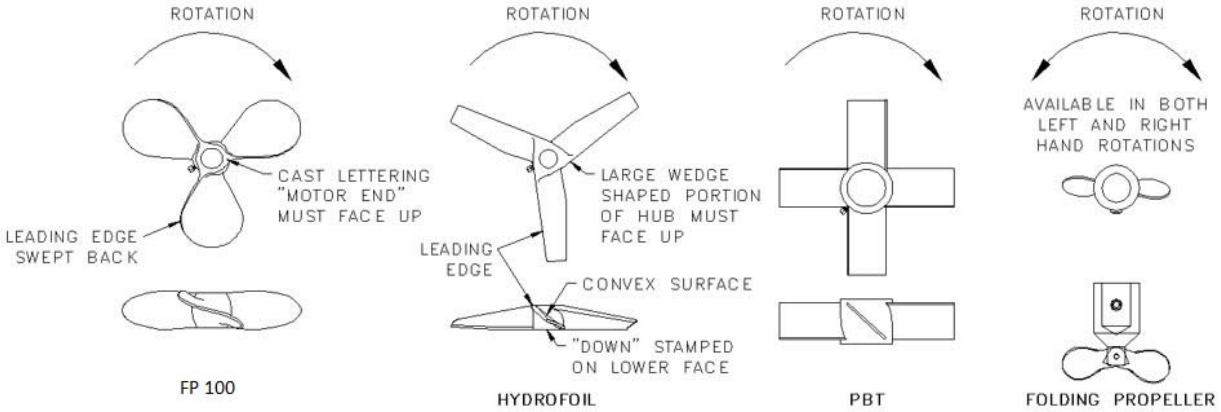


FIGURE 13

Shaft Installation:

Models: Mi1, Mi5 & Mi6 (P,Q,L)

5.2 Before installing the mixer shaft (42), clean the mixer shaft end and drive quill (35) thoroughly. To install the mixer shaft, remove the access plug (97), and orient the drive quill so that the set screw (96) aligns with the access hole. Align the drive quill by inserting the mixer shaft (42) into the quill and rotate quill manually. Insert the mixer shaft into the quill bore as far as it will go. Draw up the set screw, rotating the shaft slightly back and forth to make sure the set screw (96) seats against the flat of the shaft. Tighten the set screw (96) to 29 ft-lbs (39 Nm). **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.** Re-install the access plug (97).

NOTE: A safety feature is provided by a slight taper in the flat on the impeller shaft. The shaft cannot drop out unless the set screw is intentionally loosened.

Models: Mi5 & Mi6S

5.3 Loosen the eight captive hex head cap screws (113) that secure the two safety covers (112) to the pedestal (111), then remove the safety covers (112). Before installing the mixer shaft (42), clean the mixer shaft end and drive quill (35) thoroughly. To install the mixer shaft, remove the access plug (97), and orient the drive quill so that the set screw (96) aligns with the access hole. Align the drive quill by inserting the mixer shaft (42) into the quill and rotate quill manually. Remove the mixer shaft (42) from the drive quill (35). Lightly lubricate sealing ring (407) in the rotary seal head (402) with silicone grease. Insert the rotary seal head (402) in thru the access window of the seal pedestal (111). CAREFULLY slide the shaft (42), through the rotary seal head (402). Insert the mixer shaft into the quill bore as far as it will go. Draw up the set screw, rotating the shaft slightly back and forth to make sure the set screw (96) seats against the flat of the shaft. Tighten the set screw (96) to 29 ft-lbs (39 Nm). **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.** Re-install the access plug (97). Slide the rotary seal head (402) down into position until it just touches the face of the stationary seal face (405). Care should be taken to avoid getting silicone grease on the sealing faces. Evenly tighten spring holder set screws (412). Remove seal setting tabs (459) and store for use during seal removal. Install the two safety covers (112) and tighten the eight captive hex head cap screws (113).

NOTE: A safety feature is provided by a slight taper in the flat on the impeller shaft. The shaft cannot drop out unless the set screw is intentionally loosened.

SECTION 6 - MIXER OPERATION

6.1 This ***LIGHTNIN*** mixer is designed for continuous operation, and normally needs no additional maintenance.

6.2 Variable speed units have specified critical speed ranges where the unit should not be operated during draw off condition or operated in air.

CAUTION: THESE CONDITIONS MUST BE AVOIDED WHEN THE UNIT IS BEING OPERATED WITH A VARIABLE SPEED DRIVE. IT IS ALSO NOT RECOMMENDED TO OPERATE THE MIXER WITH EXTREME VORTEXING OR SURGING OF THE LIQUID BEING MIXED.

6.3 All bolts should be retightened 12 hours after assembly, and at each scheduled shut down thereafter.

6.4 Turn on the mixer. Allow time for the mixing pattern to be established, then make any required adjustments of position as outlined in Section 2 of these instructions.

SECTION 7 - LUBRICATION

7.1 Your ***LIGHTNIN*** mixer has been lubricated at the factory with the correct type and amount of high quality lubricants. Lubricant cleanliness is protected by properly designed closures.

7.2 All mixer bearings are sealed type and are pre-packed with lubricant. Re-lubrication of these bearings is not necessary.

7.3 The gear chamber in ***LIGHTNIN*** Mi5(P,Q,L, or S) & Mi6(P,Q,L, or S) Series mixers has been factory filled with a grease suitable for ambient temperature ranges of -4° F to +122° F (-20° C to +50° C). Under normal operating conditions, this lubricant need not be changed until the unit has been dismantled for some reason. Refer to Table 3 for lubricant specifications.

7.4 Under adverse operating conditions, periodic changes of lubricant may be necessary. Adverse conditions are defined as operating in very humid, dust laden, chemical atmospheres, or where wide variations in ambient temperatures occur. Such adverse conditions can lead to deterioration of lubricant compounds and additives, and it is recommended that the condition of the grease be checked within six months of start-up.

Refer to Section 10 for instructions on disassembling the gear drive.

NOTE: THE GEAR CHAMBER SHOULD BE FILLED PER TABLE 15 CAPACITIES. ALL SEALING SURFACES SHOULD BE CLEANED AND NEW GASKET ELIMINATOR APPLIED. LOCTITE® GASKET ELIMINATOR 518 SEALANT AND LOCTITE® 7649 PRIMER IS RECOMMENDED BY THE FACTORY.

MODELS	RECOMMENDED GREASE		GREASE CAPACITY	
	STANDARD	FOOD GRADE	LBS.	kg
Mi5 & Mi6 (P,Q,L,S) 1 & 8	***LIGHTNIN*** SHC 0	BEL-RAY NO-TOX HD 0	.9	.4
Mi5 & Mi6 (P,Q,L,S) 2 – 6 & 9 - 10			1.6	.7

TABLE 15

LIGHTNIN STANDARD GREASE (PART NUMBER 293101PSP – 2 LB. CONTAINER) AND FOOD GRADE GREASE (PART NUMBER 275255PSP – 14 OZ. TUBE) ARE AVAILABLE.

7.5 An alternate method to achieve the proper amount of grease required, is to measure from the top of the mixer housing (36) down to the grease level as shown in Figure 16.

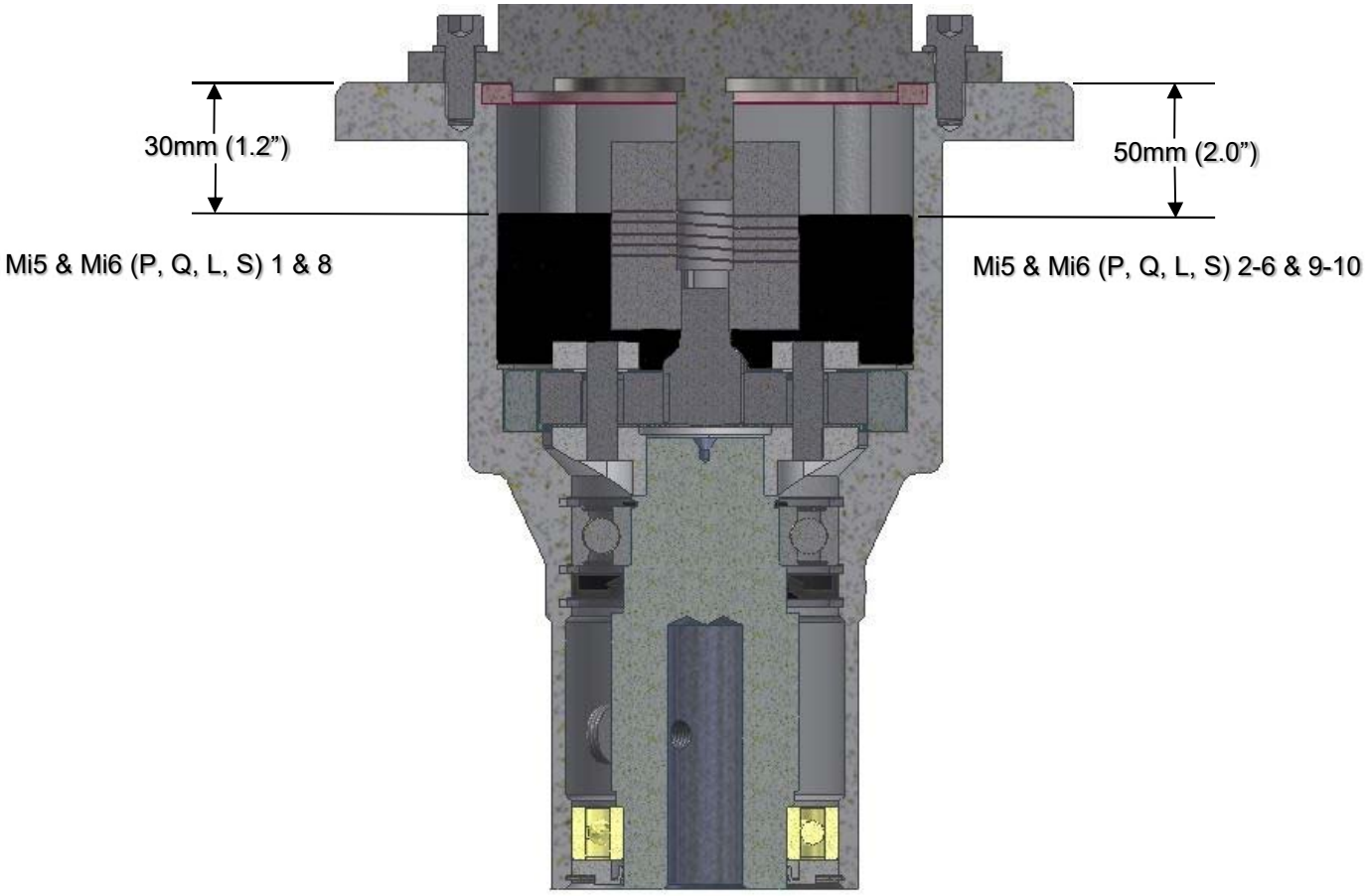


FIGURE 16

7.6 CHANGING GEAR LUBRICANT

Standard Grease: Gear sets are initially lubricated at the factory with ***LIGHTNIN*** SHC 0 grease. This is the optimum lubricant. It will give the best performance, and is available from ***LIGHTNIN***. An alternate grease, Mobilith SHC 007 can be used, but assembly and disassembly will be more difficult due to the fluid nature of the grease. Greater care must be taken during assembly and disassembly to ensure the grease remains in the gear chamber.

Food Grade Grease: Gear sets are initially lubricated at the factory with Bell-Ray No-Tox HD 0 grease. This is the optimum lubricant. **NO OTHER FOOD GRADE GREASE IS ALLOWED.** It will give the best performance, with no derate necessary, and is available from ***LIGHTNIN***.

a. Make sure the gear housing is vertical to prevent spillage.

b. Remove all old grease from the gear chamber and wipe the gear chamber clean.

c. Pack the gear chamber with fresh grease (see Table 3 or Figure 9). Paddle the grease to fill voids and remove air pockets, rotating the shaft and shaking the housing while paddling.

d. Check for free movement of all components by rotating the drive shaft. If satisfactory, refer to Section 11 and complete assembly.

SECTION 8 - PREPARATION FOR DISASSEMBLY AND ASSEMBLY

WARNING: DISCONNECT MOTOR LEADS OR OTHERWISE LOCK-OUT POWER SUPPLY BEFORE SERVICING THIS MIXER. EYE PROTECTION MUST BE WORN.

8.1 GENERAL - ***LIGHTNIN*** mixers are precision manufactured and assembled to provide long, trouble free service when properly maintained. If it becomes necessary to disassemble the unit, careful, precise reassembly is necessary.

Refer to the assembly drawing for location of parts. Equipment that will be required to service the mixer, in addition to standard mechanics tools, is a rubber mallet, retaining ring pliers, arbor press and torque wrench.

When disassembling the mixer, clean adjacent external surfaces to prevent dirt from entering the housings.

It is recommended that oil seals be replaced and gasket eliminator sealer be reapplied when the mixer is disassembled.

8.2 SEAL REPLACEMENT

New oil seals should always be used. Drive out all old oil seals and remove accumulations of sealing compound. When replacing seals:

a. Coat the lips of seals with bearing grease.

b. Install oil seals with the lip facing in the direction indicated on the assembly drawing.

c. Coat the section of the shaft sealing surface with oil. If the oil seal must pass over a keyway, wrap the shaft with thin paper or tape, coat with grease, and pass the seal over.

8.3 BEARING REPLACEMENT

Inspect the bearings carefully and replace if necessary.

a. Old bearings can be removed with a puller or an arbor press.

b. New bearings can be pressed onto the shafts. Be careful to apply load only to the inner race.

c. Make sure the bearings are tightly seated against the shaft or housing shoulder with no clearance.

SECTION 9 - DISASSEMBLY AND ASSEMBLY OF DIRECT DRIVE UNITS

DISASSEMBLY:

9.1 MOTOR REMOVAL

Models: Mi1(P,Q,L)

a. Remove set screw access plug (97) from the mixer housing (36).

b. Remove the impeller shaft (42) from the drive quill (35), by loosening the set screw (96) enough to release the impeller shaft. The impeller shaft is now free from the chuck and can be removed.

"P" Units: Turn the clamp screw counterclockwise to loosen the clamp assembly (116). Remove the mixer from the tank. Remove the yoke / clamp assembly (114 / 115), from the housing (36) by removing the two hex head cap screws 113).

"Q" & "L" Units: Hold the two hex head cap screws (110) and loosen the two hex nuts (109). Remove the mixer from the pedestal (111). On "L" units with the Sanitary Flange Pedestal, loosen the four socket head cap screws (110).

f. Set the mixer upright on a workbench.

g. Remove the four hex head cap screws (160), (or four nuts 161 on D70 and D90 motors) holding the motor (101) to the housing (36).

h. Separate and remove the motor (101) from the housing (36). One half of the motor coupling (150) will remain attached to the motor shaft.

i. Loosen the set screw, and remove the motor coupling half (150) and key (106).

j. Loosen the set screw, remove the quill shaft coupling half, and coupling insert.

9.2 QUILL SHAFT & HOUSING DISASSEMBLY

a. Place the housing (36) upright on a workbench and remove the retaining rings (44 & 56).

b. Place the housing upright in a press, and press out the quill shaft (35), bearing (41) and oil seal (49).

c. Press the lower bearing (41) off the shaft.

d. Turn the housing over and press out the upper bearing (37).

e. Remove lower retaining ring (44), only if necessary.

f. Inspect the bearings (37 & 41). Replace if there is excessive wear.

ASSEMBLY:

9.3 PREPARING FOR ASSEMBLY

a. Clean all parts thoroughly.

b. Inspect for the following defects:

1. Cracks or damage of the housing.
2. Dents, gouges or scoring of the drive shaft, housing bore, and particularly the mating faces of the motor and housing.

c. Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore, and around the oil seal lip to provide lubrication and make the seal more effective.

d. Replace the bearings if they show indications of wear.

9.4 QUILL SHAFT ASSEMBLY

a. Press the lower bearing (41) onto the quill shaft (35). The bearing must seat against the shoulder with no visible gap.

9.5 QUILL SHAFT AND HOUSING ASSEMBLY

a. Install the lower retaining ring (44), if removed, in the housing (36).

b. Mount the housing (36) in an arbor press, large end up.

c. Press the bearing (37) on its outer race to seat against retaining ring (44).

d. Install the upper retaining ring (44).

e. Support the housing, large end down, by resting the inner race of the bearing on a suitable sleeve.

f. Press the quill shaft (35) into the bearing until the shoulder of the shaft registers against the inner race of the bearing.

g. Install the upper retaining ring (56) in the shaft groove.

h. Turn the housing large end down, and press the lower oil seal (49) until it is flush with the end of the housing.

9.6 MOTOR COUPLING ASSEMBLY

a. Position the motor coupling hub (150) as shown in Figure 18.

b. Tighten the set screws.

c. Place the drive coupling half and key onto the end of the quill shaft. The drive coupling half on the quill on Models Mi1(P,Q,L) 1, 4, 5, 8 & 10 are seated directly against the shaft shoulder. Model Mi1(P,Q,L) 6 is set 3mm (.12”) off the shoulder and models Mi1(P,Q,L)2, 3 & 9 are 4.5mm (.18”) off the shoulder. Tighten the set screw.

d. Install the coupling insert into the quill shaft coupling half.

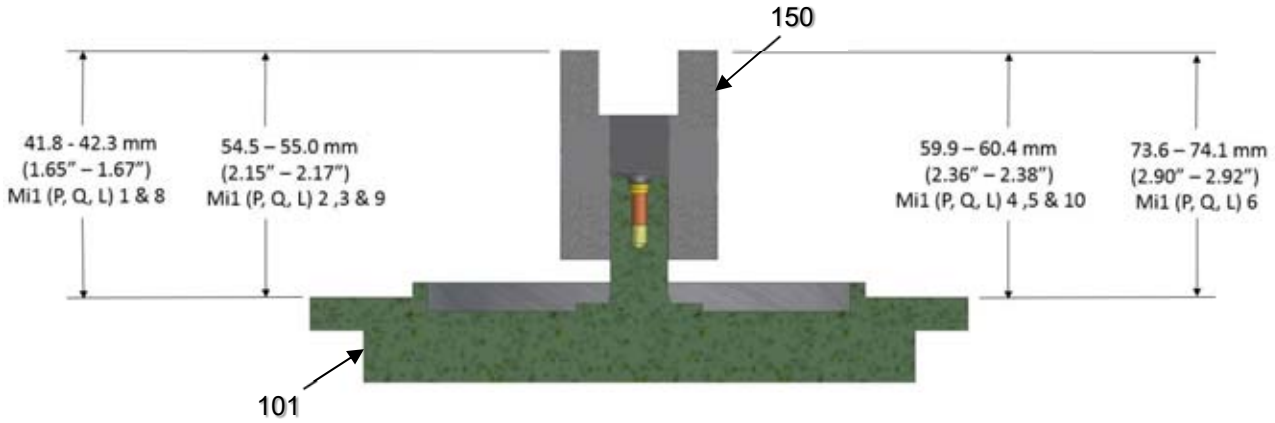


FIGURE 18 – MOTOR COUPLING PLACEMENT

9.7 MOTOR ASSEMBLY

a. Apply LOCTITE GASKET ELIMINATOR 518 SEALANT on the motor mounting face of the housing (36).

b. Align the housing so the set screw access hole is to the right. Orient the motor, so the conduit box (or junction box) of the motor is facing you.

c. Move the motor, over the housing (36) and align the motor coupling (150) with the coupling insert on the quill shaft coupling half.

d. Once the coupling halves engage, align the housing rabbets, screw holes, and conduit box (or junction box) of the motor, with the set screw access hole in the housing, to the right.

Note: Units using D80 and D90 frame motors will use a spacer ring (98) on motor rabbet to mixer housing rabbet connection.

e. Install the housing cap screws (160) (or four nuts 161 on D70 and D90 motors) and tighten evenly.

9.8 MIXER MOUNTING

a. Refer to Section 2 for attachment of applicable mounting configuration.

SECTION 10 - DISASSEMBLY AND ASSEMBLY OF GEAR DRIVE UNITS

DISASSEMBLY:

10.1 MOTOR REMOVAL

Models: Mi5 & Mi6(P,Q,L)

a. Remove set screw access plug (97) from the mixer housing (36).

b. Remove the impeller shaft (42) from the drive quill (35) by loosening the set screw (96) enough to release the impeller shaft. The impeller shaft is now free from the chuck and can be removed.

Models: Mi5 & Mi6S

c. Loosen the eight captive hex head cap screws (113) that secure the two safety covers (112) to the pedestal (111) to gain access to the mechanical seal (401). Remove the safety covers (112).

d. Install seal setting tabs (459), then loosen spring holder set screws (412).

e. Remove set screw access plug (97) from the mixer housing (36).

f. Remove the impeller shaft (42) from the drive quill (35) by loosening the set screw (96) enough to release the impeller shaft. The impeller shaft is now free from the chuck and can be withdrawn.

g. Slide the mixer shaft (42) down through the rotary seal head (402).

h. CAREFULLY remove the rotary seal head assembly (402).

i. The impeller shaft can be removed.

"P" Units: Turn the clamp screw counterclockwise to loosen the clamp assembly (116). Remove the mixer from the tank. Remove the yoke / clamp assembly (114 / 115), from the housing (36) by removing the two hex head cap screws 113).

"Q" & "L" Units: Hold the two hex head cap screws (110) and loosen the two hex nuts (109). Remove the mixer from the pedestal (111). On "L" units with the Sanitary Flange Pedestal, loosen the four socket head cap screws (110).

"S" Units: Hold the four hex head cap screws (110) and loosen the four hex nuts (109). Remove the mixer from the pedestal (111).

u. Set the mixer upright on a workbench.

v. Remove the four hex head cap screws (160) (or four nuts 161 on D70 and D90 motors) holding the motor (101) to the mixer housing (36).

w. Separate and remove the motor (101) from the mixer housing (36). The helical coupling (150) and sun gear will remain attached to the motor shaft.

x. Move the mixer housing over a suitable container, remove the old lubricant and dispose of properly.

y. Remove the sun gear (9) and motor coupling (150).

z. Remove the gear carrier assembly (1), retaining ring (7), ring gear (2), four dowel pins (5) and any remaining old lubricant.

10.2 QUILL SHAFT & HOUSING DISASSEMBLY

a. Place the housing (36) upright on a workbench and remove the retaining rings (44 & 56).

b. Place the housing upright in a press, and press out the quill shaft (35), bearing (41) and oil seal (49).

c. Press the lower bearing (41) off the shaft.

d. Turn the housing over and press out the upper bearing (37).

e. Turn the housing over, remove middle retaining ring (44).

f. Turn the housing over and press the oil seal (38), from the housing (36).

g. Inspect the bearings (37 & 41). Replace if there is excessive wear.

ASSEMBLY:

10.3 PREPARING FOR ASSEMBLY

a. Clean all parts thoroughly.

b. Inspect for the following defects:

1. Cracks or damage of the housing.
2. Dents, gouges or scoring of the quill shaft, housing bore, and particularly the mating faces of the motor and housing.

c. Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore, and around the oil seal lip to provide lubrication and make the seal more effective.

d. Replace the bearings if they show indications of wear.

10.4 QUILL SHAFT ASSEMBLY

a. Press the lower bearing (41) onto the quill shaft (35). The bearing must seat against the shoulder with no visible gap.

10.5 QUILL SHAFT AND HOUSING ASSEMBLY

a. Install the lower retaining ring (44) in the housing (36).

b. Mount the housing (36) in an arbor press, large end up.

c. Press the oil upper seal (38) into the housing (36) with the seal cavity facing the large end of the housing.

d. Install the middle retaining ring (44) in the housing (36).

e. Press the bearing (37) on its outer race to seat against the middle retaining ring (44).

f. Install the upper retaining ring (44).

g. Support the housing, large end down, by resting the inner race of the bearing on a suitable sleeve.

h. Press the quill shaft (35) into the bearing until the shoulder of the shaft registers against the inner race of the bearing.

i. Install the upper retaining ring (56) in the shaft groove.

j. Turn the housing large end down, and press the lower oil seal (49) until it is flush with the end of the housing.

10.6 GEAR ASSEMBLY

a. Install the ring gear retaining pins (5).

b. Install the ring gear (2) in the bearing housing (36).

c. Install the retaining ring (7) in the groove above the ring gear.

d. **PACK THE GEAR CARRIER (1) WITH GREASE** and rotate the gears several times to distribute the grease to the needle bearings (13). Refer to Section 6 of these instructions for lubricant recommendations.

e. Models Mi5 & Mi6 (P,Q,L,S) 1, 2, 3, 4, 5, 8 & 9: Align the flats on the inside of the gear carrier (1) with the flats on the quill shaft (35).

f. Models Mi5 & Mi6 (P,Q,L,S) 6 &10: Install the key (27) in the quill shaft (35). Align the keyway in the gear carrier (1) with the keyway on the quill shaft (35).

g. Place the gear carrier assembly onto the quill shaft.

10.7 MOTOR COUPLING ASSEMBLY

a. Assemble the sun gear (9), the drive coupling (150) and key (107), (Item 107 – On all models except Mi5 & Mi6 (P,Q,L,S) 1 & 8, until the sun gear shoulders against the drive coupling. Tighten the set screws.

b. Set the elevation of the sun gear to the dimension shown in Figure 21, and tighten the remaining set screws.

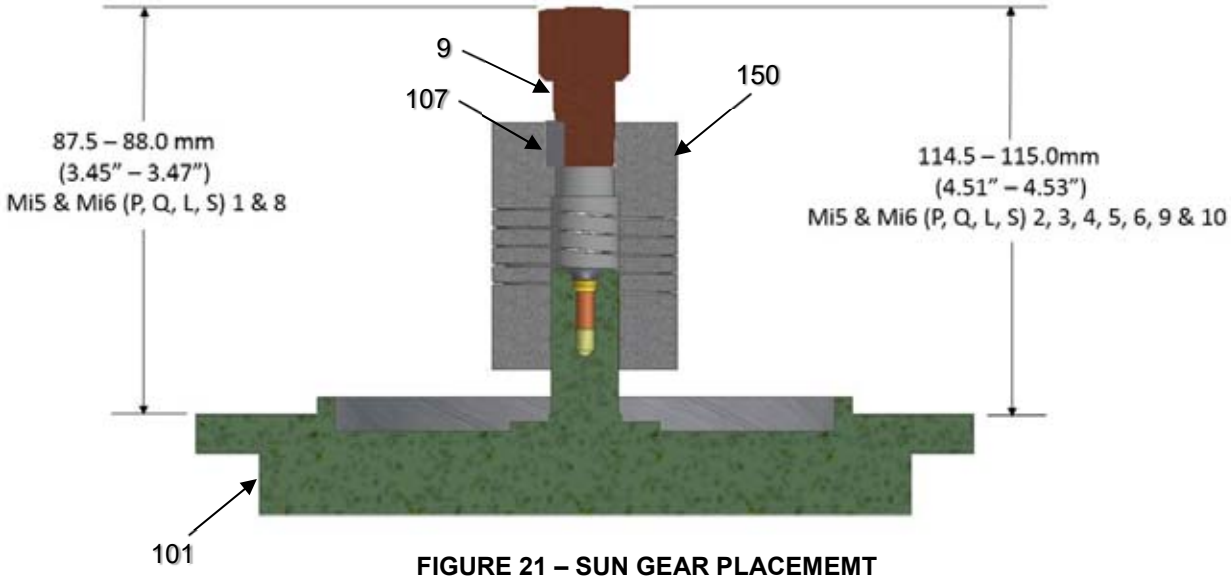


FIGURE 21 – SUN GEAR PLACEMEMT

c. Fill the gear housing with lubricant. Refer to Section 7 of these instructions for lubricant recommendations.

10.8 MOTOR ASSEMBLY

a. Apply LOCTITE GASKET ELIMINATOR 518 SEALANT on the motor mounting face of the housing (36).

b. Align the housing so the set screw access hole is to the right. Orient the motor, so the conduit box (or junction box) of the motor is facing you.

c. Move the motor, over the housing (36) and align the sun gear (9) in the center of the gear carrier so it meshes with the planet gears.

d. Once the gears engage, align the housing rabbets, screw holes, and conduit box (or junction box) of the motor, with the set screw access hole in the housing, to the right.

Note: Units using D80 and D90 frame motors will use a spacer ring (98) on motor rabbet to mixer housing rabbet connection.

e. Install the housing cap screws (160) (or four nuts 161 on D70 and D90 motors) and tighten evenly.

10.9 MIXER MOUNTING

a. Refer to Section 2 for attachment of applicable mounting configuration.

LIGHTNIN
AN SPX BRAND

ELECTRIC MOTOR INSTRUCTIONS

SECTION 1 - INITIAL INSPECTION

1.1 Care is taken at the factory to assure that the motor arrives at its destination in first class condition. If there is evidence of rough handling or damage in shipment, file a claim at once with the carrier and notify our factory.

Examine the outside of the motor carefully for damage, with particular attention to the conduit box, fans and covers. Check nameplate for correct speed, kilowatt, voltage, hertz and phase for conformance with power supply.

1.2 GENERAL DATA:

a. Single phase totally enclosed motors are wired at our factory for correct rotation.

b. All three phase must be field wired for proper rotation. If rotation does not agree with nameplate, reverse any two line leads.

c. Dual or multiple voltage motors must be wired for the desired voltage. Connection diagrams for the motors are located inside the conduit box cover.

Certain motor manufacturer's require using motor nameplate information in conjunction with the connection diagrams to determine the proper wiring configuration. Dependant on voltage requirements, in may be necessary to change lead and / or jumper bar locations.

d. Refer to Section 2 for motor maintenance and storage instructions.

1.3 WARNING

- If the thermal protector continues to trip, some abnormal condition exists. This condition must be corrected before motor will operate normally.
- **ALWAYS DISCONNECT POWER LINE BEFORE SERVICING ANY PART OF THE MIXER**. Unexpected motor start–up may occur after the thermal protection circuit trips.

1.4 After unpacking and inspection to see that all parts are in good condition, turn the shaft by hand to be sure there are no obstructions to free rotation. Equipment which has been in storage should be tested prior to being put into service.

a. It is best to check the insulation resistance of the stator winding with a megohmeter. If resistance is lower than one megaohm, consult ***LIGHTNIN***.

b. Motors are shipped from the factory with bearings properly packed with grease and ready to operate.

1.5 WIRING - Examine the nameplate data to see that it agrees with the power circuit to which the motor is to be connected. The motor is guaranteed to operate successfully with frequency not more than 5% and voltage not more than 10% above or below the nameplate data, or combined variation of voltage and frequency of not more than 10% above or below nameplate data. Efficiency, power factor and current may vary from nameplate data.

1.6 Connect the motor leads to a power source that matches the line voltage and wiring diagram specified on the motor nameplate.

1.7 Check impeller shaft rotation by jogging the motor until it is determined that rotation is correct.

1.8 **CAUTION**

Repeated trial starts can overheat the motor (particularly for across–the–line starting). If repeated trial starts are made, allow sufficient time between trials to permit heat to dissipate from the windings or rotor to prevent

overheating. Starting currents are several times running currents, and heating varies as the square of the current. Do not exceed 12 starts per hour.

1.9 **WARNING**

The frames and other metal exteriors of motors should be grounded to limit their potential to ground in the event of accidental connection or contact between live electrical parts and the metal exteriors. All motors should be grounded through the conduit box.

1.10 **WARNING**

Before starting motor, remove all unused shaft keys and loose rotating parts to prevent them from flying off.

1.11 Start motor and operate at minimum load prior to filling the tank or basin. Look for any unusual condition.

The motor should run smoothly with little noise. If the motor should fail to start and produces a decided hum, it may be that the load is too great for the motor or that it has been connected improperly. Shut down immediately and investigate for trouble.

SECTION 2 - MOTOR MAINTENANCE AND STORAGE

Electric motors or other prime movers are not prepared by ***LIGHTNIN*** for indoor storage beyond 12 months in a dry ambient atmosphere with controlled temperatures, or 6 months in a dry ambient atmosphere with no temperature control. OUTDOOR STORAGE OF ELECTRIC MOTORS IS NOT RECOMMENDED BY ANY MOTOR MANUFACTURER. For information on storage periods beyond those shown, consult ***LIGHTNIN***.

2.1 To insure continued reliable operation of electric motors, the following basic rule applies: **KEEP THE MOTOR CLEAN AND DRY.** Motors should be inspected, and output shaft rotated, at a minimum of 6 month intervals with increased frequency as needed depending upon the type of motor and the service.

2.2 Terminal connections and assembly hardware may loosen from vibration during service and should be tightened.

2.3 Insulation resistance should be checked at operative temperature and humidity conditions to determine possible deterioration of insulation due to excessive moisture or extremes in operating environment. If wide variations are detected, motors should be reconditioned.

2.4 LUBRICATION – Each motor manufacturer has a specific method for regreasing the bearings. Refer to the motor manufacturer's instruction manual for complete details.

2.5 **STORAGE REQUIREMENTS FOR MOTORS -** These extended storage requirements must be followed to allow the submission of a valid warranty claim.

a. The motors, if not mounted, are to be stored in the original containers in a clean, dry, protected warehouse.

b. The storage area is to be free from any vibration and from extremes in temperature.

c. Windings to be megged at the time equipment is put in storage. At the time of removal from storage, the resistance reading must not have dropped more than 50% from the initial reading. Any drop below this point, consult ***LIGHTNIN***.

d. All external parts and motors subjected to corrosion should be protected by a corrosive resistant coating.

LIGHTNIN
AN SPX BRAND

Care of Stainless Steel

Stainless Steel Corrosion

Corrosion resistance is greatest when a layer of oxide film is formed on the surface of stainless steel. If film is disturbed or destroyed, stainless steel becomes much less resistant to corrosion and may rust, pit or crack.

Corrosion pitting, rusting and stress cracks may occur due to chemical attack. Use only cleaning chemicals specified by a reputable chemical manufacturer for use with 300 series stainless steel. Do not use excessive concentrations, temperatures or exposure times. Avoid contact with highly corrosive acids such as hydrofluoric, hydrochloric or sulfuric. Also avoid prolonged contact with chloride-containing chemicals, especially in presence of acid. If chlorine-based sanitizers are used, such as sodium hypochlorite (bleach), do not exceed concentrations of 150 ppm available chlorine, do not exceed contact time of 20 minutes, and do not exceed temperatures of 104°F (40°C).

Corrosion discoloration, deposits or pitting may occur under product deposits or under gaskets. Keep surfaces clean, including those under gaskets or in grooves or tight corners. Clean immediately after use. Do not allow equipment to set idle, exposed to air with accumulated foreign material on the surface.

Corrosion pitting may occur when stray electrical currents come in contact with moist stainless steel. Ensure all electrical devices connected to the equipment are correctly grounded.

Elastomer Seal Replacement Following Passivation

Passivation chemicals can damage product contact areas of ***LIGHTNIN*** equipment. Elastomers (rubber components) are most likely to be affected. Always inspect all elastomer seals after passivation is completed. Replace any seals showing signs of chemical attack. Indications may include swelling, cracks, loss of elasticity or any other noticeable changes when compared with new components.

SPX. Lightnin®

BOLT TIGHTENING TORQUE RECOMMENDATIONS

Inadequately or improperly tightened hardware can loosen due to vibration or the load reactions imposed by fluid forces. This can result in reduced equipment service life or damage and failure.

Recommended torques for tightening ANSI bolts and screws on ***LIGHTNIN*** Mixers and Aerators and their mounting structures are listed below for your general reference. These average torque values should be considered only as guides and not as absolute values.

The amount of torque required to maintain a tight connection can vary considerably for bolts of the same size under different operating conditions. Variations such as basic joint design, compression factors, type and strength of base and hardware material, surface finish of mating parts and lubrication are only some of the factors that influence the tightness of bolted connections for given bolt torques.

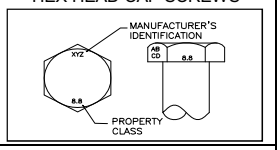
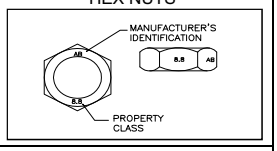
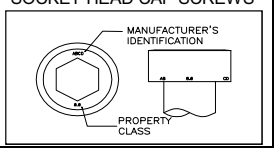
UNLESS SPECIFICALLY LISTED ELSEWHERE IN THE DETAILED INSTRUCTIONS, TIGHTEN THE MIXER AND MOUNTING HARDWARE TO THE RECOMMENDED VALUES SHOWN. A torque wrench must be used to ensure compliance with these torque requirements.

Certain assembly connections may require special torques that are not listed in the table. These torques can be found in the detailed assembly and disassembly sections of your manual. REVIEW YOUR MANUAL CAREFULLY TO DETERMINE WHERE SPECIAL TORQUES ARE REQUIRED.

For severe duty service, torques higher than listed, to tighten a bolt to maximum capacity, can often be used. However, due to the many variables previously mentioned, the only absolute method to determine optimum torque is to deliberately yield a bolt under actual conditions. If a bolt does yield or shear, 75% of the torque applied in yielding the bolt can be used to obtain a tight connection that is satisfactory.

ALL BOLTS SHOULD BE RETIGHTENED 12 HOURS AFTER ASSEMBLY, AND AT EACH SCHEDULED SHUT DOWN THEREAFTER.

RECOMMENDED TIGHTENING TORQUES FOR *LIGHTNIN*
GRADE 5.6 & 8.8 STEEL, 304 & 316 STAINLESS STEEL HARDWARE (1) (2) (4)

BOLT THREAD SIZE	Tightening Torque (ft-lbs) Grade 5.6 or 304/316 SS (5) Lubricated (4)	Tightening Torque (ft-lbs) Grade 8.8 Lubricated (4)	Tightening Torque (N-m) Grade 5.6 or 304/316 SS (5) Lubricated (4)	Tightening Torque (N-m) Grade 8.8 Lubricated (4)	ISO MARKING REFERENCE GUIDE (2)
M5	1.9	3.9	2.5	5.3	HEX HEAD CAP SCREWS
M6	3.2	6.6	4.3	8.9	
M7	5	11	7	15	
M8	8	16	10	22	
M10	15	32	21	43	
M12	27	55	36	75	
M14	42	88	57	119	HEX NUTS
M16	66	137	89	186	
M18	91	195 (3)	123	265 (3)	
M20	129	277	174	375	
M22	175	377	237	511	
M24	222	479	301	649	
M27	245 (3)	700	382 (3)	950	SOCKET HEAD CAP SCREWS
M30	332	951	450	1 290	
M33	452	1 294	618	1 755	
M36	581	1 662	787	2 254	
M39	752	2 151	1 019	2 917	
M42	930	2 661	1 261	3 608	

(1) ALL BOLTS SHOULD BE COATED WITH OIL, GREASE OR AN ANTI-SEIZE COMPOUND WHENEVER POSSIBLE. THE THREADS AND BEARING FACE OF BOLT HEADS AND/OR NUTS SHOULD BE LUBRICATED.

(2) TORQUE VALUES SHOWN SUPERSEDE PREVIOUS TABLES THAT MAY HAVE ALLOWED LOWER VALUES. IT IS RECOMMENDED THAT ONLY FASTERNERS BE USED THAT ARE PROPERLY MARKED, INCLUDING MANUFACTURER'S TRADE MARKING. ONLY FASTENERS MARKED AS SHOWN ARE GUARANTEED TO MEET SPECIFICATION AND PERFORMANCE REQUIREMENTS.

(3) ALLOWABLE BOLT STRESS VALUES CHANGE AT THESE LOCATIONS AND IS REFLECTED IN THE SUGGESTED TORQUE VALUES.

(4) CONVERSION FACTORS:

DRY VALUES: MULTIPLY LUBRICATED VALUE BY 1.33.

METRIC VALUES IN N-m 1FT-LB = 1.3558 N-m

(5) APPLICABLE MATERIAL GRADES FOR SPECIFIED TORQUE VALUES:

TORQUE VALUES ARE BASED ON THE LOWER OF GRADE 5.6 STEEL OR STAINLESS STEEL:

A2/A4 CLASS 70 FOR BOLTS LESS THAN OR EQUAL TO M24

A2/A4 CLASS 50 FOR BOLTS LARGER THAN M24

MIXER PARTS **UNIT SIZE: NETTCO - i Series**

For service and repair: www.lightninmixers.com 888-649-2378

ITEM NO.	IDENTITY CODE #		DESCRIPTION	QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
Note: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier.							
101			**ELECTRIC MOTOR SELECTIONS:**				
			.37kW (.5 HP), 3 Phase, TEFC, D71 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227222GRPSP		
			60Hz, 1800RPM, 575 volts	1	227266GRPSP		
			.37kW (.5 HP), 1 Phase, TEFC, D71 Frame w/ Switch, Cord & Plug	1	227228GRPSP		
			.55kW (.75 HP), 3 Phase, TEFC, D80 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227223GRPSP		
			60Hz, 1800RPM, 575 volts	1	227267GRPSP		
			.75kW (1.0 HP), 3 Phase, TEFC, D80 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227224GRPSP		
			60Hz, 1800RPM, 575 volts	1	227268GRPSP		
			1.1kW (1.5 HP), 3 Phase, TEFC, D90 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227225GRPSP		
			60Hz, 1800RPM, 575 volts	1	227269GRPSP		
			1.5kW (2.0 HP), 3 Phase, TEFC, D90 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227226GRPSP		
			60Hz, 1800RPM, 575 volts	1	227270GRPSP		
			2.2kW (3.0 HP), 3 Phase, TEFC, D100 Frame				
			50Hz, 1500 RPM, 190/380 volts, 60Hz, 1800RPM, 230/460 volts	1	227227GRPSP		
			60Hz, 1800RPM, 575 volts	1	227271GRPSP		
			AIR MOTOR SELECTIONS:				
			.37 kW (.5 HP), D71 Frame	1	227674PSP		
			.55 - 1.5 kW (.75 - 2.0 HP), D80 Frame	1	227675PSP		
			2.2 kW (3.0 HP), D90 Frame	1	227676PSP		

\# **IDENTITY CODE:**

(1)

Blank Code denotes common parts.

* Recommended spare parts

MIXER PARTS **UNIT SIZE: NETTCO - i Series**

For service and repair: www.lightninmixers.com 888-649-2378

ITEM NO.	IDENTITY CODE #		DESCRIPTION		QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
Note: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier.								
			AIR MOTOR REPAIR KITS: Includes: Seal, Bearings, Vanes, Push Pins, Vane Springs and Gaskets.		**AVAILABLE AS A KIT, ONLY**			
			1 Size, D71 Motor Frame		1	227663PSP		
			2 Size, D80 Motor Frame		1	227664PSP		
			2 Size, D90 Motor Frame		1	227665PSP		
			REBUILD KITS: for Direct Drive Mixers Includes items: 37, 41, 44, 49, 56, 96 and 150		**AVAILABLE AS A KIT, ONLY**			
			1 Size, D71 Motor Frame		1	873318PSP		
			2 Size, D80 Motor Frame		1	873321PSP		
			2 Size, D90 Motor Frame		1	873324PSP		
			3 Size, D100 Motor Frame		1	873327PSP		
			REBUILD KITS: for Gear Drive Mixers Includes items: 1, 2, 5, 7, 37, 38, 41, 44, 49, 56, 96 and 150		**AVAILABLE AS A KIT, ONLY**			
			1 Size, D71 Motor Frame	5:1 Ratio	1	873319PSP		
				6:1 Ratio	1	873320PSP		
			2 Size, D80 Motor Frame	5:1 Ratio	1	873322PSP		
				6:1 Ratio	1	873323PSP		
			2 Size, D90 Motor Frame	5:1 Ratio, Elec.	1	873325PSP		
				5:1 Ratio, Air	1	873401PSP		
				6:1 Ratio, Elec.	1	873326PSP		
				6:1 Ratio, Air	1	873402PSP		
			3 Size, D100 Motor Frame	5:1 Ratio	1	873328PSP		
				6:1 Ratio	1	873329PSP		

IDENTITY CODE:

(1)

Blank Code denotes common parts.

* Recommended spare parts

MIXER PARTS **UNIT SIZE: NETTCO - i Series**

For service and repair: www.lightninmixers.com 888-649-2378

ITEM NO.	IDENTITY CODE #		DESCRIPTION		QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
Note: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier.								
120			**MECHANICAL SEAL - Style 10**		**AVAILABLE AS COMPLETE SEAL, ONLY.**			
			1 Size (20mm Shaft)	for ANSI or DIN Flange	1	226945PSP		
			2 & 3 Size (25mm Shaft)	for ANSI or DIN Flange	1	226946PSP		
			MECHANICAL SEAL - Style 10T		**AVAILABLE AS COMPLETE SEAL, ONLY.**			
			1 Size (20mm Shaft)	for Sanitary Flange	1	227376PSP		
			2 & 3 Size (25mm Shaft)	for Sanitary Flange	1	227377PSP		
134			**Q PLATE ISOLATION MOUNT**					
			All Sizes	Flex Mount	4	138317PSP		
209			**LIP SEAL**					
			1 Size (20mm Shaft)	for ANSI or DIN Flange	1	226968PSP		
				for Sanitary Flange				
			2 & 3 Size (25mm Shaft)	for ANSI or DIN Flange	1	226937PSP		
				for Sanitary Flange				
			LUBRICANT					
			1 Size, D71 Motor Frame	Standard - 2 LB. Can	1	293101PSP		
				Food Grade - 14 OZ. Tube	1	275255PSP		
			2 Size, D80 or D90 Motor Frame	Standard - 2 LB. Can	1	293101PSP		
				Food Grade - 14 OZ. Tube	2	275255PSP		
			3 Size, D100 Motor Frame	Standard - 2 LB. Can	1	293101PSP		
				Food Grade - 14 OZ. Tube	2	275255PSP		

IDENTITY CODE:

(1)

Blank Code denotes common parts.

* Recommended spare parts

Notes

LIMITED WARRANTY

Unless otherwise noted on the face hereof, SPX Flow goods, auxiliaries and parts thereof are warranted to the original purchaser against defective workmanship and material for a period of twelve (12) months from date of installation or (18) months from date of shipment from factory, whichever expires first. If the goods or services do not conform to the warranty stated above, then as Buyer's sole remedy, SPX Flow shall, at SPX Flow's option, either repair or replace the defective goods or re-perform defective services. Third party goods furnished by SPX Flow will be repaired or replaced as Buyer's sole remedy, but only to the extent provided in and honored by the original manufacturer's warranty. Unless otherwise agreed to in writing, SPX Flow shall not be liable for breach of warranty or otherwise in any manner whatsoever for: (i) normal wear and tear; (ii) corrosion, abrasion or erosion; (iii) any good or services which, following delivery or performance by SPX Flow, has been subjected to accident, abuse, misapplication, improper repair, alteration, improper installation or maintenance, neglect, or excessive operating conditions; (iv) defects resulting from Buyer's specifications or designs or those of Buyer's contractors or subcontractors other than SPX Flow; or (v) defects resulting from the manufacture, distribution, promotion or sale of Buyer's products.
THE WARRANTIES CONTAINED HEREIN ARE THE SOLE AND EXCLUSIVE WARRANTIES AVAILABLE TO BUYER AND SPX FLOW HEREBY DISCLAIMS ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE FOREGOING REPAIR, REPLACEMENT AND REPERFORMANCE OBLIGATIONS STATE SPX FLOW'S ENTIRE AND EXCLUSIVE LIABILITY AND BUYER'S EXCLUSIVE REMEDY FOR ANY CLAIM IN CONNECTION WITH THE SALE AND FURNISHING OF SERVICES, GOODS OR PARTS, THEIR DESIGN, SUITABILITY FOR USE, INSTALLATION OR OPERATIONS.

SPX®
WHERE IDEAS MEET INDUSTRY

TECHNICAL SERVICES

The Lightnin brand dedicated after sales support teams are on hand to offer advice and support. With more than 85 years' experience in the manufacture and supply of agitation equipment, we know what parts need to be on hand to support our customer base so that your downtime is minimized. Our team of highly experienced field service technicians is on call to support the on-site servicing of equipment, or supervise and train your maintenance staff in best practice care of equipment.

INSTALLATION AND COMMISSIONING

Proper installation of your Lightnin mixer is critical to its long term performance and reliability. To ensure that installation procedures are followed, a certified technician will:

- Audit the equipment
- Supervise job-site contractors
- Perform a final inspection

SERVICE SUPPORT & REFURBISHMENT

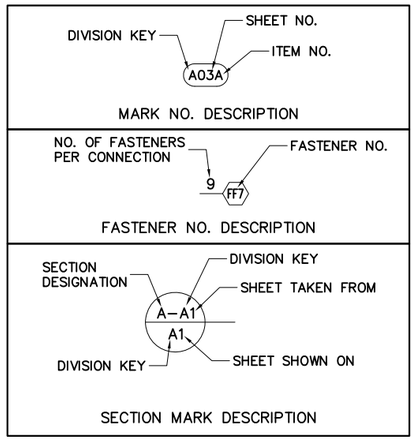
The equipment audit is specifically designed to identify potential mechanical problems before they occur. Using many forms of modern technology and drawing on our mixer manufacturing experience, our technicians can identify the onset of bearing and gear failures, misalignment and system problems without the need to interrupt production. Factory gearbox exchange and refurbishment programs offer a fast and cost-effective route to extending equipment life.

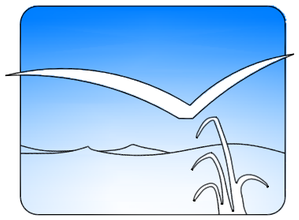
SPX FLOW TECHNOLOGY
135 Mt. Read Blvd.
Rochester, NY 14611
P: (888) 649-2378 (MIX-BEST) or +1 (585) 436-5550
F: (585) 436-5589
E: lightnin@spx.com ▪ www.lightninmixers.com

ISSUED 2012

Appendix C

Drawings





MONROE ENVIRONMENTAL

Liquid Clarification & Air/Gas Cleaning Systems

PHONE: (734) 242-7654
FAX: (734) 242-5275

810 WEST FRONT ST.
MONROE, MI 48161

WEBSITE: WWW.MON-ENV.COM
EMAIL: SALES@MON-ENV.COM

MONROE ENVIRONMENTAL
810 W. FRONT STREET – MONROE, MI 48161
(800) 992-7707 | SALES@MON-ENV.COM

USE ONLY GENUINE MONROE ENVIRONMENTAL REPLACEMENT PARTS

VERTICAL CLARIFIER
P.O.# PO-0056
SERIAL# 19-7706-1
MODEL# VC-300
EFFECTIVE AREA: 300 FT.²
FLOW RATE: 105 GPM
DRY WEIGHT: 12,200 LBS.
MANUFACTURED: 2019
DRAWING:
7706-01-A02

NAMEPLATE

NOTES:

- EFFECTIVE PLATE AREA: 300 FT²
- ACTUAL PLATE AREA: 523 FT²
- DRY WEIGHT: 12,200 LBS TOTAL
- OPERATING WEIGHT: 30,650 LBS TOTAL
- FLASH MIX TANK: 105 GALLON
- FLOCCULATION TANK: 450 GALLON
- MAXIMUM HYDRAULIC FLOW RATE: 180 GPM
- FLASH/FLOCCULATION MIXERS TO HAVE 316SS FOR WETTED PARTS
- TOP OF TANK FLANGE MUST BE LEVELED WITHIN 1/16" IN 10' LENGTH
- ALL FLANGED CONNECTIONS TO STRADDLE CENTER LINES
- SEPARATOR PLATE SLOPE IS 55° WITH 2" SPACING
- ALL GASKETS TO BE EPDM
- UNIT IS DESIGNED FOR OUTDOOR INSTALLATION
- PLATFORM DESIGNED TO 40 LBS/FT²
- PLATFORM TOP SAFETY GATE NOT BY MONROE
- LAUNDERS TO INCLUDE QUICK RELEASE CLAMPS AND HINGES

MEC JN: 7706
CUSTOMER: HYDRUS TECHNOLOGY
CUSTOMER P.O.: PO-0056
END USER: CROW WING CO. LANDFILL
QUANTITY: (1)
MODEL: VC-300

MATERIAL OF CONSTRUCTION:

TANK: 1/4" THICK 304L STAINLESS STEEL
SUPPORT STRUCTURE: 304L STAINLESS STEEL
FASTENERS TO BE 18-8 STAINLESS STEEL
STRUCTURAL FASTENERS TO BE A325 MECHANICALLY GALVANIZED
LAUNDER TO BE 304L STAINLESS STEEL
SEPARATOR PLATES TO BE 18GA 304L STAINLESS STEEL
GRATING TO BE ALUMINUM, 1-1/4 X 3/16, 19W4

FINISH REQUIREMENTS:

304L/18-8 STAINLESS STEEL:
ALL STAINLESS STEEL WELDS, WELD MARKS, AND BURN THROUGH FROM INTERNAL WELDS, ARE TO BE PASSIVATED ACCORDING TO ASTM A967 OR B912 STANDARDS

SUBMERGED STEEL:
N/A

NON-SUBMERGED STEEL:
N/A

AS BUILT
6/20/19

DIVISION KEY	
A	ARRANGEMENT
B	BILL OF MATERIALS
D	DUCTWORK
E	ELECTRICAL
F	FOOTPRINT
H	HYDRAULIC
I	INSTRUMENTATION
P	PNEUMATIC
S	STRUCTURAL
T	TAGS
W	WELDMENT

FILE NAME BREAKDOWN
JOB NUMBER – UNIT NUMBER – DIVISION SHEET NUMBER – REVISION

REV	CHANGE	DRW	DATE	CKD	DATE	APP	DATE
0	ISSUED FOR CONSTRUCTION	DAS	5/7/19	DS	5/7/19	DS	5/7/19

FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED
0 FT ≤ 10 FT ±1/8 — 0 mm ≤ 3000 mm ±3.5 mm
10 FT ≤ 20 FT ±1/8 — 3000 mm ≤ 6000 mm ±3 mm
> 20 FT ±2/8 — > 6000 mm ±4.5 mm
STRUCTURAL STEEL TOLERANCES PER AISC

MACHINING TOLERANCES
UNLESS OTHERWISE SPECIFIED
ANGULAR ±1 (0.030) — 1 PLACE DECIMAL INCHES ±0.1 INCHES (±2.5 mm)
SURFACE FINISH – 125 MICROINCHES — 2 PLACE DECIMAL INCHES ±0.01 INCHES (±0.25 mm)
3 PLACE DECIMAL INCHES ±0.001 INCHES (±0.025 mm)

CAUTION
WHEN INSTALLING, OPERATING, OR SERVICING EQUIPMENT, ALWAYS REFER TO INSTALLATION, OPERATING, AND MAINTENANCE MANUAL FOR SAFETY PRECAUTIONS.

"NF" INDICATES NOT FURNISHED BY M.E.C.
DO NOT SCALE USE DIMENSIONS ONLY
DO NOT USE FOR CONSTRUCTION UNLESS APPROVED ABOVE

MONROE ENVIRONMENTAL CORPORATION
MONROE, MICHIGAN

TITLE
VERTICAL CLARIFIER VC-300, 105 GPM
COVER SHEET

CROW WING CO. LANDFILL / BRAINERD, MN

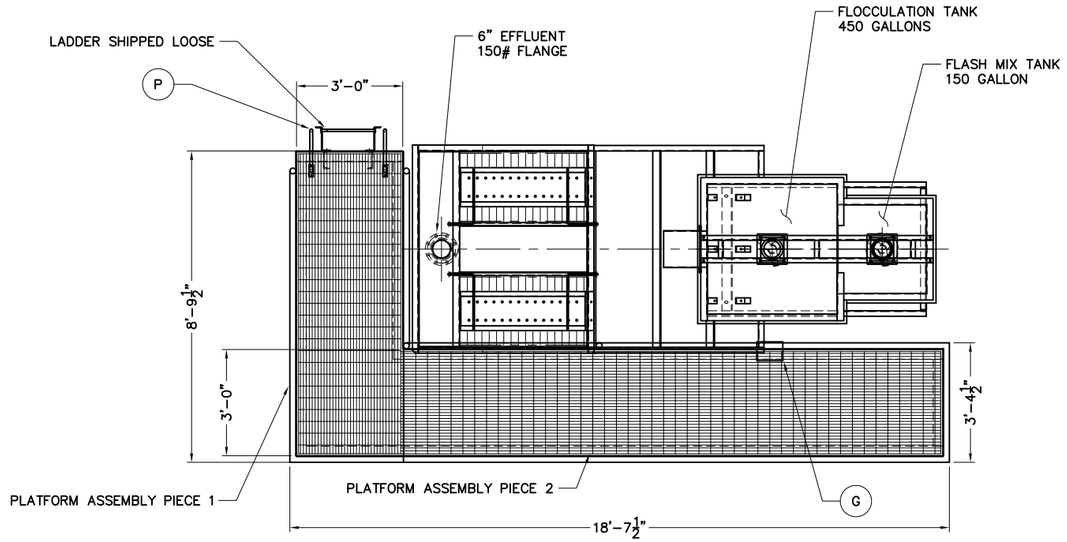
SCALE: NONE
PROJECT NO.: 7706-1
DRAWING NO.: 7706-01-A01-0

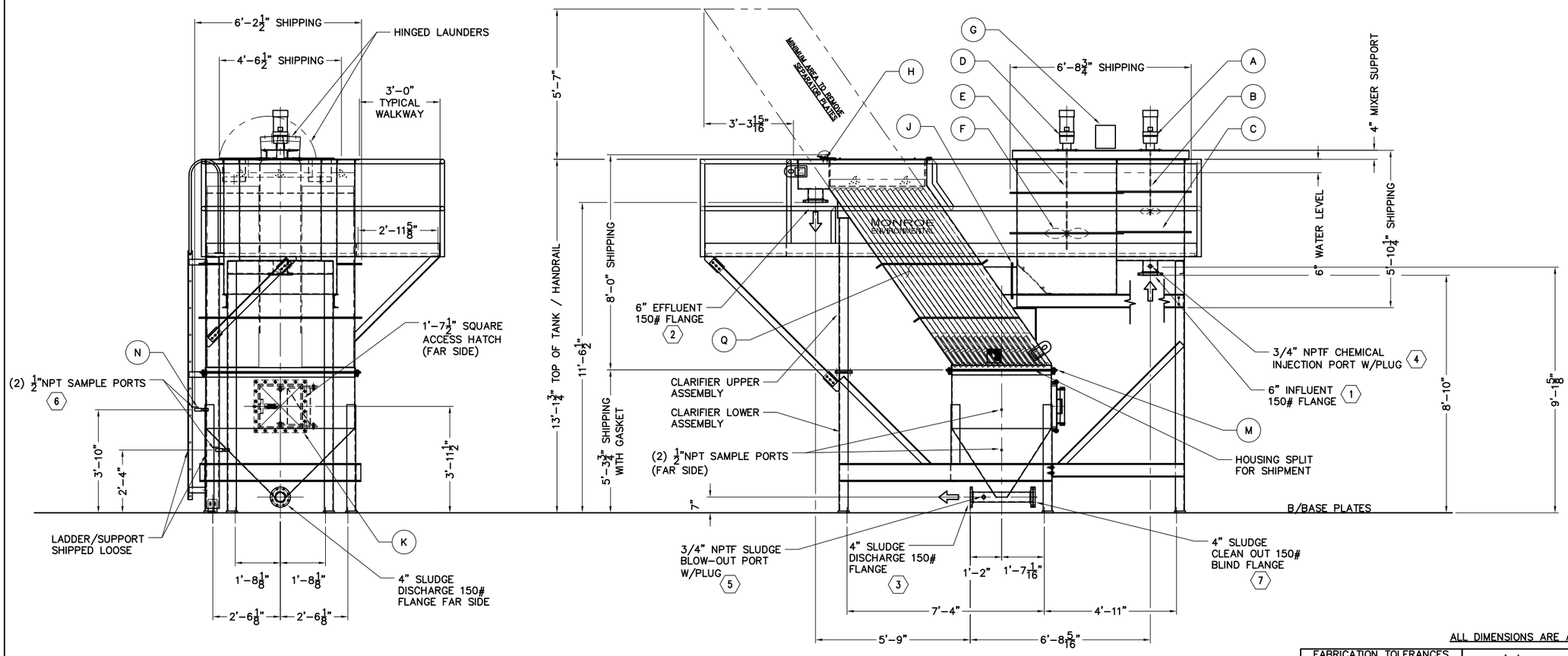
7706-01-A01-0

NOZZLE INFORMATION				
NOZZLE	SIZE	TYPE	ELEVATION	FUNCTION
1	6"	150# FLANGE SLIP ON	8'-10"	INFLUENT
2	6"	150# FLANGE SLIP ON	11'-6½"	EFFLUENT
3	4"	150# FLANGE SLIP ON	0'-7"	SLUDGE DISCHARGE
4	3/4"	FNPT	9'-1⅝"	CHEMICAL INJECTION
5	3/4"	FNPT	0'-7"	SLUDGE FLUSHING PORT
6	1/2"	FNPT	3'-10" / 2'-4"	(2) SLUDGE SAMPLE PORTS
7	4"	150# FLANGE BLIND	0'-7"	SLUDGE CLEAN OUT PORT

CONTACT MONROE ENVIRONMENTAL AT 800-992-7707 OR SALES@MON-ENV.COM FOR PRICING AND AVAILABILITY
RSP = RECOMMENDED SPARE PARTS

RSP	No.	QTY	DESCRIPTION	PART #
	A	1	FLASH MIXER	7198
	B	1	FLASH MIXER SHAFT	7200
	C	1	FLASH MIXER IMPELLER	7199
	D	1	FLOCCULATION MIXER	7201
	E	1	FLOCCULATION MIXER SHAFT	7203
	F	1	FLOCCULATION MIXER IMPELLER	7202
	G	1	FLOCCULATION MIXER VFD	7263
	H	4	DRAW LATCH, ADJUSTABLE 304 STAINLESS STEEL	6377
	J	1	MIX TANK GASKET	W16B
	K	1	ACCESS DOOR GASKET	S1440-1D
	M	1	SLUDGE HOPPER GASKET	W16A
	N	2	1/2" NPT BALL VALVE STAINLESS STEEL	6006
	P	1	WALK-THRU LADDER	7268
	Q	34	304SS. SEPARATOR PLATES, 23" X 96"	7346





LADDER REMOVED FOR CLARITY

ALL DIMENSIONS ARE APPROXIMATE

AS BUILT
6/20/19

REV	CHANGE	DRW	DATE	CKD	DATE	APP	DATE
0	AS BUILT	DAS	6/20/19	DS	6/20/19	DS	6/20/19

FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED

0 FT ≤ 10 FT	±1/16
10 FT ≤ 20 FT	±1/8
> 20 FT	±3/16

0 mm ≤ 3000 mm	±1.5 mm
3000 mm ≤ 6000 mm	±3 mm
> 6000 mm	±4.5 mm

STRUCTURAL STEEL TOLERANCES PER AISC

MACHINING TOLERANCES
UNLESS OTHERWISE SPECIFIED

ANGULAR (± 1.0000)	1 PLACE DECIMAL INCHES ±0.1 INCHES (±2.5 mm)
SURFACE FINISH — 125 MICROINCHES	2 PLACE DECIMAL INCHES ±0.01 INCHES (±0.25 mm)
	3 PLACE DECIMAL INCHES ±0.001 INCHES (±0.025 mm)

CAUTION
WHEN INSTALLING, OPERATING, OR SERVICING EQUIPMENT, ALWAYS REFER TO INSTALLATION, OPERATING, AND MAINTENANCE MANUAL FOR SAFETY PRECAUTIONS.

"NF" INDICATES NOT FURNISHED BY M.E.C.
DO NOT SCALE USE DIMENSIONS ONLY
DO NOT USE FOR CONSTRUCTION UNLESS APPROVED ABOVE

MONROE ENVIRONMENTAL
MONROE, MICHIGAN

7706-01-A02-0

TITLE
150 GPM VERTICAL CLARIFIER, VC-300
GENERAL ARRANGEMENT

CROW WING CO. LANDFILL / BRAINERD, MN

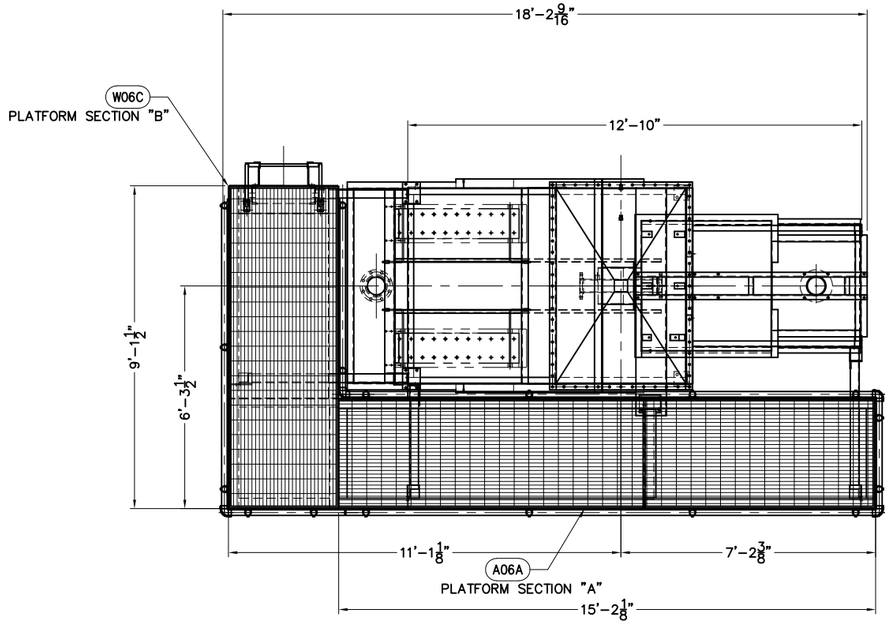
DRAWING NO.
7706-01-A02-0

SCALE
D 1=24

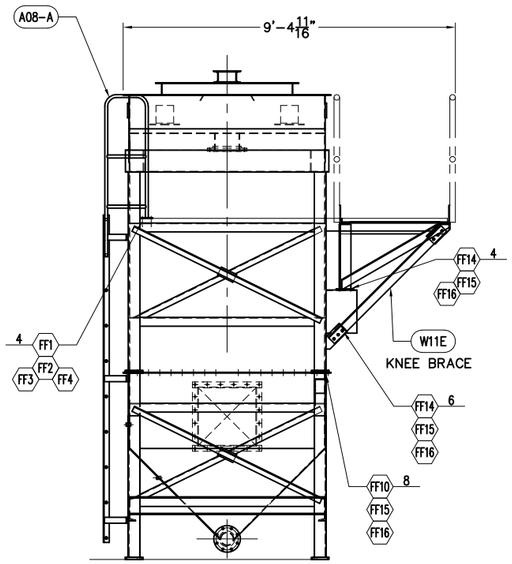
PROJECT NO.
7706-1

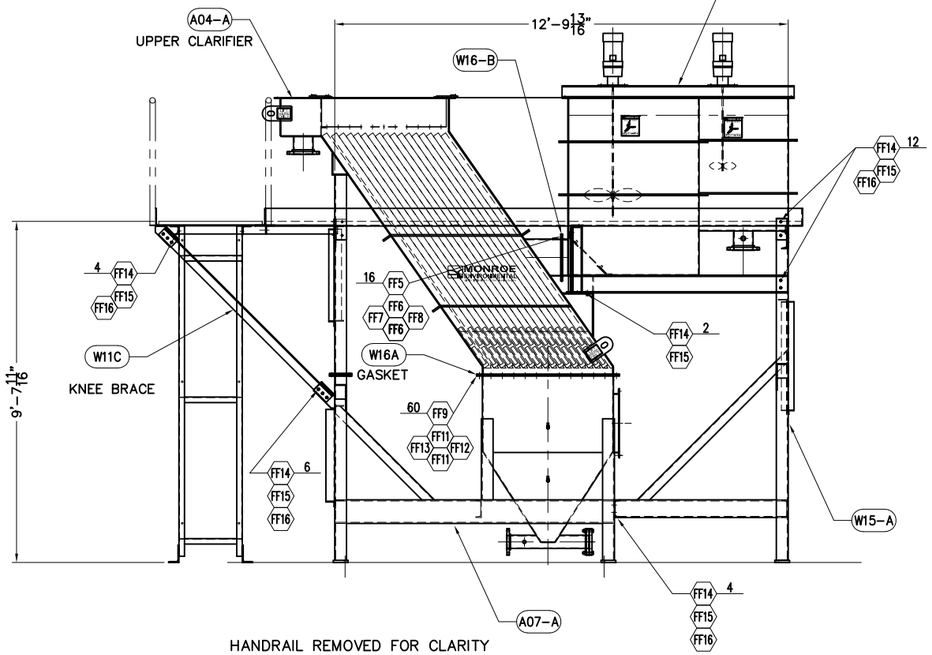
CONTACT MONROE ENVIRONMENTAL AT 800-992-7707 OR SALES@MON-ENV.COM FOR PRICING AND AVAILABILITY
MATERIAL IS FOR ONE

MKD	QTY	DESCRIPTION	WEIGHT
A04A	1	UPPER CLARIFIER ASSEMBLY/ SHIPPING	5650
A05A	1	MIX/ FLOCCULATION TANK ASSEMBLY/ SHIPPING	1730
A06A	1	PLATFORM/ HANDRAIL ASSEMBLY/SHIPPING	1100
A06C	1	PLATFORM/ HANDRAIL ASSEMBLY/SHIPPING	700
A07A	1	SLUDGE DISCHARGE HOPPER ASSEMBLY/ SHIPPING	1880
A08A	1	LADDER ASSEMBLY	440
W11C	1	KNEE BRACE	35
W11E	1	KNEE BRACE	25
W11F	1	KNEE BRACE	80
W15A	1	MIX TANK SUPPORTS	460
W16A	1	SLUDGE HOPPER GASKET	10
W16B	1	MIX TANK GASKET	5
FF1	4	SCREW, 3/8"-16 X 2 3/4" LG SS 18-8 HHCS	
FF2	4	3/8"Ø SS18-8 FLAT WASHER	
FF3	4	3/8"Ø SS18-8 SPRING-LOCK WASHER	
FF4	4	3/8"-16 SS18-8 HEX NUT	
FF5	16	SCREW, 1/2"-13 X 1 1/2" LG SS18-8 HHCS	
FF6	32	1/2"Ø SS18-8 FLAT WASHER	
FF7	16	1/2"Ø SS18-8 SPRING-LOCK WASHER	
FF8	16	1/2"-13 SS18-8 HEX NUT	
FF9	60	SCREW, 5/8"-11 X 1 1/2" LG SS18-8 HHCS	
FF10	8	SCREW, 5/8"-11 X 2" LG A325 HHCS (MECH. GALV.)	
FF11	120	5/8"Ø SS18-8 FLAT WASHER	
FF12	60	5/8"Ø SS18-8 SPRING-LOCK WASHER	
FF13	60	5/8"-11 SS18-8 HEX NUT	
FF14	40	SCREW, 5/8"-11 X 1 1/2" LG A325 (MECH. GALV.) HHCS	
FF15	48	5/8"Ø F436 (MECH. GALV.) FLAT WASHER	
FF16	46	5/8"-11 A563 (MECH. GALV.) HEX NUT	

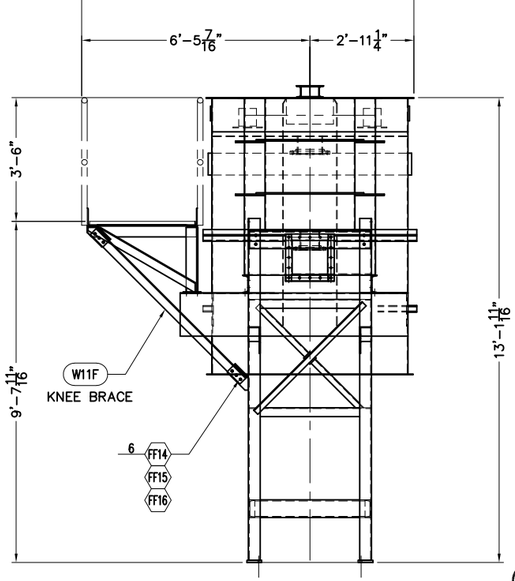


LADDER AND SUPPORT ASSEMBLY





HANDRAIL REMOVED FOR CLARITY



AS BUILT
6/20/19

FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED
0 FT ≤ 10 FT ±1/16 — 0 mm ≤ 3000 mm ±1.5 mm
10 FT ≤ 20 FT ±1/8 — 3000 mm ≤ 6000 mm ±3 mm
> 20 FT ±3/16 — > 6000 mm ±4.5 mm
STRUCTURAL STEEL TOLERANCES PER AISC

MACHINING TOLERANCES
UNLESS OTHERWISE SPECIFIED
ANGULAR ±1° (±0.0003) — 1 PLACE DECIMAL INCHES ±0.1 INCHES (±2.5 mm)
SURFACE FINISH — 125 MICROINCHES — 2 PLACE DECIMAL INCHES ±0.01 INCHES (±0.25 mm)
3 PLACE DECIMAL INCHES ±0.005 INCHES (±0.025 mm)

CAUTION
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REV	CHANGE	DRW	DATE	CKD	DATE	APP	DATE
0	AS BUILT	DAS	6/20/19	DS	6/20/19	DS	6/20/19

MONROE ENVIRONMENTAL
MONROE, MICHIGAN

TITLE
150 GPM VERTICAL CLARIFIER, VC-300
GENERAL ASSEMBLY

7706-01-A03-0

CROW WING CO. LANDFILL / BRAINERD, MN

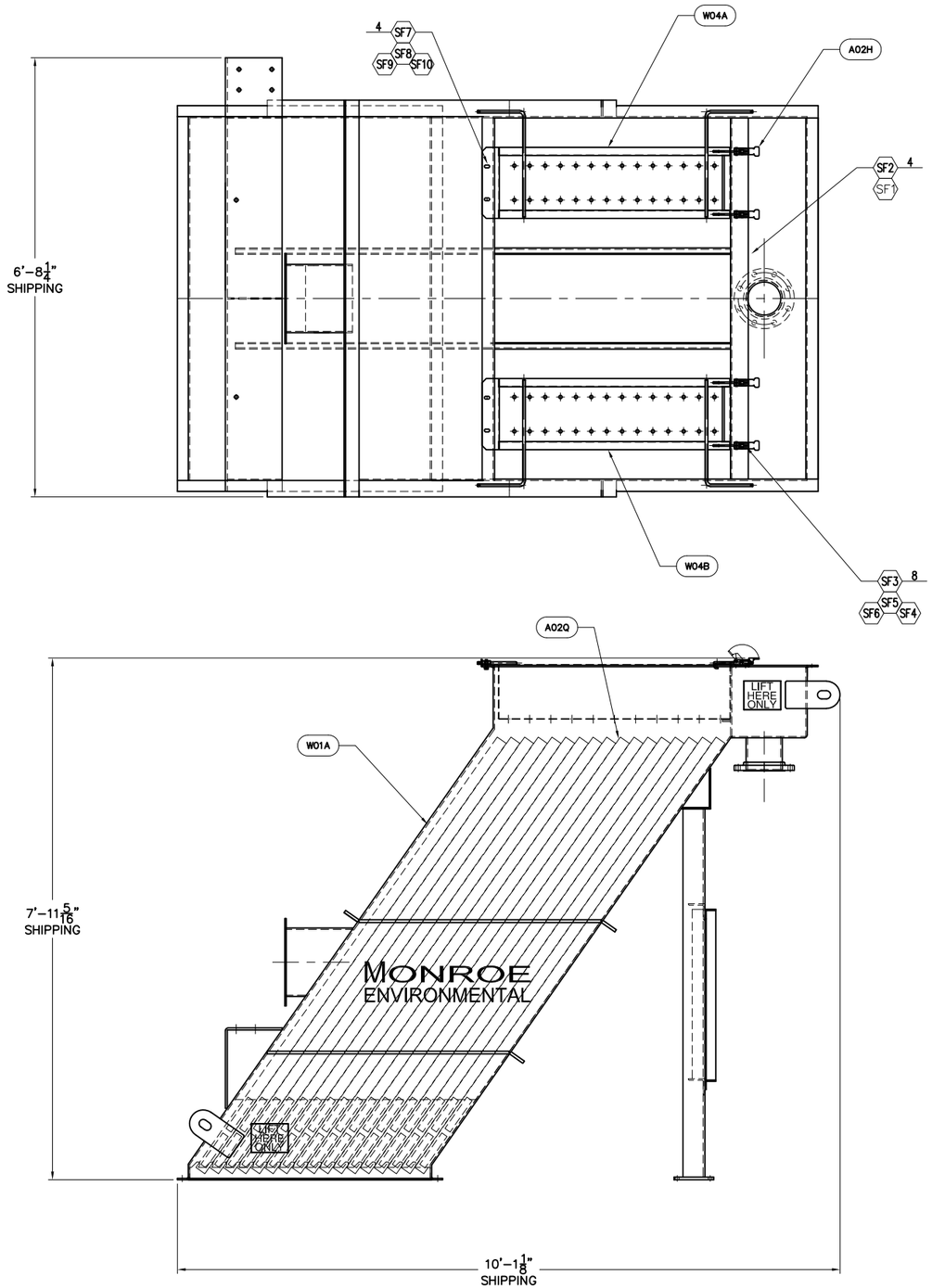
DRAWING NO.
7706-01-A03-0

SCALE
D 1=24

PROJECT NO.
7706-1

CONTACT MONROE ENVIRONMENTAL AT 800-992-7707 OR SALES@MON-ENV.COM FOR PRICING AND AVAILABILITY
MATERIAL IS FOR ONE

MKD	QTY	DESCRIPTION	WEIGHT
A04A		UPPER CLARIFIER ASSEMBLY/ SHIPPING	5650
W01A	1	UPPER CLARIFIER SECTION	3820
W04A	1	LEFT HAND LAUNDER	60
W04B	1	RIGHT HAND LAUNDER	60
A02Q	34	SEPARATOR PLATES (S1454A)	1700
SF1	4	1/2" Ø TYPE 18-8 SS FLAT WASHER	–
SF2	4	0.094"Ø 18-8 SS HAIRPIN FOR 1/2"Ø SHAFT	–
SF3	8	1/4-20 X 1" HHCS, 18-8 SS	–
SF4	8	1/4" FLAT WASHER, 18-8 SS	–
SF5	8	1/4" SPRING-LOCK WASHER, 18-8 SS	–
SF6	8	1/4-20 HEX NUT, 18-8 SS	–
SF7	4	3/8-16 X 1-1/4" HHCS, 18-8 SS	–
SF8	4	3/8" FLAT WASHER, 18-8 SS	–
SF9	4	3/8" SPRING-LOCK WASHER, 18-8 SS	–
SF10	4	3/8-16 HEX NUT, 18-8 SS	–
A02H	4	DRAW LATCH (REF A02)	–



1-REQD-A04A
UPPER CLARIFIERS ASSEMBLY/SHIPPING

AS BUILT
6/20/19

FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED
0 FT ≤ 10 FT ±1/16 — 0 mm ≤ 3000 mm ±1.5 mm
10 FT ≤ 20 FT ±3/16 — 3000 mm ≤ 6000 mm ±5 mm
> 20 FT ±3/16 — > 6000 mm ±4.5 mm
STRUCTURAL STEEL TOLERANCES PER AISC

MACHINING TOLERANCES
UNLESS OTHERWISE SPECIFIED
ANGULAR ± 1 DEGREE — 1 PLACE DECIMAL INCHES ±0.1 INCHES (±2.5 mm)
SURFACE FINISH — 2 PLACE DECIMAL INCHES ±0.01 INCHES (±0.25 mm)
125 MICROINCHES — 3 PLACE DECIMAL INCHES ±0.001 INCHES (±0.025 mm)

CAUTION
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REV	CHANGE	DRW	DATE	CKD	DATE	APP	DATE
0	AS BUILT	DAS	6/20/19	DS	6/20/19	DS	6/20/19

MONROE ENVIRONMENTAL CORPORATION
MONROE, MICHIGAN

TITLE
UPPER CLARIFIER SECTION ASSEMBLY

CROW WING CO. LANDFILL / BRAINERD, MN

DRAWING NO.
7706-01-A04-0

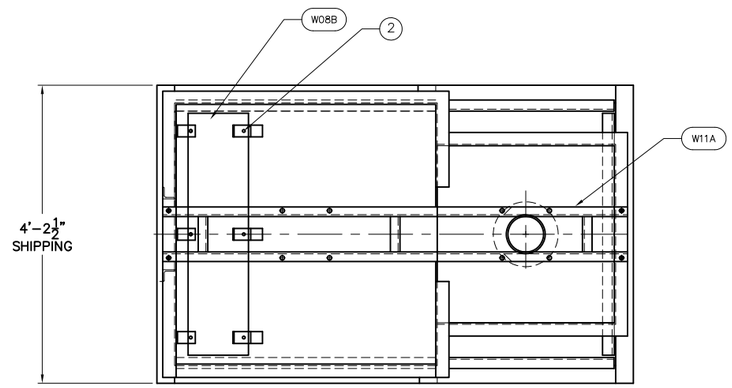
SCALE D 1=12

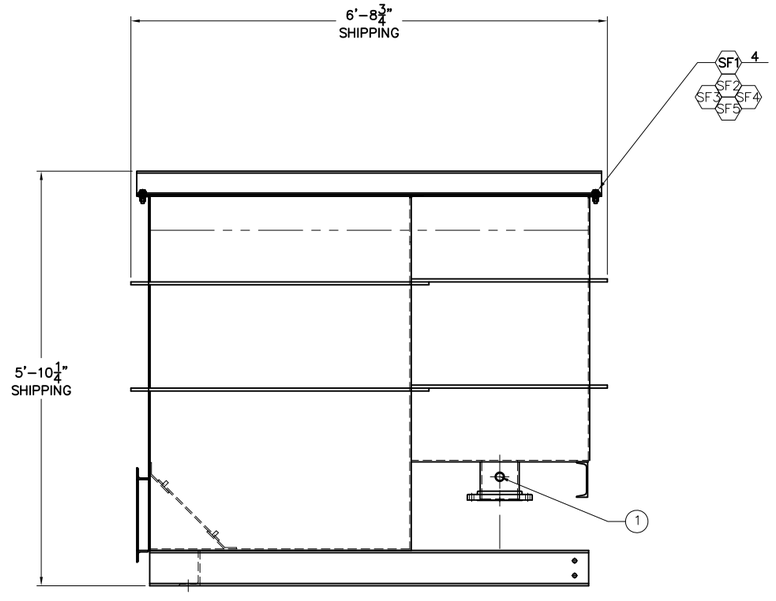
PROJECT NO. 7706

7706-01-A04-0

CONTACT MONROE ENVIRONMENTAL AT 800-992-7707 OR SALES@MON-ENV.COM FOR PRICING AND AVAILABILITY
MATERIAL IS FOR ONE

MKD	QTY	DESCRIPTION	WEIGHT
A05A	1	MIXER/ FLOCCULATION TANK ASSEMBLY/ SHIPPING	1730
W08A	1	MIX/ FLOCCULATION TANK	1575
W11A	1	MIXER SUPPORT	110
W08B	1	BAFFLE PLATE	45
SF1	4	1/2 X 2" 18-8 SS HHCS	–
SF2	4	1/2" 18-8 SS FLAT WASHER	–
SF3	4	1/2" 18-8 SS SPRING-LOCK WASHER	–
SF4	4	1/2" 18-8 SS HEX NUT	–
SF5	4	1/2" 18-8 SS BEVEL WASHER	–
1	1	3/4" NPT PIPE PLUG, 304 SS	–
2	6	0.094"Ø HAIRPIN FOR 1/2" SHAFT, 18-8 SS	–





1-REQD-A05A
MIXER/FLOCCULATION TANK ASSEMBLY/ SHIPPING

AS BUILT
6/20/19

FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED
0 FT ≤ 10 FT ±1/8 — 0 mm ≤ 3000 mm ±3.5 mm
10 FT ≤ 20 FT ±1/8 — 3000 mm ≤ 6000 mm ±6 mm
> 20 FT ±2/8 — > 6000 mm ±6.5 mm
STRUCTURAL STEEL TOLERANCES PER AISC

MACHINING TOLERANCES
UNLESS OTHERWISE SPECIFIED
ANGULAR ±1 (0.030) — 1 PLACE DECIMAL INCHES ±0.1 INCHES (±2.5 mm)
SURFACE FINISH — 125 MICROINCHES — 2 PLACE DECIMAL INCHES ±0.01 INCHES (±0.25 mm)
3 PLACE DECIMAL INCHES ±0.001 INCHES (±0.025 mm)

CAUTION
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REV	CHANGE	DRW	DATE	CKD	DATE	APP	DATE
0	AS BUILT	DAS	6/20/19	DS	6/20/19	DS	6/20/19

MONROE ENVIRONMENTAL CORPORATION
MONROE, MICHIGAN

TITLE
MIXER/FLOCCULATION TANK
SHIPPING ASSEMBLY

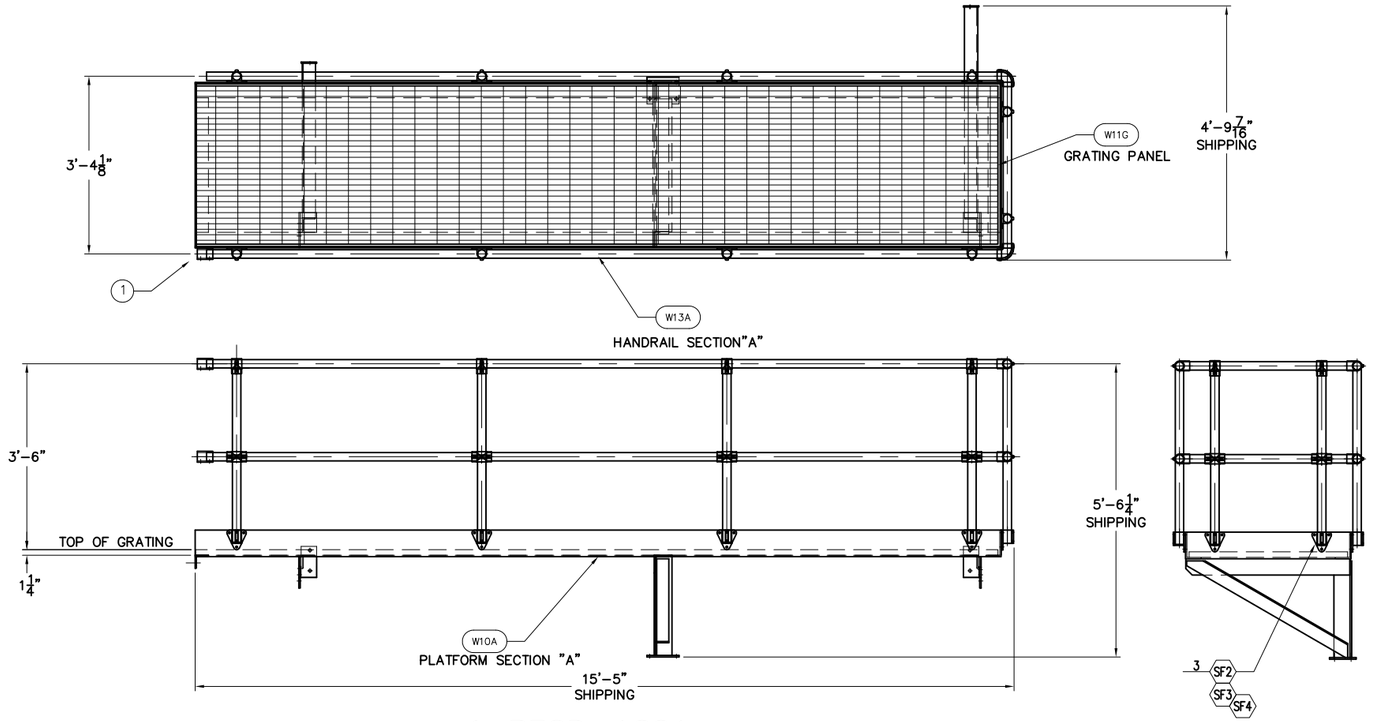
7706-01-A05-0

CROW WING CO. LANDFILL / BRAINERD, MN

DRAWING NO.
7706-01-A05-0

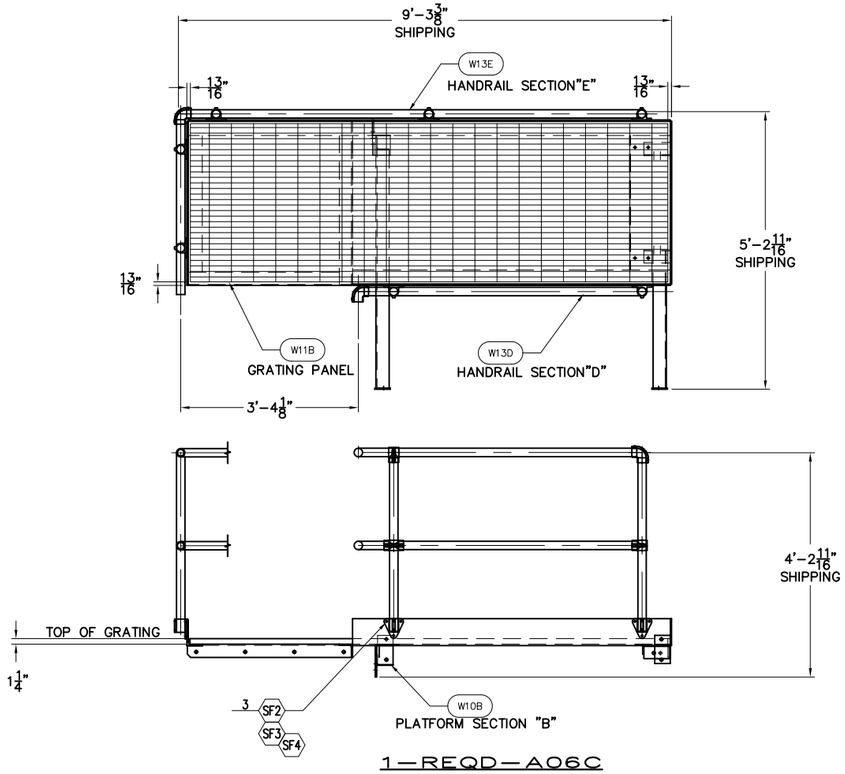
SCALE
D 1=12

PROJECT NO.
7706-1



1—REQD—A06A

PLATFORM ASSEMBLY "A"



1—REQD—A06C

PLATFORM ASSEMBLY "C"

CONTACT MONROE ENVIRONMENTAL AT 800-992-7707 OR SALES@MON-ENV.COM FOR PRICING AND AVAILABILITY
MATERIAL IS FOR ONE

MKD	QTY	DESCRIPTION	WEIGHT
A06A		PLATFORM ASSEMBLY/ SHIPPING "A"	466
W10A	1	PLATFORM SECTION "A"	92
W13A	2	HANDRAIL SECTION "A"	230
W11G	1	GRATING PANEL	144
			–
SF1	10	316 SS GRATING CLIPS, McNICHOLS #60RSSGC1C9	–
SF2	30	3/8-16 X 1-1/2" LG HHCS 18-8	–
SF3	30	3/8" FLAT WASHER 18-8	–
SF4	30	3/8-16 HEX NUT 18-8	–
			–
1	2	SLIP-ON COUPLING, McMASTER # 4698T12	–
			–
A06C		PLATFORM ASSEMBLY/ SHIPPING "C"	414
W10B	1	PLATFORM SECTION "B"	275
W13D	1	HANDRAIL SECTION "D"	12
W13E	1	HANDRAIL SECTION "E"	40
W11B	1	GRATING PANEL	87
			–
SF1	6	316 SS GRATING CLIPS, McNICHOLS #60RSSGC1C9	–
SF2	21	3/8-16 X 1-1/2" LG HHCS 18-8	–
SF3	21	3/8" FLAT WASHER 18-8	–
SF4	21	3/8-16 HEX NUT 18-8	–

NOTE:
PLACEMENT OF GRATING CLIPS SF1 BY SHOP TO SUIT.

AS BUILT
6/20/19

REV	CHANGE	DRW	DATE	CKD	DATE	APP	DATE
0	AS BUILT	DAS	6/20/19	DS	6/20/19	DS	6/20/19

FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED
0 FT ≤ 10 FT ±1/8 — 0 mm ≤ 3000 mm ±1.5 mm
10 FT ≤ 20 FT ±1/4 — 3000 mm ≤ 6000 mm ±6 mm
> 20 FT ±3/16 — > 6000 mm ±4.5 mm
STRUCTURAL STEEL TOLERANCES PER AISC

MACHINING TOLERANCES
UNLESS OTHERWISE SPECIFIED
ANGULAR ± 1 DEGREE — 1 PLACE DECIMAL INCHES ±0.1 INCHES (±2.5 mm)
SURFACE FINISH — 125 MICROINCHES — 2 PLACE DECIMAL INCHES ±0.01 INCHES (±0.25 mm)
3 PLACE DECIMAL INCHES ±0.005 INCHES (±0.013 mm)

CAUTION
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MONROE ENVIRONMENTAL CORPORATION
MONROE, MICHIGAN

TITLE
PLATFORM/ HANDRAIL
ASSEMBLY/ SHIPPING SECTIONS

CROW WING CO. LANDFILL / BRAINERD, MN

SCALE D 1=16

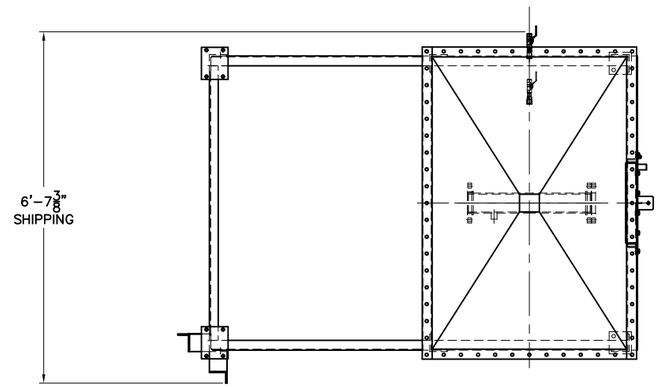
PROJECT NO. 7706-1

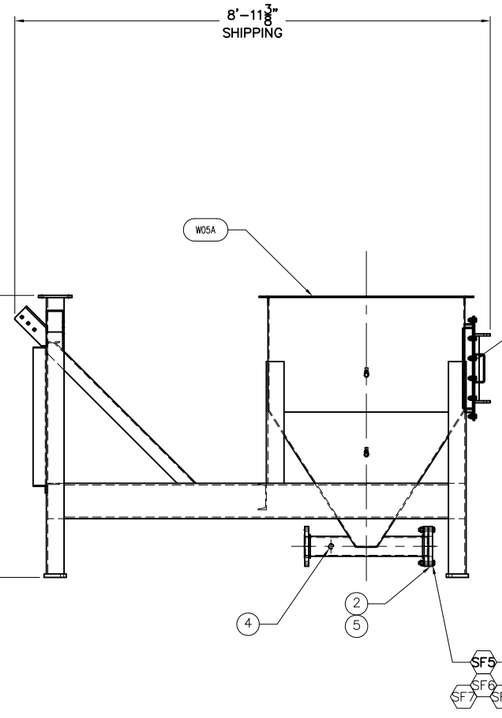
DRAWING NO. 7706-01-A06-0

7706-01-A06-0

CONTACT MONROE ENVIRONMENTAL AT 800-992-7707 OR SALES@MON-ENV.COM FOR PRICING AND AVAILABILITY
MATERIAL IS FOR ONE

MKD	QTY	DESCRIPTION	WEIGHT
A07A		SLUDGE HOPPER ASSMBLY/SHIPPING	1880
W05A	1	SLUDGE HOPPER	1850
SF5	8	5/8" X 3 1/4" HHCS, 18-8 SS	–
SF6	8	5/8" FLAT WASHER, 18-8 SS	–
SF7	8	5/8" SPRING-LOCK WASHER, 18-8 SS	–
SF8	8	5/8" HEX NUT, 18-8 SS	–
A02N	2	1/2" NPT 316 SS BALL VALVE (REF. A02)	–
2	1	4" 150# BLIND FLANGE, 304L STAINLESS STEEL	–
3	2	1/2" 304 SS NPT PIPE NIPPLE X 2" LG	–
4	1	3/4" 304 SS NPT PIPE PLUG	–
5	1	GASKET, PIPE FLANGE, 4", 1/16" THICK PTFE	–





1—REQD—A07A
SLUDGE HOPPER ASSEMBLY

AS BUILT
6/20/19

FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED
0 FT ≤ 10 FT ±1/8 — 0 mm ≤ 3000 mm ±1.5 mm
10 FT ≤ 20 FT ±1/8 — 3000 mm ≤ 6000 mm ±6 mm
> 20 FT ±3/16 — > 6000 mm ±4.5 mm
STRUCTURAL STEEL TOLERANCES PER AISC
MACHINING TOLERANCES
UNLESS OTHERWISE SPECIFIED
ANGULAR ± 1 DEGREE — 1 PLACE DECIMAL INCHES ±0.1 INCHES (±2.5 mm)
SURFACE FINISH — 125 MICROINCHES — 2 PLACE DECIMAL INCHES ±0.01 INCHES (±0.25 mm)
3 PLACE DECIMAL INCHES ±0.001 INCHES (±0.025 mm)
CAUTION
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REV	CHANGE	DRW	DATE	CKD	DATE	APP	DATE
1	AS BUILT	DAS	6/20/19	DS	6/20/19	DS	6/20/19
0	ISSUED FOR CONSTRUCTION	DAS	5/7/19	DS	5/7/19	DS	5/7/19

MONROE ENVIRONMENTAL CORPORATION
MONROE, MICHIGAN

TITLE
SLUDGE DISCHARGE HOPPER
SHIPPING ASSEMBLY

CROW WING CO. LANDFILL / BRAINERD, MN

DRAWING NO.
7706-01-A07-1

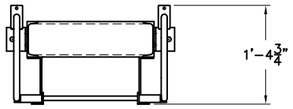
SCALE
D 1=16

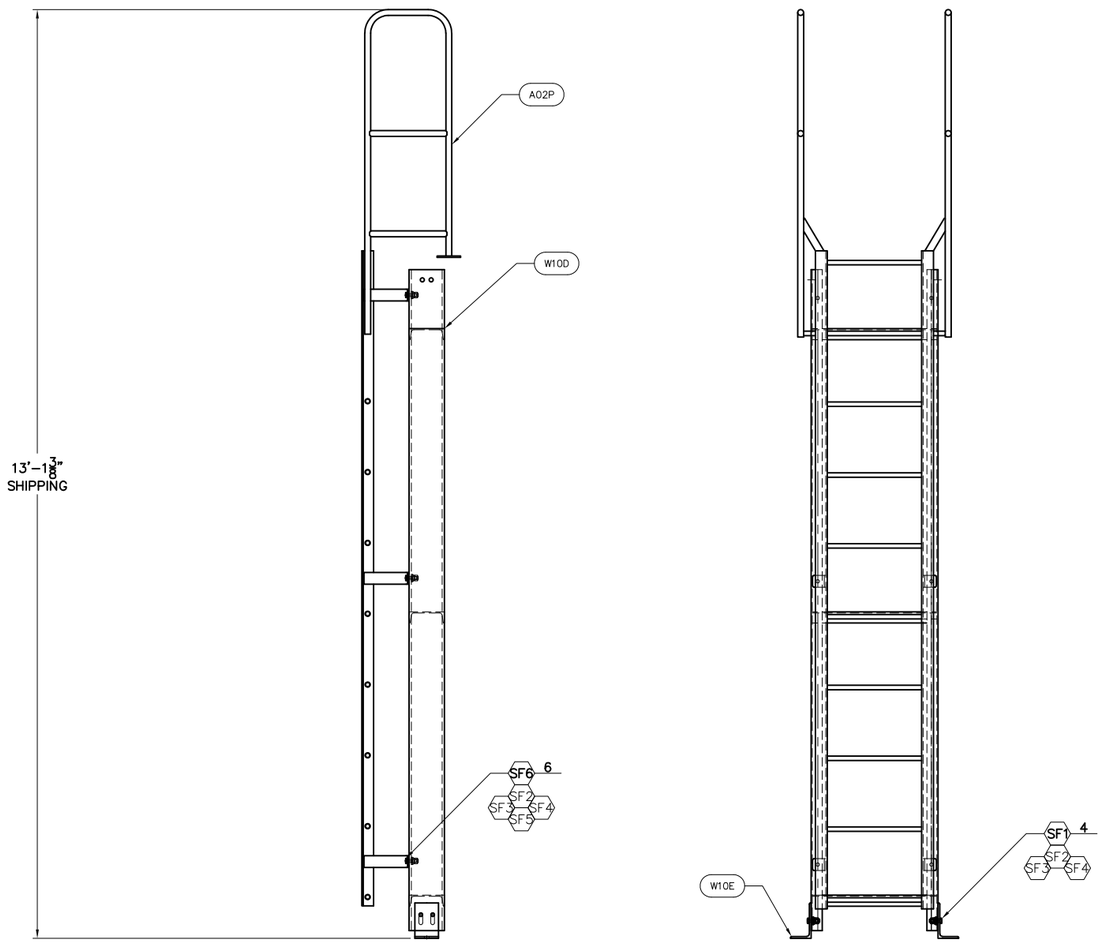
PROJECT NO.
7706-1

7706-01-A07-1

CONTACT MONROE ENVIRONMENTAL AT 800-992-7707 OR SALES@MON-ENV.COM FOR PRICING AND AVAILABILITY
MATERIAL IS FOR ONE

MKD	QTY	DESCRIPTION	WEIGHT
A08A		LADDER ASSEMBLY	450
W10D	1	PLATFORM SUPPORT	200
W10E	2	SUPPORT ANGLE	10
SF1	4	1/2-13 X 1 1/2" 304 SS HHCS	–
SF2	10	1/2" FLAT WASHER, 304 SS	–
SF3	10	1/2" SPRING-LOCK WASHER, 304 SS	–
SF4	10	1/2" HEX NUT, 304 SS	–
SF5	6	1/2" 304 SS BEVEL WASHER	–
SF6	6	1/2-13 X 1 3/4" 304 SS HHCS	–
A02P	1	F10W FIXED WALKTHRU LADDER (REF. A02)	225





1-REQD-A08A
LADDER ASSEMBLY

AS BUILT
6/20/19

REV		DRW	DATE	CKD	DATE	APP	DATE
0	AS BUILT	DAS	6/20/19	DS	6/20/19	DS	6/20/19
REV	CHANGE	DRW	DATE	CKD	DATE	APP	DATE

FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED

0 FT ≤ 10 FT ±1/16	0 mm ≤ 3000 mm ±1.5 mm
10 FT ≤ 20 FT ±3/16	3000 mm ≤ 6000 mm ±5 mm
> 20 FT ±3/16	> 6000 mm ±4.5 mm

STRUCTURAL STEEL TOLERANCES PER AISC

MACHINING TOLERANCES
UNLESS OTHERWISE SPECIFIED

ANGULAR ± 1° 0'0"	1 PLACE DECIMAL INCHES ±0.1 INCHES (±2.5 mm)
SURFACE FINISH –	2 PLACE DECIMAL INCHES ±0.01 INCHES (±0.25 mm)
125 MICROINCHES	3 PLACE DECIMAL INCHES ±0.001 INCHES (±0.025 mm)

CAUTION
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"NF" INDICATES NOT FURNISHED BY M.E.C.
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MONROE ENVIRONMENTAL CORPORATION
MONROE, MICHIGAN

TITLE
LADDER ASSEMBLY

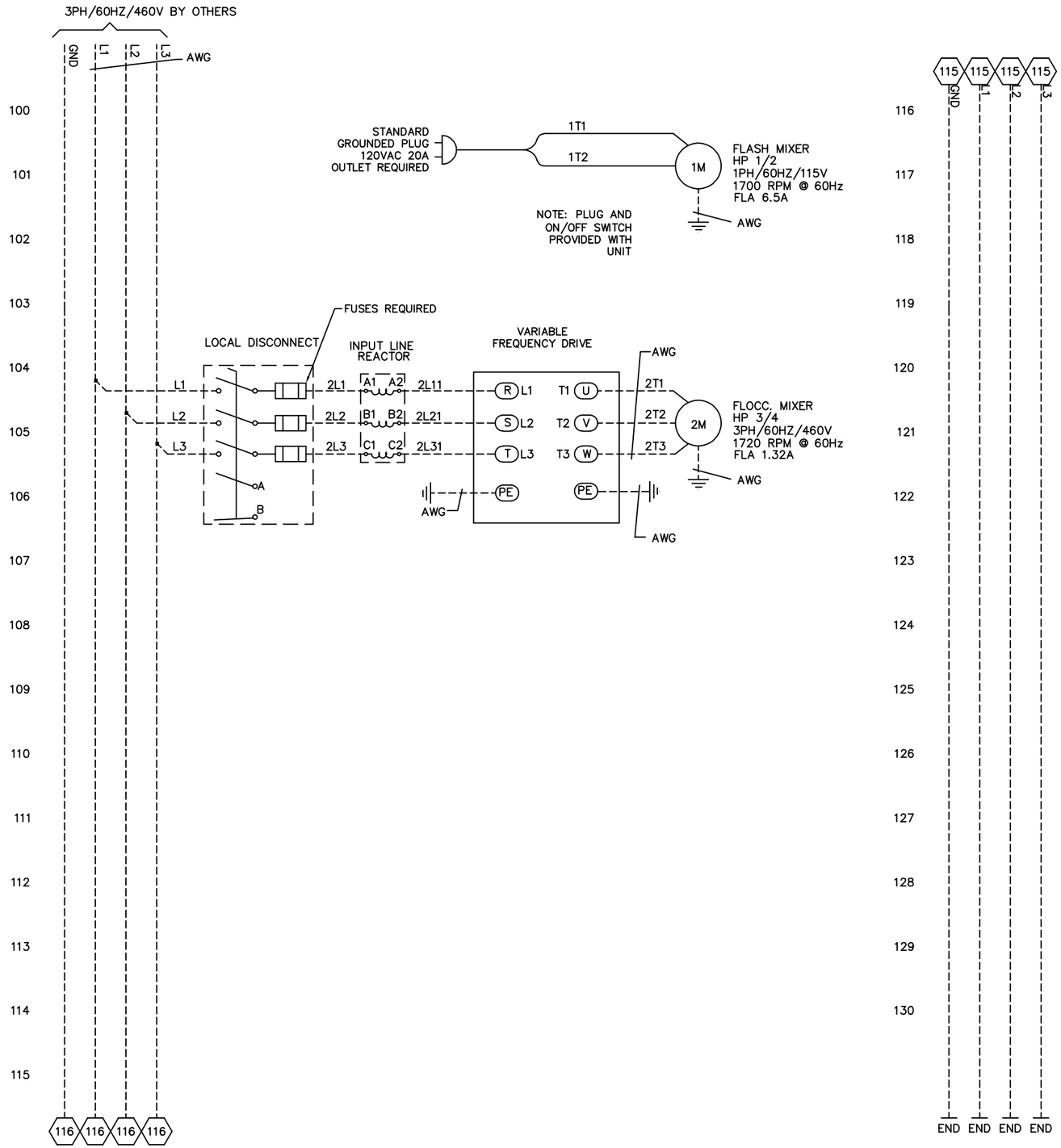
7706-01-A08-0

CROW WING CO. LANDFILL / BRAINERD, MN

DRAWING NO.
7706-01-A08-0

SCALE
D 1=12

PROJECT NO.
7706-1



NOTES:

1. ⌜ ⌝ ⌞ ⌟ INDICATES ITEMS NOT PROVIDED BY MONROE ENVIRONMENTAL.
2. ——— INDICATES WIRING BY MONROE EVIRONMENTAL.
3. – – – – INDICATES FIELD WIRING NOT BY MONROE ENVIRONMENTAL.

AS BUILT

REV	CHANGE	DRW	DATE	CKD	DATE	APP	DATE
1	UPDATED MOTOR INFORMATION	RNS	06/26/19	DAS	06/26/19	RC	06/26/19
0	ISSUED FOR CONSTRUCTION	DAS	6/21/19	DAS	6/21/19	RC	6/21/19

FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED
0 FT ≤ 10 FT ±1/16 — 0 mm ≤ 3000 mm ±1.5 mm
10 FT ≤ 20 FT ±3/16 — 3000 mm ≤ 6000 mm ±4 mm
> 20 FT ±3/16 — > 6000 mm ±4.0 mm
STRUCTURAL STEEL TOLERANCES PER AISC

MACHINING TOLERANCES
UNLESS OTHERWISE SPECIFIED
ANGULAR (A.T.S.0000) 1 PLACE DECIMAL INCHES ±0.1 INCHES (±2.5 mm)
SURFACE FINISH – 125 MICROINCHES 2 PLACE DECIMAL INCHES ±0.01 INCHES (±0.25 mm)
3 PLACE DECIMAL INCHES ±0.001 INCHES (±0.025 mm)

CAUTION
WHEN INSTALLING, OPERATING, OR SERVICING EQUIPMENT, ALWAYS REFER TO INSTALLATION, OPERATING, AND MAINTENANCE MANUAL FOR SAFETY PRECAUTIONS.

"NF" INDICATES NOT FURNISHED BY M.E.C.
DO NOT SCALE USE DIMENSIONS ONLY
DO NOT USE FOR CONSTRUCTION UNLESS APPROVED ABOVE

MONROE ENVIRONMENTAL CORPORATION
MONROE, MICHIGAN

TITLE
105 GPM VERTICAL CLARIFIER, VC-300
460V POWER WIRING

HUSQVARNA / MCRAE, GA

SCALE: NONE
PROJECT NO.: 7706-1
DRAWING NO.: 7706-01-E01-1

7706-01-E01-1

Appendix D

Failure Reporting & Warranty Information

MONROE ENVIRONMENTAL
Liquid Clarification & Air/Gas Cleaning Systems

810 West Front Street, Monroe, MI 48161
Phone: 800.992.7707 Fax: 734.242.5275

FAILURE REPORT

FR No._____ (to be assigned by Engineering)
Reference Feedback Number_____if applicable (to be assigned by Sales)

Customer _____ Date _____ Page 1 of _____

Address _____ Job Number _____

_____ Equip. Description _____

Contact(s) _____ Equip. Serial No. _____

Phone _____ Equip. Location _____

Fax _____ Part Number _____

E-mail _____ Number attached pages _____

Name of preparer: _____

FAILURE DATA

Time On Machine: _____

Root Cause/Failure Mode: _____

Failure Effect: _____

Environmental Observances (ambient, roof, outside, etc.): _____

Immediate Corrective Action: _____

Remove and Replace Time: _____

Description of failure: _____

FOR INTERNAL USE:

Permanent Corrective Action: _____

Responsible Department: _____

Date: _____

Failure Class: ☐ minor ☐ major ☐ hazardous

Warranty: yes/no

MONROE ENVIRONMENTAL
Liquid Clarification & Air/Gas Cleaning Systems

Certificate of Warranty

Effective Dates: 6/25/2019 through 6/25/2020

Serial Number:	**19-7706-1**	**Shipped To:**	**Crow Wing Co. Landfill**
Job Number:	**7706**		**157285 Highway 210**
Equipment Description:	**105 GPM VC-300**		**Brainerd, MN 56401**
PO Number:	**0056**	**End User:**	**Crow Wing Co. Landfill**

Monroe Environmental warrants the equipment against defects in workmanship and material for a period of 12 months after delivery. The 12-month warranty is for parts only and does not include freight; if a technician were required it would be at an additional charge. Monroe is not liable for production, downtime or incidental(s) costs. This warranty does not cover corrosion or failures that result from process or operational variations that are unknown, undocumented, unforeseen, or unverifiable prior to the purchase of the equipment.

In the event of a component failure, complete the "Failure Report" located in the General Maintenance section of the Installation, Operation and Maintenance Manual and submit to Monroe Environmental Corporation either by fax: 734-242-5275 or by mail to: 810 West Front Street, Monroe, MI 48161; Attention: Reliability Engineer. For technical assistance, please call Monroe Environmental Corporation at 1-800-992-7707.

Authorized Monroe Environmental Corporation Signature: *Debbie Machnak* Date: 6/25/2019