VIBRATORY SPIRAL ELEVATOR

GENERAL: *The General Kinematics' vibratory equipment is custom engineered to suit a particular requirement. General Arrangement Drawings are provided for each job and show all dimensions, recommended clearances and foundation supports required for the satisfactory installation and operation of the vibratory equipment.*

Before shipping, the units are completely assembled and test run. Care should be taken when unloading and installing the unit in position.

TABLE OF CONTENTS

SAFETY

GENERAL

Safety i*s a basic factor that must be considered at all times during the installation, operation and maintenance of mechanical equipment. Through the use of proper tools, clothing and procedures, serious injury and property damage can be prevented. Any accident regardless of the situation is generally the result of someone's carelessness or neglect. No amount of instruction or training can replace common sense, sound judgment and acceptable work habits. A few general safety precautions are listed below. Study each of them carefully, being certain that all personnel installing, operating and maintaining General Kinematics' equipment are familiar with them.* **FAILURE TO DO SO COULD RESULT IN SERIOUS PERSONAL INJURY AND/OR PHYSICAL DAMAGE.**

1. ***ALWAYS*** refer to the General Kinematics' General Arrangement Drawing/s and Service Manuals for complete installation, operation and maintenance procedures.
2. ***DO NOT*** use General Kinematics' equipment for any use other than that for which it is intended. If any questions arise, refer to General Kinematics' General Arrangement Drawing/s or contact the manufacturer.
3. ***DO NOT*** operate vibratory equipment until the unit is properly installed. Also before operating the equipment ensure that the path of material flow is clear of any obstructions, all operation personnel are standing clear of the equipment, **ALL** *shipping braces* have been removed and the equipment has been fully checked for loose bolts, etc.
4. ***NEVER*** operate the equipment without all required safety device in position and operable. Any caution and warning stickers affixed to the equipment should remain in plain view of operating and maintenance personnel.
5. ***NEVER*** walk, sit, lean or perform any maintenance on or under the troughs (pans), covers, grid sections, or any portion of the equipment while the unit is in operation or is not in the ***"ZERO MECHANICAL STATE."*** (*All power to the complete system is turned off and* ***LOCKED OUT***, *pneumatic/hydraulic lines are* **relieved** *of* ***ALL*** *pressure,* ***ALL*** *Safety Stops in position, etc.)*
6. ***NEVER*** place hands or feet in any equipment openings until the equipment has completely come to rest and electric power has been locked out.
7. ***BEFORE*** performing **any** maintenance ensure that the unit is in its **"ZERO-MECHANICAL STATE"** *(All power to the complete system is turned off and LOCKED OUT, pneumatic/hydraulic lines are* **relieved** *of* ***ALL*** *pressure,* ***ALL*** *Safety Stops in position, etc.)*
8. ***ALWAYS*** provide the necessary protective clothing for operating personnel if the conveying material has a tendency to splash out of the unit's trough.
9. ***ALWAYS*** have a clear view of the material loading and unloading points on the equipment as well as immediate access to all emergency stop and safety devices for the equipment.
10. ***DO NOT*** allow the accumulation of rubbish, tools, discarded parts, or any other material to clutter the path of material flow. Keep the area around and under the equipment free of spilled material or debris.
11. ***ALWAYS*** regularly check for any signs of corrosion or excessive wear on the wire rope and safety cables which are required on all suspension mounted units. All cable clips should be regularly checked for tightness to prevent slippage.
12. ***ALWAYS*** make periodic checks of all electric motor cables for wear or damage. All ground (earth) wires should be securely and properly fastened.

SAFETY DEVICES: Equipment and Machinery supplied by General Kinematics is provided with various safety measures and devices, which may include, but are not limited to guards, safety rails, safety controls, emergency stops and monitoring circuits. Purchaser/User is responsible for the continued use and maintaining of these safety measures and devices in proper working condition without modification and to provide and install any additional safety features required by health and safety laws that apply to the user or otherwise. In the event Purchaser/User fails to maintain such safety features and in proper working condition and in place on General Kinematics equipment, then the Purchaser/User is responsible for any and all claims, judgments and expenses, including legal fees, resulting from, or incidental to, any injuries or claimed injuries to persons or property resulting from or claimed to result from, an accident or damage to health caused during the installation, operation or maintenance of General Kinematics equipment and attributable, directly or indirectly, to the absence or malfunction of such measures or devices. General Kinematics cannot be held responsible for any accident or health damage that occurs due to:
-hazards created by the use of the machine beyond the controls of the manufacturer, -where the equipment is not installed or used in accordance with the General Kinematics manual, -where the equipment is not properly maintained in accordance with the General Kinematics manual, -the safeguards provided are removed or modified without the approval by General Kinematics, -the equipment or its intended use is modified without approval of General Kinematics.

INSTALLATION and MAINTENANCE HINTS

CAUTION!	*LOCKOUT electric power to the equipment, read **ALL** Safety Notes **before** operating the unit and **before** performing **any** maintenance.*

1. Install the unit exactly as shown on the certified **GENERAL ARRANGEMENT DRAWING/S.** Note clearances required. ***REMOVE** ALL red shipping braces.*

2. Allow clearances around the unit as recommended on the **GENERAL ARRANGEMENT DRAWING/S.** The unit should be free and clear of any stationary skirts, hoppers, hoods, etc., both empty and under load.

3. **ELECTRICAL CONNECTION:** Be sure that the motor is connected for the proper voltage and that the ground wires are properly fastened. There must be slack in electrical cable leading from the drive/s, and care must be taken to prevent the cable from contacting drive covers or stationary steel. Refer to **ELECTRICAL CABLE INSTALLATION REQUIREMENTS** page for proper installation of electrical cables. If the unit was in storage, check the motor maintenance section in this manual for possible motor testing before energizing the motor.

4. **ROTATION:** For units with **one motor**, the motor rotation is not critical; however, one direction may provide better material flow than the other. Best rotation direction must be determined by trial and error. For **two motor** units, Refer to the General Arrangement Drawing for the proper rotation directions.

5. It is important that all bolts inside and outside the unit remain tight. Occasionally, as a normal maintenance operation, all bolts on the unit should be checked and tightened on a quarterly basis. Refer to the applicable **"TORQUE CHART/S"** in this manual for proper torque values.

6. The unit should operate at a low noise level. If unusual sounds are observed near the unit, all bolts and clearances should be checked. If noise continues, notify *General Kinematics' Engineering Department* for instructions.

	USA		EUROPE
Phone	815.455.3222	Phone	+49 (0) 211 542250 10
Fax	815.479.9102	Fax	+49 (0) 211 542250 15

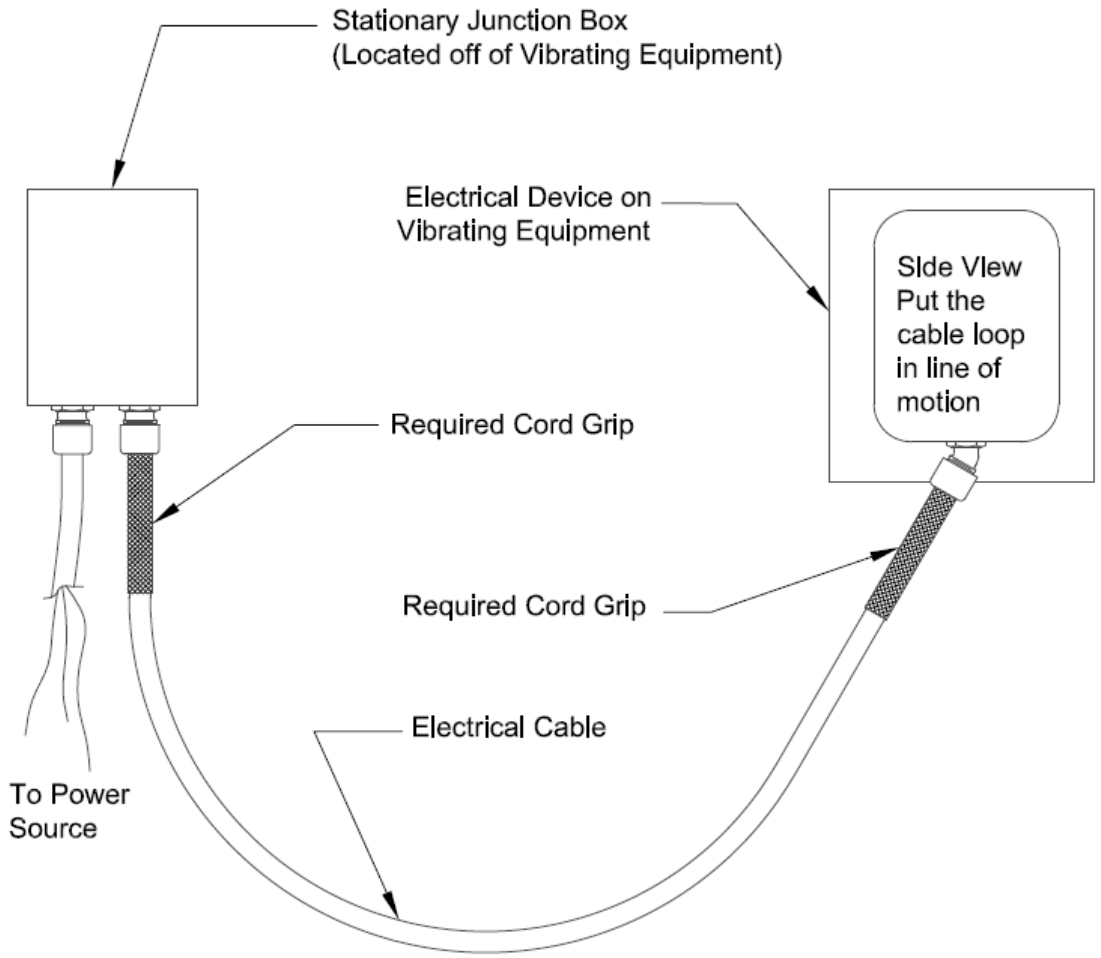
7. **LUBRICATION:** The motor, on the unit, generally is the only item requiring lubrication. Refer to the **MOTOR TAB SECTION** for lubrication requirements and the **TABLE OF CONTENTS** for possible additional items that might require lubrication.

8. **MATERIAL FLOW CAPACTIY:** If maximum capacity range is not satisfactory, then contact *General Kinematics' Engineering Department.* ***See phone numbers listed above.***

9. After 24 to 48 hours of initial running time, check the unit for loose bolts and tighten per the **"TORQUE CHART/S"** in this manual. If any loose hardware is found repeat torque sequence after an additional 24 hours of operation.

10. **SPARE PARTS:** Part should be kept on hand at all times. See the **"Spare Parts List/s"** for recommendations.

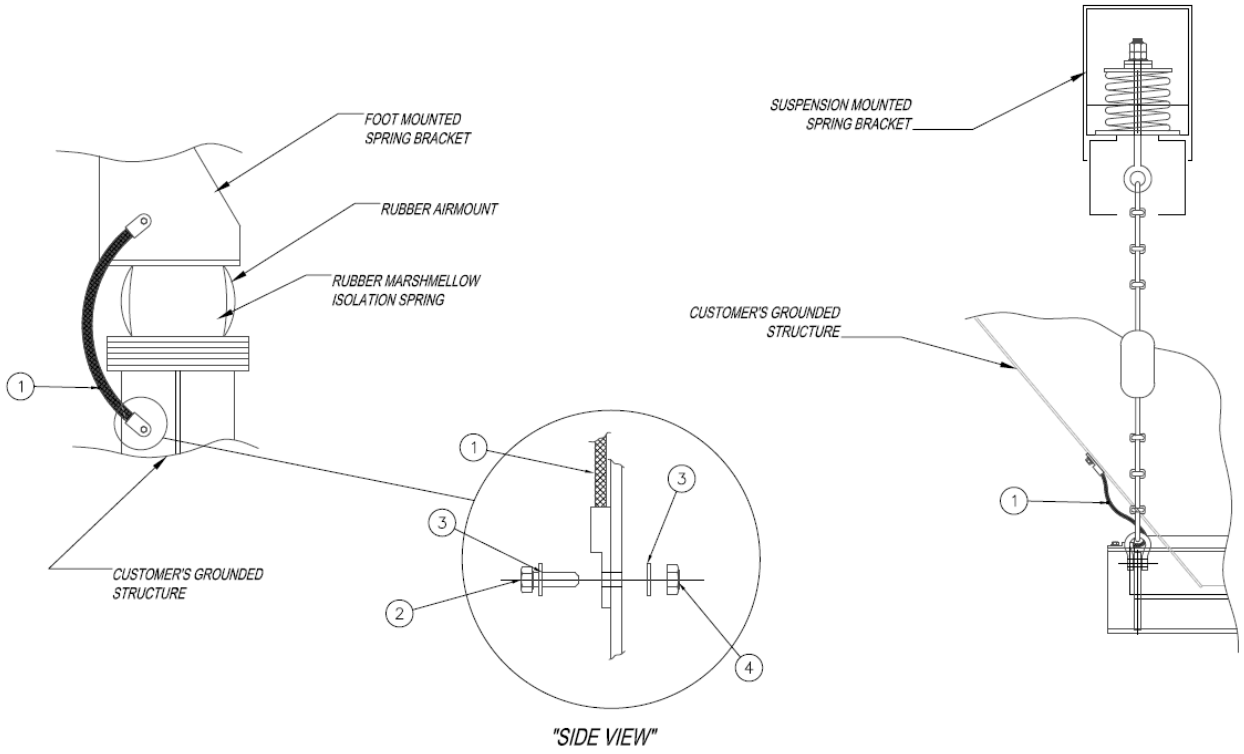
ELECTRICAL CABLE INSTALLATION REQUIREMENTS



CAUTION!	*LOCKOUT electric power to the equipment, read **ALL** Safety Notes **before** operating the unit and **before** performing **any** maintenance. Make periodic checks of ALL electrical cables to ensure that the cables remain free hanging for the Vibrating Electrical Device to the Stationary Junction Box. Check for any wear or damage.*

- Electrical Device/s must be installed and wired per the instructions on the General Arrangement Drawings and/or in this manual. (Some installation and wiring instructions may be vendor supplied)
- Be sure that the Electrical Cable is connected for the correct voltage and that the ground (earth) wires are properly fastened.
- The Electrical Device is to be wired to a **Stationary Junction Box** located **off** of the Vibrating Equipment, then wired from the Stationary Junction Box to the power source. See illustration above.
- Loop the cable allowing enough slack for the full movement of the Vibrating Equipment. The Electrical Cable **MUST NOT** at any time come in contact with the vibrating equipment, stationary steel and any surface or damage to the cable will occur. A damaged cable can cause fatal electrical shock to personnel and damage to the Electrical Device.

GROUND STRAP



PART	DESCRIPTION
1	*GROUNDING STRAP*
2	*HEX HEAD CAP SCREW*
3	*FLAT WASHER*
4	*LOCKNUT*

CAUTION!

To prevent possible electrical shock and/or machinery (motor) damage, a grounding strap is required whenever a rubber type isolation spring is used, such as a marshmallow spring, air bag on suspended units. In general any installation that interrupts metal continuity between the unit and supporting structure requires a grounding strap.

GROUND STRAP REPLACEMENT:

CAUTION!	*LOCKOUT electric power to the equipment, read **ALL** Safety Notes **before** operating the unit and **before** performing **any** maintenance.*

1. Mating surfaces to be free of corrosion, rust or any foreign matter to insure good metal to metal continuity.
2. Make sure that there is slack in the grounding strap to compensate for the up and down motion of the unit while the unit is running with and without material load.
3. Fasteners should be checked periodically for tightness, also periodically check for corrosion build up between the strap and grounding structure.

WEEKLY INSPECTION

WEEKLY MAINTENANCE INSPECTIONS SHOULD BE PERFORMED TO THE UNIT TO HELP ENSURE PEAK PERFORMANCE and HELP PREVENT PREMATURE DOWN TIME.
Listed below are the inspection items to be performed on a weekly basis.

1. CHECK STROKE OF UNIT

The stroke of the unit is the **key** performance indicator. Being above or below the design stroke will result in an unsatisfactory conveying speed of the media being moved. Stroking **above** the design stroke will damage the unit; stroking **below** the design stoke will result in a low conveying speed and in some cases cause damage to the unit**.** Refer to the **STROKE** PLATE page as referenced in the "Table of Contents," which explains *"How to read a Stroke Plate."* The required stroke of the unit should be listed on one of the General Arrangement Drawings. If the stroke of the units is not listed on of the General Arrangement Drawings then call General Kinematics' Engineering Department:

USA		EUROPE	
PHONE	815.455.3222	PHONE	+49 (0) 211 542250 10
FAX	815.479.9102	FAX	+49 (0) 211 542250 15

2. WALK AROUND

During the "Walk Around," visually inspect the entire unit, also listen for unusual sounds. Visually look for the following:

a. All Safety Devices in position and operable. Caution and Warning Stickers are in place and in clear view.

b. Excessive wear on items such as flexible boots, electrical motor cables, suspension cables, air hoses etc.

c. Material is conveying evenly. Refer to the "**TROUBLE SHOOTING GUIDE**" in this manual for possible causes if the material is not conveying properly.

d. Material build-up / obstruction in trough.

During the "Walk Around" **listen** for UNUSUAL noise. The unusual noise can be caused by: Broken or loose bolts, broken springs or loose bolts securing springs, broken rocker leg or loose bolts securing rocker legs, unit hitting stationary steel. Refer to the "**TROUBLE SHOOTING GUIDE**" for additional *Possible Causes* of noise.

-NOTE To achieve proper torque values, before tightening loose bolts, check bolts for thread damage, replace bolt if damage has occurred.

3. FASTENER TIGHTNESS

Check all fasteners to ensure that they are tightened to the proper torque value. After initial torque sequence is verified (see installation and maintenance hints) check quarterly.

4. LUBRICATION

Ensure that all items requiring lubrication are lubed at the proper time intervals and grease amounts.

5. DRIVE INSPECTION

a. Check for excessive wear on the Drive Belt/s.

b. Check for proper alignment and tension of the Drive Belt/s.

c. Check that sheaves/ sprockets are secured and positioned properly on the Drive Shaft.

STROKE PLATE

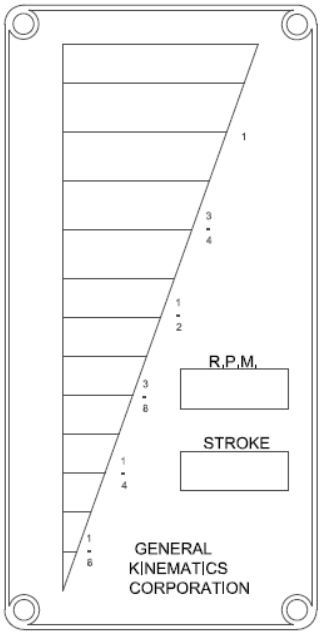


FIGURE "A"

Stationary

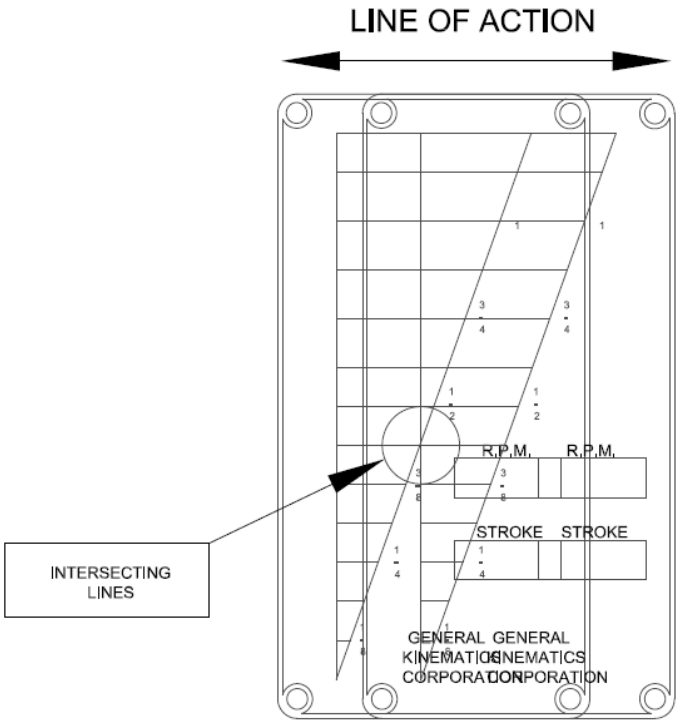


FIGURE "B"

Operating

STROKE PLATE

PLEASE NOTE: - The following information only explains ***how to*** read a stroke plate, **not** the stroke requirement of your unit.

The vibration amplitude or stroke of the trough (pan) is the indicator of the unit's performance. Check the stroke of the unit periodically to ensure it is operating at the intended stroke. The stroke varies for each unit depending upon its application. In most cases the required stroke will be shown on one of the General Arrangement Drawings; if not, then contact the General Kinematics' Engineering Department.

USA		EUROPE	
Phone	815.455.3222	Phone	+49 (0)211 542250 10
Fax	815.479.9102	Fax	+49 (0)211 542250 15

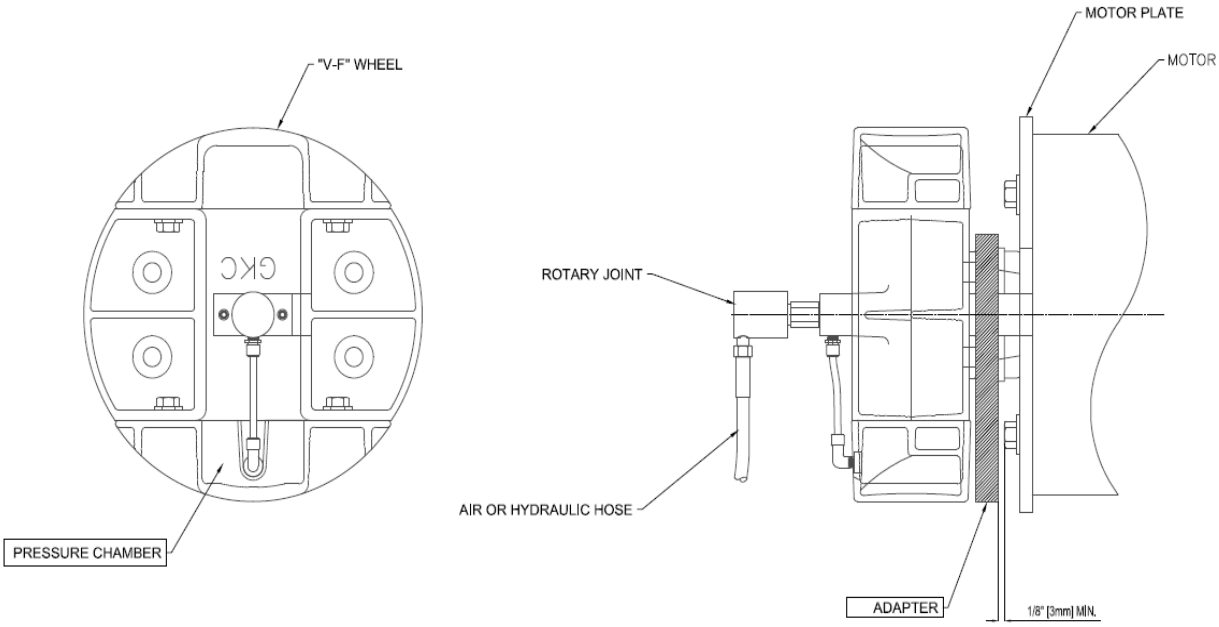
READING THE STROKE PLATE

The stroke Plate is located on the side of the trough and approximately mid-span of the length. When the trough (pan) is vibrating the stroke appears as a double image. See sample reading in – FIGURE "B" which illustrates this double image and shows intersecting lines at 7/16". **(**Note **LINE OF ACTION)**. A **larger** stroke will show the intersecting lines ***above*** 7/16" and a smaller trough stroke will show the intersecting line ***below*** 7/16".

Whenever the trough stroke is found to be either below or above the Design Stroke, the unit will not function properly, this under or over stroking condition can also cause damage to the unit.

"V-F" COUNTERWEIGHT WHEEL

CAUTION! *LOCKOUT electric power to the equipment, read **ALL** Safety Notes **before** operating the unit and **before** performing **any** maintenance.*



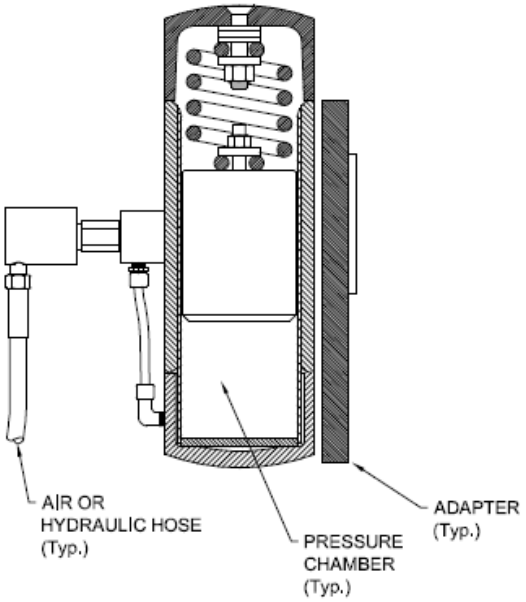
ARRANGEMENT FOR MAX. FEED RATE AT "0" P.S.I.

PRESSURE CHAMBER ADJACENT TO ADAPTER

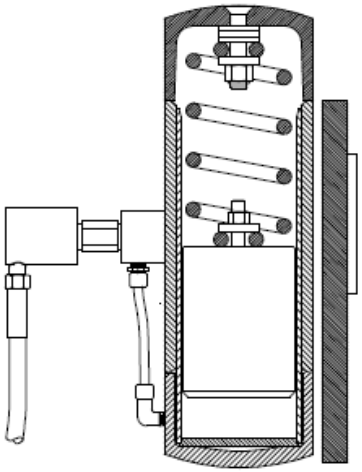
NOTE: REFER TO THE GENERAL ARRANGEMENT DRAWINGS FOR MAX. PSI VALUE

"V-F" COUNTERWEIGHT WHEEL
MAXIMUM FEED RATE "0" P.S.I.

Note ► Pressure Chamber adjacent to Adapter
Refer to General Arrangement Drawings

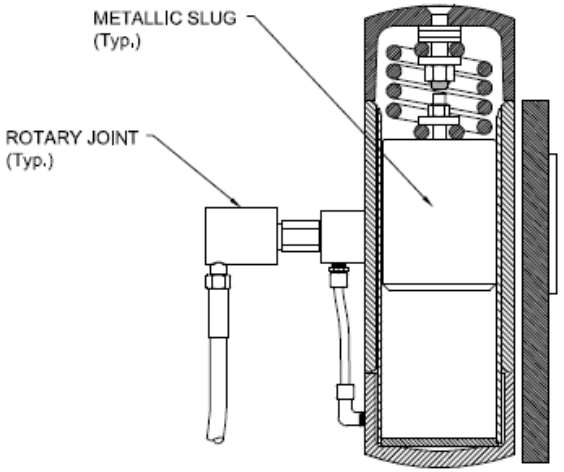


STATIC



ROTATING - No Pressure

MAX. Un-Balanced
MAX. Exciting Force



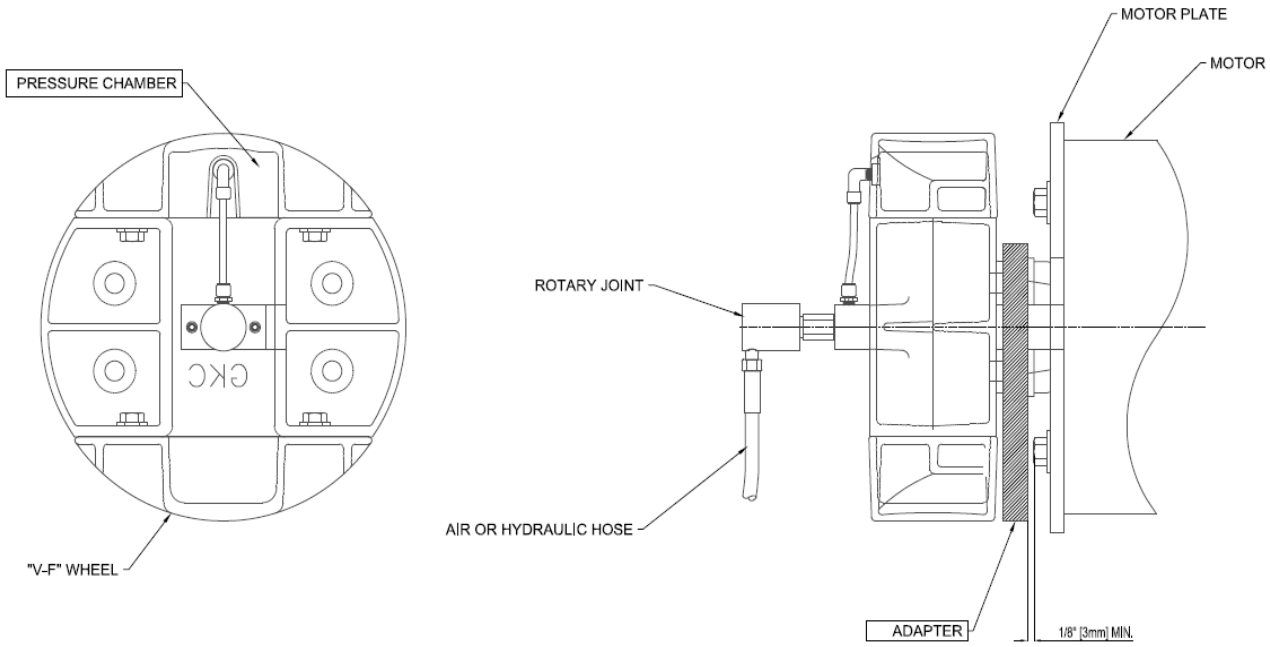
ROTATING - Max. Pressure

Fully Balanced
No Exciting Force

"V-F" COUNTERWEIGHT WHEEL

CAUTION!

*LOCKOUT electric power to the equipment, read **ALL** Safety Notes **before** operating the unit and **before** performing **any** maintenance.*



ARRANGEMENT FOR MAX. FEED RATE AT MAX P.S.I.

PRESSURE CHAMBER OPPOSITE ADAPTER

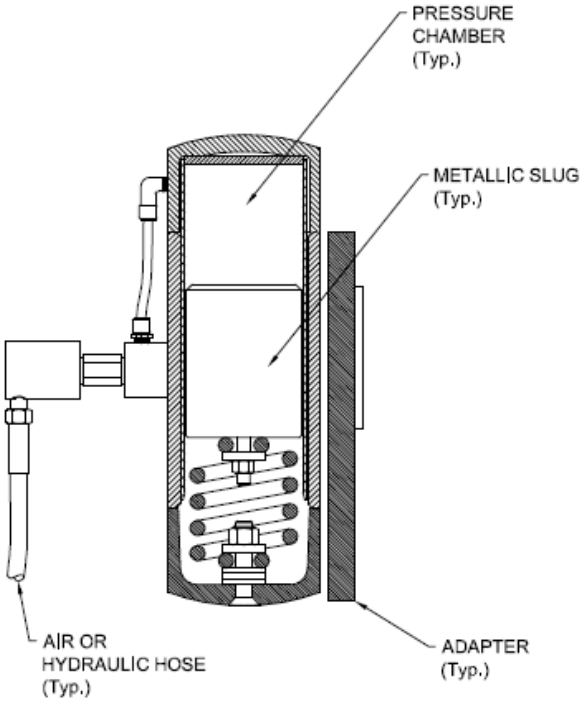
NOTE: REFER TO THE GENERAL ARRANGEMENT DRAWINGS FOR MAX. PSI VALUE

"V-F" COUNTERWEIGHT WHEEL

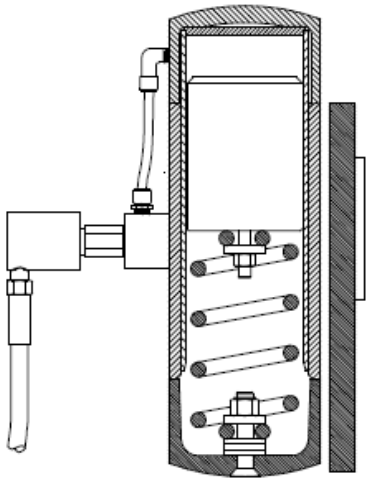
MAXIMUM FEED RATE MAX P.S.I.

Note ▶ Pressure Chamber opposite Adapter

Refer to General Arrangement Drawings

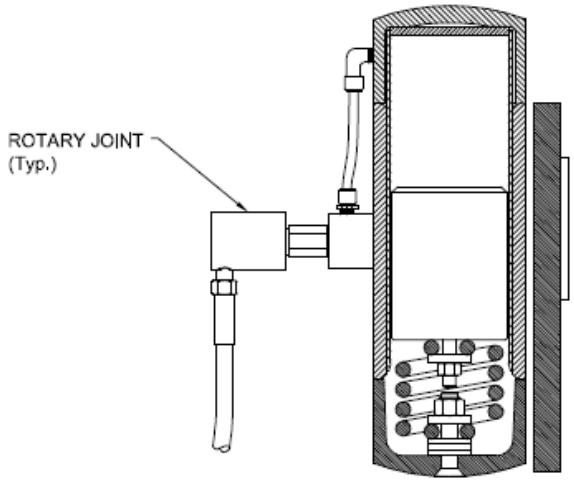


STATIC



ROTATING - No Pressure

Fully Balanced
No Exciting Force

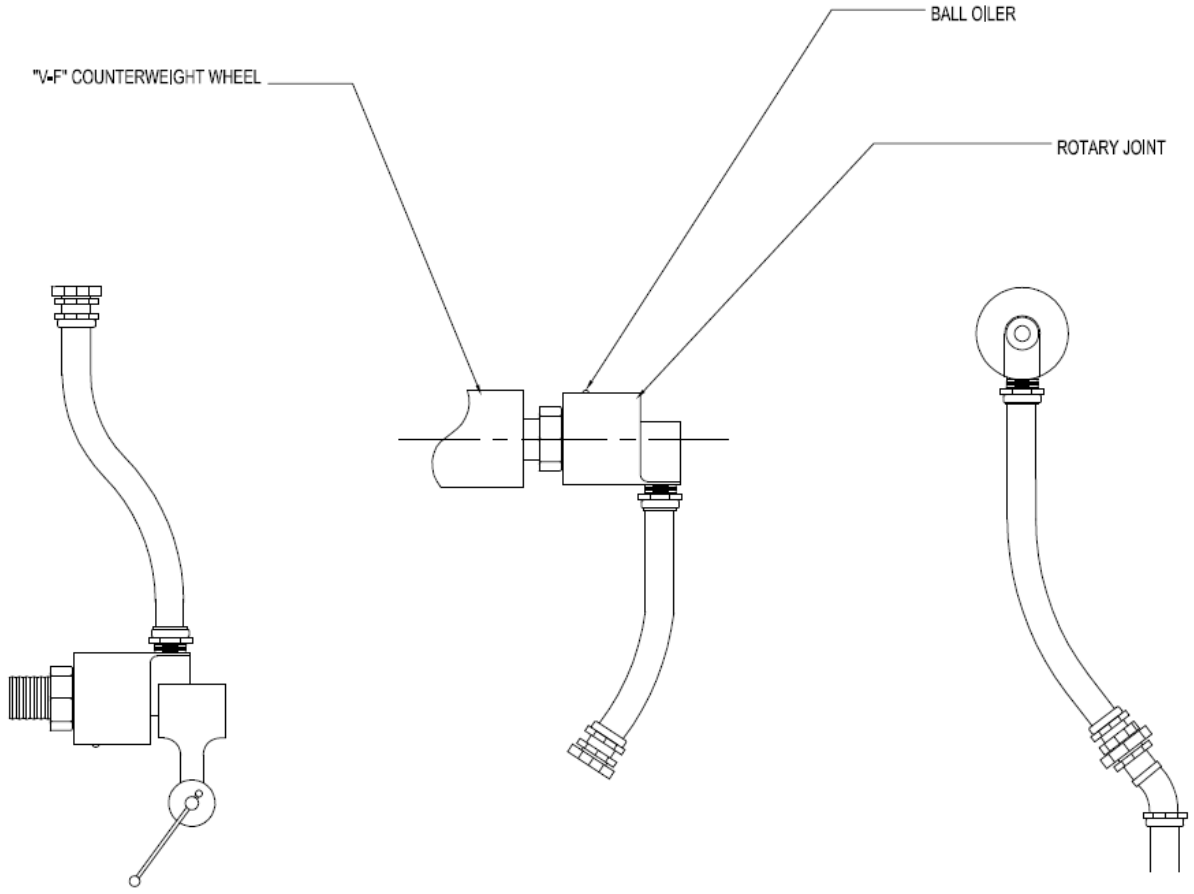


ROTATING - Max. Pressure

MAX. Un-Balanced
MAX. Exciting Force

"V-F" WHEEL ROTARY JOINT

CAUTION!	*LOCKOUT electrical power to the equipment, read **ALL** Safety Notes **before** operating the unit and **before** performing **any** maintenance.*



1 Grasp the rear of the housing in a bench vice and install flexible hose.

2 Install Rotary Joint to the "V-F" Wheel.

3 Connect flexible hose to supply line. Be sure the hose is not taut.

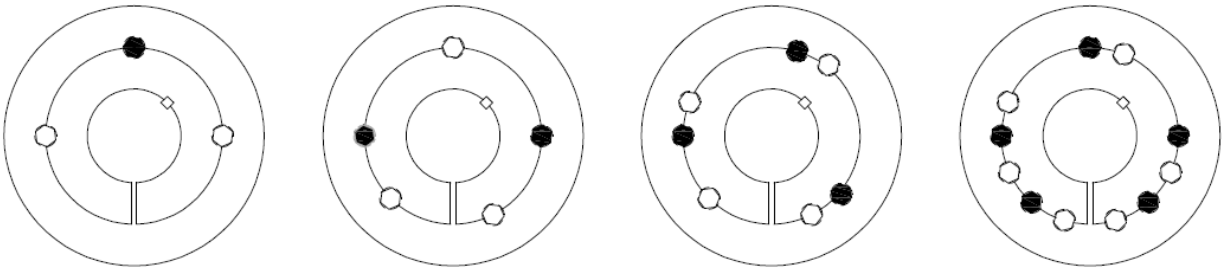
LUBRICATION

The rotary Joints have Carbon Graphite-to-Tool steel seals with an oil wick that keeps the seal faces lubricated. The oil wick must be lubed with SAE 30 oil, via a Ball Oiler, every 200 to 300 hours. The ball bearings are lubricated for life.

NOTE: REFER TO THE GENERAL ARRANGEMENT DRAWINGS

TAPER-LOCK Bushings

IMPORTANT: Follow all instructions below carefully. This is necessary in ensure satisfactory performance.



1008 to 3030 *3535 to 6050* *7060 to 10085* *120100*

CAUTION!	LOCKOUT electric power to the equipment, read ***ALL*** Safety Notes ***before*** operation the unit and ***before*** performing ***any*** maintenance.

REMOVAL

1. Remove all set screws.
2. Insert set screws in holes indicated by ● shown above. Loosen bushing by alternately tightening set screws.
3. To reinstall, complete all eight of the installation steps listed below.

INSTALLATION

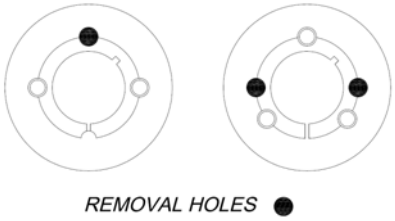
1. Clean shaft, bore and outside of bushing, and hub bore of all oil lacquer, and dirt. File away any burrs.
2. Insert bushing in hub. Match the hole pattern, not threaded holes. (Each hole will be threaded on one side only).
3. **LIGHTLY** oil set screws and thread into those half threaded holes indicated by ○ on above diagram.
4. Alternately torque set screws* to recommended torque setting in chart shown at right.
5. Hammer face of bushing using drift or sleeve. ***(Do not Hit Bushing Directly With Hammer).***
6. Repeat steps 4 and 5 until torque wrench reading after hammering is the same as before hammering.
7. Recheck screw torque after initial run-in, and periodically thereafter. Repeat 4 and 5 if loose.
8. Fill all unoccupied holes with grease. Where bushing is used with lubricated products such as chain, gear or grid couplings, be sure to seal all pathways (where lubricant could leak) with RTV or similar material.

RECOMMENDED SET SCREW TORQUES		
Bushing Number	Set Screw Size	Torque to: (Inch Lbs. / Nm)
1008, 1108	1/4"	55 / 6 Nm
1210, 1215, 1310, 1610,1615	3/8”	175 / 20 Nm
2012	7/16”	280 / 32 Nm
2517,2525	1/2"	430 / 49 Nm
3020, 3030	5/8”	800 / 90 Nm
3535	1/2"	1,000 / 113 Nm
4040	5/8”	1,700 / 192 Nm
4545	3/4"	2,450 / 277 Nm
5050	7/8”	3,100 / 350 Nm
6050,7060,8065	1-1/4”	7,820 / 884 Nm
10085,120100	1-1/2”	13,700 / 1548 Nm

* If two bushings are used on the same component and shaft, then fully tighten one bushing before working on the other.

CAUTION!

BECAUSE OF THE POSSIBLE DANGER TO PERSON (S) OR PROPERTY FROM ACCIDENTS, WHICH MAY RESULT FROM THE USE OF PRODUCTS, IT IS IMPORTANT THAT CORRECT PROCEDURES BE FOLLOWED. PRODUCTS MUST BE USED IN ACCORDANCE WITH THE INFORMATION SPECIFIED IN THIS MANUAL. PROPER INSTALLATION, MAINTENANCE AND OPERATION PRECEDURES MUST BE OBSERVED. THE INSTRUCTION MANUALS MUST BE FOLLOWED. INSPECTIONS SHOULD BE MADE AS NECESSARY TO ASSURE SAFE OPERATION UNDER PREVAILING CONDITIONS. PROPER GUARDS AND OTHER SAFETY DEVICES OR PROCEDURES SHOULD BE MADE AS NECESSARY TO ASSURE SAFE OPERATION UNDER PREVAILING CONDITIONS. PROPER GUARDS AND OTHER SUITABLE SAFETY DEVICES OR PROCEDURES AS MAY BE DESIRABLE OR AS MAY BE SPECIFIED IN SAFETY CODES SHOULD BE PROVIDED AND ARE NEITHER PROVDED BY GENERAL KINEMATICS OR BUSHING MANUFACTURER NOR ARE THE RESPONSIBILITY OF GENERAL KINEMATICS OR BUSHING MANUFACTURER.



CAUTION!	LOCKOUT electric power to the equipment, read ***ALL*** Safety Notes ***before*** operation the unit and ***before*** performing ***any*** maintenance.

REMOVAL

1. Slacken all screws by several turns, remove one or two according to number of removal holes shown thus ● in diagram. Insert screws into removal holes after oiling thread and under head of cap screw.
2. Insert set screws in holes indicated by ● shown above. Loosen bushing by alternately tightening set screws in hub and assembly is free on shaft.
3. Remove assembly from shaft.
4. To reinstall, complete all eight of the installation steps listed below.

INSTALLATION

1. Clean shaft, bore and outside of bushing, and hub bore of all oil, lacquer, and dirt. File away any burrs. Insert bush on hub so that holes line up.
2. Sparingly oil thread and point of grub screws, or thread under head of cap screws. Place screws loosely in holes threaded in hub, indicated by ○ on above diagram.
3. If a key is to be fitted, place it in the shaft keyway before fitting the bush. It is essential that it is a parallel key and side fitting only has TOP CLEARANCE.
4. Clean shaft and fit hub to shaft as one unit and locate in position desired, remembering that bush will nip the shaft first and then hub will be slightly drawn to the bush.
5. Using a hexagon wrench, tighten screws gradually and alternately to torque shown in table.
6. Hammer against large end of bush using block or sleeve to prevent damage. ***(Do not Hit Bushing Directly With Hammer).*** (This will ensure that the bush is seated squarely in the bore.) Screws will now turn a little more. Repeat this alternate hammering and screw tightening once or twice to achieve maximum grip on the shaft.
7. Recheck screw torque after initial run-in, and periodically thereafter. Repeat steps 5 and 6 if loose.
8. Fill all unoccupied holes with grease. Where bushing is used with lubricated products such as chain, gear or grid couplings, be sure to seal all pathways (where lubricant could leak) with RTV or similar material.

RECOMMENDED SET SCREW TORQUES		
Bushing Number	*Set Screw Size*	*Torque to: Nm. / Ft.-Lbs.*
1008, 1108	3mm	5.6 Nm / 4 Ft-Lbs
1210, 1215, 1310, 1610,1615	5mm	20 Nm / 15 Ft-Lbs
2012, 2517	6mm	30 Nm / 22 Ft-Lbs
3020, 3030	8mm	90 Nm / 66 Ft-Lbs
3525, 3535	10mm	115 Nm / 85 Ft-Lbs
4030, 4040	12mm	170 Nm / 125 Ft-Lbs
4535, 4545	14mm	190 Nm / 140 Ft-Lbs
5040, 5050	14mm	270 Nm / 199 Ft-Lbs

* If two bushings are used on the same component and shaft, then fully tighten one bushing before working on the other.

CAUTION!

BECAUSE OF THE POSSIBLE DANGER TO PERSON (S) OR PROPERTY FROM ACCIDENTS, WHICH MAY RESULT FROM THE USE OF PRODUCTS, IT IS IMPORTANT THAT CORRECT PROCEDURES BE FOLLOWED. PRODUCTS MUST BE USED IN ACCORDANCE WITH THE INFORMATION SPECIFIED IN THIS MANUAL. PROPER INSTALLATION, MAINTENANCE AND OPERATION PRECEDURES MUST BE OBSERVED. THE INSTRUCTION MANUALS MUST BE FOLLOWED. INSPECTIONS SHOULD BE MADE AS NECESSARY TO ASSURE SAFE OPERATION UNDER PREVAILING CONDITIONS. PROPER GUARDS AND OTHER SAFETY DEVICES OR PROCEDURES SHOULD BE MADE AS NECESSARY TO ASSURE SAFE OPERATION UNDER PREVAILING CONDITIONS. PROPER GUARDS AND OTHER SUITABLE SAFETY DEVICES OR PROCEDURES AS MAY BE DESIRABLE OR AS MAY BE SPECIFIED IN SAFETY CODES SHOULD BE PROVIDED AND ARE NEITHER PROVDED BY GENERAL KINEMATICS OR BUSHING SUPPLIER NOR ARE THE RESPONSIBILITY OF GENERAL KINEMATICS OR BUSHING SUPPLIER.

AIR LINE FILTER | INSTALLATION and OPERATING INSTRUCTIONS

WARNING! The air filter comes with a polycarbonate plastic bowl. Never use polycarbonate plastic bowls on air supplied by a compressor lubricated with synthetic oils or oils containing phosphate esters or chlorinated hydrocarbons. They can carry-over into the air distribution system and chemically attack and possibly rupture the bowls. On these applications use a metal bowl. Also, do not expose there polycarbonate plastic bowls to material such as carbon tetrachloride, trichloroethylene, acetone, paint thinner, cleaning fluids, or other harmful materials, for they too will craze and/or rupture the bowl. If materials harmful to polycarbonate are present either outside or inside the bowl, use a metal bowl.

INSTALLATION: Before installing, blow out pipelines to remove scale and other foreign matter. This unit has **DRY SEAL** pipe threads; use pipe compound or tape sparingly to male threads only. Install filter with bowl in downward vertical position in pipeline so that air will flow in direction indicated on filter body. Install as near as possible to equipment serviced and upstream of regulator, lubricator, etc.

MAINTNEANCE: To maintain maximum filtering efficiency and to avoid excessive pressure drop, the filter must be kept clean. On standard filters, open drain cock (turn clockwise) periodically and drain off any bowl accumulation before it reaches level of baffle. Bowl drainage is automatic in the PISTON DRAIN and AUTO DRAIN however; manual draining can also be done by turning drain clockwise. A visible coating of dirt or condensation on the filter element surface or an excessive pressure drop is an indication that cleaning is necessary.

CLEANING: To clean, it is not necessary to remove filter from the line, disassembly is simple and does not require tools. Before disassembly, shut off air supply and depressurize filter. Clean all parts except plastic bowls and sight glasses with methanol and blow out filter body before reassembly. Wash filter element in alcohol and blow out from the inside. *CLEAN PLASTIC BOWL and SIGHT GLASS WITH HOUSEHOLD SOAP ONLY; NEVER USE CARBON TETRACHRIDE, TRICHLOROETHYLENE, THINNER, ACETONE or SIMIALR SOLVENTS.*

AUTO DRAIN OPERATION

The *AUTO DRAIN* is a float-actuated device which automatically ejects liquid contaminates. When supplied in kit form, Part No. SA-62MD-M3, simply depressurize, remove flange, ring bowl from filter and drain cock from bowl and insert *AUTO DRAIN* in its place, reassembling bowl in reverse order.

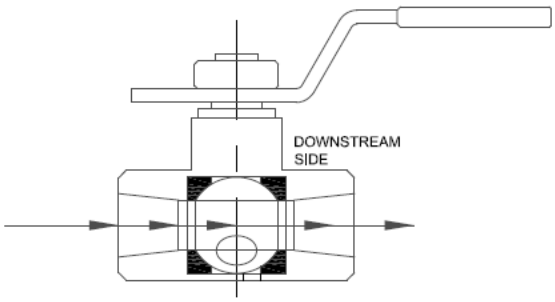
PISTON DRAIN OPERATION

In the *AUTO DRAIN* filter the automatic drain mechanism is operated by pressure drop created as air flow is initiated or as the air line is depressurized. However; (to conserve air), the drain will not function over normal operating air flow range unless liquids are present to form a fluid seal between the piston and inside wall of the bowl. On low air flow application (below 5 SCFM at 100 psi or .5 SCFM at 25 psi) *PISTON DRAIN* must be close-coupled to the control valve; otherwise there may be insufficient dynamic pressure drop to trigger the drain mechanism. When supplied in kit form, assemble filter in same manner as described under *AUTO DRAIN* operation.

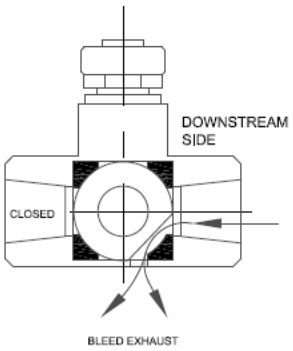
Exhaust Valve

Bronze, Pad Locking

Safety Exhaust/Shutoff Valve



VALVE IN OPEN POSITION.
DRAIN VENT SHUT OFF.



VALVE CLOSED AND DRAINING.
UPSTREAM SEAT STOPS AIR FLOW.
DOWN STREAM SYSTEM IS VENTED
TO ATMOSPHERE.

CAUTION ***LOCKOUT electric power to the equipment, read ALL Safety Notes before operating the unit and before performing any maintenance.***

Safety exhaust/shutoff ball valves automatically and continuously vent residual air on the downstream side of the valve when the handle is turned off. With this type of venting action the ball valve ensures air power equipment is safe to service.

SYNCHRONOUS DRIVE INSTALLATION

The synchronous belt drive will perform successfully when proper installation procedures are followed.

SPROCKET INSTALLATION

Thoroughly inspect the bore of the sprocket and the tapered surface of the bushing. Any paint, dirt, oil or grease must be removed.
Assemble bushing into sprocket per **BUSHING INSTALLATION INSTRUCTIONS**. Loosely insert the cap screws into assembly, but do not lubricate cap screw threads. (Note: Install **M** thru **S** bushings so the two extra holes in the hub are located as far as possible from the bushing's saw cut).

With key in key seat of shaft, slide sprocket to its desired position with cap screw heads to the outside. (A few small sprockets may have to be installed with the cap screws on the inside). If it is hard to slide the bushing onto the shaft, wedge a screwdriver blade into the saw cut to overcome the tightness.

Line up assembly so as not to misalign belts, and tighten cap screws evenly and progressively. Apply the recommended torque to cap screws. There should be 1/8" to 1/4" gap between the sprocket hub and the bushing flange. If gap is closed, the shaft is seriously undersize.

SPROCKET ALIGNMENT

Sprocket alignment and parallelism of the shafts is very important. Proper alignment helps to equalize the load across the entire belt width, thereby reducing wear and extending belt life.

PLACE A STRAIGHTEDGE against the outside of the sprockets and move sprockets until the straightedge touches the two outside and two inside edges of the sprockets. The straightedge should cross the sprockets as near the shafts as possible. A string can be used if a straightedge is not available. Remember the string should contact at four points as explained above.

After aligning the sprockets, check the rigidity of the supporting framework. Shafts should be well supported to prevent distortion and a resulting change in the center distance under load. **Do not** use spring-loaded or weighted idler. Idler sprocket or pulleys must be locked into position after adjusting belt tension.

Please note: At least one sprocket must have a flange.

BELT INSTALLATION

Do not pry or otherwise force the belt onto the sprockets, as this can result in permanent damage to the belt. Either remove the sprocket's outside flange or reduce the center distance between the pulleys so that the belt can be easily installed.

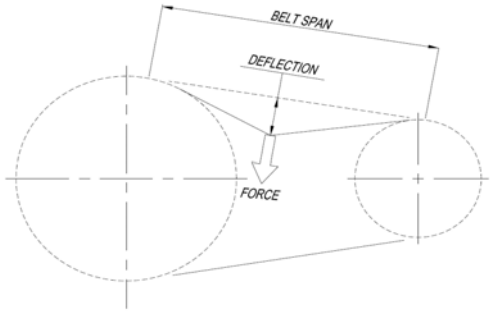
Synchronous belts are not to be tensioned as you would a ***V-Belt*** or any other belt that depends on friction to transmit the load. They should be installed with a snug fit, neither too taut nor too loose.

An alternate method can be used to properly tension the belt on a synchronous drive. After the drive has been installed and tension applied, the deflection force can be measured to verify the proper tension. Stop the drive and measure the belt span (See sketch). Using a spring scale, apply a perpendicular force to the exact center of the belt width and near the center of the span. Measure the force required to deflect the belt 1/64 inch for every inch of span length. For example, the deflection of a 32 inch span would be 1/64 multiplied by 32 or 1/2 inch.

The formula shown gives the range of forces normally sufficient for drive installation. Actual installation tension required depends on peak loads, system rigidity, number of teeth in mesh, etc. Fore drives with shock loading or other unusual conditions, the force may have to be increased for proper operation of the drive.

Note: For belts wider than 2 inches, it is suggested that a rigid strip of key stock, or something similar, be placed across the belt between the point of force and the belt to prevent belt distortion.

Note: -Refer to General Arrangement Drawings-



MIN FORCE (lbs.) = $\frac{\textbf{5000 x BHP}}{\textbf{RPM x PITCH DIA}}$

MAX FORCE (lbs.) = $\frac{\textbf{4000 x DHP}}{\textbf{RPM x PITCH DIA}}$

WHERE:

DHP = BELT HP or MOTOR HP x RECOMMENDED SERVICE FACTOR

BHP = BRAKE HP or MOTOR HP

RPM = SPEED OF FASTEST SHAFT

PITCH DIA = DIA OF SMALLEST SPROCKET

SYNCHRONOUS DRIVE INSTALLATION

The synchronous belt drive will perform successfully when proper installation procedures are followed.

PULLEY INSTALLATION

Thoroughly inspect the bore of the sprocket and the tapered surface of the busing. Any paint, dirt, oil or grease must be removed.

Assemble bushing into pulley per **BUSHING INSTALLATION INSTRUCTIONS**. Loosely insert the cap screws into assembly, but do not lubricate cap screw threads.

With key in key seat of shaft, slide sprocket to its desired position with cap screw heads to the outside. If it is hard to slide the bushing onto the shaft, wedge a screwdriver blade into the saw cut to overcome the tightness.

Line up assembly so as not to misalign belts, and tighten cap screws evenly and progressively. Apply the recommended torque to cap screws.

PULLEY ALIGNMENT

Misalignment of drive Pulleys results in unequal tension across the belt width and extreme edge wear. Pulley alignment should be proved using a straightedge or laser device, and shafts checked for parallelism. Misalignment on any synchronous drive should not exceed 1/4° angular or 5mm/meter center distance parallel. Pulley alignment and parallelism of the shafts is very important. Proper alignment helps to equalize the load across the entire belt width, thereby reducing wear and extending belt life.

PLACE A STRAIGHTEDGE against the outside of the pulleys and move pulleys until the straightedge touches the two outside and two inside edges of the pulleys. The straightedge should cross the pulleys as near the shafts as possible. A string can be used if a straightedge is not available. Remember the string should contact at four points as explained above.

After aligning the pulleys, check the rigidity of the supporting framework. Shafts should be well supported to prevent distortion and a resulting change in the center distance under load. **Do not** use spring-loaded or weighted idler. Idler sprocket or pulleys must be locked into position after adjusting belt tension.

Please note: At least one sprocket must have a flange.

BELT INSTALLATION

Do not pry or otherwise force the belt onto the pulleys, as this can result in permanent damage to the belt. Either remove the pulley's outside flange or reduce the center distance between the pulleys so that the belt can be easily installed.

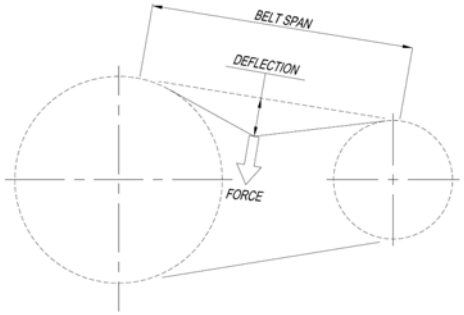
Synchronous belts are not to be tensioned as you would a ***V-Belt*** or any other belt that depends on friction to transmit the load. They should be installed with a snug fit, neither too taut nor too loose.

An alternate method can be used to properly tension the belt on a synchronous drive. After the drive has been installed and tension applied, the deflection force can be measured to verify the proper tension. Stop the drive and measure the belt span (See sketch). Using a spring scale, apply a perpendicular force to the exact center of the belt width and near the center of the span. Measure the force required to deflect the belt D for every 20mm/meter of span length. For example, the deflection of a .5 meter span would be .02 multiplied by .5 or 10mm.

The formula shown gives the range of forces normally sufficient for drive installation. Actual installation tension required depends on peak loads, system rigidity, number of teeth in mesh, etc. Fore drives with shock loading or other unusual conditions, the force may have to be increased for proper operation of the drive.

Note: For belts wider than 50mm, it is suggested that a rigid strip of key stock, or something similar, be placed across the belt between the point of force and the belt to prevent belt distortion.

Note: -Refer to General Arrangement Drawings-



MIN FORCE = $\frac{\textbf{955,000 x KW}}{\textbf{RPM x PITCH DIA}}$

MAX FORCE = $\frac{\textbf{477,500 x KW}}{\textbf{RPM x PITCH DIA}}$

WHERE:

KW = MOTOR POWER, or ABSORBED POWER IF KNOWN

RPM = REVOLUTIONS PER MINUTES OF FASTEST PULLEY

PITCH DIA = DIA OF SMALLEST PULLEY [mm]

DRIVE MAINTENANCE

CAUSE OF FAILURE	CAUSE OF FAILURE	CORRECTIVE ACTION
EXCESSIVE EDGE WEAR (Exposed tensile member)	MISALIGNMENT or NON-RIGID CENTERS	CHECK ALIGNMENT and/or REINFORCE MOUNTING
	BELT FLANGE	STRAIGHTEN FLANGE
JACKET WEAR ON PRESSURE FACE SIDE OF BELT TOOTH	EXCESSIVE OVERLOAD and/or EXCESSOVE BELT TIGHTNESS	REDUCE INSTALLATION TENSION and/or INCREASE DRIVE LOAD CARRYING CAPACITY
EXCESSIVE JACKET WEAR BETWEEN BELT TEETH (Exposed tension members)	EXCESSIVE INSTALLATION TENSION	REDUCE INSTALLATION TENSION
CRACKS IN NEOPRENE BACKING	EXPOSURE TO EXCESSIVE LOW TEMPERATURE (Below -30° F/ -34° C)	ELIMINATE LOW TEMPERATURE CONDITION or CONSULT FACTORY FOR PROPER BELT CONSTRUCTION
SOFTENING OF NEOPRENE BACKING	EXPOSURE TO EXCESSIVE HEAT (+200° F) and/or OIL	ELIMINATE HIGH TEMPERATURE and OIL CONDITION or CONSULT FACTORY FOR PROPER BELT CONSTRUCTION
EXCESSIVE PULLEY TOOTH WEAR (On pressure face and/or OD)	EXCESSIVE OVERLOAD and/or EXCESSIVE BELT TIGHTNESS	REDUCE INSTALLATION TENSION and/or INCREASE DRIVE LOAD CARRYING CAPACITY
	INSUFFICIENT HARDNESS OF PULLEY MATERIAL	SURFACE-HARDEN PULLEY or USE HARDER MATERIAL
UNMOUNTING OF FLANGE	INCORRECT FLANGE INSTALLATION	REINSTALL FLANGE CORRECTLY
	MISALIGNMENT	CORRECT ALIGNMENT
*EXCESSIVE DRIVE NOISE**	MISALIGNMENT	CORRECT ALIGNMENT
	EXCESSIVE INSTALLATION TENSION	REDUCE TENSION
	EXCESSIVE LOAD	INCREASE DRIVE CARRYING CAPACITY
	SUB-MINIMUM PULLEY DIAMETER	INCREASE PULLEY DIAMETERS
TOOTH SHEAR	LESS THAN 6 TEETH IN MESH (**TIM**)	INCREASE **TIM** or USE NEXT SMALLER PITCH
	EXCESSIVE LOAD	INCREASE DRIVE LOAD CARRYING CAPACITY
APPARENT BELT STRETCH	REDUCTION OF CENTER DISTANCE or NON-RIGID MOUNTING	RETENSION DRIVE and/or REINFORCE MOUNTING
CRACKS or PREMATURE WEAR AT BELT TOOTH ROOT	IMPROPER PULLEY GROOVE TOP RADIUS	REGROOVE OR INSTALL NEW PULLEYS
TENSILE BREAK	EXCESSIVE LOAD	INCREASE LOAD-CARRYING CAPACITY OF DRIVE
	SUB-MINIMUM PULLEY DIAMETER	INCREASE PULLEY DIAMETERS

NOTE - Effective noise reduction for power transmission drives can be accomplished by incorporating a flexible noise absorbing material with the protective guard. The guard design must allow a cooling air passage on the top and bottom to prevent overheating the drive.

FLANGE BEARING REPLACEMENT

FLOATING BEARING

CAUTION!	*LOCKOUT electric power to the equipment, read **ALL** Safety Notes **before** operating the unit and **before** performing **any** maintenance.*

1. Refer to the **GENERAL ARRANGEMENT DRAWING/S** for the Drive Assembly Illustration and for parts description. Refer to the **DRIVE ASSEMBLY FLOATING AND FIXED BEARINGS** page in this manual for enlarged views of the **Flange Bearings**.

2. The Drive Assembly contains two Drive Shafts. A "V-F" Counterweight Wheel is attached on each end of both Drive Shafts. Each Drive Shaft is mounted and secured through Flange Bearings; one end of the Drive Shaft is mounted through a **Floating** Flange Bearing and the other end through a **Fixed** Flange Bearing. *(Note: The Driven Sprocket is mounted on the side of the shaft with the **Fixed** Flange Bearing).*

3. Remove Guards.

4. Ensure that the eccentricities of the four Counterweight Wheel Adapters are in the **down** position. Block Drive Shaft, **securely** in the **lower neutral position**. See **SAFETY** page 1, note 7.

5. Remove "V-F" Counterweight Wheel located next to the Floating Flange Bearing that is being replaced. The "V-F: Counterweight Wheel is bolted on to a Counterweight Wheel Adapter; the Counterweight Wheel Adapter is secured to the Drive Shaft with a Taper-Lock Bushing. **Match mark** the "V-F" Counterweight Wheel in relation to the Counterweight Wheel Adapter. First remove the "V-F" Counterweight Wheel off the Adapter, and then remove the Adapter. See **TAPER-LOCK BUSHING REPLACEMENT** page in this manual.

6. Remove Flinger. The Flinger is secured in place by set screws.

7. Remove Floating Flange Bearing, secured by Bearing Fasteners.

8. The bearings are special tolerance and fit units. **DO NOT SUBSTITUTE**. Use bearings supplied by General Kinematics only. Before installing new bearings, clean Drive Shaft with emery cloth or file to remove any burrs or protrusions.

9. The new bearings are packed with Grease at the factory. See **DRIVE FLANGE BEARING LUBRICTATION** page for Grease types and re-lubrication intervals.

10. Install new bearing in reverse of above procedures. Check to ensure labyrinth seal is packed with grease. When installing Flinger, bottom out Flinger on to bearing then pull the Flinger back out so that there is a .125" minimum space between the Bearing and the Flinger. Tighten Flinger Set Screws to 290 inch pounds.

11. Install the counterweight Wheel Adapter, which is secured to the shaft with a Taper-Lock Bushing. Ensure that **ALL** Eccentricities of the Counterweight Wheel Adapters are pointing **down**. Refer to the **TAPER-LOCK BUSHING REPLACEMENT** instructions page in this manual, when installing the Counterweight Wheel Adapter.

12. Install the "V-F" Counterweight Wheel to the Wheel Adapter ensuring that the **match marks** are aligned.

13. Torque fasteners per the applicable **FASTENER TORQUE CHART** page in this manual

14. Remove Blocking

15. Check the tension of Drive Belt (on the opposite side of this shaft). Ensure Belt is tensioned properly. Refer to the **SPROCKET INSTALLATION & ALIGNMENT, BELT INSTALLATION** page for tensioning procedure.

16. Replace Guard/s.

17. Retighten all fasteners after short run in period.

FLANGE BEARING REPLACEMENT

FIXED BEARING

CAUTION!	*LOCKOUT electric power to the equipment, read **ALL** Safety Notes **before** operating the unit and **before** performing **any** maintenance.*

1. Refer to the **GENERAL ARRANGEMENT DRAWING/S** for the Drive Assembly Illustration and for parts description. Refer to DRIVE **ASSEMBLY FLOATING AND FIXED BEARINGS** page in this manual for enlarged views of Flange Bearings.

2. The Drive Assembly contains two Eccentric Drive Shaft. A "V-F" Counterweight Wheel is attached to one end on each end of both Drive Shafts. Each Drive Shaft is mounted and secured through Flange Bearings; one end of the Drive Shaft is mounted through a **Floating** Flange Bearing and the other end through a **Fixed** Flange Bearing. *(Note: The Driven Sprocket is mounted on the side of the shaft with the **Fixed** Flange Bearing).*

3. Remove Guards.

4. Ensure that the eccentricities of the four Counterweight Wheel Adapters are in the **down** position. Bock Drive Shaft **securely** in the **lower neutral position**. See **SAFETY** page 1, note 7.

5. Remove "V-F: Counterweight Wheel located next to the Fixed Flange Bearing that is being replaced. The "V-F" Counterweight Wheel is bolted onto a Counterweight Wheel Adapter; the Counterweight Wheel Adapter is secured to the Drive Shaft with a Taper-Lock Bushing. **Match mark** the "V-F" Counterweight Wheel in relation to the Counterweight Wheel Adapter. First remove the "V-F: Counterweight Wheel off of the Adapter, and then remove the Adapter. See **TAPER-LOCK BUSHING REPLACEMENT** page in this manual.

6. Remove Drive Belt and Driven Sprocket.

7. Remove Flinger. The Flinger is secured in place by set screws.

8. Remove Bearing End Cap from Bearing Housing, secured by cap screws.

9. Remove the two-piece Clamp Collar.

10. Remove Bearing Housing, secured by Bearing Housing Fasteners.

11. The bearings are special tolerance and fit units. **DO NOT SUBSTITUTE**. Use bearings supplied by General Kinematics only. Before installing new bearings, clean Drive Shaft with emery cloth or file to remove any burrs or protrusions.

12. The new bearings are packed with Grease at the factory. See **DRIVE FLANGE BEARING LUBRICTATION** page for Grease types and re-lubrication intervals.

13. Install new bearing in reverse of above procedures. Check to ensure labyrinth seal is packed with grease. When installing Flinger, bottom out Flinger on to bearing then pull the Flinger back out so that there is a .125" minimum space between the Bearing and the Flinger. Tighten Flinger Set Screws to 290 inch pounds.

14. Install the Counterweight Wheel Adapter, which is secured to the shaft with a Taper-Lock Bushing. Ensure that **ALL** Eccentricities of the Counterweight Wheel Adapters are pointing **down**. Refer to the **TAPER-LOCK BUSHING REPLACEMENT** instructions page in this manual when installing the Counterweight Wheel Adapter.

15. Install the "V-F" Counterweight wheel to the Wheel Adapter ensuring that the **match marks** are aligned.

16. Install Driven Sprocket and Drive Belt. Ensure Belt is tensioned properly. Refer to **SPROCKET INSTALLATION & ALIGNMENT, BELT INSTALLATION** page for tensioning procedure.

17. Torque fasteners per the applicable **FASTENER TORQUE CHART** page in this manual.

18. Remove Blocking

19. Replace Guard/s.

20. Retighten all fasteners after short run in period.

DRIVE FLANGE BEARING LUBRICATION

New Drive Flange Bearings are packed with **Mobilgrease® XHP 222** at the factory

BEARING SIZE (mm)	PART NUMBER	RPM	RE-LUBE INTERVAL Weeks *	RE-LUBE GREASE QTY. (oz/g)
75	10-05-41	400 to 900	8	1.5/42.5
		900 to 1200	4	1.5/42.5
100	10-05-100	400 to 600	8	3.0/85
		600 to 1200	4	3.0/85
120	10-05-120	400 to 600	8	4.0/113
		600 to 1200	4	4.0/113
150	10-05-125	400 to 500	8	6.0/170
		500 to 700	4	6.0/170
		700 to 1200	2	6.0/170
* Continuous Duty 24 Hour/Day use				
RELUBE WITH **Mobilgrease® XHP 222** ***NOTE*** – IF OPERATING TEMPERATURE IS ABOVE 190° F, THEN RELUBE WITH **MOBILITH SHC460**				

Re-lubrication interval is dependent on the contamination level of the environment. There is no set guideline or table that can correctly provide a time interval. For bad contamination conditions the re-lubrication interval is once per shift or once per day. To adequately determine an interval the recommendation is to monitor the lubricant that is purged out and if it is contaminated the interval should be decreased. If the purged lubricant is clean the interval should be increased.

A simple method to determine contamination in the lubricant is to take a sample of the clean new grease and smear a little on a white sheet of paper. The take the purged lubricant sample and smear a little on the same sheet. Then compare the two.

SAE GRADE 5 BOLTS | NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts **are not** substituted. Tighten bolts using a calibrated torque wrench.

All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values according to bolts diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

BOLT DIA.	THREADS/in.	DRY Threads TORQUE NUT to:	LUBRICATED** Threads TORQUE NUT to:
1/4"	*20*	*8 Ft-Lbs./ 11 Nm*	*6 Ft.-Lbs./ 8 Nm*
5/16"	*18*	*17 Ft-Lbs./ 23 Nm*	*13 Ft-Lbs./ 17 Nm*
3/8"	*16*	*31 Ft-Lbs./ 42 Nm*	*22 Ft.-Lbs./ 30 Nm*
1/2"	*13*	*76 Ft-Lbs./ 103 Nm*	*55 Ft.-Lbs./ 74 Nm*
5/8"	*11*	*150 Ft-Lbs./ 203 Nm*	*109 Ft.-Lbs./ 148 Nm*
3/4"	*10*	*265 Ft-Lbs./ 359 Nm*	*193 Ft.-Lbs./ 262 Nm*
7/8"	*9*	*430 Ft-Lbs./ 583 Nm*	*311 Ft.-Lbs./ 422 Nm*
1"	*8*	*645 Ft-Lbs./ 875 Nm*	*467 Ft.-Lbs./ 633 Nm*
1-1/8"	*7*	*795 Ft-Lbs./ 1077 Nm*	*576 Ft.-Lbs./ 781 Nm*
1-1/4"	*7*	*1120 Ft-Lbs./ 1518 Nm*	*812 Ft.-Lbs./ 1101 Nm*
1-1/2"	*6*	*1950 Ft-Lbs./ 2642 Nm*	*1414 Ft.-Lbs./ 1917 Nm*
1-5/8"	*5-1/2*	*2475 Ft-Lbs./ 3355 Nm*	*1794 Ft.-Lbs./ 2433 Nm*

**** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY.**

– NOTE Anti-Seize to be **NON COPPER** based.

IMPORTANT! ***Tightening when bolt threads are lubricated.***

When using an *Impact Wrench*, **DO NOT** run up to the torque value in **one** operational cycle of the *Impact Wrench*. When the threads are lubricated, the nut has less resistance and the power *Impact Wrench* will spin the nut faster than when on dry threads. The faster nut spin speed is fast enough to cause a ramming force powerful enough to damage the bolt and/or nut.

Run up nut in separate pulse cycles until contact is made and is snug tight to the parts being bolted, and then tighten to the Torque Value.

BOWMAN FASTENERS — TORQUE VALUES

IMPORTANT! Bowma-Grip Nut Tightening.

The threads of the Bowma-Grip Nuts have a special lubricant on them from the factory. When using an *Impact Wrench* **DO NOT** run up nut to the torque value in **one** operational cycle of the *Impact Wrench*. Because of the factory lubrication specified above, the nut has less resistance and the power of the *Impact Wrench* will spin the nut faster than a nut with dry threads. The faster nut spin speed is fast enough to cause a ramming force powerful enough to damage the bolt and/or nut.

Run up nut in separate pulse cycles until contact is made and is snug tight to the parts being bolted, and then tighten to the Torque Value.

BOWMA-GRIP IMPERIAL NUTS					
For Bowman alloy & Bowman Socketed Fasteners Only			***For Gr. 5 Zinc Dichromate Plated or equal Bolts Only***		
Bolt Diameter	**Threads/in**	**Torque Nut To:**	**Bolt Diameter**	**Threads/in**	**Torque Nut To:**
3/8”	*16*	*29 Ft-Lbs. / 39 Nm*	*3/8”*	*16*	*15 Ft-Lbs./ 20 Nm*
1/2"	*13*	*70 Ft-Lbs. / 94 Nm*	*1/2"*	*13*	*36 Ft-Lbs. / 49 Nm*
5/8”	*11*	*140 Ft-Lbs. / 190 Nm*	*5/8”*	*11*	*72 Ft-Lbs. / 98 Nm*
3/4”	*10*	*245 Ft-Lbs. / 332 Nm*	*3/4”*	*10*	*128 Ft-Lbs. / 174 Nm*
7/8”	*9*	*400 Ft-Lbs. / 542 Nm*	*7/8”*	*9*	*204 Ft-Lbs. / 277 Nm*
1”	*8*	*602 Ft-Lbs. / 816 Nm*	*1”*	*8*	*305 Ft-Lbs. / 414 Nm*
1-1/8”	*7*	*852 Ft-Lbs. / 1155 Nm*	*1-1/8”*	*7*	*380 Ft-Lbs. / 515 Nm*
1-1/4”	*7*	*1195 Ft-Lbs. / 1620 Nm*	*1-1/4”*	*7*	*530 Ft-Lbs. / 719 Nm*
1-1/2”	*6*	*2095 Ft-Lbs. / 2840 Nm*	*1-1/2”*	*6*	*932 Ft-Lbs. / 1264 Nm*
BOWMALLOY METRIC BOLTS (12.9)			*BOWMA-GRIP METRIC NUTS (12.9)*		
M10	*37 Ft-Lbs. / 50 Nm*		*M10*	*28 Ft-Lbs. / 38 Nm*	
M12	*65 Ft-Lbs. / 88 Nm*		*M12*	*49 Ft-Lbs. / 66 Nm*	
M14	*104 Ft-Lbs. / 140 Nm*		*M14*	*78 Ft-Lbs. / 105 Nm*	
M16	*162 Ft-Lbs. / 220 Nm*		*M16*	*121 Ft-Lbs. / 165 Nm*	
M18	*223 Ft-Lbs. / 302 Nm*		*M18*	*167 Ft-Lbs. / 225 Nm*	
M20	*316 Ft-Lbs. / 428 Nm*		*M20*	*237 Ft-Lbs. / 320 Nm*	
M24	*545 Ft-Lbs. / 740 Nm*		*M24*	*410 Ft-Lbs. / 555 Nm*	
M30	*1084 Ft-Lbs. / 1470 Nm*		*M30*	*813 Ft-Lbs. / 1102 Nm*	
M36	*1894 Ft-Lbs. / 2568 Nm*		*M36*	*1420 Ft-Lbs. / 1925 Nm*	

NOTE:
All torque values shown, for the ***Bowma-Grip Nuts,*** are for turning the NUT while holding the head of the bolt with a wrench. If the application demands tightening by the bolt head increase the value shown by 20% (multiply by 1.20). This will allow for the natural torisional twist of the bolt shank.

GRADE 8.8 METRIC FASTENERS | NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts **are not** substituted. Tighten bolts using a calibrated torque wrench.

All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values according to bolts diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

BOLT DIA.	Pitch mm	DRY Threads TORQUE NUT to:	LUBRICATED** Threads TORQUE NUT to:
M8	*1.25*	*25 Nm /19 Ft-Lbs.*	*18 Nm / 14 Ft.-Lbs.*
M10	*1.5*	*50 Nm / 37 Ft-Lbs.*	*37 Nm / 27 Ft.-Lbs.*
M12	*1.75*	*90 Nm / 65 Ft-Lbs.*	*65 Nm / 47 Ft.-Lbs.*
M14	*2*	*140 Nm / 103 Ft-Lbs.*	*100 Nm / 75 Ft.-Lbs.*
M16	*2*	*215 Nm / 158 Ft-Lbs.*	*160 Nm / 115 Ft.-Lbs.*
M18	*2.5*	*295 Nm / 217 Ft-Lbs.*	*225 Nm / 165 Ft.-Lbs.*
M20	*2.5*	*420 Nm / 309 Ft-Lbs.*	*320 Nm / 235 Ft.-Lbs.*
M22	*2.5*	*600 Nm / 440 Ft-Lbs.*	*435 Nm / 320 Ft.-Lbs.*
M24	*3*	*760 Nm / 560 Ft-Lbs.*	*550 Nm / 405 Ft.-Lbs.*
M27	*3*	*1115 Nm / 820 Ft-Lbs.*	*810 Nm / 595 Ft.-Lbs.*
M30	*3.5*	*1515 Nm / 1115 Ft-Lbs.*	*1100 Nm / 810 Ft.-Lbs.*
M33	*3.5*	*2060 Nm / 1520 Ft-Lbs.*	*1495 Nm / 1100 Ft.-Lbs.*
M36	*4*	*2645 Nm / 1950 Ft-Lbs.*	*1915 Nm / 1415 Ft.-Lbs.*

**** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY.**

– NOTE Anti-Seize to be **NON COPPER** based.

IMPORTANT! ***Tightening when bolt threads are lubricated.***

When using an *Impact Wrench*, **DO NOT** run up to the torque value in **one** operational cycle of the *Impact Wrench*. When the threads are lubricated, the nut has less resistance and the power *Impact Wrench* will spin the nut faster than when on dry threads. The faster nut spin speed is fast enough to cause a ramming force powerful enough to damage the bolt and/or nut.

Run up nut in separate pulse cycles until contact is made and is snug tight to the parts being bolted, and then tighten to the Torque Value.

GRADE 10.9 METRIC FASTENERS | NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts **are not** substituted. Tighten bolts using a calibrated torque wrench.

All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values according to bolts diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

BOLT DIA.	Pitch mm	DRY Threads TORQUE NUT to:	LUBRICATED** Threads TORQUE NUT to:
M8	*1.25*	*36 Nm / 27 Ft-Lbs.*	*26 Nm / 19 Ft.-Lbs.*
M10	*1.5*	*72 Nm / 53 Ft-Lbs.*	*52 Nm / 38 Ft.-Lbs.*
M12	*1.75*	*125 Nm / 92 Ft-Lbs.*	*91 Nm / 67 Ft.-Lbs.*
M14	*2*	*198 Nm / 146 Ft-Lbs.*	*144 Nm / 106 Ft.-Lbs.*
M16	*2*	*306 Nm / 226 Ft-Lbs.*	*222 Nm / 165 Ft.-Lbs.*
M18	*2.5*	*420 Nm / 310 Ft-Lbs.*	*305 Nm / 225 Ft.-Lbs.*
M20	*2.5*	*590 Nm / 435 Ft-Lbs.*	*430 Nm / 320 Ft.-Lbs.*
M22	*2.5*	*800 Nm / 590 Ft-Lbs.*	*580 Nm / 430 Ft.-Lbs.*
M24	*3*	*1020 Nm / 752 Ft-Lbs.*	*740 Nm / 545 Ft.-Lbs.*
M27	*3*	*1510 Nm / 1114 Ft-Lbs.*	*1095 Nm / 810 Ft.-Lbs.*
M30	*3.5*	*2050 Nm / 1512 Ft-Lbs.*	*1485 Nm / 1095 Ft.-Lbs.*
M33	*3.5*	*2770 Nm / 2043 Ft-Lbs.*	*2010 Nm / 1485 Ft.-Lbs.*
M36	*4*	*3560 Nm / 2626 Ft-Lbs.*	*2580 Nm / 1905 Ft.-Lbs.*

**** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY.**

– NOTE Anti-Seize to be **NON COPPER** based.

IMPORTANT! ***Tightening when bolt threads are lubricated.***

When using an *Impact Wrench*, **DO NOT** run up to the torque value in **one** operational cycle of the *Impact Wrench*. When the threads are lubricated, the nut has less resistance and the power *Impact Wrench* will spin the nut faster than when on dry threads. The faster nut spin speed is fast enough to cause a ramming force powerful enough to damage the bolt and/or nut.

Run up nut in separate pulse cycles until contact is made and is snug tight to the parts being bolted, and then tighten to the Torque Value.

GRADE 12.9 METRIC FASTENERS | NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts **are not** substituted. Tighten bolts using a calibrated torque wrench.

All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values according to bolts diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

BOLT DIA.	Pitch mm	DRY Threads TORQUE NUT to:	LUBRICATED** Threads TORQUE NUT to:
M8	*1.25*	*43 Nm / 31 Ft-Lbs.*	*32 Nm / 24 Ft.-Lbs.*
M10	*1.5*	*84 Nm / 62 Ft-Lbs.*	*61 Nm / 45 Ft.-Lbs.*
M12	*1.75*	*146 Nm / 108 Ft-Lbs.*	*105 Nm / 77 Ft.-Lbs.*
M14	*2*	*235 Nm / 173 Ft-Lbs.*	*170 Nm / 125 Ft.-Lbs.*
M16	*2*	*365 Nm / 269 Ft-Lbs.*	*265 Nm / 195 Ft.-Lbs.*
M18	*2.5*	*504 Nm / 372 Ft-Lbs.*	*365 Nm / 270 Ft.-Lbs.*
M20	*2.5*	*712 Nm / 525 Ft-Lbs.*	*515 Nm / 380 Ft.-Lbs.*
M22	*2.5*	*971 Nm / 716 Ft-Lbs.*	*705 Nm / 520 Ft.-Lbs.*
M24	*3*	*1231 Nm / 908 Ft-Lbs.*	*890 Nm / 655 Ft.-Lbs.*
M27	*3*	*1805 Nm /1331 Ft-Lbs.*	*1310 Nm / 965 Ft.-Lbs.*
M30	*3.5*	*2446 Nm / 1804 Ft-Lbs.*	*1775 Nm / 1310 Ft.-Lbs.*
M33	*3.5*	*3328 Nm / 2455 Ft-Lbs.*	*2415 Nm / 1780 Ft.-Lbs.*
M36	*4*	*4276 Nm / 3154 Ft-Lbs.*	*3100 Nm / 2285 Ft.-Lbs.*

**** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY.**

– NOTE Anti-Seize to be **NON COPPER** based.

IMPORTANT! ***Tightening when bolt threads are lubricated.***

When using an *Impact Wrench*, **DO NOT** run up to the torque value in **one** operational cycle of the *Impact Wrench*. When the threads are lubricated, the nut has less resistance and the power *Impact Wrench* will spin the nut faster than when on dry threads. The faster nut spin speed is fast enough to cause a ramming force powerful enough to damage the bolt and/or nut.

Run up nut in separate pulse cycles until contact is made and is snug tight to the parts being bolted, and then tighten to the Torque Value.

TURN-OF-THE-NUT METHOD | TORQUE VALUES

When the use of a torque wrench cannot be used on a fastener due to its location, the turn-of-the-method should be used to achieve the proper torque. This method is for **COARSE THREADED** fasteners with a nut only.

Install all fasteners and thread all nuts until they come in contact with the mounting surface; using a ***short-handled wrench*** to avoid excess leverage snug the nuts against the mounting surface. This will place a preload of approximately 1000 lbs. for small diameter bolts and several 1000 lbs. for large diameter bolts. (This depends on the length of the wrench). Next, mark one point of the nut, mounting surface and socket with paint or chalk. Then, without allowing the head of the bolt to turn, rotate the nut the prescribed amount as described in the example below.**

Bolt Size (Diameter/Length) (All bolts Grade 5 or 8.8)	"Snugged" Torque Value at 12 inches	Fraction of a Turn	Angle of the nut when torqued (starting from zero)	Torque Value Achieved
3/4" x 4"	*45 ft/lbs / 61 Nm*	*1/4*	*90º*	*250 ft/lbs / 339 Nm*
1" x 4"	*80 ft/lbs /108 Nm*	*1/8*	*45º*	*600 ft/lbs / 813 Nm*
1-1/4" x 4"	*90 ft/lbs /122 Nm*	*1/6*	*60º*	*1100 ft/lbs / 1491 Nm*
20mm x 100	*40 ft/lbs /54 Nm*	*1/4*	*90º*	*300 ft/lbs / 407 Nm*
24mm x 100	*50 ft/lbs /68 Nm*	*1/6*	*60º*	*534 ft/lbs / 724 Nm*
30mm x 120	*40 ft/lbs /54 Nm*	*1/4*	*90º*	*1069 ft/lbs / 1449 Nm*

Bolt threads were dry and torque was applied to the nut. All bolts were snugged up with the appropriate wrench but the leverage was applied at 12" radius / 12" wrench.

Bolt Size (Diameter/Length) (All bolts Grade 5 or 8.8)	"Snugged" Torque Value at 12 inches	Fraction of a Turn	Angle of the nut when torqued (starting from zero)	Torque Value Achieved
3/4" x 8"	*45 ft/lbs /61 Nm*	*1/3*	*110º*	*250 ft/lbs / 339 Nm*
1" x 8"	*75 ft/lbs /102 Nm*	*1/4*	*90º*	*600 ft/lbs / 813 Nm*
1-1/4" x 8"	*75 ft/lbs /102 Nm*	*3/8*	*100º*	*1100 ft/lbs / 1491 Nm*
20mm x 200	*40 ft/lbs /54 Nm*	*1/3*	*130º*	*310 ft/lbs / 420 Nm*
24mm x 200	*75 ft/lbs /102 Nm*	*1/4*	*90º*	*534 ft/lbs / 724 Nm*
30mm x 180	*75 ft/lbs /102 Nm*	*3/16*	*75º*	*1070 ft/lbs / 1451 Nm*

**** Information taken from Barnes Distribution Technical Series, Fastener Facts, A Maintenance and Engineering Reference Guide, pg. 81.**

TROUBLE SHOOTING GUIDE
SPIRAL ELEVATORS

THE GENERAL KINEMATICS' VIBRATORY SPIRAL ELEVATOR IS DESIGNED TO OPERATE AT A LOW NOISE LEVEL IF PROPERLY MAINTAINED. SHOUD A MALFUNCTION OCCUR; THE FOLLOWING *TROUBLE SHOOTING GUIDE* LISTS POSSIBLE CAUSES AND REMEDIES. IF MALFUNCTIONS PERSIST, THEN CONTACT GENERAL KINEMATICS' ENGINEERING DEPARTMENT.

USA		EUROPE	
PHONE	815.455.3222	PHONE	+49 (0) 211 542250 10
FAX	815.479.9102	FAX	+49 (0) 211 542250 15

NOTE!
General Kinematics' Vibratory Equipment varies in design because it is custom built for particular applications, thus some of the "POSSIBLE CAUSE" items may not apply.

CAUTION!	*LOCKOUT electric power to the equipment, read **ALL** Safety Notes **before** operating the unit and **before** performing **any** maintenance.*

MALFUNCTION	POSSIBLE CAUSE	REMEDY
STROKE or CAPCITY INCREASE		
	1. REACTOR SPRING LOOSE	*TIGHTEN BOLTS TO PROPER TORQUE*
	2. REACTOR SPRING BREAKAGE	*REPLACE SPRING*
	3. MATERIAL BUILD-UP	*CLEAN TROUGH*
	4. ADDITIONAL TROUGH WEIGHT	*CONTACT GENERAL KINEMATICS' ENGINEERING DEPARTMENT*
STROKE or CAPCITY DECREASE		
	1 MATERIAL BUILD-UP	*CLEAN OUT*
	2. TROUGH HITTING STATIONARY EQUIPMENT	*CHECK CLEARANCE ON THE GENERAL ARRANGEMENT DRAWINGS*
	*3. "V-F" COUNTERWEIGHT WHEEL BAD or *(LOST OR LOW PRESSURE)*	*REPALCE BOTH "V-F" WHEELS, CHECK AIR/HYDRAULIC LINE*
**** MAXIMUM FEED RATE PRESSURES MAY VARY DEPENDING UPON THE DESIGN - REFER TO THE GENERAL ARRANGEMENT DRAWING/S.**		
NOISE		
	1. LOOSE BOLTS	*TIGHTEN TO PROPER TORQUE*
	2. BROKEN or LOOSE SPRING	*REPLACE BROKEN SPRING*
	3. ROCKER LEG LOOSE or BROKEN	*REPLACE ROCKER LEG and TIGHTEN BOLTS TO PROPER TORQUE*
	4. HITTING STATIONARY OBJECT	*PROVIDE NECESSARY CLEARANCE*
	5. WELD BREAKAGE	*CONTACT GENERAL KINEMATICS' ENGINEERING DEPARTMENT*

MALFUNCTION	POSSIBLE CAUSE	REMEDY
ROCKER LEG FAILURE		
	1. LOOSE BOLTS	*TIGHTEN BOLTS TO PROPER TORQUE*
	2. BUSHING FAILURE	*REPLACE BUSHING*
	3. MATERIAL BUILD-UP	*CLEAN UP*
SPRING FAILURE		
	1. LOOSE BOLTS	*TIGHTEN BOLTS TO PROPER TORQUE*
	2. FATIGUE	*REPLACE SPRING*
MATERIAL CONVEYING TO ONE SIDE		
	1. MATERIAL BUILD-UP	*CLEAN UP*
	2. ROCKER LEG FAILURE	*REPLACE ROCKER LEG*
	3. LOOSE BOLTS	*TIGHTEN BOLTS TO PROPER TORQUE*
	4. ISOLATION SPRING BROKEN	*REPLACE ISOLATION SPRING*
MATERIAL NOT CONVEYING or LOW CAPACITY		
	1. OBSTRUCTION IN DRUM BODY	*REMOVE OBSTRUCTION*
	2. GATE CLOSED	*OPEN GATE*
	3. "V-F" WHEELS BAD	*REPLACE BOTH "V-F" WHEELS*
	*4. *NO PRESSURE FOR ADJUSTABLE unit WITH 80 PSI MAX FEED RATE*	*CHECK AIR SUPPLY & AIR LINES*
*** MAXIMUM FEED RATE PRESSURE MAY VARY DEPENDING ON DESIGN - REFER TO THE GENERAL ARRANGEMENT DRAWING/S.**		
MOTOR MALFUNCTION		
	1. IMPROPER VOLTAGE	*CHECK GENERAL ARRANGEMENT DRAWING/S FOR PROPER VOLTAGE*
	2. DISCONNECT OR STARTER	*RESET, CHECK OVERLOAD HEATER SIZE*
	3. SINGLE PHASING	*CHECK CABLE, WIRE LEAD and CABLE CONNECTION (MOTOR CONDUIT BOX IS PACKED WITH DUXSEAL/FOAM AND MUST BE REPACKED WITH SAME)*
	4. BAD DEARING or WINDINGS	*REPLACE MOTOR. USE THE SAME TYPE LOCKING BOLTS WITH HARDENED STEEL WASHERS and TIGHTEN BOLTS TO PROPER TORQUE*

STORAGE PROCEDURES
for
GENERAL KINEMATICS VIBRATORY EQUIPMENT

The following considerations should be taken when storing General Kinematics' units, loose parts and controls.

The units are generally shipped fully assembled and in the case of longer units may be shipped in assembled sections. It is our recommendation that they are stored indoors, or if stored outdoors they must be covered to protect them from rain, snow, dust, etc. Elevate them above the ground where there is proper drainage.

If the unit has air or hydraulic controls, check to ensure that the hose connection points have pipe plugs in them. These plugs prevent any foreign matter from entering the air/hydraulic lines. The loose parts and control components for the units are shipped in boxes or crates. They are strapped to the units and should be stored indoors.

Before operating the motor, refer to the **"MOTOR MAINTENANCE and LUBRICATION"** section in this manual.

LONG TERM STORAGE INSTRUCTIONS

INTRODUCTION

The intent of this section is to establish minimum storage standards for NEMA frame Motors. This manual will treat the storage consideration based on three major time categories:

CATEGORY	TIME INTERVAL (years)
A	*Less than 1*
B	*1 to 2*
C	*Greater than 2*

All of the storage intervals will be subjected to the similar basic considerations.

GENERAL STORAGE CONSIDERATIONS

AUXILIARY HEAT: To ensure that condensation does not develop inside the motor causing possible corrosion of internal metal parts and deterioration of stator windings, an auxiliary heat source should be provided. Normal methods of providing the heat required are:

1. Space Heaters
2. Light bulbs installed inside the motor in proximity to the stator cores at the lowest possible location
3. Low voltage heating of one phase of the stator winding
4. Warm air blower

The auxiliary heat should be supplied such that the internal temperature of stator winding is maintained at a temperature five (5) degrees Celsius above the ambient room temperature. This can be accomplished by either of the following:

1. Energizing auxiliary heat source at all times.
2. Employing a control circuit to allow for energizing of auxiliary heat any time motor stator core temperature is less than 5 degrees Celsius/41 degrees Fahrenheit above room ambient.

The auxiliary heat source should also be equipped with an alarm signal to warn if auxiliary heat source becomes inoperative.

STORAGE MAINTENANCE: As a minimum, the following maintenance must be performed on motors regardless of storage period.

1. Rotate Shaft – To ensure that grease covers all bearing surfaces. The motor shafts must be rotated on a regular basis.
2. Megger Stator Winding – On a regular basis, the stator winding should be meggered to assure maintenance of insulation system integrity. The winding resistance should be kept to establish any changes or pattern of changes in winding resistance readings. At any time, if the winding resistance drops below **TEN MEGOHMS**, A MOTOR FACTORY REPRESENTATIVE MUST BE CONSULTED FOR THE POSSIBLE CORRECTIVE ACTION REQUIRED.
3. Visual Inspection – On a regular basis, motor should be inspected for signs of unusual dirt build-up, rust or general deterioration.

STORAGE AREA: To ensure proper maintenance of the motor, the motor should be stored in a clean, dry, heated warehouse. Storage area should be free of ambient vibration. Where no heat is available in the warehouse, space heaters or an auxiliary heat source should be supplied.

Where indoor storage is not available, then the motor must be covered with a tarpaulin and auxiliary heat must be supplied.

Vertical motors should be stored such that the shaft extension is accessible and rotation is possible.

STORAGE COVERING: Motor should be loosely covered with a tarpaulin, plastic cover or similar type of protective cloth. Covering should extend to the ground and must not tightly wrap the motor. This will allow the motor to properly breath.

STORAGE INSPECTION RECORDS: Records must be maintained for all maintenance over the storage period.

GENERAL STORAGE DETAILS

CATEGORY 'A' – STORAGE PERIODS LESS THAN ONE YEAR

Indoor storage is recommended. Outdoor storage may be acceptable as approved by the factory. In the case of outdoor storage, the minimum recommended service intervals are listed below:

1. ROTATE SHAFT – Once per month. 2. MEGGER WINDINGS – Once per month.

CATEGORY 'B' – STORAGE PERIODS GREATER THAN ONE YEAR BUT LESS THAN TWO YEARS

Indoor storage mandatory. Auxiliary heaters must be energized (if supplied).

1. ROTATE SHAFT – Once per month. 2. MEGGER WINDINGS – Once per two months.

CATEGORY 'C' – STORAGE PERIODS GREATER THAN TWO YEARS

1. MEGGER WINDING – Once per month.
2. EXAMINE PRESERVATIVE – The preservative coating should be examined yearly. If there is a scratch on the preservative coating. Surface must be recoated.
3. If motor has bearings installed, rotate shaft every two months.

SPECIFIC STORAGE DETAILS

I. STORAGE O.E.M.'s and DISTRIBUTORS
   a. Motors shall always be used on a first in first out basis.

II. MOTORS STORED FOR SIX MONTHS TO TWO YEARS
   a. Remove grease drain plugs and observe for sign of condensation.
   b. Insert a wire into the grease cavity to determine if:
      1. Grease is present.
      2. Grease amount is adequate.
      3. If oil has separated from its base.
   c. If grease is satisfactory, energize motor to check for noise and vibration.
   d. Remove grease inlet plugs and release if:
      1. Condensation is evident (***flush completely***).
      2. Inadequate grease.
      3. Evidence of oil separation.
   e. Shafts of motors without grease fittings are to be turned every three months to prevent oil separation in grease.

      PROCEED AS FOLLOWS BEOFRE INSTALLING MOTOR:
      1. Turn shaft by hand to determine if bearings are rough and/or noisy.
      2. If satisfactory, energize motor to check for noise and vibration.
      3. If shaft turns hard and friction is evident, remove end bells.
      4. Remove grease from bearing and cavities and lubricate with recommended grease.

PRIOR TO INSTALLATION

Introduce grease with low pressure grease gun until fresh grease exits drain holes. Run motor long enough to get bearings and winding up to operating temperature to properly seat bearing and evaporate any condensation that may exist. Check for noise and vibration.

I. **MOTORS STORED LONGER THAN TWO YEARS**
   a. Re-lubricate bearings
   b. Inspect winding to determine if insulation has deteriorated due to moisture or other contamination. If condition of winding is questionable, the winding must be dried out by a suitable method. Preferable method is to bake in an oven until all moisture has been removed.

"TOOL LIST"

The following Tool List contains the recommended tool type, size and manufactures. Customer to determine type and sizes of the tools based on the complexity of their unit.

AIR TOOLS
1/2" Air impact Ingersoll Rand Model, 2906P1
3/4" Air impact Ingersoll Rand Model, 2925P1T1 –Titanium Impact
90° Adapter Ingersoll Rand Model, 4UA9 – attaches to 1/2" impact
GKC special reduced size sockets P/N 103-30-10, 1/2" Drive 1-1/2" – For use with 90° attachment
GKC special reduced size sockets P/N 10-01-108-K, 1/2" (13mm) drive 36 mm socket– For use with 90° attachment
Website www.irtools.com

STANDARD COMBINATION WRENCH		
SIZE	**Normal Depth Socket**	**Deep Socket**
3/4"	1/2" Drive	NA
7/8"	1/2" Drive	NA
15/16"	1/2" Drive	1/2" Drive
1-1/16"	1/2" Drive	1/2" Drive
1-1/8"	1/2" Drive	1/2" Drive
1-1/4"	1/2" Drive	1/2" Drive
1-5/16"	3/4" Drive	3/4" Drive
1-7/16"	3/4" Drive	3/4" Drive
1-1/2"	3/4" Drive	3/4" Drive
1-5/8"	3/4" Drive	3/4" Drive
1-7/8"	3/4" Drive	NA
2"	3/4" Drive	NA

METRIC COMBINATION WRENCH		
SIZE	**Normal Depth Socket**	**Deep Socket**
19mm	13mm / 1/2" Drive	NA
21mm	13mm / 1/2" Drive	NA
24mm	13mm / 1/2" Drive	NA
27mm	13mm / 1/2" Drive	NA
30mm	13mm / 1/2" Drive	13mm / 1/2" Drive
34mm	19 mm / 3/4" Drive	NA
36mm	19 mm / 3/4" Drive	19 mm / 3/4" Drive
41mm	19 mm / 3/4" Drive	19 mm / 3/4" Drive

- Continued –

"TOOL LIST" - Continued

HYDRAULIC JACK KIT		
QUANTITY	SPX POWER TEAM PART NUMBER	DESCRIPTION
1	P159	SPX Power Team 2 Speed Hand Pump
1	C1010C	SPX Power Team 10 Ton 3 5/8" High Cylinder
1	C2510C	SPX Power Team 25 Ton 14 3/4" High Cylinder
1	9764	6' SPX Power Team Hose Assembly
1	9636	SPX Power Team 1 gallon Hydraulic Fluid
WEBSITE: www.powerteam.com		

HYDRAULIC FASTENER TORQUE SYSTEM
SPX Power Team 10,000 psi pump, Model PE55A-HH-X-M-A-D-B-A-D-A-A-G
Hytorc XLCT-2 Power Head Assembly w/360 x 360 Swivel Head Connection
Hytorc XLCT-2 Square Drive attachment
Hytorc XLCT-4 Power Head Assembly w/360 x 360 Swivel Head Assembly Connection
Hytorc XLCT-4 1" Square Drive Attachment
Hytorc Avanti P7 3/4" Square Drive Power Head
Hytorc Hexlink 1-1/2" Cassette
Hytorc Hexlink 1-5/8" Cassette
Hytorc Hexlink 1-7/8" Cassette
Hytorc Hexlink 2" Cassette
WEBSITE: www.hytorc.com

AIR POWERED FASTENER TORQUE SYSTEM RAD TORQUE SYSTEM
10GX 200-1000
25 GX 800-2500
WEBSITE: www.radtorque.com

RETURN MERCHANDISE POLICY

GENERAL KINEMATICS strives to provide their customers with maximum follow-up support and in order to offer the most practical flexibility; the following conditions apply to return merchandise. Adherence to these procedures will assure the most prompt and efficient service.

RETURNS WILL BE CONSIDERED IN THE FOLLOWING SITUATIONS:

- Products ordered in error by customer. *(Subject to a restocking charge)*
- Incorrect or defective products shipped to customer.
- Repair or upgrade of existing products.
- Products ordered correctly but which are unwanted or unsuitable. (*Subject to a restocking charge)*

RETURN PROCEDURE:

1. Customer must obtain a Return Merchandise Authorization Number (**RMA#**) from General Kinematics prior to returning the merchandise.

2. To obtain a RMA#, customer should contact the Customer Service Department as follows:

	General Kinematics (USA)	General Kinematics (Europe)
Phone	*815.455.3222*	*+49 (0) 211 542250 10*
Fax	*815.479.9098*	*+49 (0) 211 542250 15*
Mailing Address	*General Kinematics Corporation* *ATTN: Customer Service Department – RMA* *5050 Rickert Road* *Crystal Lake, IL 60014*	*GK Europe GmbH.* *ATTN: Customer Service Department – RMA* *Mündelheimer Weg 37* *40472 Düsseldorf* *Germany*

3. Material to be returned must be identified and the reason for its return **clearly** specified.

4. All returned merchandise is to be shipped with transportation charges PREPAID, unless otherwise agreed when the RMA# is assigned. Following inspection of the returned merchandise, if it is found to be defective because of faulty workmanship or error by General Kinematics, the customer's account will be credited for the value of the inbound transportation cost upon receipt of a copy of a paid freight bill.

   When it has been predetermined that returned merchandise is to be shipped **COLLECT**, General Kinematics will specify the desired routing.

5. All returned shipment will be subject to inspection upon arrival at the General Kinematics' plant.

6. Material returned without RMA # may be refused and returned at customer's expense.

SEND SHIPMENTS TO THE ABOVE ADDRESS, AS APPLICABLE, CLEARLY LABELED WITH THE RMA# AS ADVISED BY GENERAL KINEMATICS CUSTOMER SERVICE DEPARTMENT.

Italvibras USA

Industrial Electric Vibrators

Model MVLS

Operator's Manual

italvibras
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USA

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Introduction

Italvibras USA industrial electric vibrators have been designed and manufactured in accordance with the most exacting international industrial standards and requirements. Italvibras USA industrial electric vibrators are designed for long life at continuous duty and maximum force output. The electric vibrators are suitable for operation in ambient from -30°C to 40°C (operation outside of this range needs engineering consideration).

Italvibras USA industrial electric vibrators have been evaluated for installation throughout the world. Standard ratings include CSA (Canadian Standards Association) Approval, the CE (European Directive) Mark, EX Approval for Zone 21 (ATEX II2D tD A21 IP66), Russian GOST Mark and IECEx Approval (II2D tD A21 IP66). Check the electric vibrator nameplate for the exact ratings and Approvals for the specific Model.

The electric vibrator can be referred to by its Model or Type designation or by its Item number. The vibrator Model or Type designations referred to in this manual are as follows:

MVLS – Continuous duty industrial electric vibrator, three phase.

The electric vibrator may optionally be CSA Approved for Class I, Division 2, Group A, B, C and D hazardous locations, or it may be marked as being suitable for Class II, Division 2, Group F and G hazardous locations. Applications and installations requiring Division 1 equipment shall use Italvibras' CDX explosion-proof and dust-ignition-proof industrial electric vibrators.

General Safety requirements

Read this entire manual before proceeding. Compliance with all company, local and OSHA regulations is essential. Any electrical work must be done in accordance with all applicable local and national codes and must be performed only by qualified, licensed and authorized personnel. Always follow lockout and tag out procedures and requirements and always wear ear protection when in close proximity to operating vibratory equipment.

Comprehensive adherence to these documents at a minimum is required – The National Electrical Code NFPA 70, ANSI z244.1 the American National Standard for Personnel Protection – Lockout/Tag out of Energy Sources – Minimum Safety Requirements, CFR 29 Part 1910 – Control of Hazardous Energy Sources (Lockout/Tag out) Final Rule and CFR 29 Part 1910.15 Occupational Noise Exposure.

Storage

Storage of the electric vibrator should be in an ambient not less than 5°C with a relative humidity not more than 60%. If the vibrator has been stored for longer than two years, the vibrator should be evaluated by authorized and trained personnel to ensure that the grease is intact, that there is no bearing damage such as brinelling and that the ground insulation is sound and not damaged from condensation.

Installation

Before installing the vibrator, make sure that you have everything that you will need and that there is no shipping damage. Any product damage should be reported to the delivery service immediately. Standard metric hand tools will be needed. Carefully handle the electric vibrator. Dropping or impacting the electric vibrator may damage the bearings.

Welding – Never weld on a bin, hopper or machine with the electric vibrator mounted to it since the welding may damage the vibrator bearings or electrical circuits. When you do weld, especially in an enclosed area, make sure that the area is known to be nonhazardous and that there are no flammable or explosive levels of gases, vapors or dusts.

Mounting Surface – The object of vibration on bins and hoppers is to transmit vibration energy through the structure to the material within. The mounting surface must be rigid and strong for this transfer of energy to take place. The mounting surface must also be clean, flat (0.010 in. across mounting feet maximum), free of paint and have a minimum thickness equal to the major diameter of the mounting bolt. Also make sure that the electric vibrator feet are clean and free of debris.

Mounting Hardware & Torque

Always use new bolts, nuts and compression washers. The bolts should be Grade 5 or 8 (equivalent international designation is 8.8 and 12.9, respectively). Grade 5 bolts are suitable for a majority of applications. Do not use split lock washers. Use only compression washers. Table I offers suggested mounting bolt torque values. Always check with the bolt manufacturer for recommended torque values. Torque the mounting bolts in the proper sequence as shown in figure 1 so as not to damage casting. After operating vibrator for 15 minutes, disconnect, lockout/tag out, and torque the mounting bolts a second time. Periodically check the mounting bolt torque thereafter.

Table I. Mounting Bolts & Torque Requirements

	British, (lb-ft)		Metric, (kg-m)	
Frame Size	**Bolt Size**	**Dry Torque, Grade 5**	**Bolt Size**	**Dry Torque, Grade 8.8**
184, 215	1 in-8 NC	645	M24	71
256, 286	1-1/4 in-7 NC	1120	M30	138

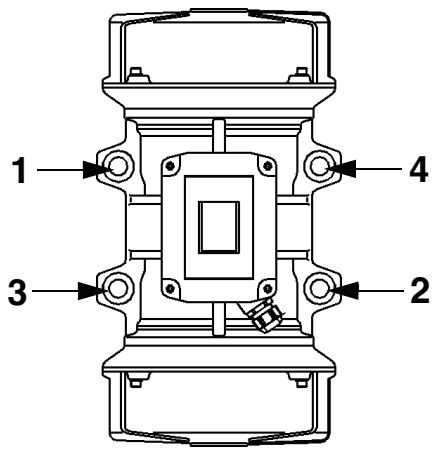


Figure 1. Torque Sequence

Wiring Electric Vibrator

It is mandatory to comply with the National Electrical Code, NFPA 70, and all applicable local codes. Identify which wiring diagram is applicable by referencing the Diagram designation on the nameplate. Remove the four screws with washers securing the wiring box cover along with the foam rubber block and set aside. Identify the wiring diagram by referencing the predetermined Diagram noted on the wiring diagram found within the wiring box or by referring to the Diagrams shown in Figure 2.

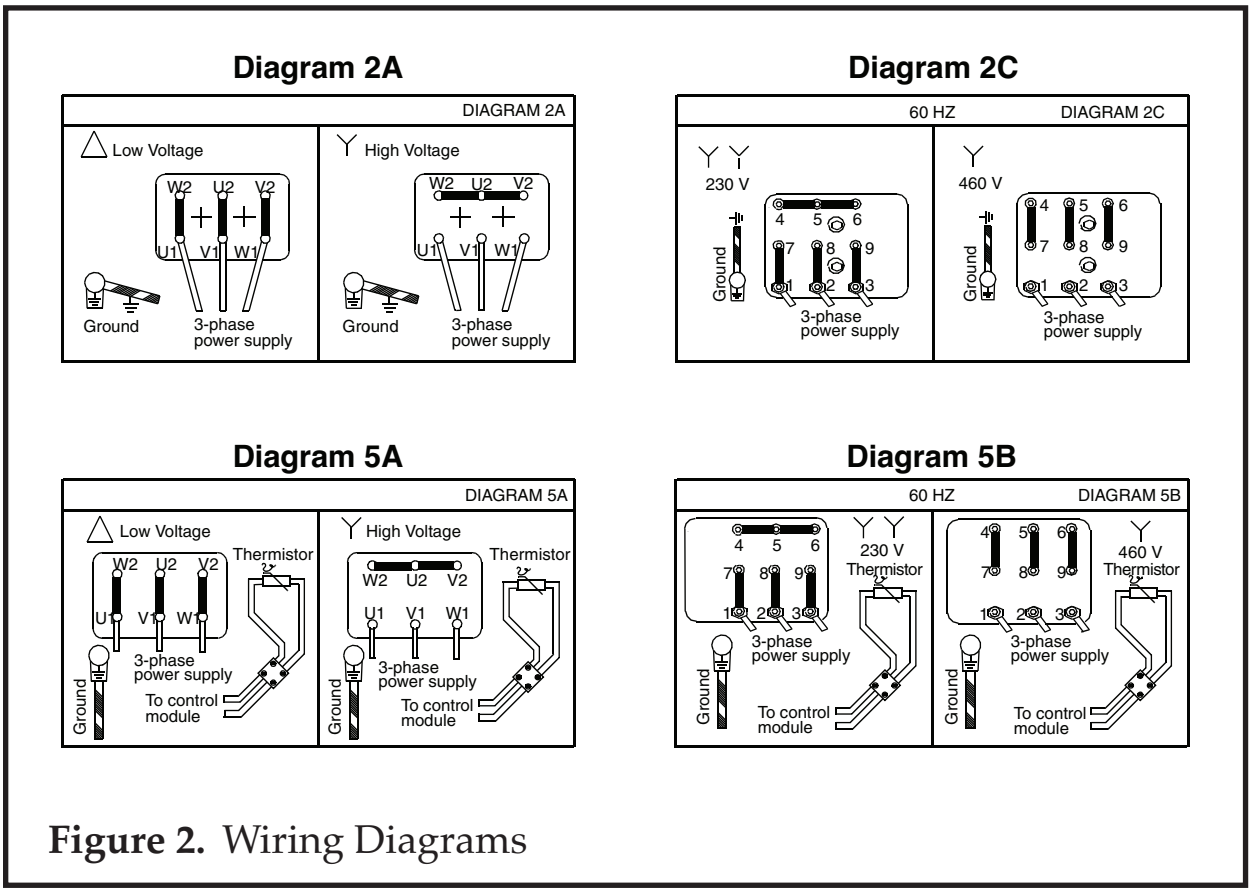


Figure 2. Wiring Diagrams

Wiring Electric Vibrator Cont.

Select a cord type that has a voltage rating not less than the power supply voltage, that has a minimum temperature rating of 105°C, and that has an overall jacket diameter within the range specified in Table II. This table also details the cord provided by the factory for reference. We recommend Coleman black portable cord SEOOW Seoprene rated 600 V and 105°C. Coleman Cable Inc. can be reached by phone at 847-672-2300 or at www.colemancable.com. Italvibras USA also stocks the Coleman cable.

Table II. Cord Grip Chart

Frame Size	Size mm x 1.5	Item No.	Suitable Cord Diameter Range, mm	Cord Provided By Factory		
				Size	Nominal Diameter, in.	Distance Between Flats, in.
184	M25	511597	9-16	14/4	0.575	1/16 to 1/8
215, 256	M32	511598	13-21	10/4	0.705	1/16 to 1/8
286	M32	511598	13-21	8/4	0.807	3/32 to 5/32
Thermistor Circuit Cord	M20	511596	6.5-12	16/3	0.39	1/16 to 1/8

When wiring the electric vibrator, leave enough slack in the cord so that the cord does not become taut during operation causing stress on the connections. It is always best to position the cord down so that should there be any moisture present the moisture would tend to run down instead of into the vibrator wiring box.

Trim the cord by removing the jacket exposing the conductors and ground wire for approx. 6 in. Be careful not to cut the conductor or ground wire insulation. Loosen the compression nut from the cord fitting assembled to the side wall of the wiring box on the electric vibrator. Position the compression nut on the cord and insert the cord through the opening in the side wall of the wiring compartment. Position the jacket of the cord approx. ½ in beyond the inside wall of the wiring box wall and secure the compression nut by threading it to a position equal to the "Distance Between Flats" noted in Table II. Reference figure 3. which pictorially defines "Distance Between Flats"

Wiring Electric Vibrator Cont.

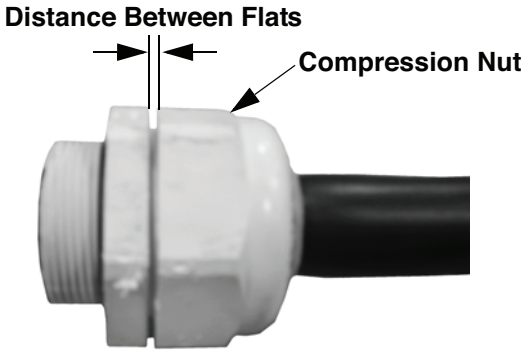


Figure 3. Distance Between Flats

Trim the conductors within the wiring box leaving plenty of slack. Next, strip the conductor insulation for 1/4 in. to 3/8 in. Crimp on closed loop wire connectors. Use only the intended crimping tool as designated by the wire connector manufacturer. The conductors should be neatly arranged on the floor of the wiring box. The wires should not cross over each other. See figure 4.

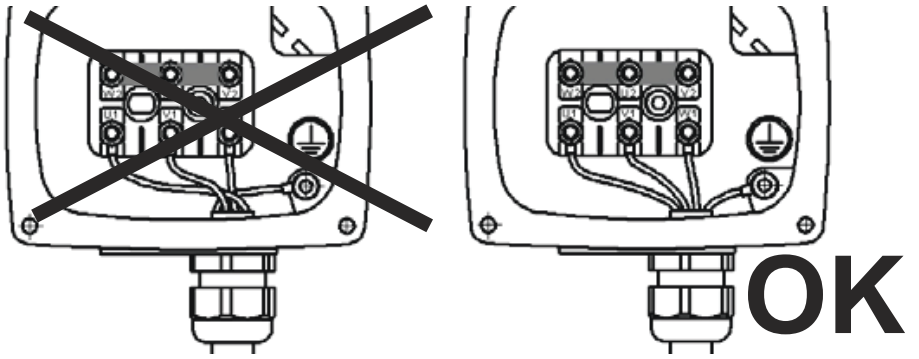


Figure 4. Proper Wiring Arrangement/Positioning

Secure the wire connectors and the shorting bars to the terminal block in the positions shown on the wiring diagram using the hardware provided. It is essential that the hardware be positioned as shown in Figure 5.

Note that the closed loop wire connectors provided on the power supply cord are positioned between the two flat washers. A drop or two of thread sealant such as Locktite is recommended. Do not use permanent thread sealant because the terminal block will be damaged should you wish to remove and replace the power supply cord. The terminal block nuts should not be over tightened since the possibility of damaging the plastic insulating body is high. Reference table V in the Appendix for torque values. Make the connections hand-tight followed by a ¼ turn but never put a ratchet on these nuts.

Wiring Electric Vibrator Cont.

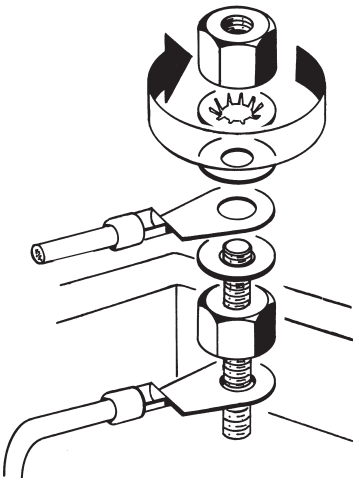


Figure 5. Terminal Block Hardware Installation

For wiring diagrams 2A and 2C (Fig.4), reinstall the rubber block over the power supply conductors and install the wiring box cover being careful not to pinch the O-ring. Screw torque is specified in the Appendix. See figure 6.

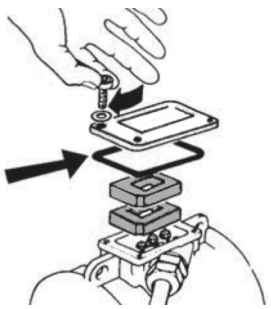


Figure 6. Wiring Block Assembly

For wiring diagrams 5A and 5B, you will note that there is a small 2-pole terminal block in the wiring box. This is the thermistor circuit. Proceed to Thermistor Wiring.

Thermistor Wiring

Electric vibrators with Diagram 5A and 5B have thermistor circuits installed in the winding. These devices are intended to protect the winding from over-temperature. Connect the thermistors to the motor starter using a thermistor control module such as Siemens 3RN1012-1CK00. Never apply line voltage to the thermistor circuit. It is a low voltage +/- 5V dc circuit. The thermistor control module is connected to the motor starter control circuit which commonly operates at 120 Vac. Follow the wiring diagram provided with the thermistor control module.

The thermistors are our Item No. 0539503 and are rated 130°C. There are three PTC thermistors wired in series that are installed in the vibrator winding and connected to blue or grey leads. These leads are secured to the small 2-pole terminal block mounted in the wiring box.

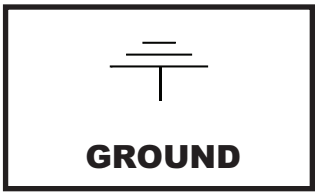
To assemble the thermistor cord, remove the threaded metal plug assembled in the side wall of the wiring box and install a M20 cord grip (our Item No. 0511596). Select a cord type that has a voltage rating not less than the power supply voltage, that has a minimum temperature rating of 105°C, and that has an overall jacket diameter within the range specified in Table III. This table also details the cord provided by the factory for reference. We recommend Coleman black portable cord SEOOW Seoprene rated 600 V and 105°C. Coleman Cable Inc. can be reached by phone at 847-672-2300 or at www.colemancable.com. Italvibras USA also stocks the Coleman cable.

Trim the cord by removing the jacket exposing the conductors for approx. 6 in. Be careful not to cut the conductor wire insulation. Loosen the compression nut from the cord fitting assembled to the side wall of the wiring box on the electric vibrator. Position the compression nut on the cord and insert the cord through the opening in the side wall of the wiring compartment. Position the jacket of the cord approx. ½ in beyond the inside wall of the wiring box wall and secure the compression nut by threading it to a position equal to the "Distance Between Flats" noted in Table II. Reference figure 3 which pictorially defines "Distance Between Flats".

Trim the conductors within the wiring box leaving plenty of slack. Next, strip the conductor insulation for ¼ in. to 3/8 in. The conductors should be neatly arranged on the floor of the wiring box. The wires should not cross over each other. Secure the wires to the 2-pole terminal block by tightening the compression screws. Reinstall the rubber block over the power supply and thermistor circuit conductors and install the wiring box cover being careful not to pinch the O-ring. Screw torque is specified in the Appendix. Reference figure 5.

Grounding & Bonding

The electric vibrator must be grounded using the ground wire provided in the cord. The ground wire shall be connected to a closed loop wire connector which is then connected to the ground terminal located within the wiring box (See figure 4). The ground terminal is identified by the international symbol.



It may be necessary to bond the electric vibrator to ground using the external ground screw as shown in figure 7. The external ground terminal is identified by the international symbol. Use a wire size no smaller than the internal ground wire.

Grounding & Bonding Cont.

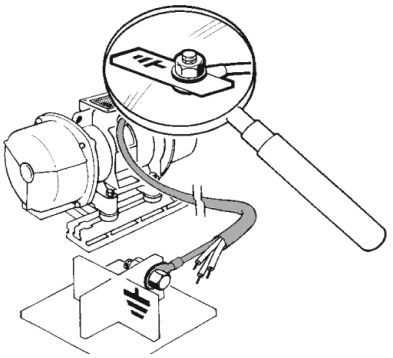


Figure 7. Ground Bonding Screw

Overload, Short-Circuit & Ground-Fault Protection

In the USA, The National Electrical Code, NFPA 70, and all applicable local codes, govern how to properly size, select and install overload protection (sometimes called heaters) and short-circuit and ground-fault protection (fuses or circuit breakers). Proper selection and installation of these devices is required and essential for not only protection of the electric vibrator and the power supply circuit but also for protection of personnel.

If the overload or short-circuit and ground fault protection operate, have qualified personnel locate and fix the problem before resetting.

When operating two electric vibrators, the vibrators should be controlled with a single motor starter that has overload protection dedicated to each electric vibrator. The overloads shall be electrically interlocked such that should there be a fault with one electric vibrator, both electric vibrators will be de-energized.

Variable Frequency Inverter

The electric vibrators may be supplied with a variable frequency inverter. Never operate the vibrators above the maximum frequency noted on the nameplate. If operating two vibrators, use one variable frequency inverter along with overload protection dedicated to each electric vibrator. The overloads shall be electrically interlocked such that should there be a fault with one electric vibrator, both electric vibrators will be de-energized.

The nameplate current should never be exceeded throughout the entire frequency range.

Eccentric Weight Adjustment

The eccentric weights may be adjusted to produce the desired centrifugal force output. It is always best to operate the electric vibrator at the lowest weight setting that produces the desired result. This will result in lower energy expense and extend the bearing life. The factory setting is 50% which would result in 50% of the centrifugal force noted on the nameplate. To adjust the force output, lockout/tag out the electric vibrator. Remove each weight cover and set it and the screws, washers and O-rings aside. The outer adjustable weight clamping screw or the shaft nut may be loosened and then the adjustable weights may be rotated to the desired position. Reference Figure 8.

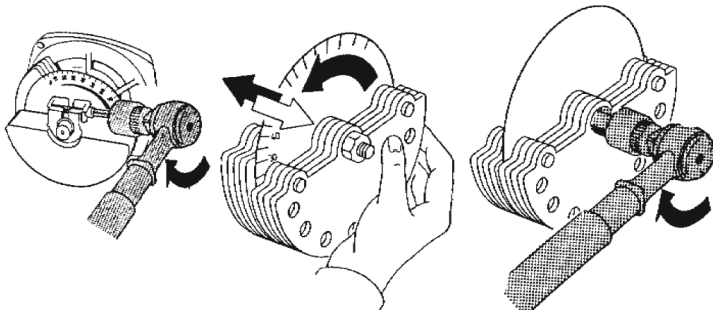


Figure 8. Eccentric Weight Adjust.

The eccentric weights must be adjusted to mirror images of each other at the same setting number as shown in Figure 9.

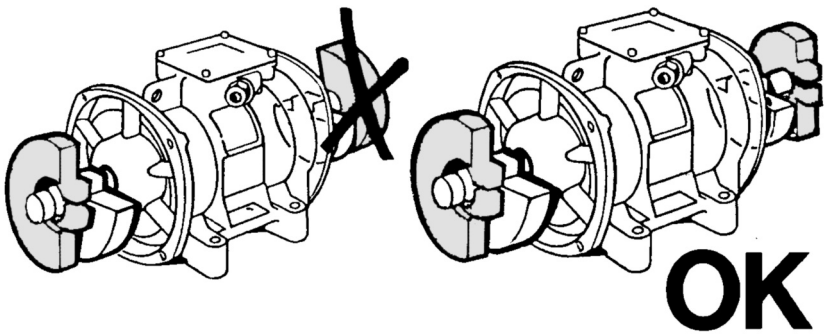


Figure 9. Setting Sets of Eccentric Weights to Mirror Images

Properly torque the clamping screw or shaft nut to secure the weights in position. Torque values are outlined in the Appendix. Reinstall the weight covers making sure not to pinch the O-rings.

Eccentric Weight Adjustment Cont.

Check shaft rotation before replacing weight covers. Start vibrator for 1 second, stop and lockout/tag out. Observe direction of rotation. If desired to reverse the direction of rotation, switch two of the three power supply leads in the wiring box or at the motor starter for 3-phase electric vibrators.

Replace weight covers using screws and washers being careful not to pinch the O-rings. The screw torque is outlined in the Appendix. Never operate the electric vibrator without weight covers in place. They provide a degree of protection for the bearings and a shield for the rotating eccentric weights. Always replace broken weight covers immediately. Do not operate electric vibrator with weight covers removed or with damaged weight covers.

Starting Up

After making sure that the power supply voltage matches the voltage marked on the nameplate, that the mounting bolts are properly secured, that all covers are in place and secured, and that the motor starter is properly installed and adjusted, turn the electric vibrator on. Excessive noise would indicate a problem but slight bearing noise is normal due to the type of bearing used. After a few hours of operation, check each line current and verify that it does not exceed nameplate current. If the line current exceeds the nameplate current, then the mount needs to stiffened, the vibrator weights need to be reduced or the vibrator needs to be moved to a more rigid location. Never operate the vibrator above nameplate current.

After the first 8 hours of operation, check the line current to make sure that it does not exceed nameplate and check mounting bolt torque. See MOUNTING HARDWARE AND TORQUE.

Electric Vibrator Lubrication

All electric vibrators are lubricated at the factory. If there are no external grease fittings, then the vibrator construction is lubricated for life. No grease ever need be added to these electric vibrators. If external grease fittings are provided, then it is intended that the bearings be periodically lubricated. The lubrication schedule is outlined in Table III.

Table III. Lubrication Schedule For Each Bearing.

Lubricate every 2000 hours unless specified otherwise.

184 Frame		215 Frame		256 Frame		286 Frame	
Model	**Grease, g**	**Model**	**Grease, g**	**Model**	**Grease, g**	**Model**	**Grease, g**
MVLS 6-2150	10	MVLS 6-3310	12	MVLS 6-5100	12	MVLS 6-9150	35
MVLS 7-1700	12	MVLS 7-3290	15	MVLS 6-6600	20	MVLS 6-14600	55
MVLS 7-3330	12	MVLS 7-5110	15	MVLS 7-4400	24	MVLS 7-14700	65
MVLS 9-3320	14	MVLS 9-5150	18	MVLS 7-6600	24	MVLS 7-18000	65
				MVLS 7-5940	32	MVLS 9-16600	80
				MVLS 7-9400	32		
				MVLS 9-6890	30		
				MVLS 9-9330	40		
				MVLS 12-16400	40		
				MVLS 12-18600	40		

The lubrication frequency is every 2000 hours of operation unless specified otherwise in the table. Follow the table except when the operating temperature exceeds 90°C. If the operating temperature exceeds 90°C, reduce the lubrication frequency and lubrication volume by 50% for every 10°C increment above 90°C. If the electric vibrator operating temperature exceeds 100°C, contact Italvibras USA by phone at 815-872-1350. The electric vibrator should never operate above 120°C.

When adding grease through the grease fitting, make sure to clean the fitting so as not to introduce dirt into the bearing. Add the specified amount of grease. Experiment with your grease gun to determine how many grams are introduced with each pump. Never over-grease a bearing since this will damage the bearing and cause high operating temperature.

Always use the correct grease. Never mix greases. All electric vibrators are lubricated with Kluber NBU 8EP grease. Kluber grease may be purchased direct from Kluber Lubrication by calling 800-447-2238. Italvibras USA also stocks the Kluber grease.

Electric Vibrator Repair

If the electric vibrator needs repair, contact Italvibras USA at 815-872-1350 for instructions. Most electric motor repair shops are not trained to repair our industrial electric vibrators. We recommend that they be returned to the service center located in Princeton, IL. Attempting to repair the electric vibrator or replace the bearings will void the warranty.

Electric Vibrator Maintenance

Every quarter, we recommend a thorough inspection of the electric vibrator. After lockout/tag out, do the following:

1.) Inspect the cord for any visible damage or wear. Replace the cord if there are any signs of damage or wear. This holds true for both the power supply cord and the thermistor circuit cord.

2.) Remove the wiring box cover and inspect for any foreign matter or liquid. Vacuum any foreign matter. If wet, remove electric vibrator from service and have the ground insulation tested by a trained, qualified and licensed technician.

3.) Before replacing the wiring box cover, make sure the electrical connections are tight (do not over-tighten) and inspect the cover O-ring and rubber compression block. If the O-ring or rubber compression block is damaged or if they have lost their compression set, replace them.

4.) Remove each weight cover and inspect for foreign matter. Vacuum if necessary. Replace O-rings if they are damaged or if they have lost their compression set.

5.) Check the mounting bolt torque.

6.) Replace any broken parts.

Appendix

Electric Vibrator Item Numbers

The table below outlines a list of electric vibrator Model/Type designations next to their respective Item No. The information is sorted by frame size. Please reference the Model/Type designation and Item No. when ordering electric vibrators or their parts.

Table IV. Vibrator Item Numbers By Frame

184 Frame		215 Frame		256 Frame		286 Frame	
Model	**Item No.**	**Model**	**Item No.**	**Model**	**Item No.**	**Model**	**Item No.**
MVLS 6-2150	602957	MVLS 6-3310	602949	MVLS 6-5100	602950	MVLS 6-9150	602947
MVLS 7-1700	602965	MVLS 7-3290	602966	MVLS 6-6600	602951	MVLS 6-14600	602948
MVLS 7-3330	602958	MVLS 7-5110	602953	MVLS 7-4400	602968	MVLS 7-14700	602946
MVLS 9-3320	602531	MVLS 9-5150	602532	MVLS 7-6600	602959	MVLS 7-18000	602960
				MVLS 7-5940	602967	MVLS 9-16600	602536
				MVLS 7-9400	602952		
				MVLS 9-6890	602533		
				MVLS 9-9330	602534		
				MVLS 12-16400	602303		
				MVLS 12-18600	602321		

Electric Vibrator Torque Requirements

Table V. Vibrator Nut & Screw Torque Requirements

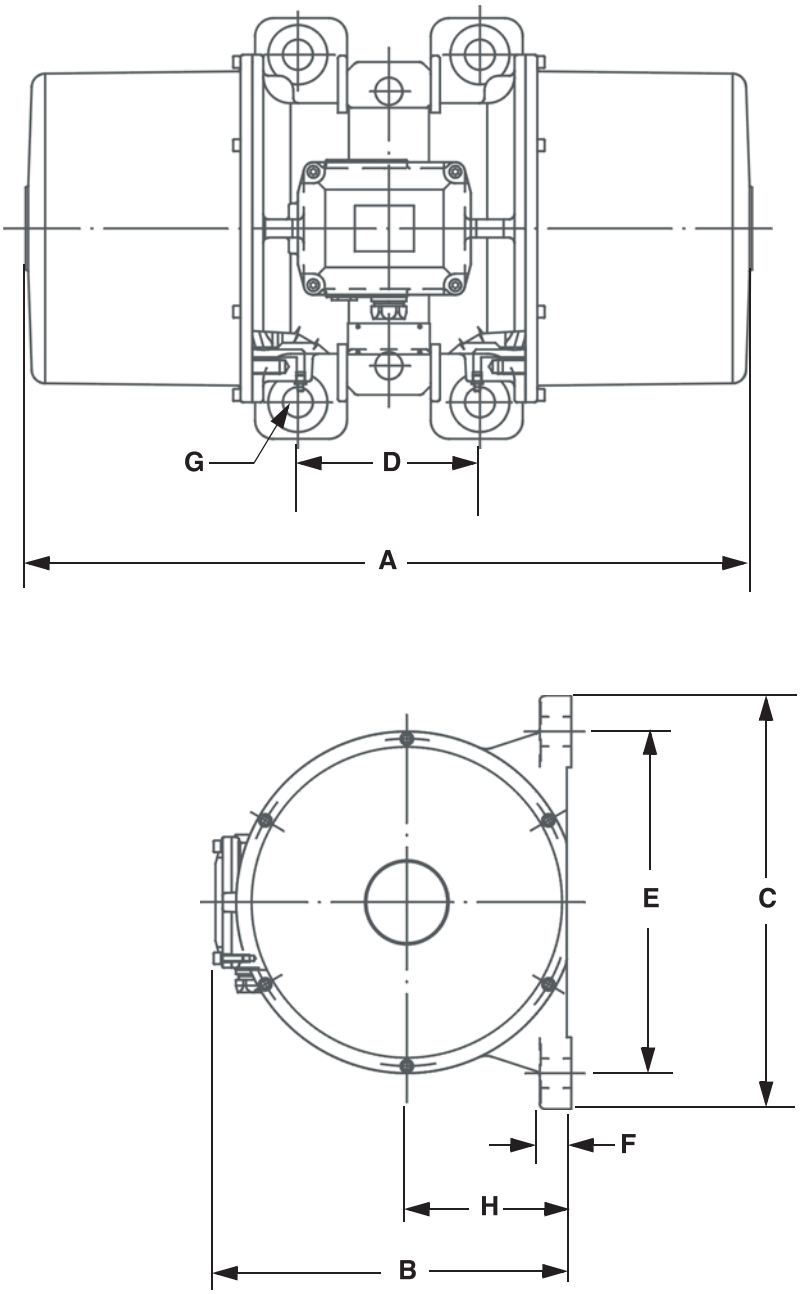
Cap Screws	ft/lb (kgm)
M6	7 (1)
M8	16.5 (2.3)
M10	35 (4.8)
M12	58 (8)
M14	95 (13)
M16	137 (19)
M18	195 (27)
M20	275 (38)

Shaft Nuts	ft/lb (kgm)
M13x1	22 (3)
M15x1	36 (5)
M20x1	72 (10)
M25x1.5	123 (17)
M30x1.5	246 (34)
M45x1.5	360 (50)

Terminal Block Nuts	ft/lb (kgm)
M4	0.87 (0.12)
M5	1.45 (0.20)
M6	2.17 (0.30)
M8	4.70 (0.65)
M10	9.80 (1.35)

Electric Vibrator Dimensions (in./mm)

Table VI. Vibrator Dimensions By Frame



Electric Vibrator Dimensions Cont (in./mm)

Table VI. Vibrator Dimensions By Frame Cont.

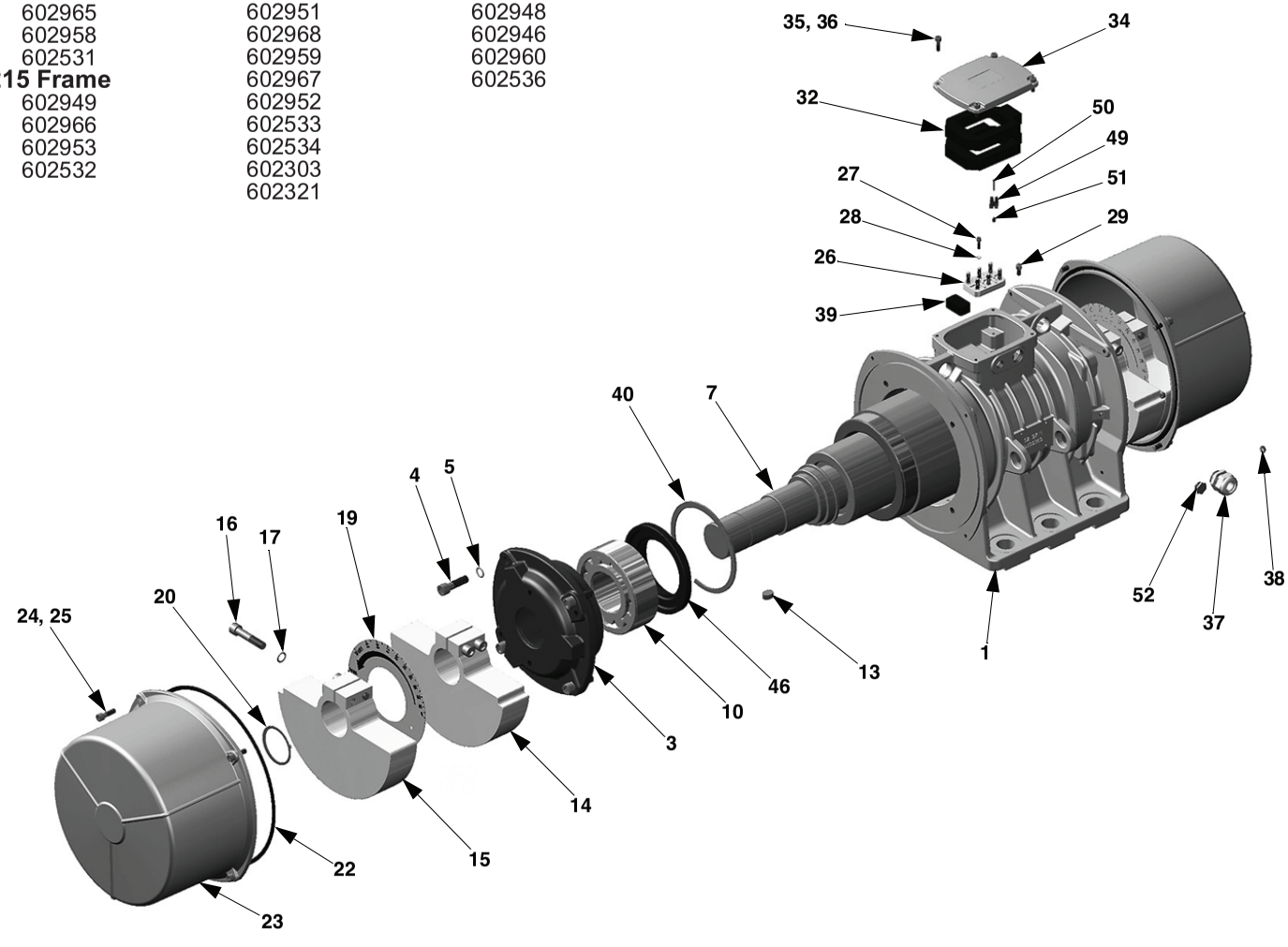
Item No.	Model	Dimensions in. (mm)								
		A	B	C	D	E	F	G	N°	H
Frame Size 184										
602957	MVLS6-2150	26 (658)	12 (312)	13.5 (340)	6.3 (160)	11 (280)	.98 (25)	1 (26)	4	5.9 (150)
602965	MVLS7-1700	26 (658)	12 (312)	13.5 (340)	6.3 (160)	11 (280)	.98 (25)	1 (26)	4	5.9 (150)
602958	MVLS7-3330	26 (658)	12 (312)	13.5 (340)	6.3 (160)	11 (280)	.98 (25)	1 (26)	4	5.9 (150)
602531	MVLS9-3320	26 (658)	12 (312)	13.5 (340)	6.3 (160)	11 (280)	.98 (25)	1 (26)	4	5.9 (150)
Frame Size 215										
602949	MVLS6-3310	28 (710)	13.8 (350)	15 (390)	7.8 (200)	12.5 (320)	1.18 (30)	1.10 (28)	4	6.4 (162)
602966	MVLS7-3290	28 (710)	13.8 (350)	15 (390)	7.8 (200)	12.5 (320)	1.18 (30)	1.10 (28)	4	6.4 (162)
602953	MVLS7-5110	28 (710)	13.8 (350)	15 (390)	7.8 (200)	12.5 (320)	1.18 (30)	1.10 (28)	4	6.4 (162)
602532	MVLS9-5150	24 (604)	13.8 (350)	15 (390)	7.8 (200)	12.5 (320)	1.18 (30)	1.10 (28)	4	6.4 (162)
Frame Size 256										
602950	MVLS6-5100	27 (688)	16 (398)	18 (460)	7.8 (200)	15 (380)	1.4 (35)	1.3 (33)	4	7.2 (183)
602951	MVLS6-6600	31 (798)	16 (398)	18 (460)	7.8 (200)	15 (380)	1.4 (35)	1.3 (33)	4	7.2 (183)
602968	MVLS7-4400	27 (688)	16 (398)	18 (460)	7.8 (200)	15 (380)	1.4 (35)	1.3 (33)	4	7.2 (183)
602959	MVLS7-6600	27 (688)	16 (398)	18 (460)	7.8 (200)	15 (380)	1.4 (35)	1.3 (33)	4	7.2 (183)
602967	MVLS7-5940	31 (798)	16 (398)	18 (460)	7.8 (200)	15 (380)	1.4 (35)	1.3 (33	4	7.2 (183)
602952	MVLS7-9200	31 (798)	16 (398)	18 (460)	7.8 (200)	15 (380)	1.4 (35)	1.3 (33)	4	7.2 (183)
602533	MVLS7-6620	27 (688)	16 (398)	18 (460)	7.8 (200)	15 (380)	1.4 (35)	1.3 (33)	4	7.2 (183)
602534	MVLS9-9330	31 (798)	16 (398)	18 (460)	7.8 (200)	15 (380)	1.4 (35)	1.3 (33)	4	7.2 (183)
Frame Size 286										
602947	MVLS6-9150	28.3 (718)	20.3 (503)	20.8 (528)	7.8 (200)	17.3 (440)	1.4 (35)	1.3 (33)	4	9.4 (238)
602948	MVLS6-14600	35 (892)	20.3 (503)	20.8 (528)	7.8 (200)	17.3 (440)	1.4 (35)	1.3 (33)	4	9.4 (238)
602946	MVLS6-14700	35 (892)	20.3 (503)	20.8 (528)	7.8 (200)	17.3 (440)	1.4 (35)	1.3 (33)	4	9.4 (238)
602960	MVLS7-18000	35 (892)	20.3 (503)	20.8 (528)	7.8 (200)	17.3 (440)	1.4 (35)	1.3 (33)	4	9.4 (238)
602536	MVLS9-16600	35 (892)	20.3 (503)	20.8 (528)	7.8 (200)	17.3 (440)	1.4 (35)	1.3 (33)	4	9.4 (238)

Part# - -Description

1 - -CASE
2 - -STATOR
3 - -BEARING FLANGE
4 - -SCREW
5 - -SCHNORR WASHER
6 - -O-RING
7 - -SHAFT
8 - -FLANGE ADAPTER
9 - -SHAFT WASHER
10 -BEARING
11 -BEARING COVER
12 -SHAFT SEAL
13 -SHFT KEY
14 -FIXED WEIGHT
15 -ADJUSTABLE WEIGHT
16 -SCREW
17 -SCHNORR WASHER
18 -BRASS WASHER
19 -WEIGHT ADJUSTMENT DISC
20 -EXTERNAL SNAP RING
21 -SHAFT NUT
22 -O-RING
23 -WEIGHT COVER
24 -SCREW
25 -SCHNORR WASHER
26 -TERMINAL BLOCK
27 -SCREW
28 -SCHNORR WASHER
29 -GROUND SCREW
30 -SCHNORR WASHER
31 -GROUND LABEL
32 -RUBBER COMPRESSION BLOCK
33 -O-RING
34 -WIRING BOX COVER
35 -SCREW
36 -SCHNORR WASHER
37 -CORD GRIP
38 -GREASE FITTING/PLUG
39 -LEAD PROTECTOR
40 -INTERNAL SNAP RING
41 -SCHNORR WASHER
42 -SHAFT SEAL
45 -FAN
46 -BEARING COVER
47 -SCREW
48 -SCHNORR WASHER
49 -THERMISTOR TERMINAL BLOCK
50 -SCREW
51 -ADAPTER SCREW
52 -PLUG
53 -SCREW
54 -SCHNORR WASHER
55 -SCHNORR WASHER
59 -SPACER
60 -SCREW
61 -WIRING BOX COVER
64 -SCREW
66 -GREASE SEAL RING
67 -SPLIT WEIGHT COVER
71 -SHAFT SEAL
75 -WEIGHT SPACER

Item Numbers

184 Frame	256 Frame	286 Frame
602957	602950	602947
602965	602951	602948
602958	602968	602946
602531	602959	602960
215 Frame	602967	602536
602949	602952	
602966	602533	
602953	602534	
602532	602303	
	602321	



Order Information

When ordering, **please specify** the following:

Vibrator Model _____

Series _____

Serial number _____

Voltage, frequency & number of phases _____

Part#/Description	Quantity Required	Part#/Description	Quantity Required
1 CASE		32 RUBBER COMPRESSION BLOCK	
2 STATOR		33 O-RING	
3 BEARING FLANGE		34 WIRING BOX COVER	
4 SCREW		35 SCREW	
5 SCHNORR WASHER		36 SCHNORR WASHER	
6 O-RING		37 CORD GRIP	
7 SHAFT		38 GREASE FITTING/PLUG	
8 FLANGE ADAPTER		39 LEAD PROTECTOR	
9 SHAFT WASHER		40 INTERNAL SNAP RING	
10 BEARING		41 SCHNORR WASHER	
11 BEARING COVER		42 SHAFT SEAL	
12 SHAFT SEAL		45 FAN	
13 SHAFT KEY		46 BEARING COVER	
14 FIXED WEIGHT		47 SCREW	
15 ADJUSTABLE WEIGHT		48 SCHNORR WASHER	
16 SCREW		49 THERMISTOR TERMINAL BLOCK	
17 SCHNORR WASHER		50 SCREW	
18 BRASS WASHER		51 ADAPTER SCREW	
19 WEIGHT ADJUSTMENT DISC		52 PLUG	
20 EXTERNAL SNAP RING		53 SCREW	
21 SHAFT NUT		54 SCHNORR WASHER	
22 O-RING		55 SCHNORR WASHER	
23 WEIGHT COVER		59 SPACER	
24 SCREW		60 SCREW	
25 SCHNORR WASHER		61 WIRING BOX COVER	
26 TERMINAL BLOCK		64 SCREW	
27 SCREW		66 GREASE SEAL RING	
28 SCHNORR WASHER		67 SPLIT WEIGHT COVER	
29 GROUND SCREW		71 SHAFT SEAL	
30 SCHNORR WASHER		75 WEIGHT SPACER	
31 GROUND LABEL			

Fax, Phone or E-Mail to:

italvibras g.silingardi USA

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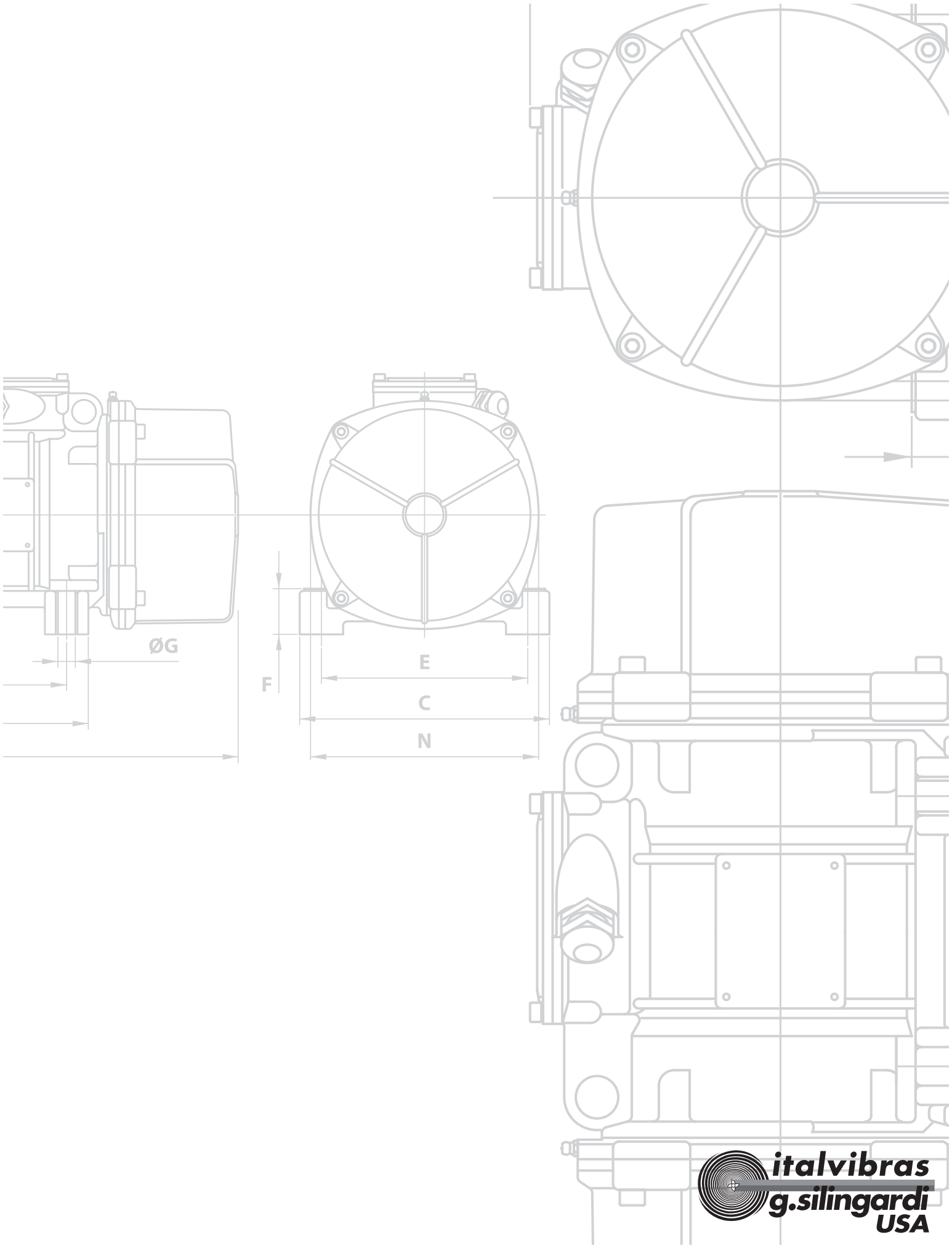

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USA

Vibration Monitor
Manual

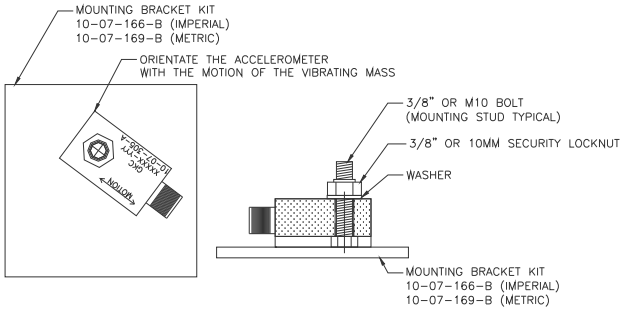
TABLE OF CONTENTS

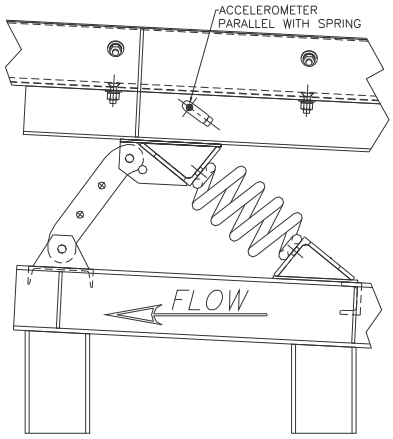
The vibration monitor is a complete system used to monitor and display the status of vibratory equipment. This system consists of the vibration monitor and an accelerometer.

Accelerometer
(P/N 10-07-305-B)

The industrial accelerometer in this system is housed in a heavy-duty housing. It includes a ten foot [3 meters] cord with strain relief and abrasion protection (P/N 10-07-305-C). Connection to the vibration monitor is accomplished with a "Mini-Fast" molded quick connector. The accelerometer units are rated and tagged with a mV/G of acceleration rating. This rating is used to "match" the accelerometer to the vibration monitor for a more accurate reading.

The accelerometer is mounted to the vibrating unit by bolting in place with one 3/8" (M10) bolt.



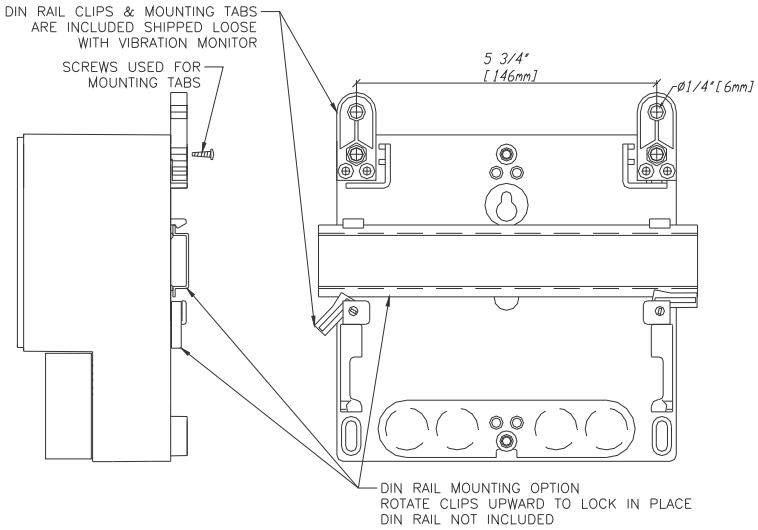


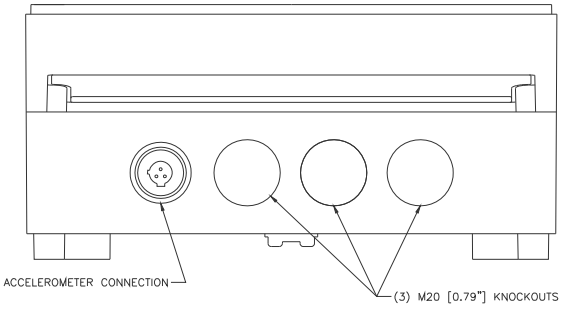
Vibration Monitor
(P/N 10-07-315-A)

Mechanical:

The vibration monitor is protected by a NEMA 4X (IP65) polycarbonate enclosure. Located at the bottom of the vibration monitor enclosure is the connection for the accelerometer and three knockouts available for wiring. The two-tiered front of the enclosure allows for wiring and user interface. The lower tier is a removable cover that allows for the wiring of the vibration monitor and the upper tier provides the LCD display and user interface. **The upper tier cover is not to be removed by anyone other than General Kinematics personnel.**

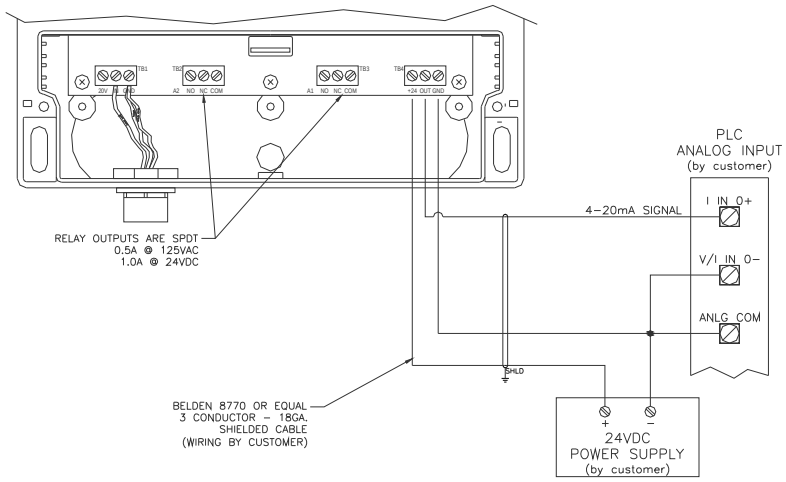
The vibration monitor can be mounted in two ways. The hardware for the two options are shipped loose with the vibration monitor. The first is to utilize the mounting tabs provided. The tabs are attached to the vibration monitor with the screws provided. The second mounting option is to mount the unit to a standard piece of 35mm DIN rail.





BOTTOM VIEW

Wiring:



VIBRATION MONITOR WIRING EXAMPLE

Three knockouts are available for wiring entry to the vibration monitor. The vibration monitor is a three-wire device requiring 24VDC. The relays are dry and require external voltage. See the next section "operation" for a description of the relays and 4-20mA signal.

Operation:

The vibration monitor is a multi-functional, three-wire device that monitors an accelerometer signal. The vibration monitor conditions the signal from the accelerometer and displays the value on the LCD screen. The value can represent acceleration, velocity, or displacement depending on the setup of the vibration monitor. The vibration monitor then outputs a 4-20mA signal to represent this scaled value. The vibration monitor also provides two relay outputs tied to alarm setpoints.

The 4-20mA output of the vibration monitor represents the scaled value of acceleration, velocity, or displacement. 4mA is equal to zero and 20mA is equal to the range selected. For example, if acceleration is selected for the mode and the range is set to 5g, then the 4-20mA signal will represent 0-5g's.

Each of the two Form C relays provides one normally open and one normally closed contact for alarming purposes. Each relay has its own setpoint, time delay, and reset reaction (MODE). The alarm setpoint can be set to react as a low or high alarm (TYPE). A low alarm triggers the relay when the actual value falls below the setpoint. A high alarm triggers the relay when the actual value rises above the setpoint. Each setpoint has an adjustable time delay. This delay is the time between the actual value exceeding the setpoint value and the activation of the respective relay. Each alarm can also be setup for floating or latching. This refers to the resetting of the alarm once the system is no longer in alarm condition. A floating alarm will automatically reset the alarm when the actual value falls back into normal range. A latching alarm must be reset manually even after the actual value has fallen back into normal range.

To maintain the CE certification of the vibration monitor, a CE certified power supply must be used.

Configuration Parameters:

UNITS

The vibration monitor can be setup to display the value in Imperial or Metric units. For displacement, the units can be inches or millimeters. For velocity, the units can be inches per second or millimeters per second. Acceleration has the units of g's for Imperial or Metric.

MODE

The vibration monitor can be setup for the measurement of acceleration, velocity, or displacement.

RANGE

The range with respect to the mode can be selected for better accuracy. This sets the scaling for the 4-20mA output. See the table below for the possible ranges.

MODE				
Displacement		Velocity		Acceleration
0.5 in	15mm	10in/s	250mm/s	5g
1.0 in	30mm	20in/s	500mm/s	10g
2.0 in	50mm	40in/s	1000mm/s	20g
4.0 in	100mm	80in/s	2000mm/s	40g

SENSITIVITY

Each accelerometer is tagged with a sensitivity rating in the range of 90-110mV/g. This value is then selected in the setup of the vibration monitor for better accuracy.

ALARM 1

Level

The alarm level is the setpoint that is compared to the actual value for alarming.

Type

The alarm type sets up the alarm as either high or low reacting. A low type indicates an alarm when the actual value falls below the sepoint. An example of this use would be an indication that the unit is not vibrating. A high type indicates an alarm when the actual value rises above the setpoint. This can be used for the notification that the displacement is too high and the unit must shut down.

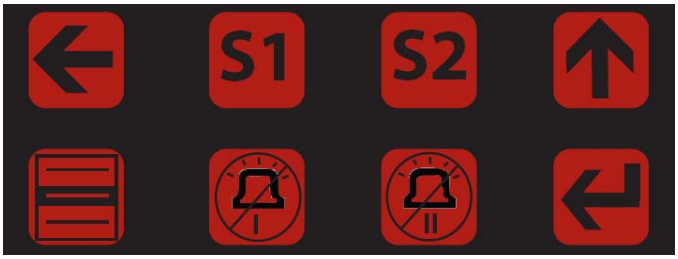
Mode

The mode sets the alarm as either floating or latching. Floating allows the alarm to automatically reset once the actual value has returned to normal limits. Latching maintains the alarm condition after the actual value has returned to the normal limits. This must then be reset manually at the vibration monitor display.

Delay

A time delay can be set to delay the alarm relay once the alarm setpoint has been met. This prevents nuisance tripping for momentary disruptions. A vibratory unit may exceed the setpoint during the startup but a short delay will allow the unit to settle into normal operating limits before tripping the relay.

Interface:



Below the LCD screen is an eight button keypad that provides interfacing for the setup of the device and alarm control.

The left arrow or “back” button allows the operator to navigate back through the screen path that has been taken. This will eventually take the operator back to the main screen.

The S1 and S2 buttons have no global function. Their functions are defined by the current screen. For example, when the current screen is the alarm setpoint entry, the S1 and S2 buttons are used for selecting the digit. These same buttons may have a different function on another screen or no function at all.

The up arrow is used for scrolling through selections on the current screen or changing the value of the selected digit.

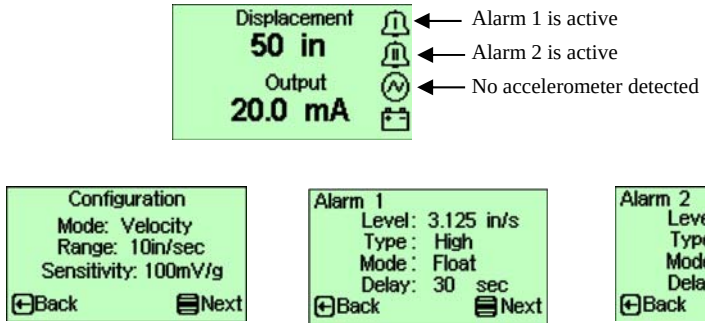
The menu button is used to jump between the current configuration screen and the two alarm configuration screens. These three screens show the current setup of the vibration monitor but do not allow for editing.

<u>Pressing the menu button and the S2 button at the same time while at the main display screen will enter the vibration monitor configuration screens that allow for editing.</u>

The two alarm reset buttons will reset the respective alarm, alarm 1 or alarm 2, when the alarm is configured for latching. If the alarm is configured for float, then the alarm will reset itself when the unit is no longer in an alarm condition. This will also change the state of the respective alarm relay back to the un-energized state.

The enter button is used to accept a change in the configuration screens. <u>If any change is made, the enter button must be pressed to accept the change</u>. Scrolling to a new setup or changing the value of a number does not take immediate affect. If a change is made and the operator backs out of the modified screen, then the change is lost.

Screens:



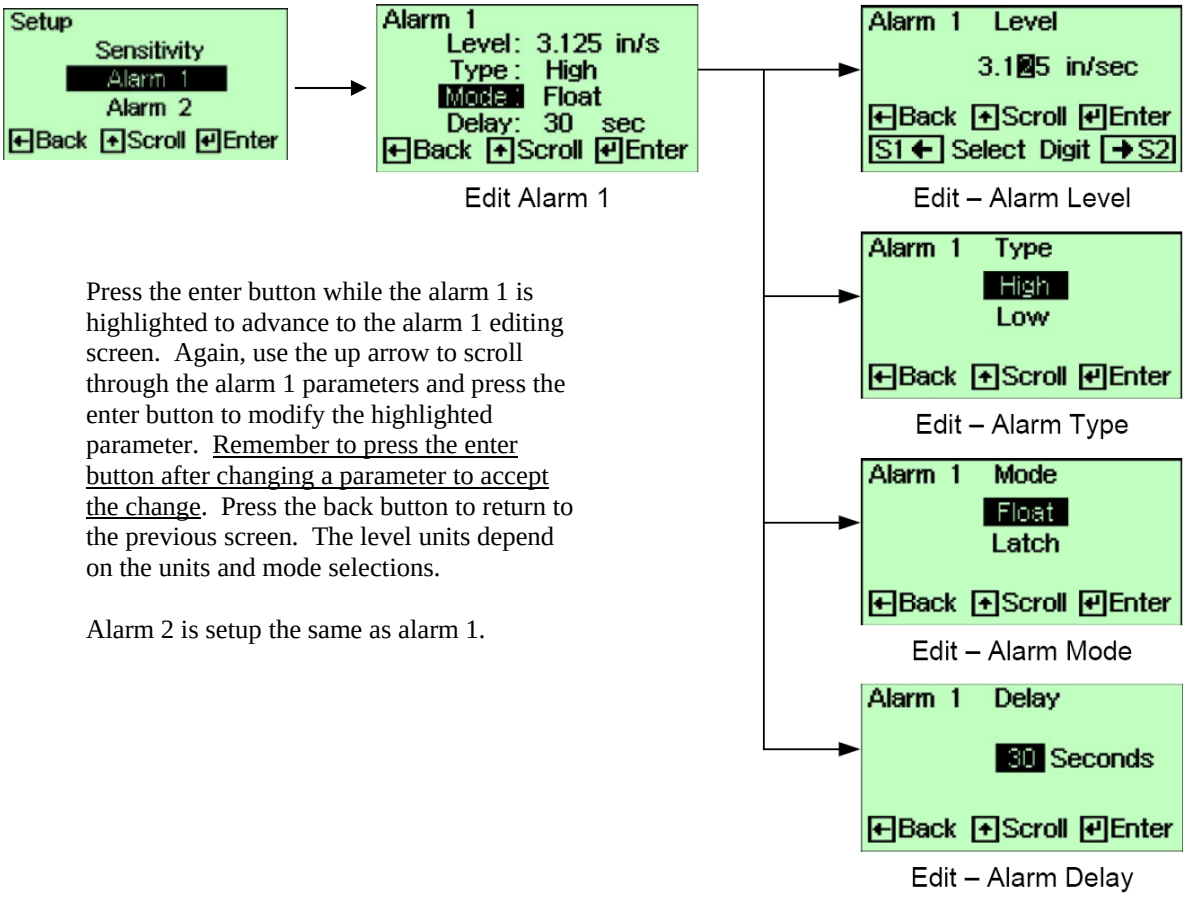
The top screen above is the main display screen showing the current measured value along with the milli-amp output. The symbols to the right of the screen only appear when there is an alarm condition. The top two are for the alarm status and appear when an alarm is active. The third symbol is displayed when there is no accelerometer detected. If this appears, it may be an indication that the accelerometer has failed or that there is a break in the cable. The fourth symbol is a battery indicator and is not applicable for this manual.

Pressing the menu button while on the main screen will open the current configuration screen. This screen displays how the vibration monitor is currently setup for the mode, range, and sensitivity. Pressing the menu button again will advance to the alarm 1 screen to display the current configuration for alarm 1. Pressing the menu button a third time will advance to the alarm 2 screen for its current configuration. Pressing of the menu button will continue to scroll through these screens in this order. Press the back button to return to the main screen. These screens are for status only and cannot be edited.

Screens cont…

To modify parameters of the vibration monitor the menu button and the S2 button must be pressed at the same time.

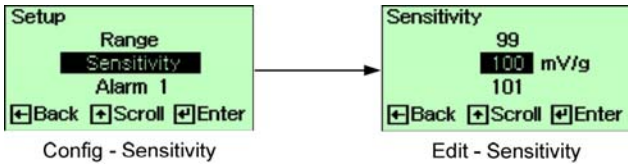
After pressing both buttons, the setup screen below will appear. Use the up arrow to scroll through the setup options and press the enter button to modify the selected setup parameter. Below is a depiction of the screen navigation.



Press the enter button while the alarm 1 is highlighted to advance to the alarm 1 editing screen. Again, use the up arrow to scroll through the alarm 1 parameters and press the enter button to modify the highlighted parameter. Remember to press the enter button after changing a parameter to accept the change. Press the back button to return to the previous screen. The level units depend on the units and mode selections.

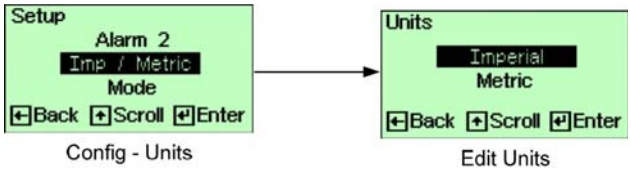
Alarm 2 is setup the same as alarm 1.

Screens cont…



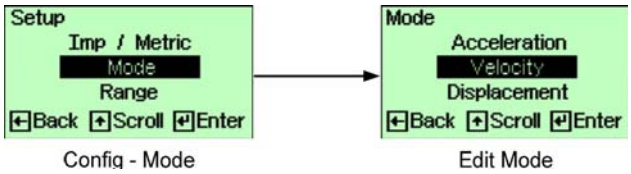
Config - Sensitivity Edit - Sensitivity

Select the accelerometer sensitivity and press the enter button to accept. The accelerometer is tagged with its respective sensitivity.



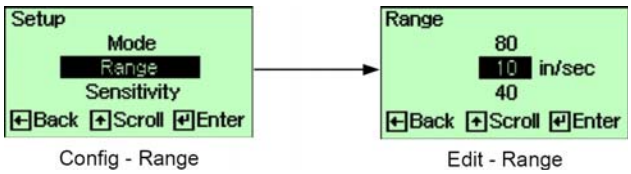
Config - Units Edit Units

Select the units to be Imperial or Metric. Press enter to accept.



Config - Mode Edit Mode

Select the mode of measurement, Acceleration, Velocity, or Displacement. Press the enter button to accept.



Config - Range Edit - Range

Select the desired range. The range should be as small as possible without going below any actual measured values. This will increase the accuracy of the 4-20mA output. The values shown depend on the units and mode selections.

Default Values:

Units: Imperial
Mode: Displacement
Range: 2 inches
Sensitivity: 100mV/g

Alarm 1:
- Type: High
- Mode: Float
- Level: 0.10 inches
- Delay: 10 seconds

Alarm 2:
- Type: High
- Mode: Latch
- Level: 0.10 inches
- Delay: 10 seconds

Troubleshooting:

Erratic Signal/Reading

- Check the accelerometer mounting and cable connections. Make sure they are tight.
- Verify good grounding practices.
- Check accelerometer (see below for procedure).

Suspect incorrect measured value

- Check sensitivity of accelerometer and setting within vibration monitor.
- Check accelerometer mounting. Verify that the axis of sensitivity is in the plane of vibration and that the connection is tight.

Reading at the PLC is incorrect

- Verify that the range setting in the vibration monitor matches the PLC scaling.

Zero milliamp output / Negative value at PLC

- Check vibration monitor main screen for missing accelerometer symbol. If it is present, then the vibration monitor detects that there is no accelerometer. Check connection.
- Check accelerometer (see below for procedure).

Troubleshooting cont…

Accelerometer Check

The accelerometer requires DC voltage for operation and returns an AC sine wave superimposed on a DC signal. This simply means is that there are a few measurements to take with a multi-meter to help determine if the accelerometer is OK. These measurements can be made at the accelerometer terminal block located in the wiring chamber of the vibration monitor. The wiring chamber is behind the cover of the lower section. **Do not remove the upper screw cover containing the LCD screen.** The accelerometer connecter terminates to the left-most terminal block, TB1.

First, disconnect the accelerometer from the connector on the outside of the vibration monitor. Then measure the DC voltage between the terminals labeled IN and GND. IN is the positive and GND is the negative. These are the terminals where the accelerometer connector terminates. This voltage should be approximately 20VDC. If the voltage is incorrect, then there may be a problem with the vibration monitor.

Second, connect the accelerometer and measure the same voltage as above. Again, this is the voltage between the IN and GND terminals of TB1. This voltage should now be approximately 12VDC. If the value is approximately 2.5-5VDC, then the accelerometer may be damaged. This voltage is the Bias Output Voltage (BOV).

Third, measure the AC voltage across the same terminals, IN and GND of TB1. The accelerometer is rated at 100mV/g nominal. This means that for every 1g that the accelerometer measures, it will output 100mV. For example, if the accelerometer measures 1.5g's, then the measured millivolt reading will be 150mVAC.

OV	mVAC	FAULT	ACTION
0V	0V	No power Cable or Connector Short	Check power Test cable for short Replace Cable/Connector
2.5-5V	0V	Damaged	Replace Accelerometer
11-13V	Erratic	Noise Loose Accelerometer Loose Cable/Connector	Check grounding Tighten Accelerometer Tighten Cable/Connector
18-20V	0V	Power is reversed Open cable/connection	Reverse leads Replace Cable/Connector

Specifications:

Supply Voltage and Current:	24VDC Power consumption: approx. 3W
Output Configuration:	(2) SPDT Rated load: 0.5A at 125VAC; 1A at 24VDC Max. switching voltage: 125VAC; 60VDC Max. switching current: 1A Max. switching power: 62.5VA; 30W (1) 4-20mA
Accuracy:	1% of full scale (velocity = 2% when under 1g)
Construction:	Polycarbonate housing NEMA 4X; IP65
Dimensions:	6.5 x 6.3 x 3.5 in [166 x 160 x 89 mm] (3) M20 Knockouts
Mounting:	
Weight:	1.45lb [.657kg]
Operating Conditions:	32-122°F [0-55°C]
Accelerometer Connection:	Microfast receptacle (AC) ¼-18 NPT thread

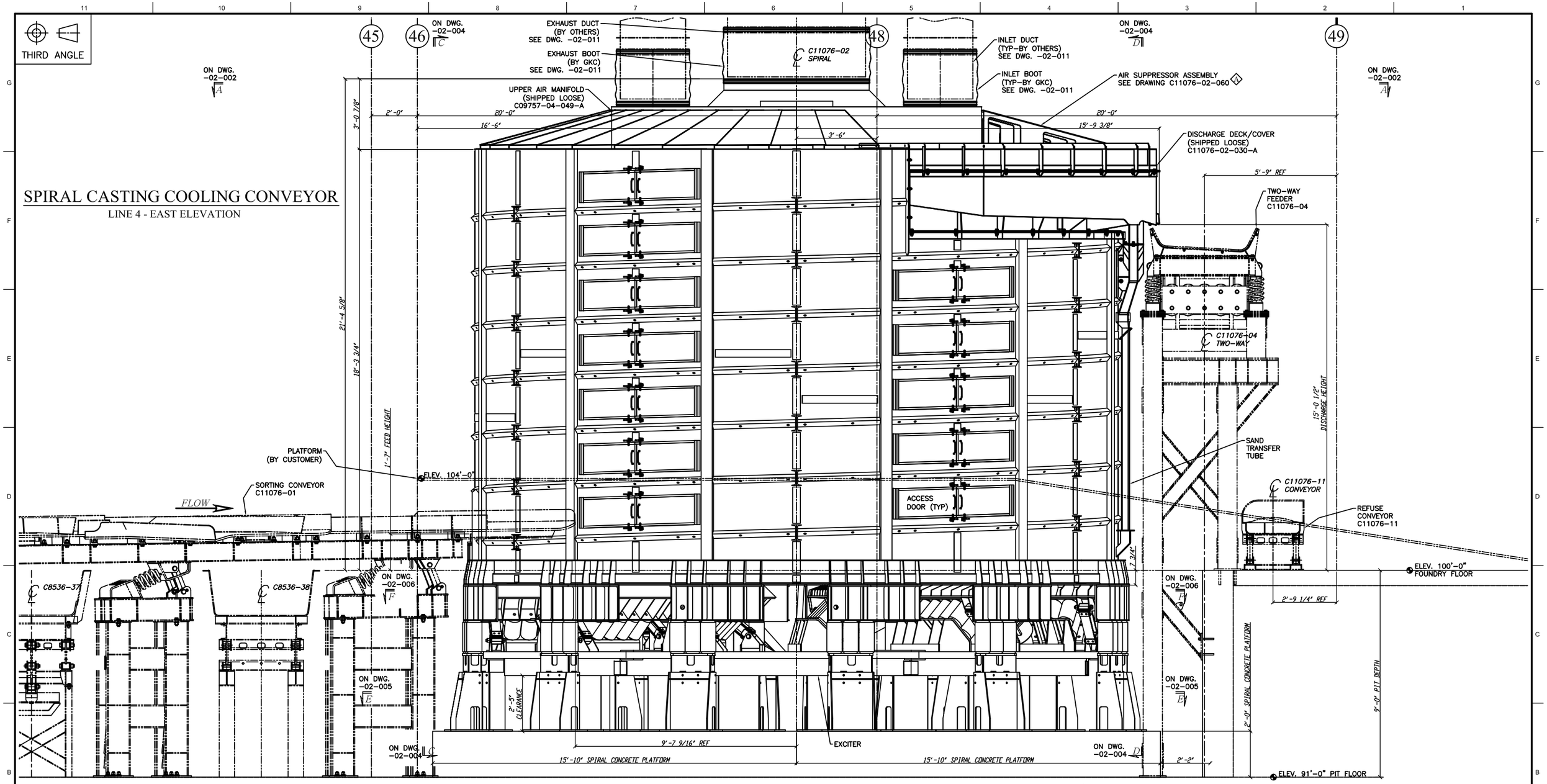
Vibration Monitor is CE certified when used with a CE certified power supply.

General Kinematics Corporation - Headquarters
5050 Rickert Road, Crystal Lake, IL 60014
Tel: 815-455-3222 / Fax: 815-455-2285 / www.generalkinematics.com

THIRD ANGLE

SPIRAL CASTING COOLING CONVEYOR

LINE 4 - EAST ELEVATION



NOTE A

MOTOR SPECIFICATIONS

(-02-000-01)
QTY., (3), 7.5 HP, 600 RPM, NEMA DESIGN B , TENV AC INDUCTION MOTOR 230/460 VOLTS, 3 PHASE,60 HZ, 1.0 SERVICE FACTOR, 24.0/12.0 F.L. AMPS. CLASS F INSULATION.

CUSTOMER TO PROVIDE THE FOLLOWING:

- ADEQUATE VENTILATION SO THAT THE MAXIMUM AMBIENT RUNNING TEMPERATURE OF THE MOTOR DOES NOT EXCEED 40 °C.
- ANY ADDITIONAL WIRING AND CONTROLS FOR THE MOTOR(S).
- AN INTERLOCK FOR THE MOTORS TO PREVENT SINGLE MOTOR OPERATION AND SEPERATE ELECTRICAL OVERLOAD PROTECTION FOR EACH MOTOR. WIRED IN SERIES. IN ORDER TO STOP ALL MOTORS WHEN ONE OVERLOAD TRIPS MOTOR(S) MUST BE GROUNDED.

CONNECT GROUND WIRE TO GREEN WIRE IN CABLE OR CONDUIT BOX.

ELECTRICAL CABLE SPECIFICATIONS

SPECIAL VIBRATORY MOTORS ONLY

TYPE SEOW , 4 CONDUCTOR, 10 AWG, 600 VOLTS, .705 IN. O.D. X 8'-0 LONG. MOTOR IS WIRED FOR A 460 VOLT POWER SUPPLY.

MARTIN SHAKER MOTORS, FRAME 70 AND UP, COME EQUIPPED WITH TEMPERATURE THERMISTOR SENSORS, WHEN USED WITH AN EXTERNAL ELECTRONIC CONTROL DEVICE, SUCH AS SIEMENS THERMISTOR CONTROL MODULE (3UN2110-0AF7), THEY PROTECT THE MOTOR AGAINST EXCESSIVE HEAT. FOR MOTORS SIZE 97 FRAME AND UP, THE SENSOR COMES PRE-WIRED TO THE TERMINAL WITH FLEXIBLE CABLE AND CORD GRIP. GKC RECOMMENDS THE USE OF THERMISTOR CONTROLS WHEN THE FOLLOWING CONDITIONS OCCUR: HIGH OR VARYING TEMPERATURE CONDITIONS, OR WHERE MATERIAL CAN COAT THE MOTOR AND INHIBIT COOLING.

NOTE D

ISOLATION SPRING SPECIFICATIONS AND ESTIMATED LOADS PER ISOLATION SPRING

SPRING SPECIFICATIONS	
ITEM MARK	-01-000-C
COLOR	BLUE
FREE LENGTH	20 IN.
OUTSIDE DIA.	8 IN.

STATIC LOADS	
UNIT	4750 LB.
MATERIAL	700 LB.
TOTAL	5450 LB.

DYNAMIC LOADS @ 600 RPM	
VERTICAL (+/-)	270 LB.
TORSIONAL(+/-) @ 171 IN. RAD.	120 LB.

IT IS THE CUSTOMER'S RESPONSIBILITY TO ENSURE THAT THE FOUNDATION IS ADEQUATE TO SUPPORT THE UNIT GIVEN THE LOADING CONDITIONS ABOVE. EMBEDDED STEEL IS RECOMMENDED FOR ANCHORING THE UNIT TO THE FOUNDATION. HOWEVER, IF EMBEDDED STEEL IS NOT AVAILABLE SEE THE INCLUDED ANCHOR BOLT NOTE. THE UNIT IS SHOWN IN AN UNLOADED POSITION. A MINIMUM OF 3" SHOULD BE ALLOWED FOR DOWNWARD DEFLECTION WHEN MATERIAL IS LOADED.

SHIPPING INFORMATION

	LG. X WD. X HT.	WT(LBS)
TOWER - SECTION 1	19'-6 X 11'-9 X 12'-8	34000
TOWER - SECTION 2	19'-6 X 11'-9 X 12'-8	34000
TOWER - SECTION 3	19'-6 X 11'-9 X 12'-8	31000
TOWER - SECTION 4	19'-6 X 11'-9 X 12'-8	31000
TOWER - SECTION 5	19'-6 X 11'-9 X 12'-8	32500
TOWER - SECTION 6	19'-6 X 11'-9 X 12'-8	32500
EXCITER - SECTION 1	24'-6 X 11'-0 X 4'-6	38000
EXCITER - SECTION 2	24'-6 X 11'-0 X 4'-6	38000
EXCITER - SECTION 3	24'-6 X 11'-0 X 4'-6	38000
DISCHARGE DECK	17'-0 X 7'-2 X 3'-6	4800
DISCHARGE COVER	14'-2 X 7'-2 X 1'-4	1000
LOWER CONE-SECT.1	15'-0 X 7'-6 X 4'-6	1500
LOWER CONE-SECT.2	15'-0 X 7'-6 X 4'-6	1500

SHIPPING INFORMATION

	LG. X WD. X HT.	WT(LBS)
MANIFOLD - SECT. 1	16'-3 X 8'-1 X 3'-1	1000
MANIFOLD - SECT. 2	16'-3 X 8'-1 X 3'-1	1000
SAND CHUTE		250
BASE ISO. STANDS		18000
ANCHOR PLATES		3200
SPLICE PLATES		600
CLAMP ANGLES		150
DISCH. DECK CHUTE		200
IR SUPPESSOR ASSY.		2400
TOTAL SHIPPING WEIGHT		344,600

ESTIMATED UNIT STROKES

1/4- " STROKE @ 45 ° ON REF. RAD. OF FLIGHT

	TROUGH	EXCITER
EMPTY:	1/4- IN.	9/16 IN.
LOADED:	1/4 IN.	5/8 IN.
STROKE RADIUS:	132 IN.	132 IN.

NOTE: LOADED STROKES ESTIMATED. VELOCITROL TO BE USED TO CONTROL LOADED STROKE.

UNIT DESCRIPTION

UNIT MODEL #: SETM 71" X 22" X 450'-0"
SIZE: 71 WIDE X 22 DEEP X 450'-0 LONG.
RATE OF FEED: 26 TPH @ 100 LBS PER CUBIC FT.
MATERIAL DESCRIPTION: CASTINGS

CUSTOMER PO#: BD300394
PAINT SPECIFICATION: GKC SPEC 01 - MACHINERY BLUE

TITLE: GENERAL ARRANGEMENT OF (1) ONE SPIRAL CASTING COOLING CONVEYOR

FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN

REV.	DATE	DESCRIPTION OF REVISION
A	9/14/2017	UPDATED VIEW OF DISCHARGE DECK AND ADDED AIR SUPPRESSOR ASSEMBLY. KMC

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN	CHRISTOPHERSON
REFERENCE	C09757-04
DIRECTORY	KMC
DATE	2017/6/22
JOB NO.	
SUBMITTED	CERTIFIED 9/14/2017
SCALE	1/2" = 1'
DWG. NO.	C11076-02-001
	DO NOT SCALE

THIRD ANGLE

45 46 48 49

20'-0" 20'-0"

2'-0" 16'-6" 3'-6"

16'-6" 17'-8" 4

60.0" SHIPPING SECTIONS

AIR SUPPRESSOR ASSEMBLY 4
SEE DWG. C11076-02-060

TOWER SHIPPING SECTION 5 C09757-04-120-A

TOWER SHIPPING SECTION 4 C11076-02-50-A

TOWER SHIPPING SECTION 6 C09757-04-130-A

16'-2 13/16" REF

24'-6" REF

SEE DWG. -02-008 FOR DETAILED PLAN VIEW OF FEED END.

9'-7 9/16" REF

15'-9 3/8"

Ø12'-6"

Ø28'-11 5/8" OVERALL DIAMETER

LINE #4 SPIRAL CENTER WORKPOINT

℄ ON DWG. -04-010

FLOW

℄ ON DWG. -04-010

C11076-04 TWO-WAY FEEDER

C11076-01 SORTING CONVEYOR

4.25"

8'-3 3/16"

TOWER SHIPPING SECTION 1 C09757-04-070-A

B

MOTOR LOCATION (TYPICAL)

FLOW

SEE DWG. -02-009 FOR DETAILED PLAN VIEW OF DISCHARGE END.

5'-9" REF

TOWER SHIPPING SECTION 2 C11076-02-040-A

DISCHARGE DECK/COVER (SHIPPED LOOSE) C11076-02-030-A

SPIRAL CONCRETE PLATFORM (BY OTHERS)

TOWER SHIPPING SECTION 3 C09757-04-090-A

TITLE: PLAN VIEW FROM DWG. C11076-02-001

FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN

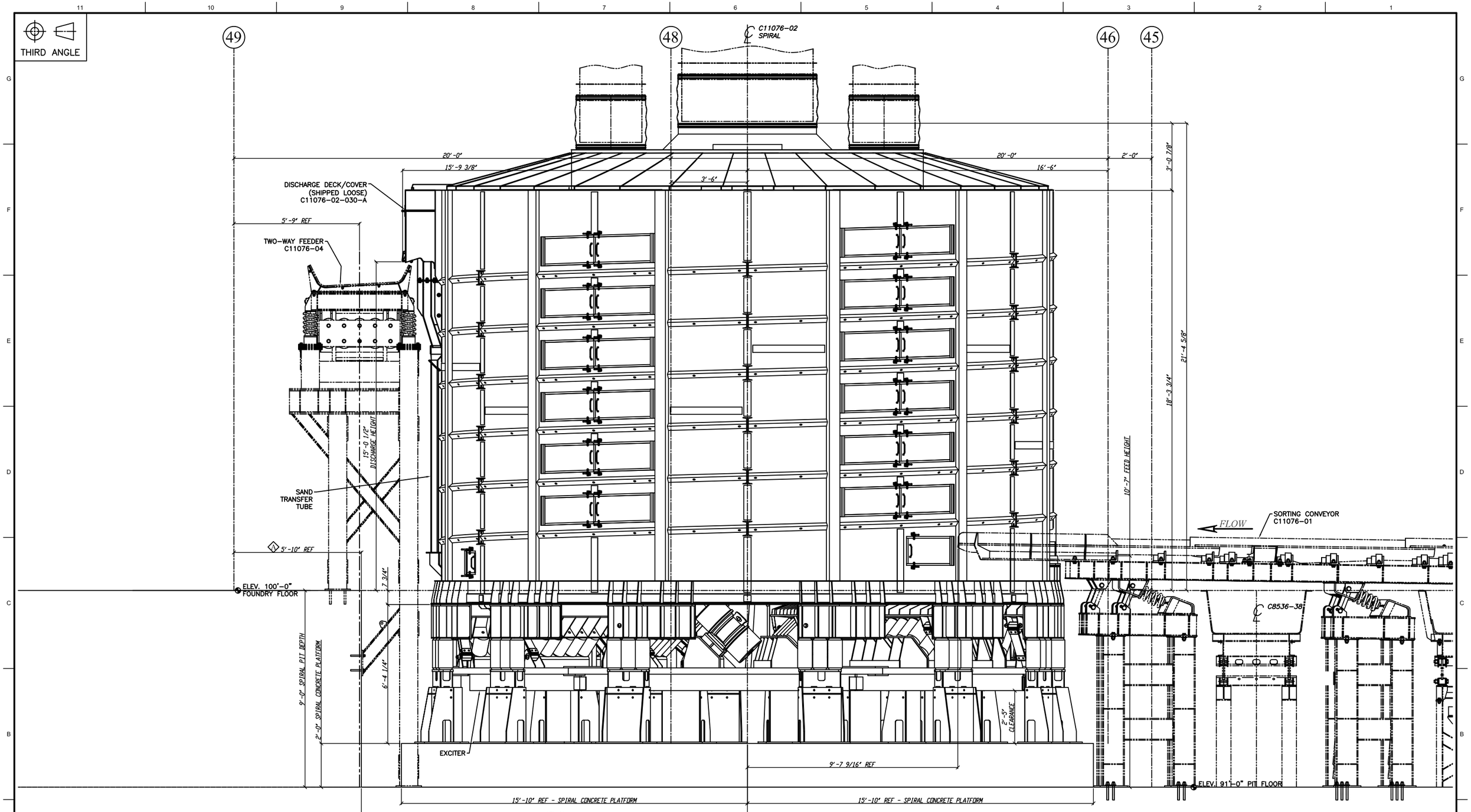
REV.	DATE	DESCRIPTION OF REVISION
A	9/14/2017	ADDED AIR SUPPRESSOR ASSEMBLY. MOVED PIT WALL. KMC

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN: CHRISTOPHERSON
CHECKED: KMC
DATE: 2017/7/10
SCALE: 0" = 1' DO NOT SCALE
REFERENCE
JOB NO.
SUBMIT: CERTIFIED 9/14/2017
DWG. NO. C11076-02-002

THIRD ANGLE



VIEW "B-B"

FROM DWG. -02-002

WEST ELEVATION

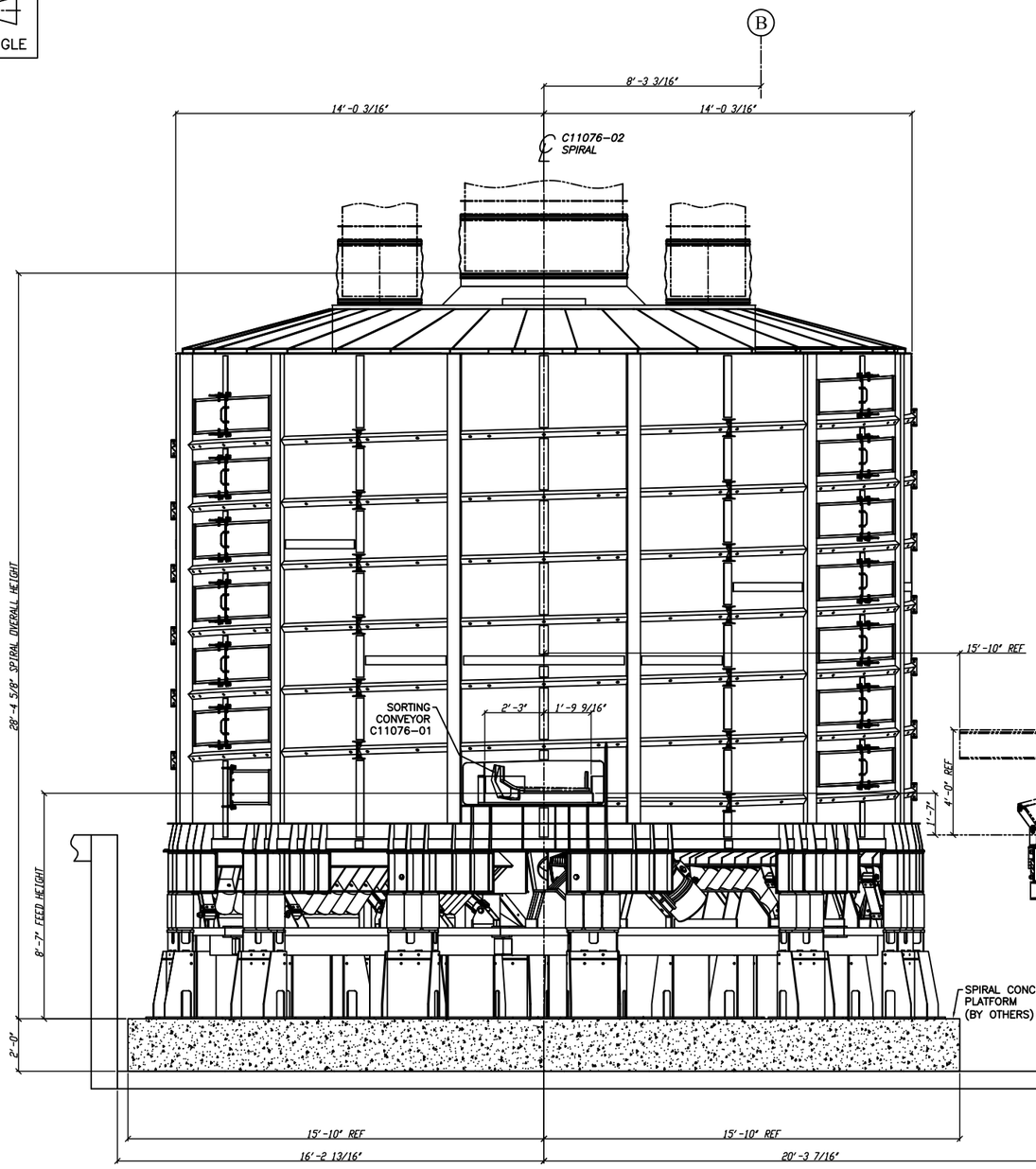
TITLE: VIEW FROM DWG. C11076-02-002			
	A	9/14/2017	ADDED AIR SUPPRESSOR ASSEMBLY, REVISED PIT WALL LOCATION. KMC
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN: CHRISTOPHERSON	REFERENCE		
CHECKED: KMC			
DATE: 2017/7/10	JOB NO.:	SUBMIT: CERTIFIED	9/14/2017
SCALE: 1/2" = 1' DO NOT SCALE	DWG. NO.: C11076-02-003		

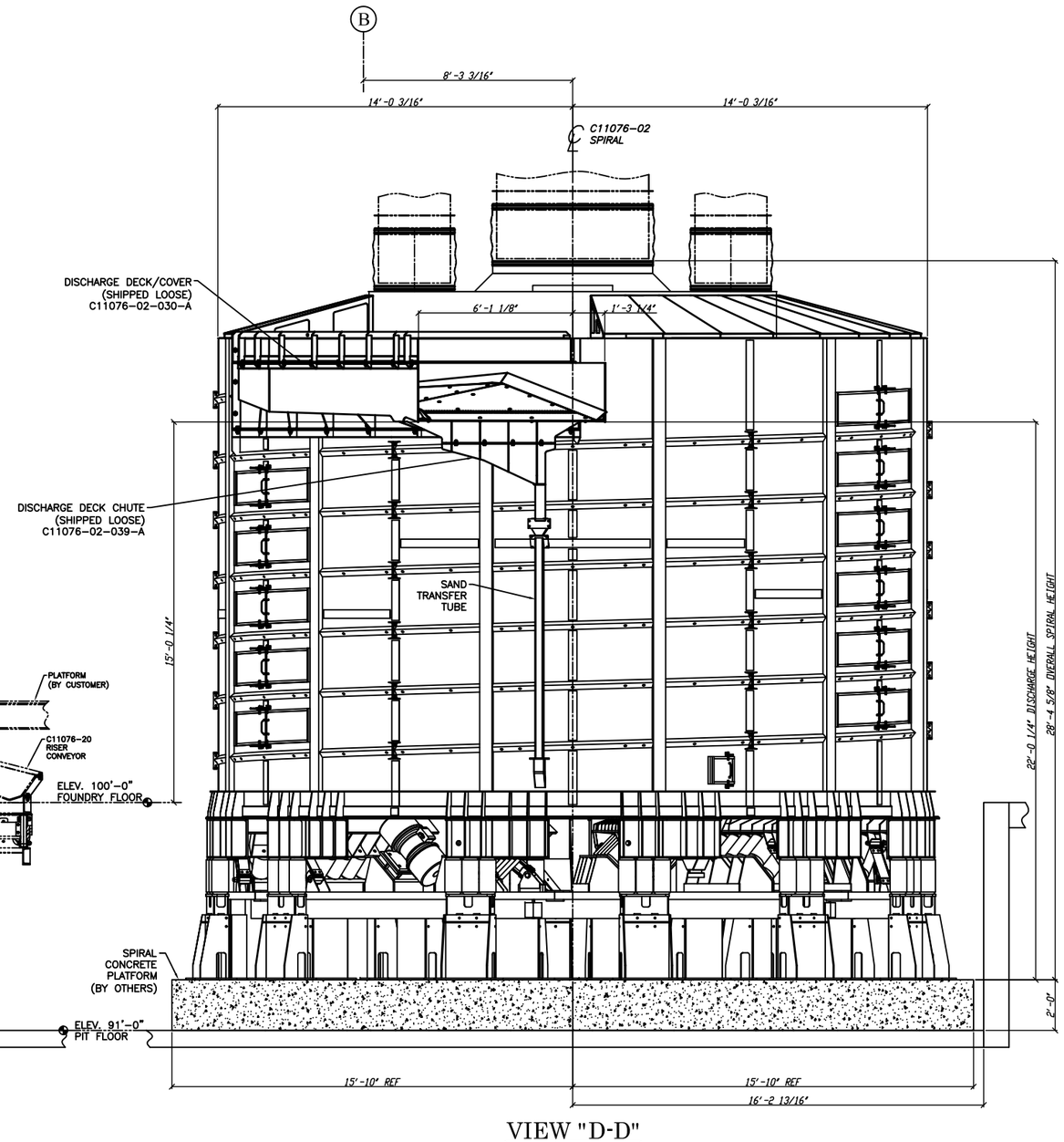
THIRD ANGLE



VIEW "C-C"

FROM DWG. -02-001

SOUTH ELEVATION



VIEW "D-D"

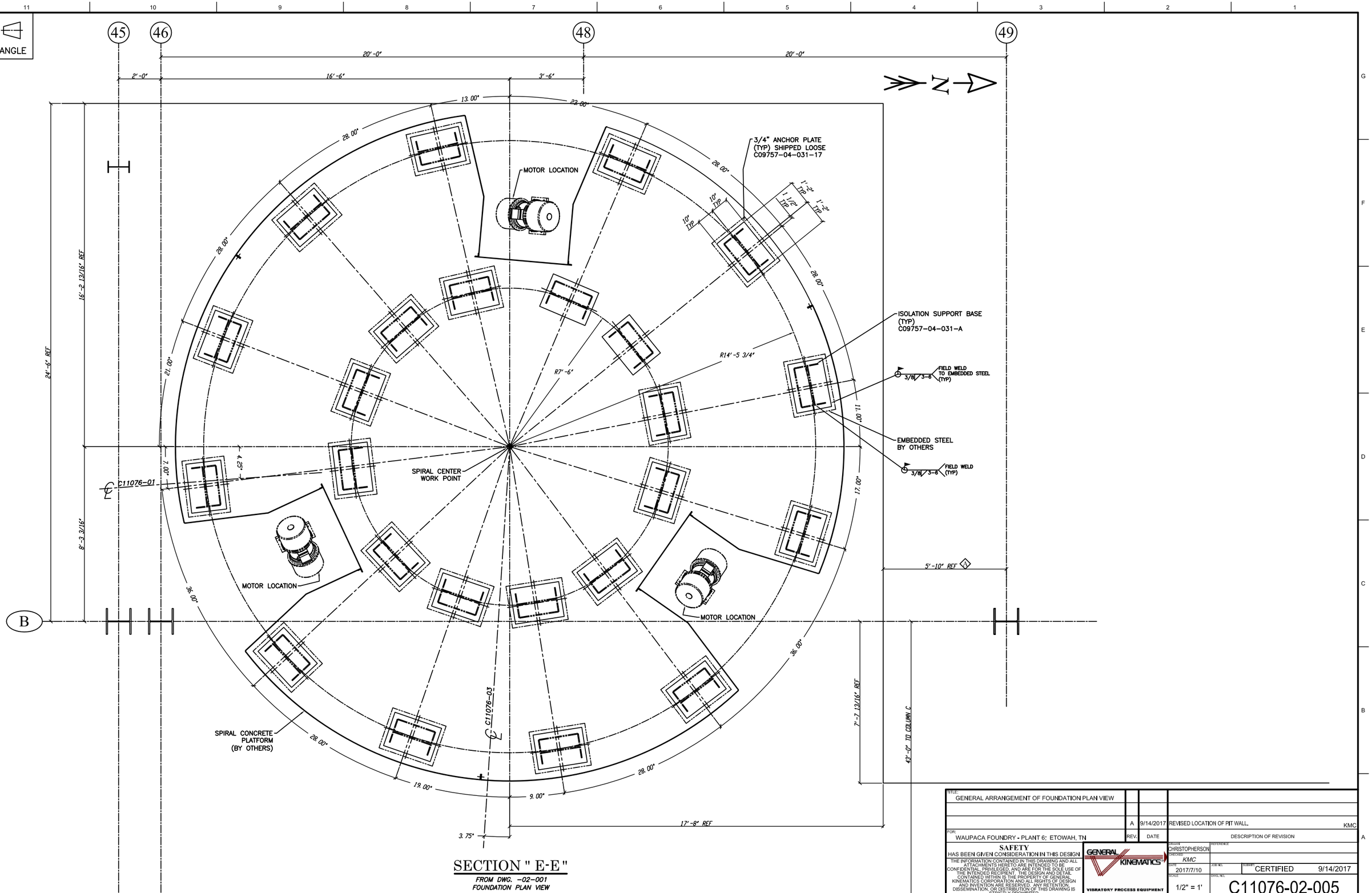
FROM DWG. -02-001

NORTH ELEVATION

TITLE: VIEWS FROM DWG. C11076-02-001			
	A	9/14/2017	ADDED AIR SUPPRESSOR ASSEMBLY. REVISED VIEW OF DISCHARGE DECK. KMC
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION
SAFETY HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN	DRAWN: CHRISTOPHERSON	REFERENCE	
	CHECKED: KMC		
	DATE: 2017/7/10	JOB NO.:	SUBMIT: CERTIFIED 9/14/2017
	SCALE: 3/8" = 1' DO NOT SCALE	DWG. NO.:	C11076-02-004

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

THIRD ANGLE



SECTION " E-E"

FROM DWG. -02-001
FOUNDATION PLAN VIEW

TITLE: GENERAL ARRANGEMENT OF FOUNDATION PLAN VIEW

FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN

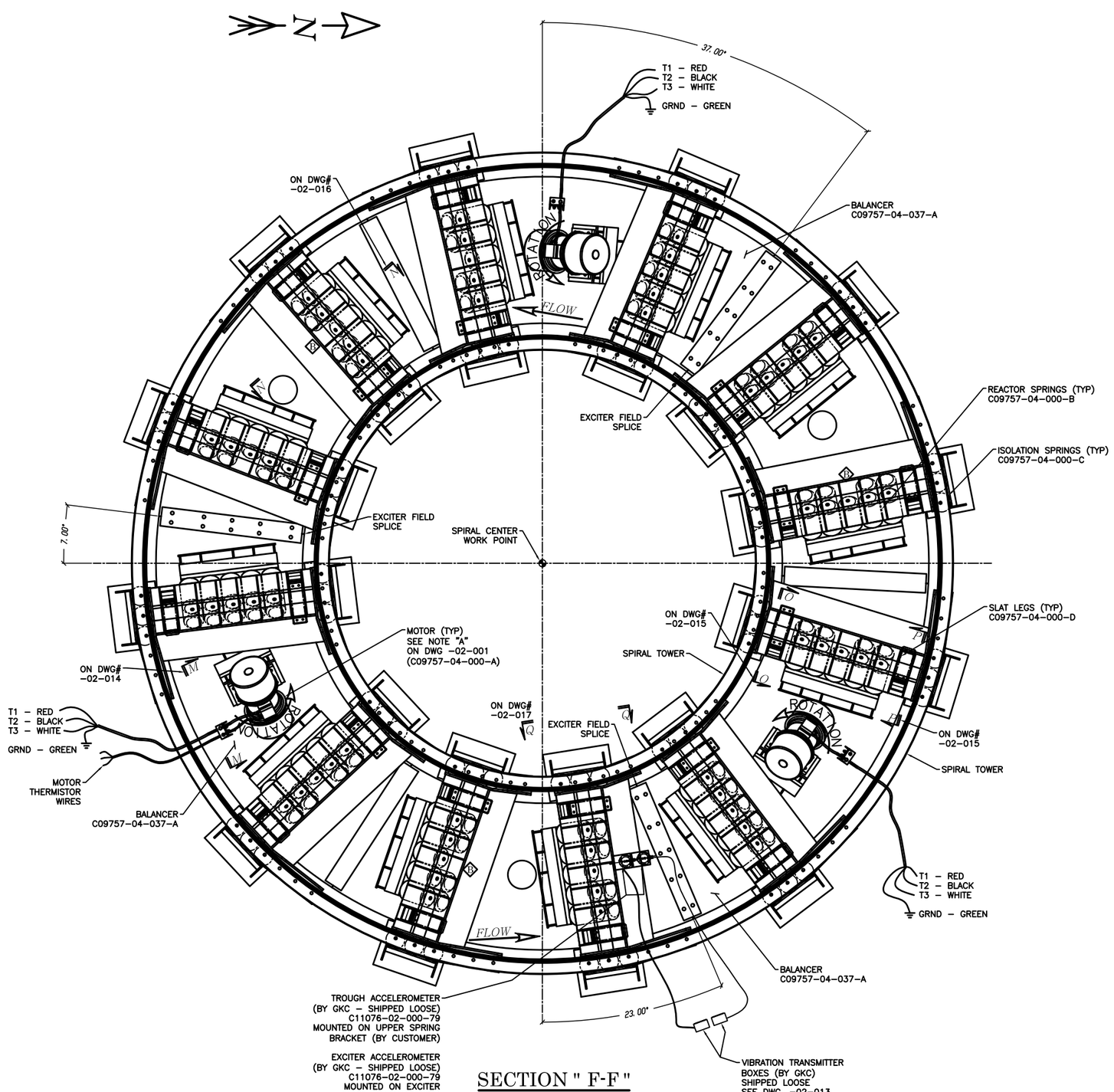
REV.	DATE	DESCRIPTION OF REVISION
A	9/14/2017	REVISED LOCATION OF PIT WALL. KMC

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN	CHRISTOPHERSON
REFERENCE	
CHECKED	KMC
DATE	2017/7/10
SCALE	1/2" = 1'
DO NOT SCALE	
JOB NO.	
SUBMIT	CERTIFIED 9/14/2017
DWG. NO.	C11076-02-005

THIRD ANGLE



SECTION " F-F "

FROM DWG. –02–001
GA OF DRIVE MACHINERY

POSSIBLE REACTOR SPRING LOCATION

REACTOR SPRING LOCATION (GREEN) 10-01-141-01

ISOLATION SPRING LOCATION (BLUE) 10-01-218-01

TITLE: GENERAL ARRANGEMENT OF DRIVE MACHINERY

FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN

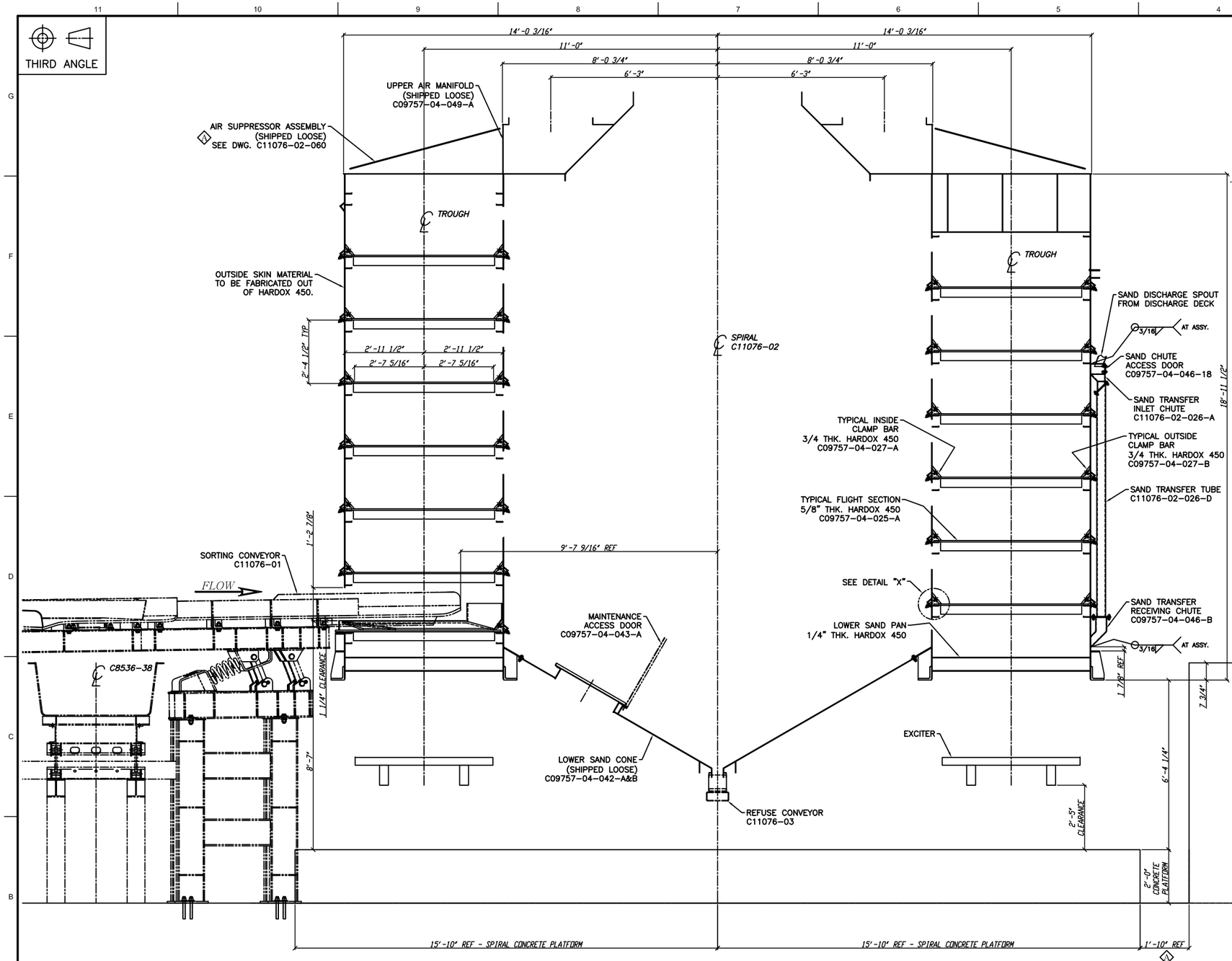
REV.	DATE	DESCRIPTION OF REVISION
B	10/11/2017	REVISED REACTOR SPRING PATTERN PER TEST AND TUNE. KMC
A	9/14/2017	REMOVED THERMISTOR WIRES PER CUSTOMER REQUEST. REVISED APPROXIMATE LOCATION FOR MOUNTING ACCELEROMETERS. KMC

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

ORIGINAL: CHRISTOPHERSON
CHECKED: KMC
DATE: 2017/7/10
SCALE: 1/2" = 1'
DO NOT SCALE
REFERENCE
JOB NO.
DRAWING: CERTIFIED 9/14/2017
DWG. NO.: C11076-02-006

THIRD ANGLE



SECTION " G-G"

FROM DWG. -02-002

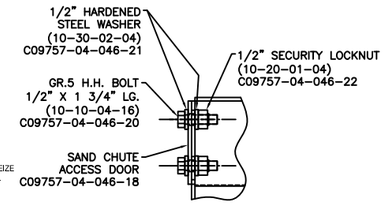
TYPICAL TORQUE VALUES UNLESS NOTED OTHERWISE

SAE GRADE 5 BOLTS	NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts are not substituted. Tighten bolts using a calibrated torque wrench. All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values based on the corresponding bolt diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

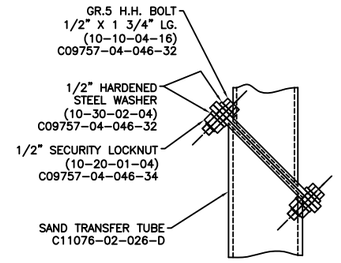
BOLT DIA.	THREADS/in.	DRY Threads TORQUE NUT to:	LUBRICATED** Threads TORQUE NUT to:
3/8"	16	31 Ft-Lbs./ 42 Nm	22 Ft-Lbs./ 30 Nm
1/2"	13	76 Ft-Lbs./ 103 Nm	55 Ft-Lbs./ 74 Nm
5/8"	11	150 Ft-Lbs./ 203 Nm	109 Ft-Lbs./ 148 Nm
3/4"	10	265 Ft-Lbs./ 359 Nm	193 Ft-Lbs./ 262 Nm
7/8"	9	430 Ft-Lbs./ 583 Nm	311 Ft-Lbs./ 422 Nm
1"	8	645 Ft-Lbs./ 875 Nm	467 Ft-Lbs./ 633 Nm
1-1/8"	7	794 Ft-Lbs./ 1077 Nm	576 Ft-Lbs./ 781 Nm
1-1/4"	7	1120 Ft-Lbs./ 1518 Nm	812 Ft-Lbs./ 1101 Nm
1-1/2"	6	1949 Ft-Lbs./ 2642 Nm	1414 Ft-Lbs./ 1917 Nm
1-5/8"	5-1/2	2475 Ft-Lbs./ 3356 Nm	1764 Ft-Lbs./ 2433 Nm

** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY. - **NOTE** Anti-Seize to be NON COPPER based.



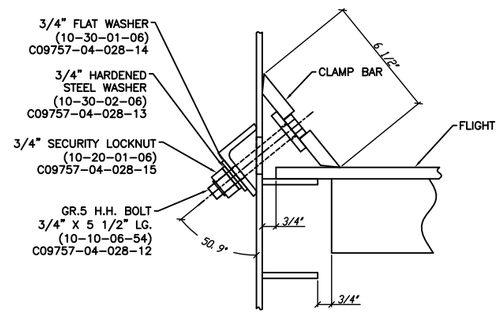
ACCESS DOOR FASTENERS

SCALE: 3" = 1'-0"



TRANSFER TUBE FASTENERS

SCALE: 3" = 1'-0"



DETAIL "X"

CLAMP BAR ASSEMBLY

SCALE: 3" = 1'-0"

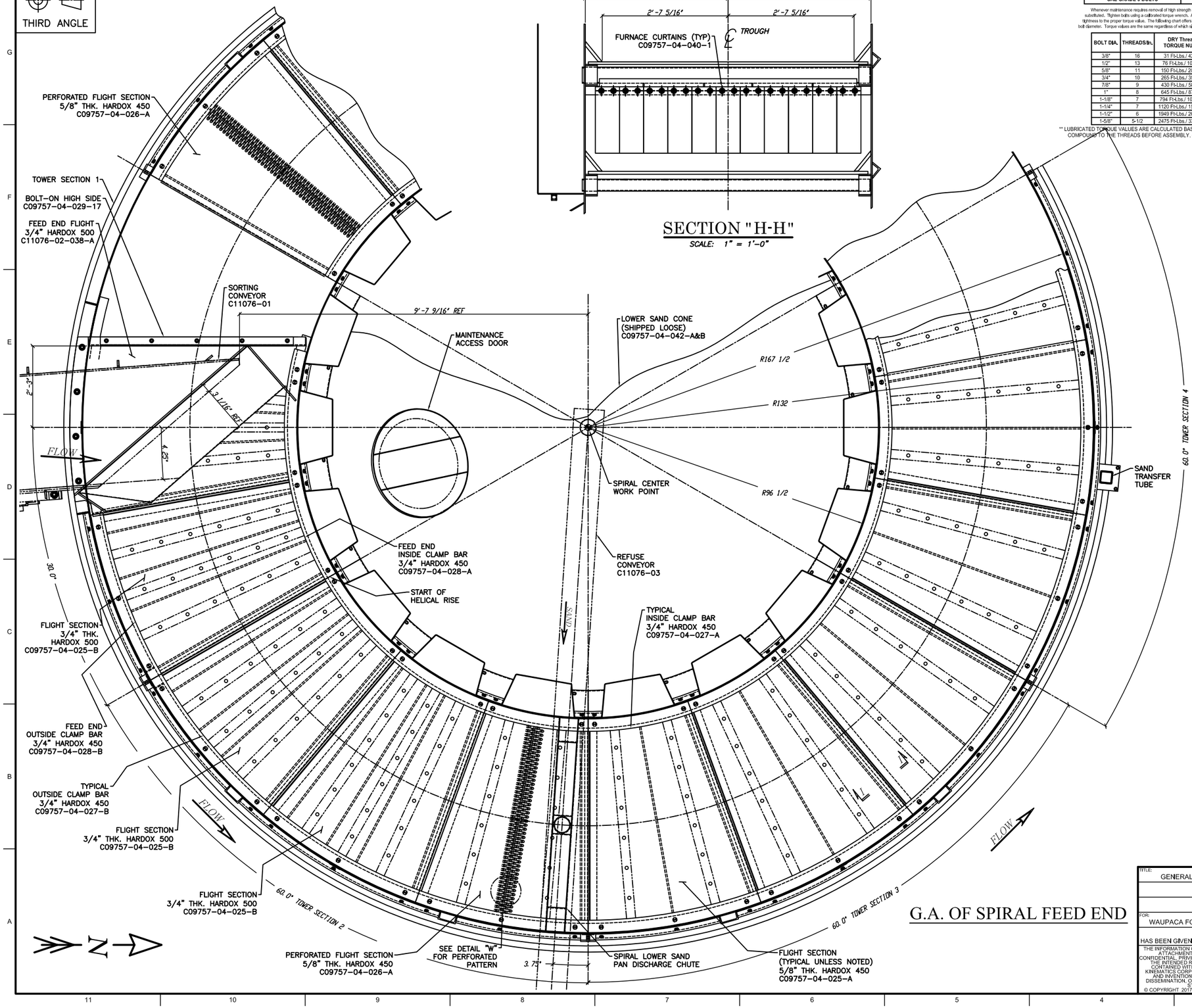
TITLE: SECTION FROM DWG. C11076-02-002			
	A	9/14/2017	REVISED VIEW OF SAND TRANSFER CHUTE, ADDED VIEW OF AIR SUPPRESSOR, MOVED PIT WALL, KMC
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION

SAFETY HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS® VIBRATORY PROCESS EQUIPMENT

DRAWN	CHRISTOPHERSON
REFERENCE	
CHECKED	KMC
DATE	2017/7/10
JOB NO.	
SUBMIT	CERTIFIED 9/14/2017
SCALE	1/2" = 1' DO NOT SCALE
DWG. NO.	C11076-02-007

THIRD ANGLE



SECTION "H-H"

SCALE: 1" = 1'-0"

TYPICAL TORQUE VALUES UNLESS NOTED OTHERWISE

SAE GRADE 5 BOLTS	NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts are not substituted. Tighten bolts using a calibrated torque wrench. All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values based on the corresponding bolt diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

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3/4"	10	265 Ft-Lbs./ 359 Nm	193 Ft-Lbs./ 262 Nm
7/8"	9	430 Ft-Lbs./ 583 Nm	311 Ft-Lbs./ 422 Nm
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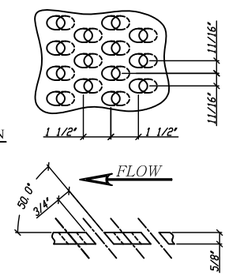
1-1/8"	7	794 Ft-Lbs./ 1077 Nm	576 Ft-Lbs./ 781 Nm
1-1/4"	7	1120 Ft-Lbs./ 1518 Nm	812 Ft-Lbs./ 1101 Nm
1-1/2"	6	1949 Ft-Lbs./ 2642 Nm	1414 Ft-Lbs./ 1917 Nm
1-5/8"	5-1/2	2475 Ft-Lbs./ 3355 Nm	1764 Ft-Lbs./ 2433 Nm

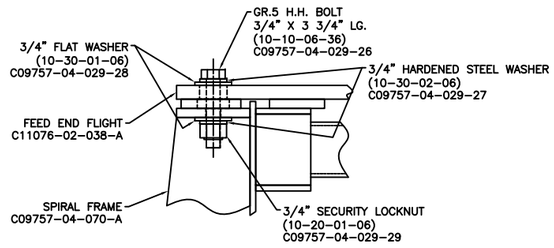
** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY. - **NOTE** Anti-Seize to be NON COPPER based.

DETAIL "W"

SCALE: 3" = 1'-0"

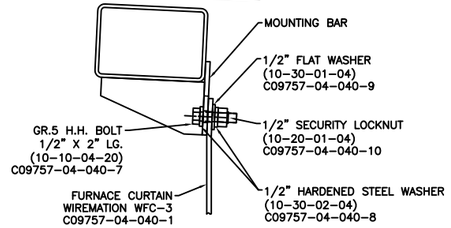
PERFORATED DECK PATTERN
(3/4" BACKDRAFTED HOLES)





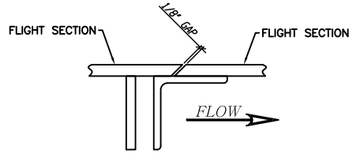
FEED END FLIGHT ASSEMBLY

SCALE: 3" = 1'-0"



FURNACE CURTAIN ASSEMBLY

SCALE: 3" = 1'-0"



SECTION " I-I "

SCALE: 3" = 1'-0"

FLIGHT EXPANSION GAP

G.A. OF SPIRAL FEED END

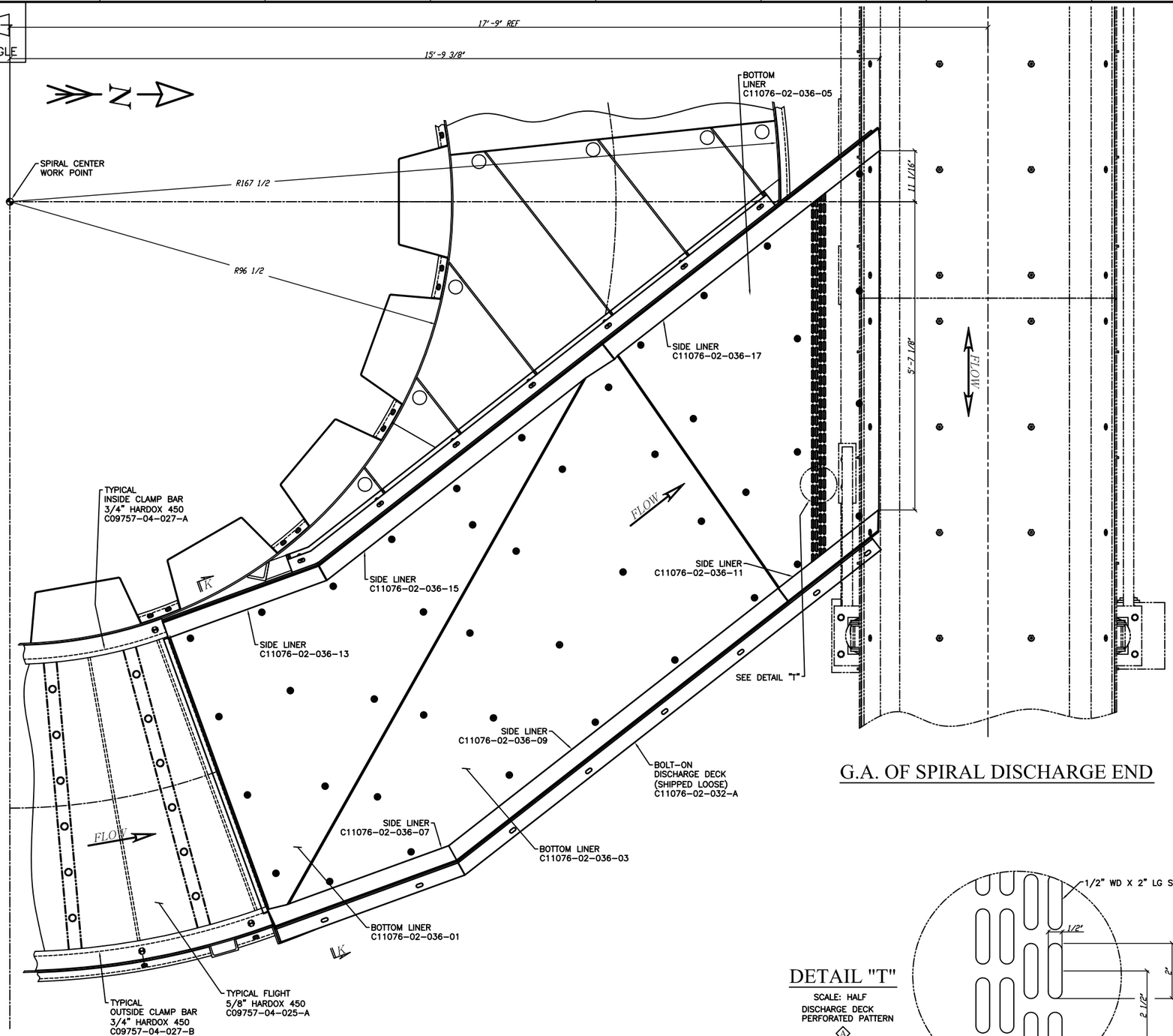
TITLE: GENERAL ARRANGEMENT OF SPIRAL FEED END			
	A	9/14/2017	CERTIFIED. KMC
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN: CHRISTOPHERSON	REFERENCE:
CHECKED: KMC	
DATE: 2017/7/10	JOB NO.: SUBMIT: CERTIFIED 9/14/2017
SCALE: 3/4" = 1' DO NOT SCALE	DWG. NO.: C11076-02-008

THIRD ANGLE

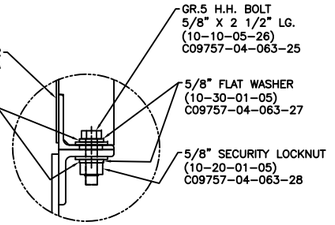


G.A. OF SPIRAL DISCHARGE END

DETAIL "R"

SCALE: 3" = 1'-0"

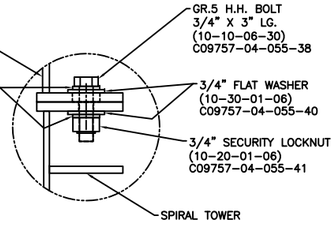
DISCHARGE COVER ASSEMBLY



DETAIL "S"

SCALE: 3" = 1'-0"

DISCHARGE DECK ASSEMBLY



TYPICAL TORQUE VALUES UNLESS NOTED OTHERWISE

SAE GRADE 5 BOLTS	NUT TORQUE VALUES

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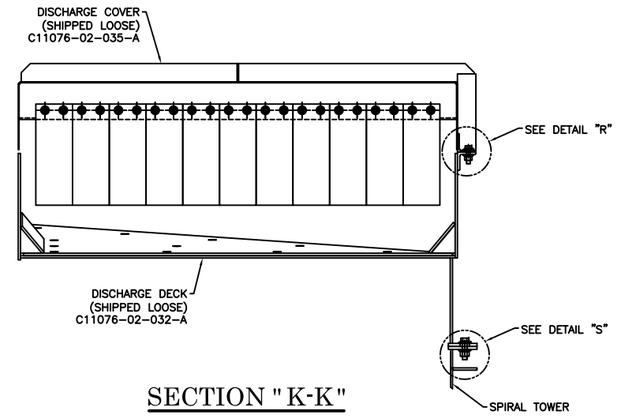


SECTION "K-K"

DETAIL "T"

SCALE: HALF

DISCHARGE DECK PERFORATED PATTERN

1

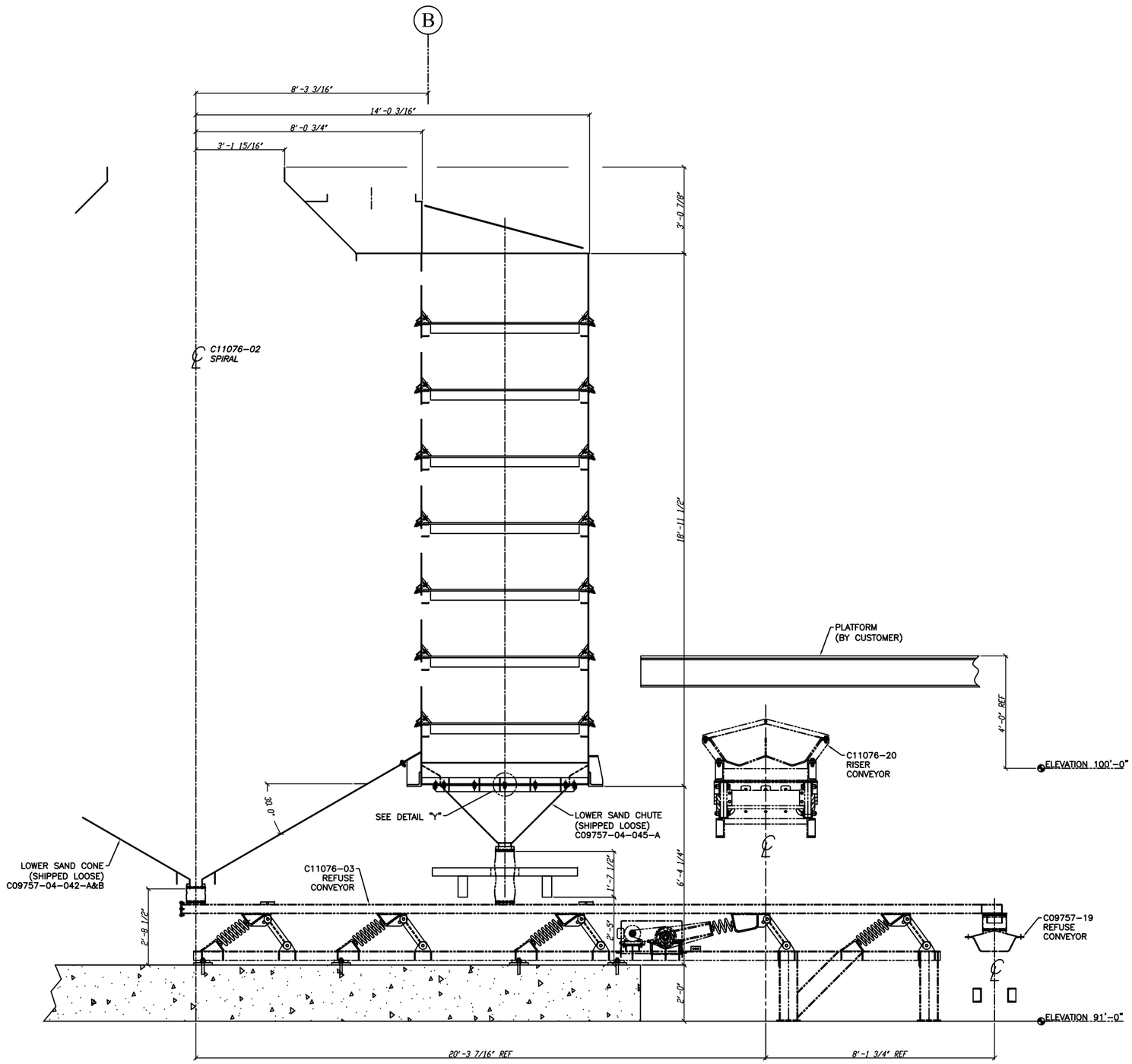
TITLE: GENERAL ARRANGEMENT OF SPIRAL DISCHARGE END			
	A	9/14/2017	REVISED PERFORATED PATTERN. KMC
FOR: WAUPACA FOUNDRY- PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION

SAFETY HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS — VIBRATORY PROCESS EQUIPMENT

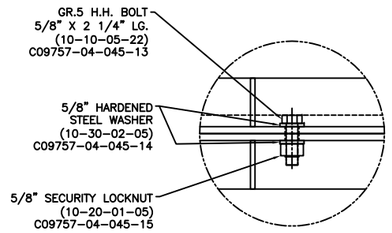
DRAWN: CHRISTOPHERSON	REFERENCE:		
CHECKED: KMC			
DATE: 2017/7/10	JOB NO.:	SUBMIT: CERTIFIED	9/14/2017
SCALE: 1" = 1' DO NOT SCALE	DWG. NO.: C11076-02-009		

THIRD ANGLE



SECTION " J-J "

FROM DWG. -02-002



DETAIL "Y"

SAND CHUTE ASSEMBLY

SCALE: 3" = 1'-0"

TYPICAL TORQUE VALUES UNLESS NOTED OTHERWISE

SAE GRADE 5 BOLTS	NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts **are not** substituted. Tighten bolts using a calibrated torque wrench. All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values based on the corresponding bolt diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

BOLT DIA.	THREADS/In.	DRY Threads TORQUE NUT to:	LUBRICATED** Threads TORQUE NUT to:
3/8"	16	31 Ft-Lbs./ 42 Nm	22 Ft-Lbs./ 30 Nm
1/2"	13	76 Ft-Lbs./ 103 Nm	55 Ft-Lbs./ 74 Nm
5/8"	11	150 Ft-Lbs./ 203 Nm	109 Ft-Lbs./ 148 Nm
3/4"	10	265 Ft-Lbs./ 359 Nm	193 Ft-Lbs./ 262 Nm
7/8"	9	430 Ft-Lbs./ 583 Nm	311 Ft-Lbs./ 422 Nm
1"	8	645 Ft-Lbs./ 875 Nm	467 Ft-Lbs./ 633 Nm
1-1/8"	7	794 Ft-Lbs./ 1077 Nm	576 Ft-Lbs./ 781 Nm
1-1/4"	7	1120 Ft-Lbs./ 1518 Nm	812 Ft-Lbs./ 1101 Nm
1-1/2"	6	1949 Ft-Lbs./ 2642 Nm	1414 Ft-Lbs./ 1917 Nm
1-5/8"	5-1/2	2475 Ft-Lbs./ 3355 Nm	1764 Ft-Lbs./ 2433 Nm

** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY. - **NOTE** Anti-Seize to be NON COPPER based.

TITLE: SECTION FROM DWG. C11076-02-002

FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN

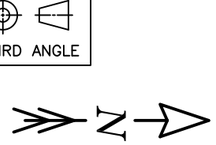
REV.	DATE	DESCRIPTION OF REVISION
A	9/14/2017	REVISED VIEW. KMC

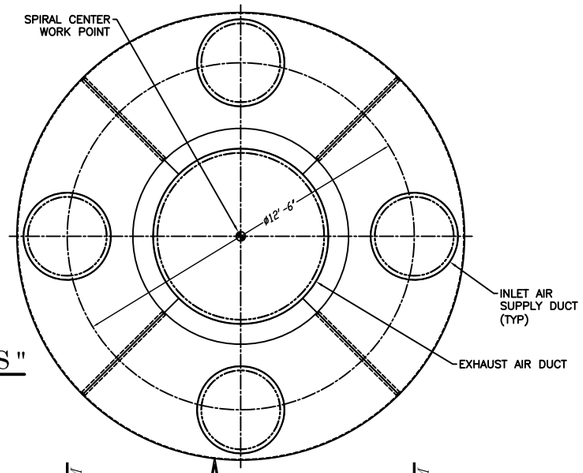
SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

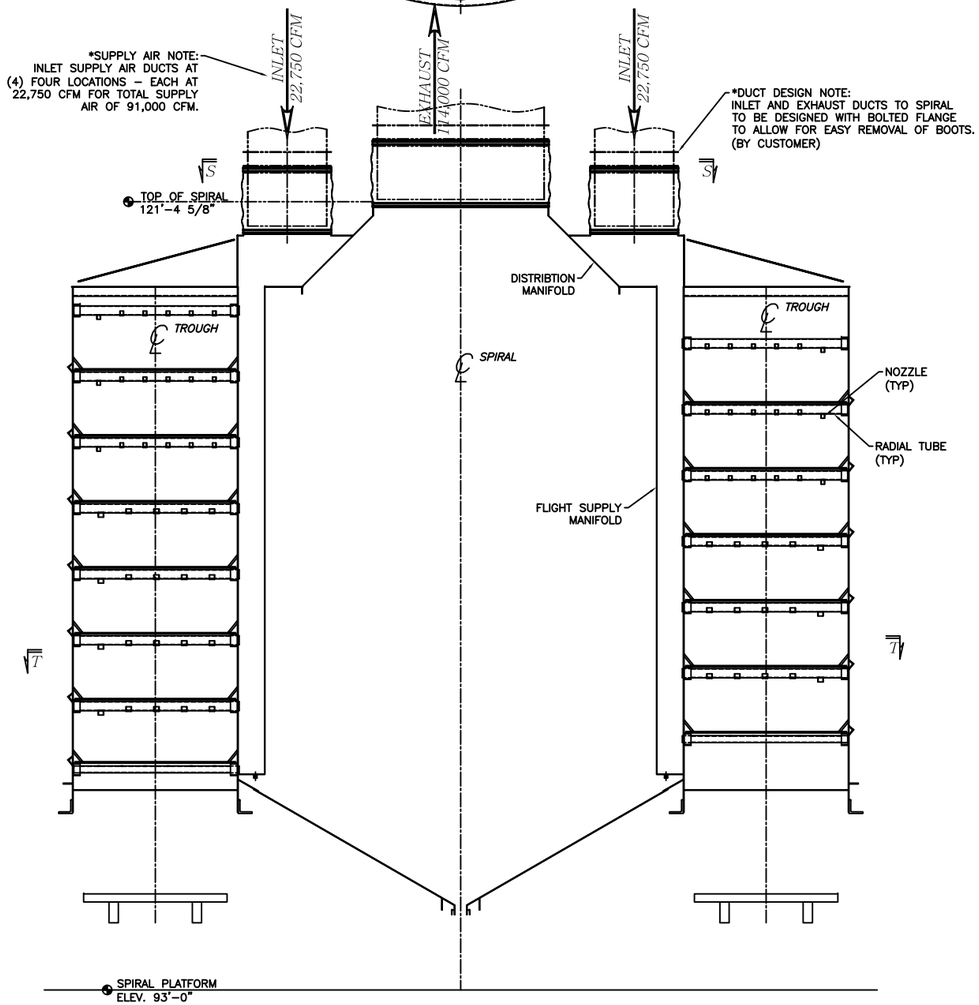
DRAWN: CHRISTOPHERSON
CHECKED: KMC
DATE: 2017/6/28
SCALE: 1/2" = 1' DO NOT SCALE
REFERENCE
JOB NO.
SUBMITTED: CERTIFIED 9/14/2017
DWG. NO.: C11076-02-010

THIRD ANGLE

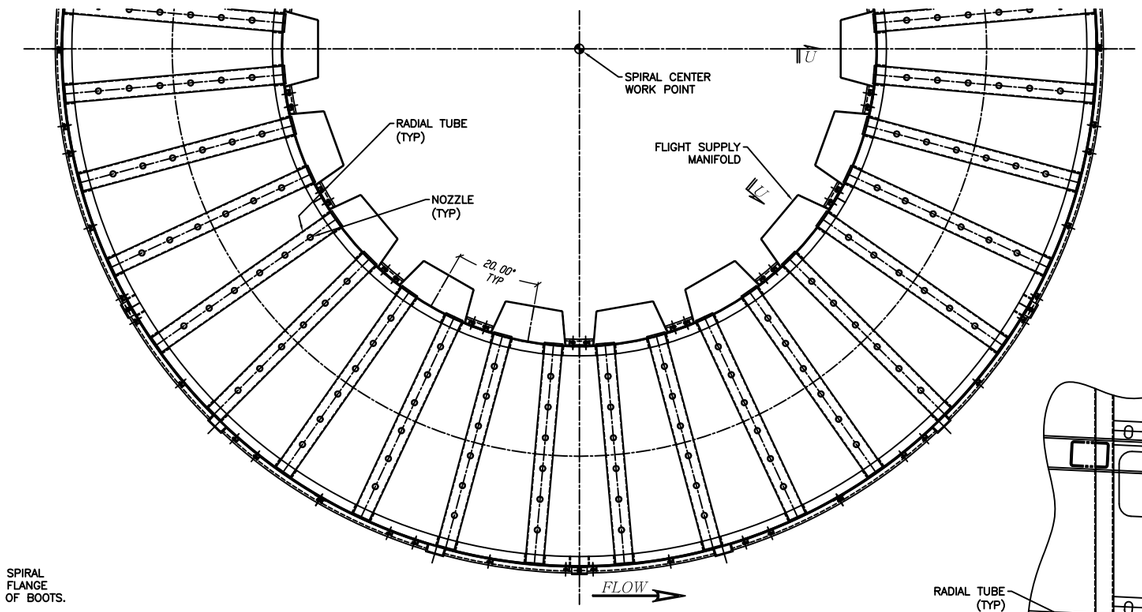




SECTION " S-S "

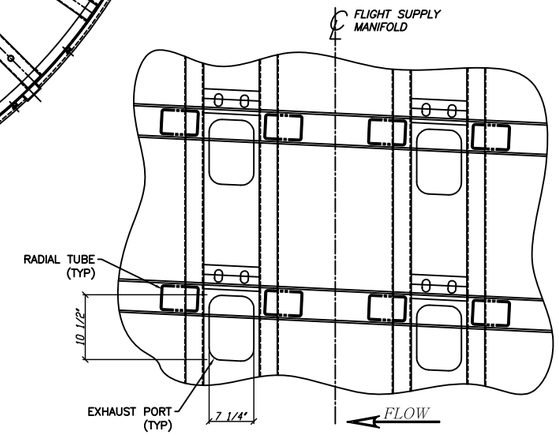


G.A. OF SUPPLY AND EXHAUST AIR



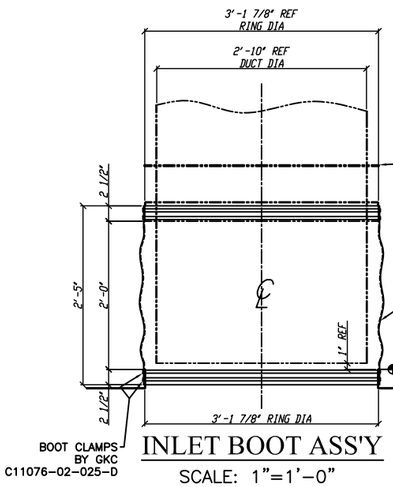
SECTION " T-T "

SCALE: 1/2"=1'-0
FLIGHT SECTION NOT SHOWN FOR CLARITY



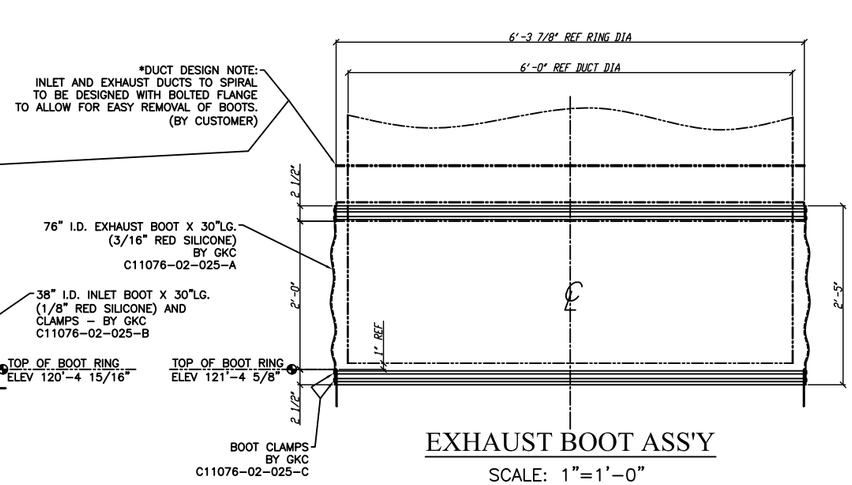
SECTION " U-U"

SCALE: 1"=1'-0"
SECTION OF INSIDE SKIN SHOWN FLAT



INLET BOOT ASS'Y

SCALE: 1"=1'-0"



EXHAUST BOOT ASS'Y

SCALE: 1"=1'-0"

TITLE: GENERAL ARRANGEMENT OF SUPPLY AND EXHAUST AIR

FOR: WAUPACA FOUNDRY- PLANT 6; ETOWAH, TN

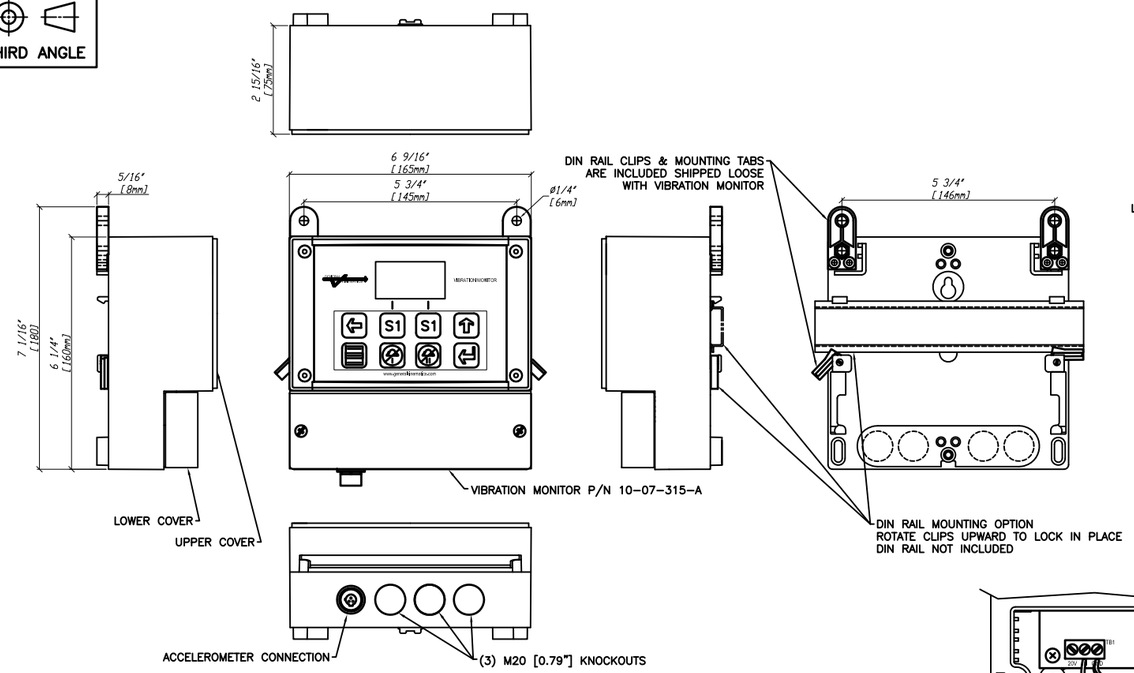
REV.	DATE	DESCRIPTION OF REVISION
A	9/14/2017	REVISED VIEW TO SHOW AIR SUPPRESSOR CONE. KMC

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN.

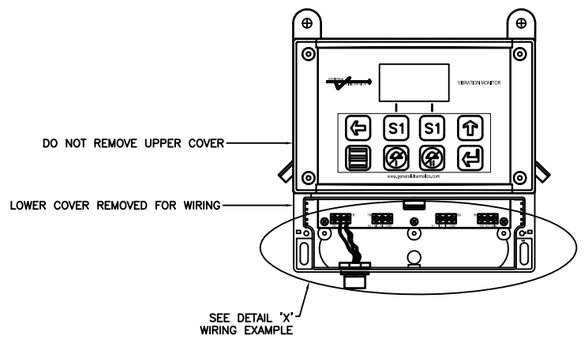
GENERAL KINEMATICS — VIBRATORY PROCESS EQUIPMENT

DRAWN	CHRISTOPHERSON
CHECKED	KMC
DATE	2017/6/27
SCALE	3/8" = 1'
	DO NOT SCALE
REFERENCE	
SUBMIT	CERTIFIED 9/14/2017
DWG. NO.	C11076-02-011

THIRD ANGLE



VIBRATION MONITOR MOUNTING



SYSTEM DESCRIPTION

ACCELEROMETER:

The industrial Accelerometer in this system is a piezo-electric type of sensor housed in a heavy duty housing. It includes a twelve foot cord with strain relief and abrasion protection. Connection to the Vibration Transmitter is accomplished with a "Mini-Fast" molded quick connector. The Accelerometer units are rated and tagged with a mV/G of acceleration rating. This rating is used to "match" the Accelerometer to the Vibration Transmitter.

The Accelerometer is mounted to the vibrating unit by one 3/8"[10mm] bolt.

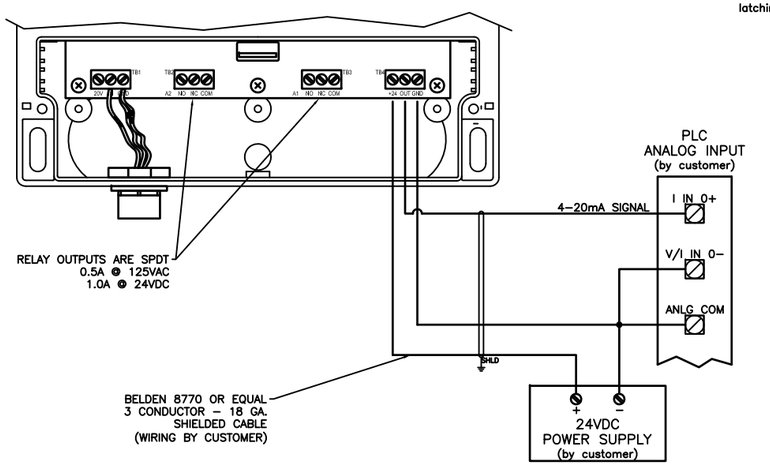
VIBRATION MONITOR:

The vibration monitor is protected by a NEMA 4X (IP65) polycarbonate enclosure. Located at the bottom of the vibration monitor enclosure is the connection for the accelerometer and three knockouts available for wiring. The two-tiered front of the enclosure allows for wiring and user interface. The lower tier is a removable cover that allows for the wiring of the vibration monitor and the upper tier provides the LCD display and user interface. The upper tier cover is not to be removed by anyone other than General Kinematics personnel.

The vibration monitor is a multi-functional, three-wire device that monitors an accelerometer signal. The vibration monitor conditions the signal from the accelerometer and displays the value on the LCD screen. The value can represent acceleration, velocity, or displacement depending on the setup of the vibration monitor. The vibration monitor then outputs a 4-20mA signal to represent this scaled value. The vibration monitor also provides two relay outputs tied to alarm setpoints.

The 4-20mA output of the vibration monitor represents the scaled value of acceleration, velocity, or displacement. 4mA is equal to zero and 20mA is equal to the range selected. For example, if acceleration is selected for the mode and the range is set to 5g, then the 4-20mA signal will represent 0-5g's.

Each of the two Form C relays provides one normally open and one normally closed contact for alarming purposes. Each relay has its own setpoint, time delay, and reset reaction (MODE). The alarm setpoint can be set to react as a low or high alarm (TYPE). A low alarm triggers the relay when the actual value falls below the setpoint. A high alarm triggers the relay when the actual value rises above the setpoint. Each setpoint has an adjustable time delay. This delay is the time between the actual value exceeding the setpoint value and the activation of the respective relay. Each alarm can also be setup for floating or latching. This refers to the resetting of the alarm once the system is no longer in alarm condition. A floating alarm will automatically reset the alarm when the actual value falls back into normal range. A latching alarm must be reset manually even after the actual value has fallen back into normal range.

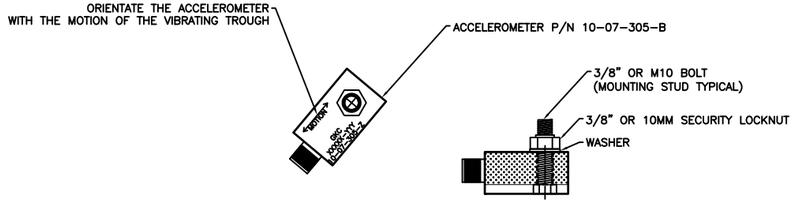


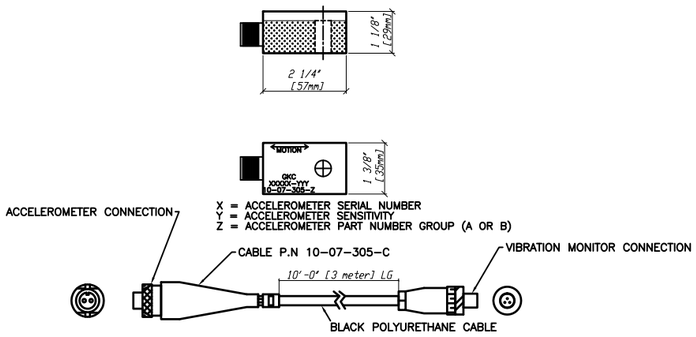
DETAIL 'X' VIBRATION MONITOR WIRING EXAMPLE

SCALE: FULL

	TRANSMITTER #1 TOWER
Set Maximum Range (0.5, 1.0, 2.0, 4.0 in) or (12.5, 25.4, 50.8, 101 mm) to:	0.5 in. [Range]
Set Alarm 1 Type (High or Low) to:	Low [AL 1 Type]
Set Alarm 1 Mode (Floating or Latching) to:	Floating [AL 1 Mode]
Set Alarm 1 Limit (0.0 to Max Range) at:	.125 in. [AL 1 Level]
Set Alarm 1 Time (1 to 600 Seconds) at:	10 sec [AL 1 Time]
Set Alarm 2 Type (High or Low) to:	High [AL 2 Type]
Set Alarm 2 Mode (Floating or Latching) to:	Latching [AL 2 Mode]
Set Alarm 2 Limit (0.0 to Max Range) at:	◇ .28 in. [AL 2 Level]
Set Alarm 2 Time (1 to 600 Seconds) at:	10 sec [AL 2 Time]

	TRANSMITTER #2 EXCITER
Set Maximum Range (0.5, 1.0, 2.0, 4.0 in) or (12.5, 25.4, 50.8, 101 mm) to:	1.0 in. [Range]
Set Alarm 1 Type (High or Low) to:	Low [AL 1 Type]
Set Alarm 1 Mode (Floating or Latching) to:	Floating [AL 1 Mode]
Set Alarm 1 Limit (0.0 to Max Range) at:	.3125 in. [AL 1 Level]
Set Alarm 1 Time (1 to 600 Seconds) at:	10 sec [AL 1 Time]
Set Alarm 2 Type (High or Low) to:	High [AL 2 Type]
Set Alarm 2 Mode (Floating or Latching) to:	Latching [AL 2 Mode]
Set Alarm 2 Limit (0.0 to Max Range) at:	.75 in. [AL 2 Level]
Set Alarm 2 Time (1 to 600 Seconds) at:	10 sec [AL 2 Time]

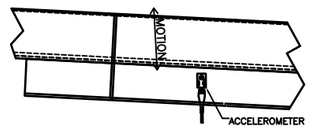




ACCELEROMETER & CABLE ASSEMBLY HAS IP65 RATING / MAX. TEMP = 250F [121C]

NOTE: SECURE ACCELEROMETER CABLE TO PREVENT WHIPPING

ACCELEROMETER MOUNTING



ACCELEROMETER MOUNTING EXAMPLE

TITLE: INSTALLATION LAYOUT VIBRATION MONITOR & ACCELEROMETER			
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	A	9/14/2017	CERTIFIED. KMC
	REV.	DATE	DESCRIPTION OF REVISION

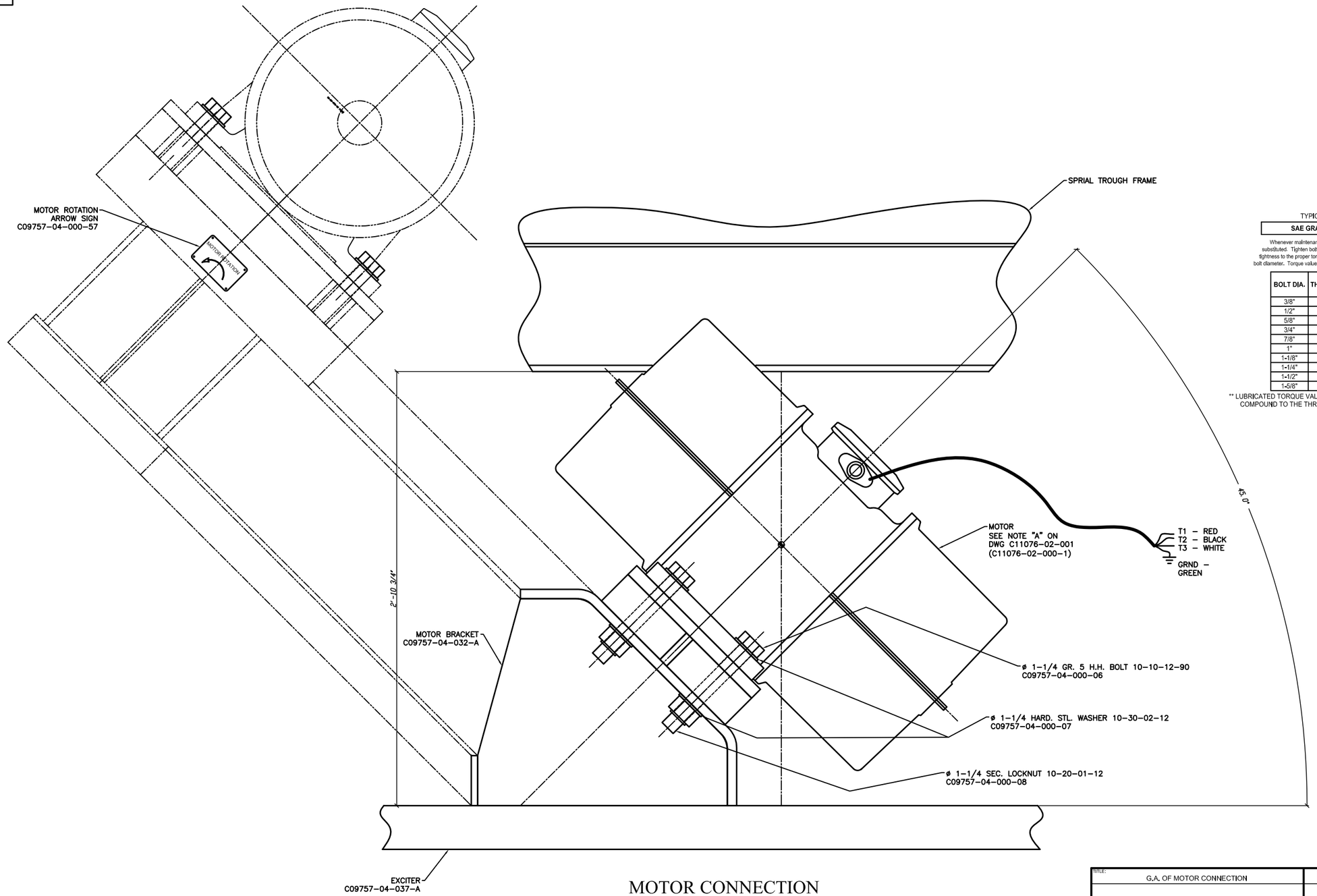
SAFETY HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS® VIBRATORY PROCESS EQUIPMENT

DRAWN: CHRISTOPHERSON	REFERENCE		
DIRECTORY: KMC			
DATE: 2017/6/27	SUBMITTED: CERTIFIED 9/14/2017		
SCALE: HALF DO NOT SCALE	DWG. NO.: C11076-02-013		

FORM DWG. NO.: 10-07-360

THIRD ANGLE



TYPICAL TORQUE VALUES UNLESS NOTED OTHERWISE

SAE GRADE 5 BOLTS	NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts **are not** substituted. Tighten bolts using a calibrated torque wrench. All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values based on the corresponding bolt diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

BOLT DIA.	THREADS/In.	DRY Threads TORQUE NUT to:	LUBRICATED** Threads TORQUE NUT to:
3/8"	16	31 Ft-Lbs./ 42 Nm	22 Ft-Lbs./ 30 Nm
1/2"	13	76 Ft-Lbs./ 103 Nm	55 Ft-Lbs./ 74 Nm
5/8"	11	150 Ft-Lbs./ 203 Nm	109 Ft-Lbs./ 148 Nm
3/4"	10	265 Ft-Lbs./ 359 Nm	193 Ft-Lbs./ 262 Nm
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1-1/4"	7	1120 Ft-Lbs./ 1518 Nm	812 Ft-Lbs./ 1101 Nm
1-1/2"	6	1949 Ft-Lbs./ 2642 Nm	1414 Ft-Lbs./ 1917 Nm
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** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY. **- NOTE** Anti-Seize to be NON COPPER based.

MOTOR CONNECTION

SECTION "M-M"

FROM DWG. -02-006

FLOW

TITLE: G.A. OF MOTOR CONNECTION			
	A	9/14/2017	REMOVED THERMISTOR WIRES PER CUSTOMER REQUEST. KMC
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION

SAFETY HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN	CHRISTOPHERSON
CHECKED	KMC
DATE	2017/6/27
SCALE	3" = 1'
	DO NOT SCALE
REFERENCE	
JOB NO.	
NUMBER	CERTIFIED 9/14/2017
DWG. NO.	C11076-02-014

THIRD ANGLE

TYPICAL TORQUE VALUES UNLESS NOTED OTHERWISE

SAE GRADE 5 BOLTS	NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts **are not** substituted. Tighten bolts using a calibrated torque wrench. All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values based on the corresponding bolt diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

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3/8"	16	31 Ft-Lbs./ 42 Nm	22 Ft-Lbs./ 30 Nm
1/2"	13	76 Ft-Lbs./ 103 Nm	55 Ft-Lbs./ 74 Nm
5/8"	11	150 Ft-Lbs./ 203 Nm	109 Ft-Lbs./ 148 Nm
3/4"	10	265 Ft-Lbs./ 359 Nm	193 Ft-Lbs./ 262 Nm
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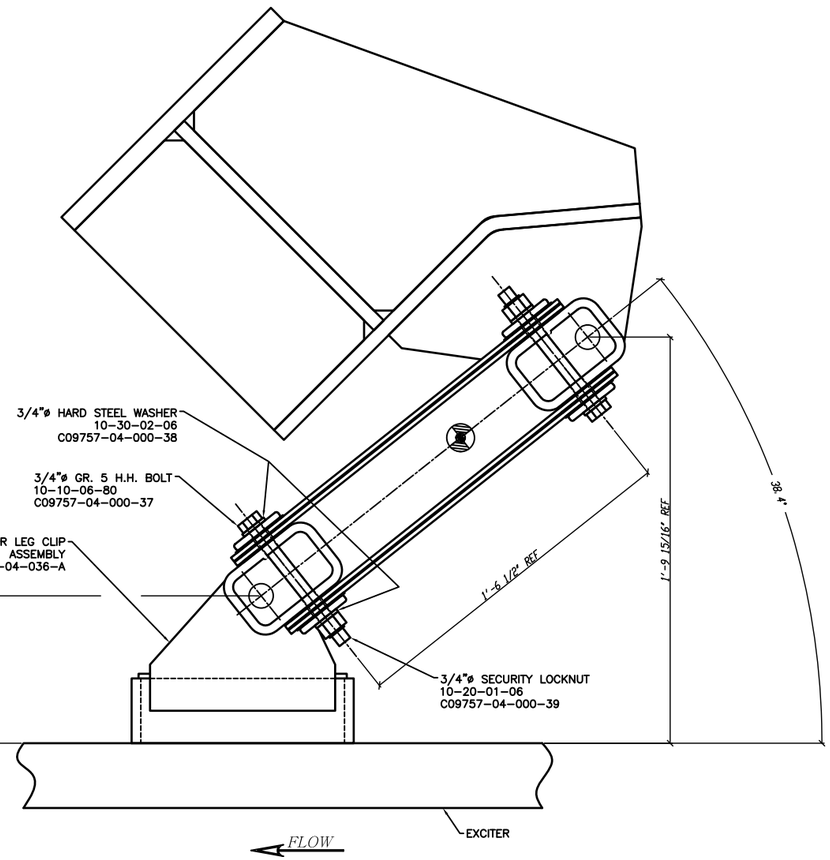
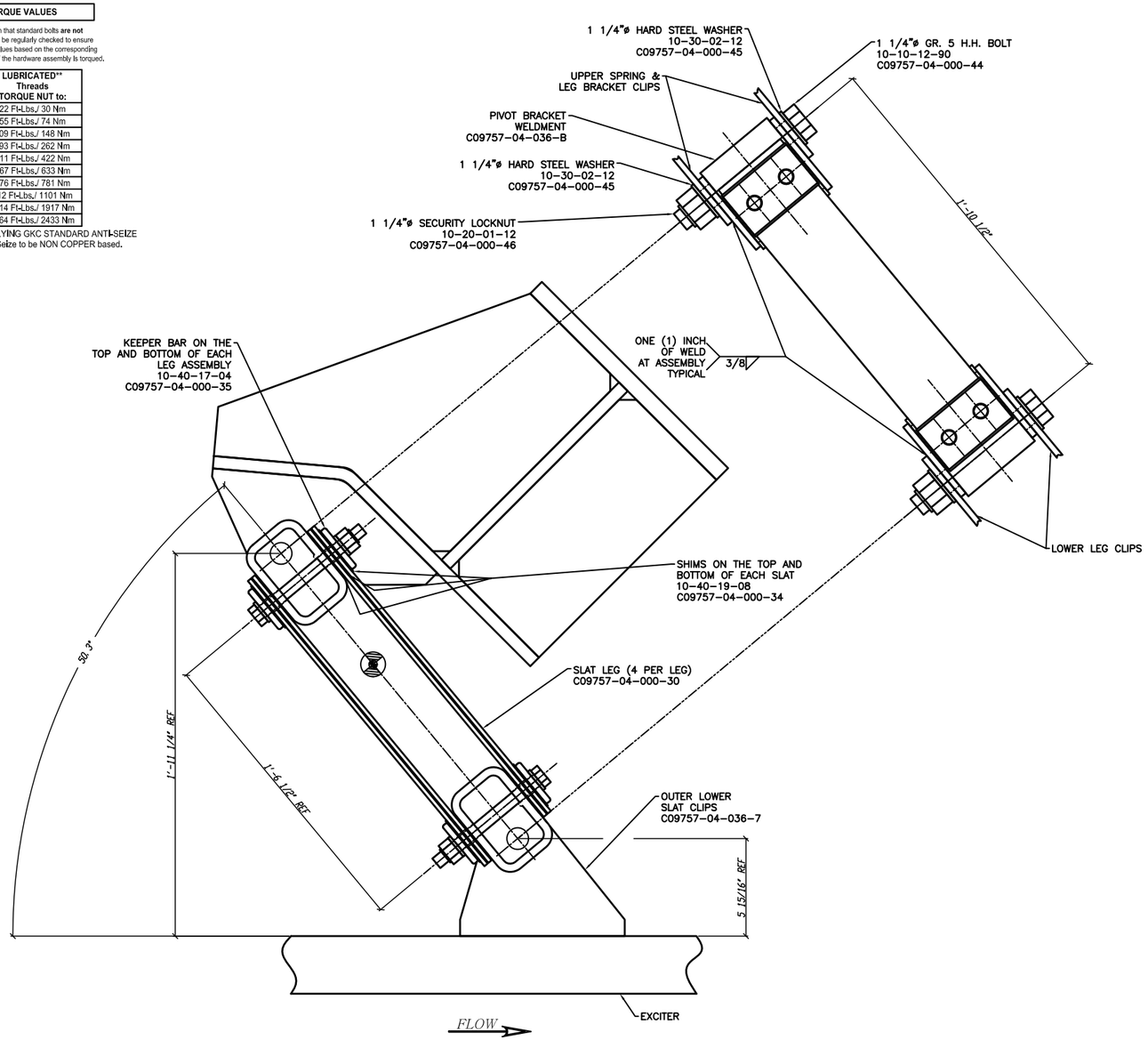
** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY. - **NOTE** Anti-Seize to be NON COPPER based.



SECTION " O-O"

FROM DWG. -02-006
INNER ROCKER LEG ASSEMBLY



SECTION " P-P"

FROM DWG. -02-006
OUTER ROCKER LEG ASSEMBLY

TITLE: G.A. OF SLAT ASSEMBLIES			
	A	9/14/2017	CERTIFIED. KMC
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN: CHRISTOPHERSON	REFERENCE		
CHECKED: KMC			
DATE: 2017/6/27	JOB NO.:	SUBMIT: CERTIFIED	9/14/2017
SCALE: 3" = 1' DO NOT SCALE	DWG. NO.: C11076-02-015		

THIRD ANGLE

TYPICAL TORQUE VALUES UNLESS NOTED OTHERWISE

SAE GRADE 5 BOLTS	NUT TORQUE VALUES

Whenever maintenance requires removal of high strength bolting, be certain that standard bolts **are not** substituted. Tighten bolts using a calibrated torque wrench. All fasteners must be regularly checked to ensure tightness to the proper torque value. The following chart offers correct torque values based on the corresponding bolt diameter. Torque values are the same regardless of which side (nut or bolt) of the hardware assembly is torqued.

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3/4"	10	265 Ft-Lbs./ 359 Nm	193 Ft-Lbs./ 262 Nm
7/8"	9	430 Ft-Lbs./ 583 Nm	311 Ft-Lbs./ 422 Nm
1"	8	645 Ft-Lbs./ 875 Nm	467 Ft-Lbs./ 633 Nm
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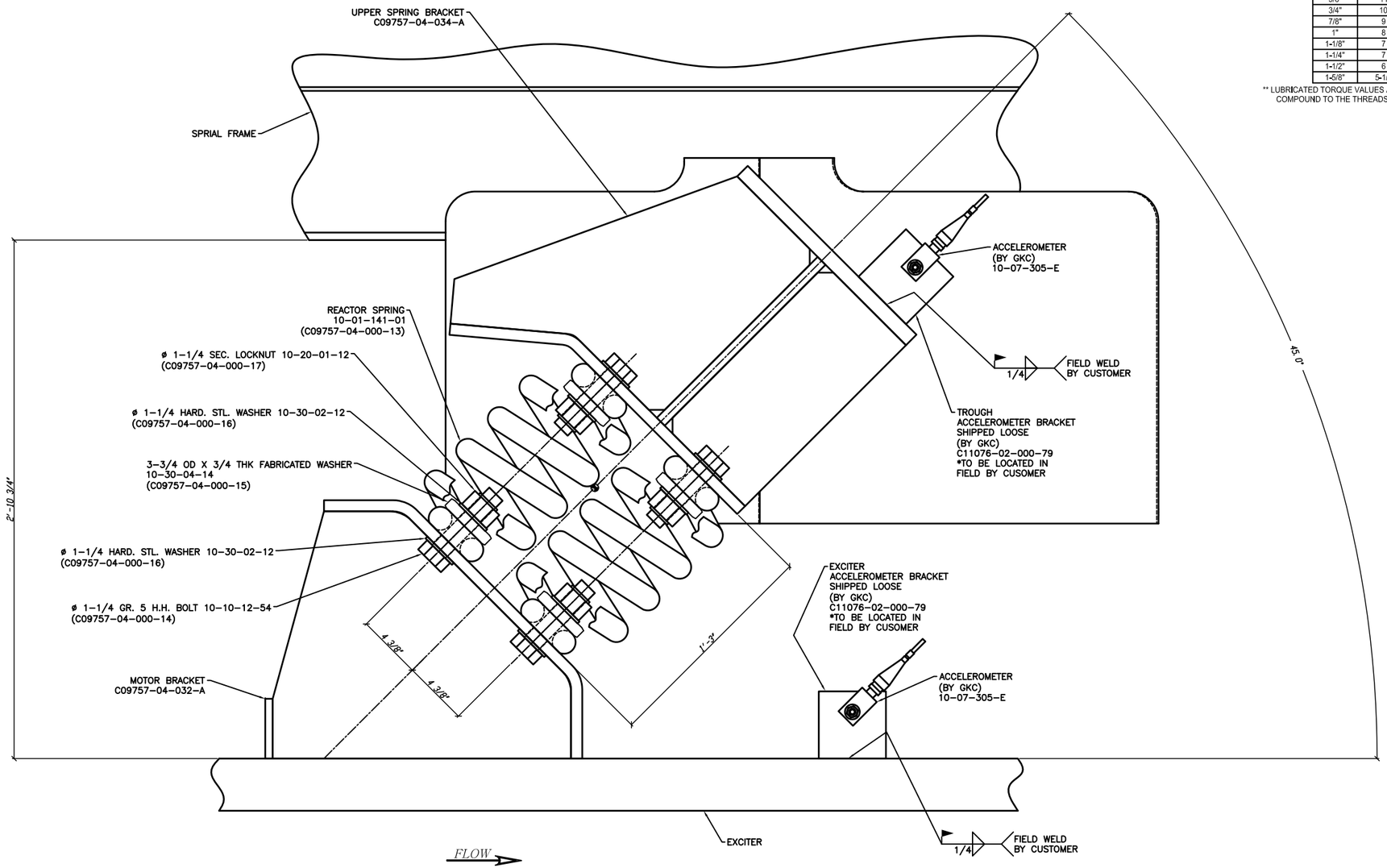
1-5/8"	5-1/2	2475 Ft-Lbs./ 3355 Nm	1764 Ft-Lbs./ 2433 Nm

** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY. - **NOTE** Anti-Seize to be NON COPPER based.



FLOW

REACTOR SPRING ASSEMBLY

SECTION " N-N"

FROM DWG. -02-006

TITLE: G.A. OF REACTOR SPRING ASSEMBLY

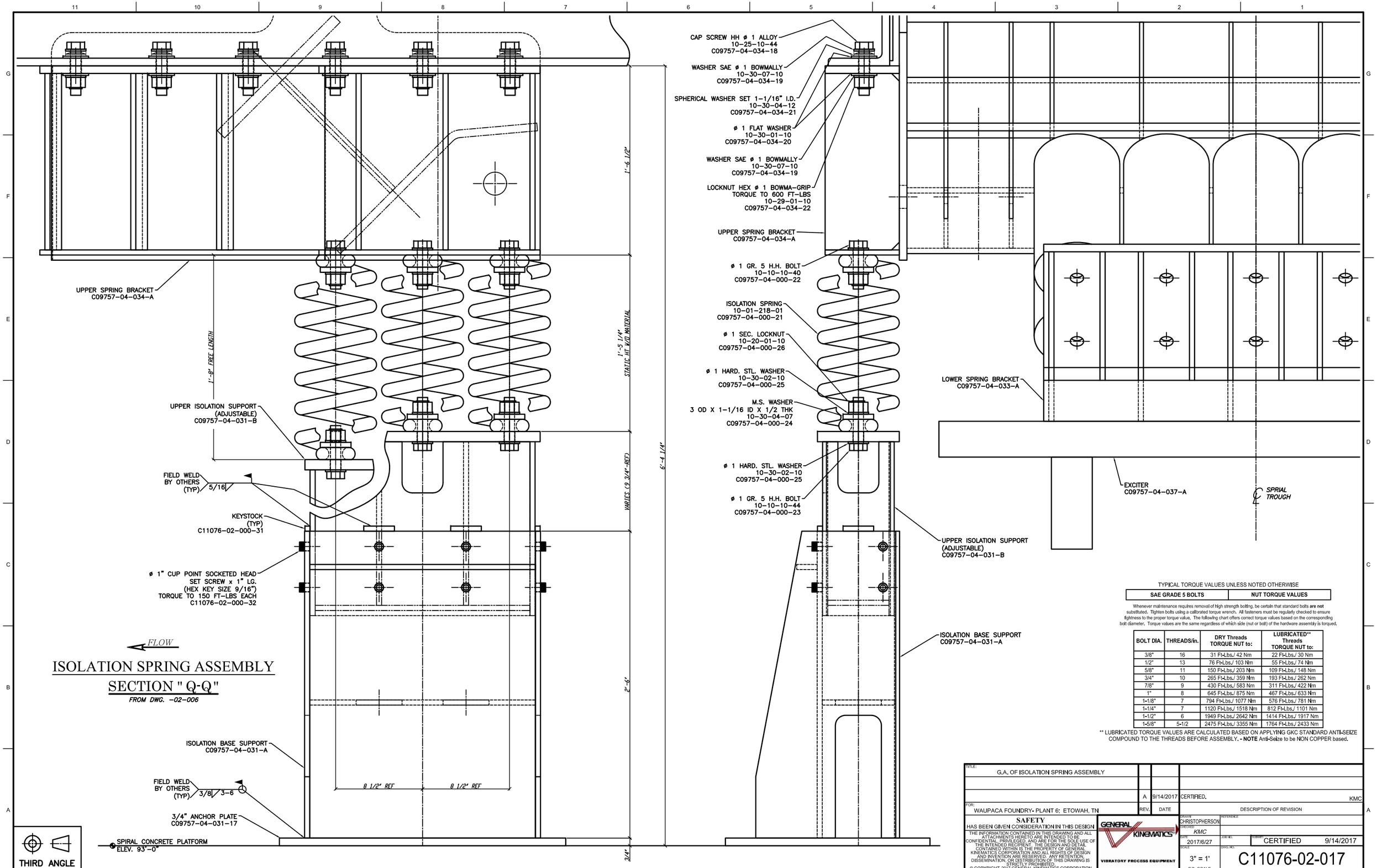
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN

REV.	DATE	DESCRIPTION OF REVISION
A	9/14/2017	CERTIFIED. KMC

SAFETY HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN	CHRISTOPHERSON
CHECKED	KMC
DATE	2017/6/27
SCALE	3" = 1'
DO. SCALE	
REFERENCE	
JOB NO.	
SUBMIT	CERTIFIED 9/14/2017
DWG. NO.	C11076-02-016



THIRD ANGLE

TYPICAL TORQUE VALUES UNLESS NOTED OTHERWISE

SAE GRADE 5 BOLTS	NUT TORQUE VALUES

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7/8"	9	430 Ft-Lbs./ 583 Nm	311 Ft-Lbs./ 422 Nm
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1-1/2"	6	1949 Ft-Lbs./ 2642 Nm	1414 Ft-Lbs./ 1917 Nm
1-5/8"	5-1/2	2475 Ft-Lbs./ 3355 Nm	1764 Ft-Lbs./ 2433 Nm

** LUBRICATED TORQUE VALUES ARE CALCULATED BASED ON APPLYING GKC STANDARD ANTI-SEIZE COMPOUND TO THE THREADS BEFORE ASSEMBLY. - **NOTE** Anti-Seize to be NON COPPER based.

TITLE: G.A. OF ISOLATION SPRING ASSEMBLY

FOR: WAUPACA FOUNDRY- PLANT 6; ETOWAH, TN

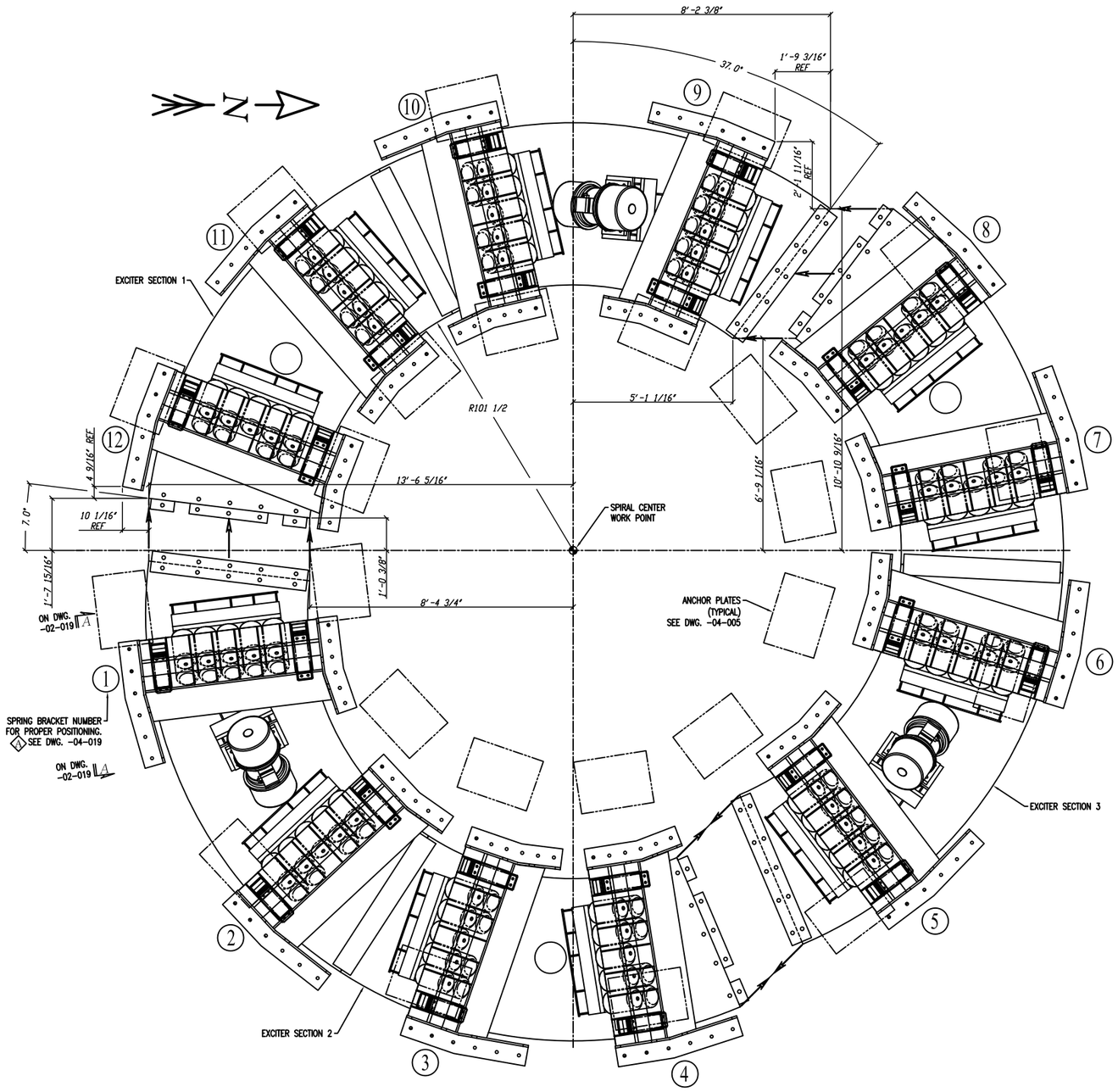
REV.	DATE	DESCRIPTION OF REVISION
A	9/14/2017	CERTIFIED. KMC

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN: CHRISTOPHERSON
CHECKED: KMC
DATE: 2017/6/27
SCALE: 3" = 1"
DO SCALE
REFERENCE
JOB NO.
SUBMIT: CERTIFIED 9/14/2017
DWG. NO. C11076-02-017

THIRD ANGLE



G.A. OF EXCITER SHIPPING SECTIONS

FIELD INSTALLATION

1) POSITION AND WELD ANCHOR PLATES (C09757-04-031-17) AS SHOWN PER DWG. C11076-02-005.

2) POSITION UNIT C11076-03 BEFORE GOING ANY FURTHER. SEE THE GENERAL ARRANGEMENT DRAWINGS FOR THIS UNIT FOR PROPER POSITIONING ON THE SPIRAL CONCRETE PAD.

3) POSITION SECTION 1 OF EXCITER (38,000 LBS) AS SHOWN PER THIS DRAWING. **NOTE SECTION 1 OF EXCITER HAS NUMBERS 9 THRU 12 LABELED ON OUTSIDE OF THE UPPER SPRING BRACKETS AT LOCATIONS SHOWN ON DRAWING. SEE VIEW "A-A" ON DWG. C11076-02-019 FOR REFERENCE. IT IS VERY IMPORTANT EXCITER SECTIONS ARE PLACED AS SHOWN USING NUMBERS ON THE UPPER SPRING BRACKETS TO POSITION SECTIONS PER THIS DRAWING.** BRACE EXCITER SECTION SO BOTTOM OF STEEL IS 29" ABOVE SPIRAL FLOOR. POSITION SECTION 2 AND 3 OF EXCITER USING THE SPLICE PLATES TO BOLT THE TWO EXCITER SECTIONS TO SECTION 1. BRACE REMAINING SECTIONS AT SAME ELEVATION AS FIRST SECTION.

4) MAKE SURE THE EXCITER SECTIONS ARE ALIGNED PROPERLY AND AT THE CORRECT ELEVATION. TORQUE THE BOLTS OF THE MATING PLATES AS NOTED ON DRAWING C11076-02-019. WELD SECTIONS TOGETHER AS SHOWN.

5) POSITION ISOLATION SPRING ASSEMBLIES PER DWG. C11076-02-017. BOLT AND TORQUE ISOLATION SPRING TO UPPER SPRING BRACKET AND TO UPPER ISOLATION SUPPORT AS SHOWN. DO NOT WELD ISOLATION BASE SUPPORT TO ANCHOR PLATE AT THIS TIME. TEMPORARILY TORQUE SET SCREWS TO HOLD UPPER ISOLATION SUPPORT IN PLACE.

6) ASSEMBLE AND LOCATE LOWER SAND CONE (C09757-04-042-A,B).
   a) BOLT LOWER SAND CONE SECTIONS TOGETHER PER DWG. C11076-02-021.
   b) WELD SECTIONS TOGETHER AS NOTED.
   c) WELD DISHARGE SPOUT (C09757-04-042-C) TO BOTTOM OF CONE AS NOTED.
   d) LOCATE LOWER SAND CONE IN CENTER OF EXCITER ASSEMBLY USING DWG. C11076-02-008 AS A GUIDE (NOTE LOCATION OF ACCESS DOOR). THE CONE WILL BE RAISED INTO POSITION LATER IN THE ASSEMBLY PROCESS.

7) POSITION TOWER SECTION 1 (C09757-04-070-A, WT = 34,000 LBS) OVER EXCITER. USE DWG. C11076-02-002 TO LOCATE SECTION 1 OVER EXCITER. **IMPORTANT: NUMBER ON UPPER SPRING BRACKET MUST CORRESPOND TO NUMBER ON MATING AREA OF TOWER AS INDICATED ON DRAWING NOTES.** THE BOTTOM OF THE TOWER SECTION SHOULD BE PLACED 76 1/4" ABOVE SPIRAL FLOOR. BRACE THE TOWER SECTION TEMPORARILY WITH SUPPORTS UNDER THE ANGLES OF THE INNER AND OUTER RADIUS. SUPPORTS MUST NOT INTERFERE WITH THE UPPER SPRING BRACKETS. INSTALL MATING BOLTS BETWEEN TOWER SECTION AND UPPER SPRING BRACKETS (SEE DWG. C11076-02-017). DO NOT TORQUE THE BOLTS AT THIS TIME IN CASE TOWER SECTION MUST BE MOVED SLIGHTLY FOR ALIGNMENT PURPOSES.

8) POSITION TOWER SECTION 2 (C11076-02-040-A, WT = 34,000 LBS) OVER EXCITER. ELEVATION ABOVE FLOOR IS NOTED IN STEP 6. USE THE ALIGNMENT CHANNELS TO AID IN MATING THE TWO TOWER SECTIONS TOGETHER PER DWG. C11076-02-022. **DO NOT USE BOLTS TO PULL SECTIONS TOGETHER.** CHECK ALIGNMENT OF TOWER SECTIONS AND THAT ENTIRE TOWER ASSEMBLY IS LEVEL AND PLUM. TEMPORARILY BRACE SECTION 2 AND INSTALL MATING BOLTS AS NOTED IN STEP 6.

9) REPEAT STEP 7 FOR TOWER SECTIONS 3 THRU 6.
   -SECTION 3 (C09757-04-090-A) WEIGHT = 31000 LBS
   -SECTION 4 (C11076-02-050-A) WEIGHT = 31000 LBS
   -SECTION 5 (C09757-04-120-A) WEIGHT = 32500 LBS
   -SECTION 6 (C09757-04-130-A) WEIGHT = 32500 LBS

10) FINAL CHECK ALIGNMENT AND POSITION OF TOWER SECTIONS AND WELD TOWER TOGETHER AS NOTED PER DWGS. C11076-02-020 THRU C11076-02-023.

11) RAISE LOWER SAND CONE INTO PLACE AND BOLT TO TOWER USING DWG. C11076-02-021 AS A GUIDE. ONCE ALIGNED AND BOLTED, WELD CONE AS NOTED.

12) FINAL TORQUE ALL MATING BOLTS FOR UPPER SPRING BRACKETS TO TOWER AS SHOWN ON DWG. C11076-02-017. TORQUE ALL BOLTS TO 600 FT-LBS.

13) ASSEMBLE AND LOCATE UPPER MANIFOLD (C09757-04-049-A).
   a) ALIGN AND WELD TWO (2) MANIFOLD HALVES TOGETHER AS NOTED ON DWG. C11076-02-020.
   b) RAISE MANIFOLD INTO POSTION ON TOP OF TOWER. USE DWG. C11076-02-002 AS GUIDE TO POSITION FOUR (4) INLET DUCTS IN THE CORRECT LOCATION. CONSULT WITH AIR DUCT INSTALLER TO CONFIRM THE CORRECT LOCATION. WELD THE UPPER MANFOLD TO THE TOWER AS NOTED ON DWG. C11076-02-020.

14) BOLT DISCHARGE DECK (C11076-02-032-A) AND COVER (C11076-02-035-A) IN PLACE USING DWG. C11076-02-009 AS A GUIDE.

15) BOLT DISCHARGE DECK LOWER CHUTE (C11076-02-039-A) TO BOTTOM OF DISCHARGE DECK AND TOWER USING C11076-02-004 AS A GUIDE.

16) BOLT SAND CHUTE (C09757-04-045-A) IN POSITION AS NOTED ON DWG. C11076-02-010.
(SEE DWG. C11076-02-008 FOR LOCATION OF SAND CHUTE IN PLAN VIEW.)

17) SETTING ISOLATION SPRING COMPRESSION (REFER TO DWG. C11076-02-017)
   a) CHECK TO SEE THAT ISOLATION SPRING ASSEMBLY IS POSITIONED CORRECTLY AS SHOWN IN DRAWING. WELD ISOLATION BASE SUPPORTS (C09757-04-031-A) TO ANCHOR PLATES (C09757-04-031-17).
   b) INSERT (2) TWO PORTA-POWER JACKS IN WINDOWS OF ISOLATION BASE SUPPORT (C09757-04-031-A). JACK UP UPPER ISOLATION SUPPORT (C09757-04-031-B) TO COMPRESS SPRINGS TO INDICATED HEIGHT. TORQUE SET SCREWS WHEN DESIRED COMPRESSION IS REACHED.
   c) REPEAT STEP b FOR 23 REMAINING ISOLATION SPRING SUPPORT ASSEMBLIES.
   d) WHEN ALL SPRINGS ARE COMPRESSED EQUALLY , WELD KEYSTOCK (C11076-02-000-31) TO UPPER ISOLATION SUPPORT (C09757-04-031-B) AS NOTED.

18) CHECK TO SEE THAT ALL WELDING HAS BEEN COMPLETED, AND FASTENERS HAVE BEEN TORQUED PROPERLY.

19) INSTALL INSULATION AT FIELD SPLICES UNDER THE LOWER SAND PAN.

20) SEE DRAWINGS C11076-02-060 AND C11076-02-061 FOR PROCEDURE TO INSTALL UPPER AIR SUPPRESSOR ASSEMBLY.

20) REMOVE TEMPORARY BRACES UNDER EXCITER.

21) REMOVE TEMPORARY BRACES UNDER TOWER.

21) REMOVE SHIPPING BRACES BETWEEN SPRING BRACKETS.

22) POWER CAN NOW BE SUPPLIED TO UNIT.

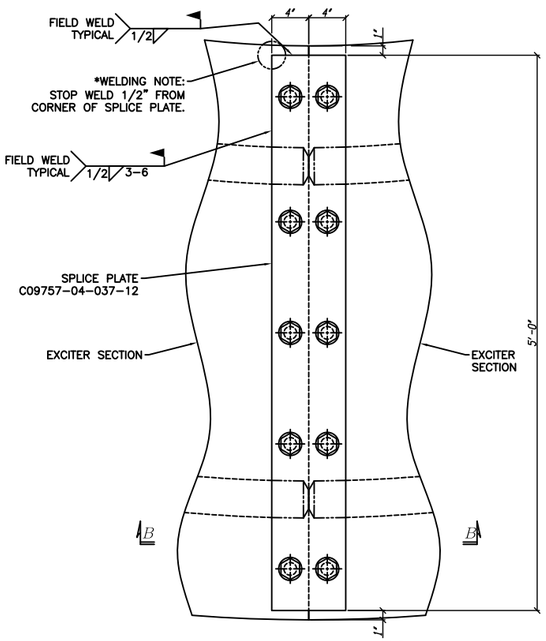
TITLE: GENERAL ARRANGEMENT OF FIELD INSTALLATION			
	A	10/11/2017	REVISED IDENTIFICATION NUMBER ON UPPER SPRING BRACKETS. KMC
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION

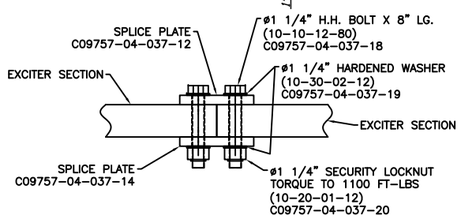
SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

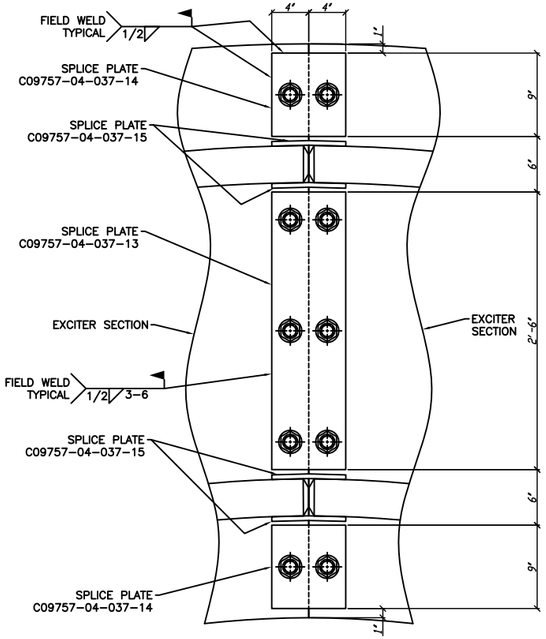
DRAWN	CHRISTOPHERSON
CHECKED	KMC
DATE	2017/9/6
SCALE	1/2" = 1'
DO NOT SCALE	
REFERENCE	
JOB NO.	
SUBMIT	CERTIFIED 9/14/2017
DWG. NO.	C11076-02-018

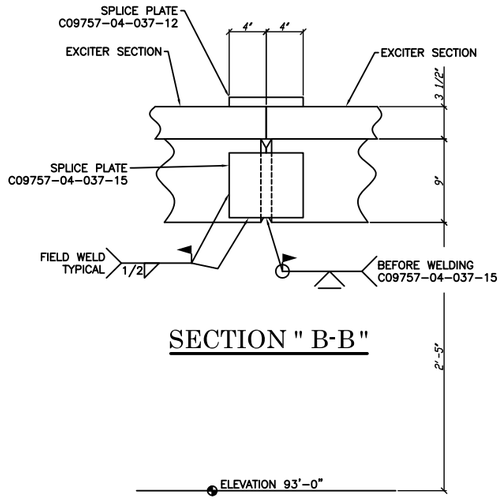
THIRD ANGLE



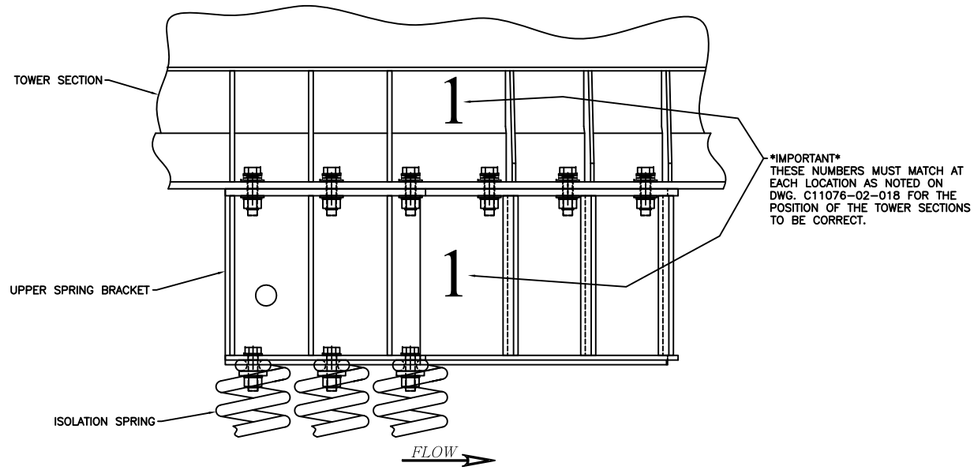


G.A. OF EXCITER FIELD SPLICE





SECTION " B-B "



VIEW "A-A"

FROM DWG. -02-018

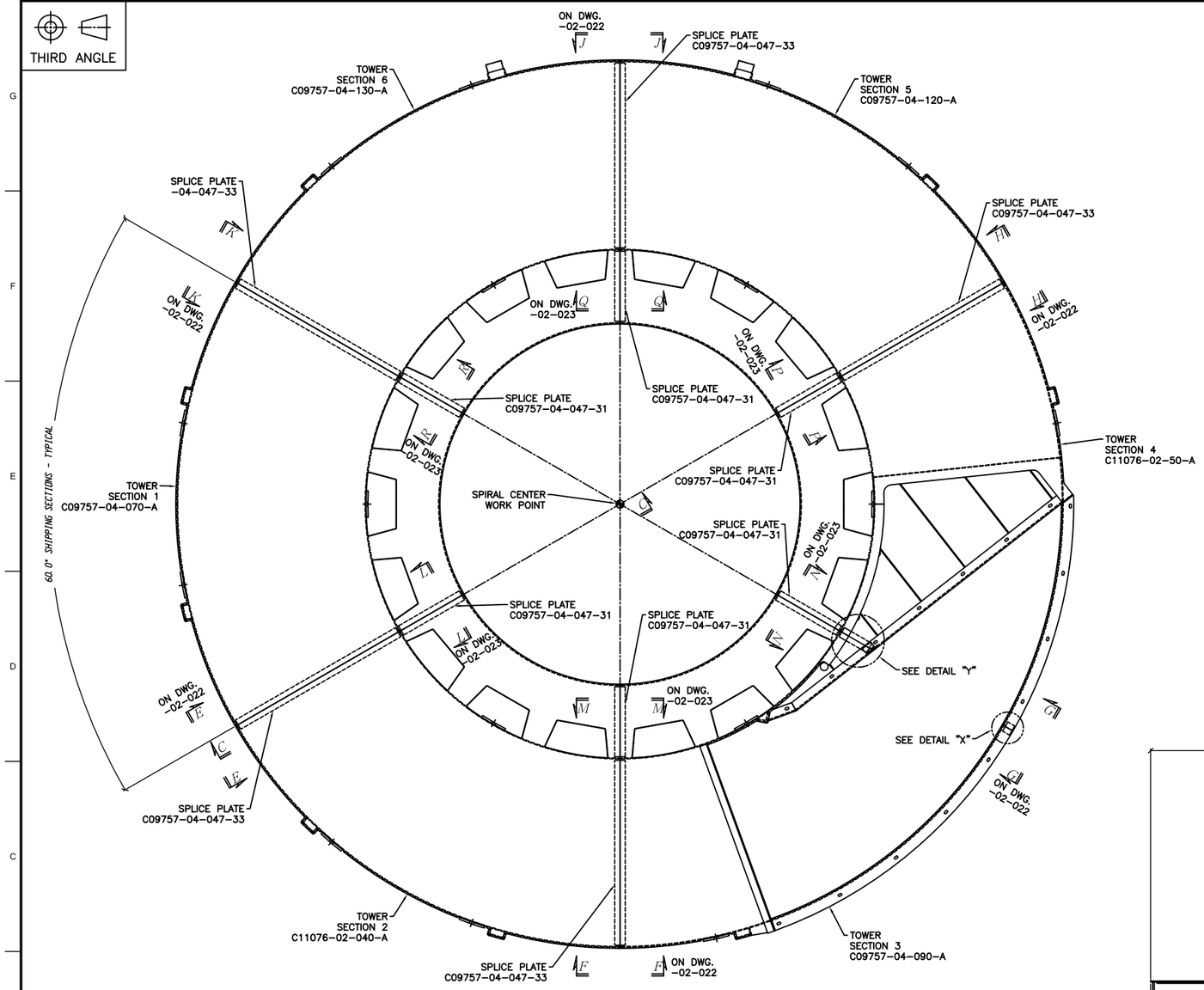
IMPORTANT

TOWER/UPPER SPRING BRACKET POSITION NUMBERS

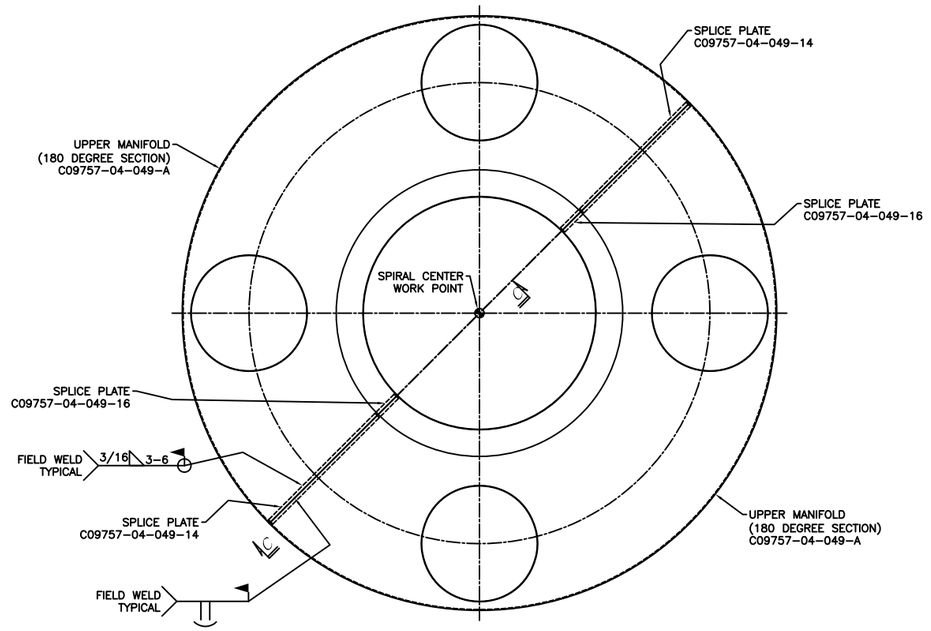
TITLE: SECTION FROM DWG. C11076-02-018			
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION
SAFETY HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN.			
DRAWN: CHRISTOPHERSON; CHECKED: KMC; DATE: 2017/9/6; SCALE: 1 1/2" = 1' DO NOT SCALE			REFERENCE; JOB NO.; SUBMIT: CERTIFIED 9/14/2017; DWG. NO.: C11076-02-019

GENERAL KINEMATICS — VIBRATORY PROCESS EQUIPMENT

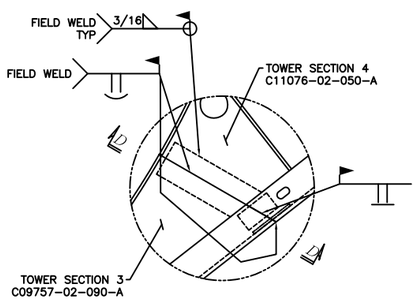
THIRD ANGLE



G.A. OF TOWER TOP SPLICE PLATES

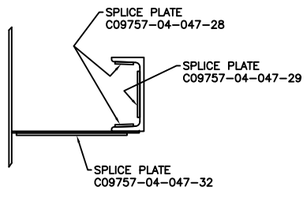


G.A. OF UPPER MANIFOLD SPLICE PLATES



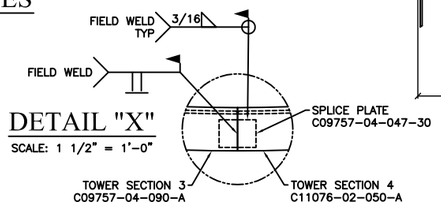
DETAIL "Y"

SCALE: 1 1/2" = 1'-0"



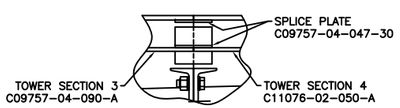
SECTION " D-D "

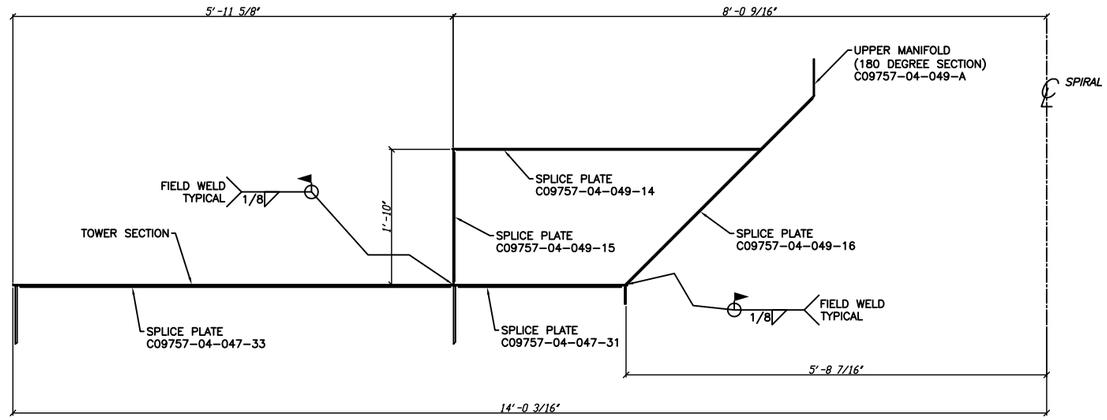
SCALE: 1 1/2" = 1'-0"



DETAIL "X"

SCALE: 1 1/2" = 1'-0"





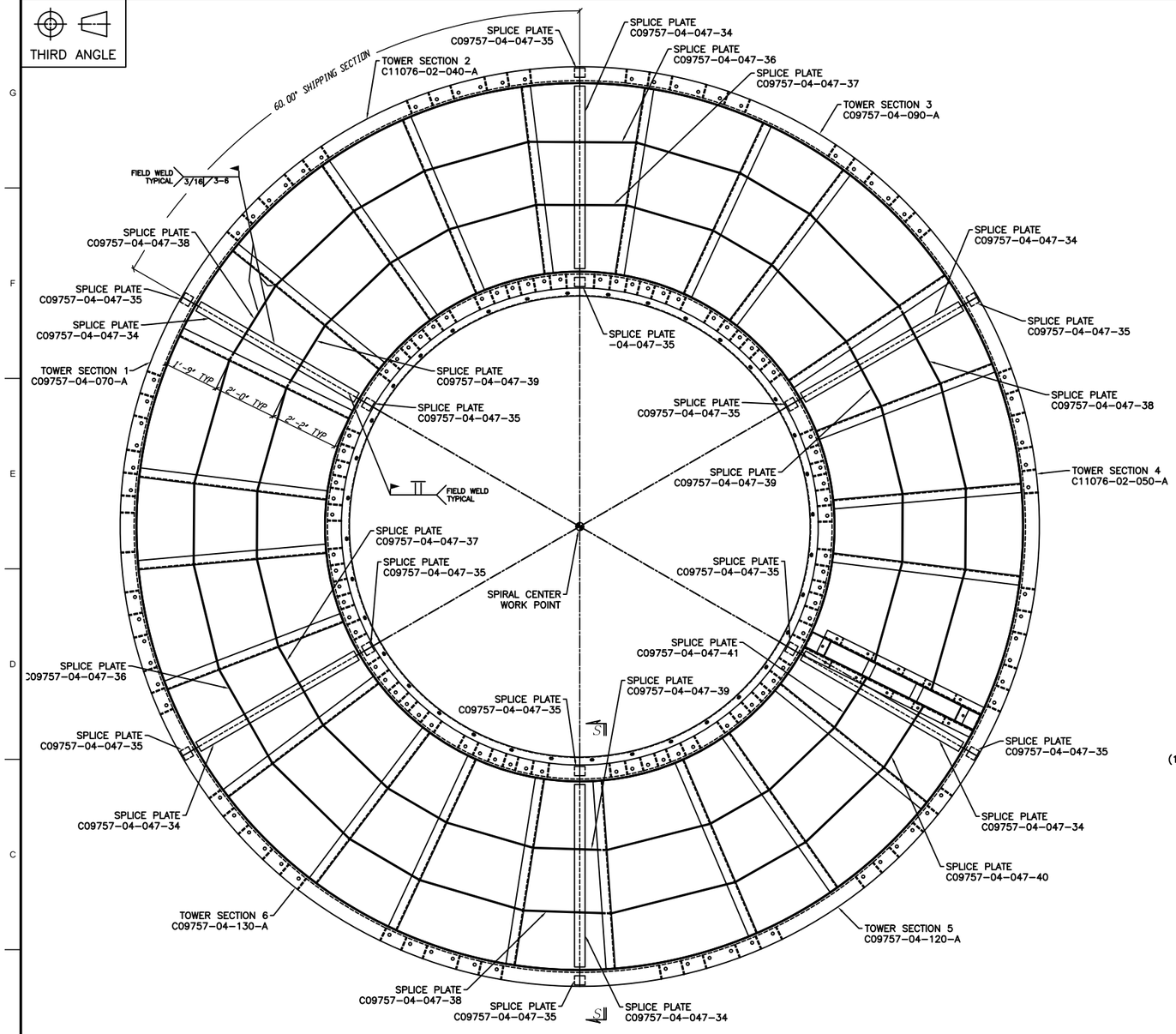
SECTION " C-C "

SCALE: 1" = 1'-0"

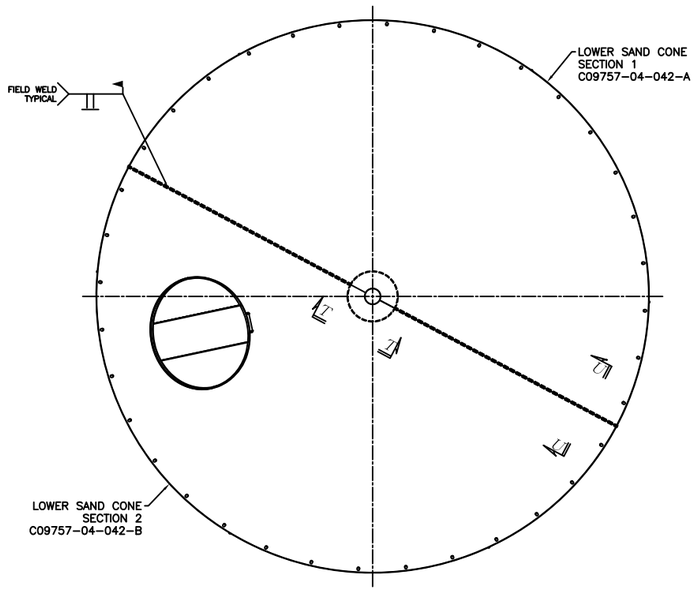
TITLE: G.A. OF WELDING FOR TOP OF SPIRAL			
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION
SAFETY HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN			
DRAWN: CHRISTOPHERSON	REFERENCE:		
CHECKED: KMC			
DATE: 2017/9/6	JOB NO.:	SUBMIT: CERTIFIED 9/14/2017	
SCALE: 1/2" = 1' DO NOT SCALE	DWG. NO.: C11076-02-020		

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

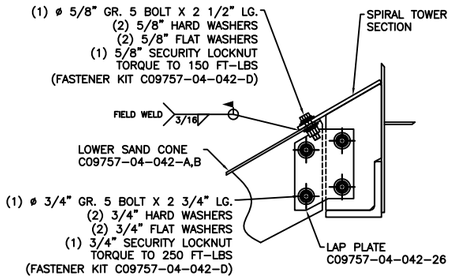
THIRD ANGLE



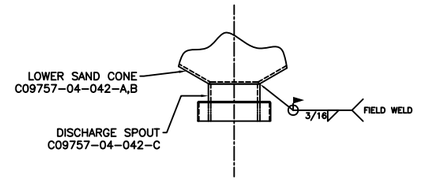
G.A. OF TOWER BOTTOM SPLICE PLATES



G.A. OF LOWER SAND CONE



LOWER SAND CONE ASSEMBLY



SECTION " T-T "

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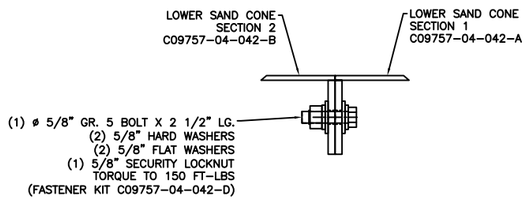
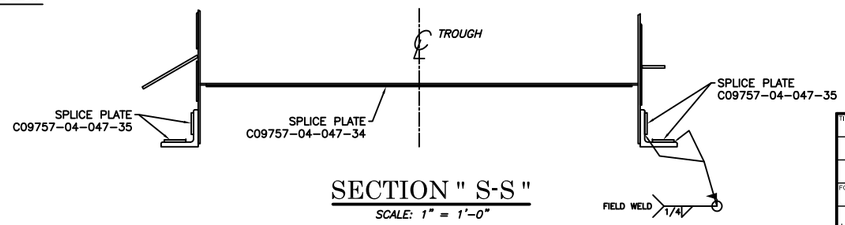


SECTION " U-U"

SCALE: 3" = 1'-0"



SECTION " S-S "

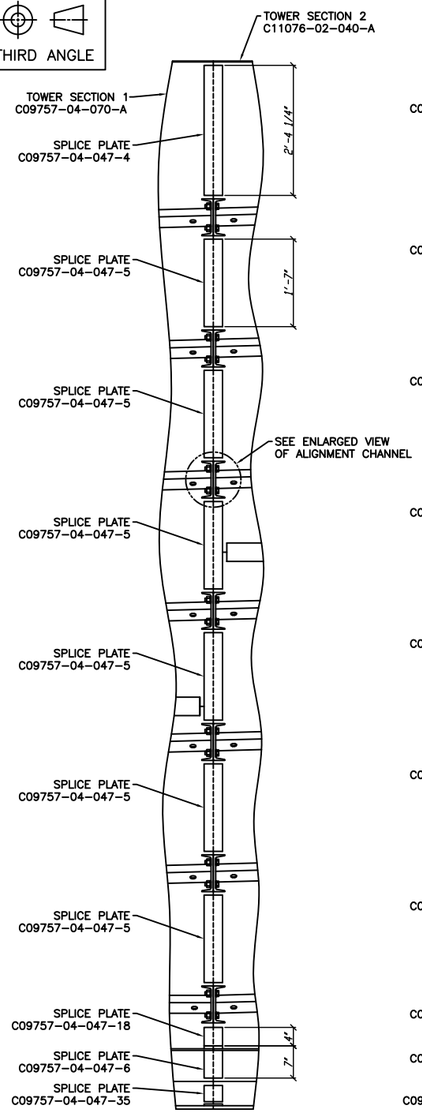
SCALE: 1" = 1'-0"

TITLE: G.A. OF TOWER BOTTOM SPLICE PLATES			
FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN	REV.	DATE	DESCRIPTION OF REVISION
SAFETY HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN			

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN	CHRISTOPHERSON	REFERENCE	
CHECKED	KMC		
DATE	2017/9/6	JOB NO.	SUBMIT CERTIFIED 9/14/2017
SCALE	1/2" = 1'	DWG. NO.	C11076-02-021
	DO NOT SCALE		

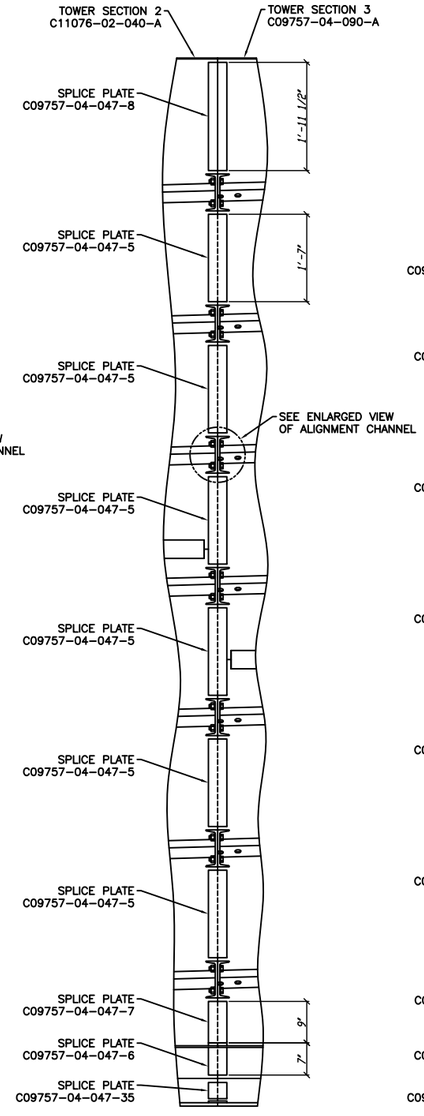
THIRD ANGLE



SECTION " E-E "

FROM DWG. -02-020

FLOW



SECTION " F-F "

FROM DWG. -02-020

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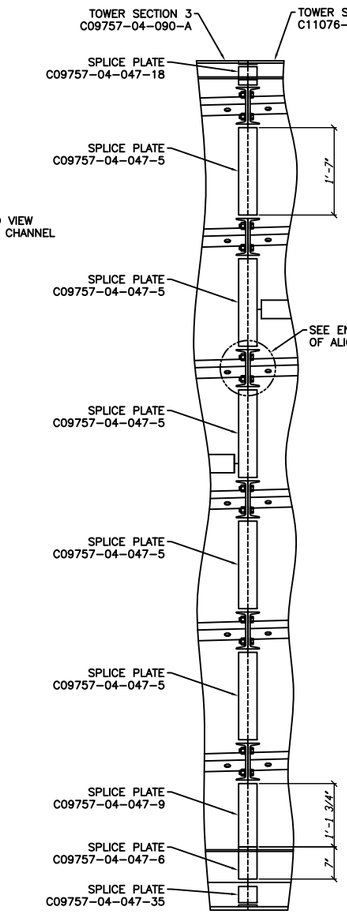

SECTION " G-G "

FROM DWG. -02-020

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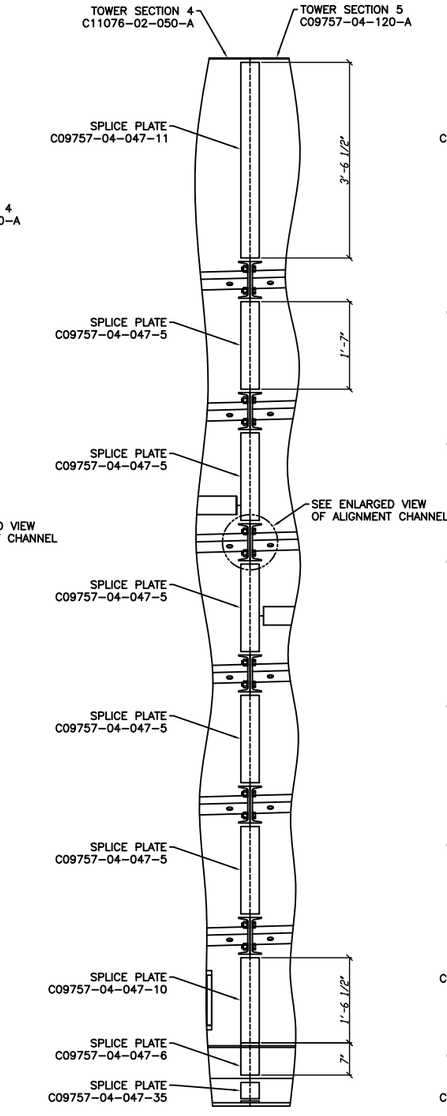

SECTION "H-H"

FROM DWG. -02-020

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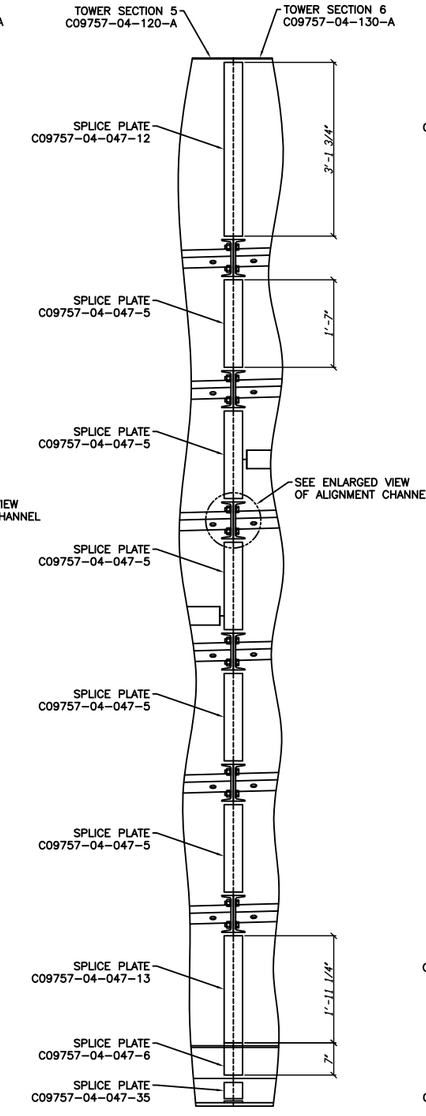

SECTION " J-J "

FROM DWG. -02-020

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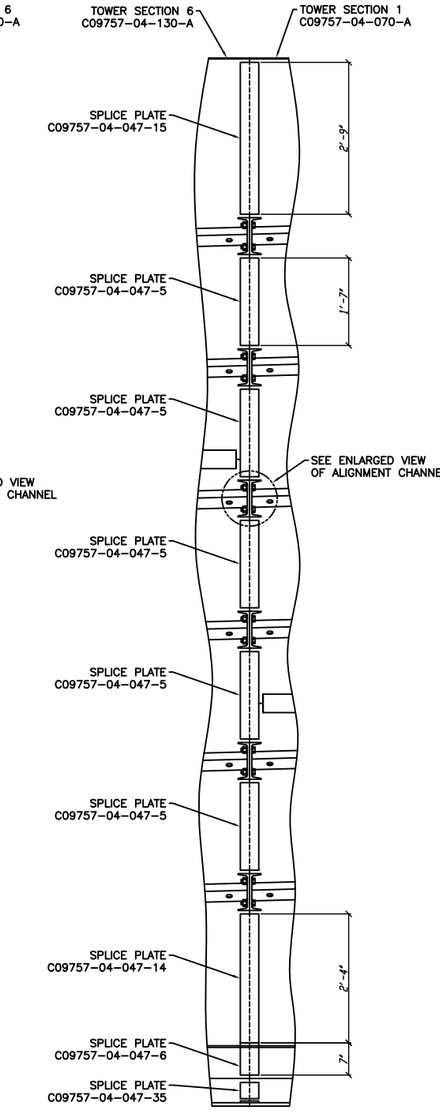
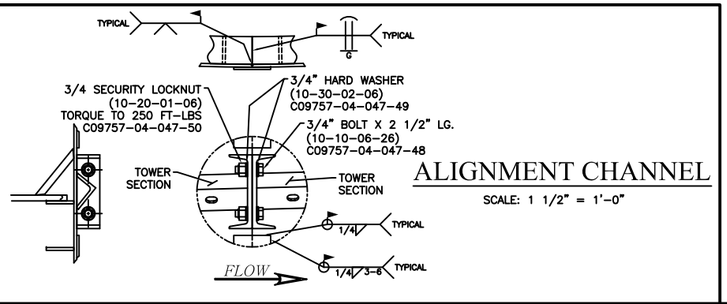


SECTION " K-K "

FROM DWG. -02-020

FLOW

G.A. OF OUTSIDE SKIN SPLICE PLATES



ALIGNMENT CHANNEL

SCALE: 1 1/2" = 1'-0"

FLOW

TITLE: G.A. OF OUTSIDE SKIN SPLICE PLATES

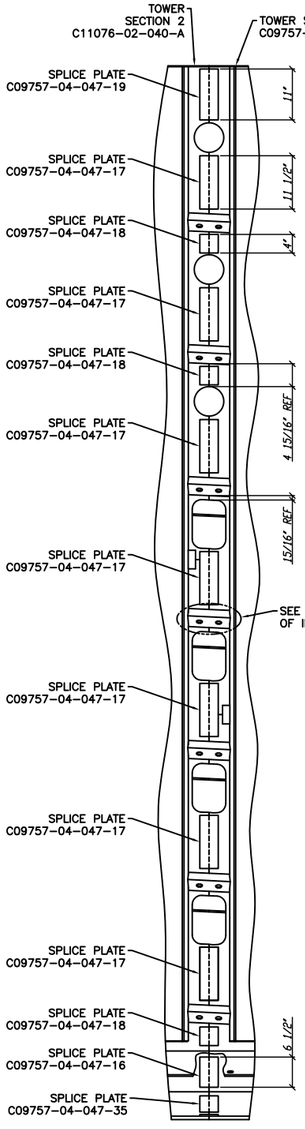
FOR: WAUPACA FOUNDRY - PLANT 6: ETOWAH, TN

REV.	DATE	DESCRIPTION OF REVISION

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

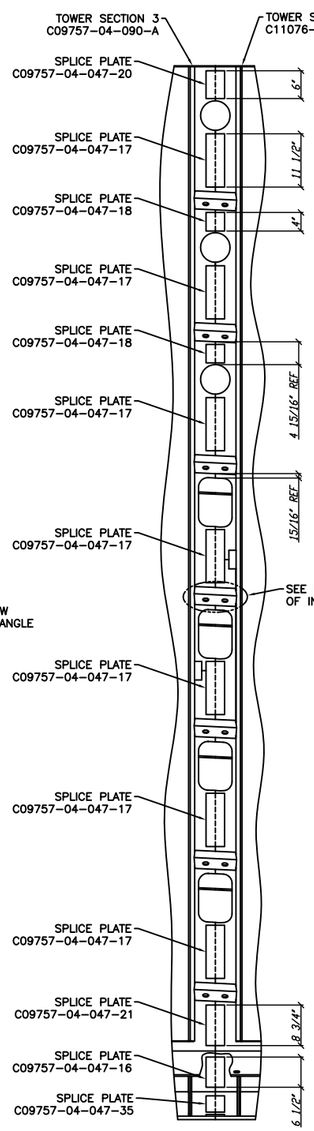
DRAWN	CHRISTOPHERSON
CHECKED	KMC
DATE	2017/9/6
SCALE	3/4" = 1'
	DO NOT SCALE
REFERENCE	
JOB NO.	
SUBMIT	CERTIFIED 9/14/2017
DWG. NO.	C11076-02-022



SECTION " L-L "

FROM DWG. -02-020

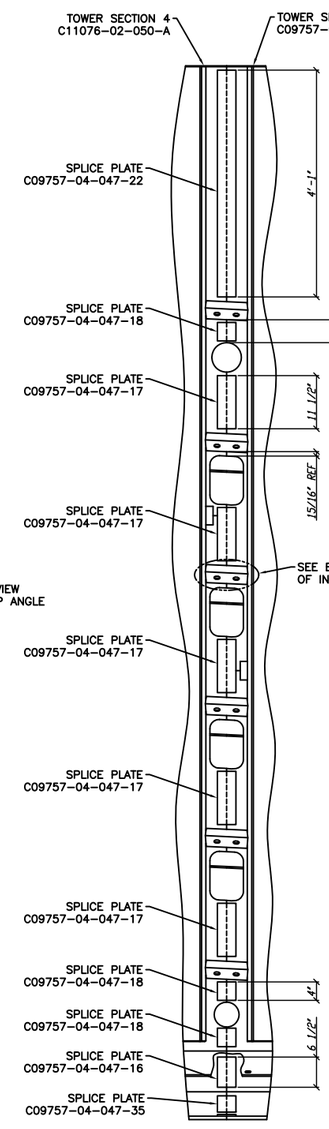
FLOW



SECTION "M-M"

FROM DWG. -02-020

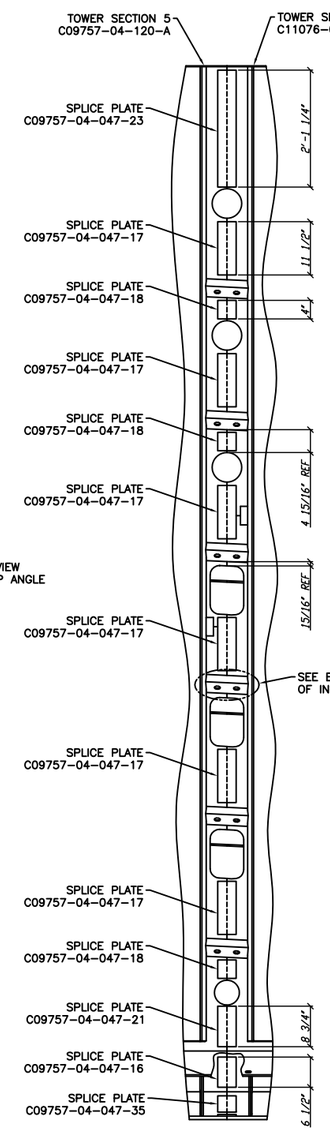
FLOW



SECTION " N-N"

FROM DWG. -02-020

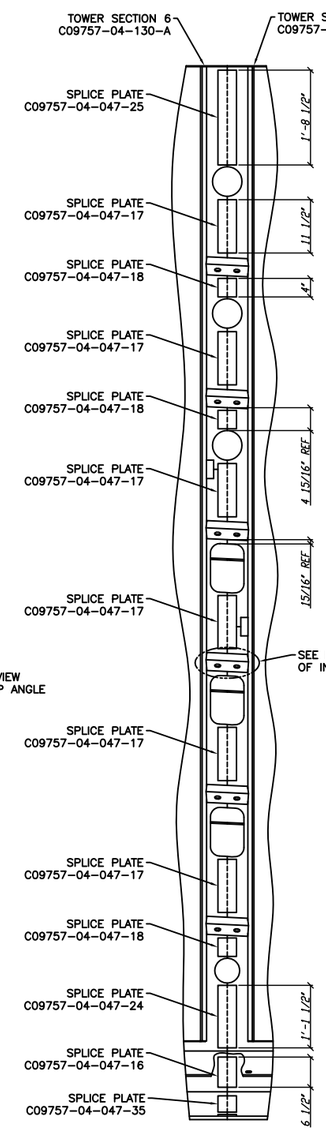
FLOW



SECTION " P-P "

FROM DWG. -02-020

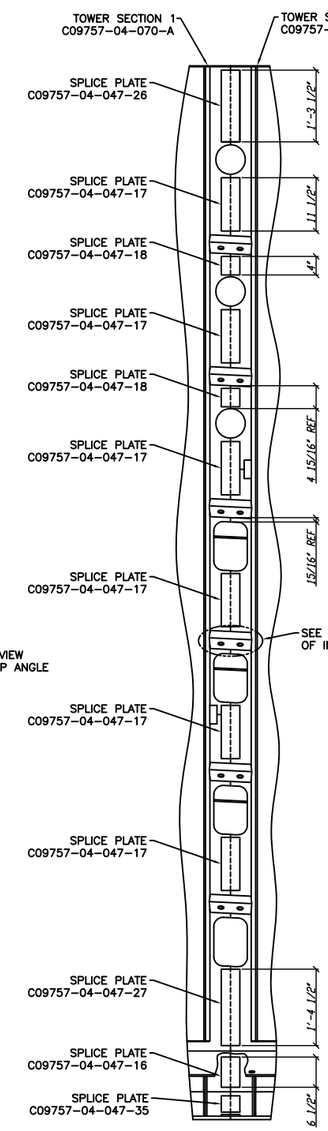
FLOW



SECTION " Q-Q"

FROM DWG. -02-020

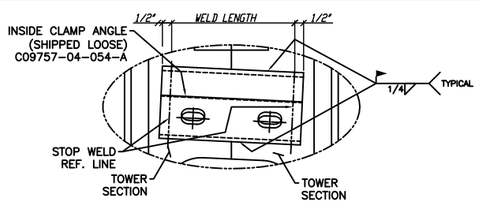
FLOW



SECTION " R-R "

FROM DWG. -02-020

FLOW



INSIDE CLAMP ANGLE

SCALE: 3" = 1'-0"

G.A. OF INSIDE SKIN SPLICE PLATES

THIRD ANGLE

TITLE: G.A. OF INSIDE SKIN SPLICE PLATES

FOR: WAUPACA FOUNDRY - PLANT 6; ETOWAH, TN

REV. | DATE | DESCRIPTION OF REVISION

SAFETY
HAS BEEN GIVEN CONSIDERATION IN THIS DESIGN

GENERAL KINEMATICS
VIBRATORY PROCESS EQUIPMENT

DRAWN: CHRISTOPHERSON | REFERENCE:
CHECKED: KMC
DATE: 2017/9/6 | JOB NO.
SCALE: 3/4" = 1' | DO NOT SCALE
SUBMITTED: CERTIFIED 9/14/2017
DWG. NO.: C11076-02-023

Assembly Drawing	Piece	Part Number	Part Description	Recommended Spare Part Qty
C11076-02-000	1	C09757-04-000-A	MOTOR ASSEMBLY WITH SPLIT COVERS	1
C11076-02-000	75	C09757-04-000-B	GREEN REACTOR SPRING GROUP	6
C11076-02-000	76	C09757-04-000-C	BLUE ISOLATION SPRING GROUP	3
C11076-02-000	77	C09757-04-000-D	SLAT LEG GROUP	2
		10-07-315-B	VIBRATION MONITOR W/ ACCEL.	1