March 18, 2024

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Subject: Letter of O&M of Record - Rev 01
NANAIMO PST 1-3 & GRIT 1-3, BC
NANAIMO, BRITISH COLUMBIA CANADA
Project Number WGZ0067000

Attn: Mr. Ian Benoit

Enclosed, please find the Brentwood Industries / Polychem Systems' Operation and Maintenance Manual of Record for the above referenced project. The O&M Manual includes the technical documentation, the Installation and Layout Drawings and is presented to you for your use. Included in this package is (1) one electronic copy of the O&M.

Should you have any questions or would like to discuss this submittal package please feel free to contact me, to set up a conference call.

Brentwood Industries thanks you for your immediate attention and looks forward to the successful completion of the project.

Regards,

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ISO-9001
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Operation & Maintenance Manual

Polychem Systems' Sludge Collection Equipment

Specification Section: Grit & Sedimentation Tanks Mechanism Purchase Specification

NANAIMO PST 1-3 & GRIT 1-3, BC

NANAIMO

CANADA

Polychem Order Number

WGZ0067000

Please communicate the Polychem Order Number listed above when contacting Polychem Systems.

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BRENTWOOD

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1.1 Introduction

This manual provides basic installation instructions for Polychem Systems rectangular clarifiers. For more information, please contact your local sales representative or the original equipment manufacturer:

Polychem Systems

500 Spring Ridge Drive

Reading, Pennsylvania 19610 USA

Telephone: (610) 374-5109

1.2 Description of Equipment and How it Functions

Polychem's drag flight conveyor is a straight-line chain and flight (scraper) sludge collection system. This collector mechanism consists of a motor and gear reduction unit transmitting torque through drive chain and sprockets to the head shaft of the collector mechanism. The collector chain and flights rotate around a series of sprockets to convey settled solids to one end of a structure (tank) and floating scum to the other end (if applicable) so that the material can be removed by a down-stream process.

The cross collector (if applicable) is similar in design to the main collector and conveys accumulated sludge from the main collector (or multiple collectors) to a sludge sump for removal by a down-stream process.

1.3 Safety Precautions

A number of safety precautions are listed in this manual. Study them carefully and follow them. Insist that those working with you do the same. Nearly all employers are now subject to federal and/or regional regulations governing safety and the prevention of work-related accidents. It is the owner's and user's responsibility to determine the suitability of a product for a particular use. Any applicable industry, trade association, federal, state and local regulations should be reviewed. Remember that an uninformed or careless operator can make the operation of any equipment dangerous.

General Safety Guidelines

1. Safety Glasses – Always wear safety glasses when working with this equipment.
2. Know your Equipment – Read all instruction manuals carefully. Learn the product's application and limitation, as well as potential hazards.
3. Guard Against Electrical Shock.
4. Guards and Guarding – Keep guards in place at all times. Remove a guard only when the equipment is de-energized, and all energy sources are disabled. Keep gates and safety chain in place and in working order.
5. Keep Work Area Clean – Wipe up and properly dispose of any oils or greases.
6. Avoid Dangerous Environments – Sewer, carbon monoxide, and chlorine gases can be lethal in unventilated areas. Refer to federal and/or regional regulations governing the safety for entering and working in Confined Spaces.
7. Unauthorized Personnel – Keep all unauthorized personnel away from the equipment.
8. Equipment Design – Do not operate or use any piece of equipment other than that for which is was designed.
9. Wear Proper Apparel – Loose clothing or jewelry should not be worn around moving parts, these items can get caught. Rubber gloves and footwear are recommended when performing maintenance on the equipment. Long hair should be contained.

10. Don't Overreach – Keep proper footing and balance at all times.
11. Maintain Equipment – Follow instructions for lubricating for the best and safest performance.
12. Power Lockout – The equipment must be de-energized, and all power must be locked out before performing any maintenance work, including lubrication and the removal of guards.
13. Remove all Tools/Wrenches – Develop a habit of checking to see that tools and service equipment are removed from machinery before energizing the equipment.
14. Hands, Feet and Head – Keep away from operating machinery. Do not reach in, on top, or underneath while any machinery is in operation. Do not attempt to remove foreign materials when the machinery is in operation.
15. Heat Strips, Portable Heaters, and Torches – These items are not to be used to thaw frozen equipment unless authorized by Polychem.
16. Handles/Levers – Keep all handles and levers free of oil, grease or ice.
17. Stay Alert – When equipment is in operation, watch what you are doing and use common sense.
18. Check for Damaged Parts – Before further operation of equipment, a guard or other parts that are damaged, should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment, binding mounting or breakage of moving parts, and any other condition that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.
19. Drugs, Alcohol, Medication – Do not operate or perform any work on equipment while under the influence of drugs, alcohol or any medication.
20. Floatation Devices – If machinery is in, on, or around a liquid filled pit, channel, or tank; precautions should be made to have flotation devices, rope, or a ladder in close proximity to this equipment.
21. Climbing – Never use machinery or its accessories to climb or stand unless machinery is so equipped with a ladder and/or work platform/bridge.
22. Ladders, Lift Platforms, Maintenance Lifts – Use only regulation conforming ladders or lifts to work on equipment.
23. Firm Footing – Never place a ladder or lift platform on unstable footing, i.e. frozen sludge or oil-soaked concrete.
24. Emergency Stops – Operators should familiarize themselves with all controls and learn to stop the equipment quickly in case of emergency.
25. Teach Safety – Teach all safety rules and operating procedures to all personnel operating or performing work on the equipment.
26. Torque Overloads – Do not change any torque overloads, mechanical or electrical, or in any way change the speed settings of drives unless authorized by Polychem.
27. Familiarity – Do not allow familiarity (gained from frequent use) to become commonplace. Always remember that a careless fraction of a second is sufficient to inflict serious injury.
28. Vents – Do not plug or cover air vents on motors, reducers and guards. Vents must be kept clean and open to keep units cool.
29. Safety Signs – Eliminate hazards wherever possible. If hazards cannot be eliminated, the workers should be informed by signs posted to alert them to the hazard.
    a. A safety sign must never replace the use of guarding.
    b. Locate safety signs and labels as near to the hazardous area as possible, where the sign is readily observed and maintained by personnel associated with the equipment.
    c. Signs and labels should be visible at all times when work is being performed and shall be removed or covered when those hazards no longer exist. Illuminate all signs that are required to be seen at night.

30. Fire and Explosion Prevention
    a. Post signs warning against smoking and open flames so that they can be easily seen in areas where fire or explosion hazards may exist.
    b. It is good practice to see that fire extinguishers or equivalent protection are located near the equipment or system. Fire extinguishers or equivalent protection should be suitable to the conditions and hazards involved (i.e. rooms containing electrical equipment must have an extinguisher rated for electrical fires).
31. Inspections – A good practice by the operator(s), before operating the equipment each day, is to make a visual inspection of the equipment and immediate area to determine that actuation will cause no hazard to personnel or damage to the equipment. The inspection should include walking the entire system to be sure it is clear of any foreign objects and the examination of at least the following: feed and discharge points, guards in place and switches operative, and any other parts of the equipment (system) exposed to personnel.
32. Safety Devices – Make inspections at regular intervals to ensure that the safety devices are in proper working condition. Do not remove, bypass, or disengage any overload or safety device from the equipment.
33. Lubrication – Do not lubricate equipment while in operation, unless the equipment is furnished with extended fittings or cups located so that they can be reached without danger to the worker.
34. Inspection Doors – Secure inspection doors against opening or removal resulting from machine vibration. Except for openings that are specifically constructed for inspection while the equipment is operating, all doors, covers, and guards must be secured in place before starting the equipment.
35. Aisles and Passageways – Keep aisles and passageways clear and in good repair with no obstructions across or in aisles. Maintain access to all work areas.
36. Special Maintenance Conditions
    a. Jammed Equipment and/or Overload
        i. Any machine which will not start, or has stopped unexpectedly, must be assumed to have stored energy and subject to sudden release.
        ii. Maintenance work and corrective measures must be approached with extreme caution to the potential danger for sudden release of stored energy.
        iii. Turn off and lock out all power sources to the stopped machine.
        iv. Wherever possible, release or neutralize the stored energy in a controlled manner.
        v. When working with tools, maintain a position such that sudden motion will not cause the tool to injure the person or force the person into contact with moving parts.
    b. Electrical Controls
        i. Do not tamper with mechanical interlocks on doors of safety switches, control panels, motor control centers, or other electrical enclosures.
        ii. Do not tamper with control interlocking of dead man controls.
        iii. Obtain Polychem's approval before changing or adding to any control or electrical system, for the components furnished.
        iv. All electrical equipment must be properly grounded.
    c. Repair of Machinery and Structures Below Water Level
        i. Lock out all power to the equipment.
        ii. Before attempting maintenance, dewater the well, tank or channel.

d. When Inspection or Repair Must be Performed Submerged by Divers:
    i. All water flow must be stopped where the divers will work.
    ii. Shut down and lock out any equipment such to eliminate water currents in the diving area.
    iii. Divers must, as a minimum, adhere to the procedures and requirements of any regulatory commission.

37. Electrical Equipment – Electrical equipment conforming to the requirements of any regulatory code or regulation should be considered for the following functions:
    a. Safety shut-off switch with power lock out provisions at the equipment.
    b. Emergency stop switches readily accessible wherever required.
    c. Signal devices to warn personnel of imminent start-up of equipment, especially if started from a remote location.
38. Noise – Take appropriate safety precautions, in accordance with any federal and/or regional regulations to avoid exposure to equipment with high noise levels.

1.4 Pre-Start Checklist

Prior to starting the collector, the following steps are recommended to prevent damage to the system:

1. Check that all hardware is installed and correctly tightened.
2. Check the location and proper alignment of all sprockets and flights.
3. Check that all collector chain pins and retaining clips are properly seated.
4. Check that there is an identical number of chain links between flights on each strand of chain.
5. Check clearance between the return shoe lugs and that they are inboard of the return rail wear strip.
6. Check the tank(s) for any items that may interfere with collector system motion (ladders, buckets, tools etc.). Remove any items if found.
7. Do not start the collector if any sludge is left in the tank. Tanks should be hose-rinsed, so that any residual sludge is removed.
8. Check that reduction units and any other lubricated equipment are properly greased, and oils are at the correct level.

1.5 Starting and Stopping the Collector

System Start

Polychem provides technical service at the time of initial start-up. A factory trained field service technician inspects all equipment before and during the initial start-up. For system start-ups after the initial, Polychem recommends that Sections 1.3, 1.4 and the following process are observed.

It is typical procedure to run collector systems dry for inspection or storage purposes. Some collectors, based on the size and loading of the system, require that the upper wear strips be lubricated and the floor wear strips be submerged at all locations along the length of the tank prior to operating the collector system to prevent nuisance trips of the over-torque protection devise.

1. Energize the collector drive unit.
2. Visually verify that the flight travel is smooth and unobstructed.
3. Visually inspect the drive and collector chains for proper chain tension.
4. Visually inspect that the sprockets exhibit smooth rotation.
5. Audibly inspect for noises. The system should run quietly.
6. Address all discrepancies upon discovery. Drain the tank if necessary.
7. The collector system should be monitored for a minimum of one (1) complete rotation.
8. Fill the tank slowly, allowing only restricted flow from influent gates/valves, until the water level is above the influent gates/valves. Once this elevation is reached then the gates/valves can be completely opened.

System Shutdown

Occasional shut down of the collector may be required during the course of normal operation. Care must be exercised to prevent sludge buildup in the event that the collector is shutdown or operation is interrupted for any length of time. Damage or torque overload may occur if the collector is started with any sludge accumulation in the tank. To shutdown the system (non-emergency) the following process should be observed.

1. Close the influent gates/valves and begin to drain the tank. Continue to run the collector until the flights are no longer submerged.
2. Hose-rinse all sprockets and shafting, continue rinsing until all residual sludge is removed from the tanks.
3. Start the system using the process outlined in this section.

Emergency Shutdown

In the event of a torque overload or in case of an emergency the collector system may be shut down by disrupting the power to the gear reduction unit(s). **Polychem's collector system requires electricity as the only utility for operation.** In either event it is necessary that the tank be drained, cleaned and inspected for damage, as outlined in this section.

1.6 Extended Shutdown of Chain and Flight Collector Mechanism

In cases where collector systems are installed and are not in continuous operation, Polychem Systems requires that these assembled components be maintained in the following manner during the warranty period:

1. The collector tank shall be dewatered.
2. The tank and collector equipment shall be cleaned, and all residual sludge shall be completely removed.
3. All metallic components shall be inspected for oxidation. If there is oxidation, it shall be removed using a hand tool and the affected parts shall be coated with a rust-inhibiting compound (Sprayon LU 777 Outdoor Metal Protectant or equal) or a petroleum-based water-resistant heavy grease. For freshwater applications a suitable Food Grade rust-inhibiting compound or heavy grease shall be used.
4. The collector system shall be rotated 180^{o} (1/2 revolution) every thirty (30) days to prevent flattening of the bearings (Brinelling) and bowing of the scraper flights.
   a. If it is not possible to rotate the entire system, the chain and flights shall be removed and stored appropriately. Please refer to section 1.7, "Receiving, Handling and Storage of Equipment" for proper requirements.
   b. If 4.a is performed, the head shaft, idler sprockets/shafts and gear motors shall be rotated 1/2 revolution every ninety (90) days to prevent flattening of the bearings (Brinelling).
5. Any snow or ice accumulation on the collector equipment and tank floor shall be removed prior to operating the collector. *Failure to remove the snow or ice may result in damage to collector components.*
6. At no time shall the collector components be allowed to become frozen in ice.
7. Heaters in gear motors, actuators and/or control panels (if included) shall remain activated and be monitored regularly if conditions should dictate.
8. Lubricants for selected temperature ranges shall be in accordance with the component manufacturer's recommendations.
9. The procedure for starting and stopping the collector mechanism shall be followed as outlined in the Polychem Systems Operation and Maintenance Manual.

Failure to comply with these requirements during the warranty period will void the equipment warranty. Polychem Systems shall not be responsible for component damage if these procedures are not followed.

Special Operational Note:

Cases may exist when the influent flow does not require that all tanks be in operation. In such cases Polychem Systems' recommends that a rotation plan be followed such that any one (1) tank is not down indefinitely, rather each tank is equally rotated into and out of service. This will allow each collector system to operate equally over the lifetime of the equipment. Polychem Systems' recommends that the rotation schedule not exceed a ninety (90) day period. During each rotation out of service the extended shutdown procedure, as previously described, should be followed to ensure the life of the equipment and minimize the potential for component damage.

Cases may also exist when a collector may be idle for a short duration due to initial installation (clean water) wet testing. The system would not need to follow extended shutdown procedures for as long as the tanks remain under clean/process water, no solids are being introduced through the influent gates and any solids in the basin have been swept to the sump and removed. If solids are being introduced during 30 days of non-operation of the equipment, then the basin should be drained and section 1.5 should be followed. If tanks are to be left in clean water for longer than 30 days, the collector system shall be rotated 180^{o} (1/2 revolution) every thirty (30) days to prevent flattening of the bearings (Brinelling) and bowing of the scraper flights. At no time shall the collector components be allowed to become covered, frozen or encased in snow or ice.

Refer to section 1.8 for Cold Weather Precautions.

1.7 Receiving, Handling and Storage of the Equipment

Receiving

It is the responsibility of the purchasing party (Installing Contractor, End User, etc.) to check quantities and conditions of all materials immediately upon receipt at the job or storage site. Particular attention is to be directed to the inspection of material finishes. All shipments must be inspected before unloading, with particular attention to the collector flights. Polychem Systems' Customer Service is to be notified of any damage as a result of shipment immediately and must be notified of any shortages within thirty (30) days after receipt of a shipment.

Handling

Extreme care must be observed when unloading the material. Polychem Systems recommends that weight appropriate equipment be used to unload and transport the system components. Additionally, follow any labeled instruction that is shown on the packaging to prevent damage. Polychem Systems cannot be responsible for damage resulting from careless handling.

Storage

Brentwood requires, upon delivery, that the equipment be stored in following manner during the warranty period:

1. All supplied components must be stored in a manner to protect their manufactured quality.
   a. Indoors (Recommended): Cool, dry environment.
   b. Outdoors: Elevated off the ground (pallets), under a heavy tarp, with adequate protection from the elements. Area shall not be subject to flooding.
2. All non-metallic components must be stored in such a way to protect them from ultra-violet (UV) radiation, i.e. sunlight.
3. All metallic components shall be inspected for oxidation. If there is any oxidation, it shall be removed using a hand tool. Metallic components shall be coated with a rust-inhibiting compound (Sprayon LU 777 Outdoor Metal Protectant or equal) or be covered in petroleum-based water-resistant heavy grease. For freshwater applications a suitable Food Grade rust-inhibiting compound or heavy grease shall be used.
4. All electrical components must be stored indoors (cool, dry environment), with adequate protection against vibration.
5. Due to special conditions and limited product shelf life, please refer to the storage instructions of the supplied adhesive anchoring system located within the product packaging.

6. It is recommended that the reduction unit output shaft be rotated 1/2 revolution every ninety (90) days to prevent flattening of the bearings (Brinelling). Extended storage shall be in accordance with the component manufacturer's requirements.
7. While in storage, quarterly inspections of all supplied equipment shall be performed to check for damage and/or oxidation.

1.8 Cold Weather Precautions

The operator must be vigilant to prevent snow and ice buildup. At no time shall the collector components be allowed to become covered, frozen or encased in snow or ice.

Ice formation or snow buildup on the water surface or tank surfaces may result in damage to the collector.

Ice formation or snow buildup on system components will result in damage to the collector.

The use of an insulated chain guard, drive enclosure or heater within the chain guard or enclosure does not guarantee the prevention of Ice formation or snow buildup on drive components or tank surfaces.

Brentwood Industries shall not be responsible for damage or performance issues caused by snow or ice formation.

1.9 System Operation

Polychem Systems sludge collector mechanisms are designed for continuous 24 hours/day, 7 days/week operation. Intermittent operation is not recommended because damage to the system could occur due to excessive sludge buildup. Intermittent operation is when a collector is stopped operationally, and solids are continuing to be added to the basin while the system is stopped. Minor stoppages to do simple checks and minor maintenance items (15 minutes or less) are not considered Intermittent operation. Greater than 15 minutes with the collector stopped or multiple successive stops with solids continued to be added is considered excessive sludge build-up. Instances where items have failed such as torque tripping, etc., should follow standard maintenance processes and section 1.5 starting and stopping the collector. Any damage to the collector system, as a result of intermittent operation or frequent stoppages, is not the responsibility of Polychem Systems and is not covered under the Warranty listed in this manual.

Objects and other debris (such as rags, wood, plastics, etc.) can hinder the operation or damage the chain, flight or sprocket mechanisms and should be removed from the flow stream prior to entering the collector mechanisms. Pre-treatment operations such as screening is recommended to prevent damage that could occur to the system due to interference or derailment caused from these type items. Any damage to the collector system, as a result of these objects or debris, is not the responsibility of Polychem Systems and is not covered under the Warranty listed in this manual.

1.10 Operation of the System in Reverse

Under no circumstances shall the collector system be run in reverse. In rare cases where stored energy must be released from the collector system it may be "Jog Reversed." A "Jog Reverse" is the momentary operation in increments of 90° (1/4 revolution) of the drive shaft. Any damage to the collector system, as a result of reverse operation, is not the responsibility of Polychem Systems and is not covered under the Warranty listed in this manual.

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Standard Installation Guidelines Section 2.

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2.3 Tank Layout

2.4 Stub Shaft Installation (Longitudinal and Cross Collectors)

2.5 Metallic Idler Shaft Installation (Grit Collectors)

2.6 Idler Sprocket Installation (Longitudinal and Cross Collectors)

Figure 2a: Typical Idler and Stub Shaft

2.7 Idler Sprocket Installation (Grit Collectors)

Figure 2b: Static Sleeve Bearing And Idler Sprocket

2.8 Head Shaft Installation (Longitudinal and Cross Collectors)

Figure 2c: Typical Tubular Head Shaft Assembly

2.9 Head Shaft Installation (Grit Collectors)

Figure 2d: Typical Longitudinal Head Shaft Assembly

2.10 Head Shaft Sprockets

2.11 Floor Wear strip

2.12 Return Rail System

Figure 2e: Typical Return Rail Mounting

2.13 Flight Assemblies

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Figure 2g: Collector Chain Assembly

Figure 2h: Catenary for a Typical 4-shaft System

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Figure 2j: Catenary for a 3-shaft System without a lower return rail

Figure 2k: Barrel wrap orientation (For Grit collectors)

2.15 Collector Drive Unit

2.16 Drive Chain and Chain Tightener

Figure 2l: Drive Chain Assembly

Figure 2m: Barrel wrap orientation (For Grit collectors)

2.17 Electrical System(s) Installation (If Applicable)

2.18 Initial System Start-Up

2.19 Field Services

2.20 Adhesive Anchorage

2.21 Installation Torque Guide

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2.1 Introduction

The installation of the collector system will require a certain amount of "fit-up" and adaptation and is considered a normal part of the installation. The following general installation instructions outline the installation of a typical four shaft longitudinal collector system. All other types of systems follow similar preparation, layout and installation procedures. This guide is offered to aid the installer but is not intended to override established construction practices in the locality where the collector system is being installed.

2.2 Pre-Installation Tank Inspection

The bay in which the equipment is to be installed must be inspected for correct dimensions and concrete finish. Polychem Systems is not responsible for the dimensional accuracy or the condition of the tank(s). It is recommended that any floor crowning or wall bulges be corrected prior to the installation of the supplied equipment.

When inspecting the bay(s) for dimensional accuracy it is required that all physical features exhibit a dimensional tolerance of ±1/4" [6] from the values shown on the Polychem supplied drawing set(s). Additionally, the bay floor must be flat across its width with a tolerance of ±1/8" [3]. Please communicate any variation in dimension or structure immediately to Polychem Systems.

2.3 Tank Layout

It is Polychem's standard practice to depict dimensions taken from the theoretical centerline of the bay (See Installation and Layout Drawings). Dimensions to the supplied equipment from the collector wall are for reference only. Establishing the bay centerline is critical to the installation and will be used as the primary datum for the installation and layout of the equipment. Below is a proven method for determining the theoretical centerline.

> *Choose a floor location at each end of the bay and measure across the tank. Divide these measurements in half and mark these two (2) points with a screw or concrete nail. Attach a string line between these two (2) points. This establishes the theoretical centerline. At each point establish a perpendicular line to the theoretical centerline. These perpendiculars will establish the reference point for the installation of the lower idler and tail shaft. Repeat this process for each collector system.*

Additional datums may include the maximum water elevation (nominal water elevation in some cases) and the influent wall. Each of these datums should be properly identified and should remain until the system has been inspected.

Explanation of Drawing Note 12 on Sheet -02

Drawing Note 12 on Sheet -02 from the Installation and Layout Drawing(s) reads:

> *Elevations shown on these drawings are for reference only. In cases where clearances are critical the dimension shall serve as a minimum requirement from the highest point across the tank width and from the furthest point longitudinally for the lower idler and the closest point longitudinally for the tail shaft.*

This note accounts for tank floor and wall variation(s). If the tank floor or wall is not perfectly level or plumb then the dimension on one (1) side of the tank may be different than the other side, or may be different along the length, axis or centerline. If this is the case, then:

1. Tank Floor – Maximum elevation along the shaft centerline.
2. Tank Wall – Closest point as measured from the perpendicular.
3. Floor Break (Low Point Elevation) – Furthest point as measured from the perpendicular.

2.4 Stub Shaft Installation (Longitudinal and Cross Collectors)

Locate the stub shaft centerline(s) for the head shaft, upper idler, lower idler and tail shaft as shown on the layout drawings. It is essential that the stub shaft axes be aligned vertically and horizontally within 1/8" [3] to each other.

Measure and mark the locations of stub shaft anchor points. Install the anchors in accordance with manufacturer's instructions, allowing sufficient time for installed anchors to cure before proceeding. Once cured the stub shafts can be placed over the anchor bolts and leveled using the three (3) leveling bolts supplied.

2.5 *Metallic Idler Shaft Installation (Grit Collectors)*

Locate the shaft centerline(s) for the lower idler and tail shaft as shown on the layout drawings. It is essential that the shaft axes be aligned vertically and horizontally within 1/8" [3] to each other.

Measure and mark the locations of the shaft mounting plate anchor points as shown on the layout drawings. Install the anchors in accordance with manufacturer's instructions, allowing sufficient time for installed anchors to cure before proceeding. Once cured the shaft mounting plate can be bolted to the wall and leveled using the supplied leveling bolts.

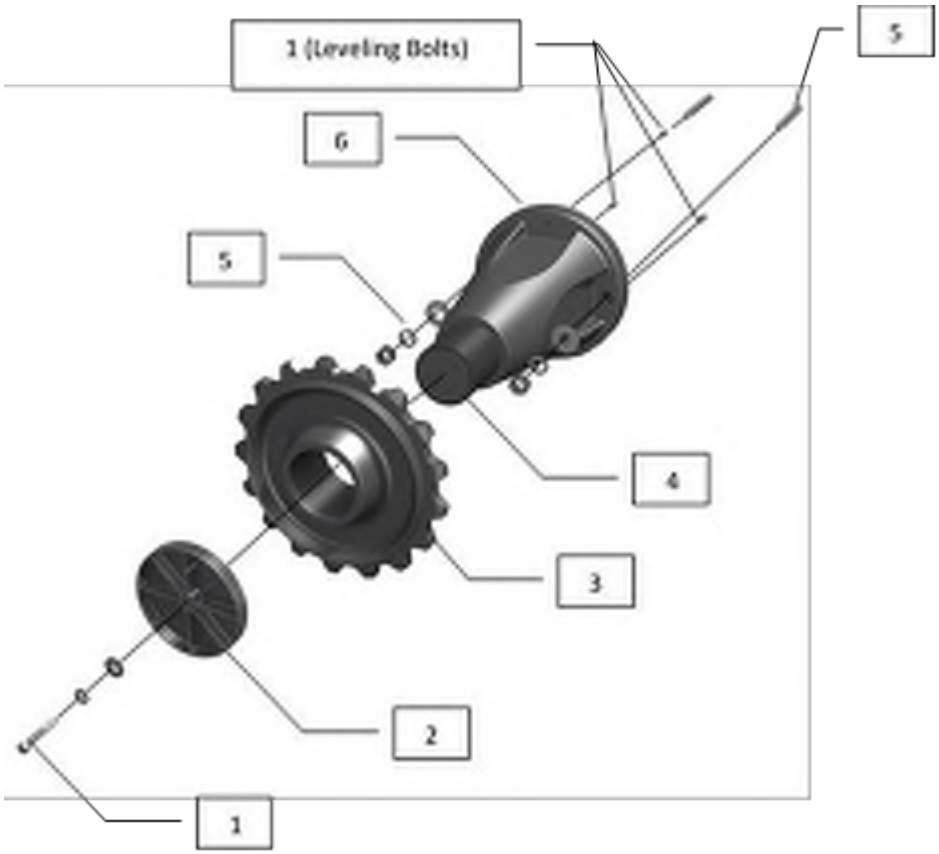
2.6 *Idler Sprocket Installation (Longitudinal and Cross Collectors)*

Locate the sprocket tooth centerline of the idler sprockets by measuring the appropriate distance from the theoretical centerline. Place the idler sprocket over the stub shaft spindle. Install the retainer plate on the stub shaft and fasten using the supplied hardware. The retainer plate has an anti-rotation dowel that must be inserted to the pre-drilled hole on the face of the stub shaft. Verify that the retainer plate does not rotate when the hardware is installed.

Rotate each sprocket by hand to verify that it moves freely. Adjust the leveling bolts on the stub shaft as necessary to ensure that each sprocket is at the correct distance from the theoretical centerline. Verify that the sprocket is level and plumb to the other sprockets on each tank wall.

1. Stub Shaft Hardware Kit
2. Polycarbonate Retainer Plate
3. Idler Sprocket
4. Factory Installed UHMW Bearing
5. Stub Shaft Anchorage Kit
6. Cast Nylon 6 Stub Shaft

Figure 2a: ***Typical Idler and Stub Shaft***



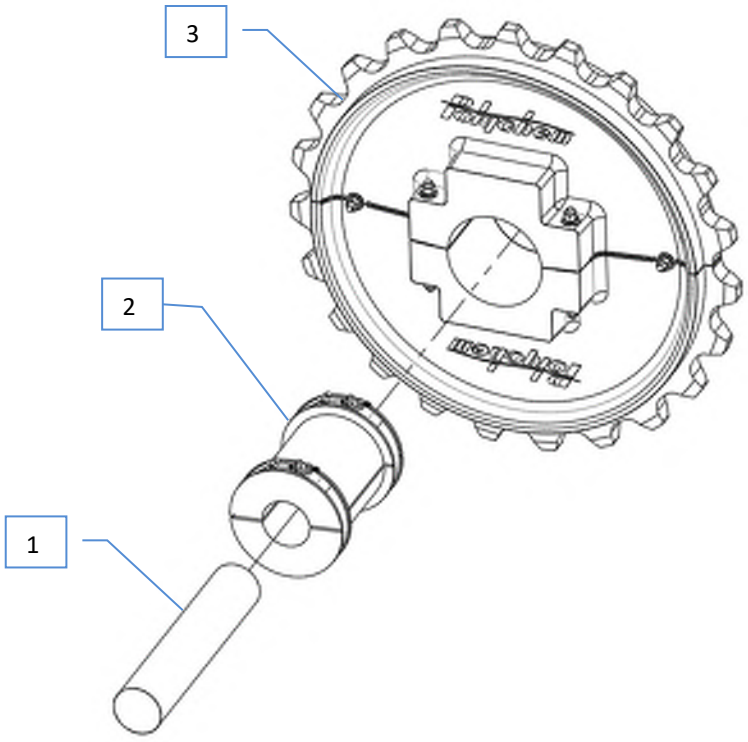
2.7 *Idler Sprocket Installation (Grit Collectors)*

Locate the sprocket tooth centerline of the idler sprockets by measuring the appropriate distance from the theoretical centerline of the bay on the concrete floor. Assemble the two-piece static sleeve bearing over the shafts and bolt together leaving the hardware somewhat loose. Then assemble the two-piece sprockets around the static sleeve bearing and bolt the halves together, leaving the hardware somewhat loose. Position the sprocket to align the sprocket tooth centerline with the collector chain centerline as shown on the Installation and Layout Drawings. Check that each of the sprockets is vertical and plumb. Tighten all the attaching hardware evenly (cross pattern) securing the two halves of the bearing and the sprocket together. Verify the correct sprocket location after the hardware is tightened. If adjustment is needed loosen the bearing hardware only and adjust as needed.

Rotate each sprocket by hand to verify that it moves freely. Ensure that axes are aligned vertically and horizontally. Make sure each sprocket is at the correct distance from the theoretical centerline. Verify that the sprocket is level and plumb to the other sprockets.

Figure 2b: ***Static Sleeve Bearing And Idler Sprocket***

1. Metallic Shaft
2. Static Sleeve Bearing
3. Plain Bore Sprocket



2.8 *Head Shaft Installation (Longitudinal and Cross Collectors)*

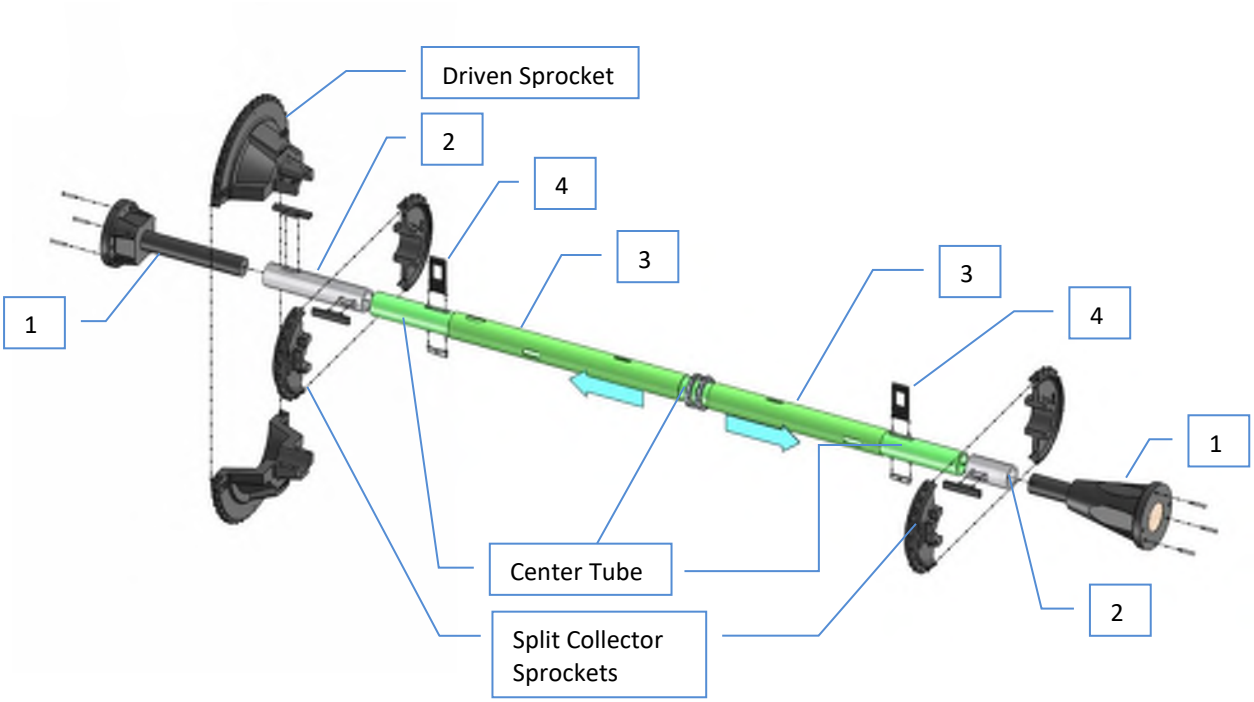
Head shaft assemblies may be of *"Telescopic Tube"* or *"Mono Tube"* design based upon system requirements. Please refer to the Installation and Layout Drawings for further information and the following installation procedure of each design type.

Telescopic Tube Head Shaft Installation

1. Install and level the wall mounted spindles in accordance with the Stub Shaft Installation section.
2. Install the tubular bearings on the stub spindles.

3. Install the two (2) end tubes over the smaller diameter center tube, hoist or lift the three (3) tube assembly and expand the tubes over the wall spindles.
4. Once expanded line up and install the rectangular interlocks into the end tubes and center tube. Ensure that the two (2) keyways that engage the split collector sprockets are in line. Install all sprocket keys flush with the head shaft tubes.
5. Adjust the head shaft tubes such that the tubular bearings contact the wall spindles and that the bearing protrudes from the head shaft tube by 1/8" [3]. Then install the two (2) split set collars snug to the ends of the end tubes.
6. Verify that head shaft is level, aligned, and rotates freely; adjust the leveling bolts if necessary.

Figure 2c: ***Typical Tubular Head Shaft Assembly***



Mono-Tube Head shaft Installation

Install the female threaded anchors in accordance with the manufacturer's instructions and allow sufficient time for installed anchors to cure before proceeding. Once cured assemble the wall mounted spindles into the mono-tube head shaft, then hoist or lift into place. Be sure that the tubular bearings are installed on the stub spindles. Install all sprocket keys flush with the head shaft tube. Adjust the spindle using the leveling bolts, such that the tubular bearings contact the wall spindles and that the bearing protrudes from the head shaft tube by 1/8" [3].

Verify that head shaft is level, aligned, and rotates freely; adjust the leveling bolts if necessary.

2.9 Head Shaft Installation (Grit Collectors)

Head shaft assemblies are of solid steel design based upon system requirements. Please refer to the Installation and Layout Drawings for further information and the following installation procedure of each design type.

Steel Head Shaft Installation

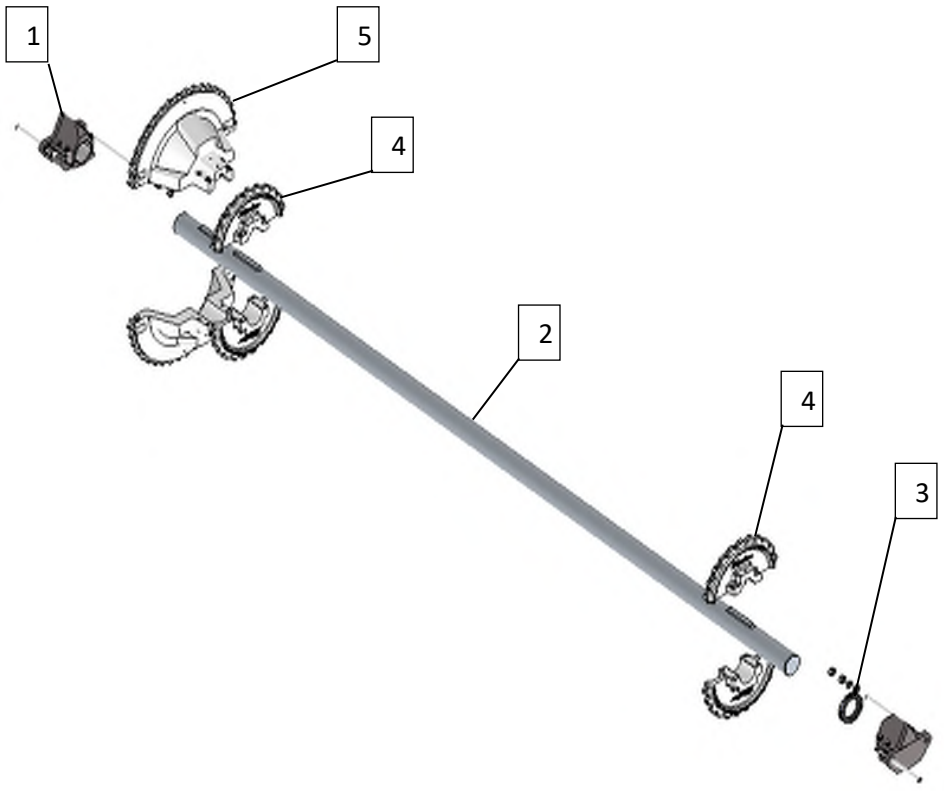
1. Measure and mark the locations of non-drive side head shaft anchor points. Install anchors in accordance with anchor manufacturer's instructions. Allow sufficient time for installed anchors to cure before proceeding. Install the head shaft support.
2. Locate the shaft centerline for the head shaft as shown on the layout drawings. It is essential that the shaft ends be aligned vertically and horizontally within 1/8" (3mm) of each other.

3. Locate the shaft centerlines on drive side of basin. Repeat the process on the opposite side of the basin. Verify that the location tolerances listed above are satisfied, adjusting both sides as required. For the non-drive side, adjust leveling anchors of head shaft support.
4. Measure and mark the locations of drive side shaft wall bearing anchor points. Install anchors in accordance with anchor manufacturer's instructions. Allow sufficient time for installed anchors to cure before proceeding.
5. Pre-Assemble set collar and cast iron wall bearings onto the appropriate side of the steel head shaft. Slide the wall bearings inward as required to facilitate installation. The keys may need to be temporarily removed. Note, the drive side wall bearing will need to clear the projected male anchor rods. Hoist shaft into location, slide bearings outward onto anchors (drive side). For the non-drive side, bolt the wall bearing to the head shaft support using the supplied hardware. Re-install keys and locate shaft laterally so the 40T driven sprocket key does not contact the wall bearing. Slide the non-drive side set collar against bearing housing and secure set collar.
6. Verify head shaft is level, aligned and rotates freely; adjust with shims if necessary and tighten down hardware. Install the split shaft collar according to Installation and Layout drawings.

Typical Steel Head Shaft Components

1. Cast Iron Bearing (actual bearing type differs from picture below, refer to component drawing section for actual bearing)
2. Head Shaft
3. Split Set Collar (drive side collar not shown below)
4. Collector Sprocket
5. Bull Sprocket (VDS style not shown)

Figure 2d: ***Typical Longitudinal Head Shaft Assembly***



2.10 Head Shaft Sprockets

Assemble the two-piece sprockets around the head shaft and bolt the halves together, leaving the hardware somewhat loose. Using a plumb line, determine the sprocket tooth centerline location from the theoretical centerline as shown on the Installation and Layout Drawings. Check that each of the sprockets is vertical and plumb. Tighten all the attaching hardware evenly (cross pattern) securing the two halves together, and then tighten the hub set screws to retain the shaft key. Be sure that the hub set screws contact the shaft key. Rotate the key in the keyway if necessary. The key does not have to protrude from the sprocket hub. Verify the correct sprocket location after the hardware is tightened.

2.11 Floor Wear strip

The proper installation of the floor wear strips is dependent upon the condition of the tank floor. The tank floor must be clean and free of any debris so that the wear strip, when installed, lies flat. Existing t-rails, if applicable, are to be flush with the tank floor. Any tank modification is by others. Polychem is not responsible if existing tee rails are in conflict with the Polychem supplied equipment.

Floor Wear Strip Installation

The UHMW wear strip is provided with one (1) round hole and three (3) slots, each counter bored for the anchoring hardware. The orientation of the wear strip is critical and should be oriented in the direction of travel. Floor wear strips are installed with the round hole closest to the tail shaft. Starting at the sump, or floor break, locate the center of the wear strip from the theoretical centerline as shown on the Installation and Layout Drawings. Using the wear strip as a guide, locate and drill 8mm holes by 45mm deep in the tank floor. The holes located in the wear strip slots should be positioned in the middle to allow for expansion and contraction. Once drilled, install the non-metallic expansion insert flush with the tank floor and fasten the wear strip. The hardware should be tightened snug then loosened 1/2 turn so that the wear strip can expand and contract. Repeat this process down the tank, leaving a gap between wear strips as outlined in the table below. End the run 6” [152] behind the tail shaft centerline. When installing the wear strip on the opposite side of the tank the wear strip splices (gaps) must not be at the same longitudinal position across the tank. Cut the starting piece of wear strip (see below) to begin the offset on the opposite side and use the remainder to end the run, if possible.

The wear strip may require field cutting to length and is considered a normal part of installation. To modify the wear strip, measure the length required, and transfer this measurement from the slotted end towards the round hole. If the measured length intersects a hole or a slot, the measurement must be retaken such that a full slot ends the wear strip piece and there is approximately 1” [25] of material past the slot. Cut the wear strip to length using standard tools. To add the round hole, drill a counter bore 1/8” [3] less the thickness of the wear strip using a 1 1/8” [30] Forstner or spade bit approximately 1 3/8” [35] from the cut end. Then drill a 9/16” [14] round hole.

> *Note: If the wear strip is 0.375” [10] thick the counter bore should be approximately 0.25” [6] deep. Specific dimensions can be obtained from the wear strip component drawing located under the Component Drawing Section of this manual.*

Polychem provides the required amount of wear strip and it is the responsibility of the installing party to properly install and/or modify the wear strip in such a manner to minimize waste.

Installation Gap by Temperature Range

Average Temperature	Wear Strip Installation Gap
Less than 30°F [-1°C]	3/4” [19mm]
31°F – 84°F [0°C-28°C]	1/2” [12mm]
> 85°F [29°C]	1/4” [6mm]

- The average temperature is to be determined in the morning and afternoon.

Floor Wear Strip Installation – Alternate Method

Cases exist where the wear strip is to be mounted to steel tee rails or other steel structures. In these cases, the wear strip is welded to the structure using the supplied conical washer. Please refer to the Installation and Layout Drawings and the installation procedure below, should this alternate method be required.

Locate the wear strip as previously described. Apply a spot weld to the conical washer, with the washer flush against the host metal. Water should be used to prevent the heat buildup from damaging the wear strip. The installed wear strip should have a limited amount of free movement. Damage to the wear strip or improper installation is the not the responsibility of Polychem Systems.

2.12 Return Rail System

This instruction outlines a collector system with an upper return rail and a lower return rail. Some systems may only require one or none at all. Please refer to the Installation and Layout Drawings for further details.

Upper Wall Bracket Anchoring

Locate and mark the wall bracket vertical centerline(s) starting at the upper idler and working towards the head shaft. Locate and mark the wall bracket anchor elevations at each bracket centerline. Install the anchors as shown in the schedule, making sure the anchors are installed level and square.

Lower Wall Bracket Anchoring

Locate and mark the wall bracket vertical centerline(s) starting at the tail shaft and working towards the head shaft. Locate and mark the wall bracket anchor locations at each bracket centerline. Install the anchors as shown in the anchor schedule, located in the Installation and Layout Drawings, making sure the anchors are installed level and square.

Wall Bracket Installation

Once the anchors have cured, install the wall brackets onto the anchors making sure to place one (1) nut and one (1) flat washer on the back side (towards the tank wall) of the bracket, and a flat washer, lock washer and nut on the face of the wall bracket. Using the installed hardware adjust the wall bracket towards or away from the tank centerline in accordance with the Installation and Layout Drawings. Once positioned, level the wall bracket and tighten all hardware.

- Re-locating brackets +/- 1” horizontally is acceptable to avoid rebar. The Length of the supplied rails and anchor edge distances should be reviewed by the installer for each location in question, to determine the optimal direction for the shift.
- If vertical adjustment of the brackets is required to avoid rebar, it is acceptable for the contractor to use a 1” thick rigid spacer between the bracket and the splice shoe to “lower” the wall bracket and maintain the top of wear strip elevation. It is also acceptable to lower the entire return rails 1”. A lowering of the upper return rails typically needs to be approved by all parties (plant, Engineer, etc.) due to a potential effect on process, as the flight freeboard to maximum water elevation would be reduced from the nominal 2” previously approved. Spacer material and longer hardware would be supplied by others.

Return Rail Installation

Once the wall brackets are properly installed, attach the splicing support bridge, also referred to as a “run shoe,” using the supplied screw and washer. Verify each run shoe is level and in line to each other.

Install the return rail over the run shoe starting at the upper idler for the upper return rail or at the tail-shaft for the lower return rail. Verify the proper spacing between the start of the return rail and the centerline of the shaft. If necessary, field cut the return rail such that all rail splices are located at a wall bracket and verify that there is a 1/4” [6] gap between return rail splices. Drill 13/32” [11] holes through the rail, using the holes in the run shoe as a guide. Fasten the return rail to the run shoe using the supplied hardware.

Polychem provides the required amount of return rail and it is the responsibility of the installing party to properly modify the return rail in such a manner to minimize waste.

Return Rail Wear Strip Installation

The UHMW wear strip is provided with one (1) round hole and three (3) slots, each counter bored for the anchoring hardware. The orientation of the wear strip is critical and should be oriented in the direction of travel. Return wear strips are installed with the round hole closest to the head shaft. Begin installing the wear strip at the end nearest the tail shaft. Locate the edge of the wear strip from the theoretical centerline as shown on the Installation and Layout Drawings. Confirm wear strips are in line and overhang the return rail. Using the wear strip as a guide locate and drill 3/8” [10] holes in the return rail. The holes located in the wear strip slots should be positioned in the middle to allow for expansion and contraction. Once drilled, fasten the wear strip using the supplied hardware. The hardware should be tightened snug then loosened 1/2 a turn so that the wear strip can expand and contract. Repeat this process down the return rail run, leaving a gap as outlined in the gap by temperature range table in section 2.8. When installing the wear strip on the opposite side of the tank the wear strip splices (gaps) must not be at the same longitudinal position across the tank. Cut the starting piece of wear strip to begin the offset on the opposite side and use the remainder to end the run, if possible.

Note: The wear strip should overlap the return rail splices. Should a wear strip splice fall on a return rail splice the wear strip must be modified to offset the splices by approximately 12" [305]. Should the wear strip mounting hole/slot fall on a return rail splice the wear strip must be modified to offset the hole/slot by approximately 6" [152].

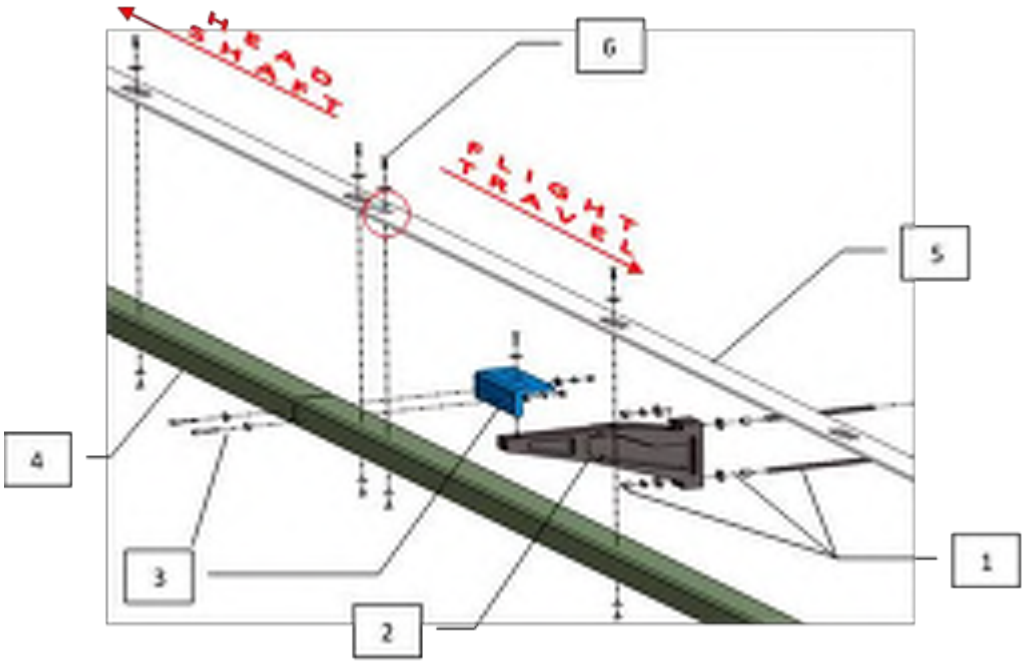
The wear strip may require field cutting to length and is considered a normal part of installation. To modify the wear strip, measure the length required, and transfer this measurement from the slotted end towards the round hole. If the measured length intersects a hole or a slot, the measurement must be retaken such that a full slot ends the wear strip piece and there is approximately 1" [25] of material past the slot. Cut the wear strip to length using standard tools. To add the round hole, drill a counter bore 1/8" [3] less the thickness of the wear strip using a 1 1/8" [30] Forstner or spade bit approximately 1 3/8" [35] from the cut end. Then drill a 9/16" [14] round hole.

Note: If the wear strip is 0.375" [10] thick the counter bore should be approximately 0.25" [6] deep. Specific dimensions can be obtained from the wear strip component drawing located under the Component Drawing Section of this manual.

Polychem provides the required amount of wear strip and it is the responsibility of the installing party to properly install and/or modify the wear strip in such a manner to minimize waste.

Figure 2e: ***Typical Return Rail Mounting***
Listed in order of Installation

1. Wall Bracket Anchorage Kit
2. Cast Nylon Wall Bracket
3. Wall Bracket Hardware Kit
4. Return Rail (Angle Return Rail Shown. C-Channel Similar)
5. Wear Strip
6. Return Rail Hardware Kit



2.13 *Flight Assemblies*

It is recommended that the installer fabricate a simple assembly fixture which will ensure the dimensional accuracy and the repeatability of the installed flight accessories.

The centerline distance between the flight attachment links are critical. This dimensional value is shown on the Installation and Layout Drawings and must be within ±1/16” [2].

The distance between the lug features of the wear shoes is also critical. This dimensional value is 1” [25] less than the distance between the inner edges of the wear strip, which is listed or can be derived from other values shown on the Installation and Layout Drawings.

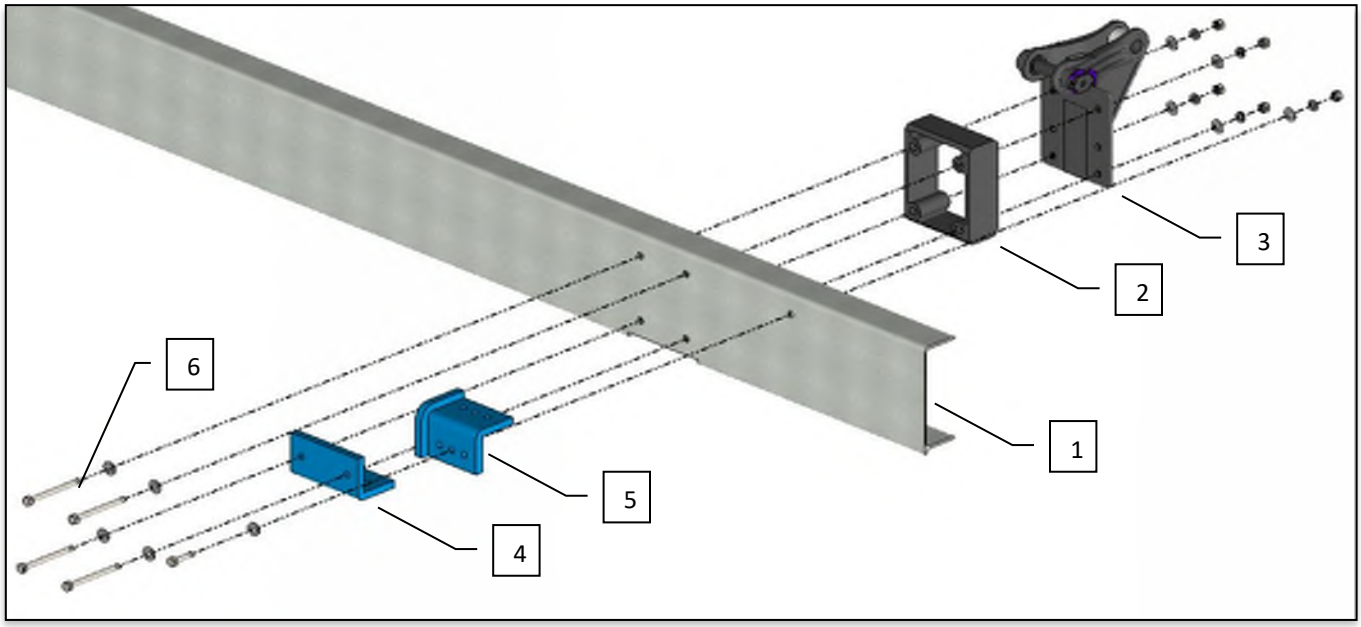
Each flight assembly may consist of, but not limited to, the following items:

1. Fiberglass Flight Channel
2. Non-Metallic Filler Blocks
3. Collector Chain Attachment Links
4. Carrying Wear Shoes
5. Return Wear Shoes (Lugged for Flight Alignment)
6. Hardware Kit(s) or Set(s)

Please refer to the exploded flight assembly in this section for applicable assembly details.

It is important that flight hardware is not over-tightened. Apply enough torque to the fastener so that the split lock washer is collapsed to a flattened state and add one-half turn. Excess torque may cause damage to the flight assembly. Polychem Systems is not liable for such damages.

Figure 2f: ***C-Channel Flight***



2.14 Collector Chain

Collector Chain Assembly

Assemble the collector chain using the steps illustrated within this section. Special tools are not required for the assembly or disassembly of the collector chain.

1. Insert the chain barrel into the chain yoke.
2. Insert the chain pin into the assembled links.
3. Rotate the pin 90° (1/4 Revolution) and withdrawal the pin until the pin fully seats and locks into the chain barrel.
4. Install the retaining clip onto the chain pin such that the grip is facing the chain barrel, opposite the direction of travel, so that the clip is flat against the chain barrel.

The collector chain is shipped with the retaining clips alternating on each link, maintain this configuration if possible. Chain disassembly is achieved by following the above steps in reverse.

Figure 2g: ***Collector Chain Assembly***



Collector Chain Installation

Place approximately 60% of the required flight assemblies onto the return rails, with the return shoes lying on the wear strips. Confirm that the flights are oriented such that the flight face (web) is orientated toward the tail shaft. Install the chain strands between the flight assemblies as they lie on the return rail.

Position the remainder of the flights on the basin floor with the scraper lip oriented toward the floor. Confirm that the flights are oriented such that the flight face (web) is orientated toward the head shaft. Install the chain strands between the flight assemblies as they lie on the tank floor.

Simultaneously feed the collector chain and flight assemblies over the collector sprockets in the direction of travel, for attachment to the collector chain and flight assemblies on the tank floor.

Collector Chain Installation – Closing the Chain Loop(s)

Loop a nylon sling or braided strap through the chain link barrel, a couple of links from the end of the chain strand(s). Connect the other end of the appropriate sling or strap to a spring scale and a ratcheting type pulling device (come-along) or a manually operated chain hoist.

Simultaneously draw the loose ends of the collector chain together, until they can be joined. Under no circumstances shall the collector chain tension exceed 350 lbf [1560 N].

Check that there is an identical number of chain links between flights on each strand of chain and confirm that the flight attachment links are aligned over the collector sprockets on the head shaft. Then slowly release the pulling device.

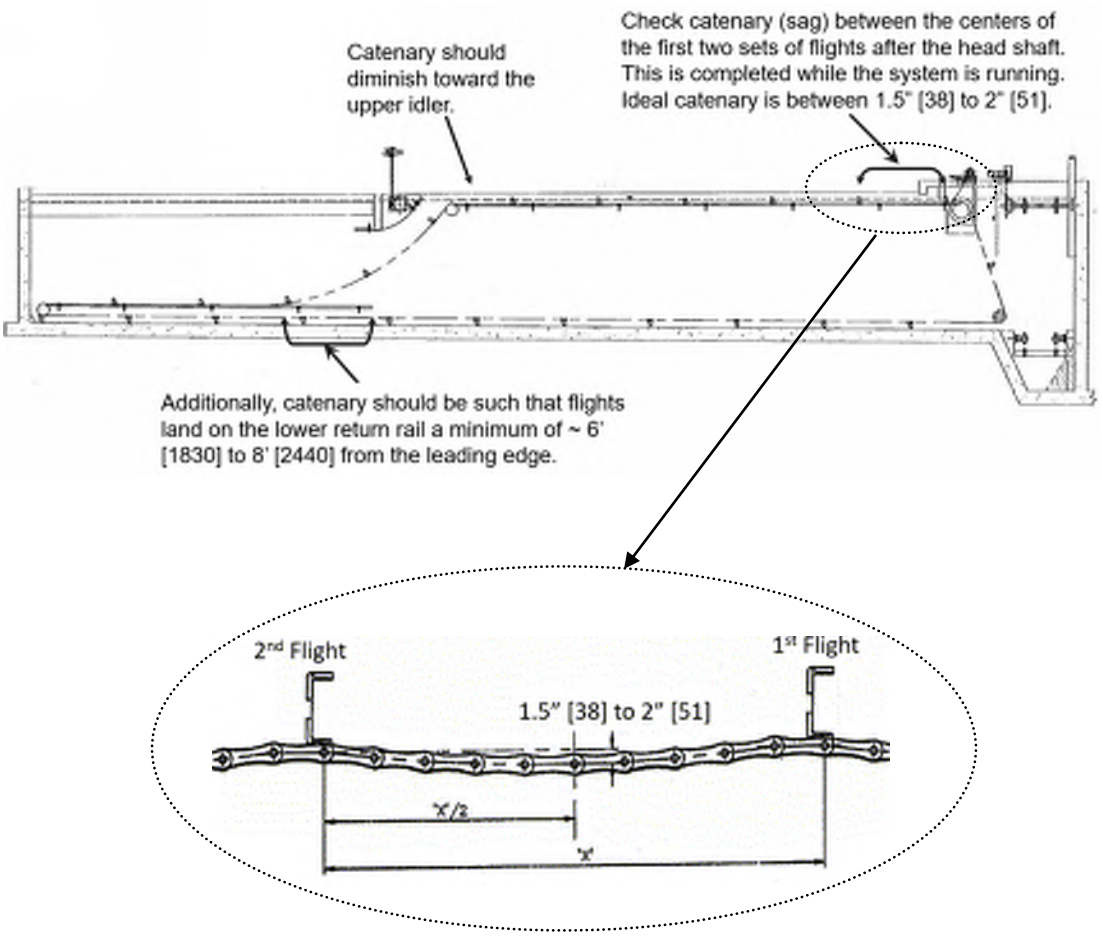
Breaking the chain is done in a similar fashion except that the straps or slings should span across the break point and should incorporate any links that may need to be removed.

Collector Chain Installation – Chain Catenary

During normal operation the system will exhibit catenary or chain sag between the collector flights as well as between the upper idler (or head shaft in 3-shaft systems) and the tail shaft. Catenary is critical to the proper operation and the life of the system. Polychem provides technical service at the time of initial start-up who will setup and inspect the chain catenary for each system. It is likely that the chain tension will have to be adjusted during the initial start-up. For field adjustment of the system catenary the following describes the typical catenary that should be maintained.

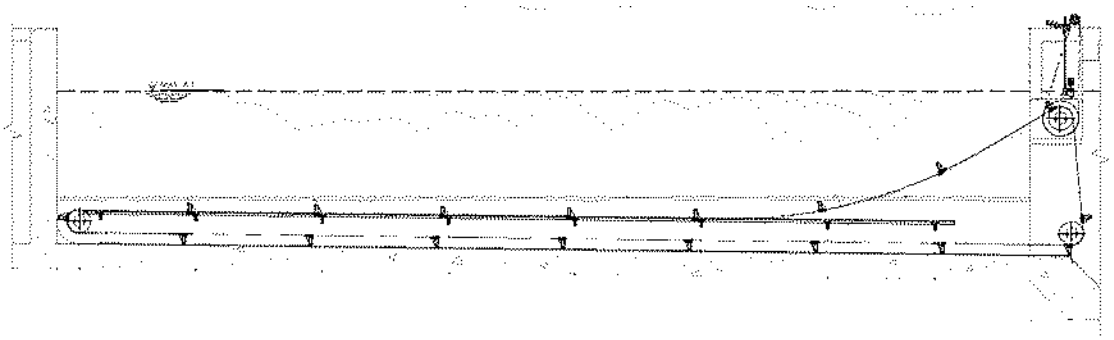
A typical 4-shaft system should have approximately 1 1/2" [38] to 2" [51] of catenary as observed between the first two (2) flights adjacent to the head shaft on the return rail. This catenary value assumes that the flights are spaced at 10' [3048]. Shorter flight spacing would require a smaller catenary value. The observable catenary should begin to disappear over the next few adjacent collector chain strands between flight assemblies. The observable collector chain catenary between flight assemblies on the tank floor should be practically nonexistent. . Additionally, the catenary should be such that the chain comes off the tail shaft at an approximate 60° angle and should allow the collector flights to contact the lower return rail (if applicable). If a lower return rail is not applicable, follow Figure 2j.

Figure 2h: ***Catenary for a Typical 4-shaft System***



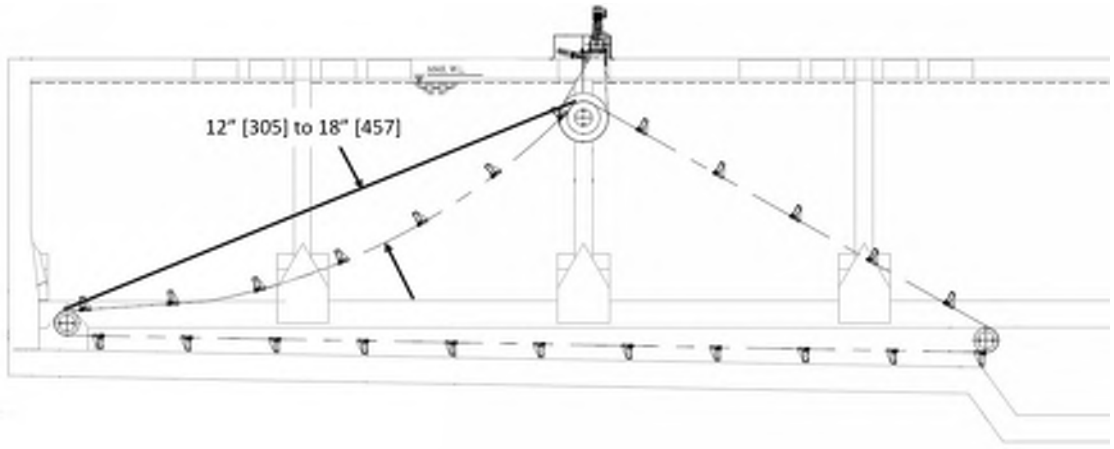
A typical 3-shaft system should have enough catenary such that the chain comes off the head shaft at an approximate 60° angle. The collector flights should contact the lower return rail. Catenary on the return rail and on the tank, floor should be practically nonexistent.

Figure 2i: ***Catenary for a 3-shaft System with a lower return rail***



If the system design does not require a lower return rail, catenary should allow a chain sag of 12" [305] to 18" [457] when looking at a straight line between the head shaft sprocket and the tail shaft sprocket.

Figure 2j: ***Catenary for a 3-shaft System without a lower return rail***

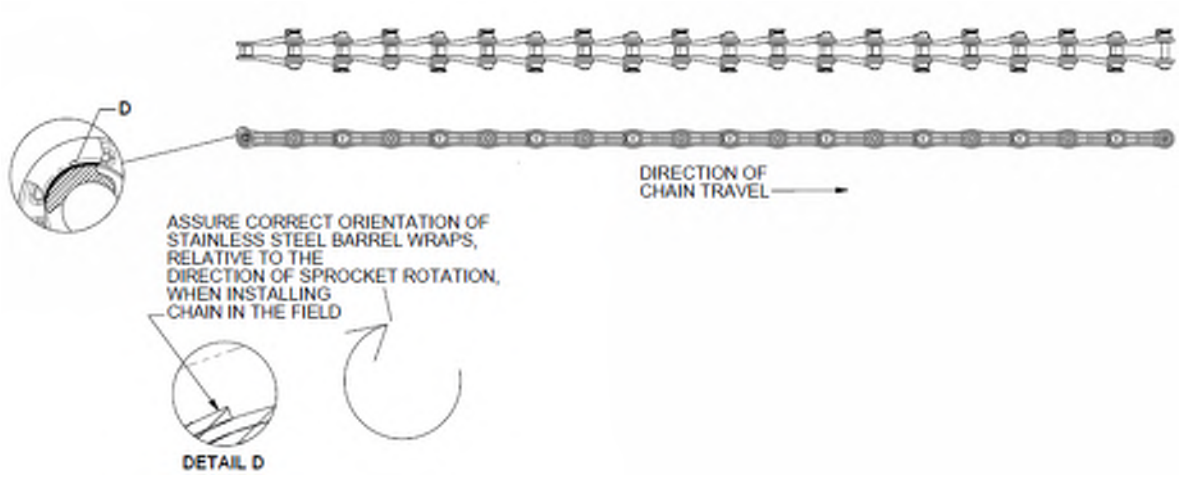


The above dimensions and angles are approximate. Catenary is dependent on tank size, equipment types and configuration, service, etc. and may vary.

Flight Spacing

The flight spacing should follow the spacing outlined in the project I&L drawings. Also refer to the project specifications to determine any maximum flight spacing requirements. When adjusting chain tension by removing chain links, it is recommended to maintain similar flight spacing between all flights throughout the chain strand when possible. If a change of two (or more) links is required, the links should be removed between different flights (i.e. one link between flight 1 & flight 2 and the second link between flight 2 & flight 3.) The number of links between each flight must be the same on each chain strand side (driven side and non-drive side). For systems that have Flight Misalignment Monitoring, maintaining a difference of only one link variation between flight groups is required for the system to operate properly.

Figure 2k: ***Barrel wrap orientation (For Grit collectors)***



2.15 Collector Drive Unit

Install the anchors, mounting plate and the reduction unit in accordance with the Installation and Layout Drawings and any applicable manufacturers' installation procedures.

Drive Sprockets:

There are several configurations of drive sprocket assemblies:

- Shear Pin Hub Assembly with Trip Pin

The most common is the shear pin hub assembly with trip pin. However, the basic installation process is similar in all instances. Confirm that the reducer output shaft is in good condition, remove any rust or scale that may have developed. Coat the reducer output shaft with an anti-seize compound prior to installing the supplied equipment. This will ease the installation process and will help protect the shaft from galling or oxidation. Install the drive sprocket assembly onto the drive unit output shaft oriented as indicated on the Installation and Layout Drawings. Use a plumb bob to aid in adjusting the assembly's position on the shaft so that the sprocket tooth centerline is in alignment with the tooth centerline of the driven sprocket located below on the head shaft. Tighten the set screw(s) to properly seat the assembly to the shaft.

2.16 Drive Chain and Chain Tightener

Direction of Travel

The system drive chain travels so that the chain barrel or narrow end leads the chain yoke or wide end.

Drive Chain Assembly

Assemble the drive chain using the following steps illustrated within this section. Standard tools are required for the assembly or disassembly of the drive chain.

1. Insert the non-metallic bearing inside the chain barrel.
2. Insert the chain barrel into the chain yoke.
3. Insert the chain pin with the non-knurled (smooth) side first.
4. Using a c-clamp fully seat the chain pin flush with the chain sidebar.

Chain disassembly is achieved by following the above steps in reverse. Use a hammer, drift pin and backing surface to remove the knurled pin, driving from the side opposite the knurl.

Figure 2l: ***Drive Chain Assembly***

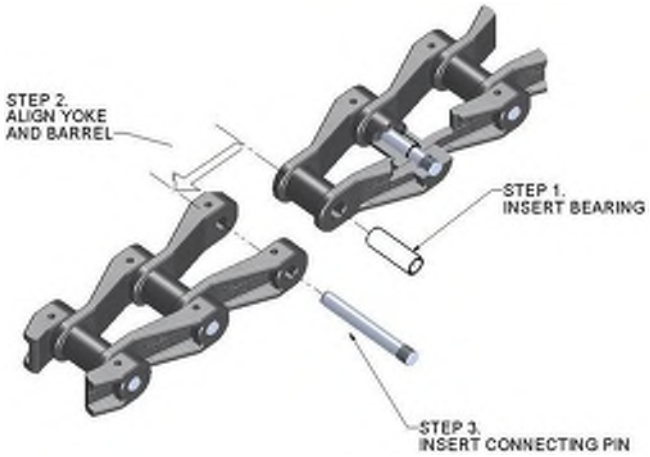
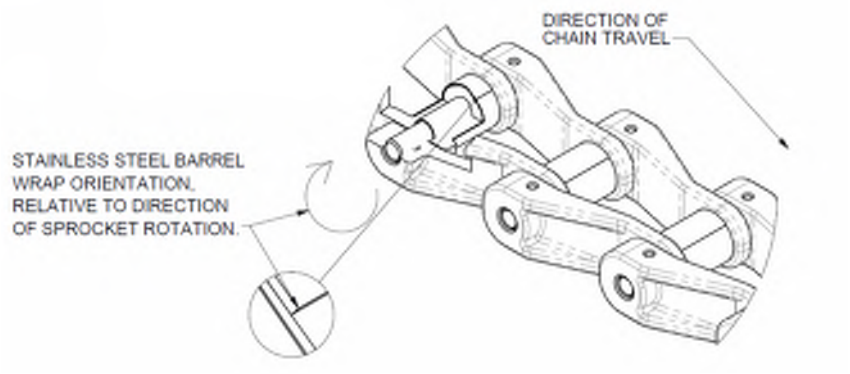


Figure 2m: ***Barrel wrap orientation (For Grit collectors)***



Drive Chain Installation

Assemble the drive chain around the drive and driven sprockets using only enough links to complete the strand. Orient and install the drive chain in accordance with this section. The drive chain is shipped in 10' [3048] sections and it is typical that individual chain strands must be joined together or shortened in order to construct the drive chain assembly.

Drive Chain Tightener Installation - 7 Tooth Adjustable Bracket Assembly

Install the 7-tooth tightener sprocket onto the adjustable bracket assembly. The sprocket is held to the bracket assembly via a stainless steel staking pin. Install this staking pin such that equal amounts of the pin protrude from each side of the sprocket shaft. Locate the chain tightener mounting support in accordance with the Installation and Layout Drawings making sure the sprocket centerline is plumb with the drive and driven sprockets. Field adjustment to the location of the tightener assembly may be required and should be communicated to Polychem Systems if such modifications are necessary.

Once installed adjust the bracket and sprocket assembly such that the excess chain (slack) is removed from the drive chain strand. Tighten the assembly to the support using the supplied hardware. Do not apply any load to the drive chain, as it is not required and doing so may cause premature wear to the drive chain.

Polychem provides technical service at the time of initial start-up who will inspect the drive chain tension for each system.

2.17 Electrical System(s) Installation (If Applicable)

Collector Drive Unit

Install the collector drive unit as outlined within this section and the Installation and Layout drawings. Then wire the electric motor in accordance with the manufacturers' instructions and standard practice.

2.18 Initial System Start-Up

Start Up

Before proceeding, please review the Safety Precautions, Pre-Start Checklist, and the Starting and Stopping of the Collector System sections. Start the collector only after the entire system has been thoroughly inspected and all findings have been corrected. Once started the collector system should run smoothly and quietly. If there is any noise, determine the problem and remedy the situation before continuing with the initial start inspection. Allow the collector to run satisfactorily for a minimum of one (1) full revolution. It is recommended that the initial system start-up is performed in the presence of a factory-certified field service technician.

Initial Adjustment of the Chain Tension

Chain links can be added or removed in order to optimize the chain tension. It is recommended that the installer obtain the services of a factory-certified field service technician during the installation. Only the manufacturer's factory-certified field service technician is qualified to determine the ideal collector chain catenary for the specific collector system.

Grout Installation

Grout can be installed behind the driven sprocket after the head shaft has been checked for dimensional accuracy by the installer. The rest of the Polychem equipment may be grouted only after the system has been inspected and certified by a factory-certified field service technician. Grout is to be non-shrink, non-metallic, non-corrosive with a compression strength no less than 3000psi. It can be either cementitious grout or epoxy grout.

2.19 Field Services

General information

Factory-certified Field Service Technicians are available to assist contractors, installers and end-users/owners in a variety of ways. Field Service requires a minimum two (2) week notice ahead of the requested service date and is dependent on availability of the technicians. Shorter lead times may be arranged depending upon availability of technicians. Additional charges may be incurred depending upon travel expenses. Requests for Field Service should be made through the Project Planner assigned to this project. Completion of a Field Service Request Form is required to initiate all field service requests.

It is recommended and may also be a requirement of the contract documents that the initial system start-up is performed in the presence of a factory-certified field service technician.

Safety

It is the contractor's (or requestor's) responsibility to ensure the area meets local and federal safety requirements. Confined space permits, if required, shall be the responsibility of the contractor to obtain, coordinate and manage. All additional personnel required for entry shall be the responsibility of the contractor. The field service technicians will have the basic Personal Protective Equipment including hard hat, eye protection, safety shoes and safety vest. Additional required PPE shall be the responsibility of the contractor.

Brentwood's Field Service Technicians are trained in Confined Space Entry Training, Ladder Safety/Fall Protection, Hazard Communications, OSHA 10-Hour General Industry Course and WHMIS (for Canada). If a technician believes a site condition to be hazardous or un-safe, that technician will request the concern to be rectified. If the condition remains, the technician may stop the inspection or leave the site until the hazard is mitigated.

Pre-installation Review

Prior to installation, Field Service can provide installation assistance training to contractors unfamiliar or inexperienced with the installation of Polychem chain and flight equipment and components. Technicians will go over how to properly lay out a tank, review all equipment being installed, and walk through the installation

manual. Technicians will also discuss common installation mistakes and how to avoid them as well as emphasize areas where attention-to-detail is critical for a properly installed system. This service can help improve installation timelines and reduce costly installation errors and correction requirements.

Installation Inspection (Startup & Commissioning)

After installation, Field Service can inspect the Polychem equipment installation to perform on-site and commissioning. Technicians will verify proper installation and alignment of equipment and compare elevations, clearances, and component locations with the Polychem-engineered installation and layout drawings. Depending on the size of the system or the number of units, multiple trips may be required.

In order to provide installation inspection, the following requirements must be met:

1. The tank(s) is to be clean and dry; floor surfaces are to be visible and debris swept and removed. Covered tanks must be properly ventilated and meet all requirements for confined space entry.
2. Safe access to the tank including all floor areas as well as all elevated components. This will require the contractor to provide multiple ladders of various types and sizes.
3. Availability of some hand tools and measurement devices such as come-along winch, nylon straps, 4' or 8' level, etc. The field service technicians travel with basic and easily transported hand tools and measuring tools, additional tools may be requested.
4. It is required that the centerline used by the installer be maintained through the final inspection. For more about this centerline, see Section 2.3 Tank Layout.
5. It is required that the elevations used for installation (max water level, etc.) be visibly marked and verified as accurate and suitable for installation by the contractor. These must be maintained through the final inspection. Brentwood is not able to confirm the elevations as part of our inspection.
6. It is required that the anchorage installation is verified as accurate and completed per the manufacture's recommendations by the contractor. Brentwood is not able to verify anchorage embedment or the installation of adhesive anchoring system as part of our inspection.
7. Power must be available to run all drives. While the permanent wiring is preferred, temporary wiring, including properly sized generators, if necessary, may be used.
8. Inspection shall include both stationary checks as well as "dry" operation. For dry operation, all tools and ladders will be removed, and the collector(s) operated while the Field Service Technician is in the tank completing additional checks.
9. If the equipment is installed in a covered tank, lighting is desirable. Note in item #7 that the equipment will be operated so any lighting must be mounted in such a way as not to interfere with the operation.
10. Communications between the technician doing the inspection and contractor or plant personnel must be established and maintained. During dry operation, a qualified person must be stationed at the local control, MCC or other location and be able to stop the collector immediately if requested by the technician.

Upon completion of the inspection, a punch list including open items and required corrective actions will be provided to the contractor. Once the items have been completed or rectified, the contractor must return a signed copy to Brentwood. The contractor's signature certifies that all items have been addressed and verified to be within required specifications and allows Brentwood to issue a certificate of proper installation to fulfill warranty requirements. Failure to complete or rectify each punch list item does not relieve the Contractor from full responsibility or compliance to the installation requirements.

Training

Following installation inspection and before the contractor turns the project over to the owner, Field Service technicians can provide training to the owner's personnel. Services can include classroom training, in-tank training, review of the operation and maintenance manual, preventative maintenance, safety precautions, recommended inventory stock levels, and troubleshooting. If specified, a final written test is provided to plant personnel to ensure understanding of training materials. Typical training runs for approximately one to two hours.

In order to provide training, the following are required:

1. A meeting area suitable for the size of trainees anticipated with 120-volt power.
2. A screen or surface suitable for projection of a PowerPoint slide presentation. With proper connections and small groups, a television or other monitor might be adequate.

It is preferred that training be scheduled towards the end of one of the Installation Inspection trips to enable the trainer to possibly include photos from the actual installation into the presentations. This also may allow the trainees to see the equipment installation prior to being placed into operation.

Other Services

Depending on your needs, Brentwood can supply numerous on-site services for our customers, please contact us for more information.

2.20 Adhesive Anchorage

Polychem provides the required amount of adhesive and it is the responsibility of the installing party to properly install the adhesive and anchors in such a manner to minimize waste.

It is recommended that the installation of ALL anchors be coordinated together per tank to optimize the drilling and anchor installation tasks and minimize waste.

Refer to the documentation received with the adhesive and the component supplier information section for installation instructions.

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2.21 Installation Torque Guide

Installation Torque Guide

Connection	Anchor/ Bolt Dia.	Torque (ft-lbs)	Comments
Stub Shaft/Spindle Anchors	1"	Max 150	Set Idler Shaft/Spindle based upon Installation Instructions. Level equipment with the leveling bolts, ensuring all bolts touch the concrete/mounting surface. Tighten (1) anchor nut until the lock washer is compressed and snug (Approximate Torque Range is 15-30ftlbs). Repeat pre-load for the second anchor nut. Tighten (1) nut an approximate 1/4 turn, and then repeat for the second anchor nut. Tighten both nuts an additional 1/4 turn. Torque should be approximately 140-150ft-lbs, not to exceed 150ft-lbs per the Hilti Installation Torque Guide.
3/8" Anchored Equipment (Limit Switch/Chain Guard Bracket Anchors)	3/8"	MAX 15	Tighten hardware, Torque not to exceed 15ft-lbs per the Hilti Installation Torque Guide
1/2" Nylon Wall Bracket Leveling Anchors	1/2"	Max 30	Tighten until split lock collapsed and snug + 1/2 turn, not to exceed 30ft-lbs per the Hilti Installation Torque Guide.
1/2" Anchored Equipment (FRP Tensioner Bracket/FRP Wall Brackets)	1/2"	MAX 20	Tighten hardware, Torque not to exceed 20ft-lbs
5/8" Anchored Equipment (KA77 Single Drive Base Plate Anchors/LCP Stands)	5/8"	MAX 60	Tighten hardware, Torque not to exceed 60ft-lbs per the Hilti Installation Torque Guide
3/4" Anchored Equipment (KA87 Dual Drive Base Plate Anchors)	3/4"	MAX 100	Tighten hardware, Torque not to exceed 100ft-lbs per the Hilti Installation Torque Guide

Please note, Brentwood performs a visual check for anchor hardware tightness and does not verify field torques as part of its inspection process. This shall be the responsibility of the installing contractor.

Standard Preventative Maintenance and Troubleshooting **Section 3.**

3.1 Introduction

3.2 Tools and Special Equipment

3.3 Materials / Replacement Parts

3.4 Equipment Condition

3.5 Cleaning

3.6 Warnings and Cautions

3.7 Safety Precautions

3.8 General Inspection

3.9 Explanation of Table Entries

3.10 Lubrication Charts

- 3.10a Lubricant Symbols
- 3.10b Lubrication Under Normal Operating Conditions

3.11 Preventive Maintenance Checks and Services

3.12 Troubleshooting Table

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3.1 Introduction

This section details preventive maintenance checks and services and troubleshooting procedures, including lubrication instructions required for the system. The preventive maintenance checks and services and troubleshooting procedure tables are provided such that the equipment performs as intended. Only knowledgeable and informed personnel are to perform any maintenance and/or troubleshooting task(s) on the system.

3.2 Tools and Special Equipment

Special tools are not required for system maintenance. Standard tools are sufficient.

3.3 Materials / Replacement Parts

The end user or owner shall provide all materials and replacement parts. Replacement parts are acquired from Polychem Systems or from the provided Spare Parts (if applicable). All lubricants (grease, oils, anti-seize etc.) are to be obtained locally. See the Component Supplier Manuals for the recommended lubrication system.

3.4 Equipment Condition

In order to perform maintenance, the system must be properly locked and tagged out. Visual inspections can be performed while the system is in operation. Please refer to the Preventive Maintenance Checks and Services Table.

3.5 Cleaning

Keep the system as clean as possible. Dirt, grease, oil, and debris may cover up or cause a serious problem. Clean the system as you work on it or as needed.

3.6 Warnings and Cautions

Always observe the WARNING(s) and CAUTION(s) at the worksite. Specific warnings and cautions are provided within the preventive maintenance checks and services and in the troubleshooting procedure tables.

3.7 Safety Precautions

1. Perform all work in accordance with any federal and/or regional regulations governing safety and the prevention of work-related accidents.
2. Release all stored energy before performing any work to the system.
3. Do not tighten the collector or drive chains while system is in operation.
4. Do not operate the drive mechanism without guards properly installed.
5. Use only Polychem supplied shear pins (if applicable).
6. Do not stand or walk on the return rail.
7. During system inspection, pinch points exist on the chains and sprockets.
8. Keep clear of moving or rotating equipment during system inspection.
9. Caution should be exercised when lifting system components of excess weight.

3.8 General Inspection

1. Hardware – Check for missing, loose or damaged hardware.
2. Components - Check for damaged components.
3. Electrical Wires and Connectors – All electrical connections are to be in good working order and in accordance with all applicable codes and regulations.

3.9 Explanation of Table Entries

1. *Item No.* – These numbers are for reference purpose only.
2. *Time Interval* – The period between procedure applications.
3. *Estimated Time* – Outlines the estimated time to complete the prescribed tasks.
4. *Item Description* – Outlines the item(s) to be inspected or serviced.
5. *Maintenance Tasks* – Outlines the procedure for the checks or services, for the item listed in the Item Description column.
6. *Collector Operating* – Outlines the recommended system operation while performing the maintenance task.
7. *Lubrication* – Outlines the required lubrication.
8. *Lube Quantity* – Outlines the required amount of lubrication.

3.10 Lubrication Charts

3.10a Lubricant Symbols	
Symbol	**Description**
W	Water
GRW	Waterproof Grease
GH1 - (For Drinking Water)	USDA H1 #2 Gear Grease
	USDA H1 Grease
AS	Anti-Seize

3.10b Lubrication Under Normal Operating Conditions		
Components[2]	**Lubricants to be used**	**Intervals**
All other Grease Fittings[3]	GRW/GH1	Quarterly
Chain	W	N/A
Drive Unit[4]	-	-
Flight	W	N/A
Flight Squeegees	W	N/A
Head Shaft (Metallic)	W	N/A
Head Shaft (Non-Metallic)	W	N/A
Over Torque Protection Device[5]	GRW/ GH1	Bi-annual
Shear Pin	AS	Yearly
Sprocket Bearings	W	N/A
Stub Shaft	W	N/A
Wear Strip	W	N/A
Wear Shoes	W	N/A

NOTES:

1. When the system is dewatered and shut down for maintenance and/or storage, make sure all components have been lubricated before system start up.
2. See Section 4.1 Scope of Supply for components used.
3. Example components are (but not limited to): metallic bearing blocks, bearing housings, etc. See component drawings for details.
4. See component supplier information section for details.
5. When using a Torque Limiting Modular Ball Detent, see component supplier information section for details.

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3.11 Preventive Maintenance Checks and Services

***WARNING*: EXTREME CAUTION MUST BE EXERCISED WHEN WORKING NEAR ELECTRICAL EQUIPMENT AND SYSTEMS. ADEQUATE SAFETY PROCEDURES SHOULD BE ESTABLISHED AND OBSERVED AT ALL TIMES. SEE THE SAFETY PRECAUTIONS SECTION IN THIS MANUAL.**

Item No.	Time Interval *	Estimated time**	Item Description ***	PROCEDURE
1.	--	--	Drive Unit (Polychem Supplied)	a. Refer to Component Supplier Information section.
2.	1 MO.	15 MIN	Drive Chain Tightener Assembly	a. Visually inspect chain for smooth operation. If a loose condition is observed, adjust chain tightener assembly using hand pressure until slack is removed. ***NOTE***: *If the chain tightener assembly is adjusted to its limits, remove a link of the drive chain and reset the tightener assembly.* b. Clean any accumulated debris.
3.	1 MO.	15 MIN	Drive and Driven Sprockets	a. Ensure that all sprocket center lines are aligned and plumb with each other, within a 1/16" [2]. b. Inspect for wear or damage. c. Inspect for loose, damaged, broken, or missing hardware. d. Clean any accumulated debris.
4.	1 MO.	15 MIN	Drive Chain	a. Inspect the drive chain for wear or buildup of debris. b. Clean any accumulated debris. ***NOTE***: *For metallic chain, see Component Supplier Information section in this manual.*
5.	1 MO.	15 MIN	Over-Torque Sensing Device (Limit Switch)	a. Clean any accumulated debris. b. Inspect for loose or damaged hardware, lever arm, wiring, etc. c. Ensure that the lever arm is positioned to engage the Over-Torque Protection Device trip pin when extended.
6.	1 MO	Varies	Flight Squeegees / Wipers	a. Visual from top of deck - Inspect for unusual wear, damage to squeegees/wipers. Inspect for loose, damaged, broken, or missing hardware. ***NOTE***: *Time is dependent on operating speed and visual access at the top of the collector.*

Preventive Maintenance Checks and Services

Item No.	Time Interval *	Estimated time**	Item Description ***	PROCEDURE
7.	3 MO.	5-10 MIN/Fitting	All Other Grease Fittings	a. Apply lubrication until clean grease appears. Remove excess grease. ***NOTE***: *Example components are (but not limited to): metallic bearing blocks, bearing housings, etc. See component drawings for details.*
8.	6 MO	Varies	Wear Shoes	a. Visual from top of deck - Inspect wear shoes for wear, loose, damaged, broken, or missing hardware. b. **NOTE**: Time is dependent on operating speed and visual access at the top of the collector.
9.	6 MO.	15 MIN	Over Torque Protection Device	a. *Shear Pin Hub Assembly:* Verify the sprocket rotates freely around the hub when the shear pin is removed. Apply anti-seize as necessary. *Jaw Clutch Type with Shear Pin Hub Assembly:* Verify the sprocket rotates freely around the hub when the shear pin is removed. Apply lubrication until clean grease appears, excess grease should be removed. *Torque Limiting Modular Ball Detent*: Refer to Component Supplier Information section in this manual b. Clean any accumulated debris.
10.	1 YR	15 MIN	Trip Pin / Lug	a. Verify that the trip pin / lug travels freely and engages the over-torque sensing device. b. Clean any accumulated debris.
11.	1 YR	30 MIN	Shear Pin	a. Replace shear pin. (Refer to document included with the shear pin kit.) ***NOTE****: May be applicable to the Torque Limiting Modular Ball Detent devices. See the Component Supplier Information section, in this manual, for details.*
12.	1 YR	30-45 MIN	Collector Chain	a. Inspect catenary and remove one (1) link as necessary. Catenary should be in accordance with the Collector Chain sub-section of the Standard Installation Guidelines. ***NOTE***: *For metallic chain, see Component Supplier Information section in this manual*.
13.	1 YR	5-20 MIN/Flight	Fiberglass Flight Assembly	a. Inspect the flight for wear. Replace if fiber strand or matting is frayed or damaged. ***NOTE****: If wear is present on the scraper lip, this could be an indication of the flights encountering the tank floor.* b. Inspect the flight assemblies for loose, damaged, broken or missing hardware. c. Inspect wear shoes for wear. Reverse or replace wear shoes when 1/4” [6] of wear is observed. d. Clean any accumulated debris.

Preventive Maintenance Checks and Services

Item No.	Time Interval *	Estimated time**	Item Description ***	PROCEDURE
14.	1 YR	15-30 MIN/Flight	Flight Squeegees / Wipers	a. Adjust flight squeegees / wipers to maintain 1/8" [3] clearance with basin wall or other wiping surface. b. Inspect for wear. Replace squeegees / wipers when the recommended clearance with the basin wall or other wiping surface can no longer be maintained. c. Inspect for loose, damaged, broken, or missing hardware.
15.	1 Yr	20-40 Min/Side	Return Rail System	a. Inspect rail system for loose, damaged, or broken parts or hardware. b. Clean any accumulated debris.
16.	1 Yr	30 Min	Non-Metallic Head Shaft Assemblies	a. Inspect for loose, damaged, broken or missing hardware. b. Clean any accumulated debris.
17.	1 Yr	30 Min	Metallic Head Shaft Assemblies	a. Inspect for loose, damaged, broken or missing hardware. b. Inspect surface finish. Touch up any chipped or missing paint, if applicable. ***NOTE**: Head shaft bearings may require lubrication; see "All Other Grease Fittings" and Component Drawings.* c. Clean any accumulated debris.
18.	1 Yr	5-10 Min/Assembly	Non-Metallic Shaft Assemblies	a. Inspect for loose, damaged, broken or missing hardware. b. Clean any accumulated debris. c. Remove the retaining plate and inspect bearing for wear. Replace bearing when approximately ½ of the bearing thickness is worn.
19.	1 Yr	5-10 Min/Assembly	Metallic Shaft Assemblies	a. Inspect for loose, damaged, broken or missing hardware. b. Clean any accumulated debris. c. Inspect the shaft bearings (wall bearings or sprocket bearings) for wear. Replace bearing(s) when approximately ½ of the bearing thickness is worn. ***NOTE**: Shaft bearings may require lubrication; see "All Other Grease Fittings" and Component Drawings.*
20.	1 Yr	5-10 Min/Assembly	Collector Sprockets	a. Ensure that all sprocket centerlines are aligned and plumb with each other, within a 1/16" [2]. b. Inspect for wear or damage. c. Inspect for loose, damaged, broken, or missing hardware. d. Clean any accumulated debris.

Preventive Maintenance Checks and Services

Item No.	Time Interval *	Estimated time**	Item Description ***	PROCEDURE
21.	1 Yr	45-90 Min/Side.	Wear Strips	a. Check, both floor and rail wear strips for wear. Replace wear strips when approximately 1/3 of the material thickness is worn. b. Inspect for loose, damaged, broken or missing hardware.
22.	1 Yr	10-20 Min/Side	FMM (ChainCheck™) Components	a. Clean any accumulated debris. b. Inspect for loose, damaged, broken, or missing hardware. c. Inspect for loose or damaged cable, target or sensor body. d. Verify the sensor clearance to the sprocket is per the installation drawings and the targets are detected. e. Inspect for wear or damage.
23.	1 Yr	10-20 Min/Side	SMM Components	a. Clean any accumulated debris. b. Inspect for loose, damaged, broken, or missing hardware. c. Inspect for loose or damaged cable/sensor. d. Verify that the sprocket rotates freely, and the magnetic targets are not loose or damaged. e. Verify the sensor clearance to the sprocket is per the installation drawings and the targets are detected. f. Inspect for wear or damage.
24.			Scum Trough or Skimmer	a. Refer to Component Supplier Information section.
25.			Screw Conveyor	a. Refer to Component Supplier Information section.

* Actual site conditions and site requirements may require adjustment of the listed time intervals. The plant applications, usage, and duty of the equipment may necessitate more service than the typical recommendations imply.

** Estimated Time shown is a typical range to complete the task for a single item in a single collector mechanism and is dependent on the experience of the worker, access to the equipment, condition of the hardware, cleanliness of the system, overall size and length of the system, the need to replace/repair items, etc. Time listed does not include taking the collector out of service, draining, cleaning, putting the collector back into service, rotating the equipment (i.e. to lower upper flights to the floor), completing safe entry/egress, or obtaining proper tools/maintenance items.

*** If applicable and supplied by Brentwood. For non-Brentwood items, refer to the original equipment manufacturer's information.

3.12 Troubleshooting Table

WARNING: **EXTREME CAUTION MUST BE EXERCISED WHEN WORKING NEAR ELECTRICAL EQUIPMENT AND SYSTEMS. ADEQUATE SAFETY PROCEDURES SHOULD BE ESTABLISHED AND OBSERVED AT ALL TIMES. SEE THE SAFETY PRECAUTIONS SECTION IN THIS MANUAL.**				
ITEM DESCRIPTION *	**SYMPTOM**	**CAUSE/TEST or INSPECT**	**CORRECTIVE ACTION**	**ADDITIONAL HELP**
Drive Unit	Excessive Noise / Vibration	a. Check for shaft misalignment b. Check for worn coupling, bearings, or gears c. Check for insufficient or improper lubrication d. Check for clogged oil breather	See manufacturer's recommended maintenance procedures in Component Supplier Information section.	1-610-374-5109
	Does not run / start	a. Check for power b. Check wiring installation. c. Ensure that the cross collector is operational. d. Tripped or actuated limit switch.	a. See manufacturer's recommended maintenance procedures in Component Supplier Information section. b. See manufacturer's recommended maintenance procedures in Component Supplier Information section. c. Turn on the cross collector. d. Reset the trip pin OR clear the impediment to allow for the limit switch lever to return to free position.	
	Drive unit on but system not moving	a. Check for over-torque trip condition.	a. Refer to over-torque protection troubleshooting.	
Over Torque Protection	Broken Shear Pin or Ball Detent Trip	a. Check for excessive loading on collector b. Check for blocked flight path c. Check for binding at idler sprockets d. Check for improper shear pin OR Check for improper torque setting	a. Drain tank and inspect. b. Drain tank and inspect c. Refer to Collector Sprocket troubleshooting. d. Replace with recommended shear pin OR See manufacturer's recommended maintenance procedures in the Component Supplier Information section.	1-610-374-5109

Troubleshooting Table

ITEM DESCRIPTION *	SYMPTOM	CAUSE/TEST or INSPECT	CORRECTIVE ACTION	ADDITIONAL HELP
Drive Chain	Unusual or Excessive Wear	a. Check chain tension. b. Check for misalignment of drive and driven sprocket c. Check for excessive buildup of grease / debris	a. Adjust chain tension. b. Adjust as necessary. c. Clean any accumulated grease / debris.	1-610-374-5109
	Broken	a. Check sprockets for misalignment b. Check for possible obstacle in the drive area and collector system.	a. Adjust as necessary. b. Visually inspect collector system, drain tank if necessary. Remove obstacle, repair any damage, re-inspect, and reset.	
	Movement Stops Abruptly	a. Check for over-torque trip condition. b. Check for electrical malfunction c. Check for electrical malfunction of drive unit	a. Inspect collector system for jams, obstacles, etc. Repair any damage, re-inspect, and reset b. Verify drive has power. Correct malfunction and reset. c. Correct malfunction and reset	
	Loose	a. Check chain tension.	a. Adjust chain tension.	
Collector Chain	Unusual or Excessive Wear	a. Check chain tension. b. Check for misalignment of drive and driven sprocket c. Check for excessive buildup of grease / debris	a. Adjust chain tension. b. Adjust as necessary. c. Clean any accumulated grease / debris.	1-610-374-5109
	Broken	a. Check sprockets for misalignment b. Check for possible obstacle in the drive area and collector system.	a. Adjust as necessary. b. Visually inspect collector system, drain tank if necessary. Remove obstacle, repair any damage, re-inspect, and reset.	
	Movement Stops Abruptly	a. Check for over-torque trip condition. b. Check for electrical malfunction	a. Inspect collector system for jams, obstacles, etc. Repair any damage, re-inspect, and reset b. Verify drive has power. Correct malfunction and reset.	
	Loose	a. Check chain tension.	a. Adjust chain tension.	

Troubleshooting Table

ITEM DESCRIPTION *	SYMPTOM	CAUSE/TEST or INSPECT	CORRECTIVE ACTION	ADDITIONAL HELP
Flights	Damaged, Excessive Wear or Frayed	a. Check for possible obstacle in the effective collection zone b. Check for high spots on the floor wear strip.	a. Visually inspect collector system, drain tank if necessary. Remove obstacle, repair any damage, re-inspect, and reset b. Inspect collector wear strips. Replace and repair as necessary.	1-610-374-5109
	Movement Stops and Starts Again	a. Check to see if the collector chain may have jumped a sprocket tooth b. Check for unequal number of chain links between the flights c. Check for sprocket or shaft misaligned	a. Reset the collector chain to the correct position. Assure that there is no reason for unusual collector system loading, such as seized or sticky stub shafts, an obstruction in the collector basin, etc... b. Correct all suspect findings. Adjust the collector chain tension as necessary. c. Refer to collector sprocket troubleshooting.	
	Movement Stops Abruptly	a. Check for broken shear pin b. Check for electrical malfunction c. Check for electrical malfunction of reducer d. Check for torque limiter overload	a. Replace shear pin. (Refer to over torque protection trouble shooting.) b. Verify drive has power c. Correct malfunction and re-check d. Reset torque limiter (refer to torque limiter troubleshooting)	
	Travel Not Parallel to Tank Side Wall	a. Check to see if the collector chain may have jumped a sprocket tooth b. Check for unequal number of chain links between flights c. Check for sprocket or shaft misalignment	a. Reset the collector chain to the correct position and adjust the tension as necessary. b. Check the number of chain links between flights on opposite strands. Add or remove links as required and adjust tension as necessary. c. Refer to collector sprocket troubleshooting.	

Troubleshooting Table				
ITEM DESCRIPTION *	**SYMPTOM**	**CAUSE/TEST or INSPECT**	**CORRECTIVE ACTION**	**ADDITIONAL HELP**
Flight Wear Shoes	Worn or Excessive Wear	a. Check for natural wear of shoe b. Check for misalignment of flight and chain	a. Replace or swap wear shoe, from end to end on each, flight when no longer making contact with wear strip. Reinstall with the fresh, unworn surface mated to the wear strip. b. Refer to troubleshooting for flights and collector chains.	1-610-374-5109
Drive Sprockets	Unusual Wear	a. Check chain tension b. Check for misalignment of drive and driven sprocket c. Check for buildup of debris	a. Adjust as necessary b. Adjust and reposition as necessary. c. Clean sprocket of debris	1-610-374-5109
	Not Rotating	a. Check for one or more seized bearings b. Check over-torque protection c. Check drives operation and/or electrical interruption.	a. Inspect all stub shafts and sprockets for smooth operation. Clean or replace effected parts as required. b. Refer to over-torque protection device troubleshooting. (If applicable refer to Torque Limiter troubleshooting.) c. Inspect and correct as necessary.	
	Loose	a. Check for loose hardware and/or collars.	a. Tighten all hardware including setscrews and collars.	
Collector Sprockets	Unusual Wear	a. Check chain tension b. Check sprocket alignment	a. Adjust as necessary b. Adjust position as necessary, re-inspect, and restart.	1-610-374-5109
	Not Rotating or Binding	a. Check for one or more seized or binding bearings	a. Inspect all shaft bearings and sprockets for smooth operation. Clean or replace effected parts as required.	
	Loose	a. Check for loose hardware and/or collars.	a. Tighten all hardware including setscrews and collars.	

Troubleshooting Table				
ITEM DESCRIPTION *	**SYMPTOM**	**CAUSE/TEST or INSPECT**	**CORRECTIVE ACTION**	**ADDITIONAL HELP**
Drive Appurtenances	Icing/freezing	a. Wind/Low ambient temperature b. Check for Air infiltration	a. Remove ice from all surfaces/areas. b. Add/adjust/repair/replace heater as necessary. c. Add/adjust/repair/replace insulation and/or weather stripping to eliminate gaps and openings. d. Cover/seal off drive chain opening, as possible, to minimize air infiltration into the chain guard from below.	
Scum Trough or Skimmer			See manufacturer's recommended maintenance procedures in Component Supplier Information section.	
Torque Limiter			See manufacturer's recommended maintenance procedures in Component Supplier Information section.	
SMM	No Signal	a. Check sensors	a. Remove debris, rags, etc. buildup from all surfaces. b. Adjust sensor position as necessary, tighten hardware. Check sensor operation, repair/replace sensor as necessary. c. See manufacturer's recommended maintenance procedures in Control/ Monitoring Panel Component Supplier Information section	
FMM (ChainCheck™)	No Signal	a. Check sensors b. Check collector chain pins	a. Remove debris, rags, etc. buildup from all surfaces. b. Verify the correct collector chain pins are used and are in the correct location/position. c. Adjust sensor position as necessary, tighten hardware. Check sensor operation, repair/replace sensor as necessary. d. See manufacturer's recommended maintenance procedures in Control/ Monitoring Panel Component Supplier Information section	
Control/ Monitoring Panel			See manufacturer's recommended maintenance procedures in Component Supplier Information section.	

* If applicable and supplied by Brentwood. For non-Brentwood items, refer to the original equipment manufacturer's information.

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Scope of Supply & Design Data Section 4.

4.1 Scope of Supply

Non-Metallic Drive Chain

Non-Metallic Collector Chain

3 x 8 Fiberglass Collector C-Flights

Wear Shoes

Metallic-HeadShaft (Grit Collectors)

Head Shaft Driving Sprockets

Head Shaft Collector Sprockets

Non-Metallic Idler Stub Shaft Assembly (Longitudinal and Cross Collectors)

Drive Chain Tightener Assembly

Non-Metallic Flight Return Rail (Longitudinal Collectors)

Non-Metallic Angle Return Rail (Grit Collectors)

Wear Strip

Hardware

Anchoring System

Over-Torque Protection

Limit Switch

Collector Drive Unit

Equipment Guarding

4.1.1 Plant Process Data

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4.1 Scope of Supply

NANAIMO PST 1-3 & GRIT 1-3, BC

WGZ0067000

Polychem shall furnish the following equipment:

Six (6) Primary Longitudinal Collector Mechanisms, Approximately

42.1 M Long x 4.9 M Wide x 3.1 M AWD, 4 Shaft System

and

Three (3) Primary Cross Collector Mechanisms, Approximately

8 M Long x 1.6 M Wide x 3.3 M AWD, 3 Shaft System

and

Three (3) Grit Cross Collectors, Approximately

8.84 M Long x 0.7 M Wide x 4 M AWD, 4 Shaft System

Non-Metallic Drive Chain

The NH-78 collector drive chain is manufactured from glass-reinforced Nylon 6/6 and consists of 2.609" [66.3] pitch links, ø3/8" [9.5] 303 stainless steel knurled pins and polypropylene bearing sleeves. The chain has a published working load of 1,740 lbf [7,740 N] and weighs approximately 1.17 lbs/ft [1.74 kg/m]. The drive chain is supplied in 10' [3048] lengths.

Drive chain is barrel wrapped with 301SS. (For Grit Collectors)

Non-Metallic Collector Chain

The NCS-720S collector chain is manufactured from glass-reinforced polyester and consists of 6" [152.4] pitch links, ø0.866 [22] glass-reinforced nylon pins and polyoxymethylene retaining clips. The chain has a published working load of 3,100 lbf [13,789 N] and weighs approximately 1.5 lbs/ft [2.23 kg/m]. The collector chain is supplied in specific lengths to suit the collector flight spacing.

The chain is molded with the barrel and sidebars as an integral assembly. Rigid, non-metallic attachment links are furnished molded from the same material as described above. Attachment links shall extend the full depth of the collector flight and are integrally molded to assure flight alignment. The attachment link bolt pattern shall conform to industry standards and will accommodate four (4) ø3/8" [M10] flight attachment hardware.

Connecting pins have integrally molded locking t-heads that seat and lock inside integrally molded chain links, which provide a positive means to prevent pin rotation. The chain pins shall be held in place with removable retaining clips. The pins are designed to provide full dead load capacity along its entire length.

Collector chain is barrel wrapped with 301SS. (For Grit Collectors)

3 x 8 Fiberglass Collector C-Flights

The pultruded fiberglass collector flights shall be 3" x 8" [76 x 203] nominal C-Channel. The collector flights are constructed of continuous strand fiberglass mat and unidirectional fiberglass roving within a UV stabilized isophthalic polyester matrix. The collector flights include a scraper lip on the leading edge to ensure cleaning of the tank floor. Collector flights have a minimum fiberglass content of 55% by weight. Collector flights are pre-drilled, notched and are attached to the collector chain using polypropylene filler blocks with ø3/8" [M10] flight attachment hardware.

Flights accommodate two (2) wear shoes and three (3) UHMW-PE wear bars on the underside. (For Grit Collectors)

Wear Shoes

Wear shoes are constructed of injection molded lubricated Nylon 6/6. Shoes are 1/2" [13] thick and are reversible, providing two (2) useable wearing surfaces. Carrying shoes shall run on the collector floor wear strips and the return shoes shall run on return rail wear strips. Return shoes are lugged for flight alignment.

Non-Metallic Head Shaft Assembly (Longitudinal and Cross Collectors)

The collector head shafts are manufactured from biaxially wrapped high strength filament wound glass reinforced epoxy resin. Head shaft tubes are supplied with replaceable UHMW tubular bearings which rotate on Cast Nylon 6 wall mounted spindles. The spindles are sized and pre-drilled to suit system requirements. Head shaft tubes are supplied with keys and keyways properly sized for collector service.

Head shaft assemblies may be of *"Mono Tube"* or *"Telescopic Tube"* design based upon system requirements. Please refer to the Installation and Layout Drawing Section and the Component Drawing Section for details.

Metallic-HeadShaft (Grit Collectors)

The collector head shafts are manufactured from solid SS304 shafting. Head shafts are supported and rotate in cast iron bearings, lined UHWM-PE bearings. Head shafts are properly sized for collector service, manufactured straight and true, and are supplied with keys and keyways. Set collars are manufactured from cast nylon material.

Head Shaft Driving Sprockets

The collector head shaft is driven by a 40 tooth Cast Nylon 6 "*driven"* sprocket. The driven sprocket is of split construction, cut and sized for the drive chain and is provided with a keyway and set screws.

Head Shaft Collector Sprockets

The sprockets are cut and sized for the collector chain, are constructed of Cast Nylon 6, have 23 teeth, hunting tooth design, split construction, to facilitate installation, with integrally molded chain saver rims. Sprockets are equipped with a keyway, set screws and are held together with hardware.

Non-Metallic Idler Stub Shaft Assembly (Longitudinal and Cross Collectors)

The idler stub shaft assembly consists of a sprocket, stub shaft and retainer plate. Sprocket is cut and sized for the collector chain, are constructed of Cast Nylon 6, have 17 teeth, hunting tooth design, plain bore, and solid construction with integrally molded chain saver rims. The sprocket is held to a Cast Nylon 6 stub shaft using a polycarbonate retainer plate and rotates on UHMW bearings. Stub shafts are sized and pre-drilled to suit system requirements.

Metallic-Static-Shaft (Grit Collectors)

The static shaft assembly consists of shafting with wall mounted plates, sprockets, and static sleeve idler bearings. The idler shafting is manufactured from solid SS304 shafting which is properly sized for collector service. The shaft is held using plates mounted directly to the collector wall and is kept from rotating. Sprockets are cut and sized for the collector chain, are constructed of Cast Nylon 6, have 23 teeth , hunting tooth design, plain bore, and solid construction with integrally molded chain saver rims. Each sprocket rotates independently upon UHMW static sleeve idler bearings which are of split construction and held in place using stainless steel band clamps.

Drive Chain Tightener Assembly

The collector drive chain shall be tightened using a 7-tooth sprocket, and an adjustable bracket assembly. The assembly is constructed of non-metallic components with a stainless steel staking pin and is mounted using a fiber reinforced polyester (FRP) angle support. All components are pre-drilled and supplied with the appropriate hardware.

Wall Bracket Assembly (Longitudinal Collectors)

The wall bracket assembly consists of a wall bracket, rail support shoe, and hardware. The wall bracket is manufactured of reinforced Nylon 6 and is prefabricated to suit system requirements. The rail support shoe is manufactured (pre-drilled) of injection molded Nylon 6/6 and attaches the return rail to the wall bracket.

Wall Bracket Assembly - Non-Metallic angles bracket (Longitudinal Collectors)

The wall bracket assembly consists of a wall bracket, rail support shoe, and hardware. The wall brackets are constructed of fiber reinforced polyester angle measuring L 3" x 3" x 3/8" [L 76 x 76 x 9.5] and L 4" x 4" x 3/8" [L 102 x 102 x 9.5] which require field assembly and adjustment or manufactured of reinforced Nylon 6 pre-fabricated to suit system requirements. The rail support shoe is manufactured (pre-drilled) of injection molded Nylon 6/6 and attaches the return rail to the wall bracket.

Non-Metallic Flight Return Rail (Longitudinal Collectors)

Collector return rails are constructed of fiber reinforced polyester flights measuring 3" x 8" [76 x 203] nominal c-channel and are supplied in 20' [6096] nominal lengths. Return rails are approximately supported every 10' [3048]. Return rails shall be cut, drilled and fitted in the field for installation.

Non-Metallic Angle Return Rail (Grit Collectors)

Collector return rails are constructed of fiber reinforced polyester angle measuring L 3" x 3" x 3/8" [L 76 x 76 x 9.5] and are supplied in 20' [6096] nominal lengths. Return rails are approximately supported every 10' [3048]. Return rails shall be cut, drilled and fitted in the field for installation.

Wear Strip

Collector wear strip is constructed of UHMW measuring 2 5/8" [66.7] wide by 3/8" [9.5] thick and supplied in 10' [3048] lengths. Each length shall have one (1) hole and three (3) slots to allow for thermal expansion/contraction. Each hole and slot are counter-bored for the attachment hardware.

Return rail wear strips are attached to the top of the rail using 1/4" [6] x 1.25" [35] machine bolts. Floor wear for the primary sedimentation tank cross and longitudinal are mounted directly to the collector floor using #14 x 2.00" [51] self-tapping screws and non-metallic drop-in anchors. The grit cross collector floor wear strips are either mounted to existing steel T-rails or by anchored as above mentioned method. In cases where collector wear strips are mounted to a T-rail, the wear strips can be field welded using the provided weld washers.

Hardware

Hardware shall be 316 stainless steel and be provided in standard measure. Hardware shall be coated with an anti-seize compound during assembly, by others.

Buy outside components shall include OEM standard hardware, which may consist of carbon steel fasteners. They shall be painted or coated per OEM standard or by others.

Anchoring System

All anchors shall be 316 stainless steel anchored in the concrete structure using the Hilti HIT-HY 200-A V3 adhesive anchoring system. Anchors shall be coated with an anti-seize compound during assembly, by others. Floor wear strips shall be mounted to the concrete using Hilti HUD-2 8x40mm non-metallic expansion anchors.

Over-Torque Protection

The collector drive unit is protected against over-torque through a stainless steel shear pin hub assembly. The assembly's over-torque protection is activated when the aluminum shear pin breaks due to high system loading. The broken shear pin allows the hub, which is keyed to the drive shaft, to rotate and a trip pin emerges from the assembly via an internal ramp type cam. The trip pin can then be detected by an electrical switch.

Limit Switch

The limit switch shall be heavy duty lever type, double pole double throw (DPDT), have an enclosure rating of NEMA 1, 2, 4, 6, 6P, 12, 13, and IP67, and shall be activated by the Over-Torque Protection Device. Switches are classified for severe duty in a hazardous location, conforming to Class 1 Division 1 Groups B/C/D and Class 2 Division 1 Groups E/F/G. The wiring and installation of this unit is by others.

Collector Drive Unit

The drive unit consists of a gear reducer sized for continuous operation with an AGMA service factor of 1.5 based upon running torque.

The electric motor is to be 1/2 HP [0.37kW], 1730 RPM (575V @ 3ϕ-60Hz), TEFC, Class F Insulation with a Class B Rise, 40°C Max Ambient and Severe Duty.

The drive unit shall include OEM standard hardware, which may consist of carbon steel fasteners. They shall be painted or coated per the OEM's standard Coating and Surface Protection System.

Equipment Guarding

Rotating equipment located above the deck will be shielded by a stainless steel sheet metal guard. An access cover shall include a handle.

Surface Preparation of Ferrous Metals

Brentwood shall provide all submerged and non-submerged carbon steel and cast-iron items with protection against corrosion of the components during shipping and storage. Proper storage is outlined in Section 1.7 of this manual. Finished Field Painting is by others.

Surface Preparation and Primer of carbon steel and cast-iron items shall be supplied as follows:

All non-submerged ferrous components will be provided with the Original Equipment Manufactures standard surface coating for protection against corrosion of the components during shipping and storage. Finished Field Painting is by others.

All submerged ferrous components will be provided with a surface preparation of SSPC-SP10 Near White Metal and a shop primer 1 coat of Sherwin Williams Dura-Plate 235 Multi-Purpose Epoxy @ 4 Mils D.F.T. It is the responsibility of the contractor to ensure finish paint is compatible with specified primer. Any adhesion issues between primer coats and finish coats are not the responsibility of Brentwood. Please be advised the topcoat must be applied within 6 months of the prime coat, otherwise the assembly surface will need to be abraded or the primer will need to be removed and surface preparation redone (by others) prior to application of the topcoat. Non-painted surfaces of any shafting shall be coated with one (1) application of SPRAYON® LU™ 777 outdoor metal protectant or similar. Finished Field Painting is by others.

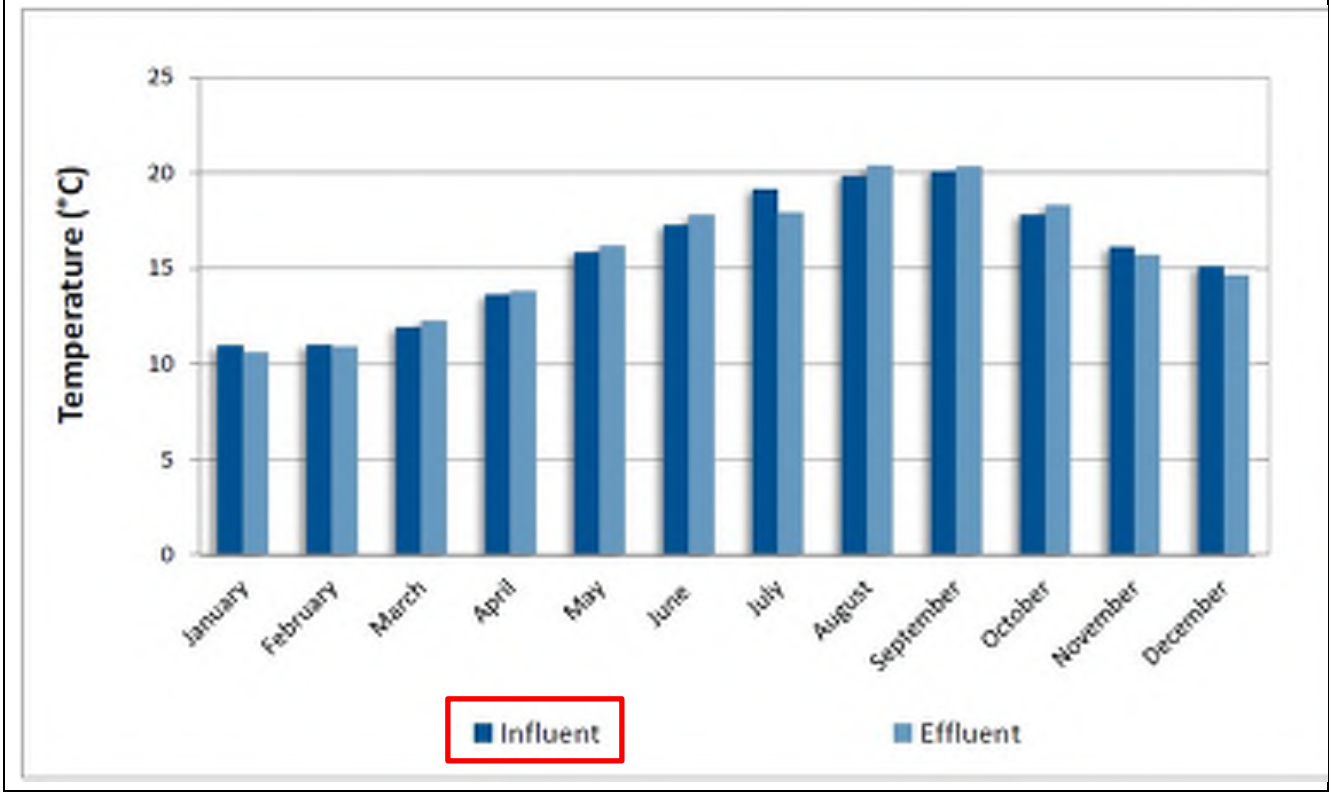
4.1.1 Plant Process Data

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GNPCC Maintenance Job: Grit & Sedimentation Tanks Refurbishment

Screened Raw Sewage Design Criteria – January 27, 2022 – Rev1

General Criteria			
Fluid description	Screened raw sewage - influent (SRS)		
Primary chemical parameters:	See list page 2		
Trace elements/compounds:	See list page 3		
Process chemicals:	Ferrous chloride, 0.022 millilitre/litre SRS (added to influent flow before screens)		
Detailed Criteria	**Design Average**	**Minimum**	**Maximum**
Fluid flow rate (m3 per day)	29,500	21,100	92,200
Fluid specific gravity	1.01	1.0	1.02
Fluid pH	7.4	6.2	7.5
cBOD5 (mg/litre)	250	100	400
Ammonia Nitrogen (mg/litre)	42	15	60
Fluid solids* (mg/litre)	405	100	1,400
* Total suspended solids (“soft” and “hard”)			
Fluid temperature* (deg. C)	16.5	10	23
* See monthly averages below			



Primary Chemical Parameters of SRS Influent to GNPCC (historical trends)											
Parameter	**Units**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
pH	-	7.38	7.56	7.36	7.16	7.17	7.63	7.29	7.22	7.22	7.51
Total Alkalinity	mg/L	181.5	133	172	176	133	153	153	128	214	157
Dissolved Chloride	mg/L	135	131	183	277	158	165	150	133	220	104
Total Kjeldahl Nitrogen	mg/L	37.5	34.5	48.0	28.6	36.5	45.6	37.3	40.4	45.7	35.7
Total Oil and Grease	mg/L	8	7.5	16.2	35.0	19.5	8.1	7.9	4.9	14.8	<9.6
Dissolved Sulphate	mg/L	35.8	43.4	60.0	67.0	45.7	51.7	48.3	52.8	69.7	42
Dissolved Sulphide (total)	mg/L	0.062	0.0447	0.1528	<0.05	0.08	0.059	0.082	0.064	0.100	0.053
Total Cyanide	mg/L	0.0036	0.0092	0.0080	0.0060	0.0040	0.0017	0.0015	<0.0050	0.0058	<1.86
Dissolved Fluoride	mg/L	0.05	0.044	0.094	0.100	0.105	0.051	0.043	0.037	0.109	<0.085
Total Organic Carbon	mg/L	36	41	52	63	64	33	47	33	35	25
Total Phosphorus	µg/L	3,075	2,745	2,140	3,500	2,415	2,845	3,125	2,770	2,680	2,510

Trace Elements/Compounds in SRS Influent to GNPCC cont'd (at June 2, 2020)

2020 GNPCC INFLUENT		
Parameter	Unit	02-Jun-20
pH	pH Units	6.20
Chloride	mg/L	136
Total Kjeldahl Nitrogen / TKN	mg/L	61.7
Oil and Grease (total)	mg/L	49.7
Sulphate	mg/L	26.6
Fluoride	mg/L	0.10
Nitrate (as N)	mg/L	<0.010
Nitrite (as N)	mg/L	0.164
Total Organic Carbon / TOC	mg/L	39.8
Phosphorus (total)	mg/L	8.86
Sulphide (total)	mg/L	0.15
Cyanide (total)	mg/L	0.0234
Polychlorinated Biphenyls / PCBs	ug/L	<0.210
Total Phenols (tested June 16, 2020)	mg/L	0.23
METALS Scan by ICP		
Aluminum (total)	ug/L	467
Arsenic (total)	ug/L	0.83
Barium (dissolved)	ug/L	<5.0
Boron (dissolved)	ug/L	181
Cadmium (dissolved)	ug/L	0.023
Chromium (total)	ug/L	6.65
Cobalt (dissolved)	ug/L	0.67
Copper (dissolved)	ug/L	17.4
Iron (dissolved)	ug/L	1,090
Lead (total)	ug/L	4.43
Manganese (dissolved)	ug/L	59.7
Mercury (total)	ug/L	<0.010
Molybdenum (total)	ug/L	2.95
Nickel (dissolved)	ug/L	3.05
Selenium (total)	ug/L	0.67
Silver (total)	ug/L	0.395
Tin (total)	ug/L	1.26
Zinc (total)	ug/L	181
VOC Scan		
Chloroform	ug/L	2.6
Dichloromethane	ug/L	<3.0
Chloromethane	ug/L	<6.0
Tetrachloroethylene	ug/L	<1.0
1,1,1-Trichloroethane	ug/L	<1.0
1,1,2-Trichloroethane	ug/L	<1.0
Trichloroethylene	ug/L	<1.0
Benzene	ug/L	<0.5
Toluene	ug/L	<1.1
Ethylbenzene	ug/L	<1.-0
Naphthalene	ug/L	<5.0
Phthalate Esters		
Di(2-ethylhexyl)phthalate	ug/L	NT
Di-n-Butylphthalate	ug/L	NT

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Installation & Layout Drawings and Bill(s) of Materials — Section 5.

5.1 Installation & Layout Drawing List - Primary Sedimentation Tank 1-3

5.2 Installation & Layout Drawing List - Grit Tank 1-3

5.3 Bill(s) of Materials - Primary Sedimentation Tank 1-3

5.4 Bill(s) of Materials - Grit Tank 1-3

5.5 Bill(s) of Materials – Spare Parts

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5.1 Installation & Layout Drawing List - Primary Sedimentation Tank 1-3

SHEET NO.		DESCRIPTION
WGZ0067001	-01	-DRAWING LIST
WGZ0067001	-02	-GENERAL NOTES, SCHEDULES, LEGENDS
WGZ0067001	-03	-PLAN VIEW
WGZ0067001	-04	-ELEVATION A-A: LONGITUDINAL COLLECTOR - DRIVE SIDE
WGZ0067001	-05	-ELEVATION A-A: LONGITUDINAL COLLECTOR - DRIVE SIDE
WGZ0067001	-06	-ELEVATION B-B: LONGITUDINAL COLLECTOR - NON-DRIVE SIDE
WGZ0067001	-07	-SECTION C-C: HEAD SHAFT & LOWER IDLER
WGZ0067001	-08	-SECTION D-D: UPPER RETURN RAIL
WGZ0067001	-09	-SECTION E-E: UPPER IDLER & LOWER RETURN RAIL
WGZ0067001	-10	-SECTION F-F: TAIL SHAFT
WGZ0067001	-11	-ELEVATION G-G: CROSS COLLECTOR
WGZ0067001	-12	-CROSS COLLECTOR SECTIONS
WGZ0067001	-13	-DETAIL SHEET: DETAILS 1-5
WGZ0067001	-14	-DETAIL SHEET: DETAILS 6-8
WGZ0067001	-15	-DETAIL SHEET: DETAILS 9-11
WGZ0067001	-16	-EXPLODED VIEW: WALL BRACKET AT COLUMNS
WGZ0067001	-17	-DETAIL SHEET: KNEE WALL BRACKET
WGZ0067001	-18	-DETAIL SHEET: LONGITUDINAL HEAD SHAFT
WGZ0067001	-19	-DETAIL SHEET: CROSS COLLECTOR HEAD SHAFT
WGZ0067001	-20	-DETAIL SHEET: FLIGHT ASSEMBLY & STUB SHAFT INSTALLATION
WGZ0067001	-21	-DETAIL SHEET: WEAR STRIP INSTALLATION
WGZ0067001	-22	-DRIVE UNIT LAYOUT: LONGITUDINAL & CROSS PLAN VIEWS - TANK T-211 & T-213
WGZ0067001	-23	-DRIVE UNIT LAYOUT: LONGITUDINAL & CROSS SECTIONS & ELEVATIONS
WGZ0067001	-24	-DRIVE UNIT LAYOUT: CROSS TANK T-211 & T-213 - SECTION
WGZ0067001	-25	-DRIVE UNIT LAYOUT: LONGITUDINAL & CROSS PLAN VIEWS - TANK T-212
WGZ0067001	-26	-DRIVE UNIT LAYOUT: CROSS TANK T-212 - SECTION

INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3, BRITISH COLUMBIA CANADA
SIX (6)- FOUR (4) SHAFT LONGITUDINAL & THREE (3) THREE (3) SHAFT CROSS COLLECTION SYSTEMS

INSTALLATION AND LAYOUT DRAWING LIST

SHEET NO.	DESCRIPTION
WGZ0067001 -01	-DRAWING LIST
WGZ0067001 -02	-GENERAL NOTES, SCHEDULES, LEGENDS
WGZ0067001 -03	-PLAN VIEW
WGZ0067001 -04	-ELEVATION A-A: LONGITUDINAL COLLECTOR - DRIVE SIDE
WGZ0067001 -05	-ELEVATION A-A: LONGITUDINAL COLLECTOR - DRIVE SIDE
WGZ0067001 -06	-ELEVATION B-B: LONGITUDINAL COLLECTOR - NON-DRIVE SIDE
WGZ0067001 -07	-SECTION C-C: HEAD SHAFT & LOWER IDLER
WGZ0067001 -08	-SECTION D-D: UPPER RETURN RAIL
WGZ0067001 -09	-SECTION E-E: UPPER IDLER & LOWER RETURN RAIL
WGZ0067001 -10	-SECTION F-F: TAIL SHAFT
WGZ0067001 -11	-ELEVATION G-G: CROSS COLLECTOR
WGZ0067001 -12	-CROSS COLLECTOR SECTIONS
WGZ0067001 -13	-DETAIL SHEET: DETAILS 1-5
WGZ0067001 -14	-DETAIL SHEET: DETAILS 6-8
WGZ0067001 -15	-DETAIL SHEET: DETAILS 9-11
WGZ0067001 -16	-EXPLODED VIEW: WALL BRACKET AT COLUMNS
WGZ0067001 -17	-DETAIL SHEET: KNEE WALL BRACKET
WGZ0067001 -18	-DETAIL SHEET: LONGITUDINAL HEAD SHAFT
WGZ0067001 -19	-DETAIL SHEET: CROSS COLLECTOR HEAD SHAFT
WGZ0067001 -20	-DETAIL SHEET: FLIGHT ASSEMBLY & STUB SHAFT INSTALLATION
WGZ0067001 -21	-DETAIL SHEET: WEAR STRIP INSTALLATION
WGZ0067001 -22	-DRIVE UNIT LAYOUT: LONGITUDINAL & CROSS PLAN VIEWS - TANK T-211 & T-213
WGZ0067001 -23	-DRIVE UNIT LAYOUT: LONGITUDINAL & CROSS SECTIONS & ELEVATIONS
WGZ0067001 -24	-DRIVE UNIT LAYOUT: CROSS TANK T-211 & T-213 - SECTION
WGZ0067001 -25	-DRIVE UNIT LAYOUT: LONGITUDINAL & CROSS PLAN VIEWS - TANK T-212
WGZ0067001 -26	-DRIVE UNIT LAYOUT: CROSS TANK T-212 - SECTION

ENGINEERS & GEOSCIENTISTS OF
BRITISH COLUMBIA PERMIT TO PRACTICE
#1003607

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — T. G. WICKIE # 41049

February 12, 2024

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21230798.000

LIMITED TO STRUCTURAL DESIGN ONLY

REV	DATE	DESCRIPTION	BY
4	05 Feb 24	SEE SHEETS: -03	RHP
3	15 Jan 24	SEE SHEETS: -03, -23, -24 AND -26	RHP
2	13 Dec 23	SEE SHEETS: -02 THRU -14, -18 THRU -26	RHP
1	29 Sep 23	ISSUED FOR REVIEW	RHP

PROJECT REVISION SCHEDULE

REV	DESCRIPTION
△	

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DRAWING LIST

SCALE	SHEET	DRAWING NUMBER	REV
NTS	01 of 26	WGZ0067001 – 01	04

Rev 01

GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS PRIOR TO INSTALLATION OF EQUIPMENT. THESE DRAWINGS ARE TO BE USED IN CONJUNCTION WITH THE APPROVED OPERATION AND MAINTENANCE MANUAL.

2. BILL OF MATERIAL IS FOR ONE (1) TANK EACH CONSISTING OF TWO (2) LONGITUDINAL COLLECTORS & ONE (1) CROSS COLLECTOR.

3. LOCATE ALL EQUIPMENT FROM THEORETICAL TANK CENTER LINE.
   INSTALLATION TOLERANCES: SPROCKETS MUST BE LEVEL & PARALLEL TO EACH OTHER WITHIN ± 1/16" & PARALLEL TO THEORETICAL TANK CENTERLINE. STUB SHAFT/SPINDLE AXIS MUST ALIGN WITH ONE ANOTHER AND BE PERPENDICULAR TO THE THEORETICAL CENTERLINE WITHIN ± 1/16. FLIGHT ATTACHMENT LINK CENTER DISTANCE MUST BE WITHIN ± 1/16".

4. ANCHOR BOLTS FURNISHED PER BILL OF MATERIAL, INSTALLED BY CONTRACTOR 2

5. ALL GROUT TO BE NON-SHRINK, 3,000 PSI MIN, FURNISHED & INSTALLED BY THE CONTRACTOR AFTER FINAL ADJUSTMENT & ALIGNMENT OF EQUIPMENT HAS BEEN VERIFIED BY POLYCHEM SYSTEMS. 2

6. INSTALL DRIVE CHAIN TENSIONER ASSEMBLIES AFTER FINAL INSTALLATION & ALIGNMENT OF NH-78 DRIVE & DRIVEN SPROCKETS & DRIVE CHAIN.

7. LUBRICATE BEARING SLEEVE OF DRIVE UNIT AND COAT INPUT SHAFT WITH ANTI-SEIZE (BY CONTRACTOR) PRIOR TO INSTALLATION. 2

8. COAT ALL STAINLESS STEEL TO STAINLESS STEEL FASTENERS WITH AN ANTI-SEIZE COMPOUND BY CONTRACTOR APPLIED PER MFG'S INSTRUCTIONS. 2

9. LOCATE & MARK ANCHOR LOCATIONS AS SHOWN.

10. CHECK LOCATIONS WITH TEST FIT OF EQUIPMENT TO BE INSTALLED, ADJUST POSITION IF NECESSARY, THEN DRILL AS SHOWN IN SCHEDULE. IF INTERFERENCE OR DISCREPANCY IS ENCOUNTERED, CONTACT POLYCHEM SYSTEMS BEFORE INSTALLING ADDITIONAL EQUIPMENT.

11. INSTALL CHAIN GUARDS & TAKE-UP ASSEMBLIES AFTER INSTALLING DRIVE UNITS, ALIGN DRIVE AND TAKE-UP SPROCKETS WITH DRIVEN SPROCKETS ON HEAD SHAFTS.

12. ELEVATIONS SHOWN ON THESE DRAWINGS ARE FOR REFERENCE ONLY. IN CASES WHERE CLEARANCES ARE CRITICAL THE DIMENSION SHALL SERVE AS A MINIMUM REQUIREMENT FROM THE HIGHEST POINT ACROSS THE TANK WIDTH AND FROM THE FURTHEST POINT LONGITUDINALLY FOR THE LOWER IDLER AND THE CLOSEST POINT LONGITUDINALLY FOR THE TAIL SHAFT. +/- DIMENSIONS ARE APPROXIMATE AND COULD VARY THROUGHOUT THE TANK UPON FINAL ADJUSTMENTS. THEY SHOULD NOT BE USED TO INSTALL EQUIPMENT EXCEPT AT LOWER IDLER OR TAILS HAFT WHERE THE +/- IS SUPPLIED TO ALLOW MOVEMENT FOR ALIGNMENT WITH THE OPPOSITE SIDE IDLER. 2

13. ORIENTATION CRITICAL FOR COLLECTOR CHAIN, DRIVE CHAIN, WEAR STRIP, AND MANY OTHER COMPONENTS. REFER TO PERTINENT COMPONENT DRAWINGS PRIOR TO INSTALLATION.

14. RETURN RAILS ARE TO BE FIELD DRILLED AND CUT TO LENGTH AS REQUIRED.

15. CONTRACTOR IS RESPONSIBLE FOR FIELD MODIFYING CHAIN GUARD COVERS, AT APPROPRIATE LOCATIONS, TO ACCOMMODATE INGRESS AND/OR EGRESS OF ELECTRICAL WIRING.

16. DIMENSIONS ARE IN FEET - INCHES AND ARE CONSIDERED TYPICAL FOR ALL TANKS UON.

17. BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UON.

18. THIS INSTALLATION & LAYOUT SET DOCUMENTS TANK STRUCTURE DIMENSIONS BY TANK VIA TABLES ON APPLICABLE SHEETS. FOR ALL STRUCTURE DIMENSIONS NOT INCLUDED IN TABLES, BRENTWOOD HAS REVIEWED TANKS 1-3 FIELD MEASUREMENT/SCAN DATA TO DETERMINE THE NOMINAL STRUCTURE DIMENSIONS SHOWN IN THIS INSTALLATION AND LAYOUT DRAWING SET. EQUIPMENT IS DESIGNED TO SUIT THE RANGE OF ACTUAL CONFIRMED DIMENSIONS.

19. WHEREVER NEW CONCRETE IS SPECIFIED TO BE APPLIED TO EXISTING, SUBMERGED CONCRETE STRUCTURES, CONTRACTOR SHALL CHIP AWAY OR OTHERWISE REMOVE APPROXIMATELY 1" OF EXISTING CONCRETE SURFACE TO PROVIDE SOUND CONCRETE TO BED NEW CONCRETE ON. 2

20. REFER TO SHEET-21 FOR WEAR STRIP FLOOR ANCHOR INSTALLATION. 2

ABBREVIATIONS

APPROX	APPROXIMATE
BOM	BILL OF MATERIALS
BRKT	BRACKET
BRG	BEARING
CL	CENTERLINE
DIST	DISTANCE
DIM	DIMENSION
EL	ELEVATION
EQPT	EQUIPMENT
FL	FLOOR
FLT	FLIGHT
FMM	FLT MISALIGNMENT MONITORING
ft/m	FEET PER MINUTE
HDSFT	HEAD SHAFT
LONG	LONGITUDINAL
MAX	MAXIMUM
MIN	MINIMUM
MTG	MOUNTING
OPNG	OPENING
OPP	OPPOSITE
SMM	SPRKT MOTION MONITORING
SPRKT	SPROCKET
TLSFT	TAIL SHAFT
THRU	THROUGH
TOD	TOP OF DECK
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
WL	WATER LEVEL
WS	WEAR STRIP
CTR	CONTRACTOR

BILL OF MATERIALS

BOM #	DESCRIPTION
WGZ0067001	PRIMARY TANK 1
WGZ0067002	PRIMARY TANK 2
WGZ0067003	PRIMARY TANK 3
WGZ0067007	SPARE PARTS

LEGEND

SYMBOL	DESCRIPTION
L	ANCHOR TYPE CALLOUT
@	AT
#	BOM ITEM CALLOUT
	GRID DATUM
# XX	DETAIL CALLOUT
# VIEW TITLE XX SCALE:	DRAWING LABEL DRAWING NUMBER(S) WHERE TAKEN
#	FLAG NOTE - SEE NOTE THAT SHEET
	FLOOR SLOPE - TO LONG LINES
MAX WL XX.XX	MAXIMUM WATER LEVEL EL
(DIM)	REFERENCE DIMENSION
<DIM>	DIMENSION REQUIRES VERIFICATION/CONFIRMATION
#	REVISION CALLOUT
# VIEW	VIEW CALLOUT
	CONCRETE
	GROUT
	STEEL
#	DATUM
W/	WITH

2 20

ADHESIVE ANCHOR SCHEDULE

SYM.	ANCHOR SIZE	DRILL SIZE	EMBED	PROJ	MIN EDGE DIST	BOM ITEM
A	1"	1 1/8"	6"	5 1/2"	5"	19
B	1/2"	9/16"	4"	4"	2 1/2"	27
C	1/2"	9/16"	4"	1 3/4"	2 1/2"	47
D	3/8"	7/16"	3"	1 3/4"	1 7/8"	52
E	5/8"	3/4"	THRU	6"	3 1/8"	61
F	3/4" \ 1 1/8"	1 1/4"	6"	0"	5 5/8"	74

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA T. G. WICKIE # 41049

February 12, 2024

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ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

REV	DESCRIPTION
2	NOTES AND CALLOUTS UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

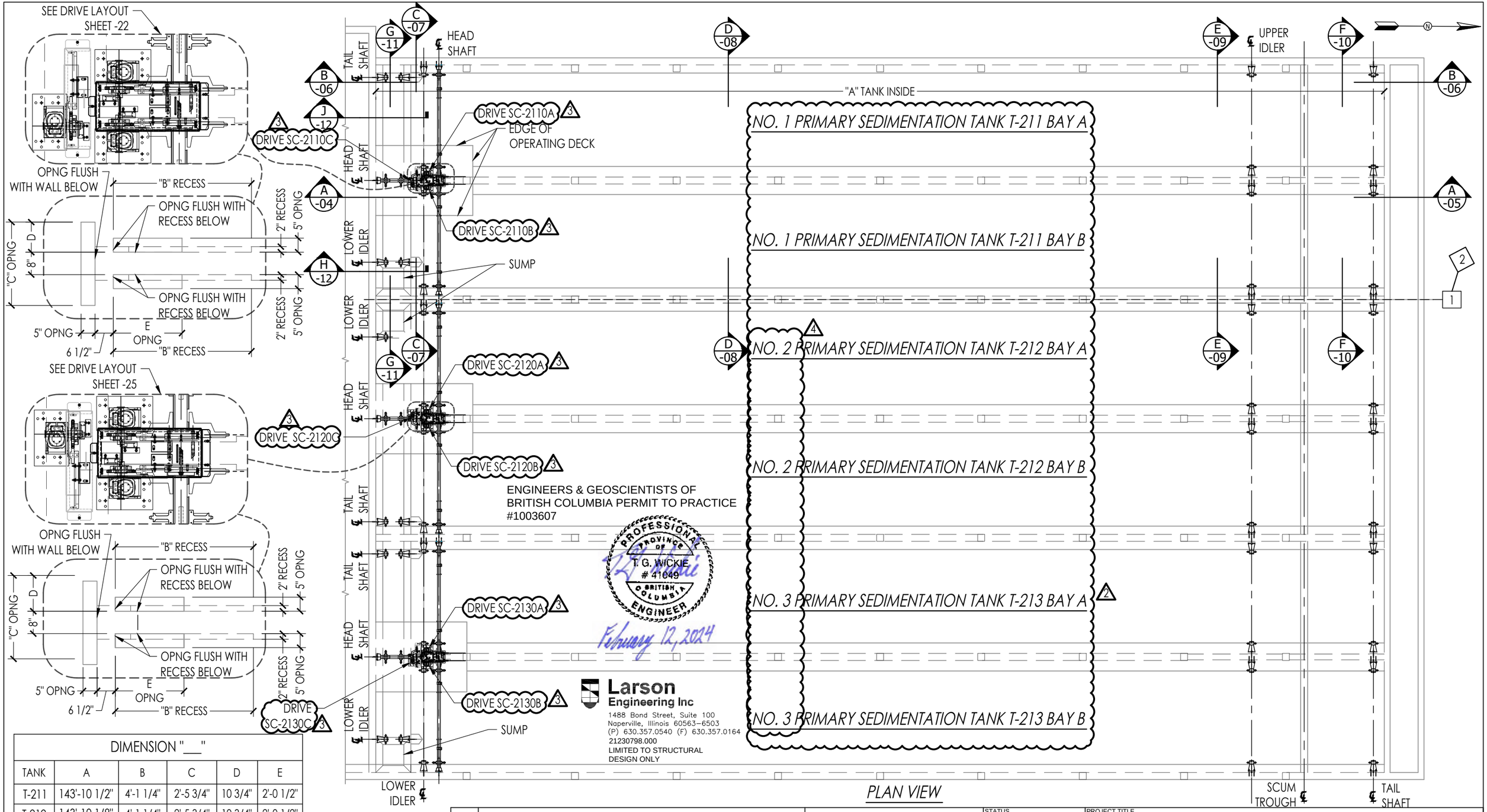
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	GENERAL NOTES, SCHEDULES, LEGENDS

SCALE	SHEET	DRAWING NUMBER	REV
NTS	02 of 26	WGZ0067001 – 02	04

Rev 01



PLAN VIEW

DIMENSION "___"					
TANK	A	B	C	D	E
T-211	143'-10 1/2"	4'-1 1/4"	2'-5 3/4"	10 3/4"	2'-0 1/2"
T-212	143'-10 1/8"	4'-1 1/4"	2'-5 3/4"	10 3/4"	2'-0 1/2"
T-213	144'-0"	3'-11"	2'-6"	11"	2'-1"

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. TANK T-211 IS SIMILAR TO TANK T-213 UON. TANK T-211 IS SIMILAR TO TANK T-212, MIRRORED ABOUT DATUM 1, UON.

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PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA T. G. WICKIE # 41049

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REV	DESCRIPTION
4.	TANK TAG NUMBERS UPDATED PER REVIEW COMMENTS BY ENGINEER
3.	ALL DRIVES TAG NUMBERS UPDATED PER REVIEW COMMENTS BY ENGINEER
2.	TANK TAG NUMBERS UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

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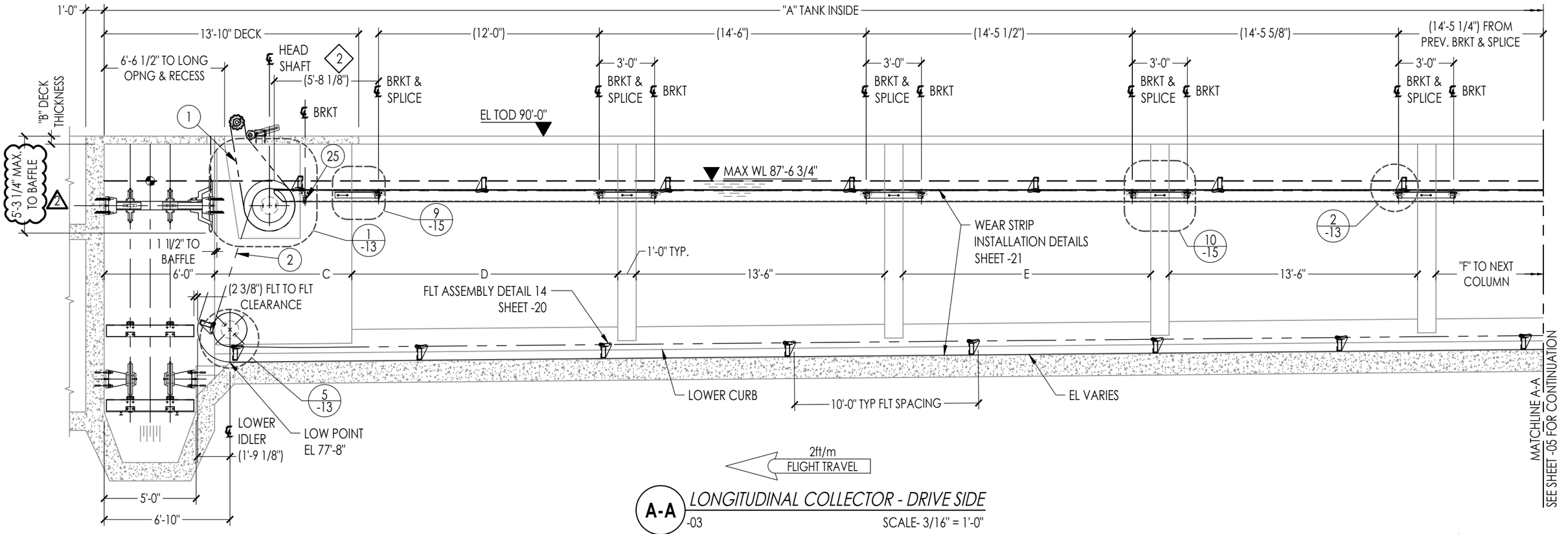
STATUS: ISSUED FOR INSTALLATION
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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	PLAN VIEW

SCALE	SHEET	DRAWING NUMBER	REV
5/64" = 1'-0"	03 of 26	WGZ0067001 – 03	04



DIMENSION "___"						
TANK	A	B	C	D	E	F
T-211	143'-10 1/2"	5 1/4"	7'-5 1/2"	14'-5 7/16"	13'-5 1/2"	13'-5 11/16
T-212	143'-10 1/8"	5 1/4"	7'-5 1/2"	14'-5 7/16"	13'-5 1/2"	13'-5 11/16
T-213	144'-0"	6"	7'-6"	14'-6"	13'-6"	13'-6"

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. USE LEFTOVER PIECE OF RETURN RAIL FROM START (AT UPPER IDLER) TO COMPLETE.

REV	DESCRIPTION
2	DIMENSION UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049

February 12, 2024

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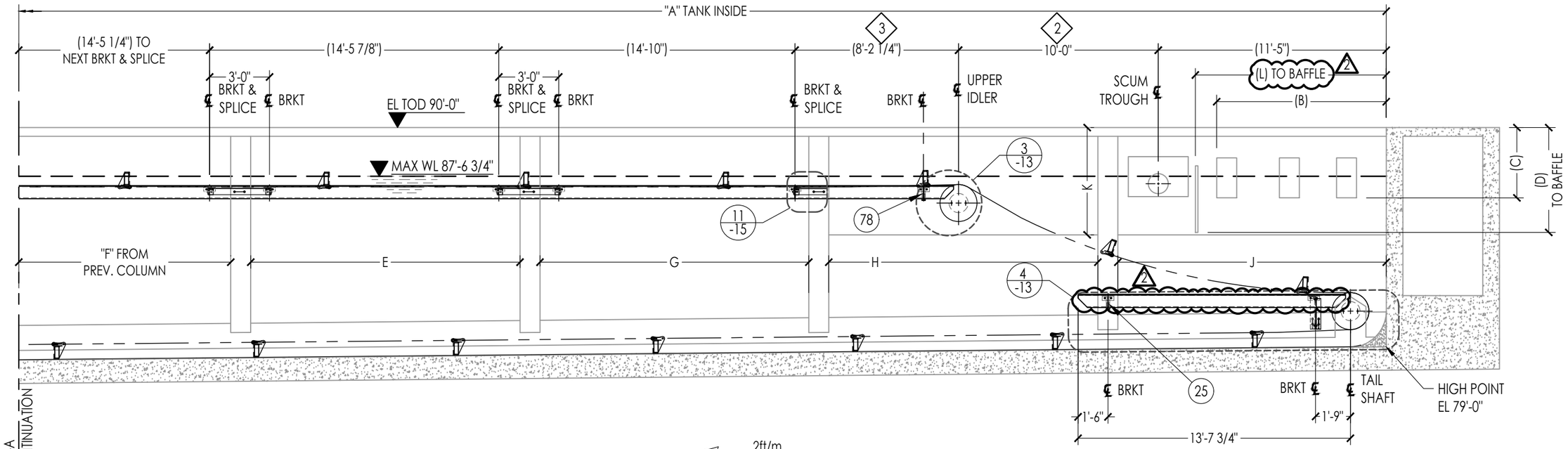
STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	ELEVATION A-A: LONGITUDINAL COLLECTOR - DRIVE SIDE

SCALE	SHEET	DRAWING NUMBER	REV
3/16" = 1'-0"	04 of 26	WGZ0067001 – 04	04



A-A LONGITUDINAL COLLECTOR - DRIVE SIDE

-03 SCALE- 3/16" = 1'-0"

DIMENSION "___"											
TANK	A	B	C	D	E	F	G	H	J	K	L
T-211	143'-10 1/2"	8'-5 7/8"	3'-6 1/4"	5'-3"	13'-5 13/16"	13'-5 11/16"	13'-5 1/2"	13'-5 11/16"	13'-6 5/16"	5'-4 1/2"	9'-6 11/16"
T-212	143'-10 1/8"	8'-5 7/8"	3'-6 1/4"	5'-3"	13'-5 13/16"	13'-5 11/16"	13'-5 1/2"	13'-6 1/4"	13'-6 5/16"	5'-4 1/2"	9'-6 11/16"
T-213	144'-0"	8'-5 7/8"	3'-6 1/4"	5'-3"	13'-6"	13'-6"	13'-6"	13'-6"	13'-6"	5'-6"	9'-6 11/16"

2 2

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. THE EXISTING UPPER IDLER WAS LOCATED AT 12'-2 1/2" FROM THE SCUM TROUGH. BRENTWOOD HAS RE-LOCATED THE UPPER IDLER CLOSER TO THE SCUM TROUGH. SCUM REMOVAL/PROCESSING SHALL BE THE RESPONSIBILITY OF OTHERS.
3. USE LEFTOVER RAIL TO COMPLETE RETURN RAIL AT HEADSHAFT.

REV	DESCRIPTION
2	LOWER RETURN RAIL LEVELLED HORIZONTAL IN LIEU OF PARELLEL TO FLOOR
2	TANK 3 DIMENSION B, C & D ADDED, COLUMN "L" ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	ELEVATION A-A: LONGITUDINAL COLLECTOR - DRIVE SIDE

SCALE	SHEET	DRAWING NUMBER	REV
3/16" = 1'-0"	05 of 26	WGZ0067001 – 05	04

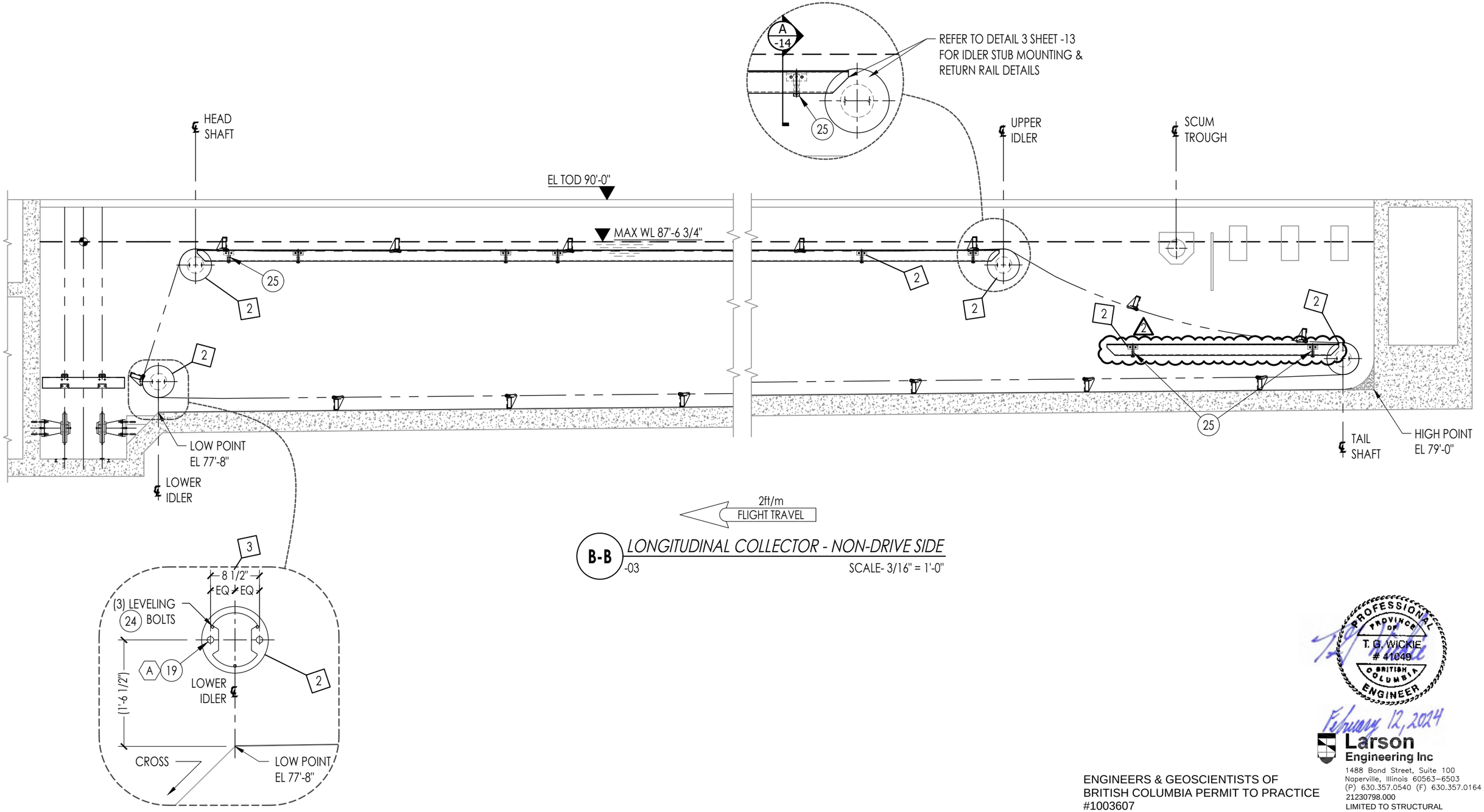
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February 12, 2024

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Rev 01



2ft/m
FLIGHT TRAVEL

B-B *LONGITUDINAL COLLECTOR - NON-DRIVE SIDE*
-03 SCALE- 3/16" = 1'-0"

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. EQUIPMENT MOUNTING LOCATION TO MATCH DRIVE SIDE OF THE TANK.
3. FOR NON-DRIVE SIDE LOWER IDLER LOCATIONS, STUB SHAFTS CAN BE ORIENTED WITH ANCHORS POSITIONED AT 0 OR 90 DEGREES. REFER TO SECTION VIEW C-C ON SHEET -07 FOR REQUIREMENTS OF ROTATING STUB SHAFTS AT ADJACENT WALLS. 2

REV	DESCRIPTION
2	LOWER RETURN RAIL LEVELLED HORIZONTAL IN LIEU OF PARELLEL TO FLOOR, NOTE UPDATED

SHEET REVISIONS

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PROJECT TITLE
INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

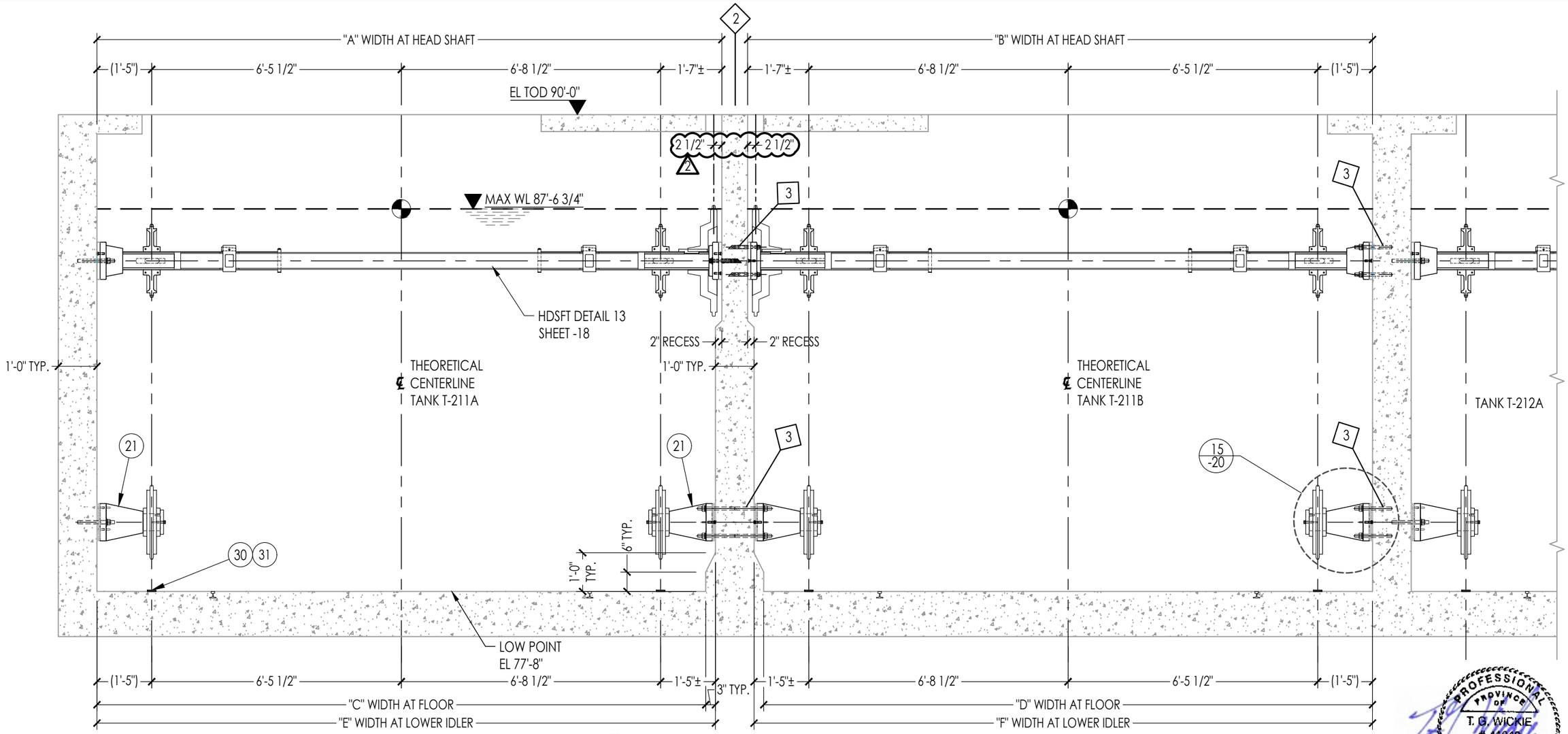
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	ELEVATION B-B: LONGITUDINAL COLLECTOR - NON-DRIVE SIDE

SCALE	SHEET	DRAWING NUMBER	REV
3/16" = 1'-0"	06 of 26	WGZ0067001 – 06	04

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41049
February 12, 2024

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#1003607



C-C *HEAD SHAFT & LOWER IDLER*

-03 SCALE- 3/8" = 1'-0"

DIMENSION "___"						
TANK	A	B	C	D	E	F
T-211	16'-1 11/16"	16'-1 3/8"	15'-9"	15'-8 19/32"	15'-11 27/32"	15'-11 3/8"
T-212	16'-1 3/8"	16'-2 3/16"	15'-9 21/32"	15'-9 11/32"	16'-0 1/4"	16'-0 1/32"
T-213	16'-2"	16'-2"	15'-9"	15'-9"	16'-0"	16'-0"

NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. DRIVES NOT SHOWN FOR CLARITY.
3. ROTATE ANCHORS 90° THIS SIDE TO AVOID INTERFERENCE.
4. FOR HEAD SHAFT AND IDLER ELEVATION SEE SHEET 13. 2

REV	DESCRIPTION
2	NOTES AND DIMENSIONS ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	SECTION C-C: HEAD SHAFT & LOWER IDLER

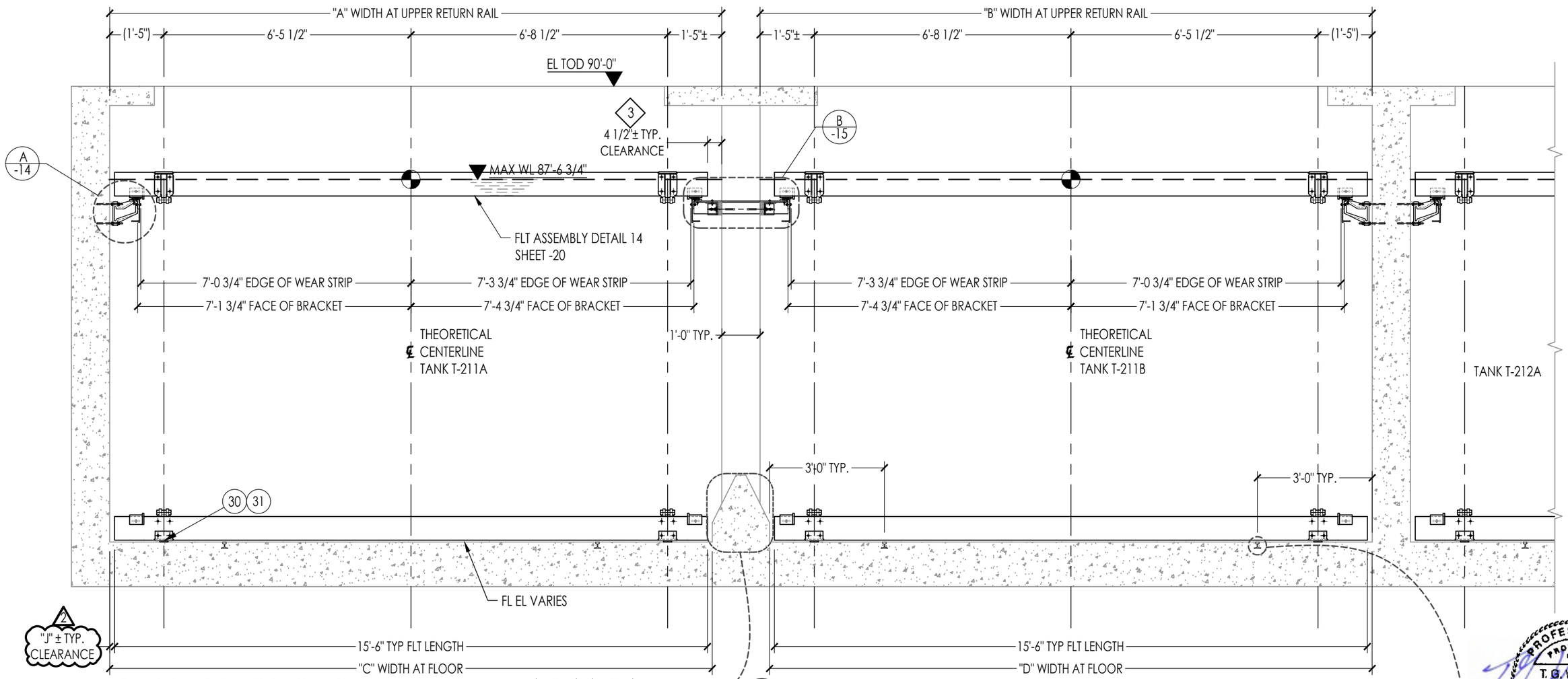
SCALE	SHEET	DRAWING NUMBER	REV
3/8" = 1'-0"	07 of 26	WGZ0067001 – 07	04

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049

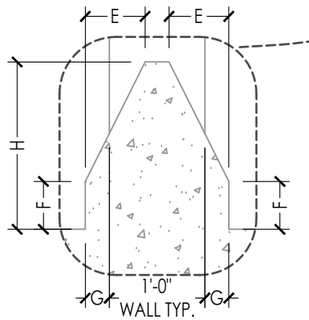
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2	DIMENSION "J"		
TANK	NOMINAL	MAXIMUM	MINIMUM
T-211A	1 1/2"	1 23/32"	1 1/2"
T-211B	1 1/2"	1 1/2"	1 5/16"
T-212A	1 1/2"	1 13/16"	1 1/2"
T-212B	1 1/2"	1 7/8"	1 1/2"
T-213A	1 1/2"	1 1/2"	1 1/2"
T-213B	1 1/2"	1 1/2"	1 1/2"



D-D *UPPER RETURN RAIL*
-03 SCALE- 3/16" = 1'-0"

DIMENSION "___"								
TANK	A	B	C	D	E	F	G	H
T-211	16'-1 23/32"	16'-1 1/16"	15'-9"	15'-9"	7 1/4"	6 1/4"	2 3/4"	1'-10"
T-212	15'-11 3/4"	15'-11 1/8"	15'-10"	15'-9 3/4"	7 1/4"	6"	2 3/4"	1'-10"
T-213	16'-0"	16'-0"	15'-9"	15'-9"	7 1/2"	6"	3"	1'-9"

T-RAIL PROJECTION
2

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February 12, 2024

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21230798.000
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ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. EXISTING T-RAILS WERE CONFIRMED TO BE FLUSH WITH THE TANK FLOOR AND THEREFORE REPRESENT A NON-ISSUE WITH BRENTWOOD'S EQUIPMENT. SHOULD THEY PROJECT ABOVE THE TANK FLOOR AT ANY LOCATION, CONTRACTOR TO GRIND FLUSH.
3. TANK STRUCTURE DOES NOT INCLUDE AN UPPER CURB, TO ALIGN WITH THE LOWER CURB BELOW. PROCESS SKIMMING INNEFFICIENCIES AS A RESULT OF A LARGER FLIGHT GAP ALONG THE LENGTH OF THE TANK SHALL BE THE RESPONSIBILITY OF OTHERS.

REV	DESCRIPTION
2	FLIGHT CLEARANCE TABLE ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

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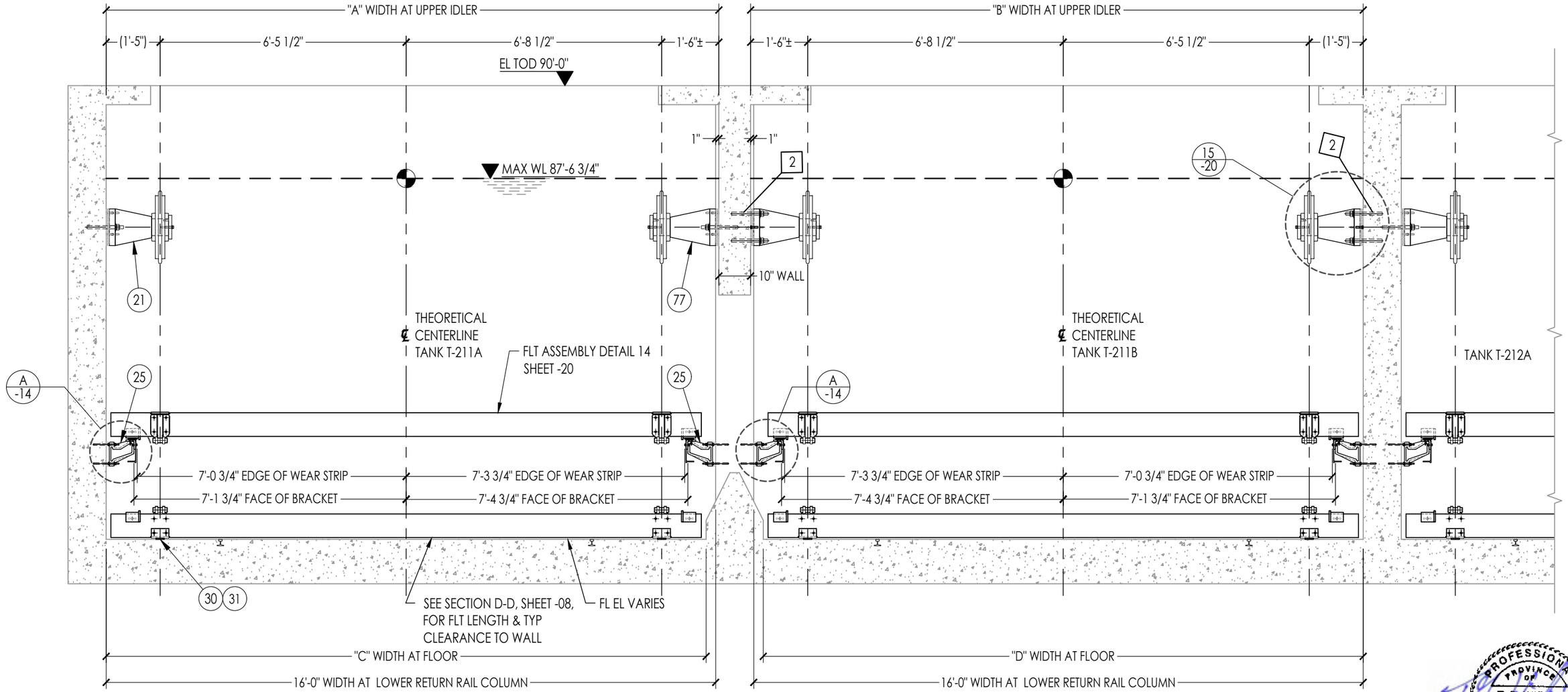
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PROJECT TITLE
INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	SECTION D-D: UPPER RETURN RAIL

SCALE	SHEET	DRAWING NUMBER	REV
3/8" = 1'-0"	08 of 26	WGZ0067001 – 08	04



E-E *UPPER IDLER & LOWER RETURN RAIL*
-03 SCALE- 3/16" = 1'-0"

DIMENSION "___"				
TANK	A	B	C	D
T-211	16'-1 23/32"	16'-1 1/16"	15'-9"	15'-9"
T-212	16'-1 23/32"	16'-1 1/16"	15'-9 9/16"	15'-9 5/8"
T-213	16'-1"	16'-1"	15'-9"	15'-9"

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. ROTATE ANCHORS 90° THIS SIDE TO AVOID INTERFERENCE.
3. FOR IDLER ELEVATION SEE SHEET 13. 2

REV	DESCRIPTION
2	NOTE ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049

February 12, 2024

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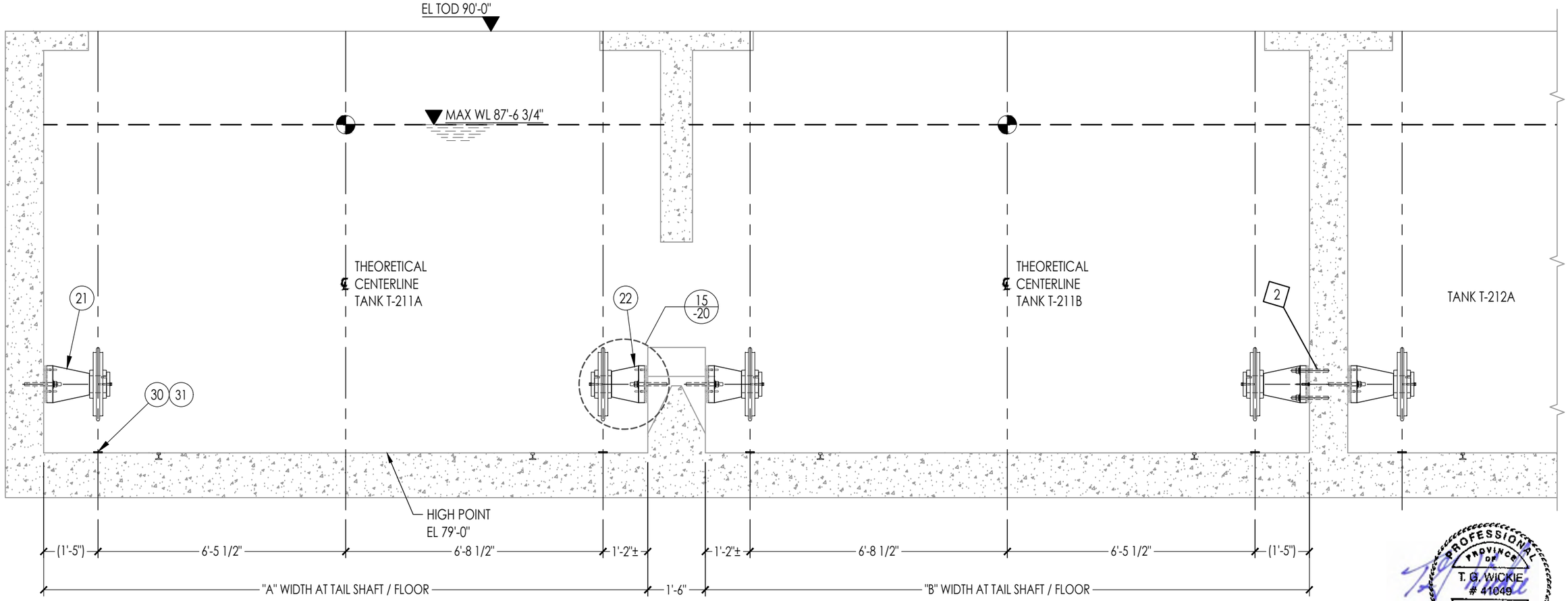
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	SECTION E-E: UPPER IDLER & LOWER RETURN RAIL

SCALE	SHEET	DRAWING NUMBER	REV
3/8" = 1'-0"	09 of 26	WGZ0067001 – 09	04

Rev 01



F-F *TAIL SHAFT*
-03 SCALE- 3/16" = 1'-0"

DIMENSION "___"		
TANK	A	B
T-211	15'-9 7/16"	15'-9"
T-212	15'-9"	15'-9"
T-213	15'-9"	15'-9"

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. ROTATE ANCHORS 90° THIS SIDE TO AVOID INTERFERENCE.
3. FOR TAIL SHAFT ELEVATION SEE SHEET 13. 2

REV	DESCRIPTION
2	NOTE ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

T. G. WICKIE
41049
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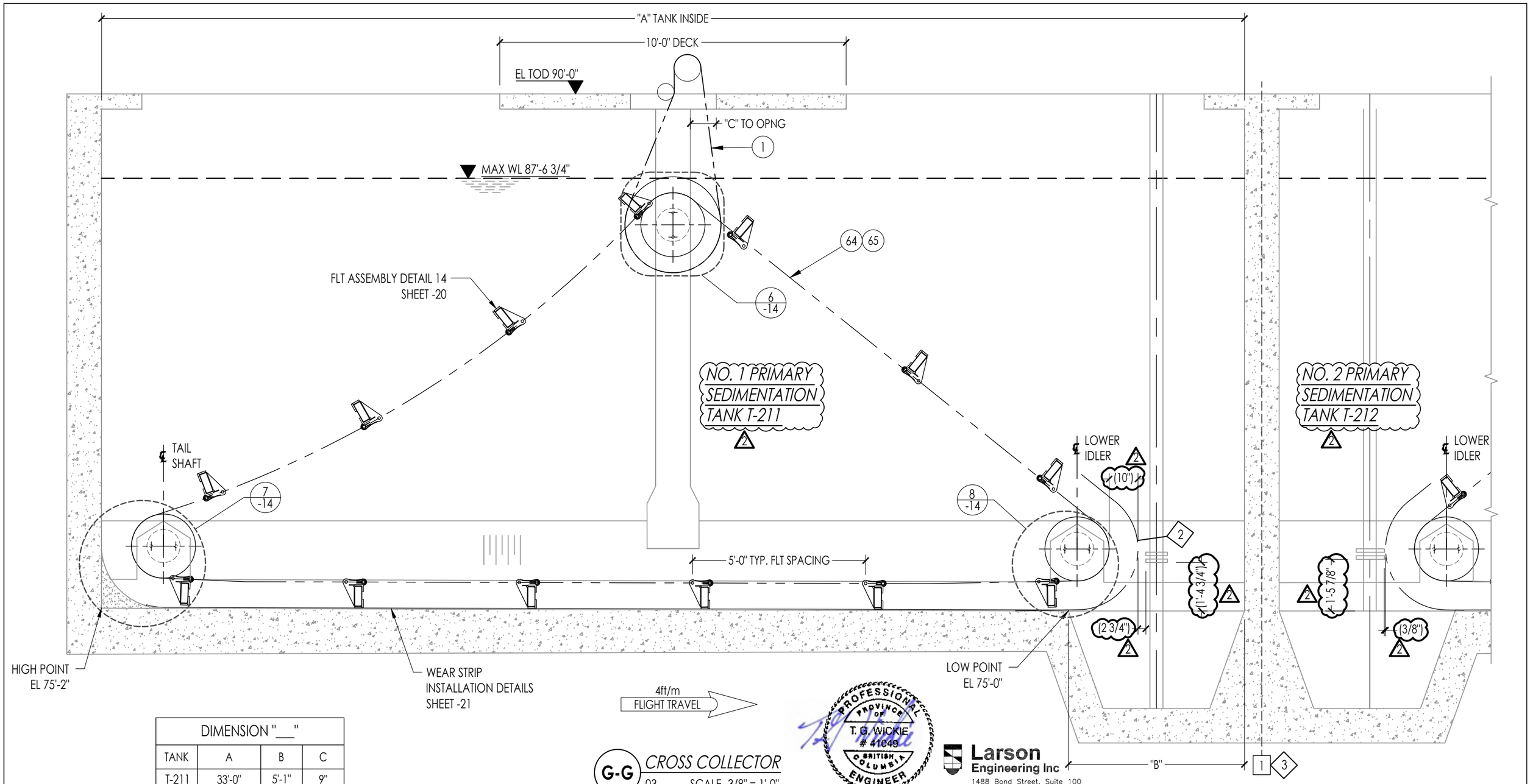
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	SECTION F-F: TAIL SHAFT

SCALE	SHEET	DRAWING NUMBER	REV
3/8" = 1'-0"	10 of 26	WGZ0067001 – 10	04

Rev 01



DIMENSION "___"			
TANK	A	B	C
T-211	33'-0"	5'-1"	9"
T-212	33'-0 29/32"	5'-1"	8 3/4"
T-213	33'-0"	5'-0"	9"

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. ANY NON-CHAIN & FLT EQUIPMENT PAST THIS POINT WILL DAMAGE SYSTEM.
3. TANK T-211 IS SIMILAR TO TANK T-213 UON. TANK T-211 IS SIMILAR TO TANK T-212, MIRRORED ABOUT DATUM 1, UON.

G-G -03 *CROSS COLLECTOR* SCALE- 3/8" = 1'-0"

PROFESSIONAL ENGINEER
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REV	DESCRIPTION
2	PIPING & DIMENSION ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

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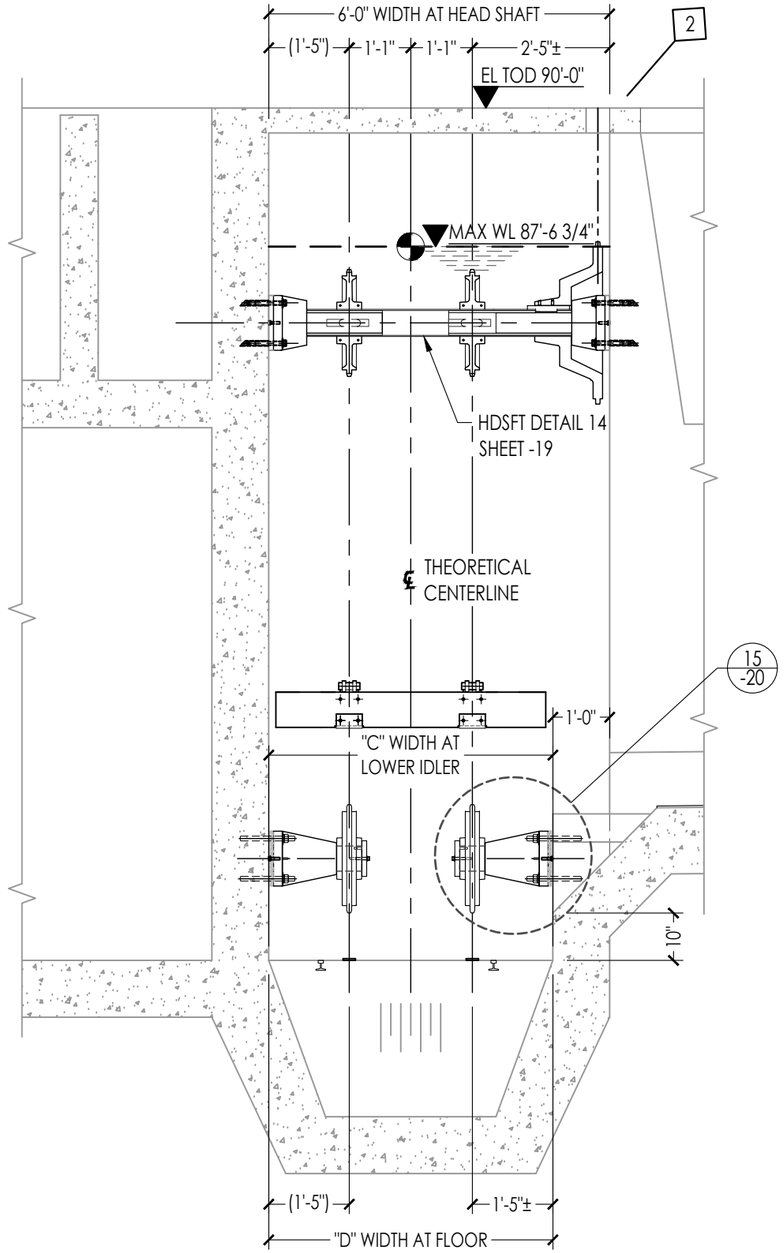
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PROJECT TITLE
INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

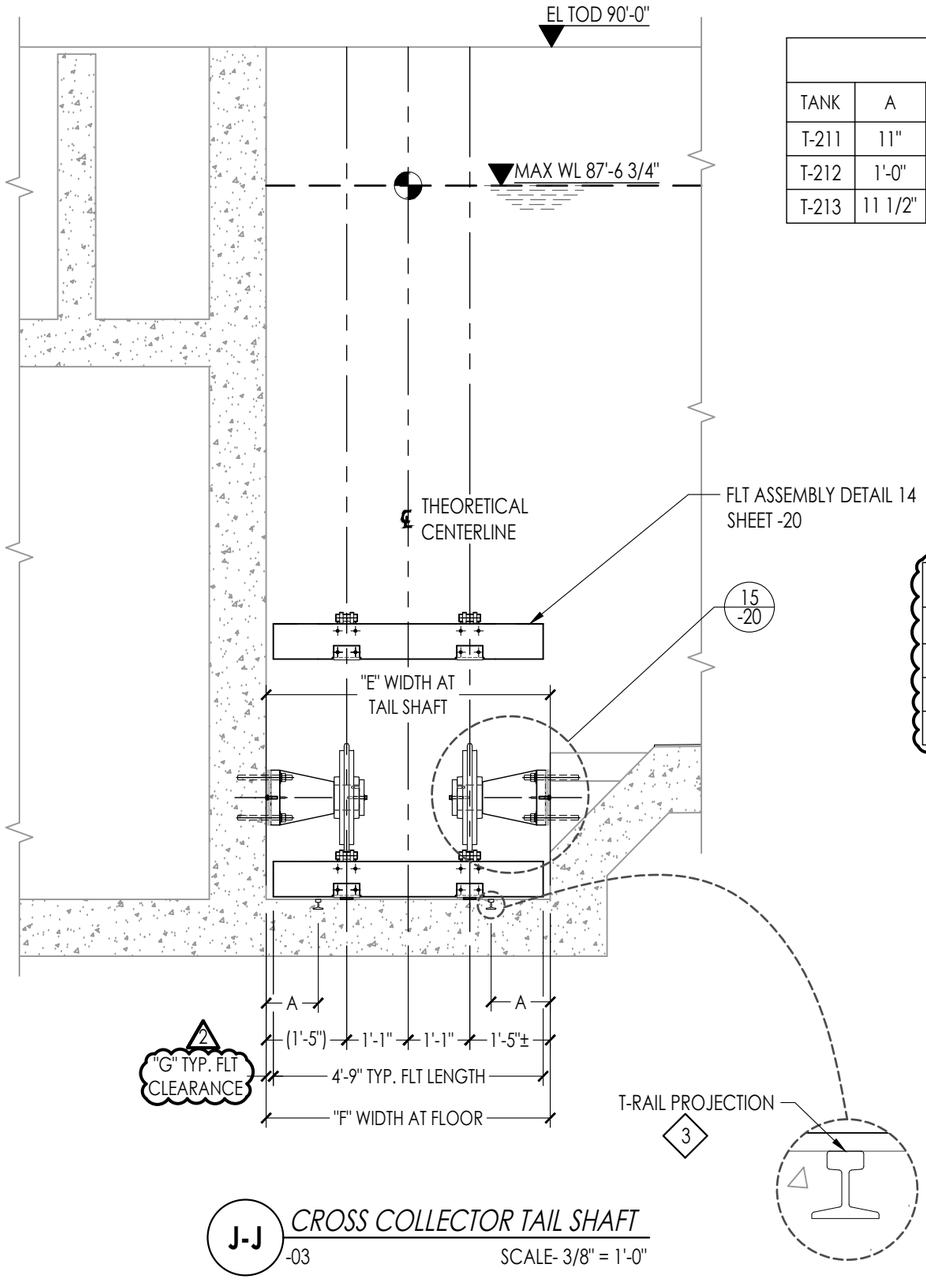
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	ELEVATION G-G: CROSS COLLECTOR

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	11 of 26	WGZ0067001 – 11	04



H-H *CROSS COLLECTOR HEAD SHAFT & LOWER IDLER*

-03 SCALE- 3/8" = 1'-0"



J-J *CROSS COLLECTOR TAIL SHAFT*

-03 SCALE- 3/8" = 1'-0"

DIMENSION "___"						
TANK	A	B	C	D	E	F
T-211	11"	1'-0 1/2"	5'-0 9/32"	4'-11 1/2"	5'-0"	4'-11 5/8"
T-212	1'-0"	11"	4'-11 1/2"	4'-11 1/2"	5'-0"	4'-11 5/8"
T-213	11 1/2"	1'-0 1/8"	5'-0"	5'-0"	5'-0"	5'-0"

2

DIMENSION "G"			
TANK	NOMINAL	MAXIMUM	MINIMUM
T-211	1 1/2"	1 5/8"	1 1/4"
T-212	1 1/2"	1 1/2"	1 1/4"
T-213	1 1/2"	1 1/2"	1 1/2"

NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. DRIVES NOT SHOWN FOR CLARITY.
3. EXISTING T-RAILS WERE CONFIRMED TO BE FLUSH WITH THE TANK FLOOR AND THEREFORE REPRESENT A NON-ISSUE WITH BRENTWOOD'S EQUIPMENT. SHOULD THEY PROJECT ABOVE THE TANK FLOOR AT ANY LOCATION, CONTRACTOR TO GRIND FLUSH.
4. FOR HEAD SHAFT, TAIL SHAFT AND IDLER ELEVATION, SEE SHEET 14. 2

REV	DESCRIPTION
2	FLIGHT CLEARANCE TABLE & NOTE ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA T. G. WICKIE # 41049

February 12, 2024

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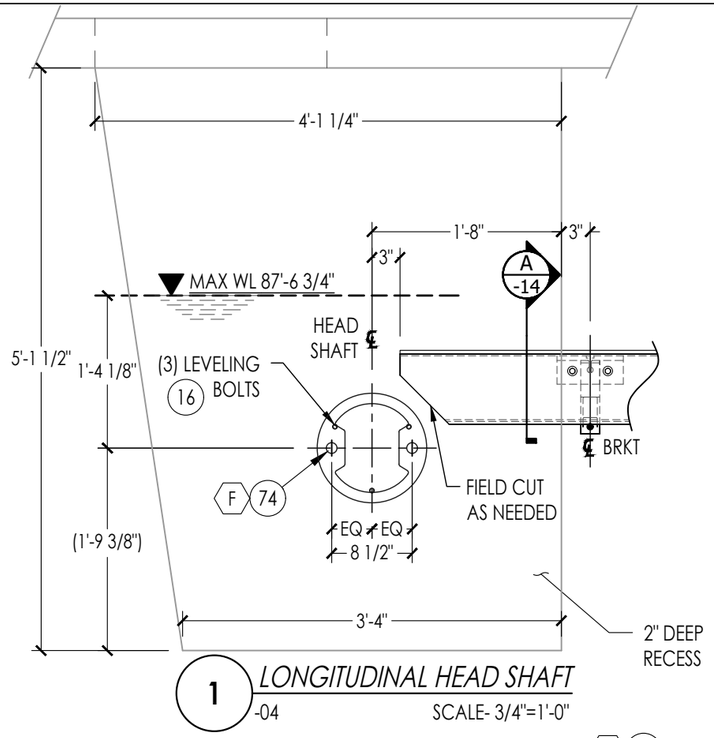
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
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PRIMARY SEDIMENTATION TANK 1-3

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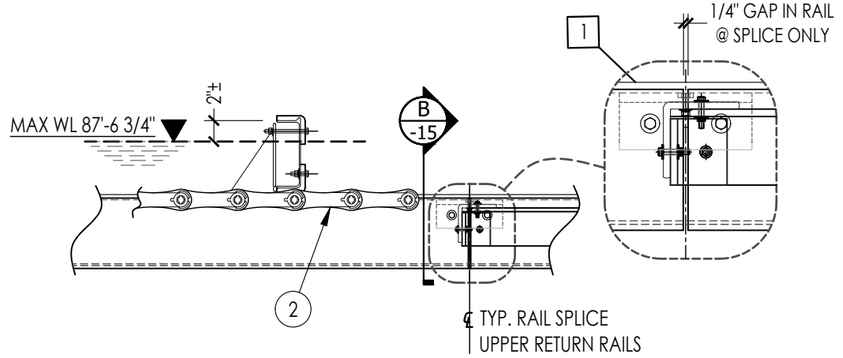
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	CROSS COLLECTOR SECTIONS

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	12 of 26	WGZ0067001 – 12	04

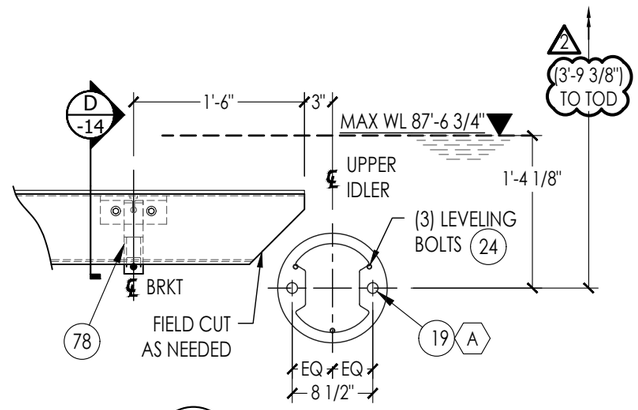
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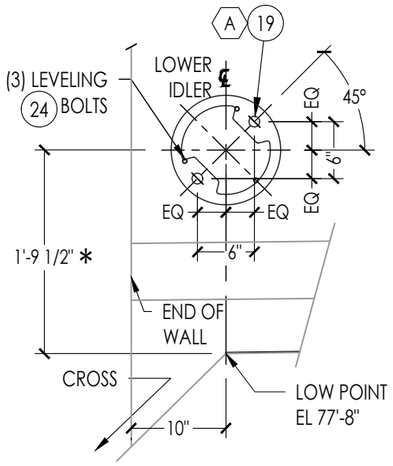
1 *LONGITUDINAL HEAD SHAFT*
-04 SCALE- 3/4"=1'-0"



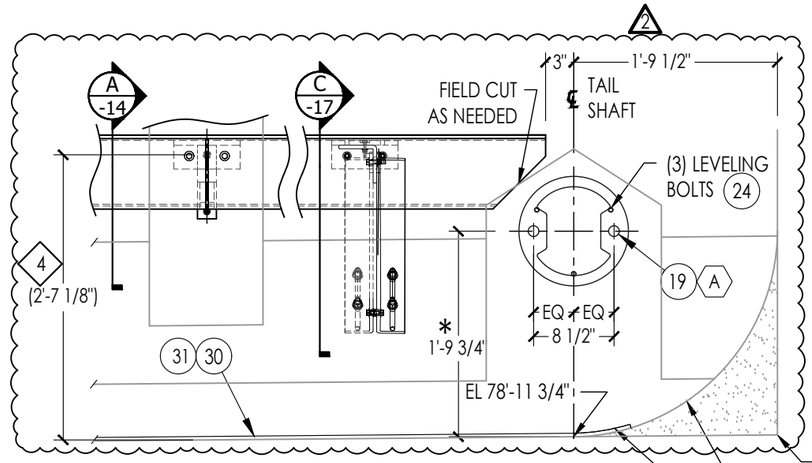
2 *UPPER RETURN RAIL*
-04 SCALE- 3/4"=1'-0"



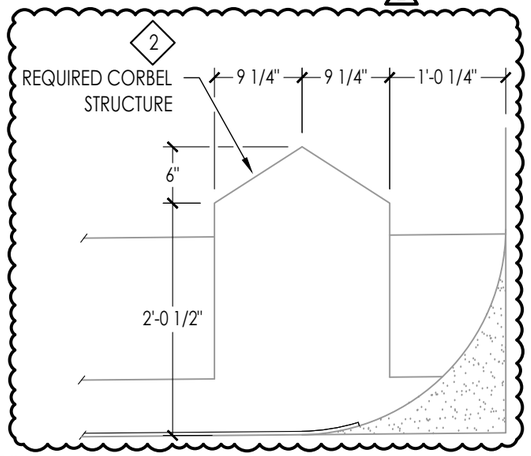
3 *UPPER IDLER*
-05 SCALE- 3/4"=1'-0"



5 *LOWER IDLER*
-04 SCALE- 3/4"=1'-0"



4 *TAIL SHAFT & LOWER RETURN RAIL*
-05 SCALE- 3/4"=1'-0"



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BRITISH COLUMBIA PERMIT TO PRACTICE
#1003607

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
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February 12, 2024

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NOTES:
1. SEE WEAR STRIP INSTALLATION DETAILS SHEET-21 FOR REQUIRED INSTALLATION GAPS. WEAR STRIP GAPS SHALL NOT OCCUR OVER THE SPLICE SHOE AREA.
2. OLD CORBELS ARE FULLY REMOVED AND REPLACED WITH NEW CORBELS. MINIMUM CORBEL SIZE SHOWN FOR PROPER EQUIPMENT INSTALLATION. FINAL DESIGN SHALL BE BY OTHERS.
3. PREVIOUS SCREED TO BE REMOVED AND REPLACED AS SHOWN.
4. THE RETURN RAIL IS INSTALLED HORIZONTAL BASED ON THE FIRST KNEE WALL BRACKET LOCATED OF THE FLOOR. DIMENSION IS SHOWN FOR REFERENCE FOR THIS BRACKET.

* SEE NOTE 12 ON SHEET -02

REV	DESCRIPTION
2	LOWER RETURN RAIL LEVELLED HORIZONTAL IN LIEU OF PARELLEL TO FLOOR
2	ONLY REQUIRED CORBEL SHOWN PER REVIEW COMMENTS BY ENGINEER
2	NOTES & DIMENSION UPDATED, EXISTING CORBEL REMOVED

SHEET REVISIONS

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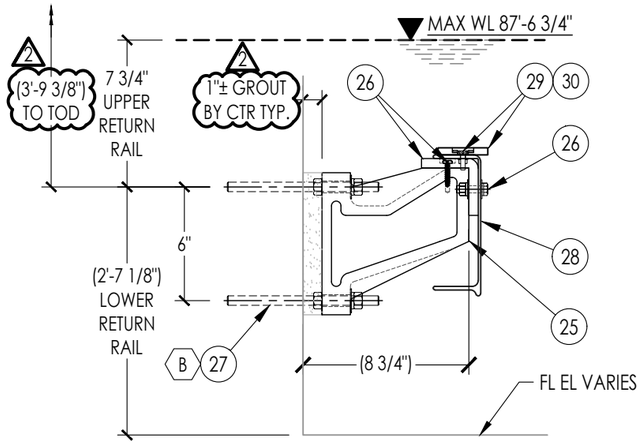
STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE
INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

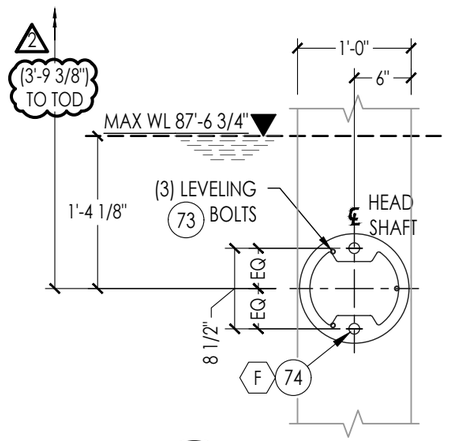
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DETAIL SHEET: DETAILS 1-5

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	13 of 26	WGZ0067001 – 13	04

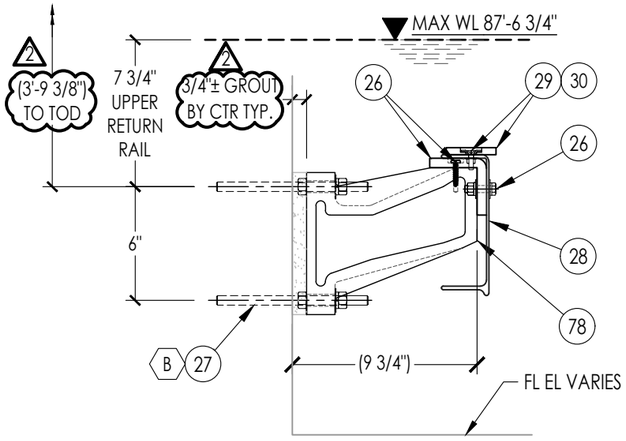
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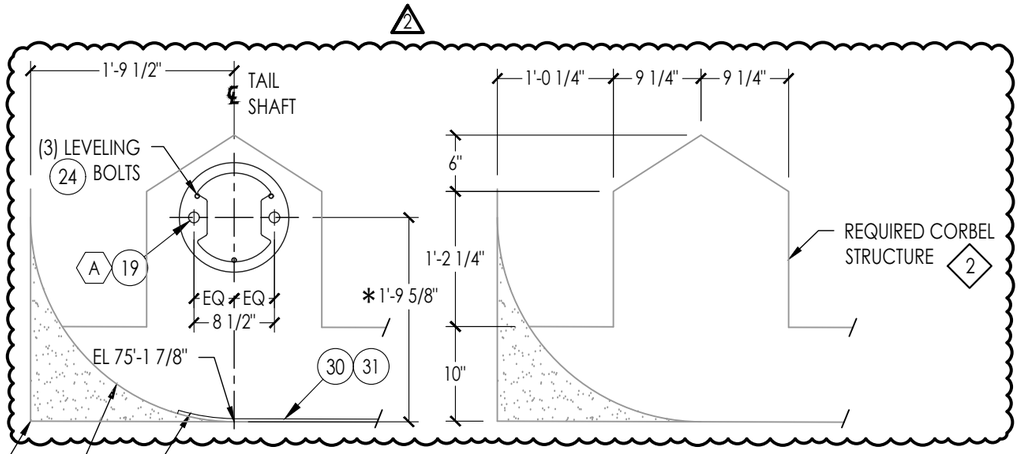
A *TYP WALL BRKT / RETURN RAIL*
-06, -08, -09, -13 SCALE- 1-1/2"=1'-0"



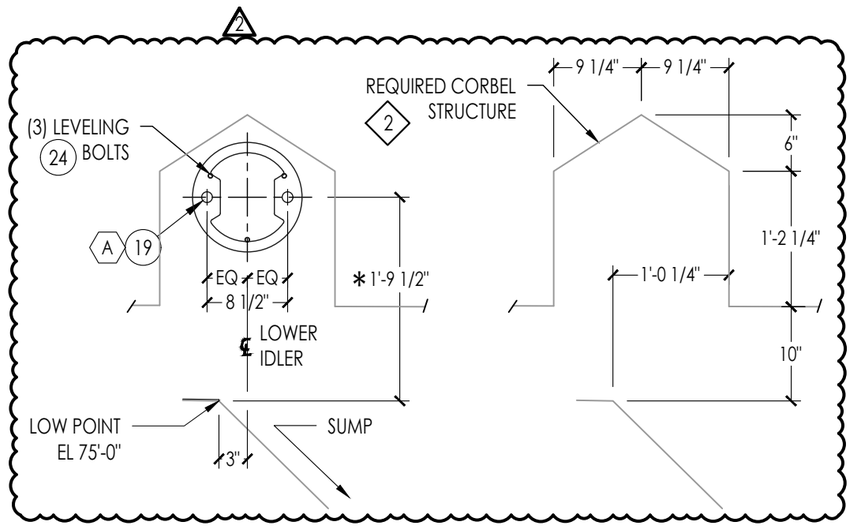
6 *CROSS COLLECTOR HEAD SHAFT*
-11 SCALE- 3/4"=1'-0"



D *WALL BRKT / RETURN RAIL - NEAR UPPER IDLER - DRIVE SIDE*
-13 SCALE- 1-1/2"=1'-0"



7 *CROSS COLLECTOR TAIL SHAFT*
-11 SCALE- 3/4"=1'-0"



8 *CROSS COLLECTOR LOWER IDLER*
-11 SCALE- 3/4"=1'-0"

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049

February 12, 2024

ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

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2. OLD CORBELS ARE FULLY REMOVED AND REPLACED WITH NEW CORBELS. MINIMUM CORBEL SIZE SHOWN FOR PROPER EQUIPMENT INSTALLATION. FINAL DESIGN SHALL BE BY OTHERS.
3. PREVIOUS SCREED TO BE REMOVED AND REPLACED AS SHOWN.

∗ SEE NOTE 12 ON SHEET 2

REV	DESCRIPTION
2	ONLY REQUIRED CORBEL SHOWN PER REVIEW COMMENTS BY ENGINEER
2	NOTES & DIMENSION UPDATED, EXISTING CORBEL REMOVED

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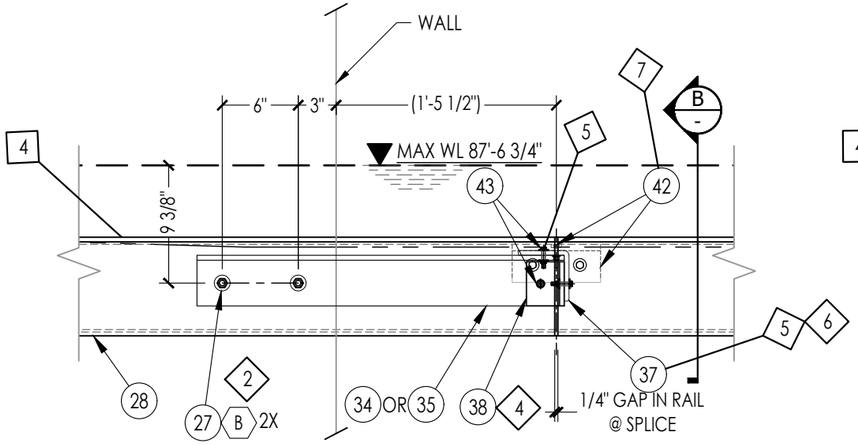
STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

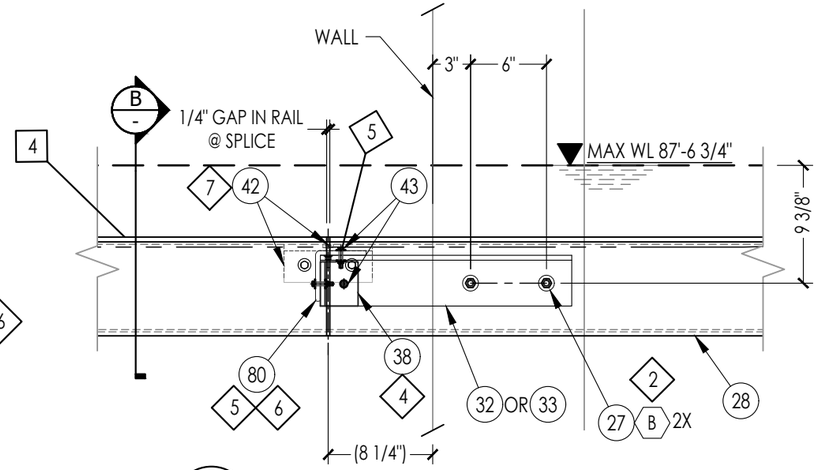
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RHP 24 Jul 23	HP 07 Feb 24	DETAIL SHEET: DETAILS 6-8

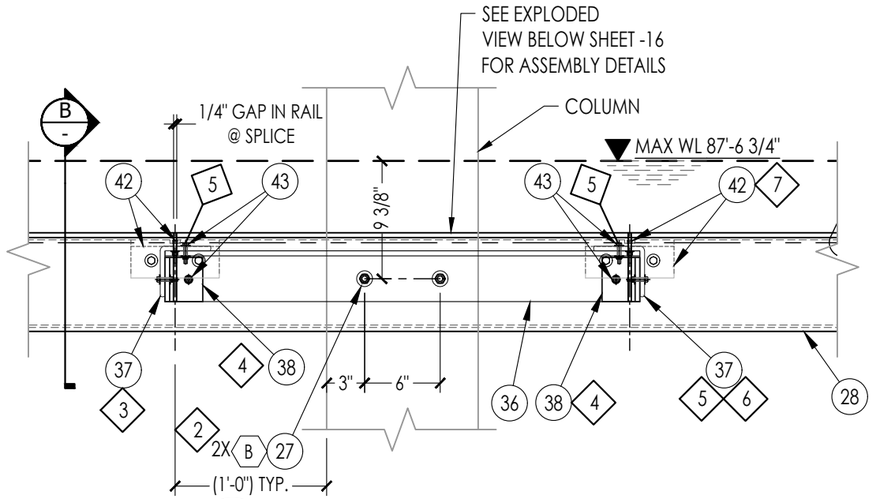
SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	14 of 26	WGZ0067001 – 14	04



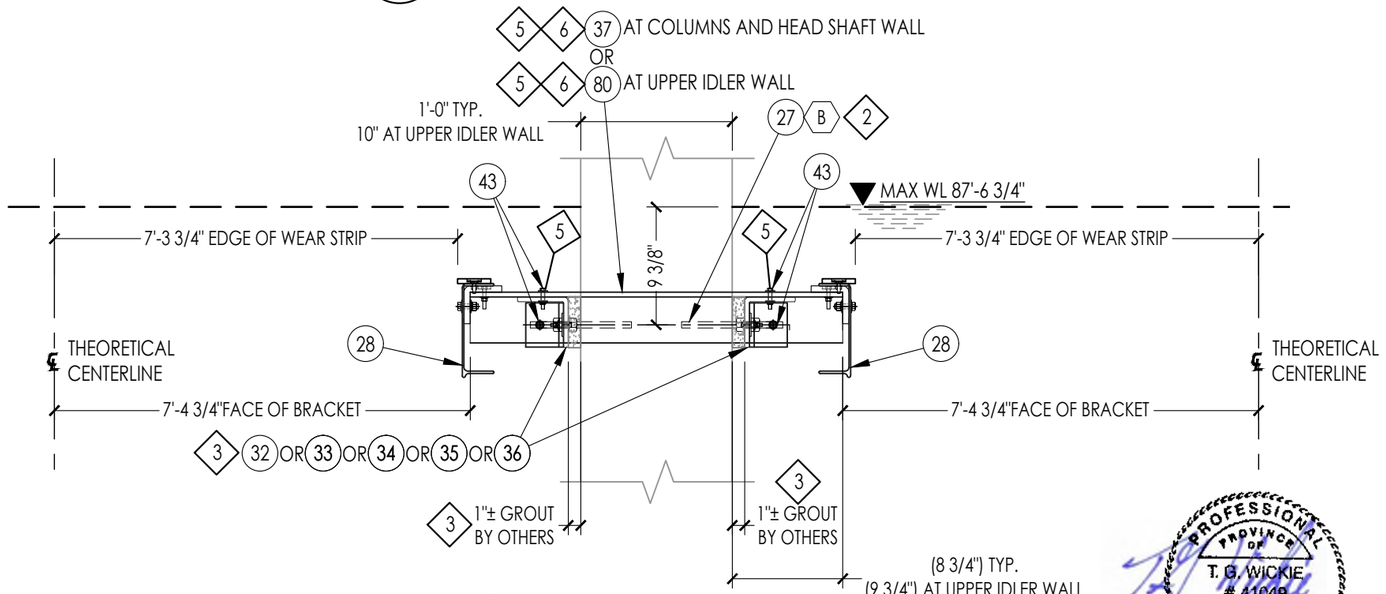
9 *WALL BRACKET VIEW AT HEAD SHAFT SIDE WALL*
-04 SCALE- 1" = 1'-0"



11 *WALL BRACKET VIEW AT UPPER IDLER SIDE WALL*
-05 SCALE- 1" = 1'-0"



10 *WALL BRACKET VIEW AT COLUMNS*
-04 SCALE- 1" = 1'-0"



B *WALL BRACKET SECTION VIEW*
-08, -13, -15 SCALE- 1" = 1'-0"

NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. LOCATE AND INSTALL ANCHORS "B" IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
3. INSTALL LEVELING NUTS/WASHER AS PART OF ANCHOR "B". SET POSITION OF THE WASHER TO ALLOW FOR A NOMINAL 1" GROUT BETWEEN THE ANGLE AND THE CONCRETE COLUMN/WALL. INSTALL ANGLE ITEMS 32, 33, 34, 35, 36 (AS APPLICABLE TO THE LOCATION) OVER ANCHORS AND TIGHTEN HARDWARE.
4. INSTALL CLIP ANGLE ITEM 38 TO ITEMS 32 THRU 36 USING SUPPLIED HARDWARE ITEM 43.
5. TEMPORARILY INSTALL ITEM 37 OR 80 ON TOP OF ITEMS 32 THRU 36. ADJUST THE LEVELING ANCHOR HARDWARE TO ALIGN THE PRE-DRILLED HOLES IN ITEM 37 OR 80 WITH CLIP ANGLE ITEM 38 AND FASTEN USING SUPPLIED HARDWARE ITEM 43.
6. FIELD CUT ITEM 37 OR 80 TO LENGTH BASED ON FACE OF BRACKET LOCATION FROM THE THEORETICAL CHAIN CL.
7. PLACE ITEM 42 (SHOE) ON ITEM 37 OR 80. USE THE HOLE IN THE ATTACHMENT SHOE AS A TEMPLATE. DRILL 5/16" THRU HOLE, MOUNT SHOE USING ITEM 42. PROCEED WITH RETURN RAIL MOUNTING AS OUTLINED IN THE INSTALLATION MANUAL.
8. CONTRACTOR TO GROUT BEHIND ANGLE ITEMS 32 THRU 36 AFTER FINAL ALIGNMENT/LEVELING AND INSPECTION BY BRENTWOOD'S FIELD SERVICE.

REV	DESCRIPTION

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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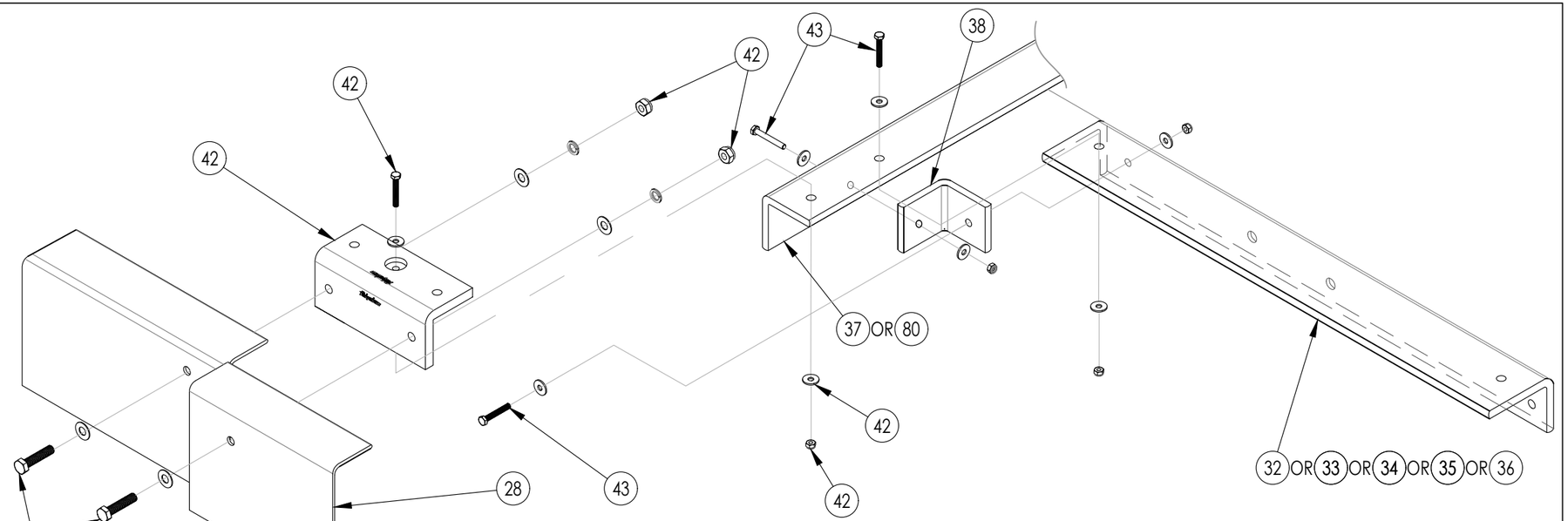
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DETAIL SHEET: DETAILS 9-11

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	15 of 26	WGZ0067001 – 15	04

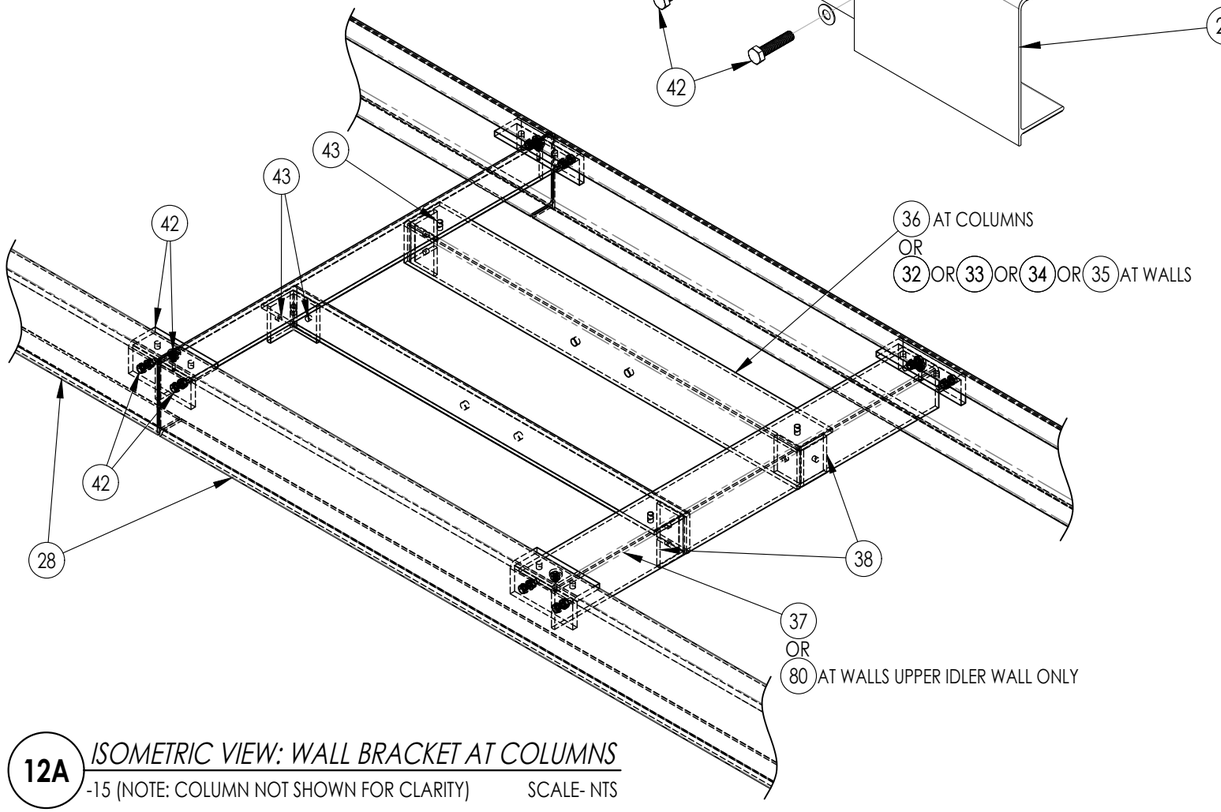
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — T. G. WICKIE # 41049
February 12, 2024

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12 *EXPLODED VIEW: WALL BRACKET AT COLUMNS*
-15 (NOTE: WEAR STRIP NOT SHOWN FOR CLARITY) SCALE- NTS



12A *ISOMETRIC VIEW: WALL BRACKET AT COLUMNS*
-15 (NOTE: COLUMN NOT SHOWN FOR CLARITY) SCALE- NTS

T. G. WICKIE
41049
PROVINCE OF BRITISH COLUMBIA
PROFESSIONAL ENGINEER

February 12, 2024

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REV	DESCRIPTION

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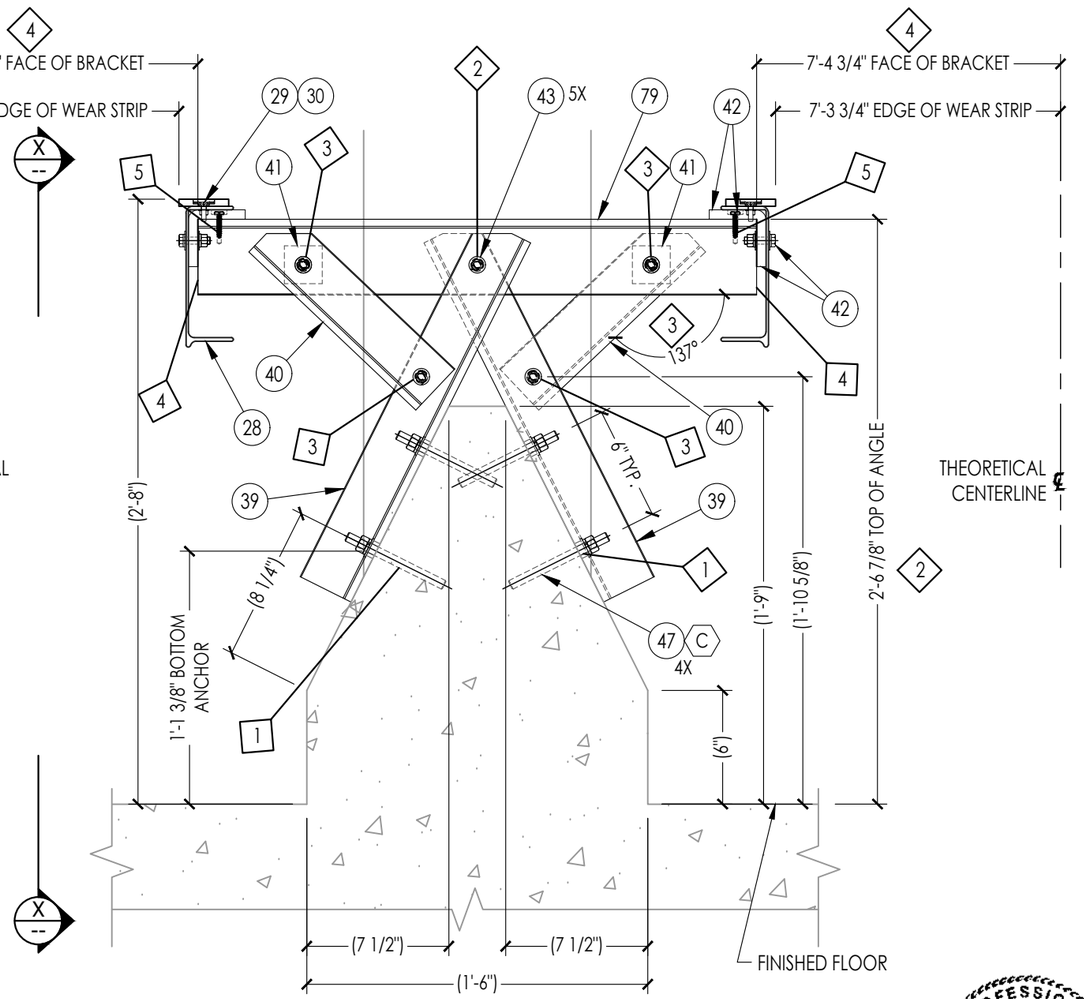
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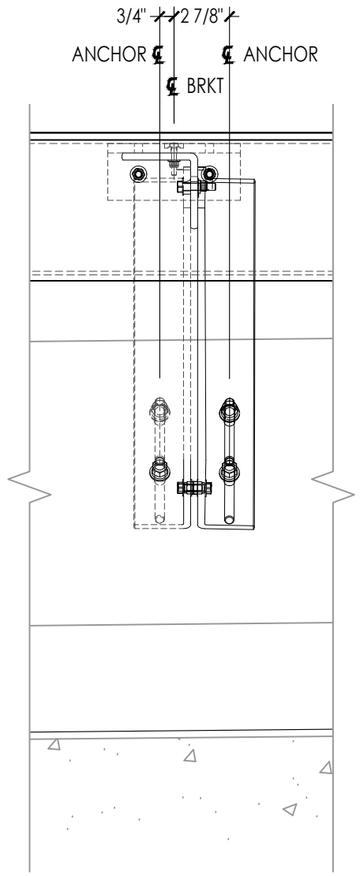
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	EXPLODED VIEW: WALL BRACKET AT COLUMNS

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	16 of 26	WGZ0067001 – 16	04



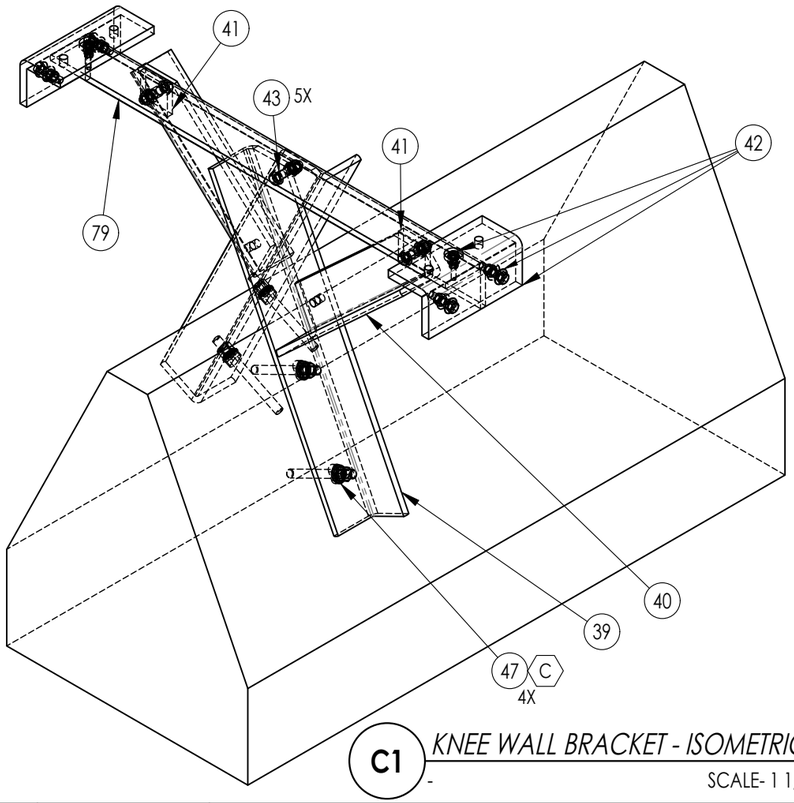
C *KNEE WALL BRACKET*

-09, -13, -17 SCALE- 1 1/2" = 1'-0"



X *SIDE VIEW*

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



C1 *KNEE WALL BRACKET - ISOMETRIC VIEW*

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

SADDLE BRACKET INSTALLATION NOTES- FOLLOWOING STEPS:

1. LOCATE AND INSTALL ANCHORS "C" IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. DRILL PERPENDICULAR TO THE SLOPE. INSTALL ITEMS 39IN THE CENTER OF THE SLOTS.
2. LOCATE ITEM 79 (4X4 FRP ANGLE) TO PROPER HEIGHT FROM FLOOR AND CENTER ON KNEE WALL. FIELD CHAMFER ITEM 39 AS DEPICTED IN DETAIL C, TO ALLOW INSTALLATION OF ITEM 79. ADJUST ITEMS 39 IN THE SLOTS AS NECESSARY. FIELD DRILL 7/16" DIA. HOLE THRU ITEMS 39, USING ITEM 79 PRE-DRILLED HOLE AS A TEMPLATE. ALL FIELD DRILLED HOLES SHALL MAINTAIN A MINIMUM FRP EDGE DISTANCE OF 1".
3. FASTEN ITEM 40 (2 PLCS.)(3X3 FRP ANGLE) AND ITEM 41 (2 PLCS.) (SPACER) TO ITEM 79 USING HARDWARE ITEM 43. IT MAY BE NECESSARY TO FIELD CUT/CHAMFER THE LENGTH OF ANGLE ITEM 40, TO ALLOW FOR FIT-UP TO ITEM 39. MAINTAIN DEGREE OF THE ANGLE OF ITEM 40 AS SHOWN. FIELD DRILL 7/16" DIA HOLE THRU ITEMS 39 AND 40. FASTEN USING HARDWARE ITEM 43. ALL FIELD DRILLED HOLES SHALL MAINTAIN A MINIMUM FRP EDGE DISTANCE OF 1".
4. FIELD CUT ITEM 79 TO LENGTH BASED ON FACE OF BRACKET LOCATION FROM THE THEORETICAL CHAIN CL.
5. PLACE ITEM 42 (SHOE) ON ITEM 79. USE THE HOLE IN THE ATTACHMENT SHOE AS A TEMPLATE. DRILL 5/16" THRU HOLE, MOUNT SHOE USING ITEM 42. PROCEED WITH RETURN RAIL MOUNTING AS OUTLINED IN THE INSTALLATION MANUAL.

NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. SEE WEAR STRIP INSTALLATION DETAILS SHEET-21 FOR REQUIRED INSTALLATION GAPS. WEAR STRIP GAPS SHALL NOT OCCUR OVER THE SPLICE SHOE AREA.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049

February 12, 2024

ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

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REV	DESCRIPTION

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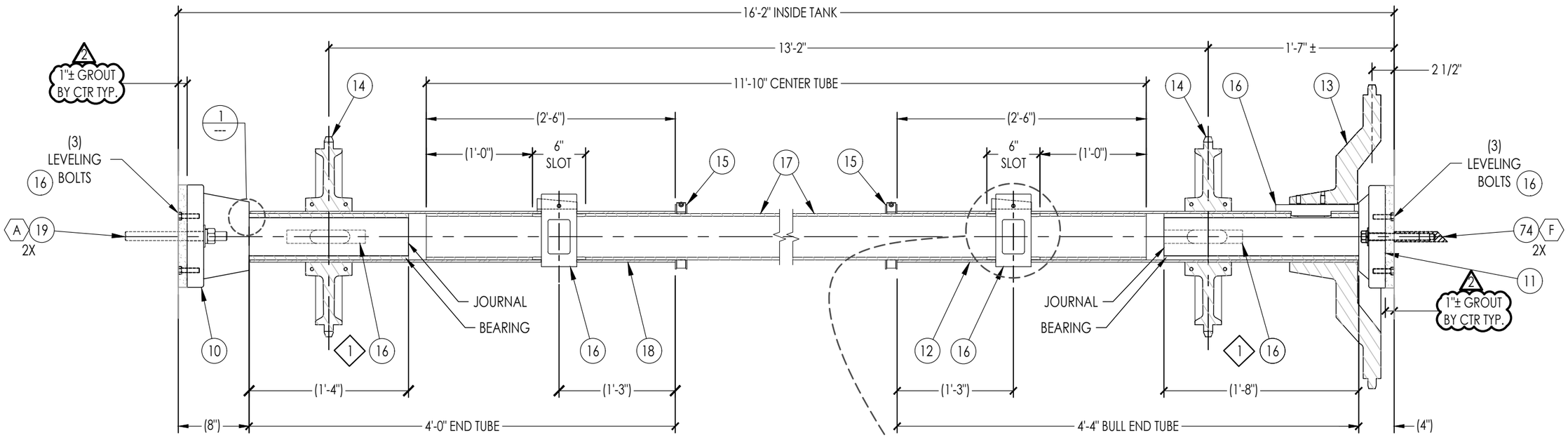
STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

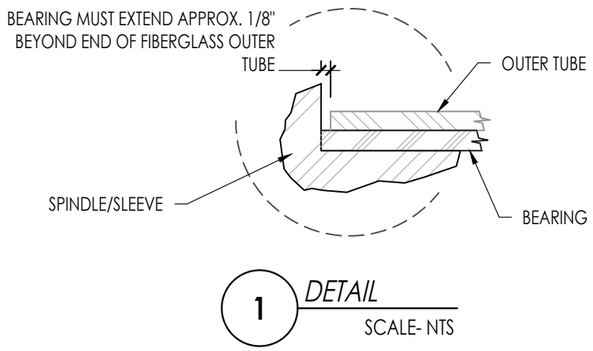
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RHP 24 Jul 23	HP 07 Feb 24	DETAIL SHEET: KNEE WALL BRACKET

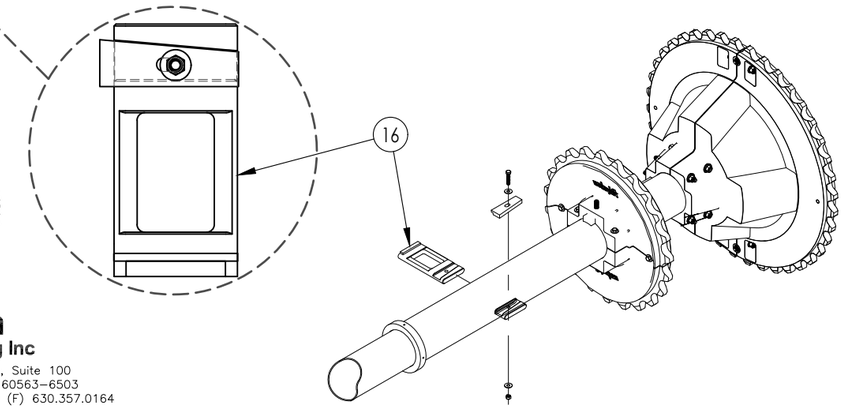
SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	17 of 26	WGZ0067001 – 17	04



13 *LONGITUDINAL HEAD SHAFT*
-07 SCALE- 1" = 1'-0"



1 *DETAIL*
SCALE- NTS



PROFESSIONAL ENGINEER
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T. G. WICKIE
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February 12, 2024

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NOTES:
1. ASSEMBLE SHAFT WITH THE END TUBE KEY AND THE BULL END TUBE KEY ON THE SAME SIDE OF SHAFT.

REV	DESCRIPTION
2	DIMENSION UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

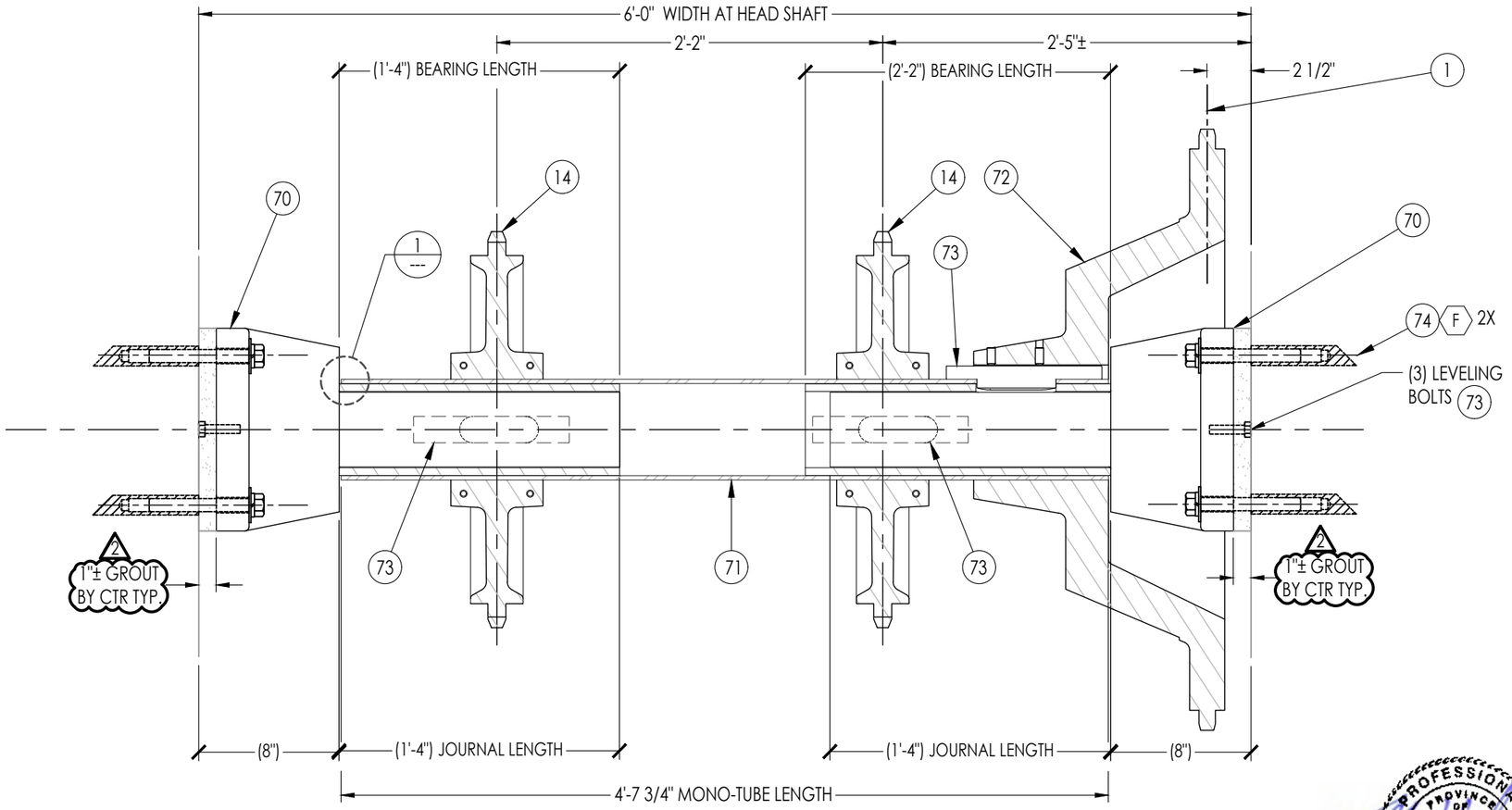
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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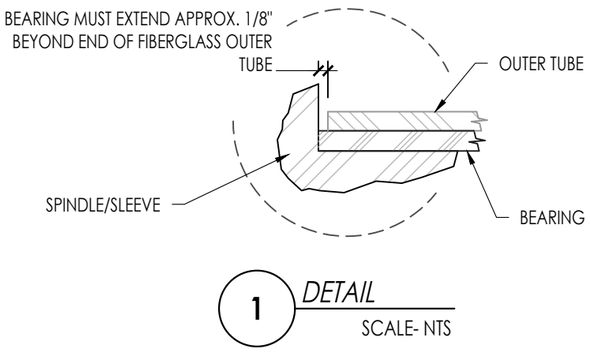
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DETAIL SHEET: LONGITUDINAL HEAD SHAFT

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	18 of 26	WGZ0067001 – 18	04

Rev 01



13 *CROSS COLLECTOR HEAD SHAFT*
-12 SCALE- 1 1/2" = 1'-0"



1 *DETAIL*
SCALE- NTS

NOTES:
1.

REV	DESCRIPTION
2	DIMENSION UPDATED PER REVIEW COMMENTS BY ENGINEER

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INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

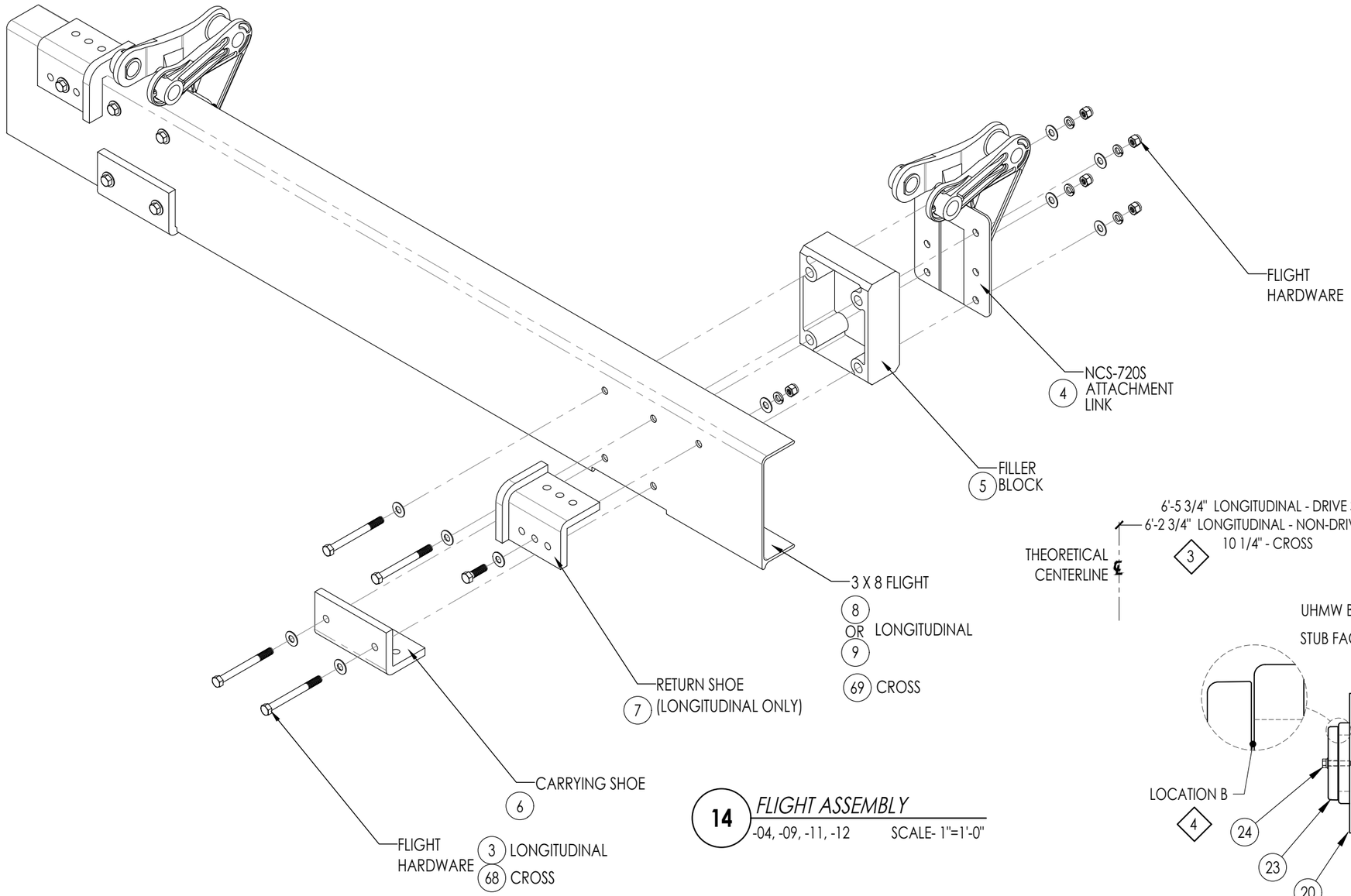
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RHP 24 Jul 23	HP 07 Feb 24	DETAIL SHEET: CROSS COLLECTOR HEAD SHAFT

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	19 of 26	WGZ0067001 – 19	04

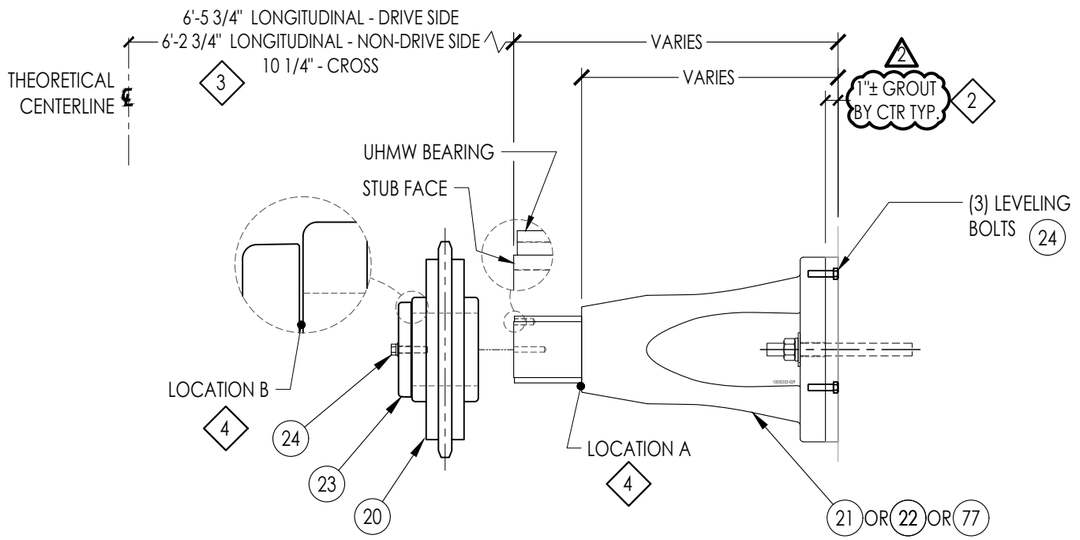
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14 *FLIGHT ASSEMBLY*
-04, -09, -11, -12 SCALE- 1"=1'-0"



5 2 **15** *STUB SHAFT INSTALLATION*
-07, -09, -10, -12 SCALE- 1"=1'-0"

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. WHERE NO GROUT IS REQUIRED, SHIM (BY OTHERS) TO MAKE LEVEL IN LIEU OF LEVELING BOLTS.
3. INSTALL STUB SHAFT USING STUB FACE DIMENSIONS SHOWN.
4. INSTALL SPROCKET TO CHAIN CENTERLINE DIMENSIONS SHOWN IN SECTION VIEW. ENSURE EQUAL SPACING AT LOCATION A AND B. THIS SPACING IS CRITICAL FOR PROPER SYSTEM PERFORMANCE. ADJUST FACE OF SHAFT DIMENSION IF NEEDED TO OBTAIN SPROCKET CENTERLINE.
5. TYPICAL INSTALLATION FOR ALL STUB SHAFTS.

REV	DESCRIPTION
2	DIMENSION UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

T. G. WICKIE # 41049 PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA
February 12, 2024

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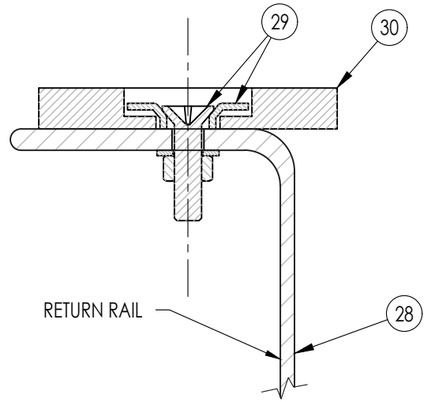
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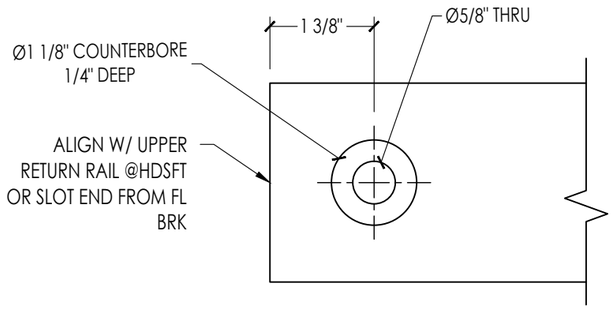
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RHP 24 Jul 23	HP 07 Feb 24	DETAIL SHEET: FLIGHT ASSEMBLY & STUB SHAFT INSTALLATION

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	20 of 26	WGZ0067001 – 20	04

Rev 01

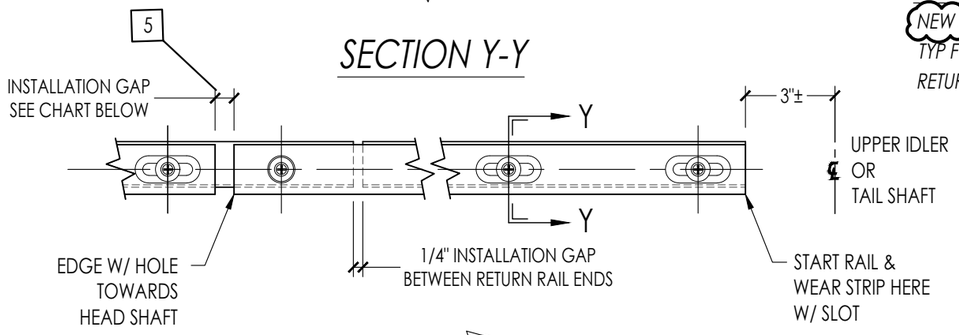




DETAIL A

NEW STARTER HOLE 2
TYP FOR FLOOR OR
RETURN RAIL

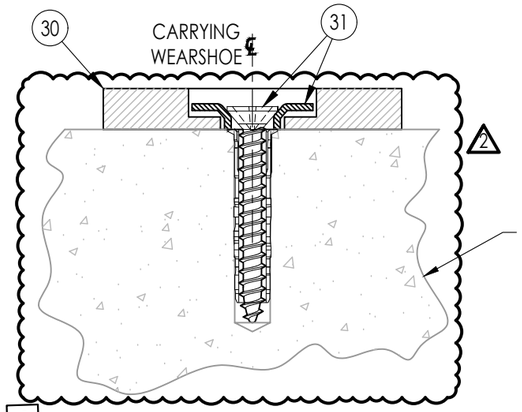
SECTION Y-Y



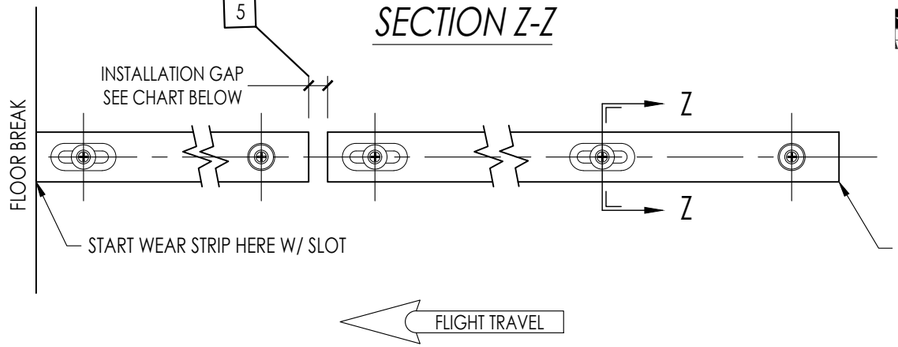
INSTALLATION NOTES (RETURN RAIL WEAR STRIPS) :

1. THE ORIENTATION OF THE WEAR STRIP IS CRITICAL AND SHOULD BE ORIENTED IN THE DIRECTION OF TRAVEL. RETURN RAIL WEAR STRIPS ARE INSTALLED WITH THE ROUND HOLE TOWARDS HEAD SHAFT.
2. STARTING AT THE UPPER IDLER OR TAIL SHAFT END OF THE RETURN RAIL, LOCATE THE EDGE OF THE WEAR STRIP FROM THE THEORETICAL CENTERLINE AS SHOWN IN THE TANK OR TANK SECTION VIEWS IN THESE DRAWINGS.
3. USING WEAR STRIP AS A GUIDE, LOCATE & DRILL 3/8" HOLES THRU THE RETURN RAIL ANGLE. ANY HOLE LOCATED IN THE WEAR STRIP SLOTS SHOULD BE POSITIONED AT THE MIDPOINT OF THE SLOT LENGTHS.
4. TIGHTEN THE FASTENERS SNUG (HARDWARE IS NOT LOOSE AND CANNOT BE MOVED WITH FINGER PRESSURE) AND LOOSEN 1/2 TURN SO THAT THE WEAR STRIP CAN EXPAND AND CONTACT UNDER ENVIRONMENTAL VARIATIONS. REPEAT PROCESS THROUGH THE TANK TOWARDS THE UPPER IDLER.
5. **FOR OPPOSITE SIDE OF TANK**: THE WEAR STRIP SPLICES (GAPS) **MUST NOT** BE AT THE SAME LONGITUDINAL POSITION ACROSS THE TANK. CUT THE STARTING PIECE OF WEAR STRIP 6" FROM THE HOLE SIDE OF THE WEAR STRIP TO BEGIN THE OFFSET. FIELD DRILL NEW STARTER HOLE AS SHOWN IN DETAIL "A" THIS SHEET.
6. PLEASE REFER TO THE OPERATION AND MAINTENANCE MANUAL FOR FOR ADDITIONAL DETAILS.

INSTALLATION GAP BY INSTALLATION TEMPERATURE RANGE	
AVERAGE TEMPERATURE	WEAR STRIP INSTALLATION GAP
LESS THAN 30°F [-1°C]	3/4"
31°F - 84°F [0°C - 28°C]	1/2"
GREATER THAN 85°F [29°C]	1/4"



SECTION Z-Z



INSTALLATION NOTES (FLOOR WEAR STRIPS) :

1. THE ORIENTATION OF THE WEAR STRIP IS CRITICAL AND SHOULD BE ORIENTED IN THE DIRECTION OF TRAVEL. FLOOR WEAR STRIPS ARE INSTALLED WITH THE ROUND HOLE TOWARDS THE TAIL SHAFT.
2. STARTING AT THE SUMP, OR FLOOR BREAK, LOCATE THE CENTER OF THE WEAR STRIP FROM THE THEORETICAL CENTERLINE AS SHOWN IN THE TANK OR TANK SECTION VIEWS IN THESE DRAWINGS.
3. USING WEAR STRIP AS A GUIDE, LOCATE & DRILL 8mm HOLES BY 45mm DEEP IN THE TANK FLOOR. INSTALL ANCHOR INSERTS IN THE DRILLED HOLES, FLUSH WITH THE CONCRETE SURFACE. REFER TO SUPPLIER CUT SHEETS FOR FURTHER DETAILS.ANY HOLE LOCATED IN THE WEAR STRIP SLOTS SHOULD BE POSITIONED AT THE MIDPOINT OF THE SLOT LENGTHS.
4. TIGHTEN THE FASTENERS SNUG (HARDWARE IS NOT LOOSE AND CANNOT BE MOVED WITH FINGER PRESSURE) AND LOOSEN 1/2 TURN SO THAT THE WEAR STRIP CAN EXPAND AND CONTRACT UNDER ENVIRONMENTAL VARIATIONS. REPEAT PROCESS THROUGH THE TANK TOWARDS TLSFT.
5. **FOR OPPOSITE SIDE OF TANK**: THE WEAR STRIP SPLICES (GAPS) **MUST NOT** BE AT THE SAME LONGITUDINAL POSITION ACROSS THE TANK. CUT THE STARTING PIECE OF WEAR STRIP 6" FROM THE HOLE SIDE OF THE WEAR STRIP TO BEGIN THE OFFSET. FIELD DRILL NEW STARTER HOLE AS SHOWN IN DETAIL "A" THIS SHEET.
6. PLEASE REFER TO THE OPERATION AND MAINTENANCE MANUAL FOR FOR ADDITIONAL DETAILS.

ENGINEERS & GEOSCIENTISTS OF
BRITISH COLUMBIA PERMIT TO PRACTICE
#1003607

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41649
February 12, 2024

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Engineering Inc
1488 Bond Street, Suite 100
Naperville, Illinois 60563-6503
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REV	DESCRIPTION
2	FLOOR ANCHOR UPDATED TO HILTI HUD-2 PER REVIEW COMMENTS BY ENGINEER
2	DETAIL AND CALLOUTS UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

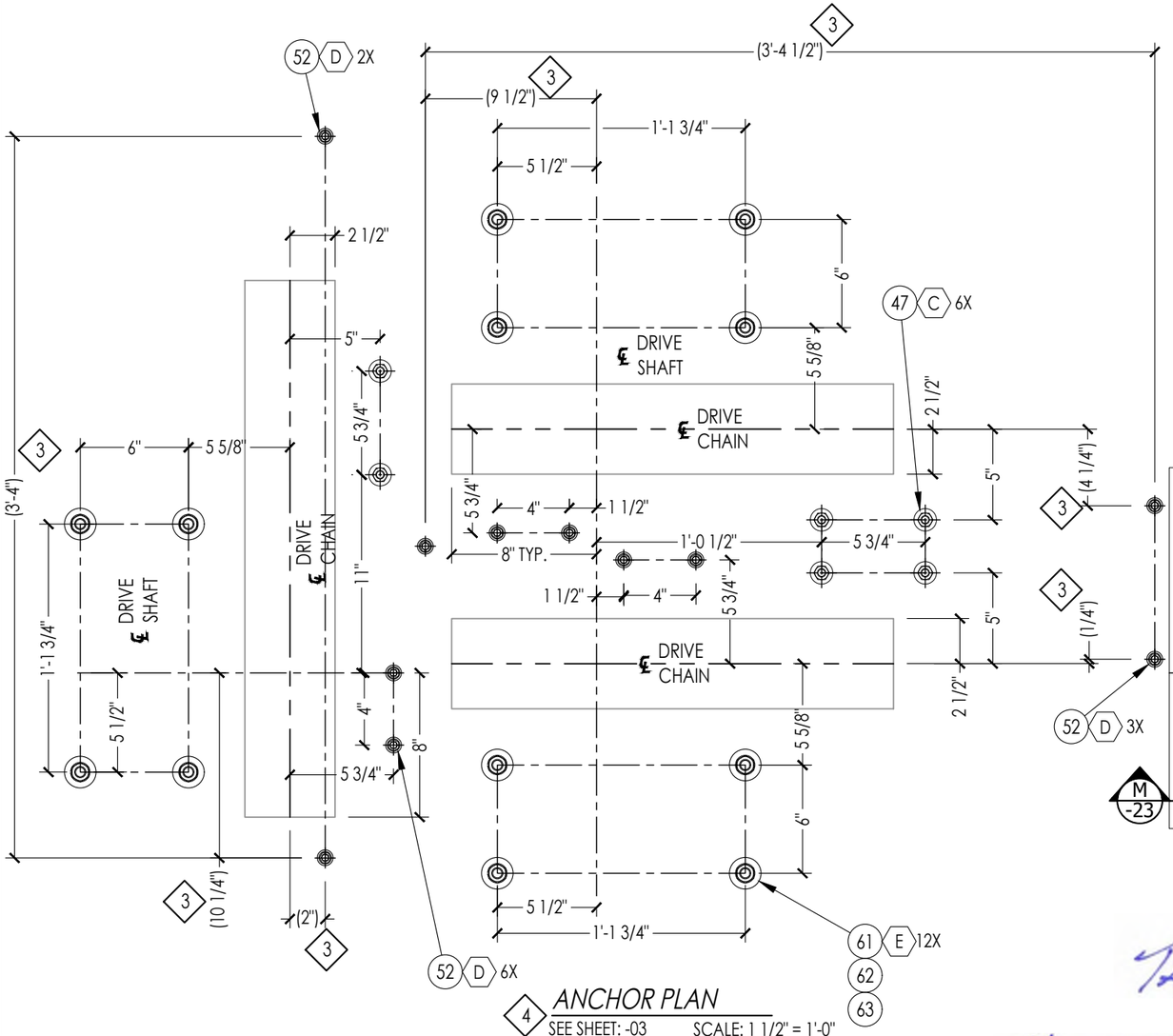
STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

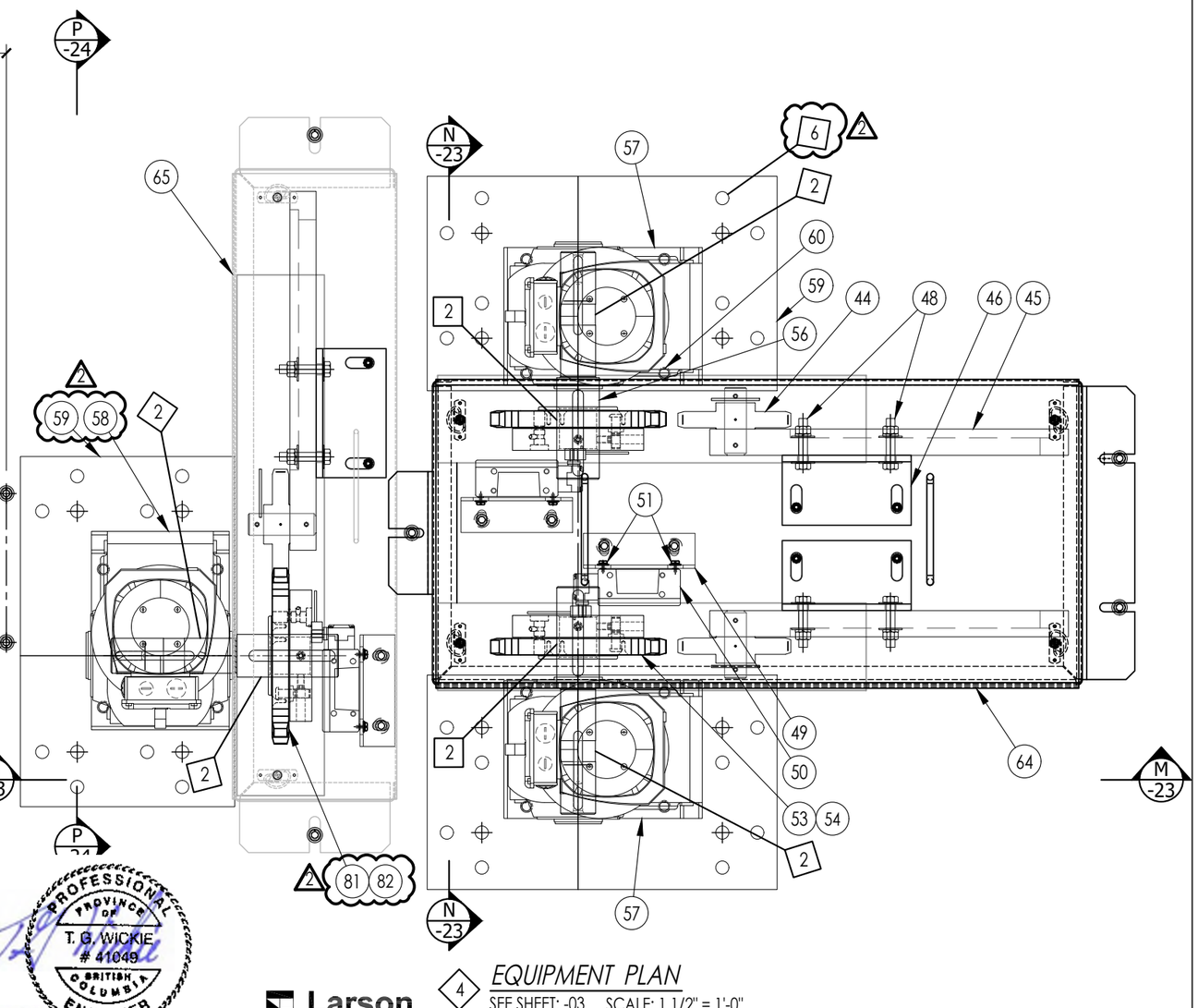
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DETAIL SHEET: WEAR STRIP INSTALLATION

SCALE	SHEET	DRAWING NUMBER	REV
NTS	21 of 26	WGZ0067001 – 21	04





NOTES:

1. DIMENSIONS AND B.O.M. CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UNLESS OTHERWISE NOTED.
2. SEE GENERAL NOTE 7, SHEET -02.
3. DIMENSIONS ARE FOR REFERENCE ONLY. FIELD LOCATE AND DRILL CHAIN GUARD ANCHORS AFTER FINAL ALIGNMENT OF DRIVE EQUIPMENT.
4. CROSS LAYOUT IS TYPICAL OF TANKS 1 AND 3. LONGITUDINAL LAYOUT IS TYPICAL FOR ALL TANKS.
5. CONTRACTOR TO REMOVE EXISTING DRIVE, DRIVE BASE, DRIVE PAD AND/OR ANY GROUT, AS WELL AS RESTORE THE SURFACE OF THE EXISTING CONCRETE SLAB TO A LEVEL BROOM FINISH, BEFORE INSTALLING NEW DRIVE COMPONENTS AS SHOWN ABOVE.
6. ALTERNATE PRE-FABRICATED HOLES SHALL BE USED BY THE CONTRACTOR AS NECESSARY TO AVOID CUTTING THRU REBAR IN THE DECK.

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — T. G. WICKIE # 41049

February 12, 2024

ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

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REV	DESCRIPTION
2	NOTE ADDED, BALLOON UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION — ISO-9001 REGISTERED

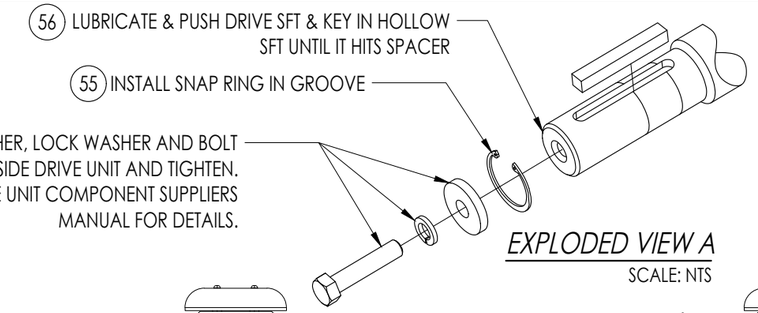
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DRIVE UNIT LAYOUT: LONGITUDINAL & CROSS PLAN VIEWS - TANK T-211 & T-213

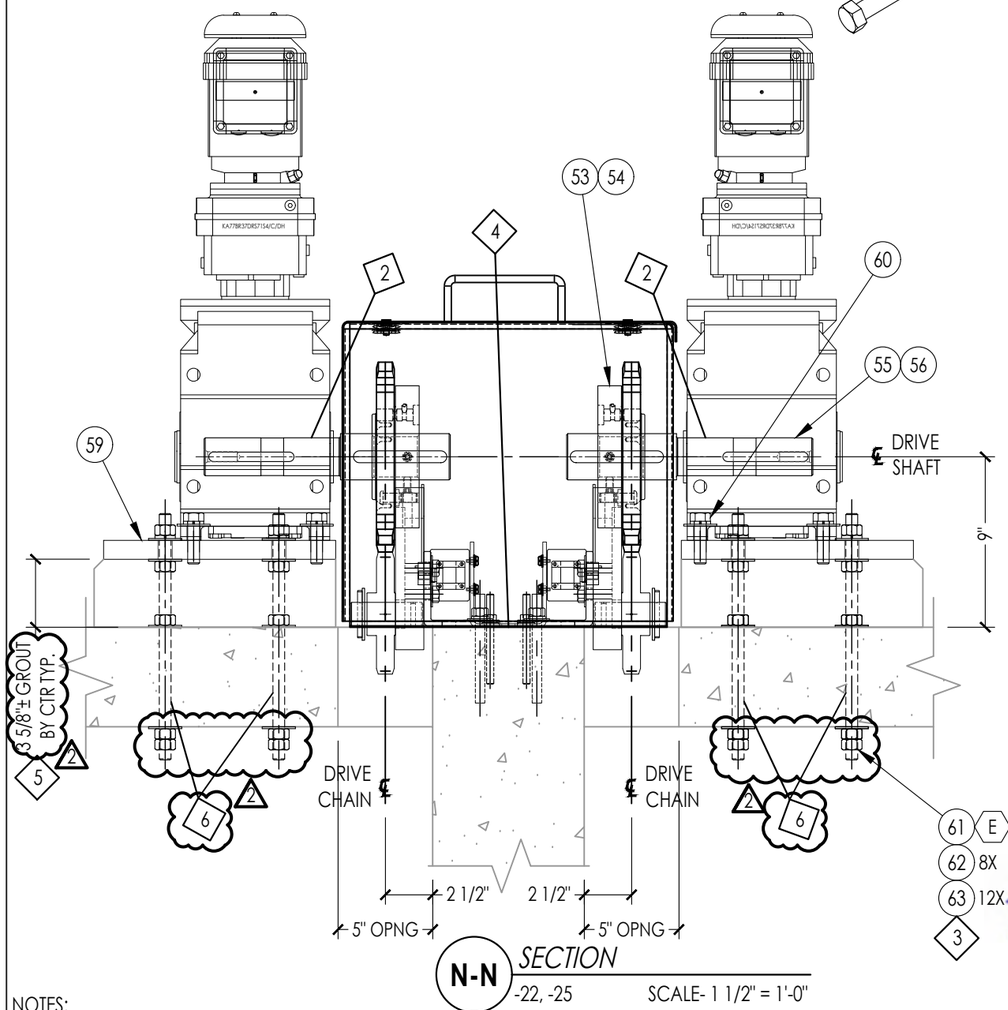
SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	22 of 26	WGZ0067001 – 22	04

Rev 01

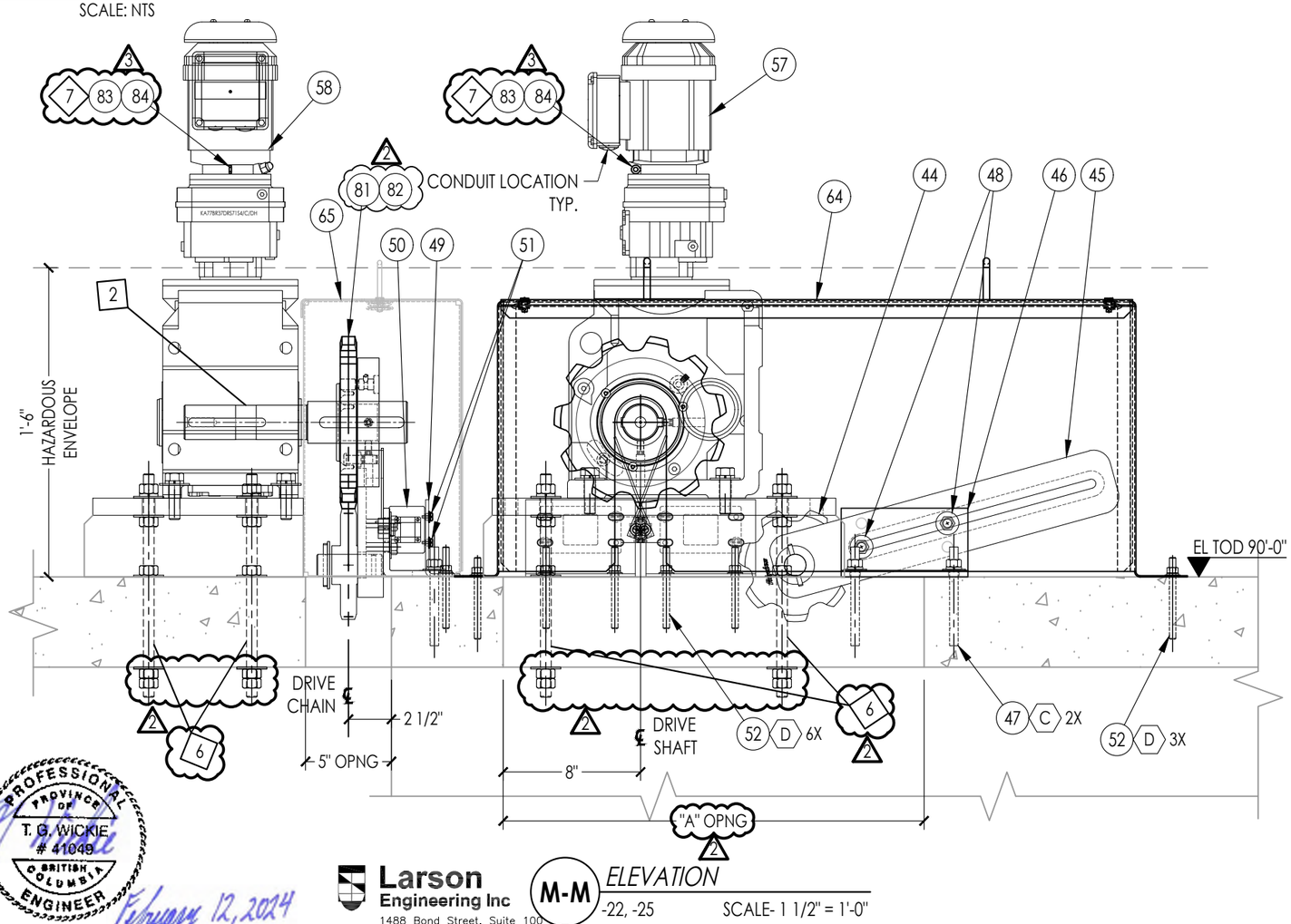


EXPLODED VIEW A
SCALE: NTS

DIMENSION "___"	
TANK	A
T-211	2'-0 1/2"
T-212	2'-0 1/2"
T-213	2'-1"



N-N *SECTION*
-22, -25 SCALE- 1 1/2" = 1'-0"



M-M *ELEVATION*
-22, -25 SCALE- 1 1/2" = 1'-0"

NOTES:
1. DIMENSIONS AND B.O.M. CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UNLESS OTHERWISE NOTED.
2. SEE GENERAL NOTE 7, SHEET -02.
3. HILTI ADHESIVE NOT REQUIRED FOR THRU DECK BOLTING.
4. CONTRACTOR TO REMOVE EXISTING DRIVE, DRIVE BASE, DRIVE PAD AND/OR ANY GROUT, AS WELL AS RESTORE THE SURFACE OF THE EXISTING CONCRETE SLAB TO A LEVEL, BROOM FINISH, BEFORE INSTALLING NEW DRIVE COMPONENTS AS SHOWN ABOVE.
5. PER THE ENGINEER, GROUT SHALL BE AGGREGATE CONTAINING PRODUCT, 3,000 PSI MIN.
6. PILOT DRILL HOLE FROM BOTTOM/TOP TO AVOID SPALLING DAMAGE TO EXIT SIDE OF CONCRETE SLAB.
7. CONTRACTOR TO USE THE RING SUPPLIED WITH THE GEAR REDUCER TO ATTACH TAGS.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA T. G. WICKIE # 41049
February 12, 2024
ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

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21230798.000
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REV	DESCRIPTION
3	NOTE 6 UPDATED PER REVIEW COMMENTS BY ENGINEER, BALLONS AND NOTE 7 ADDED
2	NOTE 5 & 6, BALLOON & DIMENSION UPDATED PER REVIEW COMMENTS BY ENGINEER
2	DRIVE ANCHORS UPDATED TO DOUBLE NUTS BELOW DECK, BASE PLATE THICKNESS UPDATED

SHEET REVISIONS

Polychem

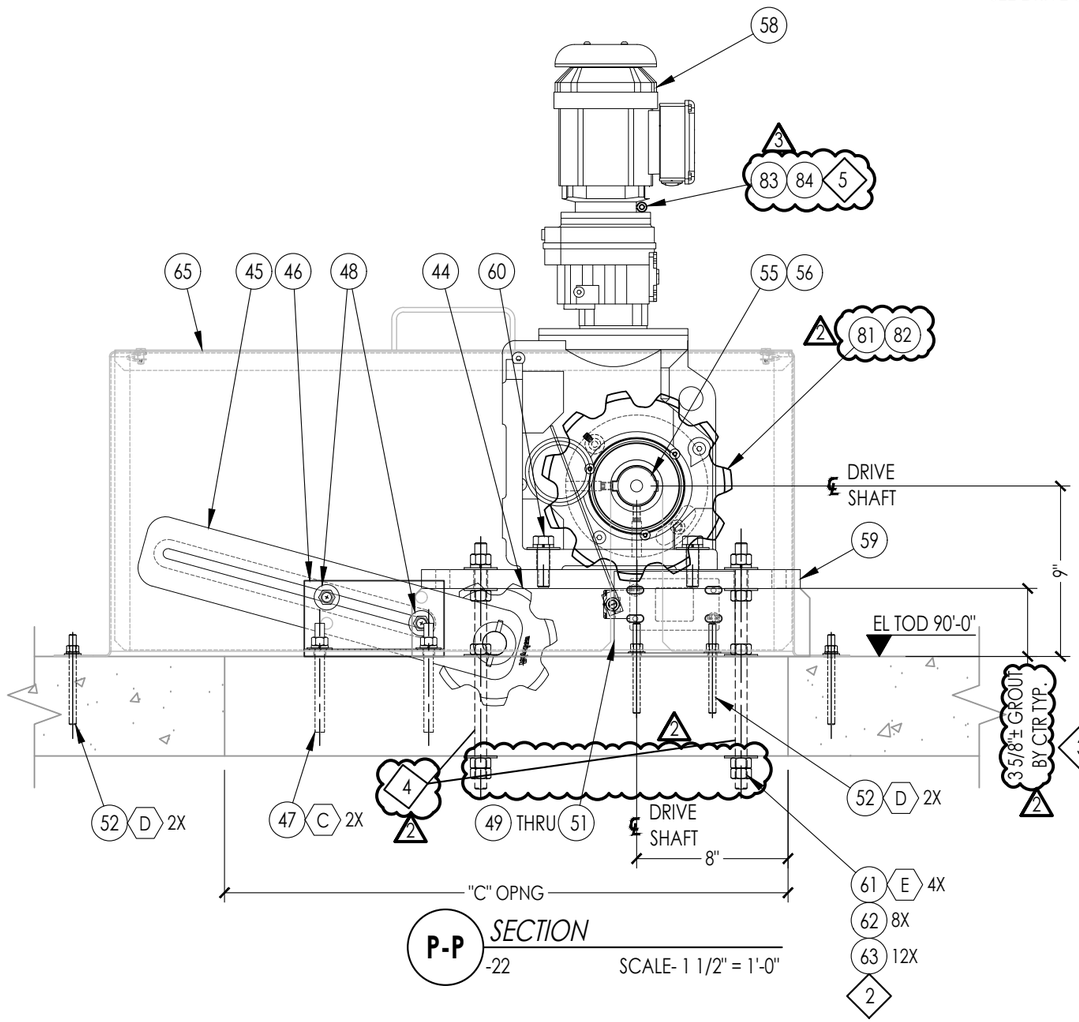
STATUS: ISSUED FOR INSTALLATION
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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

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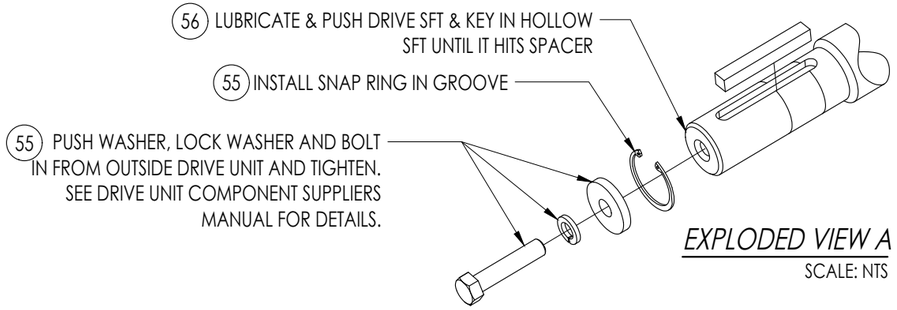
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DRIVE UNIT LAYOUT: LONGITUDINAL & CROSS SECTIONS & ELEVATIONS

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	23 of 26	WGZ0067001 – 23	04



P-P SECTION

-22 SCALE- 1 1/2" = 1'-0"



EXPLODED VIEW A

SCALE: NTS

DIMENSION "___"	
TANK	C
T-211	2'-5 3/4"
T-213	2'-6"

NOTES:

1. DIMENSIONS AND B.O.M. CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UNLESS OTHERWISE NOTED.
2. HILTI ADHESIVE NOT REQUIRED FOR THRU DECK BOLTING.
3. PER THE ENGINEER, GROUT SHALL BE AGGREGATE CONTAINING PRODUCT, 3,000 PSI MIN.
4. PILOT DRILL HOLE FROM BOTTOM/TOP TO AVOID SPALLING DAMAGE TO EXIT SIDE OF CONCRETE SLAB.
5. CONTRACTOR TO USE THE RING SUPPLIED WITH THE GEAR REDUCER TO ATTACH TAGS.

REV	DESCRIPTION
3	NOTE 4 UPDATED PER REVIEW COMMENTS BY ENGINEER, BALLONS AND NOTE 5 ADDED
2	NOTE 3 & 4 ADDED PER REVIEW COMMENTS BY ENGINEER, BALLOON UPDATED
2	BASE PLATE THICKNESS UPDATED PER REVIEW COMMENTS BY ENGINEER
2	DRIVE ANCHORS UPDATED TO DOUBLE NUTS BELOW DECK, DIMENSION UPDATED

SHEET REVISIONS

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PROJECT TITLE

INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DRIVE UNIT LAYOUT: CROSS TANK T-211 & T-213 - SECTION

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	24 of 26	WGZ0067001 – 24	04

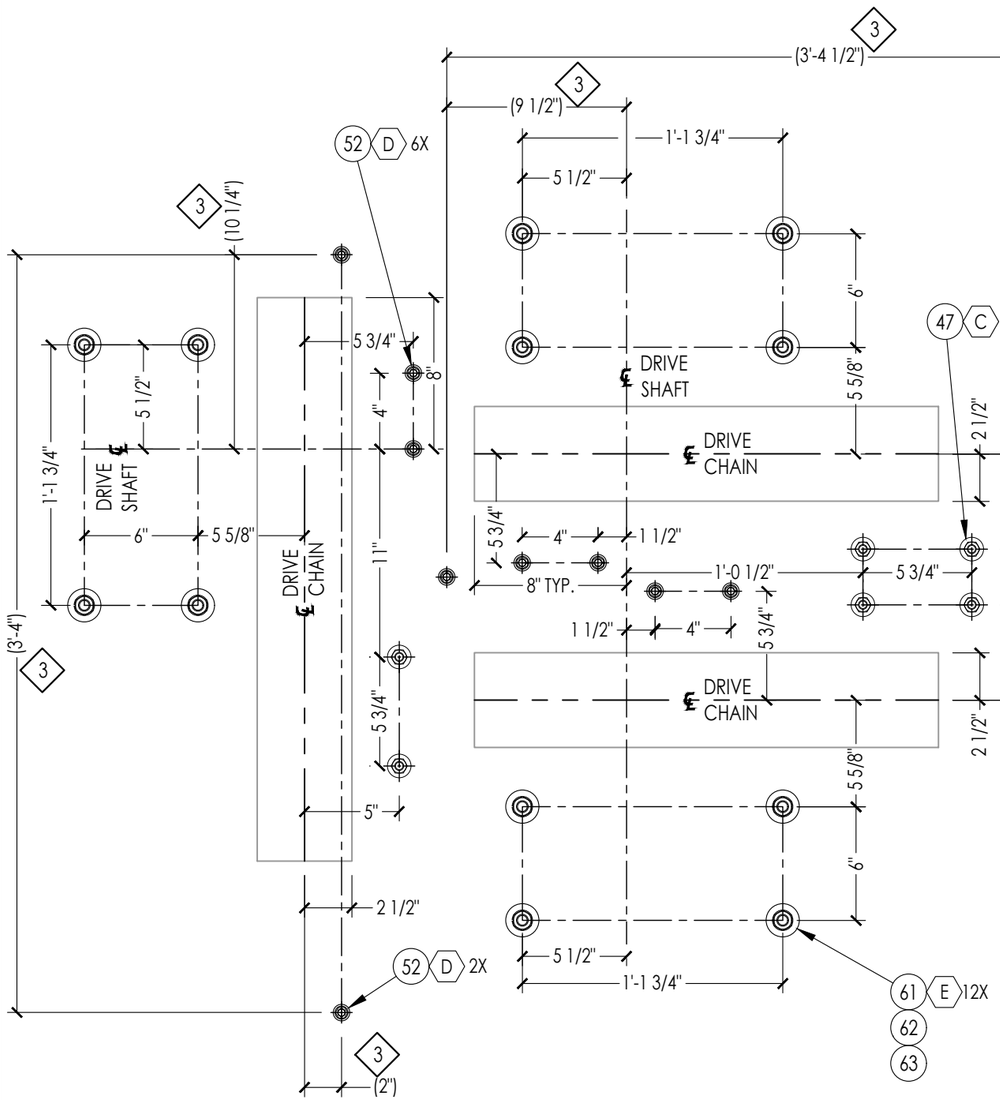
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — T. G. WICKIE # 41049

February 12, 2024

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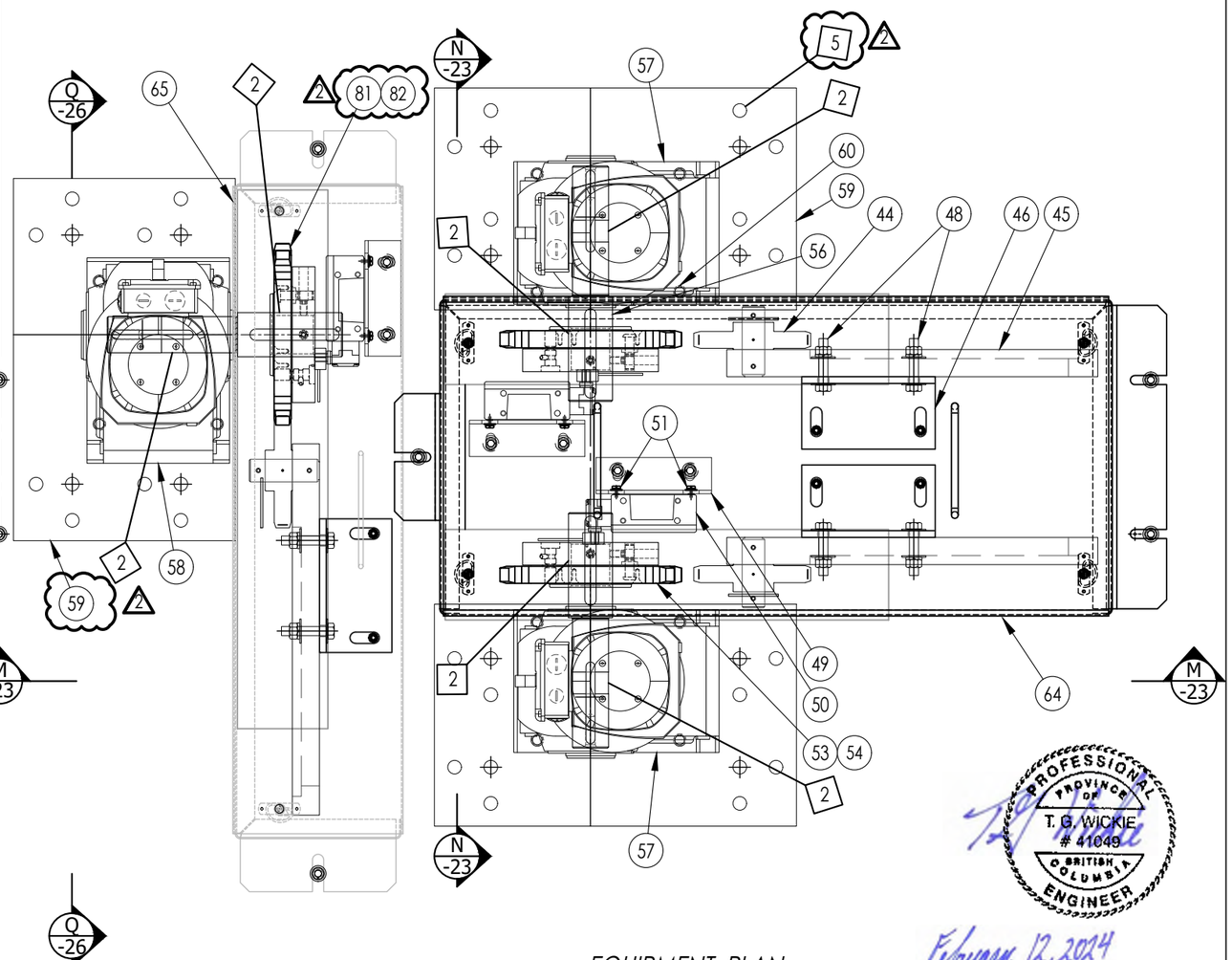
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ANCHOR PLAN

SEE SHEET: -03 SCALE: 1 1/2" = 1'-0"



EQUIPMENT PLAN

SEE SHEET: -03 SCALE: 1 1/2" = 1'-0"

NOTES:

1. DIMENSIONS AND B.O.M. CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UNLESS OTHERWISE NOTED.
2. SEE GENERAL NOTE 7, SHEET -02.
3. DIMENSIONS ARE FOR REFERENCE ONLY. FIELD LOCATE AND DRILL CHAIN GUARD ANCHORS AFTER FINAL ALIGNMENT OF DRIVE EQUIPMENT.
4. CONTRACTOR TO REMOVE EXISTING DRIVE, DRIVE BASE, DRIVE PAD AND/OR ANY GROUT, AS WELL AS RESTORE THE SURFACE OF THE EXISTING CONCRETE SLAB TO A LEVEL BROOM FINISH, BEFORE INSTALLING NEW DRIVE COMPONENTS AS SHOWN ABOVE.
5. ALTERNATE PRE-FABRICATED HOLES SHALL BE USED BY THE CONTRACTOR AS NECESSARY TO AVOID CUTTING THRU REBAR IN THE DECK.

REV	DESCRIPTION
2	NOTE & BALLOON ADDED UPDATED PER REVIEW COMMENTS BY ENGINEER, BALLOON ADDED

SHEET REVISIONS

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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DRIVE UNIT LAYOUT: LONGITUDINAL & CROSS PLAN VIEWS - TANK T-212

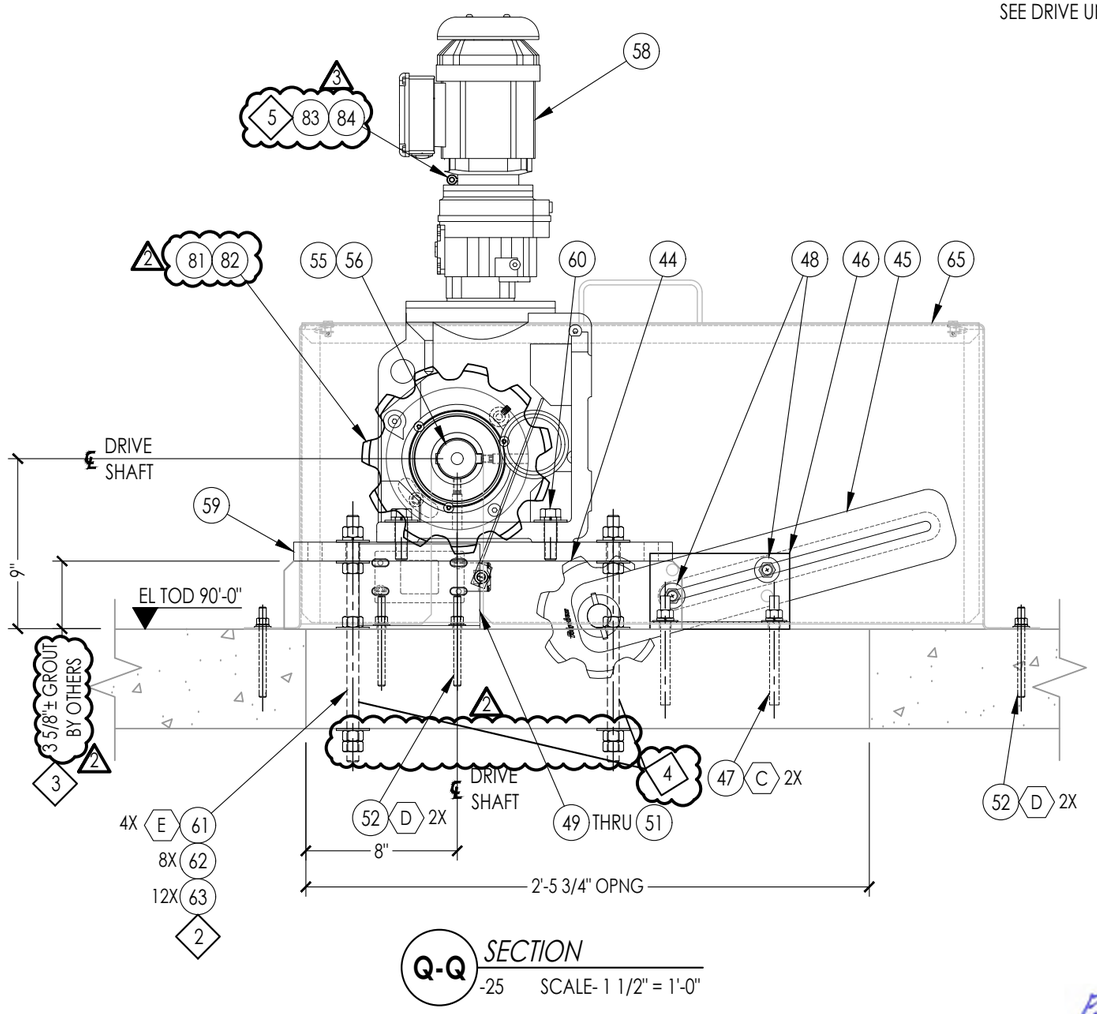
SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	25 of 26	WGZ0067001 – 25	04

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February 12, 2024

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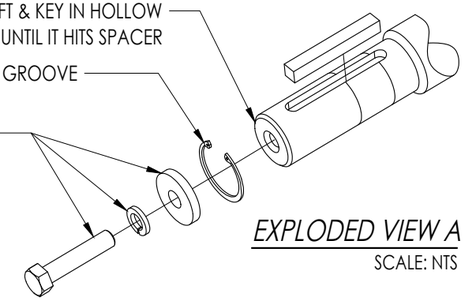
Q-Q *SECTION*

-25 SCALE- 1 1/2" = 1'-0"

56 LUBRICATE & PUSH DRIVE SFT & KEY IN HOLLOW SFT UNTIL IT HITS SPACER

55 INSTALL SNAP RING IN GROOVE

55 PUSH WASHER, LOCK WASHER AND BOLT IN FROM OUTSIDE DRIVE UNIT AND TIGHTEN. SEE DRIVE UNIT COMPONENT SUPPLIERS MANUAL FOR DETAILS.



EXPLODED VIEW A

SCALE: NTS

NOTES:

1. DIMENSIONS AND B.O.M. CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UNLESS OTHERWISE NOTED.
2. HILTI ADHESIVE NOT REQUIRED FOR THRU DECK BOLTING.
3. PER THE ENGINEER, GROUT SHALL BE AGGREGATE CONTAINING PRODUCT, 3,000 PSI MIN.
4. PILOT DRILL HOLE FROM BOTTOM/TOP TO AVOID SPALLING DAMAGE TO EXIT SIDE OF CONCRETE SLAB.
5. CONTRACTOR TO USE THE RING SUPPLIED WITH THE GEAR REDUCER TO ATTACH TAGS.

REV	DESCRIPTION
3	NOTE 4 UPDATED PER REVIEW COMMENTS BY ENGINEER, BALLONS AND NOTE 5 ADDED
2	NOTE 3 & 4 ADDED PER REVIEW COMMENTS BY ENGINEER, BALLOON UPDATED
2	BASE PLATE THICKNESS UPDATED PER REVIEW COMMENTS BY ENGINEER
2	DRIVE ANCHORS UPDATED TO DOUBLE NUTS BELOW DECK, DIMENSION UPDATED

SHEET REVISIONS

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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
PRIMARY SEDIMENTATION TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 07 Feb 24	DRIVE UNIT LAYOUT: CROSS TANK T-212 - SECTION

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	26 of 26	WGZ0067001 – 26	04

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February 12, 2024

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5.2 Installation & Layout Drawing List - Grit Tank 1-3

SHEET NO.		DESCRIPTION
WGZ0067002	-01	-DRAWING LIST
WGZ0067002	-02	-GENERAL NOTES, SCHEDULES, LEGENDS
WGZ0067002	-03	-PLAN VIEW
WGZ0067002	-04	-ELEVATION A-A: LONGITUDINAL COLLECTOR - DRIVE SIDE
WGZ0067002	-05	-ELEVATION B-B: LONGITUDINAL COLLECTOR - NON-DRIVE SIDE
WGZ0067002	-06	-SECTION C-C: HEAD SHAFT & LOWER IDLER
WGZ0067002	-07	-SECTION D-D: GRIT COLLECTOR FLIGHT
WGZ0067002	-08	-SECTION E-E: TAIL SHAFT
WGZ0067002	-09	-DETAIL SHEET: DETAILS 1-5
WGZ0067002	-10	-DETAIL SHEET: FLIGHT ASSEMBLY
WGZ0067002	-11	-DETAIL SHEET: WEAR STRIP INSTALLATION
WGZ0067002	-12	-DRIVE UNIT LAYOUT: LONGITUDINAL PLAN VIEWS - TANK T-112
WGZ0067002	-13	-DRIVE UNIT LAYOUT: LONGITUDINAL SECTIONS & ELEVATIONS - TANK T-112
WGZ0067002	-14	-DRIVE UNIT LAYOUT: LONGITUDINAL PLAN VIEWS - TANK T-111 & T-113
WGZ0067002	-15	-DRIVE UNIT LAYOUT: LONGITUDINAL SECTIONS & ELEVATIONS - TANK T-111 & T-113
WGZ0067002	-16	-DETAIL A: RETURN RAIL WALL BKT
WGZ0067002	-17	-DETAIL SHEET: RETURN RAIL WEAR STRIP INSTALLATION
WGZ0067002	-18	-DETAIL SHEET: HOLD DOWN RAILS - DRIVE SIDE
WGZ0067002	-19	-DETAIL SHEET: HOLD DOWN RAILS - NON-DRIVE SIDE

INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO GRIT 1-3, NANAIMO,BRITISH COLUMBIA CANADA
THREE (3)- THREE (3) SHAFT LONGITUDINAL GRIT COLLECTION SYSTEMS

INSTALLATION AND LAYOUT DRAWING LIST

SHEET NO.	DESCRIPTION
WGZ0067002 -01	-DRAWING LIST
WGZ0067002 -02	-GENERAL NOTES, SCHEDULES, LEGENDS
WGZ0067002 -03	-PLAN VIEW
WGZ0067002 -04	-ELEVATION A-A: LONGITUDINAL COLLECTOR - DRIVE SIDE
WGZ0067002 -05	-ELEVATION B-B: LONGITUDINAL COLLECTOR - NON-DRIVE SIDE
WGZ0067002 -06	-SECTION C-C: HEAD SHAFT & LOWER IDLER
WGZ0067002 -07	-SECTION D-D: GRIT COLLECTOR FLIGHT
WGZ0067002 -08	-SECTION E-E: TAIL SHAFT
WGZ0067002 -09	-DETAIL SHEET: DETAILS 1-5
WGZ0067002 -10	-DETAIL SHEET: FLIGHT ASSEMBLY
WGZ0067002 -11	-DETAIL SHEET: FLOOR WEAR STRIP INSTALLATION
WGZ0067002 -12	-DRIVE UNIT LAYOUT: LONGITUDINAL PLAN VIEWS - TANK T-112
WGZ0067002 -13	-DRIVE UNIT LAYOUT: LONGITUDINAL SECTIONS & ELEVATIONS - TANK T-112
WGZ0067002 -14	-DRIVE UNIT LAYOUT: LONGITUDINAL PLAN VIEWS - TANK T-111 & T-113
WGZ0067002 -15	-DRIVE UNIT LAYOUT: LONGITUDINAL SECTIONS & ELEVATIONS - TANK T-111 & T-113
WGZ0067002 -16	-DETAIL A: RETURN RAIL WALL BKT
WGZ0067002 -17	-DETAIL SHEET: RETURN RAIL WEAR STRIP INSTALLATION
WGZ0067002 -18	-DETAIL SHEET: HOLD DOWN RAILS - DRIVE SIDE
WGZ0067002 -19	-DETAIL SHEET: HOLD DOWN RAILS - NON-DRIVE SIDE

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049
January 24, 2024

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REV	DATE	DESCRIPTION	BY
3	15 Jan 24	SEE SHEETS: -03, -09, -13 AND -15	RHP
2	13 Dec 23	SEE SHEETS: -02 THRU -19	RHP
1	29 Sep 23	ISSUED FOR REVIEW	RHP

PROJECT REVISION SCHEDULE

REV	DESCRIPTION

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DRAWING LIST

SCALE	SHEET	DRAWING NUMBER	REV
NTS	01 of 19	WGZ0067002 – 01	03

Rev 01

GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS PRIOR TO INSTALLATION OF EQUIPMENT. THESE DRAWINGS ARE TO BE USED IN CONJUNCTION WITH THE APPROVED OPERATION AND MAINTENANCE MANUAL.

2. BILL OF MATERIAL IS FOR ONE (1) TANK, CONSISTING OF ONE(1) LONGITUDINAL COLLECTOR.

3. LOCATE ALL EQUIPMENT FROM THEORETICAL TANK CENTER LINE.
   INSTALLATION TOLERANCES: SPROCKETS MUST BE LEVEL & PARALLEL TO EACH OTHER WITHIN ± 1/16" & PARALLEL TO THEORETICAL TANK CENTERLINE. STUB SHAFT/SPINDLE AXIS MUST ALIGN WITH ONE ANOTHER AND BE PERPENDICULAR TO THE THEORETICAL CENTERLINE WITHIN ± 1/16. FLIGHT ATTACHMENT LINK CENTER DISTANCE MUST BE WITHIN ± 1/16".

4. ANCHOR BOLTS FURNISHED PER BILL OF MATERIAL, INSTALLED BY CONTRACTOR 2

5. ALL GROUT TO BE NON-SHRINK, 3,000 PSI MIN, FURNISHED & INSTALLED BY THE CONTRACTOR AFTER FINAL ADJUSTMENT & ALIGNMENT OF EQUIPMENT HAS BEEN VERIFIED BY POLYCHEM SYSTEMS. 2

6. INSTALL DRIVE CHAIN TENSIONER ASSEMBLIES AFTER FINAL INSTALLATION & ALIGNMENT OF NH-78 DRIVE & DRIVEN SPROCKETS & DRIVE CHAIN.

7. LUBRICATE BEARING SLEEVE OF DRIVE UNIT AND COAT INPUT SHAFT WITH ANTI-SEIZE (BY CONTRACTOR) PRIOR TO INSTALLATION. 2

8. COAT ALL STAINLESS STEEL TO STAINLESS STEEL FASTENERS WITH AN ANTI-SEIZE COMPOUND BY CONTRACTOR, APPLIED PER MFG'S INSTRUCTIONS.

9. LOCATE & MARK ANCHOR LOCATIONS AS SHOWN.

10. CHECK LOCATIONS WITH TEST FIT OF EQUIPMENT TO BE INSTALLED, ADJUST POSITION IF NECESSARY, THEN DRILL AS SHOWN IN SCHEDULE. IF INTERFERENCE OR DISCREPANCY IS ENCOUNTERED, CONTACT POLYCHEM SYSTEMS BEFORE INSTALLING ADDITIONAL EQUIPMENT.

11. INSTALL CHAIN GUARDS & TAKE-UP ASSEMBLIES AFTER INSTALLING DRIVE UNITS, ALIGN DRIVE AND TAKE-UP SPROCKETS WITH DRIVEN SPROCKETS ON HEAD SHAFTS.

12. ELEVATIONS SHOWN ON THESE DRAWINGS ARE FOR REFERENCE ONLY. IN CASES WHERE CLEARANCES ARE CRITICAL THE DIMENSION SHALL SERVE AS A MINIMUM REQUIREMENT FROM THE HIGHEST POINT ACROSS THE TANK WIDTH AND FROM THE FURTHEST POINT LONGITUDINALLY FOR THE LOWER IDLER AND THE CLOSEST POINT LONGITUDINALLY FOR THE TAIL SHAFT. +/- DIMENSIONS ARE APPROXIMATE AND COULD VARY THROUGHOUT THE TANK UPON FINAL ADJUSTMENTS. THEY SHOULD NOT BE USED TO INSTALL EQUIPMENT EXCEPT AT LOWER IDLER OR TAIL SHAFT WHERE THE +/- IS SUPPLIED TO ALLOW MOVEMENT FOR ALIGNMENT WITH THE OPPOSITE SIDE IDLER. 2

13. ORIENTATION CRITICAL FOR COLLECTOR CHAIN, DRIVE CHAIN, WEAR STRIP, AND MANY OTHER COMPONENTS. REFER TO PERTINENT COMPONENT DRAWINGS PRIOR TO INSTALLATION.

14. RETURN RAILS ARE TO BE FIELD DRILLED AND CUT TO LENGTH AS REQUIRED, IF APPLICABLE.

15. CONTRACTOR IS RESPONSIBLE FOR FIELD MODIFYING CHAIN GUARD COVERS, AT APPROPRIATE LOCATIONS, TO ACCOMMODATE INGRESS AND/OR EGRESS OF ELECTRICAL WIRING. 2 21

16. DIMENSIONS ARE IN FEET - INCHES AND ARE CONSIDERED TYPICAL FOR ALL TANKS UON.

17. BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UON.

18. BRENTWOOD INDUSTRIES SHALL FURNISH THE FOLLOWING FOR ALL CARBON STEEL AND CAST IRON COMPONENTS. REFER TO SHEET -09, FOR IDENTIFICATION OF PAINTED ITEMS. 2
    - SURFACE PREPARATION OF SSPC-SP10 NEAR-WHITE METAL BLAST CLEANING.
    - SHOP PRIMER: 1 COAT SHERWIN WILLIAMS DURA-PLATE 235 @ 4 MILS.
      FINISH PAINT SHALL BE BY OTHERS

19. THIS INSTALLATION & LAYOUT SET DOCUMENTS TANK STRUCTURE DIMENSIONS BY TANK VIA TABLES ON APPLICABLE SHEETS. FOR ALL STRUCTURE DIMENSIONS NOT INCLUDED IN TABLES, BRENTWOOD HAS REVIEWED TANKS 1-3 FIELD MEASUREMENT/SCAN DATA TO DETERMINE THE NOMINAL STRUCTURE DIMENSIONS SHOWN IN THIS INSTALLATION AND LAYOUT DRAWING SET. EQUIPMENT IS DESIGNED TO SUIT THE RANGE OF ACTUAL CONFIRMED DIMENSIONS.

ENGINEERS & GEOSCIENTISTS OF
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2

20. WHEREVER NEW CONCRETE IS SPECIFIED TO BE APPLIED TO EXISTING, SUBMERGED CONCRETE STRUCTURES, CONTRACTOR SHALL CHIP AWAY OR OTHERWISE REMOVE APPROXIMATELY 1" OF EXISTING CONCRETE SURFACE TO PROVIDE SOUND CONCRETE TO BED NEW CONCRETE ON.

21. REFER TO SHEET-11 FOR WEAR STRIP FLOOR ANCHOR INSTALLATION.

ABBREVIATIONS

APPROX	APPROXIMATE
BOM	BILL OF MATERIALS
BRKT	BRACKET
BRG	BEARING
CL	CENTERLINE
DIST	DISTANCE
DIM	DIMENSION
EL	ELEVATION
EQPT	EQUIPMENT
FL	FLOOR
FLT	FLIGHT
FMM	FLT MISALIGNMENT MONITORING
ft/m	FEET PER MINUTE
HDSFT	HEAD SHAFT
LONG	LONGITUDINAL
MAX	MAXIMUM
MIN	MINIMUM
MTG	MOUNTING
OPNG	OPENING
OPP	OPPOSITE
SMM	SPRKT MOTION MONITORING
SPRKT	SPROCKET
TLSFT	TAIL SHAFT
THRU	THROUGH
TOD	TOP OF DECK
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
WL	WATER LEVEL
WS	WEAR STRIP
CTR	CONTRACTOR

BILL OF MATERIALS

BOM #	DESCRIPTION
WGZ0067004	PRIMARY GRIT TANK 1
WGZ0067005	PRIMARY GRIT TANK 2
WGZ0067006	PRIMARY GRIT TANK 3

LEGEND

SYMBOL	DESCRIPTION
(L)	ANCHOR TYPE CALLOUT
@	AT
(#)	BOM ITEM CALLOUT
	GRID DATUM
(#) XX	DETAIL CALLOUT
# VIEW TITLE SCALE:	DRAWING LABEL DRAWING NUMBER(S) WHERE TAKEN
#	FLAG NOTE - SEE NOTE THAT SHEET
	FLOOR SLOPE - TO LONG LINES
MAX WL XX.XX	MAXIMUM WATER LEVEL EL
(DIM)	REFERENCE DIMENSION
<DIM>	DIMENSION REQUIRES VERIFICATION/CONFIRMATION
#	REVISION CALLOUT
# VIEW	VIEW CALLOUT
	CONCRETE
	GROUT
	STEEL
#	DATUM
W/	WITH

ADHESIVE ANCHOR SCHEDULE

SYM.	ANCHOR SIZE	DRILL SIZE	EMBED	PROJ	MIN EDGE DIST	BOM ITEM
(A)	5/8"	3/4"	4 1/2"	3"	3 1/8"	18
(B)	1"	1 1/8"	5"	3 1/2"	5"	19
(C)	1/2" \ 13/16"	7/8"	5"	0"	4"	23
(D)	1/2"	9/16"	4"	1 3/4"	2 1/2"	30
(E)	3/8"	7/16"	3"	1 3/4"	1 7/8"	35
(F)	5/8"	3/4"	5"	6 1/2"	3 1/8"	43
(G)	1/2"	9/16"	4"	3"	2 1/2"	50
(H)	1/2"	9/16"	3 3/4"	2"	2 1/2"	57

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049
January 29, 2024

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REV	DESCRIPTION
2	NOTES AND CALLOUTS UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

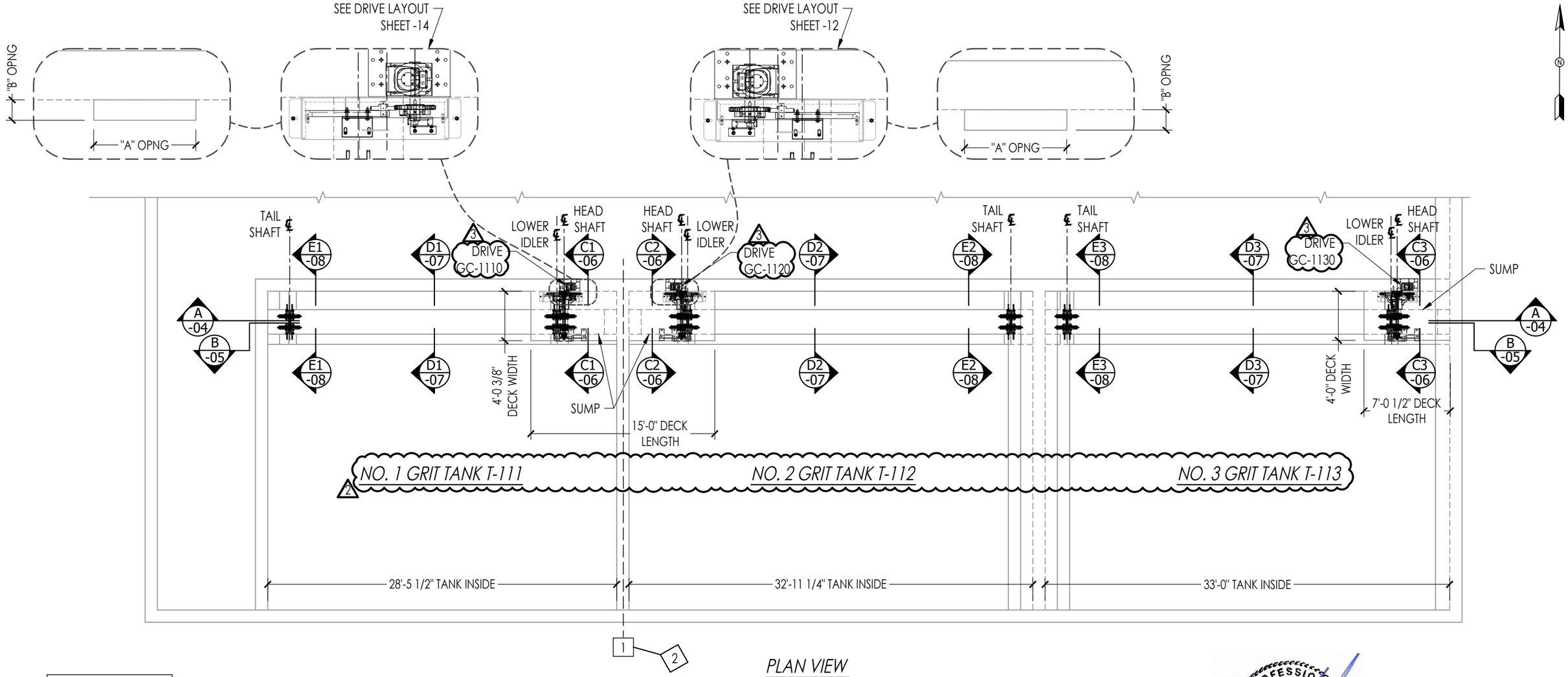
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	GENERAL NOTES, SCHEDULES, LEGENDS

SCALE	SHEET	DRAWING NUMBER	REV
NTS	02 of 19	WGZ0067002 – 02	03

Rev 01



PLAN VIEW

DIMENSION "___"		
TANK	A	B
T-111	2'-1"	5"
T-112	2'-1"	5"
T-113	3'-0"	6"

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. TANK T-111 IS SIMILAR TO TANK T-113 UON. TANK T-111 IS SIMILAR TO TANK T-112, MIRRORED ABOUT DATUM 1, UON..

REV	DESCRIPTION
3	ALL DRIVES TAG NUMBERS UPDATED PER REVIEW COMMENTS BY ENGINEER
2	TANK TAG NUMBERS UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

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January 24, 2024

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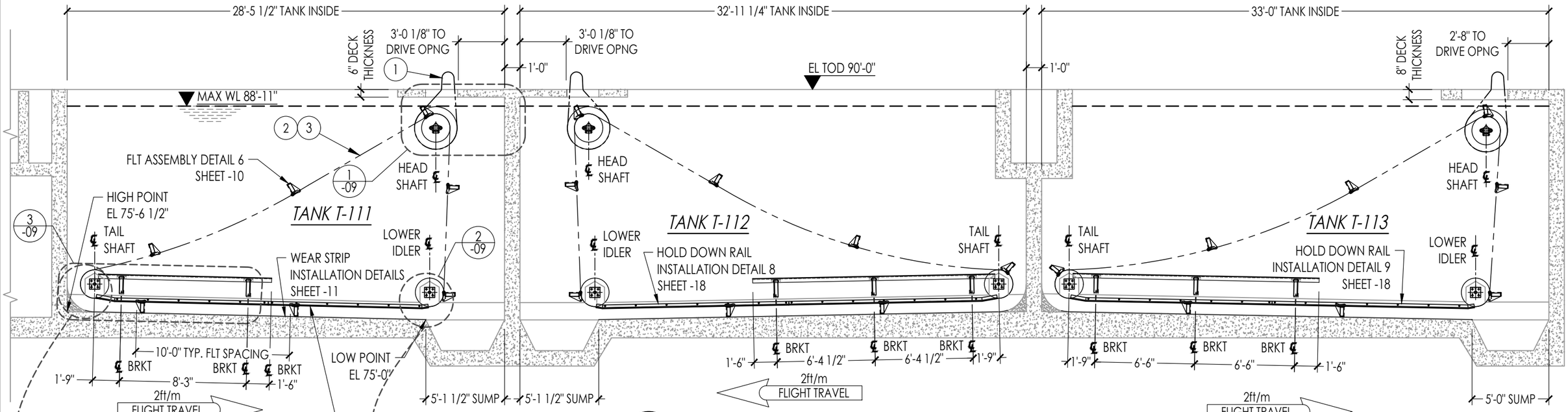
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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	PLAN VIEW

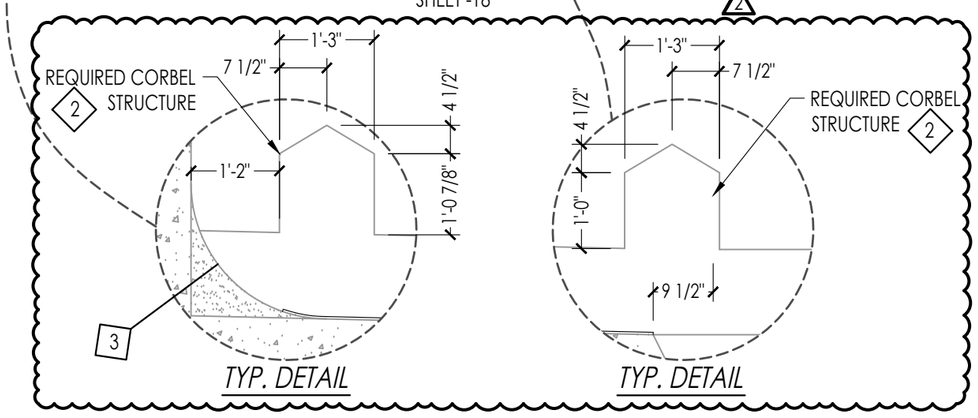
SCALE	SHEET	DRAWING NUMBER	REV
1/8" = 1'-0"	03 of 19	WGZ0067002 – 03	03

Rev 01



A-A *LONGITUDINAL COLLECTOR - DRIVE SIDE* -03

SCALE- 5/32"=1'-0"



NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. OLD CORBELS ARE FULLY REMOVED AND REPLACED WITH NEW CORBELS. MINIMUM CORBEL SIZE SHOWN FOR PROPER EQUIPMENT INSTALLATION. FINAL DESIGN SHALL BE BY OTHERS.
3. PREVIOUS SCREED TO BE REMOVED AND REPLACED AS SHOWN.

REV	DESCRIPTION
2	ONLY REQUIRED CORBEL SHOWN PER REVIEW COMMENTS BY ENGINEER
2	NOTES & DIMENSION UPDATED, EXISTING CORBEL REMOVED

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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	ELEVATION A-A: LONGITUDINAL COLLECTOR - DRIVE SIDE

SCALE	SHEET	DRAWING NUMBER	REV
5/32"=1'-0"	04 of 19	WGZ0067002 – 04	03

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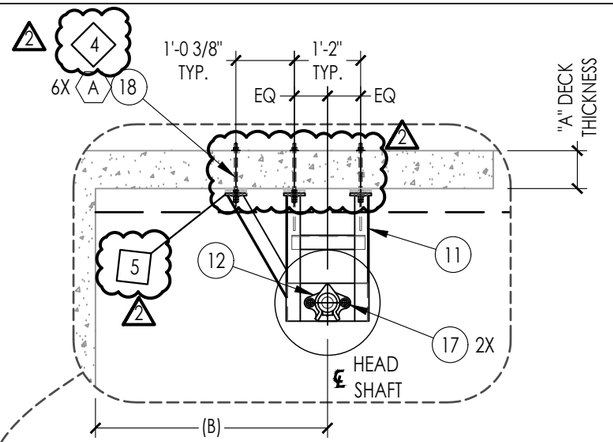
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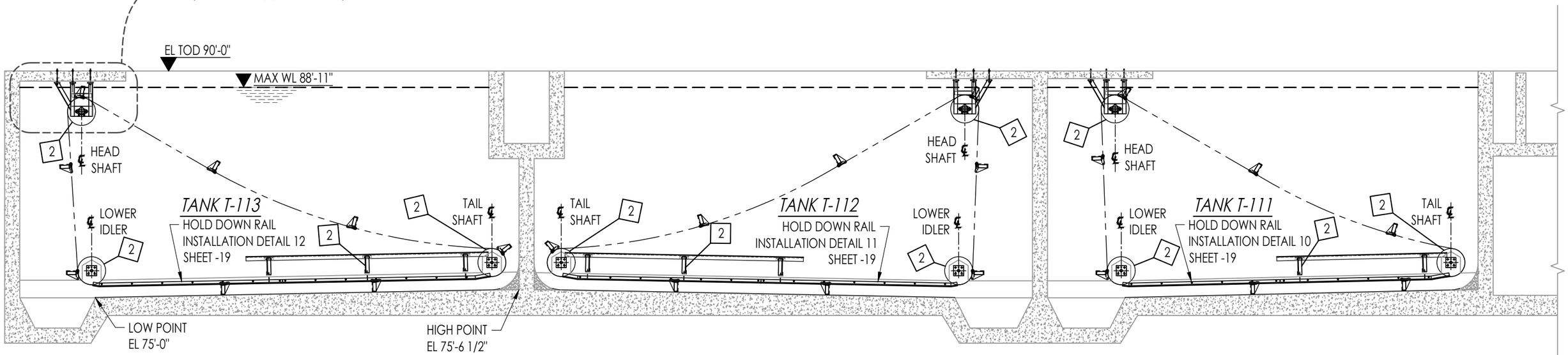
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DIMENSION "___"		
TANK	A	B
T-111	6"	4'-5 5/8"
T-112	6"	4'-5 5/8"
T-113	8"	4'-1"



B-B *LONGITUDINAL COLLECTOR - NON-DRIVE SIDE*

-03 SCALE- 5/32"=1'-0"

NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. EQUIPMENT MOUNTING LOCATION TO MATCH DRIVE SIDE OF THE TANK.
3. ALL NON-DRIVE SIDE CORBELS SHALL MATCH THE MINIMUM REQUIRED STRUCTURE AS SHOWN ON SHEET -04. ENSURE THE MINIMUM ANCHOR EDGE DISTANCE IS MAINTAINED BASED ON THE IDLER LOCATION RELATIVE TO THE FLOOR BREAK, DEFINED ON SHEET -09.
4. HILTI ADHESIVE NOT REQUIRED FOR THRU DECK BOLTING.
5. REFER TO COMPONENT DRAWING FOR ALTERNATE HOLE LOCATIONS, NOT SHOWN IN THE I&L. ALTERNATE PRE-FABRICATED HOLES SHALL BE USED BY THE CONTRACTOR AS NECESSARY TO AVOID CUTTING THRU REBAR IN THE DECK.

2

REV	DESCRIPTION
2	PER REVIEW COMMENTS BY ENGINEER, NOTE 4 & 5 ADDED
2	ANCHORS UPDATED TO THRU DECK WITH DOUBLE NUTS AT BOTTOM

SHEET REVISIONS

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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	ELEVATION B-B: LONGITUDINAL COLLECTOR - NON-DRIVE SIDE

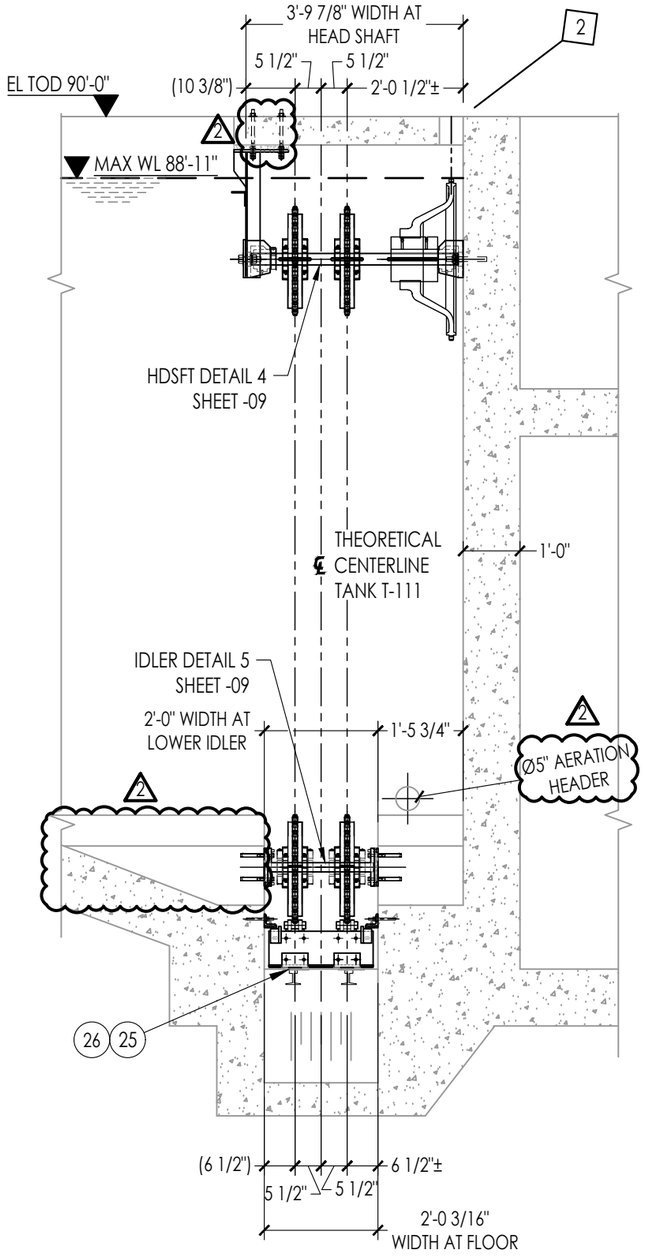
SCALE	SHEET	DRAWING NUMBER	REV
5/32"=1'-0"	05 of 19	WGZ0067002 – 05	03

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049
January 24, 2024

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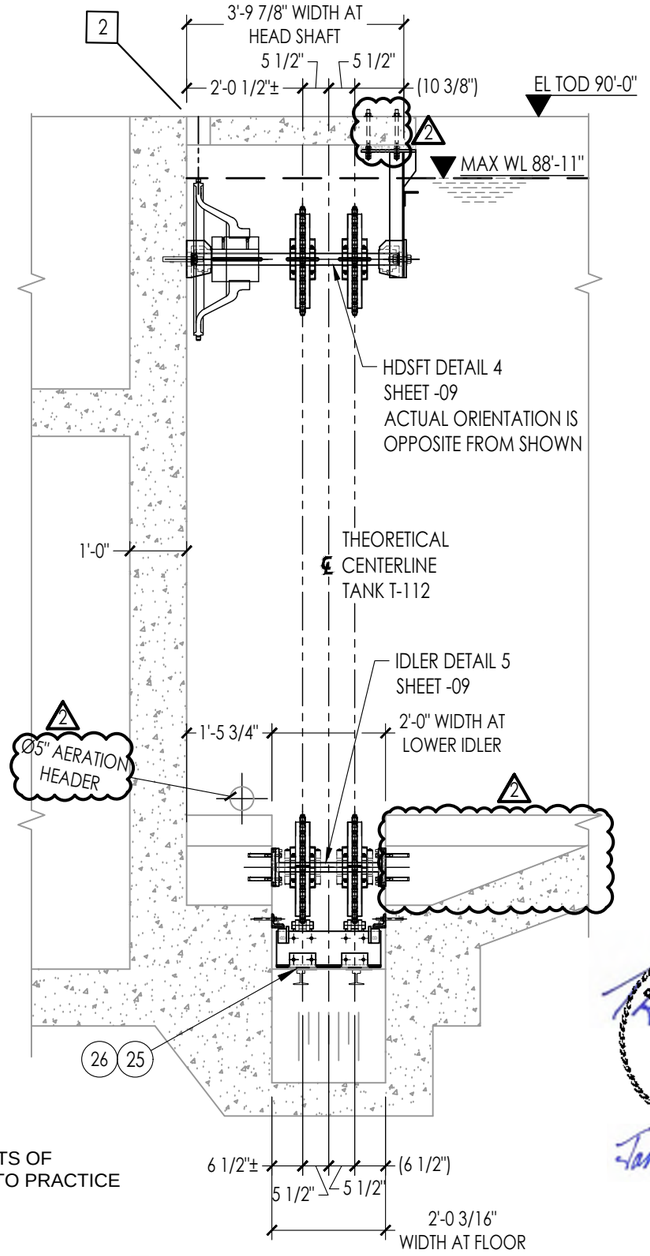
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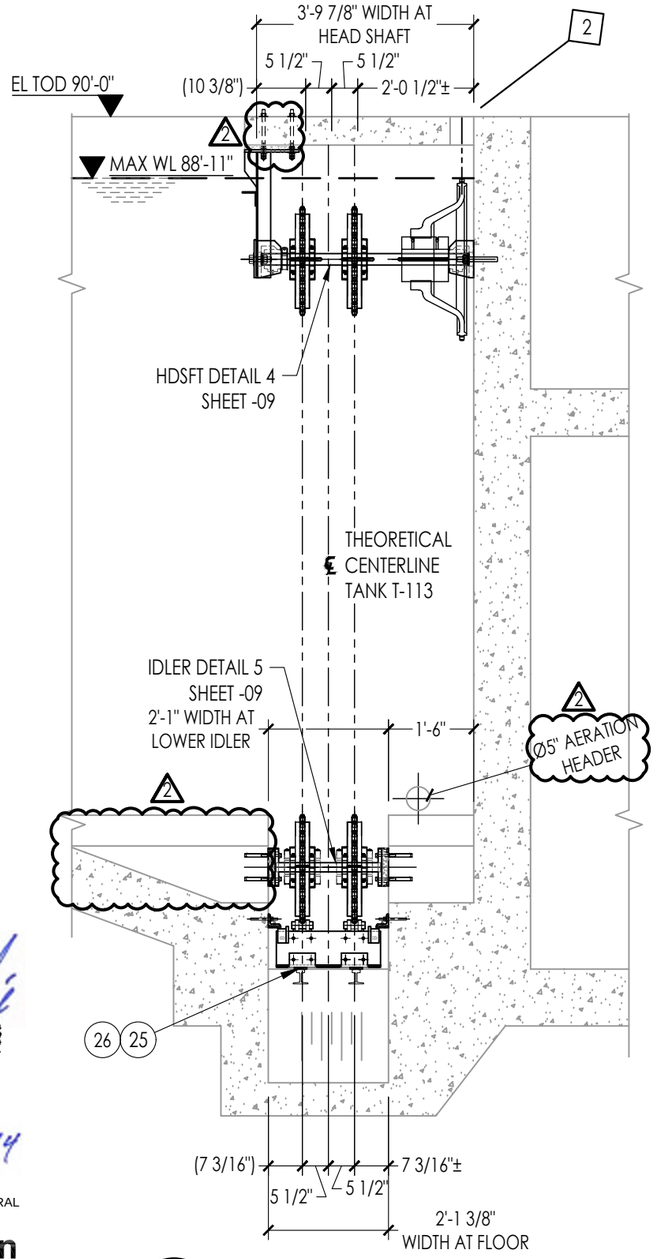
C1-C1 *HEAD SHAFT & LOWER IDLER - TANK T-111*

-03 SCALE- 3/8" = 1'-0"



C2-C2 *HEAD SHAFT & LOWER IDLER - TANK T-112*

-03 SCALE- 3/8" = 1'-0"



C3-C3 *HEAD SHAFT & LOWER IDLER - TANK T-113*

-03 SCALE- 3/8" = 1'-0"

ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA T. G. WICKIE # 41049

January 24, 2024

LIMITED TO STRUCTURAL DESIGN ONLY

Larson Engineering Inc
1488 Bond Street, Suite 100
Naperville, Illinois 60563-6503
(P) 630.357.0540 (F) 630.357.0164
21230798.000

NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. DRIVES NOT SHOWN FOR CLARITY.
3. SOME EXISTING PIPING, BAFFLES AND OTHER DETAILS OMITTED FOR CLARITY. 2
4. FOR HEAD SHAFT AND IDLER ELEVATION, SEE SHEET 9.

REV	DESCRIPTION
2	CORBEL EXTENDED TILL SLOPE PER REVIEW COMMENTS BY ENGINEER
2	DIMENSION & NOTE ADDED, ANCHORS UPDATED TO THRU DECK WITH DOUBLE NUTS AT BOTTOM

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION

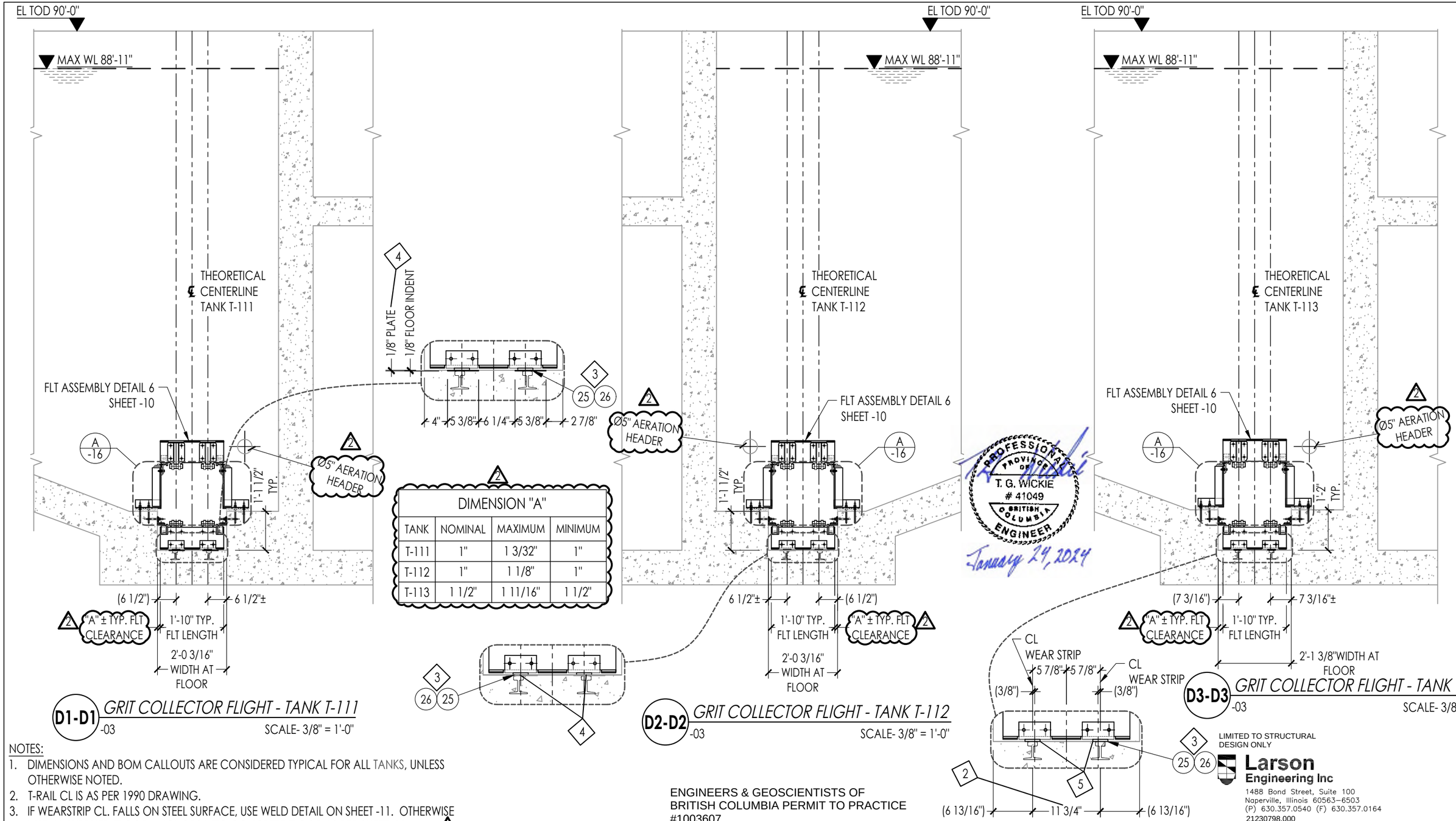
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	SECTION C-C: HEAD SHAFT & LOWER IDLER

SCALE	SHEET	DRAWING NUMBER	REV
3/8" = 1'-0"	06 of 19	WGZ0067002 – 06	03



NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. T-RAIL CL IS AS PER 1990 DRAWING.
3. IF WEARSTRIP CL. FALLS ON STEEL SURFACE, USE WELD DETAIL ON SHEET -11. OTHERWISE INSTALL SUPPLIED FLOOR ANCHORS INTO CONCRETE FLOOR AS PER SHEET -11.
4. CONTRACTOR TO REMOVE ALL EXISTING STEEL WEAR STRIPS THAT ARE WELDED TO THE EXISTING T-RAILS.
5. EMBEDDED RAIL IS ASSUMED FLUSH WITH CONCRETE FLOOR PER RFI-003 RESPONSE. IF EMBEDDED RAIL IS 1/8" OR MORE BELOW SURFACE OF CONCRETE TROUGH, CONTRACTOR TO SPOT WELD IN NEW 316 SS SHIM STOCK @ 8" CC TO BUILD UP SURFACE OF RAIL. GRIND OFF ANY HIGH SPOTS ON T-RAIL BEFORE INSTALLING SHIM STOCK. 309 SS WELDING ROD TO BE USED FOR SHIM STOCK ATTACHMENT WELDS.
6. SOME EXISTING PIPING, BAFFLES AND OTHER DETAILS OMITTED FOR CLARITY.

T. G. WICKIE # 41049 PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA
January 29, 2024

ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

REV	DESCRIPTION
2	FLIGHT CLEARANCE TABLE ADDED PER REVIEW COMMENTS BY ENGINEER
2	DIMENSION ADDED & NOTE UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION

ISO-9001 REGISTERED

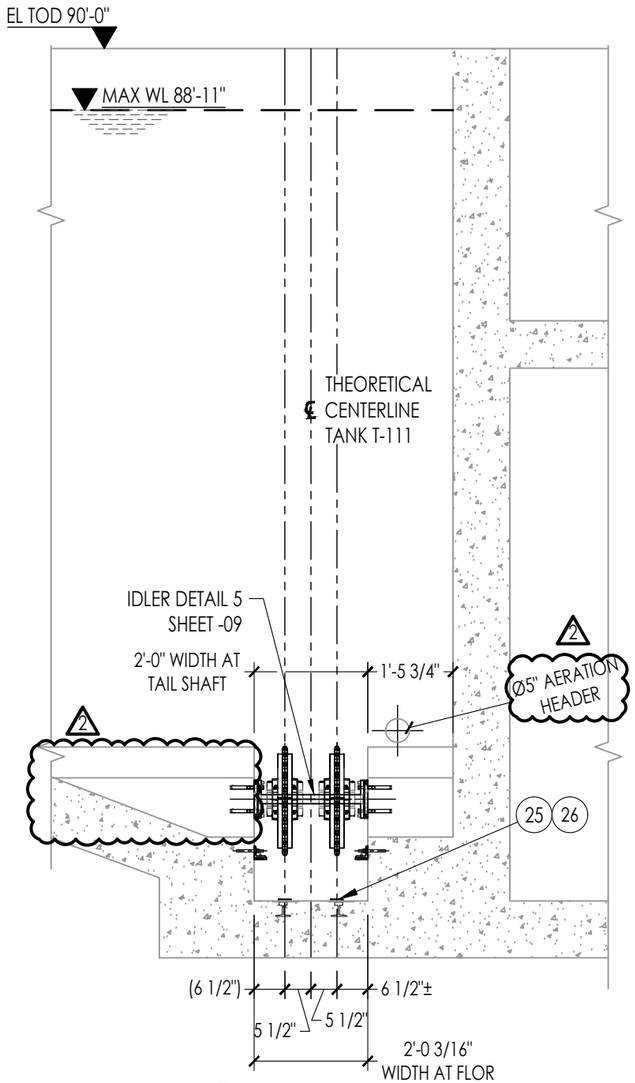
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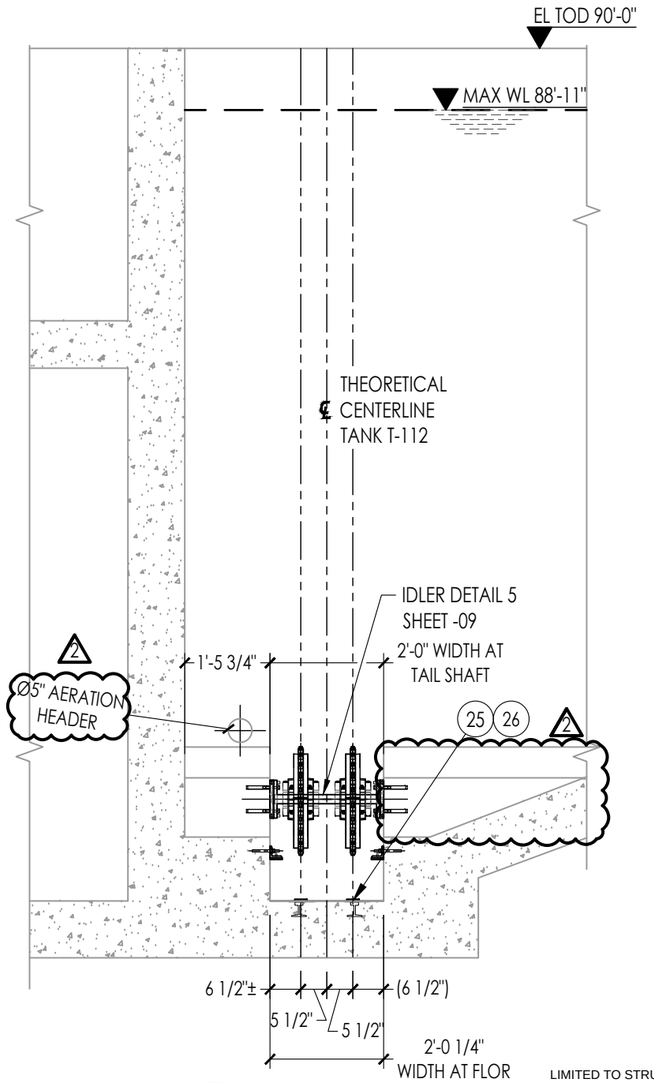
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	SECTION D-D: GRIT COLLECTOR FLIGHT

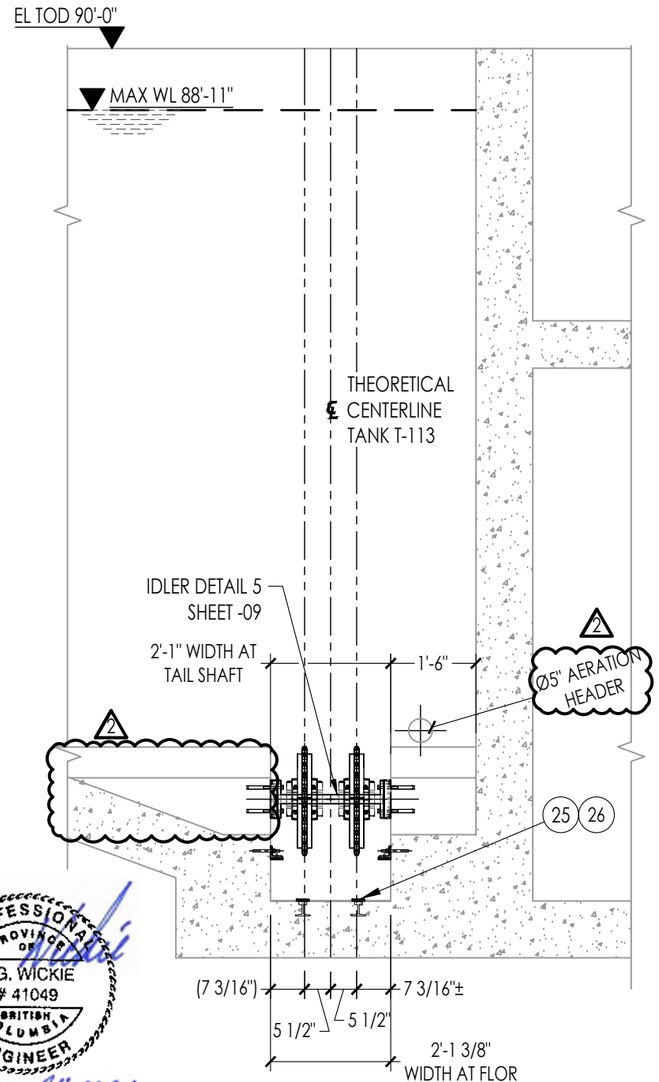
SCALE	SHEET	DRAWING NUMBER	REV
3/8" = 1'-0"	07 of 19	WGZ0067002 – 07	03



E1-E1 *TAIL SHAFT - TANK T-111*
-03 SCALE- 3/8" = 1'-0"



E2-E2 *TAIL SHAFT - TANK T-112*
-03 SCALE- 3/8" = 1'-0"



E3-E3 *TAIL SHAFT - TANK T-113*
-03 SCALE- 3/8" = 1'-0"

NOTES:
1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. FOR TAIL SHAFT ELEVATION, SEE SHEET 9. 2

PROFESSIONAL ENGINEER
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T. G. WICKIE
41049
January 29, 2024

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ENGINEERS & GEOSCIENTISTS OF
BRITISH COLUMBIA PERMIT TO PRACTICE
#1003607

REV	DESCRIPTION
2	DIMENSION & NOTE ADDED, CORBEL EXTENDED TILL SLOPE PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

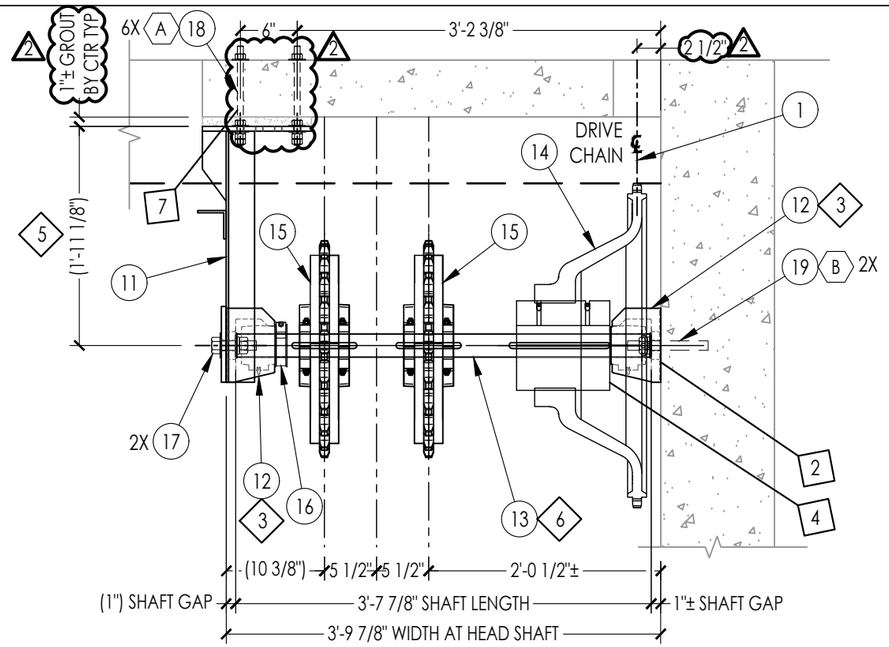
STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

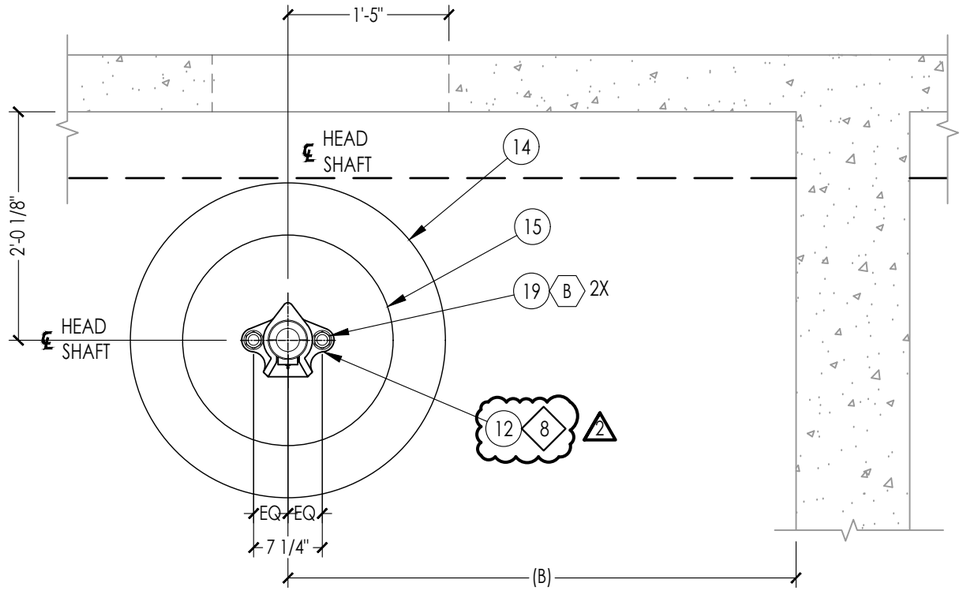
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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	SECTION E-E: TAIL SHAFT

SCALE	SHEET	DRAWING NUMBER	REV
3/8" = 1'-0"	08 of 19	WGZ0067002 – 08	03

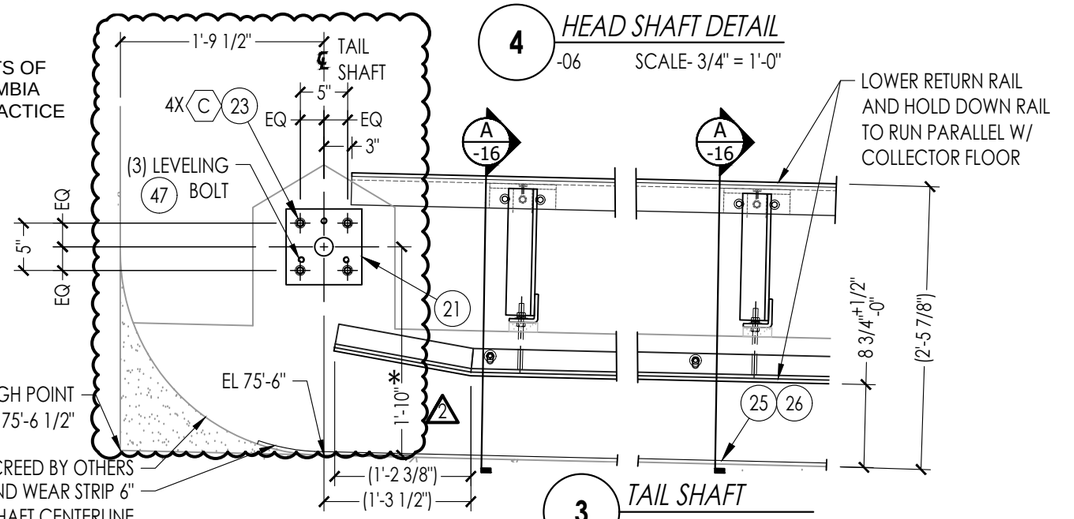


4 *HEAD SHAFT DETAIL*
-06 SCALE- 3/4" = 1'-0"

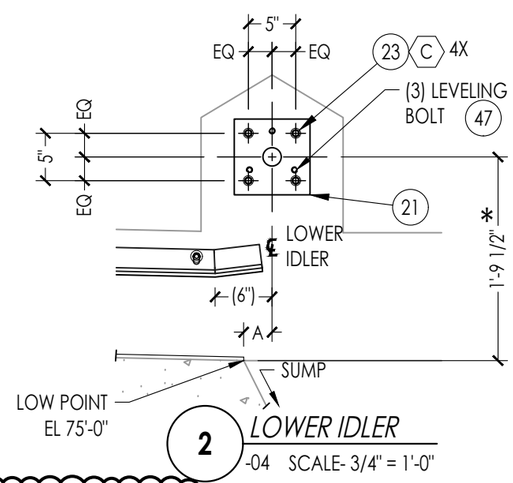


1 *HEAD SHAFT - DRIVE SIDE*
-04 SCALE- 3/4" = 1'-0"

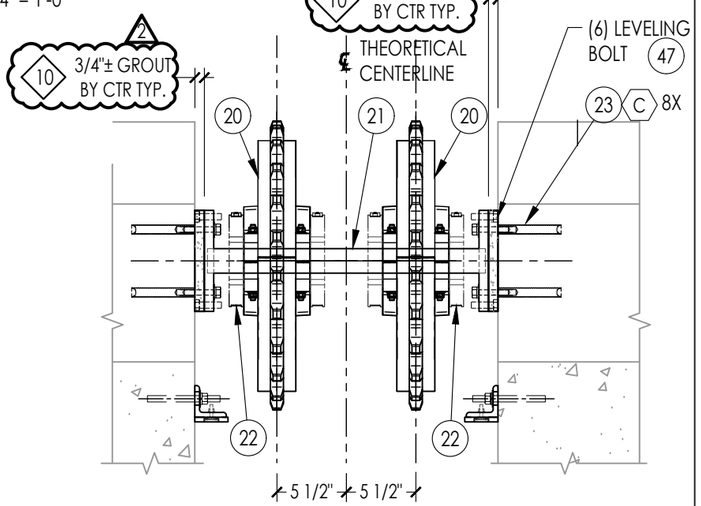
DIMENSION "___"		
TANK	A	B
T-111	3"	4'-5 5/8"
T-112	3"	4'-5 5/8"
T-113	2 3/4"	4'-1"



3 *TAIL SHAFT*
-04 SCALE- 3/4" = 1'-0"



2 *LOWER IDLER*
-04 SCALE- 3/4" = 1'-0"



5 *IDLER SPROCKET DETAILS*
-06, -08 SCALE- 1" = 1'-0"

NOTES:
1. SEE WEAR STRIP INSTALLATION DETAILS SHEET-11(FLOOR) AND SHEET-17 (RETURN RAIL) FOR REQUIRED INSTALLATION GAPS. WEAR STRIP GAPS SHALL NOT OCCUR OVER THE SPLICE SHOE AREA.
2. CONTRACTOR TO SHIM BEHIND WALL BEARING, AS REQUIRED, TO LEVEL.
3. REFER TO SHEET -02, NOTE 18.
4. LOCATE SET COLLAR WITH APPROXIMATELY 1/8" CLEARANCE TO THE BEARING. SET VDS 40T SPROCKET TO MAINTAIN A 1/8" GAP FROM THE ADJUSTABLE HUB TO THE BEARING, IN ACCORDANCE WITH THE MANUFACTURER'S CUT SHEETS.
5. ALIGN WITH DRIVE SIDE.
6. FOR INSTALLATION, CONTRACTOR SHALL PRE-ASSEMBLE WALL BEARINGS ON THE SHAFT AND SLIDE INWARD, AS REQUIRED TO CLEAR ANCHOR PROJECTIONS ON THE DRIVE SIDE. CONTRACTOR MAY NEED TO TEMPORARILY REMOVE KEYS TO SLIDE WALL BEARINGS INWARD.
7. PILOT DRILL HOLE FROM BOTTOM/TOP TO AVOID SPALLING DAMAGE TO EXIT SIDE OF CONCRETE SLAB.
8. GREASE FITTINGS ON THESE BEARINGS SHALL BE TUBED TO THE OPERATING LEVEL FOR EASY ACCESS. SS TUBING TO BE DONE BY CONTRACTOR AND SHALL AVOID INTERFERENCE TO BRENTWOOD'S EQUIPMENT.
9. PREVIOUS SCREED TO BE REMOVED AND REPLACED AS SHOWN.
10. GROUT TO BE ADDED, BY THE CONTRACTOR, AFTER FINAL ALIGNMENT AND FIELD INSPECTION OF THE EQUIPMENT.

* SEE NOTE 12 ON SHEET -02

REV	DESCRIPTION
3	NOTE 7 AND 8 UPDATED PER REVIEW COMMENTS BY ENGINEER
2	ANCHORS UPDATED TO THROUGH DECK WITH DOUBLE NUTS AT BOTTOM PER REVIEW COMMENTS BY ENGINEER
2	NOTES & DIMENSION ADDED, EXISTING CORBEL REMOVED ONLY REQUIRED CORBEL SHOWN

SHEET REVISIONS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA T. G. WICKIE # 41049
January 29, 2024

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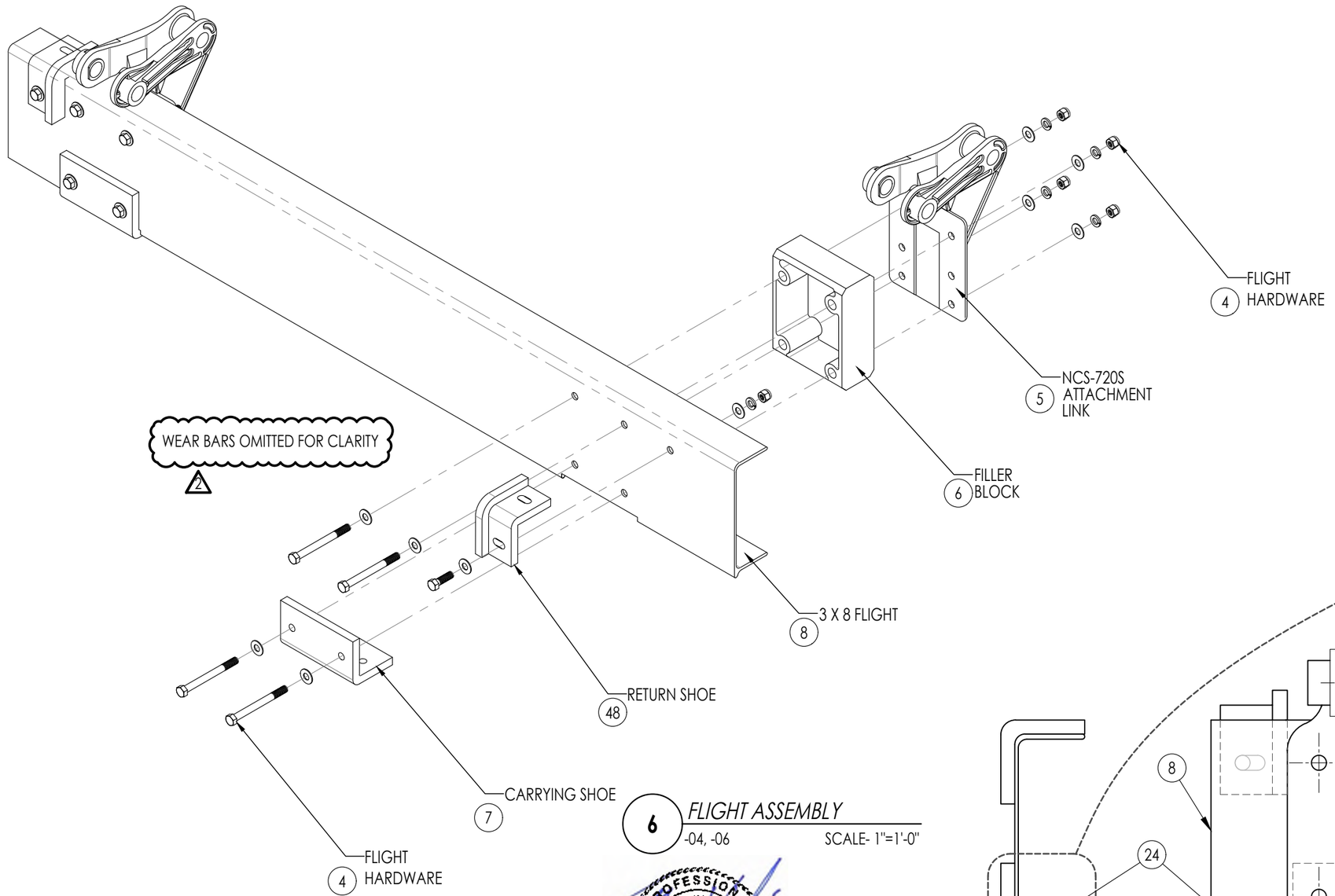
STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

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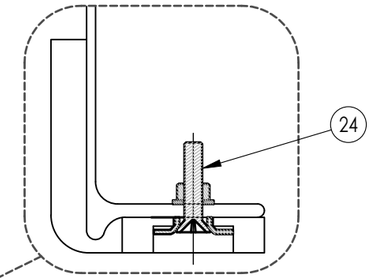
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DETAIL SHEET: DETAILS 1-5

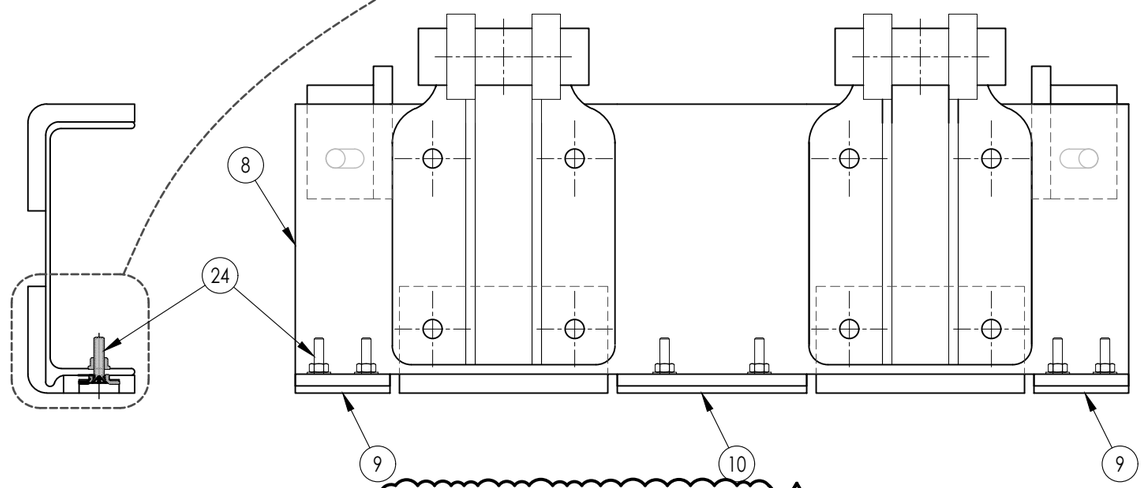
SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	09 of 19	WGZ0067002 – 09	03



6 FLIGHT ASSEMBLY

-04, -06 SCALE- 1"=1'-0"





WEAR BAR ATTACHMENT DETAIL 2

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
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#1003607

FLAG NOTES:

1. DIMENSIONS AND B.O.M. CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UNLESS OTHERWISE NOTED.
2. ASSEMBLY DETAILS MAY NOT REFLECT ACTUAL FLIGHT. ASSEMBLY PROCEDURE IS TYPICAL.

REV	DESCRIPTION
2	CALLOUTS ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

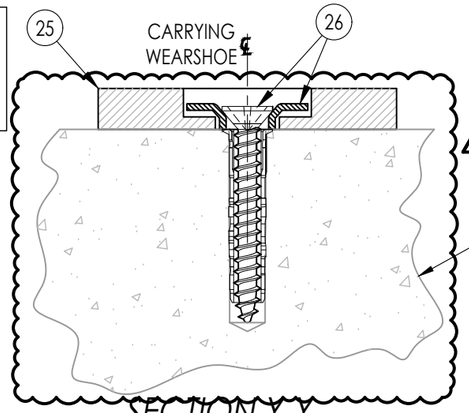
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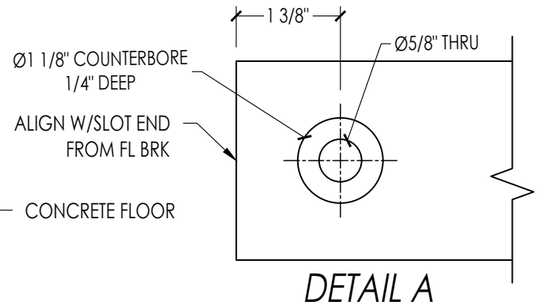
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DETAIL SHEET: FLIGHT ASSEMBLY

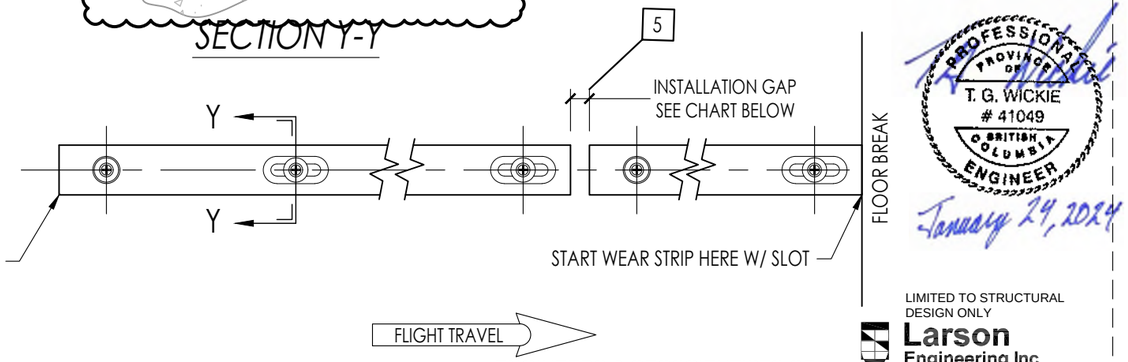
SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	10 of 19	WGZ0067002 – 10	03

Rev 01

USE THIS DETAIL IF WEARSTRIP CL. FALLS ON CONCRETE FLOOR SURFACE







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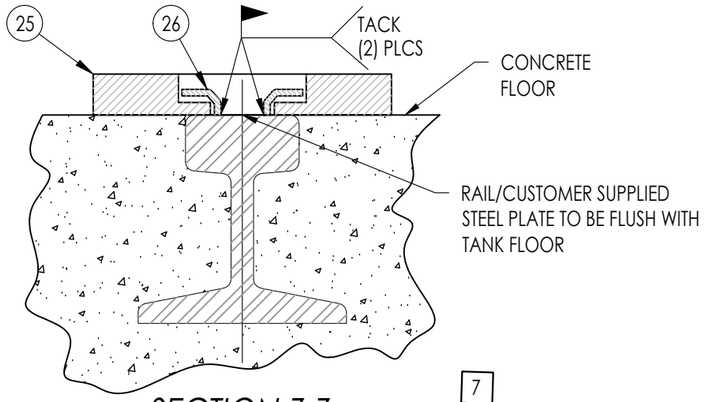
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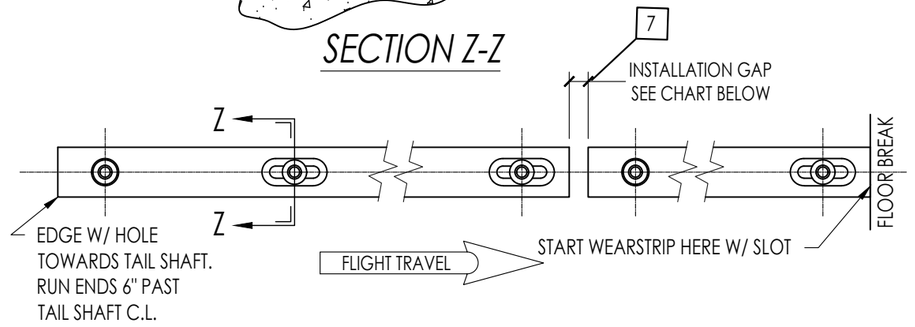
INSTALLATION NOTES:

1. THE ORIENTATION OF THE WEAR STRIP IS CRITICAL AND SHOULD BE ORIENTED IN THE DIRECTION OF TRAVEL. FLOOR WEAR STRIPS ARE INSTALLED WITH THE ROUND HOLE TOWARDS THE TAIL SHAFT.
2. STARTING AT THE SUMP, OR FLOOR BREAK, LOCATE THE CENTER OF THE WEAR STRIP FROM THE THEORETICAL CENTERLINE AS SHOWN IN THE TANK OR TANK SECTION VIEWS IN THESE DRAWINGS.
3. USING WEAR STRIP AS A GUIDE, LOCATE & DRILL 8mm HOLES BY 45mm DEEP IN THE TANK FLOOR. INSTALL ANCHOR INSERTS IN THE DRILLED HOLES, FLUSH WITH THE CONCRETE SURFACE. REFER TO SUPPLIER CUT SHEETS FOR FURTHER DETAILS.ANY HOLE LOCATED IN THE WEAR STRIP SLOTS SHOULD BE POSITIONED AT THE MIDPOINT OF THE SLOT LENGTHS.
4. TIGHTEN THE FASTENERS SNUG (HARDWARE IS NOT LOOSE AND CANNOT BE MOVED WITH FINGER PRESSURE) AND LOOSEN 1/2 TURN SO THAT THE WEAR STRIP CAN EXPAND AND CONTRACT UNDER ENVIRONMENTAL VARIATIONS. REPEAT PROCESS THROUGH THE TANK TOWARDS TLSFT.
5. **FOR OPPOSITE SIDE OF TANK**: THE WEAR STRIP SPLICES (GAPS) **MUST NOT** BE AT THE SAME LONGITUDINAL POSITION ACROSS THE TANK. CUT THE STARTING PIECE OF WEAR STRIP 6" FROM THE HOLE SIDE OF THE WEAR STRIP TO BEGIN THE OFFSET. FIELD DRILL NEW STARTER HOLE AS SHOWN IN DETAIL "A" THIS SHEET.
6. PLEASE REFER TO THE OPERATION AND MAINTENANCE MANUAL FOR ADDITIONAL DETAILS.

INSTALLATION GAP BY INSTALLATION TEMPERATURE RANGE	
AVERAGE TEMPERATURE	WEAR STRIP INSTALLATION GAP
LESS THAN 30°F [-1°C]	3/4"
31°F - 84°F [0°C - 28°C]	1/2"
GREATER THAN 85°F [29°C]	1/4"

USE THIS DETAIL IF WEARSTRIP CL. FALLS ON STEEL PLATE / T-RAIL





INSTALLATION NOTES:

1. THE ORIENTATION OF THE WEAR STRIP IS CRITICAL AND SHOULD BE ORIENTED IN THE DIRECTION OF TRAVEL. FLOOR WEAR STRIPS ARE INSTALLED WITH THE ROUND HOLE TOWARDS THE TAIL SHAFT.
2. STARTING AT THE EDGE OF THE FLOOR, LOCATE THE EDGE OF WEAR STRIP FLUSH WITH THE EDGE OF THE T-RAIL AS SHOWN IN THE TANK OR BASIN SECTION VIEWS IN THESE DRAWINGS.
3. ANY WASHER WELDED IN THE WEAR STRIP SLOTS SHOULD BE POSITIONED AT THE MIDPOINT OF THE SLOT LENGTHS.
4. **FOR OPPOSITE SIDE OF TANK**: THE WEAR STRIP SPLICES (GAPS) **MUST NOT** BE AT THE SAME LONGITUDINAL POSITION ACROSS THE TANK. CUT THE STARTING PIECE OF WEAR STRIP 6" FROM THE HOLE SIDE OF THE WEAR STRIP TO BEGIN THE OFFSET. FIELD DRILL NEW STARTER HOLE AS SHOWN IN DETAIL "A" THIS SHEET.
5. PLEASE REFER TO THE OPERATION AND MAINTENANCE MANUAL FOR ADDITIONAL DETAILS.

RECOMMENDATIONS FOR WELDING CONICAL WASHERS TO CARBON STEEL TRACK ANGLES

1. ARC WELDING IS NOT RECOMMENDED.
2. USE A MINI-MIG WELDER WITH FLUX CORED STAINLESS STEEL 309 WIRE, 0.030 INCH DIAMETER.
3. THE WELD JOINT MUST BE MADE WITH THE WELD WASHER SEATED FLAT AGAINST THE HOST METAL.
4. WATER SHOULD BE USED TO PREVENT EXCESS HEAT BUILD UP FROM COMPROMISING THE UHMW-PE WEAR STRIP.
5. THE INSTALLED WEAR STRIP SHOULD BE ABLE TO EXPAND AND CONTACT UNDER ENVIRONMENTAL VARIATIONS..

*DAMAGE TO THE WEARSTRIP OR IMPROPER INSTALLATION IS NOT THE RESPONSIBILITY OF BRENTWOOD.

REV	DESCRIPTION
2	FLOOR ANCHOR UPDATED TO HILTI HUD-2 PER REVIEW COMMENTS BY ENGINEER
2	DETAIL AND CALLOUTS UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

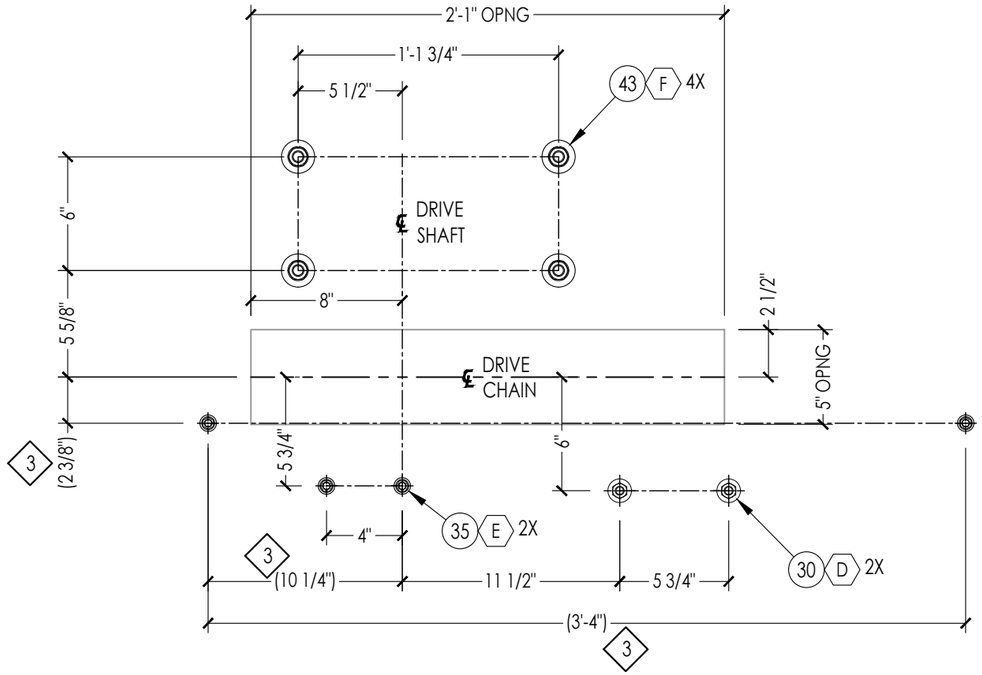
STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

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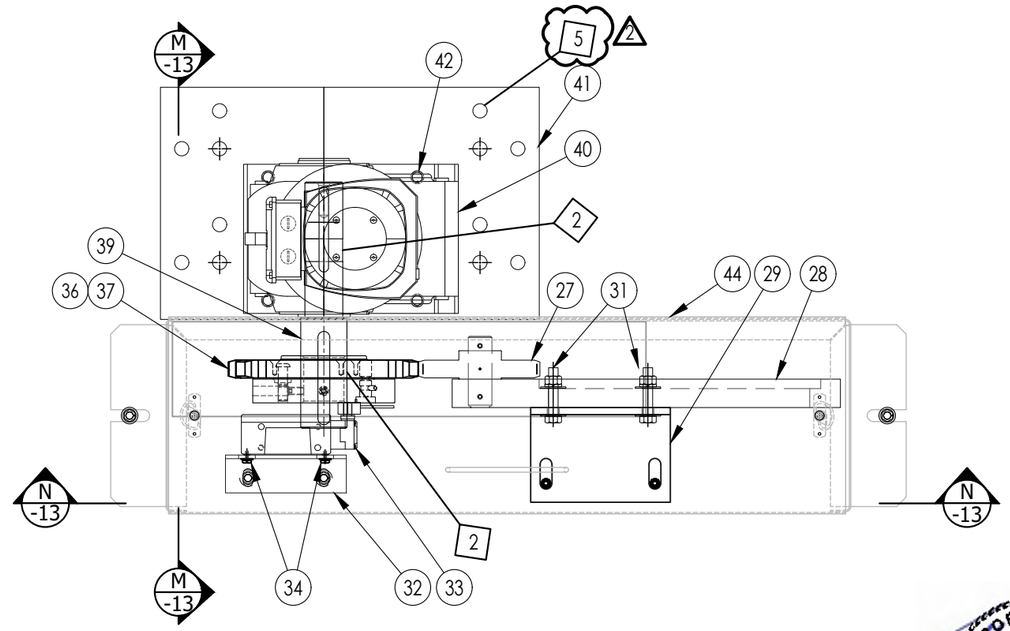
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DETAIL SHEET: FLOOR WEAR STRIP INSTALLATION

SCALE	SHEET	DRAWING NUMBER	REV
NTS	11 of 19	WGZ0067002 – 11	03



ANCHOR PLAN

SEE SHEET: -03 SCALE: 1 1/2" = 1'-0"



EQUIPMENT PLAN

SEE SHEET: -03 SCALE: 1 1/2" = 1'-0"

T. G. WICKIE
41049
PROVINCE OF BRITISH COLUMBIA
ENGINEER

January 29, 2024

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ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607

NOTES:

1. DIMENSIONS AND B.O.M. CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UNLESS OTHERWISE NOTED.
2. SEE GENERAL NOTE 7, SHEET -02.
3. DIMENSIONS ARE FOR REFERENCE ONLY. FIELD LOCATE AND DRILL CHAIN GUARD ANCHORS AFTER FINAL ALIGNMENT OF DRIVE EQUIPMENT.
4. CONTRACTOR TO REMOVE EXISTING DRIVE, DRIVE BASE, DRIVE PAD AND/OR ANY GROUT, AS WELL AS RESTORE THE SURFACE OF THE EXISTING CONCRETE SLAB TO A LEVEL, BROOM FINISH, BEFORE INSTALLING NEW DRIVE COMPONENTS AS SHOWN ABOVE. 2
5. ALTERNATE PRE-FABRICATED HOLES SHALL BE USED BY THE CONTRACTOR AS NECESSARY TO AVOID CUTTING THRU REBAR IN THE DECK.

REV	DESCRIPTION
2	NOTE ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION

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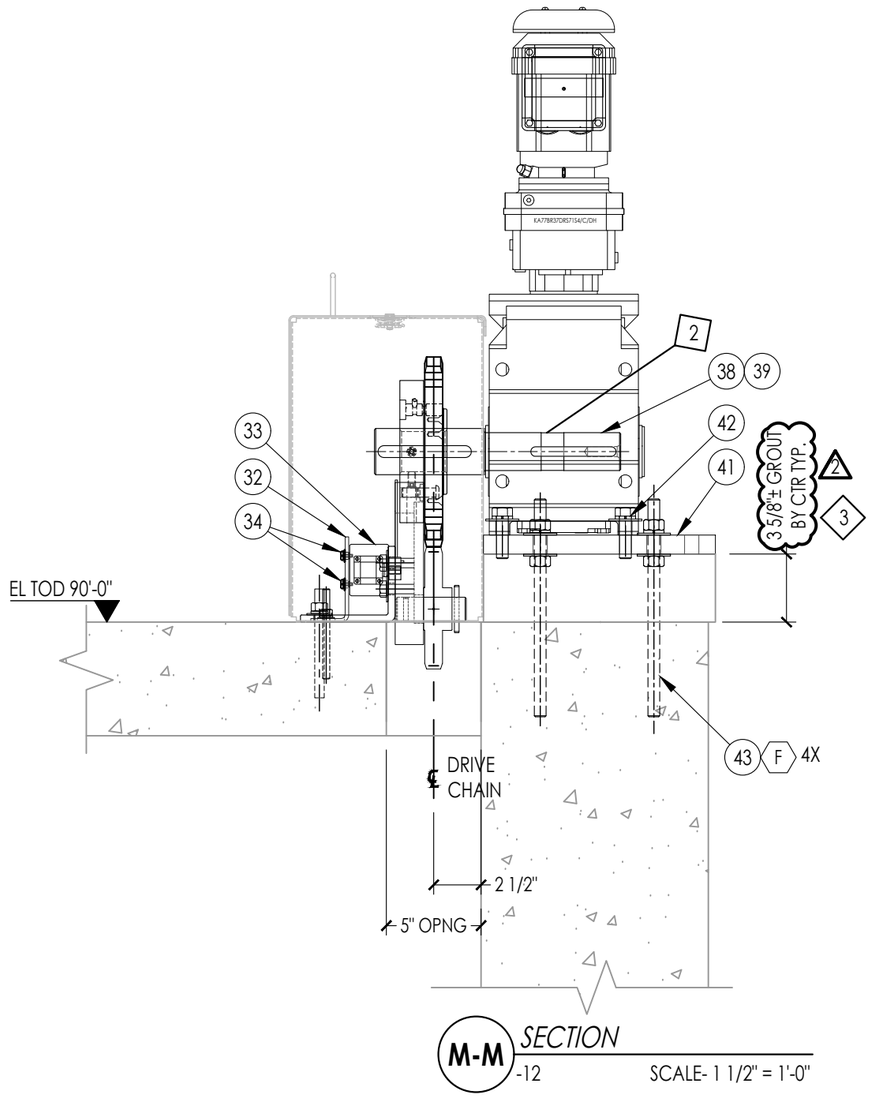
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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

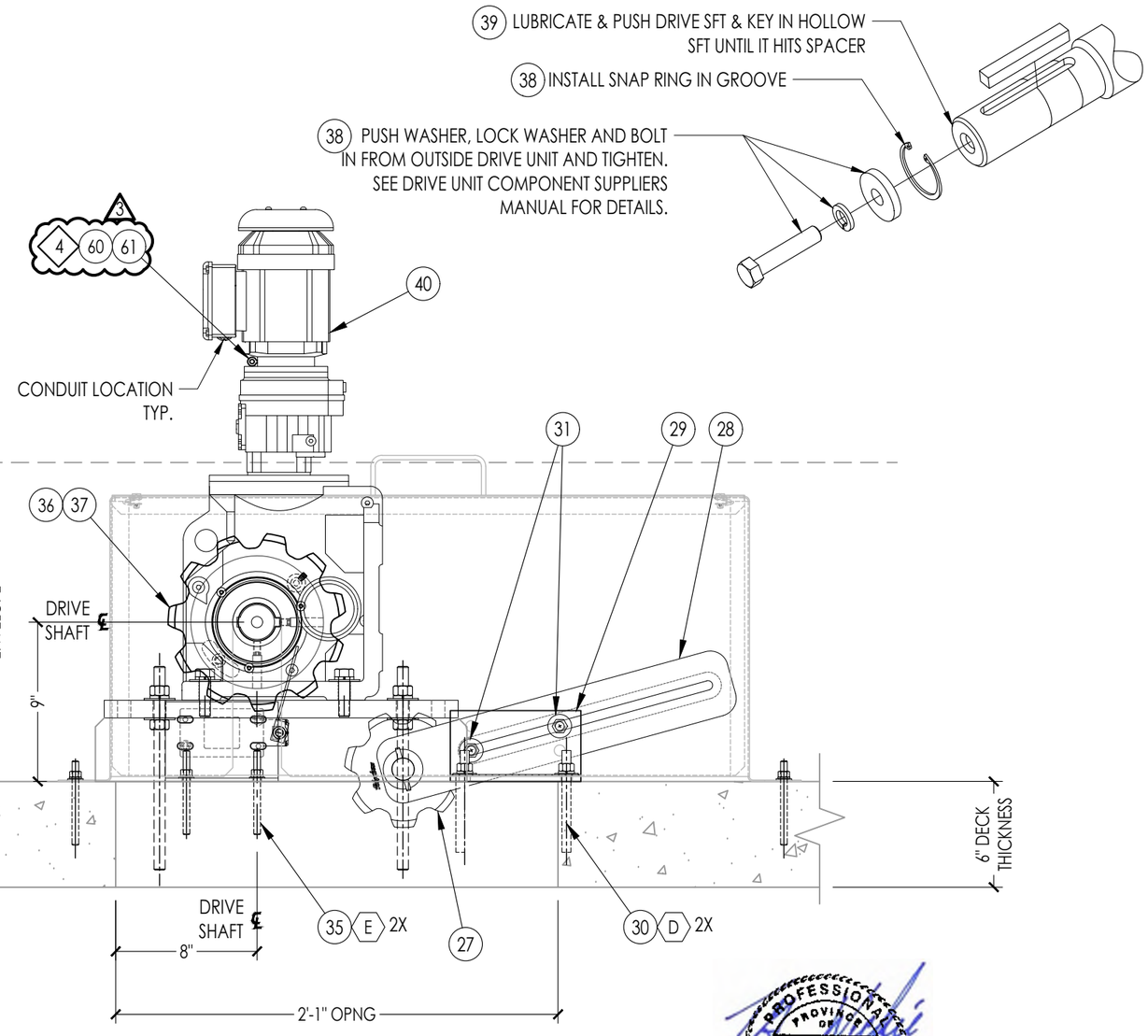
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DRIVE UNIT LAYOUT: LONGITUDINAL PLAN VIEWS - TANK T-112

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	12 of 19	WGZ0067002 – 12	03

Rev 01



M-M *SECTION*
-12 SCALE- 1 1/2" = 1'-0"



N-N *ELEVATION*
-12 SCALE- 1 1/2" = 1'-0"

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PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049
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4. CONTRACTOR TO USE THE RING SUPPLIED WITH THE GEAR REDUCER TO ATTACH TAGS. (3)

REV	DESCRIPTION
3	BALLONS AND NOTE 4 ADDED
2	NOTE 3 ADDED PER REVIEW COMMENTS BY ENGINEER
2	DIMENSION & BASE PLATE THICKNESS UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

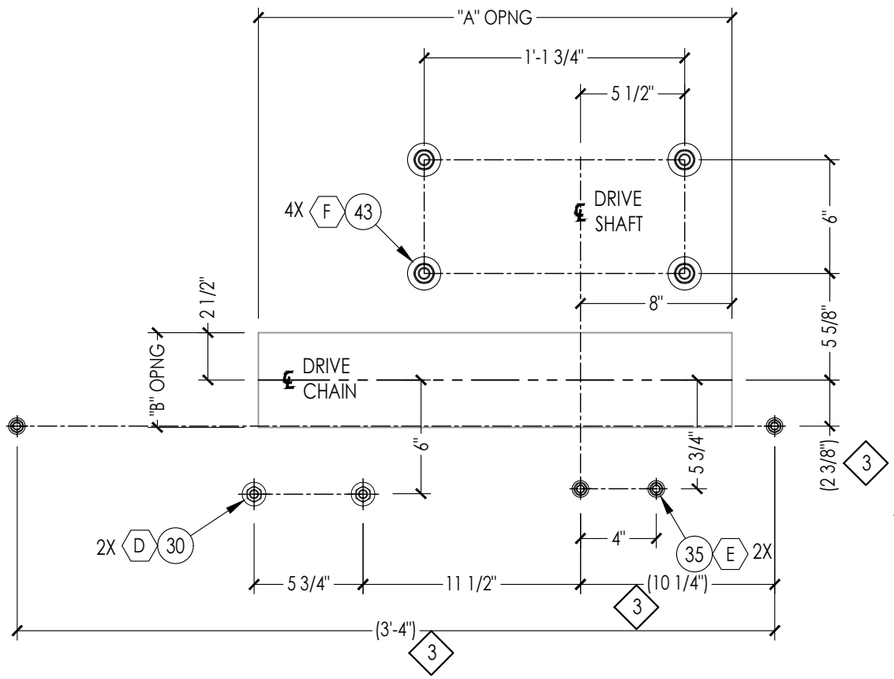
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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DRIVE UNIT LAYOUT: LONGITUDINAL SECTIONS & ELEVATIONS - TANK T-112

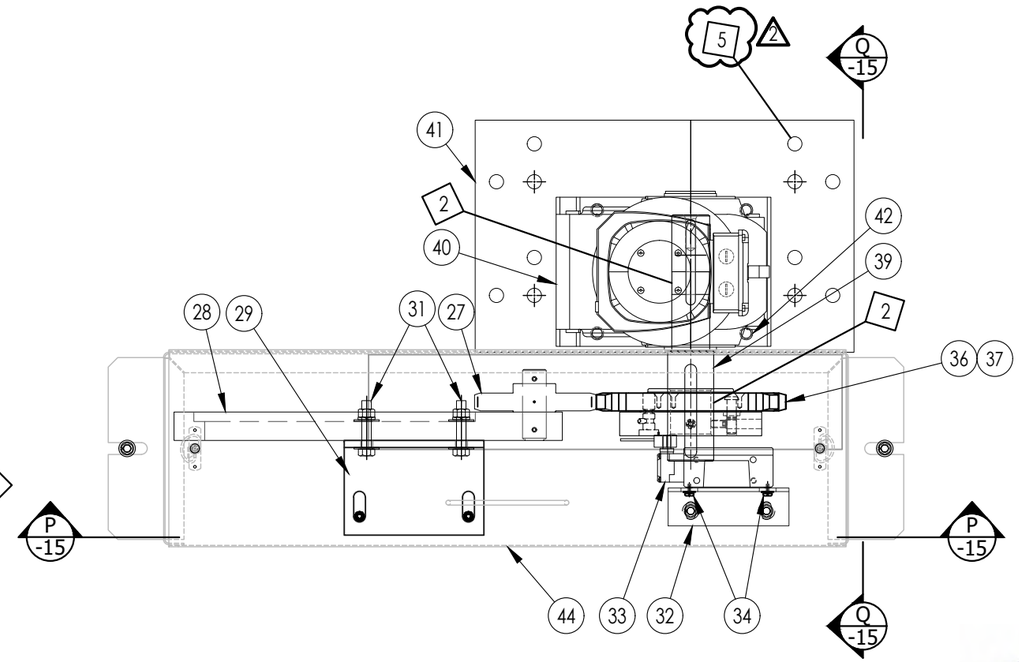
SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	13 of 19	WGZ0067002 – 13	03

Rev 01



ANCHOR PLAN

SEE SHEET: -03 SCALE: 1 1/2" = 1'-0"



EQUIPMENT PLAN

SEE SHEET: -03 SCALE: 1 1/2" = 1'-0"

DIMENSION "___"		
TANK	A	B
T-111	2'-1"	5"
T-113	3'-0"	6"

NOTES:

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REV	DESCRIPTION
2	NOTE ADDED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049
ENGINEER

January 24, 2024

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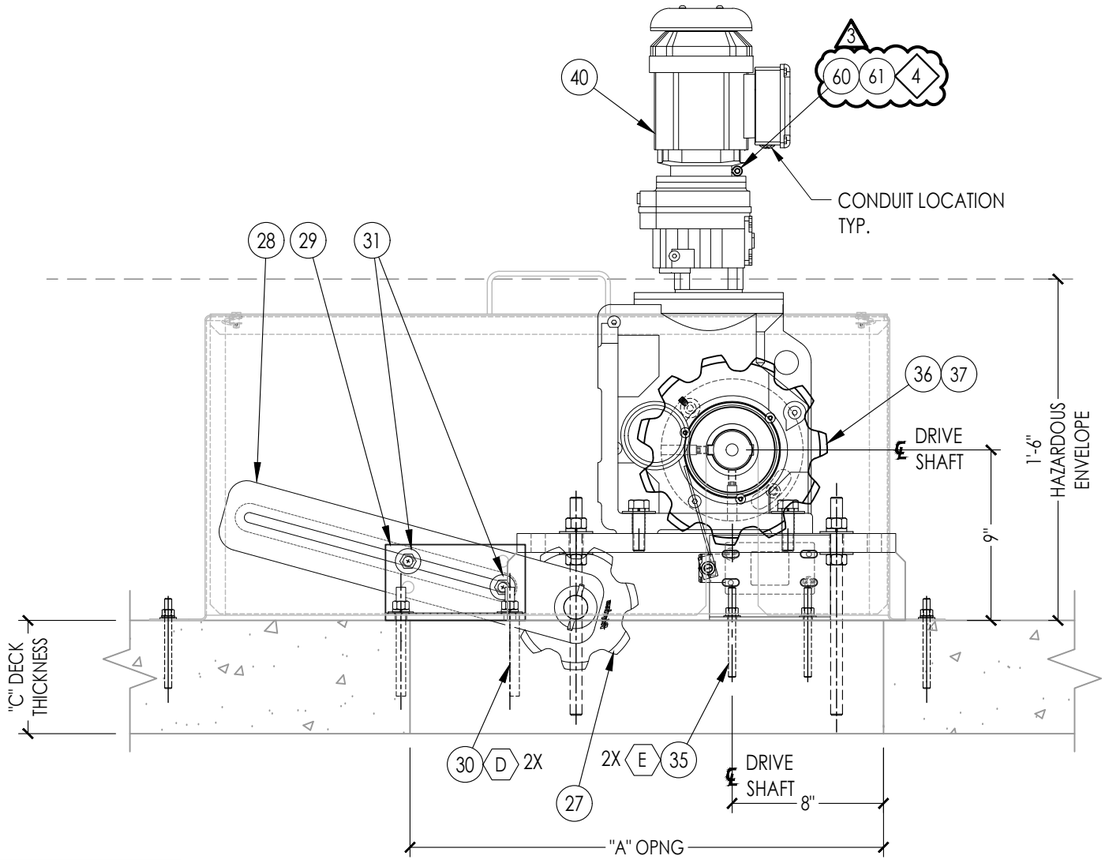
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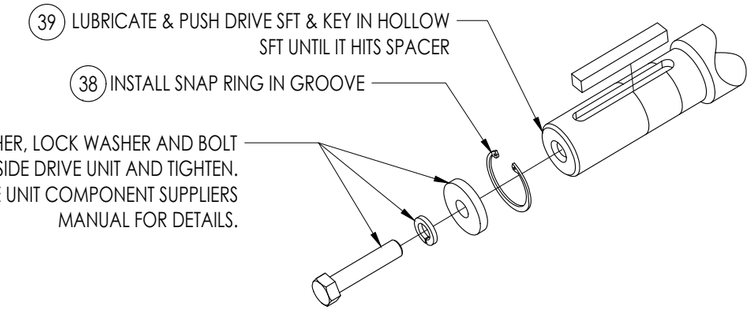
PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

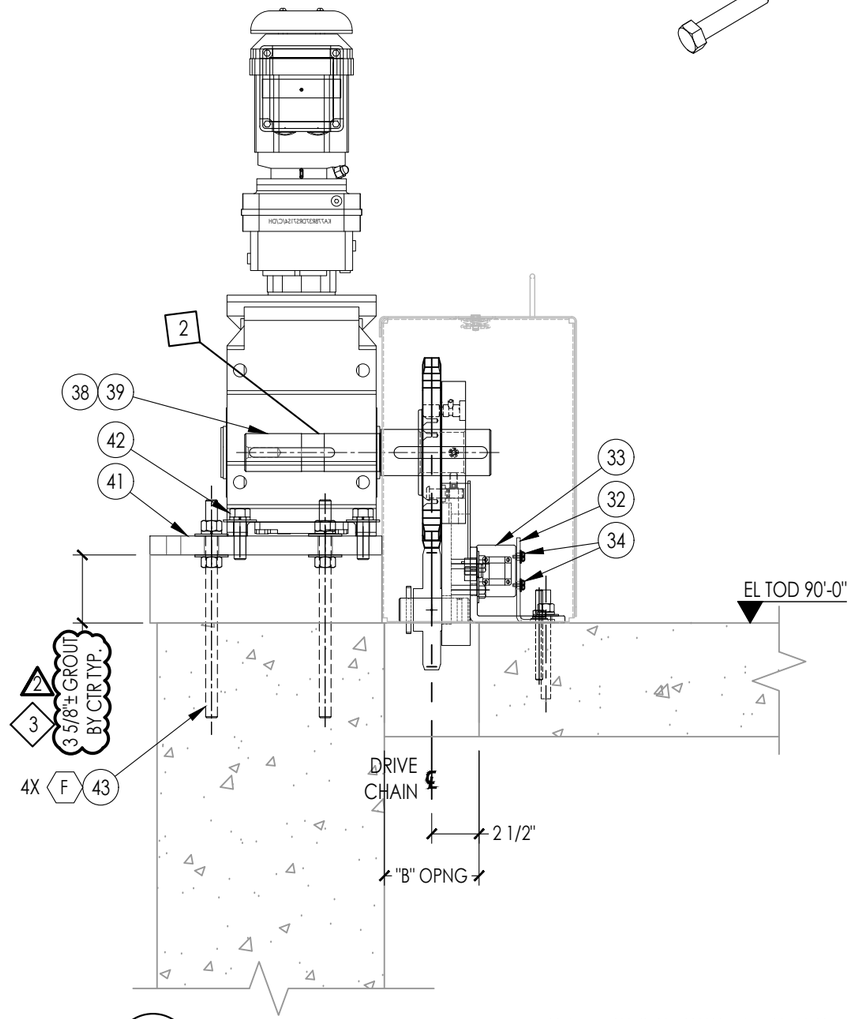
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DRIVE UNIT LAYOUT: LONGITUDINAL PLAN VIEWS - TANK T-111 & T-113

SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	14 of 19	WGZ0067002 – 14	03

Rev 01







DIMENSION "___"			
TANK	A	B	C
T-111	2'-1"	5"	6"
T-113	3'-0"	6"	8"

P-P *ELEVATION*
-14 SCALE- 1 1/2" = 1'-0"

Q-Q *SECTION*
-14 SCALE- 1 1/2" = 1'-0"

NOTES:
1. DIMENSIONS AND B.O.M. CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS UNLESS OTHERWISE NOTED.
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4. CONTRACTOR TO USE THE RING SUPPLIED WITH THE GEAR REDUCER TO ATTACH TAGS. (3)

REV	DESCRIPTION
3	BALLONS AND NOTE 4 ADDED
2	NOTE 3 ADDED PER REVIEW COMMENTS BY ENGINEER
2	DIMENSION & BASE PLATE THICKNESS UPDATED PER REVIEW COMMENTS BY ENGINEER

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NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DRIVE UNIT LAYOUT: LONGITUDINAL SECTIONS & ELEVATIONS - TANK T-111 & T-113

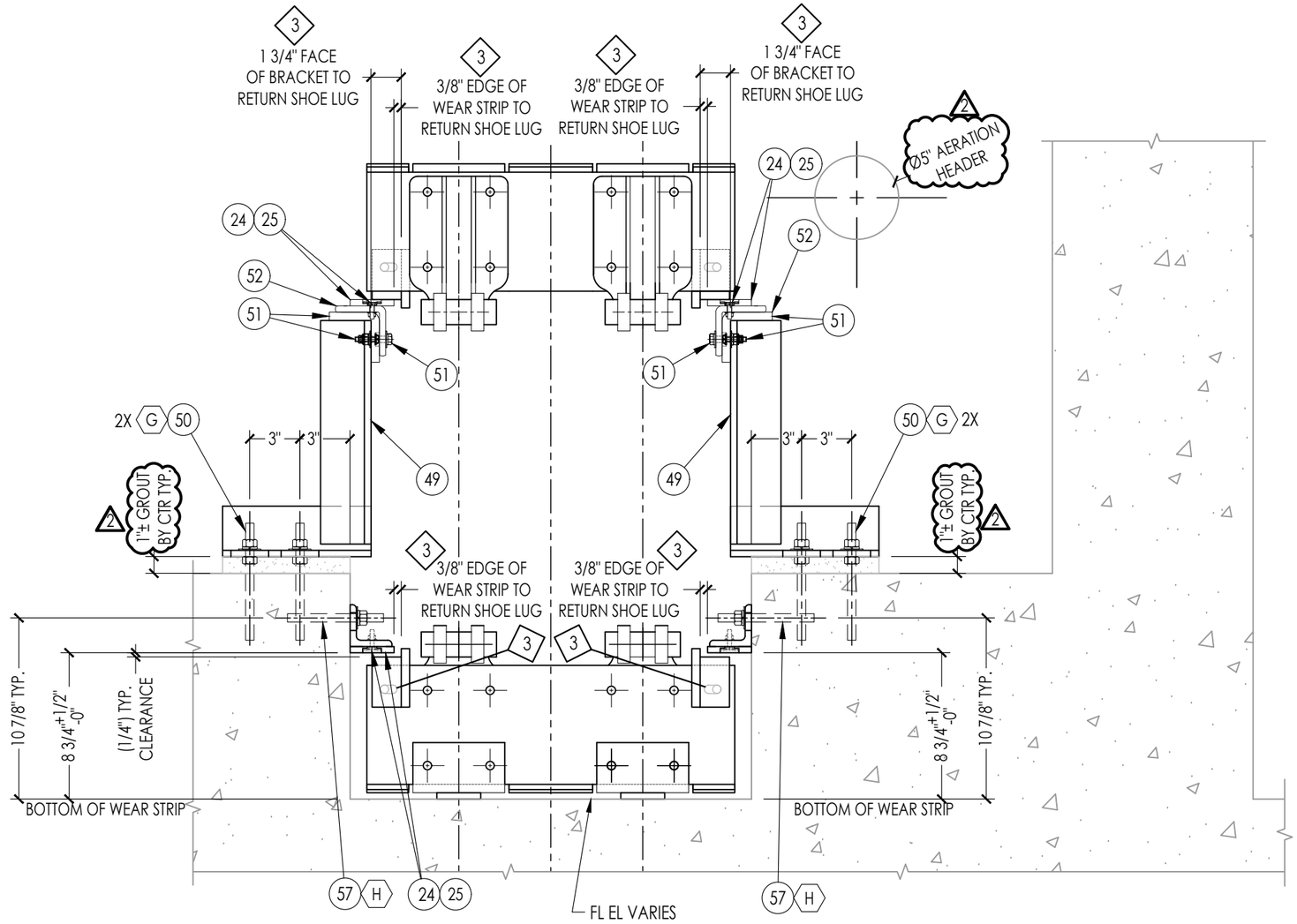
SCALE	SHEET	DRAWING NUMBER	REV
AS NOTED	15 of 19	WGZ0067002 – 15	03

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049
January 29, 2024

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ENGINEERS & GEOSCIENTISTS OF BRITISH COLUMBIA PERMIT TO PRACTICE #1003607



A *TYP WALL BRKT- RETURN RAIL & HOLD DOWN RAIL*

-07, -09 SCALE- 1 1/2" = 1'-0"

NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. CONTRACTOR TO ADJUST RAIL HOLD DOWN RAIL HEIGHT AT TIME OF INSTALLATION, TO SUIT OPERATION OF THE COLLECTOR WITHOUT BINDING.
3. CONTRACTOR TO ADJUST SLOTTED RETURN SHOES WITH SLOTS PROVIDED IN SHOES (2) TO MAINTAIN A NOMINAL 3/8" GAP FROM THE LUG TO THE WEARSTRIP, ALONG THE HOLD DOWN RAIL. ADJUST LOWER RETURN RAIL BRACKET BASED ON FINAL POSITION OF THE LUG SHOES. INSTALL WEARSTRIP BASED ON FINAL POSITION OF THE LUG SHOES, TO MAINTAIN A NOMINAL 3/8" GAP.
4. EQUIPMENT LOCATIONS SHOWN WITHIN THIS I&L SET ASSUMES ALL T-RAILS/STEEL PLATES ARE/WILL BE FLUSH WITH THE TANK FLOOR, SUCH THAT THE TANK FLOOR CAN BE CONSIDERED THE DATUM FOR INSTALLING ANCHORS.

REV	DESCRIPTION
2	DIMENSION & NOTE UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

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PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DETAIL A: RETURN RAIL WALL BKT

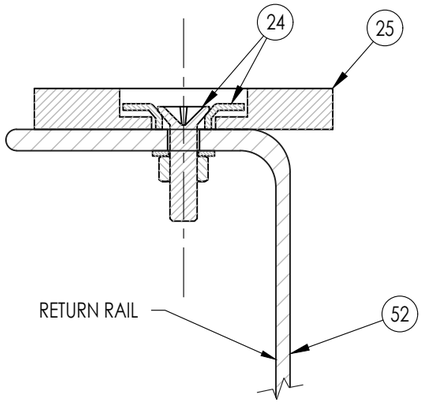
SCALE	SHEET	DRAWING NUMBER	REV
1:8	16 of 19	WGZ0067002 – 16	03

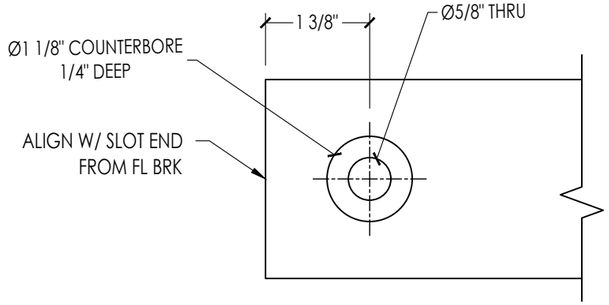
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA T. G. WICKIE # 41049
January 24, 2024

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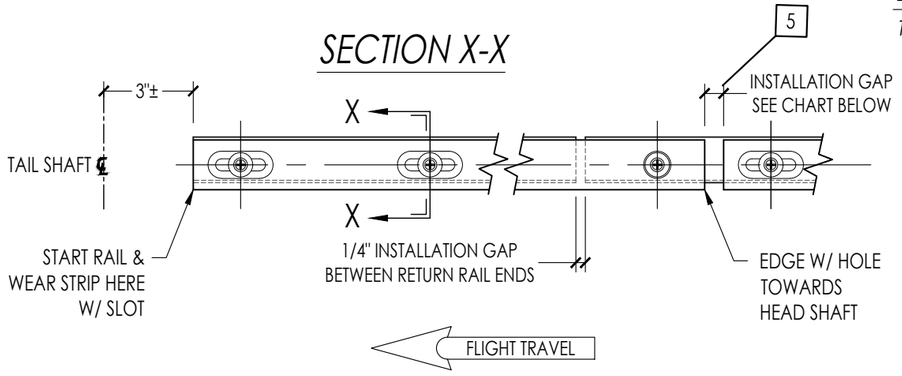




DETAIL A

TYP FOR RETURN RAIL

SECTION X-X



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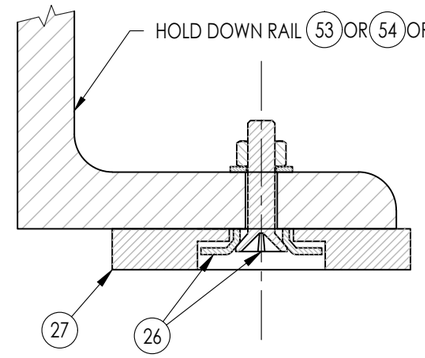
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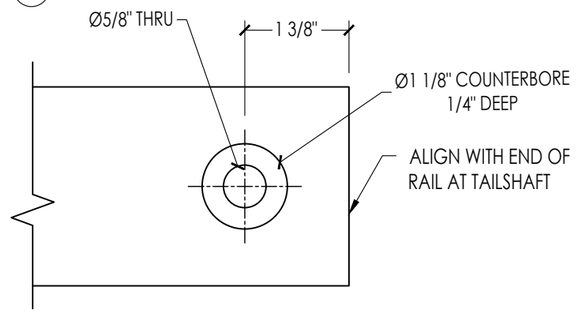
INSTALLATION NOTES:

1. THE ORIENTATION OF THE WEAR STRIP IS CRITICAL AND SHOULD BE ORIENTED IN THE DIRECTION OF TRAVEL. RETURN RAIL WEAR STRIPS ARE INSTALLED WITH THE ROUND HOLE TOWARDS HEAD SHAFT.
2. STARTING AT THE TAIL SHAFT END OF THE RETURN RAIL, LOCATE THE EDGE OF THE WEAR STRIP FROM THE THEORETICAL CENTERLINE AS SHOWN IN THE TANK OR TANK SECTION VIEWS IN THESE DRAWINGS.
3. USING WEAR STRIP AS A GUIDE, LOCATE & DRILL 3/8" HOLES THRU THE RETURN RAIL ANGLE. ANY HOLE LOCATED IN THE WEAR STRIP SLOTS SHOULD BE POSITIONED AT THE MIDPOINT OF THE SLOT LENGTHS.
4. TIGHTEN THE FASTENERS SNUG (HARDWARE IS NOT LOOSE AND CANNOT BE MOVED WITH FINGER PRESSURE) AND LOOSEN 1/2 TURN SO THAT THE WEAR STRIP CAN EXPAND AND CONTACT UNDER ENVIRONMENTAL VARIATIONS. REPEAT PROCESS THROUGH THE TANK TOWARDS THE UPPER IDLER.
5. **FOR OPPOSITE SIDE OF TANK**: THE WEAR STRIP SPLICES (GAPS) **MUST NOT** BE AT THE SAME LONGITUDINAL POSITION ACROSS THE TANK. CUT THE STARTING PIECE OF WEAR STRIP 6" FROM THE HOLE SIDE OF THE WEAR STRIP TO BEGIN THE OFFSET. FIELD DRILL NEW STARTER HOLE AS SHOWN IN DETAIL "A" THIS SHEET.
6. PLEASE REFER TO THE OPERATION AND MAINTENANCE MANUAL FOR FOR ADDITIONAL DETAILS.

INSTALLATION GAP BY INSTALLATION TEMPERATURE RANGE (2)	
AVERAGE TEMPERATURE	WEAR STRIP INSTALLATION GAP
LESS THAN 30°F [-1°C]	3/4"
31°F - 84°F [0°C - 28°C]	1/2"
GREATER THAN 85°F [29°C]	1/4"

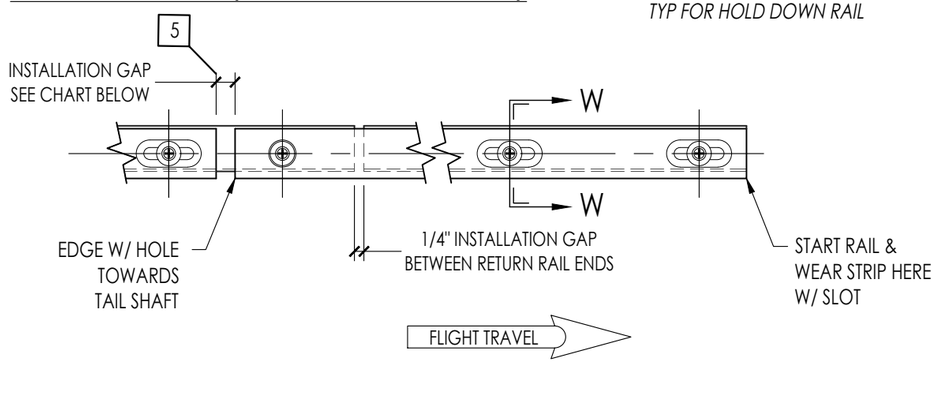


SECTION W-W (HOLD DOWN RAIL)



DETAIL B

TYP FOR HOLD DOWN RAIL



INSTALLATION NOTES:

1. THE ORIENTATION OF THE WEAR STRIP IS CRITICAL AND SHOULD BE ORIENTED IN THE DIRECTION OF TRAVEL. HOLD DOWN RAIL WEAR STRIPS ARE INSTALLED WITH THE ROUND HOLE TOWARDS TAIL SHAFT.
2. STARTING AT THE LOWER IDLER END OF THE HOLD DOWN RAIL, LOCATE THE EDGE OF THE WEAR STRIP FROM THE THEORETICAL CENTERLINE AS SHOWN IN THE TANK OR TANK SECTION VIEWS IN THESE DRAWINGS.
3. USING WEAR STRIP AS A GUIDE, LOCATE & DRILL 3/8" HOLES THRU THE HOLD DOWN RAIL ANGLE. ANY HOLE LOCATED IN THE WEAR STRIP SLOTS SHOULD BE POSITIONED AT THE MIDPOINT OF THE SLOT LENGTHS.
4. TIGHTEN THE FASTENERS SNUG (HARDWARE IS NOT LOOSE AND CANNOT BE MOVED WITH FINGER PRESSURE) AND LOOSEN 1/2 TURN SO THAT THE WEAR STRIP CAN EXPAND AND CONTACT UNDER ENVIRONMENTAL VARIATIONS. REPEAT PROCESS THROUGH THE TANK TOWARDS THE UPPER IDLER.
5. **FOR OPPOSITE SIDE OF TANK**: THE WEAR STRIP SPLICES (GAPS) **MUST NOT** BE AT THE SAME LONGITUDINAL POSITION ACROSS THE TANK. CUT THE STARTING PIECE OF WEAR STRIP 6" FROM THE HOLE SIDE OF THE WEAR STRIP TO BEGIN THE OFFSET. FIELD DRILL NEW STARTER HOLE AS SHOWN IN DETAIL "B" THIS SHEET.
6. PLEASE REFER TO THE OPERATION AND MAINTENANCE MANUAL FOR FOR ADDITIONAL DETAILS.

REV	DESCRIPTION
2	CALLOUT UPDATED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

Polychem

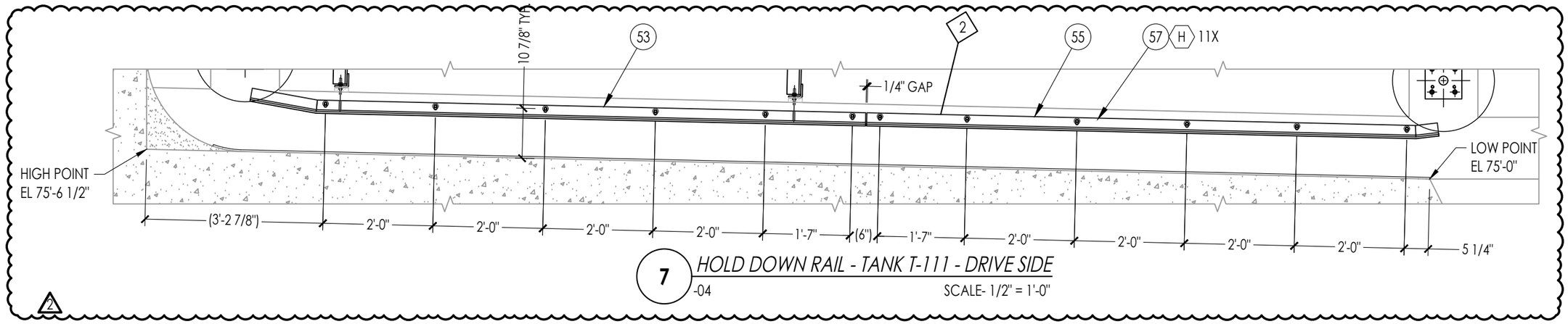
STATUS: ISSUED FOR INSTALLATION — ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

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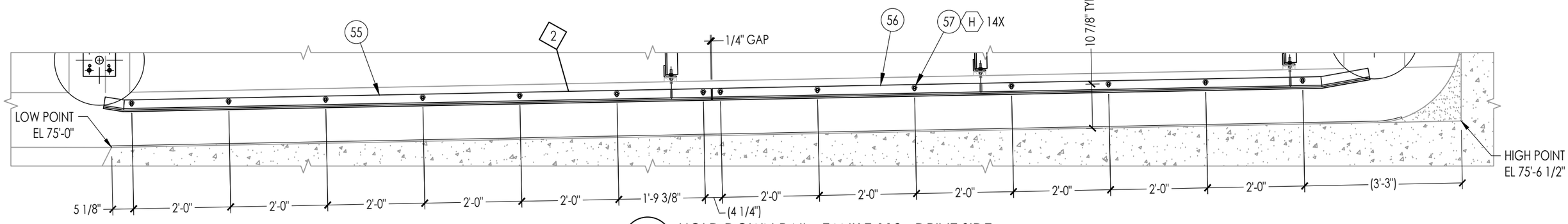
DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DETAIL SHEET: RETURN RAIL WEAR STRIP INSTALLATION

SCALE	SHEET	DRAWING NUMBER	REV
NTS	17 of 19	WGZ0067002 – 17	03



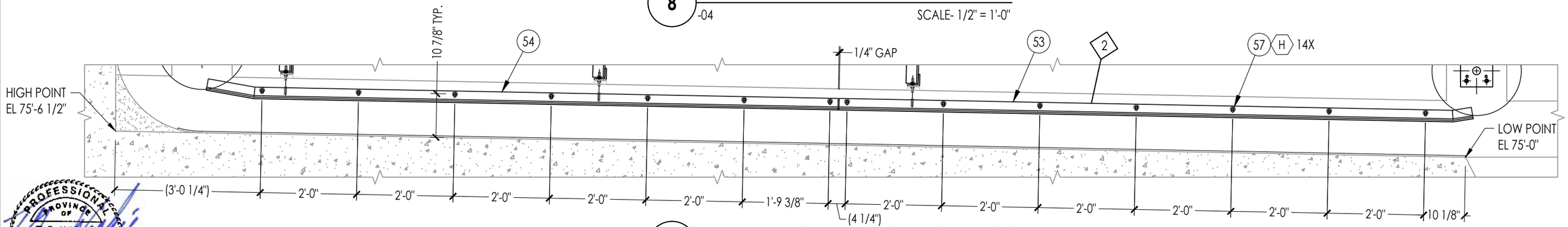
7 *HOLD DOWN RAIL - TANK T-111 - DRIVE SIDE*

-04 SCALE- 1/2" = 1'-0"



8 *HOLD DOWN RAIL - TANK T-112 - DRIVE SIDE*

-04 SCALE- 1/2" = 1'-0"



9 *HOLD DOWN RAIL - TANK T-113 - DRIVE SIDE*

-04 SCALE- 1/2" = 1'-0"

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049

January 24, 2024

Larson Engineering Inc
1488 Bond Street, Suite 100
Naperville, Illinois 60563-6503
(P) 630.357.0540 (F) 630.357.0164
21230798.000

LIMITED TO STRUCTURAL DESIGN ONLY

ENGINEERS & GEOSCIENTISTS OF
BRITISH COLUMBIA PERMIT TO PRACTICE
#1003607

NOTES:

1. DIMENSIONS AND BOM CALLOUTS ARE CONSIDERED TYPICAL FOR ALL TANKS, UNLESS OTHERWISE NOTED.
2. HOLD DOWN RAIL TO RUN PARALLEL W/ COLLECTOR FLOOR.
3. SEE WEAR STRIP INSTALLATION DETAILS SHEET-17 FOR REQUIRED INSTALLATION GAPS. WEAR STRIP GAPS SHALL NOT OCCUR OVER THE SPLICE SHOE AREA.
4. CONTRACTOR TO ADJUST RAIL HOLD DOWN RAIL HEIGHT AT TIME OF INSTALLATION, TO SUIT OPERATION OF THE COLLECTOR WITHOUT BINDING.

REV	DESCRIPTION
2	HOLD DOWN RAIL DESIGN UPDATED TO TWO PIECED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

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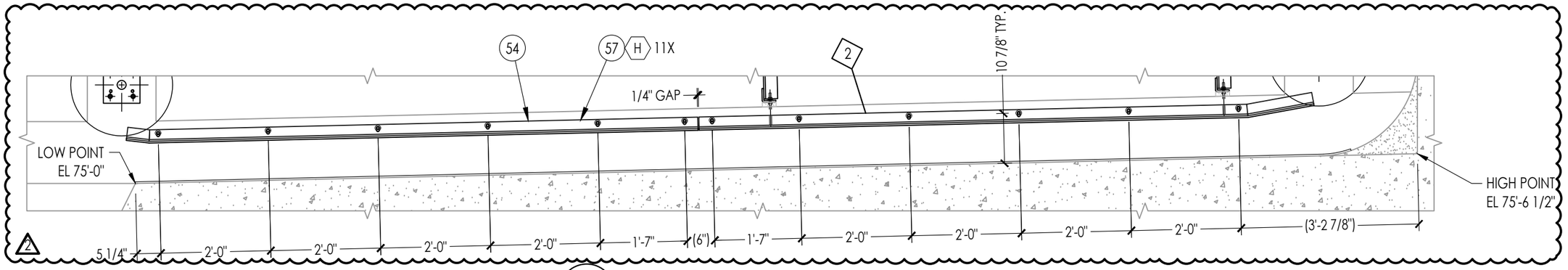
STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE: INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DETAIL SHEET: HOLD DOWN RAILS - DRIVE SIDE

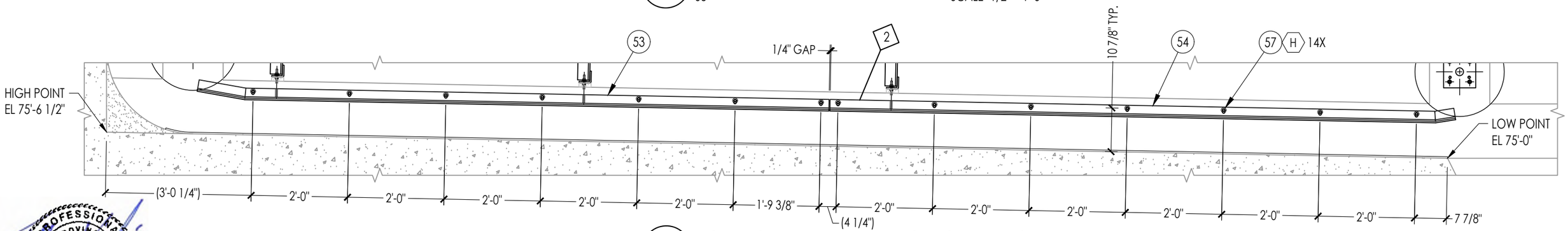
SCALE	SHEET	DRAWING NUMBER	REV
1/2" = 1'-0"	18 of 19	WGZ0067002 – 18	03

Rev 01



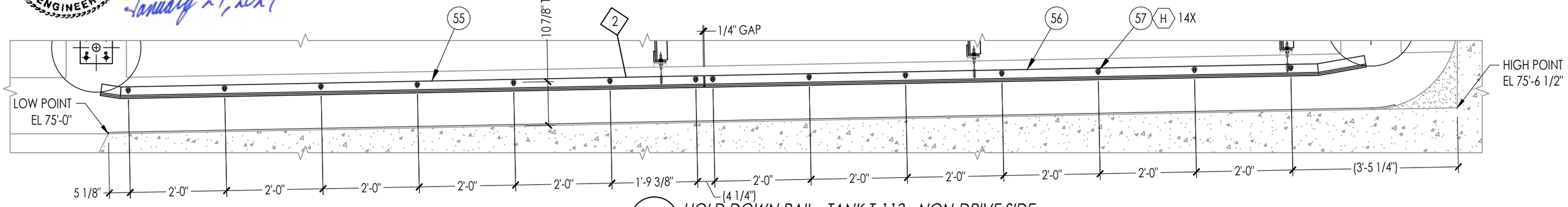
10 *HOLD DOWN RAIL - TANK T-111 - NON-DRIVE SIDE*

-05 SCALE- 1/2" = 1'-0"



11 *HOLD DOWN RAIL - TANK T-112 - NON-DRIVE SIDE*

-05 SCALE- 1/2" = 1'-0"



12 *HOLD DOWN RAIL - TANK T-113 - NON-DRIVE SIDE*

-05 SCALE- 1/2" = 1'-0"

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. G. WICKIE
41049

January 24, 2024

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2. HOLD DOWN RAIL TO RUN PARALLEL W/ COLLECTOR FLOOR.
3. SEE WEAR STRIP INSTALLATION DETAILS SHEET-17 FOR REQUIRED INSTALLATION GAPS. WEAR STRIP GAPS SHALL NOT OCCUR OVER THE SPLICE SHOE AREA.
4. CONTRACTOR TO ADJUST RAIL HOLD DOWN RAIL HEIGHT AT TIME OF INSTALLATION, TO SUIT OPERATION OF THE COLLECTOR WITHOUT BINDING.

REV	DESCRIPTION
2	HOLD DOWN RAIL DESIGN UPDATED TO TWO PIECED PER REVIEW COMMENTS BY ENGINEER

SHEET REVISIONS

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STATUS: ISSUED FOR INSTALLATION
ISO-9001 REGISTERED

PROJECT TITLE
INSTALLATION AND LAYOUT FOR COLLECTION EQUIPMENT
NANAIMO PST 1-3 & GRIT 1-3, BC
GRIT TANK 1-3

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DRAWN	CHECKER	DRAWING TITLE
RHP 24 Jul 23	HP 18 Jan 24	DETAIL SHEET: HOLD DOWN RAILS - NON-DRIVE SIDE

SCALE	SHEET	DRAWING NUMBER	REV
1/2" = 1'-0"	19 of 19	WGZ0067002 – 19	03

5.3 Bill(s) of Materials - Primary Sedimentation Tank 1-3

BOM #	DESCRIPTION
WGZ0067001	PRIMARY TANK T-211
WGZ0067002	PRIMARY TANK T-212
WGZ0067003	PRIMARY TANK T-213

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Bill of Materials

				BOM NO.	**WGZ0067001**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**05**
PREPARED BY:	**RHP**	**PROCESS:**	**Primary Sedimentation Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-211**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(2) Longitudinal & (1) Cross Collection Systems		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	1	10000508-001	5	EA	NH-78 CHAIN STRAND, 10.0 FEET	LONGS & CROSS
	2	10000275-058	114	EA	NCS-720S CHAIN STRAND, 9.5 FEET	LONGS
	3	10000150-010	58	EA	10 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS	LONGS
	4	10000274-001	142	EA	NCS-720S CHAIN ATTACHMENT KIT, F22-8, NM	LONGS & CROSS
	5	10001039-001	142	EA	FILLER BLOCK, 3x8 C-CHANNEL FLIGHT, PP-BLACK	LONGS & CROSS
	6	10000711-007	142	EA	CARRYING WEAR SHOE, 4 HOLES, 5.50", LUBRICATED PA6/6-BLACK	LONGS & CROSS
	7	10000595-006	116	EA	RETURN WEAR SHOE, LUGGED, 6 HOLES, 4.50", LUBRICATED PA6/6-BLACK	LONGS
	8	10001975-104	29	EA	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP	TANK 1A
	9	10001975-105	29	EA	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP	TANK 1B
	10	10000354-038	2	EA	HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6	NON-DRIVE SIDE
	11	10000354-093	2	EA	HEAD SHAFT SPINDLE, SMALL BASE, 3.00" SHOULDER, 20.00" JOURNAL, ENG LEVELING, PA6	DRIVE SIDE
	12	10010026-057	2	EA	BULL END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 52.00", FRP & UHMW-PE	LONGS
	13	10001811-003	2	EA	NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 1.75" OFFSET, ENG HDW, PA6,	LONGS
	14	10000301-037	6	EA	NCS-720S SPROCKET ASSY, 23T, SPLIT, KEYWAY, SET SCREW, 5.78" BORE, ENG HDW, PA6	LONGS & CROSS
	15	10000507-004	4	EA	SHAFT SPLIT BAND COLLAR ASSY, 5.23" SHAFT, 316 SS BAND CLAMP, PA6	LONGS
	16	10001041-004	2	EA	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-2INTLK-6LVL)	LONGS
	17	10010019-149	2	EA	CENTER TUBE, TELESCOPIC HEAD SHAFT, 5.23" DIA x 142.00", FRP	LONGS
	18	10010027-005	2	EA	DRIVEN END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 48.00, FRP & UHMW-PE	LONGS
	19	10000056-053	36	EA	ANCHOR SET, 1-8x11-1/2", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "A"
	20	10000300-002	16	EA	NCS-720S SPROCKET, 23T, SOLID, PLAIN BORE, 5.34" BORE, PA6	LONGS & CROSS
	21	10000359-017	12	EA	IDLER STUB SHAFT ASSY, SMALL BASE, 13.31" SHOULDER, 18.69", ENG LEVELING, PA6 & UHMW-PE	LONGS & CROSS
	22	10000359-011	2	EA	IDLER STUB SHAFT ASSY, SMALL BASE, 10.31" SHOULDER, 15.69", ENG LEVELING, PA6 & UHMW-PE	LONGS TAIL SHAFT DRIVE SIDE ONLY
	23	10001014-001	16	EA	STUB SHAFT RETAINER PLATE, PC	LONGS & CROSS
	24	10001020-003	16	EA	STUB SHAFT LEVELING/RETAINER PLATE HARDWARE KIT, ENGLISH, 316 SS (KIT=1BLT-1LW-1FW-3LVL	LONGS & CROSS
	25	10000716-005	40	EA	WALL BRACKET, 7.75", PA6/6	
	26	10001023-001	42	EA	RETURN RAIL SUPPORT INSTALLATION KIT, WALL BRACKET, ENGLISH	
	27	10000093-040	116	EA	LEVELING ANCHOR SET, 1/2-13x8", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)	ANCHOR "B"
	28	10001060-005	32	EA	3x8 C-CHANNEL FLIGHT, 180.00", BLANK, FRP	
	29	10000066-005	56	EA	RETURN RAIL WEAR STRIP HARDWARE KIT, ENG, 316 SS (KIT=4SCR-4CFW-4FW-4LN)	
	30	10000286-001	118	EA	WEAR STRIP, 0.38" x 2.63" x 120.00" , 1 HOLE & 3 SLOTS, UHMW-PE	LONGS & CROSS
4	31	10001040-002	62	EA	CONCRETE FLOOR WEAR STRIP HARDWARE KIT, HUD-2 8x40mm HILTI ANCHOR (KIT=4SCR-4CFW-4FCANC)	LONGS & CROSS
	32	10001002-251	1	EA	ANGLE, L4x4x3/8 x 19.88", 4 HOLES, FRP, RIGHT HAND	
	33	10001002-252	1	EA	ANGLE, L4x4x3/8 x 19.88", 4 HOLES, FRP, LEFT HAND	
	34	10001002-249	1	EA	ANGLE, L4x4x3/8 x 29.13", 4 HOLES, FRP, RIGHT HAND	
	35	10001002-250	1	EA	ANGLE, L4x4x3/8 x 29.13", 4 HOLES, FRP, LEFT HAND	
	36	10001002-257	12	EA	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP	
	37	10001002-256	13	EA	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP	
	38	10001002-253	28	EA	ANGLE, L3x3x3/8 x 3.50", 2 HOLES, FRP	
	39	10001002-247	2	EA	ANGLE, L3x3x3/8 x 26.25", 2 SLOTS, FRP	
	40	10001002-248	2	EA	ANGLE, L3x3x3/8 x 15.00", 1 HOLE, CHAMFERED, FRP	
	41	10001104-013	2	EA	PLATE, 0.38" x 3.00" x 3.00", 1 HOLE, FRP	
	42	10001023-003	30	EA	RETURN RAIL SUPPORT INSTALLATION KIT, EXTENDED WALL BRACKET, ENGLISH	
	43	10000070-007	89	EA	BOLT SET, LOCKNUT, 3/8-16 x 2", 316 SS, (SET=1BLT-2FW-1LW-1LN)	

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Bill of Materials

				BOM NO.	**WGZ0067001**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**05**
PREPARED BY:	**RHP**	**PROCESS:**	**Primary Sedimentation Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-211**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(2) Longitudinal & (1) Cross Collection Systems		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	44	10001033-002	3	EA	NH-78 SPROCKET, 7T, 1.28" BORE, HUB TYPE C, ASYMMETRICAL, GR PA6/6	LONGS & CROSS
4	45	10001034-007	3	EA	DRIVE CHAIN TENSION ADJUSTMENT "TAKE UP" ASSEMBLY, TRAVEL=13.88", SPECIAL	LONGS & CROSS
	46	10000581-003	3	EA	ANGLE, L4x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP	LONGS & CROSS
	47	10000056-032	10	EA	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)	ANCHOR "C"
	48	10000070-009	6	EA	BOLT SET, LOCKNUT, 1/2-13 x 2-1/2", 316 SS, (SET=1BLT-2FW-1LW-1LN)	LONGS & CROSS
	49	10001011-001	3	EA	ANGLE, L4.50x2.00x3/16 x 6.38" LONG, 6 SLOTS, 316 SS	LONGS & CROSS
	50	10001036-001	3	EA	LIMIT SWITCH WITH ROD, DPDT, SQUARE D	LONGS & CROSS
	51	10000081-005	3	EA	BOLT KIT, 1/4-20 x 3/4", 316 SS (KIT=2BLT-2LW-2FW)	LONGS & CROSS
	52	10000056-046	11	EA	ANCHOR SET, 3/8-16 x 4-3/4", ASTM CERT, 316 SS, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "D"
3	53	10001018-028	2	EA	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB	LONGS
3	54	10000221-001	2	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 1665 lbf ON THE DRIVE CHAIN	LONGS
	55	10001934-003	3	EA	SS DRIVE SHAFT INSTALLATION KIT (KIT=1BLT-1LW-1DSK-1RR), SEW KA77	LONGS & CROSS
	56	10000367-001	3	EA	SINGLE OUTPUT SHAFT ASSY, 2.44" DIA x 13.00", 2 KEYS, KA77 HOLLOW, ENG, 304 SS	LONGS & CROSS
	57	10000583-201	2	EA	SEW EURODRIVE KA77BR37DRN71M4/C/DH/RI, 1388:1, 0.50HP, 330/575V, M4	LONGS
	58	10000583-202	1	EA	SEW EURODRIVE KA77BR37DRN71M4/C/DH/RI, 709:1, 0.50HP, 330/575V, M4	CROSS
4	59	10000423-093	3	EA	BASE PLATE, 1.00"x12.25"x20.00", KA77B, VERT MOUNT, ENG TAPPED HOLES, 304 SS	LONGS & CROSS
	60	10000077-001	3	EA	BOLT SET, 5/8-11 x 2-1/4", 316 SS, (SET=4BLT-4LW-4FW)	LONGS & CROSS
3	61	10000093-065	12	EA	LEVELING ANCHOR SET, 5/8-11 x 13", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)	ANCHOR "E"
	62	10000058-001	24	EA	FLAT WASHER, 5/8, 316 SS	LONGS & CROSS
3	63	10000006-018	36	EA	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	LONGS & CROSS
	64	10001691-318	1	EA	CHAIN GUARD ASSEMBLY, DUAL, 16.00" x 17.25" x 37.00", 304 SS	LONGS
	65	10001691-144	1	EA	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 9.00" x 36.00", 304 SS	CROSS
	66	10000275-059	28	EA	NCS-720S CHAIN STRAND, 4.5 FEET	CROSS
	67	10001032-001	2	EA	NCS-720S, CHAIN LINK, HALF PITCH	CROSS
	68	10000150-008	13	EA	8 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS	CROSS
	69	10001975-106	13	EA	3x8 C-CHANNEL FLIGHT, 8 HOLES, 57.00", FRP	CROSS
	70	10000354-037	2	EA	HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6	CROSS
	71	10010028-190	1	EA	MONO TUBE ASSY, HEAD SHAFT, 5.75" DIA x 55.75, FRP & UHMW-PE	CROSS
	72	10001811-015	1	EA	NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 5.63" OFFSET, ENG HDW, LOCKNUTS, PA6	CROSS
	73	10001041-005	1	EA	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-6LVL)	CROSS
	74	10000078-019	8	EA	FEMALE ANCHOR SET, 3/4-10 x 6.00", 316 SS, EN 10088-3 CERT, (SET=1FEM-1BLT-1LW-1FW)	ANCHOR "F"
	75	10000341-001	2	EA	MANUAL DISPENSER, ADHESIVE, HDM 500 & RED CARTRIDGE HOLDER, HIT-CR 500	
	76	10000342-001	16	EA	ADHESIVE ANCHORING SYSTEM, HIT-HY 200-A-V3, FOIL PACK, MIXER & MIXER EXTENSION	
	77	10000359-019	2	EA	IDLER STUB SHAFT ASSY, SMALL BASE, 14.31" SHOULDER, 19.69", ENG LEVELING, PA6 & UHMW-PE	LONGS UPPER IDLER DRIVE SIDE ONLY
	78	10000716-009	2	EA	WALL BRACKET, 9.00", PA6/6	
	79	10001002-246	1	EA	ANGLE, L4x4x3/8 x 32.00", 3 HOLE, FRP	

Bill of Materials

				BOM NO.	WGZ0067001
PROJECT NAME:	NANAIMO PST 1-3 & GRIT 1-3, BC			NSF:	No
CUSTOMER:	REGIONAL DISTRICT OF NANAIMO			DATE:	08/04/23
CITY, STATE/COUNTRY:	NANAIMO, BRITISH COLUMBIA CANADA			REVISION:	05
PREPARED BY:	RHP	PROCESS:	Primary Sedimentation Tanks	REV. DATE:	22 Jan 24
TANK NO:	T-211	EQUIP:	Chain & Flight	REV. STATE:	Released
CHECKED BY:	HP	SYSTEMS:	(2) Longitudinal & (1) Cross Collection Systems		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	80	10001002-258	1	EA	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP	
3	81	10001018-083	1	EA	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB	CROSS
3	82	10000221-002	1	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 985 lbf ON THE DRIVE CHAIN	CROSS
5	83	10002483-001	1	EA	TAG, WGZ0067000. NANAIMO, PRIMARY SEDIMENTATION TANKS, 304SS	
5	84	10002484-001	9	EA	WIRE ROPE, SEAL TAG, 1/16" DIA., GALVANIZED STEEL	

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Bill of Materials

				BOM NO.	**WGZ0067002**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**05**
PREPARED BY:	**RHP**	**PROCESS:**	**Primary Sedimentation Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-212**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(2) Longitudinal & (1) Cross Collection Systems		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	1	10000508-001	5	EA	NH-78 CHAIN STRAND, 10.0 FEET	LONGS & CROSS
	2	10000275-058	114	EA	NCS-720S CHAIN STRAND, 9.5 FEET	LONGS
	3	10000150-010	58	EA	10 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS	LONGS
	4	10000274-001	142	EA	NCS-720S CHAIN ATTACHMENT KIT, F22-8, NM	LONGS & CROSS
	5	10001039-001	142	EA	FILLER BLOCK, 3x8 C-CHANNEL FLIGHT, PP-BLACK	LONGS & CROSS
	6	10000711-007	142	EA	CARRYING WEAR SHOE, 4 HOLES, 5.50", LUBRICATED PA6/6-BLACK	LONGS & CROSS
	7	10000595-006	116	EA	RETURN WEAR SHOE, LUGGED, 6 HOLES, 4.50", LUBRICATED PA6/6-BLACK	LONGS
	8	10001975-104	29	EA	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP	TANK 1A
	9	10001975-105	29	EA	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP	TANK 1B
	10	10000354-038	2	EA	HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6	NON-DRIVE SIDE
	11	10000354-093	2	EA	HEAD SHAFT SPINDLE, SMALL BASE, 3.00" SHOULDER, 20.00" JOURNAL, ENG LEVELING, PA6	DRIVE SIDE
	12	10010026-057	2	EA	BULL END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 52.00", FRP & UHMW-PE	LONGS
	13	10001811-003	2	EA	NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 1.75" OFFSET, ENG HDW, PA6,	LONGS
	14	10000301-037	6	EA	NCS-720S SPROCKET ASSY, 23T, SPLIT, KEYWAY, SET SCREW, 5.78" BORE, ENG HDW, PA6	LONGS & CROSS
	15	10000507-004	4	EA	SHAFT SPLIT BAND COLLAR ASSY, 5.23" SHAFT, 316 SS BAND CLAMP, PA6	LONGS
	16	10001041-004	2	EA	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-2INTLK-6LVL)	LONGS
	17	10010019-149	2	EA	CENTER TUBE, TELESCOPIC HEAD SHAFT, 5.23" DIA x 142.00", FRP	LONGS
	18	10010027-005	2	EA	DRIVEN END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 48.00, FRP & UHMW-PE	LONGS
	19	10000056-053	36	EA	ANCHOR SET, 1-8x11-1/2", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "A"
	20	10000300-002	16	EA	NCS-720S SPROCKET, 23T, SOLID, PLAIN BORE, 5.34" BORE, PA6	LONGS & CROSS
	21	10000359-017	12	EA	IDLER STUB SHAFT ASSY, SMALL BASE, 13.31" SHOULDER, 18.69", ENG LEVELING, PA6 & UHMW-PE	LONGS & CROSS
	22	10000359-011	2	EA	IDLER STUB SHAFT ASSY, SMALL BASE, 10.31" SHOULDER, 15.69", ENG LEVELING, PA6 & UHMW-PE	LONGS TAIL SHAFT DRIVE SIDE ONLY
	23	10001014-001	16	EA	STUB SHAFT RETAINER PLATE, PC	LONGS & CROSS
	24	10001020-003	16	EA	STUB SHAFT LEVELING/RETAINER PLATE HARDWARE KIT, ENGLISH, 316 SS (KIT=1BLT-1LW-1FW-3LVL	LONGS & CROSS
	25	10000716-005	40	EA	WALL BRACKET, 7.75", PA6/6	
	26	10001023-001	42	EA	RETURN RAIL SUPPORT INSTALLATION KIT, WALL BRACKET, ENGLISH	
	27	10000093-040	116	EA	LEVELING ANCHOR SET, 1/2-13x8", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)	ANCHOR "B"
	28	10001060-005	32	EA	3x8 C-CHANNEL FLIGHT, 180.00", BLANK, FRP	
	29	10000066-005	56	EA	RETURN RAIL WEAR STRIP HARDWARE KIT, ENG, 316 SS (KIT=4SCR-4CFW-4FW-4LN)	
	30	10000286-001	118	EA	WEAR STRIP, 0.38" x 2.63" x 120.00" , 1 HOLE & 3 SLOTS, UHMW-PE	LONGS & CROSS
4	31	10001040-002	62	EA	CONCRETE FLOOR WEAR STRIP HARDWARE KIT, HUD-2 8x40mm HILTI ANCHOR (KIT=4SCR-4CFW-4FCANC)	LONGS & CROSS
	32	10001002-251	1	EA	ANGLE, L4x4x3/8 x 19.88", 4 HOLES, FRP, RIGHT HAND	
	33	10001002-252	1	EA	ANGLE, L4x4x3/8 x 19.88", 4 HOLES, FRP, LEFT HAND	
	34	10001002-249	1	EA	ANGLE, L4x4x3/8 x 29.13", 4 HOLES, FRP, RIGHT HAND	
	35	10001002-250	1	EA	ANGLE, L4x4x3/8 x 29.13", 4 HOLES, FRP, LEFT HAND	
	36	10001002-257	12	EA	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP	
	37	10001002-256	13	EA	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP	
	38	10001002-253	28	EA	ANGLE, L3x3x3/8 x 3.50", 2 HOLES, FRP	
	39	10001002-247	2	EA	ANGLE, L3x3x3/8 x 26.25", 2 SLOTS, FRP	
	40	10001002-248	2	EA	ANGLE, L3x3x3/8 x 15.00", 1 HOLE, CHAMFERED, FRP	
	41	10001104-013	2	EA	PLATE, 0.38" x 3.00" x 3.00", 1 HOLE, FRP	
	42	10001023-003	30	EA	RETURN RAIL SUPPORT INSTALLATION KIT, EXTENDED WALL BRACKET, ENGLISH	
	43	10000070-007	89	EA	BOLT SET, LOCKNUT, 3/8-16 x 2", 316 SS, (SET=1BLT-2FW-1LW-1LN)	

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Bill of Materials

				BOM NO.	**WGZ0067002**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**05**
PREPARED BY:	**RHP**	**PROCESS:**	**Primary Sedimentation Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-212**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(2) Longitudinal & (1) Cross Collection Systems		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	44	10001033-002	3	EA	NH-78 SPROCKET, 7T, 1.28" BORE, HUB TYPE C, ASYMMETRICAL, GR PA6/6	LONGS & CROSS
4	45	10001034-007	3	EA	DRIVE CHAIN TENSION ADJUSTMENT "TAKE UP" ASSEMBLY, TRAVEL=13.88", SPECIAL	LONGS & CROSS
	46	10000581-003	3	EA	ANGLE, L4x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP	LONGS & CROSS
	47	10000056-032	10	EA	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)	ANCHOR "C"
	48	10000070-009	6	EA	BOLT SET, LOCKNUT, 1/2-13 x 2-1/2", 316 SS, (SET=1BLT-2FW-1LW-1LN)	LONGS & CROSS
	49	10001011-001	3	EA	ANGLE, L4.50x2.00x3/16 x 6.38" LONG, 6 SLOTS, 316 SS	LONGS & CROSS
	50	10001036-001	3	EA	LIMIT SWITCH WITH ROD, DPDT, SQUARE D	LONGS & CROSS
	51	10000081-005	3	EA	BOLT KIT, 1/4-20 x 3/4", 316 SS (KIT=2BLT-2LW-2FW)	LONGS & CROSS
	52	10000056-046	11	EA	ANCHOR SET, 3/8-16 x 4-3/4", ASTM CERT, 316 SS, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "D"
3	53	10001018-028	2	EA	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB	LONGS
3	54	10000221-001	2	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 1665 lbf ON THE DRIVE CHAIN	LONGS
	55	10001934-003	3	EA	SS DRIVE SHAFT INSTALLATION KIT (KIT=1BLT-1LW-1DSK-1RR), SEW KA77	LONGS & CROSS
	56	10000367-001	3	EA	SINGLE OUTPUT SHAFT ASSY, 2.44" DIA x 13.00", 2 KEYS, KA77 HOLLOW, ENG, 304 SS	LONGS & CROSS
	57	10000583-201	2	EA	SEW EURODRIVE KA77BR37DRN71M4/C/DH/RI, 1388:1, 0.50HP, 330/575V, M4	LONGS
	58	10000583-202	1	EA	SEW EURODRIVE KA77BR37DRN71M4/C/DH/RI, 709:1, 0.50HP, 330/575V, M4	CROSS
4	59	10000423-093	3	EA	BASE PLATE, 1.00"x12.25"x20.00", KA77B, VERT MOUNT, ENG TAPPED HOLES, 304 SS	LONGS & CROSS
	60	10000077-001	3	EA	BOLT SET, 5/8-11 x 2-1/4", 316 SS, (SET=4BLT-4LW-4FW)	LONGS & CROSS
3	61	10000093-065	12	EA	LEVELING ANCHOR SET, 5/8-11 x 13", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)	ANCHOR "E"
	62	10000058-001	24	EA	FLAT WASHER, 5/8, 316 SS	LONGS & CROSS
3	63	10000006-018	36	EA	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	LONGS & CROSS
	64	10001691-318	1	EA	CHAIN GUARD ASSEMBLY, DUAL, 16.00" x 17.25" x 37.00", 304 SS	LONGS
	65	10001691-143	1	EA	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 9.00" x 36.00", 304 SS	CROSS
	66	10000275-059	28	EA	NCS-720S CHAIN STRAND, 4.5 FEET	CROSS
	67	10001032-001	2	EA	NCS-720S, CHAIN LINK, HALF PITCH	CROSS
	68	10000150-008	13	EA	8 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS	CROSS
	69	10001975-106	13	EA	3x8 C-CHANNEL FLIGHT, 8 HOLES, 57.00", FRP	CROSS
	70	10000354-037	2	EA	HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6	CROSS
	71	10010028-190	1	EA	MONO TUBE ASSY, HEAD SHAFT, 5.75" DIA x 55.75, FRP & UHMW-PE	CROSS
	72	10001811-015	1	EA	NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 5.63" OFFSET, ENG HDW, LOCKNUTS, PA6	CROSS
	73	10001041-005	1	EA	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-6LVL)	CROSS
	74	10000078-019	8	EA	FEMALE ANCHOR SET, 3/4-10 x 6.00", 316 SS, EN 10088-3 CERT, (SET=1FEM-1BLT-1LW-1FW)	ANCHOR "F"
	75	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 01
	76	10000342-001	16	EA	ADHESIVE ANCHORING SYSTEM, HIT-HY 200-A-V3, FOIL PACK, MIXER & MIXER EXTENSION	
	77	10000359-019	2	EA	IDLER STUB SHAFT ASSY, SMALL BASE, 14.31" SHOULDER, 19.69", ENG LEVELING, PA6 & UHMW-PE	LONGS UPPER IDLER DRIVE SIDE ONLY
	78	10000716-009	2	EA	WALL BRACKET, 9.00", PA6/6	
	79	10001002-246	1	EA	ANGLE, L4x4x3/8 x 32.00", 3 HOLE, FRP	
	80	10001002-258	1	EA	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP	





Bill of Materials

				BOM NO.	WGZ0067002
PROJECT NAME:	NANAIMO PST 1-3 & GRIT 1-3, BC			NSF:	No
CUSTOMER:	REGIONAL DISTRICT OF NANAIMO			DATE:	08/04/23
CITY, STATE/COUNTRY:	NANAIMO, BRITISH COLUMBIA CANADA			REVISION:	05
PREPARED BY:	RHP	PROCESS:	Primary Sedimentation Tanks	REV. DATE:	22 Jan 24
TANK NO:	T-212	EQUIP:	Chain & Flight	REV. STATE:	Released
CHECKED BY:	HP	SYSTEMS:	(2) Longitudinal & (1) Cross Collection Systems		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
3	81	10001018-083	1	EA	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB	CROSS
3	82	10000221-002	1	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 985 lbf ON THE DRIVE CHAIN	CROSS
5	83	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 01
5	84	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 01

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Bill of Materials

				BOM NO.	**WGZ0067003**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**05**
PREPARED BY:	**RHP**	**PROCESS:**	**Primary Sedimentation Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-213**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(2) Longitudinal & (1) Cross Collection Systems		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	1	10000508-001	5	EA	NH-78 CHAIN STRAND, 10.0 FEET	LONGS & CROSS
	2	10000275-058	114	EA	NCS-720S CHAIN STRAND, 9.5 FEET	LONGS
	3	10000150-010	58	EA	10 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS	LONGS
	4	10000274-001	142	EA	NCS-720S CHAIN ATTACHMENT KIT, F22-8, NM	LONGS & CROSS
	5	10001039-001	142	EA	FILLER BLOCK, 3x8 C-CHANNEL FLIGHT, PP-BLACK	LONGS & CROSS
	6	10000711-007	142	EA	CARRYING WEAR SHOE, 4 HOLES, 5.50", LUBRICATED PA6/6-BLACK	LONGS & CROSS
	7	10000595-006	116	EA	RETURN WEAR SHOE, LUGGED, 6 HOLES, 4.50", LUBRICATED PA6/6-BLACK	LONGS
	8	10001975-104	29	EA	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP	TANK 1A
	9	10001975-105	29	EA	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP	TANK 1B
	10	10000354-038	2	EA	HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6	NON-DRIVE SIDE
	11	10000354-093	2	EA	HEAD SHAFT SPINDLE, SMALL BASE, 3.00" SHOULDER, 20.00" JOURNAL, ENG LEVELING, PA6	DRIVE SIDE
	12	10010026-057	2	EA	BULL END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 52.00", FRP & UHMW-PE	LONGS
	13	10001811-003	2	EA	NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 1.75" OFFSET, ENG HDW, PA6,	LONGS
	14	10000301-037	6	EA	NCS-720S SPROCKET ASSY, 23T, SPLIT, KEYWAY, SET SCREW, 5.78" BORE, ENG HDW, PA6	LONGS & CROSS
	15	10000507-004	4	EA	SHAFT SPLIT BAND COLLAR ASSY, 5.23" SHAFT, 316 SS BAND CLAMP, PA6	LONGS
	16	10001041-004	2	EA	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-2INTLK-6LVL)	LONGS
	17	10010019-149	2	EA	CENTER TUBE, TELESCOPIC HEAD SHAFT, 5.23" DIA x 142.00", FRP	LONGS
	18	10010027-005	2	EA	DRIVEN END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 48.00, FRP & UHMW-PE	LONGS
	19	10000056-053	36	EA	ANCHOR SET, 1-8x11-1/2", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "A"
	20	10000300-002	16	EA	NCS-720S SPROCKET, 23T, SOLID, PLAIN BORE, 5.34" BORE, PA6	LONGS & CROSS
	21	10000359-017	12	EA	IDLER STUB SHAFT ASSY, SMALL BASE, 13.31" SHOULDER, 18.69", ENG LEVELING, PA6 & UHMW-PE	LONGS & CROSS
	22	10000359-011	2	EA	IDLER STUB SHAFT ASSY, SMALL BASE, 10.31" SHOULDER, 15.69", ENG LEVELING, PA6 & UHMW-PE	LONGS TAIL SHAFT DRIVE SIDE ONLY
	23	10001014-001	16	EA	STUB SHAFT RETAINER PLATE, PC	LONGS & CROSS
	24	10001020-003	16	EA	STUB SHAFT LEVELING/RETAINER PLATE HARDWARE KIT, ENGLISH, 316 SS (KIT=1BLT-1LW-1FW-3LVL	LONGS & CROSS
	25	10000716-005	40	EA	WALL BRACKET, 7.75", PA6/6	
	26	10001023-001	42	EA	RETURN RAIL SUPPORT INSTALLATION KIT, WALL BRACKET, ENGLISH	
	27	10000093-040	116	EA	LEVELING ANCHOR SET, 1/2-13x8", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)	ANCHOR "B"
	28	10001060-005	32	EA	3x8 C-CHANNEL FLIGHT, 180.00", BLANK, FRP	
	29	10000066-005	56	EA	RETURN RAIL WEAR STRIP HARDWARE KIT, ENG, 316 SS (KIT=4SCR-4CFW-4FW-4LN)	
	30	10000286-001	118	EA	WEAR STRIP, 0.38" x 2.63" x 120.00" , 1 HOLE & 3 SLOTS, UHMW-PE	LONGS & CROSS
4	31	10001040-002	62	EA	CONCRETE FLOOR WEAR STRIP HARDWARE KIT, HUD-2 8x40mm HILTI ANCHOR (KIT=4SCR-4CFW-4FCANC)	LONGS & CROSS
	32	10001002-251	1	EA	ANGLE, L4x4x3/8 x 19.88", 4 HOLES, FRP, RIGHT HAND	
	33	10001002-252	1	EA	ANGLE, L4x4x3/8 x 19.88", 4 HOLES, FRP, LEFT HAND	
	34	10001002-249	1	EA	ANGLE, L4x4x3/8 x 29.13", 4 HOLES, FRP, RIGHT HAND	
	35	10001002-250	1	EA	ANGLE, L4x4x3/8 x 29.13", 4 HOLES, FRP, LEFT HAND	
	36	10001002-257	12	EA	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP	
	37	10001002-256	13	EA	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP	
	38	10001002-253	28	EA	ANGLE, L3x3x3/8 x 3.50", 2 HOLES, FRP	
	39	10001002-247	2	EA	ANGLE, L3x3x3/8 x 26.25", 2 SLOTS, FRP	
	40	10001002-248	2	EA	ANGLE, L3x3x3/8 x 15.00", 1 HOLE, CHAMFERED, FRP	
	41	10001104-013	2	EA	PLATE, 0.38" x 3.00" x 3.00", 1 HOLE, FRP	
	42	10001023-003	30	EA	RETURN RAIL SUPPORT INSTALLATION KIT, EXTENDED WALL BRACKET, ENGLISH	
	43	10000070-007	89	EA	BOLT SET, LOCKNUT, 3/8-16 x 2", 316 SS, (SET=1BLT-2FW-1LW-1LN)	

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Bill of Materials

				BOM NO.	WGZ0067003
PROJECT NAME:	NANAIMO PST 1-3 & GRIT 1-3, BC			NSF:	No
CUSTOMER:	REGIONAL DISTRICT OF NANAIMO			DATE:	08/04/23
CITY, STATE/COUNTRY:	NANAIMO, BRITISH COLUMBIA CANADA			REVISION:	05
PREPARED BY:	RHP	PROCESS:	Primary Sedimentation Tanks	REV. DATE:	22 Jan 24
TANK NO:	T-213	EQUIP:	Chain & Flight	REV. STATE:	Released
CHECKED BY:	HP	SYSTEMS:	(2) Longitudinal & (1) Cross Collection Systems		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	44	10001033-002	3	EA	NH-78 SPROCKET, 7T, 1.28" BORE, HUB TYPE C, ASYMMETRICAL, GR PA6/6	LONGS & CROSS
4	45	10001034-007	3	EA	DRIVE CHAIN TENSION ADJUSTMENT "TAKE UP" ASSEMBLY, TRAVEL=13.88", SPECIAL	LONGS & CROSS
	46	10000581-003	3	EA	ANGLE, L4x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP	LONGS & CROSS
	47	10000056-032	10	EA	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)	ANCHOR "C"
	48	10000070-009	6	EA	BOLT SET, LOCKNUT, 1/2-13 x 2-1/2", 316 SS, (SET=1BLT-2FW-1LW-1LN)	LONGS & CROSS
	49	10001011-001	3	EA	ANGLE, L4.50x2.00x3/16 x 6.38" LONG, 6 SLOTS, 316 SS	LONGS & CROSS
	50	10001036-001	3	EA	LIMIT SWITCH WITH ROD, DPDT, SQUARE D	LONGS & CROSS
	51	10000081-005	3	EA	BOLT KIT, 1/4-20 x 3/4", 316 SS (KIT=2BLT-2LW-2FW)	LONGS & CROSS
	52	10000056-046	11	EA	ANCHOR SET, 3/8-16 x 4-3/4", ASTM CERT, 316 SS, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "D"
3	53	10001018-028	2	EA	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB	LONGS
3	54	10000221-001	2	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 1665 lbf ON THE DRIVE CHAIN	LONGS
	55	10001934-003	3	EA	SS DRIVE SHAFT INSTALLATION KIT (KIT=1BLT-1LW-1DSK-1RR), SEW KA77	LONGS & CROSS
	56	10000367-001	3	EA	SINGLE OUTPUT SHAFT ASSY, 2.44" DIA x 13.00", 2 KEYS, KA77 HOLLOW, ENG, 304 SS	LONGS & CROSS
	57	10000583-201	2	EA	SEW EURODRIVE KA77BR37DRN71M4/C/DH/RI, 1388:1, 0.50HP, 330/575V, M4	LONGS
	58	10000583-202	1	EA	SEW EURODRIVE KA77BR37DRN71M4/C/DH/RI, 709:1, 0.50HP, 330/575V, M4	CROSS
4	59	10000423-093	3	EA	BASE PLATE, 1.00"x12.25"x20.00", KA77B, VERT MOUNT, ENG TAPPED HOLES, 304 SS	LONGS & CROSS
	60	10000077-001	3	EA	BOLT SET, 5/8-11 x 2-1/4", 316 SS, (SET=4BLT-4LW-4FW)	LONGS & CROSS
3	61	10000093-065	12	EA	LEVELING ANCHOR SET, 5/8-11 x 13", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)	ANCHOR "E"
	62	10000058-001	24	EA	FLAT WASHER, 5/8, 316 SS	LONGS & CROSS
3	63	10000006-018	36	EA	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	LONGS & CROSS
	64	10001691-318	1	EA	CHAIN GUARD ASSEMBLY, DUAL, 16.00" x 17.25" x 37.00", 304 SS	LONGS
	65	10001691-144	1	EA	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 9.00" x 36.00", 304 SS	CROSS
	66	10000275-059	28	EA	NCS-720S CHAIN STRAND, 4.5 FEET	CROSS
	67	10001032-001	2	EA	NCS-720S, CHAIN LINK, HALF PITCH	CROSS
	68	10000150-008	13	EA	8 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS	CROSS
	69	10001975-106	13	EA	3x8 C-CHANNEL FLIGHT, 8 HOLES, 57.00", FRP	CROSS
	70	10000354-037	2	EA	HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6	CROSS
	71	10010028-190	1	EA	MONO TUBE ASSY, HEAD SHAFT, 5.75" DIA x 55.75, FRP & UHMW-PE	CROSS
	72	10001811-015	1	EA	NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 5.63" OFFSET, ENG HDW, LOCKNUTS, PA6	CROSS
	73	10001041-005	1	EA	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-6LVL)	CROSS
	74	10000078-019	8	EA	FEMALE ANCHOR SET, 3/4-10 x 6.00", 316 SS, EN 10088-3 CERT, (SET=1FEM-1BLT-1LW-1FW)	ANCHOR "F"
	75	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 01
	76	10000342-001	16	EA	ADHESIVE ANCHORING SYSTEM, HIT-HY 200-A-V3, FOIL PACK, MIXER & MIXER EXTENSION	
	77	10000359-019	2	EA	IDLER STUB SHAFT ASSY, SMALL BASE, 14.31" SHOULDER, 19.69", ENG LEVELING, PA6 & UHMW-PE	LONGS UPPER IDLER DRIVE SIDE ONLY
	78	10000716-009	2	EA	WALL BRACKET, 9.00", PA6/6	
	79	10001002-246	1	EA	ANGLE, L4x4x3/8 x 32.00", 3 HOLE, FRP	
	80	10001002-258	1	EA	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP	





Bill of Materials

				BOM NO.	**WGZ0067003**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**05**
PREPARED BY:	**RHP**	**PROCESS:**	**Primary Sedimentation Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-213**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(2) Longitudinal & (1) Cross Collection Systems		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
3	81	10001018-083	1	EA	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB	CROSS
3	82	10000221-002	1	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 985 lbf ON THE DRIVE CHAIN	CROSS
5	83	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 01
5	84	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 01

Intentionally Left Blank for Printing

5.4 Bill(s) of Materials - Grit Tank 1-3

BOM #	DESCRIPTION
WGZ0067004	PRIMARY GRIT TANK T-111
WGZ0067005	PRIMARY GRIT TANK T-112
WGZ0067006	PRIMARY GRIT TANK T-113

Bill of Materials

				BOM NO.	WGZ0067004
PROJECT NAME:	NANAIMO PST 1-3 & GRIT 1-3, BC			NSF:	No
CUSTOMER:	REGIONAL DISTRICT OF NANAIMO			DATE:	08/04/23
CITY, STATE/COUNTRY:	NANAIMO, BRITISH COLUMBIA CANADA			REVISION:	06
PREPARED BY:	RHP	PROCESS:	Grit Tanks	REV. DATE:	22 Jan 24
TANK NO:	T-111	EQUIP:	Chain & Flight	REV. STATE:	Released
CHECKED BY:	HP	SYSTEMS:	(1) Longitudinal Collection System		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	1	10000508-002	2	EA	NH-78 CHAIN STRAND, 10.0 FEET, 301 SS BARREL WRAPS	
	2	10000275-056	13	EA	NCS-720S CHAIN STRAND, 9.5 FEET, 301 SS BARREL WRAPS	
	3	10001032-002	2	EA	NCS-720S, CHAIN LINK, HALF PITCH, 301 SS BARREL WRAP	
	4	10000150-010	7	EA	10 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS	
	5	10000274-002	14	EA	NCS-720S KIT, F22-8 ATTACHMENT LINK, CONNECTING PIN & RETAINER CLIP, 301 SS BARREL WRAP	
	6	10001039-001	14	EA	FILLER BLOCK, 3x8 C-CHANNEL FLIGHT, PP-BLACK	
	7	10000711-007	14	EA	CARRYING WEAR SHOE, 4 HOLES, 5.50", LUBRICATED PA6/6-BLACK	
	8	10001485-014	7	EA	3x8 C-CHANNEL FLIGHT, 16 HOLES, 22.00", WEAR BAR ATTACHMENT, FRP	
	9	10001103-011	14	EA	WEAR BAR, 0.50" x 2.00" x 2.50", 2 HOLES, UHMW-PE	
	10	10001103-012	7	EA	WEAR BAR, 0.50" x 2.00" x 5.00", 2 HOLES, UHMW-PE	
	11	10001901-002	1	EA	HEADSHAFT WELDMENT ASSEMBLY, 30.88"x11.50"x27.00", 304L SS	
	12	10000717-019	2	EA	WALL BEARING ASSY, PEAK-CAP, SPLIT, 2.44" SHAFT, UHMW LINED, WITH GREASE FITTING	
	13	10000574-099	1	EA	HEADSHAFT ASSEMBLY, 2.44" DIA, 43.88" LONG, 3 KEYS, AISI 304	
	14	10001955-002	1	EA	NH-78 VARIABLE DRIVE SPROCKET ASSY, 40T, SPLIT, 2.46" BORE, .63x.31 KWY, 316 SS HDW	
	15	10000301-009	2	EA	NCS-720S SPROCKET, 23T, SPLIT, KEYWAY, SETSCREW, 2.46" BORE, PA6	
	16	10000507-017	1	EA	SHAFT SPLIT BAND COLLAR ASSY, 2.44" SHAFT, 316 SS BAND CLAMP, PA6	
	17	10000070-162	2	EA	BOLT SET, HEX NUT, 1-8 x 4-1/2", 316 SS, FULLY THREADED (SET=1BLT-2FW-1LW-1HN)	
3	18	10000093-036	6	EA	LEVELING ANCHOR SET, 5/8-11 x 10-1/2", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)	ANCHOR "A"
	19	10000056-090	2	EA	ANCHOR SET, 1-8x8.5", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "B"
	20	10000301-016	4	EA	NCS-720S SPROCKET, 23T, SPLIT, PLAIN BORE, 2.84" BORE, PA6	
3	21	10002479-001	2	EA	IDLER STATIC SHAFT WELDMENT, 8.00" X 8.00" X 22.50", 1.94 DIA., 304LSS	
	22	10000506-001	4	EA	STATIC SLEEVE BEARING ASSY, 1.94" SHAFT, 2.84" SPROCKET BORE, 316SS BAND CLAMP, UHMW-PE	
	23	10000078-023	16	EA	FEMALE ANCHOR SET, 1/2-13 x 2.50", 316 SS, CERTIFIED, (SET=1FEM-1BLT-1LW-1FW)	ANCHOR "C"
	24	10000066-005	21	EA	RETURN RAIL WEAR STRIP HARDWARE KIT, ENG, 316 SS (KIT=4SCR-4CFW-4FW-4LN)	
	25	10000286-001	14	EA	WEAR STRIP, 0.38" x 2.63" x 120.00" , 1 HOLE & 3 SLOTS, UHMW-PE	
4	26	10001040-002	6	EA	CONCRETE FLOOR WEAR STRIP HARDWARE KIT, HUD-2 8x40mm HILTI ANCHOR (KIT=4SCR-4CFW-4FCANC)	
	27	10001033-002	1	EA	NH-78 SPROCKET, 7T, 1.28" BORE, HUB TYPE C, ASYMMETRICAL, GR PA6/6	
4	28	10001034-007	1	EA	DRIVE CHAIN TENSION ADJUSTMENT "TAKE UP" ASSEMBLY, TRAVEL=13.88", SPECIAL	
	29	10000581-004	1	EA	ANGLE, L5x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP	
	30	10000056-032	2	EA	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)	ANCHOR "D"
	31	10000070-009	2	EA	BOLT SET, LOCKNUT, 1/2-13 x 2-1/2", 316 SS, (SET=1BLT-2FW-1LW-1LN)	
	32	10001011-001	1	EA	ANGLE, L4.50x2.00x3/16 x 6.38" LONG, 6 SLOTS, 316 SS	
	33	10001036-001	1	EA	LIMIT SWITCH WITH ROD, DPDT, SQUARE D	
	34	10000081-005	1	EA	BOLT KIT, 1/4-20 x 3/4", 316 SS (KIT=2BLT-2LW-2FW)	
	35	10000056-046	4	EA	ANCHOR SET, 3/8-16 x 4-3/4", ASTM CERT, 316 SS, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "E"
3	36	10001018-083	1	EA	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB	

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Bill of Materials

				BOM NO.	**WGZ0067004**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**06**
PREPARED BY:	**RHP**	**PROCESS:**	**Grit Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-111**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(1) Longitudinal Collection System		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
3	37	10000221-002	1	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 985 lbf ON THE DRIVE CHAIN	
	38	10001934-003	1	EA	SS DRIVE SHAFT INSTALLATION KIT (KIT=1BLT-1LW-1DSK-1RR), SEW KA77	
	39	10000367-001	1	EA	SINGLE OUTPUT SHAFT ASSY, 2.44" DIA x 13.00", 2 KEYS, KA77 HOLLOW, ENG, 304 SS	
5	40	10000583-211	1	EA	SEW EURODRIVE KA77BR37EDRN71M4/FG/CICIID2/C/RI, 1388:1, 0.50HP, 330/575V, M4	
4	41	10000423-093	1	EA	BASE PLATE, 1.00"x12.25"x20.00", KA77B, VERT MOUNT, ENG TAPPED HOLES, 304 SS	
	42	10000077-001	1	EA	BOLT SET, 5/8-11 x 2-1/4", 316 SS, (SET=4BLT-4LW-4FW)	
	43	10000093-039	4	EA	LEVELING ANCHOR SET, 5/8-11 x 11-1/2", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)	ANCHOR "F"
	44	10001691-048	1	EA	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 10.00" x 36.00", 304 SS	
	45	10000341-001	1	EA	MANUAL DISPENSER, ADHESIVE, HDM 500 & RED CARTRIDGE HOLDER, HIT-CR 500	
	46	10000342-001	7	EA	ADHESIVE ANCHORING SYSTEM, HIT-HY 200-A-V3, FOIL PACK, MIXER & MIXER EXTENSION	
	47	10000032-034	12	EA	HEX BOLT, 1/2-13 x 1-3/4", FULLY THREADED, 316 SS	
	48	10000595-021	14	EA	RETURN WEAR SHOE, LUGGED, 2 SLOTS, 2.25", LUBRICATED PA6/6-BLACK	
	49	10001220-002	4	EA	WELDMENT, 14.13" x 2.38" x 8.88", 1 HOLE, 2 SLOTS, SS 304L	
	50	10000093-041	8	EA	LEVELING ANCHOR SET, 1/2-13x7", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)	ANCHOR "G"
	51	10001023-003	4	EA	RETURN RAIL SUPPORT INSTALLATION KIT, EXTENDED WALL BRACKET, ENGLISH	
	52	10000799-001	2	EA	ANGLE, L3x3x3/8 x 240.00", BLANK, FRP	
3	53	10002439-001	1	EA	HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 134.32", 6 SLOTS, RIGHT HAND, SS 304L	
3	54	10002439-005	1	EA	HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 124.83", 6 SLOTS, LEFT HAND, SS 304L	
3	55	10002439-009	1	EA	HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 124.83", 6 SLOTS, RIGHT HAND, SS 304L	
3	56	10002439-010	1	EA	HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 134.32", 6 SLOTS, LEFT HAND, SS 304L	
3	57	10000056-032	24	EA	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)	ANCHOR "H"
3	58	10000058-001	6	EA	FLAT WASHER, 5/8, 316 SS	
3	59	10000006-018	12	EA	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	
6	60	10002483-002	1	EA	TAG, WGZ0067000. NANAIMO, GRIT TANKS, 304SS	
6	61	10002484-001	3	EA	WIRE ROPE, SEAL TAG, 1/16" DIA., GALVANIZED STEEL	

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Bill of Materials

				BOM NO.	**WGZ0067005**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**06**
PREPARED BY:	**RHP**	**PROCESS:**	**Grit Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-112**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(1) Longitudinal Collection System		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	1	10000508-002	1	EA	NH-78 CHAIN STRAND, 10.0 FEET, 301 SS BARREL WRAPS	USE EXTRA QTY FROM BOM 01
	2	10000275-056	15	EA	NCS-720S CHAIN STRAND, 9.5 FEET, 301 SS BARREL WRAPS	
	3	10001032-002	2	EA	NCS-720S, CHAIN LINK, HALF PITCH, 301 SS BARREL WRAP	
	4	10000150-010	8	EA	10 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS	
	5	10000274-002	16	EA	NCS-720S KIT, F22-8 ATTACHMENT LINK, CONNECTING PIN & RETAINER CLIP, 301 SS BARREL WRAP	
	6	10001039-001	16	EA	FILLER BLOCK, 3x8 C-CHANNEL FLIGHT, PP-BLACK	
	7	10000711-007	16	EA	CARRYING WEAR SHOE, 4 HOLES, 5.50", LUBRICATED PA6/6-BLACK	
	8	10001485-014	8	EA	3x8 C-CHANNEL FLIGHT, 16 HOLES, 22.00", WEAR BAR ATTACHMENT, FRP	
	9	10001103-011	16	EA	WEAR BAR, 0.50" x 2.00" x 2.50", 2 HOLES, UHMW-PE	
	10	10001103-012	8	EA	WEAR BAR, 0.50" x 2.00" x 5.00", 2 HOLES, UHMW-PE	
	11	10001901-003	1	EA	HEADSHAFT WELDMENT ASSEMBLY, 30.88"x11.50"x27.00", 304L SS	
	12	10000717-019	2	EA	WALL BEARING ASSY, PEAK-CAP, SPLIT, 2.44" SHAFT, UHMW LINED, WITH GREASE FITTING	
	13	10000574-099	1	EA	HEADSHAFT ASSEMBLY, 2.44" DIA, 43.88" LONG, 3 KEYS, AISI 304	
	14	10001955-002	1	EA	NH-78 VARIABLE DRIVE SPROCKET ASSY, 40T, SPLIT, 2.46" BORE, .63x.31 KWY, 316 SS HDW	
	15	10000301-009	2	EA	NCS-720S SPROCKET, 23T, SPLIT, KEYWAY, SETSCREW, 2.46" BORE, PA6	
	16	10000507-017	1	EA	SHAFT SPLIT BAND COLLAR ASSY, 2.44" SHAFT, 316 SS BAND CLAMP, PA6	
	17	10000070-162	2	EA	BOLT SET, HEX NUT, 1-8 x 4-1/2", 316 SS, FULLY THREADED (SET=1BLT-2FW-1LW-1HN)	
3	18	10000093-036	6	EA	LEVELING ANCHOR SET, 5/8-11 x 10-1/2", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)	ANCHOR "A"
3	19	10000056-090	2	EA	ANCHOR SET, 1-8x8.5", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "B"
	20	10000301-016	4	EA	NCS-720S SPROCKET, 23T, SPLIT, PLAIN BORE, 2.84" BORE, PA6	
3	21	10002479-001	2	EA	IDLER STATIC SHAFT WELDMENT, 8.00" X 8.00" X 22.50", 1.94 DIA., 304LSS	
	22	10000506-001	4	EA	STATIC SLEEVE BEARING ASSY, 1.94" SHAFT, 2.84" SPROCKET BORE, 316SS BAND CLAMP, UHMW-PE	
	23	10000078-023	16	EA	FEMALE ANCHOR SET, 1/2-13 x 2.50", 316 SS, CERTIFIED, (SET=1FEM-1BLT-1LW-1FW)	ANCHOR "C"
	24	10000066-005	22	EA	RETURN RAIL WEAR STRIP HARDWARE KIT, ENG, 316 SS (KIT=4SCR-4CFW-4FW-4LN)	FOR WEAR BAR
	25	10000286-001	16	EA	WEAR STRIP, 0.38" x 2.63" x 120.00" , 1 HOLE & 3 SLOTS, UHMW-PE	
4	26	10001040-002	6	EA	CONCRETE FLOOR WEAR STRIP HARDWARE KIT, HUD-2 8x40mm HILTI ANCHOR (KIT=4SCR-4CFW-4FCANC)	
	27	10001033-002	1	EA	NH-78 SPROCKET, 7T, 1.28" BORE, HUB TYPE C, ASYMMETRICAL, GR PA6/6	
4	28	10001034-007	1	EA	DRIVE CHAIN TENSION ADJUSTMENT "TAKE UP" ASSEMBLY, TRAVEL=13.88", SPECIAL	
	29	10000581-004	1	EA	ANGLE, L5x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP	
	30	10000056-032	2	EA	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)	ANCHOR "D"
	31	10000070-009	2	EA	BOLT SET, LOCKNUT, 1/2-13 x 2-1/2", 316 SS, (SET=1BLT-2FW-1LW-1LN)	
	32	10001011-001	1	EA	ANGLE, L4.50x2.00x3/16 x 6.38" LONG, 6 SLOTS, 316 SS	
	33	10001036-001	1	EA	LIMIT SWITCH WITH ROD, DPDT, SQUARE D	
	34	10000081-005	1	EA	BOLT KIT, 1/4-20 x 3/4", 316 SS (KIT=2BLT-2LW-2FW)	
	35	10000056-046	4	EA	ANCHOR SET, 3/8-16 x 4-3/4", ASTM CERT, 316 SS, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "E"
3	36	10001018-083	1	EA	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB	

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Bill of Materials

				BOM NO.	**WGZ0067005**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**06**
PREPARED BY:	**RHP**	**PROCESS:**	**Grit Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-112**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(1) Longitudinal Collection System		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
3	37	10000221-002	1	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 985 lbf ON THE DRIVE CHAIN	
	38	10001934-003	1	EA	SS DRIVE SHAFT INSTALLATION KIT (KIT=1BLT-1LW-1DSK-1RR), SEW KA77	
	39	10000367-001	1	EA	SINGLE OUTPUT SHAFT ASSY, 2.44" DIA x 13.00", 2 KEYS, KA77 HOLLOW, ENG, 304 SS	
5	40	10000583-211	1	EA	SEW EURODRIVE KA77BR37EDRN71M4/FG/CICIID2/C/RI, 1388:1, 0.50HP, 330/575V, M4	
4	41	10000423-093	1	EA	BASE PLATE, 1.00"x12.25"x20.00", KA77B, VERT MOUNT, ENG TAPPED HOLES, 304 SS	
	42	10000077-001	1	EA	BOLT SET, 5/8-11 x 2-1/4", 316 SS, (SET=4BLT-4LW-4FW)	
	43	10000093-052	4	EA	LEVELING ANCHOR SET, 5/8-11 x 11", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)	ANCHOR "F"
	44	10001691-046	1	EA	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 10.00" x 36.00", 304 SS	
	45	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 04
	46	10000342-001	7	EA	ADHESIVE ANCHORING SYSTEM, HIT-HY 200-A-V3, FOIL PACK, MIXER & MIXER EXTENSION	
	47	10000032-034	12	EA	HEX BOLT, 1/2-13 x 1-3/4", FULLY THREADED, 316 SS	
	48	10000595-021	16	EA	RETURN WEAR SHOE, LUGGED, 2 SLOTS, 2.25", LUBRICATED PA6/6-BLACK	
	49	10001220-002	6	EA	WELDMENT, 14.13" x 2.38" x 8.88", 1 HOLE, 2 SLOTS, SS 304L	
	50	10000093-041	12	EA	LEVELING ANCHOR SET, 1/2-13x7", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)	ANCHOR "G"
	51	10001023-003	6	EA	RETURN RAIL SUPPORT INSTALLATION KIT, EXTENDED WALL BRACKET, ENGLISH	
	52	10000799-001	2	EA	ANGLE, L3x3x3/8 x 240.00", BLANK, FRP	
	53	10002439-002	1	EA	HOLD DOWN RAIL WELDMENT, 3.94" x 2.50" x 157.29", 7 SLOTS, RIGHT HAND, SS 304L	
	54	10002439-004	1	EA	HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 155.67", 7 SLOTS, LEFT HAND, SS 304L	
	55	10002439-006	1	EA	HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 150.30", 7 SLOTS, LEFT HAND, SS 304L	
	56	10002439-008	1	EA	HOLD DOWN RAIL WELDMENT, 3.94" x 2.50" x 162.66", 7 SLOTS, LEFT HAND, SS 304L	
	57	10000056-032	28	EA	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)	ANCHOR "H"
3	58	10000058-001	6	EA	FLAT WASHER, 5/8, 316 SS	
3	59	10000006-018	12	EA	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	
6	60	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 04
6	61	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 04

BRENTWOOD® Polychem

Bill of Materials

				BOM NO.	**WGZ0067006**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**06**
PREPARED BY:	**RHP**	**PROCESS:**	**Grit Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-113**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(1) Longitudinal Collection System		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	1	10000508-002	1	EA	NH-78 CHAIN STRAND, 10.0 FEET, 301 SS BARREL WRAPS	USE EXTRA QTY FROM BOM 01
	2	10000275-056	15	EA	NCS-720S CHAIN STRAND, 9.5 FEET, 301 SS BARREL WRAPS	
	3	10001032-002	2	EA	NCS-720S, CHAIN LINK, HALF PITCH, 301 SS BARREL WRAP	
	4	10000150-010	8	EA	10 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS	
	5	10000274-002	16	EA	NCS-720S KIT, F22-8 ATTACHMENT LINK, CONNECTING PIN & RETAINER CLIP, 301 SS BARREL WRAP	
	6	10001039-001	16	EA	FILLER BLOCK, 3x8 C-CHANNEL FLIGHT, PP-BLACK	
	7	10000711-007	16	EA	CARRYING WEAR SHOE, 4 HOLES, 5.50", LUBRICATED PA6/6-BLACK	
	8	10001485-014	8	EA	3x8 C-CHANNEL FLIGHT, 16 HOLES, 22.00", WEAR BAR ATTACHMENT, FRP	
	9	10001103-011	16	EA	WEAR BAR, 0.50" x 2.00" x 2.50", 2 HOLES, UHMW-PE	
	10	10001103-012	8	EA	WEAR BAR, 0.50" x 2.00" x 5.00", 2 HOLES, UHMW-PE	
	11	10001901-002	1	EA	HEADSHAFT WELDMENT ASSEMBLY, 30.88"x11.50"x27.00", 304L SS	
	12	10000717-019	2	EA	WALL BEARING ASSY, PEAK-CAP, SPLIT, 2.44" SHAFT, UHMW LINED, WITH GREASE FITTING	
	13	10000574-099	1	EA	HEADSHAFT ASSEMBLY, 2.44" DIA, 43.88" LONG, 3 KEYS, AISI 304	
	14	10001955-002	1	EA	NH-78 VARIABLE DRIVE SPROCKET ASSY, 40T, SPLIT, 2.46" BORE, .63x.31 KWY, 316 SS HDW	
	15	10000301-009	2	EA	NCS-720S SPROCKET, 23T, SPLIT, KEYWAY, SETSCREW, 2.46" BORE, PA6	
	16	10000507-017	1	EA	SHAFT SPLIT BAND COLLAR ASSY, 2.44" SHAFT, 316 SS BAND CLAMP, PA6	
	17	10000070-162	2	EA	BOLT SET, HEX NUT, 1-8 x 4-1/2", 316 SS, FULLY THREADED (SET=1BLT-2FW-1LW-1HN)	
3	18	10000093-053	6	EA	LEVELING ANCHOR SET, 5/8-11 x 12-1/2", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)	ANCHOR "A"
3	19	10000056-090	2	EA	ANCHOR SET, 1-8x8.5", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "B"
	20	10000301-016	4	EA	NCS-720S SPROCKET, 23T, SPLIT, PLAIN BORE, 2.84" BORE, PA6	
3	21	10002479-001	2	EA	IDLER STATIC SHAFT WELDMENT, 8.00" X 8.00" X 22.50", 1.94 DIA., 304LSS	
	22	10000506-001	4	EA	STATIC SLEEVE BEARING ASSY, 1.94" SHAFT, 2.84" SPROCKET BORE, 316SS BAND CLAMP, UHMW-PE	
	23	10000078-023	16	EA	FEMALE ANCHOR SET, 1/2-13 x 2.50", 316 SS, CERTIFIED, (SET=1FEM-1BLT-1LW-1FW)	ANCHOR "C"
	24	10000066-005	22	EA	RETURN RAIL WEAR STRIP HARDWARE KIT, ENG, 316 SS (KIT=4SCR-4CFW-4FW-4LN)	FOR WEAR BAR
	25	10000286-001	16	EA	WEAR STRIP, 0.38" x 2.63" x 120.00" , 1 HOLE & 3 SLOTS, UHMW-PE	
4	26	10001040-002	6	EA	CONCRETE FLOOR WEAR STRIP HARDWARE KIT, HUD-2 8x40mm HILTI ANCHOR (KIT=4SCR-4CFW-4FCANC)	
	27	10001033-002	1	EA	NH-78 SPROCKET, 7T, 1.28" BORE, HUB TYPE C, ASYMMETRICAL, GR PA6/6	
4	28	10001034-007	1	EA	DRIVE CHAIN TENSION ADJUSTMENT "TAKE UP" ASSEMBLY, TRAVEL=13.88", SPECIAL	
	29	10000581-004	1	EA	ANGLE, L5x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP	
	30	10000056-032	2	EA	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)	ANCHOR "D"
	31	10000070-009	2	EA	BOLT SET, LOCKNUT, 1/2-13 x 2-1/2", 316 SS, (SET=1BLT-2FW-1LW-1LN)	
	32	10001011-001	1	EA	ANGLE, L4.50x2.00x3/16 x 6.38" LONG, 6 SLOTS, 316 SS	
	33	10001036-001	1	EA	LIMIT SWITCH WITH ROD, DPDT, SQUARE D	
	34	10000081-005	1	EA	BOLT KIT, 1/4-20 x 3/4", 316 SS (KIT=2BLT-2LW-2FW)	
	35	10000056-046	4	EA	ANCHOR SET, 3/8-16 x 4-3/4", ASTM CERT, 316 SS, (SET=1ATH-1FW-1LW-1HN)	ANCHOR "E"
3	36	10001018-083	1	EA	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB	

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Bill of Materials

				BOM NO.	**WGZ0067006**
PROJECT NAME:	**NANAIMO PST 1-3 & GRIT 1-3, BC**			**NSF:**	**No**
CUSTOMER:	**REGIONAL DISTRICT OF NANAIMO**			**DATE:**	**08/04/23**
CITY, STATE/COUNTRY:	**NANAIMO, BRITISH COLUMBIA CANADA**			**REVISION:**	**06**
PREPARED BY:	**RHP**	**PROCESS:**	**Grit Tanks**	**REV. DATE:**	**22 Jan 24**
TANK NO:	**T-113**	**EQUIP:**	**Chain & Flight**	**REV. STATE:**	**Released**
CHECKED BY:	**HP**	**SYSTEMS:**	(1) Longitudinal Collection System		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
3	37	10000221-002	1	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 985 lbf ON THE DRIVE CHAIN	
	38	10001934-003	1	EA	SS DRIVE SHAFT INSTALLATION KIT (KIT=1BLT-1LW-1DSK-1RR), SEW KA77	
	39	10000367-001	1	EA	SINGLE OUTPUT SHAFT ASSY, 2.44" DIA x 13.00", 2 KEYS, KA77 HOLLOW, ENG, 304 SS	
5	40	10000583-211	1	EA	SEW EURODRIVE KA77BR37EDRN71M4/FG/CICIID2/C/RI, 1388:1, 0.50HP, 330/575V, M4	
4	41	10000423-093	1	EA	BASE PLATE, 1.00"x12.25"x20.00", KA77B, VERT MOUNT, ENG TAPPED HOLES, 304 SS	
	42	10000077-001	1	EA	BOLT SET, 5/8-11 x 2-1/4", 316 SS, (SET=4BLT-4LW-4FW)	
	43	10000093-052	4	EA	LEVELING ANCHOR SET, 5/8-11 x 11", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)	ANCHOR "F"
	44	10001691-048	1	EA	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 10.00" x 36.00", 304 SS	
	45	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 04
	46	10000342-001	7	EA	ADHESIVE ANCHORING SYSTEM, HIT-HY 200-A-V3, FOIL PACK, MIXER & MIXER EXTENSION	
	47	10000032-034	12	EA	HEX BOLT, 1/2-13 x 1-3/4", FULLY THREADED, 316 SS	
	48	10000595-021	16	EA	RETURN WEAR SHOE, LUGGED, 2 SLOTS, 2.25", LUBRICATED PA6/6-BLACK	
	49	10001220-002	6	EA	WELDMENT, 14.13" x 2.38" x 8.88", 1 HOLE, 2 SLOTS, SS 304L	
	50	10000093-041	12	EA	LEVELING ANCHOR SET, 1/2-13x7", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)	ANCHOR "G"
	51	10001023-003	6	EA	RETURN RAIL SUPPORT INSTALLATION KIT, EXTENDED WALL BRACKET, ENGLISH	
	52	10000799-001	2	EA	ANGLE, L3x3x3/8 x 240.00", BLANK, FRP	
	53	10002439-002	1	EA	HOLD DOWN RAIL WELDMENT, 3.94" x 2.50" x 157.29", 7 SLOTS, RIGHT HAND, SS 304L	
	54	10002439-003	1	EA	HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 157.80", 7 SLOTS, RIGHT HAND, SS 304L	
	55	10002439-006	1	EA	HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 150.30", 7 SLOTS, LEFT HAND, SS 304L	
	56	10002439-007	1	EA	HOLD DOWN RAIL WELDMENT, 3.94" x 2.50" x 164.79", 7 SLOTS, LEFT HAND, SS 304L	
	57	10000056-032	28	EA	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)	ANCHOR "H"
3	58	10000058-001	6	EA	FLAT WASHER, 5/8, 316 SS	
3	59	10000006-018	12	EA	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	
6	60	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 04
6	61	10999999-003	1	EA	NOT REQUIRED THIS TANK	SUPPLIED ON BOM 04

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5.5 Bill(s) of Materials – Spare Parts

BOM #	DESCRIPTION
WGZ0067007	SPARE PARTS

Bill of Materials

				BOM NO.	WGZ0067007
PROJECT NAME:	NANAIMO PST 1-3 & GRIT 1-3, BC			NSF:	No
CUSTOMER:	REGIONAL DISTRICT OF NANAIMO			DATE:	08/04/23
CITY, STATE/COUNTRY:	NANAIMO, BRITISH COLUMBIA CANADA			REVISION:	03
PREPARED BY:	RHP	PROCESS:	Primary Sedimentation & Grit Tanks	REV. DATE:	30 Nov 23
TANK NO:	SP	EQUIP:	Chain & Flight	REV. STATE:	Released
CHECKED BY:	BSC	SYSTEMS:	Spare Parts		

REV	ITEM	PART NUMBER	QTY	UNITS	DESCRIPTION	NOTES
	1	10000508-001	6	EA	NH-78 CHAIN STRAND, 10.0 FEET	LONGS & CROSS
	2	10000508-002	2	EA	NH-78 CHAIN STRAND, 10.0 FEET, 301 SS BARREL WRAPS	GRIT
	3	10000275-058	120	EA	NCS-720S CHAIN STRAND, 9.5 FEET	LONGS
	4	10000275-059	40	EA	NCS-720S CHAIN STRAND, 4.5 FEET	CROSS
	5	10000275-056	20	EA	NCS-720S CHAIN STRAND, 9.5 FEET, 301 SS BARREL WRAPS	GRIT
	6	10000274-001	160	EA	NCS-720S CHAIN ATTACHMENT KIT, F22-8, NM	LONGS & CROSS
	7	10000274-002	20	EA	NCS-720S KIT, F22-8 ATTACHMENT LINK, CONNECTING PIN & RETAINER CLIP, 301 SS BARREL WRAP	GRIT
	8	10000711-007	12	EA	CARRYING WEAR SHOE, 4 HOLES, 5.50", LUBRICATED PA6/6-BLACK	
	9	10000595-006	12	EA	RETURN WEAR SHOE, LUGGED, 6 HOLES, 4.50", LUBRICATED PA6/6-BLACK	
	10	10000286-001	2	EA	WEAR STRIP, 0.38" x 2.63" x 120.00" , 1 HOLE & 3 SLOTS, UHMW-PE	
3	11	10000221-001	6	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 1665 lbf ON THE DRIVE CHAIN	LONGS
	12	10000406-001	12	EA	FIELD REPLACEMENT, IDLER BEARING KIT, SLIP FIT, 5.38", UHMW-PE	
	13	10001032-001	18	EA	NCS-720S, CHAIN LINK, HALF PITCH	CROSS
	14	10001032-002	6	EA	NCS-720S, CHAIN LINK, HALF PITCH, 301 SS BARREL WRAP	GRIT
	15	10001041-004	6	EA	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-2INTLK-6LVL)	LONGS
	16	10001041-005	3	EA	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-6LVL)	CROSS
	17	10010024-006	2	EA	BULL END TUBE BEARING, HEAD SHAFT, 5.23" DIA X 20.00, UHMW-PE	LONGS
	18	10010025-005	2	EA	DRIVEN END TUBE BEARING, HEAD SHAFT, 5.23" DIA x 16.00", UHMW-PE	LONGS
	19	10010024-162	1	EA	BULL END TUBE BEARING, HEAD SHAFT, 5.23" DIA X 26.00, UHMW-PE	CROSS
	20	10010025-094	1	EA	DRIVEN END TUBE BEARING, HEAD SHAFT, 5.23" DIA x 16.00", UHMW-PE	CROSS
	21	10000717-019	2	EA	WALL BEARING ASSY, PEAK-CAP, SPLIT, 2.44" SHAFT, UHMW LINED, WITH GREASE FITTING	GRIT
	22	10000506-001	6	EA	STATIC SLEEVE BEARING ASSY, 1.94" SHAFT, 2.84" SPROCKET BORE, 316SS BAND CLAMP, UHMW-PE	GRIT
	23	10000070-162	1	EA	BOLT SET, HEX NUT, 1-8 x 4-1/2", 316 SS, FULLY THREADED (SET=1BLT-2FW-1LW-1HN)	GRIT
	24	10000330-139	1	EA	KEY, 0.63" x 0.63" x 6.25", AISI 304	GRIT
	25	10000330-077	1	EA	KEY, 0.63" x 0.63" x 10.00", 304 SS	GRIT
	26	10000289-002	6	EA	NCS-720S KIT = ONE CONNECTING PIN, A TYPE 1 RETAINER CLIP, AND A TYPE 4 RETAINER CLIP	
	27	10000510-001	6	EA	KNURLED PIN, NH-78, 0.38" DIA x 2.91", 303 SS	
	28	10001975-104	1	EA	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP	LONGS
	29	10001975-105	1	EA	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP	LONGS
	30	10001975-106	2	EA	3x8 C-CHANNEL FLIGHT, 8 HOLES, 57.00", FRP	CROSS
	31	10001485-014	2	EA	3x8 C-CHANNEL FLIGHT, 16 HOLES, 22.00", WEAR BAR ATTACHMENT, FRP	GRIT
3	32	10000221-002	6	EA	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 985 lbf ON THE DRIVE CHAIN	CROSS & GRIT

Component Drawings Section 6.

6.1 Component Drawing List

6.2 Component Drawings

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6.1 Component Drawing List

10000006-018	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED
10000032-034	HEX BOLT, 1/2-13 x 1-3/4", FULLY THREADED, 316 SS
10000056-032	ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)
10000056-046	ANCHOR SET, 3/8-16 x 4-3/4", ASTM CERT, 316 SS, (SET=1ATH-1FW-1LW-1HN)
10000056-053	ANCHOR SET, 1-8x11-1/2", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)
10000056-090	ANCHOR SET, 1-8x8.5", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)
10000058-001	FLAT WASHER, 5/8, 316 SS
10000066-005	RETURN RAIL WEAR STRIP HARDWARE KIT, ENG, 316 SS (KIT=4SCR-4CFW-4FW-4LN)
10000070-007	BOLT SET, LOCKNUT, 3/8-16 x 2”, 316 SS, (SET=1BLT-2FW-1LW-1LN)
10000070-009	BOLT SET, LOCKNUT, 1/2-13 x 2-1/2", 316 SS, (SET=1BLT-2FW-1LW-1LN)
10000070-162	BOLT SET, HEX NUT, 1-8 x 4-1/2”, 316 SS, FULLY THREADED (SET=1BLT-2FW-1LW-1HN)
10000077-001	BOLT SET, 5/8-11 x 2-1/4", 316 SS, (SET=4BLT-4LW-4FW)
10000078-019	FEMALE ANCHOR SET, 3/4-10 x 6.00", 316 SS, EN 10088-3 CERT, (SET=1FEM-1BLT-1LW-1FW)
10000078-023	FEMALE ANCHOR SET, 1/2-13 x 2.50", 316 SS, CERTIFIED, (SET=1FEM-1BLT-1LW-1FW)
10000081-005	BOLT KIT, 1/4-20 x 3/4", 316 SS (KIT=2BLT-2LW-2FW)
10000093-036	LEVELING ANCHOR SET, 5/8-11 x 10-1/2”, 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)
10000093-039	LEVELING ANCHOR SET, 5/8-11 x 11-1/2”, 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)
10000093-040	LEVELING ANCHOR SET, 1/2-13x8", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)
10000093-041	LEVELING ANCHOR SET, 1/2-13x7", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)
10000093-052	LEVELING ANCHOR SET, 5/8-11 x 11”, 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)
10000093-053	LEVELING ANCHOR SET, 5/8-11 x 12-1/2”, 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)
10000093-065	LEVELING ANCHOR SET, 5/8-11 x 13”, 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)
10000150-008	8 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS
10000150-010	10 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS
10000221-001	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 1665 lbf ON THE DRIVE CHAIN
10000221-002	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 985 lbf ON THE DRIVE CHAIN
10000274-001	NCS-720S CHAIN ATTACHMENT KIT, F22-8, NM
10000274-002	NCS-720S KIT, F22-8 ATTACHMENT LINK, CONNECTING PIN & RETAINER CLIP, 301 SS BARREL WRAP
10000275-056	NCS-720S CHAIN STRAND, 9.5 FEET, 301 SS BARREL WRAPS
10000275-058	NCS-720S CHAIN STRAND, 9.5 FEET
10000275-059	NCS-720S CHAIN STRAND, 4.5 FEET
10000286-001	WEAR STRIP, 0.38" x 2.63" x 120.00" , 1 HOLE & 3 SLOTS, UHMW-PE
10000289-002	NCS-720S KIT = ONE CONNECTING PIN, A TYPE 1 RETAINER CLIP, AND A TYPE 4 RETAINER CLIP
10000300-002	NCS-720S SPROCKET, 23T, SOLID, PLAIN BORE, 5.34" BORE, PA6
10000301-009	NCS-720S SPROCKET, 23T, SPLIT, KEYWAY, SETSCREW, 2.46" BORE, PA6
10000301-016	NCS-720S SPROCKET, 23T, SPLIT, PLAIN BORE, 2.84" BORE, PA6
10000301-037	NCS-720S SPROCKET ASSY, 23T, SPLIT, KEYWAY, SET SCREW, 5.78" BORE, ENG HDW, PA6
10000330-077	KEY, 0.63" x 0.63" x 10.00", 304 SS
10000330-139	KEY, 0.63" x 0.63" x 6.25", AISI 304
10000341-001	MANUAL DISPENSER, ADHESIVE, HDM 500 & RED CARTRIDGE HOLDER, HIT-CR 500
10000342-001	ADHESIVE ANCHORING SYSTEM, HIT-HY 200-A-V3, FOIL PACK, MIXER & MIXER EXTENSION
10000354-037	HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6
10000354-038	HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6
10000354-093	HEAD SHAFT SPINDLE, SMALL BASE, 3.00" SHOULDER, 20.00" JOURNAL, ENG LEVELING, PA6
10000359-011	IDLER STUB SHAFT ASSY, SMALL BASE, 10.31" SHOULDER, 15.69", ENG LEVELING, PA6 & UHMW-PE
10000359-017	IDLER STUB SHAFT ASSY, SMALL BASE, 13.31" SHOULDER, 18.69", ENG LEVELING, PA6 & UHMW-PE

10000359-019	IDLER STUB SHAFT ASSY, SMALL BASE, 14.31" SHOULDER, 19.69", ENG LEVELING, PA6 & UHMW-PE
10000367-001	SINGLE OUTPUT SHAFT ASSY, 2.44" DIA x 13.00", 2 KEYS, KA77 HOLLOW, ENG, 304 SS
10000406-001	FIELD REPLACEMENT, IDLER BEARING KIT, SLIP FIT, 5.38", UHMW-PE
10000423-093	BASE PLATE, 1.00"x12.25"x20.00", KA77B, VERT MOUNT, ENG TAPPED HOLES, 304 SS
10000506-001	STATIC SLEEVE BEARING ASSY, 1.94" SHAFT, 2.84" SPROCKET BORE, 316SS BAND CLAMP, UHMW-PE
10000507-004	SHAFT SPLIT BAND COLLAR ASSY, 5.23" SHAFT, 316 SS BAND CLAMP, PA6
10000507-017	SHAFT SPLIT BAND COLLAR ASSY, 2.44" SHAFT, 316 SS BAND CLAMP, PA6
10000508-001	NH-78 CHAIN STRAND, 10.0 FEET
10000508-002	NH-78 CHAIN STRAND, 10.0 FEET, 301 SS BARREL WRAPS
10000510-001	KNURLED PIN, NH-78, 0.38" DIA x 2.91", 303 SS
10000574-099	HEADSHAFT ASSEMBLY, 2.44" DIA, 43.88" LONG, 3 KEYS, AISI 304
10000581-003	ANGLE, L4x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP
10000581-004	ANGLE, L5x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP
10000583-201	SEW EURODRIVE KA77BR37DRN71M4/C/DH/RI, 1388:1, 0.50HP, 330/575V, M4
10000583-202	SEW EURODRIVE KA77BR37DRN71M4/C/DH/RI, 709:1, 0.50HP, 330/575V, M4
10000583-211	SEW EURODRIVE KA77BR37EDRN71M4/FG/CICIID2/C/RI, 1388:1, 0.50HP, 330/575V, M4
10000595-006	RETURN WEAR SHOE, LUGGED, 6 HOLES, 4.50", LUBRICATED PA6/6-BLACK
10000595-021	RETURN WEAR SHOE, LUGGED, 2 SLOTS, 2.25", LUBRICATED PA6/6-BLACK
10000711-007	CARRYING WEAR SHOE, 4 HOLES, 5.50", LUBRICATED PA6/6-BLACK
10000716-005	WALL BRACKET, 7.75", PA6/6
10000716-009	WALL BRACKET, 9.00", PA6/6
10000717-019	WALL BEARING ASSY, PEAK-CAP, SPLIT, 2.44" SHAFT, UHMW LINED, WITH GREASE FITTING
10000799-001	ANGLE, L3x3x3/8 x 240.00", BLANK, FRP
10001002-246	ANGLE, L4x4x3/8 x 32.00", 3 HOLE, FRP
10001002-247	ANGLE, L3x3x3/8 x 26.25", 2 SLOTS, FRP
10001002-248	ANGLE, L3x3x3/8 x 15.00", 1 HOLE, CHAMFERED, FRP
10001002-249	ANGLE, L4x4x3/8 x 29.13", 4 HOLES, FRP, RIGHT HAND
10001002-250	ANGLE, L4x4x3/8 x 29.13", 4 HOLES, FRP, LEFT HAND
10001002-251	ANGLE, L4x4x3/8 x 19.88", 4 HOLES, FRP, RIGHT HAND
10001002-252	ANGLE, L4x4x3/8 x 19.88", 4 HOLES, FRP, LEFT HAND
10001002-253	ANGLE, L3x3x3/8 x 3.50", 2 HOLES, FRP
10001002-256	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP
10001002-257	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP
10001002-258	ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP
10001011-001	ANGLE, L4.50x2.00x3/16 x 6.38" LONG, 6 SLOTS, 316 SS
10001014-001	STUB SHAFT RETAINER PLATE, PC
10001018-028	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB
10001018-083	NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB
10001020-003	STUB SHAFT LEVELING/RETAINER PLATE HARDWARE KIT, ENGLISH, 316 SS (KIT=1BLT-1LW-1FW-3LVL
10001023-001	RETURN RAIL SUPPORT INSTALLATION KIT, WALL BRACKET, ENGLISH
10001023-003	RETURN RAIL SUPPORT INSTALLATION KIT, EXTENDED WALL BRACKET, ENGLISH
10001032-001	NCS-720S, CHAIN LINK, HALF PITCH
10001032-002	NCS-720S, CHAIN LINK, HALF PITCH, 301 SS BARREL WRAP
10001033-002	NH-78 SPROCKET, 7T, 1.28" BORE, HUB TYPE C, ASYMMETRICAL, GR PA6/6
10001034-007	DRIVE CHAIN TENSION ADJUSTMENT "TAKE UP" ASSEMBLY, TRAVEL=13.88", SPECIAL
10001036-001	LIMIT SWITCH WITH ROD, DPDT, SQUARE D
10001039-001	FILLER BLOCK, 3x8 C-CHANNEL FLIGHT, PP-BLACK
10001040-002	CONCRETE FLOOR WEAR STRIP HARDWARE KIT, HUD-2 8x40mm HILTI ANCHOR (KIT=4SCR-4CFW-4FCANC)
10001041-004	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-2INTLK-6LVL)

10001041-005	HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-6LVL)
10001060-005	3x8 C-CHANNEL FLIGHT, 180.00", BLANK, FRP
10001103-011	WEAR BAR, 0.50" x 2.00" x 2.50", 2 HOLES, UHMW-PE
10001103-012	WEAR BAR, 0.50" x 2.00" x 5.00", 2 HOLES, UHMW-PE
10001104-013	PLATE, 0.38" x 3.00" x 3.00", 1 HOLE, FRP
10001220-002	WELDMENT, 14.13" x 2.38" x 8.88", 1 HOLE, 2 SLOTS, SS 304L
10001485-014	3x8 C-CHANNEL FLIGHT, 16 HOLES, 22.00”, WEAR BAR ATTACHMENT, FRP
10001691-046	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 10.00" x 36.00", 304 SS
10001691-048	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 10.00" x 36.00", 304 SS
10001691-143	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 9.00" x 36.00", 304 SS
10001691-144	CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 9.00" x 36.00", 304 SS
10001691-318	CHAIN GUARD ASSEMBLY, DUAL, 16.00" x 17.25" x 37.00", 304 SS
10001811-003	NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 1.75" OFFSET, ENG HDW, PA6,
10001811-015	NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 5.63" OFFSET, ENG HDW, LOCKNUTS, PA6
10001901-002	HEADSHAFT WELDMENT ASSEMBLY, 30.88"x11.50"x27.00", 304L SS
10001901-003	HEADSHAFT WELDMENT ASSEMBLY, 30.88"x11.50"x27.00", 304L SS
10001934-003	SS DRIVE SHAFT INSTALLATION KIT (KIT=1BLT-1LW-1DSK-1RR), SEW KA77
10001955-002	NH-78 VARIABLE DRIVE SPROCKET ASSY, 40T, SPLIT, 2.46" BORE, .63x.31 KWY, 316 SS HDW
10001975-104	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP
10001975-105	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP
10001975-106	3x8 C-CHANNEL FLIGHT, 8 HOLES, 57.00", FRP
10002439-001	HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 134.32", 6 SLOTS, RIGHT HAND, SS 304L
10002439-002	HOLD DOWN RAIL WELDMENT, 3.94" x 2.50" x 157.29", 7 SLOTS, RIGHT HAND, SS 304L
10002439-003	HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 157.80", 7 SLOTS, RIGHT HAND, SS 304L
10002439-004	HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 155.67", 7 SLOTS, LEFT HAND, SS 304L
10002439-005	HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 124.83", 6 SLOTS, LEFT HAND, SS 304L
10002439-006	HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 150.30", 7 SLOTS, LEFT HAND, SS 304L
10002439-007	HOLD DOWN RAIL WELDMENT, 3.94" x 2.50" x 164.79", 7 SLOTS, LEFT HAND, SS 304L
10002439-008	HOLD DOWN RAIL WELDMENT, 3.94" x 2.50" x 162.66", 7 SLOTS, LEFT HAND, SS 304L
10002439-009	HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 124.83", 6 SLOTS, RIGHT HAND, SS 304L
10002439-010	HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 134.32", 6 SLOTS, LEFT HAND, SS 304L
10002479-001	IDLER STATIC SHAFT WELDMENT, 8.00" X 8.00" X 22.50", 1.94 DIA., 304LSS
10002483-001	TAG, WGZ0067000. NANAIMO, PRIMARY SEDIMENTATION TANKS, 304SS
10002483-002	TAG, WGZ0067000. NANAIMO, GRIT TANKS, 304SS
10002484-001	WIRE ROPE, SEAL TAG, 1/16" DIA., GALVANIZED STEEL
10010019-149	CENTER TUBE, TELESCOPIC HEAD SHAFT, 5.23" DIA x 142.00", FRP
10010024-006	BULL END TUBE BEARING, HEAD SHAFT, 5.23" DIA X 20.00, UHMW-PE
10010024-162	BULL END TUBE BEARING, HEAD SHAFT, 5.23" DIA X 26.00, UHMW-PE
10010025-005	DRIVEN END TUBE BEARING, HEAD SHAFT, 5.23" DIA x 16.00", UHMW-PE
10010025-094	DRIVEN END TUBE BEARING, HEAD SHAFT, 5.23" DIA x 16.00", UHMW-PE
10010026-057	BULL END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 52.00", FRP & UHMW-PE
10010027-005	DRIVEN END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 48.00, FRP & UHMW-PE
10010028-190	MONO TUBE ASSY, HEAD SHAFT, 5.75" DIA x 55.75, FRP & UHMW-PE

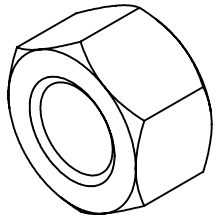
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6.2 Component Drawings

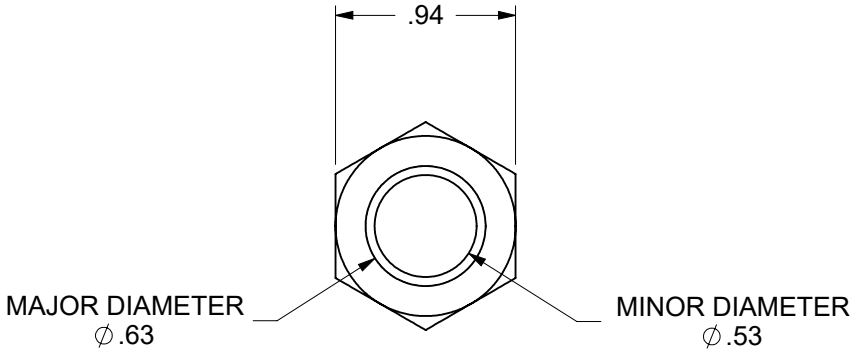
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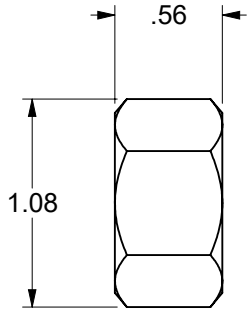
NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
3. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.
4. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
5. PRODUCT TO BE CERTIFIED TO ASTM F594G, CW1.



ISOMETRIC VIEW
SCALE: 1:1

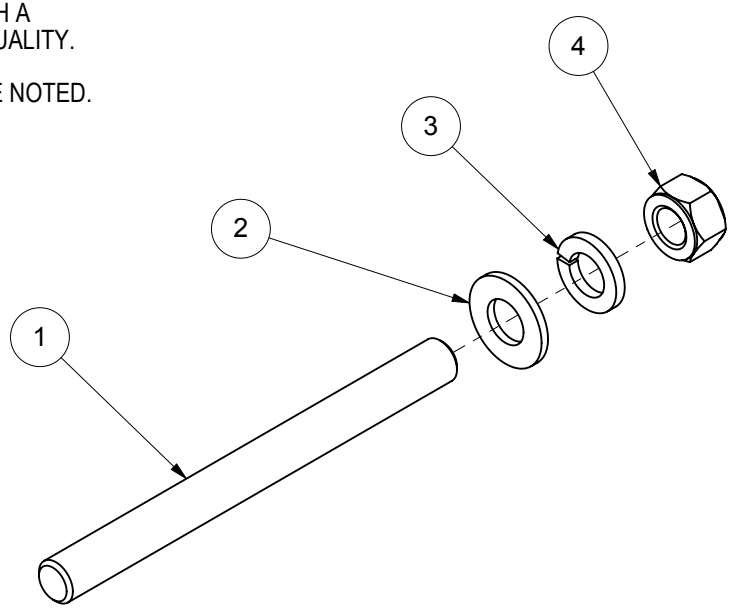




STATUS			BRENTWOOD®	DRAWN AIM 04/29/14	DOCUMENT TYPE PRODUCT DEFINITION LONG DESCRIPTION HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	
SUPERSEDES:				CHECKER MAP 02/25/14		
REV	BY	DATE	CONFIDENTIAL PROPERTY OF BRENTWOOD INDUSTRIES INC. (HEREINAFTER KNOWN AS, "BRENTWOOD") NOTICE: THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION WHICH IS THE PROPERTY OF BRENTWOOD. THE RECIPIENT OF THIS DOCUMENT AGREES TO USE THE INFORMATION CONTAINED HEREIN FOR THE LIMITED PURPOSE OF WHICH IT WAS FURNISHED BY BRENTWOOD AND FURTHER AGREES TO NEITHER COPY, MODIFY, REVERSE ENGINEER NOR AUTHORIZE ANYONE ELSE TO DO SO ON ITS BEHALF. THE RECIPIENT FURTHER AGREES THAT IT WILL NOT DISCLOSE THIS INFORMATION TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF BRENTWOOD. THIS NOTICE SHALL APPEAR ON ANY COMPLETE OR PARTIAL REPRODUCTION OF THIS DOCUMENT.	MATERIAL AISI 316 5	WEIGHT - LBS 0.086	WEIGHT - KG 0.04
01	CSR	07/24/15		SHEET 1 OF 1	DRAWING NUMBER 10000006-018	SCALE 1:1 / REV 01

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000006-012	HEX NUT, 1/2-13, ASTM F594-CW1, 316 SS	1	AISI 316
3	10000012-006	SPLIT LOCK WASHER, 1/2, 316 SS	1	AISI 316
2	10000058-007	FLAT WASHER, 1/2", 316 SS	1	AISI 316
1	10000062-094	ALL THREAD STUD, 1/2-13 x 5-3/4", 316 SS, ASTM F593G CW1 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000056-032

STATUS

SUPERSEDES:

REV	BY	DATE
02	AWK	12/02/14

BRENTWOOD®

DRAWN MAP 04/14/14

CHECKER AIM 04/28/14

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

ANCHOR SET, 1/2-13 x 5-3/4", 316 SS, CW1 CERTIFIED, (SET=1ATH-1FW-1L1-1HN)

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MATERIAL SEE BILL OF MATERIALS

WEIGHT - LBS 0.40

WEIGHT - KG 0.18

SHEET 1 OF 1

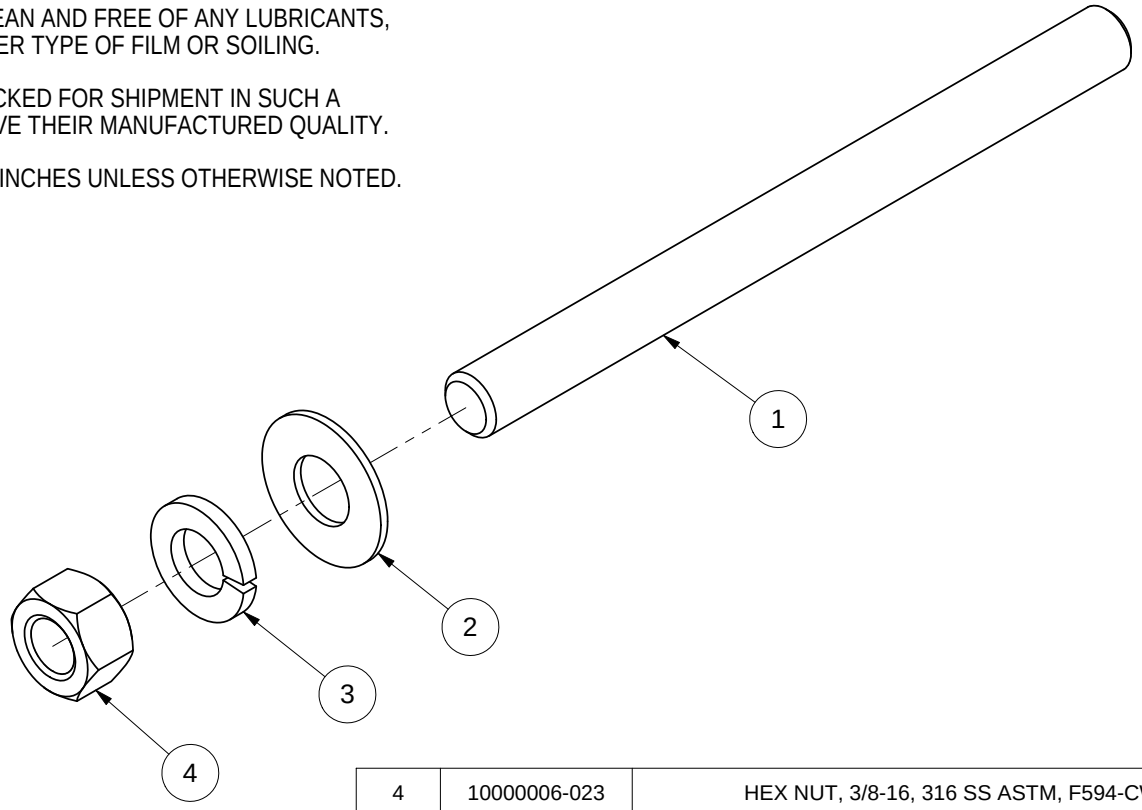
DRAWING NUMBER 10000056-032

SCALE 1:2

REV 02

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000006-023	HEX NUT, 3/8-16, 316 SS ASTM, F594-CW1	1	AISI 316
3	10000012-005	SPLIT LOCK WASHER, 3/8, 316 SS	1	AISI 316
2	10000058-005	FLAT WASHER, 3/8" SIZE, 0.406" ID x 0.875" OD x 0.043/0.057" THK, 316 SS	1	AISI 316
1	10000062-114	ALL THREAD STUD, 3/8-16 x 4-3/4", ASTM F593G CW1, 316 SS	1	AISI 316

BILL OF MATERIALS FOR 10000056-046

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
WR	CSR	07/27/15

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DRAWN: WR 12/09/14

CHECKER: CSR 12/11/14

DOCUMENT TYPE: PRODUCT DEFINITION

LONG DESCRIPTION: ANCHOR SET, 3/8-16 x 4-3/4", ASTM CERT, 316 SS, (SET=1ATH-1FW-1LW-1HN)

MATERIAL: SEE BOM

WEIGHT - LBS: 0.18

WEIGHT - KG: 0.08

SHEET: 1 OF 1

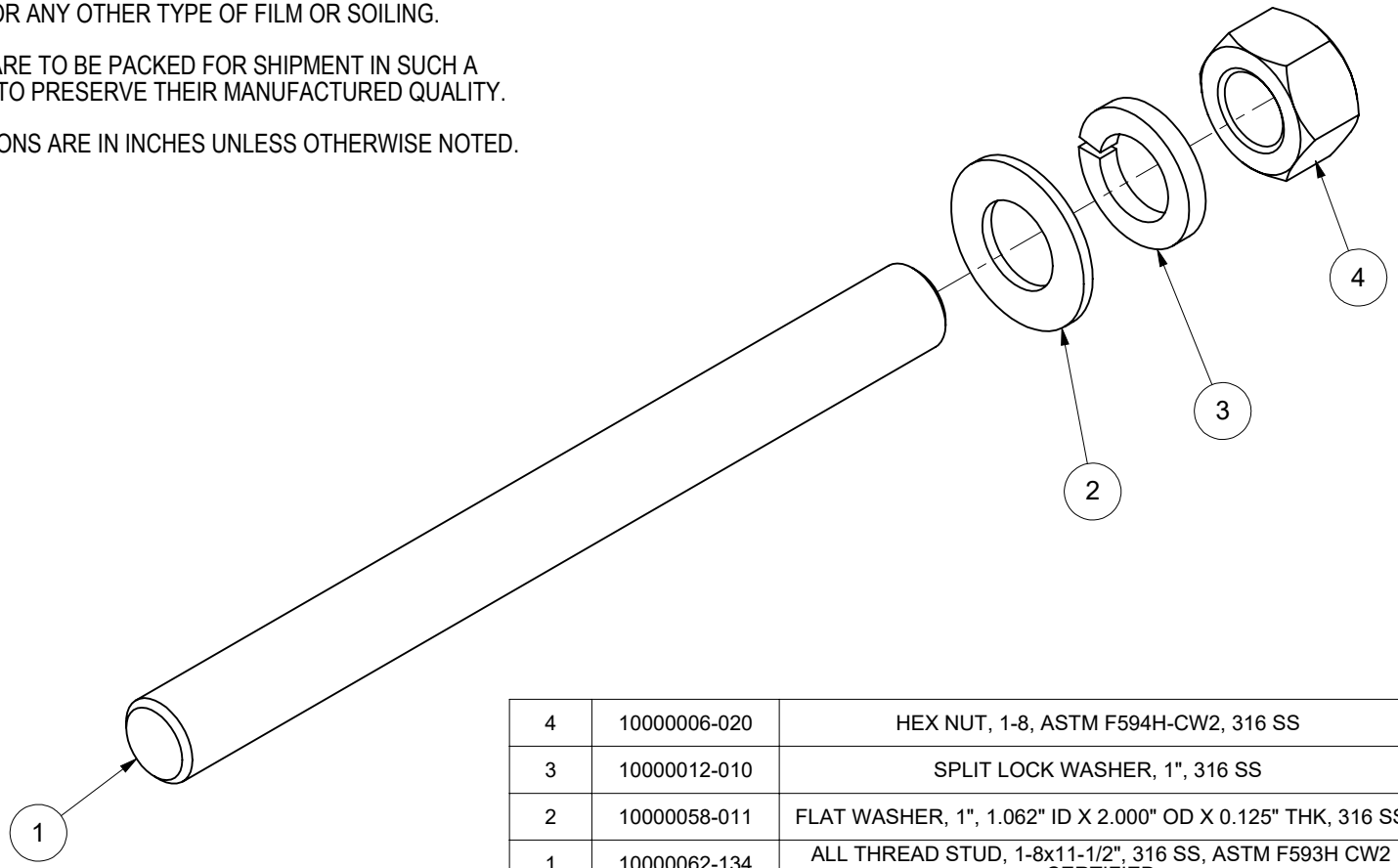
DRAWING NUMBER: 10000056-046

SCALE: 1:1

REV: 01

NOTES :

1. REMOVE ALL BURRS AND SHARP EDGES.
2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
3. PRODUCTS ARE TO BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
4. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000006-020	HEX NUT, 1-8, ASTM F594H-CW2, 316 SS	1	AISI 316
3	10000012-010	SPLIT LOCK WASHER, 1", 316 SS	1	AISI 316
2	10000058-011	FLAT WASHER, 1", 1.062" ID X 2.000" OD X 0.125" THK, 316 SS	1	AISI 316
1	10000062-134	ALL THREAD STUD, 1-8x11-1/2", 316 SS, ASTM F593H CW2 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000056-053

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
SML	AIM	03/18/20

BRENTWOOD

DRAWN CSR 12/02/15

CHECKER BSC 12/02/15

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

ANCHOR SET, 1-8x11-1/2", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)

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MATERIAL SEE BILL OF MATERIALS

WEIGHT - LBS 3.12

WEIGHT - KG 1.42

SHEET 1 OF 1

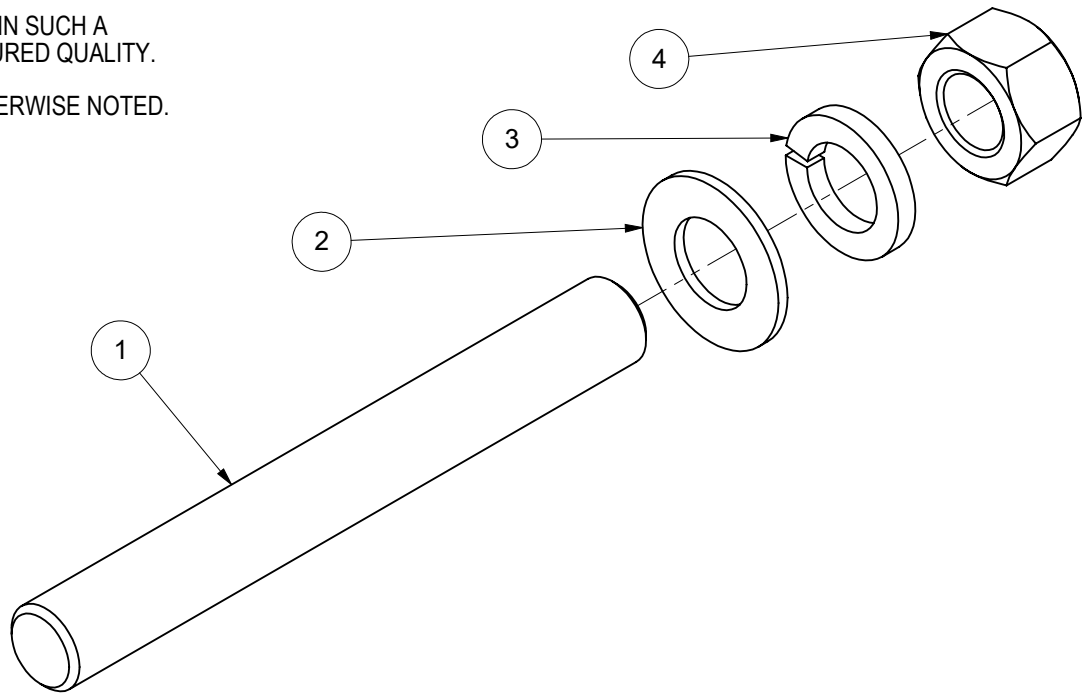
DRAWING NUMBER 10000056-053

SCALE 1:2

REV 02

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000006-020	HEX NUT, 1-8, ASTM F594H-CW2, 316 SS	1	AISI 316
3	10000012-010	SPLIT LOCK WASHER, 1", 316 SS	1	AISI 316
2	10000058-011	FLAT WASHER, 1", 1.062" ID X 2.000" OD X 0.125" THK, 316 SS	1	AISI 316
1	10000062-203	ALL THREAD STUD, 1-8x8.5", 316 SS, ASTM F593H CW2 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000056-090

STATUS

.

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
MSS	BSC	02/21/22

BRENTWOOD

DRAWN MSS 02/21/22

CHECKER BSC 02/22/22

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

ANCHOR SET, 1-8x8.5", 316 SS, CW2 CERTIFIED, (SET=1ATH-1FW-1LW-1HN)

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MATERIAL: SEE BILL OF MATERIALS

WEIGHT - LBS: 2.43

WEIGHT - KG: 1.10

SHEET: 1 OF 1

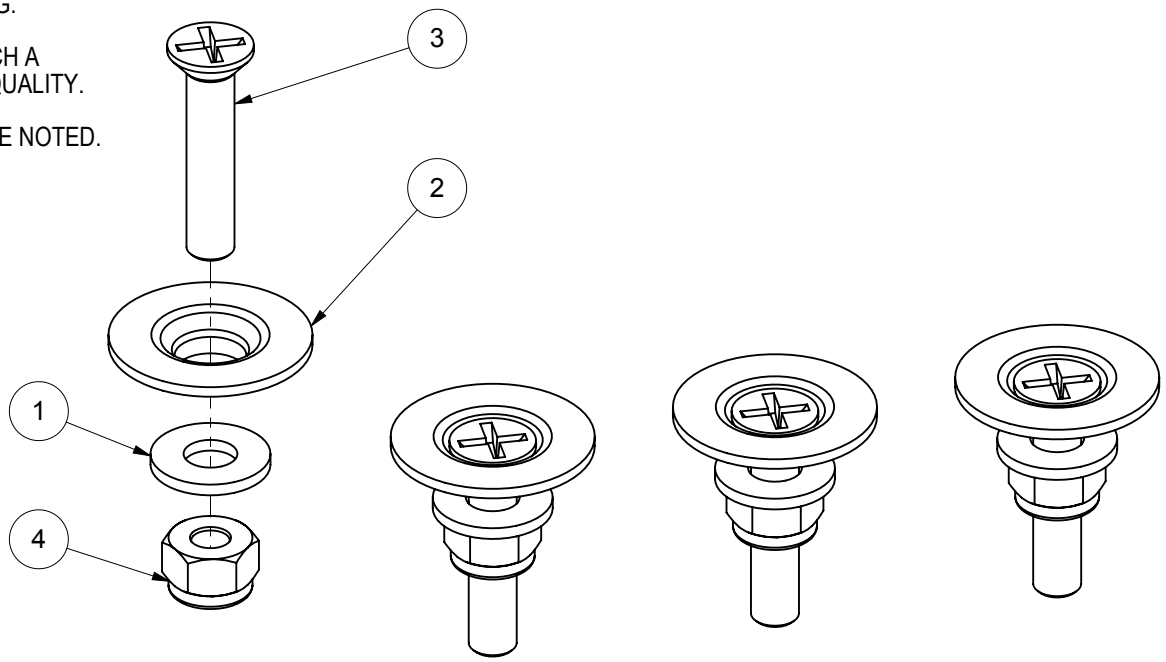
DRAWING NUMBER: 10000056-090

SCALE: 1:2

REV: 01

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000011-001	HEX LOCKNUT, NYLON INSERT, 1/4-20, 316 SS	4	AISI 316
3	10000107-001	PHILLIPS FLAT HEAD MACHINE SCREW, 1/4-20 x 1-1/4", 82° BEVEL, 316 SS	4	AISI 316
2	10000065-001	CONICAL FLANGED WASHER, CUSTOM, 316 SS	4	AISI 316
1	10000058-003	FLAT WASHER, 1/4, 316 SS	4	AISI 316

BILL OF MATERIALS FOR 10000066-005

STATUS

SUPERSEDES:
658-22261-001

REV	BY	DATE
02	SPG	01/03/14

BRENTWOOD®

DRAWN MAP 09/18/13

CHECKER VB 01/03/14

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

RETURN RAIL WEAR STRIP HARDWARE KIT, ENG, 316 SS (KIT=4SCR-4CFW-4FW-4LN)

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MATERIAL: SEE BILL OF MATERIAL

WEIGHT - LBS: 0.2018

WEIGHT - KG: 0.09

SHEET: 1 OF 1

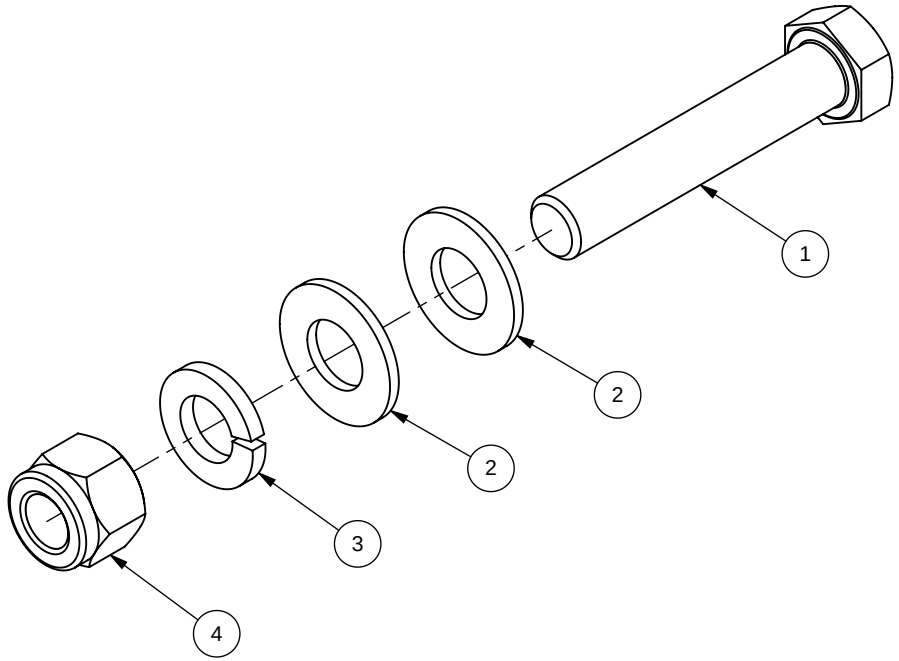
DRAWING NUMBER: 10000066-005

SCALE: 1:1

REV: 02

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.
4	10000011-002	NUT\HEX\NYLK\316\ENG\SZ=3/8-16	1
3	10000012-005	WASHER\SPLK\316\ENG\SZ=3/8	1
2	10000058-005	WASHER\FLAT\316\ENG\SZ=3/8\ID=0.406\OD=0.812\TH=0.065	2
1	10000001-010	BOLT\HEX\316\ENG\SZ=3/8-16\LG=2	1

BILL OF MATERIALS FOR 10000070-007

STATUS

SUPERSEDES:

REV	BY	DATE
02		

BRENTWOOD®

DRAWN GVA 08/12/09

CHECKER SML 03/12/14

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

BOLT SET, LOCKNUT, 3/8-16 x 2ô, 316 SS, (SET=1BLT-2FW-1LW-1LN)

MATERIAL SEE BOM

WEIGHT - LBS 0.13

WEIGHT - KG 0.06

SHEET 1 OF 1

DRAWING NUMBER 10000070-007

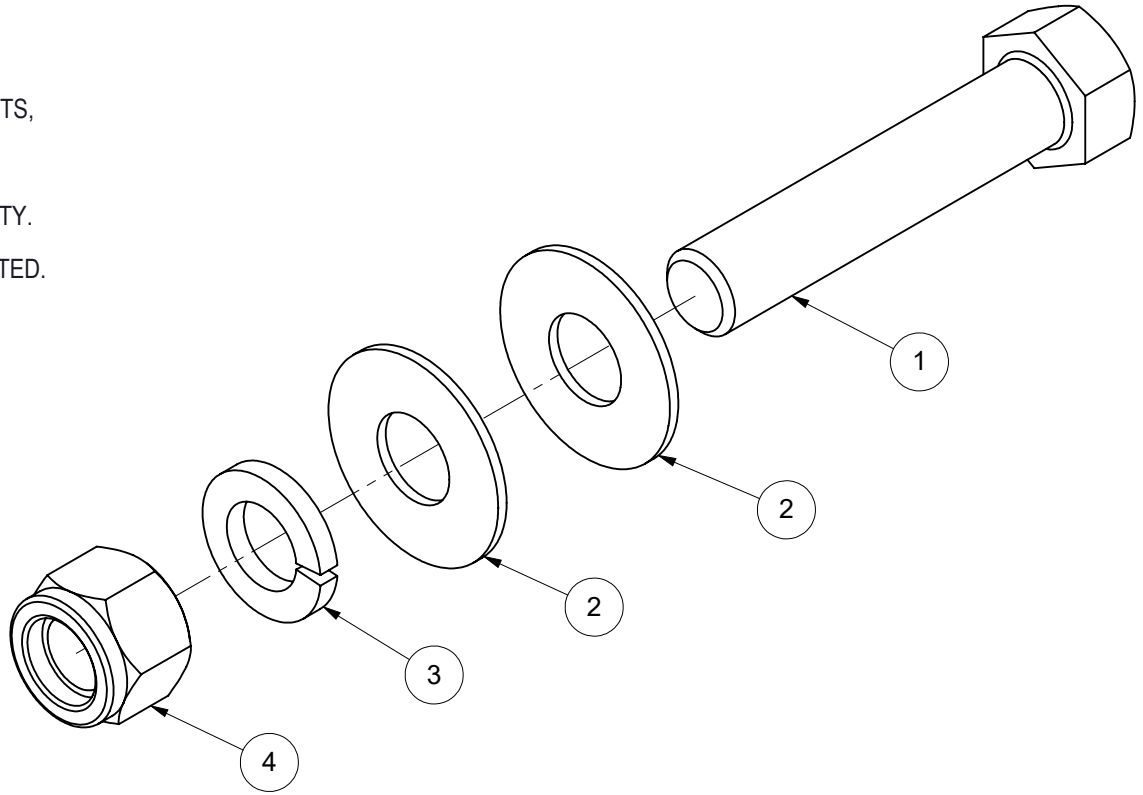
SCALE 1:1

REV 02

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NOTES :

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2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000011-003	HEX LOCKNUT, NYLON INSERT 1/2-13, 316 SS	1	AISI 316
3	10000012-006	SPLIT LOCK WASHER, 1/2, 316 SS	1	AISI 316
2	10000058-007	FLAT WASHER, 1/2" SIZE, 0.531" ID x 1.250" OD x 0.055/0.069" THK, 316 SS	2	AISI 316
1	10000001-024	HEX BOLT, 1/2-13 x 2-1/2", 316 SS	1	AISI 316

BILL OF MATERIALS FOR 10000070-009

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
MAP	SML	04/13/18

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DRAWN GVA 06/07/07

CHECKER ADM 08/12/09

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

BOLT SET, LOCKNUT, 1/2-13 x 2-1/2", 316 SS, (SET=1BLT-2FW-1LW-1LN)

MATERIAL SEE BOM

WEIGHT - LBS 0.30

WEIGHT - KG 0.14

SHEET 1 OF 1

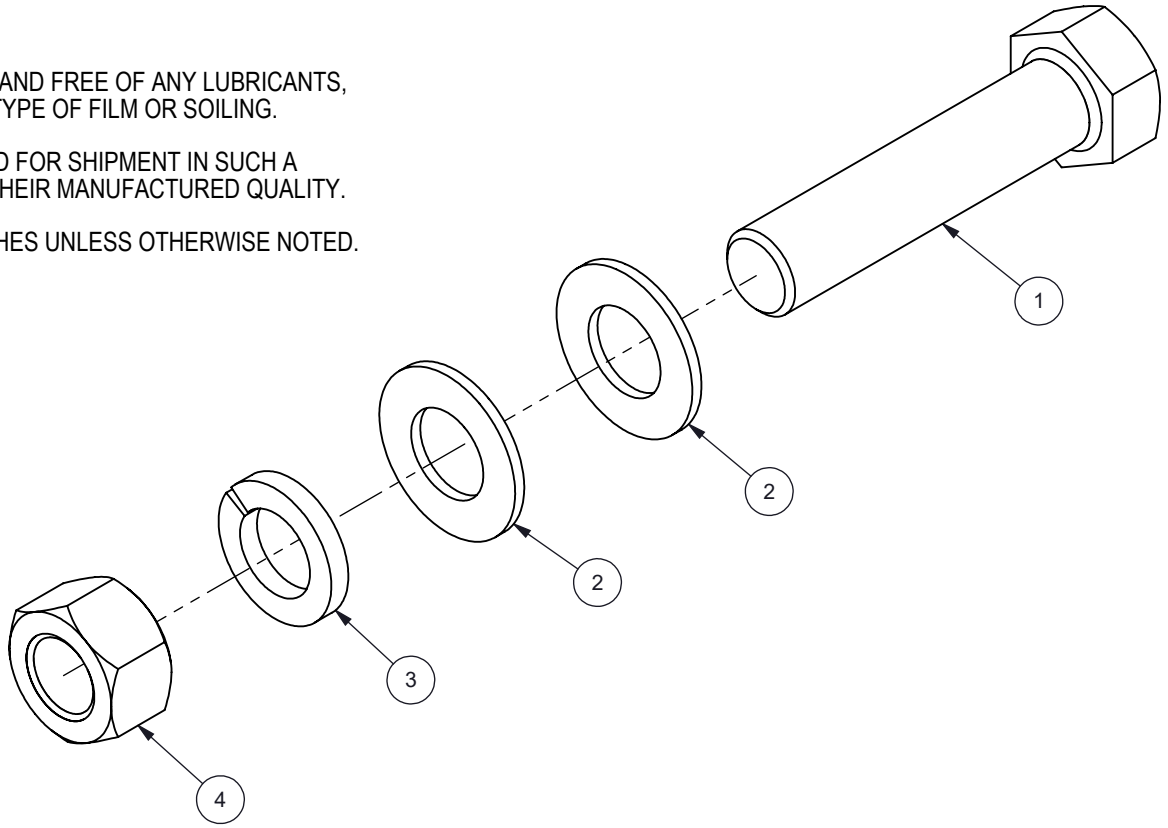
DRAWING NUMBER 10000070-009

SCALE 1:1

REV 03

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.
4	10000006-007	NUT\HEX\316\ENG\SZ=1-8	1
3	10000012-010	WASHER\SPLK\316\ENG\SZ=1	1
2	10000058-011	WASHER\FLAT\316\ENG\SZ=1\ID=1.06\OD=2.00\TH=0.113-0.132	2
1	10000001-126	BOLT\HEX\316\ENG\SZ=1-8\LG=4-1/2\FTH	1

BILL OF MATERIALS FOR 10000070-162

STATUS

.

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
RHP	SML	11/08/22

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DRAWN: RHP 11/08/22

CHECKER: SML 11/10/22

DOCUMENT TYPE: PRODUCT DEFINITION

LONG DESCRIPTION: BOLT SET, HEX NUT, 1-8 x 4-1/2", 316 SS, FULLY THREADED (SET=1BLT-2FW-1LW-1HN)

MATERIAL: SEE BOM

WEIGHT - LBS: 2.0224

WEIGHT - KG: 0.92

SHEET: 1 OF 1

DRAWING NUMBER: 10000070-162

SCALE: 1:2

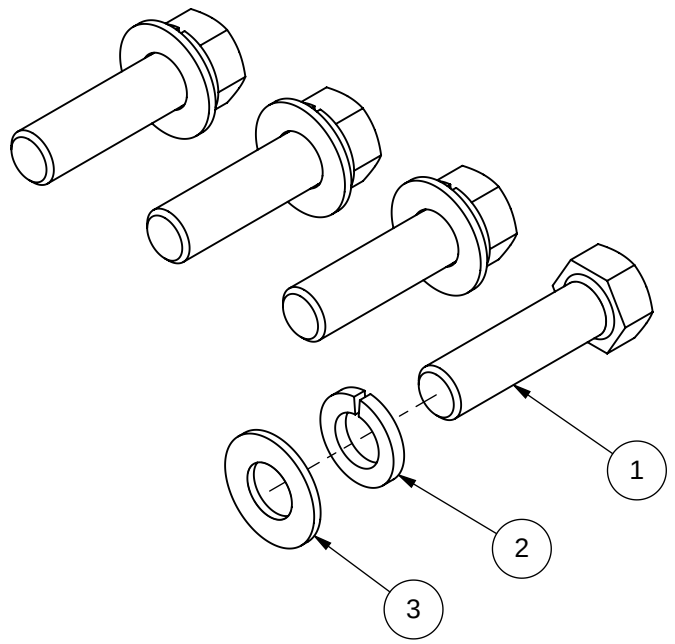
REV: 01

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.

2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.

3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000058-001	FLAT WASHER, 5/8, 316 SS	4	AISI 316
2	10000012-007	SPLIT LOCK WASHER, 5/8, 316 SS	4	AISI 316
1	10000001-031	HEX BOLT, 5/8-11 x 2-1/4", 316 SS	4	AISI 316

BILL OF MATERIALS FOR 10000077-001

STATUS

SUPERSEDES:

REV	BY	DATE
01	MAP	11/03/14

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DRAWN GVA 08/12/09

CHECKER MAP 10/24/14

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

BOLT SET, 5/8-11 x 2-1/4", 316 SS, (SET=4BLT-4LW-4FW)

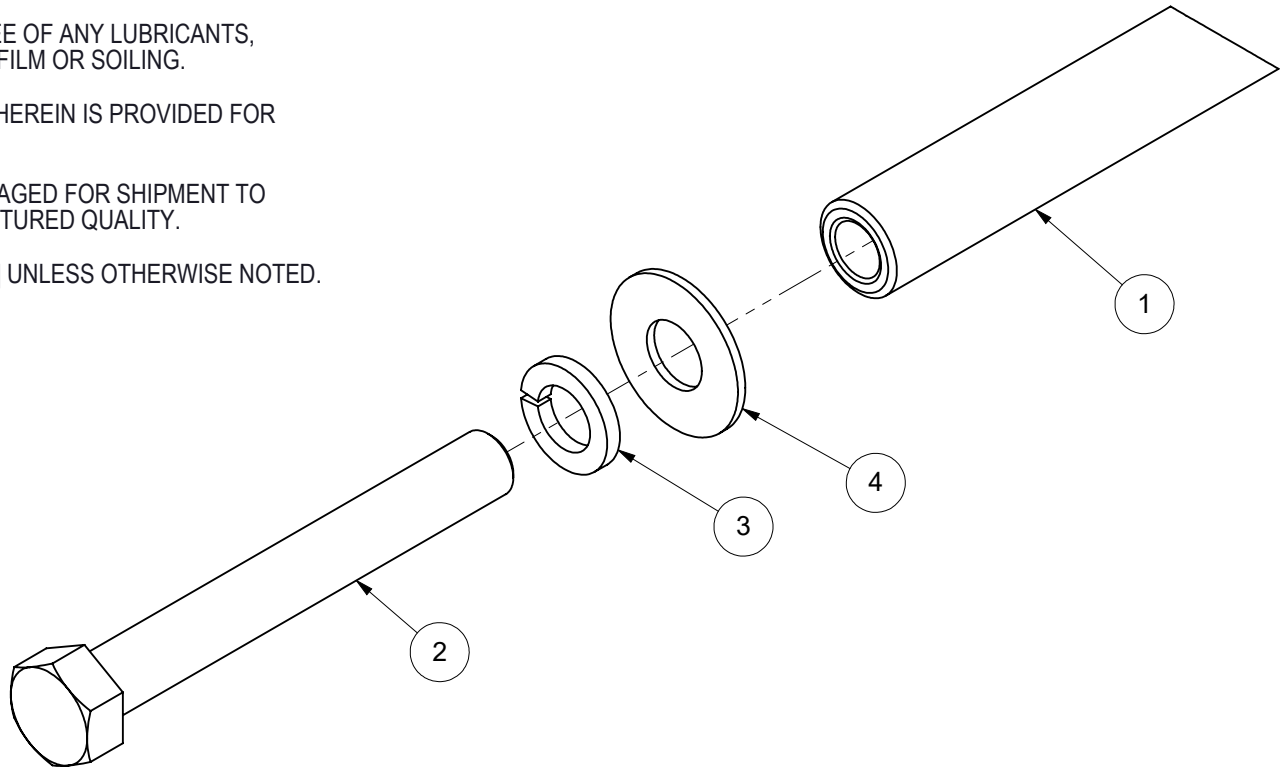
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
SEE BOM	1.39	0.63

SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10000077-001	1:2	01

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
3. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.
4. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



BILL OF MATERIALS FOR 10000078-019

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000058-020	FLAT WASHER, 3/4, 0.812" ID X 1.875" OD X 0.090-0.116" THK, 316 SS	1	AISI 316
3	10000012-008	SPLIT LOCK WASHER, 3/4", 316 SS	1	AISI 316
2	10000032-003	HEX BOLT, 3/4-10 x 6.00", FULLY THREADED, ASTM A193 B8M, 316 SS	1	AISI 316
1	10000067-016	FEMALE BEVEL POINT ANCHOR INSERT, 3/4-10 x 4" THREAD ENGAGEMENT, 6.00", 316SS, EN 10088-3 X5CrNiMo17-12-2 CERTIFIED	1	AISI 316

STATUS

.

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
CP	HP	08/17/22

BRENTWOOD

DRAWN: CP 08/17/22

CHECKER: HP 08/18/22

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

FEMALE ANCHOR SET, 3/4-10 x 6.00", 316 SS, EN 10088-3 CERT, (SET=1FEM-1BLT-1LW-1FW)

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MATERIAL: SEE BILL OF MATERIAL

WEIGHT - LBS: 2.16

WEIGHT - KG: 0.98

SHEET: 1 OF 1

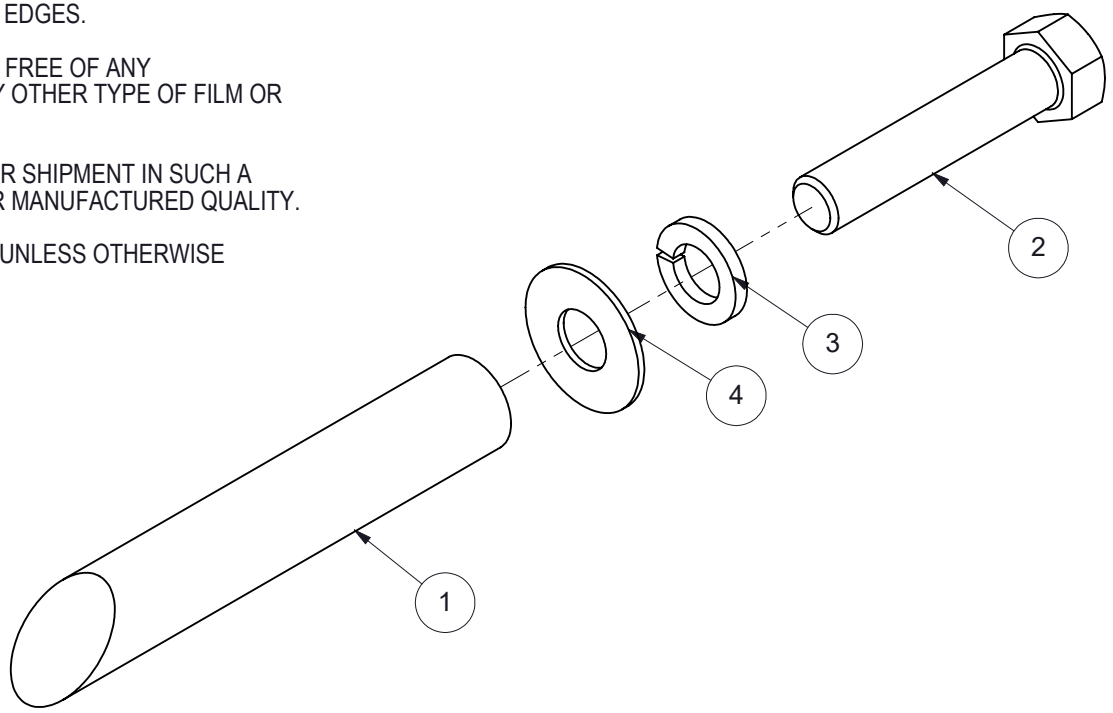
DRAWING NUMBER: 10000078-019

SCALE: 1:2

REV: 01

NOTES :

1. REMOVE ALL BURRS AND SHARP EDGES.
2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
3. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
4. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000058-007	FLAT WASHER, 1/2" SIZE, 0.531" ID x 1.250" OD x 0.055/0.069" THK, 316 SS	1	AISI 316
3	10000012-006	SPLIT LOCK WASHER, 1/2, 316 SS	1	AISI 316
2	10000032-035	HEX BOLT, 1/2-13 x 2.50", FULLY THREADED, ASTM A193 B8M, 316 SS	1	AISI 316
1	10000067-006	FEMALE BEVEL POINT ANCHOR INSERT, 1/2-13 x 1-3/16" THREAD ENGAGEMENT, 5.00", 316 SS, EN 10088-3 X5CrNiMo17-12-2 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000078-023

STATUS
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SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
RHP	SML	08 Sep 23

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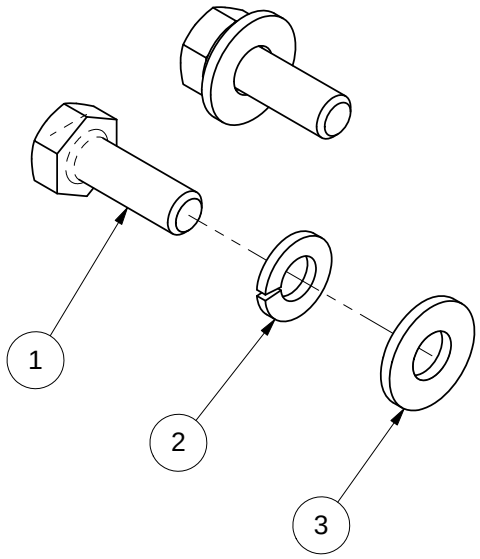
DRAWN: RHP 08 Sep 23
CHECKER: SML 08 Sep 23

DOCUMENT TYPE: PRODUCT DEFINITION
LONG DESCRIPTION: FEMALE ANCHOR SET, 1/2-13 x 2.50", 316 SS, CERTIFIED, (SET=1FEM-1BLT-1LW-1FW)

MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 0.85
WEIGHT - KG: 0.39
SHEET: 1 OF 1
DRAWING NUMBER: 10000078-023
SCALE: 2:3
REV: 01

NOTES :

1. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
2. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000058-003	FLAT WASHER, 1/4, 0.281" ID x 0.625" OD x 0.043/0.057" THK, 316 SS	2	AISI 316
2	10000012-003	SPLIT LOCK WASHER, 1/4", 316 SS	2	AISI 316
1	10000001-001	HEX BOLT, 1/4-20 x 3/4", FULLY THREADED, 316 SS	2	AISI 316

BILL OF MATERIALS FOR 10000081-005

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
BSC	SML	02/03/15

BRENTWOOD

DRAWN: EJB 08/24/09

CHECKER: KEY 08/26/09

DOCUMENT TYPE: PRODUCT DEFINITION

LONG DESCRIPTION: BOLT KIT, 1/4-20 x 3/4", 316 SS (KIT=2BLT-2LW-2FW)

MATERIAL: SEE BILL OF MATERIALS

WEIGHT - LBS: 0.05

WEIGHT - KG: 0.02

SHEET: 1 OF 1

DRAWING NUMBER: 10000081-005

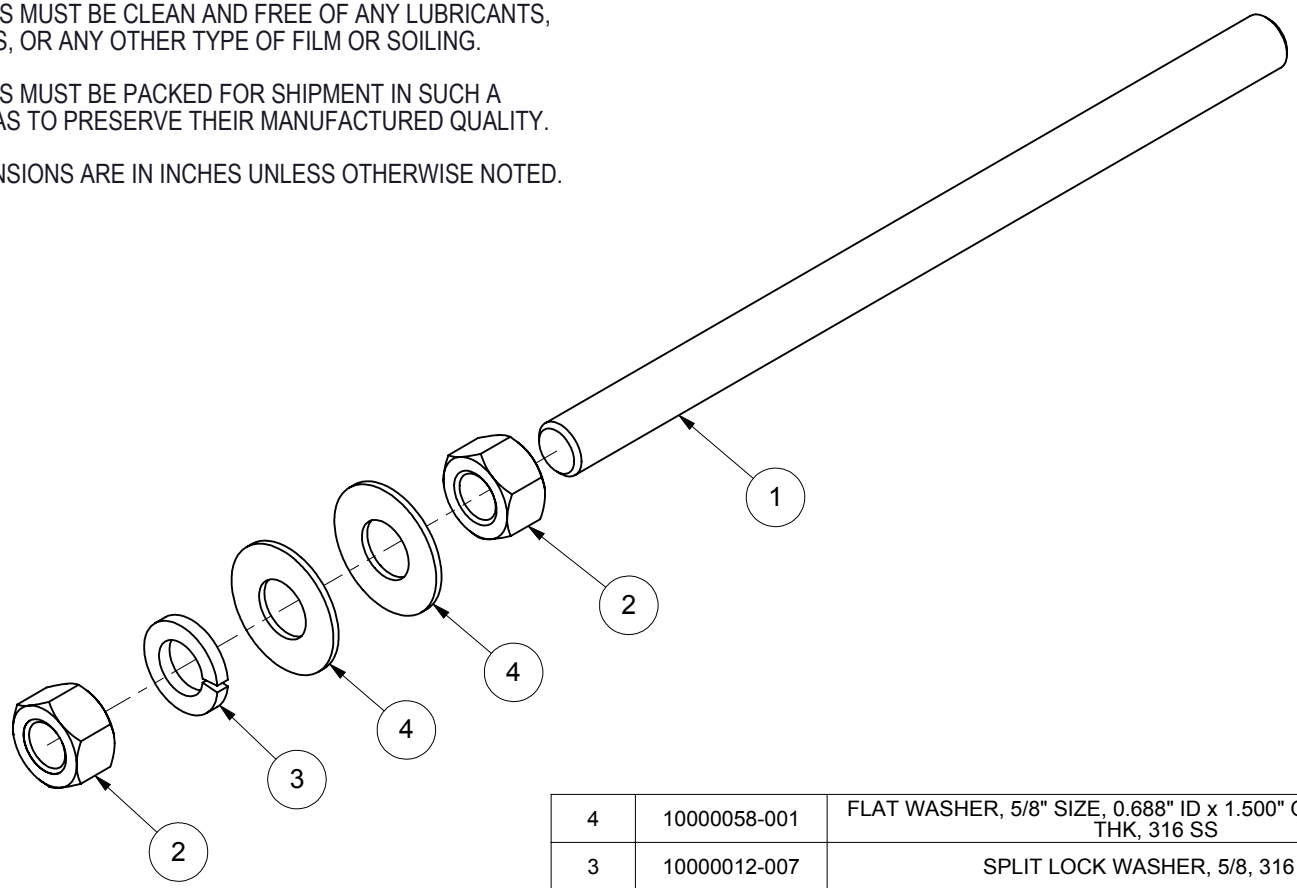
SCALE: 1:1

REV: 02

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NOTES :

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ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000058-001	FLAT WASHER, 5/8" SIZE, 0.688" ID x 1.500" OD x 0.071/0.085" THK, 316 SS	2	AISI 316
3	10000012-007	SPLIT LOCK WASHER, 5/8, 316 SS	1	AISI 316
2	10000006-018	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	2	AISI 316
1	10000062-129	ALL THREAD STUD, 5/8-11 x 10-1/2", 316 SS, ASTM F593G CW1 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000093-036

STATUS

SUPERSEDES:

REV	BY	DATE

BRENTWOOD®

DRAWN LEH 05/15/15

CHECKER MAP 05/15/15

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

LEVELING ANCHOR SET, 5/8-11 x 10-1/2", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)

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MATERIAL: SEE BILL OF MATERIALS

WEIGHT - LBS: 1.19

WEIGHT - KG: 0.54

SHEET: 1 OF 1

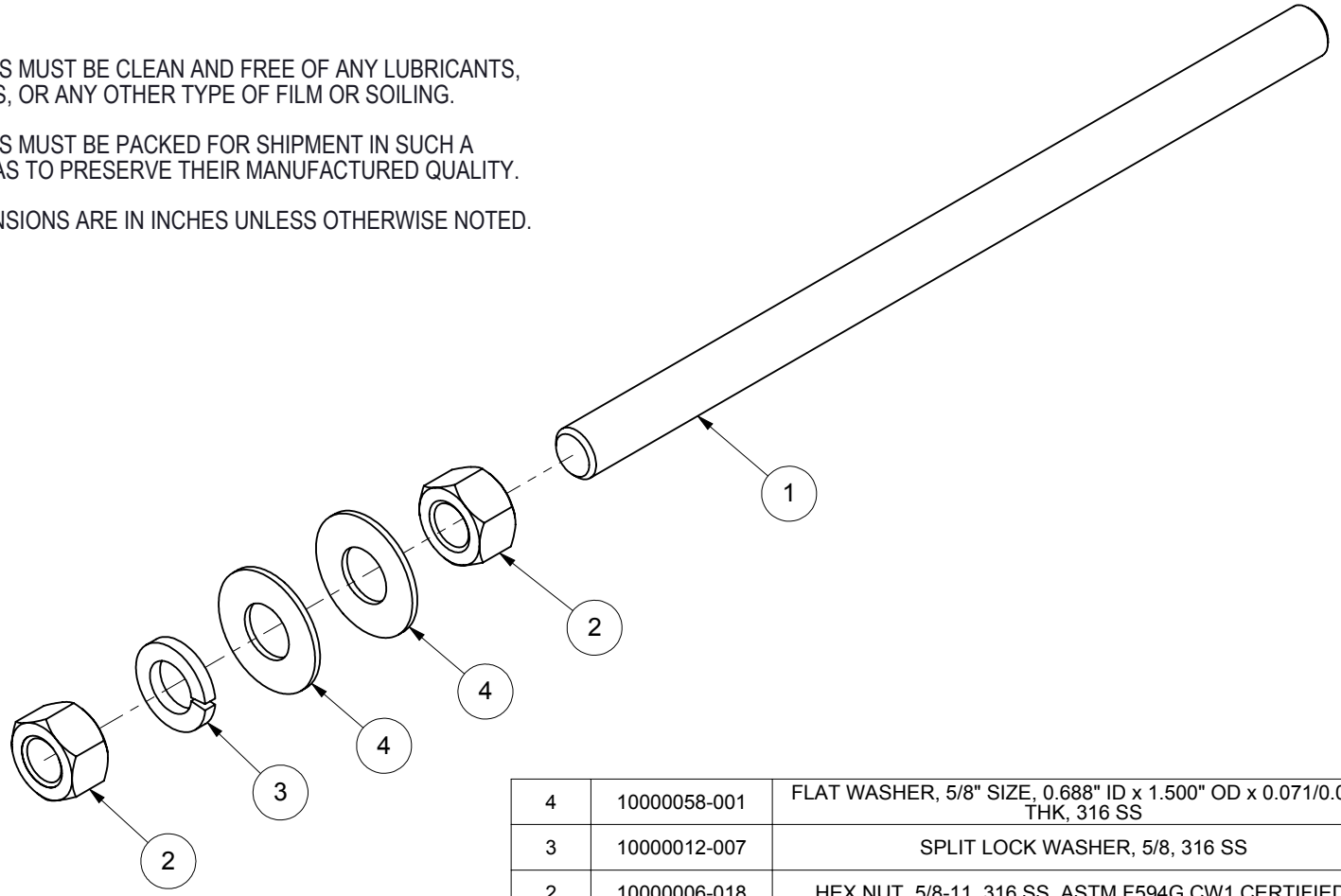
DRAWING NUMBER: 10000093-036

SCALE: 1:2

REV: 01

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000058-001	FLAT WASHER, 5/8" SIZE, 0.688" ID x 1.500" OD x 0.071/0.085" THK, 316 SS	2	AISI 316
3	10000012-007	SPLIT LOCK WASHER, 5/8, 316 SS	1	AISI 316
2	10000006-018	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	2	AISI 316
1	10000062-136	ALL THREAD STUD, 5/8-11 x 11-1/2", 316 SS, ASTM F593G CW1 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000093-039

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
BSC	SML	01/19/16

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DRAWN: BSC 01/19/16

CHECKER: SML 01/20/16

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION: LEVELING ANCHOR SET, 5/8-11 x 11-1/2", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)

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MATERIAL: SEE BILL OF MATERIALS

WEIGHT - LBS: 1.28

WEIGHT - KG: 0.58

SHEET: 1 OF 1

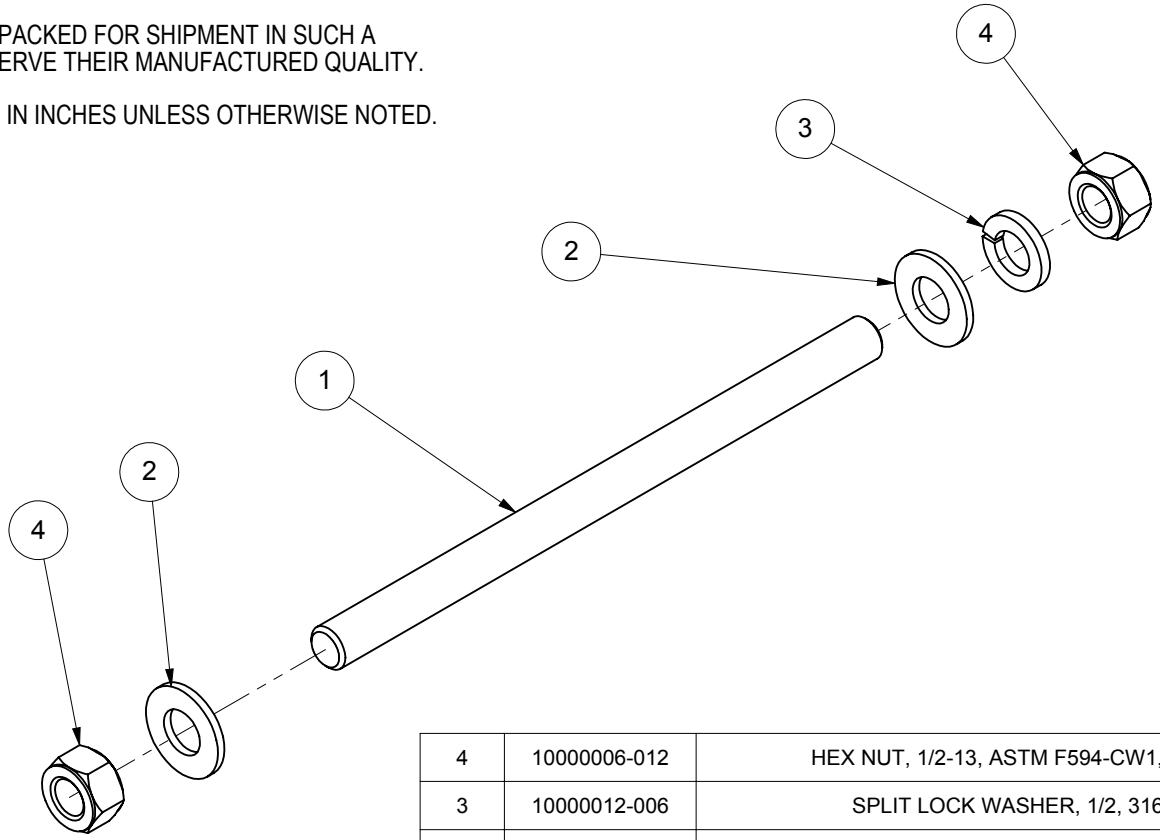
DRAWING NUMBER: 10000093-039

SCALE: 1:2

REV: 01

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
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ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000006-012	HEX NUT, 1/2-13, ASTM F594-CW1, 316 SS	2	AISI 316
3	10000012-006	SPLIT LOCK WASHER, 1/2, 316 SS	1	AISI 316
2	10000058-007	FLAT WASHER, 1/2", 316 SS	2	AISI 316
1	10000062-078	ALL THREAD STUD, 1/2-13 x 8", 316 SS, ASTM F593G CW1 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000093-040

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
BSC	SML	01/22/16

BRENTWOOD®

DRAWN BSC 01/22/16

CHECKER SML 01/22/16

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

LEVELING ANCHOR SET, 1/2-13x8", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)

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MATERIAL: SEE BILL OF MATERIALS

WEIGHT - LBS: 0.59

WEIGHT - KG: 0.27

SHEET: 1 OF 1

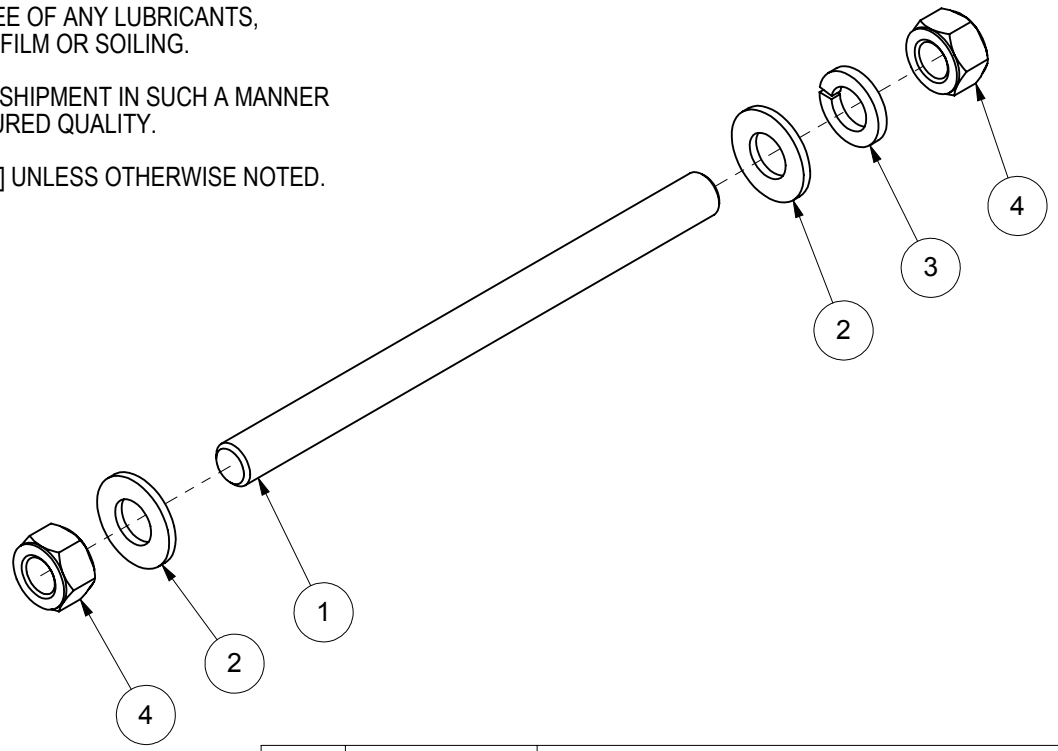
DRAWING NUMBER: 10000093-040

SCALE: 1:2

REV: 01

NOTES :

1. REMOVE ALL BURRS AND SHARP EDGES.
2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
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4. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000006-012	HEX NUT, 1/2-13, ASTM F594-CW1, 316 SS	2	AISI 316
3	10000012-006	SPLIT LOCK WASHER, 1/2, 316 SS	1	AISI 316
2	10000058-007	FLAT WASHER, 1/2", 316 SS	2	AISI 316
1	10000062-096	ALL THREAD STUD, 1/2-13 x 7", 316 SS, ASTM F593G CW1 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000093-041

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
LEH	MAP	06/03/16

BRENTWOOD®

DRAWN: LEH 06/03/16

CHECKER: MAP 06/03/16

DOCUMENT TYPE: PRODUCT DEFINITION

LONG DESCRIPTION: LEVELING ANCHOR SET, 1/2-13x7", 316 SS, CW1 CERTIFIED, (SET=1ATH-2FW-1LW-2HN)

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MATERIAL: SEE BILL OF MATERIALS

WEIGHT - LBS: 0.53

WEIGHT - KG: 0.24

SHEET: 1 OF 1

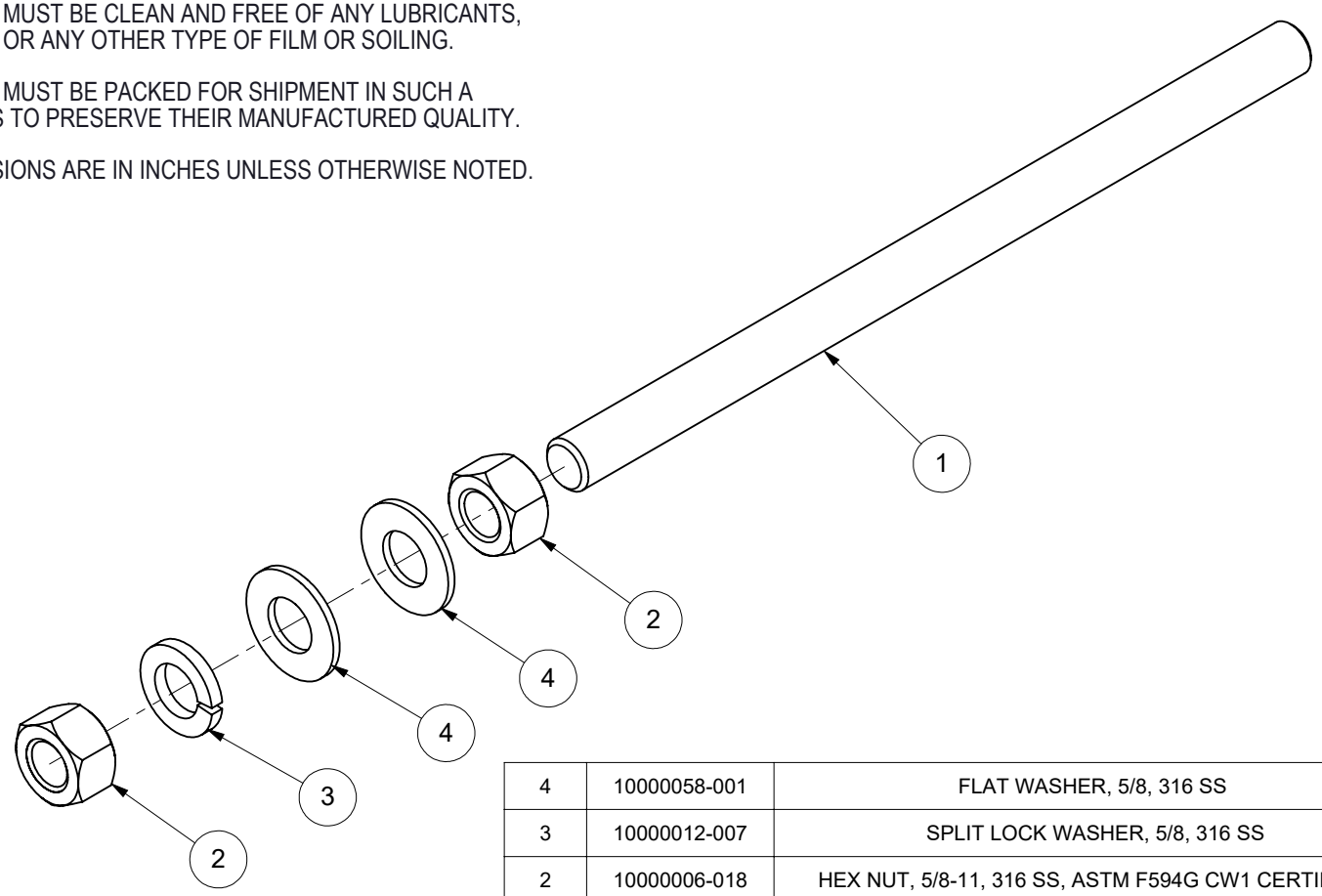
DRAWING NUMBER: 10000093-041

SCALE: 1:2

REV: 01

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000058-001	FLAT WASHER, 5/8, 316 SS	2	AISI 316
3	10000012-007	SPLIT LOCK WASHER, 5/8, 316 SS	1	AISI 316
2	10000006-018	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	2	AISI 316
1	10000062-176	ALL THREAD STUD, 5/8-11 x 11", 316 SS, ASTM F593G CW1 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000093-052

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
MSS	SML	01/22/20

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DRAWN MSS 01/22/20

CHECKER SML 01/22/20

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

LEVELING ANCHOR SET, 5/8-11 x 11", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)

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MATERIAL SEE BILL OF MATERIALS

WEIGHT - LBS 1.23

WEIGHT - KG 0.56

SHEET 1 OF 1

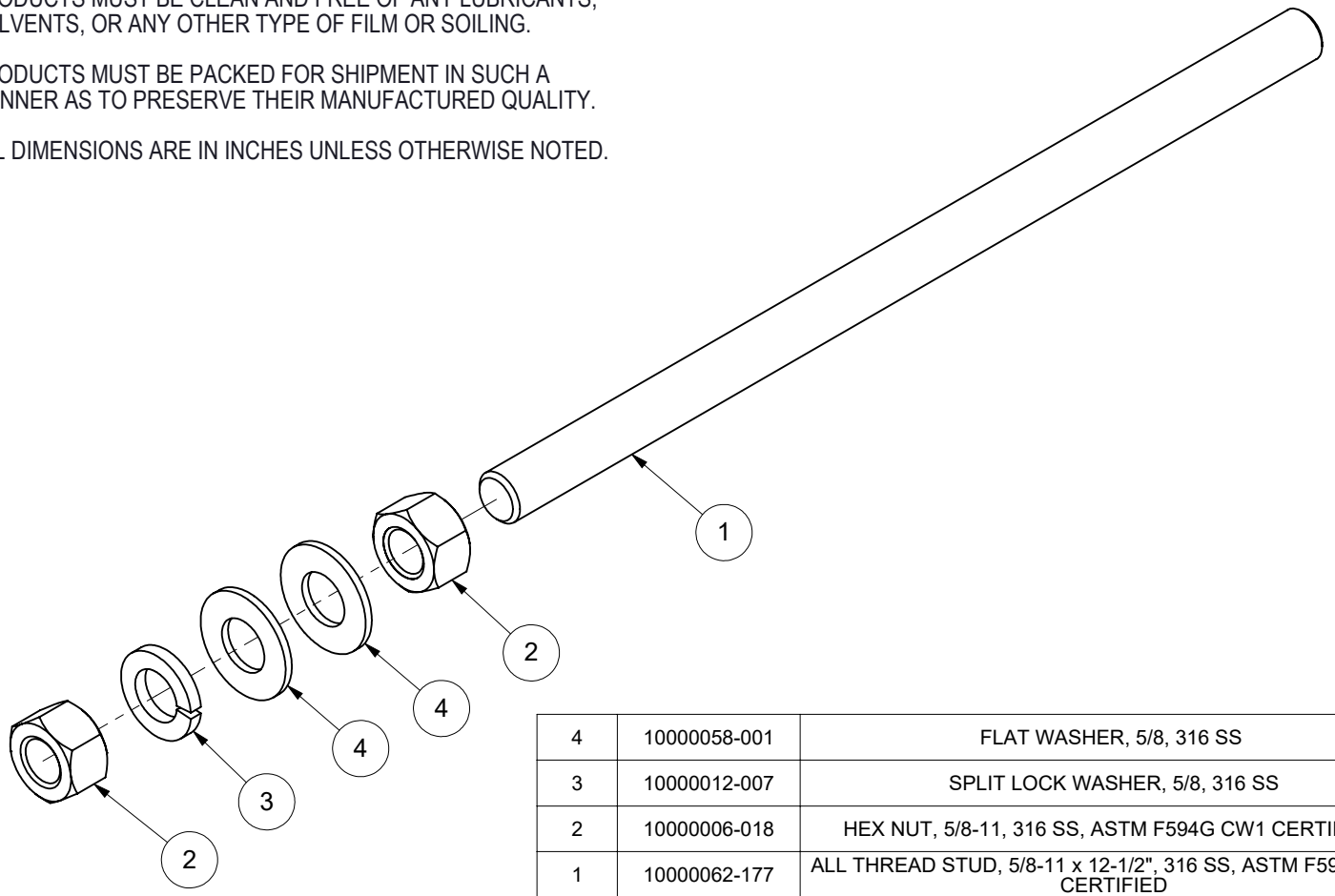
DRAWING NUMBER 10000093-052

SCALE 1:2

REV 01

NOTES :

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ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000058-001	FLAT WASHER, 5/8, 316 SS	2	AISI 316
3	10000012-007	SPLIT LOCK WASHER, 5/8, 316 SS	1	AISI 316
2	10000006-018	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	2	AISI 316
1	10000062-177	ALL THREAD STUD, 5/8-11 x 12-1/2", 316 SS, ASTM F593G CW1 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000093-053

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
BSC	SML	02/12/20

BRENTWOOD

DRAWN BSC 02/12/20

CHECKER SML 02/13/20

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

LEVELING ANCHOR SET, 5/8-11 x 12-1/2", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)

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MATERIAL SEE BILL OF MATERIALS

WEIGHT - LBS 1.36

WEIGHT - KG 0.62

SHEET 1 OF 1

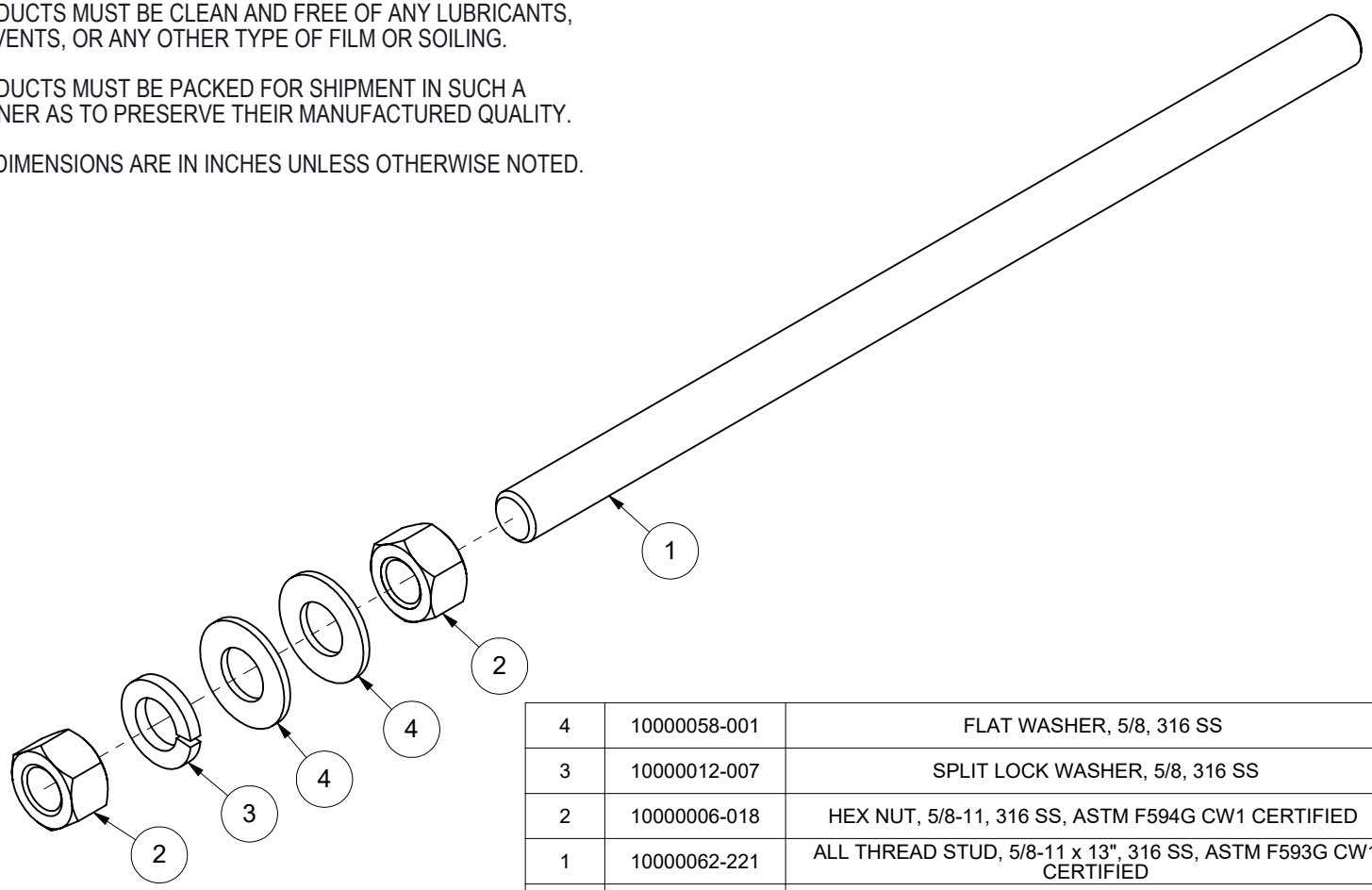
DRAWING NUMBER 10000093-053

SCALE 1:2

REV 01

NOTES :

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ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000058-001	FLAT WASHER, 5/8, 316 SS	2	AISI 316
3	10000012-007	SPLIT LOCK WASHER, 5/8, 316 SS	1	AISI 316
2	10000006-018	HEX NUT, 5/8-11, 316 SS, ASTM F594G CW1 CERTIFIED	2	AISI 316
1	10000062-221	ALL THREAD STUD, 5/8-11 x 13", 316 SS, ASTM F593G CW1 CERTIFIED	1	AISI 316

BILL OF MATERIALS FOR 10000093-065

STATUS
.

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
SK	RHP	28 Nov 23

BRENTWOOD

DRAWN SK 28 Nov 23

CHECKER RHP 30 Nov 23

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

LEVELING ANCHOR SET, 5/8-11 x 13", 316 SS, CW1 CERTIFIED (SET=1ATH-2FW-1LW-2HN)

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MATERIAL: SEE BILL OF MATERIALS

WEIGHT - LBS: 1.40

WEIGHT - KG: 0.64

SHEET: 1 OF 1

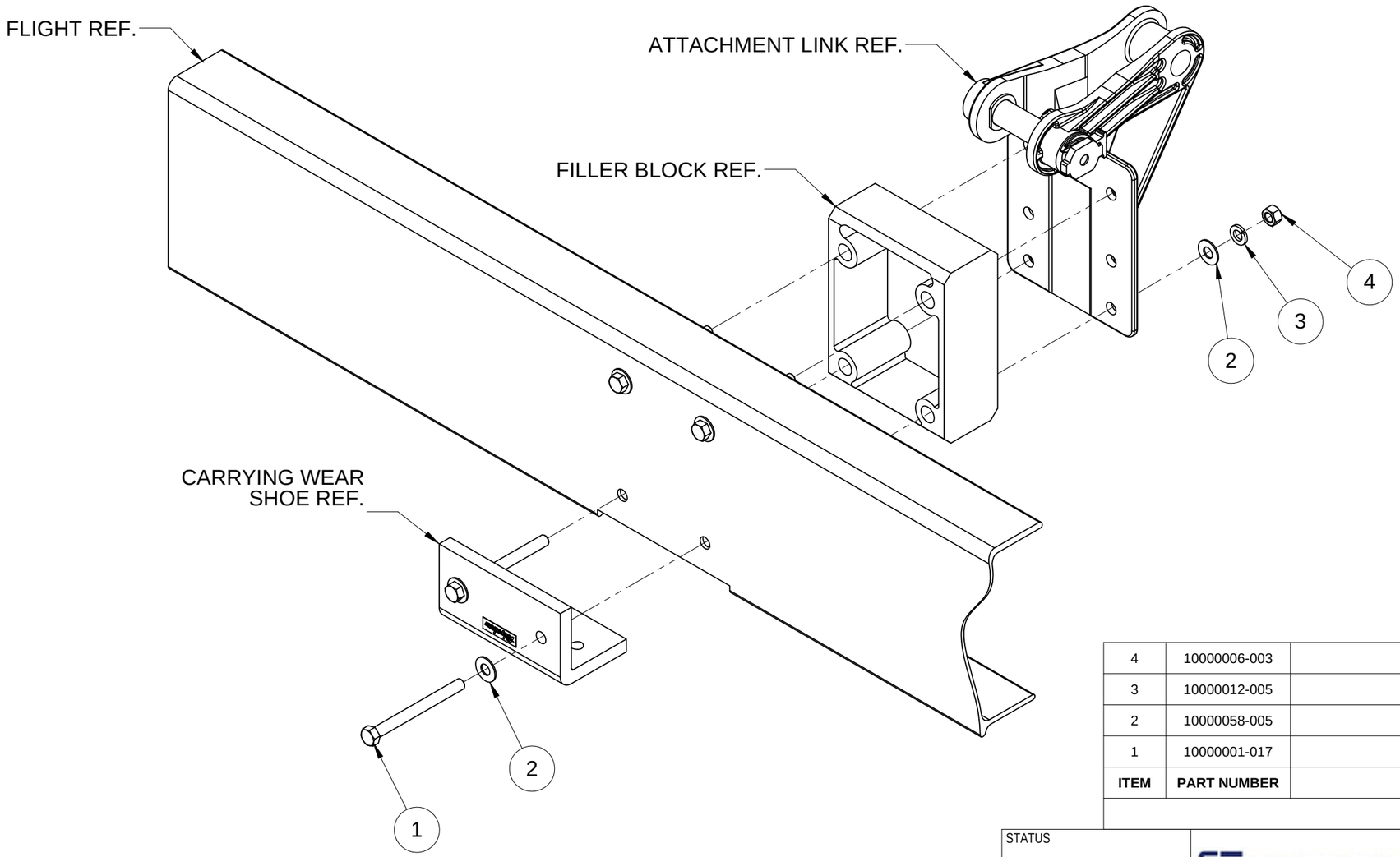
DRAWING NUMBER: 10000093-065

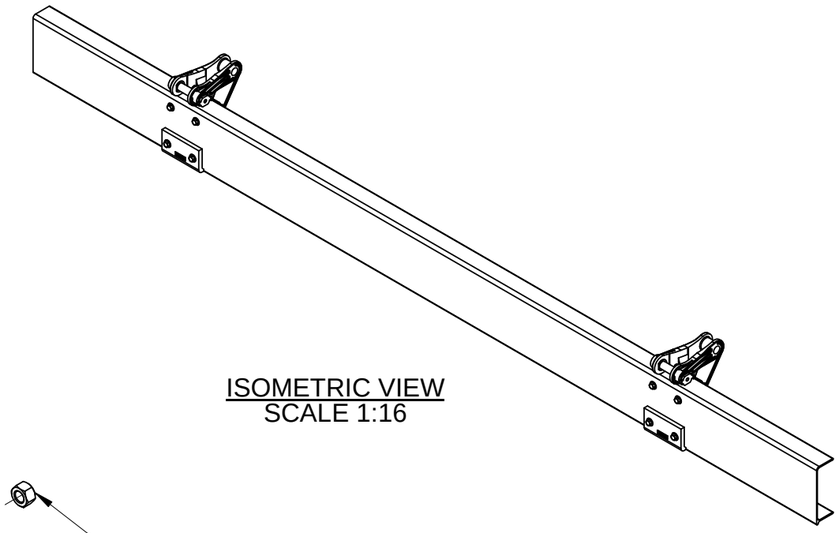
SCALE: 1:2

REV: 01

NOTES :

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4. COMPONENTS ARE SHOWN FOR REFERENCE PURPOSES ONLY. HARDWARE LOCATIONS MAY VARY.





ISOMETRIC VIEW
SCALE 1:16

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000006-003	HEX NUT, 3/8-16, 316 SS	8	AISI 316
3	10000012-005	SPLIT LOCK WASHER, 3/8, 316 SS	8	316 SS
2	10000058-005	FLAT WASHER, 3/8, 316 SS	16	316 SS
1	10000001-017	HEX BOLT, 3/8-16 x 4", 316 SS	8	AISI 316

BILL OF MATERIALS FOR 10000150-008

STATUS

SUPERSEDES: 658-11201

REV	BY	DATE
02	#	MO/DY/YEAR

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DRAWN: GTY 11/15/12
CHECKER: BSC 10/03/13

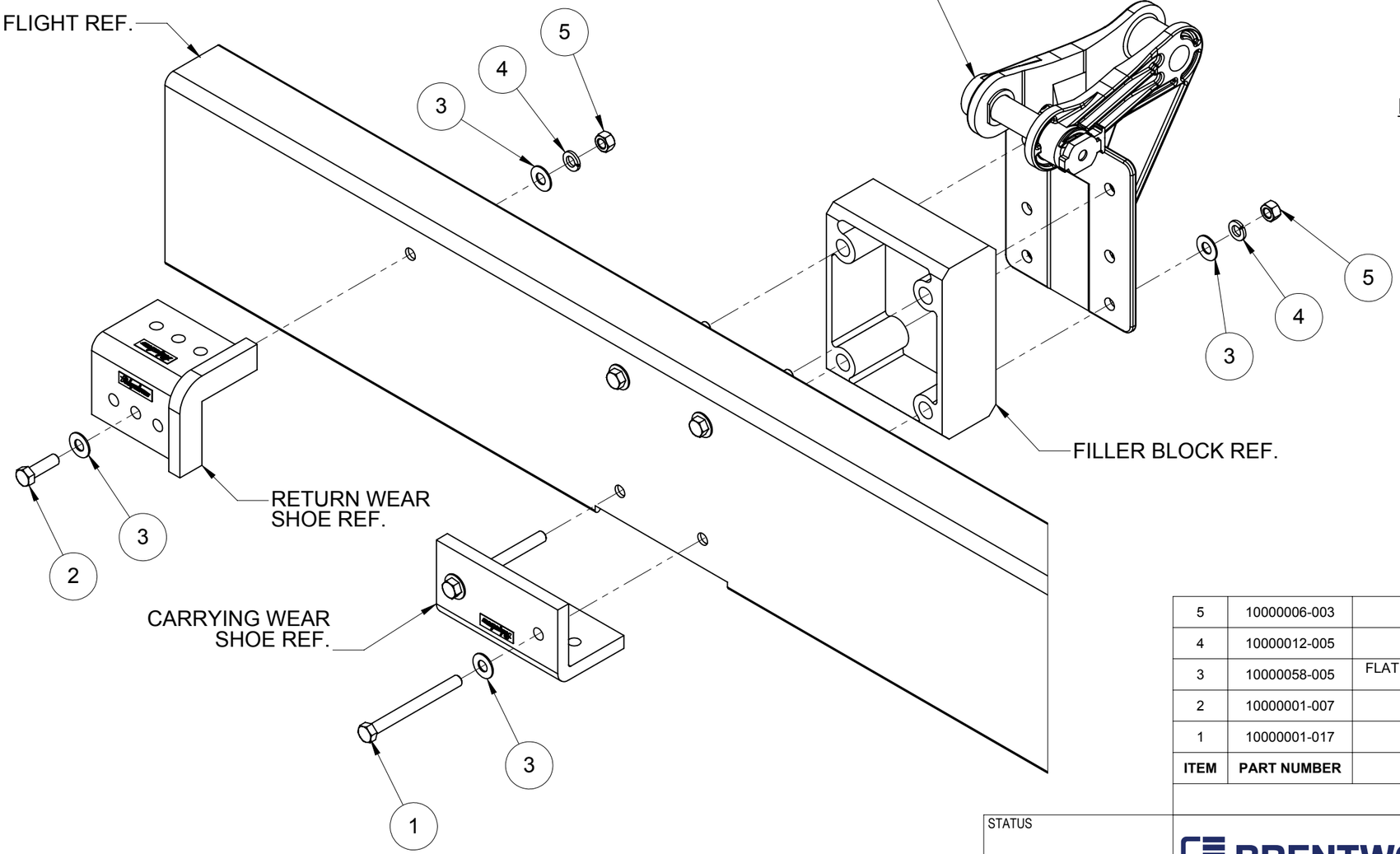
DOCUMENT TYPE: PRODUCT DEFINITION
LONG DESCRIPTION: 8 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316SS

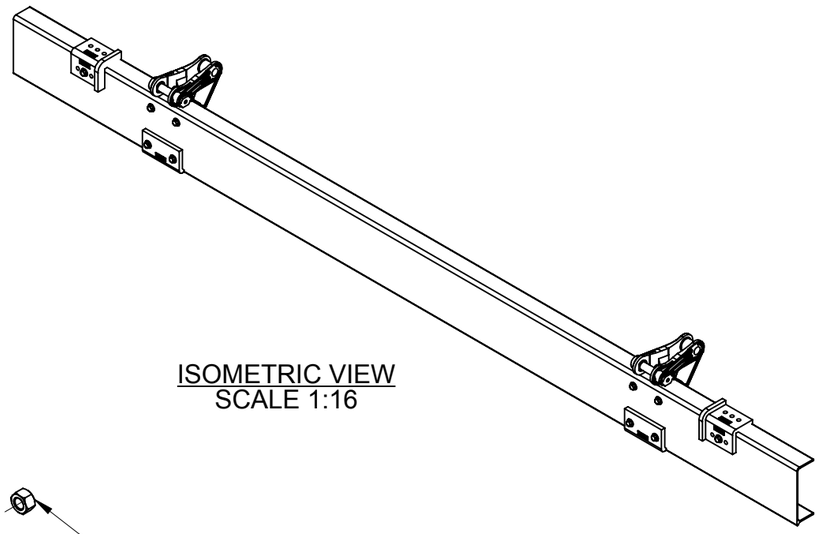
MATERIAL: SEE BILL OF MATERIAL
WEIGHT - LBS: 1.49
WEIGHT - KG: 0.68

SHEET: 1 OF 1
DRAWING NUMBER: 10000150-008
SCALE: 1:4
REV: 02

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
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ISOMETRIC VIEW
SCALE 1:16

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
5	10000006-003	HEX NUT, 3/8-16, 316 SS	10	AISI 316
4	10000012-005	SPLIT LOCK WASHER, 3/8, 316 SS	10	AISI 316
3	10000058-005	FLAT WASHER, 3/8" SIZE, 0.406" ID x 0.875" OD x 0.043/0.057" THK, 316 SS	20	AISI 316
2	10000001-007	HEX BOLT, 3/8-16 x 1-1/4", 316 SS	2	AISI 316
1	10000001-017	HEX BOLT, 3/8-16 x 4", 316 SS	8	AISI 316

BILL OF MATERIALS FOR 10000150-010

STATUS

SUPERSEDES: 658-11199

REV	BY	DATE
02	SML	10/02/15

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DRAWN GTY 11/16/12
CHECKER BSC 08/04/15

DOCUMENT TYPE PRODUCT DEFINITION
LONG DESCRIPTION
10 HOLE C-CHANNEL FLIGHT HARDWARE KIT, ENGLISH, 316 SS

MATERIAL: SEE BILL OF MATERIAL
WEIGHT - LBS: 1.69
WEIGHT - KG: 0.77

SHEET: 1 OF 1
DRAWING NUMBER: 10000150-010
SCALE: 1:4
REV: 02

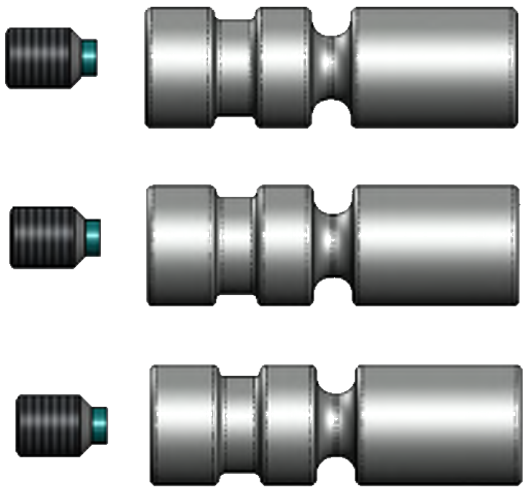
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2. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.

3. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.







ITEM	PART NUMBER	DESCRIPTION	QTY.
4	10000222-001	SHEAR PIN TO BREAK AT 1665 lbf ON DRIVE CHAIN	3
3	10000220-001	HEX SOCKET SET SCREW, M8x1.25 x 10 MM, NYLON TIP, 304 SS	3
2	10000223	SHEAR PIN INSTALLATION INSTRUCTION SHEET	1
1	10000218	NON-PERMANENT THREAD LOCKING COMPOUND, LOCTITE 22205, 0.02 OUNCE PACKAGE	1

BILL OF MATERIALS FOR 10000221-001

STATUS		
SUPERSEDES:		
CURRENT REVISION:		
BY	CKD	DATE
SPG	SML	03/23/16

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DRAWN	CHECKER	DOCUMENT TYPE: PRODUCT DEFINITION LONG DESCRIPTION
GVA 11/21/06	ADMIN 11/21/06	SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 1665 lbf ON THE DRIVE CHAIN

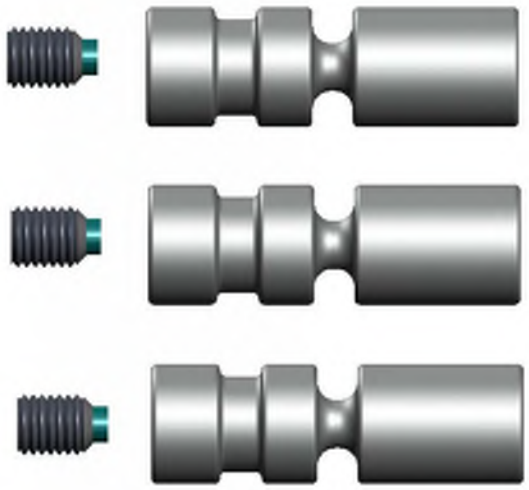
MATERIAL	WEIGHT - LBS	WEIGHT - KG
SEE BILL OF MATERIALS	0.18	0.08

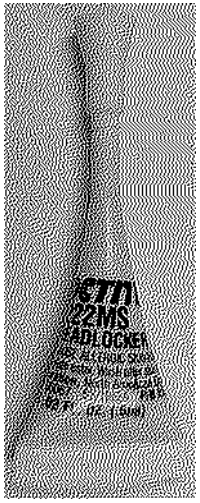
SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10000221-001	1:1	04

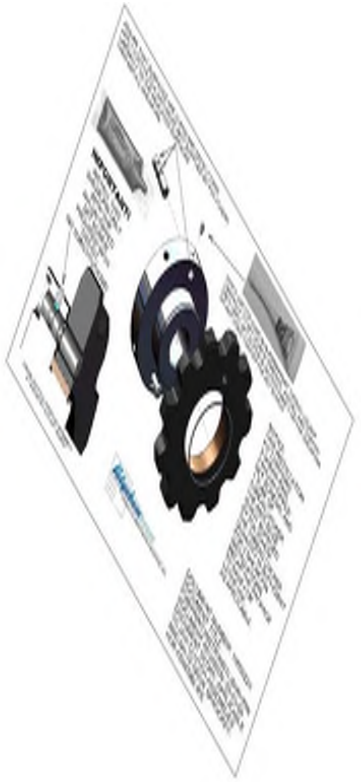
NOTES :

1. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.

2. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.







ITEM NO.	CTALOG NUMBER	DESCRIPTION	QTY.
4	10000222-002	SHEAR PIN TO BREAK AT 985 lbf ON DRIVE CHAIN	3
3	10000220-001	HEX SOCKET SET SCREW, M8 x 1.25, 10 mm LONG, NYLON TIP, 304 SS	3
2	10000223	SHEAR PIN INSTALLATION INSTRUCTION SHEET	1
1	10000218	NON-PERMANENT THREAD LOCKING COMPOUND, LOCTITE 22205, 0.02 OUNCE PACKAGE	1
BILL OF MATERIALS FOR 10000221-002			

Polychem SYSTEMS
DIVISION OF BRENTWOOD INDUSTRIES

ISO-9001 Registered

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SCALE 1:1

DRAWN VU 03-03-09

CHECKER BSC 06/13/12

SHEET 1 OF 1

DOCUMENT TYPE CUSTOMER OUTLINE

LONG DESCRIPTION
SHEAR PIN HARDWARE KIT, SHEAR PIN TO BREAK AT 985 lbf ON THE DRIVE CHAIN

MATERIALS
SEE BILL OF MATERIALS

DRAWING NUMBER
10000221-002

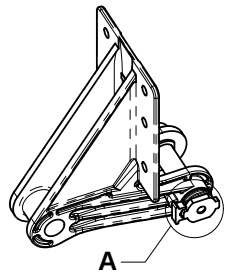
REV 03

NOTES :

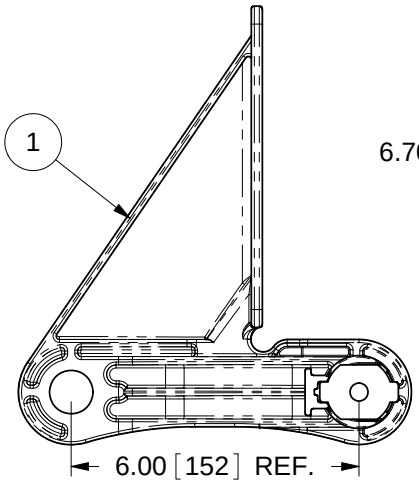
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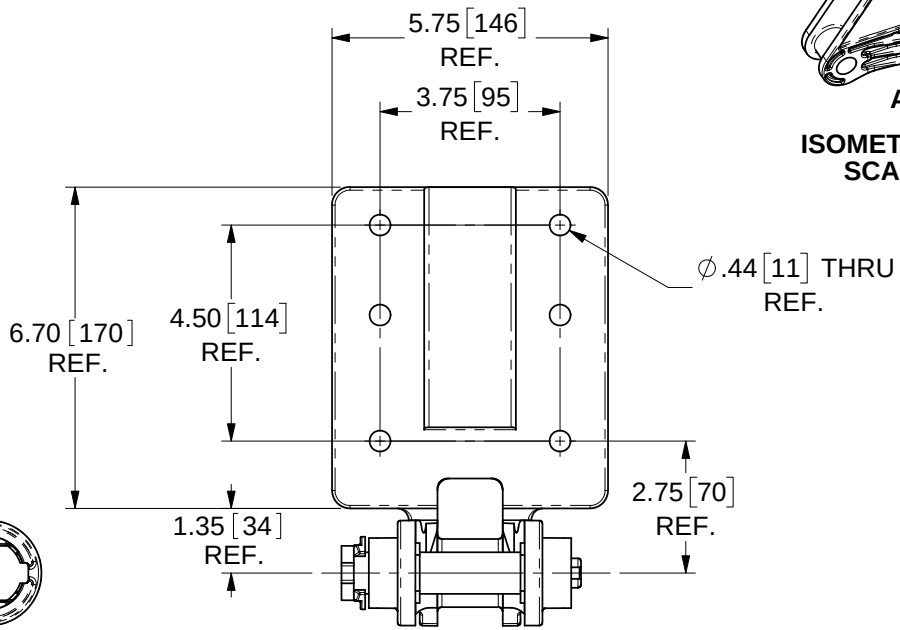
2. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.

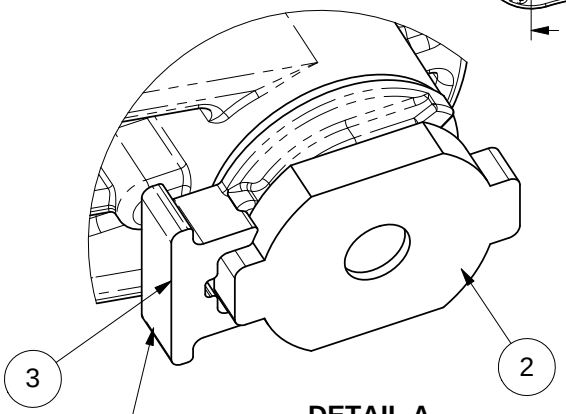
3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



ISOMETRIC VIEW
SCALE: 1:8







DETAIL A
SCALE 1 : 1

ASSURE CORRECT RETAINER CLIP ORIENTATION DURING INSTALLATION IN THE FIELD

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000498	NCS-720S, TYPE 4, RETAINER CLIP	1	POLYOXYMETHYLENE (POM)
2	10000205	NCS-720S CONNECTING PIN	1	GLASS REINFORCED NYLON
1	10000210-002	NCS-720S 8 INCH ATTACHMENT LINK, 6 STANDARD PREDRILLED HOLES	1	GLASS REINFORCED POLYESTER

BILL OF MATERIALS FOR 10000274-001

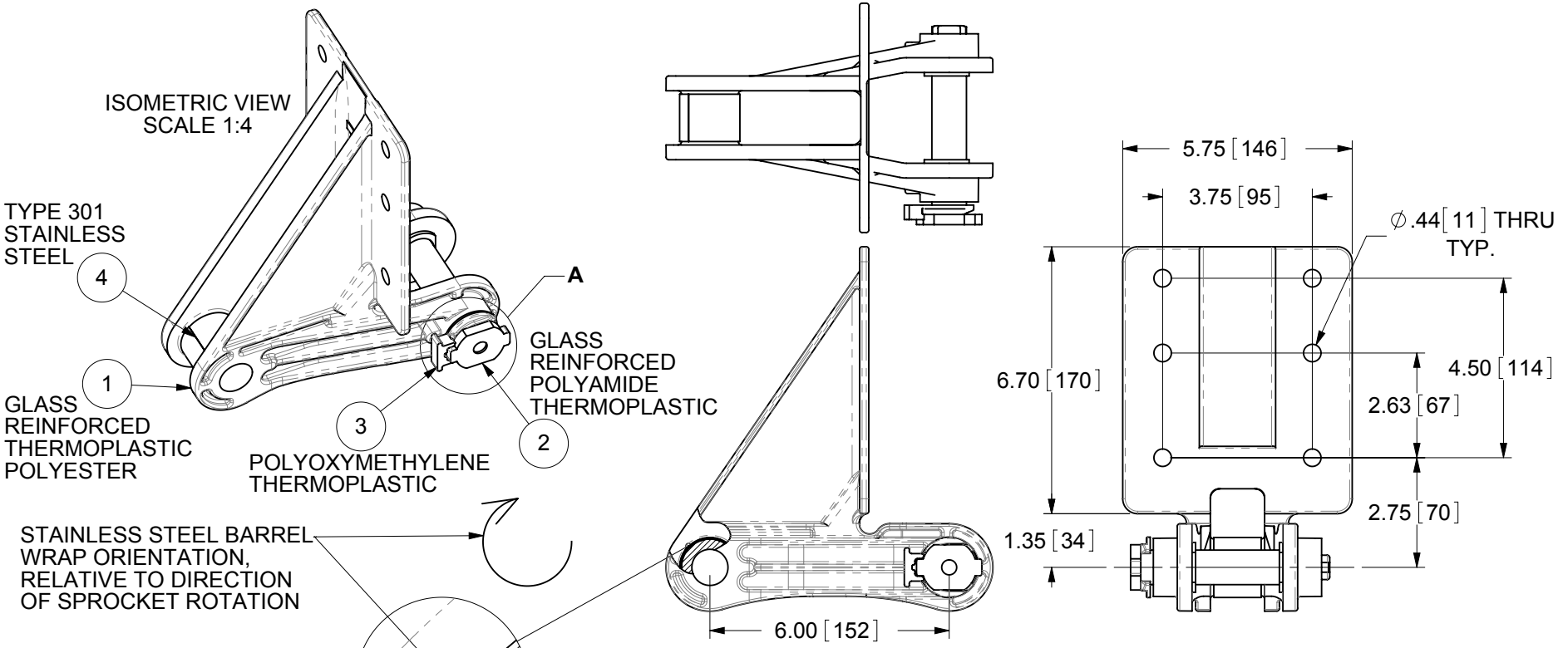
BRENTWOOD

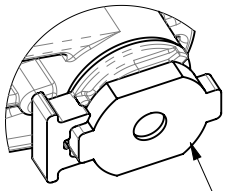
DRAWN: GVA, date drawn
CHECKER: CSR, 04/30/15
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: NCS-720S CHAIN ATTACHMENT KIT, F22-8, NM

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MATERIAL
WEIGHT - LBS: 1.06
WEIGHT - KG: 0.48
SHEET: 1 OF 1
DRAWING NUMBER: 10000274-001
SCALE: 1:3
REV: 04

SUPERSEDES:





DETAIL A
SCALE 1 : 2

ASSURE CORRECT
RETAINER CLIP
ORIENTATION DURING
INSTALLATION IN THE FIELD

SUBASSEMBLY
10000274-001
(ITEMS 1, 2, & 3)

ITEM	PART NUMBER	DESCRIPTION	QTY.
4	10000207	BARREL WRAP, CHAIN LINK, NCS-720-S, 301 SS	1
3	10000498	NCS-720S, TYPE 4, RETAINER CLIP	1
2	10000205	NCS-720S CONNECTING PIN	1
1	10000210-002	NCS-720S 8 INCH ATTACHMENT LINK, 6 STANDARD PREDRILLED HOLES	1

BILL OF MATERIALS FOR 10000274-002

NOTES :

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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

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DRAWN: GVA 05/21/07
CHECKER: VB 08/27/14
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: NCS-720S KIT, F22-8 ATTACHMENT LINK, CONNECTING PIN & RETAINER CLIP, 301 SS BARREL WRAP

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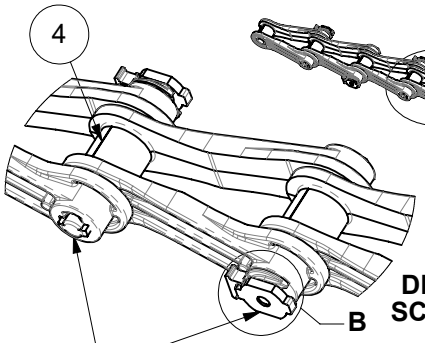
MATERIAL: AS NOTED
WEIGHT - LBS: 1.11
WEIGHT - KG: 0.50
SHEET: 1 OF 1
DRAWING NUMBER: 10000274-002
SCALE: 1:3
REV: 04

SUPERSEDES: N/A

Rev 01

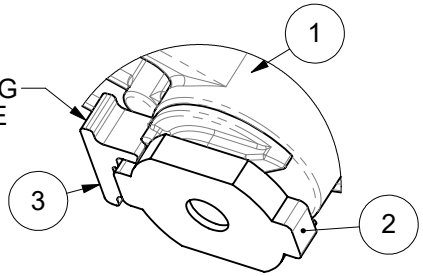
NOTES :

1. WORKING LOAD: 3100 POUNDS-FORCE [13.79kN].
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DETAIL A
SCALE 1 : 5

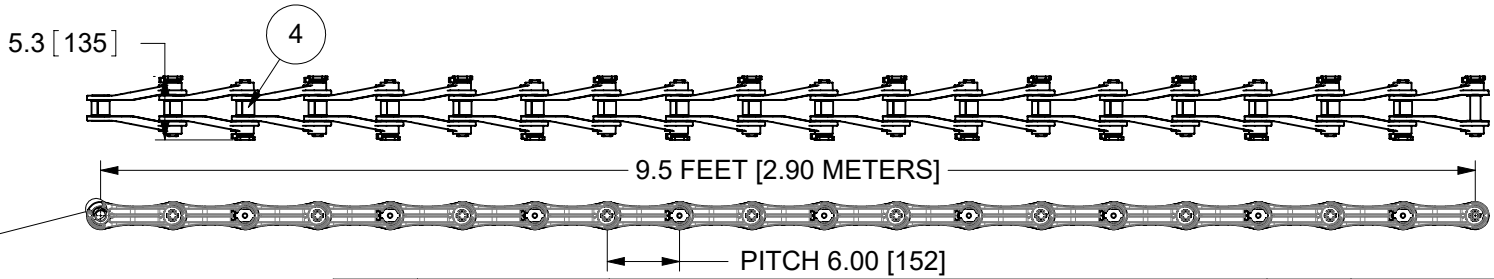
ASSURE CORRECT RETAINER CLIP ORIENTATION DURING INSTALLATION IN THE FIELD

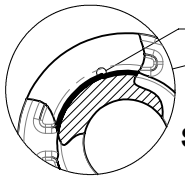


DETAIL B
SCALE 2:3

DIRECTION OF CHAIN TRAVEL

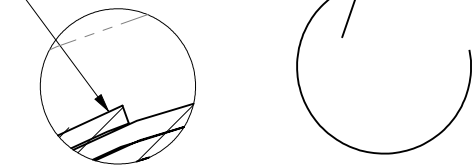
MAINTAIN ALTERNATING CHAIN LINK ORIENTATION DURING INSTALLATION IN THE FIELD.





DETAIL C
SCALE 1 : 2

ASSURE CORRECT ORIENTATION OF STAINLESS STEEL BARREL WRAPS, RELATIVE TO THE DIRECTION OF SPROCKET ROTATION, WHEN INSTALLING CHAIN IN THE FIELD



DETAIL D
SCALE 8 : 1

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000207	BARREL WRAP, CHAIN LINK, NCS-720-S, 301 SS	19	AISI 301
3	10000498	NCS-720S, TYPE 4, RETAINER CLIP	19	POLYOXYMETHYLENE (POM)
2	10000205	NCS-720S CONNECTING PIN	19	GLASS REINFORCED NYLON
1	10000209	NCS-720S CHAIN LINK	19	GLASS REINFORCED POLYESTER

BILL OF MATERIALS FOR 10000275-056

BRENTWOOD®

DRAWN: EAH 01/25/18
CHECKER: SML 01/31/18

DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: NCS-720S CHAIN STRAND, 9.5 FEET, 301 SS BARREL WRAPS

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MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 16.69
WEIGHT - KG: 7.57

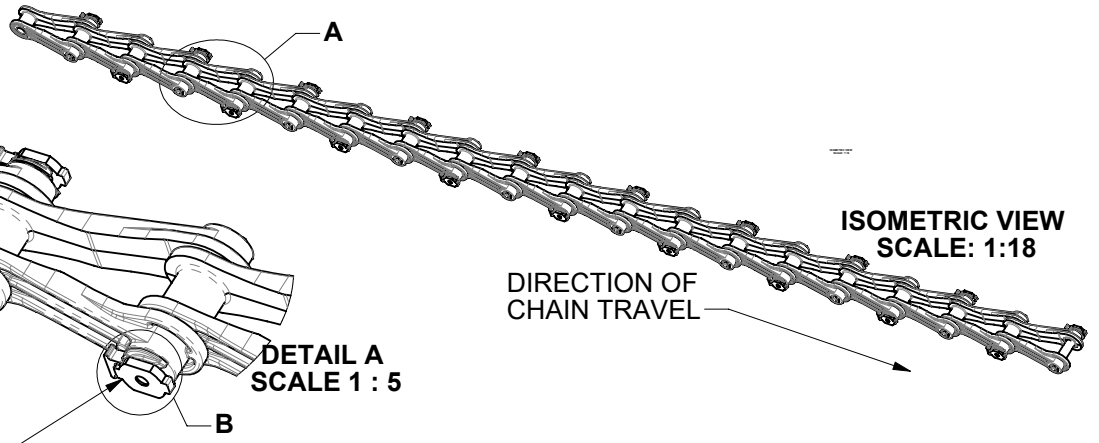
SUPERSEDES: 10000275-007

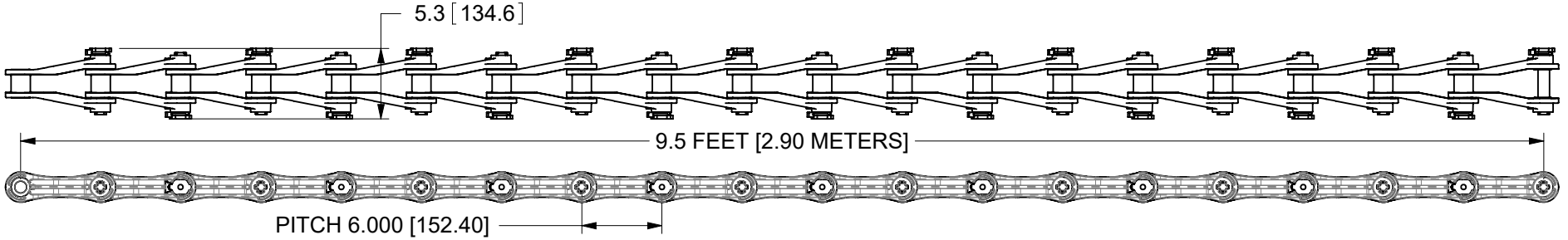
SHEET: 1 OF 1

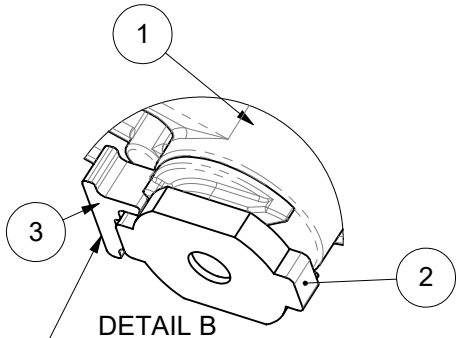
DRAWING NUMBER: 10000275-056
SCALE: 1:12
REV: 03

NOTES :

1. WORKING LOAD: 3100 POUNDS-FORCE [13.79kN].
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ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000498	NCS-720S, TYPE 4, RETAINER CLIP	19	POLYOXYMETHYLENE (POM)
2	10000205	NCS-720S CONNECTING PIN	19	GLASS REINFORCED NYLON
1	10000209	NCS-720S CHAIN LINK	19	GLASS REINFORCED POLYESTER

BILL OF MATERIALS FOR 10000275-058

BRENTWOOD

DRAWN EAH 01/30/18
CHECKER SML 01/31/18
DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
NCS-720S CHAIN STRAND, 9.5 FEET

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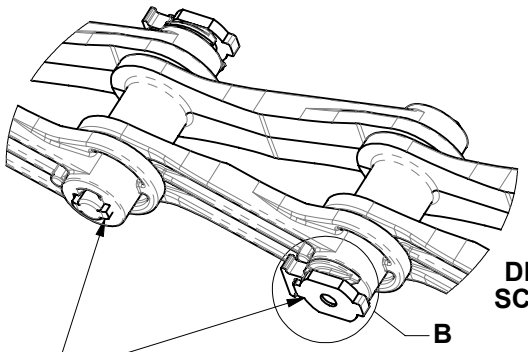
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 15.57
WEIGHT - KG: 7.06
SHEET: 1 OF 1
DRAWING NUMBER: 10000275-058
SCALE: 1:12
REV: 03

SUPERSEDES: 10000275-004

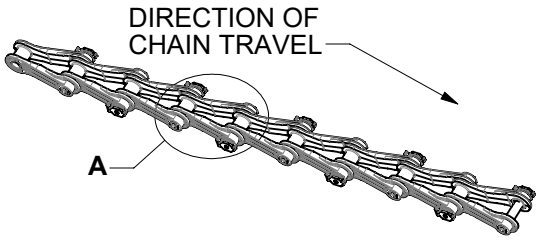
Rev 01

NOTES :

1. WORKING TENSILE LOAD: 3100 lbf [13.79kN]
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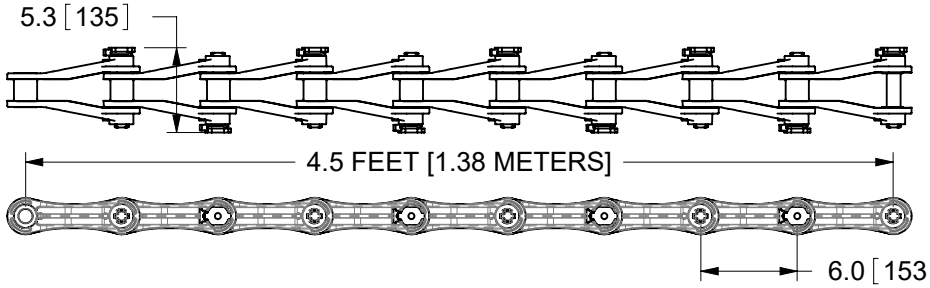


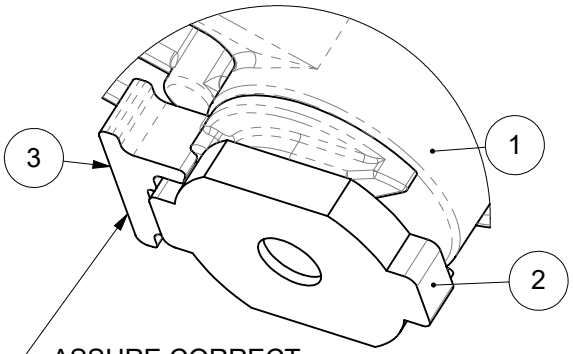
DETAIL A
SCALE 1 : 4



ISOMETRIC VIEW
SCALE: 1:18

MAINTAIN ALTERNATING CHAIN LINK ORIENTATION
DURING INSTALLATION IN THE FIELD.





ASSURE CORRECT
RETAINER CLIP
ORIENTATION
DURING INSTALLATION
IN THE FIELD

DETAIL B
SCALE 2:3

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000498	NCS-720S, TYPE 4, RETAINER CLIP	9	POLYOXYMETHYLENE (POM)
2	10000205	NCS-720S CONNECTING PIN	9	GLASS REINFORCED NYLON
1	10000209	NCS-720S CHAIN LINK	9	GLASS REINFORCED POLYESTER

BILL OF MATERIALS FOR 10000275-059

BRENTWOOD

DRAWN: EAH 01/30/18
CHECKER: SML 01/31/18
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: NCS-720S CHAIN STRAND, 4.5 FEET

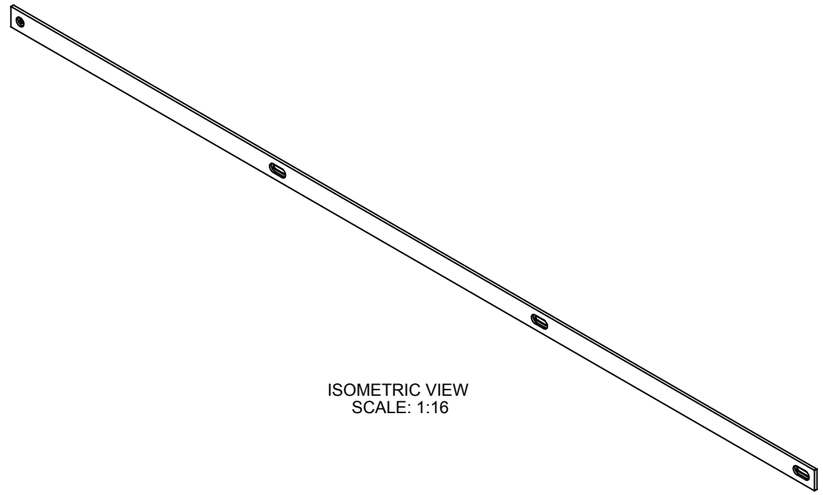
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MATERIAL: ERROR!:Material
WEIGHT - LBS: 7.37
WEIGHT - KG: 3.34
SHEET: 1 OF 1
DRAWING NUMBER: 10000275-059
SCALE: 1:12
REV: 03

SUPERSEDES: 10000275-002

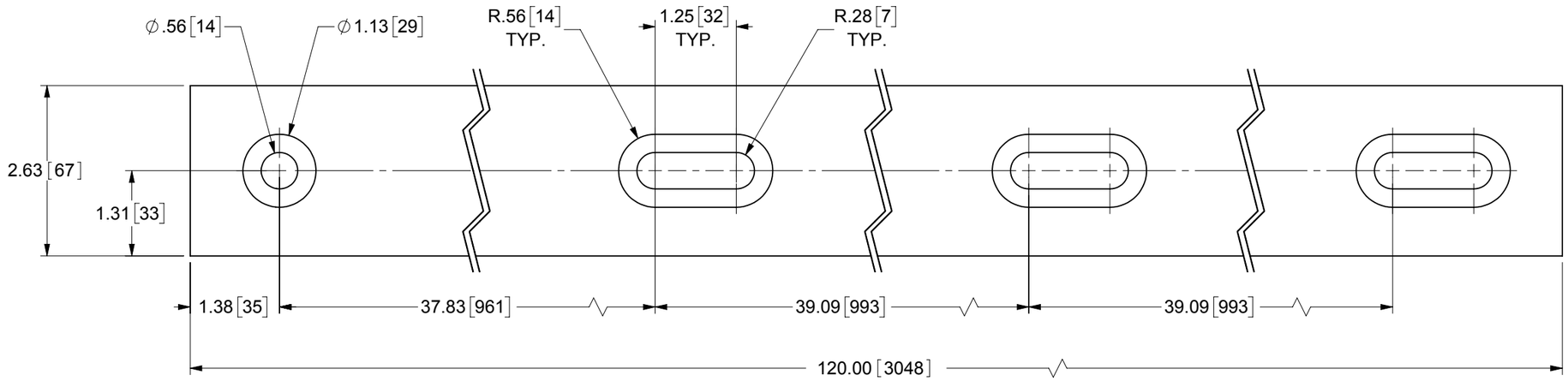
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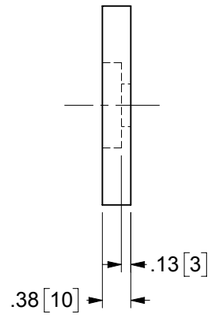
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3. FOR DETAILED INSTALLATION RECOMMENDATIONS SEE INSTALLATION BULLETIN IB00001-01, AND/OR APPLICABLE OPERATION AND MAINTENANCE MANUAL.



ISOMETRIC VIEW
SCALE: 1:16

DIRECTION OF FLIGHT TRAVEL





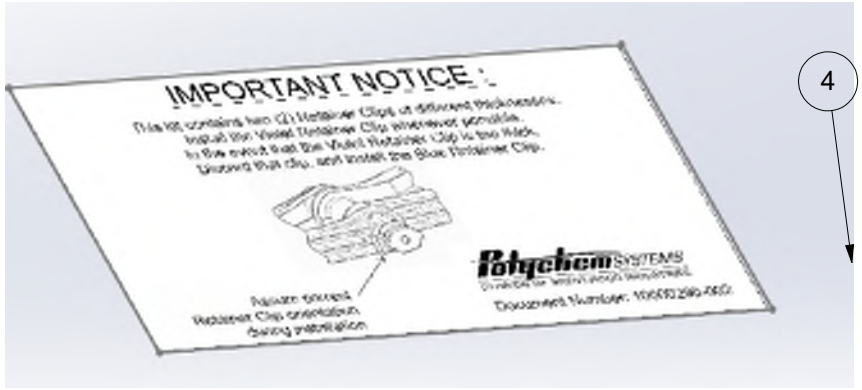
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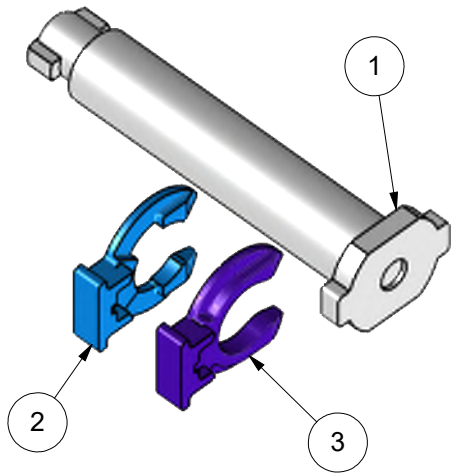
DRAWN: WR 05/31/13	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: WEAR STRIP, 0.38" x 2.63" x 120.00" , 1 HOLE & 3 SLOTS, UHMW-PE		
CHECKER: VB 08/05/13	MATERIAL: UHMW-PE	WEIGHT - LBS: 3.89	WEIGHT - KG: 1.76
SUPERSEDES:	SHEET: 1 OF 1	DRAWING NUMBER: 10000286-001	SCALE: 1:2 / REV: 04

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IMPORTANT NOTICE:

This kit contains two (2) Retainer Clips of different thicknesses.
Install the Violet Retainer Clip whenever possible.
In the event that the Violet Retainer Clip is too thick,
discard that Clip, and install the Blue Retainer Clip.





ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000290-002	PUBLICATION, PRINTED INSTALLATION INSTRUCTION INCLUDED IN NCS-720S PIN KIT 10000289-002	1	N/A
3	10000498	NCS-720S, TYPE 4, RETAINER CLIP	1	POLYOXYMETHYLENE (POM)
2	10000202-001	NCS-720S, TYPE 1, RETAINER CLIP, POM	1	POLYOXYMETHYLENE (POM)
1	10000205	NCS-720S CONNECTING PIN	1	GLASS REINFORCED NYLON

BILL OF MATERIALS FOR 10000289-002

BRENTWOOD

DRAWN VB 05/28/19
CHECKER SML 05/29/19

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
NCS-720S KIT = ONE CONNECTING PIN, A TYPE 1 RETAINER CLIP, AND A TYPE 4 RETAINER CLIP

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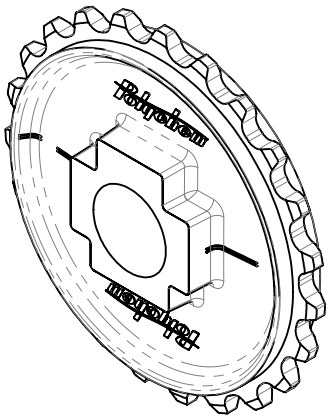
MATERIAL: PA66 & POM
WEIGHT - LBS: 0.135
WEIGHT - KG: 0.06
SHEET: 1 OF 1
DRAWING NUMBER: 10000289-002
SCALE: 1:2
REV: 02

SUPERSEDES:

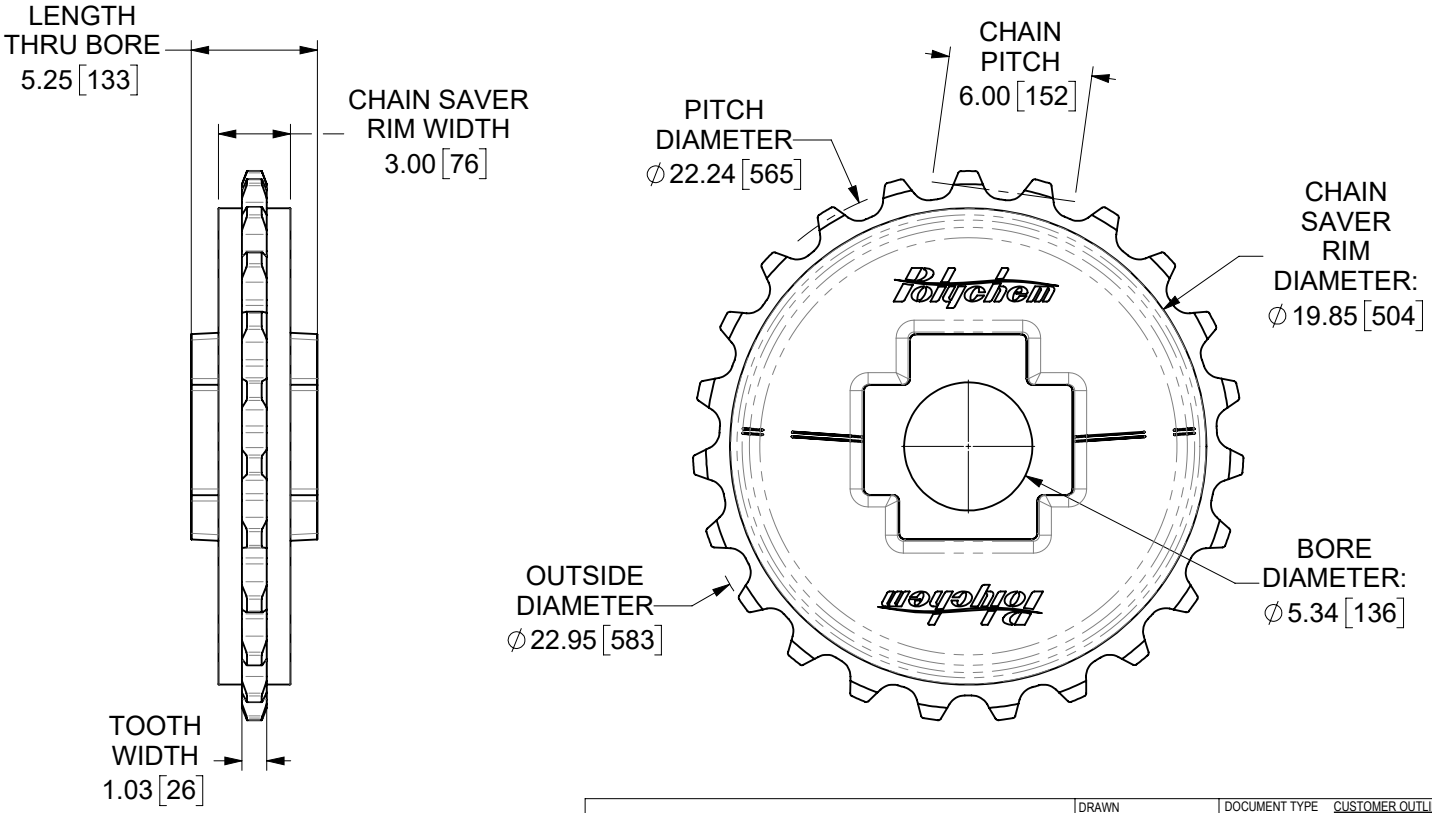
Rev 01

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ISOMETRIC VIEW
SCALE: 1:10



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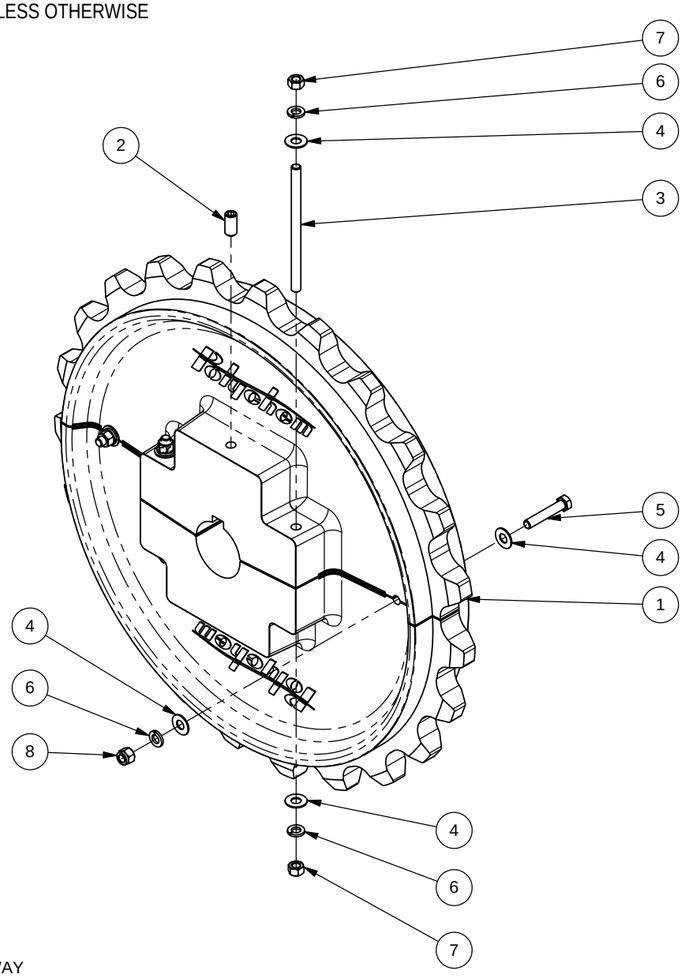
DRAWN: GAV 08/12/09	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: NCS-720S SPROCKET, 23T, SOLID, PLAIN BORE, 5.34" BORE, PA6		
CHECKER: BSC 05/20/15			
MATERIAL: CAST NYLON 6		WEIGHT - LBS: 27.12	WEIGHT - KG: 12.30
SHEET: 1 OF 1	DRAWING NUMBER: 10000300-002	SCALE: 1:8	REV: 05

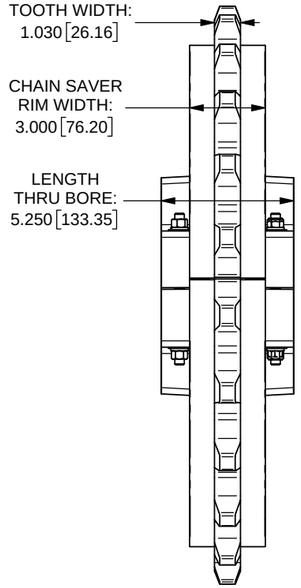
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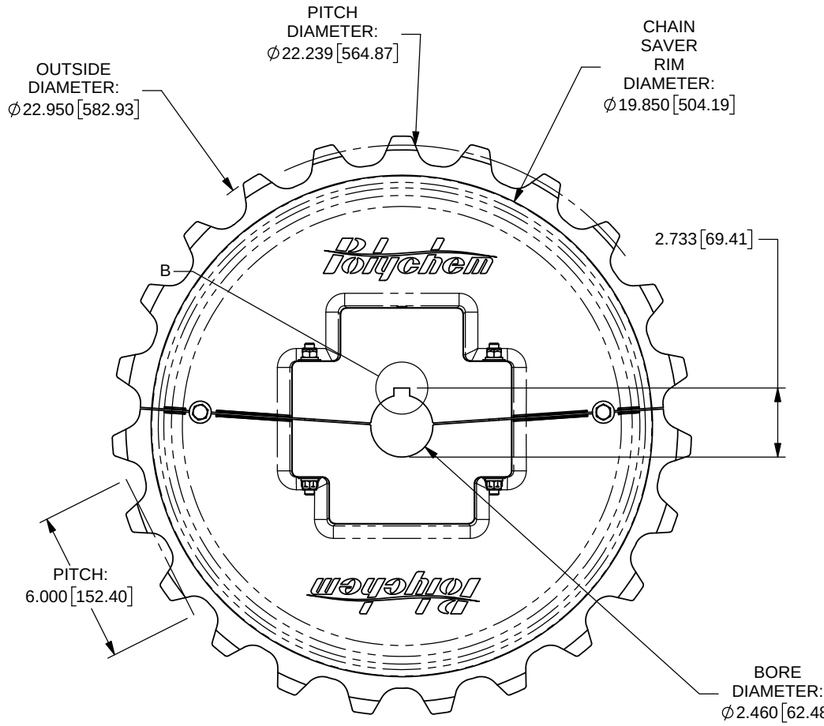
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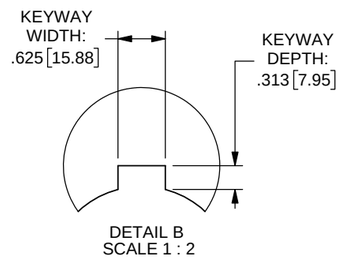
NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS ARE TO BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
4. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.









DETAIL B
SCALE 1 : 2

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
8	10000011-002	HEX LOCKNUT, NYLON INSERT 3/8-16, 316 SS	7	AISI 316
7	10000006-003	HEX NUT, 3/8-16, 316 SS	9	AISI 316
6	10000012-005	SPLIT LOCK WASHER, 3/8, 316 SS	10	AISI 316
5	10000001-010	HEX BOLT, 3/8-16 x 2", 316 SS	2	AISI 316
4	10000058-005	FLAT WASHER, 0.406" ID x 0.875" OD x 0.043/0.057" THK, (SPECIAL M10 or 3/8), 316 SS	12	AISI 316
3	10000062-022	ALL THREAD STUD, 3/8-16 x 6", 316 SS	4	AISI 316
2	10000039-003	HEX SOCKET SET SCREW, M12x1.75 x 25 MM, CUP POINT, 316 SS	2	AISI 316
1	10000300-009	NCS-720S SPROCKET, 23T, SPLIT, KEYWAY, SET SCREWS, 2.46" BORE, PA6	1	UV RESISTANT BLACK, CAST NYLON 6 (PA6)

BILL OF MATERIALS FOR 10000301-009

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
MDV	SML	11/22/17

BRENTWOOD®

DRAWN ADM 02/16/07

CHECKER ADM 08/12/09

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

NCS-720S SPROCKET, 23T, SPLIT, KEYWAY, SETSCREW, 2.46" BORE, PA6

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MATERIAL

WEIGHT - LBS 31.31

WEIGHT - KG 14.20

SHEET 1 OF 1

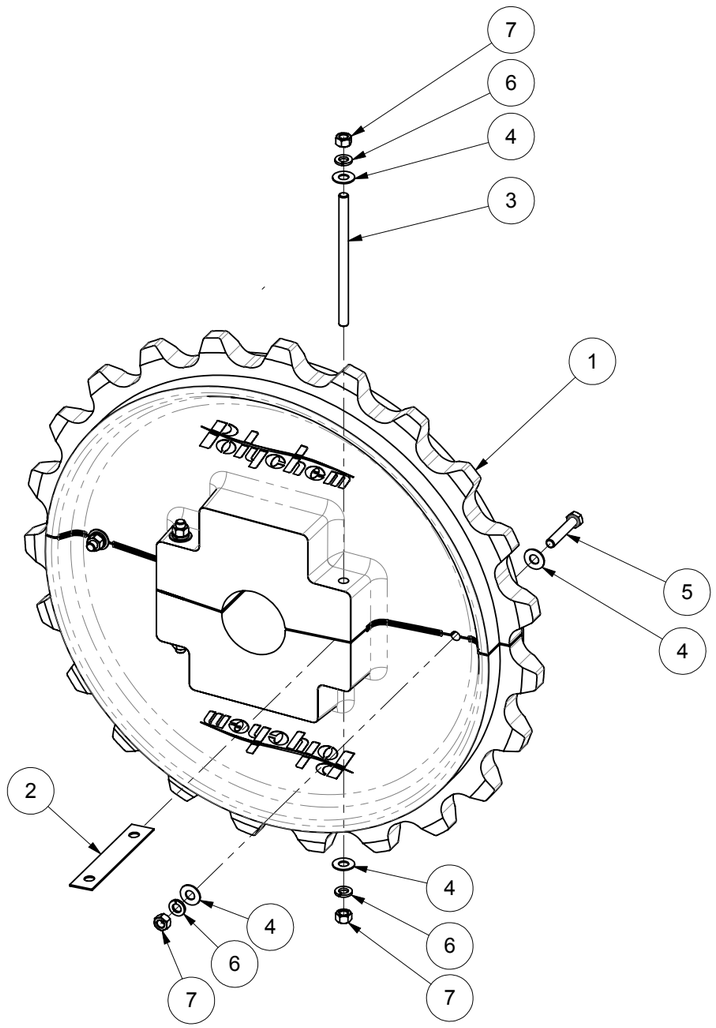
DRAWING NUMBER 10000301-009

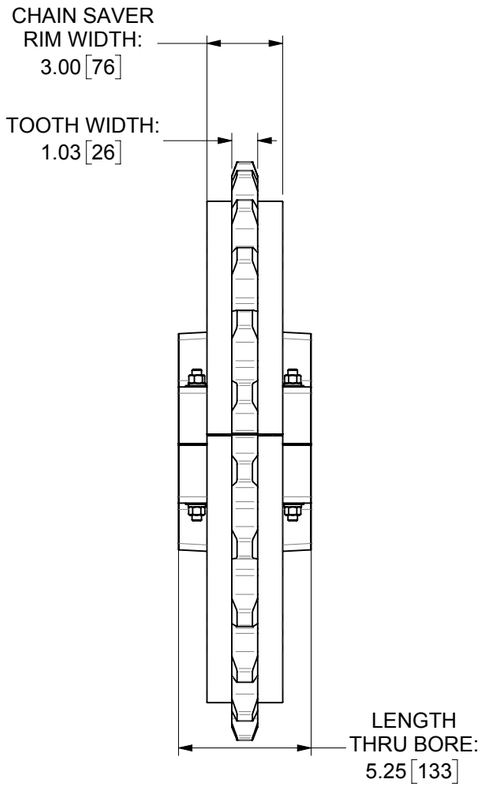
SCALE 1:8

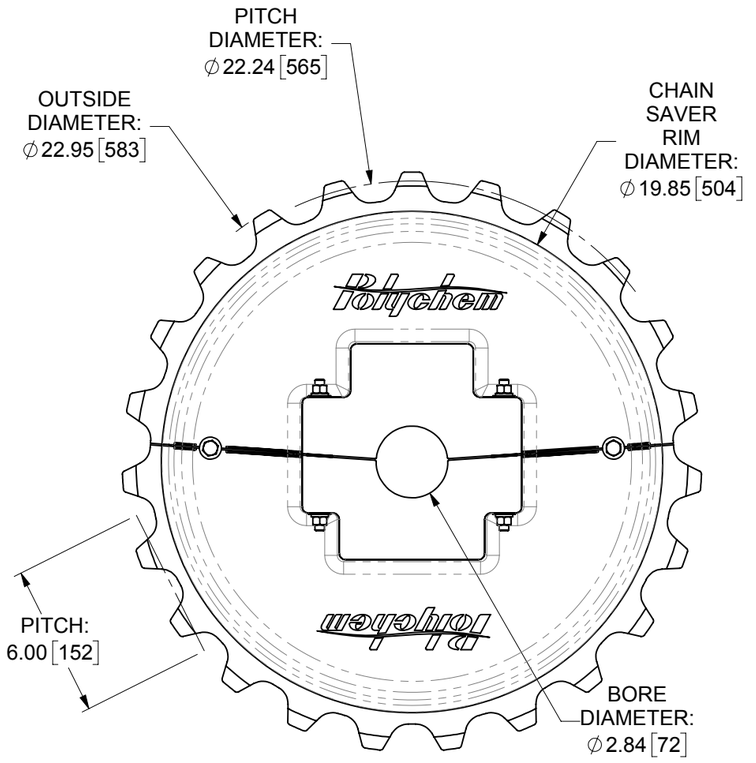
REV 03

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS ARE TO BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
4. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.







ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
7	10000006-003	HEX NUT, 3/8-16, 316 SS	10	AISI 316
6	10000012-005	SPLIT LOCK WASHER, 3/8, 316 SS	10	AISI 316
5	10000001-010	HEX BOLT, 3/8-16 x 2", 316 SS	2	AISI 316
4	10000058-005	FLAT WASHER, 3/8" SIZE, 0.406" ID x 0.875" OD x 0.043/0.057" THK, 316 SS	12	AISI 316
3	10000062-022	ALL THREAD STUD, 3/8-16 x 6", 316 SS	4	AISI 316
2	10000305-001	SPACER, BLOCK, 0.06 x 1.00 x 5.25, 2 HOLES, NYLON-BLACK	2	NYLON
1	10000300-016	NCS-720S SPROCKET, 23T, SPLIT, PLAIN BORE, 2.84" BORE, PA6	1	CAST NYLON 6

BILL OF MATERIALS FOR 10000301-016

STATUS		
SUPERSEDES:		
CURRENT REVISION:		
BY	CKD	DATE
DME	SML	07/17/17

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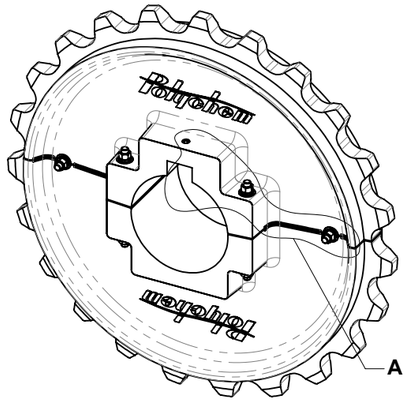
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DRAWN	CMF 02/16/07	DOCUMENT TYPE PRODUCT DEFINITION LONG DESCRIPTION	
CHECKER	BSC 10/03/11	NCS-720S SPROCKET, 23T, SPLIT, PLAIN BORE, 2.84" BORE, PA6	
MATERIAL	SEE BILL OF MATERIALS	WEIGHT - LBS 31.67	WEIGHT - KG 14.37
SHEET	1 OF 1	DRAWING NUMBER 10000301-016	SCALE 1:6 / REV 03

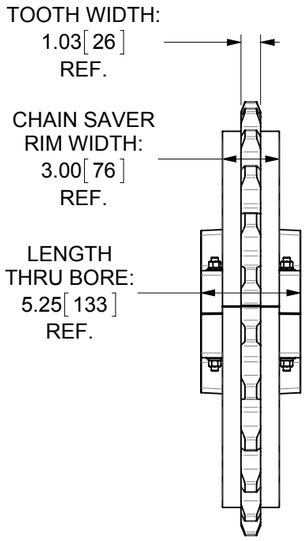
Rev 01

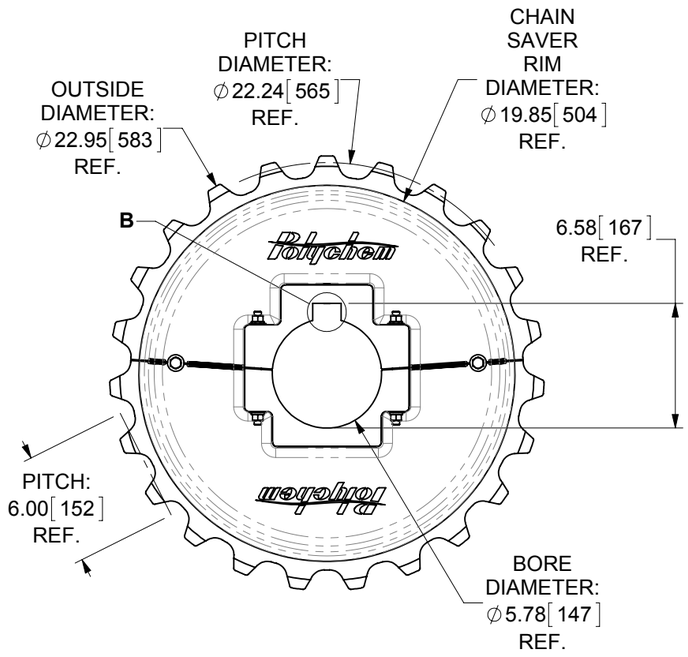
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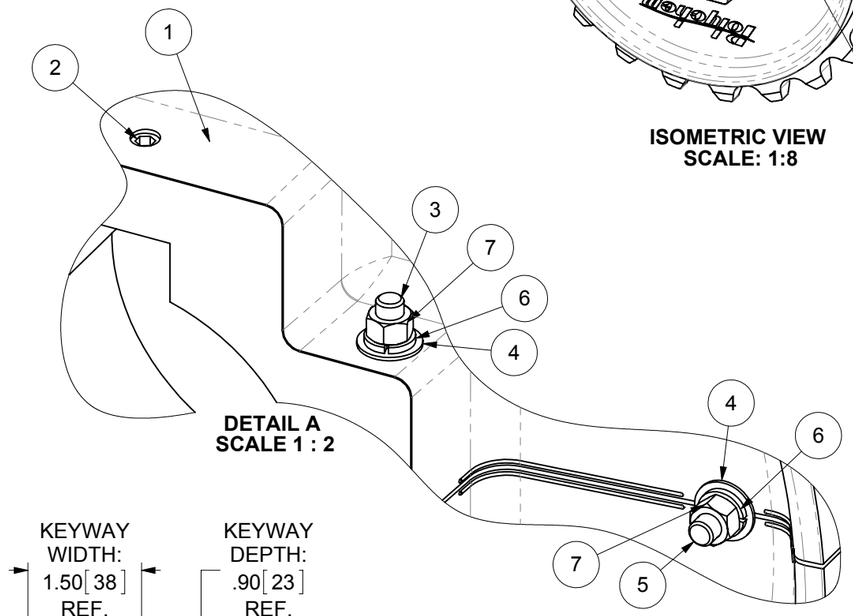
1. REMOVE ALL BURRS AND SHARP EDGES.
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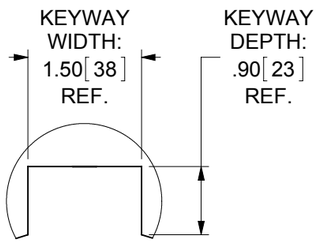
ISOMETRIC VIEW
SCALE: 1:8







DETAIL A
SCALE 1 : 2



DETAIL B
SCALE 1 : 2

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
7	10000006-003	HEX NUT, 3/8-16, 316 SS	10	AISI 316
6	10000012-005	SPLIT LOCK WASHER, 3/8, 316 SS	10	AISI 316
5	10000001-010	HEX BOLT, 3/8-16 x 2", 316 SS	2	AISI 316
4	10000058-005	FLAT WASHER, 3/8" SIZE, 0.406" ID x 0.875" OD x 0.043/0.057" THK, 316 SS	12	AISI 316
3	10000062-022	ALL THREAD STUD, 3/8-16 x 6", 316 SS	4	AISI 316
2	10000039-003	HEX SOCKET SET SCREW, M12x1.75 x 25 MM, CUP POINT, 316 SS	2	AISI 316
1	10000300-037	NCS-720S SPROCKET, 23T, SPLIT, KEYWAY, SET SCREW, 5.78" BORE, PA6	1	UV RESISTANT BLACK, CAST NYLON 6 (PA6)

BILL OF MATERIALS FOR 10000301-037

STATUS

SUPERSEDES:

REV	BY	DATE
04	SML	09/11/15

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DRAWN: CMF 02/16/07
CHECKER: CSR 08/20/15

DOCUMENT TYPE: PRODUCT DEFINITION
LONG DESCRIPTION: NCS-720S SPROCKET ASSY, 23T, SPLIT, KEYWAY, SET SCREW, 5.78" BORE, ENG HDW, PA6

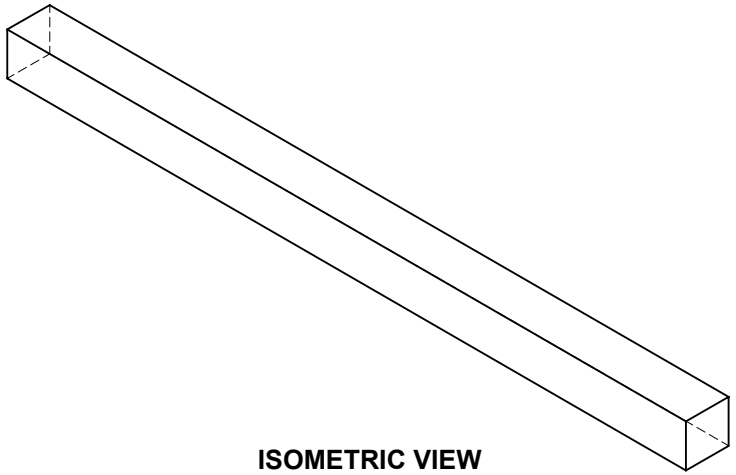
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 26.44
WEIGHT - KG: 11.99

SHEET: 1 OF 1
DRAWING NUMBER: 10000301-037
SCALE: 1:8
REV: 04

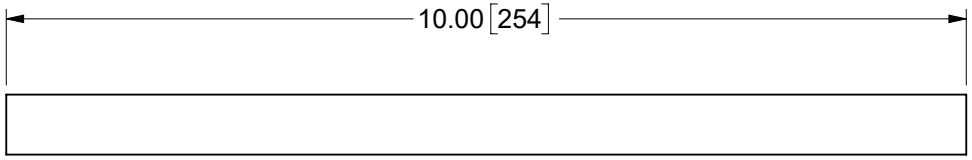
Rev 01

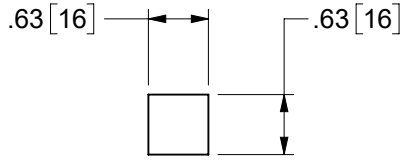
NOTES :

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ISOMETRIC VIEW
SCALE: 1:2





BRENTWOOD®

DRAWN: AIM 01/16/19
CHECKER: BSC 01/16/19
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: KEY, 0.63" x 0.63" x 10.00", 304 SS

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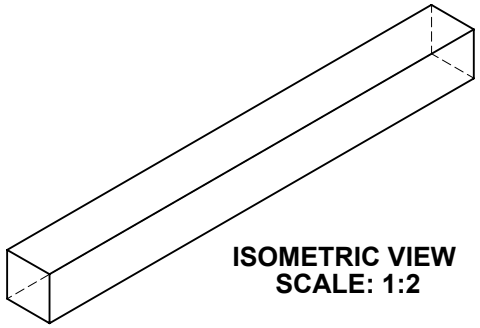
MATERIAL	WEIGHT - LBS	WEIGHT - KG
AISI 304	1.13	0.51

SUPERSEDES:	SHEET	DRAWING NUMBER	SCALE	REV
	1 OF 1	10000330-077	1:2	02

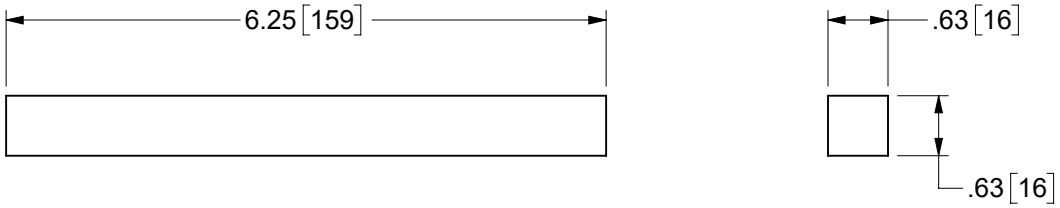
Rev 01

NOTES :

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ISOMETRIC VIEW
SCALE: 1:2



BRENTWOOD

DRAWN: VP, 05 Sep 23
CHECKER: RHP, 14 Sep 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: KEY, 0.63" x 0.63" x 6.25", AISI 304

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MATERIAL	WEIGHT - LBS	WEIGHT - KG
AISI 304	0.71	0.32

SUPERSEDES:	SHEET	DRAWING NUMBER	SCALE	REV
	1 OF 1	10000330-139	1:2	01

Anchoring Systems



HILTI HDM 500 DISPENSER

HIT DISPENSER

HDM 500 MANUAL DISPENSER

HILTI ITEM No. 3498242
PACKAGE CONTENTS: MANUAL DISPENSER W/ CARTRIDGE HOLDER



HILTI HIT-CR CARTRIDGE HOLDER

NOTES:

1. PRODUCT ACCEPTS BOTH 11.2 FL OZ (330 mL) AND 16.9 FL OZ (500 mL) HILTI FOIL PACK CARTRIDGES.
2. FOR USE WITH HILTI HIT-HY 200.

STATUS			BRENTWOOD	DRAWN KTF 04/26/13	DOCUMENT TYPE PRODUCT DEFINITION LONG DESCRIPTION MANUAL DISPENSER, ADHESIVE, HDM 500 & RED CARTRIDGE HOLDER, HIT-CR 500	
SUPERSEDES:				CHECKER VU 09/11/15		
CURRENT REVISION:			CONFIDENTIAL PROPERTY OF BRENTWOOD INDUSTRIES INC. (HEREINAFTER KNOWN AS, "BRENTWOOD") NOTICE: THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION WHICH IS THE PROPERTY OF BRENTWOOD. THE RECIPIENT OF THIS DOCUMENT AGREES TO USE THE INFORMATION CONTAINED HEREIN FOR THE LIMITED PURPOSE OF WHICH IT WAS FURNISHED BY BRENTWOOD AND FURTHER AGREES TO NEITHER COPY, MODIFY, REVERSE ENGINEER NOR AUTHORIZE ANYONE ELSE TO DO SO ON ITS BEHALF. THE RECIPIENT FURTHER AGREES THAT IT WILL NOT DISCLOSE THIS INFORMATION TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF BRENTWOOD. THIS NOTICE SHALL APPEAR ON ANY COMPLETE OR PARTIAL REPRODUCTION OF THIS DOCUMENT.	MATERIAL N/A	WEIGHT - LBS 3.25	WEIGHT - KG 1.47
BY	CKD	DATE		SHEET 1 OF 1	DRAWING NUMBER 10000341-001	SCALE 1:1 / REV 03
BSC	SML	11/08/18				

Anchoring Systems



HILTI HIT-HY 200-A V3

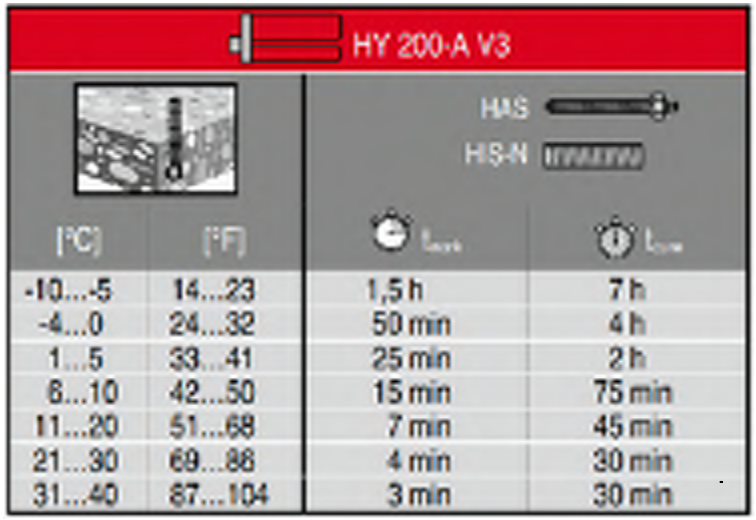


HILTI HIT-RE-M MIXER

HILTI ADHESIVE ANCHORING SYSTEM

HIT-HY-200-A-V3 11.16 FL OZ / 330 mL

ANCHOR TYPE:	CHEMICAL ANCHOR
BASE MATERIALS:	CONCRETE
MATERIAL COMPOSITION:	HYBRID ADHESIVE MORTAR
INSTALLATION TEMP RANGE:	14°F (-10°C) - 104°F (40°C)
HILTI ITEM No.	2334274
PACKAGE CONTENTS:	ONE (1) FOIL PACK, ONE (1) MIXER, AND ONE (1) MIXER EXTENSION



STATUS			BRENTWOOD	DRAWN KTF 04/29/13	DOCUMENT TYPE PRODUCT DEFINITION LONG DESCRIPTION ADHESIVE ANCHORING SYSTEM, HIT-HY 200-A-V3, FOIL PACK, MIXER & MIXER EXTENSION	
SUPERSEDES: 651-20986 & 651-25234				CHECKER VU 04/30/13		
CURRENT REVISION:			CONFIDENTIAL PROPERTY OF BRENTWOOD INDUSTRIES INC. (HEREINAFTER KNOWN AS, "BRENTWOOD") NOTICE: THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION WHICH IS THE PROPERTY OF BRENTWOOD. THE RECIPIENT OF THIS DOCUMENT AGREES TO USE THE INFORMATION CONTAINED HEREIN FOR THE LIMITED PURPOSE OF WHICH IT WAS FURNISHED BY BRENTWOOD AND FURTHER AGREES TO NEITHER COPY, MODIFY, REVERSE ENGINEER NOR AUTHORIZE ANYONE ELSE TO DO SO ON ITS BEHALF. THE RECIPIENT FURTHER AGREES THAT IT WILL NOT DISCLOSE THIS INFORMATION TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF BRENTWOOD. THIS NOTICE SHALL APPEAR ON ANY COMPLETE OR PARTIAL REPRODUCTION OF THIS DOCUMENT.	MATERIAL N/A	WEIGHT - LBS 1.45	WEIGHT - KG 0.66
BY	CKD	DATE		SHEET 1 OF 1	DRAWING NUMBER 10000342-001	SCALE 1:1 / REV 04
NAN	AIM	09/21/22				

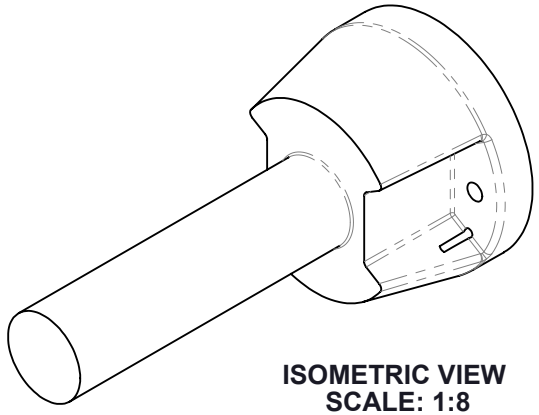
Rev 01

NOTES :

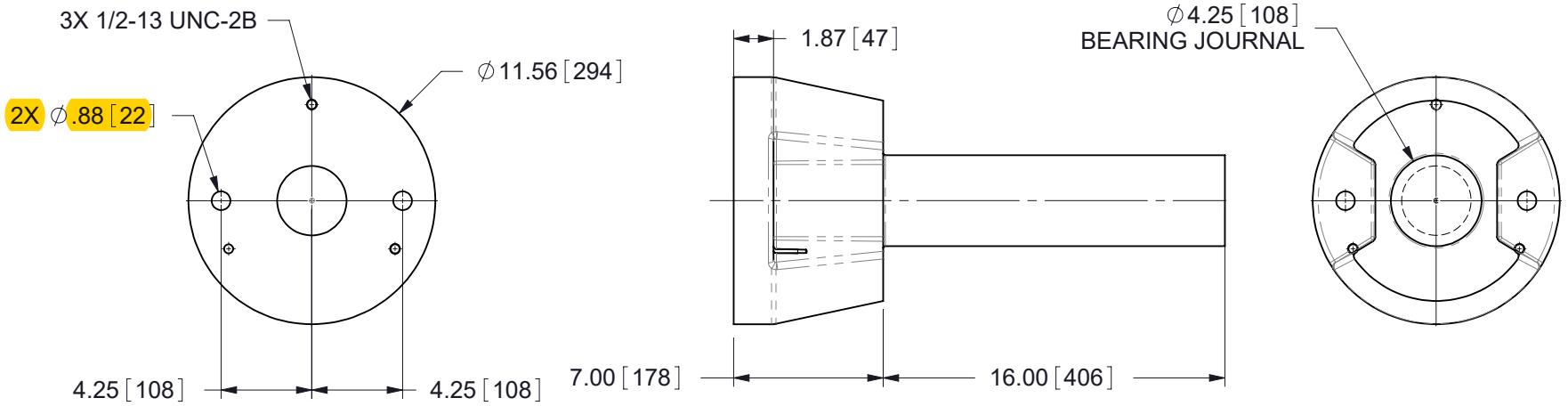
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ISOMETRIC VIEW
SCALE: 1:8



BRENTWOOD

DRAWN VU 10/14/09	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION		
CHECKER SPG 10/15/09	HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6		
MATERIAL	CAST NYLON 6	WEIGHT - LBS 31.06	WEIGHT - KG 14.09
SHEET 1 OF 1	DRAWING NUMBER 10000354-037	SCALE 1:8	REV 03

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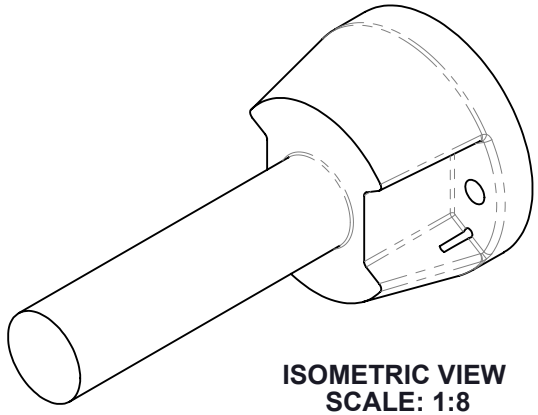
SUPERSEDES: 671-20851-001

NOTES :

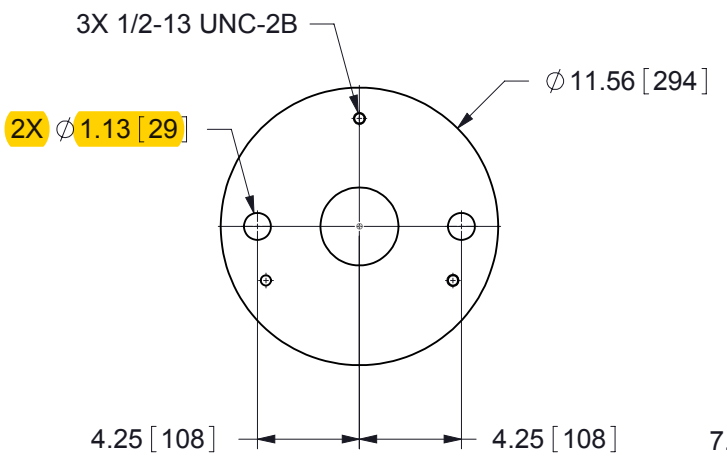
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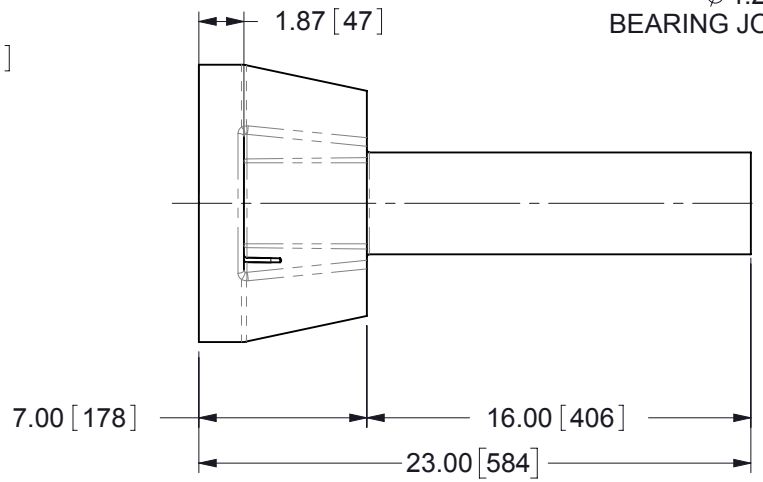
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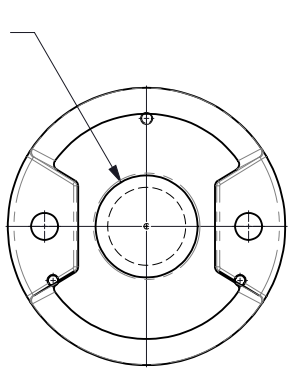
3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



ISOMETRIC VIEW
SCALE: 1:8







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DRAWN VU 10/14/09
CHECKER SPG 10/15/09

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
HEAD SHAFT SPINDLE, SMALL BASE, 7.00" SHOULDER, 16.00" JOURNAL, ENG LEVELING, PA6

MATERIAL: CAST NYLON 6
WEIGHT - LBS: 31.00
WEIGHT - KG: 14.06

SHEET: 1 OF 1
DRAWING NUMBER: 10000354-038
SCALE: 1:8
REV: 04

SUPERSEDES:

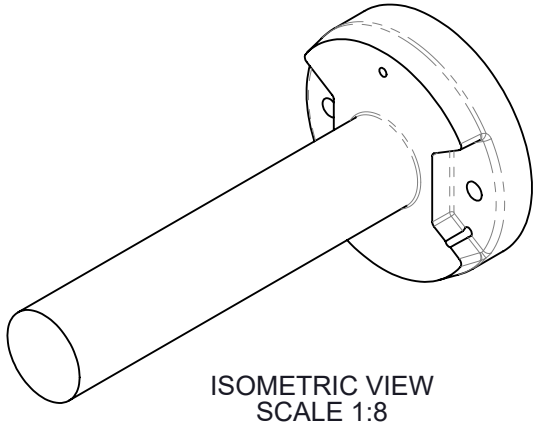
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NOTES :

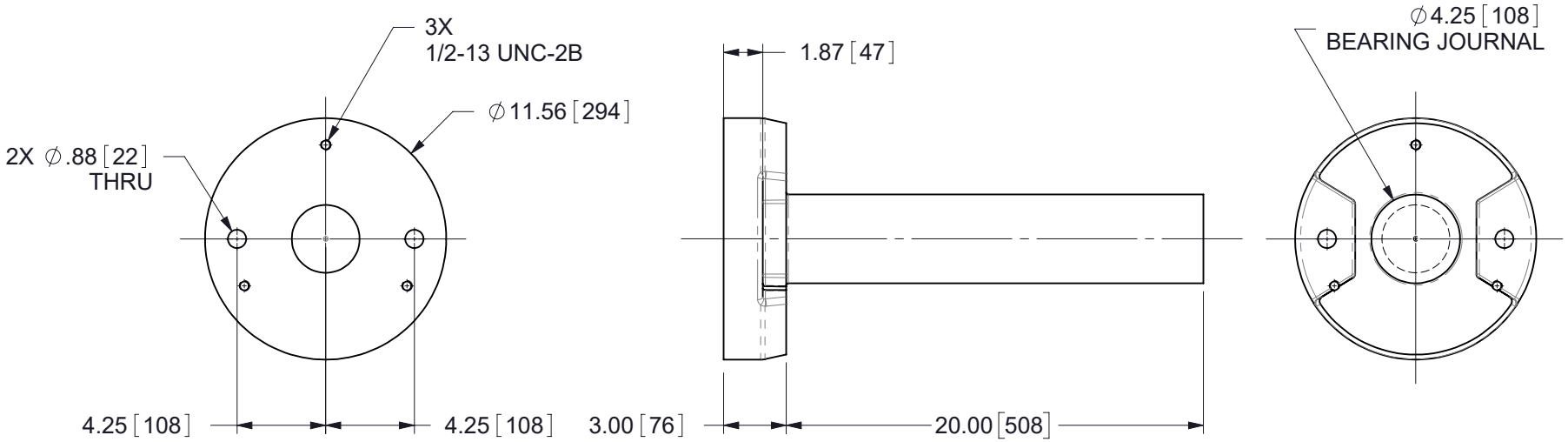
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ISOMETRIC VIEW
SCALE 1:8



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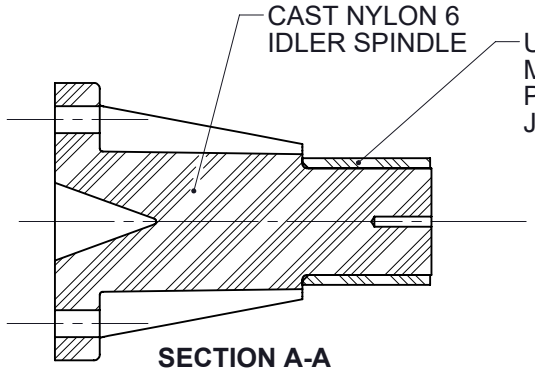
DRAWN VU 10/15/09	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION HEAD SHAFT SPINDLE, SMALL BASE, 3.00" SHOULDER, 20.00" JOURNAL, ENG LEVELING, PA6		
CHECKER SPG 10/15/09			
MATERIAL CAST NYLON 6		WEIGHT - LBS 22.88	WEIGHT - KG 10.38
SHEET 1 OF 1	DRAWING NUMBER 10000354-093	SCALE 1:8	REV 03

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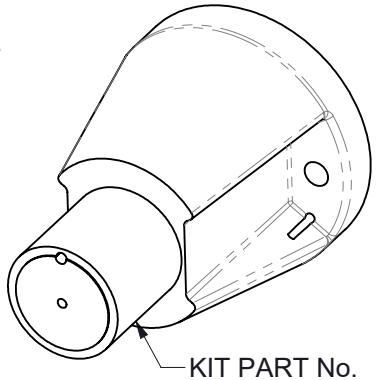
SUPERSEDES:

NOTES :

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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

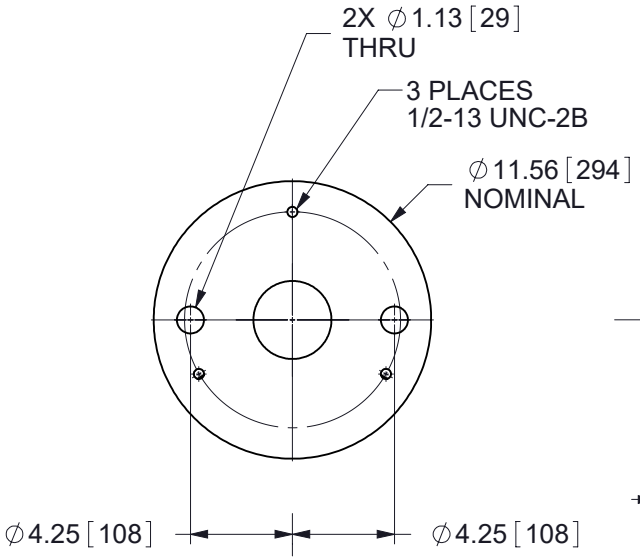


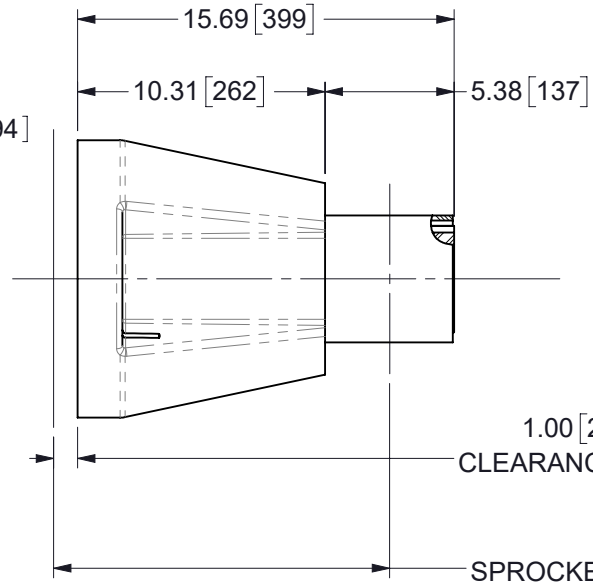
SECTION A-A

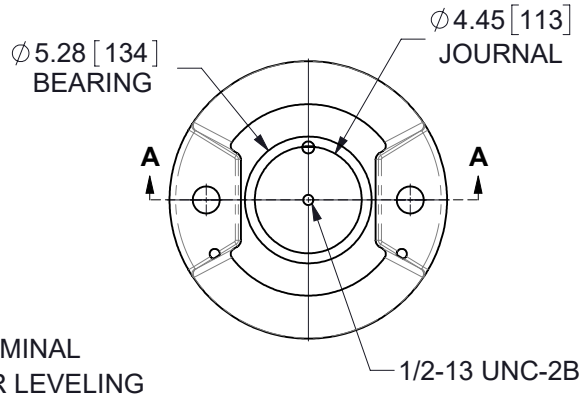


ISOMETRIC VIEW
SCALE 1:8

KIT PART No.
10000406-001
FOR FIELD
REPLACEMMENT
OF BEARING:







BRENTWOOD

DRAWN	GVA 10/14/09
CHECKER	EMG 10/15/09
DOCUMENT TYPE	CUSTOMER OUTLINE
LONG DESCRIPTION	IDLER STUB SHAFT ASSY, SMALL BASE, 10.31" SHOULDER, 15.69", ENG LEVELING, PA6 & UHMW-PE
MATERIAL	BLACK, CAST PA6 & UHMW-PE
WEIGHT - LBS	39.56
WEIGHT - KG	17.94
SHEET	1 OF 1
DRAWING NUMBER	10000359-011
SCALE	1:8
REV	04

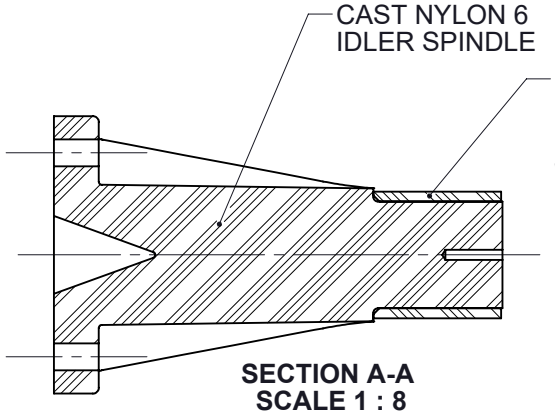
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SUPERSEDES:
671-15896-024, 671-15896-027

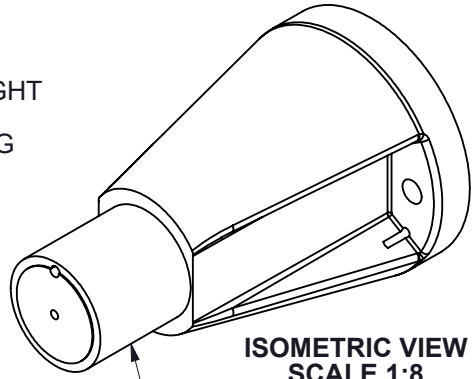
Rev 01

NOTES :

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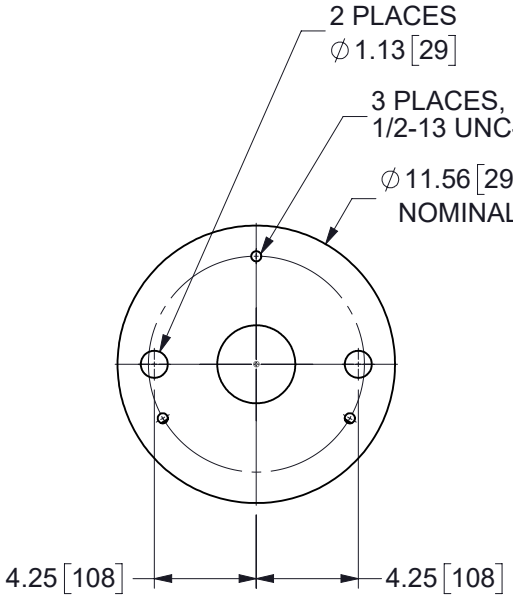


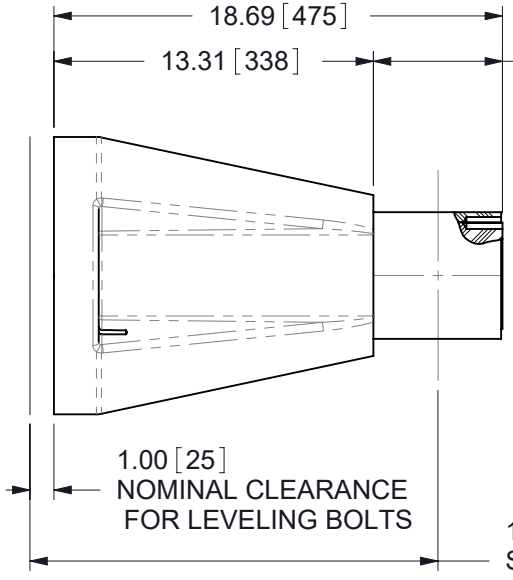
SECTION A-A
SCALE 1 : 8

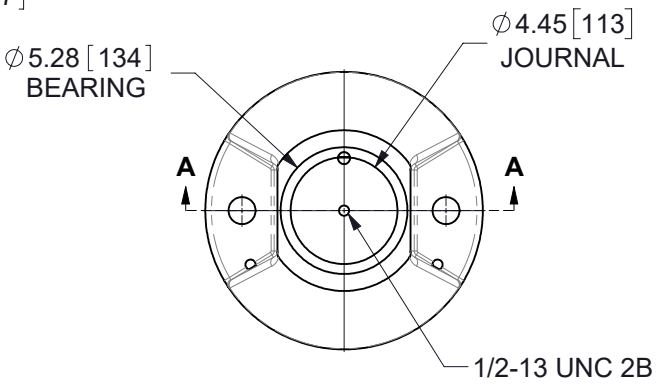


ISOMETRIC VIEW
SCALE 1:8

KIT PART No. 10000406-001
FOR FIELD REPLACEMENT
OF BEARING







BRENTWOOD

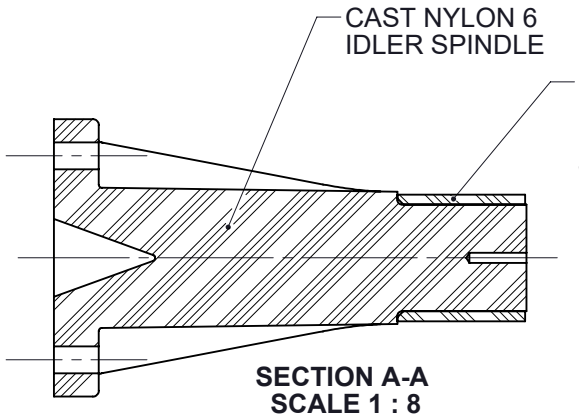
DRAWN	GVA 10/14/09
CHECKER	EMG 10/15/09
DOCUMENT TYPE	CUSTOMER OUTLINE
LONG DESCRIPTION	IDLER STUB SHAFT ASSY, SMALL BASE, 13.31" SHOULDER, 18.69", ENG LEVELING, PA6 & UHMW-PE
MATERIAL	BLACK, CAST PA6 & UHMW-PE
WEIGHT - LBS	45.16
WEIGHT - KG	20.48
SHEET	1 OF 1
DRAWING NUMBER	10000359-017
SCALE	1:8
REV	04

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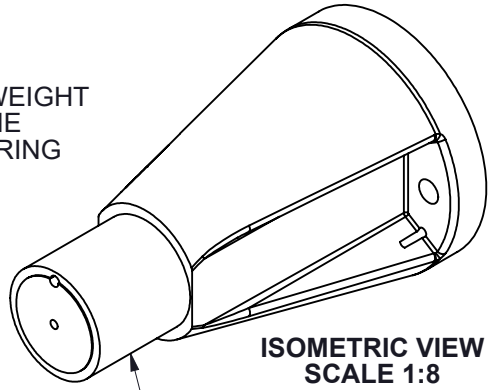
SUPERSEDES: 671-15896-021

NOTES :

1. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
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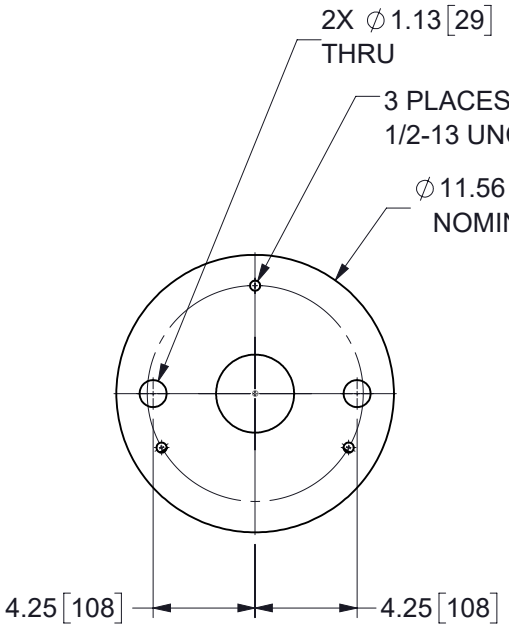


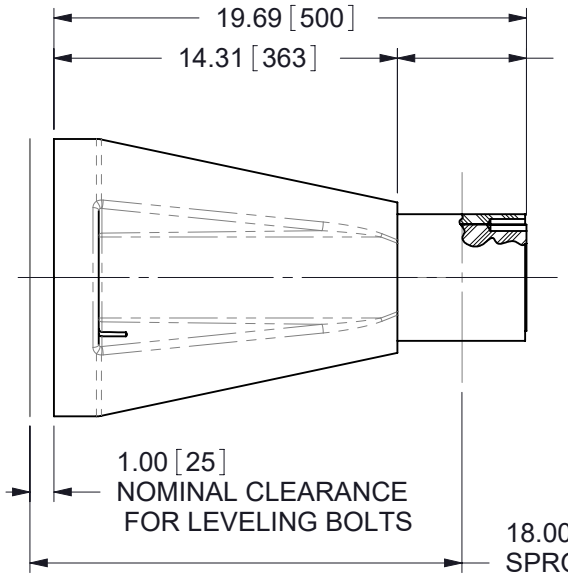
SECTION A-A
SCALE 1 : 8

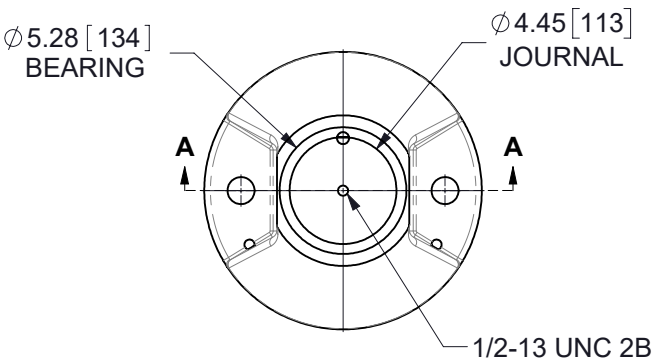


ISOMETRIC VIEW
SCALE 1:8

KIT PART No. 10000406-001
FOR FIELD REPLACEMENT
OF BEARING







BRENTWOOD

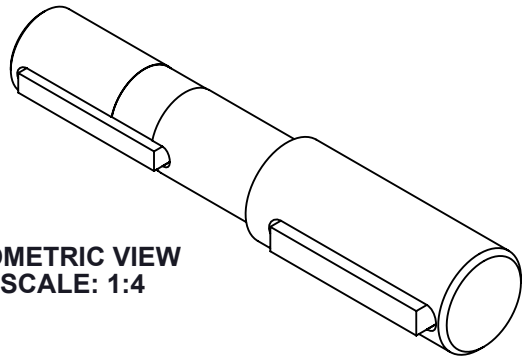
DRAWN GVA 10/14/09	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION		
CHECKER EMG 10/15/09	IDLER STUB SHAFT ASSY, SMALL BASE, 14.31" SHOULDER, 19.69", ENG LEVELING, PA6 & UHMW-PE		
MATERIAL CAST PA6 AND UHMW-PE		WEIGHT - LBS 46.72	WEIGHT - KG 21.19
SHEET 1 OF 1	DRAWING NUMBER 10000359-019	SCALE 1:8	REV 05

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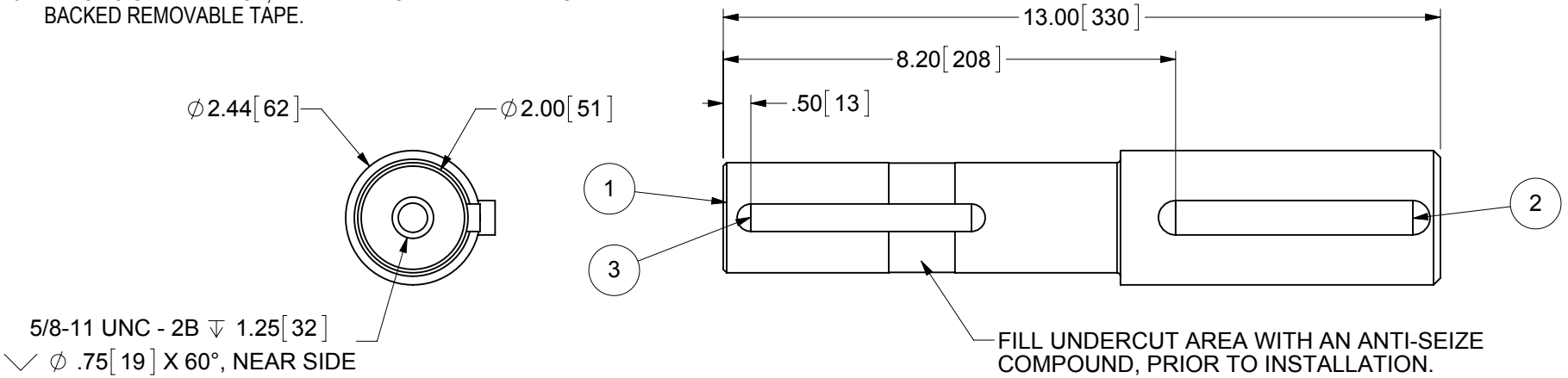
SUPERSEDES:

NOTES :

1. REMOVE ALL BURRS AND SHARP EDGES.
2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
3. PRODUCTS ARE TO BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
4. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
5. DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.
6. KEYS TO SHIP IN PLACE, HELD IN PLACE WITH AN ADHESIVE BACKED REMOVABLE TAPE.



ISOMETRIC VIEW
SCALE: 1:4



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000330-014	KEY, 0.50" x 0.50" x 4.00", 304 SS	1	AISI 304
2	10000330-026	KEY, .63" x .63" x 4.30", 304 SS	1	AISI 304
1	10000585-021	SINGLE OUTPUT DRIVE SHAFT, 2.44" DIA x 13.00", 2 KEYWAYS, KA77, SHEAR PIN, 304 SS	1	AISI 304

BILL OF MATERIALS FOR 10000367-001

STATUS

SUPERSEDES: 10000367

REV	BY	DATE
02	WR	08/22/14

BRENTWOOD®

DRAWN CSR 04/23/14

CHECKER GTY 08/09/14

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

SINGLE OUTPUT SHAFT ASSY, 2.44" DIA x 13.00", 2 KEYS, KA77 HOLLOW, ENG, 304 SS

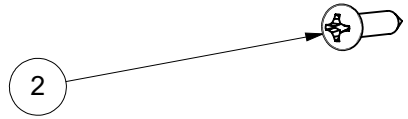
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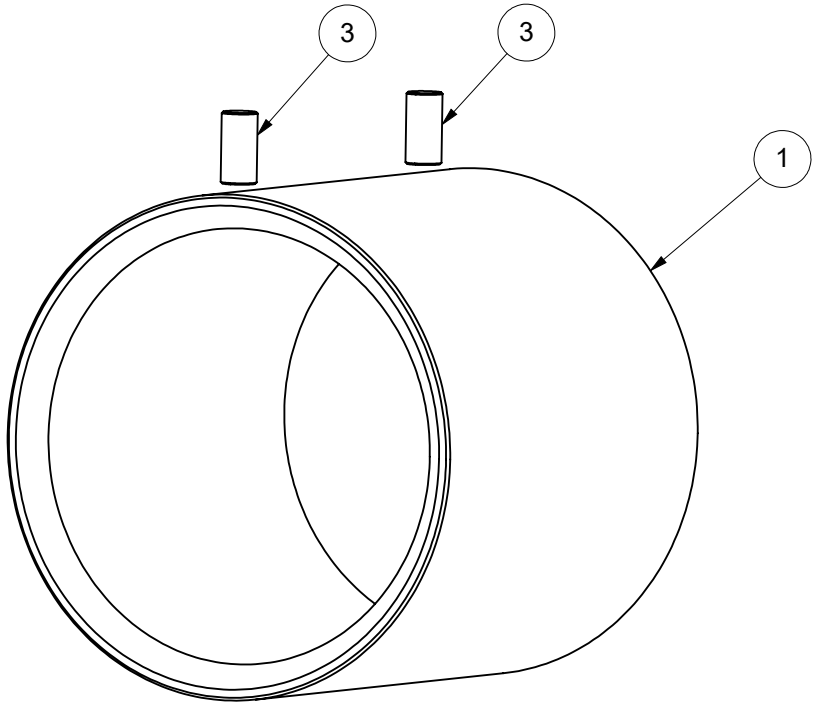
MATERIAL	WEIGHT - LBS	WEIGHT - KG
AISI 304	14.51	6.58

SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10000367-001	1:3	02

NOTES :

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2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
3. PRODUCTS ARE TO BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.





* INCLUDE A COPY OF 10000406-001-INSTL, PUB\PRINT\INSTR\INSTL\BRG\IDL, WITH EACH KIT, DURING THE KITTING PROCESS.

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000405-001	DOWEL PIN, 0.38" DIA x 0.75", UHMW-PE	2	UHMW-PE
2	10000029-002	PHILLIPS PAN HEAD SCREW, #14 x 1-1/4", TYPE A, 316 SS	1	AISI 316
1	10000403-001	FIELD REPLACEMENT IDLER BEARING, SLIP FIT, 5.350", UHMW-PE	1	VIRGIN UHMW PE

BILL OF MATERIALS FOR 10000406-001

STATUS

SUPERSEDES:
#

CURRENT REVISION:

BY	CKD	DATE
VP	SML	09 Nov 23

BRENTWOOD®

DRAWN GVA 08/12/09

CHECKER ADM 08/12/15

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

FIELD REPLACEMENT, IDLER BEARING KIT, SLIP FIT, 5.38", UHMW-PE

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MATERIAL: SEE BILL OF MATERIAL

WEIGHT - LBS: 1.04

WEIGHT - KG: 0.47

SHEET: 1 OF 1

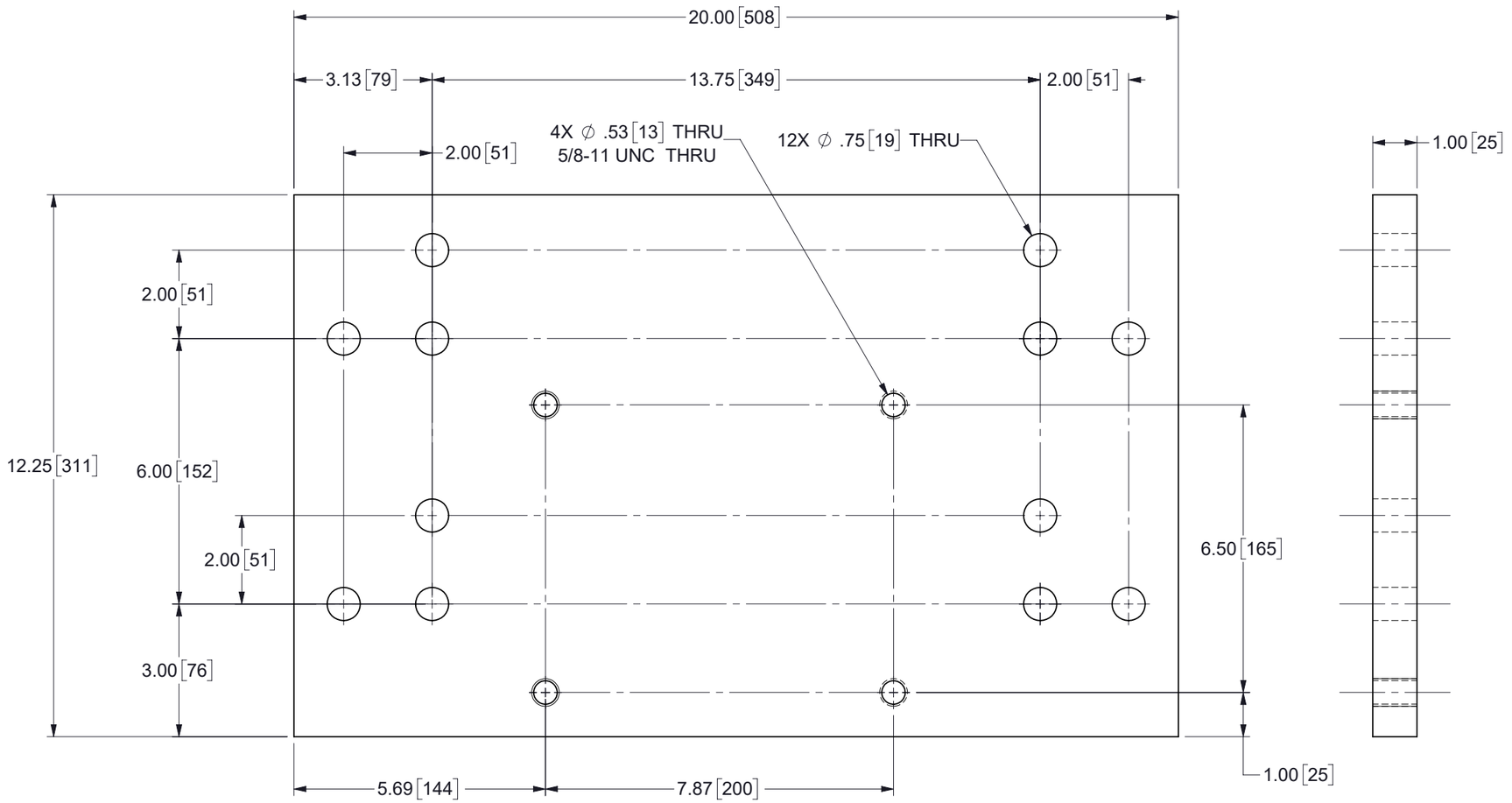
DRAWING NUMBER: 10000406-001

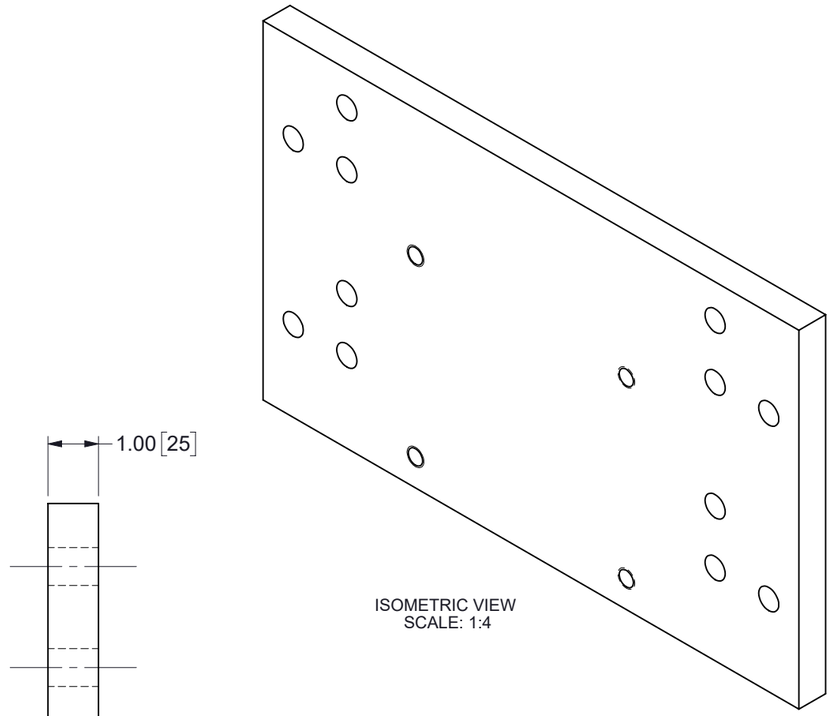
SCALE: 1:2

REV: 06

NOTES :

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3. DIMENSIONS ARE IN DECIMAL INCHES [MM]





ISOMETRIC VIEW
SCALE: 1:4

BRENTWOOD®

DRAWN: SK, 28 Nov 23	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: BASE PLATE, 1.00"x12.25"x20.00", KA77B, VERT MOUNT, ENG TAPPED HOLES, 304 SS		
CHECKER: SML, 07 Dec 23			
MATERIAL: AISI 304		WEIGHT - LBS: 69.02	WEIGHT - KG: 31.31
SHEET: 1 OF 1	DRAWING NUMBER: 10000423-093	SCALE: 1:3	REV: 01

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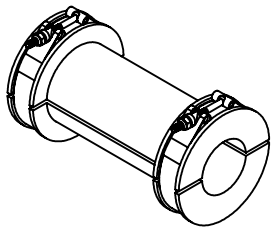
SUPERSEDES:

Rev 01

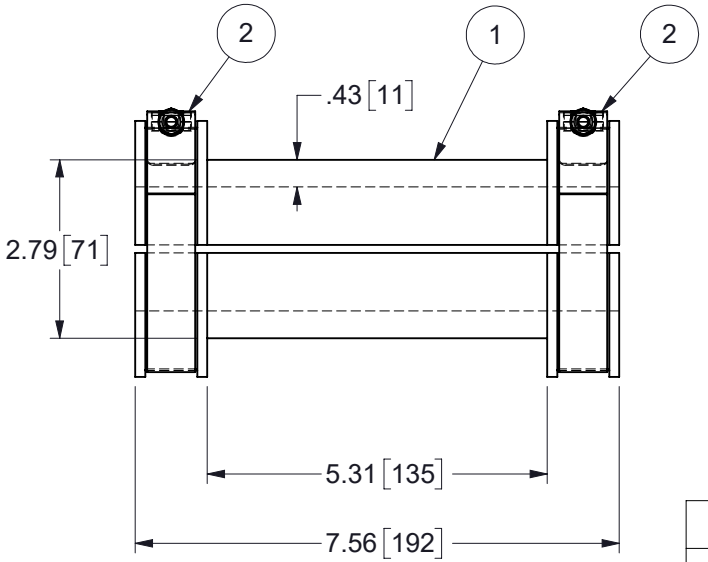
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SHAFT DIA. REF.	USED WITH SPROCKET	
	BORE DIA.	LENGTH THRU BORE
1.938 [49]	2.840 [72]	5.250 [133]

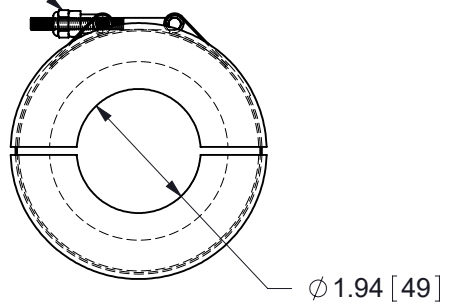


ISOMETRIC VIEW
SCALE: 1:6



SELF LOCKING HEX NUT MAY BE REMOVED TO OPEN THE BAND CLAMP FOR EASY INSTALLATION

1/4-28 HEX NUT (7/16" HEX ACROSS FLATS)
RECOMMENDED TIGHTENING TORQUE:
45 lbf in [5.1N m] MIN.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2	10000505-001	T-BOLT & TRUNION BAND CLAMP, 0.75" WIDE, 3.53" TO 3.84" ID RANGE, 316 SS	2	AISI 316
1	10000501-001	SPLIT SLEEVE BEARING, 1.94" x 4.00" x 7.56", UHMW-PE	1	UHMW-PE

BILL OF MATERIALS FOR 10000506-001

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
PF	SML	02/28/17

BRENTWOOD®

DRAWN VU 02/24/09
CHECKER ADM 08/12/09

DOCUMENT TYPE PRODUCT DEFINITION
LONG DESCRIPTION
STATIC SLEEVE BEARING ASSY, 1.94" SHAFT, 2.84" SPROCKET BORE, 316SS BAND CLAMP, UHMW-PE

MATERIAL SEE BILL OF MATERIALS
WEIGHT - LBS 1.45
WEIGHT - KG 0.66

SHEET 1 OF 1
DRAWING NUMBER 10000506-001
SCALE 1:3
REV 02

CONFIDENTIAL PROPERTY OF BRENTWOOD INDUSTRIES INC. (HEREINAFTER KNOWN AS, "BRENTWOOD")
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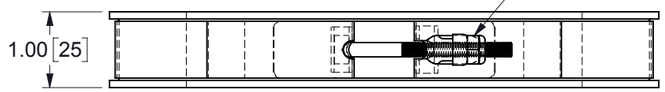
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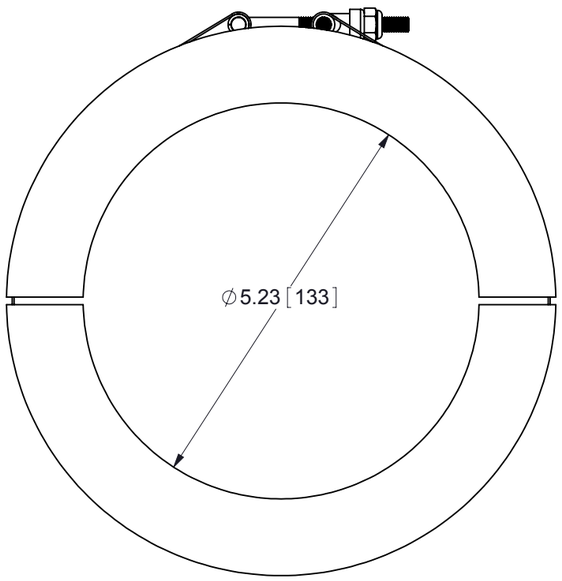
3. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.

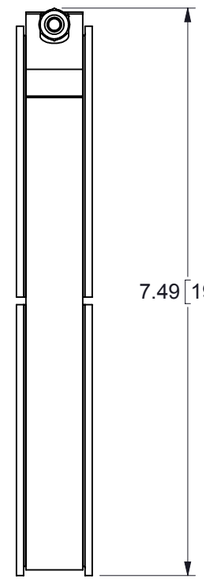
4. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

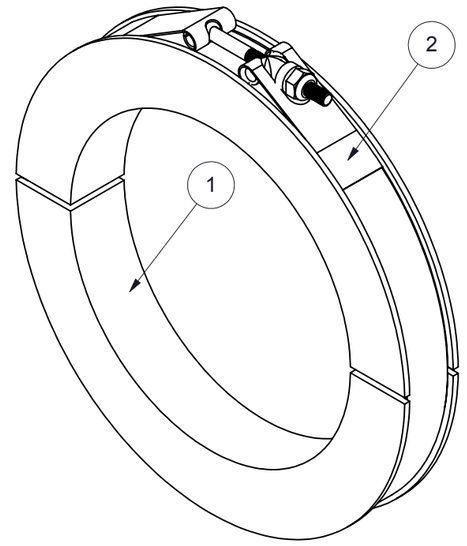
SELF LOCKING HEX NUT MAY BE REMOVED TO OPEN THE BAND CLAMP FOR EASE OF INSTALLATION.

RECOMMENDED TIGHTENING TORQUE:
45 lbf in [5.1 N m] MIN.









ISOMETRIC VIEW
SCALE: 1:2

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2	10000505-007	T-BOLT & TRUNION BAND CLAMP, 0.75" WIDE, 6.78" TO 7.09" ID RANGE, 316 SS	1	AISI 316
1	10000503-004	SPLIT COLLAR, PAIR, 5.23" DIA SHAFT, BLACK, PA6	1	CAST NYLON 6

BILL OF MATERIALS FOR 10000507-004

STATUS		
SUPERSEDES:		
CURRENT REVISION:		
BY	CKD	DATE
SPG	SML	01/06/17

BRENTWOOD®

DRAWN VU 02/24/09
CHECKER ADMIN 02/24/09

DOCUMENT TYPE PRODUCT DEFINITION
LONG DESCRIPTION
SHAFT SPLIT BAND COLLAR ASSY, 5.23" SHAFT, 316 SS BAND CLAMP, PA6

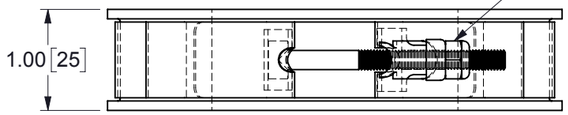
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
SEE BILL OF MATERIALS	0.92	0.42

SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10000507-004	1:2	03

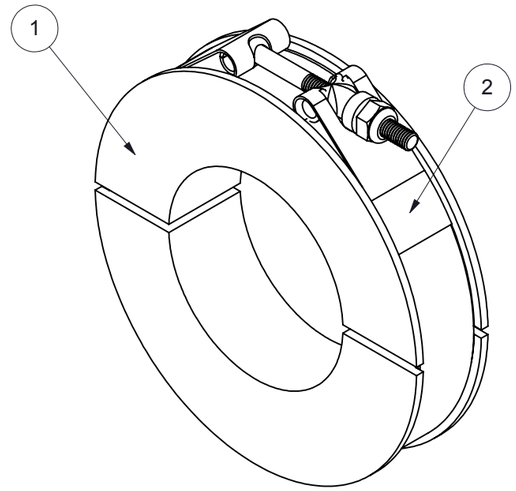
NOTES :

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2. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
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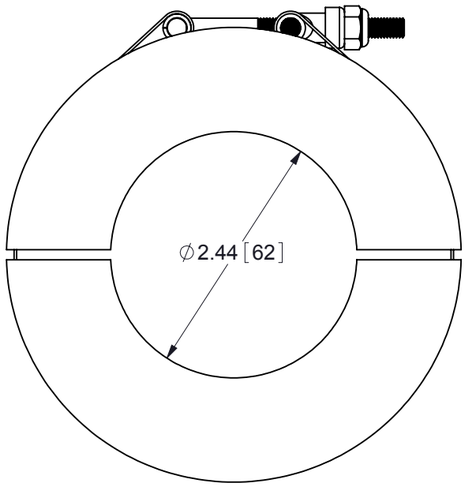


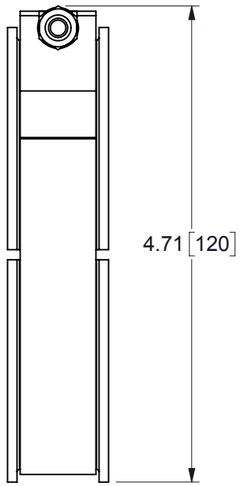
SELF LOCKING HEX NUT MAY BE REMOVED TO OPEN THE BAND CLAMP FOR EASE OF INSTALLATION.

RECOMMENDED TIGHTENING TORQUE:
45 lbf in [5.1 N m] MIN.



ISOMETRIC VIEW
SCALE: 2:3





ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2	10000505-002	T-BOLT & TRUNION BAND CLAMP, 0.75" WIDE, 4.03" TO 4.34" ID RANGE, 316 SS	1	AISI 316
1	10000503-017	SPLIT COLLAR, PAIR, 2.44" DIA SHAFT, BLACK, PA6	1	CAST NYLON 6

BILL OF MATERIALS FOR 10000507-017

CURRENT REVISION:		
BY	CKD	DATE
SPG	SML	01/06/17

STATUS

SUPERSEDES:

BRENTWOOD®

DRAWN VU 02/24/09
CHECKER ADMIN 02/24/09

DOCUMENT TYPE PRODUCT DEFINITION
LONG DESCRIPTION
SHAFT SPLIT BAND COLLAR ASSY, 2.44" SHAFT, 316 SS BAND CLAMP, PA6

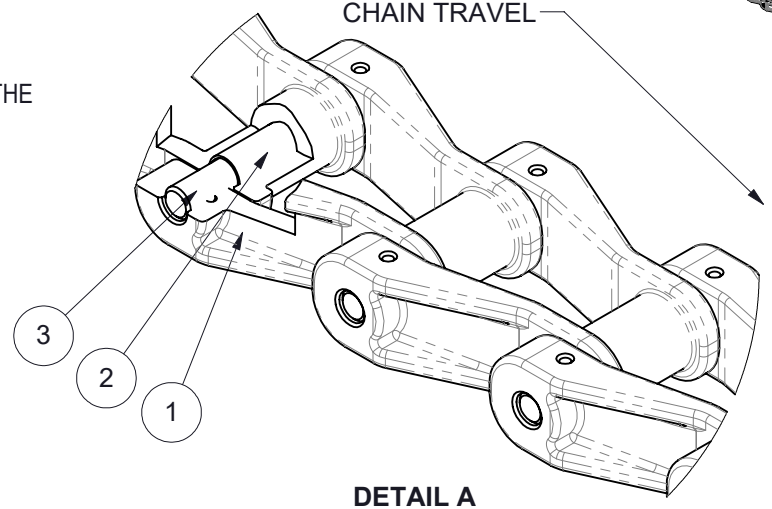
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MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 0.55
WEIGHT - KG: 0.25

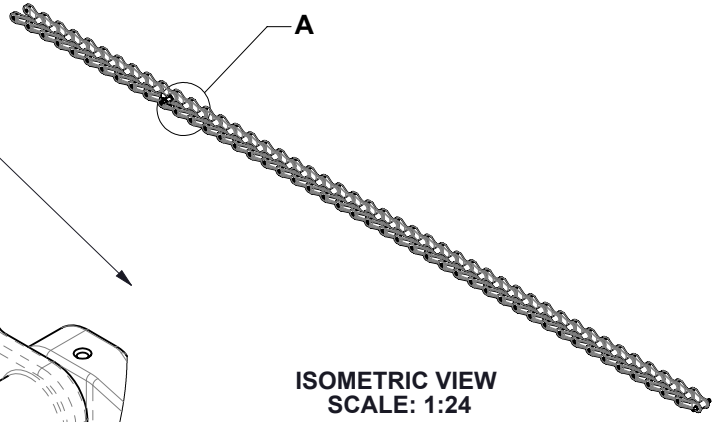
SHEET 1 OF 1
DRAWING NUMBER: 10000507-017
SCALE: 2:3
REV: 03

NOTES :

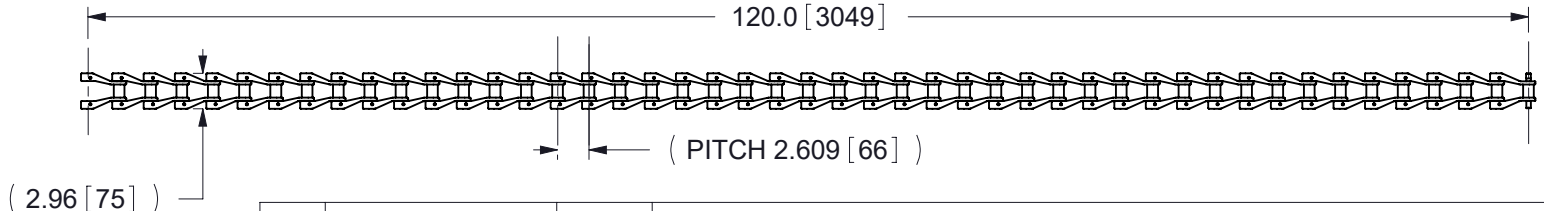
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2. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES [MM]
4. WORKING LOAD 1740lbf [7.74kN].



DETAIL A
SCALE 1 : 2



ISOMETRIC VIEW
SCALE: 1:24



ITEM	CATALOG NUMBER	QTY.	DESCRIPTION
3	10000510-001	46	KNURLED PIN, NH-78, 0.38" DIA x 2.91", 303 SS
2	10000509-001	46	SLEEVE BEARING, NH-78, 0.39" x 0.45" x 1.41, PP
1	10000511-001	46	NH-78 CHAIN LINK

BILL OF MATERIALS FOR 10000508-001

STATUS

SUPERSEDES: 637-15101

CURRENT REVISION:

BY	CKD	DATE
BSC	RAR	09/30/19

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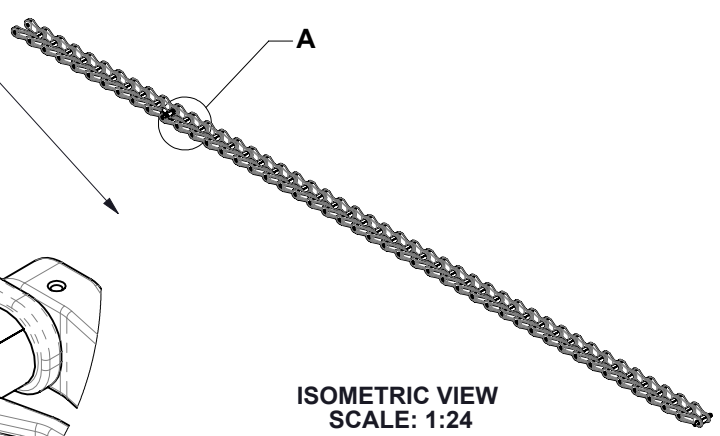
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DRAWN: VU 11/13/09
CHECKER: JMY 12/03/09

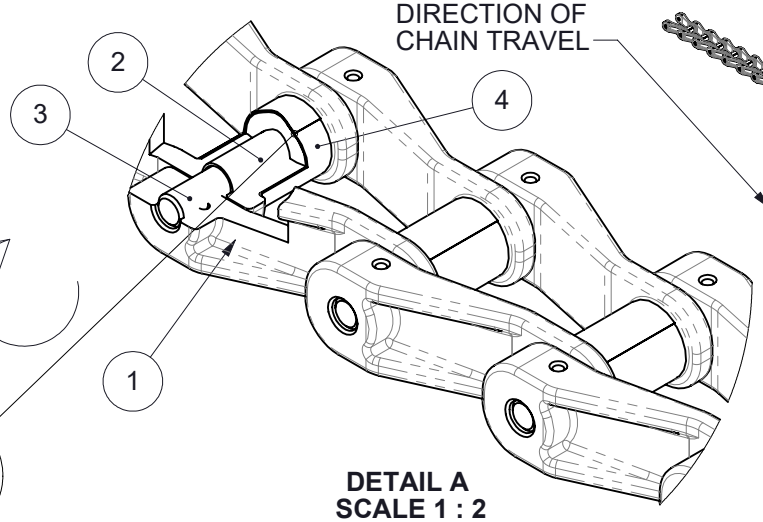
DOCUMENT TYPE: PRODUCT DEFINITION
LONG DESCRIPTION: NH-78 CHAIN STRAND, 10.0 FEET

MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 11.66
WEIGHT - KG: 5.29

SHEET: 1 OF 1
DRAWING NUMBER: 10000508-001
SCALE: 1:16
REV: 03

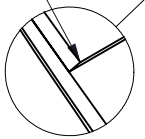


ISOMETRIC VIEW
SCALE: 1:24

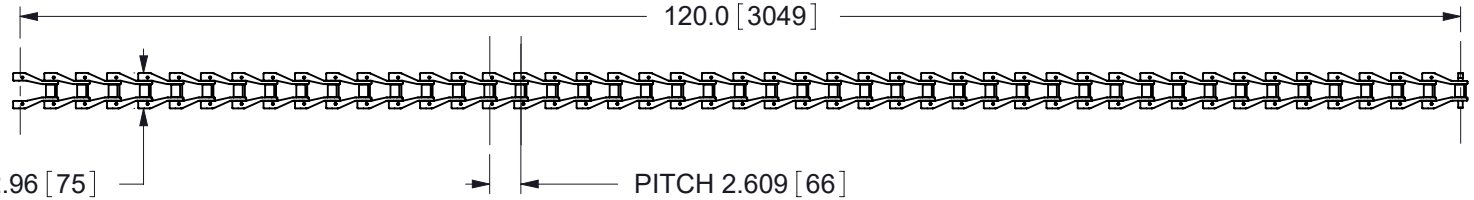


DETAIL A
SCALE 1 : 2

STAINLESS STEEL BARREL
WRAP ORIENTATION,
RELATIVE TO DIRECTION
OF SPROCKET ROTATION.



DETAIL B
SCALE 10 : 1



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000512-001	NH 78 CHAIN LINK BARREL WRAP, AISI 301	46	AISI 301
3	10000510-001	KNURLED PIN, NH-78, 0.38" DIA x 2.91", 303 SS	46	AISI 303
2	10000509-001	SLEEVE BEARING, NH-78, 0.39" x 0.45" x 1.41, PP	46	POLYPROPYLENE (PP)
1	10000511-001	NH-78 CHAIN LINK	46	GLASS REINFORCED NYLON 6/6

BILL OF MATERIALS FOR 10000508-002

NOTES :

1. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
2. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES [MM]
4. WORKING LOAD 1740lbf [7.74kN].

SUPERSEDES: 637-15133

BRENTWOOD

DRAWN: VU 11/13/09
CHECKER: SML 09/18/13
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: NH-78 CHAIN STRAND, 10.0 FEET, 301 SS BARREL WRAPS

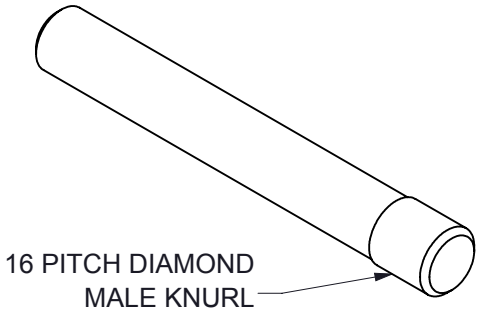
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MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 11.06
WEIGHT - KG: 5.02
SHEET: 1 OF 1
DRAWING NUMBER: 10000508-002
SCALE: 1:16
REV: 03

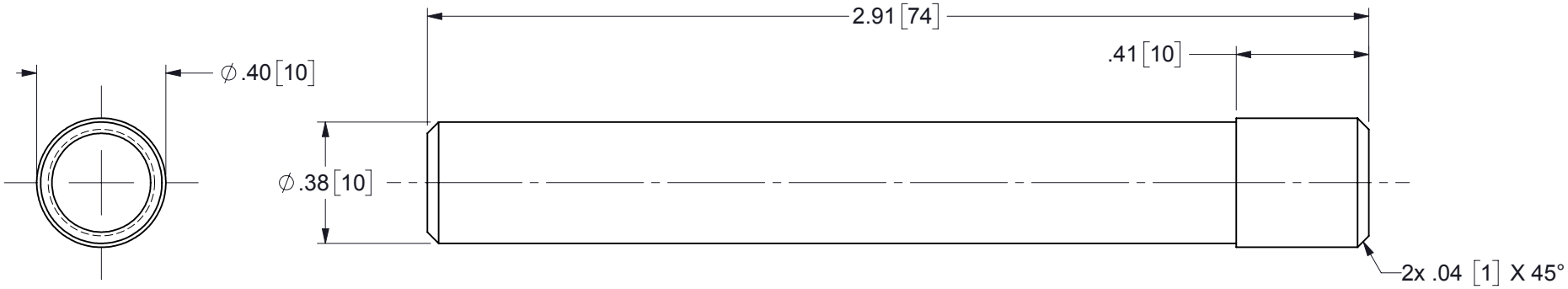
Rev 01

NOTES :

1. REMOVE ALL BURRS AND SHARP EDGES.
2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
3. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
4. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ISOMETRIC VIEW
SCALE: 1:1



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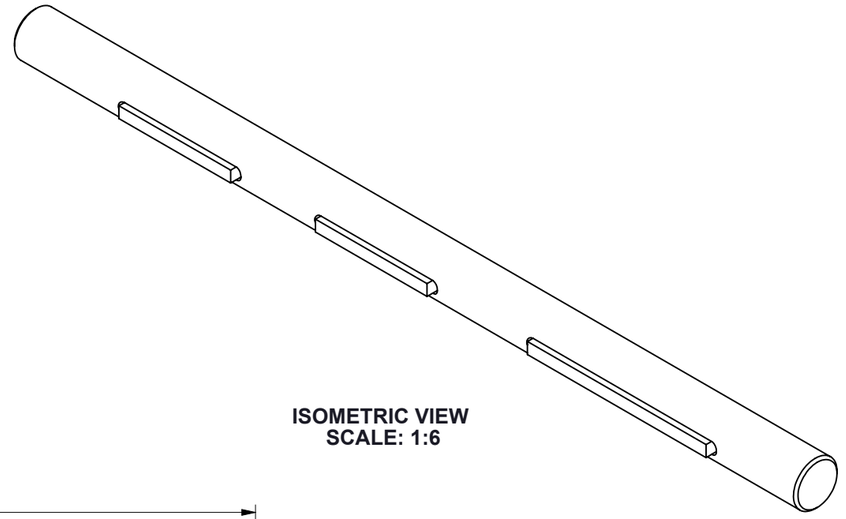
DRAWN VU 11/13/09	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION KNURLED PIN, NH-78, 0.38" DIA x 2.91", 303 SS			
CHECKER JMY 06/29/10				
MATERIAL AISI 303		WEIGHT - LBS 0.09	WEIGHT - KG 0.04	
SHEET 1 OF 1	DRAWING NUMBER 10000510-001	SCALE 1:1	REV 03	

SUPERSEDES: 638-13132

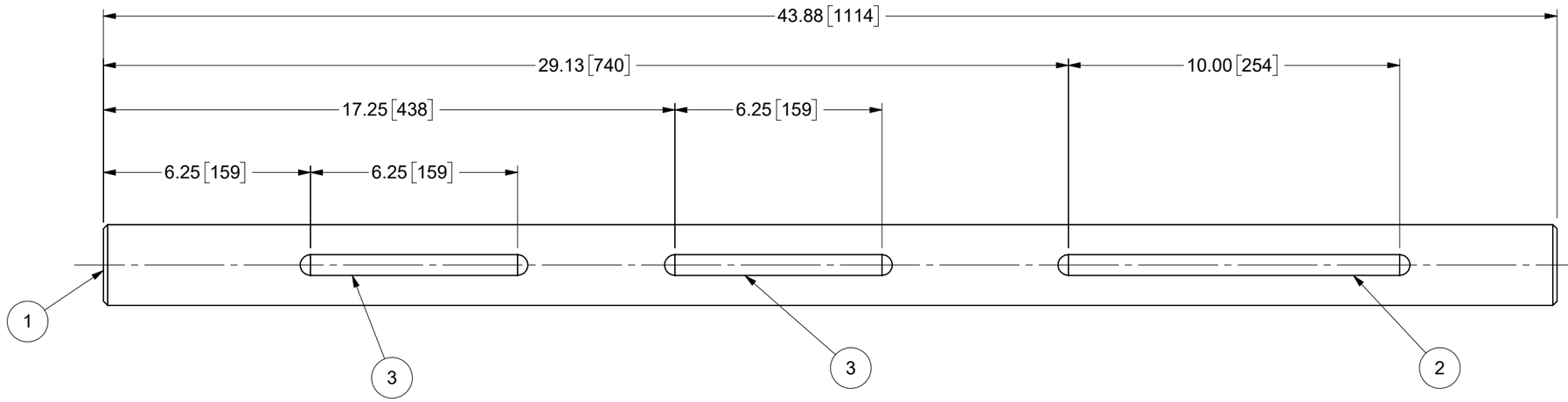
Rev 01

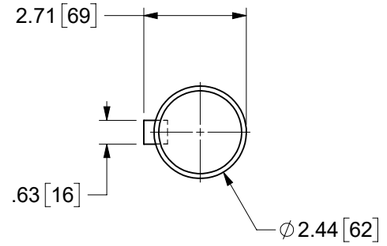
NOTES :

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5. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
6. KEYS TO SHIP IN PLACE, HELD IN PLACE WITH AN ADHESIVE BACKED REMOVABLE TAPE.
7. PICKLE AND PASSIVATE IN ACCORDANCE WITH THE LATEST REVISION OF POLYCHEM SPECIFICATION P-1000.



ISOMETRIC VIEW
SCALE: 1:6





ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000330-139	KEY, 0.63" x 0.63" x 6.25", AISI 304	2	AISI 304
2	10000330-077	KEY, 0.63" x 0.63" x 10.00", 304 SS	1	AISI 304
1	10000779-135	HEAD SHAFT, 2.44" X 43.88" LONG, 3 KEYWAYS, 304 SS	1	AISI 304

BILL OF MATERIALS FOR 10000574-099

STATUS
.

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
VP	SML	05 Sep 23

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DRAWN VP 05 Sep 23
CHECKER SML 08 Sep 23

DOCUMENT TYPE PRODUCT DEFINITION
LONG DESCRIPTION
HEADSHAFT ASSEMBLY, 2.44" DIA, 43.88" LONG, 2 KEYS, AISI 304

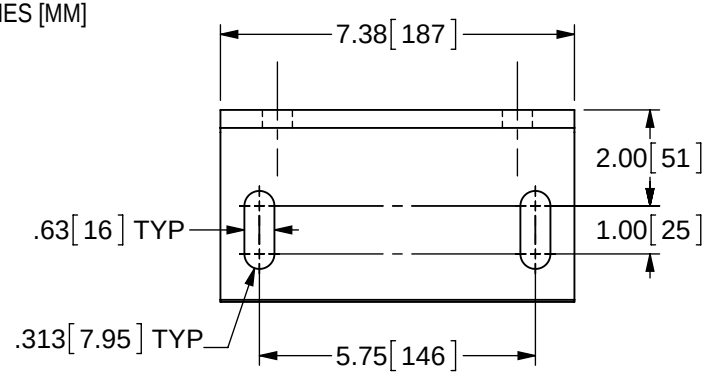
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 60.21
WEIGHT - KG: 27.31

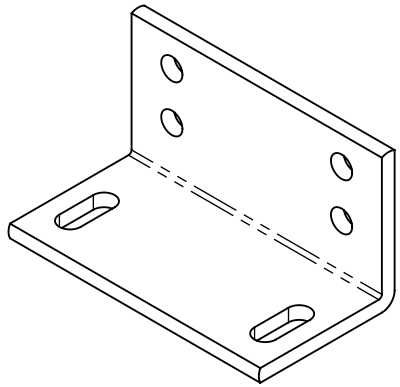
SHEET: 1 OF 1
DRAWING NUMBER: 10000574-099
SCALE: 1:4
REV: 01

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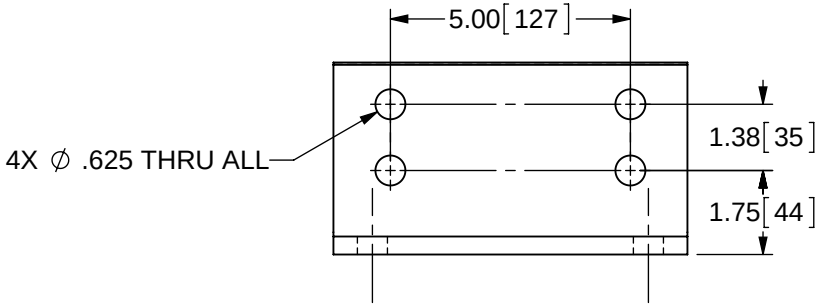
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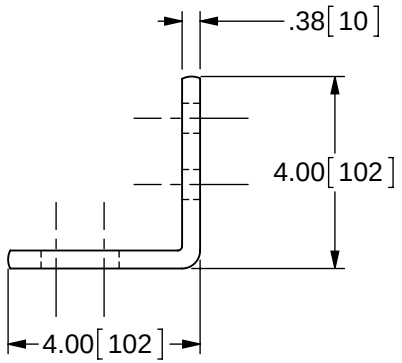
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ISOMETRIC VIEW
SCALE: 1:4





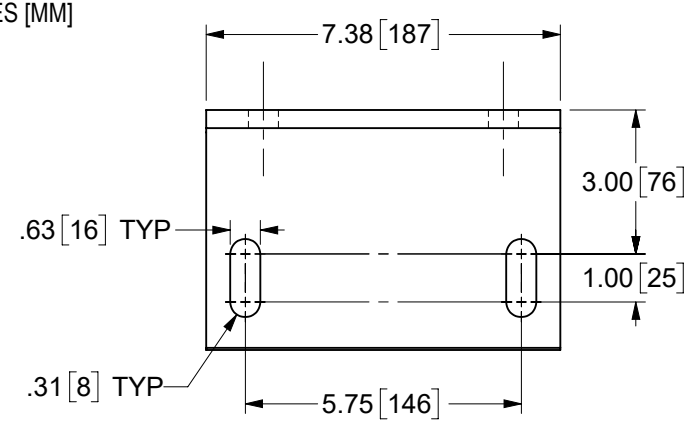
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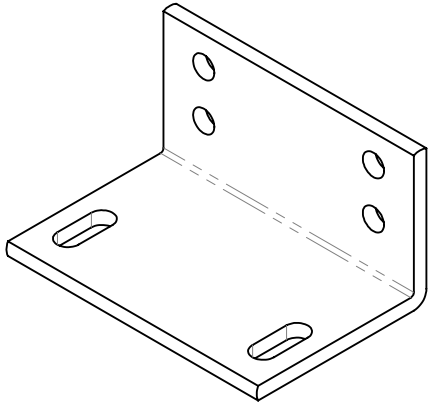
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DRAWN: AIM 09/09/13	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: ANGLE, L4x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP			
CHECKER: AIM 09/13/13				
MATERIAL: FRP		WEIGHT - LBS: 1.32	WEIGHT - KG: 0.60	
SHEET: 1 OF 1	DRAWING NUMBER: 10000581-003	SCALE: 1:4	REV: 01	

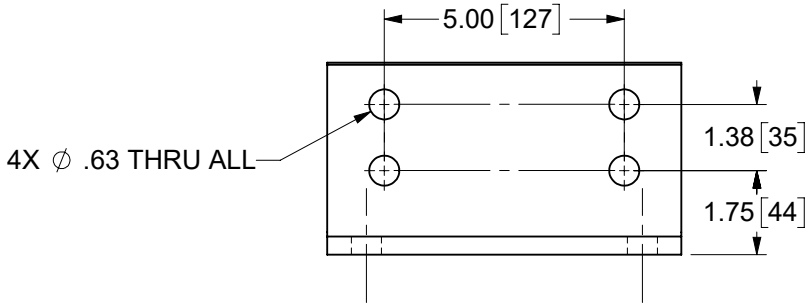
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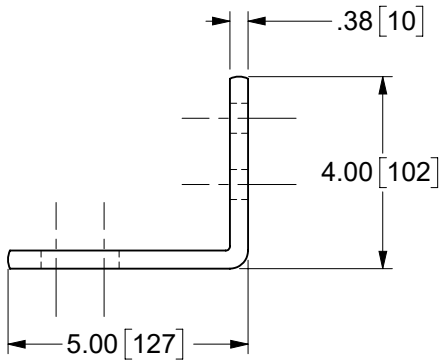
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ISOMETRIC VIEW
SCALE: 1:4





BRENTWOOD

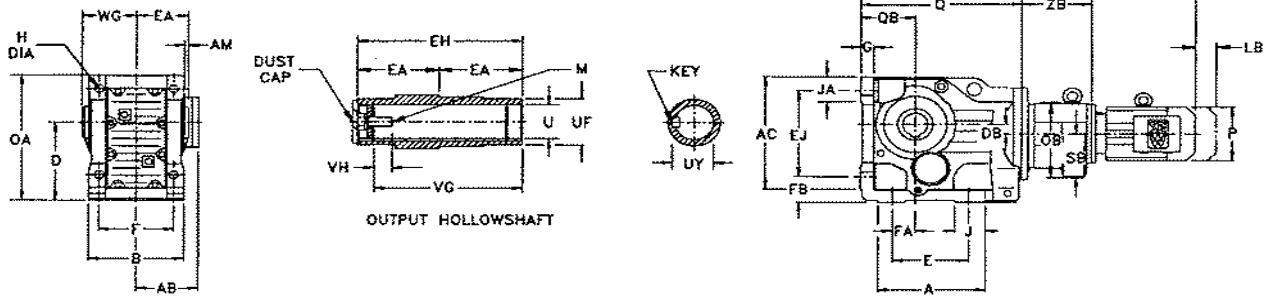
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SUPERSEDES:

DRAWN: GTY 10/19/13	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: ANGLE, L5x4x3/8 x 7.38", 4 HOLE & 2 SLOTS, FRP			
CHECKER: CSR 05/15/15				
MATERIAL: FIBER REINFORCED POLYESTER		WEIGHT - LBS: 1.50	WEIGHT - KG: 0.68	
SHEET: 1 OF 1	DRAWING NUMBER: 10000581-004	SCALE: 1:4	REV: 02	

SEW EURODRIVE

Dimensions
Type KA Gearmotors - Shaft Mounted



Gear Case

Model	A	AM	B	DB	EA	F	FA	FB	E	EJ	OA	Q	QB	ZB	WG
KA77BR37	8.19	0.16	7.87	1.23	4.13	6.5	1.57	2.17	5.91	7.87	11.3	12.36	4.41	6.18	4.25

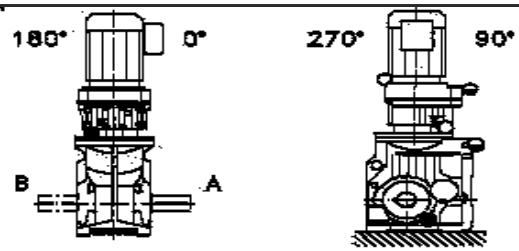
Output Shaft Inch series

EH	U	UF	UY	VG	VH	Key	M
8.27	2.000 (+0.001/-0)	2.76	2.22	7.20	1.16	1/2x1/2x2 5/8	5/8-11x1-3/4

Motor

Model	SEW DRN71M4	
	AB	5.08
	LB	2.64
	P	5.47
KA77BR37	C	27.28

Dimensions are **Inch**
Dimension LB is for Brake Option.



REDUCER SPECIFICATIONS:

Style	Helical-Bevel Gearmotor
Model	KA77BR37
Rated Torque	13700 in-lbf
Reducer Output RPM	1.20 rpm
Reducer Ratio	1388 :1
Overhung Load	3460 lbf
Output Shaft Diameter	2.000 in
Mounting	Foot Mounted, M4
Adapter	Integral
AGMA Service Factor	1.5 (Based on Running Torque)
Manufacturer	SEW

MOTOR SPECIFICATIONS:

Model	DRN71M4/C/DH/RI
Horsepower	0.5 HP
Phase	3 Ph
Frequency	60 Hz
Voltage	330/575 V
Output Speed	1730 RPM
Enclosure	TEFC/IP66
Service Factor	1.15
Mounting	Conduit Box @ 270°/1
Manufacturer	SEW

SPECIAL CONDITIONS: Reducer: Severe Duty Paint (OS4, Gray) CORTEC on Output Shaft, Double Seals on Output Shaft, Long Term Storage, Oil Sight Glasses, Stainless Steel Hollow Shaft Option

Lubricant: Shell Omala S4 GX150 (-30°C to +50°C)

**Relocate reducer nameplate on top of gear case per M4 mounting.*

Motor: Severe Duty Paint (OS4, Gray), Class F Insulation with Class B Temperature Rise, 40°C Max Ambient Temp, Canopy, Drain Holes, SS Nameplate, Include Standard/Routine Test Report, Include Reinforced Winding Insulation

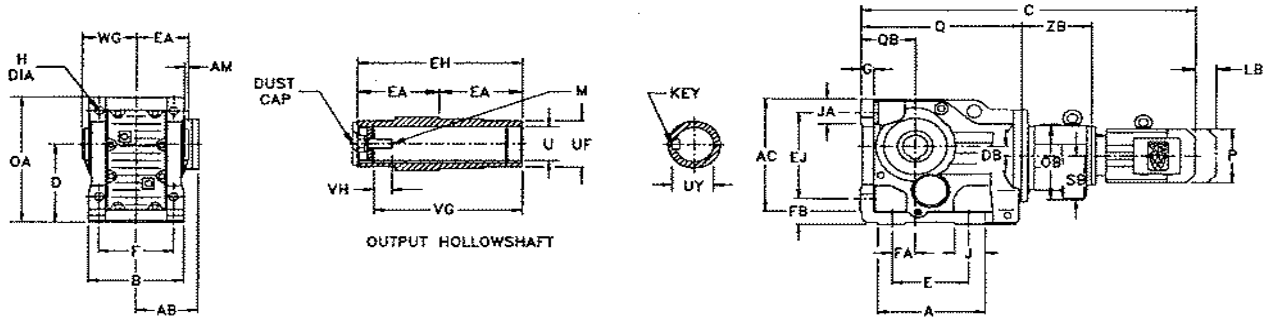
Refer also to Equipment O&M Manual section 7.2 for complete OEM technical data

Approx. Weight: 155 lbs.

DATE: 07-14-23	BRENTWOOD			
BY: RHP	SEW REDUCER KA77BR37DRN71M4/C/DH/RI, 1388:1			
NTS	SHEET 1	SIZE A	DRAWING No. 10000583-201	REV 1

SEW EURODRIVE

Dimensions
Type KA Gearmotors - Shaft Mounted



Gear Case

Model	A	AM	B	DB	EA	F	FA	FB	E	EJ	OA	Q	QB	ZB	WG
KA77BR37	8.19	0.16	7.87	1.23	4.13	6.5	1.57	2.17	5.91	7.87	11.3	12.36	4.41	6.18	4.25

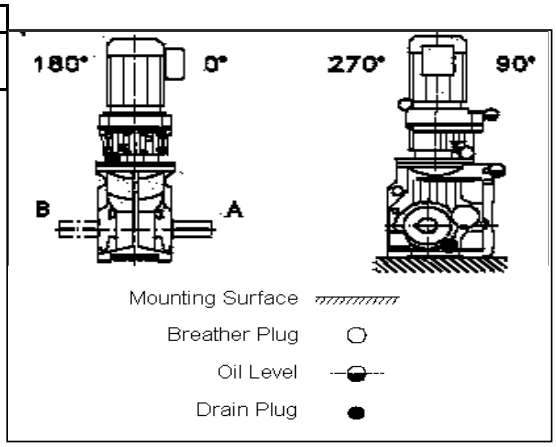
Output Shaft Inch series

EH	U	UF	UY	VG	VH	Key	M
8.27	2.000 (+0.001/-0)	2.76	2.22	7.20	1.16	1/2x1/2x2 5/8	5/8-11x1-3/4

Motor

Model	SEW DRN71M4	
	AB	5.08
	LB	2.64
	P	5.47
KA77BR37	C	27.28

Dimensions are **inch**
Dimension LB is for Brake Option.



REDUCER SPECIFICATIONS:

Style	Helical-Bevel Gearmotor
Model	KA77BR37
Rated Torque	13700 in-lbf
Reducer Output RPM	2.40 rpm
Reducer Ratio	709 :1
Overhung Load	3460 lbf
Output Shaft Diameter	2.000 in
Mounting	Foot Mounted, M4A
Adapter	Integral
AGMA Service Factor	1.5 (Based on Running Torque)
Manufacturer	SEW

MOTOR SPECIFICATIONS:

Model	DRN71M4/C/DH/RI
Horsepower	0.5 HP
Phase	3 Ph
Frequency	60 Hz
Voltage	330/575 V
Output Speed	1730 RPM
Enclosure	TEFC/IP66
Service Factor	1.15
Mounting	Conduit Box @ 270°/1
Manufacturer	SEW

SPECIAL CONDITIONS: Reducer: Severe Duty Paint (OS4, Gray), CORTEC on Output Shaft, Double Seals on Output Shaft, Long Term Storage, Oil Sight Glass, Stainless Steel Hollow Shaft Option
Lubricant: Shell Omala S4 GX150 (-30°C to + 50°C)
Motor: Severe Duty Paint (OS4, Gray), Class F Insulation with Class B Temperature Rise, 40°C Max Ambient Temp, Canopy, Drain Holes, SS Nameplate, Include Standard/Routine Test Report, Include Reinforced Winding Insulation
**Relocate reducer nameplate on top of gear case per M4 mounting.*

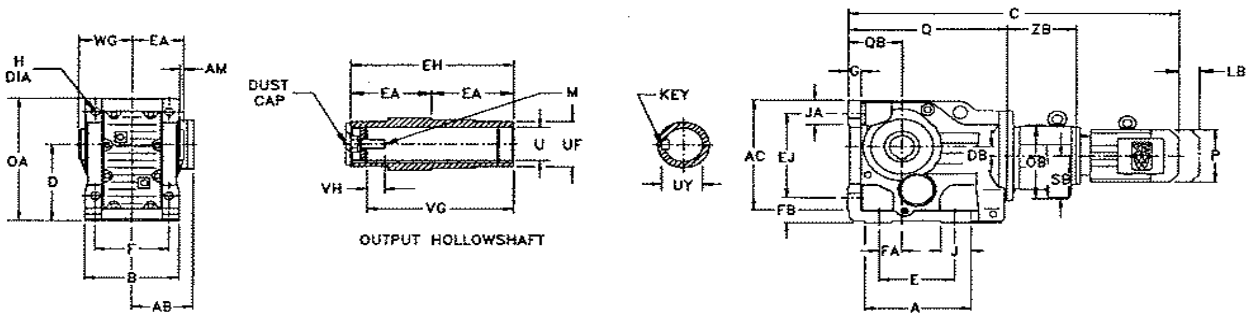
Refer also to Equipment O&M Manual section 7.2 for complete OEM technical data.

Approx. Weight: 155 lbs.

DATE: 07-14-23	BRENTWOOD			
BY: RHP	SEW REDUCER KA77BR37DRN71M4/C/DH/RI, 709:1			
NTS	SHEET 1	SIZE A	DRAWING No. 10000583-202	REV 2

SEW EURODRIVE

Dimensions
Type KA Gearmotors - Shaft Mounted



Gear Case

Model	A	AM	B	DB	EA	F	FA	FB	E	EJ	OA	Q	QB	ZB	WG
KA77BR37	8.19	0.16	7.87	1.23	4.13	6.5	1.57	2.17	5.91	7.87	11.3	12.36	4.41	6.18	4.25

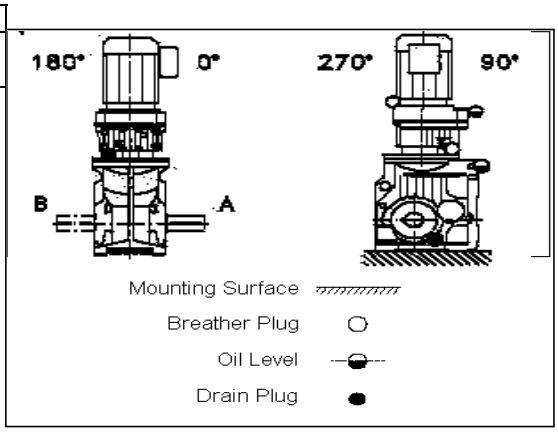
Output Shaft Inch series

EH	U		UF	UY	VG	VH	Key	M
8.27	2.000	(+0.001/-0)	2.76	2.22	7.20	1.16	1/2x1/2x2 5/8	5/8-11x1-3/4

Motor

Model	SEW DRN71M4	
	AB	5.08
	LB	2.64
	P	5.47
KA77BR37	C	27.28

Dimensions are **Inch**
Dimension LB is for Brake Option.



REDUCER SPECIFICATIONS:

Style	Helical-Bevel Gearmotor	
Model	KA77BR37	
Rated Torque	13700	in-lbf
Reducer Output RPM	1.20	rpm
Reducer Ratio	1388	:1
Overhung Load	3460	lbf
Output Shaft Diameter	2.000	in
Mounting	Foot Mounted, M4	
Adapter	Integral	
AGMA Service Factor	1.5 (Based on Running Torque)	
Manufacturer	SEW	

MOTOR SPECIFICATIONS:

Model	EDRN71M4/FG/CICIID2/C/RI	
Horsepower	0.5	HP
Phase	3	Ph
Frequency	60	Hz
Voltage	330/575	V
Output Speed	1745	RPM
Enclosure	TEFC/IP66	
Service Factor	1.15	
Mounting	Conduit Box @ 270°/1	
Manufacturer	SEW	

SPECIAL CONDITIONS: Reducer: Severe Duty Paint (OS4, Gray) CORTEC on Output Shaft, Double Seals on Output Shaft, Long Term Storage, Oil Sight Glasses, Stainless Steel Hollow Shaft Option

Lubricant: Shell Omala S4 GX150 (-30°C to +50°C)

**Relocate reducer nameplate on top of gear case per M4 mounting.*

Motor: Severe Duty Paint (OS4, Gray), Class F Insulation with Class B Temperature Rise, 40°C Max Ambient Temp, Canopy, Drain Holes, SS Nameplate, Hazardous Rating: CL 1 Div 2, Groups A-D and CLII, Div 2 Groups F&G, Include Standard/Routine Test Report, Include Reinforced Winding Insulation

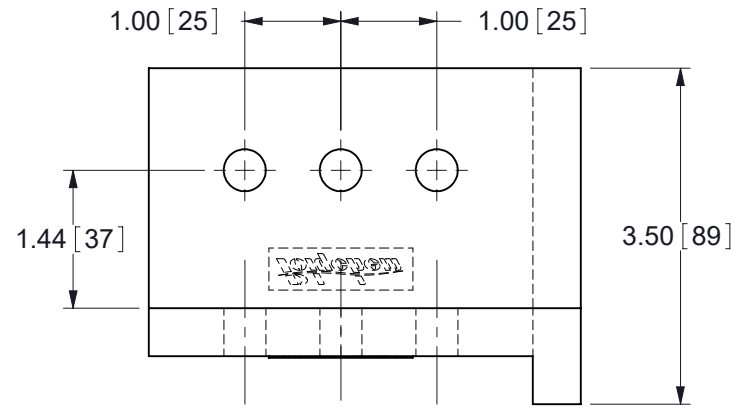
Refer also to Equipment O&M Manual section 7.2 for complete OEM technical data

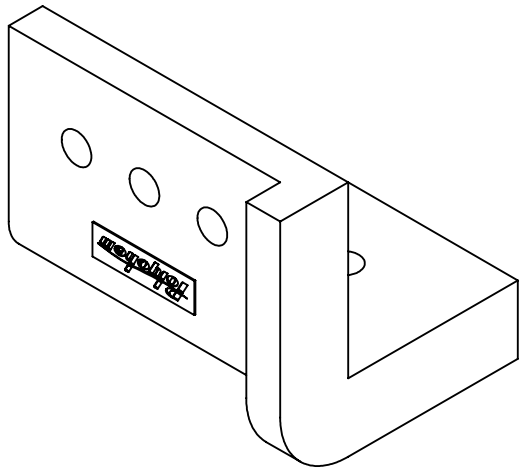
Approx. Weight: 155 lbs.

DATE: 01-08-24	BRENTWOOD			
BY: RHP	SEW REDUCER KA77BR37EDRN71M4/FG/CICIID2/C/RI, 1388:1			
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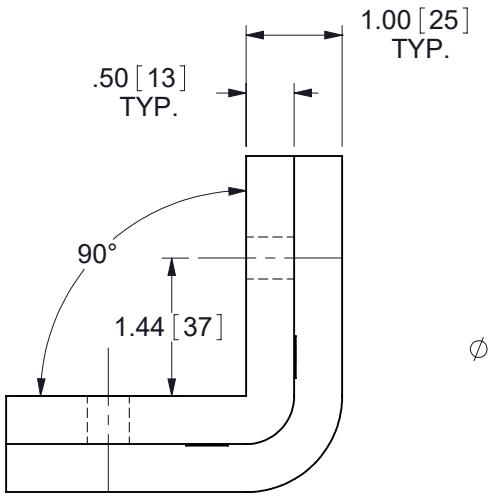
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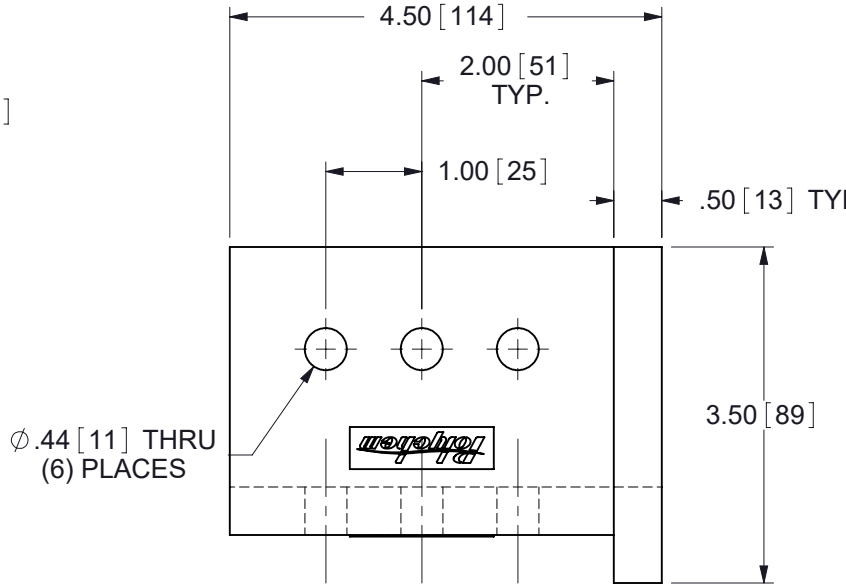
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ISOMETRIC VIEW
SCALE: 1:2





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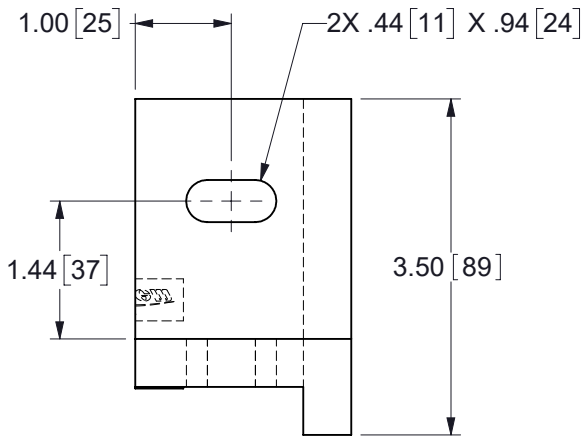
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CHECKER	LEH 05/01/15
DOCUMENT TYPE	CUSTOMER OUTLINE
LONG DESCRIPTION	RETURN WEAR SHOE, LUGGED, 6 HOLES, 4.50", LUBRICATED PA6/6-BLACK
MATERIAL	LUBRICATED NYLON 6/6
WEIGHT - LBS	0.55
WEIGHT - KG	0.25
SHEET	1 OF 1
DRAWING NUMBER	10000595-006
SCALE	1:2
REV	05

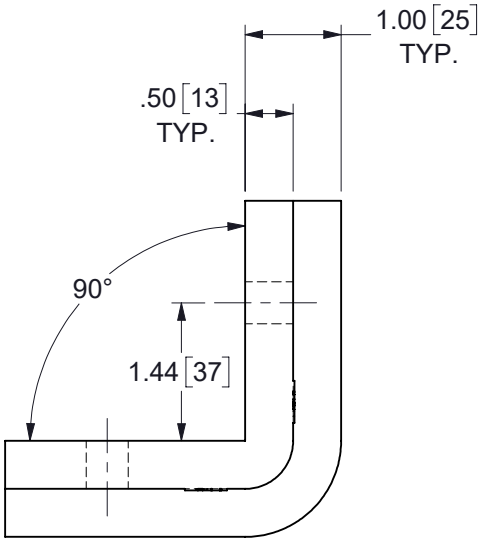
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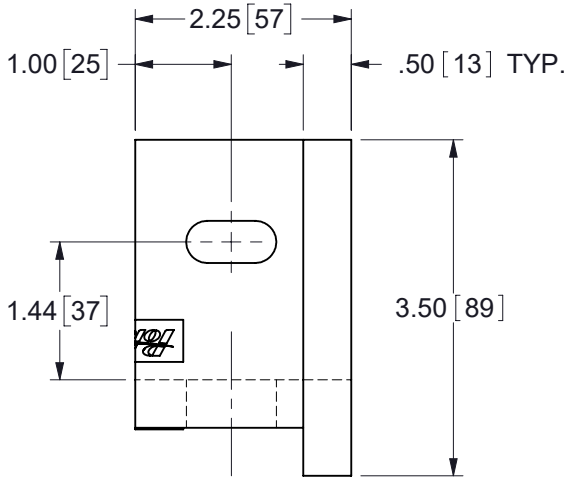
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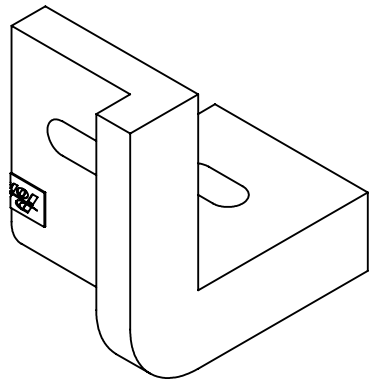
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ISOMETRIC VIEW
SCALE: 1:2

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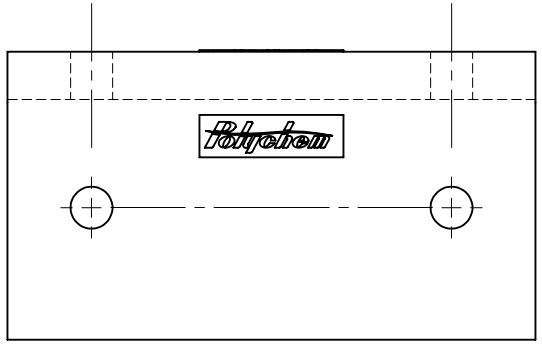
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CHECKER: SML 26 Sep 23			
MATERIAL: LUBRICATED NYLON 6/6		WEIGHT - LBS: 0.30	WEIGHT - KG: 0.14
SHEET: 1 OF 1	DRAWING NUMBER: 10000595-021	SCALE: 1:2	REV: 01

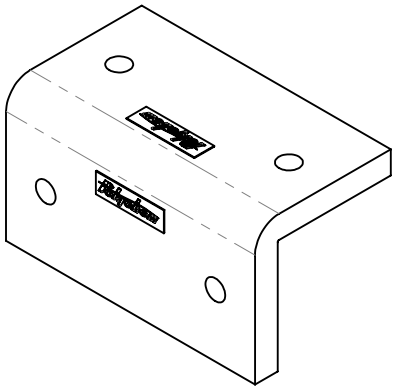
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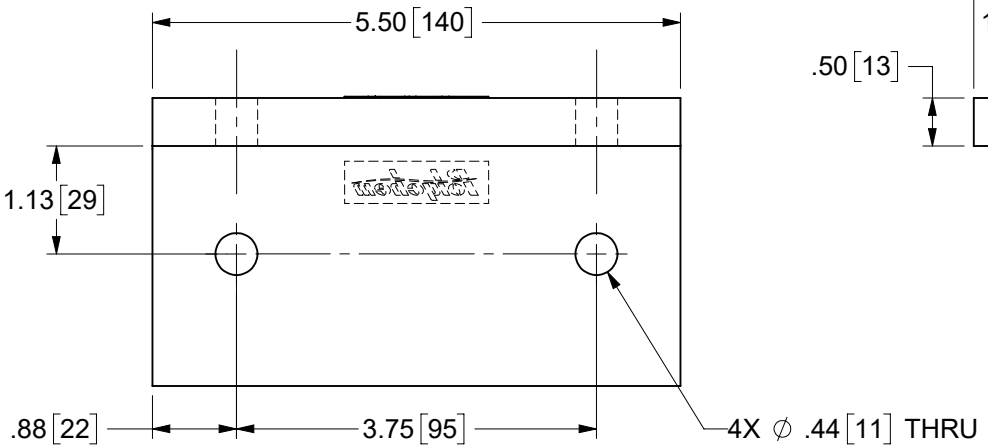
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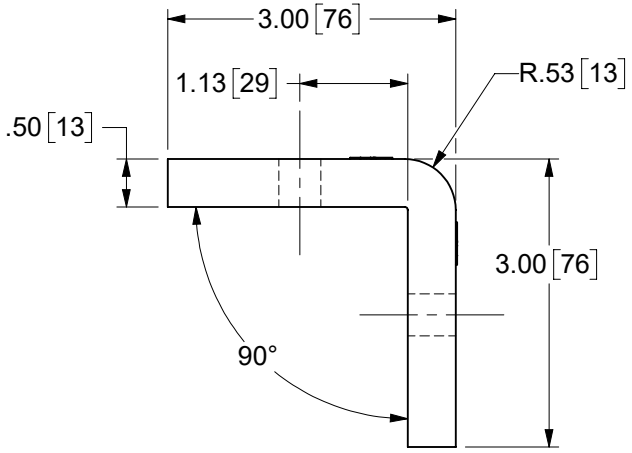
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ISOMETRIC VIEW
SCALE: 1:3





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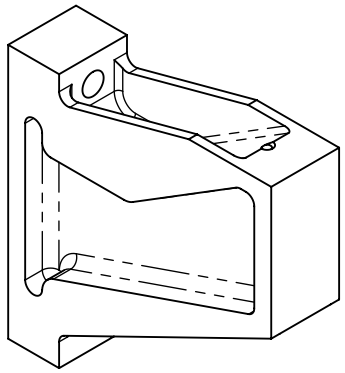
DRAWN GTY 06/20/14	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION		
CHECKER LEH 05/01/15	CARRYING WEAR SHOE, 4 HOLES, 5.50", LUBRICATED PA6/6-BLACK		
MATERIAL LUBRICATED NYLON 6/6		WEIGHT - LBS 0.60	WEIGHT - KG 0.27
SHEET 1 OF 1	DRAWING NUMBER 10000711-007	SCALE 1:2	REV 06

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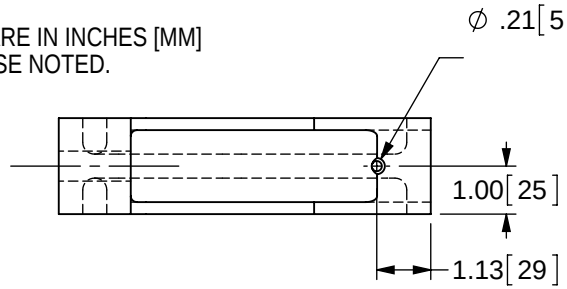
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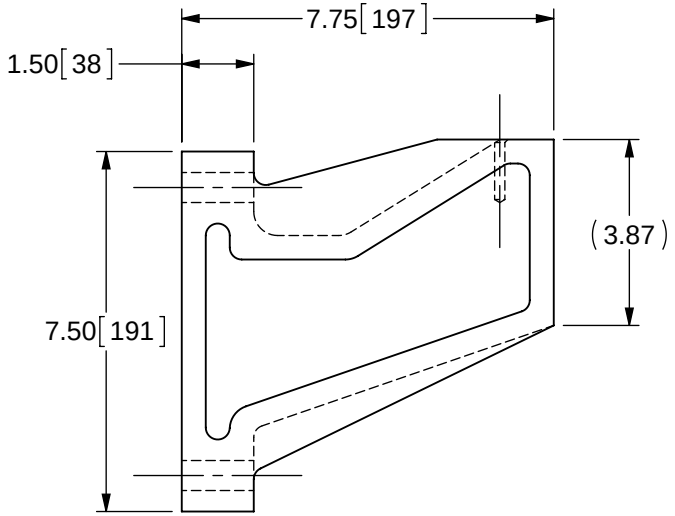
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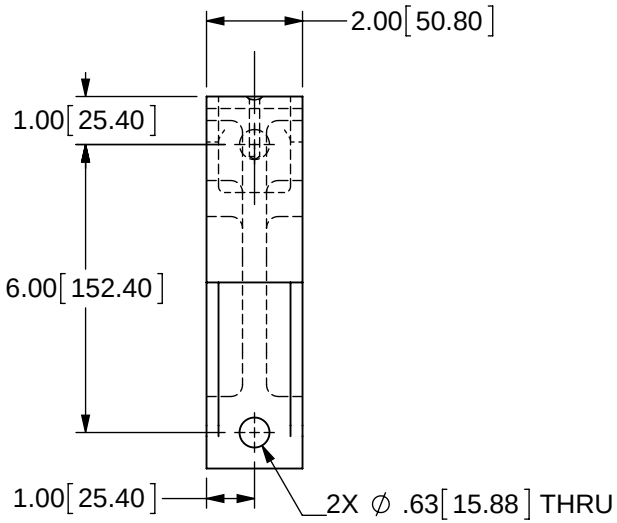
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ISOMETRIC VIEW
SCALE: 1:4







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DRAWN LEH 09/11/13
CHECKER AIM 09/18/13

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
WALL BRACKET, 7.75", PA6/6

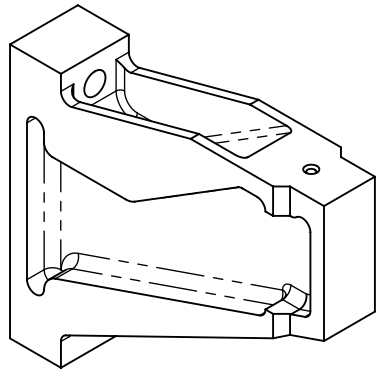
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
NYLON 6/6-33% GR	1.92	0.87

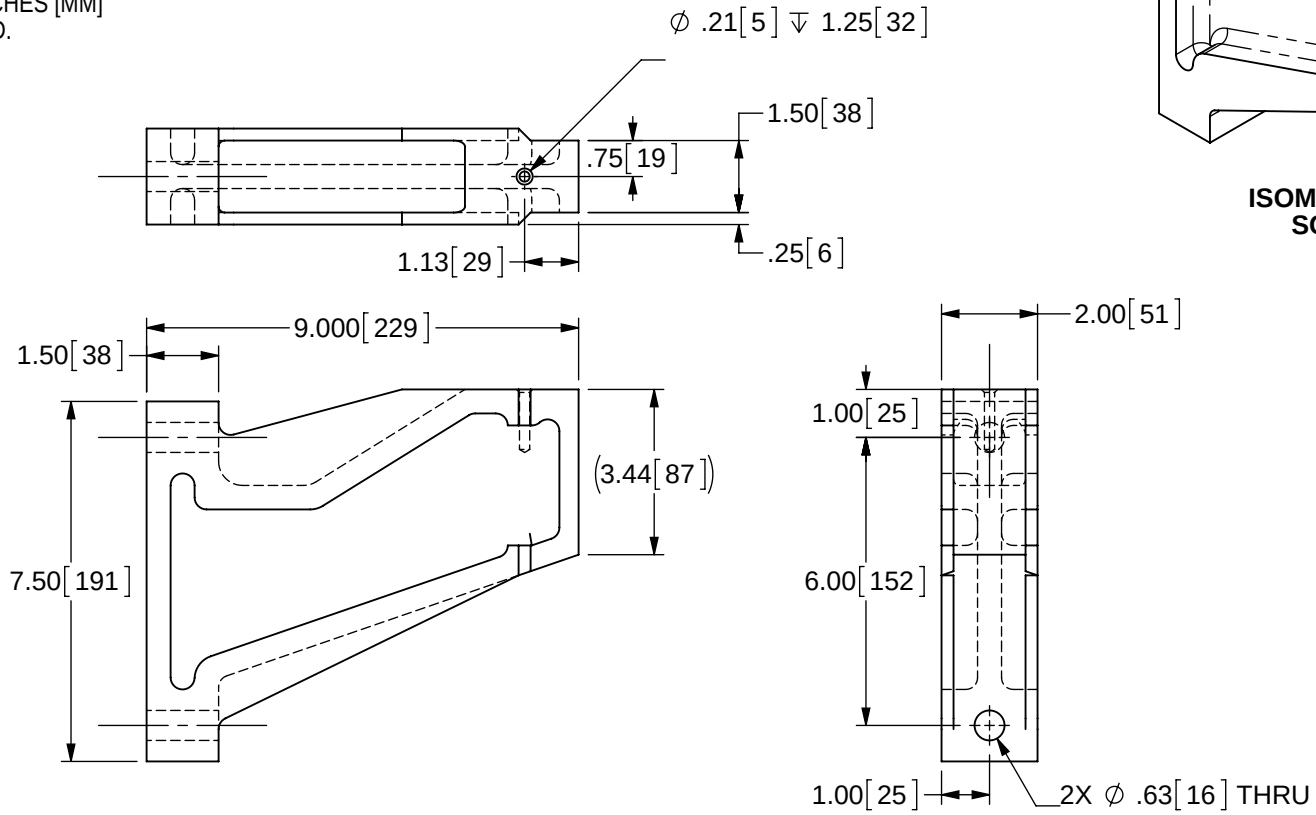
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1 OF 1	10000716-005	1:4	01

NOTES :

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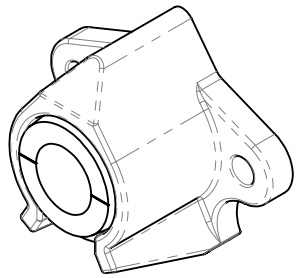
ISOMETRIC VIEW
SCALE: 1:4



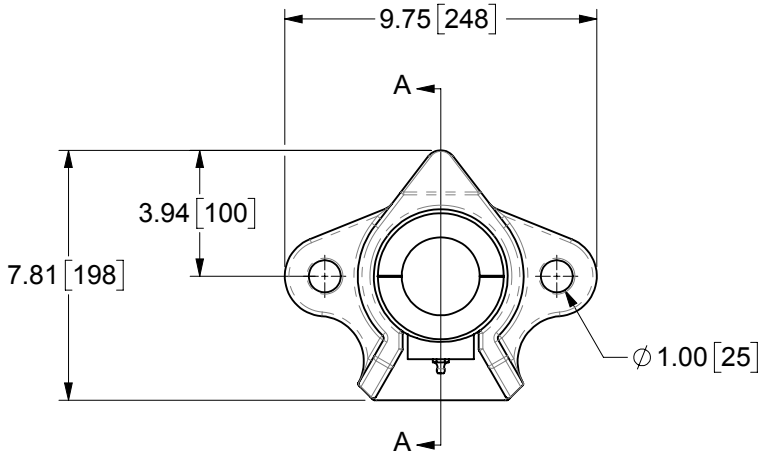
BRENTWOOD®	DRAWN LEH 09/06/13 CHECKER AIM 09/17/13	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION WALL BRACKET, 9.00", PA6/6		
CONFIDENTIAL PROPERTY OF BRENTWOOD INDUSTRIES INC. (HEREINAFTER KNOWN AS, ▯BRENTWOOD▯) NOTICE: THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION WHICH IS THE PROPERTY OF BRENTWOOD. THE RECIPIENT OF THIS DOCUMENT AGREES TO USE THE INFORMATION CONTAINED HEREIN FOR THE LIMITED PURPOSE OF WHICH IT WAS FURNISHED BY BRENTWOOD AND FURTHER AGREES TO NEITHER COPY, MODIFY, REVERSE ENGINEER NOR AUTHORIZE ANYONE ELSE TO DO SO ON ITS BEHALF. THE RECIPIENT FURTHER AGREES THAT IT WILL NOT DISCLOSE THIS INFORMATION TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF BRENTWOOD. THIS NOTICE SHALL APPEAR ON ANY COMPLETE OR PARTIAL REPRODUCTION OF THIS DOCUMENT.	MATERIAL NYLON 6/6-33% GR	WEIGHT - LBS 2.04	WEIGHT - KG 0.93	
	SHEET 1 OF 1	DRAWING NUMBER 10000716-009	SCALE 1:4	REV 01

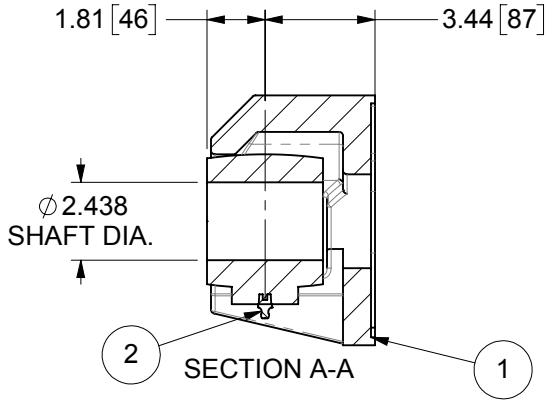
NOTES :

1. REMOVE ALL BURRS AND SHARP EDGES.
2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
3. PRODUCTS ARE TO BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
4. ALL DIMENSIONS ARE IN INCHES[MM] UNLESS OTHERWISE NOTED.
5. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
6. CARBON STEEL AND CAST IRON METALS PAINTING AND SURFACE PREP:
   1. SURFACE PREP: SSPC-SP10 NEAR WHITE METAL BLAST CLEANING
   2. PAINT: ONE(1) COAT OF SHERWIN WILLIAMS DURA-PLATE 235 @ 4 MILS D.F.T



ISOMETRIC VIEW
SCALE: 1:6





ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2	10000335-001	GREASE FITTING, STRAIGHT, MALE THREADED, 1/8 NPT, SS	1	STAINLESS STEEL
1	10000577-002	WALL BEARING, PEAK-CAP, SPLIT, 2.44" SHAFT, UHMW LINED	1	Gray Cast Iron

BILL OF MATERIALS FOR 10000717-019

STATUS

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
DME	VB	06/01/17

BRENTWOOD®

DRAWN DME 06/01/17

CHECKER VB 06/01/17

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

WALL BEARING ASSY, PEAK-CAP, SPLIT, 2.44" SHAFT, UHMW LINED, WITH GREASE FITTING

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MATERIAL: SEE BILL OF MATERIAL

WEIGHT - LBS: 28

WEIGHT - KG: 12.70

SHEET: 1 OF 1

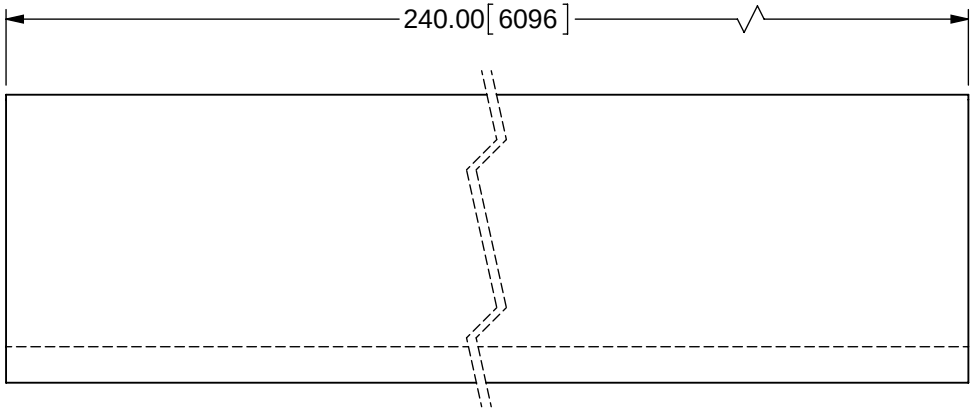
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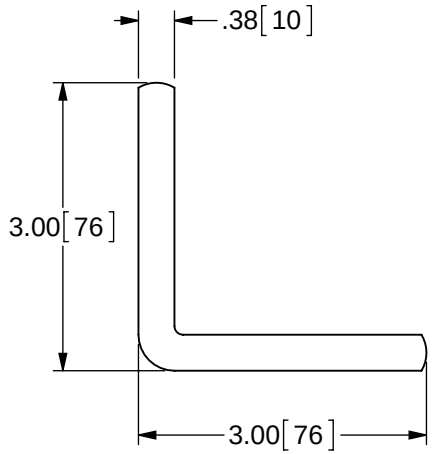
SCALE: 1:6

REV: 01

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DRAWN AIM 09/05/13

CHECKER GVA 11/26/13

DOCUMENT TYPE CUSTOMER OUTLINE

LONG DESCRIPTION

ANGLE, L3x3x3/8 x 240.00", BLANK, FRP

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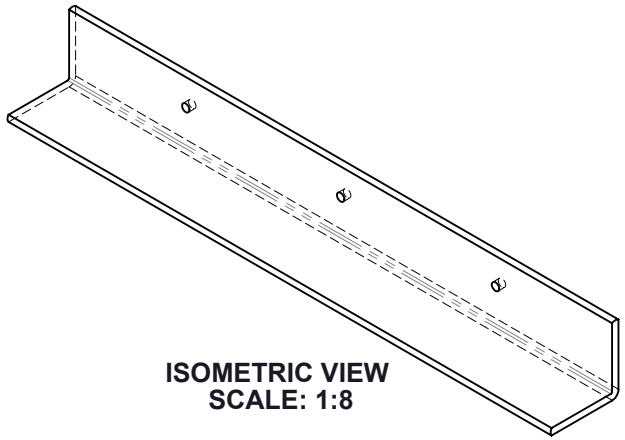
MATERIAL	WEIGHT - LBS	WEIGHT - KG
FIBER REINFORCED POLYESTER	33.26	15.09

SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10000799-001	1:2	02

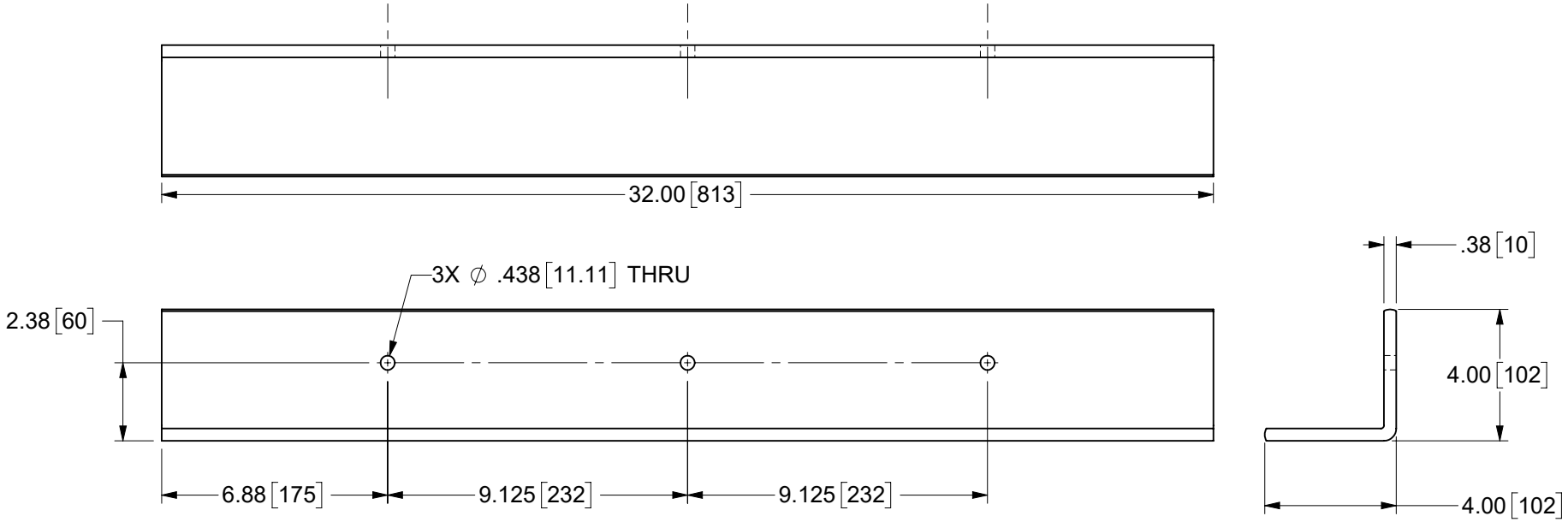
Rev 01

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ISOMETRIC VIEW
SCALE: 1:8



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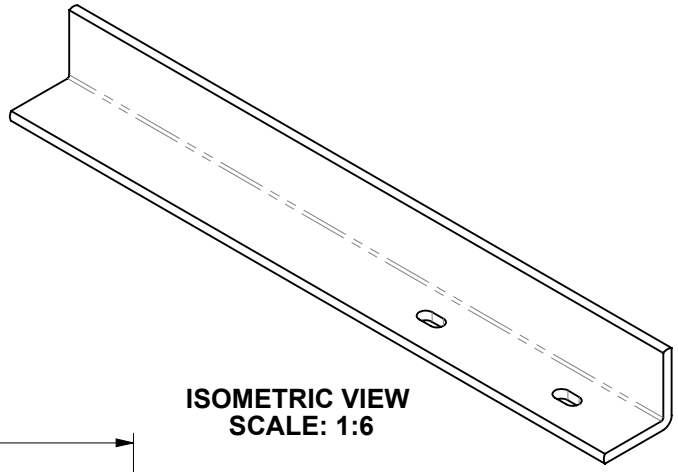
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MATERIAL: FIBER REINFORCED POLYESTER			WEIGHT - LBS: 6.03	WEIGHT - KG: 2.74
SHEET: 1 OF 1		DRAWING NUMBER: 10001002-246	SCALE: 1:5	REV: 01

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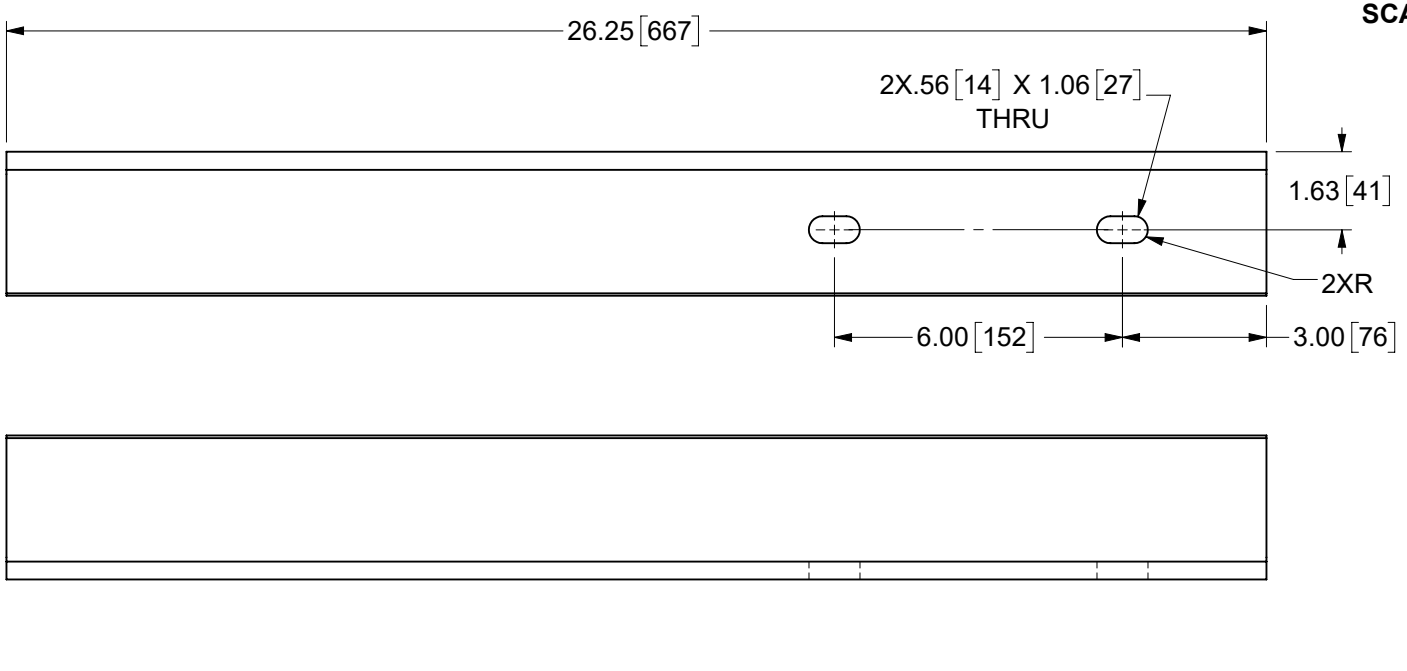
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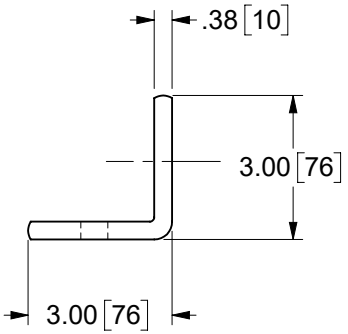
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ISOMETRIC VIEW
SCALE: 1:6





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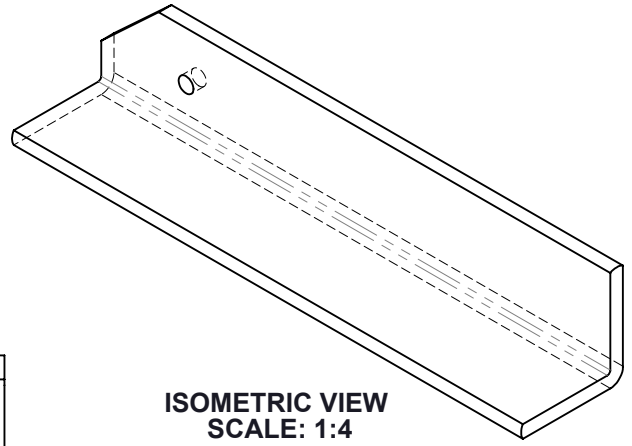
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MATERIAL: FIBER REINFORCED POLYESTER		WEIGHT - LBS: 3.61	WEIGHT - KG: 1.64
SHEET: 1 OF 1		DRAWING NUMBER: 10001002-247	SCALE: 1:4 / REV: 01

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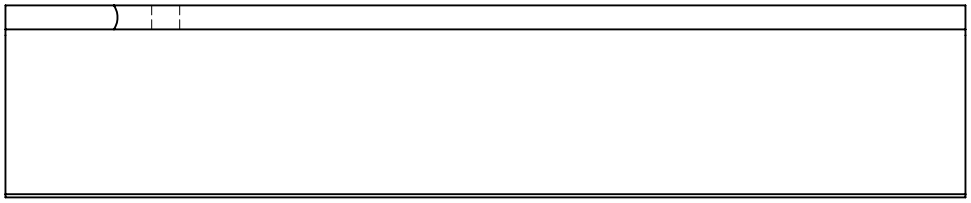
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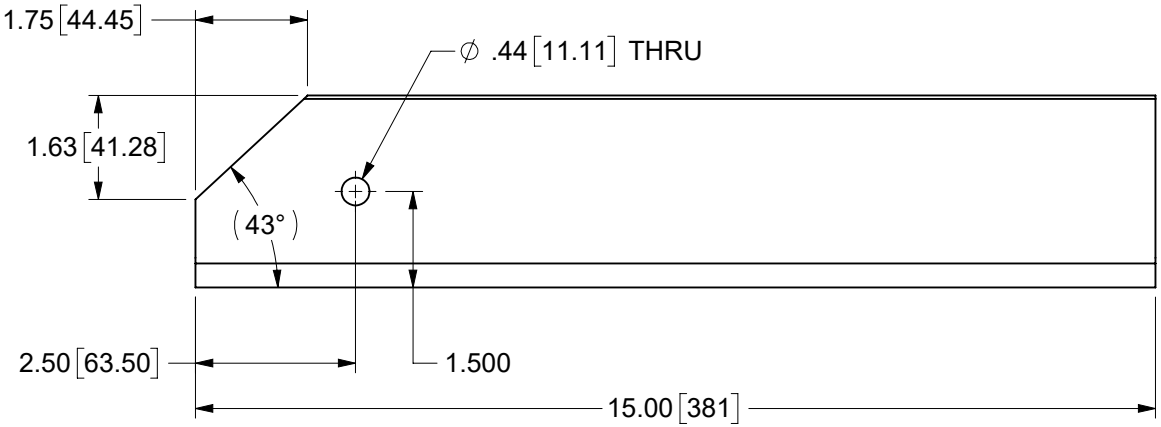
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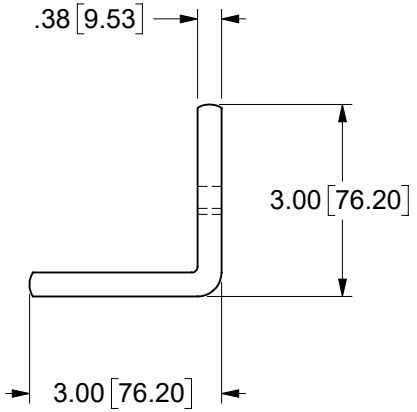
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ISOMETRIC VIEW
SCALE: 1:4







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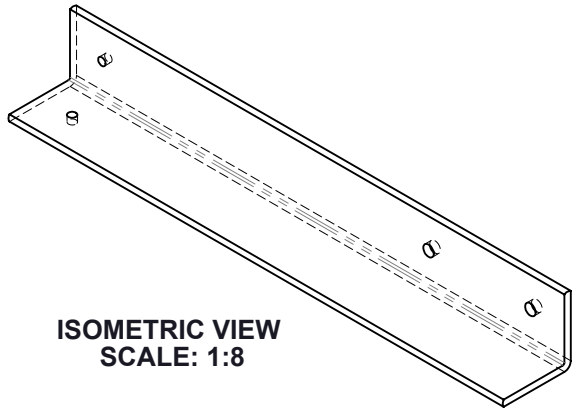
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SUPERSEDES:

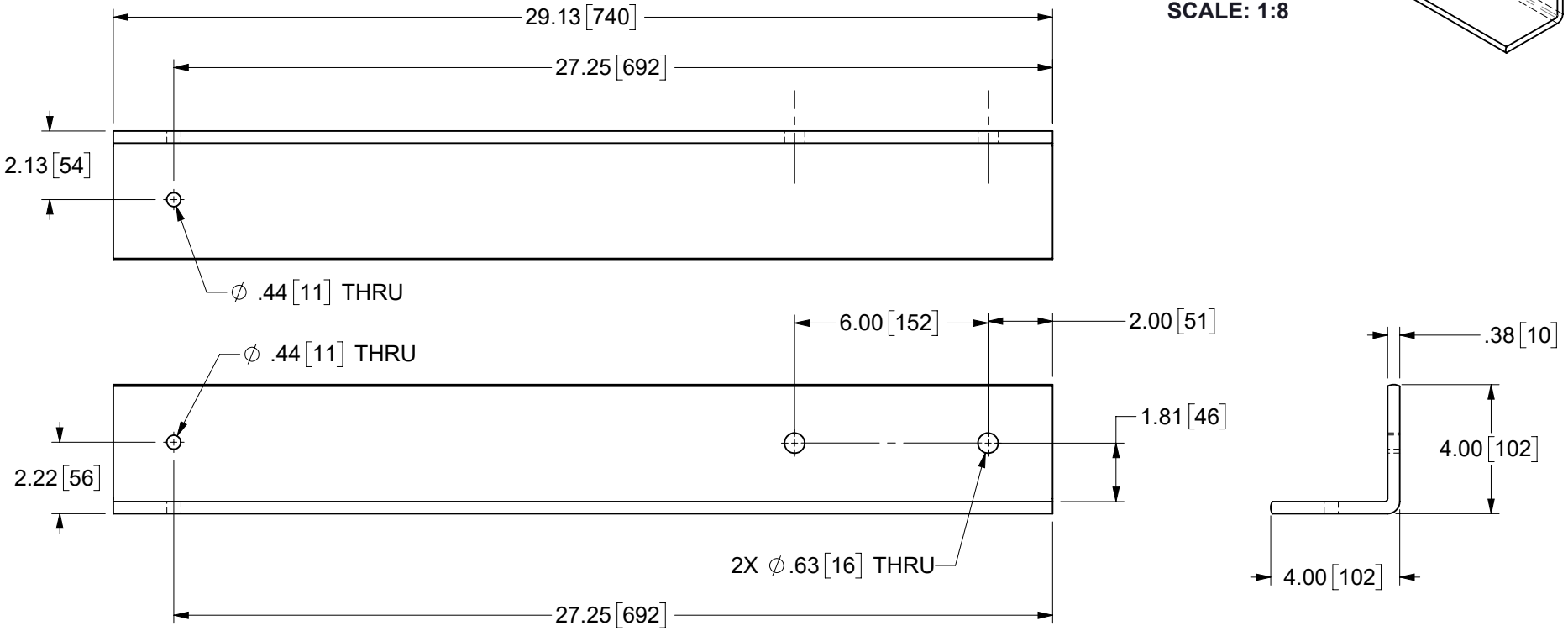
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MATERIAL: FIBER REINFORCED POLYESTER			WEIGHT - LBS: 2.04	WEIGHT - KG: 0.93
SHEET: 1 OF 1		DRAWING NUMBER: 10001002-248	SCALE: 1:3	REV: 01

NOTES :

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ISOMETRIC VIEW
SCALE: 1:8



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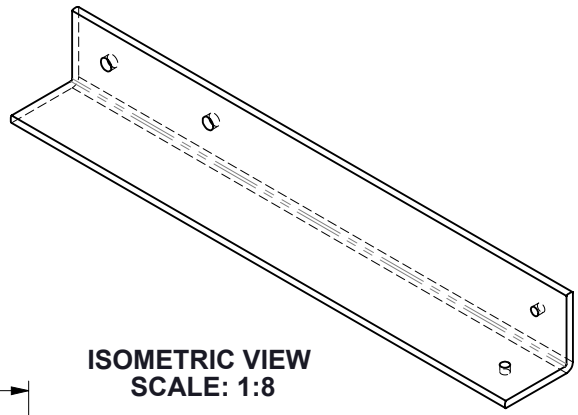
DRAWN	VP 05 Sep 23
CHECKER	RHP 13 Sep 23
DOCUMENT TYPE	CUSTOMER OUTLINE
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MATERIAL	FIBER REINFORCED POLYESTER
WEIGHT - LBS	5.48
WEIGHT - KG	2.49
SHEET	1 OF 1
DRAWING NUMBER	10001002-249
SCALE	1:5
REV	01

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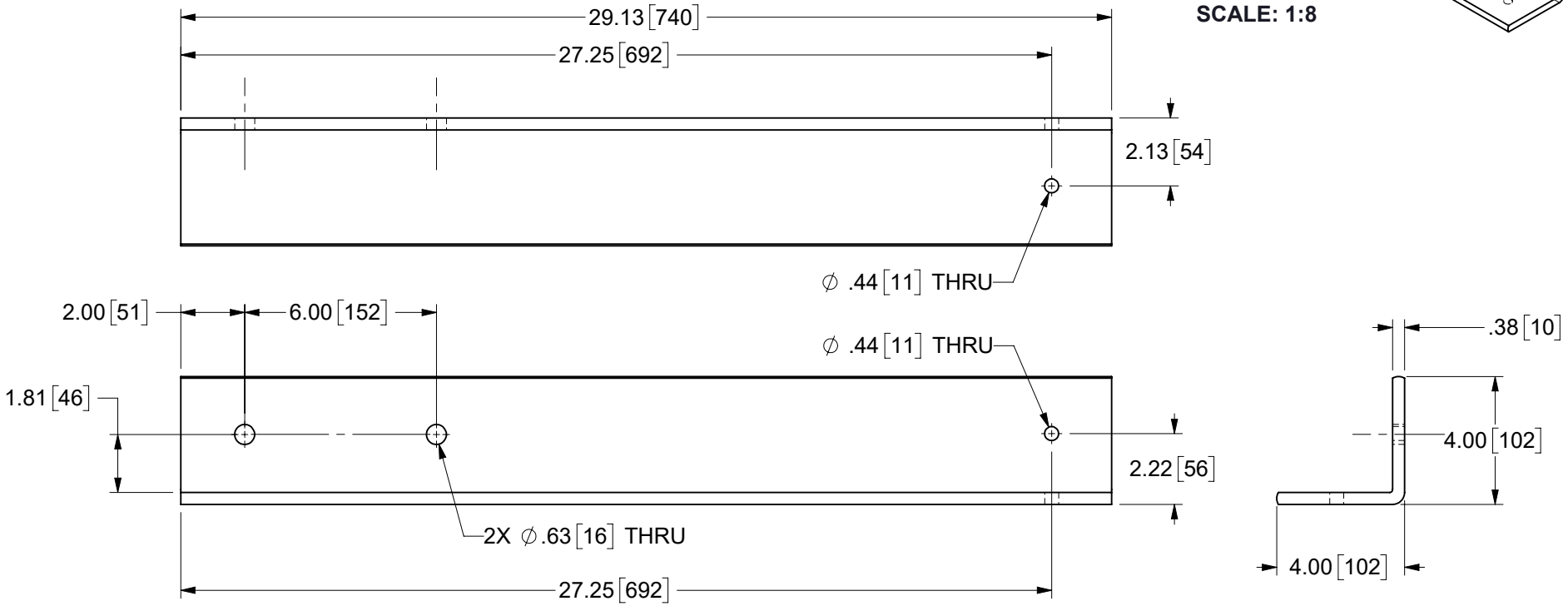
SUPERSEDES:

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ISOMETRIC VIEW
SCALE: 1:8



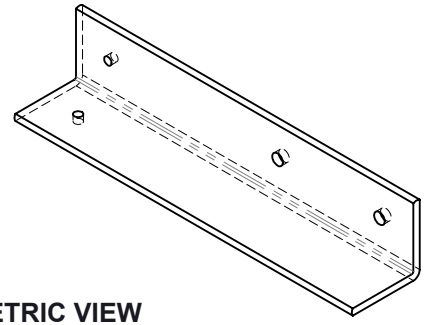
BRENTWOOD

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MATERIAL	FIBER REINFORCED POLYESTER
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SHEET	1 OF 1
DRAWING NUMBER	10001002-250
SCALE	1:5
REV	01
SUPERSEDES:	

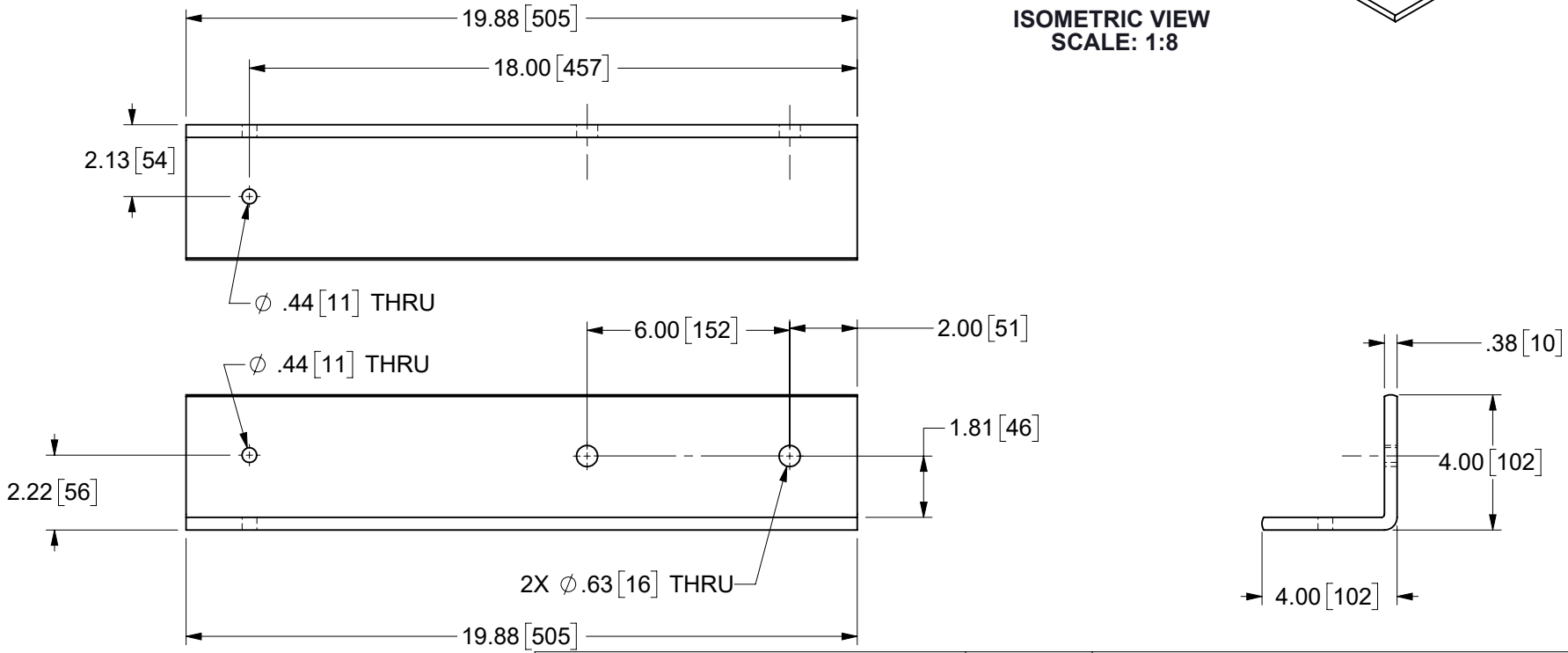
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ISOMETRIC VIEW
SCALE: 1:8



BRENTWOOD

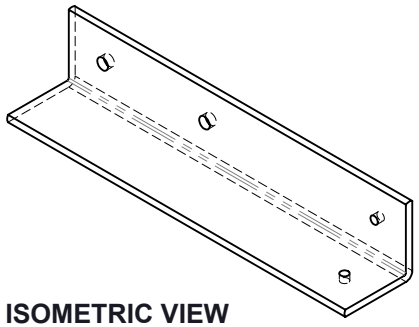
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MATERIAL: FIBER REINFORCED POLYESTER		WEIGHT - LBS: 3.73	WEIGHT - KG: 1.69
SHEET: 1 OF 1	DRAWING NUMBER: 10001002-251	SCALE: 1:5	REV: 01

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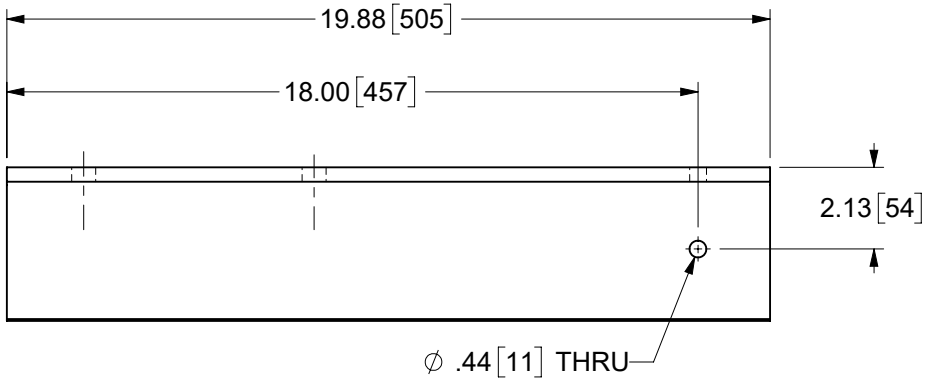
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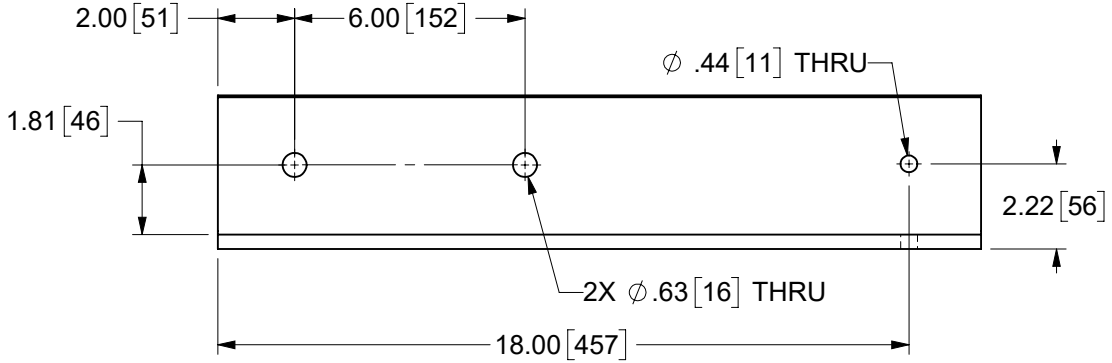
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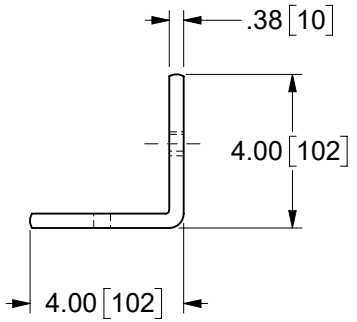
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ISOMETRIC VIEW
SCALE: 1:8



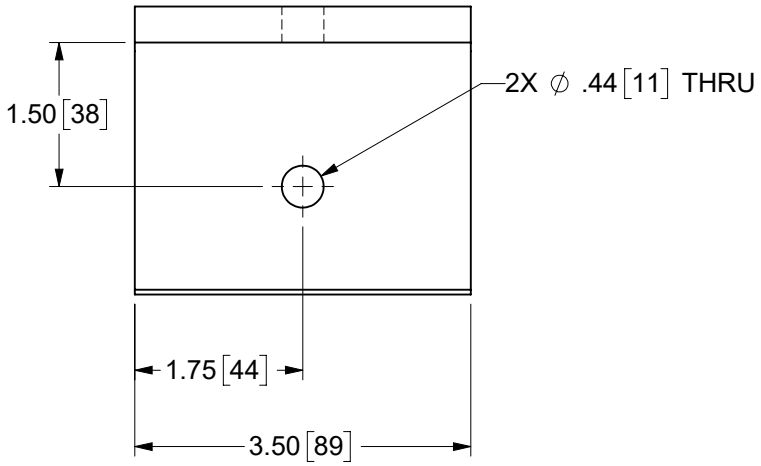


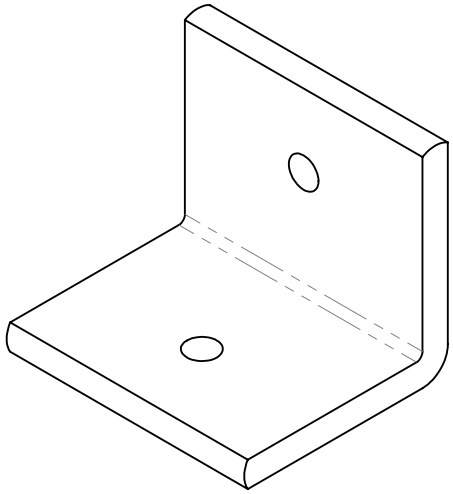


BRENTWOOD	DRAWN VP 05 Sep 23 CHECKER RHP 13 Sep 23	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION ANGLE, L4x4x3/8 x 19.88", 4 HOLES, FRP, LEFT HAND		
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SUPERSEDES:	SHEET 1 OF 1	DRAWING NUMBER 10001002-252	SCALE 1:5	REV 01

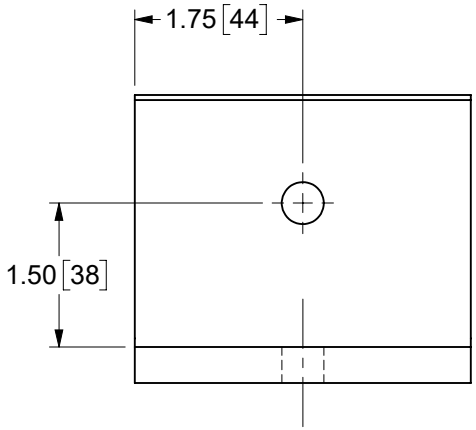
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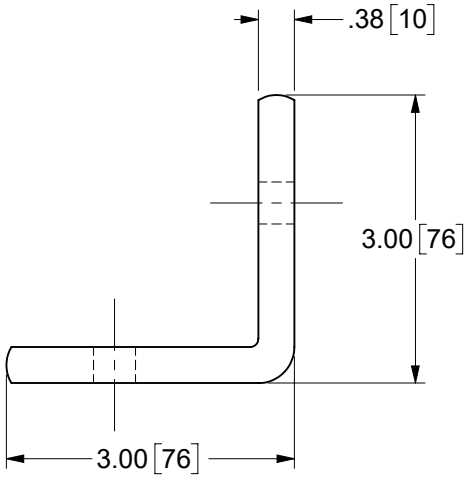
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ISOMETRIC VIEW
SCALE: 1:2



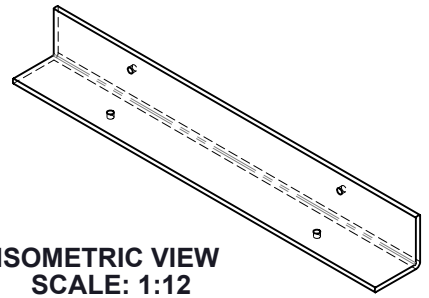


BRENTWOOD

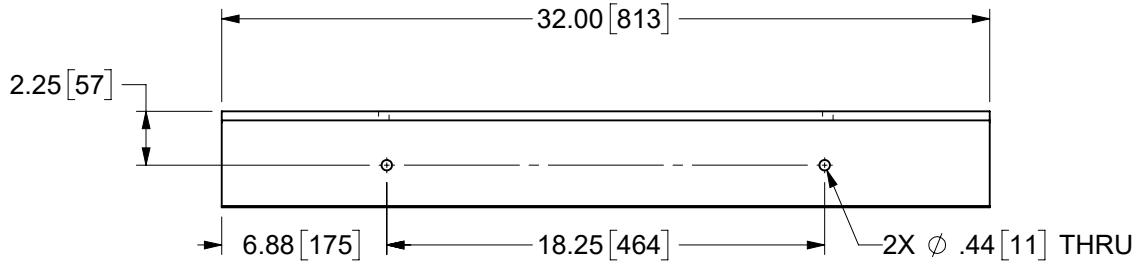
DRAWN: VP, 05 Sep 23	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: ANGLE, L3x3x3/8 x 3.50", 2 HOLES, FRP			
CHECKER: RHP, 13 Sep 23				
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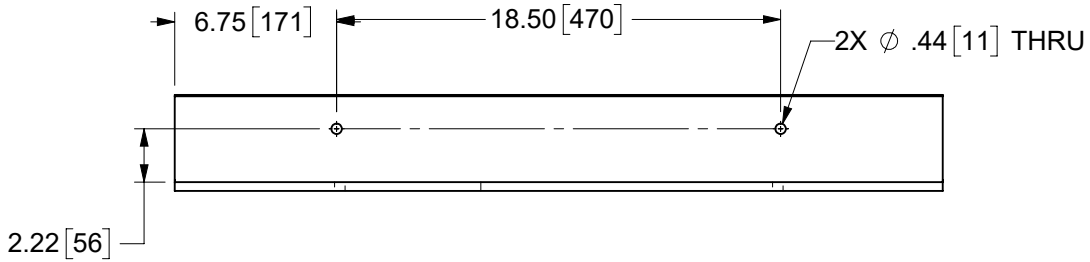
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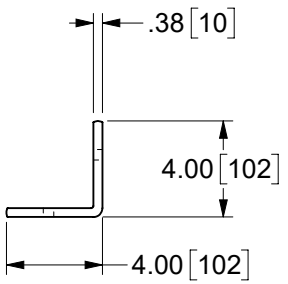
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ISOMETRIC VIEW
SCALE: 1:12







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DRAWN VP 05 Sep 23
CHECKER RHP 13 Sep 23
DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
ANGLE, L4x4x3/8 x 32.00", 4 HOLES, FRP

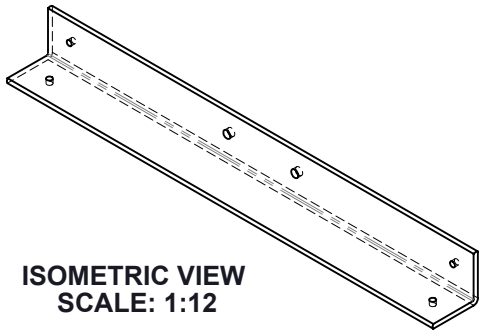
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
FIBER REINFORCED POLYESTER	6.03	2.74

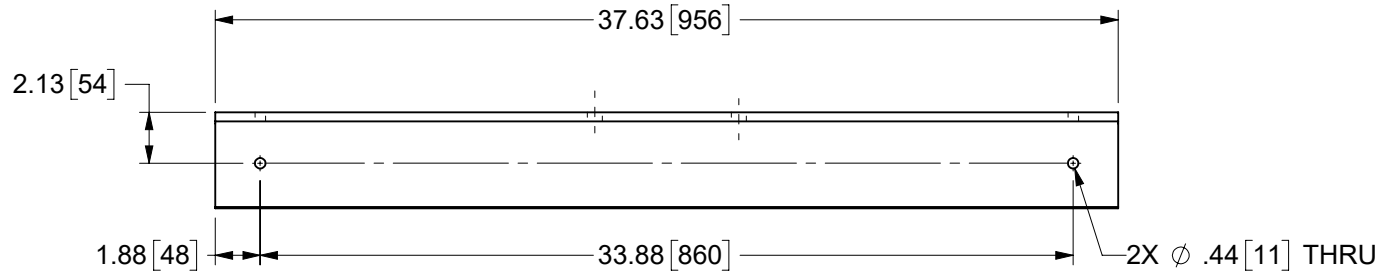
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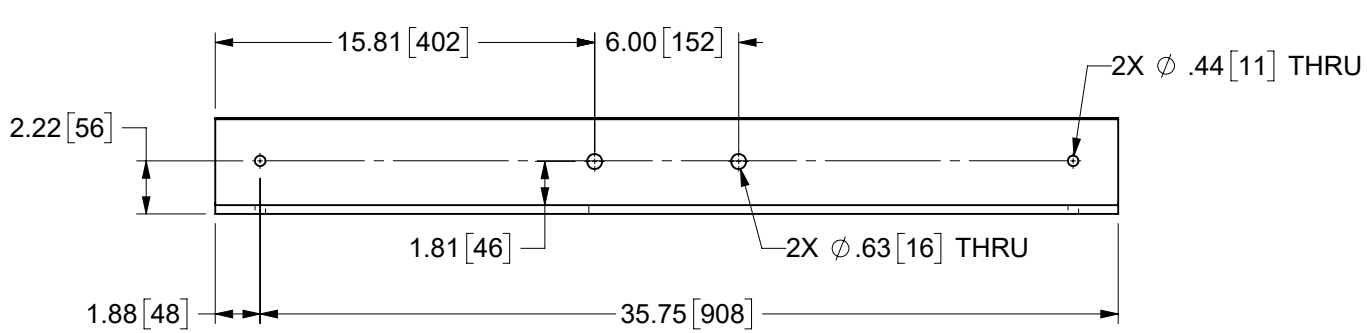
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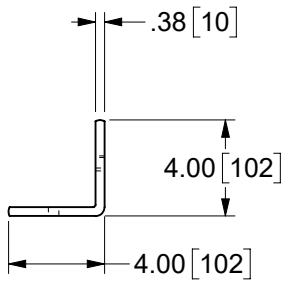
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ISOMETRIC VIEW
SCALE: 1:12







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DRAWN: VP, 05 Sep 23
CHECKER: RHP, 13 Sep 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: ANGLE, L4x4x3/8 x 37.63", 6 HOLES, FRP

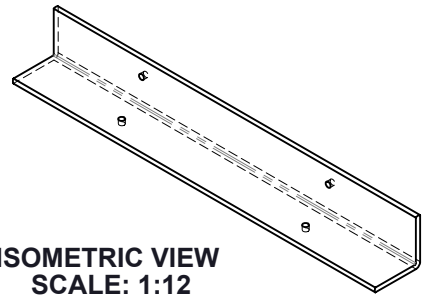
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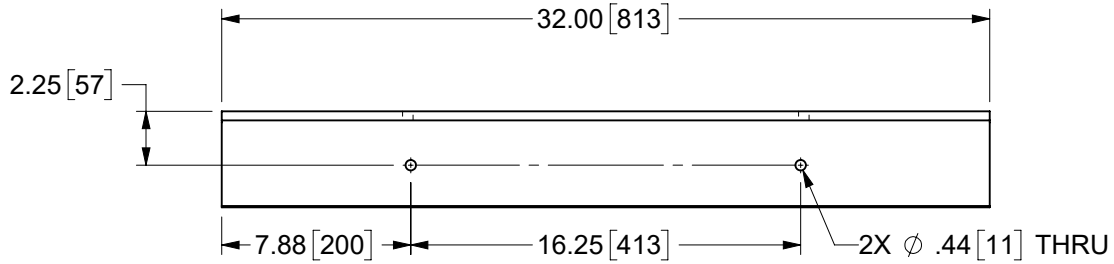
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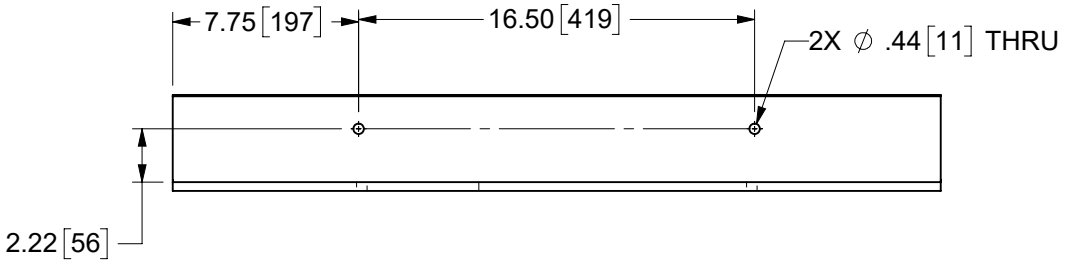
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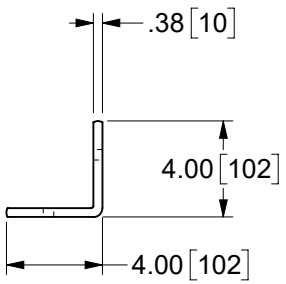
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ISOMETRIC VIEW
SCALE: 1:12







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DRAWN VP 05 Sep 23
CHECKER RHP 13 Sep 23

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
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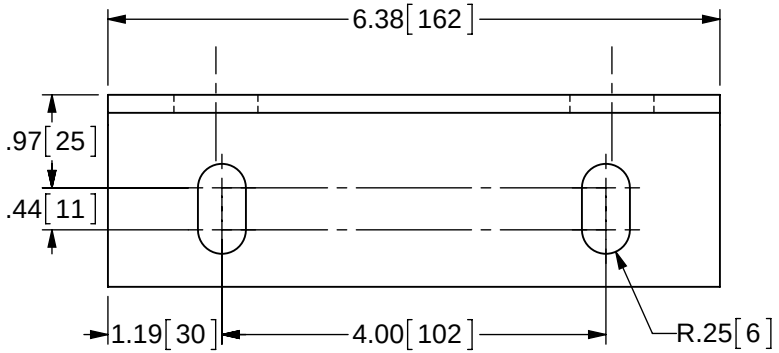
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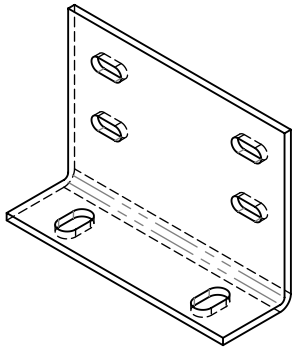
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FIBER REINFORCED POLYESTER	6.03	2.74

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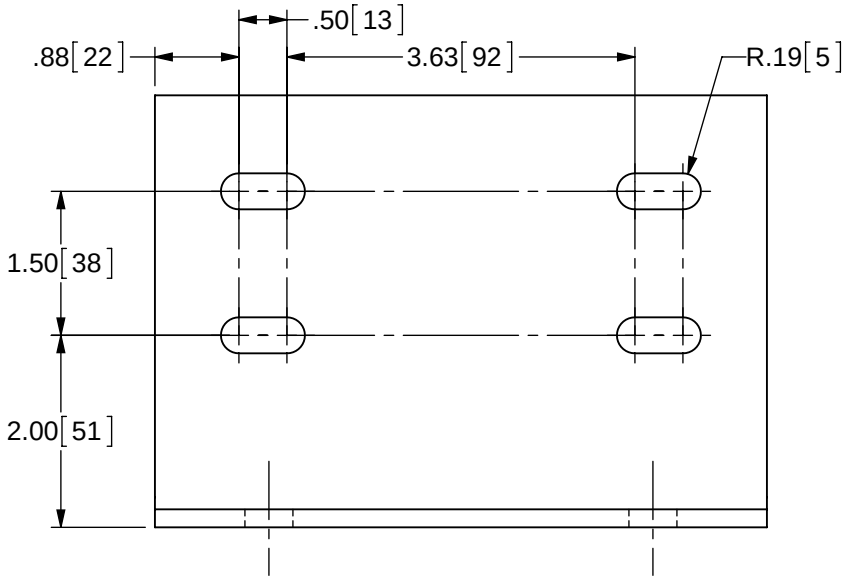
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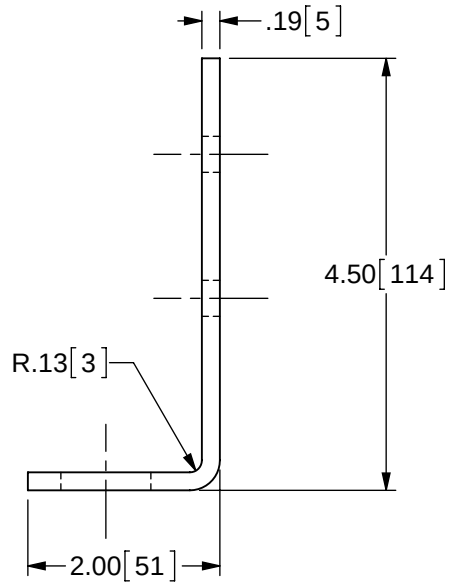
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ISOMETRIC VIEW
SCALE: 1:4





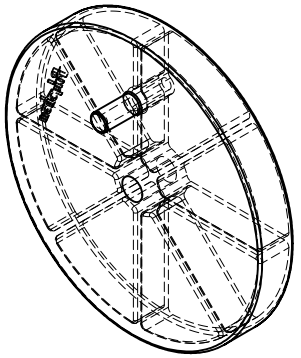
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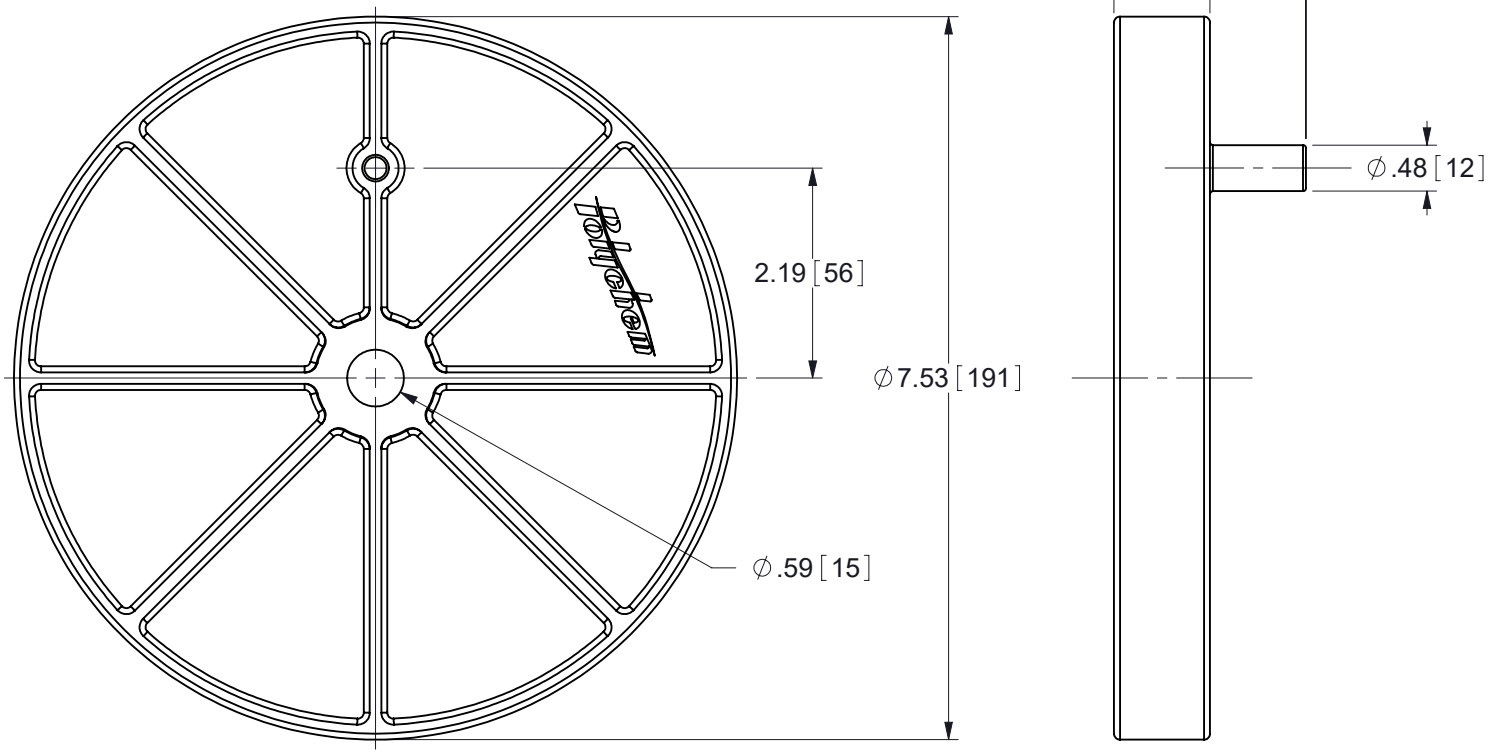
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CHECKER: AIM 09/11/13				
MATERIAL: AISI 316		WEIGHT - LBS: 2.04	WEIGHT - KG: 0.93	
SHEET: 1 OF 1	DRAWING NUMBER: 10001011-001	SCALE: 1:1	REV: 01	

NOTES :

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SCALE: 1:4



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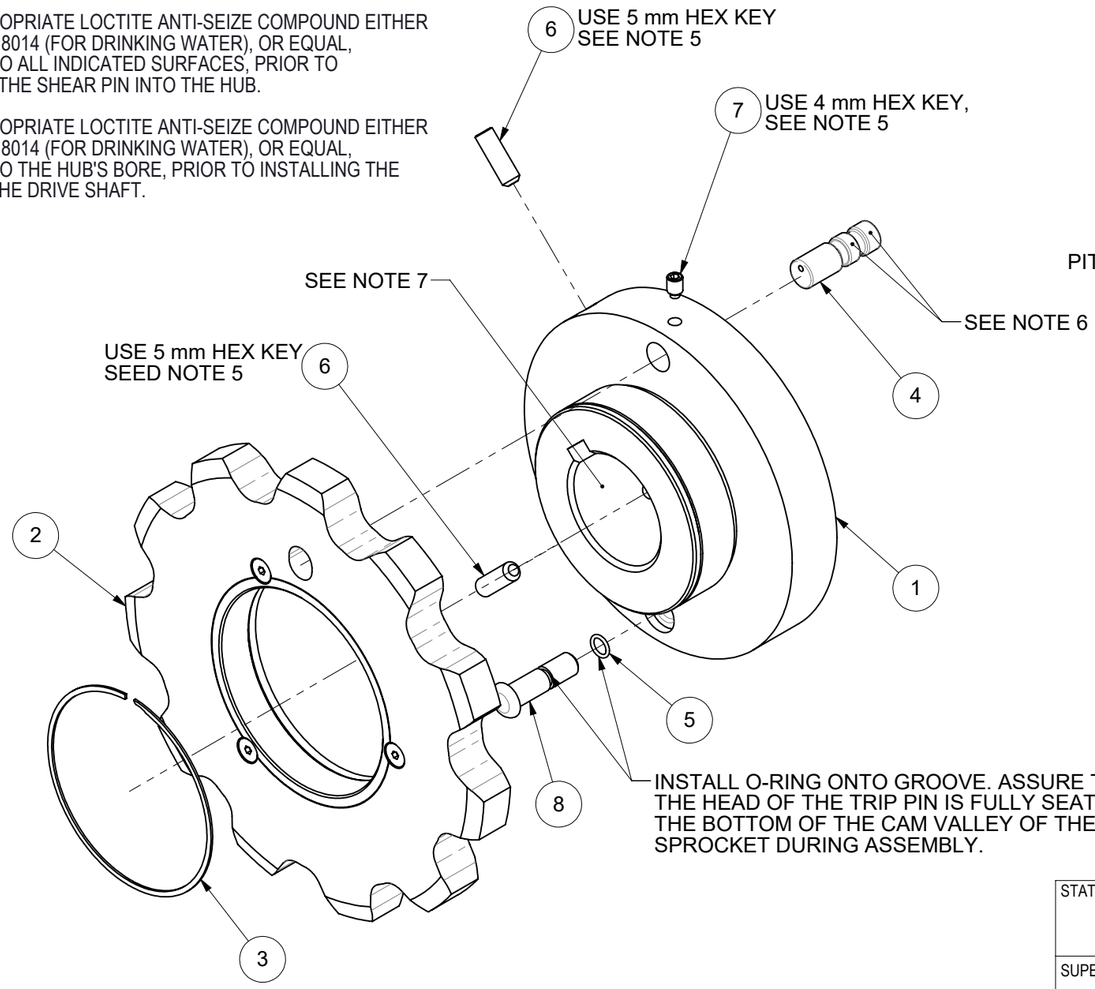
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CHECKER LEH 09/16/13			
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SHEET 1 OF 1	DRAWING NUMBER 10001014-001	SCALE 1:2	REV 03

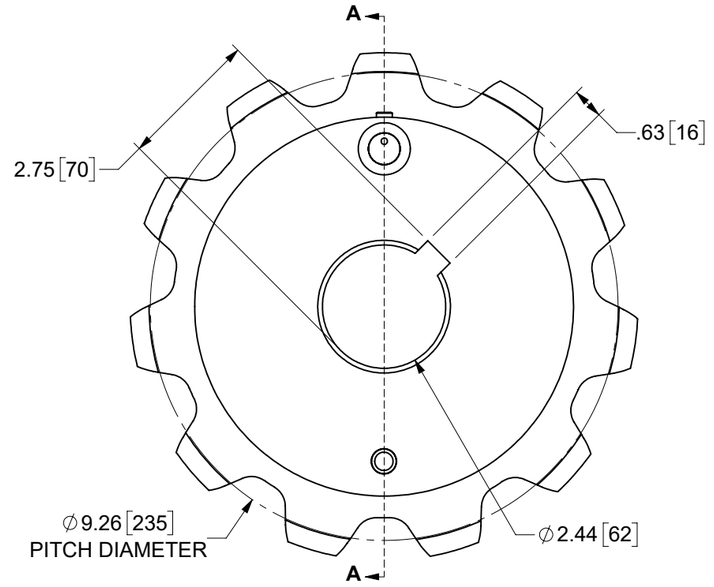
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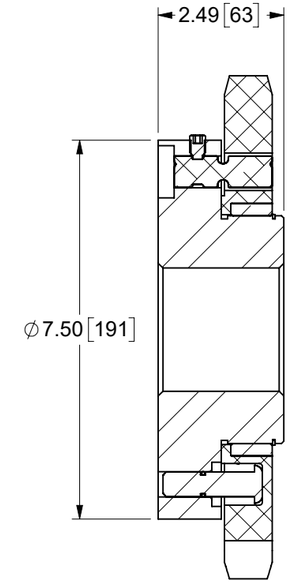
SUPERSEDES: 671-01379

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
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5. APPLY LOCTITE 22205 NON-PERMANENT THREAD LOCKING COMPOUND, OR EQUAL, LIBERALLY TO ALL THREADS, PRIOR TO INSTALLATION INTO THE HUB.
6. APPLY APPROPRIATE LOCTITE ANTI-SEIZE COMPOUND EITHER 51299 OR LB 8014 (FOR DRINKING WATER), OR EQUAL, LIBERALLY TO ALL INDICATED SURFACES, PRIOR TO INSTALLING THE SHEAR PIN INTO THE HUB.
7. APPLY APPROPRIATE LOCTITE ANTI-SEIZE COMPOUND EITHER 51299 OR LB 8014 (FOR DRINKING WATER), OR EQUAL, LIBERALLY TO THE HUB'S BORE, PRIOR TO INSTALLING THE HUB ONTO THE DRIVE SHAFT.







SECTION A-A

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
8	10001005-001	TRIP PIN, NH-78 JAW CLUTCH AND SPROCKET/HUB ASSEMBLIES, 304 SS	1	AISI 304
7	10000220-001	HEX SOCKET SET SCREW, M8x1.25 x 10 MM, NYLON TIP, 304 SS	1	AISI 304
6	10000039-004	HEX SOCKET SET SCREW, M10x1.5 x 30 MM, CUP POINT, 316 SS	2	AISI 316
5	10001004-001	O-RING, AS568A-012, BUNA-N	1	BUNA-N
4	10000222-001	SHEAR PIN TO BREAK AT 1665 lbf ON DRIVE CHAIN	1	6061-T6 ALUMINUM PER P-750
3	10001006-001	RETAINING RING, EXTERNAL, 4.51" SHAFT, 316 SS	1	AISI 316
2	10000258-001	NH-78 DRIVE SPROCKET, 11T, BRONZE BEARING, OVERTORQUE PROTECTION/FAULT ALARM TRIP FUNCTION	1	CAST NYLON 6 SPROCKET AND SAE 660 BRONZE BEARING
1	10001019-028	304 SS HUB FOR NH78 DRIVE SPROCKET WITH OVERTORQUE PROTECTION AND FAULT ALARM TRIP FUNCTION, FOR 2.437_IN DIAMETER SHAFT	1	AISI 304

BILL OF MATERIALS FOR 10001018-028

STATUS		
SUPERSEDES: 661-21321-028		
CURRENT REVISION:		
BY	CKD	DATE
AIM	SML	05/14/20

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DRAWN LEH 09/17/13
CHECKER MAP 09/17/13

DOCUMENT TYPE PRODUCT DEFINITION
LONG DESCRIPTION
NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB

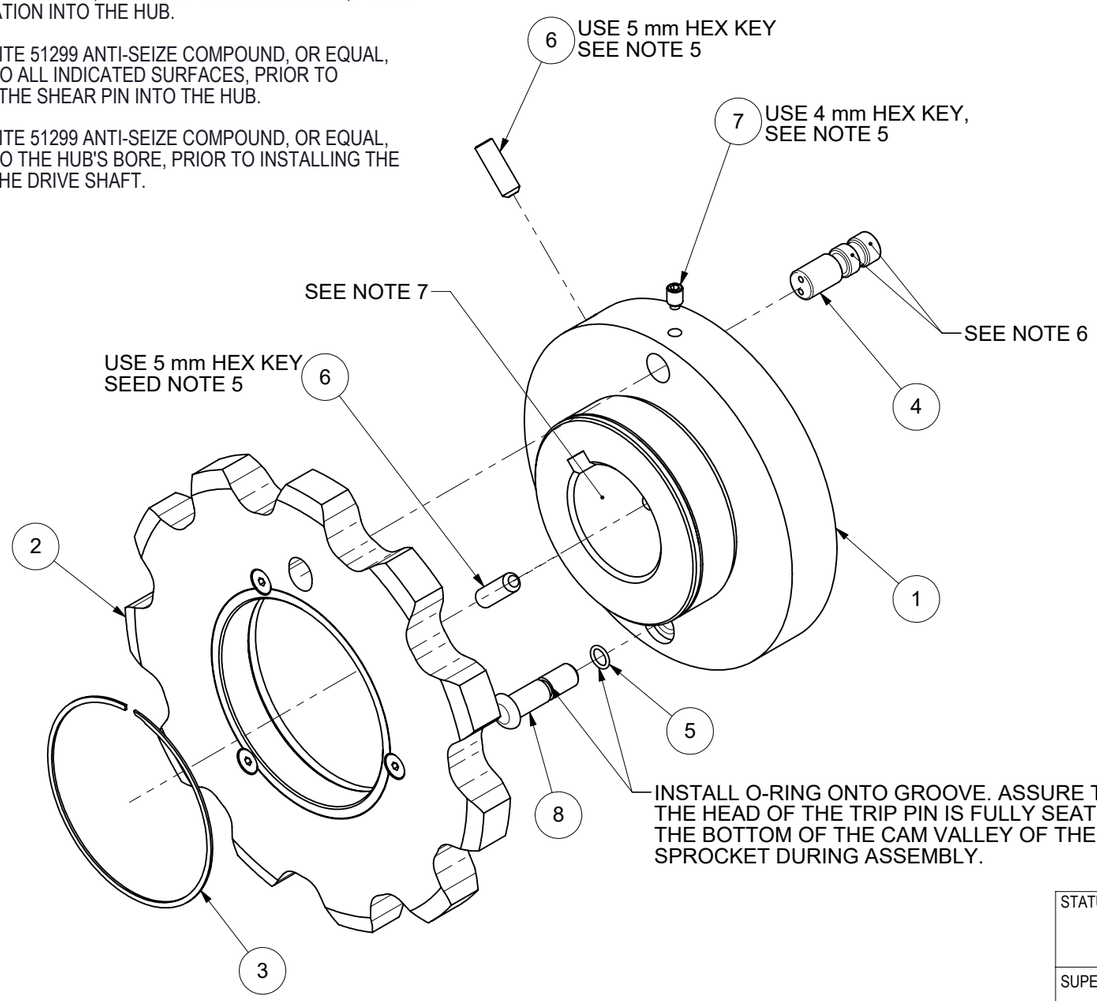
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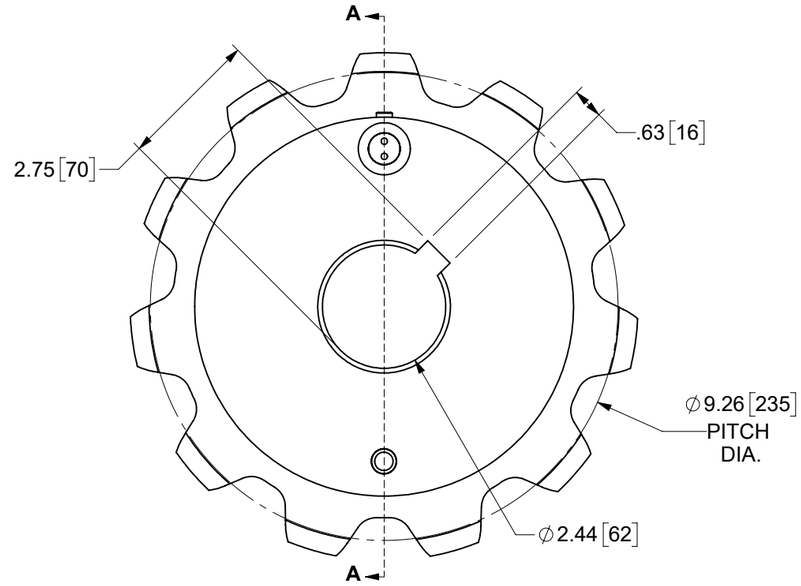
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SEE BILL OF MATERIAL	20.78	9.43

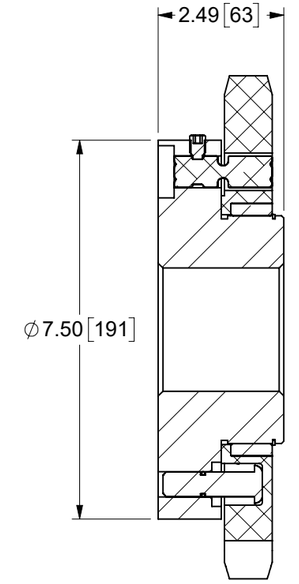
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1 OF 1	10001018-028	1:3	04

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3. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
4. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
5. APPLY LOCTITE 22205 NON-PERMANENT THREAD LOCKING COMPOUND, OR EQUAL, LIBERALLY TO ALL THREADS, PRIOR TO INSTALLATION INTO THE HUB.
6. APPLY LOCTITE 51299 ANTI-SEIZE COMPOUND, OR EQUAL, LIBERALLY TO ALL INDICATED SURFACES, PRIOR TO INSTALLING THE SHEAR PIN INTO THE HUB.
7. APPLY LOCTITE 51299 ANTI-SEIZE COMPOUND, OR EQUAL, LIBERALLY TO THE HUB'S BORE, PRIOR TO INSTALLING THE HUB ONTO THE DRIVE SHAFT.







SECTION A-A

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
8	10001005-001	TRIP PIN, NH-78 JAW CLUTCH AND SPROCKET/HUB ASSEMBLIES, 304 SS	1	AISI 304
7	10000220-001	HEX SOCKET SET SCREW, M8x1.25 x 10 MM, NYLON TIP, 304 SS	1	AISI 304
6	10000039-004	HEX SOCKET SET SCREW, M10x1.5 x 30 MM, CUP POINT, 316 SS	2	AISI 316
5	10001004-001	O-RING, AS568A-012, BUNA-N	1	BUNA-N
4	10000222-002	SHEAR PIN TO BREAK AT 985 lbf ON DRIVE CHAIN	1	6061-T6 ALUMINUM PER P-750
3	10001006-001	RETAINING RING, EXTERNAL, 4.51" SHAFT, 316 SS	1	AISI 316
2	10000258-001	NH-78 DRIVE SPROCKET, 11T, BRONZE BEARING, OVERTORQUE PROTECTION/FAULT ALARM TRIP FUNCTION	1	CAST NYLON 6 SPROCKET AND SAE 660 BRONZE BEARING
1	10001019-028	304 SS HUB FOR NH78 DRIVE SPROCKET WITH OVERTORQUE PROTECTION AND FAULT ALARM TRIP FUNCTION, FOR 2.437_IN DIAMETER SHAFT	1	AISI 304

BILL OF MATERIALS FOR 10001018-083

STATUS		
SUPERSEDES:		
CURRENT REVISION:		
BY	CKD	DATE
BSC	SML	10/17/19

BRENTWOOD®

DRAWN BSC 10/17/19
CHECKER SML 10/17/19

DOCUMENT TYPE PRODUCT DEFINITION
LONG DESCRIPTION
NH-78 11 TOOTH SHEAR PIN HUB ASSEMBLY, 2.44" SHAFT, 304 SS HUB

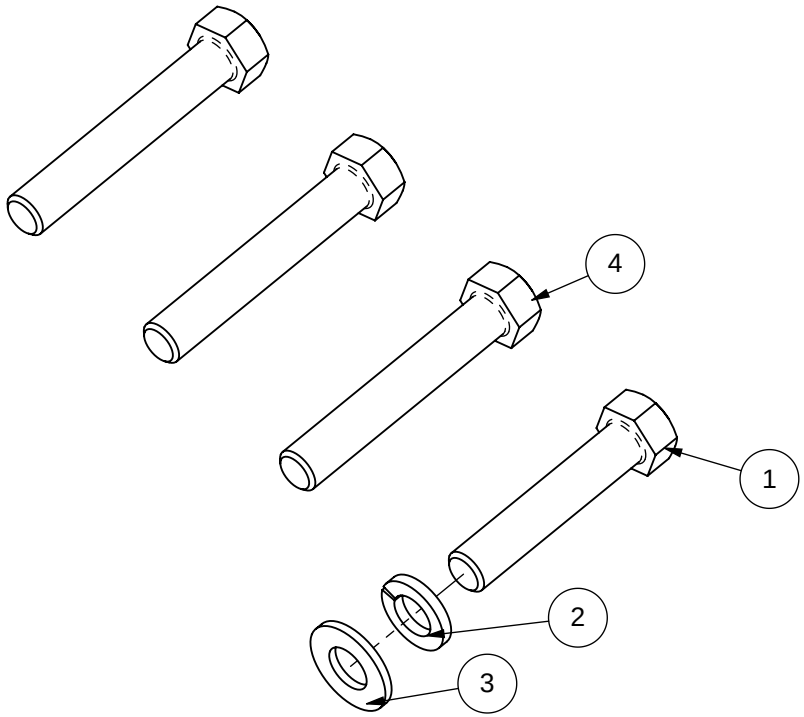
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
SEE BILL OF MATERIAL	20.77	9.42

SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10001018-083	1:3	01

NOTES :

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ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000032-005	HEX BOLT, 1/2-13 x 3", FULLY THREADED, 316 SS	3	AISI 316
3	10000058-007	FLAT WASHER, 1/2", 316 SS	1	AISI 316
2	10000012-006	SPLIT LOCK WASHER, 1/2, 316 SS	1	AISI 316
1	10000001-024	HEX BOLT, 1/2-13 x 2-1/2", 316 SS	1	AISI 316

BILL OF MATERIALS FOR 10001020-003

STATUS

SUPERSEDES: 658-14750-013

REV	BY	DATE
04	SML	03/18/15

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DRAWN CMF 09/16/13

CHECKER SML 07/14/14

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

STUB SHAFT LEVELING/RETAINER PLATE HARDWARE KIT, ENGLISH, 316 SS (KIT=1BLT-1LW-1FW-3LVL

MATERIAL SEE BILL OF MATERIAL

WEIGHT - LBS 0.89

WEIGHT - KG 0.40

SHEET 1 OF 1

DRAWING NUMBER 10001020-003

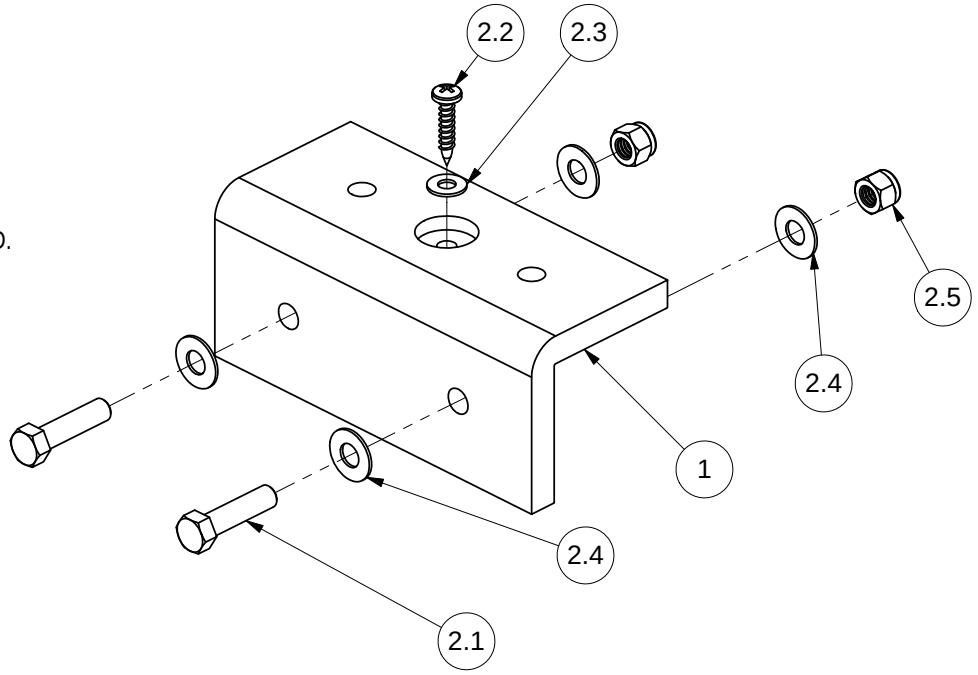
SCALE 1:2

REV 04

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ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2.5	10000011-002	SELF LOCKING HEX NUT, 3/8-16, 316 SS	2	316 SS
2.4	10000058-005	FLAT WASHER, 3/8, 316 SS	4	316 SS
2.3	10000058-003	FLAT WASHER, 1/4, 316 SS	1	AISI 316
2.2	10000029-002	TYPE A, PHILLIPS PAN HEAD, SCREW, #14 x 1-1/4 INCH LONG, 316SS	1	316 SS
2.1	10000001-008	HEX BOLT, 3/8-16 x 1-1/2", 316 SS	2	AISI 316
2	10000066-009	RETURN RAIL SUPPORT HARDWARE SUBASSEMBLY	1	SEE BILL OF MATERIAL
1	10000711-003	CARRYING WEAR SHOE, PA6/6-BLUE	1	NYLON 6/6

BILL OF MATERIALS FOR 10001023-001

STATUS

SUPERSEDES: 658-22504-001

REV	BY	DATE
02	MAP	09/24/13

BRENTWOOD

DRAWN MAP 09/16/13

CHECKER BSC 09/24/13

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

RETURN RAIL SUPPORT INSTALLATION KIT, WALL BRACKET, ENGLISH

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MATERIAL SEE BILL OF MATERIAL

WEIGHT - LBS 1.022

WEIGHT - KG 0.46

SHEET 1 OF 1

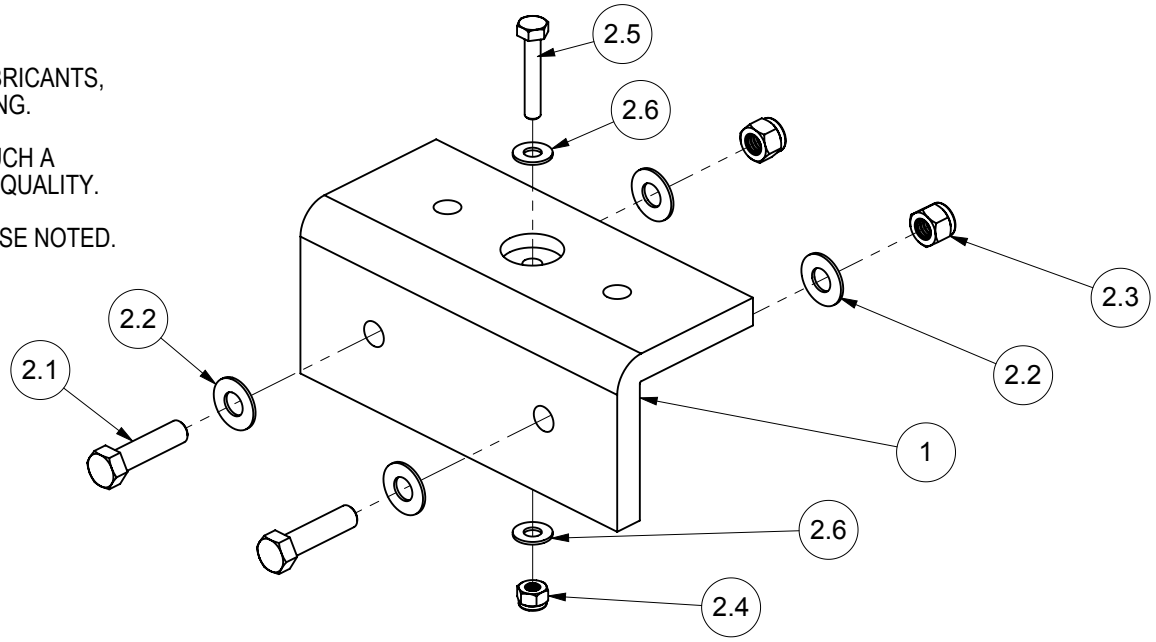
DRAWING NUMBER 10001023-001

SCALE 1:3

REV 02

NOTES :

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ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2.6	10000058-003	FLAT WASHER, 1/4, 316 SS	2	AISI 316
2.5	10000001-071	HEX BOLT, 1/4-20 x 1-1/2", FULLY THREADED, 316 SS	1	AISI 316
2.4	10000011-001	SELF LOCKING HEX NUT, 1/4-20, 316 SS	1	316 SS
2.3	10000011-002	SELF LOCKING HEX NUT, 3/8-16, 316 SS	2	316 SS
2.2	10000058-005	FLAT WASHER, 3/8, 316 SS	4	316 SS
2.1	10000001-008	HEX BOLT, 3/8-16 x 1-1/2", 316 SS	2	AISI 316
2	10000066-013	RETURN RAIL SUPPORT HARDWARE ASSEMBLY, ENGLISH, EXTENDED	1	SEE BILL OF MATERIAL
1	10000711-003	CARRYING WEAR SHOE, PA6/6-BLUE	1	NYLON 6/6

BILL OF MATERIALS FOR 10001023-003

STATUS

SUPERSEDES: 658-22504-003

REV	BY	DATE
02	MAP	09/24/13

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DRAWN: MAP 09/16/13
CHECKER: BSC 09/27/13

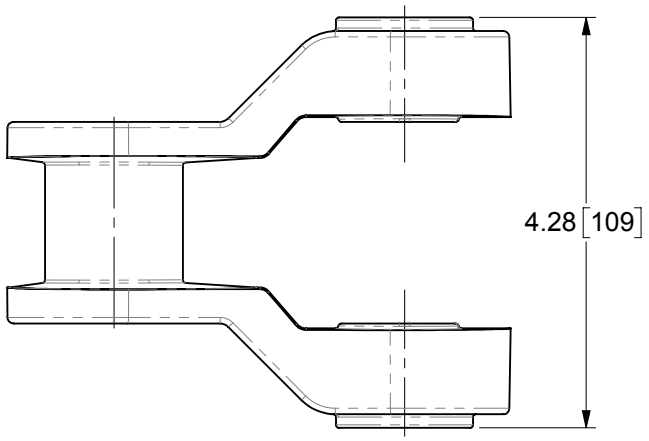
DOCUMENT TYPE: PRODUCT DEFINITION
LONG DESCRIPTION: RETURN RAIL SUPPORT INSTALLATION KIT, EXTENDED WALL BRACKET, ENGLISH

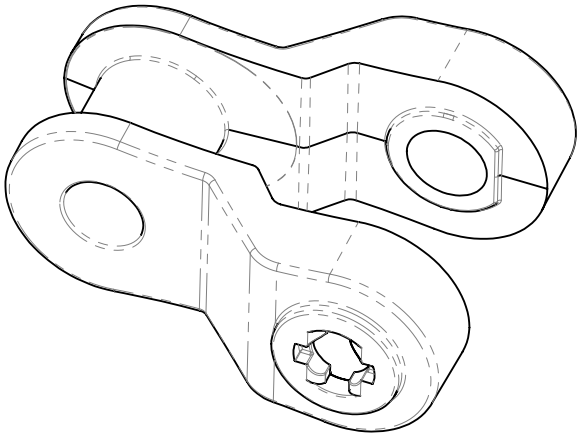
MATERIAL: SEE BILL OF MATERIAL
WEIGHT - LBS: 1.05
WEIGHT - KG: 0.48

SHEET: 1 OF 1
DRAWING NUMBER: 10001023-003
SCALE: 1:3
REV: 02

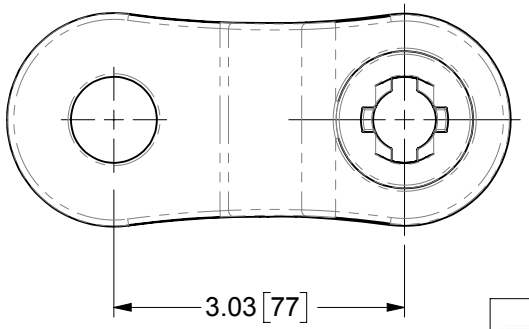
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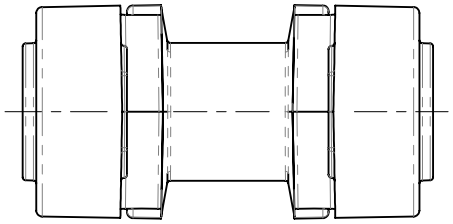
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ISOMETRIC VIEW
SCALE: 1:2





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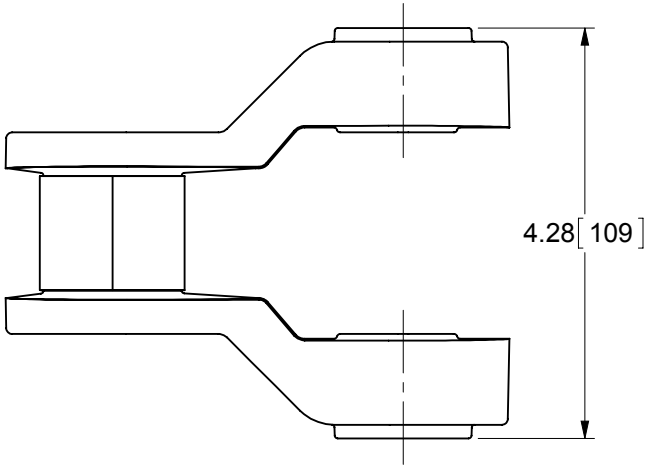
DRAWN GVA 09/17/13	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION NCS-720S, CHAIN LINK, HALF PITCH		
CHECKER LEH 10/02/13			
MATERIAL GLASS REINFORCED POLYESTER		WEIGHT - LBS 0.71	WEIGHT - KG 0.32
SHEET 1 OF 1	DRAWING NUMBER 10001032-001	SCALE 1:2	REV 04

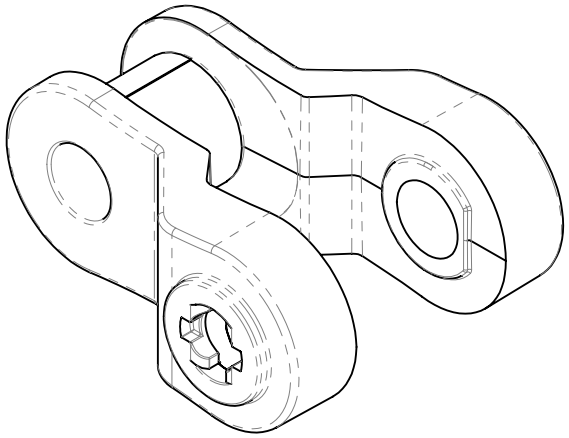
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SUPERSEDES:

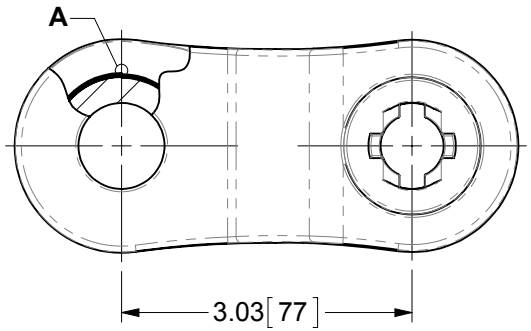
NOTES :

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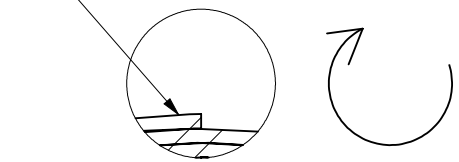




ISOMETRIC VIEW
SCALE: 1:2



ASSURE CORRECT ORIENTATION OF STAINLESS STEEL BARREL WRAPS, RELATIVE TO THE DIRECTION OF SPROCKET ROTATION, WHEN INSTALLING CHAIN IN THE FIELD



DETAIL A
SCALE 6 : 1

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2	10000207	BARREL WRAP, CHAIN LINK, NCS-720-S, 301 SS	1	AISI 301
1	10001032-001	NCS-720S, CHAIN LINK, HALF PITCH	1	GLASS REINFORCED POLYESTER

BILL OF MATERIALS FOR 10001032-002

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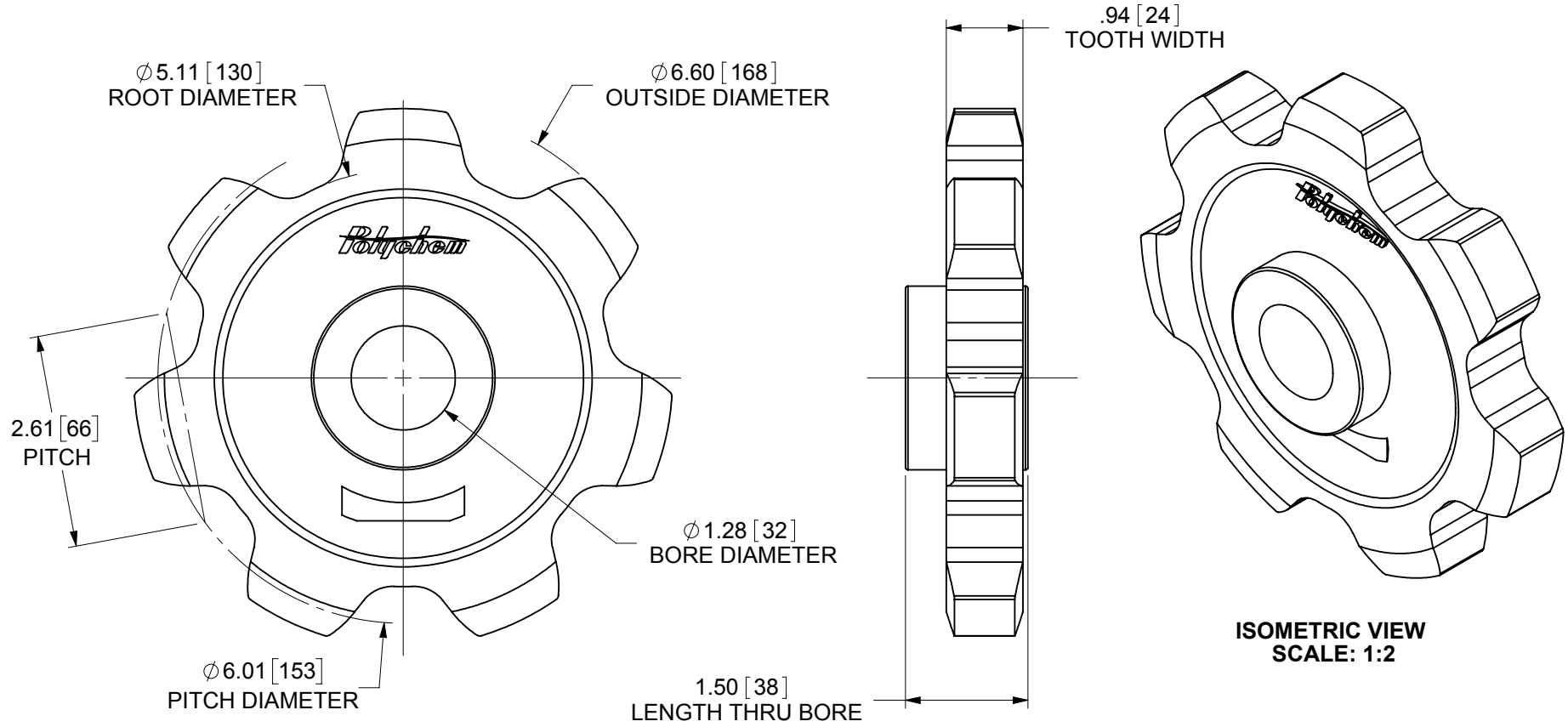
DRAWN MS 10/08/15
CHECKER GTY

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
NCS-720S, CHAIN LINK, HALF PITCH, 301 SS BARREL WRAP

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MATERIAL: SEE BILL OF MATERIAL
WEIGHT - LBS: 0.77
WEIGHT - KG: 0.35
SHEET: 1 OF 1
DRAWING NUMBER: 10001032-002
SCALE: 1:2
REV: 01

SUPERSEDES:



ISOMETRIC VIEW
SCALE: 1:2

NOTES :

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DRAWN: BSC 09/16/13
CHECKER: MAP 09/17/13

DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: NH-78 SPROCKET, 7T, 1.28" BORE, HUB TYPE C, ASYMMETRICAL, GR PA6/6

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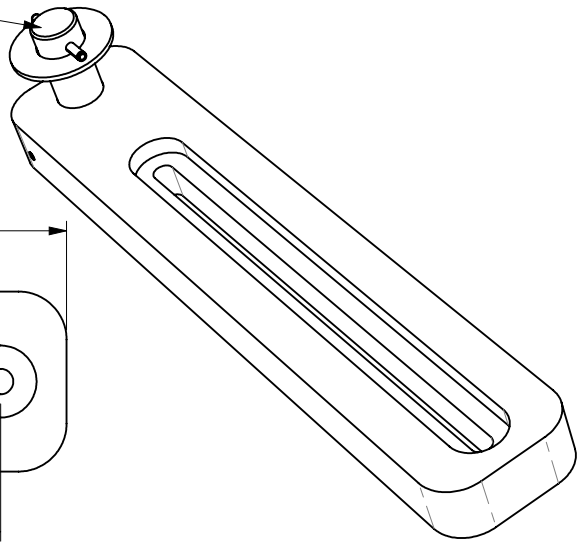
MATERIAL	WEIGHT - LBS	WEIGHT - KG
NYLON 6/6-20% GR	0.89	0.40

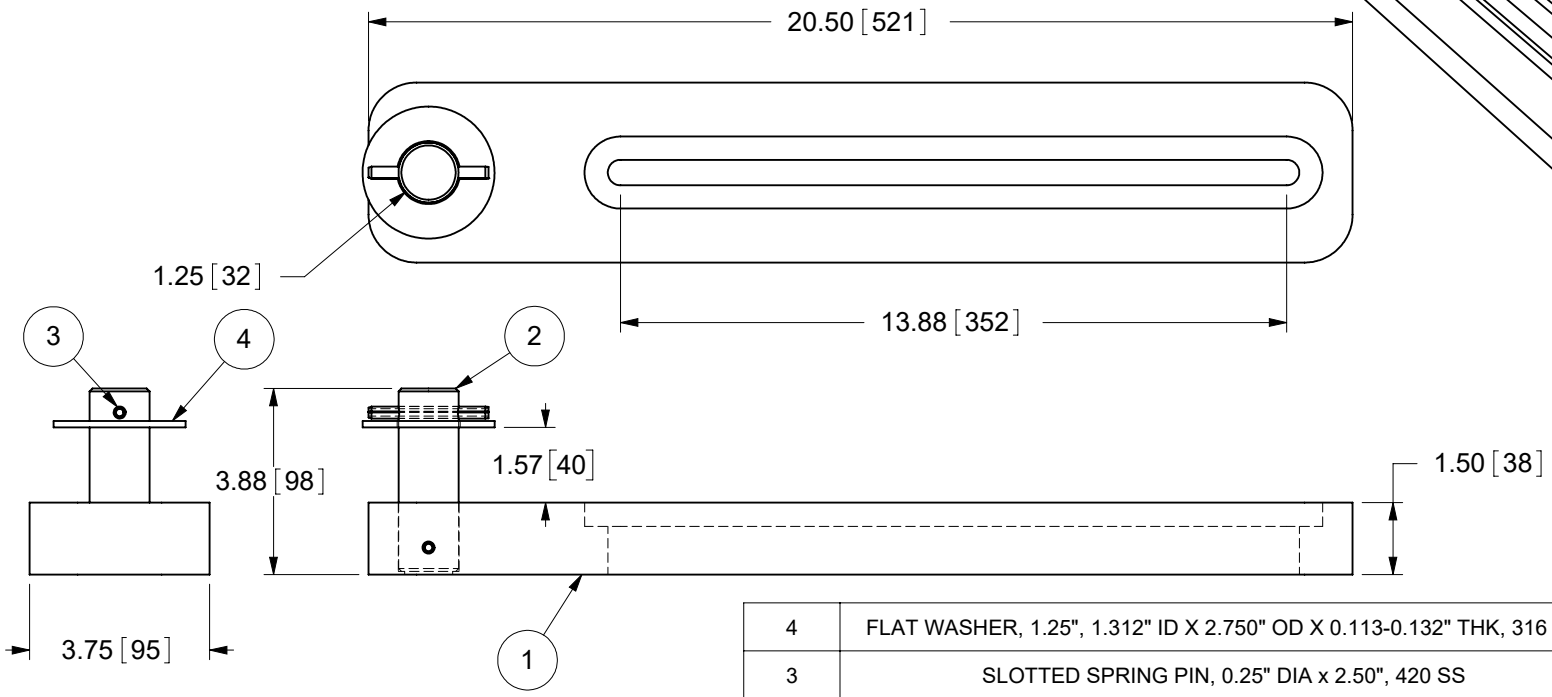
SUPERSEDES:	SHEET	DRAWING NUMBER	SCALE	REV
661-22114-002	1 OF 1	10001033-002	1:1	02

NOTES :

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THIS PIN IS INSTALLED IN THE FIELD AFTER THE DRIVE CHAIN TENSION ADJUSTMENT IDLER SPROCKET IS INSTALLED ONTO THE SHAFT. THE PIN IS TAPED TO THE EXTENSION BRACKET FOR SHIPMENT.





ITEM	DESCRIPTION	QTY.	MATERIAL
4	FLAT WASHER, 1.25", 1.312" ID X 2.750" OD X 0.113-0.132" THK, 316 SS	1	AISI 316
3	SLOTTED SPRING PIN, 0.25" DIA x 2.50", 420 SS	2	AISI 420
2	"TAKE UP" SHAFT FOR DRIVE CHAIN TENSION ADJUSTMENT, 1.25" X 3.81", 1 HOLE, POM	1	POLYOXYMETHYLENE (POM)
1	DRIVE CHAIN TENSION ADJUSTMENT "TAKE UP"	1	CAST NYLON 6

BILL OF MATERIALS FOR 10001034-007

BRENTWOOD

DRAWN: SK, 30 Nov 23
CHECKER: SML, 07 Dec 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: DRIVE CHAIN TENSION ADJUSTMENT "TAKE UP" ASSEMBLY, TRAVEL=13.88", SPECIAL

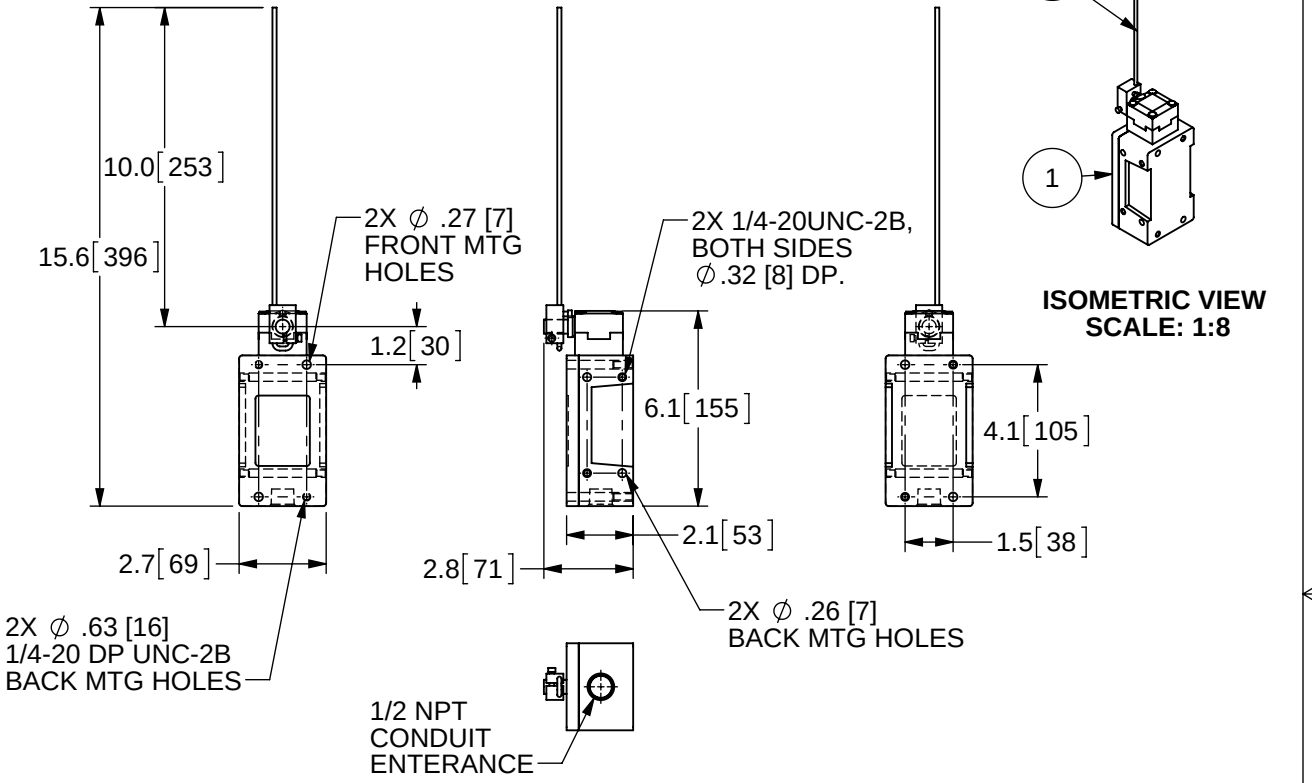
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MATERIAL: SEE BOM
WEIGHT - LBS: 4.32
WEIGHT - KG: 1.96
SHEET: 1 OF 1
DRAWING NUMBER: 10001034-007
SCALE: 1:4
REV: 01

SUPERSEDES:

NOTES :

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5. MANUFACTURER SQUARE D OR EQUAL
6. DOUBLE POLE 2NO-2NC, (9 TERMINAL)
7. RATED OPERATIONAL CURRENT: 1.2A @ 600VAC, 1.5A @ 480VAC, 3A @ 240VAC, 6A 120VAC, 0.11A @ 250VDC, .55A @ 125VDC
8. ENVIRONMENTAL RATING: NEMA AND UL TYPES 1,2,4,6,6P,12,13 AND IP 67.
9. HAZARDOUS LOCATION RATING:
   CLASS 1 DIVISION 1 GROUPS B/C/D
   CLASS 2 DIVISION 1 GROUPS E/F/G
10. WIRE SIZE AWG #22 - #12, SINGLE OR STRANDED WIRE.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2	10001038-001	LIMIT SWITCH ARM, SS	1	STAINLESS STEEL
1	10001037-001	LIMIT SWITCH,DPDT, ALUM, SQUARE D	1	CAST ALUMINUM

BILL OF MATERIALS FOR 10001036-001

REV	BY	DATE
03	JHT	03/31/14

STATUS

SUPERSEDES: 693-62BH2

BRENTWOOD®

DRAWN JHT 09/17/13

CHECKER LEH 03/31/14

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

LIMIT SWITCH WITH ROD, DPDT, SQUARE D

MATERIAL SEE BILL OF MATERIALS

WEIGHT - LBS 1.54

WEIGHT - KG 0.70

SHEET 1 OF 1

DRAWING NUMBER 10001036-001

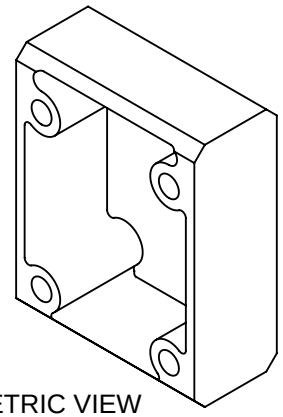
SCALE 1:6

REV 03

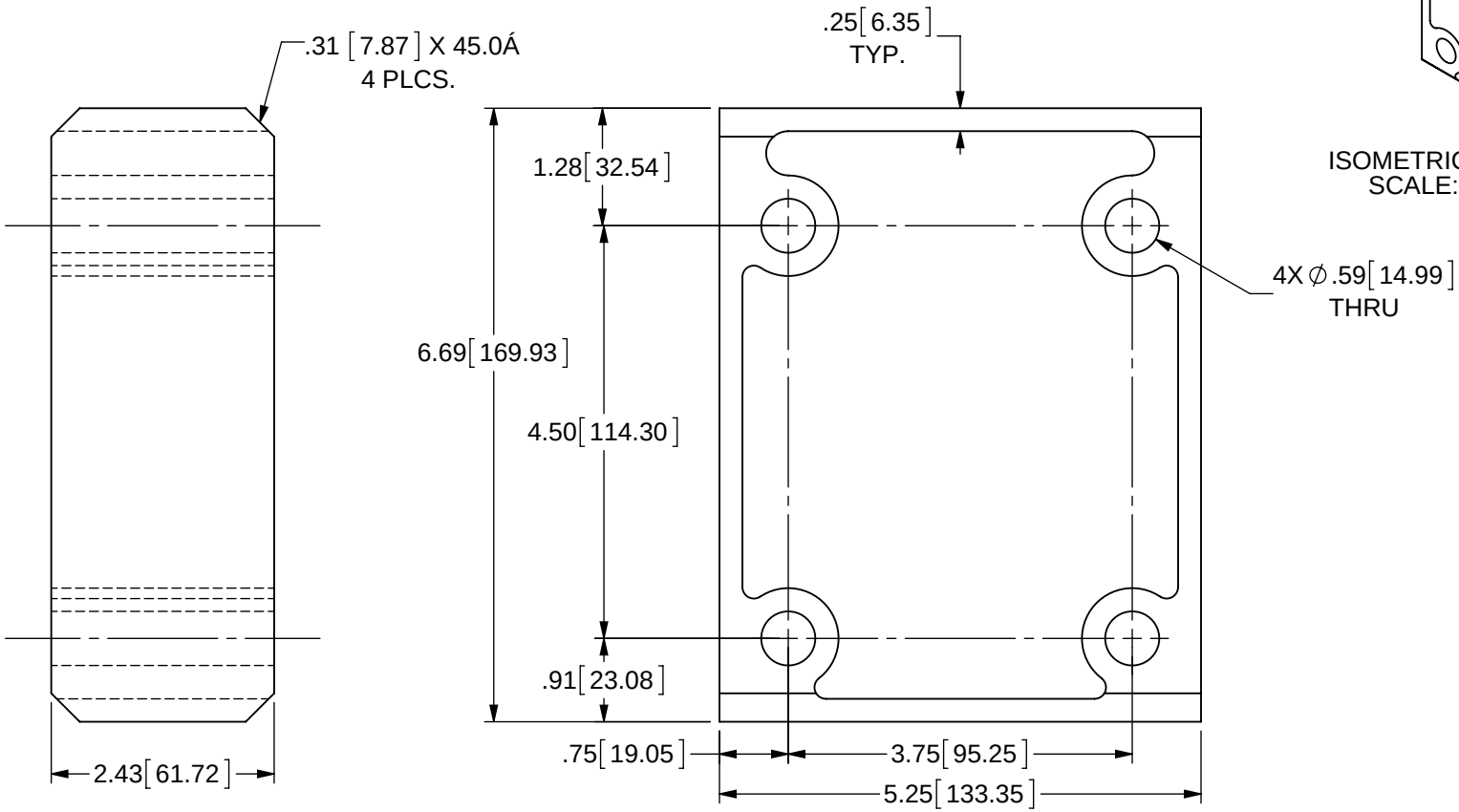
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ISOMETRIC VIEW
SCALE: 1:4



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DRAWN: BSC 09/17/13
CHECKER: MAP 09/17/13
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: FILLER BLOCK, 3x8 C-CHANNEL FLIGHT, PP-BLACK

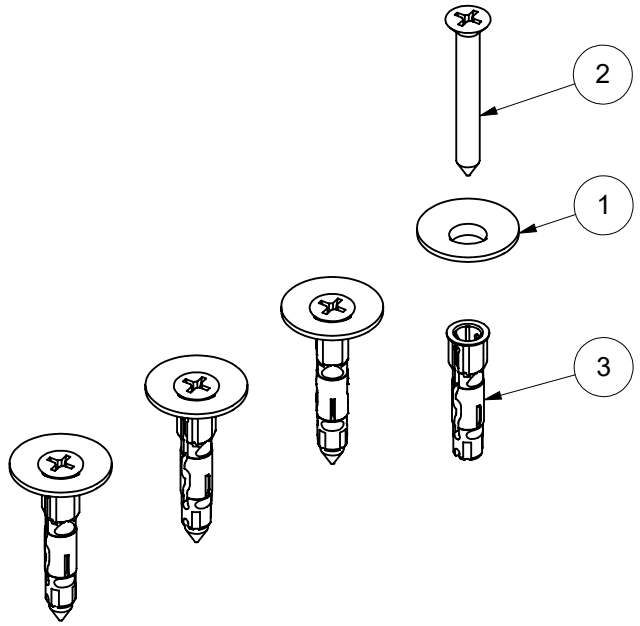
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
POLYPROPYLENE (PP)	0.68	0.31

SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10001039-001	1:2	01

NOTES :

1. REMOVE ALL BURRS AND SHARP EDGES.
2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
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ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000073-004	CONICAL FEMALE ANCHOR HUD-2 8x40mm, #14-16 SCREW, 2", PA6	4	POLYAMIDE 6
2	10000106-010	PHILLIPS FLAT HEAD SCREW 14-10 x 2", 82° BEVEL, PN=90198A769, McMASTER-CARR, 316 SS	4	AISI 316
1	10000065-001	CONICAL FLANGED WASHER, CUSTOM, 316 SS	4	AISI 316

BILL OF MATERIALS FOR 10001040-002

STATUS			TOLERANCES UNLESS OTHERWISE SPECIFIED		
			DIMENSIONS IN...	IN.	MM.
SUPERSEDES:			3 PLACE DECIMALS...	±0.030	±0.76
			2 PLACE DECIMALS...	±0.06	±1.52
			1 PLACE DECIMAL.....	±0.1	±2.5
CURRENT REVISION:			ANGULAR...	±1.0°	
BY	CKD	DATE	INTERPRET DIM AND TOL PER ASME Y14.5M-2009		
VP	RHP	14 Dec 23	MACHINED SURFACE FINISH 63 µIN. OR FINER	FLAT SURFACES: 0.063 IN. MAX FIM	

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DRAWN	DOCUMENT TYPE PRODUCT DEFINITION
SK 04 Dec 23	LONG DESCRIPTION
CHECKER SML 07 Dec 23	CONCRETE FLOOR WEAR STRIP HARDWARE KIT, HUD-2 8x40mm HILTI ANCHOR (KIT=4SCR-4CFW-4FCANC), SPECIAL

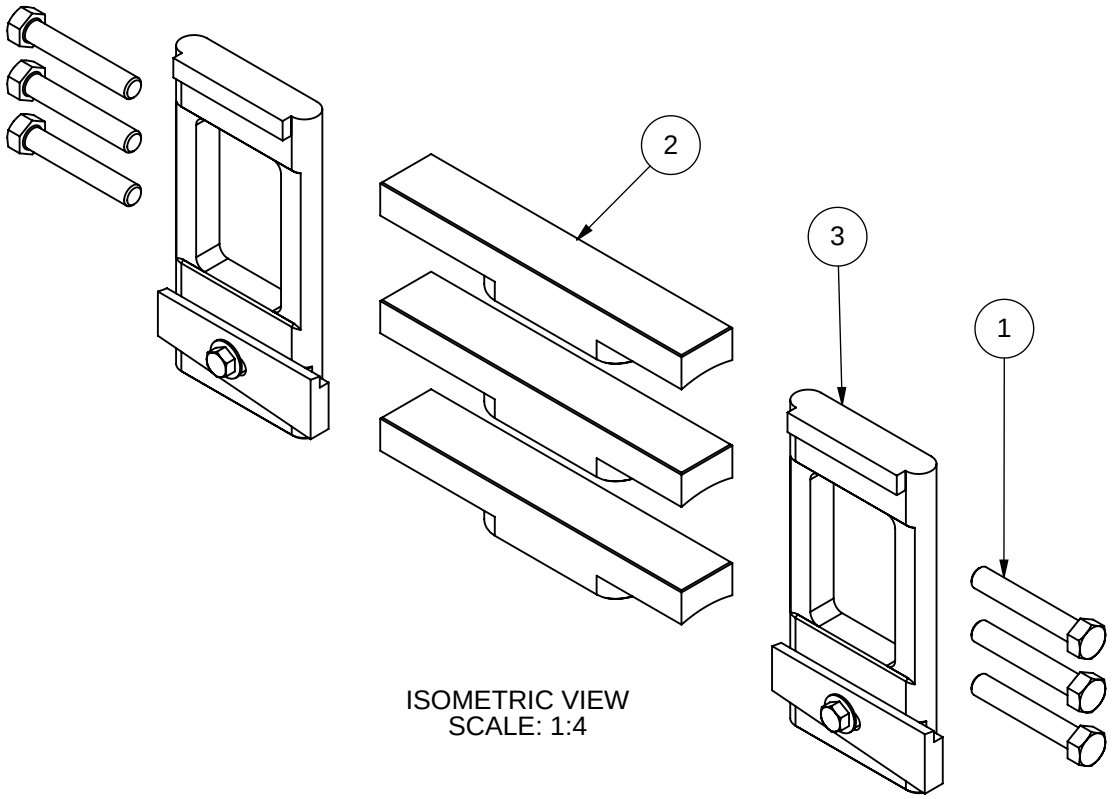
MATERIAL	WEIGHT - LBS	WEIGHT - KG
SEE BILL OF MATERIALS	0.18	0.08

SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10001040-002	1:2	02

Rev 01

NOTES :

1. REMOVE ALL BURRS AND SHARP EDGES.
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ISOMETRIC VIEW
SCALE: 1:4

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10000247	ASSY, ENGLISH 316 SS HARDWARE, KEY, INTERLOCKING, TUBE, HEAD SHAFT, TELESCOPIC, NON-METALLIC	2	SEE BOM
2	10001042-001	MOLDED SHAFT KEY, 1.500" WIDTH x 1.250" HEIGHT x 8.875" LONG, CAST NYLON 6	3	NYLON 6/6-33% GR
1	10000032-005	HEX BOLT, 1/2-13 x 3", FULLY THREADED, 316 SS	6	AISI 316

BILL OF MATERIALS FOR 10001041-004

STATUS

SUPERSEDES:
658-22204-016

REV	BY	DATE
01	#	MO/DY/YEAR

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DRAWN BSC 09/21/13

CHECKER SML 09/21/13

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-2INTLK-6LVL)

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MATERIAL: SEE BILL OF MATERIAL

WEIGHT - LBS: 5.12

WEIGHT - KG: 2.32

SHEET: 1 OF 1

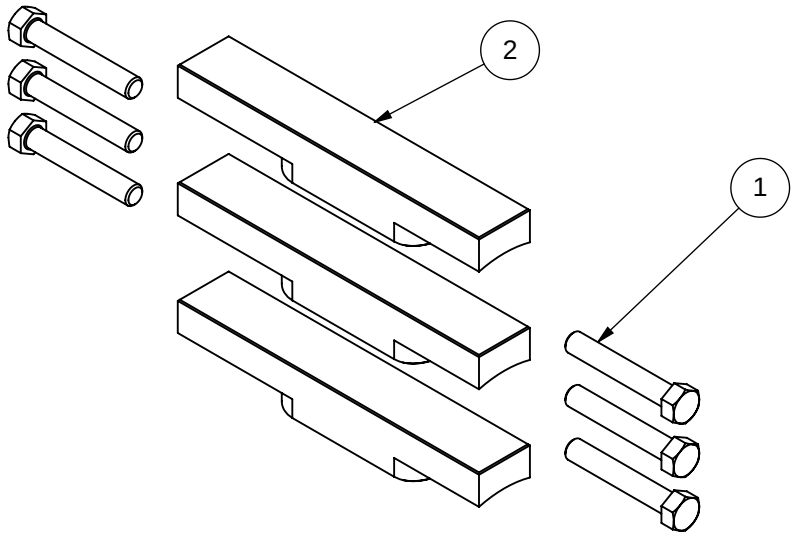
DRAWING NUMBER: 10001041-004

SCALE: 1:4

REV: 01

NOTES :

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ISOMETRIC VIEW
SCALE: 1:4

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2	10001042-001	MOLDED SHAFT KEY, 1.500" WIDTH x 1.250" HEIGHT x 8.875" LONG, CAST NYLON 6	3	NYLON 6/6-33% GR
1	10000032-005	HEX BOLT, 1/2-13 x 3", FULLY THREADED, 316 SS	6	AISI 316

BILL OF MATERIALS FOR 10001041-005

STATUS

SUPERSEDES: 658-22204-018

REV	BY	DATE
01	#	MO/DY/YEAR

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DRAWN BSC 09/21/13

CHECKER SML 09/21/13

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION

HEAD SHAFT KIT, ENGLISH, 316 & PA6/6 (KIT=3KY-6LVL)

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MATERIAL: SEE BILL OF MATERIAL

WEIGHT - LBS: 3.08

WEIGHT - KG: 1.40

SHEET: 1 OF 1

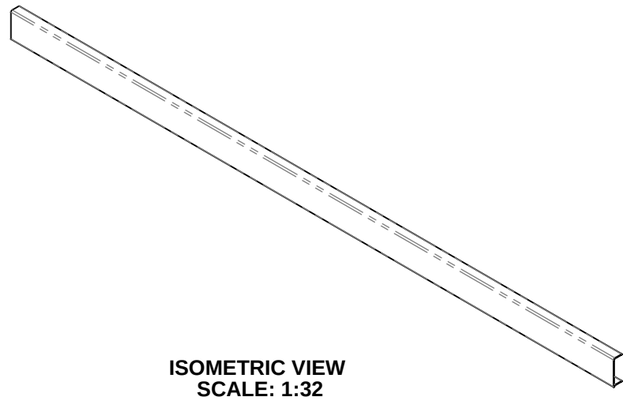
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SCALE: 1:4

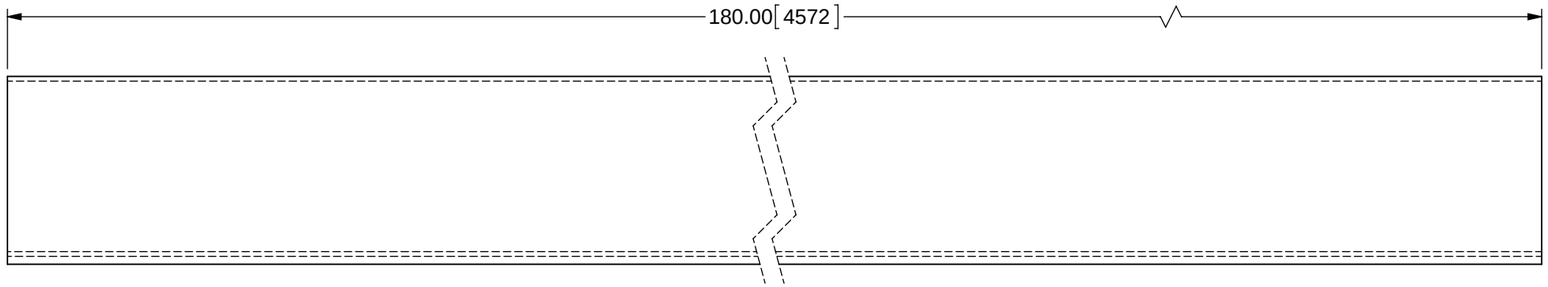
REV: 01

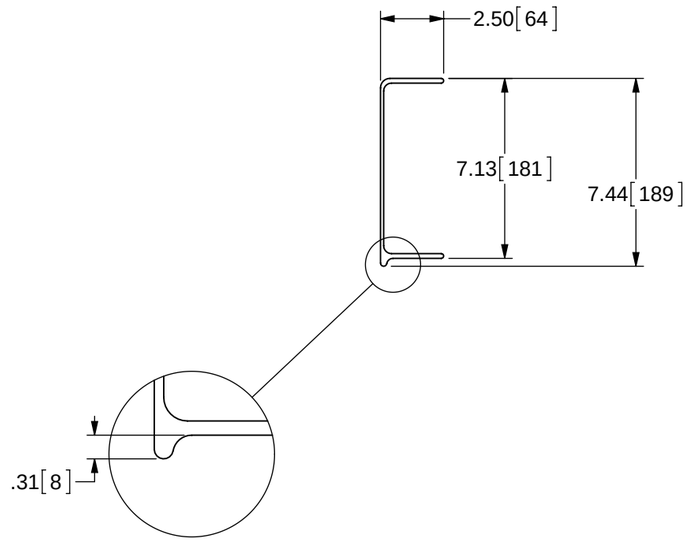
NOTES :

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3. ALL DIMENSIONS SHOWN ARE IN INCHES [MM]



ISOMETRIC VIEW
SCALE: 1:32





DETAIL A
SCALE 1 : 2

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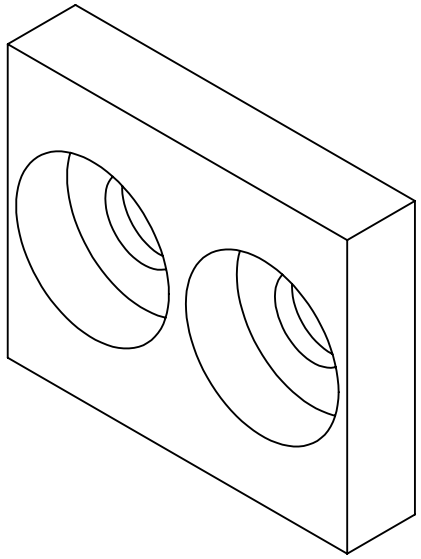
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DRAWN: WR 10/17/13	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: 3x8 C-CHANNEL FLIGHT, 180.00", BLANK, FRP			
CHECKER: GVA 10/17/13				
	MATERIAL: FIBER REINFORCED POLYESTER	WEIGHT - LBS: 22.54	WEIGHT - KG: 10.22	
SHEET: 1 OF 1	DRAWING NUMBER: 10001060-005		SCALE: 1:6	REV: 01

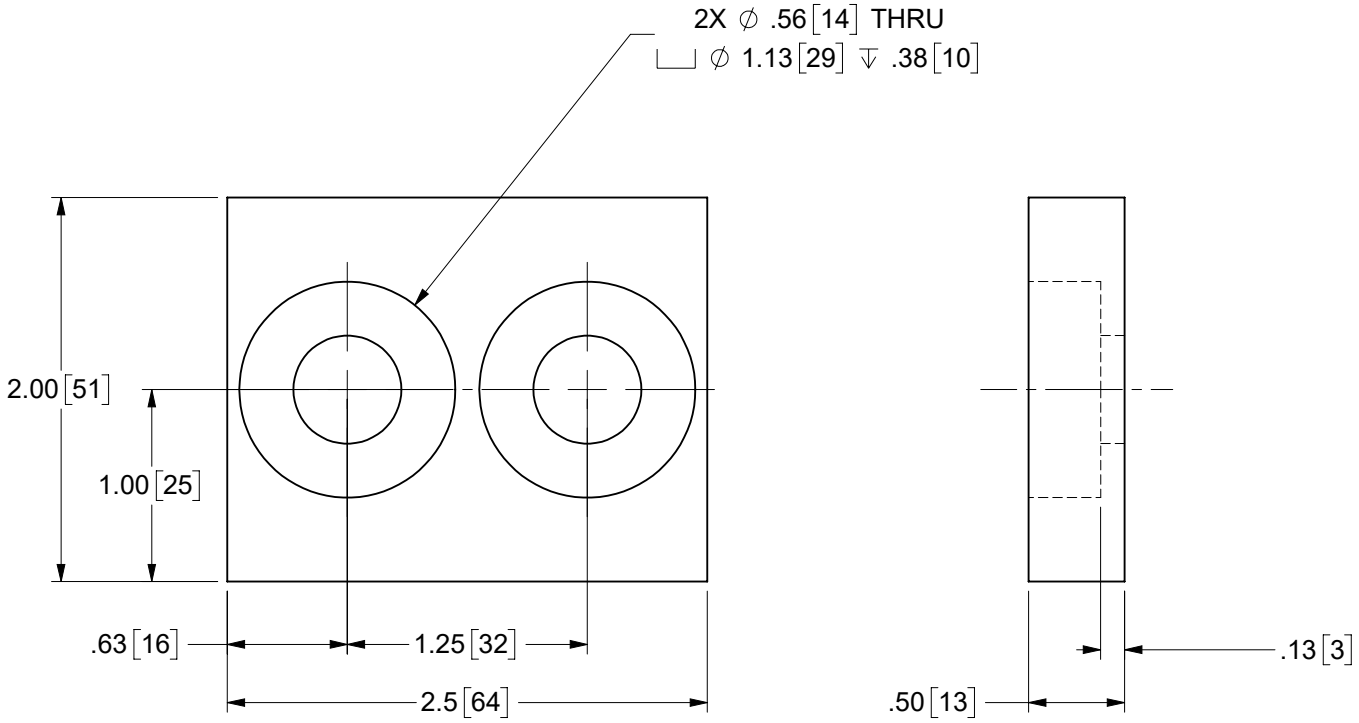
Rev 01

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ISOMETRIC VIEW
SCALE: 1:1



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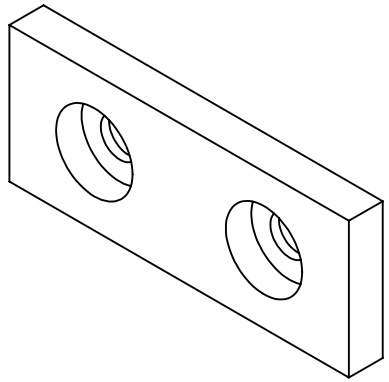
DRAWN: VP, 05 Sep 23	CHECKER: SML, 08 Sep 23	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: WEAR BAR, 0.50" x 2.00" x 2.50", 2 HOLES, UHMW-PE	
MATERIAL: UHMW-PE		WEIGHT - LBS: 0.06	WEIGHT - KG: 0.03
SHEET: 1 OF 1		DRAWING NUMBER: 10001103-011	SCALE: 1:1 / REV: 01

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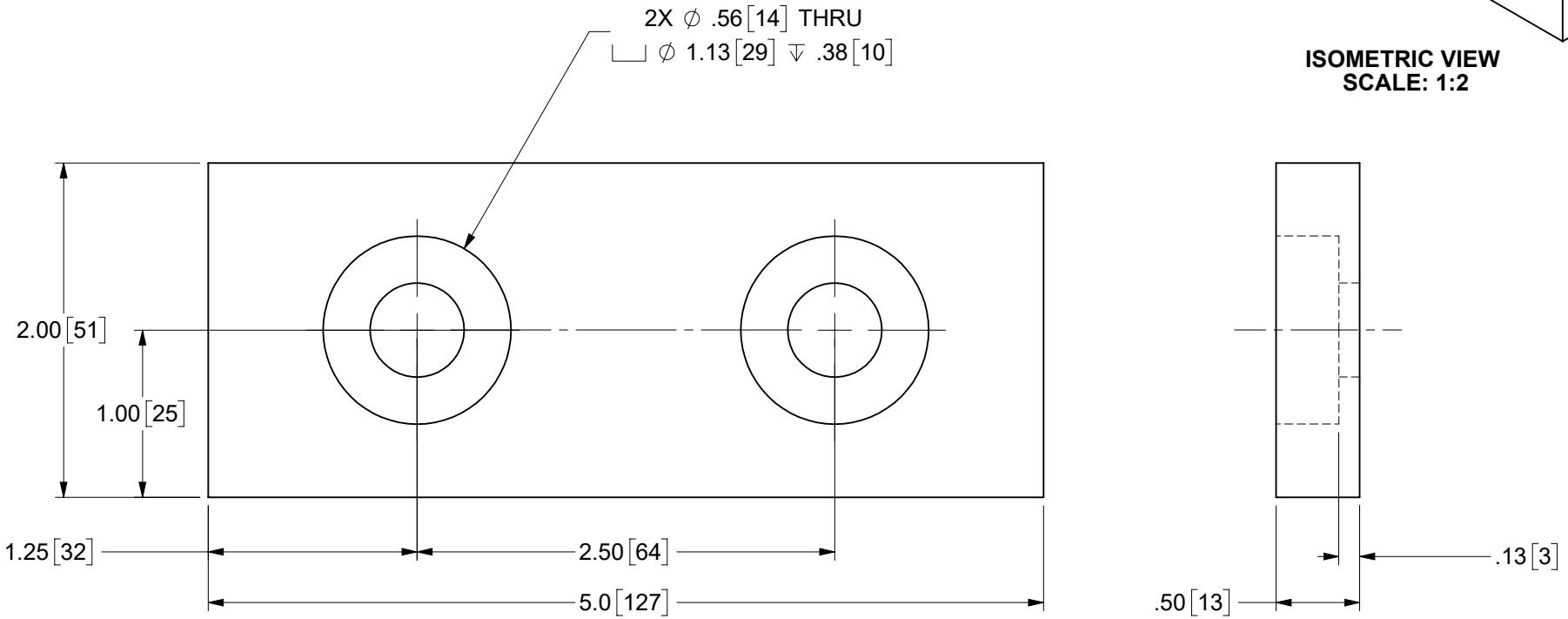
SUPERSEDES:

NOTES :

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ISOMETRIC VIEW
SCALE: 1:2



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DRAWN: VP 05 Sep 23
CHECKER: SML 08 Sep 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: WEAR BAR, 0.50" x 2.00" x 5.00", 2 HOLES, UHMW-PE

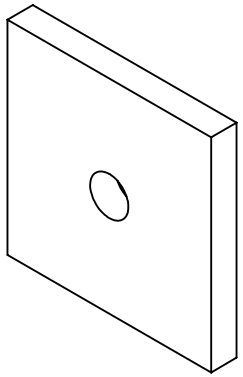
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
UHMW-PE	0.14	0.06

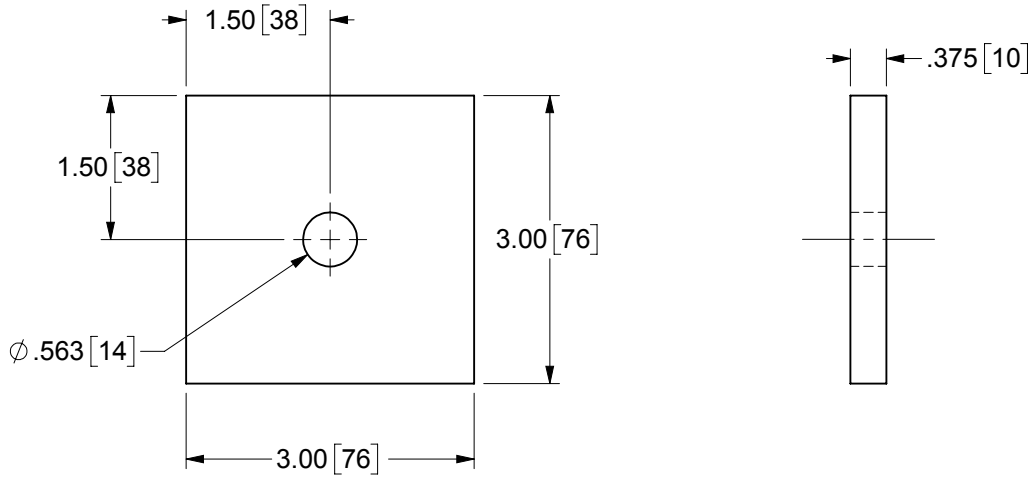
SUPERSEDES:	SHEET	DRAWING NUMBER	SCALE	REV
	1 OF 1	10001103-012	1:1	01

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ISOMETRIC VIEW
SCALE: 1:2



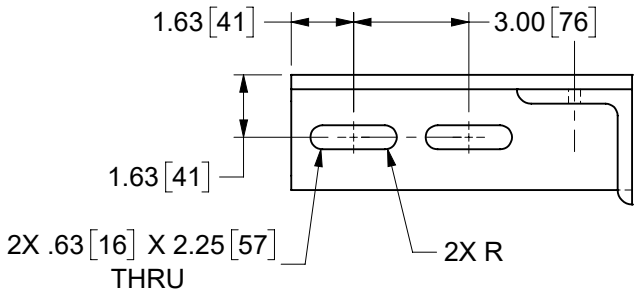
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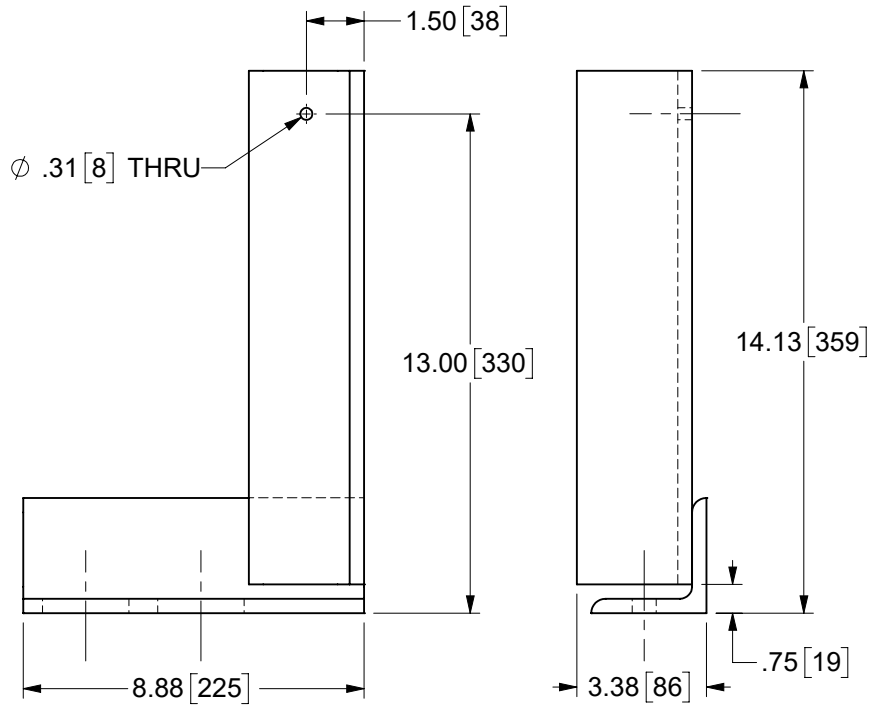
DRAWN DME 07/20/17
CHECKER SML 07/20/17
DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
PLATE, 0.38" x 3.00" x 3.00", 1 HOLE, FRP

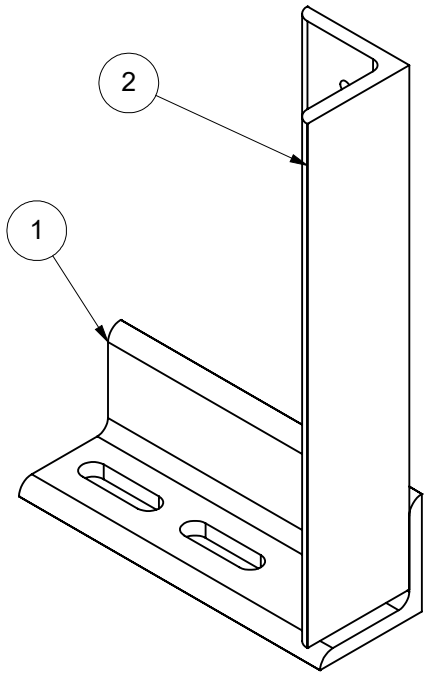
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
FIBER REINFORCED POLYESTER	0.22	0.10

SUPERSEDES:	SHEET	DRAWING NUMBER	SCALE	REV
672-24853	1 OF 1	10001104-013	1:1	01







ISOMETRIC VIEW
SCALE: 1:4

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 3" x 3" x 3/8" x 13.38 LONG, 1 HOLE, SS 304L	1	AISI 304L
1	ANGLE, 3" x 3" x 3/8" x 8.88 LONG, 2 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10001220-002

NOTES :

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SUPERSEDES:

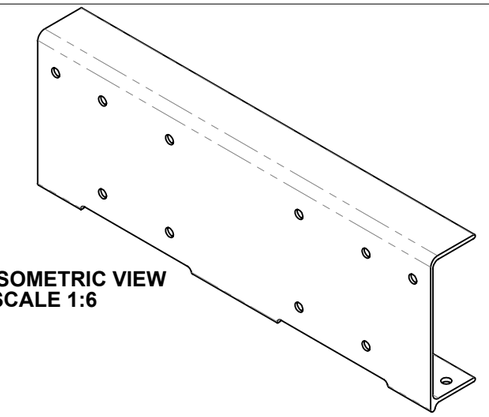
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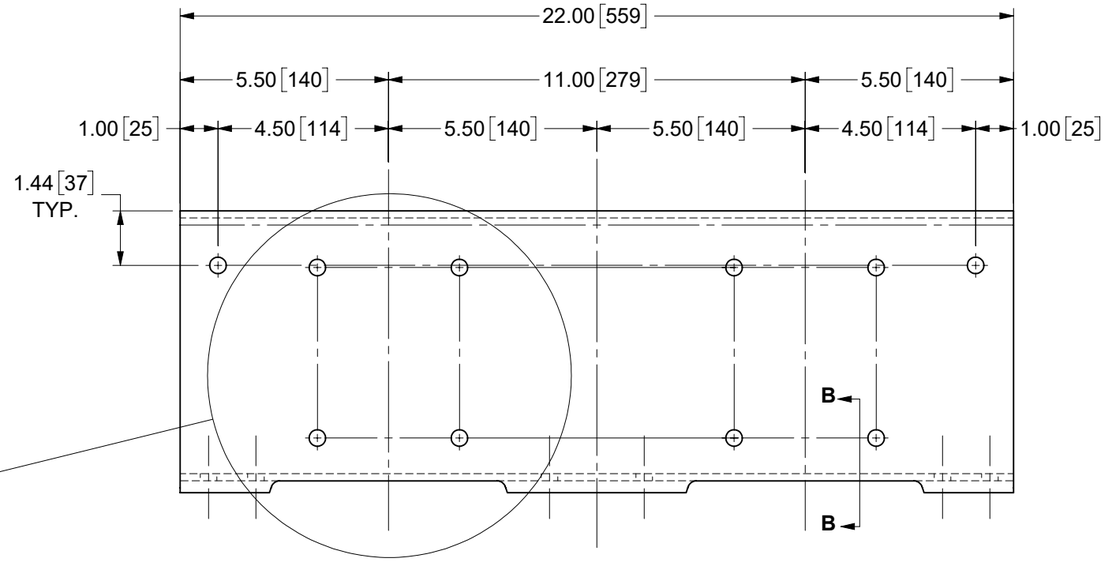
DRAWN: RHP 26 Sep 23	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: WELDMENT, 14.13" x 2.38" x 8.88", 1 HOLE, 2 SLOTS, SS 304L		
CHECKER: SML 26 Sep 23			
MATERIAL: SEE BILL OF MATERIALS		WEIGHT - LBS: 13.02	WEIGHT - KG: 5.91
SHEET: 1 OF 1	DRAWING NUMBER: 10001220-002	SCALE: 1:5	REV: 01

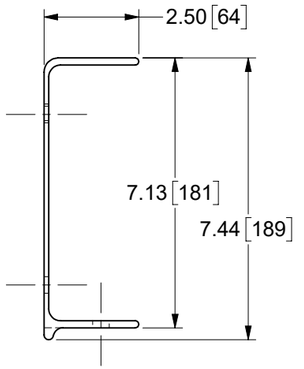
NOTES :

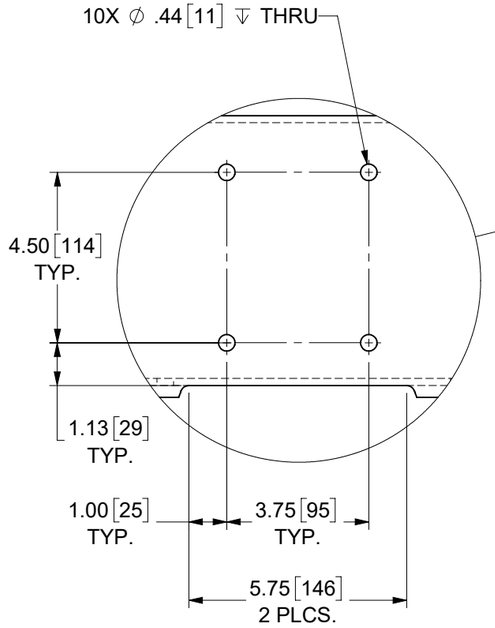
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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



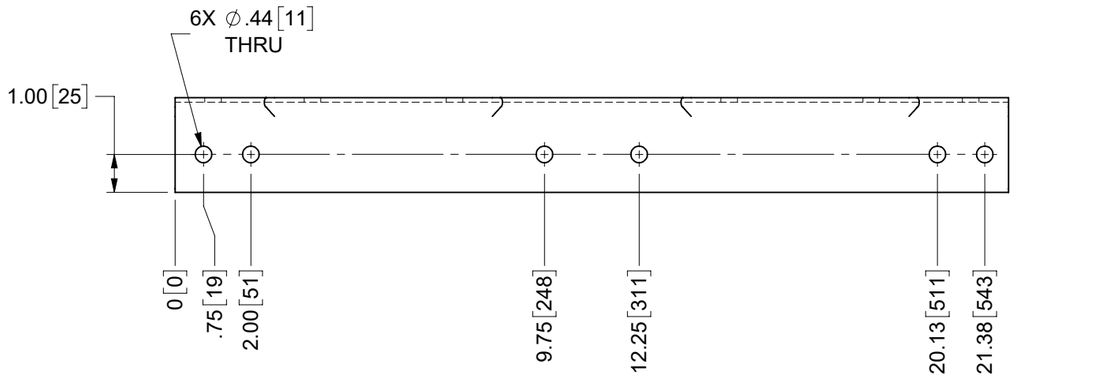
ISOMETRIC VIEW
SCALE 1:6

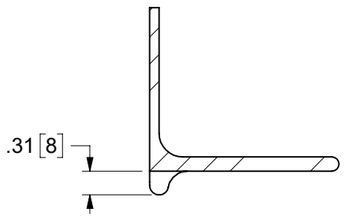






DETAIL A
SCALE 1 : 4



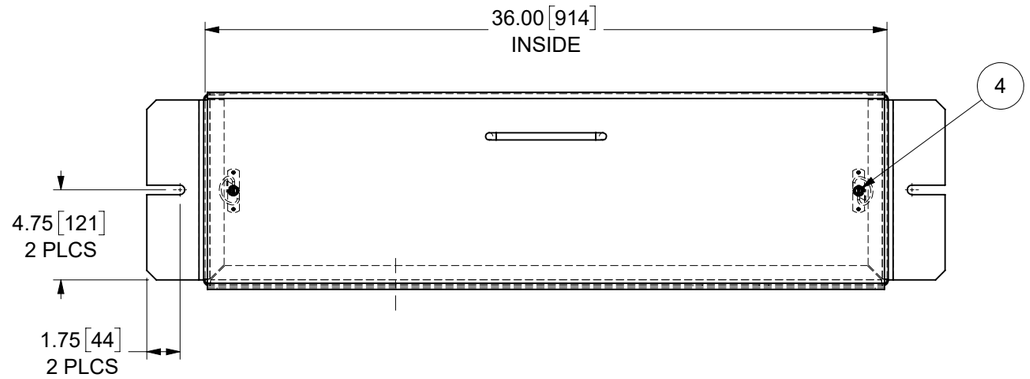


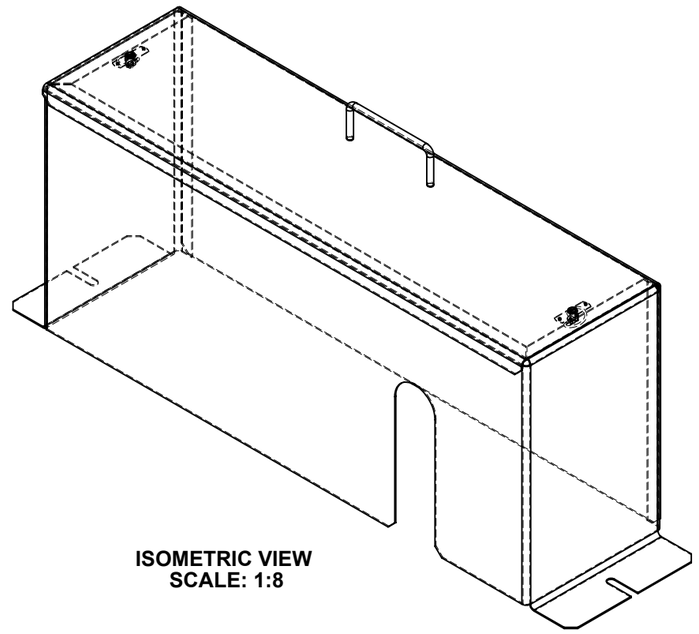
SECTION B-B
SCALE 1 : 2

BRENTWOOD®

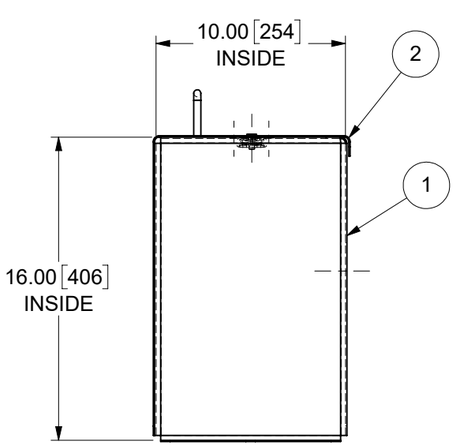
DRAWN: VP, 05 Sep 23	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: 3x8 C-CHANNEL FLIGHT, 16 HOLES, 22.00", WEAR BAR ATTACHMENT, FRP	
CHECKER: SML, 29 Sep 23		
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SUPERSEDES:	SHEET: 1 OF 1	DRAWING NUMBER: 10001485-014 / SCALE: 1:4 / REV: 01

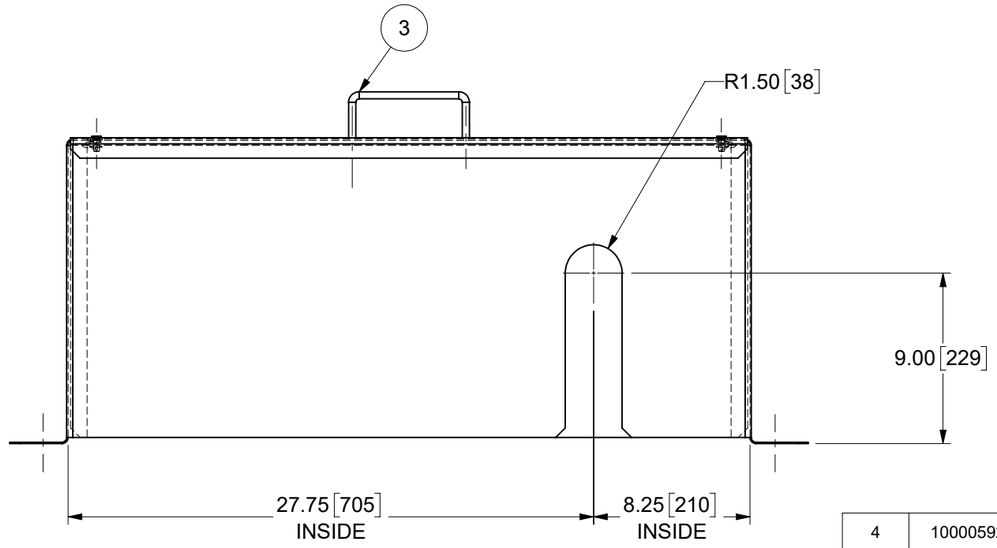
Rev 01





ISOMETRIC VIEW
SCALE: 1:8





NOTES :

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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
4. MATERIAL TO BE 14 GAUGE 304 STAINLESS STEEL.

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000592-001	SPRING LATCH, SLOTTED FLUSH HEAD, RIVET TYPE, SMOOTH SPRING, PASSIVATED SS	2	STAINLESS STEEL
3	10000567-002	PULL HANDLE, 0.38" DIA, 6.00" LONG, 304L SS	1	AISI 304L
2	10001690-015	COVER, SINGLE CHAIN GUARD, 15.75" x 10.25" x 35.75", 304 SS	1	AISI 304
1	10001689-046	BASE, SINGLE CHAIN GUARD, 16.00" x 10.00" x 36.00", 304 SS	1	AISI 304

BILL OF MATERIALS FOR 10001691-046

BRENTWOOD®

DRAWN EAGH 06/02/17
CHECKER SML 06/02/17

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 10.00" x 36.00", 304 SS
GRIT COLLECTOR - TANK T-112

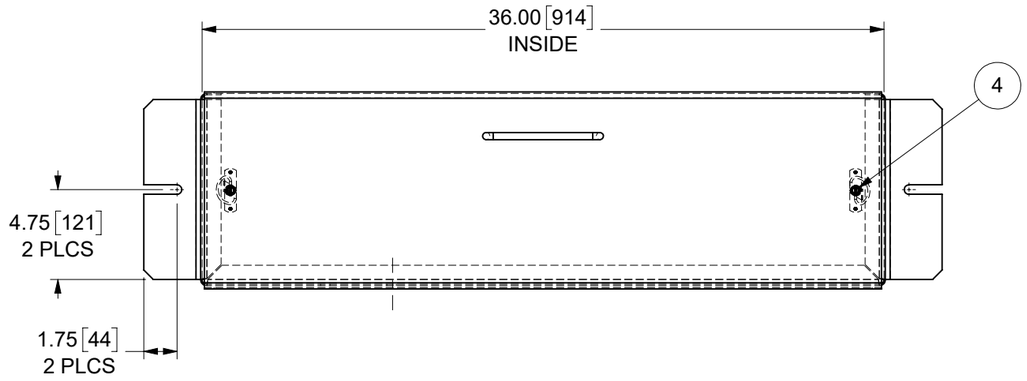
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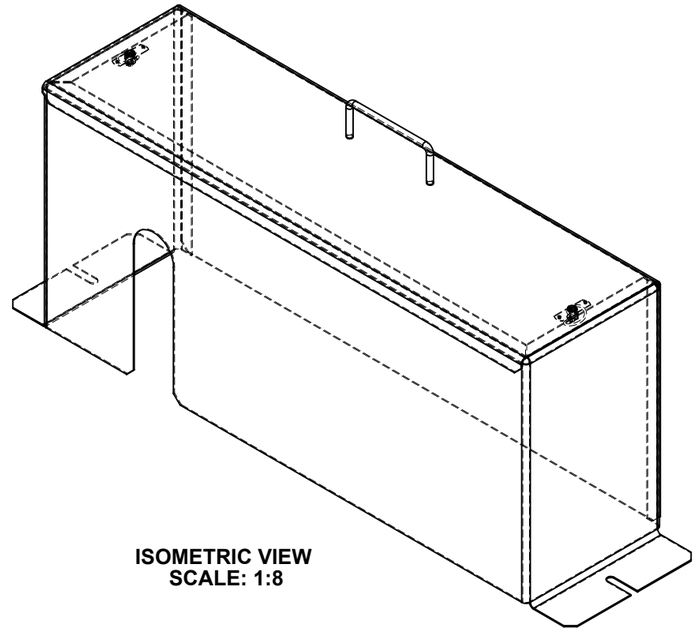
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 42.34
WEIGHT - KG: 19.21

SUPERSEDES:

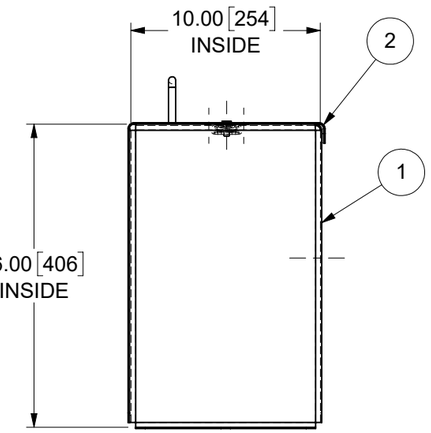
SHEET: 1 OF 1
DRAWING NUMBER: 10001691-046
SCALE: 1:8
REV: 03

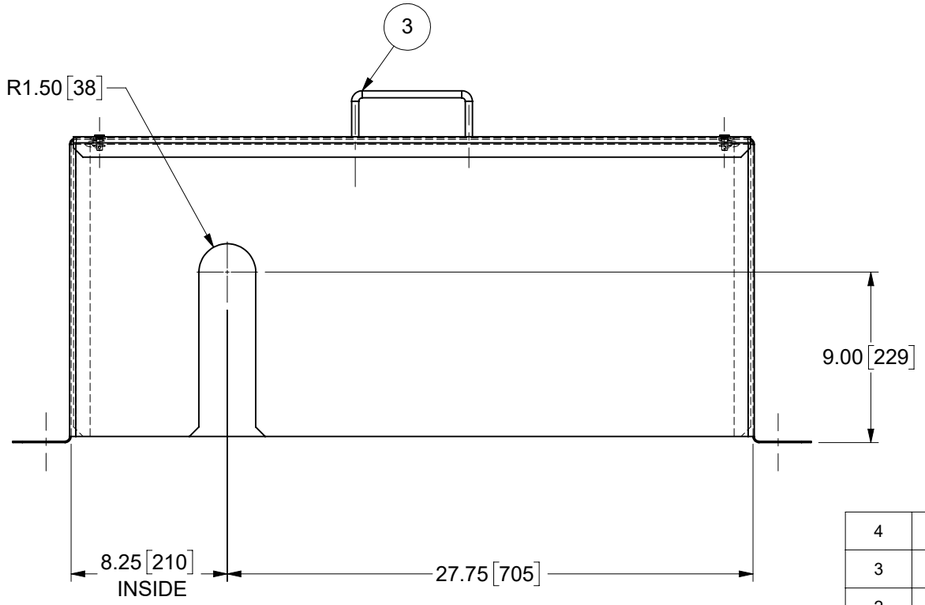
Rev 01





ISOMETRIC VIEW
SCALE: 1:8





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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
4. MATERIAL TO BE 14 GAUGE 304 STAINLESS STEEL.

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000592-001	SPRING LATCH, SLOTTED FLUSH HEAD, RIVET TYPE, SMOOTH SPRING, PASSIVATED SS	2	STAINLESS STEEL
3	10000567-002	PULL HANDLE, 0.38" DIA, 6.00" LONG, 304L SS	1	AISI 304L
2	10001690-015	COVER, SINGLE CHAIN GUARD, 15.75" x 10.25" x 35.75", 304 SS	1	AISI 304
1	10001689-048	BASE, SINGLE CHAIN GUARD, 16.00" x 10.00" x 36.00", 304	1	AISI 304

BILL OF MATERIALS FOR 10001691-048

BRENTWOOD®

DRAWN EAGH 06/02/17
CHECKER SML 06/02/17

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 10.00" x 36.00", 304 SS
GRIT COLLECTOR - TANK T-111 & T-113

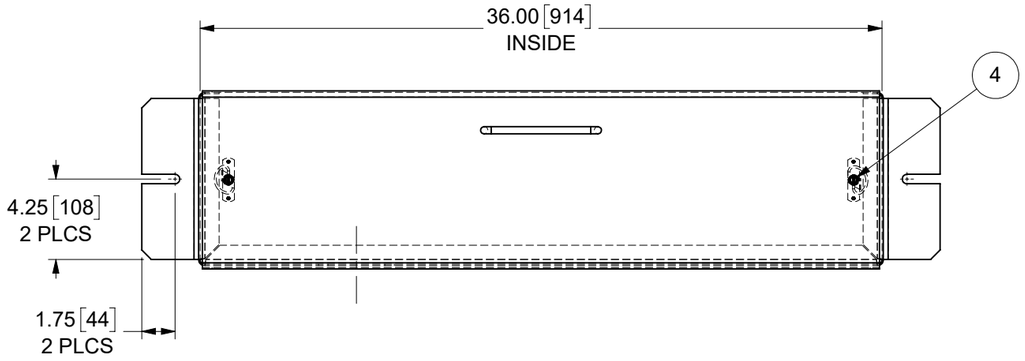
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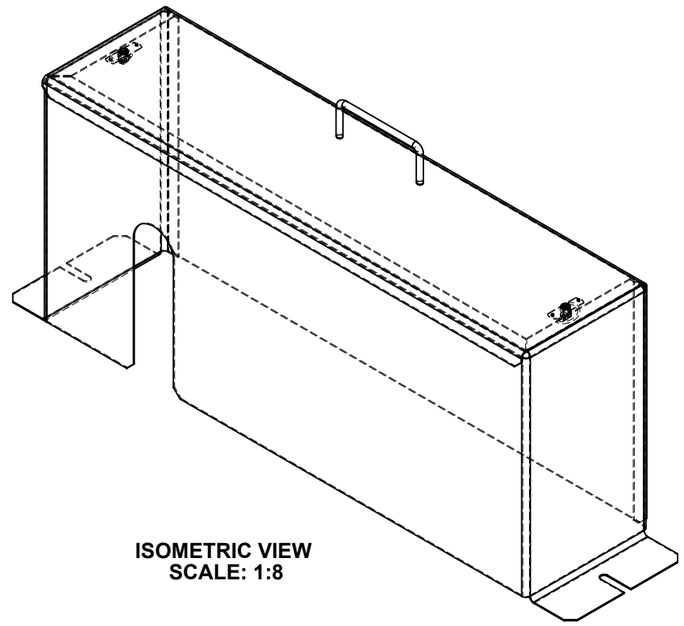
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 42.34
WEIGHT - KG: 19.21

SUPERSEDES:

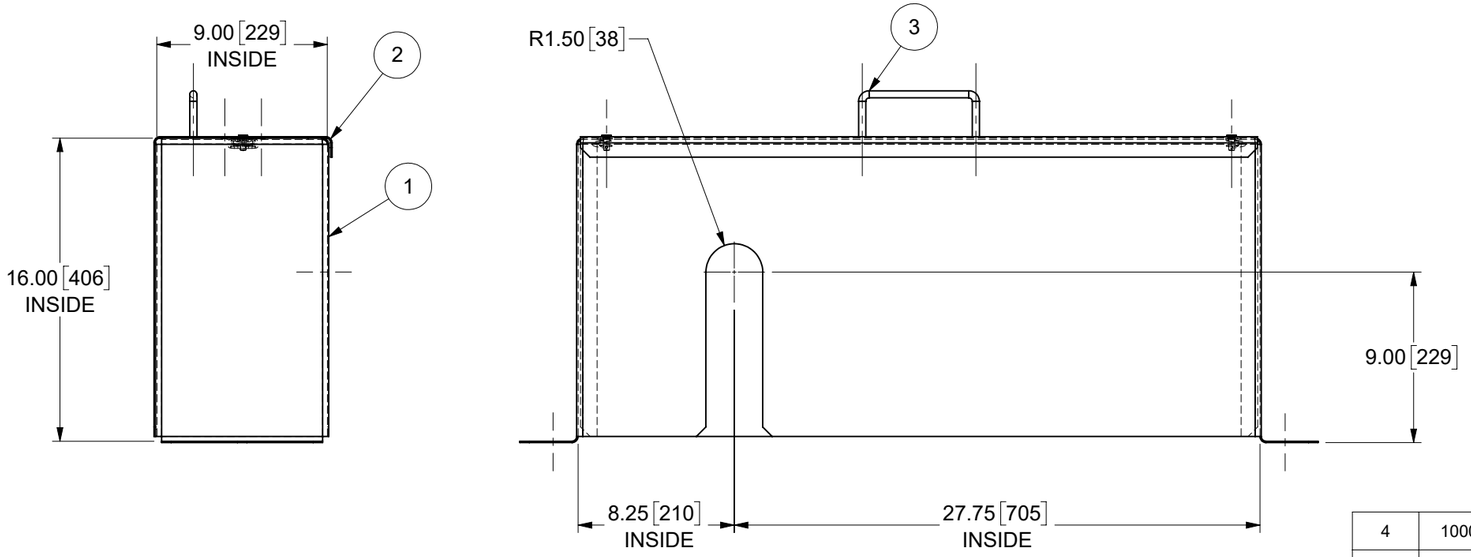
SHEET: 1 OF 1
DRAWING NUMBER: 10001691-048
SCALE: 1:8
REV: 03

Rev 01





ISOMETRIC VIEW
SCALE: 1:8



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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
4. MATERIAL TO BE 14 GAUGE 304 STAINLESS STEEL.

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000592-001	SPRING LATCH, SLOTTED FLUSH HEAD, RIVET TYPE, SMOOTH SPRING, PASSIVATED SS	2	STAINLESS STEEL
3	10000567-002	PULL HANDLE, 0.38" DIA, 6.00" LONG, 304L SS	1	AISI 304L
2	10001690-097	COVER, SINGLE CHAIN GUARD, 15.75" x 9.25" x 35.75", 304 SS	1	AISI 304
1	10001689-143	BASE, SINGLE CHAIN GUARD, 16.00" x 9.00" x 36.00", 304 SS	1	AISI 304

BILL OF MATERIALS FOR 10001691-143

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DRAWN FJH 12/09/19
CHECKER SML 12/09/19

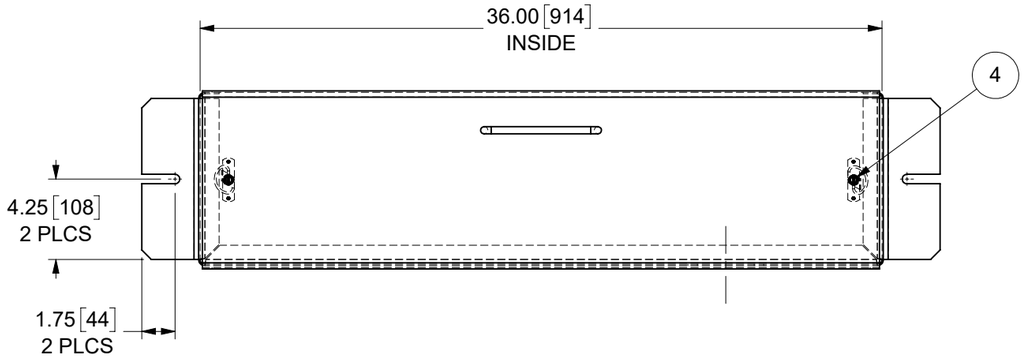
DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 9.00" x 36.00", 304 SS
CROSS COLLECTOR - TANK T-212

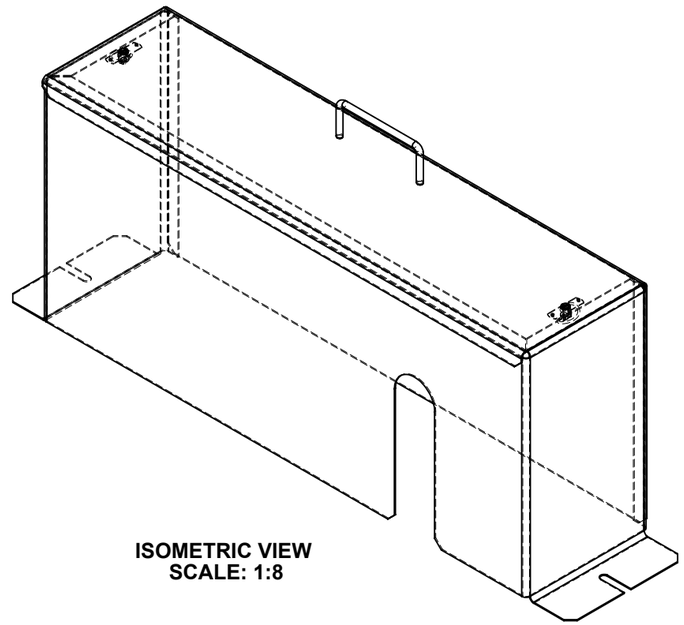
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MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 40.71
WEIGHT - KG: 18.47
SHEET: 1 OF 1
DRAWING NUMBER: 10001691-143
SCALE: 1:8
REV: 02

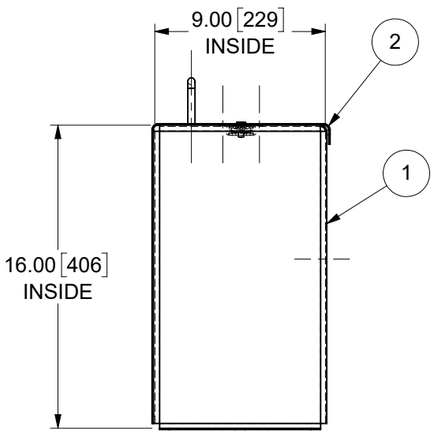
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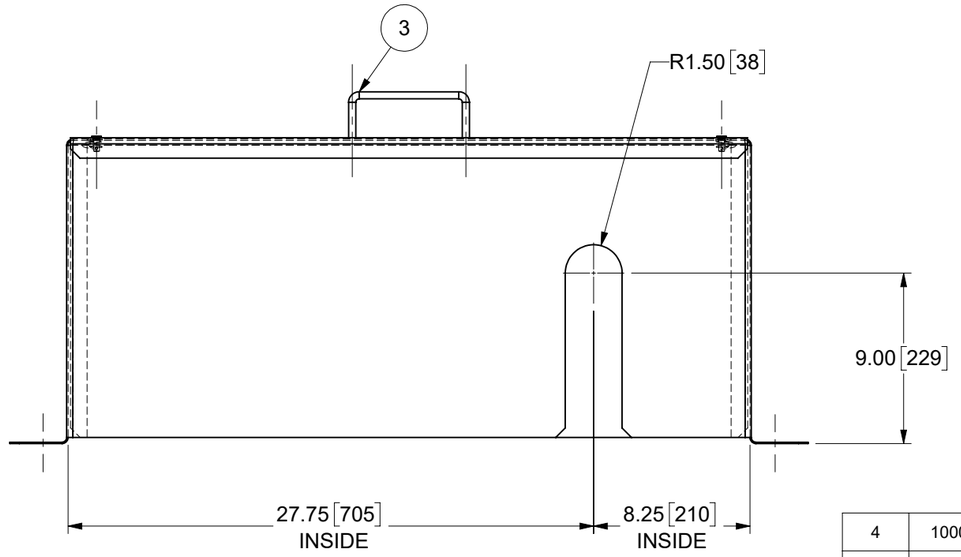
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ISOMETRIC VIEW
SCALE: 1:8





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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
4. MATERIAL TO BE 14 GAUGE 304 STAINLESS STEEL.

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000592-001	SPRING LATCH, SLOTTED FLUSH HEAD, RIVET TYPE, SMOOTH SPRING, PASSIVATED SS	2	STAINLESS STEEL
3	10000567-002	PULL HANDLE, 0.38" DIA, 6.00" LONG, 304L SS	1	AISI 304L
2	10001690-097	COVER, SINGLE CHAIN GUARD, 15.75" x 9.25" x 35.75", 304 SS	1	AISI 304
1	10001689-144	BASE, SINGLE CHAIN GUARD, 16.00" x 9.00" x 36.00", 304 SS	1	AISI 304

BILL OF MATERIALS FOR 10001691-144

BRENTWOOD®

DRAWN FJH 12/09/19
CHECKER SML 12/09/19

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
CHAIN GUARD ASSEMBLY, SINGLE, 16.00" x 9.00" x 36.00", 304 SS
CROSS COLLECTOR - TANK T-211 & T-213

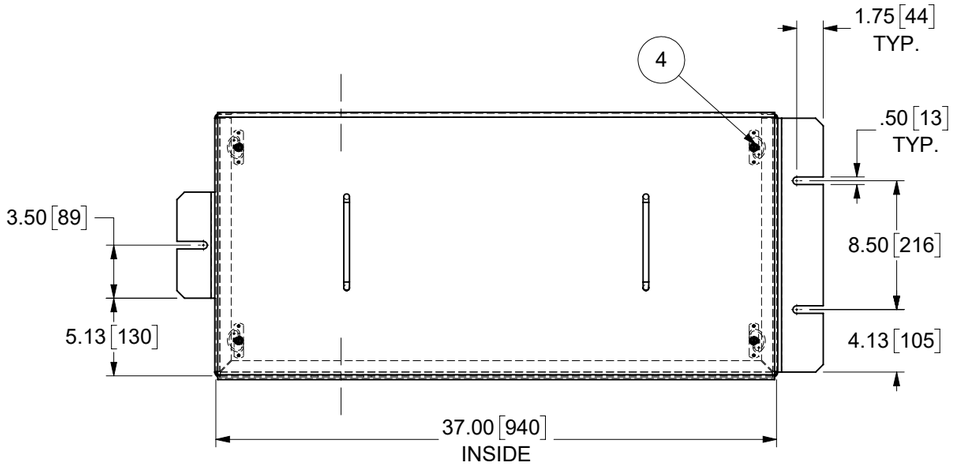
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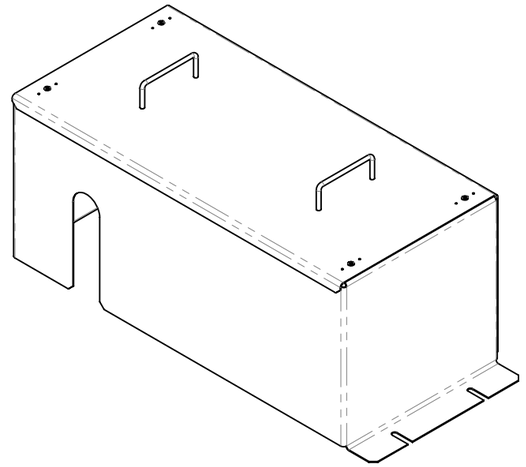
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 40.71
WEIGHT - KG: 18.47

SUPERSEDES:

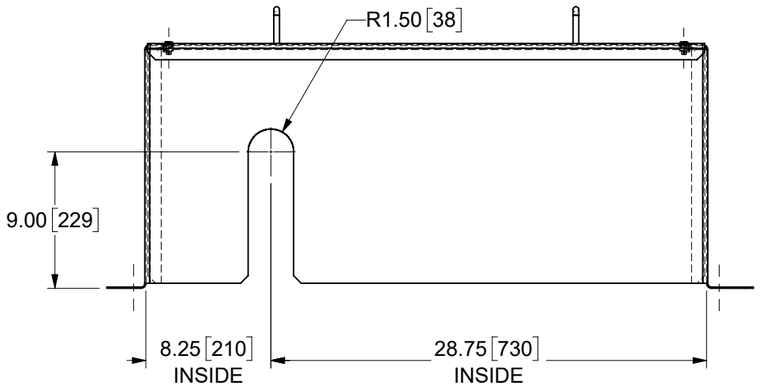
SHEET: 1 OF 1
DRAWING NUMBER: 10001691-144
SCALE: 1:8
REV: 02

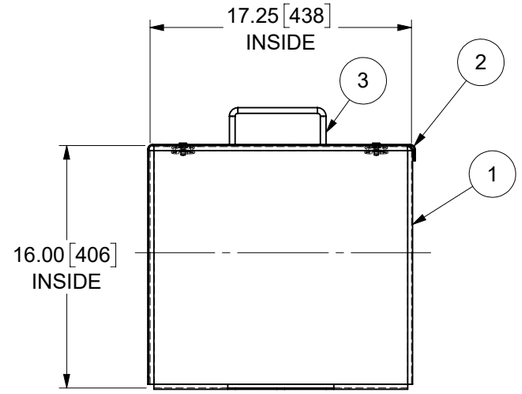
Rev 01





ISOMETRIC VIEW
SCALE: 1:12





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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
4. MATERIAL TO BE 14 GAUGE 304 STAINLESS STEEL.

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10000592-001	SPRING LATCH, SLOTTED FLUSH HEAD, RIVET TYPE, SMOOTH SPRING, PASSIVATED SS	4	STAINLESS STEEL
3	10000567-002	PULL HANDLE, 0.38" DIA, 6.00" LONG, 304L SS	2	AISI 304L
2	10001690-217	COVER, DUAL CHAIN GUARD, 15.75" x 17.50" x 36.75", 304 SS	1	AISI 304
1	10001689-312	BASE, DUAL CHAIN GUARD, 16.00" x 17.25" x 37.00", 304 SS	1	AISI 304

BILL OF MATERIALS FOR 10001691-318

BRENTWOOD®

DRAWN VP 05 Sep 23
CHECKER RHP 09 Nov 23

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
CHAIN GUARD ASSEMBLY, DUAL, 16.00" x 17.25" x 37.00", 304 SS
LONGITUDINAL COLLECTOR - TANK T-211, T-212 & T-213

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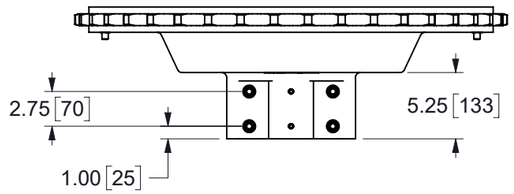
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 54.15
WEIGHT - KG: 24.56

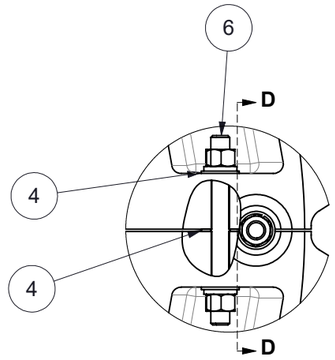
SUPERSEDES:

SHEET: 1 OF 1
DRAWING NUMBER: 10001691-318
SCALE: 1:10
REV: 01

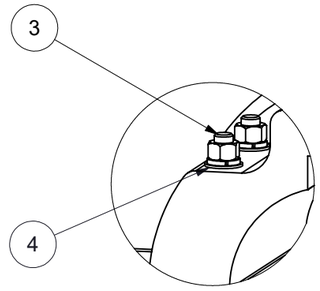
NOTES :

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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

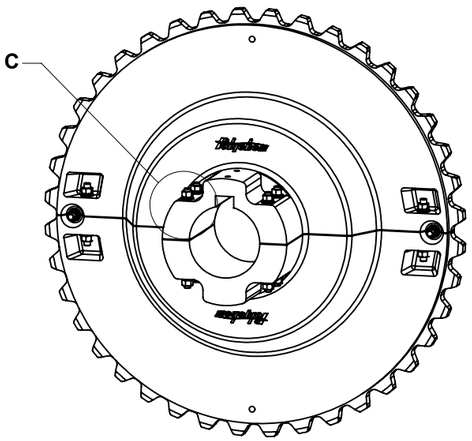




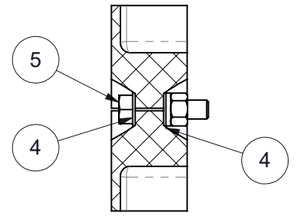
DETAIL B
SCALE 1 : 4



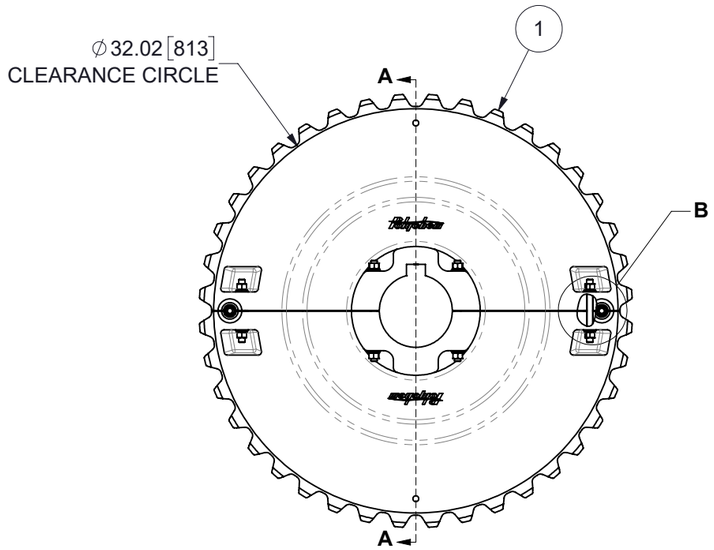
DETAIL C
SCALE 1 : 4

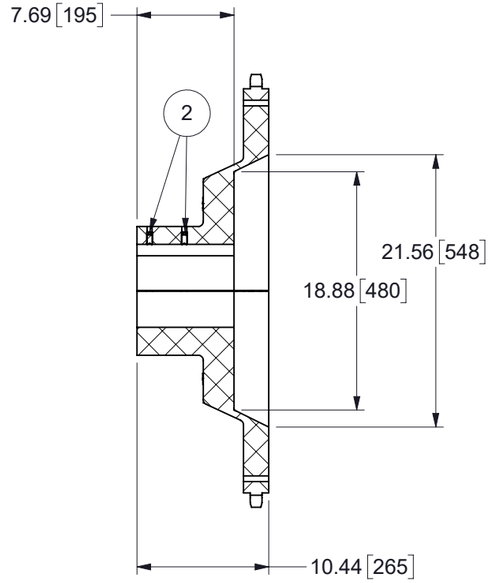


ISOMETRIC VIEW
SCALE: 1:12



SECTION D-D
SCALE 1 : 4





SECTION A-A

SPROCKET TYPE: **NH78 SPLIT BULL SPROCKET**

SPROCKET OFFSET: 1.750 IN [142.88MM] REF.

NUMBER OF TEETH: 40

TOOTH PITCH: 2.609 INCH [66.27 MM] REF.

PITCH DIAMETER: 33.252 INCH [844.60 MM] REF.

OUTSIDE DIAMETER: 34.326 INCH [871.88 MM] REF.

SHAFT DIAMETER: 5.750 INCH [146.05 MM] REF.

BORE DIAMETER: 5.775 INCH [146.69 MM] REF.

KEYWAY: 1.500 IN WIDTH x .900 IN DEPTH [25.40 MM x 12.70 MM] REF.

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
8	10000006-004	HEX NUT, 1/2-13, 316 SS	14	AISI 316
7	10000012-006	SPLIT LOCK WASHER, 1/2, 316 SS	14	AISI 316
6	10000062-037	ALL THREAD STUD, 1/2-13 x 5", 316 SS	2	AISI 316
5	10000001-023	HEX BOLT, 1/2-13 x 2", 316 SS	2	AISI 316
4	10000058-014	FLAT WASHER, 1/2, 0.53" x 1.00" x 0.06", 316 SS	18	AISI 316
3	10000062-038	ALL THREAD STUD, 1/2-13 x 8", 316 SS	4	AISI 316
2	10000039-003	HEX SOCKET SET SCREW, M12x1.75 x 25 MM, CUP POINT, 316 SS	2	AISI 316
1	N/A	NH-78 SPROCKET, 40T, SPLIT, 5.78" BORE, 1.75" OFFSET, PA6	1	CAST NYLON 6

BILL OF MATERIALS FOR 10001811-003

BRENTWOOD®

DRAWN VP 02/06/17
CHECKER SML 02/06/17

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 1.75" OFFSET, ENG HDW, PA6,
LONGITUDINAL COLLECTOR - TANK T-211, T-212 & T-213

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MATERIAL	WEIGHT - LBS	WEIGHT - KG
SEE BILL OF MATERIAL	80.68	36.60

SUPERSEDES:	SHEET	DRAWING NUMBER	SCALE	REV
	1 OF 1	10001811-003	1:12	04

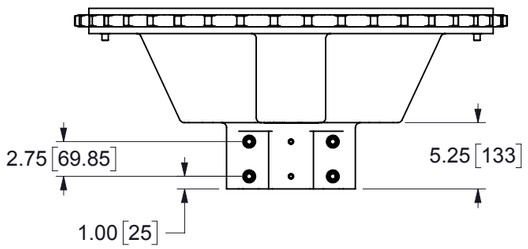
Rev 01

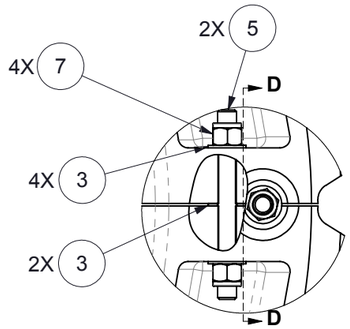
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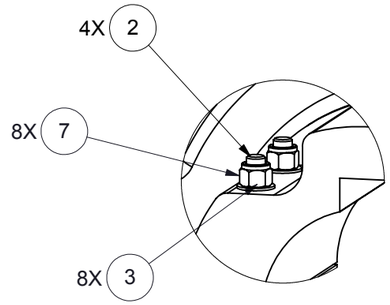
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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

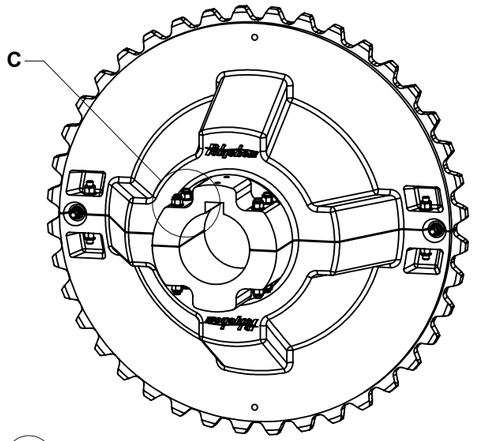




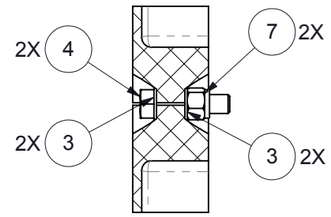
DETAIL B
SCALE 1 : 4



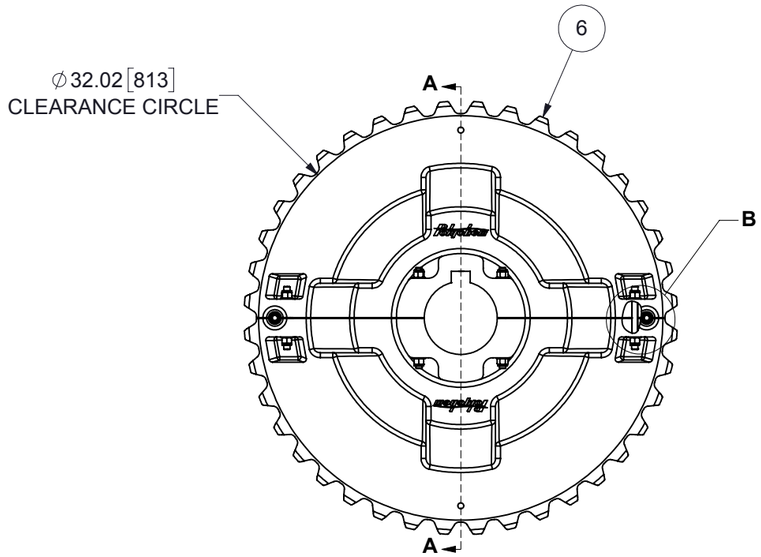
DETAIL C
SCALE 1 : 4

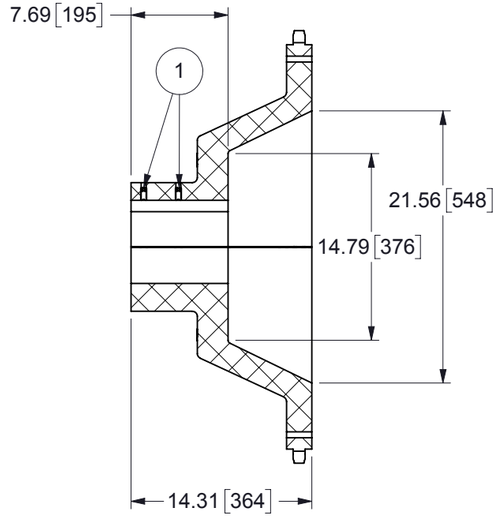


ISOMETRIC VIEW
SCALE: 1:12



SECTION D-D
SCALE 1 : 4





SECTION A-A

SPROCKET TYPE: **NH78 SPLIT BULL SPROCKET**

SPROCKET OFFSET: 5.625 IN [142.88MM] REF.

NUMBER OF TEETH: 40

TOOTH PITCH: 2.609 INCH [66.27 MM] REF.

PITCH DIAMETER: 33.252 INCH [844.60 MM] REF.

OUTSIDE DIAMETER: 34.326 INCH [871.88 MM] REF.

SHAFT DIAMETER: 5.750 INCH [146.05 MM] REF.

BORE DIAMETER: 5.775 INCH [146.69 MM] REF.

KEYWAY: 1.500 IN WIDTH x .900 IN DEPTH [38.10 MM x 22.86 MM] REF.

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
7	10000011-003	HEX LOCKNUT, NYLON INSERT 1/2-13, 316 SS	14	AISI 316
6	N/A	NH-78 SPLIT BULL SPROCKET, MACHINED FOR 5.750 INCH SHAFT, 40 TOOTH, CAST NYLON 6, 5.775 BORE, 7.69 LENGTH THRU BORE, 5.625 NOMINAL OFFSET, KEYWAY 1.500 WIDE X 0.900 DEEP	1	CAST NYLON 6
5	10000062-037	ALL THREAD STUD, 1/2-13 x 5", 316 SS	2	AISI 316
4	10000001-023	HEX BOLT, 1/2-13 x 2", 316 SS	2	AISI 316
3	10000058-014	FLAT WASHER, 1/2, 0.53" x 1.00" x 0.06", 316 SS	18	AISI 316
2	10000062-038	ALL THREAD STUD, 1/2-13 x 8", 316 SS	4	AISI 316
1	10000039-003	HEX SOCKET SET SCREW, M12x1.75 x 25 MM, CUP POINT, 316 SS	2	AISI 316

BILL OF MATERIALS FOR 10001811-015

BRENTWOOD®

DRAWN DCE 01/31/17
CHECKER SML 01/31/17

DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
NH-78 SPROCKET ASSY, 40T, SPLIT, 5.78" BORE, 5.625" OFFSET, ENG HDW, PA6
CROSS COLLECTOR - TANK T-211, T-212 & T-213

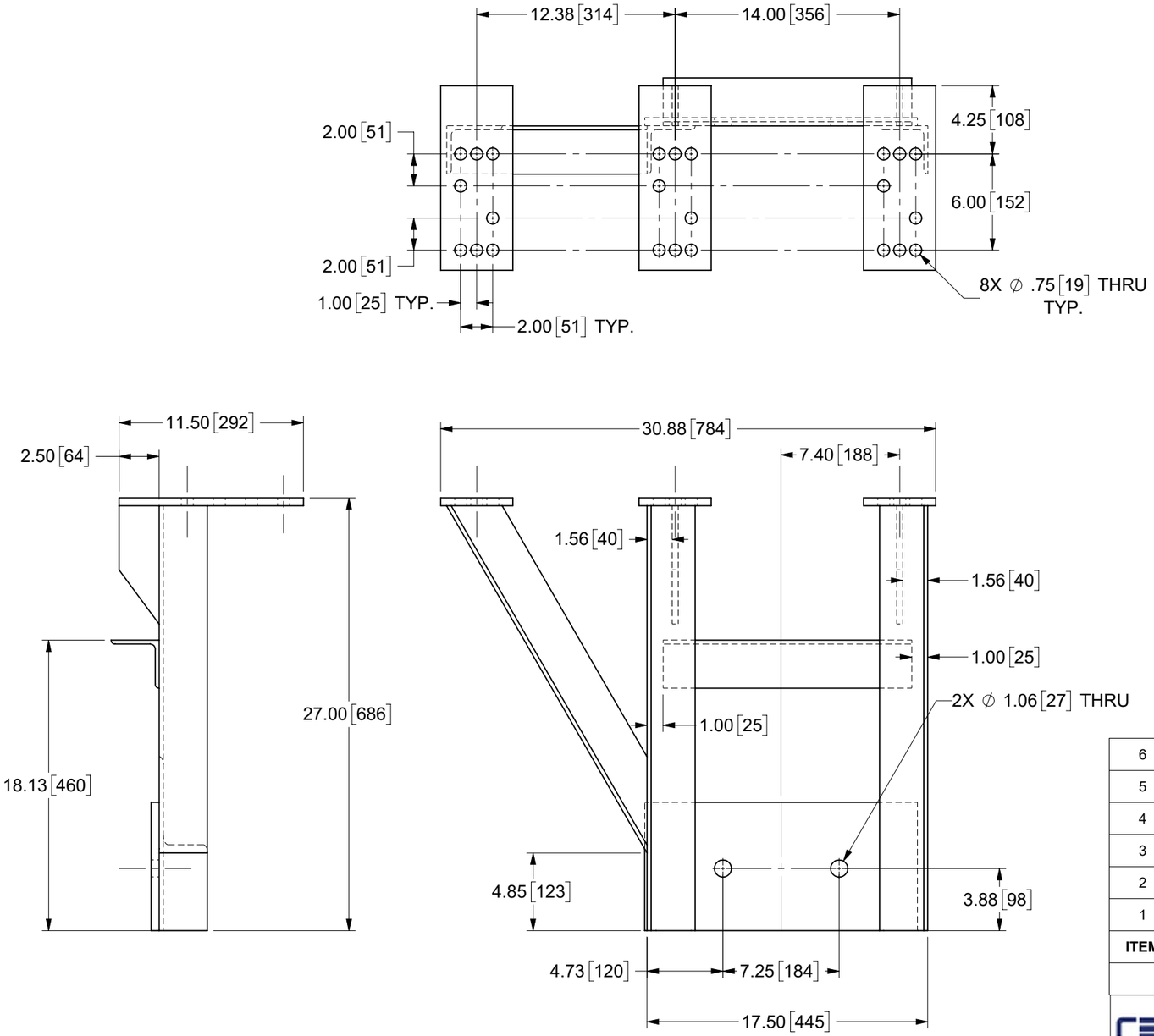
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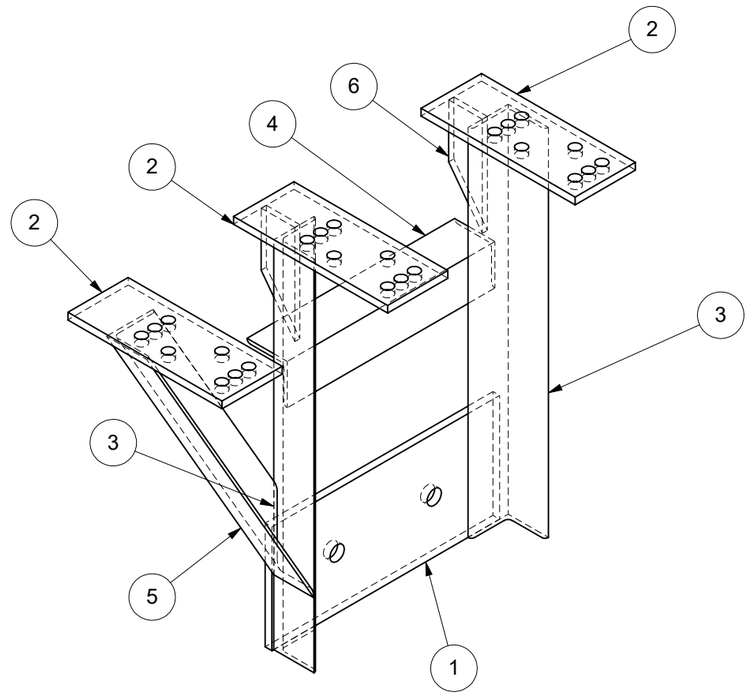
MATERIAL: SEE BILL OF MATERIAL
WEIGHT - LBS: 86.87
WEIGHT - KG: 39.40

SUPERSEDES:

SHEET: 1 OF 1
DRAWING NUMBER: 10001811-015
SCALE: 1:12
REV: 02

Rev 01





ISOMETRIC VIEW
SCALE: 1:8

ITEM	DESCRIPTION	QTY.	MATERIAL
6	GUSSET PLATE, 7.38x2.50x0.38", 304L SS	2	AISI 304L
5	ANGLE, L3xL3x1/4, LG=26.50", 304L SS	1	AISI 304L
4	ANGLE, L3xL3x1/4, LG=15.50", 304L SS	1	AISI 304L
3	ANGLE, L3xL3x1/4, LG=26.50", 304L SS	2	AISI 304L
2	PLATE, 11.50x4.50x0.50", 8 HOLES, 304L SS	3	AISI 304L
1	MOUNTING PLATE, 17.00x8.00x0.50", 2 HOLES, 304L SS	1	AISI 304L

BILL OF MATERIALS FOR 10001901-002

NOTES :

1. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERANCE ONLY.
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SUPERSEDES:

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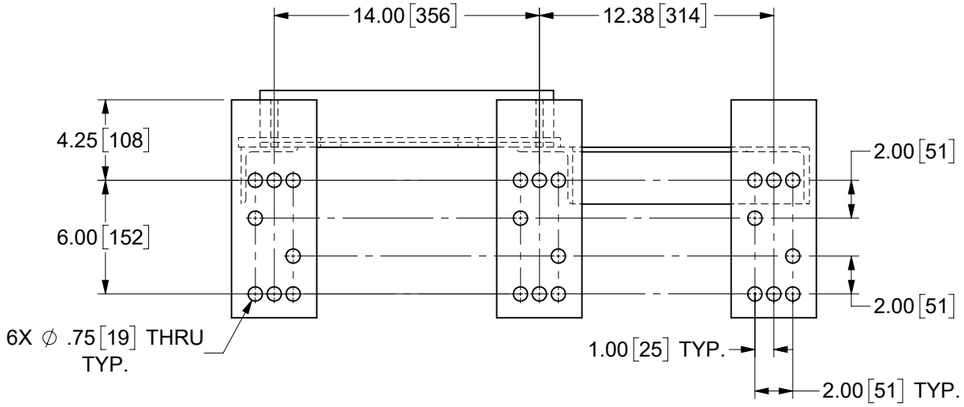
DRAWN: VP, 05 Sep 23
CHECKER: SML, 30 Nov 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: HEADSHAFT WELDMENT ASSEMBLY, 30.88"x11.50"x27.00", 304L SS

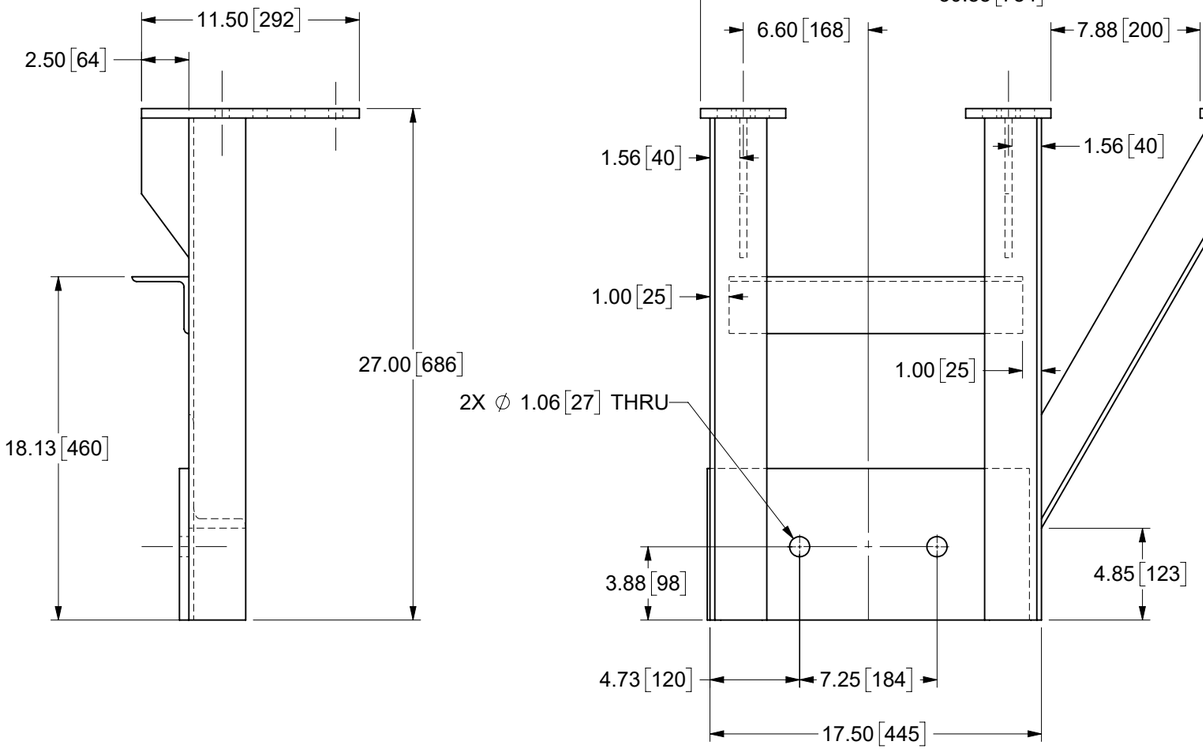
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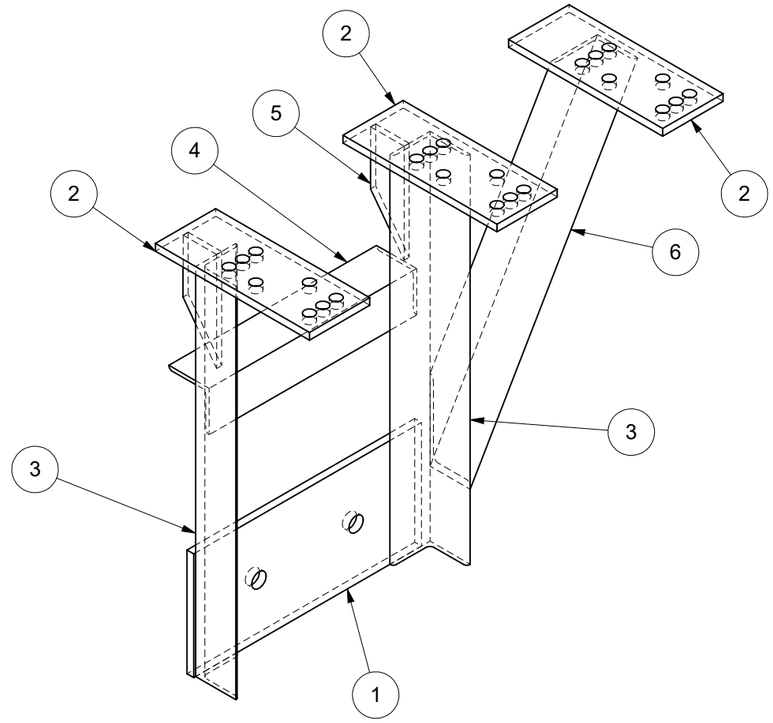
MATERIAL: SEE BILL OF MATERIAL
WEIGHT - LBS: 81.28
WEIGHT - KG: 36.87
SHEET: 1 OF 1
DRAWING NUMBER: 10001901-002
SCALE: 1:8
REV: 02

NOTES :

1. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.







ISOMETRIC VIEW
SCALE: 1:8

ITEM	DESCRIPTION	QTY.	MATERIAL
6	ANGLE, L3xL3x1/4, LG=26.50", 304L SS	1	AISI 304L
5	GUSSET PLATE, 7.38x2.50x0.38", 304L SS	2	AISI 304L
4	ANGLE, L3xL3x1/4, LG=15.50", 304L SS	1	AISI 304L
3	ANGLE, L3xL3x1/4, LG=26.50", 304L SS	2	AISI 304L
2	PLATE, 11.50x4.50x0.50", 8 HOLES, 304L SS	3	AISI 304L
1	MOUNTING PLATE, 17.00x8.00x0.50", 2 HOLES, 304L SS	1	AISI 304L

BILL OF MATERIALS FOR 10001901-003

BRENTWOOD®

DRAWN VP 05 Sep 23
CHECKER SML 30 Nov 23
DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
HEADSHAFT WELDMENT ASSEMBLY, 30.88"x11.50"x27.00", 304L SS

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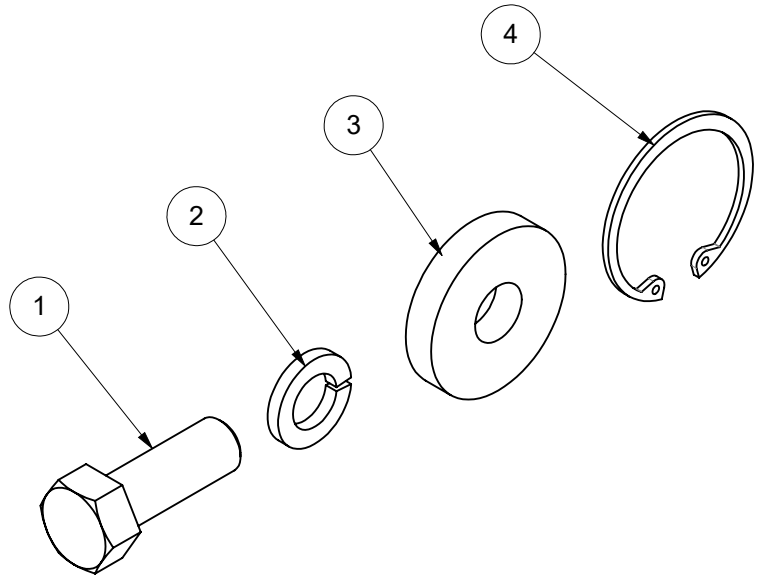
MATERIAL: SEE BILL OF MATERIAL
WEIGHT - LBS: 81.28
WEIGHT - KG: 36.87
SHEET: 1 OF 1
DRAWING NUMBER: 10001901-003
SCALE: 1:8
REV: 02

SUPERSEDES:

Rev 01

NOTES :

1. REMOVE ALL BURRS AND SHARP EDGES.
2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
3. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
4. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
4	10001865-002	INTERNAL RETAINING RING, 50MM DIA, DIN 472, STAINLESS STEEL	1	STAINLESS STEEL
3	10001539-005	SHAFT DISK, 0.69" x 1.98" x 0.38", 1 HOLE, 316 SS	1	AISI 316
2	10000012-007	SPLIT LOCK WASHER, 5/8, 316 SS	1	AISI 316
1	10000001-100	HEX BOLT, 5/8-11 x 1-3/4", FULLY THREADED, ASTM F593G CW1 CERTIFIED, 316 SS	1	AISI 316

BILL OF MATERIALS FOR 10001934-003

STATUS
.

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
ASC	SML	11/17/21

BRENTWOOD

DRAWN: ASC 11/17/21
CHECKER: SML 11/22/21

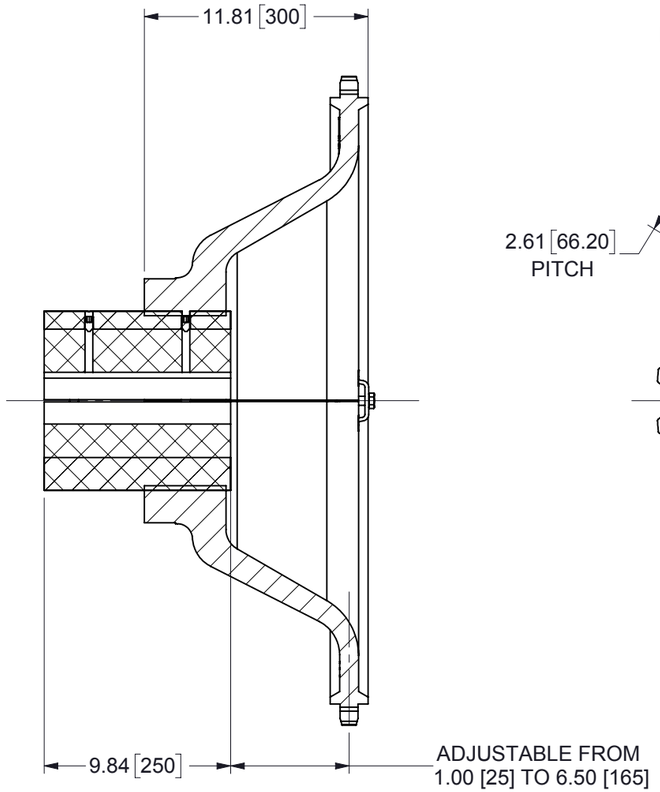
DOCUMENT TYPE: PRODUCT DEFINITION
LONG DESCRIPTION: SS DRIVE SHAFT INSTALLATION KIT (KIT=1BLT-1LW-1DSK-1RR), SEW KA77

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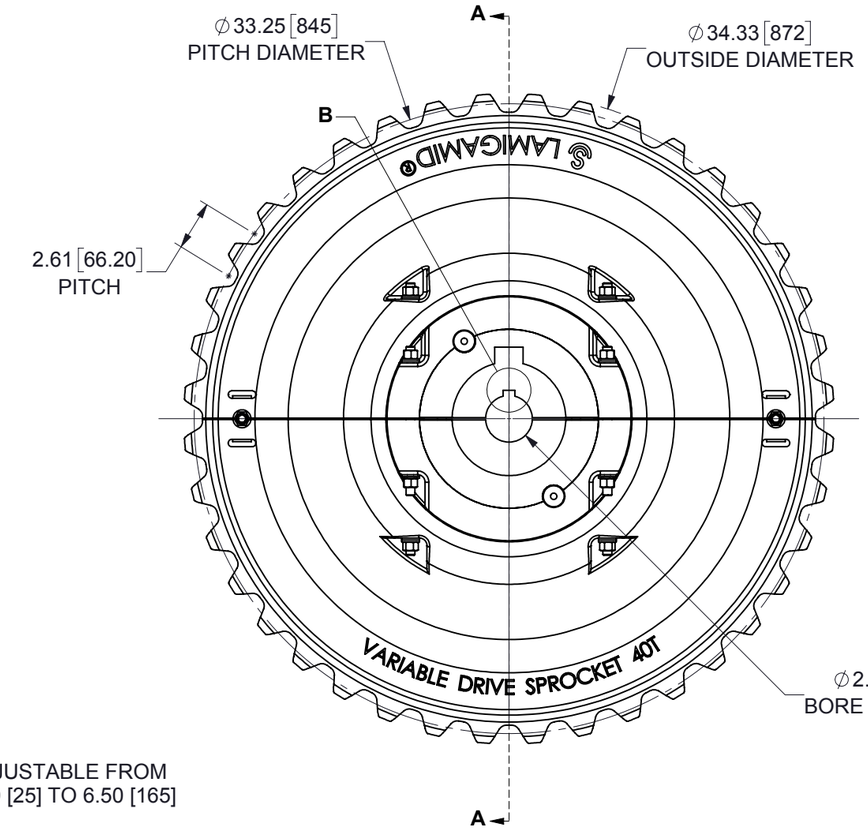
MATERIAL: SEE BILL OF MATERIAL
WEIGHT - LBS: 0.59
WEIGHT - KG: 0.27
SHEET: 1 OF 1
DRAWING NUMBER: 10001934-003
SCALE: 1:2
REV: 01

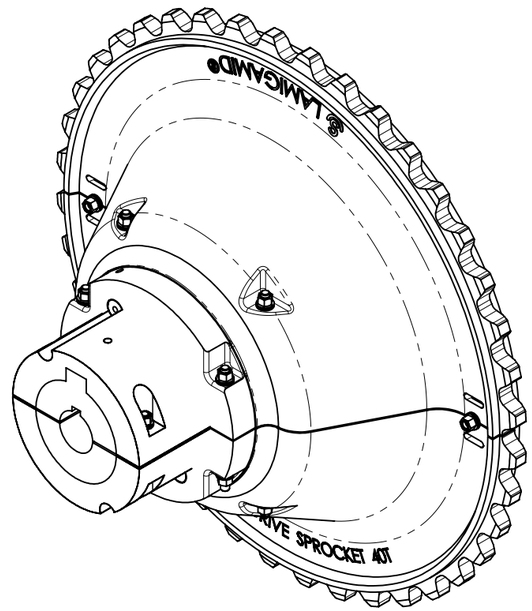
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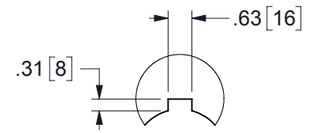
1. REMOVE ALL BURRS AND SHARP EDGES.
2. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
3. PRODUCTS MUST BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
4. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.
5. Refer also to Equipment O&M Manual section 7.5 for OEM technical data.



SECTION A-A







DETAIL B
SCALE 1 : 4

BRENTWOOD®

DRAWN FJH 01/15/19	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION		
CHECKER SML 01/17/19	NH-78 VARIABLE DRIVE SPROCKET ASSY, 40T, SPLIT, 2.46" BORE, .63x.31 KWY, 316 SS HDW		
MATERIAL LAMIGAMID	WEIGHT - LBS 93.074	WEIGHT - KG 42.22	
SHEET 1 OF 1	DRAWING NUMBER 10001955-002	SCALE 1:8	REV 01

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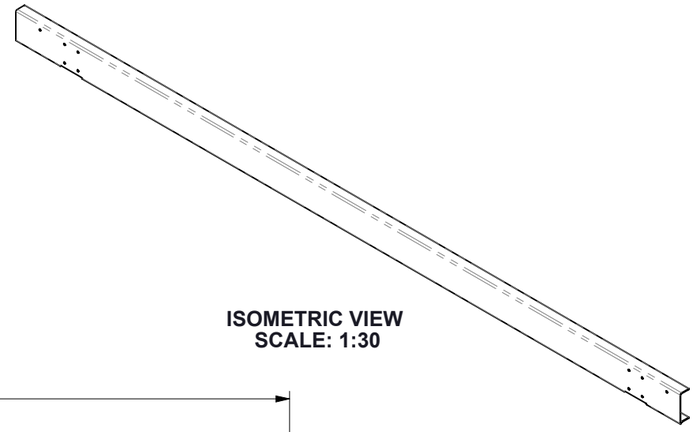
SUPERSEDES:

NOTES :

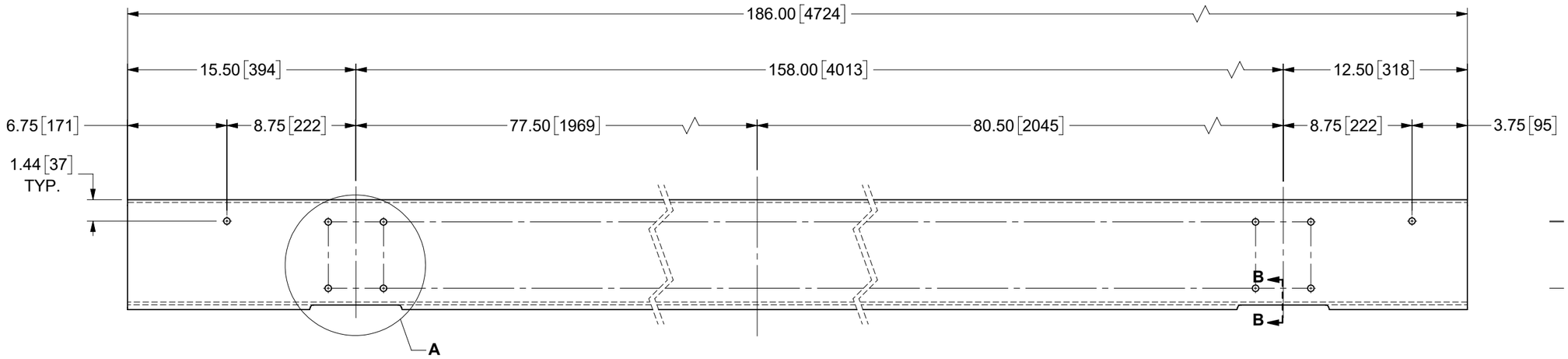
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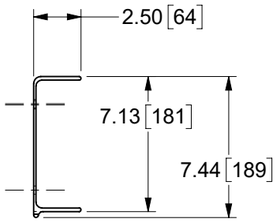
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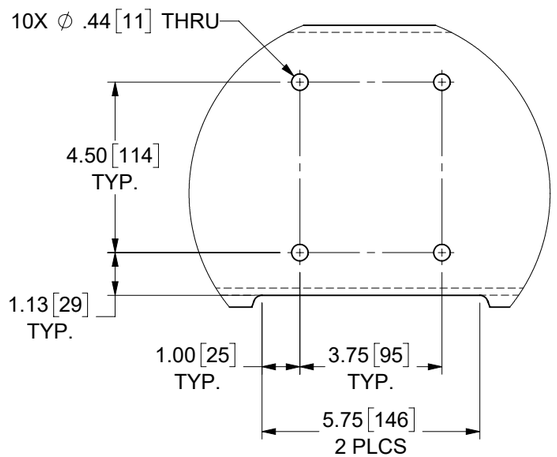
3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



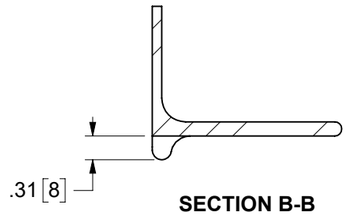
ISOMETRIC VIEW
SCALE: 1:30







DETAIL A
SCALE 1 : 4



SECTION B-B
SCALE 1 : 2

BRENTWOOD®

DRAWN VP 05 Sep 23	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION 3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP		
CHECKER RHP 06 Sep 23			
MATERIAL FIBER REINFORCED POLYESTER		WEIGHT - LBS 23.21	WEIGHT - KG 10.53
SHEET 1 OF 1	DRAWING NUMBER 10001975-104	SCALE 1:8	REV 01

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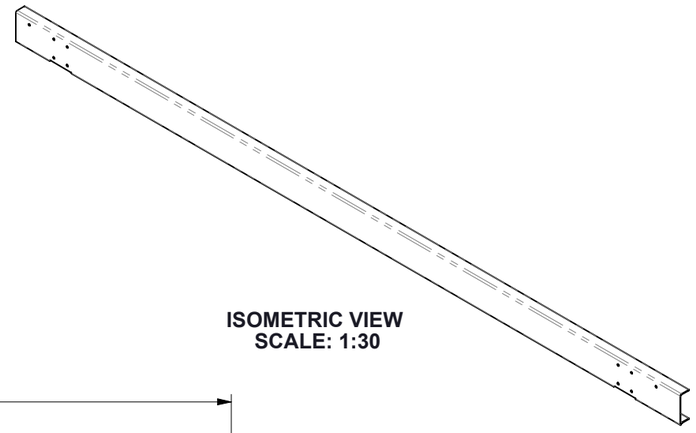
SUPERSEDES:

NOTES :

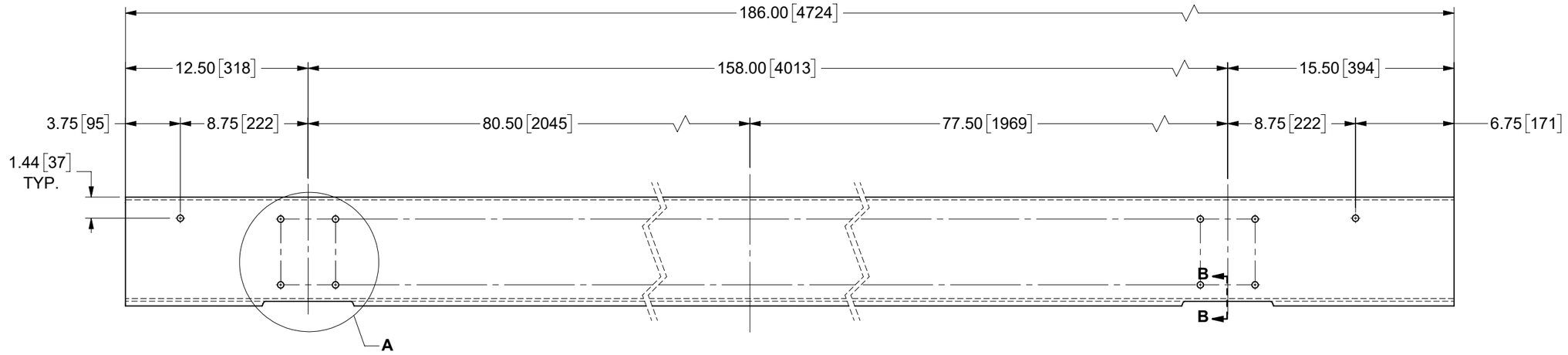
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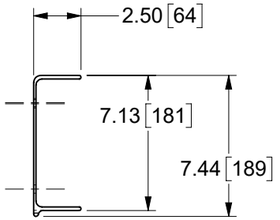
2. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.

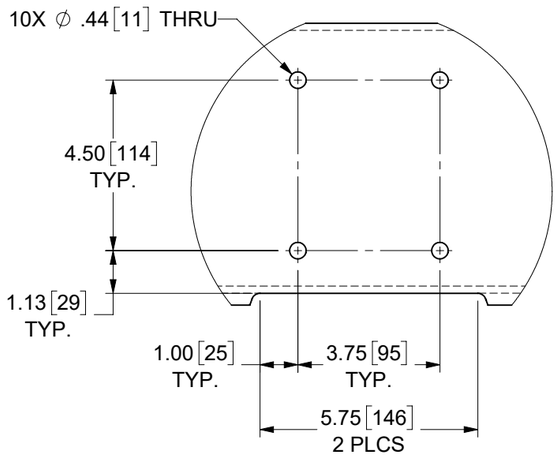
3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



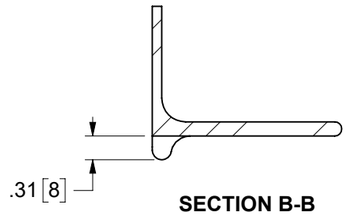
ISOMETRIC VIEW
SCALE: 1:30







DETAIL A
SCALE 1 : 4



SECTION B-B
SCALE 1 : 2

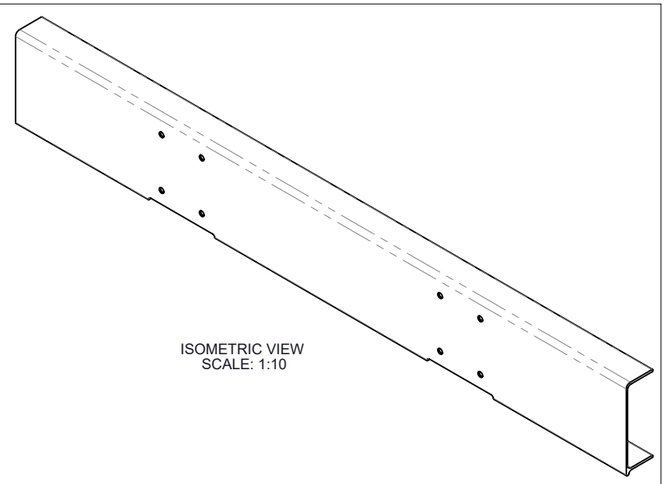
BRENTWOOD®

DRAWN VP 05 Sep 23	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION	
CHECKER RHP 06 Sep 23	3x8 C-CHANNEL FLIGHT, 10 HOLES, 186.00" ASYMMETRICAL, FRP	
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SUPERSEDES:	SHEET 1 OF 1	DRAWING NUMBER 10001975-105 / SCALE 1:8 / REV 01

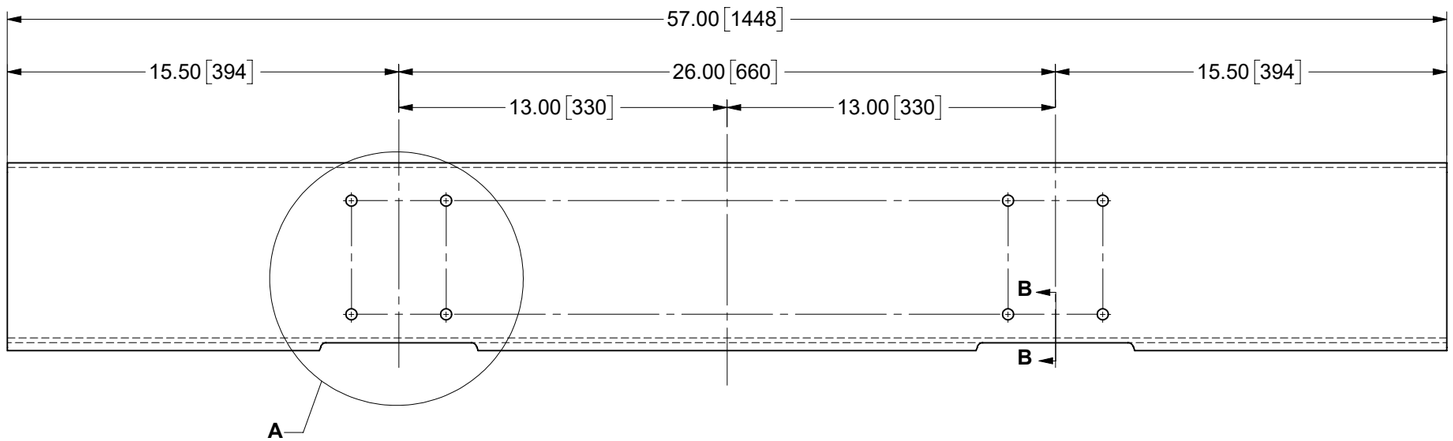
Rev 01

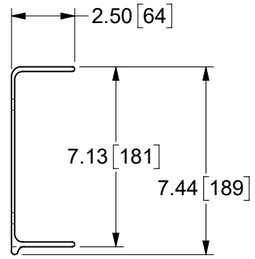
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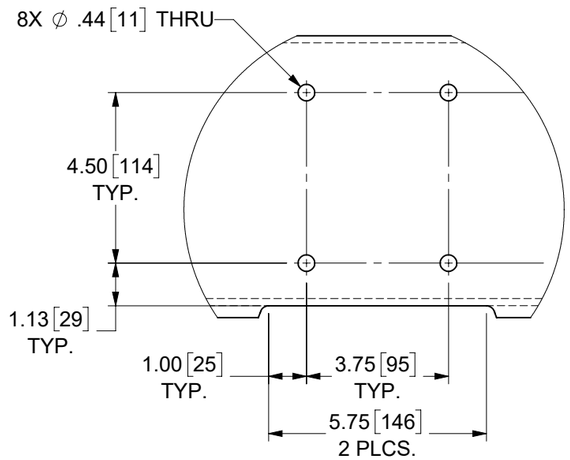
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3. ALL DIMENSIONS SHOWN ARE IN INCHES [MM]



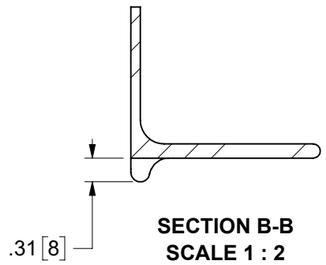
ISOMETRIC VIEW
SCALE: 1:10







DETAIL A
SCALE 1 : 4



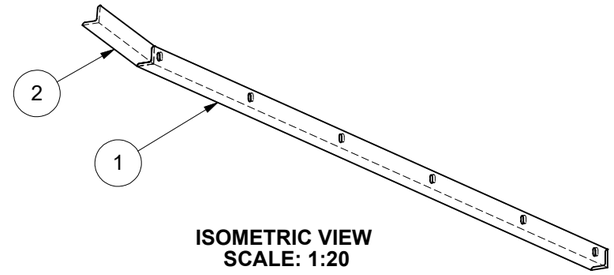
SECTION B-B
SCALE 1 : 2

BRENTWOOD®

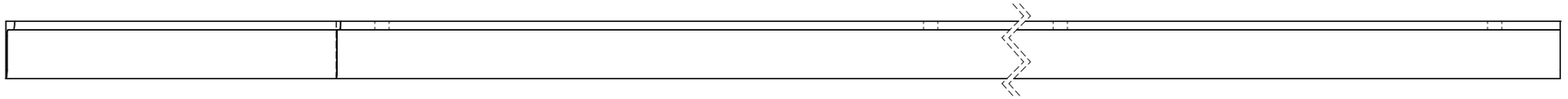
DRAWN VP 05 Sep 23	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION		
CHECKER RHP 06 Sep 23	3x8 C-CHANNEL FLIGHT, 8 HOLES, 57.00", FRP		
MATERIAL FIBER REINFORCED POLYESTER		WEIGHT - LBS 7.06	WEIGHT - KG 3.20
SHEET 1 OF 1	DRAWING NUMBER 10001975-106	SCALE 1:6	REV 01

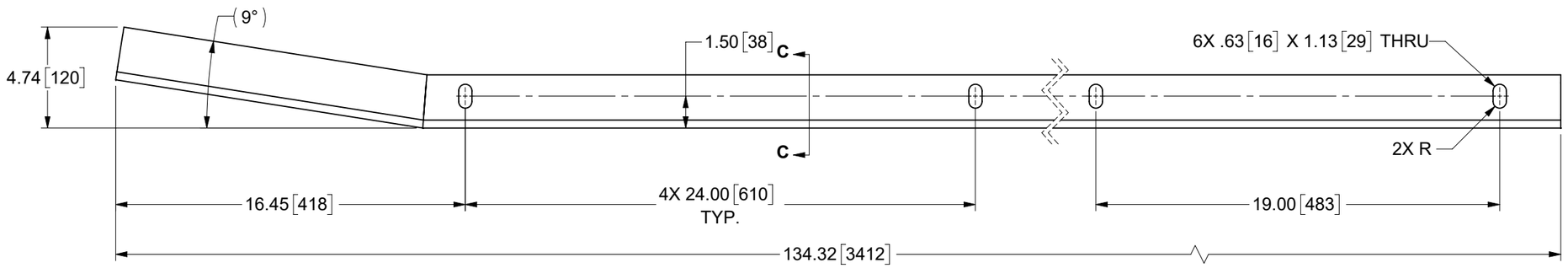
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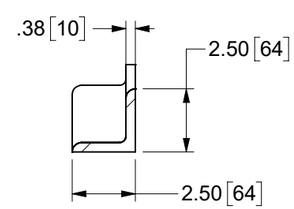
SUPERSEDES:



ISOMETRIC VIEW
SCALE: 1:20







SECTION C-C

NOTES :

1. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
2. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 14.63 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 119.88" LONG, 11 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10002439-001

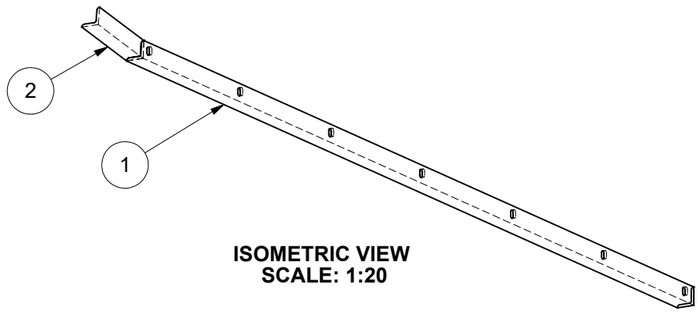
BRENTWOOD®

DRAWN: RHP 26 Sep 23
CHECKER: SML 30 Nov 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 134.32", 6 SLOTS, RIGHT HAND, 304L SS

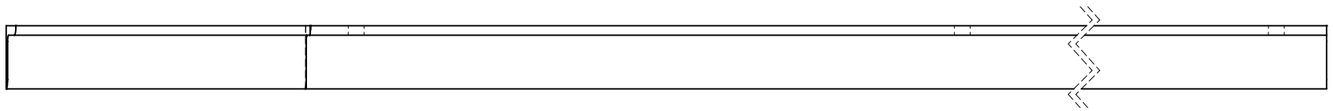
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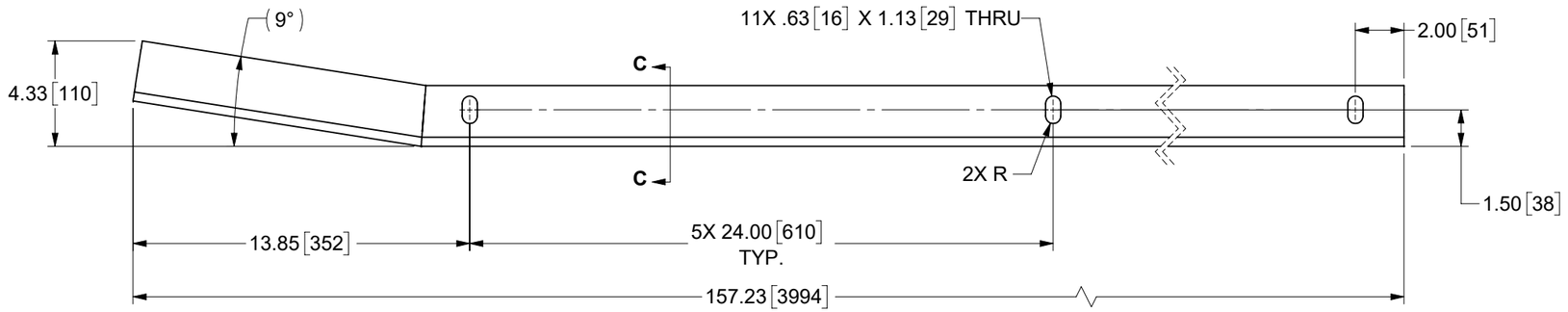
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 65.14
WEIGHT - KG: 29.55
SHEET: 1 OF 1
DRAWING NUMBER: 10002439-001
SCALE: 1:6
REV: 01

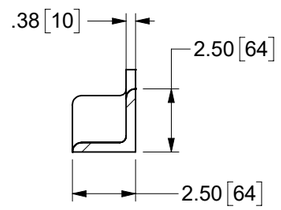
SUPERSEDES:



ISOMETRIC VIEW
SCALE: 1:20







SECTION C-C

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 12.00 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 145.38" LONG, 7 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10002439-002

BRENTWOOD

DRAWN RHP 26 Sep 23
CHECKER SML 29 Sep 23
DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
HOLD DOWN RAIL WELDMENT, 4.33" x 2.50" x 157.23", 7 SLOTS, RIGHT HAND, 304L SS

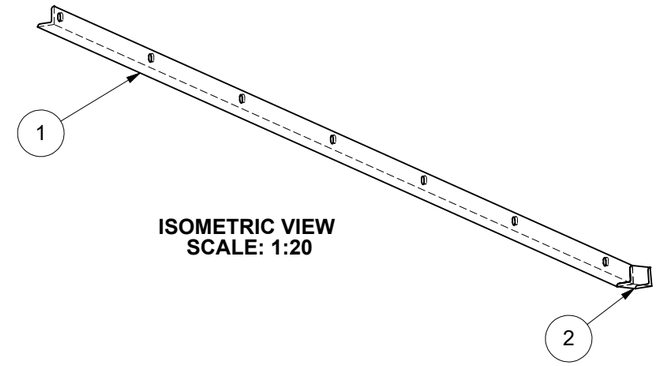
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MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 76.22
WEIGHT - KG: 34.57
SHEET: 1 OF 1
DRAWING NUMBER: 10002439-002
SCALE: 1:6
REV: 01

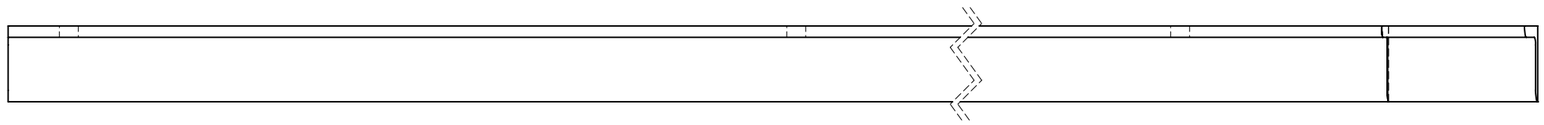
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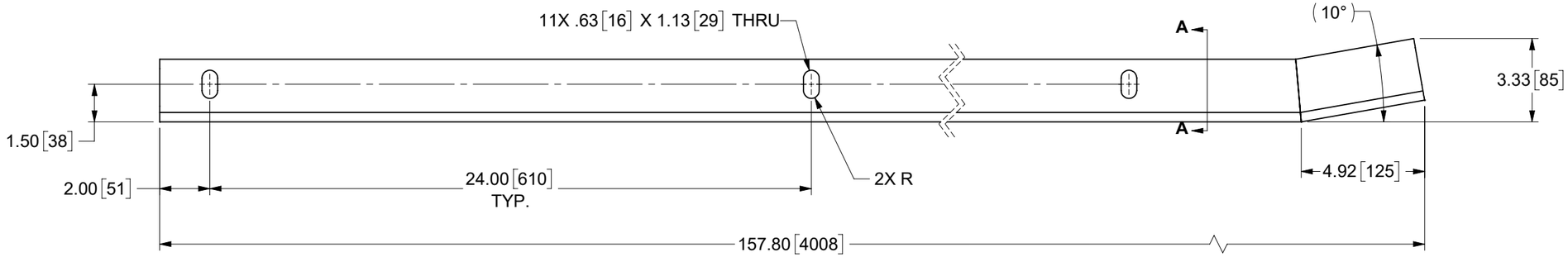
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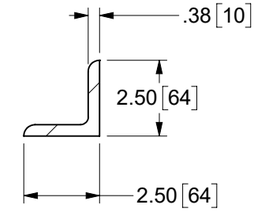
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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



ISOMETRIC VIEW
SCALE: 1:20







SECTION A-A

NOTES :

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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 5.00 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 152.88" LONG, 7 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10002439-003

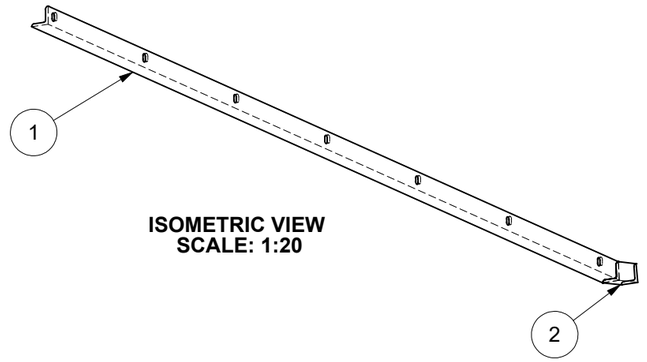
BRENTWOOD®

DRAWN: RHP 26 Sep 23
CHECKER: SML 29 Sep 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 157.80", 7 SLOTS, RIGHT HAND, 304L SS

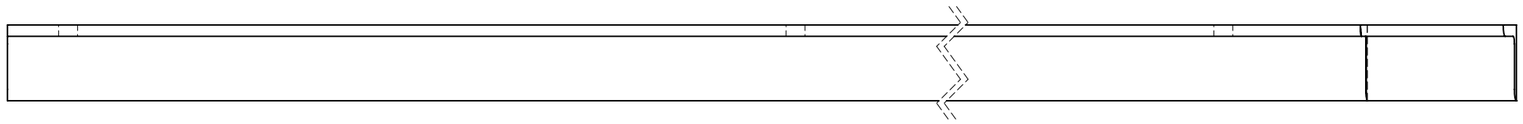
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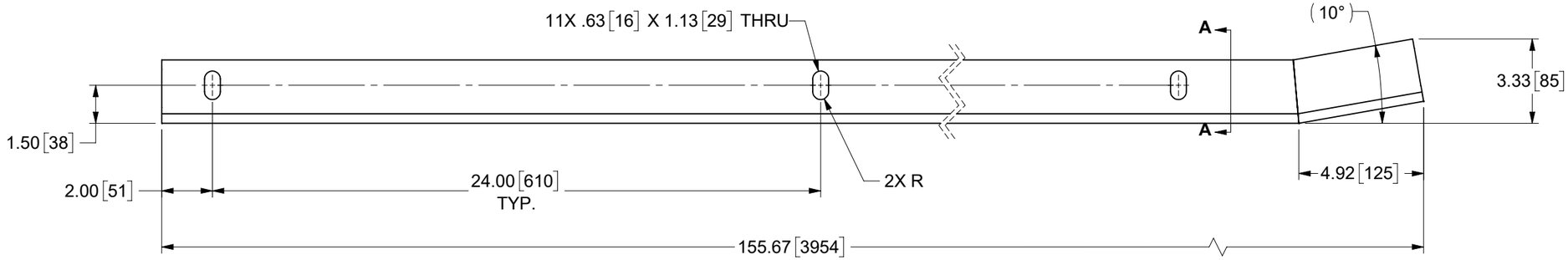
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 76.46
WEIGHT - KG: 34.68
SHEET: 1 OF 1
DRAWING NUMBER: 10002439-003
SCALE: 1:5
REV: 01

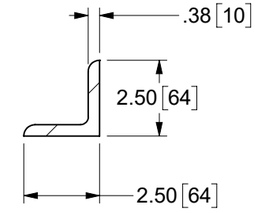
SUPERSEDES:



ISOMETRIC VIEW
SCALE: 1:20







SECTION A-A

NOTES :

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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 5.00 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 152.88" LONG, 7 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10002439-004

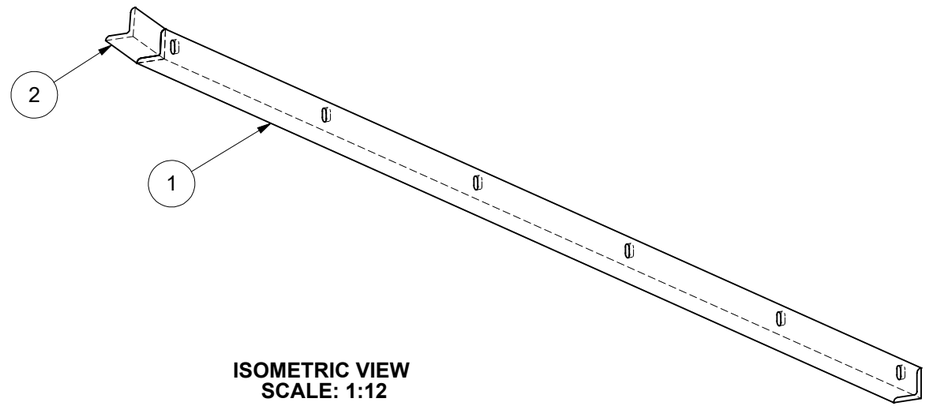
BRENTWOOD®

DRAWN: RHP 26 Sep 23
CHECKER: SML 29 Sep 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 155.67", 7 SLOTS, LEFT HAND, 304L SS

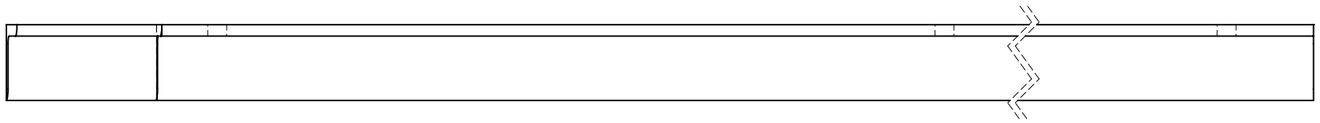
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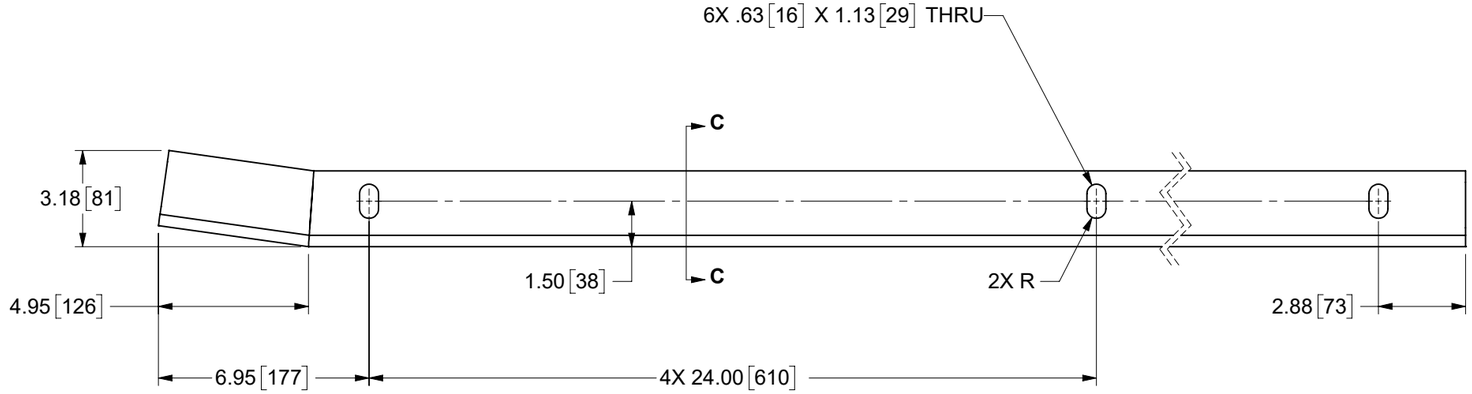
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 75.42
WEIGHT - KG: 34.21
SHEET: 1 OF 1
DRAWING NUMBER: 10002439-004
SCALE: 1:5
REV: 01

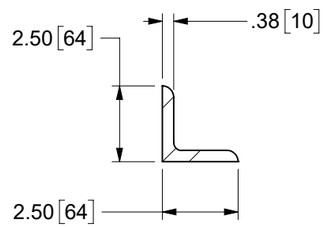
SUPERSEDES:



ISOMETRIC VIEW
SCALE: 1:12







SECTION C-C

NOTES :

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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 5.00 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 119.88" LONG, 6 SLOTS, SS 304L	1	AISI 304L

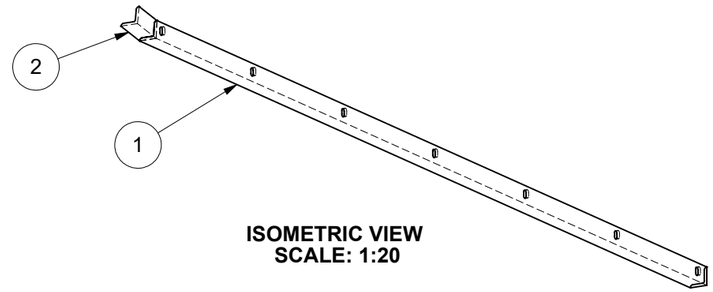
BILL OF MATERIALS FOR 10002439-005

BRENTWOOD

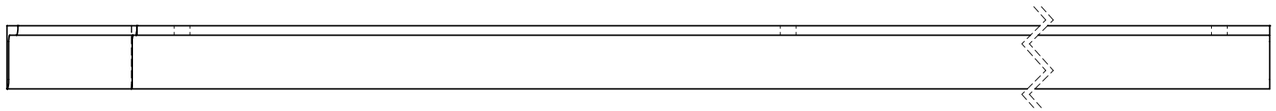
DRAWN: RHP, 26 Sep 23
CHECKER: SML, 30 Nov 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 124.83", 6 SLOTS, LEFT HAND, 304L SS

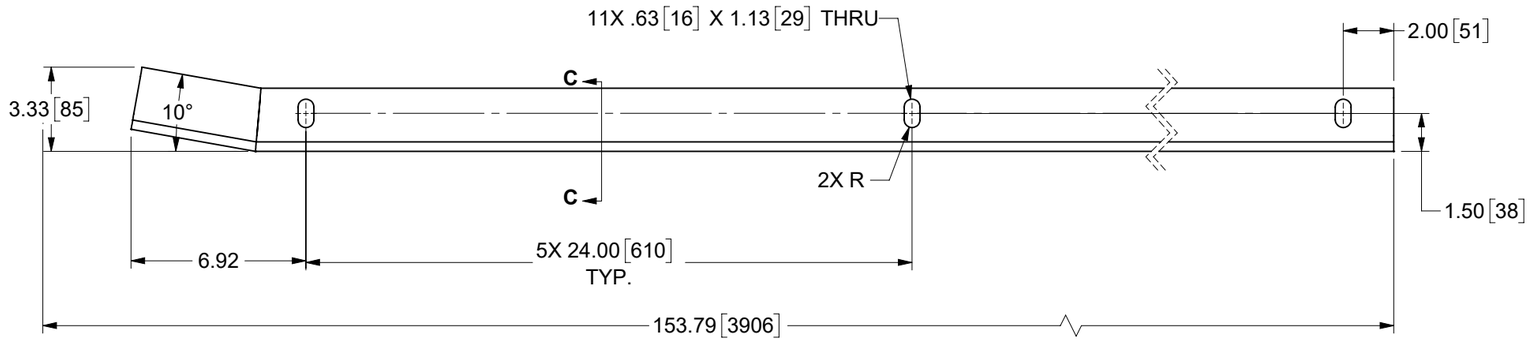
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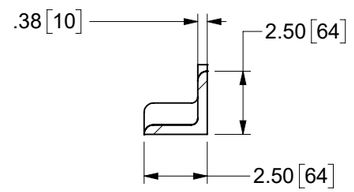
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 60.45
WEIGHT - KG: 27.42
SUPERSEDES:
SHEET: 1 OF 1
DRAWING NUMBER: 10002439-005
SCALE: 1:5
REV: 01



ISOMETRIC VIEW
SCALE: 1:20







SECTION C-C

NOTES :

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2. PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 5.00 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 145.38" LONG, 7 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10002439-006

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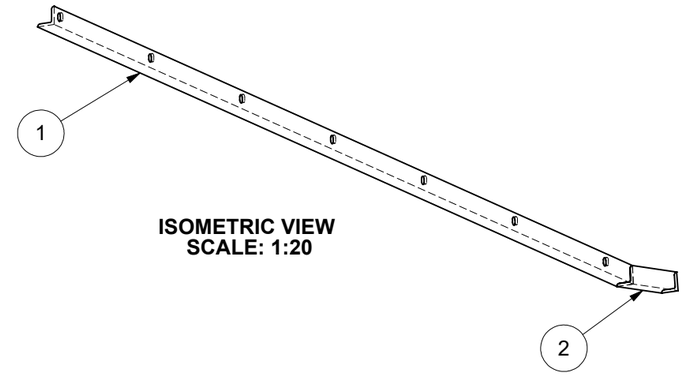
DRAWN RHP 26 Sep 23
CHECKER SML 29 Sep 23
DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
HOLD DOWN RAIL WELDMENT, 3.33" x 2.50" x 150.30", 7 SLOTS, LEFT HAND, 304L SS

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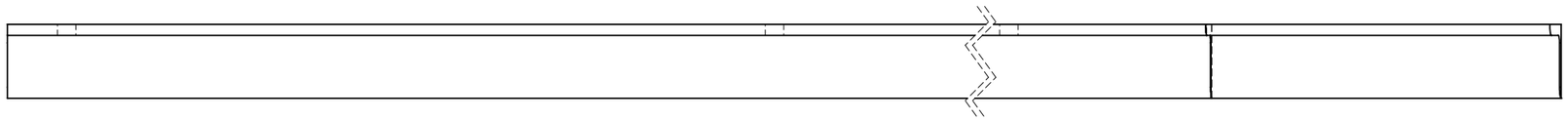
MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 72.80
WEIGHT - KG: 33.02
SHEET: 1 OF 1
DRAWING NUMBER: 10002439-006
SCALE: 1:6
REV: 01

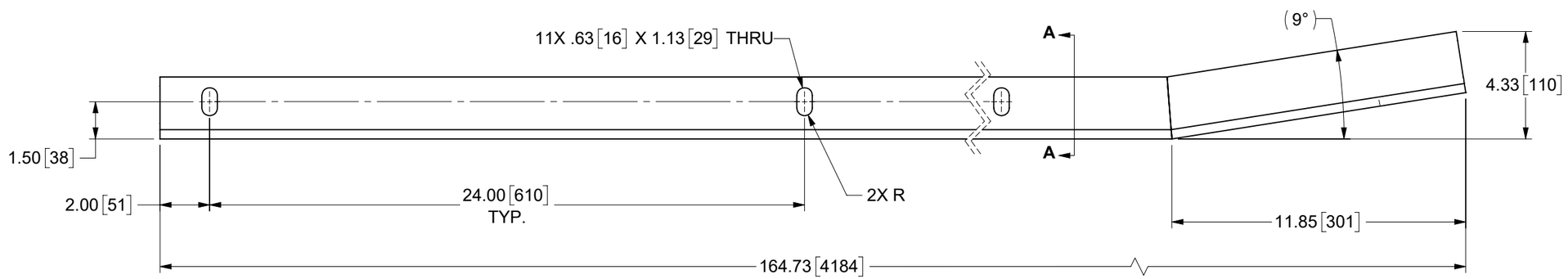
SUPERSEDES:

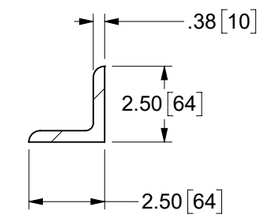
Rev 01



ISOMETRIC VIEW
SCALE: 1:20







SECTION A-A

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 12.00 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 152.88" LONG, 7 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10002439-007

BRENTWOOD

DRAWN RHP 26 Sep 23
CHECKER SML 29 Sep 23
DOCUMENT TYPE CUSTOMER OUTLINE
LONG DESCRIPTION
HOLD DOWN RAIL WELDMENT, 4.33" x 2.50" x 164.73", 7 SLOTS, LEFT HAND, 304L SS

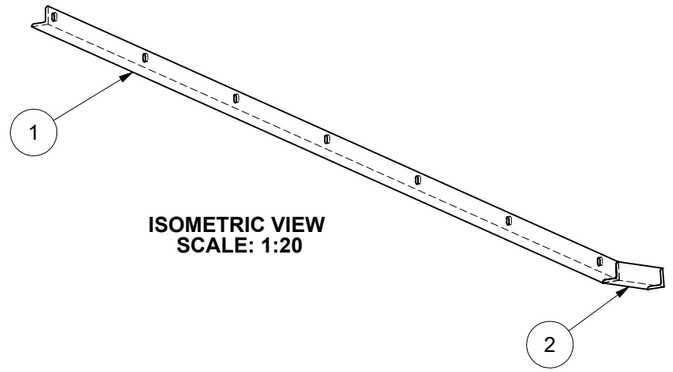
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MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 79.88
WEIGHT - KG: 36.23
SHEET: 1 OF 1
DRAWING NUMBER: 10002439-007
SCALE: 1:5
REV: 01

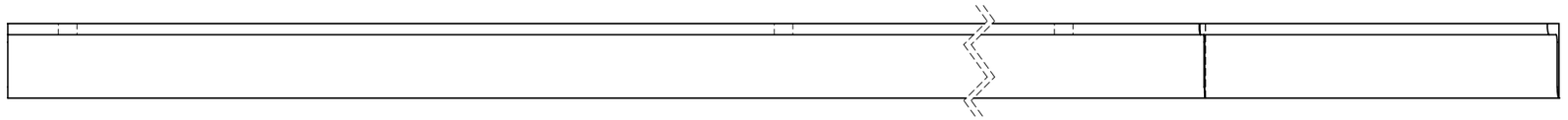
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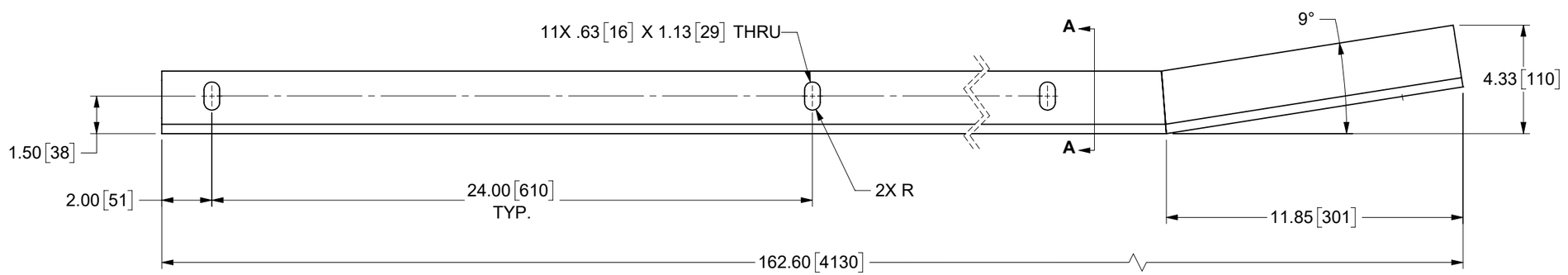
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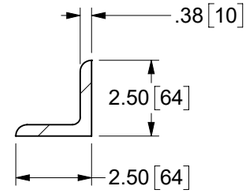
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ISOMETRIC VIEW
SCALE: 1:20







SECTION A-A

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 12.00 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 150.75" LONG, 7 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10002439-008

BRENTWOOD

DRAWN: RHP 26 Sep 23
CHECKER: SML 29 Sep 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: HOLD DOWN RAIL WELDMENT, 4.33" x 2.50" x 162.60", 7 SLOTS, LEFT HAND, 304L SS

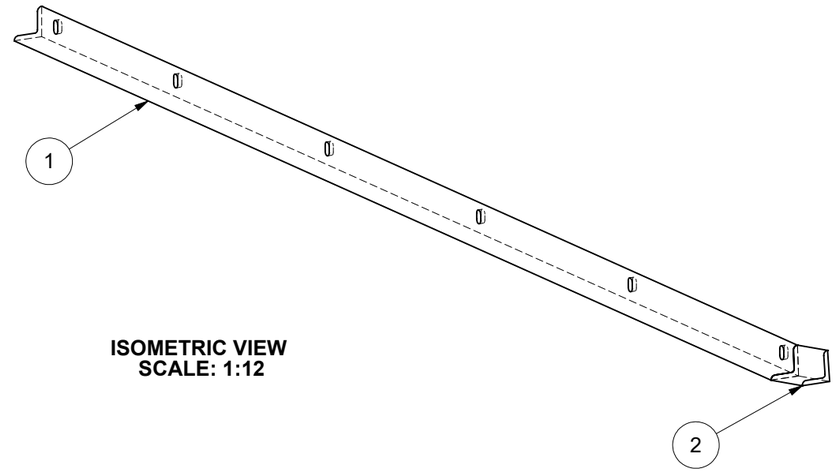
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MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 78.84
WEIGHT - KG: 35.76
SHEET: 1 OF 1
DRAWING NUMBER: 10002439-008
SCALE: 1:5
REV: 01

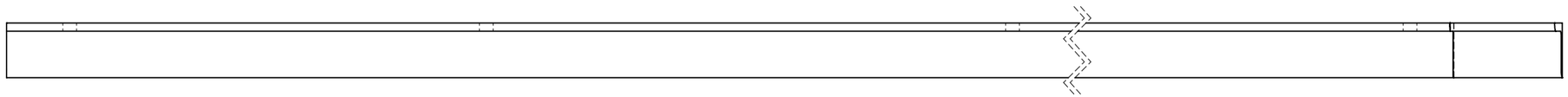
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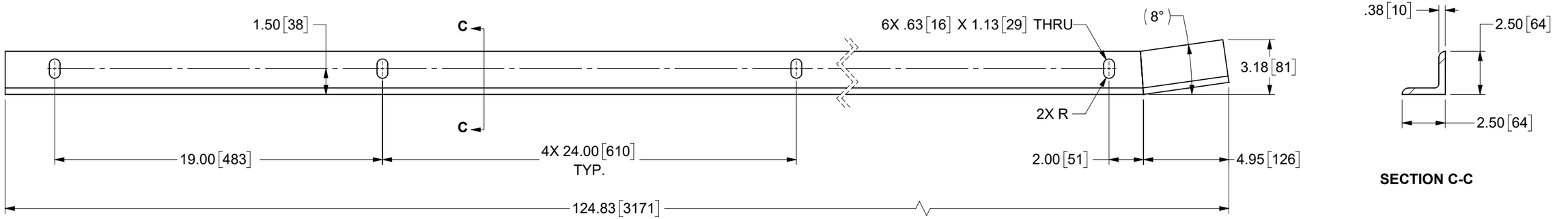
NOTES :

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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.



ISOMETRIC VIEW
SCALE: 1:12





SECTION C-C

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 5.00 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 119.87" LONG, 6 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10002439-009

NOTES :

1. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
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3. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

SUPERSEDES:

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DRAWN: VP 09 Nov 23
CHECKER: RHP 30 Nov 23

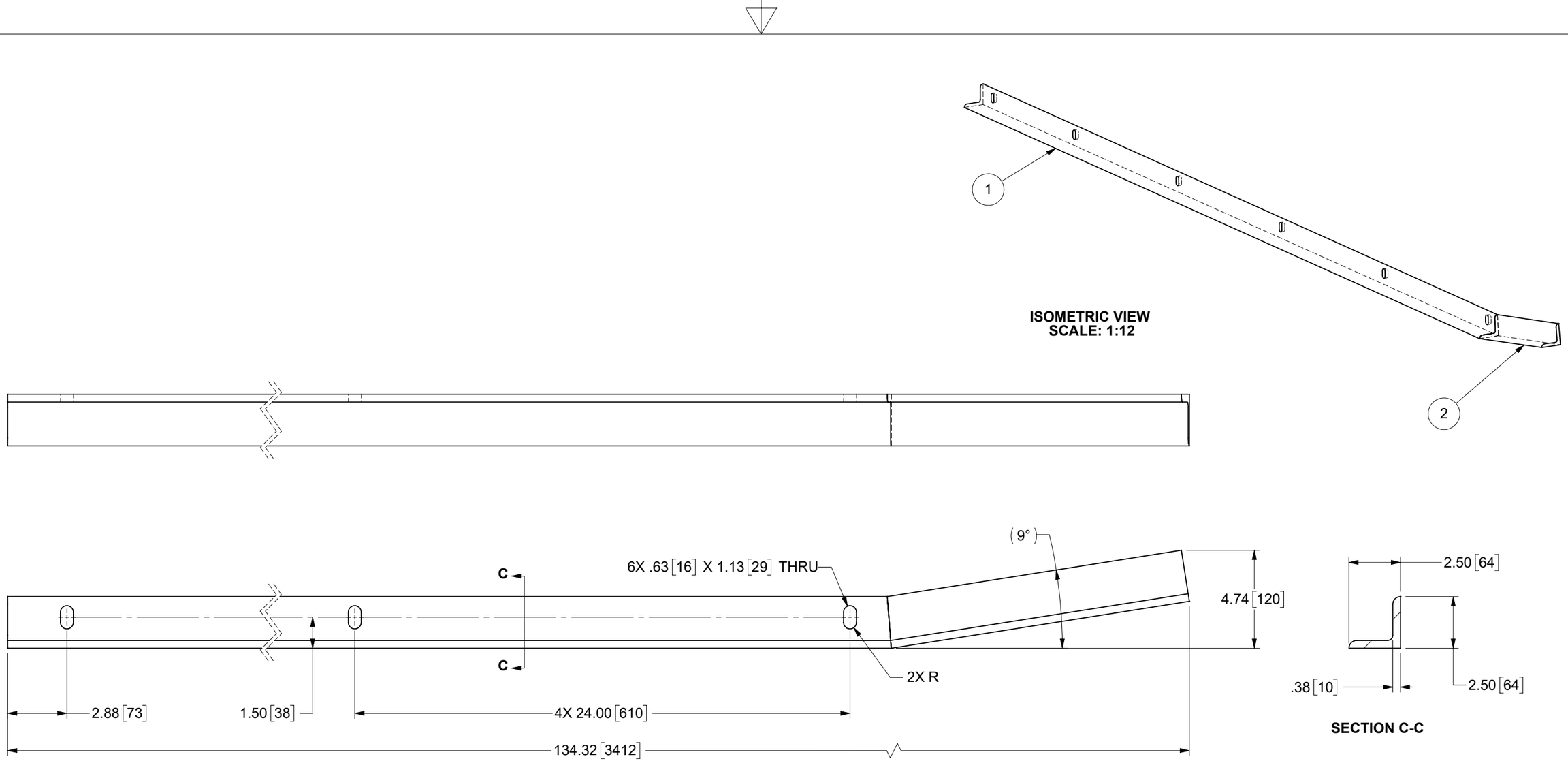
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 124.83", 6 SLOTS, RIGHT HAND, 304L SS

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MATERIAL	WEIGHT - LBS	WEIGHT - KG
SEE BILL OF MATERIALS	60.45	27.42

SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10002439-009	1:6	01

ISOMETRIC VIEW
SCALE: 1:12



SECTION C-C

ITEM	DESCRIPTION	QTY.	MATERIAL
2	ANGLE, 2.5"x2.5"x3/8" x 14.63 LONG, SS 304L	1	AISI 304L
1	ANGLE, 2.5"x2.5"x3/8" x 119.88" LONG, 6 SLOTS, SS 304L	1	AISI 304L

BILL OF MATERIALS FOR 10002439-010

BRENTWOOD

DRAWN: VP, 09 Nov 23
CHECKER: RHP, 30 Nov 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: HOLD DOWN RAIL WELDMENT, 4.74" x 2.50" x 134.32", 6 SLOTS, LEFT HAND, 304L SS

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MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 65.13
WEIGHT - KG: 29.54
SHEET: 1 OF 1
DRAWING NUMBER: 10002439-010
SCALE: 1:5
REV: 01

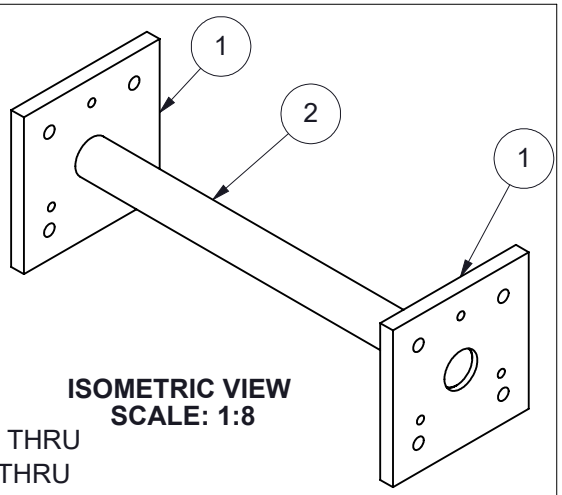
SUPERSEDES:

NOTES :

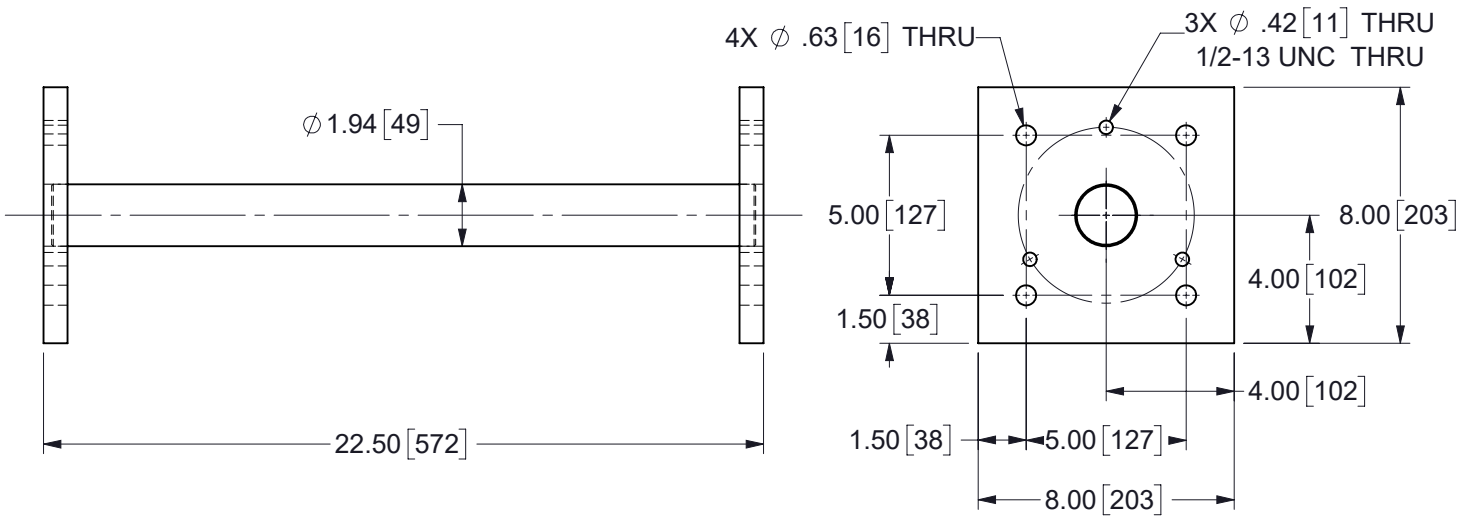
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NOTES :

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ISOMETRIC VIEW
SCALE: 1:8



ITEM	DESCRIPTION	QTY.	MATERIAL
2	SHAFT, 1.94" DIA x 22.00", 304L SS	1	AISI 304L
1	WALL MOUNTING PLATE, 3/4" x 8.00" x 8.00", 5 HOLES, 3 TAPPEDHOLES, 304L SS	2	AISI 304L

BILL OF MATERIALS FOR 10002479-001

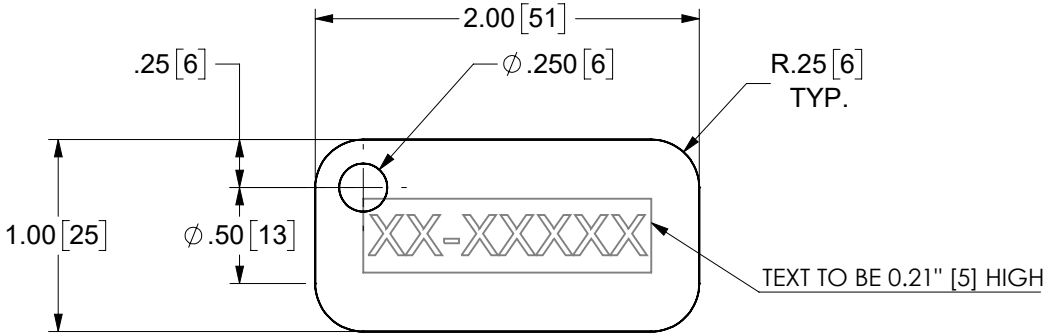
BRENTWOOD

DRAWN: VP, 05 Sep 23
CHECKER: SML, 13 Sep 23
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: IDLER STATIC SHAFT WELDMENT, 8.00" X 8.00" X 22.50", 1.94 DIA., 304LSS

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MATERIAL: SEE BILL OF MATERIALS
WEIGHT - LBS: 44.49
WEIGHT - KG: 20.18
SHEET: 1 OF 1
DRAWING NUMBER: 10002479-001
SCALE: 1:6
REV: 02

SUPERSEDES:



TAG NO.	QTY.
SC-2110A	1
SC-2110B	1
SC-2110C	1
SC-2120A	1
SC-2120B	1
SC-2120C	1
SC-2130A	1
SC-2130B	1
SC-2130C	1

NOTES:
1. MATERIAL: #16 GA THICK.
2. ALL TEXT TO BE LASER ETCHED.
3. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
4.PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.
5. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

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DRAWN: SK, 22 Jan 24
CHECKER: RHP, 22 Jan 24
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: TAG, WGZ0067000. NANAIMO, PRIMARY SEDIMENTATION TANKS, 304SS

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MATERIAL	WEIGHT - LBS	WEIGHT - KG
AISI 304	0.03	0.01

SUPERSEDES:

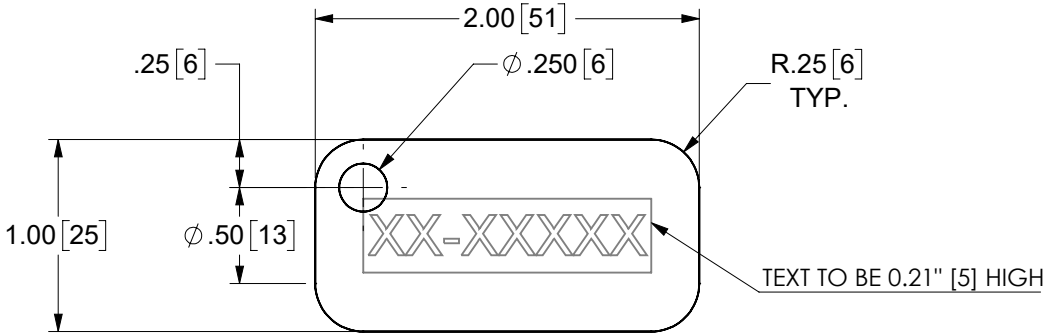
SHEET: 1 OF 1

DRAWING NUMBER: 10002483-001

SCALE: 1:1

REV: 01

TAG NO.	QTY.
GC-1110	1
GC-1120	1
GC-1130	1



NOTES:
1. MATERIAL: #16 GA THICK.
2. ALL TEXT TO BE LASER ETCHED.
3. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
4.PRODUCTS ARE SUFFICIENTLY PACKAGED FOR SHIPMENT TO ASSURE DELIVERY OF THE MANUFACTURED QUALITY.
5. ALL DIMENSIONS ARE IN INCHES [MM] UNLESS OTHERWISE NOTED.

BRENTWOOD

DRAWN: SK 22 Jan 24
CHECKER: RHP 22 Jan 24
DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: TAG, WGZ0067000. NANAIMO, GRIT TANKS, 304SS

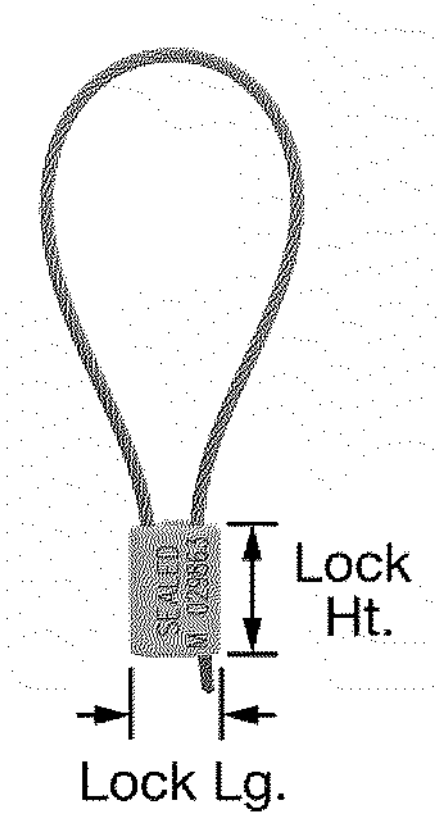
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
AISI 304	0.03	0.01

SUPERSEDES:	SHEET	DRAWING NUMBER	SCALE	REV
	1 OF 1	10002483-002	1:1	01

NOTES :

1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
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5. SOURCE: MCMASTER ITEM # 2083T31



WIRE ROPE DIAMATER	1/16"
OPEN LENGTH	12"
LOCK LENGTH	3/4"
LOCK HEIGHT	1 1/4"

STATUS .			
SUPERSEDES:			
CURRENT REVISION:			
BY	CKD	DATE	
BSC	SML	17 Jan 24	

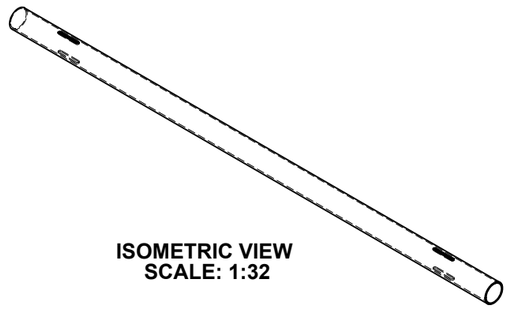
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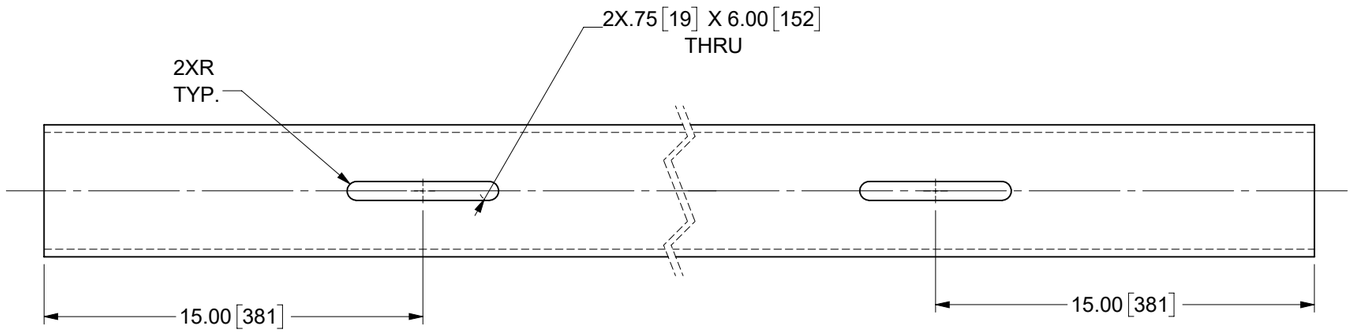
DRAWN BSC 16 Jan 24	DOCUMENT TYPE PRODUCT DEFINITION LONG DESCRIPTION WIRE ROPE, SEAL TAG, 1/16" DIA., GALVANIZED STEEL			
CHECKER SML 17 Jan 24				
MATERIAL GALVANIZED STEEL		WEIGHT - LBS 0.15	WEIGHT - KG 0.06	
SHEET 1 OF 1	DRAWING NUMBER 10002484-001		SCALE 1:1	REV 01

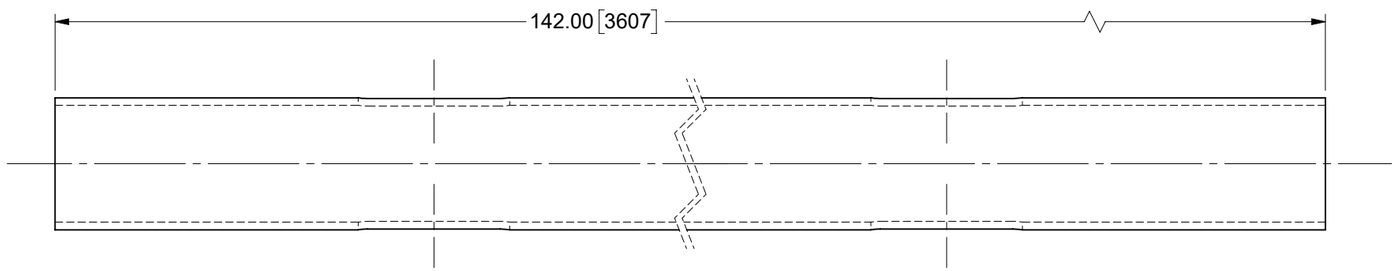
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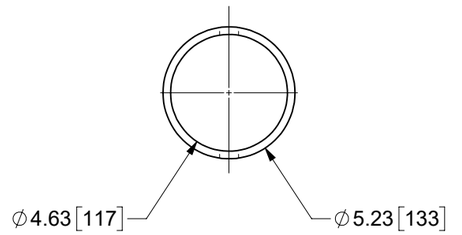
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ISOMETRIC VIEW
SCALE: 1:32







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DRAWN: BSC 09/11/19
CHECKER: SML 09/12/19

DOCUMENT TYPE: CUSTOMER OUTLINE
LONG DESCRIPTION: CENTER TUBE, TELESCOPIC HEAD SHAFT, 5.23" DIA x 142.00", FRP

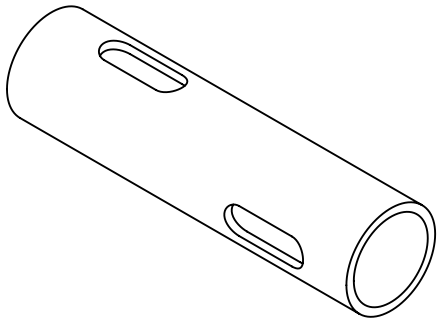
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
E-GLASS EPOXY	45.77	20.76

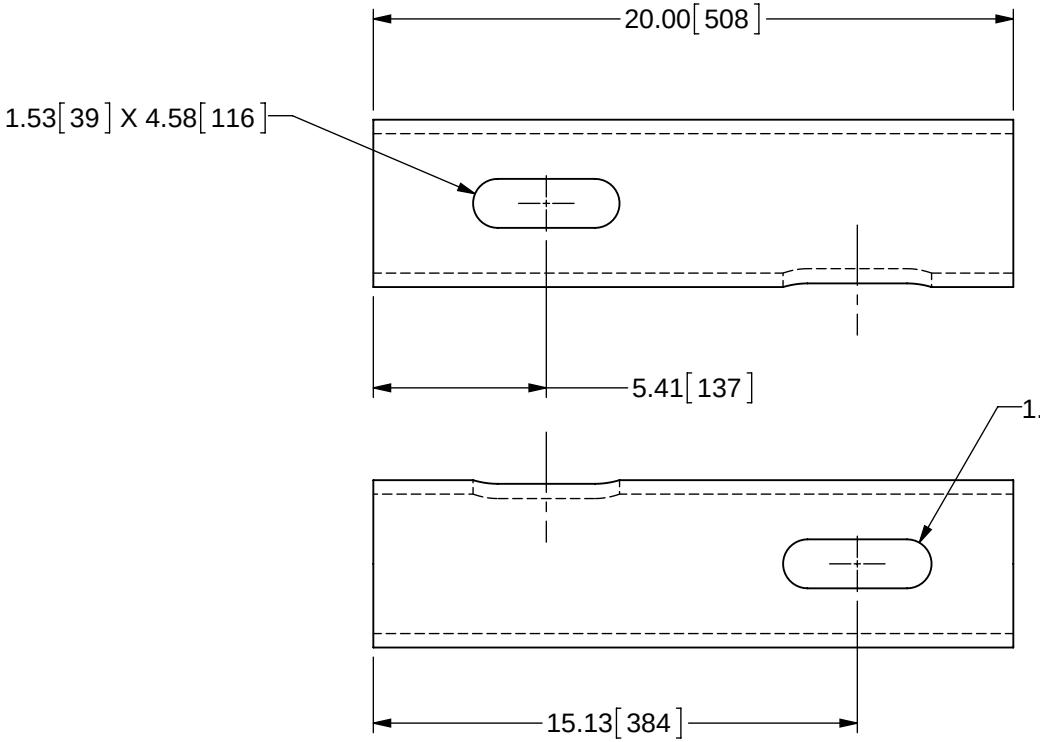
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	1 OF 1	10010019-149	1:6	01

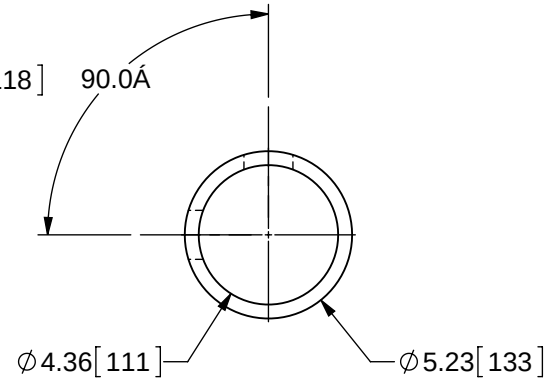
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ISOMETRIC VIEW
SCALE: 1:8





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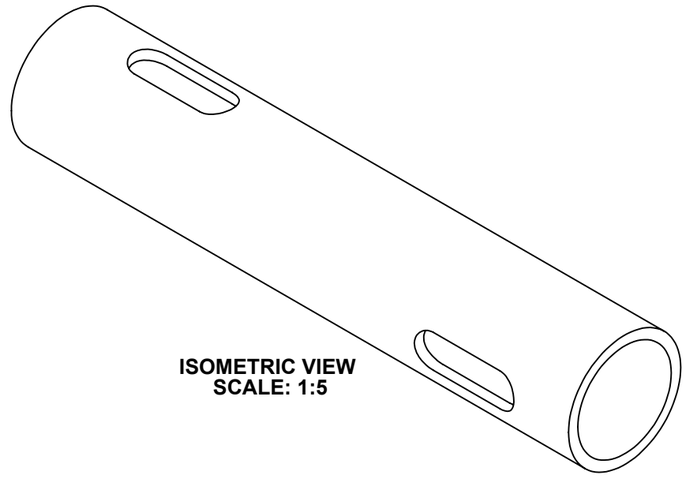
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DRAWN LEH 11/19/13	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION BULL END TUBE BEARING, HEAD SHAFT, 5.23" DIA X 20.00, UHMW-PE			
CHECKER LEH 02/21/14				
MATERIAL UHMW-PE		WEIGHT - LBS 4.22	WEIGHT - KG 1.91	
SHEET 1 OF 1	DRAWING NUMBER 10010024-006	SCALE 1:6	REV 02	

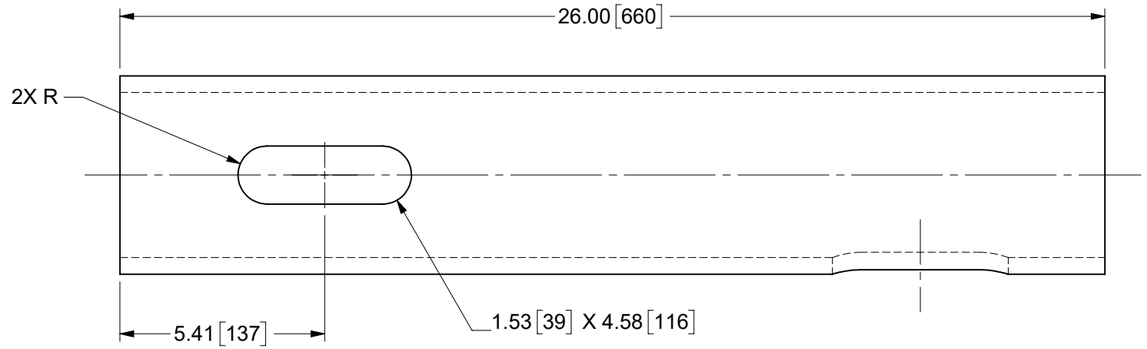
Rev 01

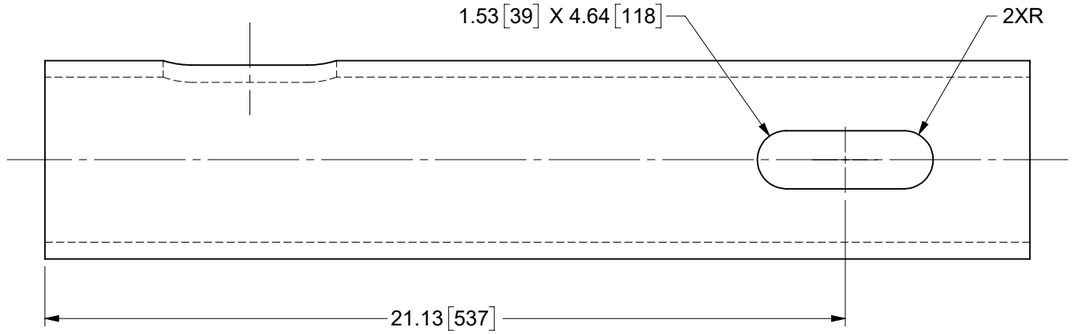
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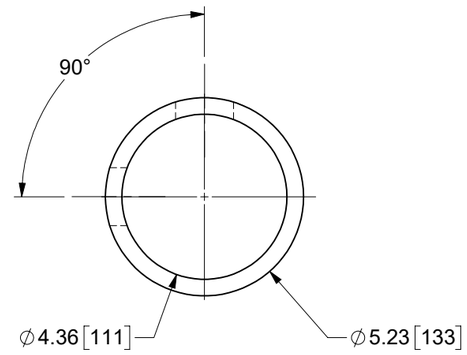
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ISOMETRIC VIEW
SCALE: 1:5







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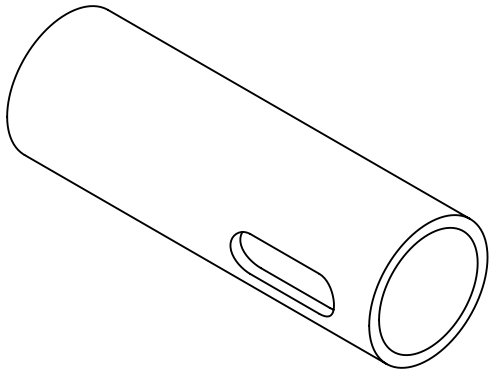
DRAWN: NS, 14 Feb 23	DOCUMENT TYPE: CUSTOMER OUTLINE		
CHECKER: HP, 14 Feb 23	LONG DESCRIPTION: BULL END TUBE BEARING, HEAD SHAFT, 5.23" DIA X 26.00, UHMW-PE		
MATERIAL: UHMW-PE	WEIGHT - LBS: 5.54	WEIGHT - KG: 2.51	
SHEET: 1 OF 1	DRAWING NUMBER: 10010024-162	SCALE: 1:4	REV: 02

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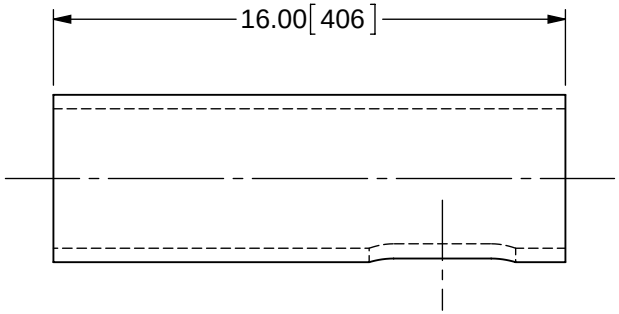
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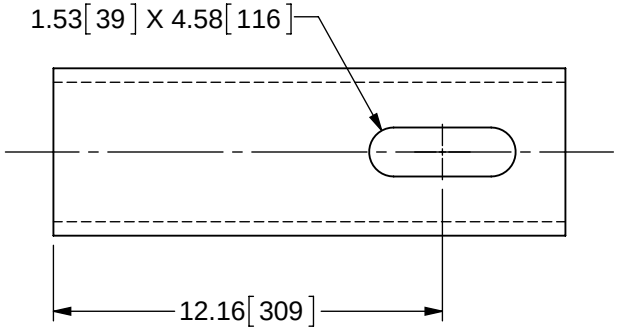
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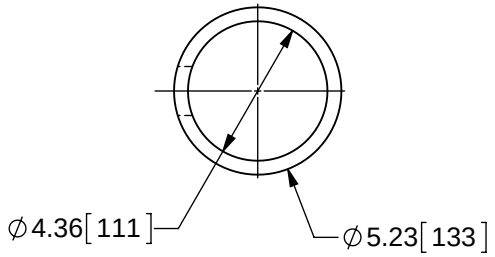
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ISOMETRIC VIEW
SCALE: 1:6







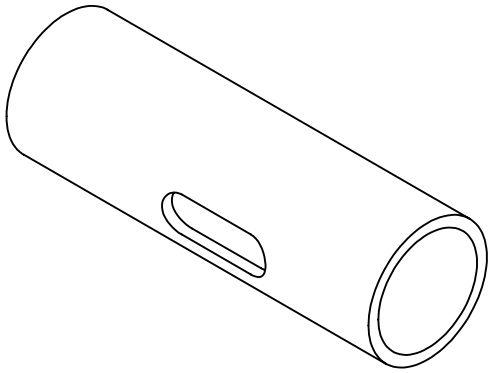
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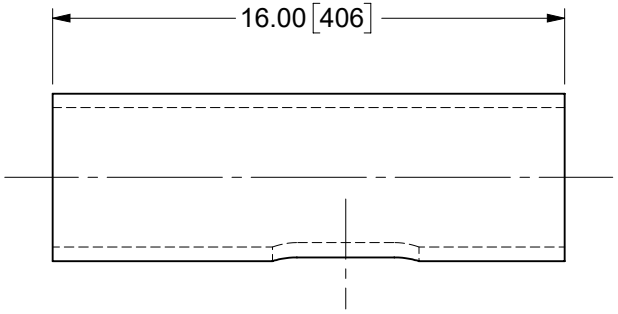
DRAWN: LEH 11/14/13	DOCUMENT TYPE: CUSTOMER OUTLINE LONG DESCRIPTION: DRIVEN END TUBE BEARING, HEAD SHAFT, 5.23" DIA x 16.00", UHMW-PE			
CHECKER: CSR 08/14/14				
MATERIAL: UHMW-PE		WEIGHT - LBS: 3.43	WEIGHT - KG: 1.56	
SHEET: 1 OF 1	DRAWING NUMBER: 10010025-005	SCALE: 1:1	REV: 01	

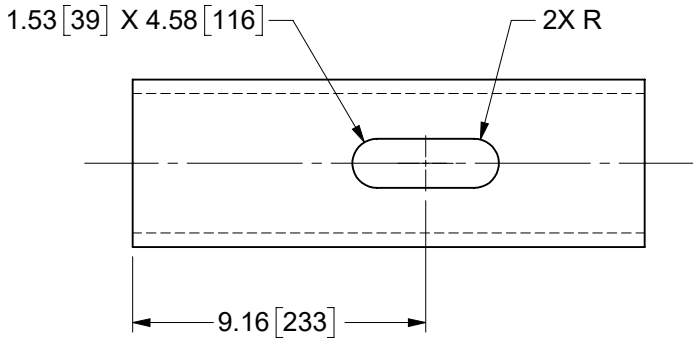
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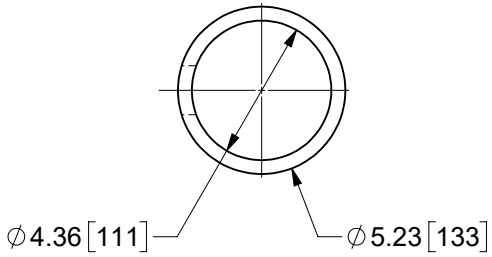
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ISOMETRIC VIEW
SCALE: 1:6



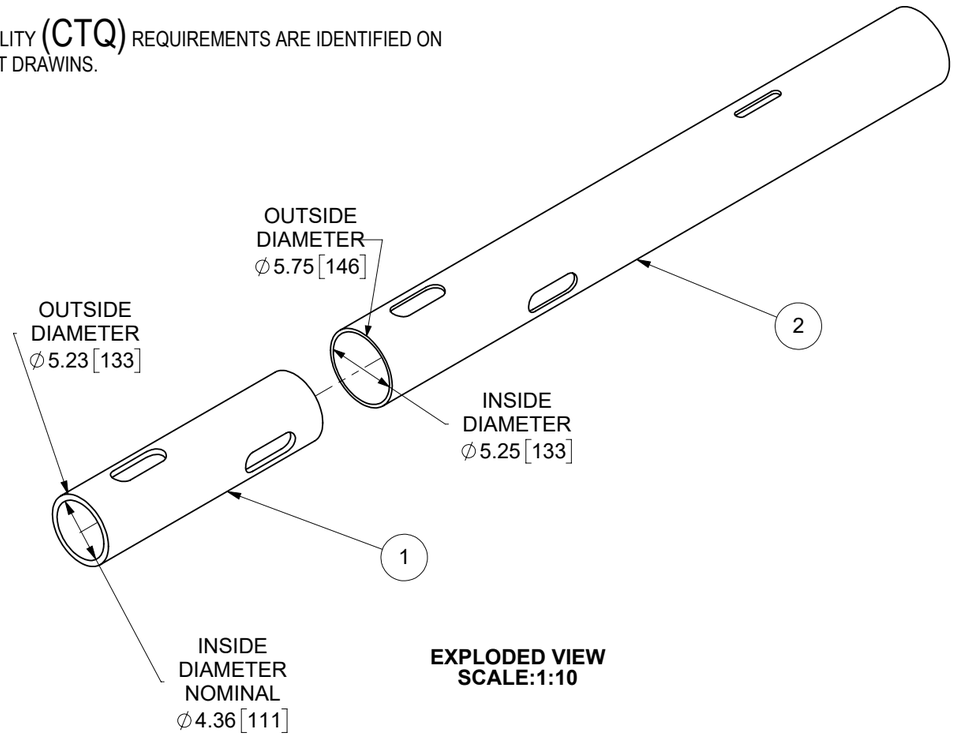




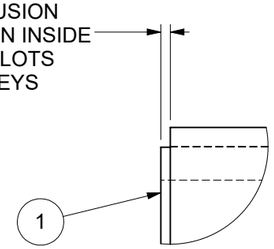
BRENTWOOD	DRAWN SK 10/16/17 CHECKER MSS 10/16/17	DOCUMENT TYPE CUSTOMER OUTLINE LONG DESCRIPTION DRIVEN END TUBE BEARING, HEAD SHAFT, 5.23" DIA x 16.00", UHMW-PE		
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SUPERSEDES:	SHEET 1 OF 1	DRAWING NUMBER 10010025-094	SCALE 1:6	REV 02

NOTES :

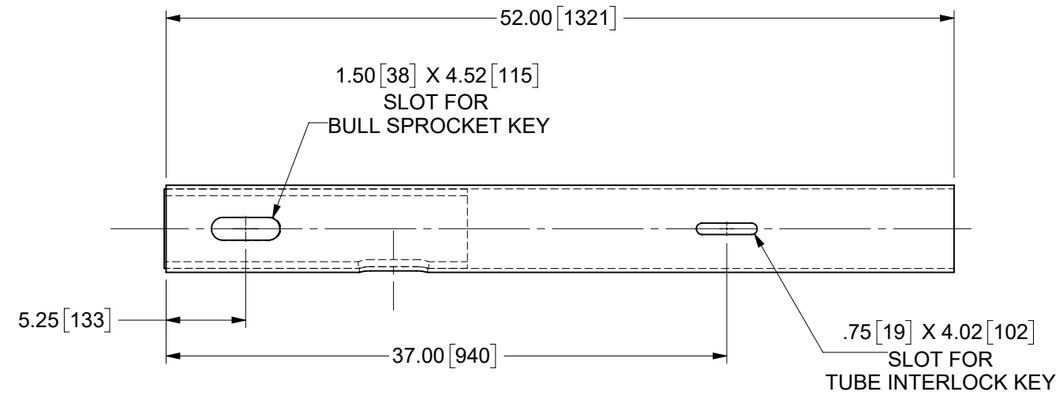
1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
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4. PRODUCT TO BE ASSEMBLED FOR SHIPPING, WITH THE BEARING LOCATED AND SECURED, INSIDE THE STRUCTURAL TUBE, USING A NYLON CABLE TIE LOOPED THROUGH THE END OF THE ASSEMBLY, AND EMERGING OUT THROUGH THE NEAREST KEY SLOT, THEN FASTENED.
5. ALL CRITICAL TO QUALITY (CTQ) REQUIREMENTS ARE IDENTIFIED ON THE SUB-COMPONENT DRAWINS.

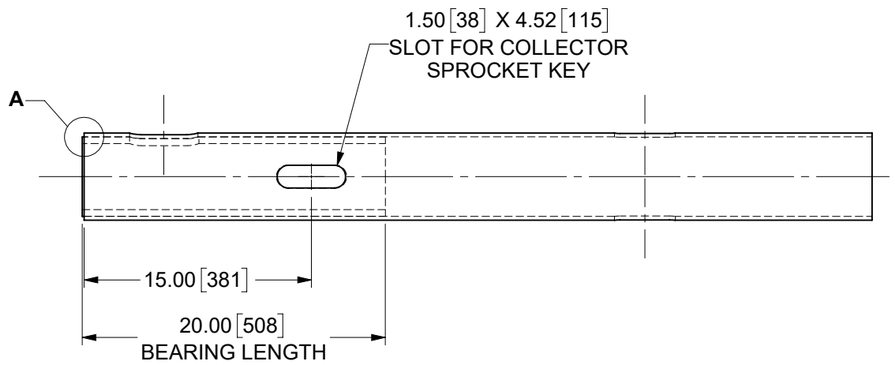


EXPLODED VIEW
SCALE:1:10



DETAIL A
SCALE 1 : 2





ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2	10010021-055	BULL END TUBE, TELESCOPIC HEADSHAFT, 5.75" DIA x 52.00", FRP	1	FIBER REINFORCED POLYESTER
1	10010024-006	BULL END TUBE BEARING, HEAD SHAFT, 5.23" DIA X 20.00, UHMW-PE	1	UHMW-PE

BILL OF MATERIALS FOR 10010026-057

BY	CKD	DATE
SK	MSS	06 Nov 23

STATUS

SUPERSEDES:

CURRENT REVISION:

BRENTWOOD®

DRAWN HP 09/03/19

CHECKER SML 09/03/19

DOCUMENT TYPE PRODUCT DEFINITION

LONG DESCRIPTION: BULL END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 52.00", FRP & UHMW-PE

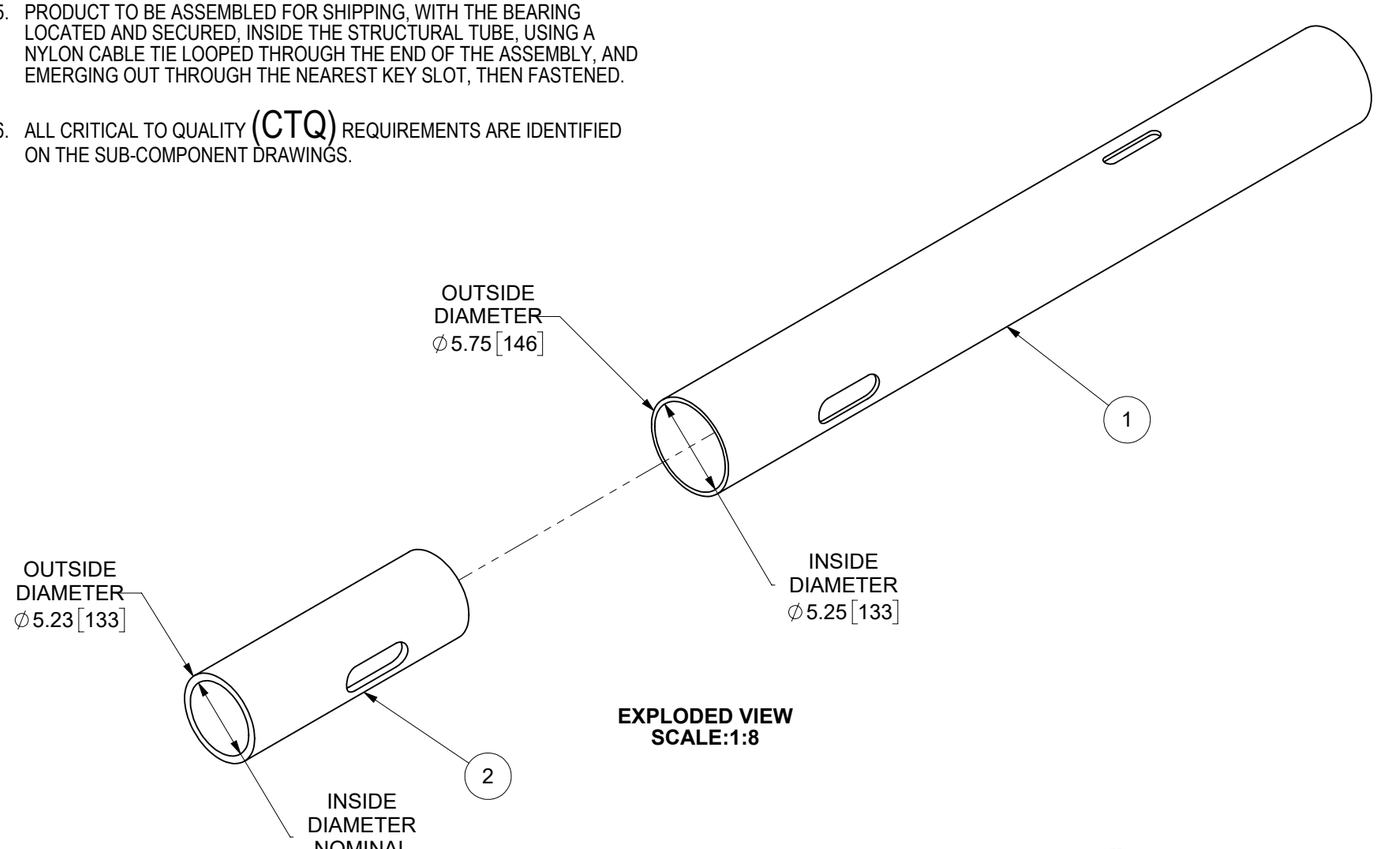
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
SEE BILL OF MATERIALS	18.96	8.60

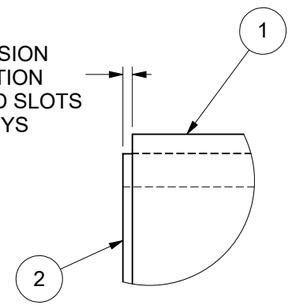
SHEET	DRAWING NUMBER	SCALE	REV
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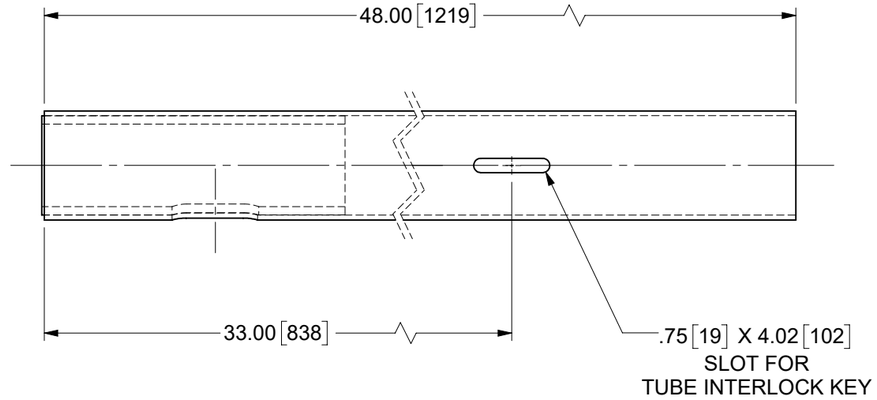
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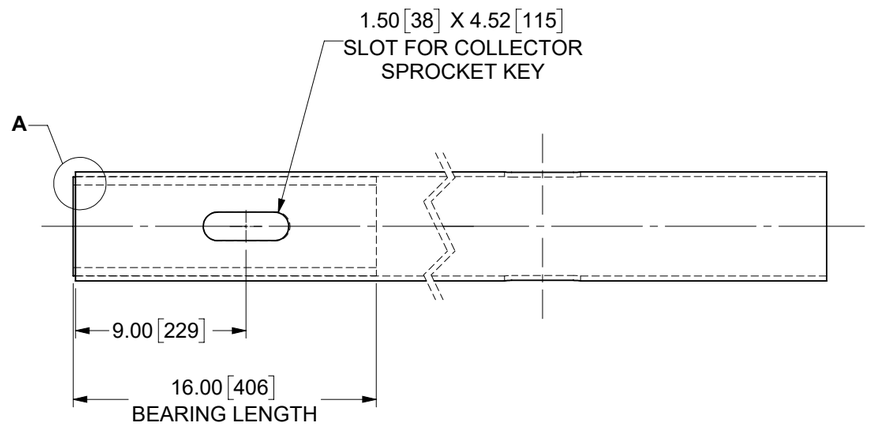


EXPLODED VIEW
SCALE:1:8



DETAIL A
SCALE 1 : 2





ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
2	10010025-002	DRIVEN END TUBE BEARING, HEAD SHAFT, 5.23" DIA x 16.00", UHMW-PE	1	UHMW-PE
1	10010022-005	DRIVEN END TUBE, TELESCOPIC HEAD SHAFT, 5.75" DIA x 48.00", FRP	1	FIBER REINFORCED POLYESTER

BILL OF MATERIALS FOR 10010027-005

STATUS		
SUPERSEDES:		
CURRENT REVISION:		
BY	CKD	DATE
SB	MSS	01/06/22

BRENTWOOD®

DRAWN LEH 12/11/13
CHECKER GTY 12/16/13

DOCUMENT TYPE PRODUCT DEFINITION
LONG DESCRIPTION
DRIVEN END TUBE ASSY, TELESCOPIC HEAD SHAFT, 5.75 DIA x 48.00, FRP & UHMW-PE

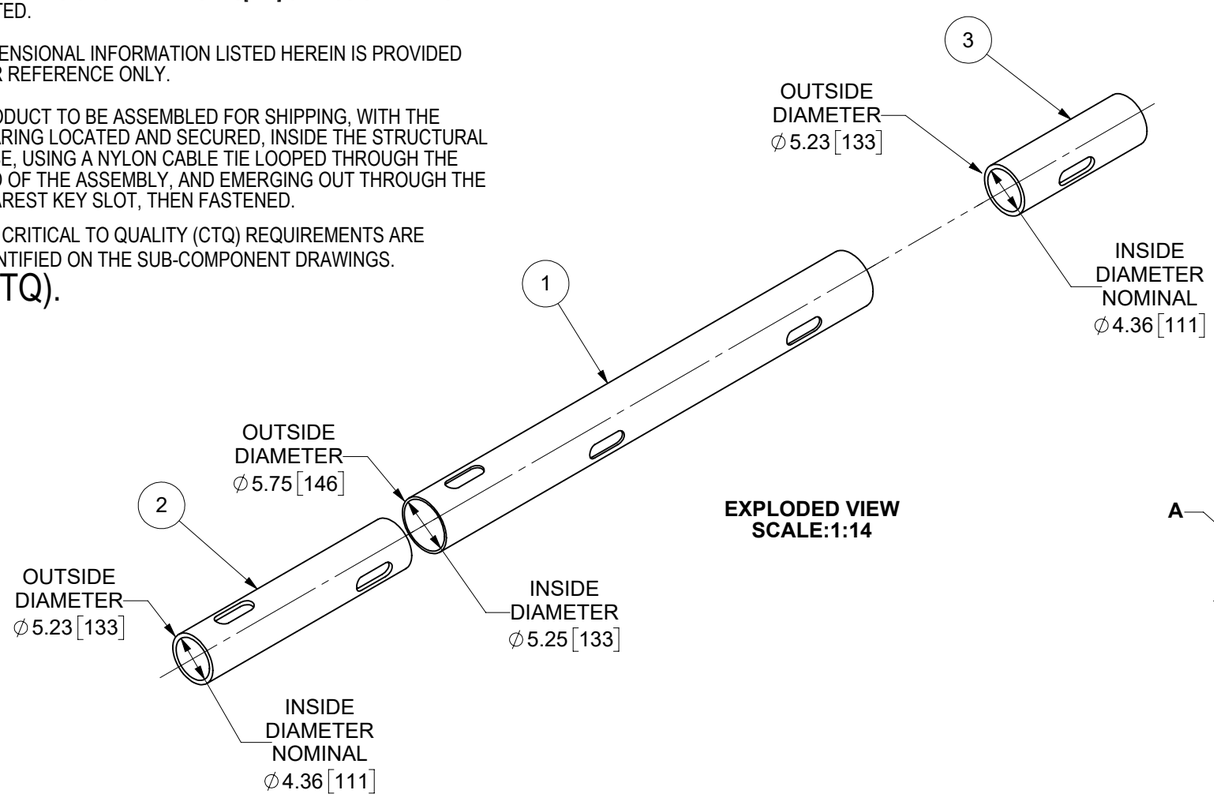
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MATERIAL	WEIGHT - LBS	WEIGHT - KG
SEE BILL OF MATERIALS	17.12	7.77

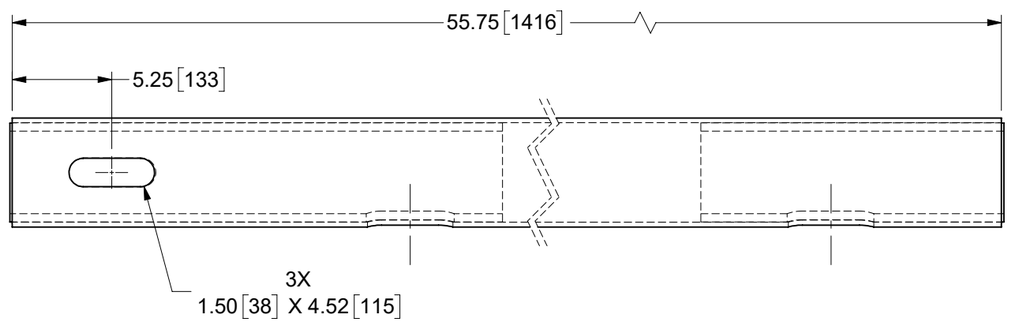
SHEET	DRAWING NUMBER	SCALE	REV
1 OF 1	10010027-005	1:8	06

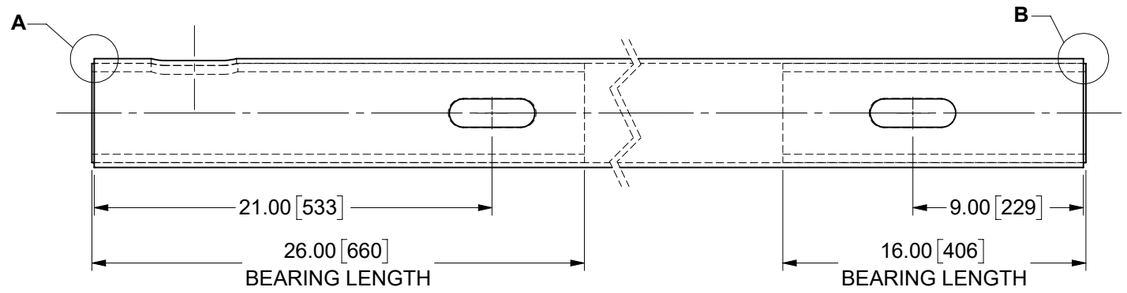
NOTES :

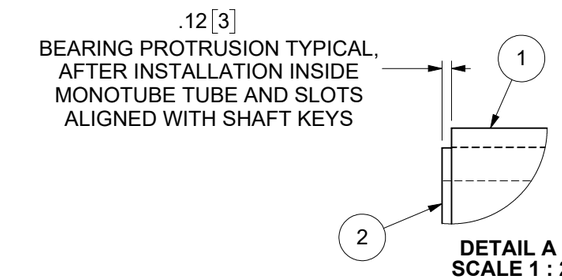
1. PRODUCTS MUST BE CLEAN AND FREE OF ANY LUBRICANTS, SOLVENTS, OR ANY OTHER TYPE OF FILM OR SOILING.
2. PRODUCTS ARE TO BE PACKED FOR SHIPMENT IN SUCH A MANNER AS TO PRESERVE THEIR MANUFACTURED QUALITY.
3. ALL DIMENSIONS ARE IN INCHES[MM] UNLESS OTHERWISE NOTED.
4. DIMENSIONAL INFORMATION LISTED HEREIN IS PROVIDED FOR REFERENCE ONLY.
5. PRODUCT TO BE ASSEMBLED FOR SHIPPING, WITH THE BEARING LOCATED AND SECURED, INSIDE THE STRUCTURAL TUBE, USING A NYLON CABLE TIE LOOPED THROUGH THE END OF THE ASSEMBLY, AND EMERGING OUT THROUGH THE NEAREST KEY SLOT, THEN FASTENED.
6. ALL CRITICAL TO QUALITY (CTQ) REQUIREMENTS ARE IDENTIFIED ON THE SUB-COMPONENT DRAWINGS. (CTQ).



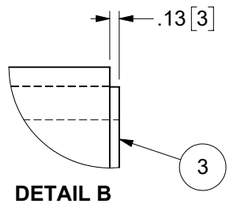
EXPLODED VIEW
SCALE:1:14







DETAIL A
SCALE 1 : 2



DETAIL B
SCALE 1 : 2

ITEM	PART NUMBER	DESCRIPTION	QTY.	MATERIAL
3	10010025-094	DRIVEN END TUBE BEARING, HEAD SHAFT, 5.23" DIA x 16.00", UHMW-PE	1	UHMW-PE
2	10010024-162	BULL END TUBE BEARING, HEAD SHAFT, 5.23" DIA X 26.00, UHMW-PE	1	UHMW-PE
1	10010023-190	MONO TUBE, HEAD SHAFT, 5.75" DIA x 55.75", FRP	1	FIBER REINFORCED POLYESTER

BILL OF MATERIALS FOR 10010028-190

STATUS
.

SUPERSEDES:

CURRENT REVISION:

BY	CKD	DATE
SK	RHP	09 Nov 23

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DRAWN: VP, 05 Sep 23
CHECKER: RHP, 09 Nov 23

DOCUMENT TYPE: PRODUCT DEFINITION
LONG DESCRIPTION: MONO TUBE ASSY, HEAD SHAFT, 5.75" DIA x 55.75, FRP & UHMW-PE

MATERIAL: SEE BILL OF MATERIAL
WEIGHT - LBS: 24.79
WEIGHT - KG: 11.24

SHEET: 1 OF 1
DRAWING NUMBER: 10010028-190
SCALE: 1:8
REV: 01

Rev 01

Component Supplier Information Section 7.

7.1 Touch up Paint

7.2 Gear Reduction Unit

7.3 Limit Switch

7.4 Anchoring System

7.5 VDS Driven Sprocket

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7.1 ***Touch up Paint***

Due to hazardous materials shipping restrictions, Brentwood Industries is unable to provide touch up paint as a part of our scope of supply. Please contact the appropriate component supplier below for touch up paint information. Please note that the component serial number (found on the nameplate) will be required when contacting the manufacturer.

Manufacturer	Contact	Phone and/or email
SEW Eurodrive	Customer Service	856-467-2277

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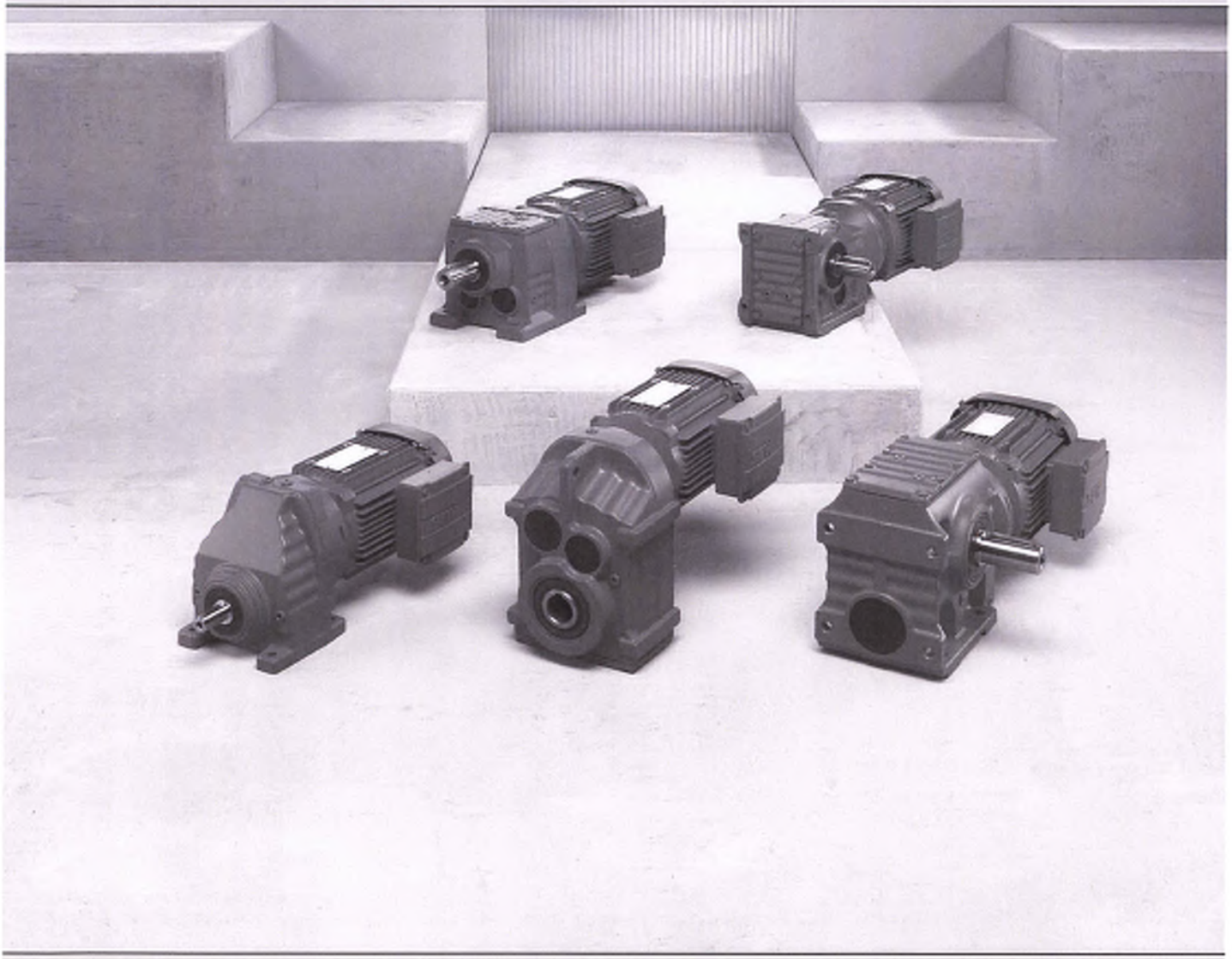
7.2 ***Gear Reduction Unit***

Refer also to Brentwood component drawings 10000583-201, 202 & 211.

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SEW EURODRIVE

Assembly and Operating Instructions



Gear unit series R..7, F..7, K..7, K..9, S..7, SPIROPLAN® W

Edition 05/2015

21932786/EN

Rev 01

1 General information

1.1 About this documentation

This documentation is an integral part of the product. The documentation is intended for all employees who perform assembly, installation, startup, and service work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries.
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries.
⚠ **CAUTION**	Possible dangerous situation	Minor injuries.
NOTICE	Possible damage to property	Damage to the drive system or its environment.
INFORMATION	Useful information or tip: Simplifies handling of the drive system.	

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:



SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

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Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of risk of crushing
	Warning of suspended load
	Warning of automatic restart

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

- ⚠ **SIGNAL WORD** Type and source of hazard.

  Possible consequence(s) if disregarded.

  – Measure(s) to prevent the hazard.

1.3 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the unit!

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1.4 Exclusion of liability

Read the information in this documentation, otherwise safe operation is impossible. You must comply with the information contained in this documentation to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, SEW-EURODRIVE assumes no liability for defects.

1.5 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.6 Copyright notice

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2 Safety notes

2.1 Preliminary information

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The user must ensure that the basic safety notes are read and observed. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. If you are unclear about any of the information in this documentation, or if you require further information, please contact SEW-EURODRIVE.

The following safety notes are primarily concerned with the use of the unit described in these operating instructions. If you use other components from SEW-EURODRIVE, also refer to the safety notes for these particular components in the corresponding documentation.

Please also observe the supplementary safety notes in the individual chapters of this documentation.

2.2 General information

⚠ WARNING



Danger of fatal injury or risk of injury during the operation of motors or gearmotors caused by live, bare (in the event of open connectors/terminal boxes) and movable or rotating parts.

Danger of fatal injury.

- All work related to transport, storage, installation, assembly, connection, startup, maintenance and repair may only be carried out by qualified personnel.
- For transport, storage, installation, assembly, connection, startup, maintenance and repair note the following documents:
  - Warning and safety signs on the motor/gearmotor
  - All the project planning documents, startup instructions and wiring diagrams related to the drive
  - System-specific regulations and requirements
  - National/regional regulations governing safety and the prevention of accidents.
- Never install damaged products.
- Never operate or energize the unit without the necessary protection covers or housing.
- Use the unit only for its intended purpose.
- Make sure installation and operation are correct.

INFORMATION



Submit any complaint to the shipping company immediately in the event of transportation damage.

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2.3 Target group

Any mechanical work may only be performed by adequately qualified personnel. Qualified personnel in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting and servicing of the product, who possess the following qualifications:

- Training in mechanical engineering, e.g. as a mechanic or mechatronics technician (final examinations must have been passed).
- They are familiar with these operating instructions.

Any electronic work may only be performed by adequately skilled person (electrically). Skilled person (electrically) in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting and servicing of the product, who possess the following qualifications:

- Training in electrical engineering, e.g. as an electrician, electronics or mechatronics technician (final examinations must have been passed).
- They are familiar with these operating instructions.

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately.

All qualified personnel must wear appropriate protective clothing.

2.4 Designated use

The gear unit series R..7, F..7, K..7, K..9, S..7, SPIROPLAN® W is intended for use in industrial systems.

The gear units may only be used according to the specifications in the technical documentation from SEW-EURODRIVE as well as the specifications on the nameplate. They fulfill the applicable standards and regulations.

When installed in machines, startup (i.e. start of designated operation) is prohibited until it is determined that the machine complies with the local laws and directives. In the individual area of application, you must especially observe the Machinery Directive 2006/42/EC as well as the EMC Directive 2004/108/EC. The EMC test specifications EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-6 and EN 61000-6-2 must be taken into account during startup.

Using these products in potentially explosive atmospheres is prohibited, unless specifically designated otherwise.

2.5 Other applicable documentation

Observe the corresponding documentation for all connected devices.

2.6 Transportation/storage

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If necessary postpone motor startup.

Tighten attached lifting eyes securely. The lifting eyes are designed to carry only the weight of the motor/gear unit/gearmotor. Do not apply any additional loads.

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The installed lifting eyebolts are in accordance with DIN 580. Observe the loads and regulations specified there. If the motor/gear unit/gearmotor has 2 lifting eye lugs or lifting eyebolts, then you should also use both lifting eye lugs for attaching transport ropes. In this case, the tension force vector of the slings must not exceed a 45° angle in accordance with DIN 580.

Use suitable, sufficiently rated handling equipment, that can be used for further transport.

In case the motor/gear unit/gearmotor is not installed immediately store it dry, free of dust and not outdoors. Do not store the motor/gearmotor on the fan guard. The motor/gear unit/gearmotor can be stored for up to 9 months without requiring any special measures before startup.

2.7 Installation



NOTICE

Danger due to static overdetermination if gear units with foot (e.g. KA19/29B, KA127/157B or FA127/157B) are mounted both via the torque arm and via the foot plate.

Risk of injuries and damage to property.

- Especially with the KA.9B/T design, it is not permitted to use the foot plates and the torque arm at the same time.
- Attach the KA 9B/T design only via the torque arm.
- Attach the K.9 or KA.9B design only via the foot plate.
- If you want to use foot plates and torque arms for mounting, contact SEW-EURODRIVE.

Observe the notes in chapter "Mechanical installation (→ 🗎 22)".

2.8 Startup/operation

Check the oil level before startup as described in chapter Inspection/Maintenance (→ 🗎 88).

Check for proper direction of rotation in **decoupled** state. Listen out for unusual grinding noises as the shaft rotates.

Secure the key for the test run without output elements. Do not deactivate monitoring and protection devices even for a test run.

Switch off the gearmotor if in doubt whenever changes occur in relation to normal operation (e.g. increased temperature, unusual noise, vibration). Determine the cause. It may be necessary to contact SEW-EURODRIVE.

2.9 Inspection/maintenance

Observe the notes in chapter "Inspection/Maintenance"!

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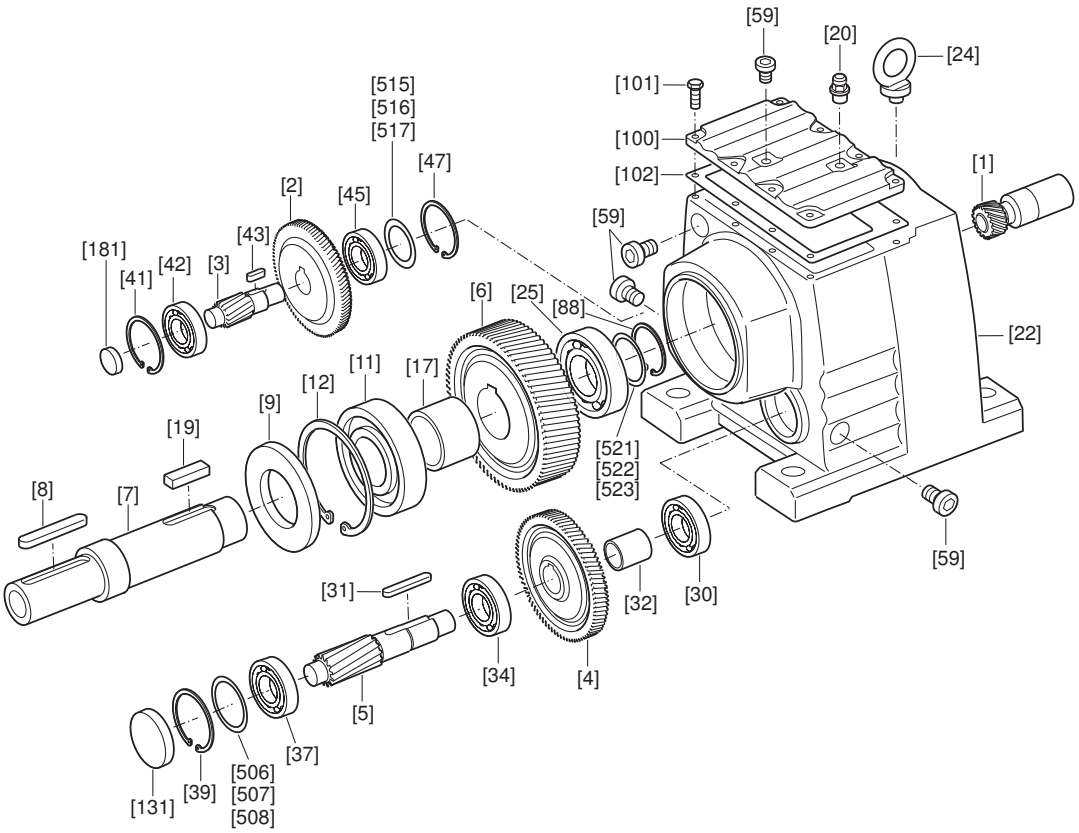
3 Gear unit structure

INFORMATION

The following figures are block diagrams. Their purpose is only to make it easier to assign components to the spare parts lists. Discrepancies may occur depending on the gear unit size and version.

3.1 Basic structure of helical gear units

PRIMARY STAGE



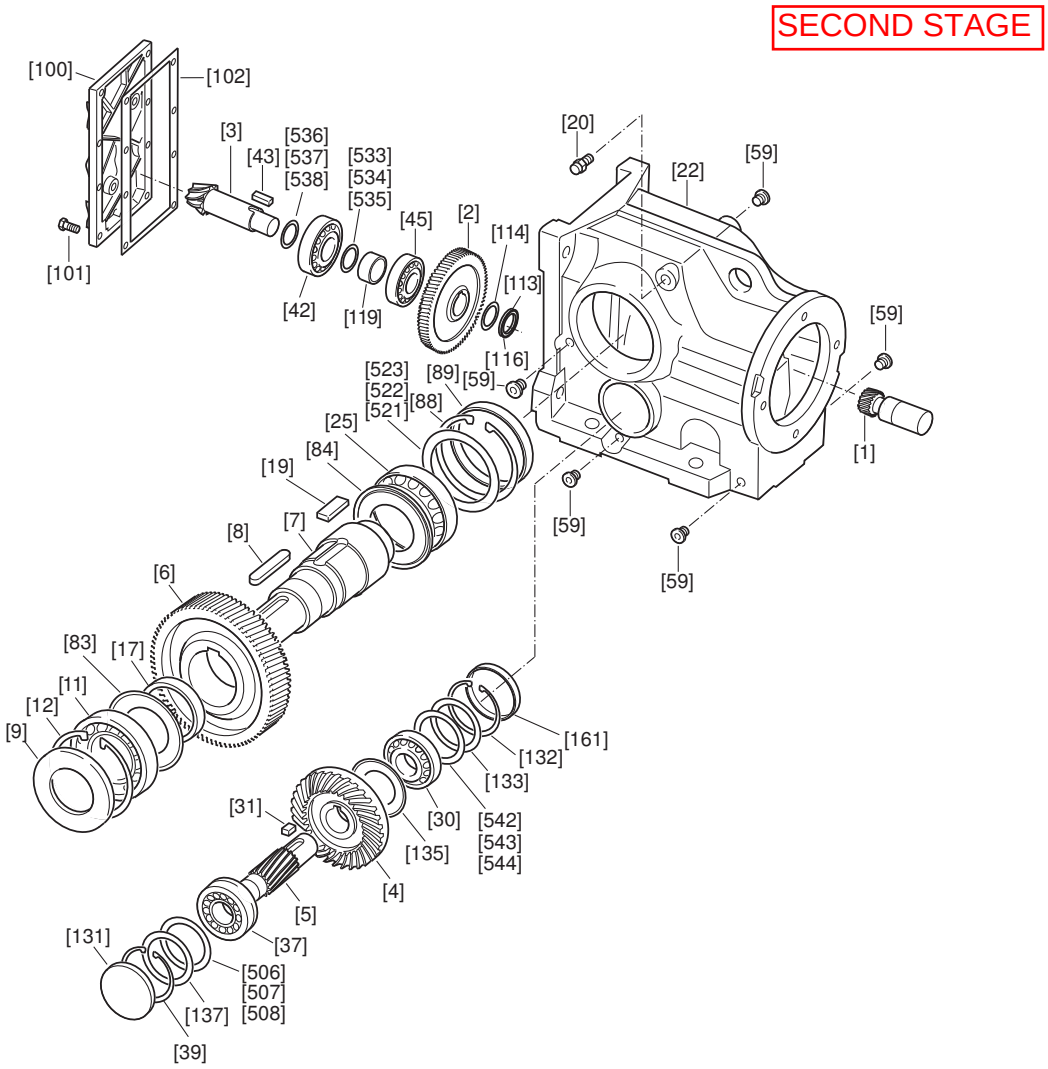
9007199273935243

[1] Pinion
[2] Gear
[3] Pinion shaft
[4] Gear
[5] Pinion shaft
[6] Gear
[7] Output shaft
[8] Key
[9] Oil seal
[11] Rolling bearing
[12] Retaining ring
[17] Spacer tube
[19] Key
[20] Breather valve
[22] Gear unit housing
[24] Eyebolt
[25] Rolling bearing
[30] Rolling bearing
[31] Key
[32] Spacer tube
[34] Rolling bearing
[37] Rolling bearing
[39] Retaining ring
[41] Retaining ring
[42] Rolling bearing
[43] Key
[45] Rolling bearing
[47] Retaining ring
[59] Screw plug
[88] Retaining ring
[100] Inspection cover
[101] Hex head screw
[102] Gasket
[131] Closing cap
[181] Closing cap
[506] Shim
[507] Shim
[508] Shim
[515] Shim
[516] Shim
[517] Shim
[521] Shim
[522] Shim
[523] Shim

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3.5 Basic structure of helical-bevel gear units K..37 – K..187



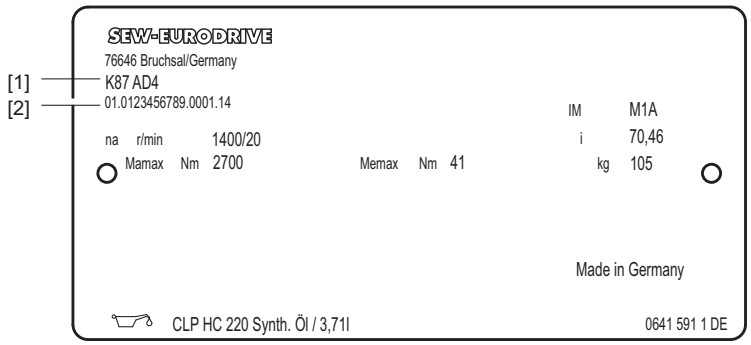
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[1]	Pinion	[25]	Rolling bearing	[102]	Gasket	[522]	Shim
[2]	Gear	[30]	Rolling bearing	[113]	Slotted nut	[523]	Shim
[3]	Pinion shaft	[31]	Key	[114]	Multi-tang washer	[533]	Shim
[4]	Gear	[37]	Rolling bearing	[116]	Thread lock	[534]	Shim
[5]	Pinion shaft	[39]	Retaining ring	[119]	Spacer tube	[535]	Shim
[6]	Gear	[42]	Rolling bearing	[131]	Closing cap	[536]	Shim
[7]	Output shaft	[43]	Key	[132]	Retaining ring	[537]	Shim
[8]	Key	[45]	Rolling bearing	[133]	Supporting ring	[538]	Shim
[9]	Oil seal	[59]	Screw plug	[135]	Shield ring	[542]	Shim
[11]	Rolling bearing	[83]	Shield ring	[137]	Supporting ring	[543]	Shim
[12]	Retaining ring	[84]	Shield ring	[161]	Closing cap	[544]	Shim
[17]	Spacer tube	[88]	Retaining ring	[506]	Shim		
[19]	Key	[89]	Closing cap	[507]	Shim		
[20]	Breather valve	[100]	Inspection cover	[508]	Shim		
[22]	Gear unit housing	[101]	Hex head screw	[521]	Shim		

3.9 Nameplate/type designation

3.9.1 Gear unit nameplate

The following figure shows an example of a nameplate for a helical-bevel gear unit with input cover:



9007203726759691

[1]		Type designation of the gear unit
[2]		Serial number
n_a	r/min	Maximum permitted output speed
M_{amax}	Nm	Maximum permitted output torque i
M_{emax}	Nm	Maximum permitted input torque
i		Gear unit ratio
IM		Mounting position

Explanation for serial number:

01.	**0123456789.**	**0001.**	**14**
Sales organization	Order number	Item number	Year of manu-facture

3.9.2 Type designation of the gear unit

A helical-bevel gear unit with AQA adapter, for example has the following type designation:

Example: K37/R AQA 80 /1		
Gear unit type	**K**	Helical-bevel gear units
Gear unit size	**37**	19 – 49; 37 – 187
Option	**/R**	e.g. option /R for servo drives: Reduced rotational clearance
Adapter	**AQA**	e.g. adapter for servo drives: AQA: Adapter with keyway AQH: Adapter with clamping ring hub
Flange key figure	**80**	
Variants	**/1**	

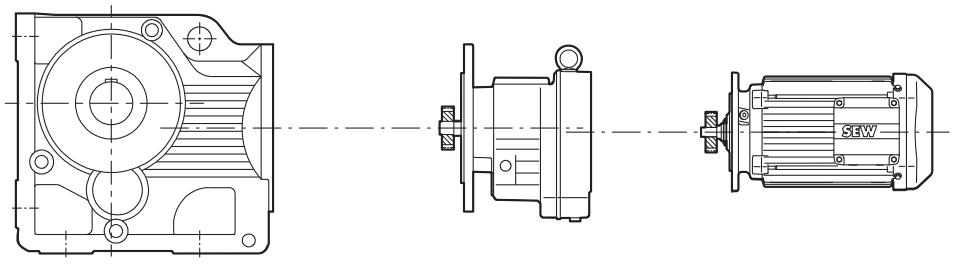
3.9.4 Type designation gearmotor

The type designation of the gearmotor starts from the component on the output end.

For instance, a multi-stage helical-bevel gearmotor with temperature sensor in the motor winding has the following type designation:

Example: K107R77DRN100M4 /TF		
Gear unit type	K	1. Gear unit
Gear unit size	107	
Gear unit series	R	2. Gear unit
Gear unit size	77	
Motor series	DRN..	Motor
Motor size	100	
Length	M	
Number of poles	4	
Motor option temperature sensor	/TF	Option

Example: DRN.. double gearmotor



K107 R77 DRN100M4/TF

SECOND STAGE PRIMARY STAGE

13368182539

4 Mechanical installation

4.1 Prerequisites for installation

NOTICE

Damage to the gear unit/gearmotor due to improper installation.

Damage to property.

- Observe the following notes.

Make sure that the following requirements are met before you start installing the unit:

- The drive has not been damaged during transportation or storage.
- The entries on the nameplate of the gearmotor match the voltage supply system.
- In case of abrasive ambient conditions, the output end oil seals must be protected against wear.
- Output shafts and flange surfaces must be completely free from anti-corrosion agent and any kind of pollution. Use a commercially available solvent to clean the flange surfaces. Note that solvent damages the oil seal. Do not let the solvent come into contact with the sealing lips of the oil seals.
- **For standard drives:**
  - Check if the gear unit/gearmotor is designed for the ambient temperatures. For the application limits refer to the technical documentation, the nameplate or the lubricant table (see chapter "Lubricant table (→ 🗎 149)").
  - Make sure the environment contains no hazardous substances (oils, acids, gases, vapors, dusts,...) or radiation.
- **For special designs:**
  - Check if the gear unit/gearmotor is designed for the ambient temperatures. You find the application limits on the nameplate.
- **With helical-worm/SPIROPLAN®gear units:**
  - Note that no large external mass moments of inertia must be present, which could exert a retrodriving load on the gear unit.
  - Note the self-locking at η' (retrodriving) < 0.5.

    Calculation of η': η' = 2- 1/η
- **Servomotor mounting:**
  - The drive may only be mounted if it is ensured that after the mounting the drive will be sufficiently ventilated. Ventilation prevents heat build-up.

4.1.1 Required tools/resources

The following tools and resources are required for the mechanical installation:

- Wrench
- Torque wrench for:
  - Gear unit mounting
  - Shrink disks
  - Motor adapter AQH or EWH
  - Input shaft assembly with centering shoulder

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- Mounting device
- Compensation elements (shims and spacing rings)
- Fasteners for input and output elements
- Lubricant (e.g. NOCO® fluid)
- Threadlocker compound for input cover with centering shoulder (e.g. Loctite® 243)

INFORMATION

Standard parts are not included in the delivery.

4.1.2 Installation tolerances

Shaft end	Flanges
Diameter tolerance according to DIN 748 • ISO k6 for solid shafts with Ø ≤ 50 mm • ISO m6 for solid shafts with Ø > 50 mm • ISO H7 for hollow shafts • Centering bore in accordance with DIN 332, shape DR	Centering shoulder tolerance to DIN 42948 • ISO j6 with b1 ≤ 230 mm • ISO h6 with b1 > 230 mm

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4.2 Installing the gear unit

⚠ CAUTION



Risk of injury due to improper installation/disassembly

Severe personal injury and damage to property.

- Work on the gear unit only when the machine is not in use.
- Secure the drive unit against unintentional power-up.
- Prevent heavy component parts (e.g. shrink disks) against falling during installation/disassembly.

⚠ CAUTION



Risk of injury due to protruding gear unit parts.

Severe injuries

- Keep a sufficient safety distance to the gear unit/gearmotor.

NOTICE



Danger due to static overdetermination if gear units with foot (e.g. KA19/29B, KA127/157B or FA127/157B) are mounted both via the torque arm and via the foot plate.

Risk of injuries and damage to property.

- Especially with the KA.9B/T design, it is not permitted to use the foot plates and the torque arm at the same time.
- Attach the KA 9B/T design only via the torque arm.
- Attach the K.9 or KA.9B design only via the foot plate.
- If you want to use foot plates and torque arms for mounting, contact SEW-EURODRIVE.

NOTICE

Damage to gear unit/gearmotor due to cold air currents. Condensed water in the gear unit can cause damage.

Damage to property.

- Protect the gear unit from direct cold air currents.

INFORMATION



When installing the gear unit, make sure that the oil level and drain plugs as well as the breather plugs are easily accessible!

Mounting position

The gear unit or gearmotor is only allowed to be installed in the specified mounting position. Observe the information on the nameplate. SPIROPLAN® gear units of sizes W10-W30 do not depend on a particular mounting position.

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Oil fill volume

Check the oil fill depending on the mounting position (for information on the fill quantity refer to the nameplate or chapter "Lubricant fill quantities" (→ 🗎 151)). Control the oil fill level at this opportunity. See chapter "Inspection/maintenance for the gear unit" (→ 🗎 95). The gear units are filled with the required oil quantity at the factory. There may be slight deviations at the oil level plug as a result of the mounting position, which are permitted within the manufacturing tolerances.

Adjust the lubricant fill volumes and the position of the breather valve accordingly in the event of a change of mounting position. Observe chapter "Lubricant fill quantities" (→ 🗎 151) and chapter "Mounting Positions" (→ 🗎 110).

Consult the SEW customer service if you intend to change the mounting position of K gear to M5 or M6 or between M5 and M6.

Please contact our SEW customer service if you want to change the mounting position of size S47 – S97 helical-worm gear units to mounting position M2 or M3.

Submounting

The support structure must have the following characteristics:

- Level
- Vibration damping
- Torsionally rigid

The following table shows the maximally permitted flatness defect for foot- and flange-mounting (guide values based on DIN ISO 1101):

Gear unit size	Flatness defect
≤ 67	max. 0.4 mm
77 – 107	max. 0.5 mm
137/147	max. 0.7 mm
157 – 187	max. 0.8 mm

Do not twist housing legs and mounting flanges against each other. Observe the permitted overhung and axial forces. Observe chapter "Project Planning" in the Gear unit/gearmotor catalog for calculating the permitted overhung and axial loads.

Screw quality

Secure the gearmotors listed in the following table using quality 10.9 screws. Use suitable washers.

Gear unit	Flange Ø in mm
RF37/R37F	120
RF47/R47F	140
RF57/R57F	160
FF/FAF77/KF/KAF77	250
RF147	450
RF167	550
RZ37 – RZ87	60ZR – 130ZR

Secure the gearmotors not listed in the table using quality 8.8 screws.

Corrosion protection for screw connections

Use plastic inserts (2 – 3 mm thick) if there is a risk of electrochemical corrosion between the gear unit and the driven machine. The material used must have an electrical leakage resistance < 10^9 Ω. Electrochemical corrosion can occur between various metals, for example, cast iron and stainless steel. Also fit the screws with plastic washers. Additionally ground the housing. Use grounding screws on the motor.

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4.2.1 Tightening torques for retaining screws

Mount the gearmotors with the following tightening torques:

Screw/nut	Tightening torque ± 10% Strength class 8.8 Nm
M6	11
M8	25
M10	48
M12	86
M16	210
M20	410
M24	710
M30	1450
M36	2500
M42	4600
M48	6950
M56	11100

Mount the specified gearmotors in flange-mounted design with the following increased tightening torques:

Flange Ø mm	Gear unit	Screw/nut	Tightening torque ± 10% Strength class 10.9 Nm
120	RF37	M6	16.5
140	RF37/RF47	M8	40.1
160	RF57	M8	40.1
450	RF147	M20	661
550	RF167	M20	661
60ZR	RZ37	M8	40
70ZR	RZ47	M8	40
80ZR	RZ57	M10	79
95ZR	RZ67	M10	79
110ZR	RZ77	M10	79
130ZR	RZ87	M12	137
250	FF77/KF77/ FAF77/KAF77	M12	137

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4.2.2 Gear unit mounting

INFORMATION

If you use the gear unit in flange-mounted design or foot/flange-mounted design with VARIGEAR® variable speed gear units, use screws of 10.9 quality and suitable washers for flange mounting on customer side.

To improve the friction contact between flange and mounting surface, SEW-EURODRIVE recommends anaerobic gaskets or anaerobic glue.

Foot-mounted gear unit

The following table shows the thread sizes of the gear units in foot-mounted design depending on the gear unit type and size:

Screw	Gear unit type					
	R/R..F	RX	F/FH..B/ FA..B	K/KH..B/KV..B/ KA..B	S	W
M6	07	-	-	19	-	10/20
M8	17/27/37	-	27/37	29	37	30/37/47
M10	-	57	47	37/39/47/49	47/57	-
M12	47/57/67	67	57/67	57/67	67	-
M16	77/87	77/87	77/87	77	77	-
M20	97	97/107	97	87	87	-
M24	107	-	107	97	97	-
M30	137	-	127	107/167	-	-
M36	147/167	-	157	127/157/187	-	-

Gear unit with B14 flange-mounted design and/or hollow shaft

The following table shows the thread sizes of the gear units with B14 flange and/or hollow shaft depending on the gear unit type and size:

Screw	Gear unit type				
	RZ	FZ/FAZ/FHZ/ FVZ	KZ/KAZ/KHZ/KVZ	SA/SAZ/SHZ	WA
M6	07/17/27	–	–	37	10/20/30[1)]
M8	37/47	27/37/47	37/47	47/57	37
M10	57/67	–	–	–	47
M12	77/87	57/67/77	57/67/77	67/77	–
M16	–	87/97	87/97	87/97	–
M20	–	107/127	107/127	–	–
M24	–	157	157	–	–

1) For W30 gear units mounted directly to a CMP motor or mounted via an EWH.. adapter, the thread size is M8.

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Gear unit with B5 flange

The following table shows the thread sizes of the gear units with B5 flange depending on the gear unit type, size and flange diameter:

Flange Ø mm	Screw	Gear unit type				
		RF/R..F/RM	FF/FAF/ FHF/FVF	KF/KAF/ KHF/KVF	SF/SAF/SHF	WF/WAF/ WHF
80	M6	-	-	-	-	10
110	M8	-	-	-	-	20
120	M6	07/17/27	-	-	37	10/20/30/37
120	M8	-	-	19	-	-
140	M8	07/17/27/37/47	-	-	-	-
160	M8	07/17/27/37/47	27/37	19/37	37/47	30/37/47
160	M10	-	-	29/39	-	-
200	M10	37/47/57/67	47	29/47	57/67	-
200	M12	-	-	49	-	-
250	M12	57/67/77/87	57/67	57/67	77	-
300	M12	67/77/87	77	77	-	-
350	M16	77/87/97/107	87	87	87	-
450	M16	97/107/137/147	97/107	97/107	97	-
550	M16	107/137/147/167	127	127	-	-
660	M20	147/167	157	157	-	-

4.2.3 Installation in damp locations or outdoors

Drives are supplied in corrosion-resistant designs with an according surface protection coating for use in damp areas or outdoors.

- Repair damage to the paint work e.g. at the breather valve or the lifting eyes (see "Painting the gear unit" (→ 🗎 30)).
- When mounting the motors onto AM, AQ adapters and to AR, AT start-up and friction couplings, seal the flange areas with a suitable sealant (e.g. Loctite® 574).
- Units installed outdoors must be protected from the sun. Provide for suitable protective devices such as covers or roofs. Avoid heat build-up.
- The system operator must ensure that no foreign objects (e.g. falling objects or coverings) affect the operation of the gear unit.

4.2.4 Gear unit venting

NOTICE

Dirt and dust in the environment affect the function of the breather valve.

Possible damage to property.

- Check the breather valve function regularly and replace it if necessary.
- In case of high dirt and dust load use a breather filter instead of a breather valve.

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The following table lists gear units that do not require venting:

Gear unit	Mounting position
R..07	M1/M2/M3/M5/M6
R..17/R..27/F..27	M1/M3/M5/M6
W..10/W..20/W..30	M1– M6
W..37/W..47/	M1/M2/M3/M5/M6
K..19/K..29	M1/M2/M3/M5/M6

All other gear units are delivered with a breather valve suitable to the mounting position and activated.

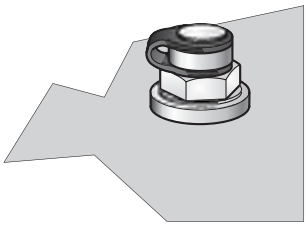
Exceptions:

1. The following gear units are delivered with a screw plug on the provided breather hole:
   - Gear units with pivoted mounting positions, if possible
   - Gear units for inclined mounting

   Before startup, replace the highest screw plug in the terminal box of the motor with the breather valve provided.
2. For **gear head units** venting on the input end, a breather valve is supplied in a plastic bag.
3. **Enclosed gear units** are delivered without a breather valve.
4. In some countries, the breather valve is installed, but not activated due to possible pressure fluctuations during transport. In such cases the transport protection must be removed. This activates the breather valve (see chapter "Activating the breather valve" (→ 🗎 29)).

Activating the breather valve

Check whether the breather valve is activated. If the breather valve has not been activated, you must remove the transport protection device from the breather valve before starting up the gear unit!

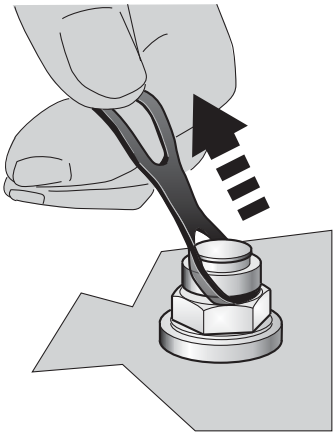


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Breather valve with transport protection

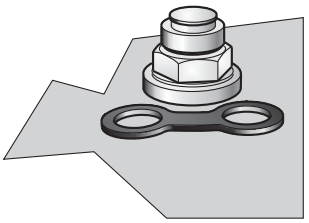
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Removing the transport protection



211314699

Activated breather valve

4.2.5 Painting the gear unit

NOTICE

Paint can block the breather valve and damage the sealing lips of the oil seals.

Damage to property.

- Thoroughly cover the breather valve and sealing lip of the oil seals with strips prior to painting/re-painting.
- Remove the strips after painting.

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4.5 Shaft-mounted gear units with keyway or splined hollow shaft

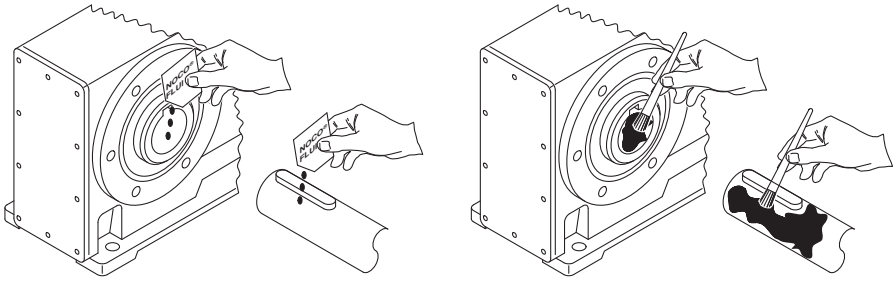
INFORMATION

Concerning the configuration of the customer shaft, please also refer to the design notes in the "Gearmotors" catalog.

4.5.1 Mounting the shaft-mounted gear unit

Proceed as follows:

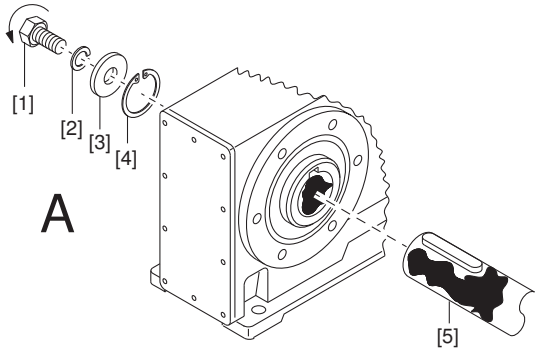
1. Apply NOCO® fluid. Spread carefully.



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2. Install the shaft and secure it axially. For easier mounting, use a mounting device. Following a description of the **3 mounting types**, depending on the scope of delivery.

- **Mount customer shaft (standard scope of delivery):**

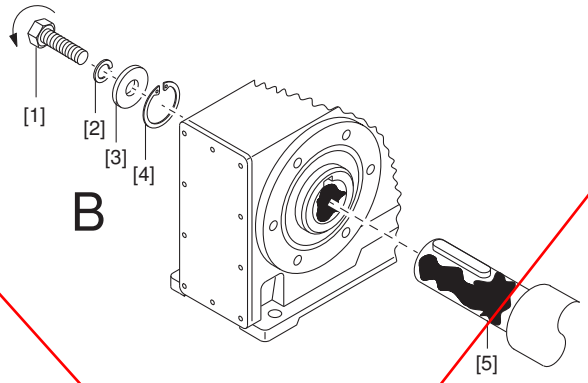


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[1]	Short retaining screw (standard scope of delivery)	[3]	Washer
[2]	Lock washer	[4]	Retaining ring
		[5]	Customer shaft

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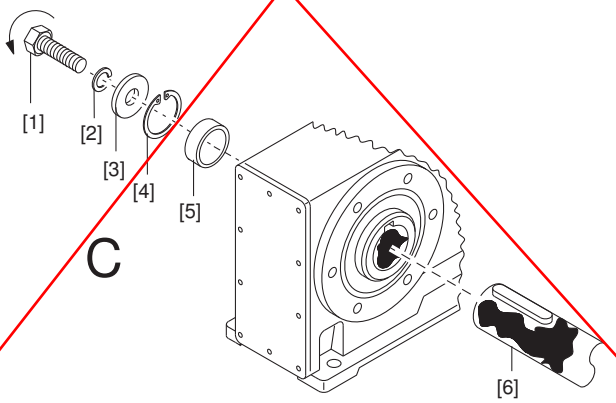
- **Mount customer shaft with contact shoulder using the SEW-EURODRIVE assembly/disassembly kit:**



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[1]	Retaining screw	[4]	Retaining ring
[2]	Lock washer	[5]	Customer shaft with contact shoulder
[3]	Washer		

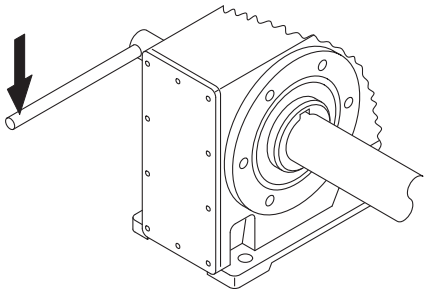
- **Mount customer shaft without contact shoulder using the SEW-EURODRIVE assembly/disassembly kit:**



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[1]	Retaining screw	[4]	Retaining ring
[2]	Lock washer	[5]	Spacer tube
[3]	Washer	[6]	Customer shaft without contact shoulder

3. Tighten the retaining screw to the appropriate torque. Observe the tightening torques specified in the following table.



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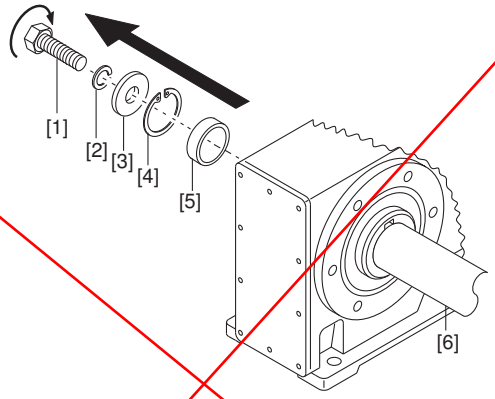
Screw	Tightening torque Nm
M5	5
M6	8
M10/12	20
M16	40
M20	80
M24	200

INFORMATION

To avoid contact corrosion, SEW-EURODRIVE recommends that the customer shaft should be lathed down between the 2 contact surfaces.

4.5.2 Remove the shaft-mounted gear unit

This description is only applicable when the gear unit was assembled using the SEW-EURODRIVE assembly/disassembly kit (see step 2 of "Mount the shaft-mounted gear unit" (→ 🗎 38)).



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[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[5] Spacer tube
[6] Customer shaft

Proceed as follows:

1. Loosen the retaining screw [1].
2. Remove parts [2] to [4] and, if applicable, the spacer tube [5].
3. Insert the forcing washer [8] and the fixed nut [7] from the SEW-EURODRIVE assembly/disassembly kit between the customer shaft [6] and the retaining ring [4] (see "SEW-EURODRIVE assembly/disassembly kit" (→ 🗎 42)).

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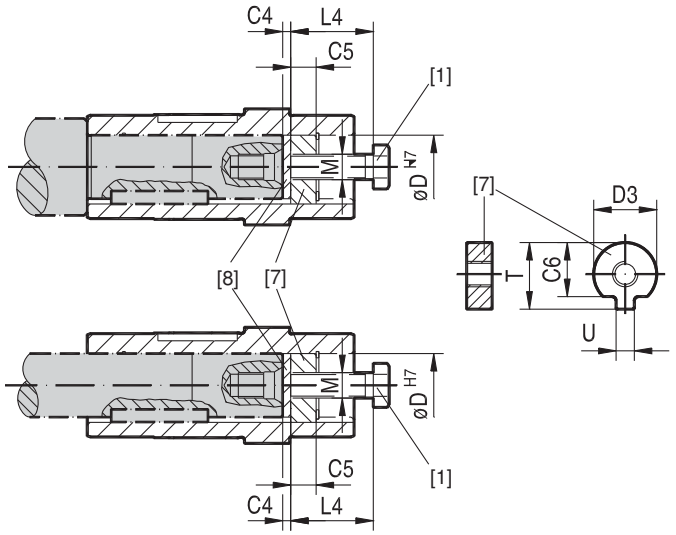
4.5.3 Assembly/disassembly kit by SEW-EURODRIVE

INFORMATION

The depicted assembly kit for attaching the customer shaft is a recommendation by SEW-EURODRIVE.

- You must always check whether this design can compensate the present axial loads.
- In particular applications (e.g. mounting agitator shafts), a different design may have to be used to secure the shaft axially. You can use your own devices to secure the shaft axially, if you ensure that these designs do not cause potential sources of combustion according to DIN EN 13463 (e.g. impact sparks).

The following figure shows the SEW-EURODRIVE assembly/disassembly kit.



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[1] Retaining screw
[7] Locked nut for removal
[8] Forcing washer

For the assembly/disassembly kit part numbers necessary to order, refer to the following table:

Gear unit type	D^{H7} mm	M[1)]	C4 mm	C5 mm	C6 mm	$U^{-0.5}$ mm	$T^{-0.5}$ mm	$D3^{-0.5}$ mm	L4 mm	Part number of the installation/ removal kit
WA..10	16	M5	5	5	12	4.5	18	15.7	50	643 712 5
WA..20	18	M6	5	6	13.5	5.5	20.5	17.7	25	643 682 X
KA..19, SA..37, WA..20, WA..30, WA..37,	20	M6	5	6	15.5	5.5	22.5	19.7	25	643 683 8
FA..27, KA..29, SA..47, WA..47,	25	M10	5	10	20	7.5	28	24.7	35	643 684 6
FA..37, KA..29, KA..37, KA..39, SA..47, SA..57, WA..47	30	M10	5	10	25	7.5	33	29.7	35	643 685 4
FA..47, KA..39, KA..47, KA..49, SA..57	35	M12	5	12	29	9.5	38	34.7	45	643 686 2
FA..57, FA..67, KA..49, KA..57, KA..67, SA..67	40	M16	5	12	34	11.5	41.9	39.7	50	643 687 0
SA..67	45	M16	5	12	38.5	13.5	48.5	44.7	50	643 688 9
FA..77, KA..77, SA..77	50	M16	5	12	43.5	13.5	53.5	49.7	50	643 689 7
FA..87, KA..87, SA..77, SA..87	60	M20	5	16	56	17.5	64	59.7	60	643 690 0
FA..97, KA..97, SA..87, SA..97	70	M20	5	16	65.5	19.5	74.5	69.7	60	643 691 9
FA..107, KA..107	80	M20	5	20	75.5	21.5	85	79.7	70	106 8211 2

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8.2.3 Lubricant fill quantities

The specified fill quantities are **guide values**. The precise values vary depending on the number of stages and gear ratio. Check the **oil level plug for the exact oil quantity** when you fill in the oil.

The following tables show guide values for lubricant fill quantities in relation to the mounting position M1 – M6.

Helical (R) gear units

R.., R..F

Gear unit	Fill quantity in liters					
	M1[1)]	M2	M3	M4	M5	M6
R07	0.12	0.20	0.20	0.20	0.20	0.20
R17	0.25	0.55	0.35	0.55	0.35	0.40
R27	0.25/0.40	0.70	0.50	0.70	0.50	0.50
R37	0.30/0.95	0.85	0.95	1.05	0.75	0.95
R47	0.70/1.50	1.60	1.50	1.65	1.50	1.50
R57	0.80/1.70	1.90	1.70	2.10	1.70	1.70
R67	1.10/2.30	2.40	2.80	2.90	1.80	2.00
R77	1.20/3.00	3.30	3.60	3.80	2.50	3.40
R87	2.30/6.0	6.4	7.2	7.2	6.3	6.5
R97	4.60/9.8	11.7	11.7	13.4	11.3	11.7
R107	6.0/13.7	16.3	16.9	19.2	13.2	15.9
R137	10.0/25.0	28.0	29.5	31.5	25.0	25.0
R147	15.4/40.0	46.5	48.0	52.0	39.5	41.0
R167	27.0/70.0	82.0	78.0	88.0	66.0	69.0

1) The larger gear unit of multi-stage gear units must be filled with the larger oil volume.

RF..

Gear unit	Fill quantity in liters					
	M1[1)]	M2	M3	M4	M5	M6
RF07	0.12	0.20	0.20	0.20	0.20	0.20
RF17	0.25	0.55	0.35	0.55	0.35	0.40
RF27	0.25/0.40	0.70	0.50	0.70	0.50	0.50
RF37	0.35/0.95	0.90	0.95	1.05	0.75	0.95
RF47	0.65/1.50	1.60	1.50	1.65	1.50	1.50
RF57	0.80/1.70	1.80	1.70	2.00	1.70	1.70
RF67	1.20/2.50	2.50	2.70	2.80	1.90	2.10
RF77	1.20/2.60	3.10	3.30	3.60	2.40	3.00
RF87	2.40/6.0	6.4	7.1	7.2	6.3	6.4
RF97	5.1/10.2	11.9	11.2	14.0	11.2	11.8
RF107	6.3/14.9	15.9	17.0	19.2	13.1	15.9
RF137	9.5/25.0	27.0	29.0	32.5	25.0	25.0
RF147	16.4/42.0	47.0	48.0	52.0	42.0	42.0
RF167	26.0/70.0	82.0	78.0	88.0	65.0	71.0

1) The larger gear unit of multi-stage gear units must be filled with the larger oil volume.

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Helical-bevel (K) gear units

K.., KA..B, KH..B, KV..B

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..37	0.50	1.00	1.00	1.25	0.95	0.95
K..47	0.80	1.30	1.50	2.00	1.60	1.60
K..57	1.10	2.20	2.20	2.80	2.30	2.10
K..67	1.10	2.40	2.60	3.45	2.60	2.60
K..77	2.20	4.10	4.40	5.8	4.20	4.40
K..87	3.70	8.0	8.7	10.9	8.0	8.0
K..97	7.0	14.0	15.7	20.0	15.7	15.5
K..107	10.0	21.0	25.5	33.5	24.0	24.0
K..127	21.0	41.5	44.0	54.0	40.0	41.0
K..157	31.0	62.0	65.0	90.0	58.0	62.0
K..167	33.0	95.0	105.0	123.0	85.0	84.0
K..187	53.0	152.0	167.0	200	143.0	143.0

KF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
KF37	0.50	1.10	1.10	1.50	1.00	1.00
KF47	0.80	1.30	1.70	2.20	1.60	1.60
KF57	1.20	2.20	2.40	3.15	2.50	2.30
KF67	1.10	2.40	2.80	3.70	2.70	2.70
KF77	2.10	4.10	4.40	5.9	4.50	4.50
KF87	3.70	8.2	9.0	11.9	8.4	8.4
KF97	7.0	14.7	17.3	21.5	15.7	16.5
KF107	10.0	21.8	25.8	35.1	25.2	25.2
KF127	21.0	41.5	46.0	55.0	41.0	41.0
KF157	31.0	66.0	69.0	92.0	62.0	62.0

KA.., KH.., KV.., KAF.., KHF.., KVF.., KAZ.., KHZ.., KVZ.., KT..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..37	0.50	1.00	1.00	1.40	1.00	1.00
K..47	0.80	1.30	1.60	2.15	1.60	1.60
K..57	1.20	2.20	2.40	3.15	2.70	2.40
K..67	1.10	2.40	2.70	3.70	2.60	2.60
K..77	2.10	4.10	4.60	5.9	4.40	4.40
K..87	3.70	8.2	8.8	11.1	8.0	8.0
K..97	7.0	14.7	15.7	20.0	15.7	15.7
K..107	10.0	20.5	24.0	32.4	24.0	24.0
K..127	21.0	41.5	43.0	52.0	40.0	40.0
K..157	31.0	66.0	67.0	87.0	62.0	62.0
K..167	33.0	95.0	105.0	123.0	85.0	84.0
K..187	53.0	152.0	167.0	200	143.0	143.0

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5 Startup



⚠ CAUTION

Damage to the gear unit due to improper startup.

Possible damage to property.

- Observe the following notes.

- Before startup, always check that the oil level is correct. Refer to the unit's nameplate for lubricant fill quantities.
- The oil level plugs and oil drain plugs, as well as the breather plugs and breather valves must be freely accessible.
- The most important technical data is provided on the nameplate. Additional data relevant for operation is available in drawings and the order confirmation.
- After having gear unit setup, ensure that all retaining screws are tight.
- Make sure that the alignment has not changed after tightening the mounting elements.
- Prior to startup, ensure that rotating shafts as well as couplings are equipped with suitable protective covers.
- If the gear unit has an oil sight glass to monitor the oil level, the oil sight glass must be protected against damage.
- It is essential that there is no open fire or risk of sparks when working on the gear unit.
- Protect the gear unit from falling objects.
- Remove transport protection prior to startup.
- Strictly observe the safety notes in the individual chapters.

5.1 Checking the oil level

Before startup, make sure that the oil level corresponds to the mounting position. Observe section "Checking the oil level and changing the oil" (→ 🗎 95).

If the gear unit is equipped with an oil sight glass, you can also determine the oil level at the oil sight glass.

NOTICE

Damage to the gear unit due to oil leaking from the damaged oil sight glass.

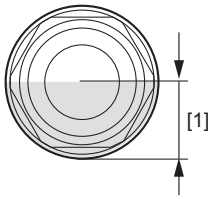
Possible damage to the unit.

- Attach a protective device to prevent the oil sight glass from being damaged by mechanical impacts.

1. Observe the notes in chapter "General information (→ 🗎 88)".
2. Check the oil level at the oil sight glass according to the following figure:

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[1] The oil level must be within this range.

3. Proceed as follows if the oil level is too low:
   - Open the respective oil fill plug, see chapter "Inspection/maintenance for the gear unit (→ 🗎 95)".
   - Fill in new oil of the same type through the oil fill plug up to the mark.
   - Screw in the oil fill plug.

Before startup, make sure that the oil level corresponds to the mounting position. Observe section "Checking the oil level and changing the oil" (→ 🗎 95).

5.2 Pseudo-leakage at shaft seals

Due to their operating principle, seals between moving surfaces at shaft passages cannot be completely tight, as a lubricant film must form during operation. The lubricant film between shaft and sealing lip keeps the development of heat and wear on the sealing system to a minimum and ensures the intended service life. The optimum sealing properties are only achieved after the run-in phase.

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5.3 Helical-worm gear units and SPIROPLAN® W gear units

5.3.1 Run-in period

SPIROPLAN® and helical-worm gear units require a run-in period of at least 48 h before reaching their maximum efficiency. A separate run-in period applies for each direction of rotation if the gear unit is operated in both directions of rotation. The table shows the average power reduction during the run-in period.

Helical-worm gear units

	Worm	
	i range	**η reduction**
1-start	Approx. 50 ... 280	About 12 %
2-start	Approx. 20 ... 75	About 6 %
3-start	Approx. 20 ... 90	About 3 %
4-start	-	-
5-start	Approx. 6 ... 25	About 3 %
6-start	Approx. 7 ... 25	About 2 %

SPIROPLAN® gear units

W10 / W20 / W30		W37 / W47	
i range	**η reduction**	**i range**	**η reduction**
Approx. 35 ... 75	About 15 %		
Approx. 20 ... 35	About 10 %		
Approx. 10 ... 20	About 8 %	Approx. 30...70	About 8 %
About 8	About 5 %	Approx. 10 ... 30	About 5%
About 6	About 3 %	Approx. 3...10	About 3%

5.4 Helical/parallel shaft helical/helical-bevel gear units

No special startup instructions are required for helical, parallel shaft helical and helical-bevel gear units providing the gear units have been installed in accordance with section "Mechanical Installation" (→ 🗎 22).

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5.5 Gear units with backstop

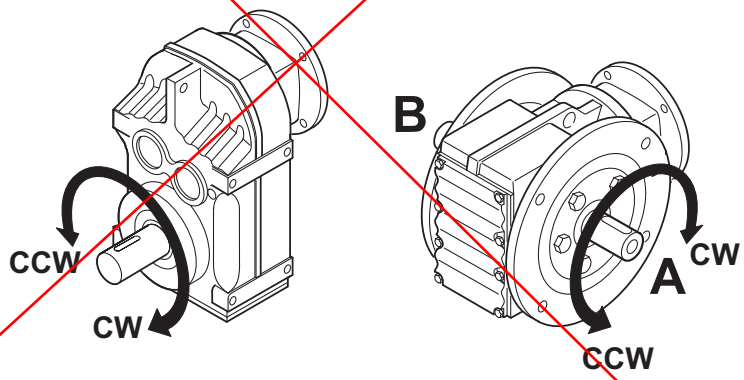
NOTICE

Operating the motor in the blocking direction could destroy the backstop.

Possible damage to property

- Do not start up the motor in the blocking direction. Before motor startup, make sure the current supply of the motor for the direction of rotation is connected accordingly.
- For control purposes, operation in blocking direction with half the output torque is permitted once.

The purpose of a backstop is to prevent unwanted directions of rotation. During operation, the backstop permits rotation only in the specified direction.



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The direction of rotation is specified as viewed onto the output shaft (LSS):

- CW rotation
- CCW rotation

The permitted direction of rotation is indicated on the housing.

5.6 Components made of elastomers with fluorocarbon rubber



⚠ CAUTION

Health risk due to dangerous gases, vapors, and residue created by heating fluorocarbon rubber to > 200 °C.

Damage to health.

- Make sure that components made of fluorocarbon rubber are not exposed to temperatures > 200 °C. Remove the components, if necessary.
- Avoid inhaling fluorocarbon rubber gases and vapors as well as skin and eye contact.
- Avoid contact with the cooled-down fluorocarbon rubber, as dangerous residue has formed it was heated.

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Under normal operating conditions and at temperatures up to 200 °C, fluorocarbon rubber is very stable and safe. However, when heated to more than 300 °C, e.g. by fire or the flame of a cutting torch, fluorocarbon rubber forms harmful gases and vapors as well as residue.

The following components of R..7, F..7, K..7, K..9, S..7, and SPIROPLAN® W gear units can contain elastomers made of fluorocarbon rubber:

- Oil seals
- Breather valve
- Screw plugs

The user is responsible for safe handling during the service life including eco-friendly disposal.

SEW-EURODRIVE is not responsible for damage caused by improper handling.

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6 Inspection/maintenance

6.1 General information

Observe the following notes regarding inspection/maintenance work at the gear unit:



⚠ WARNING

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Disconnect the gearmotor from the power supply before you start working on the unit.
- Prevent the gearmotor from starting up unintentionally (for example, by locking the key switch or removing the fuses from the current supply).



⚠ WARNING

Risk of injury if preloaded shaft connections are loosened.

Severe or fatal injuries.

- Before releasing any shaft connections, make sure there is no active torsional torque present that could lead to tension within the system.



⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries

- Let the gear unit cool down before you start working on it.
- Carefully remove the oil level plug and the oil drain plug.

NOTICE

Loss of lubricant qualities due to filling of wrong gear unit oil.

Damage to the gear unit

- Do not mix different synthetic lubricants and do not mix synthetic and mineral lubricants.
- As standard lubricant use mineral oil.

NOTICE

Ingression of water at the sealing lip of the oil seal due to cleaning the gear unit with a high-pressure cleaning device.

Damage to oil seals

- Do not clean the variable-speed gear unit with a high-pressure cleaning device.

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NOTICE

Damage to gear unit due to ingress of foreign objects during maintenance and inspection work.

Destruction of the gear unit.

- Prevent foreign particles from entering into the gear unit during maintenance and inspection work.

NOTICE

Damage to gear unit due to improper inspection and maintenance work.

Damage to the gear unit

- It is important that you observe the notes in this chapter.

INFORMATION

- Maintain the inspection and maintenance intervals. This is necessary to ensure operational safety.
- The position of the oil level plug, oil drain plug and the breather valve depends on the mounting position. Refer to the mounting position sheets in chapter "Mounting positions".
- Perform safety and functional check following all maintenance and repair work.

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6.2 Wearing parts

Gearing

If the SEW-EURODRIVE design criteria and the intervals for inspection and maintenance are observed, the gearing components are wear-free after the run-in period. The worm gearing is an excepted from this for constructional reasons. The amount of material abrasion on the worm gear tooth flanks varies depending on the operating conditions. The main influencing factors are:

- Speed
- Load
- Operating temperature
- Lubricant (type, viscosity, additives, pollution)
- Operating frequency

For information on the worm gearing service life under certain operating conditions, contact SEW-EURODRIVE.

Rolling bearing

Rolling bearing, adapter and input shaft assembly have a limited service life, even under ideal operating conditions. This nominal bearing service life is a solely statistical value. The actual service life of an individual bearing may deviate greatly from this value. The main influencing factors are:

- Speed
- Equivalent bearing load
- Operating temperature
- Lubricant (type, viscosity, additives, pollution)
- Lubricant supply of the bearing
- Misalignment under operating load

Therefore the rolling bearings must be inspected regularly. Note the respective inspection and maintenance intervals in chapters Inspection/maintenance intervals (→ 🗎 92), Lubricant change intervals (→ 🗎 93), Maintenance of AL/AM/AQ./EWH adapter (→ 🗎 93) and AD input shaft assembly maintenance (→ 🗎 94).

For information on the nominal bearing service life under certain operating conditions, contact SEW-EURODRIVE.

Lubricants

Lubricants are subject to aging. Their service life is limited depending on the load conditions.

The service life significantly depends on the oil operating temperature. The dependency of lubricant change intervals and operating temperature is depicted in the figure in chapter Lubricant change intervals (→ 🗎 93).

Oil seals

Oil seals are contact seals that are used to seal unit housings at emerging elements, such as shafts, from the environment. Oils seals are wear parts with a service life that is influenced by various factors, such as:

- Shaft speed and circumferential velocity at the sealing lip
- Ambient conditions (temperature, dust, humidity, pressure, chemicals, radiation)
- Lubricant (type, viscosity, additives, pollution)
- Surface quality of the sealing
- Lubricant supply of the sealing
- Oil seal material

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Due to the various influencing factors it is not possible to predict the service life. Therefore the oil seals must be inspected regularly. Note the respective inspection and maintenance intervals in chapters Inspection/maintenance intervals (→ 🗎 92), Lubricant change intervals (→ 🗎 93), Maintenance of AL/AM/AQ./EWH adapter (→ 🗎 93) and AD input shaft assembly maintenance (→ 🗎 94).

Cam ring/ Coupling ring

The couplings used in the AM, AL, AQ. and EWH adapters are designed to be positive, puncture-proof and low-maintenance claw couplings. They have a an impact and vibration-absorbing cam ring (AM, EWH) or coupling ring (AQ., AL). The service life of cam ring/coupling ring is influenced by various factors, such as:

- Ambient conditions (temperature, chemicals, radiation)
- Operational conditions (starting frequency, impact characteristics)

Note the respective inspection and maintenance intervals in chapters Maintenance of AL/AM/AQ./EWH adapter (→ 🗎 93).

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6.3 Inspection/maintenance intervals

The following gear units are lubricated for life:

- Helical gear units R07, R17, R27
- Parallel-shaft helical gear unit F27
- SPIROPLAN® gear units

If necessary touch up or renew the surface protection/ corrosion protection coating.

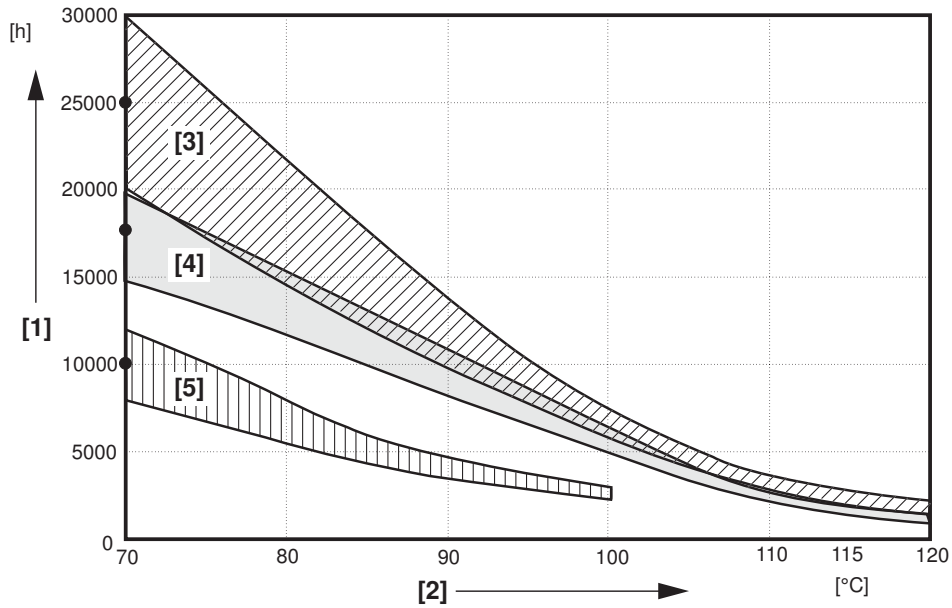
The following table lists the obligatory intervals and the corresponding measures:

Time interval	What to do?
• Every 3000 hours of operation, at least every 6 months	• Check oil and oil level • Check running noise for possible bearing damage • Visual inspection of the seals for leakage • For gear units with a torque arm: Check and replace the rubber buffers, if necessary
• Depending on the operating conditions (see illustration below), every 3 years at the latest • according to oil temperature	• Change mineral oil
	• Replace rolling bearing grease (recommendation) • Replace oil seal (do not install it in the same track)
• Depending on the operating conditions (see illustration below), every 5 years at the latest • according to oil temperature	• Change synthetic oil
	• Replace rolling bearing grease (recommendation) • Replace oil seal (do not install it in the same track)
• Varying (depending on external factors)	• Touch up or renew the surfaces/anti-corrosion coating

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6.4 Lubricant change intervals

The following image depicts the change intervals for standard gear units under normal ambient conditions. In case of special designs under severe/aggressive ambient conditions change the lubricant more frequently.



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[1] Operating hours
[2] Sustained oil bath temperature
• Average value per oil type at 70 °C
[3] CLP PG
[4] CLP HC , HCE (food grade lubricants for the food industry)
[5] CLP / HLP / E (lubricants made of biodegradable oils for agriculture, forestry, and water management)

6.5 Maintenance of AL/AM/AQ./EWH adapter

The following table lists the obligatory intervals and the corresponding measures:

Time interval	What to do?
• Every 3000 hours of operation, at least every 6 months	• Check the running noises to detect possible bearing damage. • Visually check the adapter for leakage.
• After 10000 operating hours	• Check the rotational clearance. • Visual check the cam ring (AM, EWH) or coupling ring (AQ., AL). • Change the bearing grease. • Change the oil seal. Do not mount it in the same track.

6.6 AD input shaft assembly maintenance

The following table lists the obligatory intervals and the corresponding measures:

Time interval	What to do?
• Every 3000 hours of operation, at least every 6 months	• Check the running noises to detect possible bearing damage. • Visually check the adapter for leakage.
• After 10000 operating hours	• Change the bearing grease. • Change the oil seal. Do not mount it in the same track.

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6.7 Inspection/maintenance for the gear unit

6.7.1 Checking the oil level and changing the oil

The procedure when checking the oil level and changing the oil depends on gear unit type, size and mounting position. Determine the key letter (A, B, C, D or E) in the following table in regard of gear unit type and size. The key letter indicates the procedure for the respective gear unit, that can be found in the second table.

Gear unit type	Size	Code letter for chapter "Checking the oil level and changing the oil"					
		M1	M2	M3	M4	M5	M6
R	R..07 – 27	B					
	R..37 / R..67	A					
	R..47 / R..57	A				B	A
	R..77 – 167	A					
	RX..57– 107	A					
F	F..27	B					
	F..37 – 157	A					
K	K..19 / K..29	C					
	K..39 / K49	A					
	K..37 – 187	A					
S	S..37	C					
	S..47 – 97	A					
W	W..10 – 30	B					
	W..37 – 47	D			E	D	

Code letter	Chapter "Checking the oil level and changing the oil"	Reference
A:	• Helical gear units... • Parallel-shaft helical gear units... • Helical-bevel gear unit ...K..39 / K..49, K..37 – 187 • Helical-worm gear units... S..47 – 97 **With oil level plug**	(→ 🗎 96)
B:	• Helical gear units... • Parallel-shaft helical gear units... • SPIROPLAN® gear units... **Without oil level plug, with cover plate**	(→ 🗎 98)
C:	• Helical-worm gear units S..37 • Helical-bevel gear units K..19 / K..29 **Without oil level plug, without cover plate**	(→ 🗎 102)
D:	• SPIROPLAN® W..37 / W..47 **In mounting positions M1, M2, M3, M5, M6 with oil level plug**	(→ 🗎 105)

Code letter	Chapter "Checking the oil level and changing the oil"	Reference
E:	• SPIROPLAN® W..37 / W..47... **In mounting position M4 without oil level plug and cover plate**	(→ 🗎 107)

For notes on the mounting positions, refer to chapter "Mounting Positions (→ 🗎 110)".

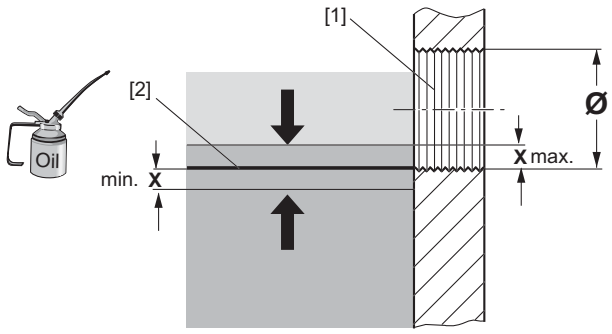
You cannot check the oil level of gear units in pivoted mounting position. The gear units are delivered with the correct oil level. Observe the designations and fill quantities on the nameplate if you have to change the oil.

6.7.2 A: Helical, parallel-shaft helical, helical-bevel and helical-worm gear units with oil level plug

Checking the oil level at the oil level plug

Proceed as follows to check the oil level of the gear unit:

1. Observe the notes in chapter "Information on gear unit inspection/maintenance" (→ 🗎 88).
2. Determine the position of the oil level plug and the breather valve using the mounting position sheets. See chapter "Mounting positions" (→ 🗎 110).
3. Place a container underneath the oil level plug.
4. Slowly remove the oil level plug. Small amounts of oil may leak out as the permitted maximum oil level is higher than the lower edge of the oil level bore.
5. Check the oil level according to the following figure and the corresponding table.



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[1] Oil level bore
[2] Ideal oil level
X min/max oil level

Ø oil level bore	Approved oil level fluctuation x mm
M10 x 1	1.5
M12 x 1.5	2
M22 x 1.5	3
M33 x 2	4
M42 x 2	5

6. Proceed as follows if the oil level is too low:
   - Fill in fresh oil of the same type (contact SEW-EURODRIVE if necessary) via the breather bore, up to the lower edge of the oil level bore.
   - Re-insert the breather valve.

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7. Screw in the oil level plug again.

Checking the oil via the oil drain plug

Proceed as follows to check the gear unit oil:

1. Observe the notes in section "Information on gear unit inspection/maintenance" (→ 🗎 88).
2. Determine the position of the oil drain plug using the mounting position sheets. See chapter "Mounting positions" (→ 🗎 110).
3. Remove a little oil from the oil drain plug.
4. Check the oil consistency:
   - Viscosity
   - If you can see that the oil is heavily contaminated, SEW-EURODRIVE recommends to change the oil even if this is outside the service intervals specified in "Inspection and maintenance intervals" (→ 🗎 92).
5. Check the oil level. See section "Checking the oil level via the oil level plug" (→ 🗎 96).

Changing the oil via the oil drain plug and the breather valve



⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries.

- Let the gear unit cool down before you start working on it. Due to the better flowability, the gear unit oil should still be warm so that the gear unit can be drained best.

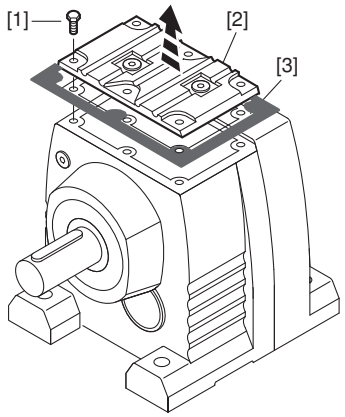
1. Observe the notes in chapter "Information on gear unit inspection/maintenance" (→ 🗎 88).
2. Determine the position of the oil drain plug, the oil level plug and the breather valve using the mounting position sheets. See chapter "Mounting positions" (→ 🗎 110).
3. Place a container underneath the oil drain plug.
4. Remove the oil level plug, the breather valve and the oil drain plug.
5. Drain the oil completely.
6. Re-insert the oil drain plug.
7. Fill in fresh oil of the same type (contact SEW-EURODRIVE if necessary) via the breather bore. Do not mix different synthetic lubricant.
   - Observe the oil quantity according to the specifications on the nameplate or according to the mounting position. See chapter "Lubricant fill quantities".
   - Check the oil level at the oil level plug.
8. Re-insert the oil level plug and the breather valve.

6.7.3 B: Helical, parallel shaft helical, SPIROPLAN® gear units without oil level plug with cover plate

Checking the oil level via the cover plate

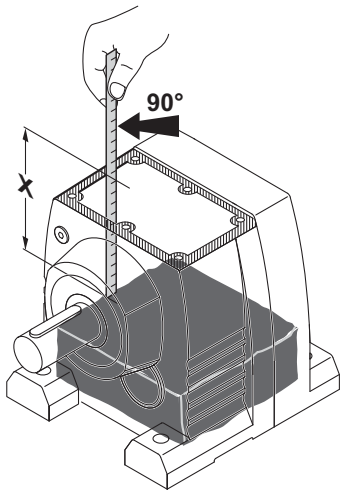
For gear units without oil level bore, the oil level is checked via the cover plate opening. Proceed as follows:

1. Observe the notes in section "Information on gear unit inspection/maintenance" (→ 🗎 88).
2. To position the cover plate on the top, place the gear unit in the following mounting position:
   - R07 - R57 in M1 mounting position
   - F27 in M3 mounting position
   - W10 - W30 in M1 mounting position
3. Loosen the screws [1] of the cover plate [2] and remove the cover plate [2] and the corresponding gasket [3] (see following figure).



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4. Determine the vertical distance "x" between oil level and sealing surface of the gear unit housing (see following figure).



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5. Compare the determined value "x" to the max. distance between oil level and sealing surface of the gear unit housing specified in the following table. Adjust the fill level if required.

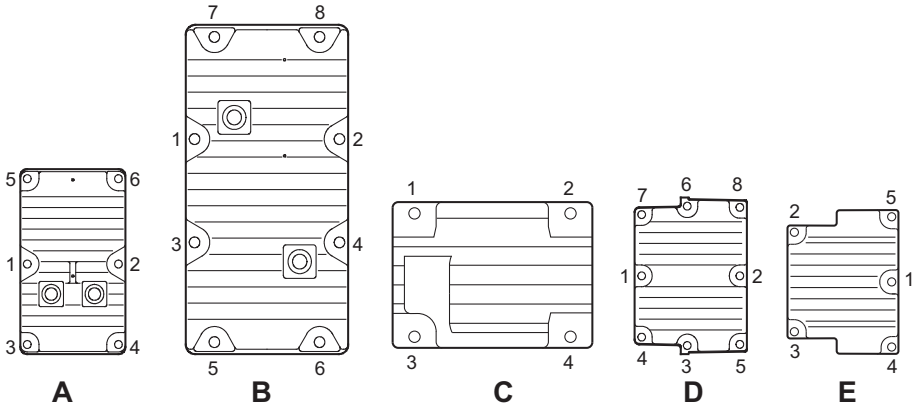
Gear unit type		Max. distance x in mm between oil level and sealing surface of the gear unit housing for mounting position					
		M1	M2	M3	M4	M5	M6
R07	2-stage	52 ± 1	27 ± 1	27 ± 1	27 ± 1	27 ± 1	27 ± 1
	3-stage	49 ± 1	21 ± 1	21 ± 1	21 ± 1	21 ± 1	21 ± 1
R17	2-stage	63 ± 1	18 ± 1	46 ± 1	18 ± 1	46 ± 1	46 ± 1
	3-stage	58 ± 1	11 ± 2	40 ± 2	11 ± 2	40 ± 2	40 ± 2
R27	2-stage	74 ± 1	22 ± 1	45 ± 1	22 ± 1	45 ± 1	45 ± 1
	3-stage	76 ± 1	19 ± 1	42 ± 1	19 ± 1	42 ± 1	42 ± 1
R47	2-stage	–	–	–	–	39 ± 1	–
	3-stage	–	–	–	–	32 ± 1	–
R57	2-stage	–	–	–	–	32 ± 1	–
	3-stage	–	–	–	–	28 ± 1	–
F27	2-stage	78 ± 1	31 ± 1	72 ± 1	56 ± 1	78 ± 1	78 ± 1
	3-stage	71 ± 1	24 ± 1	70 ± 1	45 ± 1	71 ± 1	71 ± 1
		Irrespective of mounting position					
W10		12 ± 1					
W20		19 ± 1					
W30		31 ± 1					

6. Close the gear unit after the oil level check:
   - Re-attach the gasket of the cover plate. Make sure that the sealing surfaces are clean and dry.

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- Screw on the cover plate. Tighten the cover plate screw connections working from the inside to the outside. Tighten the cover plate screw connections in the sequence depicted in the following figure. Tighten the cover plate screw connections with the specified tightening torque according to the following table. Repeat the tightening procedure until the screws are properly tightened. To avoid damaging the cover plate, use only impulse wrenches or torque wrenches. Do not use impact screwdrivers.



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Gear unit type	Figure	Retaining thread	Tightening torque T_N Nm	Minimum tightening torque T_{min} Nm
R/RF07	E	M5	6	4
R/RF17/27	D	M6	11	7
R/RF47/57	A			
F27	B			
W10	C	M5	6	4
W20	C	M6	11	7
W30	A			

Checking the oil via cover plate

Proceed as follows to check the gear unit oil:

1. Observe the notes in chapter "Information on gear unit inspection/maintenance" (→ 🗎 88).
2. Open the cover plate of the gear unit according to section "Checking the oil level via the cover plate" (→ 🗎 98).
3. Take an oil sample via the cover plate opening.
4. Check the oil consistency.
   - Viscosity
   - If you can see that the oil is heavily contaminated, SEW-EURODRIVE recommends to change the oil even if this is outside the service intervals specified in "Inspection and maintenance intervals" (→ 🗎 95).
5. Check the oil level. See section "Checking the oil level via the cover plate" (→ 🗎 98).

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6. Screw on the cover plate. Observe the order and the tightening torques according to section "Checking the oil level via the cover plate".

Changing the oil via the cover plate



⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries.

- Let the gear unit cool down before you start working on it. Due to the better flowability, the gear unit oil should still be warm so that the gear unit can be drained best.

1. Observe the notes in chapter "Information on gear unit inspection/maintenance" (→ 🗎 88).
2. Open the cover plate of the gear unit according to chapter "Checking the oil level via the cover plate".
3. Completely drain the oil into a container via the cover plate opening.
4. Fill in fresh oil of the same type (contact SEW-EURODRIVE if necessary) via the cover plate. Do not mix different synthetic lubricants.
   - Pour in the oil as specified on the nameplate or in accordance with the mounting position. See chapter "Lubricant fill quantities".
5. Check the oil level.
6. Screw on the cover plate. Observe the order and the tightening torques according to chapter "Checking the oil level via the cover plate" (→ 🗎 98).

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6.7.7 Replacing the oil seal

NOTICE

Damage to oil seal when mounted below 0 °C.

Damage to oil seal.

- Store oil seals at ambient temperatures over 0 °C.
- If necessary, heat the oil seal before mounting it.

Proceed as follows:

1. Ensure that there is a sufficient grease reservoir between the dust lip and sealing lip, depending on the gear unit design.
2. If you use double oil seals, the space has to be filled with grease for one third.

6.7.8 Painting the gear unit

NOTICE

Ingress of paint at breather valve and sealing lips of the oil seal during painting or re-painting of the gear unit.

Damage to oil seal and breather valve.

- Thoroughly cover the breather valve and sealing lip of the oil seals with strips prior to painting.
- Remove the strips after painting.

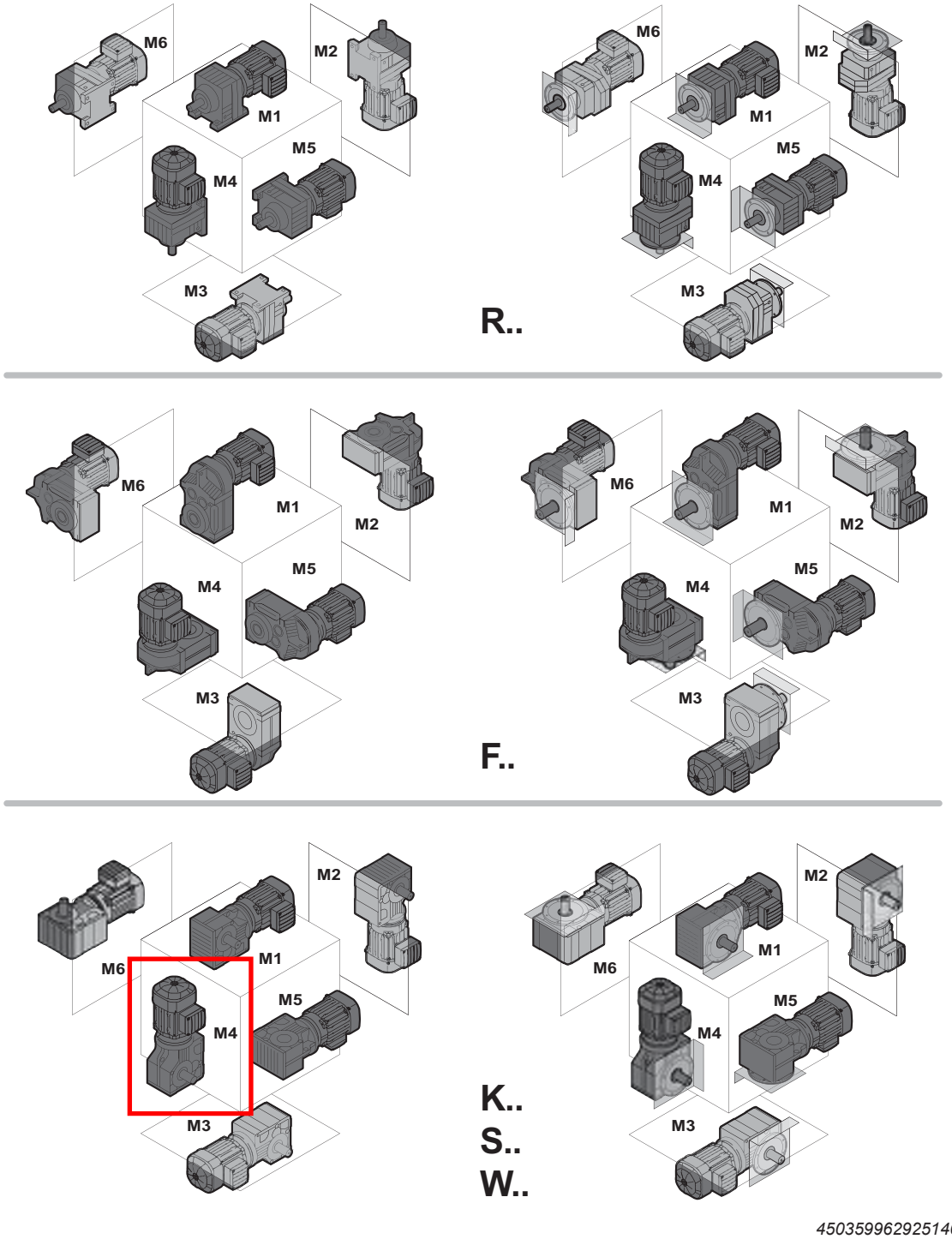
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7 Mounting positions

7.1 Designation of the mounting positions

SEW-EURODRIVE distinguishes between the gear unit mounting positions M1 – M6. The following figure shows the gearmotor in the 6 mounting positions:



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7.2 Churning losses

*(→ 🗎 XY)

Churning losses may occur in some mounting positions. Contact SEW-EURODRIVE in case of the following combinations:

Mounting position	Gear unit type	Gear unit size	Input speed rpm
M2, M4	R	97 ... 107	> 2500
		> 107	>1500
M2, M3, M4, M5, M6	F	97 ... 107	> 2500
		> 107	> 1500
	K	77 ... 107	> 2500
		> 107	> 1500
	S	77 ... 97	> 2500

7.3 Mounting position MX

Mounting position MX is available for all gear units of the R..7, F..7, K..7, K..9, S..7 and SPIROPLAN® W series.

For mounting position MX, the gear units are delivered with the maximally possible amount of oil and sealed with oil screw plugs. A breather valve is included with each drive. The oil fill volume must be adapted according to the mounting position of the gear unit. Customers will also have to mount the enclosed breather valve at the proper location depending on the mounting position (see section "Mounting position sheets (→ 🗎 112)").

Check for the correct oil level, as described in chapter "Oil level check and oil change" (→ 🗎 95).

7.4 Universal mounting position M0

SPIROPLAN® W10 – W30 gearmotors can be ordered with M0 universal mounting position as an option. Gear units with mounting position M0 are filled with the standard oil quantity.

These gear units are entirely enclosed due to their small size and have no breather valve. Customers can use the gear unit universally in every mounting position (M1 – M6) without having to take any measures prior to startup.

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7.5 Mounting positions of SPIROPLAN® gear units

NOTICE

SPIROPLAN® gearmotors of sizes W10 – W30 cannot be equipped with breather valves, oil level plugs or oil drain plugs.

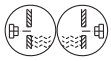
INFORMATION

SPIROPLAN® gearmotors are independent on the mounting position, except for W37 – W47 in M4 mounting position. However, mounting positions M1 to M6 are also shown for SPIROPLAN® gearmotors for a complete overview.

7.6 Mounting position sheets

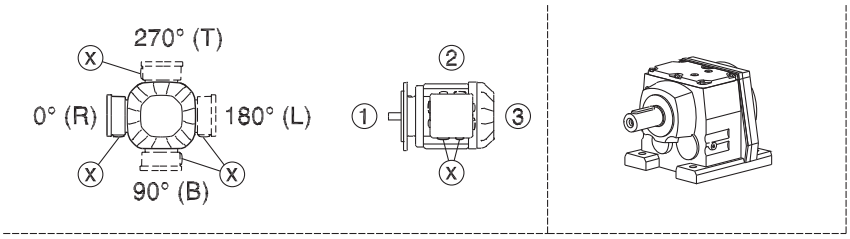
7.6.1 Key

The following table shows the symbols used in the mounting position sheets and what they mean:

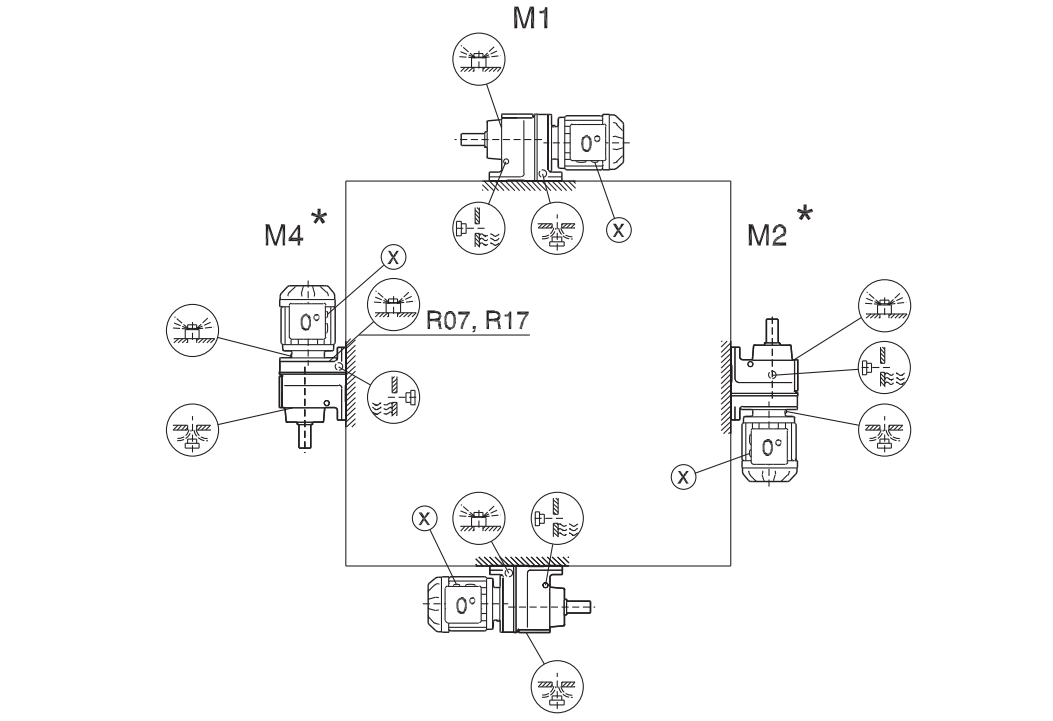
Icon	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

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R07-R167



04 040 04 00



R07	⊗	M1, M2, M3, M5, M6
R17, R27	⊗	M1, M3, M5, M6
R07, R17, R27	⊗ ⊗	
R47, R57	⊗	M5

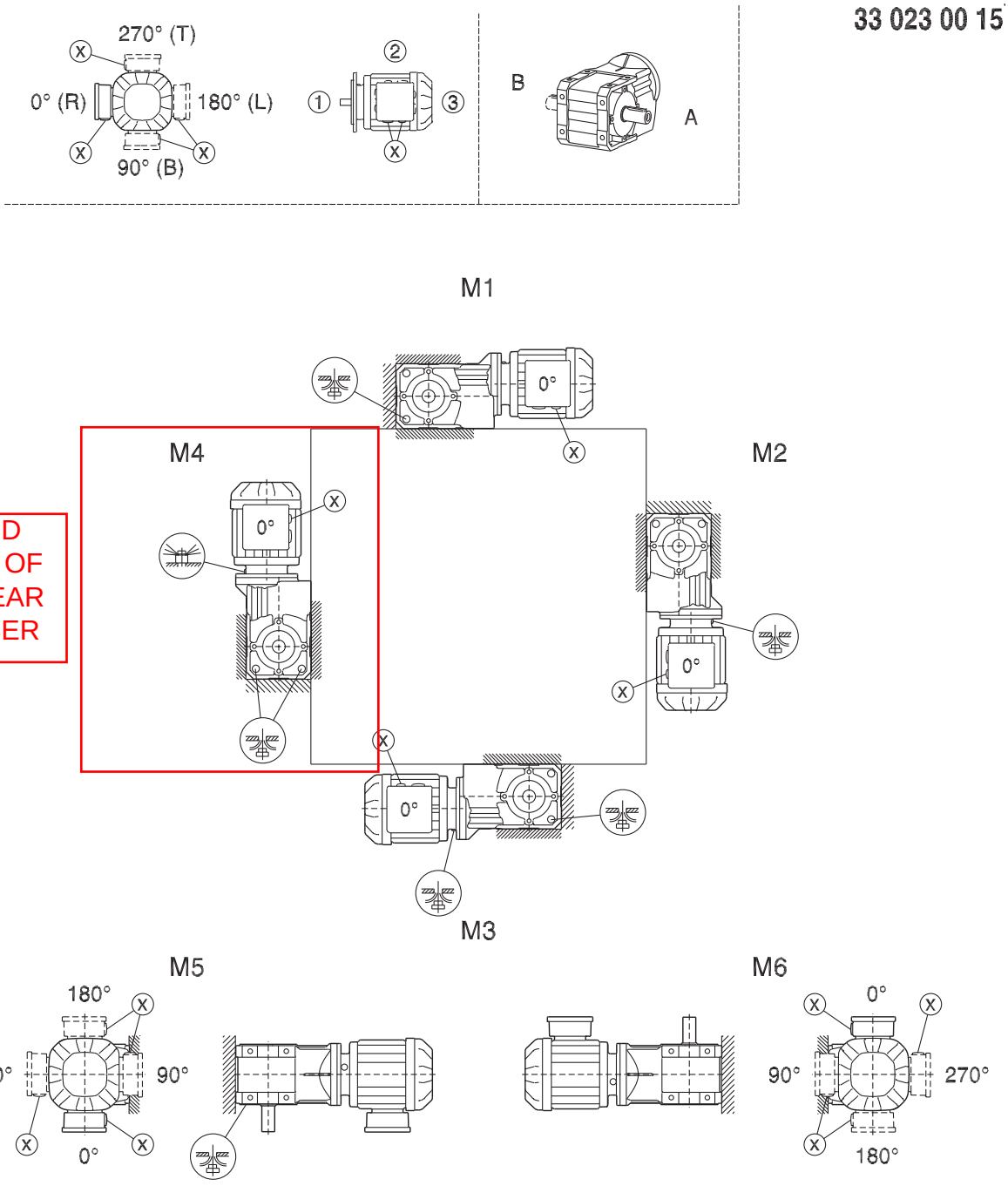
* (→ 🗎 111)

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7.6.4 Mounting positions of helical-bevel gearmotors

K/KA..B/KH19B-29B



8 Technical data

8.1 Extended storage

INFORMATION

For storage periods longer than 9 months, SEW-EURODRIVE recommends the "extended storage" gear unit type. Gear units in this design are designated with a corresponding label.

For gear units of the "extended storage" design, the following measures are taken:

- A VCI anti-corrosion agent (**v**olatile **c**orrosion **i**nhibitors) is added to the lubricant.

  Please note that this VCI anti-corrosion agent is only effective in a temperature range of -25 °C to +50 °C.
- The flange contact surfaces and shaft ends are also treated with an anti-corrosion agent.

Observe the storage conditions specified in the following table for extended storage.

8.1.1 Storage conditions

Observe the storage conditions specified in the following table for extended storage:

Climate zone	Packaging[1)]	Storage[2)]	Storage duration
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones)	• Packed in containers • With desiccant and moisture indicator sealed in the plastic wrap	• Roofed • Protected against rain and snow • Shock-free	Up to 3 years with regular checks of the packaging and moisture indicator (rel. humidity < 50%)
	Open	• Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, < 50% relative humidity) • No sudden temperature variations • Controlled ventilation with filter (free from dust and dirt) • No aggressive vapors • No shocks	2 years or more with regular inspections • Check for cleanness and mechanical damage during the inspection • Check corrosion protection

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Climate zone	Packaging[1)]	Storage[2)]	Storage duration
Tropical (Asia, Africa, Central and South America, Australia, New Zealand excluding temperate zones)	• Packed in containers • With desiccant and moisture indicator sealed in the plastic wrap • Protected against insect damage and mildew by chemical treatment	• Roofed • Protected against rain and snow • Shock-free	Up to 3 years with regular checks of the packaging and moisture indicator (rel. humidity < 50%)
	Open	• Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, < 50% relative humidity) • No sudden temperature variations • Controlled ventilation with filter (free from dust and dirt) • No aggressive vapors • No shocks • Protected against insect damage	2 years or more with regular inspections • Check for cleanness and mechanical damage during the inspection • Check corrosion protection

1) The packaging must be carried out by an experienced company using the packaging materials that have been explicitly specified for the particular application.

2) SEW-EURODRIVE recommends to store the gear units according to the mounting position.

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8.2 Lubricants

Unless a special arrangement is made, SEW-EURODRIVE supplies the drives with a lubricant fill adapted for the specific gear unit and mounting position. The mounting position (M1 – M6, see chapter "Mounting positions (→ 🗎 110)") must be specified in the order. You must adapt the lubricant fill in case of any subsequent changes made to the mounting position, see chapter "Lubricant fill quantities (→ 🗎 151)".

8.2.1 Bearing greases

The gear unit rolling bearings are given a factory-fill with the greases listed below. SEW-EURODRIVE recommends re-greasing the rolling bearings with a grease filling at the same time as changing the oil.

	Ambient temperature	Manufacturer	Type
Gear unit rolling bearings	-40 °C to +80 °C	Fuchs	Renolit CX-TOM 15[1)]
	-40 °C to +80 °C	Klüber	Petamo GHY 133 N
	-40 °C to +40 °C	Castrol	Castrol Optileb GR FS 2
	-20 °C to +40 °C	Fuchs	Plantogel 2S

1) Bearing grease based on semi-synthetic base oil.

INFORMATION

The following grease quantities are required:

- **For fast-running bearings (gear unit input side):** Fill the cavities between the rolling elements one-third full with grease.
- **For slow-running bearings (gear unit output end):** Fill the cavities between the rolling elements two-thirds full with grease.

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8.2.2 Lubricant table

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

Key to lubricant table

CLP PG	= Polyglycol (W gear units, conforms to USDA-H1)
CLP HC	= Synthetic hydrocarbons
E	= Ester oil (water hazard class 1 (German regulation – "WKG")
HCE	= Synthetic hydrocarbons + ester oil (USDA - H1 certification)
HLP	= Hydraulic oil
	= Synthetic lubricant (= synthetic roller bearing grease)
1)	Helical-worm gear units with PG oil: please consult SEW-EURODRIVE
2)	Special lubricant for SPIROPLAN® gear units only
3)	Use SEW $f_B \geq 1.2$
4)	Pay attention to critical starting behavior at low temperatures.
5)	Low-viscosity grease
6	Ambient temperature
7)	Bold
	Lubricant for the food industry (food grade oil)
	Biodegradable oil (lubricant for agriculture, forestry, and fisheries)

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Type	DIN (ISO) API	ISO SAE NLGI	R RES	F	K..7 KES/HK	S HS	Ambient Temperature °C				Note	Mobil®	Shell	Kluber Lubrication	Fuchs	Castrol Optimol	Total
Mineral	CLP	VG 680				std	0			+40		Mobilgear 600 XP 680	Shell Omala S2 G 680	Kluberoil GEM 1-680 N	Renolin SEW 680	Optigear BM 680	Carter EP 680
		VG 220	standard				-15			+40		Mobilgear 600 XP 220	Shell Omala S2 G 220	Kluberoil GEM 1-220 N	Renolin CLP 220	Optigear BM 220	Carter EP 220
		VG 150	X				-20			+30	4)	Mobilgear 600 XP 150	Shell Omala S2 G 150	Kluberoil GEM 1-150 N	Renolin CLP 150	Optigear BM 150	Carter EP 150
						X	-20			+25							
Synthetic	CLP HC	VG 460				XX	-15			+60		PSS Mobil SHC 634	Shell Omala S4 GX 460	Klubersynth GEM 4-460 N	Renolin Unisyn CLP 460	Optigear Synthetic PD 460	Carter SH 460
		VG 220	XX				-25			+60		PSS Mobil SHC 630	Shell Omala S4 GX 220	Klubersynth GEM 4-220 N	Renolin Unisyn CLP 220	Optigear Synthetic PD 220	Carter SH 220
		VG 150	X				-30			+50	4)	PSS Mobil SHC 629	Shell Omala S4 GX 150	Klubersynth GEM 4-150 N	Renolin Unisyn CLP 150	Optigear Synthetic PD 150	Carter SH 150
						X	-30			+50	4)						
		VG 68	X				-35			+20	4)	Mobil SHC 626	Shell Omala S4 GX 68	-	Renolin Unisyn CLP 68	-	-
						X	-35			+20	4)						
		VG 32	X				-40			+0	4)	Mobil SHC 624	-	-	Renolin Unisyn OL32	-	Dacnis SH 32
						X	-40			+0	4)						
	CLP PG	VG 680				X	-15			+80	1)	Mobil Glygoyle 680	Shell Omala S4 WE 680	PSS Klubersynth GH 6-680	Renolin PG 680	Optigear Synthetic 800/680	-
		VG 220	X				-25			+80		Mobil Glygoyle 220	Shell Omala S4 WE 220	PSS Klubersynth GH 6-220	Renolin PG 220	Optigear Synthetic 800/220	Carter SY 220
						X	-25			+40	1)						
	CLP HC NSF-H1	VG 460	XX			XX	-15			+40		-	-	Kluberoil 4UH1-460 N	Cassida Fluid GL 460	PSS Optileb GT 460	-
		VG 220	X			X	-25			+30		-	-	Kluberoil 4UH1-220 N	Cassida Fluid GL 220	PSS Optileb GT 220	-
		VG 68	X				-35			+20	4)	-	-	Kluberoil 4UH1-68 N	Cassida Fluid HF 68	Optileb HY 68	-
						X	-35			+10	4)						
		VG 32	X				-40			+10	4)	-	-	KluberSummit HySyn FG 32	Cassida Fluid HF 32	Optileb HY 32	-
						X	-40			+0	4)						
Bio	E	VG 460	X			X	-20			+40		-	-	Kluberbio CA2-460	Plantogear 460 S	-	-

Technical Data Sheet

Previous Name: **Shell Omala HD**

Shell Omala *S4 GX 150*

- *Extra Life and Protection*
- *Special Applications*

Advanced Synthetic Industrial Gear Oil

Shell Omala S4 GX is an advanced synthetic heavy duty industrial gear oil offering outstanding lubrication performance under severe operating conditions, including reduced friction, long service life and high resistance to micro-pitting for optimal gear protection.

DESIGNED TO MEET CHALLENGES

Performance, Features & Benefits

- **Long oil life - maintenance saving**

  Shell Omala S4 GX is formulated using an advanced additive system in combination with specially selected synthetic base fluids to provide outstanding resistance to breakdown over long duration and/or high temperature operation.

  Shell Omala S4 GX can operate successfully at bulk temperatures up to 120°C.

  Shell Omala S4 GX offers the potential to significantly extend service intervals compared to conventional industrial gear oils.

- **Excellent wear and corrosion protection**

  Shell Omala S4 GX is formulated to have excellent load carrying capacity and micro-pitting performance providing long component life even under shock loading conditions. These features provide benefits over mineral oil-based products in terms of gear and bearing component life.

  Shell Omala S4 GX also has excellent corrosion protection, even in the presence of contamination by water and solids.

- **Maintaining system efficiency**

  Shell Omala S4 GX can help maintain or enhance the efficiency of industrial gear systems through improved low temperature performance and lower friction in comparison to mineral oil-based products. This provides better lubrication at low start-up temperatures.

Main Applications



- **Wind turbines and other inaccessible installations**

  Shell Omala S4 GX is particularly recommended for certain systems where extra long life is required, maintenance is infrequent or systems are inaccessible.

- **Enclosed industrial gear systems**

  Recommended for industrial reduction gear systems operating under severe operating conditions, such as high load, very low or elevated temperatures and wide temperature variations.

- **Other applications**

  Shell Omala S4 GX oils are suitable for lubrication of bearings and other components in circulating and splash-lubricated systems.

  For geared systems, or other applications that employ a filtration unit finer than 5 microns, please consult your Shell Local Technical Advisor and Product Application Specialist before using Shell Omala S4 GX.

  For highly loaded worm drives the Shell Omala "W" series oils are recommended. For automotive hypoid gears, the appropriate Shell Spirax Oil should be used.

Specifications, Approvals & Recommendations

- David Brown S1.53.106, except ISO 1000
- Approved for wind turbine gearboxes by: Gamsea, Dongfang Wind Turbines, Dalian Heavy Industries and Sinovel
- ISO 12925-1 Type CKD, except ISO 1000
- ANSI/AGMA 9005-E02 (EP), except ISO 1000
- US Steel 224, except ISO 1000
- DIN 51517-3 (CLP), except ISO 1000

For a full listing of equipment approvals and recommendations, please consult your local Shell Technical Helpdesk.

Typical physical characteristics

Properties			Method	Shell Omala S4 GX 150
Viscosity Grade			ISO 3448	150
Kinematic Viscosity	@40°C	mm^2/s	ISO 3104	157.7
Kinematic Viscosity	@100°C	mm^2/s	ISO 3104	21.7
Viscosity Index			ISO 2909	163
Flash Point		°C	ISO 2592 (COC)	238
Pour Point		°C	ISO 3016	-45
Density	@15°C	kg/m^3	ISO 12185	877
FZG Load Carrying Test			DIN 51354-2	-
FZG Load Carrying Test		failure load stage	A/8,3/90	>14
FZG Load Carrying Test		failure load stage	A/16,6/90	>14
Timken OK Load		lbs	ASTM D2782	>85

These characteristics are typical of current production. Whilst future production will conform to Shell's specification, variations in these characteristics may occur.

Heath, Safety & Environment

- **Health and Safety**

Shell Omala S4 GX 150 is unlikely to present any significant health or safety hazard when properly used in the recommended application and good standards of personal hygiene are maintained.

Avoid contact with skin. Use impervious gloves with used oil. After skin contact, wash immediately with soap and water.

Guidance on Health and Safety is available on the appropriate Material Safety Data Sheet, which can be obtained from http://www.epc.shell.com/

- **Protect the Environment**

Take used oil to an authorized collection point. Do not discharge into drains, soil or water.

Additional Information

- **Change over procedure**

Shell Omala S4 GX is based on synthesized hydrocarbon fluids and is compatible with petroleum mineral oil-based industrial gear lubricants - no special change-over procedure is necessary. However, to achieve the complete benefit of Omala S4 GX they should not be mixed with other oils.

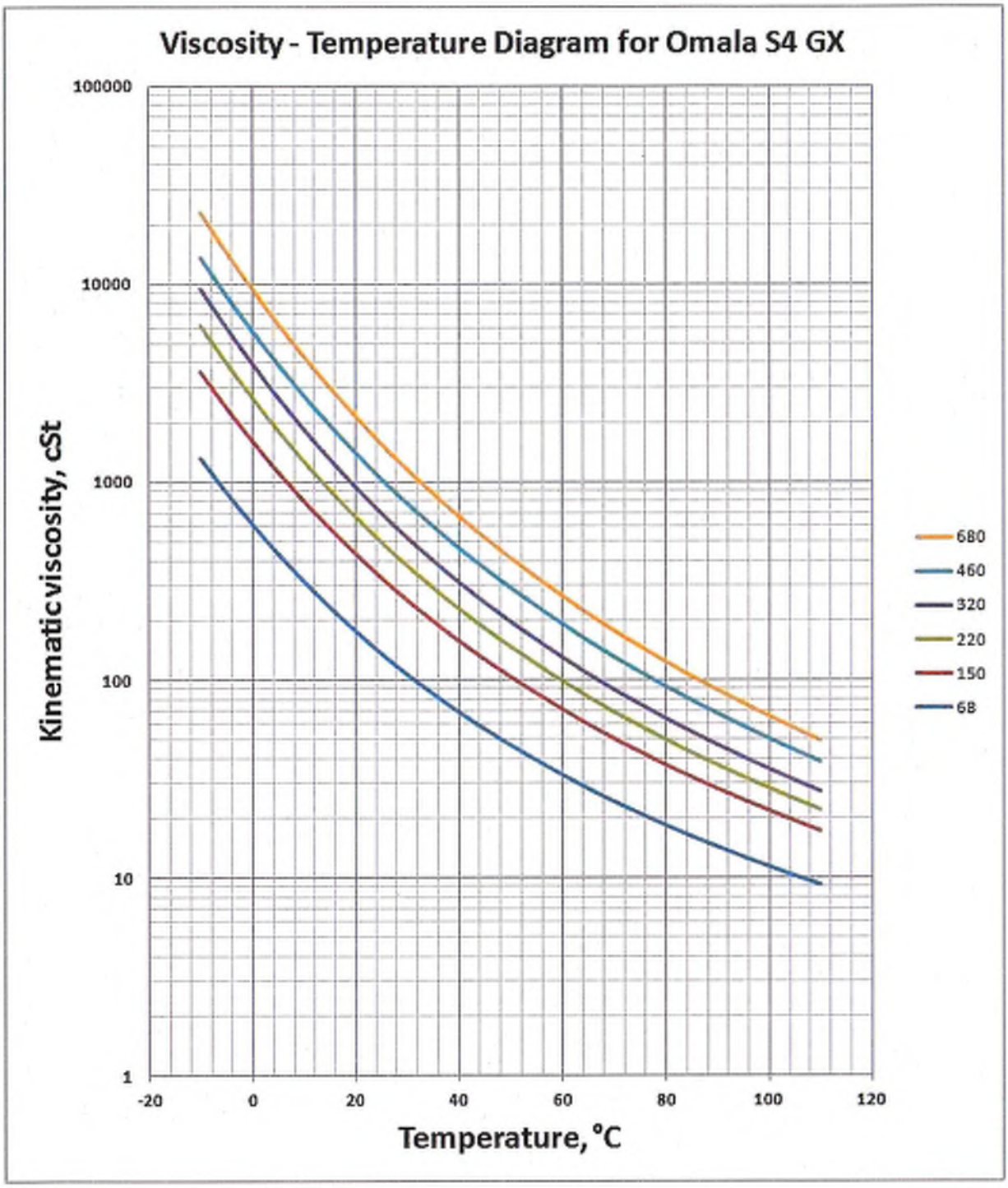
It is also advisable to ensure that oil systems are clean and free from contamination.

- **Advice**

Check compatibility with other products before use. Advice on applications not covered here may be obtained from your Shell representative.

- **Storage**

Protect against the cold.


Viscosity - Temperature Diagram for Omala S4 GX
Kinematic viscosity, cSt
100000
10000
1000
100
10
1
-20
0
20
40
60
80
100
120
Temperature, °C
680
460
320
220
150
68

SAFETY DATA SHEET

According to OSHA Hazard Communication Standard, 29 CFR 1910.1200

Shell Omala S4 GX 150

Version	Revision Date:	SDS Number:	Print Date: 05/01/2018
1.5	04/30/2018	800001007199	Date of last issue: 04/27/2018

SECTION 1. IDENTIFICATION

Product name : Shell Omala S4 GX 150

Product code : 001D7850

Manufacturer or supplier's details

Manufacturer/Supplier : **Shell Oil Products US**
PO Box 4427
Houston TX 77210-4427
USA

SDS Request : (+1) 877-276-7285

Customer Service :

Emergency telephone number

Spill Information : 877-504-9351

Health Information : 877-242-7400

Recommended use of the chemical and restrictions on use

Recommended use : Gear oil

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with 29 CFR 1910.1200

Based on available data this substance / mixture does not meet the classification criteria.

GHS label elements

Hazard pictograms : No Hazard Symbol required

Signal word : No signal word

Hazard statements : PHYSICAL HAZARDS:
Not classified as a physical hazard under GHS criteria.
HEALTH HAZARDS:
Not classified as a health hazard under GHS criteria.
ENVIRONMENTAL HAZARDS:
Not classified as an environmental hazard under GHS criteria.

Precautionary statements :

Prevention:

No precautionary phrases.

Response:

No precautionary phrases.

Storage:

No precautionary phrases.

Disposal:

No precautionary phrases.

Other hazards which do not result in classification

Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.
Used oil may contain harmful impurities.
Not classified as flammable but will burn.
The classification of this material is based on OSHA HCS 2012 criteria.
Under normal conditions of use or in a foreseeable emergency, this product does not meet the definition of a hazardous chemical when evaluated according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Blend of polyolefins and additives.

Hazardous components

SECTION 4. FIRST-AID MEASURES

If inhaled : No treatment necessary under normal conditions of use.
If symptoms persist, obtain medical advice.

In case of skin contact : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available.
If persistent irritation occurs, obtain medical attention.

In case of eye contact : Flush eye with copious quantities of water.
Remove contact lenses, if present and easy to do. Continue rinsing.
If persistent irritation occurs, obtain medical attention.

If swallowed : In general no treatment is necessary unless large quantities are swallowed, however, get medical advice.

Most important symptoms and effects, both acute and delayed : Oil acne/folliculitis signs and symptoms may include formation of black pustules and spots on the skin of exposed areas.
Ingestion may result in nausea, vomiting and/or diarrhoea.

Protection of first-aiders : When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.

Indication of any immediate medical attention and special treatment needed : Treat symptomatically.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media	:	Do not use water in a jet.
Specific hazards during firefighting	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Unidentified organic and inorganic compounds.
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Special protective equipment for firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Avoid contact with skin and eyes.
Environmental precautions	:	Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Local authorities should be advised if significant spillages cannot be contained.
Methods and materials for containment and cleaning up	:	Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.
Additional advice	:	For guidance on selection of personal protective equipment see Chapter 8 of this Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Safety Data Sheet.

SECTION 7. HANDLING AND STORAGE

Technical measures	:	Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Advice on safe handling	:	Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
Avoidance of contact	:	Strong oxidising agents.
Product Transfer	:	This material has the potential to be a static accumulator. Proper grounding and bonding procedures should be used during all bulk transfer operations.
Further information on storage stability	:	Keep container tightly closed and in a cool, well-ventilated place. Use properly labeled and closable containers. Store at ambient temperature.
Packaging material	:	Suitable material: For containers or container linings, use mild steel or high density polyethylene. Unsuitable material: PVC.
Container Advice	:	Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Components with workplace control parameters

Biological occupational exposure limits

No biological limit allocated.

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.
National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/
Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods

http://www.osha.gov/
Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances http://www.hse.gov.uk/
Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany http://www.dguv.de/inhalt/index.jsp
L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/accueil

Engineering measures : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:
Adequate ventilation to control airborne concentrations.

Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.

General Information:
Define procedures for safe handling and maintenance of controls.
Educate and train workers in the hazards and control measures relevant to normal activities associated with this product.
Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation.
Drain down system prior to equipment break-in or maintenance.
Retain drain downs in sealed storage pending disposal or subsequent recycle.
Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.
Practice good housekeeping.

Personal protective equipment

Respiratory protection : No respiratory protection is ordinarily required under normal conditions of use.
In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material.
If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation.
Check with respiratory protective equipment suppliers.
Where air-filtering respirators are suitable, select an appropriate combination of mask and filter.
Select a filter suitable for the combination of organic gases and vapours [Type A/Type P boiling point >65°C (149°F)].

Hand protection

Remarks	:	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC, neoprene or nitrile rubber gloves Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model.
Eye protection	:	If material is handled such that it could be splashed into eyes, protective eyewear is recommended.
Skin and body protection	:	Skin protection is not ordinarily required beyond standard work clothes. It is good practice to wear chemical resistant gloves.
Protective measures	:	Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.
Thermal hazards	:	Not applicable

Environmental exposure controls

General advice	:	Take appropriate measures to fulfill the requirements of relevant environmental protection legislation. Avoid contamination of the environment by following advice given in Chapter 6. If necessary, prevent undissolved material from being discharged to waste water. Waste water should be treated in a municipal or industrial waste water treatment plant before discharge to surface water. Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Liquid at room temperature.
Colour	:	amber
Odour	:	Slight hydrocarbon
Odour Threshold	:	Data not available
pH	:	Not applicable
pour point	:	-45 °C / -49 °F Method: ISO 3016
Initial boiling point and boiling range	:	> 280 °C / 536 °F estimated value(s)
Flash point	:	238 °C / 460 °F Method: ISO 2592
Evaporation rate	:	Data not available
Flammability (solid, gas)	:	Data not available
Upper explosion limit / upper flammability limit	:	Typical 10 %(V)
Lower explosion limit / Lower flammability limit	:	Typical 1 %(V)
Vapour pressure	:	< 0.5 Pa (20 °C / 68 °F) estimated value(s)
Relative vapour density	:	> 1 estimated value(s)
Relative density	:	0.877 (15 °C / 59 °F)
Density	:	877 kg/m3 (15.0 °C / 59.0 °F) Method: ISO 12185
Solubility(ies)		
Water solubility	:	negligible
Solubility in other solvents	:	Data not available
Partition coefficient: n-octanol/water	:	log Pow: > 6 (based on information on similar products)
Auto-ignition temperature	:	> 320 °C / 608 °F

Decomposition temperature	:	Data not available
Viscosity		
Viscosity, dynamic	:	Data not available
Viscosity, kinematic	:	157.7 mm2/s (40.0 °C / 104.0 °F) Method: Unspecified 21.7 mm2/s (100 °C / 212 °F) Method: Unspecified
Explosive properties	:	Not classified
Oxidizing properties	:	Data not available
Conductivity	:	This material is not expected to be a static accumulator.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph.
Chemical stability	:	Stable.
Possibility of hazardous reactions	:	Reacts with strong oxidising agents.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Strong oxidising agents.
Hazardous decomposition products	:	No decomposition if stored and applied as directed.

SECTION 11. TOXICOLOGICAL INFORMATION

Basis for assessment	:	Information given is based on data on the components and the toxicology of similar products.Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Information on likely routes of exposure
Skin and eye contact are the primary routes of exposure although exposure may occur following accidental ingestion.

Acute toxicity

Product:

Acute oral toxicity	:	LD50 (rat): > 5,000 mg/kg Remarks: Low toxicity: Based on available data, the classification criteria are not met.

Acute inhalation toxicity	:	Remarks: Based on available data, the classification criteria are not met.
Acute dermal toxicity	:	LD50 (Rabbit): > 5,000 mg/kg Remarks: Low toxicity: Based on available data, the classification criteria are not met.

Skin corrosion/irritation

Product:

Remarks: Slightly irritating to skin., Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis., Based on available data, the classification criteria are not met.

Serious eye damage/eye irritation

Product:

Remarks: Slightly irritating to the eye., Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation

Product:

Remarks: Not a skin sensitiser.
Based on available data, the classification criteria are not met.

Germ cell mutagenicity

Product:

: Remarks: Non mutagenic, Based on available data, the classification criteria are not met.

Carcinogenicity

Product:

Remarks: Not a carcinogen., Based on available data, the classification criteria are not met.

IARC	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
OSHA	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.
NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

Reproductive toxicity

Product:

:
Remarks: Not a developmental toxicant., Does not impair fertility., Based on available data, the classification criteria are not met.

STOT - single exposure

Product:
Remarks: Based on available data, the classification criteria are not met.

STOT - repeated exposure

Product:
Remarks: Based on available data, the classification criteria are not met.

Aspiration toxicity

Product:
Not an aspiration hazard.

Further information

Product:
Remarks: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal., ALL used oil should be handled with caution and skin contact avoided as far as possible.

Remarks: Slightly irritating to respiratory system.

SECTION 12. ECOLOGICAL INFORMATION

Basis for assessment : Ecotoxicological data have not been determined specifically for this product.
Information given is based on a knowledge of the components and the ecotoxicology of similar products.
Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).(LL/EL/IL50 expressed as the nominal amount of product required to prepare aqueous test extract).

Ecotoxicity

Product:

Toxicity to fish (Acute toxicity) :
Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:

Based on available data, the classification criteria are not met.

Toxicity to daphnia and other aquatic invertebrates (Acute toxicity) : Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:
Based on available data, the classification criteria are not met.

Toxicity to algae (Acute toxicity) : Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:
Based on available data, the classification criteria are not met.

Toxicity to fish (Chronic toxicity) : Remarks: Data not available

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : Remarks: Data not available

Toxicity to microorganisms (Acute toxicity) : Remarks: Data not available

Persistence and degradability

Product:

Biodegradability : Remarks: Not readily biodegradable.
Major constituents are inherently biodegradable, but contains components that may persist in the environment.

Bioaccumulative potential

Product:

Bioaccumulation : Remarks: Contains components with the potential to bioaccumulate.

Mobility in soil

Product:

Mobility : Remarks: Liquid under most environmental conditions.
If it enters soil, it will adsorb to soil particles and will not be mobile.

Remarks: Floats on water.

Other adverse effects

Product:

Additional ecological information : Does not have ozone depletion potential, photochemical ozone creation potential or global warming potential.
Product is a mixture of non-volatile components, which will not be released to air in any significant quantities under normal

conditions of use.

Poorly soluble mixture.
Causes physical fouling of aquatic organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.
Do not dispose into the environment, in drains or in water courses

Waste product should not be allowed to contaminate soil or ground water, or be disposed of into the environment.
Waste, spills or used product is dangerous waste.

Contaminated packaging : Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand. Disposal should be in accordance with applicable regional, national, and local laws and regulations.

Local legislation

Remarks : Disposal should be in accordance with applicable regional, national, and local laws and regulations.

SECTION 14. TRANSPORT INFORMATION

National Regulations

US Department of Transportation Classification (49 CFR Parts 171-180)

Not regulated as a dangerous good

International Regulations

IATA-DGR
Not regulated as a dangerous good

IMDG-Code
Not regulated as a dangerous good

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied. MARPOL Annex 1 rules apply for bulk shipments by sea.

Special precautions for user

Remarks : Special Precautions: Refer to Chapter 7, Handling & Storage,

for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

SECTION 15. REGULATORY INFORMATION

EPCRA - Emergency Planning and Community Right-to-Know Act

*: This material does not contain any components with a CERCLA RQ., Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : No SARA Hazards

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Clean Water Act

This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.

US State Regulations

Pennsylvania Right To Know

Distillates (petroleum), hydrotreated light 64742-47-8

California Prop. 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

The components of this product are reported in the following inventories:

EINECS : All components listed or polymer exempt.

TSCA : All components listed.

DSL : All components listed.

SECTION 16. OTHER INFORMATION

Further information

NFPA Rating (Health, Fire, Reactivity) 0, 1, 0

Full text of other abbreviations

Abbreviations and Acronyms : The standard abbreviations and acronyms used in this document can be looked up in reference literature (e.g. scientific dictionaries) and/or websites.

ACGIH = American Conference of Governmental Industrial Hygienists
ADR = European Agreement concerning the International Carriage of Dangerous Goods by Road
AICS = Australian Inventory of Chemical Substances
ASTM = American Society for Testing and Materials
BEL = Biological exposure limits
BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
CAS = Chemical Abstracts Service
CEFIC = European Chemical Industry Council
CLP = Classification Packaging and Labelling
COC = Cleveland Open-Cup
DIN = Deutsches Institut fur Normung
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
DSL = Canada Domestic Substance List
EC = European Commission
EC50 = Effective Concentration fifty
ECETOC = European Center on Ecotoxicology and Toxicology Of Chemicals
ECHA = European Chemicals Agency
EINECS = The European Inventory of Existing Commercial Chemical Substances
EL50 = Effective Loading fifty
ENCS = Japanese Existing and New Chemical Substances Inventory
EWC = European Waste Code
GHS = Globally Harmonised System of Classification and Labelling of Chemicals
IARC = International Agency for Research on Cancer
IATA = International Air Transport Association
IC50 = Inhibitory Concentration fifty
IL50 = Inhibitory Level fifty
IMDG = International Maritime Dangerous Goods
INV = Chinese Chemicals Inventory
IP346 = Institute of Petroleum test method N° 346 for the determination of polycyclic aromatics DMSO-extractables
KECI = Korea Existing Chemicals Inventory
LC50 = Lethal Concentration fifty
LD50 = Lethal Dose fifty per cent.
LL/EL/IL = Lethal Loading/Effective Loading/Inhibitory loading
LL50 = Lethal Loading fifty
MARPOL = International Convention for the Prevention of Pollution From Ships
NOEC/NOEL = No Observed Effect Concentration / No Ob-

served Effect Level
OE_HPV = Occupational Exposure - High Production Volume
PBT = Persistent, Bioaccumulative and Toxic
PICCS = Philippine Inventory of Chemicals and Chemical Substances
PNEC = Predicted No Effect Concentration
REACH = Registration Evaluation And Authorisation Of Chemicals
RID = Regulations Relating to International Carriage of Dangerous Goods by Rail
SKIN_DES = Skin Designation
STEL = Short term exposure limit
TRA = Targeted Risk Assessment
TSCA = US Toxic Substances Control Act
TWA = Time-Weighted Average
vPvB = very Persistent and very Bioaccumulative

A vertical bar (|) in the left margin indicates an amendment from the previous version.

Sources of key data used to compile the Safety Data Sheet	:	The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).
Revision Date	:	04/30/2018

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

US / EN

2.2 Corrosion and surface protection

General information

SEW-EURODRIVE offers various optional protective measures for operation of motors and gear units in excessive conditions.

- Corrosion protection KS for motors
- Industry option package

Corrosion protection KS

Corrosion protection KS for motors comprises the following measures:

- Stainless steel retaining screws.
- The nameplates are made from stainless steel or equivalent corrosion resistant material.
- Interior motor components are protected with a corrosion resistant coating.
- Additional sealing for brake motors.

Motors with a forced cooling fan and motors with a spreadshaft encoder (ES..) cannot be supplied with corrosion protection KS.

Industry Option Package

SEW-EURODRIVE provides options that provide protecton to the motor and reducer when operating in severe environments.

Contact SEW-EURODRIVE for additional information on available IOP's (Industry Option Packages).

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Surface protection OS

Instead of the standard surface protection, the motors and gear units are available with surface protection OS1 to OS4 as an option. The special procedure Z can also be performed in addition. The special procedure Z means that large surface recesses are sprayed with a rubber filling prior to painting.

Surface protection	Suitable for
OSG	Primer only
Standard	Normal ambient conditions
OS1	Low environmental impact
OS2	Medium environmental impact
OS3	High environmental impact
OS4	Very high environmental impact

Special protective measures

Measure	Protection principle	Suitable for
FKM oil seal	High quality material	Drives subject to chemicals
PTFE oil seal	High quality material	Drives subject to chemicals
Stainless steel output shaft	Surface protection through high-quality material	Particularly exacting applications in terms of exterior surface protection

NOCO® fluid

As standard, SEW-EURODRIVE supplies NOCO® fluid corrosion protection and lubricant with every hollow shaft gear unit. Use NOCO® fluid when installing hollow shaft gear units. Using this fluid helps prevent contact corrosion and makes it easier to assemble the drive at a later date.

NOCO® fluid is also suitable for protecting machined metal surfaces that do not have corrosion protection, including parts of shaft ends or flanges. You can also order larger quantities of NOCO® fluid from SEW-EURODRIVE.

NOCO® fluid is food grade according to NSF certified H1.

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3 Unit Designations and Versions

3.1 Unit designations for gear units and options

Helical gear units

RX..	Single-stage foot mounted version
RXF..	Single-stage B5 flange-mounted version
R..	Foot-mounted version
R..F	Foot-mounted and B5 flange-mounted version
RF..	B5 flange-mounted version
RZ..	B14 flange-mounted version
RM..	B5 flange-mounted version with extended bearing housing

Parallel shaft helical gear units

F..	Foot-mounted version
FA..B	Foot-mounted version and hollow shaft
FH..B	Foot-mounted and hollow shaft with shrink disc
FV..B	Foot-mounted version and hollow shaft with splined hollow shaft to DIN 5480
FF..	B5 flange-mounted version
FAF..	B5 flange-mounted version and hollow shaft
FHF..	B5 flange-mounted and hollow shaft with shrink disc
FVF..	B5 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480
FA..	Hollow shaft
FH..	Hollow shaft with shrink disc
FT..	Hollow shaft with TorqLOC® hollow shaft mounting system
FT..B	Foot-mounted hollow shaft with TorqLOC® hollow shaft mounting system
FV..	Hollow shaft with splined hollow shaft to DIN 5480
FAZ..	B14 flange-mounted version and hollow shaft
FHZ..	B14 flange-mounted and hollow shaft with shrink disc
FVZ..	B14 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480

Helical-bevel gear units

K..	Foot-mounted version
KA..B	Foot-mounted version and hollow shaft
KH..B	Foot-mounted version and hollow shaft with shrink disc
KV..B	Foot-mounted version and hollow shaft with splined hollow shaft to DIN 5480
KF..	B5 flange-mounted version
KAF..	B5 flange-mounted version and hollow shaft
KHF..	B5 flange-mounted and hollow shaft with shrink disc
KVF..	B5 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480
KA..	Hollow shaft

3.4 Example for the unit designation of a gear unit

The unit designation of the gear unit starts from the component on the output end. For example, a helical-bevel multi-stage gear unit with a NEMA C-face adapter has the following unit designation:

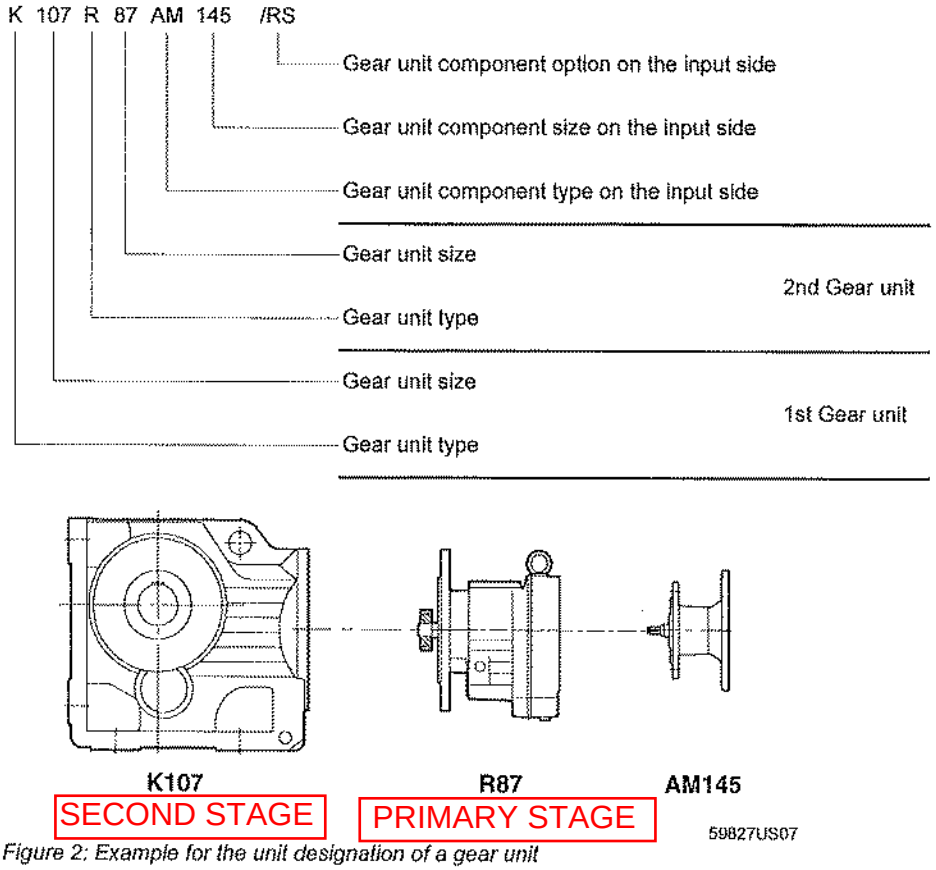


Figure 2: Example for the unit designation of a gear unit

Other examples:

- FH 47 /R /G AQH 100/3
  - Gear unit type: FH parallel shaft helical gear unit with hollow shaft and shrink disc
  - Gear unit size: 47
  - Gear unit option: /R Reduced backlash version
  - Gear unit option: /G Rubber buffer
  - Gear unit component on the input side: AQH 100/3 Adapter for mounting servomotors with size 100/3 clamping ring hub

$T_{a\ max}$ [lb-in]	n_a [rpm]	i	F_{Ra} [1] [lb]					m [lbs]	
7250	0.14	12139	2320						
	0.15	11134	2320						
	0.18	9479	2320						
	0.21	8173	2320						
	0.23	7259	2320						
	0.26	6462	2320						
	0.30	5648	2320	K	67R37	DRS	71S4	105	535
	0.35	4846	2320	KF	67R37	DRS	71S4	120	535
	0.39	4329	2320	KA	67R37	DRS	71S4	100	535
	0.45	3750	2320	KAF	67R37	DRS	71S4	110	535
	0.51	3315	2320						
	0.58	2917	2320						
	0.67	2532	2320						
	0.76	2244	2320						
	0.86	1981	2320						
	0.98	1739	2320						
	1.1	1535	2320						
	1.3	1351	2320						
	1.4	1171	2320						
	1.6	1034	2320	K	67R37	DRS	71S4	105	535
	1.9	903	2320	KF	67R37	DRS	71S4	115	535
	2.1	793	2320	KA	67R37	DRS	71S4	99	535
	2.4	697	2320	KAF	67R37	DRS	71S4	110	535
	2.8	613	2320						
	3.1	542	2320						
	3.6	471	2320						
	4.0	420	2320	K	67R37	DRS	71M4	110	535
	4.7	361	2320	KF	67R37	DRS	71M4	120	535
	5.2	323	2320	KA	67R37	DRS	71M4	100	535
				KAF	67R37	DRS	71M4	115	535
	6.2	279	2320	K	67R37	DRE	80M4	120	535
	7.1	246	2320	KF	67R37	DRE	80M4	130	535
				KA	67R37	DRE	80M4	110	535
				KAF	67R37	DRE	80M4	125	535
	8.0	217	2320	K	67R37	DRE	90M4	130	535
	9.1	191	2320	KF	67R37	DRE	90M4	140	535
	10	166	2320	KA	67R37	DRE	90M4	120	535
				KAF	67R37	DRE	90M4	135	535
	12	144	2320	K	67R37	DRE	90L4	135	535
	14	122	2320	KF	67R37	DRE	90L4	145	535
				KA	67R37	DRE	90L4	125	535
				KAF	67R37	DRE	90L4	140	535
13700	0.11	15310	3460						
	0.12	14043	3460						
	0.14	11955	3460						
	0.17	10217	3460						
	0.19	8809	3460						
	0.23	7528	3460						
	0.26	6606	3460	K	77R37	DRS	71S4	160	535
	0.29	5774	3460	KF	77R37	DRS	71S4	175	535
	0.33	5089	3460	KA	77R37	DRS	71S4	140	535
	0.38	4489	3460	KAF	77R37	DRS	71S4	160	535
	0.43	3961	3460						
	0.49	3485	3460						
	0.59	2901	3460						
	0.63	2717	3460						
	0.72	2370	3460						
	0.83	2050	3460						
	0.96	1772	3460						
	1.1	1514	3460	K	77R37	DRS	71S4	160	535
	1.2	1388	3460	KF	77R37	DRS	71S4	175	535
	1.4	1218	3460	KA	77R37	DRS	71S4	140	535
	1.6	1053	3460	KAF	77R37	DRS	71S4	160	535
	1.8	924	3460						
	2.1	815	3460	K	77R37	DRS	71M4	160	535
	2.4	709	3460	KF	77R37	DRS	71M4	180	535
	2.7	622	3460	KA	77R37	DRS	71M4	145	535
				KAF	77R37	DRS	71M4	160	535

SEDIMENATATION TANK
LONGITUDINAL COLLECTORS
PART NUMBER - 10000583- 201

GRIT COLLECTORS
PART NUMBER - 10000583- 211

CROSS COLLECTORS
PART NUMBER - 10000583- 202

Rev 01

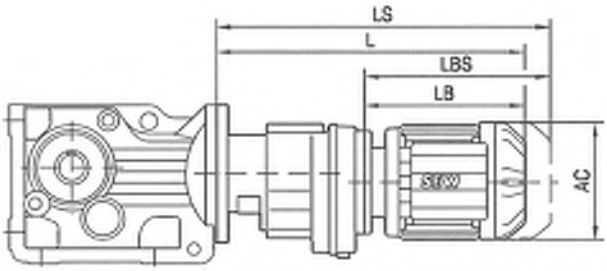


Helical-Bevel Gearmotors

K..R..D.. [lb-in]

$T_{a\ max}$ [lb-in]	n_a [rpm]	i	F_{Ra} 1) [lb]					m [lbs]	
13700	1.4	1218	3460	K	77 R37	DT	71D4	160	383
	1.6	1053	3460	KF	77 R37	DT	71D4	180	383
	1.8	924	3460	KA	77 R37	DT	71D4	145	383
				KAF	77 R37	DT	71D4	160	383
	2.1	815	3460	K	77 R37	DT	80K4	165	383
	2.4	709	3460	KF	77 R37	DT	80K4	185	383
	2.8	622	3460	KA	77 R37	DT	80K4	150	383
				KAF	77 R37	DT	80K4	165	383
	3.1	552	3460	K	77 R37	DT	80N4	170	383
	3.5	485	3460	KF	77 R37	DT	80N4	185	383
	4.0	428	3460	KA	77 R37	DT	80N4	150	383
				KAF	77 R37	DT	80N4	170	383
	4.7	367	3460	K	77 R37	DT	90S4	180	383
	5.3	328	3460	KF	77 R37	DT	90S4	195	383
	6.0	290	3460	KA	77 R37	DT	90S4	160	383
				KAF	77 R37	DT	90S4	180	383
	6.8	252	3460	K	77 R37	DT	90L4	180	383
	7.8	221	3460	KF	77 R37	DT	90L4	200	383
				KA	77 R37	DT	90L4	165	383
				KAF	77 R37	DT	90L4	180	383
	8.9	195	3460	K	77 R37	DV	100M4	190	383
	9.9	175	3460	KF	77 R37	DV	100M4	210	383
	11	154	3460	KA	77 R37	DV	100M4	175	383
				KAF	77 R37	DV	100M4	190	383
23900	0.11	14829	6130						
	0.13	13168	6130						
	0.14	11737	6130						
	0.17	10217	6130						
	0.19	9073	6130	K	87 R57	DT	71K4	270	383
	0.22	7854	6130	KF	87 R57	DT	71K4	290	383
	0.25	6832	6130	KA	87 R57	DT	71K4	245	383
	0.29	5930	6130	KAF	87 R57	DT	71K4	270	383
	0.32	5240	6130						
	0.37	4562	6130						
	0.42	4037	6130						
	0.47	3609	6130						
	0.55	3107	6130	K	87 R57	DT	71C4	270	383
	0.63	2728	6130	KF	87 R57	DT	71C4	290	383
	0.73	2371	6130	KA	87 R57	DT	71C4	245	383
				KAF	87 R57	DT	71C4	275	383
	0.81	2088	6130	K	87 R57	DT	71D4	270	383
	0.92	1854	6130	KF	87 R57	DT	71D4	290	383
	1.0	1657	6130	KA	87 R57	DT	71D4	245	383
				KAF	87 R57	DT	71D4	270	383
	1.2	1415	6130	K	87 R57	DT	80K4	270	383
	1.4	1229	6130	KF	87 R57	DT	80K4	290	383
	1.6	1078	6130	KA	87 R57	DT	80K4	245	383
				KAF	87 R57	DT	80K4	275	383
	1.8	951	6130	K	87 R57	DT	80N4	275	383
	2.0	837	6130	KF	87 R57	DT	80N4	295	383
	2.3	726	6130	KA	87 R57	DT	80N4	250	383
				KAF	87 R57	DT	80N4	280	383
	2.7	638	6130	K	87 R57	DT	90S4	285	383
	3.1	562	6130	KF	87 R57	DT	90S4	305	383
				KA	87 R57	DT	90S4	260	383
				KAF	87 R57	DT	90S4	285	383
	3.6	474	6130	K	87 R57	DT	90L4	290	383
	4.0	426	6130	KF	87 R57	DT	90L4	310	383
	4.6	373	6130	KA	87 R57	DT	90L4	265	383
				KAF	87 R57	DT	90L4	290	383
	5.2	330	6130	K	87 R57	DV	100M4	300	383
	5.9	294	6130	KF	87 R57	DV	100M4	320	383
	6.9	250	6130	KA	87 R57	DV	100M4	275	383
				KAF	87 R57	DV	100M4	300	383
	7.1	236	6130	K	87 R57	DV	100L4	305	383
	8.3	201	6130	KF	87 R57	DV	100L4	325	383
	9.2	183	6130	KA	87 R57	DV	100L4	280	383
	11	159	6130	KAF	87 R57	DV	100L4	310	383

33 133 00 06



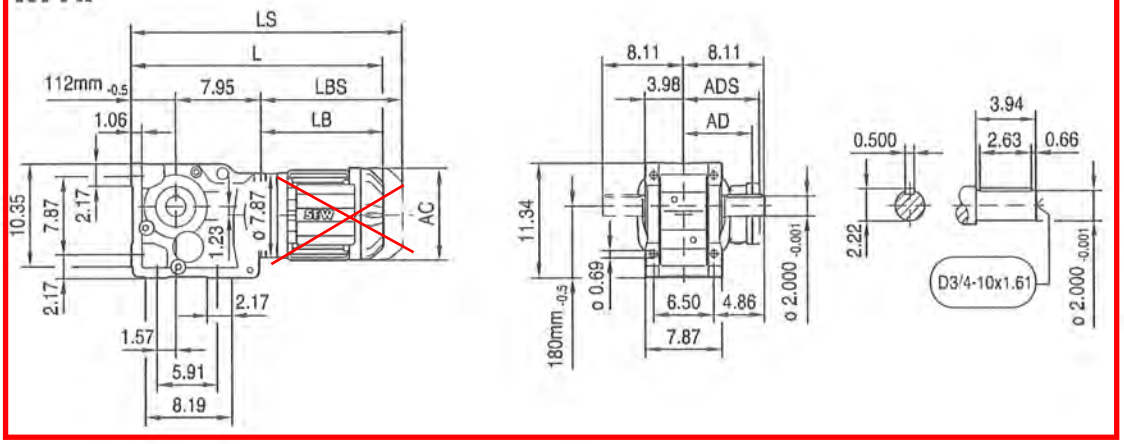
(→ 📖 14)		AC	L	LS	LB	LBS
K..37R17	DR63..	5.20	12.76	14.92	5.87	8.03
	DR71S..	5.47	13.19	15.87	6.30	8.98
K..47R37	DR63..	5.20	14.02	16.18	7.52	9.69
	DR71S..	5.47	14.45	17.13	7.95	10.63
	DR71M..	5.47	15.43	18.11	8.94	11.61
	DR80S..	6.14	15.79	18.98	9.29	12.48
K..57R37	DR63..	5.20	14.02	16.18	7.52	9.69
K..67R37	DR71S..	5.47	14.45	17.13	7.95	10.63
	DR71M..	5.47	15.43	18.11	8.94	11.61
	DR80S..	6.14	15.79	18.98	9.29	12.48
	DR80M..	6.14	17.01	20.20	10.51	13.70
K..77R37	DR63..	5.20	13.70	15.87	7.52	9.69
	DR71S..	5.47	14.13	16.81	7.95	10.63
	DR71M..	5.47	15.12	17.80	8.94	11.61
	DR80S..	6.14	15.47	18.66	9.29	12.48
	DR80M..	6.14	16.69	19.88	10.51	13.70
	DR90M..	7.05	16.77	20.43	10.59	14.25
	DR90L..	7.05	17.56	21.22	11.38	15.04
K..87R57	DR63..	5.20	15.79	17.95	7.28	9.45
	DR71S..	5.47	16.22	18.86	7.72	10.35
	DR71M..	5.47	17.20	19.84	8.70	11.34
	DR80S..	6.14	17.56	20.75	9.06	12.24
	DR80M..	6.14	18.78	21.97	10.28	13.46
	DR90M..	7.05	18.82	22.52	10.31	14.02
	DR90L..	7.05	19.61	23.31	11.10	14.80
	DR100M..	7.76	20.79	24.49	12.28	15.98
K..97R57	DR63..	5.20	15.59	17.76	7.28	9.45
	DR71S..	5.47	16.02	18.66	7.72	10.35
	DR71M..	5.47	17.01	19.65	8.70	11.34
	DR80S..	6.14	17.36	20.55	9.06	12.24
	DR80M..	6.14	18.58	21.77	10.28	13.46
	DR90M..	7.05	18.62	22.32	10.31	14.02
	DR90L..	7.05	19.41	23.11	11.10	14.80
	DR100M..	7.76	20.59	24.29	12.28	15.98
	DR100LC..	7.76	21.77	25.47	13.46	17.17
K..107R77	DR63..	5.20	16.77	18.94	7.05	9.21
	DR71S..	5.47	17.20	19.84	7.48	10.12
	DR71M..	5.47	18.19	20.83	8.46	11.10
	DR80S..	6.14	18.50	21.69	8.78	11.97
	DR80M..	6.14	19.72	22.91	10.00	13.19
	DR90M..	7.05	19.72	23.43	10.00	13.70
	DR90L..	7.05	20.51	24.21	10.79	14.49
	DR100M..	7.76	21.69	25.39	11.97	15.67
	DR100LC..	7.76	22.87	26.57	13.15	16.85
	DR132S..	8.70	24.65	29.06	14.92	19.33
	DR132M/MC..	8.70	26.61	31.02	16.89	21.30
K..127R77	DR63..	5.20	16.18	18.35	7.05	9.21

(→ 📖 14)		AC	L	LS	LB	LBS
K..127R77	DR71S..	5.47	16.61	19.25	7.48	10.12
	DR71M..	5.47	17.60	20.24	8.46	11.10
	DR80S..	6.14	17.91	21.10	8.78	11.97
	DR80M..	6.14	19.13	22.32	10.00	13.19
	DR90M..	7.05	19.13	22.83	10.00	13.70
	DR90L..	7.05	19.92	23.62	10.79	14.49
	DR100M..	7.76	21.10	24.80	11.97	15.67
	DR100LC..	7.76	22.28	25.98	13.15	16.85
	DR132S..	8.70	24.06	28.46	14.92	19.33
K..127R87	DR90M..	7.05	20.87	24.57	9.84	13.54
	DR90L..	7.05	21.65	25.35	10.63	14.33
	DR100M..	7.76	22.83	26.54	11.81	15.51
	DR100LC..	7.76	24.02	27.72	12.99	16.69
	DR132S..	8.70	25.75	30.16	14.72	19.13
	DR132M/MC..	8.70	27.72	32.13	16.69	21.10
	DR160..	10.71	29.33	34.72	18.31	23.70
K..157R97	DR71M..	5.47	20.83	23.46	8.03	10.67
K..167R97	DR80S..	6.14	21.18	24.37	8.39	11.57
	DR80M..	6.14	22.40	25.59	9.61	12.80
	DR90M..	7.05	22.40	26.10	9.61	13.31
	DR90L..	7.05	23.19	26.89	10.39	14.09
	DR100M..	7.76	24.37	28.07	11.57	15.28
	DR100LC..	7.76	25.55	29.25	12.76	16.46
	DR132S..	8.70	27.32	31.73	14.53	18.94
	DR132M/MC..	8.70	29.29	33.70	16.50	20.91
	DR160..	10.71	30.91	36.30	18.11	23.50
K..187R97	DR71M..	5.47	20.83	23.46	8.03	10.67
	DR80S..	6.14	21.18	24.37	8.39	11.57
	DR80M..	6.14	22.40	25.59	9.61	12.80
	DR90M..	7.05	22.40	26.10	9.61	13.31
	DR90L..	7.05	23.19	26.89	10.39	14.09
	DR100M..	7.76	24.37	28.07	11.57	15.28
	DR100LC..	7.76	25.55	29.25	12.76	16.46
	DR132S..	8.70	27.32	31.73	14.53	18.94
	DR132M/MC..	8.70	29.29	33.70	16.50	20.91
	DR160..	10.71	30.91	36.30	18.11	23.50
	DR180M..	12.48	34.29	42.13	21.50	29.33
K..157R107	DR132MC..	8.70	31.30	35.71	16.26	20.67
	DR160..	10.71	32.91	38.31	17.87	23.27
	DR180M	12.48	36.30	44.13	21.26	29.09
	DR180L/HC..	12.48	38.66	46.50	23.62	31.46
K..167R107	DR132M/MC..	8.70	31.30	35.71	16.26	20.67
K..187R107	DR160..	10.71	32.91	38.31	17.87	23.27
	DR180M..	12.48	36.30	44.13	21.26	29.09
	DR180L/HC..	12.48	38.66	46.50	23.62	31.46
	DR225S..	15.51	40.28	48.94	25.24	33.90
	DR225M/MC..	15.51	42.83	51.50	27.80	36.46

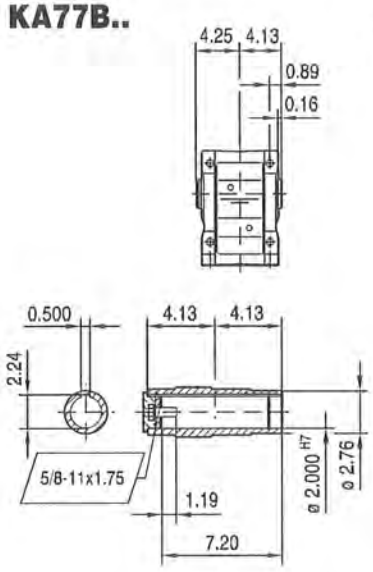
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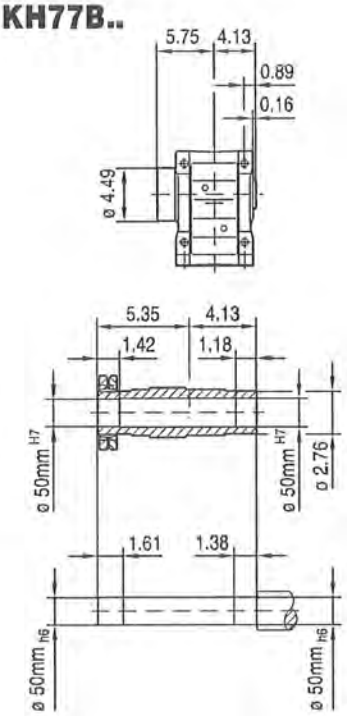
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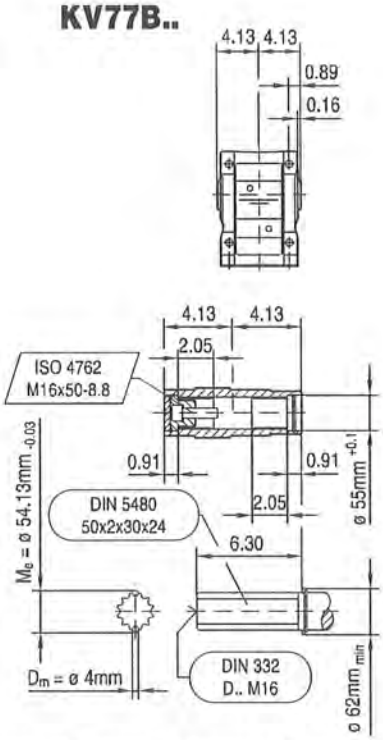
KA77B..



KH77B..



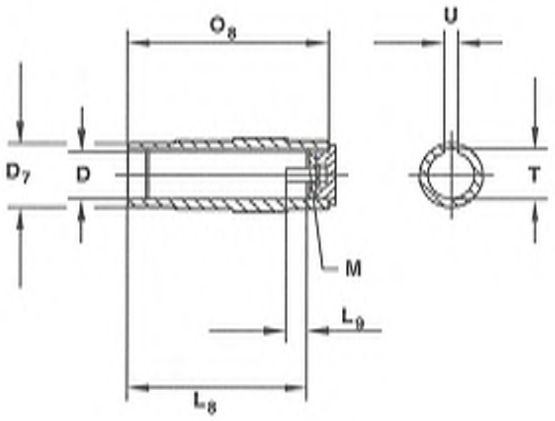
KV77B..



(→ 125)	DR71M	DR80S	DR80M	DR90M	DR90L	DR100M	DR100L/LC	DR132S	DR132M/MC	DR160..
AC	5.47	6.14	6.14	7.05	7.05	7.76	7.76	8.70	8.70	10.63
AD	4.69	5.04	5.04	5.51	5.51	6.18	6.18	6.69	6.69	8.98
ADS	5.08	5.47	5.47	5.91	5.91	6.22	6.22	6.77	6.77	8.98
L	20.79	21.14	22.36	22.44	23.23	24.41	25.59	27.28	29.25	30.87
LS	23.46	24.33	25.55	26.10	26.89	28.07	29.25	31.69	33.66	36.26
LB	8.43	8.78	10.00	10.08	10.87	12.05	13.23	14.92	16.89	18.50
LBS	11.10	11.97	13.19	13.74	14.53	15.71	16.89	19.33	21.30	23.90

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11.6.10 K Series inch hollow shafts



Model	O_8	D	D_7	T	U	L_8	L_9	M
KA...37	4.72	1.25	1.77	1.37	1/4	4.13	0.67	7/16 - 14 x 1
KA...47	5.91	1.25	1.97	1.37	1/4	5.2	0.67	7/16 - 14 x 1
	5.91	1.375	1.97	1.52	5/16	5.2	0.65	1/2 - 13 x 1
KA...57	6.54	1.5	2.17	1.67	3/8	5.59	1.36	5/8 - 11 x 1-3/4
	6.54	1.4375[1]	2.17	1.61	3/8	5.59	1.36	5/8 - 11 x 1-3/4
KA...67	7.09	1.4375[1]	2.17	1.61	3/8	6.14	1.36	5/8 - 11 x 1-3/4
	7.09	1.5	2.17	1.67	3/8	6.14	1.36	5/8 - 11 x 1-3/4
KA...77	8.27	1.9375[1]	2.76	2.16	1/2	7.2	1.16	5/8 - 11 x 1-3/4
	8.27	2	2.76	2.22	1/2	7.2	1.16	5/8 - 11 x 1-3/4
KA...87	9.45	2.375	3.35	2.65	5/8	8.27	1.39	3/4 - 10 x 2
	9.45	2.4375[1]	3.35	2.62	5/8	8.27	1.39	3/4 - 10 x 2
KA...97	11.81	2.75	3.74	3.03	5/8	10.63	1.24	3/4 - 10 x 2
	11.81	2.9375[1]	3.74	3.14	3/4	10.63	1.24	3/4 - 10 x 2
KA...107	13.78	3.25	4.65	3.59	3/4	12.32	1.24	3/4 - 10 x 2
	13.78	3.4375[1]	4.65	3.7	7/8	12.32	1.24	3/4 - 10 x 2
	13.78	3.625	4.65	3.89	7/8	12.32	1.24	3/4 - 10 x 2
KA...127	16.14	4	5.31	4.44	1	14.69	1.26	1 - 8 x 2-1/4
KA...157	19.69	4.5	6.1	4.95	1	18.11	1.26	1 - 8 x 2-1/4

1 INX shaft options incur an additional charge.

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Technical Data

01 802 01 11 US

SEW EURODRIVE

Standard Gearmotors
Project Planning Data Sheet/Coating and Surface Protection System

CE 08Dec2014

SEW Design	**Standard** Dry indoor environment	**OS2** Outdoor/splash exposure	**OS4** Chemical wet operation
			
Suited for environments	Suitable for machines and systems within buildings and interior rooms with neutral atmospheres.	Suitable for environments with high humidity such as outdoor applications subject to direct weathering or indoor environments with splashing water	Suitable for environments with permanent humidity and severe atmospheric or chemical contamination. Regular acidic or caustic wet cleaning also with chemical cleaning agents.
Example applications	Systems in the automobile industry Conveyor systems in logistics areas Conveyor belts at airports	Applications in amusement parks or water treatment facilities.	Washdown areas in the food and beverage industry. Port cranes.
Condensation test ISO 6270 – 2 (CH)	48h	120h	360h
Salt spray test DIN EN ISO 9227	-	240h	600h
Corrosion protection KS included	No	Yes	Yes
Select IP Rating	IP54 (standard)	IPx5 (x6 optional)	IPx6*
Drain Hole	-	DH	DH*

Top and base coats	Layer 4			2-Component Polyurethane Clearcoat
	Layer 3			2-Component Polyurethane Topcoat
	Layer 2		1-Component Acrylic Topcoat	2-Component Epoxy Primer Base
	Layer 1	1-Component Acrylic Topcoat	1-component Acrylic Primer Base	2-Component Epoxy Primer Base
Nominal Dry Film Thickness (mils)[1)]		1.5 - 2	3 - 4	6 - 8
Standard colors		RAL 5001 Green Blue (default), Stainless Steel Gray, RAL 9003 Signal White, RAL 9005 Jet Black, RAL 7031 Blue Gray		Stainless Steel Gray, RAL 9003 Signal White, RAL 9005 Jet Black

* - If solids can clog DH plug, use option IP46 (same as IP66 without DH plug).
1) – Typical values for layer thickness may vary based on geometrical complexities of the product.

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SEW EURODRIVE

Operating Instructions



AC Motors
DR..71 – 315, DRN80 – 315

Edition 07/2015
Rev 01
Rev 01
21927189/EN

1 General information

1.1 About this documentation

This documentation is an integral part of the product. The documentation is intended for all employees who perform assembly, installation, startup, and service work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries.
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries.
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the drive system or its environment.
INFORMATION	Useful information or tip: Simplifies handling of the drive system.	

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:



SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

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Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of risk of crushing
	Warning of suspended load
	Warning of automatic restart

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

- ⚠ **SIGNAL WORD** Type and source of hazard.

  Possible consequence(s) if disregarded.

  – Measure(s) to prevent the hazard.

1.3 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the unit!

1.4 Exclusion of liability

Read the information in this documentation, otherwise safe operation is impossible. You must comply with the information contained in this documentation to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, SEW-EURODRIVE assumes no liability for defects.

1.5 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.6 Copyright notice

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1.7 Designation convention

DR..	Stands for all motors of the DRS, DRE, DRP, DRL, DRK, DRM series
DRN..	Stand for all motors of the DRN series
..	Stands for 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280, 315 **or** S, E, P, L, K, M, N

The ".." after "DR" is an omission and stands for either the motor type "S, E, P, L, K, M, etc." and/or the omitted size.

- Examples: DR..80, DRS71

The ".." after "DRN" is an omission and stands for the omitted size.

- Examples: DRN80, DRN..

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2 Safety notes

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The user must ensure that the basic safety notes are read and observed. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. If you are unclear about any of the information in this documentation, or if you require further information, please contact SEW-EURODRIVE.

2.1 Preliminary information

The following safety notes are primarily concerned with the use of the following components: DR../DRN.. AC motors. If you use gearmotors, also refer to the safety notes in the corresponding operating instructions for: Gear units

Also observe the additional safety notes provided in the individual chapters of this document.

2.2 General information



⚠ WARNING

During operation, the motors or gearmotors can have live, bare (in the event of open connectors/terminal boxes) and movable or rotating parts as well as hot surfaces, depending on their degree of protection.

Severe or fatal injuries.

- All work related to transportation, storage, installation, assembly, connection, startup, maintenance and repair may only be carried out by qualified personnel, in strict observance of the following points:
  - The applicable detailed documentation(s)
  - Warning and safety signs on the motor/gearmotor
  - All the project planning documents, startup instructions and wiring diagrams related to the drive
  - System-specific regulations and requirements
  - National/regional safety and accident prevention regulations.
- Never install damaged drives.
- Report any damage to the shipping company immediately.

Unauthorized removal of covers, improper use, or incorrect installation and operation may result in severe injury to persons, or damage to machinery.

Refer to the following chapters for more information.

2.3 Target group

Any mechanical work may only be performed by adequately qualified personnel. Qualified personnel in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting and servicing of the product who possess the following qualifications:

- Training in mechanical engineering, e.g. as a mechanic or mechatronics technician (final examinations must have been passed).
- They are familiar with these operating instructions.

Any electronic work may only be performed by adequately qualified electricians. Qualified electricians in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting and servicing of the product who possess the following qualifications:

- Training in electrical engineering, e.g. as an electrician, electronics or mechatronics technician (final examinations must have been passed).
- They are familiar with these operating instructions.

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately.

All qualified personnel must wear appropriate protective clothing.

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2.4 Functional safety (FS)

Drives from SEW-EURODRIVE can optionally be supplied with safety-related components.

MOVIMOT®, encoders or brakes, or other accessories, can be integrated in the AC motor as safety-related components either individually or in combination.

SEW-EURODRIVE indicates such an integration by the FS logo and a number on the nameplate (→ 🗎 20).



The number is a code that indicates which components in the drive are safety-related. See the following code table for all products:

Functional safety	Inverter (e.g. MOVIMOT®)	Brake	Manual brake release monitoring	Brake monitoring	Motor protection	Encoder
02		x				
04						x
11		x				x

If the drive bears the FS logo on the nameplate, you must adhere to the information in the following documents:

- "MOVIMOT® MM..D – Functional Safety" manual
- Addendum to the operating instructions "Safety-Rated Encoders – DR..71 – 315, DRN80 – 315 AC Motors – Functional Safety"
- Addendum to the operating instructions "Safety-Rated Brakes – DR..71 – 315, DRN80 – 315 AC Motors – Functional Safety"

You find the characteristic safety values of the following components in the technical data (→ 🗎 183) section so you can determine the security level for systems and machines yourself:

- Characteristic safety values for brakes: $B10_d$ values
- Characteristic safety values for encoders: $MTTF_d$ values

The characteristic safety values of SEW-EURODRIVE components are also available on the homepage at www.sew-eurodrive.de and in the SEW-EURODRIVE library for the BGIA Sistema software.

2.5 Designated use

DR../DRN.. AC motors are intended for industrial systems.

When installed in machines, startup (i.e. start of designated operation) is prohibited until it is determined that the machine complies with the local laws and directives. In the individual area of application, you must especially observe the Machinery Directive 2006/42/EC as well as the EMC Directive 2004/108/EC. The EMC test specifications EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-6 and EN 61000-6-2 must be taken into account during startup.

Using these products in potentially explosive atmospheres is prohibited, unless specifically designated otherwise.

Air-cooled motors/gearmotors are dimensioned for ambient temperatures of -20 °C to +40 °C and installation altitudes ≤ 1000 m above sea level. Any differing specifications on the nameplate must be observed. The ambient conditions must comply with all the specifications on the nameplate.

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2.6 Other applicable documentation

2.6.1 DR..71 – 315, DRN80 – 315 AC motors

The following publications and documents have to be observed as well:

- Wiring diagrams provided with the motor
- "Gear Unit Series R..7, F..7, K..7, K..9, S..7, SPIROPLAN® W" operating instructions for gearmotors
- "AC Motors" catalog and/or
- "DRN.. AC Motors" catalog
- "DR.. Gearmotors" catalogs.
- Addendum to the operating instructions "Safety-Rated Brakes – DR..71 – 315, DRN80 – 315 AC Motors – Functional Safety" if necessary
- Addendum to the operating instructions "Safety-Rated Encoders – DR..71 – 315, DRN80 – 315 AC Motors – Functional Safety" if necessary
- "MOVIMOT® MM..D – Functional Safety" manual if necessary

2.7 Transport/storage

Inspect the shipment for damage as soon as you receive the delivery. Report any transport damage to the shipping company immediately. If necessary, suspend startup.

Tighten the eyebolts securely. They are designed to only carry the weight of the gear unit/motor/gearmotor; do not attach any additional loads.

The installed lifting eyebolts are in accordance with DIN 580. The loads and regulations specified in that document must always be observed. If two or four lifting eyes or eyebolts are attached to the gear unit/motor/gearmotor, all lifting eyes or eyebolts must be used during transport. In this case, the tension force vector of the slings must not exceed a 45° angle in accordance with DIN 580.

Use suitable, sufficiently rated handling equipment if necessary. Reattach these in the case of further transportation.

If the gear unit/motor/gearmotor is not installed immediately, it must be stored in a dry and dust-free storage location. You must not store the gear unit/motor/gearmotor outdoors or on the fan guard. The gear unit/motor/gearmotor can be stored for up to 9 months without requiring any special measures before startup.

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2.8 Installation

Make sure that the supports are even, the foot and flange mounting is correct and if there is direct coupling, align with precision. Resonances between the rotational frequency and the double line frequency caused by the structure are to be avoided. Release the brake (if installed), turn rotor manually, check for unusual grinding noise. Check the direction of rotation in decoupled state.

Only install or remove belt pulleys and couplings using suitable devices (heat up) and cover with a touch guard. Avoid improper belt tension.

Make the pipe connections that may eventually be required. Mounting positions with shaft ends pointing upwards should be equipped with a cover to prevent foreign objects from falling into the fan. Ensure that ventilation openings are not obstructed and that exhaust air, including air from adjacent units, cannot be drawn in again straight away.

Observe the notes in the "Mechanical installation" chapter.

2.9 Electrical connection

All work may only be carried out by qualified specialists. During work, the low-voltage machine must be at standstill, enabled and safeguarded against an accidental restart. This also applies to auxiliary circuits (e.g. anti-condensation heating or forced cooling fan).

Ensure that the unit is de-energized.

Exceeding the tolerances in EN 60034-1 (VDE 0530, part 1) – voltage + 5%, frequency + 2%, curve shape, symmetry – increases heating and influences electromagnetic compatibility. Also observe the standard EN 50110 (and, if applicable, other national regulations, such as DIN VDE 0105 for Germany).

Observe the wiring information and differing data on the nameplate as well as the wiring diagram in the terminal box.

The connection should be a permanent, secure electrical connection (no protruding wire ends); use the cable end pieces intended for this purpose. Establish a secure protective earth connection. When the motor is connected, the distances to non-insulated and live parts must not be shorter than the minimum values according to IEC 60664 and national regulations. With low voltage, the distances should be no shorter than the following values, in compliance with IEC 60664:

Nominal voltage V_N	Distance
≤ 500 V	3 mm
≤ 690 V	5.5 mm

The connection box must be free from foreign objects, dirt and moisture. Close unused cable entry openings and the box itself so they are dust and water proof. Secure key for test run without output elements. When operating low-voltage machines with brakes, check that the break is functioning correctly before startup.

Observe the notes in the "Electrical installation" chapter.

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2.10 Startup/operation

Whenever changes to normal operation occur in the gear unit/motor/gearmotor, such as increased temperatures, noise, vibrations, determine the cause. Consult the manufacturer if required. Never deactivate protection devices, even in test mode. Switch off the motor if you are not sure.

Regularly clean air ducts in dusty or dirty environments.

2.10.1 Surface temperature during operation



⚠ CAUTION

The surfaces of the drive can be very hot during operation.

Risk of burns.

- Make sure that hot surfaces cannot be touched unintentionally or during normal operation. Install covers or warning signs according to regulations.
- Let the unit cool down before you start working on it.

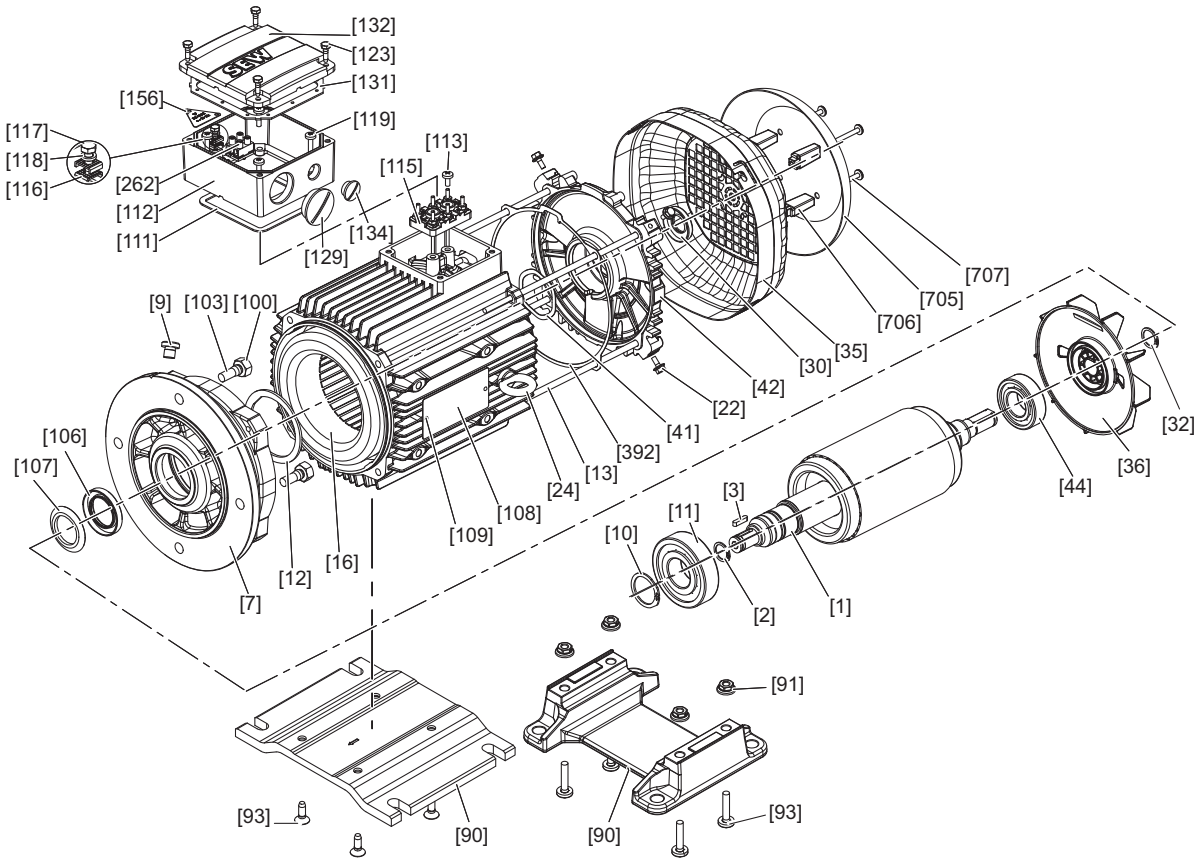
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3 Motor structure

INFORMATION

The following figures are block diagrams. Their purpose is to make it easier to assign components to the spare parts lists. Deviations are possible depending on the motor size and version.

3.1 Basic structure of DR..71 – 132/DRN80 – 132S



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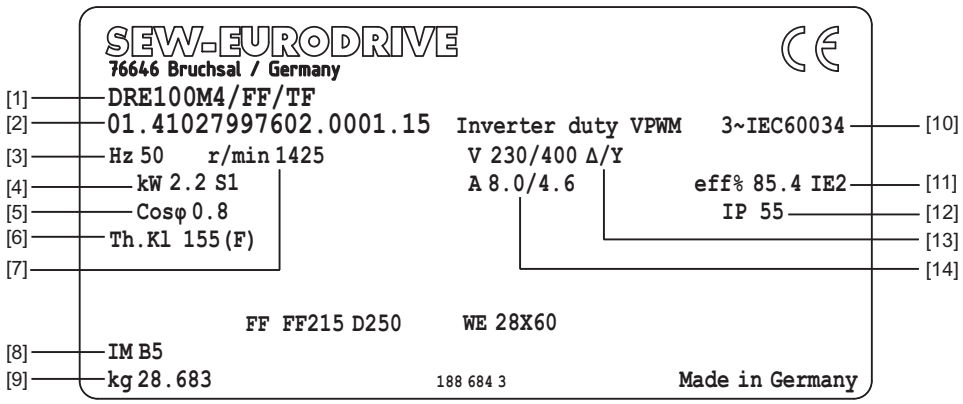
[1]	Rotor	[30]	Oil seal	[106]	Oil seal	[123]	Hex head screw
[2]	Retaining ring	[32]	Retaining ring	[107]	Oil flinger	[129]	Screw plug with O-ring
[3]	Key	[35]	Fan guard	[108]	Nameplate	[131]	Gasket for cover
[7]	Flanged endshield	[36]	Fan	[109]	Grooved pin	[132]	Terminal box cover
[9]	Screw plug	[41]	Shim washer	[111]	Gasket for lower part	[134]	Screw plug with O-ring
[10]	Retaining ring	[42]	B-side endshield	[112]	Terminal box lower part	[156]	Information sign
[11]	Deep groove ball bearing	[44]	Deep groove ball bearing	[113]	Pan head screw	[262]	Connection terminal, complete
[12]	Retaining ring	[90]	Bed plate	[115]	Terminal board	[392]	Gasket
[13]	Cap screw	[91]	Hex nut	[116]	Terminal yoke	[705]	Canopy
[16]	Stator	[93]	Pan head screw	[117]	Hex head screw	[706]	Spacer
[22]	Hex head screw	[100]	Hex nut	[118]	Lock washer	[707]	Pan head screw
[24]	Eyebolt	[103]	Stud	[119]	Pan head screw		

3.6 Nameplate

The marks on the upper edge of the nameplate are only present when the motor has been certified accordingly or when it includes the relevant components.

3.6.1 DRE.. motor nameplate

The following figure shows an example of a nameplate:

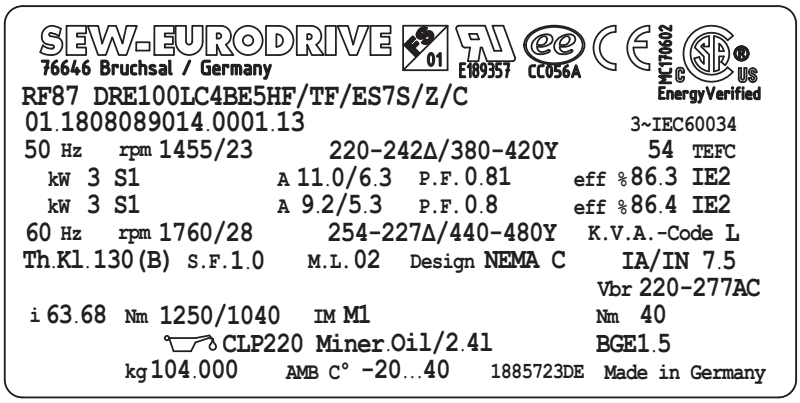


9007212456365451

[1] Type designation
[2] Serial number
[3] Nominal frequency
[4] Nominal power/duty type
[5] Power factor for AC motors
[6] Thermal class
[7] Nominal speed
[8] Mounting position
[9] Weight
[10] Number of phases and underlying rating and performance standards (IEC 60034-X and/or equivalent national standard)
[11] IE class and nominal efficiency for motors included in the scope of the IEC 60034-30-1 standard
[12] Degree of protection according to IEC 60034-5
[13] Nominal voltage
[14] Nominal current

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3.6.2 DRE.. global nameplate



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3.6.3 Markings

The following table lists all marks that can occur on a nameplate or on the motor and an explanation of what they mean.

Mark	Meaning
CE	CE mark to state compliance with European guidelines, such as the Low Voltage Directive
Ex	ATEX mark to state compliance with the European Directive 94/9/EC
UR	UR logo to confirm that UL (Underwriters Laboratory) is informed about the registered components; register number by UL: E189357
ee CC056A	DoE mark to confirm compliance with US-American efficiency limit values for AC motors
c UL us LISTED	UL logo to confirm that a component is UL (Underwriters Laboratory) tested, also valid for CSA in conjunction with the register number
CSA	CSA mark to confirm the Canadian Standard Association (CSA) and the market conformity of AC motors
MC170602 C SA US EnergyVerified	CSAe mark to confirm compliance with the Canadian efficiency limit values for AC motors
CCC	CCC logo to confirm the adherence to the Chinese regulation for small appliances
VIK	VIK mark to confirm the compliance with the directive of the German Association of Energy and Power Industry (V.I.K.)

Mark	Meaning
	FS mark with code number to identify functional safety relevant components
	EAC mark (EurAsian Conformity) Confirms compliance with the technical regulations of the economic and customs union of Russia, Belarus, Kazakhstan, Armenia.
	UkrSEPRO mark (Ukrainian Certification of Products) Confirms compliance with the technical regulations of the country Ukraine.
	Motors with this mark may only be operated with frequency inverter (VSD = Variable Speed Drive) according to regulation 640/2009.

3.6.4 Type designation

DR.., DRN.. AC brakemotor type designation

The following diagram shows a type designation example:

DRN132M4/BE11/HR/FI/TF	
DR	Series
N	Type designation
132	Size
M	Length
4	Number of poles
/BE11	Brake
/HR	Manual brake release
FI	Output option
TF	Thermal motor protection

Designation of the motors

Designation	
DRS..	Standard motor, Standard efficiency IE1
DRE..	Energy-efficient motor, High Efficiency IE2
DRP..	Energy-efficient motor, Premium Efficiency IE3
DRN..	Energy-efficient motor, Premium Efficiency IE3
DRL..	Asynchronous servomotor
DRK..	Single-phase operation with running capacitor
DRM..	Torque motor: AC motor for operation at speed n = 0
DR..J	Line start permanent magnet motor
71 – 315	Sizes: 71 / 80 / 90 / 100 / 112 / 132 / 160 / 180 / 200 / 225 / 315
K, S, M, L, MC, LC, ME, H, LS	Lengths
2, 4, 6, 8/2, 8/4, 4/2, 12	Number of poles

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3.7 Designs and options

3.7.1 Output variants

Designation	Option
/FI	IEC foot-mounted motor
/F.A, /F.B	Universal foot-mounted motor
/FG	7-series integral motor, as stand-alone motor
/FF	IEC flange-mounted motor with bore holes
/FT	IEC flange-mounted motor with threads
/FL	General flange-mounted motor (other than IEC)
/FM	7-series integral motor with IEC feet
/FE	IEC flange-mounted motor with bore and IEC feet
/FY	IEC flange-mounted motor with threads and IEC feet
/FK	General flange-mounted motor (deviating from IEC) with feet
/FC	C-face flange-mounted motor, dimensions in inch

3.7.2 Mechanical attachments

Designation	Option
/BE..	Spring-loaded brake with specification of size
/HR	Manual brake release of the brake, automatic re-engaging function
/HF	Manual brake release, lockable
/RS	Backstop
/MSW	MOVI-SWITCH®
/MM03 – MM40	MOVIMOT®
/MO	MOVIMOT® option(s)
/MI	Motor identification module for MOVIMOT®

3.7.3 Temperature sensor / temperature detection

Designation	Option
/TF	Temperature sensor (PTC thermistor or PTC resistor)
/TH	Thermostat (bimetallic switch)
/KY	1 KTY84 – 130 sensor
/PT	1 / 3 PT100 sensor(s)

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3.7.6 Ventilation

Designation	Option
/V	Forced cooling fan
/VH	Radial fan on fan guard
/Z	Additional inertia (flywheel fan)
/AL	Metal fan
/U	Non-ventilated (without fan)
/OL	Non-ventilated (closed B-side)
/C	Protection canopy for fan guard
/LF	Air filter
/LN	Low noise fan guard

3.7.7 Bearing

Designation	Option
/NS	Lubrication device
/ERF	Reinforced bearings on A-side with roller bearing
/NIB	Insulated bearing B-side

3.7.8 Condition monitoring

Designation	Option
/DUB	Diagnostic unit brake = brake monitoring
/DUE	Diagnostic Unit Eddy Current = Function and wear monitoring of the brake

3.7.9 Other additional features

Designation	Option
/DH	Condensation drain hole
/RI	Reinforced winding insulation
/RI2	Reinforced winding insulation with increased resistance against partial discharge
/2W	Second shaft end on the motor/brakemotor

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4 Mechanical installation

INFORMATION

Observe the safety notes in chapter 2 of these operating instructions for the mechanical installation.

If the nameplate of the drive bears the FS mark, also comply with the information on mechanical installation in the associated addenda to the operating instructions and/or the associated manual.

4.1 Before you start

NOTICE

The mounting position for installation must correspond to the specifications on the nameplate.

Only install the drive if the following conditions are met:

- The data on the nameplate of the drive corresponds with the voltage supply system or with the output voltage of the frequency inverter
- The drive is undamaged (no damage caused by transportation or storage)
- All transport protection has been removed
- You are certain that the following requirements have been met:
  - Ambient temperature between −20°C and +40°C

    Note that the temperature range of the gear unit may also be restricted (see gear unit operating instructions)

    Note that information on the nameplate may differ. It is essential that the operating conditions for the unit comply with the nameplate information.
  - No oil, acid, gas, vapors, radiation, etc.
  - Installation altitude max. 1000 m above sea level

    Observe the chapter Installation altitude (→ 🗎 59)
  - Note the limitations for encoders
  - Special design: Drive configured in accordance with the ambient conditions

The above mentioned information refers to standard orders. The conditions might be different when you order drives other than the standard. Observe any differing conditions in the order confirmation.

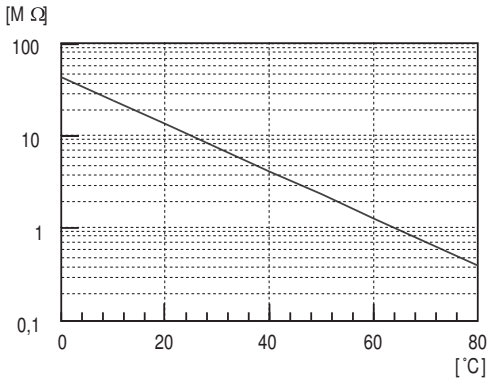
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4.2 Extended storage of motors

- Note that the service life of the lubricant in the ball bearings is reduced by 10% per year after the first year of storage.
- You should re-lubricate the lubrication devices on motors that have been in storage for longer than 5 years before startup. Observe the information on the motor lubricant plate.
- Check whether the motor has absorbed moisture as a result of being stored for a long time. Measure the insulation resistance for this purpose (measuring voltage 500 V).

The insulation resistance (see the following figure) varies greatly depending on the temperature. The motor must be dried if the insulation resistance is insufficient.



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If the measured resistance, depending on the ambient temperature, is in a range above the limit characteristic curve, the insulation resistance is sufficient. If the value is below the limit characteristic curve, the motor must be dried.

4.2.1 Drying the motor

Heating the motor either with warm air or via an isolation transformer:

- With warm air

  DR.. motors with rotor designation "J" may be dried with warm air only.

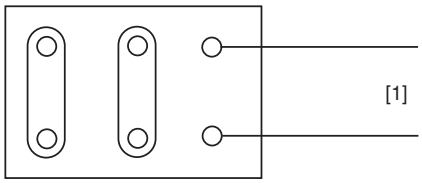
⚠ WARNING

The motor shaft may be subject to torque when drying via isolation transformer.

Possible injury.

- DR.. motors with rotor designation "J" may be dried with warm air only.

Connection with wiring diagram R13:



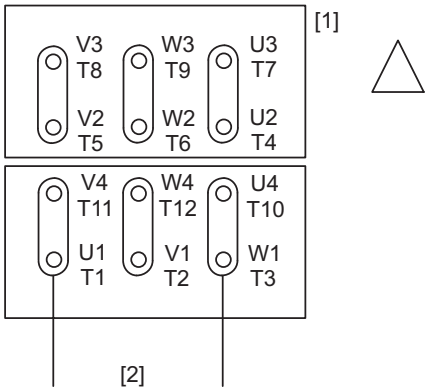
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[1] Transformer

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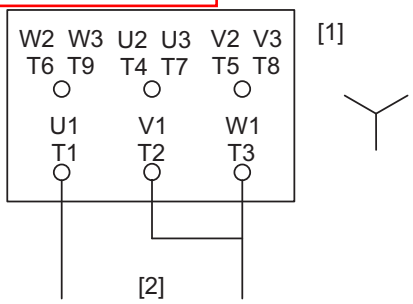
Connection with wiring diagram R72:



2343045259

[1] Motor terminal boards [2] Transformer

Connection with wiring diagram R76:



2343047179

[1] Motor terminal boards [2] Transformer

The drying process is finished when the minimum insulation resistance has been exceeded.

Check terminal box for the following:

- The inside is clean and dry
- The connections and fixing parts are free from corrosion
- The gasket and sealing surfaces are in good condition
- The cable glands are tight, otherwise clean or replace them
- Using an isolation transformer
  - Connect the windings in series (see following figures)
  - Auxiliary AC voltage supply max. 10% of the nominal voltage with max. 20% of the rated current

4.3 Motor installation notes



⚠ CAUTION

Sharp edges due to open keyway.

Minor injuries.

- Insert key in keyway.
- Pull protective sleeve over shaft.

NOTICE

Improper assembly may damage the drive and corresponding components.

Possible damage to property.

- Observe the following notes.

- Motor shaft ends must be thoroughly cleaned of anti-corrosion agents, contamination or similar (use a commercially available solvent). Do not allow the solvent to penetrate the bearings or sealing rings – this could damage the material.
- Only install the gearmotor in the specified mounting position on a level, vibration-free and torsionally rigid support structure.
- Align the motor and the driven machine carefully in order to prevent the output shaft from being exposed to unacceptable strain. Observe the permitted overhung and axial forces.
- Do not jolt or hammer the shaft end.
- Use an appropriate cover, e.g. motor option /C "Canopy", to prevent objects or fluids entering motors in vertical mounting positions (M4/V1).
- Check that there is sufficient clearance around the motor to provide for adequate cooling air supply, and that the motor does not suck in warm air from other devices.
- Balance components for subsequent mounting on the shaft with a half key (motor shafts are balanced with a half key).
- **Existing condensation drain holes are sealed with closing plugs. If contaminated, the condensation drain holes must be checked for proper functioning on a regular basis and cleaned if required.**
- If using brakemotors with manual brake release, screw in either the hand lever (with self-reengaging manual brake release) or the set screw (with lockable manual brake release).
- Protect shaft again against corrosion, if necessary.

INFORMATION



DR..: To mount motors with a foot made of aluminum, you have to use washers with at least twice the bolt diameter. Use bolts of strength class 8.8. Do not exceed the tightening torque according to VDI 2230-1.

DRN..: To mount motors with a foot made of aluminum, you have to use washers with an outer diameter that is at least twice the bolt diameter (e.g. DIN EN ISO 7090). Use bolts of strength class 8.8 up to max. 10.9. Tightening torque according to VDI 2230-1. The maximum bolt length for DRN80 – 90 = M8×20, for DRN100 – 132S = M10×25.

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4.3.1 Installation in damp locations or outdoors

- Use suitable cable glands for the incoming cable (use reducing adapters if necessary) according to the installation instructions.
- If possible, arrange the terminal box in such a way that the cable entries are pointing downwards.
- Seal the cable entry properly.
- Clean the sealing surfaces of the terminal box and the terminal box cover carefully before re-assembly; replace embrittled gaskets.
- If required, touch up the corrosion protection (especially at the eyebolts).
- Check the degree of protection.
- Protect the shaft against corrosion using a suitable anti-corrosion agent.

4.4 Installation tolerances

Shaft end	Flanges
Diameter tolerance according to EN 50347 • ISO j6 with Ø ≤ 28 mm • ISO k6 with Ø ≥ 38 mm up to ≤ 48 mm • ISO m6 at Ø ≥ 55 mm • Center bore in accordance with DIN 332, shape DR..	Centering shoulder tolerance in accordance with EN 50347 • ISO j6 with Ø ≤ 250 mm • ISO h6 with Ø ≥ 300 mm

4.5 Assembling the input elements

Drive components that are installed on the motor shaft end, e.g. pinions, must be warmed up prior to assembly in order to prevent damage, e.g. to the encoder of standalone motors.

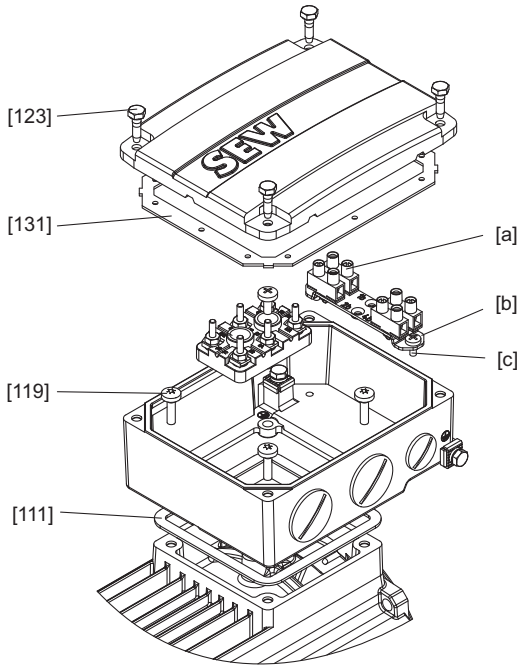
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4.10 Terminal box

4.10.1 Turning the terminal box

The following figure shows the structure of the terminal box design with terminal board:



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[111] Seal
[119] Terminal box retaining screws (4 x)
[123] Terminal box cover retaining screws (4 x)
[131] Seal
[a] Terminal
[b] Auxiliary terminal retaining screws (2 x)
[c] Retaining plate

Proceed as follows to turn the terminal box:

1. Loosen the screws [123] from the terminal box cover and remove the cover.
2. Remove the terminals [a], if available.
3. Unscrew the retaining screws [119] of the terminal box.
4. Clean the sealing surfaces at the stator shoulder as well as at the lower part and the cover of the terminal box.
5. Check the gaskets [111 and 131] for damage and replace them if necessary.
6. Position the terminal box as desired. Refer to the appendix for the arrangement of the auxiliary terminals.
7. Tighten the screws of the lower part of the terminal box with the following tightening torques:
   - **DR..71 – 132, DRN80 – 132S:** 5 Nm
   - **DR..160 – 225, DRN132M – 225:** 25.5 Nm

   Do not forget the retaining plate [c] if available.
8. Tighten the screws of the terminal box cover with the following tightening torques:
   - **DR..71 – 132, DRN80 – 132S:** 4 Nm

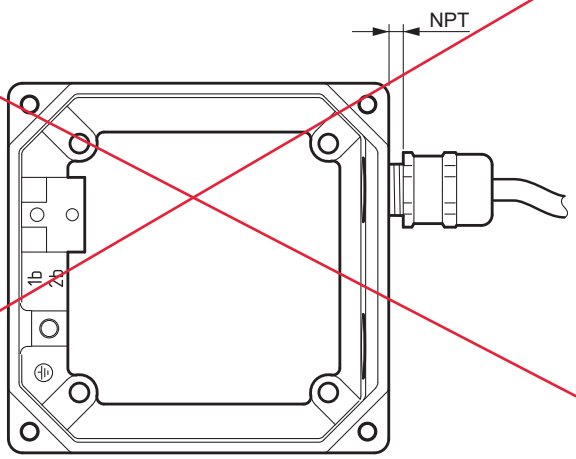
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- **DR..160, DRN132M/L:** 10.3 Nm
- **DR..180 – 225, DRN160 – 225 (aluminum design):** 10.3 Nm
- **DR..180 – 225, DRN160 – 225 (gray cast iron design):** 25.5 Nm

Make sure the gasket is seated properly.

4.10.2 Terminal box with NPT thread

In terminal boxes with NPT thread, cable glands cannot always be screwed in all the way (up to the O-ring).



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SEW-EURODRIVE recommends to seal the screw fitting with Teflon tape or Loctite®.

5 Electrical installation

If the motor includes safety-relevant components, observe the following safety note:

⚠ WARNING



Disabling functional safety devices.

Severe or fatal injuries.

- Only qualified personnel is allowed to carry out work on functional safety components.
- Any work on functional safety components must be carried out strictly in accordance with the specifications in the operating instructions at hand and the respective addendum to the operating instructions. Else, the right to claim under warranty will become invalid.

⚠ WARNING



Risk of injury due to electric shock.

Severe or fatal injuries.

- Observe the following notes.

- It is essential to comply with the safety notes in chapter 2 during installation!
- Switch contacts in utilization category AC-3 to EN 60947-4-1 must be used for switching the motor and the brake.
- Use switch contacts in utilization category DC-3 according to EN 60947-4-1 for switching the brake with DC 24 V.
- When motors are powered by inverters, you must adhere to the wiring instructions issued by the inverter manufacturer.
- Observe the operating instructions of the inverter.

5.1 Additional regulations

The generally applicable installation regulations for low-voltage electric equipment (such as DIN IEC 60364, DIN EN 50110) must be complied with when setting up electrical machinery.

5.2 Wiring diagrams and terminal assignment diagrams

Connect the motor only as shown in the wiring diagram(s) included with the motor. Do not connect or start up the motor if the wiring diagram is missing. The applicable wiring diagrams are available from SEW-EURODRIVE free of charge.

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5.3 Wiring notes

Adhere to the safety notes during installation.

5.3.1 Protecting the brake control system against interference

Brake cables must always be routed separately from other unshielded power cables with phased currents to prevent interference with brake control. In particular, power cables with phased currents include:

- Output cables from frequency inverters and servo inverters, soft-start units and brake units
- Incoming cables for braking resistors and similar options

For line-operated motors and when using AC and DC circuit cut-off, the connection between the brake rectifier and the external switch contact must be in a different power cable that is separate from the motor power supply.

5.3.2 Protecting the motor protection devices against interference

Adhere to the following points to protect SEW motor protection devices (TF temperature sensors) against interference:

- You may route separately shielded supply cables together with switched-mode power cables in one cable.
- Do not route unshielded supply cables together with switched-mode power lines in one cable.

5.4 Special aspects for operation with a frequency inverter

When motors are powered from inverters, you must observe the wiring instructions issued by the inverter manufacturer. You must also observe the operating instructions for the frequency inverter.

5.4.1 Motors with frequency inverters from SEW-EURODRIVE

We have tested operation of the motor on SEW-EURODRIVE frequency inverters. The required electric strength values of the motors were confirmed and the startup routines adjusted to the motor data. You can operate the DR../DRN.. motor with any frequency inverter from SEW-EURODRIVE. To do this, start up the motor as described in the operating instructions for the frequency inverter.

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5.10 Ambient conditions during operation

5.10.1 Ambient temperature

The temperature range of -20 °C to +40 °C must be ensured unless specified otherwise on the nameplate. Motors approved for use in higher or lower ambient temperatures have specific designations on the nameplate.

5.10.2 Installation altitude

The rated data specified on the nameplate applies to an installation altitude of maximum 1000 m above sea level. Installation altitudes of more than 1000 m above sea level must be taken into account for project planning of motors and gearmotors.

5.10.3 Hazardous radiation

Motors must not be subjected to hazardous radiation (such as ionizing radiation). Consult SEW-EURODRIVE, if necessary.

5.10.4 Hazardous gases, vapors and dusts

The DR../DRN.. AC motors are equipped with gaskets that are suitable for the designated use.

If the motor is operated in environments with high environmental impact, such as increased ozone values, the DR../DRN.. motors can be optionally equipped with gaskets of a higher quality. If you have doubts regarding the stability of the gaskets in connection with the respective environmental impacts, consult SEW-EURODRIVE.

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5.11 Notes regarding the connection of the motor

INFORMATION

It is essential to comply with the valid wiring diagram. Do not connect or start up the motor if this wiring diagram is missing. The applicable wiring diagrams are available from SEW-EURODRIVE free of charge.

INFORMATION

The terminal box must be free from foreign objects, dirt and humidity. Unused cable entry openings and the terminal box itself must be closed so they are dust and water-proof.

Observe the following points when connecting the motor:

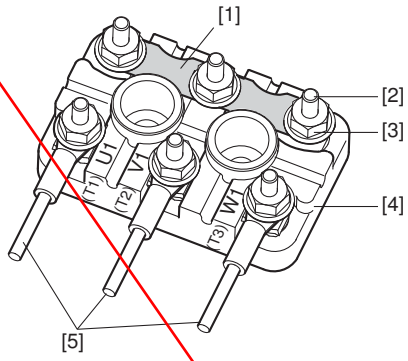
- Check cable cross section
- Arrange terminal links correctly
- Screw on the connections and the PE conductor correctly
- Make sure that the connection cables are not cramped to avoid damage to the cable insulation.
- Observe air gaps, see chapter "Electrical connection"
- In the terminal box: Check winding connections and tighten them if necessary
- Perform the connection in accordance with the enclosed wiring diagram
- Avoid protruding wire ends
- Connect the motor according to the prescribed direction of rotation

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5.12 Connecting the motor via terminal block

5.12.1 According to wiring diagram R13

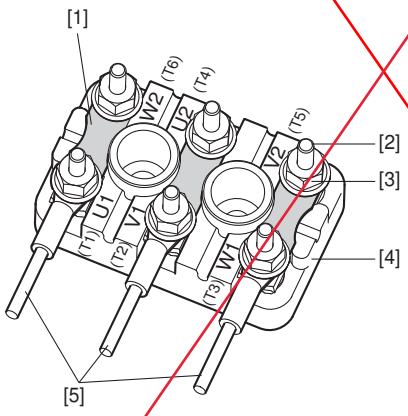
Arrangement of terminal links with ⅄ connection



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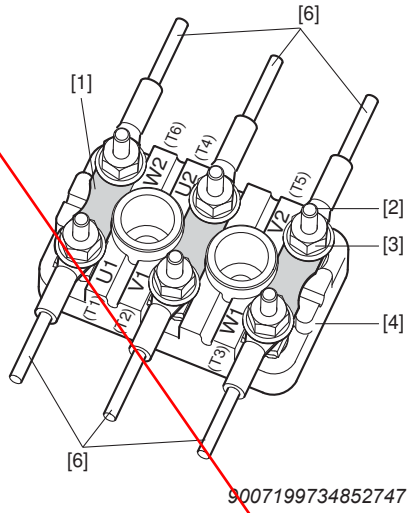
Arrangement of terminal links with △ connection

Motor size DR..71 – 280, DRN80 – 280:
(Single-sided supply)



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Motor size DR../DRN250 – 315:
(Double-sided supply)



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[1] Terminal link
[2] Terminal stud
[3] Flange nut
[4] Terminal board
[5] Customer connection
[6] Customer connection with divided connection cable

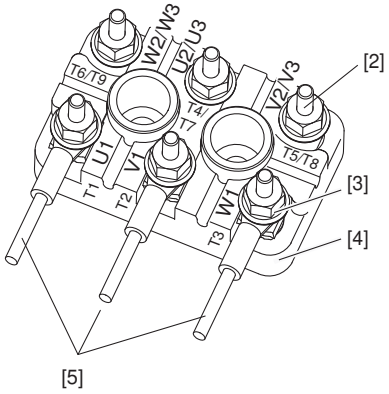
INFORMATION

For DR../DRN250 – 315 motors, SEW-EURODRIVE recommends a double-sided supply for load currents higher than

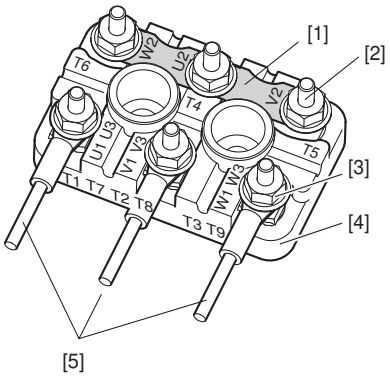
- M12: 250 A
- M16: 315 A

5.12.2 According to wiring diagram R76

Arrangement of terminal links with ⅄ connection



Arrangement of terminal links with ⅄⅄ connection



[1] Terminal link
[2] Terminal stud
[3] Flange nut
[4] Terminal board
[5] Customer connection

INFORMATION

Three winding lead ends must be rewired to change from high to low voltage:

The lines designated U3 (T7), V3 (T8) and W3 (T9) must be reconnected.

- U3 (T7) from U2 (T4) to U1 (T1)
- V3 (T8) from V2 (T5) to V1 (T2)
- W3 (T9) from W2 (T6) to W1 (T3)

→ Changing from low to high voltage is carried out in reverse order. In both cases, the customer connection is made to U1 (T1), V1 (T2) and W1 (T3). You can change the direction of rotation by interchanging 2 supply cables.

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5.12.4 Connection variants via terminal block

The motors are supplied and connected differently depending on the electrical design. Arrange the terminal links as shown in the wiring diagram and screw them on firmly. Observe the tightening torques specified in the following tables.

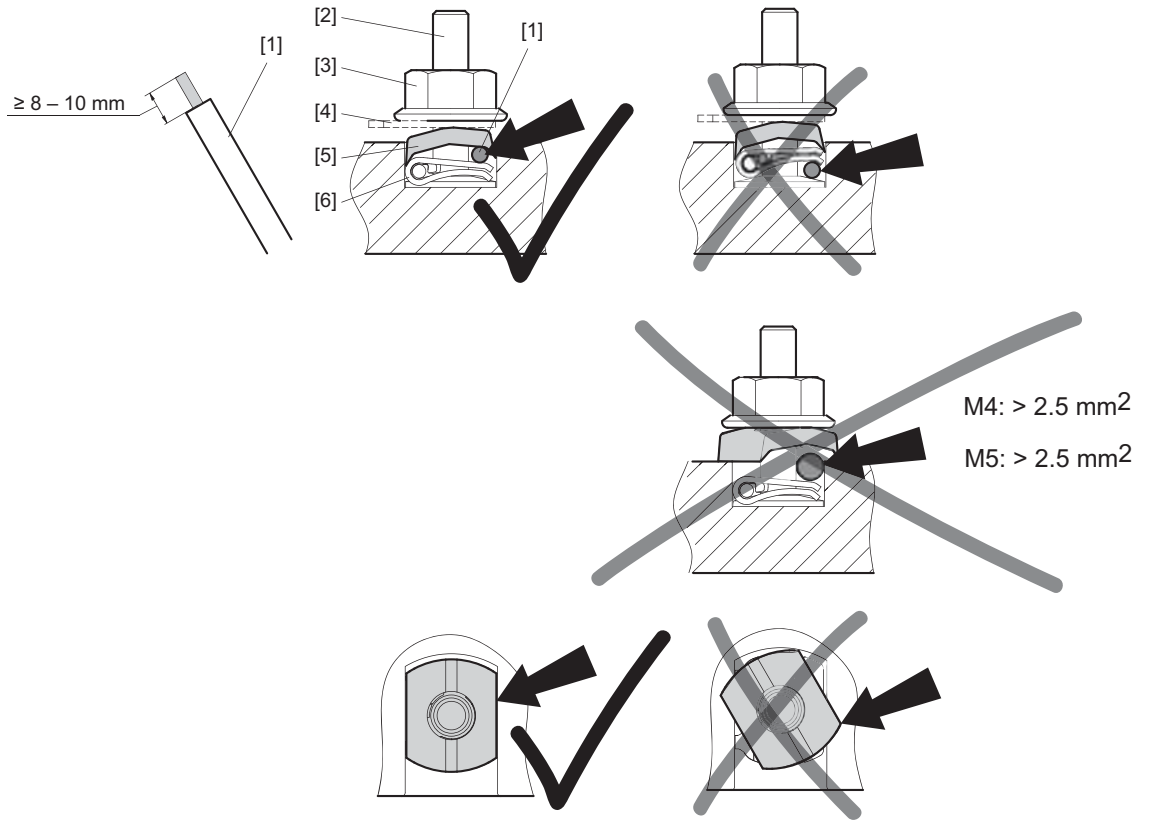
Motor size DR..71 – 100, DRN80 – 100							
Terminal studs	**Tightening torque hex nut**	**Connection**	**Design**	**Connection type**	**Scope of delivery**	**PE connection screw**	**PE design**
Ø		**Cross section**				**Ø**	
M4	**1.6 Nm**	**≤ 1.5 mm²**	**1a**	**Conductor end sleeve**	**Pre-assembled terminal links**	M5	4
		≤ 2.5 mm²	**1a**	**Solid wire**	**Pre-assembled terminal links**		
		≤ 6 mm²	**1b**	**Ring cable lug**	**Pre-assembled terminal links**		
		≤ 6 mm²	2	Ring cable lug	Connection accessories enclosed		
M5	2.0 Nm	≤ 2.5 mm²	1a	Solid wire Conductor end sleeve	Pre-assembled terminal links		
		≤ 16 mm²	1b	Ring cable lug	Pre-assembled terminal links		
		≤ 16 mm²	2	Ring cable lug	Connection accessories enclosed		
M6	3.0 Nm	≤ 35 mm²	3	Ring cable lug	Connection accessories enclosed		

Motor size DR..112 – 132, DRN112 – 132S							
Terminal studs	**Tightening torque hex nut**	**Customer connection**	**Design**	**Connection type**	**Scope of delivery**	**PE connection screw**	**PE design**
Ø		**Cross section**				**Ø**	
M5	**2.0 Nm**	**≤ 2.5 mm²**	**1a**	**Solid wire Conductor end sleeve**	**Pre-assembled terminal links**	M5	4
		≤ 16 mm²	**1b**	**Ring cable lug**	**Pre-assembled terminal links**		
		≤ 16 mm²	2	Ring cable lug	Connection accessories enclosed		
M6	3.0 Nm	≤ 35 mm²	3	Ring cable lug	Connection accessories enclosed		

Motor size DR..160, DRN132M/L							
Terminal stud	**Tightening torque hex nut**	**Customer connection**	**Design**	**Connection type**	**Scope of delivery**	**PE connection screw**	**PE design**
Ø		**Cross section**				**Ø**	
M6	**3.0 Nm**	**≤ 35 mm²**	**3**	**Ring cable lug**	**Connection accessories enclosed**	M8	5
M8	6.0 Nm	≤ 70 mm²	3	Ring cable lug	Connection accessories enclosed	M10	5

Motor size DR..180 – 225, DRN160 – 225							
Terminal studs	**Tightening torque hex nut**	**Customer connection**	**Design**	**Connection type**	**Scope of delivery**	**PE terminal stud**	**PE design**
Ø		**Cross section**				**Ø**	
M8	**6.0 Nm**	**≤ 70 mm²**	**3**	**Ring cable lug**	**Connection accessories enclosed**	M8	5
M10	10 Nm	≤ 95 mm²	3	Ring cable lug	Connection accessories enclosed	M10	5
M12	15.5 Nm	≤ 95 mm²	3	Ring cable lug	Connection accessories enclosed	M10	5

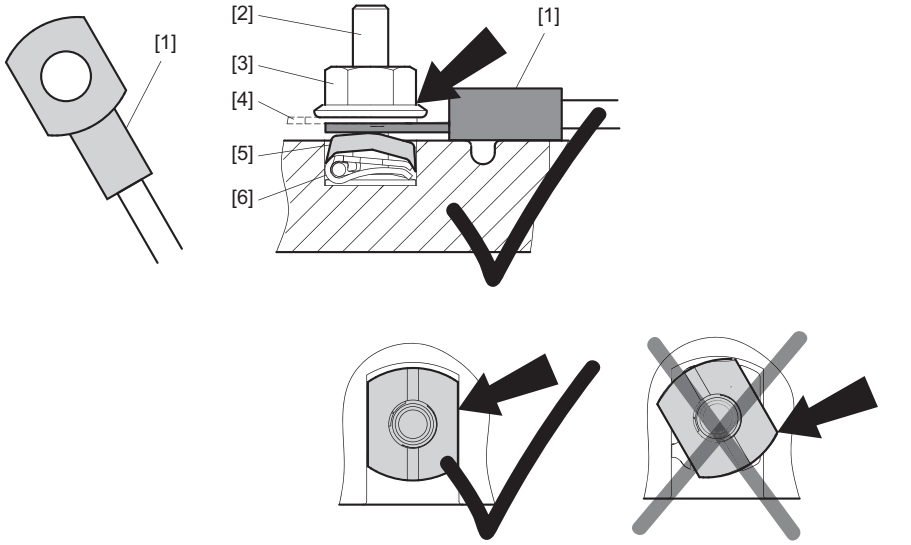
Variant 1a



27021597853089931

[1] External connection
[2] Terminal stud
[3] Flange nut
[4] Terminal link
[5] Terminal washer
[6] Winding connection with Stocko terminal

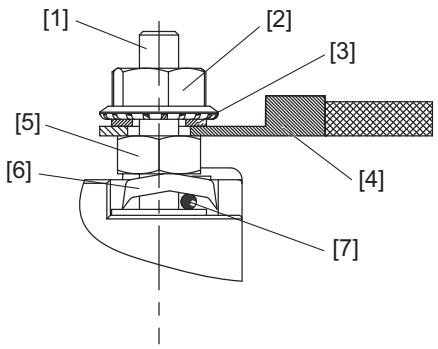
Variant 1b:



18014398598346763

[1] External connection with ring cable lug, according to DIN 46237 or DIN 46234, for example
[2] Terminal stud
[3] Flange nut
[4] Terminal link
[5] Terminal washer
[6] Winding connection with Stocko terminal

Variant 2

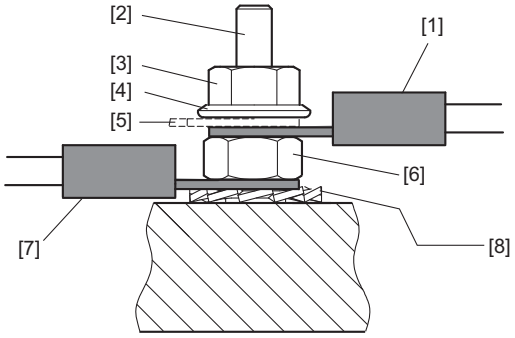


9007199440180363

[1] Terminal board
[2] Flange nut
[3] Terminal link
[4] External connection with ring cable lug, according to DIN 46237 or DIN 46234, for example
[5] Bottom nut
[6] Terminal washer
[7] Winding connection

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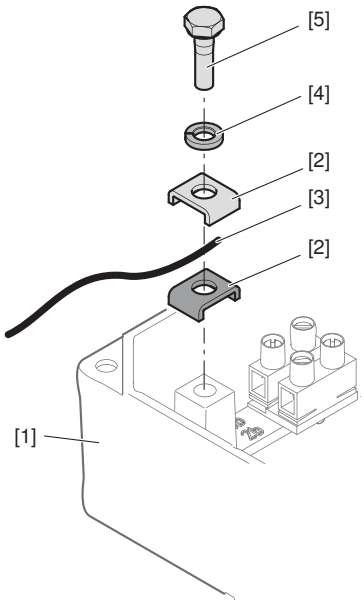
Variant 3

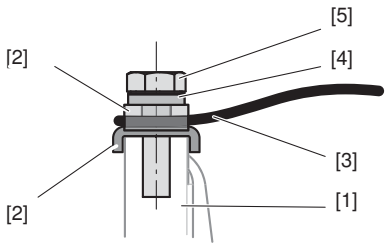


9007199454382091

[1] External connection with ring cable lug, according to DIN 46237 or DIN 46234, for example
[2] Terminal stud
[3] Upper nut
[4] Washer
[5] Terminal link
[6] Bottom nut
[7] Winding connection with ring cable lug
[8] Serrated lock washer

Variant 4

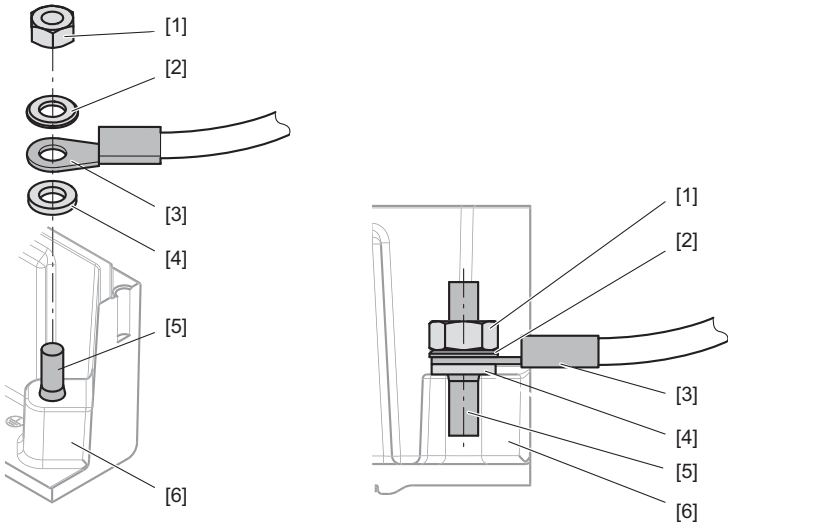




9007200394347659

[1] Terminal box
[2] Terminal clip
[3] PE conductor
[4] Lock washer
[5] Hex head screw

Variant 5



[1] Hex nut
[2] Washer
[3] PE conductor on cable lug
[4] Serrated lock washer
[5] Stud
[6] Terminal box

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6 Startup

INFORMATION

- Observe the safety notes in chapter 2 during installation.
- In case of problems, refer to the chapter "Malfunctions" (→ 🗎 185).

If the motor includes safety-relevant components, observe the following safety note:

⚠ WARNING

Disabling functional safety devices.

Severe or fatal injuries.

- Only qualified personnel is allowed to carry out work on functional safety components.
- Any work on functional safety components must be carried out strictly in accordance with the specifications in the operating instructions at hand and the respective addendum to the operating instructions. Else, the right to claim under warranty will become invalid.

⚠ WARNING

Risk of injury due to electric shock.

Severe or fatal injuries.

- Observe the following notes.
- Use switch contacts in utilization category AC-3 according to EN 60947-4-1 for switching the motor.
- When motors are powered by inverters, you must adhere to the wiring instructions issued by the inverter manufacturer.
- Observe the operating instructions of the inverter.

⚠ CAUTION

The surfaces of the drive can be very hot during operation.

Risk of burns.

- Let the motor cool down before you start your work.

NOTICE

The specified maximum limit torque (M_{pk}) and the maximum current (I_{max}) may not be exceeded, not even for acceleration.

Possible damage to property.

- Limit the maximum current at the inverter.

INFORMATION

Limit the maximum speed at the inverter. For information on the procedure, refer to the documentation of the inverter.

INFORMATION

When using the DR..250/280, DRN250/280 AC motor **with the BE brake and an encoder**, note the following:

- The brake must be used as a holding brake only.
- The brake may only be applied when the speed is ≤ 20 1/min. For higher speeds, please contact SEW-EURODRIVE.
- Emergency stops from a higher motor speed are allowed.

6.1 Before startup

Prior to startup make sure that

- The drive is undamaged and not blocked.
- Any transport locks have been removed.
- The measures stipulated in chapter "Extended storage of motors" (→ 🗎 28) are performed after extended storage periods.
- All connections have to be made correctly.
- The direction of rotation of the motor/gearmotor is correct
  - Motor rotating clockwise: U, V, W (T1, T2, T3) to L1, L2, L3
- All protective covers are installed correctly.
- All motor protection equipment is active and set for the rated motor current.
- There are no other sources of danger.
- The lockable manual brake release is permitted.
- Loose elements like keys are appropriately secured.

6.2 Motors with reinforced bearing

NOTICE

Bearings might be damaged due to missing overhung load.

The drive system might be damaged.

- Do not operate cylindrical roller bearings without overhung load.

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7 Inspection/maintenance



⚠ WARNING

Risk of crushing if the hoist falls or in the event of uncontrolled unit behavior.

Severe or fatal injuries.

- Secure or lower hoist drives (danger of falling)
- Safeguard and/or protect the driven machine against touching
- Isolate the motor, brake, and forced cooling fan, if installed, from the power supply before starting work, safeguarding them against unintentional re-start.
- Only use genuine spare parts in accordance with the valid spare parts list.
- Always install a new brake control system at the same time as replacing the brake coil.

If the motor includes safety-relevant components, observe the following safety note:



⚠ WARNING

Disabling functional safety devices.

Severe or fatal injuries.

- Only qualified personnel is allowed to carry out work on functional safety components.
- Any work on functional safety components must be carried out by strictly observing the specifications in the operating instructions at hand and the respective addendum to the operating instructions. Else, the right to claim under warranty will become invalid.



⚠ CAUTION

The surfaces of the drive can be very hot during operation.

Risk of burns.

- Let the motor cool down before you start your work.

NOTICE

Damage to the oil seals if the temperatures is too low during installation.

Possible damage to the oil seals.

- For assembly, the ambient temperature and the oil seals themselves may not be colder than 0 °C.



INFORMATION

Apply grease with a grease depot (Klüber Petamo GHY133N) to the lip of the oil seal before assembly.



INFORMATION

Friction disks in the brakemotor may only be replaced by SEW-EURODRIVE service staff.

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Only SEW-EURODRIVE repair workshops, or SEW plants that provide the necessary expertise may repair or modify the motor/brakemotor.

Before re-startup of the motor, make sure that all regulations are complied with and document this with a label on the motor or a written test report.

Always perform safety and functional checks following all maintenance and repair work (thermal protection).

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7.1 Inspection and maintenance intervals

The following table lists the inspection and maintenance intervals:

Unit / unit part	Time interval	What to do?
BE brake	• **If used as a working brake:** At least every 3000 operating hours[1)] • **If used as a holding brake:** Every 2 to 4 years, depending on operating conditions[1)]	Brake inspection • Measure the brake disk thickness • Brake disk, lining • Measure and adjust working air gap • Pressure plate • Driver/gearing • Pressure rings • Sucking off any abrasion • Inspect the switch contacts and replace them, if necessary (e.g. in case of burn-out)
Motor	• **Every 10000 operating hours**[2) 3)]	Inspect the motor: • Check rolling bearing and change if necessary. • Replace the oil seal • Clean cooling air ducts
Drive	• Different [3)]	• Touch up or renew the surface/corrosion protection • Check and clean the air filter. • if applicable, clean condensation drain hole at the bottom of the fan guard • Clean clogged bores

1) The amount of wear depends on many factors and may be high. The machine designer must calculate the required inspection/maintenance intervals individually in accordance with the project planning documents (e.g. "Project Planning for Drives").

2) For the DR../DRN250 – 315 with relubrication device, note the shortened relubrication periods in the chapter "Bearing lubrication DR../DRN250 – 315".

3) The interval depends on outer influences and can be very short, e.g. in the event of high dust concentration in the environment.

If you open the motor during inspection/maintenance, you have to clean it before you close it.

7.1.1 Connection cables

Check the connection cable for damage at regular intervals and replace if necessary.

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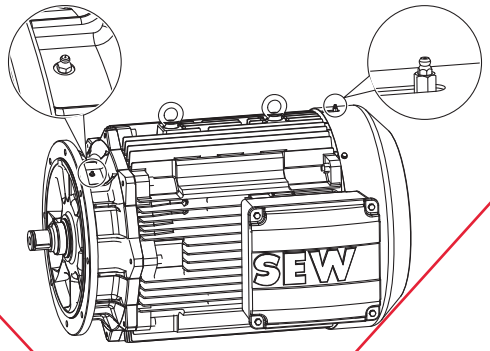
7.2 Bearing lubrication

7.2.1 Bearing lubrication DR..71 – 280, DRN80 – 280

In standard design, the bearings are lubricated for life.

7.2.2 Bearing lubrication DR..250 – 315, DRN250 – 315 with relubrication device /NS

Motors of sizes 250, 280, and 315 can be equipped with a relubrication device. The following figure shows the positions of the lubrication devices.



375353099

[1] Lubrication device in type A in accordance with DIN 71412

Under normal operating conditions and at an ambient temperature between -20 °C to +40 °C, SEW-EURODRIVE uses ESSO Polyrex EM (K2P-20 DIN 51825), a polyurea-based mineral high-performance, high-temperature grease for initial lubrication.

For motors in the low temperature range up to -40 °C SEW-EURODRIVE uses SKF GXN or LGHP2, which are also a polyurea-based mineral greases.

Relubrication

You can purchase the lubricants in 400 g cartridges from SEW-EURODRIVE. Refer to chapter Order information for lubricants and anti-corrosion agents (→ 🗎 176) for order information.

INFORMATION

Only mix lubricants of the same thickness type, the same base oil and the same consistency (NLGI class)!

Grease the motor bearings in accordance with the information on the lubricant plate. The used grease collects inside the motor and should be removed every 6 to 8 relubrication cycles during an inspection. Each time you relubricate, ensure that the bearing is two-thirds full.

After relubricating the motors, you should startup slowly, if possible, so that the grease is distributed evenly.

Re-lubrication period

The table below lists the bearing relubrication intervals for the following conditions:

- Ambient temperature -20 °C to +40 °C
- Rated speed that corresponds to that of a 4-pole AC motor
- normal load

At greater speeds, higher loads or higher ambient temperatures, the re-lubrication intervals are shorter. Use 1.5 times the quantity for the initial filling.

	Horizontal mounting position		Vertical mounting position	
Motor type	**Duration**	**Quantity**	**Duration**	**Quantity**
DR../DRN250 – 315 /NS	5000 h	50 g	3000 h	70 g
DR../DRN250 – 315 /ERF /NS	3000 h	50 g	2000 h	70 g

7.3 Reinforced bearings

In the /ERF (reinforced bearings) option, cylindrical rolling bearings are installed on the A-side.

NOTICE

Bearings might be damaged due to missing overhung load.

The drive system might be damaged.

- Do not operate cylindrical roller bearings without overhung load.

The reinforced bearings are only offered with the /NS (relubrication) option so as to facilitate optimal lubrication of the bearing. Observe the notes on bearing lubrication in chapter Bearing lubrication DR..250 – 315, DRN250 – 315 with relubrication device / NS (→ 🗎 101).

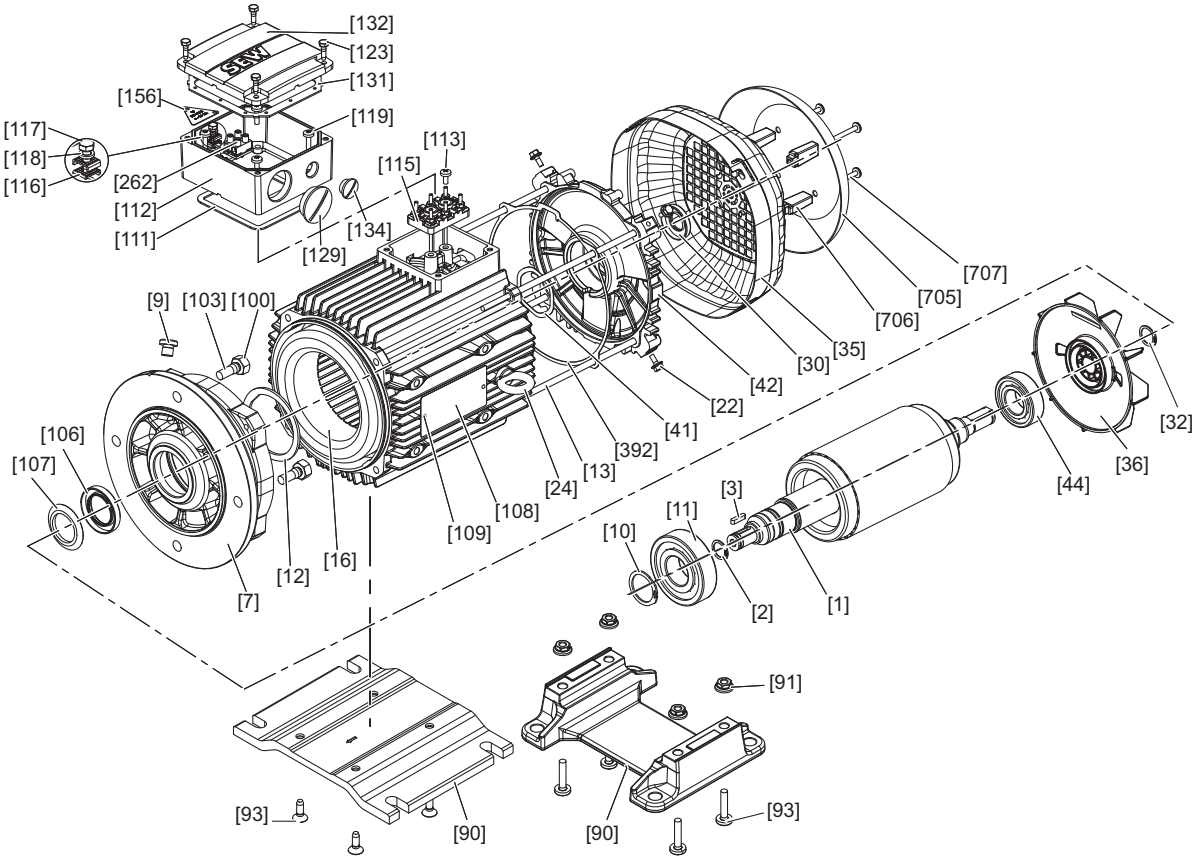
7.4 Corrosion protection

If a drive is equipped with the /KS corrosion protection option and IP56 or IP66, you have to replace the Hylomar at the studs.

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7.6 Inspection/maintenance of DR..71 – 315, DRN80 – 315 motors

7.6.1 Basic structure of DR..71 – 132/DRN80 – 132S



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[1]	Rotor	[30]	Oil seal	[106]	Oil seal	[123]	Hex head screw
[2]	Retaining ring	[32]	Retaining ring	[107]	Oil flinger	[129]	Screw plug with O-ring
[3]	Key	[35]	Fan guard	[108]	Nameplate	[131]	Gasket for cover
[7]	Flanged endshield	[36]	Fan	[109]	Grooved pin	[132]	Terminal box cover
[9]	Screw plug	[41]	Shim washer	[111]	Gasket for lower part	[134]	Screw plug with O-ring
[10]	Retaining ring	[42]	B-side endshield	[112]	Terminal box lower part	[156]	Information sign
[11]	Deep groove ball bearing	[44]	Deep groove ball bearing	[113]	Pan head screw	[262]	Connection terminal, complete
[12]	Retaining ring	[90]	Bed plate	[115]	Terminal board	[392]	Gasket
[13]	Cap screw	[91]	Hex nut	[116]	Terminal yoke	[705]	Canopy
[16]	Stator	[93]	Pan head screw	[117]	Hex head screw	[706]	Spacer
[22]	Hex head screw	[100]	Hex nut	[118]	Lock washer	[707]	Pan head screw
[24]	Eyebolt	[103]	Stud	[119]	Pan head screw		

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7.6.6 Inspection steps for DR..71 – 315, DRN80 – 315 motors



⚠ WARNING

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Isolate the motor and forced cooling fan, if installed, from the power supply before starting work, safeguarding them against unintentional re-start.
- Carefully observe the steps described below.

1. Remove forced cooling fan and rotary encoder, if installed.

   See chapter "Motor and brake maintenance – preliminary work" (→ 🗎 103).
2. With gearmotors: Remove the motor from the gear unit.

   Remove pinion and oil flinger [107].
3. Remove fan guard [35] and fan [36].
4. Remove stator:
   - **Size DR..71 – 132, DRN80 – 132S:** Remove cap screws [13] from flanged endshield [7] and B-side endshield [42]. Remove stator [16] from flanged endshield [7].
   - **Size DR..160 – 180, DRN132M – 180:** Loosen cap screws [19] and remove B-side endshield [42]. Loosen hex head screw [15] and remove stator from flanged endshield.
   - **Size DR..200 – 225, DRN200 – 225**
   – Loosen hex head screw [15] and remove the flanged endshield [7] from the stator.
   – Loosen cap screws [19] and remove the complete rotor [1] together with the B-side endshield [42].
   – Loosen cap screws [25] and remove the complete rotor [1] from the B-side endshield [42].
   - **Size DR..250 – 280, DRN250 – 280 without** /ERF or /NS option
   – Loosen cap screws [15] and remove the flange [7].
   – Loosen cap screws [19] and remove the B-side endshield [42] together with the rotor [1].
   – Loosen cap screws [25] and remove the B-side endshield [42] from the rotor [1].
   - **Size DR..250 – 280, DRN250 – 280** with /ERF or /NS option or **DR../DRN315**
   – Unfasten cap screws [19] and [25], and remove B-side endshield [42].
   – Loosen cap screws [15] and remove the flange [7] together with the rotor [1].
   – Loosen hex head screws [609] and remove the flange [7] from the rotor [1].
   – Before disassembly, preferably protect the oil seal seat from damage using adhesive tape or a protective sleeve.
5. Visual inspection: Are there traces of gear oil or moisture inside the stator?
   - If not, proceed with step 8.
   - If there is moisture, proceed with step 6.
   - If there is gear oil, have the motor repaired by a specialist workshop

6. If there is moisture inside the stator:
   - With gearmotors: Remove the motor from the gear unit.
   - With motors without a gear unit: Remove A-flange.
   - Remove the rotor [1].
7. Clean the winding, dry it and check it electrically (see chapter "Drying the motor" (→ 🗎 28)).
8. Replace the rolling bearing [11], [44] with permitted rolling bearing types.

   See chapter "Permitted rolling bearing types" (→ 🗎 174).
9. **DR..250 – 280, DRN250 – 280 with** /ERF or /NS option or **DR../DRN315**
   - Fill the rolling bearing with grease until it is two thirds full. See chapter "Bearing lubrication" (→ 🗎 101).
   - Note: Place the oil seal flange [608] and [21] onto the rotor shaft before installing the bearings.
   - Starting on the A-side, mount the motor vertically.
   - Place the springs [105] and lubrication ring [604] into the bearing bore of the flange [7].
   - Hang the rotor [1] onto the B-side thread, and guide into the flange [7].
   - Fasten the oil seal flange [608] to the flange [7] using the hex head bolts [609].
10. Reseal the shaft:
    - A-side: Replace the oil seal [106].
    - B-side: Replace the oil seal [30].

      Coat the sealing lip with grease (Klüber Petamo GHY 133).
11. Reseal the stator seat:
    - Seal the sealing surface with duroplastic sealing compound (operating temperature -40 to +180 °C), such as "SEW L Spezial".
    - For sizes **DR..71 – 132, DRN80 – 132S**: Replace sealing [392].
    - For sizes **DR..71 – 132, DRN80 – 132S**: Change O-ring [1480] if it is deformed or damaged. As an alternative, use e.g. "SEW L Spezial" instead of the O-ring.
12. Install the motor and optional equipment.

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9 Malfunctions



⚠ WARNING

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- De-energize the motor before you start working on the unit.
- Secure the motor against unintended power-up.



⚠ CAUTION

The surfaces of the drive can be very hot during operation.

Risk of burns.

- Let the motor cool down before you start your work.

NOTICE

Improper troubleshooting measures may damage the drive.

Possible damage to property.

- Use only genuine spare parts in accordance with the valid spare parts list.
- Strictly observe the safety notes in the individual chapters.

9.1 Motor malfunctions

Fault	Possible cause	Measure
Motor does not start up	Supply cable interrupted	Check the connections and (intermediate) terminal points, correct if necessary
	Brake does not release	See chapter "Brake malfunctions"
	Supply cable fuse has blown	Replace fuse
	Motor protection (switch) has triggered	Check that the motor protection (switch) is set correctly; current specification is on the nameplate
	Motor protection does not trip	Check motor protection control
	Malfunction in control or in the control process	Observe the switching sequence; correct if necessary
Motor only starts with difficulty or does not start at all	Motor power designed for delta connection but connected in star	Correct the connection from star to delta; follow the wiring diagram
	Motor power designed for star-star connection but only connected in star	Correct the connection from star to star-star; follow the wiring diagram
	Voltage or frequency differs considerably from the setpoint, at least when switching on the motor	Provide better power supply system; reduce the power supply load; Check cross section of supply cable, replace with cable of larger cross section if necessary
Motor does not start in star connection, only in delta connection	Star connection does not provide sufficient torque	If the delta inrush current is not too high (observe the regulations of the power supplier), start up directly in delta; Check the project planning and use a larger motor or special design if necessary. Contact SEW-EURODRIVE.
	Contact fault on star/delta switch	Check the switch, replace if necessary; Check the connections
Incorrect direction of rotation	Motor connected incorrectly	Swap two phases of the motor supply cable
Motor hums and has high current consumption	Brake does not release	See chapter "Brake malfunctions"
	Winding defective	Send motor to specialist workshop for repair
	Rotor rubbing	
Fuses blow or motor protection trips immediately	Short circuit in the motor supply cable	Eliminate short circuit
	Supply cables connected incorrectly	Correct the wiring, observe the wiring diagram
	Short circuit in the motor	Send motor to specialist workshop for repair
	Ground fault on motor	
Severe speed loss under load	Motor overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Voltage drops	Check cross section of supply cable, replace with cable of larger cross section if necessary

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Fault	Possible cause	Measure
Motor heats up excessively (measure temperature)	Overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Insufficient cooling	Provide for cooling air supply or clear cooling air passages, retrofit forced cooling fan if necessary. Check the air filter, clean or replace if necessary
	Ambient temperature too high	Observe the permitted temperature range, reduce the load if necessary
	Motor in delta connection instead of star connection as intended	Correct the wiring, observe the wiring diagram
	Loose contact in supply cable (one phase missing)	Tighten loose contact, check connections, observe wiring diagram
	Fuse blown	Look for and rectify cause (see above); replace fuse
	Line voltage deviates from the rated motor voltage by more than 5% (range A) / 10% (range B).	Adjust motor to line voltage
	Nominal duty cycle (S1 to S10, DIN 57530) exceeded, e.g. caused by excessive starting frequency	Adjust the nominal duty cycle of the motor to the required operating conditions; consult a professional to determine the proper drive, if necessary
Excessively loud	Ball bearing compressed, dirty or damaged	Re-align motor and the driven machine, inspect rolling bearing and replace if necessary. See chapter "Permitted rolling bearing types" (→ 🗎 174).
	Vibration of rotating parts	Look for the case, possibly an imbalance; correct the cause, observe method for balancing
	Foreign objects in cooling air ducts	Clean cooling air ducts
	For DR.. motors with rotor designation "J": Load too high	Reduce load

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9.4 Customer service

Have the following information available if you require customer service assistance:

- Nameplate data (complete)
- Nature and extent of the problem
- Time the failure occurred and any accompanying circumstances
- Assumed cause
- Ambient conditions e.g.:
  - Ambient temperature
  - Humidity
  - Installation altitude
  - Dirt
  - etc.

9.5 Disposal

Dispose of the motors in accordance with the material structure and the regulations in force:

- Iron
- Aluminum
- Copper
- Plastics
- Electronic parts
- Oil and grease (not mixed with solvents)

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Motor data sheet

1	**Designation**	
1.1	Manufacturer	SEW Eurodrive GmbH & Co KG
1.2	Type	DRS71S4
1.3	Mounting position	M4
1.4	Electrical standard	North America (USA/Canada)
1.5	Connection diagram	R76
1.6	Efficiency class	-
1.7	Equivalent IEC frame size	71
1.8	Type of motor	three-phase induction motor
1.9	Duty type	S1
1.10	no. of phases	3
2	**Rating**	
2.1	Output power	0.37kW (0.5hp)
2.2	Speed	1700min^{-1}
2.3	Torque	2.1Nm (18.4lb-in)
2.4	Voltage	230/460V YY/Y
2.5	Current	1.84//0.92A
2.6	Frequency	60Hz
2.7	Power factor	0.69
2.8	Efficiency	72.0%
3	**Design**	
3.1	Degree of protection	IP66
3.2	Method of cooling	IC411 (self ventilated)
3.3	ambient temperature	-20°C to 40°C
4	**Operation characteristics**	
4.1	Starting torque ratio M_A/M_N	1.9
4.2	Pull-up torque ratio M_H/M_N	1.9
4.3	Pull-out torque ratio M_K/M_N	2.5
4.4	Locked rotor current ratio I_A/I_N	4.2
4.5	KVA letter (NEMA)	G
4.6	No load current (without gearbox)	1.34/0.67A
4.7	Perm. no-load starts BG	4800h^{-1}
4.8	Perm. no-load starts BGE	7600h^{-1}
4.9	max. stalltimes cold/hot	32/23s

Rev 01

Motor data sheet

5 Partial load characteristics

5.1

Perc. rated load	25%	50%	75%	100%	125%
Current [A]	1.44//0.72	1.5//0.75	1.64//0.82	1.84//0.92	2.14//1.07
Speed [min^{-1}]	1777	1754	1729	1700	1662
Power factor	0.31	0.46	0.59	0.69	0.76
Efficiency [%]	52.7	66.6	71.3	72.3	71.0

6 Winding and insulation

6.1	Connection	YY/Y
6.2	Winding resistance cold	26.3Ω @ 20°C (+/-10%)
6.3	Thermal class	F
6.4	Winding temp. rise	45K
6.5	Thermal protection	-

7 Design details

7.1	Direction of rotation	both
7.2	Inertia motor	0.000513kgm² (0.0122lb-ft²)
7.3	Inertia rotor	0.000494kgm² (0.0117lb-ft²)
7.4	motor weight net	7.9kg (17lb)

8 Standard bearing sizes

8.1	Bearing A stand-alone motor	6204
8.2	Bearing A gearmotor	6303
8.3	Bearing B	6203

Rev 01

PRODUCTFOCUS

SEW EURODRIVE

Motor Series DRS../DRN..
Modular AC Motors and Brakemotors

The low-inertia rotor design of SEW's squirrel-cage AC motor and brakemotor of the DRS.. and DRN.. series provides outstanding system stability, tight control, high-cycling capacity. In many cases, its high performance allows it to replace a servo motor.

With a patented dual coil design and specialized rectifiers, its electrically-released brake automatically engages during a power failure and delivers extremely fast stopping and starting times with minimal drift. Moreover, its low-noise operation and quiet braking make it perfectly suited for theater applications.

Every motor frame is available with multiple brake sizes to optimize cost. Select higher torque for a stopping brake or lower torque for a VFD holding brake. With its various connector options, the DRN motor is especially suitable for automotive manufacturers.

Standard Features

- 0.25 to 300 HP
- Efficiency per NEMA Premium MG1 Table 12-12, IEC60034-30-1, and CSA 390-10; IE3 ≥1.0 HP, IE1 <1.0 HP
- Inverter duty; meets or exceeds NEMA MG1, part 30/31
- Continuous duty, TEFC, 1.15 Service Factor @ constant speed
- Speed range: 10-60Hz (1:6), constant torque w/std fan, 1.0 SF, 4-pole, 40°C max. Motor wired 230V@60Hz or 460V@60Hz
- Speed range: 10-120Hz (1:12), constant torque w/std fan, 1.0 SF, 4-pole, 40°C max. Motor wired 230V@60Hz & 460V@120Hz*
- Low rotor inertia - high cycling, tight control
- Connection terminals (not pigtail)
- Double sealed or shielded bearings lubed for life
- Stainless steel nameplate
- UR, CSA Energy Efficient Verified, CE, NEMA Premium

Energy Verified

Mounting Styles

- Integral - for SEW gear units
- IEC flange
- IEC foot mount
- NEMA C-Face flange (size 56C - 256TC) - 4 pole



Insulation System

- Phase insulators - prevents phase-to-phase shorts
- Class H insulation (not available with UR rating)
- Slot liners - prevents winding-to-ground shorts
- Wire sleeves
- Voltage spike resistant per NEMA MG1-31.4.4.2, which states 1600 V peak at .1µs or larger rise time

Optional Features (see back)

- 50Hz, 60Hz, or 50/60Hz global motor
- High cycling, electrically-released brake
- Two or more brake sizes per motor
- Backstop
- Encoder - built-in or externally mounted
- IP55, IP65, IP56, and IP66 ingress protection
- OS2, OS4 external protection
- Encapsulated stator (<10 HP)
- Food Industry Option Package (IO1) + 2 year warranty
- Forced cooling fan for low frequency operation
- Thermostats, thermistors, KTY temperature sensors
- Low noise fan cover
- MOVIMOT® integrated frequency inverter
- Plug connectors for quick disconnect
- Cast iron high-inertia fan or aluminum fan
- Canopy on fanguard to prevent water/ice ingress (M4 mtg)
- FKM seal on motor shaft
- Hazardous Location certified per CSA 45341 for Class I Div 2 Grps A-D, Class II Div 2 Grps F&G

*When used with appropriately-sized VFD. Consider thermal limitations of an attached gear unit for motor speeds above 60Hz.

PRODUCTFOCUS

SEW EURODRIVE

Nomenclature / Options

DRS..	IE1 (<1 HP) size 71
DRN..	IE3 (≥1 HP) sizes 80 - 315
/AC../AS../AM.. /AD../AB../IS	Plug Connectors
/A_7Y or /A_7W	SSI or RS-485 absolute encoder
/AL	Aluminum fan (cold environment)
/BE	Electrically-released brake
/C	Canopy on fan guard
/DH	Condensation drain hole
/EI7_	Built-in encoder
/E_7C	Mounted HTL encoder
/E_7R	Mounted TTL (RS-422) encoder
/E_7S	Mounted Sin/cos encoder
/FC	NEMA C-Face flange
/FF	IEC Flange with through holes (B5)
/FG	Flange for integral gearmotor
/FI	IEC foot-mounted
/FL	Alternate IEC flange (B5)
/FT	IEC flange with threaded holes (B14)
HF	Brake Screw Release
HR	Brake Hand Release
-I01	Industry Option Package for Food
/LF	Air filter
/LN	Low noise fan guard
/MM..D	MOVIMOT® inverter
/RS	Backstop on motor
/TF	Thermistor (PTC) thermal protection
/TH	Thermostat thermal protection
/U	Non-ventilated (no fan)
/V	Separately wired cooling fan
/Z	High inertia flywheel fan (cast iron)
/2W	Extended shaft @ end of motor

OS Surface Protection

OSG	Dip Primer Acrylic Primer	Not a finish coat. User should apply additional coating
STD	Dip Primer Acrylic Top Coat	Indoors - clean atmosphere, heated buildings Ex: automobile industry, shops, airports
OS2	Dip Primer Acrylic Primer Acrylic Top Coat+UV	Outdoors - low pollution, rain Indoors - unheated with humidity, condensation, splashing water Ex: water treatment facility, amusement parks
OS4	Dip Primer Epoxy Primer Polyurethane Top Coat Polyurethane Clear Coat+UV	Outdoors - high pollution or salinity Indoors - pressure spray, chemical wash, brine Ex: breweries, food processing, chemical plants, dairies, outdoor coastal areas

About SEW-Eurodrive...

Our product is motion. Our focus is solutions. As a worldwide supplier of innovative gearing, motor, and electronic drive technology, we have been solving problems in large and small applications within virtually every industry for over 85 years.

We also specialize in reducing the total cost of ownership with our customer-specific energy saving solutions.

Globally, we have assembly centers in 48 countries, along with 15 manufacturing plants. Therefore, we are able to provide uniform quality standards and international application experience.

Locally, we provide final assembly and custom modifications plus assistance with project planning, startup, and training. All products are backed by our industry-leading 24/7 support program.

SEW-Eurodrive ... Driving the World

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www.seweurodrive.com

3 General Project Planning Notes

3.1 Standards and regulations

Conformity with standards

AC (brake)motors and servo (brake)motors from SEW-EURODRIVE conform to the relevant standards and regulations, in particular:

- IEC 60034-1, EN 60034-1
  Rotating electrical machinery, rating and performance.
- IEC 60034-2-1, EN 60034-2-1
  Rotating electrical machines, determining losses and efficiency.
- IEC 60034-9, EN 60034-9
  Rotating electrical machines, noise limits.
- IEC 60034-14, EN 60034-14
  Rotating electrical machines, vibration levels.
- IEC 60034-30
  Rotating electrical machines, classification of efficiency levels IE1, IE2, IE3.
- EN 60529, IEC60034-5, EN60034-5
  IP degrees of protection for enclosures.
- IEC 60072
  Dimensions and performance of rotating electrical machinery.
- EN 50262
  Metric threads of cable glands.
- EN 50347
  Standardized dimensions and power ranges.
- NEMA MGI efficiency tables

Rated data

The specific data of an asynchronous AC motor (AC squirrel cage motor) are:

- Size
- Rated power
- Duty cycle
- Rated speed
- Rated current
- Rated voltage
- Power factor cos φ
- Degree of protection
- Thermal class
- efficiency class
- NEMA design letter according to the starting torque only

3 Unit Designations and Versions

3.1 Unit designations for gear units and options

Helical gear units

RX..	Single-stage foot mounted version
RXF..	Single-stage B5 flange-mounted version
R..	Foot-mounted version
R..F	Foot-mounted and B5 flange-mounted version
RF..	B5 flange-mounted version
RZ..	B14 flange-mounted version
RM..	B5 flange-mounted version with extended bearing housing

Parallel shaft helical gear units

F..	Foot-mounted version
FA..B	Foot-mounted version and hollow shaft
FH..B	Foot-mounted and hollow shaft with shrink disc
FV..B	Foot-mounted version and hollow shaft with splined hollow shaft to DIN 5480
FF..	B5 flange-mounted version
FAF..	B5 flange-mounted version and hollow shaft
FHF..	B5 flange-mounted and hollow shaft with shrink disc
FVF..	B5 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480
FA..	Hollow shaft
FH..	Hollow shaft with shrink disc
FT..	Hollow shaft with TorqLOC® hollow shaft mounting system
FT..B	Foot-mounted hollow shaft with TorqLOC® hollow shaft mounting system
FV..	Hollow shaft with splined hollow shaft to DIN 5480
FAZ..	B14 flange-mounted version and hollow shaft
FHZ..	B14 flange-mounted and hollow shaft with shrink disc
FVZ..	B14 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480

Helical-bevel gear units

K..	Foot-mounted version
KA..B	Foot-mounted version and hollow shaft
KH..B	Foot-mounted version and hollow shaft with shrink disc
KV..B	Foot-mounted version and hollow shaft with splined hollow shaft to DIN 5480
KF..	B5 flange-mounted version
KAF..	B5 flange-mounted version and hollow shaft
KHF..	B5 flange-mounted and hollow shaft with shrink disc
KVF..	B5 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480
KA..	Hollow shaft

3.2 Unit designations for AC motors and options

AC motor series

Designation	
DRS..	Standard efficiency motor
DRE..	High efficiency motor
DRS	Premium efficiency motor
71 - 315	Sizes: 71 / 80 / 90 / 100 / 112 / 132 / 160 / 180 / 200 / 225 / 315
K - L	Lengths: K= very short / S = short / M = medium / L = long MC/LC = Rotors with copper cage
2, 4, 6, 8/2, 8/4	Number of poles

Unit designation DR: Output variants

Designation	Option
/FI	IEC foot-mounted motor with specification of shaft height
/FG	7 Series integral motor, as stand-alone motor
/FF	IEC flange-mounted motor with bore holes
/FT	IEC flange motor with threads
/FL	General flange-mounted motor (other than IEC)
/FM	7 series integral gearmotor with IEC feet, with specification of shaft height if required
/FE	IEC flange-mounted motor with bore holes and IEC feet, with specification of shaft height
/FY	IEC flange-mounted motor with thread and IEC feet, with specification of shaft height if required
/FK	General flange-mounted motor (other than IEC) with feet, with specification of shaft height if required
/FC	C-face flange-mounted motor, dimensions in inch

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Connection options

Designation	Option
/IS	Integrated plug connector
/ASB.	HAN 10ES plug connector on terminal box with two-clamp closure (cage clamps on motor end)
/ACB.	HAN 10E plug connector on terminal box with two-clamp closure (crimp contacts on motor end)
/AMB. /ABB. /ADB. /AKB.	HAN Modular 10B plug connector on terminal box with two-clamp closure (crimp contacts on motor end)
/ASE.	HAN 10ES plug connector on terminal box with single-clamp closure (cage clamps on motor end)
/ACE.	HAN 10ES plug connector on terminal box with single-clamp closure (crimp contacts on motor end)
/AME. /ABE. /ADE. /AKE.	HAN Modular 10B plug connector on terminal box with single-clamp closure (crimp contacts on motor end)
/KCC	Terminal strip with cage clamps (for DR.71 - DR.132)
/KC1	C1 profile compliant connection of the DR80 overhead trolley drive (VDI guideline 3643) (for DR71, 80)

Ventilation

Designation	Option
/V	Forced cooling fan
/Z	Additional inertia (flywheel fan)
/AL	Metal fan
/U	Non-ventilated (without fan) TENV
/OL	Non-ventilated (closed B side) TENV
/C	Protection canopy for the fan guard
/LF	Air filter
/LN	Low-noise fan guard (for DR.71 – 132)

Bearing

Designation	Option
/NS	Relubrication device (for DR.315 only)
/ERF	Reinforced bearing A-side with roller bearing (for DR.315 only)
/NIB	Insulated bearing B-side (for DR.315 only)

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Mechanical attachments

Designation	Option
BE..	Spring-loaded brake with specification of size
HR	Manual brake release of the brake, automatic disengaging function
HF	Manual brake release, lockable
/RS	Backstop
/MSW	MOVI-SWITCH®
/MI	Motor identification module for MOVIMOT®
/MM03 - MM40	MOVIMOT®
/MO	MOVIMOT® option(s)

Temperature sensor/temperature detection

Designation	Option
/TF	Temperature sensor (positive coefficient thermistor or PTC resistor)
/TH	Thermostat (bimetallic switch)
/KY	One KTY84 - 130 sensor
/PT	One / three PT100 sensor(s)

For detailed information, refer to page 300.

Encoder

Designation	Option
/ES7S /EG7S /EH7S /EV7S	Mounted speed sensor with sin/cos interface
/ES7R /EG7R /EH7R	Mounted speed sensor with TTL (RS-422) interface, V = 9 - 26 V
/EI7C	Mounted speed sensor with HTL interface
/EI76 /EI72 /EI71	Mounted speed sensor with HTL interface and 6 / 2 / 1 period(s)
/AS7W /AG7W	Mounted absolute encoder, RS-485 interface (multi-turn)
/AS7Y /AG7Y /AH7Y	Mounted absolute encoder, SSI interface (multi-turn)
/ES7A/EG7A	Mounting adapter for encoders from the SEW portfolio
/XV.A	Mounting adapter for non-SEW encoders
/XV..	Mounted non-SEW encoders

For detailed information, refer to page 285.

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Condition monitoring

Designation	Option
/DUB	Diagnostic unit brake = brake monitoring
/DUV	Diagnostic Unit Vibration = Vibration sensor

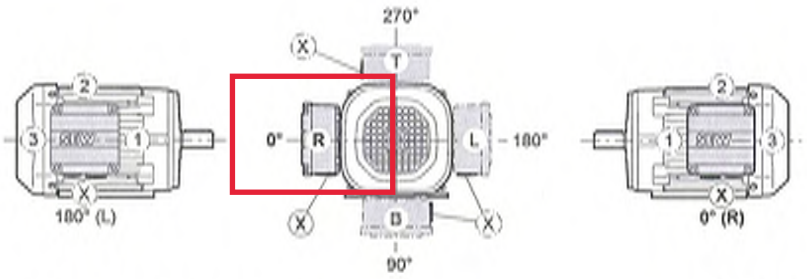
Other additional features

Designation	Option
/DH	Condensation drain hole
/RI	Reinforced winding insulation
/2W	2nd shaft end on the motor/brakemotor

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6.9 AC motor – mounting position designations

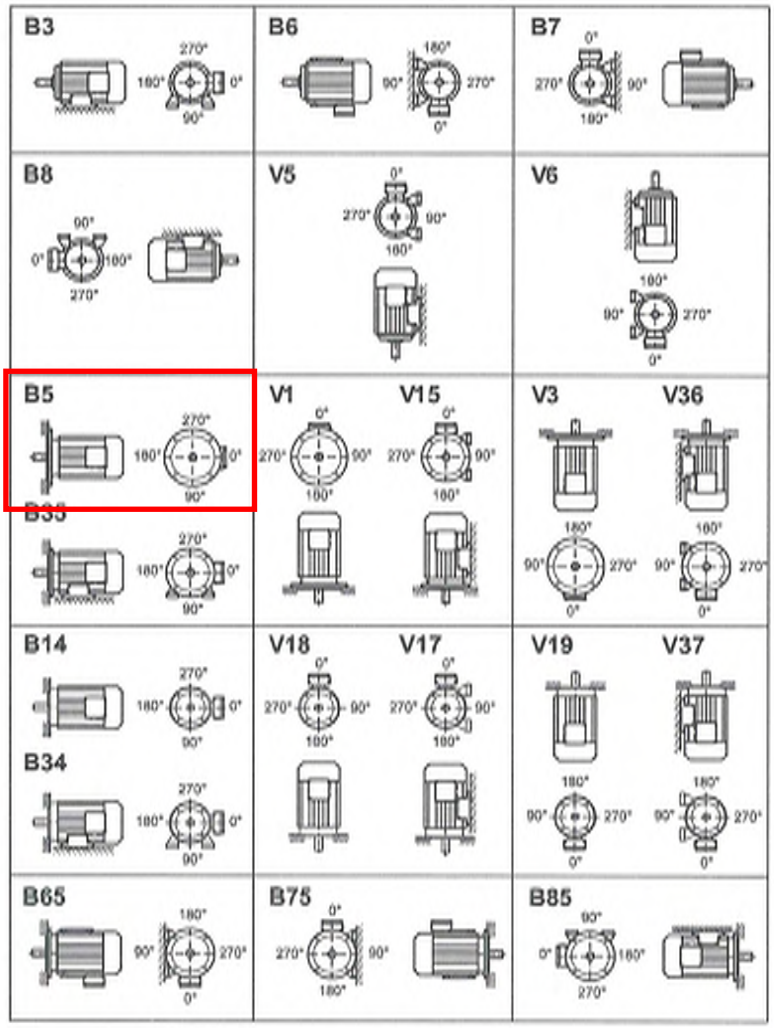
Position of motor terminal box and cable entry



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Figure 13: Position of terminal box and cable entry

Mounting positions



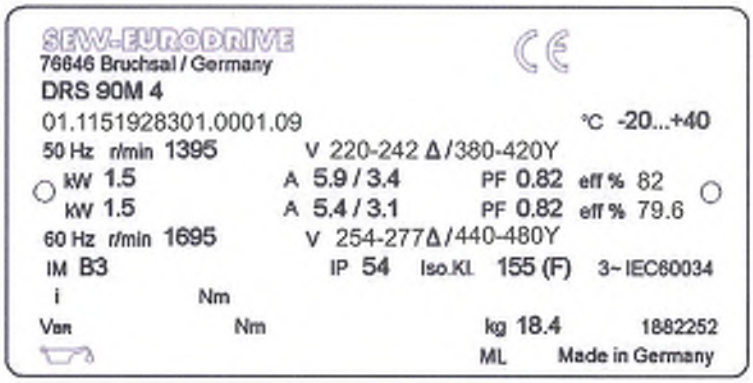
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Figure 14: AC motors mounting positions

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Example: DR motor nameplate.

EXAMPLE ONLY



65325axx

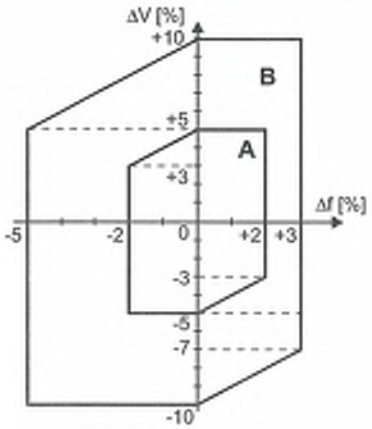
Tolerances

According to IEC 60034 (EN 60034), the following tolerances are permitted for electric motors with rated voltage (also applies to the rated voltage range):

Voltage and frequency		Tolerance A or tolerance B
Efficiency η	$P_N \leq 50$ kW $P_N > 50$ kW	$-0.15 \times (1-\eta)$ $-0.1 \times (1-\eta)$
Power factor cos φ		$-\frac{1-\cos\varphi}{6}$
Slip	$P_N < 1$ kW $P_N \geq 1$ kW	± 30 % ± 20 %
Starting current		+ 20 %
Tightening torque		- 15 % - + 25 %
Breakdown torque		- 10 %
Mass moment of inertia		± 10 %

Tolerance A, tolerance B

Tolerances A and B describe the permitted range within which the frequency and voltage are allowed to deviate from their respective rated points. The origin identified with "0" indicates the respective rated points for frequency and voltage.



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2 Important notes

2.1 Safety notes

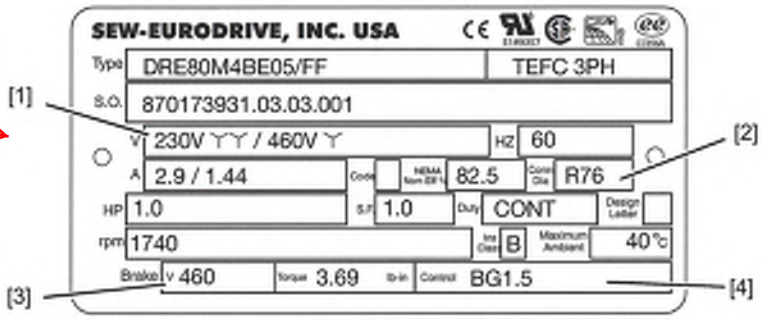
Refer to the Operating Instructions for safety and installation information. The latest version can be found at www.seweurodrive.com.

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

2.2 Motor nameplate

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

EXAMPLE ONLY



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

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

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

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

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Schaltbild/ Circuit diagram/ Schéma de branchement 68 217 00 10

Drehstrommotor / AC Motor / Moteur triphasé

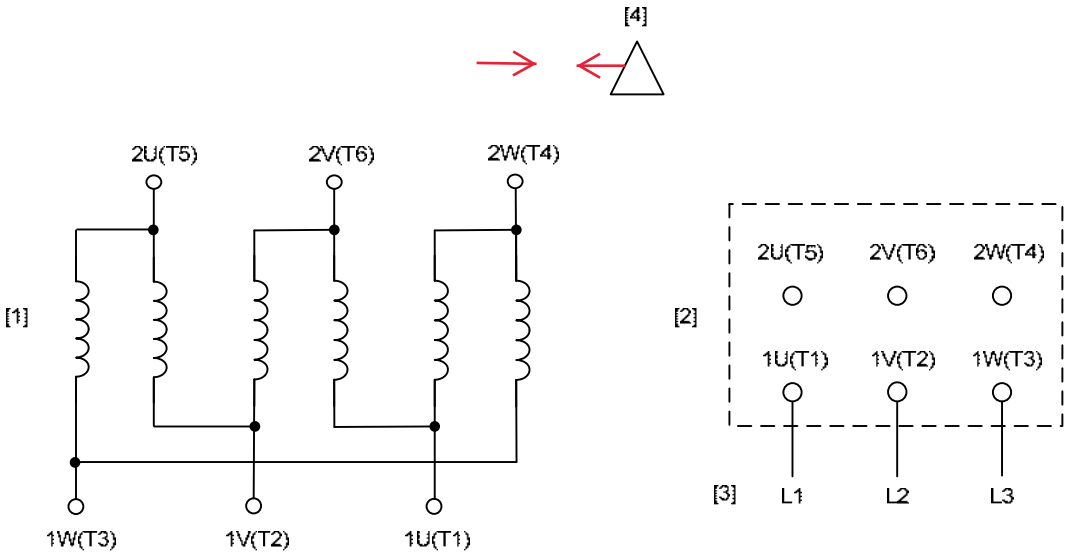
Polumschaltbar / Two-speed / Pôles commutables

Direkte Einschaltung / Direct on-line starting / Démarrage direct

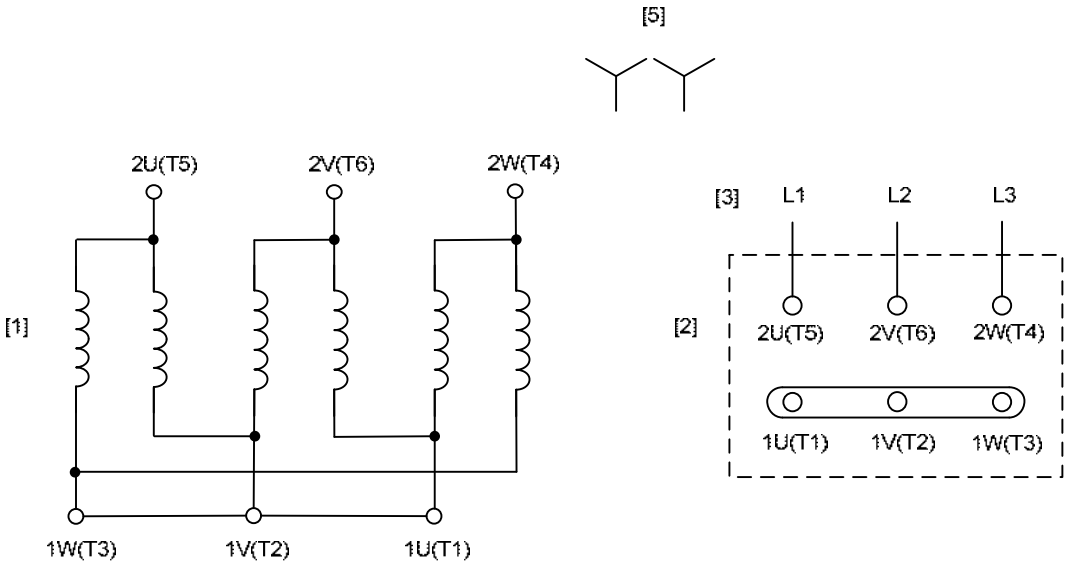
6 Klemmen, Dahlanderschaltung / 6 terminals, Tapped wound / 6 Plaque á bornes, Couplage Dahlander

Δ / YY

R33



68217 XX 10 01 00



68217 XX 10 02 00

[1]	Motorwicklung	[1]	Motor winding	[1]	Bobinage moteur
[2]	Motorklemmenplatte	[2]	Motor terminal board	[2]	Plaques à bornes du moteur
[3]	Zuleitungen	[3]	Supply leads	[3]	Alimentation
[4]	Δ-Schaltung, niedrige Drehzahl	[4]	Delta-connected, low speed	[4]	Couplage en Δ, petite vitesse
[5]	YY-Schaltung, hohe Drehzahl	[5]	Double star-connected, high speed	[5]	Couplage en YY, grande vitesse

Drehrichtungsumkehr: Vertauschen von 2 Zuleitungen (L1-L2)

To reverse: Interchange 2 supply leads (L1-L2)

Changement du sens de rotation Inverser deux conducteurs d'alimentation (L1-L2)

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4 Mechanical installation

INFORMATION

Observe the safety notes in chapter 2 of these operating instructions for the mechanical installation.

If the nameplate of the drive bears the FS mark, also comply with the information on mechanical installation in the associated addenda to the operating instructions and/or the associated manual.

4.1 Before you start

NOTICE

The mounting position for installation must correspond to the specifications on the nameplate.

Only install the drive if the following conditions are met:

- The data on the nameplate of the drive corresponds with the voltage supply system or with the output voltage of the frequency inverter
- The drive is undamaged (no damage caused by transportation or storage)
- All transport protection has been removed
- You are certain that the following requirements have been met:
  - Ambient temperature between −20°C and +40°C

    Note that the temperature range of the gear unit may also be restricted (see gear unit operating instructions)

    Note that information on the nameplate may differ. It is essential that the operating conditions for the unit comply with the nameplate information.
  - No oil, acid, gas, vapors, radiation, etc.
  - Installation altitude max. 1000 m above sea level

    Observe the chapter Installation altitude (→ 🗎 59)
  - Note the limitations for encoders
  - Special design: Drive configured in accordance with the ambient conditions

The above mentioned information refers to standard orders. The conditions might be different when you order drives other than the standard. Observe any differing conditions in the order confirmation.

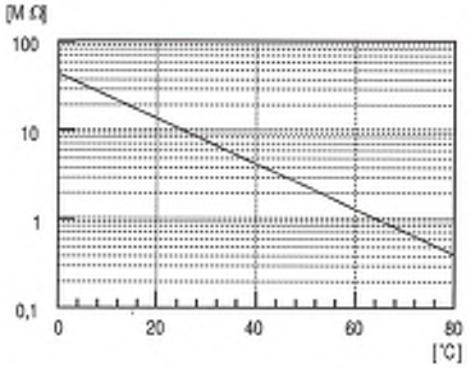
21927189/EN – 07/2015

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4.2 Extended storage of motors

- Note that the service life of the lubricant in the ball bearings is reduced by 10% per year after the first year of storage.
- You should re-lubricate the lubrication devices on motors that have been in storage for longer than 5 years before startup. Observe the information on the motor lubricant plate.
- Check whether the motor has absorbed moisture as a result of being stored for a long time. Measure the insulation resistance for this purpose (measuring voltage 500 V).

The insulation resistance (see the following figure) varies greatly depending on the temperature. The motor must be dried if the insulation resistance is insufficient.



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If the measured resistance, depending on the ambient temperature, is in a range above the limit characteristic curve, the insulation resistance is sufficient. If the value is below the limit characteristic curve, the motor must be dried.

4.2.1 Drying the motor

Heating the motor either with warm air or via an isolation transformer:

- With warm air

  DR.. motors with rotor designation "J" may be dried with warm air only.

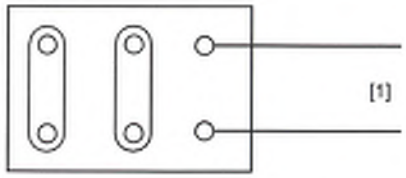
⚠ WARNING

The motor shaft may be subject to torque when drying via isolation transformer.

Possible injury.

- DR.. motors with rotor designation "J" may be dried with warm air only.

Connection with wiring diagram R13:



2336250251

[1] Transformer

Rev 0101

Tunisia			
Sales	Tunis	T. M.S. Technic Marketing Service Zone Industrielle Mghira 2 Lot No. 39 2082 Fouchana	Tel. +216 79 40 88 77 Fax +216 79 40 88 66 http://www.tms.com.tn tms@tms.com.tn

Turkey			
Assembly Sales Service	Istanbul	SEW-EURODRIVE Hareket Sistemleri Sanayi Ticaret Limited Şirketi Gebze Organize Sanayi Bölgesi 400.Sokak No:401 TR-41480 Gebze KOCAELİ	Tel. +90-262-9991000-04 Fax +90-262-9991009 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr

Ukraine			
Assembly Sales Service	Dnipropetrovsk	ООО «СЕВ-Евродрайв» ул.Рабочая, 23-В, офис 409 49008 Днепропетровск	Тел. +380 56 370 3211 Факс. +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua

United Arab Emirates			
Sales Service	Sharjah	Copam Middle East (FZC) Sharjah Airport International Free Zone P.O. Box 120709 Sharjah	Tel. +971 6 5578-488 Fax +971 6 5578-499 copam_me@eim.ae

USA			
Production Assembly Sales Service	Southeast Region	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Manufacturing +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly Sales Service	Northeast Region	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Additional addresses for service in the USA provided on request!		

Venezuela			
Assembly Sales Service	Valencia	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia, Estado Carabobo	Tel. +58 241 832-9804 Fax +58 241 838-6275 http://www.sew-eurodrive.com.ve ventas@sew-eurodrive.com.ve sewfinanzas@cantv.net

Rev 01

FOR ADDITIONAL INFORMATION PLEASE GO TO:

http://seweurodrive.com/

Rev 01

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7.3 ***Limit Switch***

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Product data sheet
Characteristics

9007CR61B2
LIMIT SWITCH 600V 10AMP C +OPTIONS



Main

Range of product	9007
Series name	Heavy duty
Product or component-type	Limit switch
Product specific applica-tion	Hazardous location box
Device short name	9007CR
Body type	Fixed
Head type	Rotary head
Material	Metal
Fixing mode	By the body
Movement of operating-head	Rotary
Type of operator	Zinc spring return without operatin-g lever (-) 9007C lever
Switch actuation	From left and right CW and CCW
Type of approach	1 or 2 programmable direction lateral approach
Electrical connection	(AWG 22...AWG 12) screw-clamp terminals, 1...2
Cable entry	1 entry for 1/2" - 14 NPT conforming to ANSI B1.20.1
Number of poles	2
Contacts type and com-position	2(NC-NO)
Contact operation	Snap action
Positive opening	Without
Level or class	Class I Division 1 Groups B/C/D Class II Division 1 Groups E/F/G
Sale per indivisible-quantity	1

Complementary

Body material	Aluminium
Head material	Zinc
Function available	-
Switch function	DPDT-DB
Contact form	Form ZZ
Contacts material	Silver contacts
Terminals description ISO n°1	(1-2)NC (3-4)NO (5-6)NC (7-8)NO
Minimum torque for tripping	4 lbf.in
Maximum actuation speed	90 ft/min with 45° cam angle, levers only 130 ft/min with 30° cam angle, levers only
Tripping angle	10 °
Maximum displacement angle	90 °
Repeat accuracy	+/- 0.002 in linear travel of cam

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein.
This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications.
It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof.
Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.

[Ie] rated operational current	1.2 A at 600 V AC, A600 conforming to NEMA 1.5 A at 480 V AC, A600 conforming to NEMA 3 A at 240 V AC, A600 conforming to NEMA 6 A at 120 V AC, A600 conforming to NEMA 0.11 A at 250 V DC, R300 conforming to NEMA 0.55 A at 125 V DC, R300 conforming to NEMA
[Ithe] conventional enclosed thermal current	10 A
[Ui] rated insulation voltage	600 V degree of pollution 3 conforming to UL 508 for contact block 600 V degree of pollution 3 conforming to CSA C22.2 No 14 for contact block
[Uimp] rated impulse withstand voltage	2.5 kV AC for 1 min conforming to CE 2.2 kV AC for 1 min conforming to UL 2.64 kV AC for 1 s conforming to CSA
Short-circuit protection	10 A by CC fuse, protection type: non-time delay
Electrical durability	1000000 cycles
Local signalling	Without
Mechanical durability	10000000 cycles
Width	2.72 in
Height	6.1 in
Depth	2.79 in
Product weight	2.5 lb(US)

Environment

Shock resistance	60 gn (duration = 9 ms) conforming to IEC 60068-2-27
Vibration resistance	25 gn (f = 10...150 Hz) conforming to IEC 60068-2-6
NEMA degree of protection	NEMA 2 conforming to Nema type 250 NEMA 4 conforming to Nema type 250 NEMA 6 conforming to Nema type 250 NEMA 6P conforming to Nema type 250 NEMA 12 conforming to Nema type 250 NEMA 13 conforming to Nema type 250 NEMA 1 conforming to Nema type 250
IP degree of protection	IP67 conforming to IEC 60529
Electrical shock protection class	Class 0 conforming to IEC 61140
Ambient air temperature for operation	-20...185 °F for hazardous location
Ambient air temperature for storage	-20...185 °F
Environmental characteristic	Standard environment
Protective treatment	Epoxy powder coat

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 1150 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Need no specific recycling operations

Contractual warranty

Warranty period	18 months

Product Life Status : Commercialised

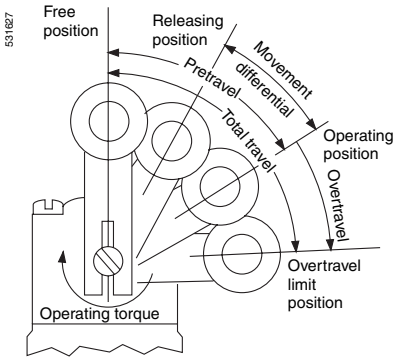


Figure 1: Rotary lever type

Glossary

CCW—Counterclockwise only (for lever types).

CW—Clockwise only (for lever types).

Differential—The movement differential or differential is the distance or angle from the operating position to the releasing position.

Free or normal position—Free or normal position is the initial position of the actuator when there is no external force (other than gravity) applied on the actuator.

Neutral position—Lever operated switch with a minimum of two contacts. One contact changes state only when lever moves CW. The second contact changes state only when the lever moves CCW. (The center position is the free position.)

Operating position—Operating position is the position of the actuator at which the contacts change state.

Overtravel—Overtravel is the distance or angle through which the actuator moves when traveling from the operating position to the overtravel limit position.

Pre-travel—Pre-travel is the distance or angle through which the actuator moves from the free position to the position at which the contacts change state, the operating position.

Release position—Release position is that position of the actuator at which the contacts change state from the operated contact position to the normal contact position.

Release torque—Release torque is the value to which the torque on the actuator must be reduced to allow the contacts to change state from the operated position to the normal contact position.

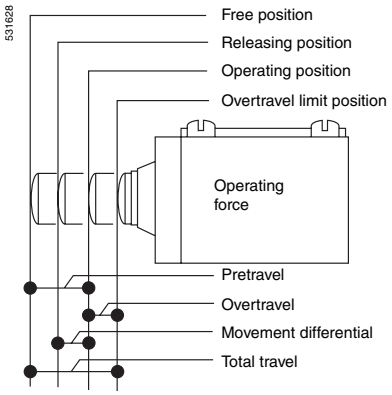


Figure 2: Linear (or Plunger) type

Actuator-lever—An actuator is the mechanism of the switch or enclosure which, when moved as intended, will operate the contacts.

Maintained contact limit switch—A maintained contact limit switch is a switch which remains in a given condition until actuated to another condition, which is also maintained until further actuation.

Momentary contact limit switch—A momentary contact limit switch is a switch which returns from the operated condition to its free or normal circuit condition when the actuating force is removed.

N.C.—Normally closed contact, when the switch mechanism is at its free or normal position.

N.O.—Normally open contact, when the switch mechanism is at its free or normal position.

Operating torque—Operating torque (force) is the minimum torque (force) value which must be applied to the actuator to cause the contacts to change state.

Overtravel limit position—Overtravel limit position is that position of the actuator beyond which further overtravel would cause damage to the switch or actuator.

Repeatability—Repeatability is the ability to consistently maintain the original operating characteristics. Measured by the difference between the operating position of a new switch and of the same after 1 million operations.

Total travel—Total travel is the sum of the pre-travel and overtravel.

Travel—Movement of the actuator from its free or normal position when force is applied. (See pre-travel and over travel.)

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Glossary (continued)
Definition of limit switch terms

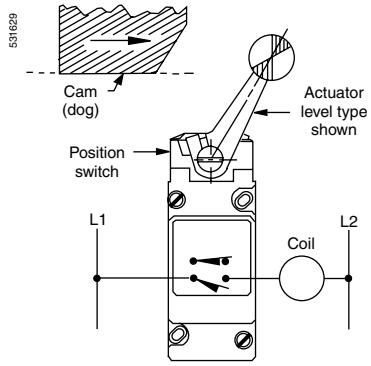


Figure 3—Limit switch

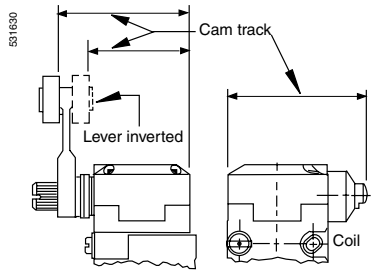


Figure 4—Cam track dimension

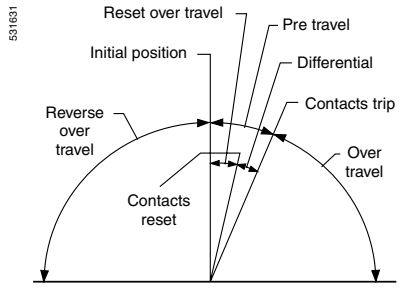


Figure 5—Contact travel

There are many terms common to position switches that are not used with other control devices. Before proceeding further, definitions of the commonly used terms should be understood as these terms will be used throughout this document.

Limit switch—A device that converts a mechanical motion into an electrical control signal.

Actuator—The mechanism of a limit switch that operates the contacts, i.e., lever arm, plunger, wobble stick.

Cam—A machine part or component that applies force to the switch actuator causing it to move as intended. Also known as “dog”.

Cam track dimension—The distance from the switch mounting surface to some point on the roller or actuator.

Differential—The distance that the limit switch actuator moves, from the trip point to the reset point of the contacts.

Direct-acting/positive opening contacts—Normally closed contacts that are moved directly by the operating shaft. They are slow make-slow break contacts and have a shorter life than snap action contacts due to longer arcing times. In general, these should only be used where movement of actuator must break welded contacts, as in a crane safety limit switch. (Snap action positive opening contacts are available in the Telemecanique® XCKJ limit switch.)

Maintained contacts—Contacts that remain in the tripped position until the return travel of the cam moves the switch actuator back and resets the contacts.

Neutral (free or normal) position limit switch—A lever arm type switch with two sets of contacts. One set operates when the shaft is rotated clockwise; the other operates when the shaft is rotated counterclockwise.

Operating force—The force required to move limit switch actuator to cause the contacts to change state.

Overtravel—The distance that the position switch actuator may move beyond the trip point, (see figure 5) without damage to the switch.

Pole—The number of moveable contacts in a switching mechanism. A single pole device may be 1 N.O., 1 N.C. or 1 N.O. and 1 N.C. with a single set of moveable contacts is used to bridge those stationary contacts. A double or two pole switch has two moveable contacts.

Positive break contacts—Normally closed contacts with a special mechanism to ensure opening. Can be snap acting positive break or direct acting slow make, slow break type. The slow break direct acting type is not recommended for high cycle applications due to shorter life.

Pre-travel—The distance that the limit switch actuator must move to trip the contacts.

Reed contacts—A mechanism consists of a set of contacts hermetically sealed in a glass envelope and actuated by a magnet attached to the operator. This sealed construction keeps contaminants out of the contact area, making the reed switch ideal for low voltage, low current circuits such as programmable controllers.

Reset point—The position of the actuator at which the contacts return to the normal position.

Snap action contacts—Contacts that move rapidly to open or closed position and are relatively independent of cam speed. Because of shorter arcing times, snap acting contacts have longer contact life than slow make and break contacts and should be used where fast moving cams are encountered or where good repeat accuracy is required.

Spring return—Contacts that return to their original position when the actuating force is removed.

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Definition

Slow break contacts—The speed of transfer of the moveable contacts depends on the speed of the operator. The amount of travel of the moveable contacts is also dependent on the amount of travel by the operator. Slow make and break contacts have the same trip and reset points, and do not have the differential travel common to snap switches.

Snap action contacts—The speed of transfer of the moveable contacts is not dependent on the speed of the operator. The amount of travel of the moveable contacts is also not dependent on the amount of travel by the operator. The movement of the moveable contacts are determined by a preset travel, after this point is reached, the contacts will trip. Snap action contacts have different trip and reset points, the difference is identified as “differential.”

Flexible operators—Flexible resilient or elastic operators, i.e., wobble sticks, do not ensure direct opening/positive opening action.

Isolated contacts—Single-pole double-throw (SPDT) contacts with four terminals which have two isolated contact bars mechanically linked. No polarity restrictions apply. Different (isolated) power supplies can also be applied.

Same polarity—Single-pole double throw (SPDT) contacts with four terminals that require the supply to be applied with the same polarity (i.e., L1 or +) on the same side of the contact bar. Two different supplies are not allowed in this configuration. (The loads should always be on the same side of the contact bar.)

Direct opening contact (also known as positive opening contacts)—A normally closed contact element coupled with the switch actuator via a non-resilient (non-elastic) member so that full contact opening is obtained when the actuator is moved through the direct opening travel by applying a direct opening force. The contact element will shear open in the event of sticking contacts or broken springs. Proper fusing of the control circuit is required. Direct opening contacts meet IEC 60947-5-1 requirements.

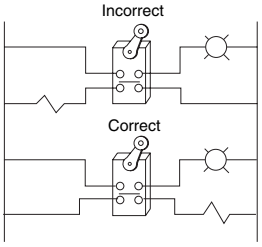
Direct opening travel (also known as positive opening travel)—Minimum travel from the actuator free position to the position where the direct opening operation is completed. Usually longer than the normal pre-travel.

Reed contacts—Contact mechanism consists of a set of contacts hermetically sealed in a glass envelope and actuated by a magnet attached to the operator. This sealed construction keeps contaminants out of the contact area, making the reed switch the ideal switch for low voltage, low current circuits such as programmable controllers.

NOTE: Because reed switches are operated by a magnet, they should not be installed in areas where strong magnetic fields may be present. The devices should always be checked for proper operation after installation.

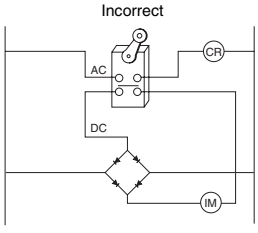
Polarity

Opposite polarities should not be connected to the contacts of one limit switch unless the limit switch is specifically designed for such service (isolated contacts—no polarity). See page 593.



Power sources

Power from different sources should not be connected to the contacts of one limit switch unless the switch is specifically designed for such service (isolated contacts—no polarity).



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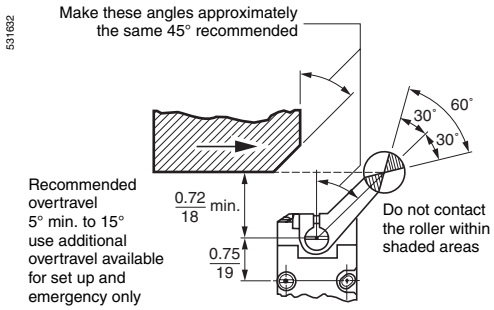


Figure 6

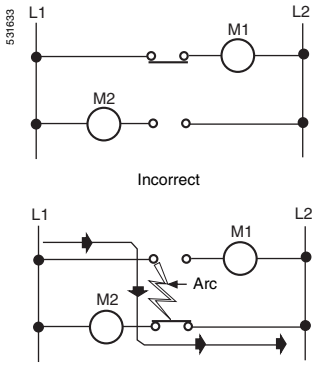


Figure 7—Contacts connected to opposite polarities.
Line to line short (bold line) can occur through arc drawn when contacts operate

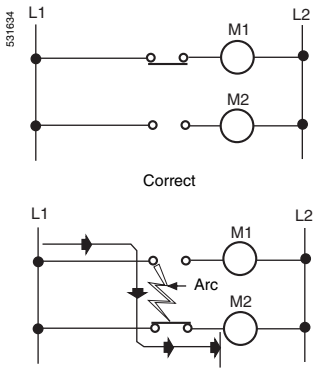


Figure 8—Contacts connected to same polarity. Line to line short cannot occur when contacts operate

Overriding Cams

The cam trailing edge on overriding cams must also be considered for maximum switch life (see figure 6). Lever arm snap back causes shock loads which reduce switch life. Also, with reversing cams the trailing edge becomes a leading edge on the return stroke. The overtravel of the limit switch should not be exceeded, but 5° minimum to 15° travel past the trip point is recommended. Additional travel should only be used for set up and emergencies. Cam design procedures for limit switches with other than lever arm actuators vary from switch type to switch type and are discussed along with other limit switch application design suggestions in additional literature “Proper Application of Limit Switches” (SM444).

Contacts

- Make sure the electrical load is within limit switch contact ratings.
- The single pole, double throw contacts of a snap switch used in a limit switch should not be used on opposite polarities. When load M1 is connected between the contact and line L2, and load M2 is connected between the other contact and line L1 (figure 7), a line-to-line short (bold line) can occur through the arc, which may be drawn as the contacts operate. When contacts are connected to the same polarity (figure 8), this line-to-line short cannot occur.
- The same result can occur if different power sources are connected to the single-pole, double-throw contacts of a snap switch.
- With limit switches having reed contacts, some form of transient protection should be used. This protects the small contacts from damaging surges and increases contact life.

Coolant

- When possible, avoid mounting limit switches where they will be constantly exposed to coolant, chips, etc. Although designed for such applications, switches last longer when not exposed to these contaminants.
- Make sure cover screws are tightened to ensure a good oiltight seal.
- When possible, avoid using fire-resistant coolants of the phosphate ester type. Equipment exposed to these coolants requires special seals and gaskets. Viton® fluoroelastomer, resistant to these types of coolants, is the standard shaft seal material on Type C lever arm types. If required, all gaskets, as well as boots on plunger types, can be furnished in Viton material.

Recommendations for Conduit Installation

Limit switch leakage is often traced to the conduit system. Coolant or condensation in the conduit line can enter the switch through the conduit entry. Oil tightness depends on the condition of the conduit connection and seal. Recommendations for installing conduit to position switches are as follows:

- To ensure an oiltight seal, use thread sealant and a conduit seal or a sealing bushing around the conduit fitting. Otherwise, the fitting probably will leak.
- Limit switches should be installed with the conduit end down whenever possible.
- If condensation or moisture is present inside the conduit, a Square D® conduit seal can be inserted into the conduit entry. The conduit fitting can then be connected in the normal manner. Thread sealant and a sealing bushing must still be used.
- Often a junction box fills with coolant and/or condensation, which backs up into the position limit through the conduit. A simple solution is to drill a hole in the bottom of the junction box to allow the liquid to drain out.
- If conduit leakage is severe, pre-wired and potted position limit (Forms Y184• and Y185•) should be used. The switches are pre-wired with either individual wires or multiconductor STOWA cord, and the receptacle is sealed with a potting material.
- The Square D limit switch is available with a pre-wired male plug receptacle. The connector provides an effective oiltight seal when used with the appropriate female connector cord.

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Terminal Identification

European (IEC) contact terminals marking

Single pole	Double pole	
	1st pole	2nd pole
11-12	11-12	21-22
13-14	13-14	23-24
11-12	11-12	21-22
13-14	13-14	23-24

Each terminal is marked with 2 digits: First digit indicates the pole (circuit). The second digit indicates the type of contact:

_1–_2 is N.C., _3–_4 is N.O.
i.e.: 11–12, 21–22 are N.C. 13–14, 23–24 are N.O.

Example of European Terminal Markings:

For switch elements without isolated contacts:
11-12 Is the N.C. contact of pole No. 1, 13-14 Is the N.O. contact of pole No. 2

For switch elements with isolated contacts:
13-14 Is the N.O. contact of pole No. 1, 21-22 Is the N.C. contact of pole No. 2

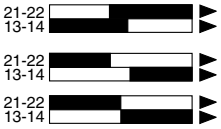
Example of US Terminal Markings

Single pole	Double pole	
	1st pole	2nd pole
1-2	1-2	5-6
3-4	3-4	7-8
1-2	1-2	5-6
3-4	3-4	7-8

Each contact terminal is marked with one digit, i.e., 1-2, 3-4, 5-6,7-8.

Example of US Terminal Markings:

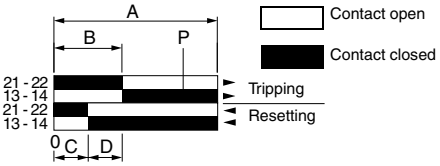
For most snap switch elements (isolated contacts not usually on US manufactured switches):
1-2 is the N.C. contact of pole No. 1,
3-4 is the N.O. contact of pole No. 1
5-6 is the N.C. contact of pole No. 2,
7-8 is the N.O. contact of pole No. 2



Make-before-break (overlapping) SPDT: the normally open contact closes before the normally closed contact opens.

Break-before-make (offset) SPDT: the normally closed contact opens before the normally open contact closes.

Simultaneous make and break SPDT: the normally closed contact opens at the same time as the normally open contact closes.



A = Maximum travel of the operator in mm or degrees.
B = Tripping travel of the contact.
C = Resetting travel of contact.
D = B-C = Differential travel.
P = Point from which positive opening is assured.

NOTE: The arrows indicate direction of actuation clockwise (CW) and return for simplicity reasons. For counterclockwise (CCW) only direction of actuation is reversed.

Wiring diagrams

Form A
SPST-NO



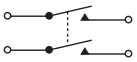
Form B
SPST-NC



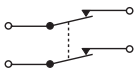
Form C
SPDT



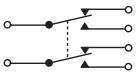
Form AA
DPST-NO



Form BB
DPST-NC



Form CC
DPDT

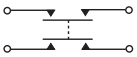


Form X
SPST-NO-DB

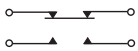


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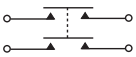
Form Zb
SPDT isolated contacts



Form Z
DPDT-DB



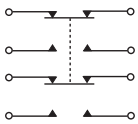
Form XX
DPST-NO-DB



Form YY
DPST-NC-DB



Form ZZ
DPDT-DB



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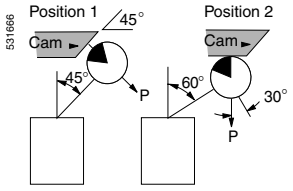


Figure 1A cam design for speeds up to 50 fpm

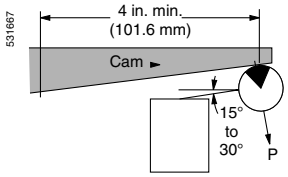


Figure 1B cam design for speeds from 50 to 200 fpm (15.2 to 60.9 mpm).

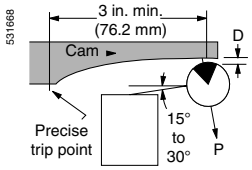


Figure 1C cam design for speeds from 200 to 400 fpm (60.9 to 121.9 mpm).

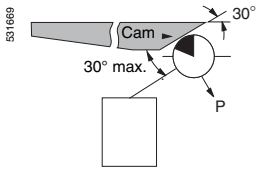


Figure 2

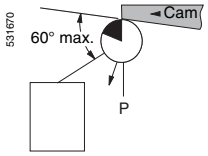


Figure 3

Application information

Excessive impact from improperly designed actuating systems is without question the leading cause of premature failure of the electromechanical limit switch. At slow speed, impact is rarely troublesome, but as speed increases, impact applied to the switch becomes a critical problem. In today's higher speed machines, therefore, it is important to give proper consideration to correctly designed actuating systems.

These recommendations are designed to assist you in obtaining greater life from your limit switches. The black sector in the roller indicates the recommended design limits of the angle of pressure shown in the illustrations as "P". Three main design and installation considerations are:

- The pressure applied by the actuating mechanism to switch operating lever should approximate direction of lever rotation with a variation not to exceed 30°.
- Since the angle of pressure changes drastically with rotation of the lever, the cam must be designed for proper pressure angles at all positions of the lever travel.
- The switch operating levers should be positioned as nearly parallel with the leading edges of the cams as possible.

Considering these three factors:

- The cam in Figure 1A is satisfactory for speeds up to 50 fpm (15.2 mpm)
- The cam in Figure 1B is suitable for speeds up to 200 fpm (60.9 mpm) (nonuniform acceleration of switch lever)
- The cam in Figure 1C is satisfactory for speeds up to 400 fpm (121.9 mpm) (uniform or other controlled acceleration)

Designing proper pressure angles for overriding cams for electromechanical limit switches

Don't underestimate the importance of adjusting the cams and operating levers in electromechanical limit switches to provide the proper pressure angles in every travel position. Without the means to control the angle of pressure or the limit of override, the operating lever may spring back with damaging results. *Lever flyback usually causes double pulsing of the contacts, and places additional stresses on the mechanical system of the limit switch.* The excessive impacts absorbed from inadequately designed actuating devices eventually leads to abnormal wear and premature failure of the limit switch.

By looking closely at the actuating angles of the cam surface, designers and engineers can obtain the maximum operating life from electromechanical limit switches. The following recommendations help provide a workable knowledge of proper lever and cam angles—and how they are applied to secure optimum conditions:

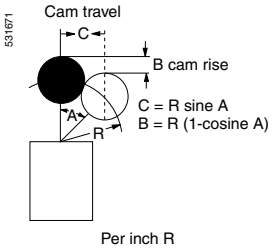
- Actuating cam on machinery or slide should provide a trailing edge so that upon overriding the operating lever will not snap back.
- During the approach phase, **the pressure angle of the cam should not vary from the lever angle more than 30°**.
- On the override phase, **the angle of the trailing edge of the cam to the lever should be no more than 60°**.

If these guidelines are followed, the switch operating levers will always be approximately parallel with the leading edges of the actuating surfaces or cams.

Figure 2 shows leading edge of cam about to depress and actuate the electromechanical limit switch. The black sector of the roller indicates the recommended design limits of the angle of pressure shown in drawings as "P".

Figure 3 shows operating lever roller following the trailing edge of the cam on the override cycle. Unless a one-way lever is used, the cam will operate the switch on the return cycle.

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Application information (continued)

The table below can assist the designer of machine tools and conveyors, the plant engineer, or the maintenance personnel responsible for keeping this equipment in a satisfactory operating condition.

The design engineer will find the table useful in making trouble-free cam layouts. For example, if the recommended operating travel for a switch is between 15° and 30°, use the table to figure cam rise and travel. This aids in determining what type of cam to design, its dimensions, etc.

The plant engineer can use the table to determine where to position levers on replacement switches or revamped circuitry to operate existing cams. The engineer can also use the table to position the lever in proper relationship to the cam, and to find out whether switches and cams are installed properly to obtain maximum switch life.

All dimensions in the table are for 1 in. (25.4 mm) levers. If you use longer levers, multiply the figures by the increased lever length. For example, for a 2 in. (50.8 mm) lever, use the multiplier 2.

All limit switches have a recommended operating travel and for best performance should be installed within these limits. *(1)*

Dual dimensions: in. (mm)

A	B	C	A	B	C
1°	0.0002 (0.005 mm)	0.017 (0.43 mm)	46°	0.305 (7.7 mm)	0.719 (18.2 mm)
2°	0.0006 (0.015 mm)	0.035 (0.89 mm)	47°	0.318 (8.1 mm)	0.731 (18.6 mm)
3°	0.0014 (0.035 mm)	0.052 (1.3 mm)	48°	0.331 (8.4 mm)	0.743 (18.9 mm)
4°	0.002 (0.05 mm)	0.070 (1.8 mm)	49°	0.344 (8.7 mm)	0.755 (19.2 mm)
5°	0.004 (0.101 mm)	0.087 (2.2 mm)	50°	0.357 (9.0 mm)	0.766 (19.4 mm)
6°	0.005 (0.127 mm)	0.105 (2.6 mm)	51°	0.371 (9.4 mm)	0.777 (19.7 mm)
7°	0.007 (0.178 mm)	0.122 (3.1 mm)	52°	0.384 (9.7 mm)	0.788 (20.0 mm)
8°	0.010 (0.254 mm)	0.139 (3.5 mm)	53°	0.398 (10.1 mm)	0.799 (20.3 mm)
9°	0.012 (0.304 mm)	0.156 (4.0 mm)	54°	0.412 (10.4 mm)	0.809 (20.5 mm)
10°	0.015 (0.381 mm)	0.174 (4.4 mm)	55°	0.426 (11.0 mm)	0.819 (20.8 mm)
11°	0.018 (0.457 mm)	0.191 (4.8 mm)	56°	0.441 (11.2 mm)	0.829 (21.0 mm)
12°	0.022 (0.559 mm)	0.208 (5.3 mm)	57°	0.455 (11.5 mm)	0.839 (21.3 mm)
13°	0.026 (0.660 mm)	0.225 (5.7 mm)	58°	0.485 (12.3 mm)	0.857 (21.7 mm)
14°	0.030 (0.762 mm)	0.242 (6.1 mm)	59°	0.485 (12.3 mm)	0.857 (21.7 mm)
15°	0.034 (0.863 mm)	0.259 (6.6 mm)	60°	0.500 (12.7 mm)	0.866 (22 mm)
16°	0.039 (0.990 mm)	0.276 (7.2 mm)	61°	0.515 (13.1 mm)	0.875 (22.2 mm)
17°	0.044 (1.12 mm)	0.292 (7.4 mm)	62°	0.531 (13.5 mm)	0.883 (22.4 mm)
18°	0.049 (1.24 mm)	0.309 (7.8 mm)	63°	0.546 (14.0 mm)	0.891 (22.6 mm)
19°	0.054 (1.37 mm)	0.326 (8.3 mm)	64°	0.562 (14.3 mm)	0.899 (22.8 mm)
20°	0.060 (1.52 mm)	0.342 (8.7 mm)	65°	0.577 (14.6 mm)	0.906 (23.0 mm)
21°	0.066 (1.67 mm)	0.358 (9.1 mm)	66°	0.593 15.0(mm)	0.914 (23.2 mm)
22°	0.073 (1.85 mm)	0.375 (9.5 mm)	67°	0.609 15.5(mm)	0.921 (23.4 mm)
23°	0.079 (2.00 mm)	0.391 (9.9 mm)	68°	0.625 (16.0 mm)	0.927 (23.5 mm)
24°	0.086 (2.2 mm)	0.407 (10.3 mm)	69°	0.642 (16.3 mm)	0.934 (23.7 mm)
25°	0.094 (2.38 mm)	0.423 (10.7 mm)	70°	0.658 (16.7 mm)	0.940 (23.9 mm)
26°	0.101 (2.56 mm)	0.438 (11.1 mm)	71°	0.674 (17.1 mm)	0.946 (24.0 mm)
27°	0.109 (2.77 mm)	0.454 (11.5 mm)	72°	0.691 (17.5 mm)	0.951 (24.1 mm)
28°	0.117 (2.9 mm)	0.469 (12 mm)	73°	0.708 (18.0 mm)	0.956 (24.3 mm)
29°	0.125 (3.17 mm)	0.485 (12.3 mm)	74°	0.724 (18.4 mm)	0.961 (24.4 mm)
30°	0.134 (3.40 mm)	0.500 (12.7 mm)	75°	0.741 (19.0 mm)	0.966 (24.5 mm)
31°	0.143 (3.6 mm)	0.515 (13.1 mm)	76°	0.758 (19.2 mm)	0.970 (24.6 mm)
32°	0.152 (3.9 mm)	0.530 (13.4 mm)	77°	0.775 (20.0 mm)	0.974 (24.7 mm)
33°	0.161 (4.1 mm)	0.545 (14.0 mm)	78°	0.792 (20.1 mm)	0.978 (24.8 mm)
34°	0.171 (4.3 mm)	0.559 (14.2 mm)	79°	0.809 (20.5 mm)	0.982 (24.9 mm)
35°	0.181 (4.6 mm)	0.574 (14.6 mm)	80°	0.826 (21.0 mm)	0.985 (25.0 mm)
36°	0.191 (4.8 mm)	0.588 (15 mm)	81°	0.844 (21.4 mm)	0.988 (25.1 mm)
37°	0.201 (5.1 mm)	0.602 (15.3 mm)	82°	0.861 (21.8 mm)	0.990 (25.1 mm)
38°	0.212 (5.4 mm)	0.616 (15.6 mm)	83°	0.878 (22.3 mm)	0.993 (25.2 mm)
39°	0.223 (5.7 mm)	0.629 (16.0 mm)	84°	0.895 (22.7 mm)	0.995 (25.3 mm)
40°	0.234 (6.0 mm)	0.643 (16.3 mm)	85°	0.913 (23.2 mm)	0.996 (25.3 mm)
41°	0.245 (6.2 mm)	0.656 (16.6 mm)	86°	0.930 (23.6 mm)	0.9976 (25.3 mm)
42°	0.257 (6.5 mm)	0.669 (17.0 mm)	87°	0.948 (24.0 mm)	0.9986 (25.4 mm)
43°	0.269 (6.8 mm)	0.682 (17.3 mm)	88°	0.965 (24.5 mm)	0.9994 (25.4 mm)
44°	0.281 (7.1 mm)	0.695 (17.6 mm)	89°	0.983 (25.0 mm)	0.9999 (25.4 mm)
45°	0.293 (7.4 mm)	0.707 (18 mm)	90°	1.000 (25.4 mm)	1.000 (25.4 mm)

1. Refer to document SM444R1 for additional information regarding Cam speed and angles.

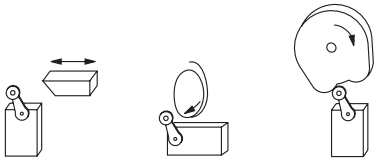
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Lever Actuators

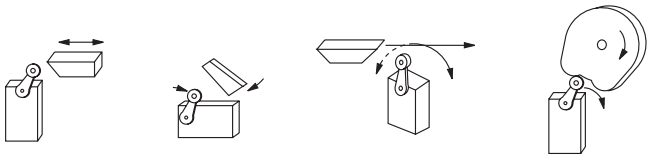
For limit switches with lever actuators, the actuating force should be applied as nearly perpendicular to the lever as practical and perpendicular to the shaft axis about which the lever rotates.

Lever Actuators

Correct



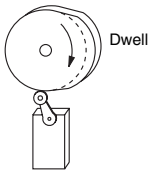
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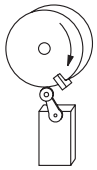
Dwelling Requirements

Where relatively fast motions are involved, the cams should be so designed that the limit switch will be held operated long enough to operate relays, valves, etc.

Correct

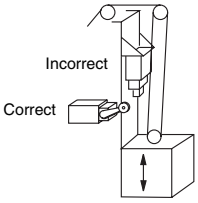


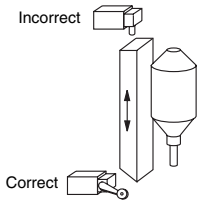
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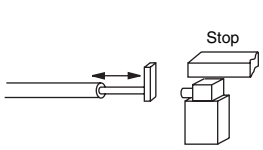
Overtravel limitations

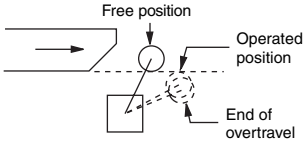
Operating mechanisms for limit switches should be so designed that, under any operating or emergency conditions, the limit switch is not operated beyond its overtravel limit position. A limit switch should not be used as a mechanical stop.

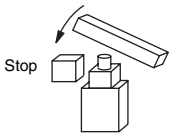




Correct







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Limit Switches—Class 9007 Type C
Interruptores de límite—clase 9007 tipo C
Interrupteurs de position—classe 9007 type C

Replaces / Reemplaza / Remplace 65013-309-03 08/2001

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on it.

Failure to follow these instructions will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELECTRICO

Desenergice el equipo antes de realizar cualquier trabajo en él.

Si no se siguen estas instrucciones provocará lesiones graves o incluso la muerte.

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ARC ELECTRIQUE

Coupez l'alimentation de cet appareil avant d'y travailler.

Le non-respect de ces instructions provoquera la mort ou des blessures graves.

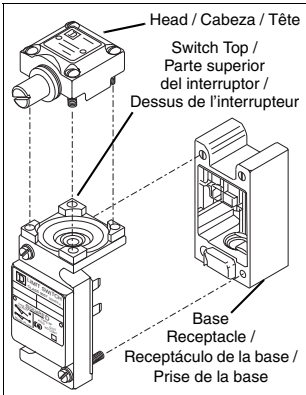


Figure / Figura / Figure 1

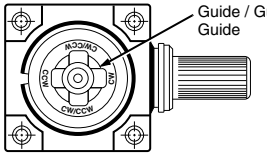


Figure / Figura / Figure 2

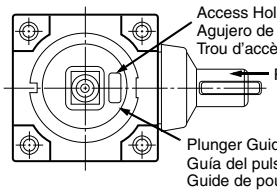


Figure / Figura / Figure 3

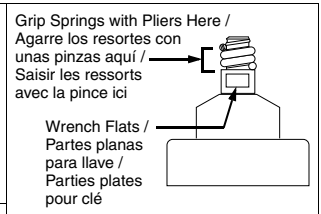


Figure / Figura / Figure 4

For complete application data, see product data bulletin SM444R1.

Para obtener los datos de aplicación completos, consulte el boletín de datos del producto no. SM444R1.

Pour des données complètes d'application, voir la fiche technique n° SM444R1.

CONVERSION OF HEADS

Head Rotation—All Types

All heads can be rotated to one of four positions, 90° apart. See Figure 1.

1. Loosen the four head mounting screws.
2. Rotate the head to the desired position and tighten the screws.

Mode of Operation—Lever Types A, B, and N

The mode of operation converts easily to clockwise (CW), counterclockwise (CCW), or both (CW/CCW). See Figure 2.

1. Loosen the four head mounting screws and remove the head.
2. Pull up on the guide and position it so that the arrow points to the desired letters: CW, CCW, or CW/CCW.

CONVERSION DE LAS CABEZAS

Giro de la cabeza—todos los tipos

Todas las cabezas se pueden girar a una de las cuatro posiciones, 90° separadas. Vea la figura 1.

1. Afloje los cuatro tornillos de montaje de la cabeza.
2. Gire la cabeza a la posición deseada y apriete los tornillos.

Modo de funcionamiento—palanca tipos A, B y N

El modo de funcionamiento se puede convertir fácilmente en el sentido de las manecillas del reloj (CW) o en sentido contrario a las manecillas del reloj (CCW), o ambos (CW/CCW). Vea la figura 2

1. Afloje los cuatro tornillos de montaje de la cabeza y retire esta última.
2. Jale la guía hacia arriba y colóquela de tal manera que la flecha señale las letras deseadas: CW, CCW o CW/CCW.

CONVERSION DES TÊTES

Rotation des têtes—Tous les types

Toutes les têtes peuvent être tournées à l'une des quatre positions à 90 ° d'intervalle. Voir la figure 1.

1. Desserrer les quatre vis de montage de la tête.
2. Faire tourner la tête à la position désirée et serrer les vis.

Mode de fonctionnement—levier de types A, B et N

Le mode de fonctionnement peut facilement être converti en mode sens horaire (CW), anti-horaire (CCW) ou aux deux (CW/CCW). Voir la figure 2.

1. Desserrer les quatre vis de montage de la tête et enlever la tête.
2. Tirer sur le guide et le placer de sorte que la flèche soit orientée vers les lettres désirées : CW, CCW ou CW/CCW.

3. Push the guide back down into the slots.
4. Reassemble the head in the desired position.
   NOTE: CW or CCW refers to the operation.

Side Plunger Roller Operation—Type F

The switch comes with the roller in the vertical position. It can be rotated 90° to a horizontal position. See Figure 3.

1. Loosen the four head mounting screws and remove the head.
2. Depress and hold in the roller plunger.
3. Insert the blade of a flat-head screwdriver through the access hole in the plunger guide to hold the white nylon cam inside the head. Pull out the roller plunger.
4. Rotate the roller plunger 90° and remove the screwdriver blade.
5. Make sure the guide pin in the plunger is seated in the slot of the nylon cam and reassemble the head in the desired position.

INSTALLATION

1. When assembling or replacing the switch top assembly (Figure 1), be sure that the gasket surface is clean and in position. Tighten the switch's top fastening screws to 20–30 lb-in (2.26–3.39 N•m), to ensure proper sealing and electrical integrity.

2. When assembling or replacing heads (Figure 1), always tighten the head fastening screws to 20–30 lb-in (2.26–3.39 N•m), to ensure proper operation and adequate sealing.
3. When connecting the conduit to the base receptacle (Figure 1), use tight fittings and apply a sealing compound to the threads for best sealing.

   NOTE: On devices with maintained contact heads, the wiring diagram on the nameplate and the base casting reflects the contact status when the shaft is in the CCW position (Type C heads) or Reset position (Type H heads).

3. Empuje la guía en las ranuras.

4. Vuelva a ensamblar la cabeza en la posición deseada.
   NOTA: CW o CCW se refieren al funcionamiento.

Funcionamiento del pulsador con roldana lateral—tipo F

El interruptor esta provisto con una roldana en posición vertical. La roldana se puede girar 90° en la posición horizontal. Vea la figura 3.

1. Afloje los cuatro tornillos de montaje de la cabeza y retire esta última.
2. Baje el pulsador con roldana y sosténgalo en esa posición.
3. Inserte la punta plana de un desarmador por el agujero de acceso en la guía del pulsador para sostener la leva de nylon blanco dentro de la cabeza y jale el pulsador con roldana hacia afuera.
4. Gire el pulsador con roldana 90° y retire la punta del desarmador.
5. Asegúrese de que la espiga de la guía en el pulsador esté bien colocada en la ranura de la leva de nylon y vuelva a ensamblar la cabeza en la posición deseada.

INSTALACION

1. Cuando instale o reemplace el ensamble de la parte superior del interruptor (figura 1), asegúrese de que esté limpia la superficie del empaque y que se encuentre en su posición. Apriete los tornillos de sujeción de la parte superior del interruptor en 2.26–3.39 N•m (20–30 lbs-pulg), para asegurar un cierre hermético adecuado y la integridad eléctrica.
2. Cuando instale o reemplace las cabezas (figura 1), siempre apriete los tornillos de sujeción de la cabeza en 2.26–3.39 N•m (20–30 lbs-pulg), para asegurar un funcionamiento correcto y el cierre hermético adecuado.
3. Cuando realice las conexiones del tubo conduit en el receptáculo de la base (figura 1), apriete los adaptadores y aplique un compuesto de cierre hermético a las roscas para obtener mejores cierres.
   NOTA: En los dispositivos con cabezas de contacto sostenido, el diagrama de cableado en la placa de identificación y la pieza fundida de la base reflejan el estado del contacto cuando el eje se encuentra en la posición CCW (cabezas tipo C) o en la posición de restablecimiento (cabezas tipo H).

3. Enfoncer le guide dans les fentes.

4. Réassembler la tête dans la position désirée.
   REMARQUE : CW ou CCW se réfèrent au fonctionnement.

Fonctionnement du poussoir à galet latéral—type F

L'interrupteur est fourni avec le galet en position verticale. Le galet peut être tourné de 90 ° à la position horizontale. Voir la figure 3.

1. Desserrer les quatre vis de montage de la tête et enlever la tête.
2. Appuyer sur le poussoir à galet et le maintenir enfoncé.
3. Introduire la lame d'un tournevis plat dans le trou d'accès du guide de poussoir pour retenir la came de nylon blanc à l'intérieur de la tête et faire sortir le poussoir à galet en le tirant.
4. Faire tourner le poussoir à galet de 90 ° et enlever la lame du tournevis.
5. S'assurer que la goupille de guide du poussoir est installée dans la fente de la came de nylon et réassembler la tête dans la position désirée.

INSTALLATION

1. Lors de l'assemblage ou du remplacement de l'ensemble de dessus de l'interrupteur (figure 1), s'assurer que la surface du joint est propre et dans la bonne position. Serrer les vis d'attache du dessus de l'interrupteur à un couple entre 2.26 et 3.39 N•m (20 et 30 lbs-po), pour assurer la bonne étanchéité et l'intégrité électrique.

2. Lors de l'assemblage ou du remplacement des têtes (figure 1), toujours serrer les vis d'attache de la tête à un couple entre 2.26 et 3.39 N•m (20 et 30 lbs-po), pour assurer le bon fonctionnement et la bonne étanchéité.
3. Lors de l'installation du conduit de la prise de base (figure 1), bien serrer les adaptateurs et utiliser un produit d'étanchéité sur les filetages pour assurer une meilleure étanchéité.

   REMARQUE : Sur les appareils avec des têtes à contact maintenu, le schéma de câblage sur la plaque signalétique et le moulage de base indique l'état du contact lorsque l'arbre est dans la position anti-horaire (têtes de type C) ou dans la position de réinitialisation (têtes de type H).

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CAM Design Data / Datos de diseño de la leva / Données de conception de la CAME

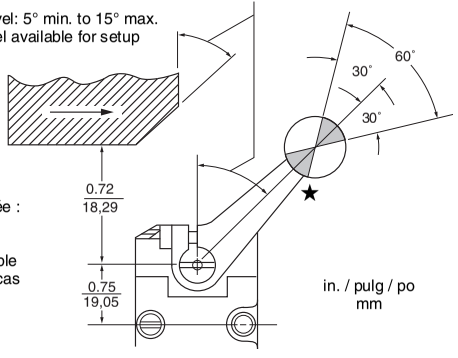
Leading Edge / Borde anterior / Bord antérieur

Make these angles approximately the same, 45° recommended
Haga que los ángulos sean aproximadamente del mismo tamaño, se recomiendan 45°
Ces angles doivent être approximativement les mêmes, 45 ° est recommandé

Recommended overtravel: 5° min. to 15° max.
Use additional overtravel available for setup and emergency only.

Sobrerecorrido recomendado:
mín. 5°; máx. 15°
Use el sobrerecorrido adicional disponible sólo para la instalación y emergencias.

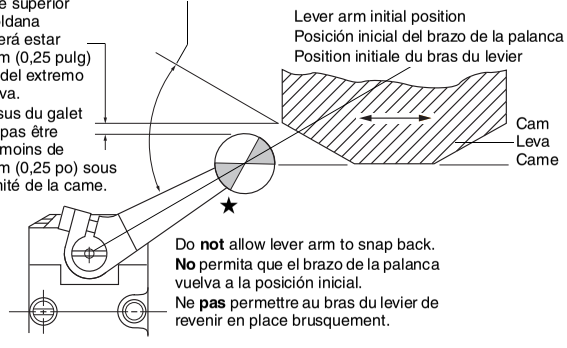
Surcourse recommandée :
min. 5 °; max. 15 °
Utiliser la surcourse supplémentaire disponible pour l'installation et en cas d'urgence uniquement.



Trailing Edge / Borde posterior / Bord arrière

Top of roller should not be less than 0.25 in. (6.35 mm) below end of cam.
La parte superior de la roldana no deberá estar 6,35 mm (0,25 pulg) debajo del extremo de la leva.
Le dessus du galet ne doit pas être situé à moins de 6,35 mm (0,25 po) sous l'extrémité de la came.

60 ° MAX.	Reversing Cam Leva reversible Came réversible	80 ° MAX.	Non-reversing Cam Leva no reversible Came non réversible



★ Do **not** contact roller within the shaded area / **No** permite que la roldana tenga contacto con el área sombreada / Ne **pas** entrer en contact avec le galet dans la zone ombrée

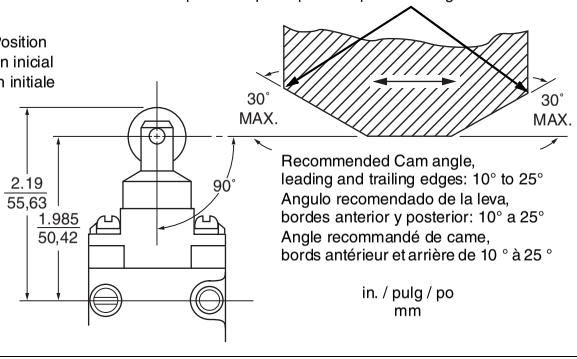
High Speed Cams (90 FPM or more), see SM444R1. / Levas de alta velocidad (0,46 MPS o más), vea SM444R1. / Cames grande vitesse (90 pi/m ou plus), voir SM444R1.

Figure / Figura / Figure 5 : Lever Type / Tipo palanca / Type du levier

Top Roller Plunger / Pulsador de roldana superior / Poussoir à galet supérieur

These points must NOT be lower than the top of the roller.
Estos puntos NO deberán estar más bajos que la parte superior de la roldana.
Ces points ne doivent PAS être plus bas que la partie supérieure du galet

Initial Position
Posición inicial
Position initiale



Side Roller Plunger / Pulsador con roldana lateral / Poussoir à galet latéral

These points must NOT be lower than the top of the roller.
Estos puntos NO deberán estar más bajos que la parte superior de la roldana.
Ces points ne doivent PAS être plus bas que la partie supérieure du galet

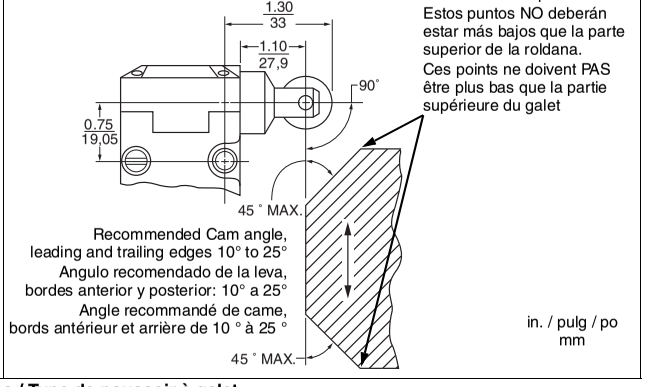


Figure / Figura / Figure 6 : Roller Plunger Type / Tipo pulsador con roldana / Type de poussoir à galet

Wobble Stick

When changing or installing wobble stick extensions on Types J, K, KC, or JKC (Figure 4), use a 1/4 in. open-end wrench to prevent the shaft from turning. Grip the extension spring with pliers and turn CCW to remove or CW to install. The extensions are interchangeable.

Replacement Parts

Heads, switch top assemblies, and base receptacles are available as replacement parts. To order, specify the Type number marked on the individual component, or refer to the *Digest*.

- Type C limit switches, when fully assembled, are designed to be operationally interchangeable with Type B limit switches. However, individual components (heads, switch tops, and base receptacles) are not interchangeable with the Type B components.
- On Type C limit switch plunger devices, the cam track dimension is the same as on the Type B *non-plug-in* devices, but 0.22 in. (5.6 mm) less than on the Type B *plug-in* devices. If this creates a problem, a 9007 CT10 adapter plate is available.
- Types C68, CO68, CT68, T5, and T10 neutral position limit switch components are **not** interchangeable with **any** other Type C limit switch components **including** Types C64, CO64, CT64, and BW.
- Type CO plug-in units are UL Listed only when used with 9007 CT base receptacles.
- Class 9007 Type C limit switches comply with IEC 60957.5.1, SC 8.3.4 when protected with a Bussmann CC KTK-R-10 fuse.

Varilla oscilante

Cuando se cambian o instalan extensiones de varilla oscilante en los tipos J, K, KC, o JKC (figura 4), utilice una llave española de 1/4 pulg para evitar que gire el eje. Agarre el resorte de la extensión con unas pinzas y gire hacia CCW para retirar la extensión o gire hacia CW para instalarla. Las extensiones son intercambiables.

Piezas de repuesto

Las cabezas, los ensambles de la parte superior del interruptor y los receptáculos de la base se pueden obtener como piezas de repuesto. Para solicitarlos, especifique el número de tipo del componente individual o consulte el *Compendiado*.

- Los interruptores de límite tipo C, cuando están completamente instalados, han sido diseñados para ser funcionalmente intercambiables con los interruptores de límite tipo B. Sin embargo, los componentes individuales (cabezas, partes superiores del interruptor y receptáculos de la base) no se pueden intecambiar con los componentes del interruptor tipo B.
- La medida de la trayectoria de la leva de los dispositivos del pulsador del interruptor de límite tipo C es la misma que para los dispositivos *no enchufables* tipo B, pero 5,6 mm (0,22 pulg) menor que la de los dispositivos *enchufables* tipo B. Si esto le crea problemas, se encuentra disponible una placa adaptadora 9007 CT10.
- Los componentes de los interruptores de límite de posición neutra tipos C68, CO68, CT68, T5 y T10 **no** son intercambiables con **ningun** otro componente de los interruptores de límite tipo C **incluyendo** los tipos C64, CO64, CT64 y BW.
- Las unidades enchufables tipo CO están registrados por UL solamente cuando se utilizan con los receptáculos de base clase 9007 CT.
- Los interruptores de límite clase 9007 tipo C cumplen con el requisito IEC 60957.5.1, SC 8.3.4 cuando están protegidos con un fusible Bussmann CC KTK-R-10.

Tige à ressort

Lors du changement ou de l'installation de rallonges de tige à ressort sur les types J, K, KC, ou JKC (figure 4), utiliser une clé plate de 1/4 po pour empêcher l'arbre de tourner. Saisir le ressort de la rallonge avec des pinces et tourner dans le sens anti-horaire pour démonter ou tourner dans le sens horaire pour installer. Les rallonges sont interchangeables.

Pièces de rechange

Les têtes, les assemblages de la partie supérieure de l'interrupteur et les réceptacles de base peuvent être obtenus comme pièces de rechange. Pour les commander, spécifier le numéro de type inscrit sur le composant individuel ou se reporter au *Digest*.

- Les interrupteurs de position de type C, lorsqu'ils sont complètement assemblés, sont conçus pour être fonctionnellement interchangeables avec les interrupteurs de position de type B. Toutefois, les composants individuels (têtes, parties supérieures de l'interrupteur et réceptacles de base) ne sont pas interchangeables avec les composants de type B.
- La dimension du trajet de la came des appareils de poussoir pour interrupteurs de position de type C est la même que celle des appareils de type B *non enfichables;* mais 5,6 mm (0,22 po) de moins que celle des appareils de type B *enfichables*. Si cela cause un problème, une plaque intermédiaire 9007 CT10 est disponible.
- Les composants de l'interrupteur de position à position neutre de type C68, CO68, CT68, T5 et T10 **ne** sont interchangeables avec **aucun** autre composant d'interrupteur de position de type C, **incluant** les types C64, CO64, CT64 et BW.
- Les unités enfichables de type CO sont listées UL seulement lorsqu'elles sont utilisées avec les réceptacles de base classe 9007 CT.
- Les interrupteurs de position classe 9007 type C sont conformes avec IEC 60957.5.1, SC 8.3.4 lorsqu'ils sont protégés par un fusible Bussmann CC KTK-R-10.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

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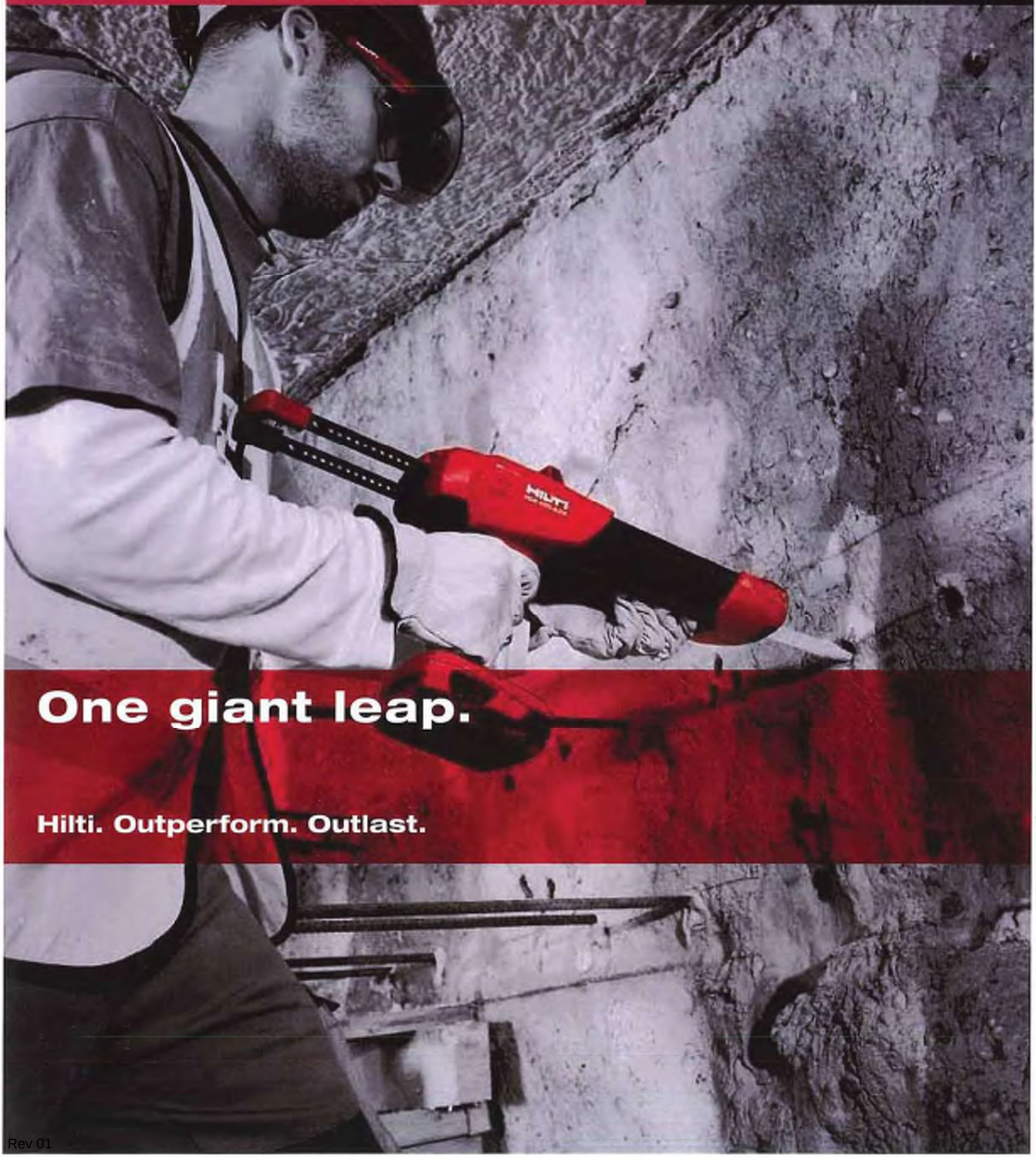
7.4 ***Anchoring System***

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HILTI

HIT-HY 200

Adhesive Anchor



One giant leap.

Hilti. Outperform. Outlast.

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ICC-ES Evaluation Report

ESR-4868

Reissued November 2022

This report is subject to renewal November 2024.

DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 19—Post-installed Concrete Anchors

REPORT HOLDER:

HILTI, INC.

EVALUATION SUBJECT:

HILTI HIT-HY 200 V3 ADHESIVE ANCHORS AND POST INSTALLED REINFORCING BAR CONNECTIONS IN CONCRETE

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, 2015, and 2012 *International Building Code®* (IBC)
- 2021, 2018, 2015, and 2012 *International Residential Code®* (IRC)

For evaluation for compliance with codes adopted by the Los Angeles Department of Building and Safety (LADBS), see ESR-4868 LABC and LARC Supplement.

Property evaluated:

Structural

2.0 USES

Adhesive anchors and reinforcing bars installed using the Hilti HIT-HY 200 V3 Adhesive Anchoring System and Post-Installed Reinforcing Bar System are used to resist static, wind and earthquake (Seismic Design Categories A through F) tension and shear loads in cracked and uncracked normal-weight or lightweight concrete having a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa) .

The anchor system complies with anchors as described in Section 1901.3 of the 2021, 2018 and 2015 IBC, and Section 1909 of the 2012 IBC and is an alternative to cast-in-place anchors described in Section 1908 of the 2012 IBC. The anchor systems may also be used where an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

The post-installed reinforcing bar system is an alternative to cast-in-place reinforcing bars governed by ACI 318 and IBC Chapter 19.

3.0 DESCRIPTION

3.1 General:

The Hilti HIT-HY 200 V3 Adhesive Anchoring System and Post-Installed Reinforcing Bar System are comprised of the following components:

- Hilti HIT-HY 200 V3 adhesive packaged in foil packs (either Hilti HIT-HY 200-A V3 or Hilti HIT-HY 200-R V3)
- Adhesive mixing and dispensing equipment
- Equipment for hole cleaning and adhesive injection

The Hilti HIT-HY 200 V3 Adhesive Anchoring System may be used with continuously threaded rod, Hilti HIT-Z(-R) anchor rods, Hilti HIS-(R)N internally threaded inserts or deformed steel reinforcing bars as depicted in Figure 1. The Hilti HIT-HY 200 V3 Post-Installed Reinforcing Bar System may only be used with deformed steel reinforcing bars as depicted in Figure 2. The primary components of the Hilti Adhesive Anchoring and Post-Installed Reinforcing Bar Systems, including the Hilti HIT-HY 200 V3 Adhesive, HIT-RE-M static mixing nozzle and steel anchoring elements, are shown in Figure 5 of this report.

The manufacturer's printed Installation instructions (MPII), as included with each adhesive unit package, are replicated as Figure 6.

3.2 Materials:

3.2.1 Hilti HIT-HY 200 V3 Adhesive: Hilti HIT-HY 200 V3 Adhesive is an injectable, two-component hybrid adhesive. The two components are separated by means of a dual-cylinder foil pack attached to a manifold. The two components combine and react when dispensed through a static mixing nozzle attached to the manifold. Hilti HIT-HY 200 V3 is available in 11.1-ounce (330 mL) and 16.9-ounce (500 mL) foil packs. The manifold attached to each foil pack is stamped with the adhesive expiration date. The shelf life, as indicated by the expiration date, applies to an unopened foil pack stored in a dry, dark environment and in accordance with Figure 6.

Hilti HIT-HY 200 V3 Adhesive is available in two options, Hilti HIT-HY 200-A V3 and Hilti HIT-HY 200-R V3. Both options are subject to the same technical data as set forth

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in this report. Hilti HIT-HY 200-A V3 will have shorter working times and curing times than Hilti HIT-HY 200-R V3. The packaging for each option employs a different color, which helps the user distinguish between the two adhesives.

3.2.2 Hole Cleaning Equipment:

3.2.2.1 Standard Equipment: Standard hole cleaning equipment, comprised of steel wire brushes and air nozzles, is described in Figure 6 of this report.

3.2.2.2 Hilti Safe-Set™ System: The Hilti Safe-Set™ with Hilti HIT-HY 200 V3 consists of one of the following:

- For the Hilti HIT-Z and HIT-Z-R anchor rods, hole cleaning is not required after drilling the hole, except if the hole is drilled with a diamond core drill bit.
- For the elements described in Sections 3.2.4.2 through 3.2.4.4 and Section 3.2.5, the Hilti TE-CD or TE-YD hollow carbide drill bit with a carbide drilling head conforming to ANSI B212.15. Used in conjunction with a Hilti vacuum with a minimum value for the maximum volumetric flow rate of 129 CFM (61 ℓ/s), the Hilti TE-CD or TE-YD drill bit will remove the drilling dust, automatically cleaning the hole.

3.2.3 Hole Preparation Equipment:

3.2.3.1 Hilti Safe-Set™ System: TE-YRT Roughening Tool: For the elements described in Sections 3.2.5.2 through 3.2.5.4 and Tables 12, 13, 15, 18, 19, 21, 24, 25, 28 and 29, the Hilti TE-YRT roughening tool with a carbide roughening head is used for hole preparation in conjunction with holes core drilled with a diamond core bit as illustrated in Section 4.1.4.2 of this report.

3.2.4 Dispensers: Hilti HIT-HY 200 V3 must be dispensed with manual or electric dispensers provided by Hilti.

3.2.5 Anchor Elements:

3.2.5.1 Hilti HIT-Z and HIT-Z-R Anchor Rods: Hilti HIT-Z and HIT-Z-R anchor rods have a conical shape on the embedded section and a threaded section above the concrete surface. Mechanical properties for the Hilti HIT-Z and HIT-Z-R anchor rods are provided in Table 2. The rods are available in diameters as shown in Table 7 and Figure 1. Hilti HIT-Z anchor rods are produced from carbon steel and furnished with a 0.005-millimeter-thick (5 μm) zinc electroplated coating. Hilti HIT-Z-R anchor rods are fabricated from grade 316 stainless steel.

3.2.5.2 Threaded Steel Rods: Threaded steel rods must be clean, continuously threaded rods (all-thread) in diameters as described in Tables 11 and 17 and Figure 1 of this report. Steel design information for common grades of threaded rods is provided in Table 3. Carbon steel threaded rods may be furnished with a 0.0002-inch-thick (0.005 mm) zinc electroplated coating complying with ASTM B633 SC 1 or must be hot-dipped galvanized complying with ASTM A153, Class C or D. Stainless steel threaded rods must comply with ASTM F593 or ISO 3506 A4. Threaded steel rods must be straight and free of indentations or other defects along their length. The ends may be stamped with identifying marks and the embedded end may be blunt cut or cut on the bias to a chisel point.

3.2.5.3 Steel Reinforcing Bars for use in Post-Installed Anchor Applications: Steel reinforcing bars are deformed bars as described in Table 4 of this report. Tables 11A, 17, and 23 and Figure 1 summarize reinforcing bar size ranges. The embedded portions of reinforcing bars must be straight, and free of mill scale, rust, mud, oil and other coatings (other than zinc) that may impair the bond with the adhesive. Reinforcing bars must not be bent after installation except as set forth in ACI 318-19 Section 26.6.3.2(b) ACI 318-14 Section 26.6.3.1(b) or ACI 318-11 Section 7.3.2, as applicable, with the additional condition that the bars must be bent cold, and heating of reinforcing bars to facilitate field bending is not permitted.

3.2.5.4 Hilti HIS-N and HIS-RN Inserts: Hilti HIS-N and HIS-RN inserts have a profile on the external surface and are internally threaded. Mechanical properties for Hilti HIS-N and HIS-RN inserts are provided in Table 5. The inserts are available in diameters and lengths as shown in Table 27 and Figure 1. Hilti HIS-N inserts are produced from carbon steel and furnished with a 0.005-millimeter-thick (5 μm) zinc electroplated coating complying with ASTM B633 SC 1. The stainless steel Hilti HIS-RN inserts are fabricated from X5CrNiMo17122 K700 steel conforming to DIN 17440. Specifications for common bolt types that may be used in conjunction with Hilti HIS-N and HIS-RN inserts are provided in Table 6. Bolt grade and material type (carbon, stainless) must be matched to the insert. Strength reduction factors, ϕ, corresponding to brittle steel elements must be used for Hilti HIS-N and HIS-RN inserts.

3.2.5.5 Ductility: In accordance with ACI 318-19 and ACI 318-14 2.3 or ACI 318-11 D.1, as applicable, in order for a steel element to be considered ductile, the tested elongation must be at least 14 percent and reduction of area must be at least 30 percent. Steel elements with a tested elongation of less than 14 percent or a reduction of area of less than 30 percent, or both, are considered brittle. Values for various steel materials are provided in Tables 2, 3, and 6 of this report. Where values are nonconforming or unstated, the steel must be considered brittle.

3.2.6 Steel Reinforcing Bars for Use in Post-Installed Reinforcing Bar Connections: Steel reinforcing bars used in post-installed reinforcing bar connections are deformed bars (rebar) as depicted in Figures 2 and 3. Tables 30, 31, 32, and Figure 6 summarize reinforcing bar size ranges. The embedded portions of reinforcing bars must be straight, and free of mill scale, rust and other coatings that may impair the bond with the adhesive. Reinforcing bars must not be bent after installation, except as set forth in Section 26.6.3.2(b) of ACI 318-19, Section 26.6.3.1(b) of ACI 318-14 or Section 7.3.2 of ACI 318-11, as applicable, with the additional condition that the bars must be bent cold, and heating of reinforcing bars to facilitate field bending is not permitted.

3.3 Concrete:

Normal-weight and lightweight concrete must comply with Sections 1903 and 1905 of the IBC, as applicable. The specified compressive strength of the concrete must be from 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

4.0 DESIGN AND INSTALLATION

4.1 Strength Design of Post-Installed Anchors:

Refer to Table 1 for the design parameters for specific installed elements, and refer to Section 4.1.4.2 for a table to determine the applicable design bond strength or pullout strength.

4.1.1 General: The design strength of anchors under the 2021 IBC, as well as the 2021 IRC, must be determined in accordance with ACI 318-19 and this report. The design strength of anchors under the 2018 and 2015 IBC and 2018 and 2015 IRC must be determined in accordance with ACI 318-14 and this report. The design strength of anchors under the 2012 IBC, as well as the 2012 IRC must be determined in accordance with ACI 318-11 and this report.

Design parameters are based on ACI 318-19 for use with the 2021 IBC, ACI 318-14 for use with the 2018 and 2015 IBC, and ACI 318-11 for use with the 2012 IBC unless noted otherwise in Sections 4.1.1 through 4.1.11 of this report.

The strength design of anchors must comply with ACI 318-19 17.5.1.2 or ACI 318-14 17.3.1 or ACI 318-11 D.4.1 as applicable, except as required in ACI 318-19 17.10 or ACI 318-14 17.2.3 or ACI 318-11 D.3.3, as applicable.

Design parameters are provided in Table 7 through Table 29. Strength reduction factors, ϕ, as given in ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable must be used for load combinations calculated in accordance with Section 1605.1 of the 2021 IBC or Section 1605.2 of the 2018, 2015 and 2012 IBC or ACI 318-19 and ACI 318-14 5.3 or ACI 318-11 9.2, as applicable. Strength reduction factors, ϕ, as given in ACI 318-11 D.4.4 must be used for load combinations calculated in accordance with ACI 318-11 Appendix C.

4.1.2 Static Steel Strength in Tension: The nominal static steel strength of a single anchor in tension, N_{sa}, in accordance with ACI 318-19 17.6.1.2, ACI 318-14 17.4.1.2 or ACI 318-11 Section D.5.1.2, as applicable and the associated strength reduction factors, ϕ, in accordance with ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 Section D.4.3, as applicable, are provided in the tables outlined in Table 1 for the anchor element types included in this report.

4.1.3 Static Concrete Breakout Strength in Tension: The nominal concrete breakout strength of a single anchor or group of anchors in tension, N_{cb} or N_{cbg}, must be calculated in accordance with ACI 318-19 17.6.2, ACI 318-14 17.4.2 or ACI 318-11 D.5.2, as applicable, with the following addition:

The basic concrete breakout strength of a single anchor in tension, N_b, must be calculated in accordance with ACI 318-19 17.6.2.2, ACI 318-14 17.4.2.2 or ACI 318-11 D.5.2.2, as applicable using the values of $k_{c,cr}$, and $k_{c,uncr}$ as described in this report. Where analysis indicates no cracking in accordance with ACI 318-19 17.6.2.5, ACI 318-14 17.4.2.6 or ACI 318-11 D.5.2.6, as applicable, N_b must be calculated using $k_{c,uncr}$ and $\Psi_{c,N}$ = 1.0. See Table 1. For anchors in lightweight concrete, see ACI 318-19 17.2.4, ACI 318-14 17.2.6 or ACI 318-11 D.3.6, as applicable. The value of f'_c used for calculation must be limited to 8,000 psi (55 MPa) in accordance with ACI 318-19 17.3.1, ACI 318-14 17.2.7 or ACI 318-11 D.3.7, as applicable. Additional information for the determination of nominal bond strength in tension is given in Section 4.1.4 of this report.

4.1.4 Static Bond Strength/Static Pullout Strength in Tension:

4.1.4.1 Static Pullout Strength In Tension: Hilti HIT-Z and HIT-Z-R Anchor Rods: The nominal static pullout strength of a single anchor in accordance with ACI 318-19 17.6.3.1 and 17.6.3.2.1, ACI 318-14 17.4.3.1 and 17.4.3.2 or ACI 318-11 D.5.3.1 and D.5.3.2, as applicable, in cracked and uncracked concrete, $N_{p,cr}$ and $N_{p,uncr}$, respectively, is given in Table 10. For all design cases $\Psi_{c,P}$ = 1.0.

Pullout strength values are a function of the concrete compressive strength, whether the concrete is cracked or uncracked, the drilling method (hammer drill, including Hilti hollow drill bit, diamond core drill) and installation conditions (dry or water-saturated). The resulting characteristic pullout strength must be multiplied by the associated strength reduction factor ϕ_{nn} as follows:

HILTI HIT-Z AND HIT-Z-R THREADED RODS				
DRILLING METHOD	**CONCRETE TYPE**	**PERMISSIBLE INSTALLATION CONDITIONS**	**PULLOUT STRENGTH**	**ASSOCIATED STRENGTH REDUCTION FACTOR**
Hammer-drill (or Hilti TE-CD or TE-YD Hollow Drill Bit) or Diamond Core Bit	Uncracked	Dry	$N_{p,uncr}$	ϕ_d
		Water saturated	$N_{p,uncr}$	ϕ_{ws}
	Cracked	Dry	$N_{p,cr}$	ϕ_d
		Water saturated	$N_{p,cr}$	ϕ_{ws}

Section 4.1.4.2 of this report presents a pullout strength design selection table. Strength reduction factors for determination of the bond strength are given in the tables referenced in Table 1 of this report.

4.1.4.2 Static Bond Strength in Tension: Threaded Rod, Steel Reinforcing Bars, and Hilti HIS-N and HIS-RN Inserts: The nominal static bond strength of a single adhesive anchor or group of adhesive anchors in tension, N_a or N_{ag}, must be calculated in accordance with ACI 318-19 17.6.5, ACI 318-14 17.4.5 or ACI 318-11 D.5.5, as applicable. Bond strength values are a function of the concrete compressive strength, whether the concrete is cracked or uncracked, the concrete temperature range, and the installation conditions (dry or water-saturated concrete). The resulting characteristic bond strength shall be multiplied by the associated strength reduction factor ϕ_{nn} as follows:

DRILLING METHOD	**CONCRETE TYPE**	**PERMISSIBLE INSTALLATION CONDITIONS**	**BOND STRENGTH**	**ASSOCIATED STRENGTH REDUCTION FACTOR**
Hammer-drill (or Hilti TE-CD or TE-YD Hollow Drill Bit) or Diamond Core Bit with Hilti TE-YRT roughening tool	Uncracked	Dry	$\tau_{k,uncr}$	ϕ_d
		Water saturated	$\tau_{k,uncr}$	ϕ_{ws}
	Cracked	Dry	$\tau_{k,cr}$	ϕ_d
		Water saturated	$\tau_{k,cr}$	ϕ_{ws}
Hammer-drill (or Hilti TE-CD or TE-YD Hollow Drill Bit)	Uncracked	Water-filled	$\tau_{k,uncr}$	ϕ_{wf}
	Cracked		$\tau_{k,cr}$	ϕ_{wf}

Strength reduction factors for determination of the bond strength are outlined in Table 1 of this report. Adjustments to the bond strength may also be made for increased concrete compressive strength as noted in the footnotes to the bond strength tables. For anchors in lightweight concrete see ACI 318-19 17.2.4, ACI 318-14 17.2.6, or ACI 318-11 D.3.6, as applicable.

4.1.5 Static Steel Strength in Shear: The nominal static strength of a single anchor in shear as governed by the steel, V_{sa}, in accordance with ACI 318-19 17.7.1.2, ACI 318-14 17.5.1.2 or ACI 318-11 D.6.1.2, as applicable and strength reduction factors, ϕ, in accordance with ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are given in the tables outlined in Table 1 for the anchor element types included in this report.

4.1.6 Static Concrete Breakout Strength in Shear: The nominal static concrete breakout strength of a single anchor or group of anchors in shear, V_{cb} or V_{cbg}, must be calculated in accordance with ACI 318-19 17.7.2, ACI 318-14 17.5.2 or ACI 318-11 D.6.2, as applicable, based on

information given in the tables outlined in Table 1. The basic concrete breakout strength of a single anchor in shear, V_b, must be calculated in accordance with ACI 318-19 17.7.2.2, ACI 318-14 17.5.2.2 or ACI 318-11 D.6.2.2, as applicable, using the values of *d* given in the tables as outlined in Table 1 for the corresponding anchor steel in lieu of d_a (2021, 2018, 2015, and 2012 IBC). In addition, h_{ef} must be substituted for ℓ_e. In no case must ℓ_e exceed *8d*. The value of f'_c must be limited to a maximum of 8,000 psi (55 MPa) in accordance with ACI 318-19 17.3.1, ACI 318-14 17.2.7 or ACI 318-11 D.3.7, as applicable.

4.1.7 Static Concrete Pryout Strength in Shear: The nominal static pryout strength of a single anchor or group of anchors in shear, V_{cp} or V_{cpg}, must be calculated in accordance with ACI 318-19 17.7.3, ACI 318-14 17.5.3 or ACI 318-11 D.6.3, as applicable.

4.1.8 Interaction of Tensile and Shear Forces: For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318-19 17.8, ACI 318-14 17.6 or ACI 318-11 D.7, as applicable.

4.1.9 Minimum Member Thickness, h_{min}, Anchor Spacing, s_{min} and Edge Distance, c_{min}:

4.1.9.1 Hilti HIT-Z and HIT-Z-R Anchor Rods: In lieu of ACI 318-19 17.9.2, ACI 318-14 17.7.1 and 17.7.3 or ACI 318-11 D.8.1 and D.8.3, as applicable, values of s_{min} and c_{min} described in Table 9 of this report must be observed for anchor design and installation. The minimum member thicknesses, h_{min}, given in Table 9 of this report must be observed for anchor design and installation.

4.1.9.2 Threaded Rod, Steel Reinforcing Bars, and Hilti HIS-N and HIS-RN Inserts: In lieu of ACI 318-19 17.9.2, ACI 318-14 17.7.1 and 17.7.3 or ACI 318-11 D.8.1 and D.8.3, as applicable, values of c_{min} and s_{min} described in this report must be observed for anchor design and installation. Likewise, in lieu of ACI 318-19 17.9.4, ACI 318-14 17.7.5 or ACI 318-11 D.8.5, as applicable, the minimum member thicknesses, h_{min}, described in this report must be observed for anchor design and installation. For adhesive anchors that will remain untorqued, ACI 318-19 17.9.3, ACI 318-14 17.7.4 or ACI 318-11 D.8.4, as applicable, applies.

For edge distances c_{ai} and anchor spacing s_{ai}, the maximum torque T_{max} shall comply with the following requirements:

REDUCED MAXIMUM INSTALLATION TORQUE $T_{max,red}$ FOR EDGE DISTANCES c_{ai} < (5 x d_a)		
EDGE DISTANCE, c_{ai}	**MINIMUM ANCHOR SPACING, s_{ai}**	**MAXIMUM TORQUE, $T_{max,red}$**
1.75 in. (45 mm) ≤ c_{ai} < 5 x d_a	5 x d_a ≤ s_{ai} < 16 in.	0.3 x T_{max}
	s_{ai} ≥ 16 in. (406 mm)	0.5 x T_{max}

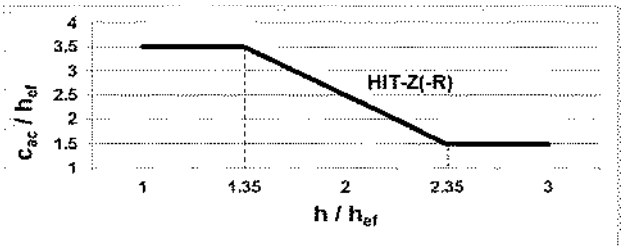
4.1.10 Critical Edge Distance c_{ac} and $\psi_{cp,Na}$:

4.1.10.1 Hilti HIT-Z and HIT-Z-R Anchor Rods: In lieu of ACI 318-19 17.9.5, ACI 318-14 17.7.6 or ACI 318-11 D.8.6, as applicable, for the calculation of N_{cb} and N_{cbg} in accordance with ACI 318-19 17.6.2.6.1, ACI 318-14 17.4.2.7 or ACI 318-11 D.5.2.7, as applicable and Section 4.1.3 of this report, the critical edge distance, c_{ac}, must be determined as follows:

i. $c_{ac} = 1.5.h_{ef}$ *for* $h/h_{ef} \geq 2.35$

ii. $c_{ac} = 3.5.h_{ef}$ *for* $h/h_{ef} \leq 1.35$

For definitions of *h* and h_{ef}, see Figure 1.



Linear interpolation is permitted to determine the ratio of c_{ac}/h_{ef} for values of h/h_{ef} between 2.35 and 1.35 as illustrated in the graph above.

4.1.10.2 Threaded Rod, Steel Reinforcing Bars, and Hilti HIS-N and HIS-RN Inserts: The modification factor $\psi_{cp,Na}$, must be determined in accordance with ACI 318-19 17.6.5.5, ACI 318-14 17.4.5.5 or ACI 318-11 D.5.5.5, as applicable, except as noted below:

For all cases where c_{Na}/c_{ac}<1.0, $\psi_{cp,Na}$ determined from ACI 318-19 Eq. 17.6.5.5.1b, ACI 318-14 Eq. 17.4.5.5b or ACI 318-11 Eq. D-27, as applicable, need not be taken less than c_{Na}/c_{ac}. For all other cases, $\psi_{cp,Na}$ shall be taken as 1.0.

The critical edge distance, c_{ac} must be calculated according Eq. 17.6.5.5.1c for ACI 318-19, to Eq. 17.4.5.5c for ACI 318-14 or Eq. D-27a for ACI 318-11, in lieu of ACI 318-19 17.9.5, ACI 318-14 17.7.6 or ACI 318-11 D.8.6, as applicable.

$$c_{ac}=h_{ef}\cdot\left(\frac{\tau_{k,\,uncr}}{1160}\right)^{0.4}\cdot\left[3.1-0.7\frac{h}{h_{ef}}\right]$$

(Eq. 17.6.5.5.1c for ACI 318-19, Eq. 17.4.5.5c for ACI 318-14 or Eq. D-27a for ACI 318-11)

where

$\left[\frac{h}{h_{ef}}\right]$ need not be taken as larger than 2.4; and

$\tau_{k,uncr}$ is the characteristic bond strength in uncracked concrete, *h* is the member thickness, and h_{ef} is the embedment depth.

$\tau_{k,uncr}$ *need not be taken as greater than:*

$$\tau_{k,uncr}=\frac{k_{uncr}\sqrt{h_{ef}f'_c}}{\pi\cdot d} \qquad \text{Eq. (4-1)}$$

4.1.11 Design Strength in Seismic Design Categories C, D, E and F: In structures assigned to Seismic Design Category C, D, E or F under the IBC or IRC, anchors must be designed in accordance with ACI 318-19 17.10, ACI 318-14 17.2.3 or ACI 318-11 D.3.3, as applicable, except as described below:

Modifications to ACI 318-19 17.10 and ACI 318-14 17.2.3 shall be applied under Section 1905.1.8 of the 2021, 2018 and 2015 IBC, as applicable. For the 2012 IBC, Section 19.5.1.9 shall be omitted. The nominal steel shear strength, V_{sa}, must be adjusted by $\alpha_{V,seis}$ as given in the tables summarized in Table 1 for the anchor element types included in this report. For tension, the nominal pullout strength $N_{p,cr}$ or bond strength τ_{cr} must be adjusted by $\alpha_{N,seis}$. See Tables 10, 13, 14, 15, 16, 19, 20, 21, 22, 25, 26 and 29.

As an exception to ACI 318-11 D.3.3.4.2:

Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 shall be deemed to satisfy ACI 318-11 D.3.3.4.3(d). Under ACI 318-11 D.3.3.4.3(d), in lieu of requiring the anchor design tensile strength to satisfy the tensile strength requirements of ACI 318-11 D.4.1.1, the anchor design tensile strength shall be calculated from ACI 318-11 D.3.3.4.4.

The following exceptions apply to ACI 318-11 D.3.3.5.2:

1. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or non-bearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane shear strength in accordance with ACI 318-11 D.6.2 and D.6.3 need not be computed and ACI 318-11 D.3.3.5.3 need not apply provided all of the following are satisfied:

1.1. The allowable in-plane shear strength of the anchor is determined in accordance with AF&PA NDS Table 11E for lateral design values parallel to grain.

1.2. The maximum anchor nominal diameter is $^5/_8$ inch (16 mm).

1.3. Anchor bolts are embedded into concrete a minimum of 7 inches (178 mm).

1.4. Anchor bolts are located a minimum of $1^3/_4$ inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.

1.5. Anchor bolts are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the wood sill plate.

1.6. The sill plate is 2-inch or 3-inch nominal thickness.

2. For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or non-bearing walls of light-frame construction to foundations or foundation stem walls, the in-plane shear strength in accordance with ACI 318-11 D.6.2 and D.6.3, need not be computed and ACI 318-11 D.3.3.5.3 need not apply provided all of the following are satisfied:

2.1. The maximum anchor nominal diameter is $^5/_8$ inch (16 mm).

2.2. Anchors are embedded into concrete a minimum of 7 inches (178 mm).

2.3. Anchors are located a minimum of $1^3/_4$ inches (45 mm) from the edge of the concrete parallel to the length of the track.

2.4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.

2.5. The track is 33 to 68 mil designation thickness.

Allowable in-plane shear strength of exempt anchors, parallel to the edge of concrete shall be permitted to be determined in accordance with AISI S100 Section E3.3.1.

3. In light-frame construction, bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 1 inch [25 mm] in diameter attaching a sill plate or track to foundation or foundation stem wall need not satisfy ACI 318-11 D.3.3.5.3(a) through (c) when the design strength of the anchors is determined in accordance with ACI 318-11 D.6.2.1(c).

4.2 Strength Design of Post-Installed Reinforcing Bars:

4.2.1 General: The design of straight post-installed deformed reinforcing bars must be determined in accordance with ACI 318 rules for cast-in place reinforcing bar development and splices and this report.

Examples of typical applications for the use of post-installed reinforcing bars are illustrated in Figure 3 of this report.

4.2.2 Determination of bar development length l_d: Values of l_d must be determined in accordance with the ACI 318 development and splice length requirements for straight cast-in place reinforcing bars.

Exceptions:

1. For uncoated and zinc-coated (galvanized) post-installed reinforcing bars, the factor Ψ_e shall be taken as 1.0. For all other cases, the requirements in ACI 318-19 25.4.2.5, *ACI 318-14 25.4.2.4 or ACI 318-11 Section 12.2.4 (b) shall apply.*

2. When using alternate methods to calculate the development length (e.g., anchor theory), the applicable factors for post-installed anchors generally apply.

4.2.3 Minimum Member Thickness, h_{min}, Minimum Concrete Cover, $c_{c,min}$, Minimum Concrete Edge Distance, $c_{b,min}$, Minimum Spacing, $s_{b,min}$,: For post-installed reinforcing bars, there is no limit on the minimum member thickness. In general, all requirements on concrete cover and spacing applicable to straight cast-in bars designed in accordance with ACI 318 shall be maintained.

For post-installed reinforcing bars installed at embedment depths, h_{ef}, larger than 20d (h_{ef} > 20d), the minimum concrete cover shall be as follows:

REBAR SIZE	MINIMUM CONCRETE COVER, $c_{c,min}$
$d_b \leq$ No. 6 (16mm)	$1^3/_{16}$ in.(30mm)
No. 6 < $d_b \leq$ No.10 (16mm < $d_b \leq$ 32mm)	$1^9/_{16}$ in. (40mm)

The following requirements apply for minimum concrete edge and spacing for h_{ef} > 20d:

Required minimum edge distance for post-installed reinforcing bars (measured from the center of the bar):

$$c_{b,min} = d_0/2 + c_{c,min}$$

Required minimum center-to-center spacing between post-installed bars:

$$s_{b,min} = d_0 + c_{c,min}$$

Required minimum center-to-center spacing from existing (parallel) reinforcing:

$$s_{b,min} = d_b/2 \text{ (existing reinforcing)} + d_0/2 + c_{c,min}$$

4.2.4 Design Strength in Seismic Design Categories C, D, E and F: In structures assigned to Seismic Category C, D, E or F under the IBC or IRC, design of straight post-installed reinforcing bars must take into account the provisions of ACI 318-19 or ACI 318-14 Chapter 18 or ACI 318-11 Chapter 21, as applicable.

4.3 Installation:

Installation parameters are illustrated in Figure 1. Installation must be in accordance with ACI 318-19 26.7.2, ACI 318-14 17.8.1 and 17.8.2 or ACI 318-11 D.9.1 and D.9.2, as applicable. Anchor and post-installed reinforcing bar locations must comply with this report and the plans and specifications approved by the code official. Installation of the Hilti HIT-HY 200 V3 Adhesive Anchor and Post-Installed Reinforcing Bar Systems must conform to the manufacturer's printed installation instructions (MPII) included in each unit package as provided in Figure 6 of this report. The MPII contains additional requirements for combinations of drill hole depth, diameter, drill bit type, and dispensing tools.

4.4 Special Inspection:

Periodic special inspection must be performed where required in accordance with Section 1705.1.1 and Table 1705.3 of the 2021, 2018, 2015 and 2012 IBC, and this report. The special inspector must be on the jobsite initially during anchor or post-installed reinforcing bar installation to verify anchor or post-installed reinforcing bar type and dimensions, concrete type, concrete compressive strength, adhesive identification and expiration date, hole dimensions, hole cleaning procedures, spacing, edge distances, concrete thickness, anchor or post-installed reinforcing bar embedment, tightening torque and adherence to the manufacturer's printed installation instructions.

The special inspector must verify the initial installations of each type and size of adhesive anchor or post-installed reinforcing bar by construction personnel on site. Subsequent installations of the same anchor or post-installed reinforcing bar type and size by the same construction personnel are permitted to be performed in the absence of the special inspector. Any change in the anchor or post-installed reinforcing bar product being installed or the personnel performing the installation requires an initial inspection. For ongoing installations over an extended period, the special inspector must make regular inspections to confirm correct handling and installation of the product.

Continuous special inspection of adhesive anchors or post-installed reinforcing bar installed in horizontal or upwardly inclined orientations to resist sustained tension loads shall be performed in accordance with ACI 318-19 26.13.3.2e and 26.7.1(j), ACI 318-14 17.8.2.4, 26.7.1(h), and 26.13.3.2(c) or ACI 318-11 D.9.2.4, as applicable.

Under the IBC, additional requirements as set forth in Sections 1705, 1706, and 1707 must be observed, where applicable.

5.0 CONDITIONS OF USE

The Hilti HIT-HY 200 V3 Adhesive Anchor System and Post-Installed Reinforcing Bar System described in this report complies with, or is a suitable alternative to what is specified in, the codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Hilti HIT-HY 200 V3 Adhesive anchors and post-installed reinforcing bars must be installed in accordance with the manufacturer's printed installation instructions (MPII) as included in the adhesive packaging and provided in Figure 6 of this report.

5.2 The anchors and post-installed reinforcing bars must be installed in cracked and uncracked normal-weight or lightweight concrete having a specified compressive strength f'_c = 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

5.3 The values of f'_c used for calculation purposes must not exceed 8,000 psi (55.1 MPa) except as noted in Sections 4.2.2 and 4.2.4 of this report.

5.4 The concrete shall have attained its minimum design strength prior to installation of the adhesive anchors.

5.5 Anchors and post-installed reinforcing bars must be installed in concrete base materials in holes predrilled in accordance with the instructions in Figure 6, using carbide-tipped masonry drill bits manufactured with the range of maximum and minimum drill-tip dimensions specified in ANSI B212.15-1994. The Hilti HIT-Z(-R) anchor rods may be installed in holes predrilled using diamond core drill bits. Threaded rods, reinforcing bars, and the Hilti HIS-(R)N inserts may be installed in holes predrilled using diamond core bits and roughened with the Hilti TE-YRT roughening tool as detailed in Figure 6.

5.6 Loads applied to the anchors must be adjusted in accordance with Section 1605.1 of the 2021 IBC or Section 1605.2 of the 2018, 2015 and 2012 IBC for strength design and in accordance with Section 1605.1 of the 2021 IBC or Section 1605.3 of the 2018, 2015, and 2012 IBC for allowable stress design.

5.7 Hilti HIT-HY 200 V3 adhesive anchors and post-installed reinforcing bars are recognized for use to resist short- and long-term loads, including wind and earthquake, subject to the conditions of this report.

5.8 In structures assigned to Seismic Design Category C, D, E or F under the IBC or IRC, anchor strength must be adjusted in accordance in accordance with Section 4.1.11 of this report, and post-installed reinforcing bars must comply with section 4.2.4 of this report.

5.9 Hilti HIT-HY 200 V3 adhesive anchors and post-installed reinforcing bars are permitted to be installed in concrete that is cracked or that may be expected to crack during the service life of the anchor, subject to the conditions of this report.

5.10 Anchor strength design values must be established in accordance with Section 4.1 of this report.

5.11 Post-installed reinforcing bar development and splice length is established in accordance with Section 4.2 of this report.

5.12 Minimum anchor spacing and edge distance as well as minimum member thickness must comply with the values noted in this report.

5.13 Post-installed reinforcing bar spacing, minimum member thickness, and cover distance must be in accordance with the provisions of ACI 318 for cast-in place bars and section 4.2.3 of this report.

5.14 Prior to anchor installation, calculations and details demonstrating compliance with this report must be submitted to the code official. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.15 Anchors and post-installed reinforcing bars are not permitted to support fire-resistive construction. Where not otherwise prohibited by the code, Hilti HIT-HY 200 V3 adhesive anchors and post-installed reinforcing bars are permitted for installation in fire-resistive construction provided that at least one of the following conditions is fulfilled:

- Anchors and post-installed reinforcing bars are used to resist wind or seismic forces only.
- Anchors and post-installed reinforcing bars that support gravity load–bearing structural elements are within a fire-resistive envelope or a fire-resistive membrane, are protected by approved fire-resistive materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- Anchors and post-installed reinforcing bars are used to support nonstructural elements.

5.16 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of adhesive anchors and post-installed reinforcing bars subjected to fatigue or shock loading is unavailable at this time,

the use of these anchors under such conditions is beyond the scope of this report.

5.17 Use of zinc-plated carbon steel threaded rods or steel reinforcing bars is limited to dry, interior locations.

5.18 Use of hot-dipped galvanized carbon steel and stainless steel rods is permitted for exterior exposure or damp environments.

5.19 Steel anchoring materials in contact with preservative-treated and fire-retardant-treated wood must be of zinc-coated carbon steel or stainless steel. The minimum coating weights for zinc-coated steel must comply with ASTM A153.

5.20 Periodic special inspection must be provided in accordance with Section 4.4 of this report. Continuous special inspection for anchors and post-installed reinforcing bars installed in horizontal or upwardly inclined orientations to resist sustained tension loads must be provided in accordance with Section 4.4 of this report.

5.21 Installation of anchors and post-installed reinforcing bars in horizontal or upwardly inclined orientations to resist sustained tension loads shall be performed by personnel certified by an applicable certification program in accordance with ACI 318-19 26.7.2(e), ACI 318-14 17.8.2.2 or 17.8.2.3, or ACI 318-11 D.9.2.2 or D.9.2.3, as applicable.

5.22 Hilti HIT-HY 200 V3 adhesive anchors and post-installed reinforcing bars may be used to resist tension and shear forces in floor, wall, and overhead installations only if installation is into concrete with a temperature between 14°F and 104°F (-10°C and 40°C) for threaded rods, rebar, and Hilti HIS-(R)N inserts, or between 41°F and 104°F (5°C and 40°C) for Hilti HIT-Z(-R) anchor rods. (For post-installed reinforcing bars with embedment depth greater than 20d refer to additional temperature limitations in the MPII as provided in Figure 6 of this report). Overhead installations for hole diameters larger than $^{7}/_{16}$-inch or 10mm require the use of piston plugs (HIT-SZ, -IP) during injection to the back of the hole. $^{7}/_{16}$-inch diameter holes may be injected directly to the back of the hole with the use of extension tubing on the end of the nozzle. The anchor or post-installed reinforcing bars must be supported until fully cured (i.e., with Hilti HIT-OHW wedges, or other suitable means). Where temporary restraint devices are used, their use shall not result in impairment of the anchor shear resistance. Installations in concrete temperatures below 32°F require the adhesive to be conditioned to a minimum temperature of 32°F.

5.23 Anchors and post-installed reinforcing bars when installed at temperatures below 40°F shall not be used for applications where the concrete temperature can rise from 40°F or less to 80°F or higher within a 12-hour period. Such applications may include, but are not limited to, anchorage of building façade systems and other applications subject to direct sun exposure.

5.24 Hilti HIT-HY 200-A V3 and Hilti HIT-HY 200-R V3 adhesives are manufactured by Hilti GmbH, Kaufering, Germany, under a quality control program with inspections by ICC-ES.

5.25 Hilti HIT-Z and HIT-Z-R rods are manufactured by Hilti AG, Schaan, Liechtenstein, under a quality-control program with inspections by ICC-ES.

5.26 Hilti HIS-N and HIS-RN inserts are manufactured by Hilti (China) Ltd., Guangdong, China, under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Post-installed Adhesive Anchors in Concrete Elements (AC308), dated June 2019, editorially revised February 2021, which incorporates requirements in ACI 355.4-11 and ACI 355.4-19, and Table 3.8 for evaluating post-installed reinforcing bars.

7.0 IDENTIFICATION

7.1 Product labeling shall include, the name of the report holder or listee, and the ICC-ES mark of conformity. The listing or evaluation report number (ICC-ES ESR-4868) may be used in lieu of the mark of conformity. Hilti HIT-HY 200 A V3 and Hilti HIT HY 200 R V3 adhesive is identified by packaging labeled with the manufacturer's name (Hilti Corp.) and address, product name, lot number, expiration date, and evaluation report number (ESR-4868).

7.2 Hilti HIT-Z and HIT-Z-R rods are identified by packaging labeled with the manufacturer's name (Hilti Corp.) and address, anchor name, and evaluation report number (ESR-4868).

7.3 Hilti HIS-N and HIS-RN inserts are identified by packaging labeled with the manufacturer's name (Hilti Corp.) and address, anchor name and size, and evaluation report number (ESR-4868).

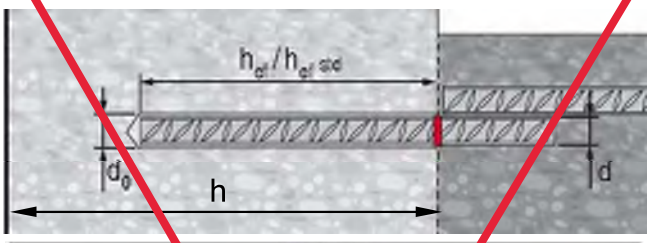
7.4 Threaded rods, nuts, washers, bolts, cap screws, and deformed reinforcing bars are standard elements and must conform to applicable national or international specifications.

7.5 The report holder's contact information is the following:

HILTI, INC.
7250 DALLAS PARKWAY, SUITE 1000
PLANO, TEXAS 75024
(800) 879-8000
www.hilti.com
HiltiTechEng@us.hilti.com

THE FOLLOWING CONTAIN EDITED PAGES THAT REMOVE AND/OR "X" OUT INFORMATION FOR ANCHOR/ROD TYPES THAT ARE NON-APPLICABLE FOR THE PROPOSED SUPPLY. PLEASE REFER TO WWW.HILTI.COM FOR FULL DOCUMENT.

DEFORMED REINFORCMENT



US REBAR

d	Ø d_0 [inch]	$h_{ef,min}$ [inch]	h_{ef} [inch]
#3	½	3⅜	2⅜...7½
#4	½	4½	2¾...10
#5	⅝	5⅛	3⅛...12½
#6	⅞	6¾	3½...15
#7	1	7⅞	3½...17½
#8	1⅛	9	4...20
#9	1⅜	10⅛	4½...22½
#10	1½	11¼	5...25

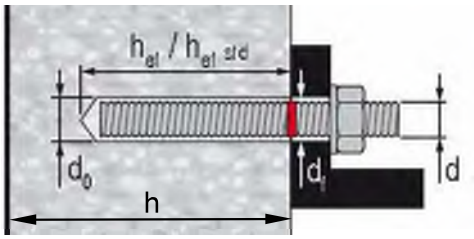
CANADIAN REBAR

d	Ø d_0 [inch]	$h_{ef,min}$ [mm]	h_{ef} [mm]
10 M	½	115	70...226
15 M	¾	140	80...320
20 M	1	200	90...390
25 M	1¼	239	101...504
30 M	1½	260	120...596

EUROPEAN REBAR

Ø d [mm]	Ø d_0 [mm]	$h_{ef,min}$ [mm]	h_{ef} [mm]
10	14	90	60...200
12	16	110	70...240
16	18	125	75...280
16	20	125	80...320
20	25	170	90...400
25	32	210	100...500
28	35	270	112...560
32	40	300	128...640

THREADED ROD



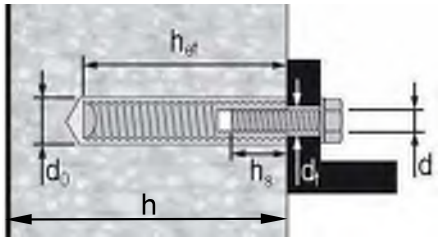
FRACTIONAL THREADED ROD

Ø d [inch]	Ø d_0 [inch]	$h_{ef,min}$ [inch]	h_{ef} [inch]	T_{max} [ft-lb]	T_{max} [Nm]
⅜	7/16	3⅜	2⅜...7½	15	20
½	9/16	4½	2¾...10	30	41
⅝	¾	5⅝	3⅛...12½	60	81
¾	⅞	6¾	3½...15	100	136
⅞	1	7⅞	3½...17½	125	169
1	1⅛	9	4...20	150	203
1¼	1⅜	11¼	5...25	200	271

METRIC THREADED ROD

Ø d [mm]	Ø d_0 [mm]	$h_{ef,min}$ [mm]	h_{ef} [mm]	T_{max} [Nm]
M10	12	90	60...200	20
M12	14	110	70...240	40
M16	18	125	80...320	80
M20	22	170	90...400	150
M24	28	210	96...480	200
M27	30	240	108...540	270
M30	35	270	120...600	300

HILTI HIS-N AND HIS-RN THREADED INSERTS



FRACTIONAL HILTI HIS-N AND HIS-RN THREADED INSERTS

Ø d [inch]	Ø d_0 [inch]	h_{ef} [inch]	Ø d_t [inch]	h_s [inch]	T_{max} [ft-lb]	T_{max} [Nm]
⅜	11/16	4⅜	7/16	⅜...15/16	15	20
½	⅞	5	9/16	½...1 3/16	30	41
⅝	1⅛	6¾	11/16	⅝...1½	60	81
¾	1¼	8⅛	13/16	¾...1⅞	100	136

METRIC HILTI HIS-N AND HIS-RN THREADED INSERTS

Ø d [mm]	Ø d_0 [mm]	h_{ef} [mm]	Ø d_t [mm]	h_s [mm]	T_{max} [Nm]
M8	14	90	9	8...20	10
M10	18	110	12	10...25	20
M12	22	125	14	12...30	40
M16	28	170	18	16...40	80
M20	32	205	22	20...50	150

Applicable to Longitudinal Head shaft stubs (drive side) & Grit static stub shaft weldments

FIGURE 1—INSTALLATION PARAMETERS FOR POST INSTALLED ADHESIVE ANCHORS (Continued)

TABLE 1—DESIGN TABLE INDEX

Design Table		Fractional		Metric	
		Table	Page	Table	Page
Hilti HIT-Z and HIT-Z-R Anchor Rod 	Steel Strength - N_{sa}, V_{sa}	7	14	7	14
	Concrete Breakout - N_{cb}, N_{cbg}, V_{cb}, V_{cbg}, V_{cp}, V_{cpg}	8	15	8	15
	Pullout Strength – N_p	10	19	10	19
Standard Threaded Rod 	Steel Strength - N_{sa}, V_{sa}	11	20	17	27
	Concrete Breakout - N_{cb}, N_{cbg}, V_{cb}, V_{cbg}, V_{cp}, V_{cpg}	12	22	18	28
	Bond Strength - N_a, N_{ag}	15 & 16	25 & 26	21 & 22	31 & 32
Hilti HIS-N and HIS-RN Internally Threaded Insert 	Steel Strength - N_{sa}, V_{sa}	27	36	27	36
	Concrete Breakout - N_{cb}, N_{cbg}, V_{cb}, V_{cbg}, V_{cp}, V_{cpg}	28	37	28	37
	Bond Strength - N_a, N_{ag}	29	38	29	38

Design Table		Fractional		EU Metric		Canadian	
		Table	Page	Table	Page	Table	Page
Steel Reinforcing Bars 	Steel Strength – N_{sa}, V_{sa}	11A	21	17	27	23	33
	Concrete Breakout – N_{cb}, N_{cbg}, V_{cb}, V_{cbg}, V_{cp}, V_{cpg}	12	22	18	28	24	33
	Bond Strength – N_a, N_{ag}	13 & 14	23 & 24	19 & 20	29 & 30	25 & 26	34 & 35
	Determination of development length for post-installed reinforcing bar connections	30	39	31	40	32	40

TABLE 2—SPECIFICATIONS AND PHYSICAL PROPERTIES OF FRACTIONAL AND METRIC HIT-Z AND HIT-Z RODS

	HIT-Z AND HIT-Z-R ROD SPECIFICATION		Minimum specified ultimate strength, f_{uta}	Minimum specified yield strength 0.2 percent offset, f_{ya}	f_{uta}/f_{ya}	Elongation, min. percent	Reduction of Area, min. percent	Specification for nuts[2]
CARBON STEEL	3/8-in. to 5/8-in. and M10 to M12 - AISI 1038 3/4-in. - AISI 1038 or 18MnV5	psi (MPa)	94,200 (650)	75,300 (520)	1.25	8	20	ASTM A563 Grade A
	M16 - AISI 1038	psi (MPa)	88,400 (610)	71,000 (490)				
	M20 - AISI 1038 or 18MnV5	psi (MPa)	86,200 (595)	69,600 (480)				
STAINLESS STEEL	3/8-in. to 3/4-in. and M10 to M12 Grade 316 DIN-EN 10263-5 X5CrNiMo 17-12-2+AT	psi (MPa)	94,200 (650)	75,300 (520)	1.25	8	20	ASTM F594 Type 316
	M16 Grade 316 DIN-EN 10263-5 X5CrNiMo 17-12-2+AT	psi (MPa)	88,400 (610)	71,000 (490)				
	M20 Grade 316 DIN-EN 10263-5 X5CrNiMo 17-12-2+AT	psi (MPa)	86,200 (595)	69,600 (480)				

[1] Steel properties are minimum values and maximum values will vary due to the cold forming of the rod.
[2] Nuts of other grades and styles having specified proof load stresses greater than the specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than the minimum tensile strength of the specified threaded rod.

TABLE 3—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON CARBON AND STAINLESS STEEL THREADED ROD MATERIALS[1]

	THREADED ROD SPECIFICATION		Minimum specified ultimate strength, f_{uta}	Minimum specified yield strength 0.2 percent offset, f_{ya}	f_{uta}/f_{ya}	Elongation, min. percent[7]	Reduction of Area, min. percent	Specification for nuts[8]
CARBON STEEL	ASTM A193[2] Grade B7 ≤ 2 1/2 in. (≤ 64 mm)	psi (MPa)	125,000 (862)	105,000 (724)	1.19	16	50	ASTM A563 Grade DH
	ASTM F568M[3] Class 5.8 M5 (1/4 in.) to M24 (1 in.) (equivalent to ISO 898-1)	psi (MPa)	72,500 (500)	58,000 (400)	1.25	10	35	ASTM A563 Grade DH[9] DIN 934 (8-A2K)
	ASTM F1554, Grade 36[7]	psi (MPa)	58,000 (400)	36,000 (248)	1.61	23	40	ASTM A194 or ASTM A563
	ASTM F1554, Grade 55[7]	psi (MPa)	75,000 (517)	55,000 (379)	1.36	21	30	ASTM A194 or ASTM A563
	ASTM F1554, Grade 105[7]	psi (MPa)	125,000 (862)	105,000 (724)	1.19	15	45	ASTM A194 or ASTM A563
	ISO 898-1[4] Class 5.8	MPa (psi)	500 (72,500)	400 (58,000)	1.25	22	-	DIN 934 Grade 6
	ISO 898-1[4] Class 8.8	MPa (psi)	800 (116,000)	640 (92,800)	1.25	12	52	DIN 934 Grade 8
STAINLESS STEEL	ASTM F593[5] CW1 (316) 1/4-in. to 5/8-in.	psi (MPa)	100,000 (689)	65,000 (448)	1.54	20	-	ASTM F594
	ASTM F593[5] CW2 (316) 3/4-in. to 1 1/2-in.	psi (MPa)	85,000 (586)	45,000 (310)	1.89	25	-	ASTM F594
	ASTM A193 Grade 8(M), Class 1[2] - 1 1/4-in.	psi (MPa)	75,000 (517)	30,000 (207)	2.50	30	50	ASTM F594
	ISO 3506-1[6] A4-70 M8 – M24	MPa (psi)	700 (101,500)	450 (65,250)	1.56	40	-	ISO 4032
	ISO 3506-1[6] A4-50 M27 – M30	MPa (psi)	500 (72,500)	210 (30,450)	2.38	40	-	ISO 4032

[1] Hilti HIT-HY 200 V3 adhesive may be used in conjunction with all grades of continuously threaded carbon or stainless steel rod (all-thread) that comply with the code reference standards and that have thread characteristics comparable with ANSI B1.1 UNC Coarse Thread Series or ANSI B1.13M M Profile Metric Thread Series. Values for threaded rod types and associated nuts supplied by Hilti are provided here.
[2] *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service*
[3] *Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners*
[4] *Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs*
[5] *Standard Steel Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs*
[6] *Mechanical properties of corrosion-resistant stainless steel fasteners – Part 1: Bolts, screws and studs*
[7] Based on 2-in. (50 mm) gauge length except for A 193, which are based on a gauge length of 4d and ISO 898, which is based on 5d.
[8] Nuts of other grades and styles having specified proof load stresses greater than the specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than the minimum tensile strength of the specified threaded rod.
[9] Nuts for fractional rods.

TABLE 4—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON STEEL REINFORCING BARS

REINFORCING BAR SPECIFICATION		Minimum specified ultimate strength, f_{uta}	Minimum specified yield strength, f_{ya}
ASTM A615[1] Gr. 60	psi (MPa)	80,000 (550)	60,000 (414)
ASTM A615[1] Gr. 40	psi (MPa)	60,000 (414)	40,000 (276)
ASTM A706[2] Gr. 60	psi (MPa)	80,000 (550)	60,000 (414)
DIN 488[3] BSt 500	MPa (psi)	550 (79,750)	500 (72,500)
CAN/CSA-G30.18[4] Gr. 400	MPa (psi)	540 (78,300)	400 (58,000)

[1] *Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement*
[2] *Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement*
[3] *Reinforcing steel; reinforcing steel bars; dimensions and masses*
[4] *Billet-Steel Bars for Concrete Reinforcement*

TABLE 5—SPECIFICATIONS AND PHYSICAL PROPERTIES OF FRACTIONAL AND METRIC HIS-N AND HIS-RN INSERTS

HILTI HIS-N AND HIS-RN INSERTS		Minimum specified ultimate strength, f_{uta}	Minimum specified yield strength, f_{ya}
Carbon Steel DIN EN 10277-3 11SMnPb30+c or DIN 1561 9SMnPb28K $^3/_8$-in. and M8 to M10	psi (MPa)	71,050 (490)	59,450 (410)
Carbon Steel DIN EN 10277-3 11SMnPb30+c or DIN 1561 9SMnPb28K $^1/_2$ to $^3/_4$-in. and M12 to M20	psi (MPa)	66,700 (460)	54,375 (375)
Stainless Steel EN 10088-3 X5CrNiMo 17-12-2	psi (MPa)	101,500 (700)	50,750 (350)

TABLE 6—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON BOLTS, CAP SCREWS AND STUDS FOR USE WITH HIS-N AND HIS-RN INSERTS[1,2]

BOLT, CAP SCREW OR STUD SPECIFICATION		Minimum specified ultimate strength f_{uta}	Minimum specified yield strength 0.2 percent offset f_{ya}	f_{uta}/f_{ya}	Elongation, min.	Reduction of Area, min.	Specification for nuts[6]
SAE J429[3] Grade 5	psi (MPa)	120,000 (828)	92,000 (634)	1.30	14	35	SAE J995
ASTM A325[4] $^1/_2$ to 1-in.	psi (MPa)	120,000 (828)	92,000 (634)	1.30	14	35	A563 C, C3, D, DH, DH3 Heavy Hex
ASTM A193[5] Grade B8M (AISI 316) for use with HIS-RN	psi (MPa)	110,000 (759)	95,000 (655)	1.16	15	45	ASTM F594[7] Alloy Group 1, 2 or 3
ASTM A193[5] Grade B8T (AISI 321) for use with HIS-RN	psi (MPa)	125,000 (862)	100,000 (690)	1.25	12	35	ASTM F594[7] Alloy Group 1, 2 or 3

[1] Minimum Grade 5 bolts, cap screws or studs must be used with carbon steel HIS inserts.
[2] Only stainless steel bolts, cap screws or studs must be used with HIS-RN inserts.
[3] *Mechanical and Material Requirements for Externally Threaded Fasteners*
[4] *Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength*
[5] *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service*
[6] Nuts must have specified minimum proof load stress equal to or greater than the specified minimum full-size tensile strength of the specified stud.
[7] Nuts for stainless steel studs must be of the same alloy group as the specified bolt, cap screw, or stud.



Fractional Threaded Rod



Steel Strength

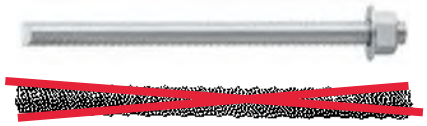
TABLE 11—STEEL DESIGN INFORMATION FOR FRACTIONAL THREADED ROD

DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (in.)[1]						
				3/8	1/2	5/8	3/4	7/8	1	1 1/4
Rod O.D.		d	in. (mm)	0.375 (9.5)	0.5 (12.7)	0.625 (15.9)	0.75 (19.1)	0.875 (22.2)	1 (25.4)	1.25 (31.8)
Rod effective cross-sectional area		A_{se}	in.^{2} (mm^2)	0.0775 (50)	0.1419 (92)	0.2260 (146)	0.3345 (216)	0.4617 (298)	0.6057 (391)	0.9691 (625)
ISO 898-1 Class 5.8	Nominal strength as governed by steel strength	N_{sa}	lb (kN)	5,620 (25.0)	10,290 (45.8)	16,385 (72.9)	24,250 (107.9)	33,470 (148.9)	43,910 (195.3)	70,260 (312.5)
		V_{sa}	lb (kN)	3,370 (15.0)	6,175 (27.5)	9,830 (43.7)	14,550 (64.7)	20,085 (89.3)	26,345 (117.2)	42,155 (187.5)
	Reduction for seismic shear	$\alpha_{V,seis}$	-	1.00						
	Strength reduction factor ϕ for tension[2]	ϕ	-	0.65						
	Strength reduction factor ϕ for shear[2]	ϕ	-	0.60						
ASTM A193 B7	Nominal strength as governed by steel strength	N_{sa}	lb (kN)	9,685 (43.1)	17,735 (78.9)	28,250 (125.7)	41,810 (186.0)	57,710 (256.7)	75,710 (336.8)	121,135 (538.8)
		V_{sa}	lb (kN)	5,810 (25.9)	10,640 (47.3)	16,950 (75.4)	25,085 (111.6)	34,625 (154.0)	45,425 (202.1)	72,680 (323.3)
	Reduction for seismic shear	$\alpha_{V,seis}$	-	1.00						
	Strength reduction factor ϕ for tension[2]	ϕ	-	0.75						
	Strength reduction factor ϕ for shear[2]	ϕ	-	0.65						
ASTM F1554 Gr. 36	Nominal strength as governed by steel strength	N_{sa}	lb (kN)	- -	8,230 (36.6)	13,110 (58.3)	19,400 (86.3)	26,780 (119.1)	35,130 (156.3)	56,210 (250.0)
		V_{sa}	lb (kN)	- -	4,940 (22.0)	7,865 (35.0)	11,640 (51.8)	16,070 (71.5)	21,080 (93.8)	33,725 (150.0)
	Reduction factor, seismic shear	$\alpha_{V,seis}$	-	0.6						
	Strength reduction factor ϕ for tension[2]	ϕ	-	0.75						
	Strength reduction factor ϕ for shear[2]	ϕ	-	0.65						
ASTM F1554 Gr. 55	Nominal strength as governed by steel strength	N_{sa}	lb (kN)	- -	10,645 (47.4)	16,950 (75.4)	25,090 (111.6)	34,630 (154.0)	45,430 (202.1)	72,685 (323.3)
		V_{sa}	lb (kN)	- -	6,385 (28.4)	10,170 (45.2)	15,055 (67.0)	20,780 (92.4)	27,260 (121.3)	43,610 (194.0)
	Reduction factor, seismic shear	$\alpha_{V,seis}$	-	1.00						
	Strength reduction factor ϕ for tension[2]	ϕ	-	0.75						
	Strength reduction factor ϕ for shear[2]	ϕ	-	0.65						
ASTM F1554 Gr. 105	Nominal strength as governed by steel strength	N_{sa}	lb (kN)	- -	17,740 (78.9)	28,250 (125.7)	41,815 (186.0)	57,715 (256.7)	75,715 (336.8)	121,135 (538.8)
		V_{sa}	lb (kN)	- -	10,645 (47.4)	16,950 (75.4)	25,090 (111.6)	34,630 (154.0)	45,430 (202.1)	72,680 (323.3)
	Reduction factor, seismic shear	$\alpha_{V,seis}$	-	1.00						
	Strength reduction factor ϕ for tension[2]	ϕ	-	0.75						
	Strength reduction factor ϕ for shear[2]	ϕ	-	0.65						
ASTM F593, CW Stainless	Nominal strength as governed by steel strength	N_{sa}	lb (kN)	7,750 (34.5)	14,190 (63.1)	22,600 (100.5)	28,435 (126.5)	39,245 (174.6)	51,485 (229.0)	- -
		V_{sa}	lb (kN)	4,650 (20.7)	8,515 (37.9)	13,560 (60.3)	17,060 (75.9)	23,545 (104.7)	30,890 (137.4)	- -
	Reduction factor, seismic shear	$\alpha_{V,seis}$	-	0.80						-
	Strength reduction factor ϕ for tension [2]	ϕ	-	0.65						-
	Strength reduction factor ϕ for shear [2]	ϕ	-	0.60						-
ASTM A193, Gr. 8(M), Class 1 Stainless	Nominal strength as governed by steel strength	N_{sa}	lb (kN)	- -						55,240 (245.7)
		V_{sa}	lb (kN)	- -						33,145 (147.4)
	Reduction factor, seismic shear	$\alpha_{V,seis}$	-	-						0.80
	Strength reduction factor ϕ for tension [2]	ϕ	-	-						0.75
	Strength reduction factor ϕ for shear [2]	ϕ	-	-						0.65

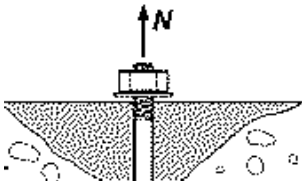
For **SI**: 1 inch = 25.4 mm, 1 lbf = 4.448 N. For **pound-inch** units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf

[1] Values provided for common rod material types are based on specified strengths and calculated in accordance with ACI 318-19 Eq. (17.6.1.2) and Eq (17.7.1.2b), ACI 318-14 Eq. (17.4.1.2) and Eq (17.5.1.2b) or ACI 318-11 Eq. (D-2) and Eq. (D-29). Nuts and washers must be appropriate for the rod.

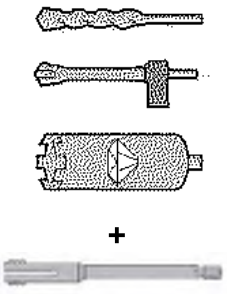
[2] The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, the appropriate strength reduction factor must be determined in accordance with ACI 318-11 D.4.4.



Fractional Threaded Rod and Reinforcing Bars



Concrete Breakout Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit with Roughening Tool

TABLE 12—CONCRETE BREAKOUT DESIGN INFORMATION FOR FRACTIONAL THREADED ROD AND REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

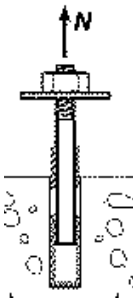
DESIGN INFORMATION	Symbol	Units	Nominal rod diameter (in.) / Reinforcing bar size							
			3/8 or #3	1/2 or #4	5/8 or #5	3/4 or #6	7/8 or #7	1 or #8	#9	1 1/4 or #10
Effectiveness factor for cracked concrete	$k_{c,cr}$	in-lb (SI)	17 (7.1)							
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	in-lb (SI)	24 (10)							
Minimum Embedment	$h_{ef,min}$	in. (mm)	2 3/8 (60)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 1/2 (89)	4 (102)	4 1/2 (114)	5 (127)
Maximum Embedment	$h_{ef,max}$	in. (mm)	7 1/2 (191)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	22 1/2 (572)	25 (635)
Min. anchor spacing[3]	s_{min}	in. (mm)	1 7/8 (48)	2 1/2 (64)	3 1/8 (79)	3 3/4 (95)	4 3/8 (111)	5 (127)	5 5/8 (143)	6 1/4 (159)
Min. edge distance (Threaded rods)	c_{min}	in. (mm)	1¾ (45)	1¾ (45)	2 (3) (50) (3)	2 1/8 (3) (55) (3)	2¼ (3) (60) (3)	2¾ (3) (70) (3)	n/a	3 1/8 (3) (80) (3)
Min. edge distance (Reinforcing bars)[3]	c_{min}	-	5d; or see Section 4.1.9.2 of this report for design with reduced minimum edge distances							
Minimum concrete thickness	h_{min}	in. (mm)	h_{ef} + 1 1/4 (h_{ef} + 30)	h_{ef} + $2d_0$ (4)						
Critical edge distance – splitting (for uncracked concrete)	c_{ac}	-	See Section 4.1.10.2 of this report.							
Strength reduction factor for tension, concrete failure modes, Condition B (supplemental reinforcement not present)[2]	ϕ	-	0.65							
Strength reduction factor for shear, concrete failure modes, Condition B (supplemental reinforcement not present)[2]	ϕ	-	0.70							

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

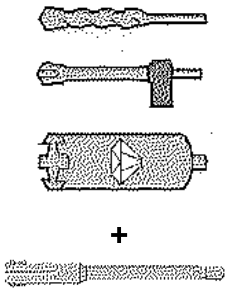
[1] Additional setting information is described in Figure 6, Manufacturers Printed Installation Instructions (MPII).
[2] The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, the appropriate strength reduction factor must be determined in accordance with ACI 318-11 D.4.4.
[3] For installations with 1 3/4-inch edge distance, refer to Section 4.1.9.2 for spacing and maximum torque requirements.
[4] d_0 = hole diameter.



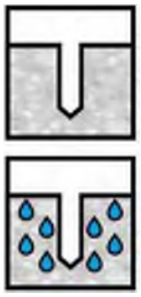
Fractional Threaded Rod



Bond Strength

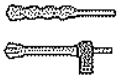


Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit with Roughening Tool



Dry and Water Saturated Concrete

TABLE 15—BOND STRENGTH DESIGN INFORMATION FOR FRACTIONAL THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (in.)						
				$^3/_8$	$^1/_2$	$^5/_8$	$^3/_4$	$^7/_8$	1	$1^1/_4$
Minimum Embedment		$h_{ef,min}$	in. (mm)	$2^3/_8$ (60)	$2^3/_4$ (70)	$3^1/_8$ (79)	$3^1/_2$ (89)	$3^1/_2$ (89)	4 (102)	5 (127)
Maximum Embedment		$h_{ef,max}$	in. (mm)	$7^1/_2$ (191)	10 (254)	$12^1/_2$ (318)	15 (381)	$17^1/_2$ (445)	20 (508)	25 (635)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	psi (MPa)	1,045 (7.2)	1,135 (7.8)	1,170 (8.1)	1,260 (8.7)	1,290 (8.9)	1,325 (9.1)	1,380 (9.5)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	psi (MPa)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	psi (MPa)	1,045 (7.2)	1,135 (7.8)	1,170 (8.1)	1,260 (8.7)	1,290 (8.9)	1,325 (9.1)	1,380 (9.5)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	psi (MPa)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)	2,220 (15.3)
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	psi (MPa)	855 (5.9)	930 (6.4)	960 (6.6)	1,035 (7.1)	1,055 (7.3)	1,085 (7.5)	1,130 (7.8)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	psi (MPa)	1,820 (12.6)	1,820 (12.6)	1,820 (12.6)	1,820 (12.6)	1,820 (12.6)	1,820 (12.6)	1,820 (12.6)
Permissible installation conditions	Dry and water saturated concrete 	Anchor Category	-	1						
		ϕ_d, ϕ_{ws}	-	0.65						
Reduction for seismic tension	Hammer drilled 	$\alpha_{N,seis}$	-	0.88	0.99	0.99	1.0	1.0	0.95	0.99
	Core drilled + roughening 	$\alpha_{N,seis}$	-	N/A		0.88	0.96	0.96	1.0	0.82

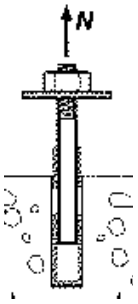
For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [For SI: $(f'_c / 17.2)^{0.1}$]. See Section 4.1.4 of this report for bond strength determination.

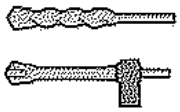
[2] Temperature range A: Maximum short term temperature = 130°F (55°C), Maximum long term temperature = 110°F (43°C).
Temperature range B: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Temperature range C: Maximum short term temperature = 248°F (120°C), Maximum long term temperature = 162°F (72°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.



Fractional Threaded Rod



Bond Strength



Carbide Bit or
Hilti Hollow Carbide Bit



Water-filled hole

TABLE 16—BOND STRENGTH DESIGN INFORMATION FOR FRACTIONAL THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT)

DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (in.)						
				$^3/_8$	$^1/_2$	$^5/_8$	$^3/_4$	$^7/_8$	1	$1^1/_4$
Minimum Embedment		$h_{ef,min}$	in. (mm)	$2^3/_8$ (60)	$2^3/_4$ (70)	$3^1/_8$ (79)	$3^1/_2$ (89)	$3^1/_2$ (89)	4 (102)	5 (127)
Maximum Embedment		$h_{ef,max}$	in. (mm)	$7^1/_2$ (191)	10 (254)	$12^1/_2$ (318)	15 (381)	$17^1/_2$ (445)	20 (508)	25 (635)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	psi (MPa)	825 (5.7)	875 (6.0)	865 (6.0)	910 (6.3)	890 (6.1)	885 (6.1)	840 (5.8)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	psi (MPa)	1,755 (12.1)	1,710 (11.8)	1,645 (11.3)	1,600 (11)	1,535 (10.6)	1,490 (10.3)	1,355 (9.3)
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	psi (MPa)	825 (5.7)	875 (6.0)	865 (6.0)	910 (6.3)	890 (6.1)	885 (6.1)	840 (5.8)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	psi (MPa)	1,755 (12.1)	1,710 (11.8)	1,645 (11.3)	1,600 (11.0)	1,535 (10.6)	1,490 (10.3)	1,355 (9.3)
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	psi (MPa)	675 (4.7)	715 (4.9)	710 (4.9)	745 (5.1)	730 (5.0)	730 (5.0)	690 (4.8)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	psi (MPa)	1,440 (9.9)	1,405 (9.7)	1,350 (9.3)	1,310 (9.0)	1,260 (8.7)	1,220 (8.4)	1,110 (7.7)
Permissible installation conditions	Water-filled hole 	Anchor Category	-	3						
		ϕ_{wf}	-	0.45						
Reduction for seismic tension	Hammer drilled 	$\alpha_{N,seis}$	-	0.88	0.99	0.99	1.0	1.0	0.95	0.99

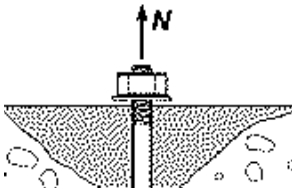
For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [For SI: $(f'_c / 17.2)^{0.1}$]. See Section 4.1.4 of this report for bond strength determination.

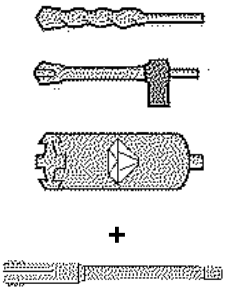
[2] Temperature range A: Maximum short-term temperature = 130°F (55°C), Maximum long-term temperature = 110°F (43°C).
Temperature range B: Maximum short-term temperature = 176°F (80°C), Maximum long-term temperature = 110°F (43°C).
Temperature range C: Maximum short-term temperature = 248°F (120°C), Maximum long-term temperature = 162°F (72°C).
short-term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. long-term concrete temperatures are roughly constant over significant periods of time.



Metric Threaded Rod and EU Metric Reinforcing Bars



Concrete Breakout Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit with Roughening Tool

TABLE 18—CONCRETE BREAKOUT DESIGN INFORMATION FOR METRIC THREADED ROD AND EU METRIC REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

DESIGN INFORMATION	Symbol	Units	Nominal rod diameter (mm)						
			10	12	16	20	24	27	30
Minimum Embedment	$h_{ef,min}$	mm (in.)	60 (2.4)	70 (2.8)	80 (3.1)	90 (3.5)	96 (3.8)	108 (4.3)	120 (4.7)
Maximum Embedment	$h_{ef,max}$	mm (in.)	200 (7.9)	240 (9.4)	320 (12.6)	400 (15.7)	480 (18.9)	540 (21.3)	600 (23.6)
Min. anchor spacing[3]	s_{min}	mm (in.)	50 (2.0)	60 (2.4)	80 (3.2)	100 (3.9)	120 (4.7)	135 (5.3)	150 (5.9)
Min. edge distance[3]	c_{min}	-	5d; or see Section 4.1.9.2 of this report for design with reduced minimum edge distances						
Minimum concrete thickness	h_{min}	mm (in.)	h_{ef} + 30 (h_{ef} + $1^1/_4$)	h_{ef} + $2d_o$[4]					

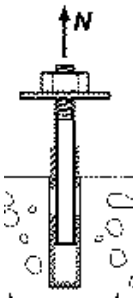
DESIGN INFORMATION	Symbol	Units	Reinforcing bar size							
			10	12	14	16	20	25	28	32
Minimum Embedment	$h_{ef,min}$	mm (in.)	60 (2.4)	70 (2.8)	75 (3.0)	80 (3.1)	90 (3.5)	100 (3.9)	112 (4.4)	128 (5.0)
Maximum Embedment	$h_{ef,max}$	mm (in.)	200 (7.9)	240 (9.4)	280 (11.0)	320 (12.6)	400 (15.7)	500 (19.7)	560 (22.0)	640 (25.2)
Min. anchor spacing[3]	s_{min}	mm (in.)	50 (2.0)	60 (2.4)	80 (3.2)	100 (3.9)	120 (4.7)	135 (5.3)	140 (5.5)	160 (6.3)
Min. edge distance[3]	c_{min}	-	5d; or see Section 4.1.9 of this report for design with reduced minimum edge distances							
Minimum concrete thickness	h_{min}	mm (in.)	h_{ef} + 30 (h_{ef} + $1^1/_4$)	h_{ef} + $2d_o$[4]						
Critical edge distance – splitting (for uncracked concrete)	c_{ac}	-	See Section 4.1.10.2 of this report.							
Effectiveness factor for cracked concrete	$k_{c,cr}$	SI (in-lb)	7.1 (17)							
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	SI (in-lb)	10 (24)							
Strength reduction factor for tension, concrete failure modes, Condition B (supplemental reinforcement not present)[2]	ϕ	-	0.65							
Strength reduction factor for shear, concrete failure modes, Condition B(supplemental reinforcement not present)[2]	ϕ	-	0.70							

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

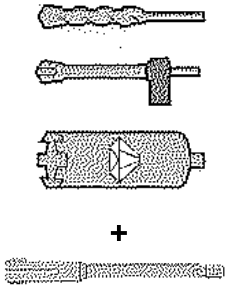
[1] Additional setting information is described in Figure 6, Manufacturers Printed Installation Instructions (MPII).
[2] The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, the appropriate strength reduction factor must be determined in accordance with ACI 318-11 D.4.4.
[3] For installations with $1^3/_4$-inch edge distance, refer to Section 4.1.9.2 for spacing and maximum torque requirements.
[4] d_o = hole diameter.



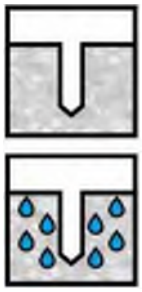
Metric Threaded Rod



Bond Strength

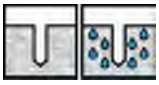
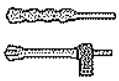


Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit with Roughening Tool



Dry and Water Saturated Concrete

TABLE 21—BOND STRENGTH DESIGN INFORMATION FOR METRIC THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (mm)						
				10	12	16	20	24	27	30
Minimum Embedment		$h_{ef,min}$	mm	60	70	80	90	96	108	120
			(in.)	(2.4)	(2.8)	(3.1)	(3.5)	(3.8)	(4.3)	(4.7)
Maximum Embedment		$h_{ef,max}$	mm	200	240	320	400	480	540	600
			(in.)	(7.9)	(9.4)	(12.6)	(15.7)	(18.9)	(21.3)	(23.6)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	7.3	7.6	8.1	8.8	9.0	9.2	9.4
			(psi)	(1,055)	(1,105)	(1,170)	(1,270)	(1,305)	(1,340)	(1,365)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	15.3	15.3	15.3	15.3	15.3	15.3	15.3
			(psi)	(2,220)	(2,220)	(2,220)	(2,220)	(2,220)	(2,220)	(2,220)
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	7.3	7.6	8.1	8.8	9.0	9.2	9.4
			(psi)	(1,055)	(1,105)	(1,170)	(1,270)	(1,305)	(1,340)	(1,365)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	15.3	15.3	15.3	15.3	15.3	15.3	15.3
			(psi)	(2,220)	(2,220)	(2,220)	(2,220)	(2,220)	(2,220)	(2,220)
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	6.0	6.3	6.6	7.2	7.4	7.6	7.7
			(psi)	(865)	(905)	(960)	(1,040)	(1,070)	(1,095)	(1,120)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	12.6	12.6	12.6	12.6	12.6	12.6	12.6
			(psi)	(1,820)	(1,820)	(1,820)	(1,820)	(1,820)	(1,820)	(1,820)
Permissible Installation Conditions	Dry and water saturated concrete 	Anchor Category	-	1						
		ϕ_d, ϕ_{ws}	-	0.65						
Reduction for seismic tension	Hammer drilled 	$\alpha_{N,seis}$	-	0.88	0.88	0.99	1.0	0.95	0.95	0.95
	Core drilled + roughening 	$\alpha_{N,seis}$	-	N/A		0.88	0.96	0.96	0.82	0.82

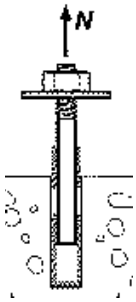
For **SI**: 1 inch ≡ 25.4 mm, 1 **l**bf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [For **SI**: $(f'_c / 17.2)^{0.1}$]. See Section 4.1.4 of this report for bond strength determination.

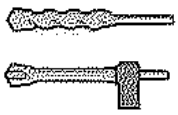
[2] Temperature range A: Maximum short term temperature = 130°F (55°C), Maximum long term temperature = 110°F (43°C).
Temperature range B: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Temperature range C: Maximum short term temperature = 248°F (120°C), Maximum long term temperature = 162°F (72°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.



Metric Threaded Rod



Bond Strength



Carbide Bit or Hilti Hollow Carbide Bit



Water-filled hole

TABLE 22—BOND STRENGTH DESIGN INFORMATION FOR METRIC THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT)

DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (mm)						
				10	12	16	20	24	27	30
Minimum Embedment		$h_{ef,min}$	mm	60	70	80	90	96	108	120
			(in.)	(2.4)	(2.8)	(3.1)	(3.5)	(3.8)	(4.3)	(4.7)
Maximum Embedment		$h_{ef,max}$	mm	200	240	320	400	480	540	600
			(in.)	(7.9)	(9.4)	(12.6)	(15.7)	(18.9)	(21.3)	(23.6)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	5.8	5.9	6.0	6.2	6.1	6.0	5.9
			(psi)	(835)	(850)	(865)	(900)	(885)	(870)	(860)
	Characteristic bond strength in uncracked	$\tau_{k,uncr}$	MPa	12.1	11.8	11.3	10.9	10.4	10.0	9.7
			(psi)	(1755)	(1710)	(1645)	(1580)	(1510)	(1445)	(1400)
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	5.8	5.9	6.0	6.2	6.1	6.0	5.9
			(psi)	(835)	(850)	(865)	(900)	(885)	(870)	(860)
	Characteristic bond strength in uncracked	$\tau_{k,uncr}$	MPa	12.1	11.8	11.3	10.9	10.4	10.0	9.7
			(psi)	(1755)	(1710)	(1645)	(1580)	(1510)	(1445)	(1400)
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	4.7	4.8	4.9	5.1	5.0	4.9	4.9
			(psi)	(685)	(700)	(710)	(740)	(725)	(715)	(705)
	Characteristic bond strength in uncracked	$\tau_{k,uncr}$	MPa	9.9	9.7	9.3	8.9	8.5	8.2	7.9
			(psi)	(1440)	(1405)	(1350)	(1295)	(1240)	(1185)	(1150)
Permissible Installation Conditions	Water-filled hole 	Anchor Category	-	3						
		ϕ_{wf}	-	0.45						
Reduction for seismic tension	Hammer drilled 	$\alpha_{N,seis}$	-	0.88	0.88	0.99	1.0	0.95	0.95	0.95

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [For SI: $(f'_c / 17.2)^{0.1}$]. See Section 4.1.4 of this report for bond strength determination.

[2] Temperature range A: Maximum short-term temperature = 130°F (55°C), Maximum long-term temperature = 110°F (43°C).
Temperature range B: Maximum short-term temperature = 176°F (80°C), Maximum long-term temperature = 110°F (43°C).
Temperature range C: Maximum short-term temperature = 248°F (120°C), Maximum long-term temperature = 162°F (72°C).
short-term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. long-term concrete temperatures are roughly constant over significant periods of time.



Fractional and Metric HIS-N and HIS-RN Internal Threaded Insert



Steel Strength

TABLE 27—STEEL DESIGN INFORMATION FOR FRACTIONAL AND METRIC HIS-N AND HIS-RN THREADED INSERTS[1]

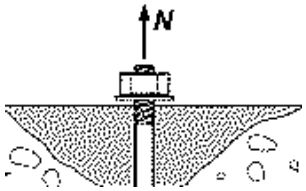
DESIGN INFORMATION		Symbol	Units	Nominal Bolt/Cap Screw Diameter (in.) Fractional				Units	Nominal Bolt/Cap Screw Diameter (mm) Metric				
				$^3/_8$	$^1/_2$	$^5/_8$	$^3/_4$		8	10	12	16	20
HIS Insert O.D.		D	in. (mm)	0.65 (16.5)	0.81 (20.5)	1.00 (25.4)	1.09 (27.6)	mm (in.)	12.5 (0.49)	16.5 (0.65)	20.5 (0.81)	25.4 (1.00)	27.6 (1.09)
HIS insert length		L	in. (mm)	4.33 (110)	4.92 (125)	6.69 (170)	8.07 (205)	mm (in.)	90 (3.54)	110 (4.33)	125 (4.92)	170 (6.69)	205 (8.07)
Bolt effective cross-sectional area		A_{se}	in.^{2} (mm^2)	0.0775 (50)	0.1419 (92)	0.2260 (146)	0.3345 (216)	mm^2 (in.^{2})	36.6 (0.057)	58 (0.090)	84.3 (0.131)	157 (0.243)	245 (0.380)
HIS insert effective cross-sectional area		A_{insert}	in.^{2} (mm^2)	0.178 (115)	0.243 (157)	0.404 (260)	0.410 (265)	mm^2 (in.^{2})	51.5 (0.080)	108 (0.167)	169.1 (0.262)	256.1 (0.397)	237.6 (0.368)
ASTM A193 B7	Nominal steel strength – ASTM A193 B7[3] bolt/cap screw	N_{sa}	lb (kN)	9,690 (43.1)	17,740 (78.9)	28,250 (125.7)	41,815 (186.0)	kN (lb)	- -	- -	- -	- -	- -
		V_{sa}	lb (kN)	5,815 (25.9)	10,645 (47.3)	16,950 (75.4)	25,089 (111.6)	kN (lb)	- -	- -	- -	- -	- -
	Nominal steel strength – HIS-N insert	N_{sa}	lb (kN)	12,650 (56.3)	16,195 (72.0)	26,925 (119.8)	27,360 (121.7)	kN (lb)	- -	- -	- -	- -	- -
ASTM A193 Grade B8M SS	Nominal steel strength – ASTM A193 Grade B8M SS bolt/cap screw	N_{sa}	lb (kN)	8,525 (37.9)	15,610 (69.4)	24,860 (110.6)	36,795 (163.7)	kN (lb)	- -	- -	- -	- -	- -
		V_{sa}	lb (kN)	5,115 (22.8)	9,365 (41.7)	14,915 (66.3)	22,075 (98.2)	kN (lb)	- -	- -	- -	- -	- -
	Nominal steel strength – HIS-RN insert	N_{sa}	lb (kN)	17,165 (76.3)	23,430 (104.2)	38,955 (173.3)	39,535 (175.9)	kN (lb)	- -	- -	- -	- -	- -
ISO 898-1 Class 8.8	Nominal steel strength – ISO 898-1 Class 8.8 bolt/cap screw	N_{sa}	lb (kN)	- -	- -	- -	- -	kN (lb)	29.5 (6,582)	46.5 (10,431)	67.5 (15,161)	125.5 (28,236)	196.0 (44,063)
		V_{sa}	lb (kN)	- -	- -	- -	- -	kN (lb)	17.5 (3,949)	28.0 (6,259)	40.5 (9,097)	75.5 (16,942)	117.5 (26,438)
	Nominal steel strength – HIS-N insert	N_{sa}	lb (kN)	- -	- -	- -	- -	kN (lb)	25.0 (5,669)	53.0 (11,894)	78.0 (17,488)	118.0 (26,488)	110.0 (24,573)
ISO 3506-1 Class A4-70 Stainless	Nominal steel strength – ISO 3506-1 Class A4-70 Stainless bolt/cap screw	N_{sa}	lb (kN)	- -	- -	- -	- -	kN (lb)	25.5 (5,760)	40.5 (9,127)	59.0 (13,266)	110.0 (24,706)	171.5 (38,555)
		V_{sa}	lb (kN)	- -	- -	- -	- -	kN (lb)	15.5 (3,456)	24.5 (5,476)	35.5 (7,960)	66.0 (14,824)	103.0 (23,133)
	Nominal steel strength – HIS-RN insert	N_{sa}	lb (kN)	- -	- -	- -	- -	kN (lb)	36.0 (8,099)	75.5 (16,991)	118.5 (26,612)	179.5 (40,300)	166.5 (37,394)
Reduction for seismic shear		$\alpha_{V,seis}$	-	0.94				-	0.94				
Strength reduction factor for tension[2]		ϕ	-	0.65				-	0.65				
Strength reduction factor for shear[2]		ϕ	-	0.60				-	0.60				

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

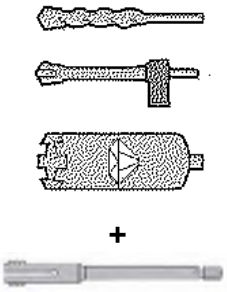
[1] Values provided for common rod material types based on specified strengths and calculated in accordance with ACI 318-19 Eq. (17.6.1.2), ACI 318-14 Eq. (17.4.1.2), ACI 318-11 Eq. (D-2) and Eq. (D-29). Nuts and washers must be appropriate for the rod.
[2] The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, the appropriate strength reduction factor must be determined in accordance with ACI 318-11 D.4.4.
[3] For the calculation of the design steel strength in tension and shear for the bolt or screw, the ϕ factor for ductile steel failure according to ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3 can be used.



Fractional and Metric HIS-N and HIS-RN Internal Threaded Insert



Concrete Breakout Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit with Roughening Tool

TABLE 28—CONCRETE BREAKOUT DESIGN INFORMATION FOR FRACTIONAL AND METRIC HILTI HIS-N AND HIS-RN INSERTS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

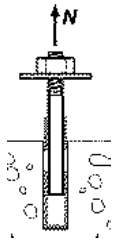
DESIGN INFORMATION	Symbol	Units	Nominal Bolt/Cap Screw Diameter (in.) Fractional				Units	Nominal Bolt/Cap Screw Diameter (mm) Metric				
			$^3/_8$	$^1/_2$	$^5/_8$	$^3/_4$		8	10	12	16	20
Effectiveness factor for cracked concrete	$k_{c,cr}$	in-lb	17				SI	7.1				
		(SI)	(7.1)				(in-lb)	(17)				
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	in-lb	24				SI	10				
		(SI)	(10)				(in-lb)	(24)				
Effective embedment depth	h_{ef}	in.	$4^3/_8$	5	$6^3/_4$	$8^1/_8$	mm	90	110	125	170	205
		(mm)	(110)	(125)	(170)	(205)	(in.)	(3.5)	(4.3)	(4.9)	(6.7)	(8.1)
Min. anchor spacing[3]	s_{min}	in.	$3^1/_4$	4	5	$5^1/_2$	mm	63	83	102	127	140
		(mm)	(83)	(102)	(127)	(140)	(in.)	(2.5)	(3.25)	(4.0)	(5.0)	(5.5)
Min. edge distance[3]	c_{min}	in.	$3^1/_4$	4	5	$5^1/_2$	mm	63	83	102	127	140
		(mm)	(83)	(102)	(127)	(140)	(in.)	(2.5)	(3.25)	(4.0)	(5.0)	(5.5)
Minimum concrete thickness	h_{min}	in.	5.9	6.7	9.1	10.6	mm	120	150	170	230	270
		(mm)	(150)	(170)	(230)	(270)	(in.)	(4.7)	(5.9)	(6.7)	(9.1)	(10.6)
Critical edge distance – splitting (for uncracked concrete)	c_{ac}	-	See Section 4.1.10.2 of this report				-	See Section 4.1.10.2 of this report				
Strength reduction factor for tension, concrete failure modes, Condition B (supplemental reinforcement not present)[2]	ϕ	-	0.65				-	0.65				
Strength reduction factor for shear, concrete failure modes, Condition B (supplemental reinforcement not present)[2]	ϕ	-	0.70				-	0.70				

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

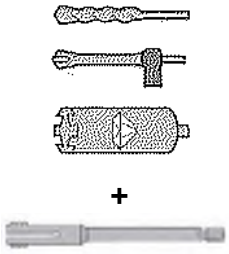
[1] Additional setting information is described in Figure 6, Manufacturers Printed Installation Instructions (MPII).
[2] The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, the appropriate strength reduction factor must be determined in accordance with ACI 318-11 D.4.4.
[3] For installations with $1^3/_4$-inch edge distance, refer to Section 4.1.9.2 for spacing and maximum torque requirements.



Fractional and Metric HIS-N and HIS-RN Internal Threaded Insert



Bond Strength

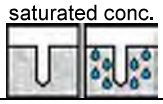
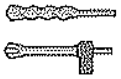
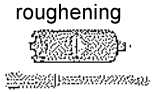


Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit with Roughening Tool



Dry and Water Saturated Concrete

TABLE 29—BOND STRENGTH DESIGN INFORMATION FOR FRACTIONAL AND METRIC HILTI HIS-N AND HIS-RN INSERTS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT)[1]

DESIGN INFORMATION		Symbol	Units	Nominal Bolt/Cap Screw Diameter (in.) Fractional				Units	Nominal Bolt/Cap Screw Diameter (mm) Metric				
				3/8	1/2	5/8	3/4		8	10	12	16	20
Effective embedment depth		h_{ef}	in.	$4^3/_8$	5	$6^3/_4$	$8^1/_8$	mm	90	110	125	170	205
			(mm)	(110)	(125)	(170)	(205)	(in.)	(3.5)	(4.3)	(4.9)	(6.7)	(8.1)
HIS Insert O.D.		D	in.	0.65	0.81	1.00	1.09	mm	12.5	16.5	20.5	25.4	27.6
			(mm)	(16.5)	(20.5)	(25.4)	(27.6)	(in.)	(0.49)	(0.65)	(0.81)	(1.00)	(1.09)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	psi	870	890	910	920	MPa	5.9	6.0	6.1	6.3	6.3
			(MPa)	(6.0)	(6.1)	(6.3)	(6.3)	(psi)	(850)	(870)	(890)	(910)	(920)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	psi	1,950	1,950	1,950	1,950	MPa	13.5	13.5	13.5	13.5	13.5
			(MPa)	(13.5)	(13.5)	(13.5)	(13.5)	(psi)	(1,950)	(1,950)	(1,950)	(1,950)	(1,950)
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	psi	870	890	910	920	MPa	5.9	6.0	6.1	6.3	6.3
			(MPa)	(6.0)	(6.1)	(6.3)	(6.3)	(psi)	(850)	(870)	(890)	(910)	(920)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	psi	1,950	1,950	1,950	1,950	MPa	13.5	13.5	13.5	13.5	13.5
			(MPa)	(13.5)	(13.5)	(13.5)	(13.5)	(psi)	(1,950)	(1,950)	(1,950)	(1,950)	(1,950)
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	psi	715	730	750	755	MPa	4.8	4.9	5.0	5.2	5.2
			(MPa)	(4.9)	(5.0)	(5.2)	(5.2)	(psi)	(695)	(715)	(730)	(750)	(755)
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	psi	1,600	1,600	1,600	1,600	MPa	11.0	11.0	11.0	11.0	11.0
			(MPa)	(11.0)	(11.0)	(11.0)	(11.0)	(psi)	(1,600)	(1,600)	(1,600)	(1,600)	(1,600)
Permissible installation conditions	Dry and water saturated conc. 	Anchor Category	-	1				-	1				
		ϕ_d, ϕ_{ws}	-	0.65				-	0.65				
Reduction for seismic tension	Hammer drilled 	$\alpha_{N,seis}$	-	0.92				-	0.92				
	Core drilled + roughening 	$\alpha_{N,seis}$	-	0.81	0.88	0.92	0.76	-	N/A	0.81	0.88	0.92	0.76

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ for uncracked concrete, [For SI: $(f'_c / 17.2)^{0.1}$] and $(f'_c / 2{,}500)^{0.3}$ for cracked concrete, [For SI: $(f'_c / 17.2)^{0.3}$]. See Section 4.1.4 of this report for bond strength determination.

[2] Temperature range A: Maximum short term temperature = 130°F (55°C), Maximum long term temperature =110°F (43°C).
Temperature range B: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Temperature range C: Maximum short term temperature = 248°F (120°C), Maximum long term temperature = 162°F (72°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.



HILTI HIT-HY 200 V3 FOIL PACK AND MIXING NOZZLE



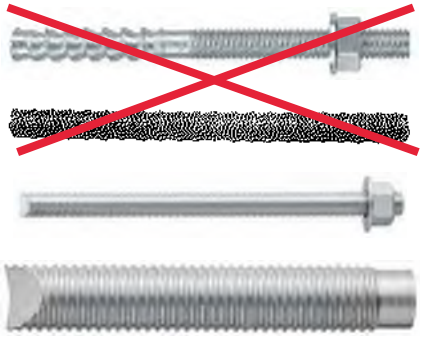
HILTI DISPENSER



HILTI TE-CD OR TE-YD HOLLOW CARBIDE DRILL BIT



HILTI TE-YRT ROUGHENING TOOL



ANCHORING ELEMENTS

FIGURE 5—HILTI HIT-HY 200 V3 ANCHORING SYSTEM

TABLE 30—DEVELOPMENT LENGTH FOR U.S. CUSTOMARY UNIT REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT OR HILTI HOLLOW CARBIDE BIT[1, 2, 4]

DESIGN INFORMATION	Symbol	Criteria Section of Reference Standard	Units	Bar size							
				#3	#4	#5	#6	#7	#8	#9	#10
Nominal reinforcing bar diameter	d_b	ASTM A615/A706	in.	0.375	0.500	0.625	0.750	0.875	1.000	1.125	1.250
			(mm)	(9.5)	(12.7)	(15.9)	(19.1)	(22.2)	(25.4)	(28.6)	(31.8)
Nominal bar area	A_b	ASTM A615/A706	in^2 (mm^2)	0.11 (71.3)	0.20 (126.7)	0.31 (197.9)	0.44 (285.0)	0.60 (387.9)	0.79 (506.7)	1.00 (644.7)	1.27 (817.3)
Development length for f_y = 60 ksi and f'_c = 2,500 psi (normal weight concrete)[3]	l_d	ACI 318-19 25.4.2.4 ACI 318-14 25.4.2.3 ACI 318-11 12.2.3	in.	12.0	14.4	18.0	21.6	31.5	36.0	40.5	45.0
			(mm)	(304.8)	(365.8)	(457.2)	(548.6)	(800.1)	(914.4)	(1028.7)	(1143)
Development length for f_y = 60 ksi and f'_c = 4,000 psi (normal weight concrete) [3]	l_d	ACI 318-19 25.4.2.4 ACI 318-14 25.4.2.3 ACI 318-11 12.2.3	in.	12.0	12.0	14.2	17.1	24.9	28.5	32.0	35.6
			(mm)	(304.8)	(304.8)	(361.4)	(433.7)	(632.5)	(722.9)	(812.8)	(904.2)

For **SI:** 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Development lengths valid for static, wind, and earthquake loads (SDC A and B).
[2] Development lengths in SDC C through F must comply with ACI 318-19 and ACI 318-14 Chapter 18 or ACI 318-11 Chapter 21 and section 4.2.4 of this report.
[3] For sand-lightweight concrete, increase development length by 33%, unless the provisions of ACI 318-19 25.4.2.5, ACI 318-14 25.4.2.4 or ACI 318-11 12.2.4 (d) are met to permit $\lambda > 0.75$.
[4] $\left(\frac{c_b + K_{tr}}{d_b}\right) = 2.5$, $\psi_t = 1.0$, $\psi_e = 1.0$, $\psi_s = 0.8$ for $d_b \le$ #6, 1.0 for $d_b >$ #6.

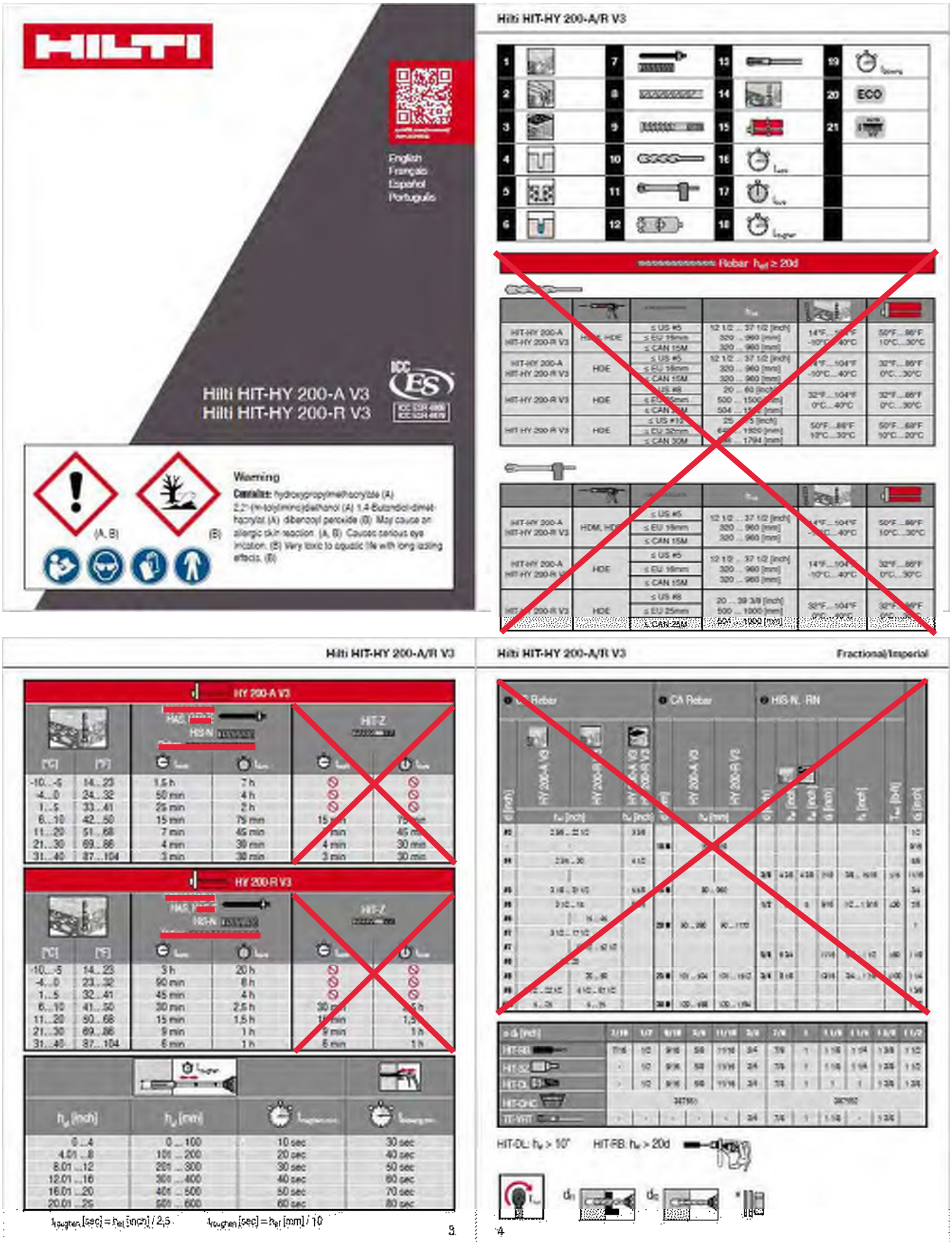


FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII)

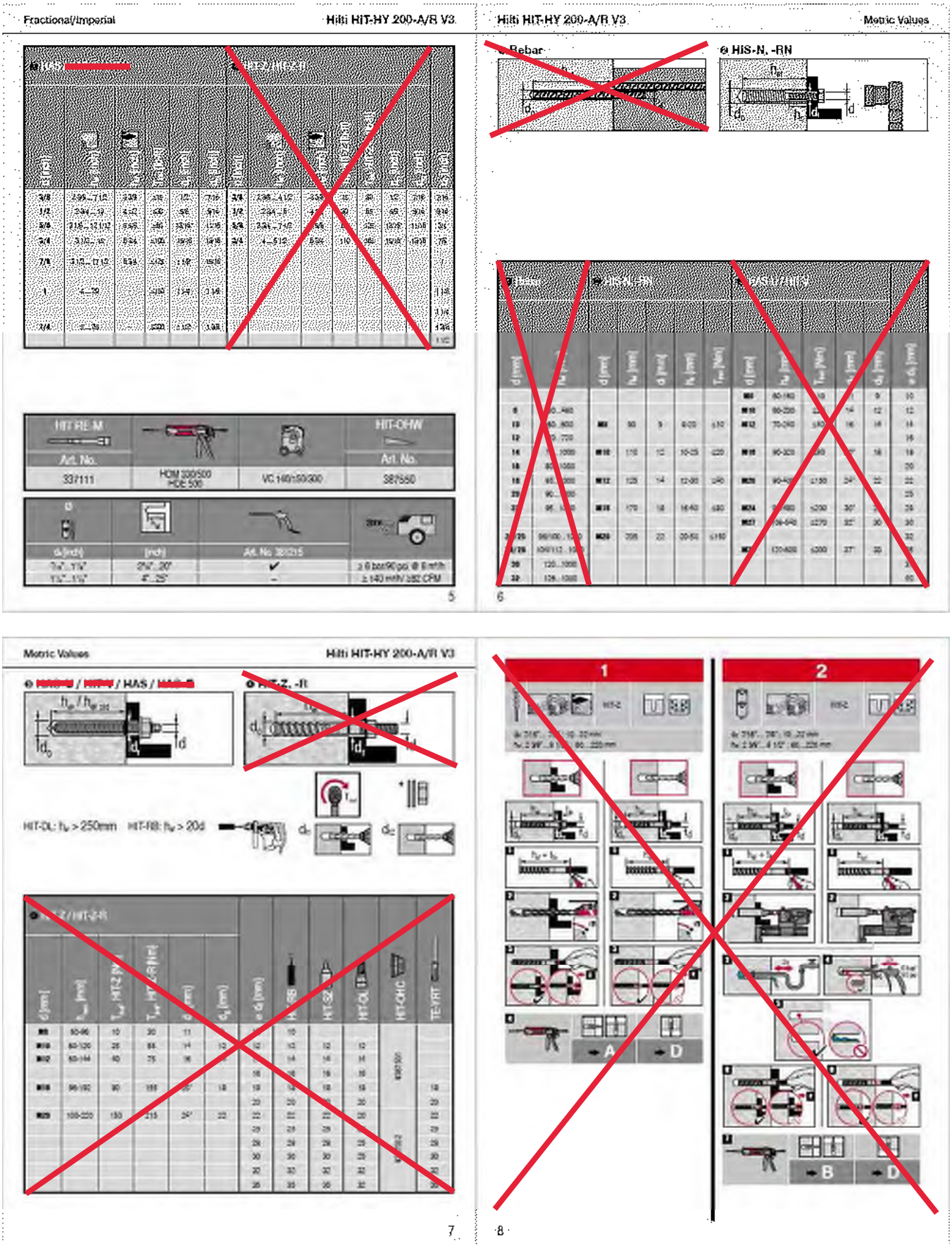


FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

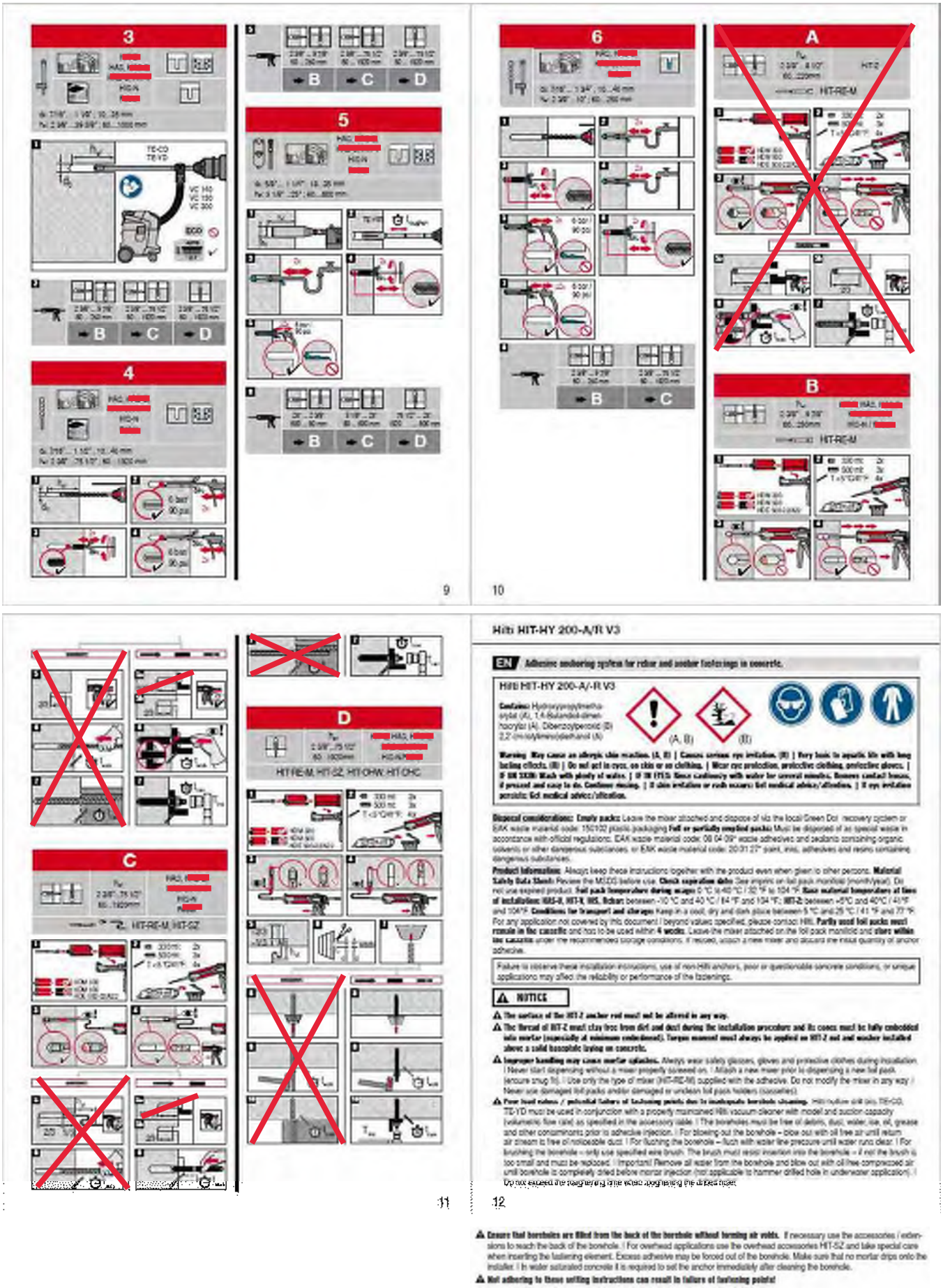
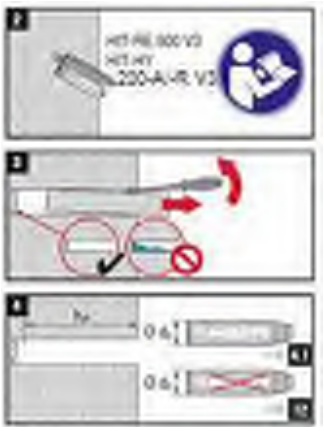
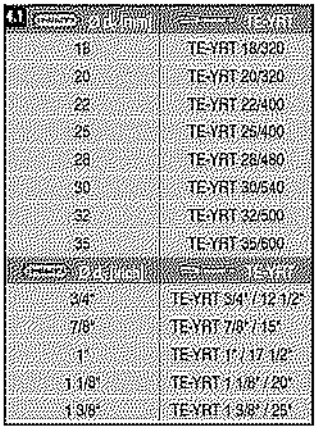


FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

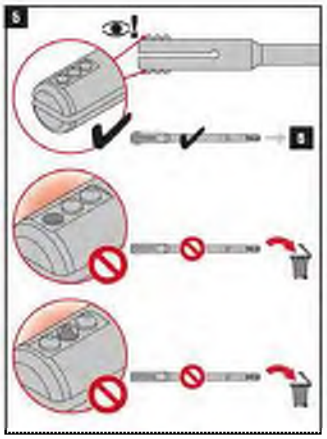




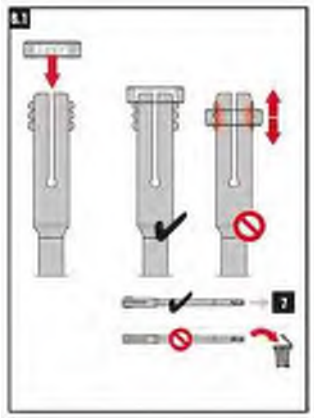


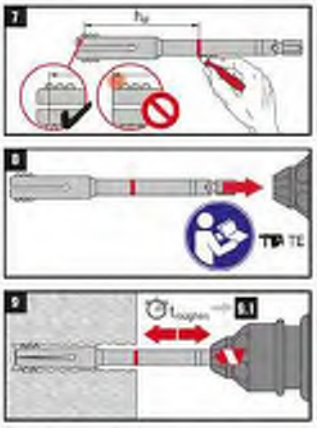


16	TE-YRT 16/320
20	TE-YRT 20/320
22	TE-YRT 22/400
25	TE-YRT 25/400
28	TE-YRT 28/480
30	TE-YRT 30/540
32	TE-YRT 32/500
35	TE-YRT 35/600
3/4"	TE-YRT 3/4" / 12 1/2"
7/8"	TE-YRT 7/8" / 15"
1"	TE-YRT 1" / 17 1/2"
1 1/8"	TE-YRT 1 1/8" / 20"
1 3/8"	TE-YRT 1 3/8" / 25"

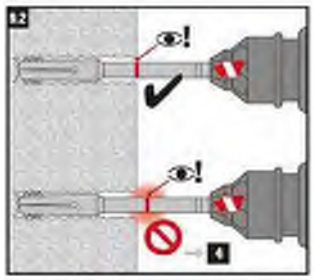


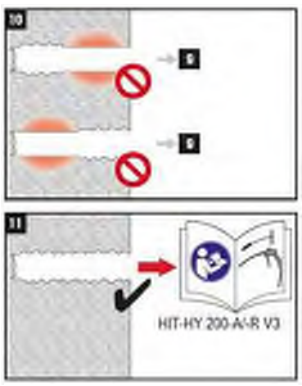
TE-YRT 16/320	RTG 16
TE-YRT 20/320	RTG 20
TE-YRT 22/400	RTG 22
TE-YRT 25/400	RTG 25
TE-YRT 28/480	RTG 28
TE-YRT 30/540	RTG 30
TE-YRT 32/500	RTG 32
TE-YRT 35/600	RTG 35
TE-YRT 3/4" / 12 1/2"	RTG 3/4"
TE-YRT 7/8" / 15"	RTG 7/8"
TE-YRT 1" / 17 1/2"	RTG 1"
TE-YRT 1 1/8" / 20"	RTG 1 1/8"
TE-YRT 1 3/8" / 25"	RTG 1 3/8"





0 ... 100	10 sec
101 ... 200	20 sec
201 ... 300	30 sec
301 ... 400	40 sec
401 ... 500	50 sec
501 ... 600	60 sec
0 ... 4	10 sec
4.01 ... 8	20 sec
8.01 ... 12	30 sec
12.01 ... 16	40 sec
16.01 ... 20	50 sec
20.01 ... 25	60 sec





17.9 ... 18.2	TE-YRT 16/320
19.9 ... 20.2	TE-YRT 20/320
21.9 ... 22.2	TE-YRT 22/400
24.9 ... 25.2	TE-YRT 25/400
27.9 ... 28.2	TE-YRT 28/480
29.9 ... 30.2	TE-YRT 30/540
31.9 ... 32.2	TE-YRT 32/500
34.9 ... 35.2	TE-YRT 35/600
0.764 ... 0.776	TE-YRT 3/4" / 12 1/2"
0.862 ... 0.874	TE-YRT 7/8" / 15"
1.008 ... 1.020	TE-YRT 1" / 17 1/2"
1.146 ... 1.157	TE-YRT 1 1/8" / 20"
1.374 ... 1.386	TE-YRT 1 3/8" / 25"

FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 19—Post-Installed Concrete Anchors

REPORT HOLDER:

HILTI, INC.

EVALUATION SUBJECT:

HILTI HIT-HY 200 V3 ADHESIVE ANCHORS AND POST INSTALLED REINFORCING BAR CONNECTIONS IN CONCRETE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Hilti HIT HY 200 Adhesive Anchoring System and Post-Installed Reinforcing Bar System for cracked and uncracked concrete, described in ICC-ES evaluation report ESR-4868, has also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 *City of Los Angeles Building Code* (LABC)
- 2020 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Hilti HIT-HY 200 V3 Adhesive Anchoring System and Post-Installed Reinforcing Bar System for cracked and uncracked concrete, described in Sections 2.0 through 7.0 of the evaluation report ESR-4868, complies with LABC Chapter 19, and LARC, and is subjected to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Hilti HIT HY 200 V3 Adhesive Anchoring System and Post-Installed Reinforcing Bar System described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-4868.
- The design, installation, conditions of use and labeling of the Hilti HIT-HY 200 V3 Adhesive Anchoring System and Post-Installed Reinforcing Bar System are in accordance with the 2018 *International Building Code®* (2018 IBC) provisions noted in the evaluation report ESR-4868.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.
- The allowable and strength design values listed in the evaluation report and tables are for the connection of the adhesive anchors and post-installed reinforcing bars to the concrete. The connection between the adhesive anchors or post-installed reinforcing bars and the connected members shall be checked for capacity (which may govern).
- For use in wall anchorage assemblies to flexible diaphragm, anchors shall be designed per the requirements of City of Los Angeles Information Bulletin P/BC 2020-071.

This supplement expires concurrently with the evaluation report, reissued November 2022.

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ICC-ES Evaluation Report

ESR-4868 FBC Supplement

Reissued November 2022

This report is subject to renewal November 2024.

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DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 19—Post-Installed Concrete Anchors

REPORT HOLDER:

HILTI, INC.

EVALUATION SUBJECT:

HILTI HIT-HY 200 V3 ADHESIVE ANCHORS AND POST INSTALLED REINFORCING BAR CONNECTIONS IN CONCRETE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Hilti HIT-HY 200 V3 Adhesive Anchors and Post-Installed Reinforcing Bar System in Concrete, described in ICC-ES evaluation report ESR-4868, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2020 *Florida Building Code—Building*
- 2020 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Hilti HIT-HY 200 V3 Adhesive Anchor System and Post-Installed Reinforcing Bar System, described in Sections 2.0 through 7.0 of the ICC-ES evaluation report ESR-4868, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design requirements are in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-4868 for the 2018 *International Building Code®* meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential.*

Use of the Hilti HIT-HY 200 V3 Adhesive Anchor System and Post-Installed Reinforcing Bar System have also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential*, with the following condition:

a) For anchorage to wood members, the connection subject to uplift must be designed for no less than 700 pounds (3114 N).

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official, when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report, reissued November 2022.

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HIT-HY 200-A V3

Safety information for 2-Component-products

Issue date: 13/04/2023 Revision date: 13/04/2023 Supersedes: 09/07/2021 Version: 1.1

SECTION 1: Kit identification

1.1 Product identifier

Product name HIT-HY 200-A V3



Product code BU Anchor

1.2 Details of the supplier of the Safety information for 2-Component-products

Hilti, Inc.
Legacy Tower, Suite 1000
7250 Dallas Parkway
TX 75024 Plano - USA
T +1 9724035800
1-800-879-8000 toll free - F +1 918 254 0522

SECTION 2: General information

Storage Storage temperature : 5 - 25 °C

A SDS for each of these components is included. Please do not separate any component SDS from this cover page

This Kit should be handled in accordance with good laboratory practices and appropriate personal protective equipment should be used

SECTION 3: Kit contents

Classification of the Product

GHS-US classification

Eye Irrit. 2 H319 - Causes serious eye irritation.
Skin Sens. 1 H317 - May cause an allergic skin reaction.

Label elements

GHS US labelling

Hazard pictograms (GHS US)



GHS07

Signal word (GHS US) Warning

Hazardous ingredients methacrylates, dibenzoyl peroxide

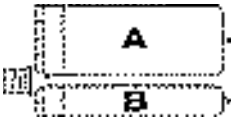
Hazard statements (GHS US) May cause an allergic skin reaction.
Causes serious eye irritation.

Precautionary statements (GHS US) Wear eye protection, protective clothing, protective gloves.
Do not get in eyes, on skin, or on clothing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present

and easy to do. Continue rinsing.
If skin irritation or rash occurs: Get medical advice/attention.
If eye irritation persists: Get medical advice/attention.
If on skin: Wash with plenty of water.

Additional information

2-Component-foilpack, contains:
Component A: Urethane methacrylate resin, inorganic filler
Component B: Dibenzoyl peroxide, phlegmatized



Name	General description	Quantity	Unit	GHS-US classification
HIT-HY 200-A V3, B		1	pcs (pieces)	Eye Irrit. 2, H319 Skin Sens. 1, H317
HIT-HY 200-A V3, A		1	pcs (pieces)	Skin Sens. 1, H317

SECTION 4: General advice

General advice — For professional users only

SECTION 5: Safe handling advice

General measures — Spilled material may present a slipping hazard

Environmental precautions — Prevent entry to sewers and public waters
Notify authorities if liquid enters sewers or public waters

Storage conditions — Keep cool. Protect from sunlight.

Precautions for safe handling — Wear personal protective equipment
Avoid contact with skin and eyes
Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work
Provide good ventilation in process area to prevent formation of vapour

Methods for cleaning up — This material and its container must be disposed of in a safe way, and as per local legislation
Mechanically recover the product
Store away from other materials.

For containment — Collect spillage.

Incompatible materials — Sources of ignition
Direct sunlight

Incompatible products — Strong bases
Strong acids

SECTION 6: First aid measures

First-aid measures after eye contact — Rinse immediately with plenty of water
Remove contact lenses, if present and easy to do. Continue rinsing.
Obtain medical attention if pain, blinking or redness persists

First-aid measures after ingestion	Rinse mouth Get medical advice/attention. Do not induce vomiting Obtain emergency medical attention
First-aid measures after inhalation	Remove person to fresh air and keep comfortable for breathing. Allow affected person to breathe fresh air Allow the victim to rest
First-aid measures after skin contact	Wash contaminated clothing before reuse. Wash with plenty of water/… If skin irritation or rash occurs: Get medical advice/attention.
First-aid measures general	Take off immediately all contaminated clothing. Never give anything by mouth to an unconscious person If you feel unwell, seek medical advice (show the label where possible)
Symptoms/effects after eye contact	Causes serious eye irritation.
Symptoms/effects after skin contact	May cause an allergic skin reaction.

SECTION 7: Fire fighting measures

Firefighting instructions	Use water spray or fog for cooling exposed containers Exercise caution when fighting any chemical fire Prevent fire fighting water from entering the environment
Protection during firefighting	Self-contained breathing apparatus Do not enter fire area without proper protective equipment, including respiratory protection
Hazardous decomposition products in case of fire	Thermal decomposition generates : Carbon dioxide Carbon monoxide

SECTION 8: Other information

No data available

HIT-HY 200-A V3, A

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision date: 4/13/2023 Issue date: 4/13/2023 Supersedes: 7/9/2021Version: 1.1

SECTION 1: Identification

1.1. Identification

Product form	Mixture
Product name	HIT-HY 200-A V3, A
Product code	BU Anchor

1.2. Recommended use and restrictions on use

Use of the substance/mixture	Composite mortar component for fasteners in the construction industry
Recommended use	For professional use only

1.3. Supplier

Supplier
Hilti, Inc.
Legacy Tower, Suite 1000
7250 Dallas Parkway
Plano, TX 75024
USA
T +1 9724035800
1-800-879-8000 toll free - F +1 918 254 0522

Department issuing data specification sheet
Hilti Entwicklungsgesellschaft mbH
Hiltistraße 6
Kaufering, 86916
Deutschland
T +49 8191 906876
anchor.hse@hilti.com

1.4. Emergency telephone number

Emergency number

Chem-Trec
Tel.: 1 800 424 9300 (USA, PR, Virgin Islands, Canada)
Tel.: 703 527 3887 (Other countries)
+1 918 8723000
1-800-879-8000 toll free

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin sensitisation, Category 1	H317	May cause an allergic skin reaction.

Full text of H-statements: see section 16

2.2. GHS Label elements, including precautionary statements

GHS US labelling

Hazard pictograms (GHS US)



Signal word (GHS US) Warning

Hazard statements (GHS US)
H317 - May cause an allergic skin reaction.

Precautionary statements (GHS US)
P280 - Wear eye protection, protective clothing, protective gloves.
P262 - Do not get in eyes, on skin, or on clothing.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P302+P352 - If on skin: Wash with plenty of water.

2.3. Other hazards which do not result in classification

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	GHS-US classification
Quartz (SiO2)	CAS-No.: 14808-60-7	40 – 60	Carc. 1A, H350
2-Propenoic acid, 2-methyl-, 1,4-butanediyl ester	CAS-No.: 2082-81-7	10 – 25	Skin Sens. 1B, H317
2-Propenoic acid, 2-methyl-, monoester with 1,2-propanediol	CAS-No.: 27813-02-1	5 - 8	Eye Irrit. 2A, H319 Skin Sens. 1, H317
1,1'-(p-tolylimino)dipropan-2-ol	CAS-No.: 38668-48-3	0.1 – 1	Acute Tox. 2 (Oral), H300 Eye Irrit. 2A, H319

Full text of hazard classes and H-statements : see section 16

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general: Take off immediately all contaminated clothing. Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation: Remove person to fresh air and keep comfortable for breathing. Allow affected person to breathe fresh air. Allow the victim to rest.

First-aid measures after skin contact: Wash contaminated clothing before reuse. Wash with plenty of water/…. If skin irritation or rash occurs: Get medical advice/attention.

First-aid measures after eye contact: Rinse immediately with plenty of water. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if pain, blinking or redness persists.

First-aid measures after ingestion: Rinse mouth. Get medical advice/attention. Do not induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects (acute and delayed)

Potential adverse human health effects and symptoms: No additional information available.

Symptoms/effects after skin contact: May cause an allergic skin reaction.

Symptoms/effects after eye contact: May cause severe irritation.

4.3. Immediate medical attention and special treatment, if necessary

No additional information available

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media	Water spray. Carbon dioxide. Dry powder. Foam. Sand.
Unsuitable extinguishing media	Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical

Hazardous decomposition products in case of fire	Thermal decomposition generates : Carbon dioxide. Carbon monoxide.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions	Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire fighting water from entering the environment.
Protection during firefighting	Self-contained breathing apparatus. Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	Spilled material may present a slipping hazard.

6.1.1. For non-emergency personnel

Emergency procedures	Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment	Use personal protective equipment as required. Equip cleanup crew with proper protection.
Emergency procedures	Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	Collect spillage.
Methods for cleaning up	This material and its container must be disposed of in a safe way, and as per local legislation. Mechanically recover the product. Store away from other materials.
Other information	Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	Wear personal protective equipment. Avoid contact with skin and eyes. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapour.
Hygiene measures	Do not eat, drink or smoke when using this product. Always wash hands after handling the product. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	Keep cool. Protect from sunlight.
Incompatible products	Strong bases. Strong acids.
Incompatible materials	Sources of ignition. Direct sunlight.
Storage temperature	5 – 25 °C

Heat and ignition sources	Keep away from heat and direct sunlight.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

HIT-HY 200-A V3, A	
USA - OSHA - Occupational Exposure Limits	
Local name	Quartz (Total Dust) (Silica: Crystalline)
Remark (OSHA)	Table Z-3. For OSHA PEL (TWA) use formula: (30 mg/m3 / (%SiO2+2)) for mg/m3. CAS No. source: eCFR Table Z-1.
Regulatory reference (US-OSHA)	OSHA Annotated Table Z-3 Mineral Dusts

Quartz (SiO2) (14808-60-7)	
USA - ACGIH - Occupational Exposure Limits	
Local name	Silica crystaline - quartz
ACGIH OEL TWA	0.025 mg/m³ (Respirable fraction)
Remark (ACGIH)	TLV® Basis: Pulm fibrosis; lung cancer. Notations: A2 (Suspected Human Carcinogen)
Regulatory reference	ACGIH 2022
USA - OSHA - Occupational Exposure Limits	
Local name	Silica, crystalline quartz, respirable dust
Remark (OSHA)	(3) See Table Z-3.

1,1'-(p-tolylimino)dipropan-2-ol (38668-48-3)
No additional information available

2-Propenoic acid, 2-methyl-, 1,4-butanediyl ester (2082-81-7)
No additional information available

2-Propenoic acid, 2-methyl-, monoester with 1,2-propanediol (27813-02-1)
No additional information available

Additional information	The product has a pasty consistency. Exposure limit values for respirable dusts are not relevant for this product.

8.2. Appropriate engineering controls

Appropriate engineering controls	Ensure adequate ventilation.
Environmental exposure controls	Not applicable.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Safety glasses. Gloves. Protective clothing. Avoid all unnecessary exposure.

Materials for protective clothing:
Long sleeved protective clothing

Hand protection:				
Wear protective gloves. The permeation time is not the maximum wearing time! Generally speaking, it must be reduced. Contact with either mixtures of substances or different substances may shorten the protective function's effective duration.				
Type	**Material**	**Permeation**	**Thickness (mm)**	**Penetration**
Disposable gloves	Nitrile rubber (NBR)	6 (> 480 minutes)	0,12	

Eye protection:		
Wear security glasses which protect from splashes		
Type	**Field of application**	**Characteristics**
Safety glasses	Droplet	clear

Personal protective equipment symbol(s):



Other information:
Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Solid
Appearance	Thixotropic paste.
Colour	Blue
Odour	characteristic
Odour threshold	Not determined
pH	No data available
Melting point	No data available
Freezing point	No data available
Boiling point	240 °C
Flash point	> 109 °C DIN EN ISO 1523
Relative evaporation rate (butylacetate=1)	No data available
Flammability (solid, gas)	Flammable.
Vapour pressure	No data available
Relative vapour density at 20°C	No data available
Relative density	No data available
Density	1.8 g/ml AW 4.3.23
Solubility	Water: % Not miscible
Partition coefficient n-octanol/water (Log Pow)	No data available
Auto-ignition temperature	Not self-igniting
Decomposition temperature	No data available
Viscosity, kinematic	No data available
Viscosity, dynamic	35 – 65 Pa·s (HN-0333)
Explosive limits	No data available
Explosive properties	Product is not explosive.
Oxidising properties	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No additional information available.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

Strong acids. Strong bases.

10.6. Hazardous decomposition products

fume. Carbon monoxide. Carbon dioxide. Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	Not classified
Acute toxicity (dermal)	Not classified
Acute toxicity (inhalation)	Not classified

1,1'-(p-tolylimino)dipropan-2-ol (38668-48-3)	
LD50 oral rat	25 mg/kg
LD50 dermal rat	> 2000 mg/kg

2-Propenoic acid, 2-methyl-, 1,4-butanediyl ester (2082-81-7)	
LD50 oral rat	10066 mg/kg
LD50 dermal rat	> 3000 mg/kg

2-Propenoic acid, 2-methyl-, monoester with 1,2-propanediol (27813-02-1)	
LD50 oral rat	> 5000 mg/kg (Rat; OECD 401: Acute Oral Toxicity; Literature study; >=2000 mg/kg bodyweight; Rat; Experimental value)
LD50 dermal rabbit	≥ 5000 mg/kg bodyweight (Rabbit; Experimental value)

Skin corrosion/irritation	Not classified
Serious eye damage/irritation	Not classified
Respiratory or skin sensitisation	May cause an allergic skin reaction.
Germ cell mutagenicity	Not classified
Carcinogenicity	Not classified

Quartz (SiO2) (14808-60-7)	
IARC group	1 - Carcinogenic to humans

Quartz (SiO2) (14808-60-7)	
National Toxicology Program (NTP) Status	Known Human Carcinogens

Reproductive toxicity	Not classified
STOT-single exposure	Not classified
STOT-repeated exposure	Not classified
Aspiration hazard	Not classified
Viscosity, kinematic	No data available
Potential adverse human health effects and symptoms	No additional information available.
Symptoms/effects after skin contact	May cause an allergic skin reaction.
Symptoms/effects after eye contact	May cause severe irritation.

SECTION 12: Ecological information

12.1. Toxicity

1,1'-(p-tolylimino)dipropan-2-ol (38668-48-3)	
LC50 - Fish [1]	≈ 17 mg/l
LC50 - Other aquatic organisms [1]	245 mg/l
EC50 - Crustacea [1]	28.8 mg/l
NOEC (acute)	57.8 mg/l

2-Propenoic acid, 2-methyl-, 1,4-butanediyl ester (2082-81-7)	
LC50 - Other aquatic organisms [1]	9.79 mg/l
NOEC (acute)	7.51 mg/l
NOEC (chronic)	20 mg/l

2-Propenoic acid, 2-methyl-, monoester with 1,2-propanediol (27813-02-1)	
LC50 - Fish [1]	493 mg/l (48 h; Leuciscus idus; GLP)
EC50 - Crustacea [1]	> 143 mg/l (48 h; Daphnia magna; GLP)
ErC50 algae	97.2 mg/l (OECD 201: Alga, Growth Inhibition Test, 72 h, Pseudokirchneriella subcapitata, Static system, Fresh water, Experimental value, GLP)
Threshold limit - Algae [1]	> 97.2 mg/l (72 h; Pseudokirchneriella subcapitata; GLP)
Threshold limit - Algae [2]	> 97.2 mg/l (72 h; Pseudokirchneriella subcapitata; GLP)

12.2. Persistence and degradability

HIT-HY 200-A V3, A	
Persistence and degradability	Not established.

Quartz (SiO2) (14808-60-7)	
Not rapidly degradable	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable (inorganic)

Quartz (SiO2) (14808-60-7)	
ThOD	Not applicable (inorganic)

2-Propenoic acid, 2-methyl-, 1,4-butanediyl ester (2082-81-7)	
Not rapidly degradable	
Biodegradation	84 %

2-Propenoic acid, 2-methyl-, monoester with 1,2-propanediol (27813-02-1)	
Not rapidly degradable	
Persistence and degradability	Readily biodegradable in water.

12.3. Bioaccumulative potential

HIT-HY 200-A V3, A	
Bioaccumulative potential	Not established.

Quartz (SiO2) (14808-60-7)	
Bioaccumulative potential	No bioaccumulation data available.

1,1'-(p-tolylimino)dipropan-2-ol (38668-48-3)	
Partition coefficient n-octanol/water (Log Kow)	2.1

2-Propenoic acid, 2-methyl-, 1,4-butanediyl ester (2082-81-7)	
Partition coefficient n-octanol/water (Log Pow)	3.1

2-Propenoic acid, 2-methyl-, monoester with 1,2-propanediol (27813-02-1)	
BCF - Fish [1]	≤ 100
BCF - Fish [2]	3.2 Quantitative structure-activity relationship (QSAR)
Partition coefficient n-octanol/water (Log Pow)	0.97 (OECD 102 method)
Bioaccumulative potential	Low bioaccumulation potential (BCF < 500).

12.4. Mobility in soil

Quartz (SiO2) (14808-60-7)	
Surface tension	No data available in the literature
Ecology - soil	Low potential for mobility in soil.

2-Propenoic acid, 2-methyl-, monoester with 1,2-propanediol (27813-02-1)	
Organic Carbon Normalized Adsorption Coefficient (Log Koc)	1.9 (log Koc, Calculated value)
Ecology - soil	Highly mobile in soil.

12.5. Other adverse effects

Other information: Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Regional legislation (waste)	Disposal must be done according to official regulations.
Product/Packaging disposal recommendations	After curing, the product can be disposed of with household waste. . Full or only partially emptied cartridges must be disposed of as special waste in accordance with official regulations. Packaging contaminated by the product : Dispose in a safe manner in accordance with local/national regulations.
Ecology - waste materials	Avoid release to the environment.

SECTION 14: Transport information

In accordance with ADR / IMDG / IATA / RID

ADR	IMDG	IATA	RID
14.1. UN number or ID number			
Not regulated	Not regulated	Not regulated	Not regulated
14.2. UN proper shipping name			
Not regulated	Not regulated	Not regulated	Not regulated
14.3. Transport hazard class(es)			
Not regulated	Not regulated	Not regulated	Not regulated
14.4. Packing group			
Not regulated	Not regulated	Not regulated	Not regulated
14.5. Environmental hazards			
Not regulated	Not regulated	Not regulated	Not regulated
No supplementary information available			

14.6. Special precautions for user

Overland transport

Not regulated

Transport by sea

Not regulated

Air transport

Not regulated

Rail transport

Not regulated

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

15.1. US Federal regulations

All components of this product are present and listed as Active on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

15.2. International regulations

Quartz (SiO2) (14808-60-7)
Listed on IARC (International Agency for Research on Cancer)

15.3. US State regulations

WARNING: This product can expose you to 1,2-dihydroxybenzene, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

SECTION 16: Other information

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision date 04/13/2023

Other information None.

Full text of H-statements	
H300	Fatal if swallowed.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H350	May cause cancer.

Abbreviations and acronyms	
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	Acute Toxicity Estimate
BCF	Bioconcentration factor
CLP	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
DMEL	Derived Minimal Effect level
DNEL	Derived-No Effect Level
EC50	Median effective concentration
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
LC50	Median lethal concentration
LD50	Median lethal dose

Abbreviations and acronyms	
LOAEL	Lowest Observed Adverse Effect Level
NOAEC	No-Observed Adverse Effect Concentration
NOAEL	No-Observed Adverse Effect Level
NOEC	No-Observed Effect Concentration
OECD	Organisation for Economic Co-operation and Development
PBT	Persistent Bioaccumulative Toxic
PNEC	Predicted No-Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
vPvB	Very Persistent and Very Bioaccumulative

NFPA health hazard — 1 - Materials that, under emergency conditions, can cause significant irritation.

NFPA fire hazard — 1 - Materials that must be preheated before ignition can occur.

NFPA reactivity — 0 - Material that in themselves are normally stable, even under fire conditions.



Indication of changes:			
Section	**Changed item**	**Change**	**Comments**
9	Physical and chemical properties	Modified	

SDS_US_Hilti

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

HIT-HY 200-A V3, B

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision date: 4/13/2023 Issue date: 4/13/2023 Supersedes: 7/9/2021Version: 1.1

SECTION 1: Identification

1.1. Identification

Product form	Mixture
Product name	HIT-HY 200-A V3, B
Product code	BU Anchor

1.2. Recommended use and restrictions on use

Use of the substance/mixture	Composite mortar component for fasteners in the construction industry
Recommended use	For professional use only

1.3. Supplier

Supplier
Hilti, Inc.
Legacy Tower, Suite 1000
7250 Dallas Parkway
Plano, TX 75024
USA
T +1 9724035800
1-800-879-8000 toll free - F +1 918 254 0522

Department issuing data specification sheet
Hilti Entwicklungsgesellschaft mbH
Hiltistraße 6
Kaufering, 86916
Deutschland
T +49 8191 906876
anchor.hse@hilti.com

1.4. Emergency telephone number

Emergency number	Chem-Trec Tel.: 1 800 424 9300 (USA, PR, Virgin Islands, Canada) Tel.: 703 527 3887 (Other countries) +1 918 8723000 1-800-879-8000 toll free

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Serious eye damage/eye irritation, Category 2	H319	Causes serious eye irritation.
Skin sensitisation, Category 1	H317	May cause an allergic skin reaction.

Full text of H-statements: see section 16

2.2. GHS Label elements, including precautionary statements

GHS US labelling

Hazard pictograms (GHS US)



Signal word (GHS US)	Warning
Hazard statements (GHS US)	H317 - May cause an allergic skin reaction. H319 - Causes serious eye irritation.
Precautionary statements (GHS US)	P280 - Wear eye protection, protective clothing, protective gloves. P262 - Do not get in eyes, on skin, or on clothing.

P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P302+P352 - If on skin: Wash with plenty of water.

2.3. Other hazards which do not result in classification

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	GHS-US classification
Quartz (SiO2)	CAS-No.: 14808-60-7	40 – 60	Carc. 1A, H350
dibenzoyl peroxide	CAS-No.: 94-36-0	10 - 15	Org. Perox. B, H241 Eye Irrit. 2A, H319 Skin Sens. 1, H317

Full text of hazard classes and H-statements : see section 16

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general: Take off immediately all contaminated clothing. Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation: Remove person to fresh air and keep comfortable for breathing. Allow affected person to breathe fresh air. Allow the victim to rest.

First-aid measures after skin contact: Wash contaminated clothing before reuse. Wash with plenty of water/…. If skin irritation or rash occurs: Get medical advice/attention.

First-aid measures after eye contact: Rinse immediately with plenty of water. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if pain, blinking or redness persists.

First-aid measures after ingestion: Rinse mouth. Get medical advice/attention. Do not induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after skin contact: May cause an allergic skin reaction.

Symptoms/effects after eye contact: May cause severe irritation.

4.3. Immediate medical attention and special treatment, if necessary

No additional information available

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Water spray. Carbon dioxide. Dry powder. Foam. Sand.

Unsuitable extinguishing media: Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical

Hazardous decomposition products in case of fire	Thermal decomposition generates : Carbon dioxide. Carbon monoxide.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions	Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire fighting water from entering the environment.
Protection during firefighting	Self-contained breathing apparatus. Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	Spilled material may present a slipping hazard.

6.1.1. For non-emergency personnel

Emergency procedures	Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment	Use personal protective equipment as required. Equip cleanup crew with proper protection.
Emergency procedures	Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	Collect spillage.
Methods for cleaning up	This material and its container must be disposed of in a safe way, and as per local legislation. Mechanically recover the product. Store away from other materials.
Other information	Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	Wear personal protective equipment. Avoid contact with skin and eyes. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapour.
Hygiene measures	Do not eat, drink or smoke when using this product. Always wash hands after handling the product. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	Keep cool. Protect from sunlight.
Incompatible products	Strong bases. Strong acids.
Incompatible materials	Sources of ignition. Direct sunlight.
Storage temperature	5 – 25 °C
Heat and ignition sources	Keep away from heat and direct sunlight.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

HIT-HY 200-A V3, B	
USA - ACGIH - Occupational Exposure Limits	
Local name	Benzoyl peroxide
ACGIH OEL TWA	5 mg/m³
Remark (ACGIH)	TLV® Basis: URT & skin irr. Notations: A4 (Not classifiable as a Human Carcinogen)
Regulatory reference	ACGIH 2023
USA - OSHA - Occupational Exposure Limits	
Local name	Benzoyl peroxide
OSHA PEL TWA [1]	5 mg/m³
Regulatory reference (US-OSHA)	OSHA Annotated Table Z-1

Quartz (SiO2) (14808-60-7)	
USA - ACGIH - Occupational Exposure Limits	
Local name	Silica crystaline - quartz
ACGIH OEL TWA	0.025 mg/m³ (Respirable fraction)
Remark (ACGIH)	TLV® Basis: Pulm fibrosis; lung cancer. Notations: A2 (Suspected Human Carcinogen)
Regulatory reference	ACGIH 2022
USA - OSHA - Occupational Exposure Limits	
Local name	Silica, crystalline quartz, respirable dust
Remark (OSHA)	(3) See Table Z-3.

dibenzoyl peroxide (94-36-0)	
USA - ACGIH - Occupational Exposure Limits	
Local name	Benzoyl peroxide
ACGIH OEL TWA	5 mg/m³
Remark (ACGIH)	TLV® Basis: URT & skin irr. Notations: A4 (Not classifiable as a Human Carcinogen)
Regulatory reference	ACGIH 2020
USA - OSHA - Occupational Exposure Limits	
Local name	Benzoyl peroxide
OSHA PEL TWA [1]	5 mg/m³
Regulatory reference (US-OSHA)	OSHA Annotated Table Z-1

Additional information	The product has a pasty consistency. Exposure limit values for respirable dusts are not relevant for this product.

8.2. Appropriate engineering controls

Appropriate engineering controls	Ensure adequate ventilation.
Environmental exposure controls	Not applicable.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Safety glasses. Gloves. Protective clothing. Avoid all unnecessary exposure.

Materials for protective clothing:
Long sleeved protective clothing

Hand protection:				
Wear protective gloves. The permeation time is not the maximum wearing time! Generally speaking, it must be reduced. Contact with either mixtures of substances or different substances may shorten the protective function's effective duration.				
Type	**Material**	**Permeation**	**Thickness (mm)**	**Penetration**
Disposable gloves	Nitrile rubber (NBR)	6 (> 480 minutes)	0,12	

Eye protection:		
Wear security glasses which protect from splashes		
Type	**Field of application**	**Characteristics**
Safety glasses	Droplet	clear

Personal protective equipment symbol(s):



Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Solid
Appearance	Thixotropic paste.
Colour	white
Odour	characteristic
Odour threshold	Not determined
pH	6 – 7
Melting point	No data available
Freezing point	No data available
Boiling point	100 °C
Flash point	No data available
Relative evaporation rate (butylacetate=1)	No data available
Flammability (solid, gas)	Flammable.
Vapour pressure	23 hPa
Relative vapour density at 20°C	No data available
Relative density	No data available
Density	1.9 g/cm³
Solubility	Water: % Miscible with water
Partition coefficient n-octanol/water (Log Pow)	No data available
Auto-ignition temperature	Not self-igniting

Decomposition temperature	No data available
Viscosity, kinematic	No data available
Viscosity, dynamic	25 – 55 Pa·s HN-0333
Explosive limits	No data available
Explosive properties	Product is not explosive.
Oxidising properties	No data available

9.2. Other information

SADT 65 °C dibenzoyl peroxide

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No additional information available.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

Strong acids. Strong bases.

10.6. Hazardous decomposition products

fume. Carbon monoxide. Carbon dioxide. Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	Not classified
Acute toxicity (dermal)	Not classified
Acute toxicity (inhalation)	Not classified
Skin corrosion/irritation	Not classified pH: 6 – 7
Serious eye damage/irritation	Causes serious eye irritation. pH: 6 – 7
Respiratory or skin sensitisation	May cause an allergic skin reaction.
Germ cell mutagenicity	Not classified
Carcinogenicity	Not classified

Quartz (SiO2) (14808-60-7)	
IARC group	1 - Carcinogenic to humans
National Toxicology Program (NTP) Status	Known Human Carcinogens

dibenzoyl peroxide (94-36-0)	
IARC group	3 - Not classifiable

Reproductive toxicity	Not classified
STOT-single exposure	Not classified

STOT-repeated exposure	Not classified
Aspiration hazard	Not classified
Viscosity, kinematic	No data available
Symptoms/effects after skin contact	May cause an allergic skin reaction.
Symptoms/effects after eye contact	May cause severe irritation.

SECTION 12: Ecological information

12.1. Toxicity

dibenzoyl peroxide (94-36-0)	
EC50 - Crustacea [1]	0.11 mg/l (OECD 202: Daphnia sp. Acute Immobilisation Test, 48 h, Daphnia magna, Static system, Fresh water, Experimental value, GLP)
LC50 - Fish [2]	0.0602 mg/l (96h; Oncorhynchus mykiss; ECHA)
ErC50 algae	0.0711 mg/l (OECD 201: Alga, Growth Inhibition Test, 72 h, Pseudokirchneriella subcapitata, Static system, Fresh water, Experimental value, GLP)
NOEC (acute)	0.0316 mg/l (96h; Oncorhynchus mykiss; ECHA)
NOEC chronic fish	0.001 mg/l

12.2. Persistence and degradability

HIT-HY 200-A V3, B	
Persistence and degradability	Not established.

Quartz (SiO2) (14808-60-7)	
Not rapidly degradable	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable (inorganic)
ThOD	Not applicable (inorganic)

dibenzoyl peroxide (94-36-0)	
Persistence and degradability	Readily biodegradable in water. Not established. May cause long-term adverse effects in the environment.

12.3. Bioaccumulative potential

HIT-HY 200-A V3, B	
Bioaccumulative potential	Not established.

Quartz (SiO2) (14808-60-7)	
Bioaccumulative potential	No bioaccumulation data available.

dibenzoyl peroxide (94-36-0)	
Partition coefficient n-octanol/water (Log Pow)	3.71
Bioaccumulative potential	Low bioaccumulation potential (Log Kow < 4).

12.4. Mobility in soil

Quartz (SiO2) (14808-60-7)	
Surface tension	No data available in the literature
Ecology - soil	Low potential for mobility in soil.

dibenzoyl peroxide (94-36-0)	
Surface tension	No data available (test not performed)
Organic Carbon Normalized Adsorption Coefficient (Log Koc)	3.8 (log Koc, OECD 121: Estimation of the Adsorption Coefficient (Koc) on Soil and on Sewage Sludge using High Performance Liquid Chromatography (HPLC), Experimental value)
Ecology - soil	Low potential for mobility in soil.

12.5. Other adverse effects

Other information: Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Regional legislation (waste): Disposal must be done according to official regulations.

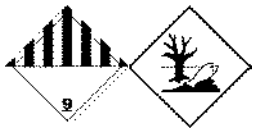
Product/Packaging disposal recommendations: After curing, the product can be disposed of with household waste. . Full or only partially emptied cartridges must be disposed of as special waste in accordance with official regulations. Packaging contaminated by the product : Dispose in a safe manner in accordance with local/national regulations.

Ecology - waste materials: Avoid release to the environment.

SECTION 14: Transport information

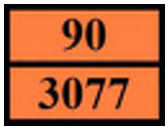
In accordance with ADR / IMDG / IATA / RID

ADR	IMDG	IATA	RID
Special provision(s) applied : 375	Special provision(s) applied : 969	Special provision(s) applied : A197	Special provision(s) applied : 375
These substances when carried in single or combination packagings containing a net quantity per single or inner packaging of 5 l or less for liquids or having a net mass per single or inner packaging of 5 kg or less for solids, are not subject to any other provisions of ADR provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.			
14.1. UN number or ID number			
UN 3077	UN 3077	UN 3077	UN 3077
14.2. UN proper shipping name			
ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (dibenzoyl peroxide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (dibenzoyl peroxide)	Environmentally hazardous substance, solid, n.o.s. (dibenzoyl peroxide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (dibenzoyl peroxide)
Transport document description			
UN 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (dibenzoyl peroxide), 9, III, (-)	UN 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (dibenzoyl peroxide), 9, III	UN 3077 Environmentally hazardous substance, solid, n.o.s. (dibenzoyl peroxide), 9, III	UN 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (dibenzoyl peroxide), 9, III

ADR	IMDG	IATA	RID
14.3. Transport hazard class(es)			
9	9	9	9
			
14.4. Packing group			
III	III	III	III
14.5. Environmental hazards			
Dangerous for the environment: Yes	Dangerous for the environment: Yes Marine pollutant: Yes	Dangerous for the environment: Yes	Dangerous for the environment: Yes
Environmentally hazardous substances derogation applies (quantity of liquids ≤ 5 litres or net mass of solids ≤ 5 kg). The environmentally hazardous substance mark is therefore not required, as stated in the ADR regulation, section 5.2.1.8.1.			
not restricted according ADR Special Provision SP375, IATA-DGR Special Provision A197 and IMDG-Code 2.10.2.7			

14.6. Special precautions for user

Overland transport

Classification code (ADR)	M7
Special provisions (ADR)	274, 335, 375, 601
Limited quantities (ADR)	5kg
Packing instructions (ADR)	P002, IBC08, LP02, R001
Mixed packing provisions (ADR)	MP10
Transport category (ADR)	3
Orange plates	
Tunnel restriction code (ADR)	-

Transport by sea

Special provisions (IMDG)	274, 335, 966, 967, 969
Limited quantities (IMDG)	5 kg
Packing instructions (IMDG)	LP02, P002
EmS-No. (Fire)	F-A
EmS-No. (Spillage)	S-F
Stowage category (IMDG)	A
Stowage and handling (IMDG)	SW23
MFAG-No	171

Air transport

PCA packing instructions (IATA)	956
PCA max net quantity (IATA)	400kg
CAO packing instructions (IATA)	956
Special provisions (IATA)	A97, A158, A179, A197, A215

Rail transport

Special provisions (RID)	274, 335, 375, 601
Limited quantities (RID)	5kg
Packing instructions (RID)	P002, IBC08, LP02, R001

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

15.1. US Federal regulations

All components of this product are present and listed as Active on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

dibenzoyl peroxide	CAS-No. 94-36-0	10 - 15%

15.2. International regulations

Quartz (SiO2) (14808-60-7)

Listed on IARC (International Agency for Research on Cancer)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision date	04/13/2023
Other information	None.

Full text of H-statements	
H241	Heating may cause a fire or explosion.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H350	May cause cancer.

Abbreviations and acronyms	
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	Acute Toxicity Estimate
BCF	Bioconcentration factor
CLP	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008

Abbreviations and acronyms	
DMEL	Derived Minimal Effect level
DNEL	Derived-No Effect Level
EC50	Median effective concentration
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
LC50	Median lethal concentration
LD50	Median lethal dose
LOAEL	Lowest Observed Adverse Effect Level
NOAEC	No-Observed Adverse Effect Concentration
NOAEL	No-Observed Adverse Effect Level
NOEC	No-Observed Effect Concentration
OECD	Organisation for Economic Co-operation and Development
PBT	Persistent Bioaccumulative Toxic
PNEC	Predicted No-Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
vPvB	Very Persistent and Very Bioaccumulative

NFPA health hazard	1 - Materials that, under emergency conditions, can cause significant irritation.
NFPA fire hazard	1 - Materials that must be preheated before ignition can occur.
NFPA reactivity	0 - Material that in themselves are normally stable, even under fire conditions.



SDS_US_Hilti

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

~~HDM 330~~

HDM 500

English

Rev 01

Printed: 20.03.2017 | Doc-Nr: PUB / 5208057 / 000 / 03

1 Information about the documentation

1.1 About this documentation

- Read this documentation before initial operation or use. This is a prerequisite for safe, trouble-free handling and use of the product.
- Observe the safety instructions and warnings in this documentation and on the product.
- Always keep the operating instructions with the product and make sure that the operating instructions are with the product when it is given to other persons.

1.2 Explanation of symbols used

1.2.1 Warnings

Warnings alert persons to hazards that may occur when handling or using the product. The following signal words are used in combination with a symbol:

	**DANGER!** Draws attention to an imminent hazard that will lead to serious personal injury or fatality.
	**WARNING!** Draws attention to a potential hazard that could lead to serious personal injury or fatality.
	**CAUTION!** Draws attention to a potentially dangerous situation that could lead to minor personal injury or material damage.

1.2.2 Symbols in the documentation

The following symbols are used in this document:

	Read the operating instructions before use
	Instructions for use and other useful information

1.2.3 Symbols in the illustrations

The following symbols are used in illustrations:

	These numbers refer to the corresponding illustrations found at the beginning of these operating instructions.
3	The numbering reflects the sequence of operations shown in the illustrations and may deviate from the steps described in the text.
	Item reference numbers are used in the **overview illustration** and refer to the numbers used in the key in the **product overview** section.
	This symbol is intended to draw special attention to certain points when handling the product.

1.3 Symbols in the documentation

1.3.1 Symbols

The following symbols are used in this document:

	National waste-materials management system
	Wear protective clothing when working with the tool.

1.3.2 Explanation of symbols used

The following symbols are used on the product:

	Wear protective goggles while working with the tool.
	Wear protective gloves when working with the tool.

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2 Safety

2.1 Product information

Hilti products are designed for professional use and may be operated, serviced and maintained only by trained, authorized personnel. This personnel must be informed of any particular hazards that may be encountered. The product and its ancillary equipment can present hazards if used incorrectly by untrained personnel or if used not in accordance with the intended use.

The type designation and serial number are stated on the rating plate.

- Write down the serial number in the table below. You will be required to state the product details when contacting Hilti Service or your local Hilti organization to inquire about the product.

Product information

Type:	HDM 500 | ~~HDM 600~~
Generation:	01
Serial number:	

2.2 Safety instructions

ATTENTION! Read all instructions!

Follow these safety instructions!

Workplace

- Make sure that the workplace is well ventilated.
- Make sure that the workplace is well lit.
- Keep your workplace clean and well lit. Cluttered or poorly lit workplaces invite accidents.
- **Keep children and other persons clear when the dispenser is in use.** Distractions can cause you to lose control of the tool.

Personal safety

- Stay alert, watch what you are doing and use common sense when operating the tool.
- **Do not use the dispenser while you are tired or under the influence of drugs, alcohol or medication.** A moment of inattention while operating the tool can result in serious injury.
- To reduce the risk of injury, use only genuine **Hilti** accessories and accessory tools.

Careful handling and use

- Do not tamper with or attempt to make alterations to the tool.
- Operate the dispenser only as intended and when it is in faultless condition.
- Use only foil pack holders approved for use with the dispenser.
- Do not use damaged foil pack holders or damaged foil packs.
- The dispenser, the cradle for the foil pack holders, the piston rods with pressure pieces and the foil pack holders must be clean and free from foreign matter.
- Maintain the dispenser with care. Check that moving parts function faultlessly and do not jam. Check for parts that are broken or damaged to the extent that the tool is not in full working order.
- Use the dispenser and accessories in accordance with these instructions and as specified for this particular model. Take the working conditions and the work to be performed into account.
- Do not attempt to open or disassemble the dispenser. Only **Hilti** Service is authorized to undertake repairs.

Personal protective equipment

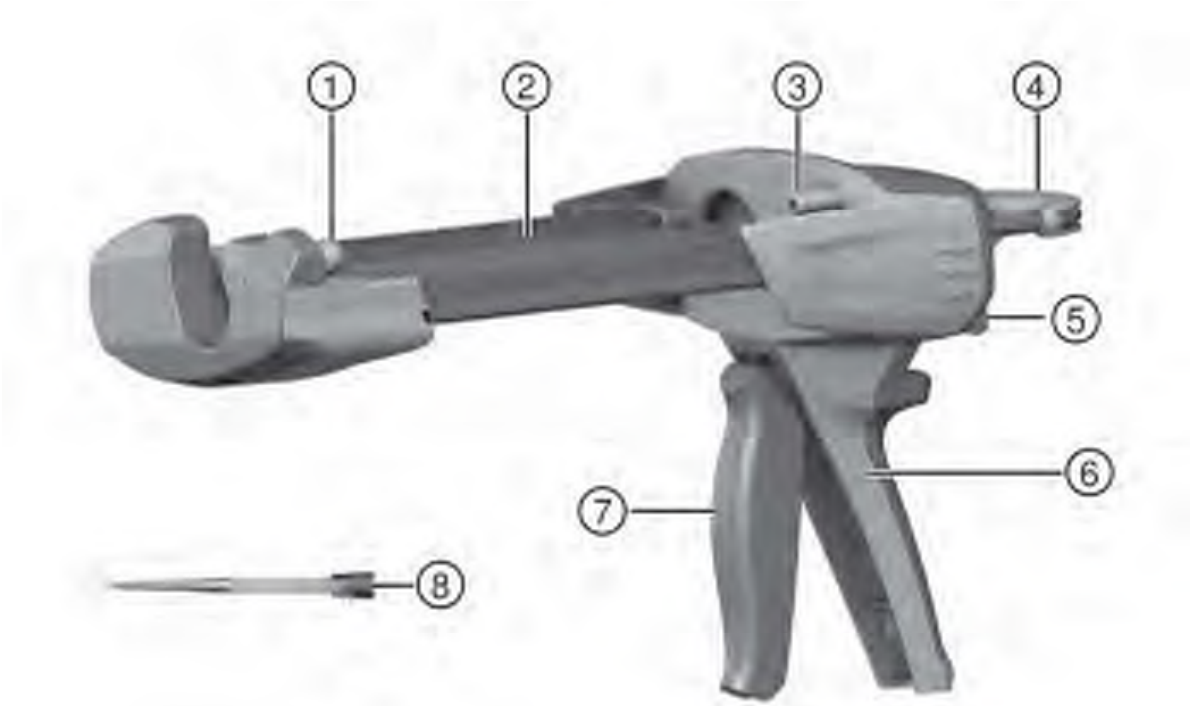
- Wear personal protective equipment when using the dispenser: closely fitting protective goggles or face shield, protective gloves and protective clothing. Wearing personal protective equipment reduces the risk of injury.
- Persons in the immediate vicinity must also wear personal protective equipment when the dispenser is in use.

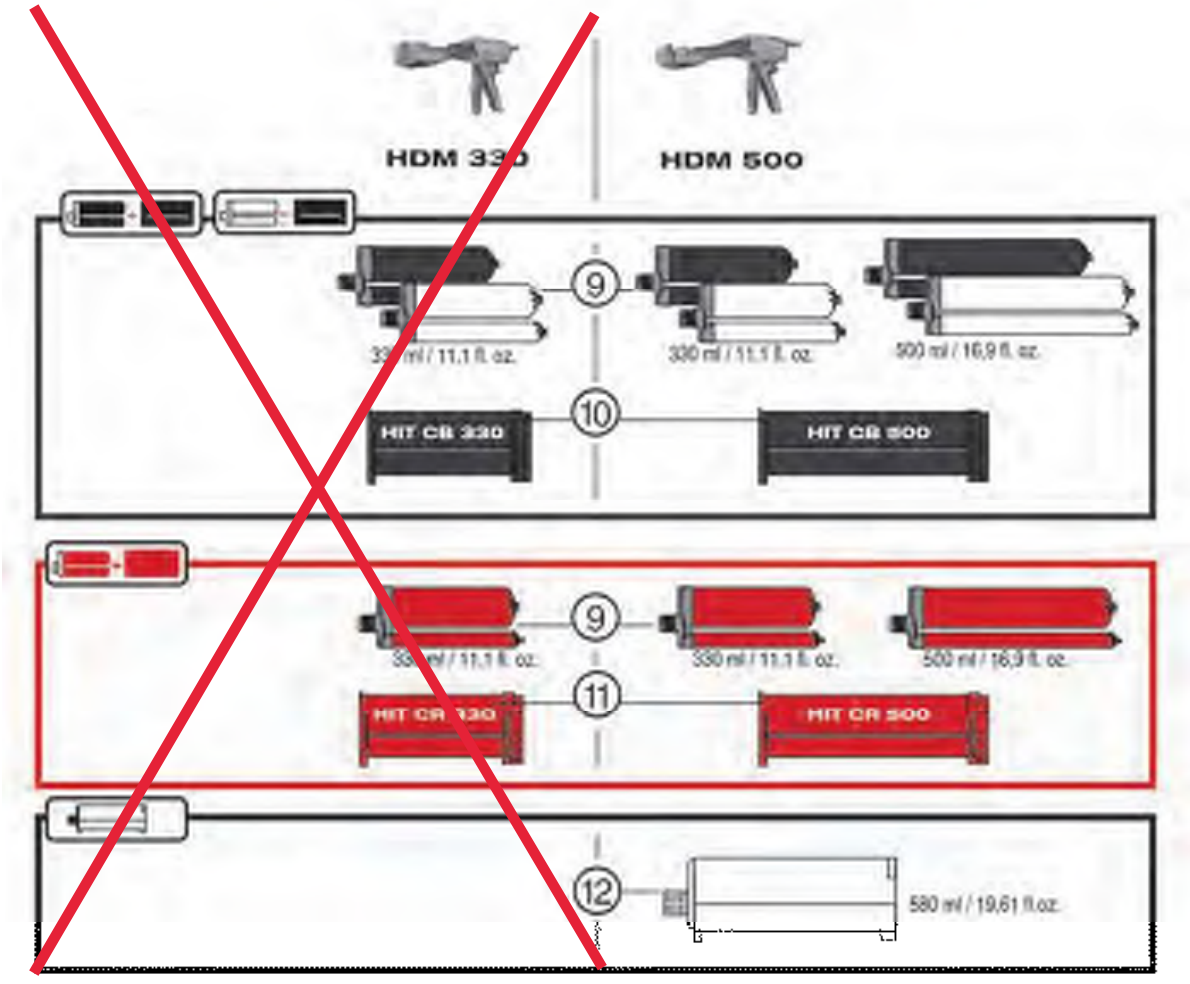
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3 Description

3.1 Tool components and controls





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① Front locating lug for installation of the foil pack holder
② Cradle for foil pack holder
③ Rear locating lug for installation of the foil pack holder
④ Parallel piston rods with grip
⑤ Release button
⑥ Grip
⑦ Trigger for starting and controlling dispensing

Accessories

⑧ Mixing nozzle (static mixer)
⑨ Foil pack
⑩ Foil pack holder, black
⑪ Foil pack holder, red
⑫ Cartridge

3.2 Intended use

The HDM is a mechanical dispenser.
The dispenser is designed to dispense the contents of **Hilti** foil packs in a controlled operation.

HDM 330

The **Hilti** HDM 330 is designed to be used exclusively with **Hilti** HIT CB 330 or HIT CR 330 foil pack holders and **Hilti** 330 ml (11.1 fl.oz) foil packs.

HDM 500

The **Hilti** HDM 500 is designed to be used exclusively with **Hilti** HIT CB 500 or HIT CR 500 foil pack holders and **Hilti** 500 ml (16.9 fl.oz) or 330 ml (11.1 fl.oz) foil packs and 580 ml (19.61 fl. oz.) cartridges.

3.3 Items supplied

Dispenser, operating instructions.

4 Operation

4.1 Comply with all safety instructions and instructions for use.

WARNING
Chemicals hazard Incorrect use can lead to injury.

- Prior to use, read and comply with the safety data sheet for the product, the instructions on the packaging and the instructions for use of the foil pack.

4.2 Selecting and inserting the foil pack holder / cartridge

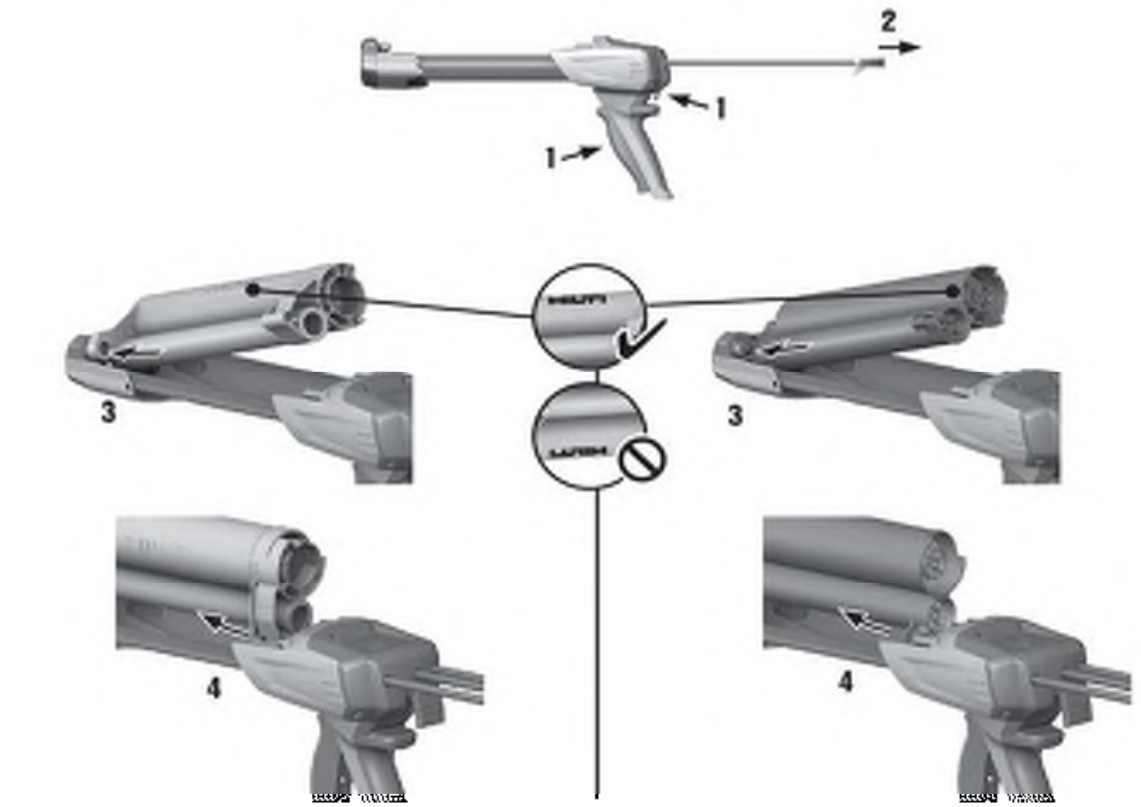
CAUTION
Trap hazard Hands can be trapped if care is not exercised when swiveling the foil pack holder closed.

- Keep your hands clear of the cradle area when swiveling the foil pack holder into position.

CAUTION
Risk of injury Chemicals hazard.

- Check the foil pack holder for damage and soiling. Both pistons must move smoothly and easily in both directions over the full length of their travel in the foil pack holder. **Replace the foil pack holder if it is damaged and/or badly soiled.**

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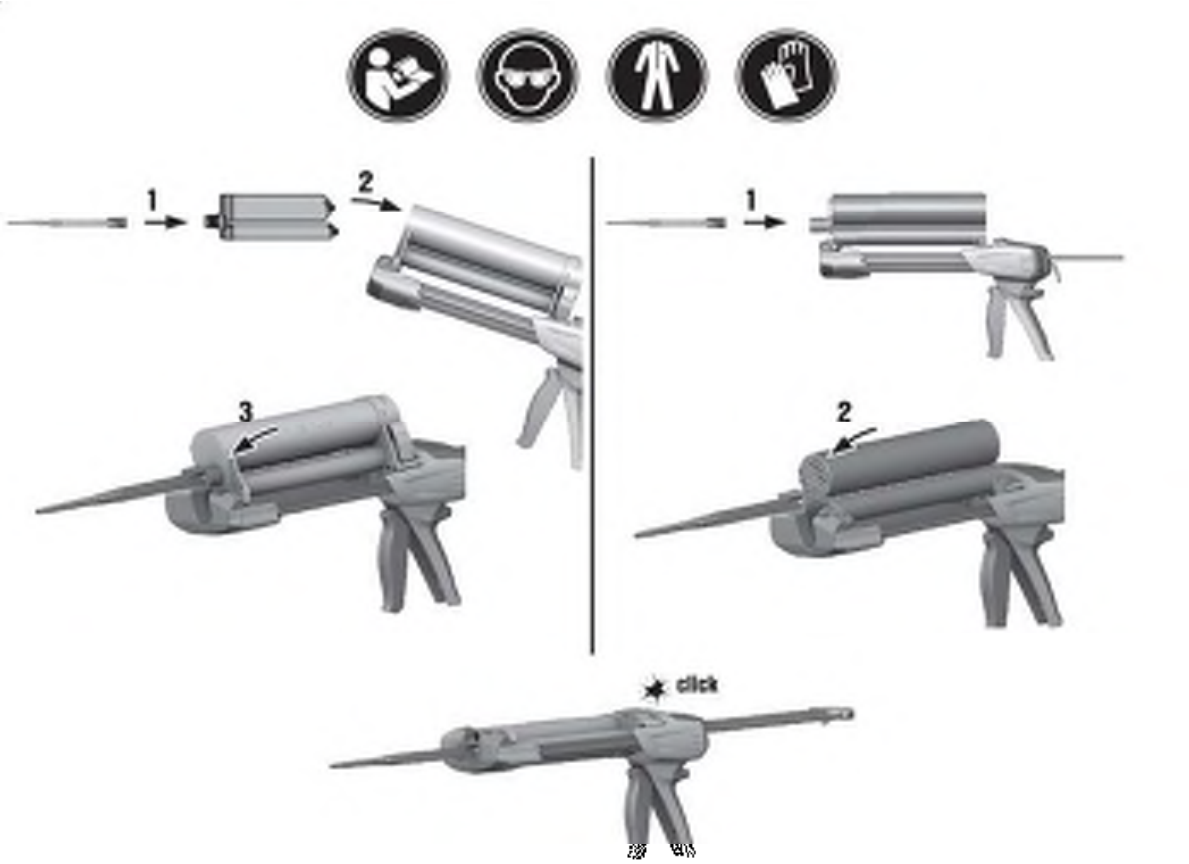
- Select the foil pack holder that matches the color of the foil pack.

Note
Black foil pack holder: BLACK or WHITE foil pack
Red foil pack holder: RED foil pack

4.3 Inserting foil pack into foil pack holder

Note
Follow the instructions for use of the foil pack.

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- Insert the foil pack into the foil pack holder.

4.4 Discarding initially dispensed mortar

WARNING
Risk of injury Chemicals hazard.

- Never point the dispenser toward yourself or other persons. Incorrect use can lead to injury.

WARNING
Risk of injury Chemicals hazard.

- Begin dispensing mortar only after the mixing nozzle has been screwed on. Incorrect use can lead to injury.

Note
Discard the initially dispensed mortar every time the static mixer (mixing nozzle) is changed.
The initially dispensed mortar is not suitable for use.

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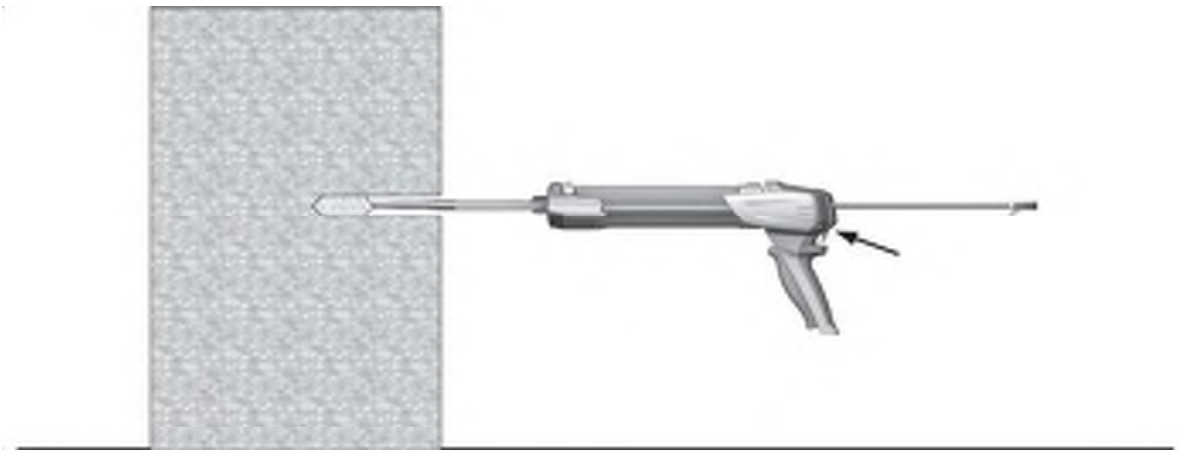
1. Repeatedly pull the trigger to the grip until the foil pack opens and mortar is ejected from the mixing nozzle.
2. Pull the trigger back to the grip for one stroke of the dispenser.
   - ◃ 1 = 1 stroke (approx. 5 ml)
   - ◃ 15 = 1 stroke (approx. 75 ml)
3. Press the release button after the specified number of strokes.
4. Discard the volume of mortar initially dispensed.
   - ◃ The dispenser is now ready to dispense ready-to-use mortar.

4.5 Dispensing

⚠ **CAUTION**
Risk of injury Chemicals hazard.

- ▸ When preparing to change the mixing nozzle, make sure that the dispenser/foil pack is not under pressure.

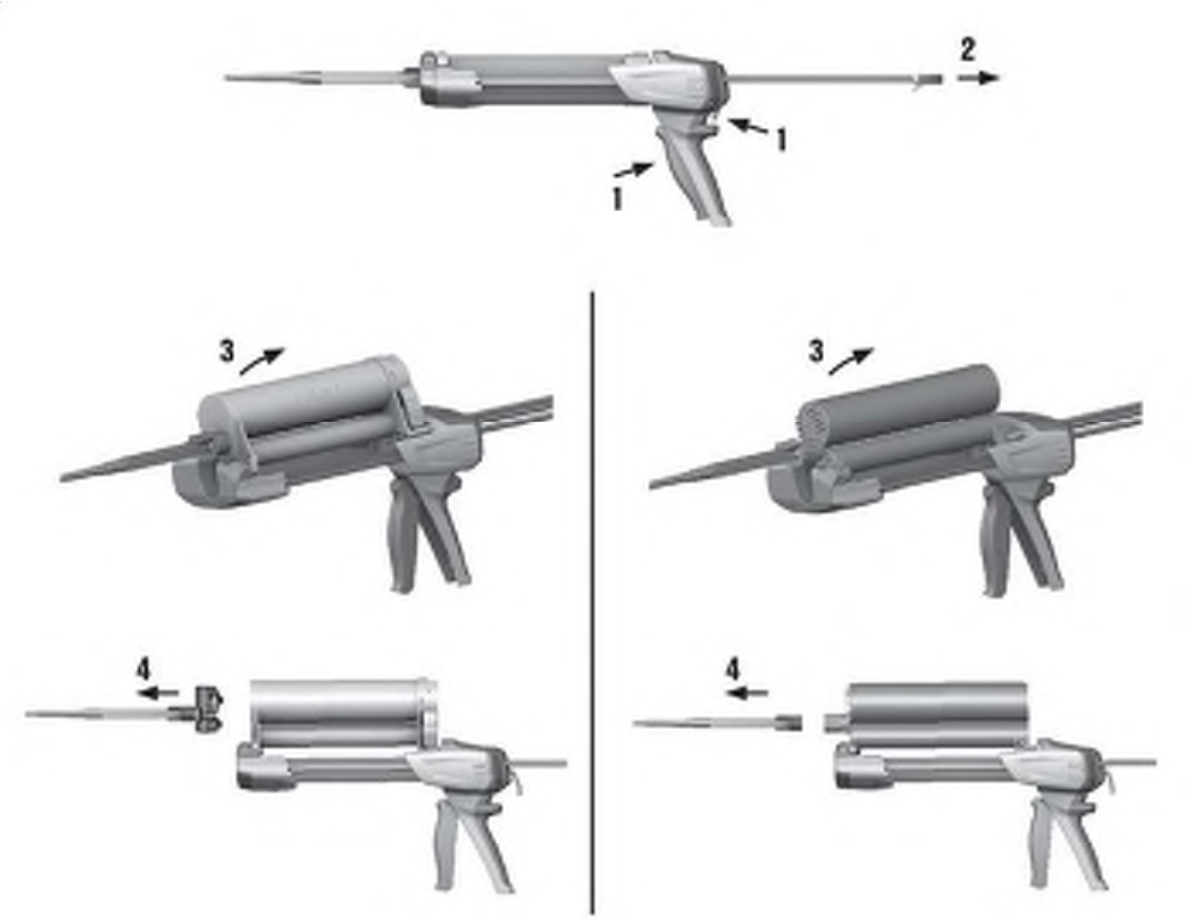
Note
Refer to the instructions for use of the foil pack / cartridge for further information about use of the mortar.
Fit a new mixing nozzle for each use. Failure to comply with this point will result in an inadequate quantity of mortar being dispensed.



1. Repeatedly pull the trigger to the grip until the foil pack opens and mortar is ejected from the mixing nozzle.
2. Press the release button after finishing dispensing or if the operation is interrupted.
3. Pressing the release button prevents further ejection or leakage of mortar.

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4.6 Changing the foil pack



- Change the foil pack.

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4.7 Removing the foil pack holder / cartridge from the tool



- Remove the foil pack holder / cartridge from the tool.

5 Care of the product

CAUTION
Risk of injury Chemicals hazard in the event of inadvertent dispensing.
- Before cleaning, remove the foil pack to prevent inadvertent dispensing.

- **Keep the dispenser, especially its grip surfaces, clean and free from oil and grease.**
- Clean the outside of the tool at regular intervals with a slightly damp cloth. Do not use a sprayer, steam pressure cleaning equipment or running water for cleaning.
- Oil the piston rods when necessary.
- Mortar adhering to the product or foil pack holder must be cleaned off with a cloth before it hardens. Hardened mortar can be removed only by mechanical means. Take care to ensure that the tool is not damaged by cleaning.
- Never dip or soak the dispenser or its parts in solvents.
- Make sure that the pistons move freely in the foil pack holder.

6 Troubleshooting

If the trouble you are experiencing is not listed in this table or you are unable to remedy the problem by yourself, please contact **Hilti** Service.

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6.1 Troubleshooting

Trouble or fault	Possible cause	Action to be taken
The trigger cannot be pulled all the way back.	The foil pack holder has not fully engaged.	▸ Fully engage the foil pack holder with an audible click.
	The mortar in the mixing nozzle has hardened.	▸ Press the release button and replace the static mixer (mixing nozzle).
	The advance mechanism is defective.	▸ Replace the tool.
Foil pack does not open automatically.	The tool has reached the end of its useful life.	▸ Replace the tool.
Trigger movement is very stiff.	Foil pack is too cold.	▸ Increase the foil pack temperature (follow the instructions for use of the foil pack).
	The dispensing pressure required is too high for the tool.	▸ Select a tool that is suitable for the intended purpose.
The foil pack holder cannot be swiveled completely into the tool.	The foil pack is not pushed fully into the holder.	▸ Push the foil pack into the foil pack holder as far as it will go.
	The piston rods are not pulled back fully.	▸ Press the release button and pull the piston rods back to the end stop.
Foil pack holder does not engage with an audible click.	The retaining lugs are dirty	▸ Clean the retaining lugs and engage the foil pack holder fully.
	The retaining lugs are defective.	▸ Replace the foil pack holder. Contact **Hilti** Service if the problem persists.
No mortar is dispensed from the mixing nozzle.	The mortar in the mixing nozzle has hardened.	▸ Unscrew the mixing nozzle containing the hardened mortar and fit a new mixing nozzle.

7 Disposal

Most of the materials from which **Hilti** tools and appliances are manufactured can be recycled. The materials must be correctly separated before they can be recycled. In many countries, your old tools, machines or appliances can be returned to **Hilti** for recycling. Ask **Hilti** Service or your Hilti representative for further information.



▸ Disposal of electric tools or appliances together with household waste is not permissible.

8 Manufacturer's warranty

▸ Please contact your local **Hilti** representative if you have questions about the warranty conditions.

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Hilti = registered trademark of Hilti Corp., Schaan

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HUD-2
PLASTIC ANCHOR

Technical Datasheet

Update: Jan-23

HUD-2 Plastic anchor

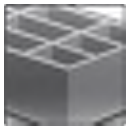
Economical universal plastic anchor

Anchor version		Benefits
	HUD-2 (5, 6, 8)	- Flat setting - Flexibility of screw length - An anchor for every base material

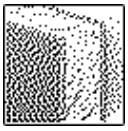
Base material


Concrete (non-cracked)


Solid brick


Hollow brick


Autoclaved aerated concrete


Drywall

Basic loading data

All data in this section applies to:

- Correct setting (see setting instruction)
- Load data are only valid for the specified chipboard screw type
- No edge distance and spacing influence
- Base material as specified in the table
- Minimum base material thickness
- Load data given in the tables is independent of load direction

Anchorage depth

Anchor size			5x25	6x30	8x40
Nominal embedment depth	h_{nom}	[mm]	25	30	40

Characteristic resistance

Anchor size			HUD-2 5x25	HUD-2 6x30	HUD-2 8x40
Screw type			Chipboard screw 4x40 a)	Chipboard screw 5x50 b)	Chipboard screw 6x50 c)
Base material	Drilling mode				
Concrete, uncracked Strength ≥ C16/20	hammer	F_{Rk} [kN]	0,60	1,2	2,5
Solid clay brick Name: Mauerziegel MZ Manuf.: Ziegelwerk Klosterbeuren Size : NF Strength: ≥ 20	hammer	F_{Rk} [kN]	0,60	0,90	2,50
Hollow clay brick Name: ThermoPlan Planziegel-TS² 1,2 Manuf.: Ziegelwerk Klosterbeuren Size : 373x175x249 mm Strength class: ≥ 12	rotary	F_{Rk} [kN]	0,60	0,80	1,20
Autoclaved aerated concrete Name: AAC 4 Manuf.: Ytong Size : 625x250x250 mm Strength: ≥ 6	rotary	F_{Rk} [kN]	0,30	0,60	0,90
Drywall, single layer 12,5 Name: Bauplatte Manuf.: Knauff Size : 2000x1250x12,5 mm	rotary	F_{Rk} [kN]	0,15	0,15	0,15
Drywall, double layer 2x12,5 Name: Bauplatte Manuf.: Knauff Size : 2000x1250x12,5 mm	rotary	F_{Rk} [kN]	0,20	0,25	0,40
Fibre reinf. drywall, single layer 12,5 Name: Vidiwall Manuf.: Knauff Size : 1250x1000x12,5 mm	rotary	F_{Rk} [kN]	0,50	0,60	0,60

a) chipboard screw 4x40: outer diameter 3,9 mm, core diameter 2,4 mm
b) chipboard screw 5x50: outer diameter 4,8 mm, core diameter 2,9 mm
c) chipboard screw 6x50: outer diameter 5,8 mm, core diameter 3,8 mm

Design resistance [d]

Anchor size				HUD-2 5x25	HUD-2 6x30	HUD-2 8x40
Screw type				Chipboard screw 4x40 [a]	Chipboard screw 5x50 [b]	Chipboard screw 6x50 [c]
Base material	Drilling mode					
Concrete, uncracked Strength ≥ C16/20	hammer	F_{Rd}	[KN]	0,33	0,67	1,4
Solid clay brick Name: Mauerziegel MZ Manuf.: Ziegelwerk Klosterbeuren Size : NF Strength: ≥ 20	hammer	F_{Rd}	[KN]	0,24	0,36	1,00
Hollow clay brick Name: ThermoPlan Planziegel-TS² 1,2 Manuf.: Ziegelwerk Klosterbeuren Size : 373x175x249 mm Strength class: ≥ 12	rotary	F_{Rd}	[KN]	0,24	0,32	0,48
Autoclaved aerated concrete Name: AAC 4 Manuf.: Ytong Size : 625x250x250 mm Strength: ≥ 6	rotary	F_{Rd}	[KN]	0,15	0,30	0,45
Drywall, single layer 12,5 Name: Bauplatte Manuf.: Knauff Size : 2000x1250x12,5 mm	rotary	F_{Rd}	[KN]	0,06	0,06	0,06
Drywall, double layer 2x12,5 Name: Bauplatte Manuf.: Knauff Size : 2000x1250x12,5 mm	rotary	F_{Rd}	[KN]	0,08	0,10	0,16
Fibre reinf. drywall, single layer 12,5 Name: Vidiwall Manuf.: Knauff Size : 1250x1000x12,5 mm	rotary	F_{Rd}	[KN]	0,20	0,24	0,24

a) chipboard screw 4x40: outer diameter 3,9 mm, core diameter 2,4 mm
b) chipboard screw 5x50: outer diameter 4,8 mm, core diameter 2,9 mm
c) chipboard screw 6x50: outer diameter 5,8 mm, core diameter 3,8 mm
d) with partial safety factor factors γ_M = 1,8 for concrete; γ_M = 2,0 for AAC, γ_M = 2,5 for masonry, γ_M = 2,5 for drywall

Recommended loads [d)]

Anchor size				HUD-2 5x25	HUD-2 6x30	HUD-2 8x40
Screw type				Chipboard screw 4x40 [a)]	Chipboard screw 5x50 [b)]	Chipboard screw 6x50 [c)]
Base material	Drilling mode					
Concrete, uncracked Strength ≥ C16/20	hammer	F_{rec}	[KN]	0,24	0,48	1,0
Solid clay brick Name: Mauerziegel MZ Manuf.: Ziegelwerk Klosterbeuren Size : NF Strength: ≥ 20	hammer	F_{rec}	[KN]	0,17	0,26	0,71
Hollow clay brick Name: ThermoPlan Planziegel-TS² 1,2 Manuf.: Ziegelwerk Klosterbeuren Size : 373x175x249 mm Strength class: ≥ 12	rotary	F_{rec}	[KN]	0,17	0,23	0,34
Autoclaved aerated concrete Name: AAC 4 Manuf.: Ytong Size : 625x250x250 mm Strength: ≥ 6	rotary	F_{rec}	[KN]	0,11	0,21	0,32
Drywall, single layer 12,5 Name: Bauplatte Manuf.: Knauff Size : 2000x1250x12,5 mm	rotary	F_{rec}	[KN]	0,04	0,04	0,04
Drywall, double layer 2x12,5 Name: Bauplatte Manuf.: Knauff Size : 2000x1250x12,5 mm	rotary	F_{rec}	[KN]	0,06	0,07	0,11
Fibre reinf. drywall, single layer 12,5 Name: Vidiwall Manuf.: Knauff Size : 1250x1000x12,5 mm	rotary	F_{rec}	[KN]	0,14	0,17	0,17

a) chipboard screw 4x40: outer diameter 3,9 mm, core diameter 2,4 mm
b) chipboard screw 5x50: outer diameter 4,8 mm, core diameter 2,9 mm
c) chipboard screw 6x50: outer diameter 5,8 mm, core diameter 3,8 mm
d) with additional safety factor $\gamma = 1,4$ to design values

Materials

Material quality

Part	Material
Plastic sleeve	Polyamide 6

Setting information

Installation temperature
-10°C to +40°C

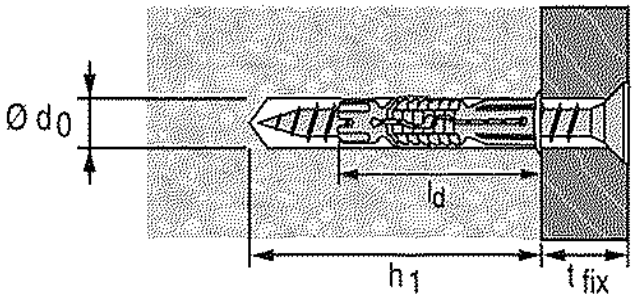
Service temperature range
Hilti HUD-2 universal anchor may be applied in the temperature range given below.

Temperature range	Base material temperature	Max. long term base material temperature	Max. short term base material temperature
Temperature range I	-40 °C to +80 °C	+50 °C	+80 °C

Max short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.
Max long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Installation parameters

Anchor size			5x25	6x30	8x40
Nominal diameter of drill bit	d_0	[mm]	5	6	8
Cutting diameter of the drill bit	$d_{cut} \leq$	[mm]	5,4	6,4	8,45
Nominal embedment depth	l_d	[mm]	25	30	40
Recommended length of screw in base material		[mm]	≥30	≥35	≥45
Drill hole depth	h_0	[mm]	≥ 30	≥ 35	≥ 45
Minimum spacing	s_{min}	[mm]	Not determined		
Minimum edge distance	c_{min}	[mm]	Not determined		

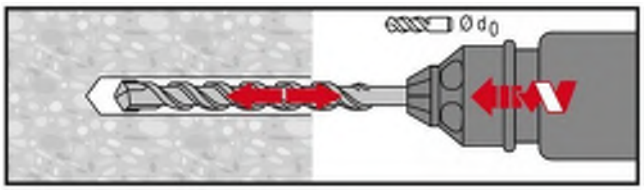
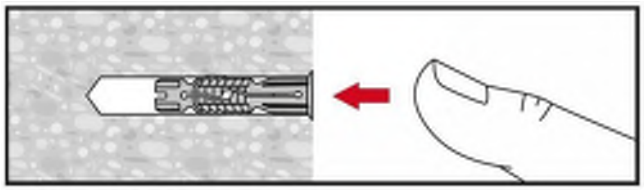
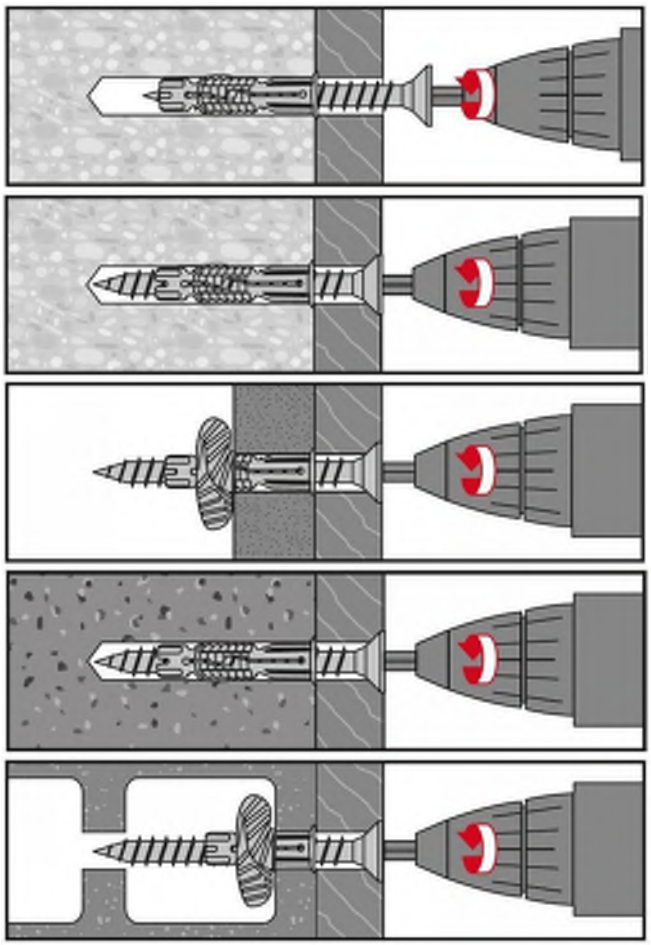


Installation equipment

Anchor size	5x25	6x30	8x40
Rotary hammer	TE 2 - TE16		
Other tools	Screwdriver		

Setting instruction[a)]

***For detailed information on installation see instruction for use given with the package of the product.**

Setting instruction	
	**1. Drill hole with drill bit**
	**2. Install anchor**
	**3. Drive screw into anchor**

a) Use only for wall and floor applications. Not applicable for ceiling and façade applications.

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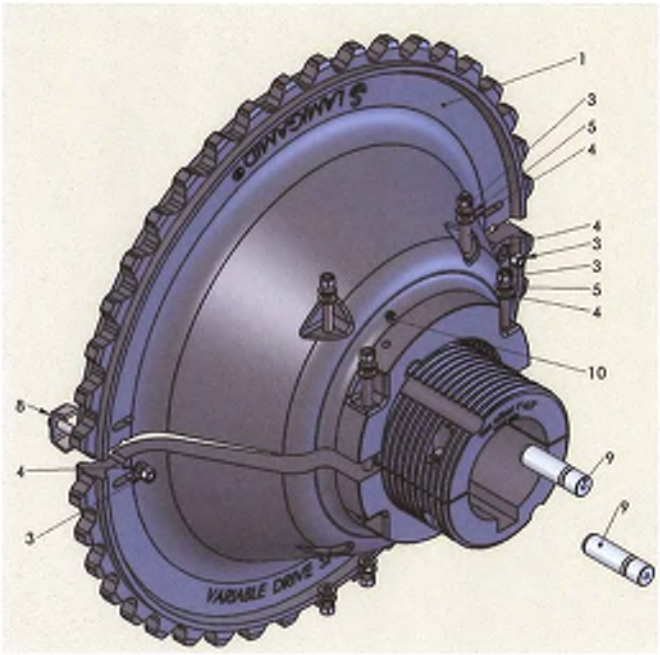
7.5 ***VDS Driven Sprocket***

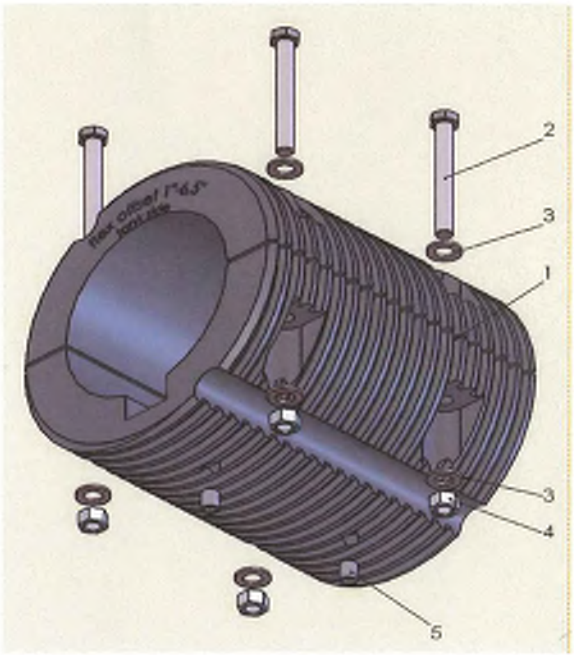
Refer also to Brentwood component drawing 10001955-002

40T (VDS) Variable Drive Sprocket
Specification/Description

The 40 teeth Variable Drive Sprocket, produced from LAMIGAMID® 312 (Cast Polyamide 6 , PA6 C) is a split type design with integral teeth for Type 78 chain. It has an adjustable offset to accommodate a range of 1 inch to 6.5 inches, to allow for clearance of the wall bearing and the collector flights and is installed onto a threaded shaft bushing with (4) stainless steel studs, hex nuts, flat washers, and lock washers and locked into place with two set pins.

The shaft bushing has a bore range of 1 15/16 inches to 6 inches, provided with standard keyway and (2) stainless steel set screws to restrict lateral movement and will be assembled to the shaft with (4) stainless steel bolts, hex nuts, flat washers and lock washers.





Schwartz Technical Plastics 7038 Front River Road Pittsburgh, PA 15225
Phone: 724 266 7045 Fax: 724 202 9999 E-Mail: sales-usa@schwartz-plastic.com
www. schwartz-plastic.com

MU-TB-FB-04 Sprocket installation, 40 teeth with flexible OFFSET.

1. General note

Installation work must only be carried out by trained personnel. All standard and industry specific procedures have to be followed.
The responsibility for the installation lies with the installation foreman.

At the start of installation, all assembly parts must be checked for cleanliness and cleaned if req. This applies in particular for the assembly area on the shaft.

Before installation, check all components for compatibility!
- **Does the shaft diameter match the bore dimension of the plastic bushing?**
- **Does the key width match the groove width in the plastic bushing?**

2. Dismantling the supplied assembly

If the check results are positive, the sprocket can be dismantled.

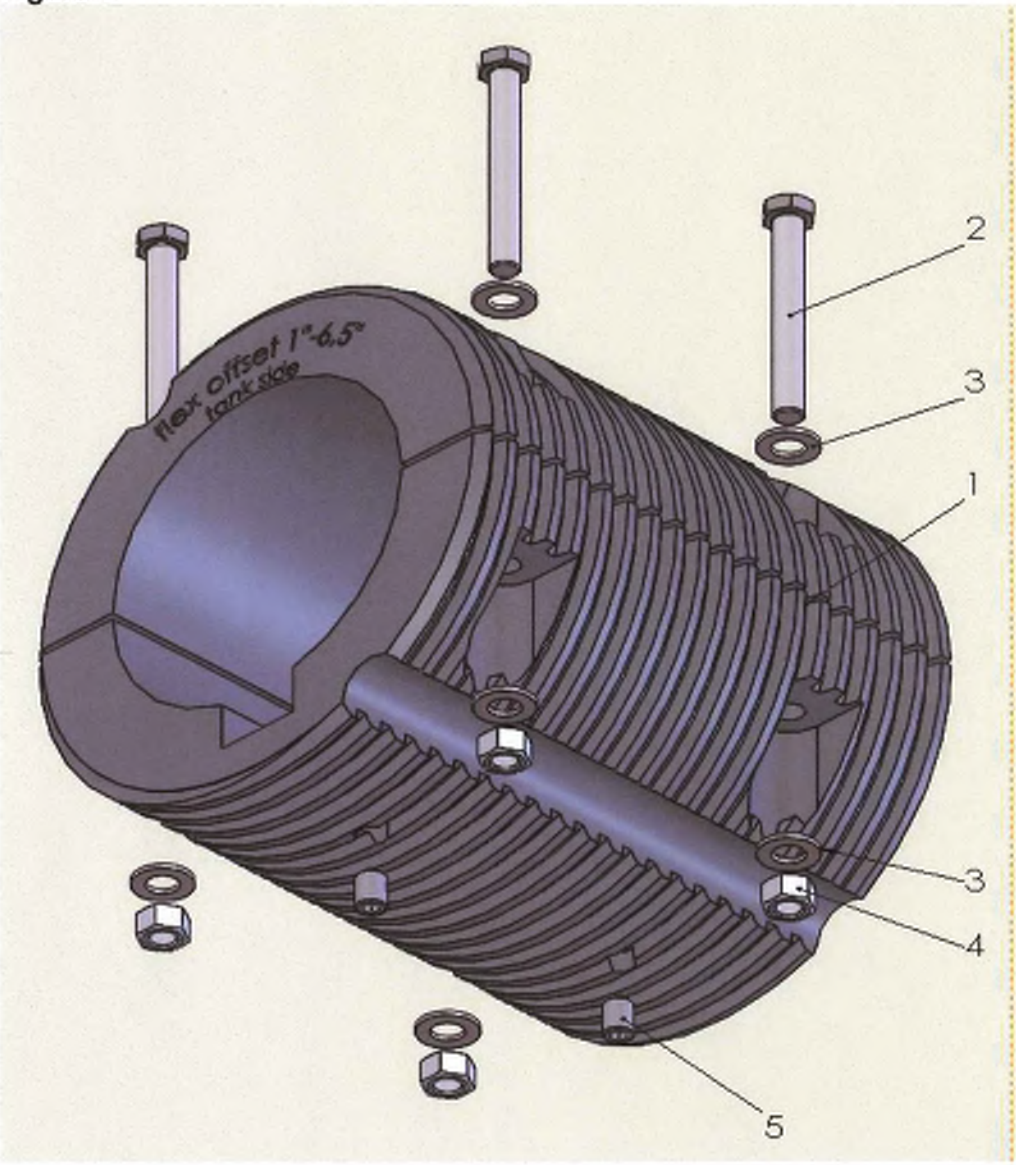
Caution:
The set screws Pos 10 must be loosened to remove the Pos 9 set pins before any other items can be disassembled.

3. Basic information:

- **All threaded fasteners are M12 (metric). Do not mix with imperial size fasteners.**
- **Tools required for installation: 19mm sockets for bolts and nuts and 6mm allen key for set screws**
- **For the installation, all thread ends should be brushed with lubricant paste or grease to prevent seizing of the thread!**
- **A U-washer DIN125 must be placed under all bolt heads and nuts.**
- **For all thread ends with nuts, U-washers DIN125 should be positioned first, then the spring washers DIN127 and finally the nut DIN ISO 4032.**
- **All M12 bolts and nuts must be tightened with a torque of 18 ftlbs to 22 ftlbs (25Nm to 30Nm).**
- **The metal key length has to be minimum 8" (200mm).**

4. Installation of the threaded bushing

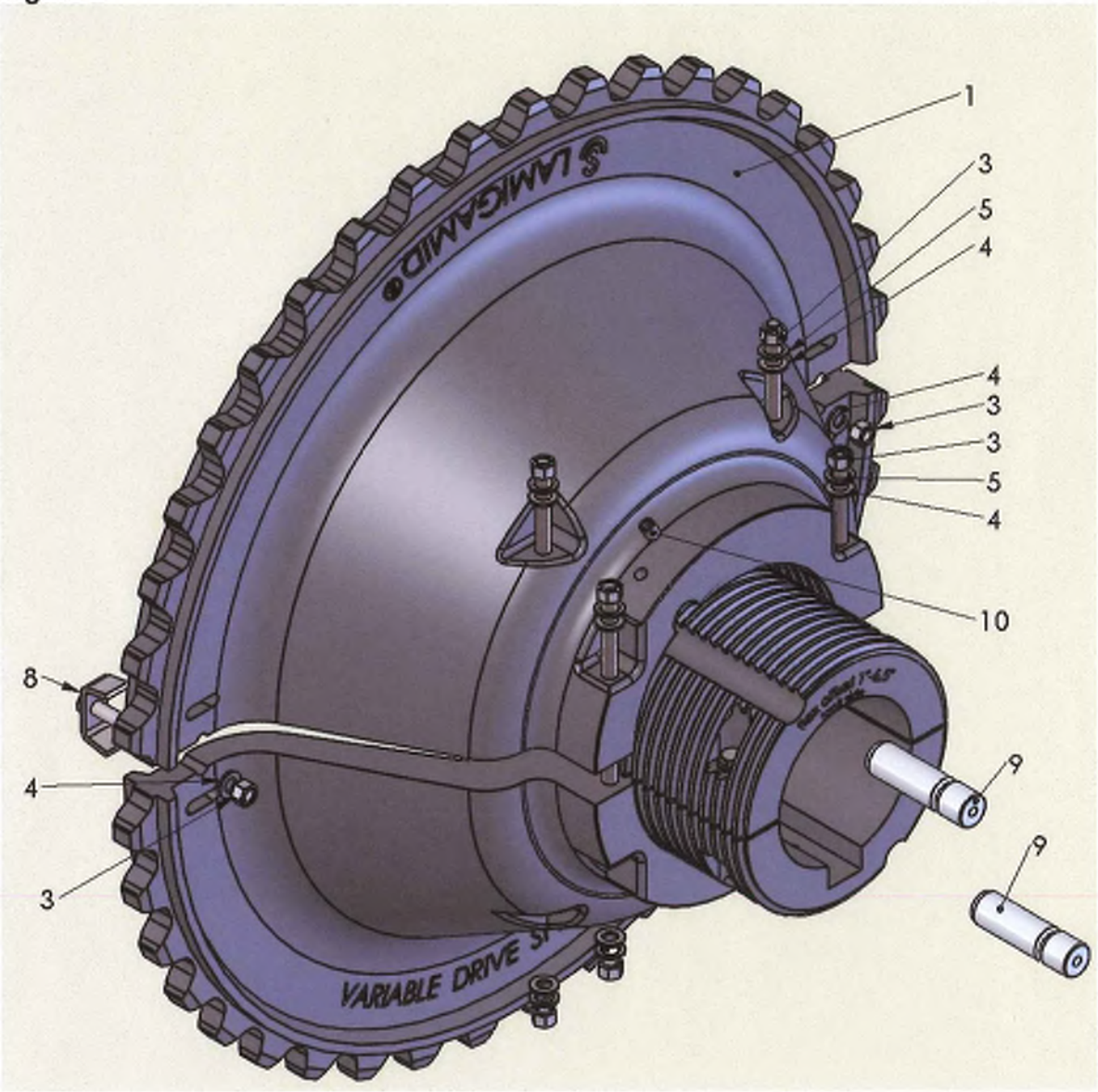
Figure 1



First, the two-piece threaded bushing is installed on the shaft, see Figure 1. The screws are tightened evenly crosswise. When doing so ensure that the gap distance is approximately equal on both sides. (Gap must be even to ensure product can be adjusted)
Once bushing is assembled onto the shaft, the key set screws Pos 5 are tightened with max. 10 ftbls (15Nm) (the key is not part of scope of supply of sprocket and should be supplied with the shaft).

5. Installation of the sprocket

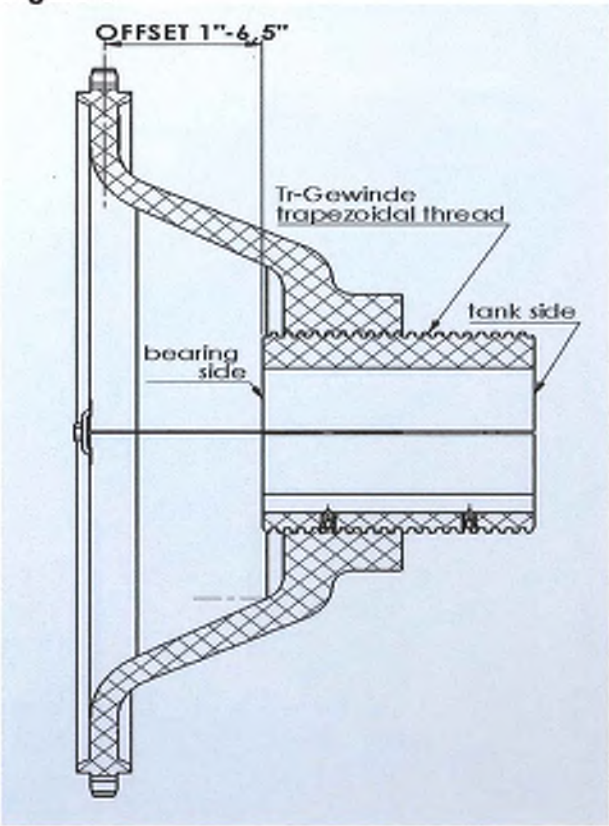
Figure 2



Next, as shown in Figure 2, both sprocket halves Pos 1 are placed on and connected with the threaded bars and the two clamping brackets Pos 8. The nuts Pos 3 on the threaded rod as well as on the clamping bracket screws should be positioned loosely. (Pos 8 clamping bracket can be tightened snug. Only hand tighten bolts for threaded rod; they need to be loose to allow for adjustment.) The pins Pos 9 are not installed yet.

6. Setting of OFFSET

Figure 3



Now the sprocket can be set by turning on the outer shell on the bushing. An OFFSET of 1" to 6.5" is possible. A half turn (180°) causes a change of 1/4" (6.35mm). During the setting ensure that the joints of the threaded bushing and sprocket lie over each other. Only in this way are two holes available for inserting the set pins Pos 9.

7. Final installation

Once the sprocket is positioned, the set pins Pos 9 are slid into the holes between threaded bushing and sprocket. When doing so, ensure that the ends of the set pins lie flush on the outside of the threaded holes with the contour of the sprocket.

Now all nuts Pos 3 of the threaded bars are tightened evenly crosswise with increasing torque to 18ftlbs to 22 ftlbs (25Nm to 30Nm). The nuts Pos 3 of the clamping brackets Pos 8 are then tightened 18ftlbs to 22 ftlbs (25Nm to 30Nm). Finally, the threaded pins Pos 10 for form-fitting fixing of the pins Pos 9 must be tightened to max. 4 ftlbs (max. 5 Nm).

8.1 Standard Warranty

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8.1 Standard Warranty

Clarification and Biological Treatment Parts and Components

Limited Express Warranty

WARRANTY ("Warranty"): Unless agreed otherwise, in writing, between Brentwood Industries, Inc. ("Brentwood") and Purchaser (or other third party beneficiary named by Brentwood), Brentwood warrants its Clarification and Biological Treatment parts or components of Brentwood tube settlers, scum removers, SedVac™, AccuFAS® submerged fixed film, trickling filters, and Polychem® sludge collectors (collectively referred to hereinafter as "Parts and Components") against defects in materials and workmanship that affect the performance for which the Parts and Components were intended. Warranty coverage is contingent and shall remain in effect only upon proper storage, installation, use, operation, maintenance, and shutdown procedures, all occurring under ordinary conditions and in compliance with good industry standards, the approved design criteria, Brentwood's approved Submittal and Operation and Maintenance Manual, and Brentwood's Warranty claim procedure. The Warranty period shall be limited to twelve (12) months from when the RDN puts the Goods into operation, the operational date being no later than October 31, 2025; however, the Warranty for aftermarket/OEM orders shall be limited to twelve (12) months from date of Parts and Components shipment. This Warranty is limited to the Purchaser of the Parts and Components or third-party beneficiary named by Brentwood by written agreement. The terms of this Warranty shall be modified only through written agreement by an authorized Brentwood employee.

REMEDY AND EXCLUSIONS: The remedy for a covered defect during the Warranty period shall be limited, at Brentwood's option and control, to repair or replacement of defective Parts and Components, including shipping costs. The remedy excludes costs of labor, removal of non-conforming Parts and Components, and expenses related to installation of the replacement Parts and Components. In no event will Brentwood be obligated to pay costs, damages or other amounts, in total, exceeding the original price paid to Brentwood for the Parts and Components by the Purchaser. Brentwood shall not warrant Parts and Components, nor be liable to the Purchaser or any third party for any damage caused by non-compliance with any of the foregoing conditions or, without limitation, any of the following:

i) abuse or neglect;
ii) acts of god;
iii) abnormal contaminants detrimental to the Parts and Components or any other material of construction as submitted or damages due to pollutants, solvents, or other hazardous substances;
iv) improper operation, maintenance, storage, or improper/unplanned shut down procedures;
v) improper handling during installation, improper installation or improper or unintended use;
vi) damage caused by excessive hydraulic flows or other surface damage caused by abusive foot traffic;
vii) exceeding maximum media structural loads or temperatures;
viii) media blocks assembled in the field or elsewhere by contractor or others; and
ix) additional exceptions provided for by Brentwood and agreed upon in Brentwood's proposal/quotation to Purchaser or executed contract between Brentwood and Purchaser.

THE TERMS OF THIS WARRANTY ARE THE SOLE AND EXCLUSIVE OBLIGATION OF BRENTWOOD TO PURCHASER OR THIRD PARTY. UNDER NO CIRCUMSTANCE SHALL BRENTWOOD BE LIABLE TO ANY PERSON OR ENTITY FOR ANY INCIDENTIAL, CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES OR ANY OTHER LOSS, COST, OR EXPENSE OTHER THAN SPECIFICALLY STATED IN THIS WARRANTY. OTHER THAN THE EXPRESS LIMITED WARRANTIES MADE HEREIN, BRENTWOOD EXPRESSLY DISCLAIMS ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED BY LAW, WITH RESPECT TO ANY SERVICE OR DELIVERABLE, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AS WELL AS ANY WARRANTIES WHICH MAY ARISE FROM PRIOR COURSE OF DEALING, CUSTOM, TRADE USAGE, PROVISION OF SAMPLES, PRODUCT LITERATURE OR WEBSITE CONTENT.

CLAIM PROCEDURE:

1) Notification: Warranty claims must be submitted to Brentwood within fifteen (15) days of discovering facts upon which such claim is based. Claims must be accompanied by an original Warranty certification or proof of purchase, detailed explanation of claim and damages, any relevant work logs/repair orders, and pictorial documentation of the claimed defect. Claims made after installation shall be accompanied by a signed certification (and, as applicable, signed punch list) by an authorized Brentwood employee, verifying Brentwood's certification of the Parts and Components' installation. Failure to provide evidence of Brentwood's certification may void this Warranty; however, provision of such certification is merely support indicating proper installation and is not conclusive evidence of the existence of an alleged defect. At all times, Brentwood reserves the right to investigate all claims and request additional information. Claims shall be emailed to water@brentwoodindustries.com or mailed to: Brentwood Industries, Inc., Attn: Warranty Claims-Clarification and/or Biological Treatment, 500 Spring Ridge Drive, Reading, PA 19610. Claims shall be waived if they are not received in writing nor within the aforementioned Warranty period.

2) Dispute Resolution: Brentwood shall, in its sole opinion, have the authority to judge the existence and extent of any alleged defect. In the event Brentwood denies a Warranty claim, the Purchaser (or third-party beneficiary named by Brentwood) has ten (10) days to supply additional data in support of its claim. If a second denial is made by Brentwood, or a resolution cannot otherwise be reached amongst the parties, both Brentwood and Purchaser (or third party beneficiary named by Brentwood) agree upon and preserve the right to pursue impartial mediation/arbitration under the Pennsylvania Uniform Arbitration Act, Pa. Stat. §7301-7320, subchapter A, as the means of dispute resolution. Mediation/arbitration shall take place in Reading, Berks County, in the Commonwealth of Pennsylvania. Costs of mediation/arbitration (excluding attorneys' fees and travel/individual related expenses which shall be borne by the party incurring the costs/expenses) shall be divided equally between Brentwood and Purchaser (or third-party beneficiary named by Brentwood).

COMPLETE AGREEMENT: This Warranty incorporates and shall be interpreted along with Brentwood's Standard Terms and Conditions, in their entirety; however, in the event of conflict between the two, the terms of this Warranty shall supersede the Standard Terms and Conditions.

SIGNED WARRANTIES: A signed copy of this Warranty with Purchaser named, and order-specific details shall become available upon request subsequent to Parts and Components certification by an authorized Brentwood employee. Limited to aftermarket/OEM orders, signed warranties shall become available upon request upon Parts and Components shipment date. This Warranty will not be honored when past due invoice amounts related to the project or order for the Parts and Components exist at the time a Warranty claim is made.

BRENTWOOD