THERMO BLACK CLAWSON INC.
A Thermo Fibertek company

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SANSGRIT™ MANUAL

Installation, Operation, Maintenance, and Service Parts
Deccember 7, 2000

Deliver manuals to:

Climax Manufacturing Company
30 Champion Street
Carthage, NY 13619

Attention : Mr. Neil Newman

Prepared for:: Climax Manufacturing Company

Mill: Carthage, NY

Customer order number: 21428 Number of Manuals: (1)

Shop order number	Serial number
1559	00-SG360-0143

Read this manual carefully to learn how to operate and service your equipment correctly; failure to do so could result in personal injury or equipment damage. Keep this manual readily accessible and legible to anyone doing maintenance on or operating this equipment.

Thank you for purchasing a Thermo Black Clawson product.

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Contents *(Figures and tables are italized)*

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Manual Overview

This manual is for general information and guidance. For specific information concerning parts or items, refer to the certified drawings of the equipment.

Your Thermo Black Clawson unit will provide many years of dependable service when installed, operated, and maintained according to our recommended procedures. The instructions in this manual are recommended procedures for installing, operating, and maintaining your unit. Correct installation of the unit is critical. Reasonable operation and maintenance will not compensate for poor installation.

All information, illustrations, and specifications in this manual are based on the latest information available at the time of publication.

Drawings in this manual are only sketches that exist for no other purpose than to provide a visual reference for the text within this manual. The drawings in this manual are not to be used for construction purposes.

It is the responsibility of the purchaser of this equipment to make sure that operators, maintenance personnel, and anyone else involved with this equipment is aware of this manual, has easy access to this manual, and has read and understands the contents of this manual. It is also the purchaser's responsibility to keep this manual in legible condition.

WE RESERVE THE RIGHT TO MAKE CHANGES AT ANY TIME WITHOUT NOTICE.

Thermo Black Clawson Inc.

605 Clark Street, Middletown, OH 45042

Phone 1-513-424-7400

North America emergency 24-hour service: 1-800-448-5422

Global emergency 24-hour service: 1-513-391-0881

1.0 SAFETY

1.1 SAFETY INTRODUCTION

This manual is a guide for safe and trouble-free installation and operation of your Thermo Black Clawson equipment. Follow the recommendations in this manual to ensure the safety of your personnel along with the dependable operation of your Thermo Black Clawson equipment. Your particular situation may require additional procedures and safety measures.

You--the purchaser of this equipment--are responsible for ensuring that your personnel are trained in the safe operation and maintenance of this equipment. We recommend that your personnel obtain refresher sessions covering safety, operation, and maintenance procedures periodically throughout the life of your Thermo Black Clawson equipment. Note: Thermo Black Clawson offers qualified field service instructors to help train your operators and maintenance personnel.

FOLLOW THE SAFETY INFORMATION IN THIS MANUAL

RECOGNIZE SAFETY INFORMATION. The triangle to the left with the exclamation mark within it is the international safety alert symbol. When you see this symbol on your equipment or in this manual, be alert to the potential for personal injury. Follow recommended precautions and safe operating practices.

UNDERSTAND SIGNAL WORDS

DANGER

Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. *Danger* is to be limited to the most extreme situations.

WARNING

Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Caution indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTE: Notes place special emphasis on information.

Safety Steps

- Carefully read all safety messages in this manual and on your machine safety signs.
- Do not operate equipment until it has been fully integrated into the system.
- Do not perform service or maintenance work on this equipment until unit is at zero mechanical state (ZMS).
- Keep safety signs in good condition, clean, and legible.
- Replace missing or damaged safety signs.
- Learn how to operate the machine and how to use controls properly.
- Do not let anyone operate the machine without instructions.
- Keep your machine in proper working condition.
- Do not modify the equipment without written authorization from Thermo Black Clawson. Unauthorized modifications may impair the function, shorten the machine life, and render built-in safety features useless.
- Inspect the unit before starting and make sure that the following conditions are met:

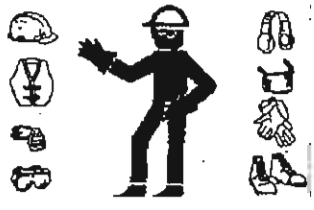
    - All guards and covers are in good condition and fastened in place.

    - No parts are loose, worn, damaged, or missing.

    - All personnel are clear of equipment.

Safe Maintenance Overview

- Keep equipment area clean and dry.
- Keep all equipment parts in good condition and properly installed.
- Understand service procedures before you do the work.
- Replace worn, broken, or missing parts.
- Do not operate damaged equipment--fix damage immediately.



- Wear close fitting clothing and safety equipment appropriate to the job.

- Consult applicable federal, state, and local codes for proper installation and guarding.

1.2 SAFETY GUIDELINES

Do not use or service this equipment until you read and understand the guidelines and instructions below and throughout this manual. If you have any questions, contact your supervisor.

Safety Guidelines

HAZARD	WHAT COULD HAPPEN	PREVENTION
Stock leaks from pipe connections, blind flanges, body joints, open access doors, etc. Water leaks from shower water, inlet dilution water, or other water sources.	**WARNING** Skin contact with stock might result in chemical or thermal skin reaction, such as skin irritation or scalding.	Follow shut down guidelines. Lock out unit and bring unit to ZMS. Tighten or replace loose, leaking connections.
Valves - air and electrically operated.	**WARNING** Amputation or severe injury to fingers, hands, or arms, could result.	Lock out valves and their energy sources and ensure that equipment is at zero mechanical state (ZMS). NOTE: Controls may not be independent. Extreme care must be used when isolating power sources. Be sure of what will shut down when energy sources are locked out. Make sure that other automatic equipment connected to source will also shut down. Do not insert fingers, hands, arms, head, or and other body parts into such devices.

HAZARD	WHAT COULD HAPPEN	PREVENTION
Motor-drive units	**WARNING** Amputation or severe injury to fingers, arms, or hands could result.	Do not expose electrical units to water. Shut down and lock out unit before cleaning or servicing. Do not operate the unit with covers, hoods, or guards removed. Note: Manual rotation of rotating elements may be required with enclosures removed. Be sure all personnel are clear of unit before manually rotating rotor.
Discharged debris from trash chamber.	**WARNING** Cuts, abrasions, skin irritation, and scalding could occur.	Wear eye protection and protective clothing.
Discharge chute or spiral area	**DANGER** Amputation, severe injury, or death will occur if you place limbs into these areas while the machine is on.	Keep away from the spiral inlet of the Sansgrit unit. Also, don't place hand-held objects into this area unless the unit is brought to ZMS and lockouts are in place.
Exceeding design pressure of unit.	**WARNING** Seals, gaskets, or the vessel might fail and cause severe personal injury.	Know the correct design pressure of the equipment. Refer to the manual and the certified drawings. Adhere to proper operating procedures.

HAZARD	WHAT COULD HAPPEN	PREVENTION
Installation, repair, or maintenance.	**WARNING** Amputation, severe injury, or death could occur.	Be sure unit is shut down, brought to zero mechanical state by locking out all sources of energy including feed and all power connections. Make sure that all lockouts are in place and that there is a lockable disconnect within sight.
Equipment usage by unqualified personnel.	**WARNING** Amputation, severe injury, or death could occur if operators aren't trained or fail to adhere to all applicable safety procedures	Train operators and be certain that they have read and understand this manual and the safety procedures within your mill.
Overload and safety switches.	**WARNING** Do not use overload or safety switches to stop mechanism during normal operation--these are for emergencies only. Machine damage could occur.	Use normal procedures during normal conditions. Use emergency procedures during emergency conditions.
Installation or maintenance.	**WARNING** Severe injury or death could occur if lifting equipment isn't sufficient and personnel aren't qualified.	When installing or maintaining this unit and associated hardware, be sure that the lifting device is capable. Always use qualified personnel.

HAZARD	WHAT COULD HAPPEN	PREVENTION
Damaged or malfunctioning mechanism	**WARNING** Injury or death could result from operating a damaged or malfunctioning mechanism.	Do not operate a damaged or malfunctioning mechanism. Make necessary adjustments repairs.
Overloading unit or using the unit for purposes for which it wasn't designed.	**WARNING** Injury or death could result from the unit for purposes for which it wasn't designed or from overloading.	Do not use this equipment for purposes for which it wasn't designed. Do not overload this equipment.
Electrical connections	**WARNING** Injury or death could result from improper electrical connections.	Use qualified electricians to make electrical connections in accordance with requirements and applicable codes.
Start-Up	**WARNING** Injury or death could result from starting this unit if it is not securely mounted.	Check to make sure that this machine is securely mounted and that all machine components (particularly the covers of the drive parts) are securely fitted.
Start-Up	**DANGER** Injury or death will occur from starting this unit if someone is working on it.	This machine may only be started when you have definitely established that NO ONE is working on it. DO NOT, under and circumstance, remove someone else's tag or padlock.

1.3 SAFETY PRACTICES

Post the laminated safety sign (provided by Thermo Black Clawson and pictured below) in plain view on or near the equipment at installation and keep it clean.

SAFETY INSTRUCTIONS

STOCK PREPARATION AND PULP MILL EQUIPMENT

Failure to follow these safety instructions may result in serious personal injury or death.

DO NOT PROCEED until you READ and UNDERSTAND these instructions.

1. READ and UNDERSTAND the machine's instruction/operation manual and ALL applicable OSHA regulations (29CFR1010.261).

2. FOLLOW the SHUT DOWN PROCEDURE in the manual.

3. The machine must be brought to a ZERO MECHANICAL STATE and LOCKED OUT with YOUR PADLOCK BEFORE any maintenance, inspection, cleaning, adjusting, or servicing is performed.

a) The MOTOR MAIN POWER DISCONNECT switch must be LOCKED OUT.

b) CHECK DISCONNECT. Try to start motor BEFORE proceeding further.

c) ALL SOURCES OF POWER AND FLOW OF MATERIAL must be SHUT OFF including BLEED OFF of pressure and LOCKING OUT ALL pneumatic, hydraulic, electrical circuits, steam systems, chemical systems, gas systems, and flows of material stock.

NOTE: See the glossary in the equipment manual to obtain the definition of zero mechanical state.

NEVER REMOVE another person's lockout (padlock) or tag.

DO NOT assume the machine is locked out. ALWAYS check yourself.

NOTE: If services are not independent of the main supply, DO NOT PROCEED--contact your supervisor.

d) Place or attach a "DANGER - PERSONNEL WORKING" sign near lockout.

e) BLOCK any rotating elements to prevent accidental rotation.

4. DO NOT ENTER vessel or unit unless you have at least ONE OTHER PERSON OUTSIDE the unit at all times. Certain vessels require use of harness, gas masks, and other specialized safety equipment.

5. Upon completion, follow the START UP PROCEDURES in this manual.

6. NEVER START the machine UNLESS

a) All personnel are clear of the machine. b) All doors and hatches are closed.

c) All guards and covers are in place.

If you have any questions, contact your supervisor.

Middletown, Ohio 45042-2117 USA

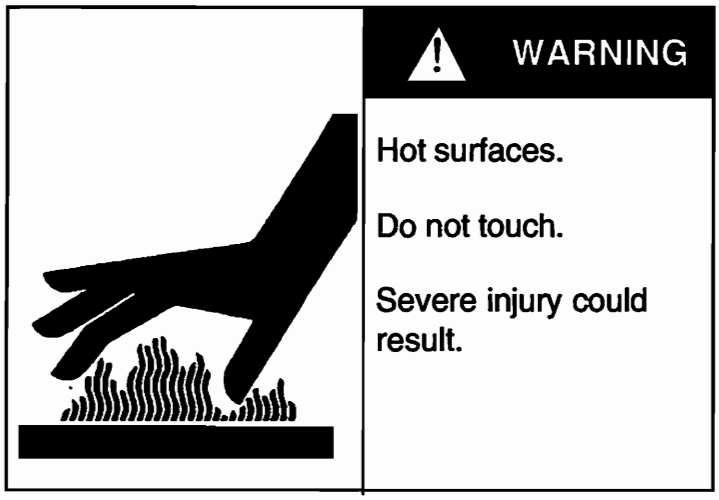
THERMO BLACK CLAWSON INC.
A Thermo Fibertek company

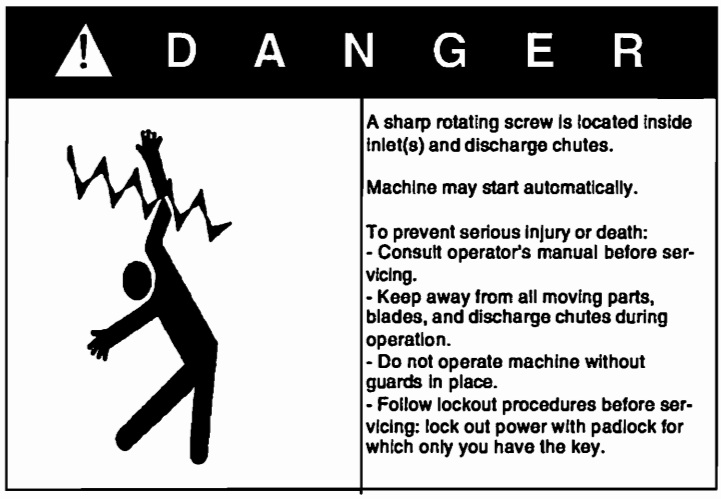
Toll Free 24 Emergency Service: 800-448-5422

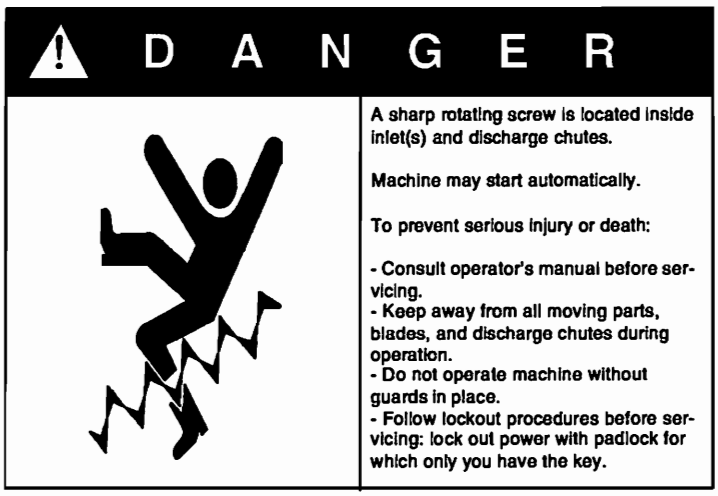
Laminated Safety Sign

1.4 SAFETY SIGNS

These following signs are factory installed and should remain on the unit for the life of the machine and should be kept clean and legible. Do not remove the signs unless replacement signs are in hand and installed immediately after the old signs are removed.





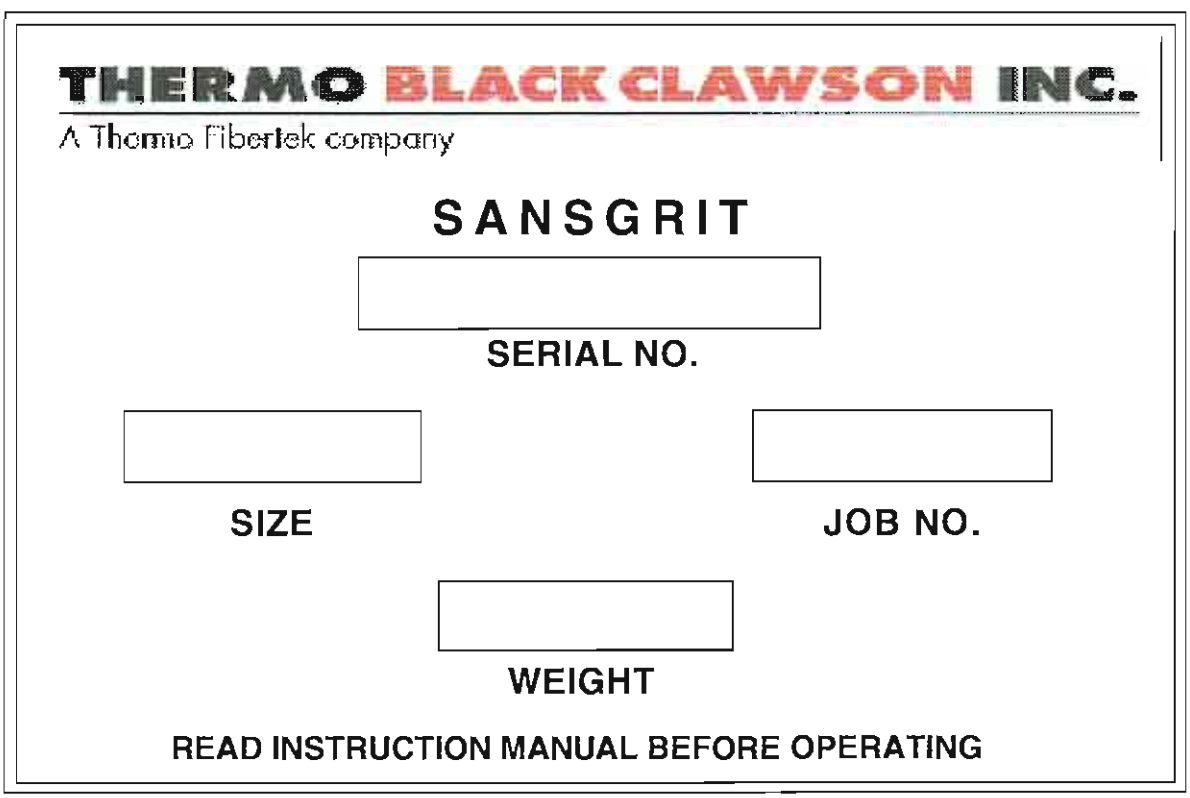


2.0 EQUIPMENT IDENTIFICATION

2.1 NAMEPLATE

Product identification information on the nameplate identifies this unit if it needs service.

Thermo Black Clawson needs these numbers when you order parts.



3.0 GENERAL INFORMATION

3.1 EQUIPMENT DETAIL

Your Thermo Black Clawson unit is designed to give trouble-free operation with minimum maintenance. However, certain precautions and procedures must be observed in handling, installing, and servicing the unit to obtain optimum performance.

The information in this manual should cover most situations. Should questions arise that are not covered in this manual, contact us for additional information:

Customer Service

Thermo Black Clawson Inc.

605 Clark Street, Middletown, OH 45042

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FAX: 1-513-424-1168

Serial Numbers

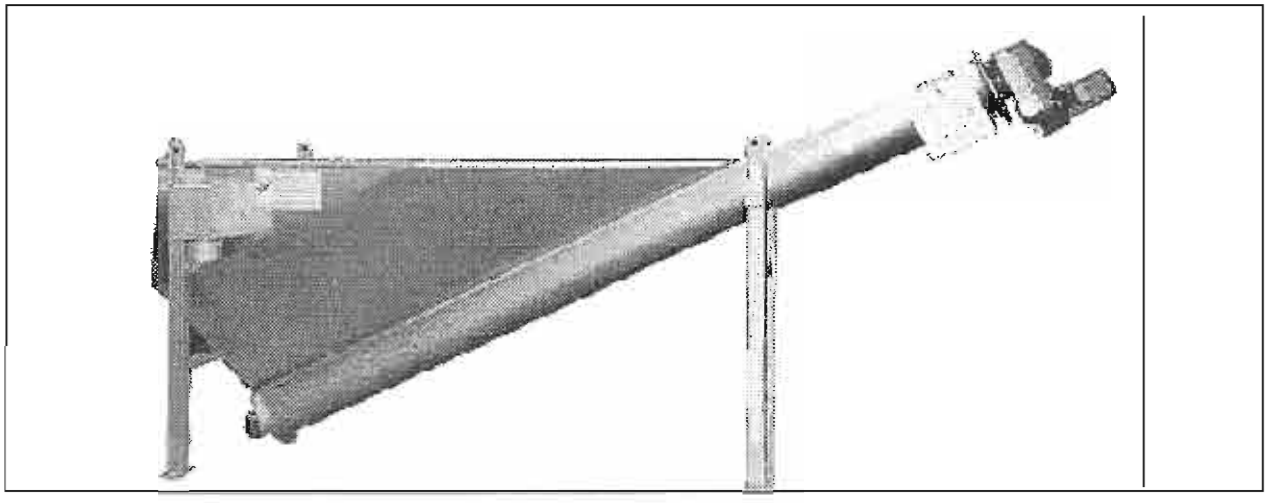
The serial number is on the nameplate and the certified drawings. When inquiring about service or maintenance problems, always provide the serial number, size, and type of unit.

Renewal Parts

Orders for renewal parts should state the serial number(s) and include the item number, description, and part number shown on the parts list of the certified drawings. **Part numbers are not specified in this manual.** Refer to your certified drawings for part numbers.

3.2 DESCRIPTION

The SansGrit is used to convey and dewater grit carried in a liquid stream. Concentrated grit is fed to the SansGrit unit on a batch basis. The grit is discharged into a receptacle for disposal.



SansGrit

Components

The main components of the standard SansGrit unit are the shaftless spiral subassembly, the tank subassembly, the trough subassembly, the discharge, the drive subassembly and controls, if supplied.

The shaftless spiral is formed of prime painted high-strength carbon steel. The spiral conveys the grit toward the discharge.

The tank subassembly receives the influent on a batch basis allowing the grit to settle into the spiral and trough. The liquid flow, along with solids that do not settle out, then pass over two weirs and out the overflow pipe. Bolt-down covers are provided at the discharge end of the tank and an easily opened inspection lid is located near the overflow.

The stainless steel trough subassembly consists of a wear bar liner, tack welded to the trough ID. The four carbon steel wear bars support the spiral along the entire length of the transport trough. The wear bars provide a wear surface, as well as drainage for free liquid. The trough is fully covered.

The discharge is located at the end of the trough subassembly, to direct solids for collection.

All stainless steel components are constructed of passivated stainless steel sheet or plate that have a protective coating prior to fabrication. After fabrication, all welded areas are cleaned and passivated using an electrochemical cleaning process.

The drive system normally consists of the following:

- 3 phase electric motor
- fixed speed gear reducer

Controls, when supplied, normally consist of a NEMA 4 control panel with control voltage trans-

former, motor starter, control relays, timers and repeat cycle timer, which is interlocked by the feed device to the SansGrit unit. Otherwise controls may be supplied by others for the unit to be part of a system, such as a distributed control system or network.

Each unit is supplied with a unit-mounted Emergency Stop button station which must be incorporated into the control system to shut down the unit and override all other control modes.

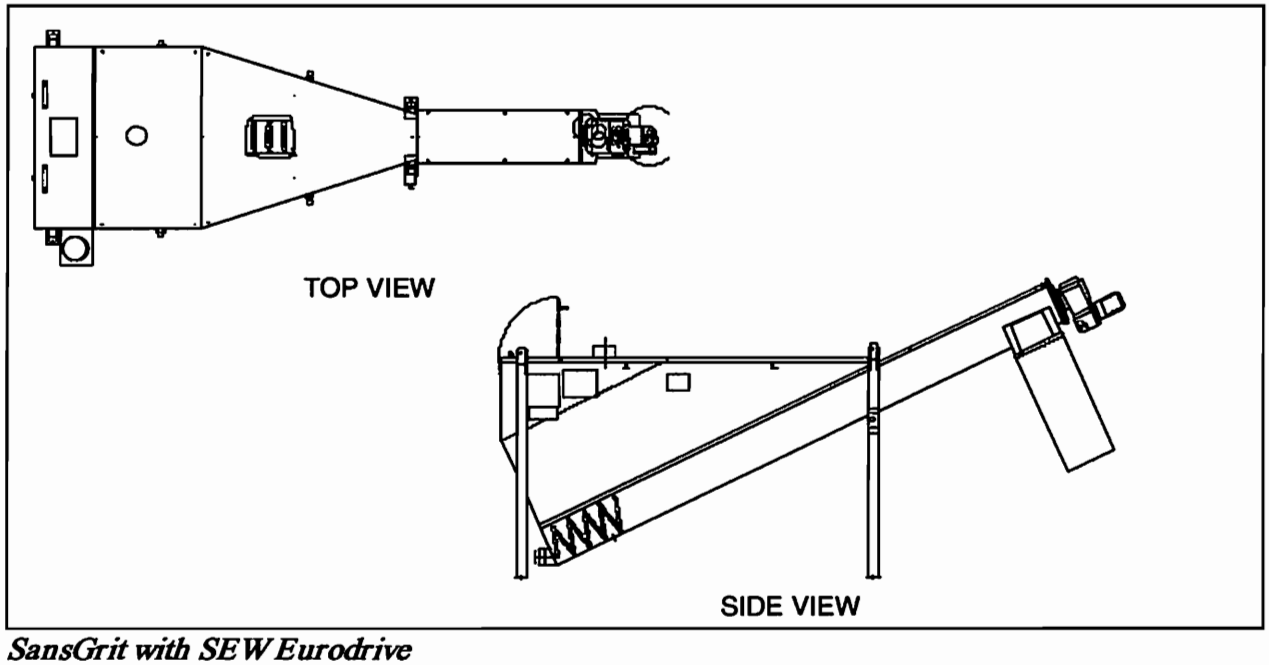
Additionally, the SansGrit comes with two sets of showers which are provided to help dilute incoming stock to maintain an operating consistency of 1/2 to 1 %. The showers, properly angled, help remove floatables from the weir area and help prevent matting.

Operation

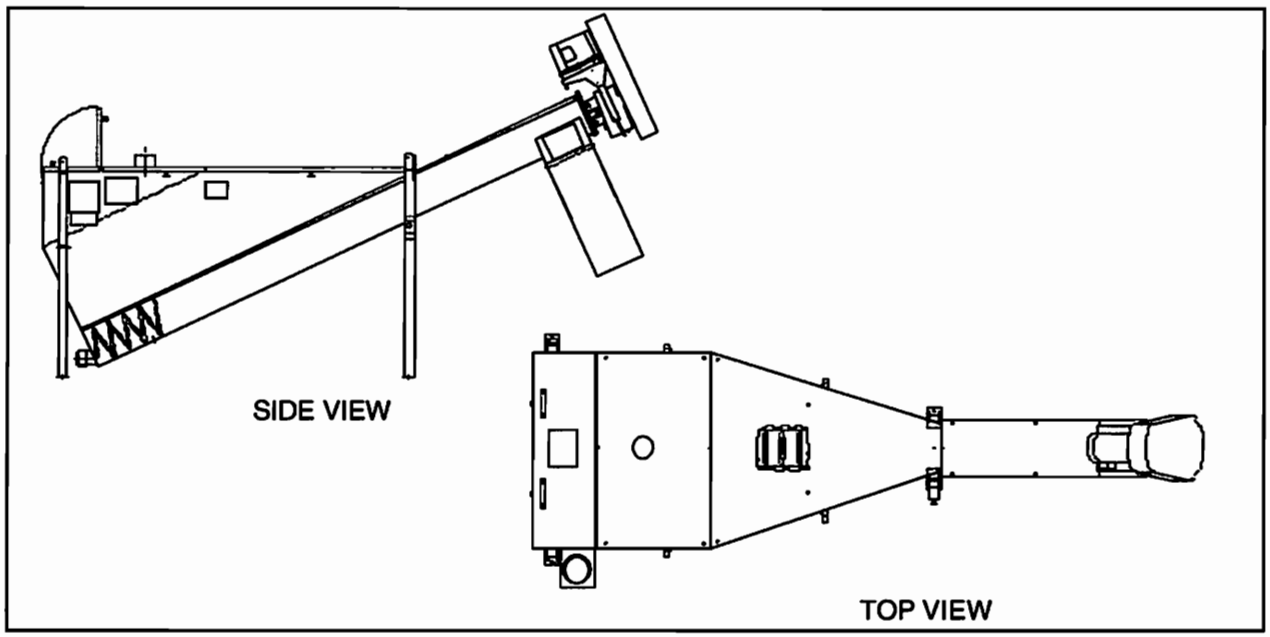
The tank subassembly receives the influent typically in a batch process. Settling is allowed to occur and then the grit is conveyed up and out the discharge. Intermittent drive operation is recommended to provide further dewatering time. Each time influent is added, the fluid that remains is discharged over a scum retaining weir and out the overflow pipe.

The SansGrit unit is typically controlled by several adjustable timers. Timers are used to define settling time and discharge time. A repeat cycle timer is used to provide intermittent spiral conveying action during the discharge cycle. The customer is responsible for wiring in a pump or feed unit (on/off) signal to the control panel. When Thermo Black Clawson doesn't supply a control panel, the customer will want to provide similar controls and timers to run the SansGrit unit in a batch process manner as described above.

The dewatered grit solids are usually deposited into a dumpster or a suitable container for transport and ultimate disposal.



SansGrit with SEW Eurodrive



SansGrit with Falk Drive

3.3 SPECIFICATIONS

The specifications below are standard. Refer to your certified drawings to verify the specifications of your unit.

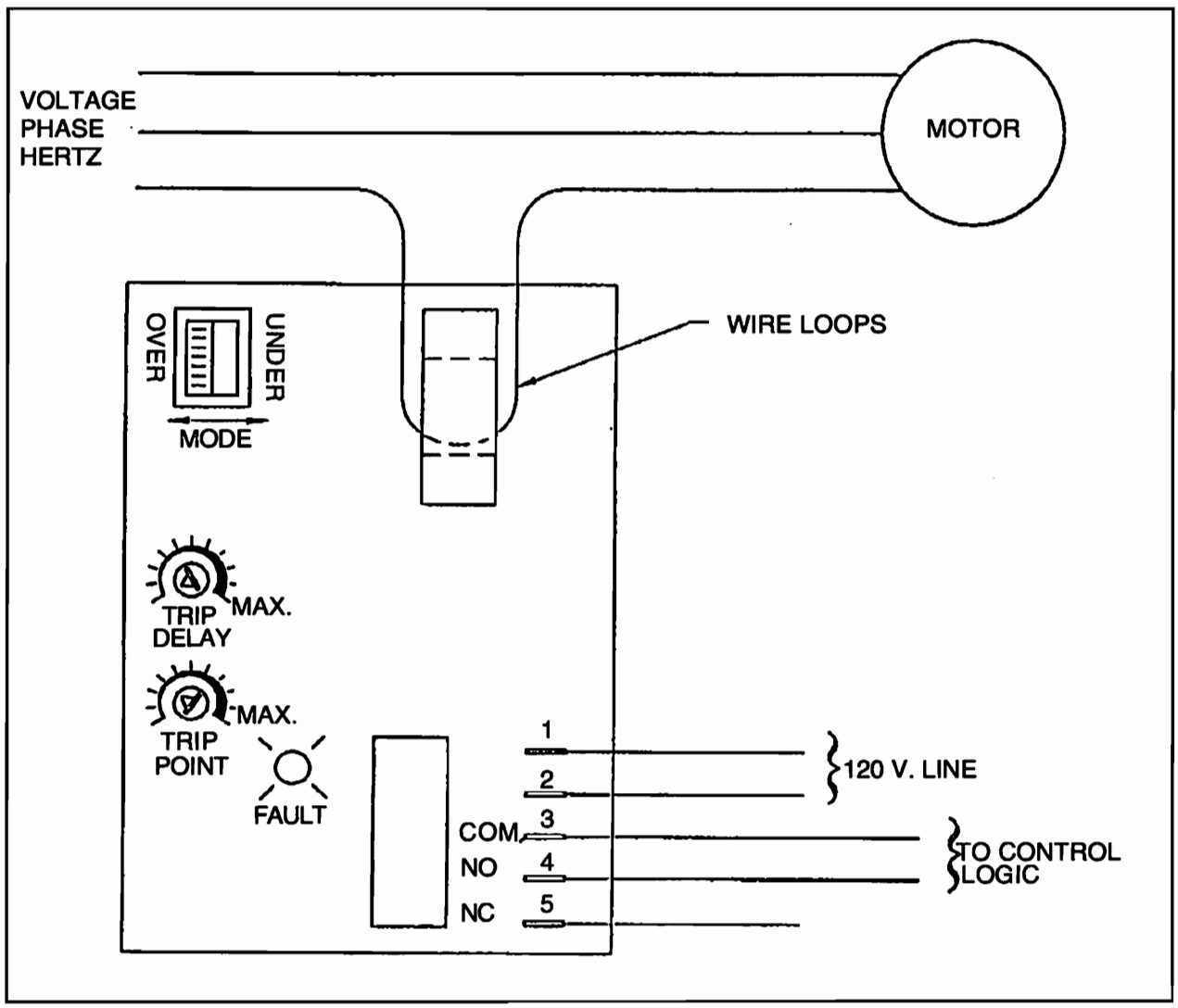
Nominal Weights and Measurements

Model	Dry Weight	Operating Weight	Drive Weight	Spiral Weight	Clearance	
Size	*pounds*	*pounds*	*pounds*	*pounds*	*feet*	*inches*
260	1,654	5,627	175	375	26	3
320	2,536	8,552	250	450	29	5
360	3,635	14,564	400	625	39	9
420	4,630	18,542	425	800	42	6

3.4 ACCESSORY EQUIPMENT

Thermo Black Clawson offers complete system design or individual units to integrate into an existing system. Your local Thermo Black Clawson Sales Manager or our Systems Engineering Group is available to assist you with your specific application requirements.

Optional Current Monitor



Optional Current Monitor

4.0 SHIPMENT CHECK

4.1 SHIPPING AND RECEIVING

The SansGrit unit is usually shipped completely assembled, skid mounted with protective crating and ready for site installation. No special site preparation is necessary prior to installation other than a reasonably level mounting surface and suitable anchor bolts for attachment

Carrier

Thermo Black Clawson units and accessory equipment are shipped by truck.

Shipping Papers

One set of shipping papers is attached to the shipment in plain view to those unloading the unit. Another copy of the shipping papers was mailed to your receiving department.

WARNING

Verify weights shown on shipping papers with certified drawings and determine if your crane or hoist can lift the heaviest item safely.

Check-Off

During unloading, check-off parts from shipping papers. Report shortages to Thermo Black Clawson within 24 hours. File damage claim against transportation company within 24 hours.

Unloading Patterns

Trucks are generally unloaded from back to front. The crane operator must be sure of a clear lift or the piece being lifted may swing against other parts and cause damage.

Wooden Boxes (Crates)

Clamps, bolts, nuts, cap screws, eyebolts, and other small parts are shipped in one or more wooden boxes. Do not store these boxes outdoors.

Bracing Material

Leave wood blocks, steel strapping, and other bracing material in place until hoisting sling is in place and the piece is ready to be lifted.

4.2 UNLOADING AND HANDLING

Lifting, Unloading, and Moving Unit

- Check to be sure that eyebolts and hooks are attached securely and have appropriate lifting rating.
- Use properly sized rigging.
- All lifting and rigging must comply with federal, state, and local safety codes.

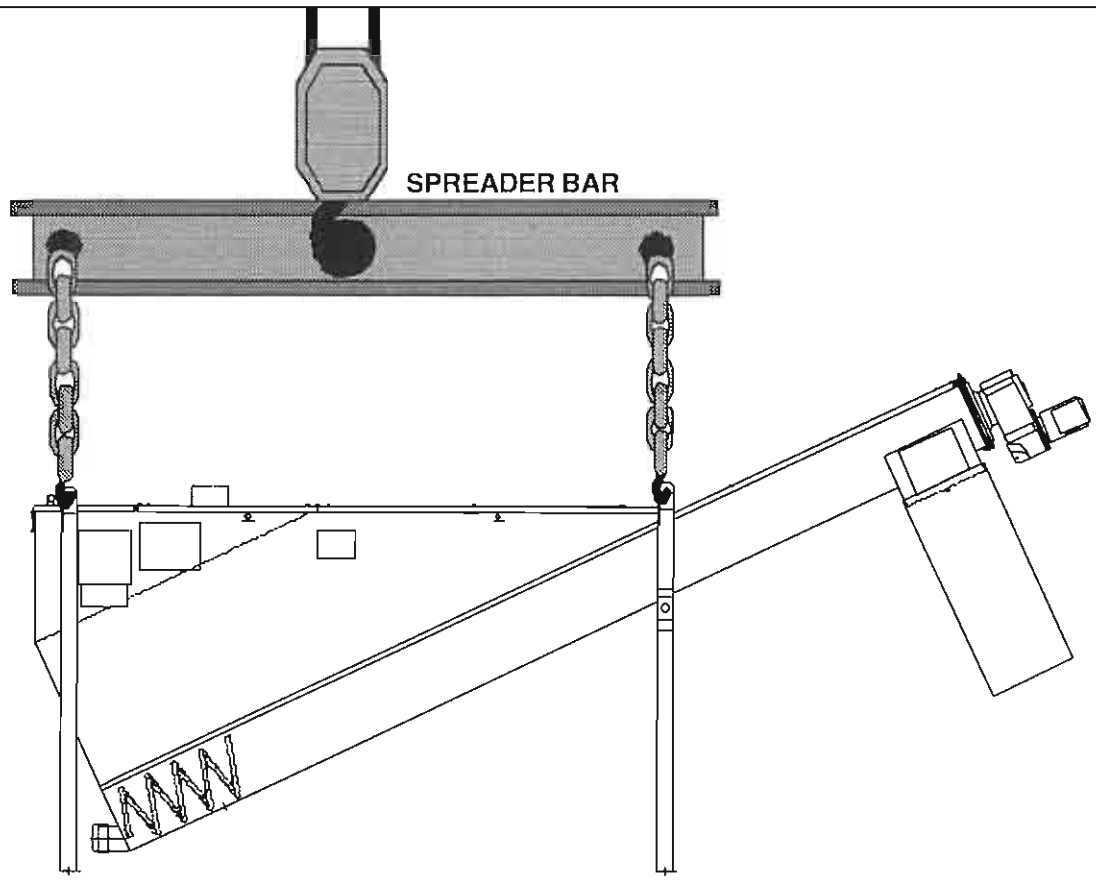
WARNING

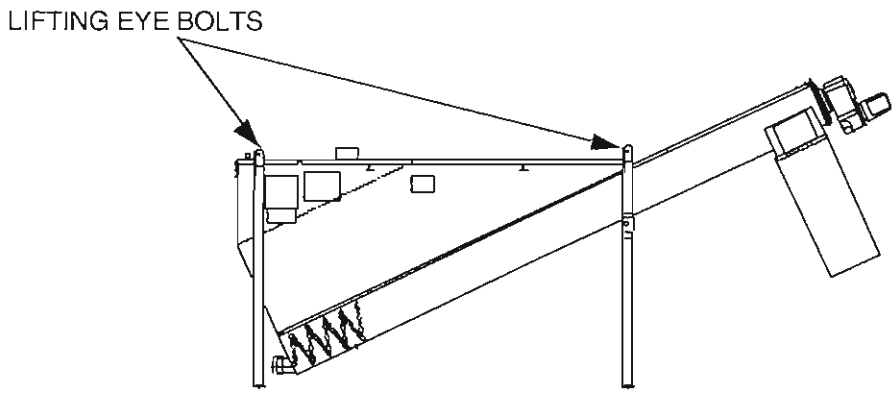
Never stand underneath equipment that is being lifted. To do so is to risk severe personal injury or death.

- Use shipping weight as a guide to determine lifting requirements. Verify that lifting equipment has sufficient capacity.
- Do not lift unit by chaining or slinging around pipe connections or motor stand.
- Use a spreader bar to prevent damage to the unit when lifting.
- Pad any contact points between the tank and the chains or slings.
- The SansGrit unit is usually shipped completely assembled, skid mounted with protective crating and ready for site installation. No special site preparation is necessary prior to installation other than a reasonably level mounting surface and suitable anchor bolts for attachment.
- Verify wall openings and transport routes are sufficient to allow the unit to be installed.
- Verify that lifting and transport equipment of suitable capacity is available. The unit is most often transported from above by a sling with spreader bars, etc. Use lifting eyes provided to prevent equipment damage.
- Check to be sure that eyebolts and hooks are attached securely and have appropriate lift rating. Fit the sling to the lifting lugs on the frame and not to the cabinet structure, motor, or other moving parts of the unit.
- Straighten the sling as slack is removed and make a test lift by allowing the weight of the piece to be supported by the crane while the piece itself is not more than an inch or two above the truck bed.
- Lift pieces carefully and smoothly; with cast parts, the flanges will break next to the cored holes if pieces are jerked suddenly by the crane.
- After the unit has been unloaded, conduct a visual inspection and a count of the shipping containers to determine if any shipping damage or loss of equipment occurred in transit. Be careful not to jar crates and/or to puncture crated materials with lifting forks.

NOTE: You must report, in writing, any damaged or missing parts to the shipping carrier and Thermo Black Clawson within 48 hours of receipt of the unit. Purchaser shall bear the responsibility for the replacement of equipment which is determined to be missing after this period.

To assist in identifying correct quantities and parts, reference the attached packing list on the shipping crate. A purchase order shall accompany any order to Thermo Black Clawson for replacement of parts which were damaged during shipment. The purchaser shall direct all shipment damage back charges to the carrier.





Lifting

5.0 STORAGE

5.1 UNIT STORAGE

Take the following precautions to minimize potential damage to the unit if outside storage is planned:

- Cover equipment with waterproof covering.
- Do not allow water to accumulate in or on the unit, especially if the weather conditions approach freezing (32 degrees Fahrenheit [0 degrees Centigrade]) or below.
- Do not store items such as valves, cylinders, switches, etc. outside.
- Consult the drive unit manual for any special storage requirements for the drive.

NOTE: At the time of installation, all protective coatings must be removed carefully to prevent damage to the seals, etc. Bearings must be flushed and lubricated with lubricants that are clean and meet the specifications for the bearing application.

Storage--Indoors and Outdoors

For storage under 30 days, the equipment should be covered to be protected from the environment and well ventilated to prevent moisture build-up on surfaces. The unit should be operated for 15 minutes once a week, if power is available, or rotated manually at least one full revolution. Upon completion of unit rotation or operation, the unit should be stopped on a different location to avoid developing flat areas on the spiral. The unit should be isolated from passage of electrical current, shock loads or vibrations during periods of non-operation in order to avoid false brinelling and damage to bearings or other contact surfaces.

If storage area is outdoors, the equipment should be skid-mounted on a wooden skid that keeps the unit off the ground and away from moisture. A skeleton crate should be constructed to support a water proof tarp on the protective surface. The tarp should completely cover the unit, but not contact the unit surfaces. There should be adequate ventilation under the tarp to preclude condensation build-up. If the unit is stored outside in areas of high humidity, we recommend that the breather plug in the drive unit be replaced with a solid plug. Also, all motor and drive unit condensate drainage or weep holes should be checked once per week to make sure they are clear and free of debris, insects, dirt, etc.

For extended storage (greater than 30 days), a rust prohibitive such as Mobil Vaprotec Concentrate 60032-0, should be added to the gear reducer's lubricating oil. The rust prohibitive will need to be replenished at intervals as specified by the manufacturer. In addition, all metal surfaces (including tank, drive and spiral) should be coated with a suitable metal protective such as Zep

Iron Clad or Dow Corning metal protective coating. The coating should be 1-2 mils for up to 6 months outdoor storage and 5-7 mils for up to 2 years outdoor storage. After removal from storage, the gear drive should be drained and filled with a proper lubricant (see Lubrication Chart, page 5-4, for proper oil selections). The metal protective coating should be removed with an industrial degreaser following any specific disposal requirements. If the drive motor must be stored for a long period (one month or more) without operating, the motor must be stored in a dry protected area and in the mounting position indicated on the unit nameplate. Store the hardware in the originally supplied shipping crates and protected from moisture, construction dust and corrosive fumes.

CAUTION

Stainless steel will rust if contaminated with weld splatter, carbon steel dust from a grinding wheel, or other airborne or waterborne contaminants. Take special care to protect the unit at all times.

Any bruises, mars and/or scratches caused by loading and unloading the equipment must be immediately touched up in the field prior to any storage.

NOTE: Any equipment (other than the spiral and wear bars) painted with prime coats only, should get additional coats of paint (to protect the surface under field storage conditions) within 14 days after receipt.

Thermo Black Clawson assumes no liability as to specific storage requirements for equipment or components.

6.0 INSTALLATION

6.1 SAFETY PRECAUTIONS

ATTENTION OPERATORS AND MAINTENANCE PERSONNEL! Read and make sure that you understand all of the safety information and correct procedures before using or servicing this equipment. This manual should be available to you at all times.

Do not modify the machine without authorization. Modifications could affect the function of the machine, shorten machine life, render built-in safety features useless, and nullify the warranty.

Never start the machine unless the following conditions are met:

- All personnel are clear of the machine.
- All doors and hatches are closed.
- All guards and covers are in place.

See "Operation" section for complete start-up procedure.

Bring machine to ZMS before servicing. Unit must be at zero mechanical state (ZMS) before any service work is done. All energy sources and stock supply must be shut-off and locked out with your padlock before and during installation, maintenance, inspection, cleaning, or adjusting this unit.

WARNING

Never remove another person's lock-out (padlock) or tag.

Check disconnect. Try to start motor before servicing unit.

Lock out all pneumatic, hydraulic and steam systems, electrical circuits, chemical and gas systems, water, and stock flow.

Do not proceed if services are not independent of the main supply. Contact your supervisor.

Follow installation and maintenance procedures in this manual along with your company's safety guidelines.

Use valves designed for lock-out and tagging. All valves used on this equipment should be designed to be locked out and tagged. Never operate unit without guards in place.

Tighten sheave bushings to manufacturer's specification.

Check torque prior to start up. Tack welding of bolt heads is an accepted industry practice.

CAUTION

Over tightening fasteners can result in failure of bolts and other attachments.

6.2 PRE-INSTALLATION

Complete pre-installation before you receive the unit. Use this section as a checklist.

Documents

- **Certified Drawings** - prepared by Thermo Black Clawson upon receipt of your purchase order and your returned approval drawings.
- **Owner's Manual** - sent with certified drawings.
- **Shipping List** - we send one copy with the shipment and one to the mill the day of shipment.

Foundation

Refer to the certified drawings for foundation information.

Equipment Placement

Certified drawings show space requirements for equipment operation and the anchor bolt plan. Adequate equipment clearances must be considered in your equipment layout. Consideration should be given to maintenance and installation requirements.

When equipment has to be lowered through an opening in the floor above, be sure that it is in correct foundation position before the unit is erected. Check to ensure that the SansGrit unit is correctly positioned. Verify the unit is level (plus or minus 1/16 of an inch along unit width and length), and adjust or shim support structure as necessary. Because the frame is parallel with the axis of the SansGrit unit, leveling of the frame is all that is required.

Once the unit is lined up with your attaching devices (piping, power conduit, etc.) and level, it can be grouted and secured to its mounting using standard concrete anchors.

NOTE: Check the certified drawings to determine if any unusual clearance problems will arise while moving the unit through the mill.

Lifting Equipment

We have attempted to ensure that the unit weights (not including crating weight) are on the certified drawings for each piece of equipment. If the weight is not on the certified drawings, contact Thermo Black Clawson. Verify that the hoist or crane at the mill has adequate load capacity to lift the unit safely. If not, lease lifting equipment or contract for the services of a rigger.

Lift the unit by the supplied lifting eyes only. Do NOT attempt to lift the unit by any other means.

Electrical Requirements

Be sure that power cables and controls are properly sized, and can be routed to the unit with a minimum of bends and turns. Verify that the available electricity is correct for the equipment.

Piping

Check certified drawings for pipe sizes. Be sure that correct sizes of pipe, fittings, and adapters will be available when the piping is installed. All piping must be well supported. Expansion loops or joints should be installed in the connecting pipes to allow for linear expansion. Piping must not be connected to the unit until the grout has hardened and the foundation bolts have been tightened.

DANGER

To avoid amputation or death adhere to one of the following installation methods: (1) Connect machine drainage to a piping system which prevents access to the rotating spiral; or (2) Install a rigid or semi-rigid pipe or hard rubber hose to prevent access to the spiral through the drain system. The pipe must be at least 38 inches long.

NOTE: All piping and valves must be supported independently of the unit.

Shower Water

Water to the showers must be clean water. Typical flow rate is 100 GPM.

6.3 INSTALLATION

Thermo Black Clawson assumes no responsibility for the site preparation and construction required for the installation of this equipment. An adequate foundation, determined from the machine weight and floor loading conditions, must be provided.

The general guidelines suggested in this manual are for those individuals involved in installing the unit. It is the responsibility of the customer's erection crew or agents to maintain *as built* specifications during the installation of the unit. If you have any problems or questions concerning the installation of this equipment, please contact the Thermo Black Clawson Field Service Department. If you want more information on grouting, ask for our *Typical Grouting Practices* manual.

Customer Supply

The customer is to furnish all foundations, anchor bolts, steel shims, packing, piping, etc. Refer to quotations and certified drawings for a complete listing of parts and hardware furnished by Thermo Black Clawson.

Anchor Bolt Pockets

Remove all debris and dust from anchor bolt pockets before installing sleeves.

Shim Packs

Steel shims will be required to level the unit before it is grouted in place. Mill supply must include 3 inch x 3 inch (76 mm x 76 mm) shims.

Anchor Bolts

Bolts must project at least ¼ inch (6.35 mm) through the nut when the unit is bolted down. Allow for grout and thickness of soleplate/footpads and nut when determining bolt length. See "Recommended Anchor Bolt Method" on page31. The certified drawings call out the anchor bolt sizes, typical spacing, and layout. We recommend that anchor bolts be encased in sleeves to make allowance for minor deviations in mounting hole location.

Foundation Surfaces

Grout

All grout design and placement of grout is the responsibility of the customer. Deviations from standard grouting practice could result in structural failure. Piping must not be connected to the unit until the grout has thoroughly hardened and the foundation bolts have been tightened. All couplings should be final aligned after the piping is completed. Grout selection will be effected by such areas as curing time, tight clearances, creep resistance at elevated temperatures, high load conditions, high impact and vibration conditions. Consult the grout manufactures engineering technical group for specific requirements.

Surface Preparation

The surface shall be free of oil, grease, and dust. When a concrete type grout is being used, the existing concrete surface should be soaked with clean water, leaving the surface saturated but free of standing water. When using epoxy grout, the surface must be clean, dry ,sound and roughened to assure a good bond.

Gap Size

For most grouts the minimum gap is one inch with the maximum being four inch. If the gap size is beyond this range, consult the technical department of the grout manufacturer.

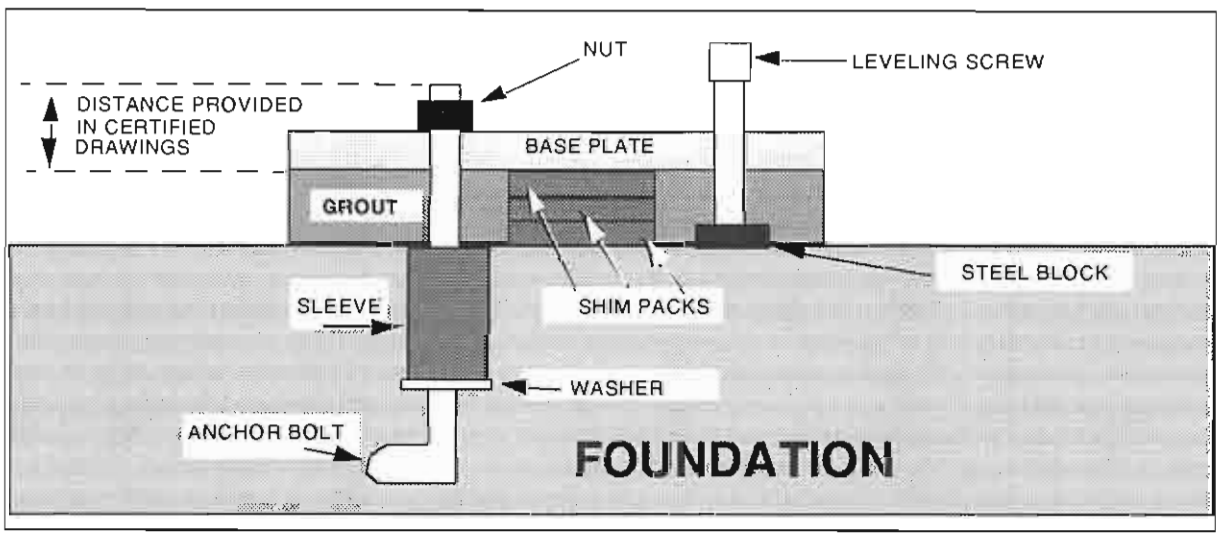
Curing Time

Curing time will be effected by thickness and temperature. Consult the technical bulletins which came with the grout being used.

Temperature

Refer to the grout manufacturer's technical bulletins for temperature requirements at the time of installation for the type of grout being used. When epoxy grout is being used, flowability and strength grain are adversely affected by lower temperatures. When the temperature is below 70 degrees Fahrenheit or above 90 degrees Fahrenheit refer to the grout suppliers technical data.

Concrete type grouts may be used with temperatures as low as 35 degrees Fahrenheit, however if lower temperatures are encountered, consult the technical department of the grout manufacturer.



Recommended Anchor Bolt Method

Leveling the Unit

Install the unit on the foundation by lowering it over the anchor bolts. Level the unit and place steel shims next to each anchor bolt and underneath unsupported lengths of the unit base. Use care not to distort the alignment of the unit when shimming. The leveling screws are intended only for leveling and should carry no weight of the unit when the anchor bolts are tight. It is a good practice to remove the leveling screws at the completion of the installation.

Position the unit over the anchor bolts. Refer to your certified drawings for correct placement and orientation of the unit on the foundation. The unit needs to be leveled before grouting into place.

- Place 3 inch x 3 inch x 1/2 inch (76 mm x 76 mm x 13 mm) thick steel plate on the foundation under each leveling screw to provide a solid surface for the leveling screw to bear against dur-

ing the leveling procedure.

- Use a machined surface to properly level the unit.
- Check for level in two directions, in line with the corners of the base.
- Adjust the leveling screws on the base mounting pads to obtain a level condition within 1/16 inch in both directions.
- Use steel shim under the mounting pads to support the unit in level position. Shims are permanent and remain in place after the unit is grouted.
- Tighten the anchor bolts.
- Recheck the unit for level and be sure that unit is securely supported on the shims, not by the leveling screws.
- Remove the leveling screws.

The SansGrit unit drive motor has been factory fitted and requires no adjustment. Check the oil level in the gearbox and verify that vent plug breather is in place. If vent plug is not installed, call factory for replacement.

Install the control panel (if supplied) at the desired location, along with the conduit from the control panel to the equipment. Don't turn on power until you've reviewed the safety section in this manual and your mill's safety procedures.

ELECTRICAL WORK

Complete the installation by connecting electrical power to the drive motor and control panel (if supplied). Also, connect control power to the Emergency Stop switch and integrate the Emergency Stop switch into the control system. Reference motor nameplate for proper power supply and wiring connections. Be sure that unit is well grounded and that all work meets National Electrical Codes as well as local wiring requirements.

WARNING

To avoid serious injury or death, make sure that electrical connections are done by qualified electricians and are in accordance with all applicable codes and requirements.

WARNING

To adhere to good safety practices, when installing this machine, ensure that there is a lockable disconnect within sight of the machine.

DANGER

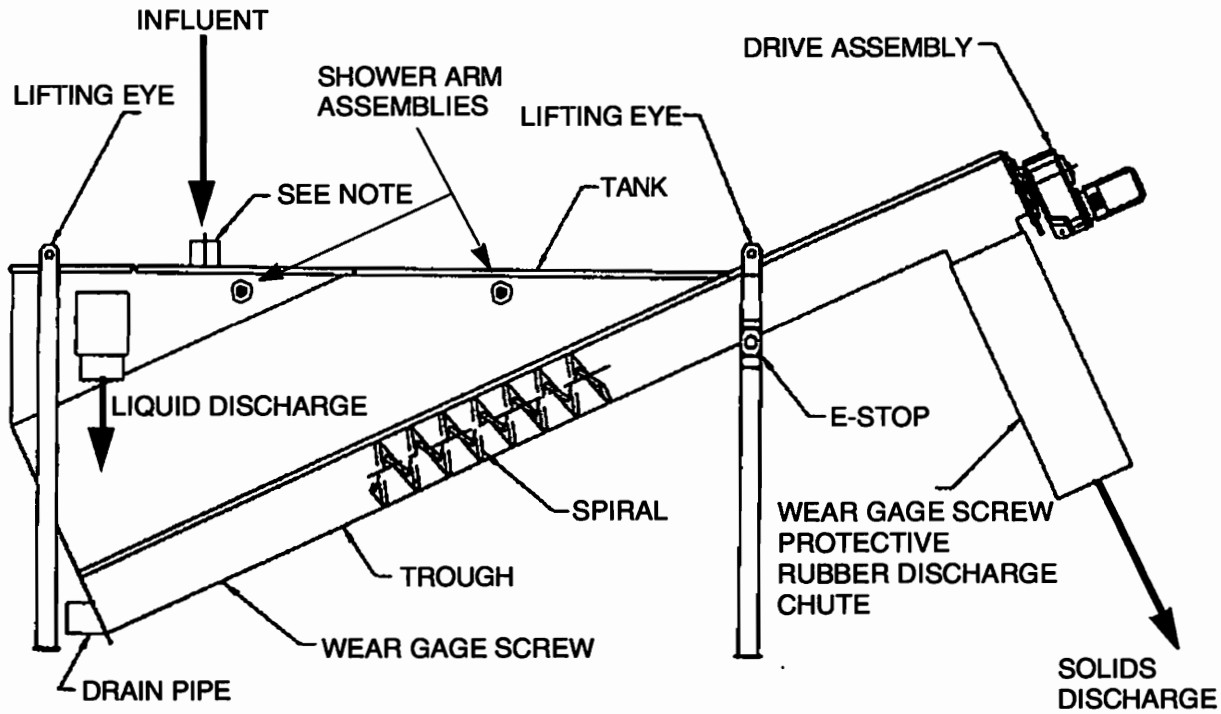
To adhere to good safety practices, the unit-mounted emergency stop button must be integrated with the control system to shut off the unit when activated and must override all other modes of control.

Containment of Rejects Flow

The rejects flow must be controlled and contained to avoid flooding, splashing, and discharge into areas where people may be affected by the discharge. Installation personnel sometimes underestimate the possible quantity of the rejects discharge flow. It is extremely important to know how much discharge flow can occur and have methods to contain the flow.

WARNING

If you don't control and contain the rejects flow, injuries such as cuts, abrasions, skin irritation, and scalding from splashing debris could occur to anyone standing in the area where an uncontained excessive rejects flow occurs.



NOTE: INFLUENT PIPE SHOWN IN RECOMMENDED LOCATION. CUSTOMER TO LOCATE AS REQUIRED FOR INSTALLATION.

SansGrit

7.0 OPERATION

7.1 PRE-CHECKOUT

Many programmable solid state systems have the capability of simulating operation in a mode known as *Test Mode* or *Dry Run Mode*. These modes allow a user to check a program and correct obvious programming errors with outputs disabled. Unexpected machine motion and possible damage to equipment is avoided. These modes can also be used to verify proper system operation after a repair.

Many programmable systems provide for *Force On* and *Force Off* of inputs and outputs. These functions can reduce troubleshooting and maintenance time by enabling personnel to bypass certain operations without physically operating switches on a machine.

WARNING

Use care when using *Force* functions to avoid exposing personnel to hazardous machine motions or process operations which might cause severe personal injury or death.

Mechanical start-up involves the following steps, which must be carried out in sequence:

- Inspect the installation before the power is connected.
- Disconnect motors and other devices that cause machine motion.
- Test inputs.
- Test outputs.
- Enter and verify your program.
- Test the system with motors and other motion-causing devices reconnected.
- Go through a *dry run* of the application.

The purpose of these procedures is to isolate such problems as wiring mistakes, equipment malfunction, and programming errors in a systematic, controlled manner. Go through these procedures very carefully. Following a given set of steps will help avoid possible personal injury and equipment damage.

WARNING

During all phases of motion check-out, station a person ready to operate the power switch if necessary.

INSPECT AND MAKE SURE OF THE FOLLOWING BEFORE STARTING THE UNIT:

- All guards and covers are in good condition and fastened in place.
- No parts are loose, worn, damaged, or missing.
- All personnel are clear of the equipment.

A FIRST-TIME CHECKOUT SHOULD INCLUDE THE FOLLOWING:

- Make sure the unit is installed in accordance with the drawings.
- Verify that all optional attachments have been correctly installed.
- Verify that the unit has been securely anchored to the foundation.
- Confirm that the electrical power supply to the motor and the motor wiring terminations are in agreement and correct.
- Verify that all other electrical connections have been made in accordance with the circuit and wiring diagrams.
- Inspect unit to insure that all packaging material has been removed and the spiral is free to rotate and in the proper position. Check to see that no construction debris or dry solids were left in the spiral or transport tube.
- Check lubrication of unit before start up.
- Check the showers for desired water flow and desired angle.

7.2 CONTROL GUIDELINES

Safety considerations are an important element of proper troubleshooting procedures. Actively thinking about safety of yourself and others, as well as the condition of your equipment is of primary importance. Several safety areas are discussed below.

Power Supply

Before working on a power supply, always remove the AC power source at the main disconnect switch. When using more than one power supply, be sure to disconnect all of them.

Main Power Disconnect

The main power disconnect switch should be located where operators and maintenance personnel have quick and easy access to it. Ideally, the disconnect switch is mounted on the outside of the enclosure so that it can be accessed without opening the enclosure. In addition to disconnecting electrical power, de-energize all other sources of power (pneumatic and hydraulic) before working on a panel controlled machine or process.

Activating Devices When Troubleshooting

When troubleshooting, never reach into the machine to actuate a device. Unexpected machine motion could occur.

Operation Safety Precaution

When troubleshooting any control panel problem, have all personnel remain clear of the machine. The problem could be intermittent, and sudden unexpected motion could occur. Have someone ready to operate an emergency stop switch in case it becomes necessary to shut off power to the machine.

Program Alteration

There are several causes of alteration to the user program, including extreme environmental conditions, electromagnetic interference (EMI), improper grounding, improper wiring connections and unauthorized tampering. If you suspect the memory has been altered, check the program against an approved version such as on the EEPROM memory module.

Hardwired Circuitry

WARNING

Circuits that are installed on the machine for safety reasons, including overtravel limit switches, stop push buttons, and interlocks, should always be hardwired in series so that when any one device opens, the master control relay is de-energized, thereby removing power to the machine. Never alter these circuits to defeat their function. Serious injury or machine damage could occur.

Safety Recommendation for Maintenance Personnel

All maintenance work should be done by qualified personnel familiar with construction, operation, and hazards involved with the equipment.

Follow the appropriate work practices of the National Fire Protection Association (NFPA) for Electrical Standards for Industrial Machinery.

Make-Do testing devices such as incandescent lamps have low impedance. The low impedance of these devices can effectively change a voltage level from logic *1* condition to a logic *0* condition when attempting to make a measurement. Unexpected machine motion can result if an output to a controlled device is energized as a result. Neon lamps do not respond to voltages typically used in logic circuits (e.g. 32 VDC or less). Use of a neon lamp tester could lead to false conclusions about the voltage present in a circuit.

High input impedance meters are required to obtain accurate voltage measurements in high impedance circuits. Unless otherwise specified by the manufacturer, a meter with an input impedance of ten (10) megohms or greater is recommended for making voltage measurements. The meter must also have sufficient sensitivity to measure logic level voltages; some meters do not respond to low voltages.

Control Panels

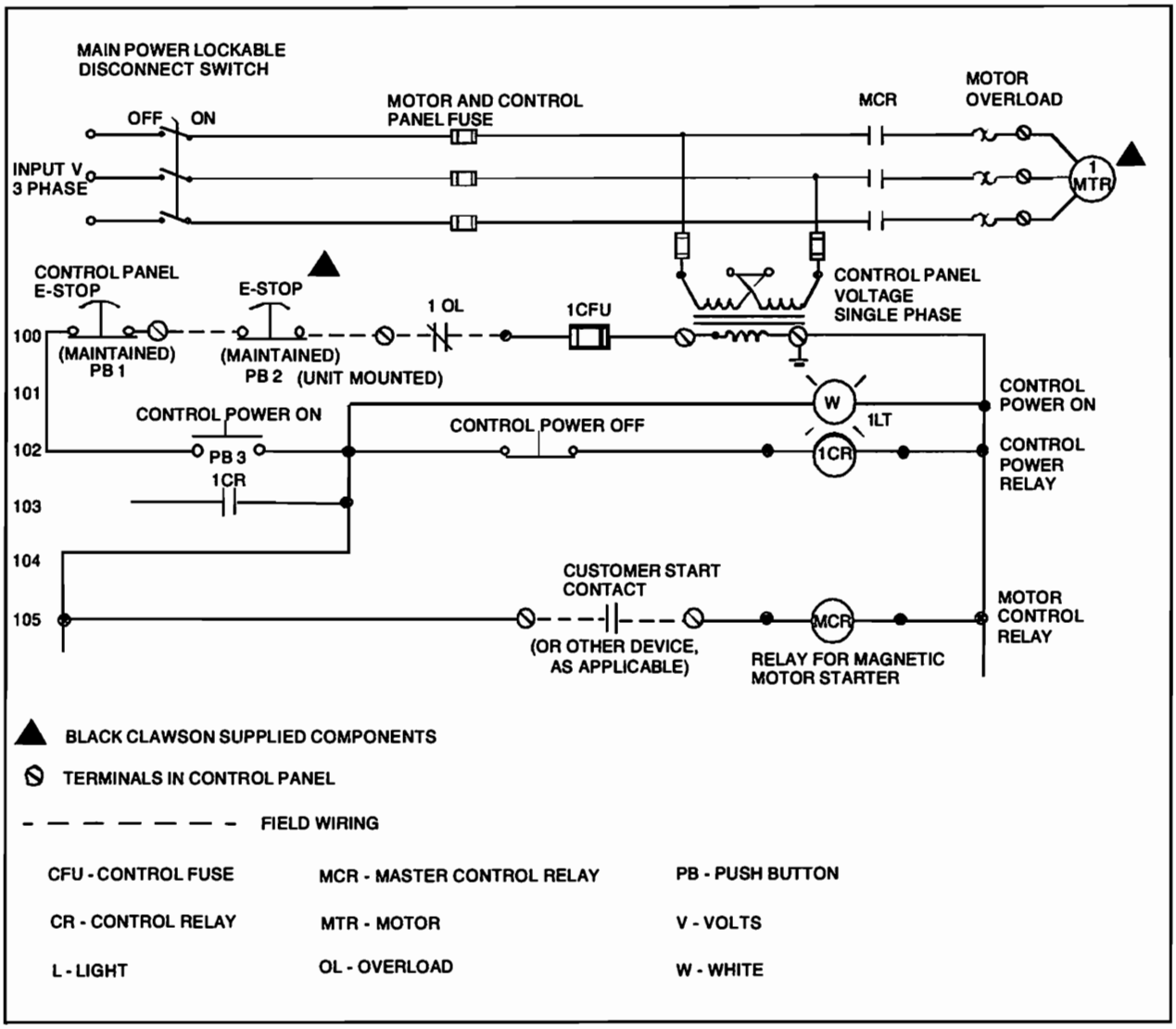
The control panels are designed using all NEMA (National Electrical Manufacturer's) and UL (Underwriter's Laboratory) approved components suited for the environment in which it is being placed. Every effort is made to adhere to the NEC (National Electrical Code), OSHA (Occupational Safety and Health Act), ANSI (American National Standards Institute), and mill standards as they apply to your application.

The power feed should include an equipment grounding conductor to bond the enclosure to building earth ground.

DANGER

Touching exposed live electrical wires will cause serious personal injury or death.

- Power feed should have a disconnect or breaker capable of being locked in the open position.
- Wire field devices per certified drawings furnished with the control panel.
- Route field wiring to separate the AC from the DC and low level signals.
- All the electronic instruments were factory programmed to a fail safe state (if a component failure occurs). The panels include a power push button that, when pushed, will power down the main panel.



Recommended Control Panel Interface for Safety Equipment

This schematic is to provide a recommended interface between the control panel and the unit mounted E-stop. Other items are shown for reference only and are typically supplied by others unless Thermo Black Clawson provides complete system controls. When pressed, either one of the two E-stops is to completely and immediately shut down the unit. Either E-stop must override all modes of operation and the unit must not restart unless a control signal is given at the control panel by the operator (the operator presses a *START* button or *CONTROL PANEL ON* button, as applicable). We recommend that this *3 wire* control logic be used to prevent the unit from restarting unexpectedly after a shutoff caused by E-stop activation, overload or power outage. Proper wiring from the E-stop to the control panel will be the responsibility of others. This system should be tested by a qualified electrician to ensure all safety related components are fully functional. In addition to Thermo Black Clawson supplied components, the customer must provide a lockable power disconnect on all power sources in clear sight of operator/service area. This schematic does not include over current of motor circuit protector devices which must be supplied for

a proper operating control system. It is the control supplier's responsibility to ensure the control system is in accordance with all applicable regulating standards. It is the customer's responsibility to properly connect the unit, motor and control panel to proper earth ground.

Education and Knowledge Lead to Safety

Planning for an effective solid state circuit requires enough knowledge to make basic decisions that will render the system safe as well as effective. Everyone who works with a solid state control should be educated in its capabilities and limitations. This includes in-plant installers, operators, service personnel, and system designers.

7.3 OPERATION

WARNING

Do not operated machine without guards and covers in place.

WARNING

Do not operate a damaged or malfunctioning mechanism. Operate after repairs, replacements, or servicing occurs which brings the unit to normal functioning.

WARNING

Exposure to material processed, lubricants, or other fluids may cause infection or adverse reactions. Wear protective clothing, safety glasses, follow safety advice in this manual, follow your mill's safety procedures, and avoid exposure.

CAUTION

Do not use the overload or safety switches to stop the mechanism during NORMAL operation--these are to be used in case of an emergency stop only.

Don't start the machine until the following conditions are met:

- All personnel are clear of the machine.
- All doors and hatches are closed.
- All guards and covers are in place.

When the preceding conditions are met, begin the start-up procedure as follows:

Normal Start Up

- Review all safety practices listed in manual.
- Check spiral for proper rotation. When viewed from the drive or discharge end, the spiral should rotate clockwise when motor is "jogged on". Material should be conveyed toward discharge (upper) end. When unit is run dry, lubricate the spiral with dish washing soap or light

grade oil. If the spiral is turning in reverse, turn off all power to the SansGrit control panel and exchange any two incoming power leads. Jog motor on again to obtain proper rotation.

- We recommend overcurrent protection. If a standard control panel is provided by Thermo Black Clawson, follow the procedure below to set the overcurrent protection device (current monitor).
  - To set the overcurrent protection, find the current monitor, located typically at the starter. Make sure that the mode selection switch is in the *over* position. Note the number of wire passes through the monitor's toroid. This determines the range and the sensitivity of the sensor.

    At 1 pass: 2-20 amp range

    At 2 passes: 1-10 amp range

    At 4 passes: .5-5 amp range

    A two-second timer is built in the current monitor to accommodate start up current and prevent nuisance tripping caused by normal equipment start up.

    There are two potentiometers on the monitor for trip point and time delay adjustments. Turning them counterclockwise will decrease and clockwise will increase set points.

    When a fault is sensed (LED on) throughout the trip delay, the output relay will energize after the delay time. If fault is corrected (LED off), before the trip delay is complete, the relay will not energize and trip timer is reset. If a fault is still sensed at the end of the start up delay, a trip delay will begin. If the fault continues through the trip delay time, the relay will stop the motor.

- If there are no mechanical problems, the unit is ready to accept solids. Always inform all area personnel of the impending start up.
- Upon start up, the sound of the spiral riding on the wear bars may be noticeable. As grit is processed and as the wear bars wear, the sound will diminish.

Operating Modes

Set duration of all timers as required.

Adding Flow

After the SansGrit unit has dry run satisfactorily, full flow can be added. Make certain that there is a container in place for receiving the dewatered grit solids.

Enhancing Performance

The SansGrit unit is intended to convey and dewater sediment (grit). (Results vary from installation to installation and by application.)

Setting the timers to slower intervals should allow for more complete settling and for more complete dewatering of the grit solids.

WARNING

Follow lockout and ZMS procedures before servicing. Lock out power with padlock for which only you have the key. Your ZMS procedure should include locking out all feed and spray wash sources.

Shutdown and Cleaning

When taking the SansGrit unit off-line for a short term shutdown period for maintenance or any other reason, follow the procedures below to save time and help prevent premature wear or service requirements.

- Shut off the feed to the unit and flush continuously with clean water in place of feed and allow to operate in a continuing discharge mode until all dewatered grit solids are discharged.
- Next, drain the unit and flush all residual fiber or other material. If, after this initial flushing material remains in the unit, this procedure should be repeated until all solids are removed from the tank.
- Steam/pressure wash for cleaning both inside and outside surfaces.
- Check the gear motor's lubrication points and refill as appropriate.

CAUTION

To avoid possible surface deformation, do not apply hot steam directly to plastic or rubber surfaces. To avoid possible electrical problems, don't apply water directly to electrical components.

DANGER

A rotating spiral is located directly below the tank and trough covers. NEVER place your hands, limbs, or any hand-held object in the discharge chute or near the spiral unless the machine is electrically locked out and brought to a zero mechanical state.

If there are no mechanical problems, the unit is ready to accept solids. Always inform all area personnel of the impending start up.

Upon start up, the sound of the spiral riding on the wear bars may be noticeable. As grit is processed and as the wear bars wear, the sound will diminish.

WARNING

We recommend that current sensor adjustments only be made by a qualified electrician using an insulated screw driver. Adjustment of the current sensor must be accomplish with electrical power supplied to the control panel and with the unit in operation. Therefore, EXTREME CARE must be taken when making these adjustments because the possibility of electrical shock does exist. Turn the trip delay adjustment clockwise to its maximum setting. With the unit in operation, slowly rotate the trip point adjustment counterclockwise until the red LED light comes on, and then rotate the trip point knob back clockwise only enough for the red LED light to shut off. After the trip point setting has been made, rotate the trip delay adjustment counterclockwise to the minimum setting. Stop and restart the unit several times to confirm the trip point setting is high enough so the unit will not trip out under start up load. Should the unit trip out, turn the trip point knob clockwise slightly until the unit can start without tripping out.

8.0 MAINTENANCE

8.1 ROUTINE MAINTENANCE

Perform a general inspection of the equipment at least every three months or every 1,000 hours of running time.

Periodic Inspection

Perform a general inspection and tightening of the machine twice a year. Locating and eliminating minor problems will assure long and dependable service. In many instances, periodic inspections will eliminate costly shut-downs and delays.

WARNING

Follow your prescribed safety procedures and those listed in this manual to prevent accidental starting while inspecting or servicing the unit.

WARNING

Follow lockout procedure before servicing. Lock out power with padlock for which only you have the key. Also, ensure that the machine is brought to a zero mechanical state by locking out all feed and spray sources.

DANGER

The rotating spiral is located directly below the tank and trough covers. To place any part of your body into this area without first locking out and bringing the unit to zero mechanical state is risking death or dismemberment. Always lock out the unit and bring it to a zero mechanical state when performing repair and maintenance procedures.

To prepare for a maintenance check, shut down the unit according to "Normal Start Up" on page41 and bring it to a zero mechanical state (ZMS) and lock out all sources of energy.

A washdown of internal parts and surfaces may be required.

Components Requiring Routine Maintenance

DESCRIPTION	SERVICE	FREQUENCY
general visual inspection	Check unit to ensure proper operation is maintained. Check that the solids are being transported to the discharge point. Inspect solids receptacle to ensure that its volume is not in danger of overfilling or backing up into SansGrit unit.	daily
accumulated solids on exterior surface	Rinse accumulated solids off of exterior surfaces. Clean other components as needed.	daily
wear bars	Visually check wear bars for excessive wear. Remove a bolt holding wear bar in place. If the bolt is less than .25 inches long, replace wear bar liner. Replace wear bar liner if leading edges are bent.	monthly
gear motor	Remove the oil level plug in reducer and check oil level. If necessary, add oil to bring to proper level.	monthly
general inspection		quarterly
gear reducer output shaft	check for abnormal "play"	semi-annually
spiral	Visually inspect spiral for wear or warping	semi-annually
electrical operating switches	check E-stop to verify that it works properly	semi-annually
gear motor	change oil	annually
complete inspection and cleaning	Flush and clean unit. Inspect the unit thoroughly and repair or replace damaged or worn parts as needed.	annually
shower inspection	Inspect showers for plugging and proper angle. Clean and adjust as needed.	weekly

8.2 TROUBLESHOOTING

Troubleshooting Guide for SansGrit Unit

PROBLEM	PROBABLE CAUSE	REMEDY
Spiral does not turn	No power to motor.	Check circuit breakers. Check connections.
	Current monitor O.L. turns off power.	Find obstruction or overload condition. Clear machine and restart.
	Control problems.	Check manual control. Verify that pump signal is working properly.
	Spiral blocked with large foreign material.	Remove foreign material.
Spiral turns erratically	Unit overload	Clear machine. Review system process.
	Broken gear	Check reducer output shaft. Repair gear reducer.
Excessive dewatering of solids	Discharge timers set for too long.	Reset timers.
Settleable solids in overflow	Settling timer set too short.	Reset settling timer.
Discharge too wet	Discharge timers set too short.	Reset discharge timers
Matting	Showers not preventing matting.	Check shower flow rate and angle of shower.
Grit accumulating in tank.	Discharge timers set too short.	Reset discharge timers
Abnormal loud noises	Gravel entered the machine.	Allow machine to clear itself.
	Wear bars worn.	Replace wear bars.
Erratic operations, vibrations	Large foreign material entered the unit.	Disassemble machine and clean as necessary.
	Extremely high solids load.	Check motor power consumption.
	Flange connections loose.	Check all flange connections and tighten fasteners as necessary.

MOTOR

Since any number of reasons could be responsible for the failure, the following guide lists usual conditions that can lead to difficulties with a motor. Should there be any indication of a premature failure, care must be taken to make certain that:

- The original motor selection was the proper one.
- The motor was installed correctly, particularly the electrical connections.
- The power supply was correct.
- The motor was of the proper size (speed and horsepower) to do the job.
- The condensate drainage holes were aerated properly to prevent trapping of moisture in the motor housing on the junction box.

Verify the above conditions have been completed. Use of the following guide in pinpointing the difficulty will lead to long service life and complete satisfaction.

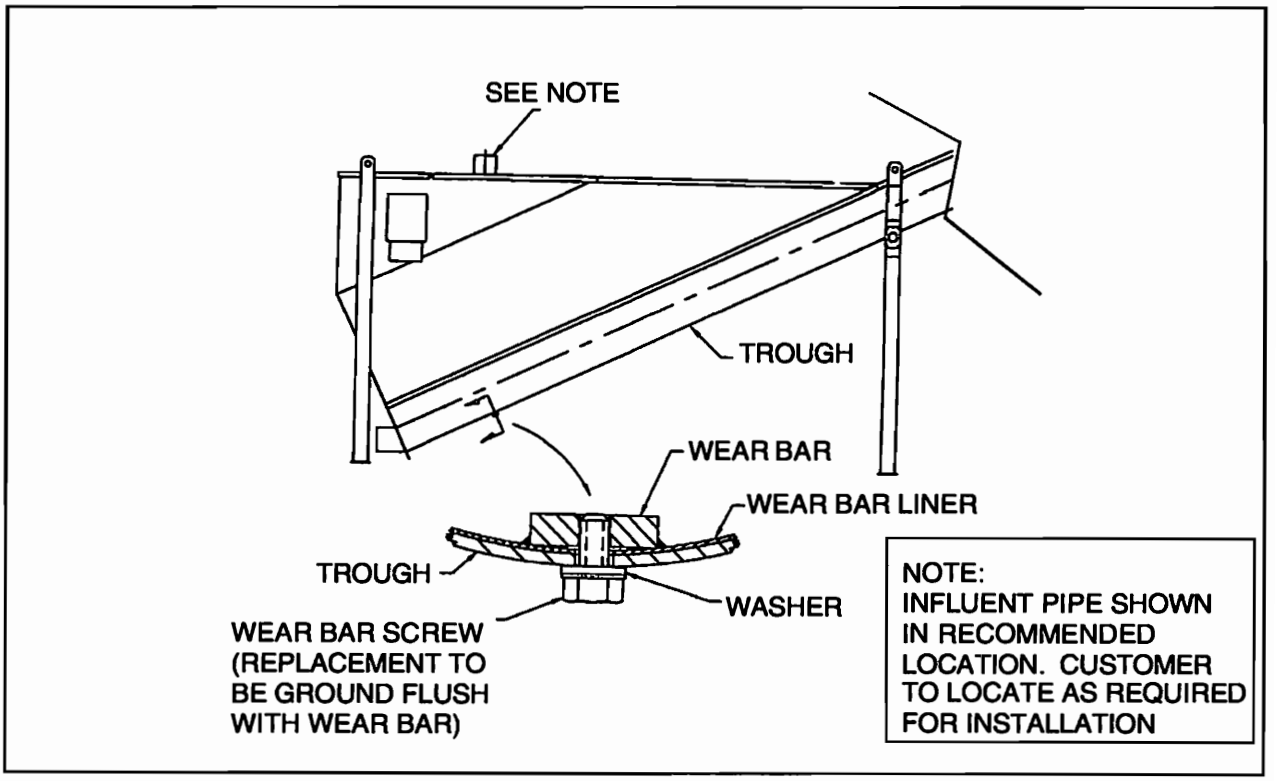
Troubleshooting Guide for Motor

PROBLEM	PROBABLE CAUSE	REMEDY
MOTOR FAILS TO START	Circuit breakers tripped.	Reset breakers. Should be at least 125% of nameplate amperes.
	Overload Trips.	Check and reset overload in starter.
	Improper power supply.	Check to see that power supplied agrees with motor nameplate and load factor.
	Improper line connections.	Check connections with diagram supplied with motor.
	Open circuit in winding.	Indicated by humming sound when starter is closed. Check for loose wiring connections.
	Mechanical failure.	Check to see if motor and drive turn freely. Check bearings and lubrication.
	Short circuited stator.	Indicated by blown fuses, tripped circuit breakers or heaters. Motor must be rewound.
	If 3 phase, one phase may be open.	Check lines for open phase.
	Low motor voltage.	See that nameplate voltage is maintained. Check connection.
MOTOR RUNS AND THEN STOPS	Power failure.	Check for loose connections to line, to fuses and to control.

MOTOR DOES NOT COME UP TO PROBLEM	Voltage too low at motor terminals PROBABLE CAUSE	Verify proper electrical wire size for power draw. REMEDY
SPEED	because of line drop.	
	Open primary circuit.	Locate fault with testing device and repair.
MOTOR TAKES TOO LONG TO ACCELERATE	Poor circuit.	Check for high resistance.
	Applied voltage too low.	Get power company to increase power tap.
WRONG ROTATION	Wrong sequence of phases.	Reverse any two line connections at motor or at the control panel.
MOTOR OVERHEATS WHILE RUNNING UNDER LOAD	Frame or bracket vents may be clogged with dirt and prevent proper ventilation of motor.	Open vent holes and check for a continuous stream of air from the motor.
	Ambient temperature too hot. (Above 40°C at a maximum elevation of 3300 feet above sea level.)	Provide local cooling of ambient air.
	Insufficient cooling.	Clean fan blades, motor fins and fan cover.
	Motor may have one phase open.	Check for voltage and make sure that all leads are well connected.
	Unbalanced terminal voltage.	Check for faulty leads, connections and transformers.
	Shorted stator.	Rewind or replace stator.
	Faulty connection.	Indicated by high resistance.
	High voltage. Exceeds +10% of nameplate volts.	Check terminals of motor with a voltmeter.
	Low voltage. Exceeds -10% of nameplate volts.	Check terminals of motor with a voltmeter.
	Rotor rubs stator bore.	If not poor machining on brackets, replace worn bearings.

PROBLEM	PROBABLE CAUSE	REMEDY
MOTOR VIBRATES AFTER CORRECTIONS HAVE BEEN MADE	Motor misaligned.	Realign.
	Loose at flange.	Tighten bolts.
	Coupling out of balance.	Balance coupling.
	Defective bearing.	Replace bearing.
	Bearings not in line.	Line up properly.
	Excessive end play.	Adjust bearing or add washer.
UNBALANCED LINE CURRENT ON POLY-PHASE MOTORS DURING NORMAL OPERATION	Unequal terminal volts.	Check leads and connections.
SCRAPING NOISE	Fan rubbing.	Remove interference.
NOISY OPERATIONS	Air gap not uniform.	Check and correct bracket or bearing.
HOT BEARINGS GENERAL	Rotor unbalance.	Rebalance.
	Insufficient grease.	Replace bearings.
	Deterioration of grease or lubricant contaminated.	Replace bearings.
	Overloaded bearing.	Check alignment, side & end thrust.
	Badly worn bearing.	Replace bearing.
	Broken ball or rough races.	Replace bearing, first clean housing thoroughly.
	Bent or sprung shaft.	Straighten or replace shaft.
	Misalignment.	Correct by alignment of drive.

8.3 WEAR BAR REPLACEMENT



Wear Bar Attachment

Disassembly

The wear bars are made of carbon steel material. They should last 5-10 years under normal wear. If wear bars need replacing, use the following procedure:

- Stop unit, redirect influent, and disconnect electrical connections to motor junction box.
- Follow shutdown and cleaning procedures in this manual.
- Bring unit to zero mechanical state.
- Unbolt the drive flange from the trough and remove the drive subassembly and spiral.
- Grind the tack welds that attach the wear bar liner to free the liner from the trough. Remove the wear bar liner out the trough end.

Reassembly

- Insert the new liner and tack weld as was done on the original liner.
- Slide the spiral and drive back into the trough and bolt the drive mounting flange to the end of the trough. Adjust the height of the spiral shaft using the slots provided so the spiral rests on the wear bars, yet does not weigh too heavily on the wear liner on the drive end.

NOTE: The unit may be equipped with an optional rubber liner. If the stainless steel outer sleeve of the liner is showing, replace it as if it was a wear bar liner.

8.4 SPIRAL REPLACEMENT

Disassembly

- Stop unit and influent feed to the unit.
- Disconnect electrical power to SansGrit unit.
- Bring the SansGrit to a zero mechanical state.
- Follow shutdown and cleaning procedures described in this manual.
- Remove the trough cover. Unbolt the spiral from the drive shaft. Unbolt the drive flange from the trough and remove the drive, flange and drive shaft. Pull the spiral out of the trough end.

Reassembly

- Carefully insert the new spiral back into the trough. Bolt the drive, drive shaft, and drive flange back to the trough. Bolt the drive shaft to the spiral. There should be .59 of an inch clearance between the end of the trough and the spiral. If there is an interference, burn or grind the spiral as necessary.
- Adjust the height of the spiral using the slots provided so the spiral rests on the wear bars, yet does not weigh too heavily on the wear liner on the drive end. Bolt the trough cover back to the trough.

WARNING

When replacing a motor, verify that the orientation of the drain hole is correct to preclude trapping condensation in the motor housing. Failure to do this will result in premature equipment failure.

8.5 GEAR REDUCER/MOTOR REPLACEMENT

Disassembly

- Disconnect electrical power to the SansGrit unit.
- Bring the SansGrit to zero mechanical state.
- Remove the trough cover.
- Remove plastic end cap in reducer output shaft. Remove drive assembly flange nuts.
- Remove drive shaft bolt, washer, and snap ring behind plastic cap and pull reducer off drive shaft. Take care not to lose the drive key. Lower entire drive assembly to a clean dry area. Make repairs as appropriate.

Reassembly

- Reattach drive assembly to drive flange. Secure drive shaft bolt, washer and key.
- Bolt the trough cover back to the trough.
- Unbolt motor from reducer as required. Be sure to support reducer to prevent spillage of lubricant.

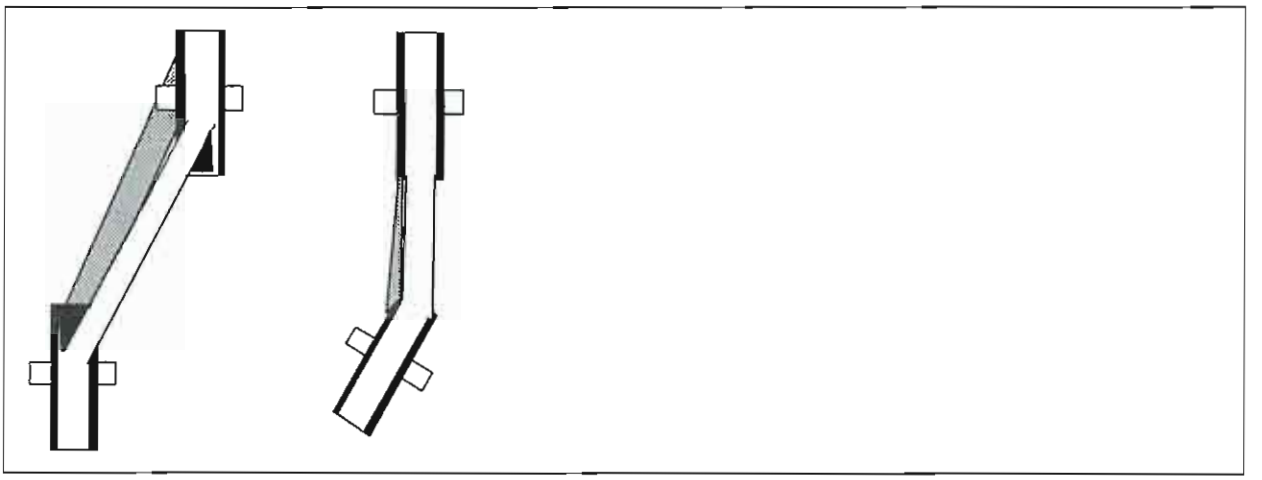
8.6 CURRENT SENSOR ADJUSTMENTS

WARNING

We recommend that current sensor adjustments only be made by a qualified electrician using an insulated screw driver. Adjustment of the current sensor must be accomplish with electrical power supplied to the control panel and with the unit in operation. Therefore, EXTREME CARE must be taken when making these adjustments because the possibility of electrical shock does exist. Turn the trip delay adjustment clockwise to its maximum setting. With the unit in operation, slowly rotate the trip point adjustment counterclockwise until the red LED light comes on, and then rotate the trip point knob back clockwise only enough for the red LED light to shut off. After the trip point setting has been made, rotate the trip delay adjustment counterclockwise to the minimum setting. Stop and restart the unit several times to confirm the trip point setting is high enough so the unit will not trip out under start up load. Should the unit trip out, turn the trip point knob clockwise slightly until the unit can start without tripping out.

8.7 V-BELT DRIVE

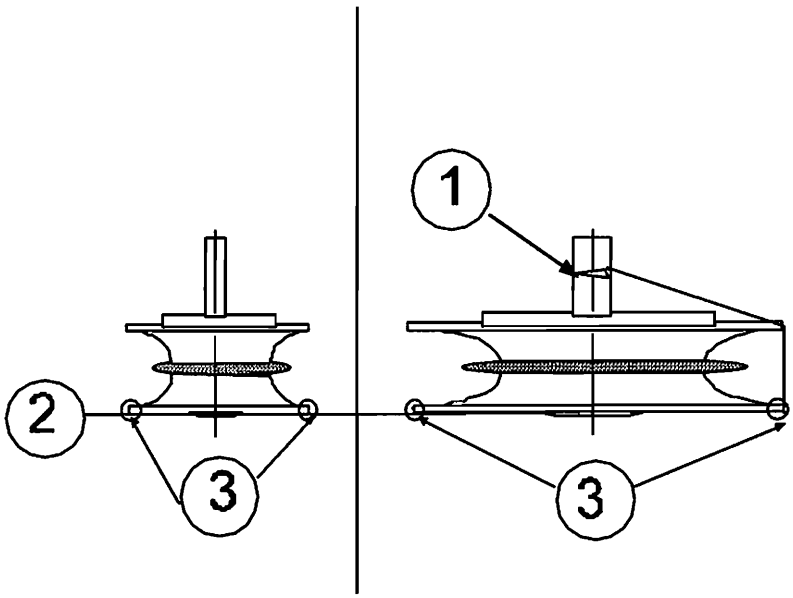
Misapplied or incorrectly assembled belts can over-load and cause overheating of the windings or the bearings. Follow instructions of the V-belt manufacturer carefully. A noisy drive should be corrected at once. Visual inspections are also helpful in finding trouble before a breakdown occurs. Rubber and some other belts are affected by oil and other liquids. For oily locations, use oil resistant belts. If the location is oily or dirty, use belts which are resistant to all petroleum derivatives. In case of overheating or bearing failures in the motor or drive shaft pillow block bearings, check the belts as a possible cause.



Misaligned Belts

When more than one belt is used on the same sheave they must all be matched (as to length). If one belt fails, the complete set of belts must be replaced with a set of matched belts. This is necessary to distribute the load among all the belts. Bearing overloading results from the use of belts of varying lengths on the same sheaves. It is possible to pull belts so tight that quick failure of the bearings or shafts will result. Sheave must be in line to keep from overloading the motor, as well as to get satisfactory service life from the equipment.

When a suitable straight edge is not available, misalignment of sheaves can be detected readily with the aid of a cord as shown in the drawing. Assuming that the shafts are parallel, as they should be, a light, strong cord secured around one shaft and held straight and tight along the sides of both sheaves should just touch at all points as shown. Each sheave can be checked by rotating it, and noting whether or not the rim contact with the cord is disturbed. If either of the rim contacts pull away, it indicates misalignment which must be corrected to obtain expected belt and equipment life.



1. CORD TIED TO SHAFT 2. CORD 3. WHERE CORD TOUCHES PULLEYS

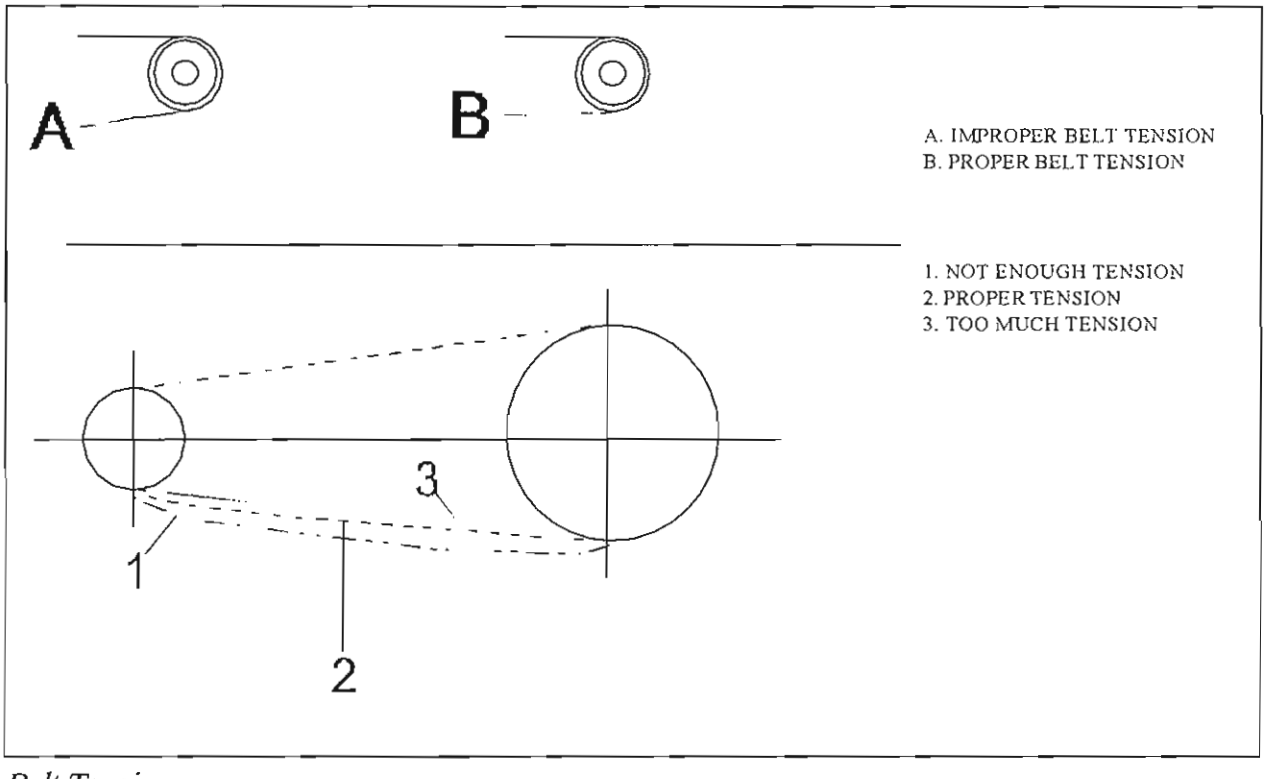
Sheave Alignment

Proper belt tension is important to provide full grip around the sheaves. While a V-belt does not depend on tension to provide grip, it is dependent on tension for the extent of its grip. As you can see from the diagrams, inadequate tension allows a V-belt to hang away from the bottom of a sheave, reducing the arc of contact. A properly adjusted V-belt is wrapped around the sheave in a full arc. Proper contact is important because horsepower ratings for the different sizes of V-belts are based on a 180 degree arc contact. Actually, this arc varies from one drive to another and allowance is made for the variation when the drive is engineered.

When a properly engineered drive is delivered to you, you must maintain that proper tension and proper contact arc. Otherwise, the belts will slip. Because many mills have no means to measure equipment in terms of pounds-pull, common practice is to measure by rule of thumb. Some of these rules are more superstition than science. Some are good. Perhaps the best one is this:

A slack V-belt feels dead when you thump it with your hand;

a properly taut V-belt has a live springiness.



Belt Tension

V-Belt Drive

CONDITION	POSSIBLE CAUSE	TO CORRECT
belt slips (side-walls glazed)	oil on belts	replace belts
	not enough tension	increase tension
mismatched belts	new belts installed with old	replace belts in matched sets
sheave grooves worn unevenly or improper groove angle	shafts not parallel	replace sheaves
		align drive
belt turned over	broken cord caused by pry-ing	replace belts correctly
	impulse loads	apply proper tension
	misalignment	realign drive
	worn sheave grooves	replace sheaves
	excessive vibration	check drive and equipment mounting
		consider banded belts
belt breaks	shock loads	apply proper tension
	heavy starting loads	apply proper tension
	belt pried over sheaves	use compensator starting
	foreign objects in drive	replace belts correctly
		provide drive shroud
belt wear	sheave grooves worn	replace sheaves
	mismatched belts	replace with matched belts
	belt slippage	increase tension
	sheaves misaligned	align sheaves
	oil or heat condition	eliminate oil
		ventilate drive

8.8 LUBRICATION

Application	Lubrication/Instructions	Manufacturer
motor	Replace sealed bearings every 10,000 hours of operation	
gear reducer	Mobilgear 630, mineral Mobilgear 629, mineral Mobil SHC 630, synthetic	Mobil Oil Corp. Mobil Oil Corp. Mobil Oil Corp.
LP adaptor (optional)	Mobilux EP-2 grease, mineral Aluania grease R3, mineral Mobilgear SHC 32, synthetic	Mobil Oil Corp. Shell Oil Corp Mobil Oil Corp.

9.0 SERVICE PARTS

9.1 RECOMMENDED PARTS

We recommend that you keep the following parts on hand for repairs and routine maintenance. This list does not include specific part numbers for your unit. You should refer to your certified drawings for individual part numbers or, if you would like a list of part numbers for your unit, contact:

Thermo Black Clawson Inc.

605 Clark Street, Middletown, OH 45042-0160

Phone 1-513-424-7400

North America emergency 24-hour service: 1-800-448-5422

Global emergency 24-hour service: 1-513-391-0881

Customer Service Department

Fax: 1-513-424-1168

IMPORTANT: When ordering spare parts or requesting a parts list, refer to the certified drawings and give the item number, drawing number, and part description, along with the product numbers. (Product identification numbers include the serial number, shop order number and model number.) Generally, allow eight to twelve weeks for delivery.

Do not modify the equipment without written authorization from Thermo Black Clawson. Unauthorized modification may impair the function, shorten the machine life, and render built-in safety features useless.

Recommended Spare Parts

Description	Quantity
gear reducer	one
motor	one
spiral	one
drive shaft	one
wear bar liner or optional rubber wear liner	one
wear bar bolt	one
wear bar bolt washer	one
optional hold-down wear bar	two

10.0 CUSTOMER INPUT

10.1 QUALITY ASSURANCE THROUGH CUSTOMER INPUT

As a Thermo Black Clawson customer, you can help us toward our goal of providing high quality manuals that meet or exceed our customers' expectations. We would like to hear from you if you have suggestions or comments that would help us toward this effort. From procedures to safety issues and other areas, your input and concerns are important to us. Perhaps we haven't described something as much as you think we should have. Maybe you have a technique that you'd like to share with us. If you have input that would help us improve our manuals, write or fax your comments to us:

Thermo Black Clawson Inc.
Technical Writing
605 Clark Street
Middletown, OH 45042 USA
Fax: 1-513-424-1168