

Intelligent Grapple Hoist

- Installation
- Operation
- Maintenance
- Service



Model(s): 4' (1.2m); 6' (1.8m)

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List of Additional Documents



Customers should always reference the Certified Drawings sent via the KBC Certified Drawings Package. The additional documents listed here are specific to the customer and installation site.

Certified Drawings

- Grapple Hoist Assembly and Installation
- Track System Assembly
- Lift Hoist System Assembly
- Hydraulic Carriage Assembly
- Grapple Shovel Assembly
- Electrical Assembly
- Controls Assembly
- P1 Main Control Panel
- P3 HMI Panel
- P2 Remote Cabinet
- JB1 Signal Junction Box
- JB2 Power Junction Box
- Paint and Nameplate Assembly
- Hydraulic Power Unit Assembly
- Dual Hydraulic Hose and Fittings Assembly
- Hydraulic Schematic
- Hydraulic Power Unit Hydraulic Schematic

Lift Hoist System Documents (Wire Rope Hoist)

- Hoist Data Sheet
- Stahl SH Wire Rope Hoists Manual
- Stahl SF Travel Drives Manual
- Stahl Overwinding Protection Manual
- Stahl Multicontroller SMC22 Manual
- Stahl Electrical Drawing Package

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Models: 4' (1.2 m) | 6' (1.8 m)

- Stahl Lift Hoist System Drawing
- Stahl Multicontroller SMC22 Troubleshooting Instructions
- Stahl SMC22 Configuration
- Stahl Device List
- Stahl SH Wire Rope Hoists Spare Parts List
- Stahl SF Travel Drives Original Parts List

Lift Hoist System Documents (Encoder)

- Dynapar Series H20 Shafted Encoder Datasheet

Lift Hoist System Documents (Wireless Remote Control Pendant and Receiver)

- Stahl Wireless Remote Control Pendant Wiring Diagram
- Panther Modified Manual
- Tele Radio Panther PN-T19-2 Transmitter Datasheet
- Tele Radio Panther T19 End User Instructions
- Tele Radio Panther PN-R15-2 Receiver Datasheet
- Tele Radio Panther R15 End User Instructions

HMI Documents

- Alarm Reference Guide

Position Sensor Documents

- IFM Inductive Kplus Sensors Info Card
- IFM IM5129 Inductive Sensor

Rotary Limit Switch Documents

- Schneider Electric XCKMR54D1H29 Product Data Sheet
- Schneider Electric XCKMR54D1H29 Instruction Sheet

Hose Reel Documents

- Hannay ISO 8 Parts List Series 600 Spring Retractable Reel for Twin Hoses
- Hannay TSB 2013.06.003 Changing a Hannay Spring Motor
- Hannay TSB 2013.07.005 Installing Hose or Cable on a Hannay Spring Retractable Reel
- Hannay TSB 2013.08.007 Super Swivel Balanced Pressure Joint Seal Repair
- Hannay TSB 2013.08.010 Super Swivel Full Flow Joint Seal Repair
- Hannay Super Swivel Lubrication Procedure

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Hydraulic Cylinder Documents

- Parker Heavy Duty Hydraulic Cylinders – Gen II Manual

Hydraulic Power Unit Documents

- Wainbee HPU Manual
- Wainbee HPU Hydraulic Schematic
- Barksdale Generation 3000 BPS3000/BTS3000/BLS3000 Datasheet
- Barksdale BPS3000 Operating Instructions
- Barksdale BTS3000 Operating Instructions
- Barksdale BLS3000 Operating Instructions
- Techtop Motor Data Package
- Anfield Hydraulic Gear Pump Datasheet
- Stauff Hydraulic Accessory Catalog (Suction Strainer, Filler Breather Basket)
- Parker Desiccant Breathers Catalog

Spare Parts Documents

- Spare Parts List

1 Introduction

This Product Manual was written to include information specific to the equipment and includes model configurations/modules that may not apply to this equipment.

This section contains information which will familiarize personnel with structure, content, and conventions of this Product Manual. It also describes who should read this Product Manual and provides information on how to order parts or contact Kadant.

1.1 Trademarks

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

The following is a list of terms and names that may be used in this manual and, as of the date of publication, are trademarks or registered trademarks of Kadant.

Table 1-1: Kadant Black Clawson Product Listing

Agi-Pulper™	Hi-Con™ Pulper	Rag Rope Cutter
Agitec II™ Propeller Agitator	High Density Extruder	Ragger, 24" and 30"
Batch Scavenger®	HL10 Rotor	SansGrit™ Sand Separator
BCV™ Pulp Washer	HV-2 Hydrapulper®	ScreenONE™
CH® Pressure Screen	Hydradenser™	Selectifier®, 60NP
Chemi-Washer®	Hydraflaker™	Selectpurge™ Screen
Continuous Lights Detrasher	Hydraflow™ Trash Pump	Seven-Finer™ Deflaker
Continuous Scavenger™	Hydrapulper®	Slotted Diabolo™ Screen
Cyclotech™ Forward Cleaner	Hydrapulper®, Two-Foot	SPH® Slotted Approach Flow Screen
D Hydrapulper®	Hydrapurge™ II & II-X Detrasher	STR Valve
Diabolo® Screen	Hydrapurge™ III Detrasher	SPM®/SPH® Screen
DiaboloFiner® Screen	Hydrascreen™	Sydrapulper™
Direct Discharge™ Disk Filter	Hy-Tec™ Pressure Knotter	Trashwell
DNT™ Washer	ID-2™	Triturator/Kneading Disperser
Double Separator	ID-3™	Twin Hydradisc® II Refiner
Drum Pulper	Impulse™ Rotor	Twin Hydradisc® III Refiner
Drum Pulper (K)	K-Tek® Cylinders	Ultra Twin-Flyte™ Kneader
Fibercone™ Press	K-Tek® Screen Seal	Ultra-Clone™ Cleaner
FiberNET™ Screen	K-Tek® 8 Screen Cylinder	UltraSorter™
FiberNET™ Retrofit	K-Rotor™ Screen Rotor	Ultra™ Screen
Fibersep™	KV Sydrapulper™	Ultra-VC™ Screen
FibreWall® Screen	K-Wave™	Ultra-V™ Screen
Flex-S Washer	Liquid Cyclone™ EX Head	V-Max™ Screen Cylinder
Float Purger™ Screen	Liquid Cyclone™ Valve	Vertiscreen™
Free-Flo™ Thickener	Liquid Cyclone™/Ruffclone™	Vokes™ Rotor
Goslin™	Liqui-Filter™	Vortech® Rotor
Grapple Hoist	Lo-Profile™	X-Clone™ Cleaner
Gyroclean® Cleaner	MAC™ Deinking Cell	XX-Clone™ Cleaner
Heli-Disc™ Rotor	Maximizer™ Bedplate	XCEL™ Cleaner
Helico® Pulper	Mid-Con™ Pulper	XCEL™ NT Cleaner
Helidrum™ Pulper	Mini-Pressure Screen	XCEL™ NT Recovery™ Cleaner
Helisoft® System	PH/PS Screen	Xtreme™ Cleaner
Helipoire® System	Powr-Savr™ Rotor	

1.2 Who Should Read This Product Manual

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

This Product Manual is intended for all personnel responsible for operating, maintaining, and servicing the equipment. It provides information about properties and technical functions of the system and the measures necessary for continuous operation. Keep this Product Manual legible and readily accessible to personnel maintaining or operating the equipment.

All personnel working with the equipment must carefully read this Product Manual before the equipment is put into operation. Kadant assumes no liability for damages and operating failures resulting from the user failing to read, understand, and follow operating instructions.



Personnel who do not work directly with but may work near or around the equipment should at minimum read all of Section 2, Safety. Section 2, Safety has important information about potential equipment hazards.

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

1.3 Customer Service

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

This Kadant equipment is designed to give trouble-free operation with minimum maintenance; however, certain precautions and procedures must be observed in handling, installing, and servicing the equipment to obtain optimum performance.

Information in this Product Manual should cover most situations; however, do not operate the equipment if questions about safe operation or maintenance exist. Questions can be answered by contacting Kadant Black Clawson LLC, Kadant Fiberline (China) Co., Ltd, or Kadant Lamort SAS (France), depending upon your region.

Kadant Black Clawson LLC

Business Hours: 1-513-229-8100

North America 24-Hour Emergency Service: 1-800-448-5422

Global 24-Hour Emergency Service: 1-888-535-3993

Fax: 1-513-229-8197

1425 Kingsview Dr.
Lebanon, Ohio 45036

Kadant Fiberline (China) Co., Ltd

Business Hours: +86-537-207 3188/+86-156 5379 5398

China 24-Hour Emergency Service: +86-139 1009 8235

Fax: +86-537-2073002

No. 99 Jidiyanyilu
High-New Technical Industry Development District
Jining, Shandong 272023, P.R. China

Kadant Lamort SAS

Business Hours: +33 (0) 3 26 74 80 80

Fax: +33 (0) 3 26 72 08 33

Lamort 24-Hour Emergency Service: +33 6 61 79 21 87

39, rue de la Fontaine Ludot BP 30046
51302 Vitry-le-Francois cedex
France

1.3.1 Ordering Parts

Please provide **all** the following information when ordering parts:

- Company name
- Contact name
- Phone number
- Unit model: **Intelligent Grapple Hoist**
- Unit serial number
- Job or shop order number
- Model number



Part numbers are not provided in this Product Manual. Refer to the Certified Drawings for the correct part numbers.

1.3.2 Nameplate

Refer to the nameplate on the equipment for the serial number and job number.

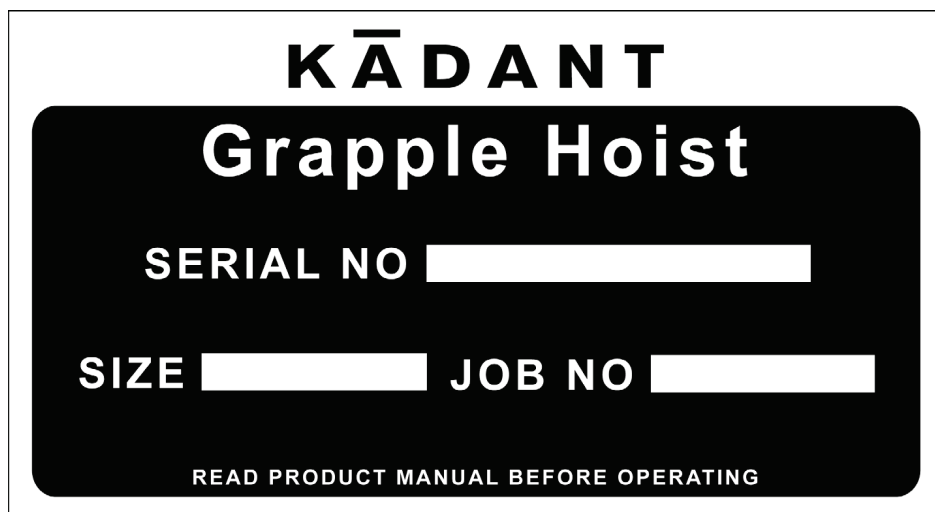


Figure 1-1: Nameplate: Intelligent Grapple Hoist

1.4 Purpose of this Product Manual

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

This Product Manual is for general information and guidance. For specific information concerning parts or items, refer to the Certified Drawings of the equipment.

This Kadant equipment will provide many years of dependable service when installed, operated, and maintained according to Kadant's recommended procedures. Instructions in this Product Manual are recommended procedures for installing, operating, and maintaining the equipment. Correct installation of the equipment is critical. Reasonable operation and maintenance will not compensate for poor installation.

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



All information, illustrations, and specifications in this Product Manual are based on the latest information available at the time of publication. Kadant reserves the right to change this Product Manual at any time without notice.

1.5 How to Use this Product Manual

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

This Product Manual is a structured document. It uses certain conventions to organize and present technical information.

Understanding the structure and conventions of this Product Manual will improve the ability to use this Product Manual to operate and maintain the equipment.

1.5.1 Structure of Product Manual

This Product Manual is divided into functional sections. It is important to be familiar with the contents of each section and to know where to find information. Each section is described briefly by its function and contents.

Table of Contents

The Table of Contents outlines the sections and procedures contained in this manual. Use the Table of Contents to quickly find the location of a specific procedure.

List of Figures

The List of Figures is a listing of the locations of specific illustrations. These illustrations or figures are often useful references. Do not use figures out of procedural context.

List of Tables

The List of Tables is a listing of the locations of specific tables. Tables present information in an organized arrangement of text in cross-referenced rows and columns.

Introduction

The Introduction section (this section) contains information to familiarize personnel with structure, content, and conventions of this manual. It also describes who should read this manual and provides information on how to contact Kadant if questions exist.

Safety

The Safety section contains general safety information about hazards, function, and personnel safety. All personnel working on, with or near the unit should read and understand Section 2, Safety. Personnel must be completely familiar with the hazards and safety concerns before approaching the unit.

Overview and Specifications

The Overview and Specifications section provides equipment specifics and a cognitive overview of the components. The overview will also help personnel become familiar with the unit.

Installation and Storage

The Installation and Storage section includes general installation instructions, electrical installation procedures, general inspection instructions, and general storage instructions.

Operation

The Operation section has instructions for each operational procedure for the unit. The operators are to read and reference all instructions before performing any operating procedures to the unit. All operating procedures are defined and assist in the chronological steps necessary to start, run or shutdown the unit. A troubleshooting section is provided to help solve any faults the unit may incur during operation.

Maintenance

The Maintenance section includes all information needed to inspect and maintain unit components, including a recommended routine maintenance schedule.

Spare Parts

The Spare Parts section includes a list of recommended spare parts to stock, instructions for ordering parts, and contact information for Kadant.

Glossary

The Glossary section includes a list of terms that may be specific to this manual, unit or industry. The terms are presented with a description for reference.

1.5.2 Defined Terms

Certified Drawings

The Certified Drawings are top-level assembly drawings of the unit prepared by Kadant upon receipt of the purchase order and returned approval drawings. These drawings provide information such as part numbers, overall dimensions, installation specifications, unit weight information, and utility requirements. The Certified Drawings are not included in this Product Manual but are supplied to the customer separately.

Product Manual

The Product Manual is sent upon completion of the Certified Drawings.

Shipping List

One copy of the Shipping List is sent with shipment and one copy is sent to the mill the day of shipment.

1.5.3 Procedural and Information Symbols

The following symbols are used throughout this Product Manual to help quickly identify different types of information.

Symbol	Description
	Functional Description: This symbol identifies any functional description for the equipment, assemblies and/or components.
	Information: This symbol identifies useful tips or gives important information to improve understanding of the descriptive or procedural text.

1.5.4 Hazard Notifications

Procedures that have specific hazards associated with the process, contact materials or unit are preceded by hazard notifications. These hazard notifications give important information about how to avoid hazards, what hazards are, and what can happen if hazards are not avoided. Read, understand, and follow these hazard notifications.

Throughout this Product Manual, there are four types of hazard notifications as follows:

DANGER



Notifications with the DANGER signal word identify imminent hazards that, if not avoided, will result in severe personal injury or death.

WARNING



Notifications with the WARNING signal word identify potential hazards that, if not avoided, could result in serious personal injury or death.

CAUTION



Notifications with the CAUTION signal word identify potential hazards that, if not avoided, could result in serious personal injury.

NOTICE



Notifications with the NOTICE signal word identify potential hazards that, if not avoided, could result in equipment or product damage only.

1.5.5 Importance of Procedural Sequence

Importance of the sequence that procedural steps are performed varies depending on procedure. For some procedures, it is important that every step is performed in order presented. Other procedures may not require that steps follow a specific sequence. To identify the difference, the following conventions are used in this Product Manual:

Numbered Steps

Numbered steps are used to show that it is important to perform procedural steps in exact order presented/numbered.

Example: Start the equipment as follows:

1. Start the feed pump.
2. Open the accept valve.
3. Adjust the valves for pressure.

Bulleted Items/Steps

Bulleted items/steps indicate that the performed order of the item/step is not important. These steps are independent of each other and are not sequence dependent. Although these steps can be performed in any order, all must be completed before proceeding to next procedure.

Example: Do not start the equipment until the following conditions are met:

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

1.5.6 Illustrations

Illustrations are used to supplement and clarify procedural text. For clarity, illustrations only show what is necessary to support the procedure and may not show protective guards and surrounding parts.

Always follow the procedure that refers to the illustrations. Never use illustrations alone to perform a procedure or determine acceptable operating condition of unit.

Always be aware of surrounding parts and potential hazards.

Numeric callouts are used to identify parts in illustrations that are referenced in text. Some illustrations have callouts that are not referred to in the text but are there for supplemental reference only.

Illustrations may depict unit components or situations that differ in some respects from this exact unit. The illustrations are intended to provide a guide for learning and is not intended to be an exact depiction.

2 Safety



WARNING

Follow all safety instructions. All industrial equipment, like this equipment, has inherent hazards. Failure to understand and follow all safety instructions can result in equipment damage, serious personal injury or death.

Thoroughly read Section 2, Safety before attempting to operate the equipment. This section presents general safety information that is not related to any specific equipment procedure and, therefore, does not appear elsewhere in this Product Manual. Safety information that applies to specific operation and maintenance procedures is included with each procedure.

2.1 Introduction

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

Before starting the equipment, read and understand the operating instructions for the entire system. Follow the recommendations in this Product Manual to make sure personnel are safe and the equipment operates properly. Some situations may require additional procedures and safety measures.



The purchaser of the equipment is responsible for making sure personnel are trained in the safe operation and maintenance of the equipment.



Make sure that all personnel that operate or work on the equipment thoroughly read and understand the entire contents of this Product Manual, paying particular attention to all safety precautions. Kadant recommends refresher sessions that cover the safety, operation, and maintenance procedures periodically throughout the life of the equipment.



Kadant offers qualified field service instructors to help train operators and maintenance personnel. See Section 1.3, Customer Service on Page 1-20 for contact information.

Do not attempt to operate or maintain this unit if safety questions exist.

2.2 General Information

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

The design and construction of Kadant equipment meets or exceeds applicable standards contained in the current American National Standards Institute (ANSI), German Industrial Standard (DIN), International Organization for Standardization (ISO), and Occupational Safety and Health Administration (OSHA) publications for pneumatic fluid power systems.

Actions and behavior of personnel are the single most important factors for the continued safe operation of the unit. No matter how many safety precautions are taken, if the equipment is not used correctly, or if personnel do not practice safe behavior, unit damage, serious injuries or death can occur.



Always be alert, recognize and avoid hazards.

2.3 Intended Use

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

This unit is designed to meet specific requirements for separating debris from fiber as outlined in Section 3, Overview and Specifications on Page 3-42. Any other use of this equipment is considered inappropriate and potentially unsafe.

NOTICE

Do not modify the equipment without written authorization from Kadant. Unauthorized modifications may impair equipment function, shorten equipment life, render built-in safety features useless, void the warranty, or result in serious injury or death.

To avoid inappropriate use, follow these guidelines:

- Only allow authorized Kadant personnel to setup or modify equipment.
- Do not operate the equipment until it has been fully integrated into system.
- Inspect the equipment before starting and make sure 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 unit.
- Carefully read all safety messages in this Product Manual and equipment safety signs.
- Keep safety signs in good condition, clean, and legible.
- Replace missing or damaged safety signs.
- Keep unit in proper working condition.
- Make sure all guards, interrupt switches, and other protective devices are present, properly installed, and fully functional before operating the equipment.
- Do not override guard interrupt switches, valves, and other control components.
- Report and eliminate all faults and damage immediately.
- Do not alter any operating conditions of the equipment.
- Do not install or incorporate individual components from other equipment.
- Allow only authorized and trained personnel to perform operation and maintenance procedures described in this Product Manual.

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

- Do not perform service or maintenance work on this equipment until Zero Energy State (ZES) has been achieved. See the entry for ZES as defined in Section 8, Glossary on Page 8-264 and confirmed by the step-by-step Zero Energy State (ZES) Checklist in Table 2-1 on Page 2-38.
- Do not allow personnel who do not meet requirements set forth in these instructions to operate or maintain the unit.



Kadant is not responsible for any damage resulting from inappropriate use of unit under any circumstances.

2.4 Safety Features of All Equipment

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

These features apply to the entire Kadant product line. For additional instructions for the specific unit covered by this Product Manual, see Section 2.5, Safety Instructions: Grapple Hoist on Page 2-39.

2.4.1 Emergency Stop



Kadant does not provide E-STOP pushbuttons. The customer is responsible for E-STOP functionality.

If the unit was shut down because of a problem, make sure problem is fixed by qualified personnel before restarting unit.

2.4.2 Protective Guarding



WARNING

Do not open or remove protective guarding if energy is supplied to any part of unit, even if power switch is in OFF position or power source is locked out. Perform the Lockout/Tagout Procedures described in Section 2.4.5.1 on Page 2-36.



WARNING

Make sure all connected equipment is in ZES as defined in Section 8, Glossary on Page 8-264 and confirmed by the step-by-step Zero Energy State (ZES) Checklist in Table 2-1 on Page 2-38. Some automatic equipment connected to a locked-out power source may not be in ZES, and could move, causing serious personal injury or death.



WARNING

Do not remove protective guarding around valves or drives while unit is running. The guarding is not connected to a safety interlock system. Opening or removing the guarding will not cause the unit to stop. Failure to follow this instruction may result in serious personal injury or death.

**WARNING**

Protective guarding is installed around unit areas or components that may cause injury to personnel. Use caution when removing protective guarding. If guarding is not connected to a safety interlock system, opening, or removing guarding **will not** cause the unit to stop.



For reasons of clarity, the figures used in this Product Manual may not show protective guards and surrounding parts. Always follow the procedure that refers to the figure. Never use figures alone to perform a procedure or to determine the acceptable operating condition of the unit. Always be aware of surrounding parts and potential hazards.

2.4.3 Signal Words in this Product Manual

**DANGER**

This sign identifies imminent hazards that, if not avoided, will result in severe personal injury or death. The DANGER label has a red field with white lettering.

**WARNING**

This sign identifies potential hazards that, if not avoided, could result in serious personal injury or death. The WARNING label has an orange field with black lettering.

**CAUTION**

This sign identifies potential hazards that, if not avoided, could result in minor or moderate personal injury. The CAUTION label has a yellow field with black lettering.

NOTICE

This sign identifies potential hazards that, if not avoided could result in equipment or product damage only. The NOTICE label has a blue field with white lettering.

2.4.4 Hazard Signs

Markings, signs, and other written warnings are displayed on the unit to identify potential hazards for personnel operating, servicing, or working within close proximity to the unit. Examples of typical hazard signs are shown in Figure 2-1 on Page 2-34. Pay special attention to these notices and be aware of hazards.

All signs and decals must remain on the unit, be legible, and be in good condition. Replace any signs that are damaged, removed, or permanently hidden from sight. Order any replacement signs immediately. If any sign is no longer legible, use the description, size, and mounting location to re-order the sign.

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

2.4.4.1 Hazard Sign Examples

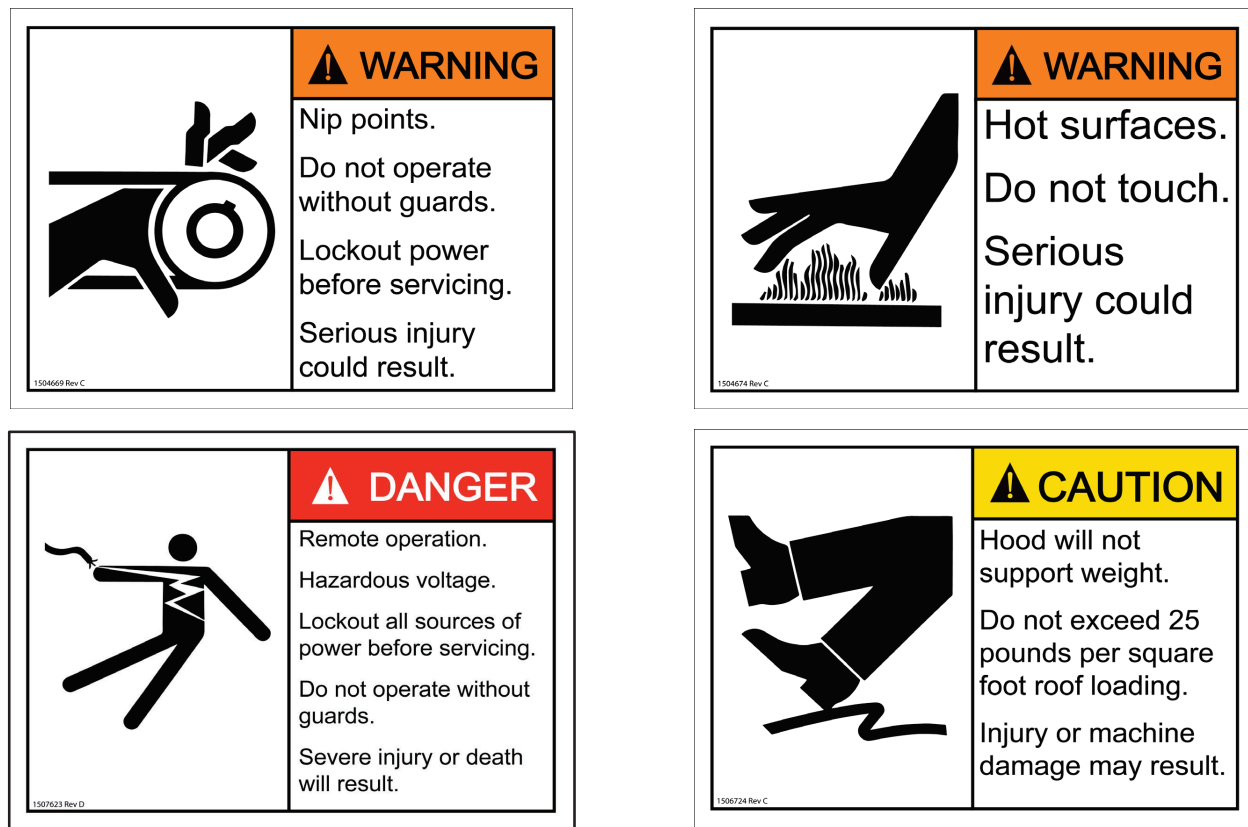


Figure 2-1: Hazard Sign Examples

2.4.4.2 Signal Icons on All Kadant Equipment

The triangle in Figure 2-2 is the International Safety Alert Symbol that can be seen on the unit. It signals potential for personal injury. Follow recommended precautions and safe operating practices. The triangle is accompanied by either the words DANGER, WARNING or CAUTION. The definitions for these signal words are found in Section 0, Signal Words in this Product Manual on Page 2-33.



Figure 2-2: International Safety Alert Symbol

2.4.4.3 Provided Laminated Safety Sign

Post the laminated safety sign(s) provided by Kadant (Figure 2-3) in plain view on or near the unit at installation. Post multiple signs that are visible to all plant personnel. Keep the signs clean.

SAFETY INSTRUCTION

STOCK PREPARATION AND PULP MILL EQUIPMENT

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

DO NOT PROCEED until personnel have READ and UNDERSTAND these instructions.

1. READ and UNDERSTAND the product manual and ALL applicable OSHA regulations (29CFR1010.261).
2. FOLLOW the SHUT-DOWN PROCEDURE in the product manual.
3. The unit must be brought to a ZERO ENERGY STATE and LOCKED OUT with a PERSONAL PADLOCK BEFORE any maintenance, inspection, cleaning, adjusting or servicing is performed.
 - a) The 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, gas systems and flows of material stock.
 - d) Place or attach a "DANGER - PERSONNEL WORKING" sign near lockout.
 - e) BLOCK any rotation elements to prevent accidental rotation.

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

NEVER REMOVE another person's lockout, padlock or tag.

DO NOT assume the unit is locked out. ALWAYS check status of unit.

NOTE: If service is not independent of the main supply, DO NOT PROCEED. Contact supervisor.

4. DO NOT ENTER vessel or unit unless at least ONE OTHER PERSON IS OUTSIDE the viseral unit at all times. Certain vessels require use of harnesses, gas masks and other specialized safety equipment.
5. Upon completion, follow the START-UP PROCEDURES in the product manual.
5. NEVER START the unit UNLESS -
 - a) All personnel are clear of unit.
 - b) All doors and hatches are closed.
 - c) All guards and covers are in place.

If questions exist, contact supervisor.



TOLL FREE 24-Hour Emergency Service: 800-448-5422
1510196 Rev C

Figure 2-3: Laminated Safety Instructions Sign

2.4.4.4 Guidelines for OEM Equipment Supplied by Kadant

**WARNING**

Read the manuals and follow recommended procedures for ALL associated OEM equipment before operating this unit. Operating OEM equipment without following recommended procedures could result in serious personal injury or death.

Unit may include ancillary equipment or sub-assemblies manufactured by Kadant's vendors. Examples include dewatering device/screw on rejects, pump and piping on feed and accepts, additional dilution connections, etc. In addition to following safety practices described in this Product Manual, refer to OEM machinery instructions for ancillary equipment for any additional necessary safety precautions or practices. Do not operate this unit until manuals have been read for all equipment.

2.4.5 Lockout/Tagout Guidelines

Many equipment maintenance procedures require removal of all sources of energy to the unit. Kadant recommends at minimum that following areas be locked out and tagged out when performing maintenance tasks on the unit.



Your facility may have procedures for lockout/tagout that are more stringent or vary from these recommendations. Make sure to follow Standard Operating Procedure (SOP) for your current facility.

2.4.5.1 Lockout/Tagout Procedures

**WARNING**

Follow the lockout/tagout procedures according to your facility's SOP. The following procedure is only a suggestion and may not contain all the steps required to safely lockout/tagout the unit at the current facility. Failure to follow these instructions can result in serious personal injury or death.

To lock out all sources of energy:

1. Switch off and lock out main electrical disconnect.
2. Switch off and lock out any additional electrical sources listed according to facility SOP for lockout/tagout.
3. Apply identifying tags to locked-out devices according to facility procedure.

**WARNING**

Contact a supervisor and do not proceed to the following steps if services are not independent of main supply. Services that are without lockout/tagout may cause serious personal injury or death.

Bring unit to ZES, including but not limited to the following actions:

- Closing off and diverting stock lines.
 - Turning off and locking out all chemical and gas systems.
-

**WARNING**

Never remove another person's lock (padlock) or tag. The person who originally placed the lock/tag is the only person permitted to bring the unit out of the lockout/tagout state. Bringing the unit out of lockout/tagout incorrectly may cause unit movement, causing serious personal injury or death.

-
1. Lock out any other sources of energy.
 2. Use the Zero Energy State (ZES) Checklist (Table 2-1 on Page 2-38) to confirm that the unit has been correctly placed in lockout/tagout state.
-

2.4.5.2 Removing Lockout/Tagout



To remove lockout controls, perform the steps in Section 2.4.5.1, Lockout/Tagout Procedures on Page 2-36 in reverse order.



Refer to Section 5, Operation on Page 5-115 for instructions on starting the unit.

2.4.6 Confirming Equipment Zero Energy State (ZES)

Use the following Zero Energy State (ZES) Checklist (Table 2-1 on Page 2-38) to confirm the unit is in Zero Energy State (ZES) before performing any maintenance on the unit.



WARNING

Follow your facility's Zero Energy State (ZES) Standard Operating Procedure (SOP). The following procedure is only a suggestion and may not include all the steps required to safely Lockout/Tagout equipment at your facility. Failure to follow this instruction could result in serious personal injury or death.

Table 2-1: Zero Energy State (ZES) Checklist

Step	Complete	Action
1		Every power source that can produce an equipment member movement has been locked off.
2		Pressurized fluid (air, oil, water, paper slurry or other) power lockoffs (shut-off valves), if used, are blocking pressure from power source and will reduce pressure on equipment side port of that valve by venting to atmosphere or draining to tank.
3		All accumulators and air surge tanks are reduced to atmospheric pressure, or treated as power sources to be locked off, as stated in Step 1 and Step 2.
4		The mechanical potential energy of all portions of equipment is at its lowest practical value, so that opening of pipe(s), tubing, hose(s) or actuation of any valve(s) will not produce a movement that could cause injury.
5		Pressurized fluid (air, oil, water, paper slurry or other) trapped in equipment's lines, cylinders or other components is not capable of producing an equipment motion upon actuation of any valve(s).
6		The kinetic energy of equipment members is at its lowest practical value.
7		Loose or freely movable equipment members are secured against accidental movement. Note: A workpiece or material supported, retained or controlled by equipment shall be considered part of the equipment if workpiece or material can move or can cause equipment movement.

2.5 Safety Instructions: Grapple Hoist

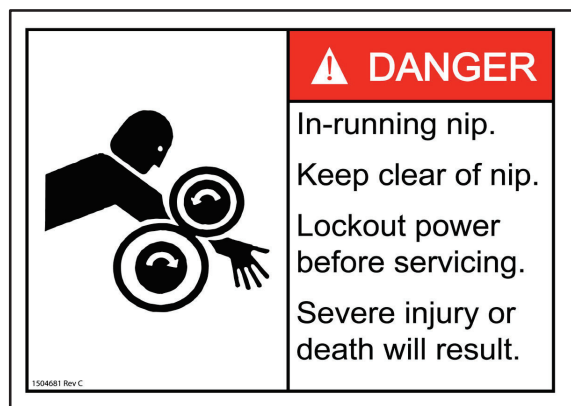
Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

2.5.1 Overview

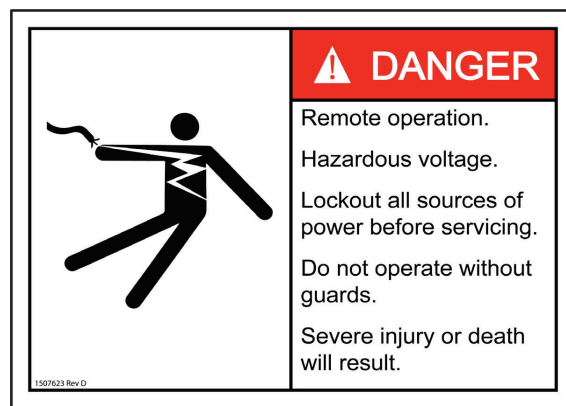
This section applies specifically to the Grapple Hoist product line.

2.5.2 Hazard Signs: Grapple Hoist

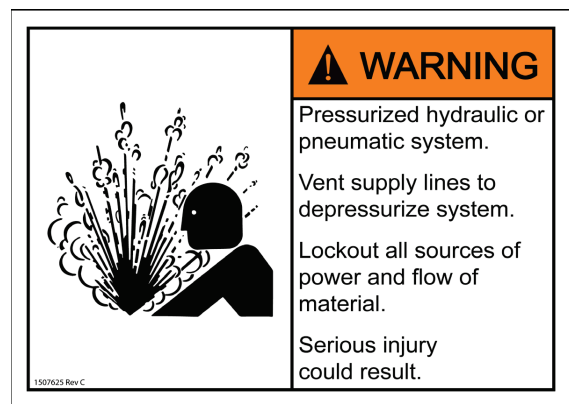
The following hazard signs are found on the unit. These signs are installed at the factory and should remain on the unit for the life of the machine. Keep the signs clean and legible. Do not remove the signs unless replacement signs are on-hand and installed immediately after the old signs are removed.



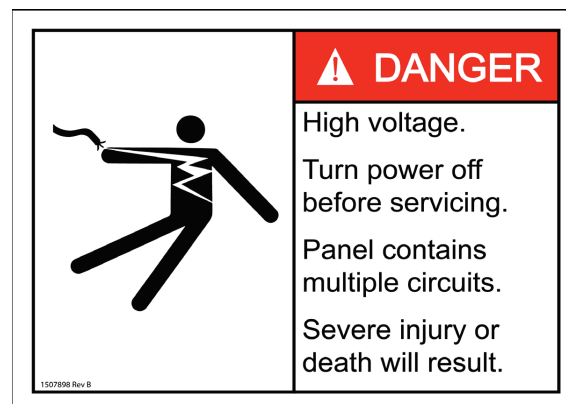
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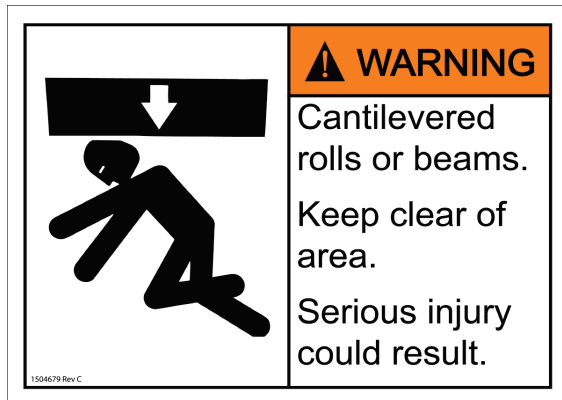


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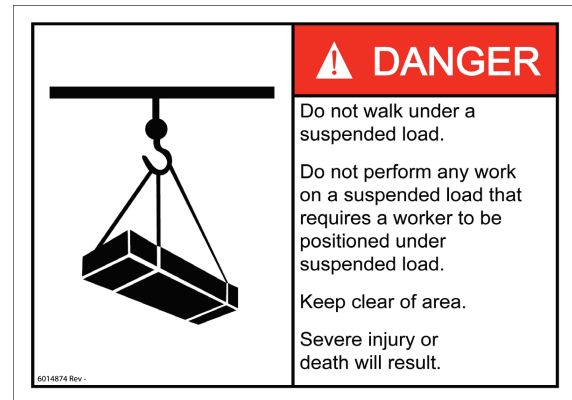


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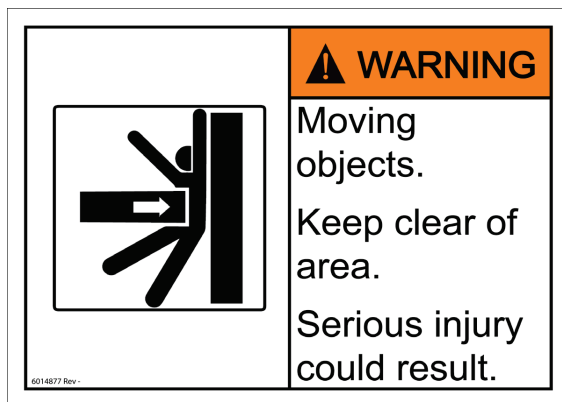
Figure 2-4: Hazard Signs on the Unit (1 of 2)



1504679



6014874



6014877

Figure 2-5: Hazard Signs on the Unit (2 of 2)

2.5.3 Safe Behavior: Grapple Hoist



WARNING

Follow all safety instructions. All industrial machinery, like this unit, has inherent hazards. Failure to understand and follow all safety instructions can result in unit damage, serious personal injury and/or death.



Follow the instructions below to safely handle hazardous conditions that are specific to the unit.

Table 2-2: Safe Behavior: Grapple Hoist

Machine Area/Situation	Hazard	Response
WARNING		
Servicing Motor Drive Unit	Do not expose electrical units to water. Shut down and lock out the unit before cleaning or servicing. Do not operate the unit with covers, hoods or guards removed. Manual rotation of rotating elements may be required with enclosures removed. Make sure all personnel are clear of unit before manually rotating the rotor. Amputation or severe injury to fingers, arms, or hands can result in serious personal injury or death.	Bring the unit to Zero Energy State (ZES). Lockout/Tagout all energy sources. Clean or service the motor drive unit. Manually rotate the drive unit elements as needed.
WARNING		
Working around moving V-Belts, Sheaves and Drive Shafts.	Do not operate the unit with guards removed. Make sure the unit is shut down and lockouts are in place before installing guards that have been removed. Amputation or severe injury to fingers, arms, or hands can result in serious personal injury or death.	Bring the unit to Zero Energy State (ZES) Lockout/Tagout all energy sources. Always shut down the machine and lock out.

3 Overview and Specifications

This section provides Grapple Hoist specifics, an overview of the basic components, use of the equipment, and explains how it works to remove heavy contaminants.

3.1 Grapple Hoist Description

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

3.1.1 Overview



The Intelligent Grapple Hoist (Figure 3-1 on Page 3-45) is designed to remove trash from a Kadant Trashwell attached to a Kadant Hydrapulper®. The unit can operate in either manual or automatic mode. As trash accumulates in Trashwell, it must be periodically removed. Frequency of trash removal is based on operating conditions and cleanliness of material fed to Hydrapulper®.

Grapple Hoist Models, Applications, and Features

3.1.1.1 Models

Table 3-1 lists the available Grapple Hoist options.

Table 3-1: Grapple Hoist Options

Grapple Size	4' (1.2 M)		6' (1.8 M)	
Voltage	460V	575V	460V	575V
Lift	42' (12.9 m)	42' (12.9 m)	42' (12.9 m)	42' (12.9 m)

3.1.1.2 Applications

Grapple Hoist is suitable for the following applications:

- Removal of heavy contaminants from the Hydrapulper, Trashwell, and Wash Tower.

3.1.1.3 Benefits

Grapple Hoist provides the following benefits:

- Heavy-duty Construction
 - Reliable service components with extended life operating cycles.
 - Forged and stainless-steel construction.
- Improved Performance
 - Consistent cycling to prevent build-up of heavies.
 - Complete PLC automatic control interfacing with DCS for logging and alarming.
 - Variable Frequency Drive (VFD) control of hoist and trolley speeds for ensured smooth movement.

Intelligent Grapple Hoist**Models: 4' (1.2 m) | 6' (1.8 m)**

- **Low Maintenance**
 - Precise programmed control and slack line sensing ensures proper positioning.
 - Top-feeding orientation of hose reel minimizes hose and fitting wear.
 - Hoist bearings and gearing are oil lubricated for the life of the unit.
- **Cost Effective**
 - Automated operation saves labor cost previously dedicated to manual control.
- **Safety**
 - Hoist cable jump alarm.
 - Debris switch protects cable spool area.
 - Sound and flashing light alerts.

3.2 Overview of Operation

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.



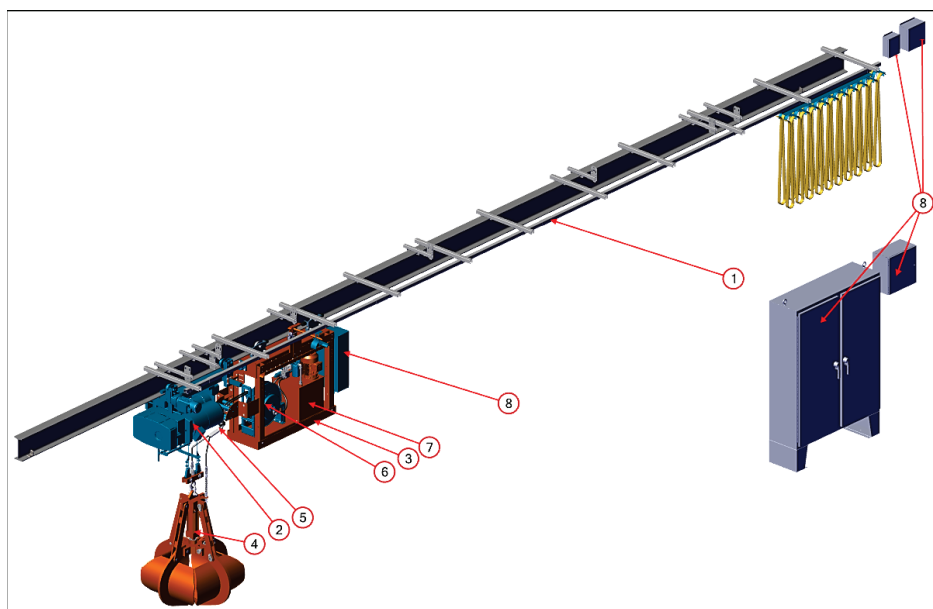
The Grapple Hoist is a system that manages heavy reject material in the pulping loop. The Lift Hoist System moves the Grapple Shovel horizontally and vertically. The hydraulic system opens and closes the Grapple Shovel. These movements allow the Grapple Shovel to remove heavy reject material from both a Trashwell and Wash Tower. This heavy material can then be transported along the beam travel length and disposed of through a chute or bin. The pick sequence and timing can be adjusted to meet the requirements for each application.

3.2.1 Unit Overview and Movement

3.2.1.1 Unit Overview

Figure Legend

- 1 Track System
- 2 Lift Hoist System
- 3 Hydraulic Carriage
- 4 Grapple Shovel
- 5 Dual Hydraulic Hose and Fittings
- 6 Hose Reel
- 7 Hydraulic Power Unit
- 8 Electrical and Controls System



Note: Some parts not shown for clarity.

Figure 3-1: Unit Overview

Track System (1) includes a customer-supplied beam that defines the horizontal path for the Grapple Hoist moving components. The Travel Drive Motor on Lift Hoist System (2) drives Lift Hoist System (2) and Hydraulic Carriage (3) horizontally along Track System (1).

Intelligent Grapple Hoist

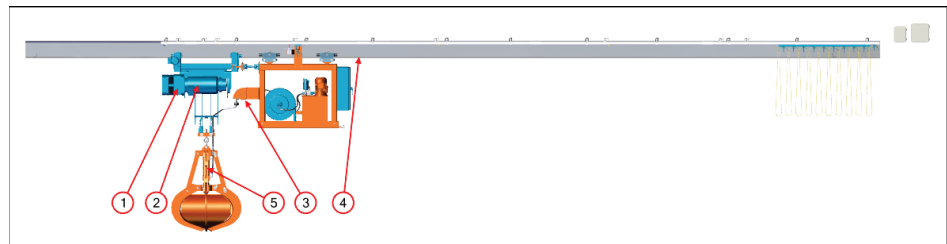
Models: 4' (1.2 m) | 6' (1.8 m)

Grapple Shovel (4) is suspended from Lift Hoist System (2). The Hoist Motor on Lift Hoist System (2) drives Grapple Shovel (4) vertically. Grapple Shovel (4) downward and upward vertical movement causes Dual Hydraulic Hose and Fittings (5) to release and retract respectively from the Hose Reel (6) on Hydraulic Carriage (3).

The Hydraulic Power Unit (7) is mounted on Hydraulic Carriage (3) and controls the pressure in Dual Hydraulic Hose and Fittings (5) which causes the Hydraulic Cylinder on Grapple Shovel (4) to actuate, opening or closing the shovels on Grapple Shovel (4). Electrical System and Controls System (8) provide power and control signal input and output for the applicable Grapple Hoist components.

3.2.1.2 Unit Movement – Horizontal**Figure Legend**

- | | |
|---|--------------------|
| 1 | Travel Drive Motor |
| 2 | Lift Hoist System |
| 3 | Hydraulic Carriage |
| 4 | Track System |
| 5 | Grapple Shovel |



Note: Some parts not shown for clarity.

Figure 3-2: Unit Movement – Horizontal

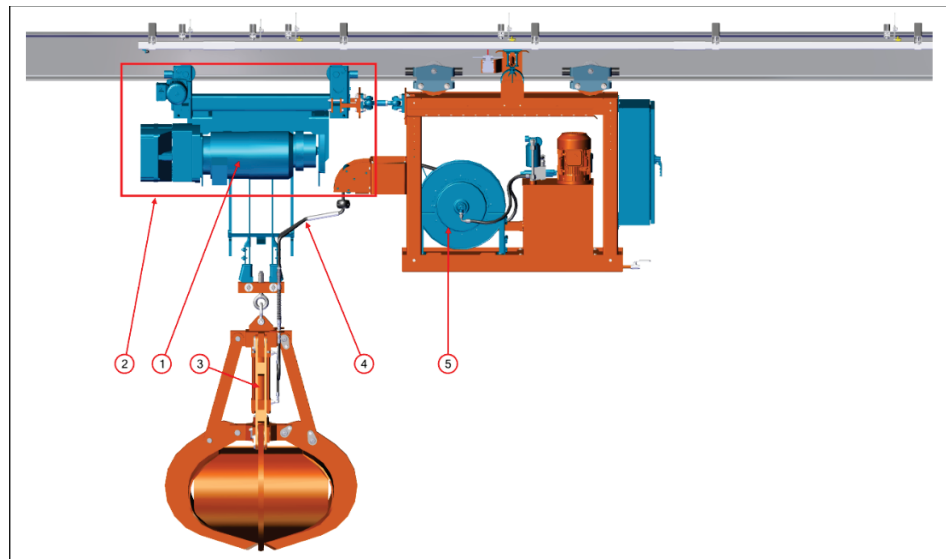
The Travel Drive Motor (1) on Lift Hoist System (2) drives the Lift Hoist System (2) and Hydraulic Carriage (3) horizontally along Track System (4). This allows the Grapple Shovel (5) to horizontally travel to relevant positions such as above the Trashwell, Wash Tower, and dump position.

VFD controls allow automatic horizontal movement at variable speeds. The operation of the Travel Drive Motor (1) is programmed to operate smoothly, safely and efficiently based on each application.

3.2.1.3 Unit Movement – Vertical

Figure Legend

- | | |
|---|-------------------------------------|
| 1 | Hoist Motor |
| 2 | Lift Hoist System |
| 3 | Grapple Shovel |
| 4 | Dual Hydraulic
Hose and Fittings |
| 5 | Hose Reel |



Note: Some parts not shown for clarity.

Figure 3-3: Unit Movement – Vertical

The Hoist Motor (1) on the Lift Hoist System (2) drives the Grapple Shovel (3) vertically. The Grapple Shovel (3) downward and upward vertical movement causes the Dual Hydraulic Hose and Fittings (4) to release and retract respectively from Hose Reel (5).

VFD controls allow for automatic vertical movement at variable speeds. The operation of the Hoist Motor (1) is programmed to operate smoothly, safely and efficiently based on each application.

3.3 Major Components

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

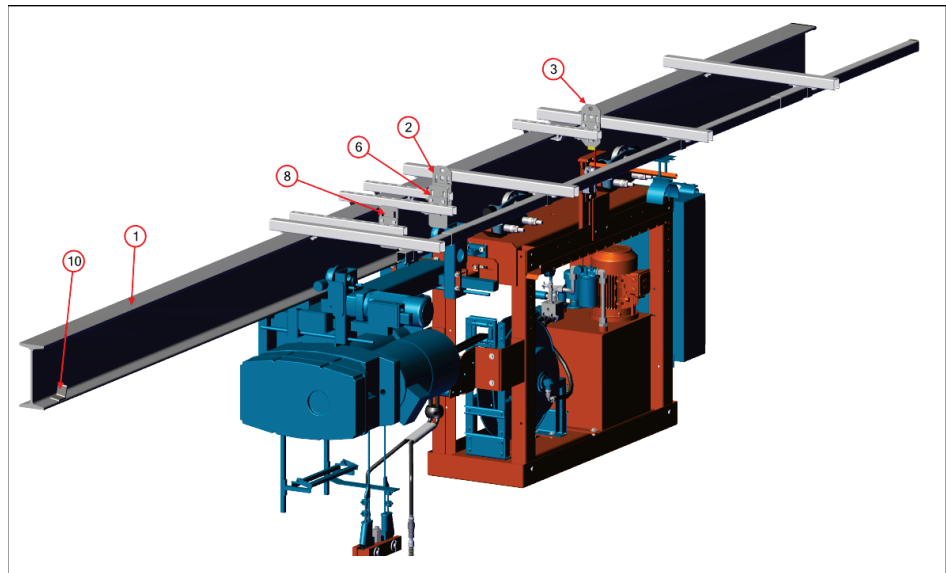
3.3.1 Overview

The Grapple Hoist consists of the following sections: Track System, Lift Hoist System, Hydraulic Carriage, Grapple Shovel, Hydraulic Power Unit, Dual Hydraulic Hose and Fittings, and Electrical and Controls Systems.

3.3.2 Track System

Figure Legend

1	Beam
2 - 5	Position Sensor
6 - 7	Target (Rotary Switch - Slow Speed)
8 - 9	Target (Rotary Switch - Stop)
10	Mechanical Stop
11	Flat Cable Trolley
12	Cable Bracket
13	Festoon Track
14	Festoon Cables



Note: Some parts not shown for clarity.

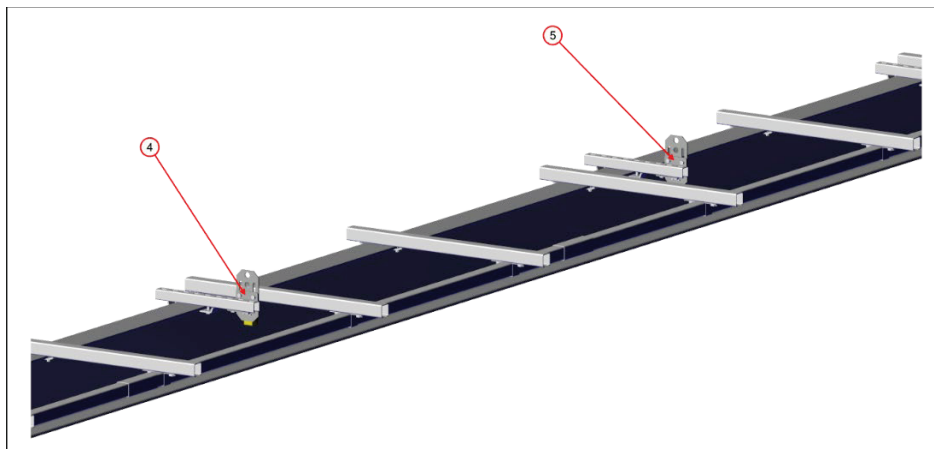
Figure 3-4: Track System (1 of 4)

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

Figure Legend

- | | |
|-----|-------------------------------------|
| 1 | Beam |
| 2-5 | Position Sensor |
| 6-7 | Target (Rotary Switch - Slow Speed) |
| 8-9 | Target (Rotary Switch - Stop) |
| 10 | Mechanical Stop |
| 11 | Flat Cable Trolley |
| 12 | Cable Bracket |
| 13 | Festoon Track |
| 14 | Festoon Cables |

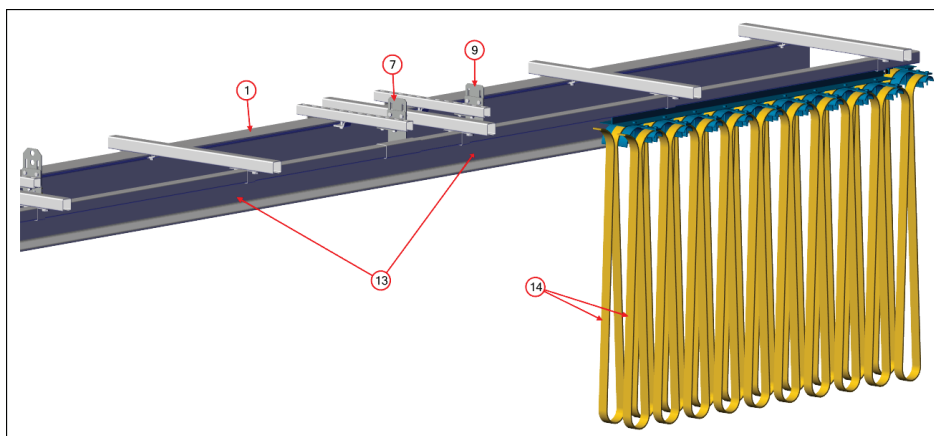


Note: Some parts not shown for clarity.

Figure 3-5: Track System (2 of 4)

Figure Legend

- | | |
|-----|-------------------------------------|
| 1 | Beam |
| 2-5 | Position Sensor |
| 6-7 | Target (Rotary Switch - Slow Speed) |
| 8-9 | Target (Rotary Switch - Stop) |
| 10 | Mechanical Stop |
| 11 | Flat Cable Trolley |
| 12 | Cable Bracket |
| 13 | Festoon Track |
| 14 | Festoon Cables |

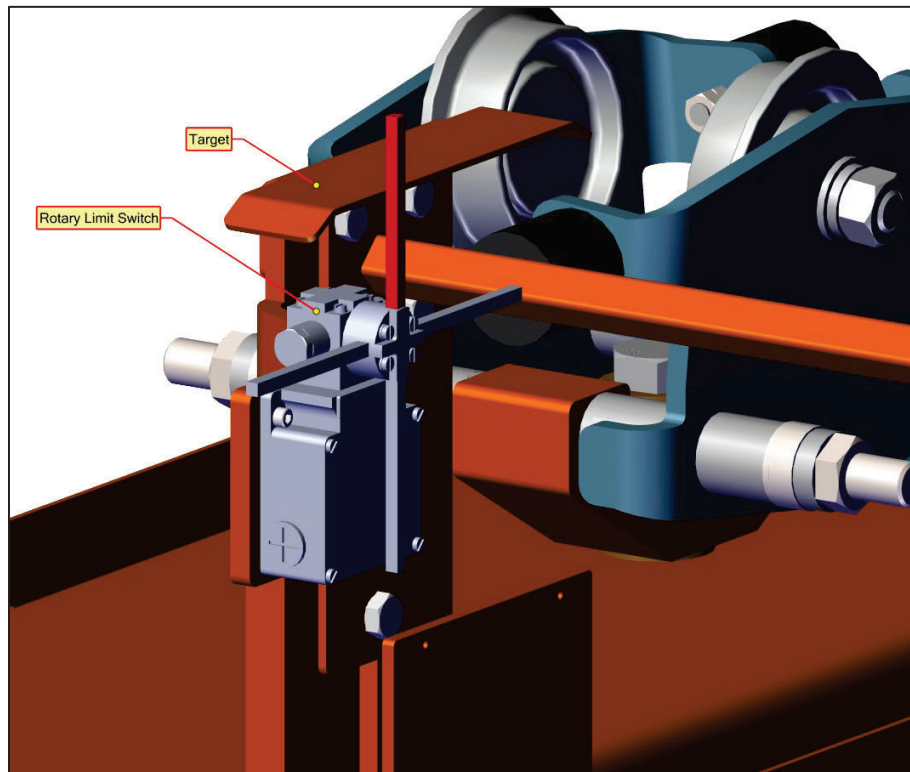


Note: Some parts not shown for clarity.

Figure 3-6: Track System (3 of 4)

Figure Legend

1	Beam
2-5	Position Sensor
6-7	Target (Rotary Switch - Slow Speed)
8-9	Target (Rotary Switch - Stop)
10	Mechanical Stop
11	Flat Cable Trolley
12	Cable Bracket
13	Festoon Track
14	Festoon Cables



Note: Some parts not shown for clarity.

Figure 3-7: Track System (4 of 4)

The Track System runs the length of a customer-supplied Beam (1). Position Sensors (2 - 5) are proximity switches positioned along the Beam (1) to connect with a target on the Hydraulic Carriage. The Position Sensors (2 - 5) stop the Grapple Shovel movement above the Trashwell Position, Wash Tower Position, Dump Position, and Overtravel Position.

As the Lift Hoist System drives the horizontal moving Grapple Hoist components, the target on the Hydraulic Carriage trips the Position Sensors (2 - 5). This operation is signified by a flashing light on the HMI Screen. If the automatic sequence has been started, the light will be accompanied by a horn sound. Targets (6 - 7) are located on the Beam (1) to trip the rotary switch on the Hydraulic Carriage to slow down horizontal movement as a stopping point approaches. Targets (8 - 9) are located on the Beam (1) to trip the rotary switch on the Hydraulic Carriage to stop horizontal movement. Mechanical Stops (10) are required, customer-supplied components that must be welded to the beam to provide hard stops for horizontal movement should the rotary limit switch fail. Flat Cable Trolleys (11) and Cable Brackets (12) travel horizontally along Festoon Track (13) allowing the Festoon Cables (14) to extend to the position of the P2 Remote Cabinet on the back of the Hydraulic Carriage.

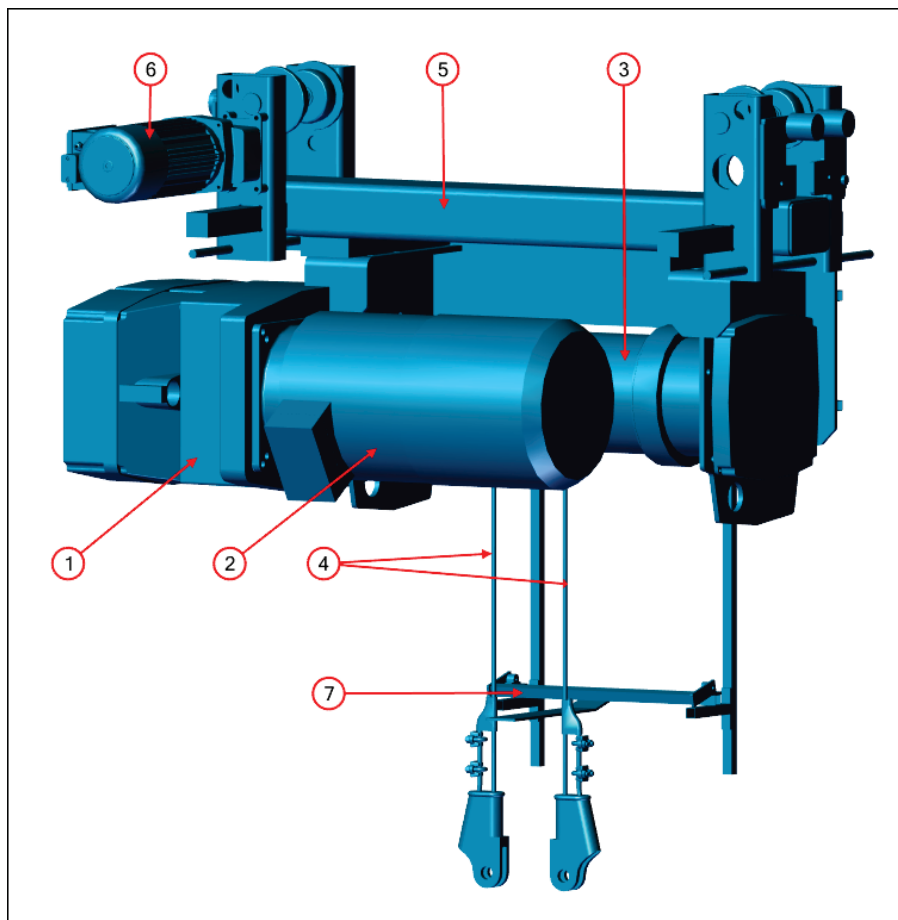


Please refer to the additional Position Sensor documents for complete instructions and the Electrical Drawings in the Certified Drawings Package.

3.3.3 Lift Hoist System

Figure Legend

- | | |
|---|---------------------|
| 1 | Gearbox Housing |
| 2 | Hoist Motor |
| 3 | Wire Rope Drum |
| 4 | Wire Ropes |
| 5 | Trolley |
| 6 | Travel Drive Motor |
| 7 | Paddle Limit Switch |



Note: Some parts not shown for clarity.

Figure 3-8: Lift Hoist System

The Lift Hoist System is a one-piece cast iron Gearbox Housing (1) that is lubricated for life. The Hoist Motor (2) provides vertical motion and has a VFD speed control, allowing for smoother start and stop resulting in less wear on the components. The Gearbox and Hoist Motor (2) are rated for very high-duty, extremely dirty environments. The Wire Rope Drum (3) uses Wire Ropes (4) to vertically move the Grapple Shovel. The Lift Hoist System is attached to the customer-supplied beam by the built-in Trolley (5). The Travel Drive Motor (6) provides horizontal motion and has a VFD speed control, allowing for a smoother start and stop, resulting in less wear on the components. Paddle Limit Switch (7) prevents the Wire Rope fastening points from interfering with the Wire Rope Drum (3).

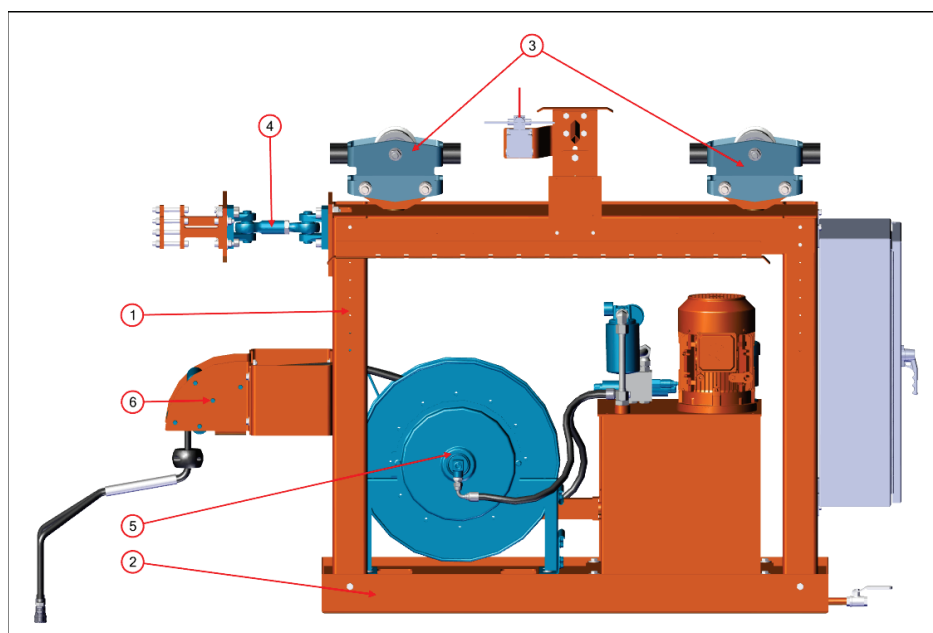


Please refer to the additional Lift Hoist System documents for the complete Hoist Installation Instructions, including the Hoist Data Sheet and Stahl Manuals.

3.3.4 Hydraulic Carriage

Figure Legend

- | | |
|---|------------------|
| 1 | Carriage Frame |
| 2 | Drip Pan |
| 3 | Carriage Trolley |
| 4 | Carriage Linkage |
| 5 | Hose Reel |
| 6 | Hose Rollers |



Note: Some parts not shown for clarity.

Figure 3-9: Hydraulic Carriage

The Hydraulic Carriage is driven horizontally by the Lift Hoist System. The Carriage Frame (1) and Drip Pan (2) house the Hydraulic Carriage components. The Carriage Trolley (3) allows horizontal movement on the customer beam. Carriage Linkage (4) connects the Hydraulic Carriage to the Lift Hoist System. Hose Reel (5) releases and retracts the Dual Hydraulic Hose and Fittings. Hose Rollers (6) guide the path of the Dual Hydraulic Hose and Fittings from Hose Reel (5) to the Grapple Shovel. The Hydraulic Power Unit is mounted inside Carriage Frame (1). The P2 Remote Cabinet is mounted to the back of Carriage Frame (1).



Please refer to the additional Rotary Limit Switch documents for complete instructions and the additional Stahl Electrical Drawing Package documents.

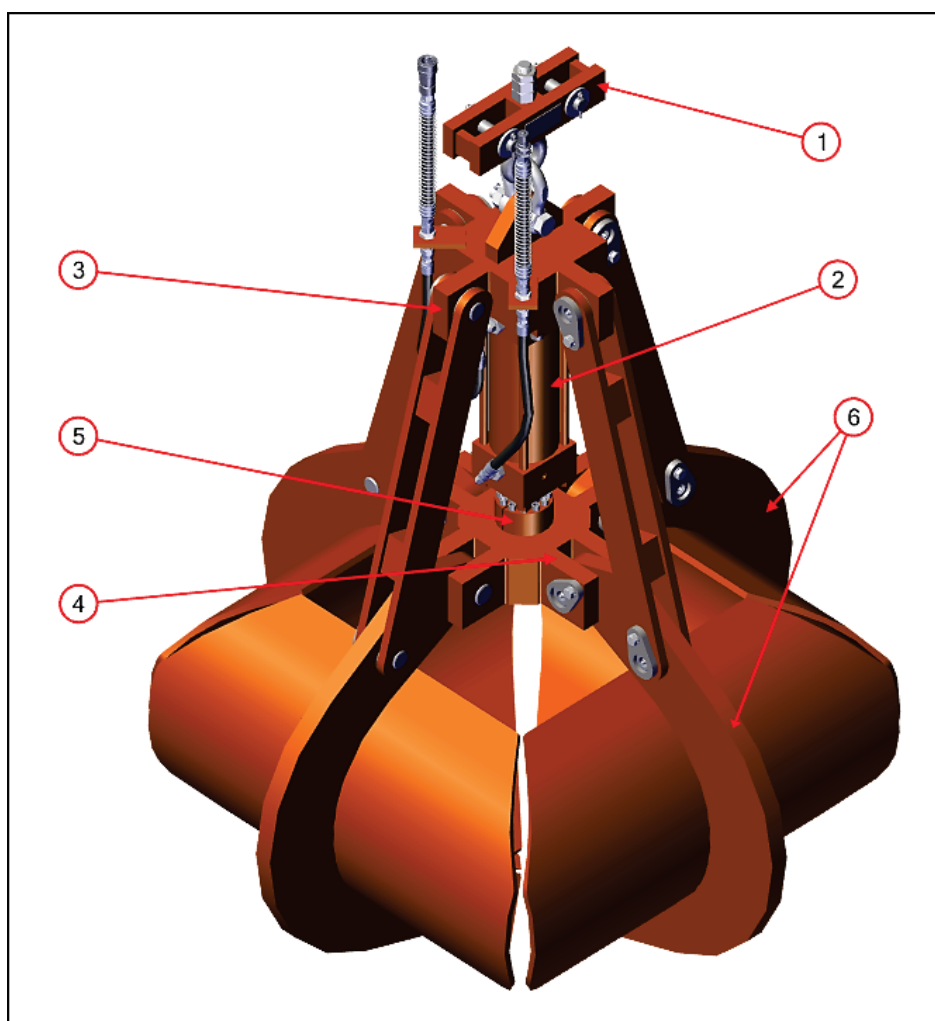


Please refer to the additional Hose Reel documents for complete instructions.

3.3.5 Grapple Shovel

Figure Legend

- 1 Hook Block
- 2 Hydraulic Cylinder
- 3 Upper Shovel Attachment
- 4 Lower Shovel Attachment
- 5 Coupling
- 6 Shovels
- 7 Bushings and Pins
- 8 Link Arms
- 9 Hydraulic Hose

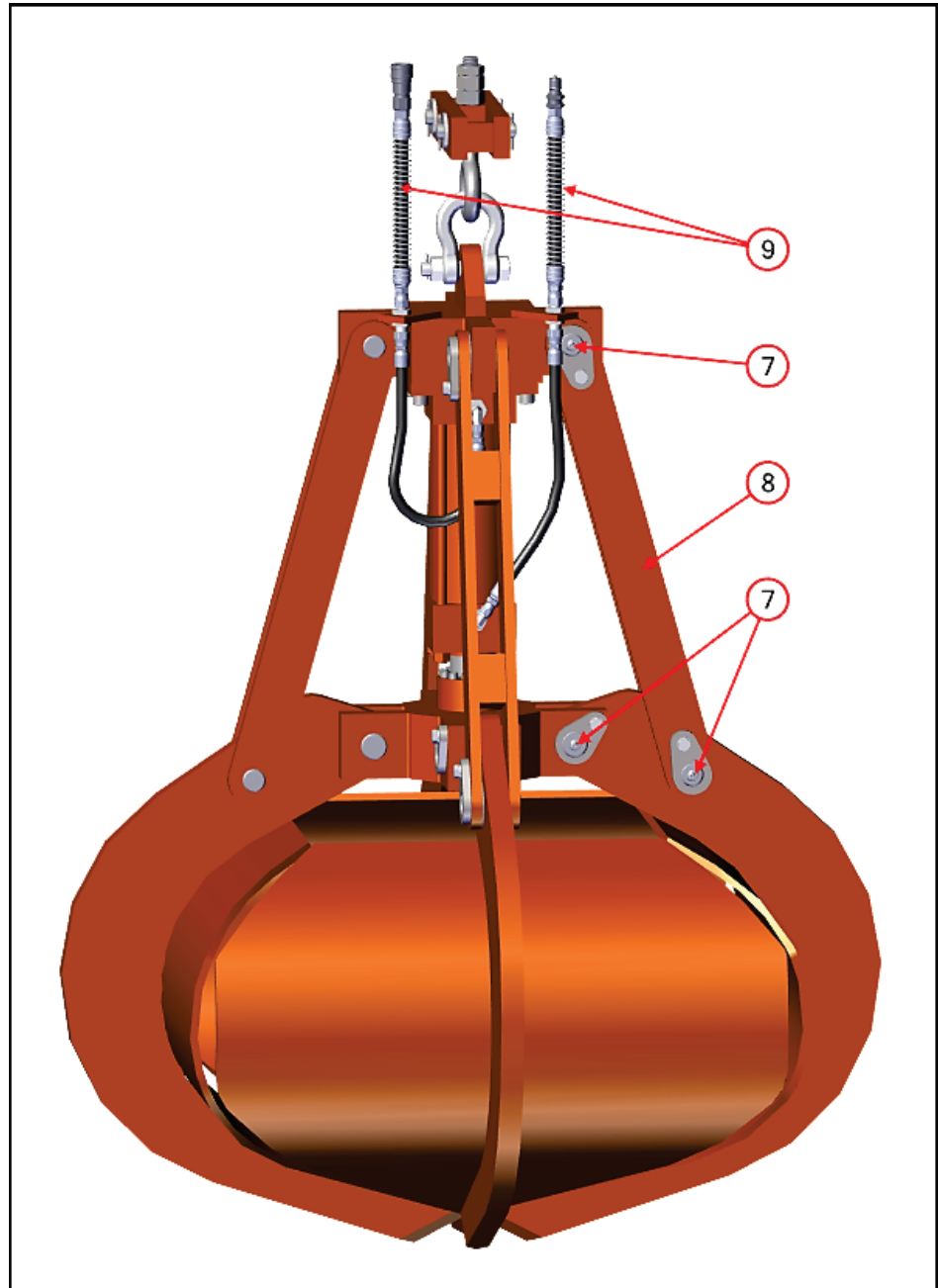


Note: Some parts not shown for clarity.

Figure 3-10: Grapple Shovel (1 of 2)

Figure Legend

- 1 Hook Block
- 2 Hydraulic Cylinder
- 3 Upper Shovel Attachment
- 4 Lower Shovel Attachment
- 5 Coupling
- 6 Shovels
- 7 Bushings and Pins
- 8 Link Arms
- 9 Hydraulic Hose



Note: Some parts not shown for clarity.

Figure 3-11: Grapple Shovel (2 of 2)

The Grapple Shovel has vertical and horizontal movement driven by the Lift Hoist System. The Grapple Shovel is suspended from the Lift Hoist System by wire ropes. The wire ropes attach to Hook Block (1), a fixed-connection hook that suspends all the other Grapple Shovel components. The Hydraulic Cylinder (2) is mounted to the Upper Shovel Attachment (3) and connects to Lower Shovel Attachment (4) with Coupling (5). Shovels (6) are attached to the Lower Shovel Attachment (4) with Bushings and Pins (7) with grease fittings. The Link Arms (8) connect to the Upper Shovel

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

Attachment (3) and Shovels (6) with Bushings and Pins (7) with grease fittings. As the Hydraulic Cylinder (2) actuates, the Shovels (6) open and close. The Hydraulic Hose (9) connects Hydraulic Cylinder (2) to the Dual Hydraulic Hose and Fittings.

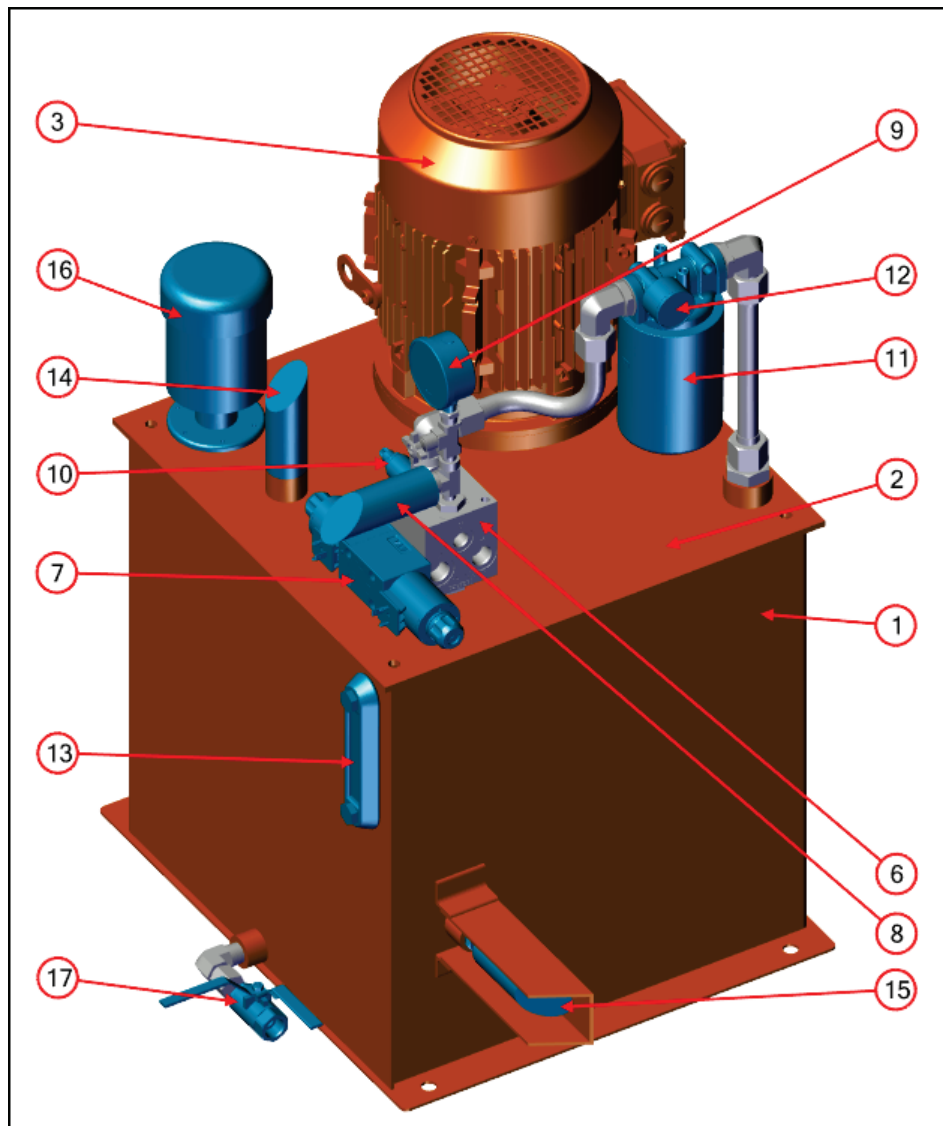


Please refer to the additional Hydraulic Cylinder documents for the complete instructions.

3.3.6 Hydraulic Power Unit

Figure Legend

- | | |
|----|---------------------------|
| 1 | Reservoir |
| 2 | Top Plate |
| 3 | Electric Motor |
| 4 | Gear Pump |
| 5 | Suction Strainer |
| 6 | Manifold |
| 7 | Directional Control Valve |
| 8 | Pressure Switch |
| 9 | Gauge |
| 10 | Relief Valve |
| 11 | Return Filter |
| 12 | Gauge |
| 13 | Level Gauge |
| 14 | Level Switch |
| 15 | Temperature Switch |
| 16 | Breather |
| 17 | Ball Valve |

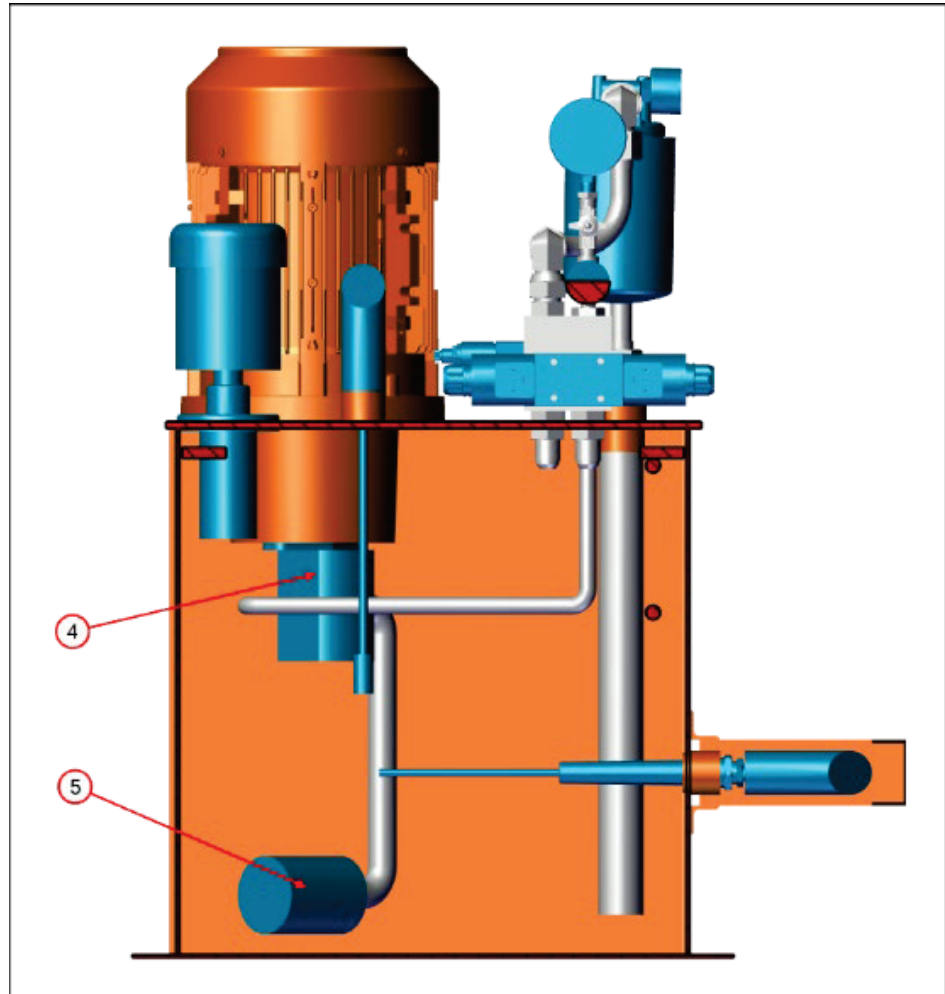


Note: Some parts not shown for clarity.

Figure 3-12: Hydraulic Power Unit (1 of 2)

Figure Legend

- 1 Reservoir
- 2 Top Plate
- 3 Electric Motor
- 4 Gear Pump
- 5 Suction Strainer
- 6 Manifold
- 7 Directional Control Valve
- 8 Pressure Switch
- 9 Gauge
- 10 Relief Valve
- 11 Return Filter
- 12 Gauge
- 13 Level Gauge
- 14 Level Switch
- 15 Temperature Switch
- 16 Breather
- 17 Ball Valve



Note: Some parts not shown for clarity.

Figure 3-13: Hydraulic Power Unit (2 of 2)

The Hydraulic Power Unit is mounted on the Hydraulic Carriage and controls the pressure in the Dual Hydraulic Hose and Fittings that cause the hydraulic cylinder on the Grapple Shovel to actuate, opening or closing the Grapple Shovel.



See Section 4.3.3, *Lifting and Installing the Hydraulic Carriage* on Page 4-78 for the Hydraulic Cylinder Operation.

Reservoir (1) and Top Plate (2) contain the oil. Electric Motor (3) couples to and drives the Gear Pump (4). The Gear Pump (4) pulls oil through the Suction Strainer (5) up to the Gear Pump (4). The oil passes through the Gear Pump (4) up to the Manifold (6).

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

The Directional Control Valve (7) connects to the Manifold (6) and directs the oil flow of oil from the Hydraulic Power Unit to the Hose Reel on the Hydraulic Carriage. Pressure Switch (8) and Gauge (9) monitor the hydraulic pressure at the Manifold (6). Relief Valve (10) connects to the Manifold (6) and provides protection against pressure spikes.

Oil that returns from the Hose Reel on the Hydraulic Carriage passes through Return Filter (11) before returning to the Reservoir (1). Gauge (12) monitors the pressure at the Return Filter (11). Level Gauge (13), Level Switch (14), and Temperature Switch (15) monitor the level and temperature of the oil inside the Reservoir (1). Breather (16) provides clean, dry air to the Reservoir (1). Ball Valve (17) provides a method to drain the Reservoir (1).

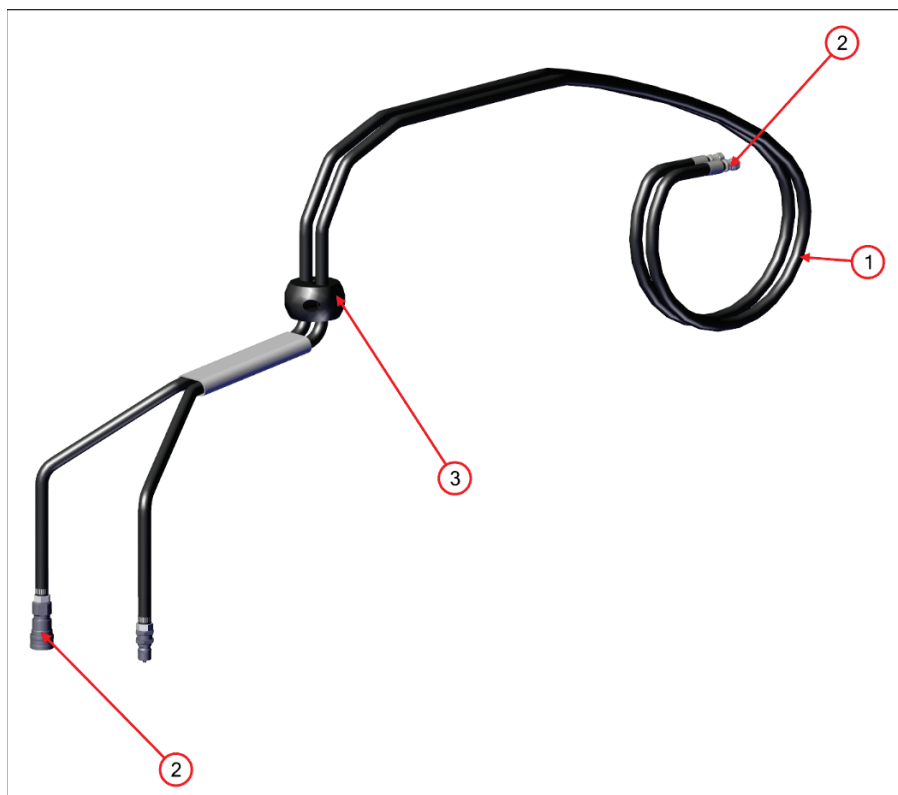


Please refer to the additional Hydraulic Power Unit documents for complete instructions.

3.3.7 Dual Hydraulic Hose and Fittings

Figure Legend

- | | |
|---|--------------------|
| 1 | Hydraulic Hose |
| 2 | Hydraulic Fittings |
| 3 | Hose Bumper |



Note: Some parts not shown for clarity.

Figure 3-14: Dual Hydraulic Hose and Fittings

The Dual Hydraulic Hose and Fittings connects the Hydraulic Power Unit to the hydraulic cylinder on the Grapple Shovel. The Hydraulic Hose (1) is coiled around the Hose Reel on the Hydraulic Carriage and routes through the hose rollers on the Hydraulic Carriage.

Intelligent Grapple Hoist

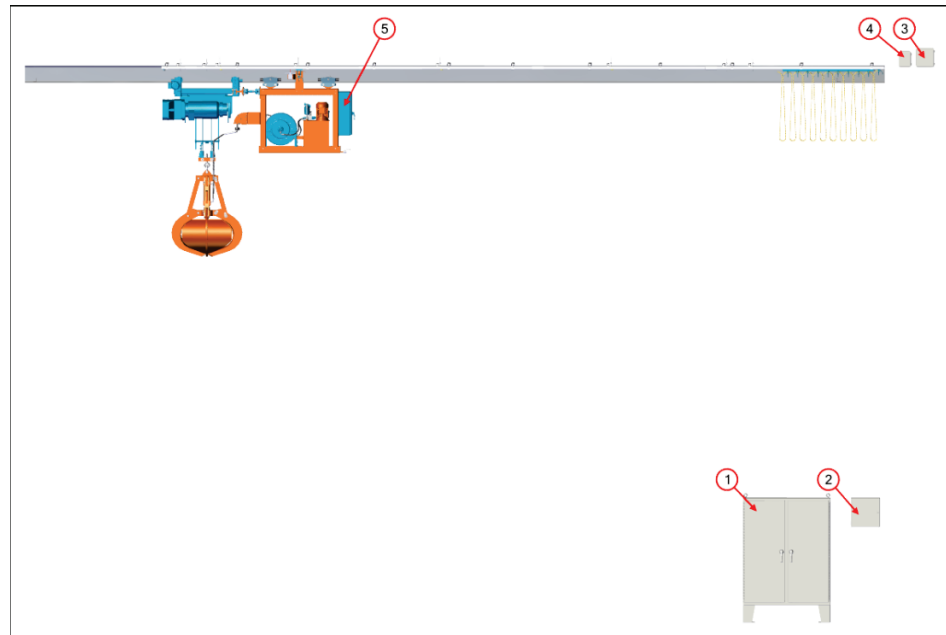
Models: 4' (1.2 m) | 6' (1.8 m)

The Hydraulic Fittings (2) connect the Hydraulic Hose (1) to the Hose Reel on the Hydraulic Carriage and to the Hydraulic Hose on the Grapple Shovel. The Hydraulic Hose (1) releases and retracts from the Hose Reel as the Grapple Shovel moves vertically. The Hose Bumper (3) prevents Hydraulic Hose (1) from retracting beyond its limit.

3.3.8 Electrical and Controls System

Figure Legend

- | | |
|---|-------------------------|
| 1 | P1 Main Control Panel |
| 2 | P3 HMI Panel |
| 3 | JB1 Signal Junction Box |
| 4 | JB2 Signal Junction Box |
| 5 | P2 Remote Cabinet |



Note: Some parts not shown for clarity.

Figure 3-15: Electrical and Controls System

The Electrical and Controls System includes the P1 Main Control Panel (1), a Programmable Logic Control (PLC) Cabinet with VFDs to control the unit. The P3 HMI Panel (2) includes a Human Machine Interface (HMI) screen that operates the unit. The P1 Main Control Panel (1) and P3 HMI Panel (2) operates the JB1 Signal Junction Box (3), JB2 Power Junction Box (4), and P2 Remote Cabinet (5) for hoist operation, limit switch signal control, and proximity switch signal control. The unit can be operated in PLC or remote-control modes.



It is recommended that the Wireless Remote Control Pendant be used within sight of the Grapple Hoist.

3.3.8.1 P1 Main Control Panel

Figure Legend

1 Panel Switch



Note: Some parts not shown for clarity.

Figure 3-16: P1 Main Control Panel



Please refer to the P1 Main Control Panel Drawing in the Certified Drawings Package for complete instructions.

The P1 Main Control Panel houses the PLC (Programmable Logic Controller) and VFDs (Variable Frequency Drives) to control the unit. When the Panel Switch (1) is in one position, the control cabinet doors are locked and will not open. When the Panel Switch (1) is in the other position, the control cabinet doors are unlocked and will open. All power is disconnected to components when the cabinet doors are open.

3.3.8.2 P3 HMI Panel

Figure Legend

- 1 Selector Switch
- 2 E-Stop Button
- 3 Reset Button
- 4 HMI Screen



Note: Some parts not shown for clarity.

Figure 3-17: P3 HMI Panel

The HMI Panel has a Human Machine Interface (HMI) screen that allows an operator to control the unit. When the Selector Switch (1) on the HMI Panel is set to HMI, the HMI controls the unit Manually. When Selector Switch (1) is set to PENDANT, the Wireless Remote Control Pendant (transmitter pendant and receiver remote-control system) operates the unit manually.

The E-Stop Button (2) stops and powers down all Grapple Hoist equipment when pressed. Pressing the Reset Button (3) allows for the function of the P3 HMI Panel after an E-Stop. The HMI Screen (4) provides visual feedback and touchscreen control to monitor and operate the Grapple Hoist.

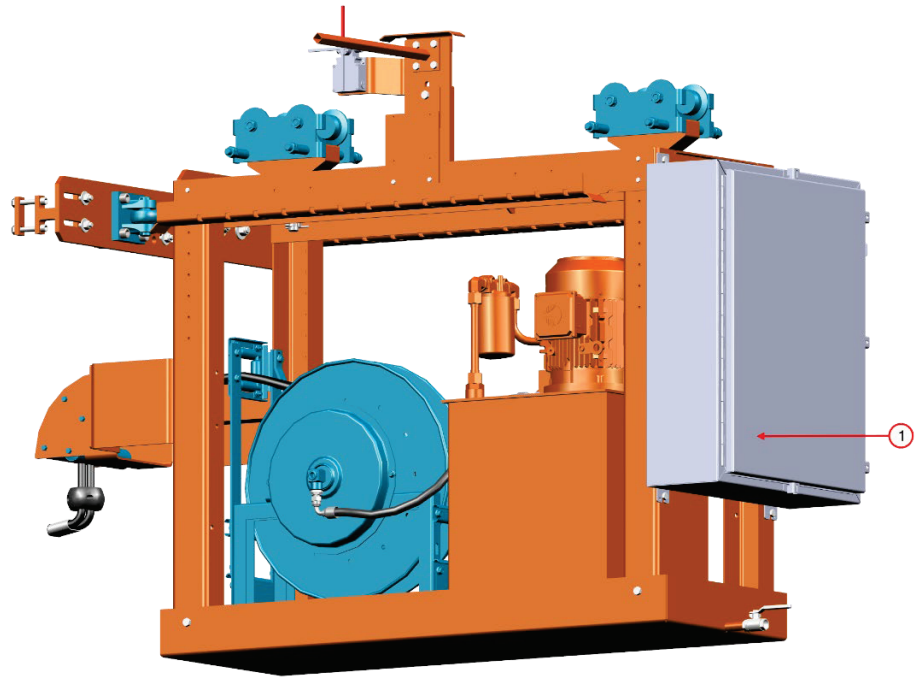


Please refer to the P3 HMI Panel Drawing in the Certified Drawings Package for complete instructions.

3.3.8.3 P2 Remote Cabinet

Figure Legend

1 P2 Remote Cabinet



Note: Some parts not shown for clarity.

Figure 3-18: P2 Remote Cabinet

The P2 Remote Cabinet (1) is attached to the Hydraulic Carriage. The P2 Remote Cabinet (1) relays signals from JB1 Signal Junction Box and JB2 Power Junction Box to operate the Lift Hoist System. The P2 Remote Cabinet (1) allows the unit to be operated with the Wireless Remote Control Pendant.

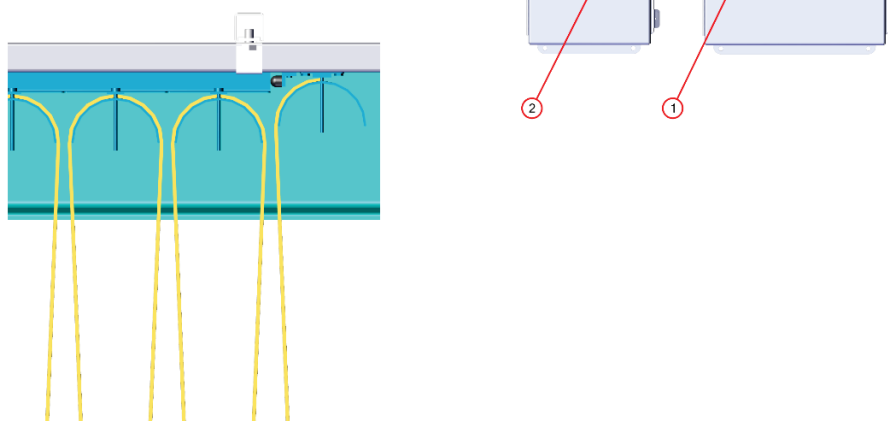


Please refer to the P2 Remote Cabinet Drawing in the Certified Drawings Package for complete instructions.

3.3.8.4 Junction Boxes

Figure Legend

- 1 JB1 Signal Junction Box
- 2 JB2 Power Junction Box



Note: Some parts not shown for clarity.

Figure 3-19: Junction Boxes

The unit has two junction boxes. The JB1 Signal Junction Box (1) sends signals to the PLC interface and remote cabinets to carry out unit movement. The JB2 Power Junction Box (2) supplies power to the unit.



Please refer to the JB1 Signal Junction Box and JB2 Power Junction Box Drawings in the Certified Drawings Package for complete instructions.

3.4 Specifications

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

3.4.1 Overview

The following sections and tables list the standard specifications. Please refer to the Certified Drawings to verify specifications for this unit.

3.4.2 Lift Host System Standard Specifications

Table 3-2: Lift Hoist System Standard Specifications

Item	4'	6'
Capacity	1000kg (2204 lbs.)	2000kg (4409 lbs.)
Maximum Lifting Speed	19.0m/min (62 FPM)	
Trolley Speed	2.5m/min - 25.0m/min (8 FPM - 82 FPM)	

3.4.3 Hydraulic Power Unit Standard Specifications

Table 3-3: Hydraulic Power Unit Standard Specifications

Item	4' and 6'
Hydraulic Unit Maximum Working Pressure	11030kPa (1600 PSI)
Pump Flow	11 LPM (2.9 GPM)
HP	5
Oil Reservoir Capacity	75 Liters (20 Gallons)

3.4.4 Lubrication Specifications

3.4.4.1 Bushing Grease Specification

Lithium-based Grease, NLGI No. 2. The grease shall not contain fillers such as resin, resinous oils, soapstone, powdered mica, asbestos, clay, or any other type of grit. Some lubricants that meet minimum requirements of this unit are:

- Mobil - Mobilith SHC 220
- Texaco - Starplex 2.

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

3.4.4.2 Wire Rope Grease Specification

Use one of the following grease options as directed by Stahl:

- Shell Gadus S2 V220 00 KP 2N (Fuchs Renolit RHF1)
- Fuchs Renolit Duraplex EP3
- BP Energ grease LS-EP 00
- CENTOPLEX GLP 500



Please refer to the Stahl SH Wire Rope Manual additional document for the complete lubrication instructions.

3.4.4.3 Oil Specification

- Use Mobil DTE 25 ISO VG 46 hydraulic oil for *normal operation*.
- Use Mobil DTE 26 ISO VG 68 hydraulic oil during the *summer or winter*, depending upon the environmental temperature.

3.5 Accessory Equipment

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

3.5.1 Trashwell

The Trashwell is a 1.22 - 1.8m (4.0 - 6.0 foot) diameter standpipe installed next to a continuous waste paper pulper and connected to the pulper by a junk chute. The Trashwell provides a means of removing heavy and lightweight contaminants from the pulper tub. The action of the rotor in the pulper propels debris to the outer periphery of the tub where it is discharged through a junk opening and into the bottom of the Trashwell. The Grapple Hoist is used to remove heavy and light contaminants from the Trashwell.

3.5.2 Wash Tower

The Grapple Hoist application may or may not include a Wash Tower. The Wash Tower provides a common location for heavy debris from the Float Purger, Detrasher, and Trashwell. The Wash Tower can be supplied in 1.22 - 1.8m (4.0 - 6.0 foot) diameters. The overall height and location relative to the Hydrapulper® is determined according to the system design. There are multiple dilution water lines in the Wash Tower that work to separate the fiber and light plastics from the heavy debris, which are then floated to the top and overflows a weir into the Hydrapulper®. This allows for the fiber and light plastics to be further processed by both the Hydrapulper® and Detrasher. The heavy debris then settles to the bottom of the Wash Tower and is removed by the Grapple Hoist. The frequency of removal needed is determined by the overall system design and furnish mix.

4 Installation and Storage

This section includes procedures for preparing, receiving, storing, inspecting, uncrating, moving, and installing the equipment.

4.1 Preparing the Site for Installation

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

4.1.1 Overview

- Complete the pre-installation before receiving the unit: Use this section as a checklist.
- Refer to the Certified Drawings, Product Manual, and Shipping Papers for information needed to complete the installation of the unit.

4.1.2 I-beam Structure

- Refer to the Certified Drawings for the I-beam information.



Kadant assumes no responsibility for site preparation and/or construction required for installation of unit.

4.1.3 Unit Placement



Check the Certified Drawings to identify any clearance problems in the path to the installation location. Collisions between the unit and other objects could result in unit damage, serious personal injury, or death.

The Certified Drawings show the space requirements for unit operation.

4.1.4 Leveling Instrument

- The Starrett 12-Inch Model 98 is industrial standard for leveling heavy machinery.
- Level the beam to within 0.9mm (0.03 of an inch) per 30cm (1.0 foot).

4.1.5 Electrical Requirements

Verify the following:

- Power cables and controls are properly sized.
- Power cables can be routed to the unit with a minimum of bends and turns.
- Available electricity is correct for the unit.

4.1.6 Main Power Disconnect

- Install the main power disconnect switch where operators and maintenance personnel have quick and easy access to it.
- Ideally, mount the disconnect switch on outside of enclosure so that it can be accessed without opening the enclosure.

4.1.7 Shipping Method

- Kadant units and accessory equipment are typically packaged for shipment by truck. The unit is packed on several skids.
- Clamps, bolts, nuts, cap screws, eyebolts, and other small parts are shipped in one or more wooden boxes. The units are shipped completely assembled.

4.1.8 Shipping Papers Locations

- One set of the Shipping Papers is attached to the shipment in plain view to the personnel unloading unit.
- Another copy of the Shipping Papers is mailed to the receiving department.

4.1.9 Inspecting the Unit

Follow this checklist when inspecting unit upon receiving it from shipper.

1. Compare the parts received against the manifest during unloading. Report any shortages to Kadant within 24 hours.
2. Inspect the unit carefully for any damage that may have occurred during shipping. File damage claims against the transportation company within 24 hours.
3. List any problems on the freight bill. Careful listing of any problems on the freight bill will facilitate a settlement if a claim is made.
4. Take photographs of problem areas if damage is too difficult to describe.

4.2 Unloading and Moving the Unit

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

4.2.1 Overview



WARNING

Make sure all lifting and rigging complies with federal, state, and local safety codes. Failure to follow this instruction can result in unit damage, serious personal injury, or death.

4.2.2 Unloading and Moving a Skidded Unit

Follow the instructions below to protect the unit during unloading from the truck and moving the unit through the mill.

- Make sure the moving/lifting equipment selected is in safe operating condition and is rated for the weight of the skidded unit and boxes of parts.



Skidded units and sub-assemblies may be moved with a fork truck. Do not move unskidded assemblies with a fork truck.

- Move the unit through the paper or recycling mill while unit is still strapped to skid.
- Do not remove the unit from skid, or set the unit upright, until it is ready to be installed and as close to the final installation location as possible.
- Do not lift the unit from the top.
- Avoid uneven loading of the slings.
- Avoid tilting the unit when lifting.
- Keep the unit level at all times.

4.2.3 Lifting the Unit

Follow these instructions after moving the skidded unit as close to its installation site as possible.

**WARNING**

Make sure the crane or hoist can lift the item safely. Verify the weights shown on the Shipping Papers with the Certified Drawings. If the item is too heavy, it may fall from crane or hoist. Failure to follow this instruction may result in unit damage, serious personal injury, or death.

**DANGER**

Never stand underneath the unit as it is being lifted. The unit may fall and strike personnel. Failure to follow this instruction can result in severe personal injury or death.

NOTICE

Leave wood blocks, steel strapping, and other bracing material in place until the hoisting sling is in place and the piece is ready to be lifted. Removing these items before the sling is in place could damage the unit.



The customer is responsible for supplying all lifting equipment and supplies.

NOTICE

Do not place chains or slings around the pipe connections to lift the unit. Failure to follow this instruction may damage the unit.

- Consult the Certified Drawings for the weight of each piece of the unit. Contact Kadant if weight is not on the Certified Drawings.
- Consult the Shipping Papers for the weight of the crating. Consult the shipping company if the weight of the crating is not on the Shipping Papers.
- Proper lifting of the product requires use of a spreader bar. The customer must supply the spreader bar. Kadant does not provide the spreader bar.
- Make sure that the hoist or crane, spreader bar, and other equipment have adequate load capacity to safely lift the crated unit. Lease lifting equipment or obtain rigging services if the equipment at the facility is not adequate.

4.3 Lifting and Installing the Unit

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

4.3.1 Overview

The unit is ready for installation in the following order after the customer-supplied beam has been installed:

1. Lifting and Installing Lift Hoist System (See Section 4.3.2, Lifting and Installing the Lift Hoist System on Page 4-71).
2. Lifting and Installing the Hydraulic Carriage (See Section 4.3.3, Lifting and Installing the Hydraulic Carriage on Page 4-78).
3. Installing the Track System (Festoon Track Components) (See Section 4.3.4, Installing the Track System (Festoon Track Components) on Page 4-80).
4. Installing the Junction Boxes (See Section 4.3.5, Installing the Junction Boxes on Page 4-83).
5. Installing the P1 Main Control Panel (See Section 4.3.6, Installing the on Page 4-84).
6. Installing the Track System (Position Stop and Position Sensor) (See Section 4.3.8, Installing the Track System (Position Stop and Position Sensor) on Page 4-85).
7. Electrical Installation (See Section 4.3.9, Electrical Installation on Page 4-87).
8. Electrical Commissioning (See Section 4.3.10, Electrical Commissioning on Page 4-89).
9. Greasing the Wire Rope (See Section 4.3.11, Greasing the Wire Rope on Page 4-92).
10. Greasing the Grapple Shovel Bushings (See Section 4.3.12, Greasing the Grapple Shovel Bushings on Page 4-92).
11. Installing the Grapple Shovel (See Section 4.3.13, Installing the Grapple Shovel on Page 4-92).
12. Setting the Hose Reel Tension (See Section 4.3.14, Setting the Hose Reel Tension on Page 4-107).
13. Additional Electrical Commissioning (See Section 4.3.15, Additional Electrical Commissioning on Page 4-110).

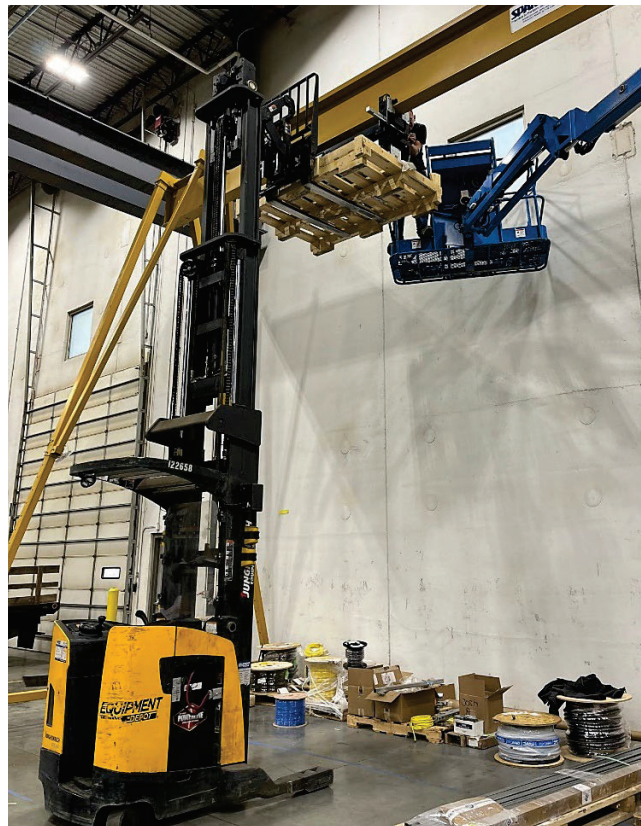
4.3.2 Lifting and Installing the Lift Hoist System



Please refer to the additional Lift Hoist System documents for the complete Hoist Installation instructions, including the Hoist Data Sheet and Stahl Manuals.

Figure Legend

- 1 Pallet
- 2 Sling Point



Note: Some parts not shown for clarity.

Figure 4-1: Lifting and Installing Lift Hoist System

4.3.2.1 Lift Procedure

To lift and install the Lift Hoist System:

1. Refer to the Certified Drawing for the unit for the orientation of components on beam.
2. Remove the packaging from the Lift Hoist System.
 - 2.1. The preferred and simplest method is to leave the Lift Hoist System secured to the Pallet (1) as it arrived or secure the Lift Hoist System to a Pallet (1) if not currently secure. The Pallet (1) is then lifted to the beam with a fork truck where the Lift Hoist System can be installed to the beam.
 - 2.2. If it is necessary to remove the hoist from the pallet, attach a sling to the Sling Points (2) marked on the Lift Hoist System. Adjust the lifting device to find the center of gravity so the Lift Hoist System is equally balanced and remains stable as it is lifted and moved. Ensure that the diagonal pull does not exceed 45-degrees from vertical.
3. The simplest way to mount the Lift Hoist System on the beam is to remove the mechanical stops on an open end of the beam, run the trolley onto the beam, and replace the mechanical stops.

Note: If this method is not possible, mount the Lift Hoist System by removing side plate assembly with wheels intact from one side of trolley.
4. Align the Wire Ropes on the Lift Hoist System with the web in the center of the beam.

NOTICE

The Lift Hoist System brakes are engaged while the electrical system is not in operation. The Lift Hoist System cannot be manually moved horizontally along the beam.

4.3.2.2 Removing the Shipping Bolts and Sleeves

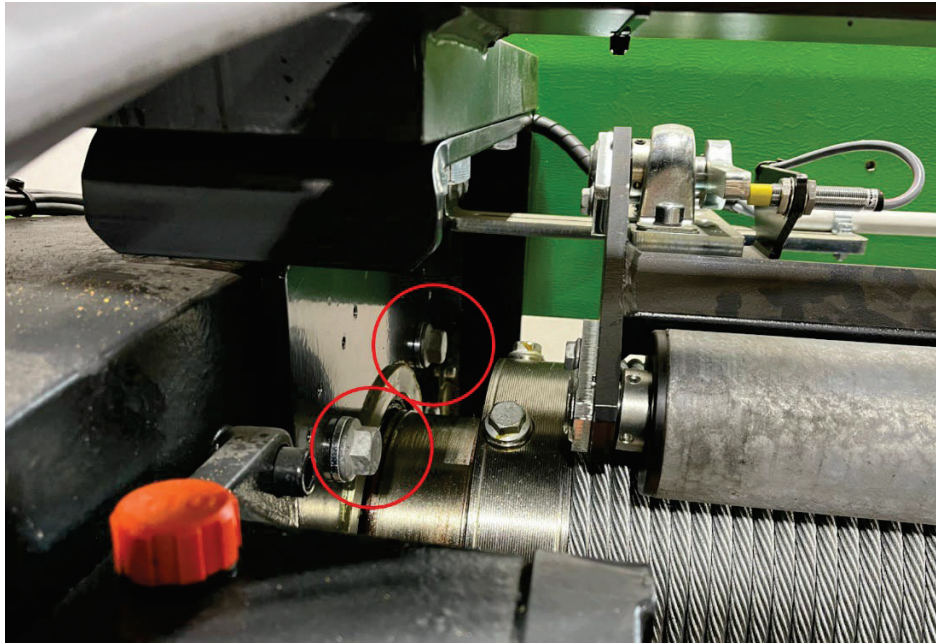


Figure 4-2: Lift Hoist System with Transport Anchor Bolts Installed

1. After the Lift Hoist System installation on the beam and before the Grapple Hoist commissioning, remove the two (2) transport anchor bolts from the Lift Hoist System.
2. Each transport anchor includes a bolt and a sleeve. Figure 4-4 on Page 4-75 shows a transport anchor bolt with the bolt and sleeve separated.



Figure 4-3: Lift Hoist System with Transport Anchor Bolts Removed



Figure 4-4: Transport Anchor Bolts – Bolt and Sleeve

4.3.2.3 Preparing the Paddle Limit Switch

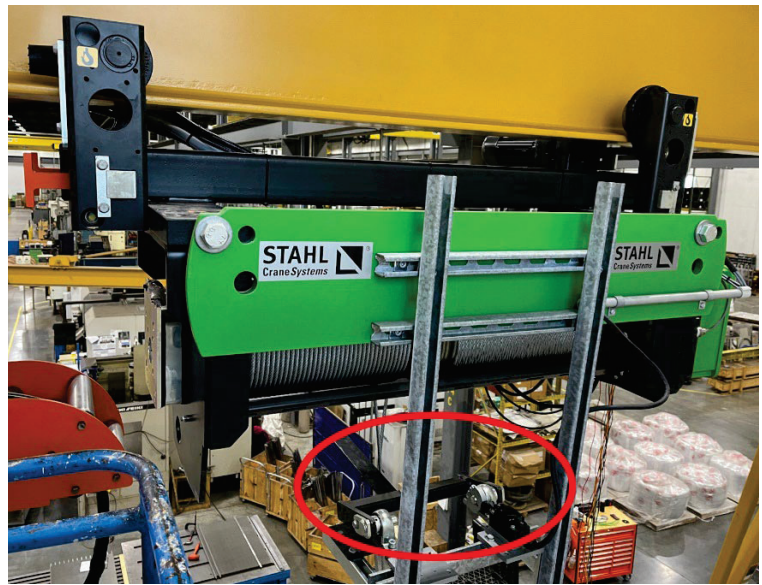


Figure 4-5: Paddle Limit Switch Assembly – Location

1. Locate the paddle limit switch assembly and tighten all the hardware. The paddle should be in the middle between the two wire ropes.

4.3.2.4 Preparing the Overwind Roll

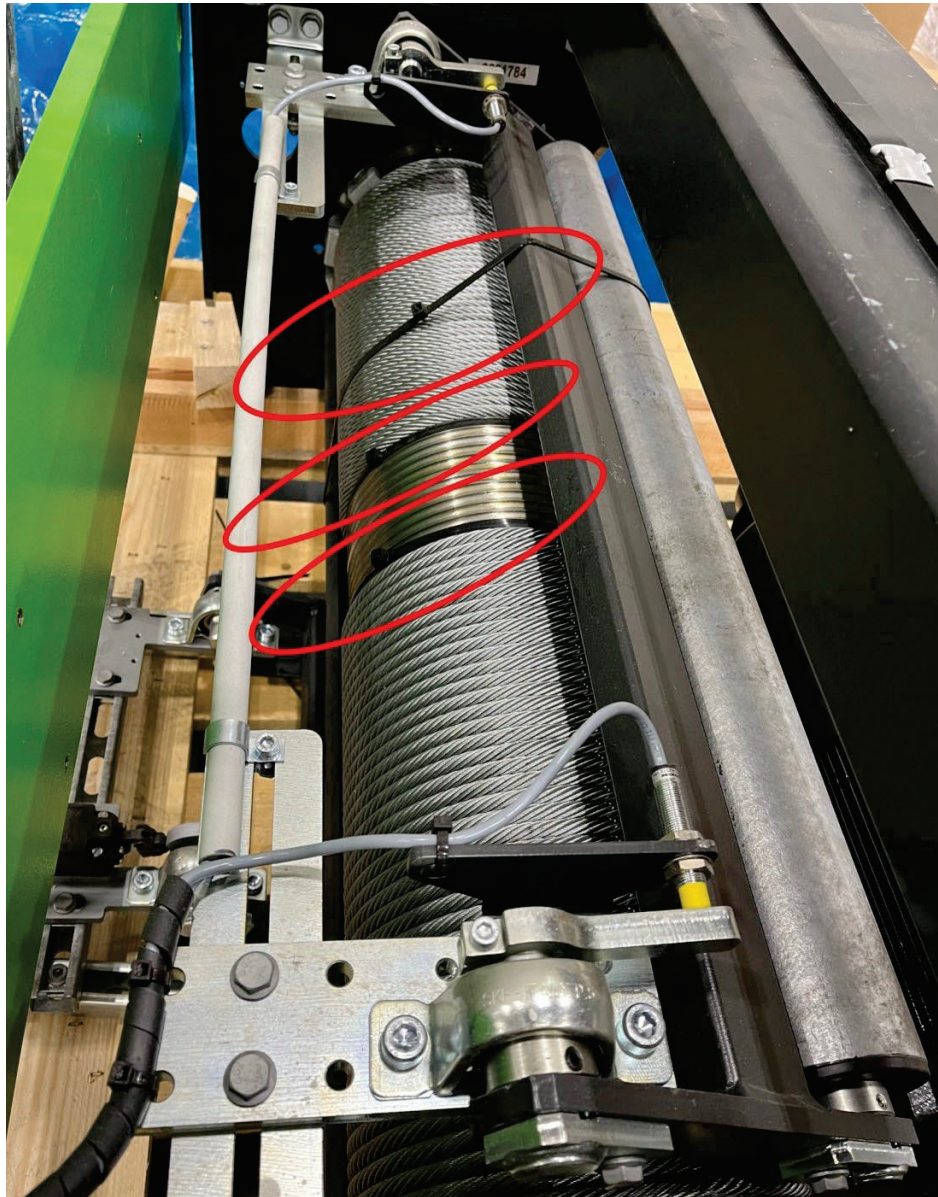


Figure 4-6: Overwind Roll Preparation

2. Remove the wire ties holding the wire ropes to the drum. Remove the wire ties holding the overwind roll in place. Remove the extra wire rope saddle clamps wire tied to the frame during shipping.

4.3.3 Lifting and Installing the Hydraulic Carriage

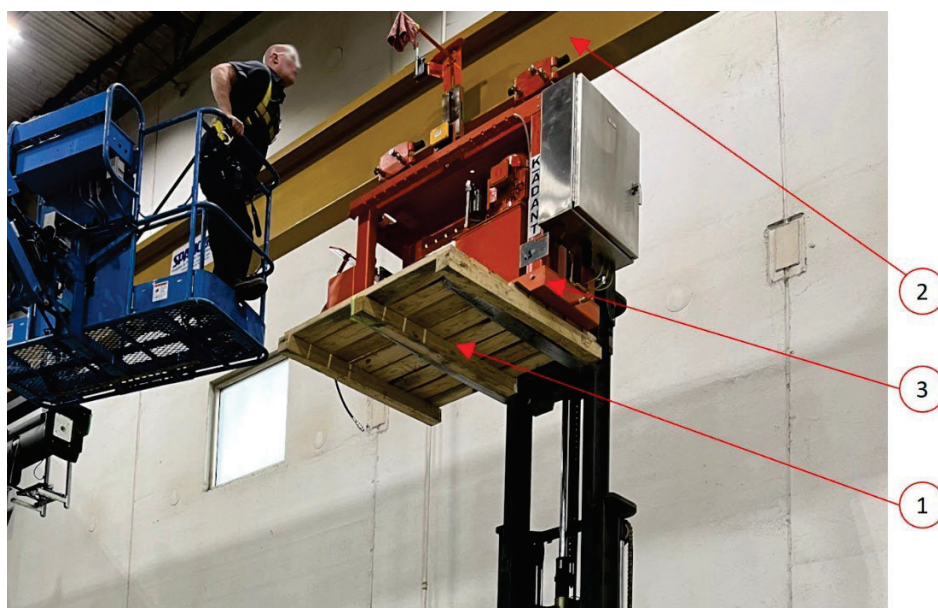
The Hydraulic Carriage can be lifted from below using fork truck. See Figure 4-7 on Page 4-78.

NOTICE

Make sure that the P2 Remote Cabinet, Hydraulic Power Unit, and Dual Hydraulic Hose and Fittings are installed on the Hydraulic Carriage before lifting and installing the Hydraulic Carriage.

Figure Legend

- 1 Pallet
- 2 Beam
- 3 Hydraulic Carriage



Note: Some parts not shown for clarity.

Figure 4-7: Lifting and Installing Hydraulic Carriage

4.3.3.1 Procedure

To lift and install hydraulic carriage:

1. Refer to the Assembly and Installation Drawings, and the Certified Drawing for this unit for orientation of components on beam.
2. Secure the Hydraulic Carriage (3) to the Pallet (1) if not currently secured to Pallet (1). Lift the Pallet (1) and Hydraulic Carriage (3) up to the Beam (2) with a fork truck.
3. Once lifted to the Beam (2), the simplest way to mount the Hydraulic Carriage (3) on the Beam (3) is to remove the mechanical end stops on an open end of Beam (3), run the trolley onto the beam, and replace the mechanical end stops.

Note: If this method is not possible, mount the Hydraulic Carriage by disassembling the Trolleys on the Hydraulic Carriage, moving the Hydraulic Carriage into place under the beam, and reassembling the Trolleys on the beam.

Note: The next step may be performed before lifting the Hydraulic Carriage.

4. Fill the Hydraulic Power Unit reservoir. Refer to Section 3.4.3, Hydraulic Power Unit Standard Specifications on Page 3-63 and Section 3.4.4.3, Oil Specification on Page 3-64 for the volume and oil type specifications.

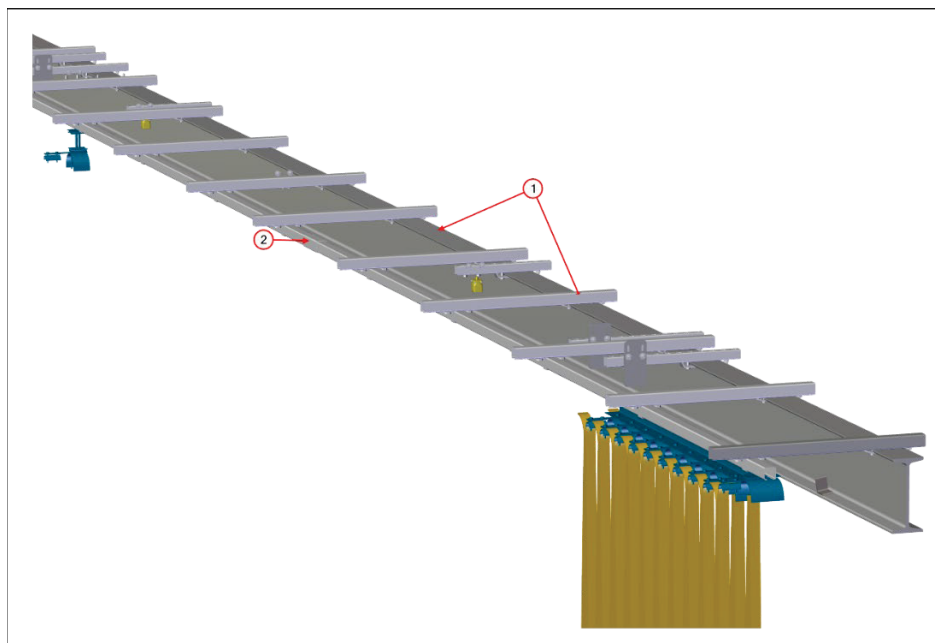
NOTICE

Install the Mechanical End Stops on the Beam (2) after installing the Hydraulic Carriage (3).

4.3.4 Installing the Track System (Festoon Track Components)

Figure Legend

- | | |
|----|---|
| 1 | Festoon C-Track |
| 2 | Festoon C-Track Joints |
| 3 | Hangers |
| 4 | Mounting Clamps |
| 5 | Flat Cable Double
Saddle Tow Trolley |
| 6 | Flat Cable Trollies |
| 7 | Flat Cable End Clamp |
| 8 | Cable Bracket |
| 9 | Festoon Track
End Stops |
| 10 | Festoon
Power Cables |
| 11 | Festoon Control Cables |

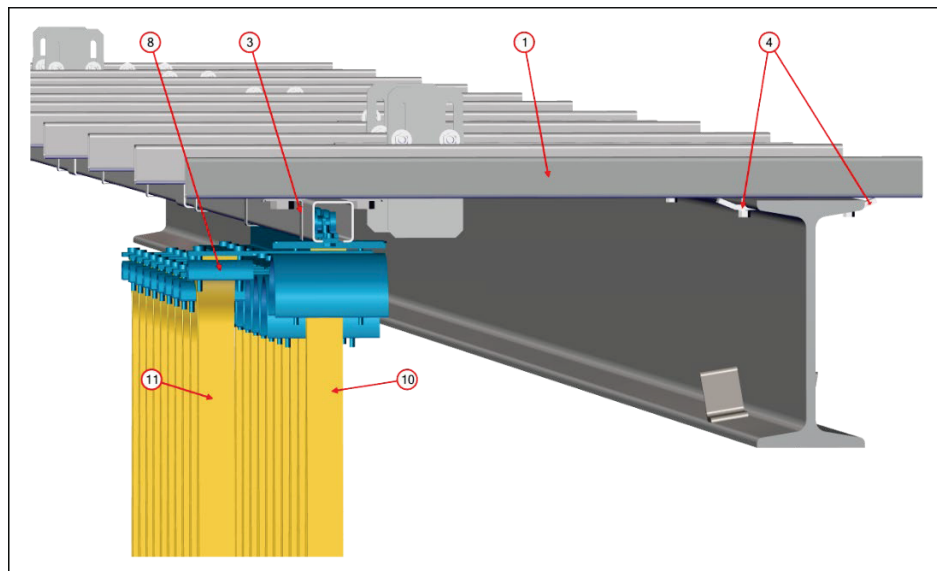


Note: Some parts not shown for clarity.

Figure 4-8: Installing the Track System (Festoon Components 1 of 4)

Figure Legend

- 1 Festoon C-Track
- 2 Festoon C-Track Joints
- 3 Hangers
- 4 Mounting Clamps
- 5 Flat Cable Double Saddle Tow Trolley
- 6 Flat Cable Trollies
- 7 Flat Cable End Clamp
- 8 Cable Bracket
- 9 Festoon Track End Stops
- 10 Festoon Power Cables
- 11 Festoon Control Cables

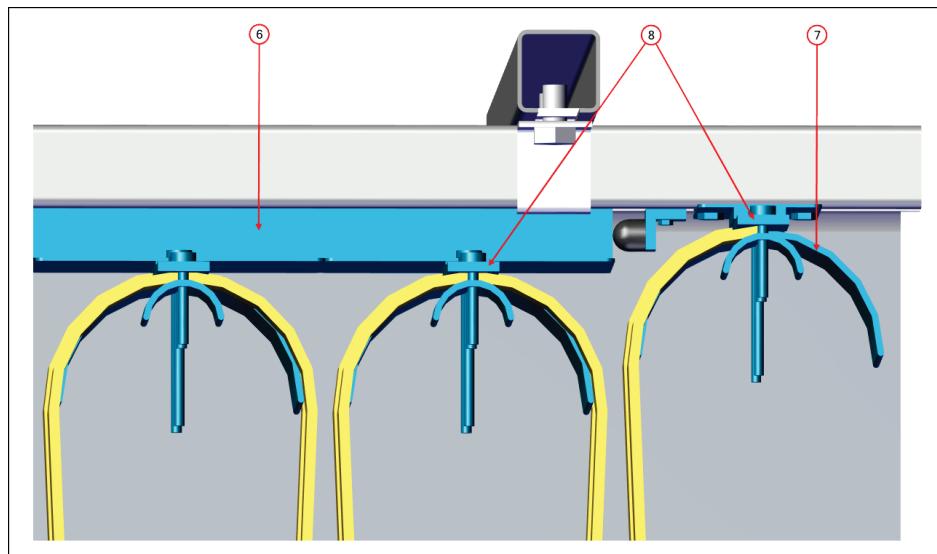


Note: Some parts not shown for clarity.

Figure 4-9: Installing the Track System (Festoon Components 2 of 4)

Figure Legend

- 1 Festoon C-Track
- 2 Festoon C-Track Joints
- 3 Hangers
- 4 Mounting Clamps
- 5 Flat Cable Double Saddle Tow Trolley
- 6 Flat Cable Trollies
- 7 Flat Cable End Clamp
- 8 Cable Bracket
- 9 Festoon Track End Stops
- 10 Festoon Power Cables
- 11 Festoon Control Cables

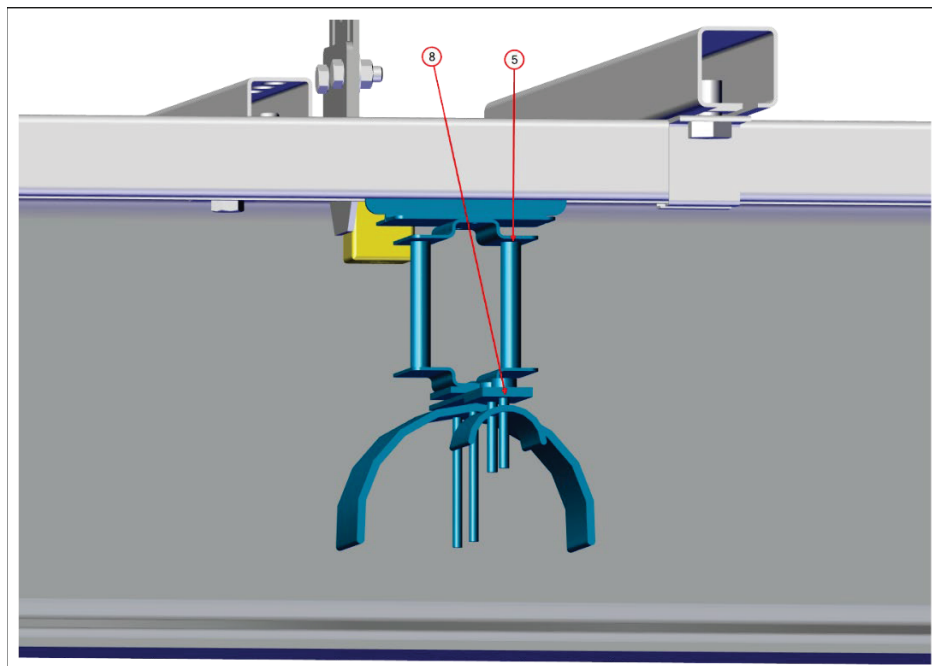


Note: Some parts not shown for clarity.

Figure 4-10: Installing the Track System (Festoon Components 3 of 4)

Figure Legend

- | | |
|----|---|
| 1 | Festoon C-Track |
| 2 | Festoon C-Track Joints |
| 3 | Hangers |
| 4 | Mounting Clamps |
| 5 | Flat Cable Double
Saddle Tow Trolley |
| 6 | Flat Cable Trollies |
| 7 | Flat Cable End Clamp |
| 8 | Cable Bracket |
| 9 | Festoon Track
End Stops |
| 10 | Festoon
Power Cables |
| 11 | Festoon Control Cables |



Note: Some parts not shown for clarity.

Figure 4-11: Installing the Track System (Festoon Components 4 of 4)

4.3.4.1 Procedure

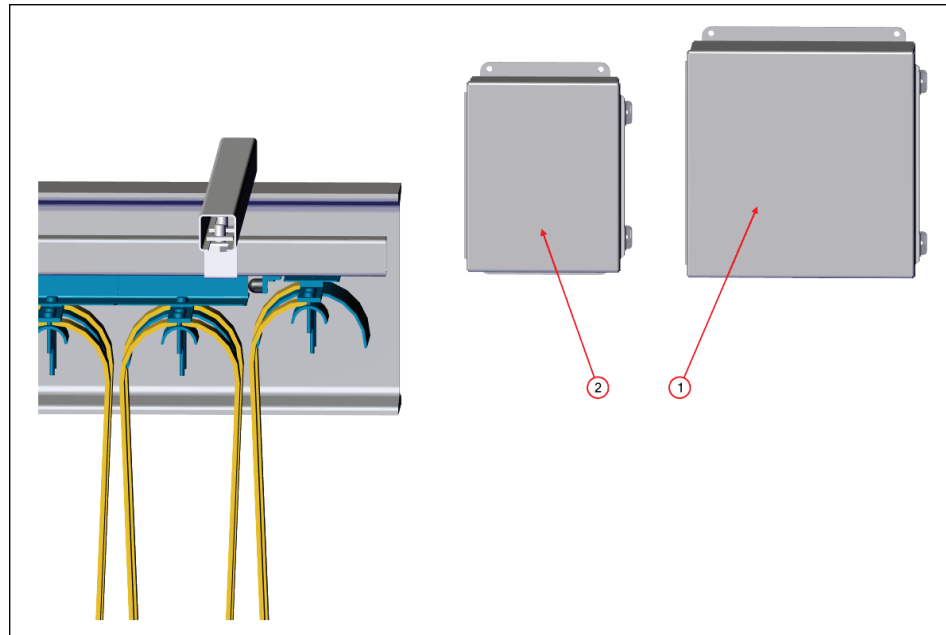
To install the Track System Festoon Components:

1. Refer to the Track System drawing for the unit for the bill of materials and layout references.
2. Position Festoon C-Track (1), Festoon C-Track Joints (2), Hangers (3), and Mounting Clamps (4) as shown on the Track System drawing.
3. Install the Flat Cable Double Saddle Tow Trolley (5), Flat Cable Trollies (6), Flat Cable End Clamp (7), Cable Brackets (8), and Festoon Track End Stops (8) as shown on Track System drawing.
4. Secure the Festoon Power Cables (10) to the Flat Cable Double Saddle Tow Trolley (5), Flat Cable Trollies (6), and Flat Cable End Clamp (7). Wrap the cable around the saddles as shown on the Track System drawing. Connect the Festoon Power Cables (10) to the P2 Remote Cabinet on the Hydraulic Carriage.
5. Secure the Festoon Control Cables (11) to the Cable Brackets (8) attached to the Flat Cable Double Saddle Tow Trolley (5), Flat Cable Trollies (6), and Flat Cable End Clamp (7). Wrap the cable around the saddles as shown on the Track System drawing. Connect the Festoon Control Cables (11) to the P2 Remote Cabinet on the Hydraulic Carriage. Some of the Festoon Control Cables (11) may not fit on the Cable Brackets (8) and may need to be placed next to the Festoon Power Cables (10). In this case, do not stack any Festoon Control Cables (11) above or below any Festoon Power Cables (10).

4.3.5 Installing the Junction Boxes

Figure Legend

- | | |
|---|-------------------------|
| 1 | JB1 Signal Junction Box |
| 2 | JB2 Power Junction Box |



Note: Some parts not shown for clarity.

Figure 4-12: Installing the Junction Boxes

4.3.5.1 Procedure

1. Refer to the Certified Drawing for this unit for the layout of the junction boxes.
2. JB1 Signal Junction Box (1) and JB2 Power Junction Box (2) must be hung within 6.0 meters (20.0 feet) of the Festoon Cable Storage end of the beam.
3. Connect the Festoon Flat Power Cable to the JB2 Power Junction Box (2).
4. Connect the Ethernet Cable to the JB1 Signal Junction Box (1).

NOTICE

Qualified and licensed personnel must install the junction boxes.



Please refer to the JB1 Signal Junction Box and JB2 Power Junction Box Drawings in the Certified Drawings Package for complete instructions.

4.3.6 Installing the P1 Main Control Panel (MCC Panel)

NOTICE

The P1 Main Control Panel (Motor Control Center or MCC Panel) and all other components of the Electrical and Controls System must be installed by qualified and licensed personnel.

1. Refer to the Certified Drawing for this unit for the layout of the P1 Main Control Panel.
2. The **P1 Main Control Panel** must be mounted in a **Motor Control Center (MCC) Room**.



Please consult with the Kadant Applications Group for the mounting location of the P1 Main Control Panel.



Please refer to the P1 Main Control Panel Drawing in the Certified Drawings Package for the complete instructions.

4.3.7 Installing the P3 HMI Panel (Local Control Panel/Operator Panel)

NOTICE

The P3 HMI Panel (Local Control Panel / Operator Panel) and all other components of the Electrical and Controls System must be installed by qualified and licensed personnel.

1. Refer to the Certified Drawing for this unit for the layout of the P3 HMI Panel.
2. The **P3 HMI Panel** must be mounted within sight of the Lift Hoist System at the ground level: **It must be easily accessible to the operator.**

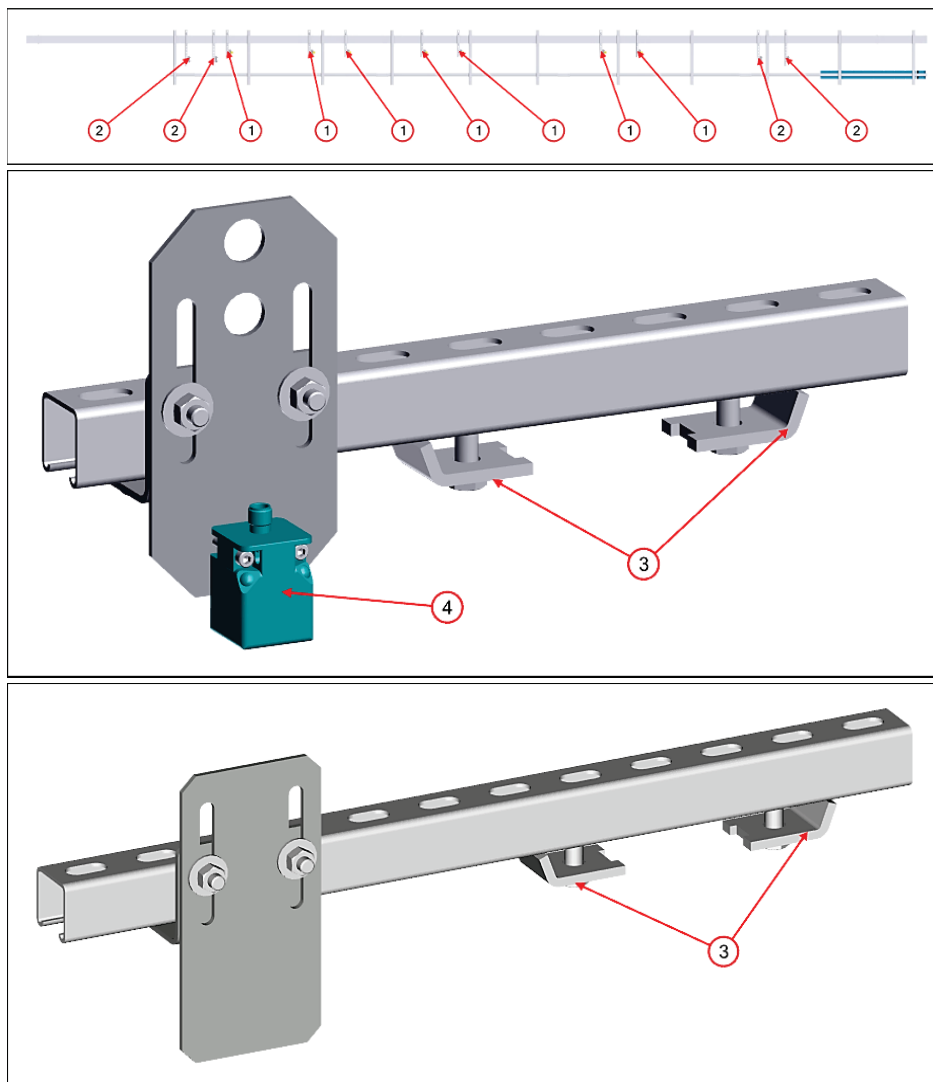


Please refer to the P3 Main Control Panel Drawing in the Certified Drawings Package for the complete instructions.

4.3.8 Installing the Track System (Position Stop and Position Sensor)

Figure Legend

- 1 Position Sensors
- 2 Position Stops
- 3 Mounting Clamps
- 4 Proximity Switch (Position Sensor)



Note: Some parts not shown for clarity.

Figure 4-13: Installing the Track System (Position Stop and Position Sensor)

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

4.3.8.1 Procedure**NOTICE****Qualified and licensed personnel must install the Position Sensors.**

1. Refer to the Track System Drawing for this unit for the BOM and layout references.
2. Install the Position Sensors (1) and Position Stops (2) at the locations shown in the Track System Drawing.
3. Use the Mounting Clamps (3) connect the Position Sensors (1) and Position Stops (2) to the beam.
4. The Proximity Switch (4) on Position Sensors (1) must be installed by qualified and licensed personnel.



Please refer to the additional Position Sensor documents and the Electrical Drawings in the Certified Drawings Package for complete instructions.

4.3.9 Electrical Installation



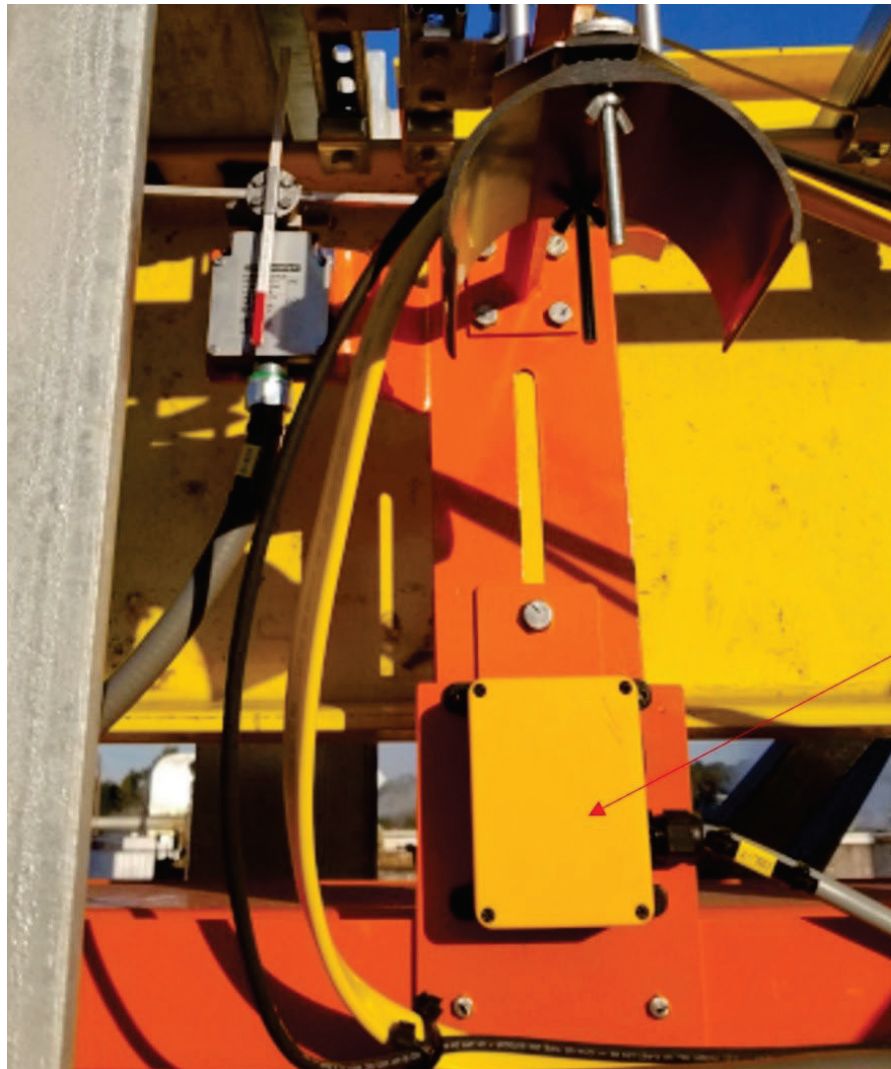
Please refer to the Certified Drawings for the Wiring Schematics and Electrical Diagrams and the additional Lift Hoist System documents.

4.3.9.1 Installing the Receiver for the Wireless Remote Control Pendant

1. Mount the Wireless Remote Control Receiver (1) to the plate on the hydraulic carriage.

Figure Legend

- | | |
|---|----------------------------------|
| 1 | Wireless Remote Control Receiver |
|---|----------------------------------|



Note: Some parts not shown for clarity.

Figure 4-14: Installing the Receiver for the Wireless Remote Control Pendant



Please refer to the additional Lift Hoist System (Wireless Remote Control Pendant) documents for the complete Wireless Remote Control Pendant and Receiver instructions.

4.3.9.2 Installing the Rotary Limit Switch

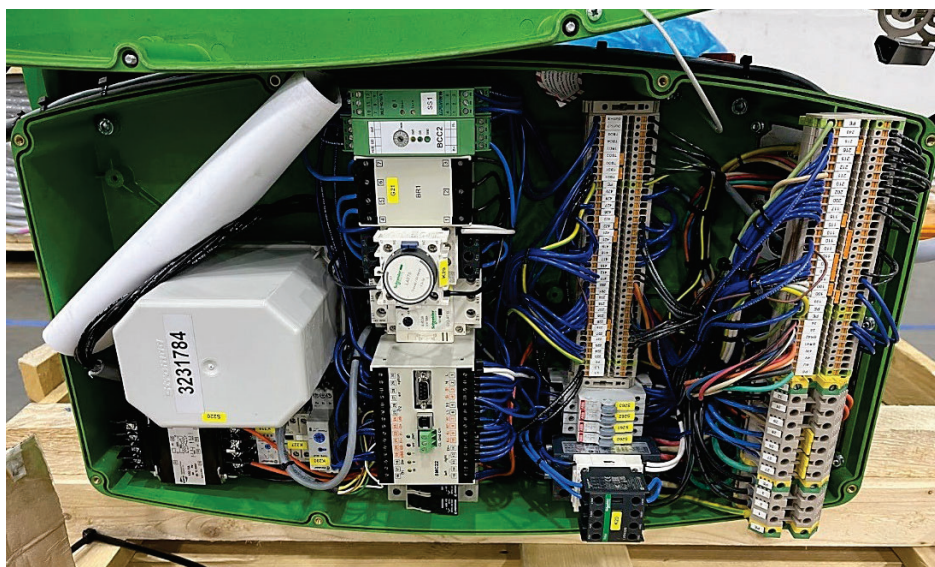
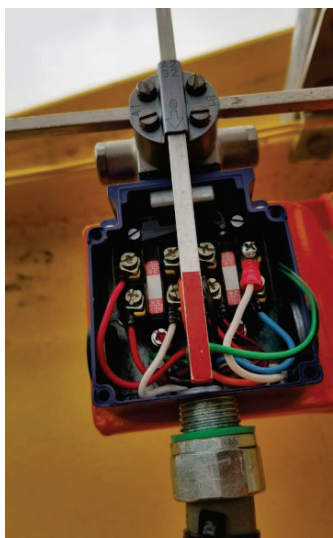


Figure 4-15: Installing the Rotary Limit Switch

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

While installing the Rotary Limit Switch, make sure the wiring matches the Stahl Electrical Drawings. See Figure 4-15 on Page 4-88.



Please refer to the additional Rotary Limit Switch documents for complete instructions and the additional Stahl Electrical Drawing Package documents for instructions.

4.3.10 Electrical Commissioning



It is necessary to apply power for this installation task! Use extreme caution whenever power is applied to complete maintenance tasks. Only qualified personnel may perform this maintenance. Failure to follow this instruction and the instructions of the equipment manufacturer can result in serious personal injury or death.



Installing the Grapple Shovel requires power to be applied to the unit. This section only covers the significant commissioning steps and does not include the full commissioning instructions.

4.3.10.1 Checking the Electrical Wiring

Check all electrical connections before applying power. Ensure that each electrical item is in good condition and wired correctly. Apply power after this check.



Please refer to the Certified Drawing Package and Stahl Electrical Drawing Package additional documents for complete electrical wiring instructions.

4.3.10.2 Motor Direction Check

Check the motor direction for the Hydraulic Power Unit Electric Motor, the Lift Hoist System Travel Drive Motor, and the Lift Hoist System Hoist Motor. After checking all three motor directions, if one or more motors is rotating incorrectly, power down all the equipment and check the motor wiring.

4.3.10.2.1 Hydraulic Power Unit Electric Motor

Check the direction of rotation for the Electric Motor on the Hydraulic Power Unit (See Section 3.3.6, Hydraulic Power Unit on Page 3-55). Verify that the direction of rotation matches the direction marked by the arrow on the motor.



CAUTION

Do not run the Hydraulic Power Unit Electric Motor backwards for any extended time as this may damage the Gear Pump.

4.3.10.2.2 Lift Hoist System Travel Drive Motor

Check the forward and reverse motion of the Lift Hoist System. The Travel Drive Motor provides horizontal motion (See Section 3.3.3, Lift Hoist System on Page 3-51) Use the Wireless Remote Control Pendant or HMI Manual Controls (See Section 5.4, Manual Operation on Page 5-154) to check the forward and reverse motion.



Please refer to the Certified Drawing Package for the orientation of forward and reverse motion. The default orientation shows reverse motion as leftward and forward motion as rightward in relation the beam on the Certified Drawing Package. The HMI allows the option to invert the forward and reverse motion to match the desired orientation.



If the Lift Hoist System does not move forward or reverse or will only move one of the two directions, power down all the equipment and check the Rotary Limit Switch wiring (See Section 4.3.9.2, Installing the Rotary Limit Switch on Page 4-88).

NOTICE

The Rotary Limit Switch red end must be oriented upward in between the two sets of Position Stops to allow Lift Hoist System movement.

4.3.10.2.3 Lift Hoist System Hoist Motor

Check the downward and upward motion of the Lift Hoist System. The Hoist Motor provides horizontal motion (See Section 3.3.3, Lift Hoist System on Page 3-51). Use the Wireless Remote Control Pendant or HMI Manual Controls (See Section 5.4, Manual Operation on Page 5-154) to check the downward and upward motion.

Press the Bypass SMC Permissions Button on the HMI at the same time as a Downward Motion button, and then press the Bypass SMC Permissions Button on the HMI at the same time as an Upward Motion button.

4.3.10.3 Horizontal Movement Test



If the Lift Hoist System does not move forward or reverse or will only move one of the two directions, power down all the equipment and check the Rotary Limit Switch wiring (See Section 4.3.9.2, Installing the Rotary Limit Switch on Page 4-88).



It is best practice to adjust all the Proximity Switches to the same height, then adjust the Hydraulic Carriage Tow Bar for any additional necessary adjustments.

NOTICE

The Rotary Limit Switch red end must be oriented upward in between the two sets of Position Stops to allow Lift Hoist System movement.



Please refer to the Certified Drawing Package for the orientation of forward and reverse motion. The default orientation shows reverse motion as leftward and forward motion as rightward in relation the beam on the Certified Drawing Package. The HMI allows the option to invert the forward and reverse motion to match the desired orientation.

4.3.10.3.1 Reverse Position Stops

Use the Wireless Remote Control Pendant or HMI Manual Controls (See Section 5.4, Manual Operation on Page 5-154) to reverse the Lift Hoist System. Continue the reverse motion past the Target Plates on the Position Stops. The Rotary Limit Switch should rotate ninety degrees after passing each Position Stop. After passing the second Position Stop, the red end of the Rotary Limit Switch should be oriented downward and reverse motion should be halted even if a reverse motion button is pressed. Adjust the Target Plate height and Hydraulic Carriage Tow Bar height as needed if the Rotary Limit Switch does not correctly contact the Target Plates.

4.3.10.3.2 Position Sensors

Use the Wireless Remote Control Pendant or HMI Manual Controls (See Section 5.4, Manual Operation on Page 5-154) to move the Lift Hoist System forward. Stop the Hoist motion when the Target on the Hydraulic Carriage Tow Bar is underneath one of the Proximity Switches. Verify that the Proximity Switch signals the Lift Hoist System Position on the HMI (See Section 5.5.4.1, HMI Trolley Sensors Screen on Page 5-167). Adjust the Proximity Switch height and Hydraulic Carriage Tow Bar height as needed if the Hydraulic Carriage Tow Bar Target does not correctly activate the Proximity Switch signal. Repeat this for each Proximity Switch, moving forward to each sensor.

4.3.10.3.3 Forward Position Stops

Use the Wireless Remote Control Pendant or HMI Manual Controls (See Section 5.4, Manual Operation on Page 5-154) to move the Lift Hoist System forward. Continue the forward motion past the Target Plates on the Position Stops. The Rotary Limit Switch should rotate ninety degrees after passing each Position Stop. After passing the second Position Stop, the red end of the Rotary Limit Switch should be oriented downward and forward motion should be halted even if a forward motion button is pressed. Adjust the Target Plate height and Hydraulic Carriage Tow Bar height as needed if the Rotary Limit Switch does not correctly contact the Target Plates.

4.3.11 Greasing the Wire Rope

Use a brush to apply grease to both wire ropes. See Section 3.4.4.2, Wire Rope Grease Specification on Page 3-64 to select the appropriate grease type.



Please refer to the Stahl SH Wire Rope Manual additional document for the complete lubrication instructions.

4.3.12 Greasing the Grapple Shovel Bushings

Apply grease to the Grapple Shovel Bushings. See Section 3.4.4.1, Bushing Grease Specification on Page 3-63 to select the appropriate grease type. See Section 6.3.2.1, Greasing the Bushings, Pins, and Spacers (Pivot Points) on Page 6-214 for the procedure for greasing the Grapple Shovel bushings.

4.3.13 Installing the Grapple Shovel



It is necessary to apply power for this installation task! Use extreme caution whenever power is applied to complete maintenance tasks. Only qualified personnel may perform this maintenance. Failure to follow this instruction and the instructions of the equipment manufacturer can result in serious personal injury or death.

4.3.13.1 Lift Hoist System Preparation and Hook Block Installation



Please refer to the additional Lift Hoist System documents for the complete Hoist Installation Instructions, including the Hoist Data Sheet and Stahl SH Wire Rope Hoists Manual.

1. Change the Grapple Hoist unit operation mode to manual mode on the HMI (if not already in manual mode).

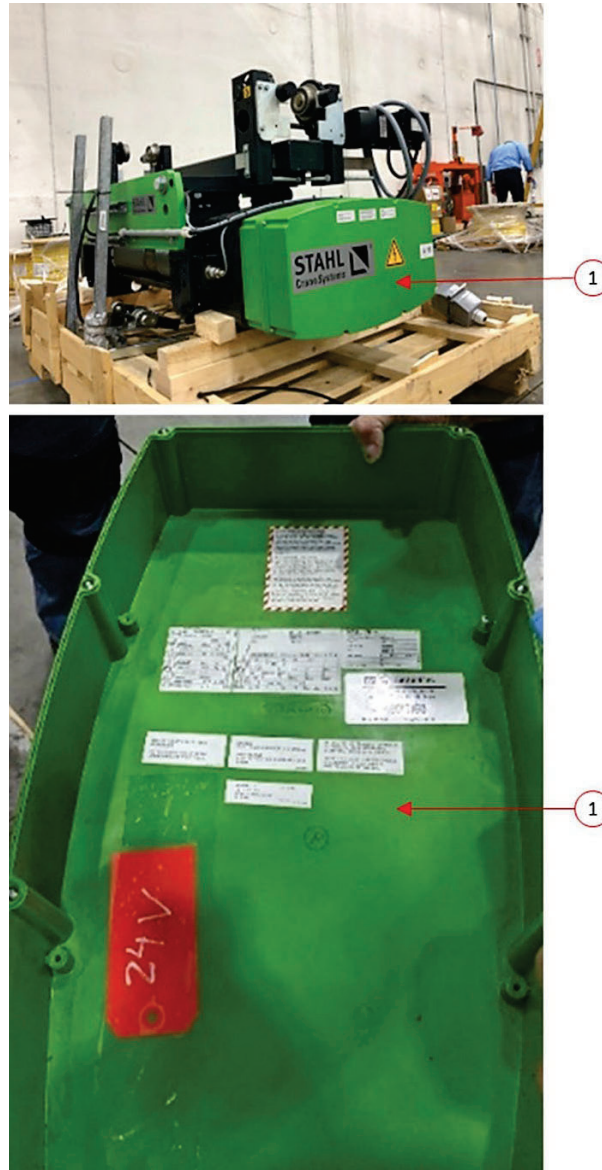
Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

2. Move the Lift Hoist System to a maintenance position. The maintenance position should position the Lift Hoist System away from the Trashwell, Wash Tower, or any other fixed equipment.
3. Open the Terminal Box (A16) and Hoist Limit Switch Box (S220) to prepare for limit switch adjustment.

Figure Legend

- | | |
|---|--|
| 1 | Terminal Box
Cover (A16) |
| 2 | Hoist Limit Switch
Box Cover (S220) |
| 3 | Bypass Switches
(S260 and S261) |

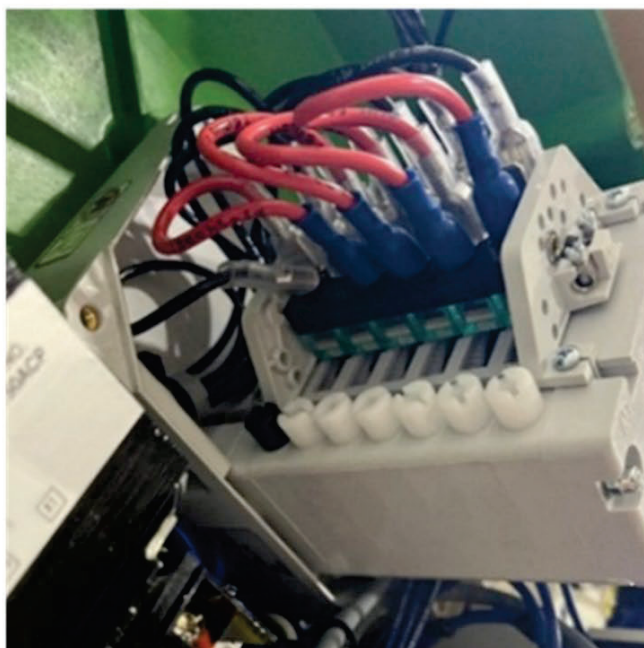


Note: Some parts not shown for clarity.

Figure 4-16: Removing the Terminal Box and Hoist Limit Switch Box Covers (1 of 3)

Figure Legend

- 1 Terminal Box
Cover (A16)
- 2 Hoist Limit Switch
Box Cover (S220)
- 3 Bypass Switches
(S260 and S261)

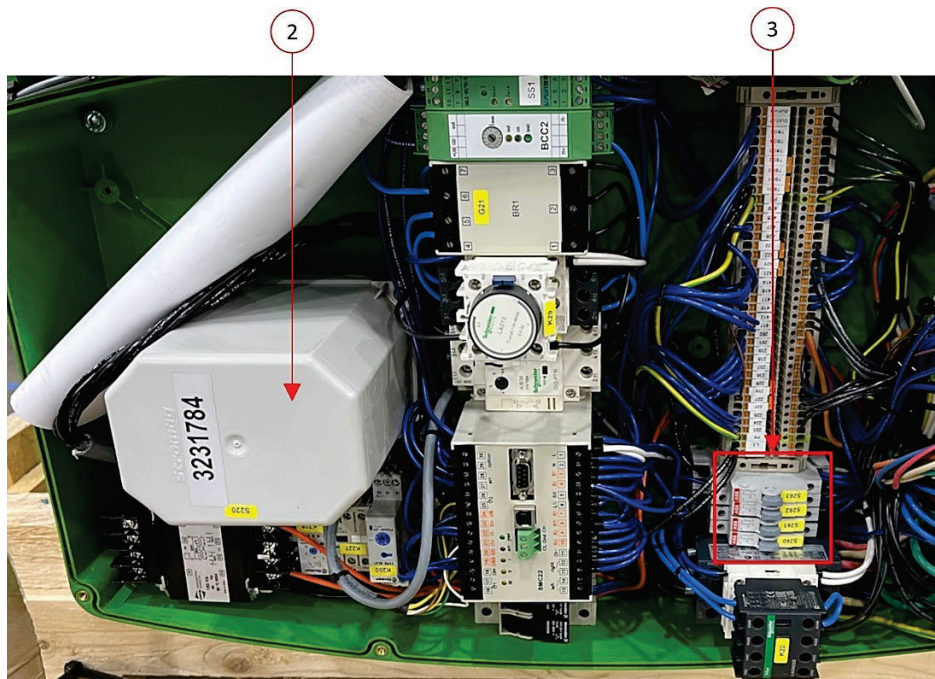


Note: Some parts not shown for clarity.

Figure 4-17: Removing the Terminal Box and Hoist Limit Switch Box Covers (2 of 3)

Figure Legend

- 1 Terminal Box
Cover (A16)
- 2 Hoist Limit Switch
Box Cover (S220)
- 3 Bypass Switches
(S260 and S261)



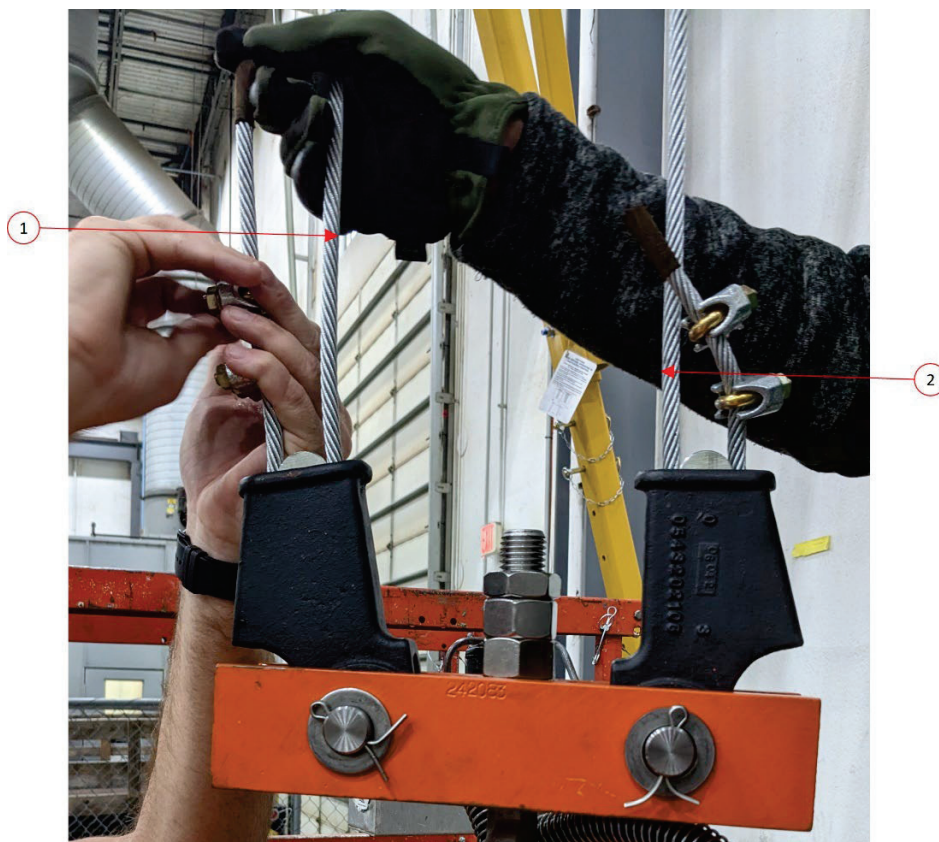
Note: Some parts not shown for clarity.

Figure 4-18: Removing the Terminal Box and Hoist Limit Switch Box Covers (3 of 3)

- a. Remove the screws in the green Terminal Box (A16) cover and remove the cover.
- b. Remove the screws in the Hoist Limit Switch Box (S220) cover and remove the cover.
4. Lower the ends of the Wire Ropes to the floor of the maintenance position using the Wireless Remote Control Pendant or HMI Manual Controls (See Section 5.4, Manual Operation on Page 5-154).
 - a. Press the Slack Line Bypass button on the HMI at the same time as a downward motion button. The Slack Line Bypass button allows the Wire Ropes to be unspooled until the Extreme Lower Limit Switch (S2) setting.
 - b. Continue pressing both buttons until motion automatically stops at the Extreme Lower Limit Switch (S2) setting.
5. Verify the Wire Rope and Wire Rope Drum Hands. The Wire Rope set should include a Left-Hand Lay Wire Rope (1) for the Wire Rope Drum Right-Hand Grooves (3) and Right-Hand Lay Wire Rope (2) for the Wire Rope Drum Left-Hand Grooves (4).

Figure Legend

- 1 Left-Hand
Lay Wire Rope
- 2 Right-Hand
Lay Wire Rope
- 3 Wire Rope Drum
Right-Hand Grooves
- 4 Wire Rope Drum
Left-Hand Grooves

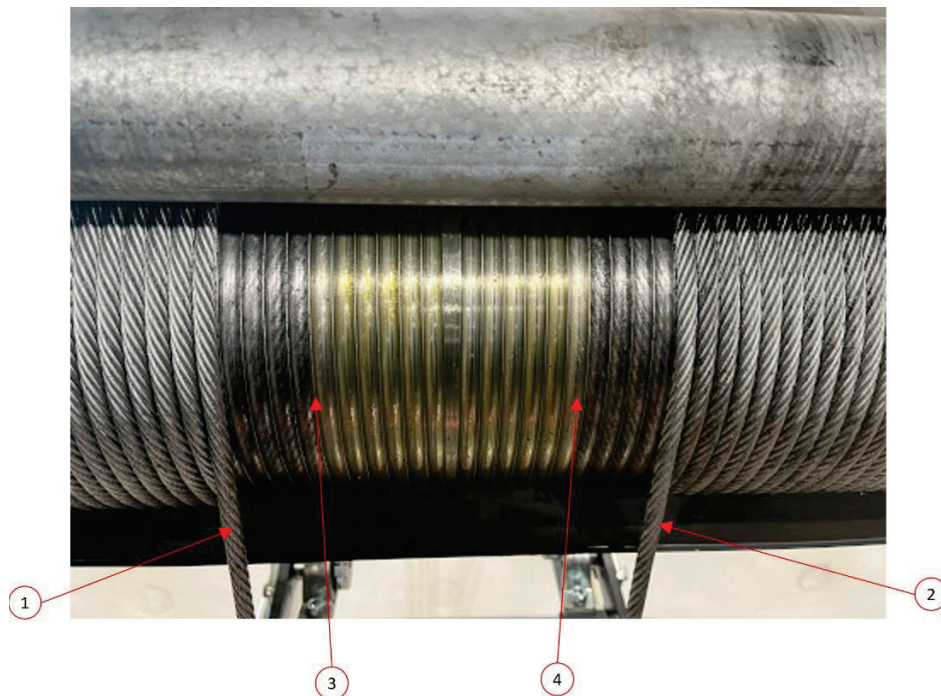


Note: Some parts not shown for clarity.

Figure 4-19: Wire Rope and Wire Rope Drum Hands (1 of 2)

Figure Legend

- | | |
|---|--------------------|
| 1 | Left-Hand |
| | Lay Wire Rope |
| 2 | Right-Hand |
| | Lay Wire Rope |
| 3 | Wire Rope Drum |
| | Right-Hand Grooves |
| 4 | Wire Rope Drum |
| | Left-Hand Grooves |



Note: Some parts not shown for clarity.

Figure 4-20: Wire Rope and Wire Rope Drum Hands (2 of 2)

6. Check the Extreme Lower Limit Switch (S2) setting.
 - a. At the Extreme Lower Limit Switch (S2) setting, the wire ropes should be wrapped around the Wire Rope Drum 5-10 times on each side of the drum.
 - b. If this is not the case, adjust the Extreme Lower Limit Switch (S2) Adjustment Screw clockwise or counterclockwise until the Wire Ropes are wrapped around the Wire Rope Drum 5-10 times at the Extreme Lower Limit Switch (S2) setting.



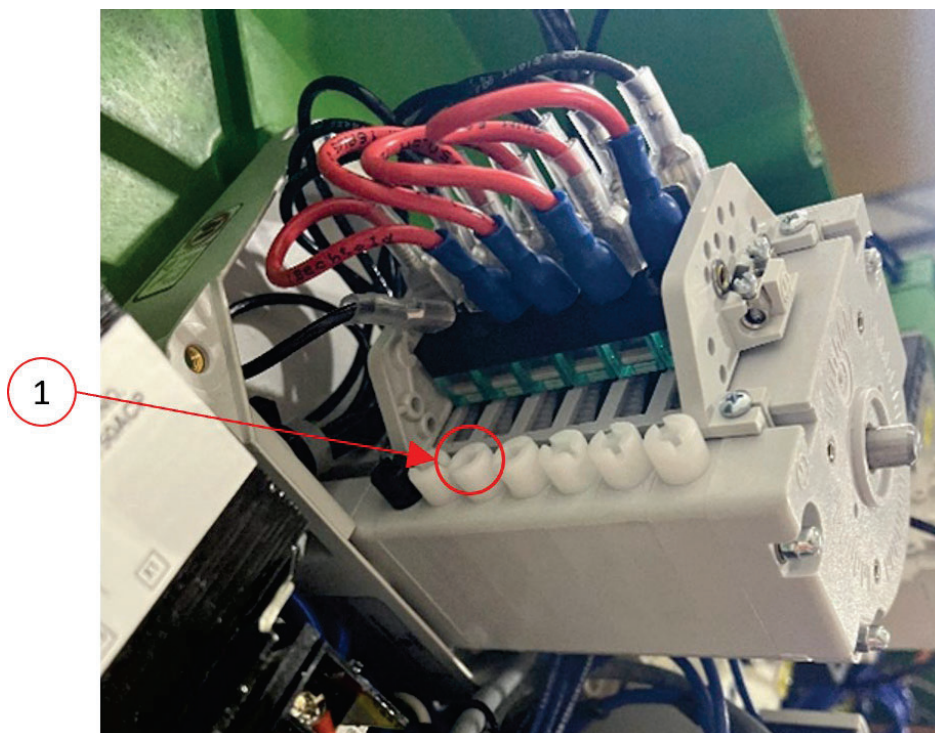
Pressing the Bypass Switch S261 simultaneously with a manual upward motion button may be required to move when the Grapple Shovel is stopped at or below the Extreme Lower Limit Switch (S2) setting.



One revolution of a limit switch adjustment screw corresponds to about one revolution of the drum.

Figure Legend

- | | |
|---|--|
| 1 | Extreme Lower Limit
Switch (S2) Adjustment
Screw |
|---|--|



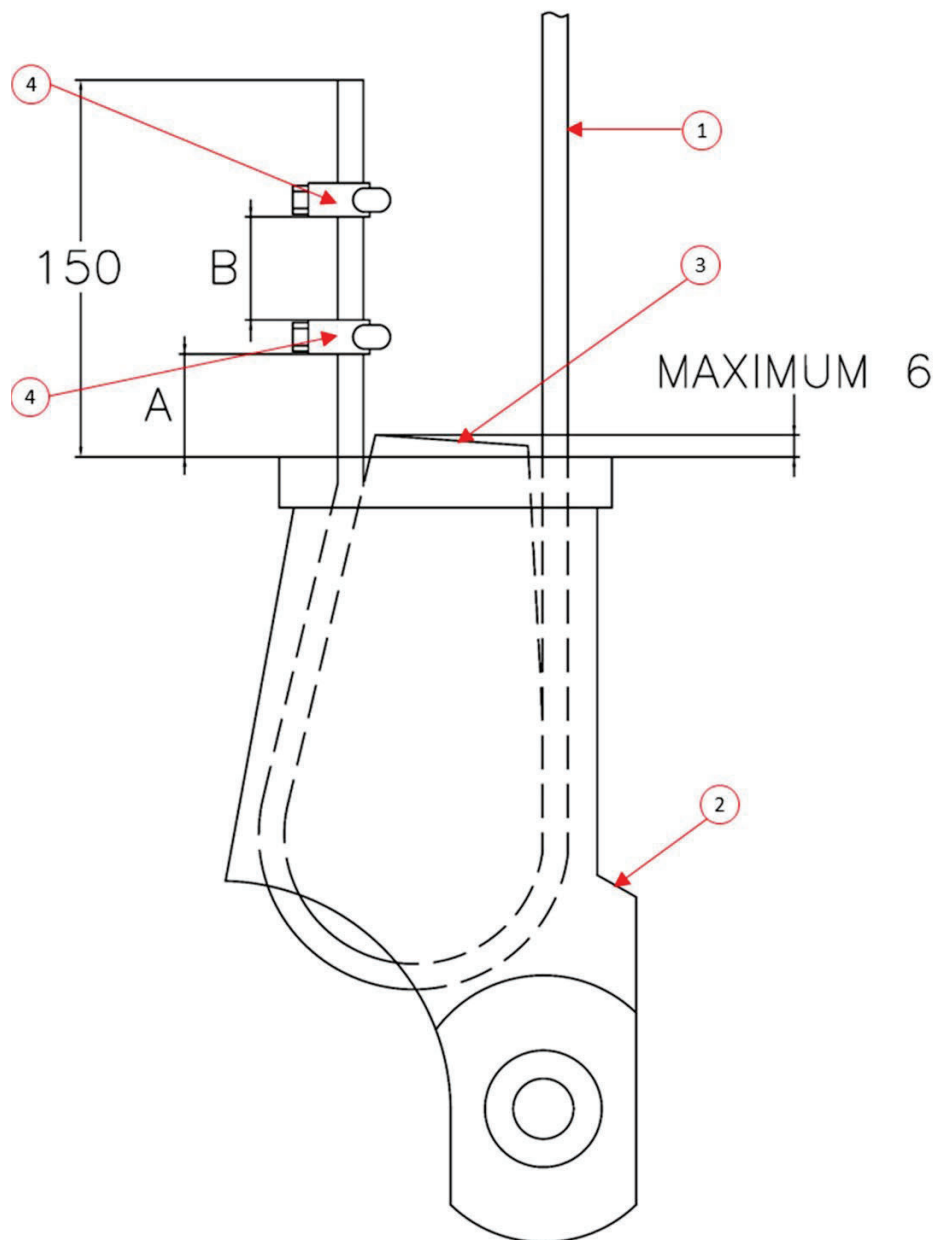
Note: Some parts not shown for clarity.

Figure 4-21: S220 – Extreme Lower Limit Switch (S2) Adjustment Screw

7. Assemble the rope fastening points with the Wire Rope ends. Refer to Figure 4-22 on Page 4-99.

Figure Legend

- 1 Wire Rope
- 2 Rope Bag
- 3 Rope Wedge
- 4 Rope Clamp
- 5 Cotter Pin (Not Shown)
- 6 Hoist Pin (Not Shown)
- 7 Hoist Washer (Not Shown)
- 8 Hook Block (Not Shown)
- 9 Wrap Sleeving (Not Shown)



Note: Not to Scale. Some parts not shown for clarity.

Figure 4-22: Rope Fastening Point Installation

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

- a. Clear all grease from the Wire Rope (1) ends, Rope Bags (2), and Rope Wedges (3).
 - b. Feed the Wire Rope (1) ends through the innermost end of the Rope Bags (2).
 - c. Wrap the Wire Ropes (1) around a Rope Wedges (3) and feed the ends of the Wire Ropes (1) through the outermost end of the Rope Bags (2). The Wire Rope (1) ends should protrude approximately 150mm (5.9 inches) out of the Rope Bags (2).
 - d. Connect the Hook Block (8) to the Rope Bags (2) with the Hoist Pins (6), Hoist Washers (7), and Cotter Pins (5).
8. Lift the Grapple Shovel off of the maintenance floor with the Wireless Remote Control Pendant or HMI manual controls.



Pressing the Bypass Switch S261 simultaneously with a manual upward motion button may be required to move when the Grapple Shovel is stopped at or below the Extreme Lower Limit Switch (S2) setting.

9. Increase the protrusion length of one of the Wire Ropes (1) until the Hook Block (8) is level with the floor.



Figure 4-23: Level Hook Block

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

10. Install the Rope Clamps at the locations shown in Figure 4-23 on Page 4-100 and Table 4-1 below. Tighten the Rope Clamps (4) to the torque specified in Table 4-1.

Table 4-1: Rope Clamp Torque Specifications

Hoist Type	Rope Diameter (mm)	Screw Size	Torque Specification	A	B
SH4	7mm (0.28")	M8	10 N-m (7.4 ft-lbs.)	25mm (1.0")	N/A
SH5	9mm (0.35")	M8	20 N-m (14.8 ft-lbs.)	25mm (1.0")	25mm (1.0")

11. Lower the Grapple Shovel to the maintenance floor.

4.3.13.2 Applying Load to the Wire Rope Fastening Point

Please refer to the additional Lift Hoist System documents for the complete Hoist Installation Instructions, including the Hoist Data Sheet and Stahl SH Wire Rope Hoists Manual.

1. Lift the Grapple Shovel off the maintenance floor and hold for one minute. Lower the Grapple Shovel down to the maintenance floor. Repeat this step five times.



Pressing the Bypass Switch S261 simultaneously with a manual upward motion button may be required to move when the Grapple Shovel is stopped at or below the Extreme Lower Limit Switch (S2) setting.



Figure 4-24: Applying Load to the Wire Rope Fastening Point

2. Check the protrusion of the Rope Wedges (3) from the Rope Bags (2). Confirm that the protrusion does not exceed 6mm. If 6mm is exceeded, disassemble the rope fastening points and restart the rope fastening point assembly (Refer to Figure 4-22: Rope Fastening Point Installation on Page 4-99).
3. Use the Wrap Sleeving (9) to secure the Wire Rope (1) ends protruding from the outermost end of the Rope Bags (2) to the Wire Rope (1) ends protruding from the innermost end of the Rope Bags (2) (Refer to Figure 4-22: Rope Fastening Point Installation on Page 4-99).

4.3.13.3 Adjusting the Limit Switch Adjustment Screws

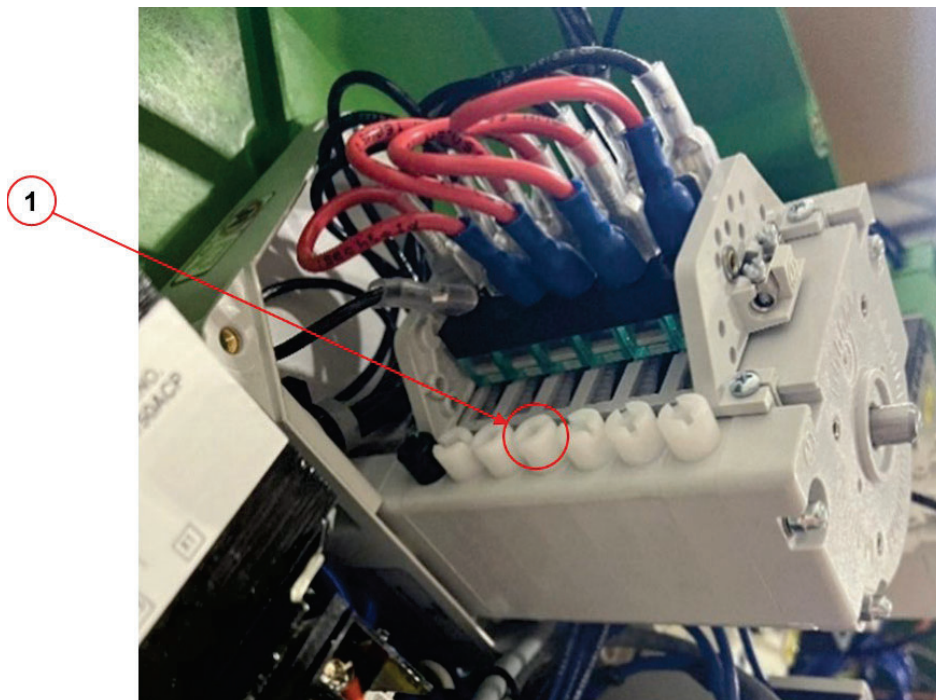


Please refer to the additional Lift Hoist System documents for the complete Hoist Installation Instructions, including the Hoist Data Sheet and Stahl SH Wire Rope Hoists Manual.

1. Check the Operating Limit Switch (S3) setting.

Figure Legend

- | | |
|---|--|
| 1 | Operating Limit Switch (S3) Adjustment Screw |
|---|--|



Note: Some parts not shown for clarity.

Figure 4-25: S220 – Operating Limit Switch (S3) Adjustment Screw

- Lift the Grapple Shovel with the Wireless Remote Control Pendant or HMI manual controls until the movement is automatically stopped. The bottom of the Grapple Shovel should be located approximately 915mm (3.0 feet) above the Trashwell unless otherwise noted on the Certified Drawing Package.
- Adjust the Operating Limit Switch (S3) Adjustment Screw until the Grapple Shovel movement stops at the correct location. Clockwise adjustment moves the setting up and counterclockwise adjustment moves the setting down.

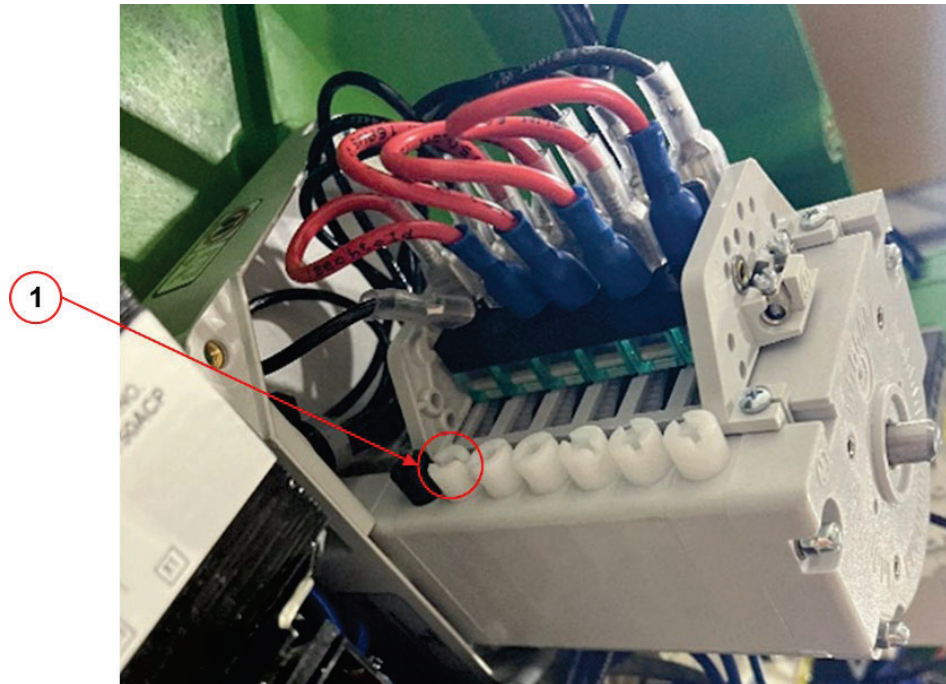


One revolution of a limit switch adjustment screw corresponds to about one revolution of the drum.

2. Check the Extreme Upper Limit Switch (S1) setting.

Figure Legend

- | | |
|---|--|
| 1 | Extreme Upper Limit Switch (S1) Adjustment Screw |
|---|--|



Note: Some parts not shown for clarity.

Figure 4-26: S220 – Extreme Upper Limit Switch (S1) Adjustment Screw

- Press and hold the Bypass Switch S260 to allow hoist movement past the Operating Limit Switch (S3) setting.
- Lift the Grapple Shovel with the Wireless Remote Control Pendant or HMI manual controls until the movement is automatically stopped.
- If the movement stops after the Hook Block contacts the Paddle Switch on the Lift Hoist System, the Extreme Upper Limit Switch (S1) is set too high. Lower the Grapple Shovel below the Operating Limit Switch (S3) setting, then turn the Extreme Upper Limit Switch (S1) Adjustment Screw counterclockwise.



Pressing the Bypass Switch S261 simultaneously with a manual downward motion button is required to move when the Grapple Shovel is stopped at Extreme Upper Limit Switch (S1).

- If the movement stops above the Operating Limit Switch (S3) setting and below the Paddle Switch on the Lift Hoist System, the Extreme Upper Limit Switch (S1) is set correctly.

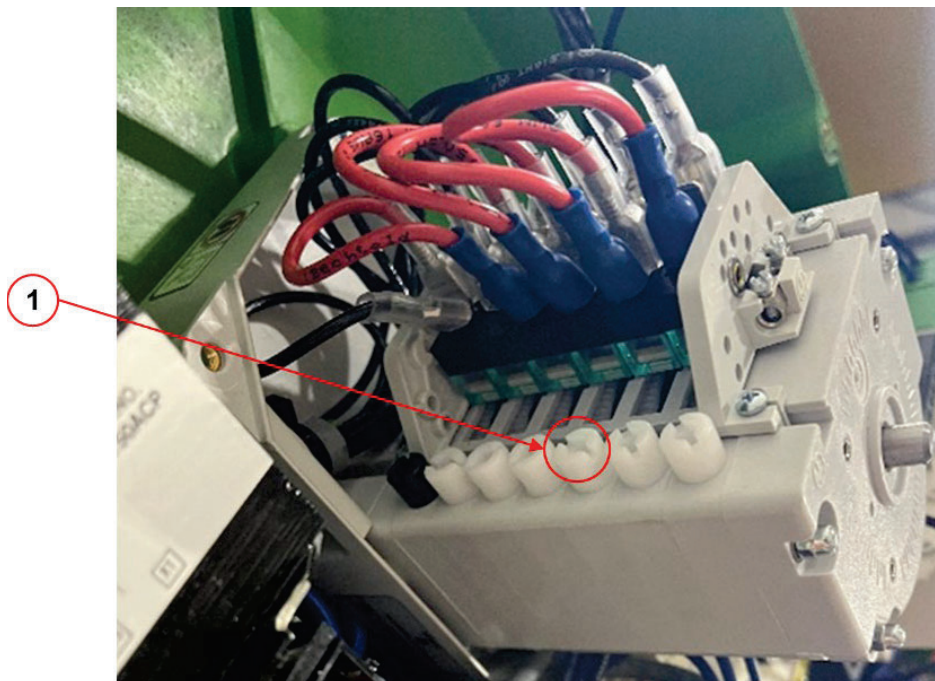
Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

- e. Lower the Grapple Shovel below the Operating Limit Switch (S3) setting.
 - f. Release the Bypass Switch S260 Switch to stop Grapple Shovel upward movement at the Operating Limit Switch (S3) setting.
3. Check the Speed Transition Limit Switch (S4) setting.

Figure Legend

- | | |
|---|---|
| 1 | Speed Transition Limit Switch (S4) Adjustment Screw |
|---|---|



Note: Some parts not shown for clarity.

Figure 4-27: S220 – Speed Transition Limit Switch (S4) Adjustment Screw

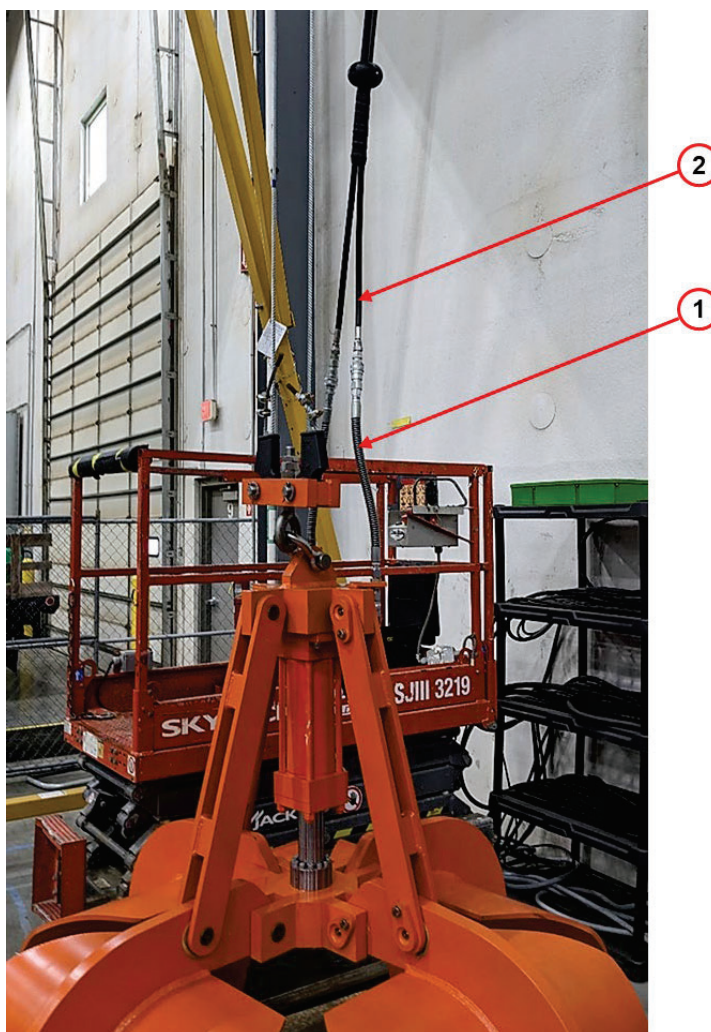
- a. Starting from the Operating Limit Switch (S3) setting, move the Grapple Shovel downward with the Wireless Remote Control Pendant or HMI manual controls until the movement transitions from a slow speed to a fast speed. The speed transition should occur approximately 460mm (18") below the Operating Limit Switch (S3) setting unless another location is necessary for the application.
 - b. Adjust the Operating Limit Switch (S3) Adjustment Screw until the Grapple Shovel movement stops at the correct location. Clockwise adjustment moves the setting up and counterclockwise adjustment moves the setting down.
4. Close the Terminal Box (A16) and Hoist Limit Switch Box (S220).
 - a. Replace the cover over the limit switches and tighten the screws for the Hoist Limit Switch Box (S220) cover.
 - b. Replace the cover over the limit switches and tighten the screws for the Terminal Box (A16) cover.

4.3.13.4 Connecting the Hydraulic Hoses

1. Release the Hydraulic Hoses from the Hose Reel on the Hydraulic Carriage. Connect the Hydraulic Hose from the Hose Reel to the Hydraulic Hose from the Grapple Shovel.

Figure Legend

- | | |
|---|--|
| 1 | Hydraulic Hose -
Grapple Shovel |
| 2 | Hydraulic Hose -
Hydraulic Carriage |



Note: Some parts not shown for clarity.

Figure 4-28: Connecting the Hydraulic Hoses

4.3.14 Setting the Hose Reel Tension

As the Hose Reel unwinds and releases the Hydraulic Hose, the Hose Reel spring tension increases. As the Hose Reel winds and retracts the Hydraulic Hose, the Hose Reel spring tension decreases.



Refer to the additional Hose Reel documents for complete instructions.

4.3.14.1 Procedure

To set the Hose Reel tension:

1. Place a mark or piece of tape on the Hose Reel to count the revolutions as shown in Figure 4-29.



Figure 4-29: Marking the Hose Reel

2. Move the Grapple Shovel to the TRASHWELL POSITION and TRAVEL ELEVATION. (See Section 5.3.3, Grapple Elevation and Position Summary on Page 5-122.)
3. Lower the Grapple Shovel to the bottom of the Trashwell **while counting the number of Hose Reel revolutions**. Make a note of the number of Hose Reel revolutions during this step.
4. Raise the Grapple Shovel to the TRAVEL ELEVATION (See Section 5.3.3, Grapple Elevation and Position Summary on Page 5-122.)
5. Move the Grapple Shovel to a maintenance area with access to the Hose Reel.
6. Shut down unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES)**.
7. Remove the Hose Bumper on the Hydraulic Hose by removing the screws in the Hose Bumper as shown in Figure 4-30.



Figure 4-30: Removing the Hose Bumper on the Hydraulic Hose

8. Remove the Rollers on the Hydraulic Carriage to allow the Hydraulic Hose to fully retract as shown in Figure 4-31.



Figure 4-31: Allowing the Hydraulic Hose to Fully Retract

9. Use the quick disconnect fittings to separate the Hydraulic Hose from the Dual Hydraulic Hose and Fittings from the Hydraulic Hose from the Grapple Shovel.
10. Wind the Hydraulic Hose fully onto the reel while counting the number of Hose Reel revolutions (or fraction of a Hose Reel revolution).
Important: Make note of the number of Hose Reel revolutions during this step.
11. Continue winding the Hose Reel until the Hose Reel comes to a rest. The Hose Reel will no longer be under spring tension in this position.
12. Tucking the Hydraulic Hose into the reel to prevent the Hydraulic Hose from unraveling from the Hose Reel while the Hose Reel unwinds.

13. Preload the Hose Reel spring tension by unwinding the Hose Reel:

- a. The Hose Reel has 18 available revolutions until the spring reaches maximum tension.
- b. Subtract the Step 3 and Step 10 revolution values from the 18 available revolutions. The value after the subtraction is the number of revolutions to unwind the Hose Reel for preloading the Hose Reel spring tension.
- c. On the last preload revolution, untuck and feed the Hydraulic Hose through the utility rollers on the Hose Reel.

Reinstall the Rollers on the Hydraulic Carriage and the Hose Bumper on the Hydraulic Hose with the Hose Reel at the preload position. The Hose Bumper should rest against the Rollers at the preload position.

14. Use the quick disconnect fittings to reconnect the Hydraulic Hose from the Dual Hydraulic Hose and Fittings and the Hydraulic Hose from the Grapple Shovel.

15. **Bring the unit out of Zero Energy State (ZES).**

4.3.15 Additional Electrical Commissioning



It is necessary to apply power for this installation task! Use extreme caution whenever power is applied to complete maintenance tasks. Only qualified personnel may perform this maintenance. Failure to follow this instruction and the instructions of the equipment manufacturer can result in serious personal injury or death.

Completing the installation of the Grapple Hoist requires power to be applied to the unit. This section covers significant commissioning steps but does not contain full commissioning instructions.

4.3.15.1 Hydraulic Power Unit Checks

Confirm the Level Switch, Temperature Switch, and Pressure Switch are working properly and show readings on the HMI (See Section 5.5.5.3, HMI Grapple Shovel and HPU Sensors Screen on Page 5-173). Adjust the maximum pressure setting to match the specification shown in Section 3.4.3, Hydraulic Power Unit Standard Specifications on Page 3-63.

4.3.15.2 Bleeding the Hydraulic Lines (Opening and Closing the Grapple Shovel)

Press the Close Button until air bleeds from the lines and the Grapple Shovel fully closes. Press the Open Button until air bleeds from the lines and the grapple opens. Continue pressing the Open Button until the pressure reaches the maximum setting (See Section 3.4.3, Hydraulic Power Unit Standard Specifications on Page 3-63).



Follow the instructions found in Section 5.4.2, Wireless Remote Control Pendant on Page 5-154 or Section 5.4.4, HMI Manual Screen on Page 5-157 to perform the steps involving the Open and Close Buttons.



The Grapple Shovel will only open or close if the Hydraulic Power Unit is operating.

4.3.15.3 Checking the Load Sensor

Check the Load Sensor reading on the HMI Overview Screen. See the Total Weight Reading on the HMI for the Load Sensor reading (See Section 5.5.3, HMI Overview Screen on Page 5-161). The Load Sensor reading should match closely to weight displayed on the Grapple Shovel Certified Drawing.



Refer to the Grapple Shovel Certified Drawings for the Grapple Shovel weight.

4.3.15.4 Checking the Paddle Limit Switch

Manually push the Paddle Limit Switch on the Lift Hoist System (See Section 3.3.3, Lift Hoist System on Page 3-51). The Paddle Upper Limit indicators should be marked red (See Section 5.5.5.2, HMI Hoist Sensors Screen on Page 5-169) and an upper limit alarm should appear on the HMI (See Section 5.5.9, HMI Alarm Screens on Page 5-201).

4.3.15.5 Checking the Overwind Protection



Please refer to the additional Lift Hoist System documents for the complete Hoist Installation Instructions, including the Hoist Data Sheet, Stahl SH Wire Rope Hoists Manual, and Stahl Overwinding Protection Manual.

Figure Legend

- | | |
|---|----------------|
| 1 | Rag |
| 2 | Wire Rope Drum |
| 3 | Overwind Roll |



Note: Some parts not shown for clarity.

Figure 4-32: Overwind Protection Test with Rag Tied to the Wire Rope

1. Change the Grapple Hoist unit operation mode to manual mode on the HMI (if not already in manual mode).
2. Move the Lift Hoist System to a maintenance position. The maintenance position should position the Lift Hoist System away from the Trashwell, Wash Tower, or any other fixed equipment.
3. Lower the Grapple Shovel to the floor of the maintenance position.
 - a. Fully open the Grapple Shovel. This ensures that the Grapple Shovel will be secure on the floor of the maintenance position.
 - b. Lower the Grapple Shovel until the Grapple Shovel is secure on the floor of the maintenance position and applies no load on the Wire Rope.

Intelligent Grapple Hoist**Models: 4' (1.2 m) | 6' (1.8 m)**

4. Tie a Rag (1) to one of the Wire Ropes. Make sure the Rag (1) is tied to a section of Wire Rope that will wrap around the Wire Rope Drum (3).
5. Move The Grapple Shovel up until the Rag (1) makes contact with the Wire Rope Drum (3). The Rag (1) should trip the Overwind Roll (2). When this occurs, the Overwind indicators should be marked red (See Section 5.5.5.2, HMI Hoist Sensors Screen on Page 5-169) and an overwind alarm should appear on the HMI Alarms Screen (See Section 5.5.9, HMI Alarm Screens on Page 5-201).

4.3.15.6 Adjusting the HMI Elevation Zero Point

1. Change the Grapple Hoist unit operation mode to manual mode on the HMI (if not already in manual mode).
2. Move the Grapple Shovel to the bottom of the Trashwell.
3. Check the Grapple Depth value on the HMI Overview Screen (See Section 5.5.3, HMI Overview Screen on Page 5-161). The value should equal the distance from the SPEED TRANSITION ELEVATION to the manufacturing floor around the Trashwell.

4.3.15.7 Checking Automatic Operation

1. Change the Grapple Hoist unit operation mode to automatic mode on the HMI (if not already in automatic mode).
2. Press the Start Auto Sequence Button to start an automatic cycle (See Section 5.5.3, HMI Overview Screen on Page 5-161).
3. Verify that the horn sounds and the light flashes on the Hydraulic Carriage before automatic motion. Stop the automatic sequence if the light or horn do not activate.
4. Verify that the automatic motion performs properly. See Section 5.3.4.6, Automatic Cycle on Page 5-128 for the automatic cycle information. Stop the automatic sequence if any part of the sequence does not perform properly.

4.4 Storing the Unit Outside

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

**WARNING**

The unit should not be stored outside.

NOTICE

The electronics, switches, and various components of the unit are prone to damage should the unit be stored outside.



Kadant assumes no liability as to the specific storage requirements for the unit or its components.

5 Operation

This section describes all unit start, run, and shutdown procedures. It contains information about preliminary inspections, startup procedures, and troubleshooting techniques.

Read Section 3, Overview and Specifications on Page 3-42 to make sure personnel are familiar with equipment components and sequence of operation when unit is in production mode.

Read this section before performing any operating procedures to unit.

- All procedures are defined in chronological steps.
- Troubleshooting is provided to help solve any faults unit may incur during operation.

5.1 Pre-Production Inspection

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

5.1.1 Precautions

- Read this section carefully and follow all procedures before placing the unit into production.
- The maintenance staff must read this manual and focus special attention on *Section 2, Safety* and specify the damage to the equipment due to failure to follow the manual; otherwise, Kadant will not assume any liability.



WARNING

Allow only qualified and licensed professionals that are familiar with the structure, operation, and potential hazard treatment methods for the equipment to install, debug and maintain the system. Failure to follow this instruction can result in serious personal injury or death.



WARNING

Read the manual carefully and understand its content before operating this system. Failure to follow this instruction can result in serious personal injury or death.

- Cut off the power supply to prevent an accident before checking or maintaining the equipment.
- The system is mainly used to control the automatic Grapple Hoist system of the bridge crane.



Locate and install the system in a location as far away as possible from any Electromagnetic Interference (EMI) sources (e.g., transformer, ventilator, high power motor, etc.) to the maximum extent,



Connect the system to a reliable grounding device.



The power supply shall be first filtered by a stabilized voltage supply, and then accessed into the system.

**WARNING**

ATTENTION! Never touch or maintain any mobile parts while the equipment is operating. Never stand or store obstacles below the Grapple Hoist or around the equipment that may be struck by the equipment. The equipment can only be maintained in Power Off mode and without any load. Failure to follow this instruction can result in equipment damage, serious personal injury, or death.

**DANGER**

It is sometimes necessary to apply power to the equipment during certain maintenance tasks (e.g., changing wire ropes). Use extreme caution whenever power is applied to complete these tasks. Failure to follow this instruction, and the instructions from the equipment manufacturer, can result in serious personal injury or death.

5.1.2 Safety

5.1.2.1 Interpretation and Description of Symbols

- Please follow the symbols related to worker safety and focus special attention on the descriptions.
- Please inform other users of safety instructions.
- Abide by the general regulations for safety and accident prevention in the factory in addition to the instructions herein.

NOTICE

ATTENTION! This mark appears in the regulations, instructions and rules of the supplier and is used to prevent personnel from causing machine damage and/or other parts in the factory.

5.1.3 Start-Up: First Time or After Maintenance

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

**WARNING**

Station a person at the power source or system control, ready to remove power from the unit upon notice. The first run of the unit may involve wiring mistakes, unit malfunctions, or programming errors that can cause the unit to move suddenly and unexpectedly. Failure to follow this instruction can result in unit damage, serious personal injury, or death.



Kadant does not supply a Digital Control System (DCS). The customer is responsible for the design, installation, and functionality of the DCS.

**WARNING**

Follow the procedures very carefully and in the listed order. Failure to follow this instruction can result in unit damage, serious personal injury, or death.

To start unit for the first time, or as needed after maintenance procedures, perform the following steps in sequence:

- Inspect the installation of the unit **before** turning on the power.
- Make sure before placing the unit into production:
 - All guards and covers are in good condition and fastened in place.
 - No parts are loose, worn, damaged or missing.
 - Check for the proper oil level in the reservoir.
 - Make sure that the bushings have been greased.
 - Inspect wire rope for broken wires or strands, kinks, and any type of deformation or damage of rope structure.
 - Make sure that the wire ropes have been greased.
- Review hooks for nicks, gouges, and twisting.
- Make sure the hoist wire rope is not used as a sling to wrap around a load.

5.2 Operation Safety

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

5.2.1 Overview



The maintenance staff must read this Product Manual and focus special attention on the following in the operation of the Grapple Hoist.

5.2.2 Safety



WARNING

ATTENTION! While the equipment is operating, never touch or maintain the mobile parts or related ones, and never stand below the equipment. Failure to follow this instruction can result in serious personal injury or death.



WARNING

ATTENTION! The equipment can only be maintained in **POWER OFF MODE** and without any load, and without potential hazards. Failure to follow this instruction can result in severe personal injury or death.



DANGER

In some cases, it is necessary to apply power during maintenance (such as changing wire ropes). Use extreme caution whenever power is applied to complete maintenance tasks. Only qualified personnel may perform maintenance if power is applied to the unit. Failure to follow this instruction and equipment manufacturer's instructions can result in serious personal injury or death.



WARNING

ATTENTION! In the case of overhead maintenance of the Grapple Hoist, make sure to use safety belts and other protective articles. There should be at least two persons assigned to the overhead maintenance.



WARNING

ATTENTION! The equipment must be protected against water, moisture, and electric shock due to the 460 VAC 3 Phases or 575 VAC 3 Phases inside.

**WARNING**

ATTENTION! Do not rotate the Electric Hoist without the Wire Ropes installed. Failure to follow this instruction can result in equipment damage.

**WARNING**

ATTENTION! Do not apply any grease on the beam as this may result in slipping during the horizontal motion along the beam. Failure to follow this instruction can result in equipment damage.

5.3 Basic Operational Procedures

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

5.3.1 Overview

The following describes some basic procedures used throughout remainder of this Product Manual. These items will be described here only for consistency and to eliminate redundancy.

5.3.2 Functional Configuration and Control Principal

5.3.2.1 Component Overview

The Grapple Hoist is designed to capture loose impurities in the Trashwell and hoist the impurities upward by use of an electric hoist. The Grapple Shovel is made from wear-resistant material and has movement by way of hinge points and link arms that are activated by a hydraulic cylinder. The Hydraulic Power Unit controls the Hydraulic Cylinder.



See Section 7.3, Recommended Spare Parts on Page 7-263, for the list of spare parts that should be kept on-hand for maintenance.

5.3.2.2 Automatic Control System

The automatic control system includes a Programmable Logic Control (PLC), Human Machine Interface (HMI), power control panel, hoist control panel, input/output control panel, radio remote control for manual operation, limit switches and proximity switches.

5.3.2.3 Operational Modes

There are two operation modes: Pendant or HMI. When the Selector Switch on the P3 HMI Panel is set to the HMI position, the PLC controls the Grapple Hoist system. When the Selector Switch is set to the Pendant position, the remote-control system (transmitter and receiver) operates the Grapple Hoist system manually.

While in Pendant mode, the operator manually control the unit by pressing buttons on the remote control. While in Pendant mode, the Position Sensors on the Track System will have no effect but the Rotary Limit Switch and Targets will still limit the available horizontal travel. While in Pendant mode, the vertical position is limited by the geared limit switches inside the Lift Hoist System control.

5.3.3 Grapple Elevation and Position Summary

In general, this manual uses “elevation” to describe vertical positioning and “position” to describe horizontal positioning. Figure 5-1 shows the relevant Grapple Shovel positions and elevations.

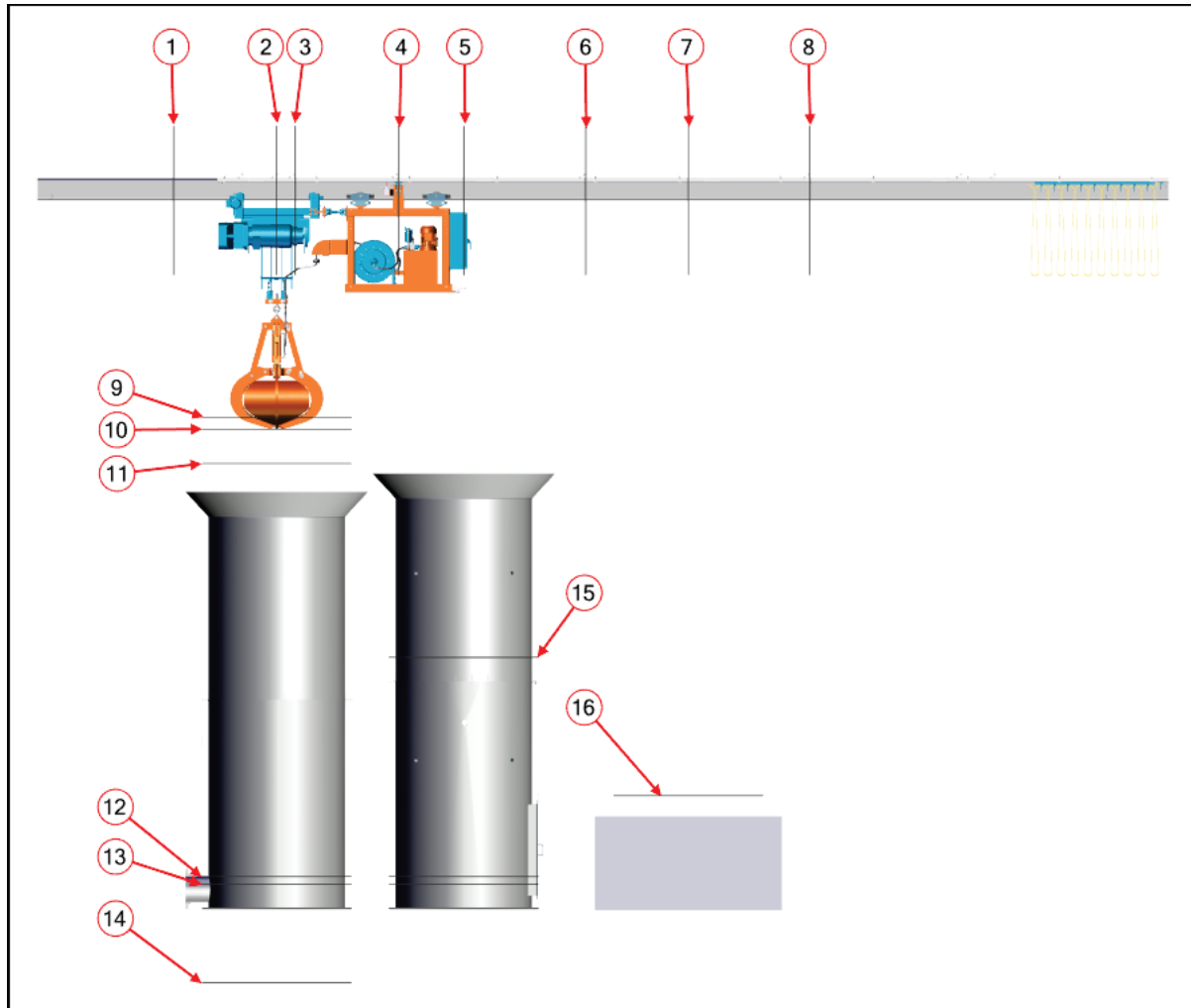


Figure Legend

1	Overtravel Position	7	Dump Position	13	Pick Elevation
2	Trashwell Position	8	Dump Position Sensor	14	Extreme Lower Limit Elevation
3	Overtravel Position Sensor	9	Extreme Upper Limit Elevation	15	Wash Tower Drop Elevation
4	Trashwell Position Sensor	10	Travel Elevation	16	Dump Drop Elevation
5	Washtower Position	11	Speed Transition Elevation		
6	Washtower Position Sensor	12	Close Motion Elevation		

Figure 5-1: Grapple Hoist Elevation and Position Summary

5.3.3.1 Grapple Elevation Summary

There are four standard elevation related geared limit switches on the hoist (Figure 5-2 on Page 5-124 and Figure 5-3 on Page 5-128) and encoder:

- **EXTREME UPPER LIMIT ELEVATION (S1):** Elevation defined by the limit switch setting for the top hook elevation (S1)
- **EXTREME LOWER LIMIT ELEVATION (S2):** Elevation defined by the limit switch setting for the bottom hook elevation (S2)
- **TRAVEL ELEVATION (S3):** Elevation defined by the limit switch setting for travel elevation in normal operation (S3)
- **SPEED TRANSITION ELEVATION (S4):** Elevation defined by the limit switch setting for a transition that limits the Maximum Hoist speed (S4)

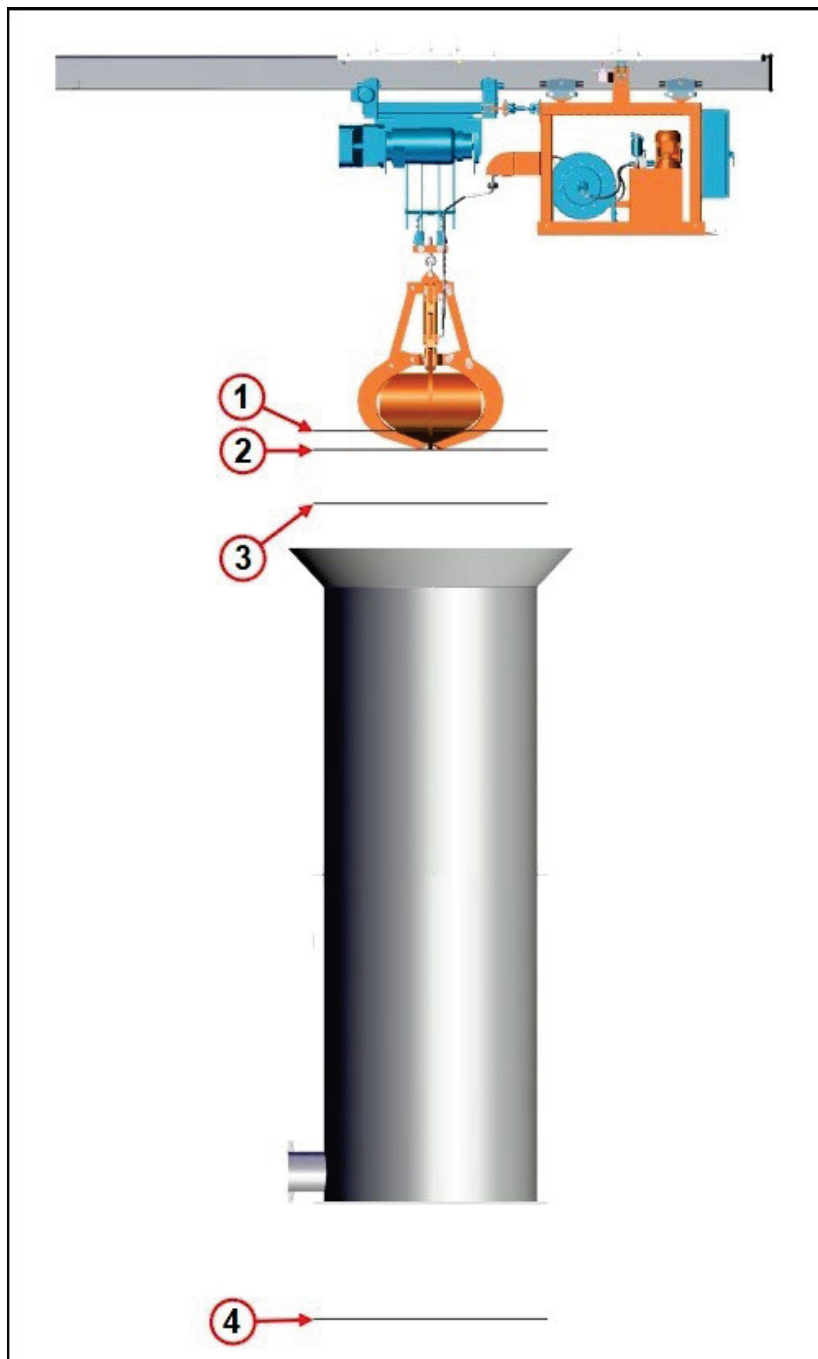
Each limit switch is adjusted to match the limits for the application. S1 is adjusted so the Hook Block on the Grapple Shovel will not interfere with the Lift Hoist System. S2 is adjusted according to the wire rope length. S3 is adjusted to an elevation defined according to the application. S4 is adjusted below S3 to optimize the speed of operation and longevity of the Lift Hoist System components.

The encoder is used in the automatic sequence to determine the elevation of the Grapple Shovel and when to open or close the Grapple Shovel.

The slack rope signal function will be activated regardless of the mode selected.

Figure Legend

- | | |
|---|----------------------------------|
| 1 | S1 Extreme Upper Limit |
| 2 | S3 Travel Elevation |
| 3 | S4 Speed
Transition Elevation |
| 4 | S2 Extreme Lower Limit |



Note: Some parts not shown for clarity.

Figure 5-2: Four Standard Hoist Hook Positions

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

The following list includes the relevant elevations that are not associated with one of the Hoist limit switches.

- **PICK ELEVATION:** Elevation that is reached after a slack-line state is reached and the Grapple Shovel moves up corresponding to the Height Hoist Goes Up Slowly Before Opening the Grapple parameter setting (See Section 5.5.6.1, HMI Picking Parameters Screen on Page 5-180).
- **CLOSE MOTION ELEVATION:** Elevation that is reached after the Grapple Shovel moves up corresponding to the Height Hoist Goes Up Slowly While Closing The Grapple parameter setting (See Section 5.5.6.1, HMI Picking Parameters Screen on Page 5-183).
- **WASH TOWER DROP ELEVATION:** Elevation that corresponds with the Wash Tower Drop Height Below Travel Elevation parameter setting (See Section 5.5.6.2, HMI Dropping Parameters Screen on Page 5-183).
- **DUMP DROP ELEVATION:** Elevation that corresponds with the Chute Drop Height Below Travel Elevation parameter setting (See Section 5.5.6.2, HMI Dropping Parameters Screen on Page 5-183).

5.3.3.2 Grapple Position Summary

The standard horizontal position switches on the Track System are listed below. Each position switch is located to either cause a speed change or to stop the Hydraulic Carriage at a position that places the Grapple Shovel in a relevant position.

- **TRASHWELL POSITION:** Position defined by the Trashwell Sensor which locates the Grapple Shovel above the Trashwell.
- **WASH TOWER POSITION:** Position defined by the Wash Tower Position Sensor which locates the Grapple Shovel above the Wash Tower.
- **DUMP POSITION:** Position defined by the Dump Position Sensor that locates the Grapple Shovel above the dump location.
- **OVERTRAVEL POSITION:** Position defined by the Overtravel Position Sensor.

5.3.4 Description of Operation**5.3.4.1 HMI Mode**

When the Selector Switch on the P3 HMI Panel is set to the HMI position, the PLC controls the Grapple Hoist system. It is possible to activate the manual or the automatic functions by selecting this mode on the main HMI screen page; the control is selected via the PLC and the HMI.

5.3.4.2 HMI AUTO Mode

When the Selector Switch on the P3 HMI Panel is set to HMI mode, the automatic sequence begins after pressing the AUTO Button and Start Sequence Button. Each time the automatic cycle begins, a homing sequence is followed to position the Grapple Shovel at the TRASHWELL POSITION and the TRAVEL ELEVATION. The Grapple Shovel also closes. If during the homing sequence the encoder has not been homed, a sequence is started to reset the encoder to zero.

5.3.4.3 Homing Sequence

The first step of the homing sequence is to move up the Grapple Shovel to the TRAVEL ELEVATION. If the encoder is not set to zero at the TRAVEL elevation, one of the following steps occurs.

- If the Grapple Shovel starts at the TRAVEL ELEVATION or above the TRAVEL ELEVATION, the Grapple Shovel is moved down until the Grapple Shovel passes the falling edge of the TRAVEL ELEVATION. The Grapple Shovel is then moved up until the Grapple Shovel reaches the rising edge of the TRAVEL ELEVATION. The encoder is set to zero on the rising edge of the TRAVEL ELEVATION
- If the Grapple Shovel starts below the TRAVEL ELEVATION, the Grapple Shovel is moved up until the Grapple Shovel reaches the rising edge of the TRAVEL ELEVATION. The encoder is set to zero on the rising edge of the TRAVEL ELEVATION.

The Grapple Shovel under normal operation will follow one of the four steps below depending on the current Grapple Hoist position.

- If the Grapple Shovel is at the TRASHWELL POSITION, no movement is required and the Automatic Cycle can begin.
- If the Grapple Shovel is at the OVERTRAVEL POSITION, the Grapple Shovel will move in the direction of the TRASHWELL POSITION until the Grapple Shovel reaches the TRASHWELL POSITION.
- If the Grapple Shovel is located between the TRASHWELL POSITION and the DUMP POSITION, the Grapple Shovel will move in the direction of the TRASHWELL POSITION until the Grapple Shovel reaches the TRASHWELL POSITION.
- If the Grapple Shovel is located between the TRASHWELL POSITION and the OVERTRAVEL PICK POSITION, the Grapple Shovel will move in the direction of the OVERTRAVEL POSITION until the Grapple Shovel reaches the OVERTRAVEL POSITION. Once located at the OVERTRAVEL POSITION, the Grapple Shovel will move in the direction of the TRASHWELL POSITION until the Grapple Shovel reaches the TRASHWELL POSITION.

The preceding steps describe the Grapple Shovel homing sequence position movements under normal operation. If the Grapple Shovel is located outside of the normal positions, the Grapple Hoist will need to be operated in manual mode back within normal operating conditions before the homing sequence can be performed. The Rotary Switch on the Hydraulic Carriage will likely be tripped by both the Slow Target Plate and the Stop Target Plate on either end of the beam. Returning the Grapple Shovel to normal operating conditions will reset the Rotary Switch if the Target Plates and Rotary Switch are still located properly.

5.3.4.4 Automatic Cycle Start

Once the hoist is at the TRASHWELL POSITION and at the TRAVEL ELEVATION and the encoder is set to zero the automatic cycle begins.



This control system has an **Emergency Stop Button** on the main panel and is operational regardless of any mode. The **ON / OFF** button on the remote is only activated when the **Pendant** mode is activated. *This is not an E-STOP and **will not** shut down all components.*

5.3.4.5 Automatic Operation Flow

The automatic operation flow is:

1. Move the Panel Switch on the P1 Main Control Panel to the ON position if the Panel Switch is not already in the ON position.
Note: See Section 3.3.8.1, on Page **Error! Bookmark not defined.** for the P1 Main Control Panel details.
2. Pull the E-Stop Button on the P3 HMI Panel out if the E-Stop Button was pressed to stop the unit.
Note: See Section 5.5, Touch Screen HMI Operation Instructions on Page 5-158 for the P3 HMI Panel details.
3. Wait approximately 30 seconds for the P1 Main Control Panel and P3 HMI Panel components to boot up.
4. Press the Reset Button on the P3 HMI Panel.
5. Wait for the HMI to indicate that the system is armed.
6. Set the Selector Switch to the HMI position.
7. Press the AUTO button Start Sequence Button on the HMI.
8. The Grapple Shovel will return to the TRASHWELL POSITION and TRAVEL ELEVATION as part of the homing.

5.3.4.6 Automatic Cycle



This section describes a general automatic cycle for a Grapple Hoist. Each Grapple Hoist automatic cycle may differ from the steps described in this section.

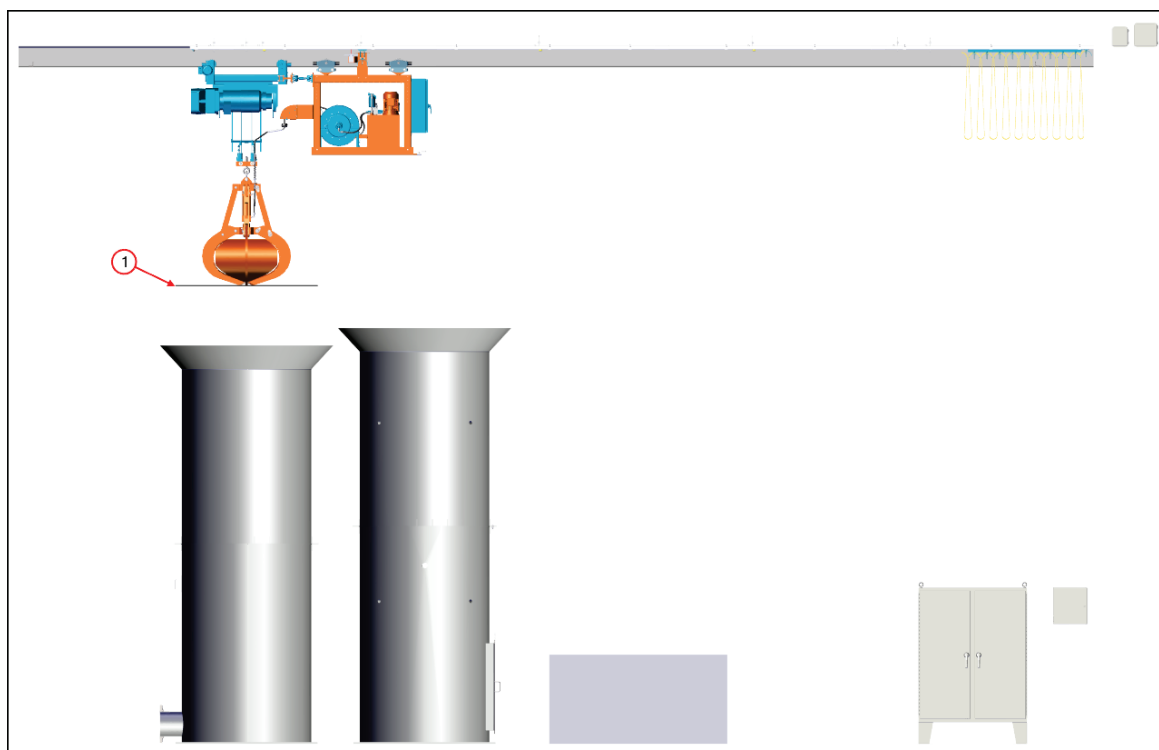


Figure Legend

1 Travel Elevation

Figure 5-3: Grapple Shovel Closed at the TRASHWELL POSITION and TRAVEL ELEVATION

The automatic cycle starts with the Grapple Shovel closed at the TRAVEL ELEVATION and the TRASHWELL POSITION. An audible and visual alarm are activated. The following sequence occurs after the delay.

5.3.4.6.1 Trashwell Pick

1. The Grapple Shovel opens to the Grapple Entering Tank State parameter setting on the HMI Picking Parameters Screen (See Section 5.5.6.1, HMI Picking Parameters Screen on Page 5-180).



The Half Open Grapple Shovel setting is recommended for most applications.

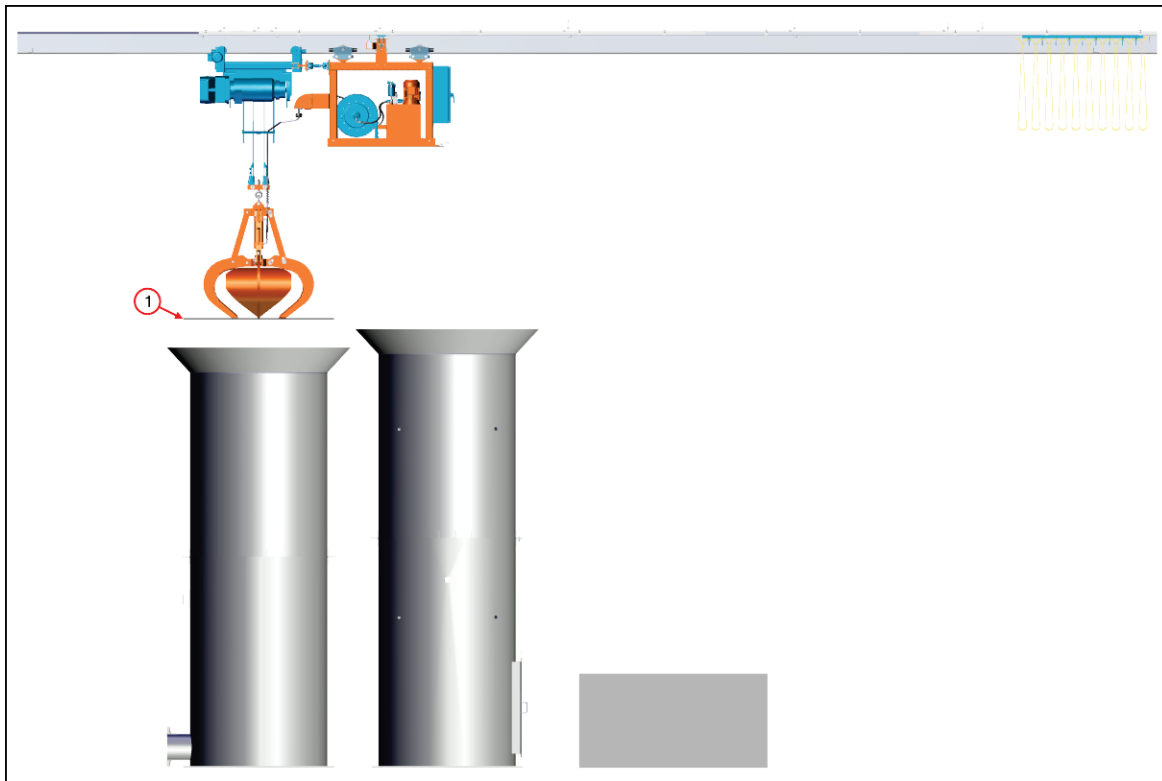


Figure Legend

1 Travel Elevation

Figure 5-4: Grapple Shovel Half Open at the TRASHWELL POSITION and TRAVEL ELEVATION

2. The Grapple Shovel moves down, ramping up speed until reaching the SPEED TRANSITION ELEVATION. After passing the SPEED TRANSITION ELEVATION, the Grapple Shovel moves down at a variable speed optimized for the application.

**Figure Legend**

1	Speed Transition Elevation
---	----------------------------

Figure 5-5: Grapple Shovel Half Open at the TRASHWELL POSITION and SPEED TRANSITION ELEVATION

3. The Grapple Shovel moves down until a slack-line state is detected. When a slack-line state is detected, the Grapple Shovel stops for an amount of time according to the Waiting Time After Slack Rope Detection parameter setting on the HMI Picking Parameters Screen (See Section 5.5, Touch Screen HMI Operation Instructions on Page 5-158). If a slack-line state is not detected at the end of the delay time, the Grapple Shovel begins to move downward again and the automatic cycle restarts Step 3 of the Trashwell Pick. If a slack-line state is detected at the end of the delay time, the automatic cycle proceeds to Step 4 of the Trashwell Pick. Figure 5-6 on Page 5-131 shows the Grapple shovel at the bottom of the Trashwell but a slack-line state can occur at any elevation inside the Trashwell.

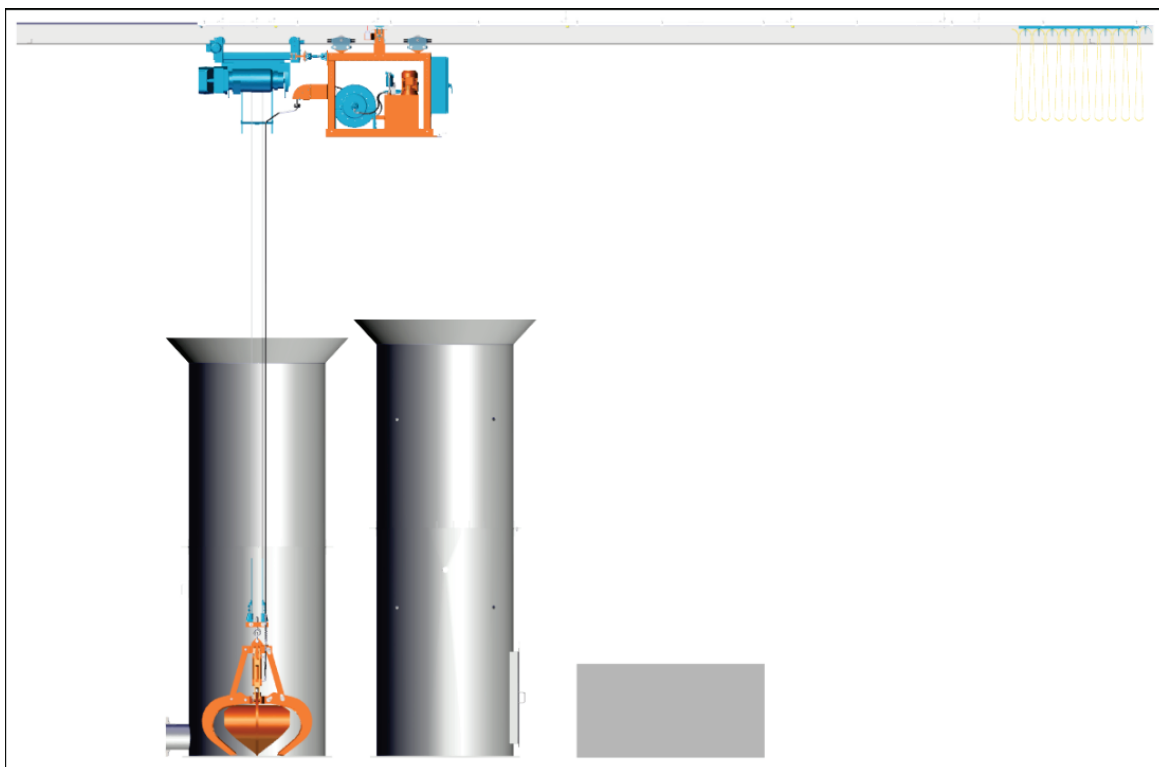


Figure 5-6: Grapple Shovel Half Open at the TRASHWELL POSITION in a Slack-Line State (Shown at the Bottom of the Trashwell)

4. After a slack-line state is detected at the end of the delay time, the Grapple Shovel moves upward until reaching the PICK ELEVATION. The Grapple Shovel upward motion stops and then fully opens.

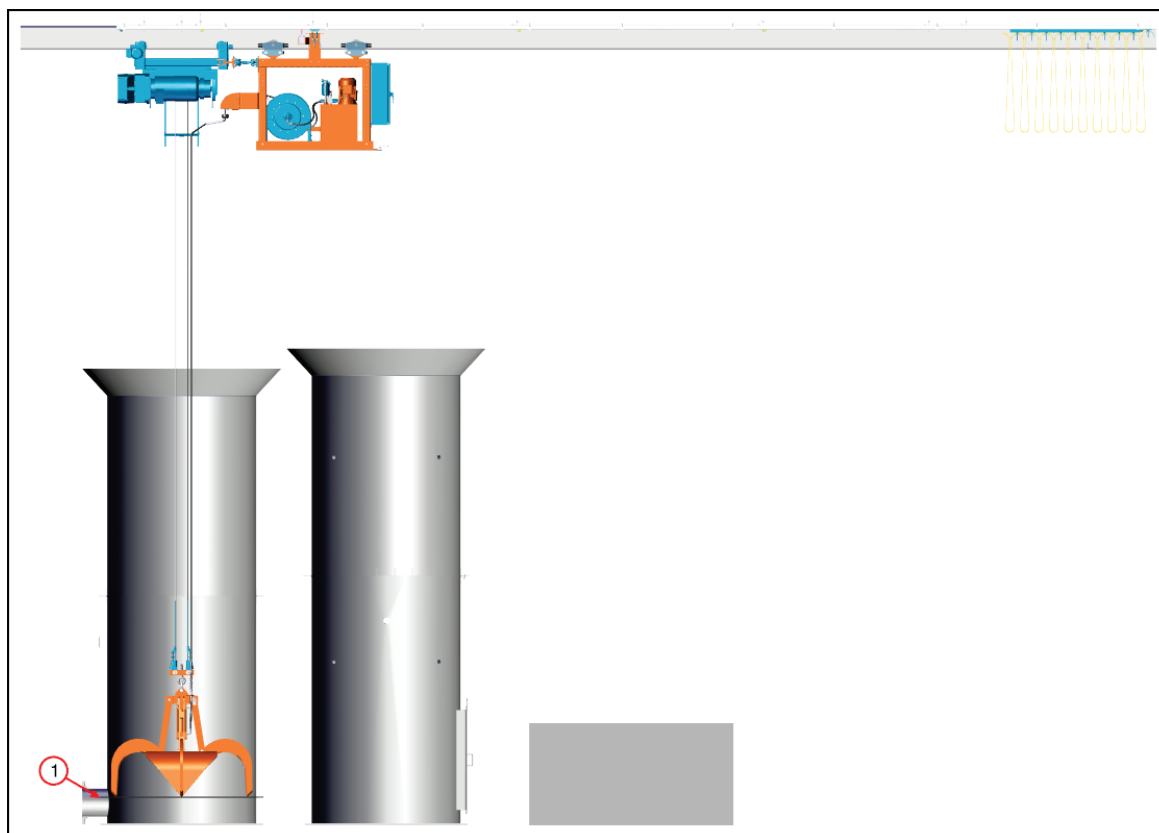


Figure Legend

1 Pick Elevation

Figure 5-7: Grapple Shovel Open at the TRASHWELL POSITION and PICK ELEVATION (Shown Where Slack-Line was at the Bottom of the Trashwell)

5. The Grapple Shovel remains fully open and moves downward until a slack-line state is detected. Figure 5-8 on Page 5-133 shows the Grapple Shovel at the bottom of the Trashwell but a slack-line state can occur at any elevation inside the Trashwell.

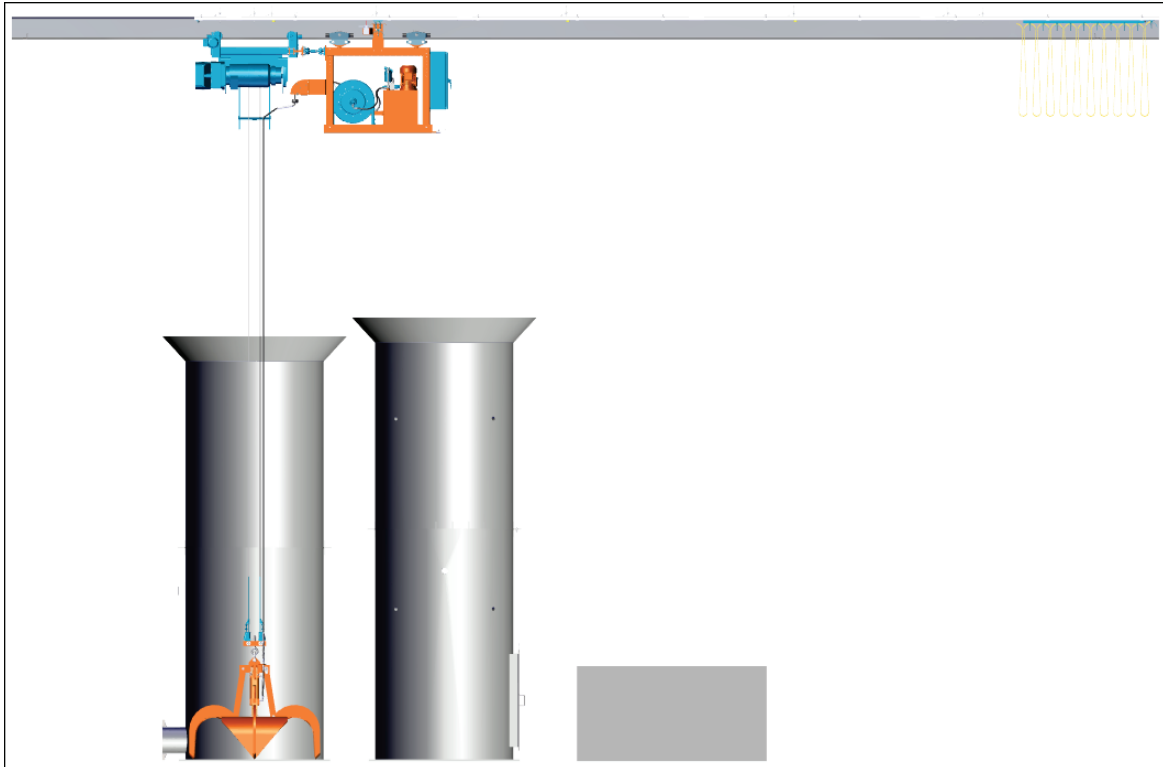


Figure 5-8: Grapple Shovel Open at the TRASHWELL POSITION in a Slack-Line State (Shown at the Bottom of the Trashwell)

6. The Grapple Shovel moves upward until reaching the CLOSE MOTION ELEVATION. The Grapple Shovel fully closes during this motion.

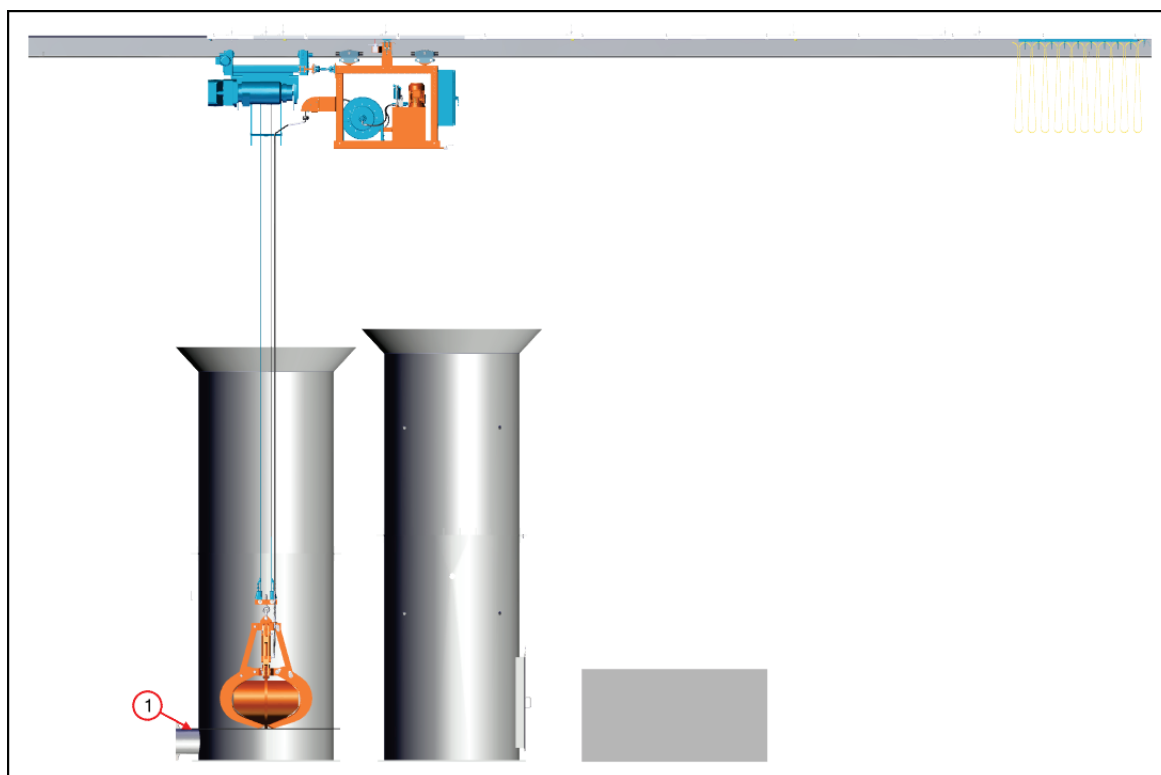


Figure Legend

1 Close Motion Elevation

Figure 5-9: Grapple Shovel Closed at the TRASHWELL POSITION and CLOSE MOTION ELEVATION

7. After the Grapple Shovel fully closes, the Grapple Shovel continues moving upward at a variable speed optimized for the application. The Grapple Shovel upward movement ramps down speed after crossing the SPEED TRANSITION ELEVATION. The Grapple Shovel stops at the TRAVEL ELEVATION.

- If the Grapple Hoist **does not have a Wash Tower**, skip to Section 5.3.4.6.4, Dump Drop on Page 5-148.
- If the Grapple Hoist **has a Wash Tower**, refer to Section 5.3.4.6.2 Wash Tower Drop on Page 5-135.



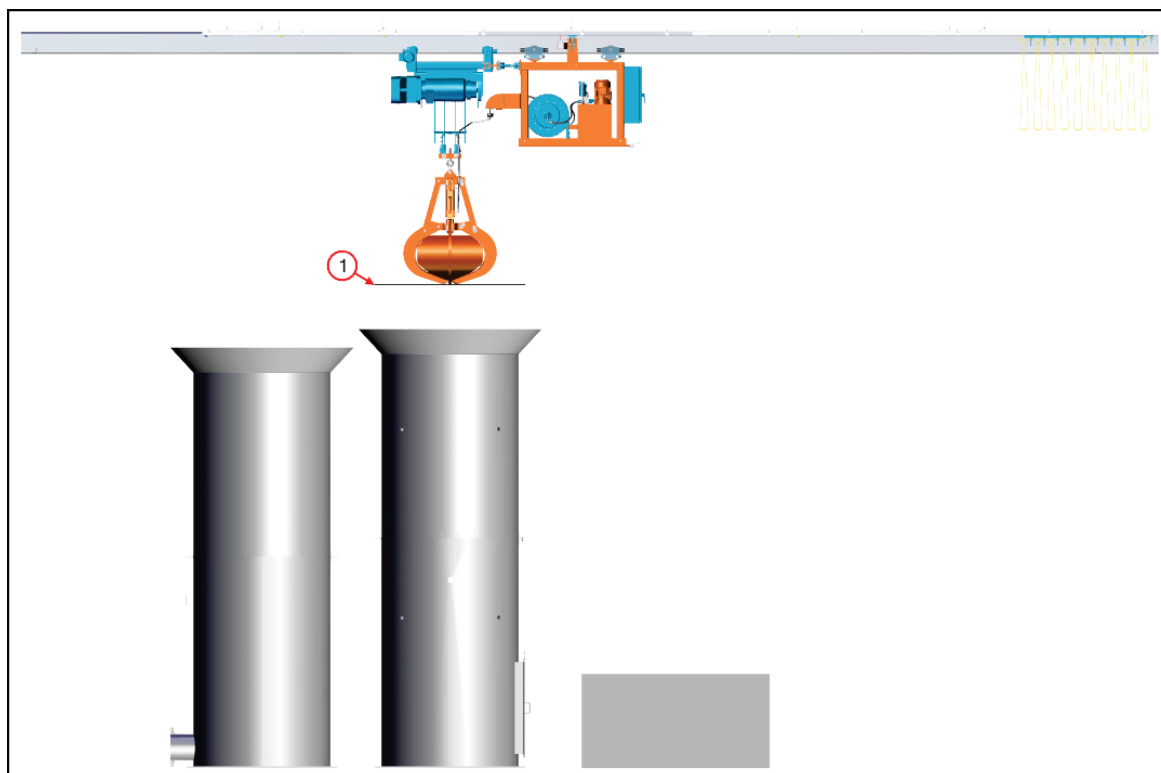
Figure Legend

1 Speed Transition Elevation

Figure 5-10: Grapple Shovel Closed at the TRASHWELL POSITION and SPEED TRANSITION ELEVATION

5.3.4.6.2 Wash Tower Drop

1. The Grapple Shovel moves horizontally at a variable speed optimized for the application from the TRASHWELL POSITION toward the WASH TOWER POSITION after a Trashwell Pick. When the target on the Hydraulic Carriage approaches the Wash Tower Position Sensor, the Grapple Shovel horizontal movement ramps down to ensure a smooth stop once the target and sensor meet. The Grapple Shovel stops at the WASH TOWER POSITION.

**Figure Legend**

1	Travel Elevation
---	------------------

Figure 5-11: Grapple Shovel Closed at the WASH TOWER POSITION and TRAVEL ELEVATION

2. The Grapple Shovel moves down, ramping up speed until reaching the SPEED TRANSITION ELEVATION. After passing the SPEED TRANSITION ELEVATION, the Grapple Shovel moves down at a variable speed optimized for the application.

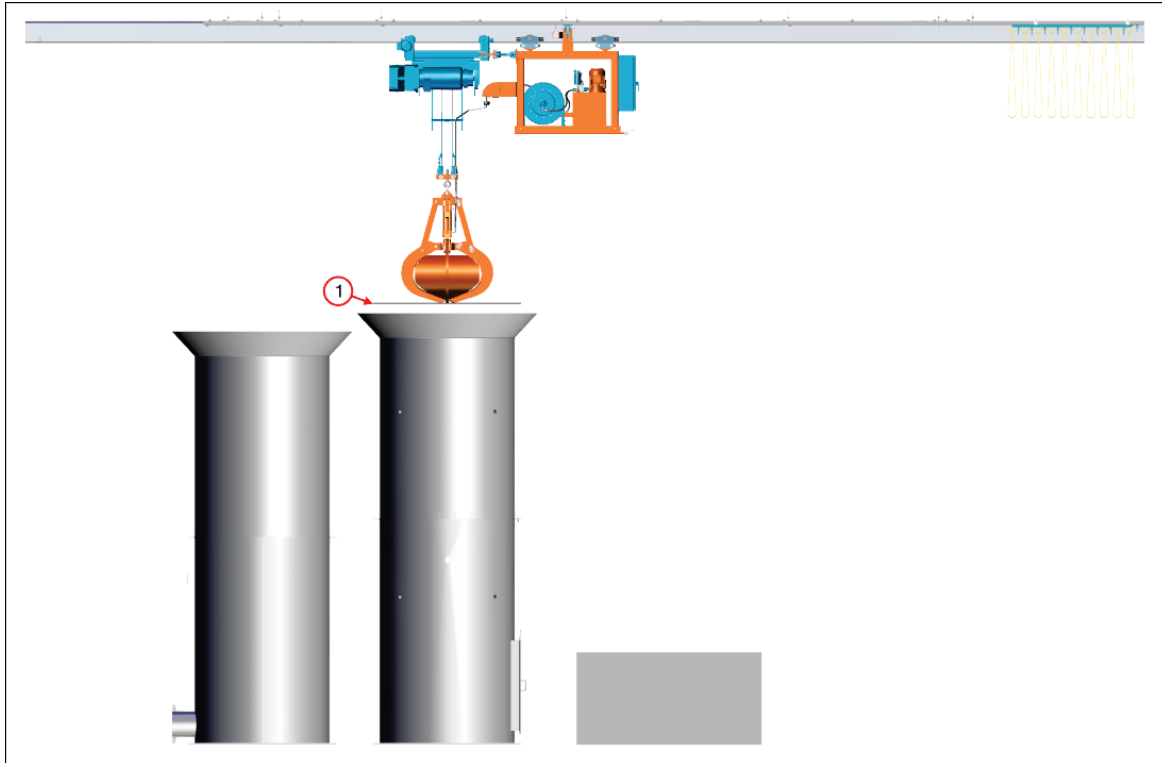


Figure 5-12: Grapple Shovel Closed at the WASH TOWER POSITION and SPEED TRASITION ELEVATION

3. The Grapple Shovel continues downward until reaching the WASH TOWER DROP ELEVATION. The Grapple Shovel stops at this elevation.

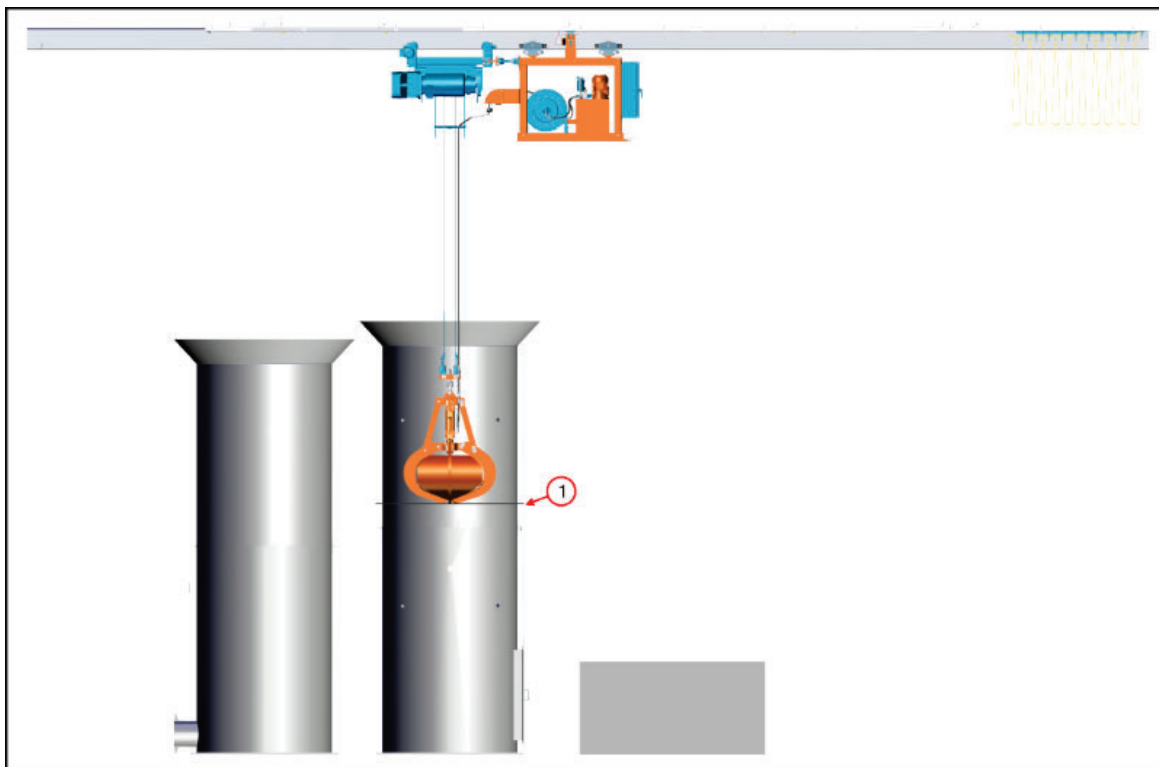


Figure Legend

1 Wash Tower Drop Elevation

Figure 5-13: Grapple Shovel Closed at the WASH TOWER POSITION and WASH TOWER DROP ELEVATION

4. The Grapple Shovel fully opens and releases the contents of the Trashwell Pick.

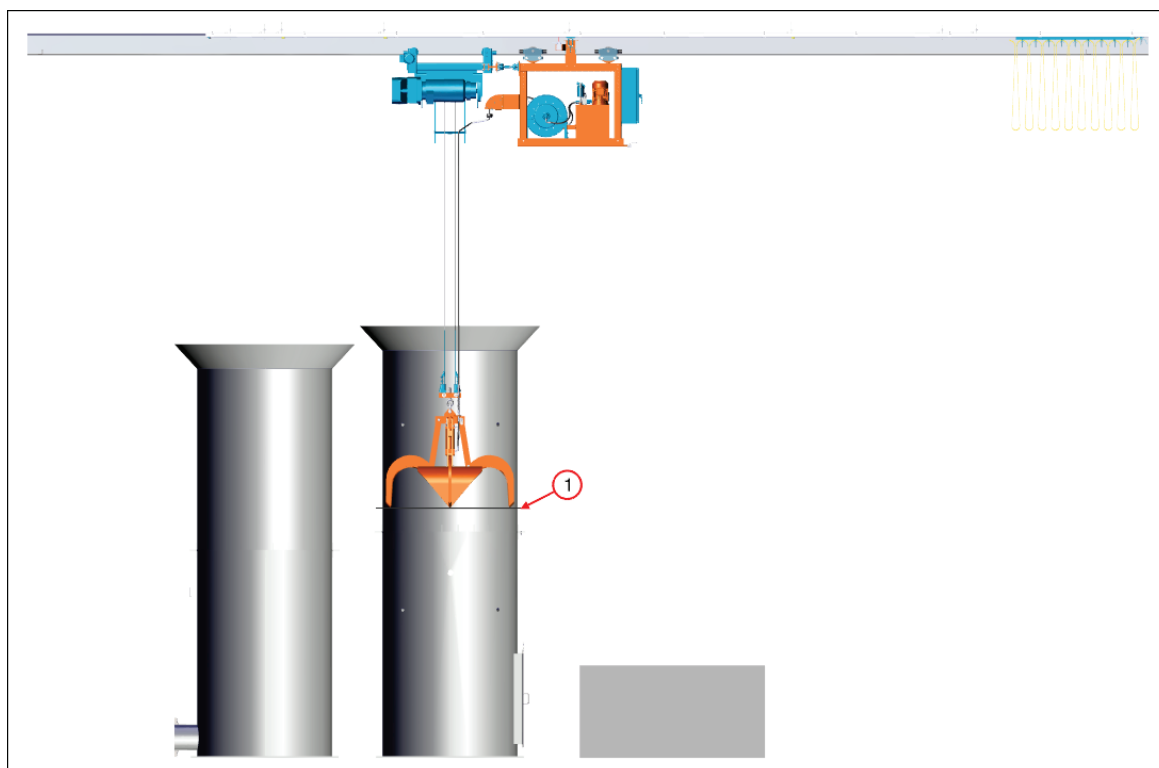
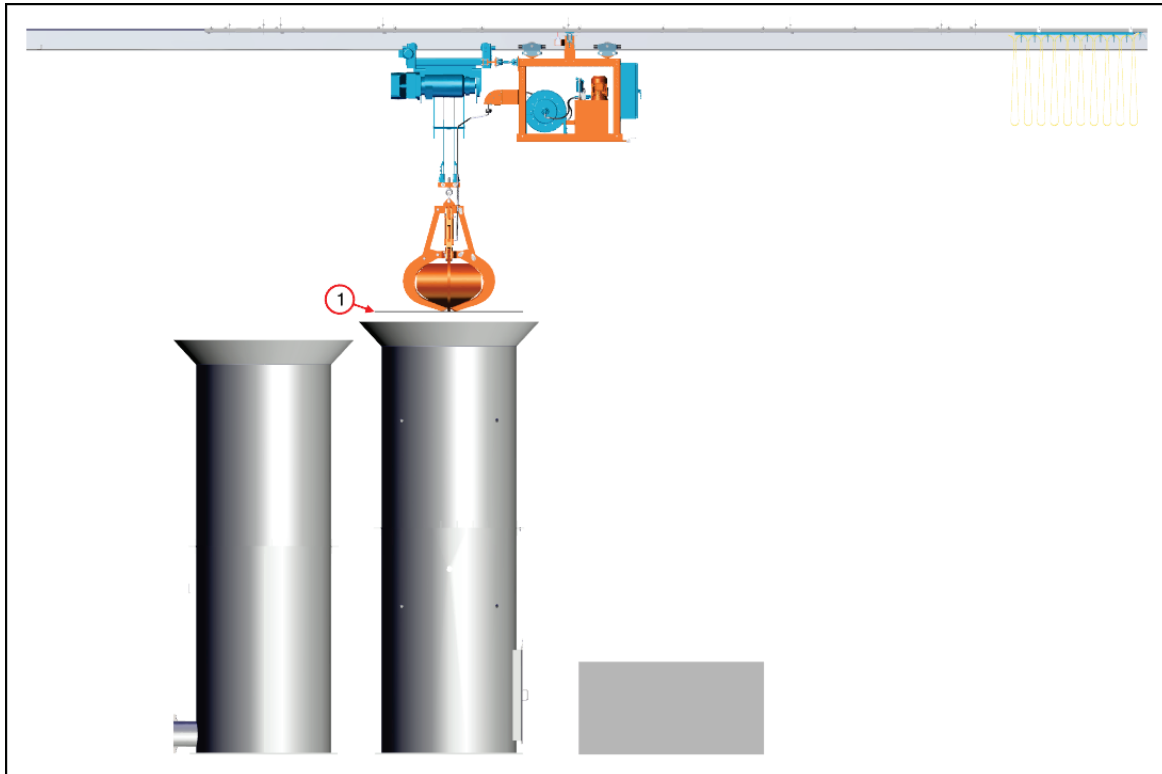


Figure Legend

1 Wash Tower Drop Elevation

Figure 5-14: Grapple Shovel Open at the WASH TOWER POSITION and WASH TOWER DROP ELEVATION

5. The Grapple Shovel moves upward and fully closes. the Grapple Shovel continues moving upward at a variable speed optimized for the application. The Grapple Shovel upward movement ramps down speed after crossing the SPEED TRANSITION ELEVATION. The Grapple Shovel stops at the TRAVEL ELEVATION.

**Figure Legend**

1 Speed Transition Elevation

Figure 5-15: Grapple Shovel Closed at the WASH TOWER POSITION and SPEED TRANSITION ELEVATION

6. If the Grapple Hoist has completed the amount of Trashwell Picks to match the Number of Wash Tower Drops Before a Pick parameter setting, skip the remaining steps and proceed to Section 5.3.4.6.3, Wash Tower Pick on Page 5-141. If the Grapple Hoist has not completed the amount of Trashwell Picks to match the Number of Wash Tower Drops Before a Pick required before a Wash Tower Pick, proceed to Step 7.
7. The Grapple Shovel moves horizontally at a variable speed optimized for the application from the WASH TOWER POSITION toward the TRASHWELL POSITION. When the target on the Hydraulic Carriage approaches the Wash Tower Position Sensor, the Grapple Shovel horizontal movement ramps down to ensure a smooth stop once the target and sensor meet. The Grapple Shovel stops at the TRASHWELL POSITION.

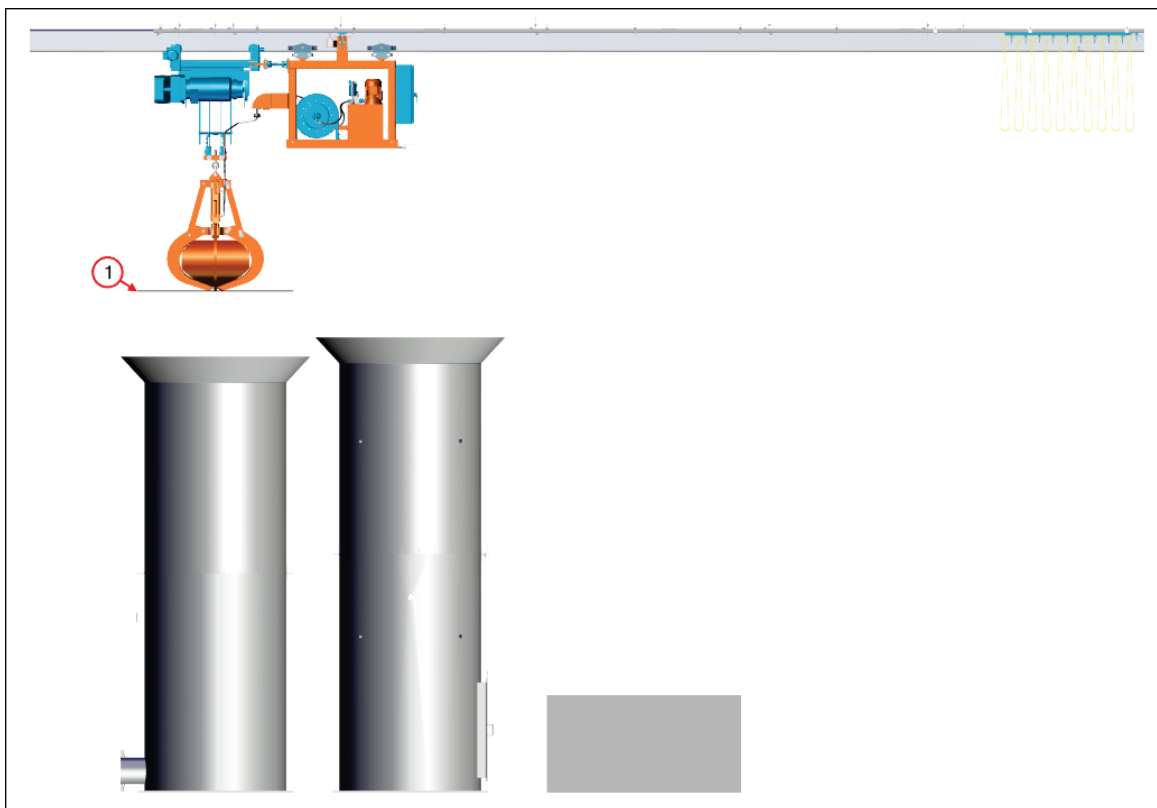


Figure 5-16: Grapple Shovel Closed at the TRASHWELL POSITION and TRAVEL ELEVATION

8. After returning to the TRASHWELL POSITION, the Grapple Shovel remains stationary for a time according to the Waiting Time Between Each Cycle parameter setting (See Section 5.5.6.1, HMI Picking Parameters Screen on Page 5-180). An audible and visual alarm are activated. Return to Section 5.3.4.6.1, Trashwell Pick on Page 5-129 to proceed with the automatic cycle.

5.3.4.6.3 Wash Tower Pick

The following sequence occurs after the last required Trashwell pick and Wash Tower Drop before a Wash Tower Pick. The sequence follows the same general steps as the Trashwell Pick, this time at the WASH TOWER POSITION instead of the TRASHWELL POSITION.

1. The Grapple Shovel opens to the Grapple Entering Tank State parameter setting on the HMI Picking Parameters Screen (See Section 5.5.6.1, HMI Picking Parameters Screen on Page 5-180).



The Half Open Grapple Shovel setting is recommended for most applications.

2. The Grapple Shovel moves down, ramping up speed until reaching the SPEED TRANSITION ELEVATION. After passing the SPEED TRANSITION ELEVATION, the Grapple Shovel moves down at a variable speed optimized for the application.

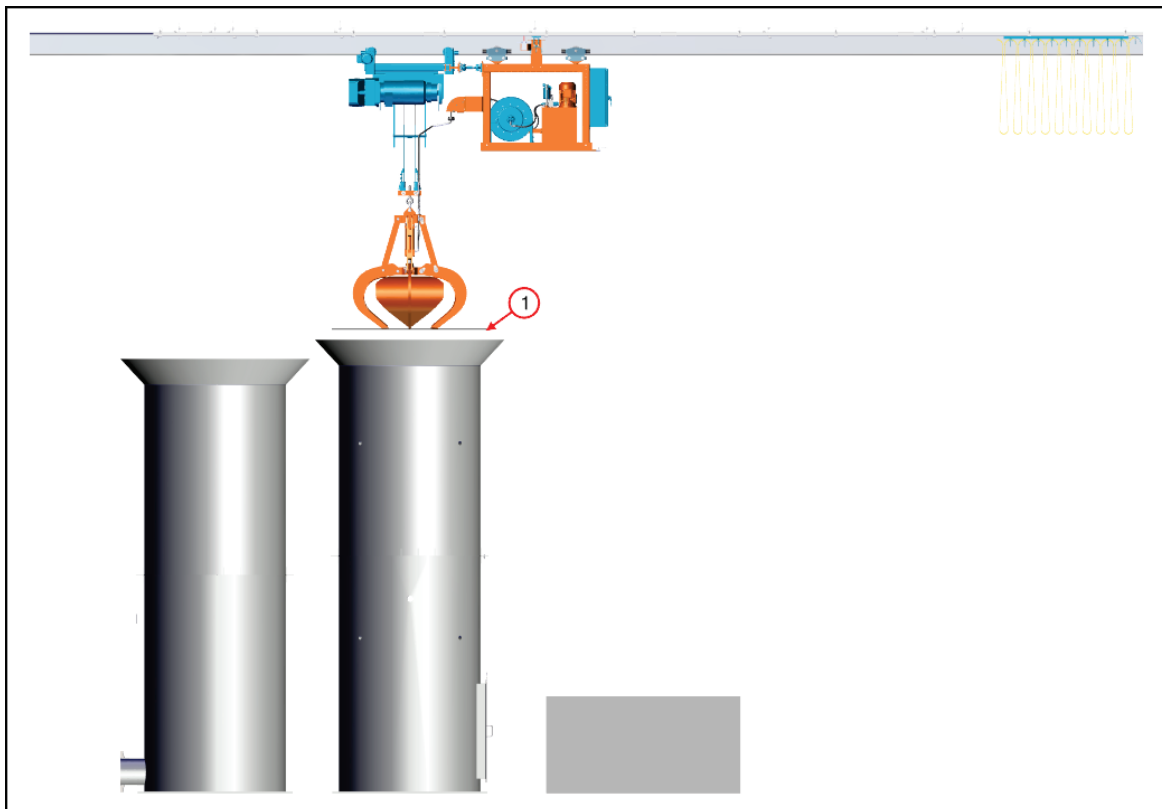


Figure Legend

1 Speed Transition Elevation

Figure 5-17: Grapple Shovel Half Open at the WASH TOWER POSITION and SPEED TRANSITION ELEVATION

3. The Grapple Shovel moves down until a slack-line state is detected. When a slack-line state is detected, the Grapple Shovel stops for an amount of time according to the Waiting Time After Slack Rope Detection parameter setting on the HMI Picking Parameters Screen (See Section 5.5, Touch Screen HMI Operation Instructions on Page 5-158). If a slack-line state is not detected at the end of the delay time, the Grapple Shovel begins to move downward again and the automatic cycle restarts Step 3 of the Trashwell Pick. If a slack-line state is detected at the end of the delay time, the automatic cycle proceeds to Step 4 of the Wash Tower Pick. Figure 5-18 on Page 5-143 shows the Grapple shovel at the bottom of the Wash Tower but a slack-line state can occur at any elevation inside the Wash Tower.

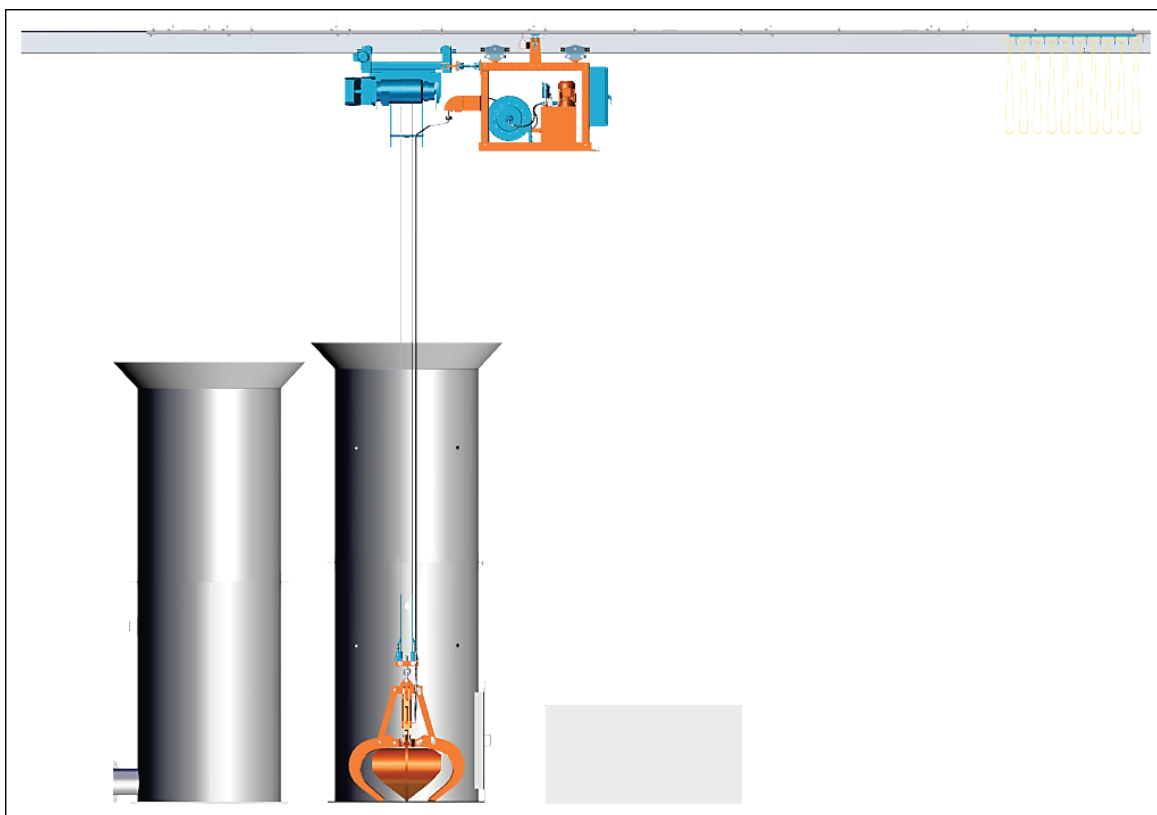


Figure 5-18: Grapple Shovel Half Open at the WASH TOWER POSITION in a Slack-Line State (Shown at the Bottom of the Wash Tower)

4. After a slack-line state is detected at the end of the delay time, the Grapple Shovel moves upward until reaching the PICK ELEVATION. The Grapple Shovel upward motion stops and then fully opens.



Figure 5-18 on Page 5-143 shows the Grapple Shovel at the bottom of the Wash Tower but a slack-line state can occur at any elevation inside the Wash Tower.

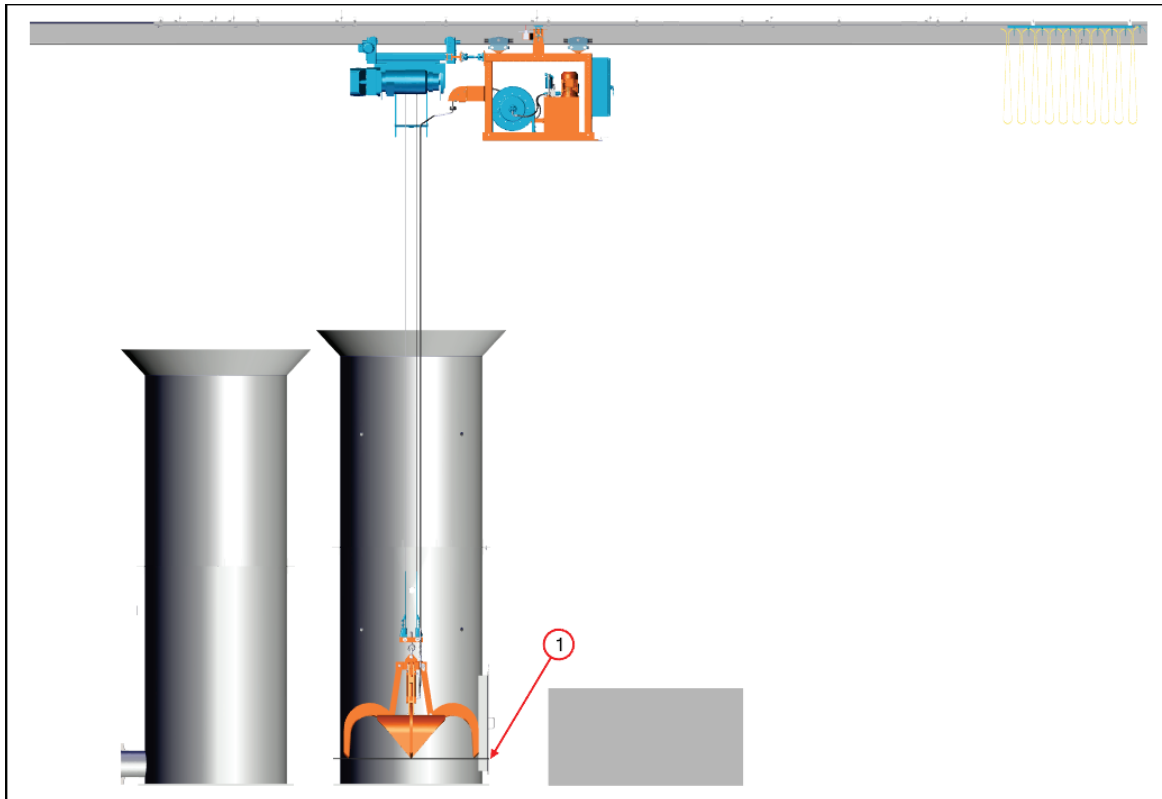


Figure Legend

1 Pick Elevation

Figure 5-19: Grapple Shovel Open at the WASH TOWER POSITION and PICK ELEVATION (Shown Where Slack-Line was at the Bottom of the Wash Tower)

5. The Grapple Shovel remains fully open and moves downward until a slack-line state is detected. Figure 5 8 on Page 5-131 shows the Grapple Shovel at the bottom of the Wash Tower but a slack-line state can occur at any elevation inside the Wash Tower.

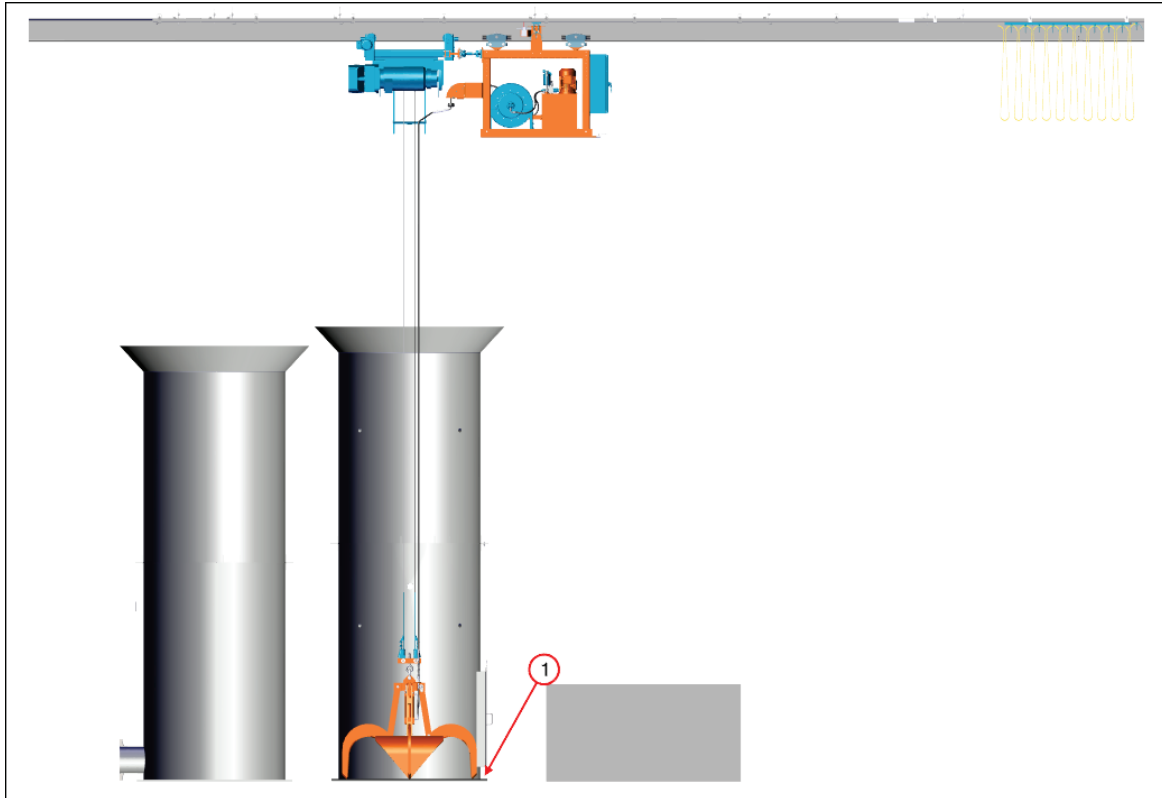


Figure 5-20: Grapple Shovel Open at the WASH TOWER POSITION in a Slack-Line State (Shown at the Bottom of the Wash Tower)

6. The Grapple Shovel moves upward until reaching the CLOSE MOTION ELEVATION. The Grapple Shovel fully closes during this motion.

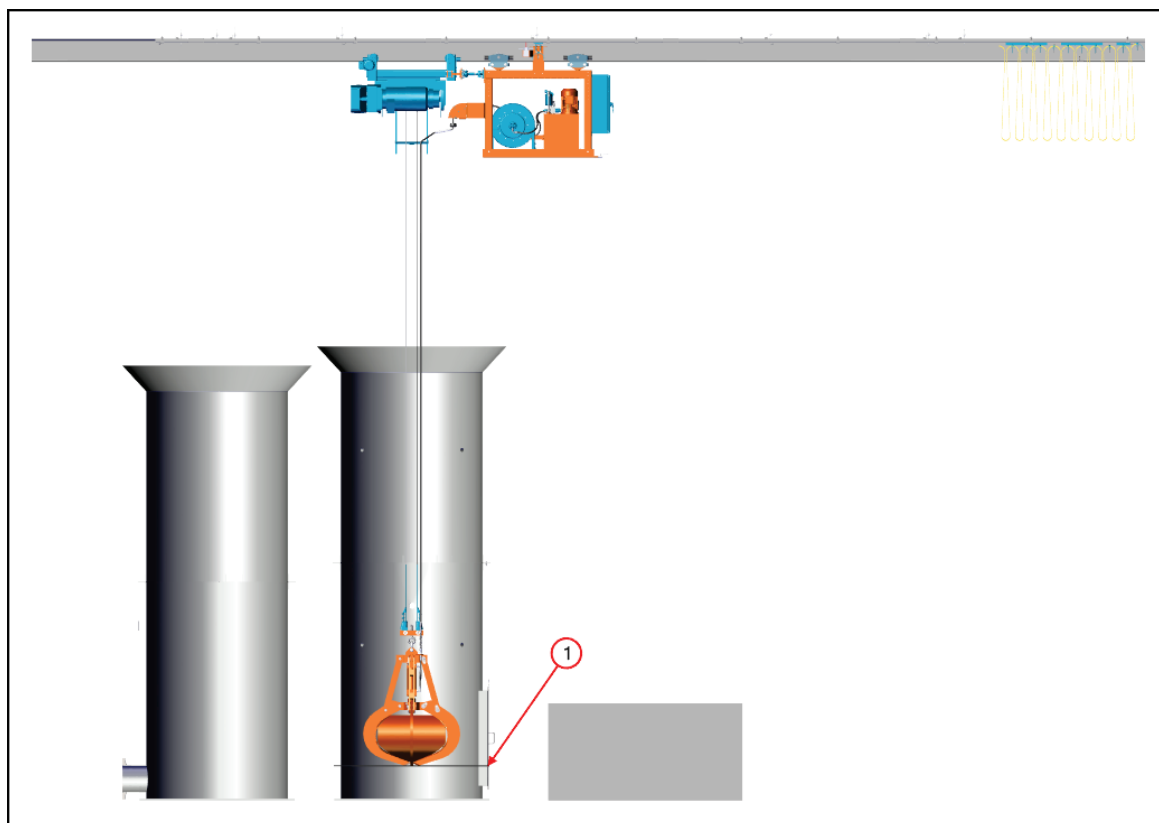


Figure Legend

1 Close Motion Elevation

Figure 5-21: Grapple Shovel Closed at the WASH TOWER POSITION and CLOSE MOTION ELEVATION

7. After the Grapple Shovel fully closes, the Grapple Shovel continues moving upward at a variable speed optimized for the application. The Grapple Shovel upward movement ramps down speed after crossing the SPEED TRANSITION ELEVATION. The Grapple Shovel stops at the TRAVEL ELEVATION. Proceed to Section 5.3.4.6.4, Dump Drop on Page 5-148.

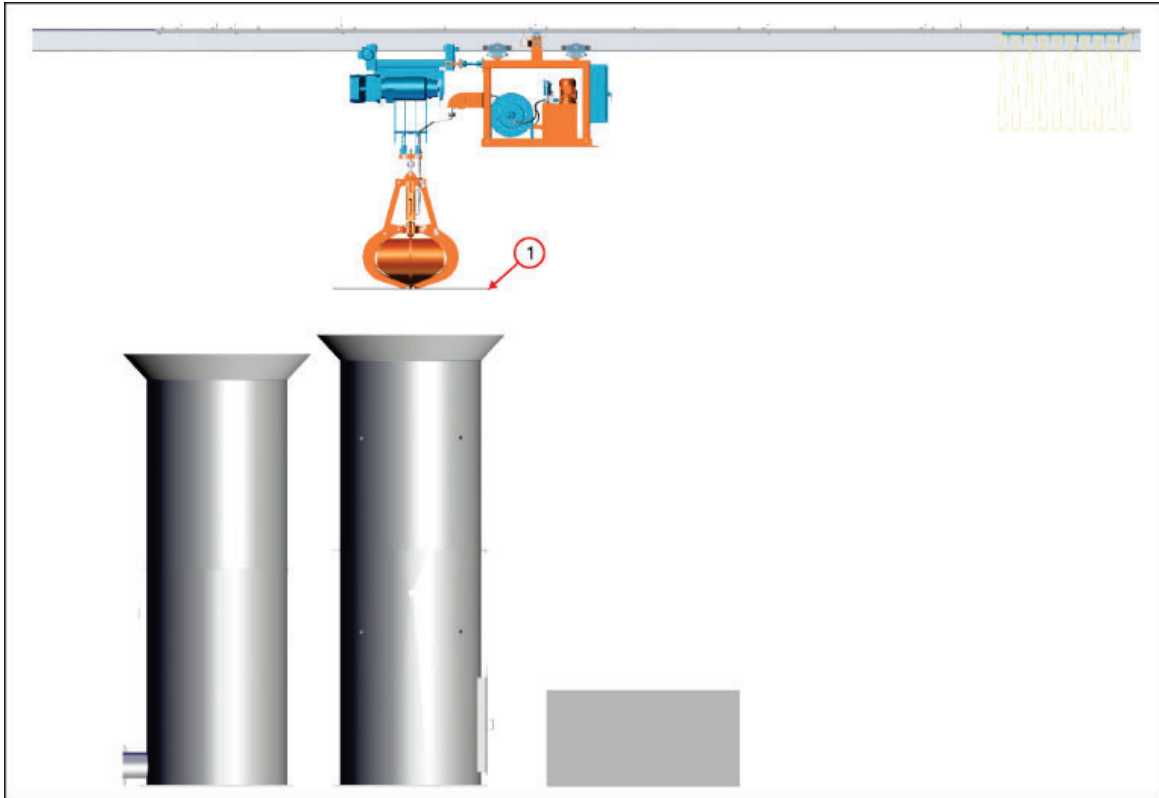


Figure 5-22: Grapple Shovel Closed at the WASH TOWER POSITION and TRAVEL ELEVATION

5.3.4.6.4 Dump Drop

For a Grapple Hoist unit without a Wash Tower, a Dump Drop occurs after a Trashwell Pick. For a Grapple Hoist unit with a Wash Tower, a Dump Drop occurs after a Wash Tower Pick.

1. The Grapple Shovel remains stationary at the TRASHWELL POSITION or the WASH TOWER POSITION for delay time set by the Drain Time After Pick parameter setting (See Section 5.5.6.1, HMI Picking Parameters Screen on Page 5-180).
2. The Grapple Shovel moves horizontally at a variable speed optimized for the application from the TRASHWELL POSITION or the WASH TOWER POSITION toward the DUMP POSITION. When the target on the Hydraulic Carriage approaches the Dump Position Sensor, the Grapple Shovel horizontal movement ramps down to ensure a smooth stop once the target and sensor meet. The Grapple Shovel stops at the DUMP POSITION.

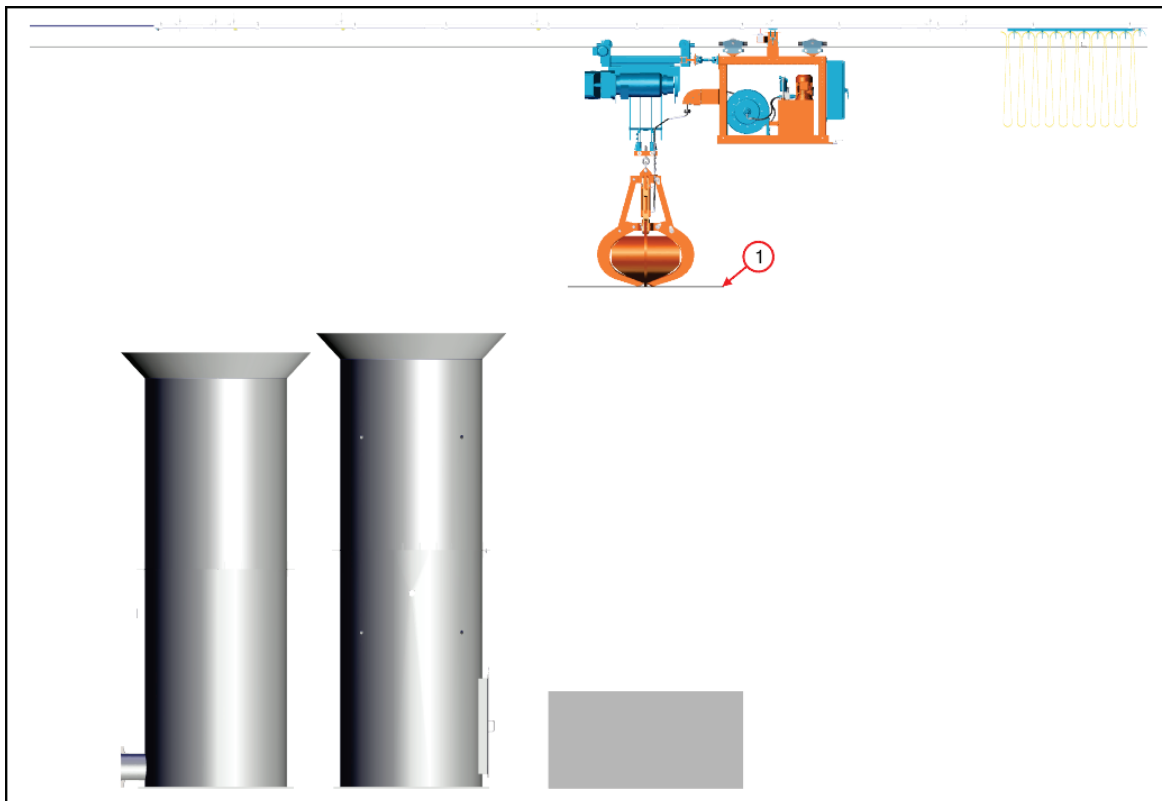


Figure Legend

1 Travel Elevation

Figure 5-23: Grapple Shovel Closed at the DUMP POSITION and TRAVEL ELEVATION

3. The Grapple Shovel moves down, ramping up speed until reaching the SPEED TRANSITION ELEVATION. After passing the SPEED TRANSITION ELEVATION, the Grapple Shovel moves down at a variable speed optimized for the application.

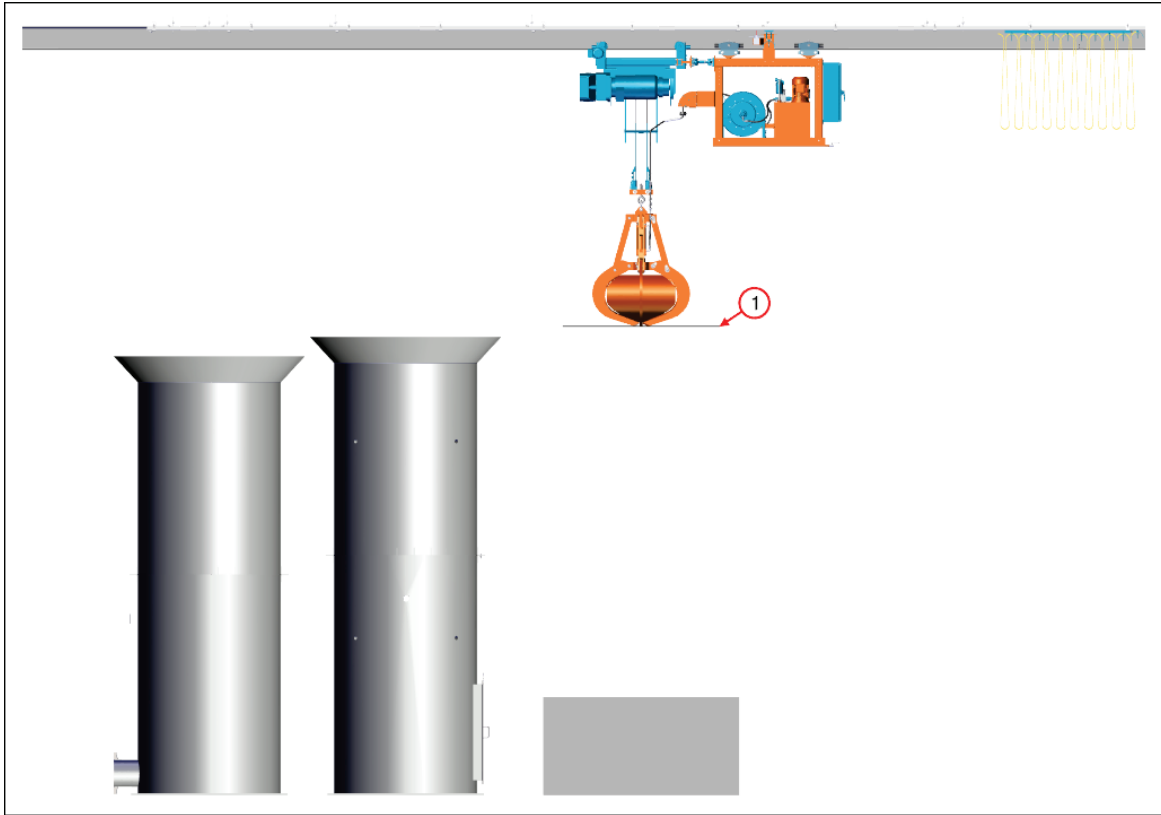
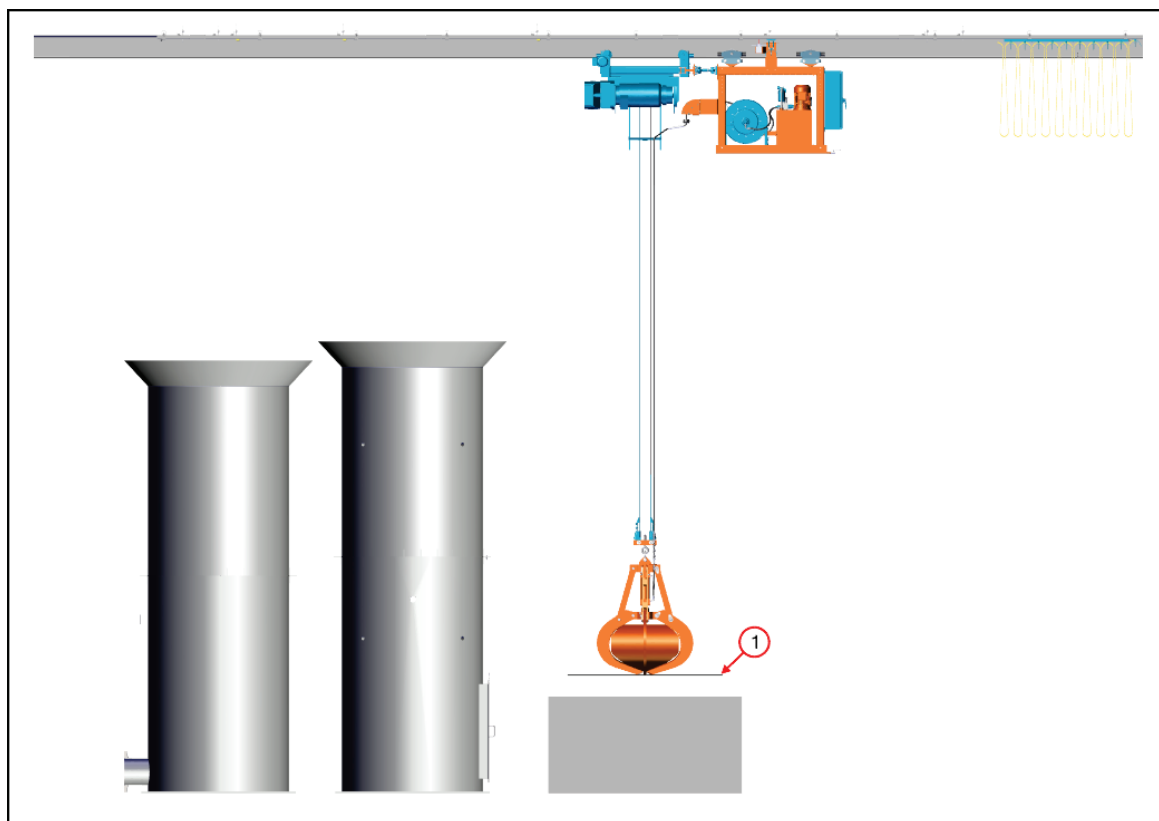


Figure 5-24: Grapple Shovel Closed at the DUMP POSITION and SPEED TRANSITION Looks

4. The Grapple Shovel continues downward until reaching the DUMP DROP ELEVATION. The Grapple Shovel stops at this elevation.

**Figure Legend**

1 Dump Drop Elevation

Figure 5-25: Grapple Shovel Closed at the DUMP POSITION and DUMP DROP ELEVATION

5. The Grapple Shovel fully opens and releases the contents of the Trashwell or Wash Tower Pick into the dump location.

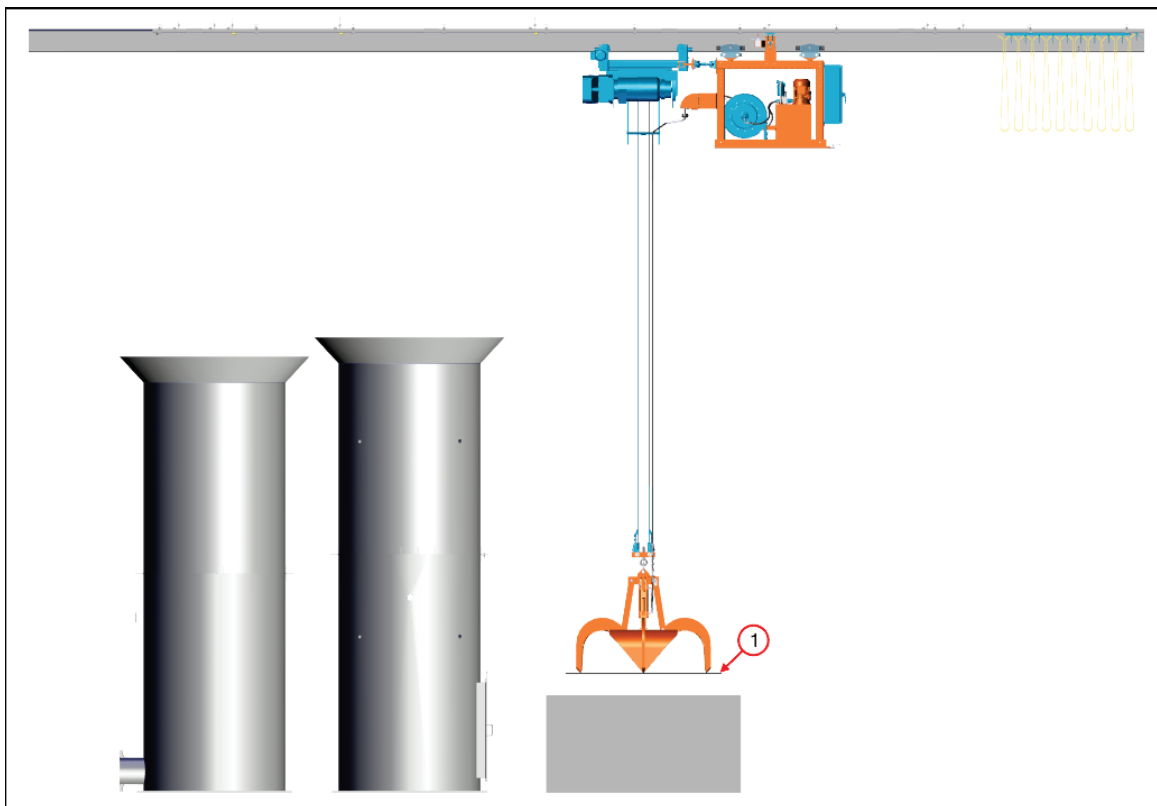
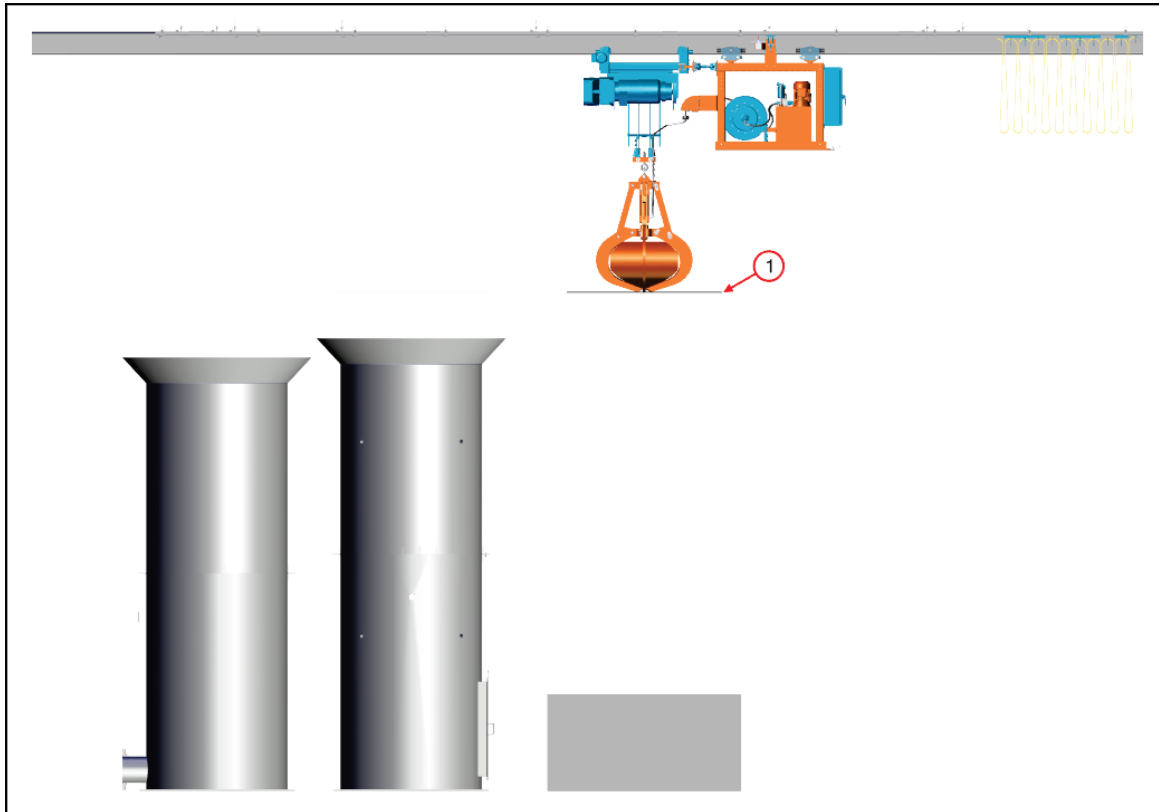


Figure Legend

1 Dump Drop Elevation

Figure 5-26: Grapple Shovel Open at the DUMP POSITION and DUMP DROP ELEVATION

6. The Grapple Shovel moves upward and fully closes. The Grapple Shovel continues moving upward at a variable speed optimized for the application. The Grapple Shovel upward movement ramps down speed after crossing the SPEED TRANSITION ELEVATION. The Grapple Shovel stops at the TRAVEL ELEVATION.

**Figure Legend**

1 Speed Transition Elevation

Figure 5-27: Grapple Shovel Closed at the DUMP POSITION and SPEED TRANSITION ELEVATION

7. The Grapple Shovel moves horizontally at a variable speed optimized for the application from the DUMP POSITION toward the TRASHWELL POSITION. When the target on the Hydraulic Carriage approaches the Trashwell Position Sensor, the Grapple Shovel horizontal movement ramps down to ensure a smooth stop once the target and sensor meet. The Grapple Shovel stops at the TRASHWELL POSITION.
8. The Grapple Shovel remains stationary after returning to the TRASHWELL POSITION, according to the Waiting Time Between Each Cycle parameter setting (See Section 5.5.6.1, HMI Picking Parameters Screen on Page 5-180). An audible and visual alarm are activated. Return to Section 5.3.4.6.1, Trashwell Pick on Page 5-129 to restart the automatic cycle.



Figure Legend

1 Travel Elevation

Figure 5-28: Grapple Shovel Closed at the TRASHWELL POSITION and TRAVEL ELEVATION

5.3.4.7 Drain Time and Wait Time

- Drain Time: The time delay remaining to drain the liquid from the Grapple Shovel above the Trashwell or Wash Tower before moving to the next step in the automatic cycle.
- Wait Time: The time delay remaining between the end of one automatic cycle and the start of the next automatic cycle.

Wait Time and Drain Time are both delay times where the Grapple Shovel remains stationary. These times can be adjusted on the HMI. When adjusting the Wait Time and Drain Time durations, consider the following factors:

- Increasing Drain Time and Wait Time improves the life of the hoist. Keeping the Grapple Shovel stationary for a percentage of time ensures that the Lift Hoist System stays within its duty cycle.
- Increasing Drain Time provides more value than increasing Wait Time. Water is recovered from the Trashwell or Wash Tower pick during Drain Time. Water is not recovered during Wait Time.

5.4 Manual Operation

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

5.4.1 Overview

The Wireless Remote Control Pendant and the P3 HMI Control Panel can both be used to manually control the Grapple Hoist.

5.4.2 Wireless Remote Control Pendant

Figure Legend

- | | |
|----|---------------------|
| 1 | Down Button |
| 2 | Up Button |
| 3 | Reverse Button |
| 4 | Forward Button |
| 5 | Open Button |
| 6 | Close Button |
| 7 | Pump Button |
| 8 | Remote Start Button |
| 9 | Power LED |
| 10 | Pump LED |
| 11 | Remote Start LED |
| 12 | Stop Button |

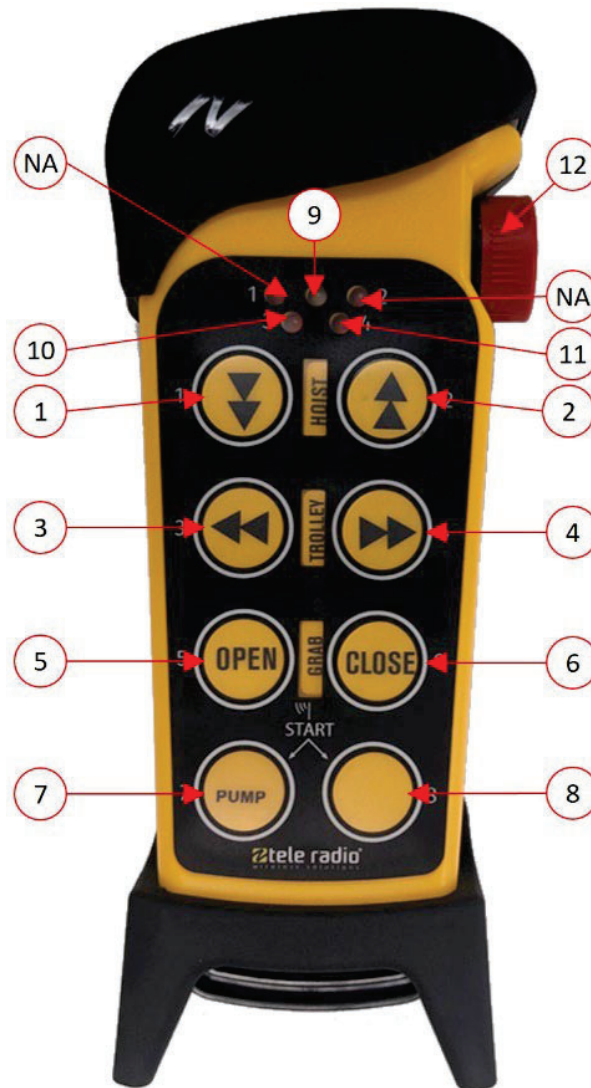


Figure 5-29: Wireless Remote Control Pendant

NOTICE

Press the Red Stop Button on the remote pendant in the event on an emergency. This will deactivate the remote control but not the power to the hoist panel.



Please refer to the additional Lift Hoist System (Wireless Remote Control Pendant and Receiver) documents for the complete Wireless Remote Control Pendant and Receiver instructions.

Use the following steps to use the Radio Remote Control Module to manually control the Grapple Hoist. Note that each of the eight buttons on the front face of the pendant are two-step buttons that have a leading state activated by a light press accompanied by a single tactile click and a trailing state activated by more forceful press accompanied by a second tactile click. For buttons that are described with a singular function, the function will activate upon activating the leading state or the trailing state.

1. Set the Selector Switch (1) on the Grapple Hoist Control Cabinet (Figure 5-30 on Page 5-157) to the Pendant position.
2. Twist and release the red Stop Button (11) on the Wireless Remote Control Pendant (Figure 5-29 on Page 5-154) to activate the pendant. The Pump LED (10) and Remote Start LED (11) will flash red. The Power LED (9) will glow green when the pendant is powered on and the battery capacity is not low. The Power LED (9) will glow red when the battery capacity is low.
3. Press the Pump Button (7) and Remote Start Button (8) at the same time for two seconds to establish remote communication. The Pump LED (10) and Remote Start LED (11) will glow red, then turn off after both buttons are released. The Power LED (9) will flash green to indicate when remote communication is established.
4. Press Pump Button (7) to activate the Hydraulic Power Unit. The Pump LED (10) will glow red. Press the Pump Button (7) again to deactivate the Hydraulic Power Unit.
5. Press the Down Button (1) to the leading state to move the Grapple Shovel down at a slow speed. Press the Down Button (1) to the trailing state to move the Grapple Shovel down at a fast speed. Press the Up Button (2) to the leading state to move the Grapple Shovel up at a slow speed. Press the Up Button (2) to the trailing state to move the Grapple Shovel up at a fast speed.



If the Grapple Shovel is above the SPEED TRANSITION ELEVATION, the Lift Hoist System will only allow vertical Grapple Shovel movement at a slow speed regardless of the whether the Up or Down Button is pressed at the leading or trailing state.

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6. Press the Reverse Button (3) to the leading state to reverse the Grapple Shovel at a slow speed. Press the Reverse Button (3) to the trailing state to reverse the Grapple Shovel at a fast speed. Press the Forward Button (4) to the leading state to move the Grapple Shovel forward at a slow speed. Press the Forward Button (4) to the trailing state to move the Grapple Shovel forward at a fast speed.



Please refer to the Certified Drawing Package for the orientation of forward and reverse motion. The default orientation shows reverse motion as leftward and forward motion as rightward in relation the beam on the Certified Drawing Package. The HMI allows the option to invert the forward and reverse motion to match the desired orientation.

7. Press and hold the Open Button (5) to open the Grapple Shovel. Press and hold the Close Button (6) to close the Grapple Shovel. Make sure to finish the manual operation in free space.



The Grapple Shovel will only open or close if the Hydraulic Power Unit is operating.

8. Press the Stop Button (12) to turn off the Wireless Remote Control Pendant. All LEDs will stop glowing.

5.4.3 P3 HMI Control Panel

Follow the steps below to use the P3 HMI Control Panel (Figure 5-30) to manually control the Grapple Hoist.

Figure Legend

1 Selector Switch



Note: Some parts not shown for clarity.

Figure 5-30: P3 HMI Panel Selector Switch



Set the Selector Switch (1) to HMI on the P3 HMI Panel to place the Grapple Hoist in Manual Mode. See Figure 5-30 for the location on the Selector Switch on the P3 HMI Panel.

5.4.4 HMI Manual Screen

Refer to Section 5.5, Touch Screen HMI Operation Instructions on Page 5-158.



Review all of Section 5.5 carefully before using any of the functions found in the HMI Manual Touch Screen.

5.5 Touch Screen HMI Operation Instructions

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

5.5.1 HMI Navigation

5.5.1.1 HMI Top Ribbon

Figure Legend

- 1 Alarm Button
- 2 Diagnostic Button
- 3 Previous Screen Button
- 4 Next Screen Button
- 5 Menu Bar Button
- 6 Logon Button
- 7 Time and Date Indicator



Note: Some parts not shown for clarity.

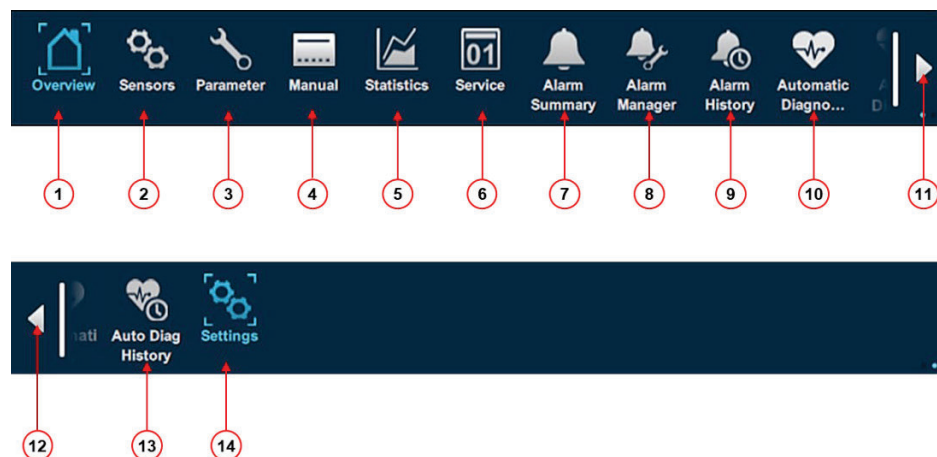
Figure 5-31: Grapple Hoist - HMI Top Ribbon

The HMI Top Ribbon appears at the top of the HMI Screen. The Alarm Button (1) navigates the operator to a list of active alarms. The Diagnostic Button (2) navigates the operator to a diagnostic overview screen. The Previous Screen Button (3) and Next Screen Button (4) allow the operator to navigate to previously visited screens and return to more recent screens. The Menu Bar Button (5) toggles the display of the HMI Menu Bar at the bottom of the HMI Screen. The Logon Button (6) navigates the operator to a login screen. The Time and Date Indicator (7) displays the current time and date.

5.5.1.2 HMI Menu Bar

Figure Legend

- 1 HMI Overview Screen
- 2 HMI Sensors Menu
- 3 HMI Parameters Menu
- 4 HMI Manual Screen
- 5 HMI Statistics Menu
- 6 HMI Service Screen
- 7 HMI Alarm Summary Screen
- 8 HMI Alarm Manager Screen
- 9 HMI Alarm History Screen
- 10 HMI Automatic Diagnostic Screen
- 11 Menu Bar
- 12 Page Right Button
- 13 Page Left Button
- 14 HMI Automatic Diagnostic History Screen
- 15 HMI Settings Screen



Note: Some parts not shown for clarity.

Figure 5-32: Grapple Hoist - HMI Menu Bar

The HMI Menu Bar allows the operator to navigate to a variety of HMI Screens. The Menu Bar Page Right Button (11) and the Menu Bar Page Left Button (12) allow the Operator to view each page of screens on the HMI Menu Bar. Each of these screens are discussed in the sections below.

- HMI Overview Screen (1): See Section 5.5.3 on Page 5-161 for details.
- HMI Sensors Menu (2): See Section 5.5.5 on Page 5-166 for details.
- HMI Parameters Menu (3): See Section 5.5.6 on Page 5-179 for details.
- HMI Manual Screen (4): See Section 5.5.4 on Page 5-164 for details.
- HMI Statistics Menu (5): See Section 5.5.7 on Page 5-193 for details.
- HMI Service Screen (6): See Section 5.5.8 on Page 5-200 for details.
- HMI Alarm Summary Screen (7): See Section 5.5.9 on Page 5-201 for details.
- HMI Alarm Manager Screen (8): See Section 5.5.9 on Page 5-201 for details.
- HMI Alarm History Screen (9): See Section 5.5.5 on Page 5-166 for details.
- HMI Automatic Diagnostic Screen (10): See Section 5.5.10 on Page 5-203 for details.
- HMI Automatic Diagnostic History Screen (13): See Section 5.5.10 on Page 5-203 for details.
- HMI Settings Screen (14): See Section 5.5.11 on Page 5-204 for details.

5.5.2 HMI Indicator Lights

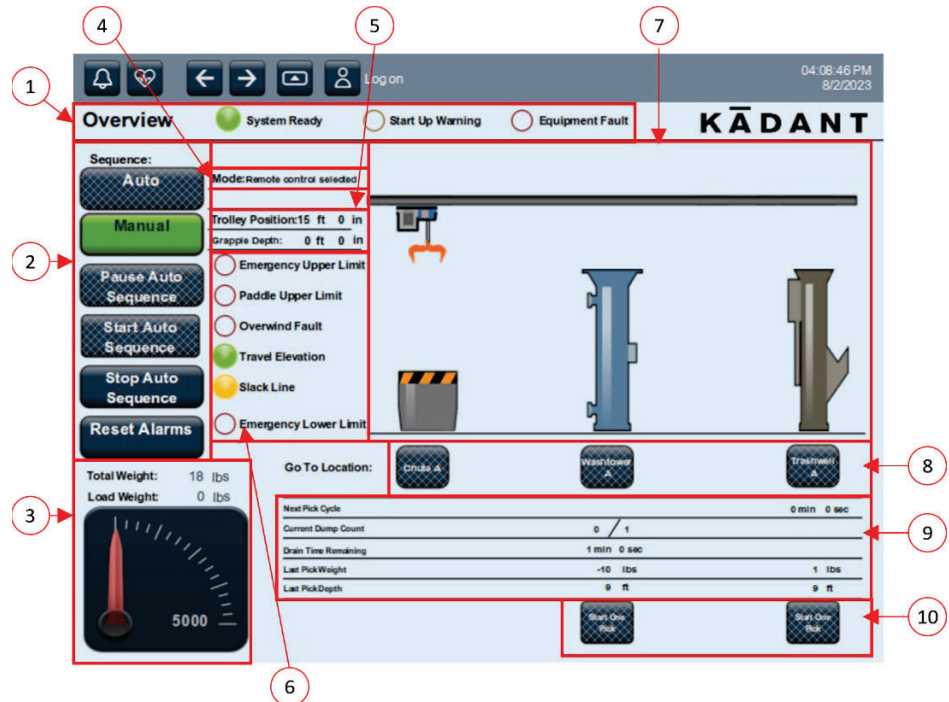
Several HMI screens contain indicator lights that convey information about the Grapple Hoist. The general meaning of each possible state is given below. Depending on the indicator, different state meanings may occur.

- For indicators related to inputs, there are two possible states.
 - Off: The indicator light is off when no color is displayed. This indicates that the input signal is low. In general, this means that a Grapple Hoist property is not currently present but this depends on the specific input signal.
 - Green: The indicator light displays a green light. This indicates that the input signal is high. In general, this means that a Grapple Hoist property is currently present but this depends on the specific input signal.
- For inputs related to alarms, there are three possible states.
 - Green: The indicator light displays a green light. This indicates that a fault related to this Grapple Hoist property is not present.
 - Yellow: The indicator light displays a yellow light. This is a warning that while Grapple Hoist operation is still functional, a fault is present.
 - Red: The indicator light displays a red light. This indicates that Grapple Hoist Operation is halted due to a fault.

5.5.3 HMI Overview Screen

Figure Legend

- 1 System Overview Section
- 2 Sequence Section
- 3 Load Sensor Section
- 4 Operation Mode Indicator
- 5 Location Indicator Section
- 6 Hoist Status Indicator Section
- 7 System Image
- 8 Homing Buttons
- 9 Statistics Section
- 10 Individual Pick Buttons



Note: Some parts not shown for clarity.

Figure 5-33: Grapple Hoist - HMI Overview Screen

The HMI Overview Screen displays a summary of important Grapple Hoist data and serves as a home screen for the HMI Screen.

- The System Overview Section (1) contains indicators for relevant Grapple Hoist statuses.
 - System Ready: Denotes if the Grapple Hoist is running or ready to run.
 - Start Up Warning: Denotes if the Grapple Hoist is in the process of automatic start up. This coincides with the light and alarm sound from the Hydraulic Carriage during automatic start up.
 - Equipment Fault: Denotes if the Grapple Hoist cannot run due to a fault.
- The Sequence Section (2) contains the following buttons.
 - Auto Button: Pressing this button disables manual operation mode features and enables automatic operation mode features for the Grapple Hoist.
 - Manual Button: Pressing this button disables automatic operation mode features and enables manual operation mode features for the Grapple Hoist.
 - Pause Auto Sequence Button: Pressing this button while the Grapple Hoist is in an automatic cycle will stop the unit's motion. The cycle can be resumed by pressing the

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- button again. The Pause Auto Sequence Button changes to a resume button that allows the user to resume the automatic cycle after a pause.
- Start Auto Sequence Button: Pressing this button when the unit will begin an automatic cycle when the automatic operation mode features are enabled.
 - Stop Auto Sequence Button: Pressing this button when the unit will stop an automatic cycle. The motion cannot be resumed when this button is pressed.
 - Reset Alarms Button: Pressing this button will clear any active alarms. If the causes of all faults are no longer present, startup will be enabled after pressing this button. Startup will not be enabled if the E-Stop was triggered and needs to be reset.
- The Load Sensor Section (3) displays information regarding the current load on the Lift Hoist System.
 - Total Weight Reading: Displays the load on the Lift Hoist System including the Grapple Shovel weight. The load sensor gauge image in the Load Sensor corresponds with this reading.
 - Load Weight Reading: Displays the load on the Lift Hoist System excluding the Grapple Shovel weight. This represents only the weight of items from a particular Trashwell or Wash Tower pick.
 - The Operation Mode Indicator (4) displays text that indicates whether the Grapple Hoist is in automatic mode or manual mode (Wireless Remote Control Pendant).
 - The Location Indicator Section (5) provide a summary of the Grapple Shovel position and elevation.
 - Trolley Position Reading: Displays the position of the Grapple Shovel on the beam. The zero point depends on the application.
 - Grapple Depth Reading: Displays the elevation of the Grapple Shovel with the TRASHWELL ELEVATION as the zero point. Downward movement increases the Grapple Depth Reading value.
 - Hoist Status Indicator Section (6) contains indicators for relevant Grapple Hoist statuses during operation.
 - Emergency Upper Limit Indicator: Denotes if the Grapple Shovel reaches the EXTREME UPPER LIMIT ELEVATION (S1) (See Section 5.3.3.1, Grapple Elevation Summary on Page 5-123).
 - Paddle Upper Limit Indicator: Denotes if the Grapple Shovel or any debris contacts and trips the Paddle Limit Switch on the Lift Hoist System.
 - Overwind Fault Indicator: Denotes if the Overwind Switch on the Lift Hoist System is tripped.
 - Travel Elevation Indicator: Denotes if the Grapple Shovel is located at the TRAVEL ELEVATION (S3) (See Section 5.3.3.1, Grapple Elevation Summary on Page 5-123).

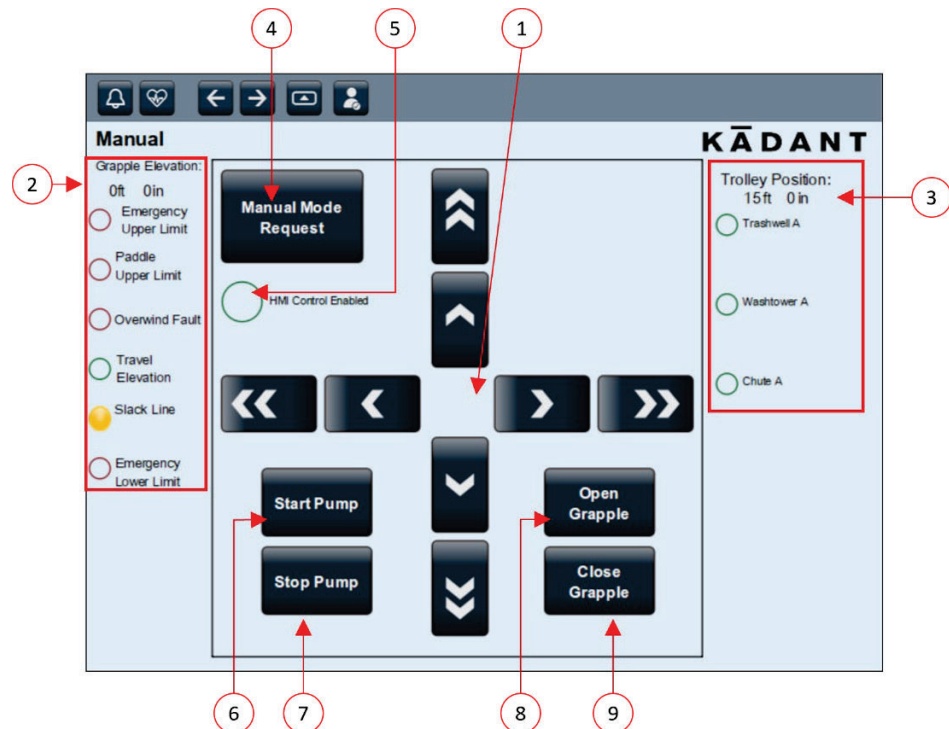
Intelligent Grapple Hoist**Models: 4' (1.2 m) | 6' (1.8 m)**

- Slack Line Indicator: Denotes if the hoist control detects a load that is below a slack-line threshold. The slack-line threshold is determined by a percentage of the maximum capacity of the Lift Hoist System.
- Emergency Lower Limit Indicator: Denotes if the Grapple Shovel reaches the EXTREME LOWER LIMIT ELEVATION (S2) (See Section 5.3.3.1, Grapple Elevation Summary on Page 5-123).
- The System Image (7) provides a visual representation of the Grapple Hoist system status.
- Pressing the Homing Buttons (8) starts an automatic sequence that moves the Grapple Shovel to the TRAVEL ELEVATION positioned above a Trashwell, Wash Tower, or dump location.
- The Statistics Section (9) provides a quick view of statistics relating to the automatic cycle.
- Pressing the Individual Pick Buttons (10) starts an automatic sequence that runs a portion of the automatic cycle that performs a single pick from a Trashwell or Wash Tower.

5.5.4 HMI Manual Screen

Figure Legend

- 1 Movement Buttons
- 2 Elevation Section
- 3 Position Section
- 4 HMI Manual Mode Button
- 5 HMI Manual Mode Indicator
- 6 Start Pump Button
- 7 Stop Pump Button
- 8 Open Grapple Shovel Button
- 9 Close Grapple Shovel Button



Note: Some parts not shown for clarity.

Figure 5-34: Grapple Hoist - HMI Manual Screen



The Grapple Shovel will only open or close if the Hydraulic Power Unit is operating.

The HMI Manual Screen allows the operator to manually control the Grapple Hoist from the P3 HMI Panel.

- The Manual Mode Request Button (4) enables the HMI manual mode related items. The HMI Manual Mode Indicator (5) displays a light when the Manual Mode Request Button (4) is pressed.
- Pressing the Movement Buttons (1) moves the Grapple Shovel horizontally or vertically at one of two speeds.
- The Elevation Section (2) contains indicators for elevation related Grapple Hoist statuses during operation.
 - Emergency Upper Limit Indicator: Denotes if the Grapple Shovel reaches the EXTREME UPPER LIMIT ELEVATION (S1) (See Section 5.3.3.1, Grapple Elevation Summary on Page 5-123).

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- Paddle Upper Limit Indicator: Denotes if the Grapple Shovel or any debris contacts and trips the Paddle Limit Switch on the Lift Hoist System.
- Overwind Fault Indicator: Denotes if the Overwind Switch on the Lift Hoist System is tripped.
- Travel Elevation Indicator: Denotes if the Grapple Shovel is located at the TRAVEL ELEVATION (S3) (See Section 5.3.3.1, Grapple Elevation Summary on Page 5-123).
- Slack Line Indicator: Denotes if the hoist control detects a load that is below a slack-line threshold. The slack-line threshold is determined by a percentage of the maximum capacity of the Lift Hoist System.
- Emergency Lower Limit Indicator: Denotes if the Grapple Shovel reaches the EXTREME LOWER LIMIT ELEVATION (S2) (See Section 5.3.3.1, Grapple Elevation Summary on Page 5-123).
- The Position Section (3) contains indicators for position related Grapple Hoist statuses during operation.
 - Trashwell Indicator(s): Denotes if the Grapple Shovel is located in the TRASHWELL POSITION (See Section 5.3.3.2, Grapple Position Summary on Page 5-125).
 - Wash Tower Indicator(s): Denotes if the Grapple Shovel is located in the WASH TOWER POSITION (See Section 5.3.3.2, Grapple Position Summary on Page 5-125).
 - Chute Indicator(s): Denotes if the Grapple Shovel is located in the DUMP POSITION (See Section 5.3.3.2, Grapple Position Summary on Page 5-125).
- Pressing the Start Pump Button (6) activates the Hydraulic Power Unit. Pressing the Stop Pump Button (7) deactivates the Hydraulic Power Unit.
- Pressing and holding the Open Grapple Button (8) opens the Grapple Shovel. Pressing and holding the Close Grapple Button (9) closes the Grapple Shovel.

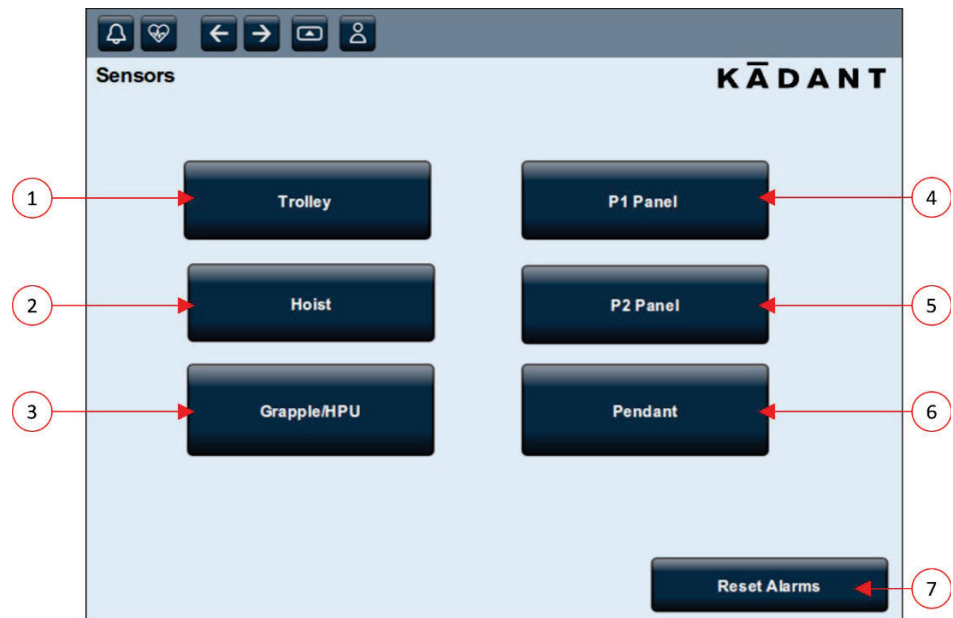


The Grapple Shovel will only open or close if the Hydraulic Power Unit is operating.

5.5.5 HMI Sensors Menu

Figure Legend

- | | |
|---|---|
| 1 | Trolley Sensors
Screen Button |
| 2 | Hoist Sensors
Screen Button |
| 3 | Grapple Shovel and
Hydraulic Power Unit
Sensors Screen Button |
| 4 | P1 Panel Sensors
Screen Button |
| 5 | P2 Panel Sensors
Screen Button |
| 6 | Pendant Sensors
Screen Button |
| 7 | Reset Alarms Button |



Note: Some parts not shown for clarity.

Figure 5-35: Grapple Hoist - HMI Sensors Menu

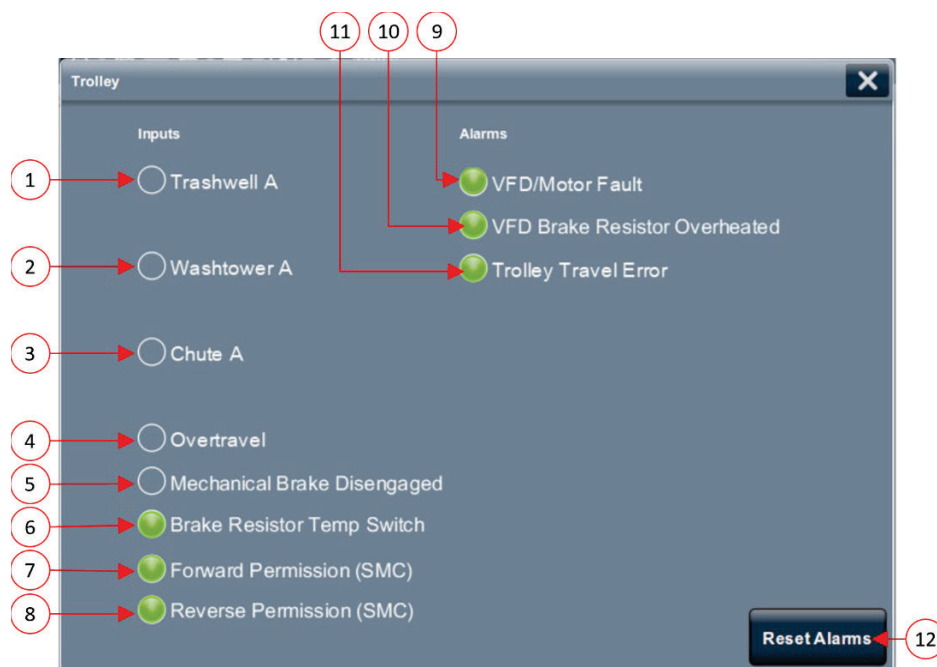
The HMI Sensors Menu allows the operator to navigate to different screens that contain information regarding the various sensors in the Grapple Hoist system.

- Trolley Sensors Screen Button (1): Pressing this button navigates the operator to the Trolley Sensors Screen.
- Hoist Sensors Screen Button (2): Pressing this button navigates the operator to the Hoist Sensors Screen.
- Grapple Shovel and Hydraulic Power Unit Sensors Screen Button (3): Pressing this button navigates the operator to the Grapple Shovel and Hydraulic Power Unit Sensors Screen.
- P1 Panel Sensors Screen Button (4): Pressing this button navigates the operator to the P1 Panel Sensors Screen.
- P2 Panel Sensors Screen Button (5): Pressing this button navigates the operator to the P2 Panel Sensors Screen.
- Pendant Sensors Screen Button (6): Pressing this button navigates the operator to the Pendant Sensors Screen.
- Reset Alarms Button: Pressing this button will clear any active alarms. If the causes of all faults are no longer present, startup will be enabled after pressing this button. Startup will not be enabled if the E-Stop was triggered and needs to be reset.

5.5.5.1 HMI Trolley Sensors Screen

Figure Legend

- | | |
|----|----------------------|
| 1 | Trashwell Indicator |
| 2 | Wash Tower Indicator |
| 3 | Chute Indicator |
| 4 | Overtravel Indicator |
| 5 | Mechanical Brake |
| 6 | Disengaged Indicator |
| 7 | Forward Permission |
| 8 | Temperature Switch |
| 9 | Indicator |
| 10 | Forward Permission |
| 11 | (SMC) Indicator |
| 12 | Reverse Permission |
| | (SMC) Indicator |
| | VFD/Motor |
| | Fault Indicator |
| | VFD Brake Resistor |
| | Overheated Indicator |
| | Trolley Travel |
| | Error Indicator |
| | Reset Alarms Button |



Note: Some parts not shown for clarity.

Figure 5-36: Grapple Hoist - HMI Trolley Sensors Screen

The HMI Trolley Sensors Screen contains indicators that display information regarding the position and horizontal movement of the Grapple Hoist (See Section 5.3.3.2, Grapple Position Summary on Page 5-125).

- Trashwell Indicator (1): Denotes if the Grapple Shovel is located in the TRASHWELL POSITION.
- Wash Tower Indicator (2): Denotes if the Grapple Shovel is located in the WASH TOWER POSITION.
- Chute Indicator (3): Denotes if the Grapple Shovel is located in the DUMP POSITION.
- Overtravel Indicator (4): Denotes if the Grapple Shovel is located in the OVERTRAVEL POSITION.

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

- Mechanical Brake Disengaged Indicator (5): Denotes if the mechanical brake is disengaged and horizontal movement is mechanically allowed.
- Brake Resistor Temperature Switch Indicator (6): Denotes if the Brake Resistor Temperature Switch is functioning properly.
- Forward Permission (SMC) Indicator (7): Denotes if the Stahl SMC22 will allow forward motion. The most likely cause of this light toggling is tripping the Rotary Limit Switch.
- Reverse Permission (SMC) Indicator (8): Denotes if the Stahl SMC22 will allow reverse motion. The most likely cause of this light toggling is tripping the Rotary Limit Switch.



Please refer to the additional Stahl Electrical Drawing Package documents and the Rotary Limit Switch documents for complete instructions.

- VFD/Motor Fault Indicator (9): Denotes if a VFD fault occurs for the Travel Drive Motor.
- VFD Brake Resistor Overheated Indicator (10): Denotes if the VFD Brake Resistor for the Travel Drive Motor is above the allowable temperature.
- Trolley Travel Error Indicator (11): Denotes if an error occurs in horizontal motion.
- Reset Alarms Button: Pressing this button will clear any active alarms. If the causes of all faults are no longer present, startup will be enabled after pressing this button. Startup will not be enabled if the E-Stop was triggered and needs to be reset.

5.5.5.2 HMI Hoist Sensors Screen

Figure Legend

- 1 Emergency Upper Limit Ok (S1) Indicator
- 2 Emergency Lower Limit Ok (S2) Indicator
- 3 Overwind Indicator
- 4 Paddle Upper Limit Okay Indicator
- 5 Slack Rope Indicator
- 6 Operating Limit Top (below S3) Indicator
- 7 Fast/Slow Top (below S4) Indicator
- 8 Stahl Mechanical Brake Disengaged Indicator
- 9 Kadant Mechanical Brake Disengaged Indicator
- 10 Brake Resistor Temp Switch Indicator



Note: Some parts not shown for clarity.

Figure 5-37: Grapple Hoist – HMI Hoist Sensors Screen (1 of 2)

The HMI Trolley Sensors Screen contains indicators that display information regarding the elevation and vertical movement of the Grapple Hoist (See Section 5.3.3.1, Grapple Elevation Summary on Page 5-123).

- Emergency Upper Limit Ok (S1) Indicator (1): Denotes if the Grapple Shovel is not at the EXTREME UPPER LIMIT ELEVATION (S1).
- Emergency Lower Limit Ok (S2) Indicator (2): Denotes if the Grapple Shovel is not at the EXTREME LOWER LIMIT ELEVATION (S2).
- Overwind Indicator (3): Denotes if the Overwind Switch on the Light Hoist System is tripped. This normally occurs when the Wire Ropes or debris on the Wire Ropes is improperly wrapped around the Wire Rope Drum.
- Paddle Upper Limit Okay Indicator (4): Denotes if the Grapple Shovel or any debris contacts and trips the Paddle Limit Switch on the Lift Hoist System.

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Models: 4' (1.2 m) | 6' (1.8 m)

- Slack Rope Indicator (5): Denotes if the Load Sensor on the Lift Hoist System detects a load that is below a slack-line threshold. The slack-line threshold is determined by a percentage of the maximum capacity of the Lift Hoist System.
- Operating Limit Top (below S3) Indicator (6): Denotes if the Grapple Shovel is below the TRAVEL ELEVATION (S3).
- Fast/Slow Top (below S4) Indicator (7): Denotes if the Grapple Shovel is below the SPEED TRANSITION ELEVATION (S4). The maximum lift speed is limited when above the SPEED TRANSITION ELEVATION (S4).
- Stahl Mechanical Brake Disengaged Indicator (8): Denotes if a relay in the Stahl A16 panel signals that the mechanical brake is disengaged and vertical movement is mechanically allowed.
- Kadant Mechanical Brake Disengaged Indicator (9): Denotes if a relay in the Electrical and Controls System signals that the mechanical brake is disengaged and vertical movement is mechanically allowed.
- Brake Resistor Temp Switch Indicator (10): Denotes if the Brake Resistor Temperature Switch is functioning properly.

Figure Legend

- 11 VFD/Motor
Fault Indicator
- 12 VFD Brake Resistor
Overload Indicator
- 13 Overwind Fault Indicator
- 14 Emergency Upper
Limit Indicator
- 15 Emergency Lower
Limit Indicator
- 16 Paddle Upper
Limit Indicator
- 17 SMC Error Indicator
- 18 Stahl Up
Permission Error
- 19 Stahl Down
Permission Indicator
- 20 Hoist Running Timeout
- 21 Grapple Elevation
Reading
- 22 Grapple Weight Reading
- 23 Bypass SMC
Permissions Button



Note: Some parts not shown for clarity.

Figure 5-38: Grapple Hoist – HMI Hoist Sensors Screen (2 of 2)

- VFD/Motor Fault Indicator (11): Displays a light when a VFD fault occurs for the Hoist Motor.
- VFD Brake Resistor Overload Indicator (12): Displays a light when the Hoist Motor VFD Brake Resistor has a current overload.
- Overwind Fault Indicator (13): Displays a light when the Overwind Switch on the Light Hoist System is tripped. This normally occurs when the Wire Ropes or debris on the Wire Ropes is improperly wrapped around the Wire Rope Drum.
- Emergency Upper Limit Indicator (14): Displays a light if the Grapple Shovel reaches the EXTREME UPPER LIMIT ELEVATION (S1).
- Emergency Lower Limit Indicator (15): Displays a light if the Grapple Shovel reaches the EXTREME LOWER LIMIT ELEVATION (S2).

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

- Paddle Upper Limit Indicator (16): Denotes if the Grapple Shovel or any debris contacts and trips the Paddle Limit Switch on the Lift Hoist System.
- SMC Error Indicator (17): Denotes if the SMC22 has an error message.
- Stahl Up Permission Error (18): Denotes if the Stahl SMC22 will allow upward motion.
- Stahl Down Permission Indicator (19): Denotes if the Stahl SMC22 will allow downward motion.
- Hoist Running Timeout (20): Denotes if vertical motion is requested but the SMC22 will not allow motion.
- Grapple Elevation Reading (21): Displays the elevation of the Grapple Shovel with the TRASHWELL ELEVATION as the zero point. Downward movement increases the Grapple Depth Reading value.
- Grapple Weight Reading (22): Displays the Load Sensor Reading on the Lift Hoist System including the Grapple Shovel weight.
- Bypass SMC Permissions Button (23): Pressing this button allows actions to occur that would normally be blocked by the SMC22 on the Lift Hoist System. For example, this button must be pressed in order to move above the TRAVEL ELEVATION when checking the EXTREME UPPER LIMIT ELEVATION (S1) during a Wire Rope change.

5.5.5.3 HMI Grapple Shovel and HPU Sensors Screen

Figure Legend

- 1 Oil Pressure Reading
- 2 Oil Temperature Reading
- 3 Oil Level Reading
- 4 Pump Motor Running Indicator
- 5 Pump Motor Contactor Fault Indicator
- 6 High Oil Pressure Fault Indicator
- 7 High Oil Temperature Fault Indicator
- 8 Low Oil Level Fault Indicator
- 9 Reset Alarms Button



Note: Some parts not shown for clarity.

Figure 5-39: Grapple Hoist - HMI Grapple Shovel and HPU Sensors Screen

The HMI Grapple Shovel and HPU Sensors Screen contains indicators that display information regarding the hydraulic system of the Grapple Hoist.

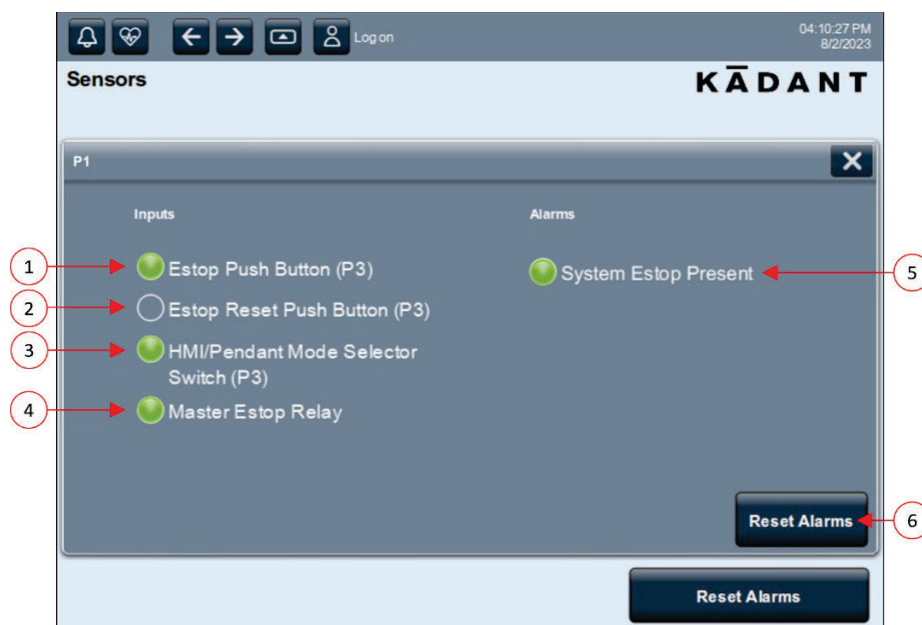
- Emergency Upper Limit Ok (S1) Indicator (1): Denotes if the Grapple Shovel is not at the EXTREME UPPER LIMIT ELEVATION (S1).
- Emergency Lower Limit Ok (S2) Indicator (2): Denotes if the Grapple Shovel is not at the EXTREME LOWER LIMIT ELEVATION (S2).
- Oil Pressure Reading (1): Displays the current oil pressure.
- Oil Temperature Reading (2): Displays the current oil temperature.
- Oil Level Reading (3): Displays the current oil level in the oil reservoir.
- Pump Motor Running Indicator (4): Denotes if the Gear Pump is running.
- Pump Motor Contactor Fault Indicator (5): Denotes if a contactor on the Gear Pump has a fault.
- High Oil Pressure Fault Indicator (6): Denotes if the oil pressure is outside of the accepted oil pressure range. See the Oil High Pressure Alarm parameter setting from 5.5.6.6, HMI Grapple Shovel and HPU Parameters Screen on Page 5-190.

- High Oil Temperature Fault Indicator (7): Denotes if the oil temperature is outside of the accepted oil temperature range. See the Oil High Temp Alarm parameter setting from 5.5.6.6, HMI Grapple Shovel and HPU Parameters Screen on Page 5-190.
- Low Oil Level Fault Indicator (8): Denotes if the oil level is below the See the Oil Low Level Alarm and Oil High Level Alarm parameter setting from 5.5.6.6, HMI Grapple Shovel and HPU Parameters Screen on Page 5-190.
- Reset Alarms Button: Pressing this button will clear any active alarms. If the causes of all faults are no longer present, startup will be enabled after pressing this button. Startup will not be enabled if the E-Stop was triggered and needs to be reset.

5.5.5.4 HMI P1 Panel Sensors Screen

Figure Legend

- 1 Estop Push Button (P3) Indicator
- 2 Estop Reset Push Button (P3) Indicator
- 3 HMI/Pendant Mode Selector Switch (P3) Indicator
- 4 Master Estop Relay Indicator
- 5 System Estop Present Indicator
- 6 Reset Alarms Button



Note: Some parts not shown for clarity.

Figure 5-40: Grapple Hoist - HMI P1 Panel Sensors Screen

The HMI P1 Panel Sensors Screen contains indicators that display information regarding the P1 Main Control Panel and the P3 HMI Panel.

- Estop Push Button (P3) Indicator (1): Denotes if the E-Stop button is pressed on the P3 HMI Panel.
- Estop Reset Push Button (P3) Indicator (2): Denotes if the E-Stop button is reset on the P3 HMI Panel.
- HMI/Pendant Mode Selector Switch (P3) Indicator (3): Denotes if the manual mode operation is set to be controlled by the HMI or the Wireless Remote Control Pendant. If the indicator light is off, this denotes HMI control. If the indicator light is green, this denotes pendant control.
- Master Estop Relay Indicator (4): Denotes if a Master E-Stop Relay fault is an active alarm.
- System Estop Present Indicator (5): Denotes if a System E-Stop fault is an active alarm.
- Reset Alarms Button: Pressing this button will clear any active alarms. If the causes of all faults are no longer present, startup will be enabled after pressing this button. Startup will not be enabled if the E-Stop was triggered and needs to be reset.

5.5.5.5 HMI P2 Panel Sensors Screen

Figure Legend

- | | |
|---|---|
| 1 | P2 Power
Contactor Indicator |
| 2 | Rack Communication
Fault Indicator |
| 3 | Panel Moisture High
Fault Indicator |
| 4 | Panel Temperature
High Fault Indicator |
| 5 | Moisture Reading |
| 6 | Temperature Reading |
| 7 | Reset Alarms Button |



Note: Some parts not shown for clarity.

Figure 5-41: Grapple Hoist - HMI P2 Panel Sensors Screen

The HMI P2 Panel Sensors Screen contains indicators that display information regarding the P2 Remote Cabinet.

- P2 Power Contactor Indicator (1): Denotes if the power contactor is connected.
- Rack Communication Fault Indicator (2): Denotes if there is a fault in the Rack Communication System.
- Panel Moisture High Fault Indicator (3): Denotes if the moisture percentage inside the panel is above the maximum moisture percentage allowed. See the P2 Moisture Alarm parameter setting from 5.5.6.7, HMI Panel Parameters Screen on Page 5-192.
- Panel Temperature High Fault Indicator (4): Denotes if the temperature inside the panel is above the maximum temperature level allowed. See the P2 High Temperature Alarm parameter setting from 5.5.6.7, HMI Panel Parameters Screen on Page 5-192.
- Moisture Reading (5): Displays the current moisture percentage inside the panel.
- Temperature Reading (6): Displays the current temperature inside the panel.
- Reset Alarms Button: Pressing this button will clear any active alarms. If the causes of all faults are no longer present, startup will be enabled after pressing this button. Startup will not be enabled if the E-Stop was triggered and needs to be reset.

5.5.5.6 HMI Pendant Sensors Screen

Figure Legend

- 1 Hoist Down Indicator
- 2 Hoist Up Indicator
- 3 Trolley Reverse Indicator
- 4 Trolley Forward Indicator
- 5 Grapple Open Indicator
- 6 Grapple Close Indicator
- 7 Start HPU Indicator
- 8 Master Control Indicator
- 9 Hoist High Speed Indicator
- 10 Trolley High Speed Indicator



Note: Some parts not shown for clarity.

Figure 5-42: Grapple Hoist - HMI Pendant Sensors Screen

The HMI Pendant Sensors Screen contains indicators that display information regarding the Wireless Remote Control Pendant operation (See Section 5.3.3.2, Grapple Position Summary on Page 5-125).

- Hoist Down Indicator (1): Denotes if the Down Button is pressed on the Wireless Remote Control Pendant.
- Hoist Up Indicator (2): Denotes if the Up Button is pressed on the Wireless Remote Control Pendant.
- Trolley Reverse Indicator (3): Denotes if the Reverse Button is pressed on the Wireless Remote Control Pendant.
- Trolley Forward Indicator (4): Denotes if the Forward Button is pressed on the Wireless Remote Control Pendant.
- Grapple Open Indicator (5): Denotes if the Open Button is pressed on the Wireless Remote Control Pendant.
- Grapple Close Indicator (6): Denotes if the Close Button on the Wireless Remote Control Pendant.
- Start HPU Indicator (7): Denotes if the Pump Button on the Wireless Remote Control Pendant.

Intelligent Grapple Hoist

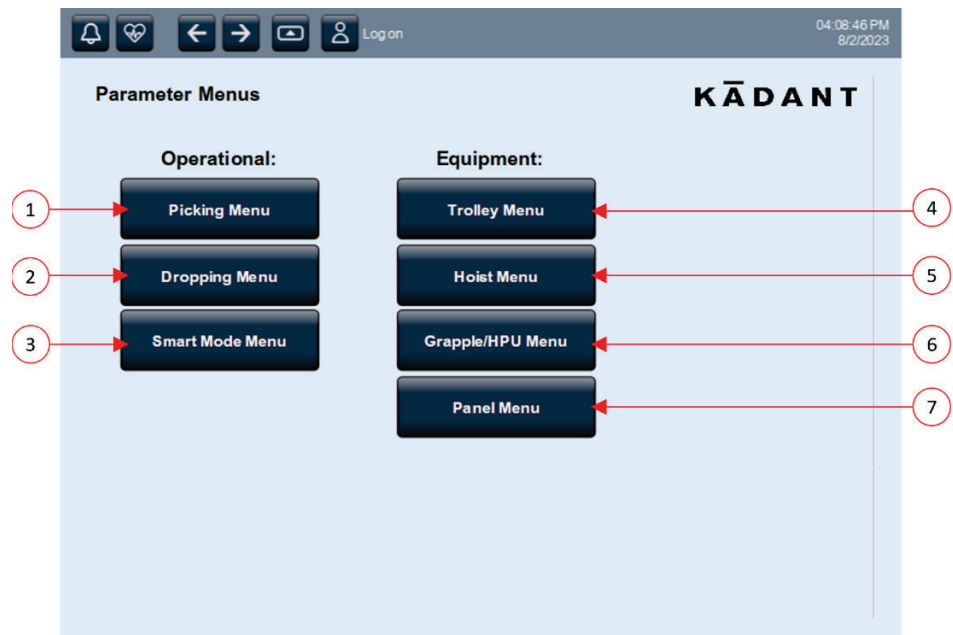
Models: 4' (1.2 m) | 6' (1.8 m)

- Master Control Indicator (8): Denotes if operation with the Wireless Remote Control Pendant is enabled and the pendant is armed to send wireless signal.
- Hoist High Speed Indicator (9): Denotes if the Up Button or Down Button is pressed to the trailing state on the Wireless Remote Control Pendant. If the Grapple Shovel is above the SPEED TRANSITION ELEVATION, the hoist high speed is not available.
- Trolley High Speed Indicator (10): Denotes if the Forward Button or Reverse Button is pressed to the trailing state on the Wireless Remote Control Pendant.

5.5.6 HMI Parameters Menu

Figure Legend

- | | |
|---|-------------------------|
| 1 | Picking Menu Button |
| 2 | Dropping Menu Button |
| 3 | Smart Mode Menu Button |
| 4 | Trolley Menu Button |
| 5 | Hoist Menu Button |
| 6 | Grapple/HPU Menu Button |
| 7 | Panel Menu Button |



Note: Some parts not shown for clarity.

Figure 5-43: Grapple Hoist – HMI Parameters Menu

The HMI Parameters Menu allows the operator to navigate to different screens that contain information regarding the various parameters for the Grapple Hoist system.

- Picking Menu Button (1): Pressing this button navigates the operator to the Picking Parameters Screen.
- Dropping Menu Button (2): Pressing this button navigates the operator to the Dropping Parameters Screen.
- Smart Mode Menu Button (3): Pressing this button navigates the operator to the Smart Mode Parameters Screen.
- Trolley Menu Button (4): Pressing this button navigates the operator to the Trolley Parameters Screen.
- Hoist Menu Button (5): Pressing this button navigates the operator to the Hoist Parameters Screen.
- Grapple/HPU Menu Button (6): Pressing this button navigates the operator to the Grapple Shovel and HPU Parameters Screen.
- Panel Menu Button (7): Pressing this button navigates the operator to the Panel Parameters Screen.

5.5.6.1 HMI Picking Parameters Screen

Figure Legend

- 1 Trashwell Parameters Section
- 2 Wash Tower Parameters Section
- 3 Grapple Entering Tank State s
- 4 Grabbing Control Parameters Section
- 5 Slack Line Control Parameters Section

The screenshot shows the 'Picking Parameters' screen with the following sections highlighted by red boxes and numbered callouts:

- 1 Trashwell Parameters Section:** A table with columns: Trashwell, Waiting Time Between Each Cycle (s), Drain Time After Pick (s), Pick Enabled (HMI, DCS), and Modified Pick Sequence. Row A shows values: 60, 1, checked, checked, and 5.2.
- 2 Wash Tower Parameters Section:** A table with columns: Washtower, Number of Wash Tower Drops Before a Pick, Drain Time After Pick (s), Pick Enabled (HMI, DCS), and Modified Pick Sequence. Row A shows values: 1, 60, checked, checked, and 6.2.
- 3 Grapple Entering Tank State s:** Radio buttons for Fully Open, Half Open (selected), and Closed.
- 4 Grabbing Control Parameters Section:** Two rows of parameters: 'Height hoist goes up slowly before opening the grapple' (18 in) and 'Height hoist goes up slowly while closing the grapple' (10 in).
- 5 Slack Line Control Parameters Section:** Two rows of parameters: 'Waiting Time After Slack Rope Detection' (3 s) and 'Maximum Number Of Slackline Detection Attempts' (4 #).

Note: Some parts not shown for clarity.

Figure 5-44: Grapple Hoist - HMI Picking Parameters Screen

The HMI Picking Parameters Screen allows the operator to modify parameters related to the Trashwell and Wash Tower picking sequences for the Grapple Hoist system.

- The Trashwell Parameters Section (1) contains parameters related to the Trashwell picking sequence for the Grapple Hoist system.
 - Each Trashwell will have a letter symbol in the first column. Most Grapple Hoist systems only have one Trashwell (Trashwell "A").
 - Waiting Time Between Each Cycle(s): The time between the end of a Wash Tower drop or Dump drop and the start of the next Trashwell pick. (See Section 5.3.4.7, Drain Time and Wait Time on Page 5-153).
 - Drain Time After Pick(s): The time set to drain the liquid from the Grapple Shovel after a Trashwell pick before moving the hoist horizontally to the Wash TOWER POSITION or the DUMP POSITION (See Section 5.3.4.7, Drain Time and Wait Time on Page 5-153).
 - The Pick Enabled section contains checkboxes to toggle whether to include Trashwell picks in the automatic cycle for both HMI and DCS controlled operation. If a checkmark is present, Trashwell picks will be included in the automatic cycle. If a checkmark is not present, Trashwell picks will not be included in the automatic cycle.

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

- The Modified Pick Sequence section contains parameters that allow the operator to change the Trashwell pick sequence to no longer use slack-line detection, instead opening at a specific opening depth.
- The Wash Tower Parameters Section (2) contains parameters related to the Wash Tower picking sequence for the Grapple Hoist system.
 - Each Wash Tower will have a letter symbol in the first column. Most Grapple Hoist systems only have one Wash Tower (Wash Tower “A”) or no Wash Towers.
 - Number of Wash Tower Drops Before a Pick: The number of Trashwell picks that will be dropped into the Wash Tower before a Wash Tower pick occurs.
 - Drain Time After Pick(s): The time set to drain the liquid from the Grapple Shovel after a Wash Tower pick before moving the hoist horizontally to the DUMP POSITION (See Section 5.3.4.7, Drain Time and Wait Time on Page 5-153).
 - The Pick Enabled section contains checkboxes to toggle whether to include Wash Tower picks in the automatic cycle for both HMI and DCS controlled operation. If a checkmark is present, Wash Tower picks will be included in the automatic cycle. If a checkmark is not present, Wash Tower picks will not be included in the automatic cycle.
 - The Modified Pick Sequence section contains parameters that allow the operator to change the Wash Tower pick sequence to no longer use slack-line detection, instead opening at a specific opening depth with a different grabbing sequence.
- The Grapple Entering Tank State Parameters Section (3) allows the operator to choose the Grapple Shovel state when the Grapple Shovel enters the Trashwell or Washtower during a picking sequence. The Grapple Shovel can be set to any of the three states below.
 - Fully Open
 - Half Open
 - Closed



The Half Open Grapple Shovel setting is recommended for most applications.

- The Grabbing Control Parameters Section (4) contains parameters related to portion of the picking sequence where the Grapple Shovel fully opens then closes before lifting out of the Trashwell or Wash Tower.
 - Height Hoist Goes Up Slowly Before Opening the Grapple: the height to move the Grapple Shovel upward after a slack-line state is detected after the Waiting Time After Slack Rope Detection parameter setting. The Grapple Shovel fully opens after completing the upward motion. This allows the Grapple Shovel to separate from the trash before fully opening.

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Models: 4' (1.2 m) | 6' (1.8 m)

- Height Hoist Goes Up Slowly While Closing the Grapple: the height to move the Grapple Shovel upward after a slack-line state is detected on the fully open Grapple Shovel after the Waiting Time After Slack Rope Detection parameter setting has passed. The Grapple Shovel fully closes during this motion. The speed is restricted during this motion.
- The Slack Line Control Parameters Section (5) contains parameters related to slack-line state detection.
 - Waiting Time After Slack Rope Detection: A timer that starts after a slack-line state is detected. When the slack-line state is detected, the system waits based on this delay time setting. If the slack-line state is no longer detected after the timer, the Grapple Shovel resumes downward motion. If the slack-line state is still detected after the timer, the Grapple Shovel begins the grabbing sequence.
 - Maximum Number of Slack-Line Detection Attempts: The maximum number of times a slack-line state can be detected before the Grapple Shovel will start the process of closing. A large amount of light items and a high viscosity mix in the Trashwell can result in an increasing number of slack-line states.

5.5.6.2 HMI Dropping Parameters Screen

Figure Legend

- 1 Washtower
Parameters
- 2 Chute
Parameters

Washtower	Drop Height Below Travel Elevation	ft	Drop Enabled	
A	4		☒ HMI	☒ DCS

Chute	Drop Height Below Travel Elevation	ft	Drop Enabled	
A	3		☒ HMI	☒ DCS

Note: Some parts not shown for clarity.

Figure 5-45: Grapple Hoist - HMI Dropping Parameters Screen

The HMI Dropping Parameters Screen allows the operator to modify parameters related to the Wash Tower and Dump dropping sequences for the Grapple Hoist system.

- The Wash Tower Parameters Section (1) contains parameters related to the Wash Tower dropping sequence for the Grapple Hoist system.
 - Each Wash Tower will have a letter symbol in the first column. Most Grapple Hoist systems only have one Wash Tower (Wash Tower “A”) or no Wash Towers.
 - Drop Height Below Travel Elevation: The height at which the closed Grapple Shovel stops inside the Wash Tower before opening.
 - The Drop Enabled section contains checkboxes to toggle whether to include Wash Tower drops in the automatic cycle for both HMI and DCS controlled operation. If a checkmark is present, Wash Tower drops will be included in the automatic cycle. If a checkmark is not present, Wash Tower drops will not be included in the automatic cycle.

- The Chute Parameters Section (2) contains parameters related to the Dump dropping sequence for the Grapple Hoist system.
 - Each chute will have a letter symbol in the first column. Most Grapple Hoist systems only have one dump location (Chute “A”).
 - Drop Height Below Travel Elevation: The height at which the closed Grapple Shovel stops above the dump location before opening.
 - The Drop Enabled section contains checkboxes to toggle whether to include Dump drops in the automatic cycle for both HMI and DCS controlled operation. If a checkmark is present, Dump drops will be included in the automatic cycle. If a checkmark is not present, Dump drops will not be included in the automatic cycle.

5.5.6.3 HMI Smart Mode Parameters Screen

Figure Legend

- 1 Trashwell Parameters
- 2 Washtower Parameters
- 3 Enable Smart Cycle Mode Button

Trashwell	Pick Height Target (ft)	Cycle Wait Time Min (sec)	Cycle Wait Time Max (sec)	Cycle Wait Time Increment (sec)	Cycle Wait Time Decrement (sec)
A	6	40	1400	30	100

Amount of trashwell picks per every washtower pick					
WashTower	Pick Height Target (ft)	Pick Minimum	Pick Maximum	Pick Amount Increment	Pick Amount Decrement
A	6	1	6	3	2

Enable Smart Cycle Mode

Note: Some parts not shown for clarity.

Figure 5-46: Grapple Hoist - HMI Smart Mode Parameters Screen

The HMI Smart Mode Parameters Screen allows the operator to modify parameters related to advanced functions that affect the automatic cycle.

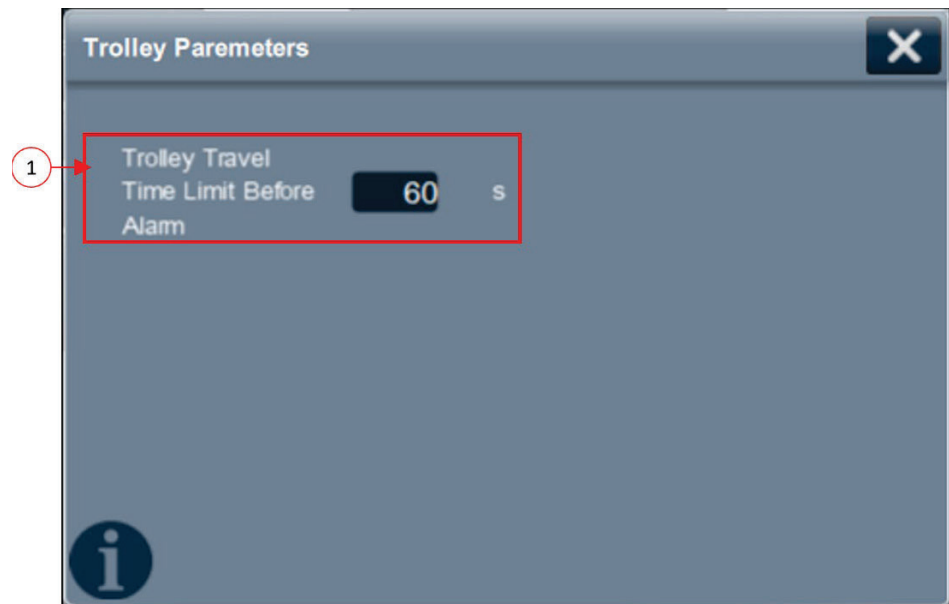
- Enable Smart Cycle Mode Button (3): Pressing this button toggles whether or not the parameters on the HMI Smart Mode Parameters Screen are enabled and affect the automatic cycle.
- The Trashwell Parameters Section (1) contains Smart Mode parameters related to the Trashwell for the Grapple Hoist system.
 - Each Trashwell will have a letter symbol in the first column. Most Grapple Hoist systems only have one Trashwell (Trashwell “A”).
 - Pick Height Target: The elevation at which the Cycle Wait Time will be increased or decreased depending on the pick elevation of any given Trashwell pick. If a Trashwell pick is at or below the parameter setting, the parameter is met and the Cycle Wait Time will be increased. If a Trashwell pick is above the parameter setting, the parameter is not met and the Cycle Wait Time will be decreased.
 - Cycle Wait Time: The minimum length of time the unit will wait after completing an automatic cycle before beginning the next automatic cycle. The number will not decrease beyond this parameter even if a Trashwell pick is above the Pick Height Target.

- Cycle Wait Time Max: The maximum length of time the unit will wait after completing an automatic cycle before beginning the next automatic cycle. The number will not increase beyond this parameter even if a Trashwell pick is below the Pick Height Target.
- Cycle Wait Time Increment: The amount to increase the length of time the unit will wait after completing an automatic cycle before beginning the next automatic cycle if the Pick Height Target is met on any given Trashwell pick.
- Cycle Wait Time Decrement: The amount to decrease the length of time the unit will wait after completing an automatic cycle before beginning the next automatic cycle if the Pick Height Target is not met on any given Trashwell pick.
- The Wash Tower Parameters Section (2) contains Smart Mode parameters related to the Wash Tower for the Grapple Hoist system.
 - Each Wash Tower will have a letter symbol in the first column. Most Grapple Hoist systems have one Wash Tower (Wash Tower "A") or no Wash Tower.
 - Pick Height Target: The elevation at which the number of Trashwell picks that will be dropped into the Wash Tower before a Wash Tower pick occurs will be increased or decreased depending on the pick elevation of any given Wash Tower pick. If a Wash Tower pick is at or below the parameter setting, the parameter is met and the number of picks will be increased. If a Wash Tower pick is above the parameter setting, the parameter is not met and the number of picks will be decreased.
 - Pick Minimum: The minimum number of Trashwell picks that will be dropped into the Wash Tower before a Wash Tower pick occurs. The number will not decrease beyond this parameter even if the Pick Height Target is not met on any given Wash Tower pick.
 - Pick Maximum: The maximum number of Trashwell picks that will be dropped into the Wash Tower before a Wash Tower pick occurs. The number will not increase beyond this parameter even if the Pick Height Target is met on any given Wash Tower pick.
 - Pick Amount Increment: The amount to increase the number of Trashwell picks that will be dropped into the Wash Tower before a Wash Tower pick occurs if the Pick Height Target is met on any given Wash Tower pick.
 - Pick Amount Decrement: The amount to decrease the number of Trashwell picks that will be dropped into the Wash Tower before a Wash Tower pick occurs if the Pick Height Target is not met on any given Wash Tower pick.

5.5.6.4 HMI Trolley Parameters Screen

Figure Legend

- | | |
|---|-------------------|
| 1 | Trolley Travel |
| | Time Limit Before |
| | Alarm |



Note: Some parts not shown for clarity.

Figure 5-47: Grapple Hoist - HMI Trolley Parameters Screen

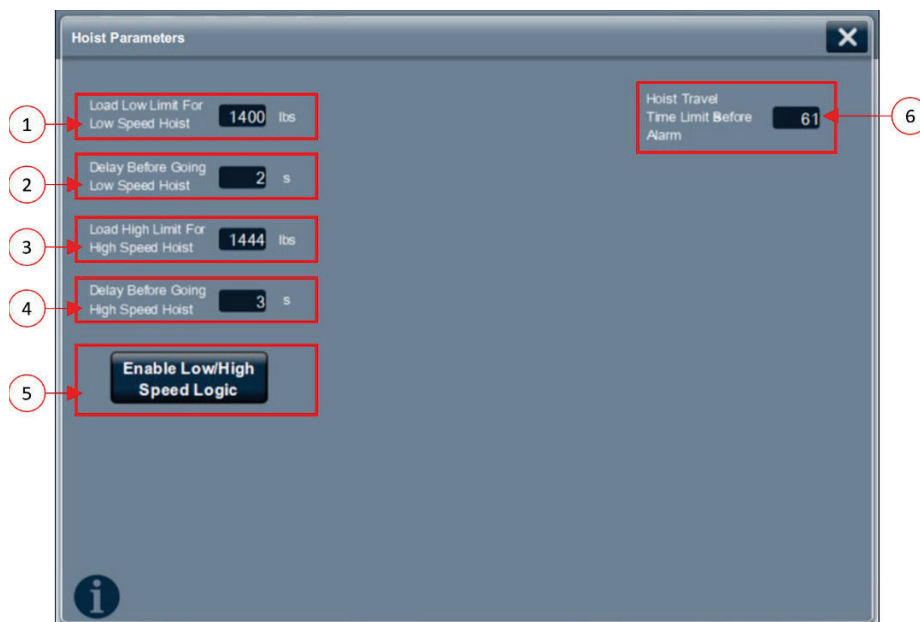
The HMI Trolley Parameters Screen allows the operator to modify parameters related to horizontal motion during the automatic cycle.

- Trolley Travel Time Limit Before Alarm (1): The length of time during horizontal motion before an alarm is activated. The timer starts when horizontal motion begins and resets when horizontal motion stops.

5.5.6.5 HMI Hoist Parameters Screen

Figure Legend

- 1 Load Low Limit For Low Speed Hoist
- 2 Delay Before Going Low Speed Hoist
- 3 Load High Limit For High Speed Hoist
- 4 Delay Before Going High Speed Hoist
- 5 Enable Low/High Speed Logic Button
- 6 Hoist Travel Time Limit Before Alarm



Note: Some parts not shown for clarity.

Figure 5-48: Grapple Hoist – HMI Hoist Parameters Screen

The HMI Hoist Parameters Screen allows the operator to modify parameters related to the Grapple Shovel lowering into the Trashwell or Wash Tower. As the Grapple Shovel enters the debris, the Load Sensor reading on the Lift Hoist System may drop below the weight of the Grapple Shovel. The following parameters adjust the speed of the hoist as the Load Sensor reading decreases and increases while lowering in the Trashwell or Wash Tower.

- Enable Low/High Speed Logic Button (5): Pressing this button toggles whether or not the parameters on the HMI Hoist Parameters Screen are enabled and affect the automatic cycle.
- Load Low Limit For Low Speed Hoist (1): The Load Sensor reading at which the Lift Hoist System will remain or change to a slow speed while lowering into the Trashwell or Wash Tower.
- Delay Before Going Low Speed Hoist (2): The delay time that occurs after the Load Sensor reaches the Load Low Limit For Low Speed Hoist parameter setting before changing to a slow speed.
- Load High Limit For High Speed Hoist (3): The Load Sensor reading at which the Lift Hoist System will remain or change to a fast speed while lowering into the Trashwell or Wash Tower.

Intelligent Grapple Hoist**Models: 4' (1.2 m) | 6' (1.8 m)**

- **Delay Before Going High Speed Hoist (4):** The delay time that occurs after the Load Sensor reaches the Load High Limit For High Speed Hoist parameter setting before changing to a slow speed.
- **Hoist Travel Time Limit Before Alarm (6):** The length of time during vertical motion before an alarm is activated. The timer starts when vertical motion begins and resets when vertical motion stops.

5.5.6.6 HMI Grapple Shovel and HPU Parameters Screen

Figure Legend

- | | |
|---|---------------------------|
| 1 | Oil High Pressure Alarm |
| 2 | Oil High Temp Warning |
| 3 | Oil High Temp Alarm |
| 4 | Oil Low Level Alarm |
| 5 | Oil Low Level Warning |
| 6 | Oil High Level Warning |
| 7 | Oil High Level Alarm |
| 8 | Grapple Half Opening Time |



Note: Some parts not shown for clarity.

Figure 5-49: Grapple Hoist – HMI Grapple Shovel and HPU Parameters Screen

The HMI Grapple Shovel and HPU Parameters Screen allows the operator to modify parameters related to the Hydraulic Power Unit and Grapple Shovel.

- Oil High Pressure Alarm (1): The hydraulic oil pressure at which an alarm that stops the Hydraulic Power Unit is activated.
- Oil High Temp Warning (2): The hydraulic oil temperature at which an alarm that warns that the hydraulic oil temperature is approaching the high temperature limit to maintain normal working conditions is activated.
- Oil High Temp Alarm (3): The hydraulic oil temperature at which an alarm that stops the Hydraulic Power Unit due to the hydraulic oil temperature reaching the high temperature limit to maintain normal working conditions is activated.
- Oil Low Level Alarm (4): The hydraulic oil level at which an alarm that stops the Hydraulic Power Unit due to the hydraulic oil volume reaching the low volume limit to maintain normal working conditions is activated.
- Oil Low Level Warning (5): The hydraulic oil level at which an alarm that warns that the hydraulic oil volume inside the Hydraulic Power unit is approaching the low volume limit to maintain normal working conditions is activated.

Intelligent Grapple Hoist

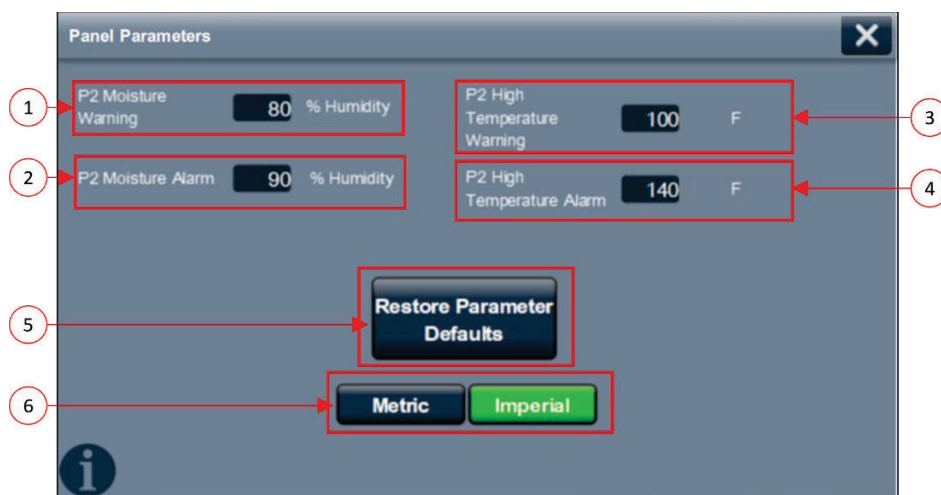
Models: 4' (1.2 m) | 6' (1.8 m)

- Oil High Level Warning (6): An alarm that warns that the hydraulic oil volume inside the Hydraulic Power unit is approaching the high volume limit to avoid overfilling the reservoir.
- Oil High Level Alarm (7): The hydraulic oil level at which an alarm that stops the Hydraulic Power Unit due to the hydraulic oil volume reaching the high volume limit to maintain normal working conditions is activated.
- Grapple Half Opening Time (8): The amount of time that pressure is applied to the Hydraulic Cylinder to partially open the Grapple Shovel for the half open setting.

5.5.6.7 HMI Panel Parameters Screen

Figure Legend

- | | |
|---|-----------------------------------|
| 1 | P2 Moisture Warning |
| 2 | P2 Moisture Alarm |
| 3 | P2 High Temperature Warning |
| 4 | P2 High Temperature Alarm |
| 5 | Restore Parameter Defaults Button |
| 6 | Metric and Imperial Units Buttons |



Note: Some parts not shown for clarity.

Figure 5-50: Grapple Hoist - HMI Panel Parameters

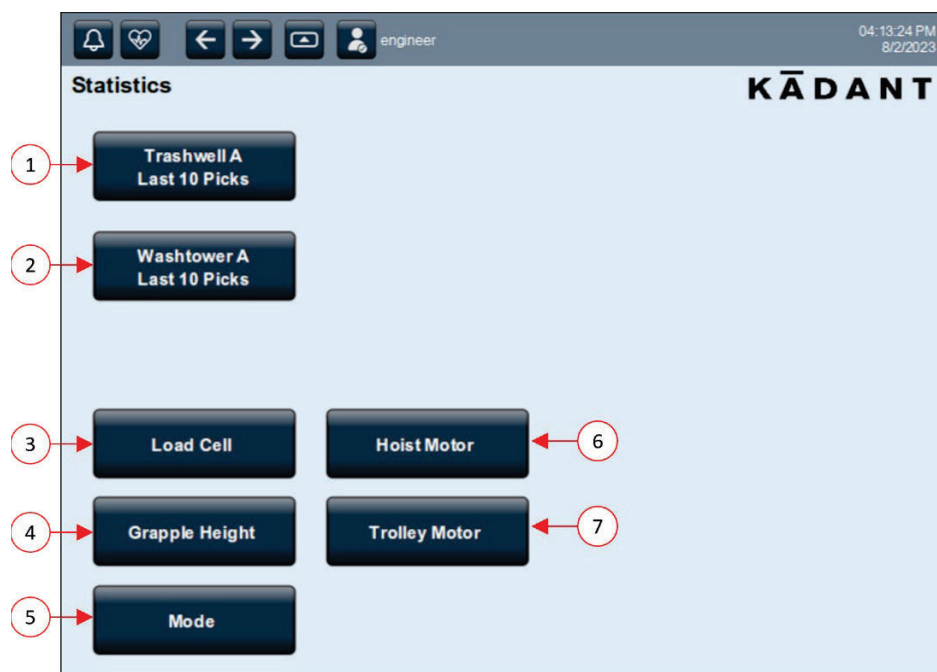
The HMI Panel Parameters Screen allows the operator to modify parameters related to the Hydraulic Power Unit and Grapple Shovel.

- P2 Moisture Warning (1): The moisture percentage in the P2 Remote Cabinet at which an alarm that warns that the moisture percentage is approaching the high moisture limit to maintain normal working conditions is activated.
- P2 Moisture Alarm (2): The moisture percentage in the P2 Remote Cabinet at which an alarm that stops the Grapple Hoist System due to the moisture percentage reaching the high moisture limit to maintain normal working conditions is activated.
- P2 High Temperature Warning (3): The temperature in the P2 Remote Cabinet at which an alarm that warns that the temperature is approaching the high temperature limit to maintain normal working conditions is activated.
- P2 High Temperature Alarm (4): The temperature in the P2 Remote Cabinet at which an alarm that stops the Grapple Hoist System due to the temperature reaching the high temperature limit to maintain normal working conditions is activated.
- Restore Parameter Defaults Button (5): Pressing this button resets the parameters on the HMI Panel Parameters Screen to the default parameter settings.
- Metric and Imperial Units Buttons (6): Pressing these buttons allow the operator to toggle between metric and imperial units on the HMI screens.

5.5.7 HMI Statistics Menu

Figure Legend

- | | |
|---|-----------------------------------|
| 1 | Trashwell
Last 10 Picks Button |
| 2 | Washtower
Last 10 Picks Button |
| 3 | Load Cell Button |
| 4 | Grapple Height Button |
| 5 | Mode Button |
| 6 | Hoist Motor Button |
| 7 | Trolley Motor Button |



Note: Some parts not shown for clarity.

Figure 5-51: Grapple Hoist - HMI Statistics Menu

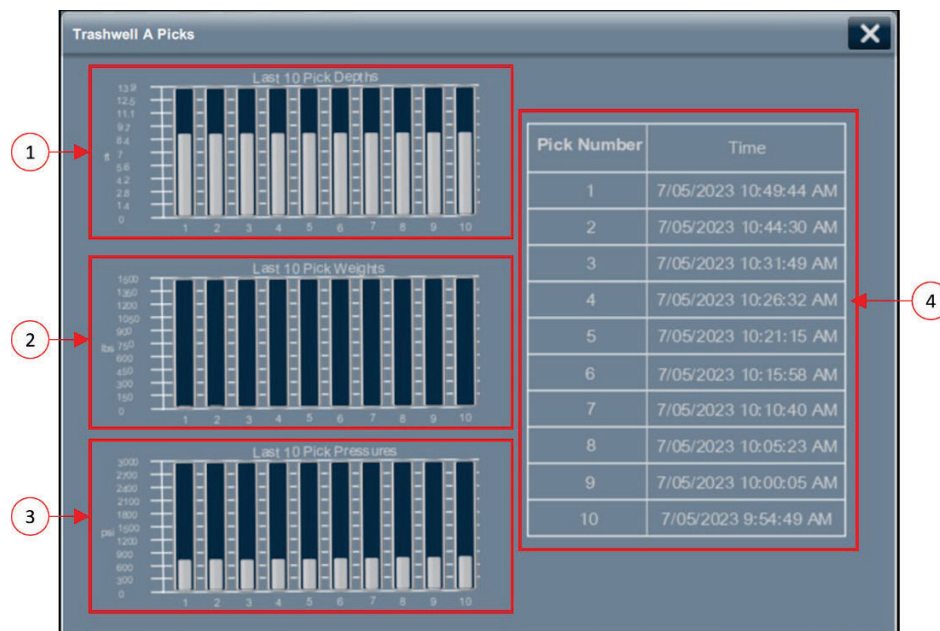
The HMI Statistics Menu allows the operator to navigate to different screens that contain information regarding various statistics in the Grapple Hoist system.

- Trashwell Last 10 Picks Button (1): Pressing this button navigates the operator to the Trashwell Picks Statistics Screen.
- Washtower Last 10 Picks Button (2): Pressing this button navigates the operator to the Wash Tower Picks Statistics Screen.
- Load Cell Button (3): Pressing this button navigates the operator to the Load Cell Statistics Screen.
- Grapple Height Button (4): Pressing this button navigates the operator to the Grapple Shovel Depth Statistics Screen.
- Mode Button (5): Pressing this button navigates the operator to the Operating Mode Statistics Screen.
- Hoist Motor Button (6): Pressing this button navigates the operator to the Hoist Motor Statistics Screen.
- Trolley Motor Button (7): Pressing this button navigates the operator to the Trolley Motor Statistics Screen.

5.5.7.1 HMI Trashwell Picks and Wash Tower Picks Statistics Screens

Figure Legend

- 1 Last 10 Pick Depths Graph
- 2 Last 10 Pick Weights Graph
- 3 Last 10 Pick Pressures Graph
- 4 Pick Number and Pick Time Table



Note: Some parts not shown for clarity.

Figure 5-52: Grapple Hoist - HMI Trashwell Picks Statistics Screen

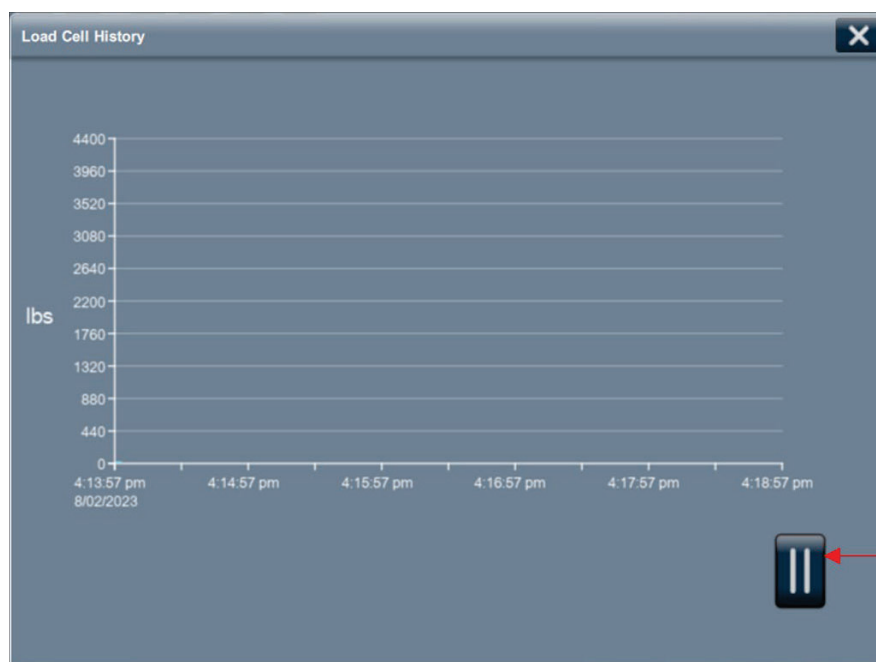
The HMI Pick Statistics Screen allows the operator to view various statistics regarding previous Trashwell or Wash Tower picks.

- Last 10 Pick Depths Graph (1): This section displays a graph depicting the elevation of the Grapple Shovel from the previous ten picks.
- Last 10 Pick Weights Graph (2): This section displays a graph depicting the Load Sensor reading on the Lift Hoist System from the previous ten picks.
- Last 10 Pick Pressures Graph (3): This section displays a graph depicting the hydraulic pressure from the previous ten picks.
- Pick Number and Pick Time Table (4): This section displays a table with the date and time of the previous ten picks.

5.5.7.2 HMI Load Cell History Screen

Figure Legend

1 Pause Button



Note: Some parts not shown for clarity.

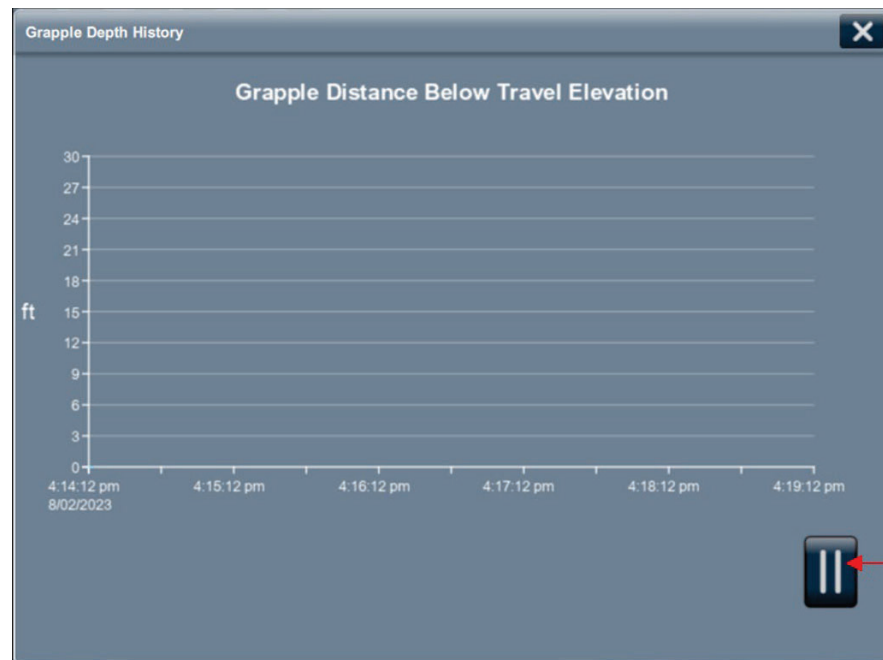
Figure 5-53: Grapple Hoist - HMI Load Cell History Screen

The HMI Load Cell History Screen displays a graph of the Load Sensor reading over time. The graph updates in real time, updating with the current Load Sensor reading. Pause Button (1) allows the operator to stop the graph from updating in real time. After pausing, the button is replaced with new buttons that allow the operator to scroll backward or forward in time, as well as to resume with real time updates.

5.5.7.3 HMI Grapple Shovel Depth Statistics Screen

Figure Legend

1 Pause Button



Note: Some parts not shown for clarity.

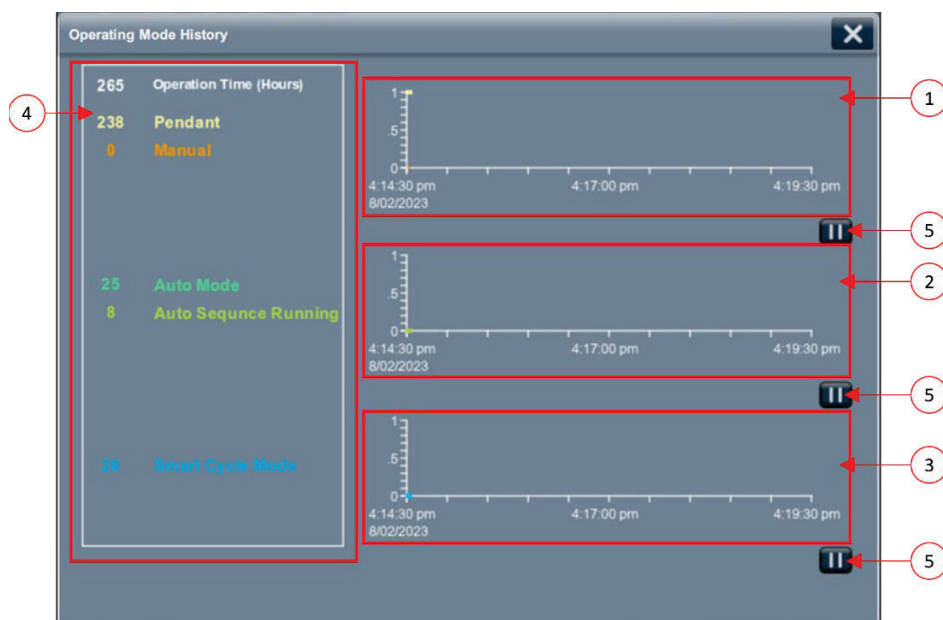
Figure 5-54: Grapple Hoist - HMI Grapple Shovel Depth Statistics Screen

The HMI Grapple Shovel Depth Statistics Screen displays a graph of the Grapple Shovel elevation over time. The TRASHWELL ELEVATION is the zero point. Downward movement increases the Grapple Depth Reading value. The graph updates in real time, updating with the current Grapple Shovel Depth reading. Pause Button (1) allows the operator to stop the graph from updating in real time. After pausing, the button is replaced with new buttons that allow the operator to scroll backward or forward in time, as well as to resume with real time updates.

5.5.7.4 HMI Operating Mode Statistics Screen

Figure Legend

- | | |
|---|------------------------|
| 1 | Manual Mode Graph |
| 2 | Automatic Mode Graph |
| 3 | Smart Cycle Mode Graph |
| 4 | Operating Time Section |
| 5 | Pause Button |



Note: Some parts not shown for clarity.

Figure 5-55: Grapple Hoist - HMI Operating Mode Statistics Screen

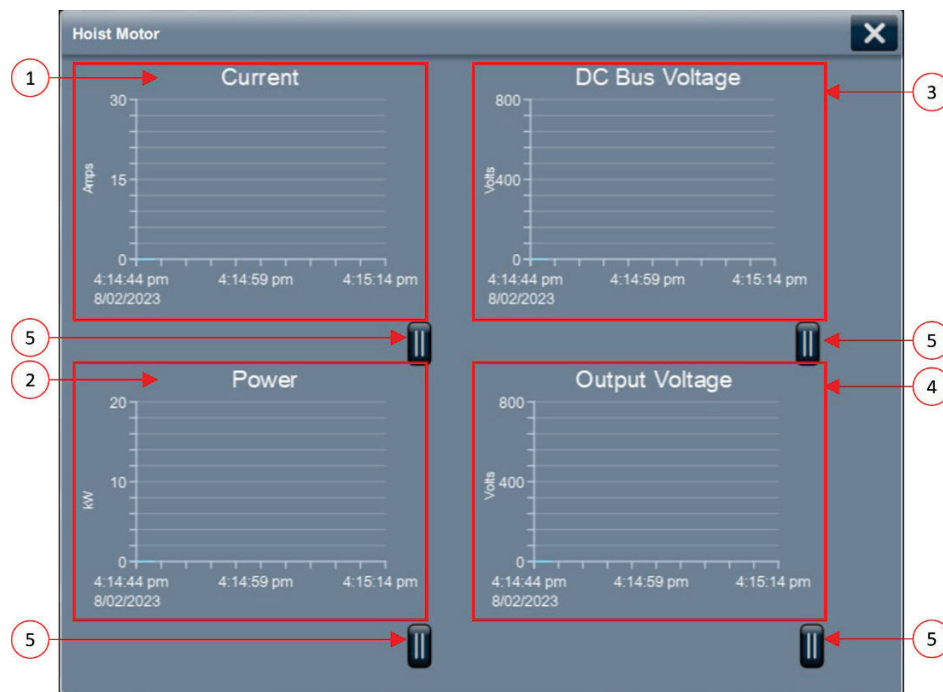
The HMI Operating Mode Statistics Screen displays graphs related to the operation modes in use over time. The graphs update in real time, updating with the current operation mode states. The Pause Buttons (5) allow the operator to stop the graph from updating in real time. After pausing, the button is replaced with new buttons that allow the operator to scroll backward or forward in time, as well as to resume with real time updates. Each Pause Button (5) is associated with a specific graph and will only pause that specific graph.

- Manual Mode Graph (1): This section displays a graph that shows if the Grapple hoist is in manual mode at any given time.
- Automatic Mode Graph (2): This section displays a graph that shows if the Grapple hoist is in automatic mode at any given time.
- Smart Cycle Mode Graph (3): This section displays a graph that shows if the Grapple hoist is in Smart Cycle mode at any given time.
- Operating Time Section (4): This section shows the total operation time and a breakdown of the operation mode hours that make up the total operation time.

5.5.7.5 HMI Hoist Motor Statistics Screen

Figure Legend

- | | |
|---|----------------------|
| 1 | Current Graph |
| 2 | Power Graph |
| 3 | DC Bus Voltage Graph |
| 4 | Output Voltage Graph |
| 5 | Pause Button |



Note: Some parts not shown for clarity.

Figure 5-56: Grapple Hoist - HMI Hoist Motor Statistics Screen

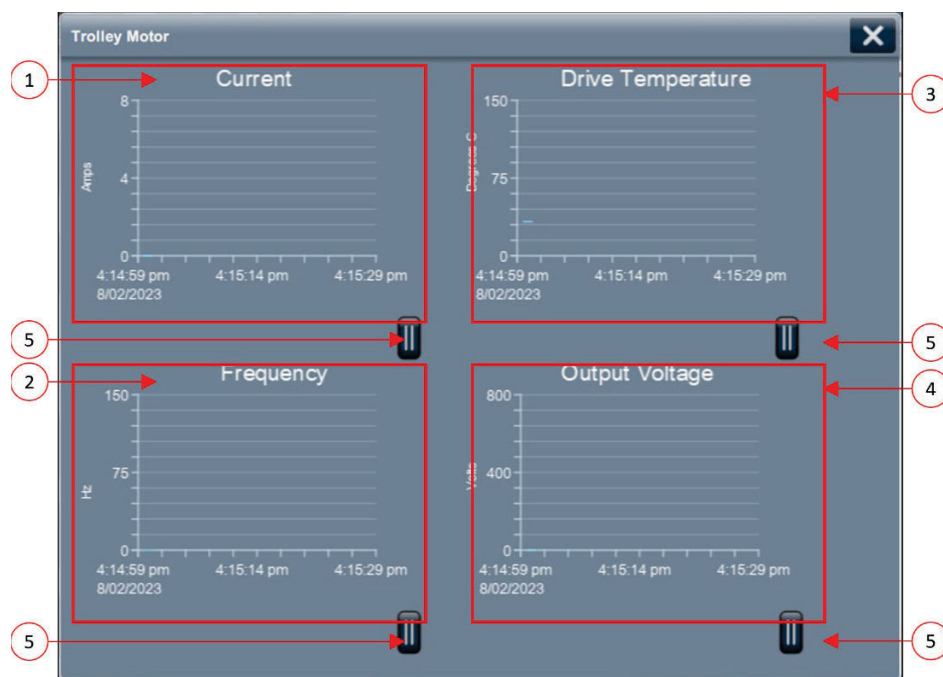
The HMI Hoist Motor Statistics Screen displays graphs related to various Hoist Motor statistics over time. The graphs update in real time, updating with the current Hoist Motor statistic readings. The Pause Buttons (5) allow the operator to stop the graph from updating in real time. After pausing, the button is replaced with new buttons that allow the operator to scroll backward or forward in time, or to resume with real time updates. Each Pause Button (5) is associated with a specific graph and will only pause that specific graph.

- **Current Graph (1):** This section displays a graph that shows the amount of current in the Hoist Motor at any given time.
- **Power Graph (2):** This section displays a graph that shows the power reading in the Hoist Motor at any given time.
- **DC Bus Voltage Graph (3):** This section displays a graph that shows the DC bus voltage reading in the Hoist Motor at any given time.
- **Output Voltage Graph (4):** This section displays a graph that shows the output voltage reading in the Hoist Motor at any given time.

5.5.7.6 HMI Trolley Motor Statistics Screen

Figure Legend

- | | |
|---|-------------------------|
| 1 | Current Graph |
| 2 | Frequency Graph |
| 3 | Drive Temperature Graph |
| 4 | Output Voltage Graph |
| 5 | Pause Button |



Note: Some parts not shown for clarity.

Figure 5-57: Grapple Hoist - HMI Trolley Motor Statistics Screen

The HMI Trolley Motor Statistics Screen displays graphs related to various Trolley Motor statistics over time. The graphs update in real time, updating with the current Trolley Motor statistic readings. The Pause Buttons (5) allow the operator to stop the graph from updating in real time. After pausing, the button is replaced with new buttons that allow the operator to scroll backward or forward in time, or to resume with real time updates. Each

- Current Graph (1): This section displays a graph that shows the amount of current in the Trolley Motor at any given time.
- Frequency Graph (2): This section displays a graph that shows the frequency reading in the Trolley Motor at any given time.
- Drive Temperature Graph (3): This section displays a graph that shows the drive temperature reading in the Trolley Motor at any given time.
- Output Voltage Graph (4): This section displays a graph that shows the output voltage reading in the Trolley Motor at any given time.

5.5.8 HMI Service Screen

Figure Legend

- 1 Task Column
- 2 Last Service Date Column
- 3 Hours Elapsed Column
- 4 Services Completed Column

Task	Last Service Date	Hours Elapsed	Service Completed
Wire rope change	5/31/2023 1:17:30 PM	15	<button>Update</button>
Hydraulic oil level	5/31/2023 10:37:50 AM	18	<button>Update</button>
Grapple shovel fittings greased	5/31/2023 10:38:39 AM	18	<button>Update</button>

Note: Some parts not shown for clarity.

Figure 5-58: Grapple Hoist - HMI Service Screen

The HMI Service Screen allows the operator to track maintenance tasks.

- Task Column (1): This column provides a description of each maintenance task.
- Last Service Date Column (2): This column provides the date and time of the last occurrence of each maintenance task.
- Hours Elapsed Column (3): This column provides the amount of running hours since the last occurrence of each maintenance task.
- Services Completed Column (4): Pressing an Update button in this column for a specific maintenance task listed in the Task column allows the operator to add an occurrence of a specific maintenance task.

5.5.9 HMI Alarm Screens

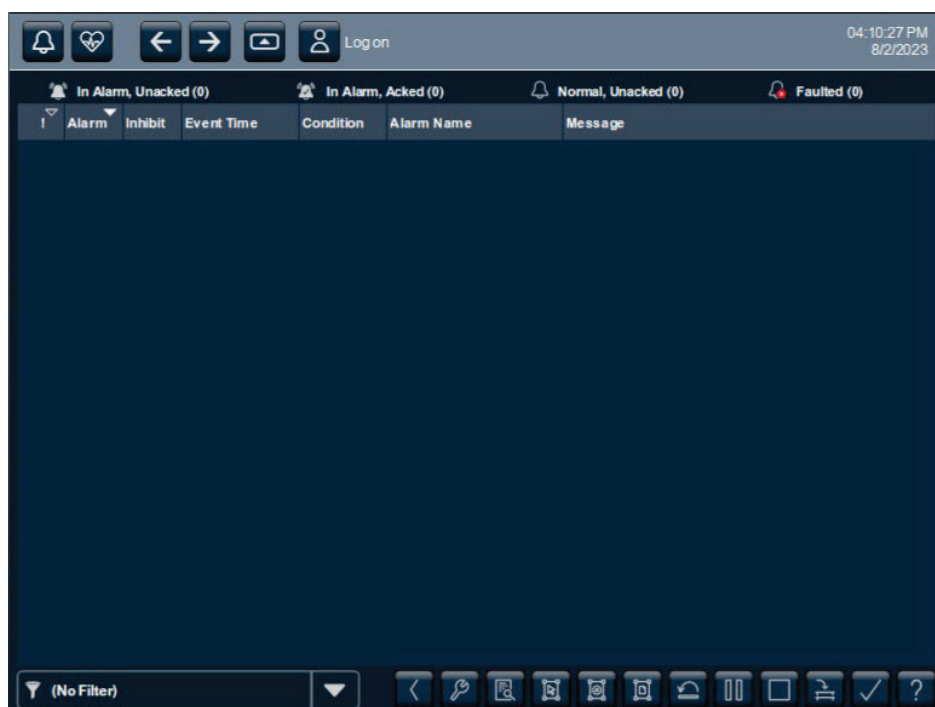


Figure 5-59: Grapple Hoist - HMI Alarm Summary Screen

The HMI Alarm Screens list alarms due to faults in the Grapple Hoist System. Some alarms will send a signal to power off the Grapple Hoist System to protect the equipment. The Grapple Hoist System can be powered on by pressing a Reset Alarms Button after resolving the problem that resulted in the specific alarm. Some of the possible alarms are listed below.



See the Alarm Reference Guide additional document for additional alarm information.

- An alarm will display when the Trolley Travel Time Limit Before Alarm is exceeded (See Section 5.5.6.4, HMI Trolley Parameters Screen on Page 5-187). Check if the delay programmed is too high. Modify the programmed delay in the sequence if necessary. Check if the stopped hoist is caused by the hoist control error.
- A alarm will display when the Hoist Travel Time Limit Before Alarm is exceeded (See Section 5.5.6.5, HMI Hoist Parameters Screen on Page 5-188). Check if the delay programmed is too high. Modify the programmed delay in the sequence if necessary. Check if the stopped hoist is caused by the hoist control error.

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- An alarm will display when one of the following protection sensors on the Hydraulic Power Unit has a reading outside of the acceptable range: Pump On, Thermal Overload, High Oil Temperature and Oil Tank Level (See Section 5.5.6.6, HMI Grapple Shovel and HPU Parameters Screen on Page 5-190).
- Pump On Alarm: Check if the pump motor contactor and its auxiliary contact are working properly. Check the wiring connections.
- Thermal Overload Alarm: Check if the pump motor overload relay is tripped. If the relay is tripped, reset the overload and then check the pump motor and its wiring.
- High Oil Temperature Alarm: The oil temperature switch is activated. Check if the oil temperature is too high. Check the temperature probe signal and the I/O wiring from the probe to the control (See Section 5.5.6.6, HMI Grapple Shovel and HPU Parameters Screen on Page 5-190).
- Oil Tank Level Alarm: The oil low level switch is activated. Check the oil level and fill. Check the level switch signal and the I/O wiring from the switch to the control (See Section 5.5.6.6, HMI Grapple Shovel and HPU Parameters Screen on Page 5-190).
- Hoist Controller Error: An error signal comes from the hoist controller. Power off the main disconnect switch, wait 10 seconds and power on. Check if the Grapple Shovel is at the OVERTRAVEL POSITION.

5.5.10 HMI Diagnostics Screens

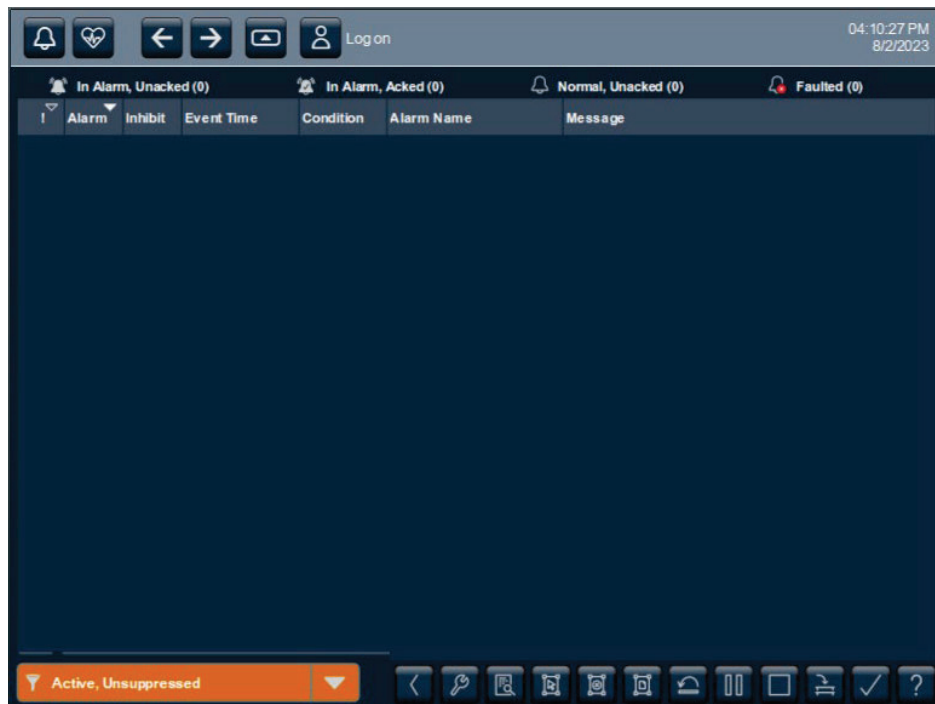


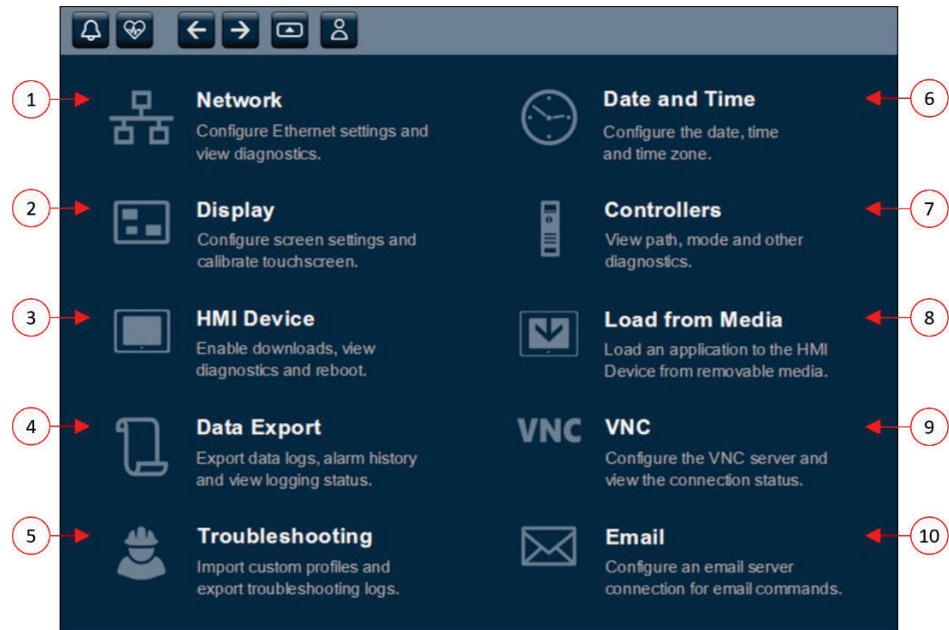
Figure 5-60: Grapple Hoist - HMI Diagnostics Screen

The HMI Diagnostic Screens are not directly in use for the Grapple Hoist System.

5.5.11 HMI Settings Screen

Figure Legend

- | | |
|----|--------------------------|
| 1 | Network Settings |
| 2 | Display Settings |
| 3 | HMI Device Settings |
| 4 | Data Export Settings |
| 5 | Troubleshooting Settings |
| 6 | Date and Time Settings |
| 7 | Controllers Settings |
| 8 | Load from Media Settings |
| 9 | VNC Settings |
| 10 | Email Settings |



Note: Some parts not shown for clarity.

Figure 5-61: Grapple Hoist - HMI Settings Screen

The HMI Settings Screen allows the operator to navigate to various screens relating to HMI settings.

- Network Settings (1): Allows the operator to navigate to settings related to ethernet and diagnostics.
- Display Settings (2): Allows the operator to navigate to settings related to the touchscreen.
- HMI Device Settings (3): Allows the operator to navigate to settings related to downloads, diagnostics, and rebooting.
- Data Export Settings (4): Allows the operator to navigate to settings related to exporting HMI data.
- Troubleshooting Settings (5): Allows the operator to navigate to settings related to troubleshooting.
- Date and Time Settings (6): Allows the operator to navigate to settings related to date, time, and time zone.
- Controllers Settings (7): Allows the operator to navigate to settings related to view path, mode, and other diagnostics.

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- Load from Media Settings (8): Allows the operator to navigate to settings related to loading applications.
- VNC Settings (9): Allows the operator to navigate to settings related to the VNC server.
- Email Settings (10): Allows the operator to navigate to settings related to email server configuration.

6 Maintenance

This section includes information needed to inspect and maintain the equipment components.

6.1 General Maintenance Procedures

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

6.1.1 Periodic Inspection or Maintenance

- Perform a general inspection of the unit at least four times a year or every 1,000 hours of running time.
- Perform a general inspection and tightening of the unit twice a year.
- Locating and eliminating minor problems will ensure long and dependable service. In many instances, periodic inspections will eliminate costly shutdowns and delays.



The unit is a hoist or lifting device, similar to a crane operation, and should be certified as such. Follow the local regulations by scheduling inspections and certifications as necessary.

6.1.2 Components Requiring Routine Maintenance



WARNING

Follow all facility equipment safety procedures and those listed in this Product Manual during inspection and maintenance. If safety procedures are not followed, the unit may accidentally start or begin sequencing during inspection or service. Contact with moving equipment parts can result in unit damage, serious personal injury, or death.

NOTICE

Do not operate a proximity sensor from a wall outlet without a load. This is considered a *Dead Short* and may cause catastrophic damage to sensors that are not protected from short circuits.

NOTICE

Do not directly operate a motor using a proximity sensor. The *Inrush Current* can cause an overload condition. Always use a motor starter, relay or other appropriate device.

6.1.3 Inspection of Unit Parts

The inspection procedure for units in regular service is dependent upon the exposure of the components and parts to wear and deterioration. The degree of exposure is based upon unit activity, severity of service, and environment of location. This exposure creates the need for frequent and periodic inspection. In addition, daily inspections are required to be performed by the operator at the start of each shift, or at the time the unit is first used during each shift.



The minimum inspection requirements are based on normal conditions. Follow all local procedures and requirements for inspection and maintenance. Refer to the following sections for how to perform key inspections.

Table 6-1: Inspection Schedule - Unit Parts

System	Item	What to Inspect or Inspect For	Daily	Weekly	Monthly	Quarterly	Annually
Lift Hoist System*							
	Wire Rope	Inspect as per manufacturer recommendations. Lubricate the wire rope. Clean debris from the rope and hoist block assembly.		X			
	Wire Rope Drum	Inspect as per manufacturer recommendations. Clean debris from the drum.		X			
	Overwind Roll	Inspect as per manufacturer recommendations. Clean debris from the roll.		X			
Grapple Shovel							
	Pivot Points	Loose or missing hardware. Excessive play in the joint.			X		
	Grease at Pivot Points	Grease the pivot points.		X			
	Hydraulic Cylinder	Leak at seals. Loose or missing bolts at the coupling.			X		

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System	Item	What to Inspect or Inspect For	Daily	Weekly	Monthly	Quarterly	Annually
Hydraulic Carriage, Hydraulic Power Unit, and Hydraulic Hoses							
	Oil Level	The oil level is shown on the HMI screen and at the reservoir. The oil level can be checked at either one. If level is decreasing, check for leaks at all the fittings	X				
	Suction Strainer	Replace the suction strainer.					X
	Directional Valve and Switches	Excessive voltage, mechanical damage to leads, dirty contacts.					X
	Hydraulic Hoses and Fittings	Loose or missing hardware. Damage to the hose. Leaks.			X		
	Filter	Clogged or damaged filter.			X		
	Trolley Wheel Assembly	Worn or damaged wheels. Loose fasteners. Gap between wheel and beam. Loose bolts. Missing cotter pins. Excessive wear on beam.				X	
Track System							
	Beam	Clear debris with a brush. Inspect for wear or damage.				X	
	Sensors	Excessive voltage, mechanical damage to leads, dirty contacts.					X
	Hardware	Wear, damage, missing hardware					X
Electrical							
	P1, P2, JB1, JB2, A16 Panels and Wiring Between	Loose wires. Loose connections. Damaged components.					X
*The hoist system is a lifting device. Qualified personnel must perform the maintenance. Follow all the applicable laws and standards for inspecting and recording inspections for overhead hoists. This table includes additional information not found in the manufacturer's instructions.							

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6.1.3.1 Frequent Inspection

Frequent inspections are visual inspections and examinations by unit operator or other designated personnel with records not required.

Nominal inspection intervals are as follows:

Normal Service - Monthly

Heavy Service - Weekly to Monthly

Severe Service - Daily to Weekly

6.1.3.2 Periodic Inspection

Periodic inspections are visual and audio inspections and examinations by designated personnel making records of external conditions to provide a basis for continuing evaluation of the unit. If the external inspection indicates a need, some disassembly may be required to make a detailed inspection and examination.

Nominal inspection intervals are as follows:

Normal Service - Annually

Heavy Service – Semiannually

Severe Service - Quarterly



The inspection intervals discussed here are nominal recommendations for reference purposes only. These recommendations are based on a single shift operation under normal operating and environmental conditions. The actual operating and environmental conditions should be reviewed by qualified personnel and inspection intervals established based on the recommendations by qualified personnel.

6.1.4 Service Levels

The service levels are defined as follows:

- **Normal Service:** Involves operation of unit with randomly distributed loads within the rated load limit, or uniform loads less than 65% of the rated load, for not more than 25% of the time for a single work shift.
- **Heavy Service:** Involves operation of unit within rated load limit that exceeds Normal Service.
- **Severe Service:** Involves operation of unit in Normal Service or Heavy Service with abnormal operating conditions.

6.1.5 Maintenance Recommendations

Establish a routine and a preventative maintenance schedule to provide safe running conditions and to keep the Grapple Hoist operating properly for an extended period.

6.2 Preparing the Unit for Maintenance

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

6.2.1 Zero Energy State (ZES)

To make the unit safe for maintenance:

1. Use the controls to move the Grapple Shovel to a maintenance position. The maintenance position should position the Lift Hoist System and Grapple Shovel away from the Trashwell, Wash Tower, or any other fixed equipment.
2. If the required maintenance involves the Grapple Shovel, lower the Grapple Shovel to the floor of the maintenance position if possible.
3. Make sure all controls are in an OFF position.
4. Switch off and lock out the main electrical disconnect.
5. Make sure the power has been removed from the motor by trying to start it.
6. Switch off and lock out any additional electrical sources according to plant procedure for lockout/tagout.
7. Apply identifying tags to locked-out devices according to plant procedure.



WARNING

Contact a supervisor and do not proceed to the following steps if services are not independent of the main supply. Services that are not in the lockout/tagout state may cause serious personal injury or death.

8. Bring the unit to Zero Energy State (ZES).



WARNING

Never remove another person's lock (padlock) or tag. The person who originally placed lock/tag is the only one permitted to bring equipment out of lockout/tagout state. Bringing the equipment out of lockout/tagout incorrectly may cause unit movement. Failure to follow this instruction can result in serious personal injury or death.

9. Lock out any other sources of energy.
10. In situations where automatic timed dump valves are used, perform the preceding steps, then post the following notice at the P3 HMI Panel: **“CAUTION. Automatic Operation. Equipment parts may move without warning. Stand clear.”**

6.3 Grapple Shovel Maintenance

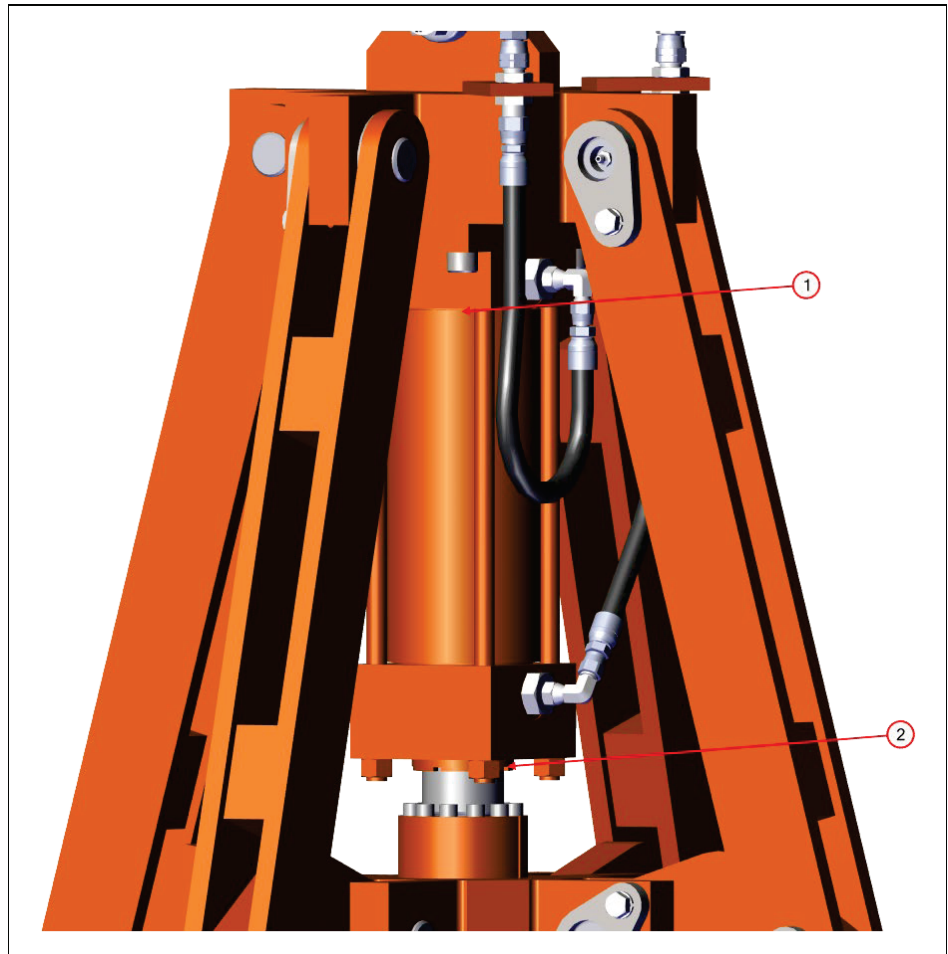
Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

6.3.1 Grapple Shovel Inspection Procedures

6.3.1.1 Inspecting the Hydraulic Lift Cylinder Seals

Figure Legend

- | | |
|---|------------|
| 1 | Upper Seal |
| 2 | Lower Seal |



Note: Some parts not shown for clarity.

Figure 6-1: Inspecting the Hydraulic Lift Cylinder Seals

Note: Inspect the hydraulic lift cylinder seals for leaks monthly.

To inspect the hydraulic lift cylinder seal:

1. Shut down the unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES)**. The grapple shovel should now be resting on a maintenance floor area.
2. Inspect the Upper Seal (1) and the Lower Seal (2) for signs of leaking.

3. If there are signs of leakage, replace both the Upper Seal (1) and Lower Seal (2).

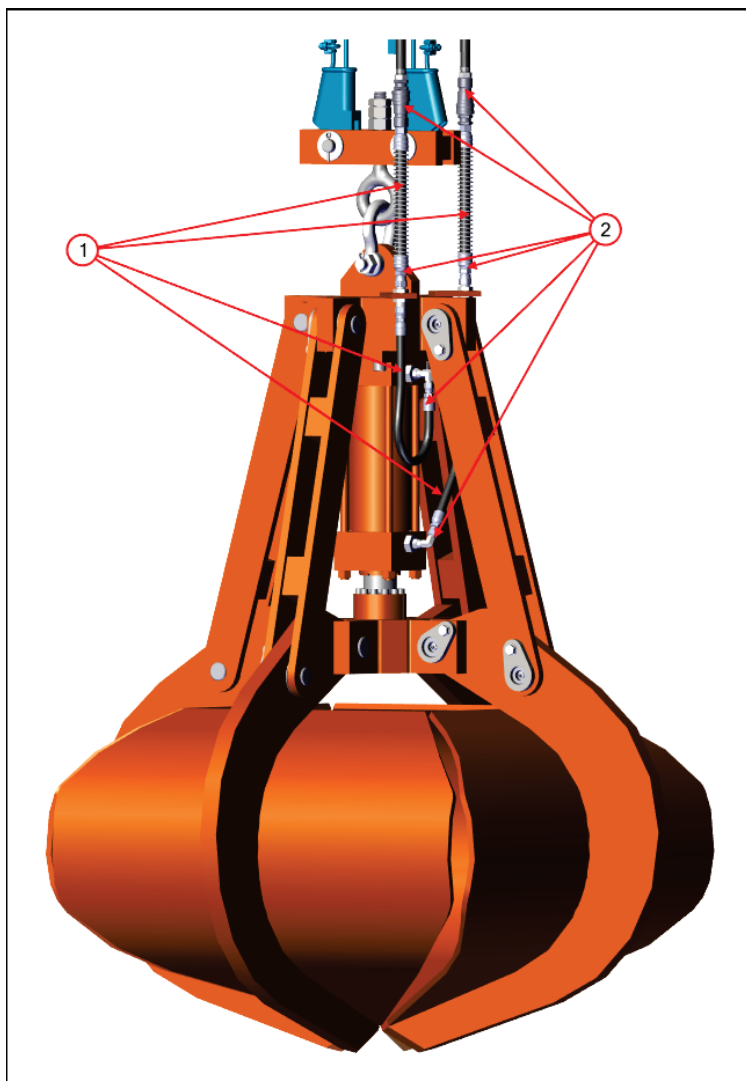


Please refer to the additional Hydraulic Cylinder documents for the complete instructions.

6.3.1.2 Inspecting the Hydraulic Hoses

Figure Legend

- | | |
|---|-----------------|
| 1 | Hydraulic Hoses |
| 2 | Fittings |



Note: Some parts not shown for clarity.

Figure 6-2: Inspecting the Hydraulic Hoses

Visually inspect all the hydraulic hoses, fittings, etc. for wear, damage, leaks, etc. once a month.

To inspect the Hydraulic Hoses (1) and Fittings (2):

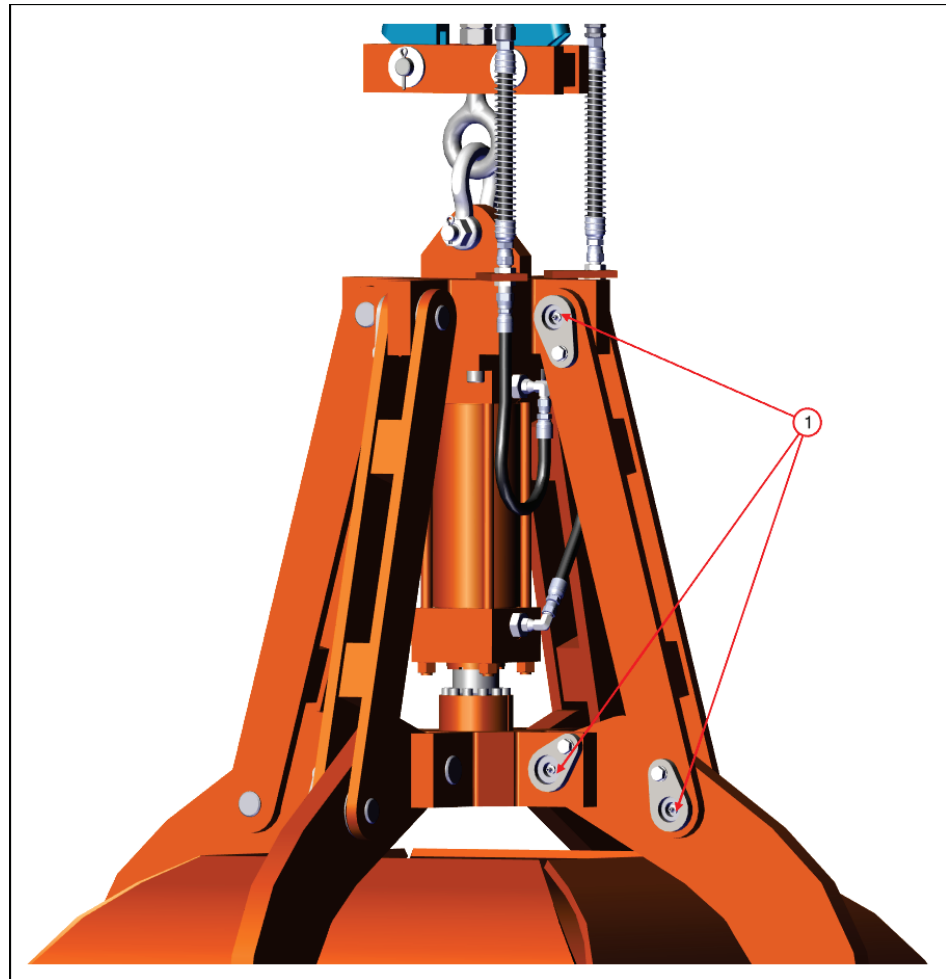
1. Shut down the unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES)**.
2. Inspect the Hydraulic Hoses (1) and Fittings (2) for signs of leaking, wear, or damage.
3. Upon signs of leaking, wear, or damage, replace the Hydraulic Hoses (1) and Fittings (2) on the Grapple Shovel.

6.3.2 Grapple Shovel Maintenance Procedures

6.3.2.1 Greasing the Bushings, Pins, and Spacers (Pivot Points)

Figure Legend

- | | |
|---|---------------------------|
| 1 | Grease Application Points |
|---|---------------------------|



Note: Some parts not shown for clarity.

Figure 6-3: Grapple Shovel Grease Application Points

Note: Apply Grease to the Grapple Shovel pivot points weekly.

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

To apply grease to the Grapple Shovel pivot points:

1. Shut down the unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES)**. The grapple shovel should now be resting on a maintenance floor area.
2. Apply grease to each Grease Application Point (1). Ensure that the grease flows into the Bushings, stopping application at a sign of grease overflow. See Section 3.4.4.1, Bushing Grease Specification on Page 3-63 to select the appropriate grease type.

6.3.2.2 Clearing the Grapple Shovel of Debris

NOTICE

Clear the Grapple Shovel of any debris according to the debris buildup on the Grapple Shovel.

To clear the Grapple Shovel of debris:

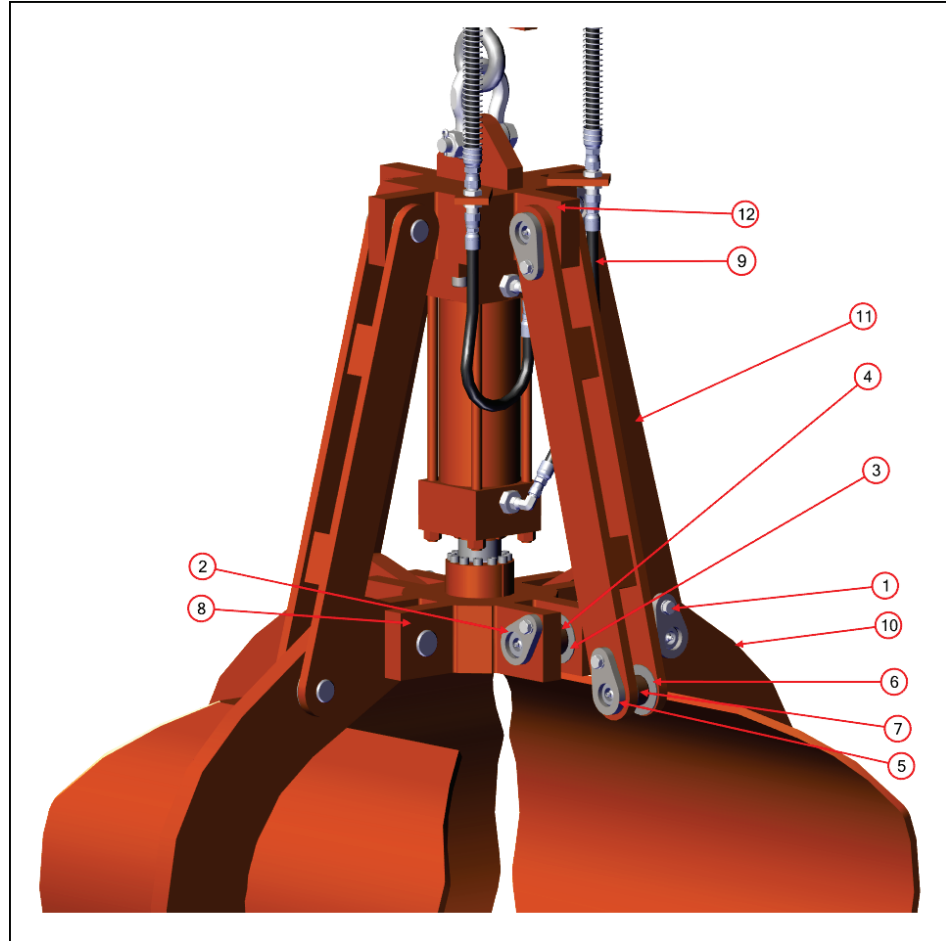
1. Shut down the unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES)**. The grapple shovel should now be resting on a maintenance floor area.
2. Remove any items attached to the Grapple Shovel. Removing these items prevents false upper limit alarms and improves the opening and closing performance.

6.3.3 Grapple Shovel Replacement Procedures

6.3.3.1 Replacing the Bushings, Pins, and Spacers

Figure Legend

1	Pin Retainer Screw
2	Lower Shovel Attachment Pin
3	Lower Shovel Attachment Spacer
4	Lower Shovel Attachment Bushing
5	Link Arm Pin
6	Link Arm Spacer
7	Link Arm Bushing
8	Lower Shovel Attachment
9	Hydraulic Hose
10	Shovel
11	Link Arm
12	Upper Shovel Attachment



Note: Some parts not shown for clarity.

Figure 6-4: Replacing the Bushings, Pins and Spacers

- Inspect the pivot points for wear, damage, or missing components monthly. Include the bushing, pins, and spacers in the pivot point inspection.
- There are two different sizes of bushings, pins, and spacers on the Grapple Shovel.
 - One size connects the Link Arms to the Upper Shovel Attachment and the Shovels.
 - The other size connects the Shovels to the Lower Shovel Attachment.

Intelligent Grapple Hoist**Models: 4' (1.2 m) | 6' (1.8 m)**

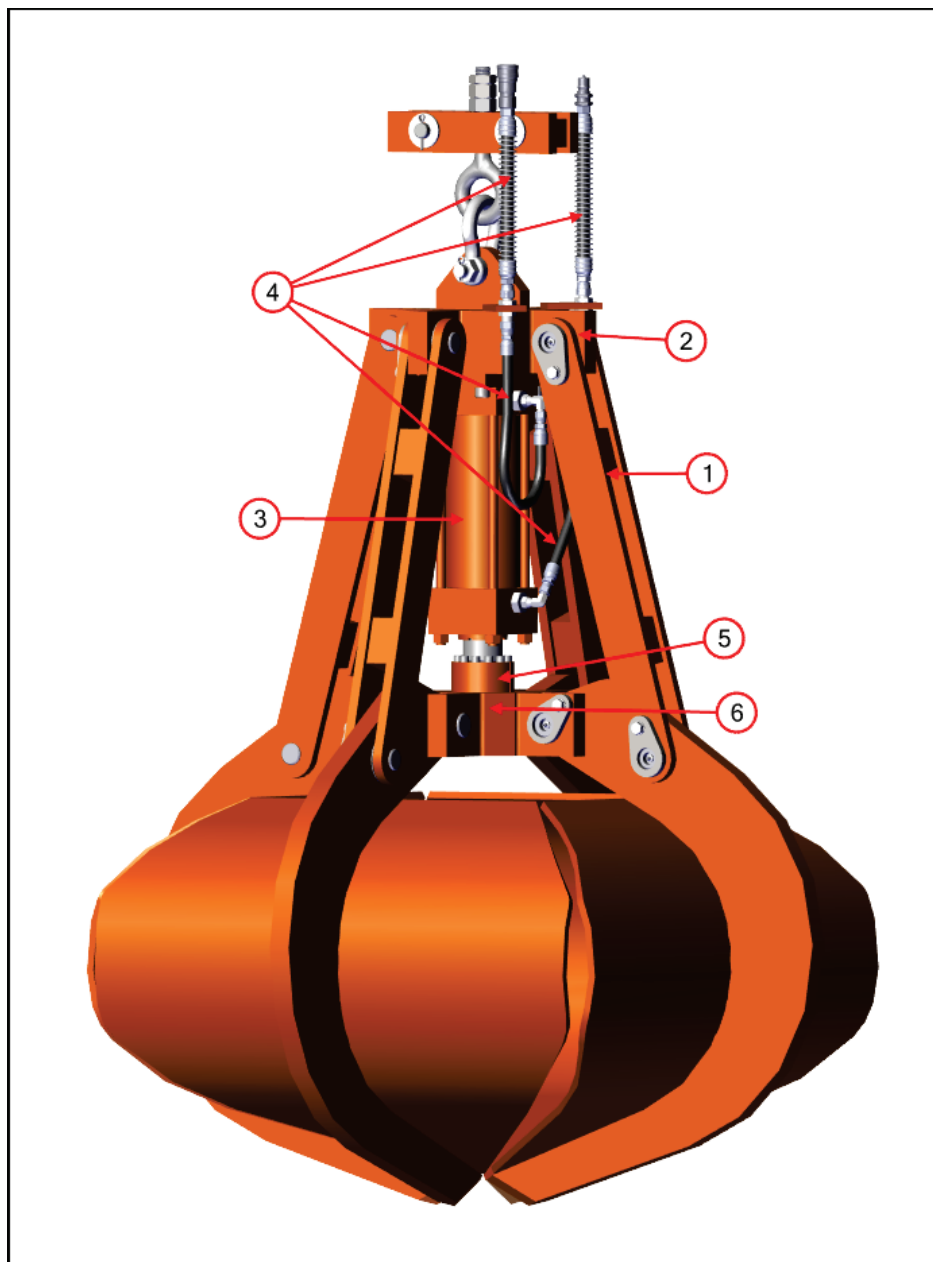
To replace the bushings, pins, and spacers:

1. Shut down the unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211, **and bring the unit to Zero Energy State (ZES)**. The grapple shovel should now be resting on a maintenance floor area.
2. Disconnect the Hydraulic Hoses (9) to clear the space for pivot point maintenance.
3. Remove the Pin Retainer Screws (1).
4. Remove the Lower Shovel Attachment Pins (2) and the Lower Shovel Attachments Spacers (3) to free the Lower Shovel Attachment (8) from the Shovels (10).
5. Remove the Link Arm Pins (5) and the Link Arm Spacers (6) to free the Link Arms (11) from the Shovels (10) and the Upper Shovel Attachment (12).
6. Use a press to push the Lower Shovel Attachment Bushings (4) out of the Shovels (10).
7. Use a press to push the Link Arm Bushings (7) out of the Shovels (10) and the Upper Shovel Attachment (12).
8. Insert replacement Lower Shovel Attachment Bushings (4) into the Shovels (10).
9. Insert replacement Link Arm Bushings (7) into the Shovels (10) and the Upper Shovel Attachment (12).
10. Install replacement Lower Shovel Attachment Pins (2) and the Lower Shovel Attachments Spacers (3) for the Shovels (10) and the Lower Shovel Attachment (8).
11. Install replacement Link Arm Pins (5) and the Link Arm Spacers (6) for the Shovels (10), Link Arms (11), and Upper Shovel Attachment (12).
12. Tighten the Pin Retainer Screws (1).
13. Grease the pivot points. See Section 6.3.2.1, Greasing the Bushings, Pins, and Spacers (Pivot Points) on Page 6-214 for the procedure for greasing the Grapple Shovel bushings.
14. Attach the Hydraulic Hoses (9).

6.3.3.2 Replacing the Hydraulic Lift Cylinder

Figure Legend

- 1 Link Arm
- 2 Upper Shovel Attachment
- 3 Hydraulic Cylinder
- 4 Hydraulic Hose
- 5 Coupling
- 6 Lower Shovel Attachment



Note: Some parts not shown for clarity.

Figure 6-5: Replacing the Hydraulic Lift Cylinder

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

To replace the Hydraulic Cylinder (3):

1. Shut down the unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES)**. The grapple shovel should now be resting on a maintenance floor area.
2. Follow the steps from Section 6.3.3.1, Replacing the Bushings, Pins, and Spacers on Page 6-216 to remove the Pins and separate the Link Arms (1) and Shovels from the Upper Shovel Attachment (2) and Lower Shovel Attachment (6).

NOTICE

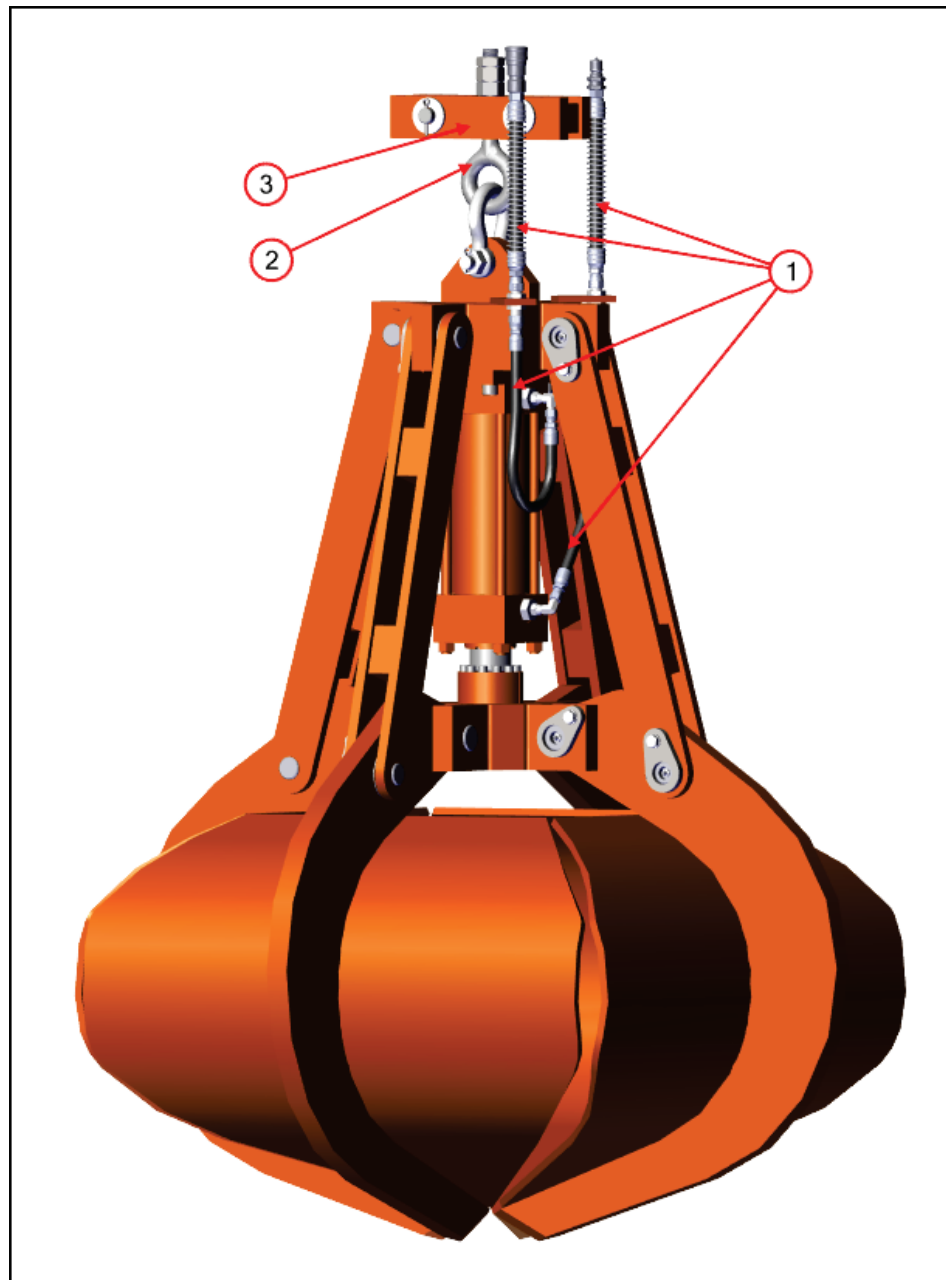
Do not remove the Bushings from the Shovels or the Upper Shovel Attachment.

3. Remove the screws connecting the Hydraulic Cylinder (3) to the Upper Shovel Attachment (2). Note the orientation of each component during this step.
4. Remove the Screws from the Coupling (5) to separate the Hydraulic Cylinder (3), Coupling (5), and Lower Shovel Attachment (6). Note the orientation of each component during this step.
5. Replace the Hydraulic Cylinder (3) and tighten the screws to reconnect the Coupling (5), Lower Shovel Attachment (6), Hydraulic Cylinder (3), and Upper Shovel Attachment (2). Take care that all components are oriented the same way as previously assembled.
6. Follow the steps in Section 6.3.3.1, Replacing the Bushings, Pins, and Spacers on Page 6-216 to reassemble the remainder of the Grapple Shovel.

6.3.3.3 Replacing the Grapple Shovel

Figure Legend

- | | |
|---|--------------------|
| 1 | Hydraulic Hoses |
| 2 | Safety-Pin Shackle |
| 3 | Hook Block |



Note: Some parts not shown for clarity.

Figure 6-6: Replacing the Grapple Shovel

To replace the Grapple Shovel:

1. Shut down unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES)**. The grapple shovel should now be resting on a maintenance floor area.
2. Disconnect the Hydraulic Hoses (1) (Figure 6-6 on Page 6-220) and remove the Safety-Pin Shackle (2) from the Hook Block (3).
3. Connect the Safety-Pin Shackle (2) of the new Grapple Shovel to the Hook Block (3). Use a new cotter pin on the Safety-Pin Shackle. Make sure the ends of the cotter pin are spread open to contain the pin.

6.4 Lift Hoist System

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

6.4.1 Overview



Please refer to the additional Lift Hoist System documents for the complete Hoist Maintenance Instructions, including the Hoist Data Sheet and Stahl Manuals.

- Shut down the unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES).**
- Follow all required and suggested maintenance from the hoist manufacturer. For complete inspection and maintenance of the hoist, refer to the hoist manufacturer additional documents. The Hoist Data Sheet additional document provides details about the Lift Hoist System to help navigate the Hoist manufacturer materials.
- In addition to all required and suggested maintenance from the hoist manufacturer, Kadant recommends giving regular attention to major components, including, but not limited to:
 - Brake Rotors
 - Wire Rope
 - Rope Attachments
 - Limit Switches
 - Load Hook
 - Power Cables
 - Motors
 - Load Sensor

6.4.2 Lift Hoist System Inspection Procedures

Refer to the Inspection and Maintenance Sections from the Stahl SH Wire Rope Hoists Manual, Stahl SF Travel Drives Manual, and Stahl Overwinding Protection Manual as well as the Commissioning and Periodic Tests section of the Stahl Multicontroller SMC22 Manual for inspection procedures for the Lift Hoist System.



Please refer to the additional Lift Hoist System documents for the complete Hoist Maintenance Instructions, including the Hoist Data Sheet and Stahl Manuals.

6.4.2.1 Inspecting the Lift Hoist System Wire Ropes

Inspect the wire rope weekly with the following procedure.

1. Wipe or brush a section of each of the Wire Ropes that wraps on and off the Wire Rope Drum. These will be the sections of the Wire Ropes to inspect.
2. Check the Wire Rope sections for corrosion. Replace the Wire Ropes if any signs of corrosion are found.
 - a. Check for loose wires and visible signs of corrosion on the outer surface.
 - b. Check for corrosion particles emerging or other visible signs of internal corrosion.
 - c. Check for reddish brown dust between the strands.
3. Check the Wire Rope sections for reduction in diameter. Replace the wire ropes if the diameter has reduced by 7.5% or more (See Table 6-2: Wire Rope Minimum Diameter below).

Table 6-2: Wire Rope Minimum Diameter

Hoist Type	Nominal Diameter	Minimum Diameter
SH4	7mm (0.28")	6.5mm (0.25")
SH5	9mm (0.35")	8.3mm (0.33")

4. Check for the Wire Rope sections for the additional conditions below. Replace the Wire ropes if any signs of these conditions are found. See the Stahl SH Wire Rope Hoists Manual for more information about these conditions.
 - Corkscrew-like deformations of more than 1/10 of the rope diameter.
 - Bird-Caging
 - Protruding cores or strands.
 - Deformed cores or strands.
 - Loop formations
 - Local rope diameter increases.
 - Flattening
 - Kinks or tightened rope loops.
 - Severe bending



See Section 6.4.4.1, Replacing the Lift Hoist System Wire Ropes on Page 6-225 for the Wire Rope Replacement procedure.

6.4.3 Lift Hoist System Maintenance Procedures

Refer to the Inspection and Maintenance Sections from the Stahl SH Wire Rope Hoists Manual, Stahl SF Travel Drives Manual, and Stahl Overwinding Protection Manual as well as the Commissioning and Periodic Tests section of the Stahl Multicontroller SMC22 Manual for maintenance procedures for the Lift Hoist System.



Please refer to the additional Lift Hoist System documents for the complete Hoist Maintenance Instructions, including the Hoist Data Sheet and Stahl Manuals.

6.4.3.1 Greasing the Wire Ropes

Use a brush to apply grease to both wire ropes. See Section 3.4.4.2, Wire Rope Grease Specification on Page 3-64 to select the appropriate grease type.



Please refer to the Stahl SH Wire Rope Manual additional document for the complete lubrication instructions.

6.4.3.2 Cleaning the Wire Rope Drum (Preventing False Overwind Conditions)

Clear debris from the Wire Rope Drum with a brush weekly to prevent false overwind conditions. An alarm condition occurs when an overwind roll condition occurs, preventing the unit from operating with a cross wound or overwind cable. When debris accumulates on the drum and overwind roll, a “false alarm” overwind condition may occur. The hoist will not raise with an active overwind alarm condition. This condition must be addressed and the power must be cycled to clear the alarm. Keeping the drum and overwind roll clean will prevent debris from causing this false overwind alarm.

6.4.4 Lift Hoist System Replacement Procedures

Refer to the Stahl manuals for instructions on when components need to be replaced.



Please refer to the additional Lift Hoist System documents for the complete Hoist Maintenance Instructions, including the Hoist Data Sheet and Stahl Manuals.

6.4.4.1 Replacing the Lift Hoist System Wire Ropes

For the maintenance task of changing Wire Ropes, it is necessary to apply power. Use extreme caution whenever power is applied to complete maintenance tasks. Only qualified personnel may perform maintenance. Failure to follow this instruction and the equipment manufacturer's instructions can result in serious personal injury or death.

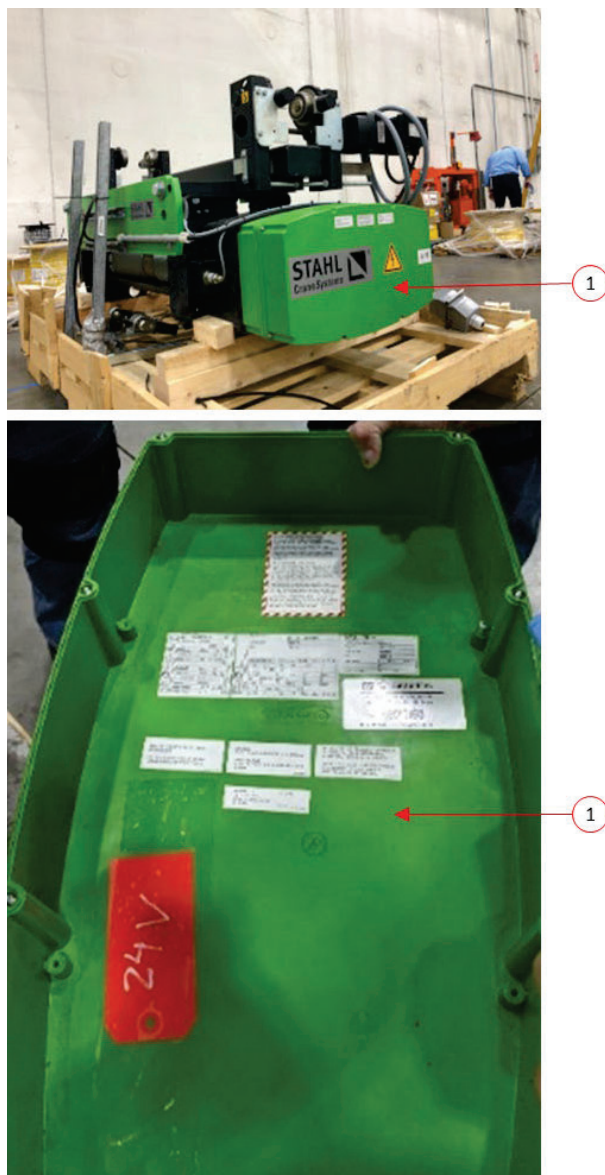
1. Change the Grapple Hoist unit operation mode to manual mode on the HMI (if not already in manual mode).
2. Move the Grapple Shovel to a maintenance position.
 - a. Open the Grapple Shovel at the DUMP POSITION to remove any load from the Grapple Shovel.
 - b. Move the Grapple Shovel to the TRAVEL ELEVATION – Operating Limit Switch (S3) setting.
 - c. Move the Grapple Shovel to a maintenance position. The maintenance position should position the Lift Hoist System and Grapple Shovel away from the Trashwell, Wash Tower, or any other fixed equipment.
3. Open the Terminal Box (A16) and Hoist Limit Switch Box (S220) to prepare for limit switch adjustment.

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

Figure Legend

- 1 Terminal Box Cover (A16)
- 2 Hoist Limit Switch Box Cover (S220)
- 3 Bypass Switches (S260 and S261)

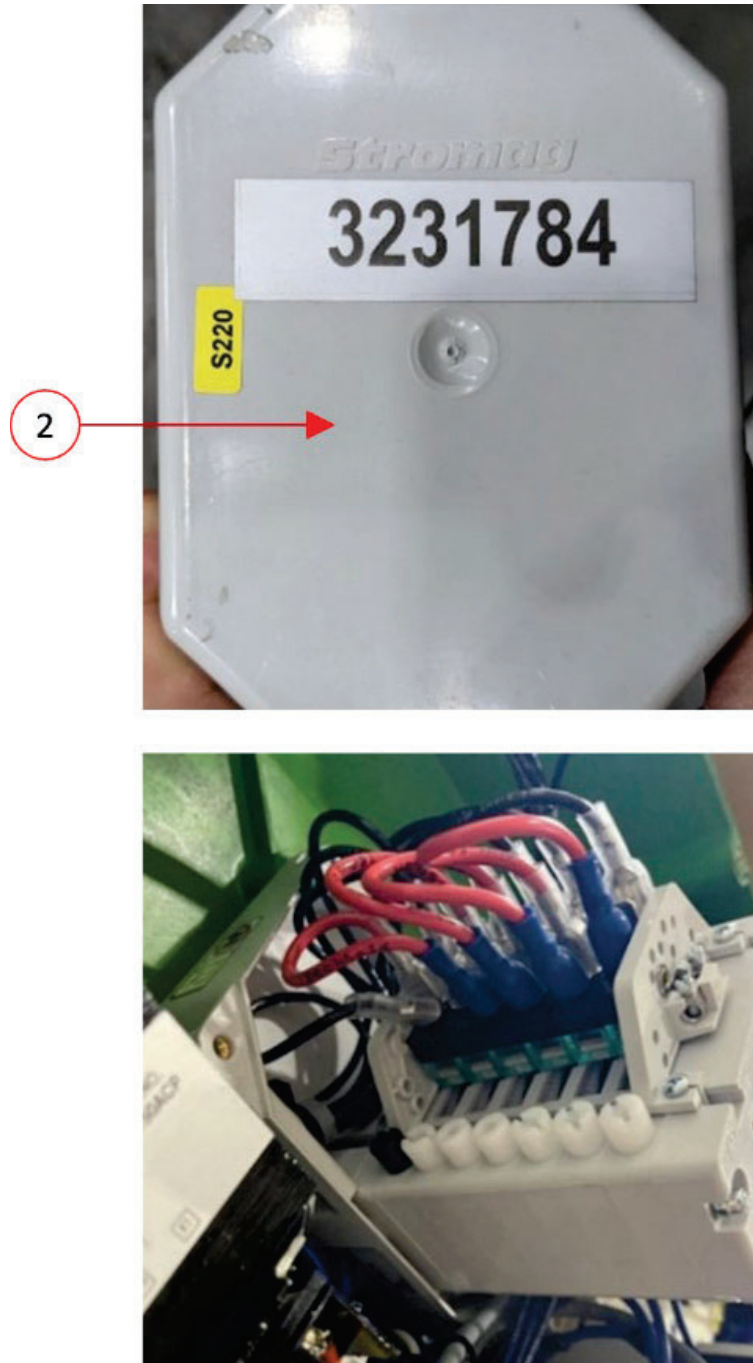


Note: Some parts not shown for clarity.

Figure 6-7: Removing the Terminal Box and Hoist Limit Switch Box Covers (1 of 3)

Figure Legend

- 1 Terminal Box Cover (A16)
- 2 Hoist Limit Switch Box Cover (S220)
- 3 Bypass Switches (S260 and S261)

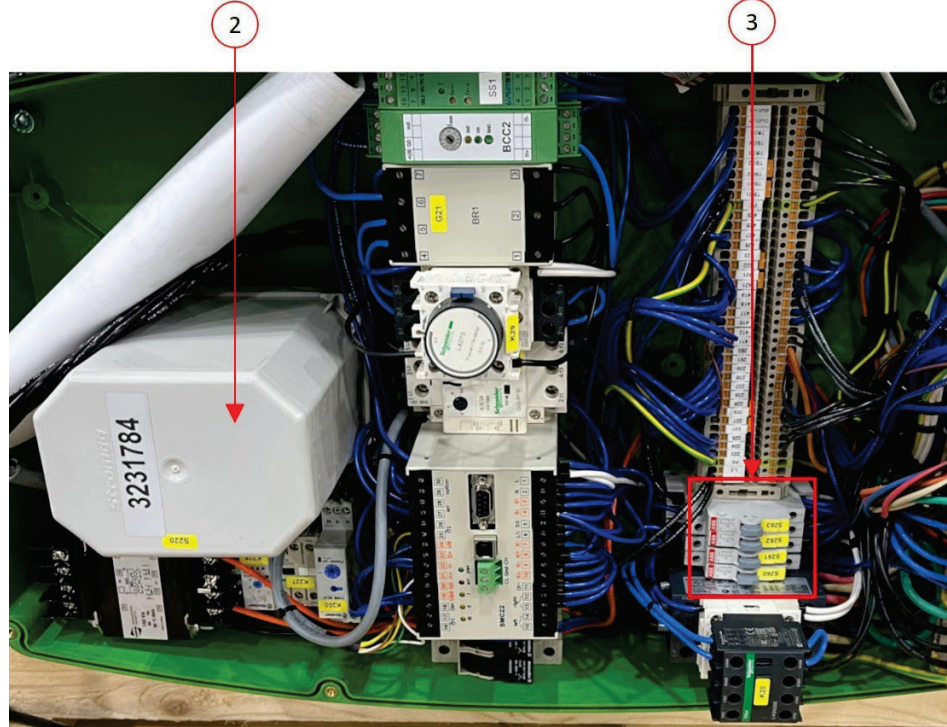


Note: Some parts not shown for clarity.

Figure 6-8: Removing the Terminal Box and Hoist Limit Switch Box Covers (2 of 3)

Figure Legend

- | | |
|---|-------------------------------------|
| 1 | Terminal Box Cover (A16) |
| 2 | Hoist Limit Switch Box Cover (S220) |
| 3 | Bypass Switches (S260 and S261) |



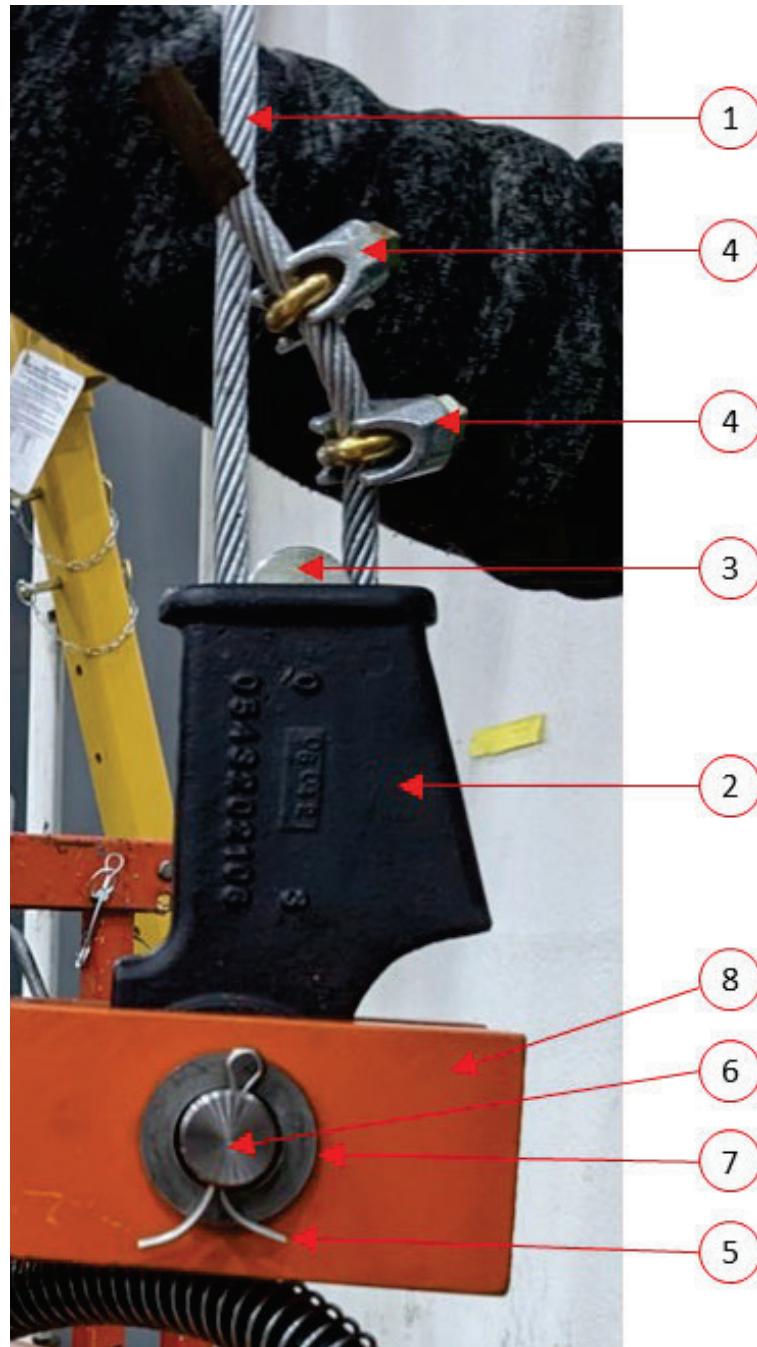
Note: Some parts not shown for clarity.

Figure 6-9: Removing the Terminal Box and Hoist Limit Switch Box Covers (3 of 3)

- a. Remove the screws in the green Terminal Box (A16) cover and remove the cover.
- b. Remove the screws in the Hoist Limit Switch Box (S220) cover and remove the cover.
4. Remove the Existing Set of Wire Ropes.
 - a. Lower the Grapple Shovel to the floor of the maintenance position.
 - i. Fully open the Grapple Shovel. This ensures that the Grapple Shovel will be secure on the floor of the maintenance position.
 - ii. Lower the Grapple Shovel until the Grapple Shovel is secure on the floor of the maintenance position and applies no load on the Wire Rope.
 - b. Unspool the Wire Ropes until reaching the Extreme Lower Limit Switch (S2) setting.
 - i. Press the Bypass SMC Permissions Button on the HMI at the same time as a downward motion button. The Bypass SMC Permissions Button allows the Wire Rope to be unspooled until the Extreme Lower Limit Switch (S2) setting.
 - ii. Continue pressing both buttons until motion automatically stops at the Extreme Lower Limit Switch (S2) setting.
 - c. Remove the Wire Ropes from the Rope Fastening Point.

Figure Legend

- 1 Wire Rope
- 2 Rope Bag
- 3 Rope Wedge
- 4 Rope Clamp
- 5 Cotter Pin
- 6 Hoist Pin
- 7 Hoist Washer
- 8 Hook Block



Note: Some parts not shown for clarity.

Figure 6-10: Rope Fastening Point

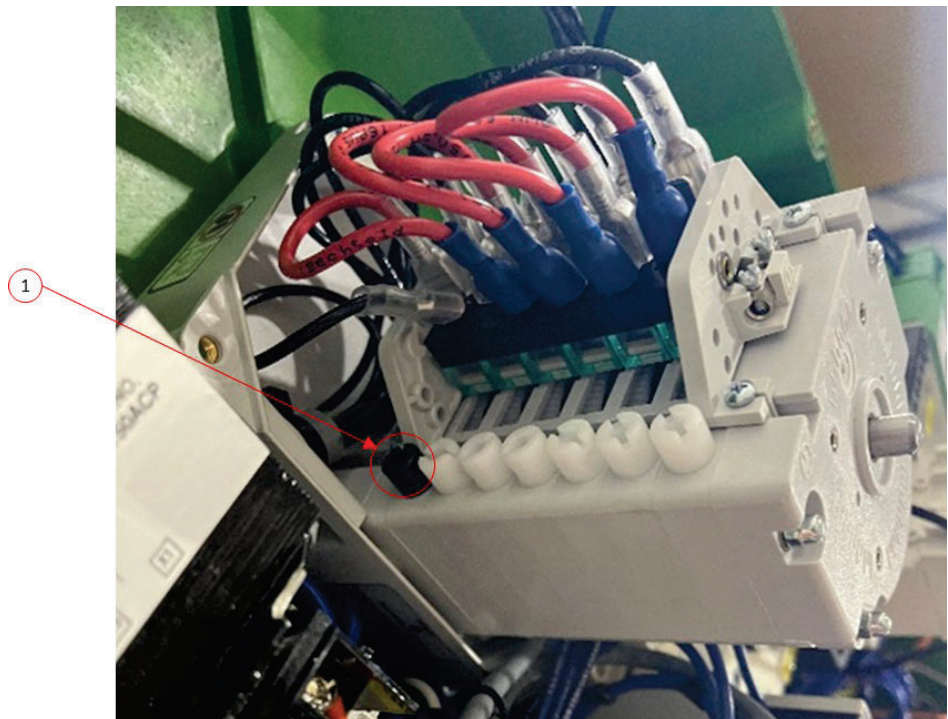
- i. Remove the Rope Clamps (4) from the ends of the Wire Ropes (1).
 - ii. Remove the Cotter Pins (5) from the Hoist Pins (6).
 - iii. Remove the Hoist Pins (6) and Hoist Washers (7) from the Hook Block (8) and Rope Bags (2).
 - iv. Remove the Wire Ropes (1) and Rope Wedges (3) from the Rope Bags (2).
- d. Turn the black Block Adjustment Limit Switch (S0) Adjustment Screw counterclockwise to allow the Wire Rope Drum to unspool the remainder of the Wire Ropes off the Wire Rope Drum. Record the number of Block Adjustment Limit Switch (S0) Adjustment Screw turns.



One revolution of a limit switch adjustment screw corresponds to about one revolution of the drum.

Figure Legend

- | | |
|---|---|
| 1 | Block Adjustment Limit Switch (S0) Adjustment Screw |
|---|---|



Note: Some parts not shown for clarity.

Figure 6-11: S220 - Block Adjustment Limit Switch (S0) Adjustment Screw

- e. Press the Bypass SMC Permissions Button on the HMI at the same time as a downward motion button. Continue pressing both buttons until the remainder of the Wire Ropes off has unspooled off the Wire Rope Drum.

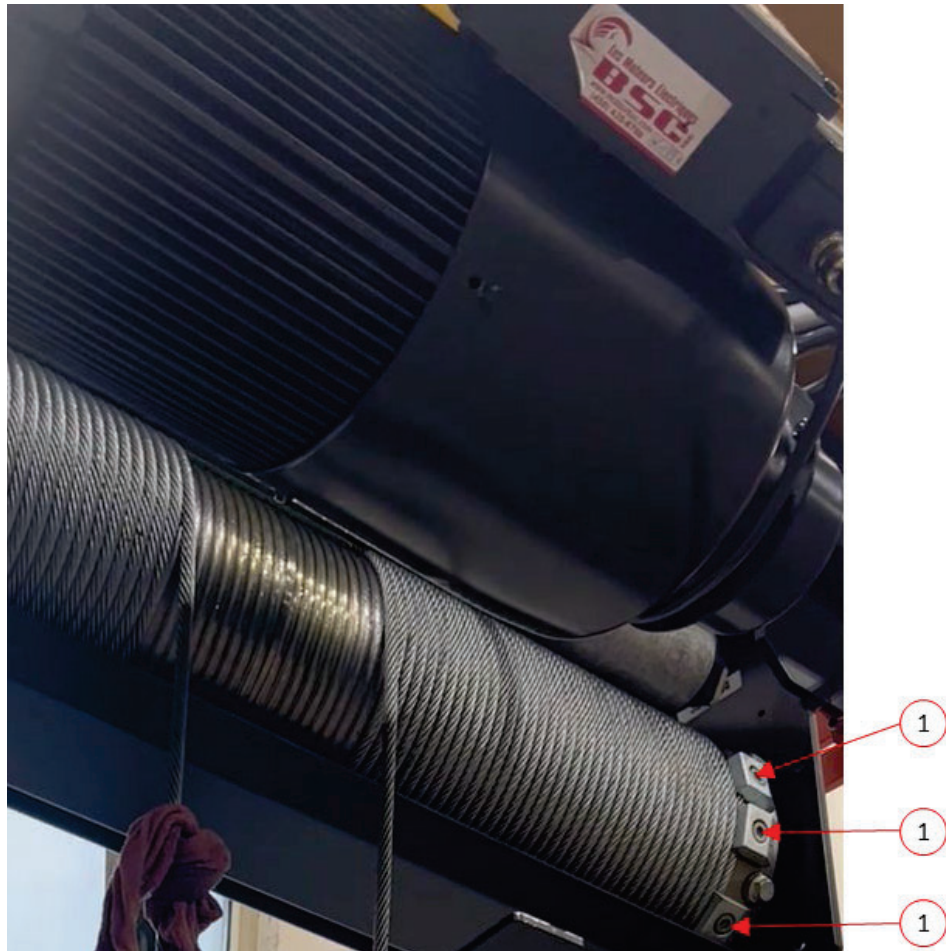
Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

- f. Secure the Wire Rope from falling uncontrolled.
- g. Note the amount of wraps of wire rope remaining on each end of the wire rope drum if any in order to install the new wire ropes in the same configuration.
- h. Loosen the Clamping plates on the left and right side of the Wire Rope Drum.

Figure Legend

1	Clamping Plate
---	----------------



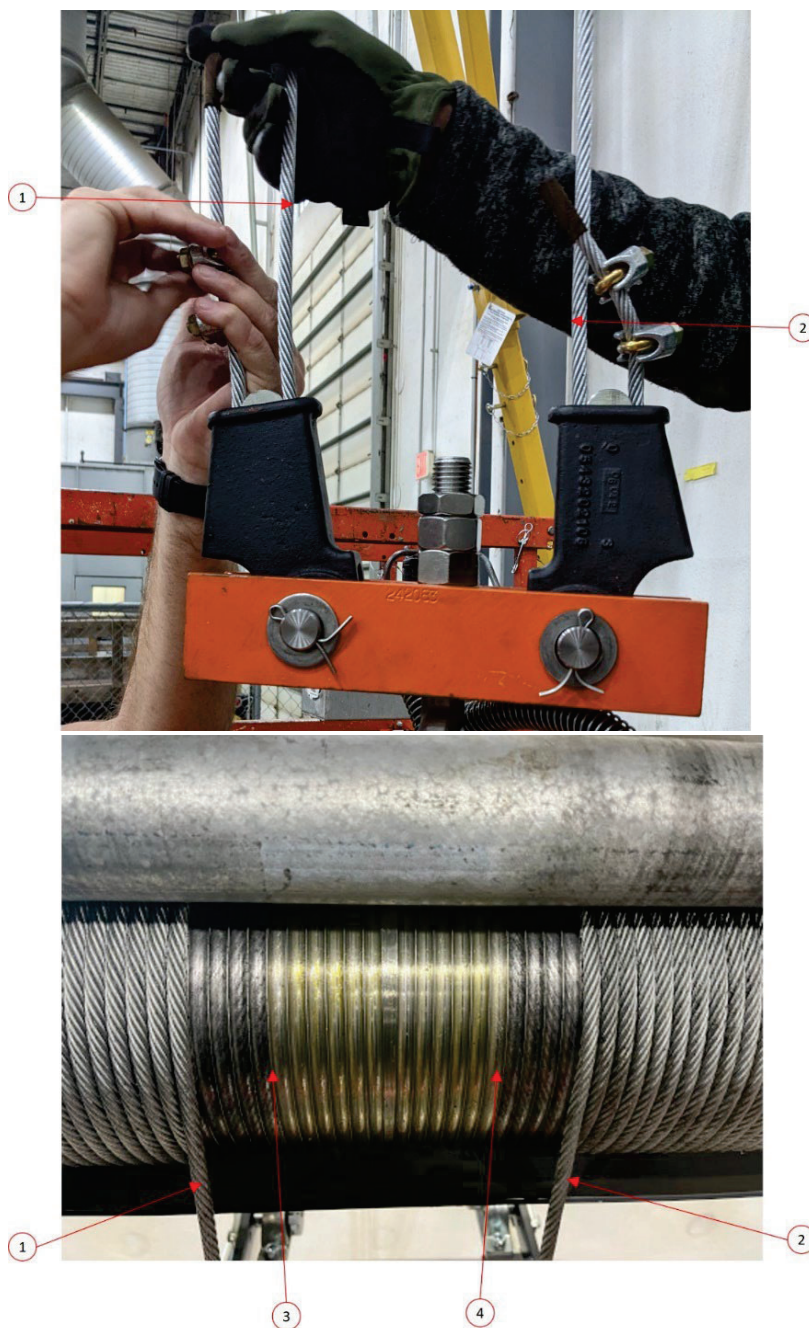
Note: Some parts not shown for clarity.

Figure 6-12: Lift Hoist System - Clamping Plates

- i. Remove the Wire Ropes from the Clamping Plates and bring the Wire Ropes to the maintenance floor.
5. Select an appropriate set of new Wire Ropes. Each Wire Rope set includes a Left-Hand Lay Wire Rope (1) for the Wire Rope Drum Right-Hand Grooves (3) and Right-Hand Lay Wire Rope (2) for the Wire Rope Drum Left-Hand Grooves (4). Table 6-3: Wire Rope Sets on Page 6-233 shows information about the Wire Rope sets for SH4 and SH5 hoists. Note that the angle of the wire wrap is mirrored when comparing Left-Hand Lay Wire Rope (1) with Right-Hand Lay Wire Rope (2).

Figure Legend

- 1 Left-Hand Lay Wire Rope
- 2 Right-Hand Lay Wire Rope
- 3 Right-Hand Grooves for Left-Hand Lay Wire Rope
- 4 Left-Hand Grooves for Right-Hand Lay Wire Rope



Note: Some parts not shown for clarity.

Figure 6-13: Wire Rope and Wire Rope Drum Hands

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

Table 6-3: Wire Rope Sets

Hoist Type	KBC Part Number	Description	Diameter	Structure	Length	Material
SH4	6015909	WIRE ROPE SET (LEFT AND RIGHT HAND WIRE ROPES INCLUDED)	7mm (0.28")	8X19 W-IWRC	15m±75mm (590"±3")	Galvanized Steel
SH5	6015856	WIRE ROPE SET (LEFT AND RIGHT HAND WIRE ROPES INCLUDED)	9mm (0.35")	8X19 W-IWRC	16.9m±75mm (665"±3")	Galvanized Steel

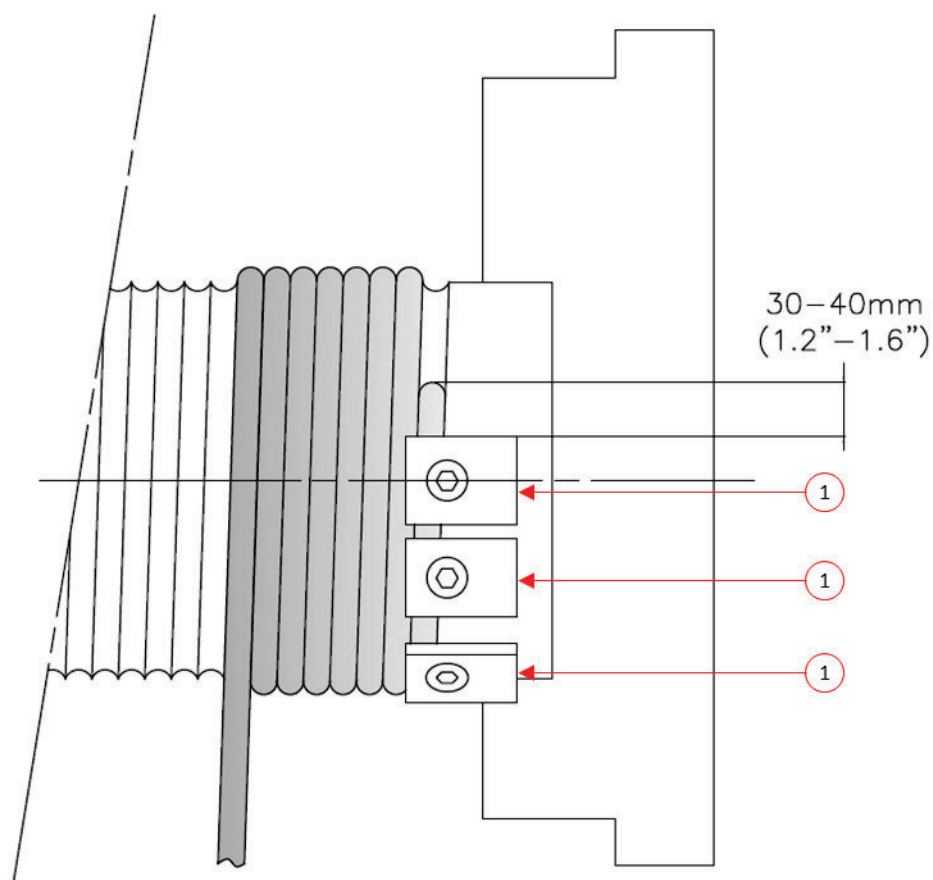
Note: Spare parts kits with additional parts for Wire Rope changes are available.

6. Install the new set of Wire Ropes.

- a. Roll out the new Wire Ropes flat on a clean and level surface. **Make sure there are no loops or bends in the Wire Ropes.**
- b. Feed the wire ropes around each end of the drum the same amount of wraps if any as the previous wire ropes with the wire rope ends through the clamping plates. Secure the clamping plates with 30-40mm of wire rope protruding beyond the last clamping plate. **Make sure the clamping plates still contain safety washers.**

Figure Legend

1 Clamping Plate



Note: Not to scale. Some parts not shown for clarity.

Figure 6-14: Wire Rope Installation - Clamping Plates

- c. Tighten the clamping plates to the torque specified in Table 6-4: Clamping Plate Torque Specifications.

Table 6-4: Clamping Plate Torque Specifications

Hoist Type	Screw Size	Torque Specification [Nm]/(ft-lbs.)
SH4	M10	50 Nm (36.9 ft-lbs.)
SH5	M10	50 Nm (36.9 ft-lbs.)
SH5	M12	87 Nm (64.1 ft-lbs.)

- d. Prepare a cloth with grease for each Wire Rope. Allow the Wire Ropes to run through the cloths for all the following Wire Rope change steps. See Section 3.4.4.2, Wire Rope Grease Specification on Page 3-64 to select the appropriate grease type.



Please refer to the Stahl SH Wire Rope Manual for the complete lubrication instructions.

- e. Turn the black Block Adjustment Limit Switch (S0) Adjustment Screw clockwise the same number of turns the limit switch was turned to remove the original Wire Ropes.



One revolution of a limit switch adjustment screw corresponds to about one revolution of the drum.

- f. Return to the Extreme Lower Limit Switch (S2) setting.
- i. Press an upward motion button on the Wireless Remote Control Pendant or HMI manual controls. Continue pressing the button until spooling the Wire Rope beyond where the Extreme Lower Limit Switch (S2) setting should be.

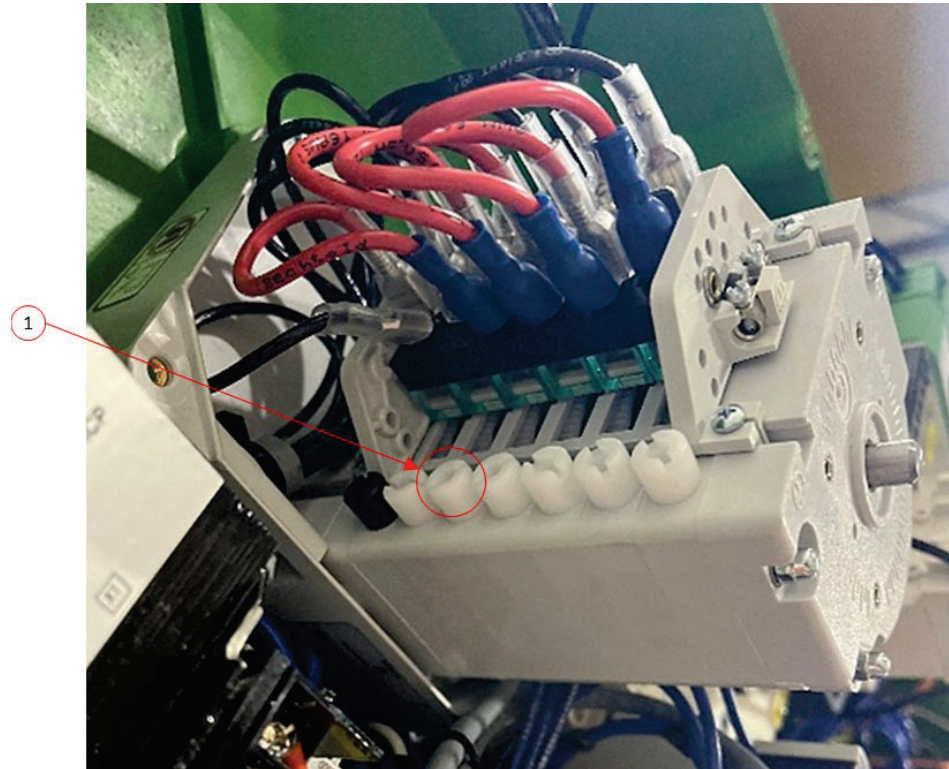


Pressing the Bypass Switch S261 simultaneously with a manual upward motion button may be required to move when the Grapple Shovel is stopped at or below the Extreme Lower Limit Switch (S2) setting.

- ii. Press the Bypass SMC Permissions Button on the HMI at the same time as a downward motion button. The Bypass SMC Permissions Button allows the Wire Rope to be unspooled until the Extreme Lower Limit Switch (S2) setting.
- iii. Continue pressing both buttons until motion automatically stops at the Extreme Lower Limit Switch (S2) setting.
- g. The Wire Ropes should be wrapped around the Wire Rope Drum 5-10 times on each side of the drum at the Extreme Lower Limit Switch (S2) setting. If this is not the case, adjust the Extreme Lower Limit Switch (S2) Adjustment Screw clockwise or counterclockwise until the Wire Ropes are wrapped around the Wire Rope Drum 5-10 times.

Figure Legend

- | | |
|---|--|
| 1 | Extreme Lower
Limit Switch (S2)
Adjustment Screw |
|---|--|



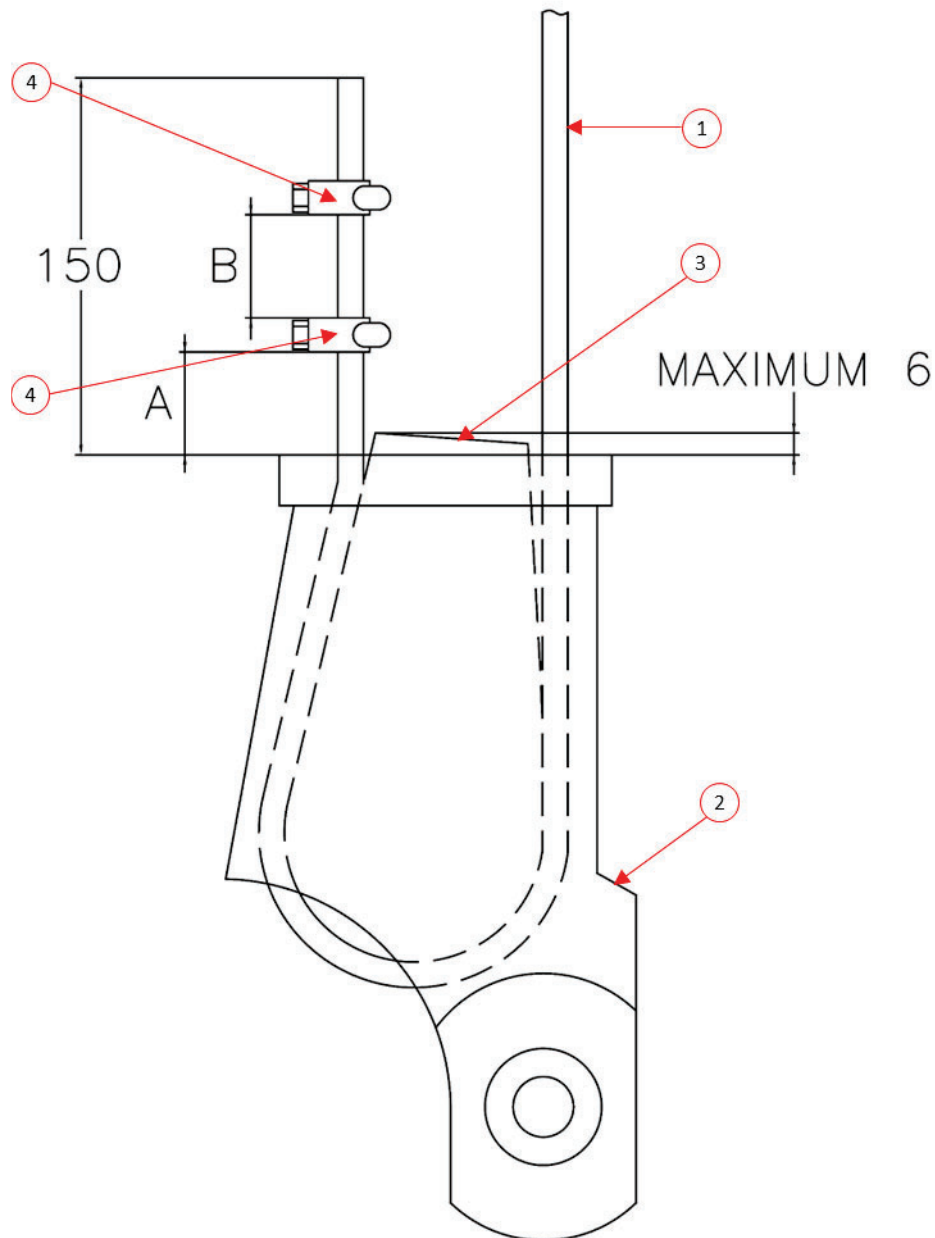
Note: Some parts not shown for clarity.

Figure 6-15: S220 - Extreme Lower Limit Switch (S2) Adjustment Screw

- h. Assemble the rope fastening points with the other ends of the Wire Ropes.

Figure Legend

- 1 Wire Rope
- 2 Rope Bag
- 3 Rope Wedge
- 4 Rope Clamp
- 5 Cotter Pin (Not Shown)
- 6 Hoist Pin (Not Shown)
- 7 Hoist Washer (Not Shown)
- 8 Hook Block (Not Shown)
- 9 Wrap Sleeve (Not Shown)



Note: Some parts not shown for clarity.

Figure 6-16: Rope Fastening Point Installation

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

- i. Clear all grease from the Wire Rope (1) ends, Rope Bags (2), and Rope Wedges (3).
- ii. Feed the Wire Rope (1) ends through the innermost end of the Rope Bags (2).
- iii. Wrap the Wire Ropes (1) around a Rope Wedges (3) and feed the ends of the Wire Ropes (1) through the outermost end of the Rope Bags (2). The Wire Rope (1) ends should protrude approximately 150mm (5.9") out of the Rope Bags (2).
- iv. Connect the Hook Block (8) to the Rope Bags (2) with the Hoist Pins (6), Hoist Washers (7), and Cotter Pins (5). **Make sure to use a brand-new set of Cotter Pins (5) each time a new set of Wire Ropes (1) is installed.**
- i. Lift the Hook Block (8) off of the maintenance floor with the Wireless Remote Control Pendant or HMI manual controls.
- j. Increase the protrusion length of one of the Wire Ropes (1) until the Hook Block (8) is level with the floor. Leveling the Hook Block (8) ensures that both Wire Ropes (1) are equally loaded.



Figure 6-17: Level Hook Block

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

- k. Install the Rope Clamps at the locations shown in Figure 6-14: Wire Rope Installation - Clamping Plates on Page 6-234 and Table 6-4 on Page 6-234. Tighten the Rope Clamps (4) to the torque specified in Table 6-5: Rope Clamp Torque Specifications.

Table 6-5: Rope Clamp Torque Specifications

Hoist Type	Rope Diameter [mm]	Screw Size	Torque Specification	A	B
SH4	7mm (0.28")	M8	10 Nm (7.4 ft-lbs.)	25mm (1")	N/A
SH5	9mm (0.35")	M8	20 Nm (14.8 ft-lbs.)	25mm (1")	25mm (1")

- l. Lift the Grapple Shovel off the maintenance floor and hold for one minute. Lower the Grapple Shovel down to the maintenance floor. Repeat this step five times.

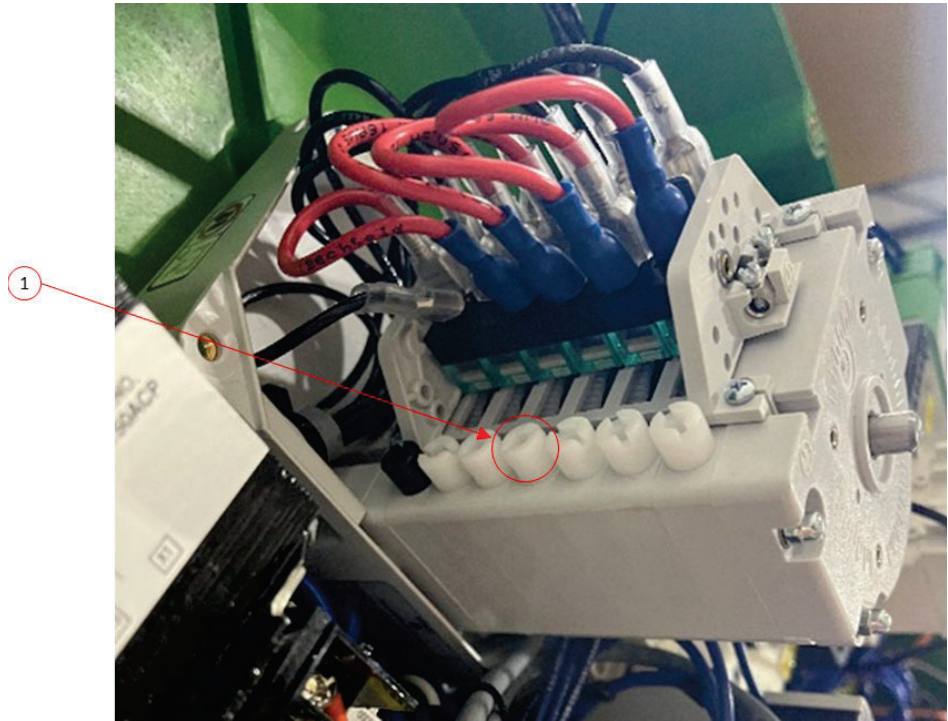


Pressing the Bypass Switch S261 simultaneously with a manual upward motion button may be required to move when the Grapple Shovel is stopped at or below the Extreme Lower Limit Switch (S2) setting.

- m. Check the protrusion of the Rope Wedges (3) from the Rope Bags (2). Confirm that the protrusion does not exceed 6mm. If 6mm is exceeded, disassemble the rope fastening points and restart the rope fastening point assembly.
- n. Use the Wrap Sleeving (9) to secure the Wire Rope (1) ends protruding from the outermost end of the Rope Bags (2) to the Wire Rope (1) ends protruding from the innermost end of the Rope Bags (2).
7. Check the Operating Limit Switch (S3) setting. See Figure 6-18 on Page 6-240.

Figure Legend

-
- | | |
|---|---|
| 1 | Operating Limit Switch
(S3) Adjustment Screw |
|---|---|
-



Note: Some parts not shown for clarity.

Figure 6-18: S220 - Operating Limit Switch (S3) Adjustment Screw

- Lift the Grapple Shovel with the Wireless Remote Control Pendant or HMI manual controls until the movement is automatically stopped. The bottom of the Grapple Shovel should be located approximately 915mm (3') above the Trashwell unless otherwise noted on the Certified Drawing Package.
- Adjust the Operating Limit Switch (S3) Adjustment Screw until the Grapple Shovel movement stops at the correct location. Clockwise adjustment moves the setting up and counterclockwise adjustment moves the setting down.

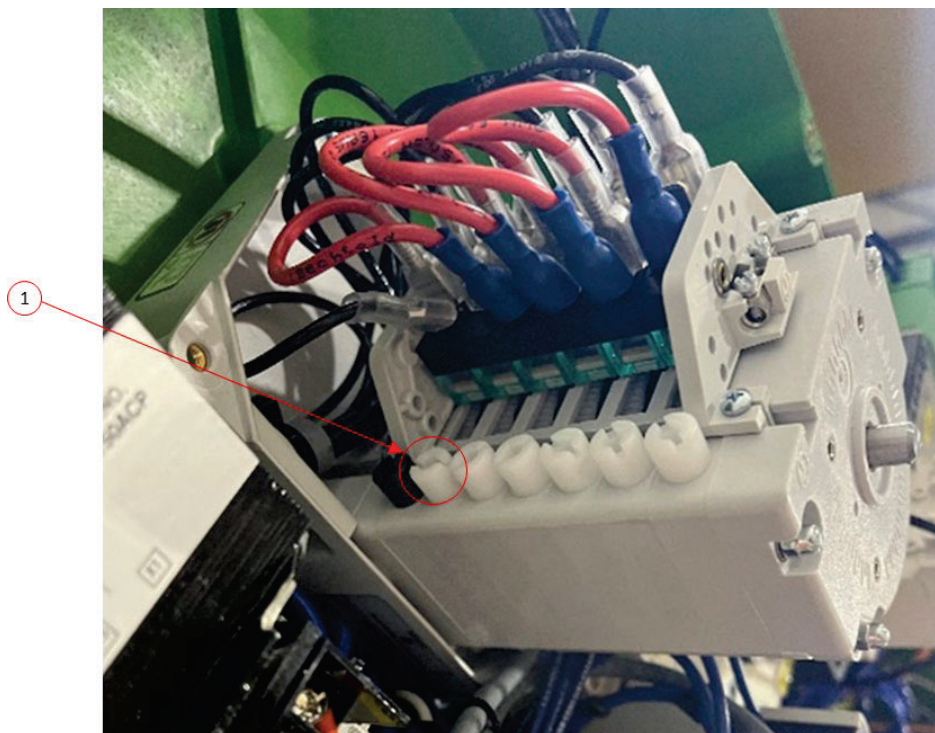


One revolution of a limit switch adjustment screw corresponds to about one revolution of the drum.

8. Check the Extreme Upper Limit Switch (S1) setting. See Figure 6-19 below.

Figure Legend

- | | |
|---|--|
| 1 | Extreme Upper
Limit Switch (S1)
Adjustment Screw |
|---|--|



Note: Some parts not shown for clarity.

Figure 6-19: S220 - Extreme Upper Limit Switch (S1) Adjustment Screw

- Press and hold the Bypass Switch S260 to allow hoist movement past the Operating Limit Switch (S3) setting.
- Lift the Grapple Shovel with the Wireless Remote Control Pendant or HMI manual controls until the movement is automatically stopped.
- If the movement stops after the Hook Block contacts the Paddle Switch on the Lift Hoist System, the Extreme Upper Limit Switch (S1) is set too high. Lower the Grapple Shovel below the Operating Limit Switch (S3) setting, then turn the Extreme Upper Limit Switch (S1) Adjustment Screw counterclockwise.

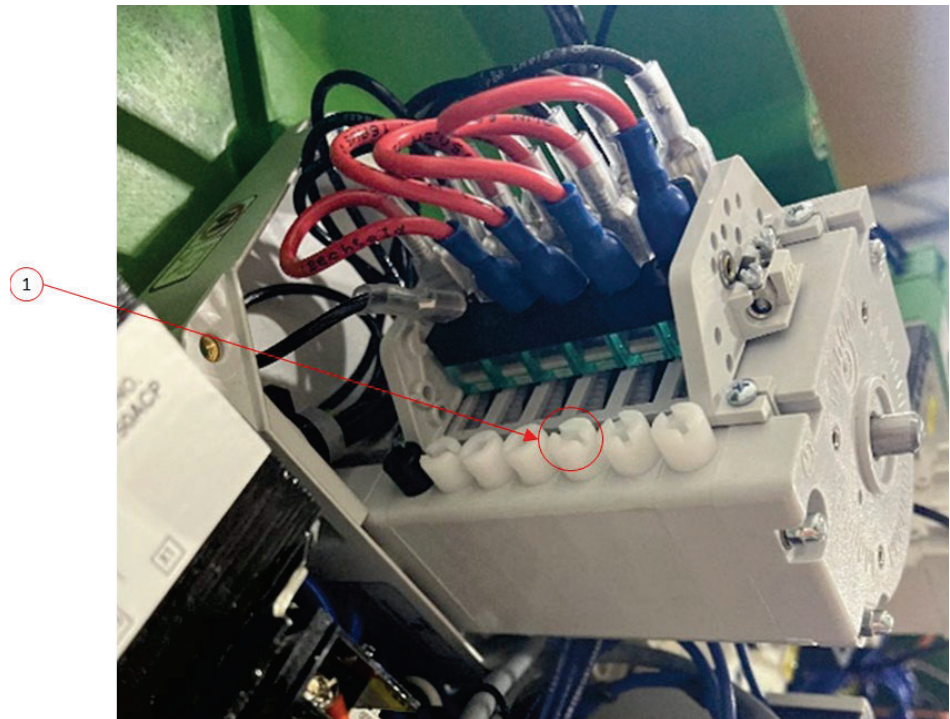


Pressing the Bypass Switch S261 simultaneously with a manual downward motion button is required to move when the Grapple Shovel is stopped at the Extreme Upper Limit Switch (S1) setting.

- d. If the movement stops above the Operating Limit Switch (S3) setting and below the Paddle Switch on the Lift Hoist System, the Extreme Upper Limit Switch (S1) is set correctly.
 - e. Lower the Grapple Shovel below the Operating Limit Switch (S3) setting.
 - f. Release the Bypass Switch S260 Switch to stop Grapple Shovel upward movement at the Operating Limit Switch (S3) setting.
9. Check the Speed Transition Limit Switch (S4) setting. See Figure 6-20 below.

Figure Legend

- | | |
|---|---|
| 1 | Speed Transition
Limit Switch (S4)
Adjustment Screw |
|---|---|



Note: Some parts not shown for clarity.

Figure 6-20: S220 - Speed Transition Limit Switch (S4) Adjustment Screw

- a. Starting from the Operating Limit Switch (S3) setting, move the Grapple Shovel downward with the Wireless Remote Control Pendant or HMI manual controls below where the movement transitions from a slow speed to a fast speed. Then move the Grapple Shovel upward until the movement transitions from a fast speed to a slow speed. The speed transition during upward motion should occur approximately 460mm (18") below the Operating Limit Switch (S3) setting unless another location is necessary for the application.
- b. Adjust the Speed Transition Limit Switch (S4) Adjustment Screw until the Grapple Shovel movement stops at the correct location. Clockwise adjustment moves the setting up and counterclockwise adjustment moves the setting down.

10. Close the Terminal Box (A16) and Hoist Limit Switch Box (S220).

- a. Replace the cover over the limit switches and tighten the screws for the Hoist Limit Switch Box (S220) cover.
- b. Replace the cover over the limit switches and tighten the screws for the Terminal Box (A16) cover.

11. Return the unit to normal operation.

6.4.4.2 Replacing the Lift Hoist System Load Sensor

The Lift Hoist System will not operate if the Load Sensor is not functioning properly. The load sensor is used to detect slack-line state and overloaded conditions. Follow the instructions from the manufacturer for connecting the load cell.



Please refer to the additional Lift Hoist System documents for the complete Hoist Maintenance Instructions, including the Hoist Data Sheet and Stahl Manuals.

NOTICE

Qualified and licensed personnel must perform this maintenance only. The following section includes items that are adapted from Stahl documentation. The Stahl documentation takes precedence over the guidelines in this manual.

The Load Sensor is positioned offset from the centerline of the drum and reacts the torque from the hoist motor and gearbox. The Load Sensor is always under load due to the offset configuration of the hoist motor, even when there is no load on the Wire Ropes. Before removing the Load Sensor, the offset load due to the gearbox and motor must be relieved for the Load Sensor to disengage.

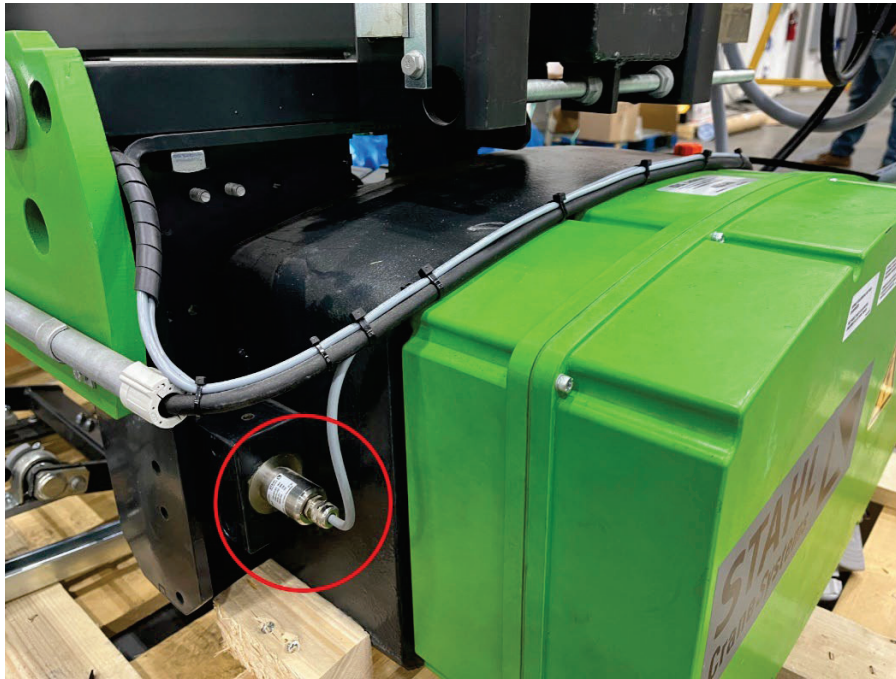


Figure 6-21: Load Sensor Overview (1 of 2)

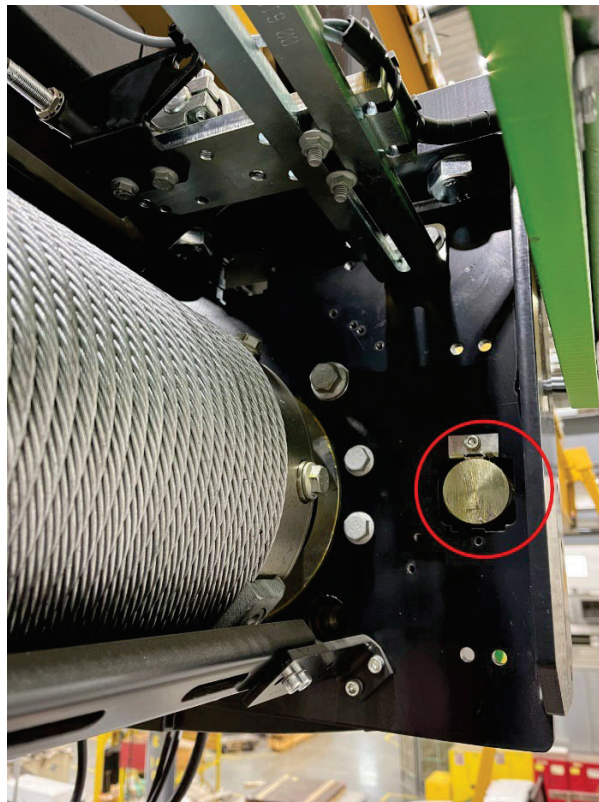


Figure 6-22: Load Sensor Overview (2 of 2)

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

1. Shut down unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES).**
2. Remove all load from the Lift Hoist System. See Section 6.3.1, Grapple Shovel Inspection Procedures on Page 6-181 to remove the Grapple Shovel load. Also remove the Hook Block from the Wire Rope fastening points.
3. Remove the green Terminal Box Cover from the Lift Hoist System. See Section 6.4.4.1, Replacing the Lift Hoist System Wire Ropes on Page 6-225 for details on how to remove and replace the Terminal Box Cover.
4. Unscrew the Set Screw to prepare for the Load Sensor removal.



Figure 6-23: Load Sensor Set Screw

5. Use a Chain Fall, Clamp, or other method to support the gearbox and unload the Load Sensor. Make sure that that the Load Sensor is unloaded.



Figure 6-24: Unloading the Load Sensor (Clamp Shown)

6. Remove the Load Sensor from the mounting hardware and housing.

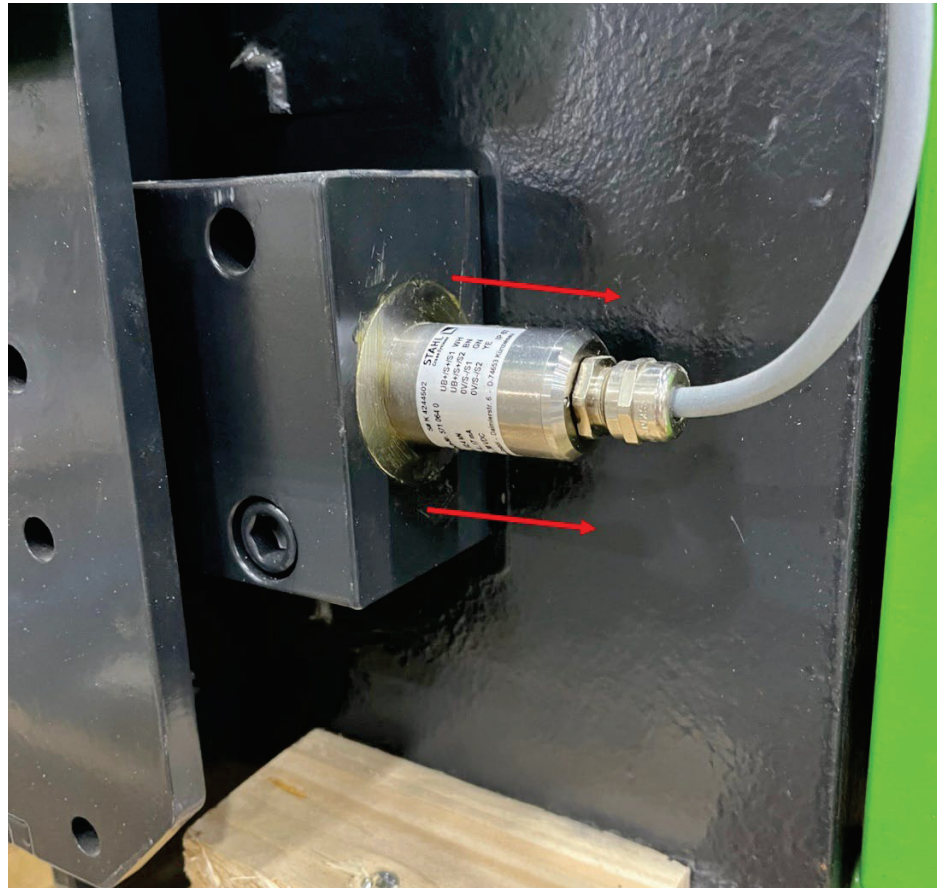


Figure 6-25: Removing the Load Sensor

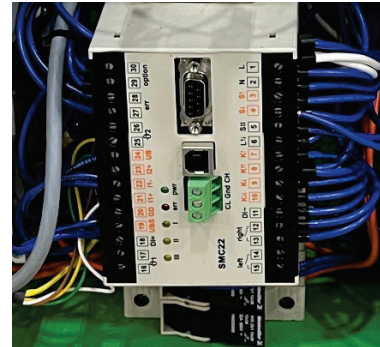
7. Place the new Load Sensor into the mounting hardware and housing. Make sure that the Load Sensor is located in the center of the housing and oriented correctly to the load.
8. Tighten the Set Screw into the Load Sensor socket.
9. Undo the previous Load Sensor wiring from the SMC22 Multicontroller inside the Terminal Box.



Please refer to the Stahl Electrical Drawing Package in the additional Lift Hoist System documents for the Lift Hoist System wiring details.



A16 Terminal Box



SMC22 Detail

Figure 6-26: Lift Hoist System SMC22 Multicontroller Inside the A16 Terminal Box

10. Note the location of each wire to prepare to connect the wiring for the new Load Sensor.
11. Connect each new Load Sensor wire into the correct SMC22 Multicontroller port inside the Terminal Box.



Please refer to the Stahl Electrical Drawing Package in the additional Lift Hoist System documents for the Lift Hoist System wiring details.

12. Replace the Terminal Box Cover. See Section 6.4.4.1, Replacing the Lift Hoist System Wire Ropes on Page 6-225 for details on how to remove and replace the Terminal Box Cover.
13. Remove the Chain Fall, Clamp, or other method that was used to support the gearbox.
14. Bring the unit out of **Zero Energy State (ZES)**.
15. Check the scaling of the Load Sensor.
16. Ensure that the load on the Lift Hoist System is the Grapple Shovel with no additional load.
17. Check the load reading on the HMI Overview Screen.
18. Compare the load reading to the Grapple Shovel weight on the Grapple Shovel drawing in the Certified Drawing Package.
19. If the load reading is not close to matching the weight on the Grapple Shovel drawing, contact Kadant Field Service.

6.5 Hydraulic Carriage and Hydraulic Power Unit

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

6.5.1 Overview

- To perform maintenance on the Hydraulic Carriage, shut down the unit according to Section 6.2, Preparing the Unit for Maintenance on Page 6-211 **and bring the unit to Zero Energy State (ZES)**.
- Refer to Figure 3-12: Hydraulic Power on Page 3-55 for an overview of the Hydraulic Power Unit Parts.

6.5.2 Hydraulic Carriage and Hydraulic Power Unit Inspections



Please refer to the additional Hydraulic Power Unit documents for complete Hydraulic Power Unit inspection instructions.

6.5.2.1 Inspecting the Hydraulic Power Unit Oil Level

The oil level is shown on the HMI screen and on the Level Gauge on the Reservoir. Check the oil level daily. The oil low level can be found in the Alarms Parameters section of the HMI Parameters Screen (See Section 5.5.9, HMI Alarm Screens on Page 5-201).

It is recommended to refill the Reservoir before reaching the oil low level. The Reservoir must be refilled if the oil low level is reached. The oil must be changed every 1000 - 2000 hours of operation or annually depending on the application and environment. Use of a filter cart is highly recommended. See Section 6.5.3.1, Oil Reservoir Maintenance on Page 6-252 for instructions on refilling the Reservoir or changing the Reservoir oil.



Inspect the Hydraulic Hoses and Fittings for leaks if the oil level is decreasing at a fast rate.

NOTICE

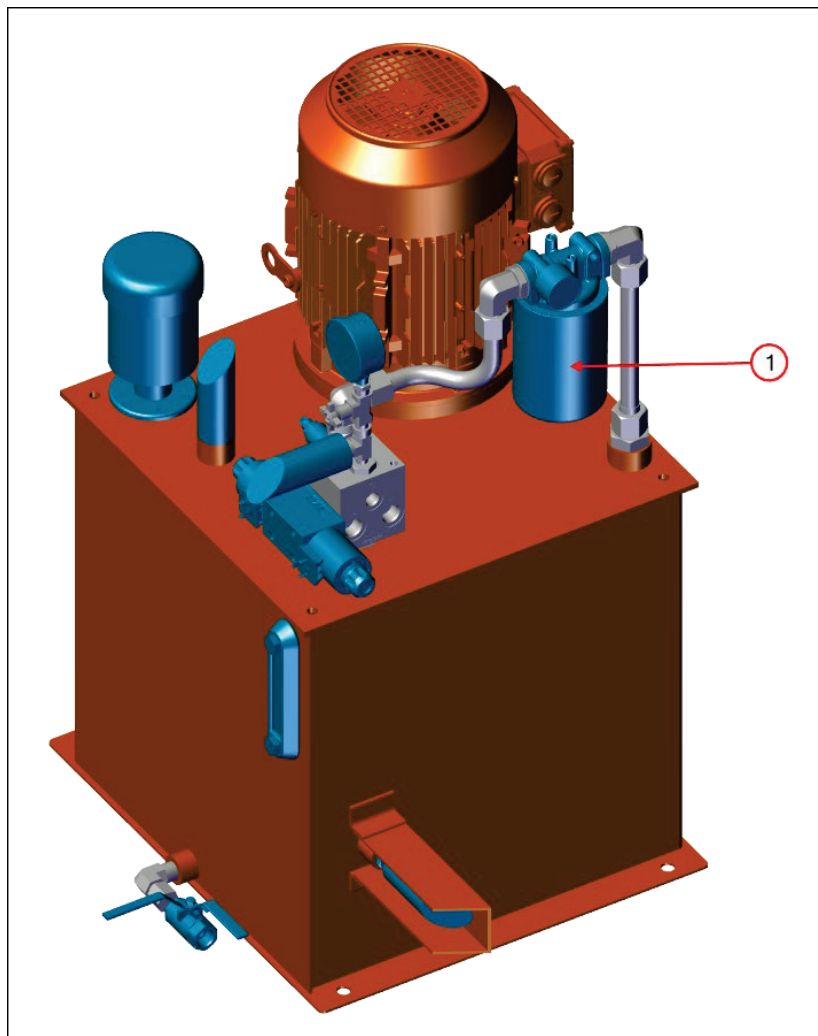
Check the oil after the first 100 hours of operation as a special inspection.

6.5.2.2 Inspecting the Hydraulic Power Unit Return Filter

Inspect the Return Filter monthly for clogs, damage, or any other replacement indicators. Replace the Filter based on the manufacturer's recommendations.

Figure Legend

1	Return Filter
---	---------------



Note: Some parts not shown for clarity.

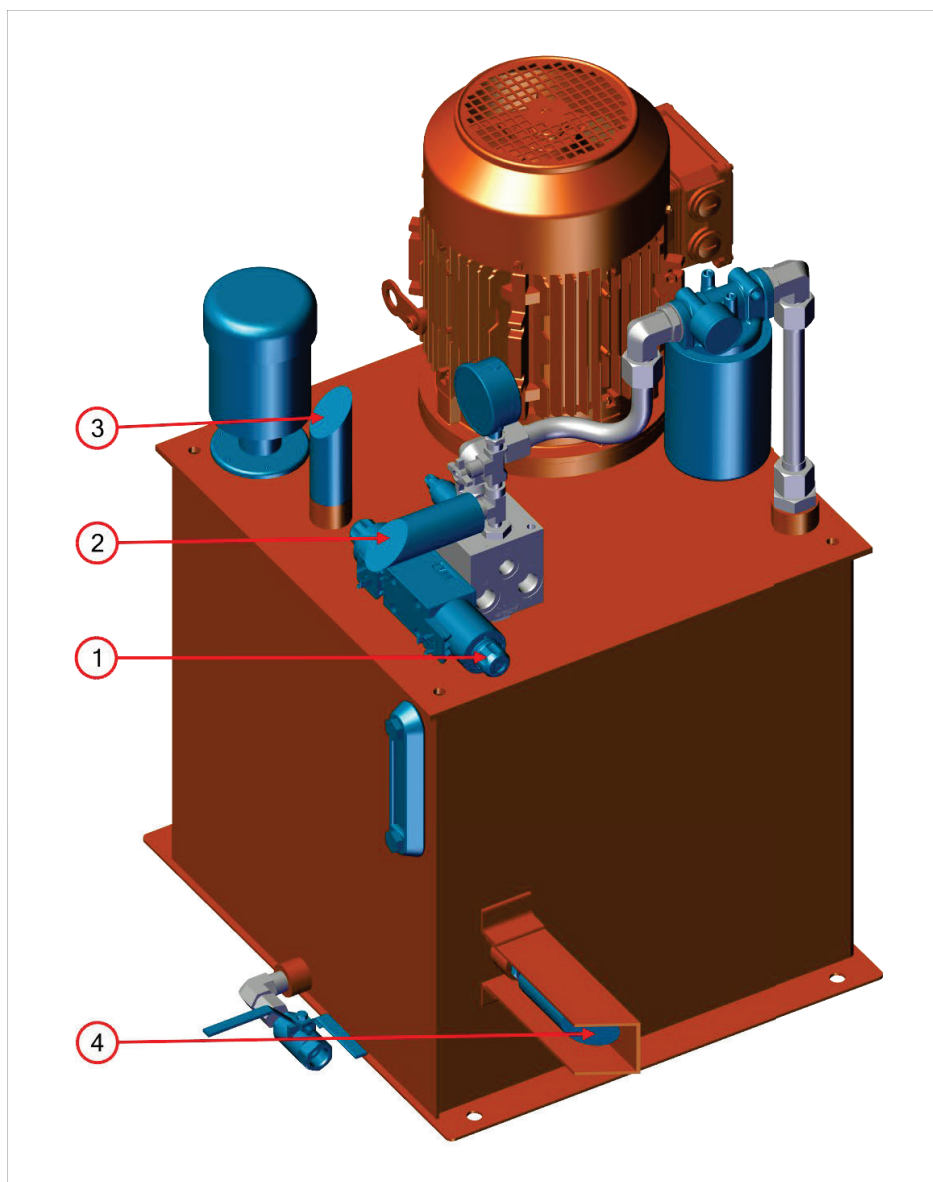
Figure 6-27: Hydraulic Power Unit Return Filter

6.5.2.3 Inspecting the Hydraulic Power Unit Directional Valve and Switches

Inspect the Directional Valve and Switches annually for excessive voltage, mechanical damage to leads, dirty or corroded contacts, or other issues. Replace the Directional Valves and Switches as needed.

Figure Legend

- | | |
|---|--------------------|
| 1 | Directional Valve |
| 2 | Pressure Switch |
| 3 | Level Switch |
| 4 | Temperature Switch |



Note: Some parts not shown for clarity.

Figure 6-28: Hydraulic Power Unit Directional Valve and Switches

6.5.2.4 Inspecting the Hydraulic Carriage Hoses and Fittings

Inspect the Hydraulic Hoses and Fittings on the Hydraulic Carriage monthly for loose or missing hardware, damage to components, and leaks. Replace any missing, damaged, or leaking components.

6.5.2.5 Inspecting the Hydraulic Carriage Trolley Assemblies

Inspect the Trolley Assemblies on the Hydraulic Carriage quarterly for loose or missing hardware and damage to components. Check the wheels for wear or damage. Make sure that the cotter pins are installed and secure. Replace components as needed.

6.5.3 Hydraulic Carriage and Hydraulic Power Unit Maintenance



Please refer to the additional Hydraulic Power Unit documents for complete Hydraulic Power Unit maintenance instructions.

6.5.3.1 Oil Reservoir Maintenance

Always maintain the required oil level. The Oil Low Level Warning and Oil Low Level Alarm can be found in the HMI Grapple Shovel and HPU Parameters Screen (See Section 5.5.6.6, HMI Grapple Shovel and HPU Parameters Screen on Page 5-190).

6.5.3.1.1 Refilling the Oil Reservoir

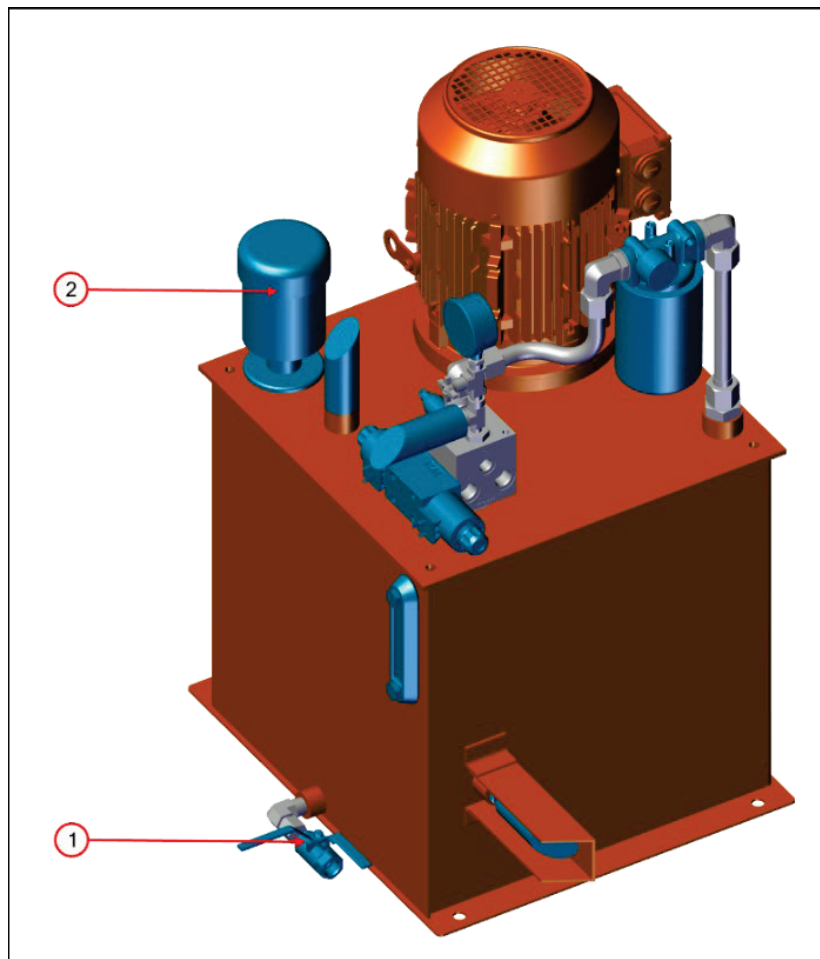
Unscrew and remove the Breather. (See Figure 6-29 below.) Fill the reservoir through the opening where the Breather was installed. Refer to Section 3.4.3, Hydraulic Power Unit Standard Specifications on Page 3-63 and Section 3.4.4.3, Oil Specification on Page 3-64 for the volume and oil type specifications. Continue filling the reservoir until the HMI displays the Oil High Level Warning (See Section 5.5.6.6, HMI Grapple Shovel and HPU Parameters Screen on Page 5-190). Screw in the Breather into its original position.

6.5.3.1.2 Changing the Reservoir Oil

Open the Ball Valve to drain the existing oil in the Reservoir. Close the Ball Valve once the Reservoir is empty of oil. Unscrew and remove the Breather. Fill the reservoir through the opening where the Breather was installed. Refer to Section 3.4.3, Hydraulic Power Unit Standard Specifications on Page 3-63 and Section 3.4.4.3, Oil Specification on Page 3-64 for the volume and oil type specifications. Continue filling the reservoir until the HMI displays the Oil High Level Warning (See Section 5.5.6.6, HMI Grapple Shovel and HPU Parameters Screen on Page 5-190). Screw in the Breather into its original position.

Figure Legend

- 1 Ball Valve
- 2 Breather



Note: Some parts not shown for clarity.

Figure 6-29: Opening the Ball Valve and Removing the Hydraulic Power Breather

6.5.3.2 Motors Maintenance

Lubricate the motors as required as per standard maintenance practices. Follow all manufacturer's recommendations.



Please refer to the additional Hydraulic Power Unit documents for complete Hydraulic Power Unit motor maintenance instructions.

6.5.4 Hydraulic Carriage and Hydraulic Power Unit Replacement



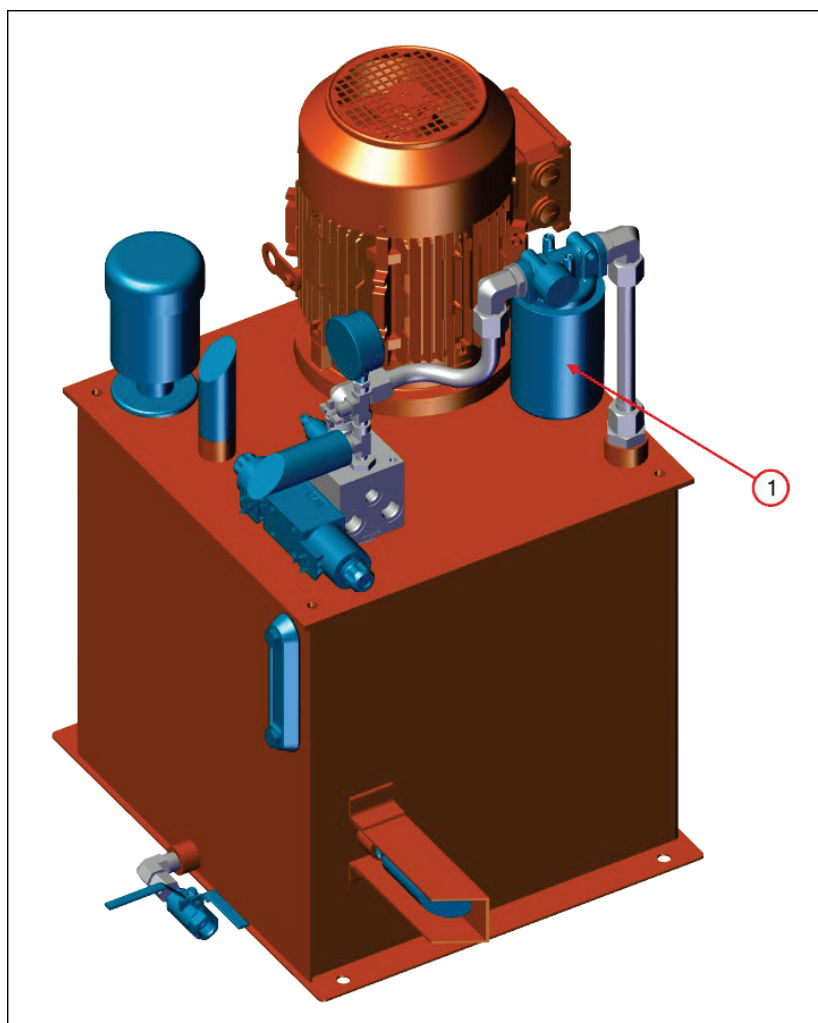
Please refer to the additional Hydraulic Power Unit documents for complete Hydraulic Power Unit replacement instructions.

6.5.4.1 Replacing the Return Filter

Replace the Return Filter as required, or as indicated on the filter supplied with bypass indicators. Make sure to check the bypass indicator shortly after startup after replacing the filter.

Figure Legend

1 Return Filter



Note: Some parts not shown for clarity.

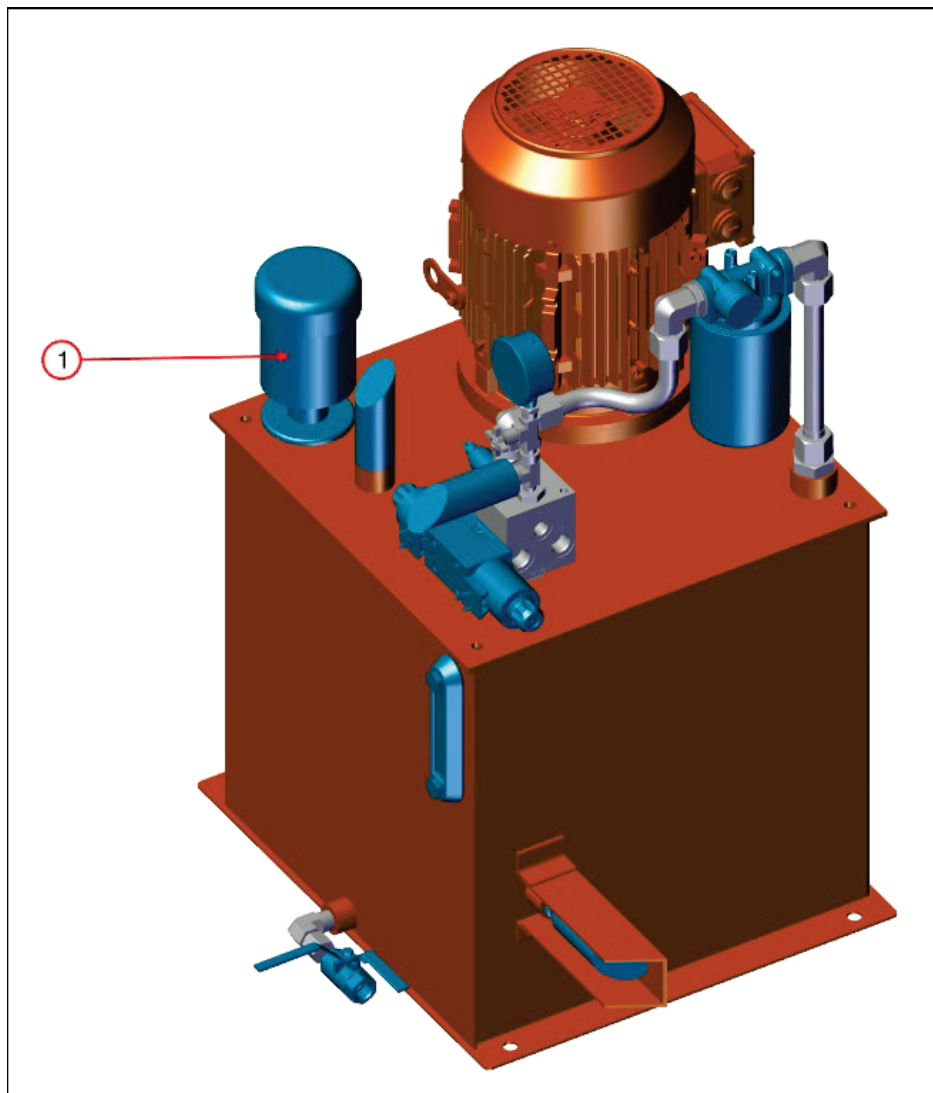
Figure 6-30: Hydraulic Power Unit Return Filter

6.5.4.2 Replacing the Breather

Replace the Breather as per the manufacturer's requirements.

Figure Legend

1 Breather



Note: Some parts not shown for clarity.

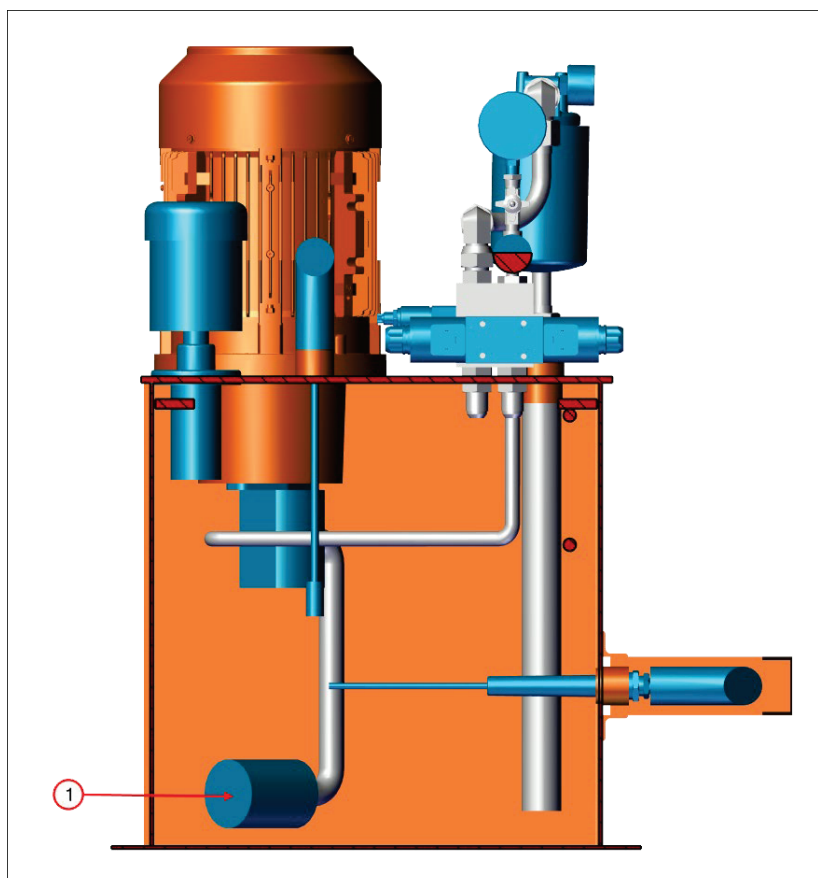
Figure 6-31: Hydraulic Power Unit Breather

6.5.4.3 Replacing the Suction Strainer

Clean or replace the Suction Strainer after the initial 10 hours of operation. Clean or replace the suction strainer every 100 hours of operation after the initial 10 hours.

Figure Legend

1	Suction Strainer
---	------------------



Note: Some parts not shown for clarity.

Figure 6-32: Hydraulic Power Unit Suction Strainer

6.6 Dual Hydraulic Hose and Fittings

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

Inspect the Dual Hydraulic Hoses and Fittings monthly for loose or missing hardware, damage to components, and leaks. Replace any missing, damaged, or leaking components.

6.7 Track System

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

6.7.1 Track System Beam

Clear the Beam of debris with a brush and inspect the Beam for wear or other damage quarterly.

6.7.2 Track System Sensors

Inspect the Proximity Switches annually for excessive voltage, mechanical damage to leads, dirty or corroded contacts, or other issues. Replace the Proximity Switches as needed.

6.7.3 Track System Hardware

Inspect the Track System Hardware Components annually for loose or missing hardware, damage to components, and leaks. Replace any missing, damaged, or leaking components.

6.8 Electrical and Controls System

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

Inspect the Electrical and Controls System annually for excessive voltage, mechanical damage to leads, dirty or corroded contacts, loose wires, loose connections, damage to components, or other issues. Replace the Electrical and Controls System components as needed.

6.9 Cleaning the Unit

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

6.9.1 Overview

**WARNING**

Do not open or remove protective guarding if energy is supplied to any part of unit, even if power switch is in the OFF position or the power source is locked out.

**WARNING**

Perform the Lockout/Tagout Procedures on Page 2-36 and make sure all connected equipment is at Zero Energy State (ZES). Some automatic equipment connected to a locked-out power source may not be in ZES and could move. Failure to follow this instruction can result in serious personal injury or death.

NOTICE

Handle the Grapple Hoist components carefully. Blemishes or distortions will lessen the ability to separate the contaminants.



If needed, wash down the internal parts and surfaces.



Periodically clean the debris off the top of the Grapple Shovel or the Lift Hoist System will become clogged and disrupt operations.

6.9.2 Cleaning the Hydraulic Oil System

Operating time between cleanings will vary, depending on the application and environment. Indications of a system requiring cleaning are system sluggishness and the formation of sludge or a gummy substance in the reservoir and on the suction filter.

6.9.3 Cleaning Procedures for the Hydraulic Oil System

To clean the oil lubrication system:

1. Shut off and lock out the unit pump motor and lubrication system motor: **Bring the unit to Zero Energy State (ZES).**
2. Close and lock out all valves that are sources of potential stock, oil, or water flow to the unit.
3. Make sure that all pressure has been relieved from the unit.
4. Drain the oil while it is still warm (48 degrees Celsius/120 degrees Fahrenheit maximum).
5. Fill with a naphthalene-based flushing oil with a viscosity of 70 - 110 SUS at 37 degrees Celsius / 100 degrees Fahrenheit maximum.
6. Run the lubrication system for 2 - 4 hours until all the sludge or gum has been removed.
7. Thoroughly drain the flushing oil and clean or replace the filter elements.
8. Refill with new oil: Refer to Section 3.4.4.3, Oil Specification on Page 3-64.

6.10 Preparing the Unit after Maintenance

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

6.10.1 Overview

Review the following checklist before returning the unit to normal operation after any maintenance, repair, or inspection work is completed:

1. Replace any guards that were removed to perform the maintenance, repair, or inspection work.
2. Reactivate any safety devices that were deactivated to perform maintenance, repair, or inspection work.
3. Perform any testing before the unit is returned to normal operation.

7 Service Parts

This section includes the list of recommended spare parts to stock, instructions for ordering parts, and contact information for Kadant Emergency Service.

7.1 Contact Information for Ordering Parts

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

Kadant recommends keeping spare parts on hand for repairs or routine maintenance. Parts can be ordered by contacting Kadant.

Kadant Black Clawson LLC

Business Hours: 1-513-229-8100

North America 24-Hour Emergency Service: 1-800-448-5422

Global 24-Hour Emergency Service: 1-888-535-3993

Fax: 1-513-229-8197

1425 Kingsview Dr.
Lebanon, Ohio 45036

Kadant Fiberline (China) Co., Ltd

Business Hours: +86-537-207 3188/+86-156 5379 5398

China 24-Hour Emergency Service: +86-139 1009 8235

Fax: +86-537-2073002

No. 99 Jidiyanyilu
High-New Technical Industry Development District
Jining, Shandong 272023, P.R. China

Kadant Lamort SAS

Business Hours: +33 (0) 3 26 74 80 80

Fax: +33 (0) 3 26 72 08 33

Lamort 24-Hour Emergency Service: +33 6 61 79 21 87

39, rue de la Fontaine Ludot BP 30046
51302 Vitry-le-Francois cedex
France

7.2 Recommended Parts

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

NOTICE

Do not modify the equipment without written authorization from Kadant. Unauthorized modification may impair function, shorten equipment life, render built-in safety features useless, may void the warranty, and result in serious personal injury or death.

When ordering spare parts or requesting a parts list:

- Refer to the Certified Drawings and provide:
 - Item number
 - Drawing number
 - Part description
 - Product identification numbers
 - Product identification numbers include serial number, shop order number, and model number.
- Generally, allow eight to twelve weeks for delivery.
- Refer to the Certified Drawings for individual part numbers or contact Kadant.

7.2.1 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.

7.2.2 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 the Certified Drawings for part numbers.

7.3 Recommended Spare Parts

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.



Please refer to the additional Spare Parts List document for the spare part details.

8 Glossary

This section includes a list of terms and definitions that may be specific to this Product Manual, equipment, or industry.

8.1 General Terms and Definitions

Thoroughly read Section 2, Safety of this Product Manual before attempting to operate or maintain the equipment.

Table 8-1: Glossary of Terms

Term	Synonym(s), Definition, Function
Absolute Viscosity	Absolute Viscosity is the kinematic viscosity corrected to overcome the variations caused by the differences in specific gravity. The centipoise is one hundredth of a poise and is the unit of absolute viscosity most used. The relation between absolute and kinematic viscosity is as follows: $\frac{\text{Centipoises}}{\text{Specific Gravity}} = \text{Centistokes or Centipoises} = \text{Centistokes} * \text{Specific Gravity}$
AGMA	American Gear Manufacturers Association
API Gravity	API Gravity is an arbitrary scale (chosen by the American Petroleum Institute) to measure how heavy or light a petroleum liquid is compared to water where the specific gravity of pure water is taken as 10. Liquids lighter than water have values greater than 10; liquids heavier than water have values less than 10. $\text{Degrees API} = \frac{141.5}{\text{SG } 60/60\text{F}} - 131.4$ S.G. = Specific Gravity F = Degrees Fahrenheit
Backlash	Running clearance between mating gear teeth.
Bangor Irons	Bangor irons sweep across wear plate and extraction plate to keep containments from getting under rotor and rotor body.
Cavitation	Cavitation is the formation and collapse of vapor bubbles in a liquid and is a significant cause of wear in some cases.
Cementitious Grout	Cementitious Grout is a mixture of hydraulic cement and water, used where concrete is not suitable because of limitations or restrictions on coarse-aggregate contents. It has the consistency of a viscous liquid.
Centipoise (cP)	A Centipoise is a centimeter-gram-second unit of dynamic viscosity equal to 0.01 poise. The centipoise is derived from the kinematic unit of viscosity, the centistoke, by multiplying it by the specific gravity of the fluid. The viscosity of water at 20 degrees Centigrade is one centipoise. Centipoise = Centistoke * Specific Gravity
CFM	Cubic Feet per Minute
Confined Space	An area which has adequate size and configuration for entry, has a limited means of access or egress, and not designed for continuous occupancy.
Cross Tie Braces	Cross Tie Channels
cSt	Centistokes The unit of Kinematic Viscosity is the Centistoke. Kinematic Viscosity in Centistokes = Ct C = Viscometer Constant t = Observed flow time in seconds.
D.O.D.	Diameter of Discharge
D.O.S.	Diameter of Suction

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

Term	Synonym(s), Definition, Function
DCS	Distributed Control System
EEPROM	Electrically Erasable Programmable Read-Only Memory. EEPROM is a type of non-volatile memory used in computers, usually integrated in microcontrollers such as smart cards and remote keyless systems, or as a separate chip device to store relatively small amounts of data by allowing individual bytes to be erased and reprogrammed.
EMI	Electromagnetic Interference is a disturbance that affects an electrical circuit due to either electromagnetic induction or electromagnetic radiation emitted from an external source. This disturbance may interrupt, obstruct, or otherwise degrade or limit the effective performance of the circuit. These effects can range from a simple degradation of data to a total loss of data.
Expansion Bearing	Free Bearing
Extraction Plate	Bed Plate, Attrition Plate; a perforated plate through which accepted stock is induced by rotor and vacuum action.
Friction Head (h_f)	A Friction Head is the head required to overcome the resistance to flow in the pipe and fittings. It depends on the size and type of pipe, flow rate, and liquid nature.
Gear Box	Drive: A gear reducer which transmits high RPM of a horizontally motivated motor to lower RPM of a vertically mounted shaft.
GPM	Gallons per Minute is a unit of volumetric flow rate.
Head (H)	Head is a term for expressing pressure. The pressure at any point in a liquid can be thought of as being caused by a vertical column of the liquid which, due to its weight, exerts a pressure equal to the pressure at the point in question. This column's height is called the static head and expressed in feet of liquid. The static head corresponding to any specific pressure is dependent upon the weight of the liquid according to the following formula: $\text{Head in Feet} = \frac{\text{Pressure in PSI} * 2.31}{\text{Specific Gravity}}$
Horsepower (HP)	Horsepower is the name of several units of measurement of power, the rate at which work is done. 1 HP = 746 Watts
Junk Trap	A Junk Trap, also known as a junk chamber, junk box or Trashwell, is made to handle reject media. Water flush/fill and air bleed connections are near the tank top and three are near the lower end to prevent clogging and congestions in dead corners.
Kilopascal (kPa)	A kilopascal is a pressure measurement unit.
Kilowatt (kW)	A Kilowatt is a unit of energy equal to 1000-Watt hours.
Kinematic Viscosity	Kinematic Viscosity is the property measured when a fixed amount of oil flows through a capillary tube under the force of gravity. The unit of kinematic viscosity is the stoke or centistoke. An intermediate measurement in seconds can be converted to centistoke with the use of the viscometer (or viscosimeter) constant. Kinematic Viscosity, $cs = Ct$, where C = Viscometer Constant t = Observed flow time in seconds.
Lantern Ring	Seal Water Ring, Packing Box Bushing: A nylon, Teflon, cast iron, or brass ring in a packing arrangement at which point water is injected into packing.
Locked Out	The condition of a unit which has had one or more locks applied to positively stop and prevent it from unexpected startup, release of hazardous energy (e.g., electric, compressed air, steam, hydraulic, mechanical, etc.), or release of harmful substances.

Intelligent Grapple Hoist

Models: 4' (1.2 m) | 6' (1.8 m)

Term	Synonym(s), Definition, Function
LPM	Liters per Minute is a unit of volumetric flow rate.
M.D.	Mounting Distance is the axial position of a spiral bevel or hypoid gear and pinion in assembly is given by a dimension called mounting distance. This is linear dimension from axial locating surface of a given member to a crossing point of its axis with that of its mate.
Non-expansion Bearing	Does not allow linear expansion of shaft due to thermal expansion.
NPSH	The Net Positive Suction Head is the difference between the suction head and the liquids vapor head. The total suction head in feet absolute, determined at the suction nozzle and corrected to datum, less the vapor pressure of the liquid in feet absolute. It is an analysis of energy conditions on the suction side of a pump to determine if the liquid will vaporize at the lowest pressure point in the pump.
NPSHA	The Net Positive Suction Head Available is a function of the system in which the pump operates. It is the excess pressure of the liquid in feet absolute over its vapor pressure as it arrives at the pump suction.
NPSHR	Net Positive Suction Head Required is a function of pump design. As liquid passes from pump suction to eye of impeller, velocity increases and pressure decreases. There are also pressure losses due to shock and turbulence as liquid strikes the impeller. Centrifugal force of impeller vanes further increases velocity and decreases pressure of liquid. NPSHR is positive head in feet absolute required at pump suction to overcome these pressure drops in pump and maintain liquid above its vapor pressure. NPSHR varies with speed and capacity within any pump.
OCC	Old Corrugated Containers, also referred to as corrugated boxes, are used to store, ship, protect and identify goods. A corrugated box has flat, outer sheets of dense fiber which sandwich an inner ruffled or "corrugated" layer.
OD T/D	Oven-Dried Tons per Day
OEM	An Original Equipment Manufacturer is a company whose products are used as components in another company's product.
Packing Box	Stuffing Box. A machined passage at bottom center of a pulper which shaft passes. Packing box contains compressed fibrous packing to control leakage.
Packing Box Water	Gland Water, Seal Water. Water added to a packing box at lantern ring to cool and lubricate packing and shaft sleeve.
Packing Sleeve	Wear Sleeve. A replaceable sleeve mounted to shaft on which packing rides
Pressure Head	Pressure Head represents the internal energy of a fluid due to the pressure exerted on its container. Pressure Head must be considered when a pumping system either begins or terminates in a tank which is under some pressure other than atmospheric. The pressure in such a tank must first be converted to feet of liquid. A vacuum in the suction tank or a positive pressure in the discharge tank must be added to the system head, whereas a positive pressure in the suction tank or vacuum in the discharge tank would be subtracted. The following formula converts inches of mercury vacuum into feet of liquid: Note: Vacuum is abbreviated to Vac. $\text{Vac., Ft. of Liq.} = \frac{\text{Vac., in. of Hg} * 1.13}{\text{Specific Gravity}}$
PSI	Pounds per Square Inch and Pounds per Square Inch Gauge have the same meaning in this manual which is a unit of pressure or of stress.
PSIG	Pounds per Square Inch Gauge. See PSI (Pounds per Square Inch).
Rotor	Vane Plate. Propeller-like rotating element that sweeps extraction plate.

Intelligent Grapple Hoist

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Term	Synonym(s), Definition, Function
Rotor Body	Hub. Hub of rotating assembly which is fixed to shaft and has rotor affixed to it.
Secondary Fiber Applications	Describes the uses for pulp fiber that have a previous history of incorporation in paper or paperboard products.
SOP	Standard Operating Procedure. An established procedure to be followed for executing a given operation or a particular situation.
Spargers	Spargers are nozzles around lower inside perimeter of a tank (in sparger tank section) that create stock directional flow by streaming air.
Static Discharge Head	Static Discharge Head is the vertical distance in feet between the pump centerline and the point of free discharge of the surface of the liquid in the discharge tank.
Static Head	Static Head is the pressure of a fluid due to the head of fluid above some reference point.
Static Suction Head	Static Suction Head is the vertical distance in feet from the centerline of the pump to the free level of the liquid being pumped.
Static Suction Lift	Static Suction Lift is the vertical distance in feet from the centerline of the pump down to the free level of the liquid source below the pump.
Suction Head (h_s)	Suction Head exists when the liquid supply level is above the pump centerline or impeller eye.
Suction Lift	Suction Lift exists when the source of supply is below the centerline of the pump.
SUS	Saybolt Universal Seconds. There are various instruments called viscometers or viscosimeters for measuring viscosity. The most widely used in the United States are kinematic and Saybolt Universal. The Saybolt Viscometer's unit of measure is time in seconds required for 60 ml of fluid to flow through an orifice at a given temperature. Results are reported as Saybolt Universal Seconds. For example, 350 SUS at 100 degrees Fahrenheit (38 degrees Centigrade).
T.I.R.	Total Indicated Runout is a measure of eccentricity of a shaft or bore usually measured by a dial indicator.
T/D	Tons per Day
Tagged Out	The condition of a unit which has a tag securely attached to an energy-isolating mechanism, such as a lock, to alert personnel that the equipment is not to be operated until the tag is removed. See also: Locked Out .
Temperature Differential	Difference between operating temperature and cooling dilution temperature. If operating temperature is 140 degrees Fahrenheit (60 degrees Centigrade), minimum cooling dilution temperature is 90 degrees Fahrenheit (32 degrees Centigrade).
Total Dynamic Discharge Head (h_d)	The Total Dynamic Discharge Head is the static discharge head plus the velocity head at the pump discharge flange plus the total friction head in the discharge line. The total dynamic discharge head, as determined on pump test, is the reading of a gage at the discharge flange, converted to feet of liquid and corrected to the pump centerline, plus the velocity head at the point of gage attachment.
Total Dynamic Head	Total Dynamic Head (TDH) is the total equivalent height that a fluid is to be pumped considering friction losses in the pipe. The total dynamic discharge head minus the total dynamic suction head or plus the total dynamic suction lift. $TDH = h_d + h_s$ (with a suction lift) $TDH = h_d - h_s$ (with a suction head)

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Models: 4' (1.2 m) | 6' (1.8 m)

Term	Synonym(s), Definition, Function
Total Dynamic Suction Head (h_s)	The Total Dynamic Suction head is the static suction head plus the velocity head at the pump suction flange minus the total friction head in the suction line. The total dynamic suction head, as determined on pump test, is the reading of the gage on the suction flange, converted to feet of liquid and corrected to the pump centerline, plus the velocity head at the point of gage attachment.
Total Head (H)	The Total Head, formerly known as the Total Dynamic Head, for a specific system is equal to the total discharge head (h_d) minus the total suction head (h_s) or plus the total suction lift. It is recommended that total head calculations for the suction side be listed separately from those for the discharge side to help avoid the possibility of overlooking a troublesome suction condition.
Velocity Head (h_v)	Velocity Head is the velocity of a fluid expressed in terms of the head or static pressure required to produce that velocity. It equals $pv/2$ where p is the density of the fluid and v is the velocity. In hydrology the density of water can be written $1/G$ where G is the gravitational constant.
Viscosity	Viscosity is a measure of flowability at definite temperatures. Change in viscosity indicates contamination or oxidation instability.
Viscosity Index	The Viscosity Index is an empirical number indicating the rate of change in viscosity of an oil within a given temperature range. A low viscosity index signifies a relatively large change in viscosity with temperature, while a high viscosity shows a relatively small change in viscosity with temperature.
Wear Strips	Deflector Strips
ZES	Zero Energy State. ZES has been reached when the following has been achieved: 1. Every power source that can produce a unit member movement has been locked off; 2. Pressurized fluid (air, oil, or other) power lock-offs (shut-off valves), if used, will block pressure from the power source and will reduce pressure on the unit-side port of that valve by venting to atmosphere or draining to tank; 3. All accumulators and air surge tanks are reduced to atmospheric pressure or treated as power sources to be locked off, as stated in Step 1 and Step 2; 4. The mechanical potential energy of all portions of the equipment is at its lowest practical value--so that opening of pipe(s), tubing, hose(s), or actuation of any valve(s) will not produce a movement that could cause injury; 5. Pressurized fluid (air, oil, or other) trapped in the equipment's lines, cylinders, or other components is not capable of producing equipment motion upon actuation of any valve(s); 6. The kinetic energy of the equipment members is at its lowest practical value; 7. Loose or freely movable equipment members are secured against accidental movement. Note: A workpiece or material supported, retained, or controlled by the equipment shall be considered as part of the equipment if the workpiece or material can move or can cause equipment movement.