VRC Vertical Reciprocating Conveyor

V1.1 72023

Documentation

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System Modifications/Disclaimer

Mechanical or electrical modifications performed on the VRC not approved by PWI may also void any warranty and/or service agreements. Please contact the PWI Sales or Service Department for assistance with service modifications.

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INTRODUCTION

Thank you for purchasing a PWI, Vertical Reciprocating Conveyor (VRC). VRCs are designed for the movement of materials only, up to its rated capacity, from one level to the next. VRCs are specifically exempt from the National Elevator Code, having their own national code (ANSI/ASME B20.1). All electrical designs and components are in accordance with National Electric Code (NEC) requirements.

NOTE

The information and illustrations in this manual are intended only as an aid to understanding the VRC's general installation. It does not cover every possible contingency or circumstance regarding non-standard options or site conditions.

If you have a problem, call PWI at (574) 646-2015, between 7:00 A.M. and 3:00 P.M., EST, Monday through Friday.

Parts - PWI maintains a complete stock of, or has access to, all replacement components.

Service - Our Service Department is available to assist your maintenance personnel with any questions or problems they may have regarding the equipment.

Feedback - Let us know how we are doing. A questionnaire is included in the installation manual. Please fill it out and return it to us. We can't prevent a problem if we are not aware of it.

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SAFETY

To ensure your safety and the safety of those around you, it is important that you read, understand, and follow ALL the safety precautions relative to a particular task. Safety precautions in this manual are labeled with the alert symbol followed by the word DANGER, WARNING or CAUTION.

! DANGER

When you see this symbol, it means that serious injury or death is likely to occur if the instructions are not followed carefully.

! WARNING

When you see this symbol, it means that the potential for personal injury is high if directions are not followed carefully.

CAUTION

When you see this, it means that the potential for damage to the equipment is high if directions are not followed carefully.

NOTE
This term is used to provide additional information to help clarify instructions.

! DANGER

HIGH VOLTAGE. Failure to follow proper procedures when performing electrical installation or service may result in serious injury or death.

! DANGER

DO NOT ride this equipment. Riding may result in injury or death. VRCs ARE NOT ELEVATORS.

! DANGER

DO NOT walk or work under a raised platform.

! DANGER

if you can open a gate when the unit is not at that level, or the unit will operate with a gate open, a safety device is not working and could result in serious injury or death.

! WARNING

DO NOT operate the unit if either the gates or interlocks are not functioning properly.

CAUTION

DO NOT exceed rated capacity.
Electrical Safety Precautions

! DANGER

Always follow OSHA procedures for locking out the control panel ANYTIME maintenance or service is being performed on the unit. Put a lock and tag on disconnects, breakers, and/or pulled fuses.

PWI Strongly recommends contacting our service team in the event of any repairs or breakdowns. In the event electrical repair or maintenance work is required that prohibits de-energizing the circuits involved, extreme measures of safety must be used. The work should be accomplished only by well-supervised personnel who are fully aware of the dangers involved. Every care should be taken to protect the person performing the work and to use all practical safety measures.

Safety Precautions When Working on Live Circuits or Equipment:

- Use a voltage tester on circuits - Use fuse pullers to change a fuse. Covers on exposed electrical devices or wires MUST be installed to protect personnel from injury or shock.

- ALL metal connection boxes, switch boxes, starting boxes, transformer shells, and motor frames must be grounded to prevent shock to personnel.

SAFETY - continued

- Avoid accidental contact with equipment or conductors which are known to be live or are NOT known to be dead. If it is necessary to work on equipment while it is hot, extra care must be observed. Always test and repair equipment that indicates a warning of unsafe conditions by giving a nonfatal shock. NEVER assume that because the warning shock is nonfatal, the next shock will also be nonfatal.
- TAKE TIME TO BE CAREFUL! Following safety precautions and using common sense will prevent injury, mutilation, or death.

MECHANICAL OVERVIEW

Each Vertical Reciprocating Conveyor (VRC) has two towers or column assemblies, a header assembly, a lifting hoist, a moving carriage (platform), interlocked safety gates or doors, and safety caging at all levels. In addition, there is a main control panel and one push button station per level. More information on the electrical components can be found in areas within this section of the manual.

The TOWERS consist of two vertical guide columns. These are anchored to the floor at the first level, support the header assembly at the top, and braced to the building/mezzanine structure. Exact bracing used may vary by application. See Figure 2.

The HEADER ASSEMBLY consists of a beam or channels, Hoist suspension point, and is bolted to the top of the Tower assemblies. See Figure 2.

SAFETY GATES or DOORS accessing the lift area are electro-mechanically interlocked. The interlock prevents movement of the carriage when a gate is open. The opening of a gate when the lift is not present at a level is prevented by the mechanical interlock. See Figure 2.

PWI Industries uses various styles of interlocks depending upon the gate type and application. The Parts section of this manual contains views with part numbers. See Figure 11.

SAFETY CAGING, in accordance with ANS1/ASME B20.1, is installed at all levels as either a full or partial enclosure preventing accidental contact with moving parts. See Figure 2.

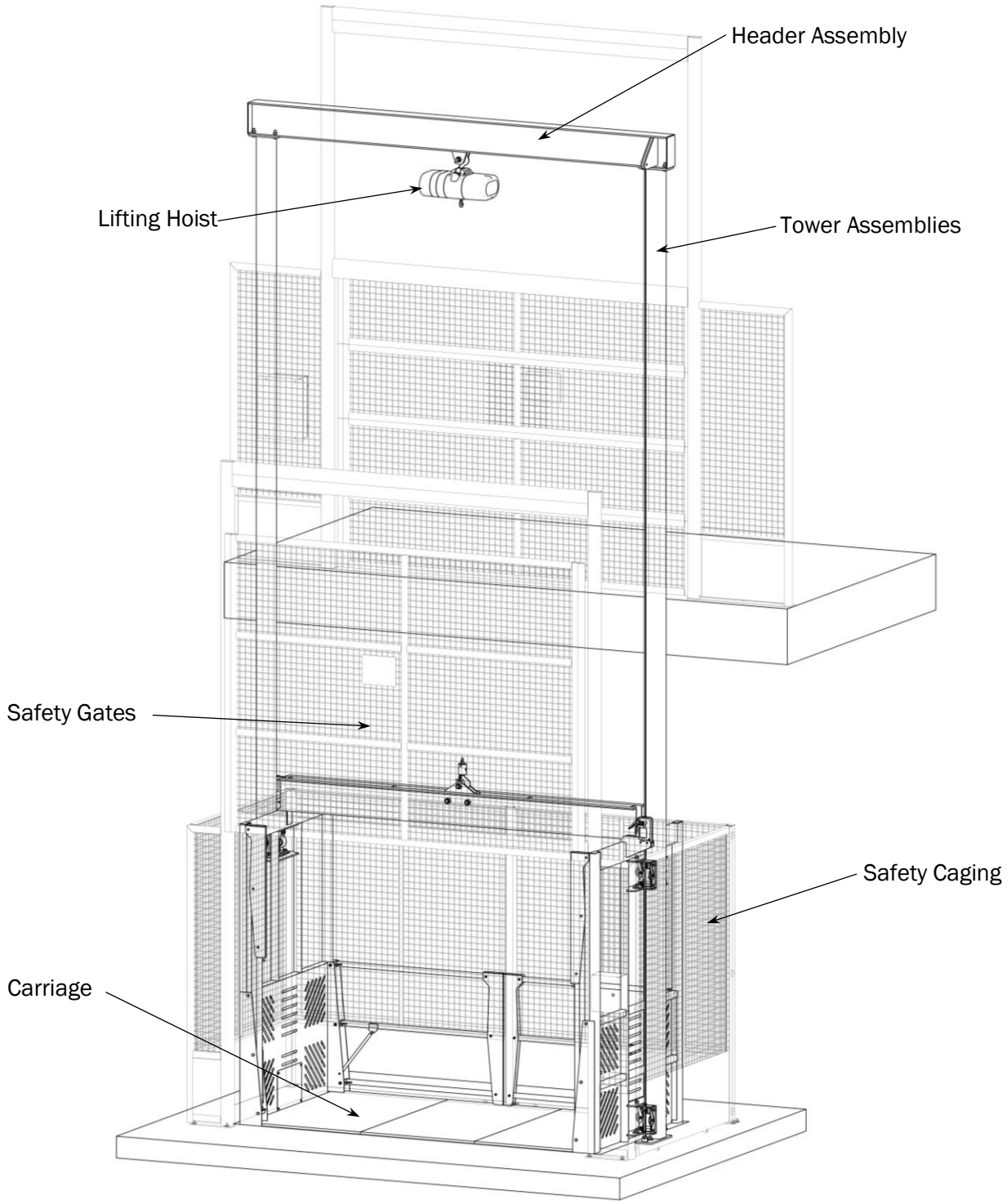
Header Assembly
Lifting Hoist
Tower Assemblies
Safety Gates
Safety Caging
Carriage

Figure 2

The CARRIAGE consists of a deck, carriage gates, uprights, carriage header, and four guide assemblies. The carriage header is attached to the top of the uprights and is the attachment point for the hoist lower hook. The Guide Assemblies are bolted to the carriage uprights and ride along each Tower guiding the carriage during travel. The Carriage also has gates the prevent materials from contacting safety gates or safety cage during travel. See Figures 3 and 4.

The hoist chain connects to a slack chain device which consists of two weighted lower attachment plates and a limit switch. Therefore, all lifting is done by the hoist chain through the slack chain device connected to the Carriage Header.

Should the hoist chain go slack, the lower attachment plates pivot down losing contact with the limit switch shutting off power supply to the Lifting Hoist

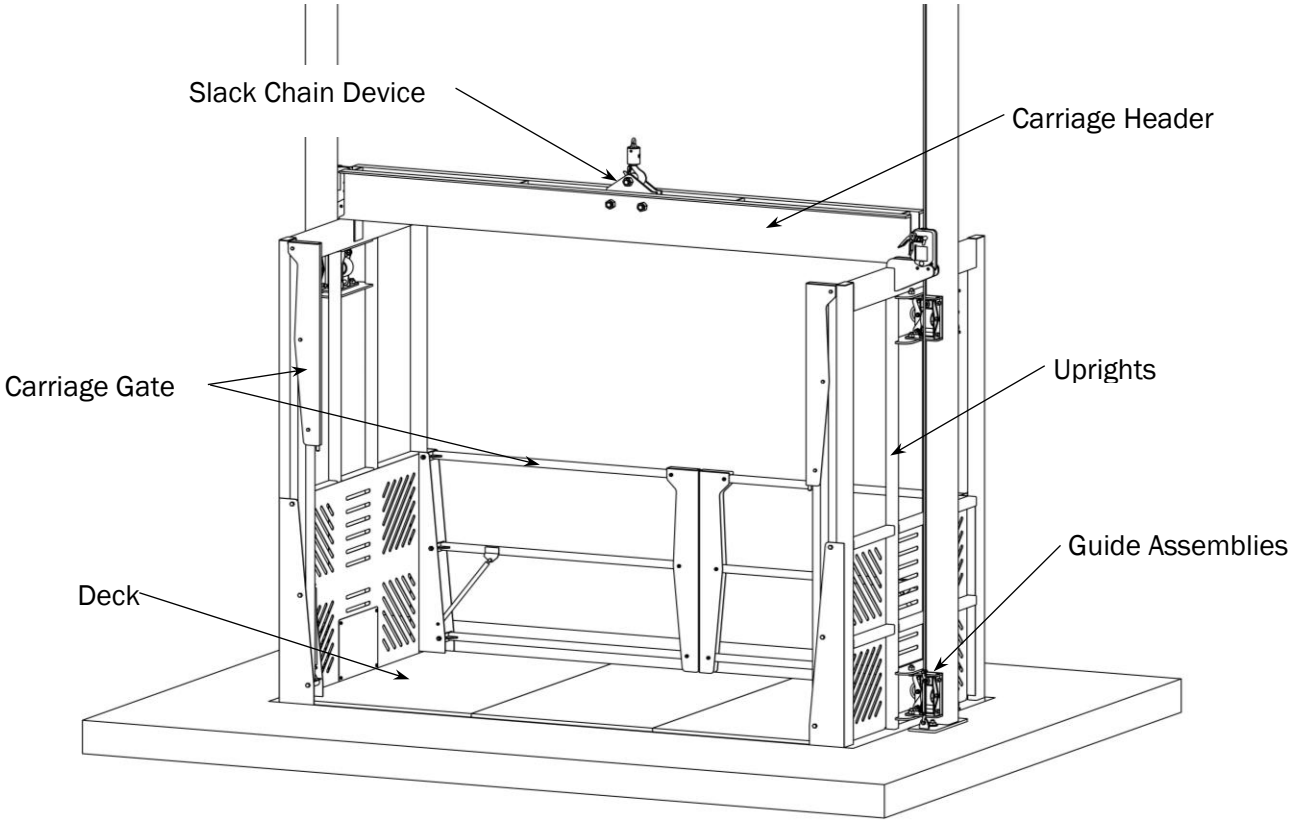

Figure 3

The SECONDARY BRAKING DEVICE is attached to the carriage upright on both sides of the carriage near each tower. A Safety Wire Rope is secured to the main header and passes through the Secondary Braking Device. The Secondary Braking Device operates automatically. A Centrifugal detector continuously monitors the speed of the wire rope as it passes through. In the event of any sudden increase in speed a pair of jaws automatically locks onto the safety wire rope stopping any additional travel. See Figure 4

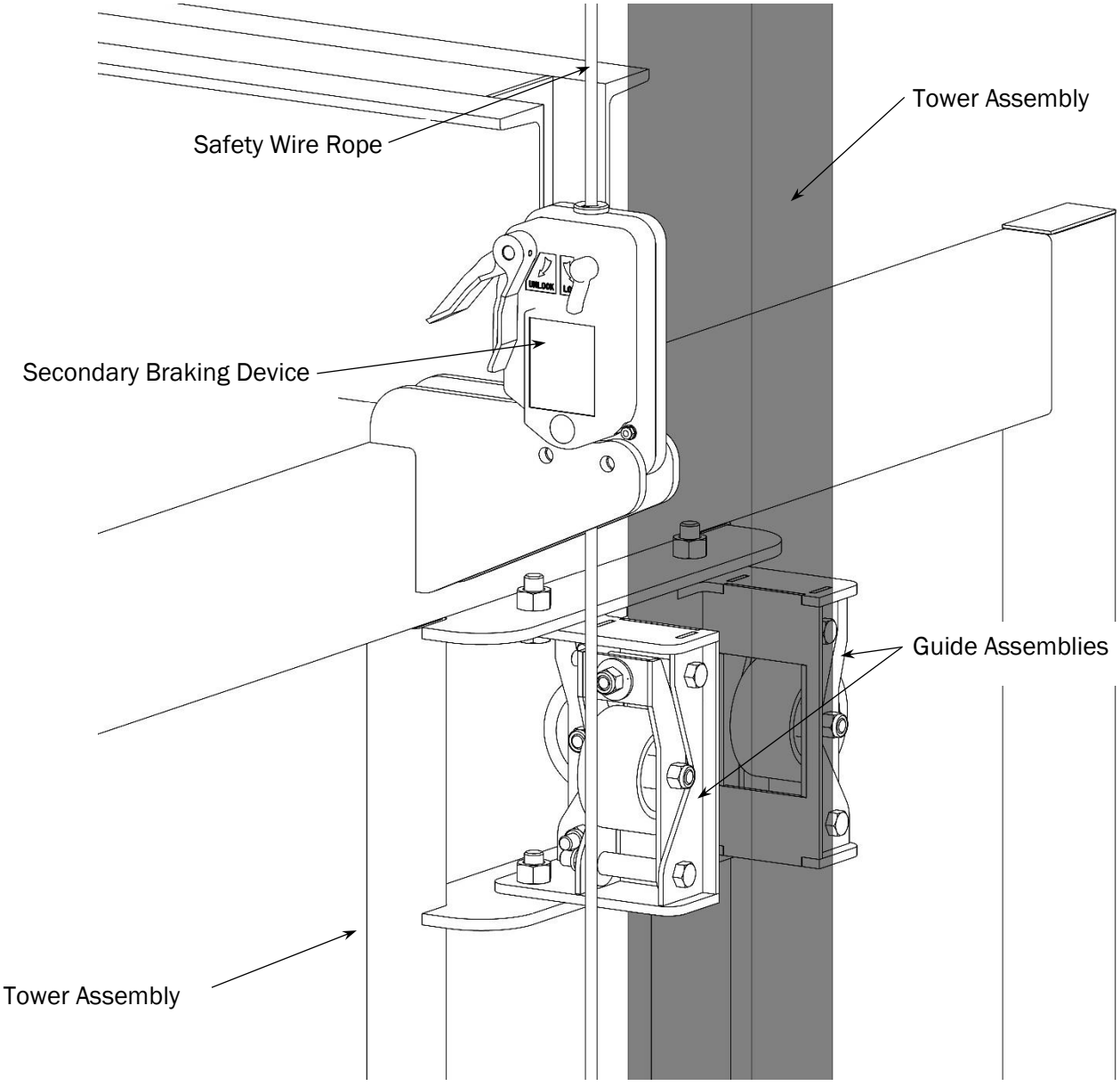

Figure 4

ELECTRICAL OVERVIEW

Electrical Overview

NOTE

The following is a standard description of the electrical wiring of the VRC ONLY. It DOES NOT include specifics on options or custom application.

All electrical devices are tied into the MAIN CONTROL PANEL. which contains a fused transformer, that reduces the high voltage needed for the motor down to the voltage required to operate the control circuit, motor starter and push button stations. Overload heaters are provided to protect the motor should excessive current draw cause overheating.

PUSH BUTTON STATIONS. One station is normally supplied for each level. ANSI/AME B20.1 code requires that they be remotely located so they cannot be activated by someone standing on the carriage. Each station has an UP, DOWN, START, and EMERGENCY STOP button.

The UP and DOWN switches are momentary contact. This allows the operator to depress the button and let go. The EMERGENCY STOP button is pushed to activate but will stay in and must be pulled back out for the unit to operate.

Required by NEC code, the MAIN DISCONNECT should be fused, lockable, and located within line of sight of the control panel. (Not supplied by PWI.)

The LIFTING HOIST unit contains the brake so only the hoist will need be wired. The hoist also contains the upper and lower limits

There are two LIMIT SWITCHES incorporated into a standard two-level unit: one at each level to stop the carriage vertical travel. All switches require field mounting and wiring. Units servicing more than two levels require two additional switches for each intermediate level.

WARNING

All gates or doors accessing the lift area are electro-mechanically INTERLOCKED to prevent the lift from operating if a gate is open when the carriage is at that level and mechanical locks to lock the gate until the carriage is at that landing.

Different types and styles of interlocks are supplied depending upon the type of gate and onsite conditions. Standard styles incorporate from one to four electrical components per gate.

SEQUENCE OF OPERATION

NOTE

For the unit to operate:

- All gates must be closed.
- Loads are not to hang over the edge or sides of the carriage.
- The load must be within the specified lifting capacity limit.

1. When the desired floor level button is pressed, the coil in the motor starter magnetically closes the high voltage contacts, and the power circuit to the motor starter is completed to turn the motor in the needed direction.

2. Now the brake is released. The motor turns which in turn rotates the internal liftwheel raising or lowering of the lift chain. (Because the motor starter is reversible, the direction of travel can be alternated.) The lift chain is fastened to the slack chain device, which is bolted to the carriage header raising or lowering the carriage

3. When the carriage arrives at the next level, the floor level limit switch (one per level) is activated by a carriage position. When activated, this switch cuts the power to the motor circuit, the motor starter contacts drop out /(opens); the motor stops; and the brake is applied stopping and holding the carriage position.

4. The carriage overtravel limit switch is the upper limit of the hoist. If there is a failure of the top floor level limit switch, this limit switch is activated by the chain position, and it will send a signal to shut the unit down. Before activating the unit, have a qualified electrical controls technician find out why this occurred and correct the problem.

5. When excessive motor current draw causes overheating, the instantaneous overload (jam) overcurrent sensor relay will protect the lift motor by cutting off the power to the control circuit. This will happen when the unit is loaded beyond its rated capacity.

6. When the lift chain goes slack or breaks, the slack chain switch will activate, cutting off the power to the hoist and applying the brake.

7. The slack chain device is composed two weighted lower attachment plates and a limit switch.

8. The slack chain limit switch is mounted to the carriage header and wired "normally open, held closed!' If the hoist chain becomes slack or is broken, the attachment plate will rotate to its static position, and the limit switch will open cutting power to the hoist circuit. The hoist stops, the brake is applied, and the carriage will stop. The unit will not operate until the hoist chain is repaired and the attachment plates contact limit switch. Before reactivating the unit, have a PWI technician find out why this occurred and correct the problem.

OPERATION

BEFORE OPERATING THE LIFT, PLEASE READ, UNDERSTAND AND FOLLOW ALL THE SAFETY PRECAUTIONS LISTED BELOW.

! DANGER

Malfunctioning interlocks may allow the door to be opened when the carriage is not present. YOU MUST MAKE SURE CARRIAGE IS PRESENT BEFORE WALKING THROUGH DOORWAY. If the carriage is not present, you could fall into the empty hoist-way and be seriously injured or die!

! DANGER

Door must be closed and locked unless carriage is present. Door interlock must be operational. It prevents door from being opened when carriage is not present. The door restricts personnel from falling into opening or from being struck by moving parts that could result in serious injury or death!

! DANGER

DO NOT ride this equipment. Riding may result in serious injury or death! VRCs ARE NOT ELEVATORS.

! DANGER

DO NOT walk or work under a raised carriage (platform). Secure the carriage during maintenance.

! WARNING

Only trained persons shall be permitted to operate or maintain this equipment. Improper operation or maintenance may cause serious injury or death!

! WARNING

If at any time proper operation or performance of your PWI VRC is in question, DO NOT USE IT! Notify your supervisor or the proper maintenance people immediately.

CAUTION

DO NOT allow loads to overhang the sides of the carriage. This will result in damage to the equipment and merchandise.

CAUTION

DO NOT exceed the rated lift capacity.

TO OPERATE LIFT

- Close gate.
- Depress and release the appropriate push button to move the carriage to the desired floor. The carriage will stop when it reaches the appropriate level.
- When the unit has arrived at the appropriate level and comes to a complete stop, open the gate.
- If an emergency occurs when the carriage is moving, push the EMERGENCY STOP button. The button will keep the lift inoperative until the button is pulled back out.

NOTE

Service must be performed by authorized personnel only Read the Owner's Manual before operating the equipment. For service, PWI.

MAINTENANCE SCHEDULE

Your VRC requires consistent minimal and basic periodic attention. Frequent Inspections should be performed by the operator, but it is recommended that a qualified person perform and document periodic inspections. Any issues or problems must be addressed immediately as they may affect the performance and or safety of the VRC. The below recommendations are based on normal service as defined in ASME B30.16 (service that involves operation with randomly distributed loads within the rated load limit, or uniform loads less than 65% of rated load for not more than 25% of the time for electric hoists). Periodic Inspections

Frequent Inspection Items		
ITEM	ACTION	Frequency
Lifting Hoist - Hook	Insure Good condition, No damage, Crack, Bends at throat	Monthly
Lifting Hoist – Chain	Insure Good condition, No Crack, Nicks, No Twist	Monthly
Lifting Hoist - Sounds	Listen for unusual sounds	Daily
Lifting Hoist - Operation	Insure control function and holding brake (no slippage)	Daily
Secondary Braking Device	Inspect Wire Rope for defects: Bends, Kinks, Broken Wires. Keep wire rope clean	Daily
Secondary Braking Device	During operation check through inspection window to insure centrifugal weights are rotating	Daily
Secondary Braking Device	No obvious defects or damage	Monthly

Periodic Inspection Items		
ITEM	ACTION	Frequency
Lifting Hoist	All Hoist items listed above	Annually
Lifting Hoist	Loose or missing fasteners	Annually
Lifting Hoist – Chain	Check for evidence of wear, deformation, and elongation	Annually
Lifting Hoist – Liftwheel	Check for evidence of wear, widening or deepening of pockets. Also check chain guide for wear or burring	Annually
Lifting Hoist - Brake	Check air gap for excessive wear	Annually
Lifting Hoist – Attachment	Inspect all attachment and suspension points of evidence of damage, distortion, or wear.	Annually
Secondary Braking Device	All Items listed above	Annually
Secondary Braking Device	Measure for reduction in wire rope diameter	Annually

Maintenance		
ITEM	ACTION	Frequency
Lifting Hoist - Chain	Clean and Lubricate (Lubriplate Bar and Chain 10-R)	Monthly
Secondary Braking Device	Lubricate device and wire rope	Monthly

If you have any questions or problems, please feel free to contact PWI's Service Department for assistance.

TROUBLESHOOTING

TROUBLE	PROBABLE CASE	REMEDY
1) VRC Carriage will not move	A) Doors not closed or door interlocks not engaged	A) Check all doors are closed completely and interlocks are in place and not damaged
	B) E-Stop(s) depressed	B) Pull out
	C) Secondary Braking Device is locked	C) If possible, raise carriage and move Secondary Brake lever to unlocked position
	D) Slack Chain device is not in contact with limit switch.	D) Hold Slack Chain plates up to limit switch and raise hoisting chain. REMOVE CLAMP OR WHATEVER IS HOLDING DEVICE UP BEFORE RAISING OR LOWERING CARRIAGE
	E) Carriage hung up	E) See 1C and 1D
2)Safety Door won't open	A) Damage to Door or Track	A) Have repaired as needed
	B) Carriage has not traveled to limit	
	C) Electro Magnetic Door lock is locked	C) Insure its free of obstruction, repair/replace as needed
3)Carriage Deck not aligned with exit landing	A) Carriage hung up	Insure there is no obstruction on Tower Assemblies and/or Carriage
	B) Travel limit switch does not see carriage	B) Make adjustment to limits or travel
4)Carriage hitting floor	A) Travel limit switch does not see carriage	A) Make adjustment to limits or travel

For Troubleshooting Hoist issues please consult the manual provided by hoist manufacturer.

For Troubleshooting Secondary Braking issues please consult the manual provided by manufacturer.

Notes_____
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7-7-2022