VRC Vertical Reciprocating Conveyor

V1.1 72023

Documentation

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.

SAFETY - continued

- ALL metal connection boxes, switch boxes, starting boxes, transformer shells, and motor frames must be grounded to prevent shock to personnel.
- 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 drive assembly, two lifting sprockets, 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 DRIVE ASSEMBLY consists of a brake motor, speed reducing gearbox, a drive shaft, bearings, Lifting chain and sprockets. 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.

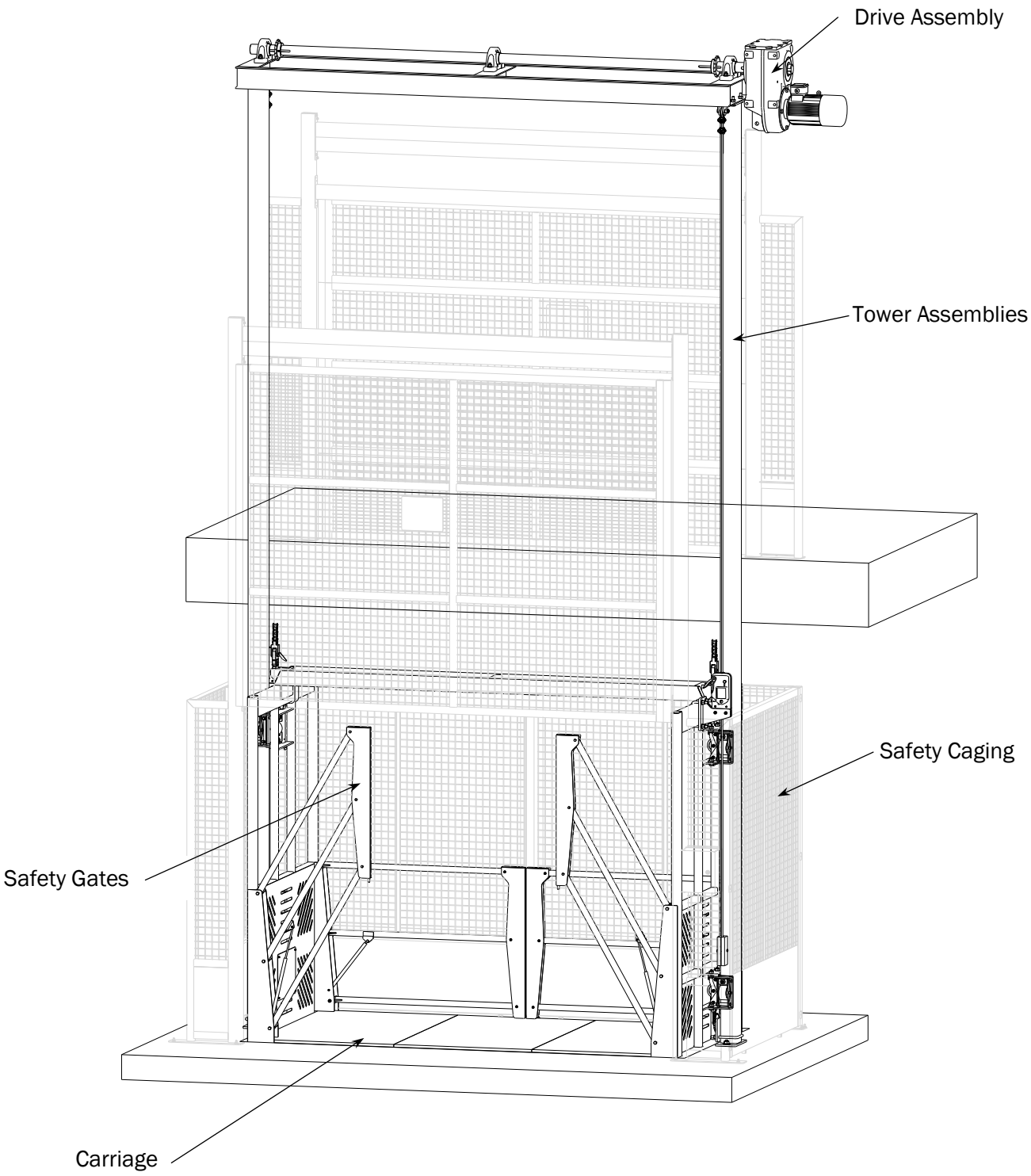
Drive Assembly
Tower Assemblies
Safety Caging
Safety Gates
Carriage

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 lifting chain. 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 lifting chain connects to a load cell which constantly monitors the total effected load. Therefore, should the load cell sense a load outside of the set parameters power to the drive assembly is halted.

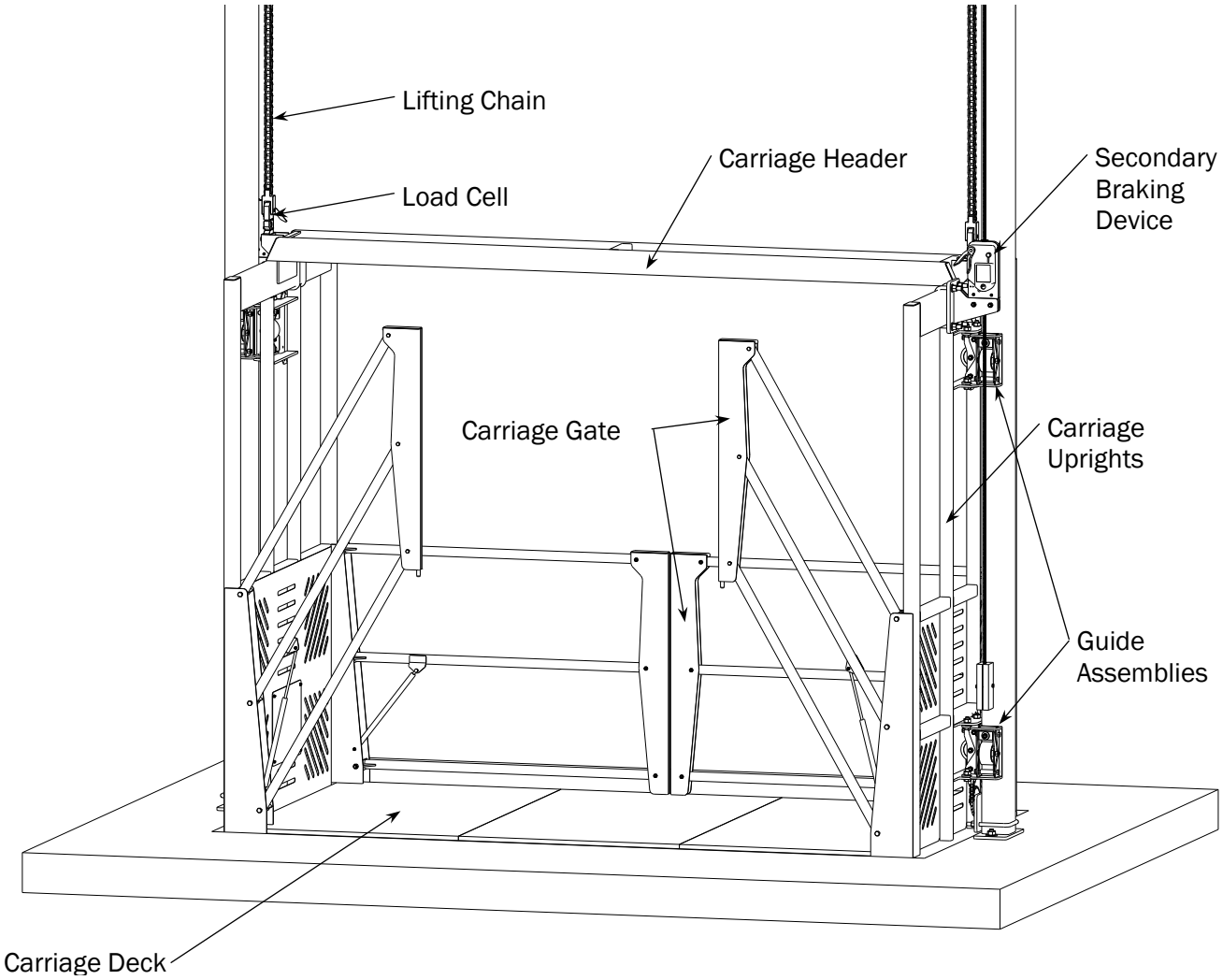

Figure 3

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

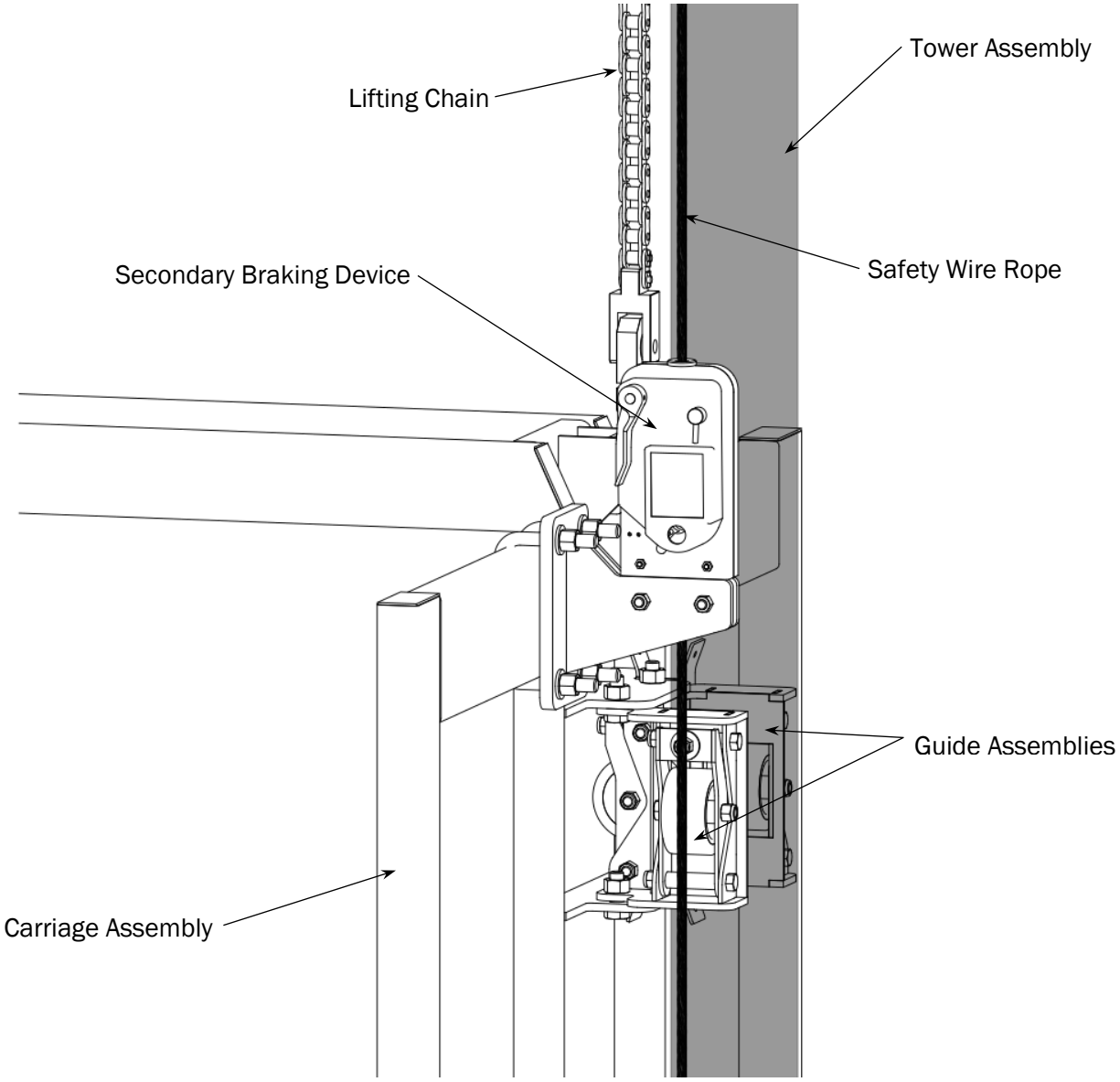

Figure 4

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, variable frequency drive (VFD) and push button stations. VFD is fused and provides protection to the motor from excessive current draw.

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. The standard PWI panel has an integrated disconnect.

The motor in the Drive Assembly contains the brake so only the motor will need be wired.

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 variable frequency drive (VFD) starts the motor in the needed direction.
2. Now the brake is released. The motor turns and through the speed reducer rotateing the drive shaft and the lifting sprockets raising or lowering of the lift chain. (Because the VFD is reversible, the direction of travel can be alternated.) The lift chain is fastened to a load cell, 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 the carriage position. When activated, the VFD interupts power to the motor circuit; the motor stops; and the brake is applied stopping and holding the carriage position.
4. The load cell monitors load for multiple reasons. In the event of the carriage getting hung up (descending) or a chain breakage the load cell will identify the load as below parameter and instantly cause an interruption in power to the drive motor. Additionally, if the carriage gets hung up (ascending) or is overloaded the load cell will identify the load as being above parameter and interrupt power to the drive motor.
5. In the event the lifting chain breaks, the carriage has two fall arrestors to prevent the carriage from dropping.

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.

Frequent Inspection Items		
ITEM	ACTION	Frequency
Lifting Chain Connections	Insure Good condition, No damage, Crack, Bends	Daily
Lifting Chain	Insure Good condition, No obvious signs of wear	Daily
VRC Operation	Without load check operation in both directions to ensure proper function and listen for odd noises	Daily
Speed Reducer Gearbox	Look for any signs of leakage	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 ensure centrifugal weights are rotating	Daily
Secondary Braking Device	No obvious defects or damage	Daily

Periodic Inspection Items		
ITEM	ACTION	Frequency
General	All Hoist items listed above	Annually
Speed Reducer Gearbox	Check lubrication	Annually
Drive Motor	Check appearance and brake	Annually
Lifting Chain	Check for evidence of wear, deformation, and elongation	Annually
Lifting Sprocket	Check for evidence of wear, widening or deepening of pockets.	Annually
Secondary Braking Device	All Items listed above	Annually
Secondary Braking Device	Measure for reduction in wire rope diameter	Annually

Maintenance		
ITEM	ACTION	Frequency
Guide roller casters	Clean and Lubricate	Monthly
Secondary Braking Device	Lubricate device and wire rope	Monthly
Drive Shaft Bearing	Lubricate	Monthly

The frequency of lift cycles and weight of product lifted impacts the service life of your VRC. Recording lift cycles per day may help you determine the frequency of service needed and intervals of routine maintenance. Replacement of worn and or damaged wear items will greatly increase the service life of this product.

If you have any questions or problems, please feel free to contact PWI's Service Department for assistance. See page 2.

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) 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

Notes:

7-7-2022