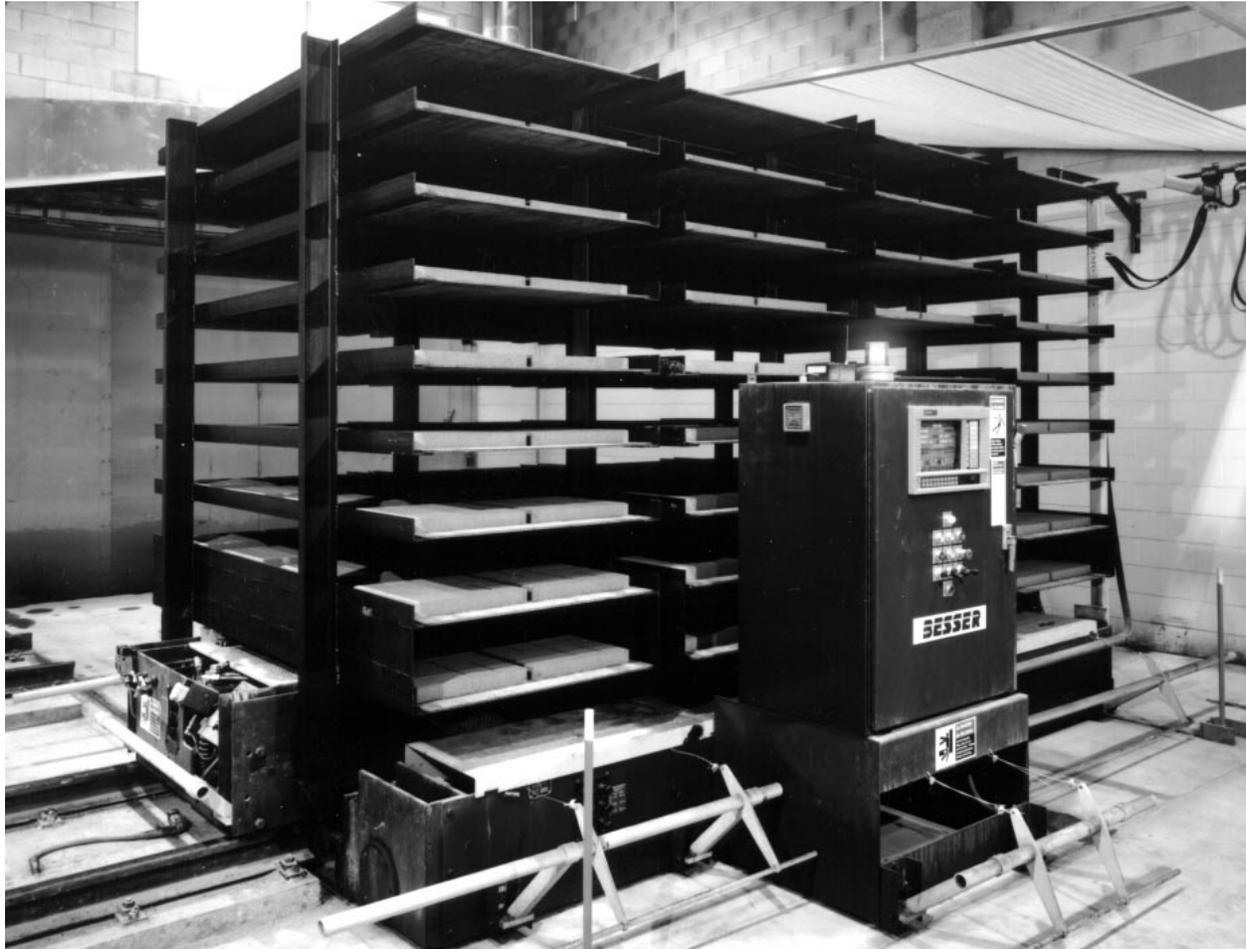




LSC-100

TRANSFER CAR SYSTEM



INSTALLATION MANUAL
466364F9601

JUNE 1997 • US\$250

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BESSER

COMPANY NAME:

SERIAL NUMBER:

ASSEMBLY NUMBER:

WIRING DIAGRAM NUMBER:

INSTALLATION DRAWING NUMBER:

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SPECIFICATIONS

TOTAL WEIGHT:

CAR: 11,300 Lbs [5130 Kg]
CRAWLER: 10,000 Lbs [4540 Kg]

MINIMUM HYDRAULIC PRESSURE:

850 psi [58 bar]

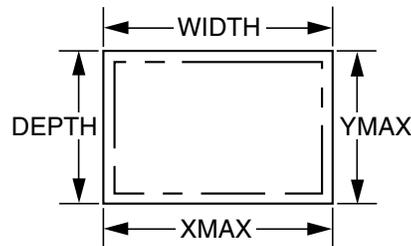
MACHINE SPEED:

Up to 10 cycles per minute

PRODUCTION CAPACITY:

Up to 4 bay x 9 high x 4 deep

PALLET REQUIREMENTS:



WIDTH & DEPTH = Actual size of steel pallet.

XMAX & YMAX = Maximum production area of steel pallet.

WIDTH	DEPTH	THICK	X	X	PALLET NO.
38.5" [978mm]	18.5" [470mm]	.375" [9.5mm]	37.5" [953mm]	17.625" [448mm]	470750F0012
38.5" [978mm]	20.5" [521mm]	.375" [9.5mm]	37.5" [953mm]	19.500" [495mm]	470750F0013
38.5" [978mm]	26.0" [660mm]	.375" [9.5mm]	37.5" [953mm]	25.000" [635mm]	470750F0014

Table 1.1 Steel pallet specifications

OPERATING CONDITIONS:

Besser machinery and equipment is designed to comply with the essential health and safety regulations (EHSR) that apply to directives which are applicable to an industrial environment.

Buyer shall utilize this equipment in a manner consistent with its design and only in an industrial environment.

OPERATING RANGES:

Here are the normal operating ranges for machine sensors (limit, proximity) and control devices contained within the control panels.

Ambient operating temperature range: 32° to 131°F [0° to 55°C]
Humidity range: 5 to 95% (non-condensing)
Line voltage: 85 to 132 volts – AC 50/60 Hz

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LSC-100**ELECTRICAL DATA****PLANT POWER SUPPLY:** 380 volt – 3 phase – 50 hertz**TOTAL ELECTRICAL CAPACITY:** 20.0HP [14.92Kw]**TOTAL AMP LOAD:** 41.42

Car Panel Control Transformer: 750 volt/amps

Crawler Panel Control Transformer: 500 volt/amps

BRANCH CIRCUIT

Distribution Switch Recommended: 60 amp

Fuse Recommended [FRS–R]: 50 amp

Feeder Recommended [THHN]: no. 8 AWG – 8.4 sq. mm

Feeder Conduit Recommended: .5 in. – 15 mm

SHORT CIRCUIT INTERRUPTING CAPACITY: 65,000 AIC

DEVICE (LOAD)	HORSEPOWER	KILOWATTS	AMPACITY
CAR POWER UNIT	10.0	7.46	16.95
CRAWLER POWER UNIT	10.0	7.46	16.95

Table 1.2 Car and crawler power units

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SAFETY BULLETIN

This notice is issued to advise you that some previously accepted shop practices may not be keeping up with changing Federal and State Safety and Health Standards. Your current shop practices may not emphasize the need for proper precautions to insure safe operation and use of machines, tools, automatic loaders and allied equipment and/or warn against the use of certain solvents or other cleaning substances that are now considered unsafe or prohibited by law. Since many of your shop practices may not reflect current safety practices and procedures, particularly with regard to the safe operation of equipment, it is important that you review your practices to ensure compliance with Federal and State Safety and Health Standards.

IMPORTANT

The operation of any machine or power-operated device can be extremely hazardous unless proper safety precautions are strictly observed. Observe the following safety precautions:

-  Always be sure proper guarding is in place for all pinch, catch, shear, crush and nip points.
-  Always make sure that all personnel are clear of the equipment before starting it.
-  Always be sure the equipment is properly grounded.
-  Always turn the main electrical panel off and lock it out in accordance with published lock-out/tag-out procedures prior to making adjustments, repairs and maintenance.
-  Always wear appropriate protective equipment, such as safety glasses, safety shoes, hearing protection and hard hats.
-  Always keep chemical and flammable material away from electrical or operating equipment.
-  Always maintain a safe work area that is free from slipping and tripping hazards.
-  Always be sure appropriate safety devices are used when providing maintenance and repairs to all equipment.
-  Never exceed the rated capacity of a machine or tool.
-  Never modify machinery in any way without prior written approval of the Besser Engineering Department.
-  Never operate equipment unless proper maintenance has been regularly performed.
-  Never operate any equipment if unusual or excessive noise or vibration occurs.
-  Never operate any equipment while any part of the body is in the proximity of potentially hazardous areas.
-  Never use any toxic flammable substance as a solvent cleaner.
-  Never allow the operation or repair of equipment by untrained personnel.
-  Never climb or stand on equipment when it is operational.

It is important that you review Federal and State Safety and Health Standards on a continual basis. All shop supervisors, maintenance personnel, machine operators, tool operators, and any other person involved in the setup, operation, maintenance, repair or adjustment of Besser-Built equipment should read and understand this bulletin and Federal and State Safety and Health Standards on which this bulletin is based.

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Sign	Description	Required
1	Electric Motor	1
2	All Machines.....	1
	All Panels	1
3	Mixer	4
4	Block Machine.....	1
	SF-7 Cuber	8
	BTO-6.....	2
	Overhead Block Transfer	3
	Depalleter.....	2
	AF-7 Block Pusher	2
5	Concrete Products Machine.....	1
6	Concrete Products Machine.....	1
7	Concrete Products Machine.....	2
8	Besser-Matic	4
9	Besser-Matic	4
10	Pallet Transport System	4
11	LSC-40	4
	Overhead Block Transfer	4
12	Conveyors	6
13	SF-7 Cuber	8
14	AF-7 Block Pusher	2
	Pallet Transport System	4
15	All Machines.....	1
	All Panels	1
16	SF-7 Cuber	3
	AF-7 Block Pusher	2
	Slat Conveyors	2

**To order safety decals, contact your local Besser representative
or the Besser Central Order Department.
Thank you!**

<p>1</p> <p>High voltage. Follow lockout procedure before servicing panel or machine.</p>	<p>2</p> <p>High voltage. Follow lockout procedure before servicing panel or machine.</p>	<p>3</p> <p>Mixer blade hazard. Close front panel and stay clear during operation. Follow lockout procedure before servicing.</p>	<p>4</p> <p>Crush hazards. Stay clear of car and crawler. Follow lockout procedure before servicing.</p>
<p>5</p> <p>Crush hazards. Stay clear of machine. Follow lockout procedure before servicing.</p>	<p>6</p> <p>Crush hazards. Stay clear of machine. Follow lockout procedure before servicing.</p>	<p>7</p> <p>Crush and pinch-points. Stay clear of machine. Follow lockout procedure before servicing.</p>	<p>8</p> <p>Crush hazards. Stay clear of transfer area. Follow lockout procedure before servicing.</p>
<p>9</p> <p>Falling objects. Stay clear of transfer area. Follow lockout procedure before servicing.</p>	<p>10</p> <p>Crush hazards. Stay clear of car and crawler. Follow lockout procedure before servicing.</p>	<p>11</p> <p>Crush hazard. Stay clear of machine. Follow lockout procedure before servicing.</p>	<p>12</p> <p>Nip hazard. Stay clear of conveyor. Follow lockout procedure before servicing.</p>
<p>13</p> <p>Crush hazard. Follow lockout procedure and secure elevator before servicing.</p>	<p>14</p> <p>Crush hazard. Stay clear of transfer area. Follow lockout procedure before servicing.</p>	<p>15</p> <p>SAFETY INSTRUCTIONS INSTRUCCIONES DE SEGURIDAD</p> <p>SUGGESTED LOCKOUT PROCEDURE</p> <ol style="list-style-type: none"> 1. Announce lockout to other employees. 2. Turn power off at main panel. 3. Lockout power in off position. 4. Put key in pocket. 5. Clear machine of all personnel. 6. Test lockout by hitting run button. 7. Block, chain or release stored energy sources. 8. Clear machine of personnel before restarting machine. 	<p>16</p> <p>Crush and pinch-points. Stay off conveyor. Follow lockout procedure before servicing.</p>

SAFETY SIGNS

SECTION 1

INTRODUCTION

1.1 INSTALLATION OVERVIEW

This initial section is a simplified overview of the LSC-100 installation. Since the purpose of this overview is to explain the general flow of installation stages, many important steps and procedures are not covered. Refer to the other topics in this section for more detailed procedures.

Figures 1.1 through 1.6 show the main stages of a typical LSC-100 installation

1.1.1 Prepare Concrete Foundation

Figure 1.1 shows the four concrete foundation levels prior to installation of the rail system.

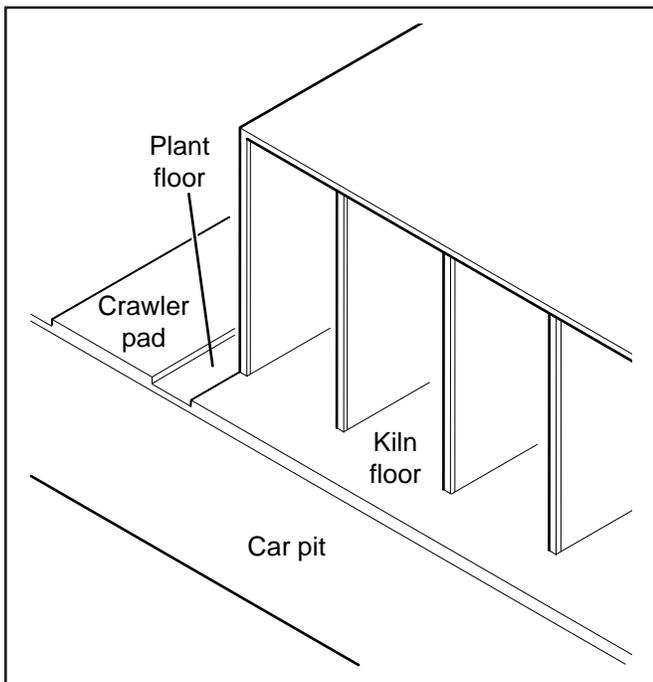


Figure 1.1 Concrete Foundation

1.1.2 Install Rail Supports

Figure 1.2 shows rail anchors and spacer shims installed along all rail paths. This stage also includes installation of the end-of-rail safety stops at the terminations of all rails.

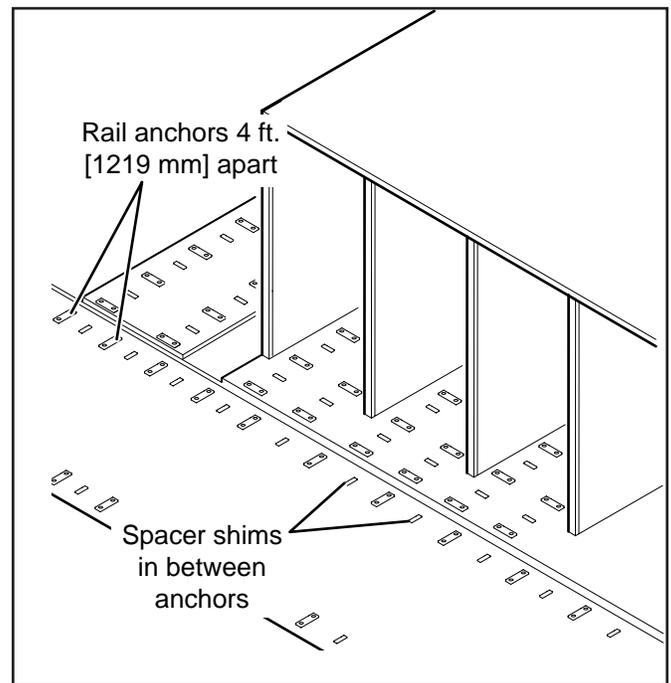


Figure 1.2 Rail Supports

1.1.3 Install Rails

Figure 1.3 shows the car, crawler and kiln rails in position.

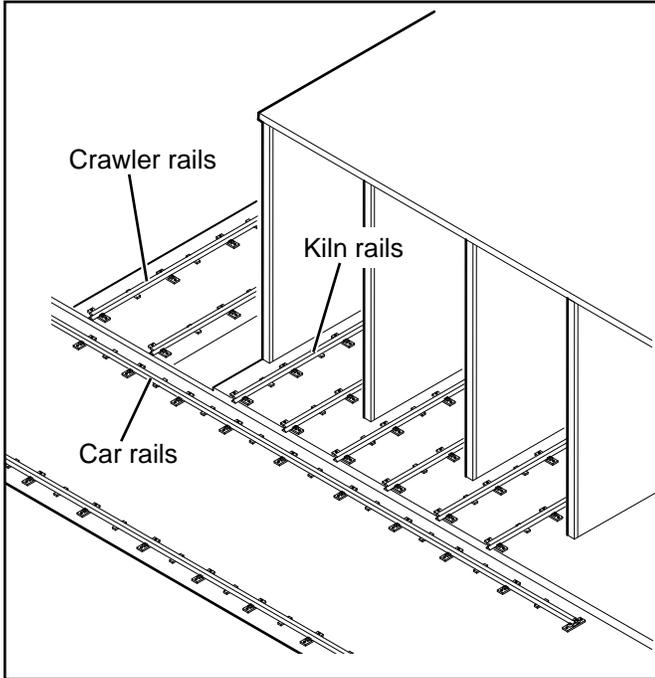


Figure 1.3 Rails

1.1.4 Install Curbs

Figure 1.4 shows elevated curbs along the kiln and crawler rails. Elevated curbs are used to place rack on and provide space for the crawler to move underneath racks to drop and retrieve racks inside the kilns. Elevated curbs on crawler rails provide space for the crawler to enter the Loader/Unloader.

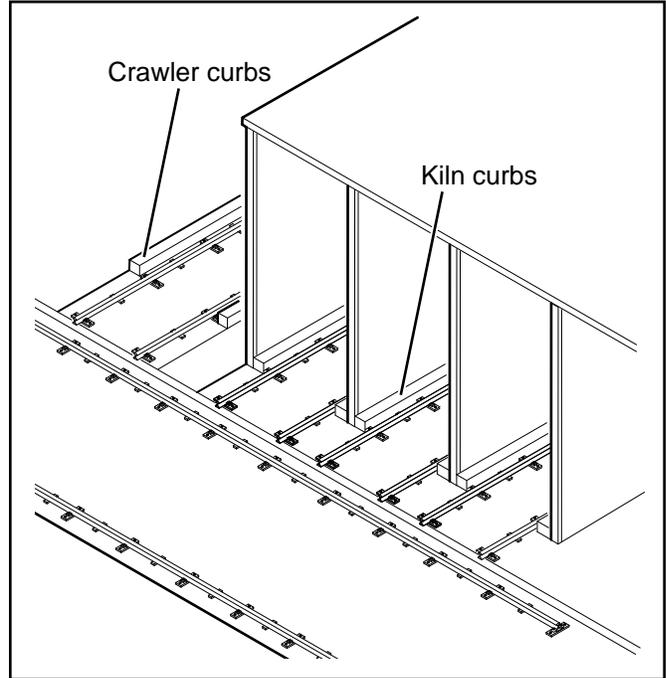


Figure 1.4 Curbs

1.1.5 Install Actuators

Figure 1.5 shows actuators installed at the centerline of each set of kiln and crawler rails. Proximity sensors on the car will use these actuators to guide car movements.

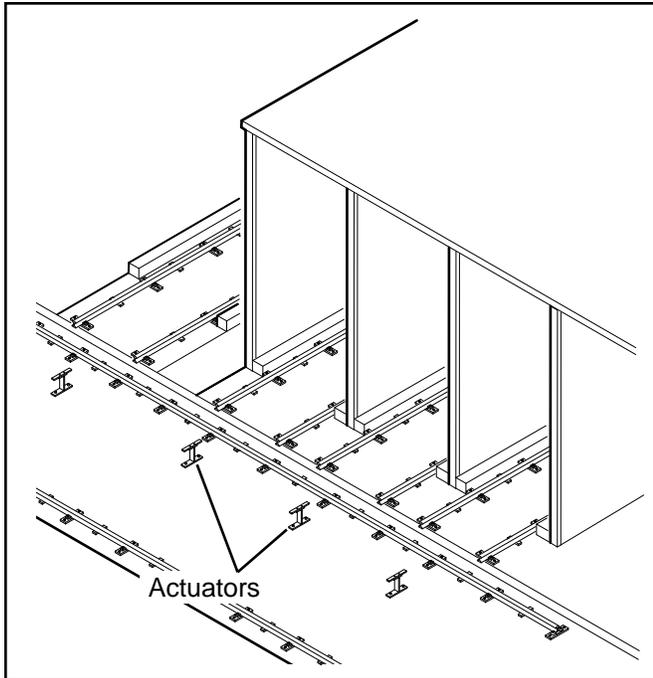


Figure 1.5 Actuators

1.1.6 Install Car and Crawler

At this stage, the car and crawler are prepared and checked out for proper operation. A fully loaded trial run verifies the function of all automatic controls.

1.1.7 Place Final Concrete Layer

Following the fully loaded trial run, Figure 1.6 shows the final concrete layer along the car rails. The final concrete layer brings the car path up to the plant floor grade. The tops of the actuators and car rails extend 1/4 inch [6 mm] above the final concrete layer.

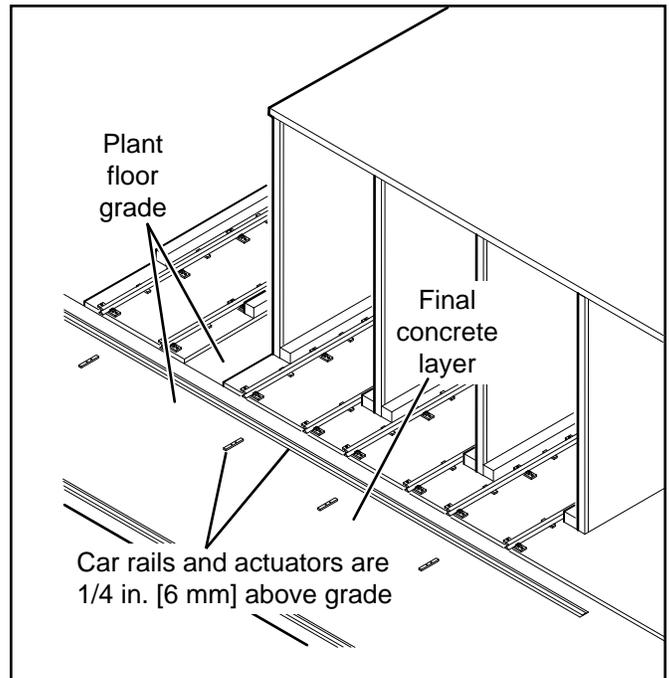


Figure 1.6 Final Concrete Layer

1.2 INSTALLATION DRAWINGS

This manual provides guidelines and procedures for installing typical LSC-100 systems. Because individual plants and applications will vary, Besser provides detailed Installation Drawings to support every installation. For best results in preparing and completing an LSC-100 installation, Besser suggests that both this manual and the Installation Drawings be used together. The Installation Drawings will provide all required dimensions and will also identify any unique requirements of a particular site. This manual will provide overviews, check-out procedures, and instructions for preparing the site and equipment.

1.3 ACCURACY REQUIRED

LSC-100 installations require a high level of accuracy in finishing the concrete and in installing the rail system. The required dimensions must be maintained for the LSC-100 to work as designed. At every stage, take the necessary time and care to ensure that the installation is meeting the standards specified in the Installation Drawings.

Accurate procedures are especially important in the initial stages such as the foundation concrete layers and when installing the rail supports. Any errors made in early stages will be very difficult to correct during the later stages.

Section 1.4 explains important dimensions and tolerances.

1.4 DIMENSIONS

Because LSC-100 systems are installed on different rail styles, the installation instructions in this manual do not include specific rail dimensions. The Installation Drawings that Besser provides are specific for each application and contain all needed measurements and dimensions.

The instructions in this manual cover the use of any Besser-approved rail. Since rail height can vary, this manual does not provide dimensions that involve rail height. The following dimensions and elevations apply to all LSC-100 installations regardless of the rail used:

Plant floor elevation	100 ft. – 0 in.	[30480 mm]
Car rail path after second concrete layer	100 ft. – 0 in.	[30480 mm]
Top of car rails	100 ft. – 1/4 in.	[30486 mm]
Tops of actuators	100 ft. – 1/4 in.	[30486 mm]
Top of crawler rails	100 ft. – 9 3/4 in.	[30728 mm]
Top of kiln curbs	101 ft. – 1 1/4 in.	[30817 mm]
Car rail gauge	14 ft. – 1 15/16 in.	[4316 mm]
Crawler rail gauge	3 ft. – 4 15/16 in.	[1040 mm]

Table 1.1 Critical Dimensions and Elevations – A

Figures 1.7 and 1.8 show the relationship of these critical dimensions. Refer to Besser Installation Drawings for detailed information on all required dimensions and placements.

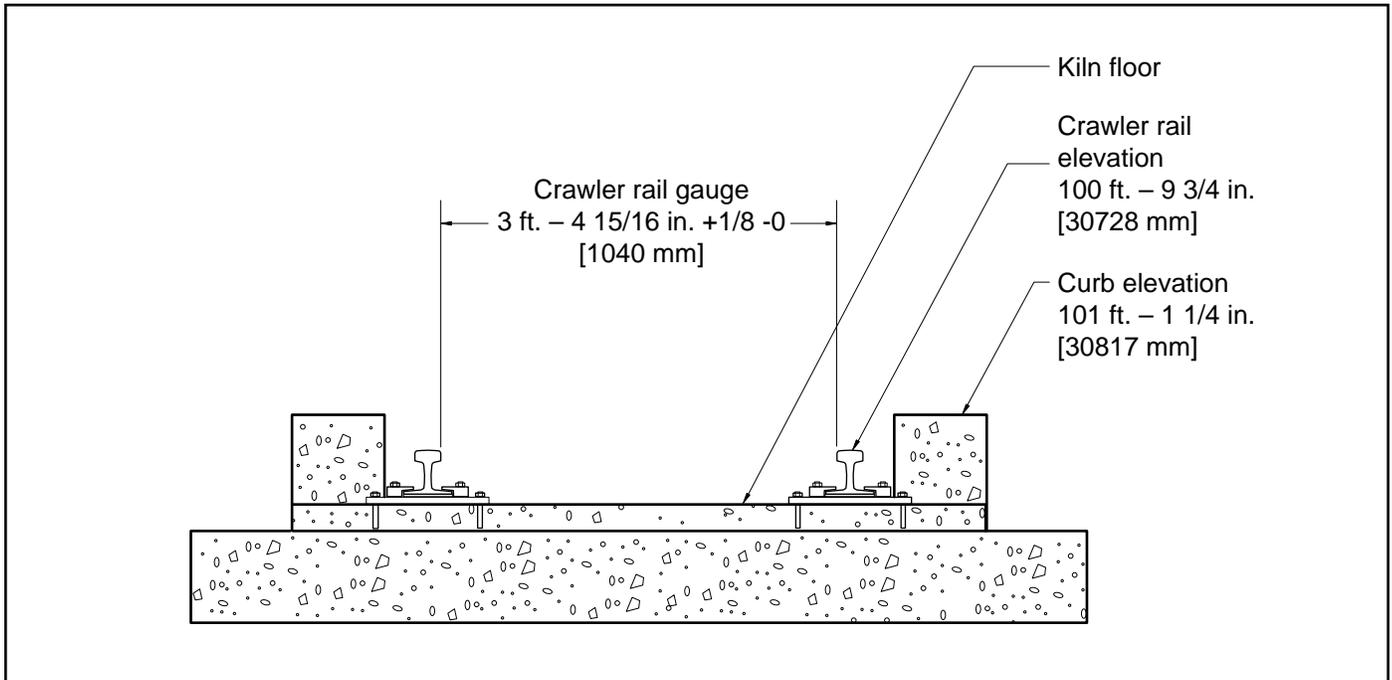


Figure 1.7 Critical Dimensions and Elevations A

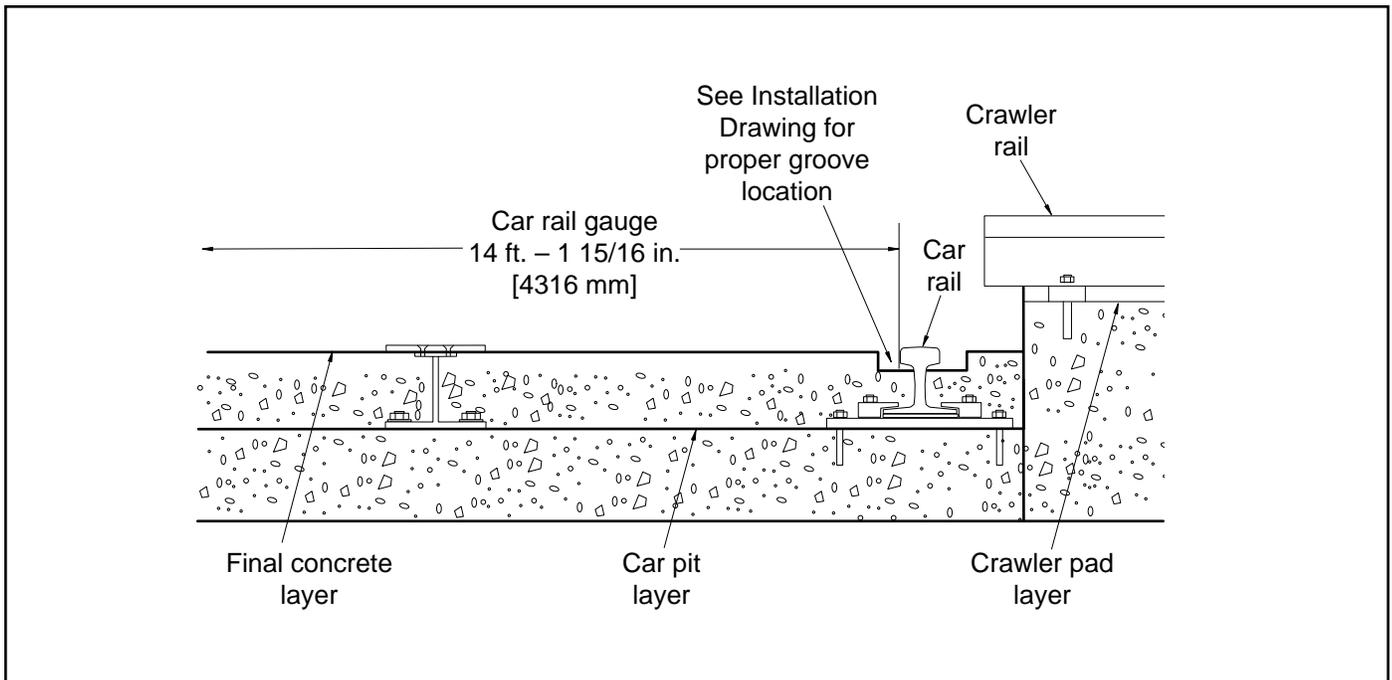


Figure 1.8 Critical Dimensions and Elevations B

1.4.1 Tolerances

The Besser Installation Drawings specify dimension tolerances for all installation stages. General dimensions tolerances are:

- Concrete levels: +0 -1/4 inch [6 mm]
- Rail gauges: +1/8 inch [3 mm] -0
- Other hardware: $\pm 1/16$ inch [2 mm]

1.5 REQUIRED PARTS AND EQUIPMENT

The LSC-100 system includes the transfer car, crawler, and the electrical connections between the plant and the LSC-100. Besser does not provide the tools and supply items needed to prepare the site and install the equipment. Here are examples of items and utilities not supplied by Besser and that must be provided by the customer:

- Anchor studs
- Metal shims
- Stop blocks
- Electrical conduit
- Power to electric panels, including fuse box, circuit breakers and disconnect panel
- Support for box track for festoon cable system
- Hydraulic tubing

1.6 RAIL PACKAGE

The rail package of the LSC-100 may be either supplied by Besser or provided by the customer. If not supplied by Besser, the customer must obtain the components listed below. Refer to installation drawing for actual Besser part numbers.

- Rail lengths
- Anchor plates
- 3/4 inch [19 mm] hex nuts
- 3/4 inch [19 mm] lockwashers
- Rail splice bars with track bolts
- K-103 rail clips
- 3/4 inch [19 mm] anchor bolts
- Spacer shims

SECTION 2 PREPARE SITE

The LSC-100 system must be installed on a concrete foundation with a 32,000 pound [14,545 Kg] load support rating. Required thickness of the base concrete and other specifications for the foundation layer depend on local soil conditions and other factors that are unique to the plant site.

2.1 PREPARE CONCRETE BASE LAYERS

Figure 2.1 shows the four concrete layers for the base of the LSC-100.

- The main plant floor is at an elevation of 100 feet [30480 mm]. This elevation is the base for the Loader/Unloader, cuber and other associated equipment.
- The car pit is the installation area for the car rails. The exact elevation depends on the rail height. Following installation of car rails and actuators, the car pit will be filled in with a second layer of concrete to bring the elevation up to 100 feet [30480 mm]. See the Installation Drawings for required elevation of car pit.
- The kiln floor supports all crawler rails inside the kilns and is at the same elevation as the crawler pad for the Loader/Unloader outside the kilns. See the Installation Drawings for required elevation of the kiln floor and crawler pad.

All concrete base layers must be installed to a tolerance level of +0 and -1/4 inch [+0 and -6 mm]. For proper LSC-100 operation, it is essential to maintain this tolerance level of the concrete top surfaces.

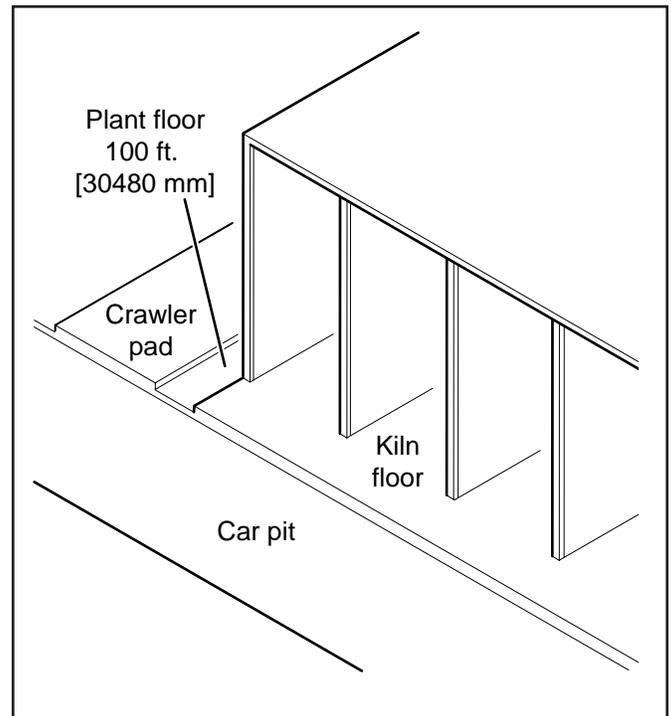


Figure 2.1 Concrete Base Layers

2.2 INSTALL RAIL ANCHORS

Car and crawler rails will be placed on two types of supports:

- 2.2.1 Rail anchors and safety stops
- 2.2.2 Shims

2.2.1 Install Rail Anchors and Safety Stops

Figure 2.2 shows the rail anchor assembly that is installed at 4 foot [1219 mm] intervals along all rail paths. Figure 2.3 shows the depth and placement using the anchor plate as a template for drilling anchor bolt holes. Mark and drill anchor bolt holes with care and precision. In order for rail gauge to be accurate, the holes for rail anchors must be located within a tolerance of $\pm 1/16$ inch [2 mm].

Figure 2.4 shows the safety stop that is installed at ends of rails at back wall of each kiln and at ends of rails at both ends of car path. Rails may be bolted or notched and welded to stops. See the Installation Drawings for the proper assembly.

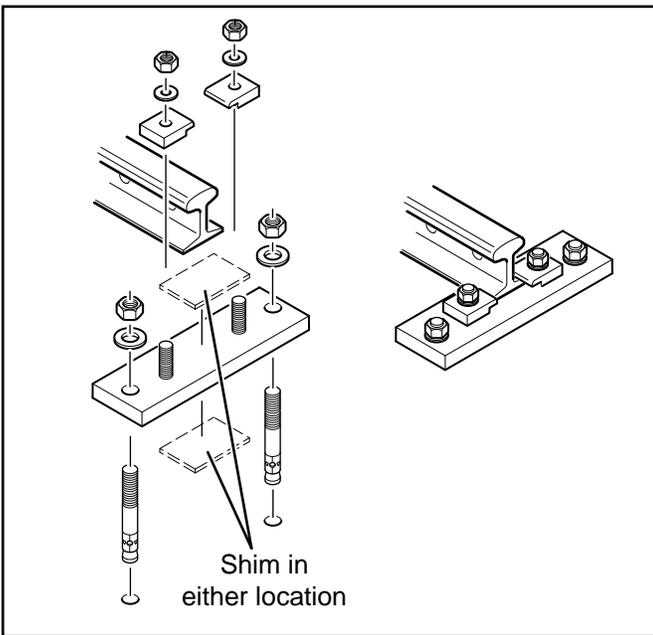


Figure 2.2 Rail Anchor

2.2.2 Shims

Shims are used in two ways in the installation of rails. Spacer shims are required for proper support. Position spacer shims every four feet [1219 mm] between each rail anchor. Weld spacer shims to rail.

Optional shims may be used to obtain the correct elevation of the rails but are not required for correct support.

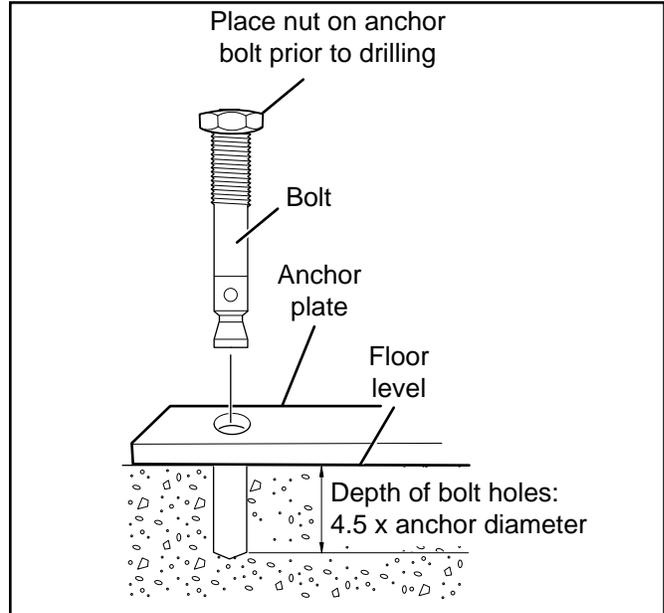


Figure 2.3 Anchor Bolt

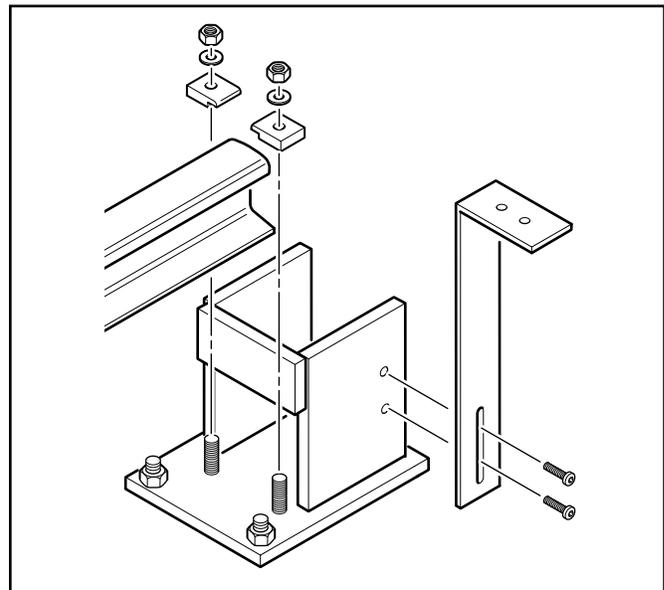


Figure 2.4 Safety Stop

2.3 PREPARE RAIL LENGTHS

2.3.1 Notch Rail Ends

At all places where car and crawler rails intersect, the crawler rail ends must have an inset notch to allow operation of the car rail locks. Figure 2.5 shows the form and dimensions of the notch.

2.3.2 Plan Splices

See Installation Drawings for required lengths of rails. Plan and prepare rail splices using splice kits.

2.4 INSTALL RAILS

Position rail sections on rail anchors for both car and crawler paths. As required, install splice bars to secure end-to-end rail joints. During rail installation, make frequent checks of rail gauge (i.e., the distance between the inner edges of the tops of the rails.) Required rail gauge separation and tolerances are:

- Crawler rails: 40 15/16 inches +1/8 inch -0 inch [1040 mm +3 mm -0 mm]
- Car rails: 169 5/16 inches +1/8 inch -0 inch [4300 mm +3 mm -0 mm]

After positioning all rails and checking gauge, complete installation as follows:

1. Install splice bars to join rail sections.
2. Install rail anchor clips, lock washers, and nuts. Shims may be used to obtain the correct elevation of the rail clips. See Figure 2.6.
3. Install horizontal probes on the left hand rails at the end of all kiln rails. See Figure 2.7.

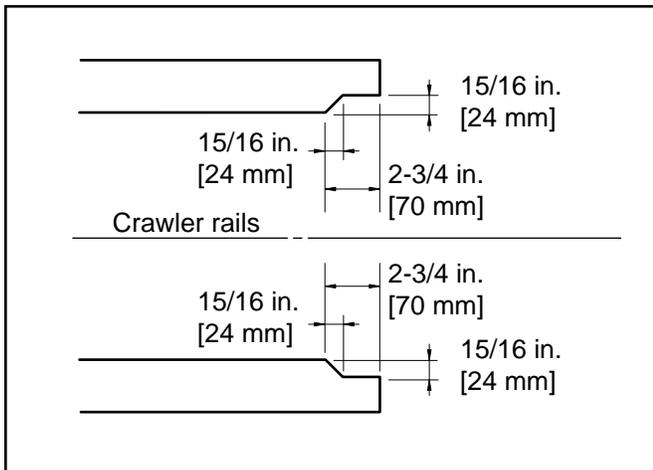


Figure 2.5 Rail End Notches

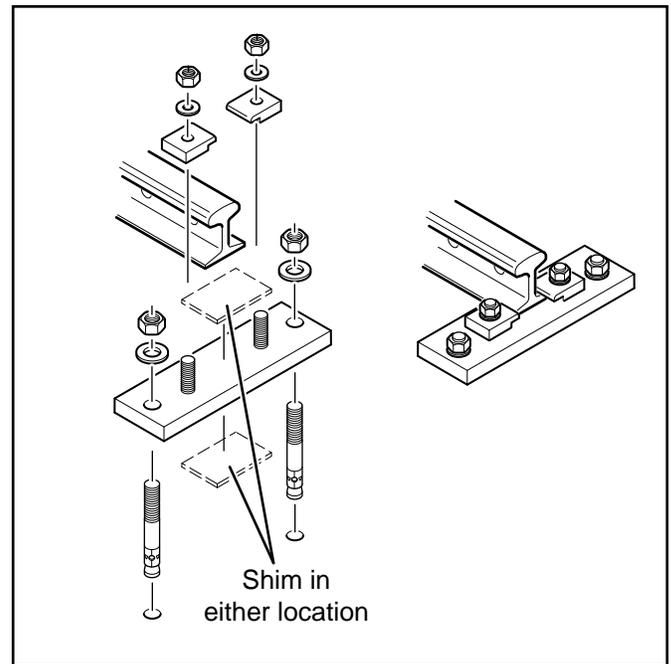


Figure 2.6 Rail Anchor

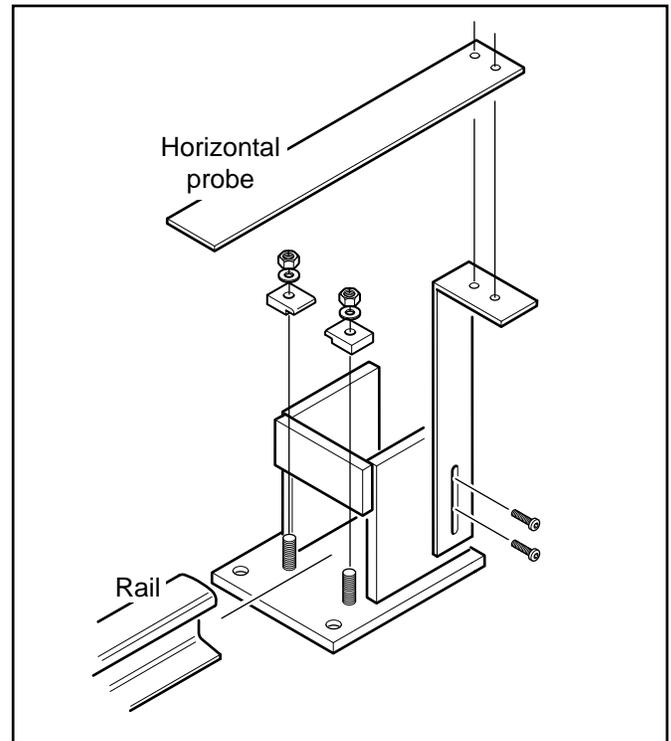


Figure 2.7 End-of-Kiln Safety Stop

2.5 INSTALL ACTUATORS

Actuators are imbedded steel plates that are utilized by proximity sensors on the car to guide car movements. Install actuators at the centerline of every crawler intersection including each kiln and the rails to the Loader/Unloader. Optional shims may be used to obtain the correct elevation of the actuators but are not required for correct support. See installation drawings for all actuator locations. Figure 2.8 shows the actuator assembly.

2.6 INSTALL CURBS

Curbs are concrete forms that support the racks within the kilns and on the crawler pad. Figure 2.9 shows curb placement and dimensions. There are two essential curb dimensions:

- Curb elevation is 101 feet – 1 1/4 inches [30817 mm]
- Difference between top of crawler rails and top of curb is 3 1/2 inches [89 mm]. The width of the kiln curbs can extend to the kiln side walls.

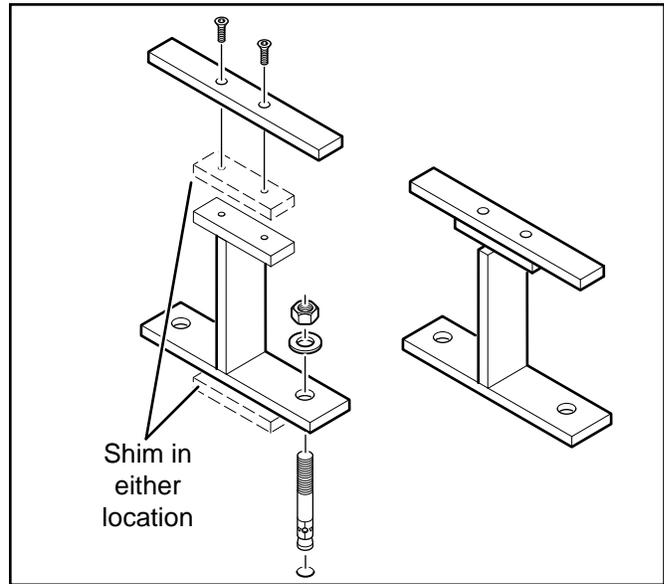


Figure 2.8 Actuator Assembly

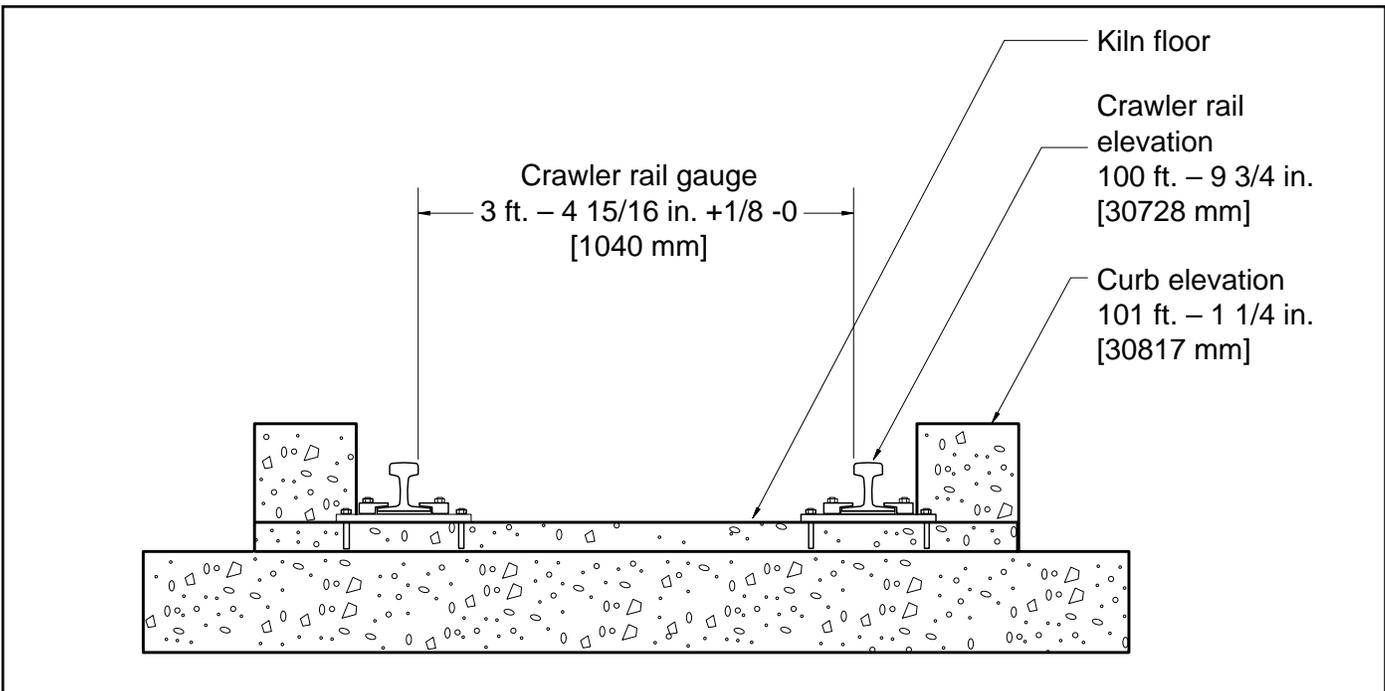


Figure 2.9 Curb and Rail Gauge

2.7 INSTALL POWER FESTOON SYSTEM

The LSC-100 receives all electrical power and control signals through an elevated festoon cable. There are two required power installations:

- 2.7.1 Install Festoon Track and Cable
- 2.7.2 Install Festoon Support Pole

2.7.1 Install Festoon Track and Cable

Besser supplies the festoon cable already assembled and connected to the trolleys which travel on the track. The customer must install the suspended track and support every 6 feet [1830 mm]. After installing the suspended upper track, load the trolleys and cable onto track.

2.7.2 Install Festoon Support Pole

Figure 2.10 shows a typical festoon support pole. To install pole:

1. Mount 60 amp safety switch and connector for flat power cable to festoon support. Secure power cable (4 conductor) from festoon system through cable connector in top of box.
2. Optional: Mount terminal box to festoon support and secure control cable (12 conductor) from festoon system through cable connector in top of box. The wire bundle from the door control panel will be connected from the bottom of the box.

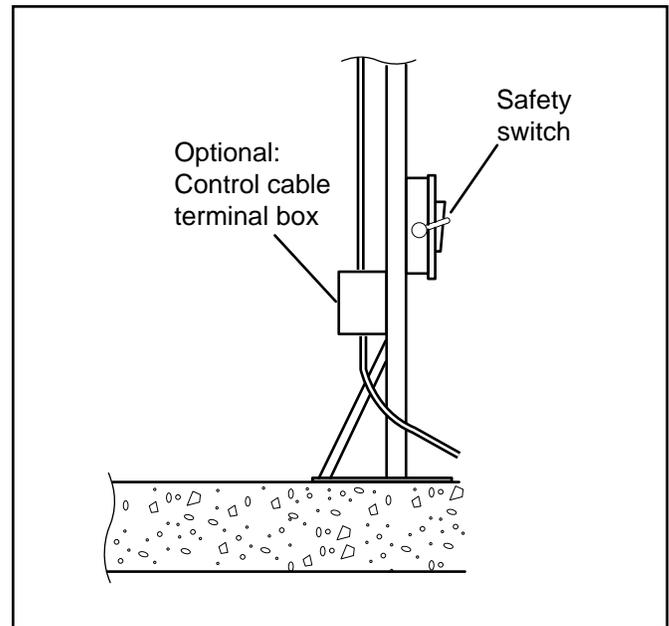


Figure 2.10 Festoon Support Pole

SECTION 3

PREPARE TRANSFER CAR

Moving the car onto the rails and preparing the car for operation requires the following steps:

- 3.1 Place car on rails
- 3.2 Connect car power system
- 3.3 Fill car hydraulic system
- 3.4 Check operation – safety bars
- 3.5 Match car with crawler rails
- 3.6 Check car operation
- 3.7 Apply safety decals

3.1 PLACE CAR ON RAILS

The method used to move the transfer car onto the car rails will depend on available equipment and plant layout. The car weight requires a lifting capacity of 11,300 pounds [5136 Kg] in the heavy duty rigging system for protection of plant personnel during the placement. See Figure 3.1 for the lifting points of the car. Make sure to use necessary safeguards and that all transfer equipment is properly rated for the load.

The car must be moved onto the rails and placed in the position shown in Figure 3.2. Refer to the installation drawings for exact specifications. Note the location on the installation drawings of the car's control panel for proper orientation.



WARNING:

Use of a non-professional rigging crew may result in personal injury and/or property damage.

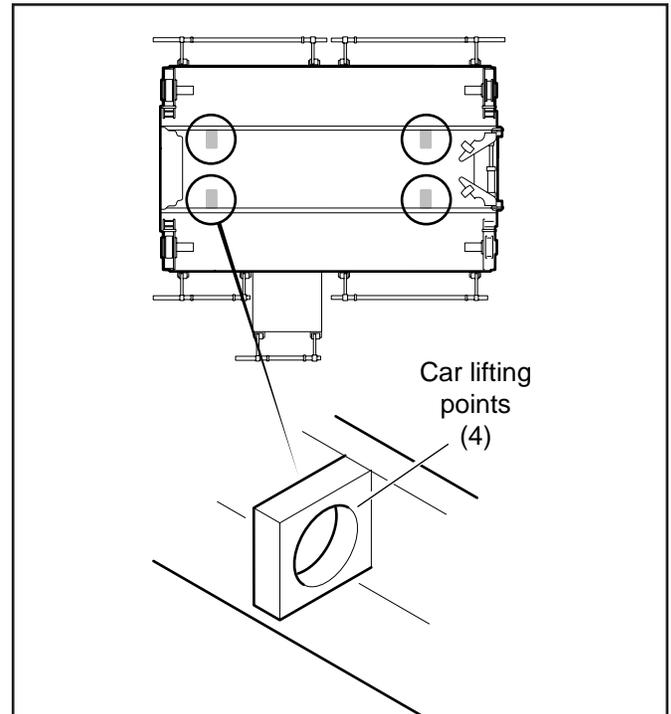


Figure 3.1 Car Lifting Points

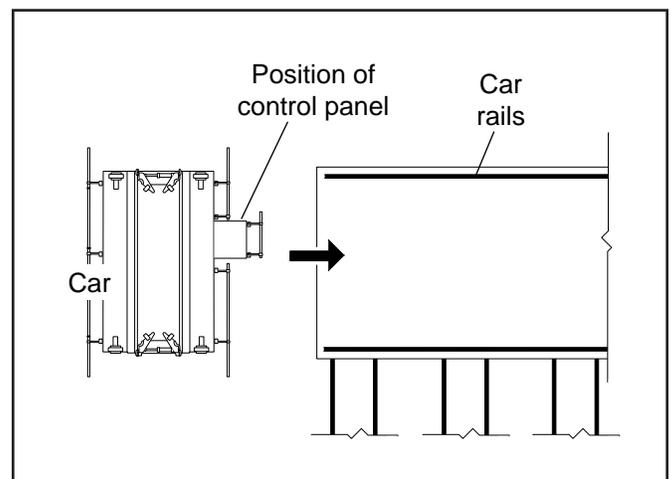


Figure 3.2 Car Placement

3.2 CONNECT CAR POWER SYSTEM

Assemble the car's vertical power mast as shown in Figure 3.3. Secure the system power cable from the festoon cable through a cable connector on the bottom of the car control panel. Figures 3.4 and 3.5 show the required terminal connections inside the car control panel.

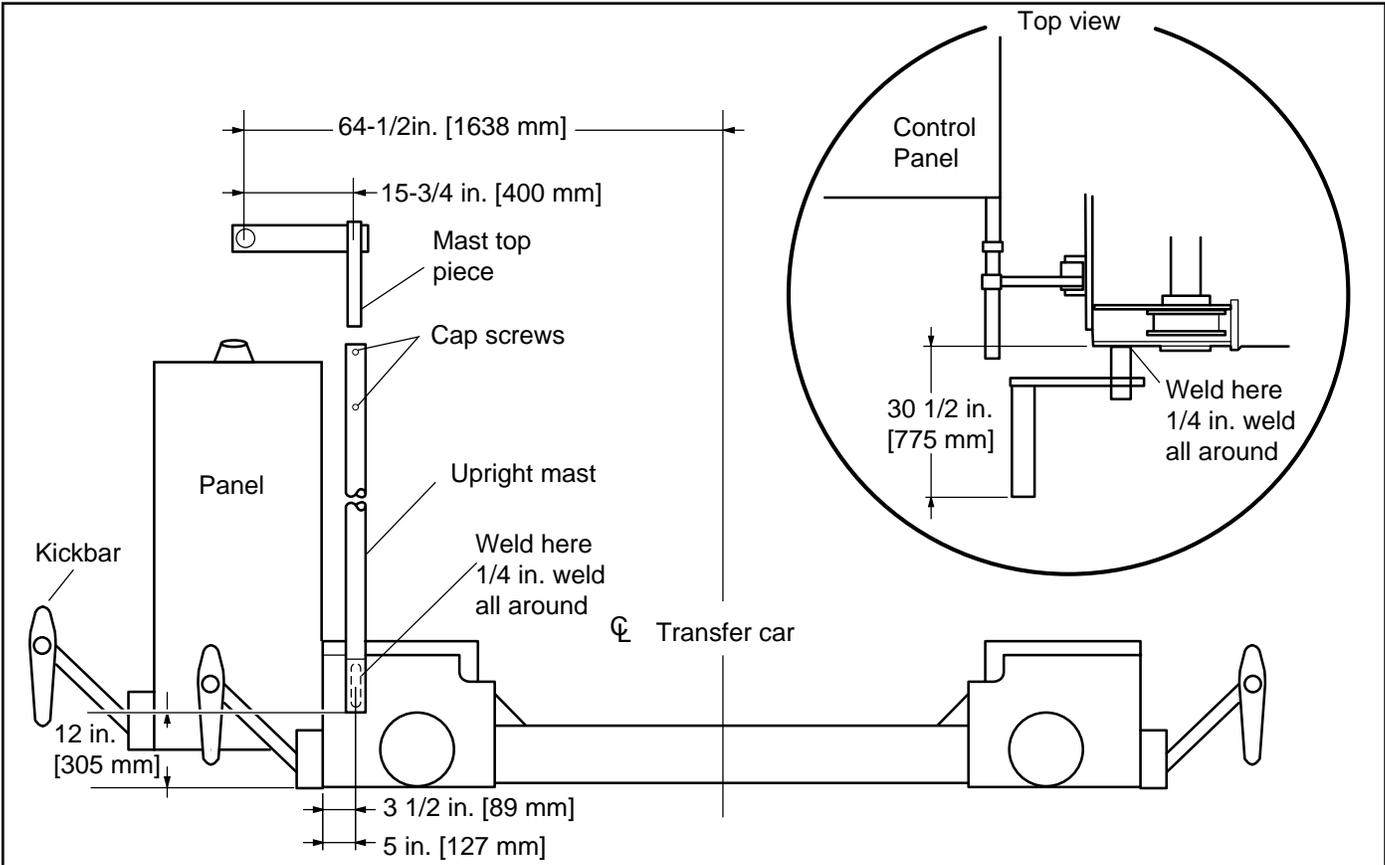


Figure 3.3 Car Power Mast

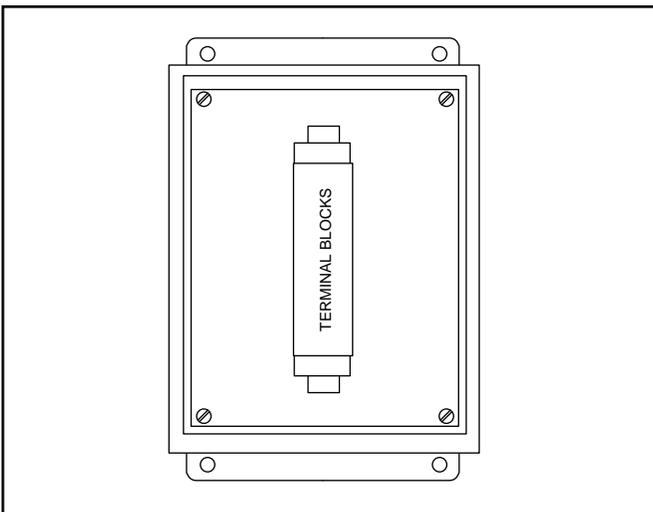


Figure 3.4 Termination of Control

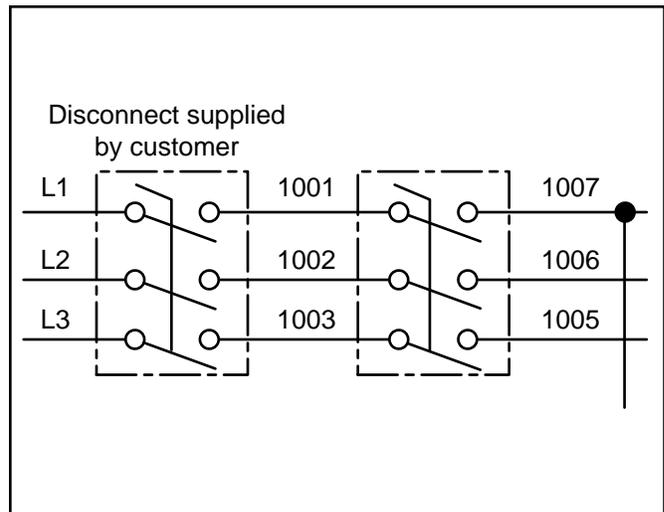


Figure 3.5 Termination of Power

3.3 FILL CAR HYDRAULIC SYSTEM

The car hydraulic system capacity is 40 gallons [151 liters]. Use Shell Tellus 46 hydraulic fluid or equivalent. In order to fill the system, the power must be available to operate the different hydraulic movements. Fill the system as follows:

1. Fill tank.
2. Push starter. Check pump rotation as shown in Figure 3.6.
3. Manually operate controls to fill the system:
 - Forward and reverse direction
 - Fast, medium and slow speeds
 - Extend and retract raillocks
4. Continue adding fluid to tank while operating the controls until the full 40 gallon [151 liter] capacity has been reached.

3.4 CHECK OPERATION – SAFETY BARS

The safety bars stop car operation whenever they touch an obstacle. The safety bars are essential components for protection of plant personnel. At all times, make sure they are in proper working order. To check safety bars in the manual mode:

1. Lift up on one of the five safety bars to simulate a safety stop.
2. Verify pump stops.
3. From the graphic control screen, verify function of all five limit switches by looking for the fault screen.
4. Adjust position of any inoperative limit switches. Check the wiring for faulty connections as directed by the instructions on the fault screen.
5. Repeat steps for the four additional safety bar switches.

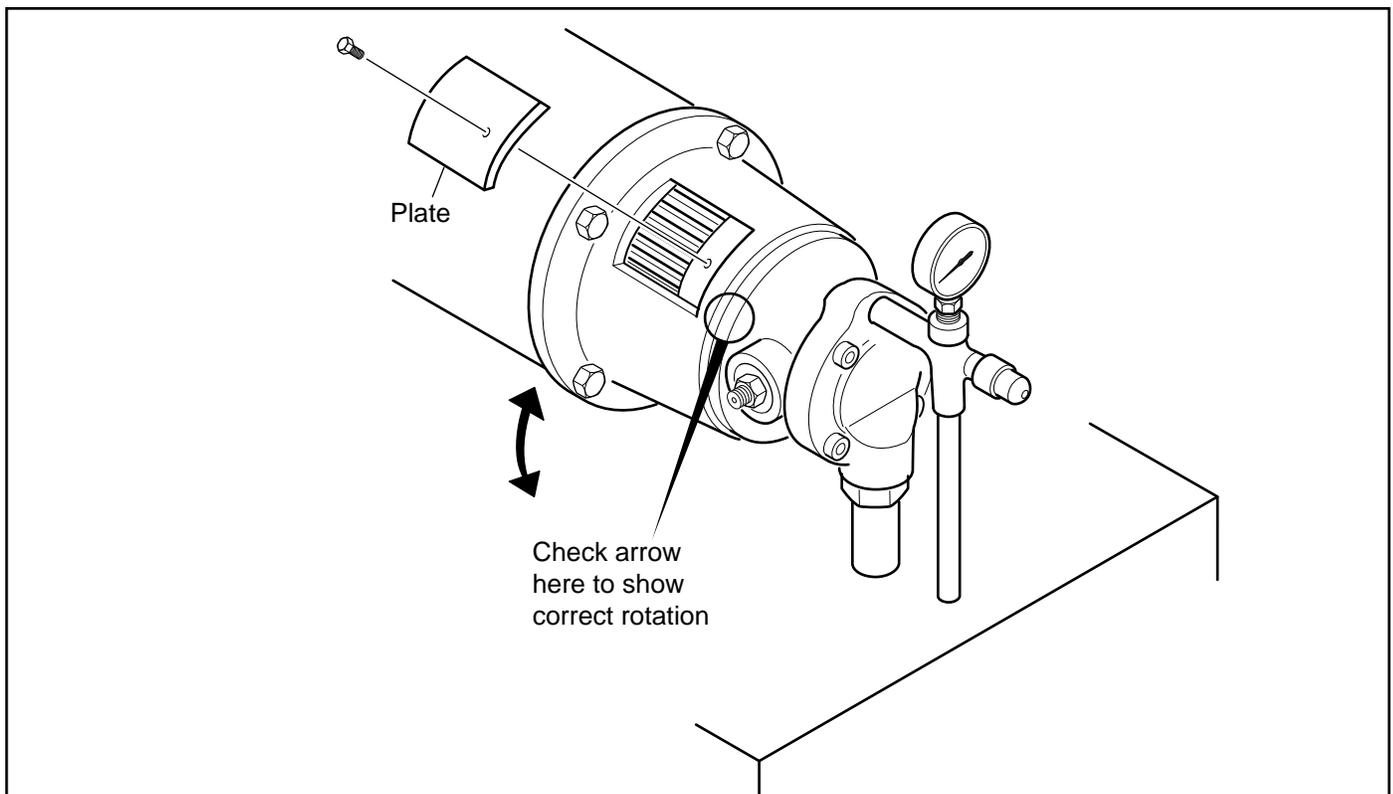


Figure 3.6 Check Pump Rotation

3.5 MATCH CAR WITH CRAWLER RAILS

This step aligns the car with the crawler rails to ensure a proper match with the top-of-car rails. An accurate actuator/Proximity Relay Switch (PRS) match is needed to stop the car at the proper location. Proper rail match provides a good transition for the crawler to move on and off the transfer car. There are two parts to this step:

- 3.5.1 Match actuators and sensors
- 3.5.2 Shim crawler rail ends

3.5.1 Match Actuators and Sensors

As a precaution, first check all actuators along the car path to verify that there will be no interference of actuators and the downward-sensing proximity sensors. This check will avoid damage to a sensor from a high elevation actuator. Figure 3.7 shows the location of PRS-3, PRS-4 and PRS-5 for cars in LSC-100 systems with kilns on the left side of car travel. For LSC-100 systems

with opposing kilns, the car will carry sensors PRS-9, PRS-10 and PRS-11 on the side opposite. For LSC-100 systems that use kilns off both sides of the car path, the car will carry all six sensors. The function of the downward-facing sensors on both sides of the car are identical. Continue as follows:

1. Using manual speed and direction controls, move car to each set of crawler rails.
2. Use the input status screen to observe sensor function.
3. Depending on travel direction, either PRS-3 or PRS-5 should first sense the actuator and signal the car to change to slow speed. When PRS-4 or PRS-10 senses the actuator, the car should stop. In order for these sensors to work as designed, the sensor faces must be within 1/4 inch [6 mm] of the actuator.

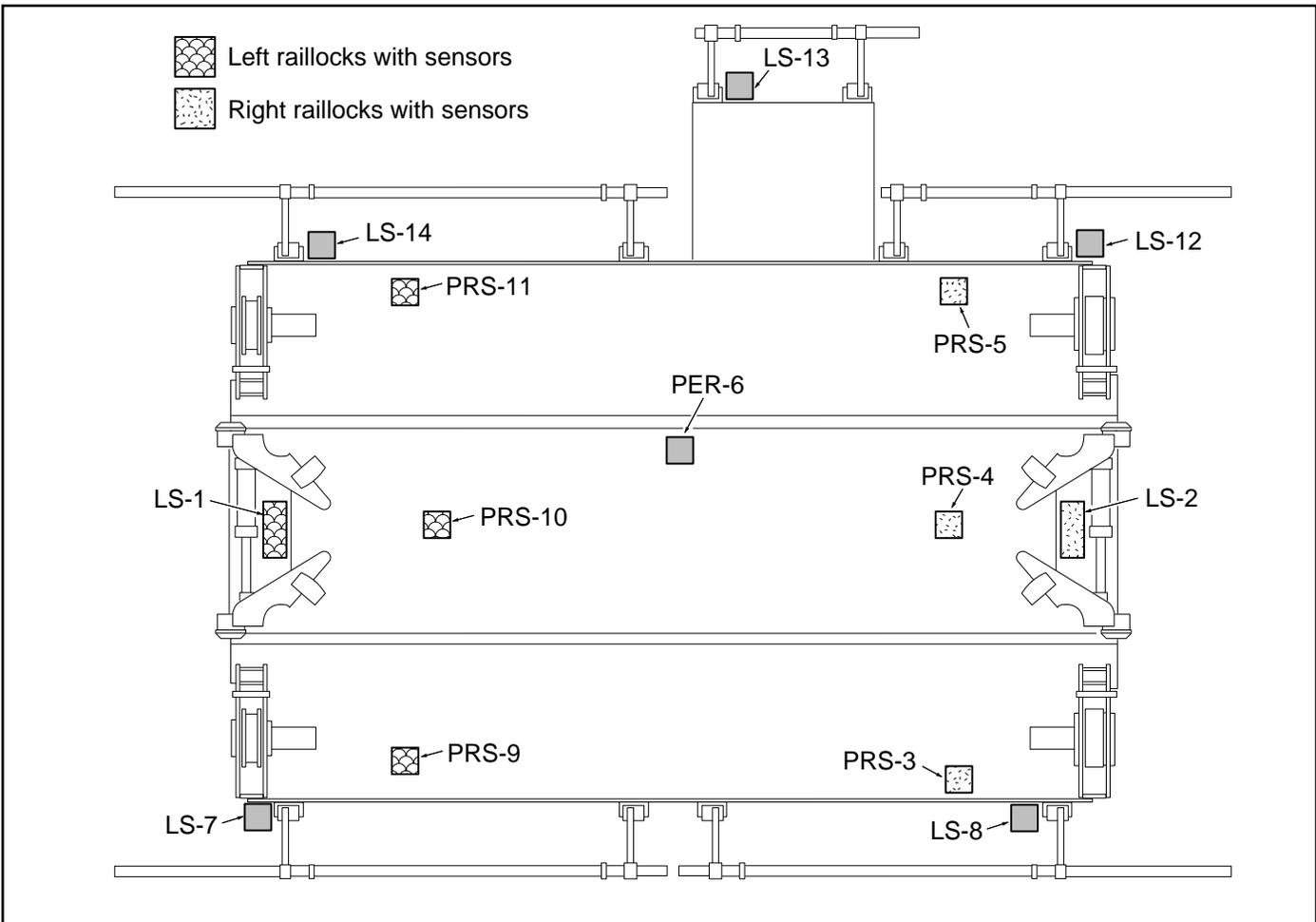


Figure 3.7 Car Sensor Locations

4. As needed to obtain the 1/4 inch [6 mm] space, adjust sensor position by moving the mounting bracket vertically as shown in Figure 3.8.
5. There will likely be variation in height of the different actuators. Take care that lowering a sensor to match a low actuator will not cause that same sensor to be damaged by hitting a high actuator. In case of significant variation in actuator height, position the sensor mounting bracket to obtain a 1/4 inch [6 mm] gap with the highest actuator. Actuators that are too low to trigger sensor must be shimmed to raise the top of the actuator into the sensor field.
6. With PRS-4 or PRS-10, the stop must also be centered on the crawler rails. If necessary, adjust PRS-4 or PRS-10 bracket laterally to adjust for the center stop. See Figure 3.8.

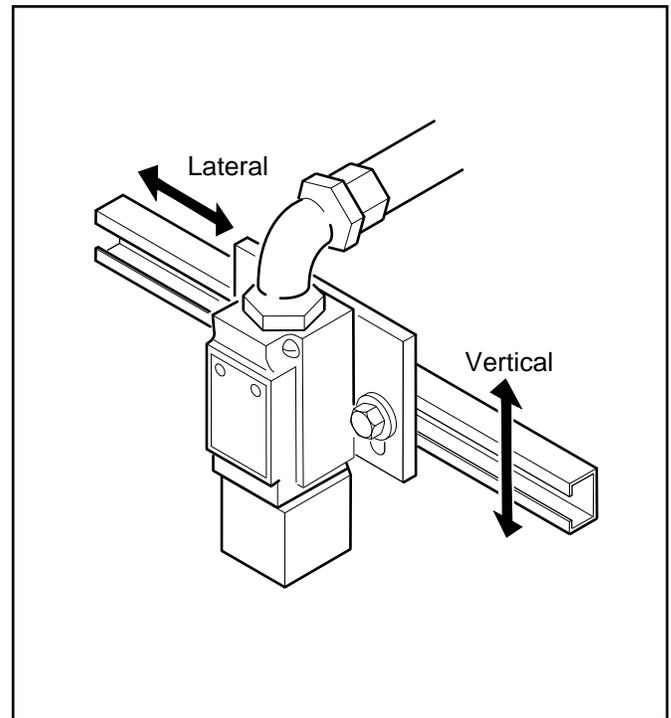


Figure 3.8 PRS Adjustment

3.5.2 Shim Crawler Rail Ends

The elevation of the crawler rail ends and the top-of-car rails should match within a tolerance of $\pm 1/32$ inch [1 mm]. As needed, shim the ends of both crawler rails. The end-to-end, or lateral, gap between the rail ends should be approximately 1/2 inch [13 mm]. See Figure 3.9.

3.6 CHECK CAR OPERATION

The purpose of this step is to make a trial run with the car before placing the crawler. In the manual mode, move the car full length of car tracks in both directions and make the following checks and adjustments:

- 3.6.1 Check actuator/PRS signal interface
- 3.6.2 Check end-of-track safety stop
- 3.6.3 Check raiilock operation
- 3.6.4 Calibrate car speed

3.6.1 Check Actuator/PRS Signal Interface

In the manual mode, operate the car in both directions along the full car rail path. Use the input

status screen to verify the proper function of PRS-3, PRS-4, and PRS-5 with every actuator. In LSC-100 systems with opposing kilns, check out PRS-9, PRS-10, and PRS-11 in the same manner.

3.6.2 Check End-of-Track Safety Stop

Using manual controls, continue operating car in low speed. Move the car to the extreme ends of car rails. Verify that the safety stop activates the car safety bar. The car should stop moving and the horn signal should change from slow to fast.

3.6.3 Check Raiilock Operation

Continue operating the car in manual mode. Move the car to positions centered on each set of crawler rails. From the car control panel, manually extend and retract raiilocks. From the input status screen, verify that LS-2 shows that locks are extended and retracted. When raiilocks are extended, check to see that the raiilocks bridge the gap between ends.

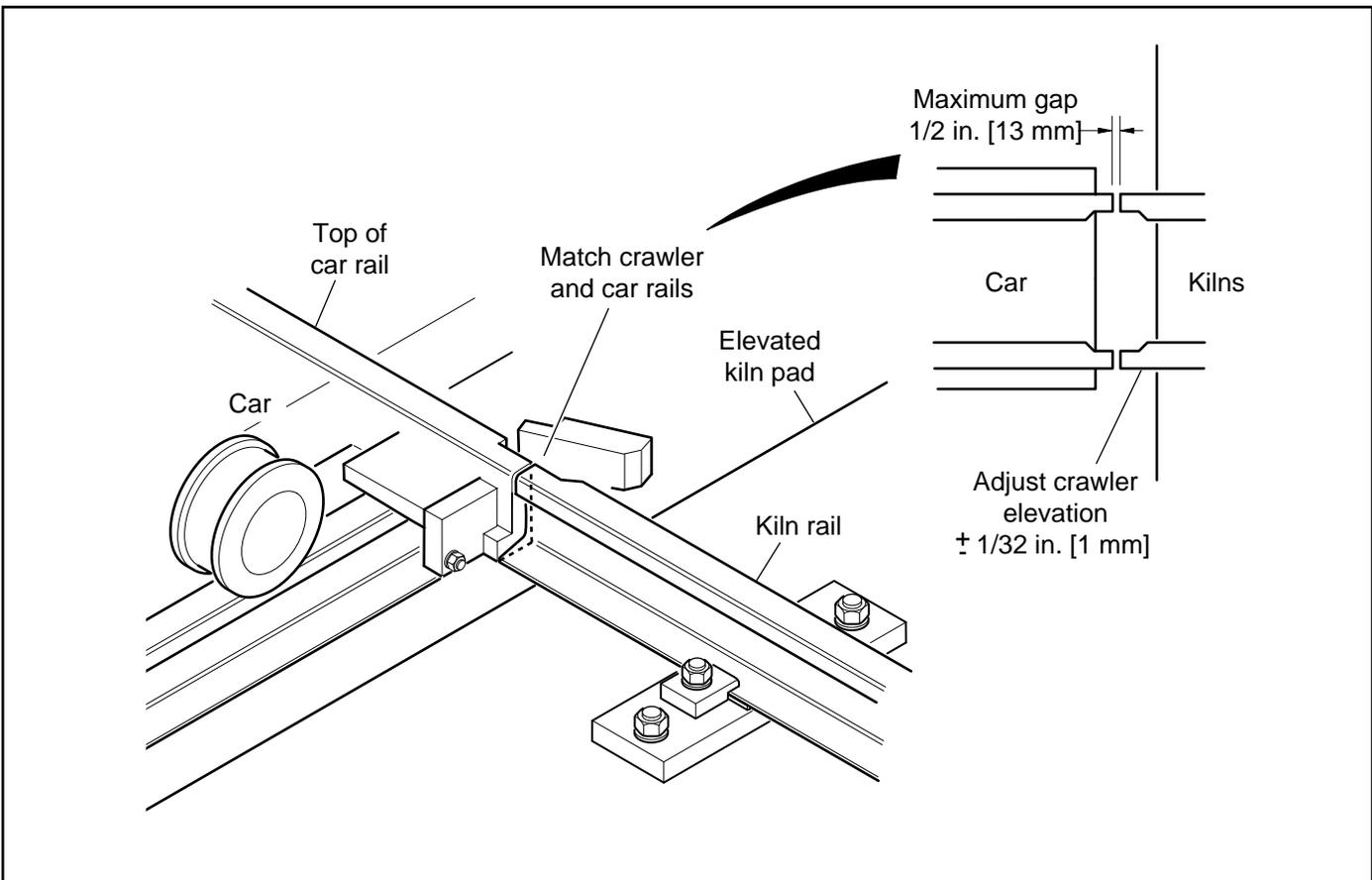


Figure 3.9 Rail End Match

3.6.4 Calibrate Car Speed

The car operates at three speeds:

- Slow: 30 feet [9140 mm] per minute
- Medium: 60 feet [18290 mm] per minute
- Fast: 90 feet [27430 mm] per minute

Figure 3.10 shows the six knobs used to adjust car speed. To calibrate car speed:

1. Mark a 10 foot [3048 mm] interval on car path.
2. Using manual control, run car both forward and reverse.
3. Rated travel times at each speed are:
 - Slow: 20 seconds
 - Medium: 10 seconds
 - Fast: 6.7 seconds
4. If actual speeds differ from rated speeds, adjust speed control knobs.

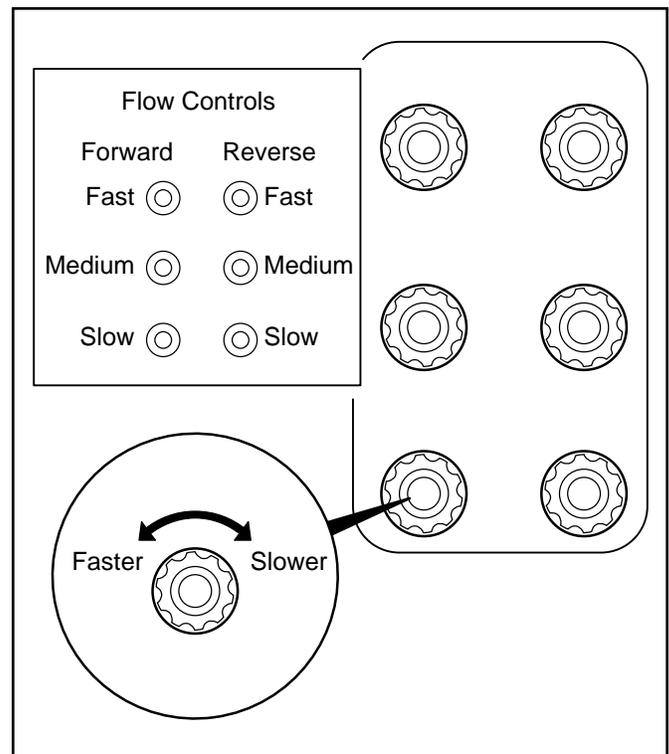


Figure 3.10 Speed Adjustments

3.7 APPLY SAFETY DECALS

Safety decals highlight areas of potential danger. Place the decals in the area shown in Figures 3.11, 3.12 and 3.13.

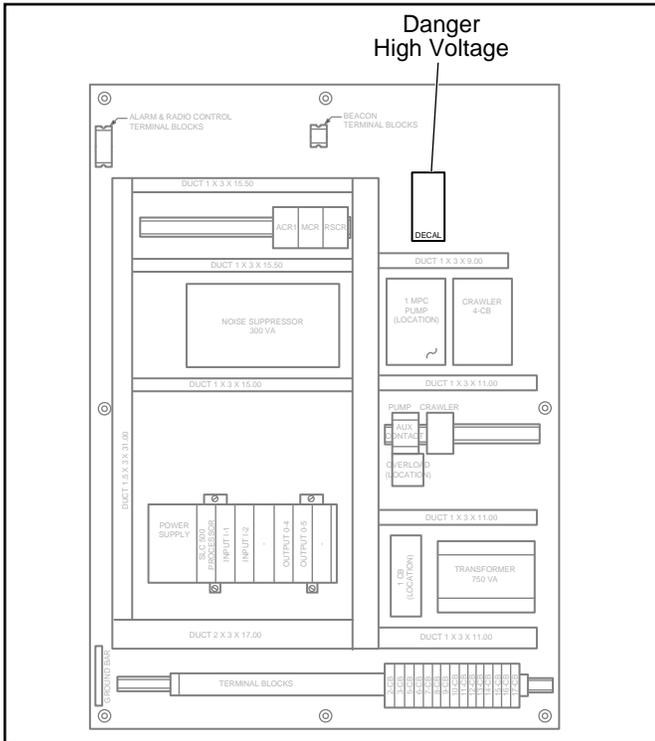


Figure 3.11 Car Safety Decals – Inside Control Panel

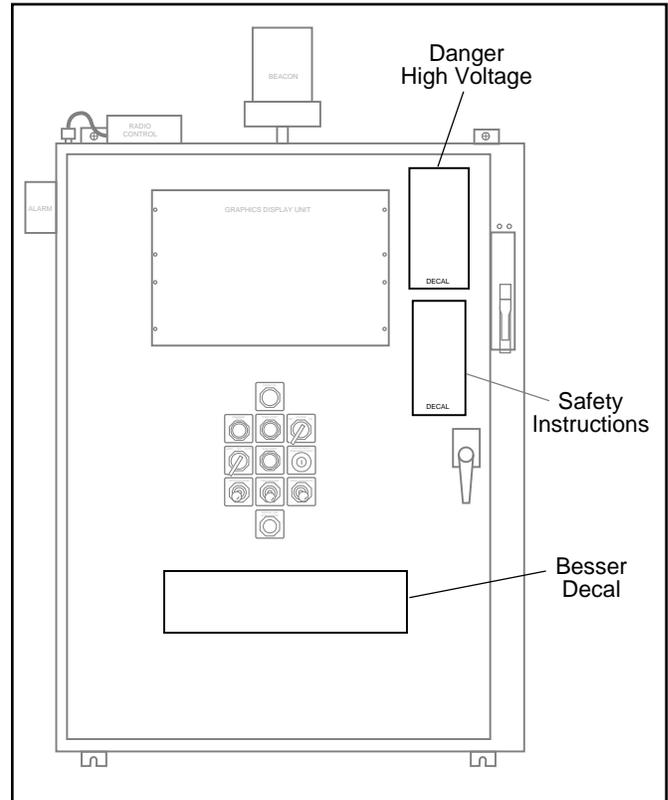


Figure 3.12 Car Safety Decals – Outside Control Panel

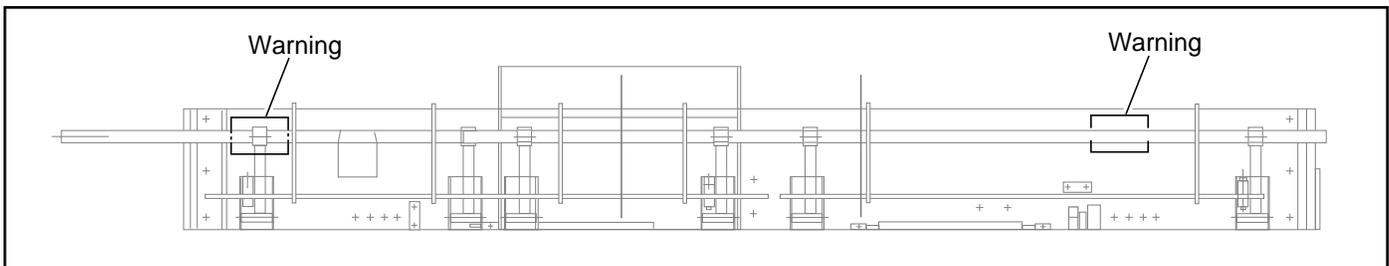


Figure 3.13 Car Safety Decals – End View

CAUTION: Keep safety decals clean and readable.

SECTION 4

PREPARE CRAWLER

Moving the crawler onto the rails and preparing the crawler for operation requires the following steps:

- 4.1 Place crawler on rails
- 4.2 Connect power cable
- 4.3 Fill crawler hydraulic system
- 4.4 Input/output indicators
- 4.5 Check operation of safety bars
- 4.6 Check crawler movement
- 4.7 Check elevator operation
- 4.8 Check rack proximity sensors
- 4.9 Check end-of-kiln safety stops
- 4.10 Check end-of-kiln actuators
- 4.11 Calibrate crawler speed
- 4.12 Apply safety decals

4.1 PLACE CRAWLER ON CRAWLER RAILS

The method used to move the crawler onto the crawler rails will depend on available equipment and plant layout. The crawler weight requires a lifting capacity of 10,000 pounds [4540 Kg] in the heavy duty rigging system for protection of plant personnel during the placement. See Figure 4.1 for the lifting points of the crawler. Make sure to use necessary safeguards and that all transfer equipment is properly rated for the load.

The crawler must be moved onto the rails in the position as shown in Figure 4.2. Note that the cable reel is always positioned opposite the Loader/Unloader. Refer to the Installation Drawings for correct orientation.

Remove lift angles before operation.



WARNING:

Use of a non-professional rigging crew may result in personal injury and/or property damage.

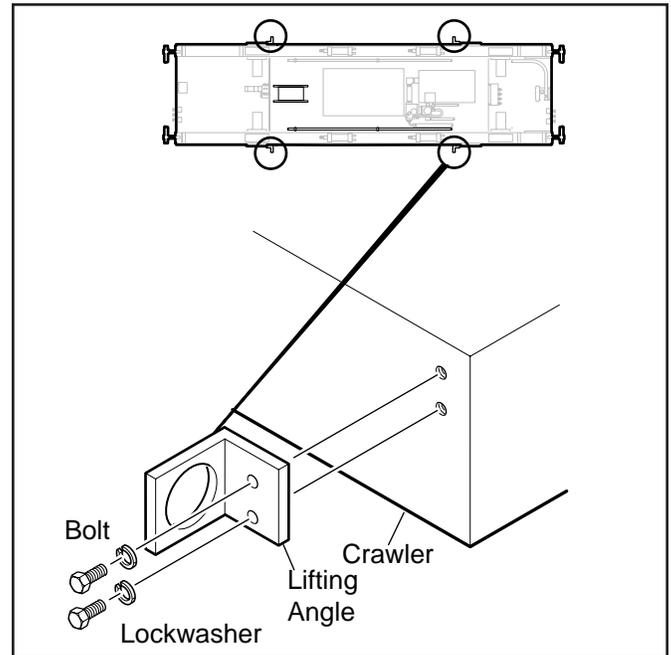


Figure 4.1 Crawler Lifting Points

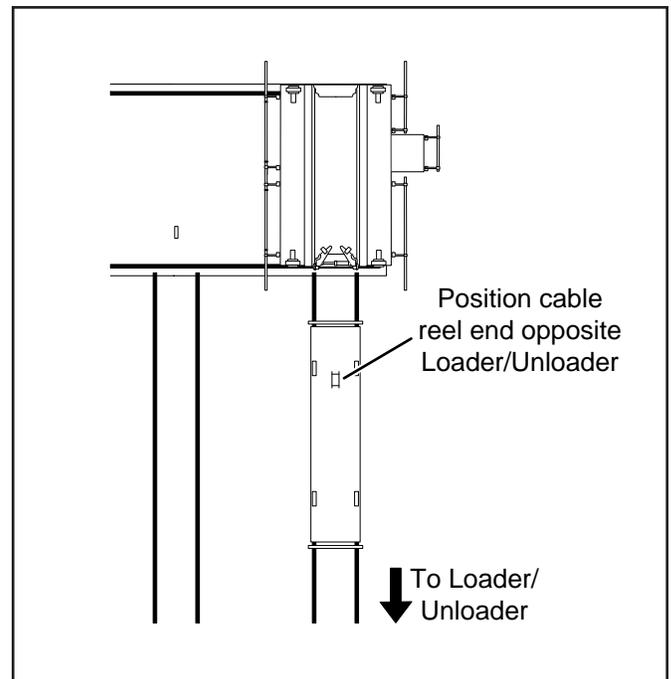


Figure 4.2 Crawler Placement

4.2 CONNECT POWER CABLE

There are three steps to connect the power cable between the car and the crawler:

1. Move crawler on rails next to car.
2. Pre-tension cable reel spring by turning reel seven times in direction of arrow.
3. Pull cable off reel from underside and route cable through crawler guide rollers.

Figure 4.3 shows the path for feeding the cable from the reel on the crawler through the pivot fitting on the car and into the car control panel. Figure 4.4 shows the terminal connections inside the car junction box.

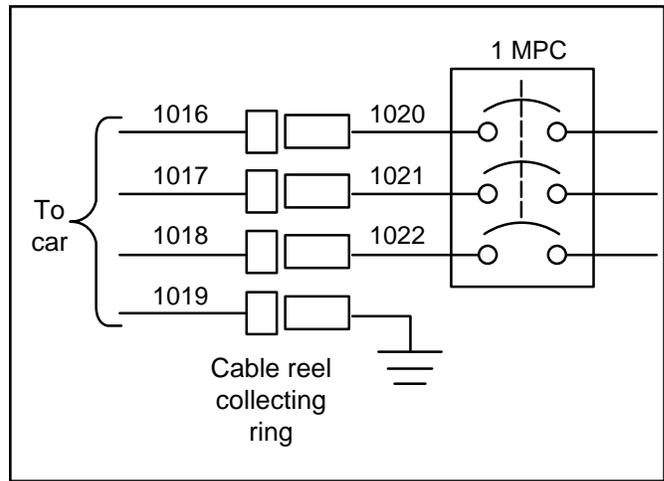


Figure 4.4 Power Cable Connections

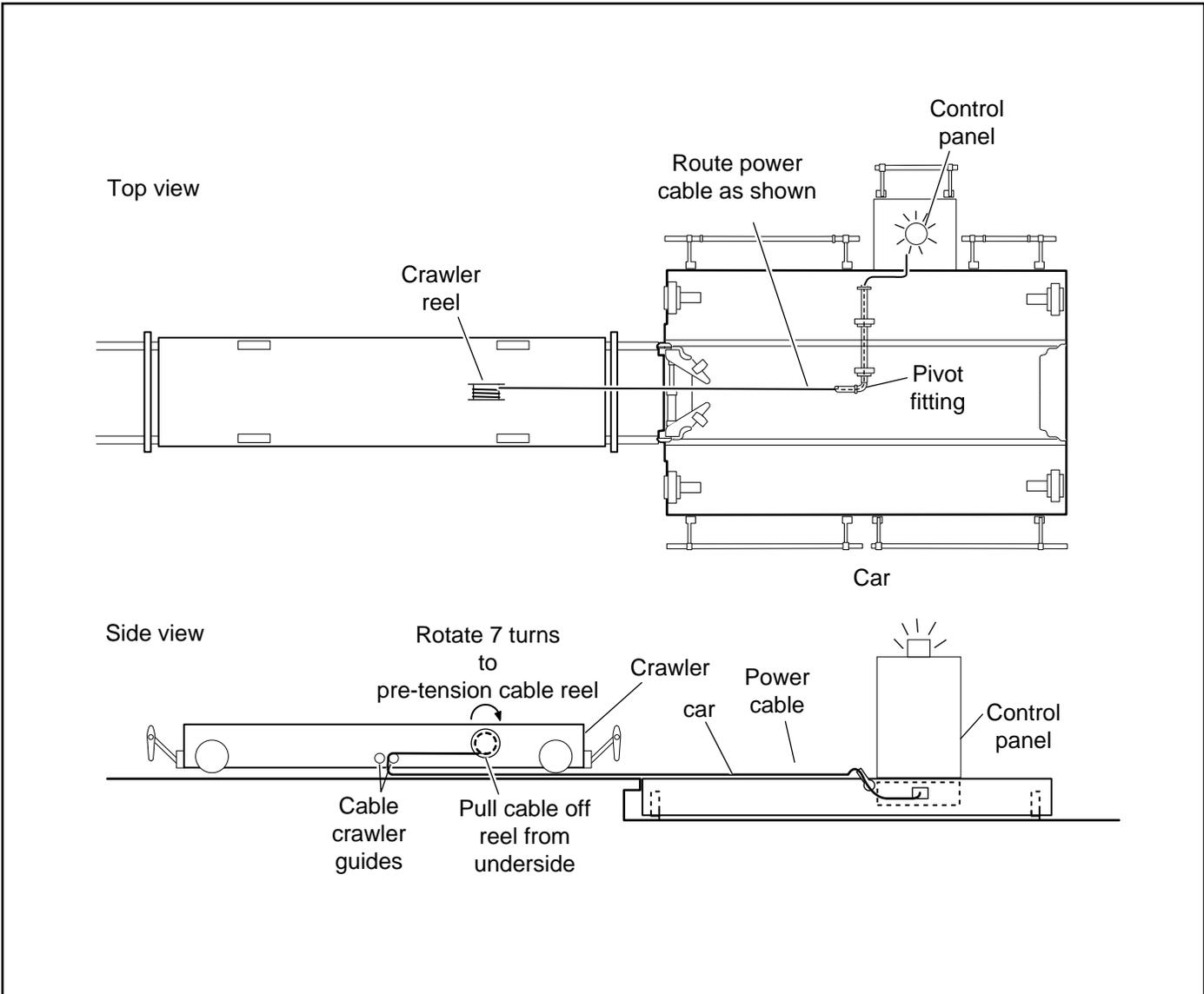


Figure 4.3 Power Cable Routing

4.3 FILL CRAWLER HYDRAULIC SYSTEM

The crawler hydraulic system capacity is 40 gallons [151liters]. In order to fill the system, the hydraulic pump must be running while operating the different hydraulic motors. Fill the system as follows:

1. Fill tank.
2. Check pump rotation by pushing starter as shown in Figure 4.5.
3. Manually operate controls to fill the system:
 - Forward and reverse direction
 - Fast, medium and slow speeds
 - Elevator up and down
4. Continue adding fluid to tank while operating the controls until the full 40 gallon [151 liter] capacity has been reached.

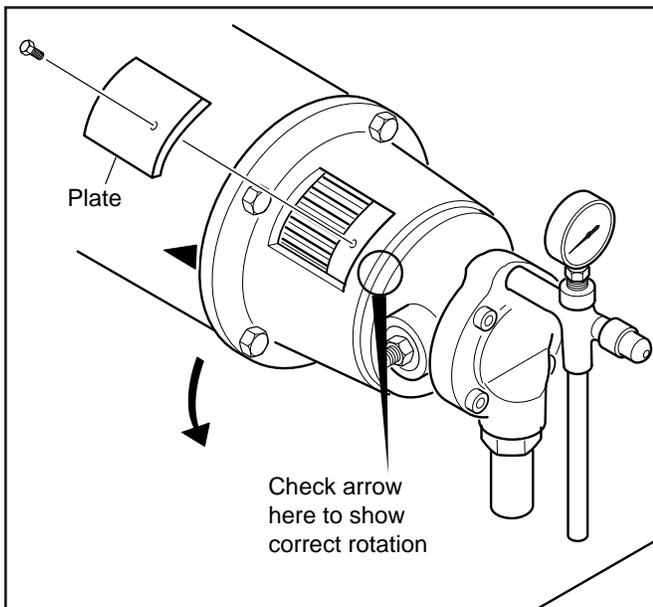


Figure 4.5 Check Pump Rotation

4.4 INPUT/OUTPUT INDICATORS

Crawler function will be checked by observing the various input and output functions from the crawler control processor. Figure 4.6 shows the input and output (I/O) modules of the SLC-500 Controller located on the crawler bed. In the sections that follow, match the various functions with the LEDs on the I/O modules.

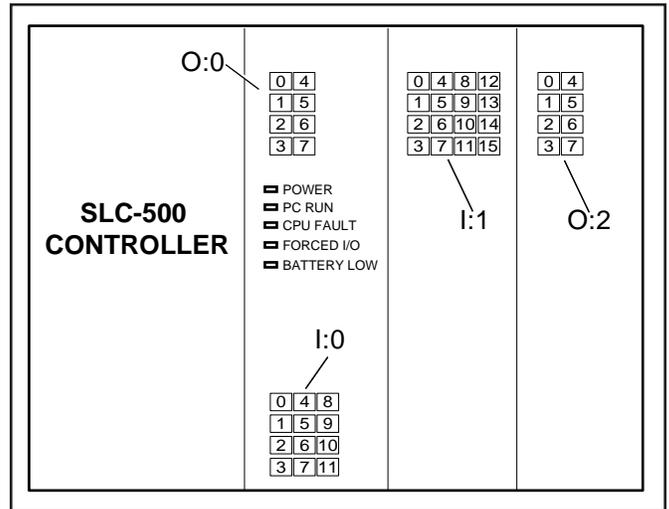


Figure 4.6 Crawler Input/Output Modules

4.5 CHECK OPERATION OF SAFETY BARS

The safety bars stop crawler operation whenever they touch an obstacle. The safety bars are essential components for protection of plant personnel. At all times, make sure they are in proper working order. To check safety bars:

1. Lift up each safety bar to simulate a safety stop.
2. Verify function of limit switches LS-1 and LS-2.
3. Verify that horn signal blasts.
4. Verify that pump stops running.

4.6 CHECK CRAWLER MOVEMENT

This step verifies proper crawler movement on and off the transfer car and also checks for proper operation of car photo sensor PER-6. This sensor signals the LSC-100 operating system that the crawler is in position on top of the car. To check crawler movement:

1. From the car control panel, extend car rail locks.
2. Using the crawler pendant control, move the crawler on and off the car.
3. From the car control panel, verify proper function of PER-6.

4.7 CHECK ELEVATOR OPERATION

From the crawler control station, move elevator up and down. On SLC Controller verify:

- for elevator up, a signal on crawler I-0, terminal 4
- for elevator down, a signal on crawler I-0, terminal 3

4.8 CHECK RACK PROXIMITY SENSORS

The LSC-100 control system coordinates the signals from eight “look up” proximity sensors to monitor crawler location in relation to a rack.

Figure 4.7 shows the sensor locations and Figure 4.8 illustrates a typical pair of sensors attached to a mounting bracket. Each pair of sensors must be positioned within 1/4 inch [6 mm] of the bottom of the first rack shelf. To check sensor function:

1. Using manual controls, move crawler off car and proceed under a rack.
2. Observe the gap between the bottom of the rack and the faces of each pair of sensors.
3. If necessary, adjust sensor bracket to get 1/4 inch [6 mm] gap.
4. Verify sensor function from SLC Controller. All signals appear on crawler I-1 and match the terminals as shown in Table 4.1.

PRS	Terminal
15	4
16	5
18	6
19	7
20	8
21	9
22	10
23	11

Table 4.1 PRS and Terminal Connections

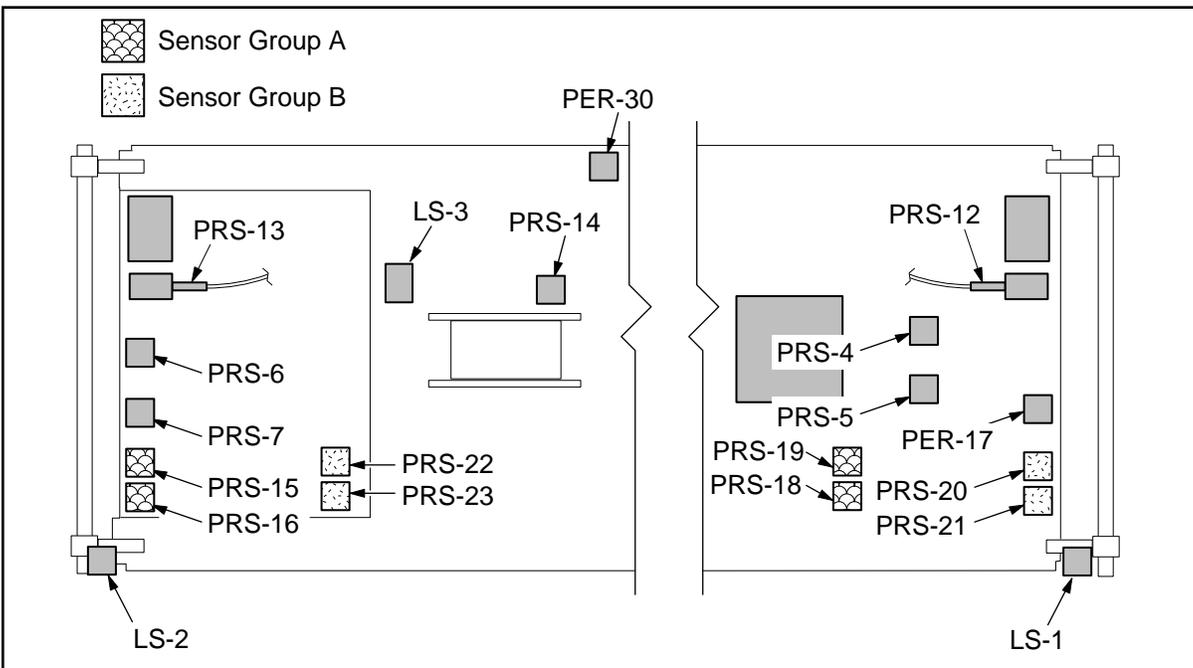


Figure 4.7 Crawler Sensor Locations

4.9 CHECK END-OF-KILN SAFETY STOP

Using manual controls, move the crawler to the back of each kiln. Verify that each end-of-kiln safety stop activates the crawler safety bar. The crawler should stop moving and the horn signal should blast.

4.10 CHECK END-OF-KILN ACTUATORS

Using manual controls, move crawler to the back of each kiln. Verify that the “look up” sensors are actuated by the probe. The distance between the probe and the “look up” sensors should be no more than 1/4 inch [6 mm]. See Figure 4.9.

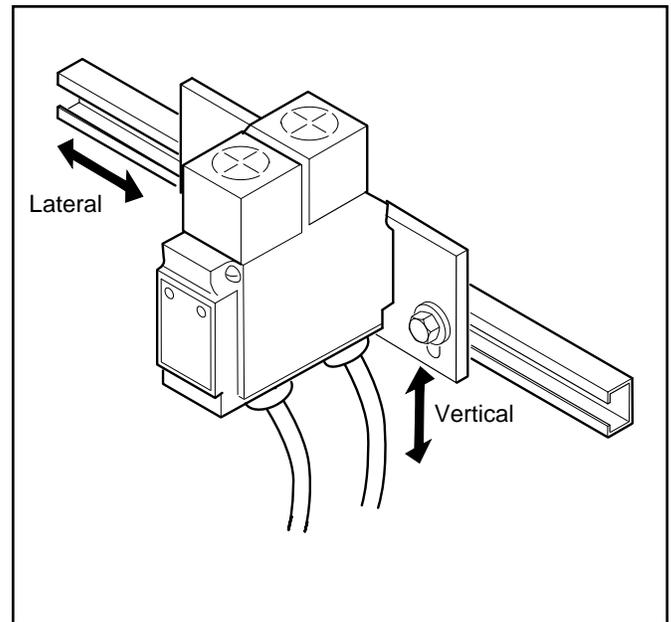


Figure 4.8 Crawler Sensor Adjustments

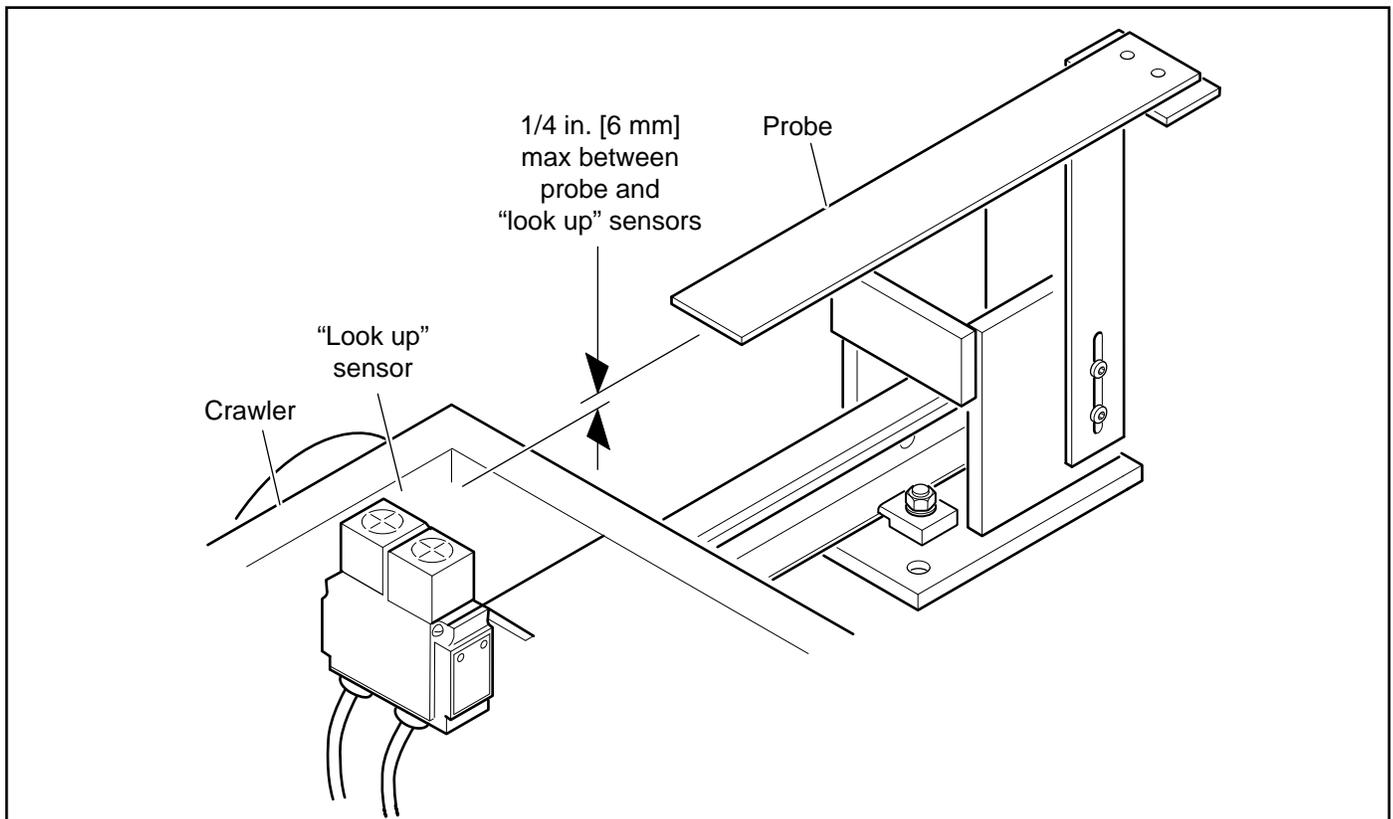


Figure 4.9 "Look Up" Sensors

4.11 CALIBRATE CRAWLER SPEED

The crawler operates at three speeds:

- Slow: 30 feet [9140 mm] per minute
- Medium: 60 feet [18290 mm] per minute
- Fast: 90 feet [27430 mm] per minute

Figure 4.10 shows the six knobs used to adjust crawler speed. To calibrate crawler speed:

1. Mark a 10 foot [3048 mm] interval on crawler path.
2. Using manual control, run crawler both forward and reverse.
3. Rated travel times at each speed are:
 - Slow: 20 seconds
 - Medium: 10 seconds
 - Fast: 6.7 seconds
4. If actual speeds differ from rated speeds, adjust speed control knobs.

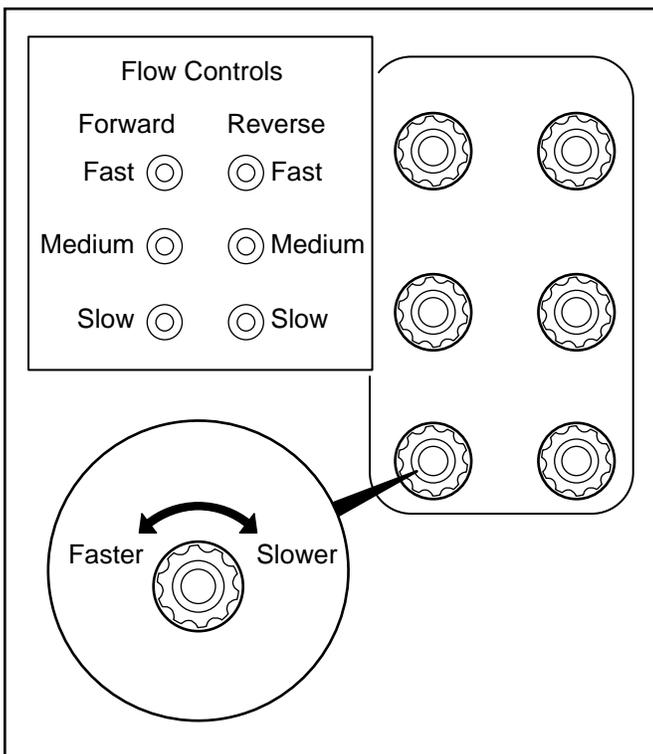


Figure 4.10 Speed Adjustments

4.12 APPLY SAFETY DECALS

Safety decals highlight areas of potential danger. Place the decals in the areas shown in Figure 4.11.

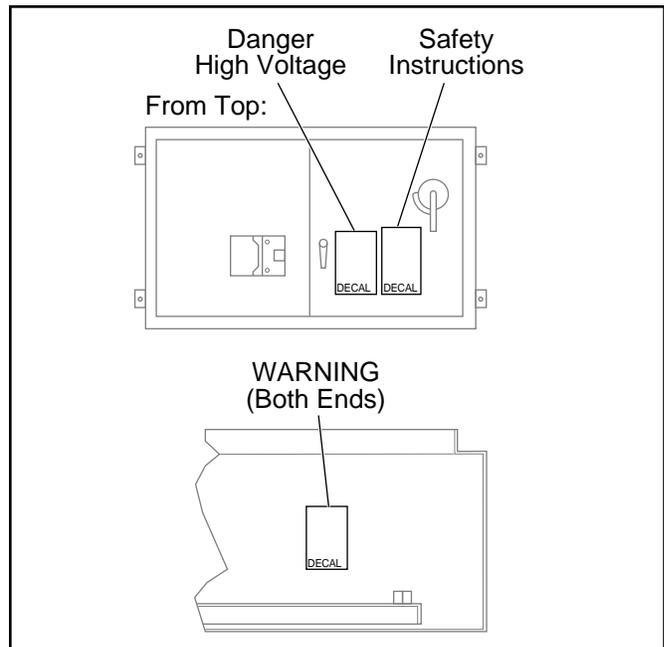


Figure 4.11 Crawler Safety Decals – Top View

CAUTION: Keep safety decals clean and readable.

SECTION 5

TRIAL RUNS

Before placing the final layer of concrete, the operator must observe and approve all details of equipment movement and make corrections as necessary. Section 5.2 provides a check list for an approved installation.

5.1 SERIES OF RUNS

Besser suggests that the operator make a series of trial runs of increasing complexity:

- Manual operation without racks
- Manual operation with unloaded racks
- Automatic operation with unloaded racks
- Manual operation with loaded racks
- Automatic operation with loaded racks

Manual and unloaded trial runs need not complete the entire cycle of kiln loading and unloading. The main purpose of these early stages is to check out the equipment and rail system before adding racks and loads of product. If early trial runs indicate the need for changes to the site or equipment, these changes will be easier to make without having to contend with loaded racks.

5.1.1 Runs Without Racks

Before racks are moved into the LSC-100 system, trial runs are needed to check the function of end-of-kiln safety stops and observe crawler travel independent of rack loading and unloading.

5.1.2 Manual Operation

Manual operation allows close observation and control of equipment. Before moving to automatic cycles, manual operation will assure that the car and crawler are working properly independent of the automatic control system.

5.1.3 Unloaded Racks

Trial runs with unloaded racks allow observation of all crawler operations independent of loads.

5.1.4 Automatic Operation

For instructions on starting and running the system on automatic control, see Section 1 of the Operation and Maintenance Manual.

5.2 INSTALLATION CHECKLIST

During the trial runs, use the check list shown in Table 5.1 as a guide to areas of observation and testing. After successful completion of a loaded trial run, make sure that all elements have been checked and approved.

LSC-100 Installation Checklist	
<p>Important Dimensions</p> <p>Check all important dimensions to make sure they meet specifications.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Top of car rails elevation <input type="checkbox"/> Top of actuators elevation <input type="checkbox"/> Car rail gauge <input type="checkbox"/> Top of crawler rails elevation <input type="checkbox"/> Crawler rail gauge <input type="checkbox"/> Kiln curbs height <p>System Operation</p> <p>Inspect for proper operation.</p> <ul style="list-style-type: none"> <input type="checkbox"/> No leaking hydraulic fluid <input type="checkbox"/> Car and crawler oil heaters are working <input type="checkbox"/> Car and crawler hydraulic systems are filled <input type="checkbox"/> Proper tension and cable retrieval <input type="checkbox"/> Smooth trolley movement on festoon <input type="checkbox"/> Kiln door interface (if used) 	<p>Proper Equipment Movement</p> <p>Observe and verify smooth, unobstructed equipment movement.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Car: full length of car rails <input type="checkbox"/> Crawler: off and on car <input type="checkbox"/> Crawler: full depth of all kilns <input type="checkbox"/> Crawler: on Loader/ Unloader rails <input type="checkbox"/> Car and Crawler: over rail splices <input type="checkbox"/> Crawler/rack: into and out of kilns <input type="checkbox"/> Crawler/rack: onto Rackveyor <p>Safety Provisions</p> <p>Test and verify that all safety equipment is in place and operating properly. Verify that all safety stops have these three results:</p> <ul style="list-style-type: none"> • Equipment movement stops • Signal horn sounds fast pattern • Hydraulic pump stops <ul style="list-style-type: none"> <input type="checkbox"/> Car rail end safety stops <input type="checkbox"/> Crawler end-of-kiln safety stops <input type="checkbox"/> Car safety kickbars <input type="checkbox"/> Crawler safety kickbars <input type="checkbox"/> Car E-Stop (no horn will sound) <input type="checkbox"/> Crawler E-Stop (no horn will sound)

Table 5.1 Installation Checklist

SECTION 6

INSTALL FINAL CONCRETE LAYER

The final installation stage is to fill in the car path up to the plant floor level of 100 feet [30480 mm].

Figure 6.1 is a side view of a car rail following placement of the final concrete layer. Note the following:

- There are 2 inch [50 mm] wide by 1 inch [25 mm] deep grooves along car rails. See installation drawings for proper groove locations and specifications for single groove or double groove.
- Actuator tops extend 1/4 inch [6 mm] above grade
- Car rail tops extend 1/4 inch [6 mm] above grade

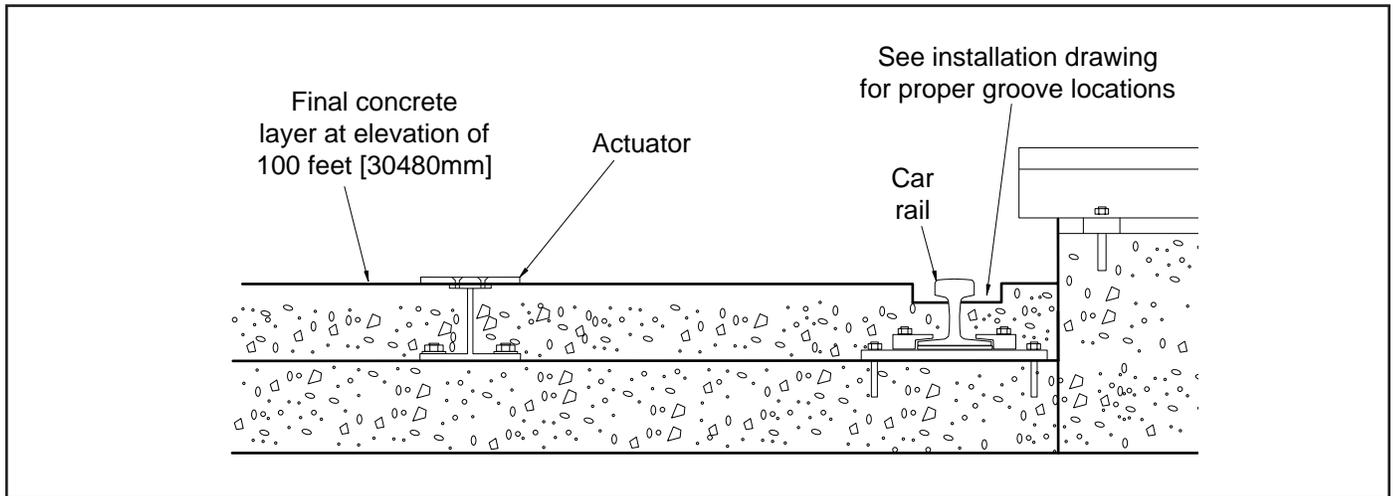


Figure 6.1 Final Concrete Layer

