

Manitowoc 31000

Operator Manual





OPERATOR MANUAL

This manual has been prepared for and is considered part of -

31000

Model Number

31001Ref

Serial Number

This Manual is divided into the following sections:


SECTION 1	INTRODUCTION
SECTION 2	SAFETY INFORMATION
SECTION 3	OPERATING CONTROLS AND PROCEDURES
SECTION 4	CRANE ASSEMBLY
SECTION 5	CRANE DISASSEMBLY
SECTION 6	MAINTENANCE CHECKS AND LUBRICATION

NOTICE

The serial number of the crane and its attachments (i.e. luffing jib) is the only method your Manitowoc dealer or the factory has of providing you with correct parts and service information.

The serial number is located on a crane identification plate attached to the operator cab and applicable attachments. Refer to the Nameplate and Decal Assembly Drawing in Section 2 of this manual for the exact location of the crane identification plates.

Always furnish serial number of crane and its attachments when ordering parts or discussing service problems with your Manitowoc dealer or the Manitowoc Crane Care Lattice Team.

	⚠ WARNING
	<p>To prevent death or serious injury:</p> <ul style="list-style-type: none">• Avoid unsafe operation and maintenance. Crane and attachments must be operated and maintained by trained and experienced personnel. Manitowoc is not responsible for qualifying these personnel.• Do not operate or work on crane or attachments without first reading and understanding instructions contained in Operator Information Manual and Service Manual supplied with crane and applicable attachments.• Store Operator Information Manual and Service Manual in operator cab. <p>If Operator Information Manual or Service Manual is missing from cab, contact your Manitowoc dealer for a new one.</p>

THE ORIGINAL LANGUAGE OF THIS PUBLICATION IS ENGLISH

See end of this manual for Alphabetical Index

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SECTION 1 INTRODUCTION

CRANE DATA

See end of this section for crane data specific to your crane:

- Basic Specifications.
- EC Declaration (if applicable).

CRANE/ATTACHMENT IDENTIFICATION

An identification plate is attached to the outside of the operator cab (see [Figure 1-2](#)) and to the attachments (i.e. luffing jib) available for this crane.

The crane or attachment model and serial number are etched into the plate.

For the exact location of the identification plates on your crane and attachments, refer to the Nameplates and Decals Drawing in Section 2 of this manual.

MANITOWOC DEALER

For questions about this manual or the MLC165 crane, contact your Manitowoc dealer. If you do not know the contact information for your dealer, locate the Manitowoc dealer nearest you, as follows:

1. Go to www.manitowoccranes.com
2. Go to Dealer Locator.
3. Follow the on-screen prompts to locate your Manitowoc dealer.

CHANGE OF OWNERSHIP REGISTRATION

If you are the new owner of a Manitowoc crane, please register it with the Manitowoc Crane Care Lattice Team so we can contact you if the need arises.

1. Go to www.manitowoccranes.com
2. Go to Service > Manitowoc Crane Care > Service Information > Change of Ownership Form.
3. Complete the form.

CRANE ORIENTATION

The terms RIGHT, LEFT, FRONT, REAR used in this manual refer to operator's right, left, front, and rear sides when seated in the operator cab looking forward.

- The operator cab is at front left of rotating bed.
- To determine the position of the upperworks with relation to the lowerworks, monitor the swing angle on the working screen of the RCL/RCI display ([Figure 1-1](#)).

0° = Front of upperworks over front of lowerworks.

90° = Front of upperworks over right side of lowerworks.

180° = Front of upperworks over rear of lowerworks.

270° = Front of upperworks over left side of lowerworks.

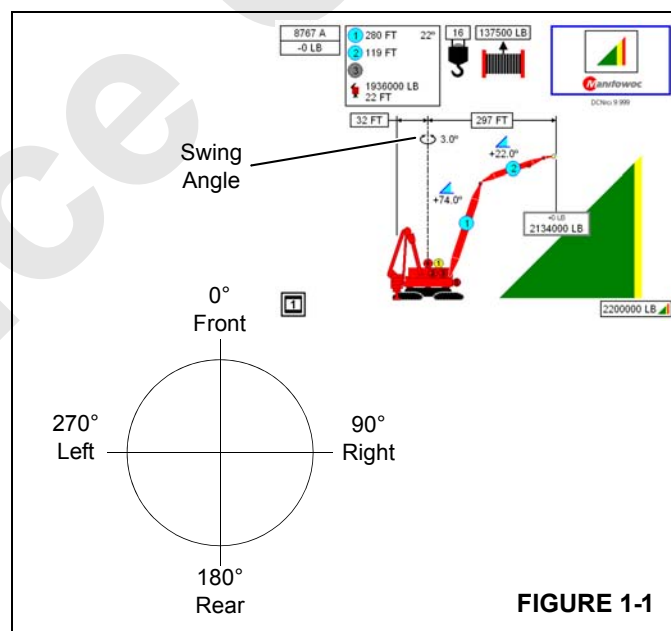


FIGURE 1-1

OUTLINE DIMENSIONS

Refer to the drawing at the end of this section.

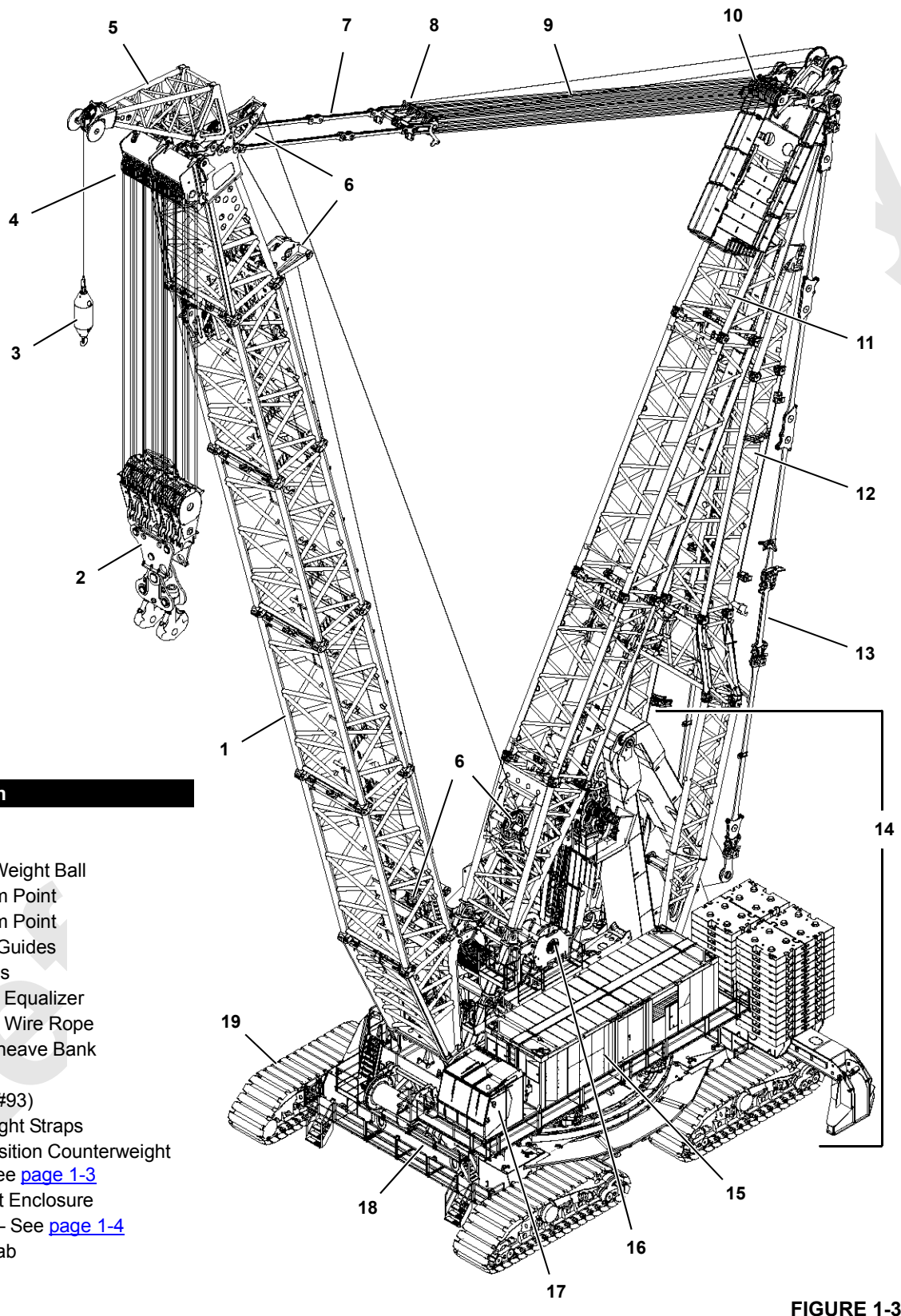
CRANE WEIGHTS

Refer to the chart at the end of this section.



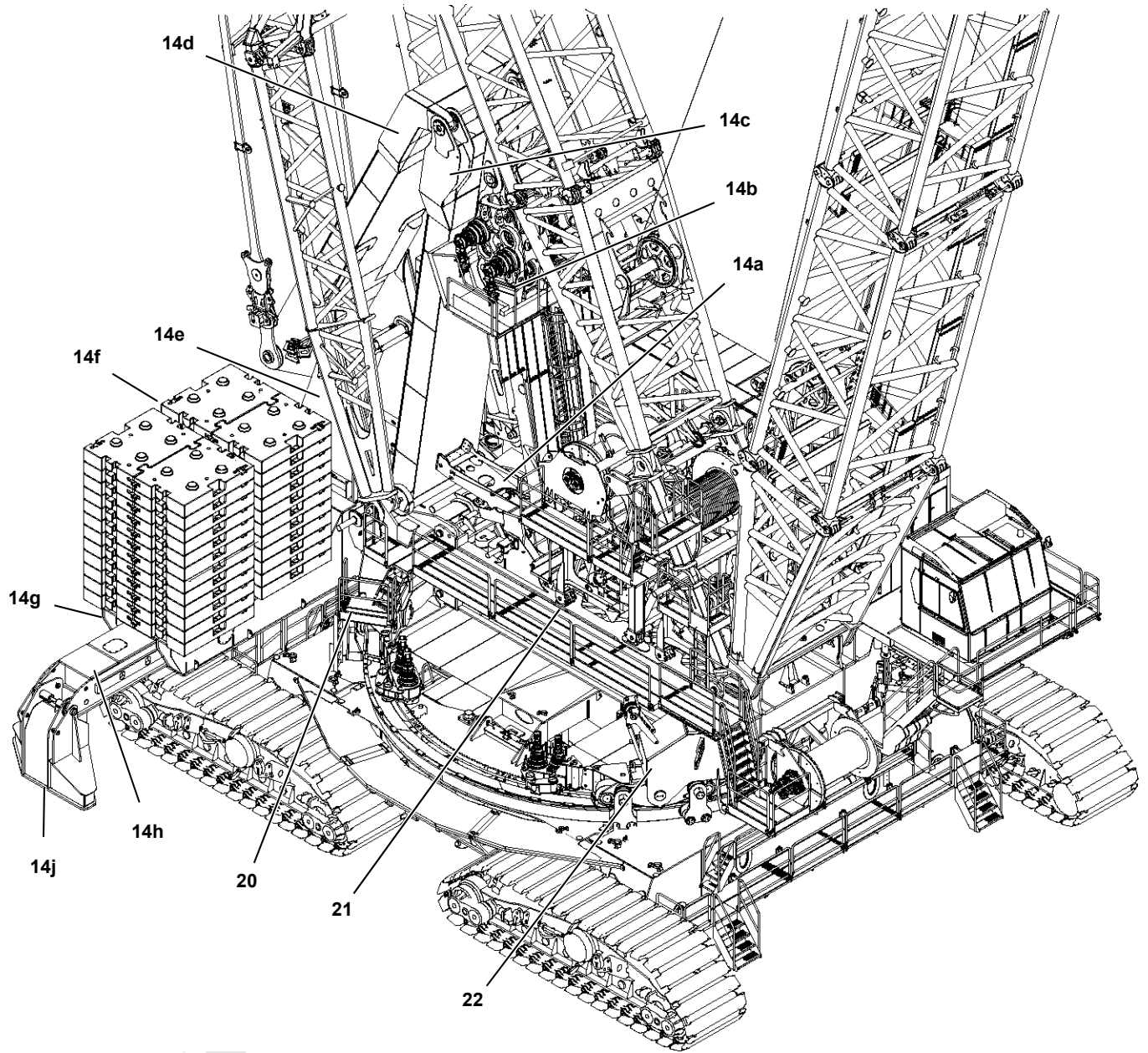
FIGURE 1-2

IDENTIFICATION AND LOCATION OF COMPONENTS



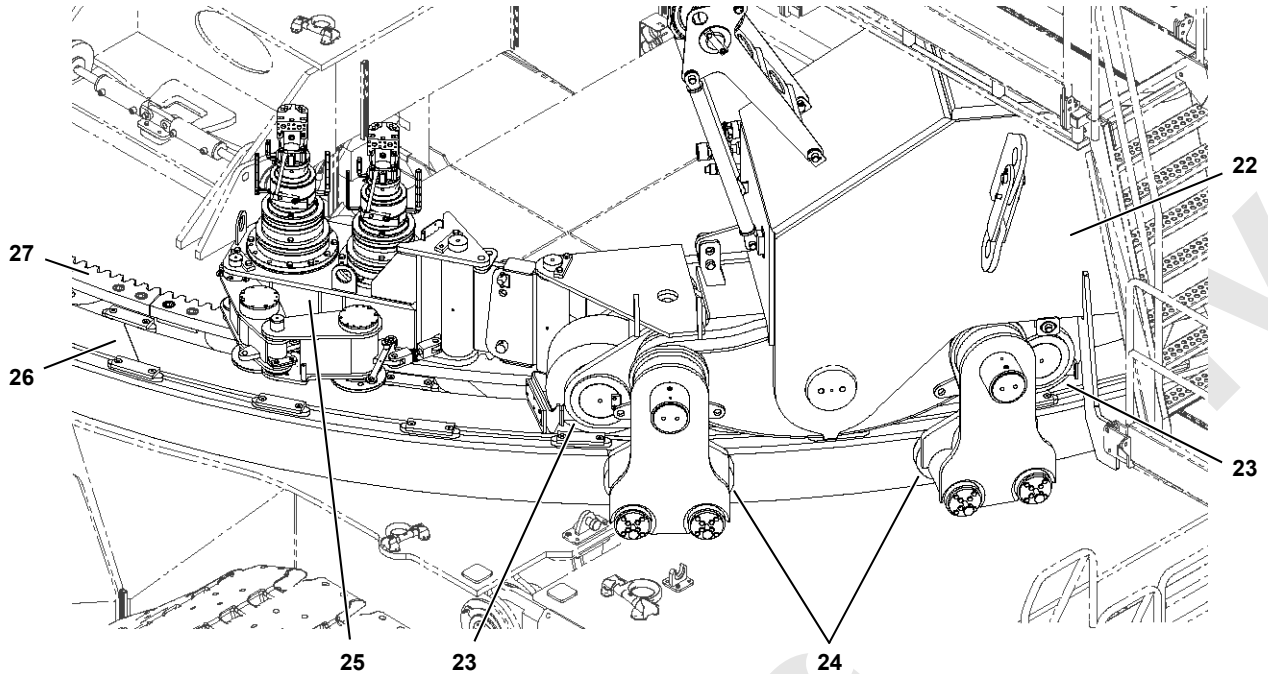
Item	Description
1	Boom (#90)
2	Hook Block
3	Hook-and-Weight Ball
4	Lower Boom Point
5	Upper Boom Point
6	Wire Rope Guides
7	Boom Straps
8	Boom Hoist Equalizer
9	Boom Hoist Wire Rope
10	Mast Top Sheave Bank
11	Mast (#92)
12	Backhitch (#93)
13	Counterweight Straps
14	Variable Position Counterweight (VPC) — See page 1-3
15	Power Plant Enclosure
16	Drums — See page 1-4
17	Operator Cab
18	Carbody
19	Crawler (4)

FIGURE 1-3



Item	Description	Item	Description
14a	VPC Actuator Frame (raising and lowering)	14g	Counterweight Side Tray (right and left)
14b	VPC Actuator	14h	Counterweight Beam (2)
14c	VPC Pivot Frame	14j	Counterweight Pad (2)
14d	VPC Counterweight Frame	20	Rear Roller Carrier
14e	Counterweight Center Tray	21	Rotating Bed
14f	Counterweight Boxes	22	Front Roller Carrier

FIGURE 1-3 continued



Item	Description
22	Front Roller Carrier (rear is similar)
23	House Rollers (8 each roller carrier)
24	Hook Rollers (8 each roller carrier)
25	Swing Drives (2 dual-drives each roller carrier)
26	Roller Path with Wear Plates
27	Ring Gear

Drum	Description
0	Rigging Winch — 1/2 in (12.7 mm)
1	Main Load Hoist #1
2	Main Load Hoist #2
3	Whip/Auxiliary Hoist
4	Boom Hoist
5	Luffing Hoist
6	Rigging Winch (19 mm)

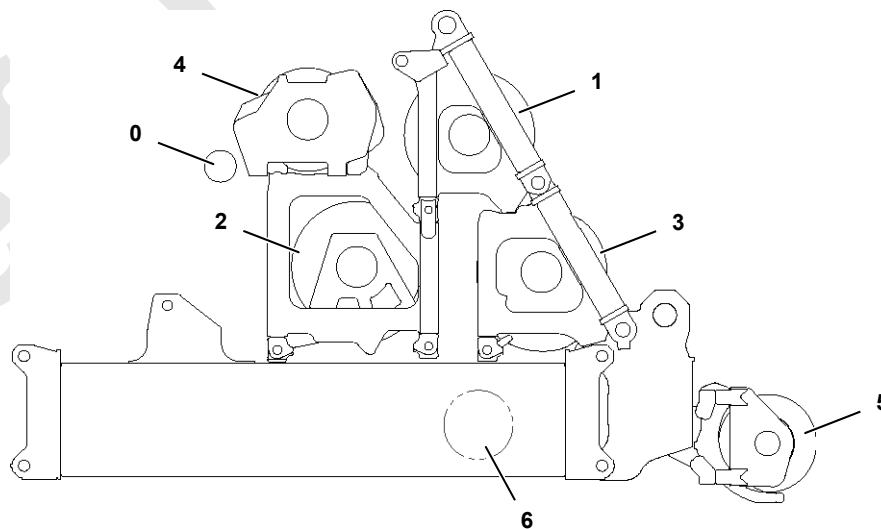


FIGURE 1-3 continued

Item	Description
28	Fixed Jib (#91)
29	Jib Stop
30	Strut
31	Strut Stop
32	Backstay Straps
33	Spreader
34	Jib Straps
35	Wire Rope Guide
36	Upper Jib Point (sam as upper boom point)
37	Lower Jib Point (with dolly lugs)
38	Hook Block or Hook-and-Weight Ball
39	Hook Block
40	Dolly (for raising and lowering jib)

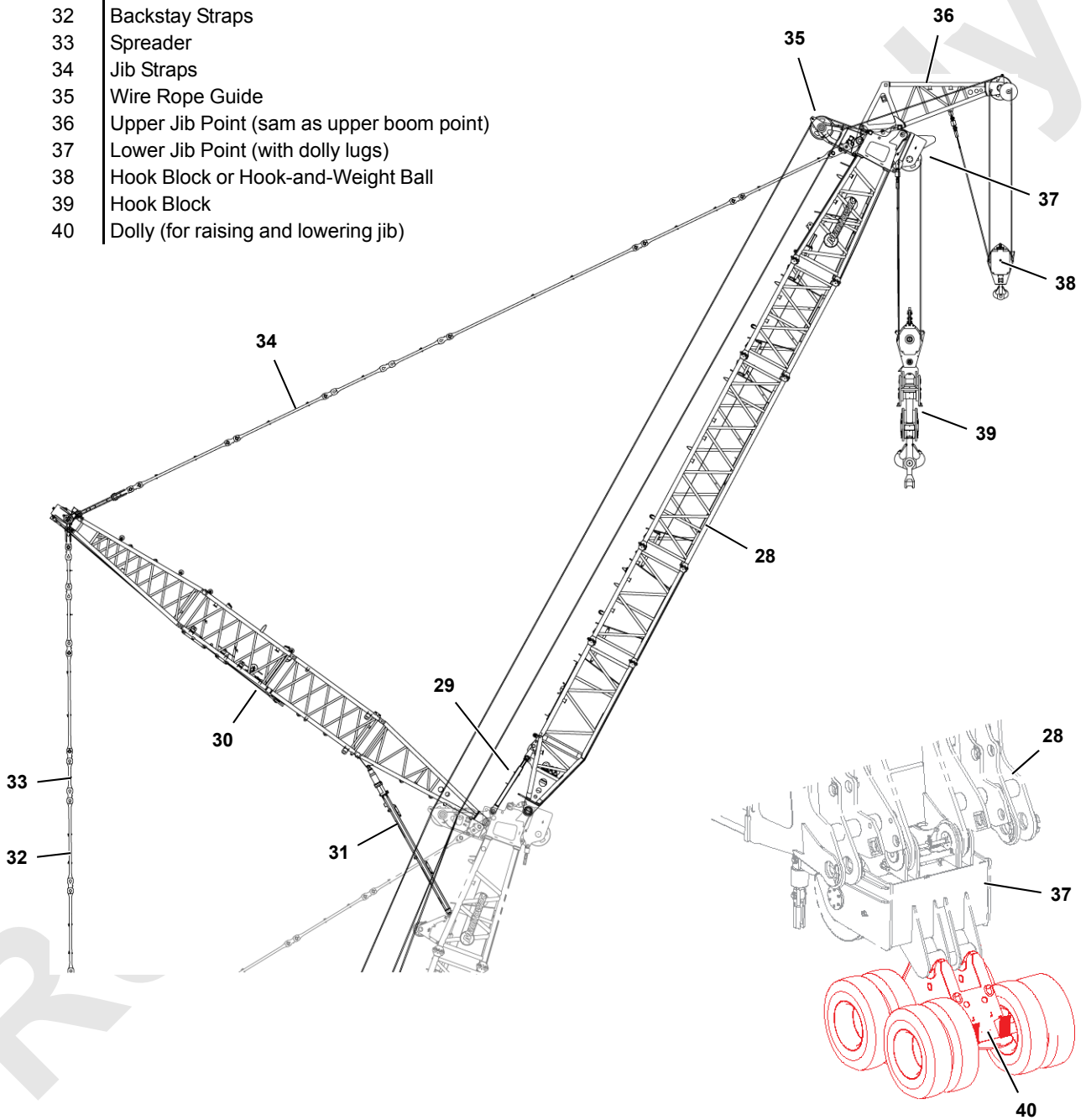


FIGURE 1-3 continued

ENGLISH AND METRIC CONVERSIONS

Direct Conversion

MULTIPLY (x) known value by conversion factor to obtain equivalent value in desired units. For example, 12 ft is converted to meters (m), as follows:

$$12 \text{ ft} \times 0.3048 = 3,6576 \text{ m}$$

Inverse Conversion

DIVIDE (/) known value by conversion factor to obtain equivalent value in desired units. For example, 3,6576 m is converted to feet, as follows:










$$3,6576 \text{ m} / 0.3048 = 12$$











To Convert	Symbol	Application	To	Symbol	Multiply By
AREA					
Square Inch	in ²	Filter Area Clutch Contact	Square Centimeter	cm ²	6.4516
Square Foot	ft ²	Ground Contact	Square Meter	m ²	0.0929
FORCE					
Pound Force	lb	Pedal Effort	KiloNewton Newton	kN N	0.00445 4.4482
Pound Force	lb	Line Pull	KiloNewton	kN	0.00445
Pound Force Per Inch	lb/in.	Spring Force	Newton per millimeter	Nmm	0.1751
Pound Force Per Foot	lb/ft		Newton per meter	Nm	14.5939
LENGTH					
Inch	in.	Adjustments	Millimeter	mm	25.4000
Foot	ft	Outline Dimensions	Meter	m	0.3048
Mile	miles	Travel Distance	Kilometer	km	1.6093
POWER					
Horsepower	hp	Engine	Kilowatt	kW	0.7457
PRESSURE					
Pound/Sq. In.	psi	Hydraulic & Air	Bar		0.0689
TEMPERATURE					
Degrees Fahrenheit	°F	Oil, Air, Etc.	Degrees Centigrade	°C	°F - 32 / 1.8
Degrees Centigrade	°C		Degrees Fahrenheit	°F	°C x 1.8 + 32
TORQUE					
Inch Pound	in lb	Bolt Torque	Newton Meter	Nm	0.1129
Foot Pound	ft lb		Newton Meter	Nm	1.3558
VELOCITY					
Miles Per Hour	mph	Vehicle Speed	Kilometers Per Hour	km/h	1.6093
Miles Per Hour	mph	Wind Speed	Meters Per Second	m/s	0.4470
Feet Per Minute	fpm	Line Speed	Meters Per Minute	m/min	0.3048
VOLUME					
Cubic Yard	yd ³	Bucket Capacity	Cubic Meter	m ³	0.7646
Cubic Foot	ft ³		Cubic Meter	m ³	0.0283
Cubic Inch	in ³	Pump Displacement	Cubic Centimeter	cm ³	16.3871

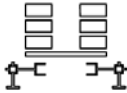
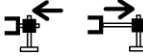








To Convert	Symbol	Application	To	Symbol	Multiply By
VOLUME (LIQUID)					
Ounce	oz	Fluid Capacities	Milliliter	mL	29.5735
Pint	pt		Liter	L	0.4732
Quart	qt		Liter	L	0.9464
Gallon	gal		Liter	L	3.7854
Gallon Per Minute	gpm	Pump Flow	Liters Per Minute	L/min	3.7854
WEIGHT					
Pound	lb	Unit/Component	Kilogram	kg	0.4536
US Ton (2000 lb)	USt	Load Ratings	Metric Ton	t	0.9072
US Ton (2000 lb)	USt		Kilogram	kg	907.1847




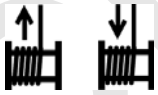

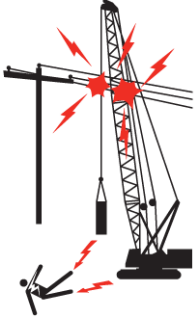





SYMBOLS













The following symbols are use used in this manual:










Description	Icon
Air conditioning	
Aircraft Warning Light	
Alert, Safety	
Alternating Current (AC)	
Anchor Point	
Backhitch Pin Location	
Battery	
Battery Disconnect	
Boom	


















Description	Icon
Burn Hazard	
Bypass	
Camera	
Center of Gravity	
Chair Controls: <ul style="list-style-type: none"> • Seat front up/down (left) • Seat up/down/forward/backward (middle) • Seat back up/down (right) 	
Chair Heater/Massage	
Chair Tilt	
Cigarette Lighter	
Circuit Breaker	
Counterweight	












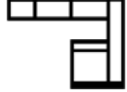
Description	Icon
Counterweight Beam	
Counterweight Beam, Extend/Retract	
Crawler	
Cruise Control ON/OFF	
Crush Hazard	
Cut/Burn Hazard	
Cylinder	
Cylinders, Extend/Retract	
Diesel Fuel	
Direct Current (DC)	

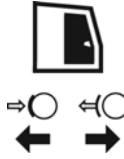

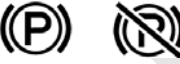

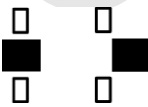






Description	Icon
Drain	
Drum	
Drum Number	
Drum, Pay Out/Haul In	
Elapsed Time (seconds)	
Electrocution Hazard	
Emergency Exit	
Emergency Stop	
Engine, Diesel	
Engine Coolant	
Engine Oil	







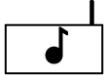


Description	Icon
Engine Run	
Engine Start	
Engine Stop	
Fall Hazard	 
Fall Protection Equipment	
Fan	
Fast/Slow	 
Fire Extinguisher	
Fire Hazard	
Fire Suppression System	





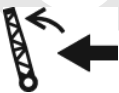
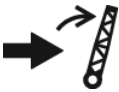



Description	Icon
Fire Suppression System, Manual Activation	
Flashlight Required	
Fluid Level, Low/Full	
Flying Debris/Noise Hazard	
Fuse	
Gear Oil	
Generator, Generator Enclosure	
Hard Hat Required	
Heater, Heat	








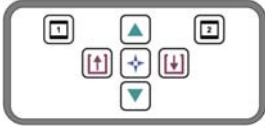
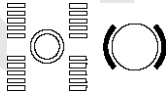

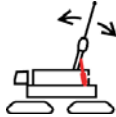

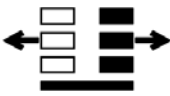



Description	Icon
<p>Heater Controls:</p> <ul style="list-style-type: none"> •  = Fan •  = Increase •  = Decrease •  = Recirculate Air/Fresh Air •  = Power Off •  = Power On •  = Automatic Fan Control •  = Windshield Defrost •  = Temperature Set Point 	
Horn	
Hydraulic Fluid	
Hydraulic Tank Level	
LED Panel	
Lifting Point	
Lifting Point, Forklift	
Lights, Exterior	



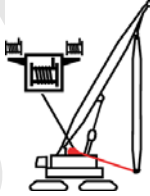
Description	Icon
Lights, Interior	
Lights, Panel	
Lock/Unlock	
Low Clearance Hazard	
Lubrication	
Monitor ("M1" = operator cab monitor #1)	 M1
Monitor Camera Choices	
No Lift Point	
No Step	
On/Off, Start/Stop	
Operator Cab	
Operator Cab, Cabinets	

Description	Icon
Operator Cab, Door Brake On/Off	
Operator Cab, Key	
Park On/ Park Off	
Personal Computer	
Pins, Engaged/Disengaged	
Portable Power Unit, Engine Heater	
Portable Power Unit, Enclosure Key	
Portable Power Unit, Engine Start Key	
Portable Power Unit, Toolbox Key	
Power Switch or Source	
Power Outlet	

Description	Icon
Powerplant Enclosure	
Powerplant Louver Control	
Powerplant Louvers, Open/Close	
Pump	
Pressure Washing	
Public Address System	
Radio	
Read Operating Instructions	
Remote Control	

Description	Icon
Restricted Access	
Setup	
Shipping Arrangement Only	
Swing	
Swing Left	
Swing Right	
Temperature	
Temperature, Cold	
Tie Down Point	

Description	Icon
Touch Pad Controls: <ul style="list-style-type: none"> •  = Display 1 (RCL/RCI Display) •  = Display 1 (Main Display) •  = Green Up Arrow •  = Green Down Arrow •  = Red Up Arrow (Enter) •  = Red Down Arrow (Exit) •  = Purple Star (Confirm) 	
Travel Brake	
Travel Speed	
VPC Actuator, Raise/Lower	
VPC Actuator, Extend/Retract	
VPC Stop	
Welding	
Welding Hazard	
Windshield Wiper Fluid	

Description	Icon
Windshield Wiper: <ul style="list-style-type: none"> • Roof (top) • Upper windshield (middle) • Lower windshield (bottom) 	
Winch: <ul style="list-style-type: none"> • Left backhitch winch on (top) • Both backhitch winches on (middle) • Right backhitch winch on (bottom) 	
Winch Location	

ABBREVIATIONS

Following is a list a abbreviations used in this manual:

Term	Definition
29CFR1910180	OSHA crane regulation
29CFR1926550	OSHA crane regulation
A	amps
A514	ANSI standard
ABC	Automatic Backlight Control
AC	Alternating Current
AISI	American Iron and Steel Institute
amp	ampere
ANSI	American National Standards Institute
ANSI B30-5-2007	ANSI Mobile and Locomotive Cranes standard
API-GL-5	American Petroleum Institute gear oil specification
ASME	American Society of Mechanical Engineers
ASME B305	See ANSI B30-5-2007
ASTM	American Society for Testing and Materials
AUX	auxiliary
AWS	American Welding Society
BAR, bar	Unit of measure equal to 10 kilopascals
BIN	Bus Interface Node
BLK	black
BLU	blue
C	Centigrade
CAN	Controller Area Network
CAP	capacity
cc	cubic centimeter
CD	Compact Disk
cm	centimeters
cST	centistokes
cyl	cylinder
DC, DC	Direct Current

Term	Definition
DCA	Diesel Coolant Additive
DIN	German Institute for Standardization
DIP	Dual In-line Package
DO	Digital Output
DOL	Department of Labor
ECM	Engine Control Module
EDC	Electronic Displacement Control
ERW	Electric Resistance Welding
etc	Latin <i>et cetera</i> ("and so on")
EXT	extend
F	Fahrenheit
FCN	Front Console Node (also called the Master Node)
fpm	feet per minute
GPO	Government Printing Office
GPS	Global Positioning System
GRN	green
GSM	Global System for Mobile communications
hp	horsepower
Hrs	hours
Hz	Hertz
ie	Latin <i>id est</i> ("that is")
in	inches
ISO	International Standards Organization
kg	kilograms
km	kilometer
km/h	kilometers per hour
kN	kiloNewton
kV	kilovolt
kW	kilowatt

Term	Definition
L	liter
L/m	liters per minute
L/min	liters per minute
L/R	left/right
L1-L2	Line 1-to-Line 2
L1-N	Line 1-to-Neutral
L2-N	Line 2-to-Neutral
LB	pounds
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LMI	Load Moment Indicator
lux	unit of illuminance
m	meters or minutes
m/min	meters per minute
m/s	meters per second
max	maximum
MCC	Manitowoc Crane Care
MIL-L-2105C	United States military gear oil specification
min	minimum
mL	milliliter
MM, mm	millimeters
MPH	miles per hour
N	Newton, north
Nm	Newton meter
NO	number
OCV	Open Circuit Voltage
OEM	Original Equipment Manufacturer
ORB	O-Ring Boss fitting
ORS	O-Ring Seal fitting
OSD	On-Screen Display
OSHA	Occupational Safety and Health Administration
oz	ounce
PA	Pennsylvania
PCP	Pressure Control Pilot valve
PNL A	panel A
PLN B	panel B

Term	Definition
PO	Post Office
pos	position
POTW	Publicly Owned Treatment Works
PSI, psi	Pounds per Square Inch
pt	pint
qt	quart
RCI	Rated Capacity Indicator
RCL	Rated Capacity Limiter
Ref	reference
RET	retract
REV	revision
RF	Radio Frequency
RPM	Revolutions Per Minute
S	south
SAE	Society of Automotive Engineers
So	south
St	street
sys	system
T	tandem
t	metric ton
TCH	tachometer
TFE	Teflon
US	United States of America
USA	United States of America
USt	United States ton (2000 pounds)
V	volts
VAC	Volts Alternating Current
VDC	Volts Direct Current
ver	version
VPC	Variable Position Counterweight
W	weight (as in 85W-140)
WHT	white
WI	Wisconsin
WT	weight
yd	yard

SECTION 1 INSERTS

The following publications are provided at the end of this section:

- Basic Specifications
- Chart 8911A, Crane Weights
- Drawing 81012799, Outline Dimensions

Reference Only

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Reference Only

SECTION 2

SAFETY INFORMATION

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SECTION 2

SAFETY INFORMATION



WARNING

California Proposition 65

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Battery posts, terminals, and related accessories contain chemical lead and lead compounds, chemicals known to the State of California to cause cancer, birth defects, and other reproductive harm. Wash hands after handling.

California Spark Arrestor

Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrestor may be required. The owner/operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.

CONTINUOUS INNOVATION

Due to continuing product innovation, the information in this manual is subject to change without notice. If you are in doubt about any procedure, contact your Manitowoc dealer or the Manitowoc Crane Care Lattice Team.

NAMEPLATES AND DECALS

See drawing at the end of this section.

SAFETY MESSAGES

General

The importance of safe operation and maintenance cannot be over emphasized. Carelessness or neglect on the part of operators, job supervisors and planners, rigging personnel, and job site workers can result in their death or injury and costly damage to the crane and property.

To alert personnel to hazardous operating practices and maintenance procedures, safety messages are used throughout this manual. Each safety message contains a safety alert symbol and a signal word to identify the hazard's degree of seriousness.

Safety Alert Symbol



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. **Obey all safety messages that follow this symbol to avoid possible death or injury.**

Signal Words



DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

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



CAUTION

Used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

CAUTION

Without the safety alert symbol, identifies potential hazards that could result in property damage.

NOTE: Highlights operation or maintenance procedures.

Symbol Identification

The symbols used in the safety and information signs and nameplates on this crane are identified in Section 1 of this manual.

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Reference Only

SAFETY AND INFORMATION SIGNS

Maintaining Signs

The crane owner/user shall make sure that all safety and information signs are legible and installed at the proper locations on the crane. If a sign has been defaced or removed, it must be replaced immediately. See the Nameplate and Decal Drawing at the end of this section for the installation locations of signs.

Ordering Signs

Order replacement safety and information signs from your Manitowoc dealer.

When ordering a sign, give the crane model number, the crane serial number, and the name and part number of the sign.

Reference Only

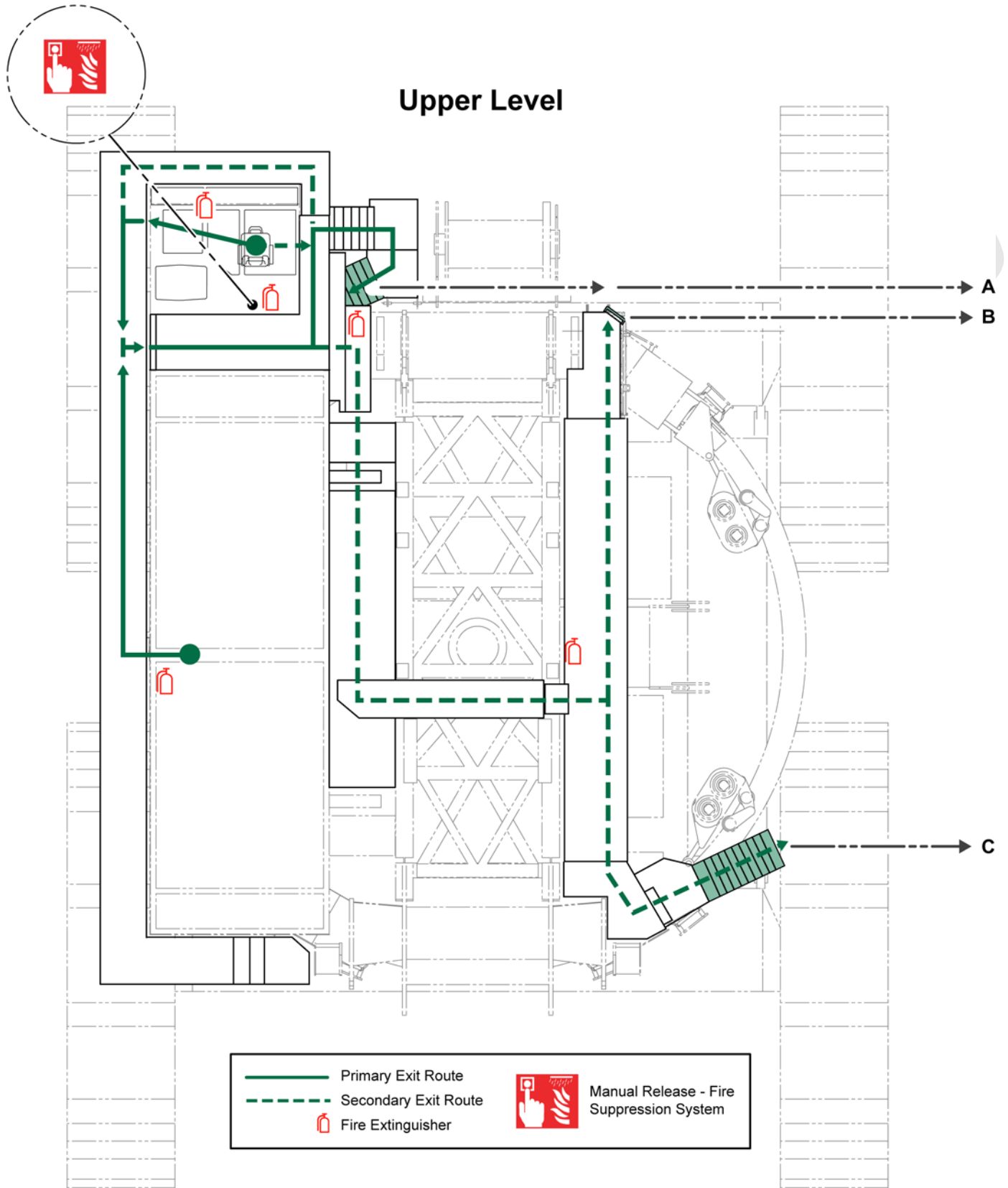


FIGURE 2-1

Lower Level

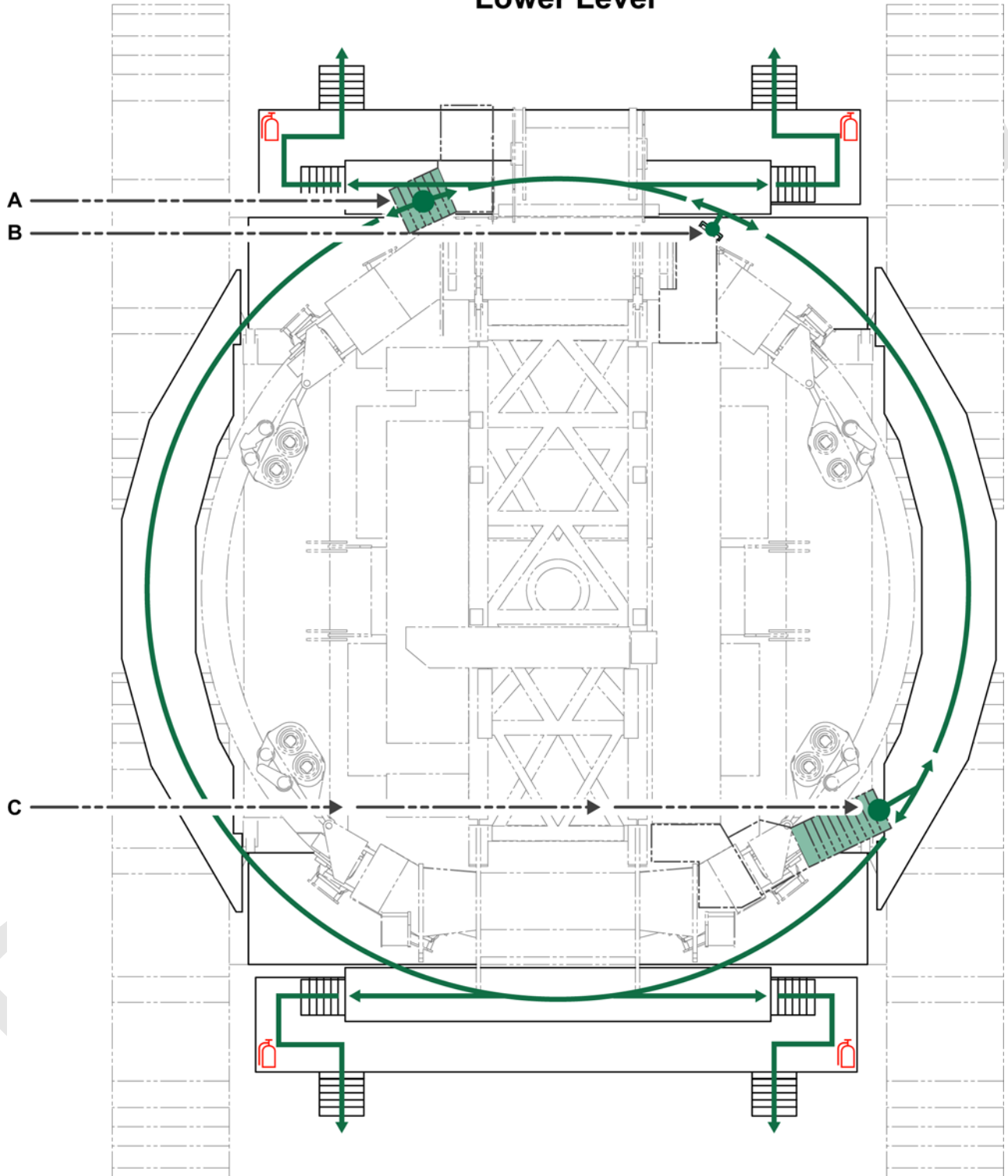


FIGURE 2-1 continued

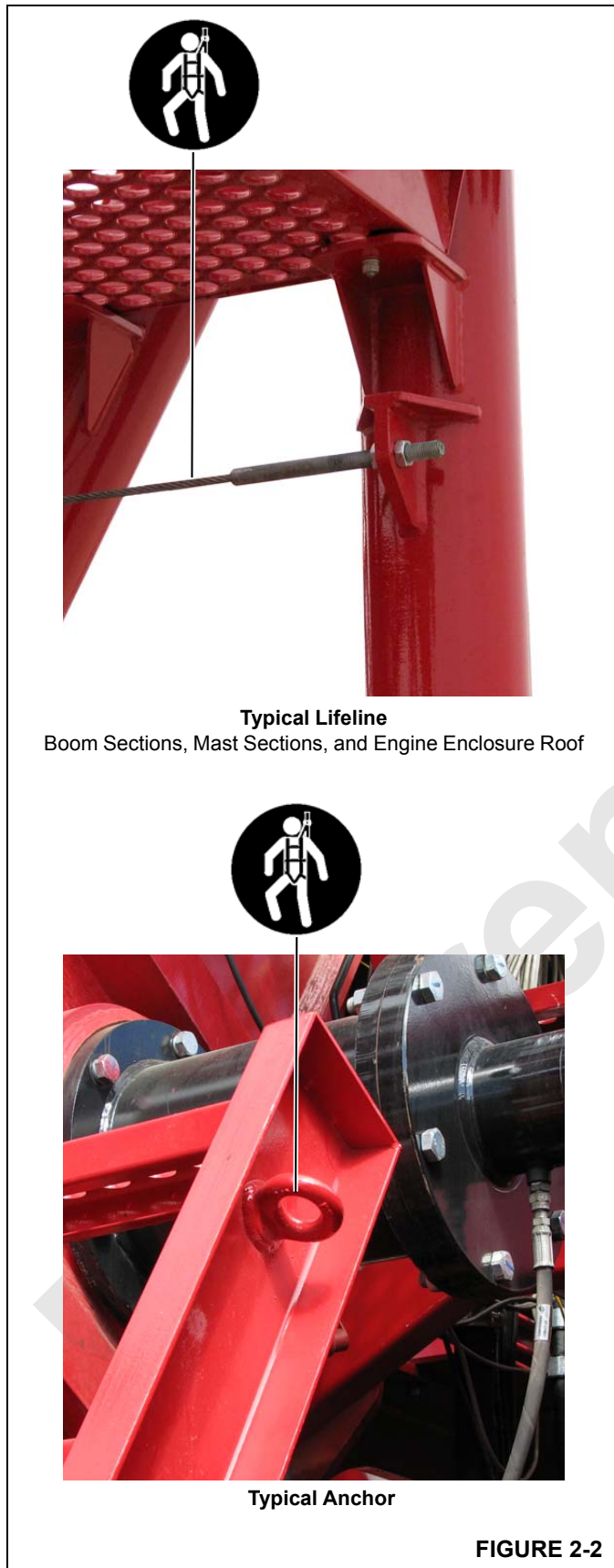


FIGURE 2-2

CRANE ACCESS POINTS



DANGER

Crushing Injury Hazard!

Rotating bed can swing into and crush personnel climbing on or off crane.

Moving crawlers can crush personnel climbing on or off crane.

To prevent death or serious injury:

- Barricade all accessible areas to crane so personnel cannot be struck or crushed when rotating bed is swung.
- Do not climb on or off crane while rotating bed is being swung or crane is being traveled.
- Signal operator that you need to climb on or off crane.
- Operator: do not swing or travel while personnel are climbing on or off crane. Stop swing and travel motions. Apply swing brake and turn on travel park.
- Automatic alarms will sound to alert personnel when the crane is swung or traveled and when the VPC (variable position counterweight) is moving.

NOTE: If the swing, travel, and VPC alarms are not operating properly, they must be repaired as soon as possible. Until they are repaired, the operator must alert personnel to crane movement using the horn on the control console.

Take necessary precaution to prevent slipping and/or falling off the crane during assembly, disassembly, maintenance, or other work. **Falling from any height could result in serious injury or death.**

Manitowoc has provided steps, ladders, catwalks, and platforms to access the operator cab and maintenance points on the lowerworks and the upperworks.

Refer to [Figure 2-1](#) for a map of where to enter and exit the operator cab.

The owner/user must provide workers with approved ladders or aerial work platform to access those areas of the crane, mast, and boom that cannot be reached from the ground or from steps, ladders, catwalks, and platforms provided by Manitowoc.

Adhere to local, state, and federal regulations for handling personnel and for personnel fall protection.

- Access points must be kept clear to prevent personal injury and unsafe operation of the crane. The operator must store his/her clothing and other personal belongings so they do not interfere with the controls in the operator cab or with operation of the crane.

- Do not allow ground personnel to store their personal belongings (clothing, lunch boxes, water coolers, and the like) on the crane.

This practice will prevent ground personnel from being crushed or electrocuted when they attempt to access personnel belongings stored on the crane.

- Tools, oil cans, spare parts, and other necessary equipment must be stored in tool boxes or other appropriate locations. Do not allow these items to lie around loose in the operators cab or on steps, ladders, catwalks, and platforms.
- To reduce the risk of slipping, non-skid material (sand in paint) has been applied to painted walkways and platforms. However, walkways and platforms can be slippery when wet and when oil or grease is spilled on them. **Keep walkways and platforms clean and dry to prevent slipping on them.** When non-skid material wears out, reapply it.
- Wear shoes with a highly slip-resistant sole material. Clean any mud or debris from the shoes before entering the crane cab or climbing onto the crane. A shoe that is not clean might slip off a control pedal during operation.
- Do not make modifications or additions to the crane's access systems that have not been evaluated and approved by Manitowoc.

GETTING ON OR OFF CRANE

Personnel getting on and off the crane shall do so only at the steps or ladders provided and only **while crane is parked**.

Never climb onto or off a moving crane. **Climb onto and off crane only when it is parked and only with operator's permission.**

When personnel use ladders to get on or off the crane, their hands shall be free of any objects. Objects which cannot be carried in pockets or tool belts shall be lifted into place with a hand line or hoist.

Always maintain three points of contact when climbing ladders: two feet and one hand or two hands and one foot.

PERSONAL FALL-PROTECTION

Manitowoc has provided lifelines and anchors throughout the crane and attachment (see [Figure 2-2](#)) to which workers can attach their personal fall-protection equipment.



WARNING

Fall Hazard!

To prevent falling from any height during crane assembly and disassembly, personnel must wear fall-protection equipment.

- Anchors and lifelines are designed to handle only one person at a time.
- Do not use anchors for lifting or pulling loads.

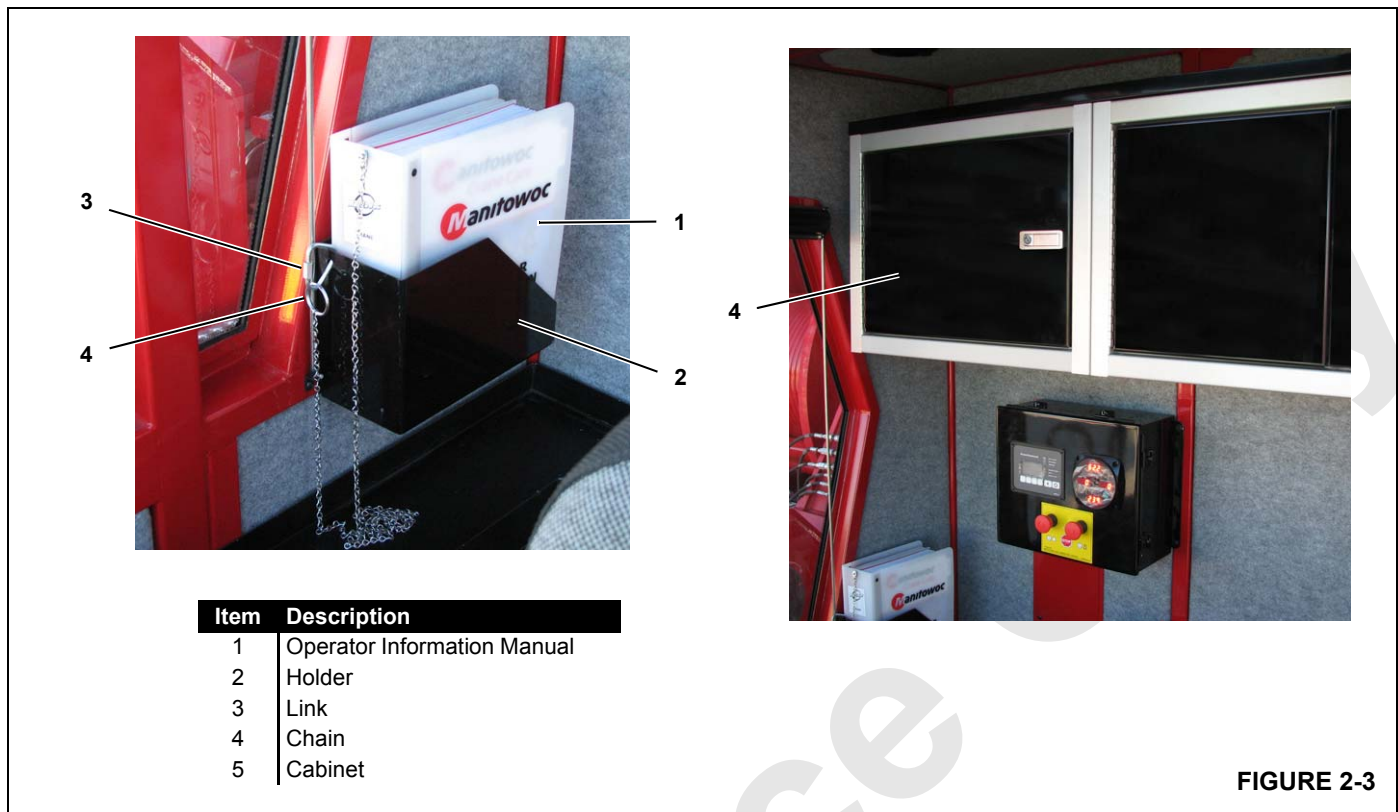


FIGURE 2-3

OPERATOR MANUAL/CAPACITY CHART STORAGE

General

Manitowoc provides the following manuals and other important literature with your crane and attachment (Luffing Jib, etc.):

- Operator Manual (Serial Numbered)
Contains safety information, crane specifications, assembly/erection procedures, operating instructions, lubrication and maintenance checks.
- Parts Manual (Serial Numbered)
Contains illustrations and part numbers of replaceable parts.
- Capacity Chart Manual (Serial Numbered)
Contains lifting capacities and related information (wire rope specifications, drum and lagging information, etc.)
- Maintenance Checks and Lube Guide
Contains lists of maintenance checks and lube services and their prescribed intervals.
- Rated Capacity Indicator/Limiter Operation
Contains rated capacity indicator and/or rated capacity limiter operation, limits, and calibration procedures.

- Service Manual (Serial Numbered)
Contains theory of operation, maintenance procedures, crane and wire rope inspection procedures, troubleshooting information, and shop procedures.

The manuals which must be retained in the operator cab (Operator Manual, Capacity Charts, Maintenance Checks and Lube Guide, and RCL Operation) are supplied in a OPERATOR INFORMATION binder. A separate binder is provided for the crane and each applicable attachment.

The Operator Manuals and Capacity Charts are stamped with the serial number of the crane or attachment. The serial number on the manuals and Capacity Charts must match the serial number of the crane and attachment in use. **Using any other manual or Capacity Chart is prohibited.**

- The crane model and serial number is located on the Crane Identification Plate on the crane cab.
- The model and serial number of the attachment (other than standard boom) is located on the Crane Identification Plate on the attachment.

If the serial numbers of your manuals and Capacity Charts do not match the serial numbers of the crane or attachment, contact your Maniowoc dealer for the proper manuals or Capacity Charts.

Do not operate crane or attachment if proper Capacity Chart is not in cab.

Storing Manuals

Store the Operator Information Manuals for the crane and each applicable attachment in the holder or in the cabinet in the operator cab (Figure 2-3).

Attach the chain from the manual in use to the link on the holder.

Keep all other manuals provided with the crane in the cabinet so they are readily available when needed.

SAFE OPERATING PRACTICES

General

The importance of safe operation cannot be over emphasized. Carelessness and neglect on the part of operators, supervisors and planners, rigging personnel and job site personnel can result in their death or injury and costly damage to the crane or property.

The safety information in this publication is intended only as a guide to assist qualified operators, supervisors and planners, rigging personnel, and job site personnel in safe operation. Manitowoc cannot foresee all hazards that will arise in the field; therefore, **safety remains responsibility of crane operators and owner.**

Local, state, and other governmental agencies may require stricter operating practices. When a conflict in practices exists, follow the strictest practice.

Read Operator Manual

Safe and efficient assembly, disassembly, and operation of this crane requires that it be maintained in proper working order and that its operators and maintenance personnel be familiar with the crane's functions and capabilities.

The Operator Manual supplied with and considered part of your crane must be read and completely understood by each person responsible for assembly, disassembly, operation, and maintenance of the crane.

The Operator Manual must be read to personnel who can not read or understand English or other language into which the manual is translated.

Because of a program of continuing improvement in product design, Manitowoc reserves the right to change the information and specifications contained in the Operator Manual at any time without notice. If you have any questions regarding the crane or its Operator Manual, please contact your Manitowoc dealer.

Operator Qualifications

The crane shall be operated only by the following **qualified** personnel:

1. Designated operators.
2. Trainees under direct supervision of a designated operator.
3. Supervisors, inspectors, and maintenance or test personnel when necessary in performance of their duties. Operation of the crane by these personnel shall be limited to the crane functions needed to perform the inspection or to verify the crane's performance after maintenance procedures.

No personnel shall be allowed to climb onto crane or enter crane cab unless performance of their duties requires them to do so, and then only with knowledge of operator or other qualified person.

Qualified person is defined as one who by reason of training and experience is thoroughly familiar with crane operations and the hazards involved. Such a person shall meet the operator qualifications specified in Occupational Safety and Health Administration (OSHA) Regulations (United States Federal Law), in ASME B30.5 American National Standard, or in any other applicable federal, state, or local laws.

Operator training and qualification is crane owner's responsibility.

NOTE: The regulations and standards mentioned above and later in this section can be obtained from:

US DOL/OSHA Rules and Regulations are available by mail from the Superintendent of Documents, PO Box 371954, Pittsburgh, PA, 15250-7954 or by:

- Phone 202-512-1899
- Fax 202-512-2250
- Online at www.osha.gov.

ASME (formerly ANSI) B30 Series American National Standards are available by mail from the ASME, 22 Law Drive, Fairfield, New Jersey, 0700-2900 or by:

- Phone US & Canada 800-843-2763
- Phone Mexico 95-800-843-2763
- Phone Universal 973-882-1167
- Fax 973-882-1717 or 973-882-5155
- E-mail infocentral@asme.org.

Operator Conduct

1. The operator shall not engage in any practice which diverts his/her attention while operating the crane.
2. The operator shall not operate the crane when he/she is physically or mentally unfit.
3. The operator shall be responsible for all operations under his/her direct control. When safety of an operation is in doubt, the operator shall stop the crane's functions in a controlled manner. Lift operations shall resume only after safety concerns have been addressed or the continuation of crane operations is directed by the lift supervisor.
4. The operator shall be thoroughly familiar with operation of crane and its proper care. If adjustments or repairs are necessary or if there are known defects that impair safe operation, the crane shall not be operated until unsafe conditions have been corrected.
5. If there is a warning sign at the start controls, the operator shall not start the engine until the warning sign has been removed by the person who installed it.
6. Before starting the engine, the operator shall make sure that:
 - a. All daily inspection and maintenance services have been performed.
 - b. All controls are in off the position and all brakes and locking devices are applied or engaged.
 - c. All personnel are clear of the crane. Deploy a swing radius barrier.



WARNING

Safety devices and operational aids such as rated capacity indicator or limiter, boom and jib angle indicator or limiter, anti-two-block device, level indicator, swing limiter, proximity device, etc., may be installed on your crane. Such devices are to be used only as **AIDS TO ASSIST OPERATOR**; their presence on crane in no way substitutes for or lessens requirement that operator knowledge, experience, and judgment are required to ensure safe operation of crane.

Crane shall not be loaded beyond applicable static or dynamic ratings given in Capacity Chart for crane.

- See Size of Load later in this section.
- For a description of each safety device and operational aid, see Safety Devices and Operational Aids in this section and Section 3 of this manual.

7. The operator shall test all controls, limits, and communication systems at the start of each shift. Any

defects found shall be corrected before operation is begun.

8. The operator shall not start crane movement if the load or designated signal person is not within his/her range of vision or communication.
9. The operator shall understand and respond to signals from the person directing the lift or from the designated signal person. When a signal person or crane follower is not required, the operator is responsible for the lift. **Operator shall obey a stop signal at all times, no matter who gives it.**
10. The operator shall verify that the Capacity Chart being used is the correct one for the cranes configuration (boom length, load line reeving, counterweight, etc.).
11. The operator shall verify that:
 - a. All attachments are properly assembled and attached to the crane according to the rigging drawings called for in the Capacity Chart.
 - b. The counterweight — to include applicable auxiliary counterweight — is in place and of proper weight. **Maximum required counterweight shall not be exceeded.**



WARNING

Moving Load/Tipping Crane Hazard!

Changing weather conditions including but not limited to: wind, ice or snow accumulation, precipitation, flooding, lightning, etc. should be considered when determining the location and configuration of a crane when it will be left unattended.

- c. The operator shall perform the following operations before leaving the operator cab for any reason:
 - a. Park crane and position upperworks so crane does not interfere with operation of other equipment.
 - b. Apply travel and swing brakes or locking devices.
 - c. Land any attached load.
 - d. Lower the boom onto blocking at ground level or onto a boom rest if possible.

If the boom cannot be lowered, as determined by a qualified designated person, it must be securely fastened from movement by wind or other outside forces (see Wind Conditions in Capacity Chart Manual).

- NOTE:** The designated person must be familiar with the job site limitations, the crane configuration, and the expected weather conditions.

- e. Move all controls to off.
- f. Apply all drum brakes and pawls.
- g. Disengage the master clutch, if equipped.
- h. Stop the engine.

NOTE: Also read Unattended Crane instructions in Section 3 of the Crane Operator Manual.

12. The operator shall perform the following operations if power or a control function fails during operation:
- a. Land all suspended loads, if possible, under brake or power control.
 - b. Apply all brakes and locking devices.
 - c. Move all controls to off.
13. If the crane will be operated at night, the operator shall make sure that there is sufficient lighting for safe operation. The load and landing area shall be illuminated.
14. The operator shall not operate the crane during periods of bad weather if his/her ability to see the load or the signal person is impaired by darkness, fog, rain, snow, and the like.

Do not operate the crane with a snow or ice covered boom. The extra weight may cause overload, tipping, or structural damage.

Never operate the crane during an electrical thunderstorm.

When a local weather storm warning exists (including electrical thunderstorm), stop operation and secure the crane. See step [c](#) under Operator Conduct topic.

NOTE: DO NOT depend on grounding. Grounding of a crane affords little or no protection from electrical hazards. The effectiveness of grounding is limited by the size of the conductor (wire) used, condition of the ground, the magnitude of voltage and current present, and numerous other factors.

15. Wind can cause the crane to tip or the boom and other attachments to collapse. The operator or qualified person directing the lift shall compensate for the effect of wind on the load and boom by reducing ratings, reducing operating speeds, or a combination of both.

Unless otherwise specified in the Capacity Chart, or in Operator Manual, stop operation under the following wind conditions:

- a. If the wind causes the load to swing forward past the allowable operating radius or sideways past either boom hinge pin, land the load and apply the drum brakes.

- b. If the wind exceeds 35 mph, land all loads and apply the drum brakes, lower the boom onto blocking at ground level or otherwise restrain it, and apply the swing and travel brakes and/or locks.

NOTE: “*Land load*” means to set it down on a firm uniformly supporting surface.

16. Booms, jibs, or masts which are being assembled or disassembled on the ground (with or without support of boom rigging) shall be securely blocked to prevent the boom, jib, or mast sections from dropping.

Workers shall not go under boom, jib, or mast sections when removing connecting pins or bolts.

17. Each outrigger shall be visible to the operator or the signal person during extension and retraction.

Handling Load

Size of Load

1. The crane shall not be loaded beyond the applicable static or dynamic ratings given in the Capacity Chart for the crane configuration.

NOTE: Capacity charts for Manitowoc cranes show the total weight of freely suspended loads for various boom and jib lengths and operating radii.

“*Freely suspended load*” is a load that is hanging free with no direct external force applied except by the crane’s load-line reeving.

To determine the actual weight of the load which can be lifted at a given radius (working load), the operator must deduct the weight of certain lifting equipment from the total weight given in the chart. See the specific Capacity Chart for your crane for a list of lifting equipment which must be deducted.

The operator’s judgment must be used to further reduce total the load to allow for the dynamic effects of swinging, hoisting, or lowering, and adverse weather conditions to include wind.

2. The operator or other designated person directing the lift shall verify that the weight of load is within the static or dynamic rating for radius at which load will be lifted.

Verified weights and measured radii shall take priority over RCI/RCL readings.

Attaching Load

1. Attach the hook to the load with slings, or other suitable rigging. Each hook shall have a latch that is in proper working order. **Hook latches shall not be wired open.**
- a. Inspect each hook and latch before using.
 - b. Never use a hook or latch that is distorted or bent.

- c. Make sure spring will force the latch against the tip of the hook.
 - d. Make sure the hook supports the load. The latch must never support the load. Latches are only intended to retain loose slings under slack conditions.
2. Only use slings and other rigging that are in safe operating condition and have a rating equal to or greater than the load to be lifted.
 3. Do not wrap the load line around the load.
 4. Use suitable protection between slings and any sharp edges on the load. When synthetic slings are used, the synthetic sling manufacturer's instructions, limitations, specifications, and recommendations must be followed.
 5. Secure unused legs of a multi-leg sling before handling a load with one leg of sling.

Lifting/Moving Load

1. Before lifting or moving a load, the operator or qualified person directing the lift shall make the following checks:
 - a. Crane has a firm, uniformly supporting foundation under all crawlers. Unless otherwise specified in the Capacity Chart, the foundation shall be *level to within 1%* — 1ft (0,3 m) rise or fall in 100 ft (30,5 m) distance.

When such a surface is not available, it shall be provided with timbers, cribbing, or other structural members to distribute the load such that the allowable bearing capacity of the underlying member is not exceeded.

*For ground bearing data go to:
www.manitowoccranes.com/site/EN/groundbearingpressure.aspx.*
 - b. The load is secured and properly balanced in the slings or the lifting device before lifting the load more than 3 to 6 in (76 to 152 mm).
 - c. The lift and swing paths are clear of personnel and obstructions.
 - d. The load is free to be lifted.
 - e. The load line is not kinked or otherwise damaged.
 - f. Multiple part load lines are not twisted around each other in such a manner that the lines will not separate when the load is lifted.
 - g. The hook is brought over the load in a manner that will minimize twisting or swinging.
 - h. The load line and the boom hoist rope are properly spooled on the drums and seated in the sheaves.
 - i. The load drum brakes are in proper working order.

The operator shall test the load drum brakes each time a load approaching the rated load is handled. Lift the load 3 to 6 in (76 to 152 mm) and fully apply the brakes — *load must not lower through applied brakes.*

- j. Unused load drums are parked (working and parking brakes applied; if equipped, drum pawls engaged).
 - k. All personnel are clear of the swing radius of the crane's counterweight.
2. While lifting or moving the load, the operator shall take the following precautions:
 - a. Accelerate and decelerate the load smoothly to avoid excessive stress on the crane boom and machinery.
 - b. Avoid sudden starts and stops while swinging. Keep the swing speed under control to prevent the load from swinging out beyond the radius at which the load can be handled and to minimize the pendulum action of the load.
 - c. Sound the signal horn before swinging and intermittently while swinging, especially when approaching personnel.

If equipped, the automatic swing alarm will sound when the crane is swung.
 - d. Use taglines or other restraints to control the load when necessary.
 - e. Do not exceed any swing limitations (areas of operation) given in the Capacity Chart.
 - f. Do not allow the load, the boom, or any other part of the crane to contact obstructions.
 - g. Do not use the crane to drag a load.
 - h. Do not hoist, lower, or swing the load while personnel are on the load or the hook. See Personnel Handling in this section.
 - i. Avoid carrying the load over personnel. Loads which are suspended shall be blocked or cribbed before personnel are allowed to work under or between them.
 - j. Before lifting a load which requires the use of outriggers (or anytime outriggers are used), fully extend the outrigger beams and jacks so the truck tires do not bear any load.

Securely fasten the outrigger jack pads or floats to jacks and set them on a flat, firm surface that will support the load placed on the pads or floats. Do not set the jack pads or floats in holes, on rocky ground, or on extremely soft ground.

When dictated by ground conditions, install wood blocking or steel plates under the jack pads or floats to properly distribute the loading on the supporting surface.

Wood blocking or steel plates used under the jack pads or floats shall be:

- Free of defects.
 - Strong enough to prevent crushing, bending, or shear failure.
 - Of sufficient thickness, width, and length to completely support the jack pad or float, transmit the load to the supporting surface, and prevent shifting, toppling, or excessive settlement under load.
- k. Fully retract and lock the jacks and the outrigger beams so they cannot extend when not in use.
- l. Operate with extreme caution when using two or more cranes to lift the same load.

One designated person shall be responsible for operation when two or more cranes are used to lift same load. The designated person shall analyze the lift and instruct all personnel involved in proper rigging and positioning of the load and all movements to be made. Decisions such as the necessity to reduce crane ratings, load position, boom position, ground support, and speed of movements shall be in accordance with the designated person's decision.

- m. Do not lower the load or the boom to a point where less than three full wraps of wire rope are remaining on the respective drum (or as otherwise indicated in local, state, or federal regulations).
 - n. Engage the boom hoist pawl when operating with the boom at a fixed radius.
 - o. Engage the luffing hoist pawl when operating with the luffing jib at a fixed radius.
3. While traveling, the operator shall take the following precautions:
- a. Sound the signal horn before traveling and intermittently while traveling, especially when approaching personnel.
- If equipped, the automatic travel alarm will sound when the crane is traveled.
- b. Carry the boom in-line with the lowerworks and facing the direction of travel.
 - c. Do not position the boom so high that it could bounce over backwards whether traveling with or without load.
 - d. Secure the rotating bed against rotation except:

- When operating with a MAX-ER® attachment.
 - When it is necessary to negotiate a turn, and then only when the operator is seated at controls or the boom is supported on a dolly.
- e. Lash or otherwise restrain unused hooks so they cannot swing freely.
4. Before traveling with a load, the operator shall take the following additional precautions:
- a. A designated person shall be responsible for operation. Decisions such as the necessity to reduce crane ratings, load position, boom position, ground support, and speed of movements shall be in accordance with the designated person's decision.
 - b. Maintain specified tire pressures (truck cranes).
 - c. Avoid sudden starts and stops. Use taglines or other restraints to control the position of the load.

Multiple Load Line Operation



WARNING

Avoid Over Load and Side Load Damage to Crane

Manitowoc highly recommends that you contact your Manitowoc dealer for lift planning assistance and approval.

Multiple load line operation is becoming common practice for applications like panel tilt-up, pile tilt-up, pile driving, rolling fabricated sections, etc. The multiple lines may be on a common shaft (each with different parts of line) or on multiple shafts (lower boom point and upper point, boom point and fixed jib point, etc).

Manitowoc authorizes multiple load line operation for those applications requiring it, provided the following steps are performed:

1. The qualified lift planner and the crane operator shall read and become thoroughly familiar with the appropriate Capacity Charts and Wire Rope Specification Charts.
 2. The lift planner and the crane operator shall make sure the total load does not exceed the rated capacity given in the Capacity Chart and Wire Rope Specification Chart for given boom point or jib point, whichever is less.
- EXAMPLE: If one load line is lifting from the jib point, the proper jib chart applies.
3. The crane shall be thoroughly inspected by a qualified person prior to setup.

4. The crane shall be thoroughly inspected for load line interference caused by routing and reeving of multiple load lines. If interference is found, it shall be eliminated.
5. For cranes produced before 2003, Rated Capacity Indicators/Limiters were not required by ASME B30.5 for non-personnel lifting.

To aid the operator in staying within the crane's Capacity Chart with the total applied load, Manitowoc recommends that its cranes be equipped with Rated Capacity Indicators/Limiters to monitor the load on each load line.

Operator is still responsible for knowing load and radius whether or not crane is equipped with load indicator(s).

6. Manitowoc recommends that each load line be equipped with an anti two-block device.
7. Manitowoc's Capacity Charts are based on freely suspended loads. To prevent side load damage to the boom, the jib, and the sheaves:
 - The load lines must hang as close to vertical as possible to minimize side and forward loads.

The distance between the load points and the hook points must be a minimum of three times the horizontal distance between the hook point on the load being lifted.
 - The load must remain centered on the boom and jib point shafts unless special lift approval is granted by Manitowoc.
 - The load lines should be located over the load's center of gravity as it is supported on a trailer, a barge, or the ground.
8. The crane operator must be familiar with the operational characteristic of the crane as it relates to multiple drum operation (simultaneous operation, same or opposite direction, or individual operation).
9. When using tandem drums, the maximum operating layers may be limited depending on whether the crane was initially designed for tandem drum operation or not.
10. Load shift when lifting with two hooks may be more unpredictable than typical one hook lifting.

Holding Load

When a load is suspended, the operator shall take the following precautions:

1. Not leave his/her position at the controls.
2. Not allow personnel to stand or pass under the load.

3. Move all controls to off, apply all drum brakes, engage the boom hoist pawl, and apply the swing and travel brakes or locks.

SIGNALS

1. Continuous communication shall be maintained between the operator and the signal person during all crane movements. If communication is disrupted, **operator shall stop all crane movements.**
2. Signals to the operator shall be in accordance with the standard signals shown in Section 3, unless communications equipment (telephone, radio, etc.) is used.
3. All signals shall be easily understood by the operator at all times. The operator shall not respond to any signal which is not clearly understood.
4. For operations not covered in the standard signals, or for special situations or emergencies, additional signals may be required. In those cases, the signals used shall be agreed upon in advance by the operator and the signal person. The signals used shall not conflict with or have potential to be confused with the standard signals.
5. When it is necessary to give instructions to the operator (other than those established by the signal system), all crane motions shall be stopped.
6. The signal person shall:
 - a. Be tested by a designated person and show that he or she has a basic understanding of crane operations and limitations, to include boom deflection.
 - b. Be thoroughly familiar with the standard hand signals and voice signals if used.
 - c. Be positioned in clear view of the operator. The signal person's position should give him or her a clear view of the load, the crane, and the operating area.
 - d. Direct the load so it does not pass over personnel.
 - e. Keep unnecessary personnel out of the crane's operating area.
7. When moving the crane, the following audible signals shall be used:
 - a. STOP - one short audible signal.
 - b. GO AHEAD - two short audible signals.
 - c. BACK UP - three short audible signals.

SAFETY DEVICES



WARNING

Do not operate crane unless all safety devices listed in this section are in proper working order.

- If a safety device stops working properly during operation, the operator must safely stop operation.
- If any safety device listed in this section is not in proper working order, the safety device must be taken out of service and crane operation must not resume until the safety device is again working properly.
- Alternative measures are not permitted to be used for a faulty safety device.
- Always tag-out any faulty safety device and place a warning tag in the cab stating that the crane is out of service and must not be used.

Manitowoc provides the following safety devices on its cranes.

1. Horn activated by a switch on the control console in the operator cab.
If the horn is not working properly, it must be tagged-out or removed, if possible.
2. Crane level indicator: either electronic (viewable in crane's electronic display) or mechanical (viewable from operator cab seat). If the crane level indicator is not working properly, it must be tagged-out or removed, if possible.
3. Cranes operating on a barge require: a trim indicator, a swing brake, and a wind direction indicator if the wind is a factor (supplied by crane owner or user).
4. Boom stops, both physical and automatic.
If a boom stop is damaged or not working properly, it must be tagged-out or removed if possible.
5. Jib stops, both physical and automatic (for fixed jib and luffing jib).
If a jib stop is damaged or not working properly, it must be tagged-out or removed, if possible.
6. Pedal locks for all foot-operated brakes (if applicable).
If a pedal lock is damaged or not working properly, it must be tagged-out or removed if possible.
7. A integral holding device or check valve on each jacking cylinder.

OPERATIONAL AIDS



WARNING

Do not operate crane unless all applicable operational aids listed in this section are in proper working order, except:

- Where an operational aid is being repaired.
- The crane user implements a specified temporary alternative measure.

If an operational aid stops working properly during operation, the operator must safely stop operation until the temporary alternative measures are implemented or the device is again working properly.

Manitowoc provides the following operational aids on its cranes, either as standard equipment or optional equipment. The operational aids are designated as Category 1 or Category 2:

Category 1 Operational Aids

If a Category 1 operational aid is not working properly, it must be repaired no later than 7 calendar days after the deficiency occurs.

Exception: If the crane user documents that he/she has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair must be completed within 7 calendar days of receiving the parts.

1. Boom or Luffing Jib Angle Limiter (automatic boom or jib stop)

Temporary alternative measures if inoperative or malfunctioning:

The qualified person directing the lift shall make sure the maximum boom or jib angle/radius specified in the Capacity Chart for the load being handled is not exceeded. One or more of the following methods must be used:

- a. Measure radius using a tape measure.
- b. Measure the boom angle with a protractor-level on the centerline of boom.
- c. Clearly mark the boom or luffing hoist cable (so it can easily be seen by the operator) at a point that gives the operator sufficient time to stop the boom or jib within the minimum allowable radius.

In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

- d. Clearly mark the boom or luffing hoist cable (so it can easily be seen by a designated signal person) at a point that gives the signal person sufficient time to signal the operator and have the operator stop the boom or jib within the minimum allowable radius.

2. Anti-Two-Block Device

Temporary alternative measures if inoperative or malfunctioning:

The qualified person directing the lift shall establish procedures to furnish equivalent protection. One or more of the following methods must be used:

- a. Assign a signal person to signal the operator to stop hoisting when the load is a safe distance from the boom or jib point.
- b. Clearly mark the hoist cable (so it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the load a safe distance from the boom or jib point.

NOTE: The temporary alternative measures for the anti-two-block device do not apply when lifting personnel in load line supported baskets. **Personnel shall not be lifted in load line supported baskets when anti-two-block devices are not functioning properly.**

Category 2 Operational Aids

If a Category 2 operational aid is not working properly, it must be repaired no later than 30 calendar days after the deficiency occurs. Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 calendar days, the repair must be completed within 7 calendar days of receiving the parts.

1. Rated Capacity Indicator/Limiter

Temporary alternative measures if inoperative or malfunctioning:

The qualified person directing the lift shall establish procedures for determining load weights and shall make sure that the weight of the load does not exceed the crane's rating at the radius where the load is handled.

The weight of the load must be provided to the operator before the lift is made.

2. Boom Angle or Radius Indicator

Temporary alternative measures if inoperative or malfunctioning:

- a. Refer to the pendulum boom angle indicator on the boom butt (viewable from operator cab).
- b. Measure the boom angle with a protractor-level on the centerline of boom.
- c. Measure radius using a tape measure.

3. Jib Angle or Radius Indicator

Temporary alternative measures if inoperative or malfunctioning. Use either or both:

- a. First, make sure you know the boom angle (see item 2 above).
- b. Then, measure radius using a tape measure.

4. Drum Rotation Indicator

Temporary alternative measures if inoperative or malfunctioning:

Mark the drum to indicate its rotation.

If the operator cannot see the drum, add mirrors or remote video cameras and displays so the operator can see the mark.

5. OPTIONAL Swing Limiter or Proximity Device

Temporary alternative measures if inoperative or malfunctioning:

The qualified person directing the lift shall establish procedures to furnish equivalent protection (for example, assign an additional signal person to observe the distance between the boom or load and job site obstructions to include power lines or to limit the swing sector specified in the Capacity Chart).

6. OPTIONAL Drum Spooling Limiter (maximum or minimum bail limit)

Temporary alternative measures if inoperative or malfunctioning:

The qualified person directing the lift, the operator, or a designated signal person shall watch the drum and signal the operator to stop it before it is over spooled (rope does not jump off drum) or before there are less than 3 full wraps of wire rope on the load drum or boom hoist.

7. OPTIONAL Closed-Circuit Television (CCTV)

Temporary alternative measures if inoperative or malfunctioning:

A designated signal person shall watch the load, the drums, and the counterweight and provide necessary hand or voice signals to the crane operator.

BELOW-THE-HOOK LIFTING DEVICES

MCC Part Number	DESCRIPTION	PURPOSE
81002331	Lever, Lifting	Lifting Crawler Assemblies
81004587	Link, Lifting	Lifting Front Roller Carrier (2 places)
81006984	Beam Assembly, Drum Lifting	Lifting Drum Assemblies
81007073	Link Assembly, Lifting	Lifting Crawler Track Treads
81009872	Winch Assembly	Raising and Lowering Boom and Jib Strap Links
81012691	Lug, Lifting	Jib Strut Raising and Lowering
81015313	Link, Lifting	Jib Strut Raising and Lowering

Manitowoc provides the above listed below-the-hook lifting devices for the Model 31000:

To prevent death or serious injury to personnel and damage to the crane or property, observe the following safety precautions when using the below-the-hook lifting devices:

- Observe the inspection, testing, maintenance, and operating procedures outlined in the current edition of the ASME B30.20 Standard.
- Do not remove or obscure the warning labels or tags on the lifting devices.
- Use the lifting devices only for the purposes specified above. Any other use is neither intended nor approved. Each lifting device and its use is identified in the Assembly and Disassembly Sections of the Operator Manual supplied with the crane.
- Read and understand the instructions in the Assembly and Disassembly Sections of the Operator Manual.
- Do not exceed the rated capacity specified on the lifting device.
- Do not use a lifting device that is damaged or missing parts.
- Do not lift people with a lifting device.
- Do not lift suspended loads over personnel.
- Do not leave a suspended load unattended.
- Keep personnel clear of a suspended load.
- Do not lift loads any higher than necessary.
- Do not alter a lifting device in any manner without written permission from Manitowoc.

ASSEMBLING, DISASSEMBLING, OR OPERATING CRANE NEAR ELECTRIC POWER AND TRANSMISSION LINES

Electrocution Hazard

Thoroughly read, understand, and abide by all applicable federal, state, and local regulations regarding operation of cranes near electric power lines or equipment.

United States federal law prohibits the use of cranes closer than 20 ft (6 m) to power sources up to 350 kV and greater distances for higher voltages unless the line's voltage is known [29CFR1910.180 and 29CFR1926.1400].

To avoid death or serious injury, Manitowoc recommends that all parts of crane, boom, and load be kept at least 20 ft (6 m) away from all electrical power lines and equipment less than 350 kV.

NOTE: For detailed guidelines on operating near power lines, refer to the current edition of OSHA 29CFR1926.1400 and ASME B30.5 American National Standard.



WARNING

Electrocution Hazard!

Manitowoc cranes are not equipped with all features required to operate within OSHA 29CFR1926.1408, Table A clearances when the power lines are energized.

1. Keep all personnel and their personal belongings (clothing, water coolers, lunch boxes, etc.) away from the crane if it is being operated near electrical power lines or equipment.
2. Before operating the crane in the vicinity of electrical power lines or equipment, notify the power utility company. Obtain positive and absolute assurance that the power has been turned off.

The crane is NOT INSULATED. Always consider all parts of the load and the crane as conductors, including the wire rope, pendants or straps, and taglines.

Most overhead power lines ARE NOT insulated. Treat all overhead power lines as being energized unless you have reliable information to the contrary from the utility company or owner.

The rules in this section must be followed at all times, even if the electrical power lines or equipment have been de-energized.

3. Crane operation is dangerous when close to an energized electrical power source. Exercise extreme caution and prudent judgement. Operate slowly and cautiously when in the vicinity of power lines.
4. If the load, wire rope, boom, or any portion of the crane contacts or comes too close to an electrical power source, everyone in, on, and around the crane can be seriously injured or killed.

The safest way to avoid electrocution is to stay away from electrical power lines and electrical power sources.

5. The operator is responsible for alerting all personnel to the dangers associated with electrical power lines and equipment. The crane is not insulated. Do not allow unnecessary personnel in the vicinity of the crane while operating. Permit no one to lean against or touch the crane. Permit no one, including riggers and load handlers, to hold the load, load lines, taglines, or rigging gear.
6. Even if the crane operator is not affected by an electrical contact, others in the area may become seriously injured or killed.
7. It is not always necessary to contact a power line or power source to become electrocuted. Electricity, depending on magnitude, can arc or jump to any part of the load, load line, or crane boom if it comes too close to an electrical power source. Low voltages can also be dangerous.

Set-Up and Operation

1. During crane use, assume that every line is energized ("hot" or "live") and take necessary precautions.
2. Position the crane such that the load, boom, or any part of the crane and its attachments cannot be moved to within 20 ft (6 m) of electrical power lines or equipment. This includes the crane boom and all attachments. Overhead lines tend to blow in the wind, so allow for movement of the overhead lines when determining a safe operating distance.
3. Erect a suitable barricade to physically restrain the crane, all attachments, and the load from entering into an unsafe distance from electrical power lines or equipment.
4. Plan ahead and always plan a safe route before traveling under power lines. A wooden clearance frame should be constructed to ensure sufficient clearance is maintained between crane and power lines.
5. Appoint a reliable and qualified signal person, equipped with a loud signal whistle or horn and voice communication equipment, to warn the operator when any part of the crane or load moves near a power

source. This person should have no other duties while the crane is working.

6. Taglines should always be made of non-conductive materials. Any tagline that is wet or dirty can conduct electricity.
7. DO NOT store materials under power lines or close to electrical power sources.
8. When operating near transmitter/communication towers where an electrical charge can be induced into the crane or load:
 - The transmitter shall be deenergized OR,
 - Tests shall be made to determine if an electrical charge will be induced into the crane or load.
 - The crane must be provided an electrical ground.
 - If taglines are used, they must be non-conductive.
 - Every precaution must be taken to dissipate induced voltages. Consult with a qualified RF (radio frequency) Consultant. Also refer to local, state, and federal codes and regulations.

Electrocution Hazard Devices

1. The use of insulated links, insulated boom cages/guards, proximity warning devices, or mechanical limit stops does not ensure that electrical contact will not occur. Even if codes or regulations require the use of such devices, failure to follow the rules in this section may result in serious injury or death.
2. Be aware that such devices have limitations and you should follow the rules and precautions outlined in this section at all times even if the crane is equipped with these devices.
3. Insulating links installed into the load line afford limited protection from electrocution hazards. Links are limited in their lifting abilities, insulating properties, and other properties that affect their performance. Moisture, dust, dirt, oils, and other contaminants can cause a link to conduct electricity. Due to their capacity ratings, some links are not effective for large cranes and/or high voltages/currents.
4. The only protection that may be afforded by an insulated link is below the link (electrically downstream), provided the link has been kept clean, free of contamination, has not been scratched or damaged, and is periodically tested (just before use) for its dielectric integrity.
5. Boom cages and boom guards afford limited protection from electrocution hazards. They are designed to cover only the boom nose and a small portion of the boom. Performance of boom cages and boom guards is limited by their physical size, insulating characteristics, and operating environment (e.g. dust, dirt, moisture, etc.).

The insulating characteristics of these devices can be compromised if not kept clean, free of contamination, and undamaged.

6. Proximity sensing and warning devices are available in different types. Some use boom point (localized) sensors and others use full boom length sensors. No warning may be given for components, cables, loads, and other attachments located outside of the sensing area. Reliance is placed upon the operator in selecting and properly setting the sensitivity of these devices.
7. Never rely solely on a device to protect you and your fellow workers from danger.

Some variables you must know and understand are:

- Proximity devices are advertised to detect the existence of electricity and not its distance, quantity, or magnitude.
 - Some proximity devices may detect only alternating current (AC) and not direct current (DC).
 - Some proximity devices detect radio frequency (RF) energy and others do not.
 - Most proximity devices simply provide a signal (audible, visual, or both) for the operator and this signal must not be ignored.
 - Sometimes the sensing portion of the proximity devices becomes confused by complex or differing arrays of power lines and power sources.
8. DO NOT depend on grounding. Grounding of a crane affords little or no protection from electrical hazards. The effectiveness of grounding is limited by the size of the (wire) conductor used, the condition of the ground, the magnitude of the voltage and current present, and numerous other factors.

Electrical Contact

If the crane comes in contact with an energized power source, the operator must:

1. Stay in the crane cab. DON'T PANIC.
2. Immediately warn PERSONNEL in the vicinity to STAY AWAY.
3. Attempt to move the crane away from the contacted power source using the crane's controls which are likely to remain functional.
4. Stay in the crane until the power company has been contacted and the power source has been de-energized. NO ONE must attempt to come close to the crane or load until the power has been turned off.

Only as a last resort should an operator attempt to leave the crane upon contacting a power source. If it is absolutely necessary to leave the cab, JUMP

COMPLETELY CLEAR OF CRANE. DO NOT STEP OFF. Hop away with both feet together. DO NOT walk or run.

- Following any contact with an energized electrical source, your Manitowoc dealer must be immediately advised of the incident and consulted on necessary inspections and repairs.

If the dealer is not immediately available, contact the Manitowoc Crane Care Lattice Team. The crane must not be returned to service until it is thoroughly inspected for any evidence of damage and all damaged parts are repaired or replaced as authorized by Manitowoc or your Manitowoc dealer.

REFUELING

- When using a portable container to refuel the crane, the container shall be a safety-type can equipped with an automatic closing cap and a flame arrester.
- The engine shall be **stopped** before refueling crane.
- Smoking and open flames shall be prohibited in refueling area.

FIRE EXTINGUISHERS

- A portable fire extinguisher with a minimum rating of 10 BC shall be installed in operator cab or machinery cab of crane.
- The operator and all maintenance personnel shall be thoroughly familiar with the location, use, and care of the fire extinguisher(s) provided.

ACCIDENTS

If this crane becomes involved in a property damage and/or personal injury accident, immediately contact your Manitowoc dealer or the Product Safety and Reliability Department at the following address:

Manitowoc Cranes
2401 So. 30th St.
Manitowoc, WI 54220
Phone: 920-684-6621

Provide a complete description of the accident, including the crane model and serial number.

The crane must not be returned to service until it is thoroughly inspected for any evidence of damage. All damaged parts must be repaired or replaced as authorized by Manitowoc.

SAFE MAINTENANCE PRACTICES



WARNING

Importance of safe maintenance cannot be over emphasized. Carelessness and neglect on part of maintenance personnel can result in their death or injury and costly damage to the crane or property.

Safety information in this publication is intended only as a guide to assist qualified maintenance personnel in safe maintenance. Manitowoc cannot foresee all hazards that will arise in field; therefore, **safety remains responsibility of maintenance personnel and crane owner.**

Maintenance Instructions

To ensure safe and proper operation of Manitowoc cranes, they must be maintained according to the instructions contained in this manual and in the Service Manual provided with the crane.

Crane maintenance and repair must be performed by qualified personnel. These personnel must **read Operator Manual and Service Manual before attempting any maintenance procedure.** If there is any question regarding maintenance procedures or specifications, contact your Manitowoc dealer for assistance.

Qualified person is defined as one who by reason of training and experience is thoroughly familiar with the crane's operation and required maintenance as well as the hazards involved in performing these tasks.

Training and qualification of maintenance and repair personnel are crane owner's responsibility.

Safe Maintenance Practices

- Perform the following steps (as applicable) before starting a maintenance procedure:
 - Park the crane where it will not interfere with other equipment or operations.
 - Lower all loads to the ground or otherwise secure them against movement.
 - Lower the boom onto blocking at ground level, if possible, or otherwise secure the boom against dropping.
 - Move all controls to off and secure all functions against movement by applying or engaging all brakes, pawls, or other locking devices.
 - Stop the engine and render the starting means inoperative.

- f. Place a warning sign at the start controls alerting other personnel that crane is being serviced and the engine must not be started. **Do not remove sign until it is safe to return crane to service.**
2. Do not attempt to maintain or repair any part of the crane while the engine is running, unless absolutely necessary.
If the engine must be run, keep your clothing and all parts of your body away from moving parts. **Maintain constant verbal communication between person at controls and person performing maintenance or repair procedure.**
 3. Wear clothing that is relatively tight and belted.
 4. Wear appropriate eye protection and approved hard hat.
 5. Never climb onto or off a moving crane. **Climb onto and off crane only when it is parked and only with operator's permission.**
Use *both hands* and handrails, steps and ladders provided to climb onto and off the crane.
Lift tools and other equipment which cannot be carried in pockets or tool belts onto and off the crane with hand lines or hoists.
 6. The boom and gantry are not intended as ladders. Do not attempt to climb lattice work of the boom or gantry to get to maintenance points. If the boom or gantry is not equipped with an approved ladder, lower them before performing maintenance or repair procedures.
 7. Do not remove cylinders until the working unit has been securely restrained against movement.
 8. Pinch points are impossible to eliminate; watch for them closely.
 9. Pressurized air, coolant, and hydraulic oil can cause serious injury. Make sure all air, coolant, and hydraulic lines, fittings, and components are tight and serviceable.
Do not use your hands to check for air, coolant or hydraulic oil leaks:
 - Use a soap and water solution to check for air leaks (apply to fittings and lines and watch for bubbles).
 - Use a piece of cardboard or wood to check for coolant and hydraulic oil leaks.
 10. Relieve pressure before disconnecting air, coolant, and hydraulic lines and fittings.
 11. Do not remove the radiator cap while the coolant is hot or under pressure. Stop the engine, wait until the pressure drops and the coolant cools, then slowly remove the cap.
 12. Avoid battery explosion: do not smoke while performing battery maintenance or short across battery terminals to check its charge.
 13. Read the safety information in the battery manufacturer's instructions before attempting to charge a battery.
 14. Avoid battery acid contact with skin and eyes. If contact occurs, flush the area with water and immediately consult a doctor.
 15. Stop the engine before refueling crane.
 16. Do not smoke or allow open flames in refueling area.
 17. Use a safety-type can with an automatic closing cap and flame arrestor for refueling.
 18. Hydraulic oil can also be flammable. Do not smoke or allow open flames in the area when filling hydraulic tanks.
 19. Never handle wire rope with bare hands. Always wear heavy-duty gloves to prevent being cut by broken wires.
 20. Use extreme care when handling coiled pendants. Stored energy can cause the coiled pendants to uncoil quickly with considerable force.
 21. When inflating tires, use a tire cage, a clip-on inflator, and an extension hose which permits standing well away from the tire.
 22. Only use cleaning solvents which are non-volatile and non-flammable.
 23. Do not attempt to lift heavy components by hand. Use a hoist, jacks, or blocking to lift components.
 24. Use care while welding or burning on the crane. Cover all hoses and components with non-flammable shields or blankets to prevent a fire or other damage.
 25. To prevent damage to crane parts (bearings, cylinders, swivels, slewing ring, computers, etc.), perform the following steps **before welding on crane:**
 - Disconnect all cables from batteries.
 - Disconnect output cables at engine junction box.
 - Attach the ground cable from the welder directly to the part being welded and as close to the weld as possible.

Do not weld on the engine or engine mounted parts (per engine manufacturer).
 26. Disconnect and lock the power supply switch before attempting to service high voltage electrical components and before entering tight areas (such as carbody openings) containing high voltage components.
 27. When assembling and disassembling booms, jibs, or masts on the ground (with or without support of boom

rigging pendants or straps), securely block each section to provide adequate support and alignment.

Do not go under boom, jib, or mast sections while connecting bolts or pins are being removed.

28. Unless authorized in writing by Manitowoc, do not alter the crane in any way that affects the crane's performance (to include welding, cutting, or burning of structural members or changing pressures and flows of air/hydraulic components). Doing so will invalidate all warranties and Capacity Charts and make the crane owner/user liable for any resultant accidents.
29. **Keep crane clean.** Accumulations of dirt, grease, oil, rags, paper, and other waste will not only interfere with safe operation and maintenance but also create a fire hazard.
30. Store tools, oil cans, spare parts, and other necessary equipment in tool boxes. Do not allow these items to lie around loose in the operator cab or on walkways and stairs.
31. Do not store flammable materials on the crane.
32. Do not return the crane to service at completion of maintenance or repair procedures until all guards and covers have been reinstalled, trapped air has been bled from hydraulic systems, safety devices have been

reactivated, and all maintenance equipment has been removed.

33. Perform a function check to ensure proper operation at the completion of maintenance or repair.

ENVIRONMENTAL PROTECTION

Dispose of waste properly! Improperly disposing of waste can threaten the environment.

Potentially harmful waste used in Manitowoc cranes includes — but is not limited to — oil, fuel, grease, coolant, air conditioning refrigerant, filters, batteries, and cloths which have come into contact with these environmentally harmful substances.

Handle and dispose of waste according to local, state, and federal environmental regulations.

When filling and draining crane components: do not pour waste fluids onto the ground, down any drain, or into any source of water.

- Always drain waste fluids into leak proof containers that are clearly marked with what they contain.
- Always fill or add fluids with a funnel or a filling pump.
- Immediately wipe up any spills.

BOOM DISASSEMBLY SAFETY



DANGER!

Collapsing Boom Hazard!

Prevent death or serious injury when disassembling boom sections — read and adhere to following instructions.

NOTE: The term “boom” used in the following instructions applies to all lattice attachments (boom, jib, mast, struts.).

Safe handling of lattice booms during assembly and disassembly is a primary concern for preventing serious or fatal injuries. A boom can collapse during assembly or disassembly if workers fail to observe safe working practices.

Accidents during boom assembly and disassembly usually result from one of three primary causes:

- Workers are not familiar with the equipment or are not properly trained.
- The work area is not suitable.

- Safe procedures are overlooked because not enough time is allocated for the task.

Safety decals (Figure 2-4) are placed near the connectors on the boom sections as shown on the Boom Disassembly Decal Drawing at the end of this section.

Workers involved with boom assembly and disassembly must be trained and experienced in operation, assembly, and disassembly of construction cranes. The workers must read and thoroughly understand the assembly and disassembly instructions provided in the Boom Assembly Drawing and in the assembly and disassembly sections of the Operator Manual supplied with the crane. **One worker who does not fully understand or fails to follow correct procedures can be killed or seriously injured or endanger other workers.**



WARNING

Falling Boom Hazard!

Crane can tip or boom can collapse if excess boom is cantilevered. Never cantilever more boom than specified in Boom Assembly Drawing.

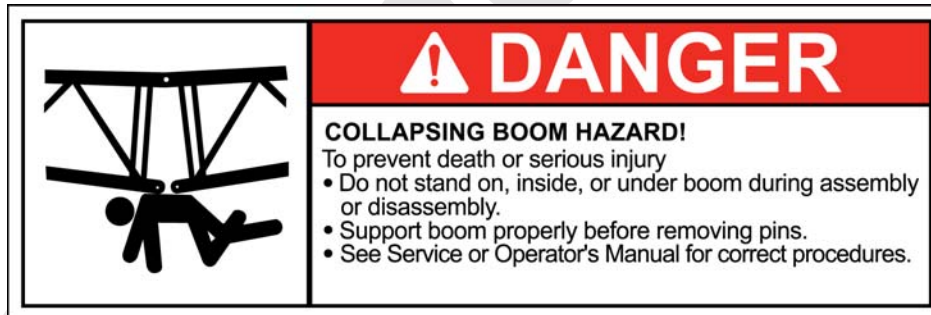


FIGURE 2-4

PERSONNEL HANDLING POLICY

In 1998, the American Society of Mechanical Engineers issued a new American National Standard entitled, Personnel Lifting Systems, ASME B30.23-1998. This standard provides, ***“lifting and lowering of personnel using ASME B30 Standard hoisting equipment shall be undertaken only in circumstances when it is not possible to accomplish the task by less hazardous means. Unless all of the applicable requirements of this volume are met, the lifting or lowering of personnel using ASME B30 Standard equipment is prohibited.”***

The ASME Standards recognize that mobile and locomotive cranes are primarily designed and intended for handling materials and not personnel. The ASME Standards have a retrofit statement that applies to existing cranes after the standards go into effect. It is not the intent of the standards to require retrofitting of existing equipment. If an item is being modified, the performance requirement shall be reviewed relative to the current standard.

This new standard is consistent with the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) regulations for Construction that state, in 29CFR1926.1431(a): ***The use of a crane or derrick to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the work site, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous or is not possible because of structural design or work site conditions.***

Use of a Manitowoc crane to handle personnel is acceptable provided:

- The crane user shall comply with the manufacturer's specifications and limitations for lifting accessories (hooks, slings, personnel platforms, etc.).
- The requirements of the applicable national, state and local regulations and safety codes are met.
- A determination has been made that use of a crane to handle personnel is the least hazardous means to perform the work.
- The crane operator shall be qualified to operate the specific type of hoisting equipment used in the personnel lift.
- The crane operator must remain in the crane cab at all times when personnel are off the ground.
- The crane operator and occupants have been instructed in the recognized hazards of personnel platform lifts.
- The crane is in proper working order.
- Load and boom hoist drum brakes, swing brakes, and locking devices such as pawls and dogs shall be

engaged when the occupied personnel platform is in a stationary position.

- The crane must be equipped with a boom angle indicator that is visible to the crane operator.
- The crane must be equipped with boom hoist limiting device.
- If the luffing jib is used for hoisting personnel, the crane must be equipped with a luffing jib angle indicator that is visible to the crane operator.
- If the luffing jib is used for hoisting personnel, the crane must be equipped with a luffing hoist limiting device.
- The crane is equipped with a positive acting device which prevents contact between the hook block or hook-and-weight ball and the boom or jib point (anti-two block device).

For friction cranes, this implies the addition of spring applied brakes activated by the anti-two block device. The load line hoist drum shall have a system or device on the power train, other than the load hoist brake, which regulates the lowering rate of speed of the hoist mechanism (controlled load lowering).

Free fall of the hoist line is prohibited.

- The crane's Operator Manual is in the crane's cab, readily accessible to the Operator.
- The crane's load Capacity Chart is affixed inside the crane cab, readily accessible to the operator. The total weight of the loaded personnel platform and related rigging shall not exceed 50 percent of the rated capacity for the radius and configuration of the crane.
- The crane is uniformly level within one percent of level grade and located on a firm footing. Some Capacity Charts require more stringent levelness criteria.

Cranes with outriggers or stabilizers shall have them all extended and locked. All outriggers or stabilizers must be extended equally in accordance with the Capacity Charts and operating procedures.
- Handling personnel from a platform suspended by wire rope from a luffing jib is acceptable, but only when it is not possible to accomplish the task using a less hazardous means. The crane user and operator shall take into account hazards that may be present when using a luffing jib.
- Direct attachment of a personnel platform to a luffing jib is prohibited.
- The platform meets the requirements as prescribed by applicable standards and regulations.
- Applicable personal protection equipment is provided (i.e., personal fall-protection system, etc.)

- For wire rope suspended platforms, the crane is equipped with a hook latch that can be closed and locked, eliminating the throat opening.
- The platform is properly attached and secure.
- Personnel platforms must not be used in winds exceeding 20 mph (9 m/s) at the hoisted platform height or in electric storms, snow, ice, sleet, or other adverse weather conditions which could affect the safety of personnel.
- Hoisting personnel within 20 ft (6 m) of a power line that is up to 350 kV or within 50 ft (15 m) of a power line that is over 350 kV is PROHIBITED, except for work covered in OSHA 29CFR1926 subpart V.

For operation outside the United States, the requirements of the applicable national, state and local regulations and safety codes must be met. This may include, in addition to the above:

- Automatic brakes such that when the equipment operating controls are released, the motions are brought to rest.

- A holding device (such as a load hold check valve) shall be provided in the hydraulic or pneumatic systems to prevent uncontrolled movement of the hoisting equipment in the case of a system failure.

Manitowoc offers upgrade packages for friction controlled models to install anti-two block, dead man control, and automatic hoist system control requirements to satisfy other codes and standards.

Manitowoc recommends that cranes be properly maintained, regularly inspected, and repaired as necessary. All safety signs must be in place and legible. We also urge Manitowoc crane owners to upgrade their cranes with rated capacity indicator/limiter systems for all lifting operations.

If you have any questions about this subject or other product safety matters relating to the operation and use of a Manitowoc crane, please contact your Manitowoc dealer or the Product Safety and Reliability Department at the following address:

Manitowoc Cranes

2401 So. 30th St.
Manitowoc, WI 54220

Phone: 920-684-6621

PEDESTAL/BARGE MOUNTED CRANES

WARNING **Overload Hazard!**

A pedestal mounted crane will not tip to indicate to operator that crane's capacity has been exceeded. When capacity of a pedestal mounted crane is exceeded, hook rollers or other structural components may break, before load lines fail, causing crane to separate from pedestal.

For this reason, great care must be taken to operate a pedestal mounted crane within its rated capacity.

Careful planning is required before a crane can be operated on a barge. Crane user shall verify that barge is capable of limiting crane list and/or dynamics to maximum allowable specified in Capacity Charts. If specified crane list and/or dynamic conditions are exceeded, crane's capacity may be exceeded; hook rollers or other structural components may break, causing crane to separate from pedestal.

WARNING

Crane owner/user must verify that method used to fasten or restrain crane to foundation, barge, ship or floating platform is strong enough, under all operating conditions, to prevent crane from breaking off foundation or moving on barge.

Manitowoc does not permit use of a truck crane on a barge, ship or floating platform.

Pedestal Mounted Crane

Also see ASME publication B30.8-2004, Floating Cranes and Derricks.

Definition

A pedestal mounted crane is a crane which is securely fastened to a foundation, barge, ship, or floating platform so the crane is restrained from tipping.

Examples

1. Crane rotating bed mounted on a turret (pedestal) which is securely fastened to the foundation ([Figure 2-5](#)).

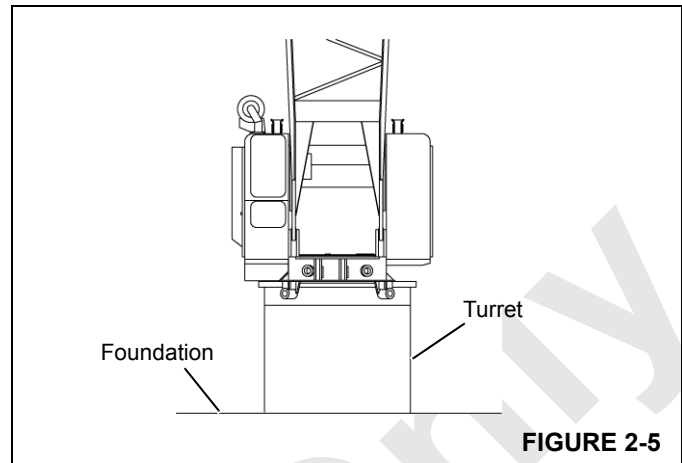


FIGURE 2-5

2. Crane rotating bed mounted on a carbody (crawlers removed) which is securely fastened to the foundation ([Figure 2-6](#)).

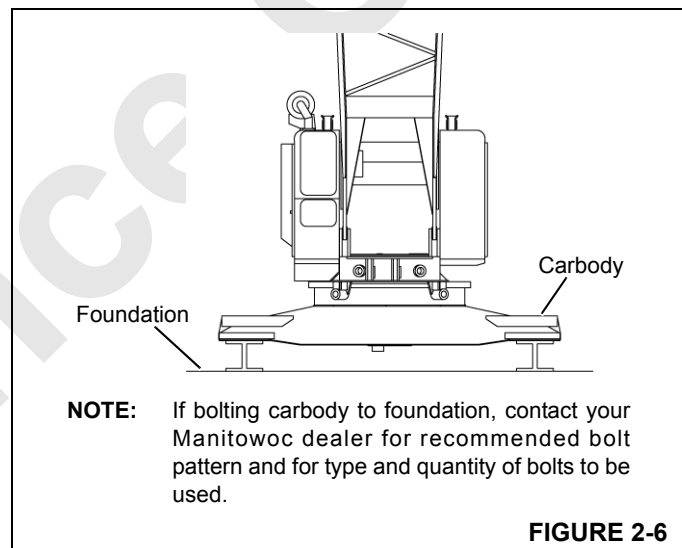


FIGURE 2-6

Barge Mounted Crane

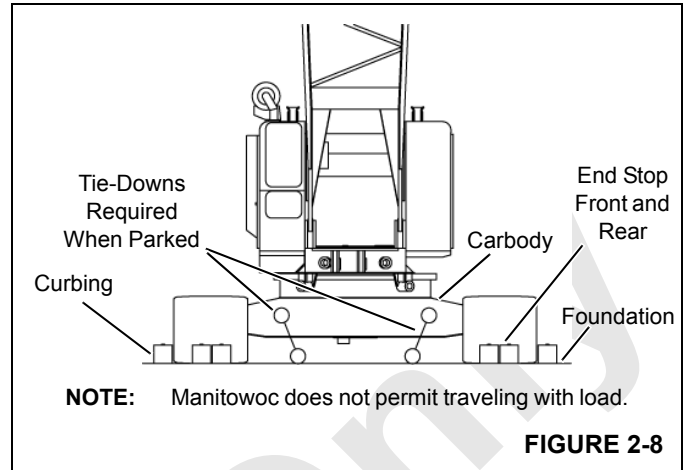
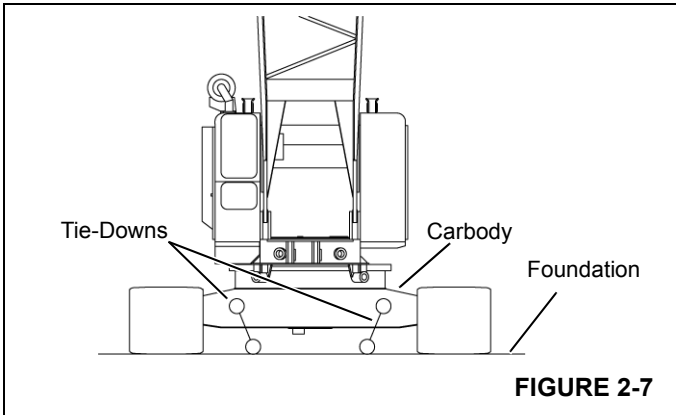
Definition

A barge mounted crane is a crane that is anchored or restrained in a work area of the barge, ship, or floating platform and is subjected to tipping forces.

Examples

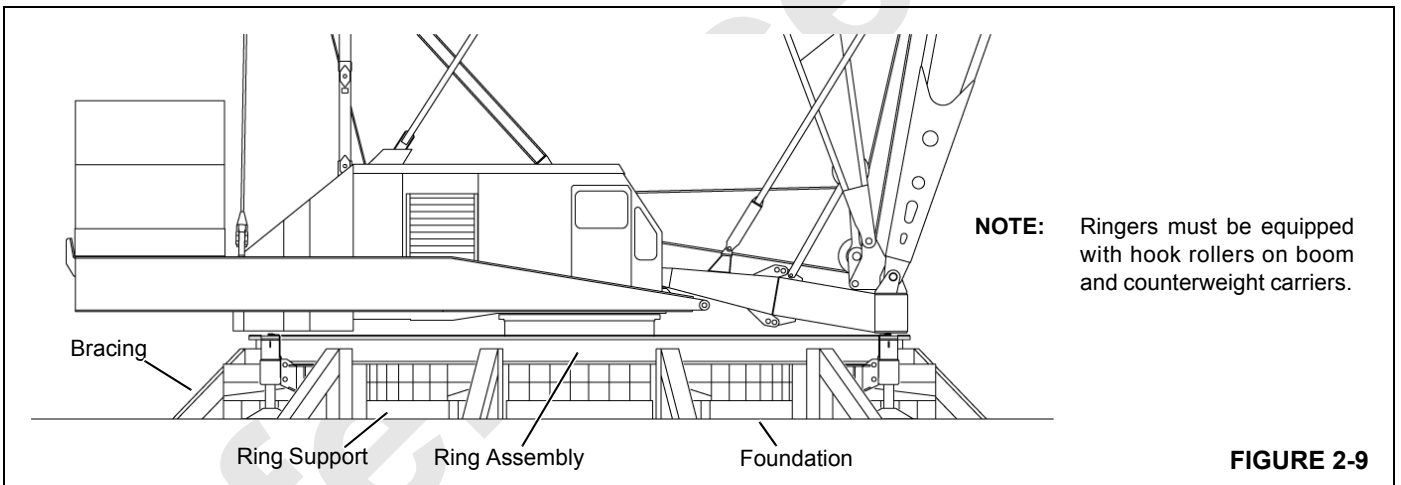
NOTE: The foundation is the deck of the barge, ship, or floating platform.

1. Crawler-mounted crane with carbody anchored with tie-downs to the foundation ([Figure 2-7](#)).



2. Crawler-mounted crane working on a timbered area of the barge, ship, or floating platform with the crawlers restrained by curbing and end stops (Figure 2-8). When not working, the crane carbody is anchored with tie-downs to the foundation. **Traveling with load is not permitted.**

- 3. RINGER® (crawler mounted, carbody mounted) supported on blocking, screw jacks, or steel pedestals which are braced and fastened to the foundation in such a manner as to prevent movement (Figure 2-9).
- 4. RINGER (platform mounted) which has the ring braced and fastened directly to the foundation in such a manner as to prevent movement.



AXIS		TRANSITIONAL		ROTATIONAL	
SYMBOL	NAME	STATIC	DYNAMIC	STATIC	DYNAMIC
X	Longitudinal		Surge	Heel List	Roll
Y	Vertical		Heave		Yaw
Z	Lateral		Sway	Trim	Pitch

Capacity Charts

Manitowoc provides two types of Capacity Charts for a crane mounted on a barge or other supporting structure under static conditions.

1. A Capacity Chart based on tipping when the crane is anchored only to prevent shifting.
2. A Capacity Chart based on structural competence when crane is securely fastened for use as a pedestal mounted crane.

NOTE: Unless otherwise specified in a machine list Capacity Chart, a 0 degree machine list Capacity Chart rating applies to machine list **not to exceed 1/2 degree**. All other machine list ratings – 1°, 2°, and 3° – must NOT be exceeded.

Shock Loading

Definition

Shock loads to the crane can be experienced when the barge is subjected to up and down movement of wave action (referred to as DYNAMICS). [Figure 2-10](#) illustrates the dynamic conditions of the barge which influence crane capacity.

CAUTION

Structural Damage Hazard!

If crane boom or structure is shock loaded during operation, or there is any indication of shock loading, all structural components of crane shall be inspected to detect cracks and other damage. Nondestructive test equipment, such as magnetic particle or ultrasonic procedures, is recommended for this inspection.

NOTE: Manitowoc does not recommend crane operation under dynamic conditions.

Operation On Barge

General

Machine list and/or dynamics will be experienced when a crane is operated on a barge, ship, or floating platform. Both of these conditions reduce the crane's capacity and each

must be taken into account for safe operation on a barge, ship, or floating platform.



WARNING

Tipping Crane Hazard!

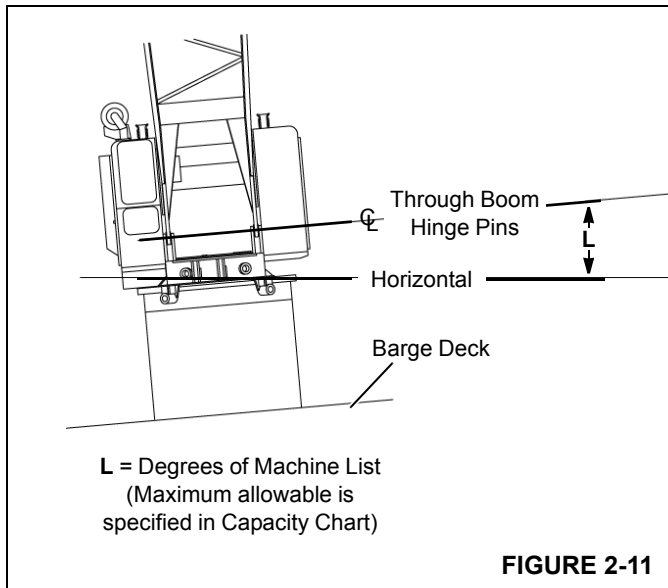
Tie-downs which only prevent crane from shifting as in barge, ship or floating platform mounting, may not provide adequate support when using a Capacity Chart for pedestal mounting. Before operating a crane on a barge, ship or floating platform, crane user shall verify that correct Capacity Chart is being used — pedestal mounted, barge mounted, 0°, 1°, 2° or 3° list or dynamic Capacity Chart.

Failing to use correct Capacity Chart can result in an accident.

Definitions

1. *Machine List*, as defined by Manitowoc, is the crane's out-of-level condition — from side-to-side — as measured by the angle between horizontal and a line drawn through the centerline of the crane's boom hinge pins ([Figure 2-11](#)). This out-of-level condition creates side load and affects the crane's lifting capacity.
2. *Barge List* (also referred to as heel or trim) causes swing out of the load and may produce side load. When Manitowoc provides a Capacity Chart showing capacities for a 2 degree machine list for example, we are referring to the maximum allowable lifting capacity for the crane when experiencing an out-of-level condition (side-to-side) of 2 degrees as measured by angle between horizontal and a line drawn through centerline of the crane's boom hinge pins.

Unless otherwise specified in the Capacity Chart, barge list (heel or trim) must not exceed the machine list degrees given in the Capacity Chart.
3. *Barge List and Machine List are not same*. As the crane rotates on a barge, barge list (as defined above) will change. The worst machine list condition generally occurs when the crane swings over the corner of the barge, producing maximum side load.



Crane Inspection

To aid in preventing harmful and damaging failure as previously indicated, regular inspection for signs of overloading in the following load bearing components is required. Correct each defect found before placing the crane into service.

- Boom
- Counterweight

- Backhitch
- Rotating Bed
- Wire Rope
- Pendants and Straps
- Hook and House Rollers

When equipped with hook rollers, it is recommended that each hook roller assembly be inspected daily for any sign of overloading, to include:

- Deformation of roller path.
- Proper hook roller adjustment.
- Deformation or cracks in hook roller hanger.
- Bent hook roller shaft.
- Damaged bearings.

Transporting Crane on Barge

If it is necessary to transport the crane on a barge, ship, or floating platform when dynamic conditions will be experienced, the boom shall be lowered onto a cradle (or other support) and the crane's boom, rotating bed, and lowerworks shall be secured against movement. If the crane is equipped with a mast, the mast shall be securely tied down with guylines. Failing to take these steps can result in shock load or side load damage to the boom and mast.

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SECTION 2 INSERTS

The following publications are provided at the end of this section:

- Drawing 175916, Nameplate and Decal Assembly for Boom
- Drawing A19440, Nameplate and Decal Assembly for Crane
- Drawing 81018027, Nameplate and Decal Assembly, Lift and Tie-Down

Reference Only

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Reference Only

SECTION 3

OPERATING CONTROLS AND PROCEDURES

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Reference Only

SECTION 3 OPERATING CONTROLS AND PROCEDURES

OPERATING CONTROLS

Operator Cab and Power Plant Enclosure Access

TABLE 1. Operator Cab and Power Plant Enclosure Access

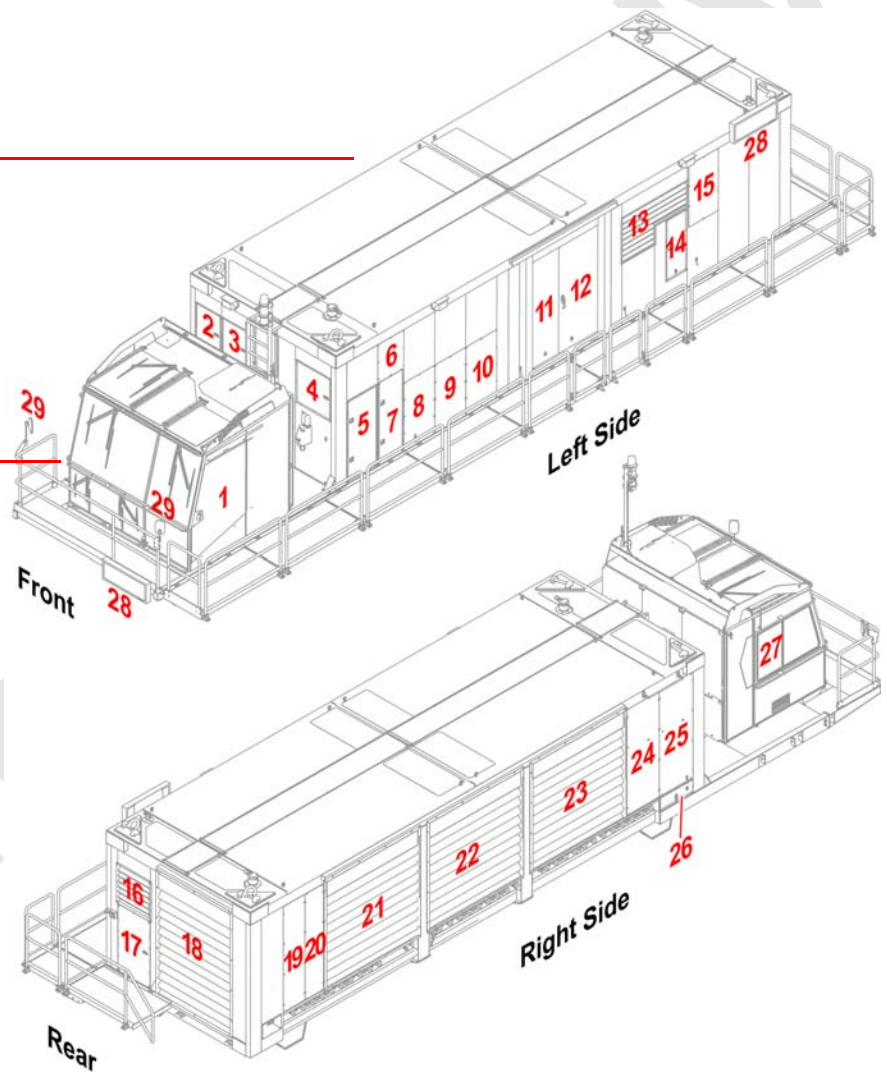
Power plant Enclosure _____

- Description on [page 3-31](#).

Operator Cab _____

- Description on [page 3-3](#).
- Operating controls on [page 3-6](#).

Exit routes and fire equipment locations on [page 3-35](#).



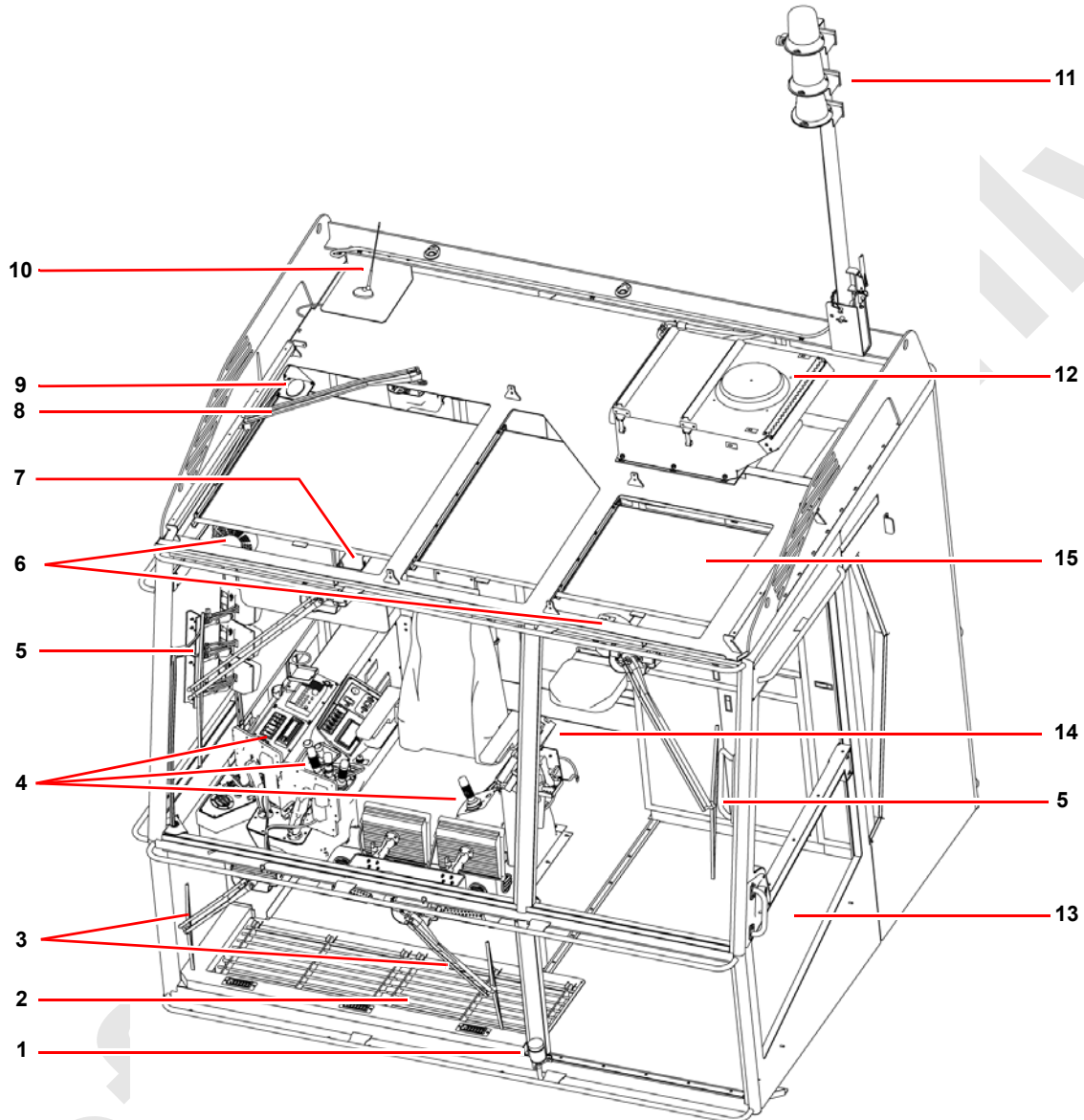
Item	Method of opening	Description
1	Lockable handle	Operator cab door.
2	Latch with key	Cold Weather AC Load Center (page 3-96)
3	Latch with key	Main AC Load Center (page 3-95).
4	Latch with key	Manual transfer switch (page 3-90).
5	Latch with key	Fire extinguisher storage during crane shipment. For fire extinguisher placement after crane assembly, see page 3-37 .

TABLE 1. Operator Cab and Power Plant Enclosure Access

6	Latch with key	Exhaust fan (page 3-33).
7	Latch with key	<ul style="list-style-type: none"> • Secondary Engine Controller Node (A19668) — Node 31. • Auxiliary Cab Power Junction Box (81004828). • Controller Universal Node (A00323) — Node 3.
8	Security screws	Hydraulic tank cleanout cover.
9	Security screws	Hydraulic tank cleanout cover.
10	Security screws	Hydraulic tank cleanout cover.
11	Inside latch	Power plant entrance door (left).
12	Lockable handle	Power plant entrance door (right).
13	—	Generator ventilation louver.
14	Latch	Diesel fuel tank fills (page 3-31).
15	Security screws	Diesel generator 12V battery.
16	—	Generator ventilation louver.
17	Latch with key	<ul style="list-style-type: none"> • Primary Engine Controller Node (A19668) — Node 30. • Diesel generator 12V battery charger (81000886). • Primary Engine 24V battery charger (81000885).
18	Security screws	Engine ventilation louver.
19	Security screws	Primary Engine radiator (right side).
20	Security screws	Primary Engine (right side).
21	Security screws	Power plant ventilation louvers.
22	Security screws	
23	Security screws	
24	Security screws	Power plant enclosure heater (page 3-34). Secondary engine (right side).
25	Security screws	Exhaust fan damper motor access.
26	Security screws	Cab, lower works, camera connections.
27	Inside latch	 <p>Cab emergency exit.</p>
28	—	<p>LED sign (optional):</p> <ul style="list-style-type: none"> • Front LED sign = percent capacity • Side LED sign = VPC radius
29	—	Rear view mirror.

Operator Cab Description

TABLE 2. Operator Cab Description



Item	Name	Description
1	Windshield wiper fluid refill	Fluid refill location for all the windshield wipers.
2	Floor window grate	Allows driver to walk over the cab floor windows.
3	Lower windshield wipers	See Windshield wiper switches, on page 3-24.
4	Cab controls	See Table 3 on page 3-6.
5	Upper windshield wipers	See Windshield wiper switches, on page 3-24.
6	Fans	An on/off switch is located on each fan.
7	Operator manuals	—
8	Roof windshield wiper	See Windshield wiper switches, on page 3-24.

TABLE 2. Operator Cab Description

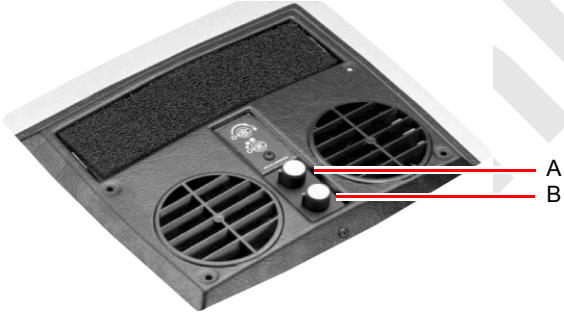
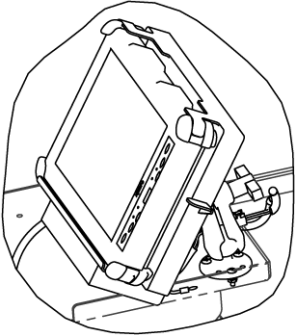
9	CraneSTAR antennas	GPS/GSM antenna.
10		Satellite antenna.
11	RCL/RCI warning lights	<p>Green light = safe working load. Amber light = near maximum rated load. Red light = equal to or greater than maximum rated load.</p>
12	Air conditioner	<p>A thermostat (A) and fan control (B) are located on the bottom of the air conditioner on the cab roof:</p> 
13	Cab door (shown closed)	—
14	Personal computer	<p>Personal computer affixed to the tray table on the operator chair:</p> 

TABLE 2. Operator Cab Description

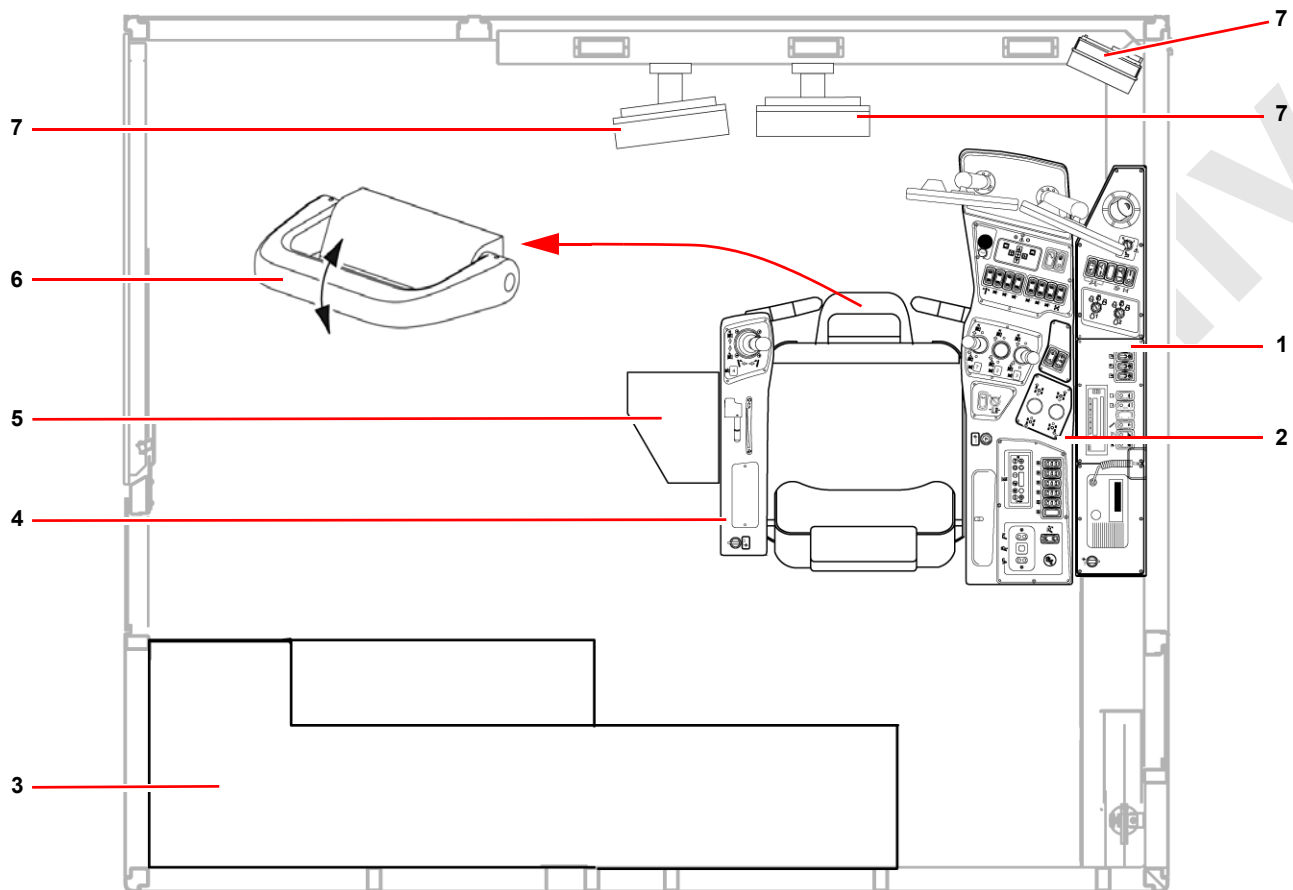
The keys to operate the crane are located on the doors of a crane cab cabinet:

Key ID	Icon	This Key ID is used for ...
CH751		<ul style="list-style-type: none"> Power plant enclosure manual transfer switch compartment door (page 3-33). Main and cold weather load center. compartment doors (page 3-33 and page 3-34). Exterior power plant enclosure door locks. Portable power unit access doors (Folio 2220). Interior cab cabinet (page 3-6).
—		<ul style="list-style-type: none"> Portable power unit storage box (Folio 2220). Portable power unit engine (Folio 2220).
A272		<ul style="list-style-type: none"> Crane job box.
FS921		<ul style="list-style-type: none"> Crane cab door (page 3-4).
3131A		<ul style="list-style-type: none"> Engine 1 and 2 ignition switches (page 3-23).
421E		<ul style="list-style-type: none"> Limit bypass switch (page 3-21).
39A		<ul style="list-style-type: none"> Personal computer lock (page 3-6).
2233		<ul style="list-style-type: none"> RCL/RCI override key. This is an option only supplied with CE cranes.
3122A		<ul style="list-style-type: none"> VPC stop switch (page 3-15).
—		<ul style="list-style-type: none"> Fire suppression system maintenance bypass for generator enclosure (page 3-41). Fire suppression system maintenance bypass for power plant enclosure (page 3-41).
2843		<ul style="list-style-type: none"> Ladder storage padlocks.

15 Crane keys

Operator Cab Operating Controls and Indicators

TABLE 3. Operator Cab Operating Controls and Indicators




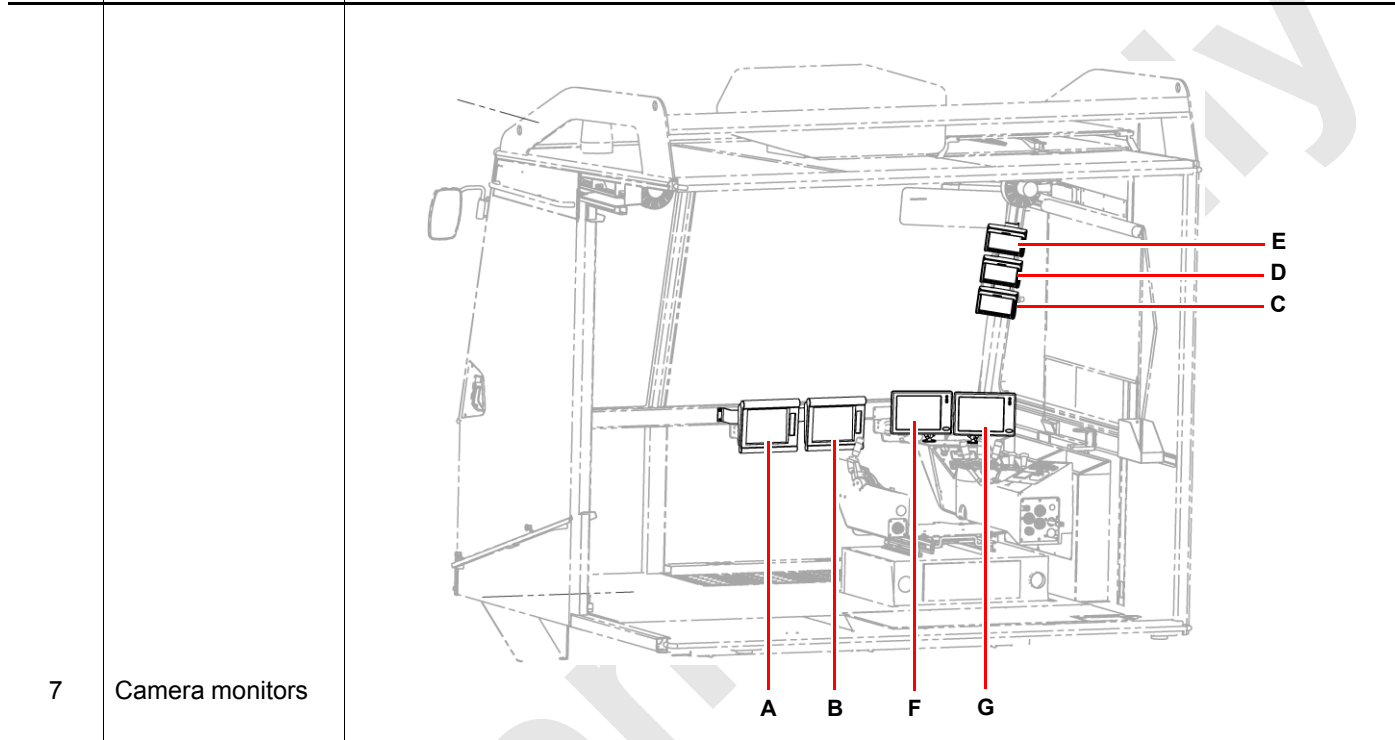
Item	Name	Description
1	Side console	See Table 6 on page 3-20 .
2	Right console	See Table 5 on page 3-10 .
3	Cabinets	Used for general storage and for the crane keys (page 3-5).
4	Left console	See Table 4 on page 3-8 .
5	Tray table	Intended for a personal computer. 

TABLE 3. Operator Cab Operating Controls and Indicators

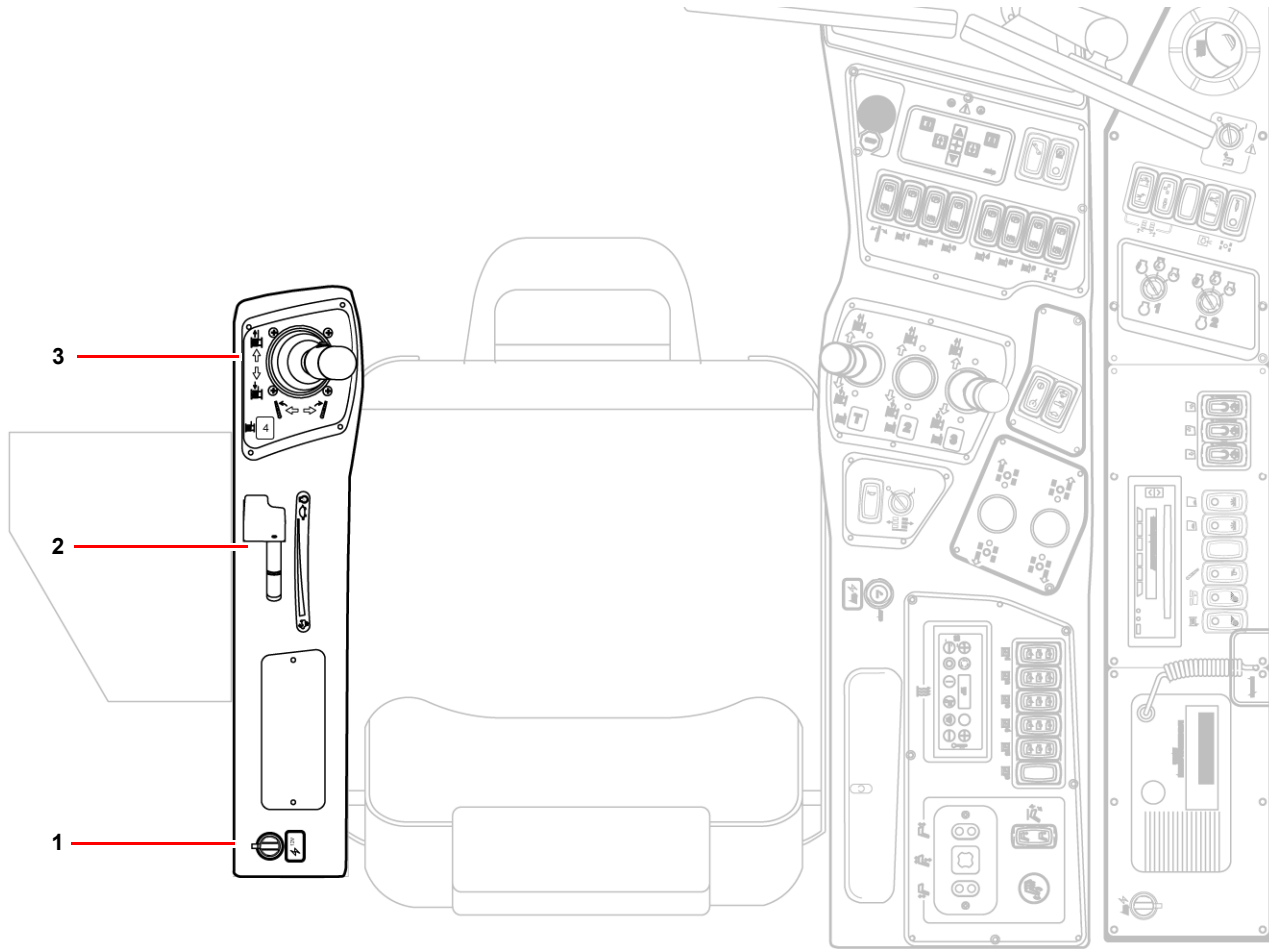
6	Foot throttle	<p>PRESS DOWN on the foot throttle to INCREASE the speed of <i>both</i> engines above the hand throttle setting (see “Hand throttle” in Table 4 on page 3-8).</p> <p>RELEASE the foot throttle to DECREASE the speed of <i>both</i> engines to idle or to the hand throttle setting (see “Hand throttle” in Table 4 on page 3-8).</p> <p>NOTE: See Appendix G — Primary and Secondary Engine Functions, on page 3-115 for a list of the crane functions assigned to each engine.</p>
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7	Camera monitors	<table border="1"> <thead> <tr> <th>Item</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>10-inch monitor 1 (M1)</td> <td rowspan="5"> Each monitor (M1 through M5) can display one of three cameras using switches on the Right Console (page 3-10). Cameras are preset for each monitor. <ul style="list-style-type: none"> • For information on crane cameras, see Appendix D — Crane Cameras and Camera Monitors, on page 3-98. • For information on monitor operation, see page 3-99 (10" monitors) or page 3-106 (7" monitors). </td> </tr> <tr> <td>B</td> <td>10-inch monitor 2 (M2)</td> </tr> <tr> <td>C</td> <td>7-inch monitor 3 (M3)</td> </tr> <tr> <td>D</td> <td>7-inch monitor 4 (M4)</td> </tr> <tr> <td>E</td> <td>7-inch monitor 5 (M5)</td> </tr> <tr> <td>F</td> <td>Main Display</td> <td>For more information, see Folio 2207 Manitowoc Model 31000 Main Display Operation.</td> </tr> <tr> <td>G</td> <td>RCL/RCI Display</td> <td>For more information, see Folio 2204 Manitowoc Model 31000 Rated Capacity Limiter (RCL) / Rated Capacity Indicator (RCI) Manual.</td> </tr> </tbody> </table>	Item	Name	Description	A	10-inch monitor 1 (M1)	Each monitor (M1 through M5) can display one of three cameras using switches on the Right Console (page 3-10). Cameras are preset for each monitor. <ul style="list-style-type: none"> • For information on crane cameras, see Appendix D — Crane Cameras and Camera Monitors, on page 3-98. • For information on monitor operation, see page 3-99 (10" monitors) or page 3-106 (7" monitors). 	B	10-inch monitor 2 (M2)	C	7-inch monitor 3 (M3)	D	7-inch monitor 4 (M4)	E	7-inch monitor 5 (M5)	F	Main Display	For more information, see Folio 2207 Manitowoc Model 31000 Main Display Operation .	G	RCL/RCI Display	For more information, see Folio 2204 Manitowoc Model 31000 Rated Capacity Limiter (RCL) / Rated Capacity Indicator (RCI) Manual .
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F	Main Display	For more information, see Folio 2207 Manitowoc Model 31000 Main Display Operation .																				
G	RCL/RCI Display	For more information, see Folio 2204 Manitowoc Model 31000 Rated Capacity Limiter (RCL) / Rated Capacity Indicator (RCI) Manual .																				

Left Console

TABLE 4. Left Console




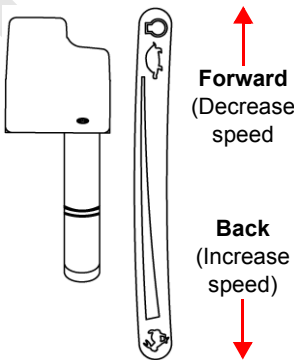
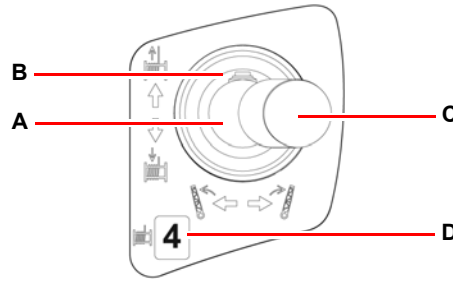
Item	Name	Description
1	Power supply receptacle (12VDC)	 <p>Provides 12VDC power to a cellular phone or a similar device.</p>
2	Hand throttle	 <p>Push the handle FORWARD to DECREASE the speed of <i>both</i> engines. Pull the handle BACK to INCREASE speed of <i>both</i> engines. The selected speed is maintained when the handle is released. The speed of the crane functions depends on engine speed and how far the control handles are moved in either direction from off. Engine speed must be fast enough to provide sufficient power for the work being done. The engine can stall under load if the engine speed is too slow. NOTE: See Appendix G — Primary and Secondary Engine Functions, on page 3-115 for a list of the crane functions assigned to each engine.</p>

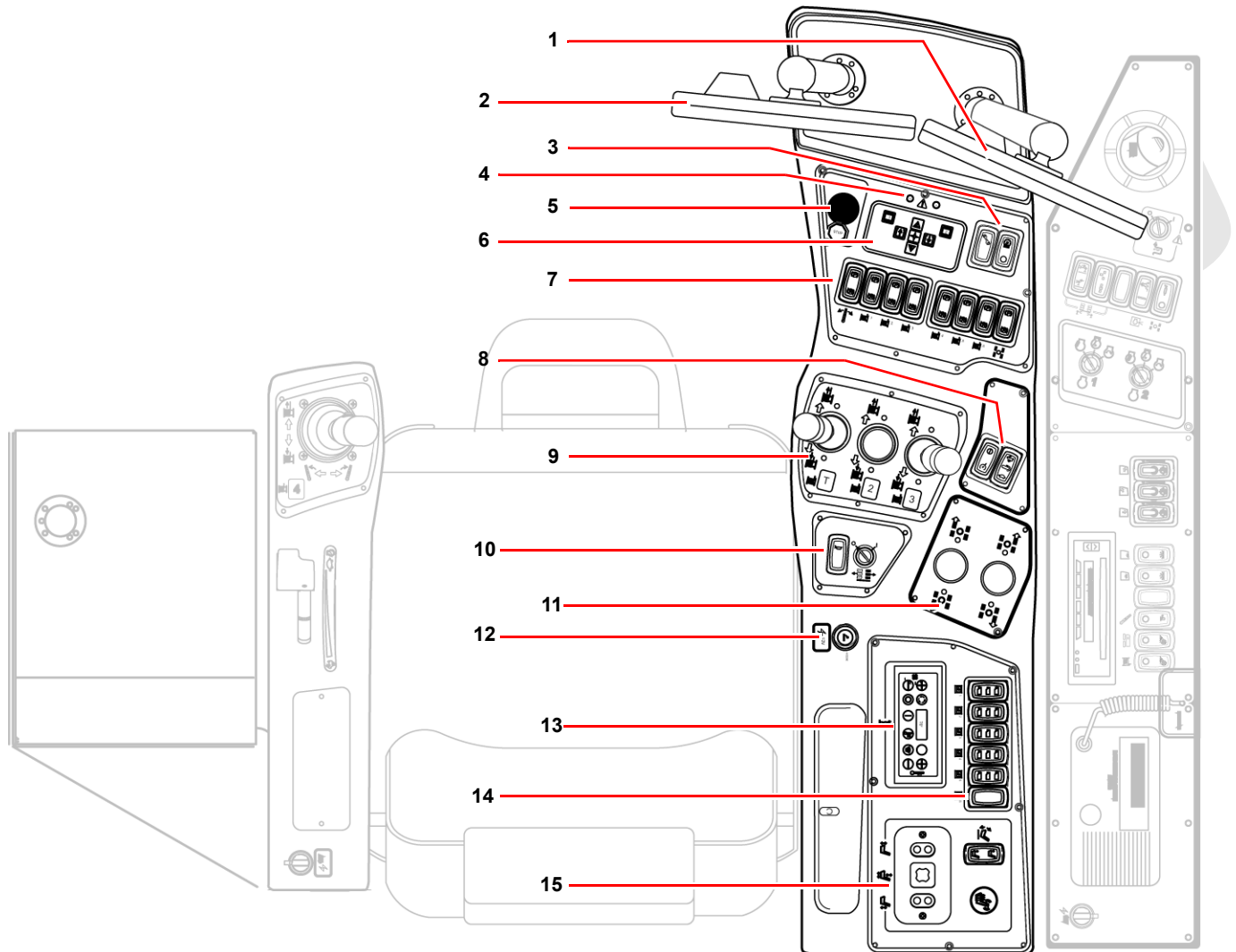
TABLE 4. Left Console



Item	Name	Description
3	Swing and boom hoist control handle	<p>A</p> <p>Swing control and boom hoist handle</p> <p>Swing control:</p> <ul style="list-style-type: none"> • Move the handle to the LEFT to SWING LEFT. Swing speed increases in relation to handle movement. • Release the handle to CENTER to STOP. Swing speed decreases to off and rotating bed slows to a stop. Move the handle in the opposite direction to stop the swing motion faster. • Move the handle to the RIGHT to SWING RIGHT. Swing speed increases in relation to handle movement. <p>Boom control:</p> <ul style="list-style-type: none"> • Pull the handle BACK to RAISE the boom. The drum brake releases and speed increases in relation to handle movement. • Release the handle to CENTER to STOP the boom. The drum brake releases and speed increases in relation to handle movement. • Push the handle FORWARD to LOWER the boom. The drum brake releases and speed increases in relation to handle movement.
	B	<p>Swing holding brake switch</p> <p>PRESS the switch to APPLY the swing holding brake. RELEASE the switch to RELEASE the swing holding brake. Holds the rotating bed in position for short periods of time during operating cycle. The swing handle will be inoperable while the swing holding brake switch is pressed.</p>
	C	<p>Drum rotation indicator</p> <p>A pin-type actuator, located on the top of the handle, moves UP and DOWN to signal the operator, by feel, that the boom hoist is moving.</p>
	D	<p>Drum identification</p> <p>Displays the drum number controlled by this handle. NOTE: For more information, see Typical Drum Control Handle Arrangements, on page 3-85.</p>

Right Console

TABLE 5. Right Console



Item	Name	Description
1	Main Display	See Folio 2207 Manitowoc Model 31000 Main Display Operation.
2	RCL/RCI Display	See Folio 2204 Manitowoc Model 31000 Rated Capacity Limiter (RCL) / Rated Capacity Indicator (RCI) Manual for detailed instructions.

TABLE 5. Right Console







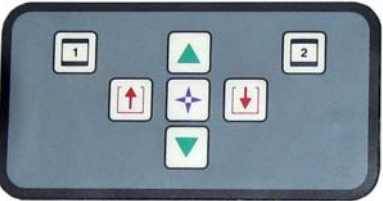


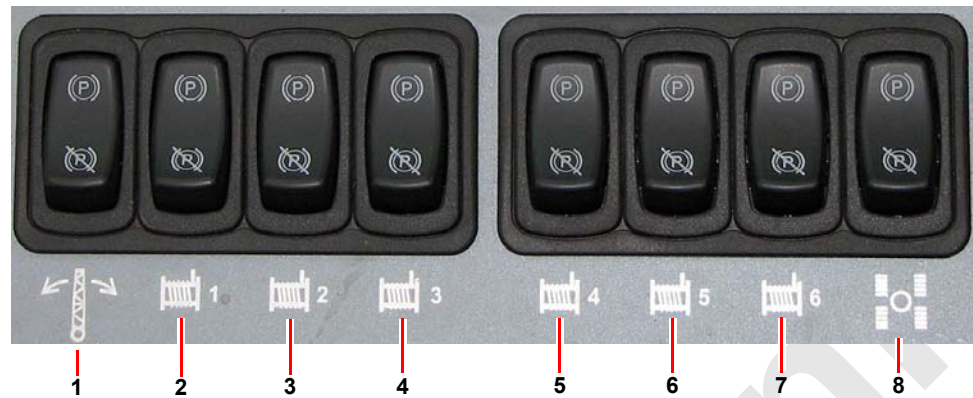
<p>3</p>	<p>Crane setup</p>	 <p>Press to display the setup screen on the Main Display. The setup screen is one of the Function Modes screens. See Folio 2207 Maniowoc Model 31000 Main Display Operation.</p>
<p>3</p>	<p>Panel lights switch</p>	 <p>Press  to TURN ON the panel switch backlights. Press  to TURN OFF the backlighting.</p>
<p>4</p>	<p>Rated Capacity Indicator/Limiter indicator lights</p>	 <p>Alerts the operator to overload conditions: Amber light (1) = near maximum rated load. Red light (2) = equal to or greater than maximum rated load.</p>
<p>5</p>	<p>Emergency Stop Button</p>	 <p>Push button DOWN to STOP engines only in an emergency — for example, if a crane function does not stop when the control handle is released to off (center position) or any other uncontrolled motion of a crane function is observed.</p> <p>When button is pushed down, the engines stop, brakes apply, and any functions being operated come to an abrupt stop. Use the engine ignition switches to stop the engines for normal operating conditions.</p> <p>NOTE: The button must be <i>pulled up</i> before the engines can be restarted. If the emergency stop button has been activated, test all drum brakes for proper operation before putting the crane back in service. See Section 2 of Service Manual for the procedure.</p>
<p>6</p>	<p>Display touch pad controls</p>	 <p>Contains all the screen controls required to operate these displays:</p> <p> RCL/RCL Display — see Folio 2204 Maniowoc Model 31000 Rated Capacity Limiter (RCL) / Rated Capacity Indicator (RCI) Manual.</p> <p> Main Display — see Folio 2207 Maniowoc Model 31000 Main Display Operation.</p>

TABLE 5. Right Console



Press **(P)** to TURN ON a park switch and press **(P)** to TURN OFF a park switch.

Swing park switch (1):

- When the park switch is on, the swing handle is not operable, and the swing brake is applied.
- When the park switch is off, the swing handle is operable, and the swing brake is released.
- The boom hoist (Drum 4 typically) and swing systems are controlled by a dual-axis handle that allows operation of both functions with the same handle.
- The swing drive has a spring-applied, hydraulically-released disc brake.

Drum park switches (2, 3, 4, 5, 6, and 7):

- When the park switch is on, the drum handle is not operable, the drum brake is applied, and the drum pawl is engaged on drum 4 or 5.
- When the park switch is off, the drum handle is operable, the drum brake is applied and released depending on handle movement, and the drum pawl is disengaged on drum 4 or 5.
- Each load drum has a spring-applied, hydraulically-released disc brake on the motor on *each* end of the drum. The corresponding drum brake is released automatically when the drum handle is moved in either direction from the off position. The corresponding drum brake is applied automatically when the drum handle is moved to the off position.

Travel park switch (8):

With the travel park switch on, the travel handles are not operable, and the brakes are applied.

With the travel park switch off, the travel handles are operable, and the brakes are applied and released in conjunction with the handle movement.

Crawlers have spring-applied, hydraulically-released disc brakes.

All crawler brakes release when either crawler handle is moved in either direction from the off position.

All crawler brakes apply when both crawler handles are moved to the off position. If power is lost for any reason, all crawler brakes apply to hold the crane in position.

NOTE: Park brakes are applied automatically when (A) *both* engines are stopped, (B) power is lost for any reason, (C) applicable operating limits are reached, (D) applicable system faults occur, or (E) the park switch is turned on.

NOTE: See [Appendix G — Primary and Secondary Engine Functions, on page 3-115](#) for a list of the crane functions assigned to each engine.

7 Park switches

TABLE 5. Right Console

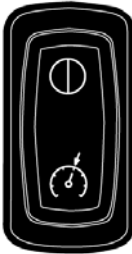





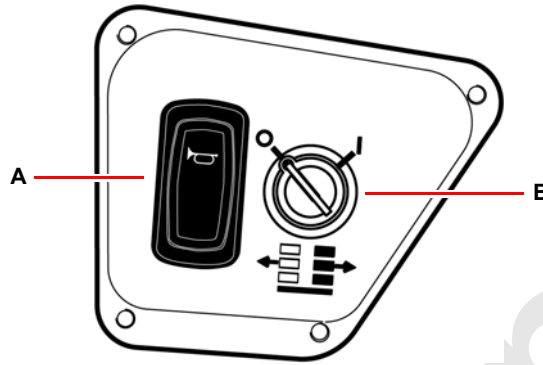
<p>Travel cruise selector</p>	 <p>Press  to TURN ON the travel cruise. Release the handles to the off position. The crawlers will continue to travel at the selected speed and direction.</p> <p>Press  to TURN OFF the travel cruise or slightly move either crawler handle in the opposite direction.</p> <p>Crawlers have spring-applied, hydraulically-released disc brakes. Crawler brakes release when either crawler handle is moved in either direction from the off position.</p> <ul style="list-style-type: none"> • All the crawler brakes apply when both crawler handles are moved to off. • If power is lost for any reason, then all the crawler brakes apply to hold crane in position. <p>The travel cruise selector allows the crawlers to operate in either direction at a selected speed without the operator's hand on the crawler handles.</p> <p>Move both crawler handles in either direction from off to select the desired speed and direction of travel.</p>
<p>8</p> <p>Travel speed selector</p>	 <p>Press  to operate the travel motors in HIGH speed. High speed operation provides maximum available travel speed for traveling long distances.</p> <p>Press  to operate the travel motors in LOW speed. Low speed operation provides smooth starts and stops and allows more precise control of the travel motors than high speed.</p> <p>In low speed, the travel motors operate at approximately 1/3 the speed of high speed.</p> <p>Crawlers have spring-applied, hydraulically-released disc brakes. Crawler brakes release when either crawler handle is moved in either direction from the off position. Crawler brakes apply when both crawler handles are moved to the off position.</p> <p>Crawler brakes apply to hold the crane in position if power is lost for any reason.</p> <p>Travel speed may be changed during travel operation. The travel motors will shift immediately from high to low when low speed is selected. The travel motors will <i>not</i> shift from low to high when high speed is selected until the engine speed is at high idle, and the hydraulic pressure is low enough to allow the motors to shift from low to high speed.</p> <p>While traveling, addition loading may be imposed due to pendulum motion imposed on a suspended load.</p> <p>NOTE: See Appendix G — Primary and Secondary Engine Functions, on page 3-115 for a list of the crane functions assigned to each engine.</p>

TABLE 5. Right Console

9	Drum control handles			
		Item	Name	Description
		A	Drum identification	Displays the drum number controller by this handle. ("T" = Tandem operation in which the drum handle operates two drums, typically drums 1 and 2.) NOTE: For more information, see Typical Drum Control Handle Arrangements, on page 3-85 .
		B	Drum rotation indicator	A pin-type actuator, located on the top of the handle, moves UP and DOWN to signal the operator, by feel, that the drum is moving.
C	Drum control handle	Pull the handle BACK to RAISE the load. The drum brake releases and speed increases in relation to handle movement. Release the handle to CENTER to STOP the load. The drum brake releases and speed increases in relation to handle movement. Push the handle FORWARD to LOWER the load. The drum brake releases and speed increases in relation to handle movement.		

TABLE 5. Right Console



10

Horn switch and VPC stop switch

Item	Name	Description
A	Horn switch	<p>Press and hold the FRONT of this switch to SOUND the horn. RELEASE the front of the switch to silence the horn.</p> <p>Before swing or traveling, sound the horn to alert nearby personnel.</p>
B	VPC stop switch	<p>The switch must be in the OFF (O) position for normal VPC operation.</p> <p>To stop the VPC from moving, set the switch to the ON (I) position. This will cause the fault alarm to sound, and a fault message will appear on the Main Display.</p> <hr/> <p style="text-align: center;">! WARNING Tipping Hazard</p> <p>Prevent crane from tipping:</p> <ul style="list-style-type: none"> • Switch OFF VPC stop switch for all normal operation with boom attached. • Switch ON VPC stop switch for crane assembly and disassembly when counterweight is installed with boom removed.

TABLE 5. Right Console

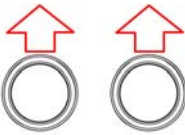
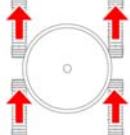

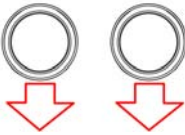
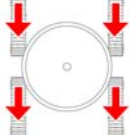


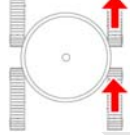

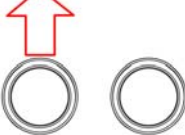
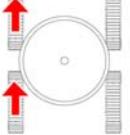

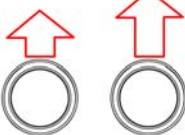
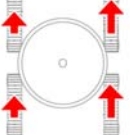

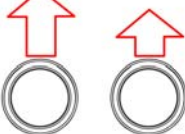
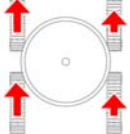

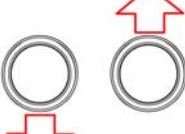
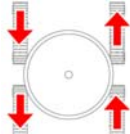

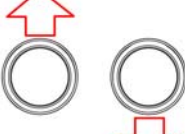
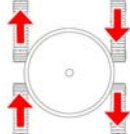








			Direction	Handle Position Left - Right	Crawler Direction	Crane Movement
11	Crawler handles		Forward			
			Reverse			
			Sharp Left Turn			
			Sharp Right Turn			
			Gradual Left Turn			
			Gradual Right Turn			
			Counterrotate Left			
			Counterrotate Right			
			12	Cigarette lighter		<p>Push IN to TURN ON lighter. The lighter will pop out when the coil is hot. This receptacle can be used to power other 12V devices.</p>

TABLE 5. Right Console

13	Heater control panel													
		<p>In cold weather it may take several hours for the operator cab to become warm. The diesel generator can be run overnight to ensure that the cab is warm the following morning. See Table 6 on page 3-93. Note that the diesel generator consumes approximately 2 gallons of diesel fuel per hour.</p>												
		Item	Name	Description										
		A	Windshield defroster	Turns fan on and opens the fresh air door to bring in air from outside the cab.										
		B	Automatic fan control switch	Places the system in a fully automatic temperature control mode including fan speed. The system will adjust the fan speed to the lowest setting necessary to maintain the cab temperature at the displayed set point temperature.										
		C	Power on (I) switch	Turns the heater control panel on. Press 3 times rapidly to display the active fault codes (see FAULT CODES below). Press power on to scroll through any fault codes. After 5 seconds without a keypress, the system will exit the fault code display.										
		D	Power off (O) switch	Turns the heater control panel off.										
		E	Fan speed up (+) down (-) switches	Overrides the automatic fan speed control feature. Increments fan speed up or down in 11 steps. The fan speed set is maintained until it is changed or AUTO is pressed.										
		F	Air source	Press to toggle between either recirculating cab air or having fresh air.										
		G	Current temperature	To change from Fahrenheit to Celsius, press the temperature up (+) and down (-) switches at the same time.										
H	Temperature set switches	Increments the set point temperature up (+) or down (-).												
<p>FAULT CODES:</p> <table style="width: 100%; border: none;"> <tr> <td>E0 = No faults detected</td> <td>E4 = Evap probe open</td> <td>E8 = Ambient sensor open</td> </tr> <tr> <td>E1 = Cab sensor shorted</td> <td>E5 = Outlet sensor shorted</td> <td>E9 = Water valve shorted</td> </tr> <tr> <td>E2 = Cab sensor open</td> <td>E6 = Outlet sensor open</td> <td>E10* = Water valve open</td> </tr> <tr> <td>E3 = Evap probe shorted</td> <td>E7 = Ambient sensor shorted</td> <td>E17 = No communications or low voltage.</td> </tr> </table> <p>* This will always be displayed.</p>			E0 = No faults detected	E4 = Evap probe open	E8 = Ambient sensor open	E1 = Cab sensor shorted	E5 = Outlet sensor shorted	E9 = Water valve shorted	E2 = Cab sensor open	E6 = Outlet sensor open	E10* = Water valve open	E3 = Evap probe shorted	E7 = Ambient sensor shorted	E17 = No communications or low voltage.
E0 = No faults detected	E4 = Evap probe open	E8 = Ambient sensor open												
E1 = Cab sensor shorted	E5 = Outlet sensor shorted	E9 = Water valve shorted												
E2 = Cab sensor open	E6 = Outlet sensor open	E10* = Water valve open												
E3 = Evap probe shorted	E7 = Ambient sensor shorted	E17 = No communications or low voltage.												

TABLE 5. Right Console

One of three different cameras can be selected for each monitor (1 through 5, see “Camera monitors” in TABLE 3.) by pressing , , or .

For example, for Monitor 1 (M1), press  to display the counterweight camera, press  to display enclosure camera, and press  to display the boom camera.

For crane camera locations, see [Appendix D — Crane Cameras and Camera Monitors, on page 3-98.](#)

14 Camera selection switches

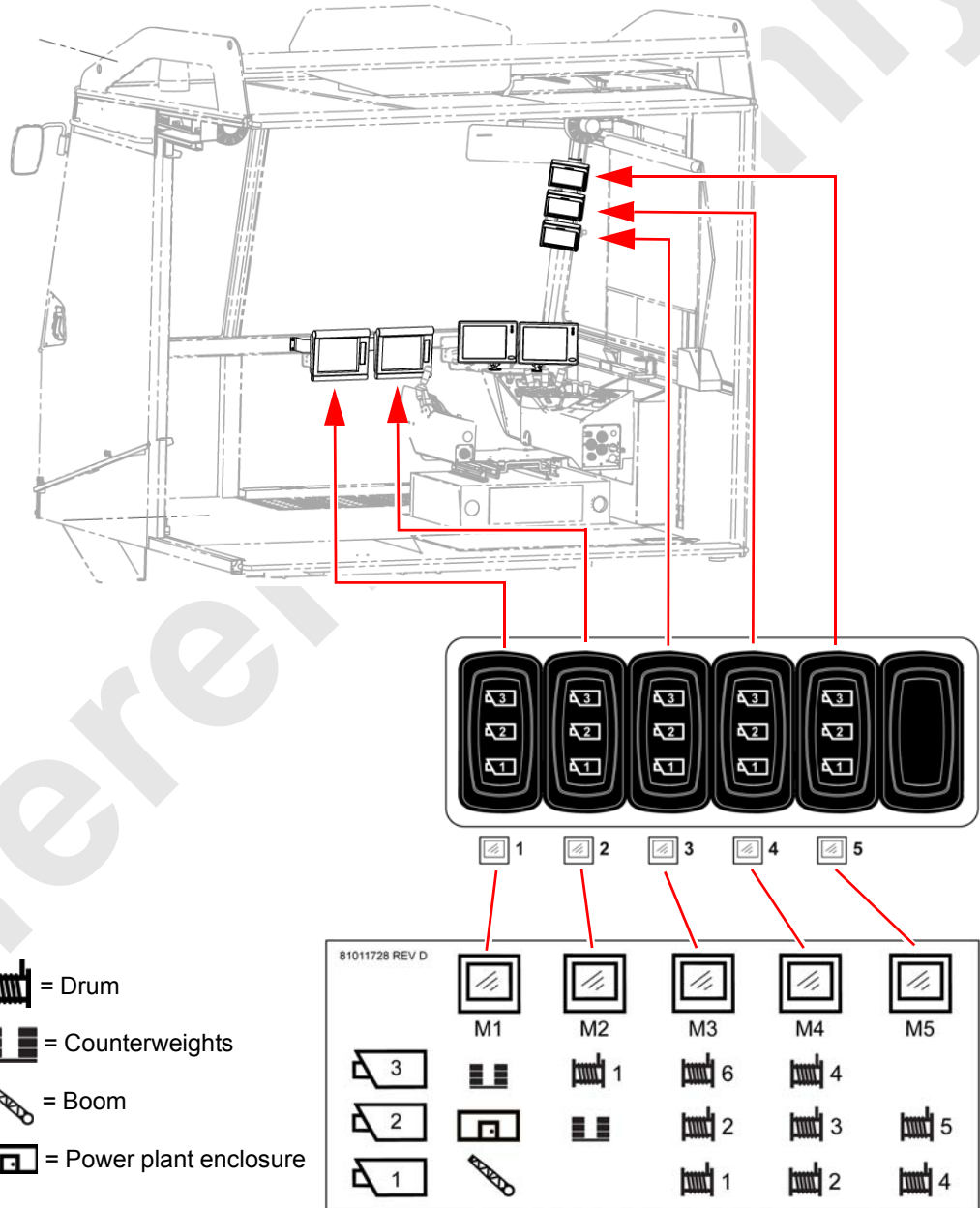
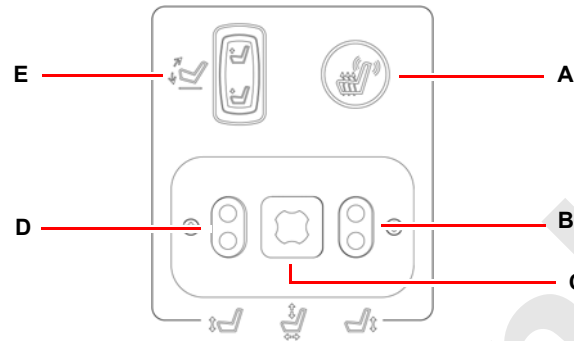
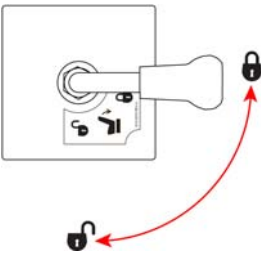


TABLE 5. Right Console



15 Seat control panel

Item	Name	Description
A	Seat heater and massage control	<p>Seat heater operation:</p> <ul style="list-style-type: none"> • PUSH DOWN ONE TIME = low heat • PUSH DOWN TWO TIMES = medium heat • PUSH DOWN THREE TIMES = high heat • PUSH DOWN FOUR TIMES = off <p>Seat massage operation:</p> <ul style="list-style-type: none"> • PULL UP ONE TIME = lower massage on • PULL UP TWO TIMES = upper massage on • PULL UP THREE TIMES = all massage on low • PULL UP FOUR TIMES = all massage on high • PULL UP FIVE TIMES = off
B	Seat back up/down adjust	<p>Press the TOP of the switch to RAISE the back of the seat.</p> <p>Press the BOTTOM of the switch to LOWER the back of the seat.</p>
C	Seat up/down and forward/back adjust	<p>Move the switch UP to RAISE the seat.</p> <p>Move the switch DOWN to LOWER the seat.</p> <p>Move the switch LEFT to move the seat FORWARD.</p> <p>Move the switch RIGHT to move the seat BACKWARD.</p>
D	Seat front up/down adjust	<p>Press the TOP of the switch to RAISE the front of the seat.</p> <p>Press the BOTTOM of the switch to LOWER the front of the seat.</p>
E	Seat tilt switch	<p>Press the TOP of the switch to tilt the seat and console BACK.</p> <p>Press the BOTTOM of the switch to return the seat and console to their normal level position.</p> <p>NOTE: Before tilting the seat, ensure that the tilt lock (located behind the operator chair) is in the unlocked position:</p> <p>NOTE: The speed at which the seat tilts can be adjusted. See Section 2 of the 31000 Service Manual.</p> 

Side Console

TABLE 6. Side Console

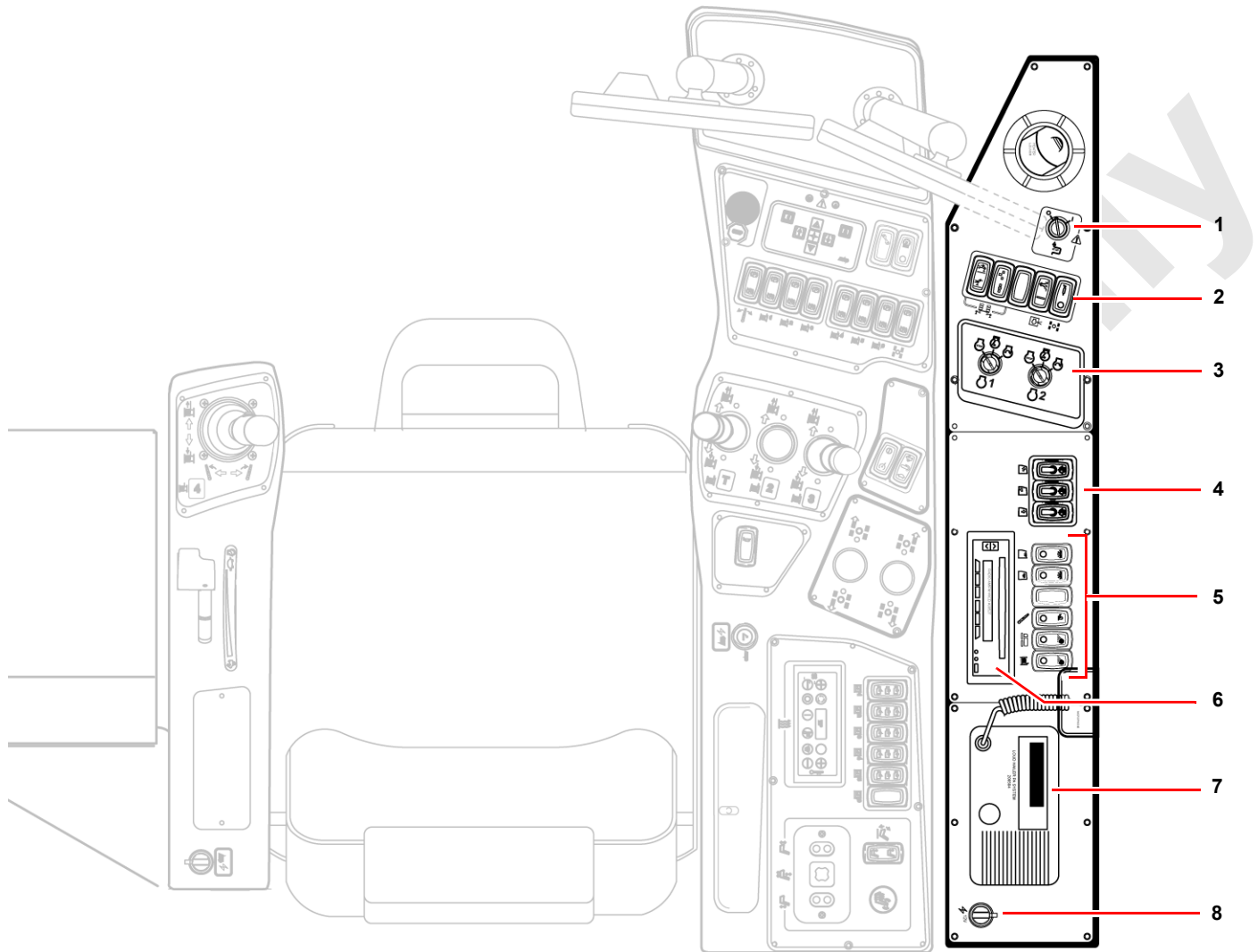


TABLE 6. Side Console

Item	Name	Description
1	Limit bypass switch	<div> <p>The diagram shows a circular switch with two positions: 'O' (Off) and 'I' (Interlock). A key is inserted into the switch. Below the switch is a 'STOP' button with an upward-pointing arrow.</p> </div> <p>The key must be inserted to operate this switch. Only remove the key to prevent unauthorized operation.</p> <hr/> <div> <p>! WARNING</p> </div> <p>When bypassing a limit, carefully follow the instructions in the tables referenced below.</p> <hr/> <ul style="list-style-type: none"> • Turn the switch to the I position and hold to BYPASS the operating limits identified in Table 8 on page 3-29. This position allows functions to be operated beyond their normal limits. • Release the switch to the O position to ENABLE the operating limits identified in Table 7 on page 3-26. This position allows the limits to stop the functions in the normal manner. <p>Limit bypass switch must be in O position for all normal operation. Otherwise, structural damage can occur.</p>

TABLE 6. Side Console

2	Counterweight, louver, and lubrication switches			
		Item	Name	Description
		A	Counterweight beam	Press to EXTEND the counterweight beam. Press to STOP the counterweight beam. Press to RETRACT the counterweight beam. NOTE: Make sure this switch is OFF (O) at startup or you will be directed to setup screen.
		B	Counterweight beam pins	Press to RETRACT the counterweight beam pins. NOTE: The pins are spring loaded and will reengage when this switch is <i>not</i> pressed.
		C	non functional	—
		D	Power plant enclosure louvers	Press to OPEN the power plant enclosure louvers. Press to CLOSE the power plant enclosure louvers. NOTE: The louvers remain open 2 hours after shutdown.
E	Crawler lubrication (see NOTE below)	Press to TURN ON crawler lubrication. Press to TURN OFF crawler lubrication.		
			NOTE: Diagnostic tests for the auto lubrication circuits are included in Folio 2207 Manitowoc Model 31000 Main Display Operation.	

TABLE 6. Side Console

3	Engine ignition switches	<div style="text-align: center;"> </div> <p>A = Primary Engine ignition switch. B = Secondary Engine ignition switch. C = Ignition switch keys. D = Engine STOP key position. E = Engine RUN key position. F = Engine START key position.</p> <p>NOTE: See Appendix G — Primary and Secondary Engine Functions, on page 3-115 for a list of the crane functions assigned to each engine.</p> <p>NOTE: Engine diagnostic faults appear on the Information screen (see Folio 2207 Manitowoc Model 31000 Main Display Operation) when the ignition switch is in the RUN (E) position. Engine faults must go away after the engine is started. See the engine manufacturer’s operating instructions for engine diagnostic information.</p> <hr/> <div style="text-align: center;"> <p>DANGER Engine Explosion Hazard!</p> <p>Do not spray any combustible starting aid (ether) into an engine air intake. Each engine has a starting aid that will automatically inject ether into an engine.</p> </div> <hr/> <div style="text-align: center;"> <p>WARNING Unauthorized Startup!</p> <p>Always STOP engine and remove key before leaving crane unattended. This practice will prevent unauthorized personnel from operating crane.</p> </div>
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TABLE 6. Side Console

4	Windshield wiper switches										
		Item	Name	Description	A	Upper windshield wipers toggle switch	Toggle fully down = OFF. Toggle up = INTERMITTENT depending on how far up the toggle is moved.	B	Lower windshield wipers toggle switch	Toggle fully up = HIGH speed.	C
Item	Name	Description									
A	Upper windshield wipers toggle switch	Toggle fully down = OFF. Toggle up = INTERMITTENT depending on how far up the toggle is moved.									
B	Lower windshield wipers toggle switch	Toggle fully up = HIGH speed.									
C	Roof windshield wipers toggle switch	Press the TOP END of the switch to SPRAY WASHER FLUID onto the windows. NOTE: During cold weather, make sure to fill the windshield wiper fluid tank (page 3-3) with a non-freezing cleaning fluid.									

TABLE 6. Side Console

5	Light switches						
		Item	Name	Description			
		A	Crane ceiling dome light switch	Press to TURN ON the crane ceiling dome light. Press to TURN OFF the crane ceiling dome light.			
		B	Cab right window dome light switch	Press to TURN ON the cab right window dome light. Press to TURN OFF the cab right window dome light.			
		C	non functional	—			
		D	Aircraft warning light	Press to TURN ON the aircraft warning light. Press to TURN OFF the aircraft warning light.			
E	Catwalk exterior lights switch	Press to TURN ON the catwalk exterior lights switch. Press to TURN OFF the catwalk exterior lights switch.					
F	Drum exterior lights switch	Press to TURN ON the drum exterior lights. Press to TURN OFF the drum exterior lights.					
6	Radio/CD player	See manufacturer's instructions.					
7	Public address system	See manufacturer's instructions.					
8	Power supply receptacle (12V)	Provides power to a 12VDC device like a cellular phone.					

Operating Limits and Faults

The following table lists operating limits that may or may not be bypassable with limit bypass switch (1). For a complete list of operating limits see **F2207, 31000 Main Display Operation**.

TABLE 7. Operating Limits and Fault Identification




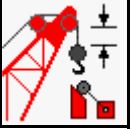


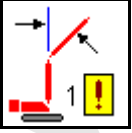

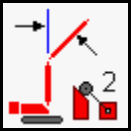

Operating Limit	Safety	Fault Number and Icon
<p>Bail, Minimum</p> <p>When there are three wraps of wire rope remaining on a drum, the drum is stopped from lowering and Fault #57 is activated.</p> <p>The load can be <i>raised</i> after the limit is reached.</p> <p>If this fault is bypassed, then the load can be lowered below the limit.</p>	<p style="text-align: center;"> WARNING Falling Load Hazard!</p> <p>When lowering load below minimum bail limit, do so slowly with extreme caution. Do not lower load to point where less than three full wraps of wire rope are on drum; wire rope could be pulled out of drum allowing load to fall.</p>	<p>Fault 57</p> 
<p>Block Up</p> <p>If the load contacts a block-up limit switch, then the boom or luffing jib is stopped from lowering, the affected load drum(s) are stopped from hoisting, and Fault #60 is activated.</p> <p>However, a load a <i>different</i> drum could still be raised.</p> <p>If this fault is bypassed, then the load can be raised above the limit.</p>	<p style="text-align: center;"> WARNING Two-Blocking Hazard!</p> <p>If it is necessary to hoist a load above block-up limit, do so slowly with extreme caution to prevent two-blocking. Do not hoist load above minimum block clearance given in Range Diagram (see Capacity Chart Manual).</p> <p>Do not use limit bypass switch to lower boom or luffing jib after block-up limit is contacted; two-blocking could occur, causing load to fall.</p>	<p>Fault 60</p> 
<p>Boom Maximum UP</p> <p>The boom is automatically stopped and Fault #55 is activated when the boom angle sensor indicates that the boom has been raised to one of the following angles:</p> <ul style="list-style-type: none"> • 84.5° for #90 Boom without Jib • 84.5° for #90-91 Boom. • 86.5° for #90 Boom with #91 Fixed Jib • 86.5° for #90 Boom with #91 Luffing Jib <p>The boom can be <i>lowered</i> after this limit is reached.</p>	<p style="text-align: center;"> WARNING Falling Boom/Jib Hazard!</p> <p>Do not raise boom above specified maximum angle. Boom and jib could be pulled over backwards.</p>	<p>Fault 55</p> 

TABLE 7. Operating Limits and Fault Identification

Operating Limit	Safety	Fault Number and Icon
<p>Luffing Jib Maximum UP 1</p> <p>The luffing jib is automatically stopped and Fault #49 is activated when the jib angle sensor indicates that the boom-to-luffing jib angle is 170°.</p> <p>The luffing jib can be <i>lowered</i> after this limit is reached.</p> <p>If this fault is bypassed, then the luffing jib can be raised to the Luffing Jib Maximum UP 2 limit (see Fault #73).</p>		<p>Fault 49</p> 
<p>Luffing Jib Maximum UP 2</p> <p>When the boom-to-luffing jib angle is 171.5°, the luffing jib maximum angle switch is contacted. This automatically stops the luffing jib from moving up any further and Fault #73 is activated.</p> <p>This limit cannot be bypassed.</p> <p>The <i>luffing jib cannot be lowered</i> after this limit is contacted until the limit is reset as follows:</p> <ul style="list-style-type: none"> • When the limit is contacted, operation will stop and the jib up prompt (shown to right) will appear on the main display. • Once the prompt appears, release the control handle to off and press the confirm button (shown to right) to reset the limit switch. The luffing jib can then be lowered. 	<hr/> <div style="text-align: center;">  <p>WARNING</p> <p>Falling Boom/Jib Hazard!</p> <p>Do not raise luffing jib above JIB MAXIMUM UP 2 limit. Boom and luffing jib could be pulled over backwards.</p> </div> <hr/>	<p>Fault 73</p> 
<p>Luffing Jib Maximum DOWN 1</p> <p>The luffing jib is automatically stopped when the jib angle sensor indicates that the boom-to-luffing jib angle is 70°.</p> <p>The luffing jib can be <i>raised</i> after this limit is reached.</p> <p>If this fault is bypassed, then the luffing jib can be lowered to the Luffing Jib Maximum DOWN 2 limit (see Fault #67).</p>		<p>Fault 50</p> 

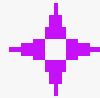
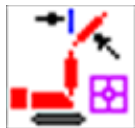


TABLE 7. Operating Limits and Fault Identification




Operating Limit	Safety	Fault Number and Icon
<p>Luffing Jib Maximum Down 2</p> <p>When the boom-to-luffing jib angle is 67°, the luffing jib minimum angle switch is contacted. This automatically stops the luffing jib from moving down any further and Fault #67 is activated.</p> <p>The <i>luffing jib cannot be raised</i> after this limit is contacted until the limit is reset as follows:</p> <ul style="list-style-type: none"> When the limit is contacted, operation will stop and the jib down prompt (shown to right) will appear on the main display. Once the prompt appears, release the control handle to off and press the confirm button (shown to right) to reset the limit switch. The luffing jib can then be raised. 	<p style="text-align: center;"> WARNING</p> <p style="text-align: center;">Falling Boom/Jib Hazard!</p> <p>Do not lower luffing jib below maximum down limit 2. Structural damage will result, possibly causing boom and luffing jib to collapse.</p>	<p>Fault 67</p> 
<p>Rated Capacity Limiter</p> <p>This fault indicates one of the following:</p> <ul style="list-style-type: none"> Overload. Sensor fault. “Off the chart” — a condition that is not covered by the current capacity chart. 		<p>Fault 54</p> 

TABLE 8. Bypassable Limit Identification

Operating Limit ⁸		Normal Operation		Luffing Jib Setup Mode ON ¹		External Override Switch ²
		Non-CE ³	CE ³	Non-CE ³	CE ³	CE ³
Bail, Minimum	[57]	Yes	No	No	No	No
Block Up	[60]	Yes	Yes ⁶	Yes	Yes	No
Boom Maximum UP	[55]	No	No	No	No	No
Luffing Jib Maximum UP 1	[73]	Yes	No	Yes	Yes	No
Luffing Jib Maximum UP 2	[49]	Yes ⁴	No	Yes ⁴	Yes ⁴	No
Luffing Jib Maximum DOWN 1	[50]	Yes	No	Yes	yes	No
Luffing Jib Maximum DOWN 2	[67]	No	No	No	No	No
Rated Capacity Limiter	[54]	Yes	Yes ⁵	Yes	Yes ⁵	Yes ⁶

¹ Use only for rigging. To turn on Luffing Jib Setup Mode, see “Crane Setup Function Modes screen” topic in **Folio 2207 Manitowoc 31000 Main Display Operation**.

² See Rated Capacity Indicator/Limiter Operation Manual.

³ CE = Cranes that comply with 2010 European requirements (see NOTE below).

⁴ Only when boom is below 50°.

⁵ Only if boom or luffing jib is below allowable angle given in Capacity Chart (while raising or lowering boom and luffing jib from or to ground level).

⁶ The speed of the crane functions is limited to 15% of their maximum speed for movements that increase load.

⁷ Numbers in brackets [] are fault codes. See [Table 7 on page 3-26](#).

Remote Control

This crane has a setup remote control (1) that is used during the assembly of the crane. This remote is stored in the operator cab and connected to a junction box (2) located on the right side of the rotating bed. See Section 4 for more details

The remote control must be enabled using a special Function Modes screen before the remote can be used. See the “Crane Setup Function Modes screen” section in **Folio 2207 Manitowoc 31000 Main Display Operation**.

The swing and travel alarm will sound continuously when a function is being operated with any of the following controls:

Manual Remote Controls (pin pullers) — Priority 1

Setup Remote Control — Priority 2

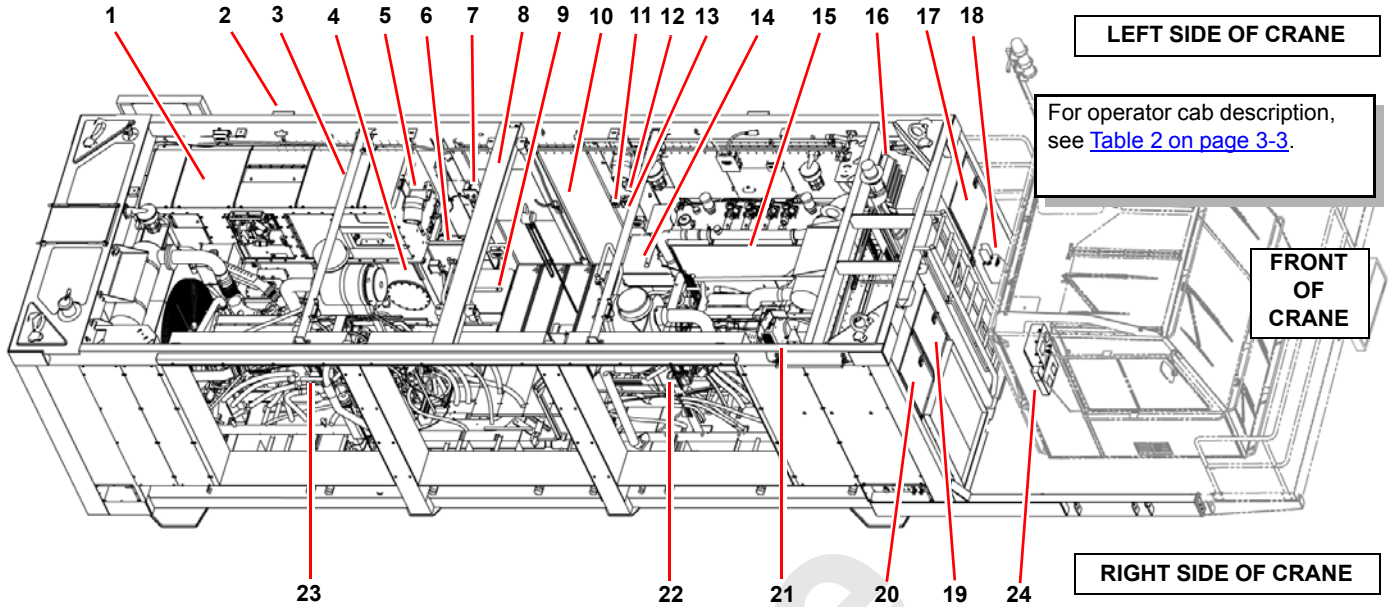
No two remote controls can be operated at the same time. Each has an operating priority as indicated above.

If you try to operate two remote controls at the same time, the remote control with the higher priority will operate. The other remote control will be disabled (turned off).



Power Plant Enclosure Description

TABLE 9. Power Plant Enclosure Description



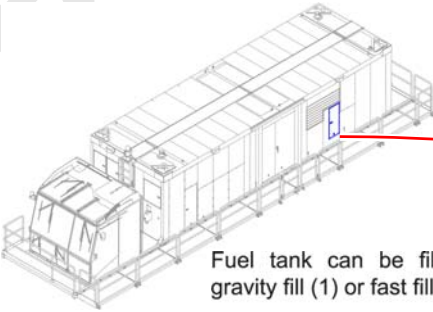
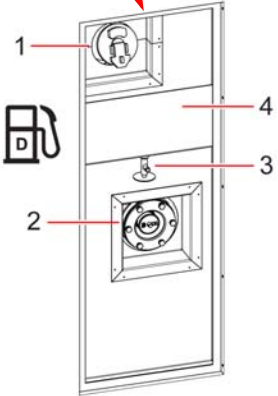
Item	Name	Description
1	Diesel generator	<p>Supplies power to both the main AC load center and the cold weather AC load center. The diesel generator must be started using the remote control panel in the operator cab. For more information, see Table 6 on page 3-93.</p> <p>NOTE: An emergency stop button for the diesel generator is located in the power plant enclosure and in the operator cab.</p>
2	Diesel fuel tank fills	<p>To fill the diesel fuel tank, use either the gravity fill or the fast fill. Both fills are located on the left side of the power plant enclosure:</p>  <p>Fuel tank can be filled through gravity fill (1) or fast fill (2).</p> <p>Use drain (3) to remove spilled fuel from catch pan (4).</p> <p>To Fill Using Fast Fill:</p> <ul style="list-style-type: none"> • Connect filling nozzle to tank receiver and begin filling. • Shutoff valve will close when tank is full. • Disconnect nozzle after filling. • See service manual for more information. 

TABLE 9. Power Plant Enclosure Description

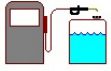

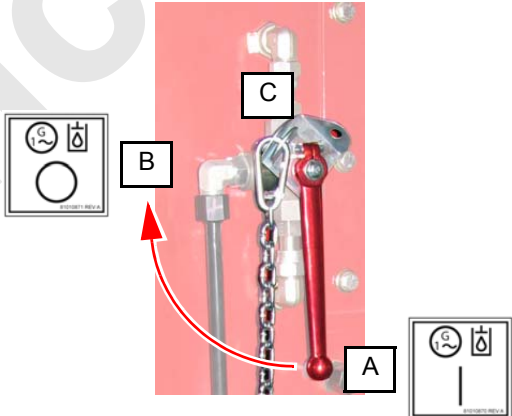

3	Hydraulic generator	<p>Supplies power to the main AC load center (page 3-95), <i>but not the cold weather AC load center</i> (page 3-96). The hydraulic generator operates whenever the Primary Engine is on. For more information, see Table 6 on page 3-93.</p> <p>NOTE: An emergency stop button for the hydraulic generator is located in the power plant enclosure and in the operator cab.</p>
4	Diesel fuel tank	<p>Located under the diesel and hydraulic generators. The fuel level for both the Primary and Secondary Engines is shown by the percentage in the icon on the right.</p> <p>To see the current diesel fuel level, see Folio 2207 Manitowoc Model 31000 Main Display Operation.</p> <div style="text-align: right;">  <p>78 % Diesel fuel level</p> </div>
5	Hydraulic generator bypass valve	<hr/> <div style="text-align: center;">  <p>CAUTION No Lights Hazard!</p> </div> <p>To prevent injury from not being able to see in the dark, do NOT move the hydraulic generator bypass valve to off unless another means of illumination is available.</p> <hr/> <p>Turns the hydraulic generator ON (A) or OFF (B). To turn the valve, first remove the valve lockout (C):</p> <div style="text-align: center;">  </div>
6	Hydraulic generator output and fan circuit breakers	See Hydraulic generator output (A) and fan (B) circuit breakers, on page 3-88 .
7	Generator emergency stop buttons (power plant enclosure)	See Generator emergency stop button (power plant enclosure), on page 3-89 .
8	Overhead crane (not shown)	Hand-operated chain hoist capable of lifting 800 pounds.
9	Primary Engine batteries	See Primary Engine batteries, on page 3-89 .
10	Power plant enclosure entrance doors	Double door entry into the power plant enclosure.

TABLE 9. Power Plant Enclosure Description

11	Light switch	<p>Light switch (11) — turns on or off the inside enclosure lights. These lights may take a minute to illuminate.</p> <p>Fan thermostat (12) — sets the temperature when the exhaust fan turns on.</p> <p>Power outlet (13) — AC power outlets.</p>
		
12	Fan thermostat	
13	Power outlet	
14	Secondary Engine batteries	See Secondary Engine batteries, on page 3-89 .
15	Hydraulic fluid tank	<p>The hydraulic fluid level for both the Primary and Secondary Engines is shown by the percentage in the icon on the right.</p> <p>To see the current hydraulic fluid level, see Folio 2207 Manitowoc Model 31000 Main Display Operation.</p>
 <p>Hydraulic fluid level and temperature</p>		
16	Exhaust fan	<p>The exhaust fan (1) is controlled by the fan thermostat (2). The fan switches on and off at the temperature set on the thermostat.</p>
		
17	Manual transfer switch	Used to select an AC power source for the crane. See Manual transfer switch (A), on page 3-90 .
18	Utility power connection	Used to supply external AC power to the crane. See Utility power connection, on page 3-91 .
19	Main load center	See Table 8 on page 3-95 .

TABLE 9. Power Plant Enclosure Description

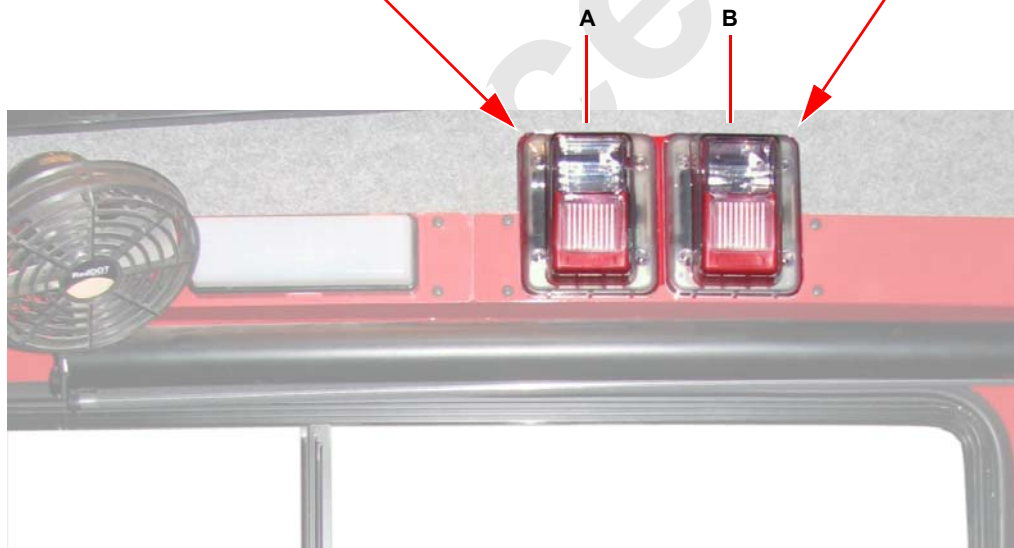
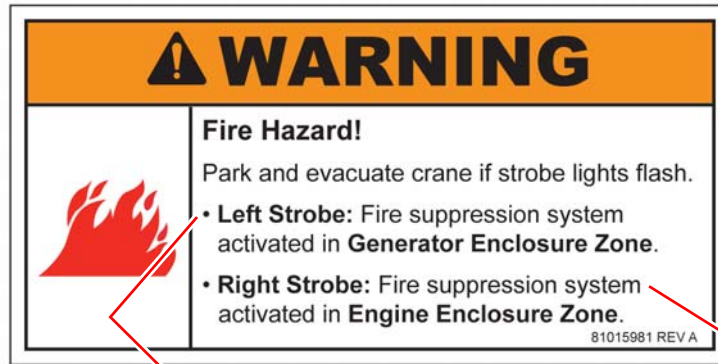
20	Cold weather load center	See Table 9 on page 3-96 .
21	Power plant enclosure heater	<p>This heater turns on automatically when the temperature falls below 40°F (4.4°C).</p> <p>NOTE: In order for the enclosure heater to operate, the power plant enclosure heater breaker (page 3-97) must be set to on and the cold weather AC load center (page 3-96) must be energized.</p> 
22	Secondary Engine	Both supply power to hydraulic pumps that are used to operate the crane. The Primary Engine also powers the hydraulic generator.
23	Primary Engine	NOTE: See Appendix G — Primary and Secondary Engine Functions, on page 3-115 for a list of the crane functions assigned to each engine.
24	Fire suppression system	See Fire Suppression System, on page 3-38 .

Fire Safety

Fire Alarms

Two fire alarm strobes are located in the operator cab above the right side cab window:

- Left Strobe (A) — fire suppression system activated in the Generator Enclosure Zone.
- Right Strobe (B) — fire suppression system activated in the Engine Enclosure Zone

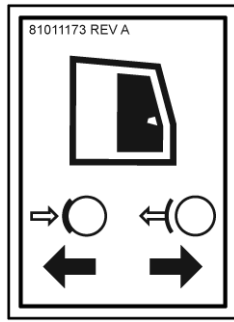


Manual Fire Suppression Buttons

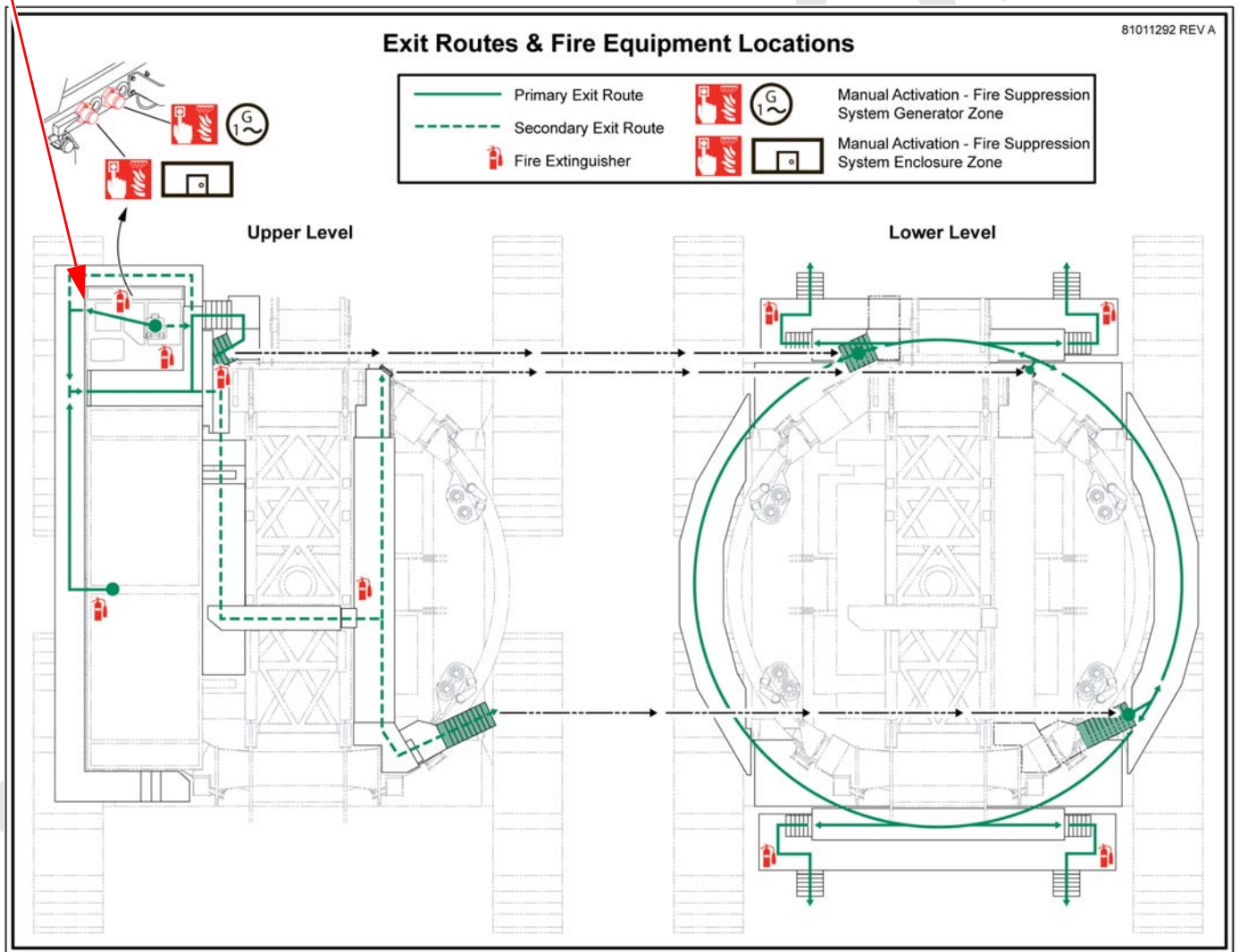
NOTICE	
	In Case of Fire In the Enclosure Zones: 1. Pull safety pin. 2. Press button hard. • Left Button: Fire suppression system activated in the Engine Enclosure Zone . • Right Button: Fire suppression system activated in the Generator Enclosure Zone .
	
81015980 REVA	



Exit Routes and Fire Equipment Locations



Cab door brake



3

Fire Suppression System

This crane contains a fire suppression system in the power plant enclosure and in the housing (referred to as the “generator enclosure” below) that contains the hydraulic and the diesel generators. See [Figure 3-1](#) for a complete description of the fire suppression process.

When the system detects a fire or is manually activated, a fire suppressant aerosol is released in the affected enclosure:

- If a fire is detected in (or is manually activated for) just the power plant enclosure, then fire suppressant aerosol will only be released in the power plant enclosure. Aerosol is released in two stages in the power plant enclosure: first, the heaviest aerosol release occurs immediately after a fire is detected (or manually activated). Then, after 30 seconds, another aerosol release occurs.
- If a fire is detected in (or is manually activated for) just the generator enclosure, then fire suppressant aerosol will only be released in the generator enclosure. There is only a single aerosol release in the generator enclosure.

Personnel in or around the affected area should leave immediately.

The fire suppression system (see [TABLE 10.](#)) consists of the following:

- Fire detection sensors — located in the power plant enclosure and in the generator enclosure.
- Manual fire suppression buttons — two buttons located in the operator cab which, when pressed, activate the power plant enclosure or the generator enclosure fire suppression systems.
- Fire alarms — visual and audible alarms located in the power plant enclosure and the operator cab.
- Fire suppression canisters — used to suppress a fire. Canisters are located in the power plant enclosure and in the generator enclosure. When electrically activated, a canister creates a fire suppression aerosol.
- Fire suppression system control panel — controls and monitors the fire suppression system (see [Table 9 on page 3-31](#)).

The fire suppression system can be activated either automatically or manually:

- When fire detection sensors in the power plant enclosure or the generator enclosure detect a fire, the fire suppression system is activated automatically.
- When one or both manual fire suppression buttons in the operator cab is pressed, the fire suppression system is activated.

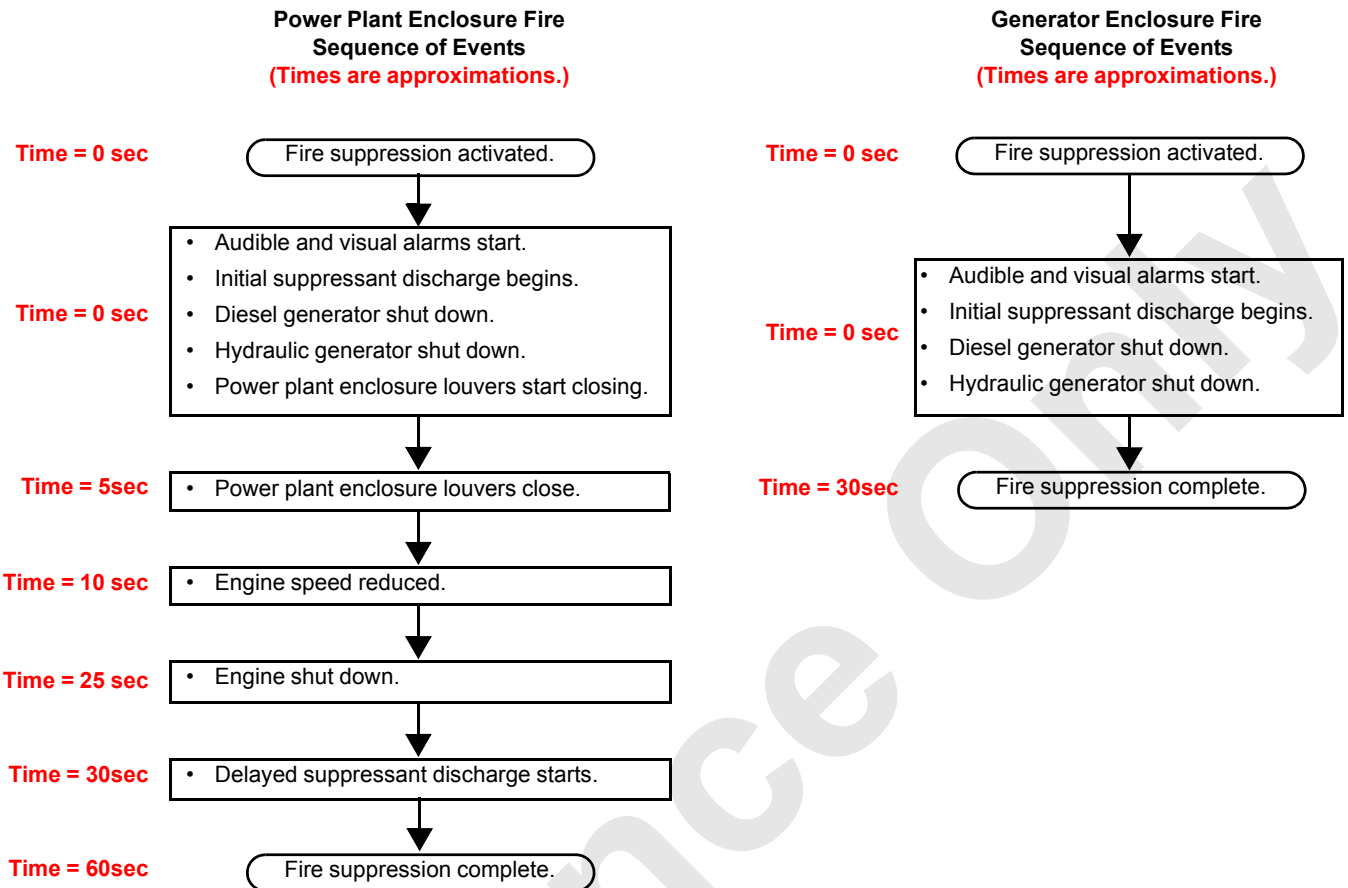
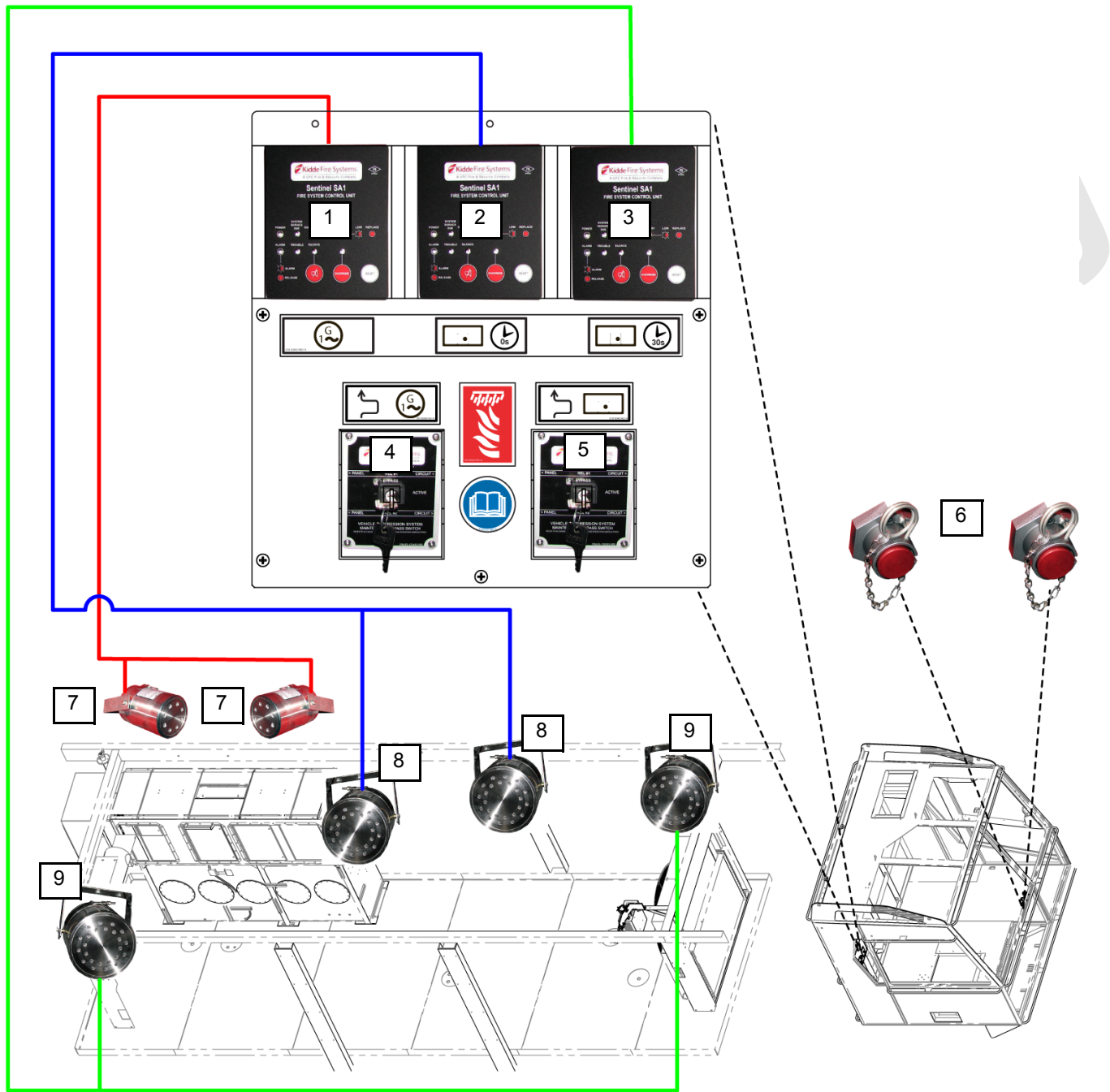


FIGURE 3-1

TABLE 10. Fire Suppression System



Item	Name	Description
1	Generator enclosure fire system control unit	See the Sentinel SA1 manual for a description of the controls on each unit.
2	Power plant enclosure fire system control unit (initial release)	
3	Power plant enclosure fire system control unit (delayed release)	

TABLE 10. Fire Suppression System

4	Generator enclosure maintenance bypass switch	<p>The purpose of this switch is to disable the generator enclosure fire suppression system during maintenance:</p> <p>BYPASS — in this position the generator enclosure fire suppression canisters are <i>disabled</i>.</p> <p>ACTIVE — in this position the generator enclosure fire suppression canisters are <i>enabled</i>. The switch should always be in this position during normal operation.</p>
5	Power plant enclosure maintenance bypass switch	<p>The purpose of this switch is to disable the power plant enclosure fire suppression system during maintenance:</p> <p>BYPASS — in this position the power plant enclosure fire suppression canisters are <i>disabled</i>.</p> <p>ACTIVE — in this position the power plant enclosure fire suppression canisters are <i>enabled</i>. The switch should always be in this position during normal operation.</p>
6	Manual fire suppression enable switches	Pull pin and press switch hard to manually enable the generator and power plant enclosure fire suppression.
7	Generator enclosure fire suppression canisters	Two, 500 gram fire suppression canisters. When a fire is detected in the generator enclosure, both canisters activate immediately and create fire suppressant aerosol for approximately 23 seconds.
8	Power plant enclosure fire suppression canisters (initial release)	Two, 2500 gram fire suppression canisters. When a fire is detected in the power plant enclosure, both canisters activate immediately and create fire suppressant aerosol for approximately 36 seconds.
9	Power plant enclosure fire suppression canisters (delayed release)	Two, 1500 gram fire suppression canisters. When a fire is detected in the power plant enclosure, both canisters activate <i>30 seconds after fire detection</i> and create fire suppressant aerosol for approximately 23 seconds.

OPERATING PROCEDURES

NOTE: See [Appendix G — Primary and Secondary Engine Functions, on page 3-115](#) for a list of the crane functions assigned to each engine.

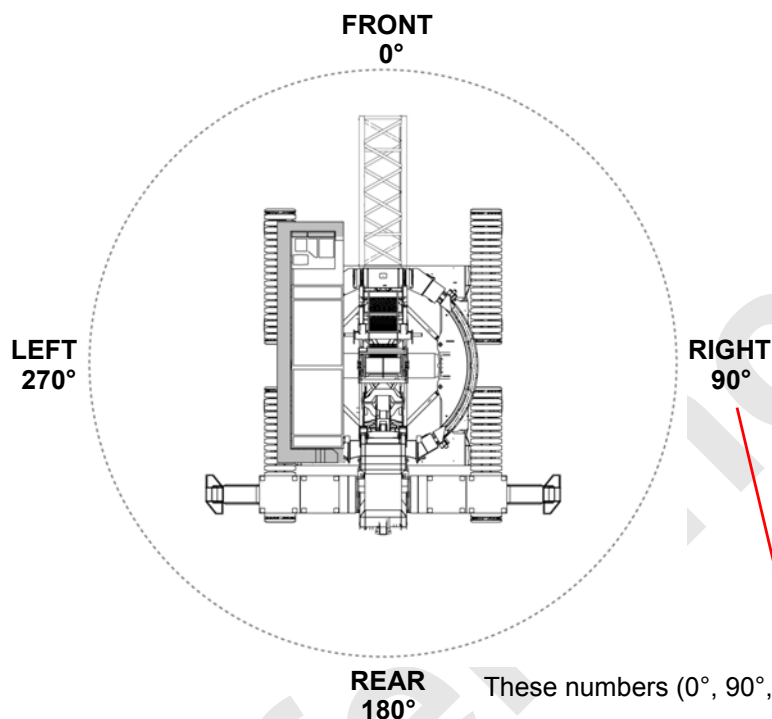


WARNING

Personal Injury Hazard!

Do NOT start either the Primary or Secondary crane engine if a warning or lockout tag is present on the crane.

Crane Orientation



These numbers (0°, 90°, 180°, and 270°) represent the swing angle.

The current swing angle is shown on the RCL/RCI system Working screen (see Folio **Manitowoc 31000 RCL/RCI Manual**).

The position of the counterweight pads (up or down) is not retained when power is cycled on and off.

- If all of the retract switches indicate that the counterweight beams are fully retracted (stored), swing is not limited (360° is permitted).
- If all of the retract switches indicate that the counterweight beams are fully extended, swing is not limited (360° is permitted).
- If the retract switches indicate that the counterweight beams are in the intermediate position and the operator has not entered “pads up” in the main display, swing is limited to $\pm 5^\circ$ about the forward and reverse positions: 355 to 5° and 175 to 185°.

Preparing the Crane for Operation



WARNING

Read Capacity Charts!

Do not attempt to operate crane without first reading and understanding capacity charts.

Crane must be rigged and operated according to instructions given in capacity charts and boom or jib assembly drawings.

All crane operations must be performed with crane level as specified in the capacity charts. Otherwise, the crane could tip.

Do not operate if wind exceeds limits given in capacity charts.

Failing to comply with capacity chart requirements can result in tipping or structural failure of boom or jib.

Moving Load Hazard!

Operator must select proper crane capacity chart before operating.

Unexpected drum motion or improper limit responses can result if wrong capacity chart is selected.

Limit bypass switches must be in "activate" position and all limits with which crane is equipped must be operational before operating crane. See Service Manual supplied with your crane for adjustment procedures.

Avoid injuring personnel in operating area!

Sound horn to alert personnel that operation is about to begin.

Moving Machinery Hazard!

To avoid injuring personnel or damaging crane and property:

- Do not start engine if warning or out-of-order sign is present at start controls.
- Check that all controls are off so crane and load do not move when engine is started.
- Check that all personnel are clear of crane before starting engine. **Sound horn to alert personnel.**

CAUTION

Avoid Machinery Damage!

Before operating crane at start of each shift, perform preventive maintenance checks and lubrication requirements listed in this manual.


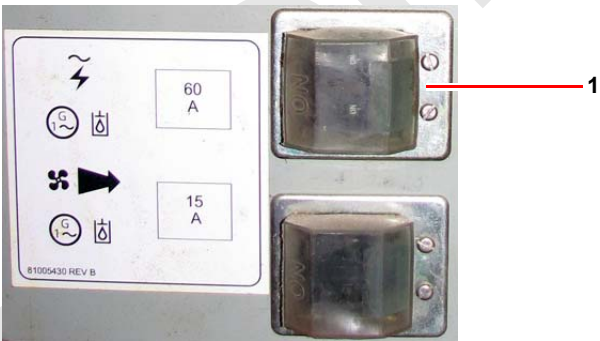
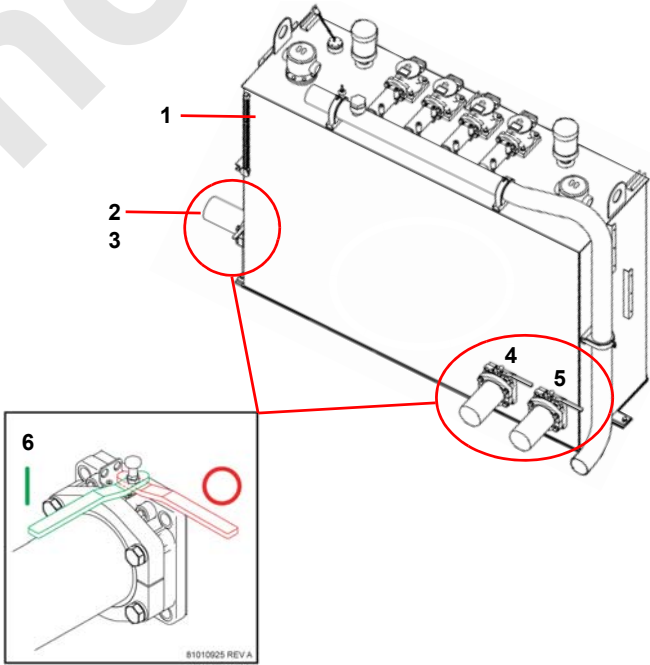
Startup Procedure

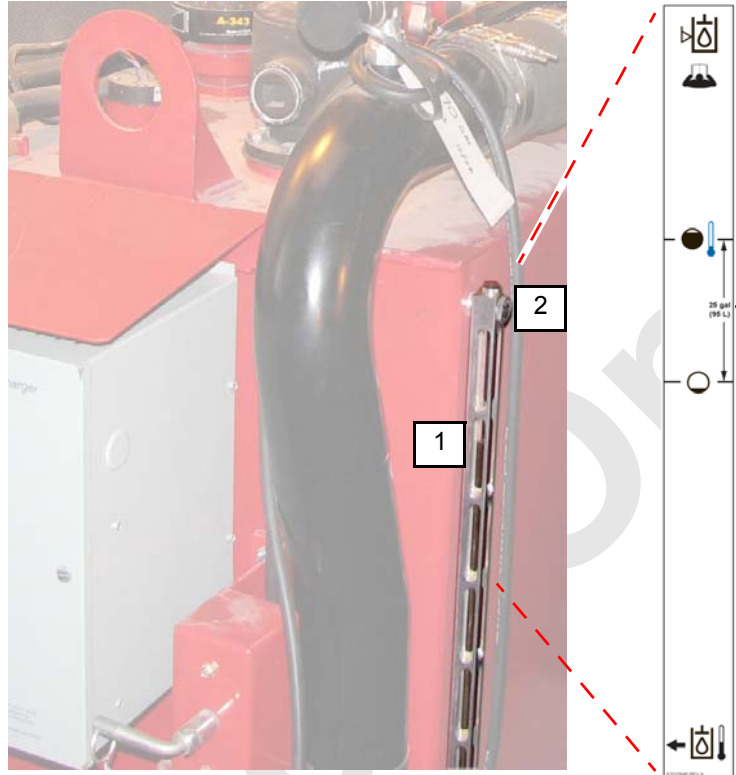
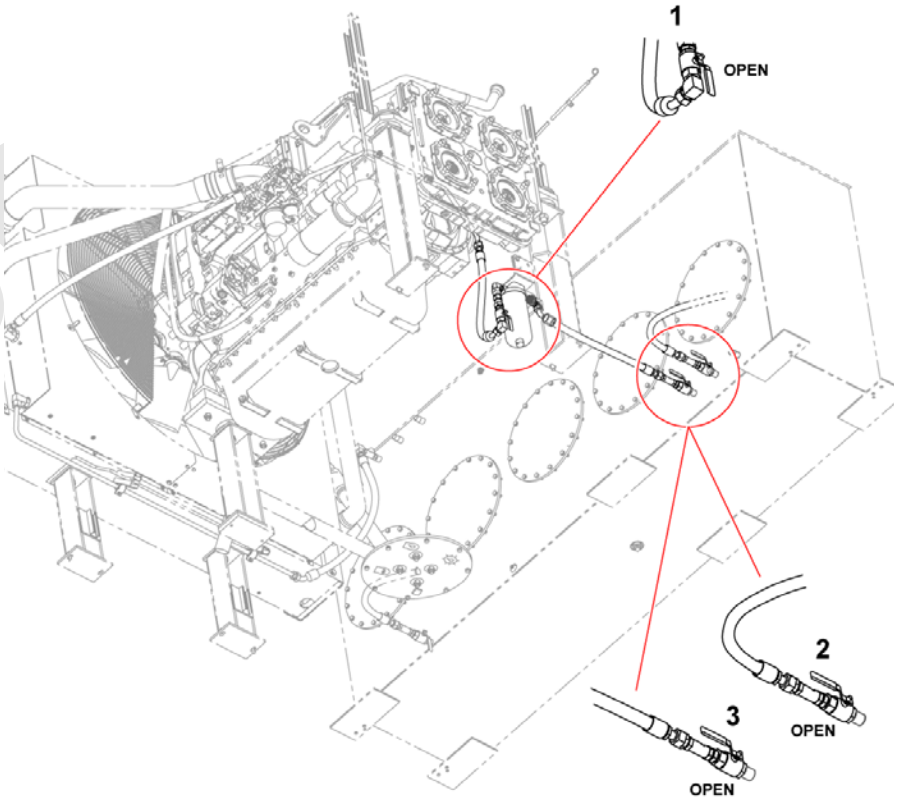
Visual Crane Inspection

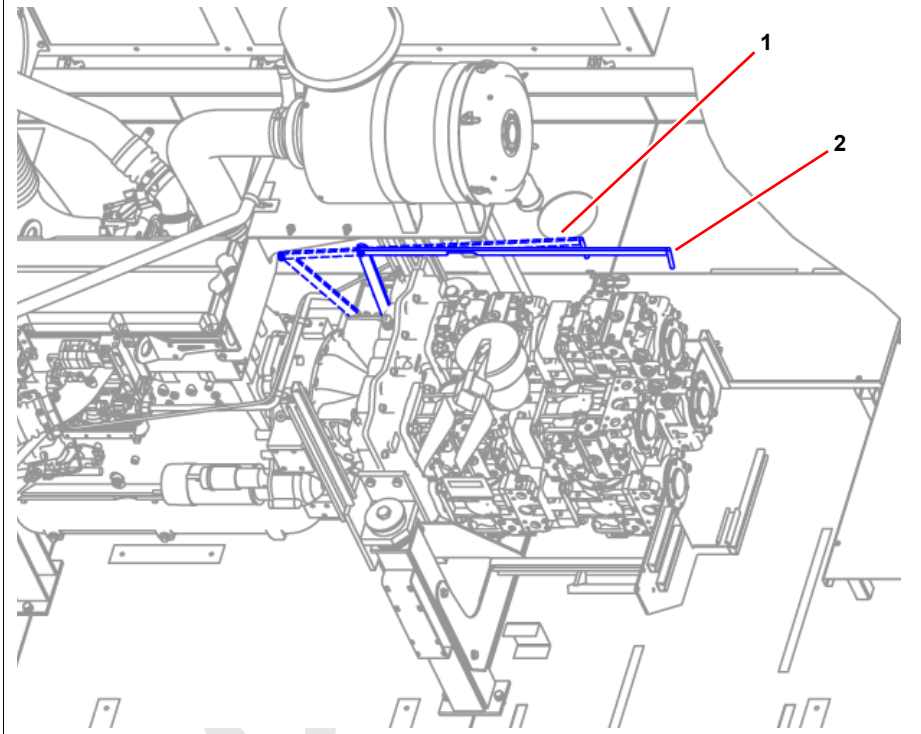
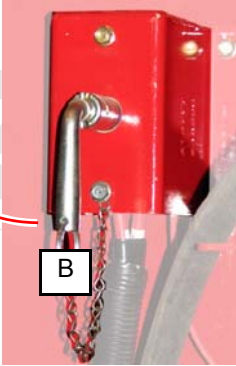
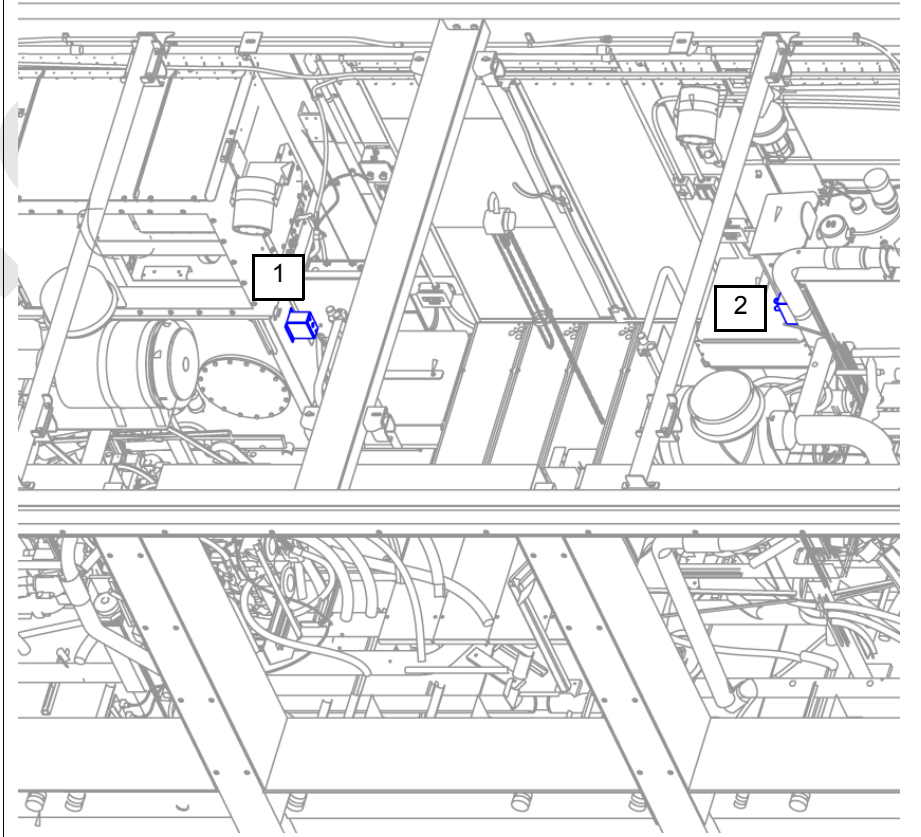
Step	Action
1	See Appendix A — Cold and Hot Weather Operation, on page 3-80 before continuing with this procedure.
2	<p>Before climbing up to the operator cab, make a complete visual inspection around the base of the crane. Look for the following:</p> <ul style="list-style-type: none"> • Possible lift obstructions. • Rigging. • Fluid leaks. • Check the crane roller path and remove any foreign objects. • Any issue that could present a safety hazard.

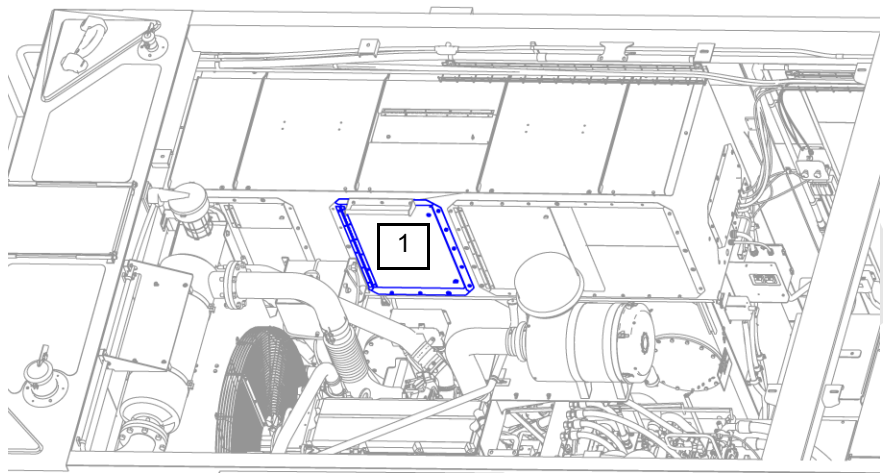
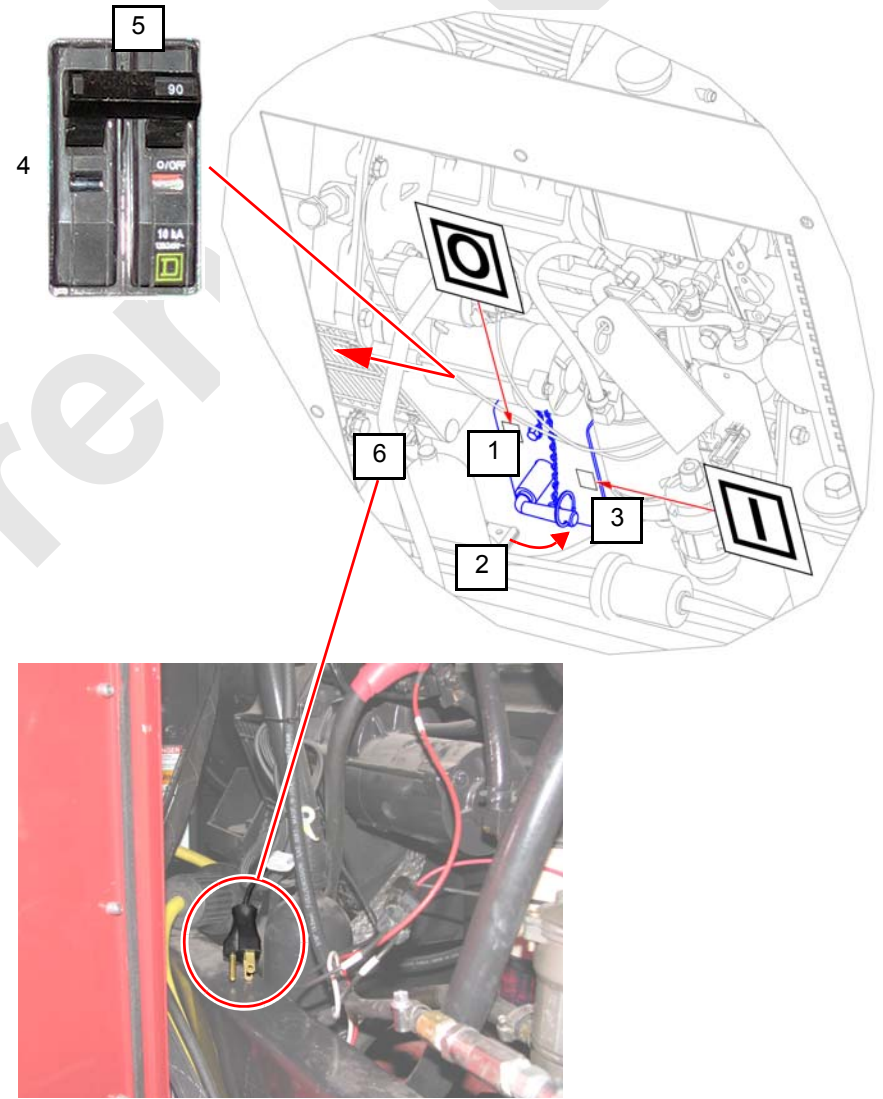
Power Plant Enclosure Startup Procedure Steps

Step	Action
3	<p>Stop the diesel generator (page 3-31).</p> <ul style="list-style-type: none"> • <i>In a non-emergency situation</i>, stop the diesel generator using the PowerCommand panel (page 3-93) in the operator cab: <div style="text-align: center;"> </div> <ul style="list-style-type: none"> • <i>In an emergency situation</i>, press the diesel generator emergency stop button located in the operator cab (page 3-93) or in the power plant enclosure (page 3-89).

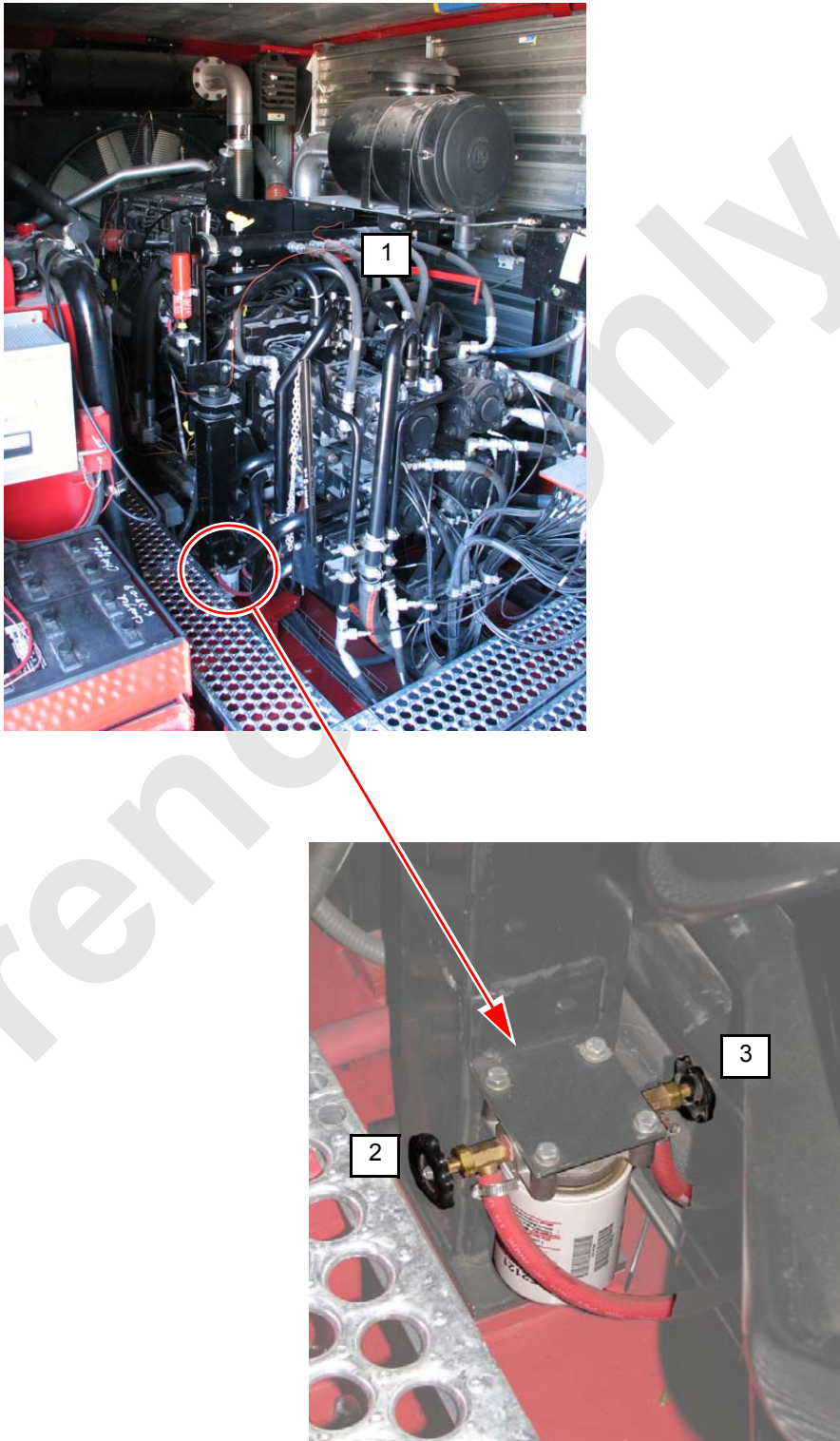
Step	Action	Action
4	Pull out both the diesel generator (1) and the hydraulic generator (2) emergency stop buttons (page 3-31).	
5	Set the hydraulic generator output breaker (1) to ON.	
6	On the hydraulic fluid tank (1, page 3-31), set each of the four shutoff valves (2, 3, 4, 5) to the OPEN position (6).	

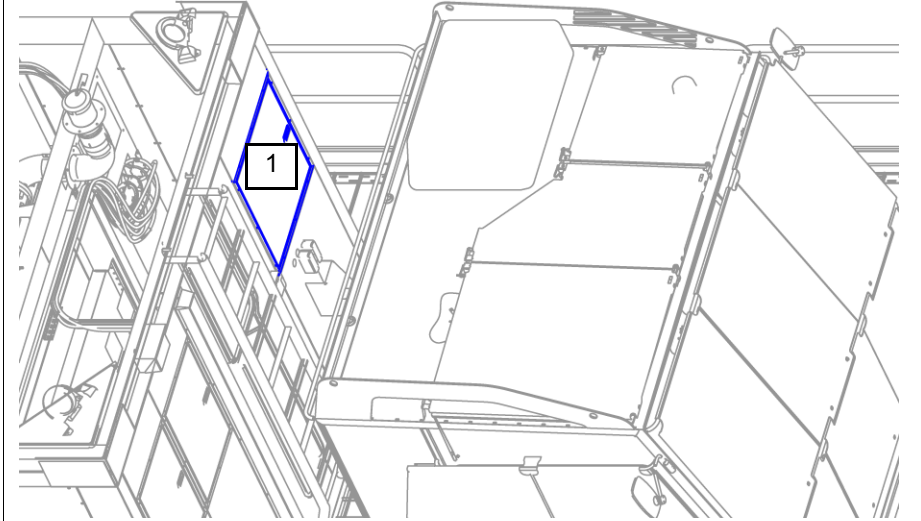

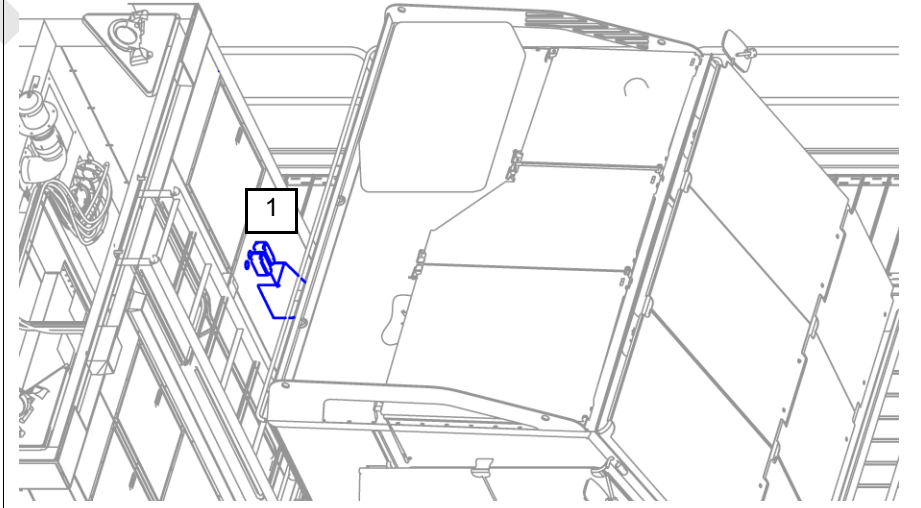
Step	Action
7	<p>Check the fluid level (1) and fluid temperature (2) on the hydraulic fluid tank. The acceptable fluid level is shown on a decal (3).</p> 
8	<p>Set the Fuel filter (1), Primary (3) and Secondary (2) engine fuel supply valves to the OPEN position.</p> 

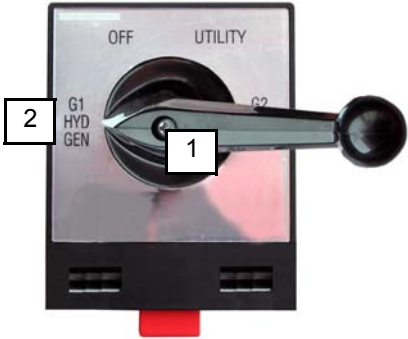
Step	Action	
<p>9</p>	<p>If the air temperature is ABOVE 32°F (0°C), then go to the next step.</p> <p>If the air temperature is 32°F (0°C) or BELOW, then DISENGAGE the clutch release levers on both engines.</p> <p>NOTE: Once an engine is started, the clutch release lever should NOT be left disengaged for more than 20 minutes.</p> <ul style="list-style-type: none"> • To ENGAGE an engine clutch (1), pull the clutch lever UP and then push IN. • To DISENGAGE an engine clutch (2), pull the clutch release lever OUT and then push DOWN. 	 <p>A technical line drawing of the engine and transmission assembly. A blue dashed line indicates the path of the clutch lever. Red callout lines point to two specific components: '1' points to the clutch lever, and '2' points to the clutch release lever.</p>
<p>10</p>	<p>Move the Primary Engine battery disconnect switch (1) and the Secondary Engine battery disconnect switch (2) from the DISCONNECTED position (B) to the CONNECTED position (A).</p> 	 <p>Two technical line drawings showing the battery disconnect switches. The top drawing shows the switches in their disconnected position, with callout '1' pointing to the Primary Engine switch and callout '2' pointing to the Secondary Engine switch. The bottom drawing shows the switches in their connected position.</p>

Step	Action
11	<p>Open the diesel generator compartment door (1).</p> 
12	<p>Move the diesel generator battery disconnect switch (1) from the DISCONNECTED position (2) to the CONNECTED position (3).</p> <p>NOTE: The battery disconnect switch should be disconnected whenever the generator is not in use. <i>If this is not done, the batteries could drain.</i></p> <p>Make sure the diesel generator output circuit breaker (4) is in the ON position (5). The circuit breaker is located on the inside left of the cabinet.</p> <p>Make sure that the diesel generator coolant heater plug (6) is not connected to power.</p> 

Step		Action
13	Open the hydraulic generator access door (1).	
14	Check the hydraulic fluid level (1) and fluid temperature (2) on the hydraulic generator. The acceptable fluid level is shown on the site gauge.	


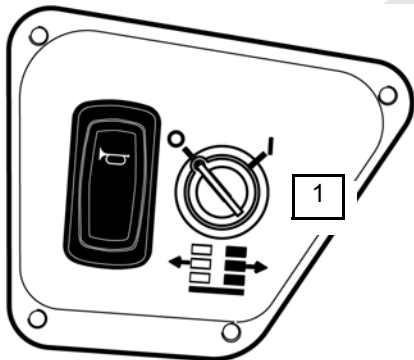
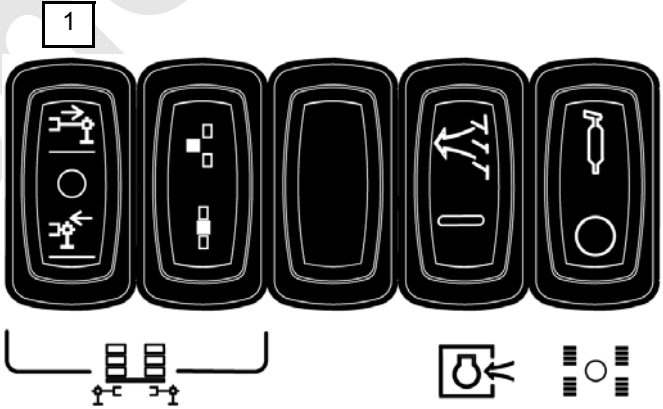

Step	Action
<p>15</p>	<p>Make sure that the Secondary Engine (1) coolant filter valves (2, 3) are both open.</p> 



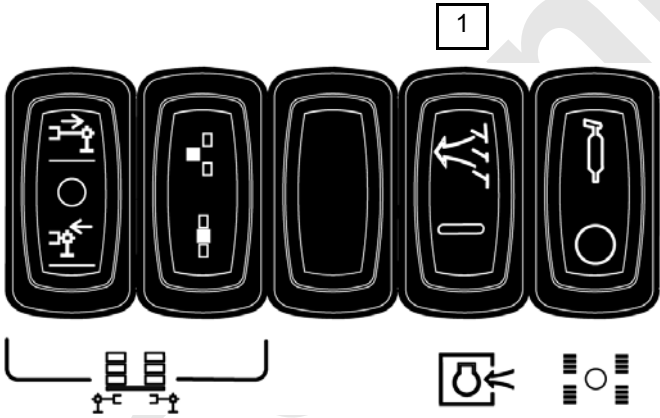

Step	Action	Action
16	Open the manual transfer switch compartment door (1).	
17	Set the manual transfer switch (1) to the OFF position (2).	
18	Disconnect the power cable from the utility power connection (1). Remove the power cable from the crane.	

Step	Action	
19	Turn the cold weather heaters off.	See Turning the Cold Weather Heaters Off, on page 3-83.
20	Set the manual transfer switch (1) to the hydraulic generator G1 HYD GEN position (2).	 <p>The diagram shows a manual transfer switch with a central handle. The handle is currently pointing towards the 'OFF' position. Two callout boxes are present: box '1' points to the handle, and box '2' points to the 'G1 HYD GEN' position on the left side of the switch. The switch panel also has 'OFF' and 'UTILITY' labels at the top, and 'G1 HYD GEN' and 'G2' labels on the sides. A red emergency stop button is visible at the bottom of the switch panel.</p>

Operator Cab Startup Procedure Steps

The following steps are a continuation of the previous steps in [Power Plant Enclosure Startup Procedure Steps, on page 3-44](#):

Step	Action	Action
21	TURN ON all Swing, Travel, and Drum park brakes (page 3-12). Pressing (P) ENABLES park.	
22	TURN OFF VPC stop switch (1) (page 3-15).	
23	Check that counterweight beam switch (1) is OFF (page 3-22). Otherwise, you will be directed to the setup screen upon startup.	
24	Pull out both the diesel (1) and the hydraulic (2) generator emergency stop buttons (page 3-31). These buttons are located behind the operator cab chair.	

<p>25</p>	<p>Pull out the Emergency Stop Button (page 3-11).</p>	
<p>26</p>	<p>Open the power plant enclosure louvers.</p> <p>Press  on the power plant louver switch (1) to OPEN the louvers.</p>	
<p>27</p>	<p>Sound the crane horn.</p>	

28 Start the Primary Engine (1).

- To start an engine, turn the engine switch to the START (C) position. *Do NOT keep the switch in this position for more than 30 seconds.*
- RELEASE to the RUN (B) position as soon as the engine starts. *Wait at least 2 minutes between each start attempt:*

NOTE: If only the Primary Engine will be started, make sure that the battery charger circuits are operating (see [Main AC Load Center, on page 3-95](#)). *Otherwise, the Secondary Engine batteries will NOT be charged and could be depleted.*

29 Start the Secondary Engine (2).

NOTE: See [Appendix G — Primary and Secondary Engine Functions, on page 3-115](#) for a list of the crane functions assigned to each engine.


30

If the crane configuration shown on the Rated Capacity Indicator/ Limiter display screen (example on right) is correct, press .

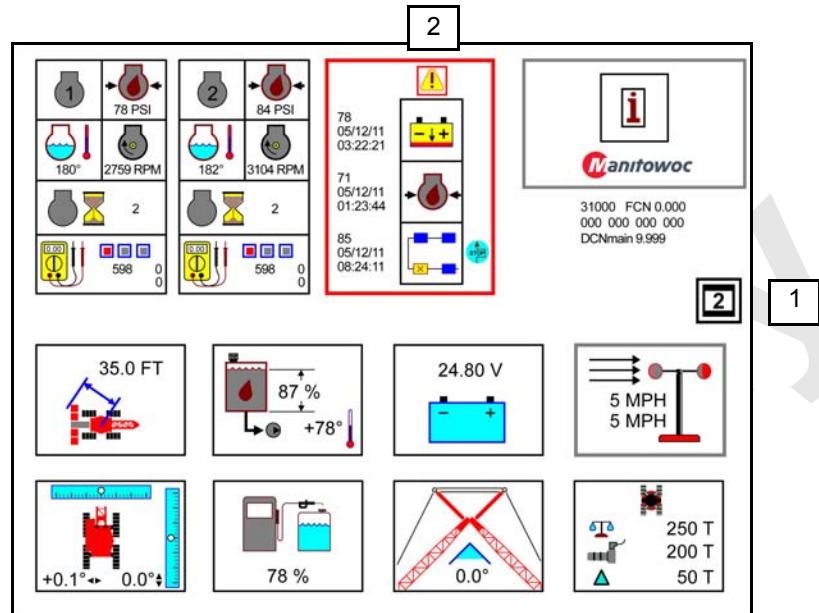
For more information, see **Folio 2204 Manitowoc Model 31000 Rated Capacity Limiter (RCL)/ Rated Capacity Indicator (RCI) Manual.**

31

Check for faults using the Information screen (shown on the right) on the Main Display.

If a System Fault icon  appears at (1), then check the fault list (2) for the type of fault.

For more information, see **Folio 2207 Manitowoc Model 31000 Main Display Operation.**



This completes the startup procedure.

Reference Only

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VPC Operation

Step	Action
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Item	Description
1	VPC Actuator Frame
2	VPC Actuator
3	VPC Pivot Frame
4	VPC Counterweight Frame
5	Counterweight Center Tray
6	Counterweight Boxes
7	Counterweight Side Tray (2)
8	Counterweight Beam (2)
9	Counterweight Pad (2)

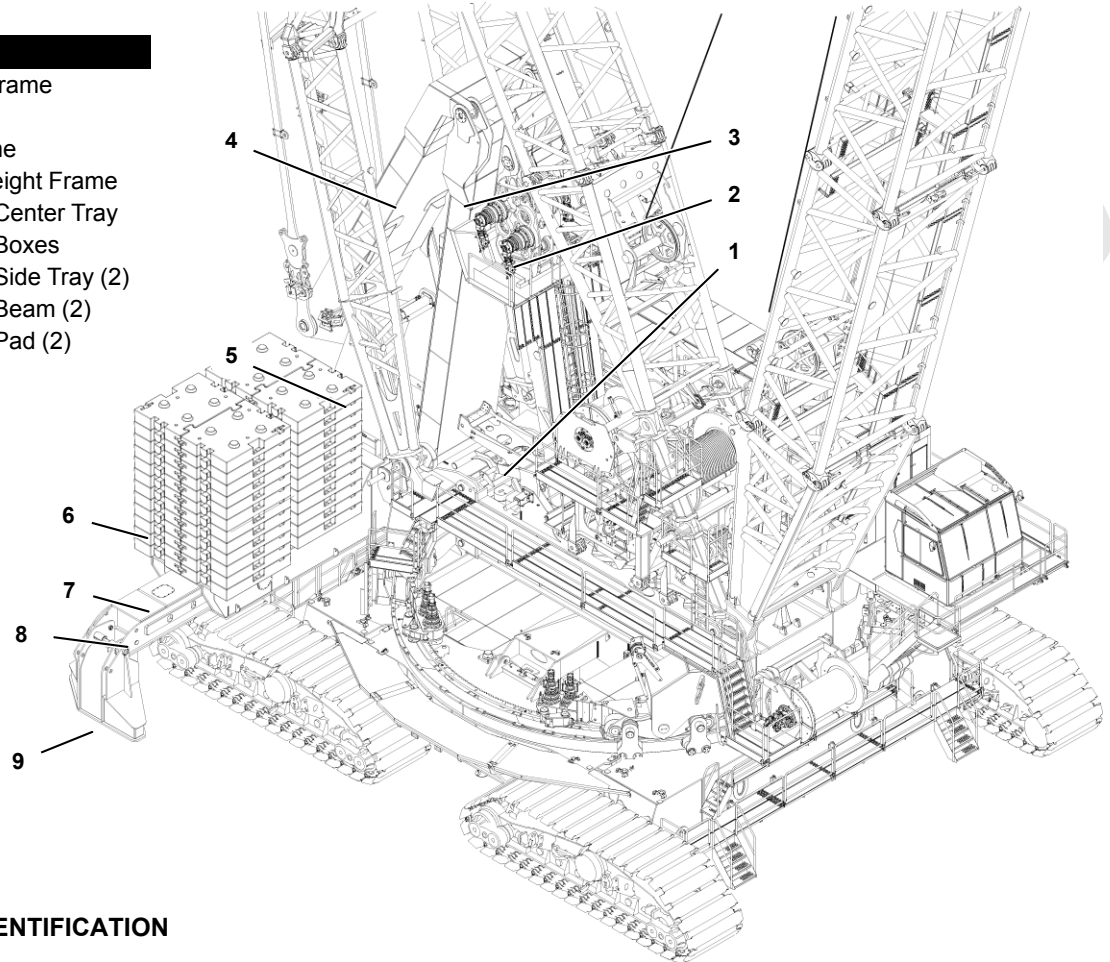


FIGURE 3-2 — VPC IDENTIFICATION

1	Be familiar with crane orientation (page 3-42).
2	Read and understand the Maximum Allowable Travel Specification charts in the Capacity Chart Manual and Table 3-2 on page 3-61 of this section. There are travel restrictions with counterweight pads down.
3	Read and understand VPC Operating Positions and Swing and Travel Restrictions, on page 3-61 of this section. There are swing restrictions with counterweight beams extended and counterweight pads down.
4	Verify that the crane is equipped with the proper counterweight per the capacity chart in use. See the Counterweight Arrangements Chart in the Capacity Chart Manual and the Upperworks Counterweight Assembly Drawing at the end of Section 4 in this manual.

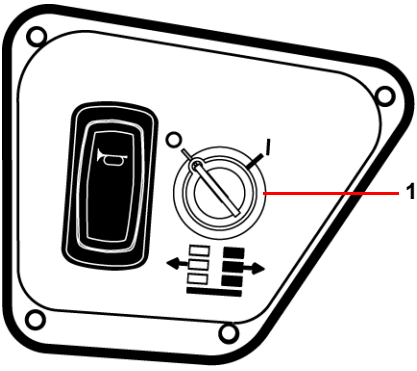
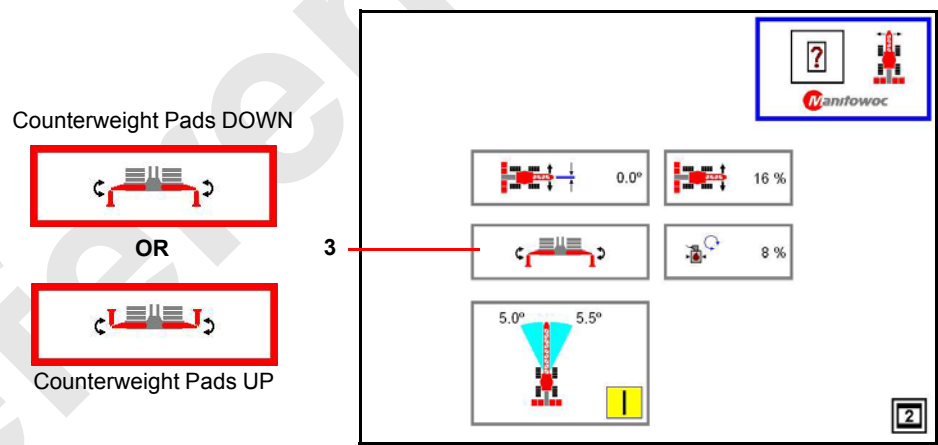
Step	Action
5	<p>Verify that VPC stop switch (1) is in the OFF position (page 3-15).</p> 
6	<p>If equipped with the optional counterweight beams and pads, verify that they are in the desired operating position (see VPC Operating Positions and Swing and Travel Restrictions, on page 3-61).</p> <ul style="list-style-type: none"> To install or remove the counterweight pads, see Installing and Removing Counterweight Pads, on page 3-62. To reposition the counterweight pads, see Repositioning Counterweight Pads, on page 3-63. To reposition the counterweight beams, see Repositioning Counterweight Beams, on page 3-64.
7	<p>Confirm the position of the counterweight pads — UP or DOWN — in the Swing Function Modes screen of the main display. See Folio 2207 Manitowoc 31000 Main Display Operation.</p> <p>The position of the pads is not retained in memory each time the engines are stopped and restarted.</p> 
8	<p>Refer to Table 3-1 on page 3-60 for a description of VPC movements during operation. Refer to Table 3-2 on page 3-61 for VPC operating positions and swing and travel restrictions.</p> <p style="text-align: center;">This completes the VPC operation procedure.</p>

Table 3-1VPC Movement During Operation

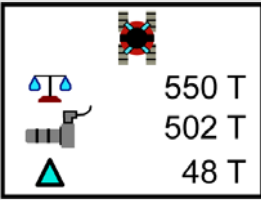

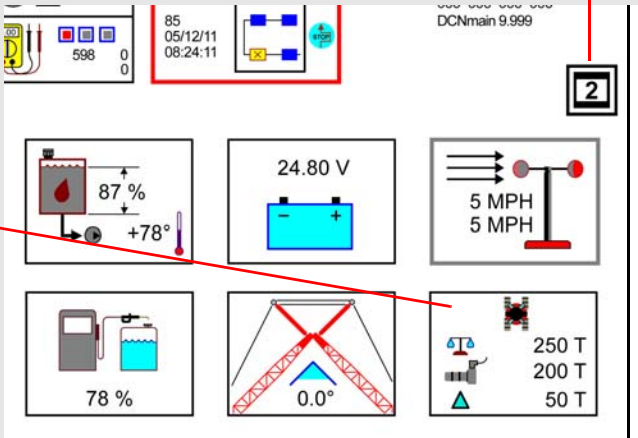
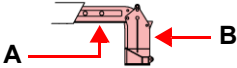
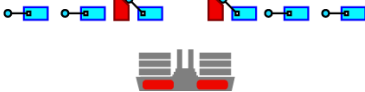
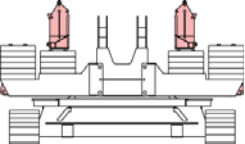
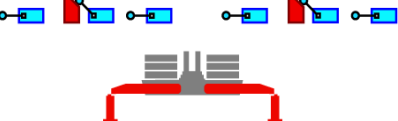
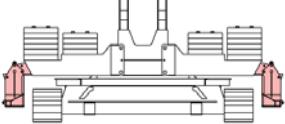
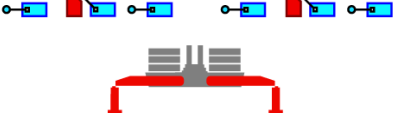
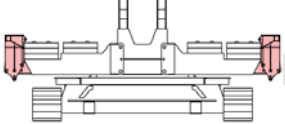
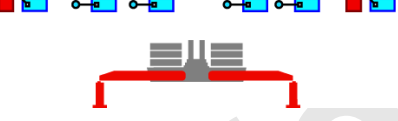
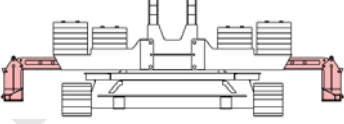

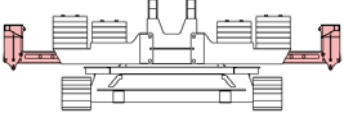
Measured Load (see below)		VPC Movement (see below)	Operator Notes
Target Load less than 150T	Target Load greater than 150T		
▲ is ± 30T of Target Load	▲ is ± 50T of Target Load	VPC moves at <i>Normal Speed</i>	<p>The VPC may continue to move even after the operator has put the hoist and boom controls in neutral.</p> <p>This VPC movement can cause the load position to change.</p> <p>Use the hoist and boom controls to counteract and minimize this movement.</p> <p>Example: If the Target Load is 180T, then a Measured Load of 230T or 130T (▲ is ± 50T) would start the VPC moving at normal speed.</p>
▲ is ± 40T of Target Load	▲ is ± 75T of Target Load	VPC moves at <i>Fast Speed</i>	<p>The VPC moves faster than normal because the operator has moved the hoist or boom controls aggressively.</p> <p>Example: If the Target Load is 130T, then a Measured Load of 170T or 90T (▲ is ± 40T) would start the VPC moving at fast speed.</p>
▲ is ± 55T of Target Load	▲ is ± 90T of Target Load	VPC moves at <i>Fast Speed</i>	<p>Operator controls that could <i>reduce</i> crane stability are disabled.</p> <p>The operator should take actions to stabilize the crane.</p> <p>Example: If the Target Load is 130T, then a Measured Load of 185T or 75T (▲ is ± 55T) would start the VPC moving at fast speed <i>and</i> disable operator controls that could reduce crane stability.</p>
<p>Measured and Target Loads:</p> <p>Measured Load = current crane load as measured by the rear house rollers.</p> <p>Target Load = maximum load on the rear house rollers as allowed by the current load chart.</p> <p>Current values for Measured Load, Target Load, and the difference (▲) between the two loads are displayed on the Main Display Information screen:</p>		<p>VPC Movement:</p> <p>When the VPC is moving, one of the two icons below will appear on the Main Display Information screen:</p>	
 <p>550 T = Target Load 502 T = Measured Load 48 T = Difference between Target and Measured Loads</p>		 <p>VPC Extending VPC Retracting</p> 	

Table 3-2 VPC Operating Positions and Swing and Travel Restrictions

The VPC operates automatically. This counterweight moves in and out in response to control handle movements in order to compensate for changes in load.

Position Icons Used in Accessory Diagnostics Screen and Crane Setup Function Modes Screen of Main Display (see NOTE 1)	Counterweight Beam (A) and Pad (B) Position 	Swing allowed?	Travel allowed?	Maximum ground clearance?
Beams Fully Retracted (see NOTE 2)				
		YES	YES	YES
Beams Extended to Intermediate Position				
		LIMITED (see NOTE 4)	YES (see NOTE 3)	LIMITED (see NOTE 4)
		YES	YES	YES
Beams Fully Extended				
		YES	YES (see NOTE 3)	NO
		YES	YES	YES
<p>NOTES:</p> <ol style="list-style-type: none"> 1. See the “Accessory Diagnostic screen” section of Folio 2207 Manitowoc 31000 Main Display Operation. 2. Pads must be removed and stored on top of outboard counterweight boxes 3. When the counterweight pads are in the down position, there are travel restrictions. See Maximum Allowable Travel Specifications. 4. If the beams are in the intermediate position with the PADS UP, 360° swing is permitted. If the beams are in the intermediate position with the PADS DOWN, swing is limited to ±5° about the forward and reverse positions: 355 to 5° and 175 to 185°. See Crane Orientation, on page 3-42. 				

Installing and Removing Counterweight Pads

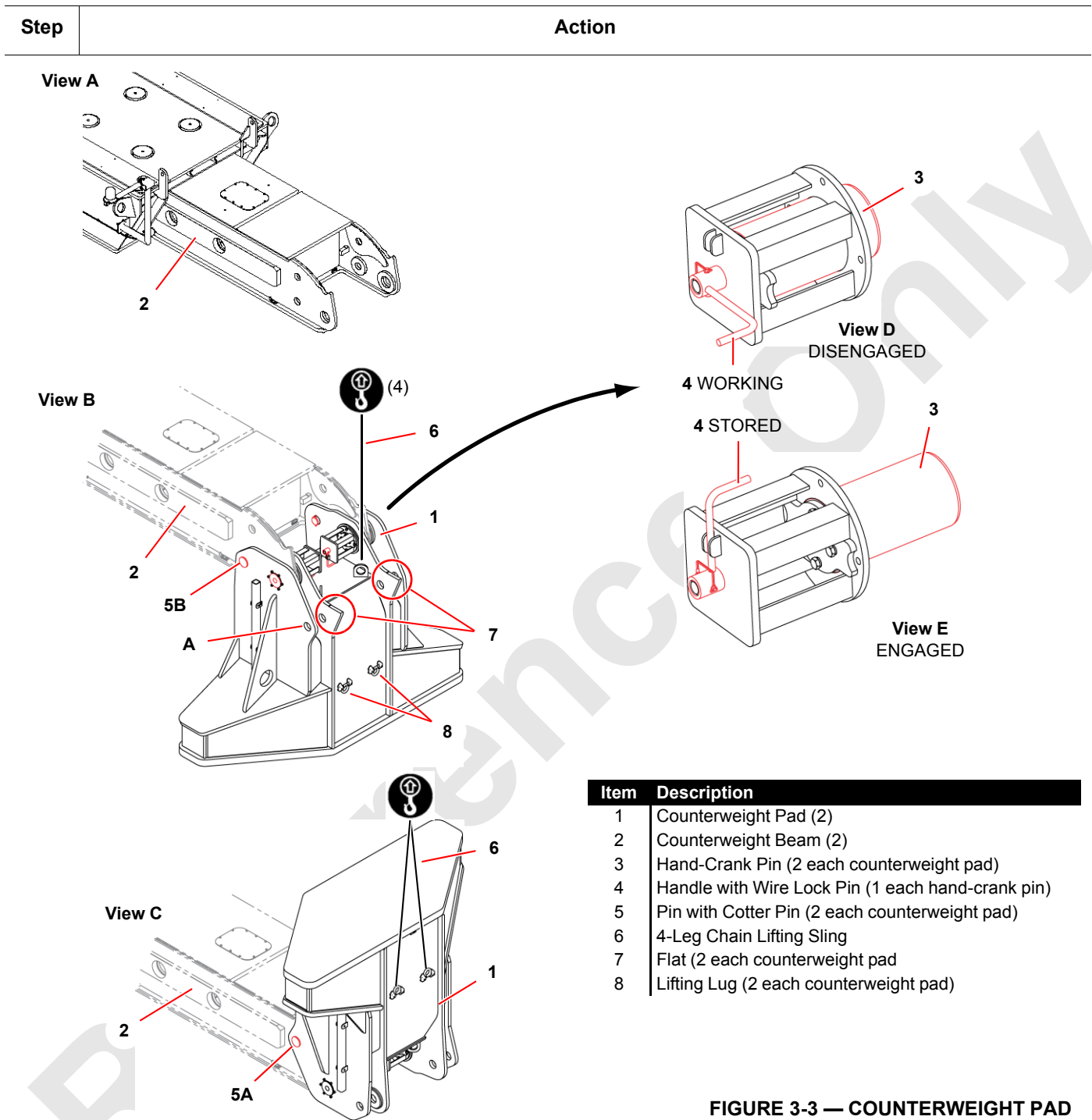


FIGURE 3-3 — COUNTERWEIGHT PAD

To INSTALL COUNTERWEIGHT PADS (1, [Figure 3-3](#)), proceed as follows: the beams must be in the intermediate position or fully extended (View A).

1	If not already done, rotate the handles (4, View E) from the stored position to the working position (View D) and disengage the hand-crank pins (3, View D).
2	Attach four legs of the lifting sling (6, View B) from an assist crane to the lifting lugs on the counterweight pad (2).


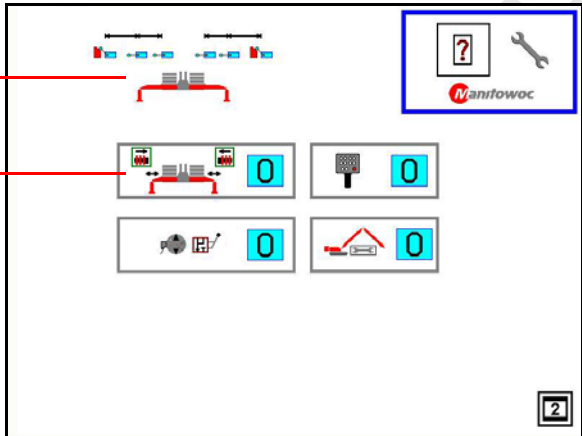
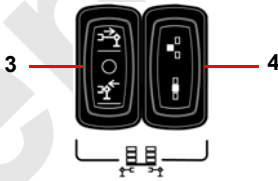

Step	Action
3	Lift the counterweight pad (2, View B) into position at the end of counterweight beam (1).
4	Align the holes in the counterweight pad with the holes in the counterweight beam.
5	Engage the hand-crank pins (3, View D). Adjust assist crane lifting tension to ease pin engagement.
6	Once the pins are engaged, remove the handles (4, View D) from the working position and install them in the stored position (View E) to lock the hand-crank pins in the engaged position.
7	Remove the pins (5, View B) from holes A and install them in holes B for operation with the counterweight pads DOWN. If desired to provide ground clearance, the counterweight pads can be rotated UP (View F) and pinned in holes A . Use the lifting lugs (8) to rotate the counterweight pads.
8	Repeat the above steps for the other counterweight pad.

To REMOVE COUNTERWEIGHT PADS (1, [Figure 3-3](#)), reverse the above steps.

Repositioning Counterweight Pads

Step	Action
UP position (View C, Figure 3-3):	
1	Attach two legs of the lifting sling (6, View C) from an assist crane to the lifting lugs (8).
2	Remove the pins (5, View B) from holes A .
3	Rotate the counterweight pad to the UP position shown in View C so the flats (7, View B) on the counterweight pad are resting on the counterweight beam.
4	Install pins (5, View C) in holes B .
5	Disconnect the lifting slings.
DOWN position:	
1	Attach two legs of lifting sling (6) from an assist crane to the lifting lugs (8, View C). Hoist so the slings are just tight.
2	Remove the pins (5, View C) from holes B .
3	Rotate the counterweight pad to the DOWN position shown in View B.
4	Install the pins (5, View B) in holes A .

Repositioning Counterweight Beams

Step	Action
1	<p>Press  in the operator cab to quickly access the Crane Setup screen:</p> 
2	<p>Access the Counterweight Beam selection box (1) in the Crane Setup screen.</p>
3	<p>Turn ON (I) the Counterweight Beam icon to enable operation of the beam extend/retract switch (3) and the counterweight beam pins switch (4).</p> 
4	<p>Press and hold the TOP end of counterweight beam pins switch (4) to DISENAGGE the beam pins. The pins out icons  will appear in the Counterweight Beam selection box (1).</p>
5	<p>Press the top end</p>

Reference Only

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Boom Hoist Operation

Step	Action
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CAUTION

Avoid Rigging Damage!

Check that boom hoist wire rope is reeved through all sheaves and spooled properly onto drum before raising boom from ground.

- See Boom Rigging Drawing in Section 4 for wire rope and reeving specifications.
- See Wire Rope Installation in Section 4 for instructions on attaching wire rope to boom.

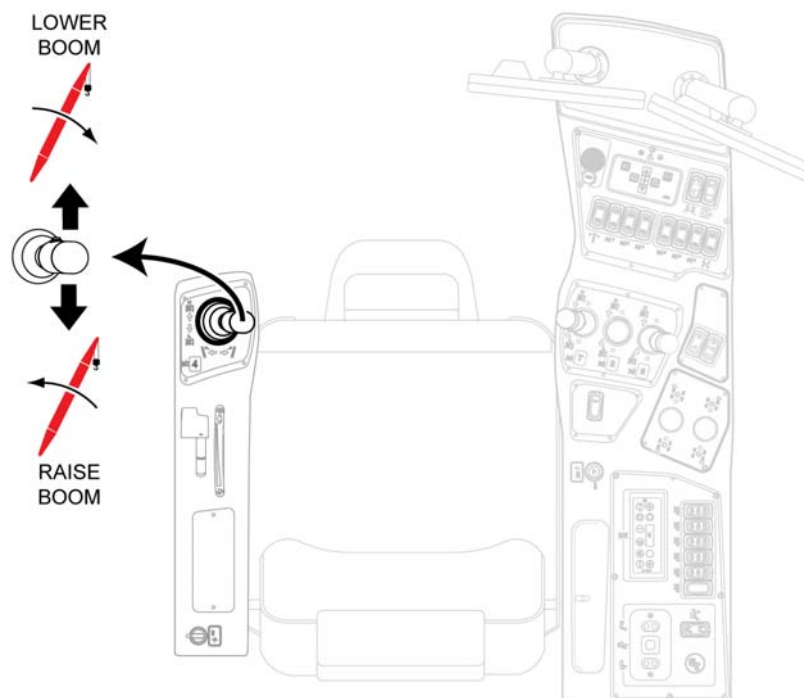



FIGURE 3-4 — BOOM HOIST HANDLE CONFIGURATION (WITHOUT LUFFING JIB)

1	Be familiar with crane orientation (page 3-42).
2	Select the correct capacity chart and crane configuration using the Rated Capacity Indicator/Limiter display screens. For detailed instructions, see Folio 2204 Manitowoc Model 31000 Rated Capacity Limiter (RCL) / Rated Capacity Indicator (RCI) Manual .
3	Make sure the automatic boom stop is set at the proper angle. For detailed instructions, see Automatic Boom Stop Adjustment in Section 4 of Service Manual .
4	If not previously done, perform the crane Startup Procedure (page 3-44).

Step	Action
5	<p>Turn off the boom hoist drum park switch (page 3-12). The drum number used for the boom hoist depends on how the crane is configured (see Table 4 on page 3-85):</p> <ul style="list-style-type: none"> • When the crane is configured <i>without a luffing jib</i>, the boom hoist drum handle is on the <i>left</i> console (Figure 3-4). • When the crane is configured <i>with a luffing jib</i>, the boom hoist drum handle is on the <i>right</i> console (Figure 3-5). <hr/> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Avoid Boom or Jib Damage!</p> <p>Do not turn on drum park switch while raising or lowering boom. Brake will bring boom to an abrupt stop. This action could cause shock load damage to boom and jib. Bring boom to a smooth stop with handle and then turn on drum park switch.</p> <hr/>
6	<p>Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase engine speed when more power is required.</p>
7	<p>Push the boom hoist handle FORWARD from off to LOWER the boom. Pull the boom hoist handle BACK from off to RAISE the boom.</p> <hr/> <p style="text-align: center;"> WARNING</p> <p style="text-align: center;">Avoid Two-Blocking Hazard!</p> <p>Pay out load lines while lowering boom. Load may contact boom point or jib point sheaves if this step is not taken. Wire rope or other parts could break allowing load to fall.</p> <hr/>
8	<p>As the boom nears the desired angle, slowly move the boom hoist handle towards off to decrease speed. Then move the handle to off to stop the boom. Hold the boom in position and the drum brake will apply.</p> <p>NOTE: Besides a boom up limit, a physical boom stop cushions boom raising between approximately 78° and the maximum angle. The boom stop also provides a physical stop at 88°.</p>
9	<p>Turn on the boom hoist drum park switch if the boom angle will not be changed.</p> <hr/> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Avoid Rigging Damage!</p> <p>When lowering boom to ground:</p> <ul style="list-style-type: none"> • If equipped, disconnect fixed jib stop before jib point contacts ground. • If equipped, remove upper boom point before upper point contacts ground. • If equipped, disengage luffing jib stop at specified boom to luffing jib angle (see Luffing Jib Rigging Guide). <hr/>
<p>This completes the boom hoist operation procedure.</p>	

Luffing Jib Hoist Operation

Step	Action
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! WARNING

Avoid Death or Serious Injury!

Read and understand instructions in Luffing Jib Rigging Guide before attempting to raise or lower luffing jib from or to ground.

Use extreme care when operating luffing hoist and boom hoist at same time. Maximum or minimum operating radius will be reached quickly when operating both hoists at same time.

CAUTION

Avoid Rigging Damage!

Check that luffing hoist wire rope is reeved through all sheaves and spooled properly before raising boom and jib from ground.

- See Jib Rigging Drawing in Luffing Jib Operator Manual for wire rope and reeving specifications.
- See Wire Rope Installation in Section 4 of this manual for instructions on attaching wire rope to luffing hoist drum.

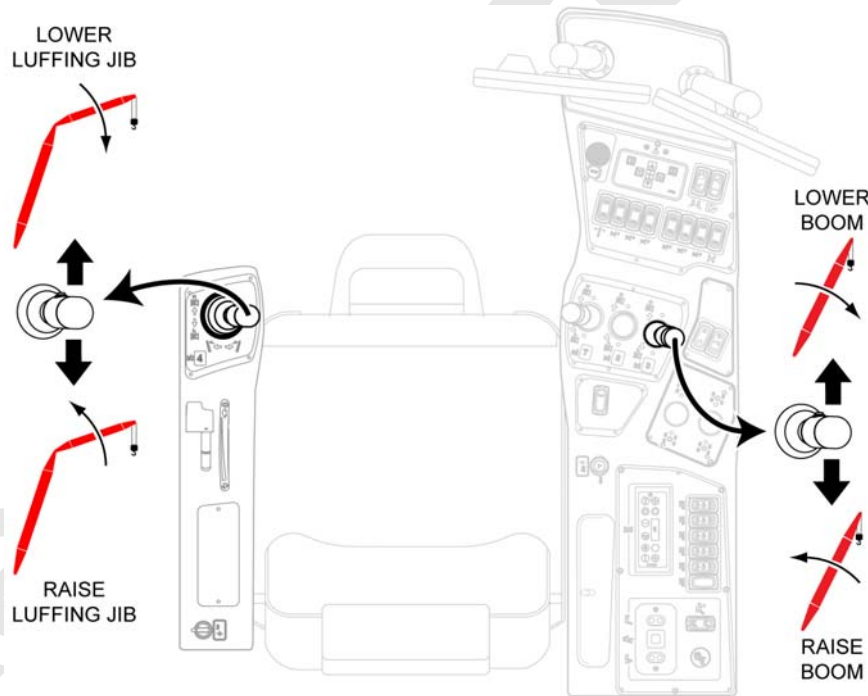



FIGURE 3-5 — BOOM/LUFFING JIB HOIST HANDLE CONFIGURATIONS

1	Be familiar with crane orientation (page 3-42).
2	Select the correct capacity chart and crane configuration using the Rated Capacity Indicator/Limiter display screens. For detailed instructions, see Folio 2204 Manitowoc Model 31000 Rated Capacity Limiter (RCL) / Rated Capacity Indicator (RCI) Manual .

Step	Action
3	Make sure the automatic boom stop is set at the proper angle. For detailed instructions, see Automatic Boom Stop Adjustment in Section 4 of Service Manual .
4	If not previously done, perform the crane Startup Procedure (page 3-44).
5	<p>Turn off the luffing hoist drum park switch (page 3-12). The drum number used for the luffing hoist depends on how the crane is configured (see Table 4 on page 3-85):</p> <ul style="list-style-type: none"> • When the crane is configured <i>without a luffing jib</i>, the boom hoist drum handle is on the <i>left</i> console (Figure 3-4). • When the crane is configured <i>with a luffing jib</i>, the boom hoist drum handle is on the <i>right</i> console (Figure 3-5). <hr/> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Avoid Boom or Luffing Jib Damage!</p> <p>Do not turn on drum park switch while raising or lowering luffing jib. Brake will bring luffing jib to an abrupt stop. This action could cause shock load damage to boom and jib. Bring luffing jib to a smooth stop with handle and then turn on drum park switch.</p> <hr/>
6	Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase engine speed when more power is required.
7	<p>Push the luffing jib hoist handle FORWARD from off to LOWER the luffing jib. Pull the luffing jib hoist handle BACK from off to RAISE the luffing jib.</p> <hr/> <p style="text-align: center;"> WARNING</p> <p style="text-align: center;">Avoid Two-Blocking Hazard!</p> <p>Pay out load lines while lowering luffing jib. Load may contact luffing jib sheaves if this step is not taken. Wire rope or other parts could break allowing load to fall.</p> <hr/>
8	As the luffing jib nears the desired angle, slowly move the luffing jib hoist handle towards off to decrease speed. Then move the handle to off to stop the luffing jib. Hold the luffing jib in position and the drum brake will apply.
9	<p>Turn on the luffing jib hoist drum park switch if the luffing jib angle will not be changed.</p> <hr/> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Avoid Luffing Jib Damage!</p> <p>When lowering boom and luffing jib to ground, disengage luffing jib stop at specified boom to luffing jib angle (see Luffing Jib Rigging Guide).</p> <hr/>
This completes the luffing hoist operation procedure.	

Swing Operation

Step	Action
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! WARNING
Tipping Hazard!

Prevent crane from tipping. Adhere to any swing limitations given in capacity charts.

! DANGER!
Moving Counterweight Hazard!

Counterweights can strike personnel in area of swing path! Barricade the swing area. Warn personnel to stay clear of swing path. Do NOT allow the counterweights to strike the ground during swinging. Sound horn prior to swinging.

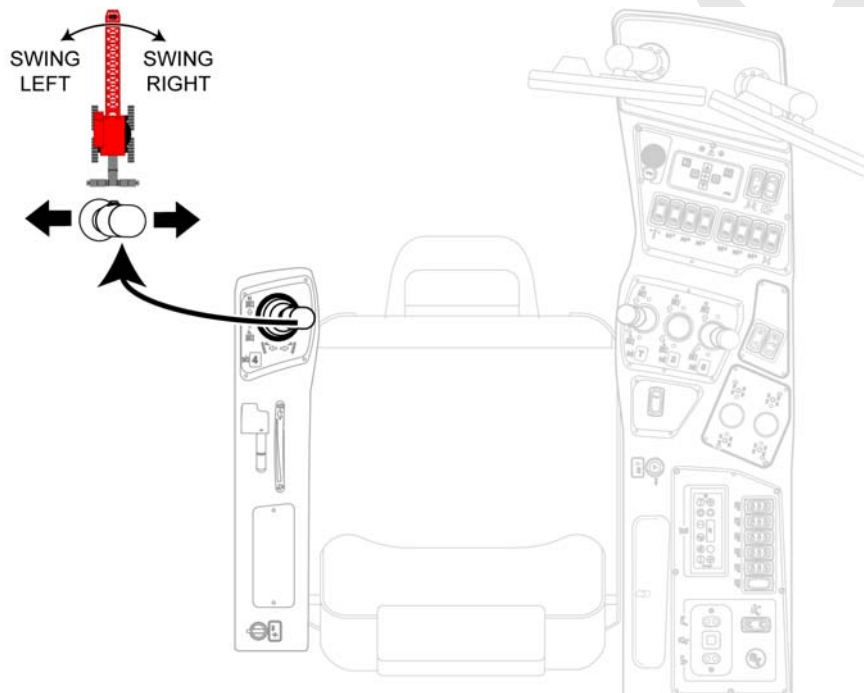


FIGURE 3-6 — SWING HANDLE

1	Be familiar with crane orientation (page 3-42). See VPC Operating Positions and Swing and Travel Restrictions, on page 3-61 .
2	Select the correct capacity chart and crane configuration using the Rated Capacity Indicator/Limiter display screens. For detailed instructions, see Folio 2204 Manitowoc Model 31000 Rated Capacity Limiter (RCL) / Rated Capacity Indicator (RCI) Manual .
3	Swing speed, torque, and angle limits can be set using the Function Modes Screen. See Folio 2207 Manitowoc Model 31000 Main Display Operation for details.
4	If not previously done, perform the crane Startup Procedure (page 3-44).

Step	Action
5	<p>Turn off the swing park brake (page 3-12).</p> <hr/> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Avoid Boom/Swing Drive Damage!</p> <p>Do not apply swing holding brake or turn on swing park switch while swinging. Brake will bring rotating bed to an abrupt stop. This action could cause damage to boom and luffing jib from side loading or damage to swing drive from shock loading. Bring rotating bed to a smooth stop with swing handle and then apply swing holding brake or turn on swing park switch.</p> <hr/>
6	<p>Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase engine speed when more power is required.</p>
7	<p>Push the swing handle to the LEFT from off to SWING LEFT. Push the swing handle to the RIGHT from off to SWING RIGHT.</p>
8	<p>Start swing motion with a smooth acceleration. Continue handle motion to swing at a desired speed.</p>
9	<p>Stop swinging by releasing the swing handle to off. Swing speed will decrease to off and the rotating bed will coast to a stop. If a faster stop is desired, move swing handle past off to opposite swing direction.</p>
10	<p>Once the rotating bed stops, turn on the swing park brake (page 3-12) to hold the rotating bed in position.</p>
<p style="text-align: center;">This completes the swing operation procedure.</p>	

Reference

Load Drum Operation

Step	Action
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! WARNING

Falling Load Hazard!

Prevent load on unused drums from falling. Turn on drum park switch for drums not in use.

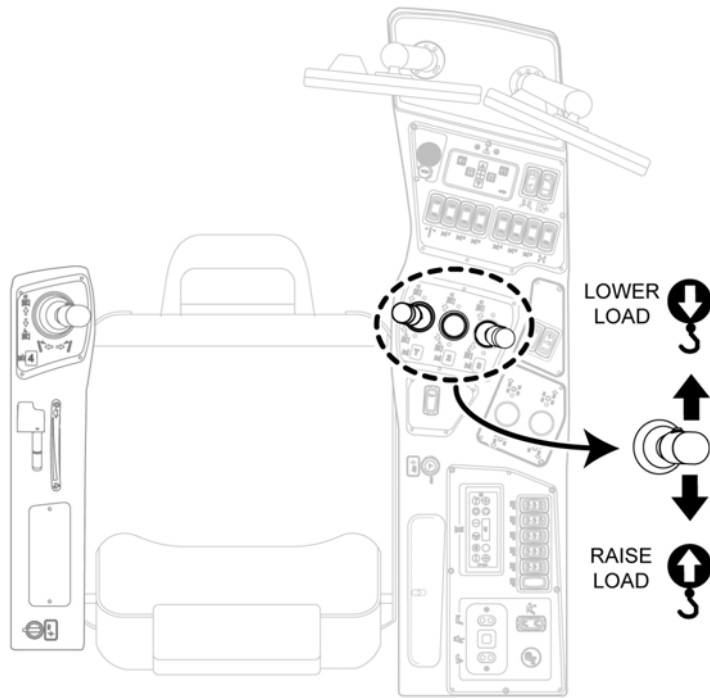



FIGURE 3-7 — LOAD DRUM HANDLES

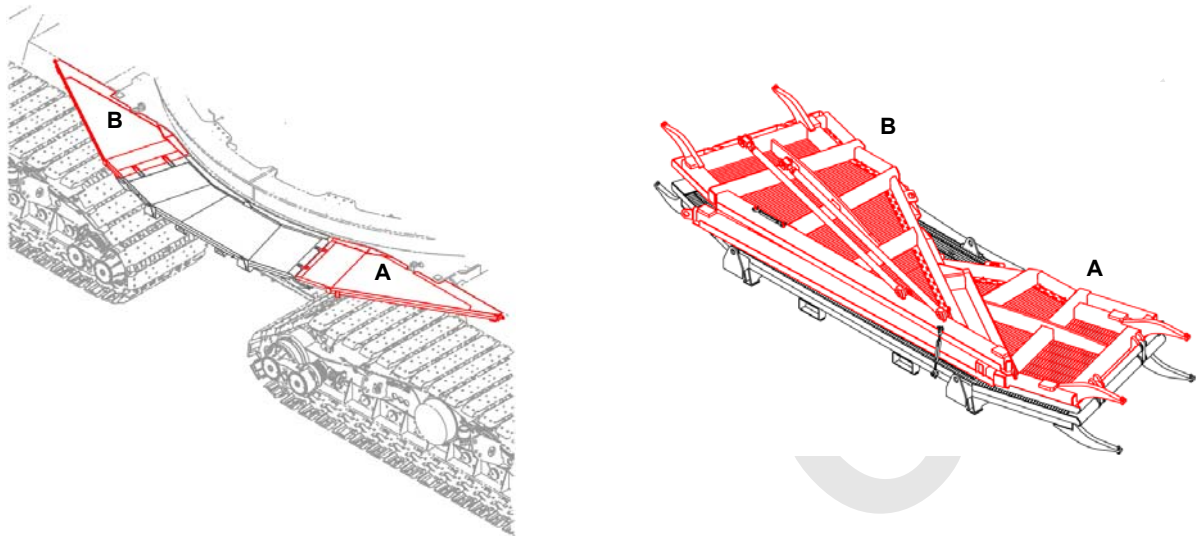
1	Be familiar with crane orientation (page 3-42).
2	Select the correct capacity chart and crane configuration using the Rated Capacity Indicator/Limiter display screens. For detailed instructions, see Folio 2204 Manitowoc Model 31000 Rated Capacity Limiter (RCL) / Rated Capacity Indicator (RCI) Manual .
3	Drum speed limit can be set using the Function Modes Screen. See Folio 2207 Manitowoc Model 31000 Main Display Operation for details.
4	If not previously done, perform the crane Startup Procedure (page 3-44).
5	<p>Turn off the drum park brake (page 3-12) for the drum to be used.</p> <hr/> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Avoid Boom or Luffing Jib Damage!</p> <p>Do not turn on drum park switch while raising or lowering load; brake will bring load to an abrupt stop. This action could cause shock load damage to boom, luffing jib, and load line. Bring load to a smooth stop with drum handle and then turn on drum park switch.</p>

Step	Action
6	Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase engine speed when more power is required.
7	Pull the drum handle BACK from off to RAISE the load. Push the drum handle FORWARD from off to LOWER the load.
8	As the load nears the desired position, slowly move the drum handle towards off to slow down the load. Then release the handle to off to stop the load. Hold in position and the drum brake will apply.
This completes the load drum operation procedure.	

Reference Only

Travel Operation

Step	Action
	<hr/> <div style="text-align: center;">  <p>WARNING</p> <p>Tipping Hazard!</p> <p>Travel surface must be firm and uniformly supporting. For all travel on grades, see the Maximum Allowable Travel Specifications chart in the Capacity Chart Manual. Failing to comply with above specifications can result in tipping.</p> <p>Moving Crane Hazard!</p> <p>Know position of rotating bed with relation to front of carbody before traveling. An accident can result if crane travels opposite of intended direction.</p> <p>Flying Object Hazard!</p> <p>Excessive dirt build-up at tumbler and front roller ends of crawlers can result in excessive tension in tread connectors. Tread connectors can break if over tensioned, causing treads to fly apart unexpectedly with dangerous force.</p> </div> <hr/> <div style="text-align: center;"> <p>CAUTION</p> <p>Crawler Damage!</p> <p>Avoid damage to crawler components (treads, rollers, frames)! Use care to prevent dirt from piling up at tumbler and front roller ends of crawlers when turning on soft surfaces:</p> <ul style="list-style-type: none"> • Bring crawlers to a complete stop before changing travel direction. • Turn a few degrees. Then slowly travel forward or reverse so dirt falls away from crawlers. Continue this procedure until desired turn has been made. • Avoid sharp turns. • Make gradual turns or counter-rotate (page 3-16) whenever possible so both crawlers are always powered. • Clean crawlers often. • Keep crawler treads properly adjusted. </div> <hr/> <div style="text-align: center;"> <p>CAUTION</p> <p>Boom Damage!</p> <p>Avoid shock loading boom and rigging!</p> <ul style="list-style-type: none"> • Perform all travel functions — starting, turning, stopping — slowly and smoothly. </div> <hr/>
1	Be familiar with crane orientation (page 3-42). See VPC Operating Positions and Swing and Travel Restrictions, on page 3-61 .
2	Plan the travel route. It must be free of ground and overhead obstructions.
3	Check crawlers for proper adjustment.

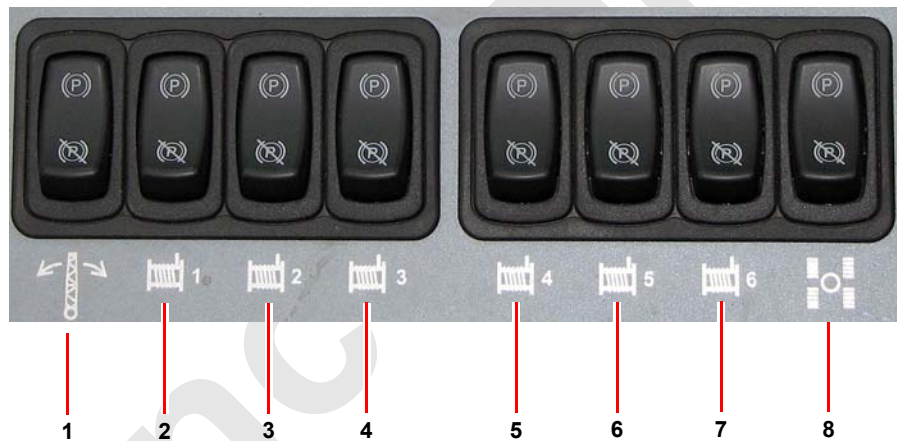
Step	Action
4	<p>To prevent the crawlers from damaging the side platforms while traveling, pull up the front (A) and rear (B) sections of the side platforms:</p> 
5	<p>Warn personnel to stay clear of the travel route. Do NOT travel without a signal person.</p>
6	<ul style="list-style-type: none"> • For traveling with a load, carry the load as close to the ground as possible. Stabilize the load with taglines. • For traveling without a load, carry the load block and weight ball low enough so that they cannot swing into the boom or jib. If desired, tie off the load block at the front of the rotating bed.
7	<p>Select the desired travel speed, low or high (page 3-13).</p>
8	<p>Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase the engine speed when more power is required.</p>
9	<p>See page 3-13 for a summary of how to move the crane using the crawler handles.</p> <p>NOTE: The directions of travel assume that the front of rotating bed and front of carbody facing same direction. The operator cab is at front of the rotating bed. If the front of the rotating bed and the front of the carbody face in <i>opposite</i> directions, the crane will travel in the direction <i>opposite</i> of the crawler handle movement.</p>
<p style="text-align: center;">This completes the travel operation procedure.</p>	

Shutdown Procedure

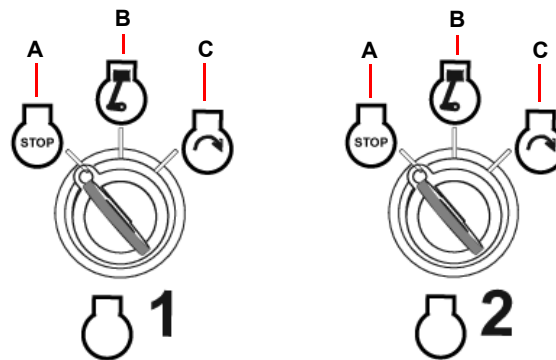
Operator Cab Shutdown Procedure Steps


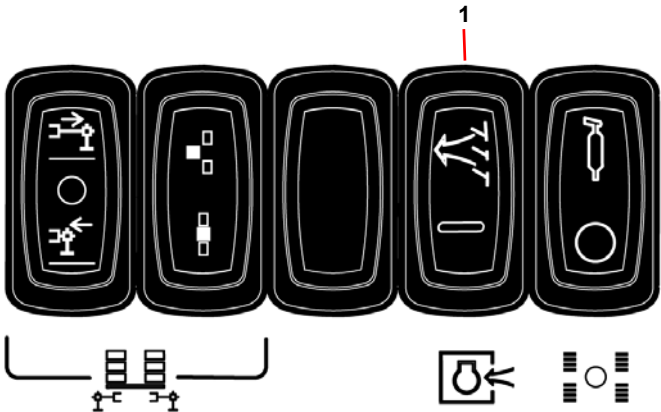

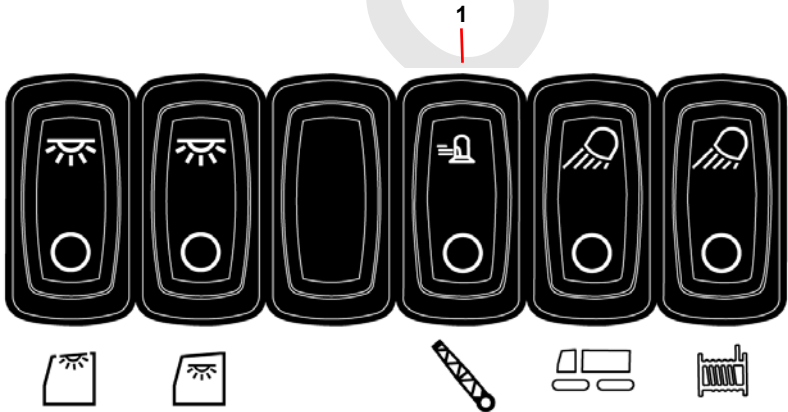
Step	Action
1	See Appendix A — Cold and Hot Weather Operation, on page 3-80 before continuing with this procedure.
2	Travel crane to a level surface.
3	Turn on the travel park switch (8).
4	Swing the boom to the desired position. Then turn on the swing park switch (1).
5	Lower all loads to the ground.
6	If possible, lower the boom onto the blocking at ground level. Secure the boom so that it cannot be moved by wind or other outside forces.
7	Turn on all the drum park switches (2 through 7).
8	Decrease the speed of both engines to idle. Allow the engines to idle 3 to 5 minutes in order to cool down.
9	Stop the Secondary Engine (2).
10	Stop the Primary Engine (1).

Pressing **(P)** ENABLES park.



To stop an engine, turn the engine switch to the STOP (A) position:



Step	Action	Action
11	<p>Press  on the power plant enclosure louver switch (1) to open the louvers.</p> <p>This allows the engines to cool.</p>	
12	<p>If the aircraft warning light must be on, then turn on the aircraft warning light switch (1).</p> <p>Pressing  turns on the aircraft warning light.</p> <p>After switching on the aircraft warning light:</p> <ul style="list-style-type: none"> • turn on the diesel generator (page 3-93) or connect the crane to utility power (page 3-91), • turn on the Primary and Secondary engine battery chargers (page 3-95). 	
13	<p>Close the operator cab window. Remove all keys from the operator cab. Then lock the cab door to <i>prevent unauthorized access</i>.</p>	

Power Plant Enclosure Shutdown Procedure Steps

Step	Action
14	<p>If the diesel generator is <i>not</i> on and the utility power is <i>not</i> connected, then set the following switches to the OPEN position. Otherwise, go to the next step.</p> <ul style="list-style-type: none"> • Primary Engine battery disconnect switch (page 3-88) • Secondary Engine battery disconnect switch (page 3-89) • Diesel generator battery disconnect switch (page 3-87)
15	<p>Close and lock the power plant entrance doors.</p>
16	<p>Lock all the keyed access panels on the power plant enclosure (page 3-1).</p>
<p style="text-align: center;">This completes the shutdown procedure.</p>	

Unattended Operation

Before leaving the crane unattended, perform the Shutdown Procedure on [page 3-76](#).



WARNING

Moving Load/Tipping Crane Hazard!

Operator shall not leave operator cab until crane, loads, and boom have been secured against movement.

Changing weather conditions including but not limited to: wind, ice or snow accumulation, precipitation, flooding, lightning, etc. should be considered when determining the location and configuration of a crane when it will be left unattended.

Reference Only

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APPENDIX

Appendix A — Cold and Hot Weather Operation

CAUTION

Machinery Damage!

Operating in an arctic climate without heaters can damage machinery during cold weather start-up due to lack of lubrication.

Heater package described in this section may not provide adequate protection when operating below -30°F (-34°C). Contact your Manitowoc dealer for recommendations.

Hydraulic Pump Damage!


To prevent damage to pumps, warm hydraulic oil to 60°F (16°C) minimum before operating crane in an arctic climate.

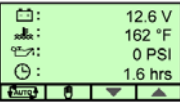
Battery Care

To provide maximum cranking power and to prevent the batteries from freezing, they must be kept fully charged (see below) and warm when crane is idle during cold weather.

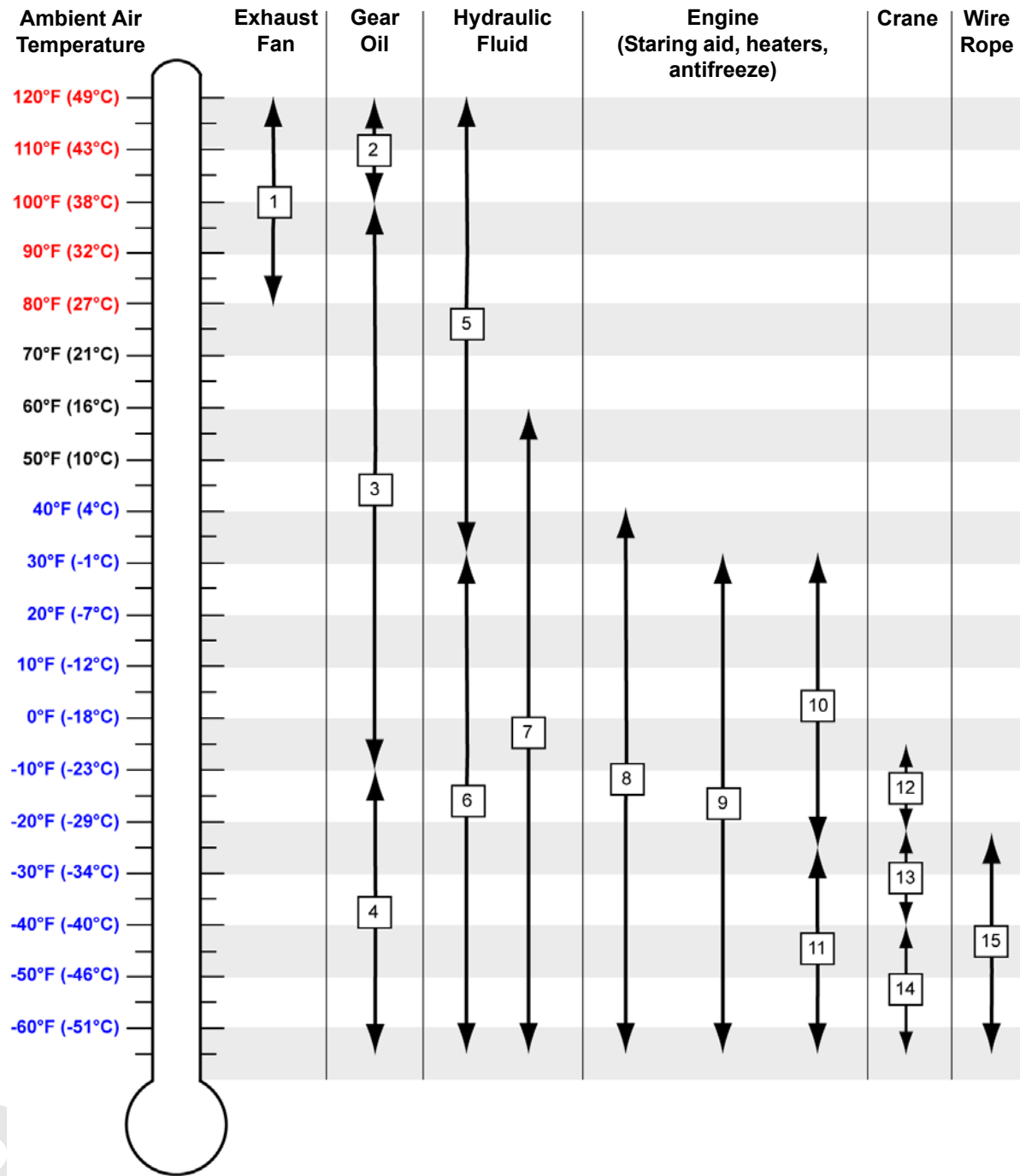
When the crane is idle, the batteries should either be stored indoors or heated with the battery pad heaters (see [Table 9 on page 3-96](#)). Be aware that:

- A battery with a 50% charge freezes at -16°F (-27°C). A battery with a 100% charge freezes at -70°F (-57°C).
- A battery with a 100% charge retains only 40% of its cranking power at -0°F (-18°C). At -20°F (-29°C), the same battery retains only 18% of its cranking power.

Primary and Secondary Engine Batteries (24V) Charging			
*OCV	State of Charge	**Recharge Time (Hrs)	Notes
25.2 V	100%	—	 *OCV = Open Circuit Voltage (The battery voltage displayed on a 31000's "Information Screen".) **Recharge time (at 20A) = charging time depends on battery age, temperature, capacity, and charger efficiency.
24.8 V	75%	1.3	
24.4 V	50%	2.7	
24.0 V	25%	4.3	
23.6 V	0%	5.7	

Diesel Generator Engine Battery (12V) Charging			
*OCV	State of Charge	**Recharge Time (Hrs)	Notes
12.6 V	100%	—	 *OCV = Open Circuit Voltage (The battery voltage displayed on the diesel generator remote control panel.) **Recharge time (at 20A) = charging time depends on battery age, temperature, capacity, and charger efficiency.
12.4 V	75%	1.3	
12.2 V	50%	2.7	
12.0 V	25%	4.3	
11.8 V	0%	5.7	

Temperature Effects



Item	Name	Temperature	Description
1	Exhaust fan	Above 80°F (27°C)	Set the exhaust fan thermostat (page 3-33) to the listed temperature.
2	Gear oil	Above 100°F (38°C)	Use 85W-140 viscosity gear oil. See NOTE 1 below.
3		100° to -10°F (38° to -23°C)	Use 80W-90 viscosity gear oil. See NOTE 1 below.
4		Below -10°F (-23°C)	Use 75W-90 viscosity gear oil. See NOTE 1 below.

5	Hydraulic fluid	Above 32°F (0°C)	Change the hydraulic fluid to ISO Grade 46 when the expected ambient air temperature will remain above 32°F (0°C).
6		32°F (0°C) or below	Change the hydraulic fluid to ISO Grade 15 when the expected ambient air temperature will remain at 32°F (0°C) or below.
7		Below 60°F (16°C)	Hydraulic fluid heater should be turned on (page 3-97). See NOTE 2 below.
8	Engine	Below 40°F (4°C)	Engine ether starting aid required (automatic). If enabled, the power plant enclosure heater (page 3-34) automatically turns on.
9		Below 32°F (0°C)	Engine oil, engine coolant, and battery pad heaters should be turned on (Cold Weather AC Load Center, on page 3-96).
10		32° to -25°F (0° to -32°C)	Use 50% ethylene glycol antifreeze and 50% water for the engine coolant mixture. The diesel fuel must have maximum cloud and pour points 10°F (6°C) lower than the ambient air temperature. Refer to the engine manual for lubricating oil recommendations.
11		-25° to -65°F (-32° to -54°C)	Use 60% ethylene glycol antifreeze and 40% water for the engine coolant mixture. The diesel fuel must have maximum cloud and pour points 10°F (6°C) lower than the ambient air temperature. Refer to the engine manual for lubricating oil recommendations.
12	Crane	-5° to -22°F (-21° to -30°C)	Avoid impact or shock loading of the crane and attachment. The potential exists for hydraulic component failure. The crane should be de-rated 25%. See NOTE 3 below.
13		-23° to -40°F (-31° to -40°C)	De-rate the crane by 40% for all lift operations. Halting all lifts should be considered. Duty-cycle operation is prohibited. See NOTE 3 below.
14		Below -40°F (-40°C)	All operation (lift and duty-cycle) is prohibited except in extreme emergencies , and then only with approval by a competent engineer who has de-rated the crane accordingly. See NOTE 3 below.
15	Wire rope	Below -30°F (-34°C)	Wire rope lubrication may become a problem as normal wire rope lubricants may harden and chip off, leaving the rope without lubrication. Consult the wire rope supplier for recommended cold weather lubricants.

NOTES:

NOTE 1 — Gear oil must meet MIL-L-2105C or API-GL-5 classification.

NOTE 2 — To prevent damage to the crane, the engine oil, engine coolant, and hydraulic fluid heaters should be turned off when either the Primary Engine or the Secondary Engine is running.

NOTE 3 — The static load carrying limits of all steels used in Manitowoc cranes are not affected by cold weather. Manitowoc's capacity charts are acceptable for use in cold weather. However, dynamic loads (impact or shock) *can* affect the steels used in Manitowoc cranes when operating in cold weather. Dynamic loads are created by traveling, sudden application and release of load, and duty-cycle operations.

Turning the Cold Weather Heaters On

The crane heaters ([page 3-96](#)) can be powered by either:

- an external 100A power supply or
 - the crane's diesel generator.
1. Shut down the crane as described in [Shutdown Procedure, on page 3-76](#).
 2. Set the main circuit breaker in the cold weather load center ([page 3-96](#)) to OFF.
 3. Set each circuit breaker in the cold weather load center to OFF.
 4. Prepare the power supply:

If an external 100A power supply will be used, then do the following:



WARNING

Electrocution Hazard!

Severe electric shock can cause death or serious injury. Crane owner/user must make provisions for turning off electrical power supply before connecting power supply cord to crane.

- a. Check that the external power supply source is OFF.
- b. Turn the manual transfer switch ([page 3-90](#)) to OFF.
- c. Connect an external power source to the utility power connection ([page 3-91](#)).
- d. Turn the manual transfer switch to UTILITY.
- e. Turn the external power source on.
- f. Go to step number 5.

If the diesel generator will be used, then do the following:

- a. Set the diesel generator battery disconnect switch to the connected position ([page 3-87](#)).
 - b. Pull out both diesel generator emergency stop buttons: one button is located in the power plant enclosure ([page 3-89](#)) and the other button is located in the operator cab ([page 3-91](#)).
 - c. Check that the diesel generator output circuit breaker is closed ([page 3-87](#)).
 - d. Turn the manual transfer switch ([page 3-90](#)) to OFF.
 - e. Start the diesel generator using the diesel generator remote control panel ([page 3-93](#)).
 - f. Turn the manual transfer switch to G2 DIESEL GEN.
 - g. Go to step number 5.
5. Set the main circuit breaker in the cold weather AC load center ([page 3-96](#)) to ON.
 6. Set each circuit breaker in the cold weather AC load center to ON.
 7. All the cold weather heaters are now ON. This completes this procedure.

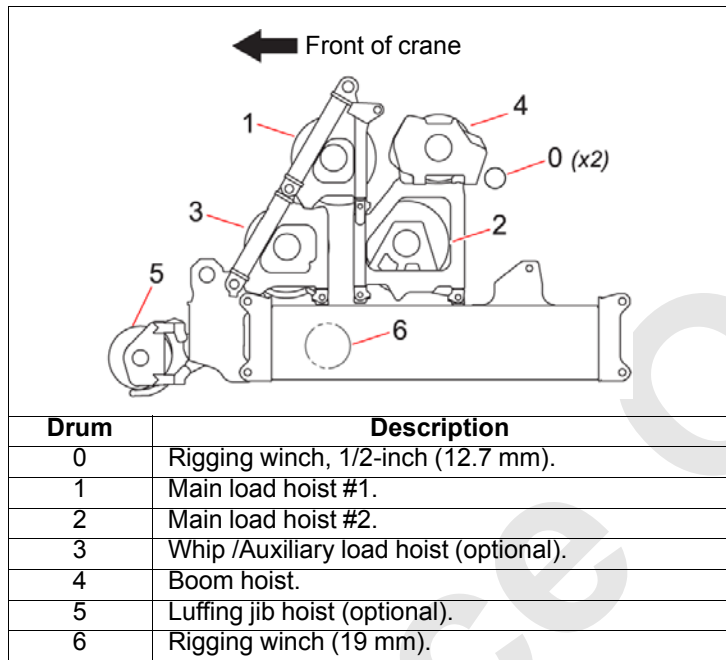
Turning the Cold Weather Heaters Off

1. Set the main circuit breaker in the cold weather AC load center ([page 3-96](#)) to OFF.
2. Set each circuit breaker in the cold weather AC load center to OFF.
3. All the cold weather heaters are now OFF. This completes this procedure.

Appendix B — Drum Information

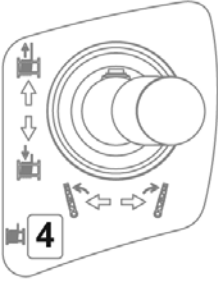
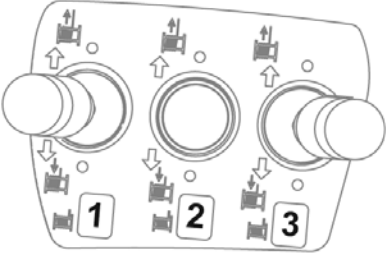
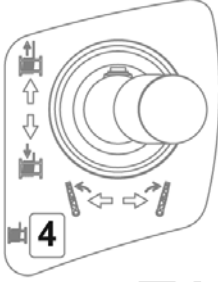
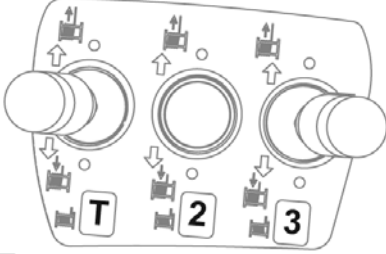
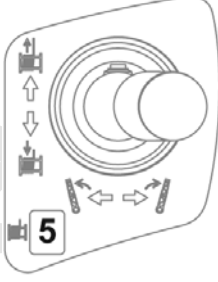
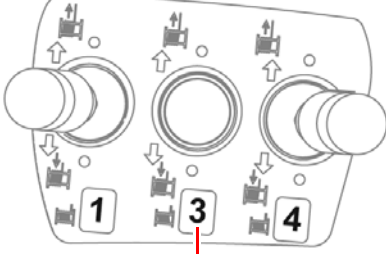
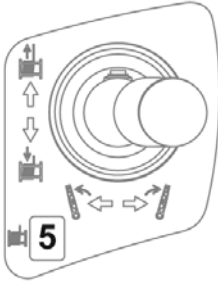
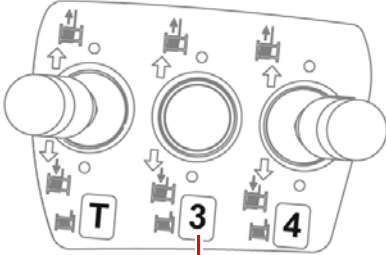
Drum Identification

Drums 1, 2, and 3 can be used in pairs for a tandem lift.



Typical Drum Control Handle Arrangements

TABLE 4. Typical Drum Control Handle Arrangements

Arrangement Name	Left Console (Swing and Boom Hoist)	Right Console ("T" = Tandem)
Single Hoist Drum Mode		
Tandem Hoist Drum Mode (see NOTE below)		
Single Hoist Drum Mode with a Luffing Jib		 <p>or drum 2</p>
Tandem Hoist Drum Mode with a Luffing Jib (see NOTE below)		 <p>or drum 2</p>

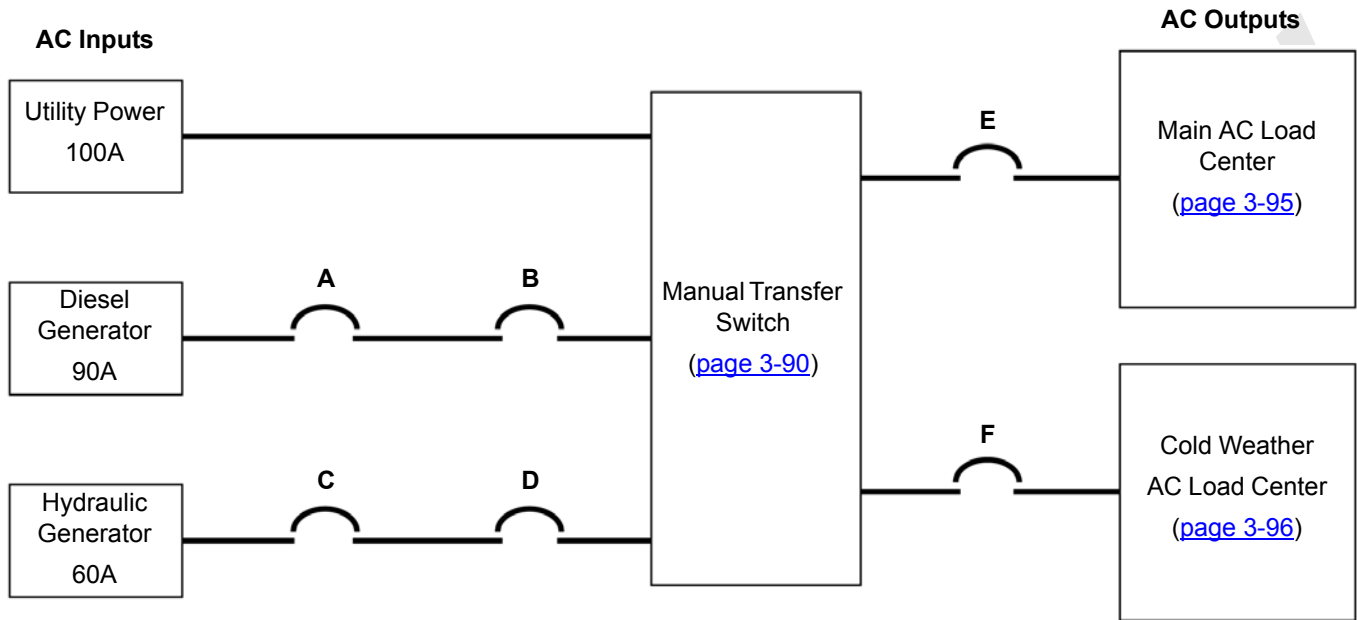
NOTE:

The tandem handle (indicated by "T") controls two drums. See **Folio 2207 Manitowoc Model 31000 Main Display Operation** for more information.

Appendix C — Electrical System

There are two types of circuits in the crane:

- AC (60Hz 120/240VAC or 50Hz 240VAC (block diagram shown below))
- DC (12/24VDC)

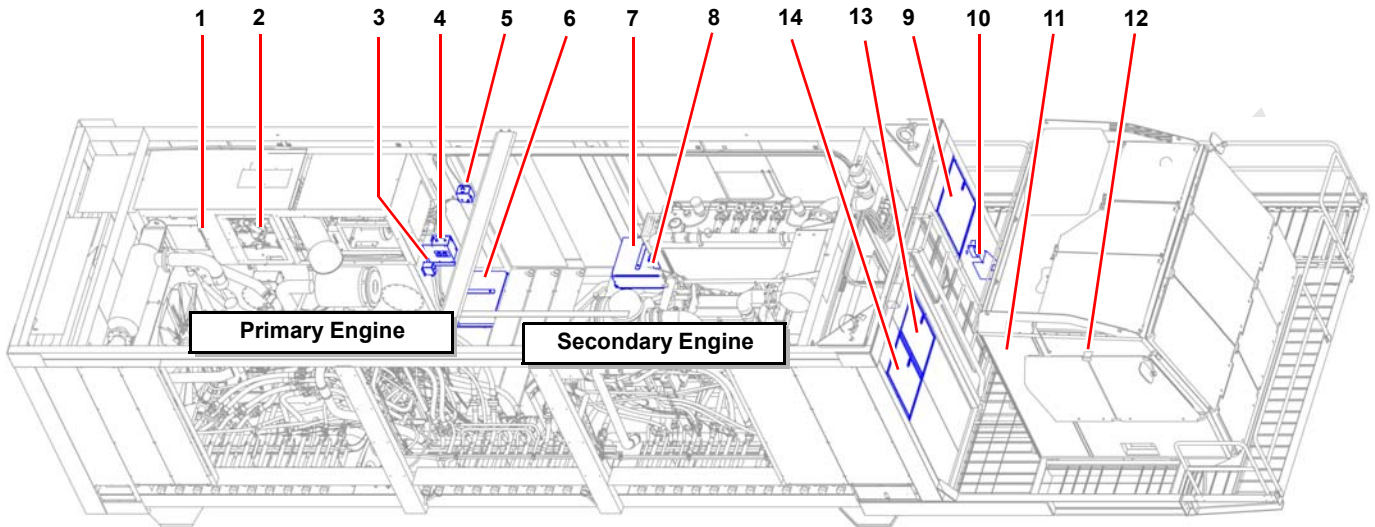


Circuit Breaker	Description
A	Diesel generator emergency stop button (page 3-89).
B	Diesel generator 90A circuit breaker (page 3-87).
C	Hydraulic generator emergency stop button (page 3-89).
D	Diesel generator 90A circuit breaker (page 3-87).
E	Main AC load center circuit breaker (page 3-95).
F	Cold Weather AC load center circuit breaker (page 3-96).

If this AC input is used then these AC outputs can be used:	
	Main AC Load Center	Cold Weather AC Load Center
Utility Power 100A	YES	YES
Diesel Generator 90A	YES	YES
Hydraulic Generator 60A	YES	NO

Circuit Breaker Locations

TABLE 5. Circuit breaker locations



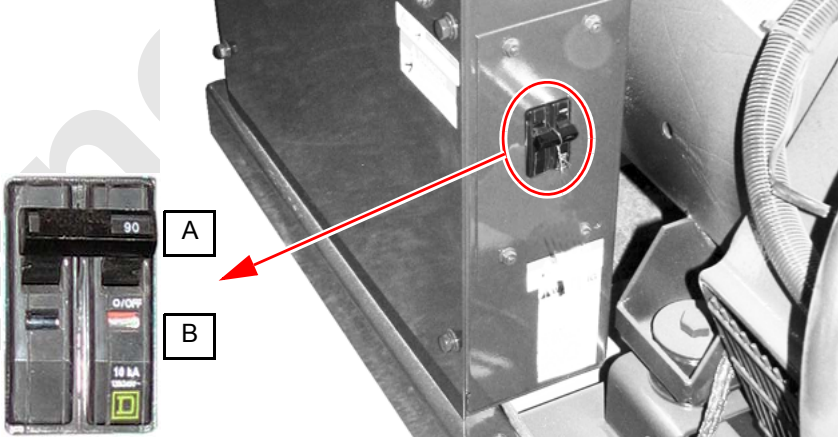
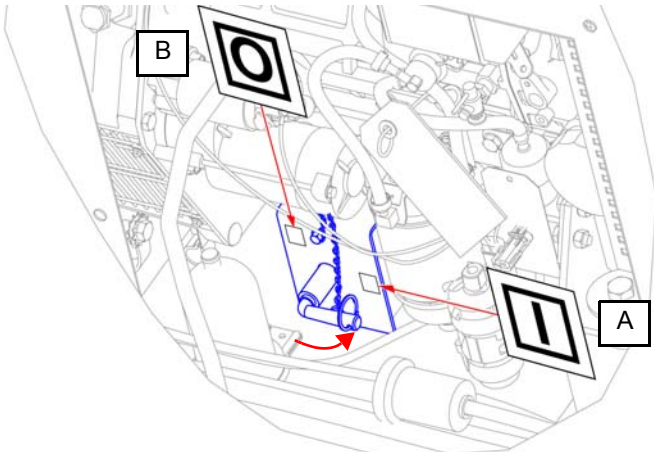
Item	Name	Description
1	Diesel generator output circuit breaker	<p>I/ON (A) = closed position (shown below). O/OFF (B) = open position:</p> 
2	Diesel generator battery disconnect switch	<p>Connects (A) or disconnects (B) the diesel generator battery:</p> 

TABLE 5. Circuit breaker locations

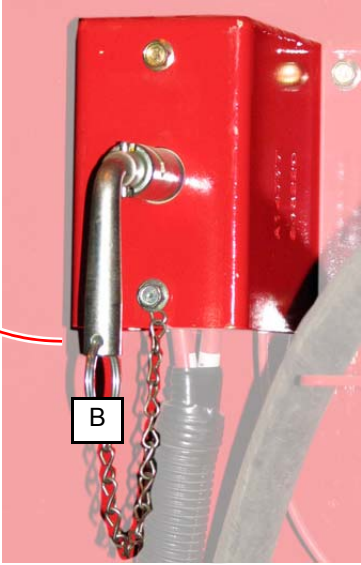
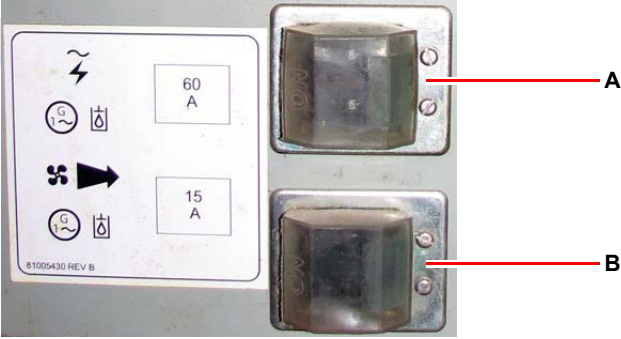
<p>3</p>	<p>Primary Engine battery disconnect switch</p>	<p>Connects (A) or disconnects (B) the Primary Engine batteries.</p> 
<p>4</p>	<p>Hydraulic generator output (A) and fan (B) circuit breakers</p>	<p>A double-pole, single-throw 60A circuit breaker and a double-pole, single-throw 15A fan circuit breaker.</p> <p>Unless deactivated, the hydraulic generator supplies power to the crane during normal operation (when the Primary Engine is operating).</p> <p>The hydraulic generator does <i>not</i> supply power to the cold weather AC load center. This is done by either the diesel generator or a utility power connection (page 3-91) to the crane.</p> 

TABLE 5. Circuit breaker locations


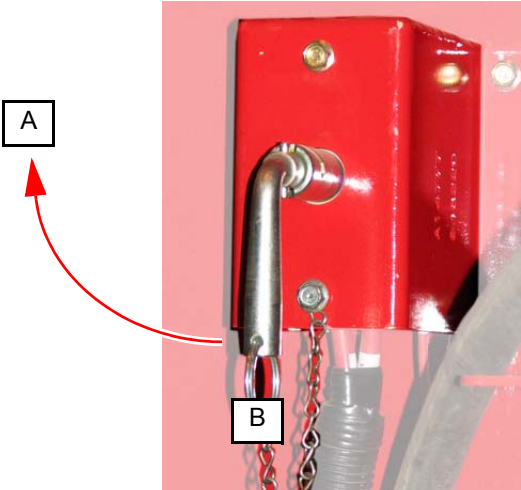
<p>5</p>	<p>Generator emergency stop button (power plant enclosure)</p>	<p>Diesel generator stop button (A): When the diesel generator stop button is pressed, the diesel generator shuts down completely. To restart the diesel generator:</p> <ul style="list-style-type: none"> • Pull out the diesel generator emergency stop button. • Restart the diesel generator using the diesel generator remote control panel which is located in the operator cab. See Table 6 on page 3-93. <p>Hydraulic generator stop button (B): When the hydraulic generator stop button is pressed, hydraulic flow is cut to the generator motor. To restart the hydraulic generator, pull out the hydraulic generator emergency stop button.</p> 
<p>6</p>	<p>Primary Engine batteries</p>	<p>For each engine, two, 12VDC, Group 8D batteries connected in series for 24VDC output.</p>
<p>7</p>	<p>Secondary Engine batteries</p>	<p>Connects (A) or disconnects (B) the Secondary Engine batteries.</p>
<p>8</p>	<p>Secondary Engine battery disconnect switch</p>	


TABLE 5. Circuit breaker locations

<p>9</p>	<p>Manual transfer switch (A)</p>  <p>Input voltage meter (B)</p> <p>Voltage meter selection switch (C)</p>  <p>Manual transfer switch lock button (D)</p>	<div style="text-align: center;">  <p>WARNING</p> </div> <p>Do NOT move the manual transfer switch during crane operation. To change the AC power source, first do the Shutdown procedure (page 3-76). Then do the Startup procedure (page 3-43).</p> <hr/> <p>Manual transfer switch (A) — used to select <i>one</i> of the four AC power sources:</p> <ul style="list-style-type: none"> • G1 HYD GEN — 60A hydraulic generator (page 3-32). • G2 DIESEL GEN — 90A diesel generator (page 3-31). • UTILITY — 100A external power source (page 3-33). • OFF = no AC power source. <p>Input voltage meter (B) — displays the voltage (0 to 300 VAC) selected by the voltage meter switch (C).</p> <p>Voltage meter selection switch (C) — used to measure any one of the following three voltages:</p> <ul style="list-style-type: none"> • L1-N — Line 1-to-neutral voltage. • L1-L2 — Line 1-to-Line 2 voltage. • L2-N — Line 2-to-neutral voltage. <p>The three voltage selections on the left side of the switch (PNL A) are for the Main AC load center (page 3-33). The three voltage selections on the right side of the switch (PNL B) are for the cold weather AC load center (page 3-34).</p> <div style="text-align: center;">  </div> <p>Manual transfer switch lock button (D) — push up to lock the manual transfer switch (A) in place.</p>
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TABLE 5. Circuit breaker locations

<p>10</p>	<p>Utility power connection</p>	<p>Connection for external AC power to the crane. Attach a power cable (C) to the bottom connection, then move the switch to ON (A). To remove a power cable, move the switch to OFF (B). Then detach the cable.</p> <div style="display: flex; justify-content: space-around;"> </div> <p>Route the utility power cable as shown below:</p> <ul style="list-style-type: none"> Route the cable along the outer edge of the catwalk. Secure the cable to a vertical post for strain relief. Utility power cable
<p>11</p>	<p>Generator emergency stop button (operator cab)</p>	<p>See Generator Controls (Operator Cab), on page 3-93.</p>

TABLE 5. Circuit breaker locations

12	DC fuses and circuit breakers	<p>DC fuses and circuit breakers for 12/24VDC systems are located in the rear console (1) behind the operator cab chair:</p>  <p>For more details, see DC Fuses and Circuit Breakers, on page 3-94.</p>
13	Main AC load center circuit breakers	<p>Circuit breakers for the power plant enclosure and operator cab. For more details, see Main AC Load Center, on page 3-95.</p>
14	Cold weather AC load center circuit breakers	<p>Circuit breakers for engine, hydraulic, battery, and power plant enclosure heaters. For more details, see Cold Weather AC Load Center, on page 3-96.</p>

Generator Controls (Operator Cab)

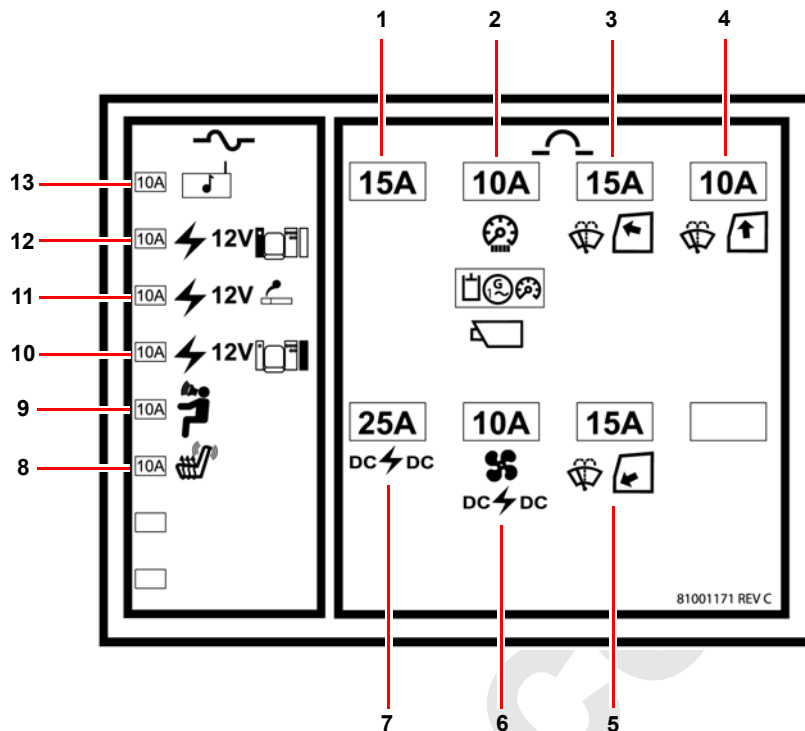
TABLE 6. Generator controls (operator cab)



Item	Name	Description
1	Diesel generator remote control panel	Used to start and stop the diesel generator as well as display the generator status. For more information, see the Generator Set with PowerCommand 1.1 Controller Cummins Service Manual. NOTE: The diesel generator low coolant temperature warning and shutdown has been set to 32°F (0°C).
2	Hydraulic generator display panel	Shows various hydraulic generator values such as voltage and line frequency. For more information, see the appropriate Harrison Hydra-Gen manual. NOTE: The hydraulic generator operates whenever the Primary Engine is on and the hydraulic generator bypass valve (page 3-32) is off.
3	Generator emergency stop button (operator cab)	Two push button switches: push the left button to stop the diesel generator, and push the right button to stop the hydraulic generator.

DC Fuses and Circuit Breakers

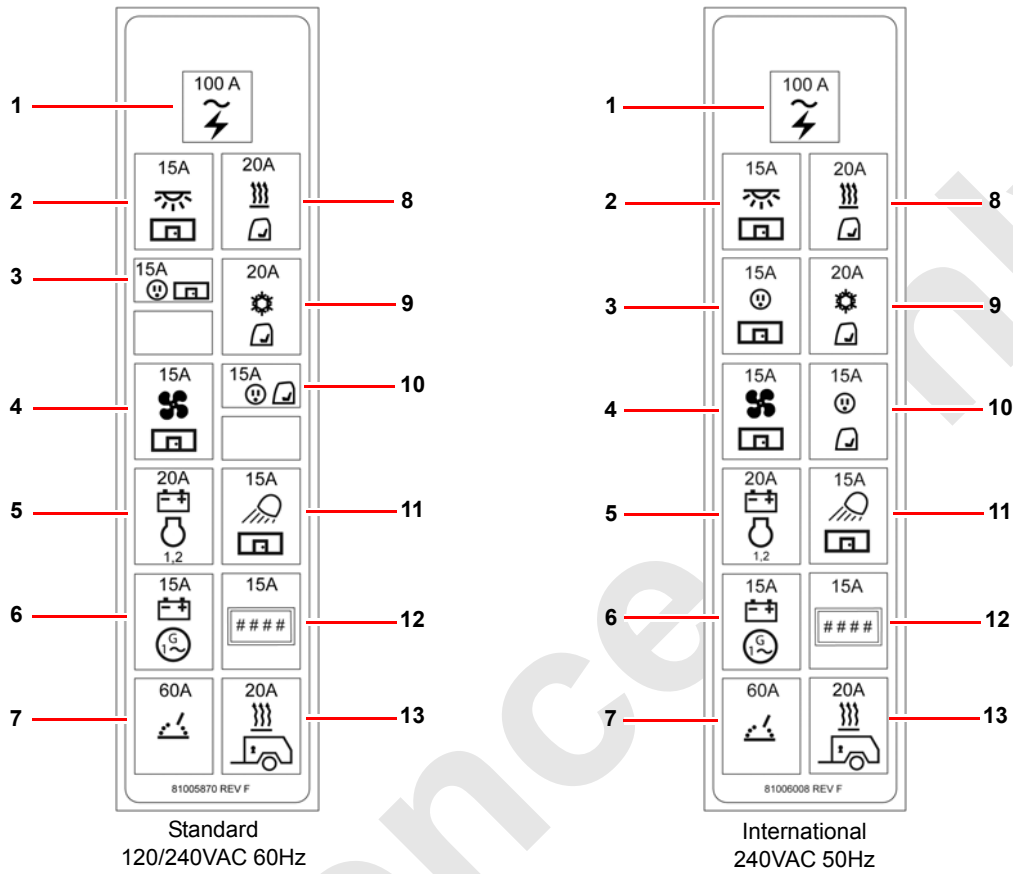
TABLE 7. Operator cab rear console 12/24VDC fuses and circuit breakers



Item	Name	Reference	Description
1	Spare	—	15A 24V circuit breaker
2	Operator cab panel lights, cameras, hydraulic generator meter	page 3-18	10A 24V circuit breaker
3	Upper windshield wiper	page 3-24	15A 24V circuit breaker
4	Roof windshield wiper	page 3-24	10A 24V circuit breaker
5	Lower windshield wiper	page 3-24	15A 24V circuit breaker
6	Fans, tablet PC	page 3-3 , page 3-6	10A 24V circuit breaker
7	Power supply 24/13.8VDC converter	—	25A 24V circuit breaker
8	Seat heater/massage	page 3-19	10A Waytek #46210 fuse
9	Public address system	page 3-25	10A Waytek #46210 fuse
10	Side Console 12VDC outlet	page 3-25	10A Waytek #46210 fuse
11	Right console cigarette lighter	page 3-16	10A Waytek #46210 fuse
12	Left console 12VDC outlet	page 3-8	10A Waytek #46210 fuse
13	Radio/CD player	page 3-25	10A Waytek #46210 fuse

Main AC Load Center

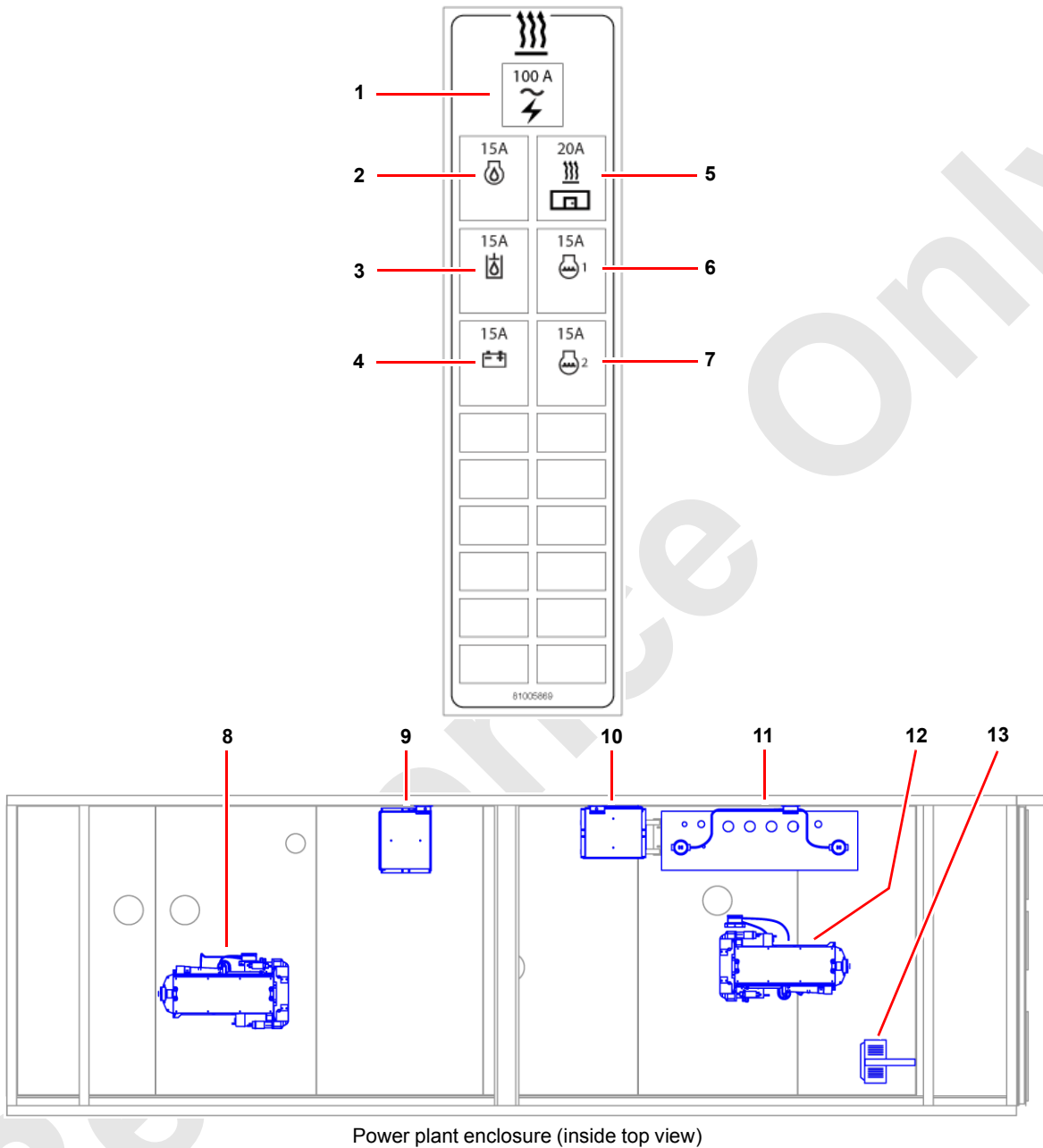
TABLE 8. Main load AC center circuit breakers



Item	Name	Reference	Description
1	Main circuit	—	100A circuit breaker
2	Power plant enclosure inside lights	page 3-25	15A circuit breaker
3	Power plant enclosure power outlets	—	15A circuit breaker
4	Power plant enclosure exhaust fan	page 3-33	15A circuit breaker
5	Primary and Secondary Engine battery chargers	—	20A circuit breaker
6	Diesel generator battery charger	—	15A circuit breaker
7	Temporary welding	—	60A circuit breaker
8	Operator cab heater	page 3-17	20A circuit breaker
9	Operator cab air conditioner	page 3-4	20A (standard) / 15A (international)
10	Operator cab power outlets	—	15A circuit breaker
11	Power plant enclosure outside lights	—	15A circuit breaker
12	LED signs	page 3-2	15A circuit breaker
13	Portable Power Unit cold weather heater.	—	See Portable Power Unit manual.

Cold Weather AC Load Center

TABLE 9. Cold weather heater locations and circuit breakers



Item	Name	Description
1	Main circuit breaker	Supplies power to all the cold weather circuit breakers. Switch OFF the main circuit breaker when the air temperature exceeds 30°F (-1°C). Switch ON starts the following: engine oil heaters (8, 12), engine coolant heaters (8, 12), hydraulic fluid heater (11), battery pad heaters (9, 10), and power plant enclosure heater (13).

TABLE 9. Cold weather heater locations and circuit breakers

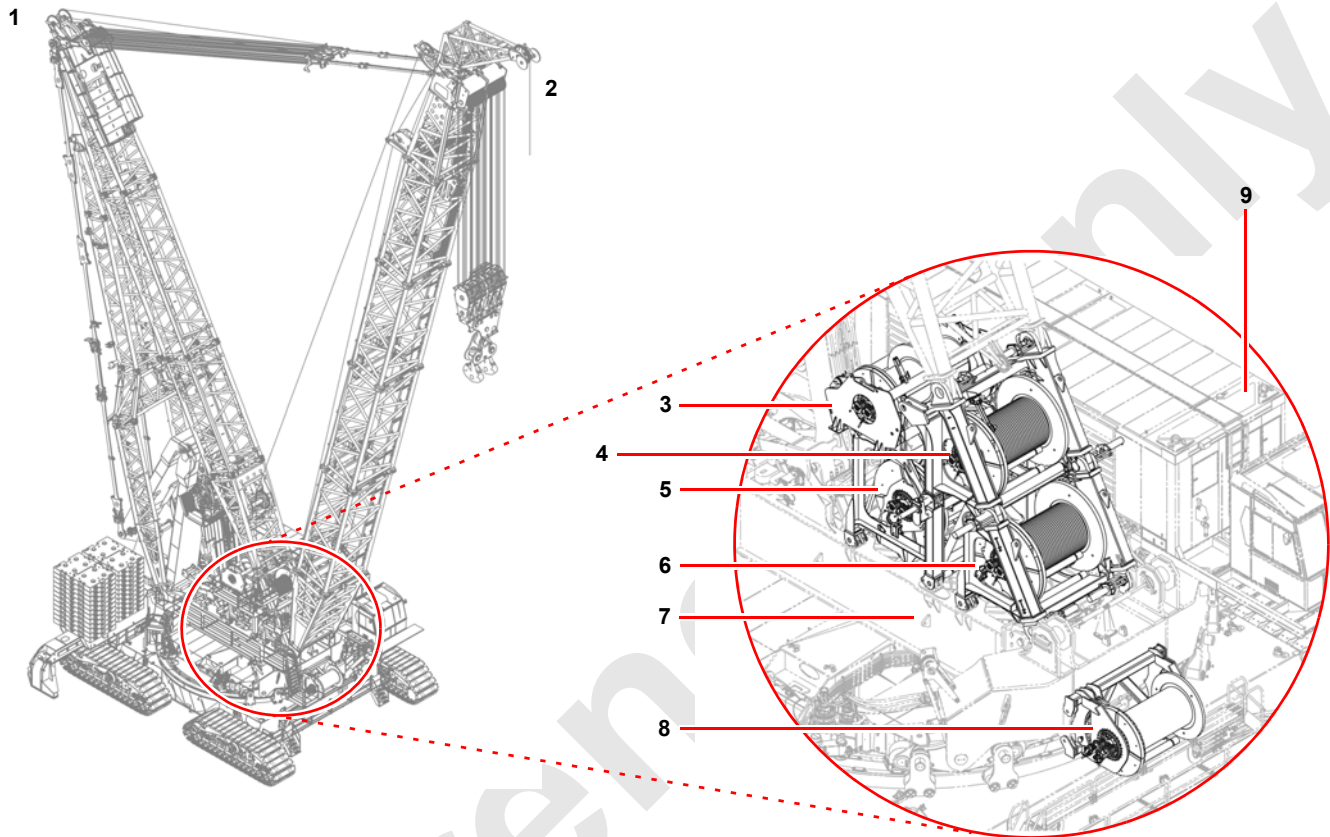
2	Engine oil heaters breaker	An engine oil heater is installed in each engine. These heaters are NOT controlled by a thermostat. Therefore, the engine oil heaters will continue heating until this circuit breaker is switched off.
3	Hydraulic fluid heaters breaker	These heaters are installed inside the hydraulic fluid tank and controlled by a thermostat: <ul style="list-style-type: none"> • ON = 60°F (16°C) • OFF = 100°F (38°C)
4	Battery pad heaters	A battery pad heater is underneath each of the four engine batteries. Battery pad heaters are not controlled by a thermostat. Therefore, battery pad heaters will continue heating until this circuit breaker is switched off.
5	Power plant enclosure heater breaker	Heats the power plant enclosure. An internal thermostat turns the heater on automatically when the temperature falls below 40°F (4°C).
6	Primary Engine coolant heater breaker	An engine coolant heater is installed in each engine and controlled by a thermostat: <ul style="list-style-type: none"> • ON = 100°F (38°C) • OFF = 120°F (49°C)
7	Secondary Engine coolant heater breaker	
8	Primary Engine oil and coolant heaters	Heater locations
9	Primary Engine battery heaters	
10	Secondary Engine battery heaters	
11	Hydraulic fluid heaters	
12	Secondary Engine oil and coolant heaters	
13	Power plant enclosure heater	

Reference

Appendix D — Crane Cameras and Camera Monitors

Crane Camera Locations

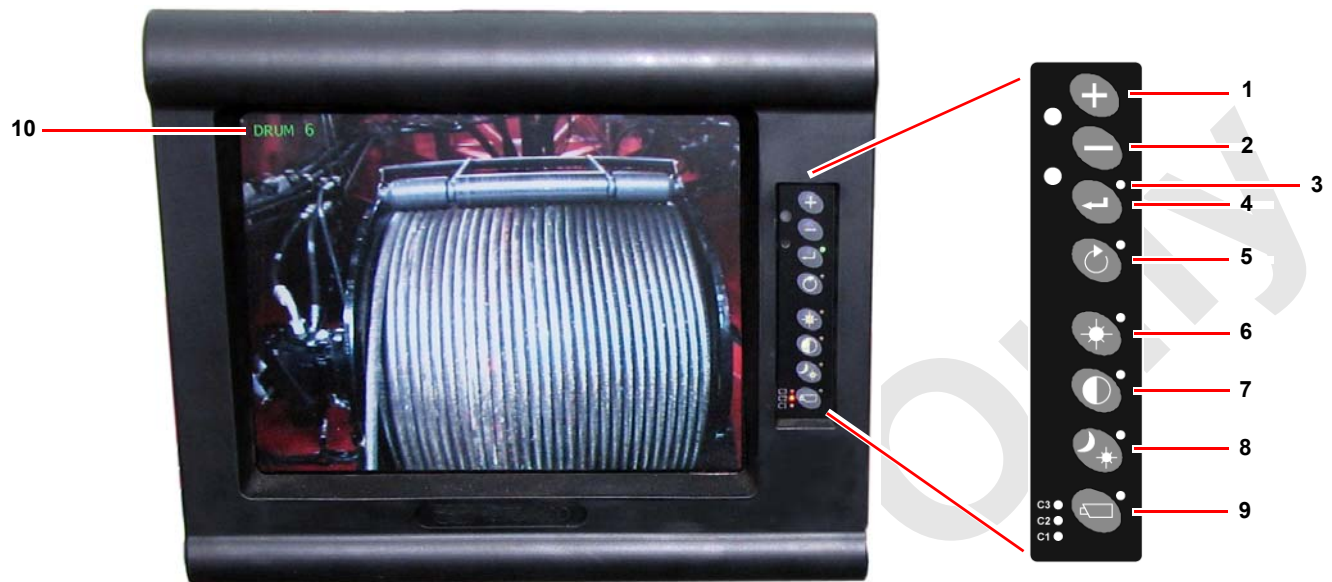
TABLE 10. Crane Camera Locations



Item	Name	Description
1	Camera #8	VPC (counterweight) camera
2	Camera #7	Boom top camera
3	Camera #4	Drum 4 camera
4	Camera #1	Drum 1 camera
5	Camera #2	Drum 2 camera
6	Camera #3	Drum 3 camera
7	Camera #6	Rigging winch (not shown) camera
8	Camera #5	Drum 5 camera
9	Camera #9	Power plant enclosure camera (inside the enclosure)

10-inch Camera Monitor Information

TABLE 11. 10-inch Camera Monitor Operating Controls











Item	Name	Description
1	 PLUS button	<ul style="list-style-type: none"> After pressing BRIGHTNESS, <i>increases</i> the monitor brightness. After pressing CONTRAST, <i>increases</i> the monitor contrast. In the Operator Menu, go to the <i>next</i> menu option.
2	 MINUS button	<ul style="list-style-type: none"> After pressing BRIGHTNESS, <i>decreases</i> the monitor brightness. After pressing CONTRAST, <i>decreases</i> the monitor contrast. In the Operator Menu, go to the <i>previous</i> menu option.
3	Power LED	Glows green when the monitor is powered.
4	 ENTER button	<ul style="list-style-type: none"> Press once to enter the monitor Operator Menu. Used to select items in the Operator Menu.
5	 OPTION button	<ul style="list-style-type: none"> Used to go to a previous menu item.
6	 BRIGHTNESS button	<ul style="list-style-type: none"> After pressing BRIGHTNESS, use PLUS and MINUS to adjust the monitor brightness.
7	 CONTRAST button	<ul style="list-style-type: none"> After pressing CONTRAST, use PLUS and MINUS to adjust the monitor contrast.
8	 AUTOMATIC BRIGHTNESS button	<ul style="list-style-type: none"> Press AUTOMATIC BRIGHTNESS, the monitor brightness will adjust automatically to changing light conditions.
9	 CAMERA button	<ul style="list-style-type: none"> After pressing CAMERA, use PLUS or MINUS to select a camera (C1, C2, or C3). After selecting a camera, press CAMERA once more. A red LED indicates the chosen camera.
10	Camera label	<ul style="list-style-type: none"> To change the label ("DRUM 6" in this case), see 10-inch Camera Monitor Operator and Service Menus, on page 3-100.

TABLE 12. 10-inch Camera Monitor Operator and Service Menus






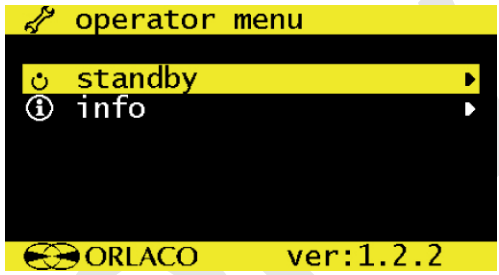

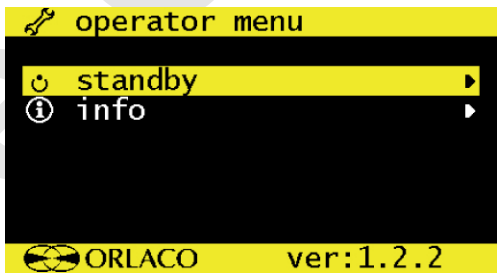

Operator Menu Screens		
Screen	Description	What You See
1	<p>To access the operator menu, press .</p> <p>To navigate through the menus, use these keys:</p> <ul style="list-style-type: none"> • Press  to go to the next menu option. • Press  to go to the previous menu option. • Press  to select or activate the highlighted option. • Press  to return to the previous menu. 	
2	<p>standby — this option switches the monitor to standby mode. Press  to switch to power on.</p>	
3	<p>info — lists the firmware revision of the camera monitor.</p>	

TABLE 12. 10-inch Camera Monitor Operator and Service Menus









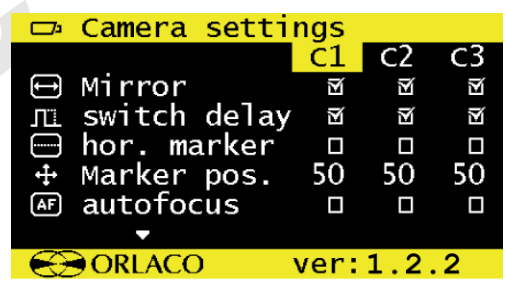
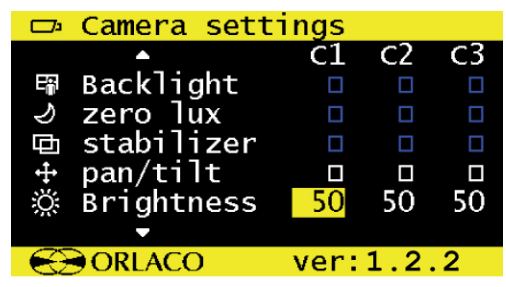
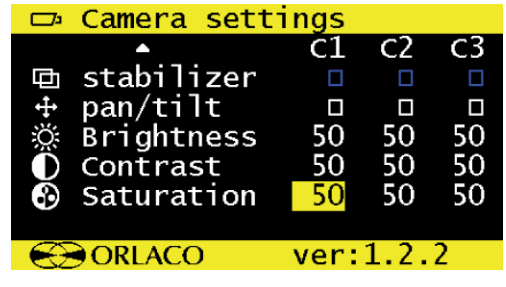
Service Menu Screens		
Screen	Description	What You See
1	<p>To access the service menu, press   and  at the same time.</p> <p>To navigate through the menus, use these keys:</p> <ul style="list-style-type: none"> Press  to go to the next menu option. Press  to go to the previous menu option. Press  to select or activate the highlighted option. Press  to return to the previous menu. 	
2	<ul style="list-style-type: none"> Mirror — enable this option to mirror the camera image (reverse left and right). switch delay — enable this option if the switchwire is controlled by an intermittent signal (for example, from an indicator light). hor. marker — enable this option to switch the marker on. The marker is displayed by a green horizontal line. Marker pos. — adjusts the vertical position of the marker (0 = top of the screen, 100 = bottom of the screen). autofocus — enable this option if an autofocus camera is connected. <i>This option is only available with an autofocus camera and a serial LCD monitor.</i> 	<p>When camera settings is selected from the top menu, the following screen appears:</p> 
3	<ul style="list-style-type: none"> Backlight — enable this option when looking at dark objects in a light environment. <i>This option is only available with an autofocus camera and a serial LCD monitor.</i> zero lux — enable this option in low-light environments. <i>This option is only available with an autofocus camera and a serial LCD monitor.</i> pan/tilt — set this option to ON to enable the pan/tilt control with the OPTION button. Brightness — adjust the brightness of the image. 	
4	<ul style="list-style-type: none"> Contrast — adjust the contrast of the image. Saturation — adjust the saturation of the image. 	

TABLE 12. 10-inch Camera Monitor Operator and Service Menus

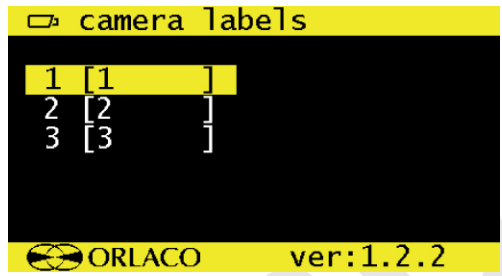
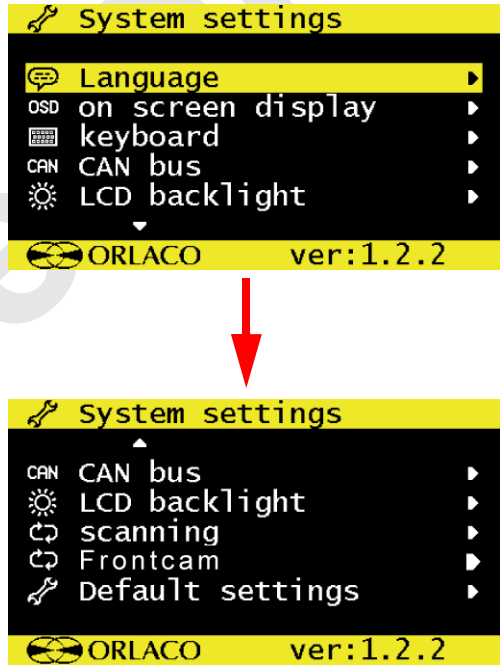

<p>5</p>	<p>In this option, the text labels for the camera inputs can be defined.</p>	<p>When camera labels is selected from the top menu, the following screen appears:</p> 
<p>6</p>	<p>system settings has the following options:</p> <ul style="list-style-type: none"> • language • on screen display (OSD) • keyboard • CAN bus • LCD backlight • scanning • Frontcam • default settings 	<p>When system settings is selected from the top menu, the following screen appears:</p> 
<p>7</p>	<p>language — the language selected will be used in all the menu screens.</p>	

TABLE 12. 10-inch Camera Monitor Operator and Service Menus

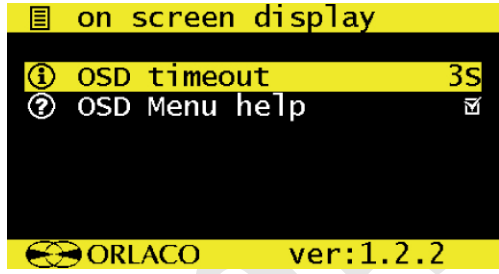
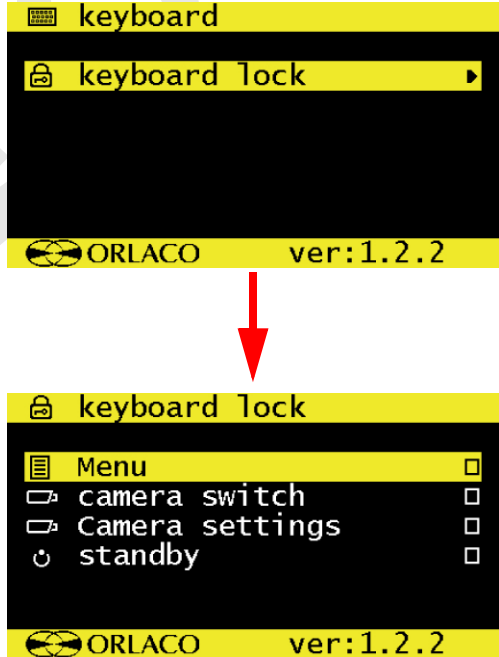
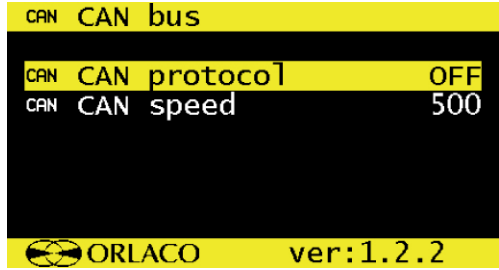
<p>8</p>	<ul style="list-style-type: none"> OSD timeout — adjust the number of seconds the on-screen display is visible. Setting this to OFF disables the timeout. OSD Menu help — used to enable or disable the display help text. If enabled, automatic help text will appear after 5 seconds of inactivity in any menu. 	<p>If on screen display is selected from the system settings screen, the following screen appears:</p> 
<p>9</p>	<ul style="list-style-type: none"> keyboard lock — this opens a submenu where various monitor functions can be disabled to avoid accidental adjustment of monitor settings. 	<p>If keyboard is selected from the system settings screen, the following screen appears:</p> 
<p>10</p>	<ul style="list-style-type: none"> CAN protocol — selects the higher level CAN protocol to use. CAN speed — <i>This option is not available on this size monitor.</i> 	<p>If CAN bus is selected from the system settings screen, the following screen appears:</p> 

TABLE 12. 10-inch Camera Monitor Operator and Service Menus

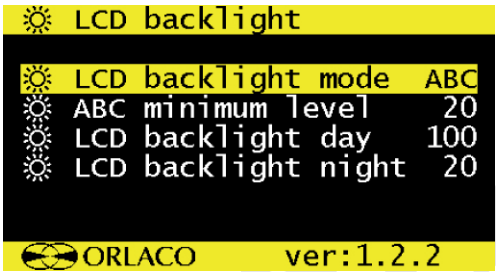
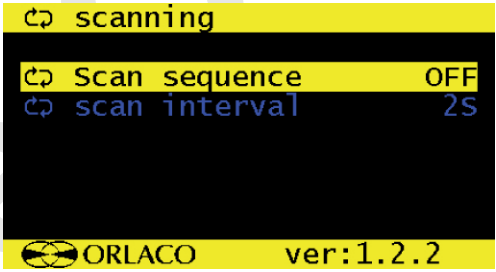
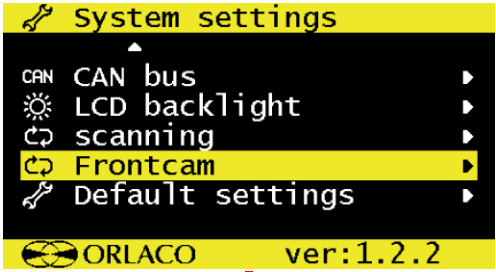

<p>11</p>	<ul style="list-style-type: none"> LCD backlight mode — if automatic backlight control (ABC) is enabled (as shown on the screen on the right), then the monitor will automatically adjust its brightness to the available light level. LCD backlight — allows manual setting of the monitor backlight level. <i>This option is only available when LCD auto backlight is disabled.</i> 	<p>If LCD backlight is selected from the system settings screen, the following screen appears:</p>  <p>The screenshot shows a menu titled "LCD backlight" with a sun icon. Below it, "LCD backlight mode" is set to "ABC". A list of settings includes "ABC minimum level" at 20, "LCD backlight day" at 100, and "LCD backlight night" at 20. At the bottom, the ORLACO logo and version "ver:1.2.2" are displayed.</p>
<p>12</p>	<ul style="list-style-type: none"> Scanning — allows the following options to be set: Scan sequence — selects which cameras will be enabled in the scanning sequence. Scan interval — selects the interval between camera switches. 	<p>The Scanning option in system settings allows multiple cameras to appear on the monitor:</p>  <p>The screenshot shows a menu titled "scanning" with a refresh icon. It lists "Scan sequence" as "OFF" and "scan interval" as "2S". The ORLACO logo and version "ver:1.2.2" are at the bottom.</p>
<p>13</p>	<ul style="list-style-type: none"> AUX wire function — selects the function of the AUX1 and AUX2 wires. Set to TCH (for tachometer) on AUX1 or KEY (for + and - key functions on AUX1/2). 	 <p>The screenshot shows the "System settings" menu with a wrench icon. Options include "CAN bus", "LCD backlight", "scanning", "Frontcam", and "Default settings". "Frontcam" is highlighted with a yellow bar. The ORLACO logo and version "ver:1.2.2" are at the bottom.</p> <p style="text-align: center;">↓</p>  <p>The screenshot shows the "Frontcam" menu with a camera icon. Options include "Enable Fontcam" (checkbox), "Invert handbreak" (checkbox), "Pulses per meter" (4), and "AUX wire function" (TCH). The ORLACO logo and version "ver:1.2.2" are at the bottom.</p>

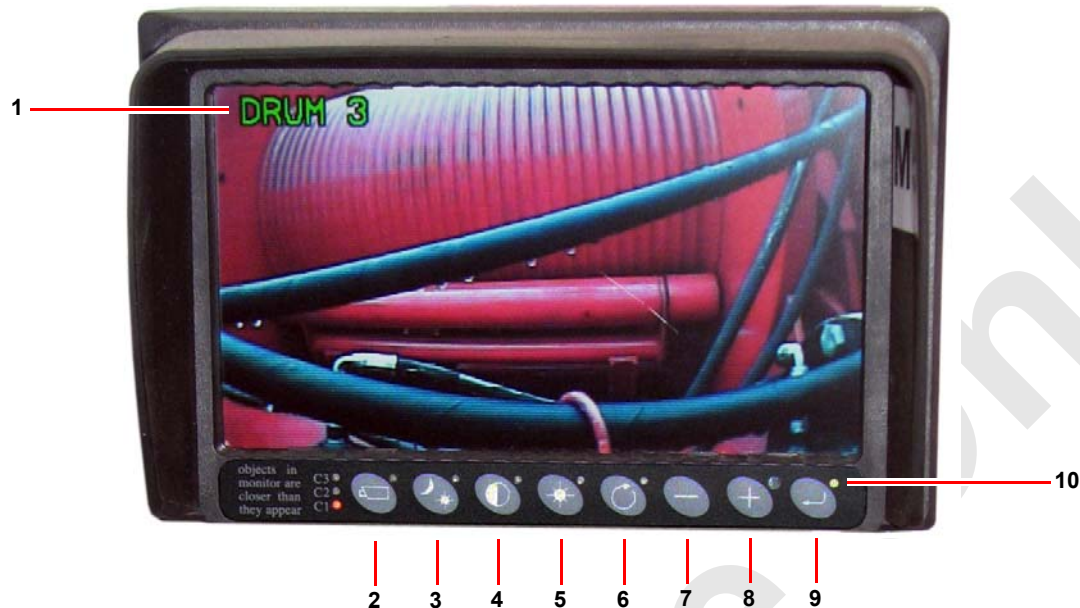
TABLE 12. 10-inch Camera Monitor Operator and Service Menus

<p>14</p>	<ul style="list-style-type: none"> • Default settings — this option opens the restore factory defaults menu. If Yes is selected, the monitor will revert all its settings to its factory defaults. <i>All user-configured settings will be lost when the factory settings are reset.</i> 	
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Reference Only

7-inch Camera Monitor Information

TABLE 13. 7-inch Camera Monitor Operating Controls
















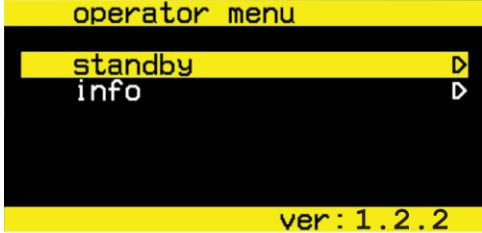

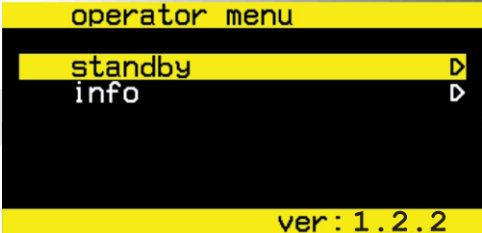

Item	Name	Description
1	Camera label	<ul style="list-style-type: none"> To change the label ("DRUM 3" in this case), see 7-inch Camera Monitor Operator and Service Menus, on page 3-107.
2	 CAMERA button	<ul style="list-style-type: none"> After pressing CAMERA, use PLUS or MINUS to select a camera (C1, C3, or C3). After selecting a camera, press CAMERA once more. A red LED indicates the chosen camera.
3	 AUTOMATIC BRIGHTNESS button	<ul style="list-style-type: none"> Press AUTOMATIC BRIGHTNESS, the monitor brightness will adjust automatically to changing light conditions.
4	 CONTRAST button	<ul style="list-style-type: none"> After pressing CONTRAST, use PLUS and MINUS to adjust the monitor contrast.
5	 BRIGHTNESS button	<ul style="list-style-type: none"> After pressing BRIGHTNESS, use PLUS and MINUS to adjust the monitor brightness.
6	 OPTION button	<ul style="list-style-type: none"> Used to go to a previous menu item.
7	 MINUS button	<ul style="list-style-type: none"> After pressing BRIGHTNESS, <i>decreases</i> the monitor brightness. After pressing CONTRAST, <i>decreases</i> the monitor contrast. In the Operator Menu, go to the <i>previous</i> menu option.
8	 PLUS button	<ul style="list-style-type: none"> After pressing BRIGHTNESS, <i>increases</i> the monitor brightness. After pressing CONTRAST, <i>increases</i> the monitor contrast. In the Operator Menu, go to the <i>next</i> menu option.
9	 ENTER button	<ul style="list-style-type: none"> Press once to enter the monitor Operator Menu. Used to select items in the Operator Menu.
10	Power LED	Glows green when the monitor is powered.

TABLE 14. 7-inch Camera Monitor Operator and Service Menus

Operator Menu Screens		
Screen	Description	What You See
1	<p>To access the operator menu, press .</p> <p>To navigate through the menus, use these keys:</p> <ul style="list-style-type: none"> • Press  to go to the next menu option. • Press  to go to the previous menu option. • Press  to select or activate the highlighted option. • Press  to return to the previous menu. 	
2	<p>standby — this option switches the monitor to standby mode. Press  to switch to power on.</p>	
3	<p>info — lists the firmware revision of the camera monitor.</p>	

3

TABLE 14. 7-inch Camera Monitor Operator and Service Menus









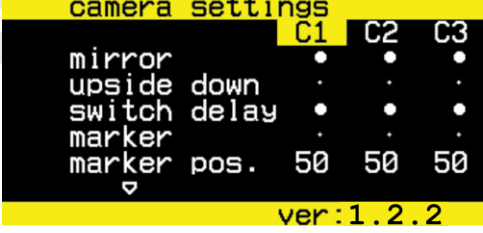

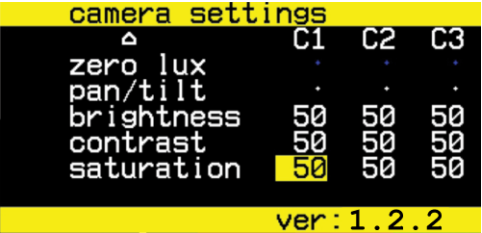

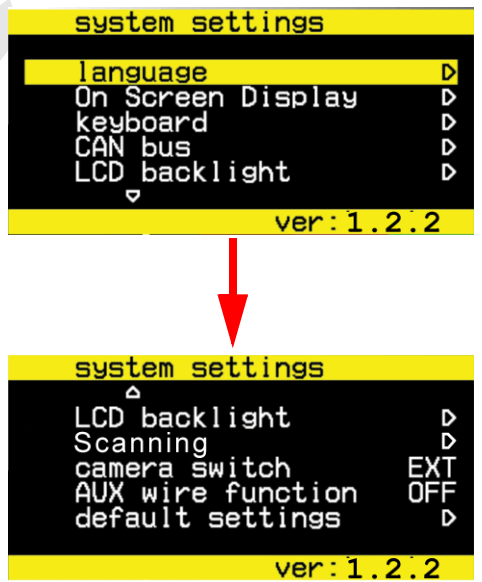

Service Menu Screens		
Screen	Description	What You See
1	<p>To access the service menu, press   and  at the same time.</p> <p>To navigate through the menus, use these keys:</p> <ul style="list-style-type: none"> • Press  to go to the next menu option. • Press  to go to the previous menu option. • Press  to select or activate the highlighted option. • Press  to return to the previous menu. 	
2	<ul style="list-style-type: none"> • mirror — enable this option to mirror the camera image (reverse left and right). • upside down — enable this option to invert the camera image (reverse up and down). • switch delay — enable this option if the switchwire is controlled by an intermittent signal (for example, from an indicator light). • marker — enable this option to switch the marker on. The marker is displayed by a green horizontal line. • marker pos. — adjusts the vertical position of the marker (0 = top of the screen, 100 = bottom of the screen). 	<p>When camera settings is selected from the top menu, the following screen appears:</p> 
3	<ul style="list-style-type: none"> • graticule — shows a grid on the camera monitor for a rear-mounted camera. <i>This option is not available on all camera monitor models.</i> • cinema mode — enable this option to display the camera image in wide screen cinema mode. • autofocus — enable this option if an autofocus camera is connected. <i>This option is only available with an autofocus camera and a serial LCD monitor.</i> • Backlight — enable this option when looking at dark objects in a light environment. <i>This option is only available with an autofocus camera and a serial LCD monitor.</i> • zero lux — enable this option in low-light environments. <i>This option is only available with an autofocus camera and a serial LCD monitor.</i> 	

TABLE 14. 7-inch Camera Monitor Operator and Service Menus

<p>4</p>	<ul style="list-style-type: none"> pan/tilt — set this option to ON to enable the pan/tilt control with the OPTION button. brightness — adjust the brightness of the image. contrast — adjust the contrast of the image. saturation — adjust the saturation of the image. 	 <pre> camera settings ^ C1 C2 C3 zero lux . . . pan/tilt . . . brightness 50 50 50 contrast 50 50 50 saturation 50 50 50 ver:1.2.2 </pre>
<p>5</p>	<p>In this option, the text labels for the camera inputs can be defined.</p>	<p>When camera labels is selected from the top menu, the following screen appears:</p>  <pre> camera labels 1 [1] 2 [2] 3 [3] ver:1.2.2 </pre>
<p>6</p>	<p>system settings has the following options:</p> <ul style="list-style-type: none"> language On Screen Display (OSD) keyboard CAN bus LCD backlight Scanning camera switch AUX wire function default settings 	<p>When system settings is selected from the top menu, the following screen appears:</p>  <pre> system settings language > On Screen Display > keyboard > CAN bus > LCD backlight > v ver:1.2.2 </pre> <p style="text-align: center;">↓</p> <pre> system settings ^ LCD backlight > Scanning > camera switch EXT AUX wire function OFF default settings > ver:1.2.2 </pre>
<p>7</p>	<p>language — the language selected will be used in all the menu screens.</p>	 <pre> language English • Nederlands . Deutsch . Français . ver:1.2.2 </pre>

3

TABLE 14. 7-inch Camera Monitor Operator and Service Menus


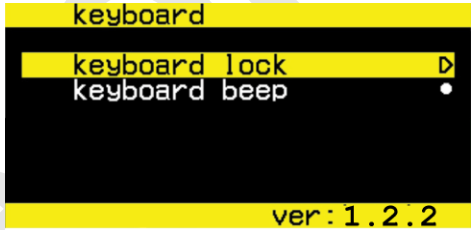

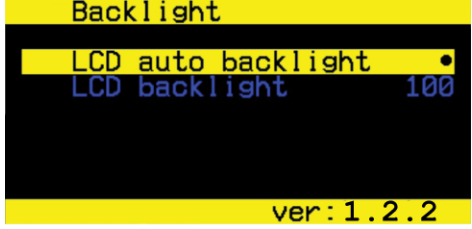

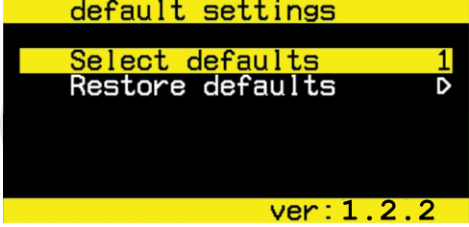
<p>8</p>	<ul style="list-style-type: none"> OSD timeout — adjust the number of seconds the on-screen display is visible. Setting this to OFF disables the timeout. OSD Menu help — used to enable or disable the display help text. If enabled, automatic help text will appear after 5 seconds of inactivity in any menu. 	<p>If On Screen Display is selected from the system settings screen, the following screen appears:</p>  <p>The screenshot shows a menu titled "On Screen Display" with two options: "OSD timeout" set to "3S" and "OSD Menu help". The version number "ver: 1.2.2" is displayed at the bottom.</p>
<p>9</p>	<ul style="list-style-type: none"> keyboard lock — this opens a submenu where various monitor functions can be disabled to avoid accidental adjustment of monitor settings. keyboard beep — turns keyboard beep on or off. 	<p>If keyboard is selected from the system settings screen, the following screen appears:</p>  <p>The screenshot shows a menu titled "keyboard" with two options: "keyboard lock" with a right arrow and "keyboard beep" with a radio button. The version number "ver: 1.2.2" is displayed at the bottom.</p>
<p>10</p>	<ul style="list-style-type: none"> CAN protocol — selects the higher level CAN protocol to use. CAN speed — selects the bitrate of the CAN bus. Valid bitrate options are 100, 125, 200, 250, 500, and 1000 kbit. 	<p>If CAN bus is selected from the system settings screen, the following screen appears:</p>  <p>The screenshot shows a menu titled "CAN bus" with two options: "CAN protocol" set to "OFF" and "CAN speed" set to "500". The version number "ver: 1.2.2" is displayed at the bottom.</p>
<p>11</p>	<ul style="list-style-type: none"> LCD auto backlight — if LCD auto backlight is enabled (as shown on the screen on the right), then the monitor will automatically adjust its brightness to the available light level. LCD backlight — allows manual setting of the monitor backlight level. <i>This option is only available when LCD auto backlight is disabled.</i> 	<p>If LCD backlight is selected from the system settings screen, the following screen appears:</p>  <p>The screenshot shows a menu titled "Backlight" with two options: "LCD auto backlight" with a radio button and "LCD backlight" set to "100". The version number "ver: 1.2.2" is displayed at the bottom.</p>

TABLE 14. 7-inch Camera Monitor Operator and Service Menus


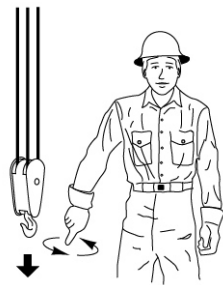
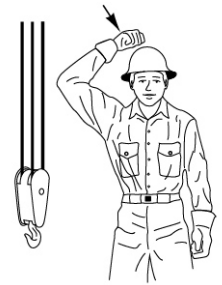
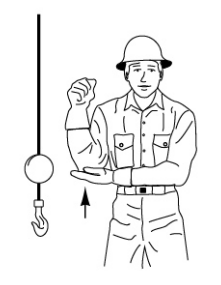


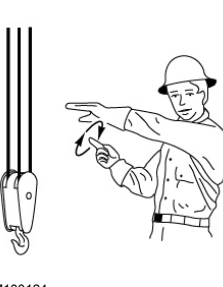


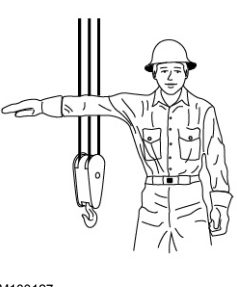

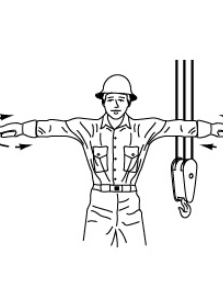
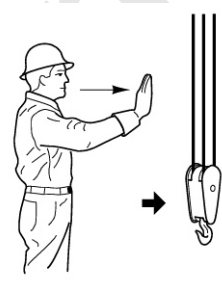

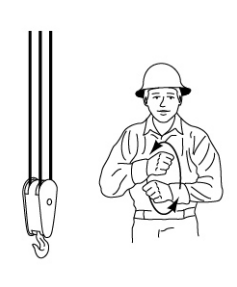

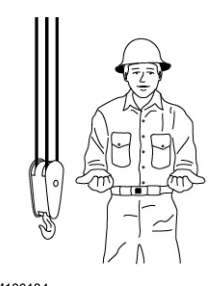
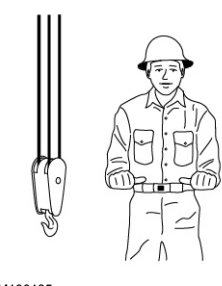


<p>12</p>	<ul style="list-style-type: none"> Scanning — allows the following options to be set: <ul style="list-style-type: none"> Scan sequence — selects which cameras will be enabled in the scanning sequence. Scan interval — selects the interval between camera switches. camera switch — configures the type of video switch that is used. Select EXT (external) if an external UNI camera switch is used. Select INT (internal) to use the internal switch. AUX wire function — selects the function of the AUX1 and AUX2 wires. Set to TCH (for tachometer) on AUX1 or KEY (for + and – key functions on AUX1/2). 	<p>The Scanning option in system settings allows multiple cameras to appear on the monitor:</p> 
<p>13</p>	<ul style="list-style-type: none"> default settings — this option opens the restore factory defaults menu. If Yes is selected, the monitor will revert all its settings to its factory defaults. <i>All user-configured settings will be lost when the factory settings are reset.</i> 	

Reference

Appendix E — Standard Hand Signals for Controlling Crane Operations

These hand signals comply with ASME B30-5.

TABLE 15. Standard Hand Signals for Controlling Crane Operations

<p style="text-align: center;">1</p>  <p>M100118</p>	<p style="text-align: center;">2</p>  <p>M100119</p>	<p style="text-align: center;">3</p>  <p>M100120</p>	<p style="text-align: center;">4</p>  <p>M100121</p>	<p style="text-align: center;">5</p>  <p>M100122</p>
<p style="text-align: center;">6</p>  <p>M100123</p>	<p style="text-align: center;">7</p>  <p>M100124</p>	<p style="text-align: center;">8</p>  <p>M100125</p>	<p style="text-align: center;">9</p>  <p>M100126</p>	<p style="text-align: center;">10</p>  <p>M100127</p>
<p style="text-align: center;">11</p>  <p>M100128</p>	<p style="text-align: center;">12</p>  <p>M100129</p>	<p style="text-align: center;">13</p>  <p>M100130</p>	<p style="text-align: center;">14</p>  <p>M100131</p>	<p style="text-align: center;">15</p>  <p>M100132</p>
<p style="text-align: center;">16</p>  <p>M100133</p>	<p style="text-align: center;">17</p>  <p>M100134</p>	<p style="text-align: center;">18</p>  <p>M100135</p>	<p style="text-align: center;">19</p>  <p>M100136</p>	<p style="text-align: center;">20</p>  <p>M100137</p>

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Item	Description
1	HOIST —With forearm vertical, forefinger pointing up, move hand in small horizontal circles.
2	LOWER —With arm extended downward, forefinger pointing down, move hand in small horizontal circles.
3	USE MAIN HOIST —Tap fist on head. Then use regular signals.
4	USE WHIPLINE (Auxiliary Hoist) —Tap elbow with one hand. Then use regular signals.
5	RAISE BOOM —Arm extended, finger closed, thumb pointing upward.
6	LOWER BOOM —Arm extended, fingers closed, thumb pointing downward.
7	MOVE SLOWLY —Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal (hoist slowly shown as an example).
8	RAISE BOOM & LOWER LOAD —With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.
9	LOWER BOOM & RAISE LOAD —With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.
10	SWING —Arm extended, point with finger in direction of swing of boom.
11	STOP —Arm extended, palm down, move arm back and forth horizontally.
12	EMERGENCY STOP —Both arms extended, palms down, move arms back and forth horizontally.
13	TRAVEL —Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.
14	DOG EVERYTHING —Clasp hands in front of body.
15	TRAVEL (Both Tracks) —Use both fists in front of body, making a circular motion about each other, indicating direction of travel forward or backward. (For Land Cranes Only).
16	TRAVEL (One Track) —Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For Land Cranes Only).
17	EXTEND BOOM (Telescoping Booms) —Both fists in front of body with thumbs pointing outward.
18	RETRACT BOOM (Telescoping Boom) —Both fists in front of body with thumbs pointing toward each other.
19	EXTEND BOOM (Telescoping Boom) —One Hand Signal. One fist in front of chest with thumb tapping chest.
20	RETRACT BOOM (Telescoping Boom) —One hand signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.

Appendix F — Wind Conditions



WARNING

Tipping Crane Hazard!

Judgment and experience of qualified operators, job planners, and supervisors must be used to compensate for the affect of wind on lifted load and boom by reducing ratings or operating speeds, or a combination of both.

Failing to observe this precaution can cause a crane to tip or a boom and/or jib to collapse. Death or serious injury to personnel can result.

Wind adversely affects the lifting capacity and stability as shown in the table below. The result could be loss of control over the load and crane, even if the load is within the crane's capacity.

Wind speed (to include wind gusts) must be monitored by job planners and supervisors prior to crane operation, during crane operation and crane parking, and prior to restarting crane operation.

Do not raise boom system to measure the wind speed with anemometer on crane.

The wind speed at the boom or jib point can be greater than the wind speed at ground level. Also, be aware that the larger the sail area of the load, the greater the wind's affect on the load.

As a general rule, ratings and operating speeds must be reduced when: ***Wind causes the load to swing forward past the allowable operating radius or sideways past either boom hinge pin.***

For wind conditions specific to this crane, see the wind conditions, if applicable, in the Capacity Charts provided with this crane and attachments.

Wind Direction	Notes
From Back-To-Front	<p>Forward stability is affected by wind on the rear of the boom. Wind applies a force to the boom and load that adds to the crane's overturning moment. This action has the same effect as adding load to the hook.</p> <p>The wind's affect on the rear of the load increases load radius. This condition can result in an overload hazard, possibly causing the crane to tip or the boom to collapse.</p> <p>To avoid this hazard, reduce operating speeds and load (see Wind Conditions Chart at end of this section or see wind conditions in Capacity Charts if applicable).</p>
From Front-To-Back	<p>Backward stability is affected by wind on the front of the boom. This condition is especially dangerous when the boom is at or near the maximum angle when operating without a load.</p> <p>Wind forces on the front of the boom reduce the normal forward tipping effect of the boom. The crane can tip or the boom can collapse if this condition is not avoided. If the wind from the front decreases, the entire crane may become overloaded.</p> <p>The boom can buckle and collapse if the load contacts the boom.</p>
From Side	<p>Boom strength is affected the most when the wind acts on the side of the boom and the load.</p> <p>The wind's effect on the side of the load can cause the load to swing out past the boom hinge pin. This condition can result in excessive side load forces on the boom, possibly causing the crane to tip or the boom to collapse.</p> <p>To avoid this hazard, reduce operating speeds and load (see Wind Conditions Chart at end of this section or see wind conditions in Capacity Charts if applicable).</p>

Appendix G — Primary and Secondary Engine Functions

Function		Primary Engine only?	Secondary Engine only?
Lift¹	• Drums 1, 2, 3, and 4 motors and brakes • Drum 4 pawl	Yes	Yes
	• Drum 5 motor, brake, and pawl		No
	• Drum 6 motor and brake		No
	• Drum 0		No
	• VPC motors and brakes		Yes
Swing²	Swing motors	Yes	Yes
	Swing brakes		No
Travel³	Travel motors	Yes	Yes
	Travel brakes		No
Accessory functions⁴		Yes	No

Notes:

1. When drum motors are operated using only one engine, fuel consumption is reduced along with performance. Drum speed is reduced because hydraulic flow is cut in half.
2. Swing is only available when *both* the Primary and Secondary engines are operating because when the Secondary Engine is off, the swing brakes will be engaged.
3. Travel is only available when (1) *both* the Primary and Secondary engines are operating and (2) Drum 5 *or* Drum 6 is *not* in use.
4. For a list of all the accessory functions, see the Accessory Diagnostic screen in **Folio 2207 Manitowoc 31000 Main Display Operation**.

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Reference Only

SECTION 3 INSERTS

The following publications are provided at the end of this section:

- F2119, Long Term Storage

Reference Only

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SECTION 4 CRANE ASSEMBLY

GENERAL SAFETY

To prevent accidents that can result in death or injury during crane assembly, comply with the following general safety information and with the specific safety information contained in the assembly steps.



WARNING

Avoid Death or Serious injury!

Read and understand setup and installation instructions in this section before attempting to assemble or disassemble crane.



WARNING

Avoid Falling Off Crane and Boom!

It is necessary to climb onto crane, mast, and boom during assembly steps.

Use sturdy owner furnished ladders or an approved personnel hoist to gain access to areas which cannot be reached from ladders or steps provided with crane.



WARNING

Moving Parts/Pinch Points!

Avoid death or crushing injury during crane assembly:

- Assembly personnel — take every precaution to prevent injury when working near moving parts.
 - Maintain communication between operator and assemblers to avoid accidents.
- Keep unauthorized personnel well clear of crane.



WARNING

Falling Load Hazard!

To prevent lifting equipment from failing and load from dropping, crane owner/user shall verify following prior to each lift:

- All lifting equipment (shackles, hooks, slings, blocks) have been properly maintained and are safe for use.
- All lifting equipment has a capacity equal to or greater than load to be lifted.

CRANE ORIENTATION

The terms RIGHT, LEFT, FRONT, REAR used in this section refer to the operator's right, left, front, and rear sides when seated in the operator cab looking forward.

RIGGING DRAWINGS

The boom assembly drawings that apply to your crane are located at the end of this section.

ASSEMBLY NOTES

The crane, boom, and jib shall be assembled by experienced personnel trained in erection and operation of construction cranes.

Read and become thoroughly familiar with the instructions in the applicable capacity charts, in this section, and in the assembly drawings at the end of this section before attempting to assemble, operate, or disassemble the crane.

Contact your Manitowoc dealer for assistance if any procedure is not fully understood.

ASSEMBLY AREA

Select an assembly area that has a firm, level, uniformly supporting foundation. Make sure the area is large enough to accommodate the crane and the selected boom length, movement of trucks with trailers, and movement of an assist crane.

Unless otherwise specified in the capacity chart, the foundation shall be level to within 0.5% — 0.5 ft (0,15 m) rise or fall in 100 ft (30,5 m) distance.

When such a surface is not available, it shall be provided with timbers, cribbing, or other structural members to distribute the load such that the allowable bearing capacity of the underlying member is not exceeded.

Set the carbody front or rear beam blocking and side beam jack pads on a flat, firm foundation that will support the load placed on them. See [Table 4-1](#) for loadings.

Do not set the end beam blocking and side beam jack pads in holes, on rocky ground, or on extremely soft ground.

If necessary, use matting or steel plates to properly distribute loading. The matting or steel plates must be:

- Free of defects.

- Strong enough to prevent being crushed or bent.
- Of sufficient length and width to prevent settling under load.

For ground bearing information go to:

www.manitowoccranes.com/site/EN/groundbearingpressure.aspx.

Table 4-1 Carbody Blocking and Jack Loads

Maximum load on each side beam jack:

- 235,600 lb (106 865 kg)
- Jack pad size — 3 ft 1-1/2 in (950 mm) diameter

Maximum load on carbody blocking (blocks of wood under front or rear beam):

- 109,000 lb (49 440 kg)
- Blocking size: 12 in (305 mm) wide by 12 in (305 mm) high by 6 ft (1.9 m) long

ACCESSING PARTS

Some parts of the crane, boom, and jib cannot be reached from the ground. Take necessary precautions to prevent falling off the crane or boom during assembly. Falling from any elevation could result in serious injury or death.

Owner/user shall provide approved ladders or personnel hoists so workers can safely access those areas of crane, boom, and jib that cannot be reached from ground. Adhere to local, state, and federal regulations for handling personnel.

PERSONNEL FALL-PROTECTION

Manitowoc has provided anchors and lifelines throughout the crane and attachment (see [Figure 4-1](#)) to which workers can attach their personnel fall-protection equipment.



WARNING

Fall Hazard!

To prevent falling from any height during crane assembly, personnel must wear fall-protection equipment.

- Anchors and lifelines are designed to handle only one person at a time.
- Do not use anchors for lifting or pulling loads.

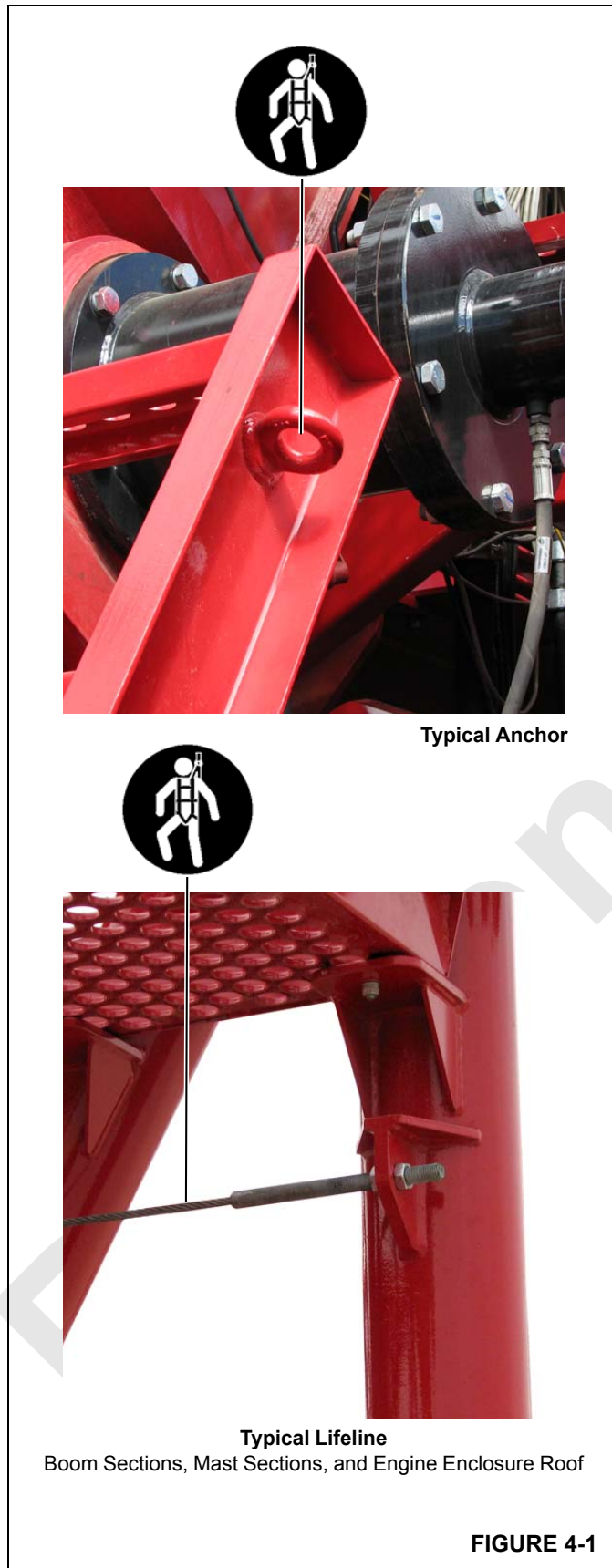
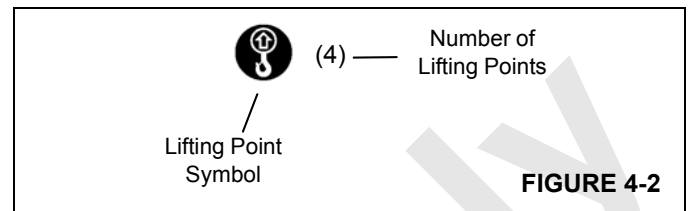


FIGURE 4-1

HANDLING COMPONENTS

The major components are equipped with lifting lugs. The lifting lugs are identified by the following symbol in the assembly illustrations.



When lifting lugs are not provided, use nylon lifting slings. If wire rope or chain lifting slings are used, install protective covering (such as sections of rubber tire) between the slings and the part being lifted.

It is owner's/user's responsibility to ensure that all lifting slings, hooks, and shackles are in safe working order and capable of handling the loads applied to them.

Manitowoc provides the lifting slings identified in [Figure 4-10](#). **Use the proper size (capacity) sling for load being handled.**

RETAINING CONNECTING PINS

Connecting pins are retained in various ways:

- Wire-lock pins
- Quick-release pins
- Cotter pins
- Hitch Pins
- Keeper plates with cap screws and lock washers

Do not operate crane until all connecting pins are installed and properly retained.

ASSIST CRANE REQUIREMENTS

An assist crane is required to assemble and disassemble the Model 31000.

Manitowoc recommends either of the following:

- Model 2250 Series 3 with 200 ft (61 m) of boom.
- Model 16000 Series 3 with 196.9 ft (60 m) of boom.

AERIAL WORK PLATFORM

Two aerial work platforms are required to access components as the crane, mast, boom, and jib are assembled. The height at which personnel will have to work is 50 ft (15,2 m).

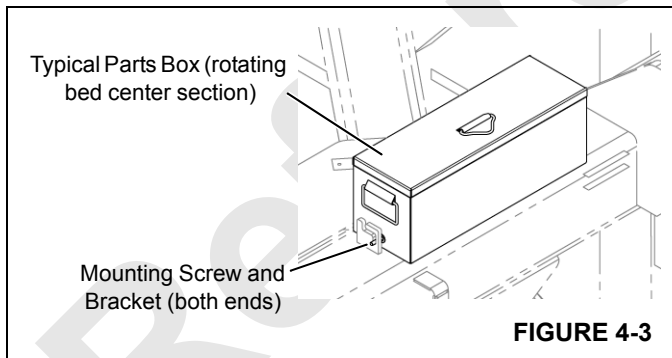
CRANE WEIGHTS

See Crane Weights in Section 1 for overall weight of the crane and individual weights of components.

HOSE AND CABLE CLEANLINESS

To prevent dirt from entering the hydraulic or grease systems or from damaging the electric connectors:

- Thoroughly clean hydraulic fittings, grease fittings, and electric connectors before connecting them.
- Thoroughly clean protective caps before attaching them to hoses, tubes, or cables.
- Do not drag hydraulic/grease hose fittings or hoses and electric connectors or cables on the ground.
- Connect matching protective caps together when they are not in use and store them in the parts boxes. Parts boxes for storing the protective caps are provided at the following locations (see [Figure 4-9](#) on [page 4-9](#)):
 - Three on top of the rotating bed center section. These parts boxes must be removed to install the drums.
 - Two inside the rotating bed center section.
 - One on each carbody beam.
 - One on rear roller carrier.



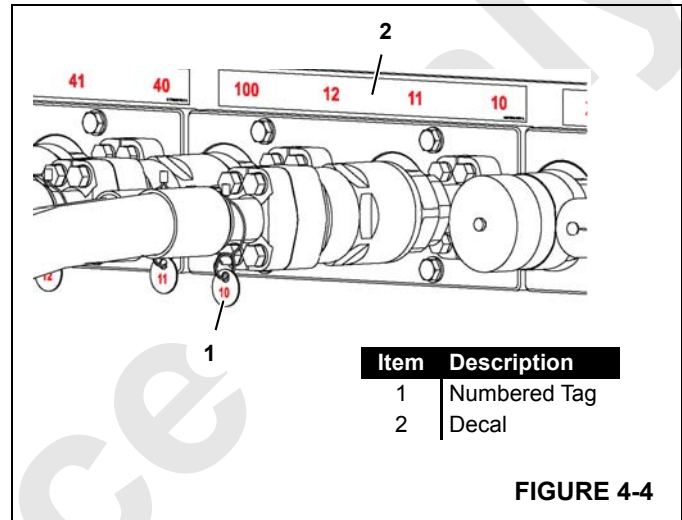
PIN AND CONNECTING HOLE CLEANLINESS

To prevent dirt from damaging closely machined surfaces of pins and connecting holes:

- Thoroughly clean all pins and connecting holes.
- Apply a light coat of grease to all pins and connecting holes.

HYDRAULIC HOSE IDENTIFICATION

Where necessary, the hydraulic hoses and corresponding couplers have identification tags as shown in [Figure 4-4](#). Match the number on the hose with the number on the decal or the corresponding coupler to ensure proper connection.



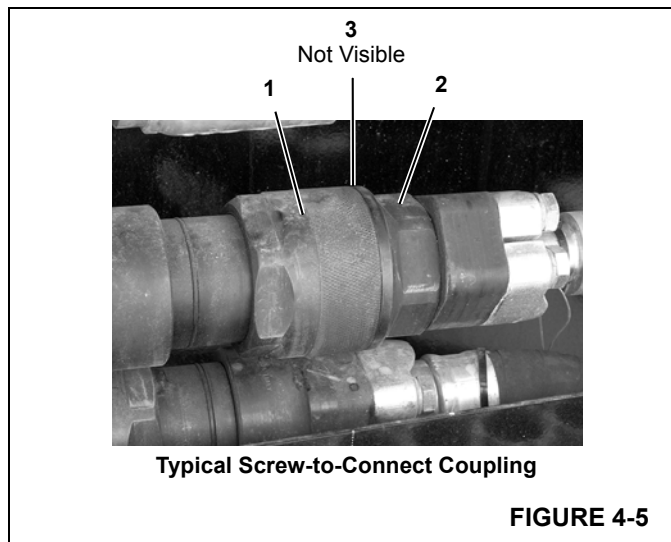
TIGHTENING HYDRAULIC COUPLERS

Connect each screw-to-connect coupler and nipple ([Figure 4-5](#)), as follows:

1. Lubricate coupler (1) threads, nipple (2) threads, and nipple O-ring (3) with clean hydraulic oil.
2. Hand tighten coupler (1) on nipple (3).
3. Using opened-end wrenches (stored in PPU), tighten the coupler until there is metal-to-metal contact between the coupler and the nipple. **O-ring (3) must not be visible.**

To avoid damage, do not exceed a torque of:

 - Size -12 (3/4 in) = 4.13 lbf ft (5,6 Nm)
 - Size -16 (1 in) and Size -20 (1-1/4 in) = 6.04 lbf ft (8,2 Nm)
 - Size -24 (1-1/2 in) = 19.16 lbf ft (26,0 Nm)
4. Check for leaks after the crane has been operated with the hydraulic oil at operating temperature. Retighten the couplers if necessary.



SYMBOLS

For identification of the symbols used in this section, refer to Section 1 of this manual.

PORTABLE POWER UNIT



Description

Manitowoc supplies a portable power unit (PPU) with the Model 31000 (Figure 4-6). The power unit supplies hydraulic oil for engaging and disengaging hydraulically-actuated pins and cylinders during crane assembly and disassembly.

The PPU has two hydraulic circuits:

CIRCUIT 1 with 46 SS Hydraulic Oil powers the following functions. The hydraulic hoses from this circuit have 1/2 in push-to-connect couplers.

- Carbody Beam Pins
- Crawler Trunnion Cylinders
- Crawler Tensioner Cylinders
- Rotating Bed Jacking Cylinders
- Front and Rear Roller Carrier Pins
- Drum Frame Pins
- Mast Section Pins
- Mast Raising Frame Pins
- Backhitch Section Pins
- Mast-to-Backhitch Pins
- Counterweight Center Tray Pins
- Boom Section Pins
- Lower Boom or Jib Point Pins
- Jib Section Pins (fixed and luffing)

CIRCUIT 2 with Arctic 15 Hydraulic Oil powers the following functions. The hydraulic hoses from this circuit have 3/8 in push-to-connect couplers.

- Jib Strut Pins (fixed jib and luffing jib)
- Jib Strut Spreader (fixed jib and luffing jib)
- Jib Stop Support Cylinders (luffing jib)

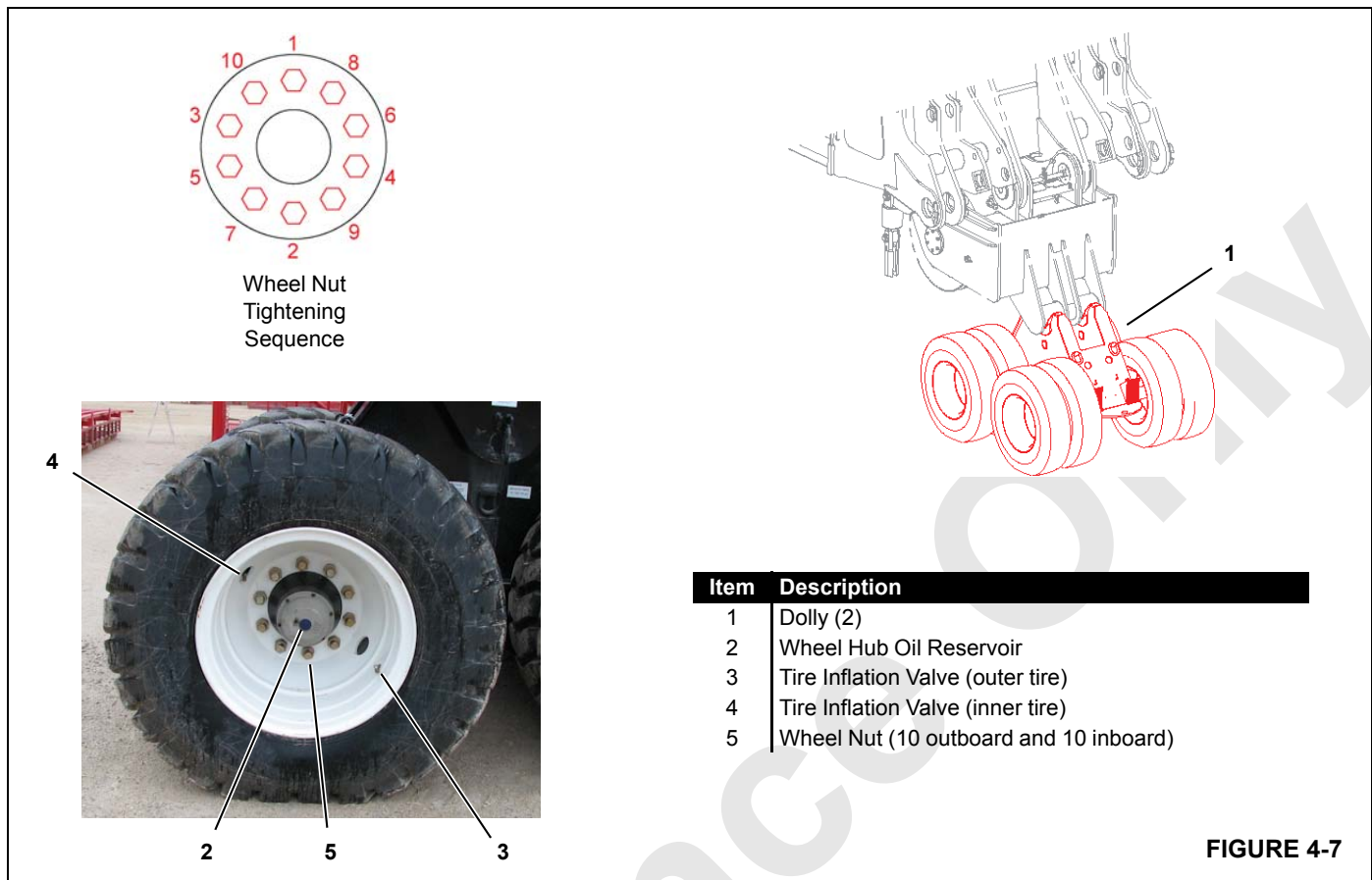
NOTE For the remainder of this section portable power unit will be referred to as PPU.

Pre-Start Checks

Perform the pre-start checks given in the PPU Operation and Maintenance Manual before starting the PPU upon arrival at the job site.

TOOLS

Tools supplied by Manitowoc are stored in the PPU. For a complete list of tools (for example: hand-held cylinders and wrenches), refer to the PPU Operation and Maintenance Manual.



DOLLY

See [Figure 4-7](#) for the following procedure.

Two dollies (1) are supplied by Manitowoc for the following procedures:

- Support jib point during jib lowering.
- Support mast backhitch butts during mast lowering.

Prep the dollies prior to each use, as follows:

1. Check wheel hub oil levels (see Lubrication Guide, F2201, for details).
2. Check tire pressures: each tire should be inflated to 120-130 psi (8,27-8,96 bar).
3. Check wheel nut tightness: each nut, inner and outer, should be torqued dry to 750-900 ft-lb (1 016.9 - 1 220.2).

PARTS STORAGE BOXES AND TRAYS

Manitowoc supplies the parts storage boxes and trays shown in [Figure 4-8](#) on [page 4-8](#).

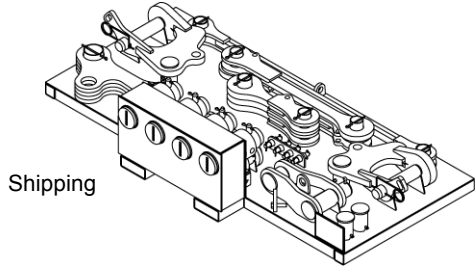
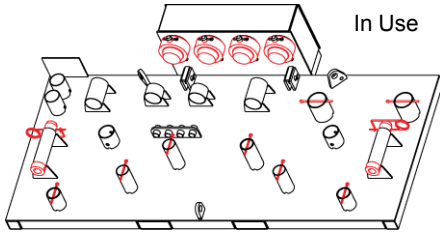
- Intermediate Suspension Trays provide storage for the intermediate suspension parts required for the attachments indicated.
- Rigging Parts Boxes provide storage for rigging parts: swivels, shackles, button sockets, and lifting slings.
- Electric Parts Boxes provide storage for electrical parts: block-up limit, wind speed indicators, aircraft warning lights, remote control.
- Counterweight Parts Boxes provide storage for counterweight pad tie-down chains.

Refer to the decals on the trays and boxes for identification of components and packing sequence.

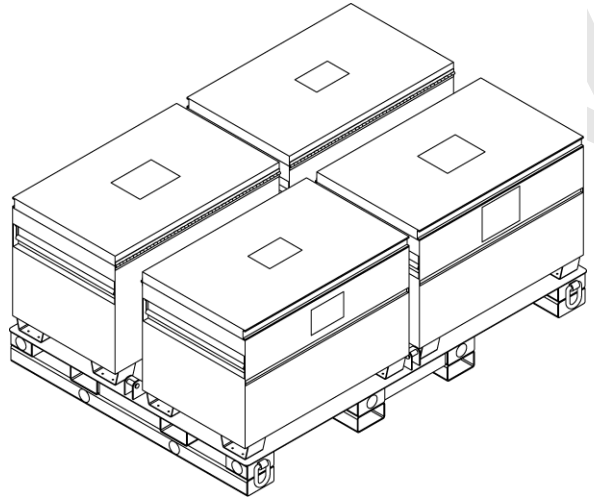
The decals also shown the lifting locations, either with lifting slings or a forklift.

Reference Only

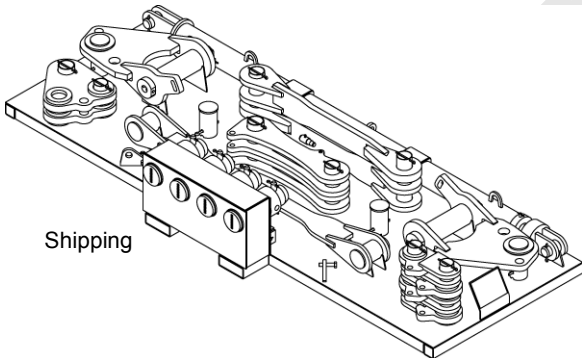
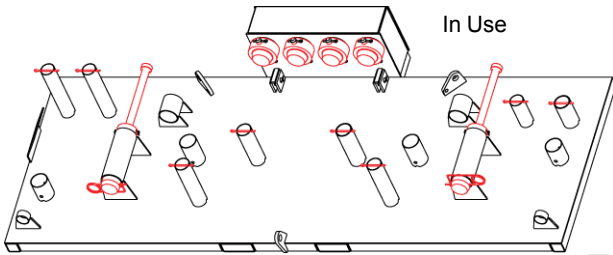
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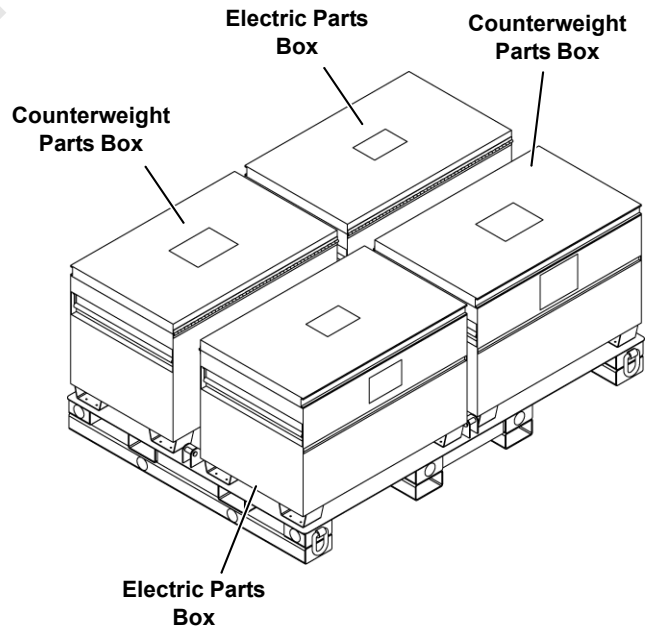
#91 Luffing Jib Intermediate Suspension Tray



Rigging Parts Boxes

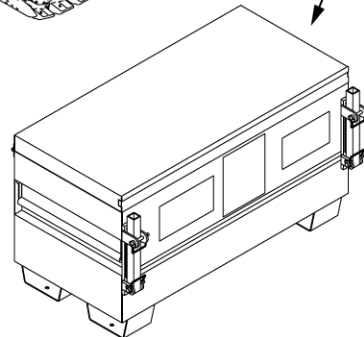
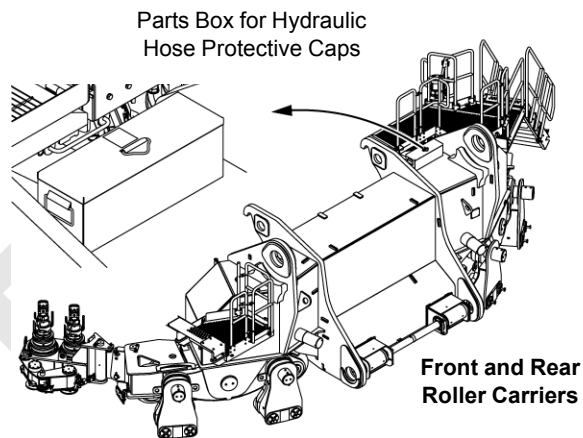
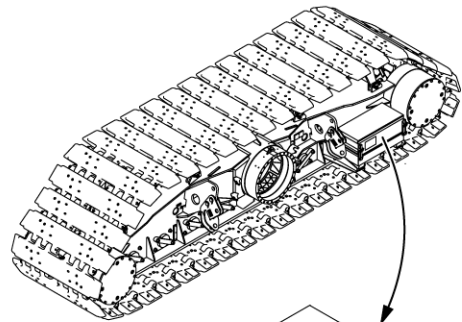
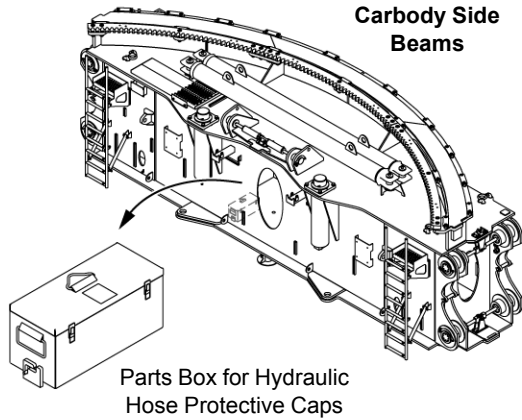
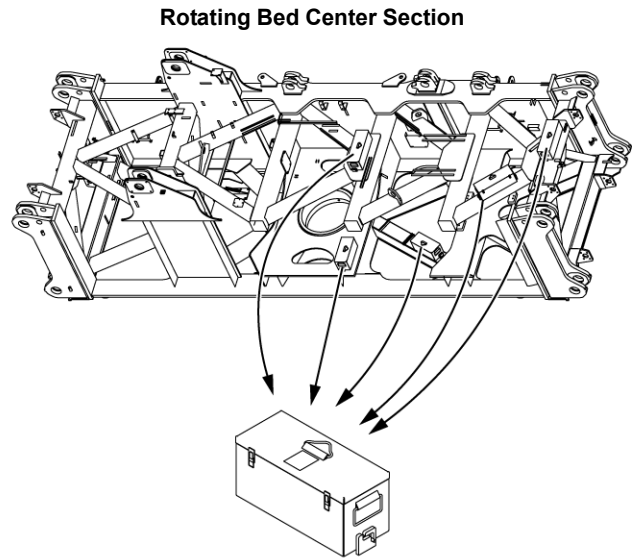
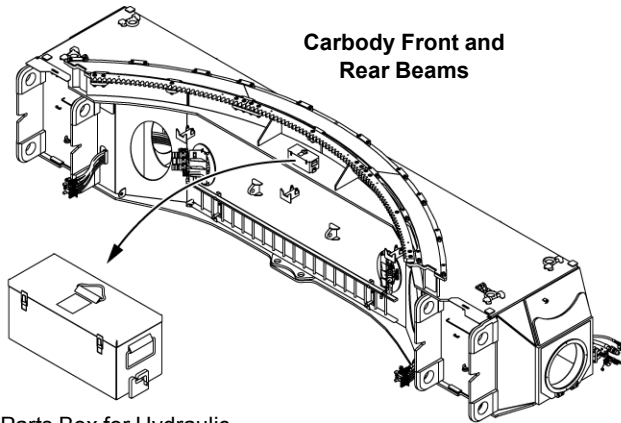


#90/91 Boom Intermediate Suspension Tray #1



#90/91 Boom Intermediate Suspension Tray #2

FIGURE 4-8

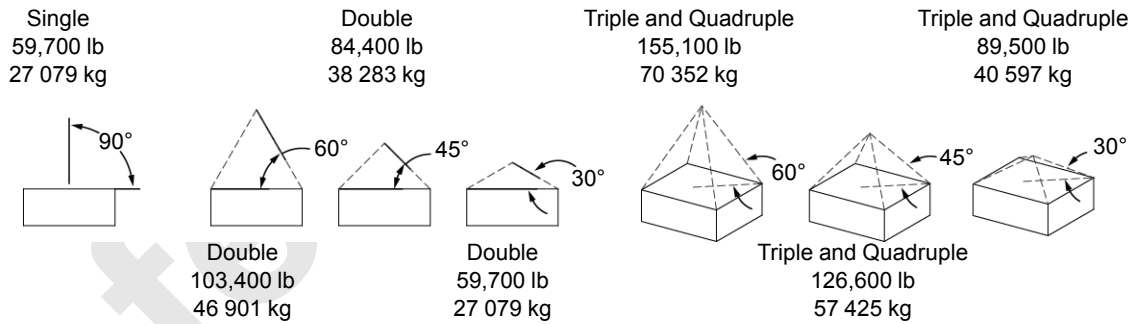
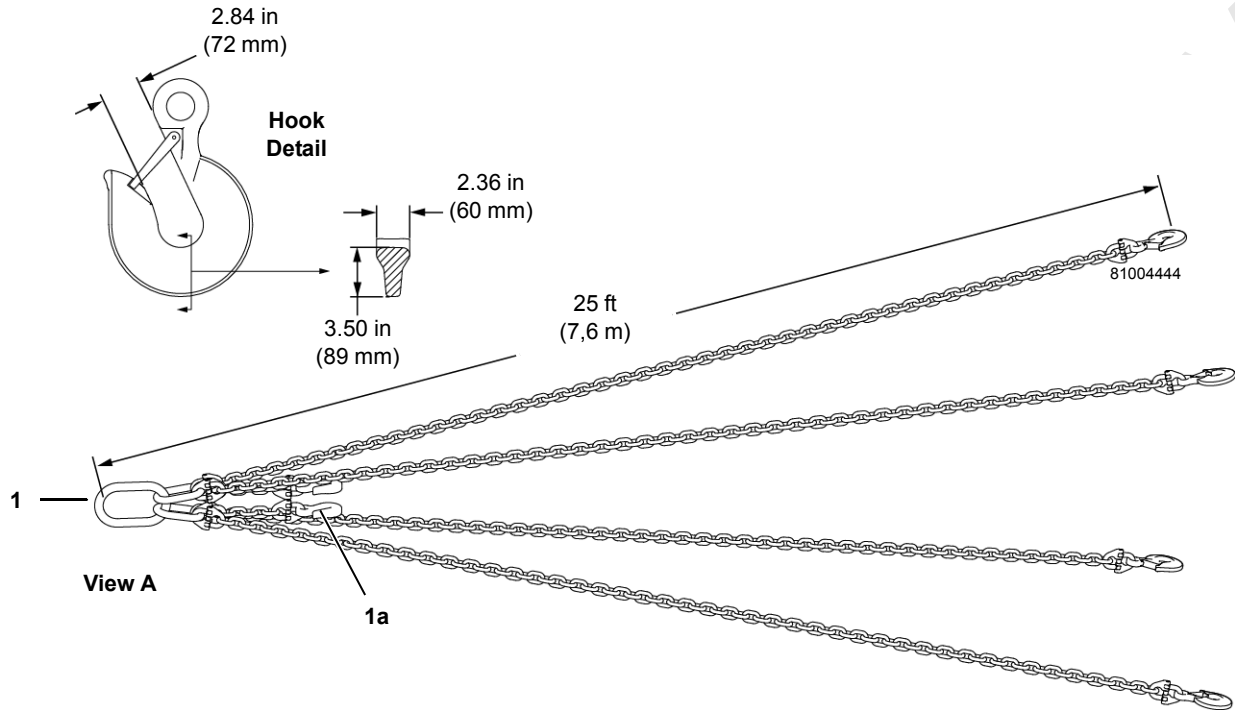


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FIGURE 4-9

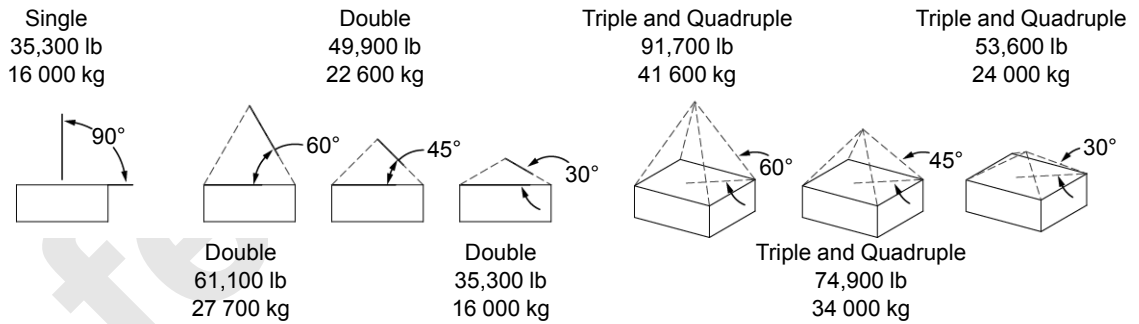
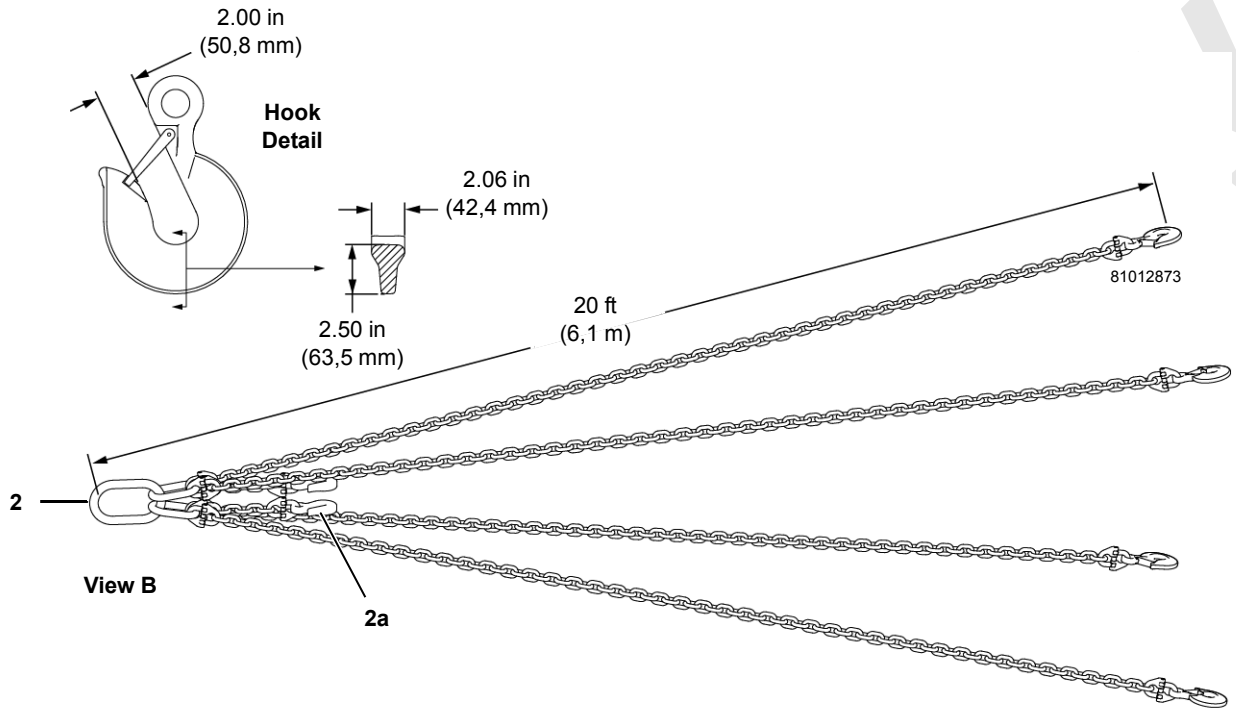
LIFTING SLINGS

The following lifting slings are supplied by Manitowoc.
 For slings that meet other international codes, contact your Manitowoc dealer.



Item	Description
1	4-Leg Chain Lifting Sling — 1 in (25.4 mm) (2 each)
1a	Grab Hooks (2)

FIGURE 4-10

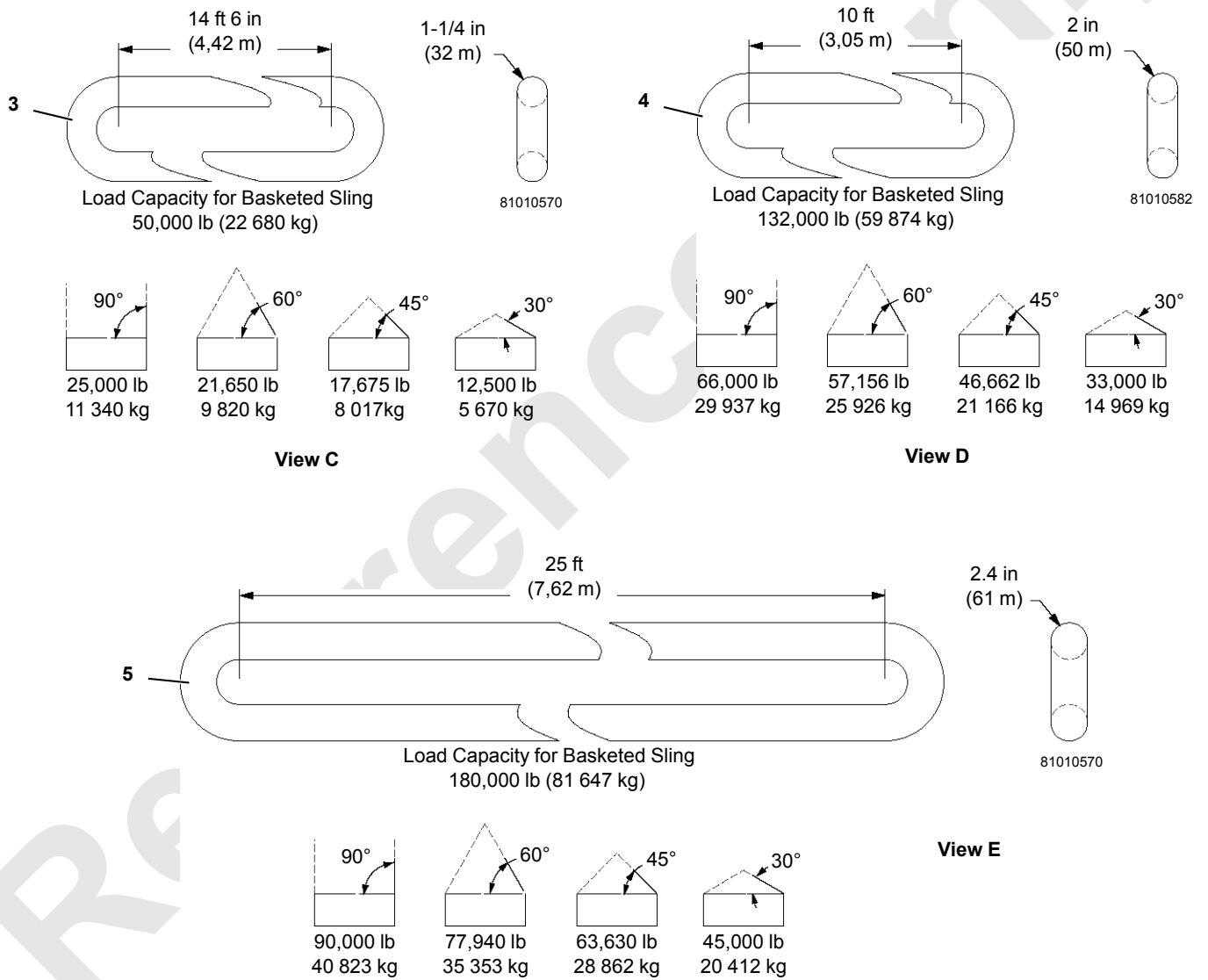


Item	Description
2	4- Leg Chain Lifting Sling — 3/4 in (19.1 mm) (1 each)
2a	Grab Hooks (2)

FIGURE 4-10 continued

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Item	Description
3	Nylon Lifting Sling (2 each)
4	Nylon Lifting Sling (4 each)
5	Nylon Lifting Sling (4 each)

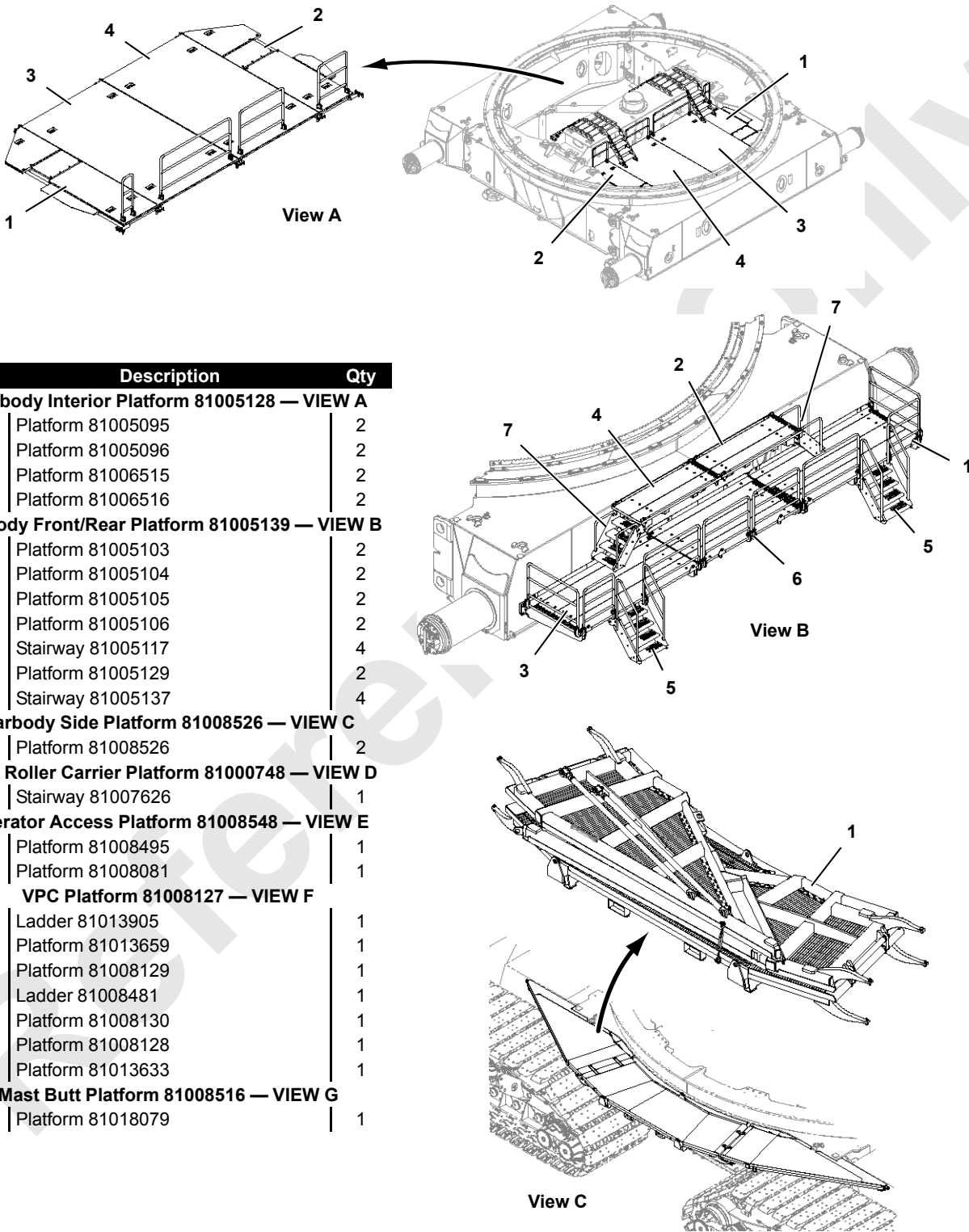


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FIGURE 4-10 continued

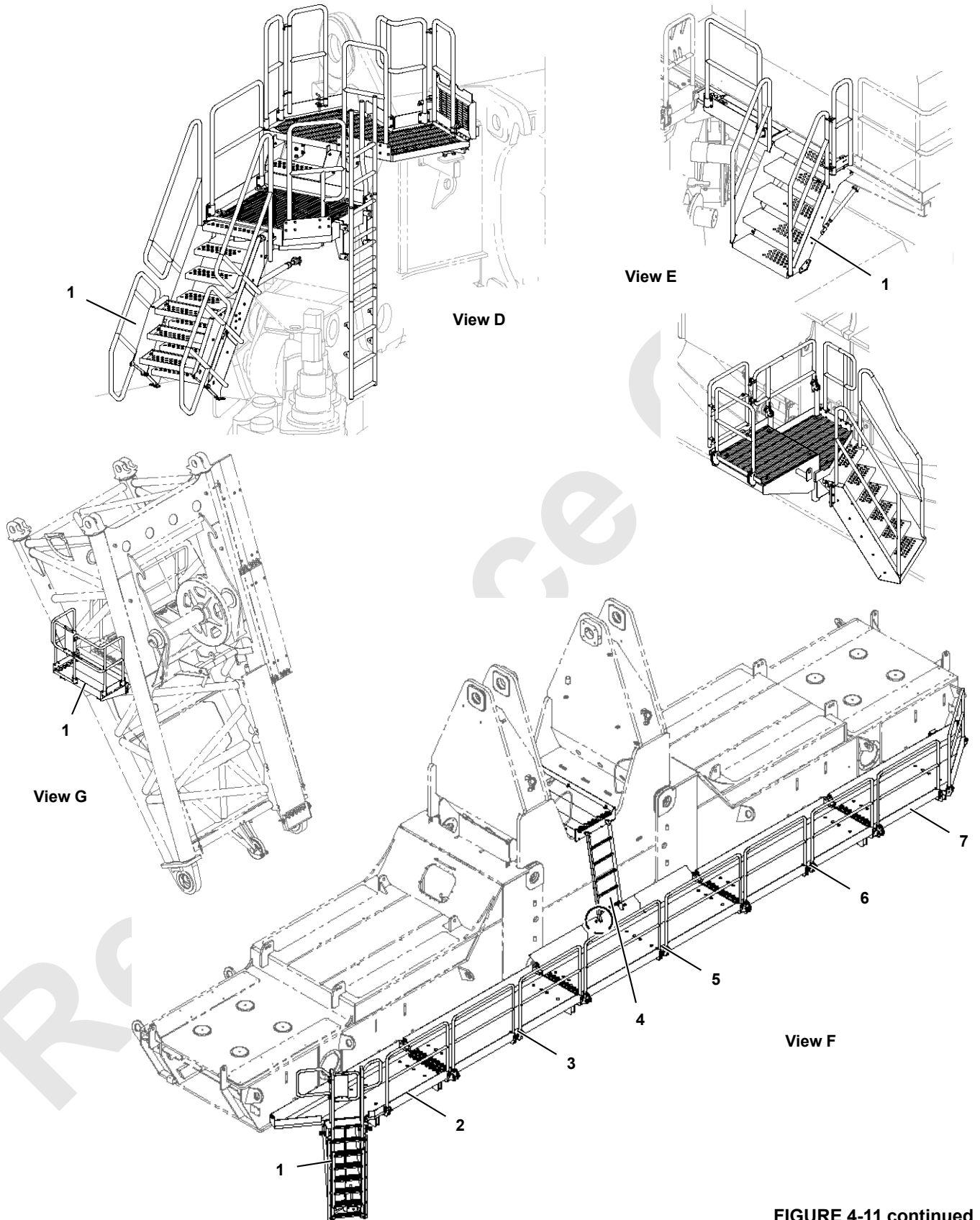
PLATFORM IDENTIFICATION

The platform and ladders shown in [Figure 4-11](#) are shipped loose. Each platform and ladder is equipped with an identification plate containing its part number.



Item	Description	Qty
Carbody Interior Platform 81005128 — VIEW A		
1	Platform 81005095	2
2	Platform 81005096	2
3	Platform 81006515	2
4	Platform 81006516	2
Carbody Front/Rear Platform 81005139 — VIEW B		
1	Platform 81005103	2
2	Platform 81005104	2
3	Platform 81005105	2
4	Platform 81005106	2
5	Stairway 81005117	4
6	Platform 81005129	2
7	Stairway 81005137	4
Carbody Side Platform 81008526 — VIEW C		
1	Platform 81008526	2
Rear Roller Carrier Platform 81000748 — VIEW D		
1	Stairway 81007626	1
Operator Access Platform 81008548 — VIEW E		
1	Platform 81008495	1
2	Platform 81008081	1
VPC Platform 81008127 — VIEW F		
1	Ladder 81013905	1
2	Platform 81013659	1
3	Platform 81008129	1
4	Ladder 81008481	1
5	Platform 81008130	1
6	Platform 81008128	1
7	Platform 81013633	1
Mast Butt Platform 81008516 — VIEW G		
1	Platform 81018079	1

FIGURE 4-11



4

FIGURE 4-11 continued

Item	Description
1	Front Beam (Rear Identical)
2	PPU
3a	Hydraulic Coupler (1/2 in [12,7 mm] supply)
3b	Hydraulic Coupler (1 in [25,4] return)
4	Electric Cable
5	Ladder
6	Padlock

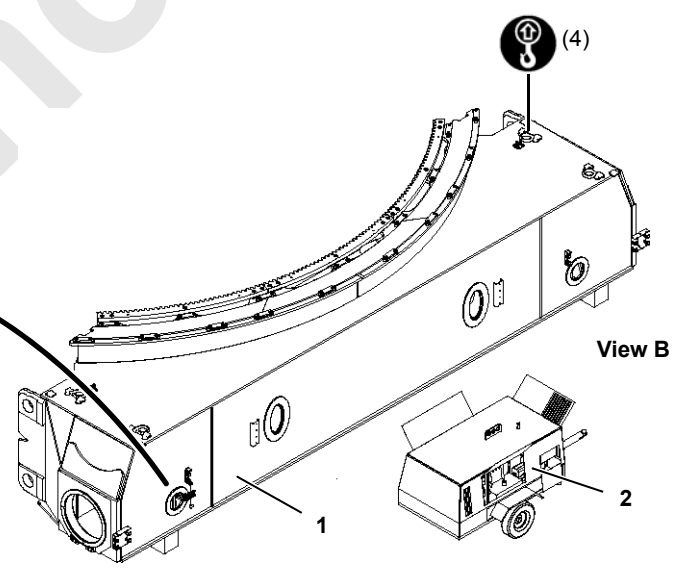
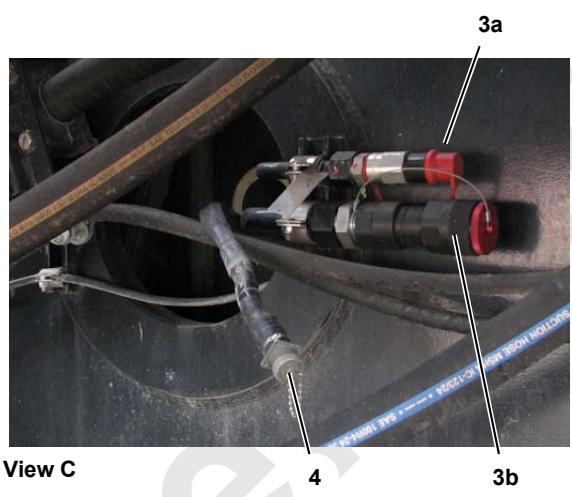
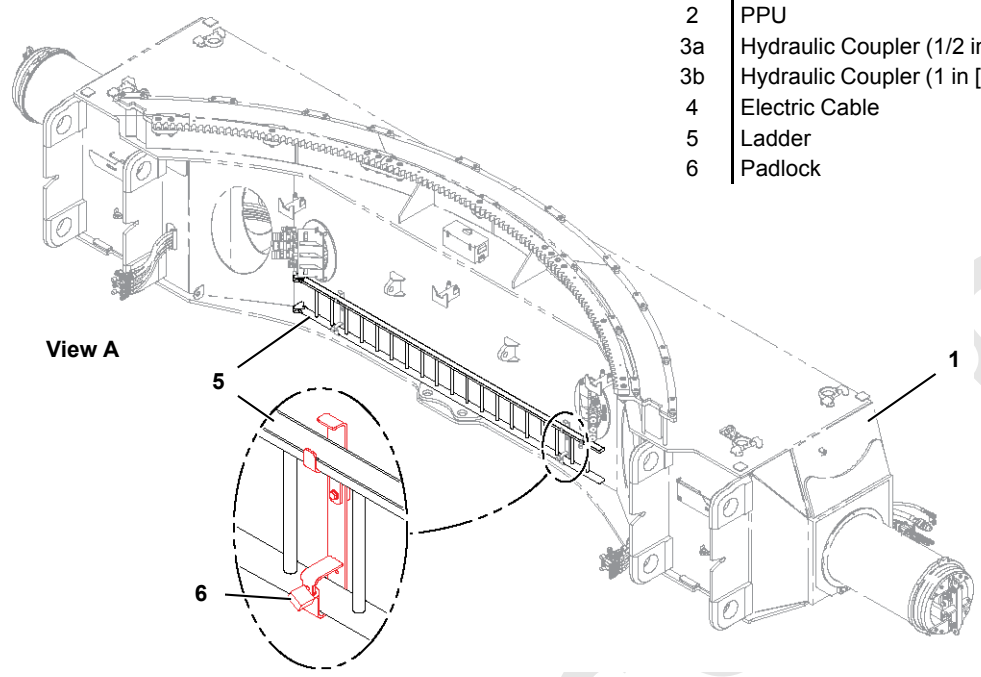


FIGURE 4-12

CRANE ASSEMBLY — CARBODY

NOTE To assist personnel in accessing parts during carbody assembly, a ladder is locked to storage brackets on the front and rear carbody beams (see [Figure 4-12](#)).

Install Front Beam

See [Figure 4-12](#) for the following procedure.

NOTE The front and rear beams are identical and interchangeable. If desired, the rear beam can be installed first.

1. Lift front beam (1) into position in the assembly area.
Use the 4-leg chain lifting sling shown in [Figure 4-10](#), View A.
2. Place the front beam on blocking at least 12 in (305 mm) high.
3. Adjust the blocking so the front beam is level.
4. Disconnect the lifting sling from the front beam.

5. Remove trunnion bore cover (1, [Figure 4-13](#)) from both ends of the front beam.
6. Store trunnion bore cover (1, [Figure 4-13](#)) and the attaching hardware in trunnion shipping container (5) after the trunnions are removed.

Connect Portable Power Unit (PPU)

See [Figure 4-12](#) for the following procedure.

1. Position PPU (2, View B) next to the front beam as shown.
The PPU remains in this position until the roller carriers and drums are installed.
2. Connect two 20 ft 5 in (6,2 m) long hydraulic hoses from the couplers on the left side of the PPU to couplers (3a and 3b, View C) on front beam (1). The hoses are stored in the PPU.
3. Connect the 30 ft (9,1 m) long electric cable from the receptacle on the PPU control panel to electric cable (4, View C) on front beam (1). The electric cable is stored in the PPU.

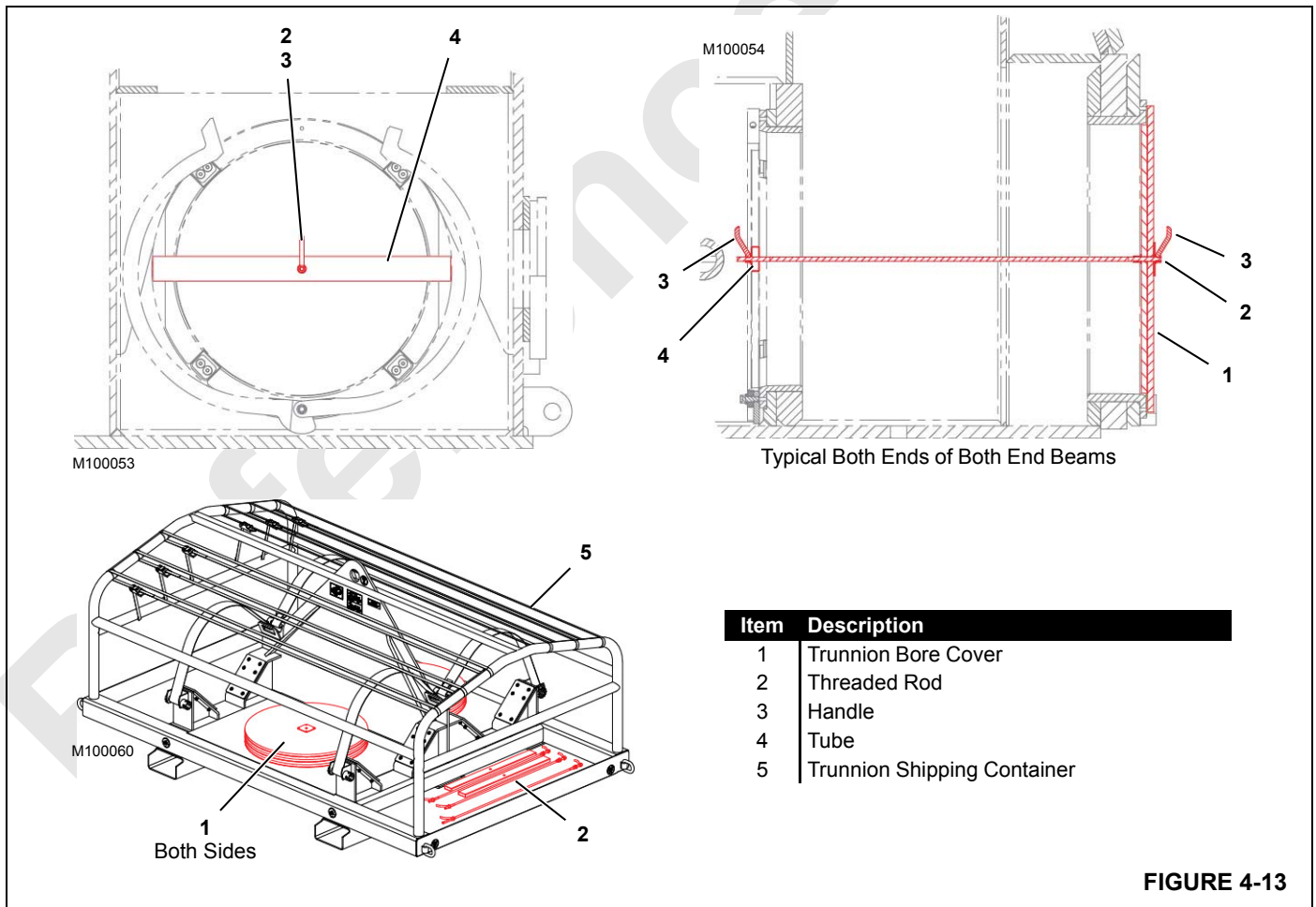
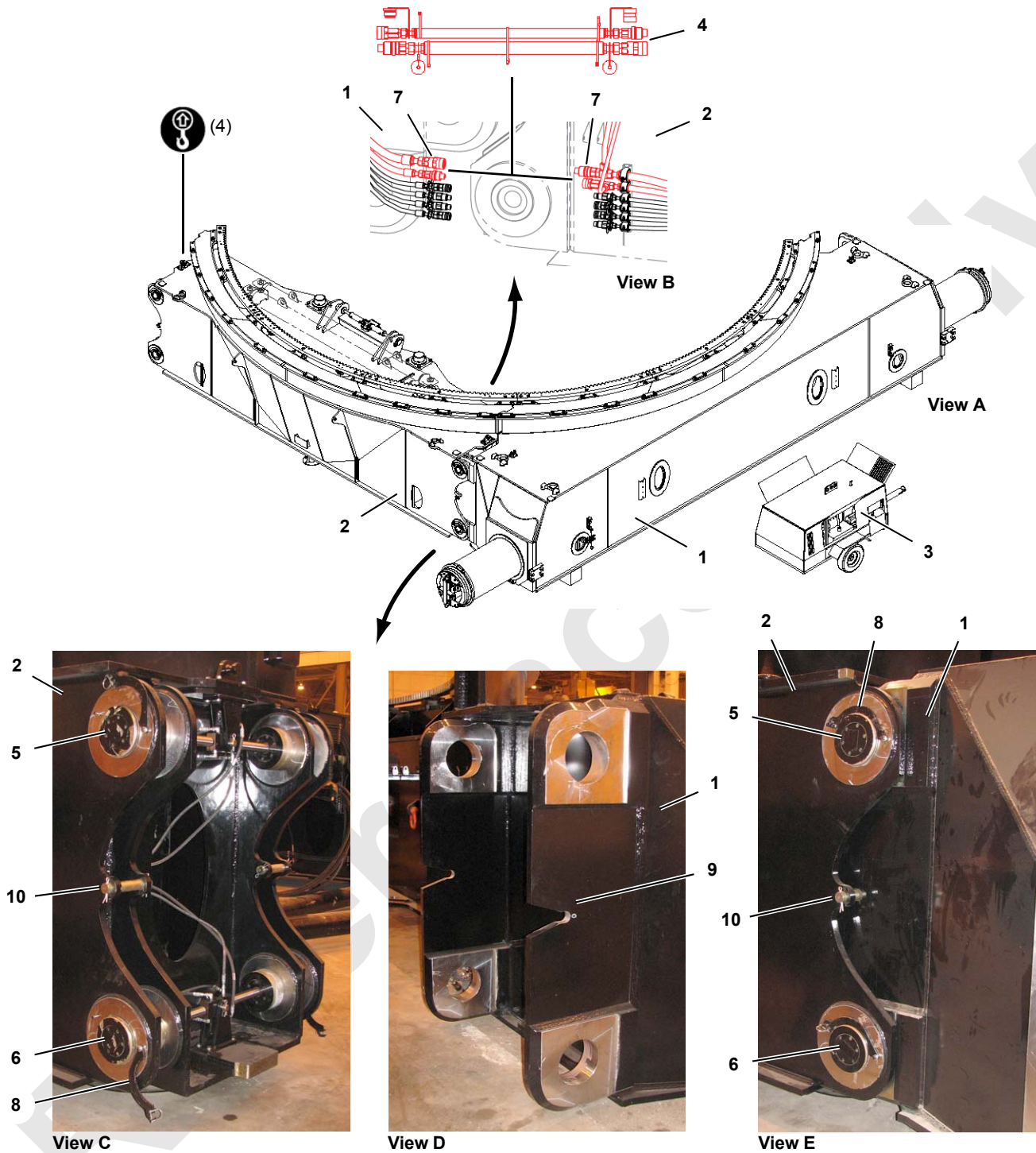


FIGURE 4-13



Item	Description	Item	Description
1	Front or Rear Beam	6	Pin
2	Side Beam	7	Hydraulic Couplers
3	PPU	8	Locking Plate with Wire-Lock Pin
4	Hydraulic Jumper Hoses	9	Alignment Notch
5	Pin	10	Alignment Pin

FIGURE 4-14

Install Side Beams

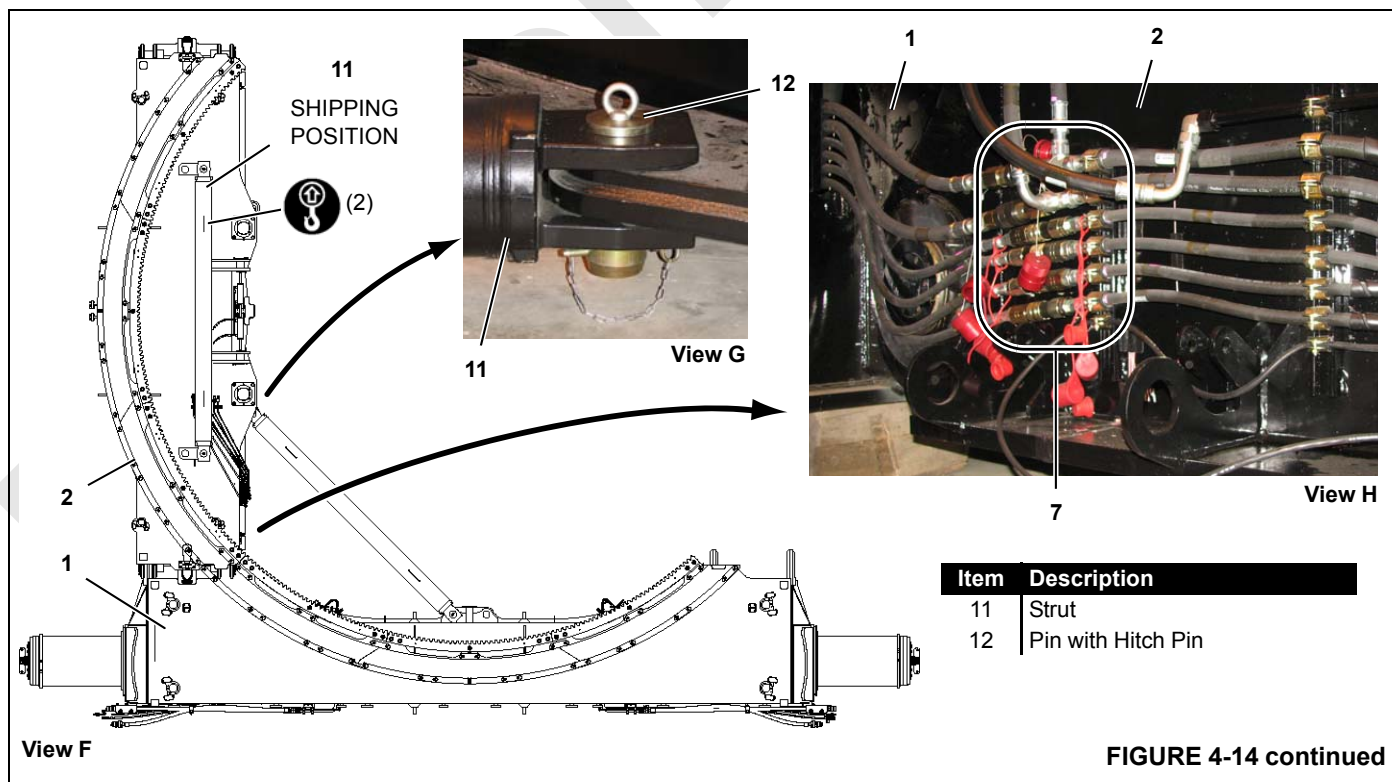
See [Figure 4-14](#) for the following procedure.

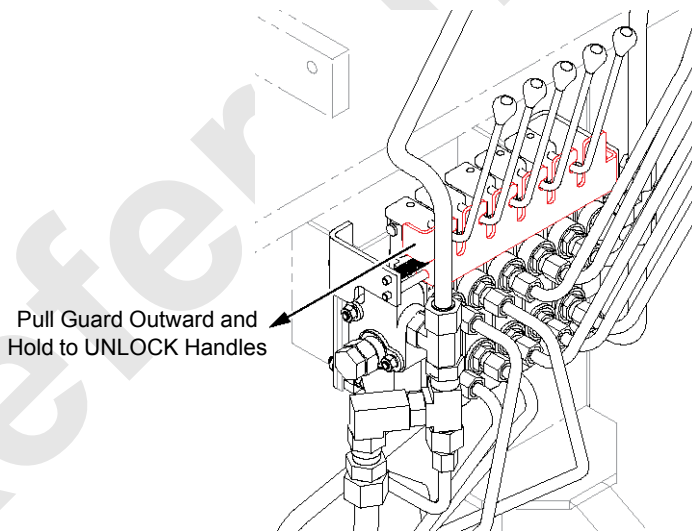
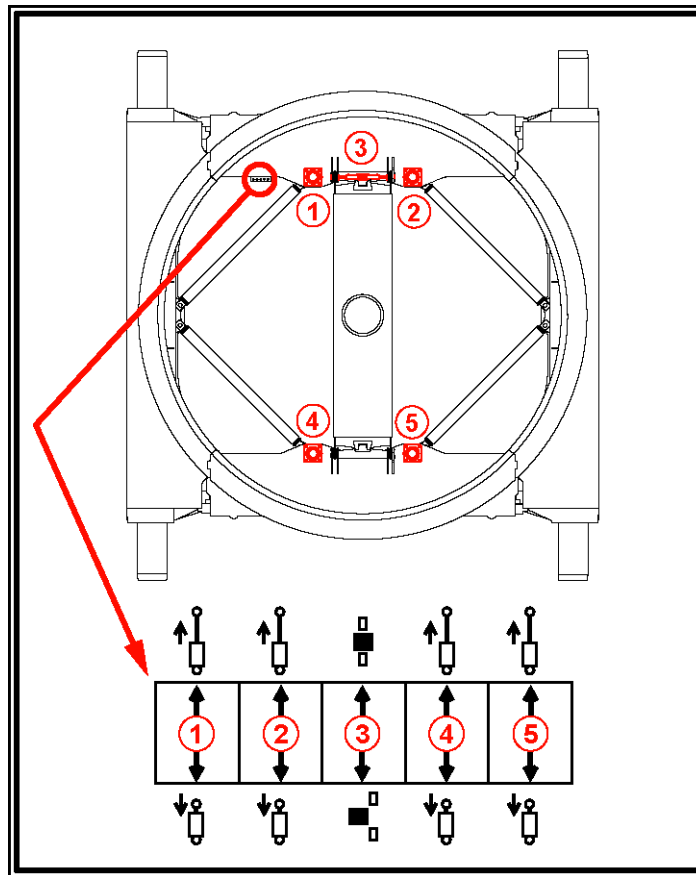
1. Lift desired side beam (2, View A) into position as close as possible to front beam (1). Use the 4-leg chain lifting sling shown in [Figure 4-8](#), View A.

NOTE The side beams are identical and interchangeable from left to right.

2. Connect hydraulic jumper hoses (4, View B) between hydraulic couplers (13) on the beams. The jumper hoses are stored in the PPU.
3. Unpin and rotate locking plates (8, View C) out of the grooves in pins (5 and 6).
4. Start the PPU and disengage pins (5 and 6, View C) using the control handles on the outboard carbony valve. See [Figure 4-16](#).
5. Guide the side beam into engagement with the front beam until alignment notches (9, View D) are snug against alignment pins (10, View C).
6. Engage pins (5 and 6, View E) using the control handles on the carbony outboard valve. See [Figure 4-16](#).
7. Rotate locking plates (8, View E) into the grooves in pins (5 and 6) and install the wire-lock pins.
8. Extend the side beam jacking cylinders ([Figure 4-16](#)) until the jack pads are contacting the ground.

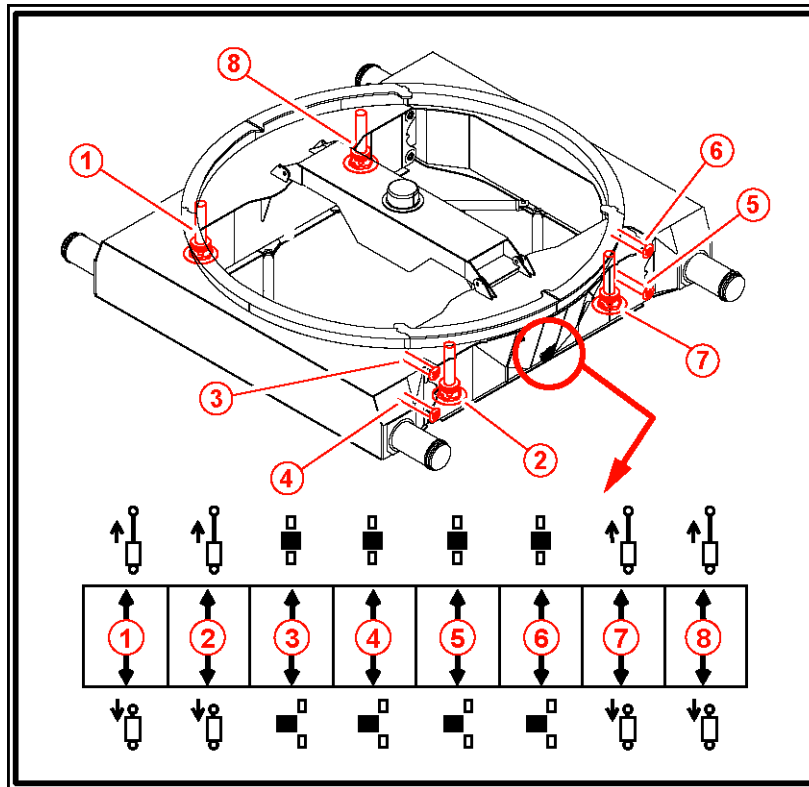
9. Disconnect the lifting sling from the side beam.
10. Attach two legs of the lifting sling to one strut (11, View F).
11. Unpin strut (11) from the shipping position on side beam (2).
12. Lift the strut off the side beam and pin it to the lugs on the side beam and the front beam (View G).
13. Disconnect the lifting sling from the strut.
14. Disconnect hydraulic jumper hoses (4, View B) from couplers (7) on the beams.
15. Connect the hydraulic hoses from front beam (1, View H) to hydraulic couplers (7) on side beam (2).
 - The hoses must be connected in order from top to bottom. The hoses must not cross.
 - Make sure the fittings are clean before connecting them.
 - Store the protective caps in the parts boxes provided on the beams.
16. Repeat the above steps for the other side beam.
17. Extend all four side beam jacking cylinders ([Figure 4-16](#)) to lift the front beam off the blocking and to level all three beams.





Control Handle Identification
Inboard Carbody Control Valve
(typical 2 places)

FIGURE 4-15



**Control Handle Identification
Outboard Carbody Control Valve**
(typical 2 places)

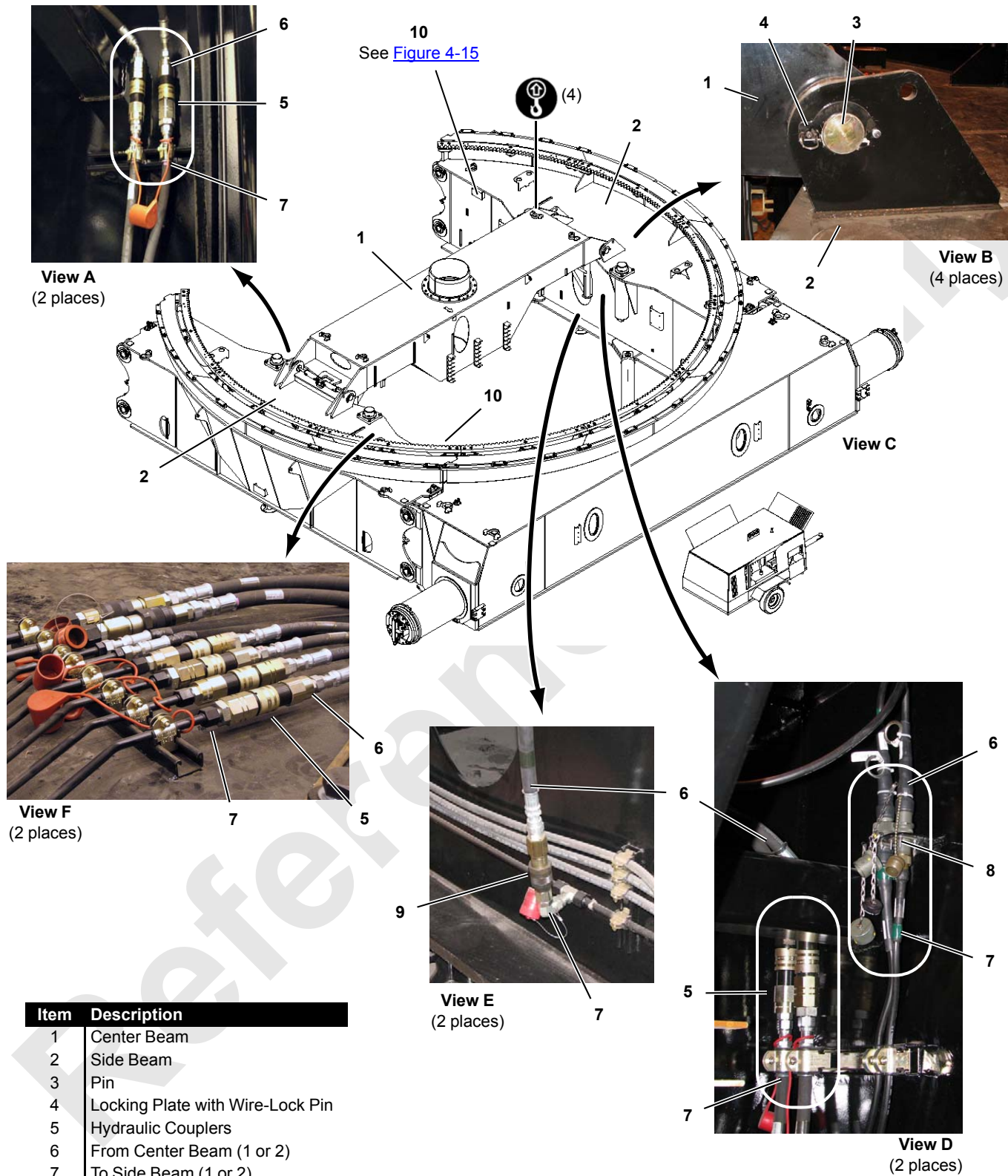
CAUTION

Avoid Damage to Control Valve!

Do not connect hydraulic hoses from PPU cable reel to hydraulic couplers at either outboard carbody valve.

Valve will be damaged when PPU is started.

FIGURE 4-16



Item	Description
1	Center Beam
2	Side Beam
3	Pin
4	Locking Plate with Wire-Lock Pin
5	Hydraulic Couplers
6	From Center Beam (1 or 2)
7	To Side Beam (1 or 2)
8	Electric Receptacles (1 or 2)
9	Grease Coupler
10	Inboard Carbody Control Valve

FIGURE 4-17

Install Center Beam

See [Figure 4-17](#) for the following procedure.

1. Lift center beam (1, View C) into position over side beams (2).

Use the 4-leg chain lifting sling shown in [Figure 4-10](#), View A.

NOTE The center beam is interchangeable from left to right.

2. Unpin and rotate locking plates (4, View B) out of the grooves in pins (3).
3. Disengage pins (3) using the inboard carbody control valve shown in [Figure 4-15](#).
4. Lower the center beam into position so the notch in each end of the center beam engages the alignment lug on each side beam.
5. Continue to lower the center beam until the lifting slings go slack. The pin holes should be aligned.

6. Engage pins (3) using the inboard carbody control valve shown in [Figure 4-15](#).
7. Rotate locking plates (4, View B) into the grooves in pins (C) and install the wire-lock pins.
8. Disconnect the lifting sling from the center beam.
9. The hydraulic hoses on each end of the center beam are coupled together for shipment. Uncouple the hoses and thoroughly clean the fittings.
10. Connect the hydraulic hoses from the ends of the center beam to the side beams as shown in Views A and F.
The fitting arrangement allows the hoses to be connected one way only. The hoses must not cross.
11. Connect electric cables (8) from the center beam to the side beams as shown in View D.
12. Connect the grease hoses (9) from the center beam to side beams as shown in View E.

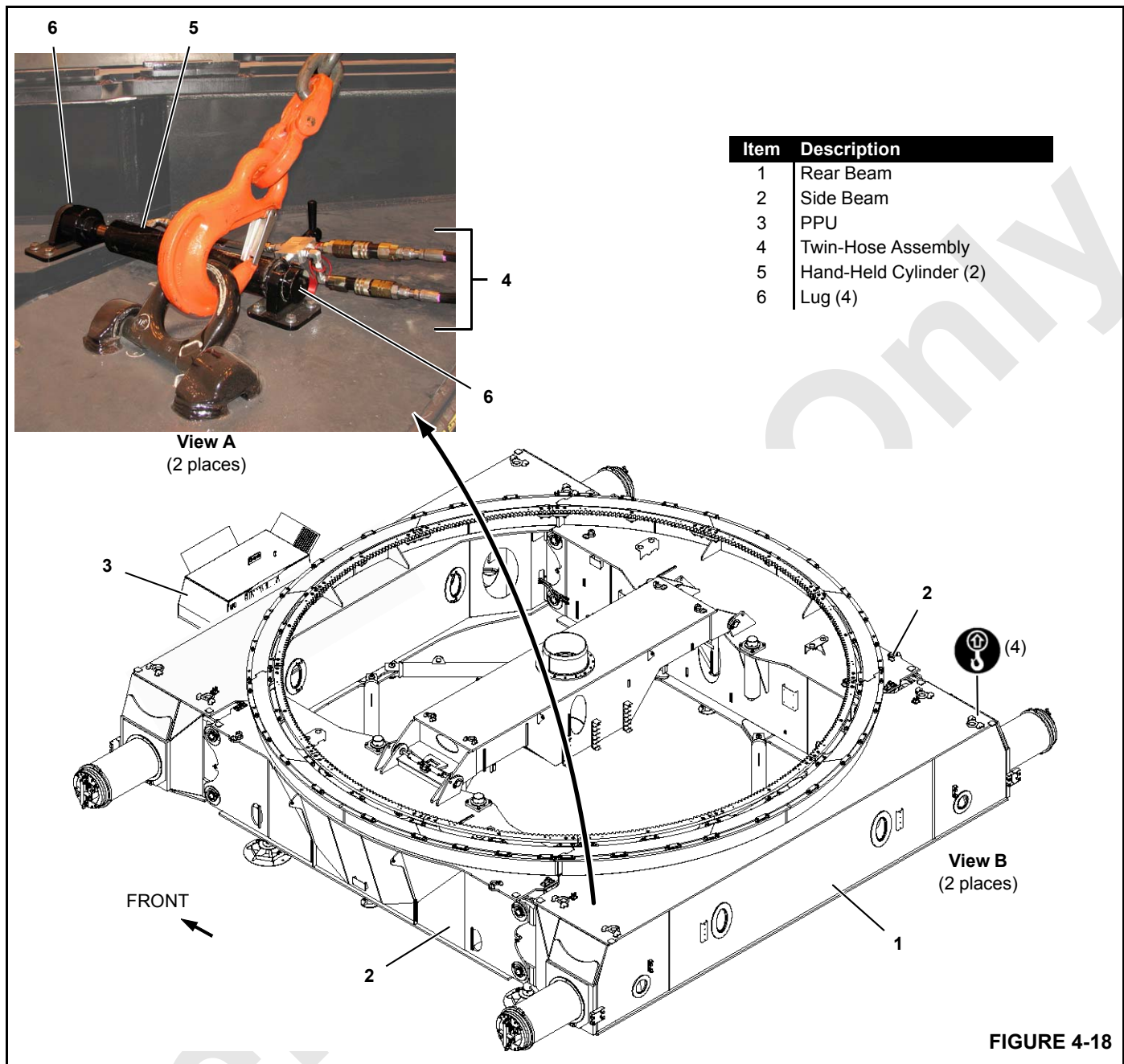


FIGURE 4-18

Install Rear Beam

Unless otherwise indicated, see [Figure 4-18](#) for the following procedure.

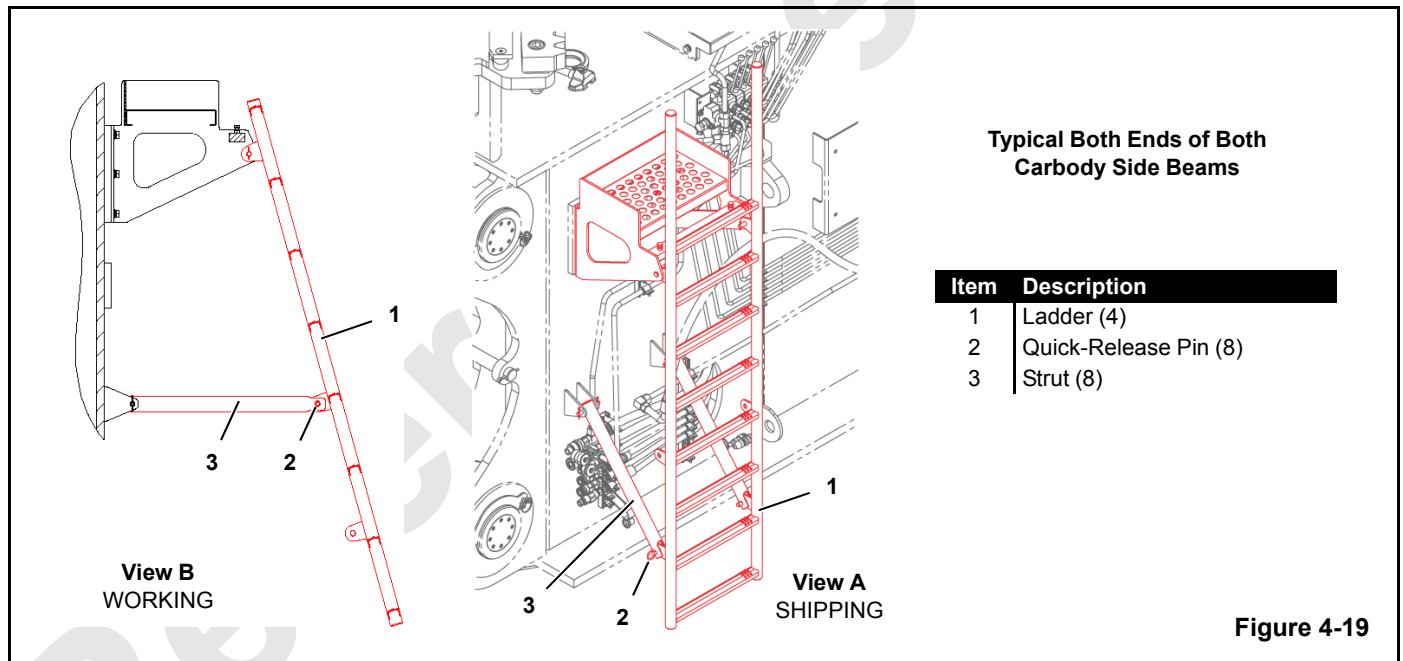
1. Lift rear beam (1) into position as close as possible to side beams (2). Use the 4-leg chain lifting sling shown in [Figure 4-8](#), View A.
2. Connect hydraulic jumper hoses ([Figure 4-14](#), View B) between the hydraulic couplers on the beams.
3. Unpin and rotate the locking plates out of the grooves in the side beam pins ([Figure 4-14](#), View C).
4. Start the PPU and disengage the side beam pins using the control handles on the outboard carbody valves. See [Figure 4-16](#).
5. Repeat above steps 2 and 3 at the other end of the rear beam.
6. Raise or lower the rear beam so the roller path surface is level with the roller surface of the side beams.
7. Attach a twin hose assembly (4, View A) to both hand-held cylinders (5).

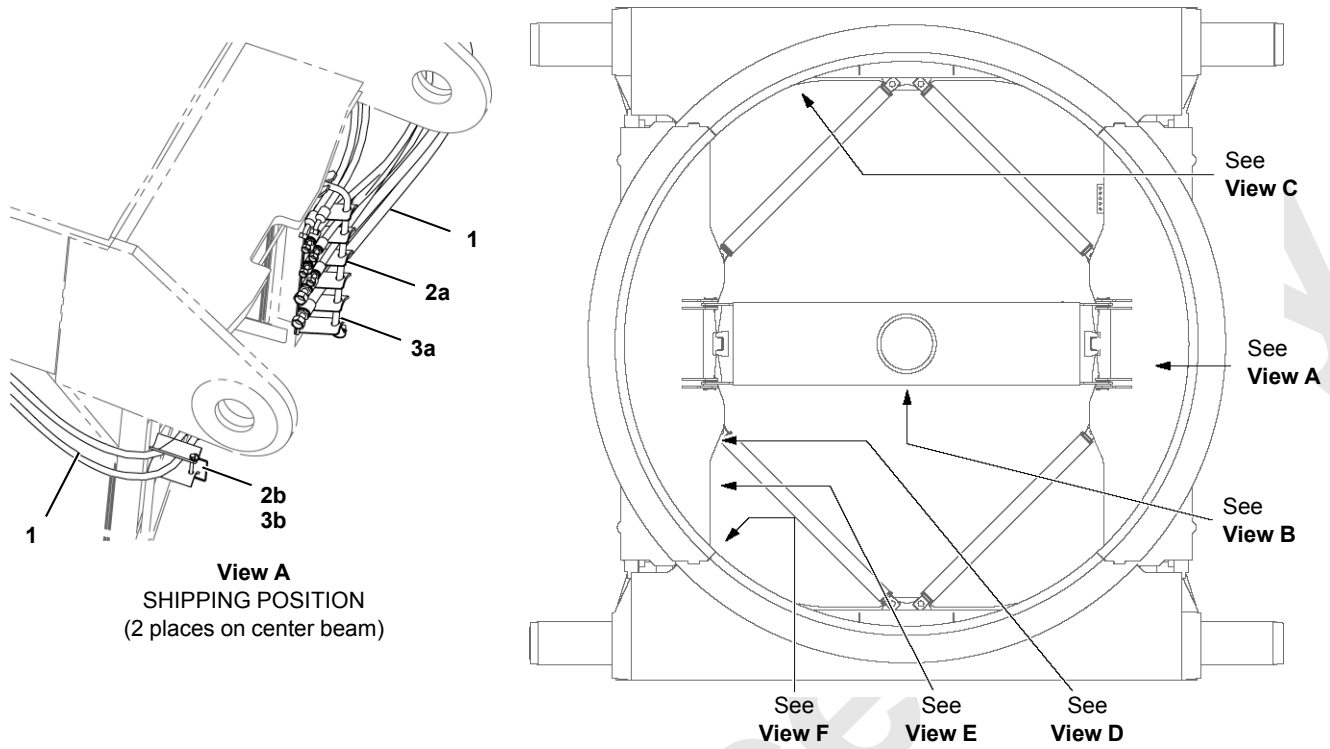
8. Connect the other end of the twin hose assemblies to the couplers at both carbody outboard valves. See [Figure 4-16](#).
 9. Start the PPU and extend or retract the hand-held cylinders, as necessary, and connect them to lugs (6, View A) on the beams.
 10. Retract both hand-held cylinders simultaneously to pull the rear beam into engagement with the side beams.
 11. Once the pin holes in the beams are aligned, engage the top side beam pins using the control handles on the outboard carbody valves. See [Figure 4-16](#).
 12. Lower the rear beam until the lifting slings are slack and engage the bottom side beam pins.
 13. Rotate the locking plates into the grooves in the side beam pins and install the wire-lock pins ([Figure 4-14](#), View E).
 14. Disconnect the lifting slings from the rear beam.
 15. Install the remaining two struts between the side beams and the rear beam in the same manner the previous struts were installed (steps [11](#) through [13](#) on [page 4-19](#)).
 16. Disconnect hydraulic jumper hoses ([Figure 4-14](#), View B) and store them in the PPU.
 17. Remove trunnion bore cover (1, [Figure 4-13](#)) from both ends of the rear beam.
 18. Store trunnion bore cover (1, [Figure 4-13](#)) and the attaching hardware in the trunnion shipping container after the trunnions are removed.
 19. Connect the hydraulic hoses from rear beam (1, [Figure 4-14](#), View H,) to the hydraulic couplers on side beam (2).
- The hoses must be connected in order from top to bottom. The hoses must not cross.
- Make sure the fittings are clean before connecting them.

Deploy Carbody Internal Ladders

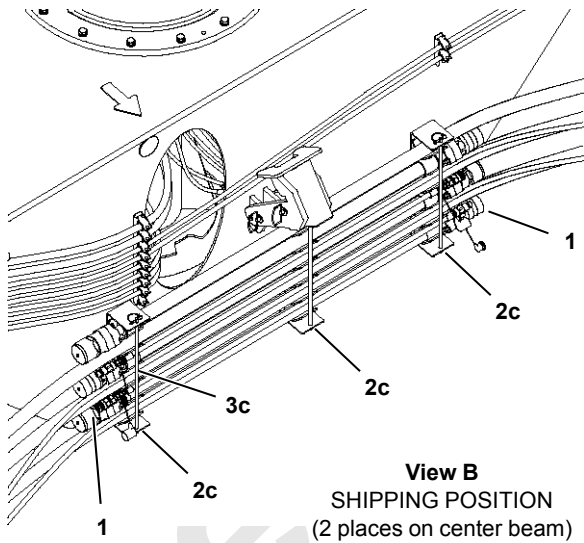
See [Figure 4-21](#) for the following procedure.

1. Unpin ladders (1, View A) from the shipping position on the side beams.
2. Pin the ladders in the working position (View B).

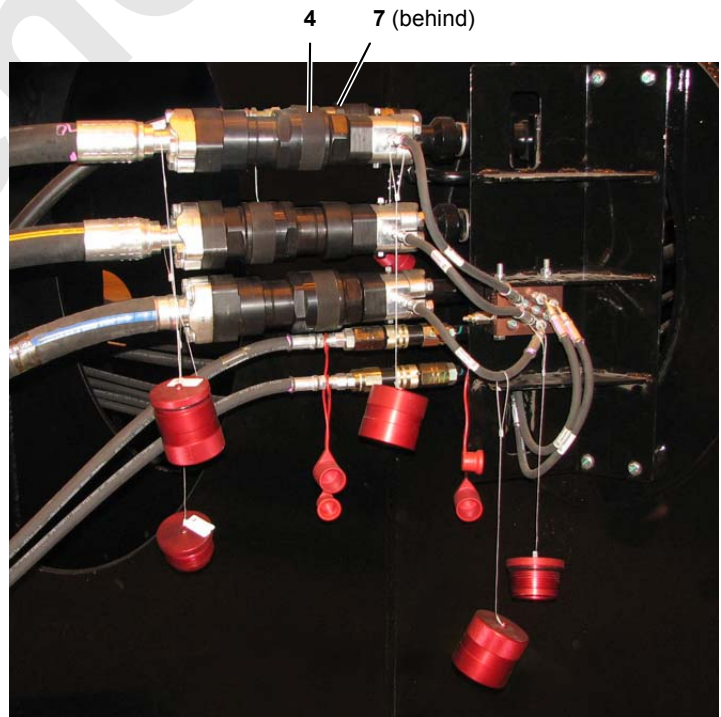




View A
SHIPPING POSITION
(2 places on center beam)



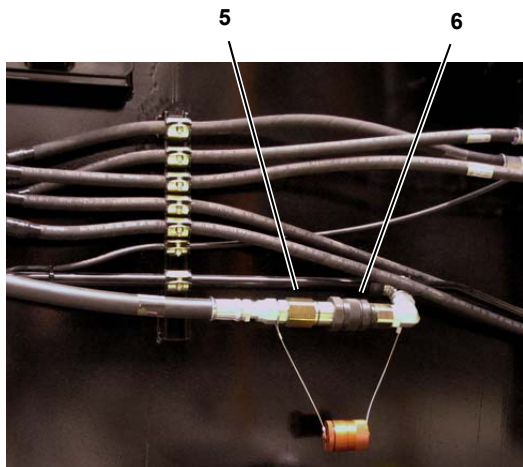
View B
SHIPPING POSITION
(2 places on center beam)



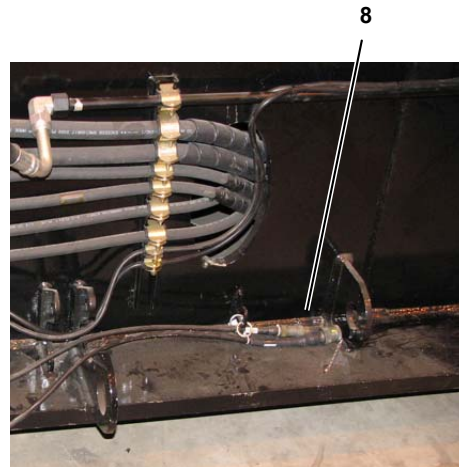
View C
WORKING POSITION
(2 places each end beam)

Item	Description
1	Hydraulic Hoses
2a	Bracket
2b	Bracket
2c	Bracket
3a	Pin with Wire Lock Pin
3b	Wire Lock Pin
3c	Pin with Wire Lock Pin
4	Hydraulic Couplers on End Beam

FIGURE 4-20



View D
SHIPPING POSITION
(2 places each side beam)



View E
SHIPPING POSITION
(1 or 2 places each side beam)



View F
WORKING POSITION
(1 or 2 places each front or rear beam)

Item	Description
5	Grease Hose
6	Storage Coupler
7	Grease Coupler
8	Electric Cables
9	Receptacles

FIGURE 4-20 continued

Connect Hydraulic Hoses

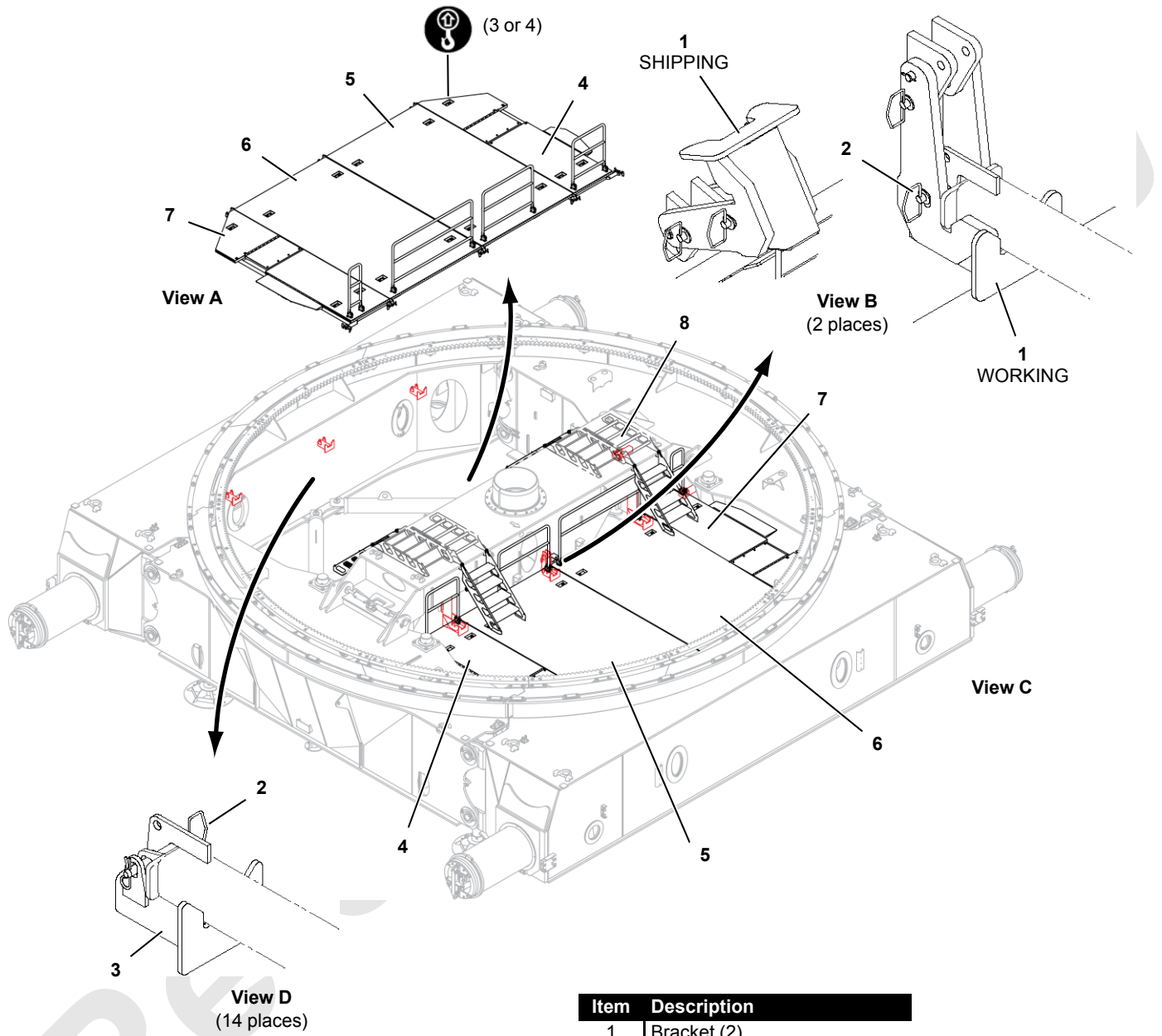
Connect the hydraulic hoses from the center beam to the front and rear beams (see [Figure 4-20](#), View B).

Connect Grease Hoses

Connect the grease hoses from the side beams to the front and rear beams (see [Figure 4-20](#), View D).

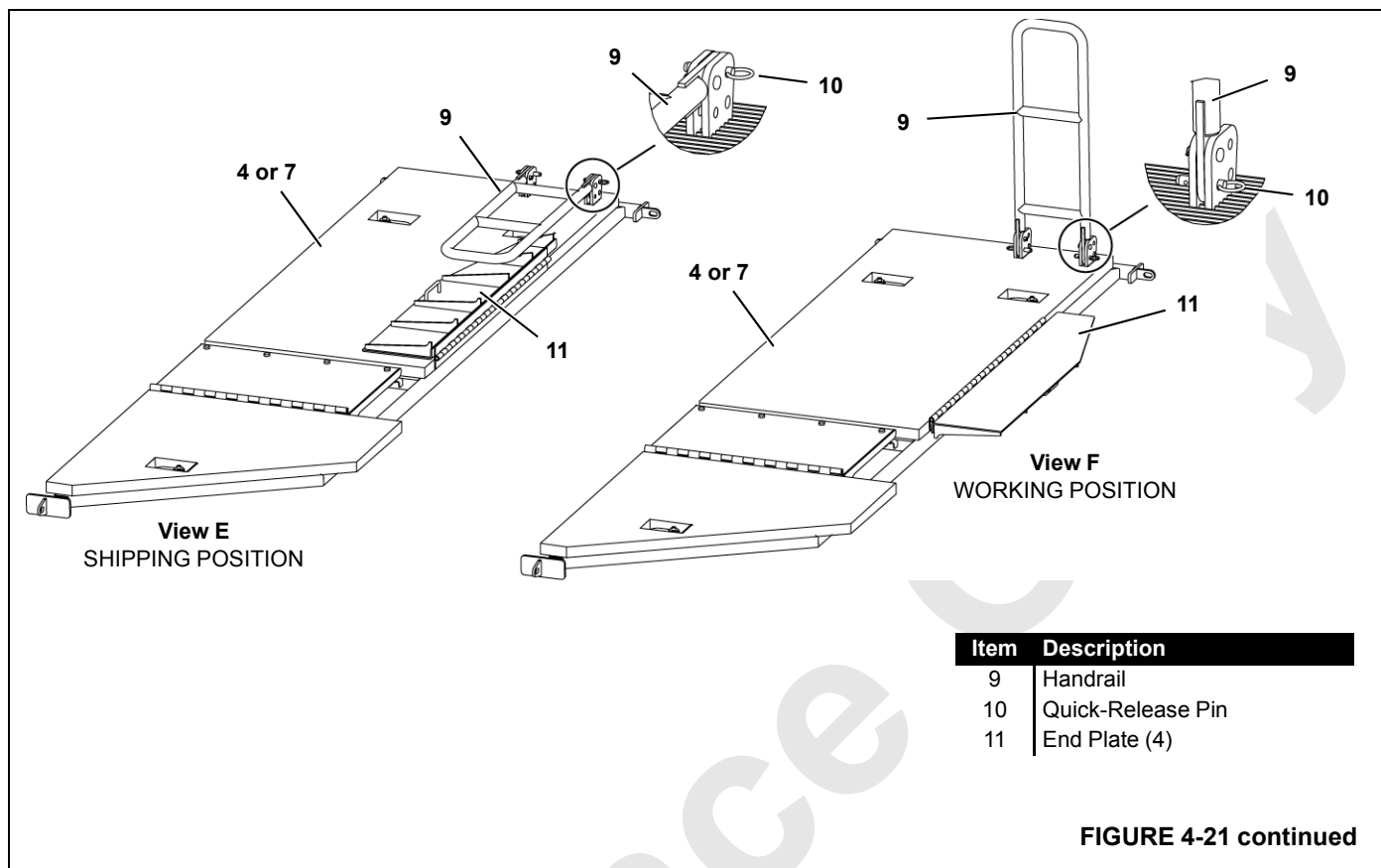
Connect Electric Cables

Connect the electric cables from the side beams to the front and rear beams (see [Figure 4-20](#), View E).



Item	Description
1	Bracket (2)
2	Hitch Pin with Hair-Pin Cotter
3	Bracket (14)
4	Platform
5	Platform
6	Platform
7	Platform
8	Stairway (4)

FIGURE 4-21



Install Carbody Interior Platforms

See [Figure 4-21](#) for the following procedure.

Perform the following steps at both ends of the carbody.

1. Lower two brackets (1, View B) on the center beam from the shipping position to the working position.
2. Remove hitch pins (2, Views B and D) from brackets (1 and 3) on the beams (16 places).
3. Lift platforms (4 through 7, View A) — one at a time — into position on brackets (1 and 3) at both ends of the carbody.

NOTE Adjust the length of the lifting the slings so that when lifted the inboard end of each platform is 3 ft (0,9 m) higher than the outboard end of the

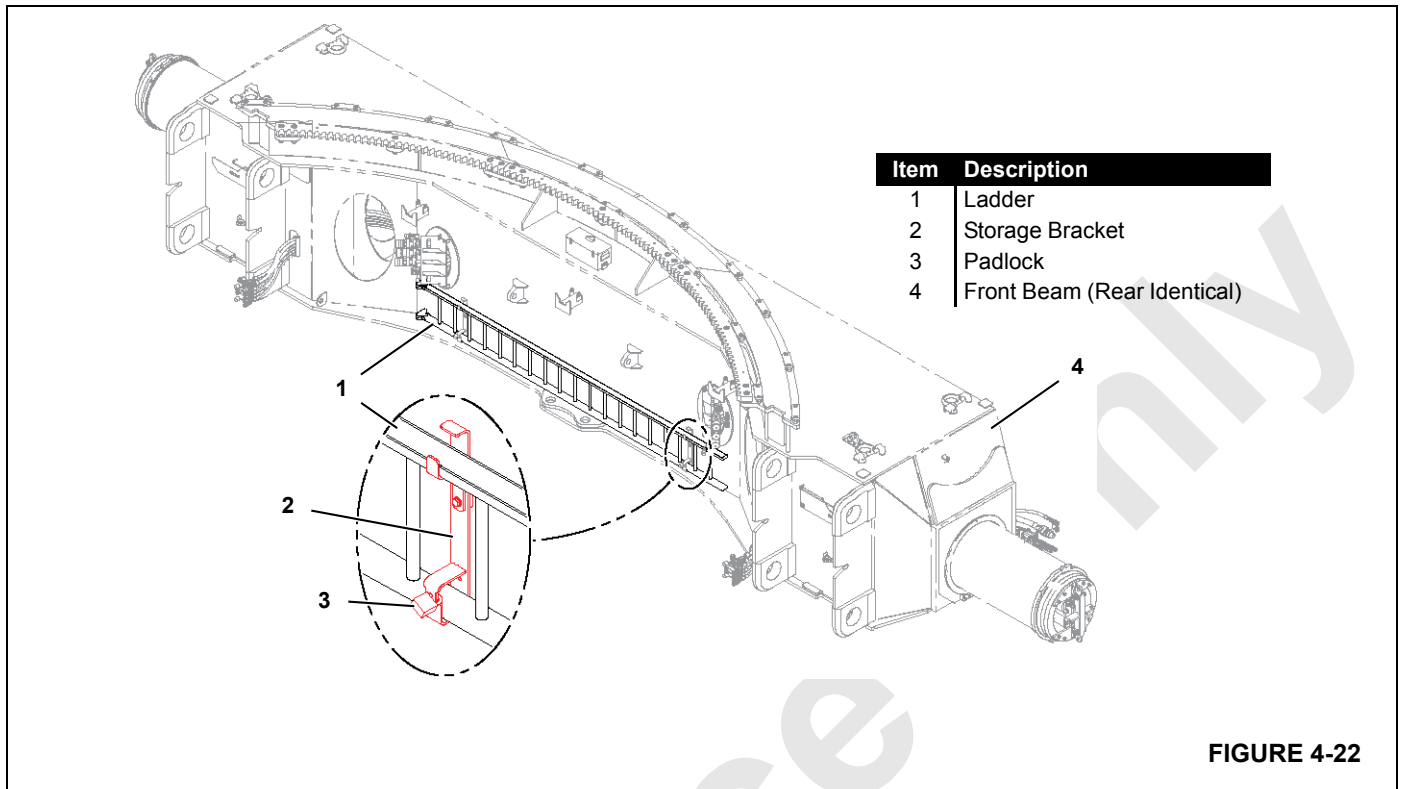
platform. Platform installation will be difficult if you don't perform this step.

4. Install hitch pins (2, Views B and D) to secure the platforms to the brackets.
The brackets can be reached from the tops of the platforms.
5. Rotate stairways (8, View C) on the center beam from the shipping position to the working position.
6. Raise handrails (9, View E) from the shipping position and pin in the working position (View F).
7. For platforms (4 and 7), rotate end plates (11, View E) from the shipping position to the working position (View F).

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Reference Only



Deploy Carbody Removable Ladders

Remove ladders (1, [Figure 4-22](#)) from storage brackets (2) and place the ladders against the outboard sides of front and rear beams (4).

Use the ladders to access the top and inboard sides of the carbody beams until after the crawlers are installed.

DO NOT install the carbody front and rear exterior platforms until after the crawlers are installed and the crawler hydraulic hoses, grease piping, and electric cables are connected.

The crawler hydraulic hoses, grease piping, and electric cables will be extremely hard to connect if you install the carbody front and rear exterior platforms now.

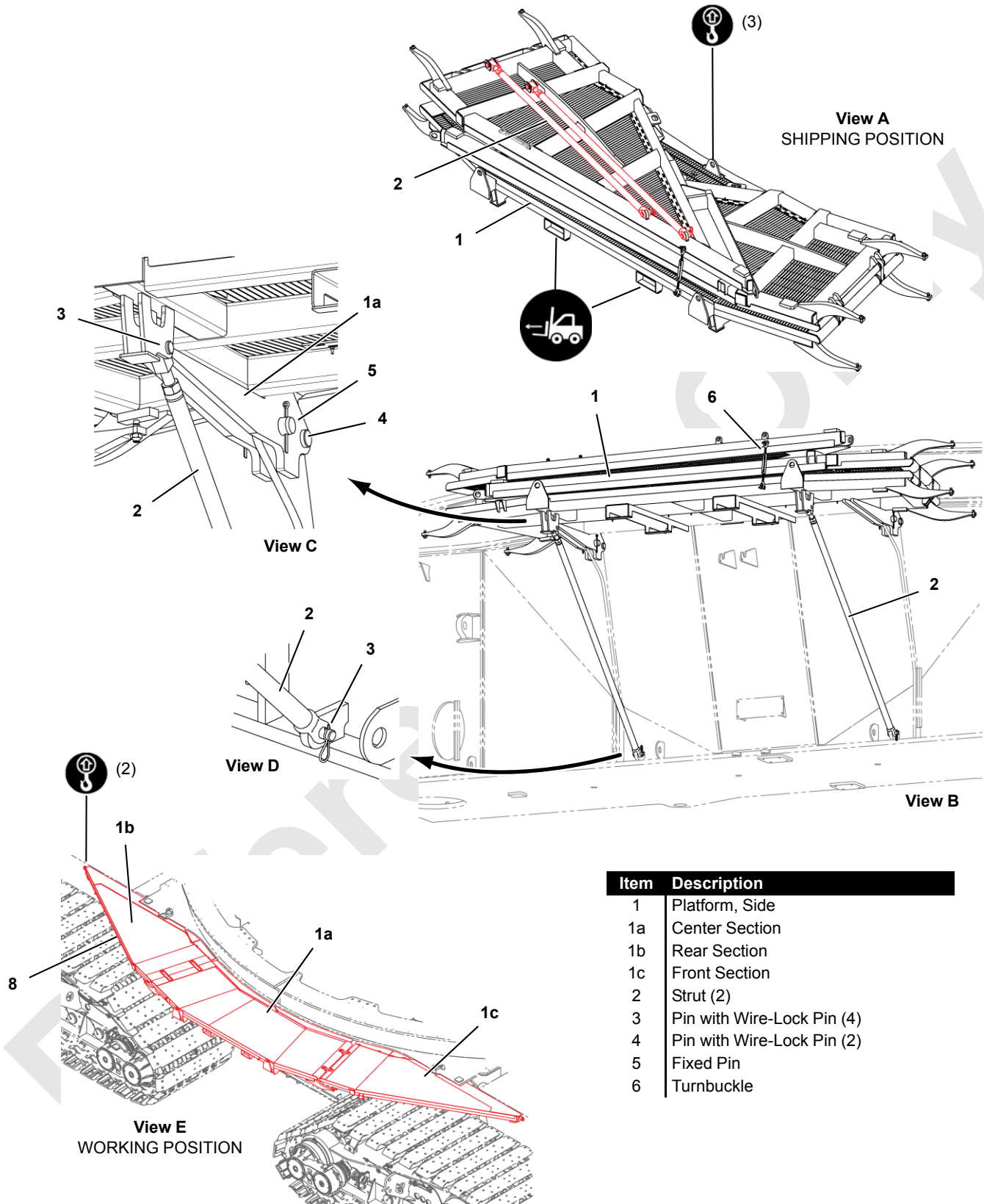


FIGURE 4-23

Install Carbody Side Exterior Platforms

See [Figure 4-23](#) for the following procedure.

Perform the following steps at both sides of the carbody — right and left.

1. Lift platform assembly (1, View A) off the trailer:
 - With slings from the assist crane OR
 - With forks from a forklift.
2. Remove struts (2, View A) from the shipping position.
3. Lift the platform assembly into position at the carbody side beam so fixed pins (3, View C) in center section (1a) engage the hooked brackets on the side beam.
4. Install pins (4, View C).
5. Install struts (2, Views C and D) between the lugs in the center section and the side beam.
6. Disconnect the assist crane or remove the forklift.
7. After the crawlers are installed, rotate front and rear sections (1b and 1c, View E) to the working position. Each section has a lifting lug for this purpose.

NOTE The struts and platform sections have adjusting screws and lock nuts that can be adjusted to level the sections.

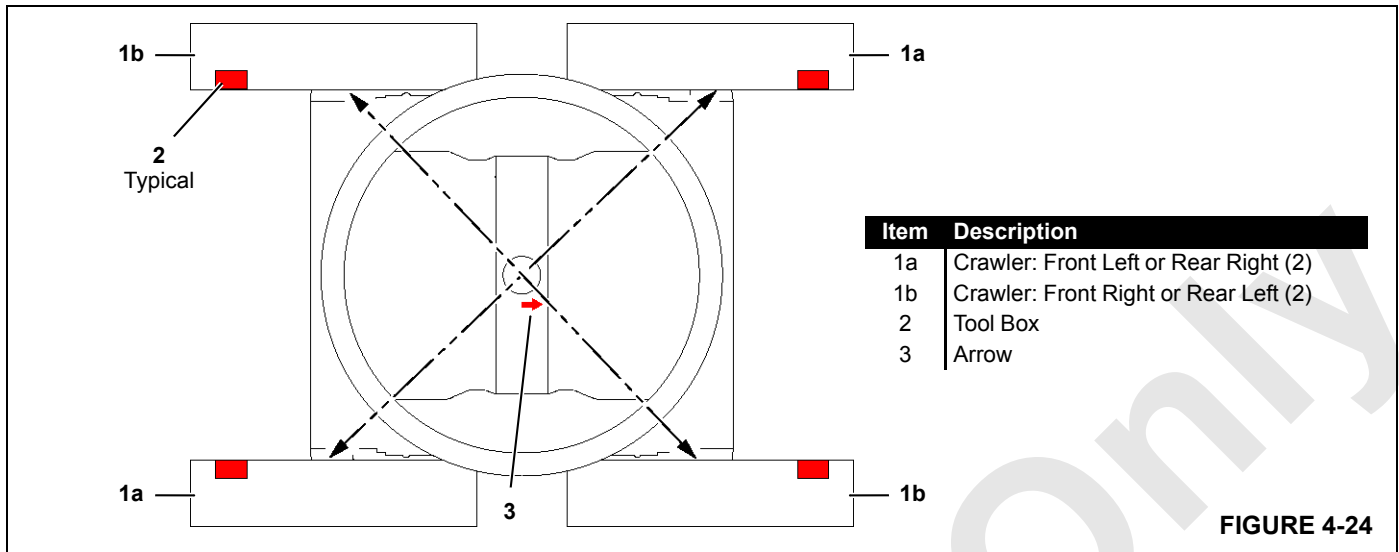


FIGURE 4-24

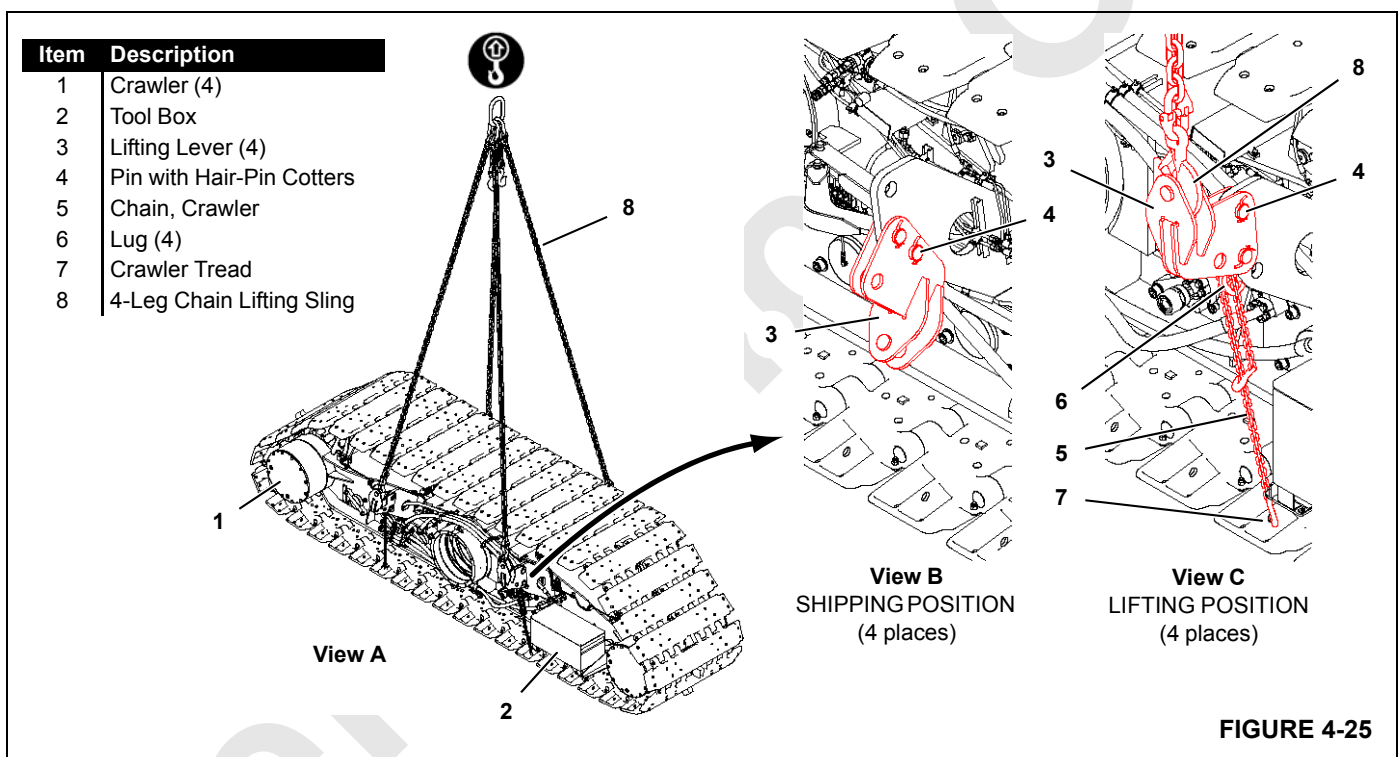


FIGURE 4-25

CRANE ASSEMBLY — CRAWLERS

Identifying Crawlers

See [Figure 4-24](#) for the following procedure.

Four crawlers are provided:

- Front Left and Rear Right crawlers (1a) are interchangeable.
- Front Right and Rear Left crawlers (1b) are interchangeable.

FRONT is determined by arrow (3) in the top of the center beam.

Note the position of tool box (2) on each crawler.

Handling Crawlers

See [Figure 4-25](#) for the following procedure.

1. Rotate lifting levers (3, View B) from the shipping position to the lifting position and pin (View C).

- Before lifting a crawler with the treads installed, snugly attach four chains (5, View C) between lugs (6) and a hole in four treads (7).

The chains are stored in tool box (2, View A) on each crawler.

The chains prevent the treads from sagging excessively when the crawler is lifted.

- Attach four legs of chain lifting sling (8) to the lifting levers.
- Lift the crawler with the assist crane.

Removing Crawler Covers

The outboard side of each crawler is equipped with covers (Figure 4-26) to protect components. During crawler installation it is necessary to remove covers:

- Remove covers (1 and 2) to access components if the trunnion will not be removed with the crawler.
 - Remove all four covers (1, 2, 3a, and 3b) to access components if the trunnion will be removed with the crawler.
 - Store the covers in a safe location during disassembly.
 - Reinstall the covers after the crawlers are installed.
- If the trunnion is shipped in the crawler, trunnion cover (2) on crawler parts box (4).
- If the trunnions are not shipped in the crawlers, remove trunnion bore cover (5, Figure 4-26) from both ends of each crawler.

Store the trunnion bore covers and attaching hardware in the trunnion shipping containers after the trunnions are removed (see Figure 4-13).

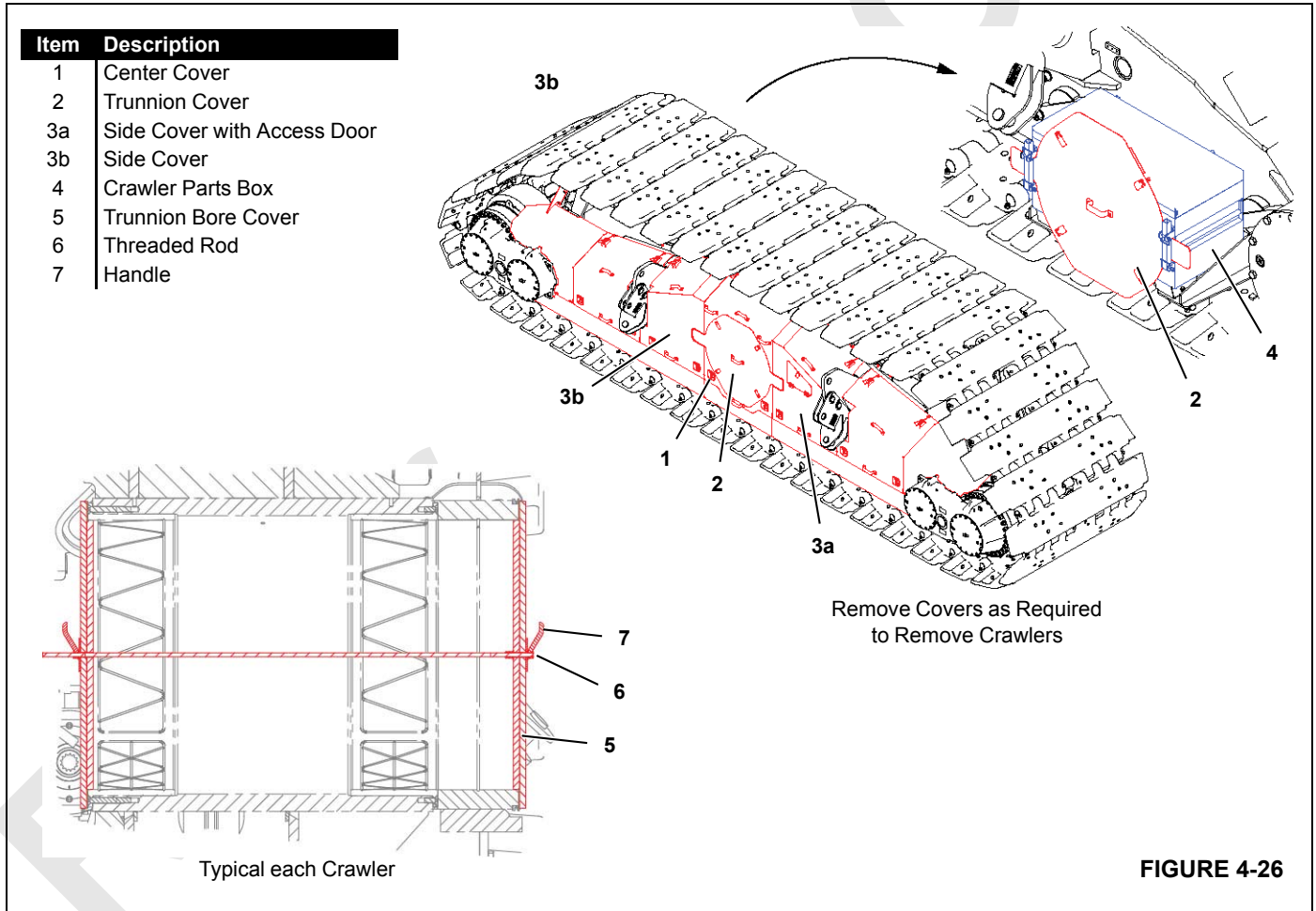


FIGURE 4-26

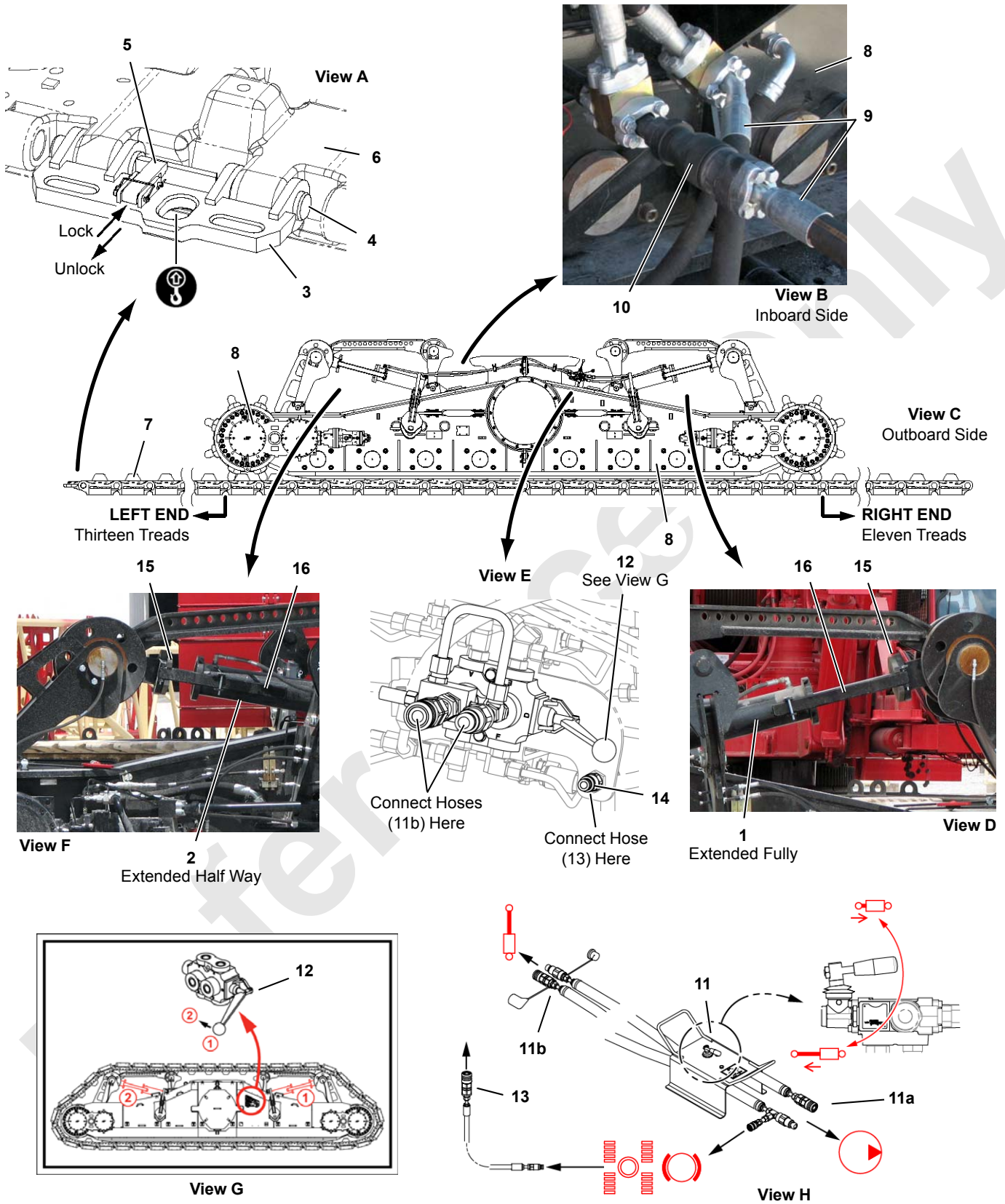


FIGURE 4-27

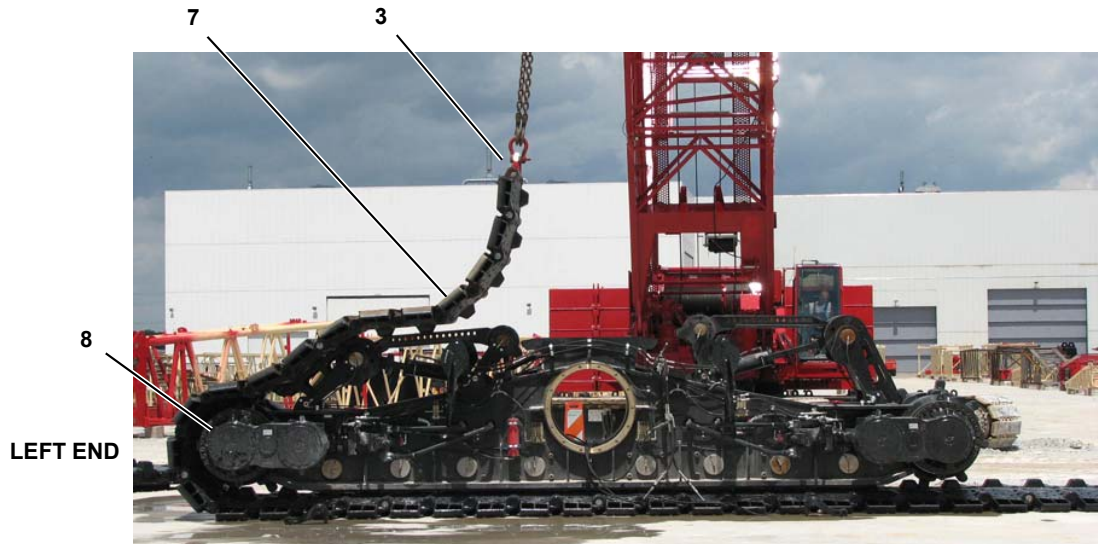
Legend for [Figure 4-27](#)

Item	Description
1	Crawler Tensioner (right)
2	Crawler Tensioner (left)
3	Lifting link
4	Pin (2)
5	Retainer
6	Tread
7	Crawler Treads (string)
8	Crawler
9	Hydraulic Hose (high pressure)
10	Coupler (high pressure)
11	Hand-Held Accessory Valve
11a	Hydraulic Hoses (to PPU)
11b	Hydraulic Hoses (to tensioner select valve)
12	Tensioner Select Valve
13	Hose Assembly — 15 ft (4.6 m)
14	Coupler (brake release)
15	Shim
16	Shim Retaining Bar

Installing Crawler Treads

Perform this procedure only if the crawler treads are not installed. See [Figure 4-27](#).

- Pin and lock lifting link (3, View A) to crawler tread (6).
- Attach one leg of the chain lifting sling to lifting link (3).
- Lift the string of crawler treads (7, View C) off the trailer and lay them on a firm, level foundation.
- Disconnect the lifting sling.
- Lift crawler (8, View C) onto the string of crawler treads so the crawler is one tread off center: 13 treads to the left and 11 threads to the right.
 - Move the handle for tensioner select valve (12, View G) UP to operate right crawler tensioner (1).
 - Move the handle for tensioner select valve (12, View G) DOWN to operate left crawler tensioner (2).
 - Rotate the handle for hand-held accessory valve (11, View H) to the extend position.
 - Extend right crawler tensioner (1, View D) FULLY.
 - Extend left crawler tensioner (2, View F) HALF WAY.
 - Move the handle to the center position once the tensioners are extended.
- Disconnect the lifting slings from the crawler.
 - Lift the crawler as shown in [Figure 4-25](#).
 - Left and right are indicated in View C.
- Remove hydraulic hose (9, View B) from storage on the crawler and connect the hose to coupler (10). This step allows the crawler motors to rotate freely during the remaining steps.
- If it is running, stop the PPU.
- Connect hoses (11a) from hand-held accessory valve (11, View H) to the PPU.
- Connect hoses (11b) from hand-held accessory valve (11, View H) to tensioner select valve (12, View E).
- Connect hose assembly (13, View H) to the brake release coupler at hand-held accessory valve (11) and to coupler (14, View B).
- Start the PPU. The crawler brakes will release.
- Extend the crawler tensioners, as follows:
 - Remove all but one 1 in (25.4 mm) shim (15, Views D and F) from both crawler tensioners.



View A



View B



Item	Description
3	Lifting link
7	Crawler Treads
8	Crawler

FIGURE 4-28

See [Figure 4-28](#) for following steps.

15. Attach one leg of the chain lifting sling to lifting link (3) on the left end of crawler treads (7, View A).
16. Lift and wrap the crawler treads around the left end of the crawler as shown in Views A and B.

 **WARNING**
Crush Hazard!

Keep all personnel at least 25 ft (7.6 m) away from left end of crawler.

Personnel can be struck or crushed if crawler treads fall off crawler.

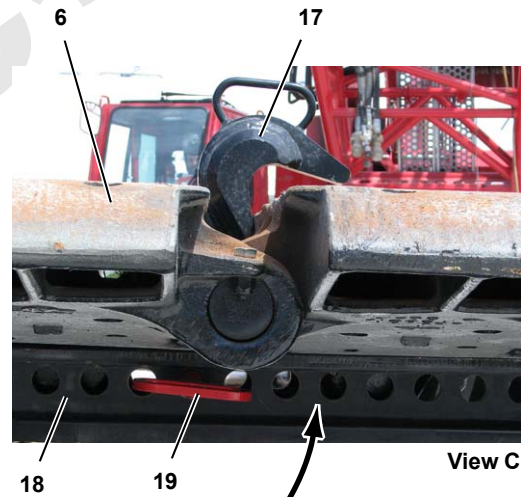
17. Disconnect lifting link (3) from the crawler tread.



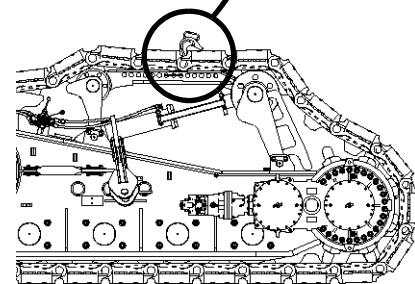
View A



View B



View C



Item	Description
3	Lifting link
6	Tread
7	Crawler Treads
8	Crawler
17	Tensioning Lug
18	Tensioner Frame
19	Hitch Pin with Hair-Pin Cotter

FIGURE 4-29

18. Pin and lock lifting link (3, [Figure 4-26](#), View A) to crawler tread (6) on the right end of the crawler.

See [Figure 4-29](#) for the following steps.

19. Attach one leg of the chain lifting sling to lifting link (3) on the right end of crawler treads (7, View A).

20. Slowly lift the right end of crawler treads (7, View A) to the vertical position.

21. Continue to slowly lift the treads so the crawler rolls to the left.

22. Stop when the crawler is centered on the treads (View B).

23. Lower the crawler treads onto the crawler as shown in View B.

24. While holding the crawler treads in position with the assist crane, install tensioning lug (17, View C) on the right end of the crawler:

- a. Lift tensioning lug (17, View C) into position between two crawler treads.

The tensioning lugs are stored in the crawler parts box.

The hooked end of the lug must point toward the nearest end of the crawler.

- b. Pin the tensioning lug to the holes in tensioner frame (18).

25. Disconnect lifting link (3, View B) from the crawler tread.

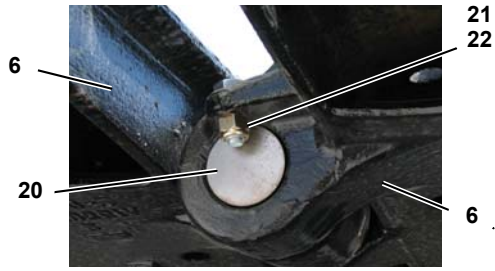
26. Repeat steps [24a](#) and [b](#) for the left end of the crawler.



WARNING

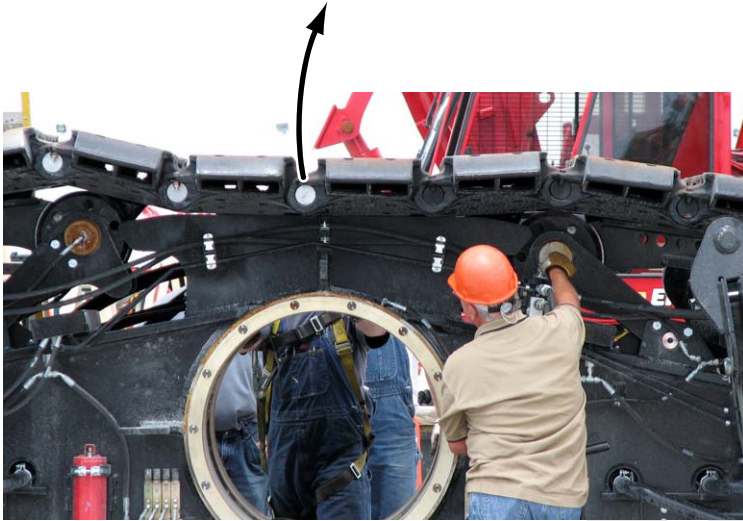
Falling Load Hazard!

Do not disconnect lifting link from crawler tread until tensioning lug is installed. Crawler treads could fall off end of crawler.



View A
(both ends of each tread)

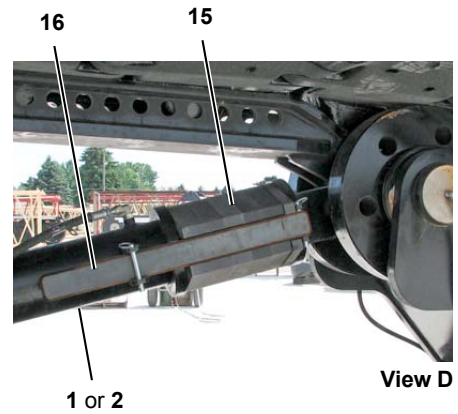
Item	Description
1	Crawler Tensioner (right)
2	Crawler Tensioner (left)
6	Tread
15	Shims
16	Shim Retaining Bar
20	Pin
21	Screw
22	Lock Nut



View B



View C



View D

FIGURE 4-30

**WARNING****Crush Hazard!**

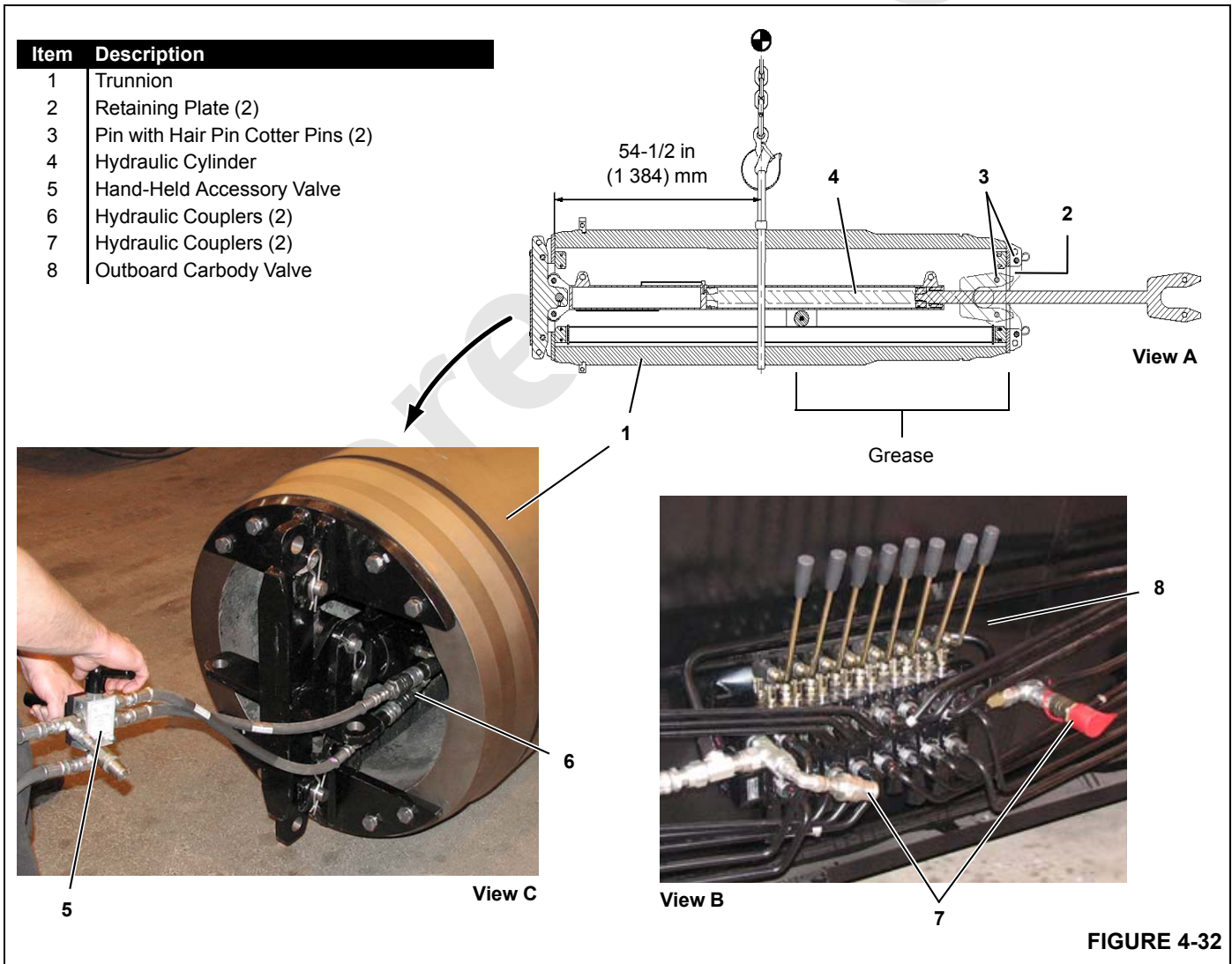
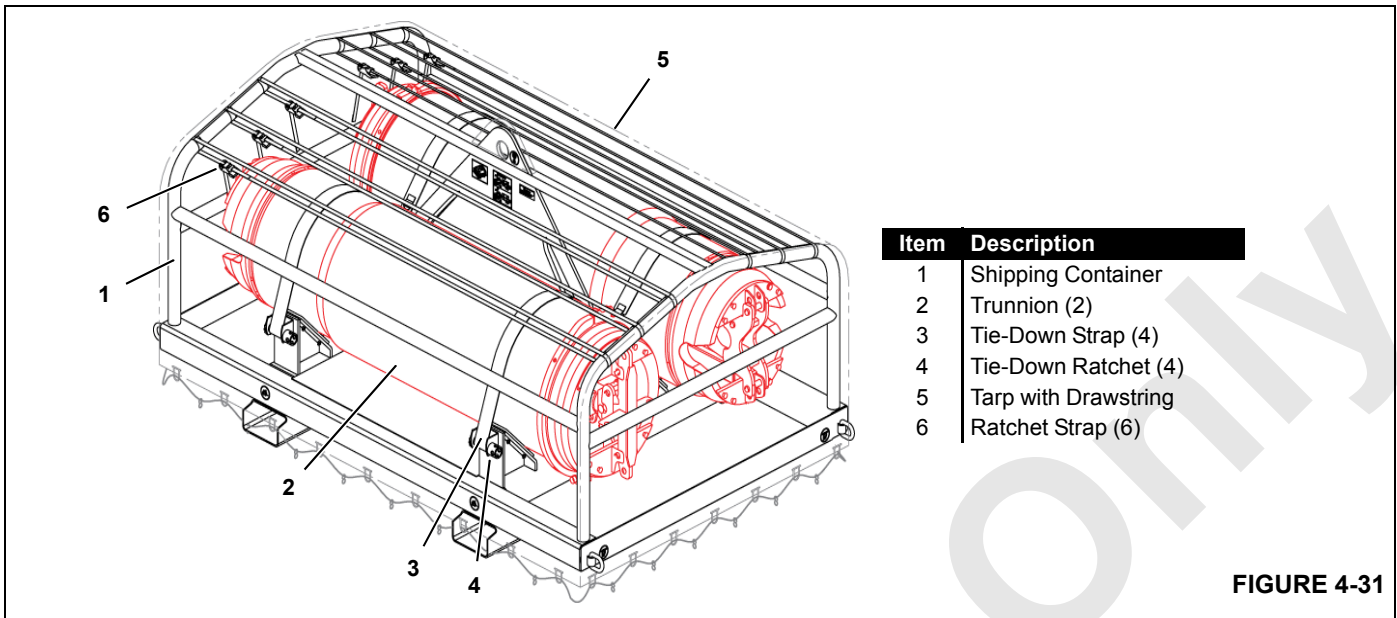
Do not proceed with remaining steps until tensioning lugs are installed — they prevent crawler treads from falling off crawler.

Personnel can be struck or crushed if crawler treads fall off crawler.

NOTE Use hand-held accessory valve (11, [Figure 4-27](#), View H) and tensioner select valve (12, [Figure 4-27](#), View G) to retract/extend the crawler tensioners.

See [Figure 4-30](#) for the following steps.

27. Retract and/or extend the crawler tensioners until the connecting holes in the crawler treads are aligned as shown in (View B).
28. Once the holes are aligned, pin the crawler treads together as shown in View A.
29. Tighten or slacken the crawler treads as necessary to loosen the tensioning lugs. Then remove and store the tensioning lugs.
Store the tensioning lugs in the crawler parts box.
30. Adjust crawler track tension as follows:
 - a. Keep hydraulic hose (9, [Figure 4-27](#), View B) connected to coupler (10) so the crawler motors can rotate freely during the remaining steps.
 - b. Keep hydraulic hose assembly (13, [Figure 4-27](#), View H) connected to coupler (14, View E).
 - c. Start the PPU. Both crawler brakes will release.
 - d. Extend both crawler tensioners to an equal height.
Proper tension is obtained at full cylinder force — 3,000 psi (207 bar) maximum pressure. The pressure is viewable on a gauge at the PPU.
 - e. Install 2 in (50.8 mm) shims (15, [Figure 4-30](#), View D) as needed at both tensioners (1 and 2).
The shims are stored in the crawler parts box.
 - f. If there is room, install a 1 in (25.4 mm) shim at both tensioners.
 - g. Retract the crawler tensioners, one at time, until the rod ends are snug against the shims.
 - h. STOP POWER SUPPLY and wait several seconds so the brake pressure exhausts. This will allow the brakes to spring apply.
 - i. Disconnect hoses (11b) from tensioner select valve (12, [Figure 4-27](#), View E).
 - j. Disconnect hose assembly (13) from coupler (14, [Figure 4-27](#), View E).
31. Perform all of the above steps for the remaining three crawlers.



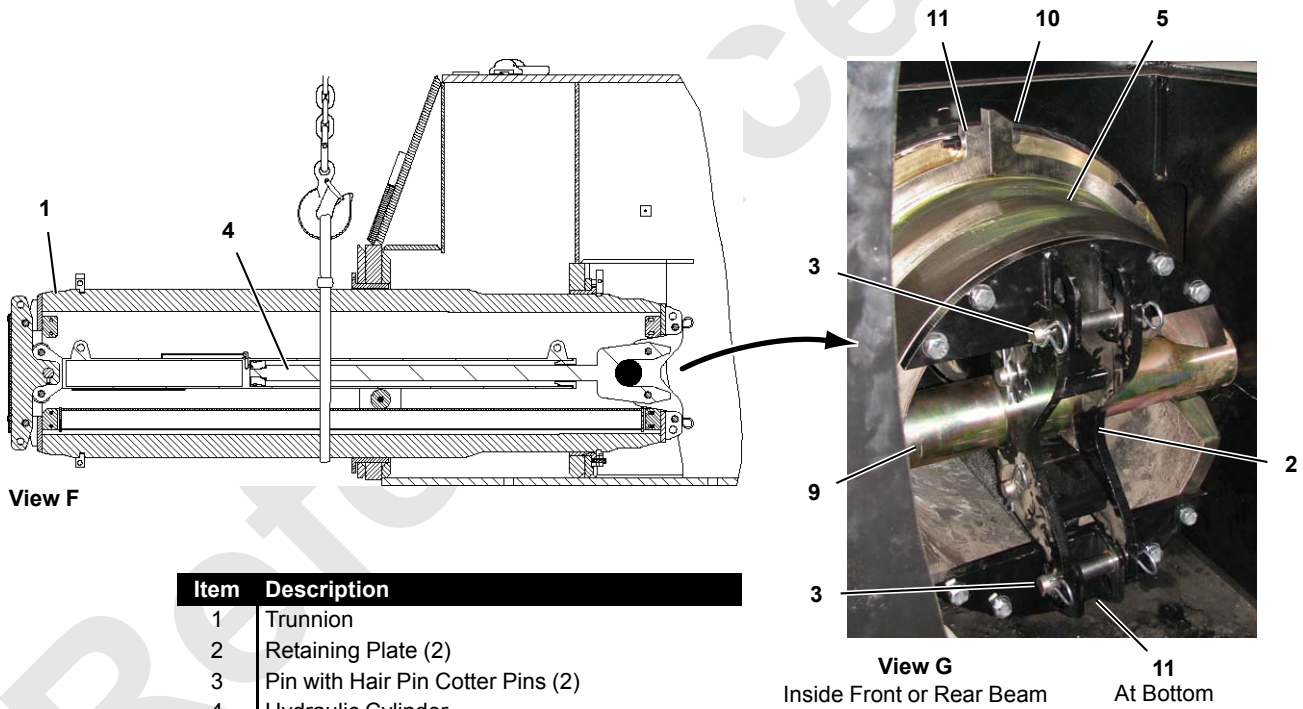
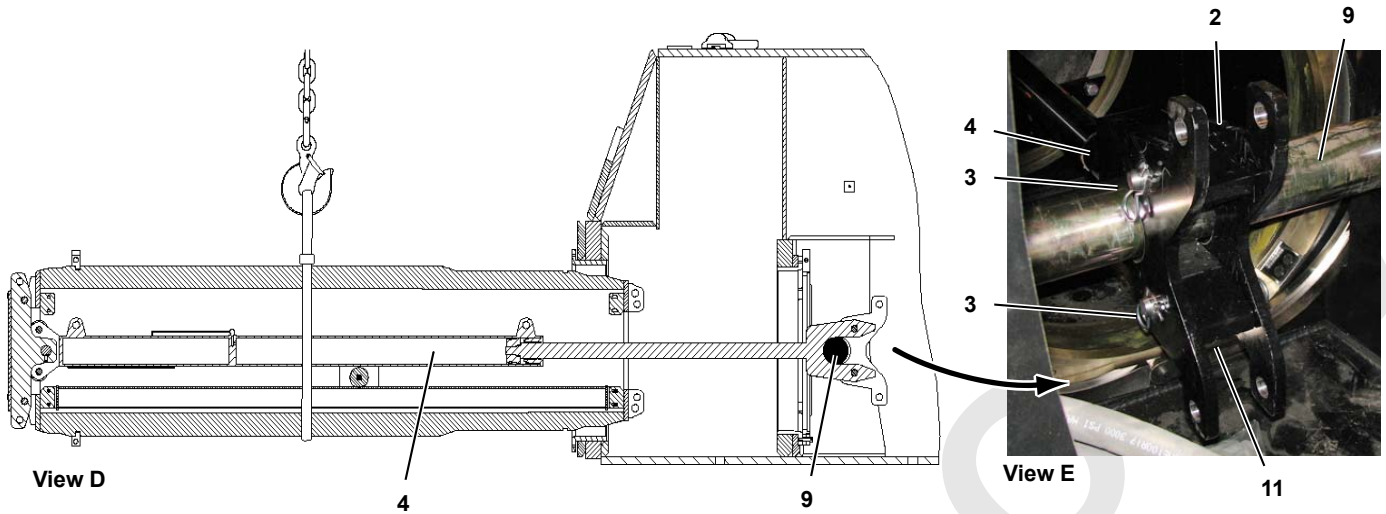
Install Trunnions

NOTE The trunnions are shipped in containers as shown [Figure 4-31](#).

See [Figure 4-32](#) for the following steps.

1. Lift trunnion (5, View A) with chain and nylon lifting slings as shown. Adjust the sling as necessary so the trunnion is balanced when lifted.
2. Thoroughly clean and grease the bushings in both ends of the front and rear beams.
3. Thoroughly clean the trunnion and grease all trunnion-to-bushing contact areas.
4. Remove retaining plate (2, View A) from the end of hydraulic cylinder (4) and trunnion (1).
5. Connect the hydraulic hoses from hand-held accessory valve (5, View C) to hydraulic couplers (6) in the end of the trunnion. The valve is stored in the PPU.
6. Connect the hydraulic hoses from the other end of the hand-held accessory valve to hydraulic couplers (7, View B) at outboard carbody valve (8) on the corresponding carbody side beam.
7. Start the PPU and fully extend the hydraulic cylinder with the hand-held accessory valve.
8. Turn on the work lights inside the front or rear beam with the switch on the PPU control panel.

Continued on [page 4-47](#)



Item	Description
1	Trunnion
2	Retaining Plate (2)
3	Pin with Hair Pin Cotter Pins (2)
4	Hydraulic Cylinder
9	Pin (inside beam)
10	Retaining Ring (2 halves)
11	Screw (2)

FIGURE 4-32 continued

9. Position the trunnion in the bushing bore in either end of the front or rear beam so the hydraulic cylinder rod is snug against pin (9, View E).

NOTE The trunnions are identical and interchangeable.

An assembly person must go inside the front or rear beam to perform step [10](#).

Maintain communication between the assembly person inside the beam and the assembly person operating the hand-held accessory valve.

10. Pin retaining plates (2, View E) to the hydraulic cylinder rod. This step attaches the cylinder to pin (9).
11. Slowly retract hydraulic cylinder (4) with the hand-held accessory valve. This step will pull the trunnion into the beam (View F).
12. STOP when the groove in the trunnion is aligned with retaining ring halves (10, View G).
13. Close the retaining ring halves and retain them with screws (11, View G).
Apply Loctite 271 to the screw threads and tighten the screws to 200 ft-lb (270 Nm).
14. Pin retaining plates (6, View G) to the end of the trunnion with pins (3).
15. Extend the hydraulic cylinder with the hand-held accessory valve until the trunnion moves out as far as it will go.
This step is required to make sure the trunnion sticks out far enough to allow crawler installation.
16. Disconnect the slings from the trunnion.
17. Disconnect the hydraulic hoses from the trunnion.
18. Repeat the above steps for the other trunnions.

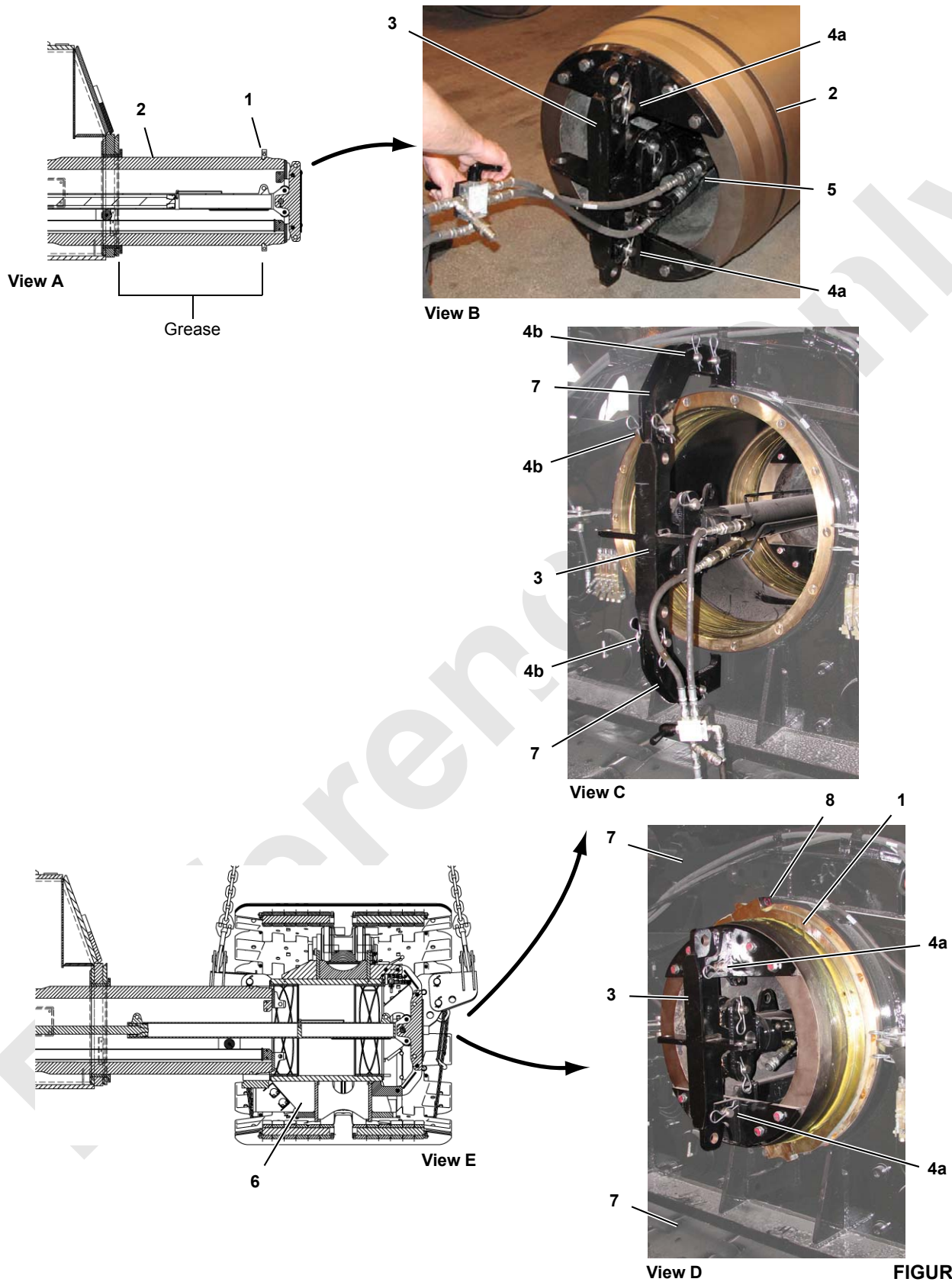


FIGURE 4-33

Legend for [Figure 4-33](#)

Item	Description
1	Retaining Ring (2 halves)
2	Trunnion
3	Support
4a	Pin with Hair-Pin Cotter (2) 3-21/32 in (93 mm) Long
4b	Pin with Hair-Pin Cotter (2) 2-7/8 in (73 mm) Long
5	Couplers (2)
6	Crawler
7	Links (2)
8	Screw with Flat Washer, Lock Washer, and Nut (2)

NOTE The carbody assembly should now be fully supported and level on all four side beam jacking cylinders ([Figure 4-18, page 4-24](#)). Raise the carbody on the side beam jacking cylinders only as high as needed to install the four crawlers.

The four crawlers can be installed on the carbody in any order, to include two on one side at a time.

The carbody must remain fully supported by all four jacking cylinders until all four crawlers are installed.

CAUTION**Avoid Cylinder Damage!**

All four side beam jacking cylinders must be lowered simultaneously to keep the carbody level to within 4° from front to rear and from side to side. Otherwise, side beam jacking cylinders can be damaged.

Installing Crawlers — Method 1

Use the following method for installing the crawlers if the trunnions are already installed in the front and rear beams. See [Figure 4-33](#).

1. Remove the center cover from the crawler ([Figure 4-26](#)).
2. Thoroughly clean and grease the bushings in the crawler.
3. Thoroughly clean the trunnion and grease all trunnion-to-bushing contact areas.
4. If installed, remove retaining ring (1, View A) from trunnion (2).
5. Remove two pins (4a, View B) connecting support (3) to the trunnion.
6. Connect the hydraulic hoses from the hand-held accessory valve to couplers (5, View B) in the end of the trunnion.

7. Connect the hydraulic hoses from the other end of the hand-held accessory valve to the couplers at the outboard carbody valve ([Figure 4-32, View B](#)).
 8. Start the PPU and extend the trunnion hydraulic cylinder with the hand-held accessory valve.
 9. Once the trunnion hydraulic cylinder is fully extended, disconnect the hydraulic hoses from couplers (5, View B).
 10. Lift the proper crawler ([Figure 4-24](#)) as shown in [Figure 4-25](#) so the bushing bore in the crawler is aligned with the trunnion.
 11. Position the crawler over the trunnion hydraulic cylinder rod as shown in View E.
 12. Pin links (7, View C) to support (3). The links are stored in the crawler parts box.
 13. Reconnect the hydraulic hoses to couplers (5, View B).
 14. Slowly retract the trunnion hydraulic cylinder with the hand-held accessory valve while following with the assist crane. This step will pull the crawler onto the trunnion.
 15. Stop when the pin holes in support (3) are aligned with the pin holes in the trunnion.
 16. Install two pins (4a, View D).
 17. Install retaining ring halves (1, View D) in the trunnion groove and retain them with screws (8, View F).
Tighten the screws to 800 ft-lb (1 880 Nm).
 18. Remove links (7, View C) store them in the crawler tool box.
 19. Disconnect the lifting sling from the crawler and pin the lifting levers in the shipping position ([Figure 4-25, View B](#)).
 20. Disconnect the hydraulic hoses from the trunnion.
 21. Repeat the above steps for the remaining crawlers.
 22. Once all four crawlers are installed, fully retract the side beam jacking cylinders with the controls on the outboard carbody valve ([Figure 4-16](#)).
- All four side beam jacking cylinders must be retracted simultaneously so the carbody remains as level as possible at all times. Otherwise, side beam jacking cylinders can be damaged.***
23. Remove crawler chains (5, [Figure 4-25, View C](#)) and store them in the tool box on each crawler.
 24. Install the center covers on the crawlers ([Figure 4-26](#)).
 25. Install the carbody side beam platforms.

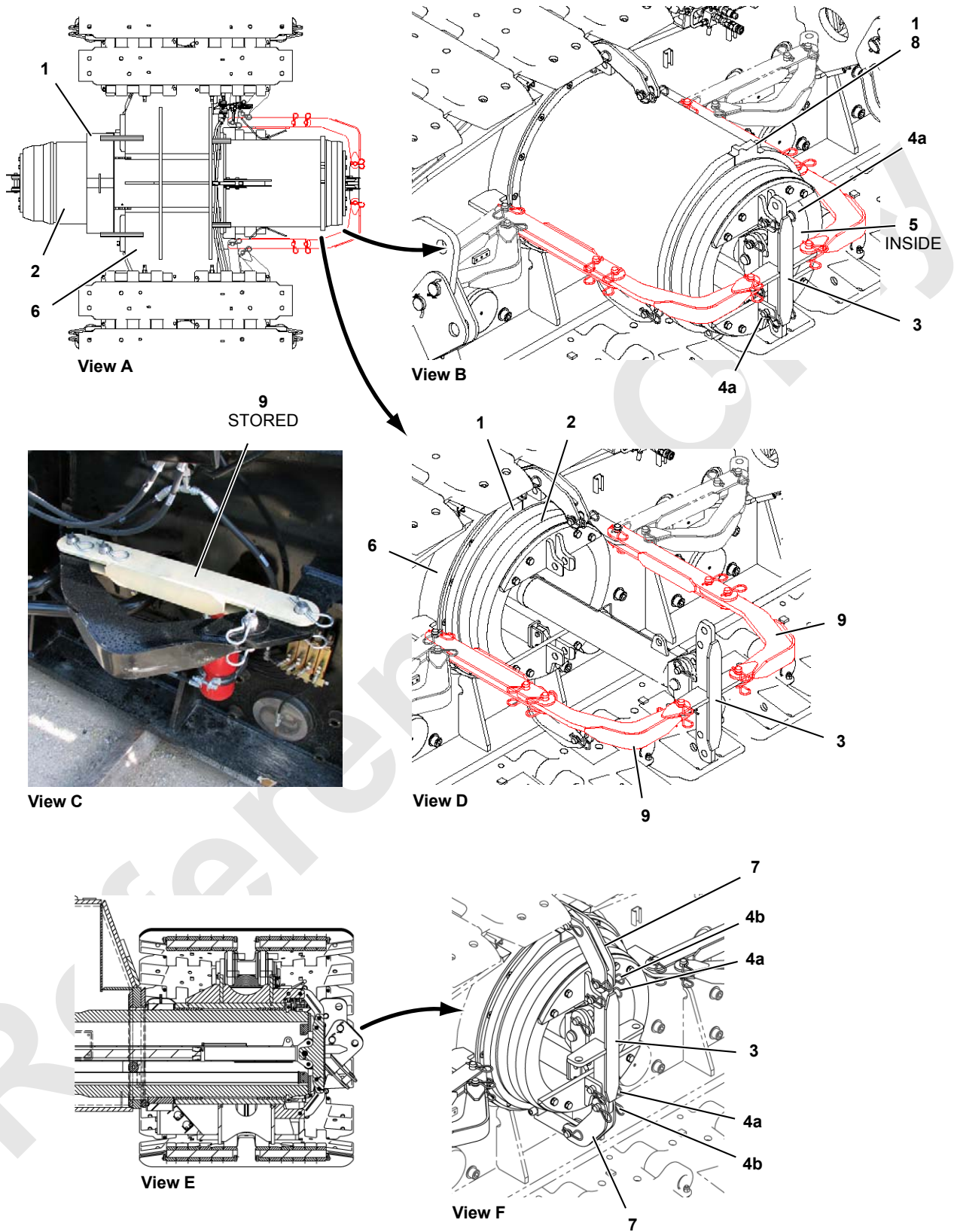


FIGURE 4-34

Legend for [Figure 4-34](#)

Item	Description
1	Retaining Ring (2 halves)
2	Trunnion
3	Support
4a	Pin with Hair-Pin Cotter (2) 3-21/32 in (93 mm) Long
4b	Pin with Hair-Pin Cotter (2) 2-7/8 in (73 mm) Long
5	Couplers (2)
6	Crawler
7	Links (2)
8	Screw with Flat Washer, Lock Washer, and Nut (2)
9	Links (4)

NOTE The carbody assembly should now be fully supported and level on all four side beam jacking cylinders ([Figure 4-18](#), [page 4-24](#)). Raise the carbody on the side beam jacking cylinders only as high as needed to install the four crawlers.

The four crawlers can be installed on the carbody in any order, to include two on one side at a time.

The carbody must remain fully supported by all four jacking cylinders until all four crawlers are installed.

CAUTION**Avoid Cylinder Damage!**

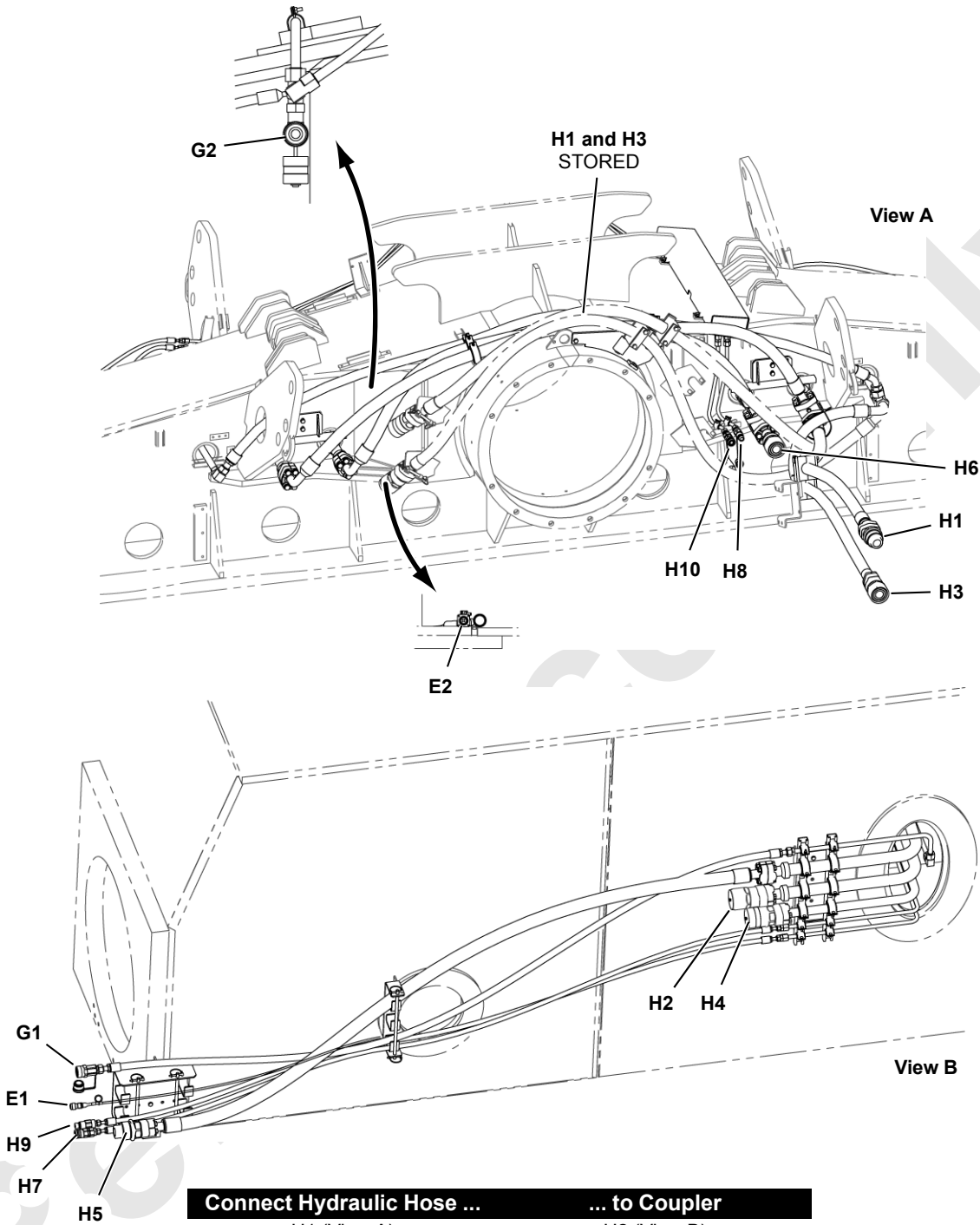
All four side beam jacking cylinders must be lowered simultaneously to keep the carbody level to within 4° from front to rear and from side to side. Otherwise, side beam jacking cylinders can be damaged.

Installing Crawlers — Method 2

Use the following method for installing the crawlers if the trunnions are already installed in the crawlers as shown in [Figure 4-34](#), View A.

1. Remove covers (1, 3a, and 3b, [Figure 4-26](#)) from the crawler.
2. Thoroughly clean the trunnion and grease all trunnion-to-bushing contact areas.
3. Remove pins (4a, View B) connecting support (3) to the trunnion.

4. Connect the hydraulic hoses from the hand-held accessory valve to the couplers in the end of the trunnion.
 5. Connect the hydraulic hoses from the other end of the hand-held accessory valve to the couplers at the outboard carbody valve ([Figure 4-32](#), View B).
 6. Start the PPU and extend the trunnion cylinder with the hand-held accessory valve until retaining ring halves (1, View D) are snug against the crawler frame.
 7. Unpin links (9, View D) from support (3) and store the links on the crawler (View C).
 8. Retract the trunnion hydraulic cylinder with the hand-held accessory valve until the holes in support (3, Views E and F) are aligned with the holes in the trunnion and install pins (4a).
 9. Pin links (7, View F) to support (3).
 10. Thoroughly clean and grease the bushings in the front or rear beam.
 11. Thoroughly clean the trunnion and grease all trunnion-to-bushing contact areas.
 12. Lift the crawler as shown in [Figure 4-25](#) so the trunnion is aligned with the bushing bores in the front or rear beam.
 13. Perform Install Trunnions steps [2](#) through [14](#) starting on [page 4-45](#).
 14. Disconnect the lifting slings from the crawler and pin the lifting levers in the shipping position ([Figure 4-25](#), View B).
 15. Disconnect the hydraulic hoses from the trunnion.
 16. Repeat the above steps for the remaining crawlers.
 17. Once all four crawlers are installed, fully retract the side beam jacking cylinders with the controls on the outboard carbody valve ([Figure 4-16](#)).
- All four side beam jacking cylinders must be retracted simultaneously so the carbody remains as level as possible at all times. Otherwise, side beam jacking cylinders can be damaged.**
18. Remove crawler chains (5, [Figure 4-25](#), View C) and store them in the tool box on each crawler.
 19. Install covers 1, 2, 3a, and 3b, [Figure 4-26](#) on all four crawlers. Covers (2) are stored on the crawler parts boxes.
 20. Install the carbody side beam platforms.



Connect Hydraulic Hose to Coupler
H1 (View A)	H3 (View A)	H2 (View B)
H5 (View B)	H7 (View B)	H4 (View B)
H9 (View B)	H10 (View A)	H6 (View A)
		H8 (View A)
Connect Grease Hose to Coupler
G1 (View B)		G2 (View A)
Connect Electric Cable to Receptacle
E1 (View B)		E2 (View A)

FIGURE 4-35

Connect Crawler Hydraulic Hoses

Connect the hydraulic hoses between each crawler and end beam as shown in [Figure 4-35](#).

Connect Crawler Grease Hose

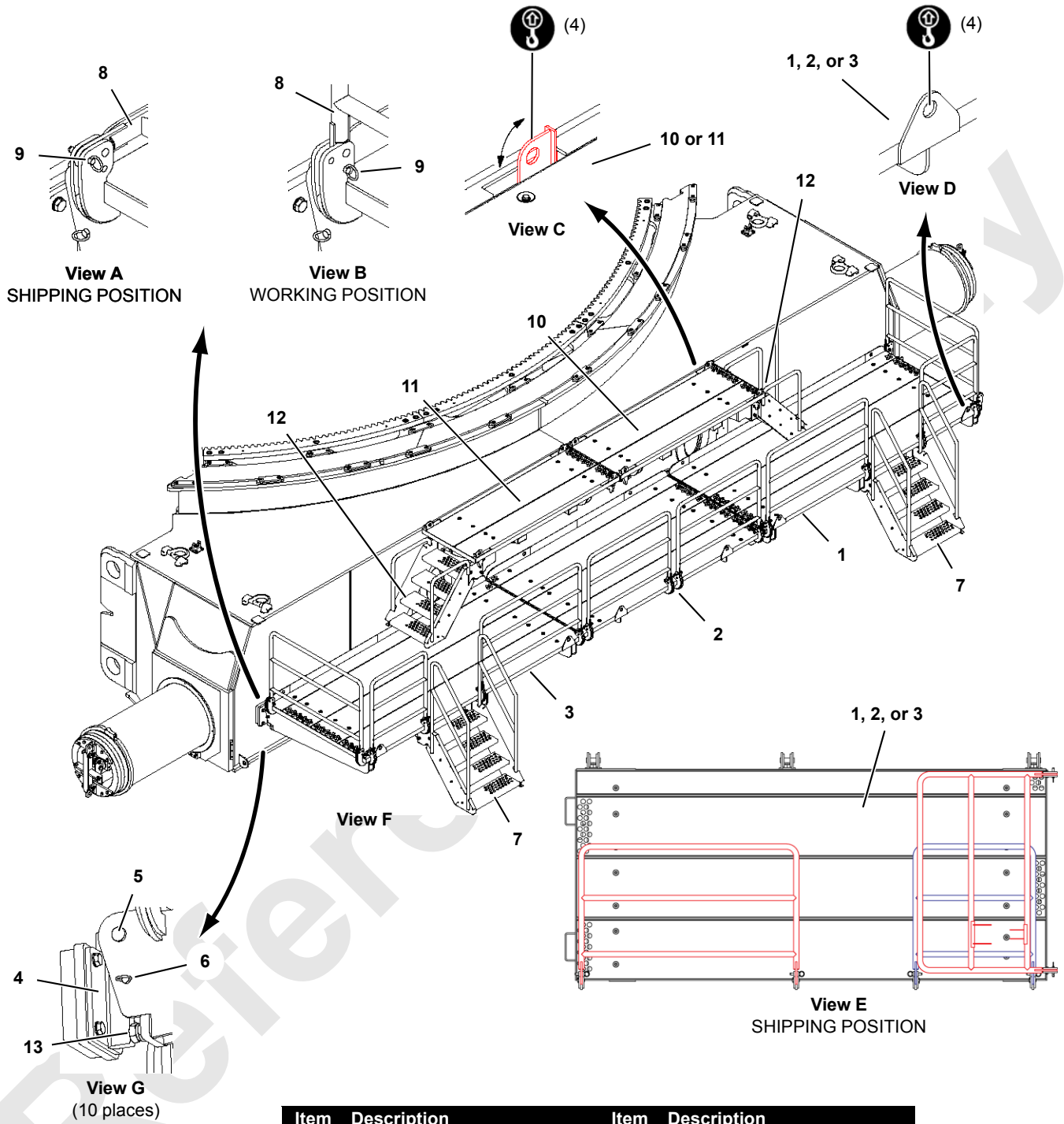
Connect the grease hose between each crawler and end beam as shown in [Figure 4-35](#).

Connect Crawler Electric Cable

Connect the electric cable between each crawler and end beam as shown in [Figure 4-35](#).

Reference Only

S



Item	Description	Item	Description
1	Platform, Lower End	8	Handrail
2	Platform, Lower Center	9	Quick-Release Pin
3	Platform, Lower End	10	Platform, Upper
4	Hooked Bracket	11	Platform, Upper
5	Fixed Pin	12	Stairway, Upper (2)
6	Quick-Release Pin	13	Adjusting Screw and Lock Nut
7	Stairway, Lower (2)		

FIGURE 4-36

Install Carbody Front and Rear Exterior Platforms

See [Figure 4-36](#) for the following procedure.

Perform the following steps at both ends of the carbody — front and rear.

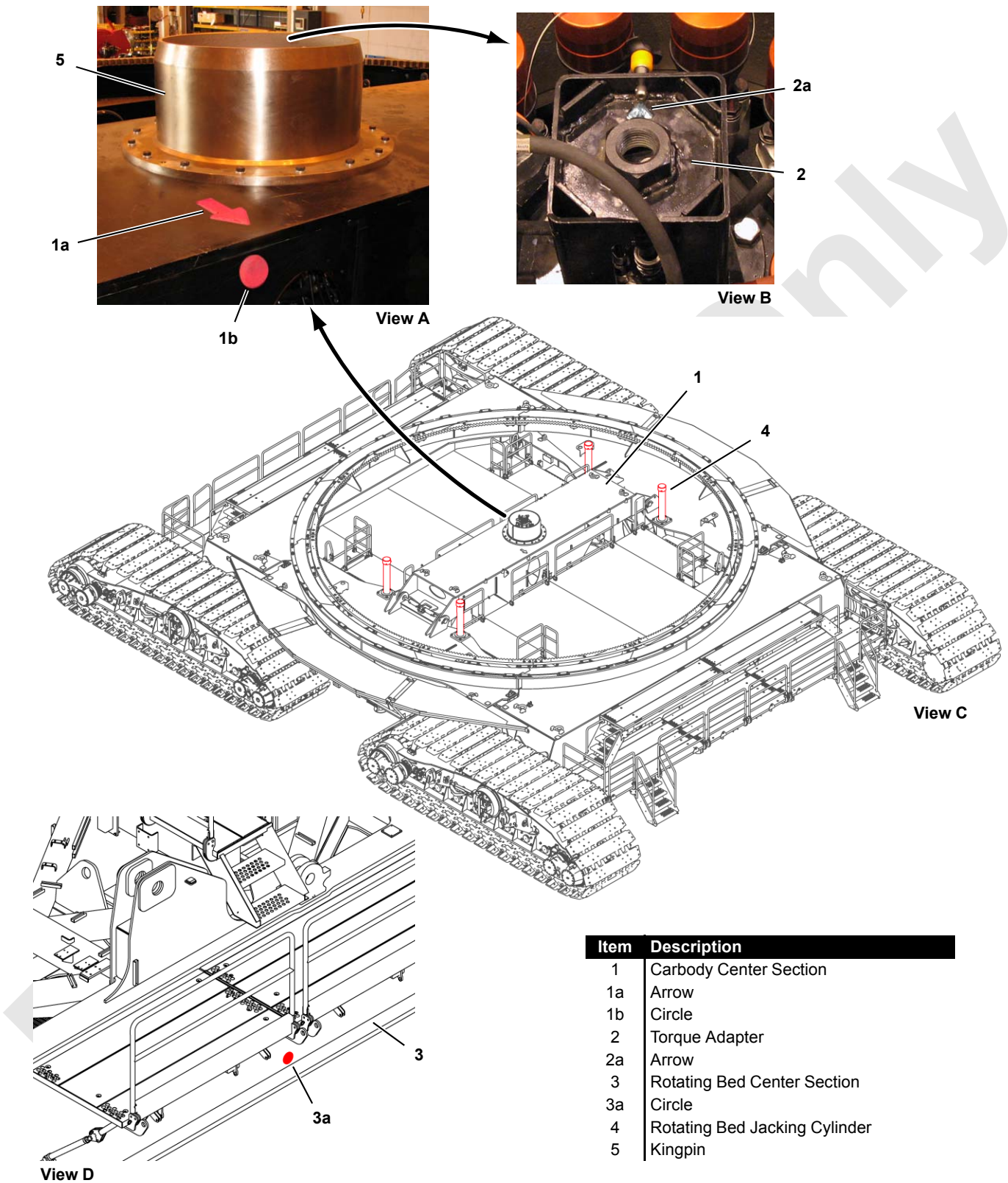
1. Remove quick-release pins (6, View G) from storage in hooked brackets (4) on the front or rear beam.
2. Lift platform (1, View C) into position so fixed pins (5, View G) in the platform engage hooked brackets (4) on the front or rear beam.

NOTE The platforms are also equipped with forklift pockets.

3. Install quick-release pins (6) to retain the platform.
4. Repeat steps [2](#) and [3](#) for platforms 2 and 3.

NOTE Stairways (7, View F) hook onto the platforms in the same manner the platforms hook onto the front or rear beam.

5. Remove the quick-release pins from storage in stairways (7).
6. Lift stairway (7, View F) into position and hook it onto platform 1 or 3).
7. Install the quick-release pins to retain the stairways.
8. Perform steps [5](#) through [7](#) for the other stairway.
9. Raise handrails (8, View A) from the shipping position (View E) and pin them in the working position (View B).
10. Adjust screws (13, View G) to level the platforms.
11. Perform the above steps for upper platforms (10 and 11) and stairways (12).



Item	Description
1	Carbody Center Section
1a	Arrow
1b	Circle
2	Torque Adapter
2a	Arrow
3	Rotating Bed Center Section
3a	Circle
4	Rotating Bed Jacking Cylinder
5	Kingpin

FIGURE 4-37

CRANE ASSEMBLY — ROTATING BED

Orient Torque Adapter

See [Figure 4-37](#) for the following procedure.

Carbody center beam (1, View A) has two indicator marks:

- Arrow (1a)
- Circle (1b)

Torque adapter (2, View B) has one indicator mark:

- Arrow (2a)

Rotating bed center section (3, View D) has one indicator mark:

- Circle (3a)

To ensure proper travel direction of the crawlers with relation to control handle movement, the indicator marks must be properly oriented when the rotating bed center section is installed.

1. Look at arrow (2a) on torque adapter (2).

The arrow must point in the same direction as arrow (1a) on carbody center beam (1).

2. If necessary rotate torque adapter (2) to the specified position with the line-up tool supplied by Manitowoc (stored in PPU).

Make sure torque adapter (2) is square with carbody center beam (1).

3. When rotating bed center section (3) is lifted into position on rotating bed jacking cylinders (4), make sure circles (3a) and (1b) face the same end of the carbody.

Extend Rotating Bed Jacking Cylinders

Fully extend rotating bed jacking cylinders (4, [Figure 4-37](#)) with the inboard carbody controls at either or both carbody end beams. See [Figure 4-16](#) for control handle identification and operation.

NOTE The PPU must be connected to the carbody and running to operate the controls.

Clean King Pin

Thoroughly clean the outside of king pin (5). The king pin is greased automatically during crane operation.

Do not apply "never-seeze" to king pin.

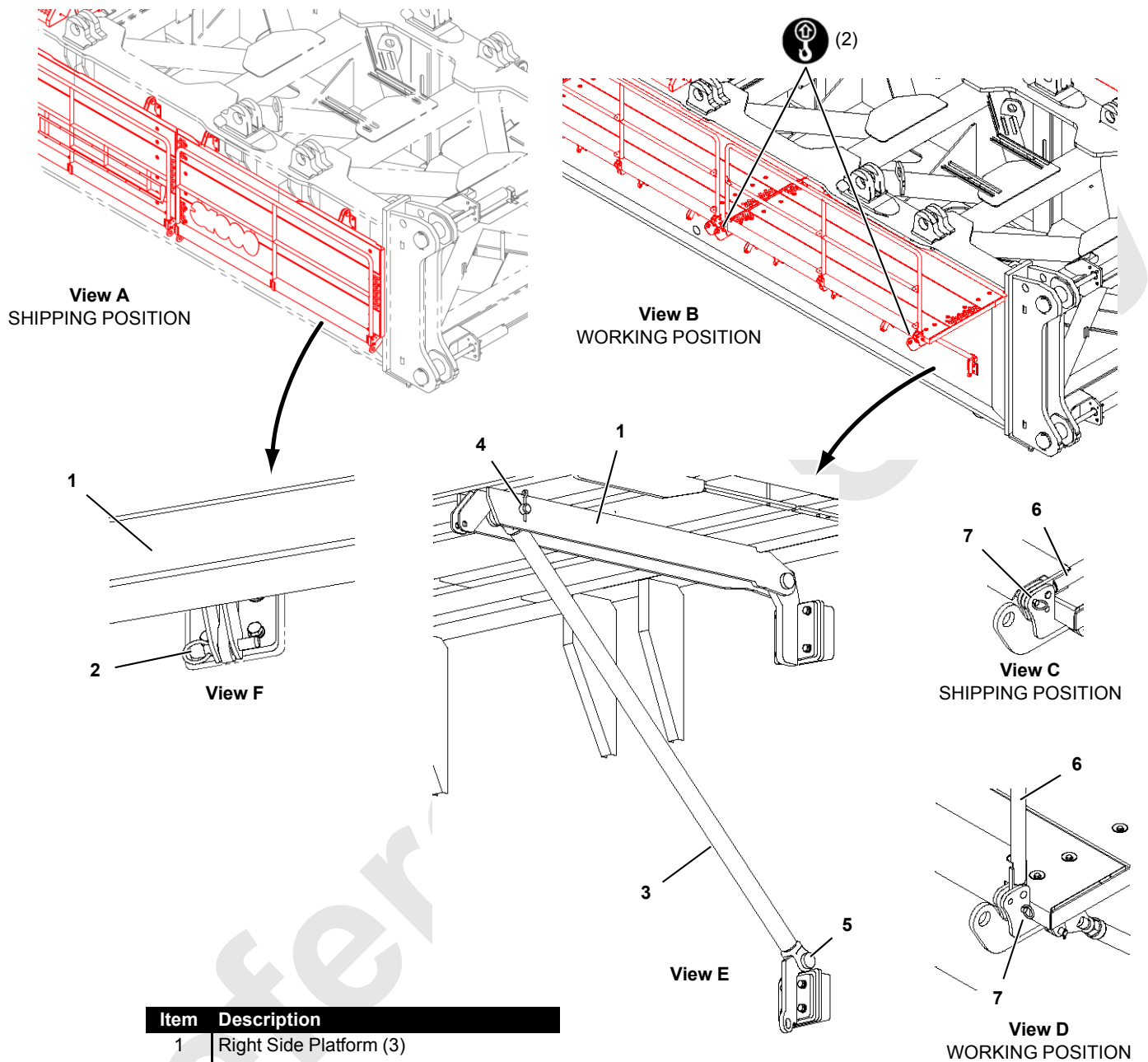


FIGURE 4-38

Deploy Rotating Bed Center Section Platforms

Deploy the rotating bed center section platforms before you lift the rotating bed center section onto the carbody.

Right Side Platforms

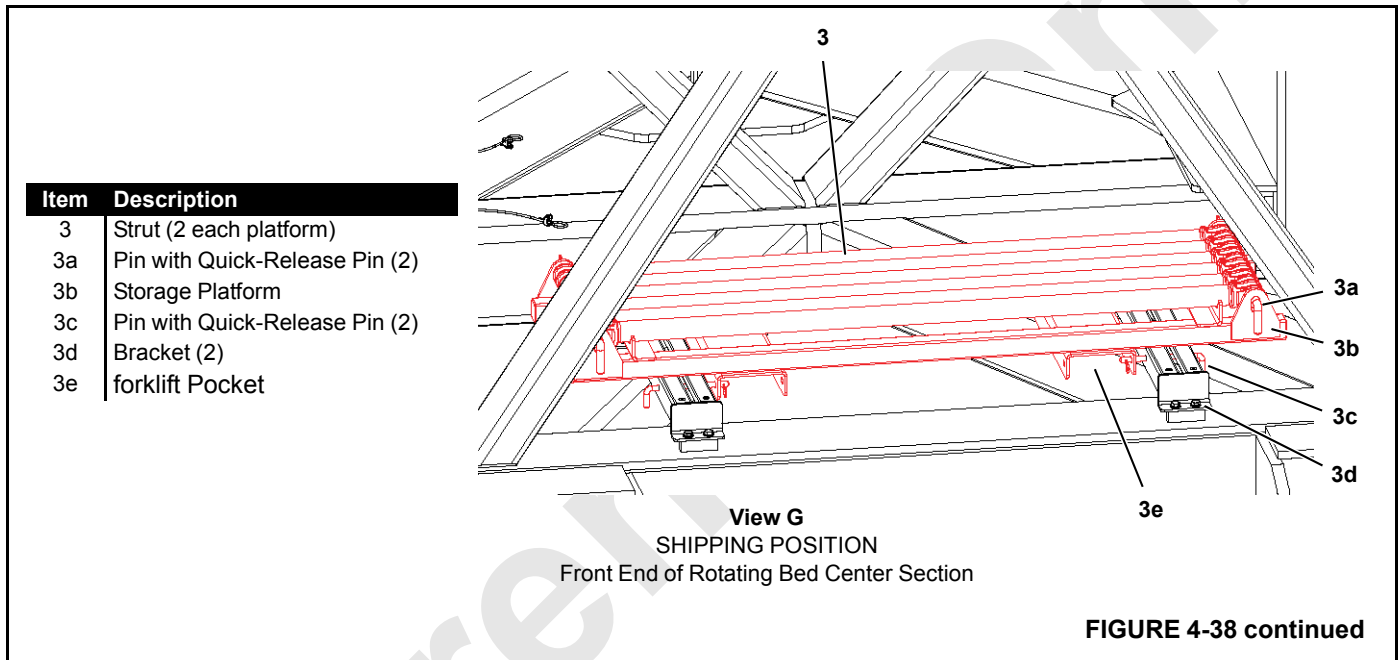
See [Figure 4-38](#) for the following procedure.

1. Remove quick-release pins (2, View F).
2. Lift platform (1, View A) from the shipping position to the working position (View B).

3. Store the quick release pins in the bracket holes.
4. Remove struts (3, View G) from storage.

NOTE If desired, storage platform (3b, View G) can be removed from the rotating bed center section with a forklift. Reinstall the platform after the struts are installed.

5. Pin struts (3, View E) to the underside of platform (1) and to the bracket on the rotating bed.
6. Raise handrail (6, View C) from the shipping position and pin it in the working position (View D).
7. Repeat the above steps for each right side platform.



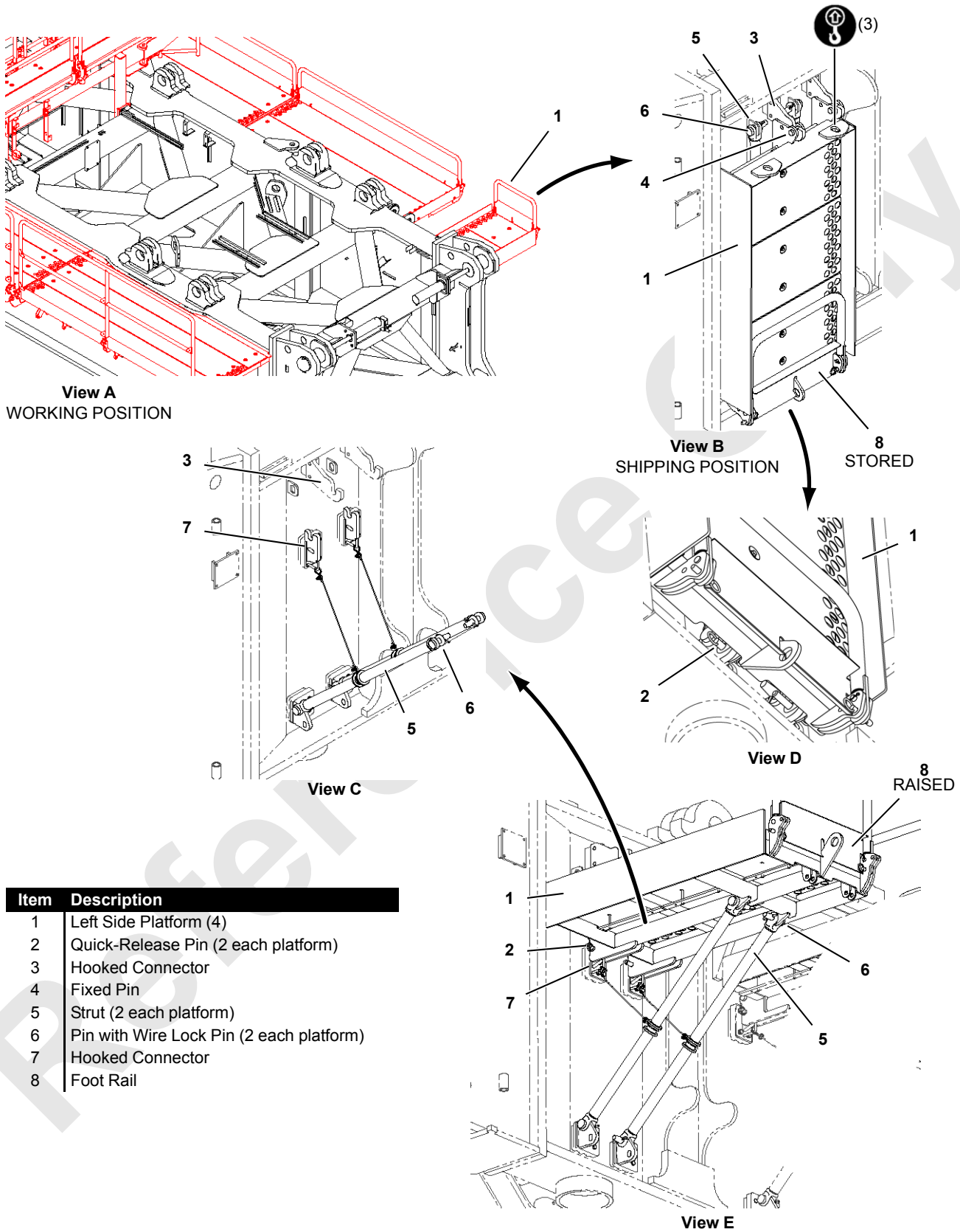


FIGURE 4-39

Left Side Platforms

See [Figure 4-39](#) for the following procedure.

1. Remove quick-release pins (2, View D).
2. Lift platform (1, View B) off hooked connectors (3) using two lifting holes.
3. Lower the platform onto the ground and reconnect the lifting slings to three lifting holes.
4. Remove pins (6, View B) and lower struts (5, View C).
5. Lift the platform into the working position so the fixed pins in the platform engage hooked connectors (7, Views C and E).
6. Install quick-release pins (2, View E).
7. Pin struts (5, View E) to the platform with pins (6).
8. Raise foot rail (8) from the shipping position and pin it in the working position (View E).
9. Repeat the above steps for each left side platform.

NOTE The rear platform has a handrail that must be raised from the shipping position and pinned in the working position before the foot rail can be raised.

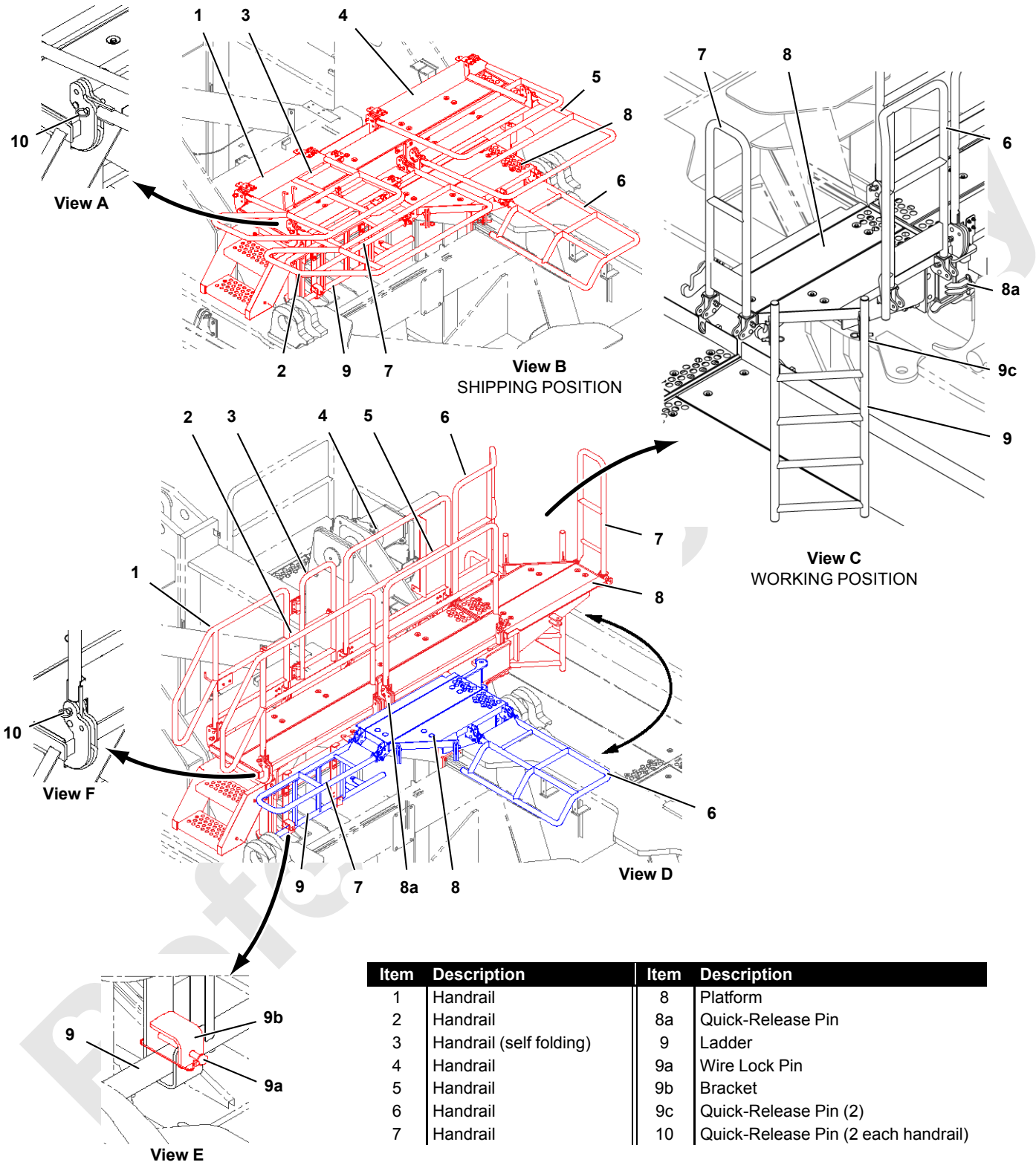


FIGURE 4-40

Center Platform

See [Figure 4-40](#) for the following procedure.

1. Unpin handrails (1 and 2) from the shipping position (Views A and B), raise the handrails, and pin them in the working position (Views D and F).
2. Unlatch handrail (3, View D) and rotate it to the working position.
1. Unpin handrails (4, 5, 6, and 7) from the shipping position (Views A and B), raise the handrails, and pin them in the working position (Views D and F).
2. Remove quick-release pin (8a, View D) and rotate platform (8) from the shipping position to the working position.
3. Install quick-release pin (8a, View C).
4. Remove wire-lock pins (9a, View E) and brackets (9b).
5. Remove ladder (9, View D) from the storage brackets.
6. Store wire-lock pins (9a, View E) and bracket (9b) on the ladder storage brackets.
7. Remove quick-release pins (9c, View C) from platform (8).
8. Hook ladder (9, View C) onto platform (8) and install pins (9c).

Clean King Pin Bushing

Thoroughly clean the king pin bushing in the center of the rotating bed. The bushing is greased automatically during crane operation.

Do not apply “never-seeze” to king pin.

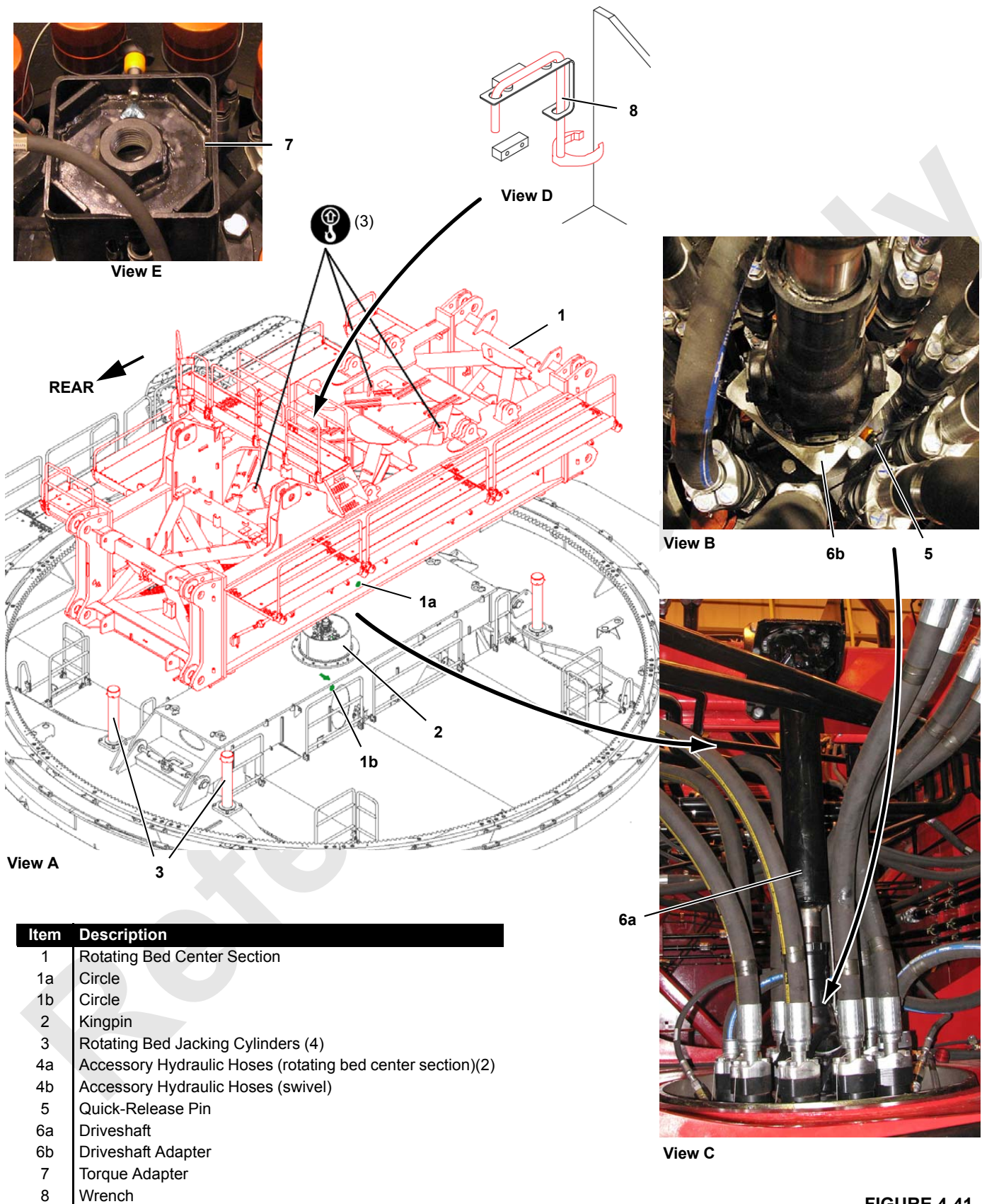
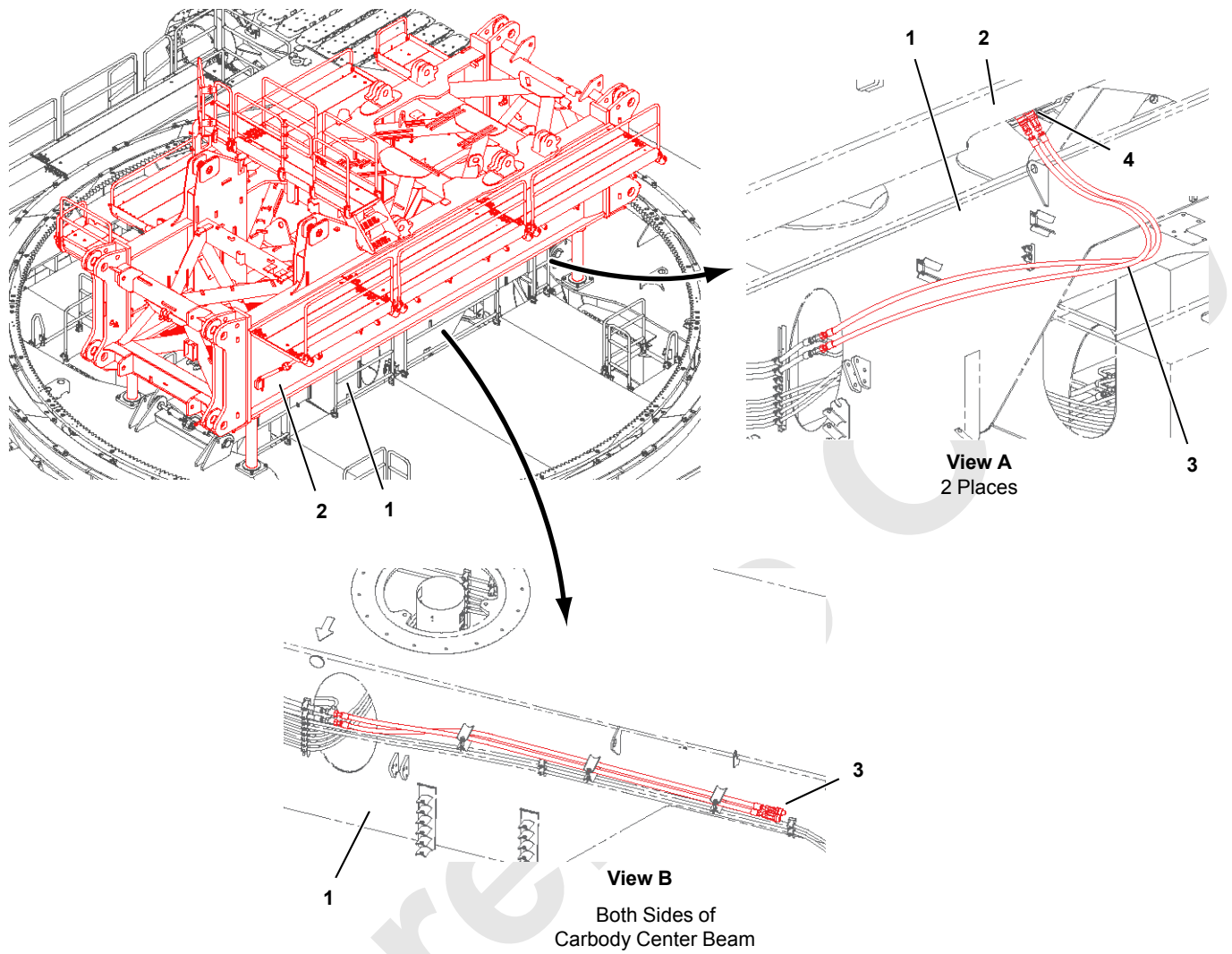


FIGURE 4-41

Lift Rotating Bed Center Section onto Jacking Cylinders

See [Figure 4-41](#) for the following procedure.

1. Attach 3-legs of the chain lifting sling to the lifting lugs on rotating bed center section (1, View A).
Shorten the rear leg of the chain 11 links.
2. Lift the rotating bed center section off the trailer and place it on blocking at ground level.
3. Deploy the rotating bed center section platforms.
4. Lift rotating bed center section (1, View A) into position over the carbody.
Make sure indicator circles (1a and 1b) are facing same end of carbody.
5. Slowly lower the rotating bed center section so the bushing in the bed engages kingpin (2).
6. Continue to lower the rotating bed center section until it comes to rest on rotating bed jacking cylinders (3).
7. Slacken and disconnect the lifting slings.
Do not retract rotating bed jacking cylinders until the roller carriers are installed.



Item	Description
1	Carbody Center Beam
2	Rotating Bed
3	Hydraulic Hose (2 each side of carbody center beam)
4	Hydraulic Coupler (2 each side of rotating bed)

FIGURE 4-42

Connect Accessory System Hydraulic Hoses

See [Figure 4-42](#) for the following procedure.

The hydraulic pins for the front roller carrier, the rear roller carrier, and the drums cannot be operated until this procedure is performed.

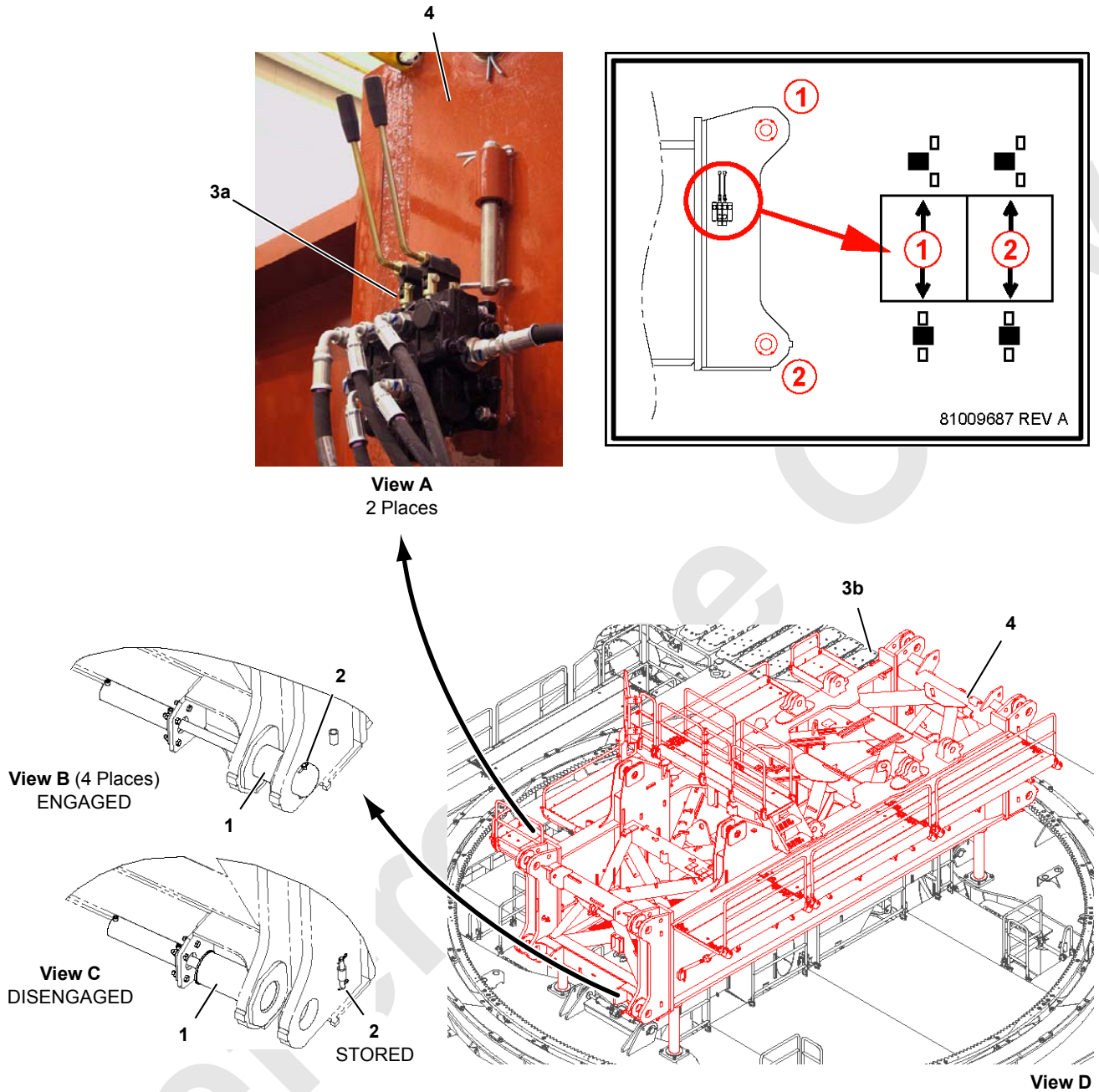
CAUTION

Avoid Hydraulic Piping Damage!

Do not swing upperworks while hydraulic hose are connect ed. Damage will occur.

1. If running, stop the PPU.
2. Disconnect two hydraulic hoses (3, View B) from storage on either side of carbody center beam (1).
3. Connect hydraulic hoses (3) to hydraulic couplers (4, View A) on the corresponding side of rotating bed (2).

It is only necessary to connect the hydraulic hoses from one side of the carbody center beam, not both.
4. Start the PPU to pressurize the rotating bed accessory system.



View A
2 Places

View B (4 Places)
ENGAGED

View C
DISENGAGED

2
STORED

View D

Item	Description
1	Roller Carrier Pin (4 front and 4 rear)
2	Locking Pin with Cotter Pins (8)
3a	Rear Rotating Bed Pins Control Valve
3b	Front Rotating Bed Pins Control Valve
4	Rotating Bed Center Section
5	Rear Roller Carrier
6	Lifting Lug (2 inboard)
7	Lifting Lug (2 outboard)
8	Alignment Hook (2)
9	Alignment Pin (2)

FIGURE 4-43

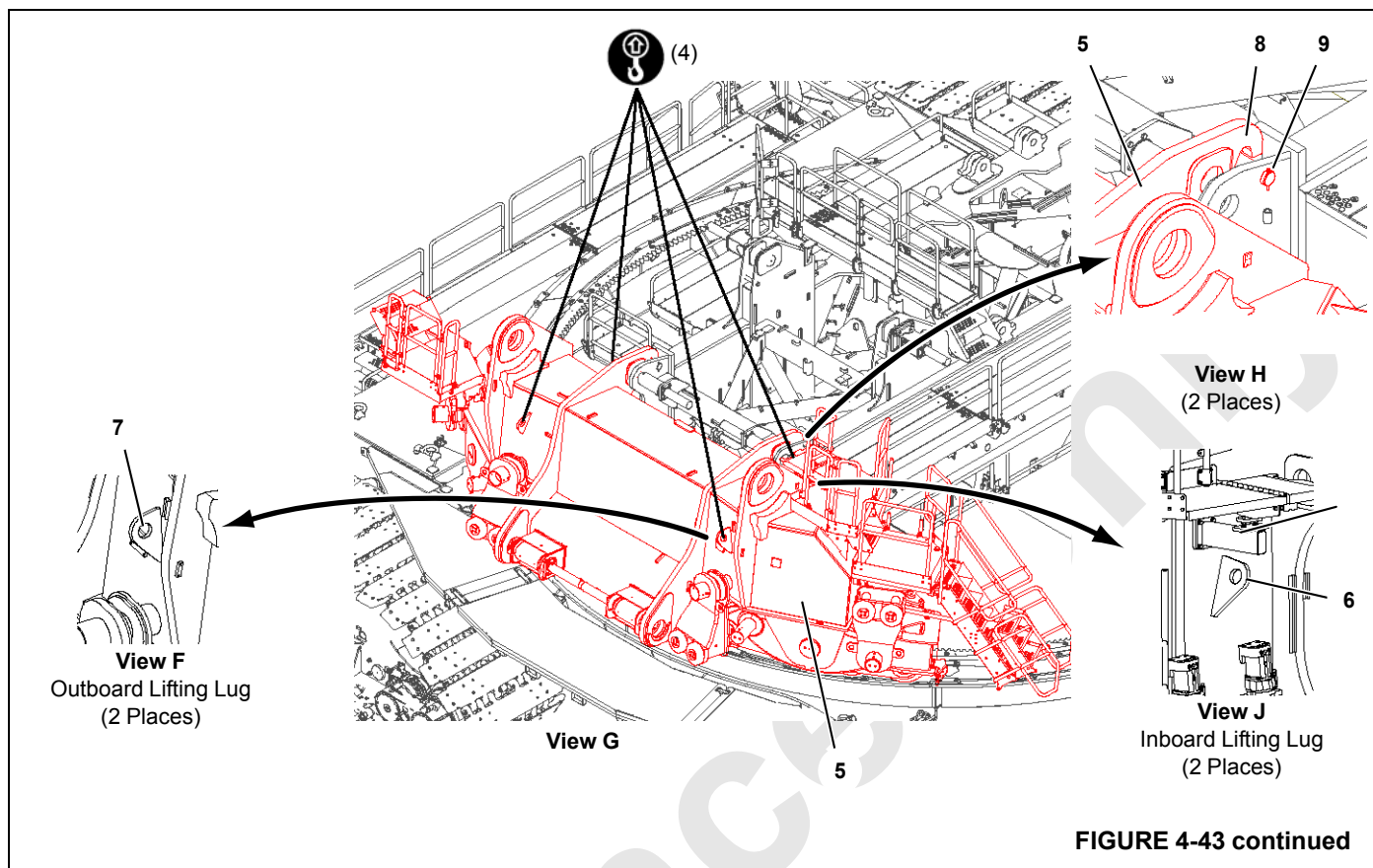


FIGURE 4-43 continued

NOTE The roller carriers can be installed in either order: rear then front OR front then rear.

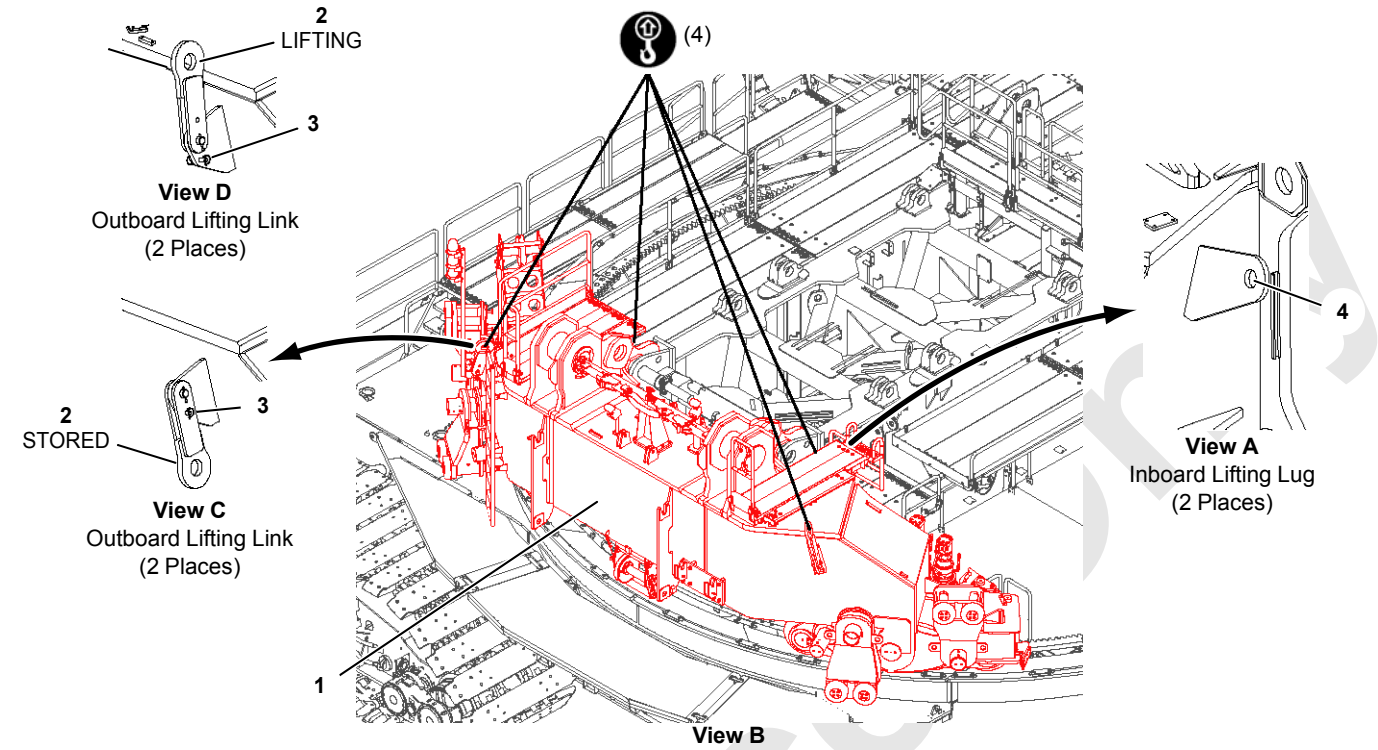
Install Rear Roller Carrier

See [Figure 4-43](#) for the following procedure.

1. Make sure the rotating bed jacking cylinders are **fully extended**
2. Thoroughly clean and grease the pins, bores, and all machined mating surfaces.
3. Disengage the roller carrier pins, as follows:
 - a. Remove locking pin (2, View B) from roller carrier pin (1) — typical eight places.
 - b. Store each locking pin (View C).
 - c. Disengage top and bottom roller carrier pins (1, View C) with control valves (3a and 3b, View D) at the front and the rear of rotating bed center section (4).

NOTE The PPU must be connected to the carbody and running to operate the control valves.

4. Attach 4-legs of the chain lifting sling to lifting lugs (6, View J) and lifting lugs (7, View F) on rear roller carrier (5).
Shorten both outboard legs of the chain 11 links.
5. Lift rear roller carrier (5, View G) into position at the rear of the rotating bed center section so alignment hooks (8, View H) engage alignment pins (9).
6. Lower the rear roller carrier until the lifting slings start to slacken. The connecting holes should be aligned.
7. First, engage both top-rear rotating bed pins (1, View B) with rear rotating bed pins control valve (3a, View A).
8. Then engage both bottom-rear rotating bed pins (1, View B) with rear rotating bed pins control valve (3a, View A).
9. Remove locking pins (2, View C) from storage and install them in rotating bed pins (1, View B).
10. Disconnect the lifting sling.



Item	Description
1	Front Roller Carrier
2	Lifting Lug (2 outboard)
3	Pin with Wire Lock Pins (2)
4	Lifting Lug (2 inboard)
5	Trapdoor
6	Ladder
7	Fixed Pin (2)
8	Quick-Release Pin (2)

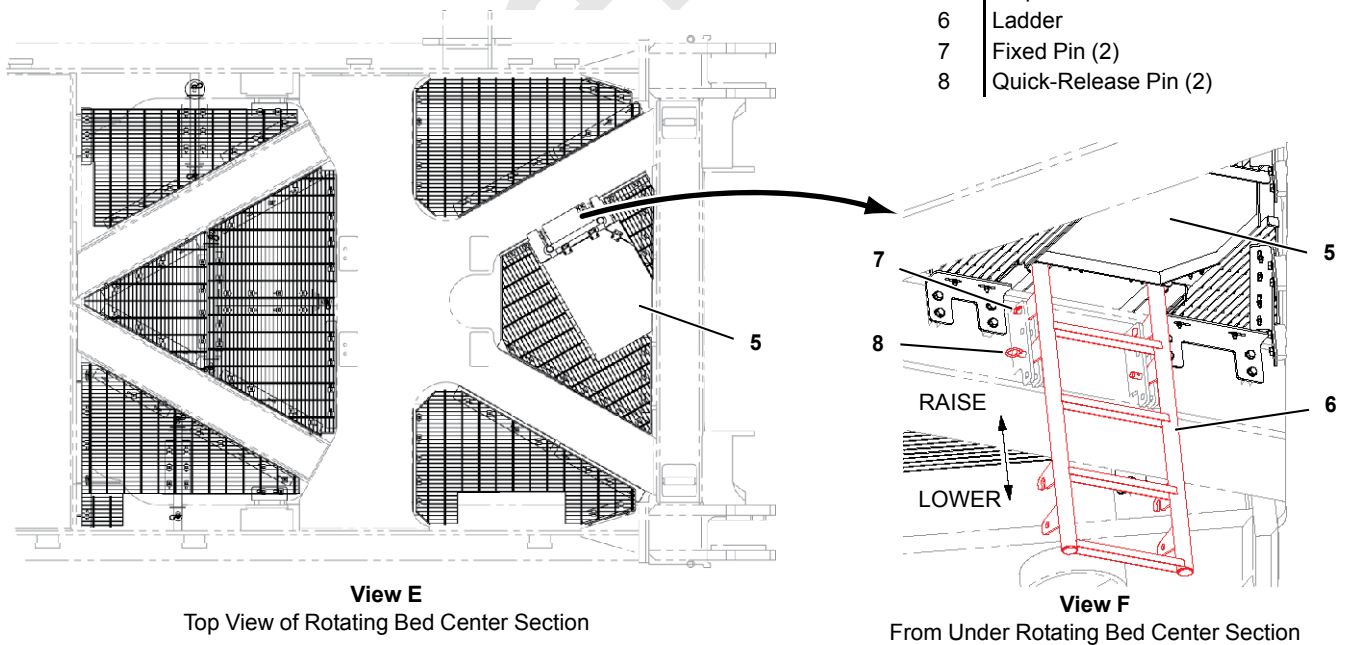


FIGURE 4-44

NOTE The roller carriers can be installed in either order: rear then front OR front then rear.

Install Front Roller Carrier

See [Figure 4-44](#) for the following procedure.

Installation of the front roller carrier is identical to installation of the rear roller carrier except for the lifting points.

To lift front roller carrier (1, View B), proceed as follows:

1. Unpin lifting links (2, View C) from the stored position and rotate the links to the lifting position.
2. Attach four legs of the chain lifting sling to lifting links (2, View B) and lifting lugs (4, View A).

Shorten both outboard legs of the chain 11 links.

3. Store links (2, View C) when done.

Retract Rotating Bed Jacking Cylinders

1. Retract the rotating bed jacking cylinders until the roller carrier rollers contact the roller path.

Use the inboard carbody valve controls at either or both carbody end beams. See [Figure 4-15](#) for control handle identification and operation.

NOTE The PPU must be connected to the carbody and running to operate the controls.

CAUTION

Avoid Cylinder Damage!

All four rotating bed jacking cylinders must be retracted simultaneously to keep the rotating bed level to within 2° from front to rear and from side to side. Otherwise, jacking cylinders can be damaged.

2. Chock the outboard roller on both sides of both roller carriers so the upperworks cannot accidentally swing on its own.
3. Once the rollers are chocked, fully retract the jacking cylinders.
4. As the rotating bed center section lowers, driveshaft adapter (6b, [Figure 4-41](#), View B) will engage torque adapter (7, [Figure 4-41](#), View E).
5. Install quick-release pin (5, [Figure 4-41](#), View B) to connect the drive shaft adapter to the torque adapter.

Connect Hoses and Cables from Rotating Bed Center Section to King Pin

1. Lower ladder (6, [Figure 4-44](#), View F) to gain access through trapdoor (5, View A) to the platforms inside the rotating bed center section.
2. Connect the hydraulic hoses from the rotating bed center section ([Figure 4-41](#), View C) to the couplers in the kingpin.
 - The hoses can be connected one way only.
 - Make sure the fittings are clean before connecting them.
 - Store the protective caps in the parts boxes provided in the rotating bed center section.
 - Use wrench (8, [Figure 4-41](#), View D) to tighten the couplers. The wrench is stored on a bracket on the left side of the rotating bed center section near the kingpin.
3. Connect the electric cable from the rotating bed center section to the cable in the kingpin.
4. RAISE ladder (6, [Figure 4-44](#), View B) when exiting the rotating bed center section. **Damage will occur if you do not perform this step.**

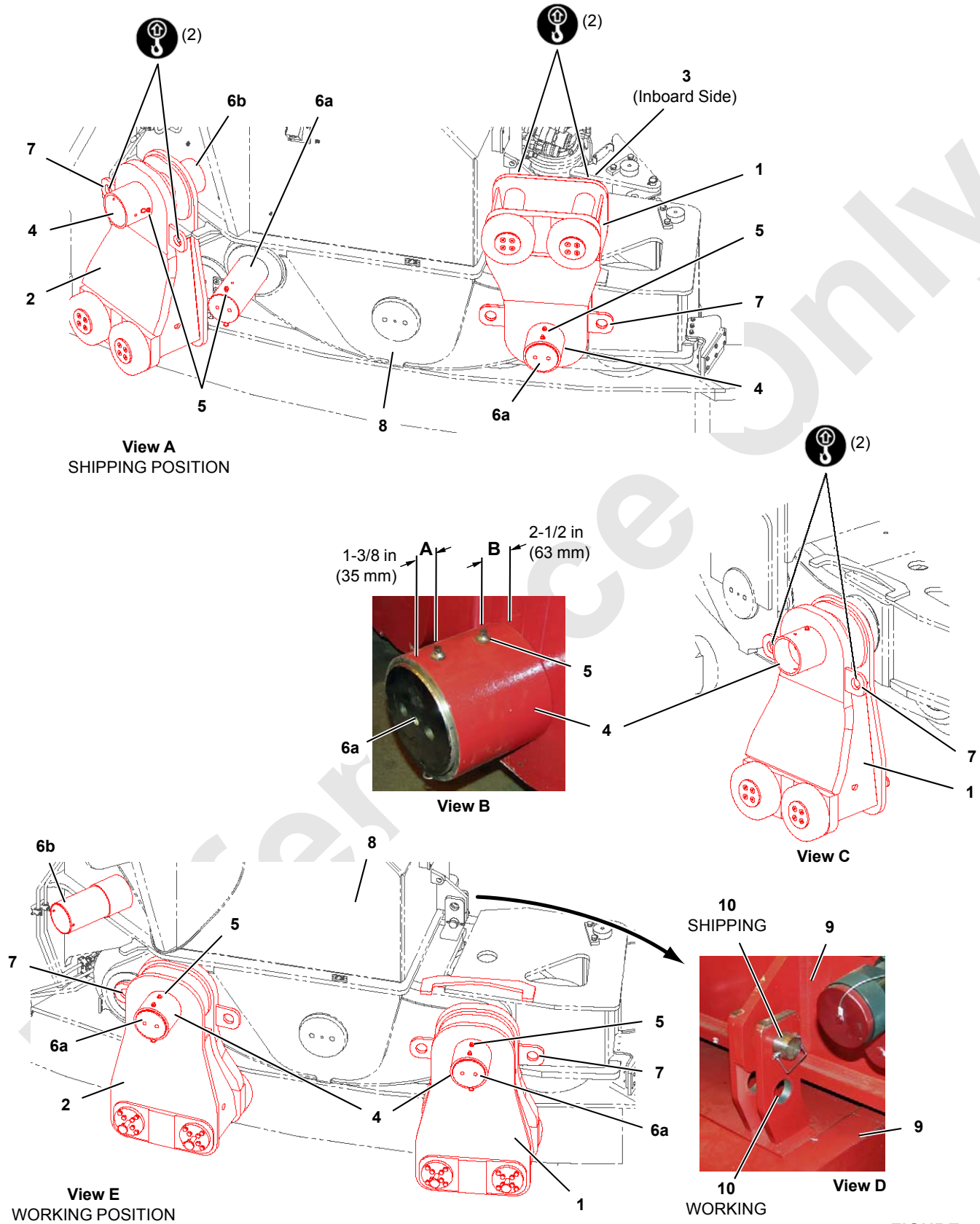


FIGURE 4-45

Legend for [Figure 4-45](#)

Item	Description
1	Outboard Hook Roller (4)
2	Inboard Hook Roller (4)
3	Lifting Stud (2 each outboard hook roller)
4	Spacer
5	Pin with Hair-Pin Cotter (2 each spacer)
6a	Pivot Pin (working)
6b	Pivot Pin (shipping)
7	Lifting Lug (2 each inboard hook roller)
8	Rear Roller Carrier
9	Roller Frame (4)
10	Stabilizer Pin with Wire Lock Pins (4)

Remove Roller Frame Stabilizer Pins

The stabilizer pins prevent the roller frames from tipping when the front and rear roller carriers are lifted.

Perform the following steps at all four roller frames (9, [Figure 4-45](#), View D).

1. Remove stabilizer pin (10) from the shipping hole.
2. Install stabilizer pin (10) in the working hole.

Rotate Hook Rollers to Working Position

See [Figure 4-45](#) for the following procedure.

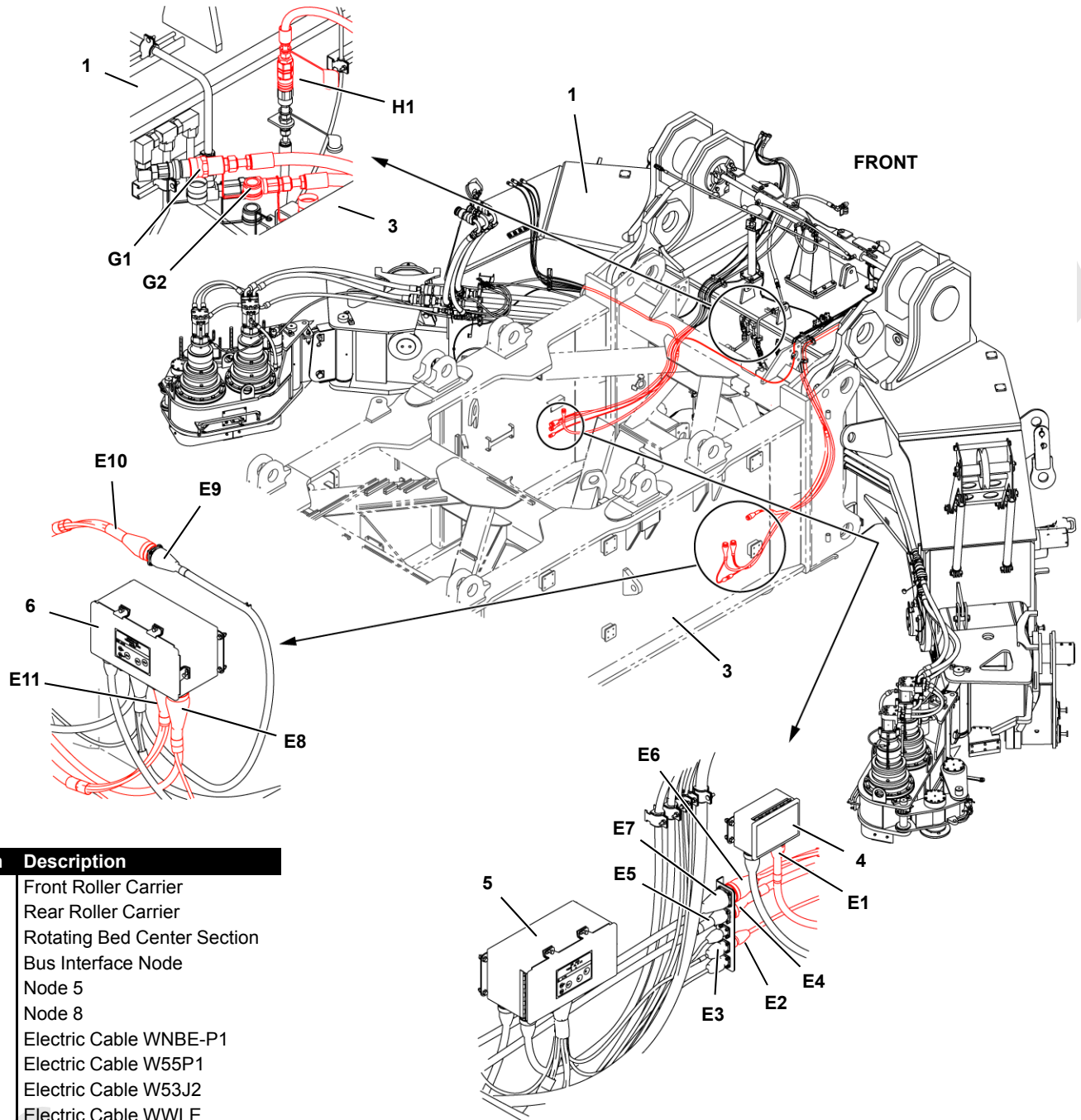
Rear roller carrier (8) is shown in [Figure 4-45](#), but the procedure is identical for both roller carriers.

1. Proceed as follows for each outboard hook roller (1, View A):
 - a. Attach the lifting sling hooks to lifting studs (3, View A).
 - b. Hoist to tighten the lifting slings.
 - c. Remove spacer (4, View A) from pivot pin (6a).
 - d. Rotate spacer (4) end for end and install it — end A first (View B) — on pivot pin (6a, View C).
 - e. Pin the spacer to the outer hole in the pivot pin.

- f. Pull hook roller (1) out to disengage it from the retaining lugs on the roller carrier and rotate the hook roller down (View C).
 - g. Disconnect the lifting slings.
 - h. Attach the lifting sling hooks to lifting lugs (7, View C).
 - i. Hoist to tighten the lifting slings.
 - j. Remove spacer (4, View C) from pivot pin (6b).
 - k. Slide hook roller (1) off the pivot pin.
 - l. Rotate the hook roller 180°.
 - m. Slide the hook roller onto pivot pin (6a, View E).
 - n. Rotate spacer (4) end for end and install it — end B first (View B) — on pivot pin (6a, View E).
 - o. Pin the spacer to both holes in the pivot pin.
 - p. Disconnect the lifting slings.
2. Proceed as follows for each inboard hook roller (2, View A):
 - a. Attach the lifting sling hooks to lifting lugs (7, View A).
 - b. Hoist to tighten the lifting slings.
 - c. Remove spacer (4, View A) from pivot pin (6b).
 - d. Slide hook roller (2) off the pivot pin.
 - e. Rotate the hook roller 180°.
 - f. Slide the hook roller onto pivot pin (6a, View E).
 - g. Rotate spacer (4) end for end and install it — end B first (View B) — on pivot pin (6a).
 - h. Pin the spacer to both holes in the pivot pin.
 - i. Disconnect the lifting slings.

Connect Hoses and Cables between Rotating Bed Center Section and Roller Carriers

Refer to [Figure 4-46](#) and connect the hydraulic hoses, grease hoses, and electric cables shown in red.

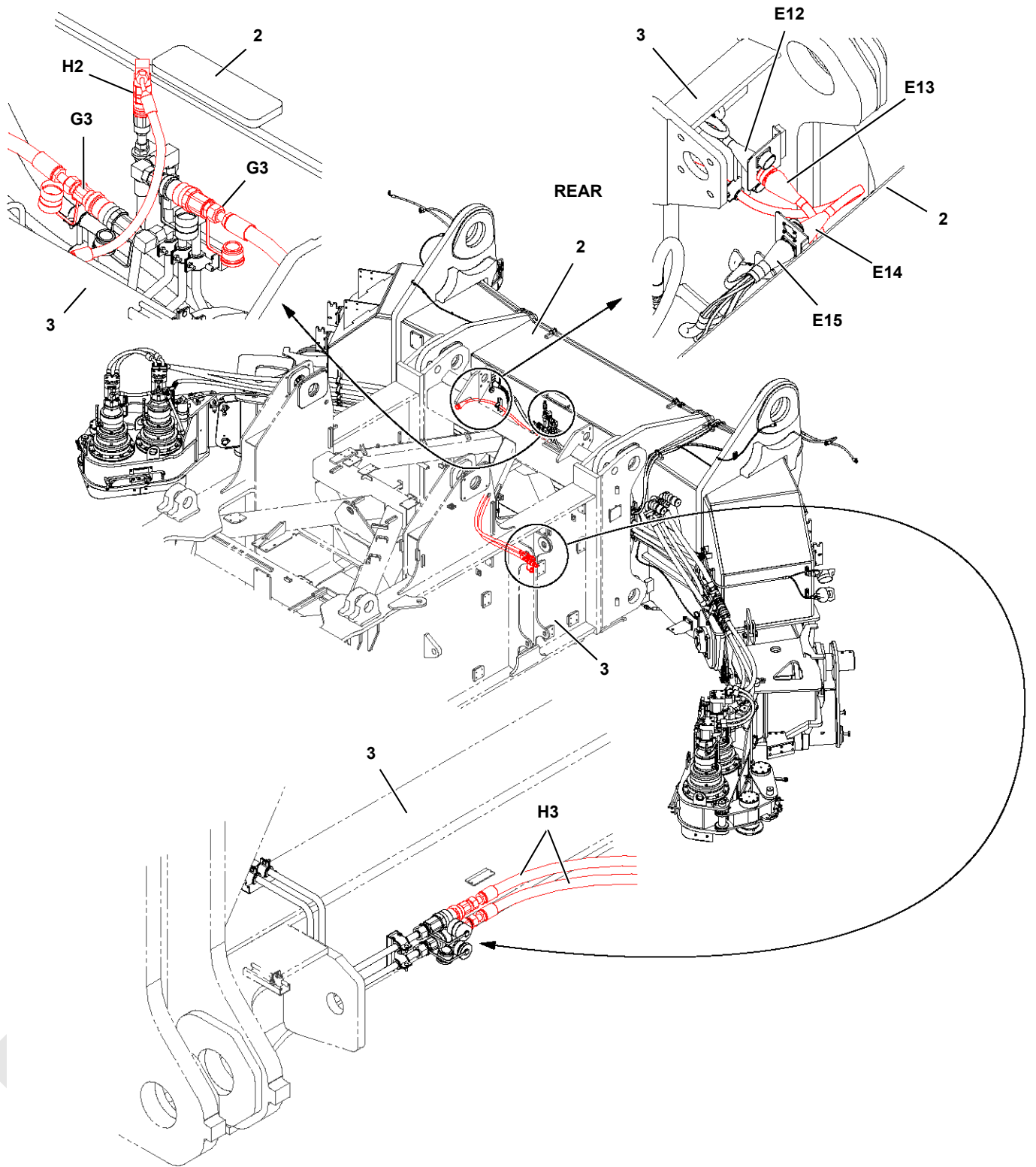


Item	Description
1	Front Roller Carrier
2	Rear Roller Carrier
3	Rotating Bed Center Section
4	Bus Interface Node
5	Node 5
6	Node 8
E1	Electric Cable WNBE-P1
E2	Electric Cable W55P1
E3	Electric Cable W53J2
E4	Electric Cable WWLE
E5	Electric Cable WWL
E6	Electric Cable CL3P1
E7	Electric Cable CL3E
E8	Electric Cable W86P1
E9	Electric Cable W84J1
E10	Electric Cable W85P1
E11	Electric Cable W83P1
E12	Electric Cable W63
E13	Electric Cable W62
E14	Electric Cable W73
E15	Electric Cable W75

Item	Description
H1	Hydraulic Hose: Front Swing Brakes
H2	Hydraulic Hose: Rear Swing Brakes
H3	Hydraulic Hoses: Counterweight and Backhitch Pins

Item	Description
G1	Grease Supply Hose: Front Roller Carrier
G2	Grease Supply Hoses: Boom Hinge Pins
G3	Grease Supply Hoses: Rear Roller Carrier

FIGURE 4-46



4

FIGURE 4-46 continued

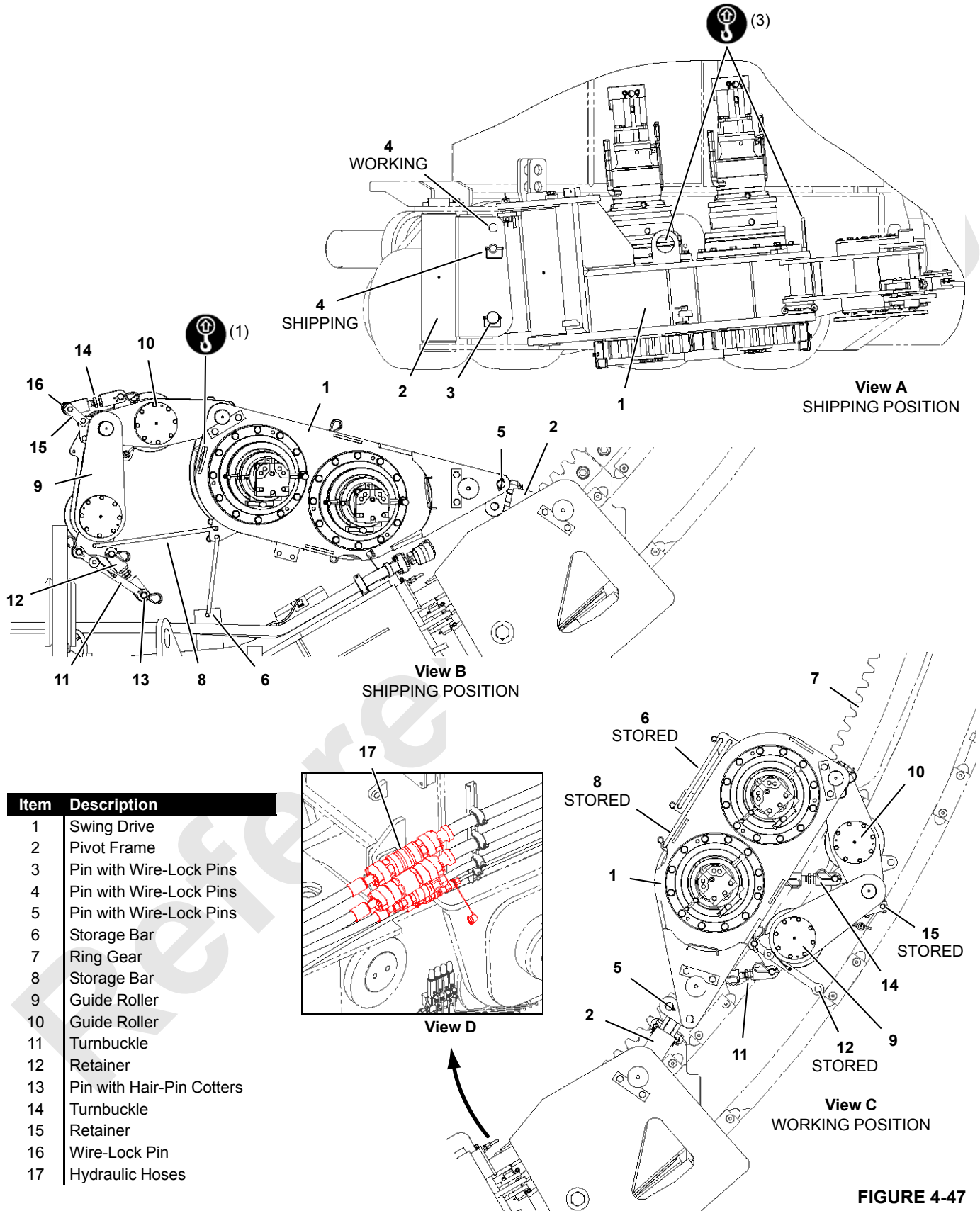


FIGURE 4-47

Install Swing Drives

Perform the following steps only if the swing drives were removed for shipping.

See [Figure 4-47](#) for the following procedure.

Perform these steps BEFORE installing the roller carriers.

1. Lift swing drive (1, View A) into position at the appropriate end of the roller carrier.
2. Pin swing drive (1, View A) to pivot frame (2) with pins (3 and 4). **Make sure you use shipping holes shown in View A so that the swing drive is tilted up.**
3. Make sure pin (5) is installed in the outer holes shown in View B.
4. Secure the swing drive to the roller carrier with storage bar (6, View B).
5. Perform the above steps for all four swing drives.

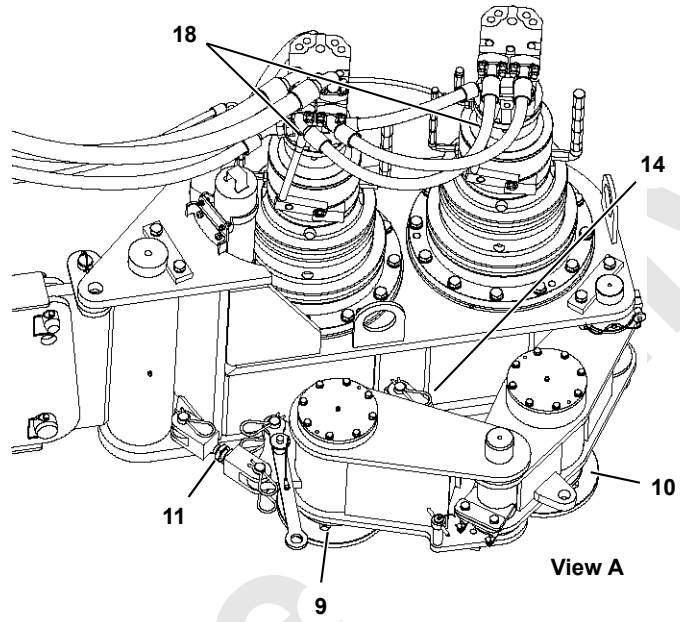
Deploy Swing Drives

Perform the following steps AFTER the roller carriers are installed and the rotating bed center section is fully lowered.

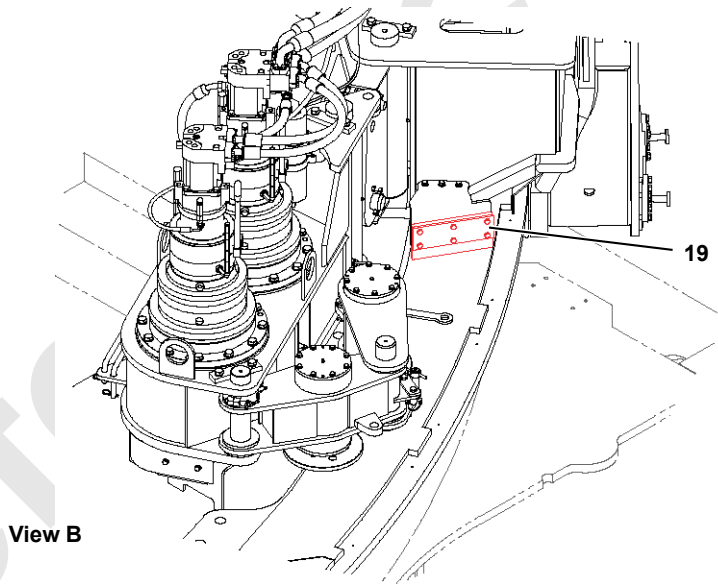
See [Figure 4-47](#) for the following procedure.

1. Attach one chain lifting sling from the assist crane to the outboard lifting lug on the swing drive (View B).
2. Unpin storage bar (6, View B) from the roller carrier.
3. Rotate the swing drive outward to the roller path so the pinions are visually aligned with ring gear (7, View C).
4. Unpin storage bar (8, View B) from swing guide (9).
5. Pin storage bars (6 and 8, View C) to swing drive (1).
6. Unpin turnbuckle (11, View B) from retainer (12) and store retainer (12, View C).
7. Unpin turnbuckle (14, View B) from retainer (15) and store retainer (15, View C).
8. Rotate guide rollers (9 and 10) to the outboard side of ring gear (7).
9. Support swing drive (1) with the chain lifting sling and remove pin (4, View A) from the shipping holes.
10. Lower the swing drive into engagement with the ring gear and install pin (4, View A) in the WORKING holes in pivot frame (2).
11. Move pin (5) from the shipping position (View B) to the working position (View C).
12. Rotate guide rollers (9 and 10, View C) against the outboard side of the ring gear.
13. Pin turnbuckles (11 and 14, View C) to the swing drive.
14. Adjust the turnbuckles if required.
15. Connect the hydraulic hoses (17, View D) from the swing drive to the roller carrier. The hoses can be connected one way only.

Item	Description
9	Guide Roller
10	Guide Roller
11	Turnbuckle
14	Turnbuckle
18	Disconnect Handle
19	Ring Wiper



View A



View B

FIGURE 4-48

Adjust Swing Drive Gear Backlash

See [Figure 4-48](#) for the following procedure.

Adjust backlash on the pinion farthest from the roller carrier first!

1. Pull disconnect handle (18) on both gearboxes to the vertical position to disengage the swing drive.
2. Tighten both turnbuckles (11 and 14) until both pinions are tightly in mesh with the ring gear.
3. Loosen turnbuckle (11) — closest to roller carrier — one half turn.
4. Loosen turnbuckle (14) — farthest from roller carrier — while holding the pinion in mesh until there is a 0.060 in (1.52 mm) gap between the guide roller and the outer edge of the ring gear. This corresponds to a 0.061 in (1.55 mm) backlash in the gear set.

5. Tighten the jam nut on the turnbuckle.
6. Repeat steps [4](#) and [5](#) for turnbuckle (11) — nearest to roller carrier.
7. The maximum allowable backlash is 0.102 in (2.59 mm) which corresponds to a guide roller gap of 0.120 in (3.05 mm).
8. Move disconnect handles (18) back to the engaged position. It may be necessary to jog the swing motors to fully engage the swing drive.

Adjust Ring Wipers

See [Figure 4-48](#) for the following procedure.

Adjust ring wipers (19, View B) so they just contact the roller path wear plate.

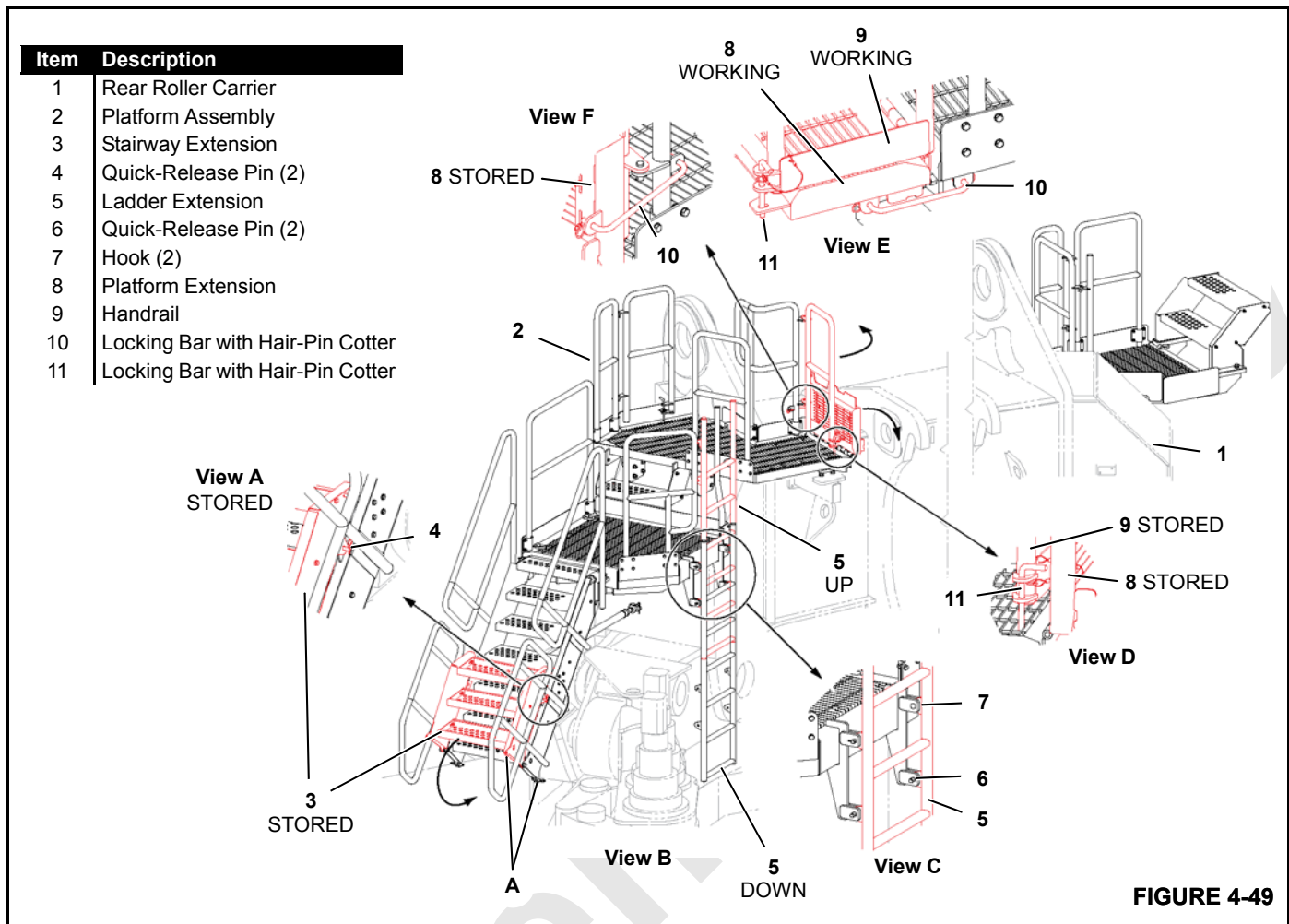


FIGURE 4-49

Install Rear Roller Carrier Platforms

The rear roller carrier platform, stairway, and ladder are shipped on the rear roller carrier as shown in [Figure 4-49](#). Once the roller carrier is installed, proceed as follows:

1. Lower stairway extension (3) to the working position.
 - a. Remove quick-release pins (4, View A).
 - b. Rotate the stairway extension down.
 - c. Install quick-release pins (4) in holes A (View B).
2. Move ladder (4) to the down position:
 - a. Remove quick-release pins (6, View C).
 - b. Unhook the ladder from the platform.
 - c. Re-hook the ladder to the platform in the down position.
 - d. Install quick-release pins (6, View C).

3. Unpin platform extension (8, View F) from the stored position, rotate it down, and pin it in the working position (View E).
4. Unpin handrail (9, View D) from the stored position, rotate it outward, and pin it in the working position (View E).

Install Front Roller Carrier Platforms

See [Figure 4-50](#) for the following procedure.

1. Lift platform (2, View B) into position so fixed pins (3, View C) engage hooked brackets (4) on front roller carrier (1).
2. Install quick-release pins (5, View C).
3. Adjust bolts (6), if needed, to level the platform.
4. Raise handrails (7, View A) to the working position.
5. Rotate platform extensions (10, View B) to the working position.

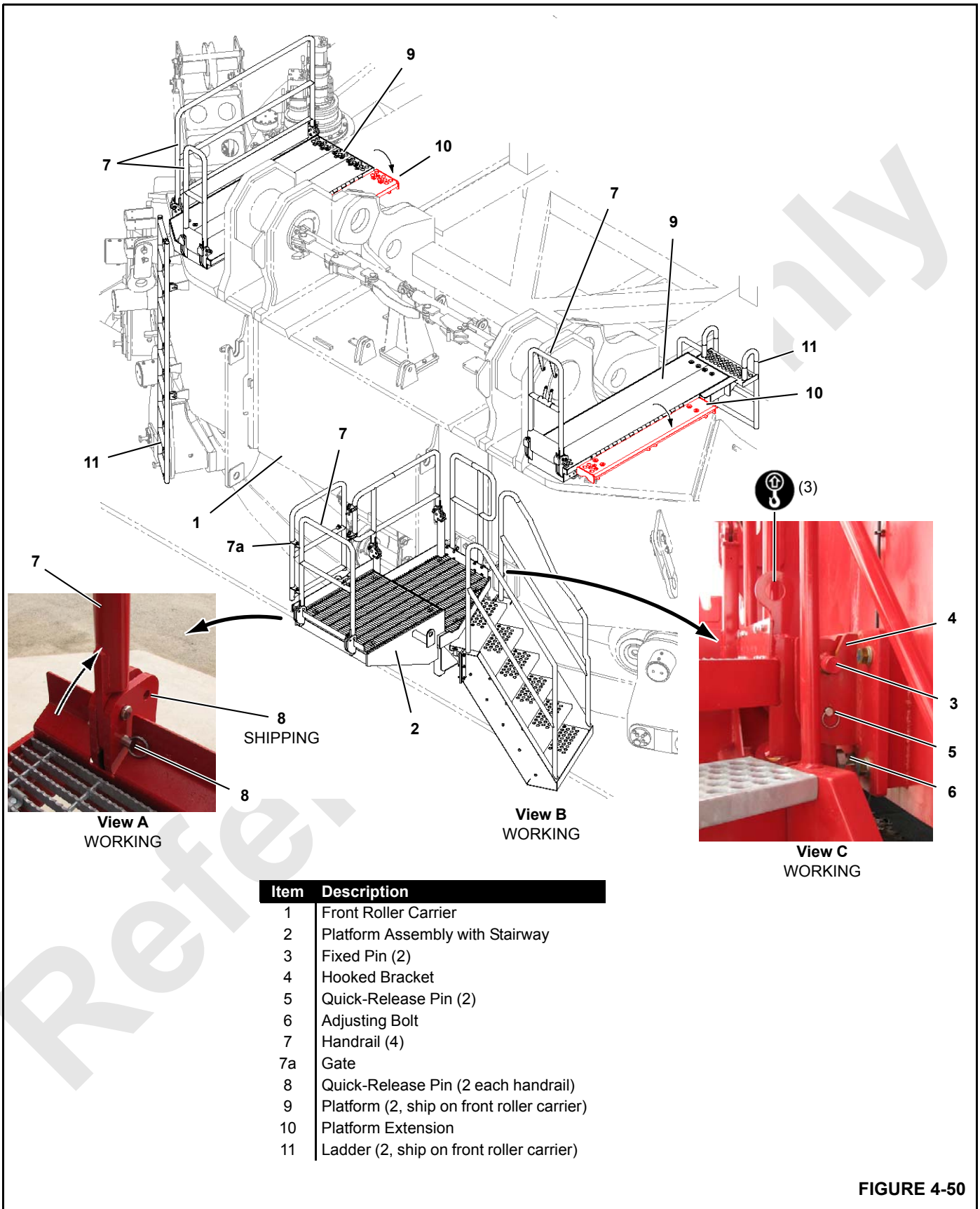


FIGURE 4-50

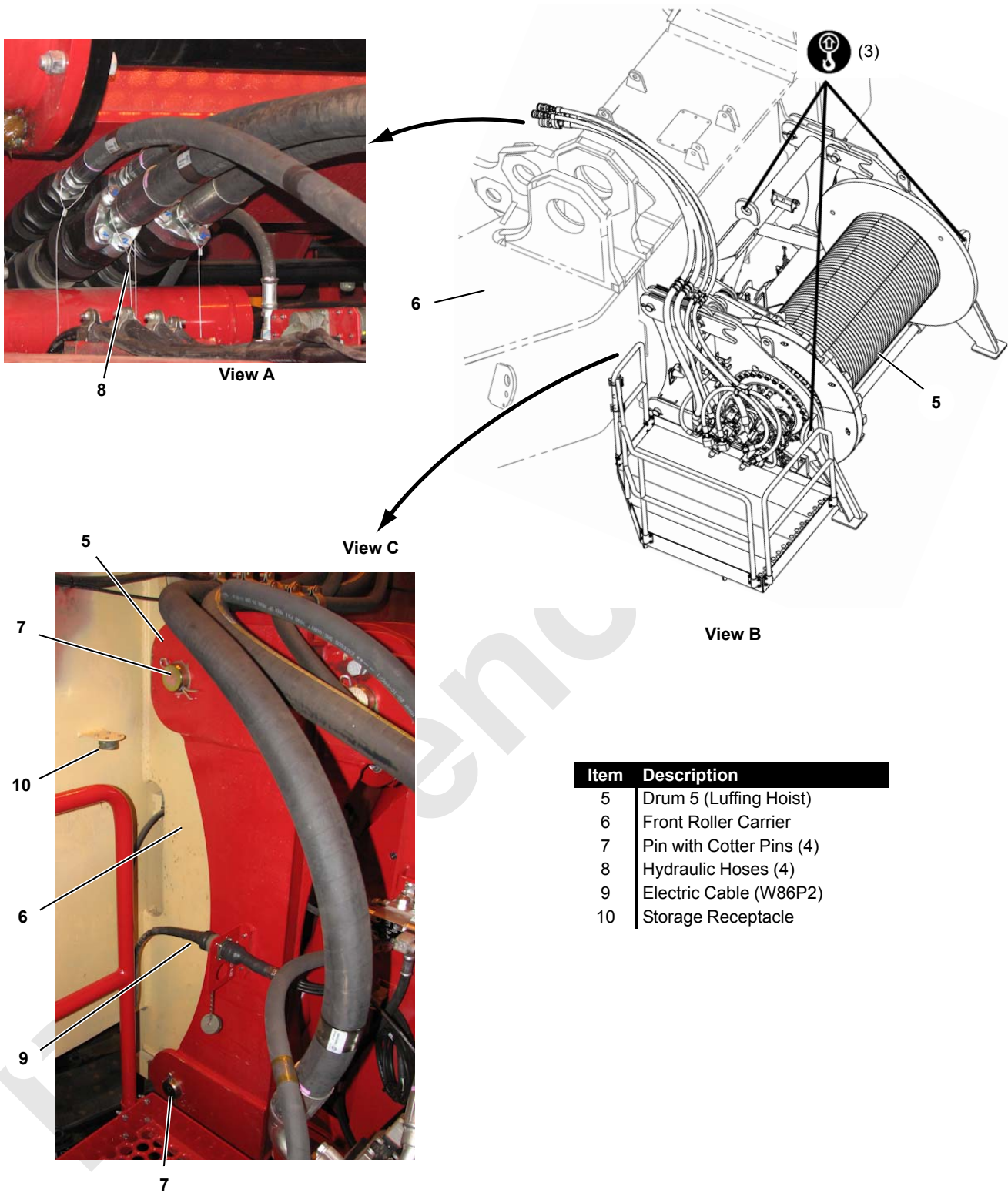


FIGURE 4-51

CRANE ASSEMBLY — DRUMS

Install Drum 5

Perform the following procedure if your crane will have a luffing jib.

See [Figure 4-51](#) for the following procedure.

1. Lift drum (5) as shown in [Figure 4-51](#).

Use three legs of the chain lifting sling shown in [Figure 4-10](#), View A.

2. Remove pins (7, View C) from the drum frame.

3. Lift drum (5) into position at the lugs on front roller carrier (6, View B).
4. Align the top connecting holes and install top two pins (7, View C).
5. Lower drum (5) until the lifting slings are slack and install bottom two pins (3, View C).
6. Disconnect the lifting slings.
7. Connect four hydraulic hoses (8, View A) from drum (5) to the hydraulic hoses at the front of the rotating bed. The couplers can be connected only one way.
8. Disconnect electric cable (9, View C) from storage receptacle (10).

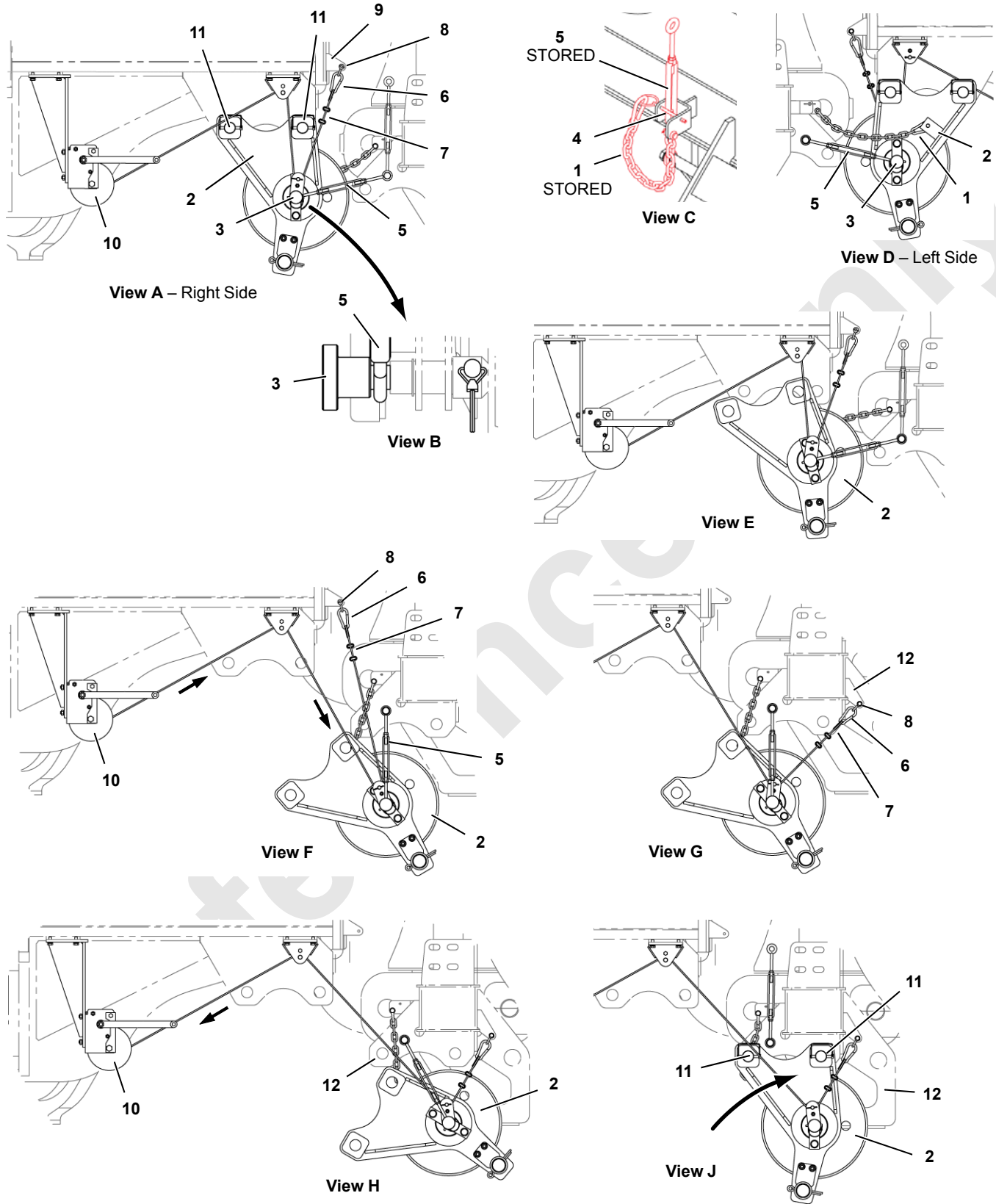


FIGURE 4-52

Item	Description
1	Chain
2	Wire Rope Guide
3	Pin with Wire-Lock Pin (2)
4	Wire-Lock Pin
5	Turnbuckle (2)
6	Snap Hook
7	Wire Rope
8	Shackle
9	Front Roller Carrier
10	Hand Winch
11	Pin with Cotter Pins (4)
12	Drum 5 Frame

Relocate Rigging Winch Wire Rope Guide

If your crane is equipped with a luffing hoist (Drum 5), the rigging winch lower wire rope guide must be relocated from under the front roller carrier to under Drum 5 to provide proper routing of the rigging line.

Do not relocate the wire rope guide until after the rigging winch is used to reeve the mast hoist wire rope.

See [Figure 4-52](#) for the following procedure.

1. Disconnect chain (1, View C) from the stored position and connect it to wire rope guide (2, View D).
2. Remove pins (3, Views A and D) from wire rope guide (2).
3. Remove wire lock pin (4, View C) and rotate turnbuckles (5) down to the working position.
4. Pin turnbuckles (5, View B) to the wire rope guide with pins (3).

NOTE Adjust the length of the turnbuckles if needed. Securely tighten the locknuts when done.

5. Route wire rope (7, View A) from hand winch (10) over the guide sheave under the front roller carrier and under the guide sheave on wire rope guide (2).
6. Pin snap hook (6, View A) on wire rope (7) to shackle (8) on front roller carrier (9).
7. Haul in wire rope with hand winch (10, View A) just enough to loosen pins (11) and remove both pins.
 - When the winch handle is turned in the raise direction (haul in), the winch makes a loud clicking noise.
 - When the winch handle is turned in the lower direction (pay out), the winch brake is actuated and there is no clicking noise.
 - When the winch handle is stopped and released, the brake applies.
8. Allow wire rope guide (2) to swing down as shown in View E.
9. Pay out wire rope from the hand winch to lower the wire rope guide until turnbuckles (5, View F) are vertical and the wire rope is slack.
10. Disconnect snap hook (6, View F) on wire rope (7) from shackle (8) on the front roller carrier and pin the snap hook to shackle (8) on Drum 5 frame (12, View G).
11. Haul in wire rope with hand winch (10) to raise wire rope guide (2) to the mounting position under Drum 5 frame (12, View H).
12. Rotate the wire rope guide by hand to align the connecting holes and install pins (11, View J).
13. Unpin the turnbuckles from the working position on the wire rope guide, rotate the turnbuckles to the storage position, and install quick-release pin (4, View C).
14. Store chain (1, View C).
15. Reverse the above steps to relocate the wire rope guide from under Drum 5 frame to under the front roller carrier.

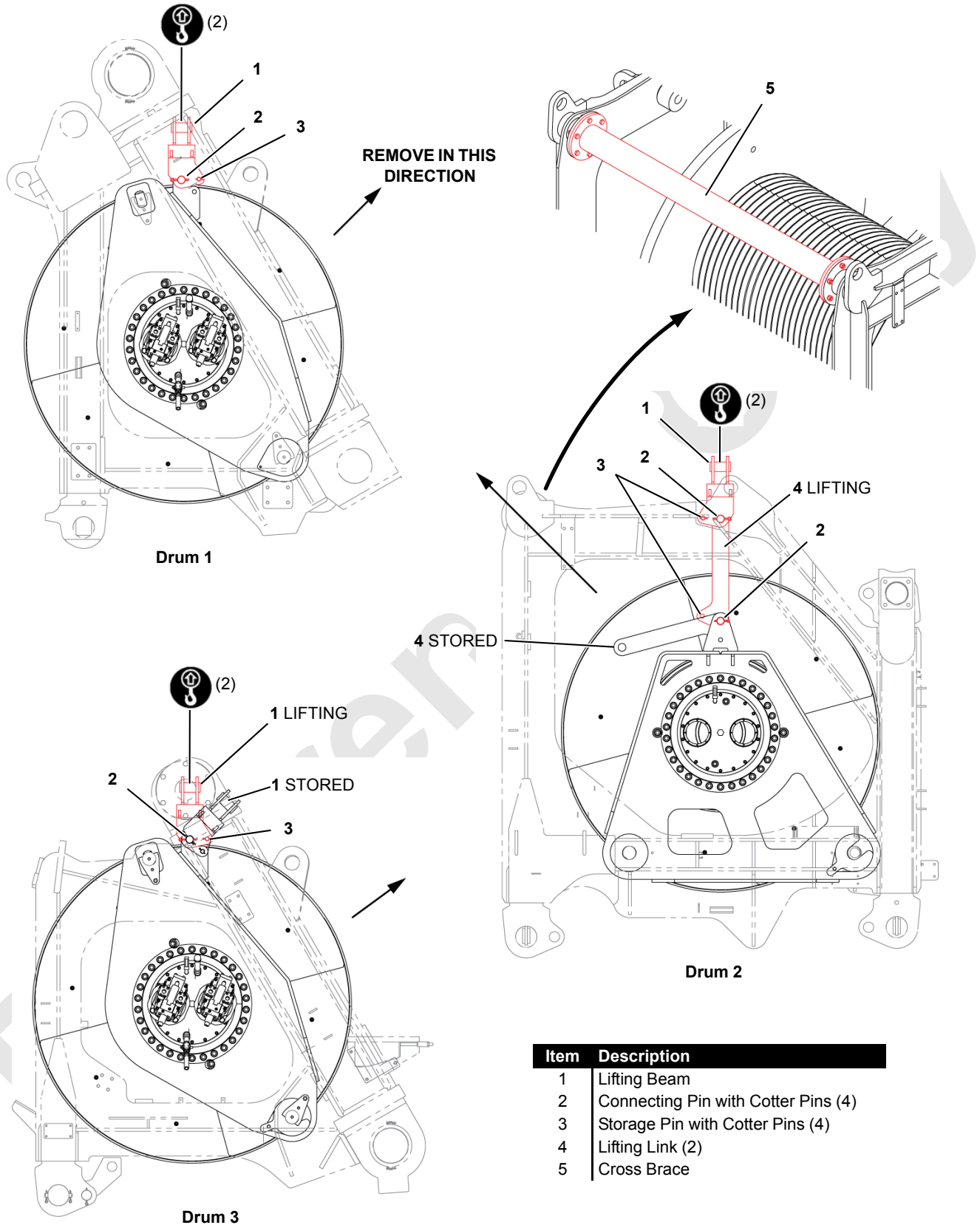


FIGURE 4-53

Using Drum Lifting Beam



WARNING

Crush Hazard!

A Falling drum can crush personnel:

- Use lifting beam (1) only for lifting a drum assembly with wire rope. **DO NOT** use lifting beam to lift drum assembly and drum frame.
 - Lifting beam must only be stored on Drum 3.
-

See [Figure 4-53](#) for the following procedure.

1. Attach lifting beam (1) to each drum as shown.
2. Unpin lifting beam (1) from the stored position before attempting to lift the drum. **Structural damage will occur if you ignore this step.**
3. Lifting links (4) must be used to lift Drum 2.
4. Cross brace (5) must be removed before Drum 2 can be removed
5. Remove each drum in the direction of the arrow.
6. Use two legs of the chain lifting sling attached to the assist crane to lift a drum
7. Store lifting beam (1) only on Drum 3. Do not attempt to store the lifting beam on any other drum. **Wire rope damage will occur if you ignore this step.**

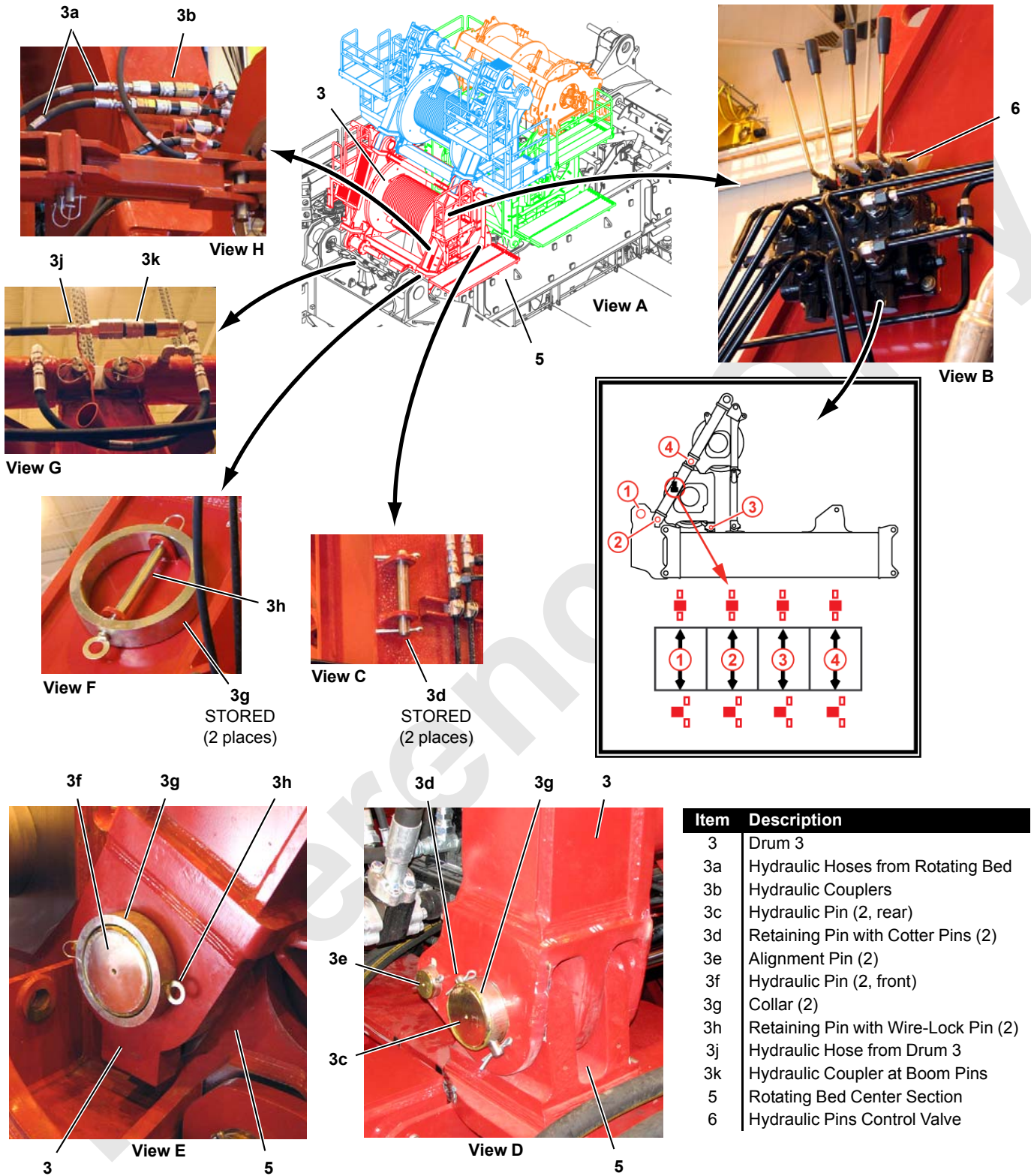


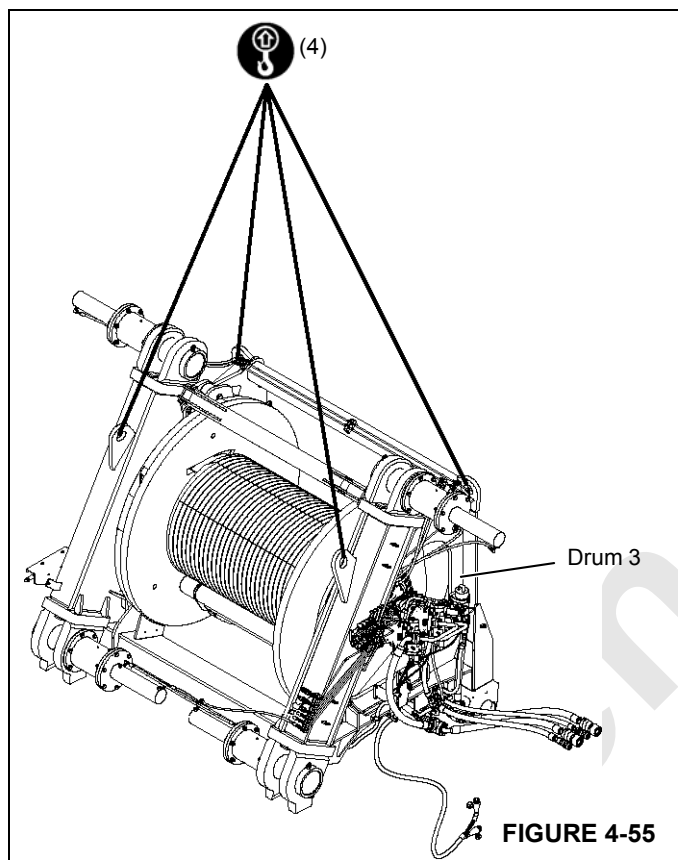
FIGURE 4-54

NOTE The drum lifting arrangements in [Figure 4-55](#), [Figure 4-58](#), and [Figure 4-62](#) are for the complete drum assembly — with or without wire rope installed.

Install Drum 3

1. Lift drum (3) as shown in [Figure 4-55](#).

Use four legs of the chain lifting sling shown in [Figure 4-10](#), View A.



See [Figure 4-54](#) for the remaining steps.

2. Lift drum (3) into position as close as possible to the connecting lugs on the front of rotating bed center section (5).
3. Connect two hydraulic hoses (3a, View H) from rotating bed center section (5) to hydraulic couplers (3b) on drum (3).
4. Start the PPU and disengage hydraulic pins (3c, View D) and (3f, View E) using the control handles on hydraulic pins control valve (6, View B).
5. Thoroughly clean and lightly grease all pins and connecting holes.
6. Slowly lower drum (3) onto rotating bed center section (5).
Alignment pins (3e, View D) will guide the connecting holes in the drum frame into proper alignment with the connecting holes in the rotating bed center section.
7. Stop lowering the drum when the lifting slings slacken.
8. Engage hydraulic pins (3c, View D) and (3f, View E) using the control handles on hydraulic pins control valve (6, View B).
9. Remove retaining pins (3d, View C) from storage and install them in hydraulic pins (3c, View D).
10. Remove collars (3g, View F) and retaining pins (3h) from storage and install them on hydraulic pins (3f, View E).
11. Disconnect the lifting slings from the drum.
12. Connect hydraulic hose (3j, View G) from drum (3) to hydraulic coupler (3k) at the boom hydraulic pins.
13. Deploy Drum 3 platforms after Drum 2 is installed (see [page 4-91](#)).

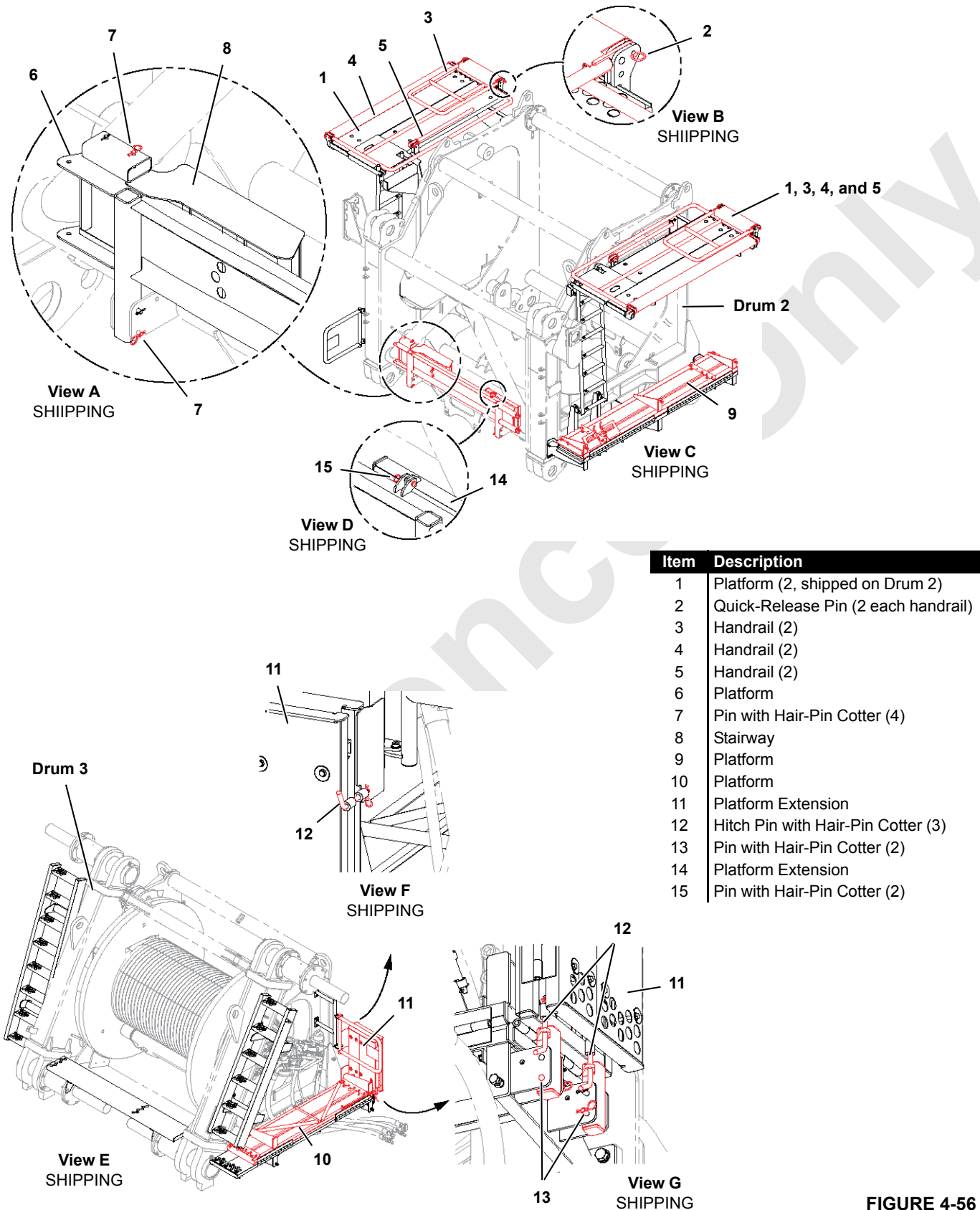


FIGURE 4-56

Deploy Drum 2 and 3 Platforms

See [Figure 4-56](#) for the following procedure.

Perform steps 1 and 2 before installing Drum 2.

1. Unpin handrails (3, 4, and 5, View C) from the shipping position (View B), raise the handrails to the working position (View L), and reinstall quick-release pins (2, View J).
2. Unpin and lower platform (6, View A) from the shipping position and pin it in the working position (Views G and M).

3. Unpin and rotate stairway (8, View A) from the shipping position and pin it in the working position (View G).

Perform the remaining steps after Drum 2 is installed.

4. Rotate platforms (9, View C) and (10, View E) from the shipping position to the working position (View L).
5. Unpin platform extension (11, Views G and F) from the shipping position and pin it in the working position (View K).
6. Unpin platform extension (14, View D) from the shipping position and pin it in the working position (View M).

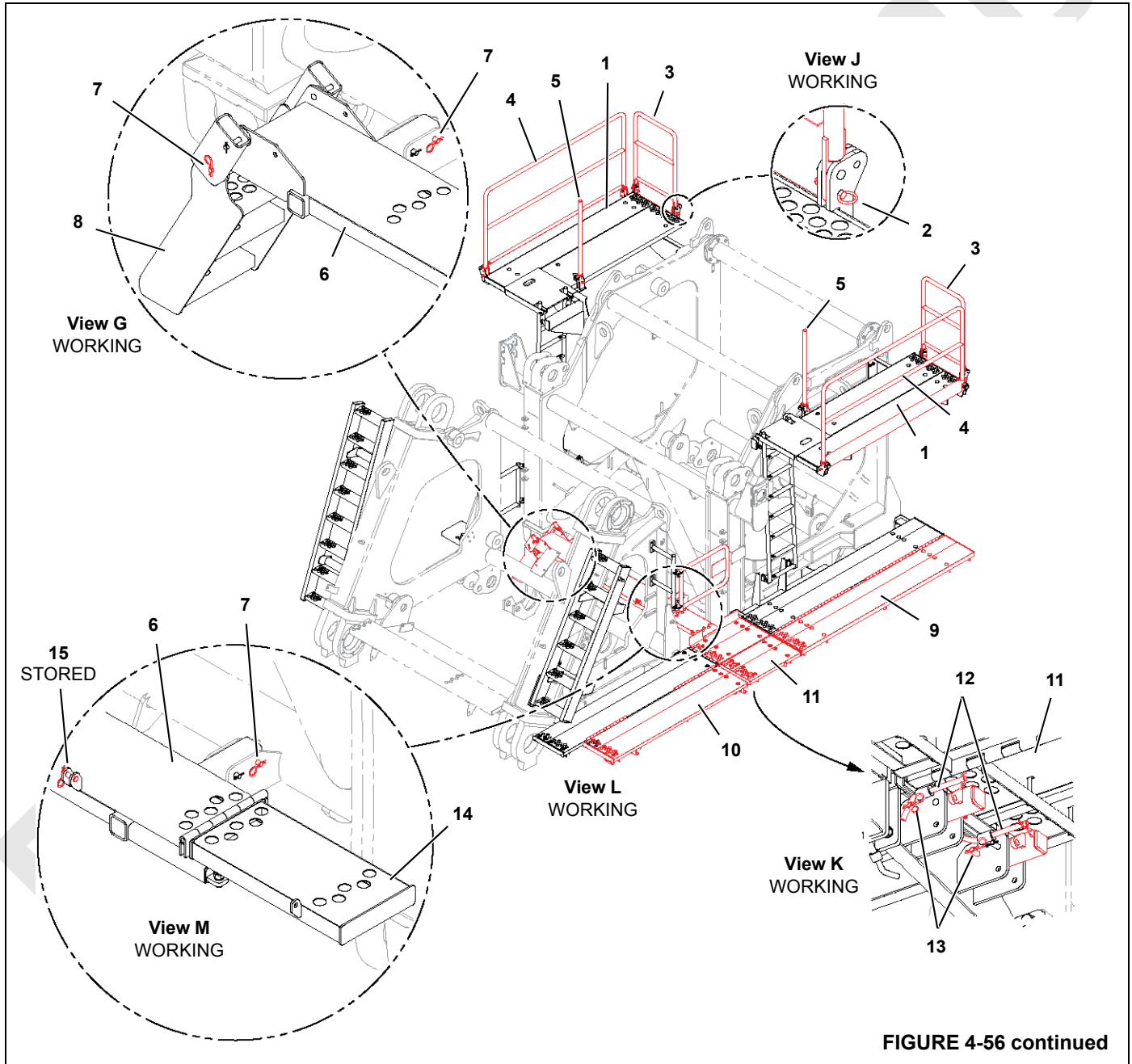
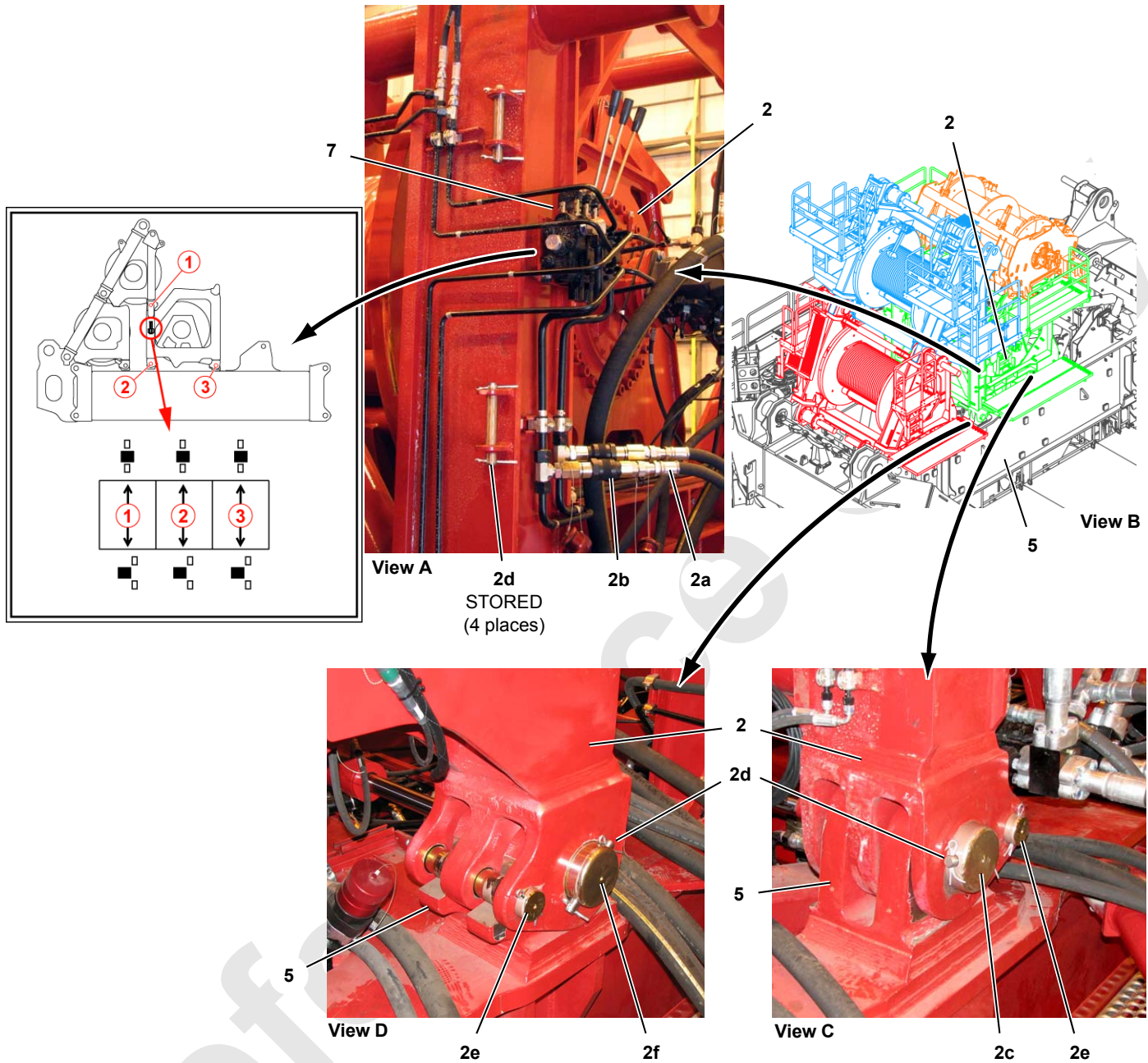


FIGURE 4-56 continued

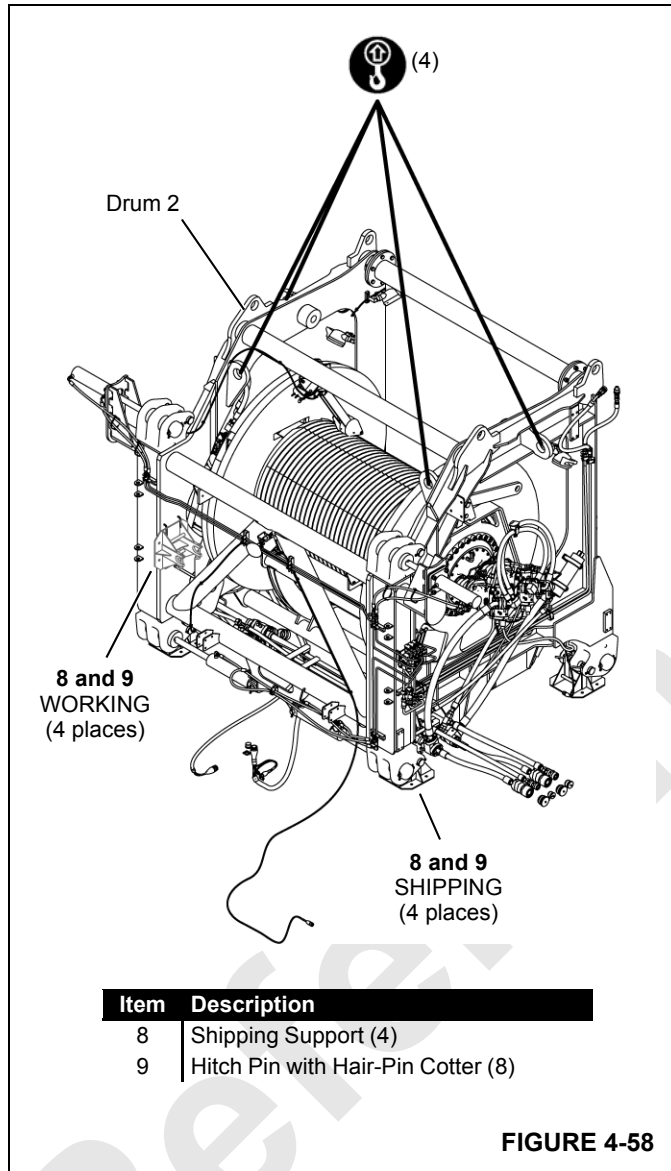


Item	Description
2	Drum 2
2a	Hydraulic Hoses from Rotating Bed
2b	Hydraulic Couplers
2c	Hydraulic Pin (2, rear)
2d	Retaining Pin with Wire-Lock Pins (4)
2e	Alignment Pin (4)
2f	Hydraulic Pin (2, front)
5	Rotating Bed Center Section
7	Hydraulic Pins Control Valve

FIGURE 4-57

Install Drum 2

1. Deploy Drum 2 platforms (steps [1](#) and [2](#) on [page 4-91](#)).
2. Lift drum (2) as shown in [Figure 4-58](#).
Use the 4-leg chain lifting sling shown in [Figure 4-10](#), View A.



3. Remove shipping supports (8, [Figure 4-58](#)) from the shipping position and hang them in the working position.

See [Figure 4-57](#) for the remaining steps.

4. Lift drum (2) into position as close as possible to the connecting lugs on rotating bed center section (5).
5. Connect two hydraulic hoses (2a, View A) from rotating bed center section (5) to hydraulic couplers (2b) on drum (2).
6. Start the PPU and disengage hydraulic pins (2c, View C) and (2f, View D) using the control handles on hydraulic pins control valve (7, View A).
7. Thoroughly clean and lightly grease all pins and connecting holes.
8. Slowly lower drum (2) onto the rotating bed center section.

Alignment pins (2e, Views C and D) will guide the connecting holes in the drum frame into proper alignment with the connecting holes in the rotating bed center section.

9. Stop lowering the drum when the lifting slings slacken.
10. Engage hydraulic pins (2c, View C) and (2f, View D) using the control handles on hydraulic pins control valve (7, View A).
11. Remove retaining pins (2d, View A) from storage and install them in hydraulic pins (2c, View C) and (2f, View D).
12. Disconnect the lifting slings from the drum.
13. Finish deploying Drum 2 and 3 platforms (steps [4](#) through [6](#) and on [page 4-91](#)).

Item	Description
1	Drum 1
2	Drum 2
3	Drum 3
4	Drum 4
4a	Pin with Cotter Pins (4)
4b	Alignment Pin (4)
4c	Hydraulic Hoses from Rotating Bed
4d	Hydraulic Couplers
5	Rotating Bed Center Section
8a	Equalizer
8a	Sheave Bank
9	Sheave
10	Pin with Wire-Lock Pin (2)

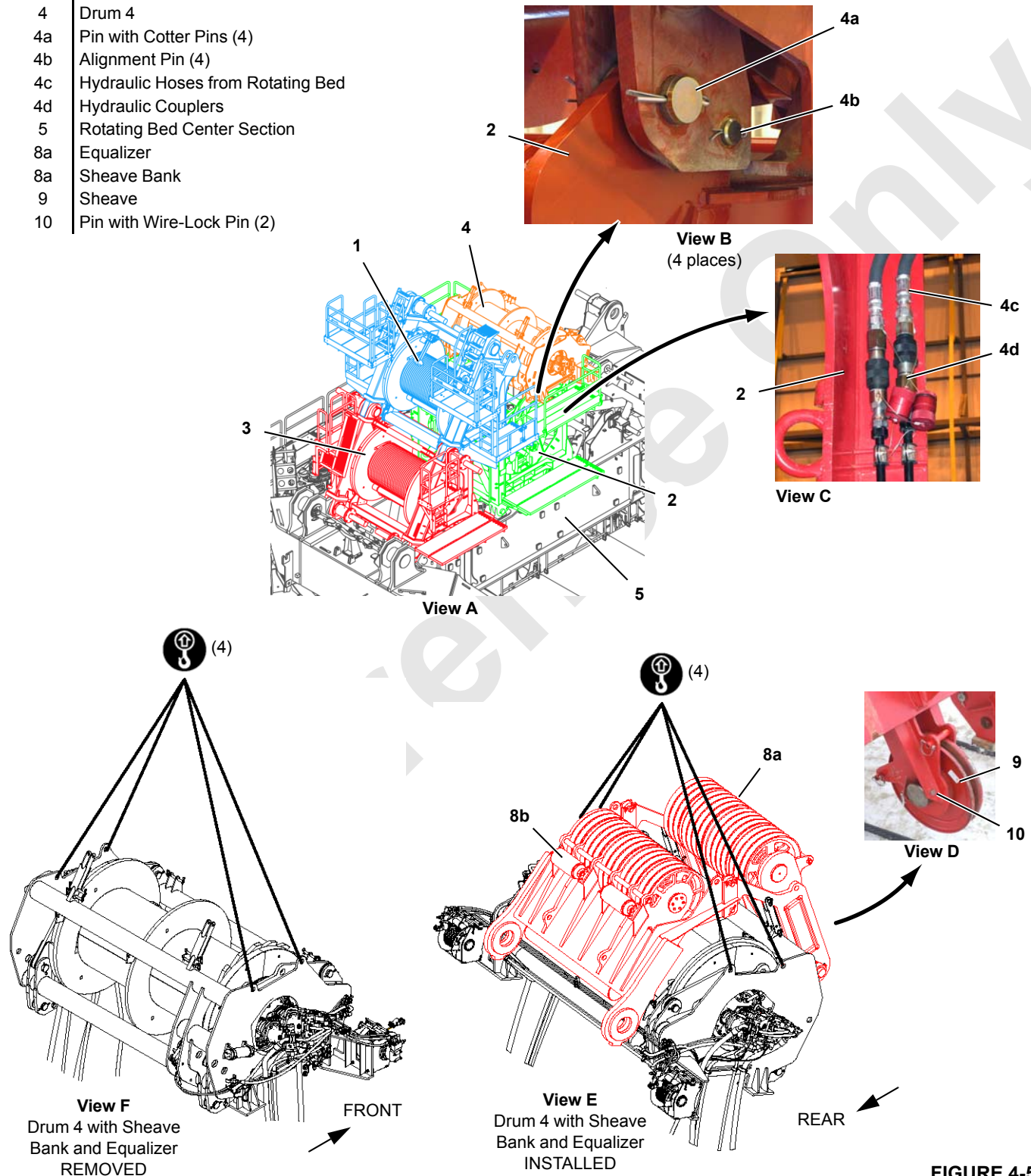


FIGURE 4-59

Install Drum 4

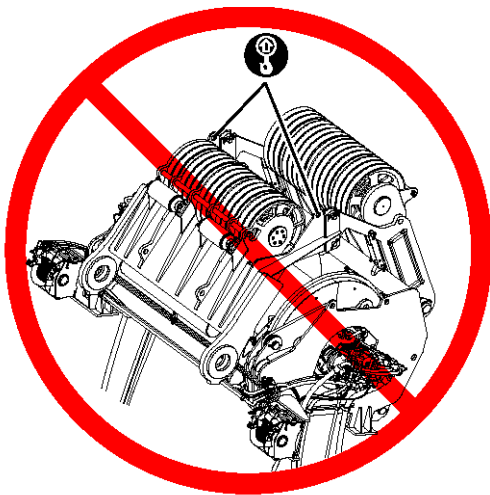
See [Figure 4-59](#) for the following procedure.

1. Lift drum (4) as shown in [Figure 4-59](#), View E or F.
Use four legs of the chain lifting sling shown in [Figure 4-10](#), View A.

CAUTION

Avoid Structural Damage!

Do not attempt to lift entire drum (4) assembly using lifting lugs on sheave bank. Lifting lugs on sheave bank are provided for lifting only the assembled sheave bank and equalizer.



Lift entire drum (4) assembly — with sheave bank and equalizer installed or removed — as shown in [Figure 4-59](#), View D or E.

1. Remove pins (4a, View B) from the drum.
2. Lift drum (4) into position over the connecting lugs on drum (2, View B).
3. Thoroughly clean and lightly grease all pins and connecting holes.
4. Slowly lower drum (4) onto drum (2).
Alignment pins (4b, View B) will guide the connecting holes in drum (4) into proper alignment with the connecting holes in drum (2).
5. Stop lowering the drum when the lifting slings slacken.
6. Install pins (4a).
7. Connect two hydraulic hoses (4c, View C) from drum (4) to hydraulic couplers (4d) on drum (2).
8. Disconnect the lifting slings from the drum.

NOTE If you attempt to install Drum 1 now, sheave (9, View D) will interfere with drum installation. You have two options:

- Install Drum 1 after sheave bank and equalizer are removed from Drum 5 (see [page 4-137](#)).

OR

- Remove sheave (9), store it temporarily, and install Drum 1 (see [page 4-97](#) and [page 4-99](#)).

Item	Description
1	Platform (right rear)
2	Platform (right front)
3	Platform Extension (right)
4	Stairway (right)
5	Platform (left rear)
6	Platform (left front)
7	Platform Extension (right)
8	Stairway (left)
9	Pin with Hair-Pin Cotter (4)
10	Pin with Hair-Pin Cotter (4)
11	Step (2)
12	Pin with Hair-Pin Cotter (4)

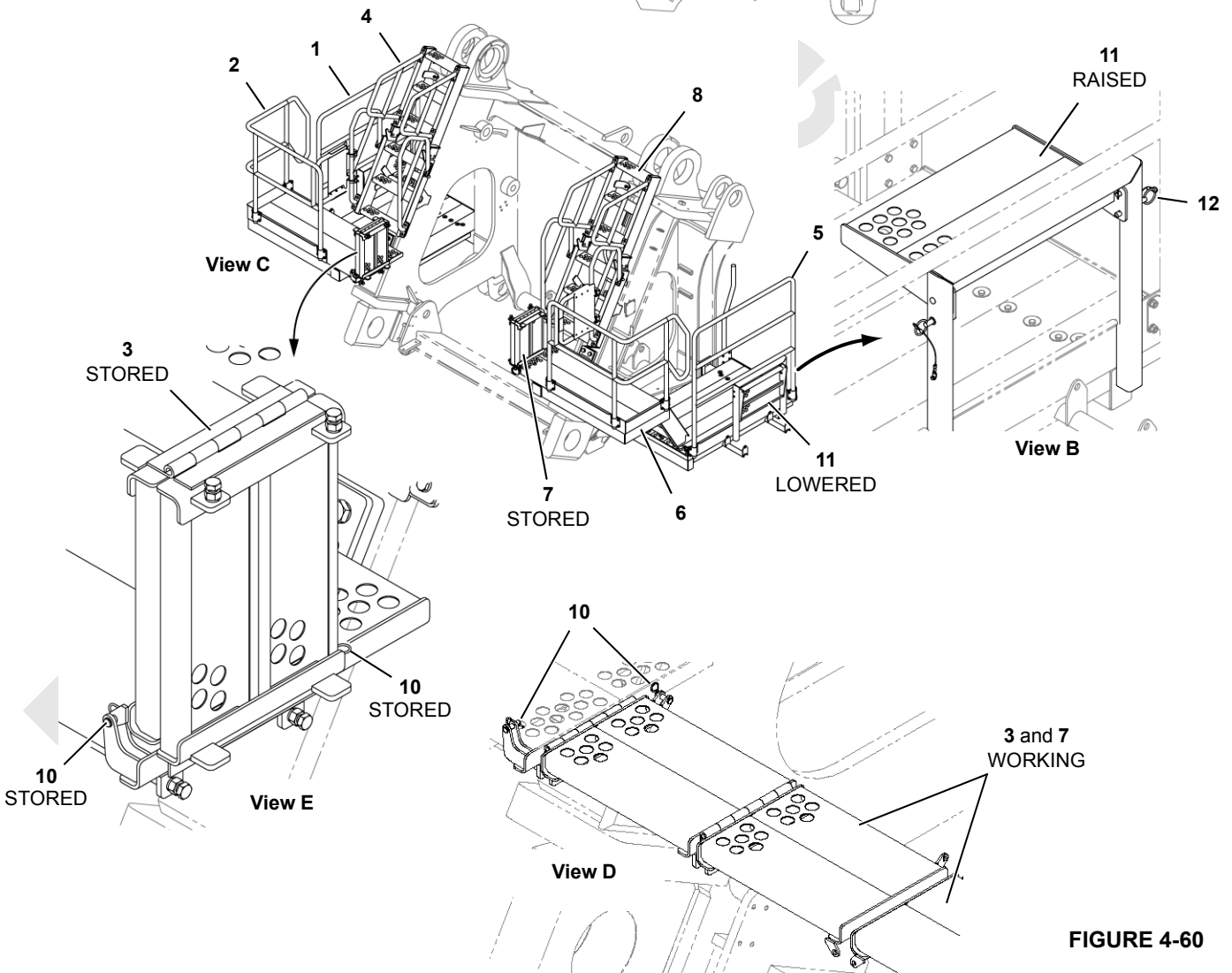
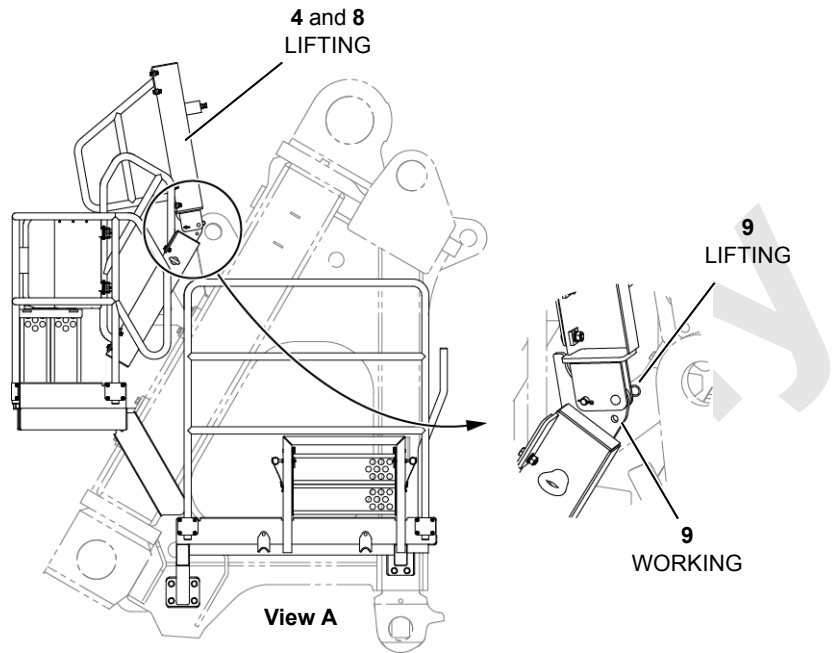


FIGURE 4-60

Prepare Drum 1 Platforms

See [Figure 4-60](#) for the following procedure.

Perform the following steps before lifting Drum 1 onto the crane.

1. Support the top half of stairway (4, View A) with a lifting sling from the assist crane.
2. Remove pins (9, View A) and rotate the stairway forward until pins (9) can be reinstalled.

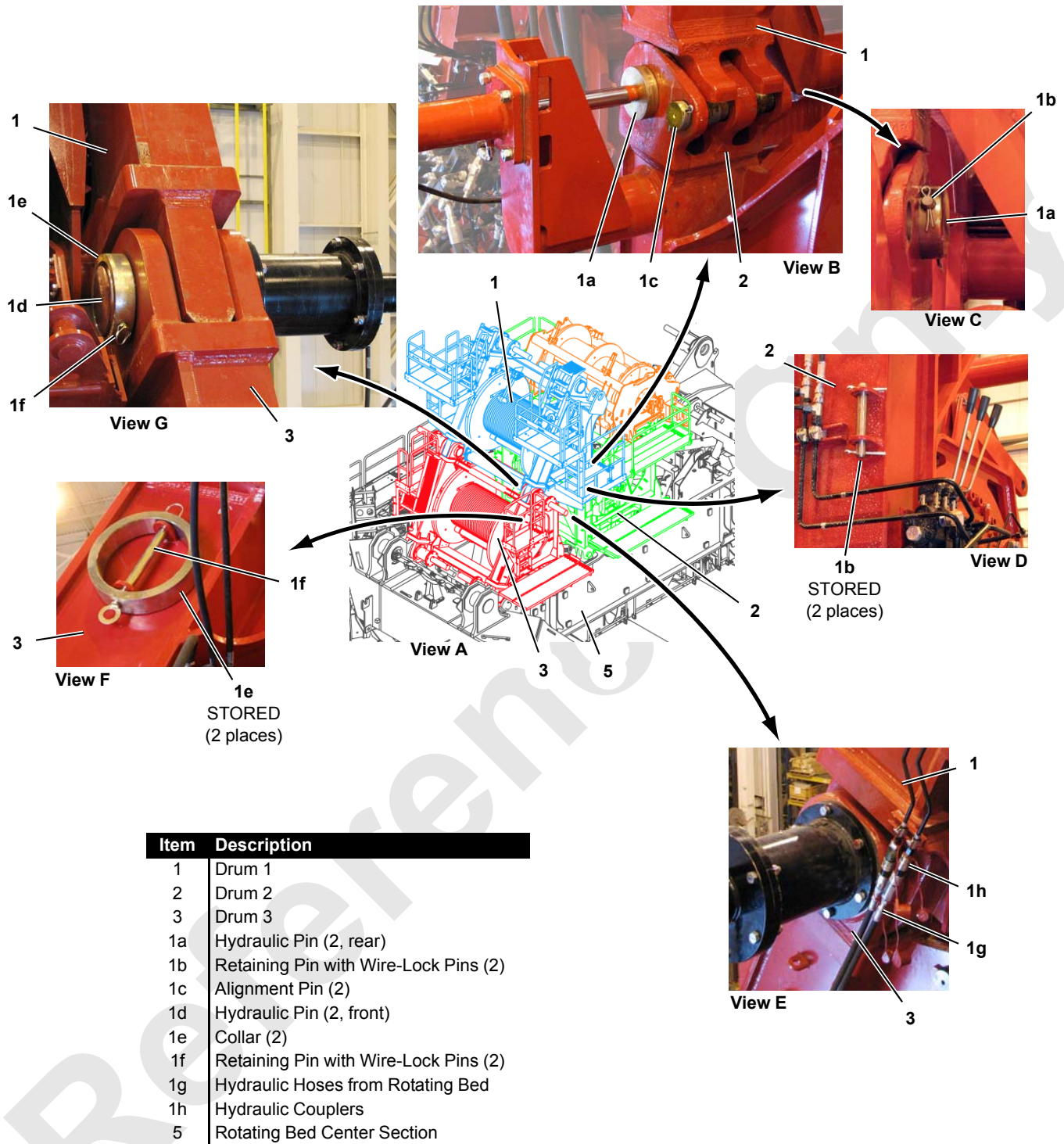
The top half of stairways (4 and 8) must be pinned in the forward position to allow access to the lifting lugs on Drum 1.

3. Disconnect the lifting sling.
4. Repeat steps [1](#) through [3](#) for the top half of stairway (8).
5. Unpin platform extensions (3 and 7, View E) from the stored position and lower them to the working position (View D).

Platform extensions (3 and 7) must be in the working position to allow access to the physical boom stops (see [page 4-191](#)).

6. Unpin steps (11, View C) from the lowered position and pin them to the raised position (View B).

Steps (11) must be in the working position to allow access to the physical boom stops (see [page 4-191](#)).



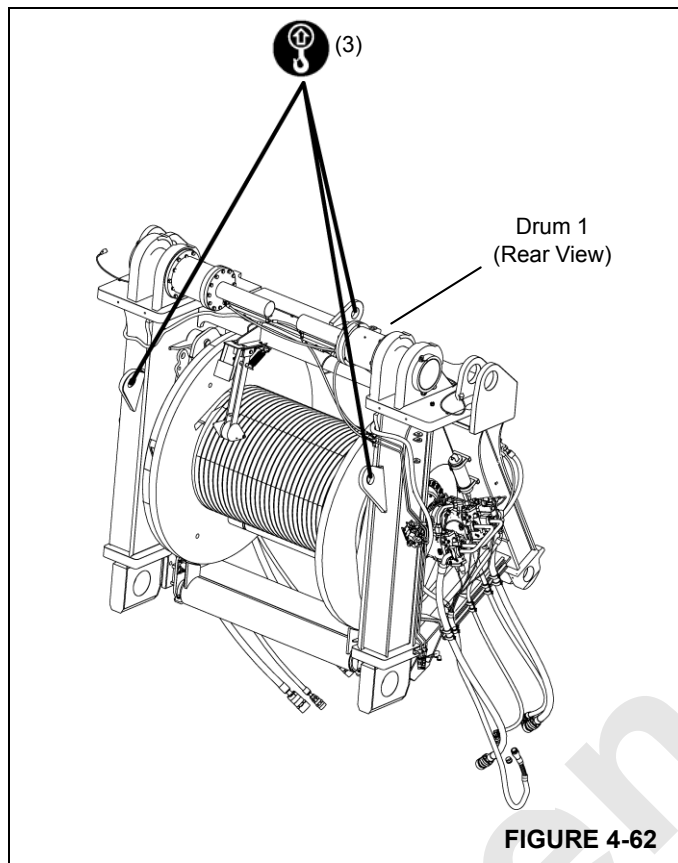
Item	Description
1	Drum 1
2	Drum 2
3	Drum 3
1a	Hydraulic Pin (2, rear)
1b	Retaining Pin with Wire-Lock Pins (2)
1c	Alignment Pin (2)
1d	Hydraulic Pin (2, front)
1e	Collar (2)
1f	Retaining Pin with Wire-Lock Pins (2)
1g	Hydraulic Hoses from Rotating Bed
1h	Hydraulic Couplers
5	Rotating Bed Center Section

FIGURE 4-61

Install Drum 1

1. Lift drum (1) as shown in [Figure 4-62](#).

Use three legs of the chain lifting sling shown in [Figure 4-10](#), View A.

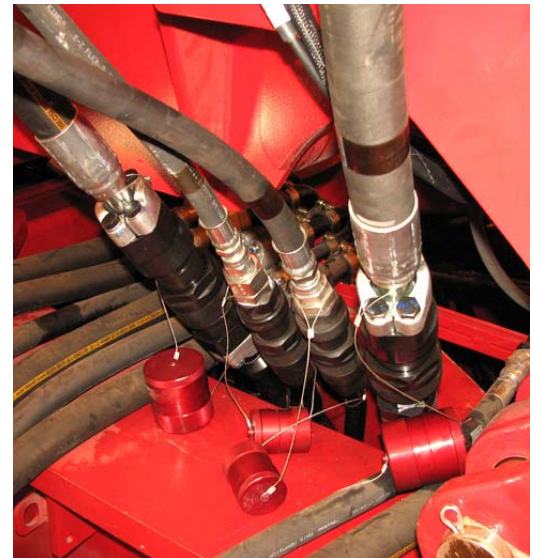
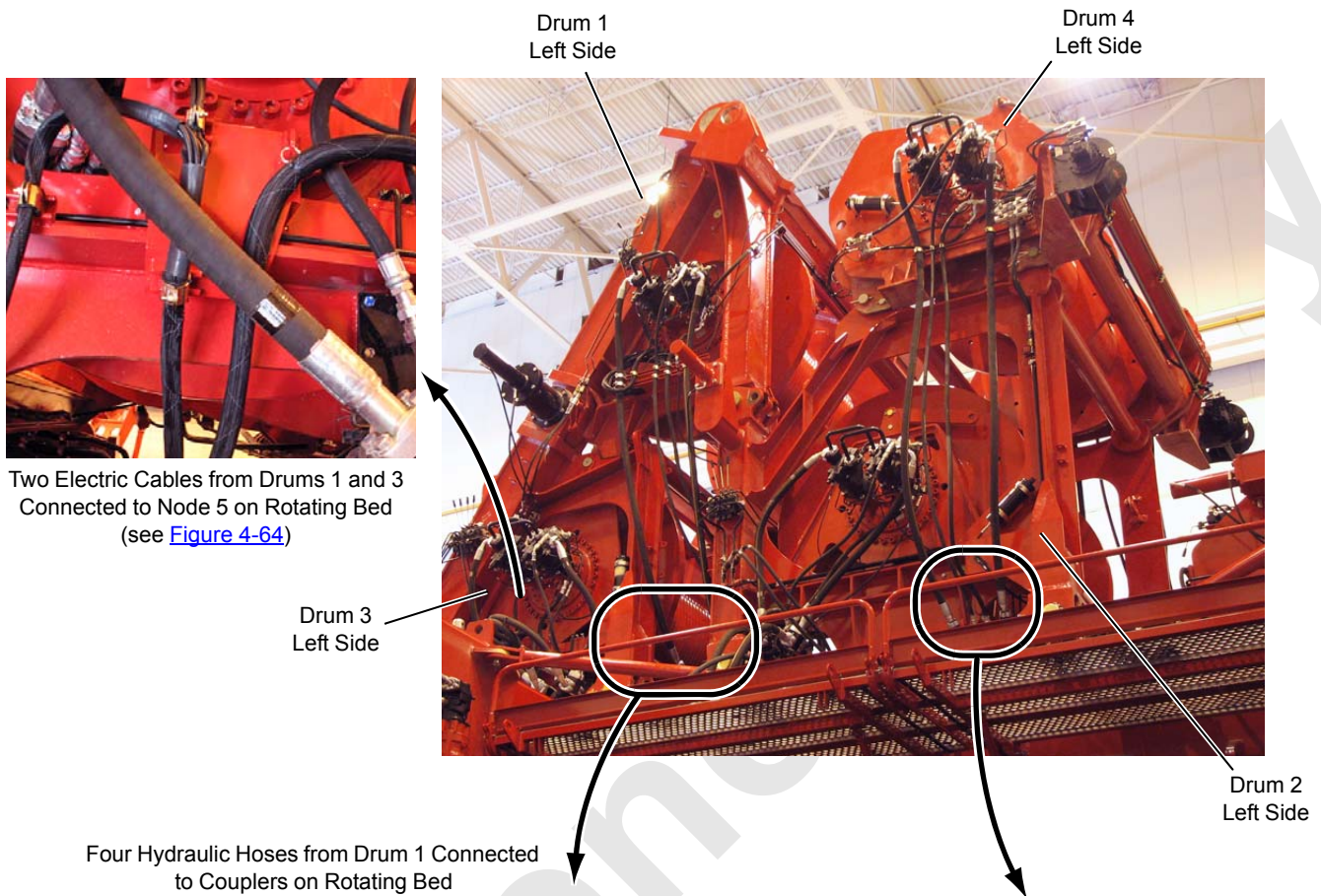


See [Figure 4-61](#) for the remaining steps.

1. Start the PPU and disengage hydraulic pins (1a, View B) and (1d, View G) using the control handles on drums (2 and 3) — see [Figures 4-54](#) and [4-57](#).
2. Lift drum (1) into position over the connecting lugs on drum (2, View B) and drum (3, View G).
3. Thoroughly clean and lightly grease all pins and connecting holes.
4. Slowly lower drum (1) onto drums (2 and 3).
Alignment pins (1c, View B) will guide the connecting holes in drum (1) into proper alignment with the connecting holes in drums (2 and 3).
5. Stop lowering the drum when the lifting slings slacken.
6. Engage hydraulic pins (1a, View B) and (1d, View G) using the control handles on drums (2 and 3) — see [Figures 4-54](#) and [4-57](#).
7. Remove retaining pins (1b, View D) from storage and install them in hydraulic pins (1a, View C).
8. Remove collars (1e, View F) and retaining pins (1f) from storage and install them on hydraulic pins (1d, View G).
9. Connect two hydraulic hoses (1g, View E) from (3) to hydraulic couplers (1h) on drum (1).
10. Disconnect the lifting slings from the drum.

Connect Hydraulic Hoses and Electric Cables from Drums to Rotating Bed

1. Route and connect the hydraulic hoses between the drums and the rotating bed as shown in [Figure 4-63](#).
Store the protective caps in the parts boxes provided.
2. Route and connect the electric cables between the drums and the rotating bed as shown in [Figure 4-64](#).

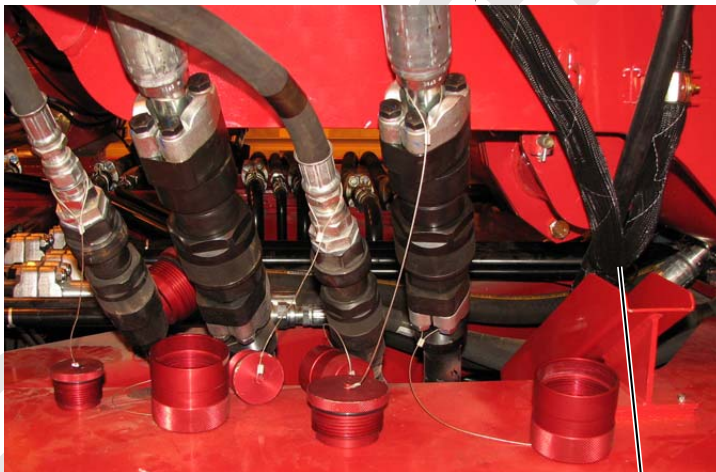
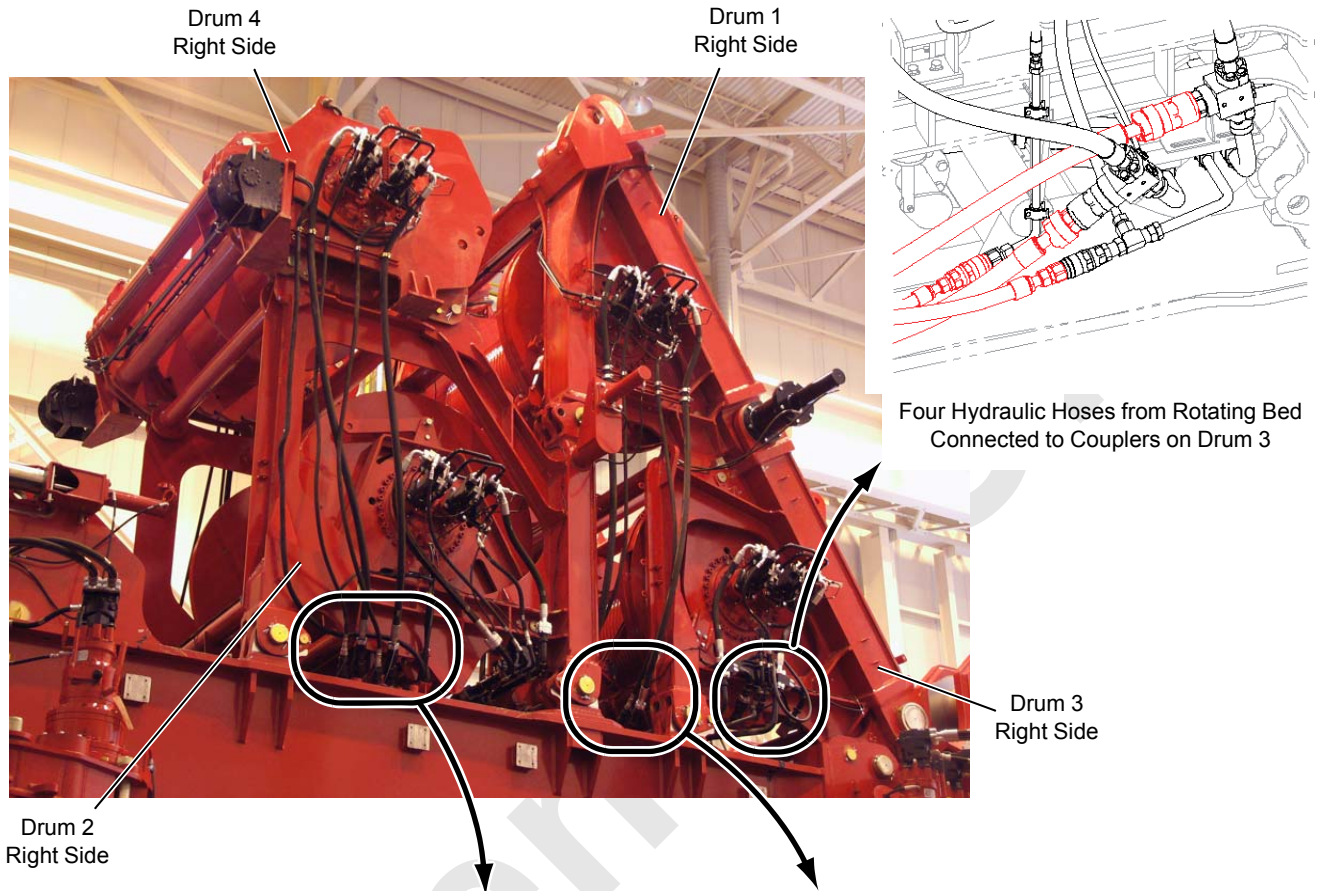


ALL HYDRAULIC HOSES FROM DRUMS RUN IN A STRAIGHT LINE TO COUPLERS ON ROTATING BED. DO NOT CROSS HOSES.

Four Hydraulic Hoses from Drum 4 Connected to Couplers on Rotating Bed

FIGURE 4-63

ALL HYDRAULIC HOSES FROM DRUMS RUN IN A STRAIGHT LINE TO COUPLERS ON ROTATING BED. DO NOT CROSS HOSES.



Two Electric Cables from Drums 2 and 4 Connected to Node 7 on Rotating Bed Center Section (see [Figure 4-64](#))

FIGURE 4-63 continued

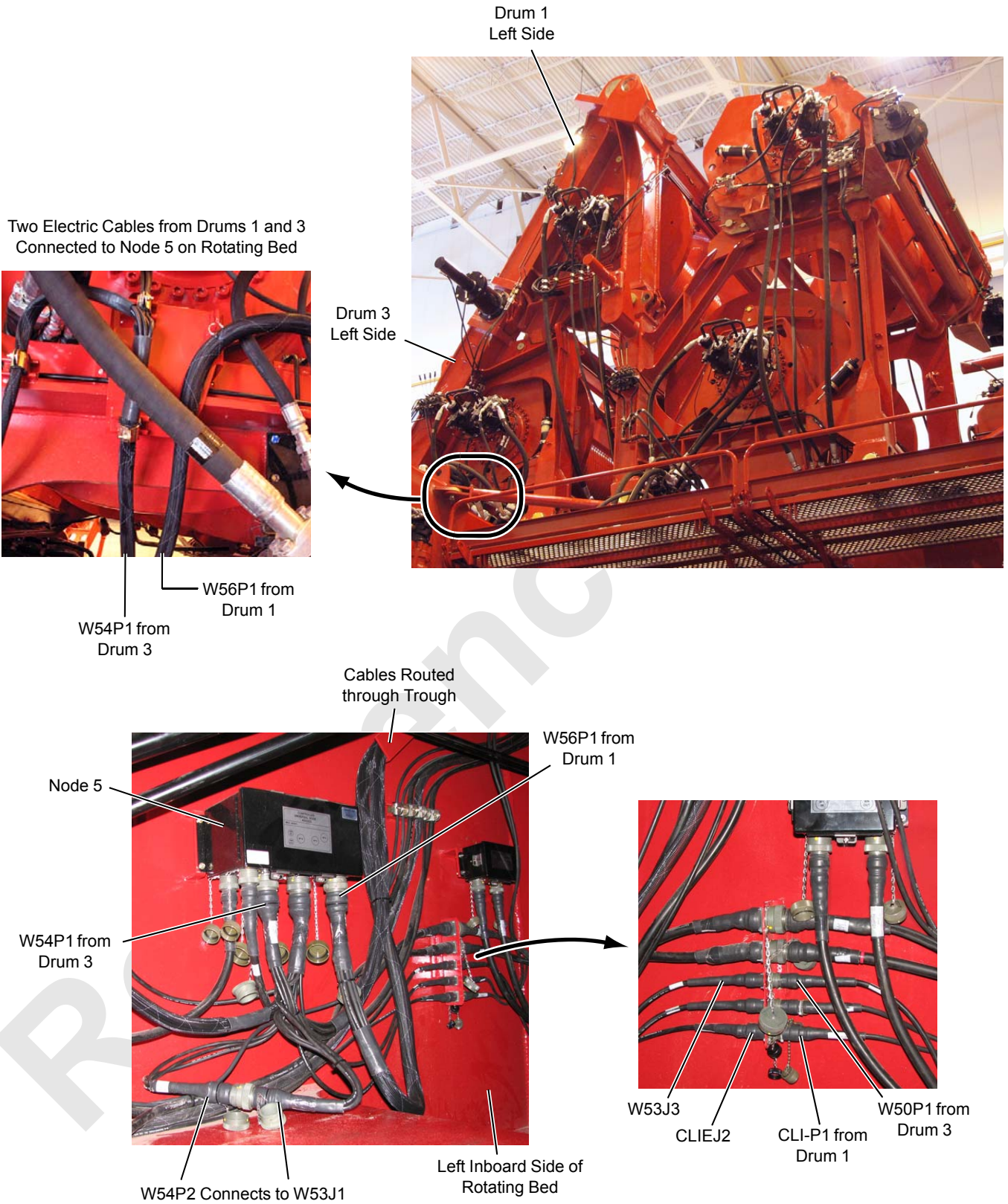


FIGURE 4-64

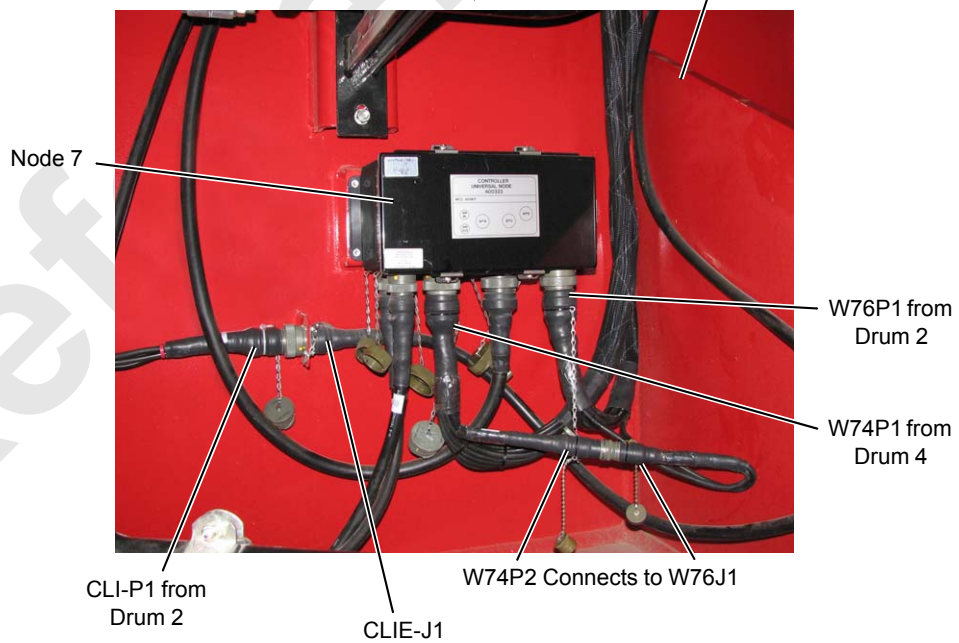
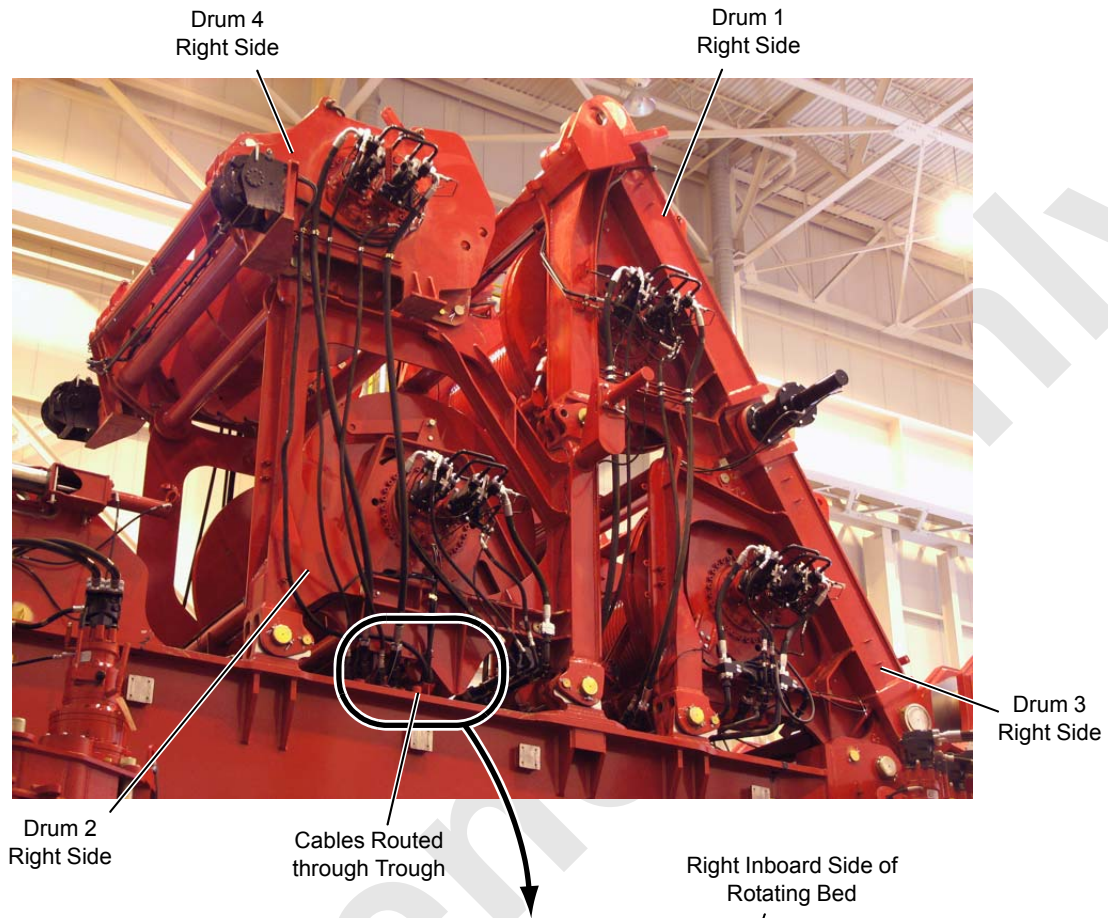


FIGURE 4-64 continued

Item	Description
1	Support (2)
2	Fixed Pin (2)
3	Pin with Cotter Pins (2)
4	Strut (2)
5	Pin with Cotter Pin (2)

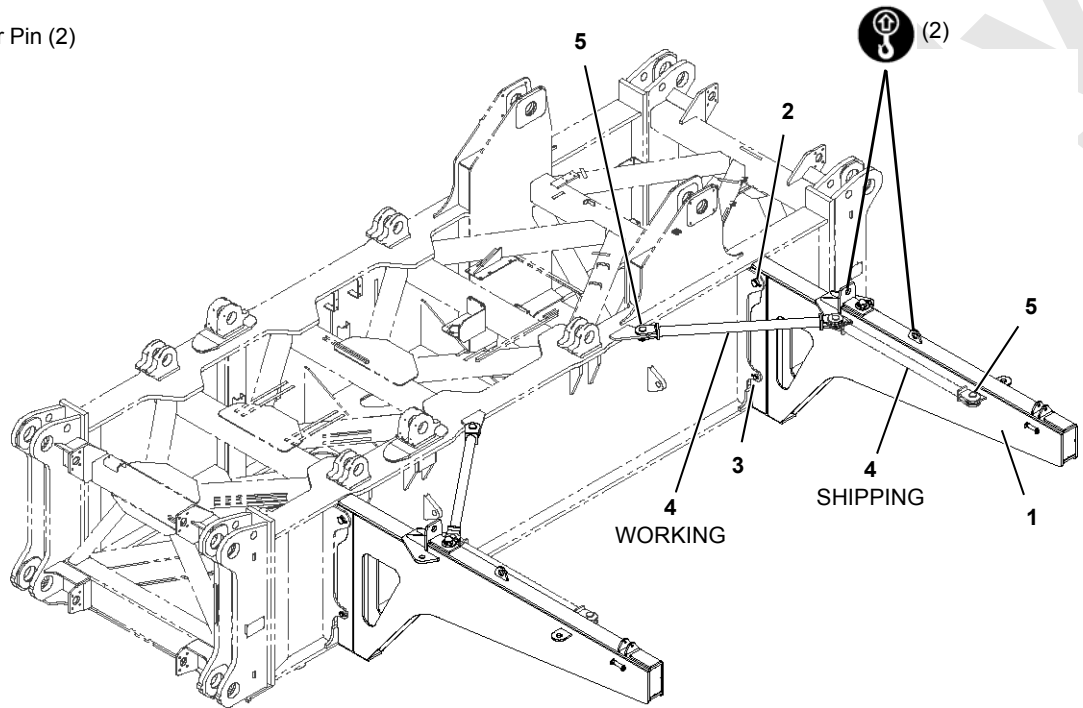


FIGURE 4-65

Disconnect PPU and Accessory System Hydraulic Hoses

Once the drums are installed, proceed as follows:

1. Stop the PPU.
2. Disconnect the PPU from the carbody. Reverse the steps on [page 4-17](#).
3. Disconnect the accessory system hydraulic hoses from the rotating bed and store the hoses on the carbody center beam. Reverse the steps on [page 4-67](#).

CAUTION

Avoid Hydraulic Piping Damage!

Do not swing upperworks while accessory system hydraulic hoses are connected between carbody center beam and rotating bed. Damage will occur.

Hydraulic Oil Leakage Hazard!

Do not connect hydraulic hoses from cab and power plant to rotating bed until PPU and accessory hydraulic system hydraulic hoses are disconnected. Hydraulic oil will overflow from PPU hydraulic tank.

CRANE ASSEMBLY — CAB AND POWER PLANT ENCLOSURE

Install Cab and Power Plant Enclosure Supports

See [Figure 4-65](#) for the following procedure.

1. Lift either support (1) into position along the left side of the rotating bed.
Use two legs of the chain lifting sling shown in [Figure 4-10](#), View A.
2. Engage the hooks in the support with fixed pin (2).
3. Install pin (3).
4. Unpin strut (4) from the shipping position and pin it to the working position on the rotating bed.
5. Disconnect the lifting slings.
6. Repeat the above steps for the other support.

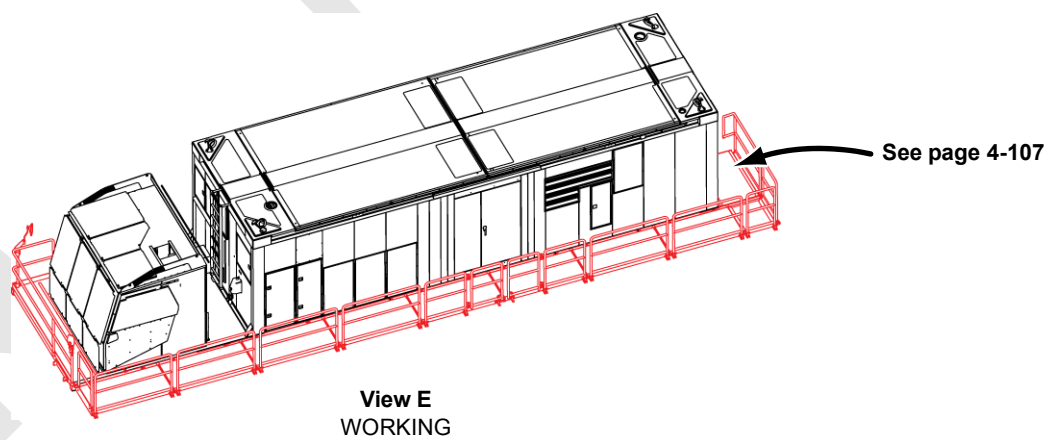
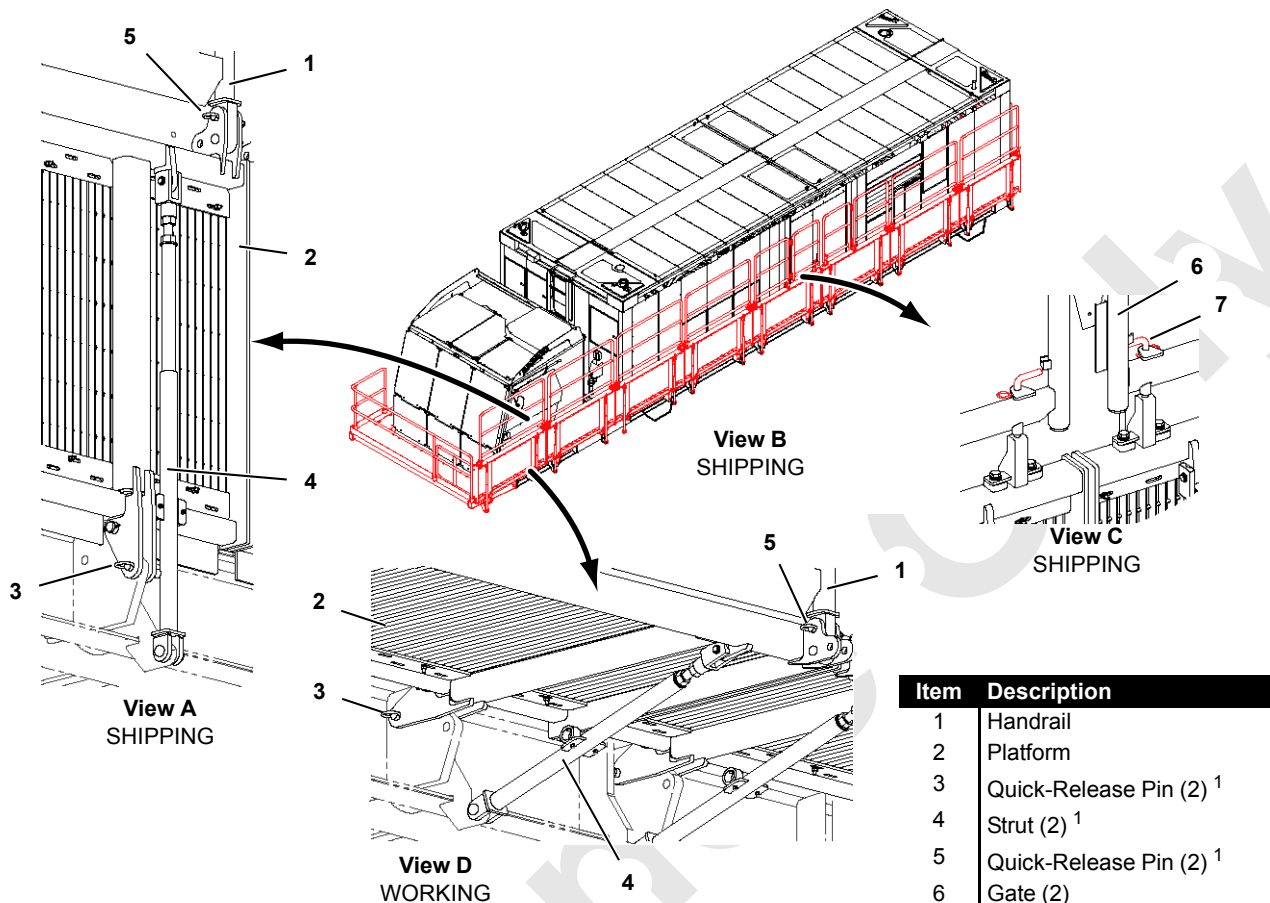


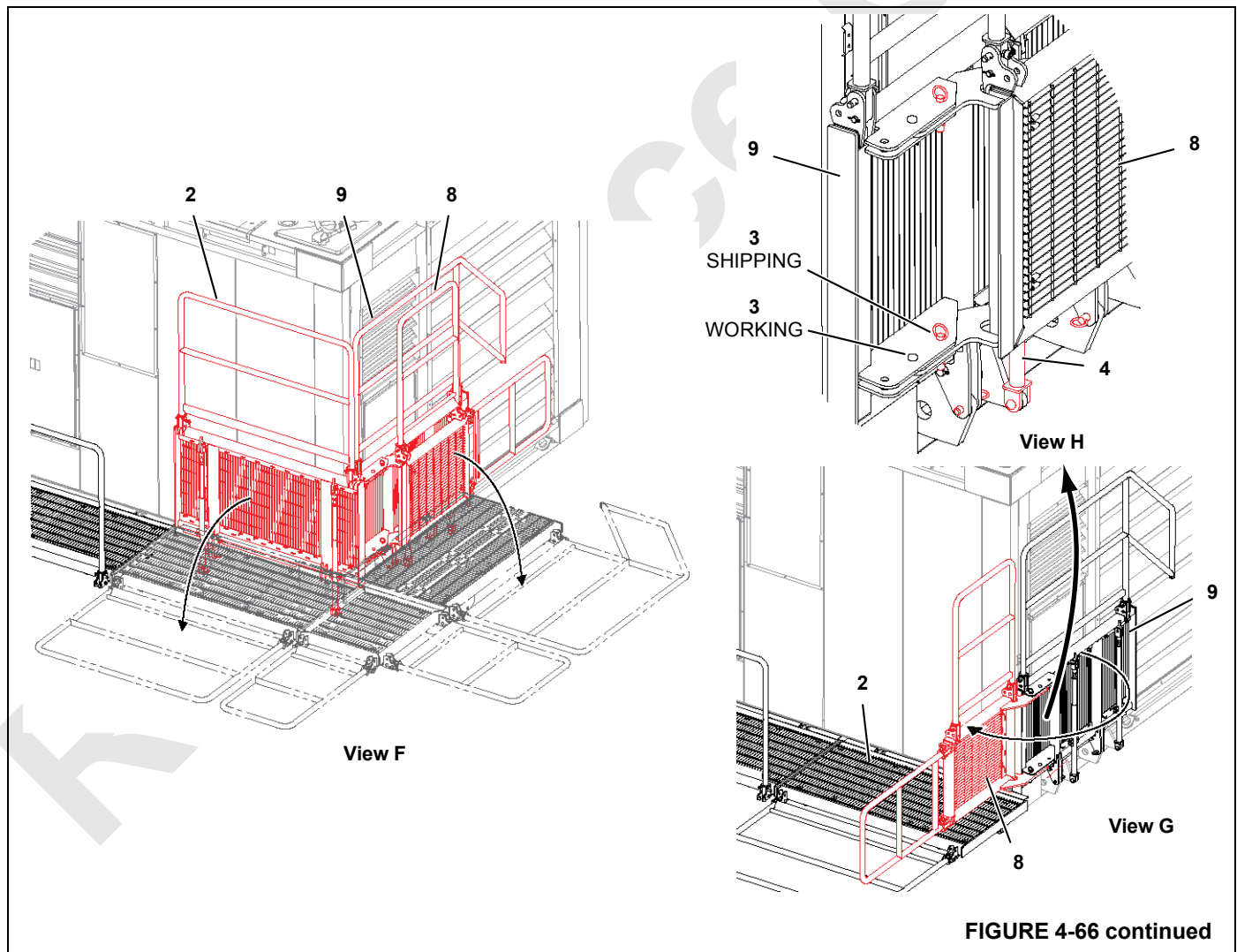
FIGURE 4-66

Lower Cab and Power Plant Enclosure Platforms

Perform the following steps before removing the cab and power plant enclosure from the trailer. See [Figure 4-66](#).

NOTE The platforms along the front of the cab are fixed in the working position.

1. Starting at the left-front corner of the cab and power plant enclosure, proceed as follows to move the platforms to the working position:
 - a. Using a nylon lifting sling from the assist crane, support handrail (1, View A) and platform (2) so they cannot fall.
 - b. Remove pins (3, View A) and lower handrail (1) and platform (2) to the working position (View D).
 - c. Struts (4) will automatically retract to the working position.
 - d. Reinstall pins (3, View D) in the working position.
 - e. Support handrail (1, View A) and remove pins (5).
 - f. Raise handrail (1) to the working position and reinstall pins (5, View D).
 - g. Disconnect the lifting sling.
2. Repeat the steps for each platform until you reach the left-rear platform. Then proceed as follows:
 - a. Lower platform (2, View F) to the working position (steps [1a](#) through [1d](#)).
 - b. Unpin platform (8, View H) from the shipping position, rotate the platform 90°, and pin it in the working position (View G).
 - c. Lower platforms (8 and 9, View F) to the working position (steps [1a](#) through [1d](#)).
 - d. Raise the handrails (steps [1e](#) through [1g](#)).



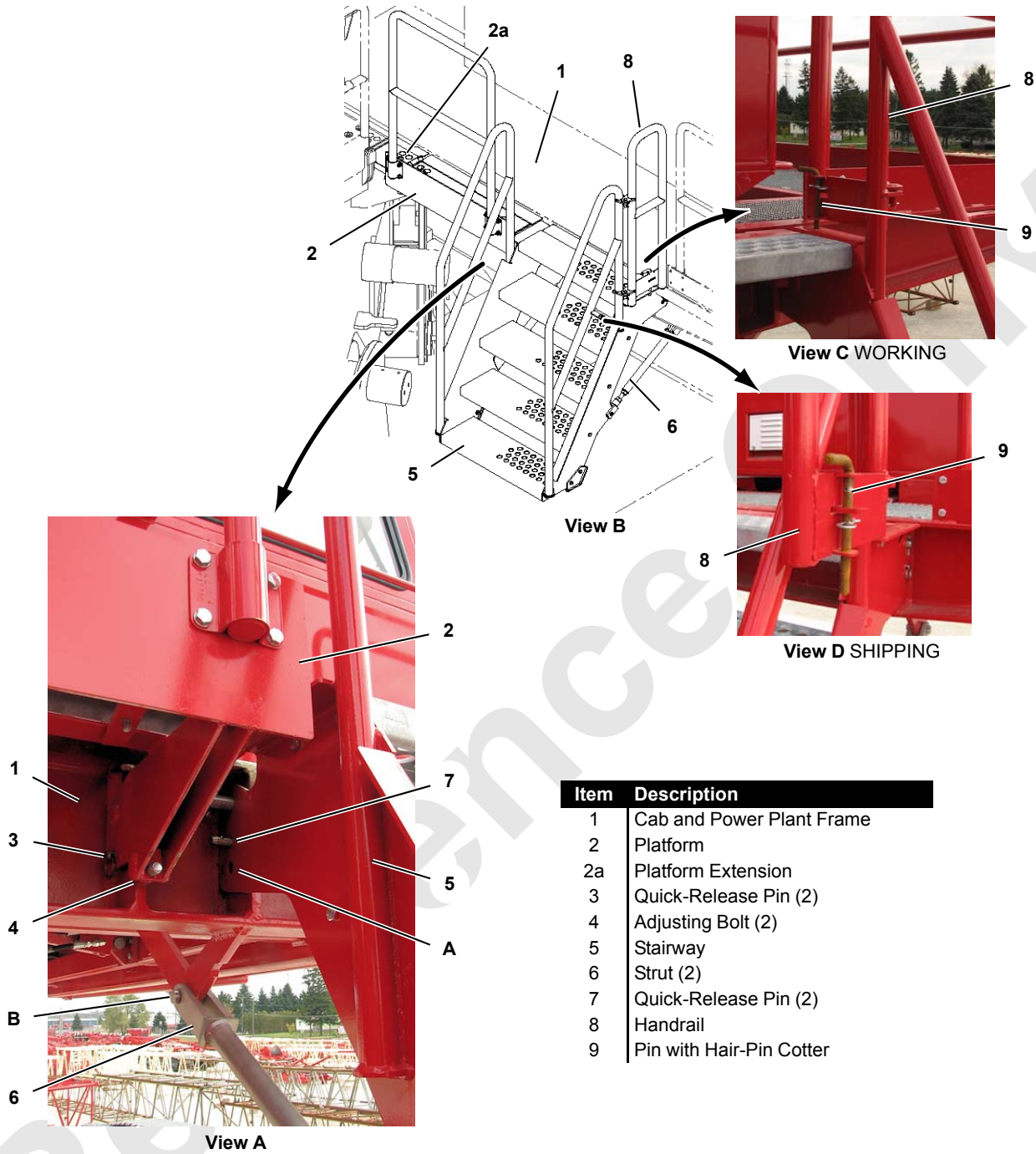


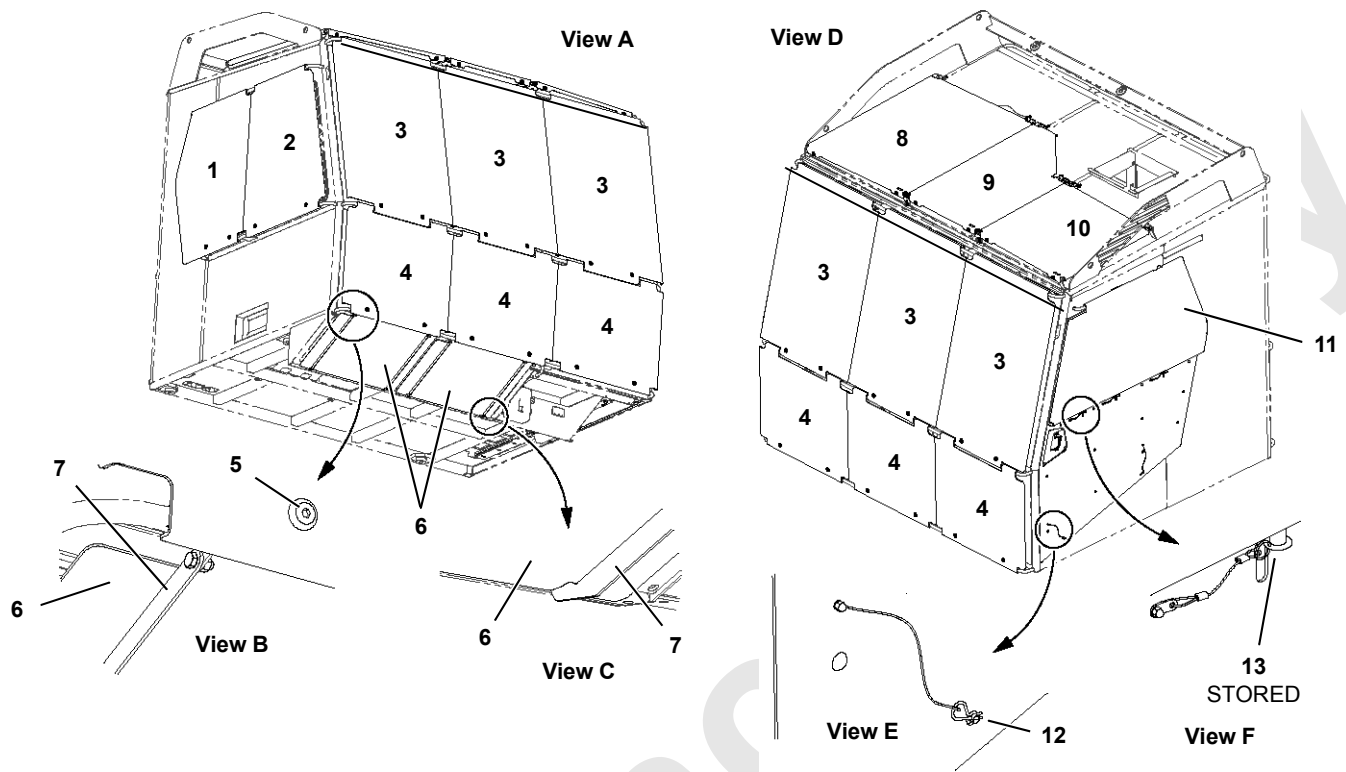
FIGURE 4-67

Install Cab and Power Plant Enclosure Stairs and Platform

Perform the following steps before removing the cab and power plant enclosure from the trailer. See [Figure 4-67](#).

1. Lift platform (2, View A) into position so it hooks onto the brackets on cab and power plant frame (1).
2. Install quick-release pins (3, View A).
3. Adjust bolts (4) to level the platform if needed.
4. Rotate platform extension (2a, View B) rearward to the working position.
5. Lift stairway (5, View A).
6. Unpin struts (6, View A) from holes (A) and lower the struts to vertical.
7. Lift stairway (5, View A) into position so it hooks onto the brackets on cab and power plant frame (1).
8. Install quick-release pins (7, View A).
9. Pin struts (6, View A) to holes (B) under the cab and power plant assembly.
10. Unpin handrail (8, View D) from the shipping position and pin it in the working position (View C).

SHIPPING POSITIONS



STORAGE POSITIONS

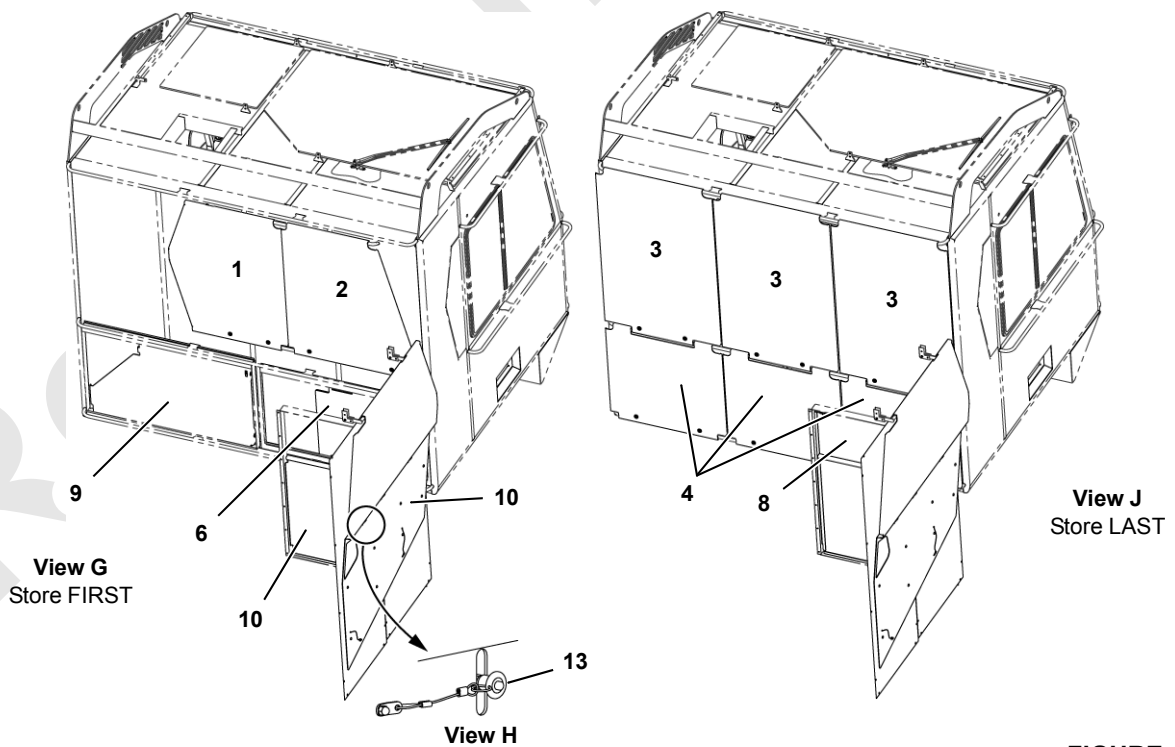


FIGURE 4-68

Legend for [Figure 4-68](#)

Item	Description
1	Right Rear Side Window Cover
2	Right Front Side Window Cover
3	Upper Front Window Cover (3)
4	Lower Front Window Cover (3)
5	Latch (22, 8 mm internal hex key)
6	Floor Window Cover (2)
7	Bracket with Screw, Lock Washer, and Nut (4)
8	Right Roof Window Cover
9	Center Roof Window Cover
10	Left Roof Window Cover
11	Door Window Cover
12	Hair-Pin Cotter (2)
13	Quick-Release Pin (3)

Store Cab Window Covers

Remove the cab window covers from the shipping position ([Figure 4-68](#), Views A and D) and store them on the back of the cab and on the power plant enclosure (Views G and J).

This step can be performed before or after the cab and power plant enclosure are removed from the trailer.

- Window covers (1 – 4) hook onto the cab handrails and are retained with latches (5, View B).
- Window covers (6) are retained with brackets (7, Views B and C).
- Window covers (8 – 10) slide onto rails and are retained with latches (5).
- Door window cover (11) hooks onto the cab door handrail and is retained with hair-pin cotters (12, View E) attached to studs on the door.

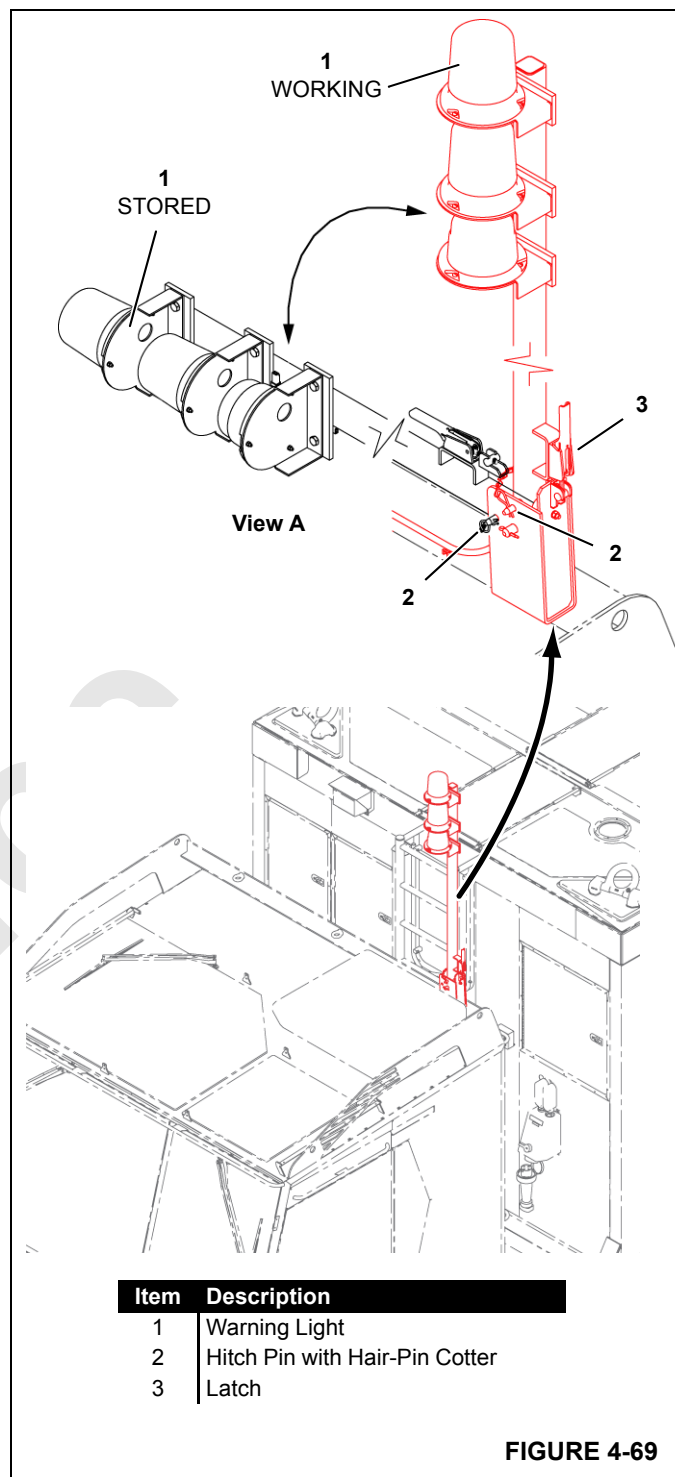
For storage, the door window cover is retained with quick-release pins (13, View H).

Raise Warning Light

This step can be performed before or after the cab and power plant enclosure are removed from the trailer.

The rated capacity limiter/indicator warning light is stored for shipping as shown in [Figure 4-69](#), View A.

1. Remove pin (2).
2. Raise warning light (1) to the operating position and engage latch (3).
3. Install pin (2).



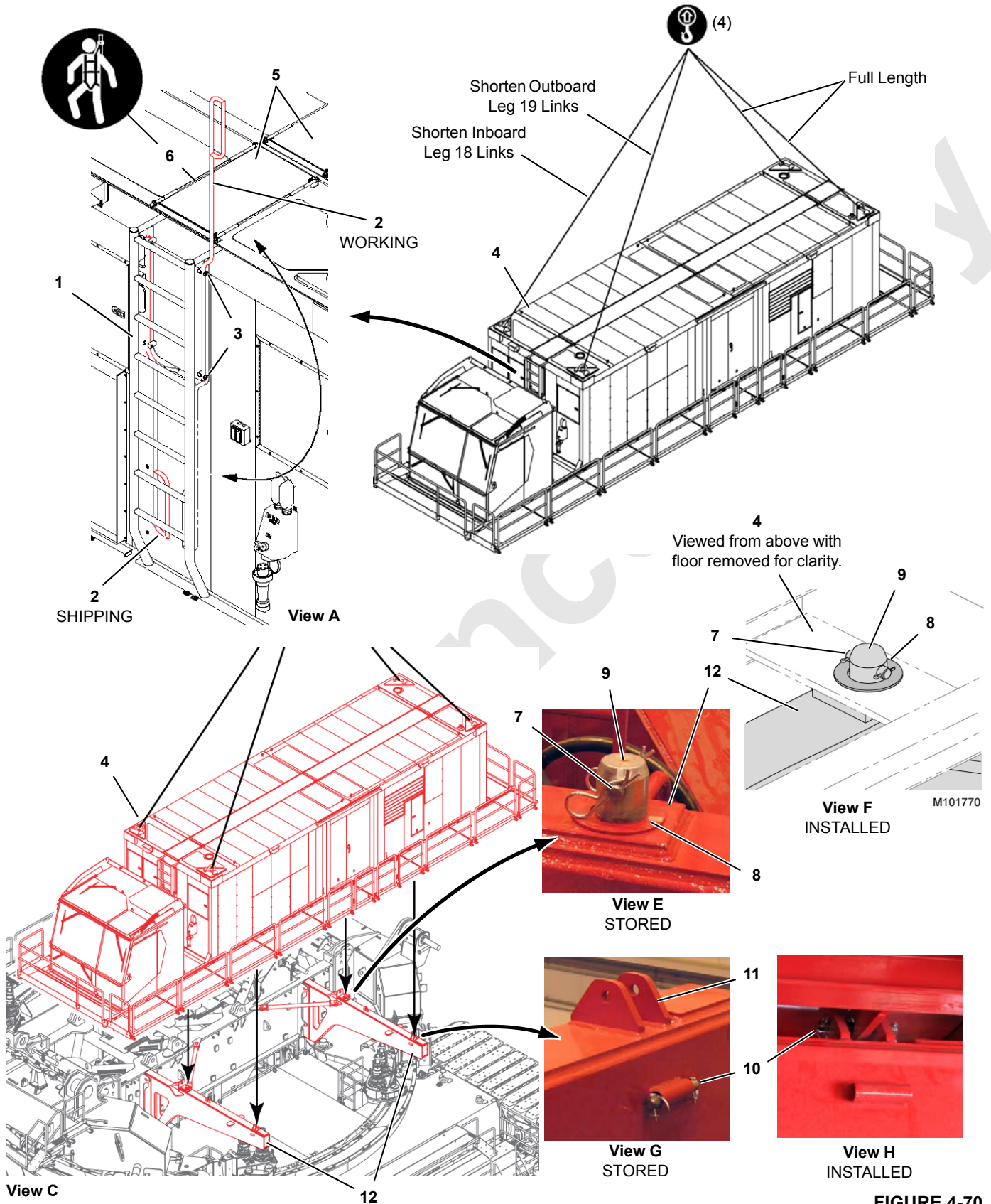


FIGURE 4-70

Legend for [Figure 4-70](#)

Item	Description
1	Ladder
2	Ladder Extension (2)
3	Wire Lock Pin (4)
4	Power Plant Enclosure
5	Catwalk (4)
6	Tie Wire (8)
7	Pin with Hair-Pin Cotters (2)
8	Flat Washer (2)
9	Fixed Pin (2)
10	Pin with Wire Lock Pins (2)
11	Lugs (4)
12	Support (4)

Lift Cab and Power Plant Enclosure Off Trailer

See [Figure 4-70](#) for the following procedure.

1. Unpin ladder extensions (2, View A) from the shipping position and pin them in the working position.
2. It is necessary to climb onto power plant enclosure roof (4) to connect the lifting slings.

Tie wires (6) are provided along both sides of roof catwalks (5).

WARNING Fall Hazard!

Avoid falling off power plant enclosure roof:

- Climb onto roof only at ladder (1).
- Fully extend ladder extensions (2) before using ladder.
- Wear personnel fall-protection equipment and attached it to tie wires (6) upon climbing onto roof.

3. Attach the four legs of the chain lifting sling shown in [Figure 4-10](#), View A to the lifting lugs on the power plant enclosure roof.

Shorten both legs closest to the operator cab the amount specified in [Figure 4-70](#).

4. Lift the cab and power plant enclosure off the trailer.

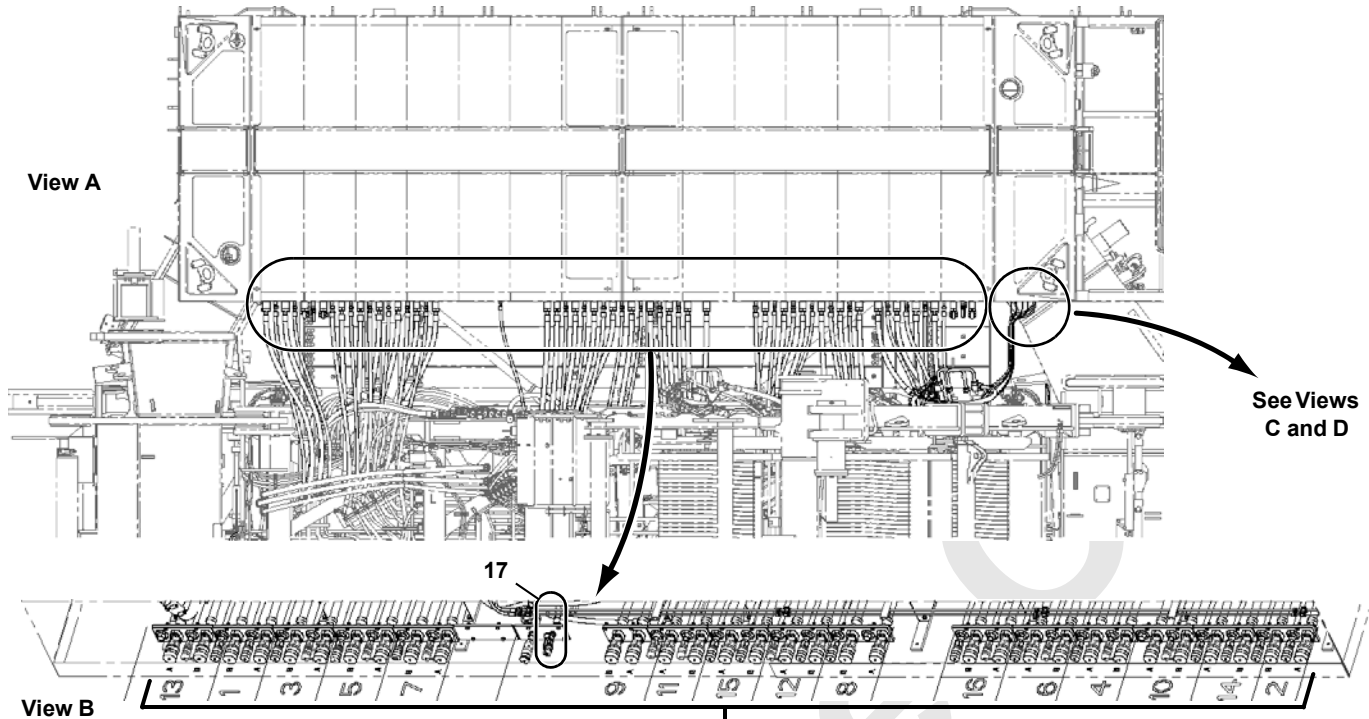
Install Cab and Power Plant Enclosure On Supports

See [Figure 4-70](#) for the following procedure.

1. Remove pins (7, View E) and flat washers (8) from fixed pins (9).
2. Lift cab and power plant enclosure (4, View C) into position over supports (12) on the rotating bed.
3. Lower the cab and power plant enclosure so the holes in the bottom of the cab and power plant enclosure engage fixed pins (9, View F) and lugs (11, View G).
4. Install flat washers (8, View F) and pins (7) on fixed pins (9). Access is from under the cab and power plant enclosure.

View F, [Figure 4-70](#) is viewed from above with the floor of the cab and power plant enclosure removed for clarity.

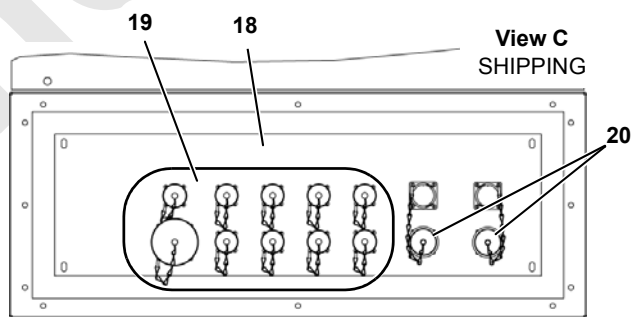
5. Install pins (10, View H). Access is from under the cab and power plant enclosure.



See Views C and D

These Item Numbers Correspond to This Table

Item	Description	Item	Description
1	Swing	10	Drum 3
2	Swing	11	Right Rear Crawler
3	Drum 2	12	Left Rear Crawler
4	Drum 1	13	Counterweight
5	Drum 1	14	Counterweight
6	Drum 4	15	Drum 3
7	Drum 4	16	Drum 2
8	Right Front Crawler	17	Accessory Supply
9	Left Front Crawler		



Item	Description
18	Electric Bulkhead
19	Protective Cap (each receptacle)
20	Terminator Plug (2)
Boom	Boom Camera
C2-D6	Camera 2-Drum 6
C3-CW	Camera 3-Counterweight
C5-D1	Camera 5-Drum 1
C6-D2	Camera 6-Drum 2
C8-D4	Camera 7-Drum 4
C9-D3	Camera 9-Drum 3
C10-D5	Camera 10-Drum 5
WN16	Cable Connects to Receptacle WNE27
LWE	Lowerworks Extension Power
WLCE	Lights Control
WLPE	Lights Power

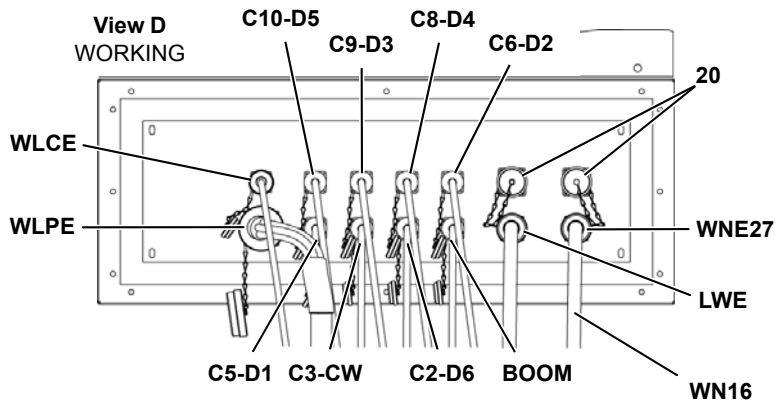


FIGURE 4-71

Connect Hydraulic Hoses and Electric Cables to Power Plant Enclosure

- Route and connect the hydraulic hoses between the power plant enclosure, the drums, and the rotating bed as shown in [Figure 4-71](#), Views A and B.
 - Match the identification numbers on the hoses with the numbers on the power plant enclosure ([Figure 4-72](#)).
 - Store the protective caps in the parts boxes provided.

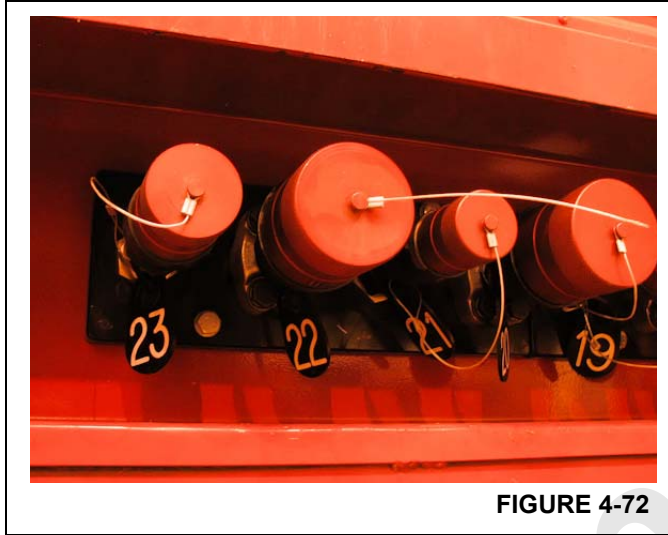


FIGURE 4-72

- Route and connect the electric cables between the power plant enclosure, the rotating bed, and the front roller carrier as shown in [Figure 4-71](#), View D.

- To allow the engines to be started when shipping or storing the cab and power plant enclosure, the terminator plugs must be connected to the bottom two receptacles on the power plant enclosure bulkhead (see View C).
- Store the terminator plugs in the top two receptacles on the power plant enclosure bulkhead for crane operation (see View D).

Perform Power Plant Pre-Start Checks

Make the following checks before starting the power plant engines. See Section 3 of this manual for start-up instructions and precautions.

Engine (each)

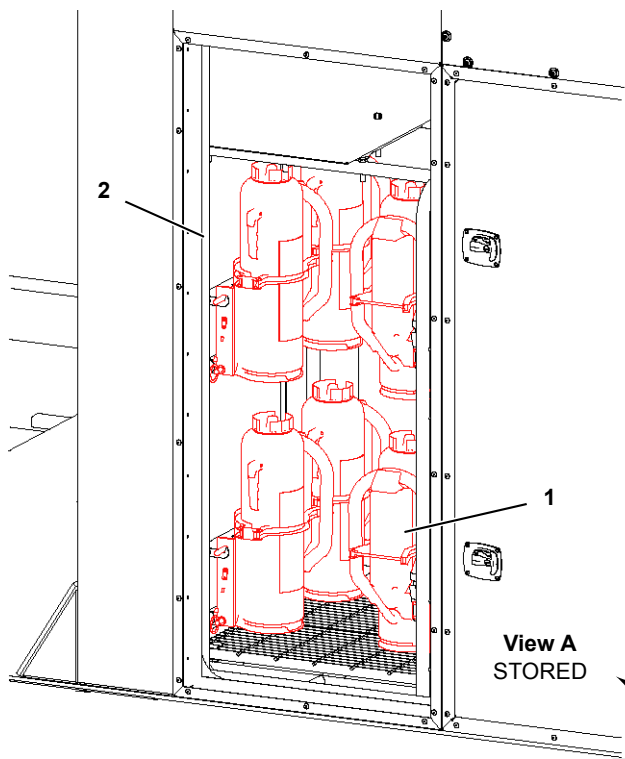
- Check for leaks.
- Check fuel, oil, and coolant levels.
- Repair or refill as required.

Pump Drive (each)

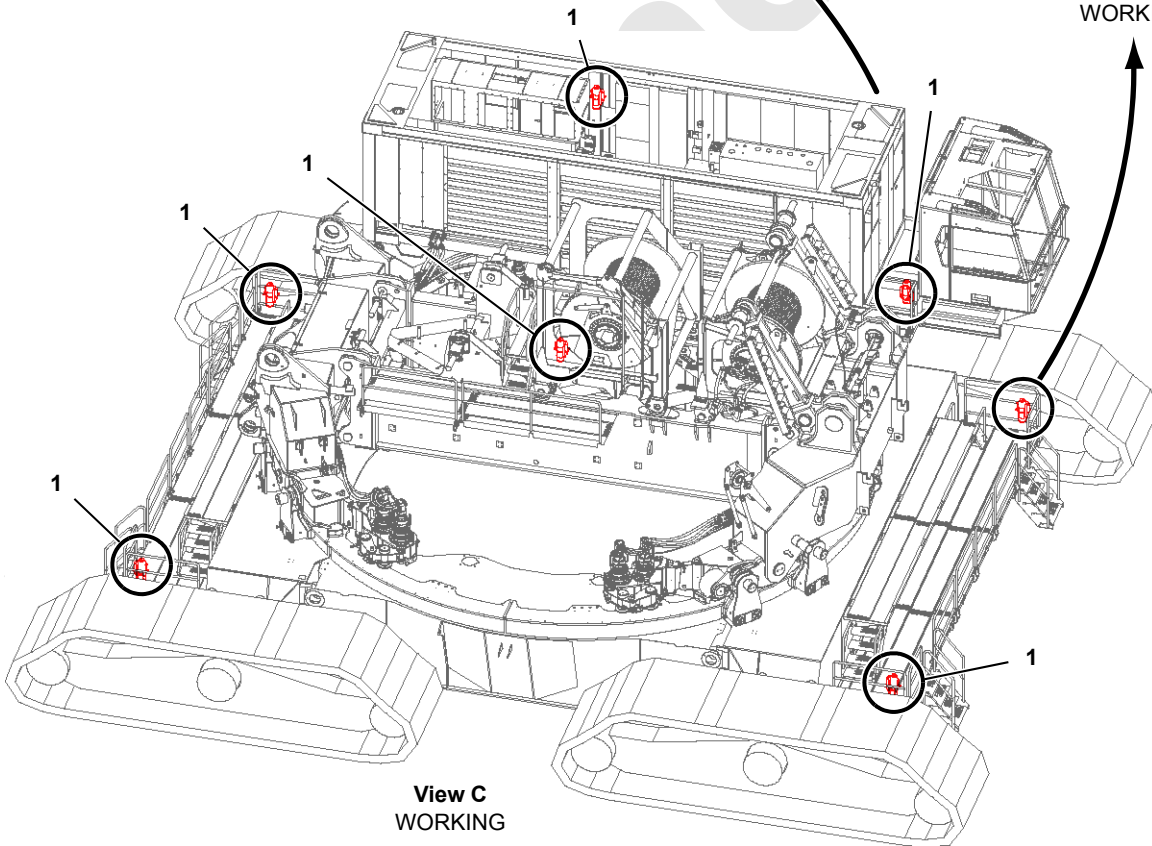
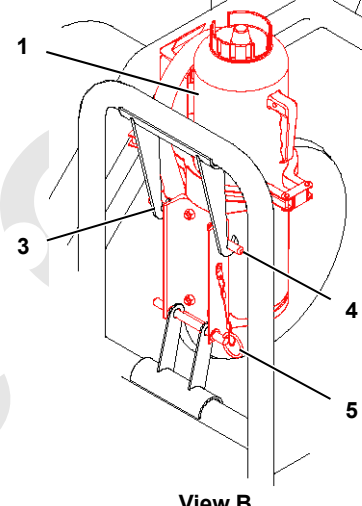
- Check for leaks.
- Check oil level.
- Repair or refill as required.

Hydraulic System

- Check for leaks.
- Check hydraulic oil level.
- Repair or refill as required.
- Make sure hydraulic shut-off valve is open.



Item	Description
1	Fire Extinguisher (7)
2	Storage Compartment
3	Hooked Bracket
4	Fixed Pin
5	Quick-Release Pin



Install Fire Extinguishers

Seven fire extinguishers (1) are stored in left-front compartment (2) of the power plant enclosure View A.

Remove the fire extinguishes from storage, and mount them at the locations shown in View C.

The fire extinguishers hook onto brackets (3, View B) and are retained with quick-release pins (5).

Reference Only

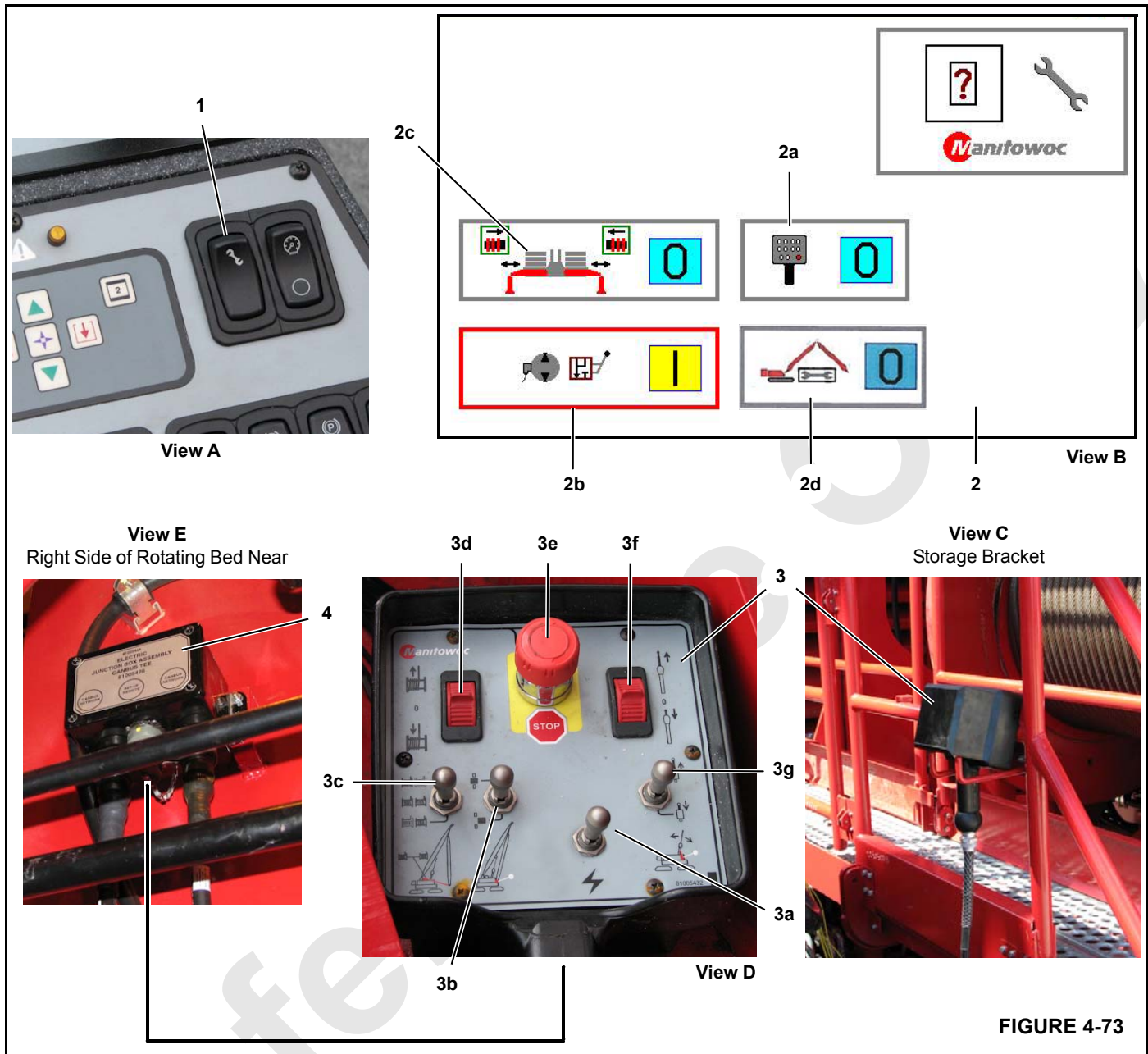


FIGURE 4-73

CRANE ASSEMBLY — SETUP MODE

NOTE When remote control (3, View D) is disconnected from junction box (4, View E), the terminator plug must be connected to the junction box receptacle. CAN faults and faulty operation will occur if this step is not performed.

See [Figure 4-73](#) for the following instructions.

Setup Modes

To operate the manual control valves and the remote control during the remaining assembly procedures, the appropriate

setup mode must be turned on. There are three setup modes (View B):

2a — Remote Control Mode

Turns on the setup remote control and the accessory hydraulic system for operation of the functions on the remote control.

2b — Accessory Valves Mode

Turns on the accessory hydraulic system for operation of the manual controls for engaging and disengaging hydraulic pins.





2c — VPC Counterweight Mode

Turns on the counterweight switches in the cab and the accessory hydraulic system for operation of the counterweight pins and beams.

2d — Luffing Jib Mode

See Luffing Jib Operator Manual.

Turning on Desired Setup Mode

1. Press setup switch (1, View A) in the cab to display setup screen (2) on the Main Display.
2. Scroll up  or down  until there is blue box around the desired mode (2a, 2b, or 2c, View B).
3. Press the enter  button. The blue box will turn red.
4. Scroll up or down until the mode is on (I) or off (O).
5. Press the exit  button.

Turn off the selected setup mode when you are done with the corresponding assembly process.

Operating the Remote Control

To operate the remote control, the cable must be connected to junction box (4, View E) and the remote control setup mode must be turned on.

3a – Power Switch

NOTE The toggle must be pulled UP to UNLOCK it.

Move the toggle FORWARD to TURN ON electric power to the remote control switches.

RELEASE the toggle to CENTER to TURN OFF electric power to the remote control switches.

3b – Backhitch Pins Switch

NOTE The toggle must be pulled UP to UNLOCK it.

Move the toggle FORWARD from center to ENGAGE the backhitch pins.

Move the toggle to CENTER to LOCK the toggle in position.

Move the toggle REARWARD from center to DISENGAGE the backhitch pins.

3c – Backhitch Winch Selector Switch

NOTE The toggle must be pulled UP to UNLOCK it.

Move the toggle FORWARD from center to TURN ON the LEFT backhitch winch.

Move the toggle to CENTER to TURN ON BOTH backhitch winches.

Move the toggle REARWARD to TURN ON the RIGHT backhitch winch.

3d – Backhitch Winch Direction/Speed Switch

Rotate the thumb wheel FORWARD from center to PAYOUT wire rope at the desired speed from the selected backhitch winch.

Release the thumb wheel to CENTER to STOP the selected backhitch winch.

Rotate the thumb wheel REARWARD from center to HAUL IN wire rope at the desired speed on the selected backhitch winch.

3e – Stop Switch

DEPRESS the knob to STOP the engine and all remote controlled functions in an emergency only — for example: if a function does not stop when the control is released to off or any other uncontrolled motion of a function is observed.

Beware: when the knob is pushed down, the engine stops and any function being operated comes to an abrupt stop.

Always use the ignition switch in the cab to stop the engine for normal operating conditions.

NOTE: The knob must be pulled UP to RESTART the engine and to operate remote controlled functions.

3f – VPC Actuator Switch

VPC = Variable Position Counterweight

Rotate the thumb wheel FORWARD from center to EXTEND the VPC actuator.

Release the thumb wheel to CENTER to STOP the VPC actuator (it will remain at the last position it was moved to).

Rotate the thumb wheel REARWARD from center to RETRACT the VPC actuator.

3g – VPC Actuator Frame Switch

The toggle must be pulled UP to UNLOCK it.

Move the toggle FORWARD from center to RAISE the actuator frame (extend cylinder).

Move the toggle to CENTER to STOP the actuator frame (it will remain at the last position it was moved to).

Move the toggle REARWARD from center to LOWER the actuator frame (retract cylinder).

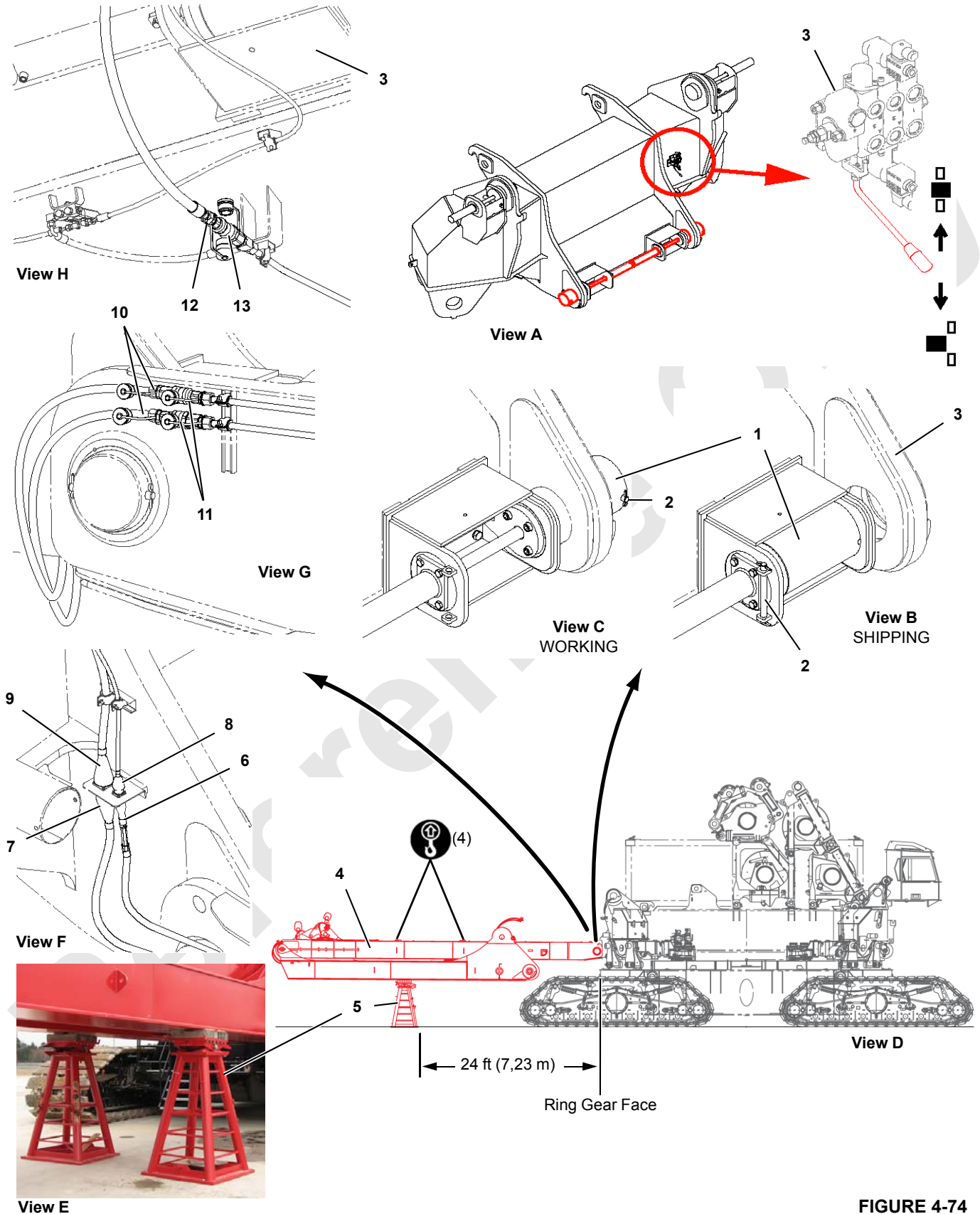


FIGURE 4-74

NOTE VPC stands for variable position counterweight.

Legend for [Figure 4-74](#)

Item	Description
1	Hydraulic Pin
2	Pin with Cotter Pins
3	Rear Roller Carrier
4	VPC Beam Assembly
5	Boom Support (2)
6	Electric Cable W77P1 from VPC Beam Assembly
7	Electric Cable W61P1 from VPC Beam Assembly
8	Electric Cable W75J1 on Rear Roller Carrier
9	Electric Cable W62J1 on Rear Roller Carrier
10	Hydraulic Hoses from Rear Roller Carrier
11	Hydraulic Couplers on VPC Beam Assembly
12	Grease Hose from VPC Beam Assembly
13	Grease Coupler on Underside of Rear Roller Carrier

CRANE ASSEMBLY — VPC BEAM ASSEMBLY

Install VPC Beam Assembly

See [Figure 4-74](#) for the following procedure.

1. Start the primary engine.
2. Check that hydraulic pins (1, View B) are disengaged. If not, disengage them using the control handle on rear roller carrier (3, View A).
3. Lift VPC beam assembly (4, View D) into position at the rear roller carrier.

Use four legs of the chain lifting sling shown in [Figure 4-10](#), View A. The beam assembly will lift level.

4. Align the connecting holes and engage hydraulic pins (1, View C) with the control on rear roller carrier (3, View A).
5. Install retaining pins (2, View C).
6. Stop the primary engine.
7. Remove boom supports (5) from storage on the mast butt (see procedure on [page 4-135](#)).
8. Place boom supports (5, View D) under VPC beam assembly (4) as shown in Views D and E).

Do not exceed the dimension given in View D. Side-to-side positioning of the boom supports is not critical.
9. Lower VPC beam assembly (4, View D) onto boom supports (5).
10. Connect electric cables (6 and 7, View F) from VPC beam assembly (4) to electric cables (8 and 9) on rear roller carrier (3).

The electric cables are connected to dummy receptacles on the beam.

11. Connect hydraulic hoses (10, View G) from rear roller carrier (3) to hydraulic couplers (11) on VPC beam assembly (4). The hoses can be connected only one way.
12. Connect grease hose (12, View H) from VPC beam assembly (4) to grease coupler (13) on the underside of rear roller carrier (3).

VPC Actuator Platform Assembly
SHIPPING POSITIONS

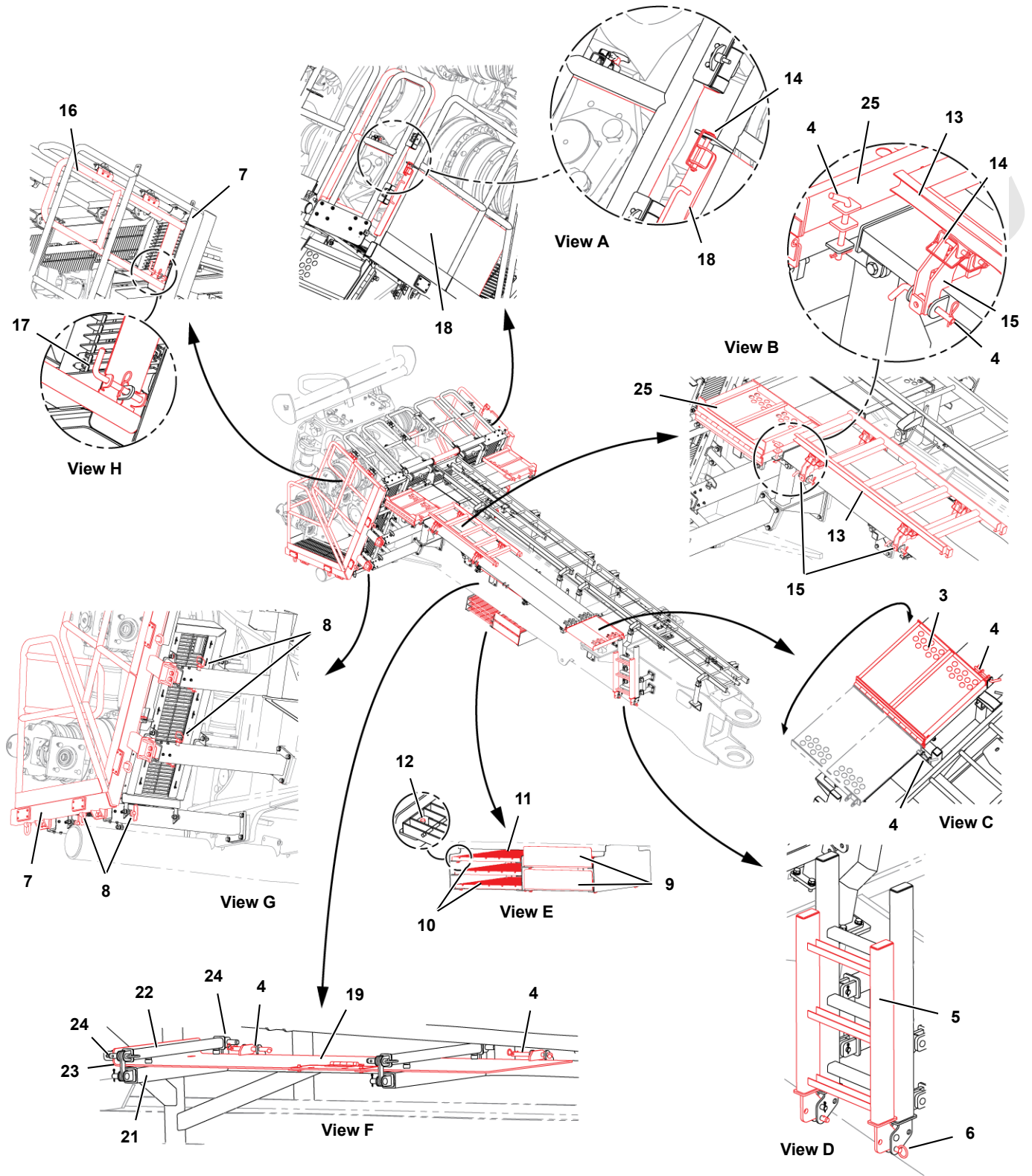


FIGURE 4-75

VPC Actuator Platform Assembly
WORKING POSITIONS

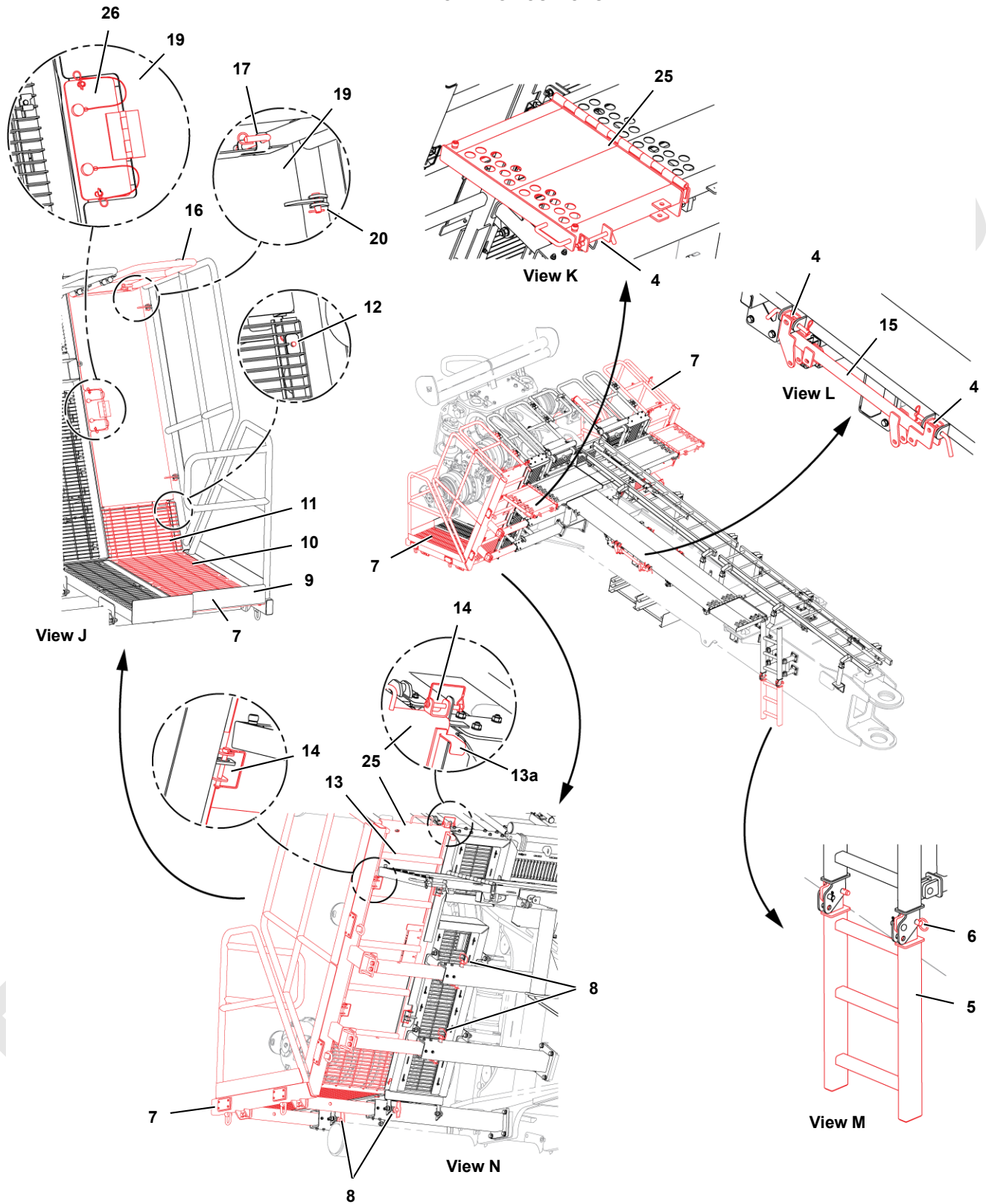


FIGURE 4-75 continued

Legend for Figure 4-75

Item	Description
1	VPC Actuator
2	Actuator Frame
3	Walkway Extension
4	Hitch Pin with Hair-Pin Cotter (8)
5	Ladder
6	Quick-Release Pin (2)
7	Platform (2)
8	Hitch Pin with Hair-Pin Cotter (8)
9	Grate (2)
10	Grate (2)
11	Grate (2)
12	Stud with Hair-Pin Cotter (4 each grate)
13	Ladder (2)
13a	Ladder Hook (2 each ladder)
14	Wire-Lock Pin (10)
15	Ladder Bracket (2)
16	Handrail (2)
17	Hitch Pin with Hair-Pin Cotter (2)
18	Walkway
19	Walkway
20	Pin with Cotter Pin (2)
21	Walkway Shipping Support (2)
22	Hold-Down Bracket (2)
23	Hold-Down Link (2)
24	Quick-Release Pin (4)
25	Walkway Extension
26	Door with Hair-Pin Cotters

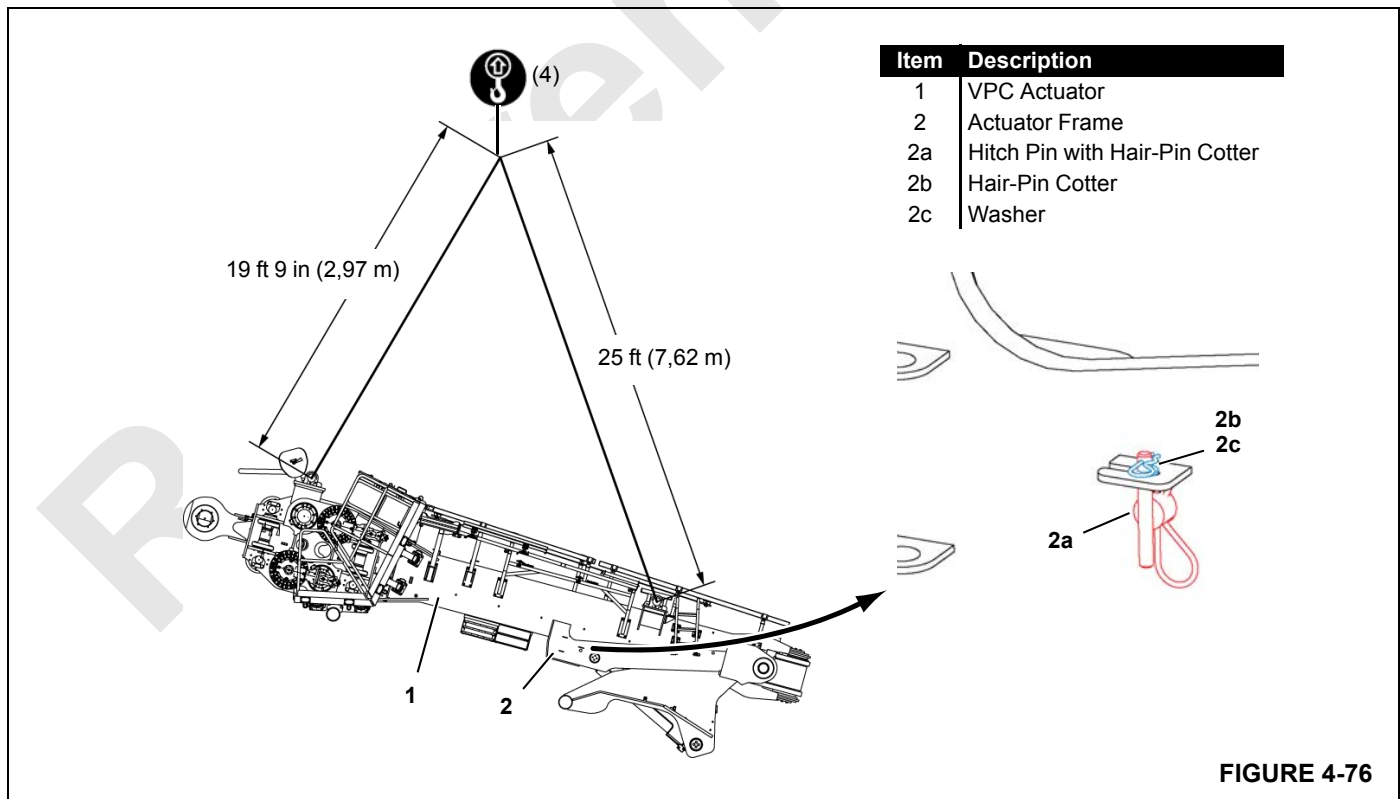


FIGURE 4-76

Deploy VPC Actuator Platform Assembly

1. Make sure VPC actuator (1, [Figure 4-76](#)) and actuator frame (2) are pinned together (two places) with hitch pin (2a).
2. Lift VPC actuator (1, [Figure 4-76](#)) and actuator frame (2) off the trailer and place them on the ground in the assembly area.
 - Use four legs of the chain lifting sling shown in [Figure 4-10](#), View A. Adjust the length of the rear legs to the specified dimension.
 - You will have to unpin and rotate walkway extension (3, [Figure 4-75](#), View C) out of the way to access the bottom-right lifting lug.
3. Disconnect the lifting slings.

See [Figure 4-75](#) for the remaining steps.

4. Install detachable cable sleeves on the cable going up the VPC actuator ladder. The sleeves should be stored in one of the rigging parts boxes.

See the manufacturer's installation and operation instructions in the OEM Manual stored in the operator cab.

5. Unpin ladder (5) from the shipping position (View D) and lower it to the working position (View M).
6. Reinstall pins (6, View M).
7. On both sides of the VPC actuator, remove pins (8) and pull platform (7) out from the shipping position (View G) to the working position (View N).

Rings are provided on the platforms for pulling and lifting them to the working position.

Synthetic pads are provided on the platforms for pushing them to the shipping position.

8. Reinstall pins (8, View N).
9. Remove grates (9, 10, and 11) from the shipping position (View E) and install them in the working position (View J) at both platforms (7).
10. Install hair-pin cotters (12) to retain the grates.

11. Remove ladders (13) from the shipping position (View B).
12. Install ladders (13) in the working position (View N). Ladder hooks (13a) will engage the top of the platform.
13. Retain the ladders with wire-lock pins (14).
14. Remove ladder brackets (15) from the shipping position (View B) and pin them in the working position (View L) with hitch pins (4).
15. At both platforms (7), unpin handrail (16) from the shipping position (View H) and pin it in the working position (View J) with hitch pin (17).
16. On the left side of the VPC actuator, unpin walkway (18) from the shipping position (View A) and lower it to the working position.
17. Retain the walkway with wire-lock pin (14).
18. On the right side of the VPC actuator, remove walkway (19) from the shipping position (View F) and pin it in the working position (View J) with pins (14, View N) and (20, View J).
19. On the right side of the VPC actuator, repin hold-down brackets (22) and hold-down links (23) in the shipping position (View F) with quick-release pins (24).
20. On both sides of the VPC actuator, unpin walkways (25) from the shipping position (View B) and rotate them to the working position (View K). Store hitch pins (4, View K).

NOTE 1 Ladder (5) should be lowered to the working position only when the VPC actuator is in the horizontal position. At all other times the ladder should be stored.

NOTE 2 When the VPC actuator is in the horizontal position, you must raise and latch walkways (18 and 19) so you can climb ladders (13).

NOTE 3 Before raising walkway (19) on the right side of the VPC actuator, open door (26, View J) to avoid damaging the electric sensor on the end of the motor.

NOTE 4 When the VPC actuator is in the vertical position, walkways (18 and 19) must be pinned down.

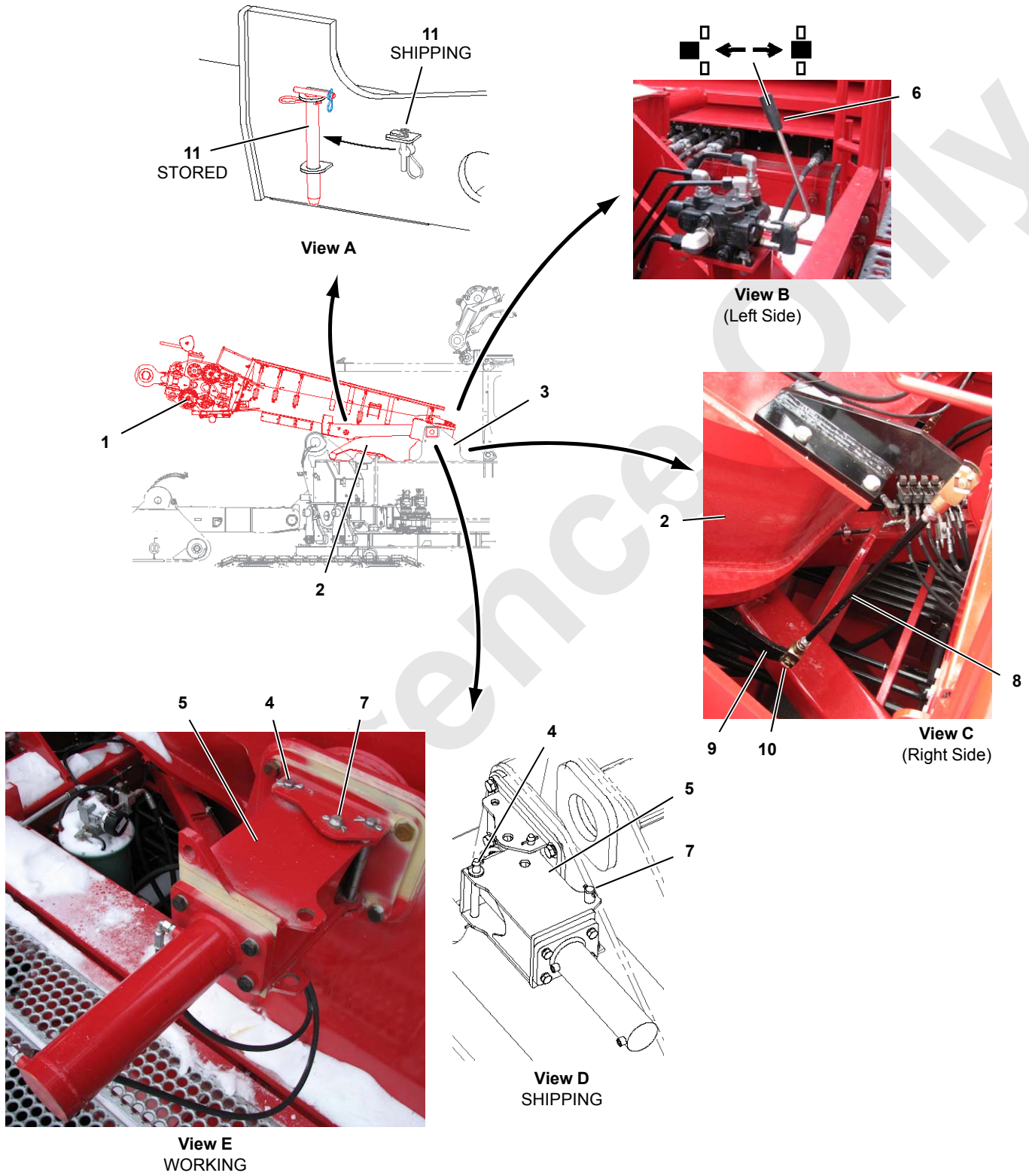


Figure 4-77

Legend for [Figure 4-77](#)

Item	Description
1	VPC Actuator
2	Actuator Frame
3	Rotating Bed
4	Pin with Cotter Pins (2)
5	Hydraulic Pin (2)
6	Control Valve
7	Pin with Cotter Pins (2)
8	Rod (2)
9	Pin with Keeper Plate (2)
10	Hydraulic Swivel Lever (2)
11	Hitch Pin with Hair-Pin Cotter (2)

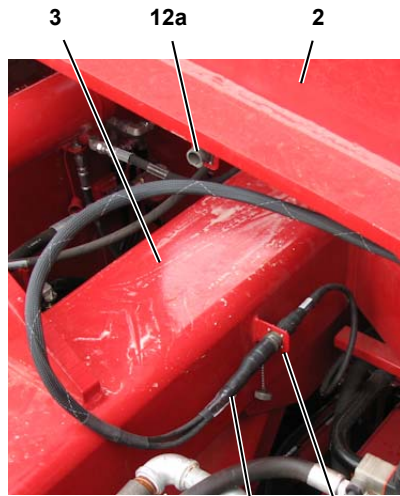
Install VPC Actuator Assembly

- Attach Lifting slings to VPC actuator (1, [Figure 4-76](#)) and actuator frame (2).
 - Use four legs of the chain lifting sling shown in [Figure 4-10](#), View A. Adjust the length of the rear legs to the specified dimension.
 - You will have to unpin and rotate walkway extension (3, [Figure 4-75](#), View C) out of the way to access the bottom-right lifting lug.
- Remove pins (4) and rotate hydraulic pins (5) from the shipping position (View D) to the working position (View E).
- Install pins (4, View E).
- Lift VPC actuator (1) and actuator frame (2) into position at the rear of the rotating bed.
- Align the connecting holes in actuator frame (2) with the connecting holes in rotating bed (3).
- Engage hydraulic pins (5, View E) with control valve (6, View B).
- Lower the VPC actuator until the lifting slings go slack. Then disconnect the lifting slings.
- Rotate walkway extension (3, [Figure 4-75](#), View C) to the working position and pin it.
- Remove pins (7) from the shipping position (View D) and install them in the working position (View E).
- Pin rods (8, View C) from actuator frame (2) to hydraulic swivel levers (9). Adjust the rod ends if necessary to align the connecting holes.

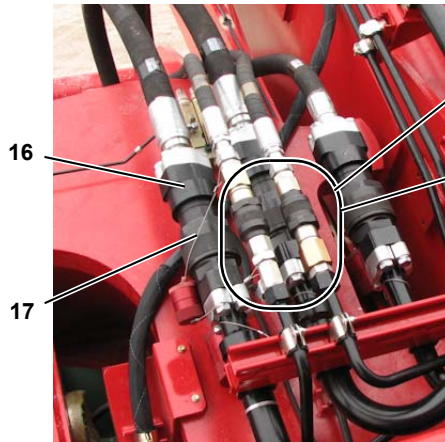
This step ensures that the hydraulic hoses swivel properly in response to rotation of the VPC actuator.
- Remove hitch pin (11, View A) from the shipping position in both sides of actuator frame (2) and store the pins.

See [Figure 4-77](#) for the following steps.

Continued on Next Page



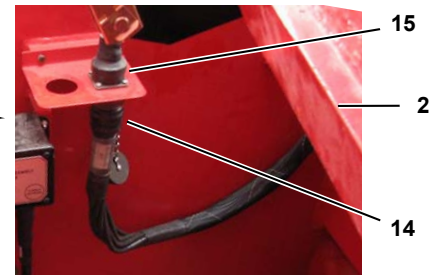
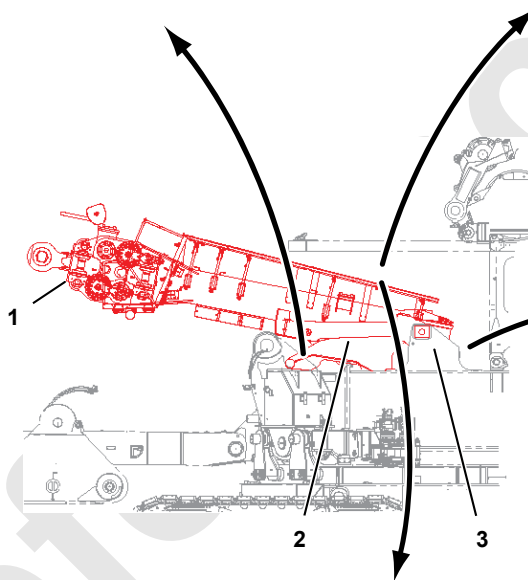
View F
(Right Rear Side)



View G (Right Side)



View H (Left Side)



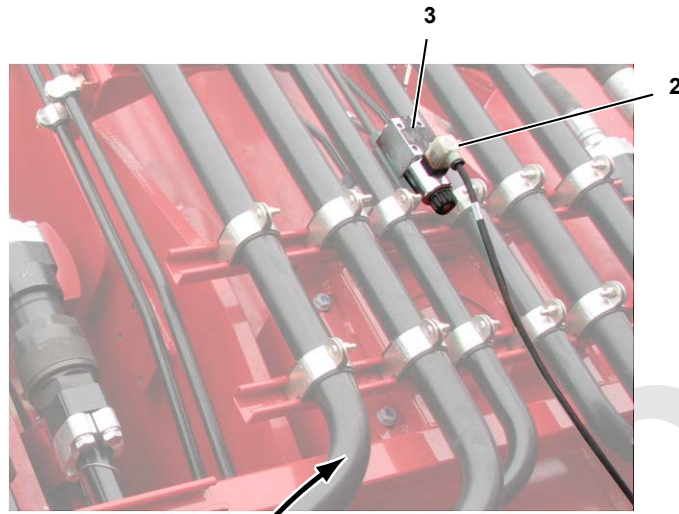
View J
(Right Side)

FIGURE 4-77 continued

Legend for [Figure 4-77](#)

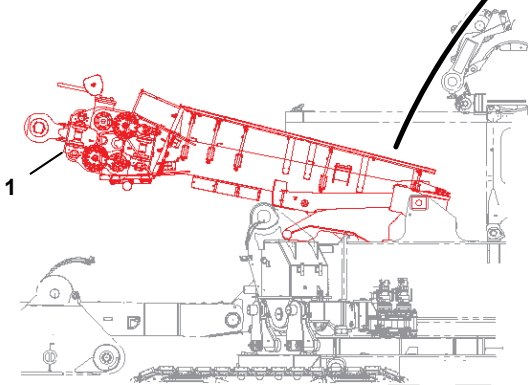
Item	Description
1	VPC Actuator
2	Actuator Frame
3	Rotating Bed
12	Electric Cable W65P1 from VPC Actuator Assembly
12a	Storage Receptacle
13	Electric Cable W64J1 on Rotating Bed
14	Electric Cable W66P1 from Rotating Bed
15	Electric Cable W67P10 on VPC Actuator Assembly
16	Hydraulic Hoses from Rotating Bed (3 each side)
17	Hydraulic Couplers on VPC Actuator (3 each side)
18	Grease Hoses from Rotating Bed (2)
19	Grease Couplers on VPC Actuator (2)

12. Disconnect electric cable (12, View F) from storage receptacle (12a) on VPC actuator (1).
13. Connect electric cable (12, View A) to electric cable (13) on rotating bed (3).
14. Connect electric cable (14, View J) from VPC actuator (1) to electric cable (15) on the rotating bed.
15. Remove the protective caps from hydraulic hoses and couplers (16 and 17, Views G and H).
16. Store the protective caps in the parts boxes provided.
17. Connect hydraulic hoses (16, Views G and H) from the rotating bed to hydraulic couplers (17) on the VPC actuator. These are straight line connections. The hoses must not cross.
18. Connect grease hoses (18, View G) from the rotating bed to grease couplers (19) on the VPC actuator. The hoses can be connected only one way.

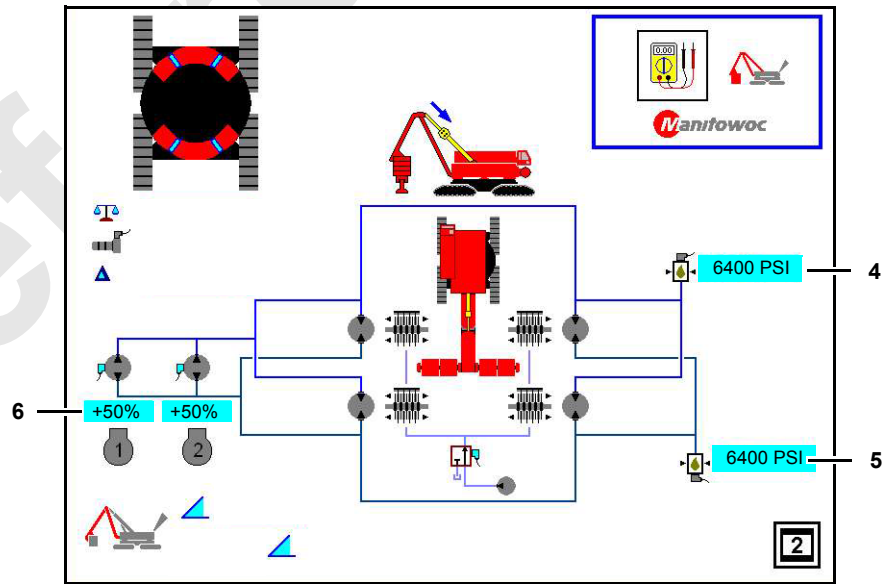


M103490

View A



Item	Description
1	VPC Actuator
2	Electric Connector
3	VPC Actuator Brake Solenoid Valve
4	Extend Hydraulic Pressure
5	Retract Hydraulic Pressure
6	Pump Command (-100 to +100)



View B

FIGURE 4-78

Test VPC Actuator Brakes

An operational test of the VPC actuator brakes must be performed each time the 31000 is assembled.

See [Figure 4-78](#) for the following procedure.

1. Disconnect electric connector (1, View A) from VPC actuator brake solenoid valve (2).
2. Start and run the engine at low idle (850 to 950 rpm).
3. Turn on the remote control mode (see [page 118](#))
4. Access the VPC diagnostic screen (View B) in the main display.
5. Perform the following step in both directions, extend and retract:
 - a. Slowly rotate the VPC actuator switch (on remote control) in the desired direction
 - b. Pressure — extend (4, View B) or retract (5) — must reach 6,400 psi (441 bar) before 50% pump command (6) is reached and the **brakes must not slip** (actuator must not extend or retract).

CAUTION

Overheating Hazard!

Do not hold the brakes on stall for more than 5 seconds. Damage from overheating can occur to system components.



WARNING

Falling Load/Moving Crane Hazard!

If brakes slip when operational test is performed, repair or replace them before placing crane back into service. The counterweight could fall if brakes are not operating properly.

See gear box manufacturer's manual for disc brake repair instructions.

6. Reconnect electric connector (2, View A) to VPC actuator brake solenoid valve (3).
7. If the brakes are repaired or replaced, retest them before placing the crane back into service.

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Reference Only

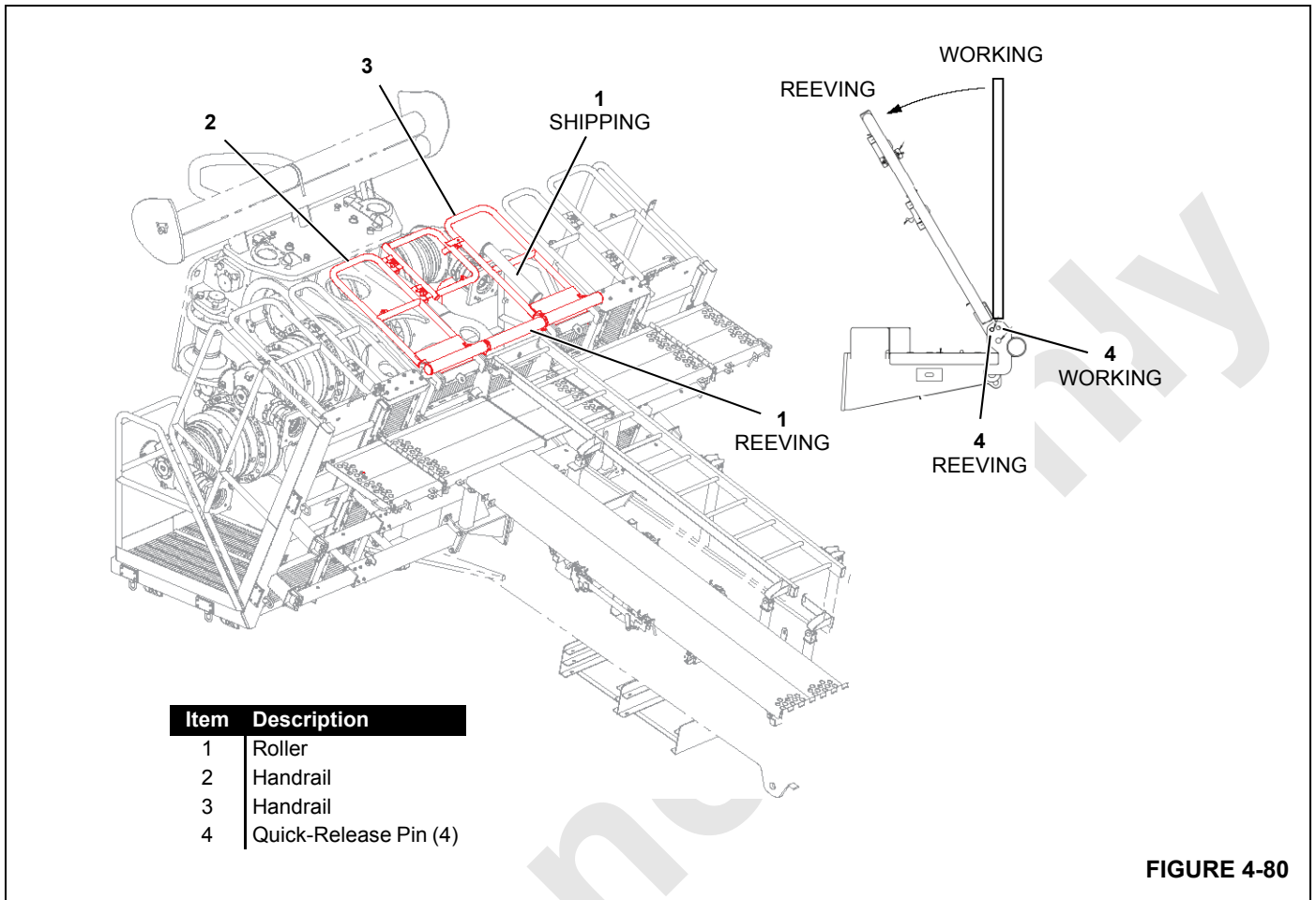


FIGURE 4-80

CRANE ASSEMBLY — MAST

See [Figure 4-80](#) for the following procedure.

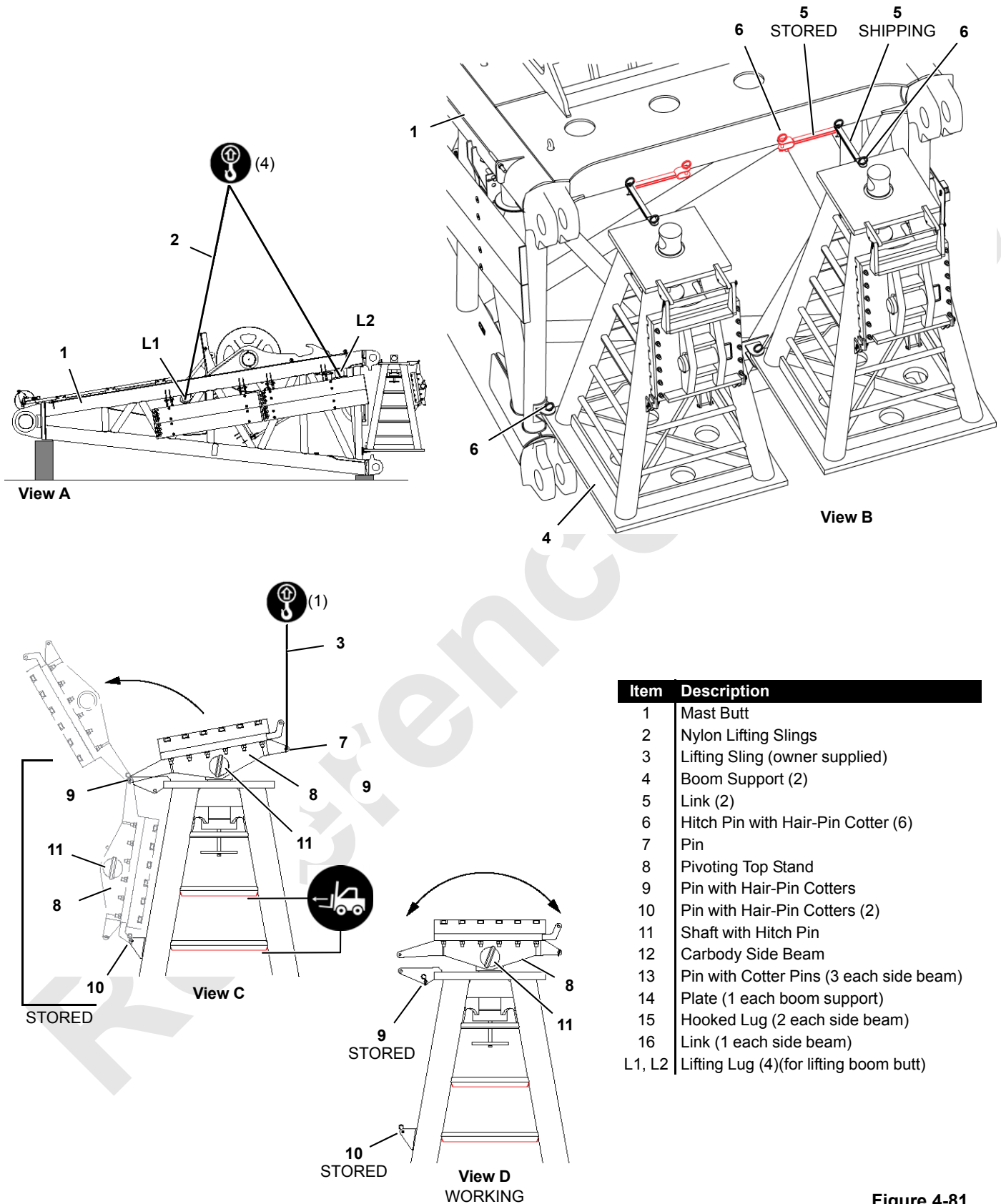
CAUTION

Wire Rope Damage!

Perform the following procedure to prevent damage to the boom hoist wire during mast assembly and raising.

Prepare VPC Actuator Platform

1. Move roller (1) from the shipping position to the reeving position.
2. Rotate handrails (2 and 3) from the working position to the reeving position.



Item	Description
1	Mast Butt
2	Nylon Lifting Slings
3	Lifting Sling (owner supplied)
4	Boom Support (2)
5	Link (2)
6	Hitch Pin with Hair-Pin Cotter (6)
7	Pin
8	Pivoting Top Stand
9	Pin with Hair-Pin Cotters
10	Pin with Hair-Pin Cotters (2)
11	Shaft with Hitch Pin
12	Carbody Side Beam
13	Pin with Cotter Pins (3 each side beam)
14	Plate (1 each boom support)
15	Hooked Lug (2 each side beam)
16	Link (1 each side beam)
L1, L2	Lifting Lug (4)(for lifting boom butt)

Figure 4-81

Prepare Mast Butt

See [Figure 4-81](#) for the following procedure.

1. Lift mast butt (1) off the trailer and place it onto blocking at ground level.
 - Use four nylon lifting slings (2) attached to lifting lugs (L1 and L2, View A).
 - Block the mast butt so the bases of the boom supports are horizontal.
2. Disconnect the lifting slings.
3. Support boom support (4, View B) with a forklift.

Lift only under the tubular supports shown in View C (colored red).

4. Unpin link (5, View B) from the shipping position and pin it in the stored position.
5. Remove two bottom hitch pins (6, View B) and lift the boom support away from the mast butt.
6. Store bottom hitch pins (6, View B) in the mast butt lugs.
7. Place the boom support on the ground and remove the forklift.
8. Connect owner supplied lifting sling (3, View C) to pin (7).
9. Hoist just enough to support pivoting top (8, View C) and remove pin (9).
10. Lower pivoting top (8, View D) to the working position and disconnect the lifting sling.
11. Store pin (9, View D).
12. Repeat steps 3 through 11 for the other boom support.

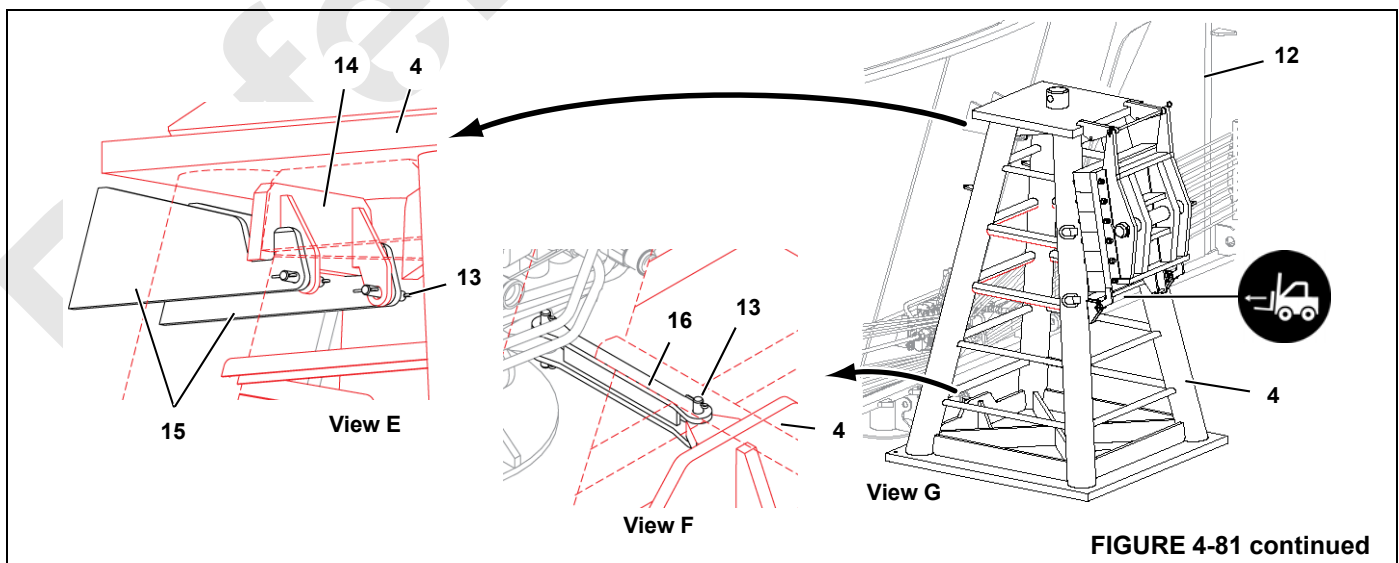
NOTE Both boom supports have an adjusting wheel so the pivoting top stand can be raised or lowered to

assist in leveling parts. Grease the adjusting mechanism as required.

13. Once the boom is completely assembled, store the boom supports as follows:
 - a. Remove pins (9 and 10, View D) from storage.
 - b. Connect owner supplied lifting sling (3, View C) to pin (7).
 - c. Hoist against pivoting top (8, View C) until the connecting holes are aligned and install pin (9, View C).
 - d. Hoist against pivoting top (8) until shaft (11, View C) is loose.
 - e. Remove shaft (11).
 - f. Rotate pivoting top (8, View C) to the stored position and install pins (10).
 - g. Disconnect lifting sling (3).
 - h. Store shaft (11, View C) in pivoting top (8).
 - i. Remove pins (13, Views E and F) from storage on the carbody side beam.
 - j. Using a forklift, lift boom support (4) into position at either carbody side beam (12, View G).

Lift only under the tubular supports shown in View G (colored red).

- k. Engage plate (14, View E) in the boom support with hooked lugs (15) on the side beam.
- l. Install pins (13, View E).
- m. Pin links (16, View F) to the lug on boom support (4).
- n. Repeat the steps for the other boom support.



Item	Description
1	Sheave Bank and Equalizer
2	4-Leg Chain Lifting Sling
3	Sheave
4	Digital Level
5	Shackles (owner furnished)
6	Drum 4
7a	Link (2)
7b	Hitch Pin with Hair-Pin Cotter (4)
7c	Hitch Pin with Hair-Pin Cotter (2)
8	Pin with Cotter Pins (2)
9	Tagline (2) (owner furnished)

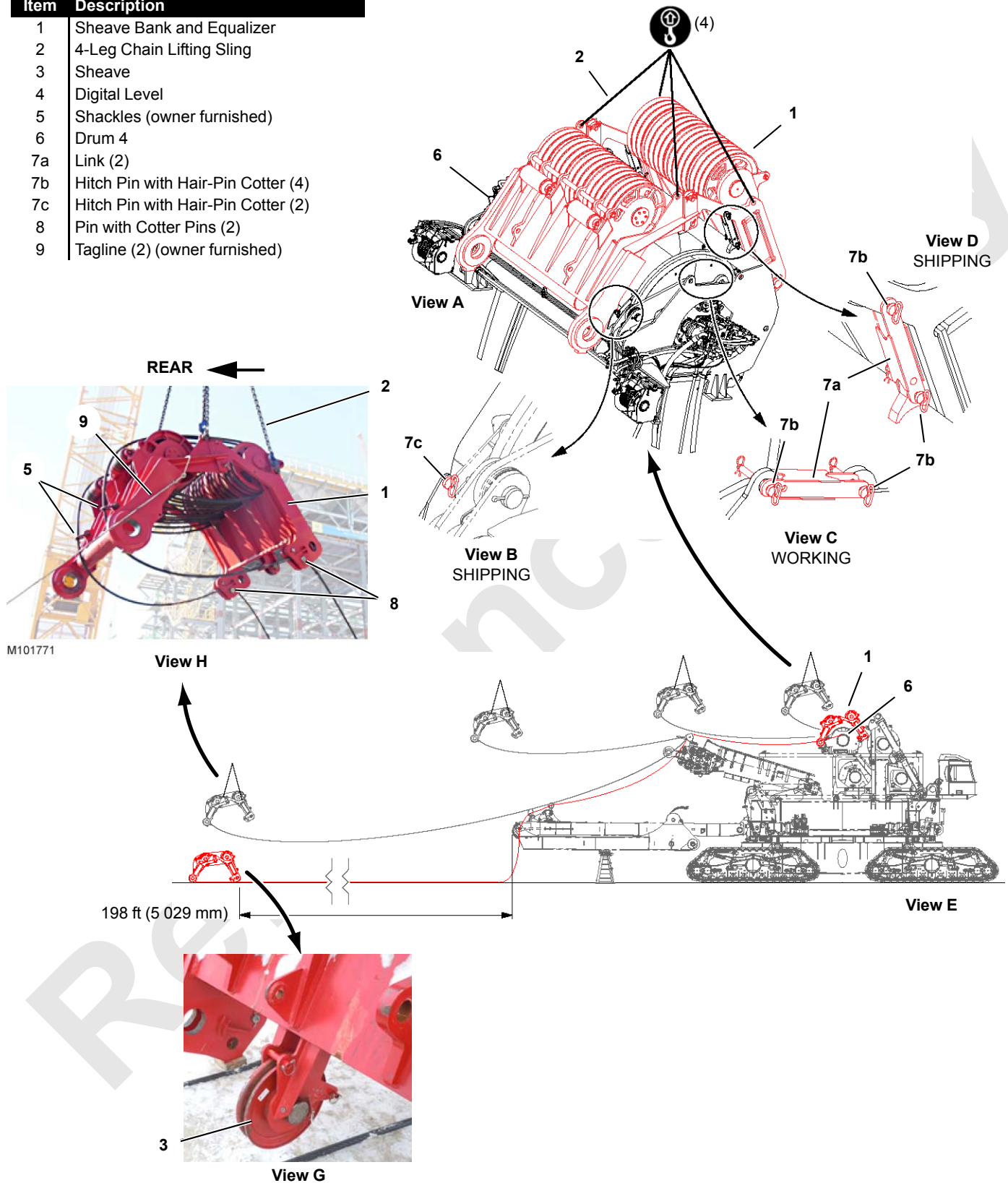


FIGURE 4-82

Assemble Mast

See [Figure 4-82](#) for the following steps.

1. Remove sheave bank and equalizer (1, View A) from Drum 4 as follows:
 - a. Attach four legs of chain lifting sling (2, View A) to the lifting holes in sheave bank and equalizer (1) with owner furnished shackles.

If using the large chain lifting sling, shorten both rear legs 11 links.

If using the small chain lifting sling, shorten both rear legs 8 links.
 - b. If not already done, secure the boom hoist wire rope with shackles (5, View H). This step will prevent the wire rope from falling off the rollers on the sheave bank and equalizer.
 - c. Route the boom hoist wire rope over pins (8, View H). This step will help to prevent the sheave bank and equalizer from spinning during lifting.
 - d. Attach two 100 ft (30,2 m) long taglines (9, View H) to the sheave bank and equalizer so ground personnel can keep the sheave bank and equalizer from spinning during lifting.
 - e. Lift just enough to loosen hitch pins (7b, View D).
 - f. Unpin links (7a, View D) from the shipping position and pin them in the working position (View C).
 - g. Slowly lift against sheave bank and equalizer (1) until hitch pins (7c, View B) are loose and remove the hitch pins.
 - h. Lift the sheave bank and equalizer clear of Drum 4 while slowly paying out boom hoist wire rope. **Use care not to kink wire rope.**
 - i. Store pins (7c) in the drum frame holes.
 - j. While slowly paying out the boom hoist wire rope from Drum 4, place the sheave bank and equalizer on the ground at the minimum dimension given in View E.

Take every precaution to prevent damaging the boom hoist wire rope.
 - k. Disconnect the lifting slings and taglines.
 - l. Remove shackles (5, View H).
 - m. If it was removed, install sheave (3, View G).

Continued on Next Page

Item	Description
1	Sheave Bank and Equalizer
2	Mast Insert — 8.5 m
3	Mast Raising Frame
4	Bracket (2)
5	Pin with Wire Lock Pin (2)
6	Pin (2)
7	Wire Rope Guide Roller (2)
8	Handle (2)
9	Pin with Wire Lock Pin (4)
10	Platform (2)
11	Quick-Release Pin (2)
12	Platform (2)
13	Pin with Wire Lock Pin (4)

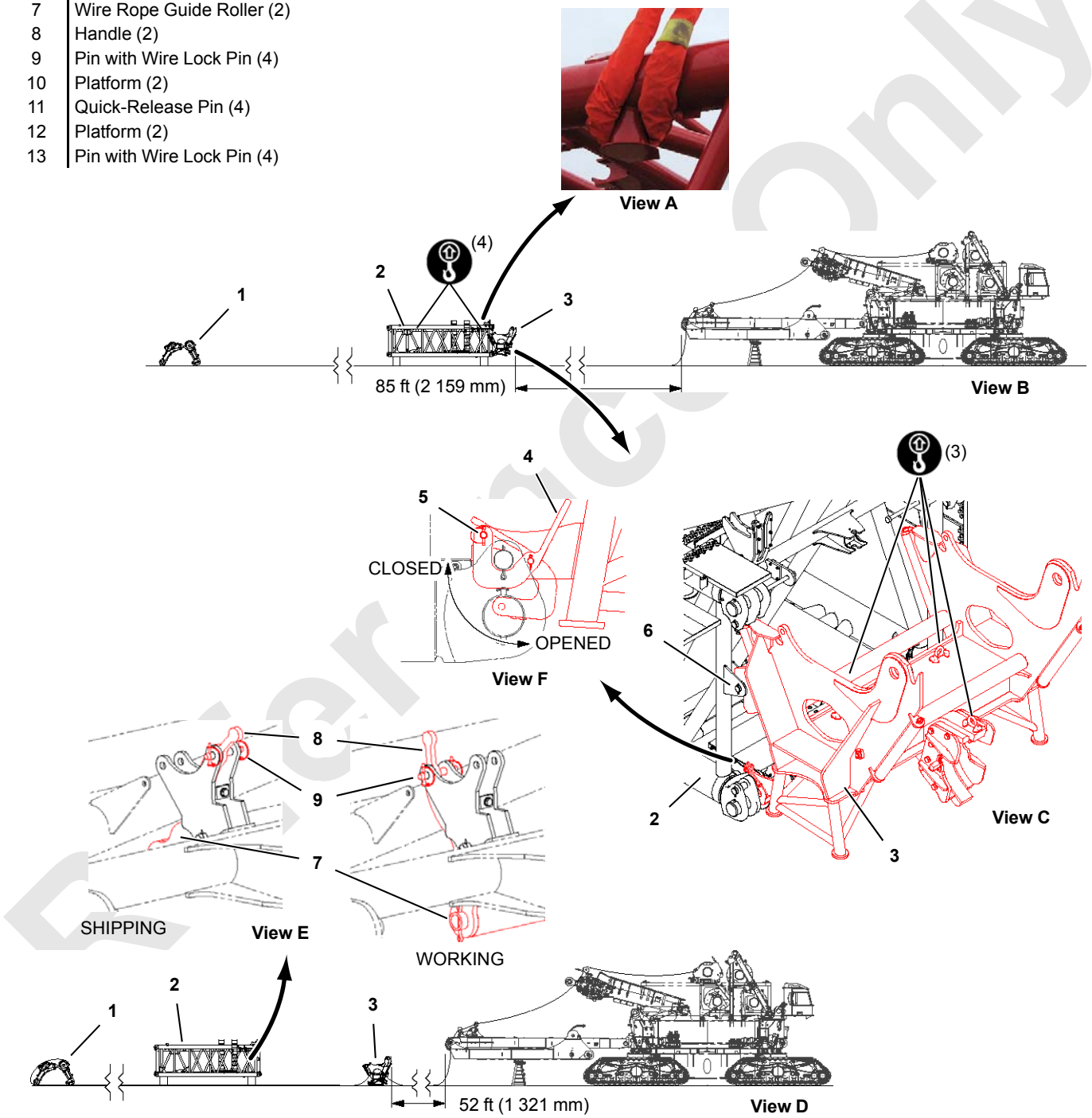


FIGURE 4-83

See [Figure 4-83](#) for the following steps.

2. Lift insert (2) into position at the minimum dimension given in View B.
 - a. Lift with nylon lifting slings as shown in View A. See [Figure 4-86](#) for lifting lug identification.
 - b. Place the insert on blocking at least 30 in (762 mm) high. The blocking must straddle the boom hoist wire rope.
 - c. Level the insert on the blocking.
3. Remove mast raising frame (3, View C) from insert (2):
 - a. Attach three legs of the chain lifting sling to the lifting lugs on mast raising frame (3).
 - b. Hoist until the slings are supporting the frame.
 - c. Unpin brackets (4) from the closed position.
 - d. Rotate the brackets open and reinstall pins (5).
- e. Lift mast raising frame (3) off pins (6) on the end of insert (2).
- f. Place mast raising frame (3) on the ground at the maximum dimension given in View D and disconnect the lifting slings.
- g. Pin brackets (4) in the closed position (View F).
- h. Using extreme care not to damage the boom hoist wire rope, place the wire rope inside the raising frame.
4. Deploy each wire rope guide roller (7, View E) in insert (2):
 - a. Grasp handles (8) and remove pins (9) from the shipping position.
 - b. Rotate wire rope guide roller (7) to the working position and install pins (9).

Item	Description
2	Insert
10	Platform (2)
11	Quick-Release Pin (4)
12	Platform (2)
13	Pin with Wire Lock Pin (4)
14	Ladder (2)
15	Ladder Extension (4)
16	Quick-Release Pin (4)

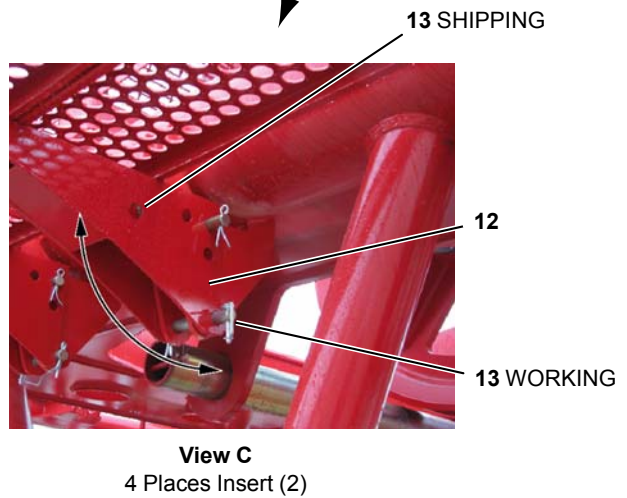
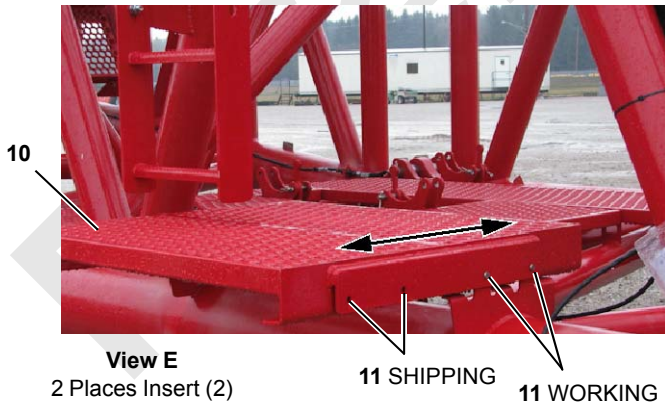
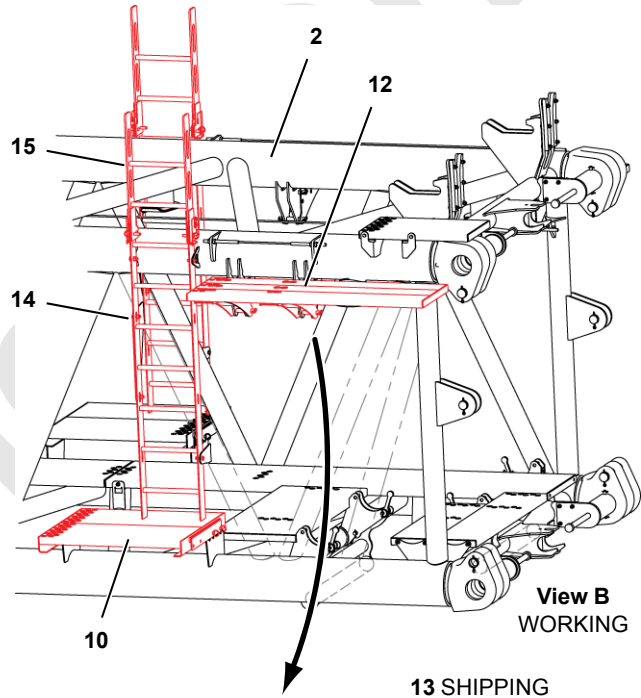
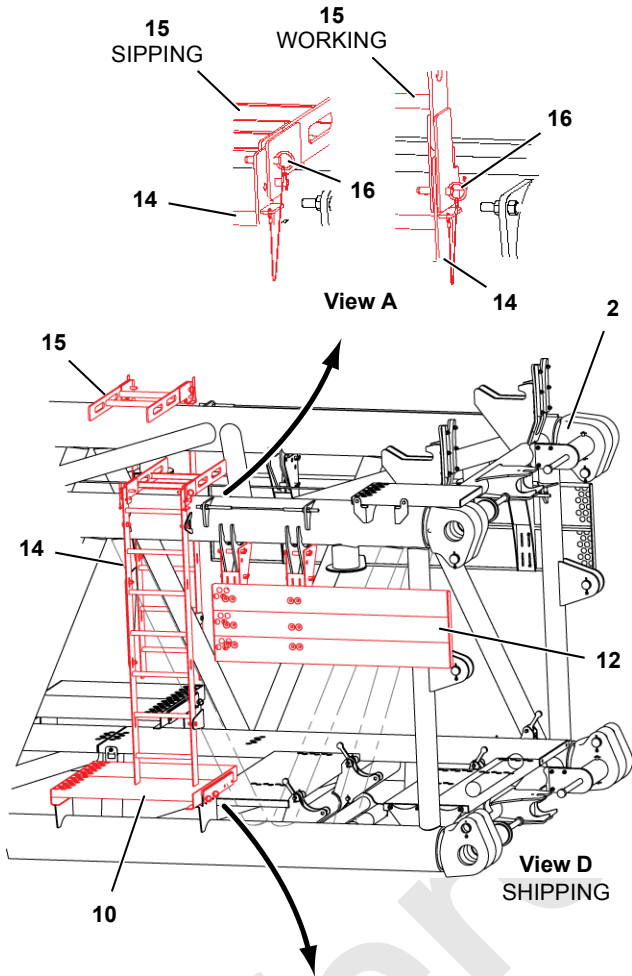


FIGURE 4-84

5. Deploy each platform (10, View D) on insert (2):
 - a. Remove pins (11, View E) from the shipping position.
 - b. Pull platform (10) out to the working position.
 - c. Install pins (11, View E) in the working position.
6. Deploy each platform (12, View D) on insert (2):
 - a. Remove pins (13, View C) from the shipping position.
 - b. Rotate platform (12) up to the working position.
 - c. Install pins (13, View C) in the working position.
7. Deploy each ladder extension (15, View D):
 - a. Remove pins (16, View A) from the shipping position.
 - b. Rotate ladder extensions (15) up to the working position.
 - c. Install pins (16, View A) in the working position.

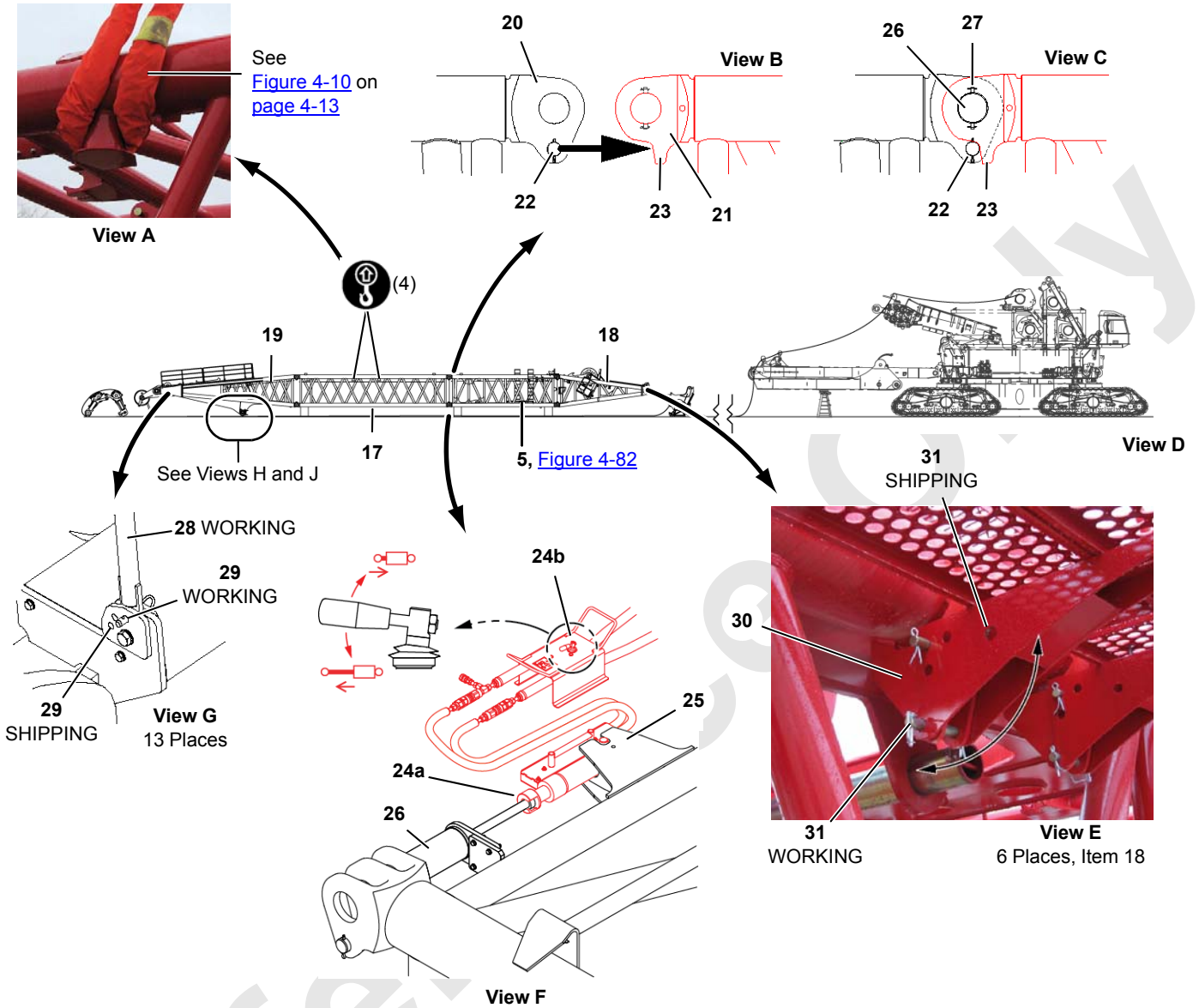


FIGURE 4-85

Legend for [Figure 4-85](#)

Item	Description
5	Mast Insert — 8.5 m
17	Mast Insert — 12 m
18	Mast Butt
19	Mast Top
20	2-Lug Connector
21	3-Lug Connector
22	Alignment Pin
23	Alignment Lug
24a	Hand-Held Cylinder (with trunnions)
24b	Hand-Held Accessory Valve
25	Bracket
26	Connecting Pin
27	Pin with Cotter Pins
28	Handrail (5)
29	Quick-Release Pin (12)
30	Platform (3)
31	Pin with Wire-Lock Pin (6)

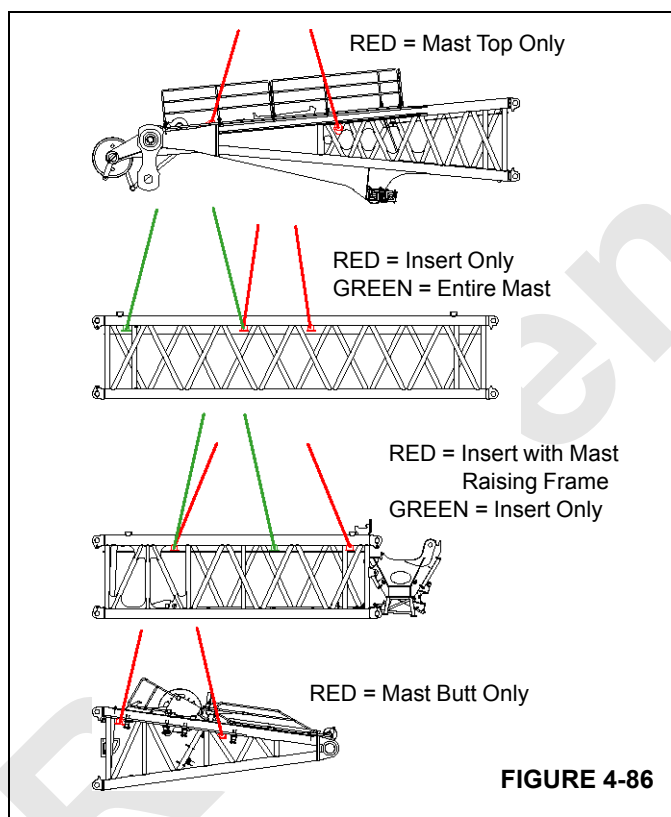


FIGURE 4-86

See [Figure 4-85](#) for the following steps.

8. To ensure stability, assemble the remaining mast sections in the following order:
 - Mast insert (17, View D) with blocking at top end

- Mast butt (18)
- Mast top (19)

9. Install the mast sections as follows:
 - a. Lift the mast section with nylon lifting slings attached to the lifting lugs as shown in View A. See [Figure 4-86](#) for lifting lug identification. The mast section must be level.
 - b. Lift the mast section into position (View B) so all four connectors (20) engage connectors (21). The 2-lug connectors must straddle the center lug of the 3-lug connectors.
 - c. The connecting pin holes will align automatically when alignment pins (22, View C) are bottomed against alignment lugs (23).
 - d. Place hand-held cylinder (24a, View F) in position so the cylinder trunnion engages the slots in bracket (25) and the cylinder rod end engages the pin head in connecting pin (26).

The connecting pins are shipped in the retracted position.

- e. Remove pin (27, View C) from connecting pin (26).
 - f. Connect hand-held accessory valve (24b, View F) to the PPU and to hand-held cylinder (24a).
 - g. Start the PPU.
 - h. Engage connecting pin (26) using the control on the hand-held accessory valve (24b).
 - i. Install pin (27, View C).
 - j. Remove the hand-held cylinder.
 - k. Repeat steps [9d](#) – [9j](#) for the remaining pins.
 - l. Repeat steps [9a](#) – [9k](#) for the mast butt and mast top.
10. Raise each handrail (28, View G) on mast top (19):
 - a. Remove pins (29) from the shipping position.
 - b. Raise handrail (28) to the working position.
 - c. Install pins (29) in the working position.
 11. Deploy each platform (30, View E) on mast butt (18):
 - a. Remove pins (31) from the shipping position.
 - b. Raise platform (30) to the working position.
 - c. Install pins (31) in the working position.

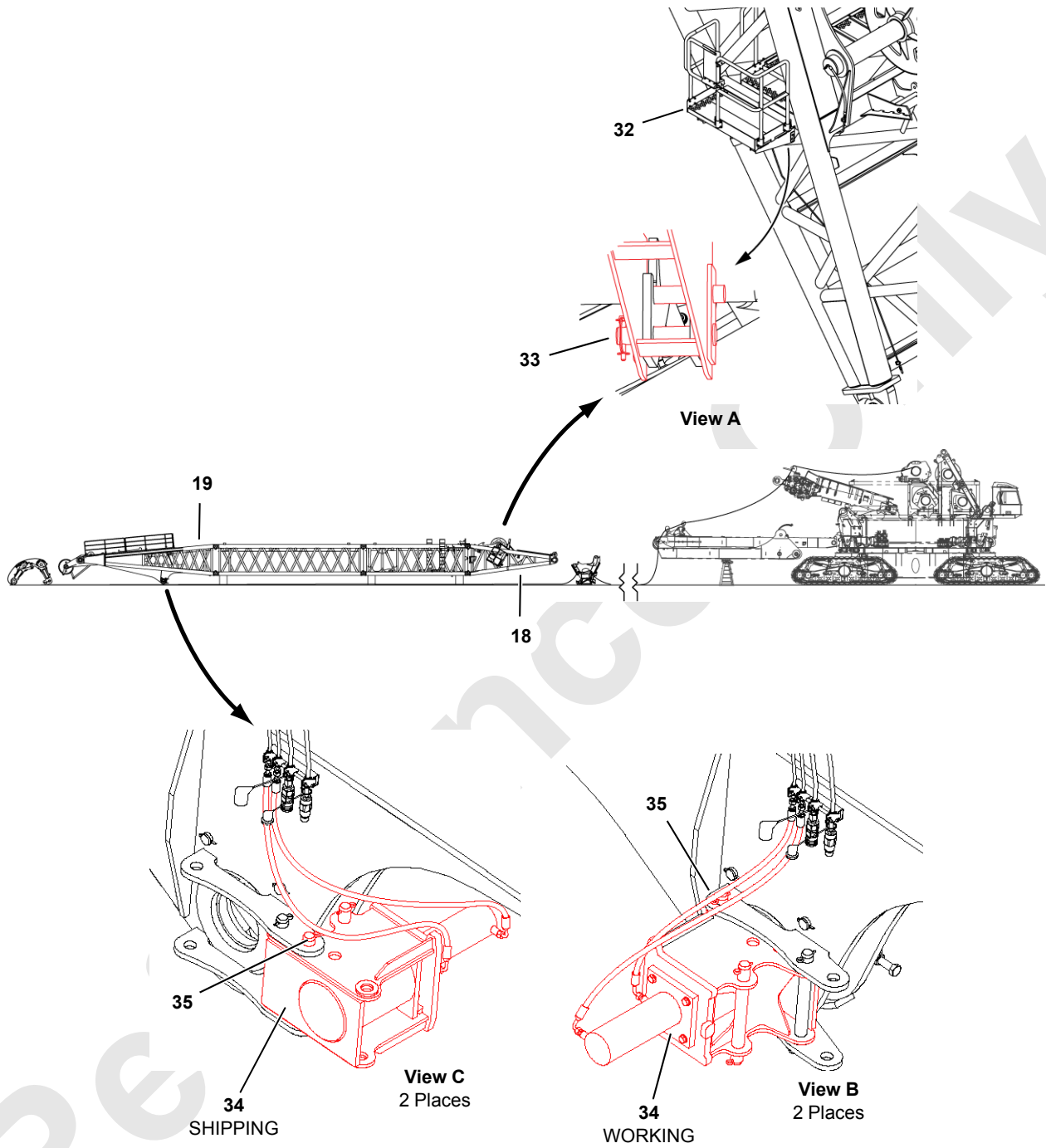


FIGURE 4-87

Legend for [Figure 4-87](#)

Item	Description
18	Mast Butt
19	Mast Top
32	Platform
33	Pin with Wire-Lock Pin (2)
34	Backhitch Pin (2)
35	Pin with Cotter Pins (2)

See [Figure 4-87](#) for the following steps.

12. Install platform (32, View A) on mast butt (18):

- a. Remove pins (33, View A) from platform (32).
 - b. Lift platform (32) into the working position so the fixed pins in the platform engage the hooked connectors on the mast butt.
 - c. Install pins (33, View A).
- 13.** Deploy each backhitch pin (34, View C) on mast top (19):
- a. Remove pin (35, View C) from the shipping position.
 - b. Rotate backhitch pin (34, View C) from the shipping position to the working position (View B).
 - c. Install pin (35, View B) in the working position.

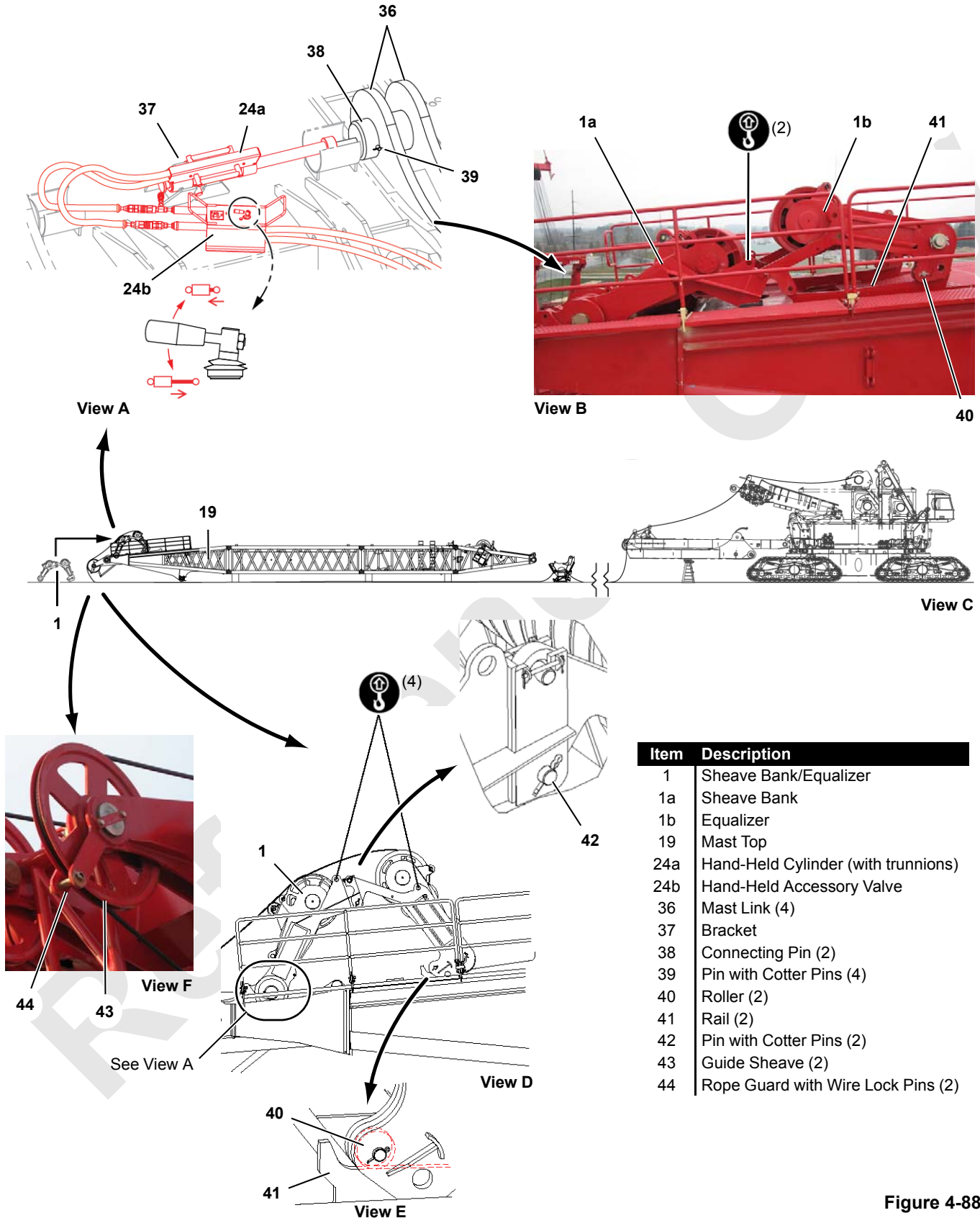


Figure 4-88

See [Figure 4-88](#) for the following steps.

14. Disengage mast strap pins (38, View A):
 - a. Place hand-held cylinder (24a) in position so the cylinder trunnion engages the slots in bracket (37) and the cylinder rod end engages the pin head in connecting pin (38).
 - b. Connect hand-held accessory valve (24b) to the PPU and to hand-held cylinder (24a).
 - c. Start the PPU.
 - d. Remove pins (39) from connecting pin (38).
 - e. Fully retract connecting pin (38).
 - f. Repeat steps [14a](#) – [14e](#) for the other connecting pin.
15. Install sheave bank/equalizer (1) on mast top (19, View D) as follows:
 - a. Attach all four legs of the chain lifting sling ([Figure 4-10](#), View A) to the lifting holes in sheave bank/equalizer (1, View D).
 - b. Lift sheave bank/equalizer (1) onto mast top (19, View D) so the connecting pin holes in sheave bank (1a) are aligned with connecting pins (38) and rollers (40, View E) are resting on rails (41).
16. Engage either mast strap pin (38, View A) and install pins (39).
17. Reposition hand-held cylinder (24), engage other mast strap pin (38, View A), and install pins (39).
18. Remove hand-held cylinder (24).
19. Disconnect the lifting slings from sheave bank/equalizer (1).
20. Attach two legs of the chain lifting sling to the lifting holes in sheave bank (1a, View B).
21. Hoist just enough to support sheave bank (1a) and equalizer (1b).
22. Remove pins (42, View D).

DO NOT remove the pins connecting the top holes between sheave bank (1a) and equalizer (1b).
23. Slowly pay out the hoist line from the assist crane to unfold sheave bank (1a, View B) and equalizer (1b).
24. Reinstall pins (42) in the sheave bank holes once the sheave bank and equalizer separate.
25. Disconnect the lifting slings once they go slack.
26. Remove rope guard (44, View F) at both mast top guide sheaves (44).
27. Engage the boom hoist wire rope with both guide sheaves and reinstall rope guards (44).

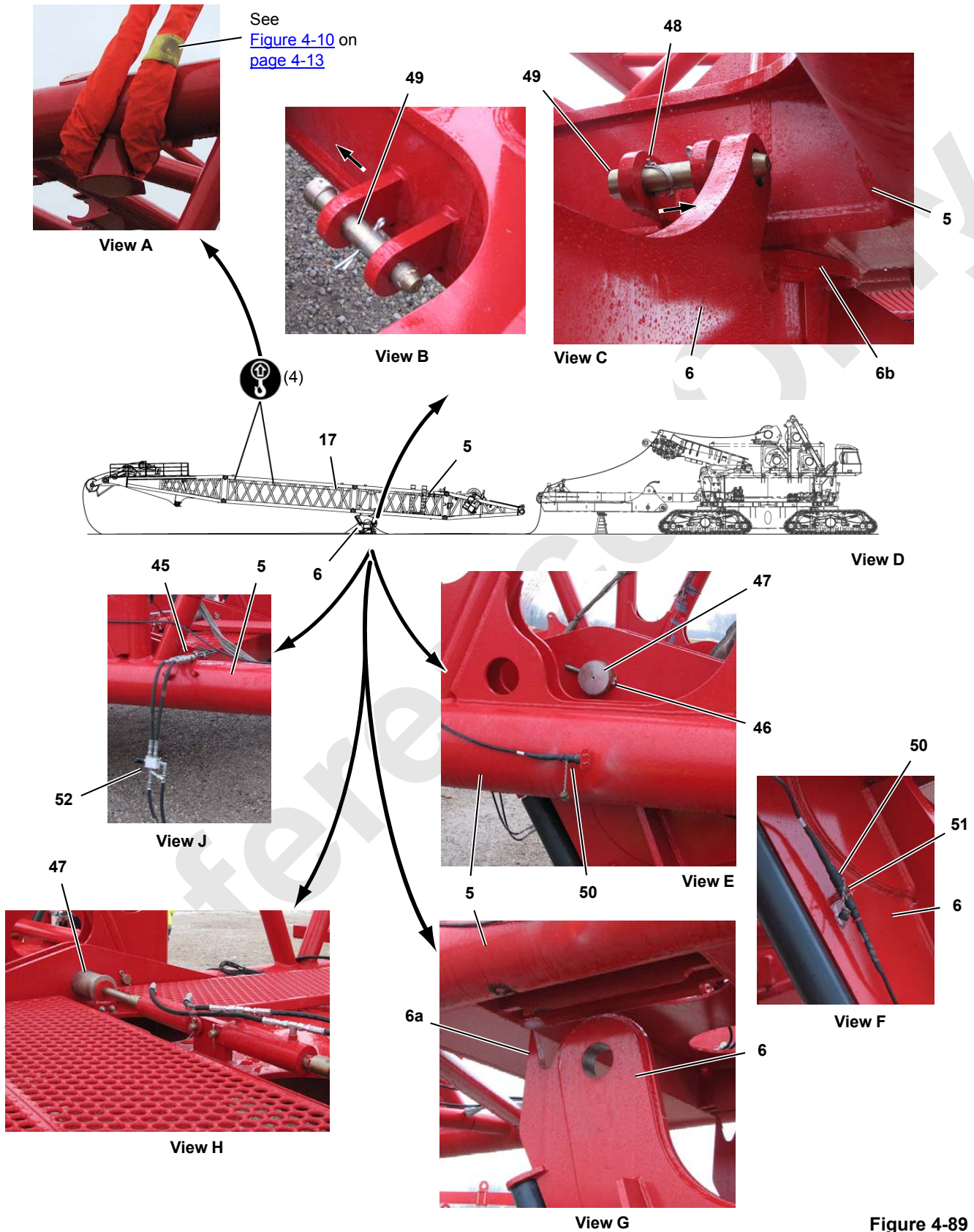


Figure 4-89

Legend for [Figure 4-89](#)

Item	Description
5	Mast Insert — 8.5 m
6	Mast Raising Frame
6a	Hooked Lug (2)
6b	Pad (2)
17	Mast Insert — 12 m
45	Hydraulic Couplers
46	Pin with Cotter Pins (2)
47	Connecting Pin (2)
48	Wire Lock Pin (2)
49	Pin (2)
50	Electric Cable
51	Receptacle
52	Hand-Held Accessory Valve

See [Figure 4-89](#) for the following steps.

28. Connect hand-held accessory valve (52, View J) from the PPU to hydraulic couplers (45, View J) on mast insert (5).
29. Remove pins (46, View E) from connecting pins (47).
30. Start the PPU and disengage connecting pins (47, View H) with the hand-held accessory valve.
31. Remove wire lock pins (48, View C) and pull pins (49, View B) inward against the cotter pins.
32. Attach nylon lifting slings to the four lifting lugs nearest the top end of mast insert (17, View D) as shown in View A.
33. Lift the mast so mast insert (5) is positioned over mast raising frame (6, View G).
34. Slowly lower the mast onto the mast raising frame so hooked lugs (6a, View G) engage the alignment pins in mast insert (5) and pads (6b, View C) contact mast insert (5).
35. Start the PPU and engage connecting pins (47, View E) with the hand-held accessory valve.
36. Install pins (46, View E).
37. Stop the PPU and disconnect the hand-held accessory valve from hydraulic couplers (45, View J).
38. Engage pins (49, View C) with mast raising frame (6) and install wire-lock pins (48).
39. Unplug electric cable (50, View E) from the dummy receptacle on mast insert (5).
40. Connect electric cable (50, View F) to receptacle (51) on mast raising frame (6).
41. Thoroughly clean and grease the pocket in the mast raising frame.

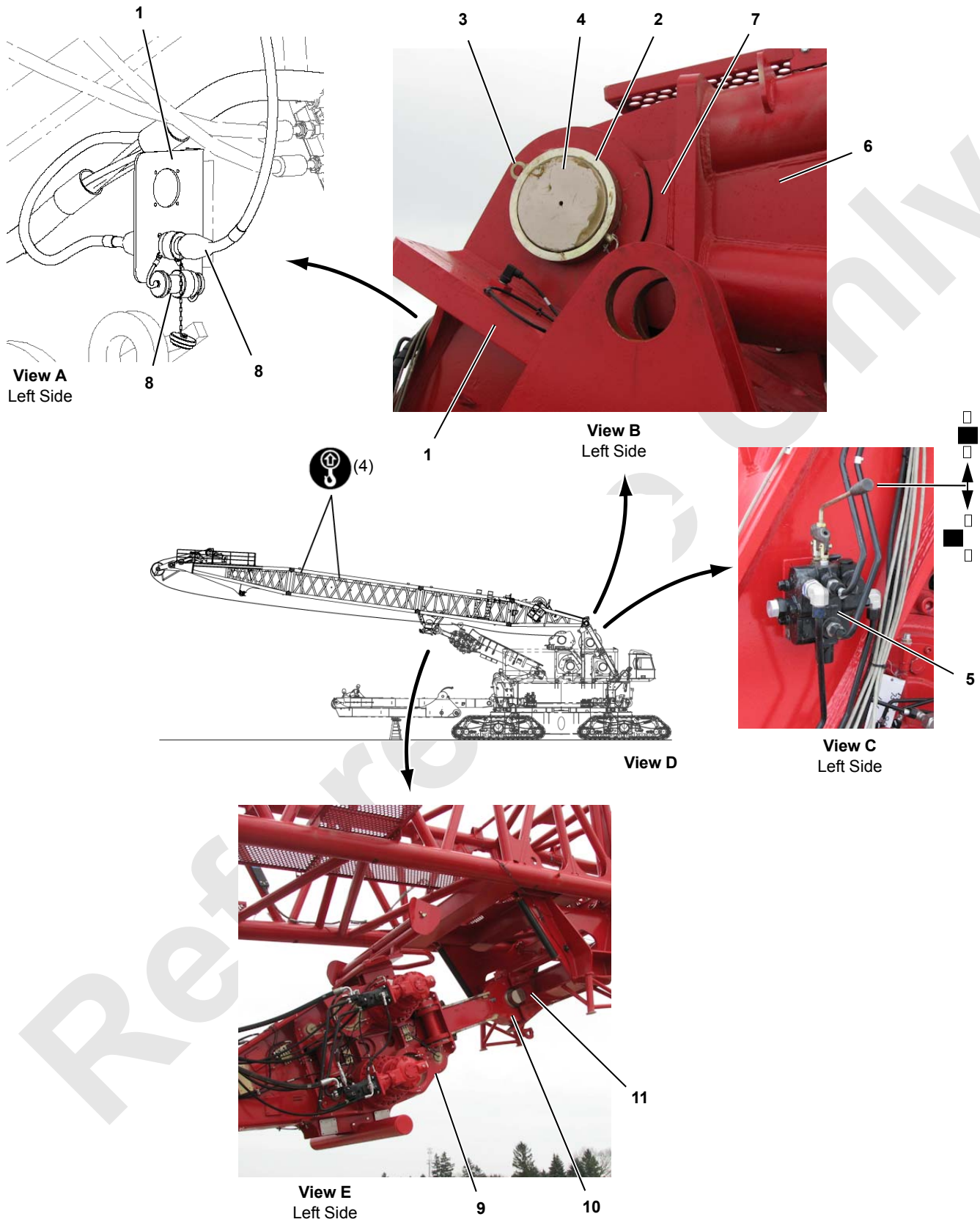


Figure 4-90

Install Mast

Legend for [Figure 4-90](#)

Item	Description
1	Drum 1
2	Collar (2)
3	Pin with Wire Lock Pin
4	Connecting Pin
5	Control Valve
6	Mast
7	Alignment Lug
8	Electric Cable
8a	Terminator Plug
9	VPC Actuator
10	Head
11	Mast Raising Frame

See [Figure 4-90](#) for the following steps.

- Remove collars (2, View B) from connecting pins (4).
- Start the engine and disengage the connecting pins with control valve (5, View C).
- Using a digital level, measure and record the levelness across connecting pins (4).
- Using a digital level, measure the levelness across the butt end of mast (6).
- Adjust the nylon lifting slings so the angles measured in steps 3 and 4 are as close to the same as possible.
- Lift the mast into position over Drum 1.
- Lower the mast so alignment lugs (7, View B) are snug against the lugs on Drum (1) and the pin holes are aligned.
- Engage connecting pins (4, View B) with control valve (5, View C).
- Install collars (2, View B).
- Disconnect terminator plug (8a, View A) from the to the receptacle on Drum 1. Connect the protective cap to the end of the terminator plug.
- Connect electric cable (8, View A) from the mast butt to the receptacle on Drum 1.
- Using the setup remote control, raise and extend VPC actuator (9, View E) until actuator head (10) engages the pocket in mast raising frame (11).
- Extend the VPC actuator until the lifting slings are slack.
- Disconnect the lifting slings from the mast.
- Fully lower the VPC actuator frame.
- Then fully retract the VPC actuator and mast.

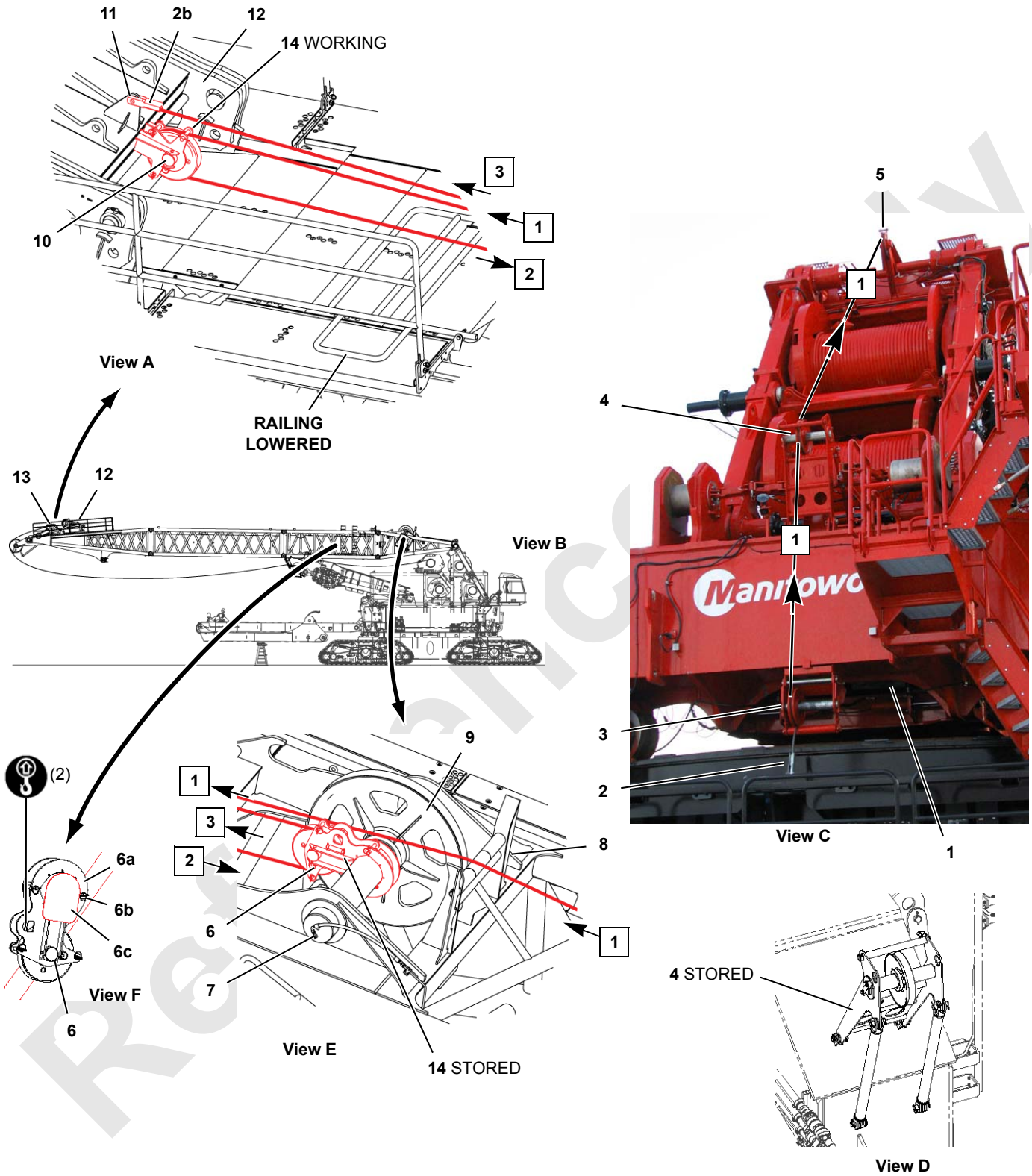


FIGURE 4-91

Move Equalizer from Mast Top to Mast Butt

Legend for [Figure 4-91](#) and [Figure 4-92](#)

Item	Description
1	Drum 6
2	Rigging Line with Button
2a	Alignment Lug
2b	Button Socket
2c	Pin with Cotter Pin
3	Wire Rope Guide
4	Wire Rope Guide
5	Wire Rope Guide
6	Wire Rope Guide
6a	Clamp
6b	Pin with Wire Lock Pin
6c	Storage Lug
7	Shaft
8	Roller
9	Sheave
10	Wire Rope Guide
11	Lug
12	Equalizer
13	Sheave Bank
14	Pin with Cotter Pins

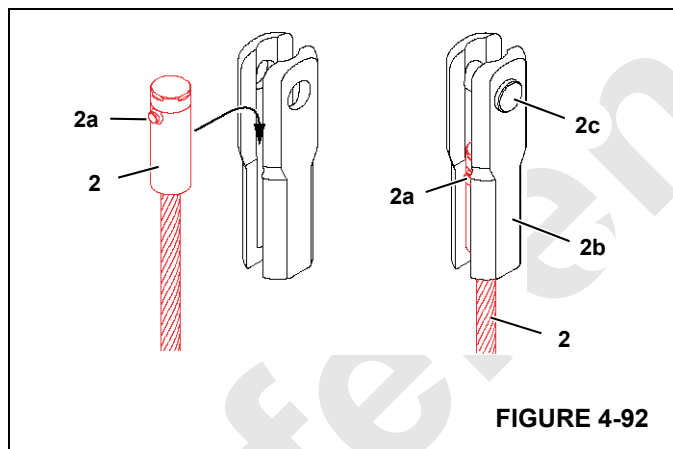


FIGURE 4-92

See [Figure 4-91](#) for the following steps.

1. Lower the front railing on the mast top platform (View A).
2. Remove wire rope guide (4, View D) from storage on the right end of the front roller carrier and install the wire rope guide on the center of the front roller carrier (View C).

3. Attach lifting slings from the assist crane to the lifting holes in wire rope guide (6, View F). The wire rope guide is stored on the diagonal lacing inside the 8,5 m mast insert.
4. Raise wire rope guide (6, View F) to horizontal, remove pin (6b) and lift the wire rope guide out of the insert.
5. Assemble wire rope guide (6, View E) to shaft (7).
6. Grease sheaves (3, 4, 5, 6, and 10). Make sure shafts of sheaves (3 and 4) are coated with grease.
7. Turn on the rigging winch mode (see [page 4-153](#)).
8. Pay out rigging line (2) from Drum 6 (see [page 4-153](#)).

NOTE During the following steps, it will be necessary to remove the rope guards from the sheaves. Reinstall the rope guards once the rigging line is engaged with the sheaves.

Pull the rigging line with the assist crane. Use a nylon lifting sling from the assist crane “choked” around the rigging line.

9. Route the rigging line, as follows (follow numbered boxes):
 - Under guide sheave (3, View C).
 - Over guide sheave (4, View C).
 - Over guide sheave (5, View C).
 - Over roller (8, View E) in mast butt.
 - Over shaft (7, View E) in the mast butt. **Do not route the rigging line over sheave (9).**
 - Over guide sheave (10, View A).
 - Under guide sheave (6, View E).
 - Over guide sheave (6, View E) to lug (11, View A) on equalizer (12).
10. Attach the rigging line to lug (11, View A) with button socket (2a, [Figure 4-92](#)).
11. Remove pin (14, View E) from storage on wire rope guide (6) and install the pin on guide sheave (10, View A).

Continued on Next Page

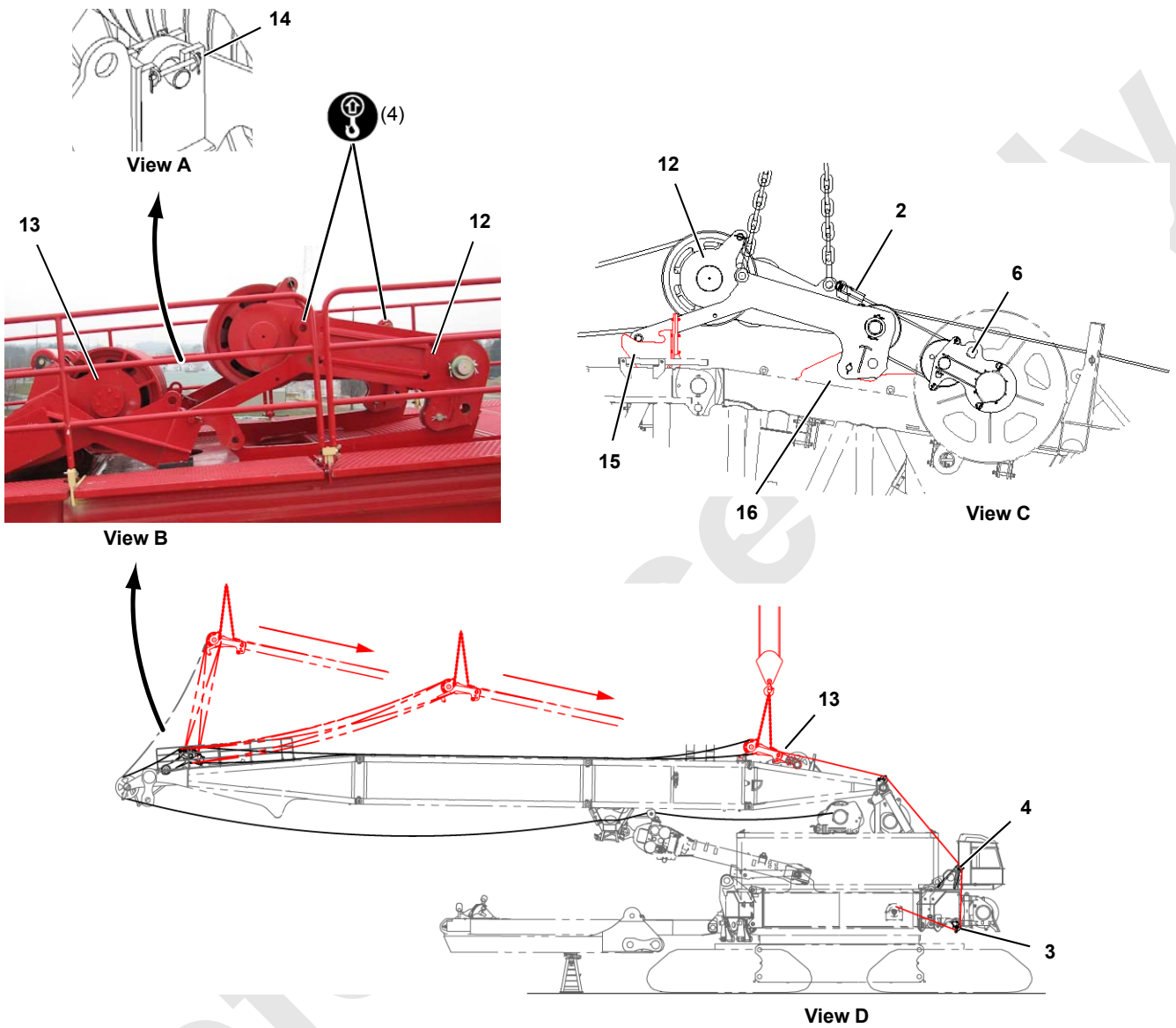


FIGURE 4-93

Legend for [Figure 4-93](#)

Item	Description
2	Rigging Line with Button Socket
3	Wire Rope Guide
4	Wire Rope Guide
6	Wire Rope Guide
12	Equalizer
13	Sheave Bank
14	Pin with Cotter Pins (2)
15	Rail, Insert (2)
16	Rail, Butt (2)

See [Figure 4-93](#) for the following steps.

12. Attach four legs of the chain lifting sling ([Figure 4-8](#), View A) to the lifting holes in equalizer (12, View B).
13. Remove pins (14, View A) and lift equalizer (12) clear of sheave bank (13).
14. Reinstall pins (14, View A) in the sheave bank lugs.

CAUTION

Avoid Damage!

Keep slack in boom hoist reeving while handling equalizer with assist crane.

Failing to do so could result in mast being lifted off VPC actuator.

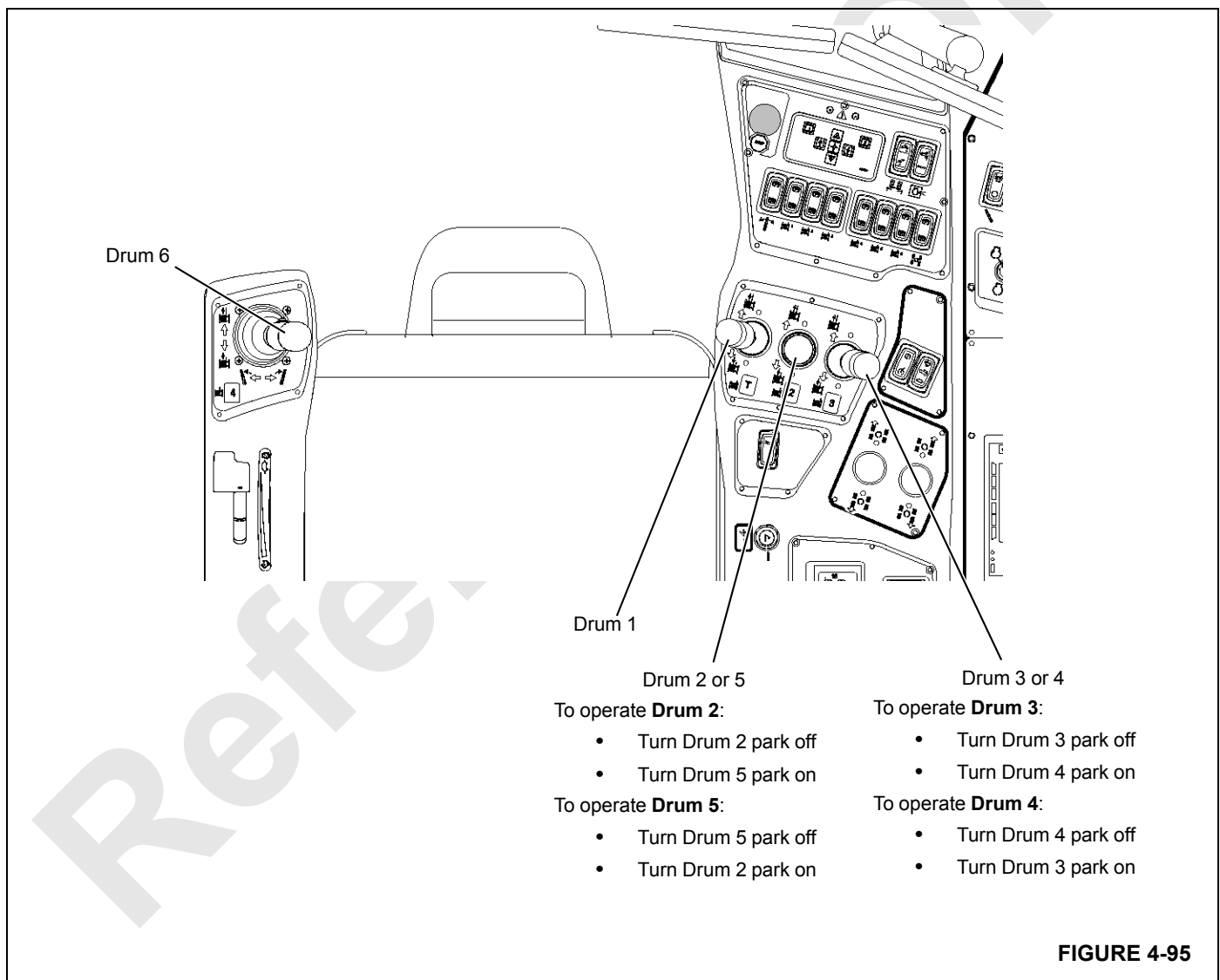
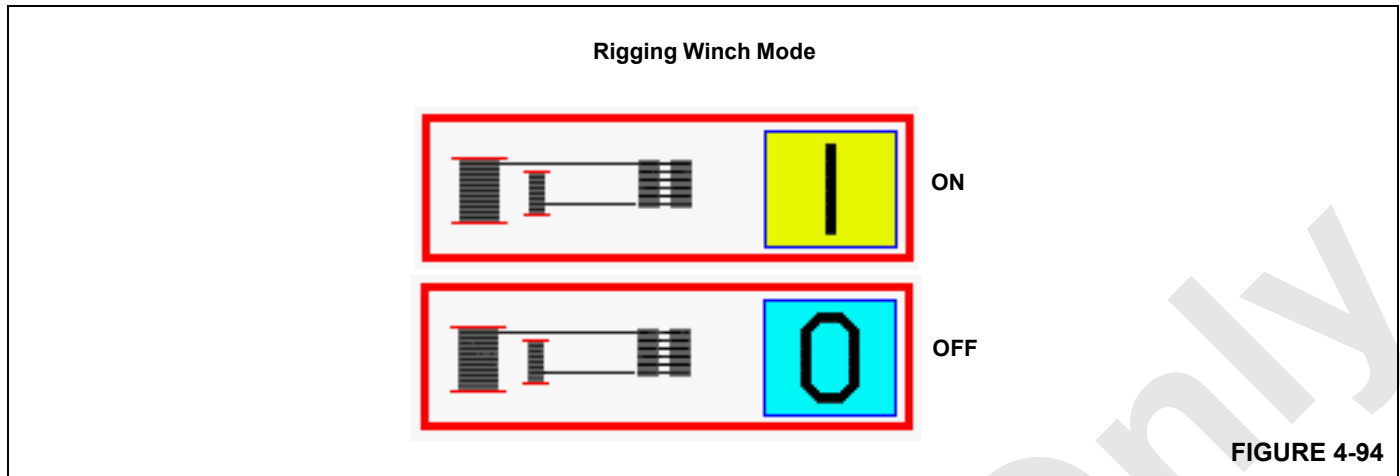
Damage to VPC actuator or raising frame could occur.

Maximum reading of assist crane's Rated Capacity Indicator must not exceed 25,000 lb (11 364 kg).

15. Haul in the rigging line on Drum 6, pay out wire rope from the boom hoist, and follow with the assist crane to position the equalizer over the mast butt.

GO SLOW during this step to prevent problems. The rigging winch pays out at a maximum speed of 2 rpm. Paying out wire rope too fast from the boom hoist or following too fast with the assist crane can result in damage.

16. Stop when equalizer (12) is over rails (15, View C) on the mast insert and rails (16) on the mast butt.
17. Lower the equalizer onto the rails. The hooks on the front end of rails (15) will prevent the equalizer from rolling forward.
18. Disconnect the lifting slings.
19. Remove the rigging line and store it on Drum 6.
20. Leave the rigging line connected to sheave (3, View D) for rigging the boom.
21. Move wire rope guide (4, View D) to the storage position on the right end of the front roller carrier (see [Figure 4-91](#), View D).
22. Move wire rope guide (6, View F) from the working position to the storage position (View F).



CRANE ASSEMBLY — OPERATING RIGGING WINCH

The rigging winch (Drum 6) is used for the following operations:

- Moving the equalizer from the shipping position on the mast top to the storage position on the mast butt (see [page 4-153](#)).
- Moving the equalizer from the storage position on the mast butt to the boom insert (see [page 4-207](#)).
- Reeving the hook block (see [page 4-223](#)).

Selecting Rigging Winch Mode

TO TURN RIGGING MODE ON —

1. Go to the Function Mode screen in the main display.
2. Select the rigging winch data box ([Figure 4-94](#)).
3. Enter the data box and use the select buttons to turn on the rigging winch mode.
4. The boom hoist handle (Drum 4) on the left console is now used to control the rigging winch (Drum 6).

The number 6 will appear in the drum indicator display next to the control handle.

TO TURN RIGGING MODE OFF —

1. Go to the Function Mode screen in the main display.
2. Select the rigging winch data box ([Figure 4-94](#)).
3. Enter the data box and use the select buttons to turn off the rigging winch mode.

NOTE: The rigging winch mode will automatically turn off when power to the control system is turned off.

Operating Rigging Winch

NOTE Engine speed controls tension: the higher the engine speed the higher the tension in the wire rope.

1. Turn on the rigging winch mode.
2. Pay out the rigging line by moving Drum 6 control handle forward.

NOTE Drum 6 is operated independent of the load drums when the load drum control handles are off.

To operate a load drum independent of Drum 6, move Drum 6 control handle to off and turn on Drum 6 park.

3. Reeve the rigging line through the required sheaves in the boom, hook block, or other components.
4. Dead end the rigging line to the required component depending on the operation being performed.
5. Use the engine throttle to snug up the rigging line prior to paying out wire rope from the selected drum. Faulty operation will result if there is slack in the rigging line before engaging the automatic part of the operation.
6. Move Drum 6 control handle to off.
7. Push the corresponding drum control handle forward to pay out wire rope. The rigging winch will haul in the rigging line automatically.

See [Figure 4-95](#) to determine which drum is controlled by which handle in the rigging winch mode.



WARNING Flying Object Hazard!

Do not attempt to disconnect rigging line from wire rope or other component until the rigging line is slack.

Lines could fly apart with explosive force and strike personnel.

8. Once the operation is complete:
 - a. Move the drum control handle to off.
 - b. Slacken (pay out) the rigging by pushing Drum 6 control handle forward.
 - c. Disconnect the rigging line from the equalizer or the wire rope.
 - d. Haul in the rigging line for storage on the rigging winch by pulling Drum 6 control handle back.
 - e. Secure the rigging line to the rigging winch for storage.
 - f. Turn off the rigging winch mode.

CRANE ASSEMBLY — BACKHITCH

Lifting Backhitch Parts

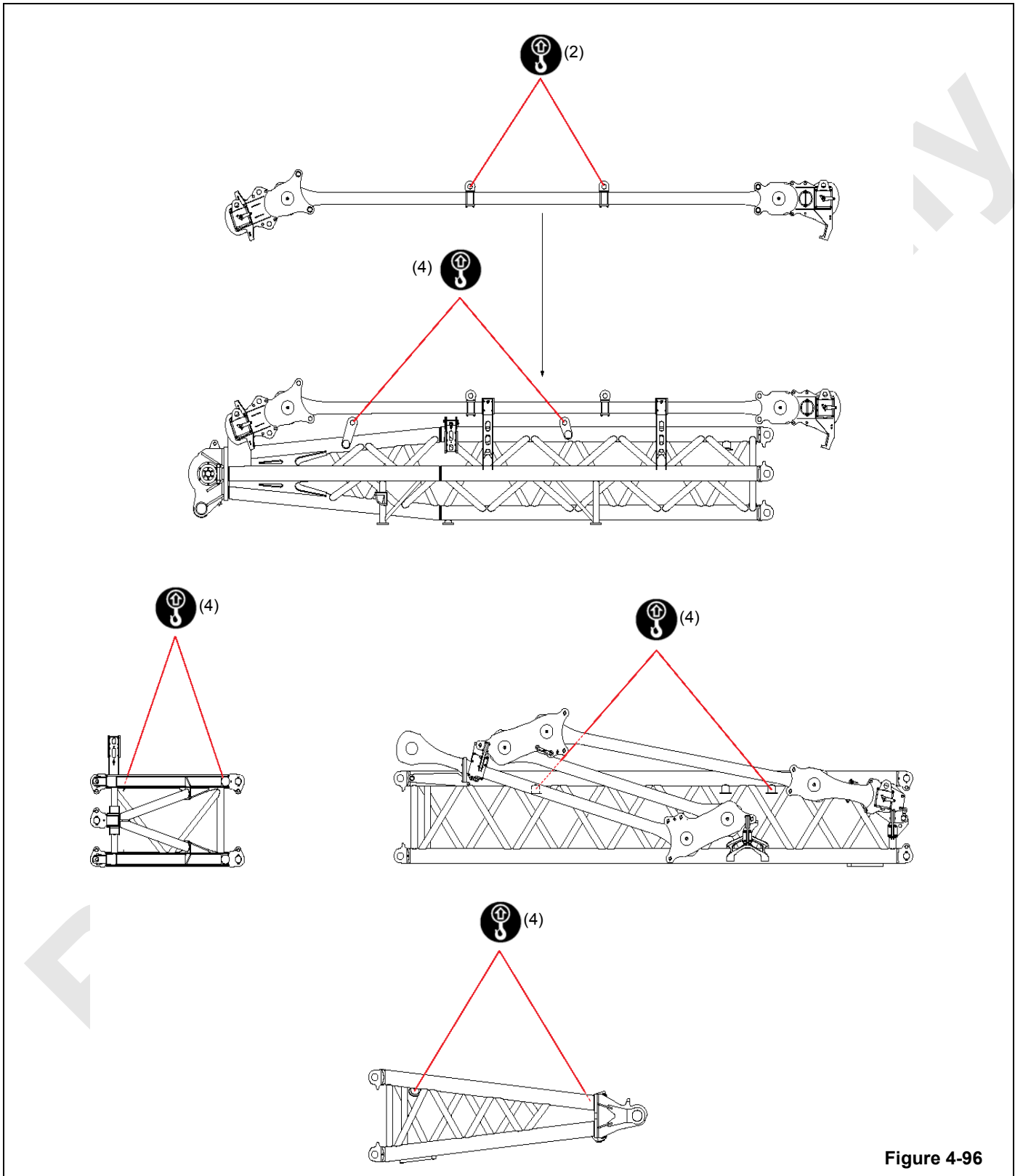


Figure 4-96

Reference Only

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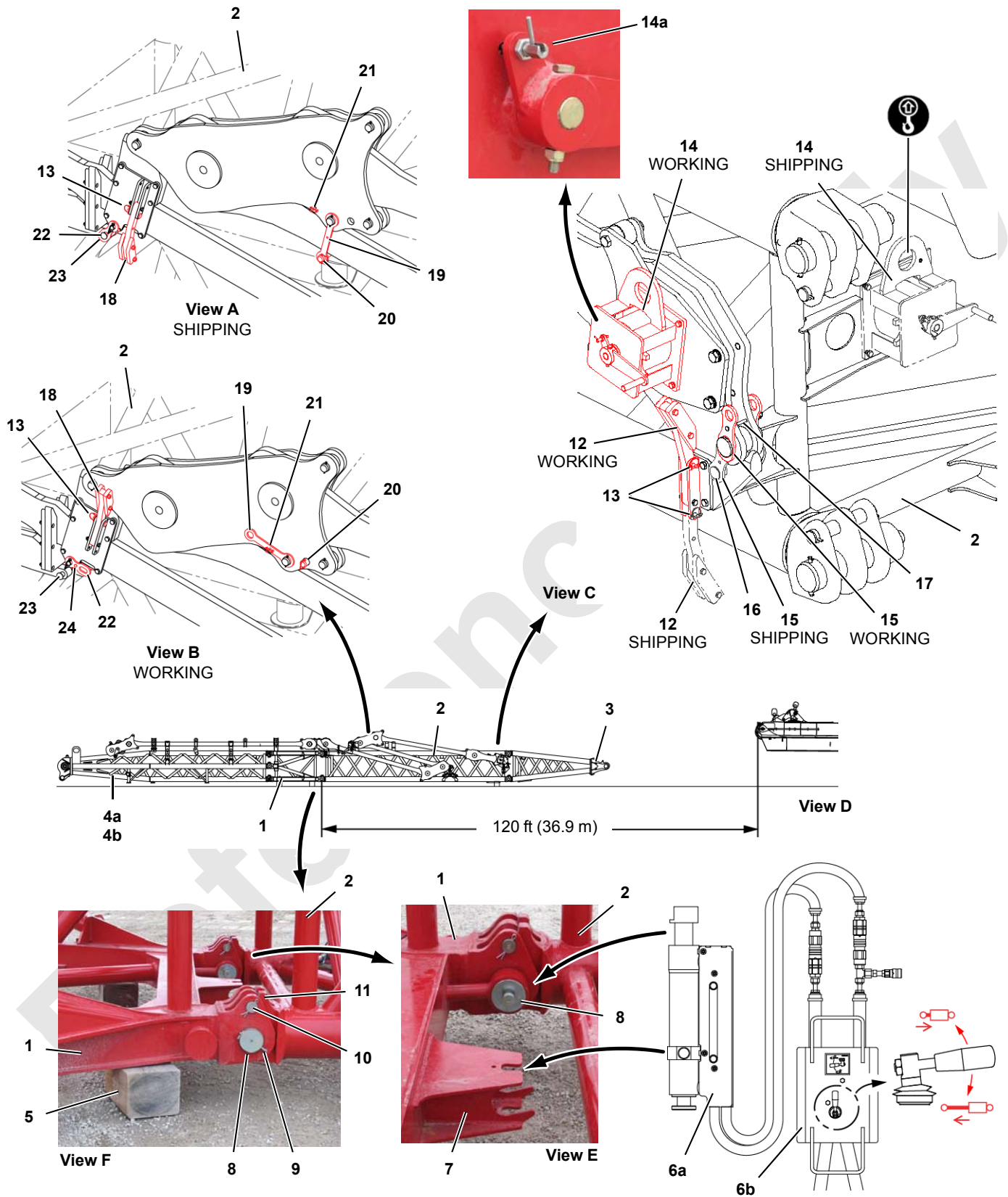


FIGURE 4-97

Legend for [Figure 4-97](#)

Item	Description
1	Transition Insert
2	Insert
3	Top
4a	Right Butt
4b	Left Butt
5	Blocking — 8 - 10 in (203 - 254 mm) high
6a	Hand-Held Cylinder (with trunnions)
6b	Hand-Held Accessory Valve
7	Bracket
8	Connecting Pin
9	Pin with Cotter Pins
10	Alignment Pin
11	Alignment Lug
12	Strap Guide Bracket (4)
13	Pin with Wire-Lock Pin (6)
14	Hand-Crank Pin (2)
14a	Locking Pin (2)
15	Link (4)
16	Pin with Wire-Lock Pin (2)
17	Pin with Wire-Lock Pin (2)
18	Strap Guide Bracket (2)
19	Link (4)
20	Pin with Wire-Lock Pin (2)
21	Pin with Wire-Lock Pin (2)
22	Link (4)
23	Pin with Wire-Lock Pin (2)
24	Pin with Wire-Lock Pin (2)

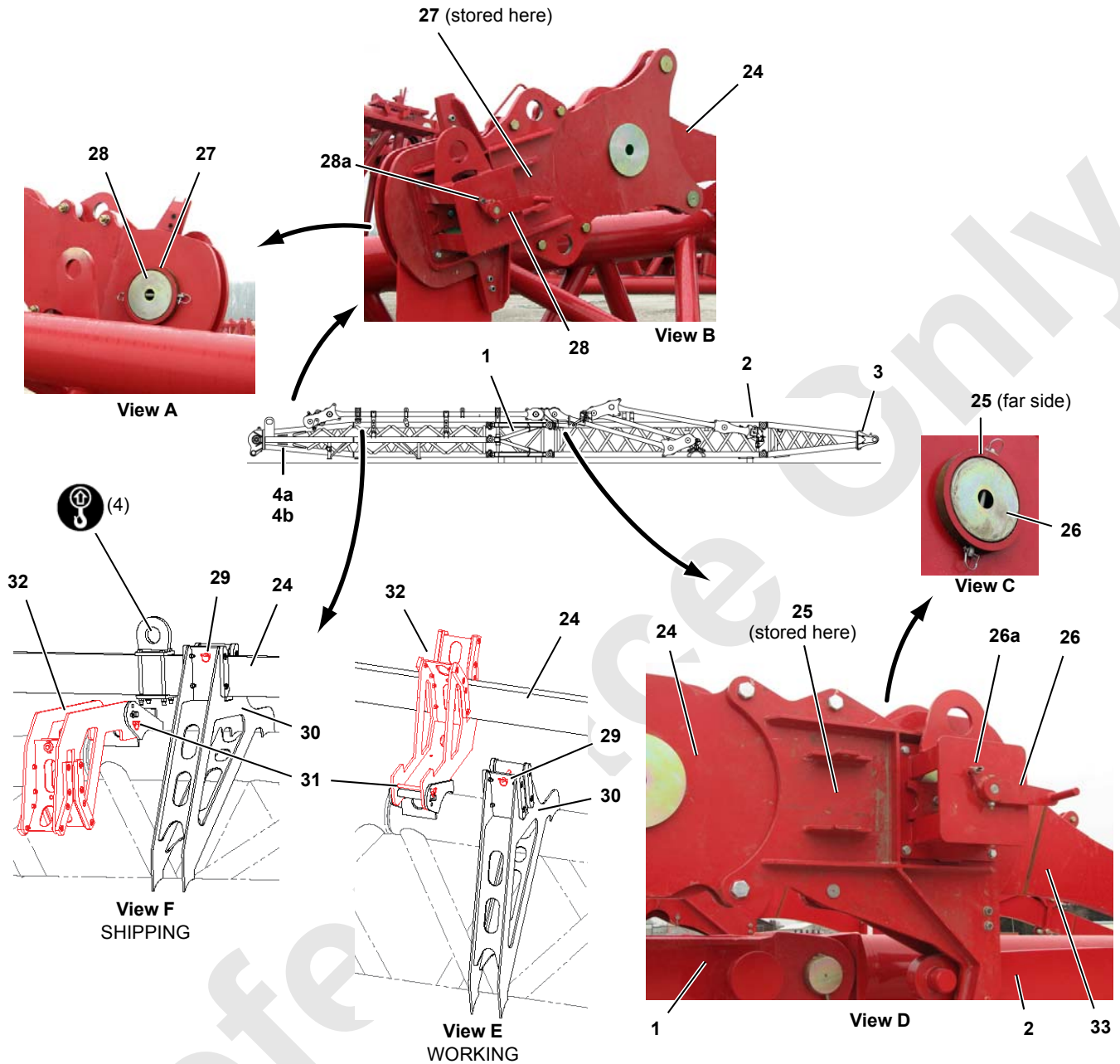
Assemble Backhitch

See [Figure 4-96](#) for lifting points.

See [Figure 4-97](#) for the following steps.

1. To ensure stability, assemble the backhitch sections in the following order (View D):
 - Transition insert (1) with blocking at all four corners.
 - Insert (2) with blocking on both sides of the top end.
 - Top (3).
 - Right and left butts (4a and 4b).
2. Lift transition insert (1, View F) onto blocking (5) at the dimension given in View D.
3. Level the transition insert on the blocking.
4. Disconnect the slings.
5. Install backhitch insert (2) as follows:
 - a. Place hand-held cylinder (6a, View E) in position so the cylinder trunnion engages the slots in bracket (7) and the cylinder rod end engages the pin head in connecting pin (8).
 - b. Connect hand-held accessory valve (6b, View E) to the PPU and to hand-held cylinder (6a) and start the PPU.
 - c. Remove pin (9, View F) from connecting pin (8).
 - d. Fully retract connecting pin (8).
 - e. Move the hand-held cylinder to the next position.
 - f. Repeat steps [5a](#) – [5e](#) for each connecting pin (8).
 - g. Lift insert (2) into position so all four connectors are engaged between insert (2, View F) and transition insert (1).

The 2-lug connectors on insert (2) must straddle the center lug of the 3-lug connectors on transition insert (1).
 - h. The connecting pin holes will align automatically when alignment pins (10, View F) are bottomed against alignment lugs (11).
 - i. Engage connecting pin (8, View F) using the control on the hand-held accessory valve (6b).
 - j. Install pin (9, View F).
 - k. Move the hand-held cylinder to the next position.
 - l. Repeat steps [5i](#) – [5k](#) for the remaining connecting pins.
 - m. Remove the hand-held cylinder.
 - n. Block under the top end of insert (2). The insert must be level.
 - o. Disconnect the slings.
6. Unpin strap guide brackets (12, View C) from the shipping position and pin them in the working position. Perform this step at four locations.
7. Move hand-crank pins (14, View C) from the shipping position to the working position. Perform this step at two locations.
8. Unpin links (15, View C) from the shipping position and pin them in the working position. Perform this step at two locations.
9. Unpin strap guide brackets (18, View A) from the shipping position and pin them in the working position (View B). Perform this step at two locations.
10. Unpin links (19, View A) from the shipping position and pin them in the working position (View B). Perform this step at two locations.
11. Unpin links (22, View A) from the shipping position and pin them in the working position. Perform this step at two locations.



Item	Description	Item	Description
1	Transition Insert	27	Collar with Pin and Wire-Lock Pins (2)
2	Insert	28	Hand-Crank Pin (2)
3	Top	28a	Spring Plunger
4a	Right Butt	29	Pin with Wire-Lock Pin (2)
4b	Left Butt	30	Strap Bracket (2)
24	Straps (2)	31	Pin with Wire-Lock Pin (2)
25	Collar with Pin and Wire-Lock Pins (2)	32	Strap Bracket (1)
26	Hand-Crank Pin (2)	33	Strap (2) (on insert 2)
26a	Spring Plunger (2)		

FIGURE 4-98

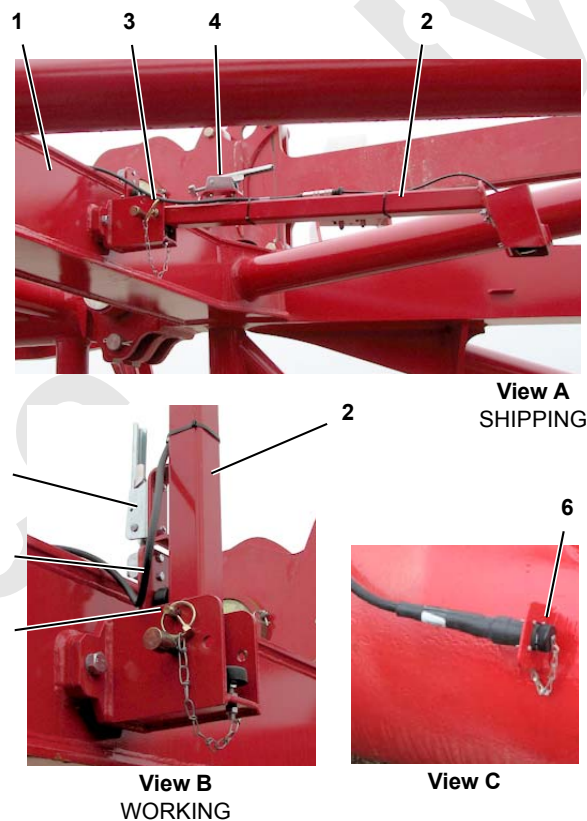
See [Figure 4-96](#) for lifting points.

See [Figure 4-98](#) for the following steps.

12. Connect top (3) to insert (2) in the same manner insert (2) was connected to transition insert (1).
13. Connect butts (4a and 4b) to transition insert (1) in the same manner insert (2) was connected to transition insert (1).
14. Perform the following steps at the top end of both straps (24, View D):
 - a. Remove collar (25, View C) from hand-crank pin (26) and store the collar (View D).
 - b. Fully retract hand-crank pin (26).
15. Attach two legs of the chain lifting sling to straps (24, View F).
16. Remove collar (27, View A) from hand-crank pin (28) and store the collar (View B).
17. Fully retract hand-crank pin (28).
Rotate the hand-crank pin until spring plunger (28a, View B) is in the locking hole.
18. Remove pin (29, View F) from strap bracket (30). Perform this step at two locations
19. Lift strap (24) out of strap brackets (30, View E).
20. Store pins (29, View E) in strap brackets (30).
21. Support strap bracket (32, View F) with a forklift or the whip line from the assist crane and remove pin (31) from strap bracket (32).
22. Rotate strap bracket (32, View F) to the working position (View E) and reinstall pin (31).
23. Lower strap (24, View E) into strap bracket (32) and align the connecting hole in the top end of strap (24) with the connecting hole in strap (33, View D).
24. Fully engage hand-crank pin (26, View D) and install collar (25, View C). The collar is stored on strap (24).
Rotate the hand-crank pin until spring plunger (26a, View D) is in the locking hole.
25. Disconnect the slings.
26. Repeat steps [15](#) – [25](#) for other strap (24).

27. Deploy the backhitch camera ([Figure 4-99](#)):

- a. Grasp camera (2, View A) and remove pin (3).
- b. Raise the camera to the operating position (View B) and install pin (3).
- c. Engage latch (4, View B).
- d. Connect electric cable (5, View B) from the camera to receptacle (6, View C) on the left backhitch butt.



Item	Description
1	Transition Insert
2	Camera
3	Hitch Pin with Hair-Pin Cotter
4	Latch
5	Electric Cable
6	Receptacle

FIGURE 4-99

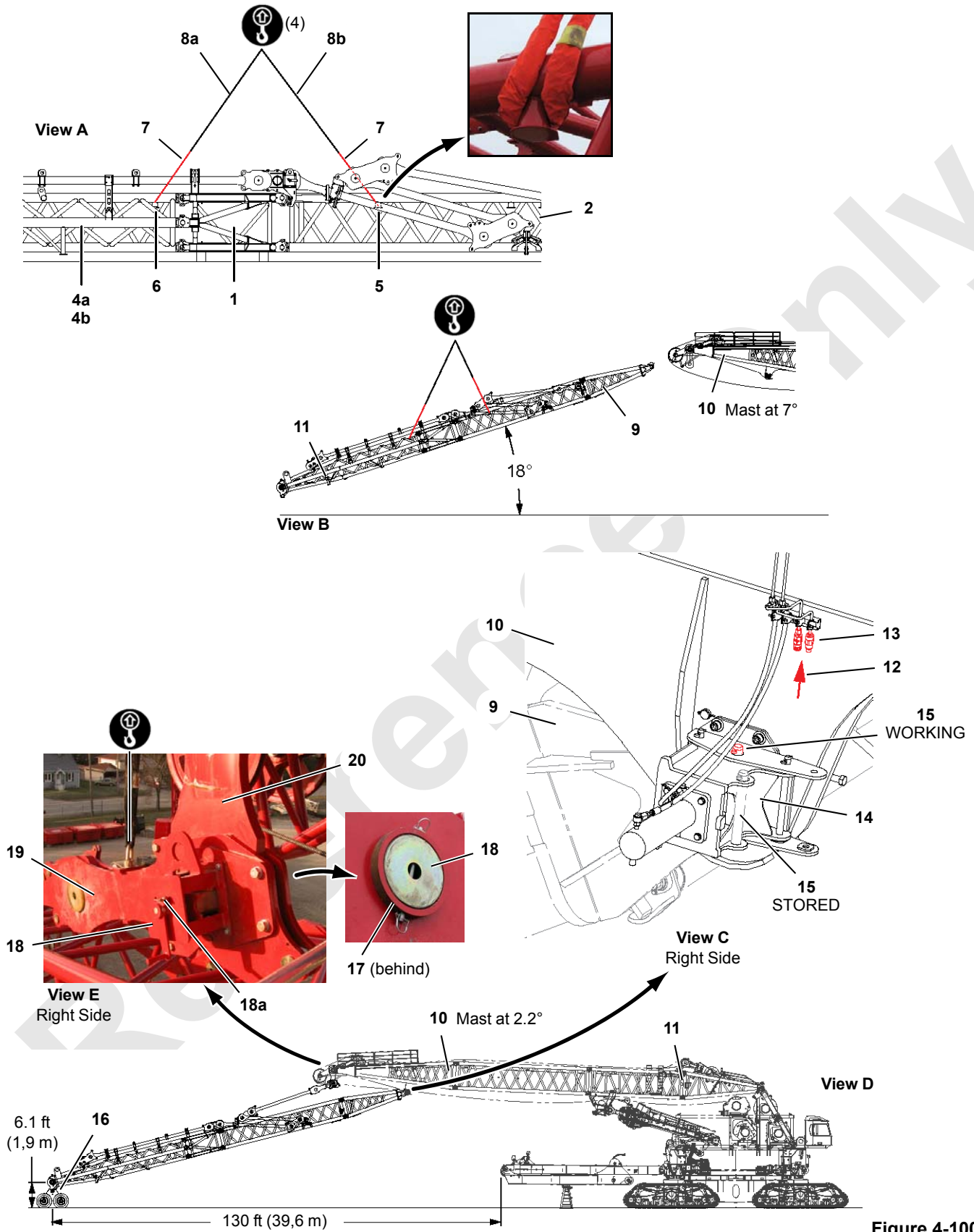


Figure 4-100

Legend for [Figure 4-100](#)

Item	Description
1	Transition Insert
2	Insert
4a	Right Butt
4b	Left Butt
5	Lifting Lug (2)(closest to transition insert)
6	Lifting Lug (2)(closest to transition insert)
7	Nylon Lifting Sling — 10 ft (3,05 m) (4)
8a	2-Legs of Chain Lifting Sling at 25 ft (7,6 m)
8b	2-Legs of Chain Lifting Sling at 17 ft (5,2 m)
9	Backhitch Assembly
10	Mast
11	Angle Indicator
12	Hydraulic Hoses from Hand-Held Accessory Valve
13	Hydraulic Couplers
14	Pin (hydraulic) (2)
15	Pin with Wire Lock Pin (2)
16	Dolly (2)
17	Collar with Pin and Wire Lock Pins (2)
18	Hand-Crank Pin (2)
18a	Spring Plunger
19	Backhitch Strap (2)
20	Mast Link (2)

Install Backhitch

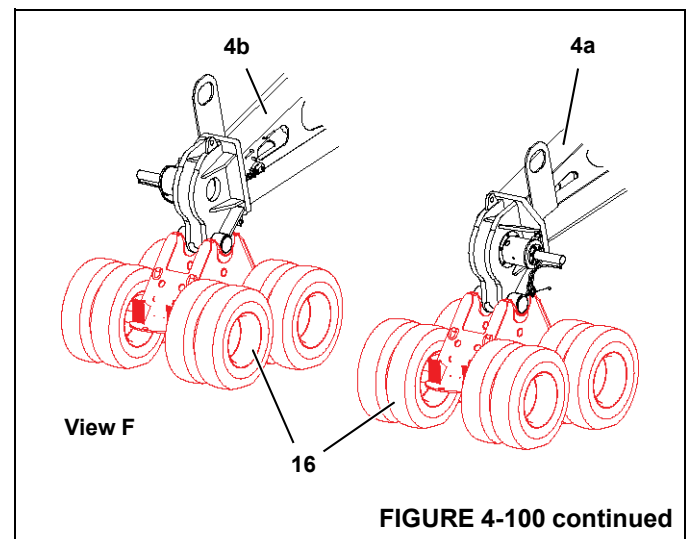
See [Figure 4-100](#) for the following steps.

- Attach nylon lifting slings to the backhitch assembly as shown in View A.
The sling lengths given will lift the backhitch at 18°.
- Using the setup remote control, raise the mast to 7°. Check the mast angle using indicator (11, View D) on the mast butt.
- Lift backhitch assembly (9, View B) into position under mast (10).
- Connect hydraulic hoses (12, View C) from the hand-held accessory valve to hydraulic couplers (13) on either side of mast (10).
- Connect the hand-held accessory valve to the PPU and start the PPU.
- Fully disengage pins (14, View C) with the hand-held accessory valve.
- Lift the backhitch assembly into position so the connecting holes in the backhitch are aligned with the connecting holes in the mast.

- Fully engage pins (14, View C) with the hand-held accessory valve.
- Stop the PPU.
- Remove pins (15, View C) from the shipping position and install them in the working position.
- Disconnect hydraulic hoses (12, View C) from hydraulic couplers (13) on either side of the mast. Clean and install dust caps on the couplers.
- Position dolly (16, View H) under each backhitch butt (4a and 4b).
- Lower the backhitch until the lifting slings are slack and the backhitch butts are fully engaged with the dollies.
- Disconnect the lifting slings from the backhitch assembly.
- Using the setup remote control, lower mast (10, View D) to 2.2°.
- Remove collars (17, View E) from hand-crank pins (18) and fully disengage the pins.
- Attach a nylon lifting sling to the lifting lug on backhitch strap (19, View E).
- Lift backhitch strap (19) so it engages mast link (20, View E).
- Align the connecting holes and fully engage hand-crank pin (18).

Rotate the hand-crank pin until spring plunger (18a, View E) is in the locking hole.

- Install collar (17, View E) on the inboard side of the pin.
- Disconnect the lifting sling.
- Repeat steps [16](#) – [21](#) for the other backhitch strap.



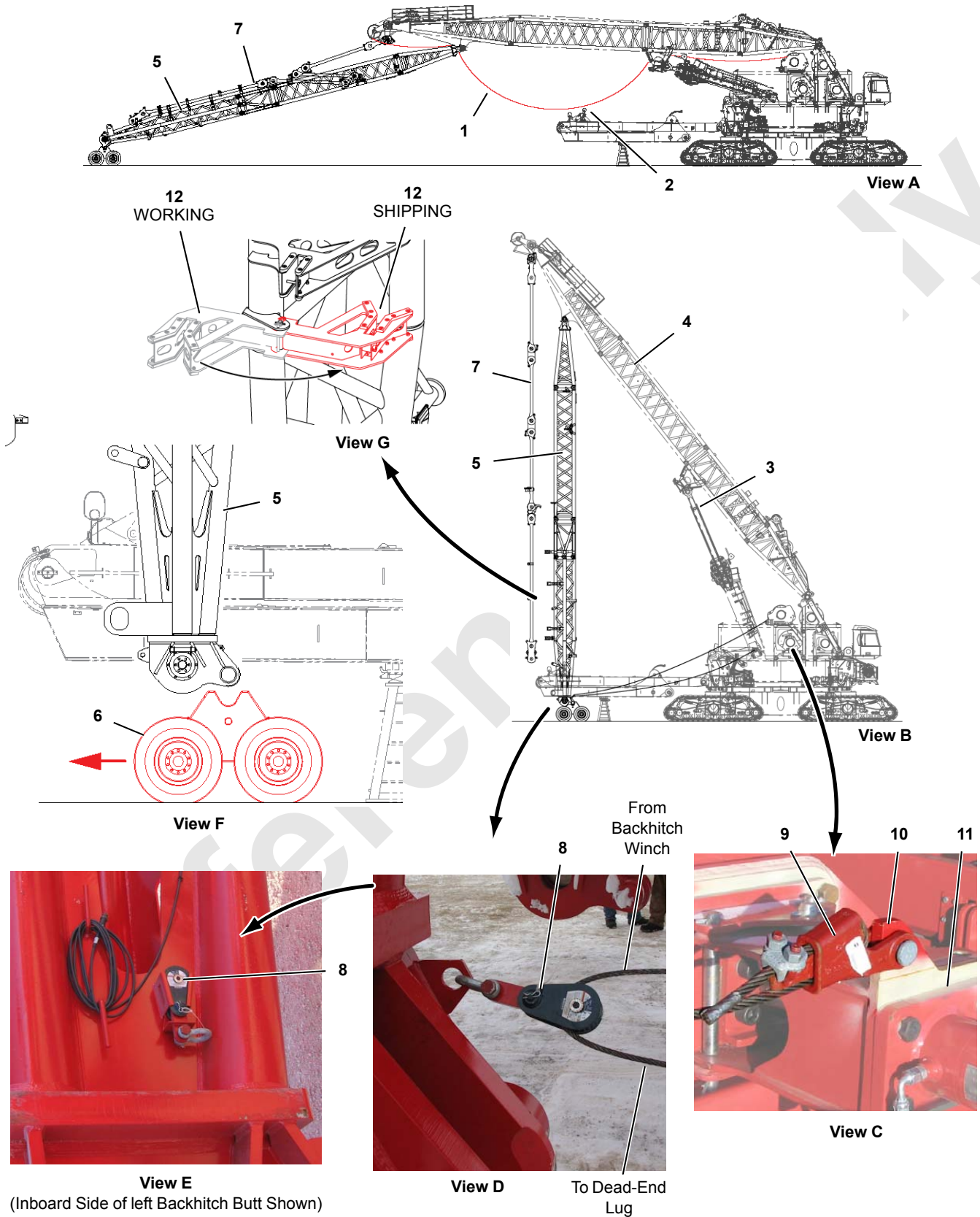


Figure 4-101

Legend for [Figure 4-101](#)

Item	Description
1	Boom Hoist Wire Rope
2	VPC Beam Assembly
3	VPC Actuator
4	Mast
5	Backhitch
6	Dolly (2)
7	Backhitch Straps
8	Snatch Block (2)
9	Wedge Socket with Pin and Cotter Pin (2)
10	Dead-End Lug (2)
11	VPC Hydraulic Pin (2)
12	Strap Bracket with Pin and Wire-Lock Pin (2)

CRANE ASSEMBLY — MAST RAISING

See [Figure 4-101](#) for the following steps.

1. Pay out boom hoist wire rope (1, View A) until the rope is just above the guards on VPC beam assembly (2).

Beware that the wire rope will tighten as the mast is raised.

NOTE The following personnel are required for this procedure:

- One rigging person to operate the remote controls from the platform on the right-rear corner of the rotating bed.
- A signal person on each side of the backhitch assembly to provide signals to the operator.

Closely watch the backhitch straps as the mast rises. Signal the operator to stop raising the mast if the straps do not unfold properly.

2. Using the VPC actuator switch on the remote control, (see [page 4-119](#)) extend VPC actuator (3, View B) to raise mast (4).

Operate as slowly as possible. Stop operating immediately if signaled to do so.

3. As the VPC actuator extends:
 - Mast (4) will rise.
 - Backhitch (5) will rise as dollies (6) roll along the ground.
 - Backhitch straps (7) will unfold automatically.
4. Continue to raise the mast.

CAUTION

Avoid Damage!

Use care as backhitch butts near VPC beam assembly. Guide backhitch butts clear of hydraulic piping on either side of VPC beam assembly.

5. Stop raising the mast when the backhitch is in the vertical position as shown in View B.
6. SLOWLY raise the mast to lift the backhitch butts out of the saddles in the dollies (View F).
7. Remove dollies (6) with a forklift.
8. Lower the mast (retract VPC actuator) until the backhitch butts are 1-2 ft (0,30-0,61 m) above the ground.
9. Remove snatch blocks (8, View E) from storage and fasten them to the lug on each backhitch butt (View D).
For shipping, the snatch blocks are stored in one of the rigging parts boxes supplied with the crane.
10. Pay out the wire rope from both backhitch winches using the switches on the remote control (see [page 4-119](#)).
The backhitch winches are also referred to as Drum 0. One winch is mounted on each side of the boom hoist (Drum 4).
11. Route the wire rope over the top of each snatch block (8, View D) and dead-end wedge socket (9, View C) to lug (10) on each VPC hydraulic pin (11).
12. Unpin strap brackets (12, View G) from the working position, rotate the brackets outward, and pin them in the shipping position.

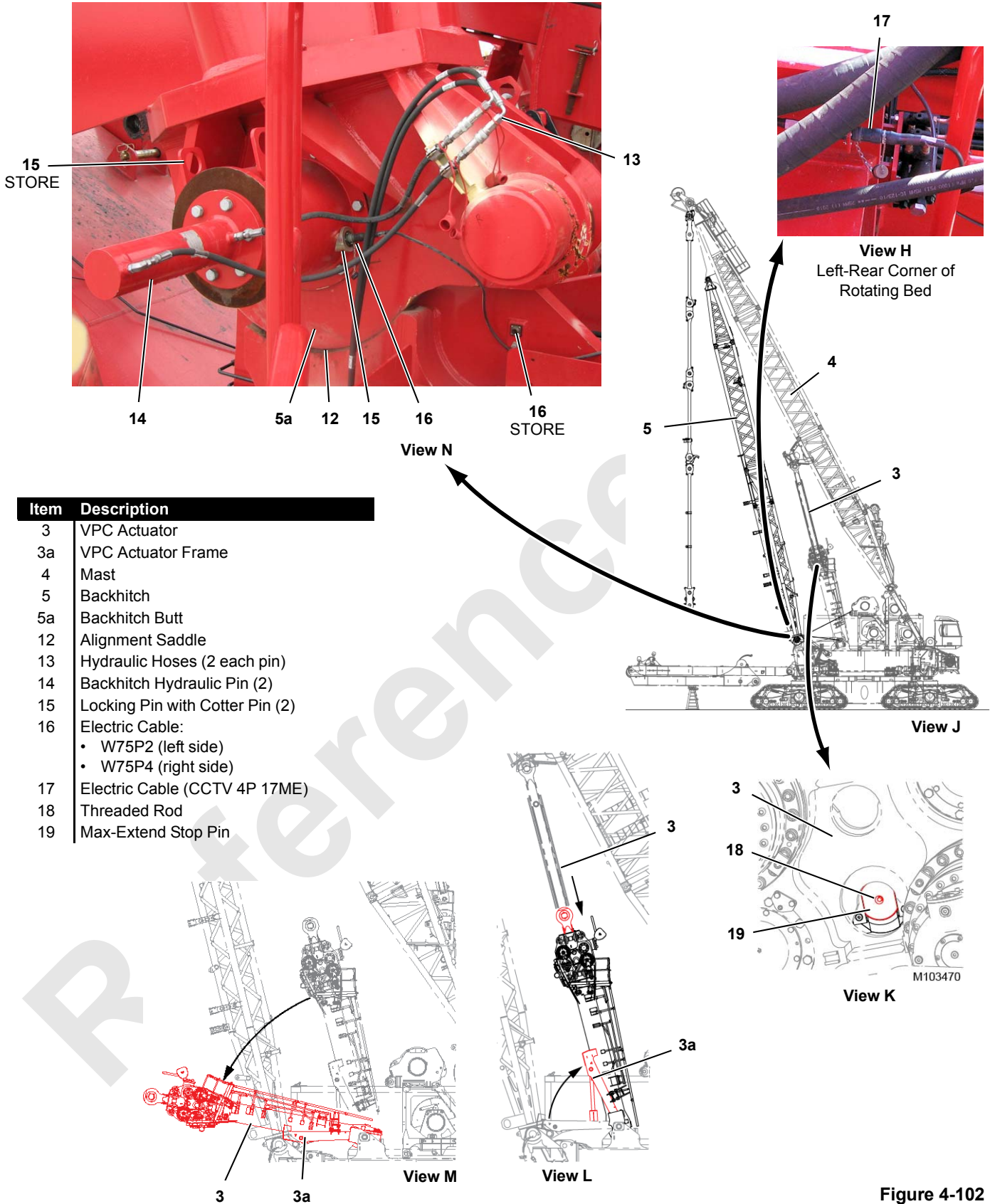


Figure 4-102

See [Figure 4-102](#) for the remaining steps.

13. Check to make sure the wire rope from the backhitch winches is not hooked on any pins or other structure.
14. Resume extending VPC actuator (3) to raise mast (4).
15. At the same time, haul in wire rope on the backhitch winches.
16. Time the operation so the backhitch moves in slowly as the mast rises.



WARNING Moving Part Hazard!

To prevent personnel from being crushed or injured by a moving part:

- Do not operate VPC actuator while personnel are on platform performing steps [17](#) and [30](#).

17. Stop when VPC actuator (3) is fully extended and proceed as follows:
 - a. Have an assembler climb the ladder to the platform on VPC actuator (3, View J).
 - b. Using a 14 mm socket, turn threaded rod (18, View K) in to collapse max-extend stop pin (19) until it is clear of the stops in the VPC actuator (3).
 - c. Get off VPC actuator (3) before proceeding.

CAUTION

Avoid Damage!

Bottom of backhitches must clear rear roller carrier during step [18](#).

Go slowly and do not allow backhitches to strike rear roller during step [18](#).

18. Continue raising the mast and hauling in the wire rope on the backhitch winches so the end of each backhitch butt (5a, View N) is over alignment saddle (12) on the rear roller carrier.
19. Connect hydraulic hoses (13, View N) from the rear roller carrier to backhitch hydraulic pins (14). The hoses can be connected one way only.
20. Using the backhitch pins switch on the remote control, disengage backhitch pins (14, View N). See [page 4-119](#).
21. Slowly lower the mast (retract VPC actuator) and pay out wire rope from the backhitch winches so backhitch butts (5a, View N) come to rest in the bottom of alignment saddles (12).

22. Using the backhitch pins switch on the remote control, engage backhitch pins (14, View N). See [page 4-119](#).
23. Remove locking pins (15, View N) from storage and install them.
24. Connect corresponding electric cable (16, View N) to each locking pin (15).
25. Connect electric cable (17, View H) from the left backhitch butt to the receptacle on the left-rear corner of the rotating bed.
26. Disconnect snatch blocks (8, View E, [Figure 4-101](#)) from the wire rope and store the snatch blocks (View F).
27. Haul in excess wire rope onto both backhitch winches using the switches on the remote control (see [page 4-119](#)).
28. It is not necessary to disconnect dead-end wedge sockets (9, View D, [Figure 4-101](#)).
29. Using the VPC actuator frame switch on the remote control (see [page 4-119](#)), raise VPC actuator frame (3a, View L) against VPC actuator (3).

NOTE A limit switch will prevent the VPC actuator frame from being raised too high.

30. Once the VPC actuator frame is raised, proceed as follows:
 - a. Retract VPC actuator (3, View K) until max-extend stop pin (19) is accessible through the access hole.
 - a. Have an assembler climb the ladder to the platform on VPC actuator (3, View J).
 - b. Using a 14 mm socket, turn threaded rod (18, View K) to screw out (extend) max-extend stop pin (19) until it is engaged with the stops in VPC actuator (3).
 - c. Get off the VPC actuator (3) before proceeding.



WARNING Falling Load Hazard!

To prevent faulty operation of VPC actuator and possible collapse of counterweight:

- Do not proceed to step [31](#) until step [30](#) is completed.

31. Fully retract VPC actuator (3, View L) using the VPC actuator switch on the remote control (see [page 4-119](#)).

NOTE The VPC actuator will not retract until the VPC actuator frame is raised.

32. Fully lower VPC actuator (3, View N) and frame (3a) using the VPC actuator frame switch on the remote control (see [page 4-119](#)).

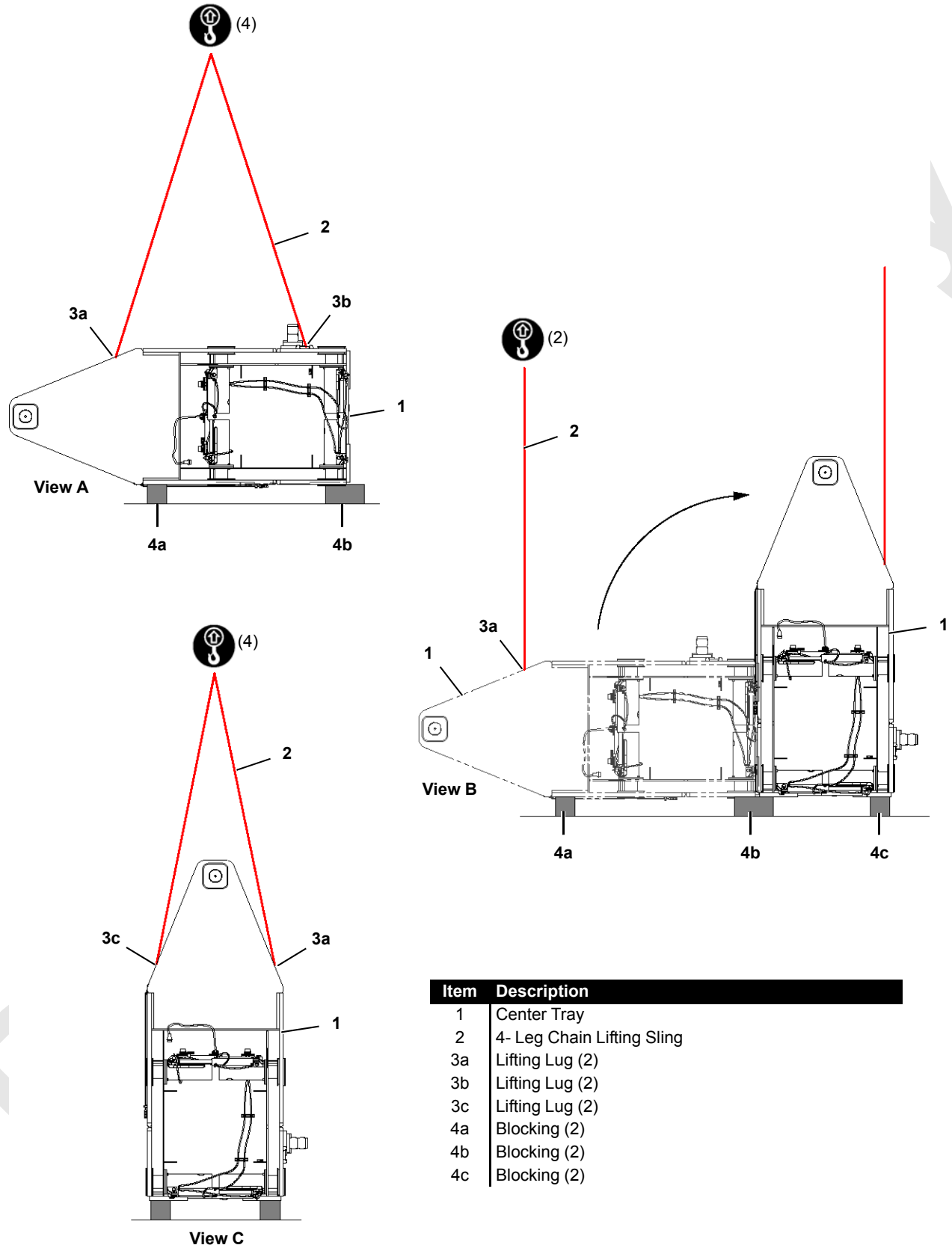


FIGURE 4-103

CRANE ASSEMBLY — COUNTERWEIGHT

Prepare Center Tray

See [Figure 4-103](#) for the following steps.

NOTE Center tray (1) is shipped in the position shown in View A.

1. Attach four legs of chain lifting sling (2) to lifting lugs (3a and 3b) on the center tray.
2. Lift the center tray off the trailer and place it on blocking (View A).
3. Place blocking (4b) along the bottom edge of the tray. This blocking will provide a tipping point.

 **WARNING**
Crush Hazard!

To prevent personnel from being crushed by a falling load:

- Do not attempt to lift center tray off blocking during following step. Lifting lugs may break causing tray to fall.
-
4. Disconnect two legs of the lifting sling from lifting lugs (3b).
 5. Slowly hoist and travel the assist crane to tip the center tray to vertical (View B).
 6. Place blocking (4c) under the tray.
 7. Attach the other two legs of lifting sling (2, View C) to lifting lugs (3c) on the opposite side of the center tray.
 8. Lift the center tray to the desired assembly position.
 9. Place the center tray on blocking and level it.
 10. Disconnect the lifting slings.

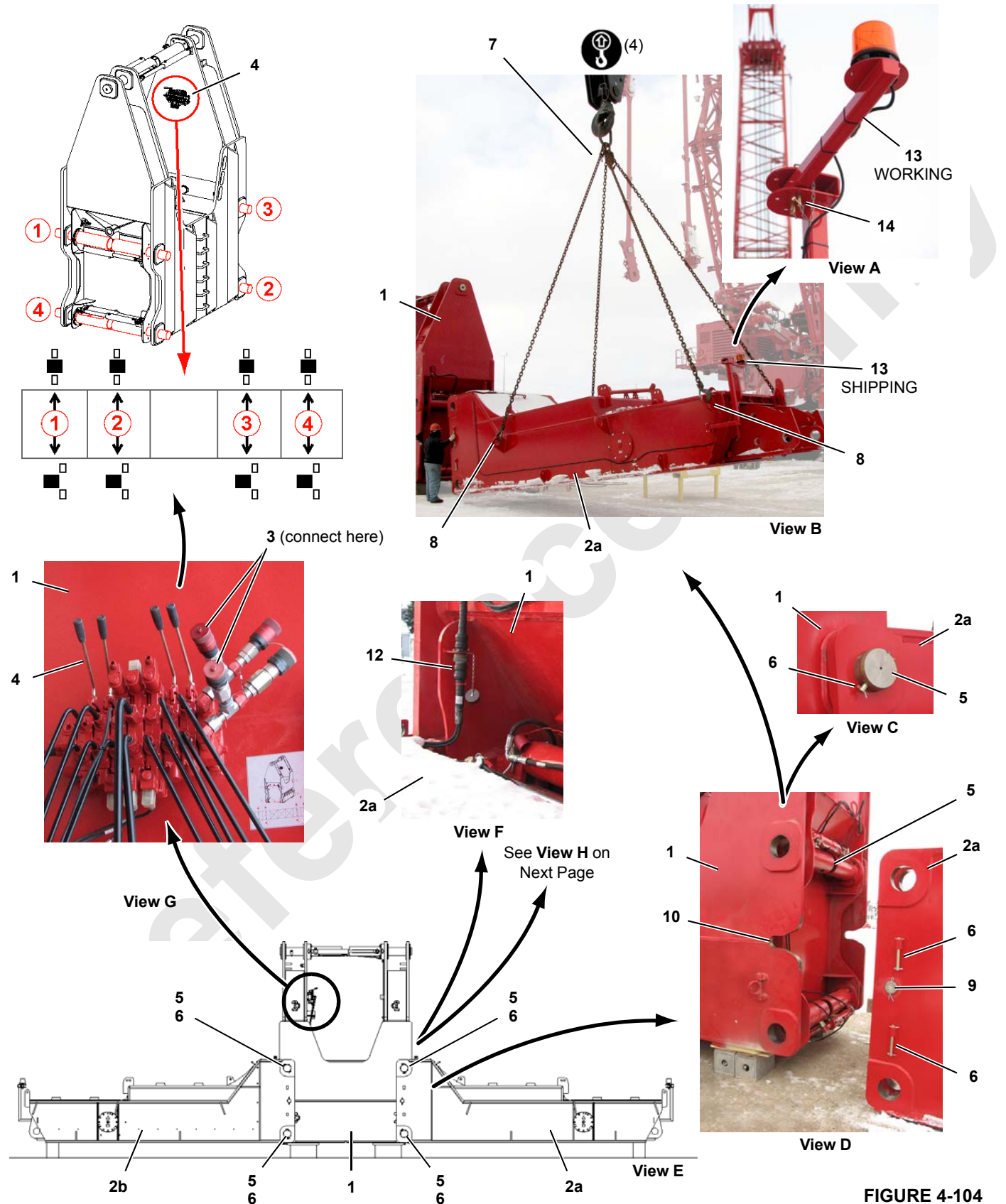


FIGURE 4-104

Legend for [Figure 4-104](#)

Item	Description
1	Center Tray
2a	Side Tray (right)
2b	Side Tray (left)
3	Hydraulic Hose (2) (from PPU)
4	Control Valve
5	Hydraulic Pin (8)
6	Retaining Pin with Cotter Pins (4 each side tray)
7	4-Leg Chain Lifting Sling
8	Lifting Lug (4 each side tray)
9	Alignment Pin (2 each side tray)
10	Notch (2 each side tray)
11a	Hydraulic Hose (3 from each side tray)
11b	Hydraulic Couplers (3 each side of center tray)
12	Electric Cable (1 from each side tray)
13	Warning Light (2)
14	Hitch Pin with Hair-Pin Cotter (2)

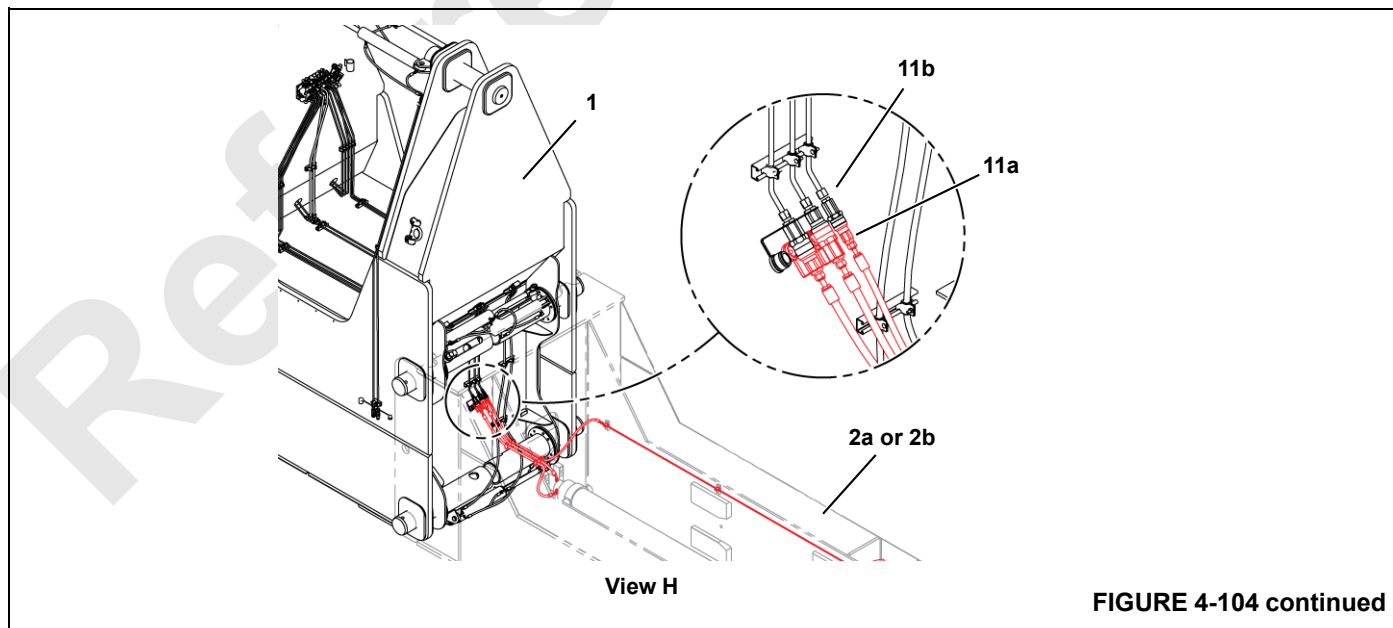
Assemble Counterweight Trays

See [Figure 4-104](#) for the following steps.

1. Connect three hydraulic hoses (11a, View H) from side trays (2a and 2b) to couplers (11b) on both sides of center tray (1).
2. Connect hydraulic hoses (3, View G) from the PPU to the couplers at control valve (4) on center tray (1).
3. If not already done, disengage pins (5, View D) with the control handles at valve (4).

NOTE The center tray should be shipped with pins (5, View D) disengaged so the pins cannot be damaged.

4. Attach four legs of chain lifting sling (7, View B) to lifting lugs (8) on desired side tray (2a or 2b).
5. Lift the side tray into position at the center tray.
The inboard end of the tray will be lower than the outboard end.
Warning light (13, View B) on the side tray should be at the rear.
6. Engage alignment pins (9, View D) with notches (10) to align the connecting holes.
7. Engage top pins (5, View C) and install retaining pins (6). The retaining pins are stored on the side tray (View D).
8. Lower the tray until the bottom connecting holes are visibly aligned.
9. Engage bottom pins (5, View E) and install retaining pins (6).
10. Block under the end of the side tray.
11. Disconnect the lifting slings.
12. Repeat the above steps for the other side tray.
13. Disconnect hydraulic hoses (3, View G) from the couplers at control valve (4).
14. Connect electric cable (12, View F) from each side tray (2a and 2b) to both sides of center tray (1).
15. Rotate warning lights (13, View B) from the shipping position to the working position (View A).



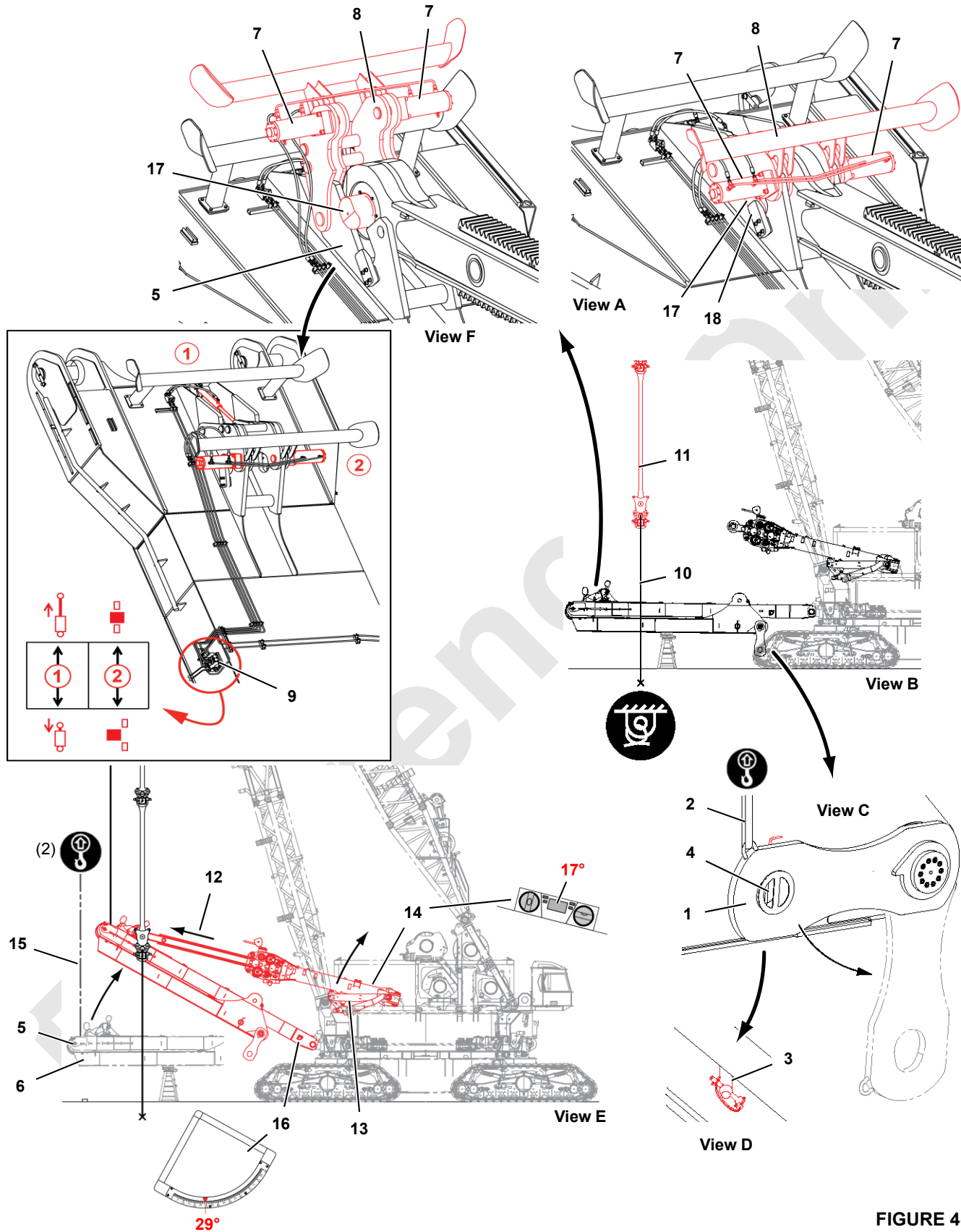


FIGURE 4-105

Legend for [Figure 4-105](#)

Item	Description
1	Link (2)
2	Nylon Lifting Sling
3	Retaining Pin with Wire Lock Pin (2)
4	Pin (2)
5	Pivot Frame
6	Counterweight Frame
7	Catch Pin (2)
8	Catch
9	Control Valve
10	Tagline
11	Counterweight Straps
12	VPC Actuator
13	VPC Actuator Frame
14	Digital Level
15	4-Leg Chain Lifting Sling
16	Angle Indicator
17	Actuator Shaft
18	Alignment Guide (2)

Attach VPC Actuator to Pivot Frame

See [Figure 4-105](#) for the following steps.

1. Lower each link (1, View C) to the working position:
 - a. Attach nylon lifting sling (2, View C) from the assist crane to link (1) and hoist until the sling supports the link.
 - b. Remove retaining pin (3, View D) and pin (4, View C). The top end of pin (3) has a handle.
 - c. Lower link (1) to vertical.
 - d. Reassemble pin (4) and retaining pin (3) to counterweight frame (5).
2. Disengage catch pins (7, View F) and fully open catch (8) with control valve (9).
3. Attach taglines (10, View B) to counterweight straps (11).
4. Pull counterweight straps (11, View B) out — away from the frames — approximately 2 ft (1.5 m) and anchor the taglines.

This step is required to provide clearance to raise the frames between the straps.
5. Attach two legs of lifting sling (15, View E) from the assist crane to the lifting lugs on the end of pivot frame (5). The required capacity is the weight of the rigging plus 88,000 lb (39 916 kg).
6. Lift pivot frame (5) and counterweight frame (6) with the assist crane to an angle of 29° as indicated on angle indicator (16, View E).
7. Using the remote control, raise VPC actuator (12) with VPC actuator frame (13) to an angle of 17°. Use a digital level (14) placed on the VPC actuator to measure this angle.
8. Using the remote control, fully extend VPC actuator (12).
9. Using the remote control, slowly lower VPC actuator (12) with VPC actuator frame (13) until the flats on actuator shaft (17, View F) contact pivot frame (5).

The flats on the shaft should be clocked as shown in View F.
10. Continue to lower the VPC actuator frame to allow the actuator shaft to completely rest on the pivot frame flats.
11. Fully lower VPC actuator frame (13).

NOTE The added weight the assist crane is now supporting is included in the weight given in step [5](#) above.

12. Using the remote control, slowly retract VPC actuator (12) until actuator shaft (17, View A) is fully seated in the pivot frame slot.

Alignment guides (18) will properly center the shaft in the pivot frame.

13. Using control valve (9), close catch (8, View A) and engage catch pins (7).
14. Disconnect the lifting slings and remove the assist crane.

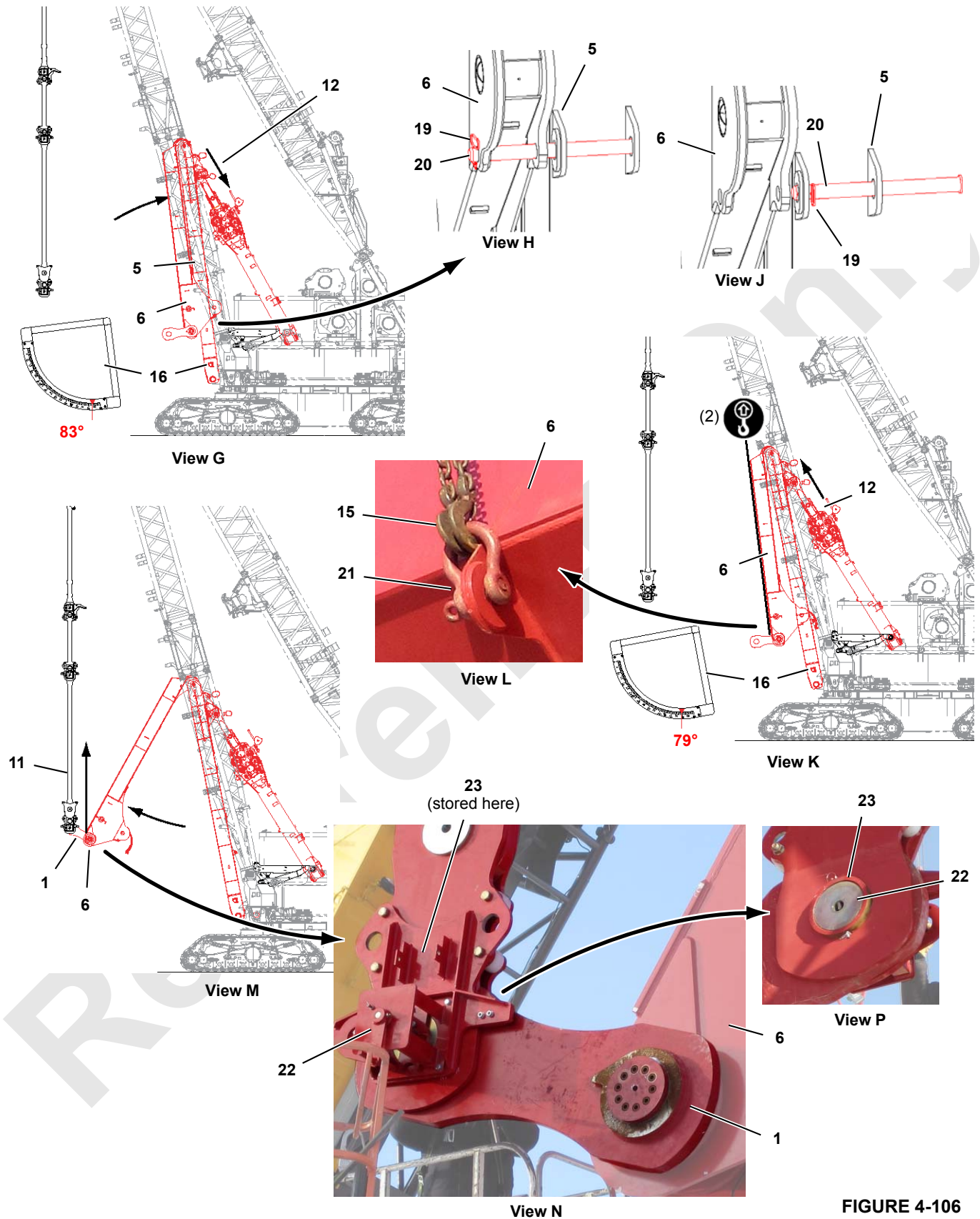


FIGURE 4-106

Legend for [Figure 4-105](#)

Item	Description
1	Link (2)
5	Pivot Frame
6	Counterweight Frame
11	Counterweight Straps
12	VPC Actuator
15	4-Leg Chain Lifting Sling
16	Angle Indicator
19	Wire Lock Pin (2)
20	Pin (2)
21	Shackle (2)
22	Hand-Crank Pin (2)
23	Collar with Pin and Wire-Lock Pins (2)

Attach Counterweight Frame to Counterweight Straps

See [Figure 4-106](#) for the following steps.

- Retract VPC actuator (12, View G) with the remote control until pivot frame (5) is at an angle of 83° as indicated on angle indicator (16).
- Remove wire-lock pins (19, View H) from the shipping position.
- Slide pins (20, View J) in to the working position and reinstall wire-lock pins (19).
- Extend VPC actuator (12, View K) with the remote control until pivot frame (5) is at an angle of 79° as indicated on angle indicator (16).
- Using shackles (21, View L) attach lifting slings (15) from a “rough terrain” crane to the lifting lugs on the end of counterweight frame (6).
The boom of the assist crane must be telescoped between the counterweight straps as the counterweight frame is lifted. The load weighs 25,000 lb (11 340 kg).
- Raise the counterweight frame to counterweight straps (11, View M) with the assist crane.
- Align the connecting holes in links (1, View N) with the connecting holes in counterweight straps (11).
- Engage hand-crank pin (22, View N).
Rotate the hand-crank pin until the spring plunger is in the locking hole.
- Remove collar (23) from storage (View N) and attach it to the end of hand-crank pin (22, View P).
- Disconnect the lifting slings and remove the shackles.

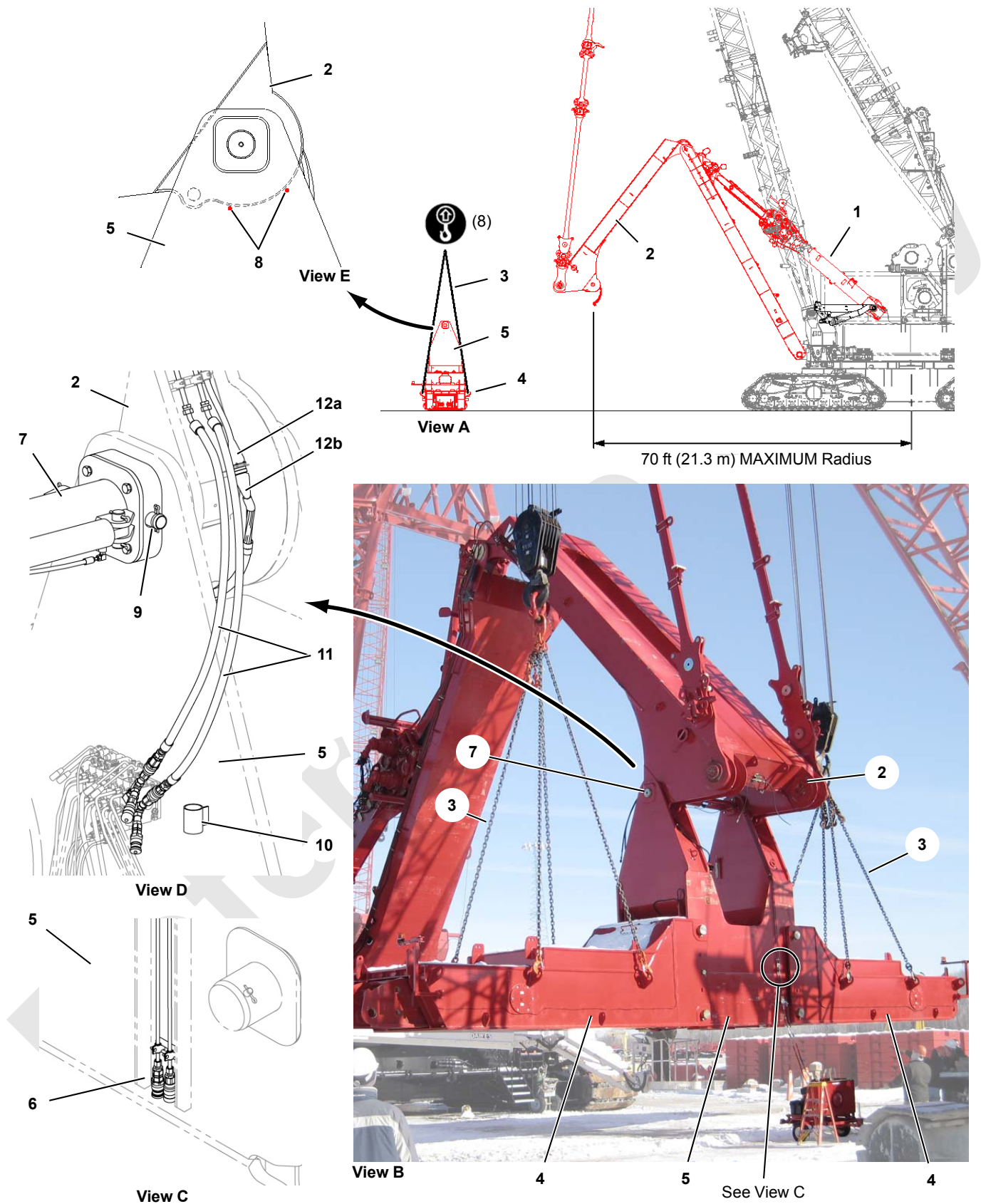


FIGURE 4-107

Legend for [Figure 4-107](#)

Item	Description
1	VPC Actuator
2	Counterweight Frame
3	4-Leg Chain Lifting Sling (2)
4	Side Tray (2)
5	Center Tray
6	Hydraulic Coupler (2)
7	Hydraulic Pin (2)
8	Alignment Stud (4)
9	Pin with Cotter Pins (2)
10	Storage Tube (2)
11	Hydraulic Hose (2) (from counterweight frame)
12a	Electric Cable W61J1 (on counterweight frame)
12b	Electric Cable W60P1 (from center tray)

Attach Counterweight Trays to Counterweight Frame

See [Figure 4-107](#) for the following steps.



WARNING

Crush Hazard!

To prevent crane from tipping and crushing personnel when boom is not installed:

- Do not exceed a 70 ft (21.3 m) radius when attaching assembled counterweight trays to counterweight frame.
- Do not install counterweight boxes until VPC actuator is fully retracted — rubber bumpers on center tray against pivot frame at rear of crane ([Figure 4-111](#)).

1. Extend VPC actuator (1, View A) with the remote control to move counterweight frame (2) to the desired position within a 70 ft (21.3 m) radius.
2. Attach all four legs of lifting slings (3) from two assist cranes to the lifting lugs on each side tray (4) as shown in View B.
3. Travel/hoist/swing the assist cranes as needed to position center tray (5) close to engagement with counterweight frame (2).
4. Connect hydraulic hoses from the PPU and the hand-held accessory valve to couplers (6, View C) on center tray (5).

See [Figure 4-10](#), View D for identification and operation of the hand-held accessory valve.

5. If not already done, disengage hydraulic pins (7, View B) in counterweight frame (2) with the hand-held accessory valve.

NOTE The center tray should be shipped with pins (7) disengaged so the pins cannot be damaged.

6. Slowly lift the center tray until four studs (8, View E) are contacting counterweight frame (2). The connecting holes should now be aligned.
7. Engage hydraulic pins (7, View D)
8. Install pins (9, View D). The pins are stored in tubes (10) on center tray (5).
9. Disconnect the hydraulic lines from couplers (6, View C).
10. Disconnect the lifting slings.
11. Connect two hydraulic hoses (11, View D) and electric cable (12) between counterweight frame (2) and center tray (5).
12. Attach the counterweight pads to the counterweight beams (see [page 4-181](#)) **before you retract the VPC actuator.**

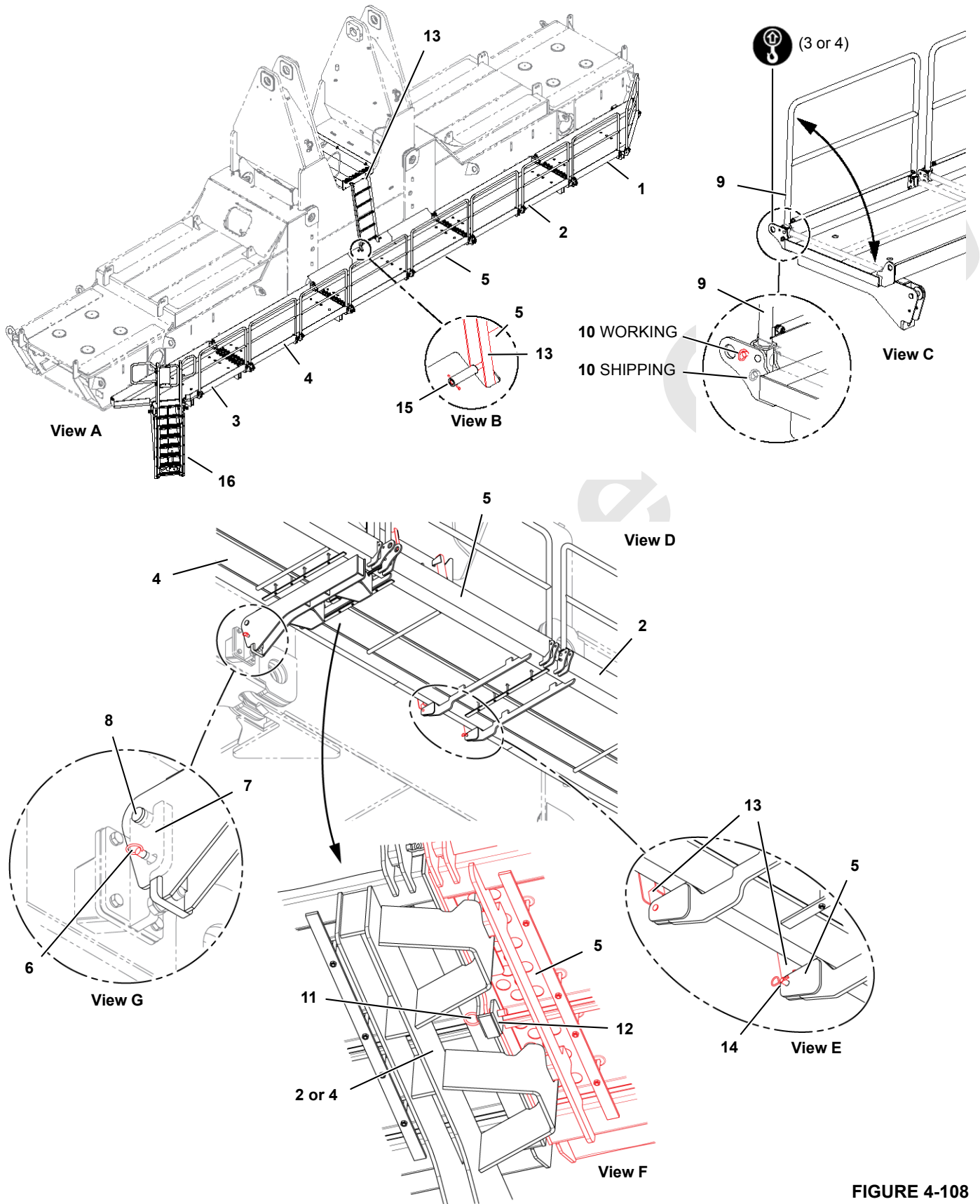
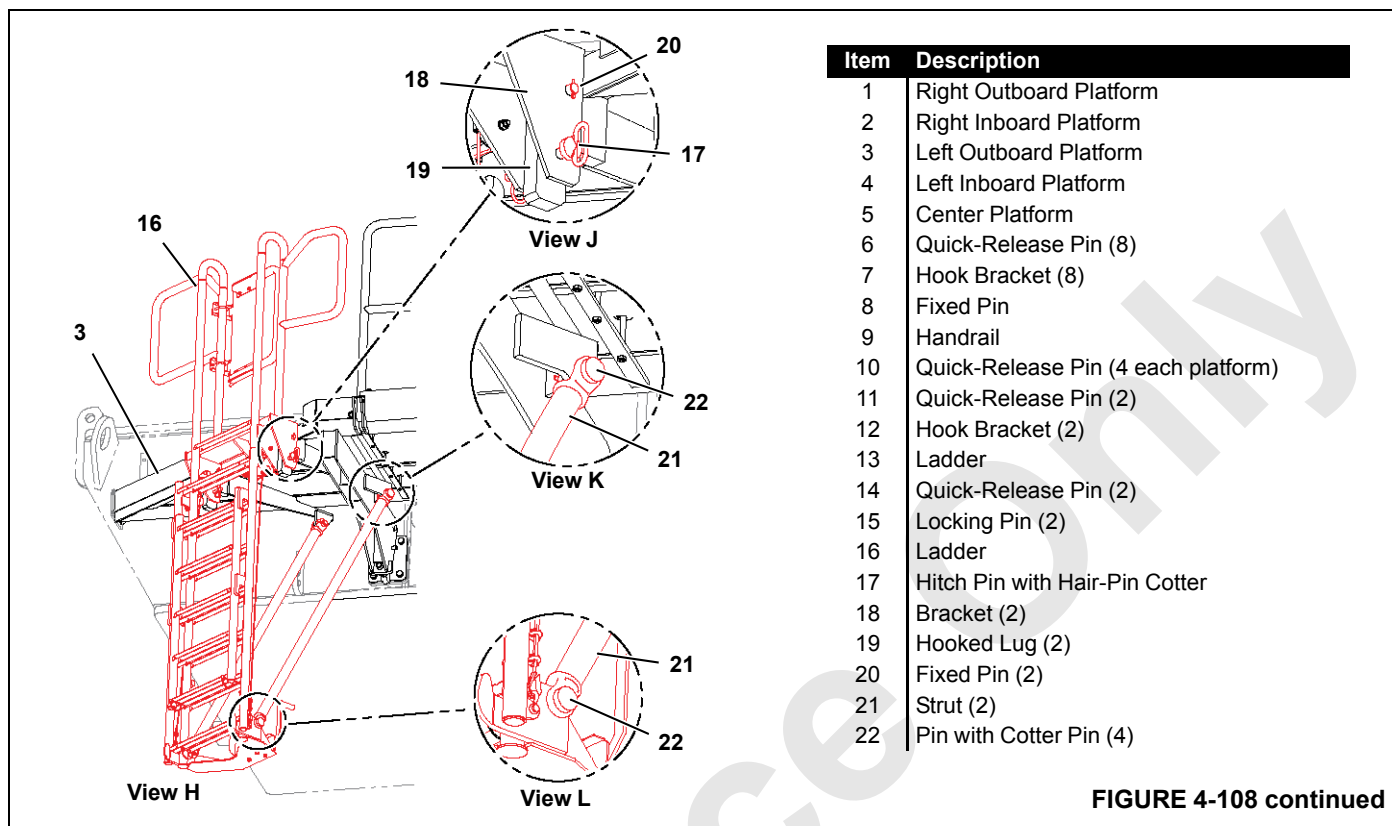


FIGURE 4-108



Install Counterweight Platforms

See [Figure 4-108](#) for the following steps.

1. Remove eight quick-release pins (6, View G) from storage in hooked brackets (7) on the counterweight beam.
2. Lift platform (1, Views A and C) off the trailer and into position so fixed pins (8, View G) on the platform engage hooked brackets (7) on the right side of the counterweight beam.
3. Install quick-release pins (6, View G) to retain the platform.
4. Raise handrails (9, View C) from the shipping position and pin them in the working position.
5. Repeat steps [2-4](#) for platforms 2, 3, and 4 (in that order).
6. Remove two quick-release pins (11, View F) from storage in hooked brackets (12) on platforms (2 and 4).
7. Lift platform (5, View A) off the trailer and into position so it engages the hooked brackets on platforms (2 and 4, View F).
8. Install two quick-release pins (11, View F) to retain platform (5).
9. Install ladder (13, View A):
 - a. Lift ladder (13) into position (rubber bumpers up) so the legs pass through the slots in platform (5, View B).
 - b. Align the holes in ladder (13, View E) with the connecting holes in platform (5) and install pins (14).
 - c. Engage locking pins (15, View B) on both sides of ladder (13).
10. Install ladder (16, View A):
 - a. Remove two hitch pins (17, View J) from storage in brackets (18) on platform (3).
 - b. Lift ladder (16, View J) into position so hooked lugs (19) on the ladder engage fixed pins (20) in brackets (18) on platform (3).
 - c. Install hitch pins (17, View J).
 - d. Connect struts (21, View K and L) to the lugs on platform (3) and ladder (16) with pins (22).

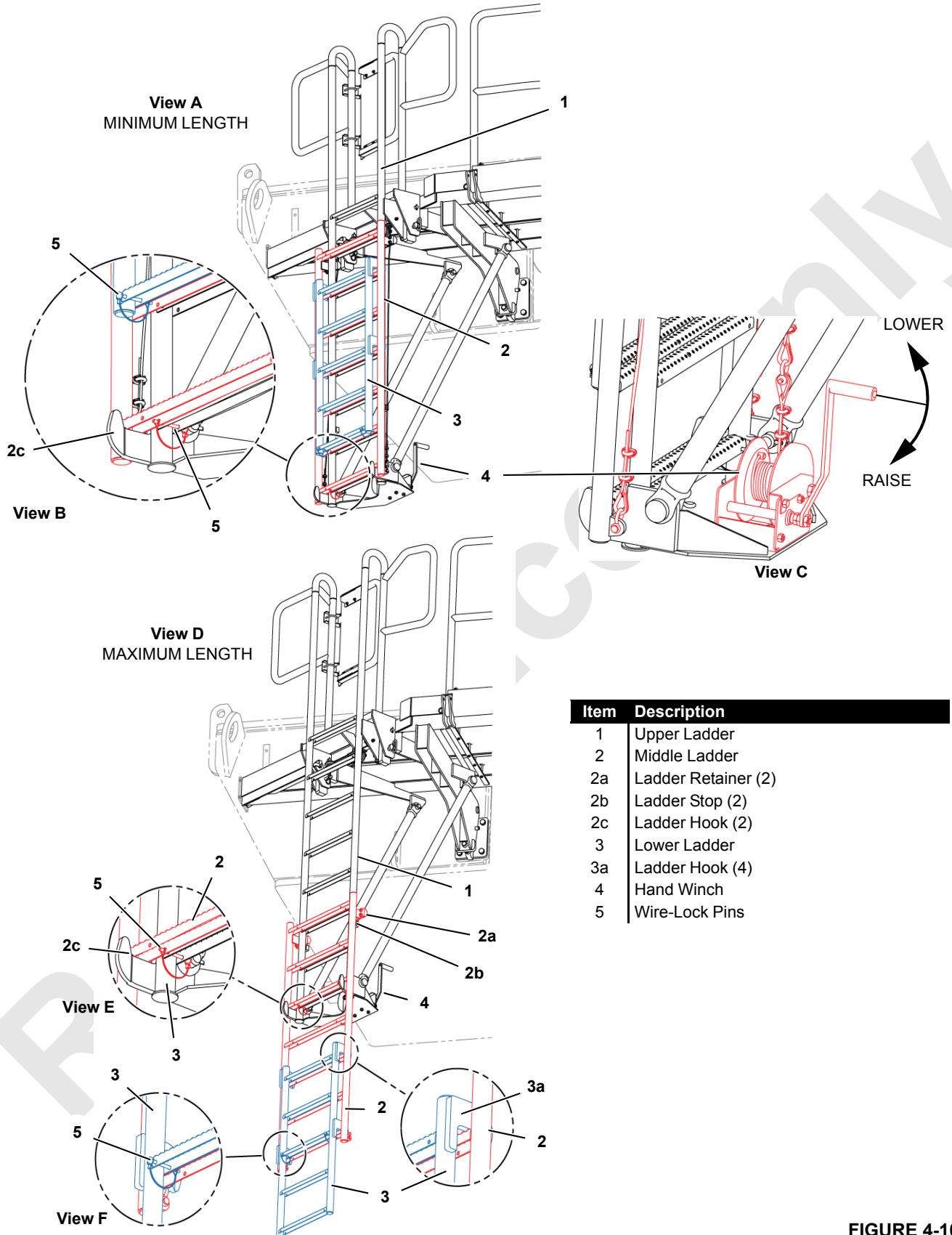


FIGURE 4-109

Operating Counterweight Ladder

See [Figure 4-109](#) for the following steps.



WARNING

Avoid Death or Serious Injury!

VPC (counterweight) rises and lowers automatically without notice during operation. For that reason do not attempt to climb ladder while crane is operating:

- You could fall off ladder.
- You could be struck by moving ladder.

CAUTION

Avoid Damage to Ladder!

Fully retract ladder before operating crane.

Make sure operator is aware when ladder is in an extended position.

The ladder has multiple operating positions:

- Fully retracted (View A).
- Middle ladder (2) has six operating positions.
- Lower ladder (3) has seven operating positions.
- Fully extended (View D).

To operate the ladder proceed as follows:

1. Rotate hand winch (4) lever slightly in the raise direction to support the weight of the ladders.
2. Remove two wire-lock pins (5, View E) from between middle ladder (2) and upper ladder (1).
3. Continue to raise middle ladder (2) until the rungs are clear of ladder hooks (2c, View E) at the bottom of upper ladder (1).
4. Rotate hand winch (4) lever in the desired direction to raise or lower the ladders to the desired position.
 - When the winch handle is turned in the raise direction, the winch makes a loud clicking noise.
 - When the winch handle is turned in the lower direction, the winch brake is actuated and there is no clicking noise.
 - When the winch handle is stopped and released, the brake applies.
5. Lower desired middle ladder (2) rungs onto ladder hooks (2c, View E) at the bottom of upper ladder (1).
6. Install two wire-lock pins (5, View E) to LOCK middle ladder (2) to upper ladder (1).
7. Remove two wire-lock pins (5, View F) from between middle ladder (2) and lower ladder (3).
8. Lift lower ladder (3, View D) by hand to the desired position on middle ladder (2).
9. Hook lower ladder (3, View D) onto middle ladder (2) rungs and install two wire-lock pins (5, View F) to LOCK lower ladder (3) to inner ladder (1).

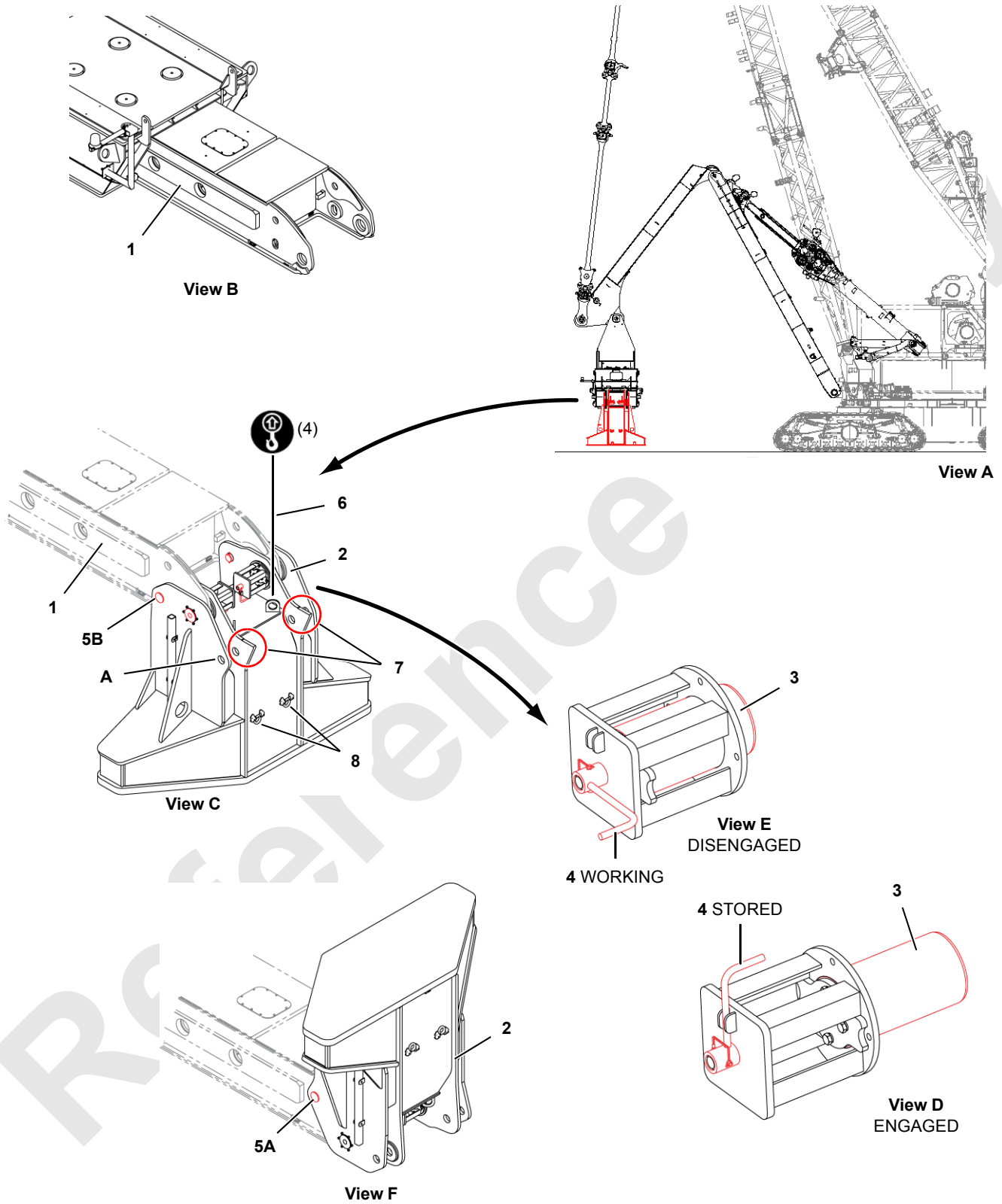


FIGURE 4-110

Legend for [Figure 4-110](#) and [Figure 4-111](#)

Item	Description
1	Counterweight Beam (2)
2	Counterweight Pad (2)
3	Hand-Crank Pin (2 each counterweight pad)
4	Handle with Wire Lock Pin (1 each hand-crank pin)
5	Pin with Cotter Pin (2 each pad)
6	4-Leg Chain Lifting Sling
7	Flat (2 each counterweight pad)
8	Lifting Lug (2 each counterweight pad)
9	Rubber Bumpers
10	Center Tray
11	Pivot Frame

Attach Counterweight Pads to Counterweight Beams

See [Figure 4-110](#) for the following steps.

NOTE Counterweight beams (1, View C) must be as level as possible to install counterweight pads (2). For this reason, install the pads before you perform step 11. If you fully retract the VPC actuator with empty counterweight beams, the beams will tip slightly out of level.

- Using the counterweight controls in the operator cab, extend counterweight beams (1, View B) to the intermediate position or to the fully extended position.

Counterweight pads (2) cannot be installed when the beams are fully retracted.

- If not already done, disengage hand-crank pins (3, View E).

It will be necessary to rotate the handles (4, View D) from the stored position to the working position (View E).

- Attach four legs of lifting sling (6, View C) to the lifting lugs on counterweight pad (2).
- Lift counterweight pad (2, View C) into position at the end of counterweight beam (1).
- Align the holes in the counterweight pad with the holes in the beam.
- Engage either hand-crank pin (3, View D).

Adjust assist crane lifting tension to ease pin engagement.

- Once the pin is engaged, remove handle (4, View E) from the working position and install it in stored position (View D) to lock the hand-crank pin in the engaged position.

- Repeat steps 6 and 7 for the other hand-crank pin.

- Install pins (5, View C) from holes A and install them in holes B for operation with the counterweight pads down.

NOTE If desired to provide ground clearance, the counterweight pads can be rotated to the position shown in View F and pinned in holes A. Use lifting lugs (8) to rotate the pads.

- Repeat the above steps for the other counterweight pad.
- Fully retract the VPC actuator with the remote control to position rubber bumpers (19) on center tray (10, [Figure 4-111](#)) against pivot frame (11) at the rear of the crane.

WARNING Crush Hazard!

To prevent crane from tipping and crushing personnel when boom is not installed:

- Do not install counterweight boxes until VPC actuator is fully retracted — rubber bumpers on center tray against pivot frame at rear of crane ([Figure 4-111](#)).

- Turn ON the VPC stop switch in the cab to prevent unintentional movement of the counterweight.
- 360° swing is permitted with in the VPC actuator fully retracted ([Figure 4-111](#)) and the counterweight beams fully extended.
- Install the counterweight boxes (see [page 4-183](#) or [page 4-185](#)).

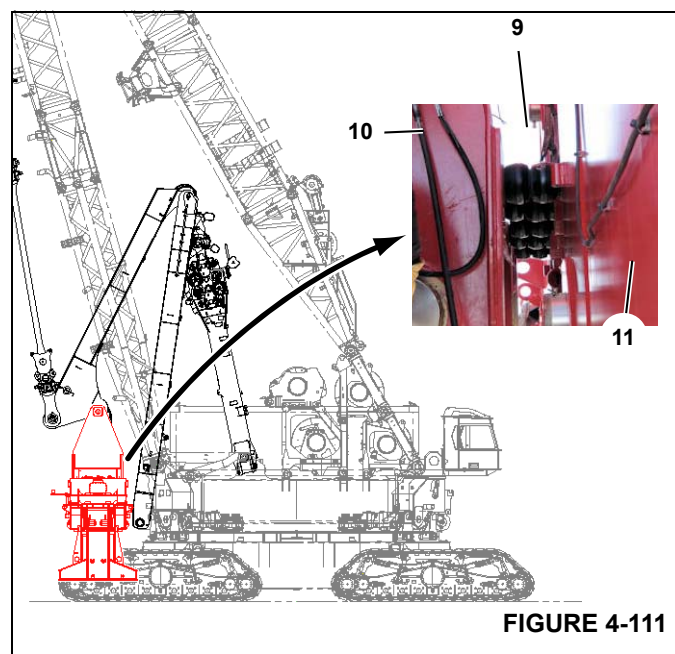
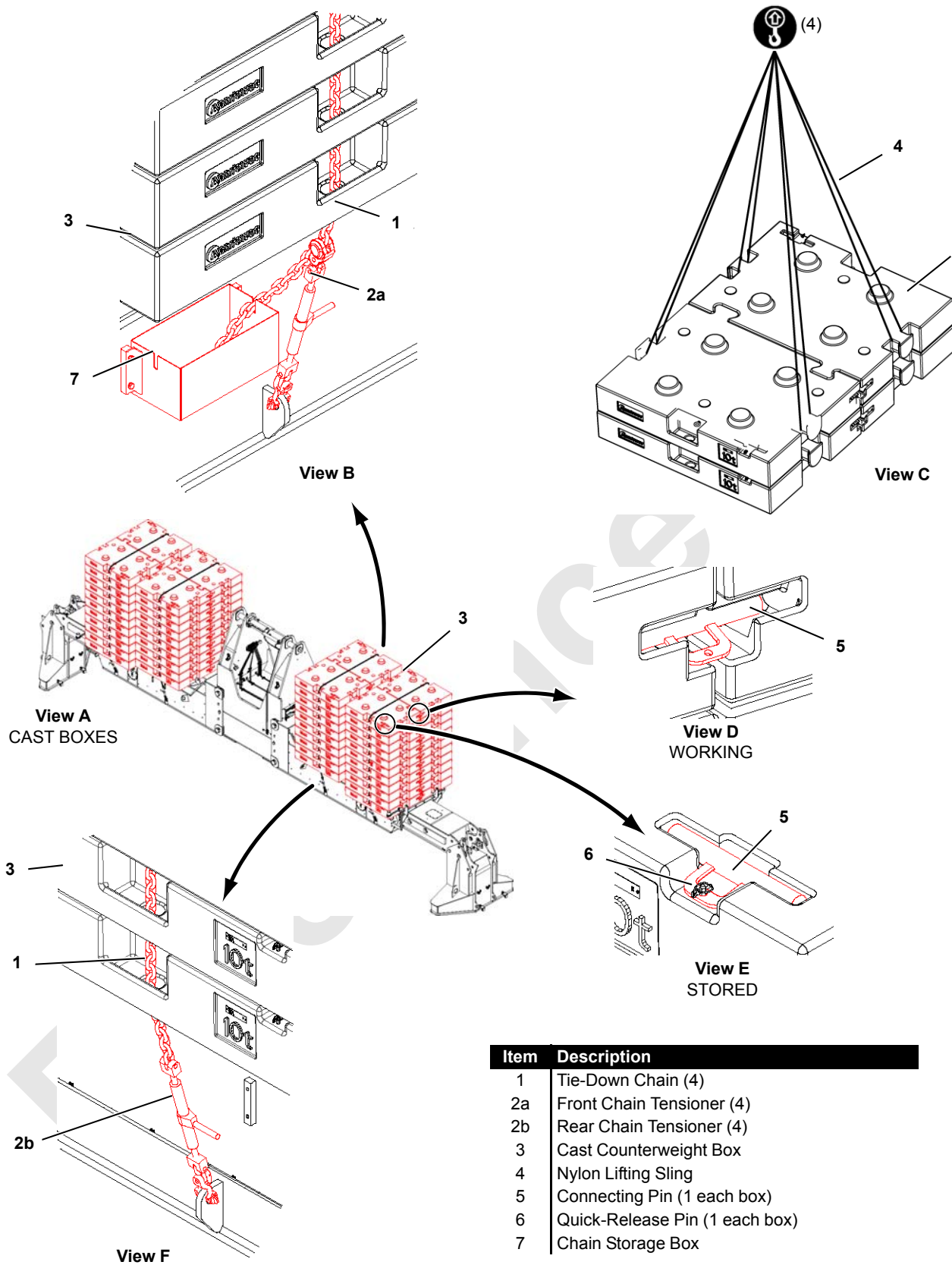


FIGURE 4-111



Item	Description
1	Tie-Down Chain (4)
2a	Front Chain Tensioner (4)
2b	Rear Chain Tensioner (4)
3	Cast Counterweight Box
4	Nylon Lifting Sling
5	Connecting Pin (1 each box)
6	Quick-Release Pin (1 each box)
7	Chain Storage Box

FIGURE 4-112

**WARNING****Crush Hazards!**

To prevent crane from tipping and crushing personnel when boom is not installed:

- Do not install counterweight boxes until VPC actuator is fully retracted — rubber bumpers on center tray against pivot frame at rear of crane (Figure 4-111).

To prevent a counterweight box from falling and crushing personnel:

- Do not lift more than four cast boxes (Figure 4-112, View C). Lifting lugs may break allowing box(es) to fall.

To prevent counterweight boxes from falling off trays:

- Do not operate crane until stacks of boxes are chained to side trays.

NOTE Refer to the Counterweight Tray Assembly Drawing at the end of this section and to the Counterweight Arrangement Chart in the Capacity Chart Manual supplied with the crane for the allowable counterweight stacking arrangements.

NOTE 360° swing is permitted with any counterweight series when the VPC actuator is fully retracted and the counterweight beams fully extended.

Install Cast Counterweight Boxes

See Figure 4-112 for the following steps.

1. Loosen tie-down chains (1, View B), unhook the chains from front chain tensioners (2a), and remove the chains from the side trays.
2. Install the inboard stacks of boxes first:
 - a. Pre-assemble four boxes (3) on the ground by aligning the dovetail joints (View C).
 - b. Remove connecting pins (5) from storage (View E) and install the connecting pins between the mating boxes (View D).
 - c. Lift four boxes (3) into position on either side tray. Lift the boxes as shown in View C.
The lugs on the side tray and boxes will center the boxes on the tray and each other.
 - d. Continue installing the inboard boxes in an alternating sequence until the required number of boxes are installed.
 - e. Working from rear (View F) to front (View B) at each stack of boxes, route chain (1) through the holes in the boxes and connect the chain to front chain tensioner (2a).
The chain is permanently connected to rear chain tensioner (2b).
 - f. Tighten rear and front chain tensioners (2a and 2b).
 - g. Store excess chain in chain storage boxes (7, View B).
3. Once the inboard boxes are installed and secured, repeat the process for the outboard boxes.

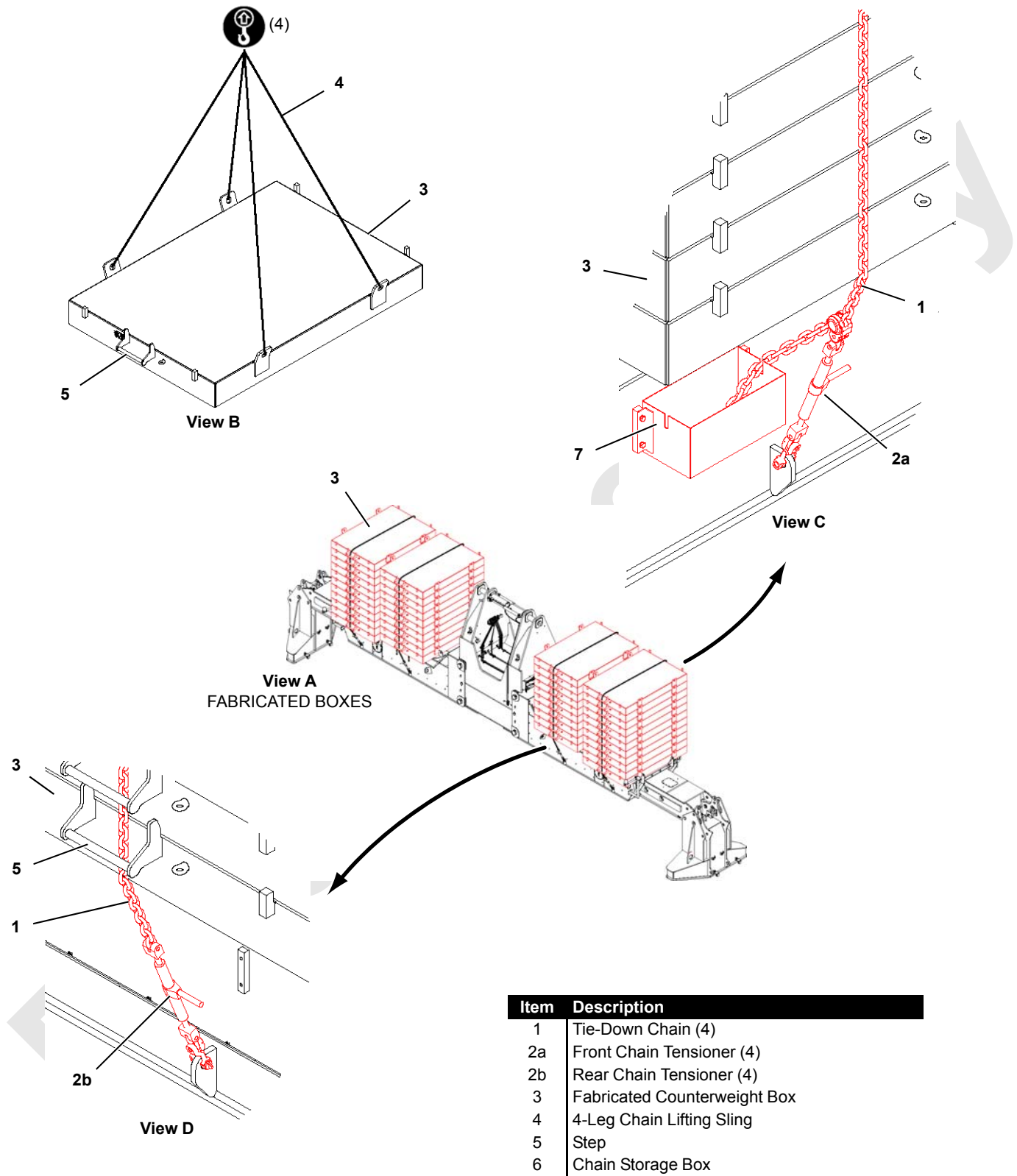


FIGURE 4-113

**WARNING****Crush Hazards!**

To prevent crane from tipping and crushing personnel when boom is not installed:

- Do not install counterweight boxes until VPC actuator is fully retracted — rubber bumpers on center tray against pivot frame at rear of crane (Figure 4-111).

To prevent counterweight box from falling and crushing personnel:

- Do not lift more than one fabricated box at a time (Figure 4-113, View C). Lifting lugs may break allowing box(es) to fall.

To prevent counterweight boxes from falling off trays:

- Do not operate crane until stacks of boxes are chained to side trays.

CAUTION

To prevent damage to power plant enclosure:

- Make sure step (5, Figure 4-113, View B) faces to rear.

NOTE Refer to the Counterweight Tray Assembly Drawing at the end of this section and to the Counterweight Arrangement Chart in the Capacity Chart Manual supplied with the crane for the allowable counterweight stacking arrangements.

NOTE 360° swing is permitted with any counterweight series when the VPC actuator is fully retracted and the counterweight beams fully extended.

Install Fabricated Counterweight Boxes

See Figure 4-113 for the following steps.

1. Loosen tie-down chains (1, Views C and D), unhook the chains from front chain tensioners (2a), and remove the chains from the side trays.

2. Install the inboard stacks of boxes first:
 - a. Lift one box (3) into position on either side tray. Lift the boxes as shown in View B. Steps (5) must face rear. Lugs on the side tray and on the boxes will center the boxes on the tray and each other.
 - b. Lift one box into position on the other side tray. Steps (5) must face rear.
 - c. Continue installing the inboard boxes in an alternating sequence until the required number of boxes is installed (see Counterweight Arrangement Chart).
 - d. Working from the rear (View D) to the front (View C) at each stack of boxes, route chain (1) through steps (5) on the boxes and connect the chain to front chain tensioner (2a). The chain is permanently connected to rear chain tensioner (2b).
 - e. Tighten rear and front chain tensioners (2a and 2b).
 - f. Store excess chain in chain storage boxes (7, View C).
3. Once the inboard boxes are installed and secured, repeat the process for the outboard boxes.

Store Remote Control

See Figure 4-73 on page 4-116 for the following steps.

1. Disconnect remote control (3, View D) from junction box (4, View E).
2. Clean all plugs and receptacles.
3. Connect the protective cap on the remote control cable and store the remote control in the operator cab.
4. Connect the terminator plug to the junction box receptacle. CAN faults and faulty operation will occur if this step is not performed.

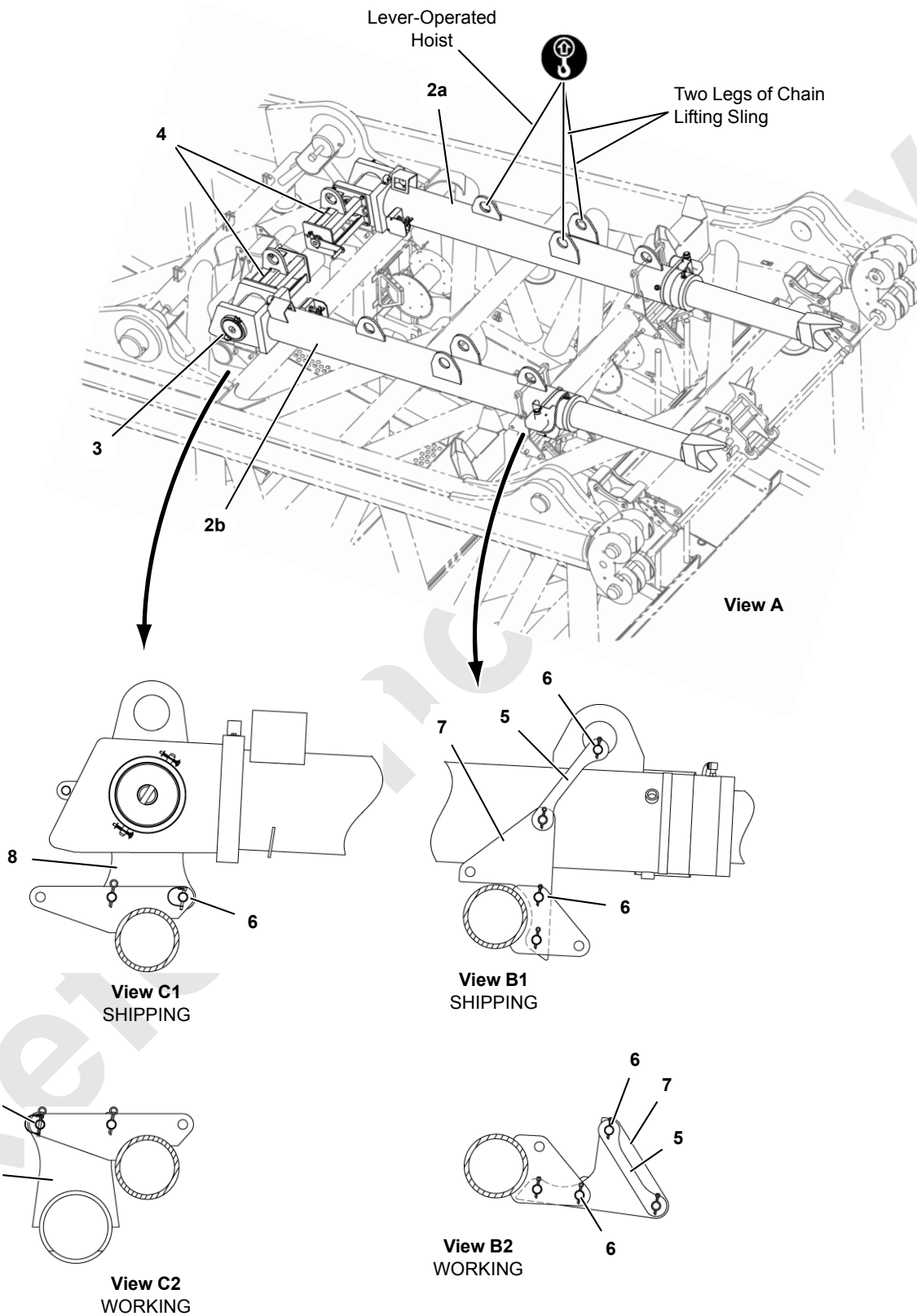


Figure 4-114

CRANE ASSEMBLY — PHYSICAL BOOM STOP

Legend for [Figure 4-114](#)

Item	Description
1	Drum 1
2a	Right Boom Stop
2b	Left Boom Stop
3	Collar with Pin and Wire-Lock Pins
4	Hand-Crank Pin (2)
4a	Spring Plunger
5	Link (4)
6	Pin with Wire Lock Pin (6)
7	Bracket (2)
8	Bracket (2)
9	Rubber Bumper (2)
10	Valve Handle (2)
11	Electric Cable (2)
11a	Storage Receptacle (2)

See [Figure 4-114](#) for the following steps.

- Lower Drum 1 platform extensions to the working position and raise Drum 1 steps (see [page 4-97](#)).
- Lift the boom butt off the trailer and place the butt on blocking at ground level (see [page 4-192](#)).
- Attach two legs of the chain lifting sling and a lever-operate hoist to the lugs on right boom stop (2a, View A).
- Hoist with the assist crane just enough to support the boom stop.
- Remove collar (3, View A) from hand-crank pin (4) at right boom stop (2a).
- Unpin links (5, View B1).
- Lift right boom stop (2a, View A) away from the boom butt and place it on blocking at ground level.
- Check that valve handle (10, View E) is turned all the OUT to the OPEN position. Otherwise, the pressure transducer will not operate properly.
- Unpin bracket (7, View B1) from the shipping position and pin it in the working position (View B2). Store links (5).
- Unpin bracket (8, View C1) from the shipping position and pin it in the working position (View C2).
- Adjust the length of the lever-operated hoist so the right boom stop hangs at 38° and the hand-crank pin is horizontal.
- Lift right boom stop (2a, View D) into position at the lugs on the right side of Drum 1 so hand-crank pin (4, View E) faces out.
- Fully disengage the hand-crank pin.
- Align the connecting holes and fully engage the hand-crank pin.
- Install collar (3, View F) on hand-crank pin (4).
- Rotate the hand-crank pin until spring plunger (4a, View E) is in the locking hole.
- Lower the boom stop onto rubber bumper (9, View E) and disconnect the lifting slings.
- Disconnect electric cable (11, View E) from storage receptacle (11a) and connect it to the boom stop.
- Repeat the steps for left boom stop (2b).
- Store Drum 1 platform extensions and lower Drum 1 steps (see [page 4-97](#)).

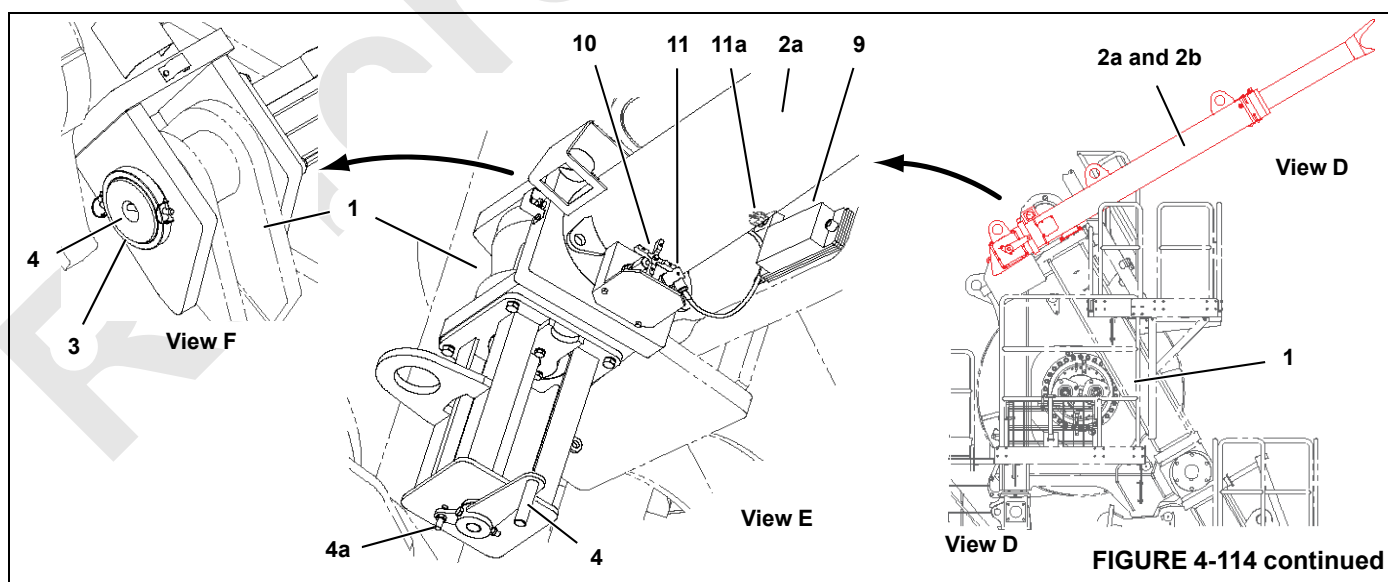
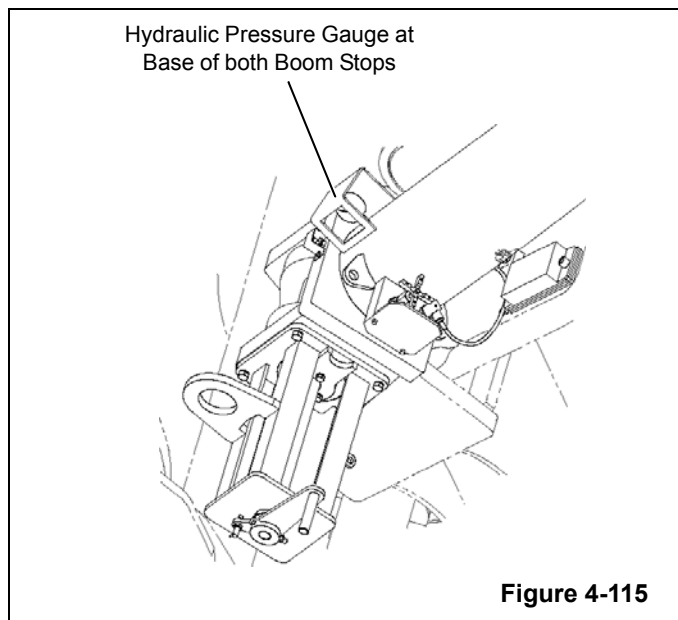


FIGURE 4-114 continued

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Reference Only

CRANE ASSEMBLY — PHYSICAL BOOM STOP PRESSURE SETTING



Each boom stop has a hydraulic pressure gauge ([Figure 4-115](#)).

Check both gauges WEEKLY. The gauges should read the pre-charge pressure given in the table for the corresponding outside air temperature.

Outside Temperature	Pressure
90°F (32°C)	1,390 psi (95,8 bar)
80°F (26°C)	1,365 psi (94,1 bar)
70°F (21°C)	1,340 psi (92,4 bar)
60°F (16°C)	1,315 psi (90,7 bar)
50°F (10°C)	1,290 psi (88,9 bar)
40°F (4°C)	1,265 psi (87,2 bar)
30°F (-1°C)	1,240 psi (85,5 bar)
20°F (-7°C)	1,215 psi (83,8 bar)
10°F (-12°C)	1,190 psi (82,0 bar)
0°F (-18°C)	1,165 psi (80,3 bar)
-10°F (23°C)	1,140 psi (78,6 bar)

If the proper reading is not indicated at either gauge, determine the cause of the faulty pressure and take corrective action.

! WARNING
Explosion Hazard!

Boom stop cylinders are equipped with nitrogen gas pre-charged accumulators.

Do not tamper with accumulators unless authorized and trained to do so.

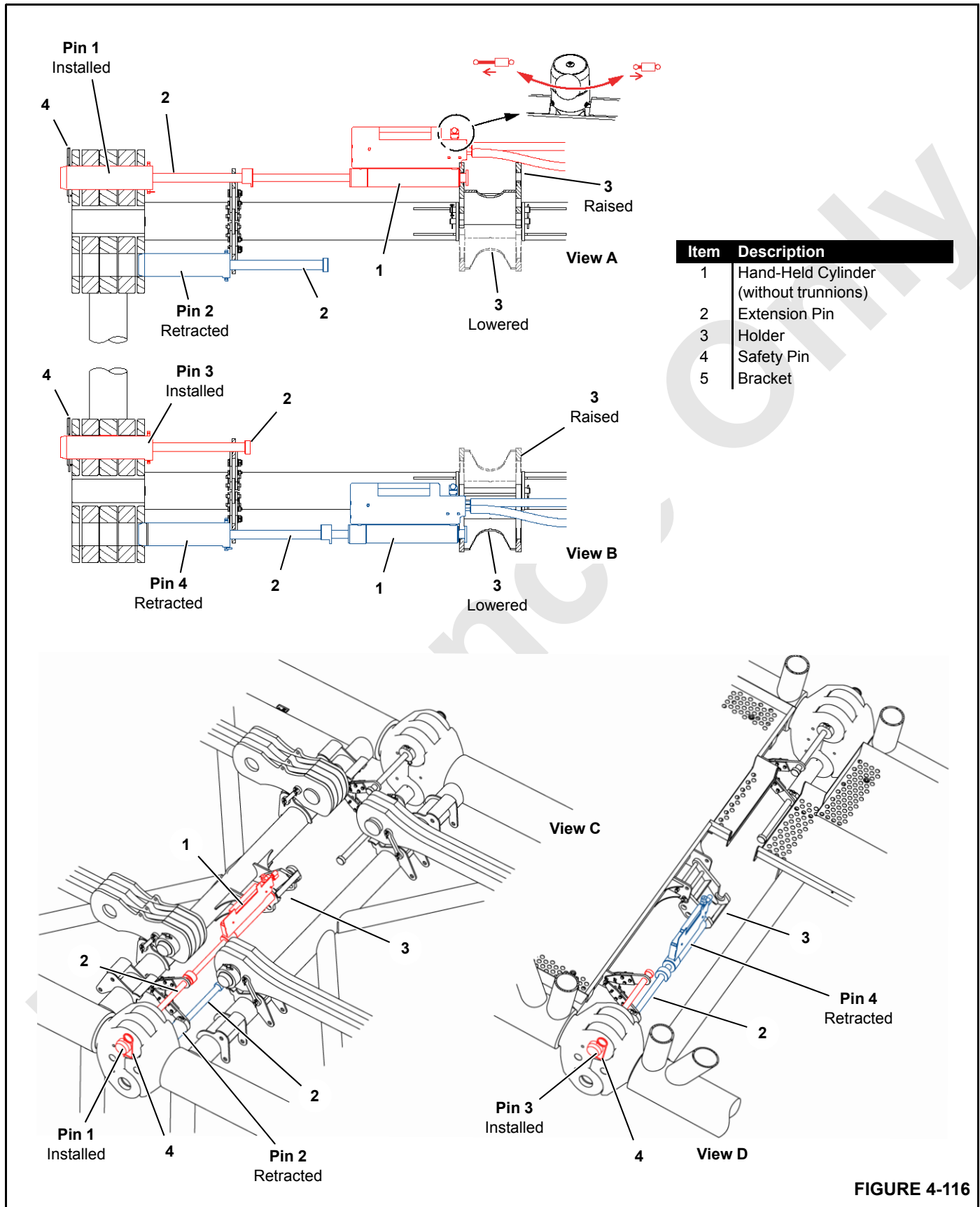
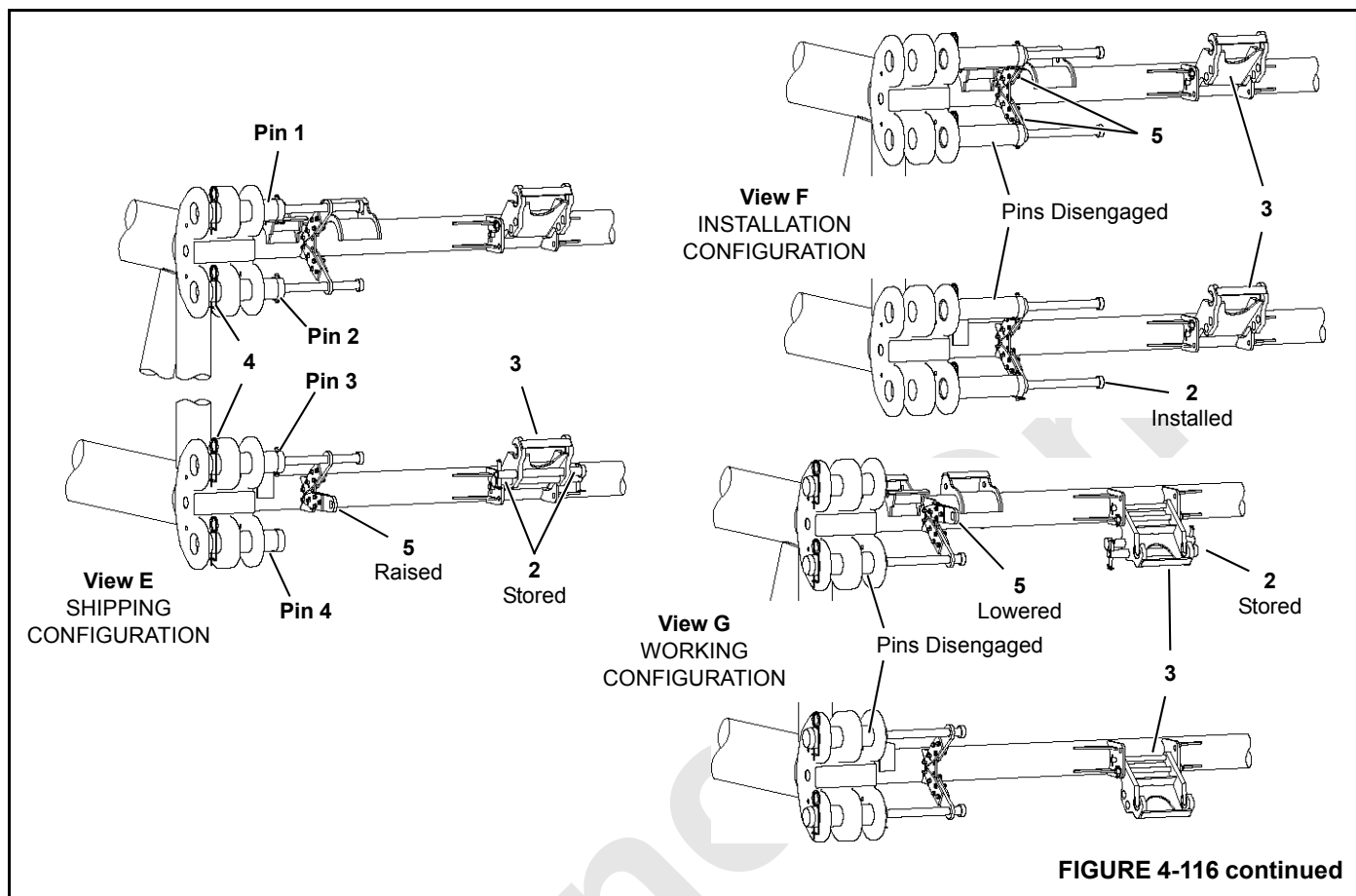


FIGURE 4-116



CRANE ASSEMBLY — BOOM CONNECTOR PINS

See [Figure 4-116](#) for the following procedures.

Connect Pins 1

1. Position the connector pins and components as shown in Views E, F, and G.
2. Clean and grease/oil all connector pins and holes.
3. Align the top connector holes of mating boom sections.
4. Position hand-held cylinder (1, View A) on extension pin (2) and holder (3).
5. Connect hydraulic lines from the PPU to the hand-held cylinder and start the power unit.
6. Remove safety pin (4, View A) from Pin 1.
7. Extend the hand-held cylinder to engage Pin 1 (View A) with the mating holes.
8. Install safety pin (4).
9. Repeat the procedure for Pin 1 on the opposite side.

10. Remove hand-held cylinder (1).

11. Lower top holder (3, View G).

12. Remove extension pins (2, View G) from Pins 1 and install them in holder (3) for storage during boom use.

13. Lower bracket (5, View G) to provide clearance for boom and luffing jib backstay strap assembly.

Connect Pins 2

1. Lower the boom section with the assist crane and align the connector holes for Pin 2 installation.
2. Connect Pins 2 following the Pin 1 instructions.

Connect Pins 3

Connect Pins 3 following the Pin 1 instructions.

Connect Pins 4

1. Lower holder (3, View E), remove extension pins (2) from storage in holder (3), and attach them to Pins 4 (View G).
2. Connect Pins 4 following the Pin 1 instructions.

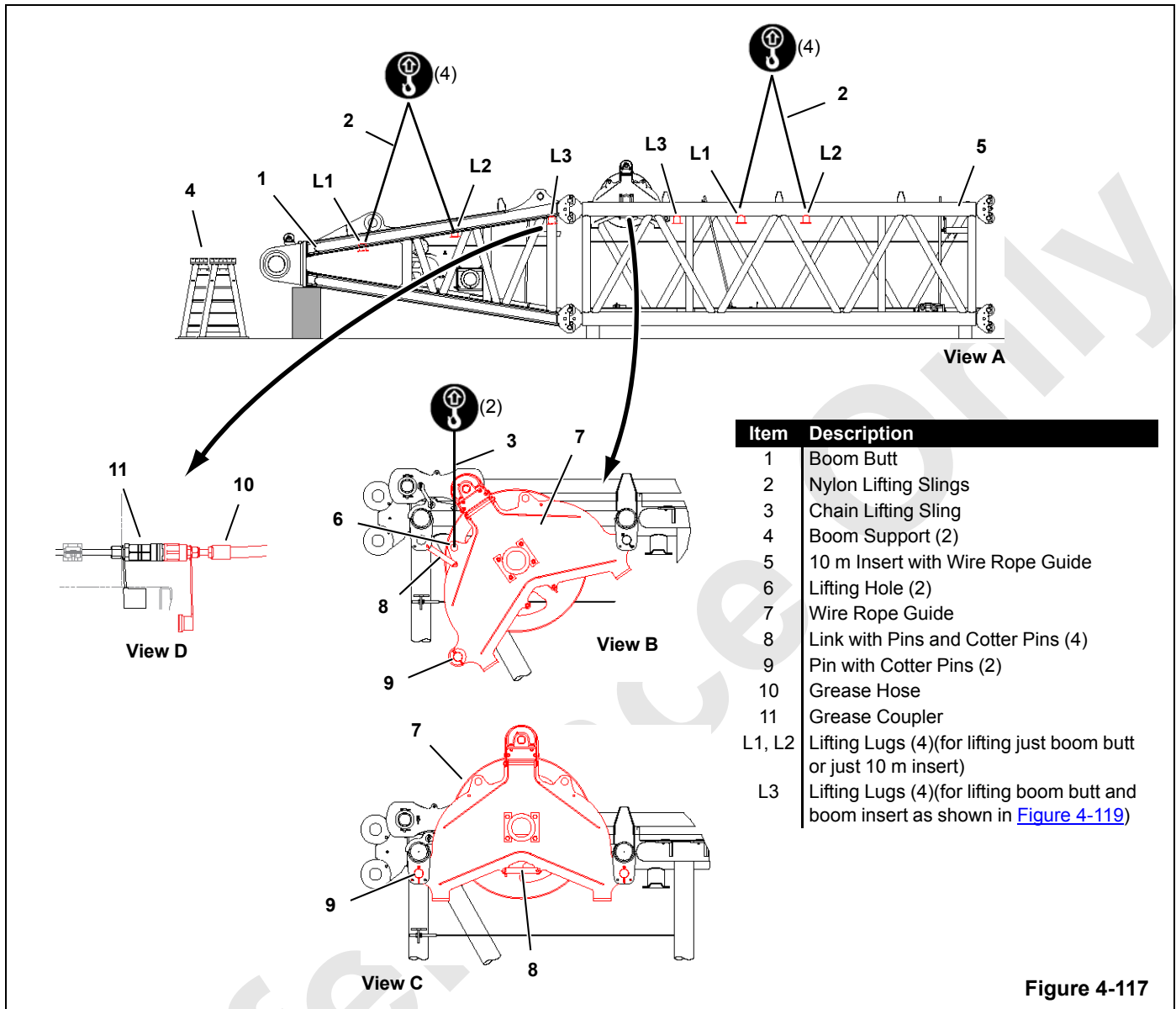


Figure 4-117

CRANE ASSEMBLY — BOOM

Prepare 10 m Boom Insert With Wire Rope Guide

See [Figure 4-117](#) for the following procedure.

The 10 m insert with wire rope guide must be installed next to the boom butt.

1. Lift insert (5, View A) off the trailer and place it on blocking at ground level.

Use four nylon lifting slings attached to lifting lugs (L1 and L2, View A).

The blocking must be at least 8 in (203 mm) high.

2. Level the insert on the blocking.
3. Connect the hooks from chain lifting sling (3, View B) to lifting holes (6) in wire rope guide (7).
4. Tension the slings so the pins in links (8, View B) are loose.
5. Remove links (8) and pins (9, View B).
6. Raise wire rope guide (9, View C) to the operating position and install pins (9).
7. Store links (8, View C) on the wire rope guide.
8. Disconnect the lifting slings.
9. Connect grease hose (10, View D) from wire rope guide (7) to coupler (11) on the boom butt.

Connect Boom Butt to 10 m Insert with Wire Rope Guide

See [Figure 4-117](#) for the following procedure.

1. Attach four nylon lifting slings (2) to lifting lugs (L1 and L2, View A) on boom butt (1).
2. Adjust the lifting slings so the butt is level from side to side.
3. Lift the boom butt into position at the rear of the 10 m insert.
4. Connect the pins between the boom butt and the 10 m insert as instructed on [page 4-191](#).
5. Securely block under the boom butt (View A) so it cannot tip when the lifting slings are disconnected.
6. Disconnect the lifting slings.

Lower Railings on Cab Access Platform

See [Figure 4-118](#) for the following procedure.

Lower handrails (1, 2, and 3) from the working position (View A) to the assembly position (View B) before connecting the boom butt and 10 m insert to the front roller carrier. **Damage will occur if you do not perform this step.**



WARNING

Trip and Fall Hazard!

To prevent tripping and falling off cab access stairway:

- Do not use cab access stairway while handrails are lowered in assembly position.
- Use stairway at rear of crane to access operator cab.

1. Unpin handrail (2, View A) from handrail (1).
2. Rotate handrail (2) in and latch it to handrail (3).
3. Unpin handrail (3, View A) from the working position, lower handrails (2 and 3) to the assembly position (View B), and reinstall quick-release pins (4).
4. Unpin handrail (1, View A) from the working position, lower it to the assembly position (View B), and reinstall quick-release pins (4).
5. Reverse the above steps to raise the handrails after the boom is raised to the operating position.

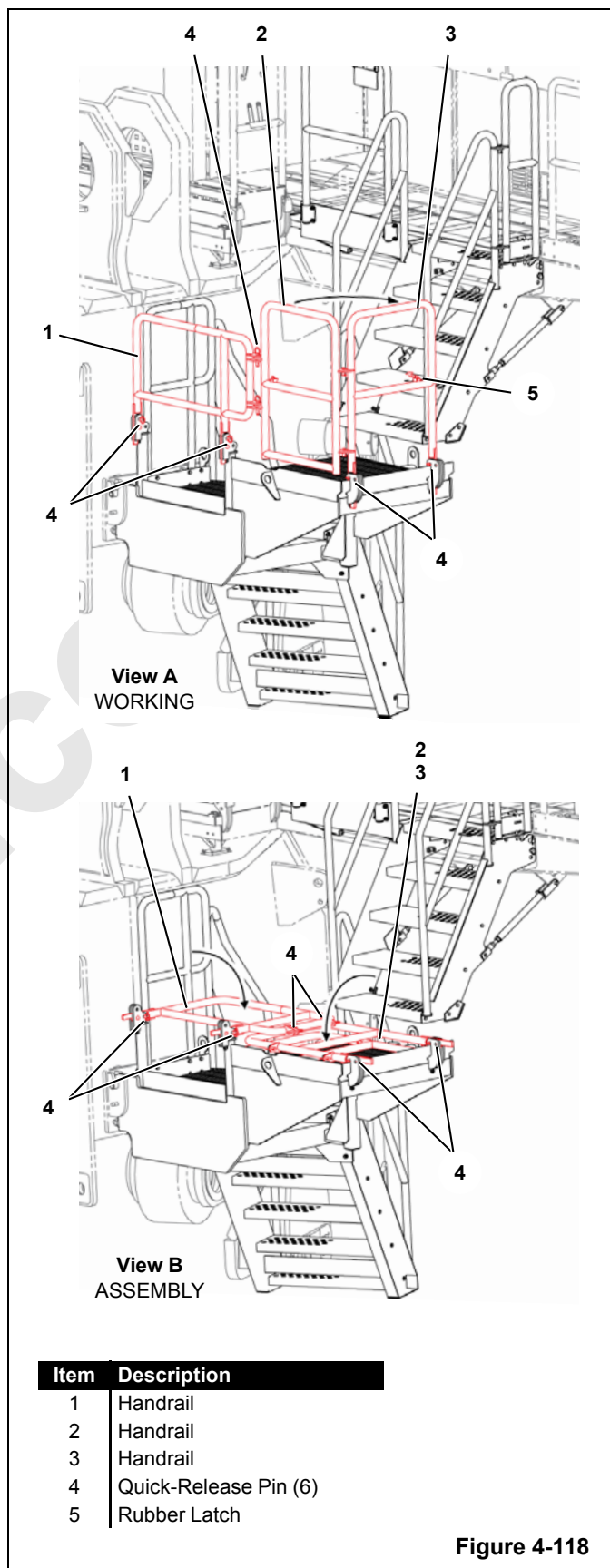
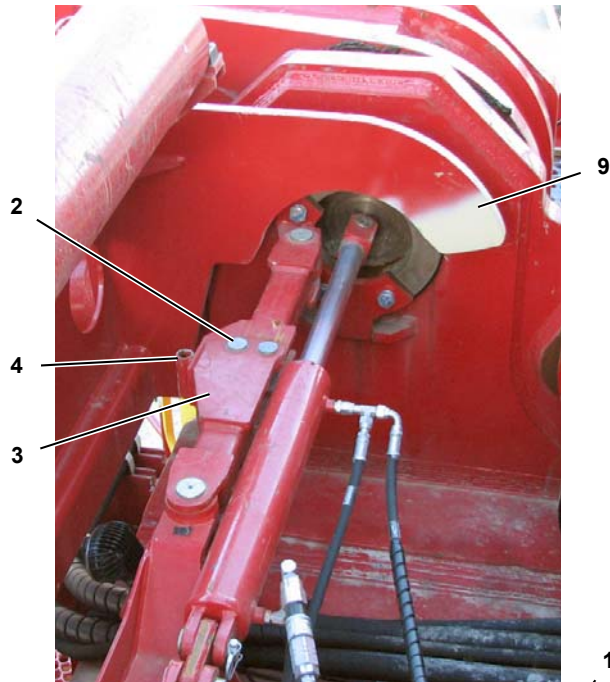
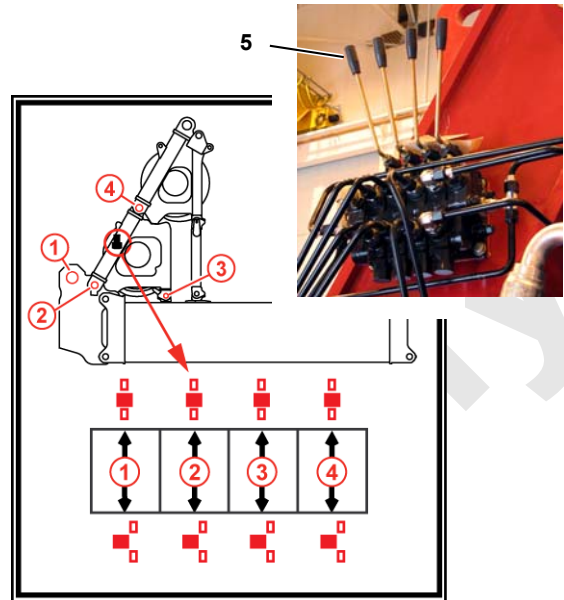


Figure 4-118



View A

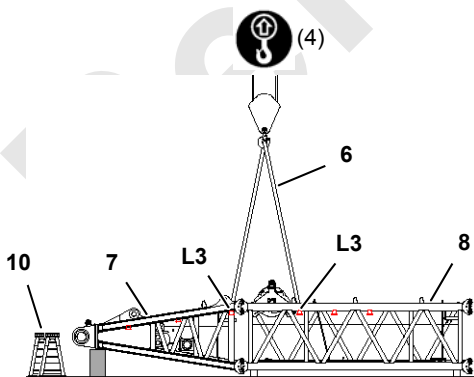


View C

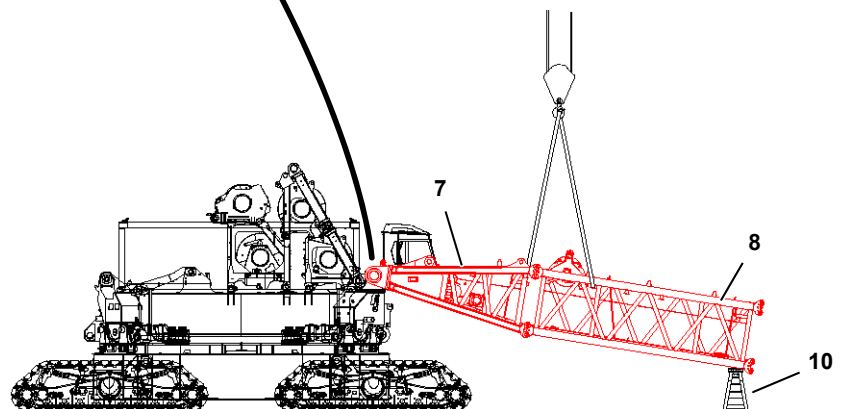


View B

Item	Description
1	Boom Hinge Pin (2)
2	Pin with Wire Lock Pin (2)
3	Locking Lever (4)
4	Storage Tube
5	Control Valve
6	Nylon Lifting Sling (4)
7	Boom Butt
8	10 m Insert
9	Alignment Lug (2)
10	Boom Support (2)
L3	Lifting Lugs (4)(for lifting boom butt and 10 m insert)



View D



View E

Figure 4-119

Connect Boom Butt and 10 m Insert to Crane

See [Figure 4-119](#) for the following procedures.

1. Remove pins (2, View A) from locking levers (3).
2. Store pins (2) in tubes (4).
3. Retract boom hinge pins (1, View B) using control valve (5, View C) on Drum 3.
4. Attach four nylon lifting slings (6) to lifting lugs (L3, View D) on boom butt (7) and 10 m insert (8).
5. Adjust the lifting slings so the butt and insert are level from side to side.
6. Lift the boom butt and insert into position at the lugs on the front roller carrier (View E).

Alignment lugs (9, View A) on the butt should rest on top of the retracted boom hinge pins. This will align the connecting holes.

7. Connect hydraulic hoses (13 and 14, [Figure 4-120](#)) from the boom hinge pins to the couplers on the left side of Drum 3.

Route the hoses UNDER the platform on the front of Drum 3.

8. Engage boom hinge pins (1, View B) using control valve (5) on Drum 3.
9. Remove pins (2, View B) from storage tubes (4) and install the pins in locking levers (3, View A).
10. Using a forklift, position boom supports (10, View E) under the end of 10 m insert (8).
11. Add blocking as needed between the boom supports and the insert so the insert does not twist when the lifting slings are disconnected. Failing to perform this step will make it difficult to connect the next insert.
12. Disconnect the lifting slings.

See [Figure 4-120](#) for the remaining steps.

13. Connect the electric cables from the front roller carrier to the butt. Route the cables through cable guide (11).
14. Connect boom hinge pins grease hose (12) from the front roller carrier to the butt.

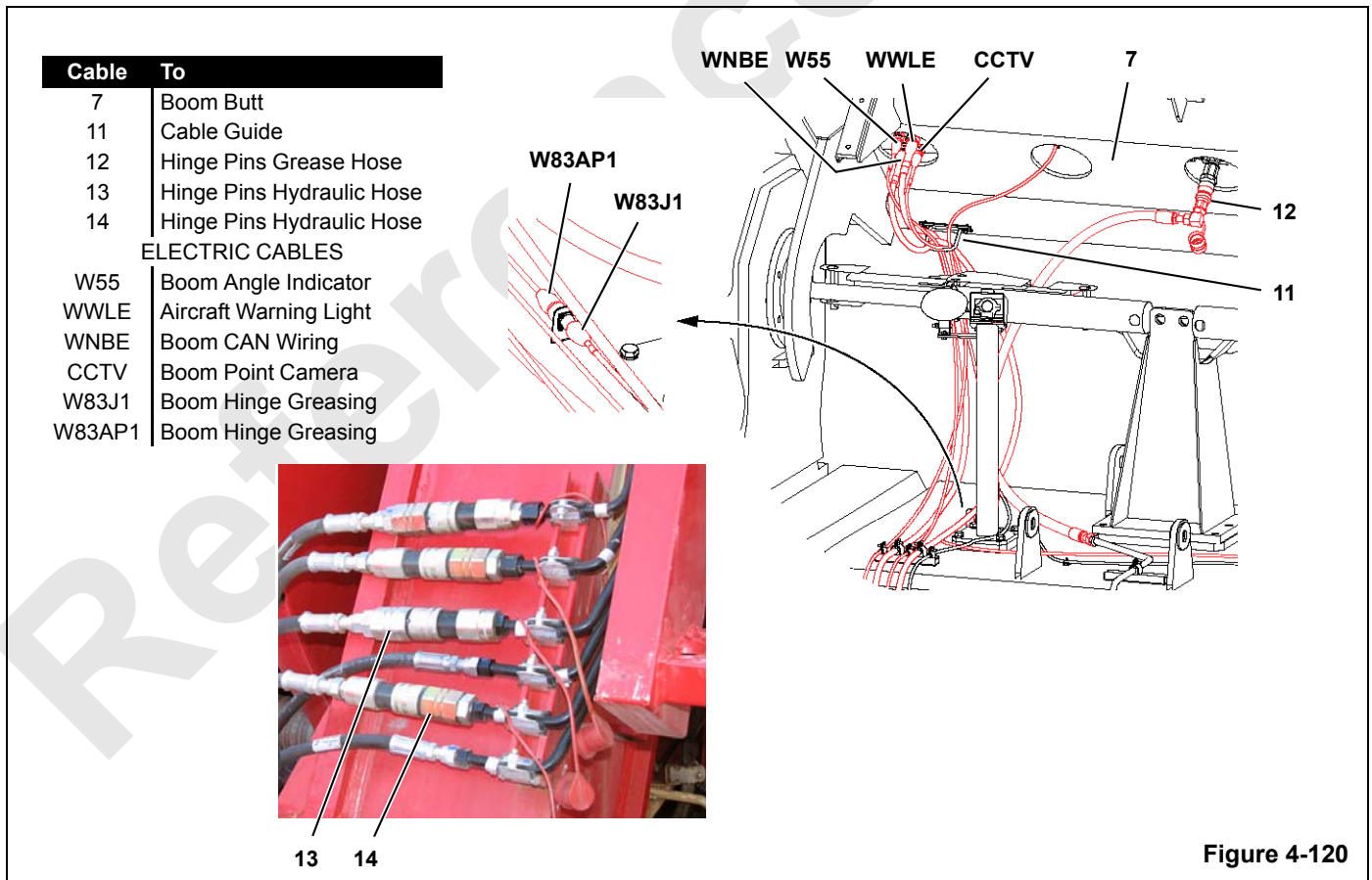


Figure 4-120

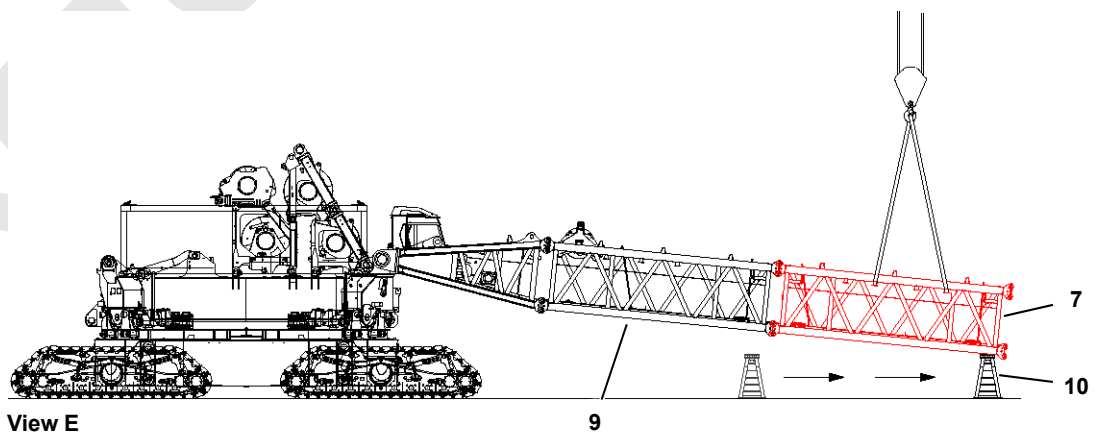
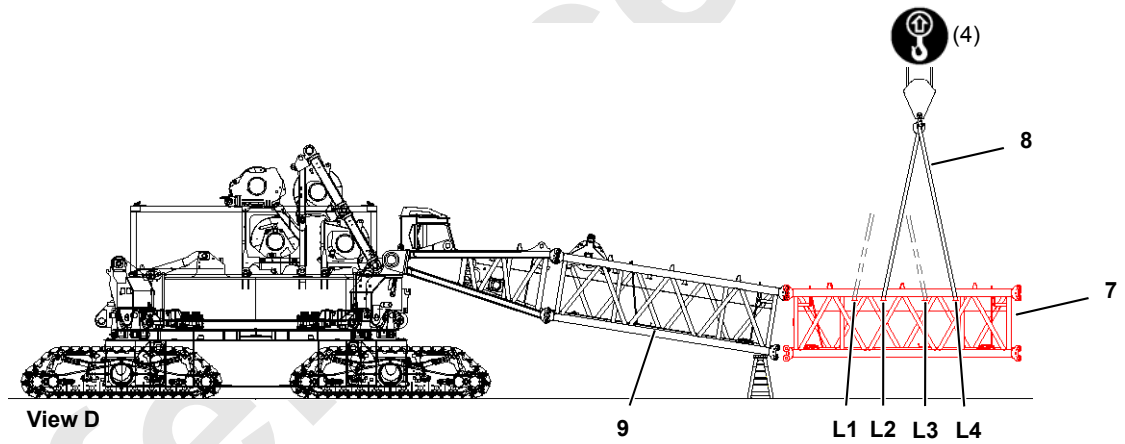
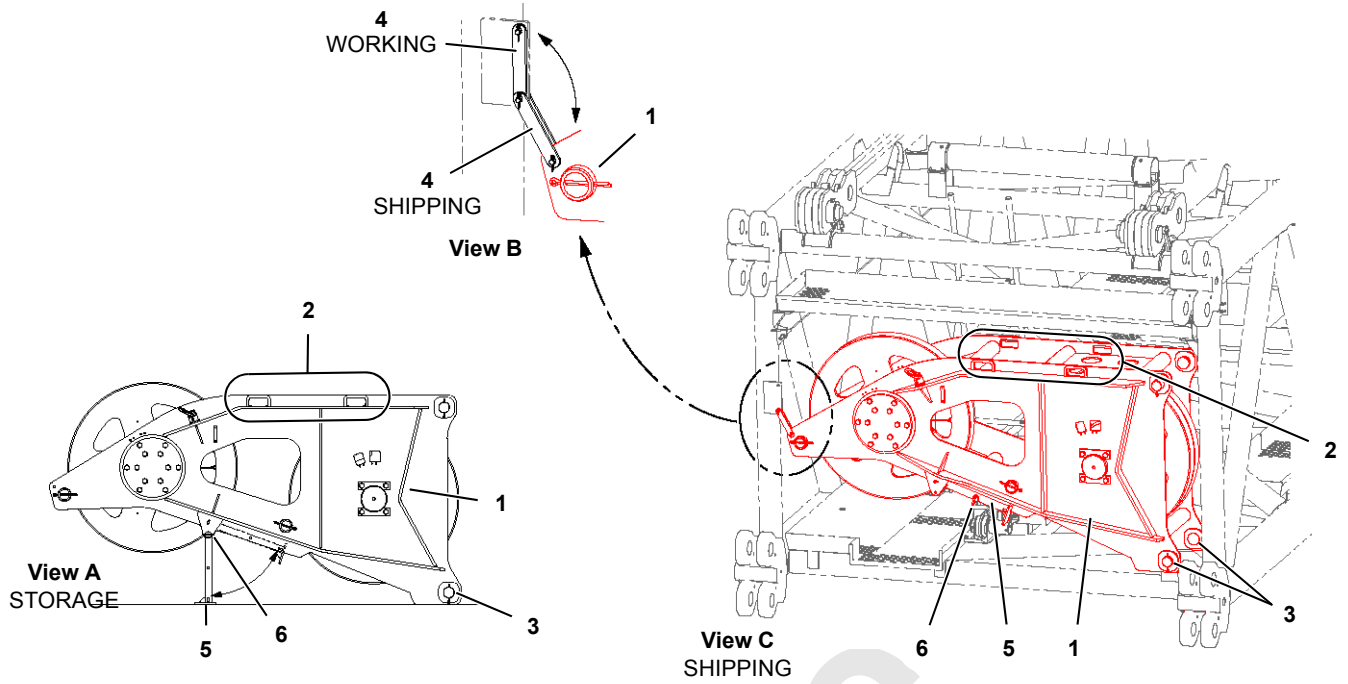


Figure 4-121

Legend for [Figure 4-121](#)

Item	Description
1	Wire Rope Guide
2	forklift Slot (4)
3	Pin with Cotter Pin(4)
4	Link with Pin and Cotter Pins (4)
5	Stand
6	Hitch Pin with Hair-Pin Cotter
7	10 m Insert without Boom Straps (2)
8	Nylon Lifting Sling (4)
9	10 m Insert with Wire Rope Guide
10	Boom Support (2)

Prepare 10 m Insert without Boom Straps

Two 10 m inserts without boom straps are required. The inserts must be installed next to the 10 m insert with wire rope guide.

The boom top wire rope guide is shipped on the end of one of the 10 m inserts without boom straps. Remove the wire rope guide as follows.

See [Figure 4-121](#) for the following procedure.

1. Lift 10 m insert (7) off the trailer and place the insert on blocking at ground level.

Use four nylon lifting slings (8) attached to the proper lifting lugs:

- L1 and L3 (View D) for lifting the insert with wire rope guide (1, View C).
- L2 and L4 (View D) for lifting the insert without wire rope guide (1, View C).

2. Insert the forks from a forklift into slots (2, View C) in wire rope guide (1).
3. Support the wire rope guide (1) with the forklift and remove bottom pins (3, View C).

4. Unpin links (4, View B) from the wire rope guide and pin the links in the working position.
5. Remove wire rope guide (1) from the insert.
6. Reinstall pins (3) in the wire rope guide holes.
7. Remove hitch pins (6, View C), lower stands (5, View A), and pin the stands in the storage position.
8. Place the wire rope to the side for later installation on the boom top.

Install 10 m Insert without Boom Straps

1. Attach four nylon lifting slings (8) to lifting lugs (L2 and L4, View D) on 10 m insert (7).
2. Adjust the lifting slings so the 10 m insert is level from side to side.
3. Lift the 10 m insert into position in front of 10 m insert (9).
4. Connect the top pins between the inserts as instructed on [page 4-191](#).
5. Lower the insert until the bottom pin holes are aligned and connect the remaining pins as instructed on [page 4-191](#).
6. With the lifting slings still attached to 10 m insert (7), lift the inserts and the butt off boom supports.
7. Using a forklift, reposition boom supports (10, View E) under the end of 10 m insert (7).
8. Add blocking as needed between the boom supports and the insert so the insert does not twist when the lifting slings are disconnected. Failing to perform this step will make it difficult to connect the next insert.
9. Disconnect the lifting slings.
10. Repeat the above steps for the second 10 m insert without boom straps.

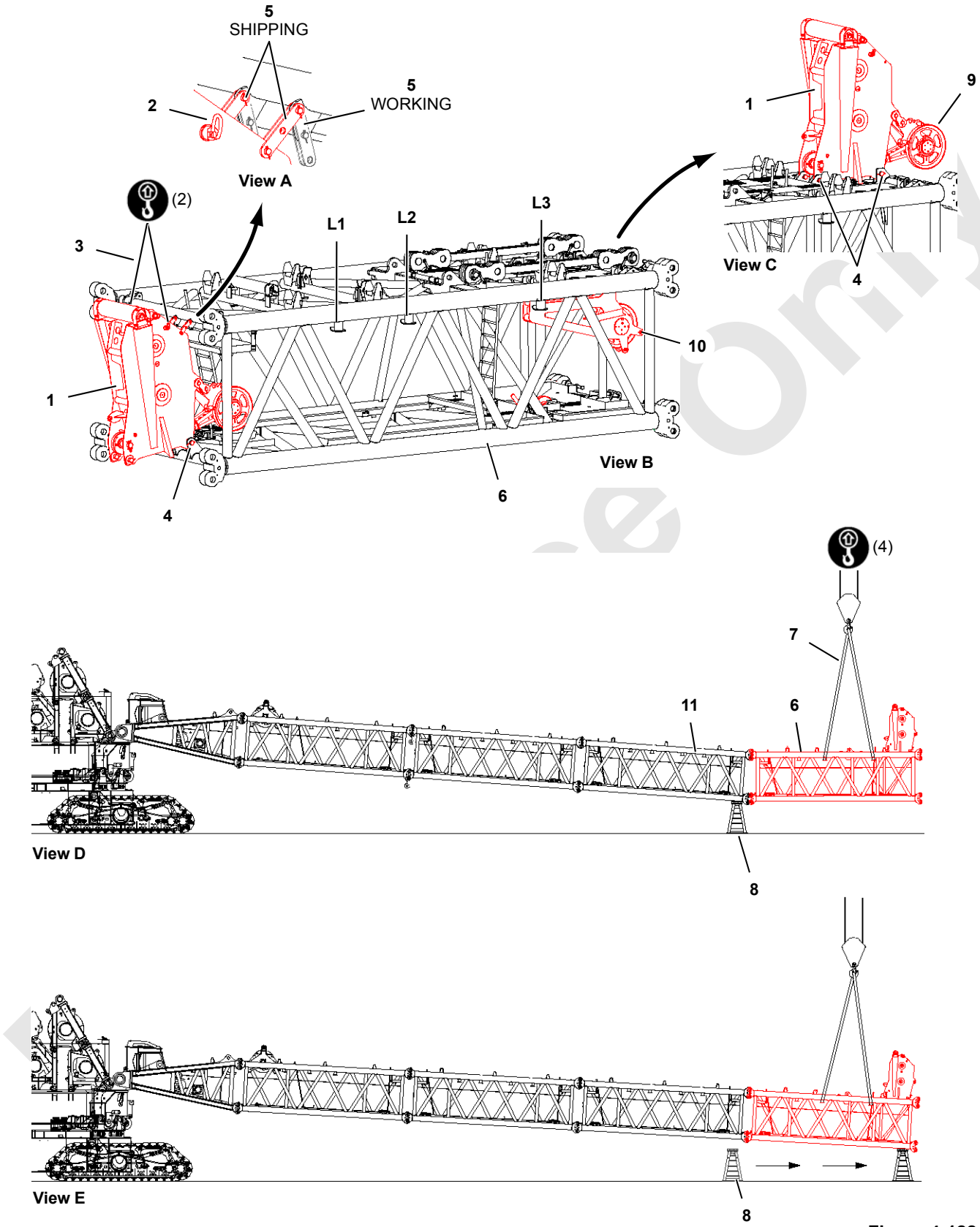


Figure 4-122

Legend for [Figure 4-122](#)

Item	Description
1	Wire Rope Guide
2	Lifting Lug (2)
3	Chain Lifting Sling
4	Pin with Cotter Pins (4)
5	Link with Pin and Cotter Pins (3)
6	10 m Insert with Equalizer Rails
7	Nylon Lifting Sling (4)
8	Boom Support (2)
9	Wire Rope Guide (optional for luffing lib)
10	Wire Rope Guide (optional for luffing lib)
11	10 m Insert without Boom Straps

Prepare 10 m Insert with Equalizer Rails

A wire rope guide is shipped on the end of the 10 m insert with equalizer rails. Remove the wire rope guide as follows.

See [Figure 4-122](#) for the following procedure.

1. Lift 10 m insert (6) off the trailer and place the insert on blocking at ground level.

Use four nylon lifting slings (7) attached to the proper lifting lugs:

- L1 and L3 (View B) for lifting the insert with wire rope guide (1, View C) stored on the end of the insert.
- L2 and L3 (View B) for lifting the insert with wire rope guide (1, View C) installed on the insert.

2. Connect two hooks from chain lifting sling (3, View B) to the lifting lugs on wire rope guide (1).
3. Support the wire rope with the lifting slings and remove pins (4, View B).

4. Unpin links (5, View A) from the wire guide and pin the links in the working position.
5. Remove wire rope guide (1) from the insert.
6. Remove the other two pins (4) from the wire rope guide.
7. Lift the wire rope guide into position on top of the insert, align the connecting holes, and install pins (4, View C).
8. Disconnect the lifting slings.
9. If necessary, deploy wire rope guides (9, View C) and (10, View B) as instructed in the Luffing Jib Operator Manual.

Install 10 m Insert with Equalizer Rails

1. Attach four nylon lifting slings (7) to lifting lugs (L2 and L3, View B) on 10 m insert (6).
2. Adjust the lifting slings so the 10 m insert is level from side to side.
3. Lift the 10 m insert into position in front of 10 m insert (11).
4. Connect the top pins between the inserts as instructed on [page 4-191](#).
5. Lower the insert until the bottom pin holes are aligned and connect the remaining pins as instructed on [page 4-191](#).
6. With the lifting slings still attached to 10 m insert (6), lift the inserts and the butt off boom supports (8).
7. Using a forklift, reposition boom supports (8, View E) under the end of 10 m insert (6).
8. Add blocking as needed between the boom supports and the insert so the insert does not twist when the lifting slings are disconnected. Failing to perform this step will make it difficult to connect the next insert.
9. Disconnect the lifting slings.

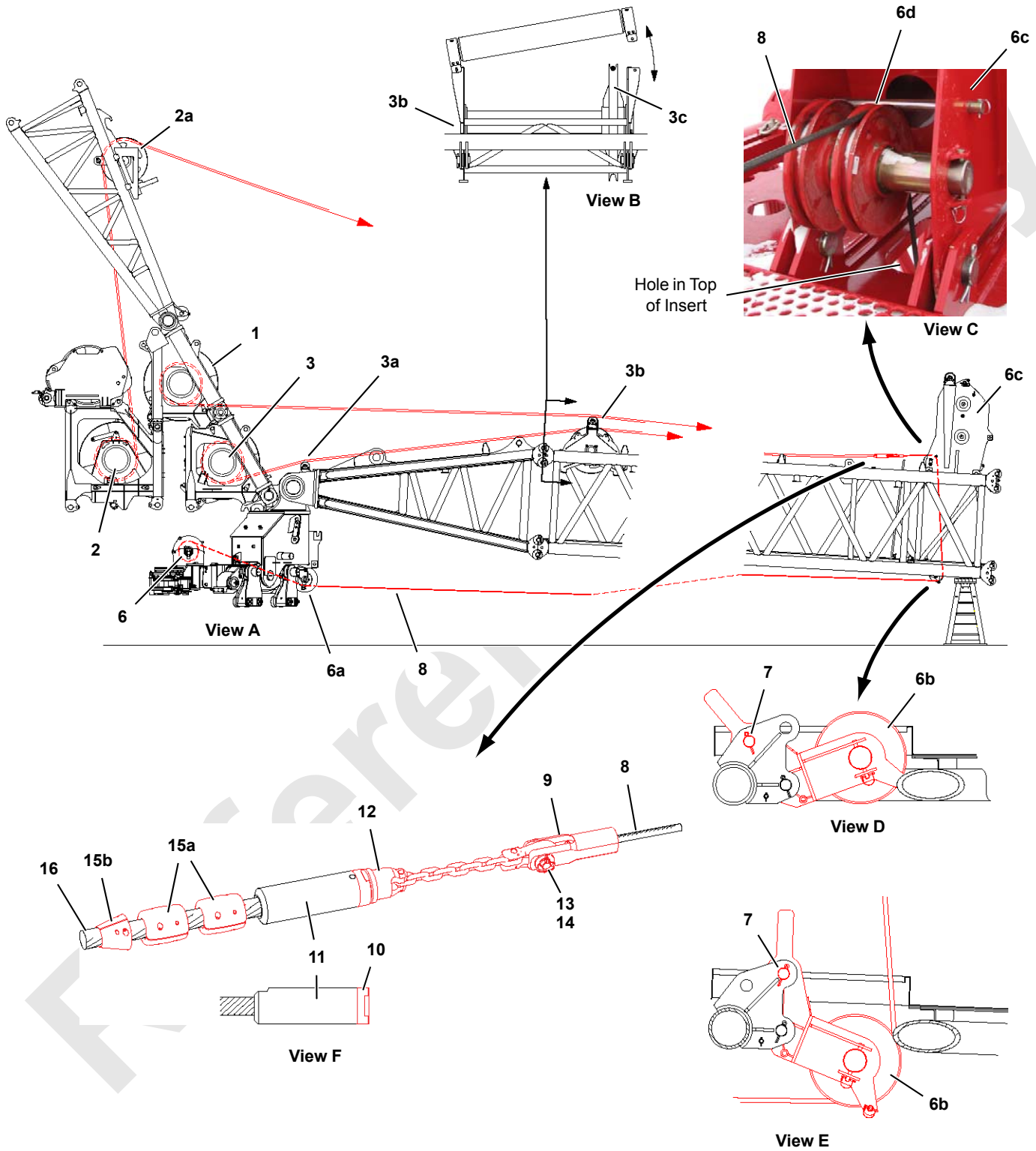


Figure 4-123

Legend for [Figure 4-123](#)

Item	Description
1	Drum 1
2	Drum 2
2a	Wire Rope Guide — Drum 2 in Mast
3	Drum 3
3a	Roller — Boom Butt
3b	Wire Rope Guide — 10 m Insert
3c	Sheave
6	Drum 6 — Rigging Winch
6a	Wire Rope Guide — Front Roller Carrier
6b	Wire Rope Guide — Bottom of 10 m Equalizer Insert
6c	Wire Rope Guide — Top of 10 m Equalizer Insert
6d	Sheave
7	Pin with Cotter Pins (1)
8	Rigging Line — from Rigging Winch
9	Button Socket (19 mm)
10	Button Cap
11	Button (50 mm)
12	Button Swivel Head with Chain and Coupler
13	Pin
14	Keeper
15a	Split Collar (2)
15b	Tapered Split Collar
16	Wire Rope — from Load Drum

Route Wire Rope from Drums to 10 m Equalizer Insert

See [Figure 4-123](#) for the following procedure.

1. Grasp the handle of wire rope guide (6b, View D) and remove pin (7).
2. Lower wire rope guide (6b, View E) to the rigging position and install pin (7).
3. Turn on the rigging winch mode (see [page 4-153](#)).
4. Pay out rigging line (8) and route it to the top of the 10 m equalizer insert as follows:
 - a. Pay out the rigging line from the top of rigging winch (6, View A).
 - b. Route the rigging line under wire rope guide (6a, View A).
 - c. Route the rigging line under wire rope guide (6b, View E).
 - d. Route the rigging line through the hole in the insert (View C) and over sheave (6d) in wire rope guide (6c).
5. Attach button socket (9, View F) to rigging line (8).
6. Prepare the wire rope from the load drum:
 - a. Remove button cap (10, View F) from the end of button (11).
 - b. Fasten button swivel head (12, View F) to the end of button (11).
 - c. Pin the coupler on button swivel head chain (12, View F) to button socket (9) with pin (13) and keeper (14).
 - d. Fasten split collars (15a, View F) and tapered split collar (15b) to wire rope (16). Space the collars 2-3 in (50-70 mm) apart. The collars prevent the button from catching on parts during reeving/unreeving.
7. Route the wire rope from Drum 3 to the 10 m equalizer insert:
 - a. Unpin the roller on wire rope guide (3b, View B) and rotate the roller up to allow reeving the wire rope from Drum 3 over sheave (3c).
 - b. Pay out rigging line (8) to the end of the wire rope at Drum 3.
 - c. Perform step [6](#) at the end of the wire rope from Drum 3.
 - d. Connect the rigging line to the wire rope from the drum (View F).
 - e. Use Drum 3 control handle to pull the wire rope off the drum (see [page 4-153](#)).
 - f. Stop when the wire rope from the drum is as close as possible to wire rope guide (6c, View C).
 - g. Slacken the rigging line and disconnect button swivel head (12, View F) from button (11).
 - h. Connect button cap (10, View F) to button (11).
 - i. Remove tapered split collar (15b, View F) from wire rope (16).
 - j. Pin the roller to wire rope guide (3b, View B).
8. Route the wire rope from Drum 1 to the 10 m equalizer insert:
 - a. Pay out rigging line (8) to the end of the wire rope at Drum 1.
 - b. Repeat steps [7c](#) - [7i](#) for Drum 1. The wire rope from Drum 1 must pass over the top of the roller on wire rope guide (3b).
9. Route the wire rope from Drum 2 to the 10 m equalizer insert:
 - a. Pay out rigging line (8) to the end of the wire rope at Drum 2. The rope must pass over the top of wire rope guide (2a, View A).
 - b. Repeat steps [7c](#) - [7i](#) for Drum 2.

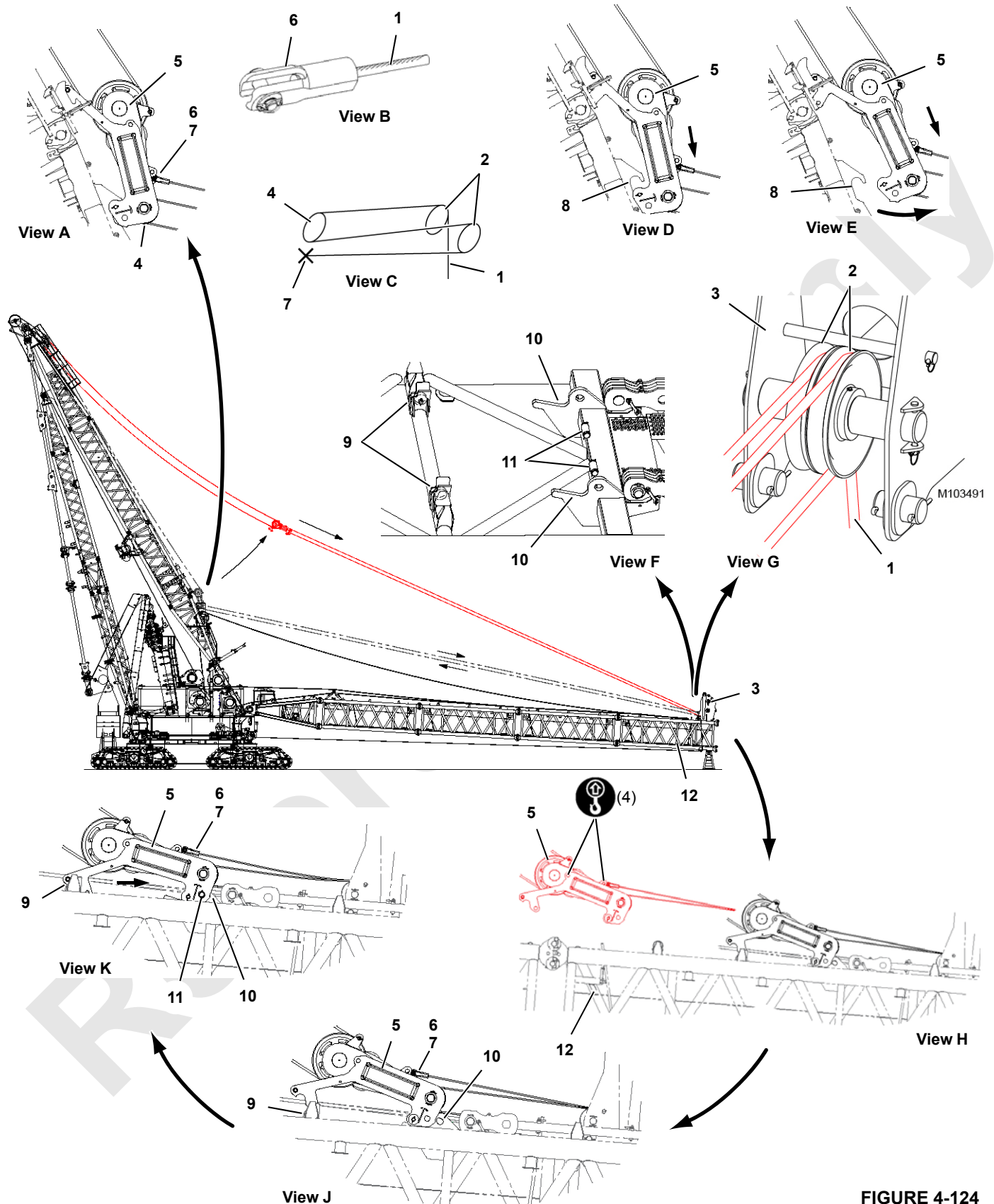


FIGURE 4-124

Legend for [Figure 4-124](#)

Item	Description
1	Rigging Line (from Drum 6)
2	Sheave (2)
3	Wire Rope Guide
4	Sheave
5	Equalizer
6	Button Socket
7	Lug
8	Hook (2)
9	Roller (2)
10	Rail (2)
11	Pin with Cotter Pins (2)
12	10 m Equalizer Insert

Move Equalizer from Mast to 10 m Equalizer Insert

See [Figure 4-124](#) for the following steps.

1. Turn on the rigging winch mode (see [page 4-157](#)).
2. Turn on the setup remote mode (see [page 4-118](#)).
3. Pay out rigging line (1) with Drum 6 control handle in the cab.
4. Reeve rigging line (1, View G) through sheaves (2) in wire rope guide (3) and through sheave (4, View A) in equalizer (5).
See the reeving diagram in View C.
5. Install button socket (6, View B) on the rigging line and connect the button socket to lug (7, View A) on equalizer (5).
6. Turn off the rigging winch mode (see [page 4-157](#)).
7. Slowly pay out boom hoist wire rope until equalizer (5, View D) disengages hooks (8) on the mast butt.
8. Turn on the rigging winch mode and activate Drum 4 control handle on the right console in the cab.

9. Push Drum 4 control handle forward to simultaneously pay out the boom hoist wire rope and haul in the rigging line.

The equalizer will pivot away from the mast butt (View E) and automatically lower to the boom.

GO SLOW during the lowering process.

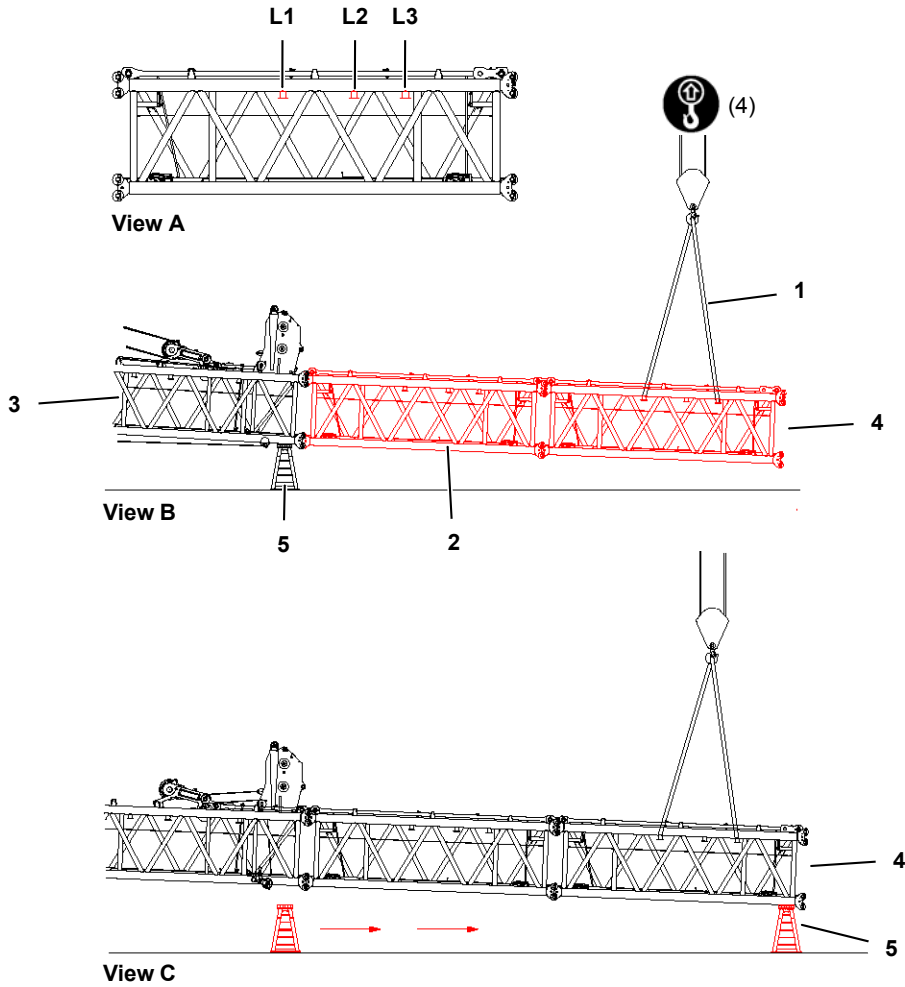
10. Stop the operation when equalizer (5 View H) is over the butt end of 10 m insert (12).
11. Attach four legs of the chain lifting sling from the assist crane to the lifting lugs on the equalizer.
12. Push Drum 4 control handle forward to simultaneously pay out the boom hoist wire rope and haul in the rigging line. **Follow with assist crane so equalizer does not bounce into insert and cause damage.**
13. Stop the operation when equalizer (5, View J) lands on rollers (9, View F) and rails (10).
14. Turn off the rigging winch mode (see [page 4-157](#)).
15. Slowly pay out boom hoist wire rope until equalizer (5, View K) rolls all the way forward on rails (10, View F).
16. Remove pins (11, View F) from storage.
17. Fasten equalizer (5, View K) to rails (10) with pins (11).
18. Turn on the rigging winch mode and slacken the rigging line.
19. Disconnect the rigging line from lug (7, View J) on equalizer (5) and store the rigging line.
20. Disconnect the lifting slings.

NOTE Once the equalizer is pinned to the equalizer insert, the boom can be raised to a maximum angle of 40°.

Additionally, the boom can be raised with the following length of inserts cantilevered beyond the equalizer insert:

- 30 m (98.4 ft) with luffing jib backstay straps installed.
- 35 m (114.8 ft) without luffing jib backstay straps installed

See the Boom Handling with Equalizer Table in the Boom Assembly Drawing.



! WARNING
Falling Load Hazard!

See Boom Handling with Equalizer Table in Boom Assembly Drawing at end of this section to determine maximum boom that can be cantilevered beyond equalizer.

Equalizer lugs can break allowing boom to fall if equalizer is overloaded.

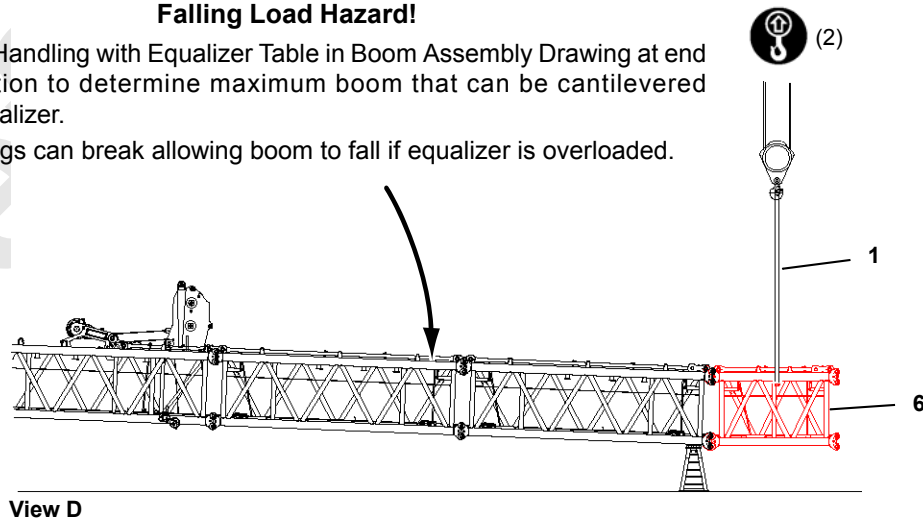


FIGURE 4-125

Legend for [Figure 4-125](#)

Item	Description
1	Nylon Lifting Sling (4)
2	Insert
3	Equalizer Insert
4	Insert
5	Boom Support
6	Insert

Install Remaining Inserts

See [Figure 4-125](#) for the following steps.

The remaining inserts must be installed in the sequence shown in the Boom Assembly Drawing at the end of this section.

1. Attach four nylon lifting slings (1) to lifting lugs (L1 and L3, View A) on insert (2).

The 10 m inserts have six lifting lugs:

- Use lugs L1 and L2 for lifting the insert on and off the trailer.
- Use lugs L1 and L3 for installing and removing the insert from the boom.

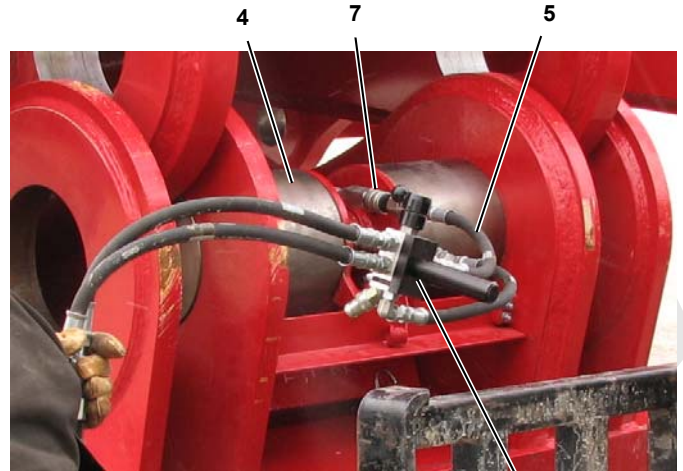
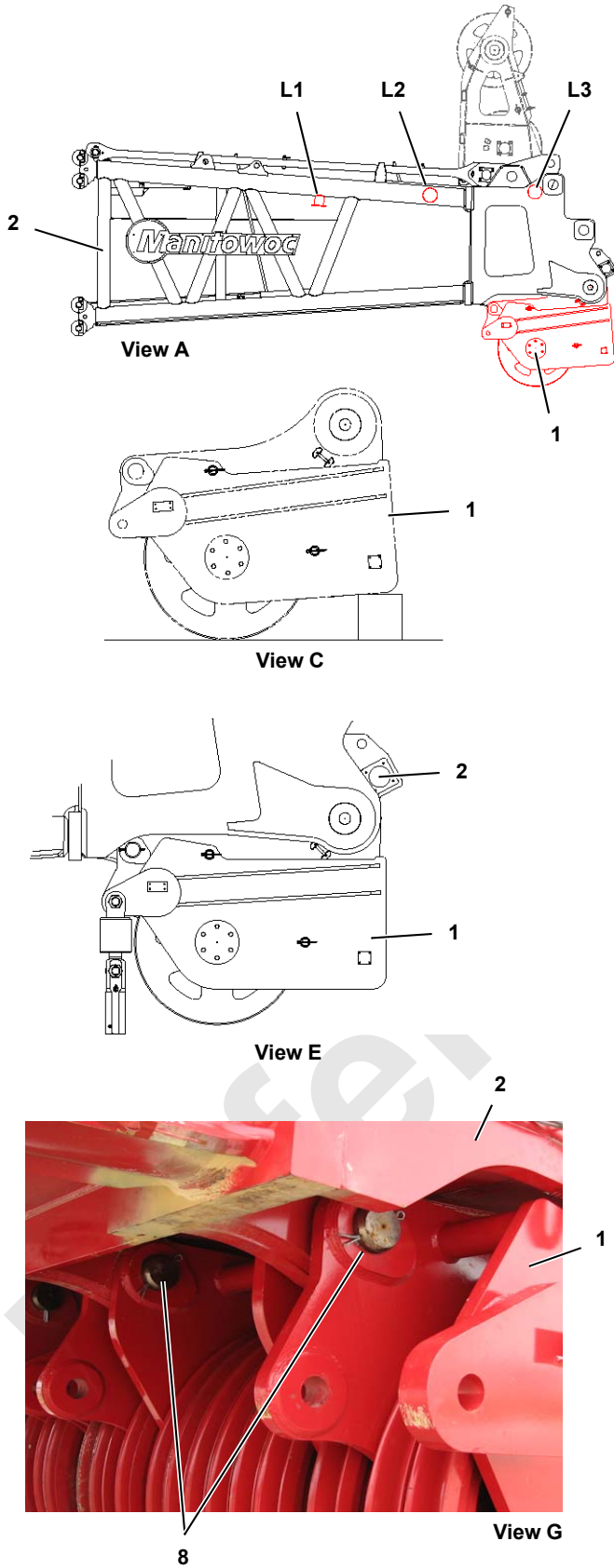
The 5 m inserts have two lifting lugs in the center of the inserts.

2. Adjust the lifting slings so the insert is level from side to side.
3. Lift insert (2) into position in front equalizer insert (3).

4. Connect the top pins between the inserts as instructed on [page 4-191](#).
5. Lower the insert until the bottom pin holes are aligned and connect the remaining pins as instructed on [page 4-191](#).
6. Disconnect the lifting slings.
7. Repeat steps [1](#) through [6](#) for insert (4).

See Boom Handling with Equalizer Table in Boom Assembly Drawing at end of this section to determine maximum boom that can be cantilevered beyond equalizer.

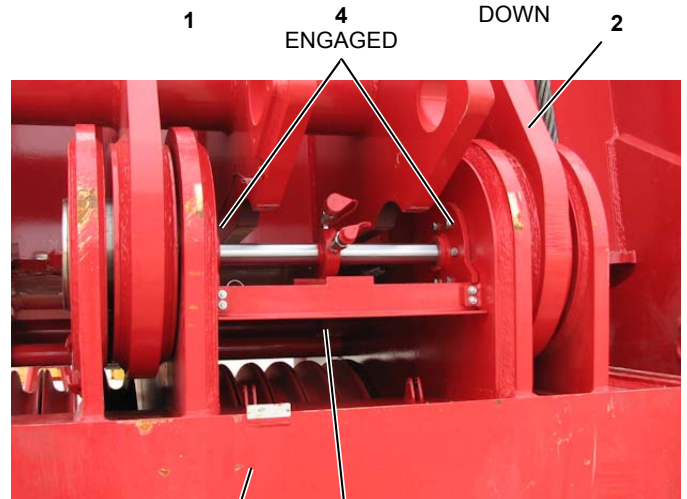
- **Be sure to use an assist crane as specified in the table.**
 - **When an assist crane is required, 31000 operator must boom up while assist crane operator hoists against boom so that both cranes are loaded equally.**
 - **Operator's must have voice communication.**
8. Lift the boom off supports (5, View C).
 9. Using a forklift, move boom supports (5, View C) to the end of insert (4).
 10. Add blocking as needed between the boom supports and the insert so the insert does not twist when the lifting slings are disconnected. Failing to perform this step will make it difficult to connect the next insert.
 11. Disconnect the lifting slings.
 12. Repeat all of the above steps for the remaining boom inserts.



View B



View D

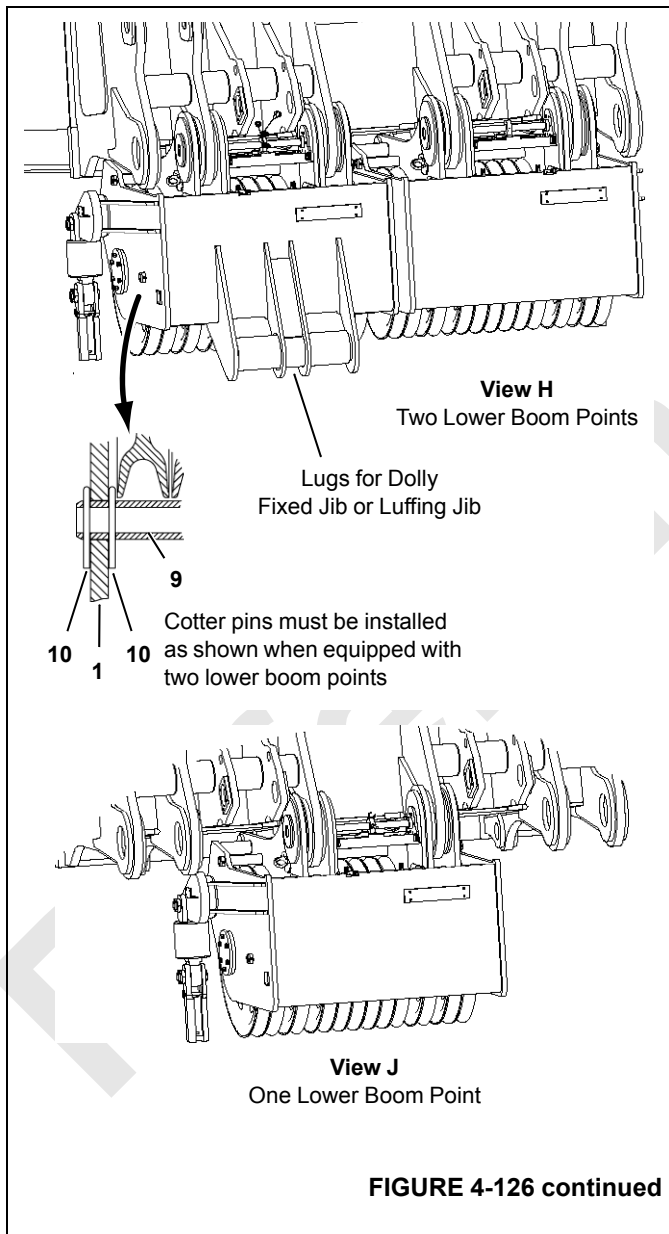


View F

FIGURE 4-126

Legend for [Figure 4-126](#)

Item	Description
1	Lower Boom Point (1 or 2)
2	Boom Top
3	Locking Plate with Wire Lock Pins
4	Hydraulic Pins (2)
5	Hydraulic Hoses from Power Unit (2)
6	Hand-Held Valve Assembly
7	Hydraulic Couplers (2)
8	Pin with Cotter Pin (1 or 2)
9	Rope Guard
10	Cotter Pin (2 each rope guard)



Install Lower Boom Points

See [Figure 4-126](#) for the following steps.

There are two lower boom point arrangements as shown in Views H and J.

1. Place lower boom point (1, View C) on blocking so the front end is higher than the rear end.
2. Unpin locking plate (3, View F) from the UP position and pin the plate in the DOWN position (View D).

Hydraulic pins (4, View D) cannot be disengaged until the locking plate is down.

3. Attach hydraulic hoses (5, View B) and hand-held accessory valve (6) from the PPU to hydraulic couplers (7) at hydraulic pins (4) in the lower boom point.
4. Start the PPU and disengage the hydraulic pins with the hand-held accessory valve.
5. Attach four nylon lifting slings to lifting lugs (L1, L2 or L3, View A) on boom top (2).
 - Use lugs L1 and L2 for lifting the boom top when the wire rope guide is removed.
 - Use lugs L1 and L3 for lifting the boom top when the wire rope guide is installed as shown in View A.
6. Lift boom top (2) into position over lower boom point (1) and align the front connecting holes.

7. Engage hydraulic pins (4, View F).
8. Unpin locking plate (3, View D) from the DOWN position and pin the plate in the UP position (View F).

The locking plate must be up to LOCK the pins in the engaged position.

9. Turn off the power unit and disconnect the hydraulic hoses.
10. Use a forklift to rotate the rear of the lower boom point up until the rear connecting holes are aligned and install pin (8, View G).
11. Repeat the above steps for the other lower boom point if required.

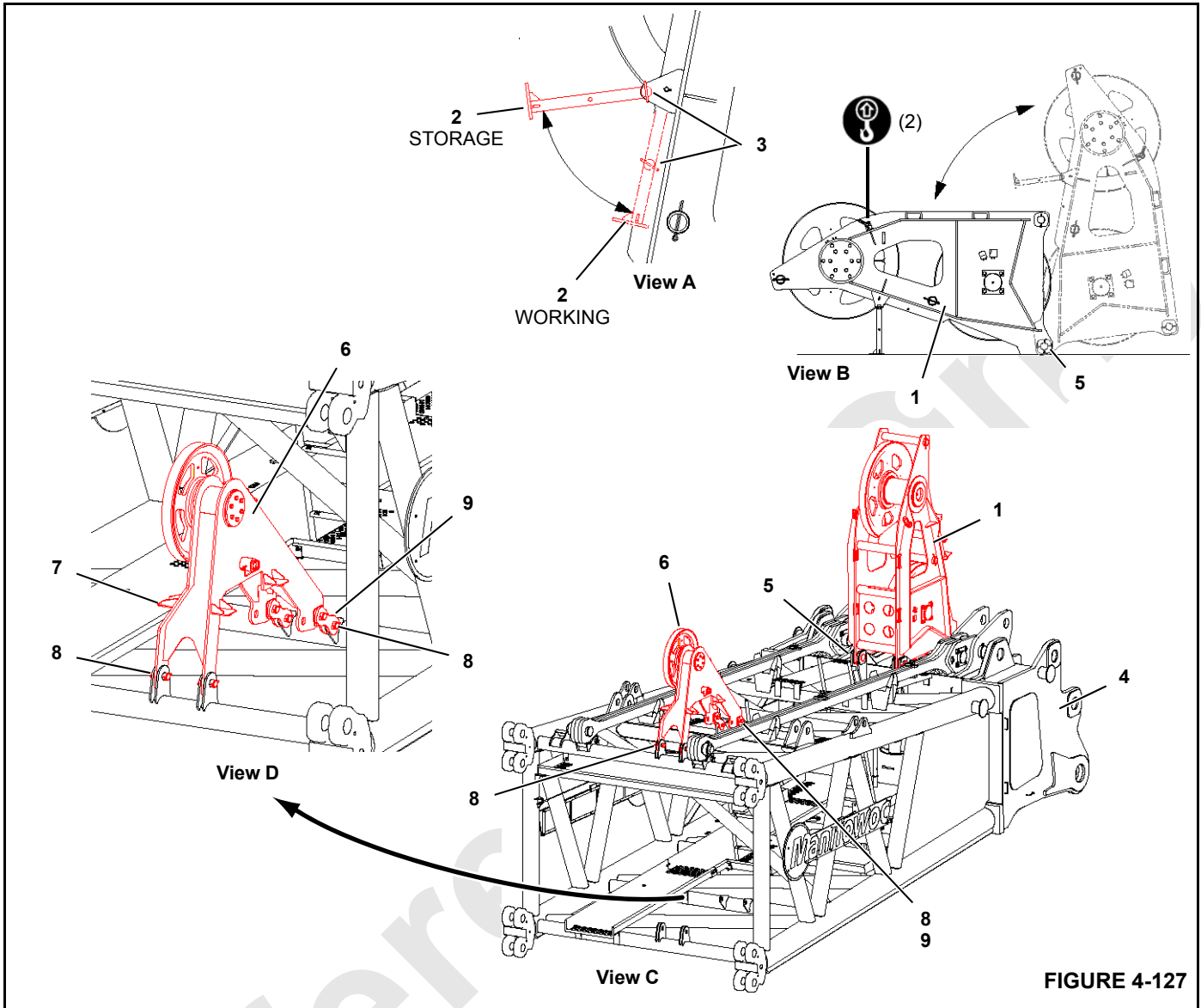


FIGURE 4-127

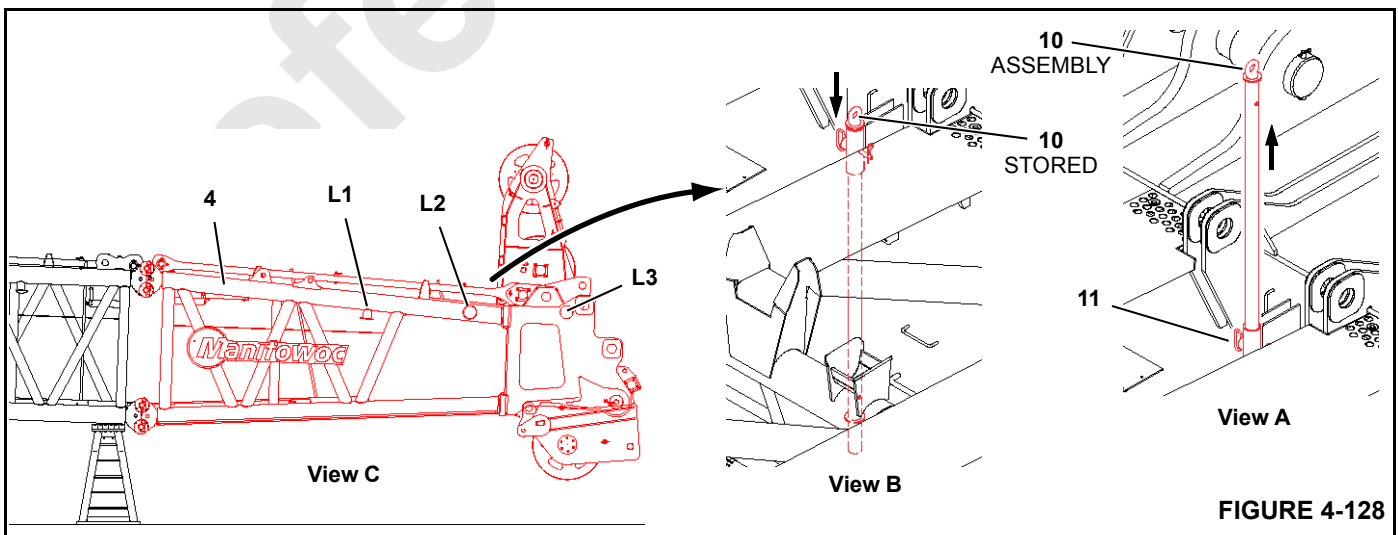


FIGURE 4-128

Legend for [Figure 4-127](#) and

Item	Description
1	Wire Rope Guide
2	Stand (2)
3	Hitch Pin with Hair-Pin Cotter (2)
4	Boom Top
5	Pin with Cotter Pin
6	Wire Rope Guide
7	Lifting Lug (4)
8	Pin with Cotter Pins (4)
9	Link (4)
10	Anchor
11	Hitch Pin with Hair-Pin Cotter

NOTE Besides the horizontal lifeline inside each boom section, anchor (10, [Figure 4-128](#)) is provided in the boom top. When personnel are working on top of the boom top:

- Raise the anchor to the assembly position (View A).
- Connect the personnel fall protection lanyard to the anchor.
- Lower the anchor to the stored position when not in use.

Install Boom Top Wire Rope Guides

See [Figure 4-127](#) for the following steps.

1. Attach two legs of chain lifting slings to the lifting lugs on wire rope guide (1, View B).
2. Lift the wire rope guide to vertical.
3. Unpin stands (2, View A) from the storage position and pin the stands in the working position.
4. Lift wire rope guide (1, View C) into position on boom top (4).
5. Remove pins (5, View B) from the wire rope guide.
6. Align the connecting holes and install pins (5).
7. Disconnect the lifting slings.

NOTE Perform the remaining steps if the crane will be rigged with a luffing jib.

8. Position the forks from a forklift under lifting lugs (7, View D) on wire rope guide (6).
9. Remove pins (8, View D) and lift the wire rope guide out of the insert.
10. If a luffing jib will be attached to the boom, install wire rope guide (6, View C) on boom top (1) as follows. Otherwise, store the wire rope guide for future use.
 - a. Lift wire rope guide (6, View C) into position on boom top (1).
 - b. Align the connecting holes and install pins (8).

Install Boom Top

See [Figure 4-128](#) for the following steps.

1. Attach four nylon lifting slings to lifting lugs (L1, L2 or L3, View A) on boom top (4).
 - Use lugs L1 and L2 for lifting the boom top when the wire rope guide is removed.
 - Use lugs L1 and L3 for lifting the boom top when the wire rope guide is installed.
2. Adjust the lifting slings so the boom top is level from side to side.
3. Lift the boom top into position at the insert.
4. Connect the top pins between the boom top and insert as instructed on [page 4-191](#).
5. Lower the boom top until the bottom pin holes are aligned and connect the remaining pins as instructed on [page 4-191](#).
6. Disconnect the lifting slings.

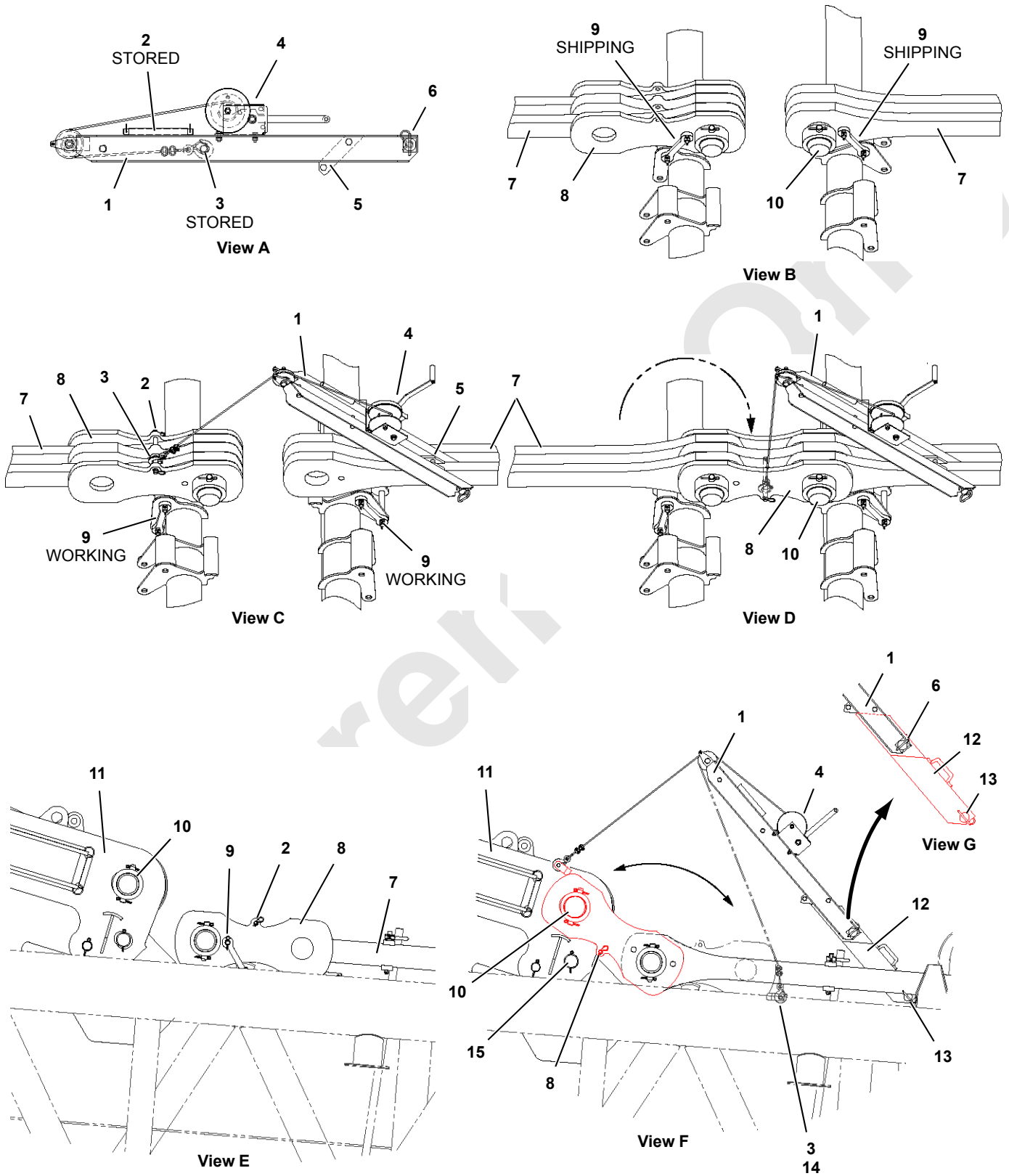


FIGURE 4-129

Legend for [Figure 4-129](#)

Item	Description
1	Strap Rigging Winch
2	Lifting Pin with Hair-Pin Cotters
3	Hook
4	Winch
5	Guide Bars
6	Hitch with Hair-Pin Cotter
7	Boom Strap (2 sets of 2 each boom section)
8	Boom Strap Links (2 sets of 3 each boom section)
9	Link with Pin and Cotter Pins (4)
10	Pin with Collar, Retaining Pin and Cotter Pins (2 each boom section)
11	Equalizer
12	Winch Strap Extension
13	Hitch with Hair-Pin Cotter
14	Winch Adapter
15	Pin with Cotter Pins (2)

Connect Boom Straps to Adjacent Section

See [Figure 4-129](#) for the following steps.

Starting at the boom top, connect the boom straps at the end of each boom section — both sides of boom — as follows.

1. Unpin links (9, View B) from the shipping position and pin them in the working position (View C).
2. Remove hitch pin (6, View A) from strap rigging winch (1).
3. Place strap rigging winch (1, View C) on boom strap (7) and install hitch pin (6).
4. Pay out the rigging line and disconnect hook (3, View A) from storage.

NOTE Turn the winch handle clockwise to LIFT (haul in cable). **The ratchet must make a loud clicking noise.**

Turn the winch handle counterclockwise to LOWER (pay out line). No clicking will be heard because the automatic braking system is activated.

The brake is designed to hold the load when the winch handle is released.

5. Remove lifting pin (2, View A) from storage and install it in the holes in boom strap links (8, View C).
6. Connect hook (3, View C) to lifting pin (2).
7. Use winch (4, View C) to rotate boom strap links (8) to the working position (View D).
8. Install pin (10, View D).

9. Remove strap rigging winch (1) from the boom straps.
10. Repeat all of the above steps at the end of each boom section until you reach the boom strap links at the equalizer.

Connect Boom Straps to Equalizer

See [Figure 4-129](#) for the following steps.

1. Remove pins (10, View E) from equalizer (11).
2. Unpin links (9, View E) from the shipping position and pin them in the working position.
3. Install lifting pin (2, View E) in the holes in boom strap links (8).
4. Remove winch strap extension (12, View G) from storage on the equalizer insert wire rope guide.
5. Pin winch strap extension (12, View G) to strap rigging winch (1) with hitch pin (6).
6. Remove hitch pin (13, View G) from winch strap extension (12).
7. Place strap rigging winch (1, View F) and winch strap extension (12) on boom strap (7) and install hitch pin (13).
8. Connect hook (3, View F) to winch adapter (14) on the end of the boom strap links.
9. Use winch (4, View F) to rotate boom strap links (8) to the working position at equalizer (11).
10. Install pin (10, View F).
11. Remove strap rigging winch (1) from boom strap (7).
12. Repeat the above steps on the other side of the equalizer.
13. Store the strap rigging winch.

Unpin Equalizer from Equalizer Insert

CAUTION

Structural Damage Hazard!

To prevent structural damage to boom when it is raised:

- Remove and store pins (15) once straps are connected to equalizer.
- Do not attempt to raise boom until pins (15) are removed.

1. Remove pin (15, [Figure 4-129](#), View F) from both sides of the equalizer.
2. Store the pins in the pockets on the equalizer insert ([Figure 4-124](#), View F).

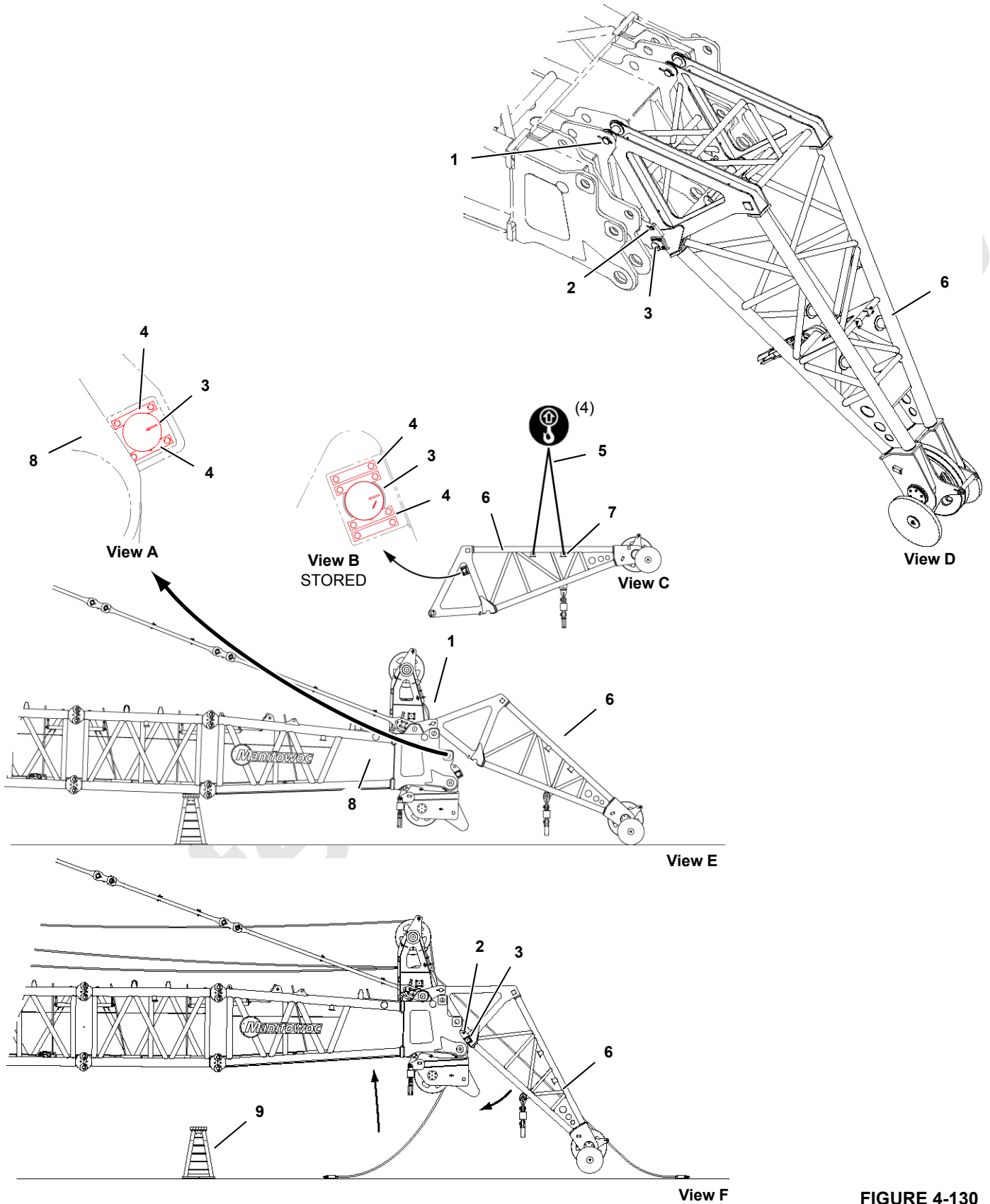


FIGURE 4-130

Legend for [Figure 4-130](#)

Item	Description
1	Pin with Cotter Pins (2)
2	Pin with Cotter Pins (2)
3	Load Pin (2)
4	Keeper Plate with Cap Screws and Lock Washers (8)
5	Nylon Lifting Sling (4)
6	Upper Boom Point
7	Lifting Lug (2)
8	Boom Top
9	Boom Support (2)

Install Upper Boom Point (Optional)

See [Figure 4-130](#) for the following steps.

1. Remove pins (1 and 2, View D) from the holes in upper boom point (6).
2. Install load pins (3):
 - a. Remove load pins (3, View B) from storage on upper boom point (6)
 - b. Attach load pins (3, View A) to boom top (8) with keeper plates (4).
 - a. **The arrow on each pin must point down.**
 - b. Apply Loctite #271 to the screw threads and torque the screws to 90 ft-lb (122 Nm).
3. Attach four nylon lifting slings (5) to lifting lugs (7, View C) on upper boom point (6).
4. Lift the upper boom point into position at the end of the boom top and align the connecting holes.
5. Install pins (1, Views D and E).
6. Lower the upper boom point until the rollers are on the ground and the lifting slings are slack.
7. Disconnect the lifting slings.
8. Perform the following procedures:
 - a. Attach Boom Point Electrical Components and Wiring (see [page 4-217](#)).
 - b. Pull Load Lines to End of Boom Points (see [page 4-219](#)).

! WARNING
Crush Hazard!

Upper boom point rollers will roll along ground as boom is raised.

To prevent personnel from being crush by rollers:

- Warn all personnel to stay clear of upper boom point rollers as boom is raised.

-
9. Once steps [8a](#) and [8b](#) are performed, proceed as follows:
 - a. Slowly raise the boom until the upper boom point rollers are off the ground. The upper boom point will now be resting on load pins (3).
 - b. Install pins (2, View D and F).

CAUTION

Structural Damage Hazard!

To prevent structural damage to boom top and upper boom point:

- Do not attempt to support boom on upper boom point rollers.

Keep upper boom point rollers off ground when bottom pins (2) are installed.

-
10. Using a forklift, remove boom supports (9, View F) from the area and store them (see [page 4-131](#)).

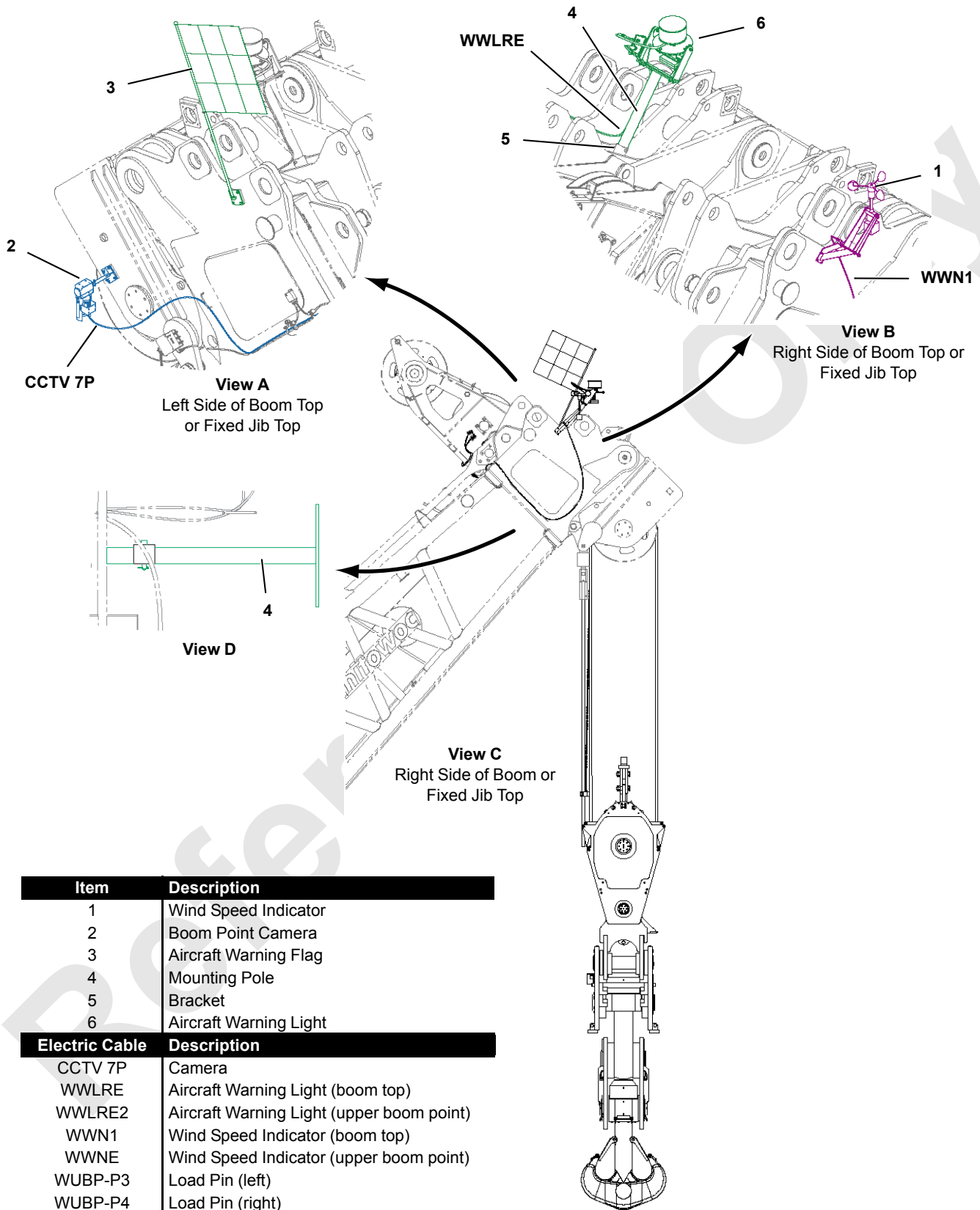


FIGURE 4-131

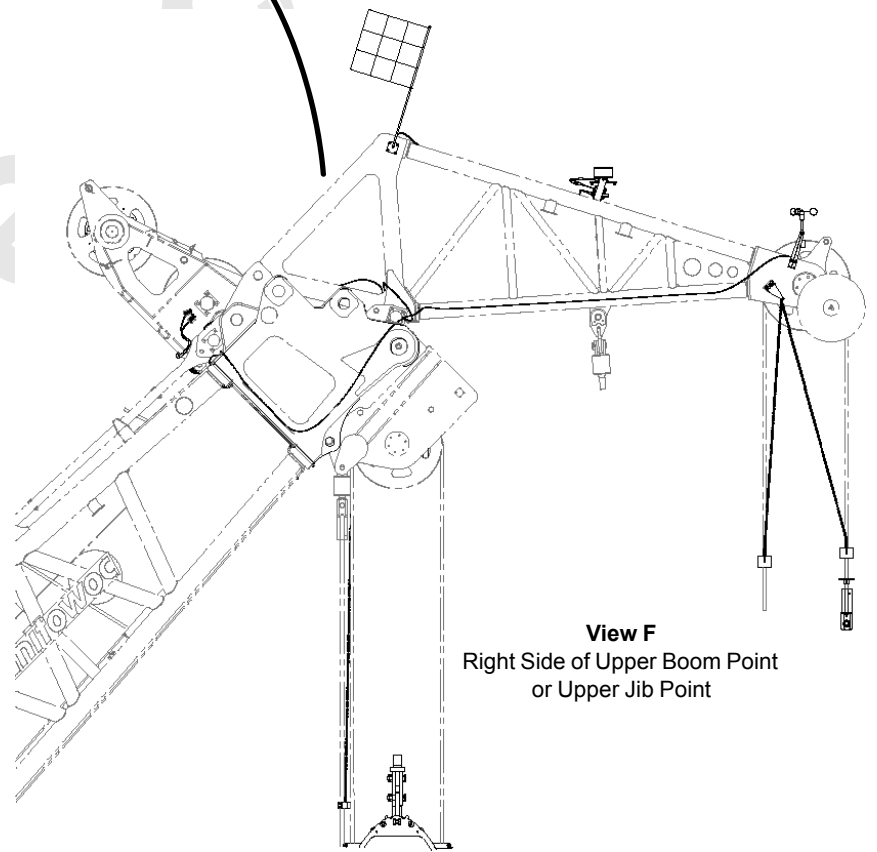
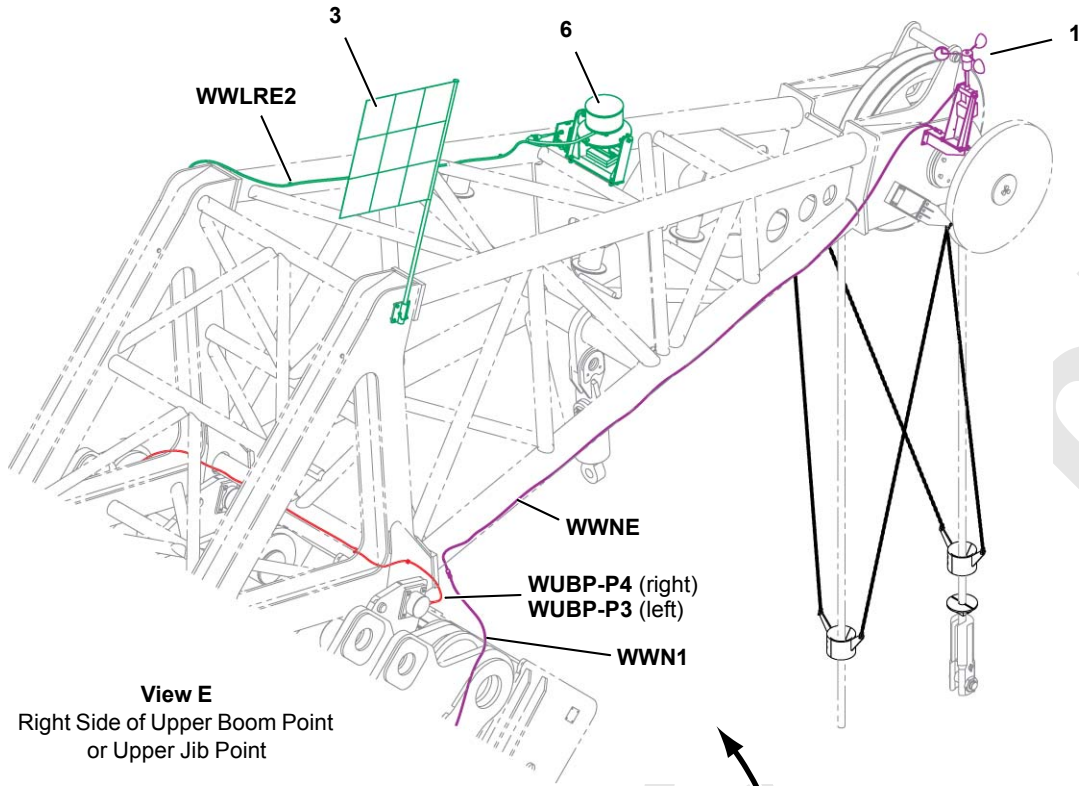


FIGURE 4-131 continued

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Attach Boom Point Electrical Components and Wiring

See [Figure 4-131](#) for the following procedure.

1. Thoroughly clean the ends of all cables and receptacles before connecting the electric cables.
 2. Always cover unused cables and receptacles with protective caps.
 3. Route the electric cables from the cable reels in the boom butt to the boom top as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.
 4. Secure the cables to the boom sections as shown in the drawing.
 5. Once the cables from the cable reels are connected to the boom top, connect the butt end of the cables from the cable reels to the supply cables in the boom butt. See the wiring diagram in the Electric Control Assembly – Boom Wiring and Limits at the end of this section.
 6. For boom with or without fixed jib, make sure the CAN BUS terminator plug is connected to the WN OUT receptacle on the boom top universal node.
 7. Install the wind speed indicator as follows:
 - a. Fasten wind speed indicator (1) either to the bracket on the boom top (View B) or to the bracket on the upper boom point (View E).
Use serrated washers to ensure a good ground.
 - b. Connect the electric cables as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.
8. Install the boom point camera as follows:
 - a. Fasten boom point camera (2, View A) to the left side of the boom top.
 - b. Connect the electric cables as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.
 9. Install the aircraft warning light as follows:
 - a. Fasten aircraft warning flag (3) either to the boom top (View A) or to the upper boom point (View E).

FOR BOOM TOP

- b. Remove mounting pole (4, View D) from storage and connect it to bracket (5, View B) on the boom top.
- c. Fasten aircraft warning light (6, View B) to mounting pole (4).
- d. Connect the electric cables as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.

FOR UPPER BOOM POINT

- e. Fasten aircraft warning light (6, View E) to the mounting bracket on the upper boom point.
- f. Connect the electric cables as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.

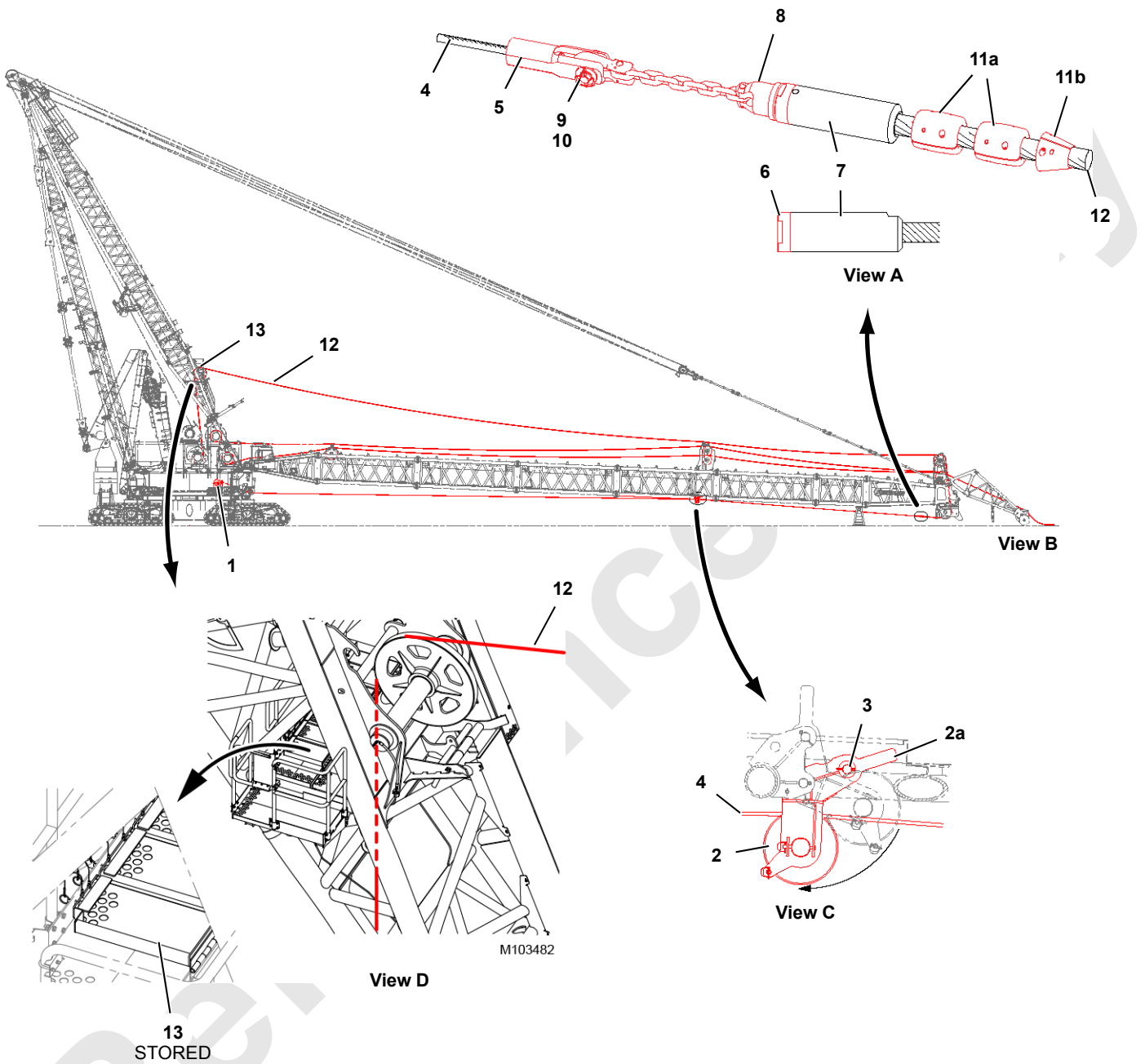


FIGURE 4-132

Legend for [Figure 4-132](#)

Item	Description
1	Drum 6 — Rigging Winch
2	Wire Rope Guide
2a	Handle
3	Pin with Cotter Pins (1)
4	Rigging Line — from Drum 6
5	Button Socket (19 mm)
6	Button Cap
7	Button (50 mm)
8	Button Swivel Head with Chain and Coupler
9	Pin
10	Keeper
11a	Split Collar (2)
11b	Tapered Split Collar
12	Wire Rope — from Load Drum
13	Mast Butt Platforms

Pull Load Lines to End of Boom Points

See [Figure 4-132](#) for the following procedure.

1. Rotate mast butt platforms (13, View D) rearward and pin for storage. This must be done before the wire rope from Drum 2 can be routed over the wire rope guide sheave in the mast butt.
2. Grasp handle (2a, View C) to support wire rope guide (2) and remove pin (3).
3. Lower wire rope guide (2) to the lowest position and install pin (3).
4. Route rigging line (4, View C) over the top of wire rope guide (2).
5. Attach button socket (5, View A) to rigging line (4).
6. Prepare the load line from the load drum, as follows:
 - a. Remove button cap (6, View A) from the end of button (7).
 - b. Fasten button swivel head (8, View A) to the end of button (7).
 - c. Pin the coupler on button swivel head chain (8) to button socket (5, View A) with pin (9) and keeper (10).
 - d. Fasten split collars (11a, View A) and tapered split collar (11b) to wire rope (12). Space the collars 2-3 in (50-70 mm) apart. The collars prevent the button from catching on parts during reeving/un-reeving.
7. Turn on the rigging winch mode ([page 4-157](#)).
8. Route the rigging line through the proper sheaves in the boom and jib as shown in the Boom Assembly Drawing at the end of this section.
9. Connect the rigging line to the load line as shown in View A and pull the load to the end of the boom point.

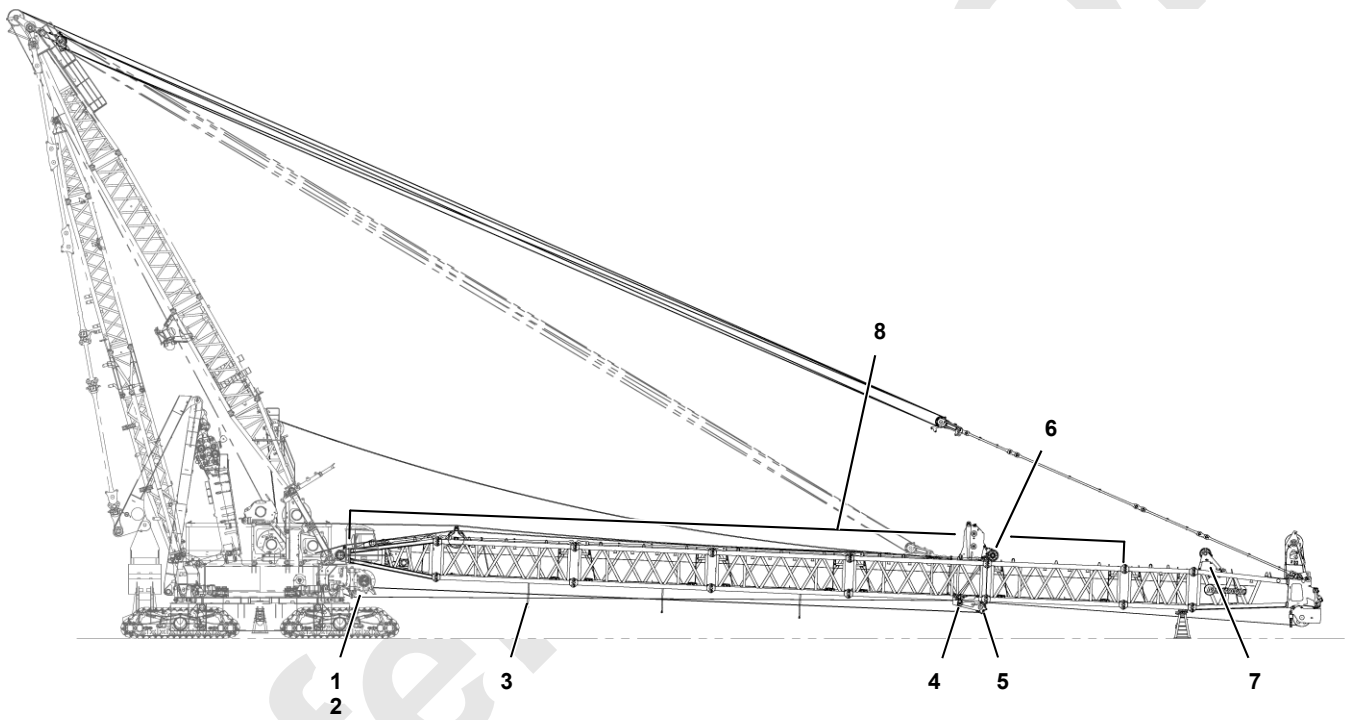


FIGURE 4-133

Reeve Load Lines

Refer to the Wire Rope Specifications Chart in the Capacity Chart Section of the Operator Information Manual to determine the parts of line required for your job. Size the hook block(s) accordingly.

Refer to the Hook Block and Reeving Guide (in operator cab) for hook block information and assembly instructions and for hook block reeving diagrams.

1. Use the rigging winch to pull the load lines through the hook blocks as shown in the block reeving drawings.
2. Dead end the load lines as shown in [Figure 4-135](#).
3. When done, store the rigging line on Drum 6 and store wire rope guide (10) as shown in [Figure 4-134](#).

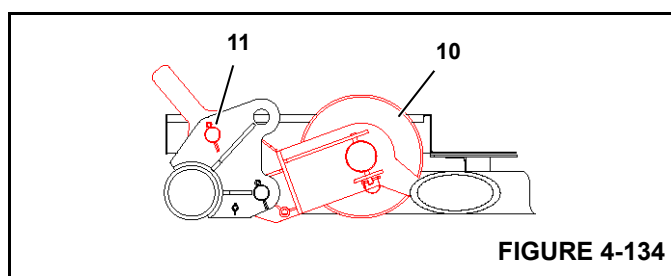


FIGURE 4-134

Connect Anti-Two Block Weights

Connect the anti-two block weights and chains to the load lines as shown in [Figure 4-135](#).

Install Jib

If the crane will be equipped with a fixed jib, install it at this time. See [page 4-229](#).

If the crane will be equipped with a luffing jib, install it at this time. See the separate Luffing Jib Operator Manual located in the operator cab.

Prepare Boom

The numbers in [Figure 4-133](#) correspond to the following item numbers.

1. Drum 5 (luffing hoist) either installed or removed.
2. Rigging winch lower wire rope guide installed under Drum 5, if installed.
3. Wire rope rollers (under boom sections) stored, deployed, or removed. See Luffing Jib Operator Manual for procedure.
4. Rigging winch wire rope guide stored. See [Figure 4-134](#).
5. Luffing hoist wire rope guide (item 9 on [page 4-203](#)) stored, deployed, or removed. See Luffing Jib Operator Manual for procedure. ***This wire rope guide must be stored or removed for 55 m and 60 m boom lengths if the boom will be operated above 80°.***
6. Luffing hoist wire rope guide (item 10 on [page 4-203](#)) stored, deployed, or removed. See Luffing Jib Operator Manual for procedure.
7. Luffing hoist wire rope guide (item 6 on [page 4-213](#)) stored, deployed, or removed. ***This wire rope guide must be stored or removed for 55 m, 60 m, and 65 m boom lengths.***
8. All jib backstay straps (fixed or luffing) removed from boom sections if a jib will not be attached.

Raise Boom

Perform the pre-raising steps given on [page 4-287](#).

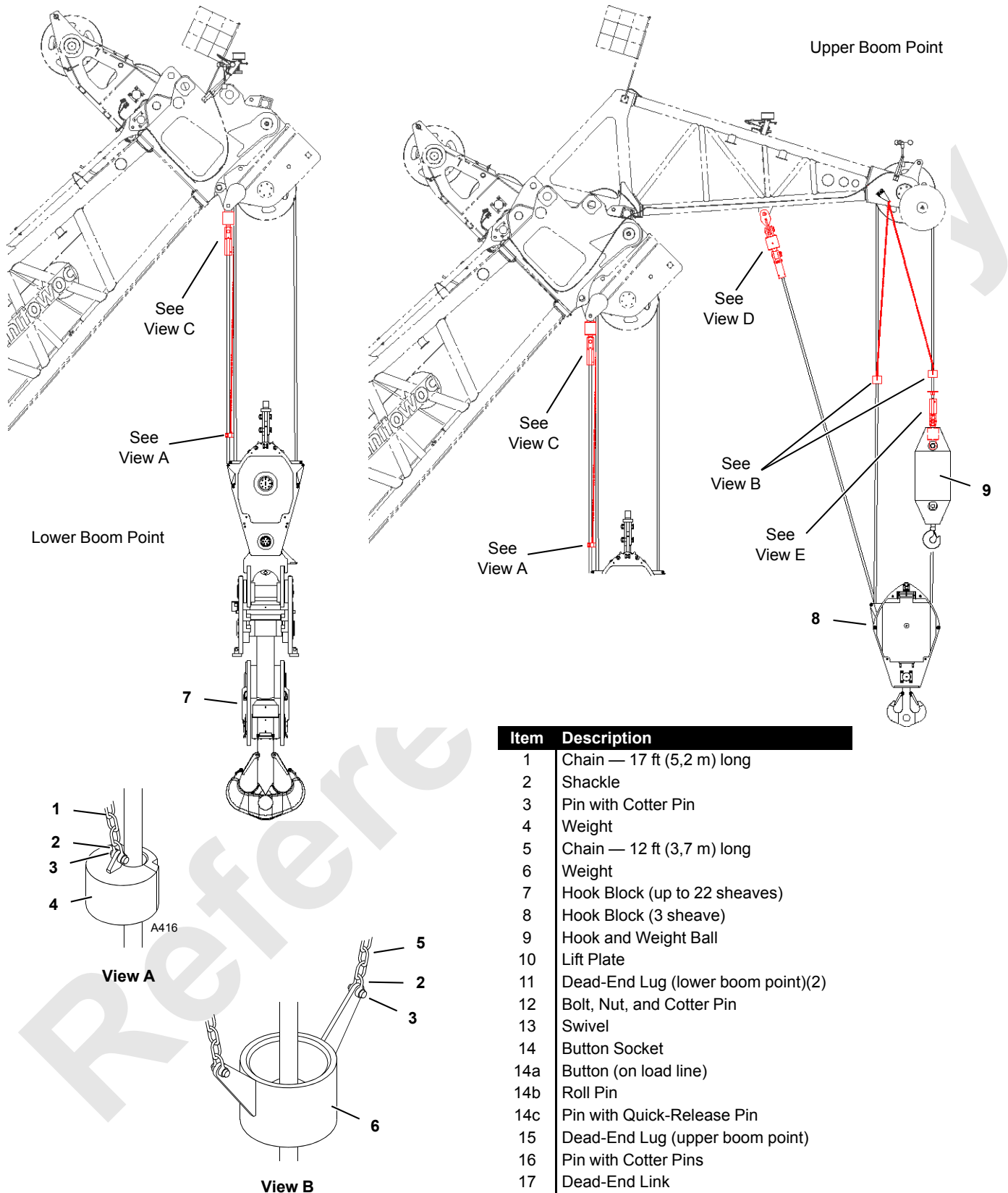
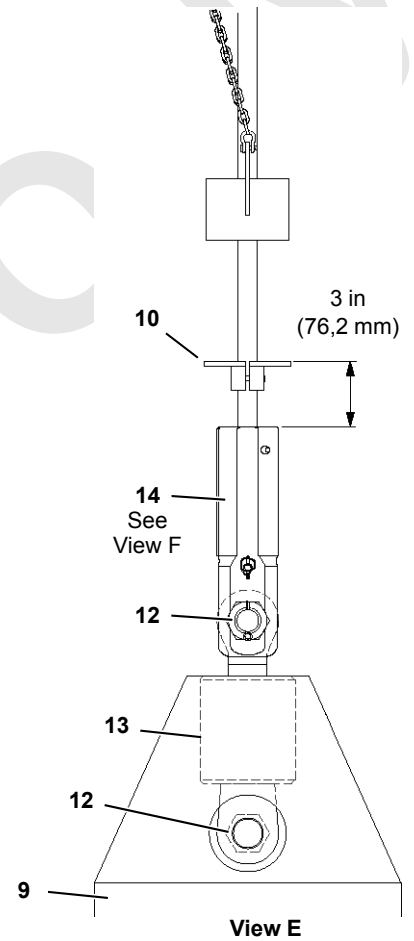
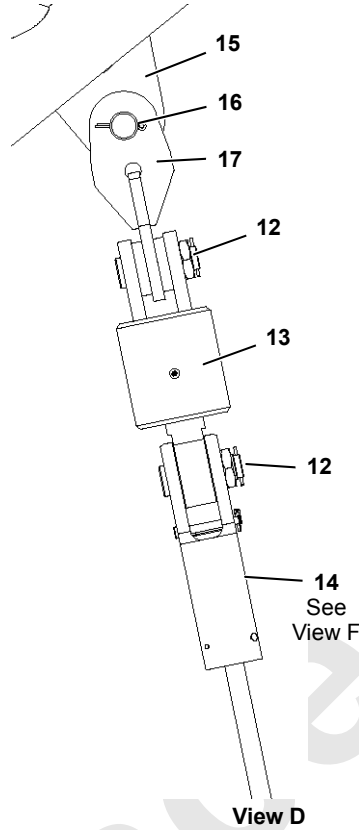
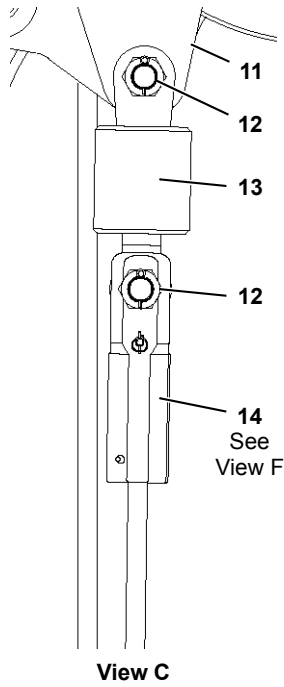
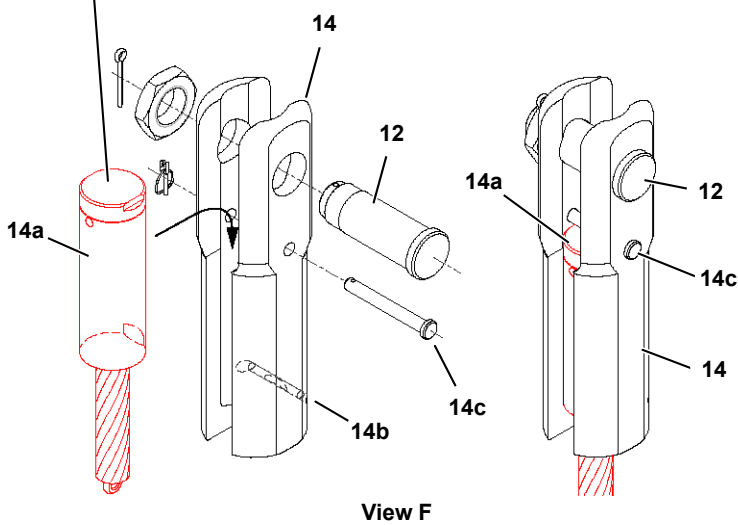


FIGURE 4-135



4

- Be sure to install button cap on button (14a).



- Flat on button (14a) must be against roll pin (14b).
- Be sure to install pin (14c) after button is inserted in socket.

FIGURE 4-135 continued

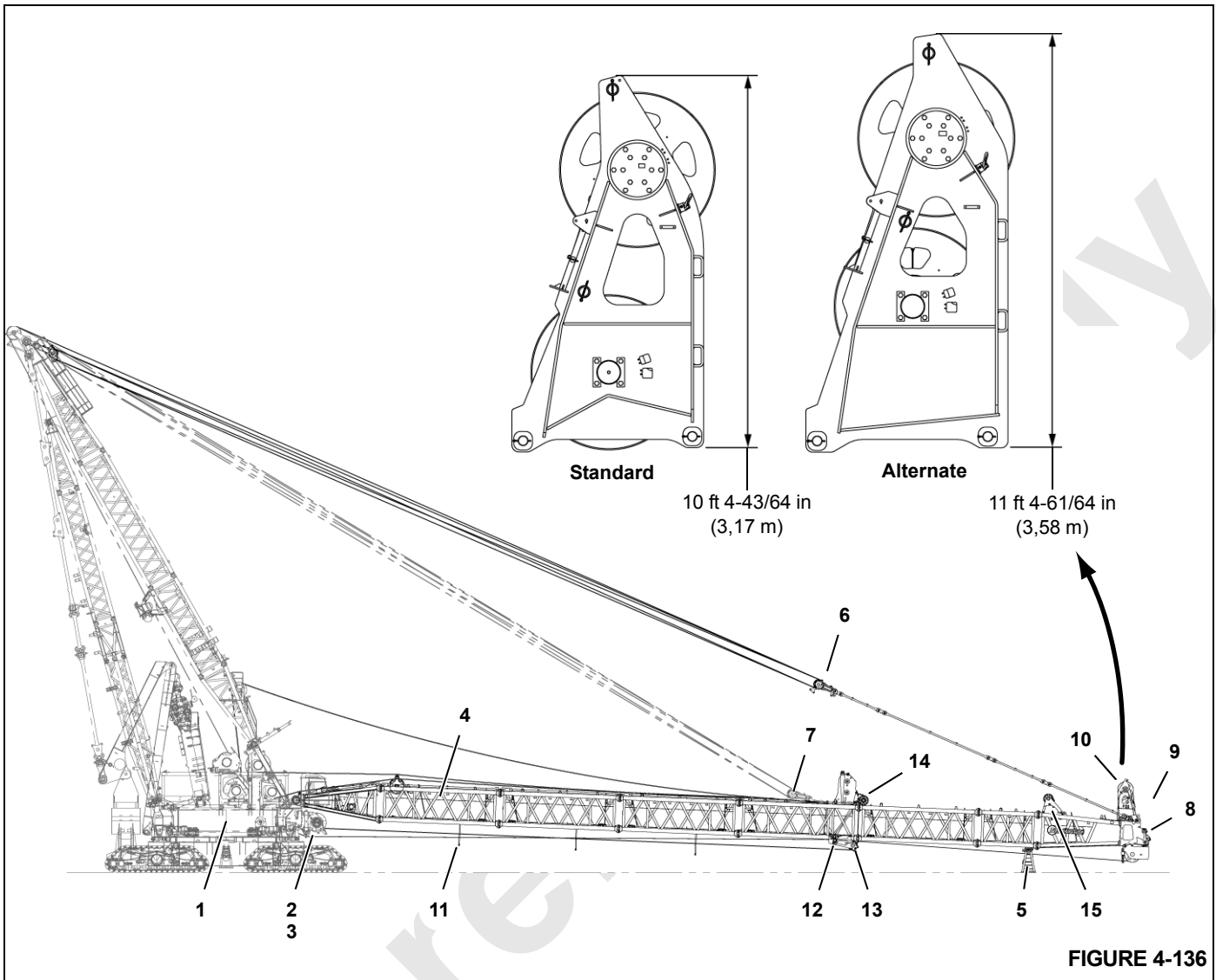


FIGURE 4-136

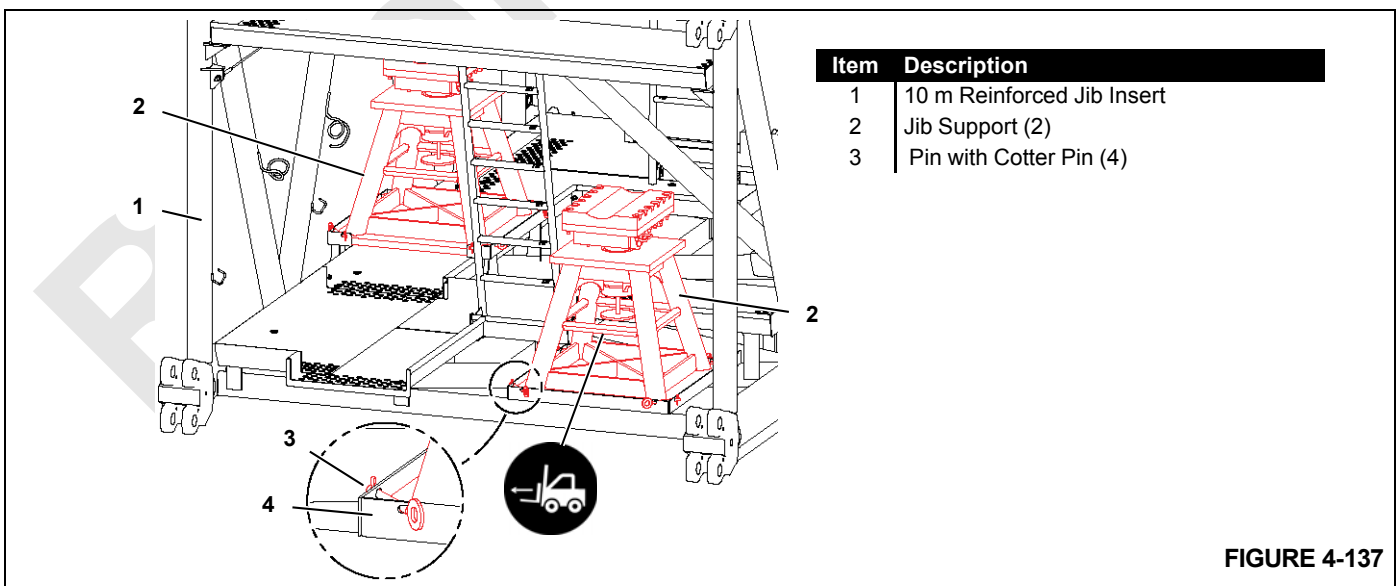


FIGURE 4-137

CRANE ASSEMBLY — FIXED JIB

Prepare Crane and Boom

See [Figure 4-136](#) for the following procedure.

The fixed jib assembly instructions assume that the crane and boom are in the following configuration.

The numbers in [Figure 4-136](#) correspond to the following item numbers.

1. Crane completely assembled.
2. Drum 5 (luffing hoist) either installed or removed.
3. Rigging winch lower wire rope guide installed under Drum 5, if installed.
4. Required boom length completely assembled.
5. Boom resting on boom supports.

Add shims between the boom and boom supports so the boom top is as level as possible from side to side. This step will make it easier to pin the jib butt to the boom top.
6. Equalizer raised initially so load lines can be routed under it.
7. Equalizer lowered onto equalizer insert after Drum 3 load line is routed under it.
8. One lower boom point without dolly lugs installed. See [page 4-211](#) for procedure.
9. Upper boom point removed. Reverse steps on [page 4-217](#).
10. Boom top wire rope guide relocated (see [page 4-213](#)):
 - Standard wire rope guide removed from boom top and installed on jib top.
 - Alternate wire rope guide installed on boom top.

11. Wire rope rollers (under boom sections) stored, deployed, or removed. See Luffing Jib Operator Manual for procedure.
12. Rigging winch wire rope guide lowered. See [page 4-223](#) for procedure.
13. Luffing hoist wire rope guide (item 9 on [page 4-203](#)) stored, deployed, or removed. See Luffing Jib Operator Manual for procedure. ***This wire rope guide must be stored or removed for 55 m and 60 m boom lengths if the boom will be operated above 80°.***
14. Luffing hoist wire rope guide (item 10 on [page 4-203](#)) stored, deployed, or removed. See Luffing Jib Operator Manual for procedure.
15. Luffing hoist wire rope guide (item 6 on [page 4-213](#)) stored, deployed, or removed. ***This wire rope guide must be stored or removed for 55 m, 60 m, and 65 m boom lengths.***

Remove Jib Supports from Storage

See [Figure 4-137](#) for the following procedure.

Two jib supports are stored for shipping inside the 6 m reinforced jib insert.

1. Support jib support (2) with a forklift.

Lift only under the tubular supports.
2. Remove pins (3).
3. Lift the jib support out of the insert.
4. Store pins (3) in tray (4) holes.
5. Place the jib support on the ground and remove the forklift.

NOTE Both jib supports have an adjusting wheel so the pivoting top stand can be raised or lowered to assist in leveling jib sections. Grease the adjusting mechanisms as required.

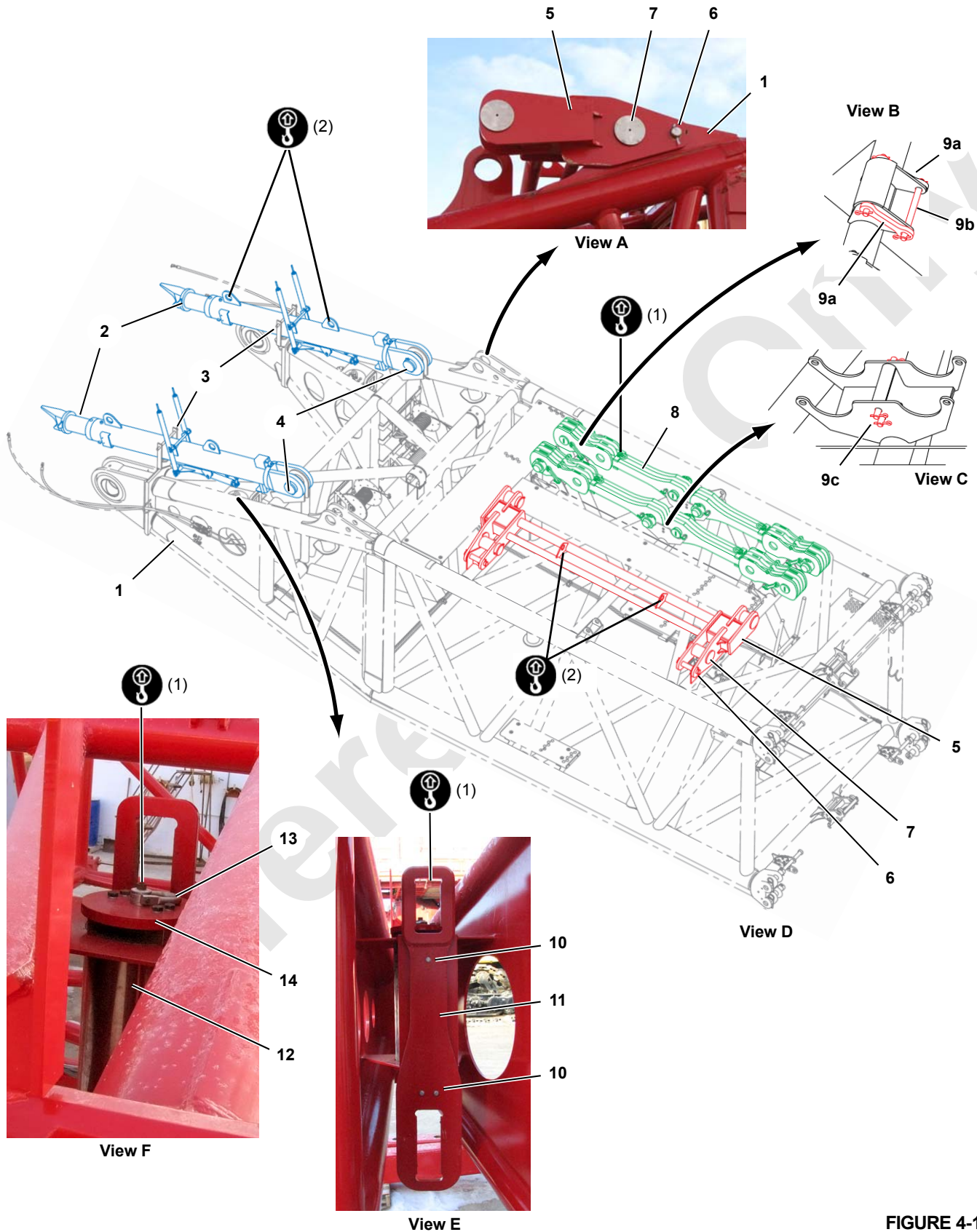


FIGURE 4-138

Legend for Figure 4-138

Item	Description
1	Jib Butt
2	Luffing Jib Stop (2)
3	Storage Pin with Cotter Pins (2)
4	Connecting Pin with Retaining Pin and Cotter Pins (2)
5	Jib Stop Spreader
6	Pin with Cotter Pins (2)
7	Pin with Cotter Pin (2)
8	Strap Assembly – 2.2 m (4)
9a	Strap Storage Link (8)
9b	Pin with Cotter Pins (4)
9c	Pin with Cotter Pins (4)
10	Screw with Washers and Nut (6)
11	Locking Link (2)
12	Hinge Pin (2)
13	Lifting Ring (1 each pin)
14	End Plate with Screws and Lock Washers (2 each pin)

Prepare Jib Butt

See [Figure 4-138](#) for the following procedure.

1. If installed, remove and store two luffing jib stops (2, View D), as follows:
 - a. Remove storage pin (3).
 - b. Attach two legs of the chain lifting sling to the lifting lugs on luffing jib stop (2).
 - c. Lift the luffing jib stop until it is horizontal and remove connecting pin (4).
 - d. Lift the jib stop clear of the jib butt.
 - e. Reinstall pin (4) in the luffing jib stop.
 - f. Reinstall pin (3) in the jib butt.
 - g. Store the luffing jib stop in a safe location for future use with the luffing jib.
 - h. Disconnect the lifting slings.
 - i. Repeat the steps for the other luffing jib stop.
2. Install jib stop spreader (5, View D), as follows:
 - a. Attach two legs of the chain lifting sling to the lifting lugs on jib stop spreader (5, View D).
 - b. Remove pins (6 and 7, View D) from both ends of the spreader.
 - c. Lift the spreader clear of the hooked storage lugs on the jib butt.
 - d. Pin jib stop spreader (5, View A) to the lugs on jib butt (1).
 - e. Disconnect the lifting slings.
3. Remove four strap assemblies (8, View D) from storage on the jib butt, as follows:

Strap assemblies (8) will not hang level when lifted. They will hang vertically. For that reason, please check the torque of the lifting ring bolts before lifting. The bolts must be torqued to 60 ft-lb (81 Nm).

 - a. Attach one leg of the chain lifting sling to the lifting ring on strap assembly (8, View D).
 - b. Unpin/remove the storage links and pins from the strap assembly.
 - c. Lift the strap assembly off the jib butt and place it to the side for use later in the assembly process.
 - d. Disconnect the lifting sling.
 - e. Store links (9a) and pins (9b and 9c) as shown in Views B and C.
 - f. Repeat the steps for each strap assembly.
4. Remove two locking links (11, View E) from boom butt (1), as follows:
 - a. Attach one leg of the chain lifting sling to locking link (11).
 - b. Remove screws (10) securing the link to the jib butt and lift the link out of the butt.
 - c. Securely reinstall the screws in the jib butt.
 - d. Place the locking link on the ground next to the boom top and disconnect the lifting sling.
 - e. Repeat the steps for the other locking link.
5. Remove two hinge pins (12, View F) from jib butt (1), as follows:
 - f. Attach one leg of the chain lifting sling to lifting ring (13) in hinge pin (12).
 - g. Remove end plate (14) from the other end of the hinge pin and lift the hinge pin out of the jib butt.
 - h. Place the hinge pin on the ground next to the boom top and disconnect the lifting sling.
 - i. Repeat the steps for the other hinge pin.

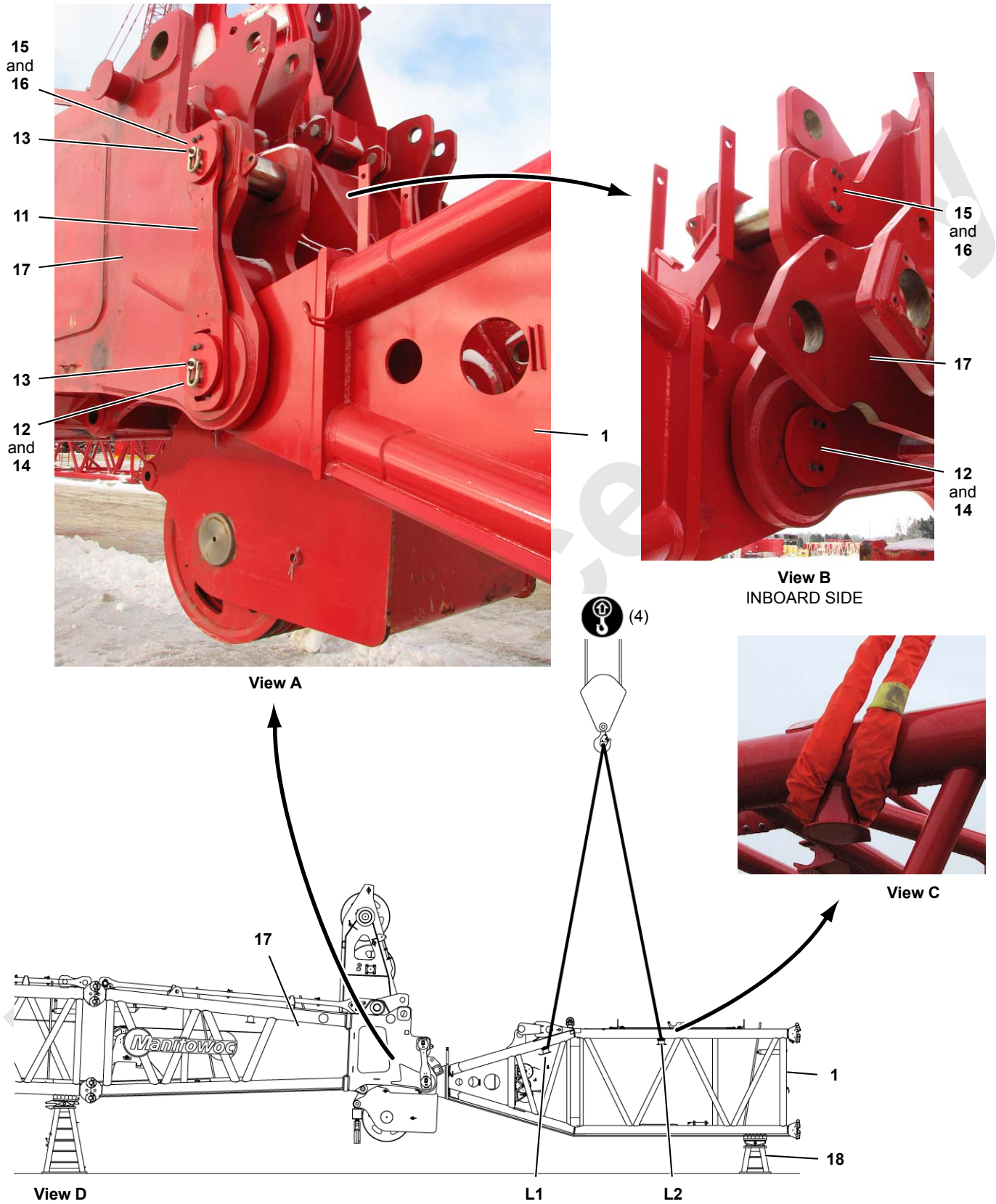


FIGURE 4-139

Legend for [Figure 4-139](#)

Item	Description
1	Jib Butt
11	Locking Link (2)
12	Hinge Pin (2)
13	Lifting Ring (1 each pin)
14	End Plate with Screws and Lock Washers (4)
15	End Plate with Screws and Lock Washers (4)
16	Jib Strut Pin (2)
17	Boom Top
18	Jib Support (2)

Install Jib Butt

See [Figure 4-139](#) for the following procedure.

- Remove lifting ring (13, View A) and outboard end plate (14) from both jib hinge pins (16). Then reinstall the lifting rings in the pins.
 - Remove lifting ring (13, View A) and outboard end plate (15) from both jib strut pins (16).
- NOTE** The jib strut pins remain with the boom top.
- Attach four nylon lifting slings to lifting lugs (L1 and L2, View D) on jib butt (1).
 - Lift the jib butt into position at the lugs on boom top (17, View A).
 - Align the connecting holes and install both hinge pins. Use the lifting rings to assist in lifting the pins into position.
 - Install both inboard end plates (14, View B). Securely tighten the screws.
 - Remove the lifting rings from the outboard end of the pins.
 - Install locking links (11), outboard end plates (14 and 15), and lifting rings (13) as shown in View A.
- Rotate the pins as needed to align the lugs in the pins with the locking holes in the links. Securely tighten all screws.
- Using a forklift, position jib supports (18, View D) under the end of jib butt (1).
 - Add blocking as needed between the jib supports and the jib butt so the butt does not twist when the lifting slings are disconnected. The jib butt must be as level as possible from side to side.
- Failing to perform step [10](#) will make it difficult to connect the next insert.
- Lower the jib butt onto the jib supports and disconnect the lifting slings.

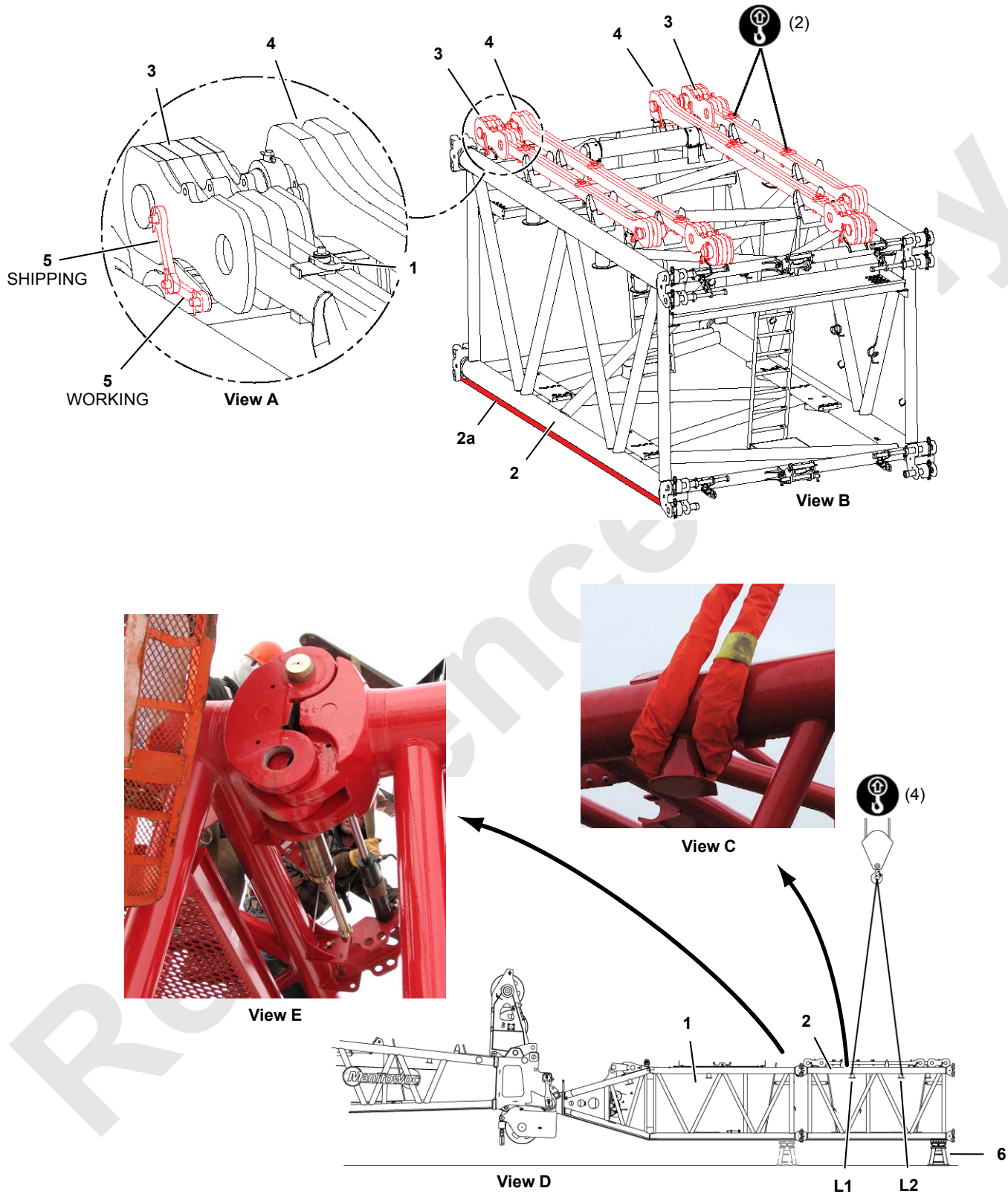


FIGURE 4-140

Legend for [Figure 4-140](#)

Item	Description
1	Jib Butt
2	6 m Reinforced Jib Insert
2a	Reinforcing Plate (under both bottom chords)
3	Strap Assembly – 5 m (2)
4	Strap Assembly – 6 m (2)
5	Strap Storage Link with Pin and Cotter Pins (8)
6	Jib Support (2)

Prepare 6 m Reinforced Jib Insert

See [Figure 4-140](#) for the following procedure.

The 6 m reinforced jib insert must be installed next to the jib butt as specified in the Fixed Jib Assembly Drawing at the end of this section.

The 6 m reinforced jib insert has reinforcing plates (2a) under both bottom chords.

The 6 m reinforced jib insert has four sets of strap assemblies stored on top of it. Remove the strap assemblies as follows:

1. Attach two legs of the chain lifting sling to the lifting rings on strap assembly (3, View B).
2. Unpin strap storage links (5, View A) from the shipping position and pin the links in the working position.
3. Lift the strap assembly off the insert and place it to the side for use later in the assembly process.
4. Disconnect the lifting slings.
5. Repeat the steps for each strap assembly.

Install 6 m Reinforced Jib Insert

See [Figure 4-140](#) for the following procedure.

1. Attach four nylon lifting slings to lifting lugs (L1 and L2, View D) on 6 m reinforced jib insert (2).

2. Adjust the lifting slings so the insert is level from side to side.
3. Lift the insert into position in front of jib butt (1).
4. Align the top connecting holes and connect the top pins (View E) between the insert and butt as instructed on [page 4-195](#).

NOTE The procedure for connecting the boom sections is identical for the jib sections.

5. Lower the insert until the bottom pin holes are aligned and connect the remaining pins as instructed on [page 4-195](#).
6. With the lifting slings still attached to insert, lift the insert and butt off the blocking.
7. Using a forklift, reposition jib supports (6, View D) under the end of jib insert (2).
8. Add blocking as needed between the jib supports and the jib insert so the insert does not twist when the lifting slings are disconnected. The insert must be as level as possible from side to side.

Failing to perform step 8 will make it difficult to connect the next insert.

9. Lower the jib insert onto the jib supports and disconnect the lifting slings.

Install Remaining Jib Inserts

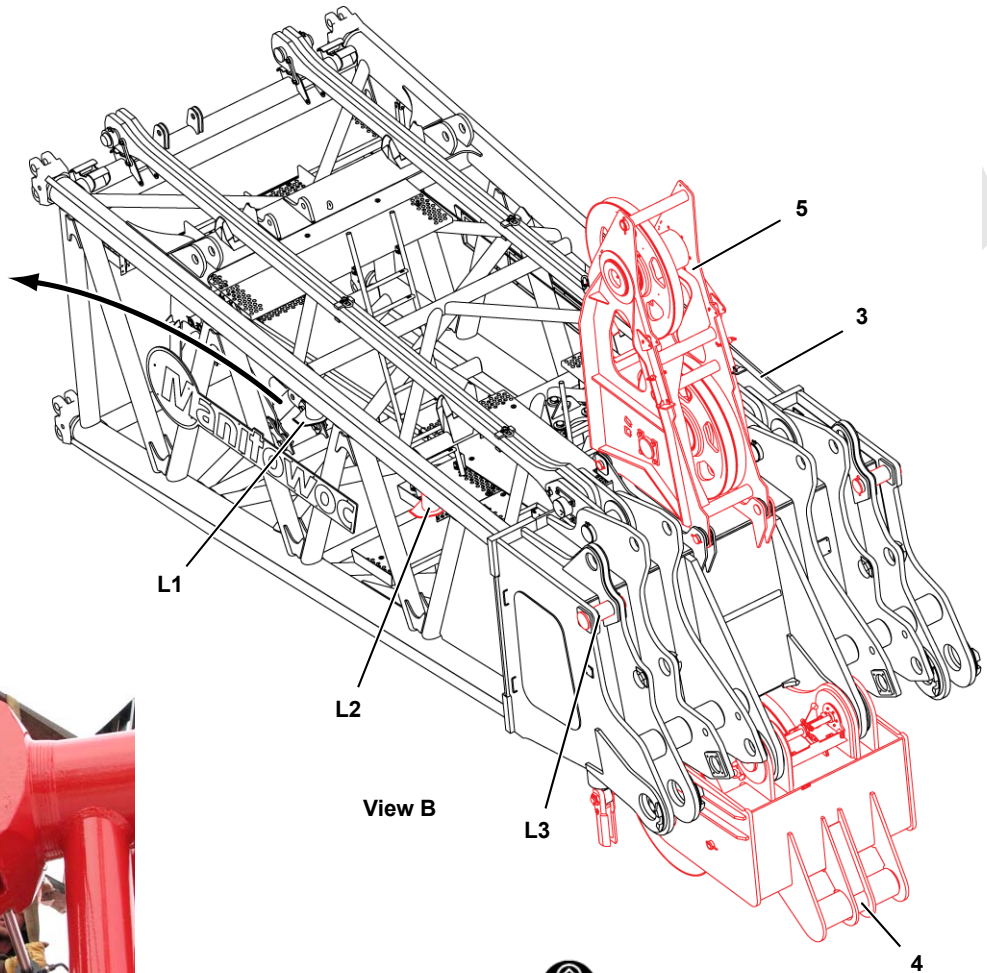
Repeat the above steps for the remaining jib inserts. Install the jib inserts in the exact sequence given in the Fixed Jib Assembly Drawing at the end of this section.

NOTE Two outboard 6 m strap assemblies must be removed from the 6 m insert that is installed next to the jib top (for some lengths). Remove the strap assemblies in the same manner described above for the 6 m reinforced jib insert.

Lift At	Description
L1 and L3	Jib Top without Wire Rope Guide or Lower Point
L2 and L3	Jib Top with Wire Rope Guide or Lower Point



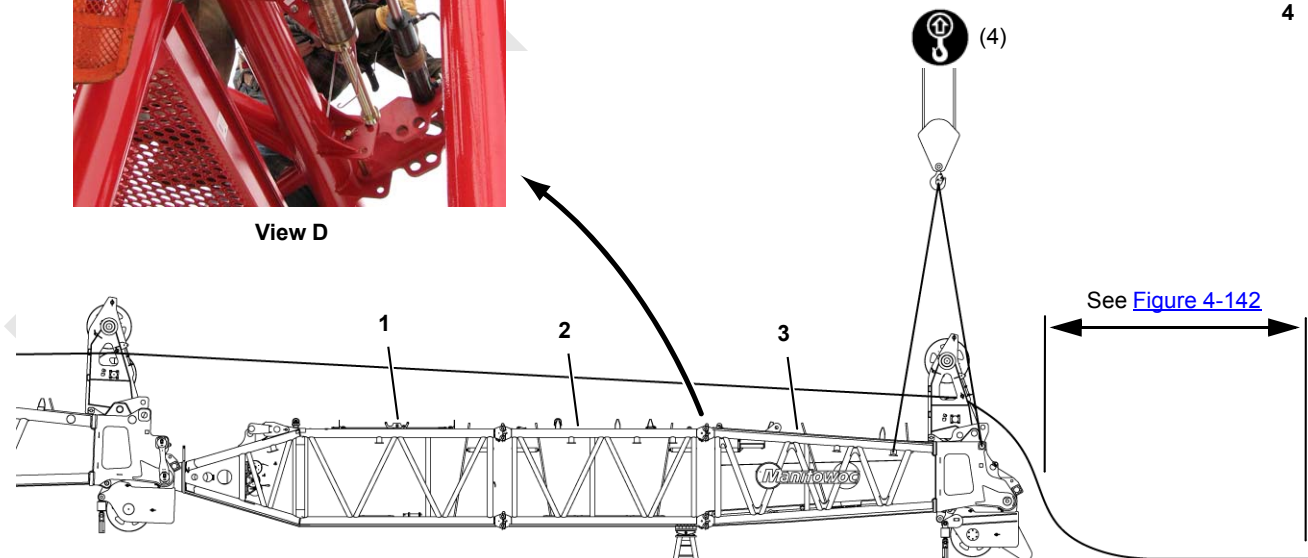
View A



View B



View D



View C

FIGURE 4-141

Legend for Figure 4-141

Item	Description
1	Jib Butt
2	Jib Insert(s)
3	Jib Top
4	Lower Jib (Boom) Point with Integral Stand
5	Wire Rope Guide (moved from Boom Top)

Prepare Jib Top

See [Figure 4-141](#) for the following procedure.

1. Install lower jib point (4).
The lower jib point is identical to the lower boom point and installation is the same. See [page 4-211](#) for the installation procedure.
2. Install standard wire rope guide (5).
The standard wire rope guide is normally mounted on the boom top (see [Figure 4-127](#)). It must be relocated from the boom top to the jib top. See [page 4-213](#) for the installation procedure.

Install Jib Top

See [Figure 4-141](#) for the following procedure.

1. Attach four nylon lifting slings to lifting lugs (L2 and L3, Views A and B) on jib top (3).

2. Adjust the lifting slings so the jib top is level from side to side.
3. Lift the jib top into position in front of insert (2).
4. Align the top connecting holes and connect the top pins (View D) between the jib top and insert as instructed on [page 4-195](#).

NOTE The procedure for connecting the boom sections is identical for the jib sections.

5. Lower the insert until the bottom pin holes are aligned and connect the remaining pins as instructed on [page 4-195](#).
6. At this point the jib must be parallel to the ground.
Installation of the backstay and jib straps will be difficult if the jib is not parallel to the ground.
7. Disconnect the lifting slings.

Route Drum 1 or 3 Load Line to End of Jib

Route Drum 1 or 3 load line past the end of the jib top the amount specified in [Figure 4-142](#). The rigging winch can be used for this step. See [page 4-223](#) for procedure.

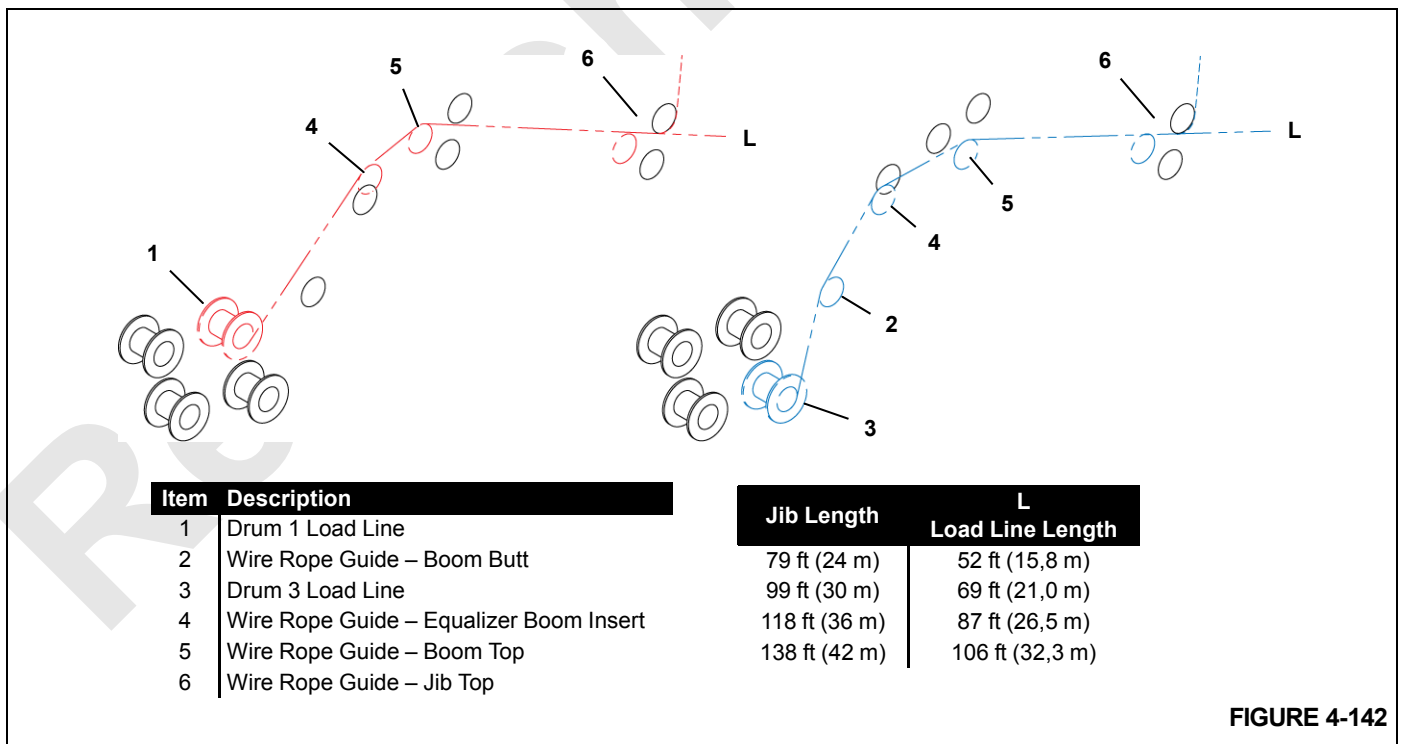


FIGURE 4-142

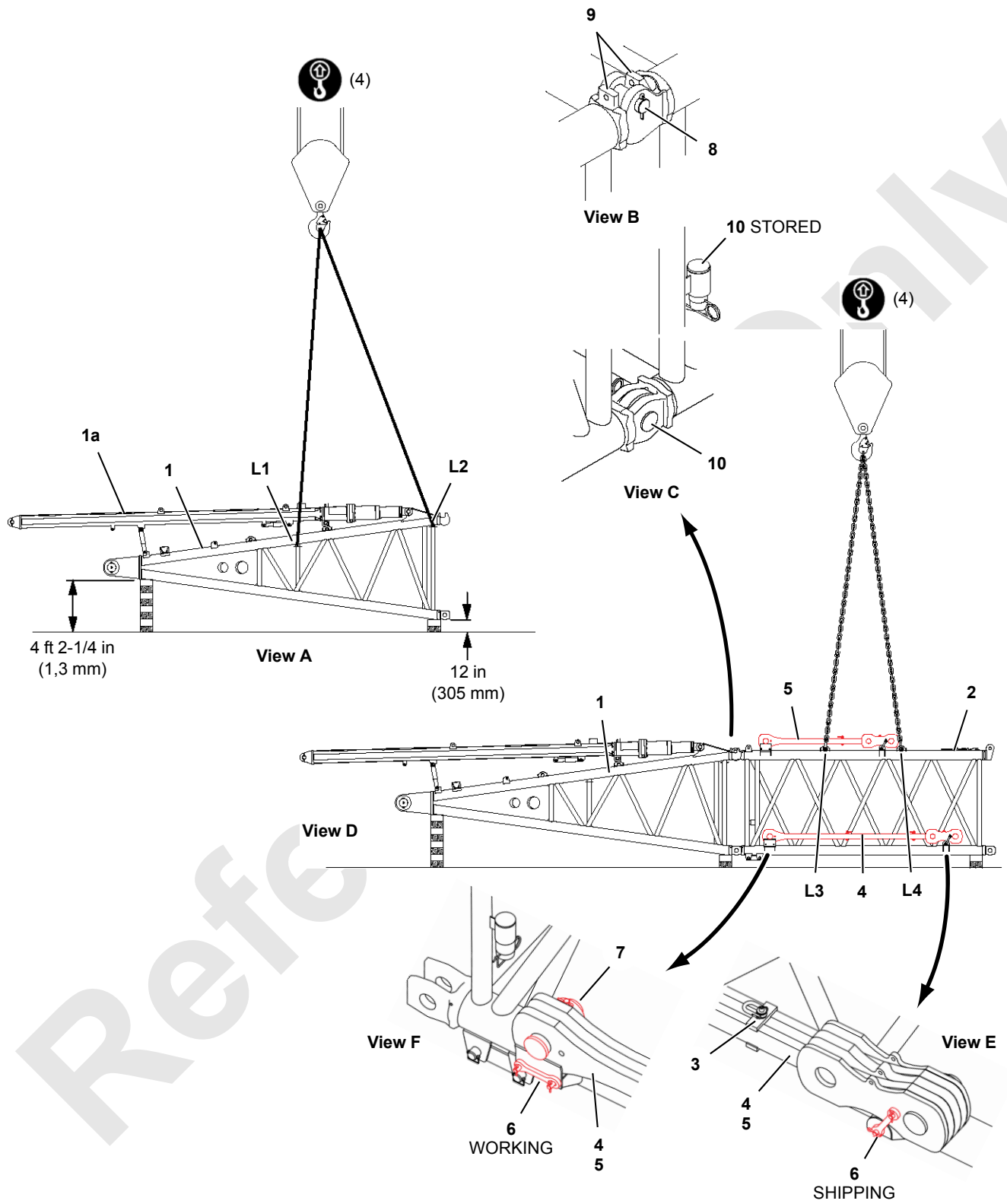


FIGURE 4-143

Legend for [Figure 4-143](#) and [Figure 4-144](#)

Item	Description
1	Butt
1a	Strut Stop – Fixed Jib
1b	Strut Stop – Luffing Jib
2	Lower Insert
3	Lifting Ring (1 or 2 each strap assembly)
4	Strap Assembly – 5 m (2)
5	Strap Assembly – 3,6 m (2)
6	Strap Storage Link with Pins and Cotter Pins (3)
7	Pin with Collar, Connecting Pin, and Cotter Pins (3)
8	Fixed Pin (2)
9	Hooked Connector (2)
10	Pin with Safety Pin (2)

Assemble Lower Half of Strut

See [Figure 4-143](#) for the following procedure.

NOTE There are two different strut stops as shown in [Figure 4-144](#) — fixed jib (1a) and luffing jib (1b). Make sure the fixed jib strut stops are installed before proceeding with the following steps.

- Attach four nylon lifting slings to lifting lugs (L1 and L2, View A) on butt (1, View A).
- Lift the butt onto blocking as shown in View A.
 - The blocking at the top end of the butt must be at least 12 in (0,30 m) high.
 - The center line of the butt must be parallel to the ground.
- Disconnect the lifting slings from the butt.
- Prepare lower insert (2) as follows:
 - Connect two legs of the chain lifting sling to lifting rings (3, View E) on strap assembly (4).
 - Remove strap storage links and pins (6, View E) from the shipping position and store them in the working position (View F).
 - Remove pin (7, View F) from the strap assembly.
 - Lift the strap assembly off the insert and place it to the side for use later in the assembly procedure.
 - Disconnect the lifting slings.
 - Store pin (7, View F) in the strap assembly.
 - Repeat the steps for each strap assembly (4 and 5). Strap assemblies (5) have only one lifting ring.
- Attach four legs of the chain lifting sling to lifting lugs (L3 and L4, View D) on lower insert (2).
- Lift the lower insert into position at the end of the butt and engage fixed pins (8, View B) with hooked connectors (9).
- Lower the insert until the bottom connector holes are aligned and install pins (10, View C). The pins are stored in pockets on the lower insert.
- Block under the top end of the insert.
- Disconnect the lifting slings.

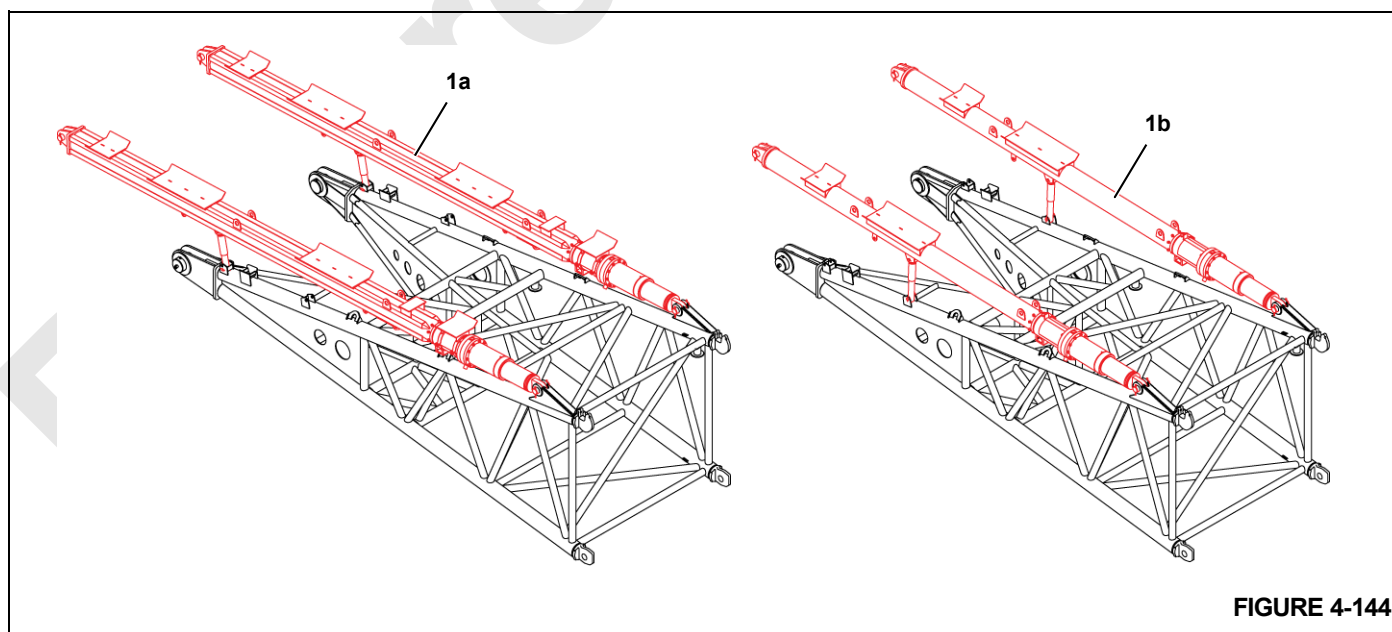


FIGURE 4-144

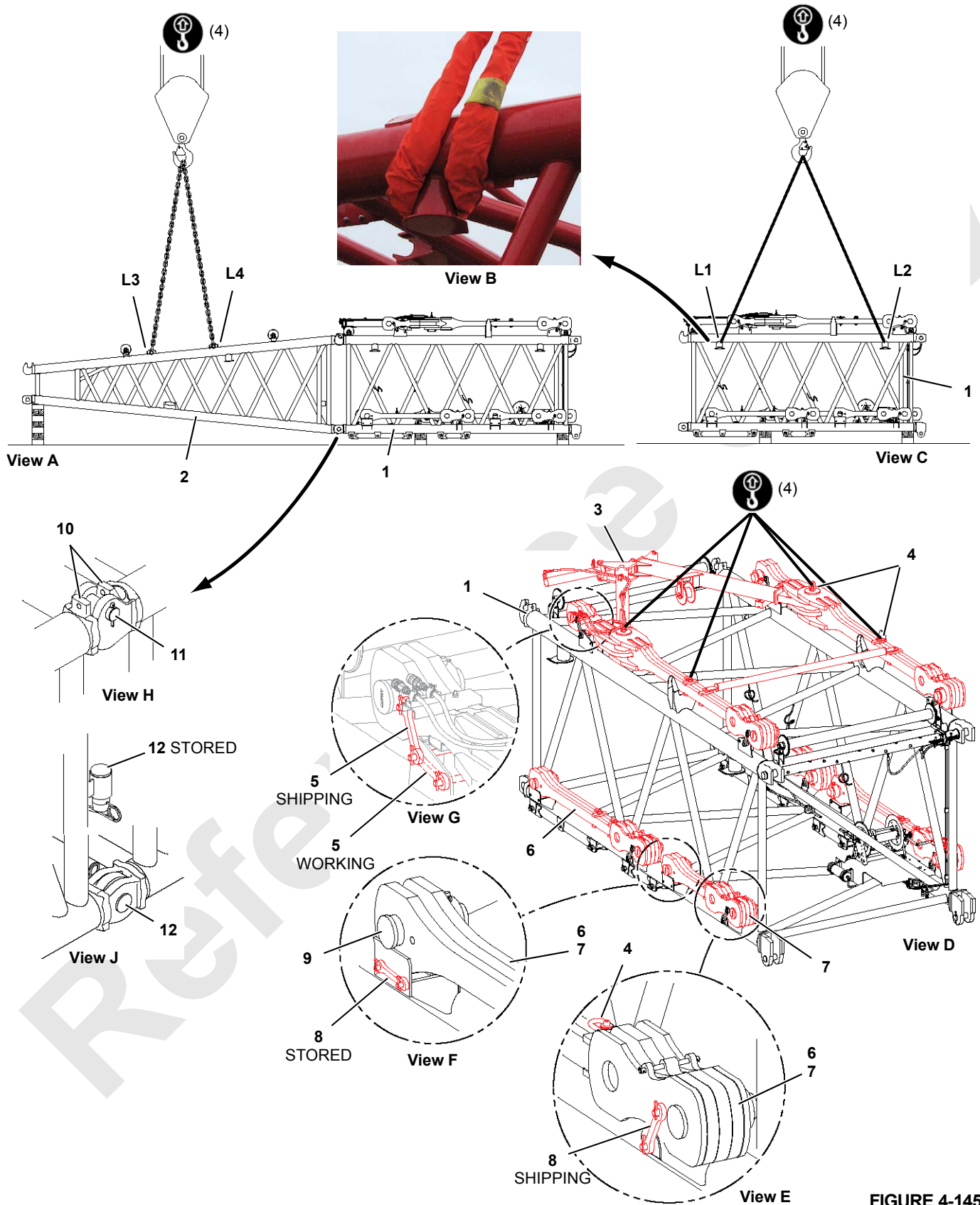


FIGURE 4-145

Legend for Figure 4-145

Item	Description
1	Upper Insert
2	Transition Insert
3	Spreader Assembly
4	Lifting Ring (10)
5	Strap Storage Links with Pin and Cotter Pins (4)
6	Strap Assembly – 3,1 m (2)
7	Strap Assembly – 2,2 m (2)
8	Strap Storage Link with Pins and Cotter Pins (43)
9	Pin with Collar, Connecting Pin, and Cotter Pins (4)
10	Hooked Connector (2)
11	Fixed Pin (2)
12	Pin with Safety Pin (2)

Assemble Upper Half of Strut

See [Figure 4-145](#) for the following procedure.

1. Attach four nylon lifting slings to lifting lugs (L1 and L2, View C) on upper insert (1).
2. Lift upper insert (1) onto blocking as shown in View C.
 - The blocking must be at least 12 in (0,30 m) high.
 - The center line of the insert must be parallel to the ground.
 - The insert must be level from side to side.
3. Prepare upper insert (1) as follows:
 - a. Connect four legs of the chain lifting sling to lifting rings (4, View D) on spreader assembly (3).
 - b. Unpin strap storage links (5, View G) from the shipping position and pin them in the working position.
 - c. Lift the spreader assembly off the upper insert and place it to the side for use later in the assembly procedure.
 - d. Disconnect the lifting slings.
 - e. Connect two legs of the chain lifting sling to lifting rings (4, View E) on strap assembly (6).
 - f. Remove strap storage links and pins (8, View E) from shipping position and store them in the working position (View F).
 - g. Remove pin (9, View F) from the strap assembly.
 - h. Lift the strap assembly off the insert and place it to the side for use later in the assembly procedure.
 - i. Store pin (9, View F) in the strap assembly.
 - j. Repeat the steps for each strap assembly (6 and 7). Strap assemblies (7) have only one lifting ring.
4. Attach four legs of the chain lifting sling to lifting lugs (L3 and L4, View A) on transition insert (2).
5. Lift the transition insert into position at the end of the upper insert and engage hooked connectors (10) with fixed pins (11, View H).
6. Lower the insert until the bottom connector holes are aligned and install pins (12, View J). The pins are stored in pockets on the transition insert.
7. Block the end of the transition insert.
8. Disconnect the lifting slings.

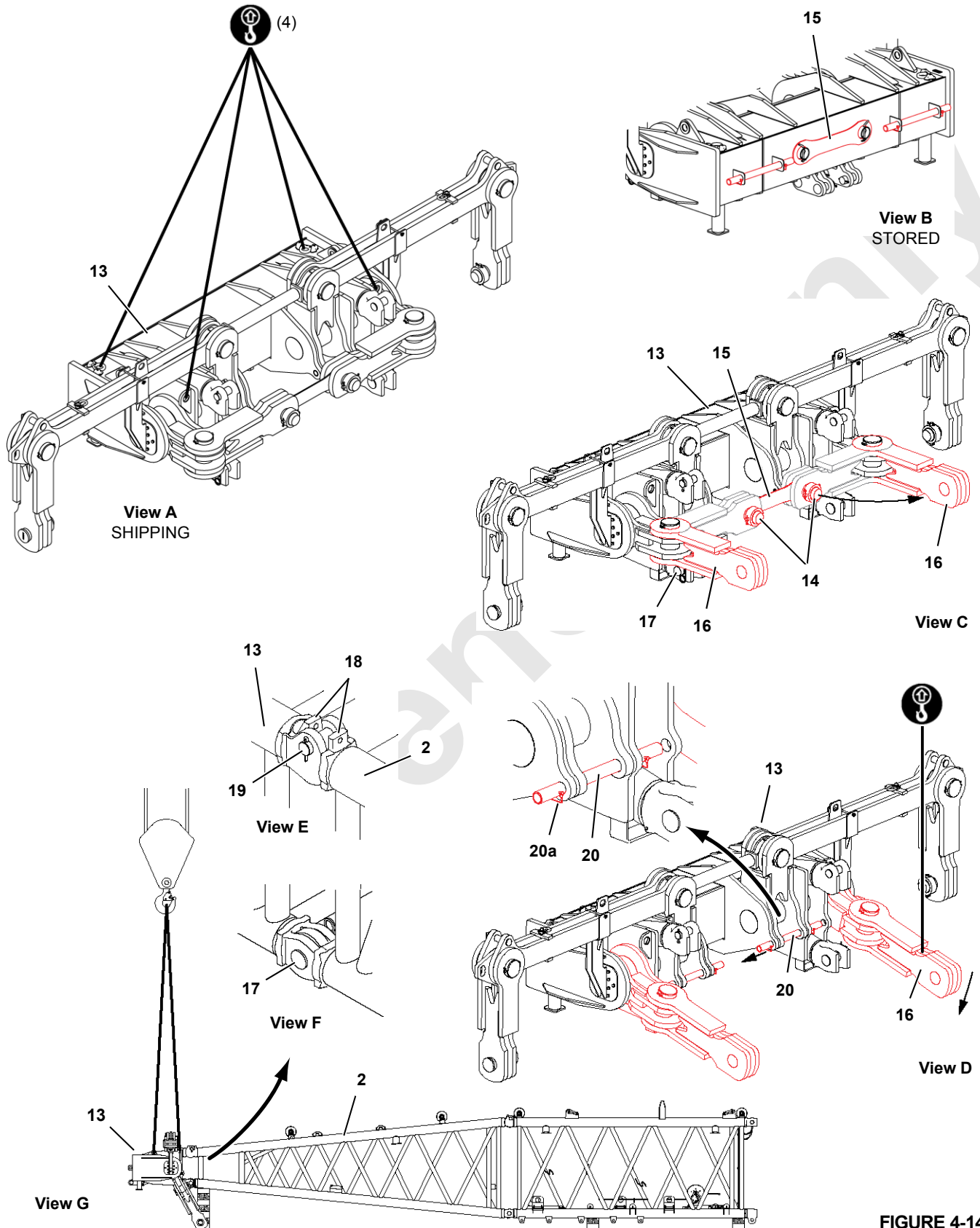


FIGURE 4-146

Legend for [Figure 4-146](#)

Item	Description
2	Transition Insert
13	Top
14	Pin with Collar, Connecting Pin, and Cotter Pins (2)
15	Link
16	Link (backstay strap) (2)
17	Pin with Safety Pin (2)
18	Hooked Connector (2)
19	Fixed Pin (2)
20	Pin (2)
20a	Wire Lock Pin (4)

See [Figure 4-146](#) for the following procedure.

9. Attach four legs of the chain lifting sling to the lifting lugs and rings on top (13, View A).
10. Lift top (13, View G) into position at the end of transition insert (2).
11. Remove pins (14, View C) and link (15).
12. Place pins (14) to the side for later use and store link (15, View B) on the end of the top.
13. Rotate links (16, View C) outward.
14. Remove pins (17, View C).
15. Lift the top into position so fixed pins (19, View E) in the top engage hooked connectors (18) on the transition insert.
16. Lower the top until the bottom connector holes are aligned and install pins (17, View F).
17. Disconnect the lifting slings.
18. Lower links (16, View D) to the ground as follows:
 - a. Support link (16) so it cannot fall. Use a nylon lifting sling from the assist crane.
 - b. Remove only inboard wire lock pin (20a, View D).
 - c. Pull pin (20, View D) out only enough to disengage link (16) from top (13).
 - d. Reinstall wire lock pin (20a, View D).
 - e. Lower link (16) to the ground.
 - f. Disconnect the lifting sling.
 - g. Repeat the steps for other link (16).

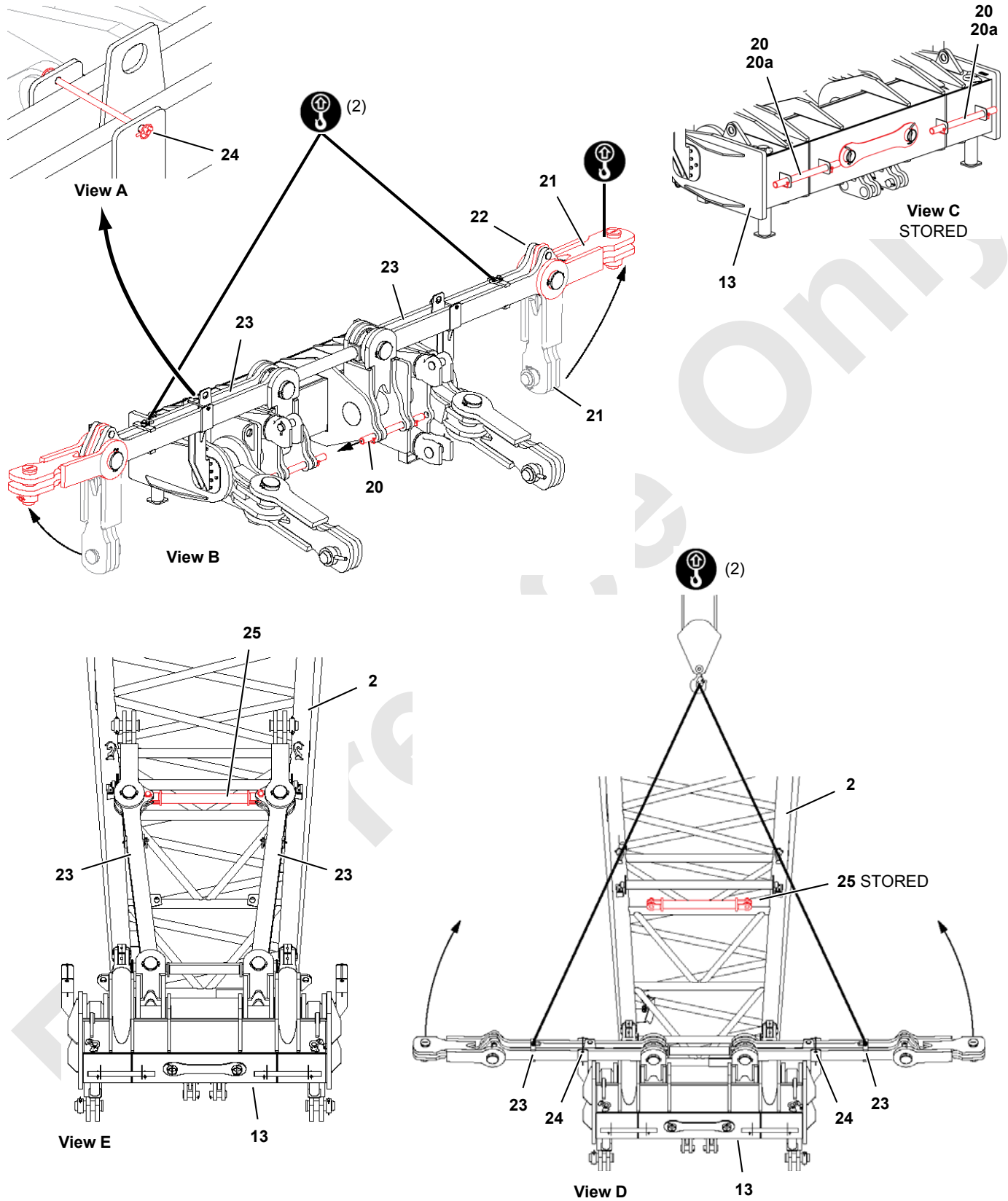


FIGURE 4-147

Legend for [Figure 4-147](#)

Item	Description
2	Transition Insert
13	Top
20	Pin (2)
20a	Wire Lock Pins (4)
21	Link (2)
22	Pin with Safety Pin (2)
23	Link (2)
24	Pin with Wire Lock Pins (2)
25	Link with Pins and Cotter Pins (2)

See [Figure 4-147](#) for the following steps.

19. Raise links (21, View B), as follows:

- a. Remove pin (22).
- b. Using a nylon lifting sling from the assist crane, rotate link (21) to horizontal.
 - c. Install pin (22).
 - d. Disconnect the lifting sling.
 - e. Repeat the steps for other link (21).

20. Attach two legs of the chain lifting sling to the lifting rings on links (23, View B).
21. Remove pins (24, View A).
22. Make sure the hook block from the assist crane is centered over the links and the center line of the transition insert.
23. Lift links (23, View D) to vertical.
24. Reinstall pins (24, View A) in the lugs on the top.
25. Remove pins (20, View B) and store them in the end of the top (View C).
26. Lower links (23, View E) onto transition insert (2).
27. Remove link (25, View D) from storage and pin it between links (23, View E).
28. Disconnect the lifting slings.

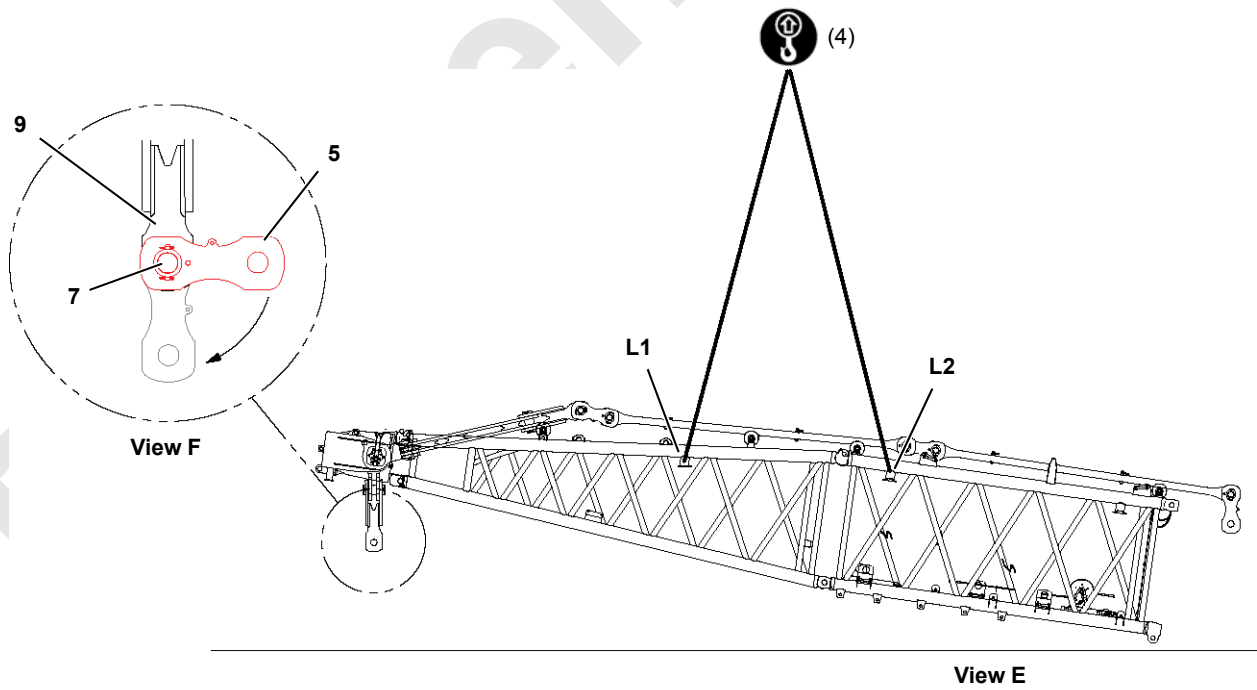
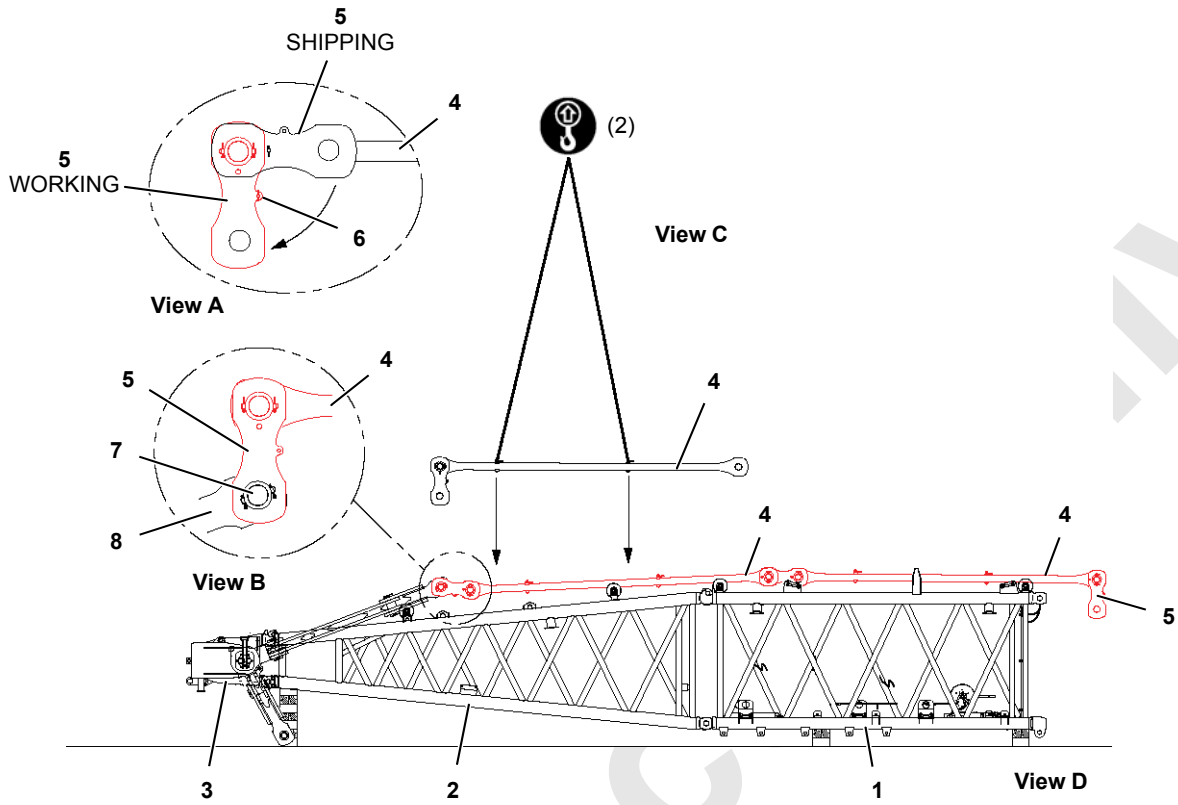


FIGURE 4-148

Legend for Figure 4-148

Item	Description
1	Upper Insert
2	Transition Insert
3	Top
4	Strap Assembly — 6 m (4)
5	Strap Links (set of 3 with each strap)
6	Link Storage Pin and Cotter Pins (1 each set of strap links)
7	Pin with Collar, Retaining Pin, and Cotter Pins (1 each strap)
8	Link (2)
9	Link (2)

See [Figure 4-148](#) for the following steps.

29. Install strap assemblies (4, View D):

- a. Attach two legs of the chain lifting sling to the lifting rings on strap assembly (4, View C).
- b. Lower strap links (5, View A) from the shipping position to the working position.

- c. Remove pin (7, View B) from link (8).
- d. Lift strap assembly (4, View B) into position at link (8) and align the connecting holes.
- e. Install pin (7, View B).
- f. Lower strap assembly (4, View D) onto the insert rollers.
- g. Disconnect the lifting slings.
- h. Repeat the steps for the remaining strap assemblies.

30. Connect strap links (5, View D) to the end of both strap assemblies (4) on upper insert (1).
31. Attach four nylon lifting slings to lifting lugs (L1 and L2, View E).
32. Lift the upper half of the strut off the blocking.
33. Connect strap links (5, View F) to the end of both strap links (9) on top (1).
34. Lift the upper half of the strut onto blocking.
35. Disconnect the lifting slings

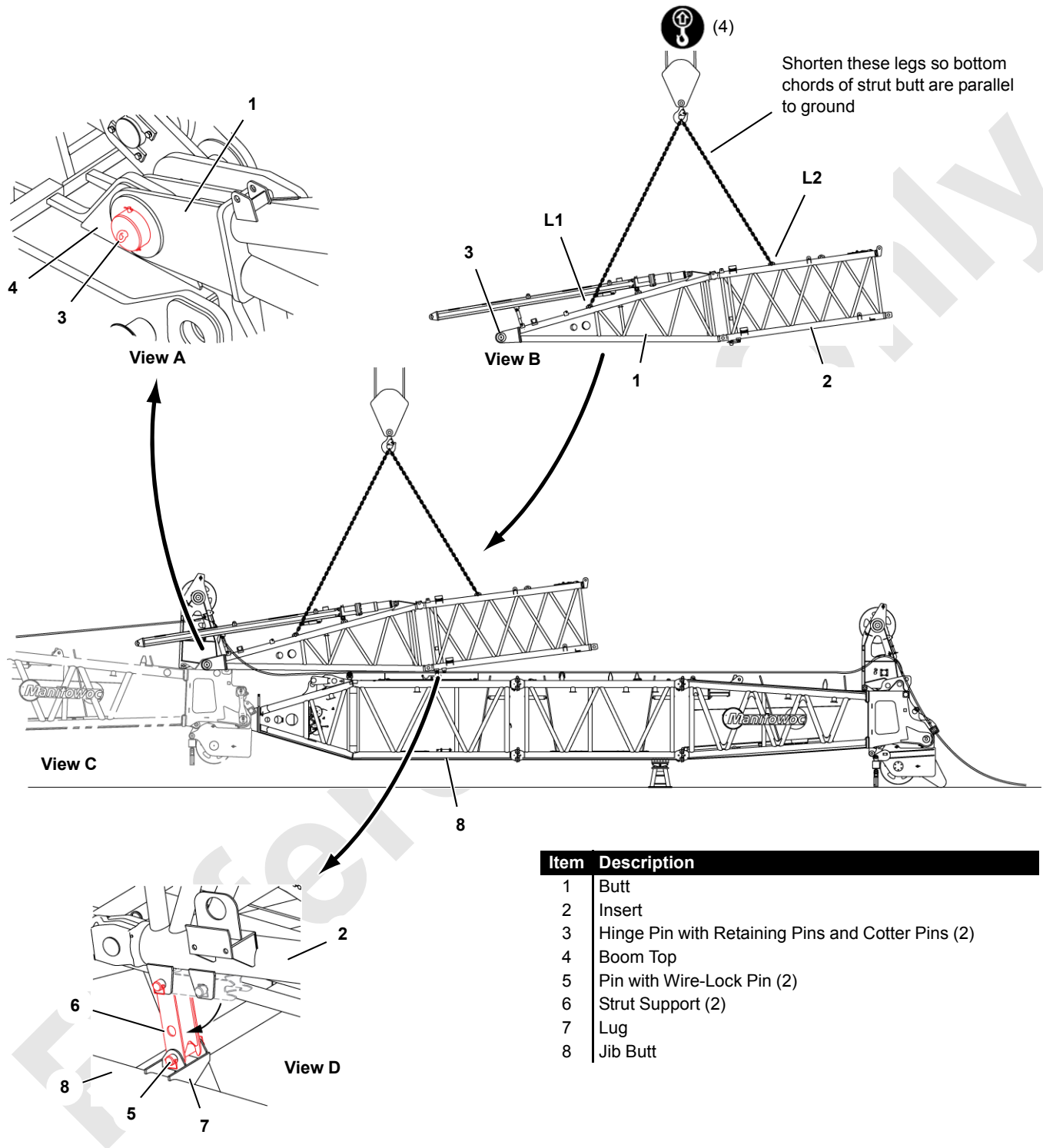


FIGURE 4-149

Install Lower Half of Strut

See [Figure 4-149](#) for the following procedure.

1. Attach four legs of the chain lifting sling to lifting lugs (L1 and L2, View B) on butt (1) and insert (2).
Attach the two legs with grab hooks to the lifting lugs on insert (2).
2. Using the grab hooks, shorten the front two legs of the lifting sling so the bottom chords of butt (1, View B) are parallel to the ground when the butt and insert are lifted.
3. Remove hinge pins (3, View B) from butt (1).
4. Lift the lower half of the strut into position over the boom top (View C).
5. Align the connecting holes in butt (1, View A) with the connecting holes in boom top (4).
6. Install hinge pins (3, View A).
7. Remove pin (5, View D) and lower strut support (6) on both sides of insert (2).
8. Install pins (5, View D) in lugs (7) on jib butt (8).
9. Lower the upper half of the strut so strut supports (6, View D) engage pins (5).
10. Disconnect the lifting slings.

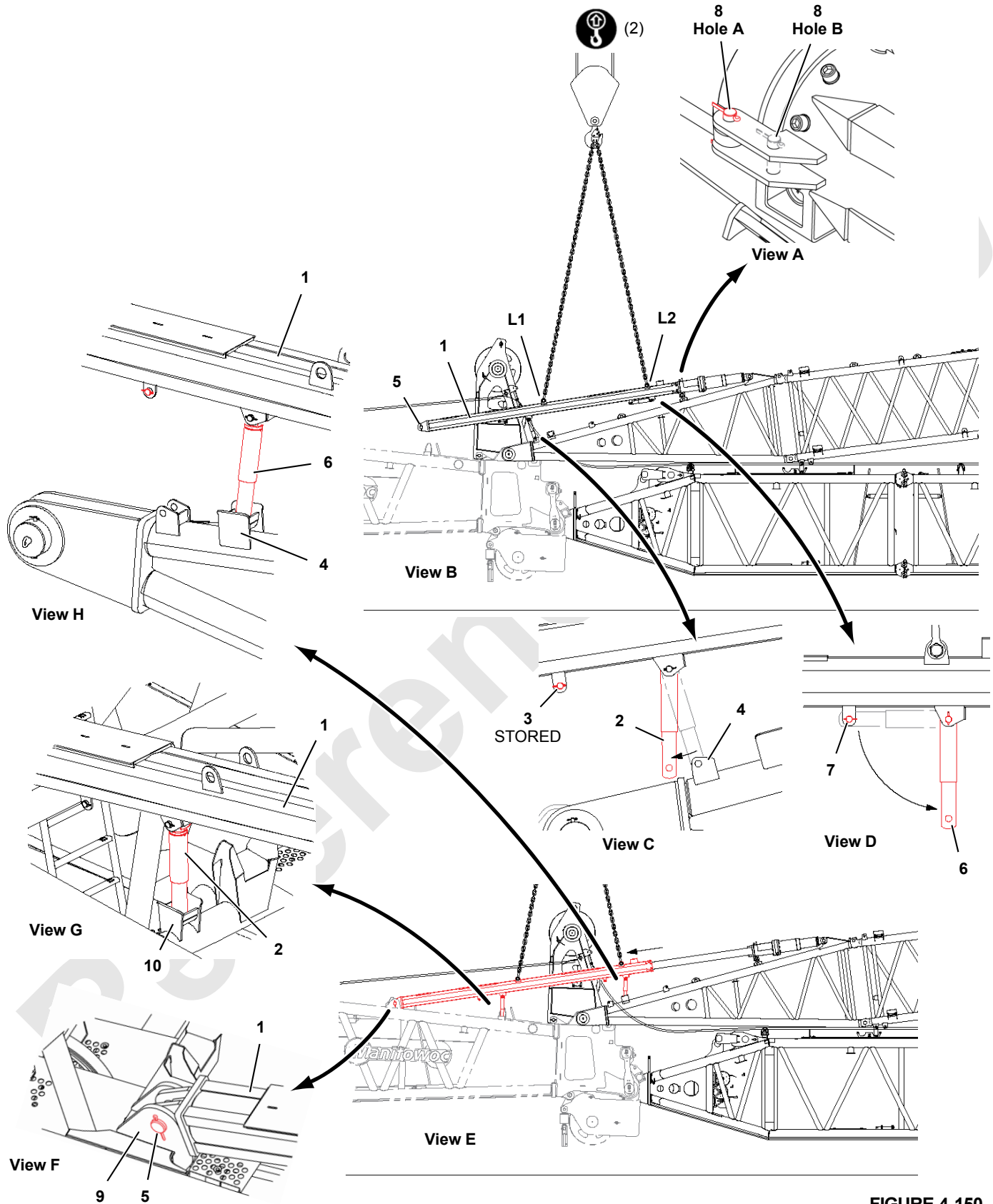


FIGURE 4-150

Legend for [Figure 4-150](#)

Item	Description
1	Strut Stop (2)
2	Strut Stop Support (2)
3	Pin with Cotter Pins (2)
4	Lug, Jib Butt (2)
5	Pin with Cotter Pins (2)
6	Strut Support (2)
7	Pin with Cotter Pins (2)
8	Pin with Cotter Pins (1 each strut stop)
9	Lug, Boom Top (2)
10	Lug, Boom Top (2)

Extend Strut Stops

See [Figure 4-150](#) for the following procedure.

- Attach two legs of the chain lifting sling to lifting lugs (L1 and L2, View B) on strut stop (1).
- Hoist just enough to support the strut stop.
- Unpin strut stop support (2, View C) from lug (4) on the jib butt. Store pin (3) in the strut stop lug.
- Remove pin (5, View B) from the end of the strut stop.
- Raise the strut stop to horizontal.
- Remove pin (7, View D) to unpin strut stop support (6) from the strut stop and lower the support to vertical.
- Reinstall pin (7, View D) in the strut stop lug.
- Remove pin (8, View A) from hole (A) and store it in hole (B).
- Slowly extend and lower the strut stop tube with the assist crane until the holes in strut stop (1, View F) are aligned with the holes in lugs (9) on the boom top.

As the strut stop is lowered, engage strut supports (2, View G) and (6, View H) with lug (10, View G) and lug (4, View H).

It may be necessary to shorten the length of the strut stop supports if pin (5, View F) cannot be installed. The lower support can be threaded into and out of the upper support.
- Check that strut supports (2, View G) and (6, View H) are snug against the bottom of lugs (10 and 4). Turn the lower supports out as needed.
- Install pin (5, View F).
- Disconnect the lifting sling.
- Repeat the above steps for the other strut stop.

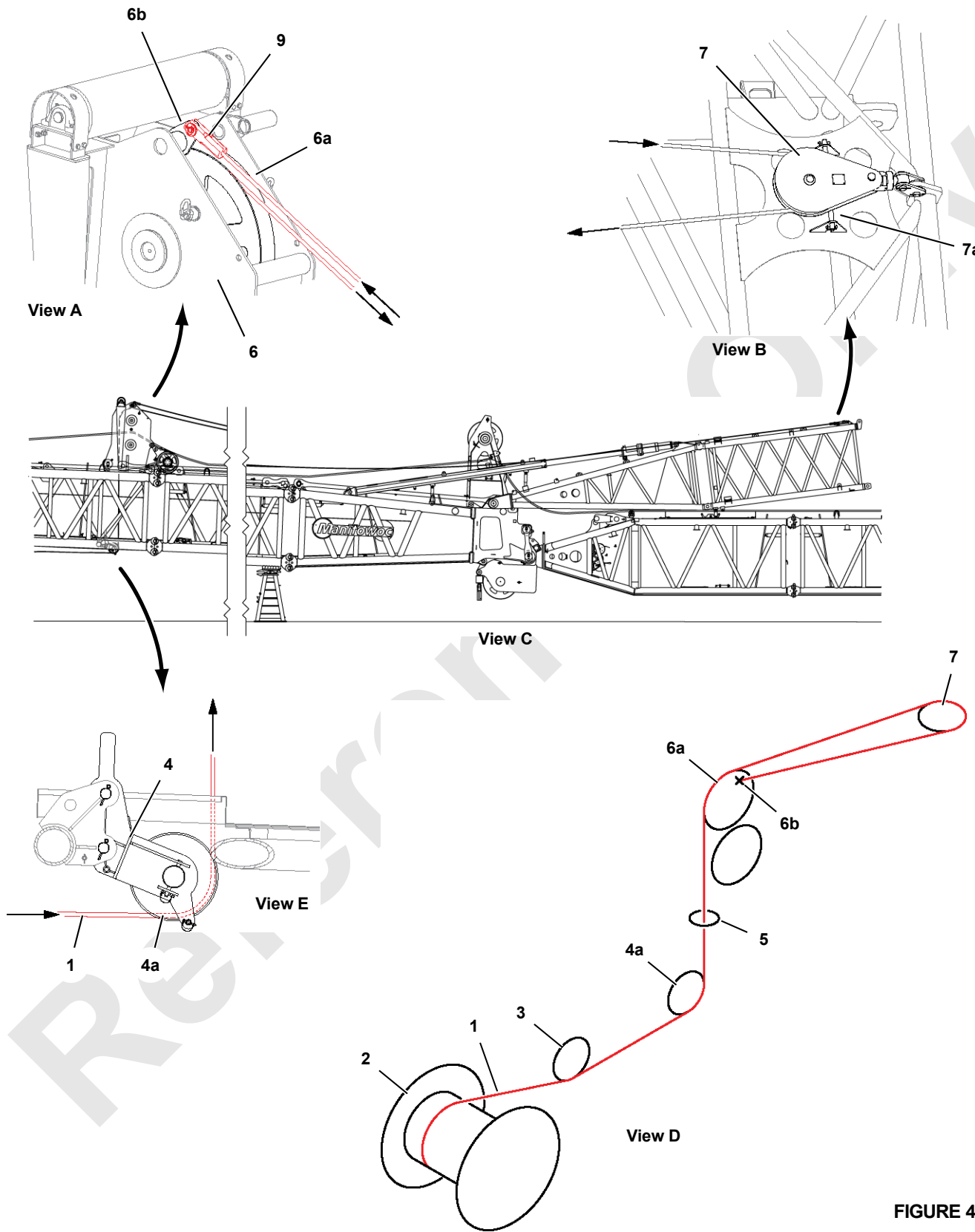


FIGURE 4-151

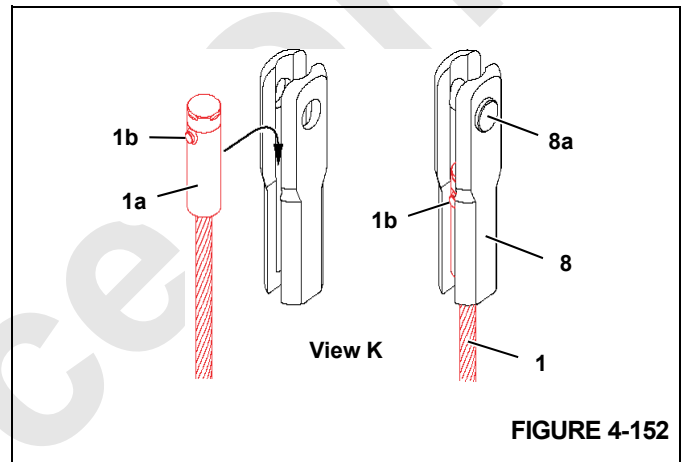
Legend for Figures 4-151 and 4-152

Item	Description
1	Rigging Line (Drum 6)
1a	Button
1b	Alignment Lug
2	Rigging Winch (Drum 6)
3	Guide Sheave (front of rotating bed)
4	Wire Rope Guide (under equalizer insert)
4a	Guide Sheave
5	Hole in Wire Rope Guide
6	Wire Rope Guide (equalizer insert)
6a	Guide Sheave (top)
6b	Dead-End Lug
7	Snatch Block Guide Sheave (on strut insert)
7a	Pin with Snap Pins
8	Button Socket
8a	Pin with Retainer

Route Rigging Line to Wire Rope Guide on Equalizer Insert

See [Figure 4-151](#) for the following procedure.

- Route rigging line (1, View D) from rigging winch (2), as follows:
 - Under guide sheave (3, View D).
 - Under guide sheave (4a, View D and E). See [page 4-223](#) for instructions on positioning the wire rope guide sheave.
 - Through hole (5, View D) in the bottom of wire rope guide (6).
 - Over guide sheave (6a, Views D and A).
 - Around snatch block guide sheave (7, View B).
The block must be moved from the stored position under pin (7a, View B) to the working position as shown.
- Dead end the rigging line to lug (6b, View A) with button socket (8, [Figure 4-152](#)).



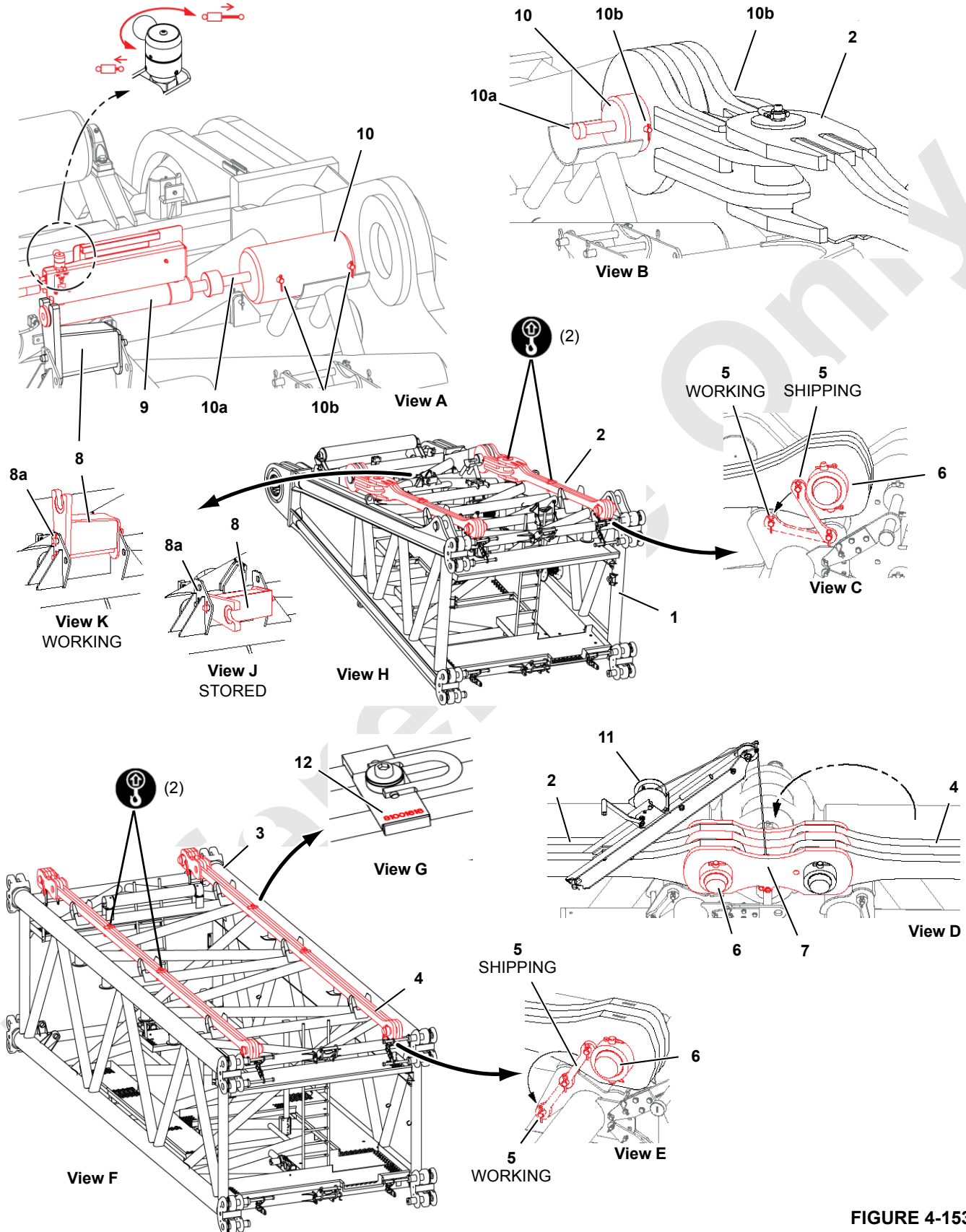


FIGURE 4-153

Legend for [Figure 4-153](#)

Item	Description
1	Boom Butt
2	Backstay Strap, Boom Butt (2)
3	Boom Insert
4	Backstay Strap (2 each boom insert)
5	Strap Storage Link with Pin and Cotter Pins (4 each insert)
6	Pin with Collar, Retaining Pin and Cotter Pins (2 each boom insert)
7	Backstay Strap Links (2 sets of three each insert)
8	Support
8a	Pin with Cotter Pins
9	Hand-Held Cylinder (without trunnions)
10	Pin (2)
10a	Extension Pin (2)
10b	Retaining Pin and Cotter Pins (4)
11	Strap Rigging Winch
12	Strap Identification Tag (with strap part number)

Install and Connect Backstay Straps

See [Figure 4-153](#) for the following procedure.

NOTE The backstay straps can be shipped in the stored position of the boom sections.

Each backstay strap has an identification tag with the strap's part number (see View G). The backstay straps must be installed in the exact sequence given in the Fixed Jib Assembly Drawing at the end of this section.

1. If the backstay straps are already installed on the boom sections, proceed as follows starting at the butt end of the boom:
 - a. Rotate strap storage links (5, Views C and E) from the shipping position to the working position.
 - b. Remove pin (6, Views C and E) from the adjacent backstay strap.
 - c. Rotate backstay strap links (7, View D) from the shipping position to the working position. Strap rigging winch (10, View D) can be used in the same manner it was used for the boom straps. See [page 4-215](#) for procedure.
 - d. Install pin (6, View D).
 - e. Repeat the above steps at each backstay strap.

2. If the backstay straps are not already installed on the boom sections, proceed as follows starting at the butt end of the boom:

AT BOOM BUTT —

- a. Rotate support (8, View J) from the stored position to the working position (View K).
- b. Position hand-held cylinder (9, View A) on extension pin (10a) and support (8).
- c. Connect hydraulic lines from the PPU to the hand-held cylinder and start the power unit.
- d. Remove outboard retaining pin (10b, View A) from pin (10).
- e. Retract the hand-held cylinder to disengage pin (10, View A).
- f. Attach two legs of the chain lifting sling to the lifting lugs on backstay strap (2, View H).
- g. Lift the strap into position on boom butt (1, View H) and align the connecting holes.
- h. Extend the hand-held cylinder to engage pin (10, View B).
- i. Disconnect the lifting slings.
- j. Install outboard retaining pin (10b, View B) in pin (10).
- k. Flip the hand-held cylinder end for end and repeat the above steps for other backstay strap (2).
- l. Remove hand-held cylinder (1).
- m. Rotate support (8, View H) from the working position to the stored position (View J).

AT BOOM INSERTS —

- a. Attach two legs of the chain lifting sling to the lifting lugs on backstay strap (4, View F).
- b. Lift the strap into position on boom insert (3, View F).
- c. Disconnect the lifting slings.
- d. Repeat the above steps for all of the required backstay straps. See the Fixed Jib Assembly Drawing at the end of this section.

Backstay straps must be installed in the exact sequence given in the Fixed Jib Assembly Drawing.

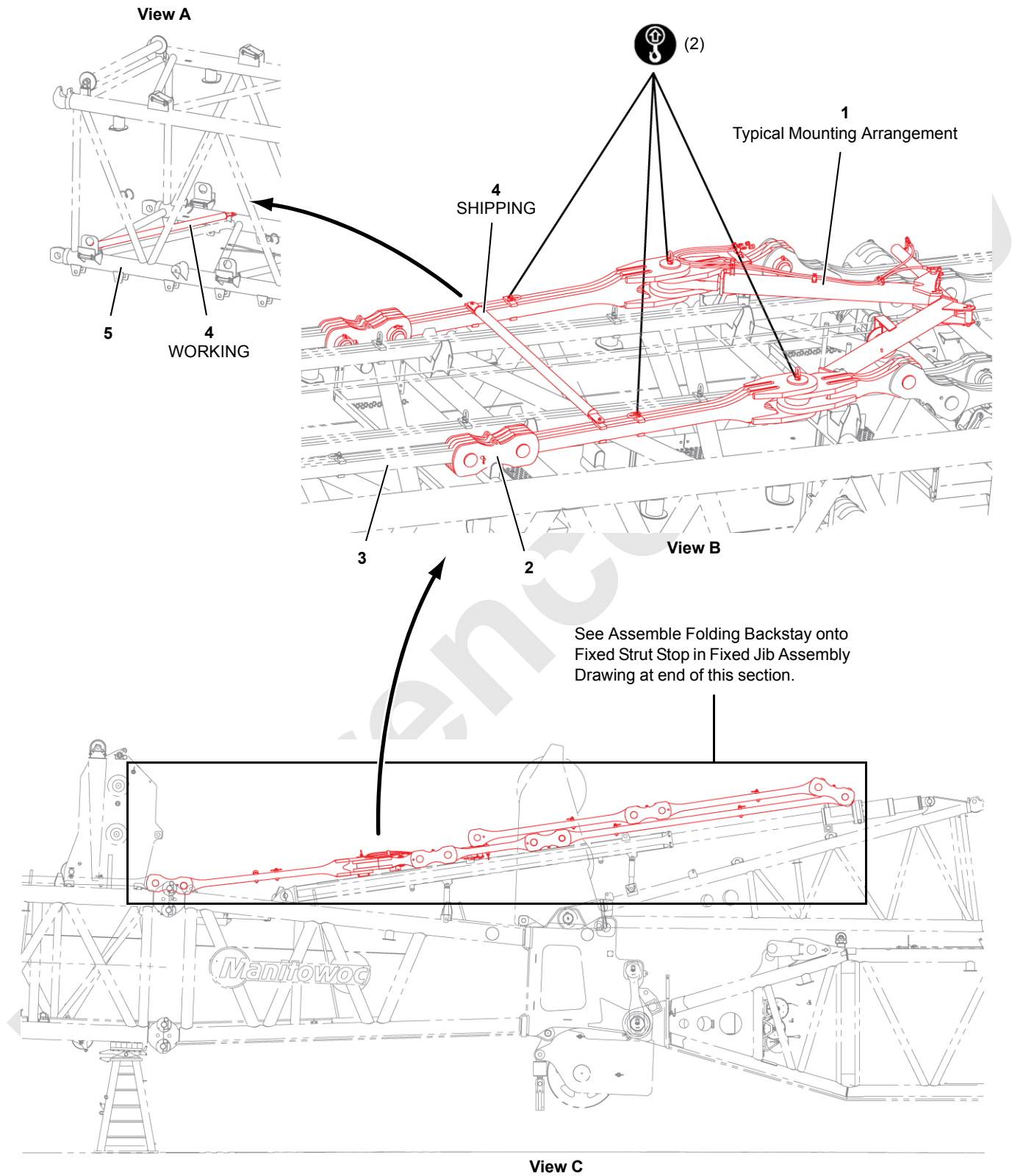


FIGURE 4-154

Legend for Figure [4-154](#)

Item	Description
1	Backstay Spreader
2	Backstay Strap Links (2)
3	Backstay Strap
4	Tie Rod
5	Strut Upper Insert

AT JIB STOPS —

See [Figure 4-154](#) for the following procedure.

- a. Attach four legs of the chain lifting sling to the lifting links on backstay spreader (1, View B).

- b. Lift the backstay spreader into position on the boom and connect backstay strap links (2, View B) to adjacent backstay straps (3).

- c. Install the remaining backstay straps (View C) as shown in the Fixed Jib Assembly Drawing at the end of this section.

Backstay straps must be installed in exact sequence given in Fixed Jib Assembly Drawing.

Backstay straps must be folded on jib stops as shown in Fixed Jib Assembly Drawing.

- d. Remove tie rod (4, View B) from backstay spreader (1).
- e. Store tie rod (4) in the top end of strut upper insert (5, View A).

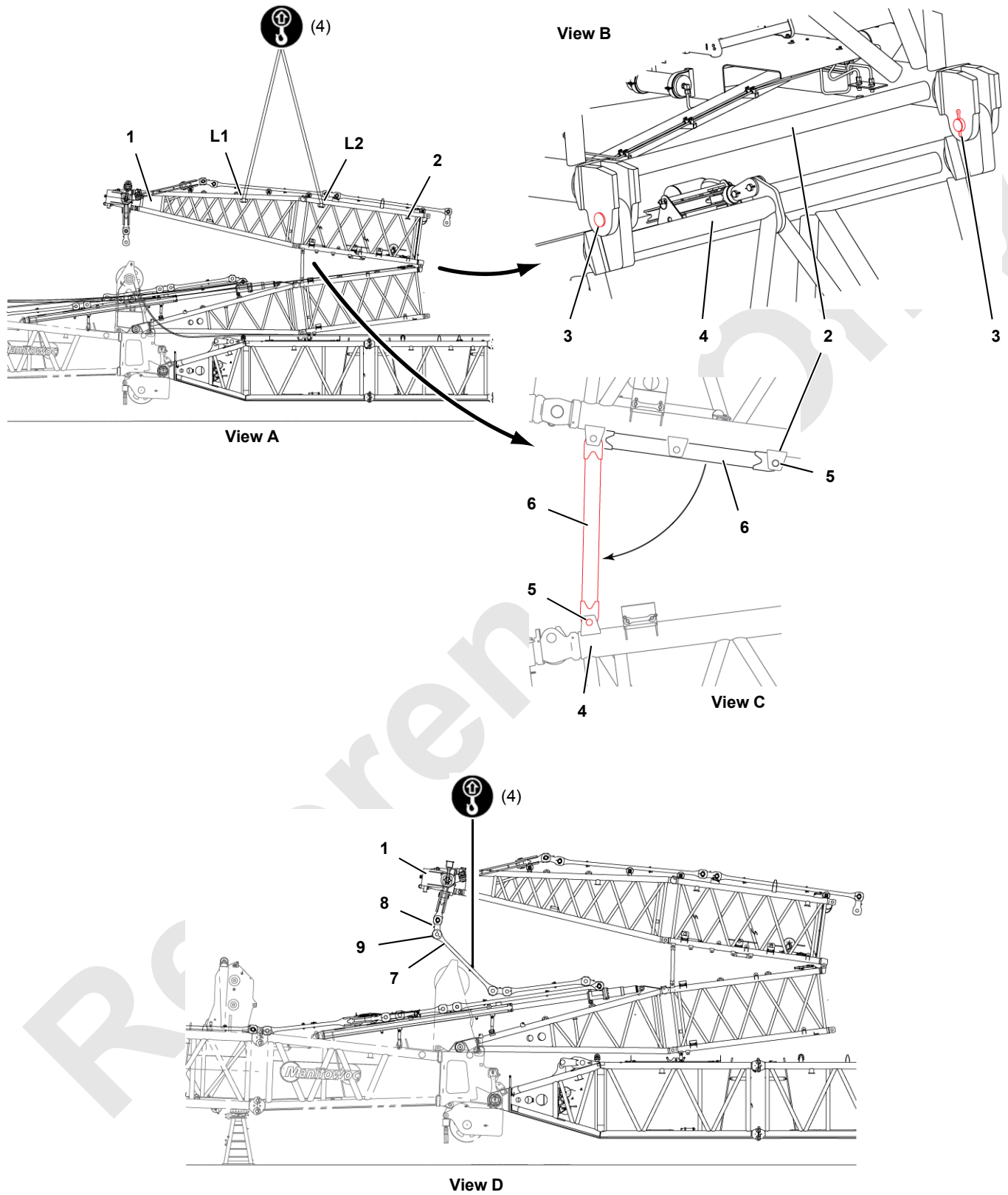


FIGURE 4-155

Legend for Figure 4-155

Item	Description
1	Strut Top
2	Strut Upper Insert
3	Hinge Pin with Cotter Pins (2)
4	Strut Lower Insert
5	Pin with Wire Lock Pin
6	Strut Support (2)
7	Backhitch Strap (2)
8	Strap Link (2)
9	Pin with Collar, Retaining Pin and Cotter Pins (2)

Install Upper Half of Strut

See [Figure 4-155](#) for the following procedure.

1. Attach four nylon lifting slings to lifting lugs (L1 and L2, View A) on strut top (1) and upper insert (2).
2. Remove hinge pins (3, View B) from strut upper insert (2).
3. Lift the upper half of the strut into position over the lower half of the strut (Views A and B).
4. Align the connecting holes in upper and lower inserts (2 and 4, View B).
5. Install hinge pins (3, View B).
6. Remove pin (5, View C) and lower strut support (6) on both sides of strut insert (2).
7. Install pins (5, View C) in the lugs on strut insert (4).
8. Lower the upper half of the strut so strut supports (6, View C) engage pins (5).
9. Disconnect the lifting slings.

Connect Backstay Straps to Strut Top

See [Figure 4-155](#), View D for the following procedure.

1. Attach one leg of the chain lifting sling to backhitch strap (7).
2. Lift the strap into position so the holes in the strap are aligned with the holes in strap link (8).
3. Install pin (9).
4. Repeat the above steps for the other backstay strap.

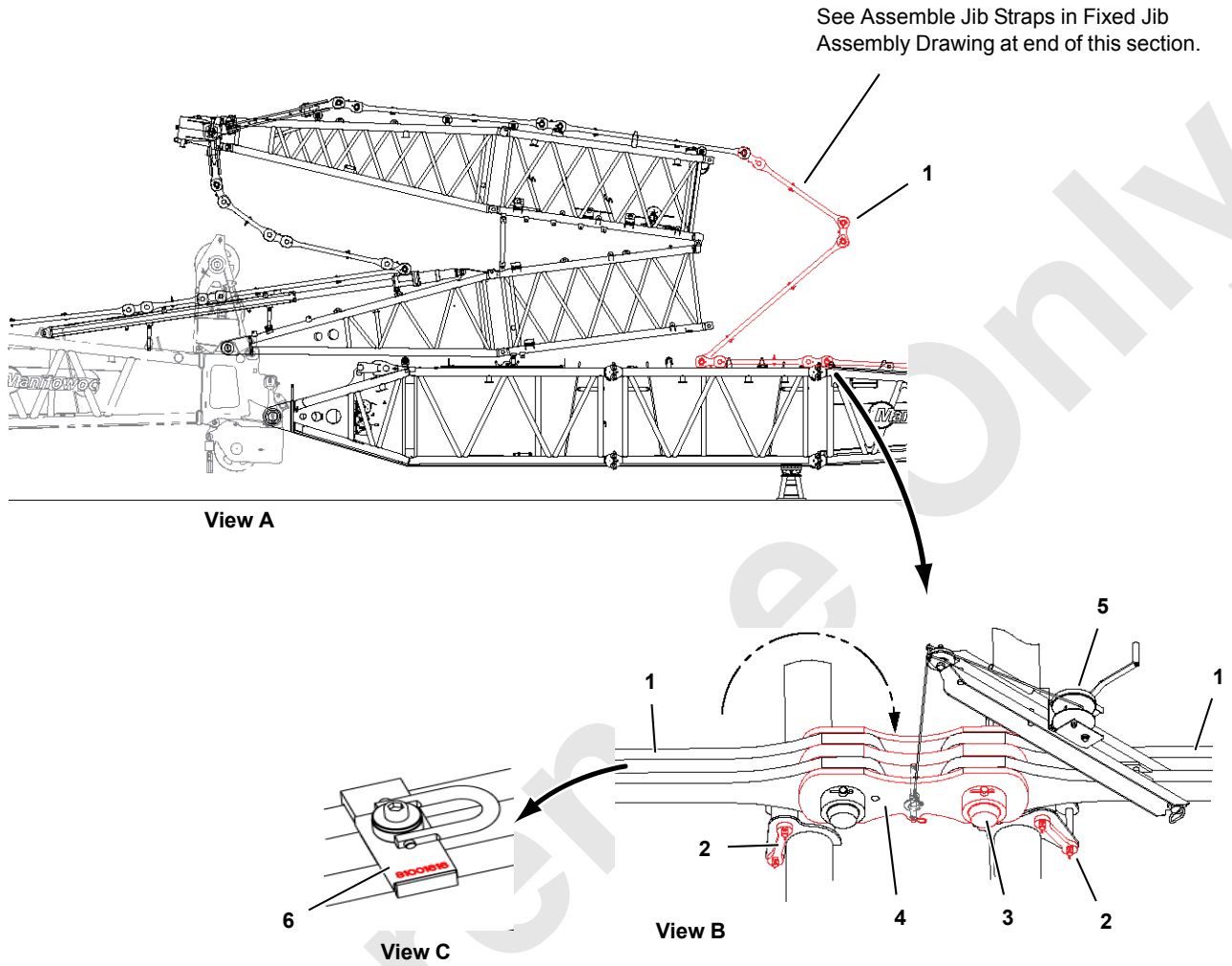


FIGURE 4-156

Legend for Figure 4-156

Item	Description
1	Jib Strap (2 each jib insert)
2	Strap Storage Link with Pin and Cotter Pins (4 each insert)
3	Pin with Collar, Retaining Pin and Cotter Pins (2 each boom insert)
4	Jib Strap Links (2 sets of three each insert)
5	Strap Rigging Winch
6	Strap Identification Tag (with strap part number)

Install and Connect Jib Straps

See [Figure 4-156](#) for the following procedure.

NOTE The jib straps are shipped in the stored position on the jib sections.

Each jib strap has an identification tag with the strap's part number (see View C). The jib straps must be installed in the exact sequence given in

the Fixed Jib Assembly Drawing at the end of this section.

1. Proceed as follows starting at the jib top:
 - a. Rotate strap storage links (2, View B) from the shipping position to the working position.
 - b. Remove pin (3, View B) from the adjacent jib strap.
 - c. Rotate jib strap links (4, View B) from the shipping position to the working position. Strap rigging winch (5, View B) can be used in the same manner it was used for the boom straps. See [page 4-215](#) for procedure.
 - d. Install pin (3, View B).
 - e. Repeat the above steps at each backstay strap.
2. Install the remaining jib straps between the jib and strut (View A) as shown in the Fixed Jib Assembly Drawing at the end of this section.

Jib straps must be installed in exact sequence given in Fixed Jib Assembly Drawing.

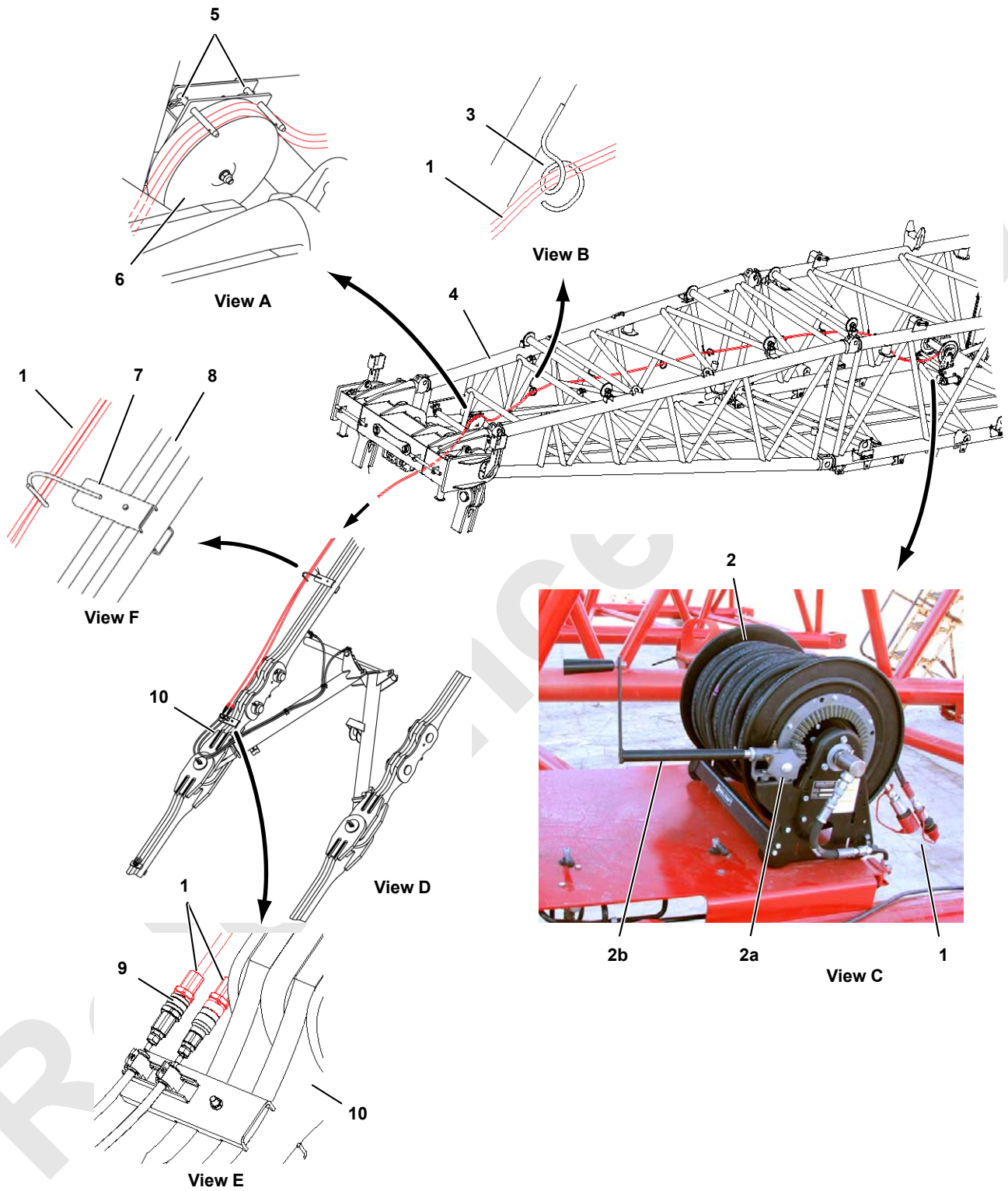


FIGURE 4-157

Legend for Figure [4-157](#)

Item	Description
1	Hydraulic Hoses
2	Cable Reel
2a	Tension Knob
2b	Hand Crank (store in power unit when not in use)
3	Hose Hanger
4	Strut
5	Hitch Pin with Hair Pin Cotter (2)
6	Sheave
7	Hose Hanger
8	Backstay Strap
9	Hydraulic Coupler (2)
10	Spreader

Connect Hydraulic Lines to Backstay Spreader

See [Figure 4-157](#) for the following procedure.

1. Pull hydraulic hoses (1, View C) off cable reel (2) in the strut insert.
You can adjust reel spooling tension by turning tension knob (2a, View C).
2. Route the hoses through hose hangers (3, View B) in strut (4).
3. Remove hitch pins (5, View A) from sheave (6).
4. Route the hydraulic hoses over sheave (6) and reinstall hitch pins (5).
5. If not already done, securely fasten hose hangers (7, View F) to backstay straps (8) on the left side of the strut. See Fixed Jib Assembly Drawing at the end of this section for details.
6. Route the hoses through hose hangers (7, View F).
7. Connect the couplers on hydraulic hoses (1, View E) to couplers (9) on spreader (10).

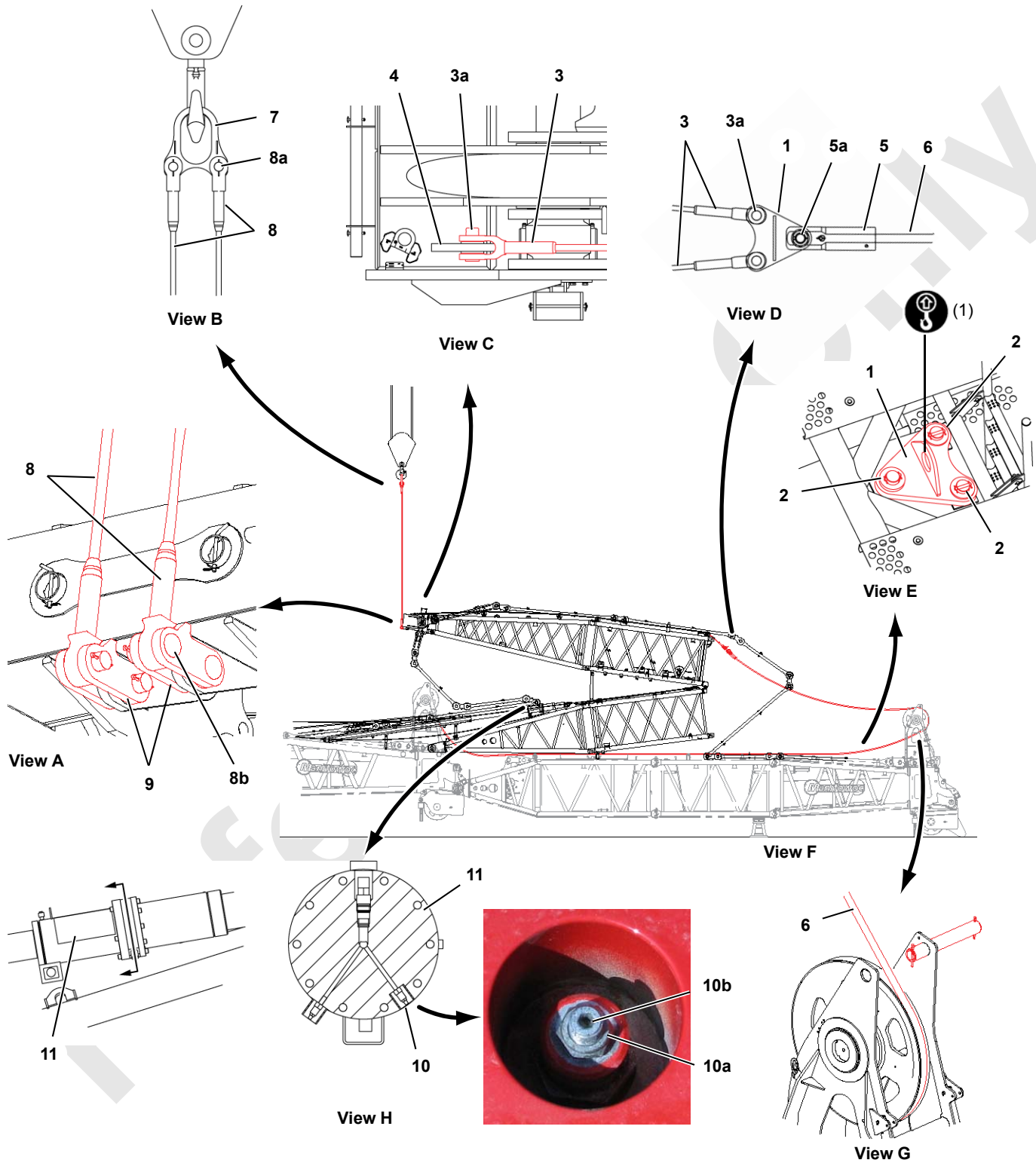


FIGURE 4-158

Legend for Figure 4-158

Item	Description
1	Link
2	Retaining Pin with Cotter Pins (3)
3	Pendant — 1-1/4 in Diameter (2)
3a	Pin with Cotter Pin (2 with each pendant)
4	Strut Top Lug (2)
5	Button Socket
5a	Bolt with Nut and Cotter Pin
6	Drum 1 or 3 Load Line
7	Lifting Lug
8	Pendant — 1-1/2 in Diameter (2)
8a	Pin with Cotter Pin (1 with each pendant)
8b	Pin with Cotter Pin (2)
9	Lifting Lug (2)
10	Bypass Valve (2)
10a	Locknut
10b	Adjusting Screw
11	Strut Stop (2)

Prepare Strut for Raising**Attach Pendants to Front Side of Strut**

See [Figure 4-158](#) for the following procedure.

1. Attach one leg of the chain lifting sling to link (1, View E) in the jib top.
2. Remove retaining pins (2, View E) and lift the link out of the strut top.
3. Reinstall the retaining pins in the jib top.
4. Pin two pendants (3, View D) to link (1).
5. Lift the link and pendants into position over the top end of the strut top.
6. Pin pendants (3, View C) to strut top lugs (4).
7. Lower the pendants onto the strut so the link hangs over the end of the strut insert as shown in View F.
8. Pull out the rope guide bar from the boom top wire rope guide as shown in View G.
9. Connect button socket (5) to load line (6) from Drum 1 or 3. See [Figure 4-166](#), View F for the procedure.
10. Route Drum 1 or 3 load line under the boom top guide sheave as shown in Views F and G.
11. Pin button socket (5, View D) to lifting link (1).
12. Disconnect the lifting sling.

Install Strut Raising Pendants

See [Figure 4-158](#) for the following procedure.

1. Attach lifting lug (7, View B) to the hook of the assist crane.
2. Pin pendants (8, View B) to the lifting lug.
3. Lift pendants (8, View A) into position at the top end of the strut top.
4. Pin pendants (8, View A) to lifting lugs (9) on the end of the strut.
5. Hoist with the assist crane until the pendants just start to take on load.

Open Strut Stop Bypass Valves**WARNING**
Falling Load Hazard

Fully open both strut stop bypass valves before raising strut.

Strut could collapse and fall if you fail to perform this step.

See [Figure 4-158](#) for the following procedure.

Fully OPEN bypass valve (10, View H) at both strut stops (11).

1. Loosen locknut (10a) with a 9/16 in wrench.
2. Turn adjusting screw (10b) OUT until it stops (COUNTERCLOCKWISE) with a 5/32 in (4 mm) internal hex wrench.
3. Hold the adjusting screw in position and tighten the locknut.

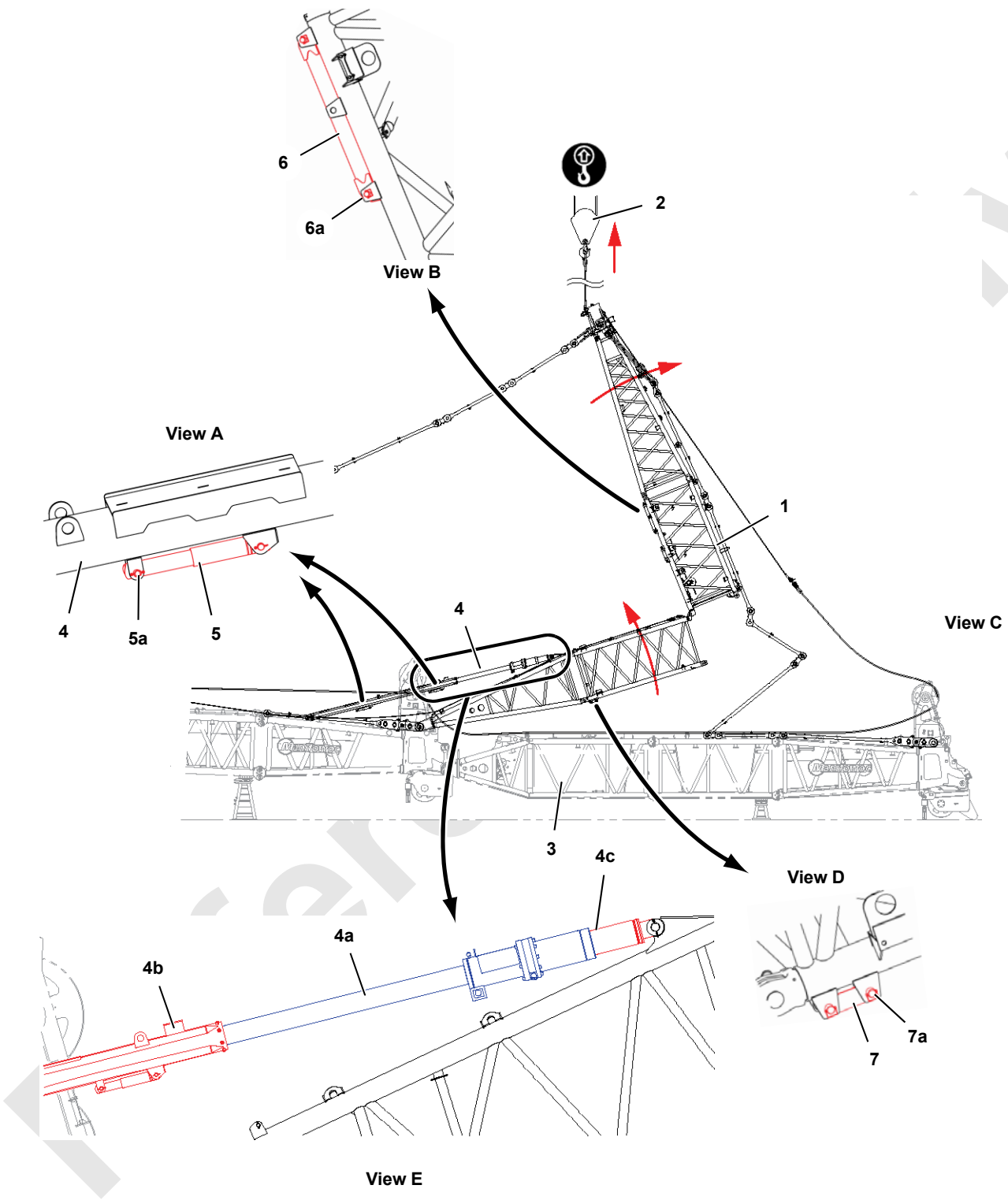


FIGURE 4-159

Legend for Figure [4-159](#)

Item	Description
1	Strut
2	Assist Crane
3	Jib Butt
4	Strut Stop
4a	Upper Tube
4b	Lower Tube
4c	Cylinder Rod
5	Strut Stop Support (4)
5a	Pin with Wire-Lock Pin (4)
6	Strut Support (2)
6a	Pin with Wire-Lock Pin (2)
7	Strut Support (2)
7a	Pin with Wire-Lock Pin (2)

Raise Strut

See [Figure 4-159](#) for the following procedure.

1. SLOWLY start raising strut (1, View C) with assist crane (2).
2. Stop raising the strut when it starts to unfold and rises off jib butt (3, View C).
3. Store strut stop supports (5, View A).
4. Store strut supports (6, View B).
5. Store strut supports (7, View D).
6. Note the extended position of strut stop upper tubes (4a, View E) and strut stop cylinder rod (4c).

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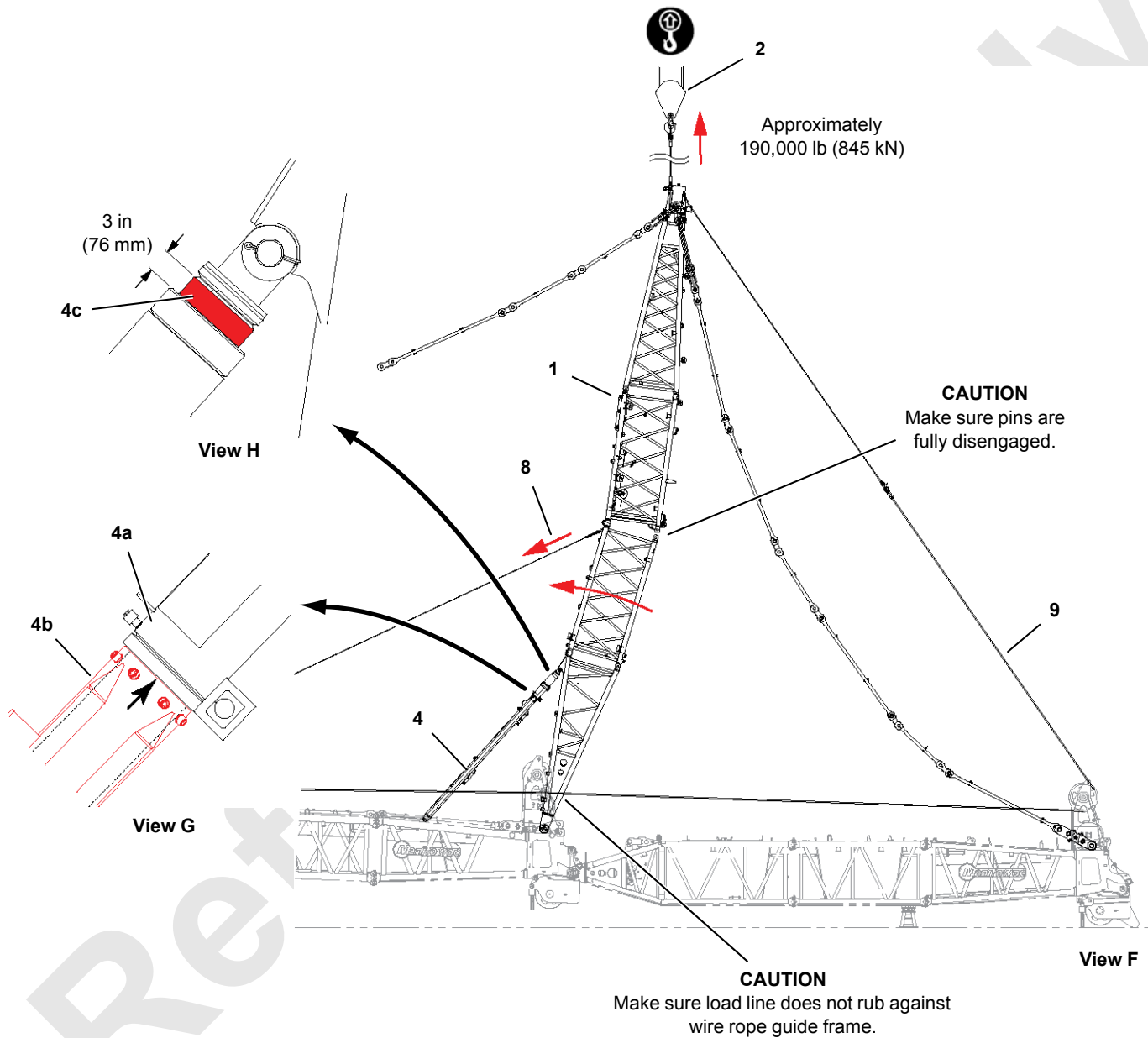


FIGURE 4-159 continued

Legend for Figure 4-159 continued

Item	Description
1	Strut
2	Assist Crane
4	Strut Stop
4a	Upper Tube
4b	Lower Tube
4c	Cylinder Rod
8	Drum 6 Rigging Line
9	Drum 6 Rigging Line

See [Figure 4-159](#) continued for the following steps.

- Continue to SLOWLY raise strut (1, View F) with assist crane (2) until upper strut stop tubes (4a, View G) are fully retracted into lower strut stop tubes (4b).

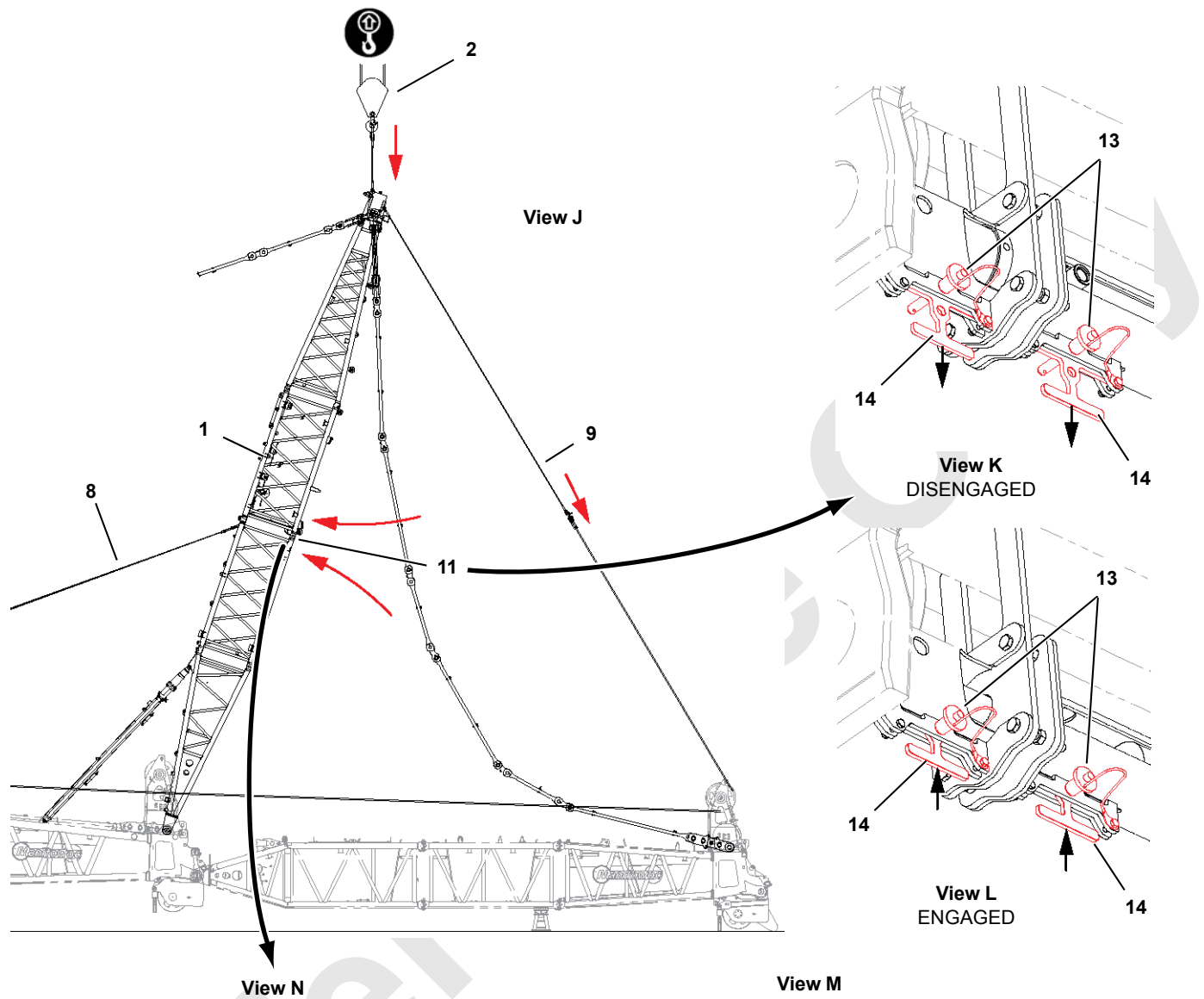
CAUTION
Avoid Structural Damage!

Visually check that both strut pins (View F) are fully disengaged.

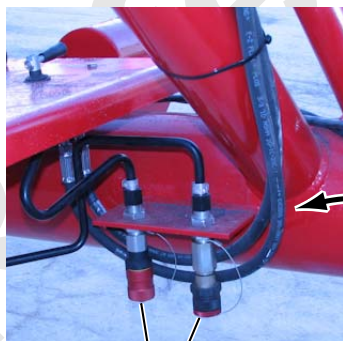
If necessary, disengage pins: reverse step [16](#) on [page 4-271](#).

- Haul in (hoist) Drum 6 rigging line (8, View F) and Drum 1 or 3 load line (9, View F) just enough to remove the slack from the lines.
- SLOWLY haul in (hoist) Drum 6 rigging line (8, View F) to extend strut stop cylinder rods (4c, View H).
- STOP when there is approximately 3 in (76 mm) of exposed cylinder rod (View H) at both strut stops.

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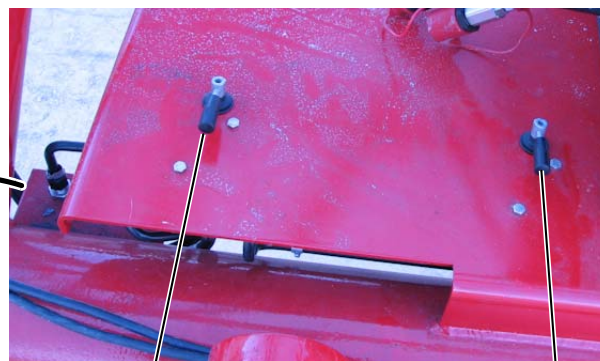


View M
Also see [Figure 4-160](#)



10

Connect Hoses from PPU Hydraulic Circuit 2 —
Arctic 15 Hydraulic Oil



12

15

FIGURE 4-159 continued

Legend for [Figure 4-159](#) continued and [Figure 4-160](#)

Item	Description
1	Strut
2	Assist Crane
8	Drum 6 Rigging Line
9	Drum 1 or 3 Load Line
10	Hydraulic Couplers (2)
11	Strut Connecting Pin (2)
12	Control Handle — Strut Connecting Pins
13	Quick-Release Pin (2)
14	Keeper Plate (2)
15	Control Handle — Backstay Strap Spreader

See [Figure 4-159](#) continued for the following steps.

11. Maintain the rod exposure specified in step [10](#).
 12. SLOWLY haul in (hoist) Drum 1 or 3 load line (9, View J).
 13. At the same time, let off on the assist crane so the strut fully closes.
 14. Check that the connectors between the strut inserts are in contact with each other — connecting pin holes
15. Close the strut bypass valves as instructed on [page 4-269](#).
 16. Engage the strut connecting pins as follows:
 - a. Connect two hydraulic hoses from the PPU to couplers (10, View N) on the strut insert. **Hoses must be from PPU hydraulic Circuit 2 — Arctic 15 Hydraulic Oil.**
 - b. Turn on the power unit.
 - c. Fully engage strut connecting pins (11, View J) with control handle (12, View M and [Figure 4-160](#), View A).
 - d. Remove quick-release pins (13, View K).
 - e. Push keeper plates (14, View L) UP and reinstall quick-release pins (13) to LOCK the connecting pins in the ENGAGED position.
 17. Fully extend backstay strap spreader with control handle (15, View M and [Figure 4-160](#), View B).
 18. Disconnect the hydraulic hoses from couplers (10, View N) on the strut insert.

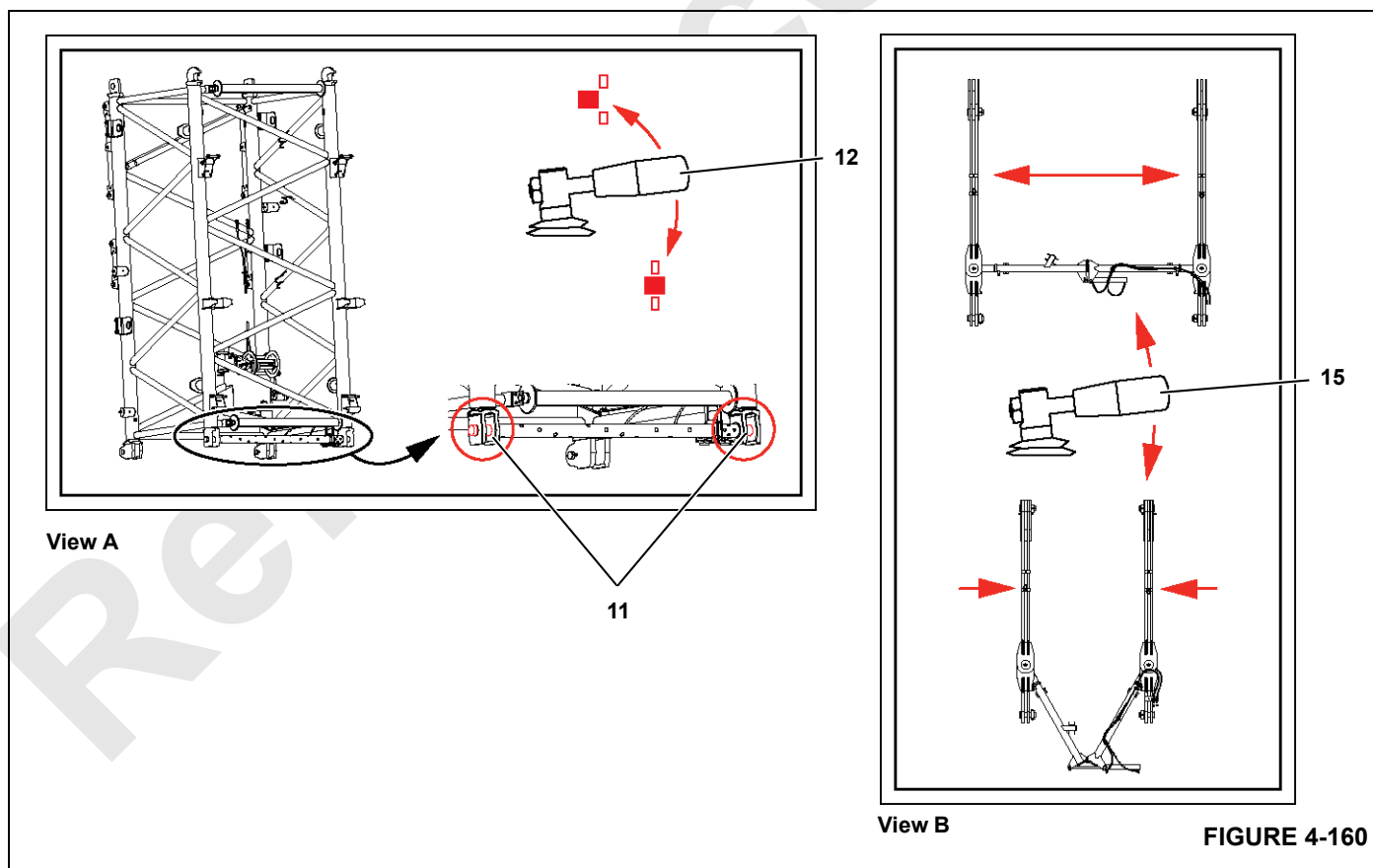


FIGURE 4-160

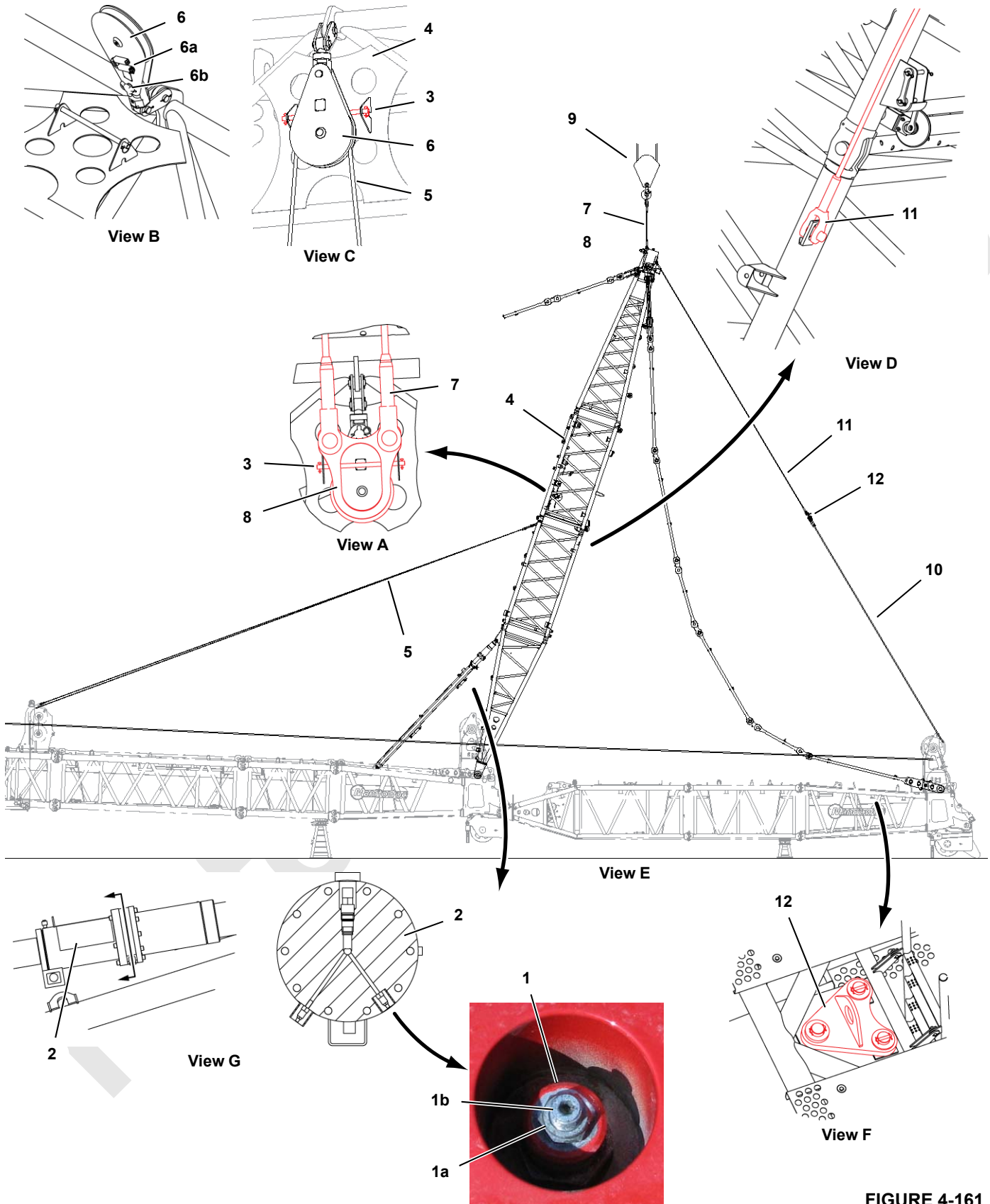


FIGURE 4-161

Legend for [Figure 4-161](#)

Item	Description
1	Bypass Valve (2)
1a	Locknut
1b	Adjusting Screw
2	Strut Stop (2)
3	Pin with Snap Pins
4	Strut
5	Drum 6 Rigging Line
6	Snatch Block
6a	Snatch Block Swivel Lock
6b	Snatch Block Handle
7	Pendant (2)
8	Lifting Link
9	Assist Crane
10	Drum 1 or 3 Load Line
11	Pendant (2)
12	Link

Close Strut Stop Bypass Valves



WARNING

Falling Load Hazard

Fully CLOSE both strut stop bypass valves once strut is fully raised.

Strut stops will not properly support strut and backstay straps if you fail to perform this step.

See [Figure 4-161](#) for the following procedure.

Fully CLOSE bypass valve (1, View F) at both strut stops (2).

1. Loosen locknut (1a) with a 9/16 in wrench.
2. Turn adjusting screw (1b) all the way IN until it stops (CLOCKWISE) with a 5/32 in (4 mm) internal hex wrench.
3. Hold the adjusting screw in position and tighten the locknut.

Store Strut Raising Components

See [Figure 4-161](#) for the following procedure.

1. Remove pin (3, View C) from strut (4).
2. Slacken Drum 6 rigging line (5, View C) until snatch block (6) is resting on the strut.
3. Snatch block swivel lock (6a, View B) and snatch block handle (6b) must face the strut.
4. Disconnect Drum 6 rigging line from the snatch block and remove the rigging line from the top of the boom.
5. Lower pendants (7, View A) and lifting link (8) with assist crane (9) until the lifting links are over the snatch block.
6. Install pin (3, View A) to secure the snatch block and lifting link to the strut.
7. Pay out Drum 1 or 3 load line (10, View D) until pendants (11) hang vertically.
8. Disconnect Drum 1 or 3 load line (10) and link (12, View E) from pendants (11).
9. Store link (12, View F) in the jib top using the retaining pins provided.
10. Pin pendants (11, View D) to the strut insert.

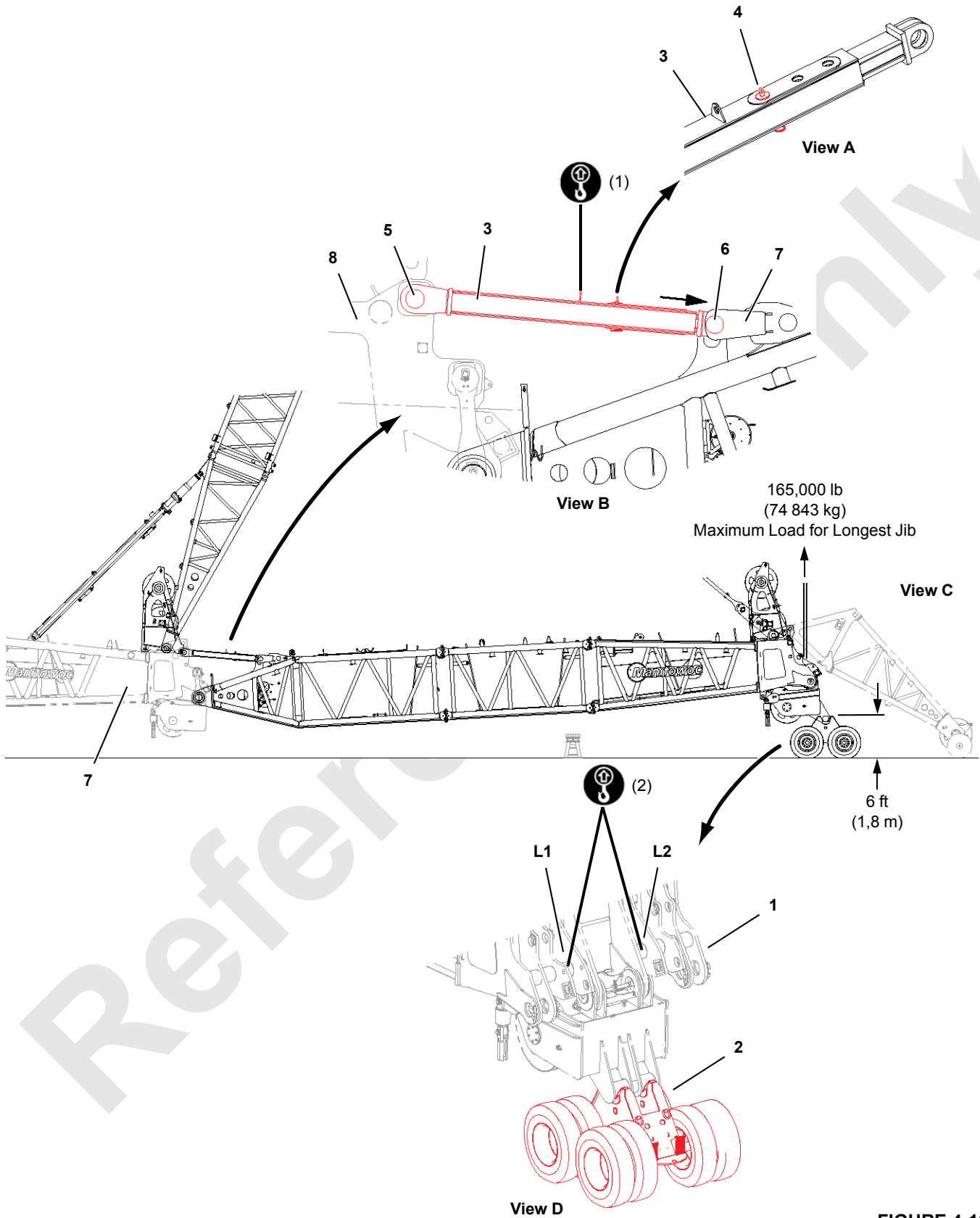


FIGURE 4-162

Legend for Figure 4-162

Item	Description
1	Jib Top
2	Dolly
3	Jib Stop (2)
4	Stop Pin with Safety Pin (1 each jib stop)
5	Pin with Cotter Pin (1 each jib stop)
6	Pin with Cotter Pin (1 each jib stop)
7	Jib Stop Spreader
8	Boom Top

Install Dolly Under Jib Point

1. Prep the dolly prior to each use, as follows (see [Figure 4-163](#)):
 - a. Check wheel hub oil levels (see Lubrication Guide, F2201, for details).
 - b. Check tire pressures: each tire should be inflated to 120-130 psi (8,27-8,96 bar).
 - c. Check wheel nut tightness: each nut, inner and outer, should be torqued dry to 750-900 ft-lb (1 016.9 - 1 220.2).

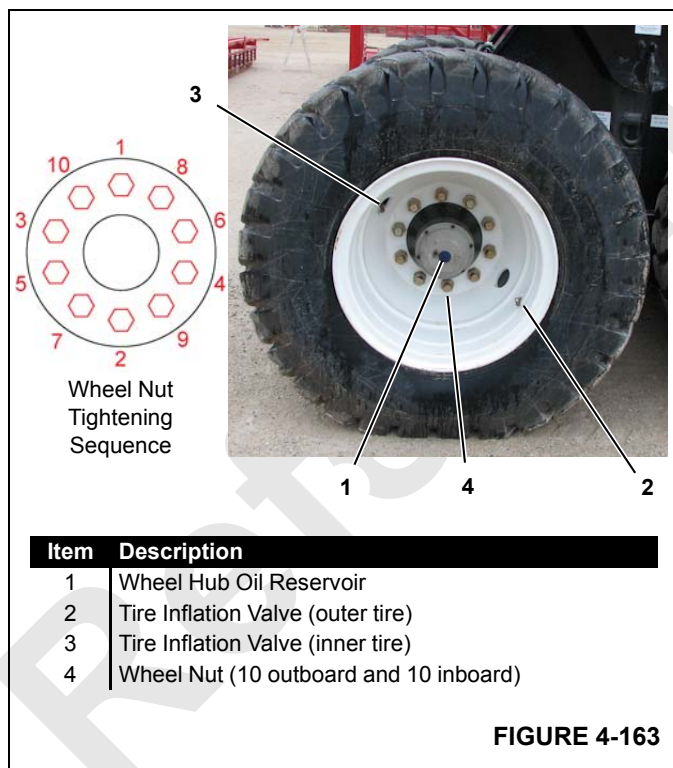


FIGURE 4-163

See [Figure 4-162](#) for the remaining steps.

2. Attach two nylon lifting slings to the tubes (L1 and L2, View D) in jib top (1).
3. Lift the jib top approximately 6 ft (1,8 m) above the ground.
4. Roll dolly (2) into position under the jib top.
5. Lower the jib top onto the dolly.
6. Disconnect the lifting slings.
7. Using a forklift, remove the jib supports from under the jib and store them.

Install Upper Jib Point (Optional)

The upper jib point is identical to the upper boom point and installation is the same. See [page 4-217](#) for the installation procedure.

Install Jib Stop

See [Figure 4-162](#) for the following procedure.

Perform the following steps at each jib stop.

1. Move stop pin (4, View A) to the setup hole in jib stop (1).
This position will allow the upper stop tube to extend and retract as needed during installation.
2. Remove pin (5, View B) from the end of jib stop (3).
3. Remove pin (6, View B) from jib stop spreader (7).
4. Attach one leg of chain lifting sling to the lifting lug on jib stop (3, View B).
5. Lift jib stop (3, View B) into position over the jib butt and pin the lower tube to boom top (8).
6. Extend the upper tube as needed and pin it to jib stop spreader (7, View B).
7. Repeat the steps for the other jib stop.

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Attach Jib Point Electrical Components and Wiring

See [Figure 4-131](#) for the following procedure.

1. Thoroughly clean the ends of all cables and receptacles before connecting the electric cables.
 2. Always cover unused cables and receptacles with protective caps.
 3. Route the electric cables from the cable reels in the boom butt to the boom top as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.
 4. Secure the cables to the boom sections as shown in the drawing.
 5. Once the cables from the cable reels are connected to the boom top, connect the butt end of the cables from the cable reels to the supply cables in the boom butt. See the wiring diagram in the Electric Control Assembly – Boom Wiring and Limits at the end of this section.
 6. For boom with or without fixed jib, make sure the CAN BUS terminator plug is connected to the WN OUT receptacle on the boom top universal node.
 7. Route the electric cables from the cable reels in the jib butt to the jib top as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.
 8. Secure the cables to the jib sections as shown in the drawing.
 9. Once the cables from the jib butt cable reels are connected to the jib top, connect the cables from the boom top to the cable reels. See the wiring diagram in the Electric Control Assembly – Boom Wiring and Limits at the end of this section.
- See [Figure 4-131](#) for the remaining steps.
10. Install the wind speed indicator as follows:
 - a. Fasten wind speed indicator (1) either to the bracket on the jib top (View B) or to the bracket on the upper jib point (View E).
Use serrated washers to ensure a good ground.
 - b. Connect the electric cables as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.
11. Install the jib point camera as follows:
 - a. Fasten boom point camera (2, View A) to the left side of the jib top.
 - b. Connect the electric cables as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.
 12. Install the aircraft warning light as follows:
 - a. Fasten aircraft warning flag (3) either to the jib top (View A) or to the upper jib point (View E).

FOR JIB TOP

 - b. Remove mounting pole (4, View D) from storage in the boom top and connect it to bracket (5, View B) on the jib top.
 - c. Fasten aircraft warning light (6, View B) to mounting pole (4).
 - d. Connect the electric cables as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.

FOR UPPER JIB POINT

 - e. Fasten aircraft warning light (6, View E) to the mounting bracket on the upper jib point.
 - f. Connect the electric cables as shown in Electric Control Assembly – Boom Wiring and Limits at the end of this section.

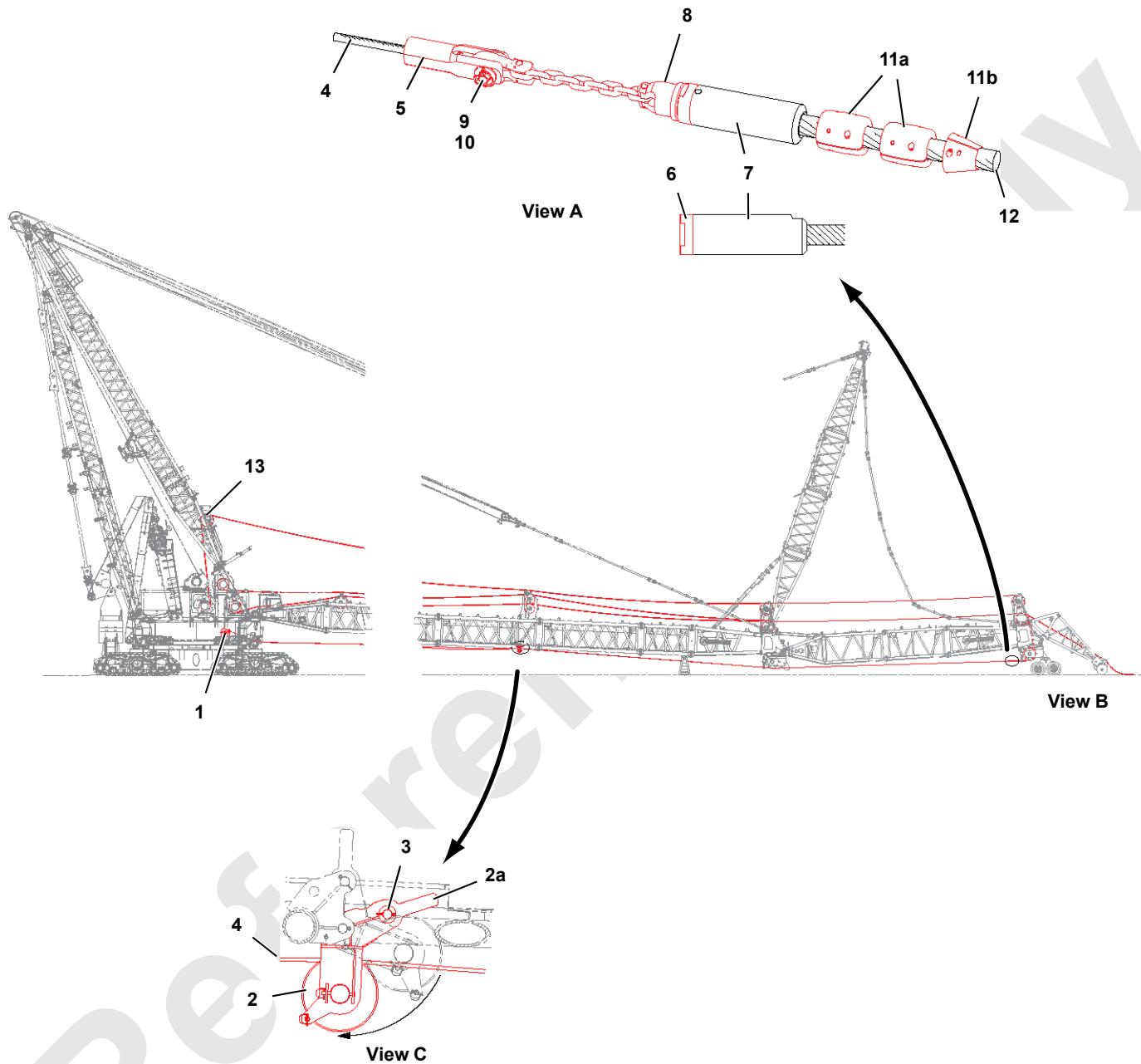


FIGURE 4-164

Legend for [Figure 4-164](#)

Item	Description
1	Drum 6 — Rigging Winch
2	Wire Rope Guide
2a	Handle
3	Pin with Cotter Pins (1)
4	Rigging Line — from Drum 6
5	Button Socket (19 mm)
6	Button Cap
7	Button (50 mm)
8	Button Swivel Head with Chain and Coupler
9	Pin
10	Keeper
11a	Split Collar (2)
11b	Tapered Split Collar
12	Wire Rope — from Load Drum
13	Mast Butt Platforms

Pull Load Lines to End of Jib Points

See [Figure 4-164](#) for the following procedure.

1. Rotate mast butt platforms (13, View B) rearward and pin for storage. This must be done before wire rope from Drum 2 can be routed over the wire rope guide sheave in the mast butt.
2. Grasp handle (2a, View C) to support wire rope guide (2) and remove pin (3).
3. Lower wire rope guide (2) to the lowest position and install pin (3).
4. Route rigging line (4, View C) over the top of wire rope guide (2).
5. Attach button socket (5, View A) to rigging line (4).
6. Prepare the load line from the load drum, as follows:
 - a. Remove button cap (6, View A) from the end of button (7).
 - b. Fasten button swivel head (8, View A) to the end of button (7).
 - c. Pin the coupler on button swivel head chain (8) to button socket (5, View A) with pin (9) and keeper (10).
 - d. Fasten split collars (11a, View A) and tapered split collar (11b) to wire rope (12). Space the collars 2-3 in (50-70 mm) apart. The collars prevent the button from catching on parts during reeving/unreeving.
7. Turn on the rigging winch mode ([page 4-157](#)).
8. Route the rigging line through the proper sheaves in the boom and jib as shown in the Jib Assembly Drawing at the end of this section.
9. Connect the rigging line to the load line as shown in View A and pull the load to the end of the jib point.

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Reeve Load Lines

Refer to the Wire Rope Specifications Chart in the Capacity Chart Section of the Operator Information Manual to determine the parts of line required for your job. Size the hook block(s) accordingly.

Refer to the Hook Block and Reeving Guide (in operator cab) for hook block information and assembly instructions and for hook block reeving diagrams.

1. Use the rigging winch to pull the load lines through the hook blocks as shown in the block reeving drawings.
2. Dead end the load lines as shown in [Figure 4-166](#).
3. When done, store the rigging line on Drum 6 and store wire rope guide (1) as shown in [Figure 4-165](#).

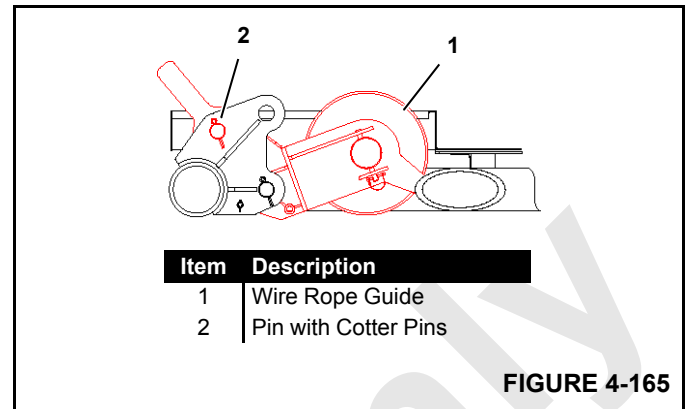


FIGURE 4-165

Connect Anti-Two Block Weights

Connect the anti-two block weights and chains to the load lines as shown in [Figure 4-166](#).

Raise Boom and Jib

Perform the pre-raising steps given on [page 4-287](#).

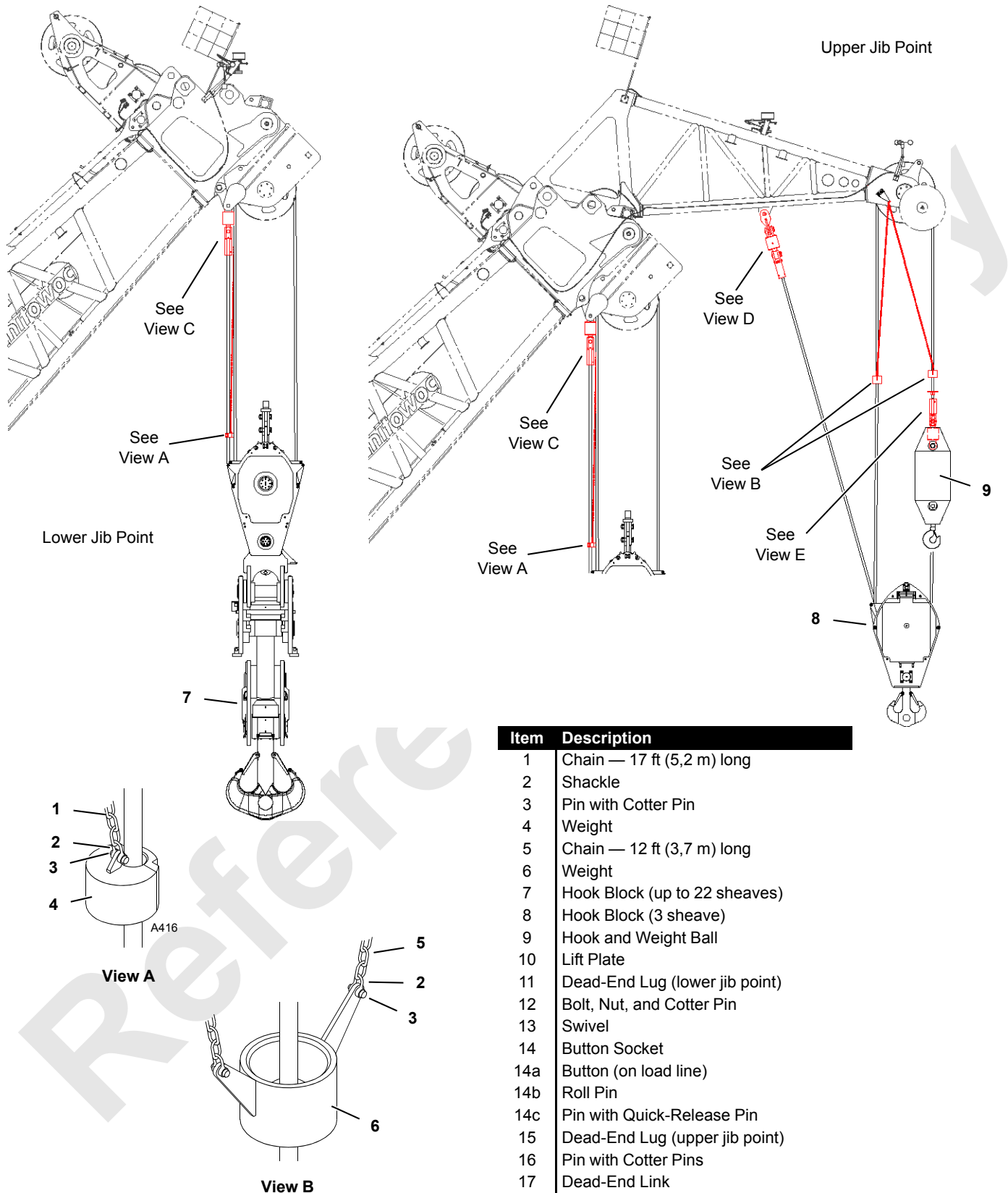


FIGURE 4-166

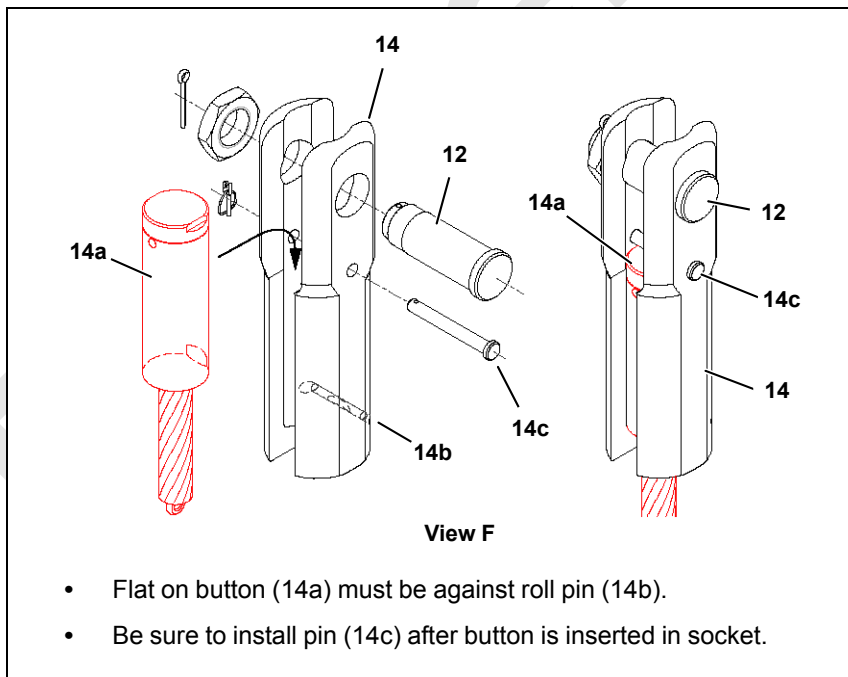
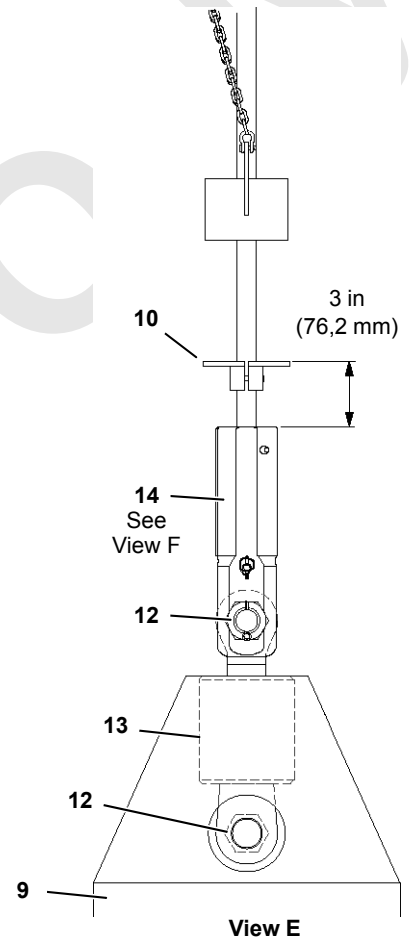
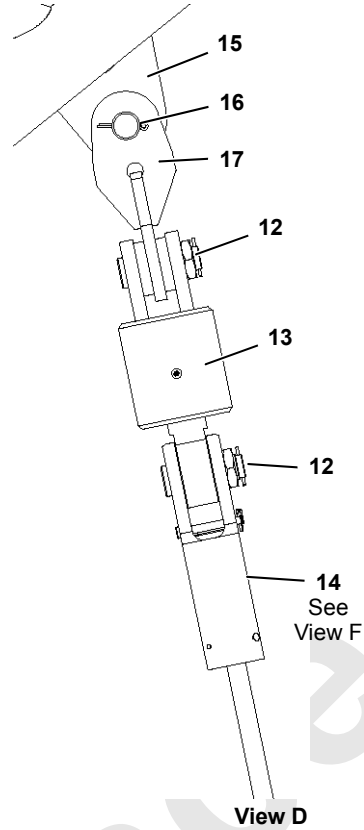
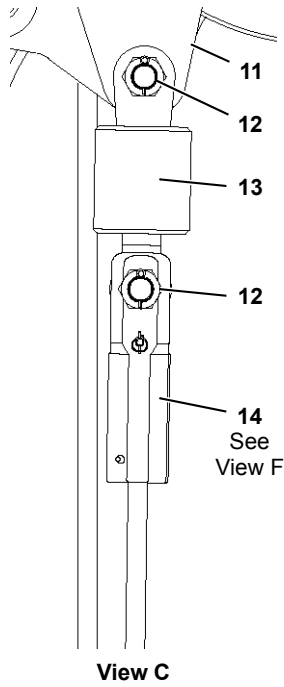


FIGURE 4-166 continued

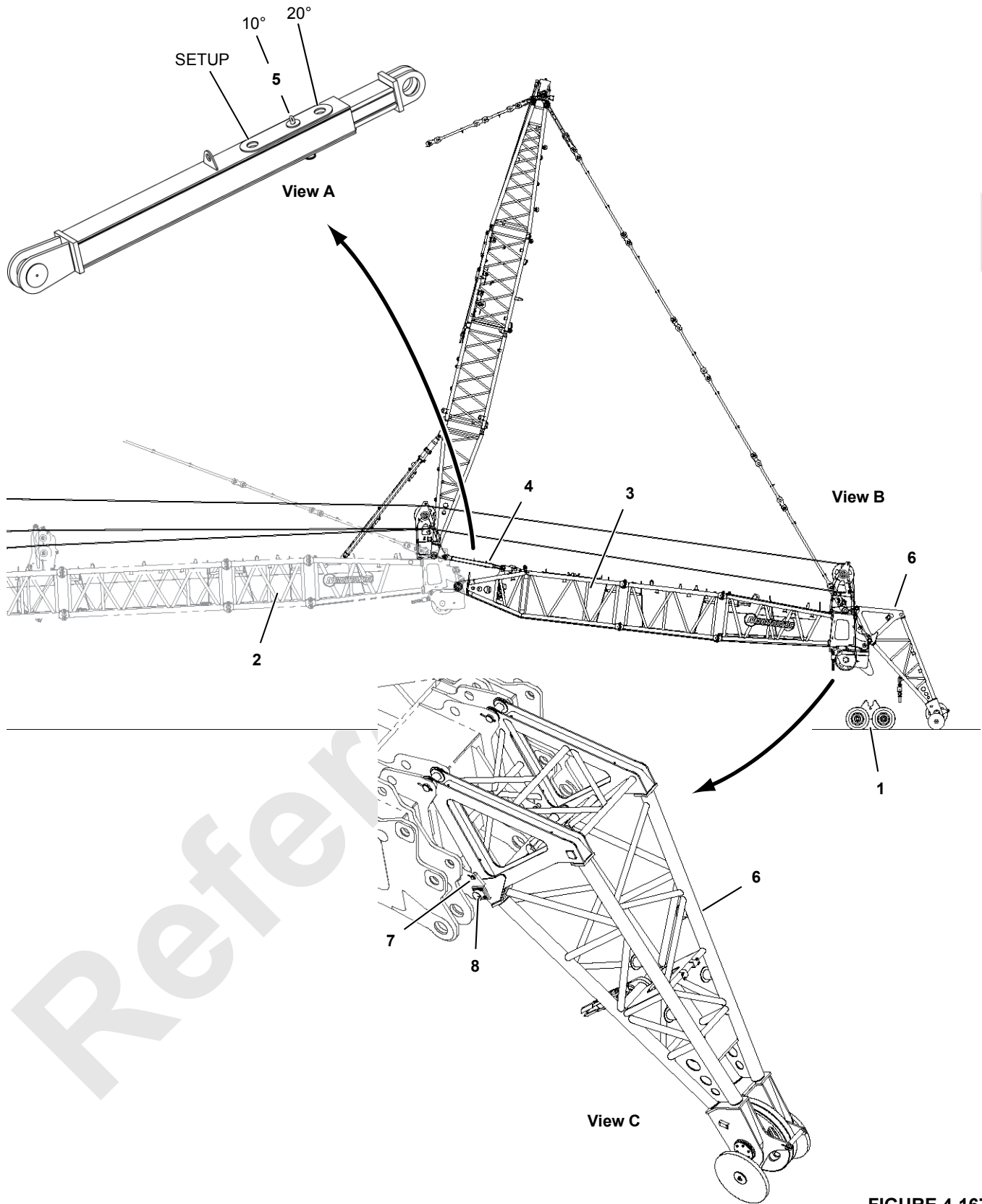


FIGURE 4-167

Legend for [Figure 4-167](#)

Item	Description
1	Dolly
2	Boom
3	Jib
4	Jib Stop (2)
5	Stop Pin with Safety Pin (1 each jib stop)
6	Upper Jib Point
7	Pin with Cotter Pins (2)
8	Load Pin (2)

Raise Fixed Jib

See [Figure 4-167](#) for the following procedure.

1. Perform Pre-Raising Checks.
 - e. If equipped with upper jib point (6, View C), remove pins (7).
2. Slowly boom up. Dolly (1, View B) will roll back as boom (2) and jib (3) rise.
3. Stop booming up when desired jib stop offset holes are lined up: 10° or 20°, View A.
4. Remove stop pins (5, View A) from the setup position and install them in the desired offset holes.
5. Using a forklift, remove dolly (1) from the area once the jib is clear of it.
6. If equipped with upper jib point (6, View C), proceed as follows:
 - a. Continue booming up until the upper boom point rollers are off the ground. The upper boom point will now be resting on load pins (8).
 - b. Install pins (7).

CAUTION**Structural Damage Hazard!**

To prevent structural damage to jib top and upper jib point:

- Do not attempt to support jib on upper jib point rollers.
- Keep upper jib point rollers off ground when pins (7, View C) are installed.

**WARNING****Crush Hazard!**

Dolly tires and upper boom point rollers will roll along ground as boom and jib are raised.

To prevent personnel from being crushed by tires or rollers:

- Warn all personnel to stay clear of dolly tires and upper jib point rollers as boom and jib are raised.

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Reference Only

PRE-RAISING CHECKS

Perform the following pre-raising checks and correct any defects before raising the boom. If equipped with a luffing jib, see the checks in the Luffing Jib Operator Manual:

- o Crane on firm, level surface.
- o Crawlers blocked if required per Capacity Chart.
- o Boom inserts installed in proper sequence.
- o Boom straps installed in proper sequence.
- o All boom insert and strap connecting pins installed and properly retained.
- o All jib backstay straps, links, and pins removed from boom sections (if fixed jib or luffing will not be used).
- o Fixed jib inserts installed in proper sequence.
- o Fixed jib straps installed in proper sequence.
- o Fixed jib backstay straps installed in proper sequence on boom sections.
- o All fixed jib insert and strap connecting pins installed and properly retained.
- o Optional drums, rollers, and wire rope guides, deployed, stored, or removed as specified in Boom Assembly Drawing.
- o Load lines spooled tightly onto drums and engaged with proper sheaves. Load lines securely anchored to sockets at boom and fixed jib points or at hook-and-weight ball.
- o All blocking, tools, and other items removed from boom and fixed jib.
- o Electronic boom angle indicator properly installed and adjusted.
- o Wind speed indicators properly installed and operational.
- o Boom and fixed jib point camera properly installed and operational.
- o Aircraft warning lights properly installed and operational.
- o Wind speed indicators properly installed and operational.
- o Block-up limit control properly installed and operational.
- o Automatic boom stop properly installed. Must be adjusted after boom is raised.
- o Physical boom stop properly installed.
- o Crane and attachment properly lubricated.
- o All personnel off boom and jib.
- o Rated Capacity Limiter/Indicator (RCL/RCI) properly installed and operational.
- o RCL/RCI properly configured for boom and jib in use.
- o VPC stop switch in the cab turned to OFF position to allow proper movement of the counterweight.
- o Wind within allowable limits for operation.

WIRE ROPE INSTALLATION

NOTE The Wire rope manufacturer's recommendations take precedence over the information under this topic.

Wire Rope Storage

- Store wire rope in coils or on reels off the ground or floor in a clean and dry indoor location.
- If outdoor storage is necessary, the wire rope must be covered with a protective wrapper.
- Keep the wire rope away from acids, fumes, and other corrosives.
- Keep the wire rope away from heat that can dry out the lubricant.
- If the storage period will be long, lubricate the wire rope and perform periodic inspection given in this section at least monthly.

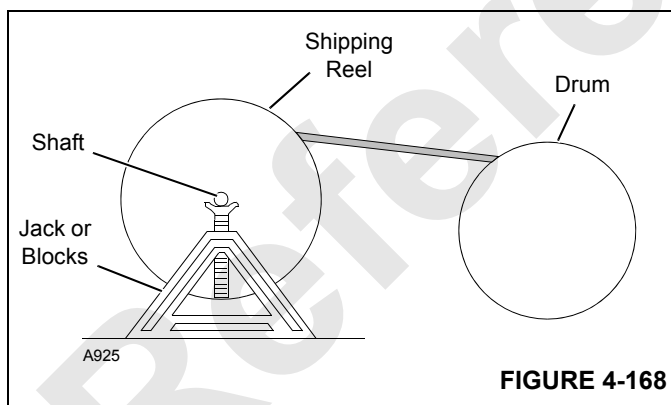
Removing Wire Rope from Shipping Reel

CAUTION!

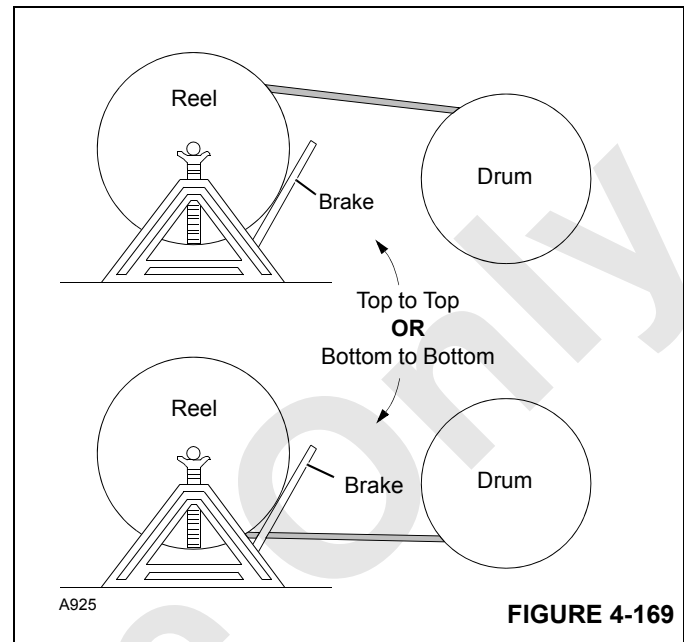
Wire Rope Damage!

Shipping reel must rotate when wire rope is unwound. Attempting to remove wire rope from a stationary reel can result in a "kinked" wire rope, and wire rope will be ruined.

1. Mount the wire rope shipping reel on a shaft supported at both ends by jacks or blocks as shown in [Figure 4-168](#).



2. Provide a brake at the shipping reel (see [Figure 4-169](#)) so the wire rope can be wound tightly onto the drum.



3. Avoid a reverse bend when winding wire rope onto drum: wind from the top of reel to the top of drum or from the bottom of reel to the bottom of drum as shown in [Figure 4-169](#).
4. Avoid dragging the wire rope in dirt or around objects that can scrape, nick, cut, or crush the wire rope.

Cutting Wire Rope

To prevent damage to the wire rope during cutting, seizings must be applied to both sides of the point where the cut will be made.

Cut the wire rope with a rope cutter or abrasive cut-off wheel.

or:

- The seizing length must be:
 - One seizing three rope diameters long on both sides of the cut OR three seizings each one rope diameter long on both sides of the cut.
- Apply the seizing as shown in [Figure 4-170](#).

1. Place the free end of the seizing wire in the valley between two stands.
2. Then wind the seizing wire over the free end as shown.
3. Finally, twist and pull the two ends of seizing wire together until the seizing is tight.

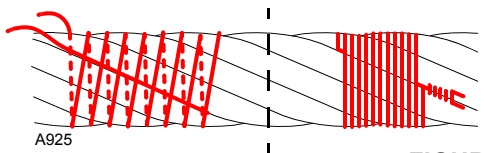


FIGURE 4-170

Pad Eye Usage for Wire Rope Reeving

Manitowoc provides a 34 mm pad eye on either or both ends of the 34 mm and 50 mm wire rope it supplies. See [Figure 4-171](#).

The eye can be used to pull the rope for reeving purposes when needed.

1. Do not exceed 6,600 lb (29,35 kN) single line pull.
2. Make sure rigging line and attaching hardware (clips and rope connectors) are rated for at least 6,600 lb (29,35 kN) single line pull.
3. Inspect pad eyes prior to each use. **Replace if:**
 - Any original dimensions have changed.
 - Cracks or breaks exist in metal or weld.

! WARNING
Flying Part Hazard!

Pad eye on end of wire rope has been provided **for reeving purposes only**. Any other use is neither intended nor approved.

Pad eye can break and fly apart with considerable force if it is overloaded, not used properly, or not maintained properly.

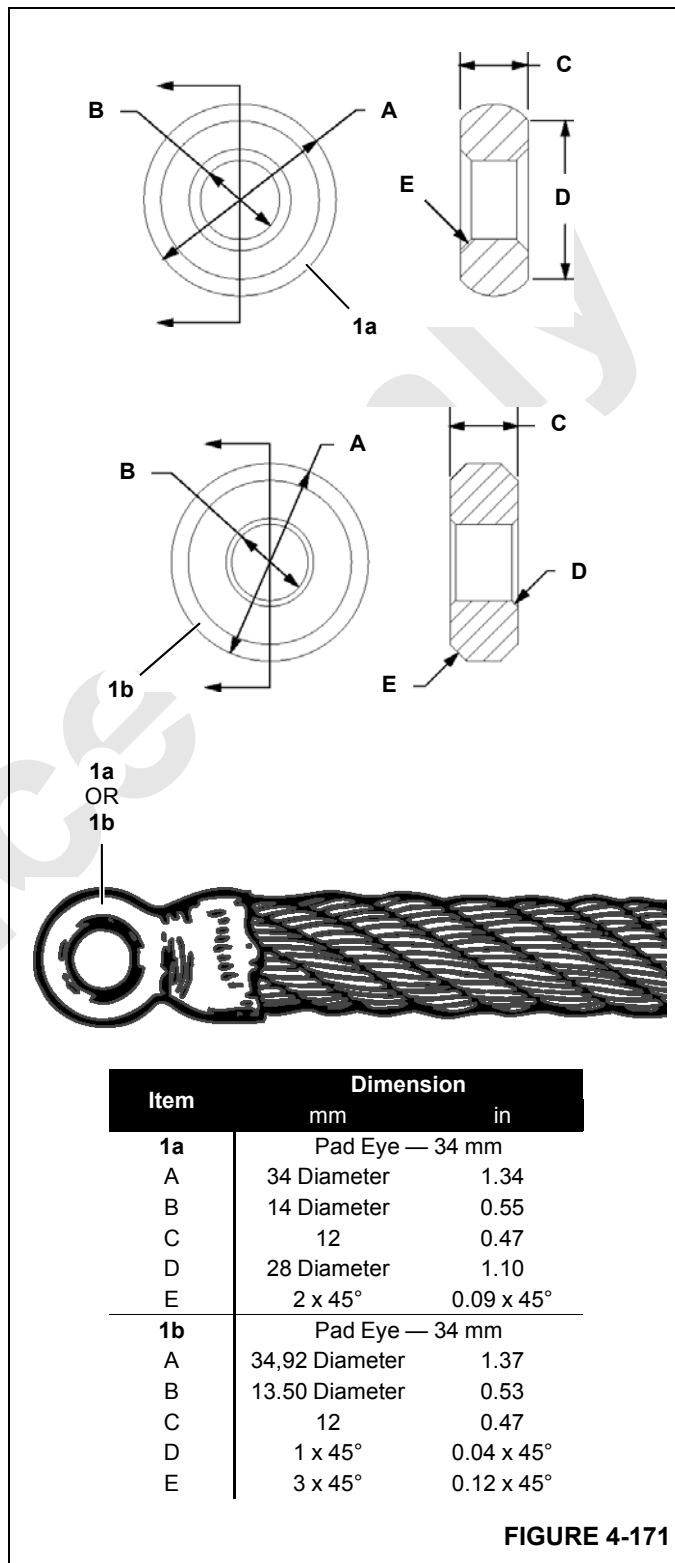
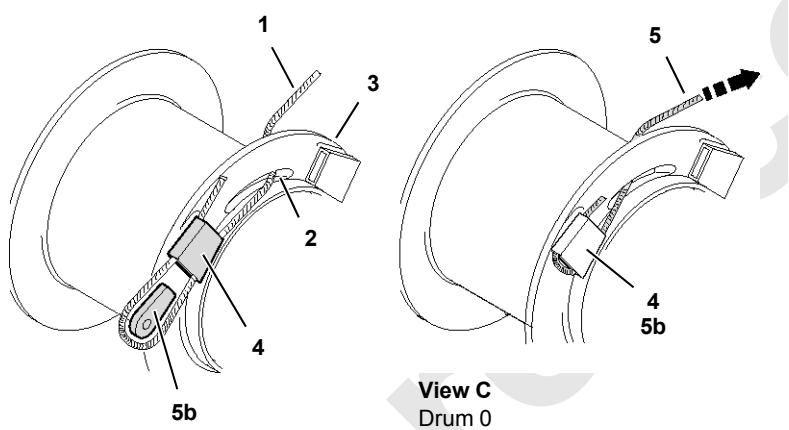
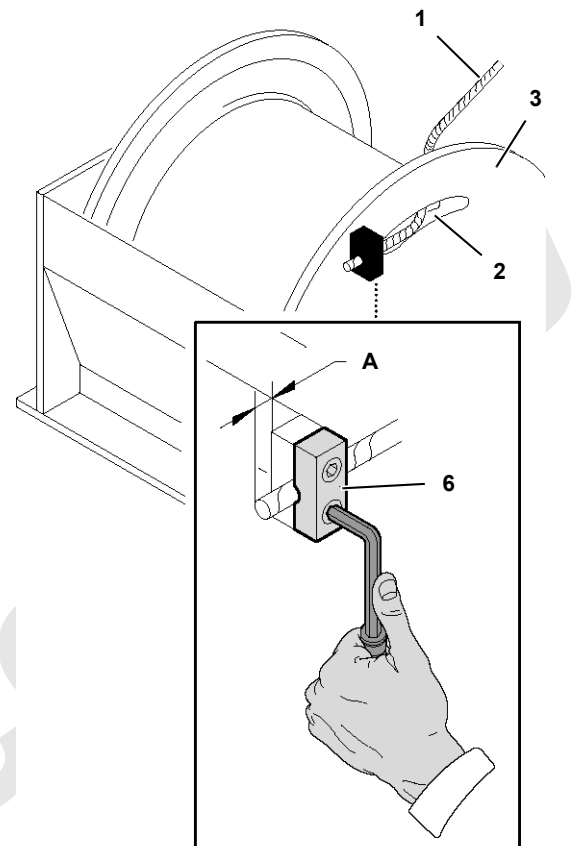
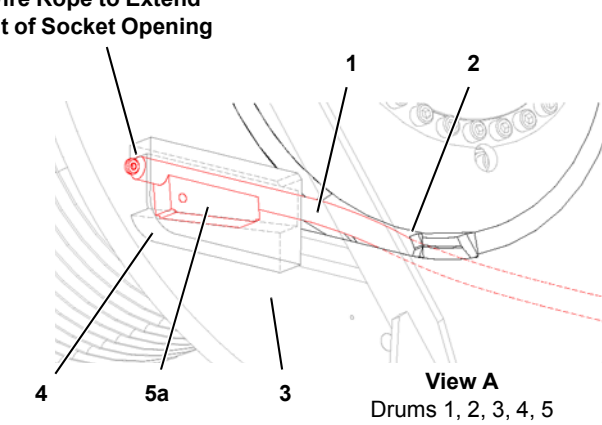


FIGURE 4-171

Don't Allow End of Wire Rope to Extend Out of Socket Opening



Item	Description
1	Wire Rope
2	Hole in Drum Flange
3	Drum Flange
4	Wedge Socket
5a	Wedge — Straight
5b	Wedge
6	Clamp (3)

FIGURE 4-172

Anchoring Wire Rope to Drums



WARNING!

Falling Load Hazard!

Wire rope can be pulled out of drum if following steps are not taken.

- Use correct wedge for size of wire rope being installed. See the Parts Manual supplied with the crane.
- Remove minor nicks, burrs, or rough edges from drum sockets and wedges by lightly grinding. Do not reduce original dimensions by more than 10%.
- Install straight wedge (View A) so corrugated side is against wire rope.
- Install straight wedge (View A) so end of wire rope extends past end of wedge, but not out of drum socket.
- Make sure there is no seizing under wedge. Remove seizing if it interferes with assembly.

See [Figure 4-172](#) for the following procedure.

DRUMS 1 THROUGH 5

The wire rope on Drums 1 through 4 is anchored as shown in View A.

1. Route wire rope (1) through hole (2) in drum flange (3).
2. Attach wire rope (1) to drum socket (4) with straight wedge (5a) to drum socket.
3. Tighten straight wedge (5) by rapping the end of it with a brass drift pin and hammer.

DRUM 6

The wire rope on Drum 6 is anchored as shown in View B.

1. Remove clamps (6) from drum flange (3).
2. Route wire rope (1) through hole (2) in drum flange (3).
3. Attach wire rope (1) to drum flange (3) with clamps (5).
4. Securely tighten the clamp screws.

DRUMS 0

The wire rope on Drums 0 is anchored as shown in View C.

1. Route wire rope (1) through hole (2) in drum flange (3).
2. Pass the wire rope through drum socket (4) and wrap the wire rope around wedge (5b).
3. Insert the wire rope and wedge in the drum socket.
4. Adjust the length of the wire rope so it matches the length of the rope gauge cast into the drum flange.
5. Pull against the wire rope to tighten the wedge in the drum socket.

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Reference Only

Winding Wire Rope onto Drum

See the Wire Rope Specification Chart in the Capacities Section of the Operator Information for the correct type, size, and amount of wire rope to be installed on load drums.

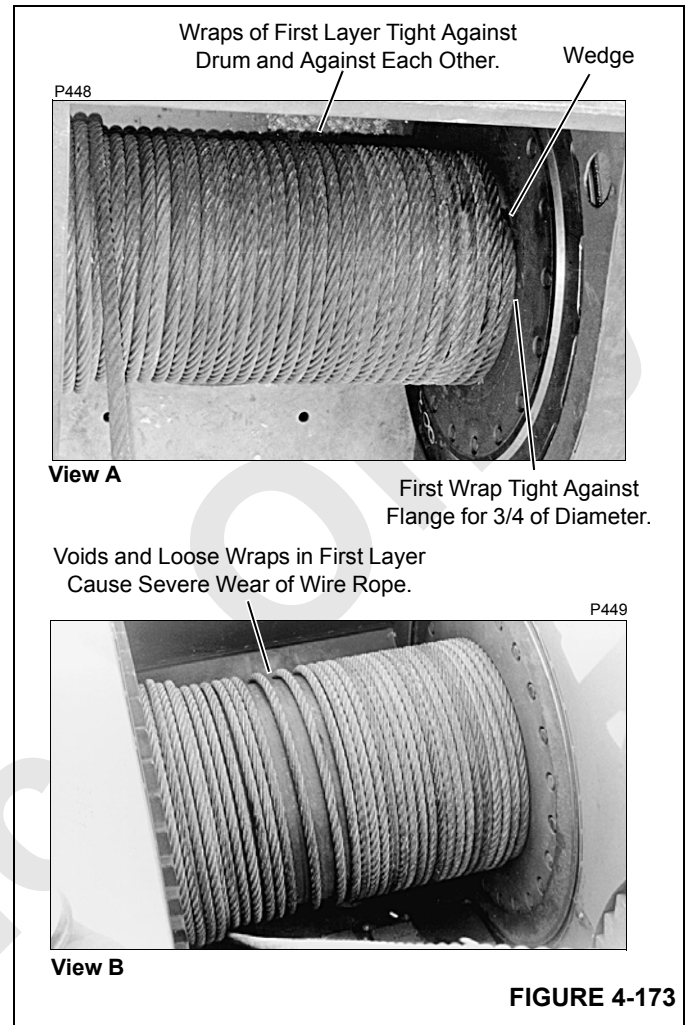
See Boom Rigging Drawing at end of this section for correct type, size, and amount of wire rope to be installed on boom hoist drums.

1. Carefully inspect drums and all rope guides, rollers, and sheaves for defects that can cause wire rope to wear or be cut. If defects cannot be fixed, replace faulty parts.
2. Apply tension to wire rope as it is wound slowly onto drum.

First wrap must be tight against drum flange for approximately three-fourths of drum diameter (see [Figure 4-173](#)).

3. Tap adjacent wraps against each other with a soft metal or wooden mallet.

Use extreme care not to put twists or turns in wire rope; allow rope to assume its natural lay.



CAUTION!

Wire Rope Damage!

Voids or spaced wraps in first layer (see [Figure 4-173](#), View B) will permit movement and a wedging action with subsequent layers. Wedging action will cause crushing and abrasion of wire rope.

Never allow wire rope to “cross wind” on drums.

T (Rope Clip Nut Torque)

inch (mm)	Wire Rope/Clip Size							
	3/8 (9,5)	1/2 (12,7)	5/8 (15,9)	3/4 (19,1)	7/8 (22,2)	1 (25,4)	1-1/8 (28,6)	1-1/4 (31,8)
Torque								
* ft/lbs (kN/m)	45 (61)	65 (88)	95 (129)	130 (176)	225 (305)	225 (305)	225 (305)	360 (488)

* Tightening torque values shown are based on threads being clean, dry and free of lubrication.

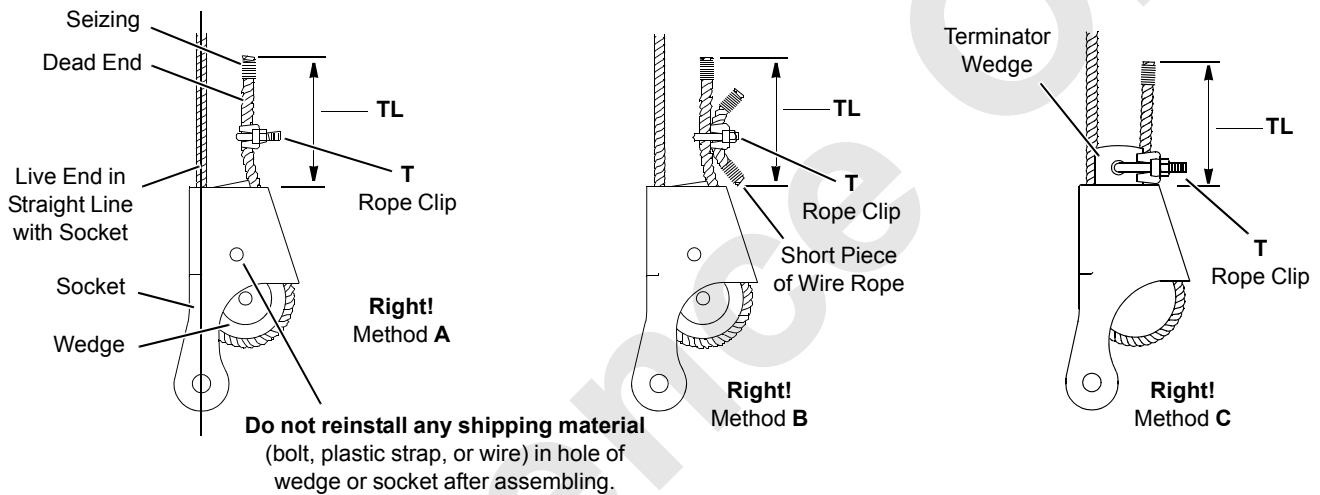
TL (Tail Length)

Standard 6 to 8 Strand Wire Rope

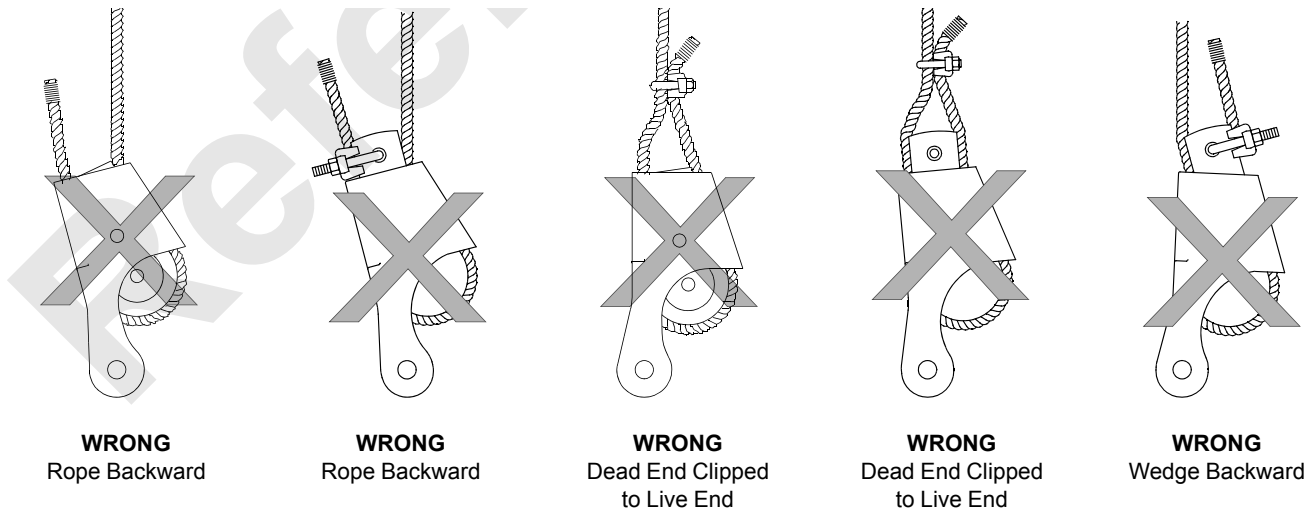
Minimum of 6 rope diameters, but not less than 6 in (152 mm).

Rotation Resistant Wire Rope

Minimum of 20 rope diameters, but not less than 6 in (152 mm).



ALL ARE DANGEROUS AND PROHIBITED!



A925

FIGURE 4-174

Anchoring Wire Rope to Wedge Socket



WARNING

Falling Load Hazard!

To prevent wedge socket from failing and load from falling:

- Inspect all parts prior to use. Do not use parts that are cracked or otherwise defective.
- Remove minor nicks, burrs, or rough edges from socket, wedge, or pin by lightly grinding. Do not reduce original dimensions by more than 10%.
- Do not reinstall shipping material (bolt, plastic strap or wire) in hole of wedge or socket after assembling. Discard these materials because they can prevent wedge from tightening in socket.
- Only use a wedge and socket which are correct size for wire rope being used. Do not mix and match parts from one assembly with parts from another assembly.

Terminator™ socket and wedge has “go” and “no-go” holes to check for proper rope size.

- Attach wire rope clip to dead end of wire rope after assembling wire rope to wedge and socket.
- If dead end of wire rope is welded, seize end of wire rope and cut off weld before assembling to wedge and socket. Weld will not allow strands of wire rope to adjust around bend of wedge, resulting in high strands and wavy rope. This condition can seriously weaken attachment.
- Do not attach dead end of wire rope to live end of wire rope with wire rope clip. Wire rope clip will transfer load from live side of wire rope to dead end, seriously weakening attachment.

See [Figure 4-174](#) for following procedure.

1. Assemble the wire rope and wedge to the socket so the live end of wire rope is in a straight line with the socket pin hole. *Do not assemble WRONG as shown.*
2. Allow the dead end of the wire rope to extend past the end of socket the amount shown.

3. Allow the wire rope to assume its natural lay.
4. Pull against the wedge and the live end of the wire rope enough to tighten the wedge in the socket.

Use a brass hammer to seat the wedge and wire rope as deep into the socket as possible.

5. Attach a wire rope clip to the dead end of the wire rope using one of the RIGHT methods shown. The rope clip will aid in preventing the wire rope from being pulled out of socket.

NOTE Use Right Method A only if the wire rope clip is small enough to be securely tightened to the dead end. Right Method C is only for a Terminator™ wedge socket.

6. After the socket is pinned in place, hoist the load slowly so the wedge seats tight. *Do not shock load socket and wedge.*

Anchoring Wire Rope to Button Socket

Anchor the wire rope to bottom sockets as shown in:

- [Figure 4-91](#), View K ([page 4-152](#)) for the rigging line.
- [Figure 4-135](#), View F ([page 4-226](#)) for the load line.

Breaking in Wire Rope

After installing a new wire rope, break it in by operating it several times under light load and at reduced speed. This practice allows the wire rope to form its natural lay and the strands to seat properly.

NOTE Wire rope will stretch during the break-in period, reducing the wire rope's diameter as the strands compact around the core.

The dead wraps of wire rope on the drum can become slack during operation, even if the utmost care is used during installation of the wire rope. This slackening is caused by the normal stretch that occurs in a new wire rope under tension and periodically throughout the wire rope's life from release of the load.

When slackness is noted, tightly wind the dead wraps of wire rope onto the drum. If left uncorrected, a wedging action with subsequent layers will occur, and the resultant abrasion may cause broken wires in the dead wraps.

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Reference Only

HOOK BLOCK REEVING

Hook Block Identification

See the Boom Assembly Drawing and the Hook Block Drawing at the end of this section for a complete list of hook blocks and hook-and-weight balls available for this crane.



WARNING

Falling Load Hazard!

Use only a hook block with a capacity equal to or greater than load to be handled.

Avoid overloading hook block sheave bearings. Attach load to duplex hook so load hangs straight.

Hook block can fail if overloaded, allowing load to fall.

Wire Rope Specifications

See the Wire Rope Specifications Chart in Capacity Chart Manual for the following hook block reeving information:

- Parts of line required to handle desired load.
- Wire rope length required for various boom lengths and parts of line.
- Maximum spooling capacity of load hoists.

Wire Rope Installation and Maintenance

See Wire Rope Installation this section for instructions:

- Installing wire rope on drums.
- Anchoring wire rope to drums.

Duplex Hook

Attach the load so it is balanced equally on each hook. Lifting slings must be within angles given in [Figure 4-175](#) to achieve maximum hook capacity. Each duplex hook has a hole to which an optional shackle can be attached as shown in [Figure 4-175](#).

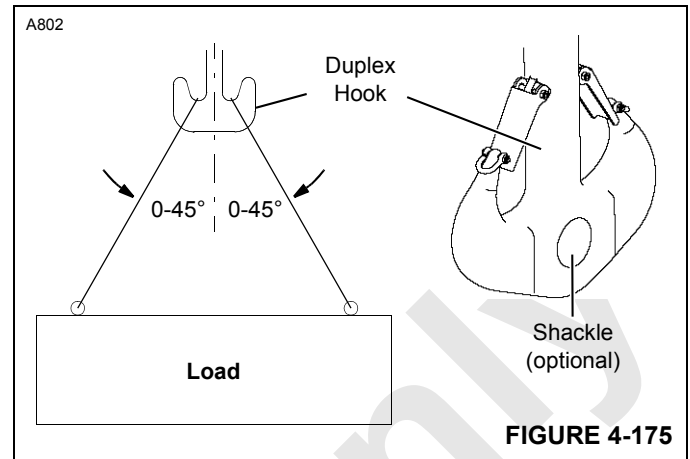


WARNING

Falling Load Hazard!

Limit load to be handled with shackle to capacity of hook block or shackle, whichever is less.

Hook block or shackle can fail if overloaded, allowing load to fall.



Guide Sheaves and Drums

Refer to the Boom and/or Jib Assembly Drawing at the end of this section for identification of the load drums and guide sheaves and for proper routing of the load lines.

Once the wire rope is routed through the guide sheaves, be sure to install the rope guard pins, bars, and rollers to retain the wire rope on the sheaves. **Wire rope and sheaves can be damaged if rope is not properly retained on sheaves.**

Hook Block Reeving

Refer to the Hook Block and Reeving Guide (in operator cab) for hook block information and assembly instructions and for hook block reeving diagrams.

CAUTION

Wire Rope Damage!

Do not hoist hook block any closer to boom point than shown on Block Reeving Drawings. Improper fleet angle or contact with other parts can damage wire rope.

Block Level Sensor

The boom top wire rope guide is equipped with block level sensors.

The crane's programmable controller uses signals from the sensors to equalize the rotation speed of the drums so the hook block remains level when two load lines are routed to the hook block.

The sensors are adjusted at the factory and need to be readjusted only when a new sensor is installed or the position of a sensor is reconfigured. See the Hoist Section of the Service Manual for the adjustment procedure.

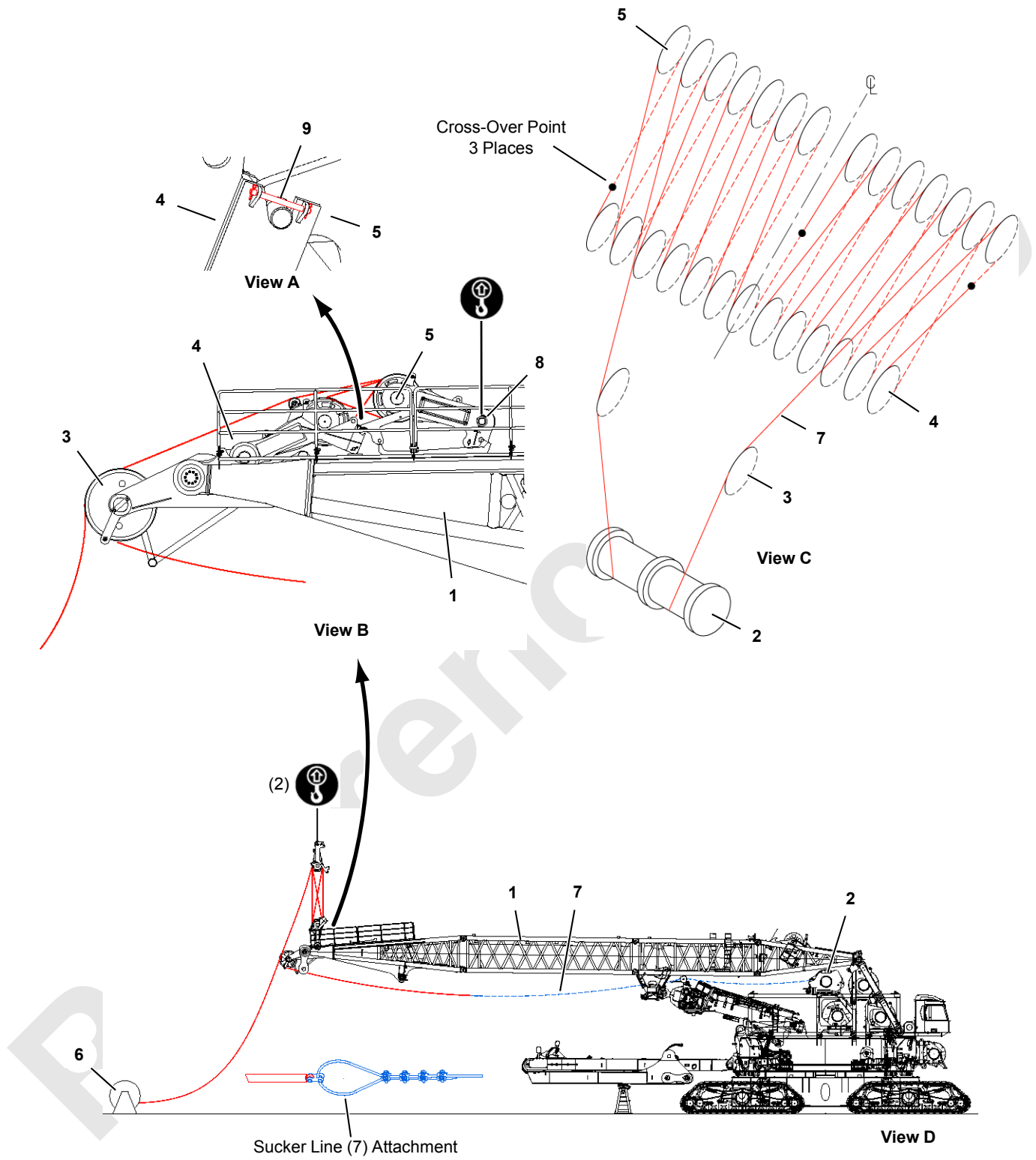


FIGURE 4-176

Legend for [Figure 4-176](#)

Item	Description
1	Mast
2	Boom Hoist
3	Sheave (2)
4	Sheave Bank
5	Equalizer
6	Boom Hoist Wire Rope: 34 mm Dia. x 2,310 ft (704 m) Long (MCC #81002710)
7	Sucker Line (user furnished): 3/8 in (9,5 mm) Dia. x 475 ft (145 m) Long (minimum)
8	Pin (2)
9	Pin with Cotter Pins (2)

BOOM HOIST REEVING

The following procedure assumes that mast (1, View D) is completely assembled to the crane and that sheave bank (4) and equalizer (5) are pinned to the mast top and each other as shown in View B.

Depending on the position of shipping spool (6, View D), this procedure requires at least 475 ft (145 m) of sucker line (7).

- Place the shipping spool of boom hoist wire rope (6) in a support beyond the end of mast (1).
- Route sucker line (7) through sheaves (3), sheave bank (4) and equalizer (5) and to boom hoist (2) as shown in View B.
- Connect sucker line (7) to the corresponding boom hoist drum.
- Attach the other end of sucker line (7) to boom hoist wire rope (6) as shown in View D.
- Haul in the sucker line on the boom hoist drum to pull the boom hoist wire rope through all of the sheaves and to the boom hoist drum.
- Pull enough rope onto the drum to allow for sag in the rope when the tension is removed.
- Unwind the boom hoist wire rope and the sucker line from the boom hoist drum.
- Support the boom hoist wire rope with a sling from the assist crane and disconnect the sucker line from the boom hoist wire rope.
- Anchor the boom hoist wire rope to the corresponding drum and wind at least 3 wraps of rope onto the drum.
See the instructions on [page 4-291](#) for anchoring the wire rope to the drum.
- Attach lifting slings from the assist crane to pins (8, View B).
- Remove pins (9, View A).
- Lift equalizer (5) off the mast with the assist crane.
- Equalizer (5) must be lifted at least 270 ft (82 m) above sheave bank (4) to allow the free end of the boom hoist wire rope to be routed to the boom hoist drum.
- Route the free end of boom hoist wire rope to the corresponding boom hoist drum.
- Pay off the wraps of rope from the first drum.
- Anchor the free end of the boom hoist wire rope to the second drum.
See the instructions on [page 4-291](#) for anchoring the wire rope to the drum.
- Slowly haul in the wire rope on the boom hoist drums while lowering the equalizer with the assist crane.
- Stop when the equalizer can be pinned to the sheave bank (View A).
- Pin the equalizer to the sheave bank (View A), lower the equalizer onto the mast top rails, and disconnect the lifting slings.

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SECTION 4 INSERTS

The following publications are provided at the end of this section:

- Drawing 81018826 Upperworks Counterweight Assembly – Cast Boxes
- Drawing 81018827 Upperworks Counterweight Assembly – Fabricated Boxes
- Drawing 81018828 Upperworks Counterweight Assembly – Concrete and Steel Boxes
- Drawing 81009008 Electric Accessory Assembly – Aircraft Warning
- Drawing 81011450 Wire Rope Guide Assembly #90 Boom (with Luffing Jib installed)
- Drawing 81012924 Electric Control Assembly – Boom Wiring and Limits
- Drawing 81016132 Intermediate Suspension #90/91
- Drawing A18701 Boom Assembly #90 (without Luffing Jib installed)
- Drawing A18941 Wire Rope Guide Assembly #90 Boom
- Drawing A18958 Mast Assembly #92
- Drawing A19442 Boom Assembly #90/91
- Drawing A19444 Fix Jib Assembly #91
- Drawing A20228 Backhitch Assembly #93

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Reference Only

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Reference Only

SECTION 5

CRANE DISASSEMBLY

GENERAL SAFETY

To prevent accidents that can result in death or injury during crane Disassembly, comply with the following general safety information and with the specific safety information contained in the Disassembly steps.



WARNING

Avoid Death or Serious injury!

Read and understand Disassembly instructions in this section before attempting to disassemble crane.



WARNING

Avoid Falling Off Crane and Boom!

It is necessary to climb onto crane, mast, and boom during Disassembly steps.

Use sturdy owner furnished ladders or an approved personnel hoist to gain access to areas which cannot be reached from ladders or steps provided with crane.



WARNING

Moving Parts/Pinch Points!

Avoid death or crushing injury during crane Disassembly:

- Disassembly personnel — take every precaution to prevent injury when working near moving parts.
 - Maintain communication between operator and disassemblers to avoid accidents.
- Keep unauthorized personnel well clear of crane.
-



WARNING

Falling Load Hazard!

To prevent lifting equipment from failing and load from dropping, crane owner/user shall verify following prior to each lift:

- All lifting equipment (shackles, hooks, slings, blocks) have been properly maintained and are safe for use.
 - All lifting equipment has a capacity equal to or greater than load to be lifted.
-

CRANE ORIENTATION

The terms RIGHT, LEFT, FRONT, REAR used in this section refer to the operator's right, left, front, and rear sides when seated in the operator cab looking forward.

RIGGING DRAWINGS

The boom and jib assembly drawings that apply to your crane are located at the end of Section 4.

DISASSEMBLY NOTES

The crane, boom, and jib shall be disassembled by experienced personnel trained in operation and Disassembly of construction cranes.

Read and become thoroughly familiar with the instructions in this section and in the drawings at the end of Section 4 before attempting to operate or disassemble the crane.

Contact your Manitowoc dealer for assistance if any procedure is not fully understood.

DISASSEMBLY AREA

Select a Disassembly area that has a firm, level, uniformly supporting foundation. Make sure the area is large enough to accommodate the crane and the boom length, movement of trucks with trailers, and movement of an assist crane.

Unless otherwise specified in the capacity chart, the foundation shall be level to within 0.5% — 0.5 ft (0,15 m) rise or fall in 100 ft (30,5 m) distance.

When such a surface is not available, it shall be provided with timbers, cribbing, or other structural members to distribute the load such that the allowable bearing capacity of the underlying member is not exceeded.

Set the carbody front or rear beam blocking and side beam jack pads on a flat, firm foundation that will support the load placed on them. See [Table 5-1](#) for loadings.

Do not set the end beam blocking and side beam jack pads in holes, on rocky ground, or on extremely soft ground.

If necessary, use matting or steel plates to properly distribute loading. The matting or steel plates must be:

- Free of defects.
- Strong enough to prevent being crushed or bent.

- Of sufficient length and width to prevent settling under load.

For ground bearing information go to:

www.manitowoccranes.com/site/EN/groundbearingpressure.aspx.

Table 5-1 Carbody Blocking and Jack Loads

Maximum load on each side beam jack:

- 235,600 lb (106 865 kg)
- Jack pad size — 3 ft 1-1/2 in (950 mm) diameter

Maximum load on carbody blocking (blocks of wood under front or rear beam):

- 109,000 lb (49 440 kg)
- Blocking size: 12 in (305 mm) wide by 12 in (305 mm) high by 6 ft (1.9 m) long

ACCESSING PARTS

Some parts of the crane, boom, and jib cannot be reached from the ground. Take necessary precautions to prevent falling off the crane or boom during Disassembly. Falling from any elevation could result in serious injury or death.

Owner/user shall provide approved ladders or personnel hoists so workers can safely access those areas of crane, boom, and jib that cannot be reached from ground. Adhere to local, state, and federal regulations for handling personnel.

PERSONNEL FALL-PROTECTION

Manitowoc has provided anchors and lifelines throughout the crane and attachment (see Figure 5-1) to which workers can attach their personnel fall-protection equipment.



WARNING

Fall Hazard!

To prevent falling from any height during crane Disassembly, personnel must wear fall-protection equipment.

- Anchors and lifelines are designed to handle only one person at a time.
- Do not use anchors for lifting or pulling loads.

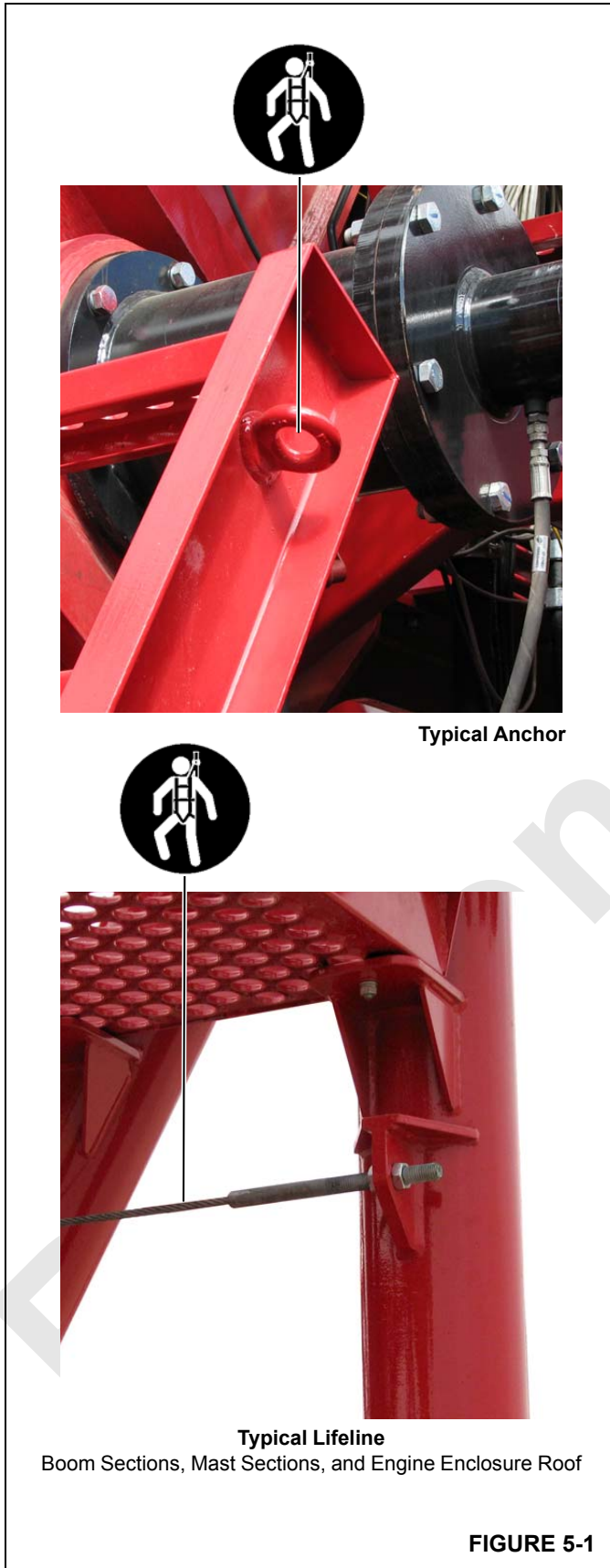


FIGURE 5-1

HANDLING COMPONENTS

The major components are equipped with lifting lugs. The lifting lugs are identified by the following symbol in the assembly illustrations.

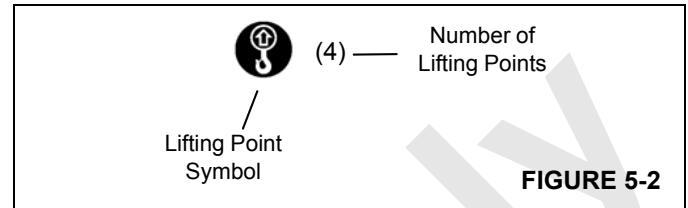


FIGURE 5-2

When lifting lugs are not provided, use nylon lifting slings. If wire rope or chain lifting slings are used, install protective covering (such as sections of rubber tire) between the slings and the part being lifted.

It is owner's/user's responsibility to ensure that all lifting slings, hooks, and shackles are in safe working order and capable of handling the loads applied to them.

Manitowoc provides the lifting slings identified in [Figure 5-8](#). **Use the proper size (capacity) sling for load being handled.**

ASSIST CRANE REQUIREMENTS

An assist crane is required to assemble and disassemble the Model 31000.

Manitowoc recommends either of the following:

- Model 2250 Series 3 with 200 ft (61 m) of boom.
- Model 16000 Series 3 with 196.9 ft (60 m) of boom.

AERIAL WORK PLATFORM

Two aerial work platforms are required to access components as the crane, mast, boom, and jib are assembled. The height at which personnel will have to work is 50 ft (15,2 m).

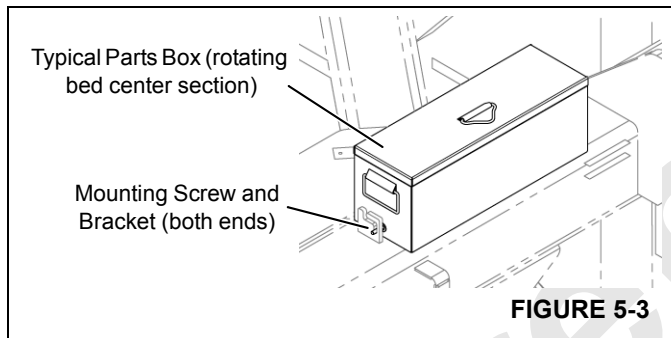
CRANE WEIGHTS

See Crane Weights in Section 1 for overall weight of the crane and individual weights of components.

HOSE AND CABLE CLEANLINESS

To prevent dirt from entering the hydraulic or grease systems or from damaging the electric connectors:

- Thoroughly clean hydraulic fittings, grease fittings, and electric connectors when they are disconnected.
- Do not drag hydraulic/grease hose fittings or hoses and electric connectors or cables on the ground.
- Thoroughly clean protective caps before attaching them to hoses, tubes, or cables.
- Hydraulic protective caps are stored in parts boxes at the following locations on the crane (see [Figure 5-7](#) on [page 5-7](#)):
 - Three on top of the rotating bed center section. These parts boxes must be removed to install the drums.
 - Two inside the rotating bed center section.
 - One on each carbody beam.
 - One on rear roller carrier.



SYMBOLS

For identification of the symbols used in this section, refer to Section 1 of this manual.



PORTABLE POWER UNIT

Description

Manitowoc supplies a portable power unit (PPU) with the Model 31000 ([Figure 5-4](#)). The power unit supplies hydraulic oil for engaging and disengaging hydraulically-actuated pins and cylinders during crane assembly and Disassembly.

The PPU has two hydraulic circuits:

CIRCUIT 1 with 46 SS Hydraulic Oil powers the following functions. The hydraulic hoses from this circuit have 1/2 in push-to-connect couplers.

- Carbody Beam Pins
- Crawler Trunnion Cylinders
- Crawler Tensioner Cylinders
- Rotating Bed Jacking Cylinders
- Front and Rear Roller Carrier Pins
- Drum Frame Pins
- Mast Section Pins
- Mast Raising Frame Pins
- Backhitch Section Pins
- Mast-to-Backhitch Pins
- Counterweight Center Tray Pins
- Boom Section Pins
- Lower Boom or Jib Point Pins
- Jib Section Pins (fixed and luffing)

CIRCUIT 2 with Arctic 15 Hydraulic Oil powers the following functions. The hydraulic hoses from this circuit have 3/8 in push-to-connect couplers.

- Jib Strut Pins (fixed jib and luffing jib)
- Jib Strut Spreader (fixed jib and luffing jib)
- Jib Stop Support Cylinders (luffing jib)

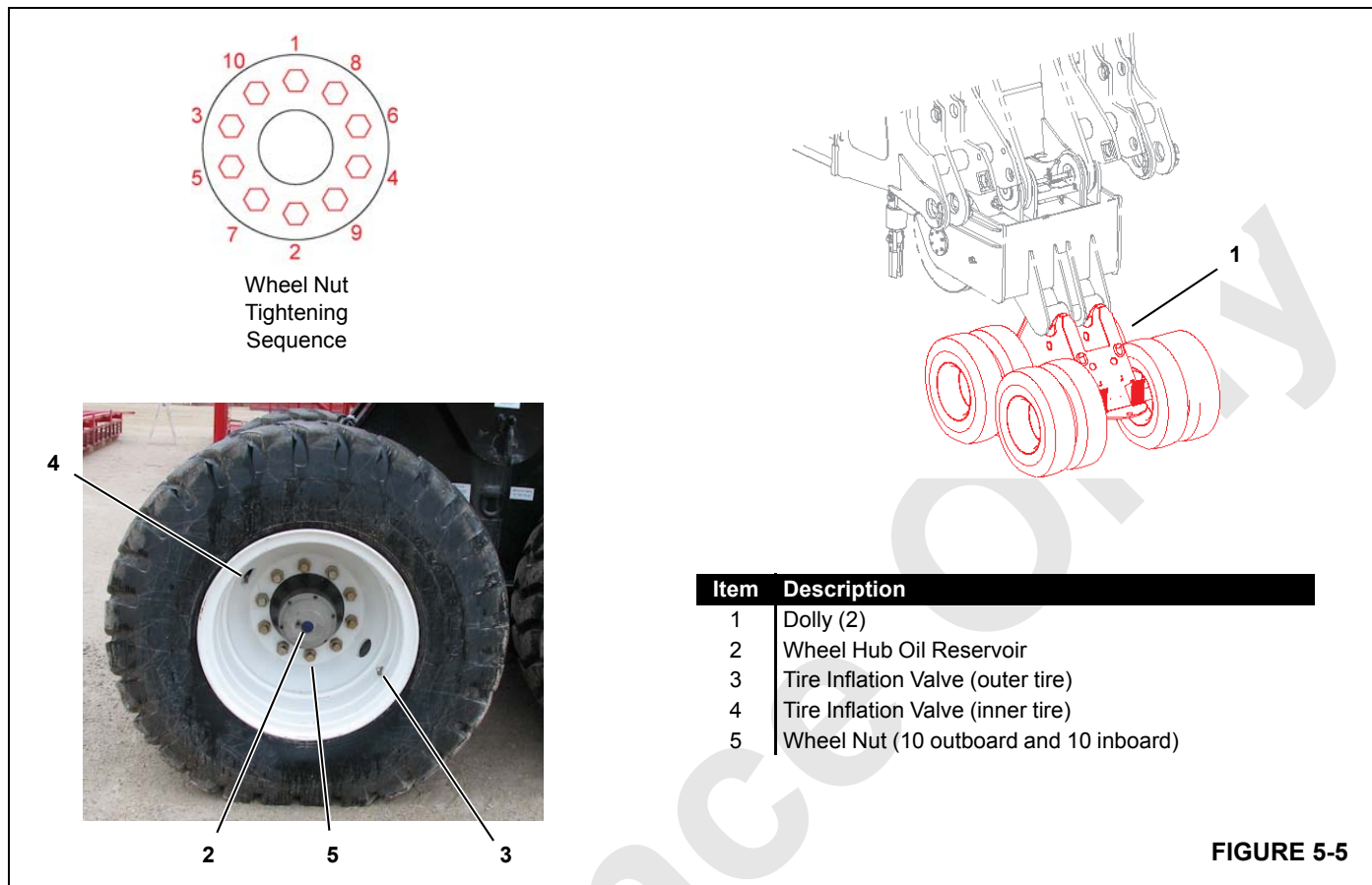
NOTE For the remainder of this section portable power unit will be referred to as PPU.

Pre-Start Checks

Perform the pre-start checks given in the PPU Operation and Maintenance Manual before starting the portable power.

TOOLS

Tools supplied by Maniowoc are stored in the PPU. For a complete list of tools (for example: hand-held cylinders and wrenches), refer to the PPU Operation and Maintenance Manual.



DOLLY

See [Figure 5-5](#) for the following procedure.

Two dollies (1) are supplied by Manitowoc for the following procedures:

- Support jib point during jib lowering.
- Support mast backhitch butts during mast lowering.

Prep the dollies prior to each use, as follows:

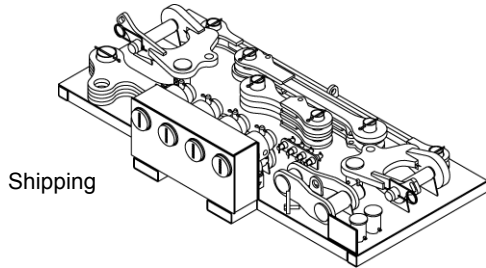
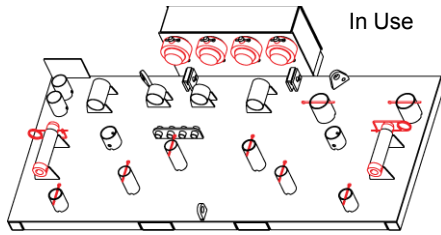
1. Check wheel hub oil levels (see Lubrication Guide, F2201, for details).
2. Check tire pressures: each tire should be inflated to 120-130 psi (8,27-8,96 bar).
3. Check wheel nut tightness: each nut, inner and outer, should be torqued dry to 750-900 ft-lb (1 016.9 - 1 220.2).

PARTS STORAGE BOXES AND TRAYS

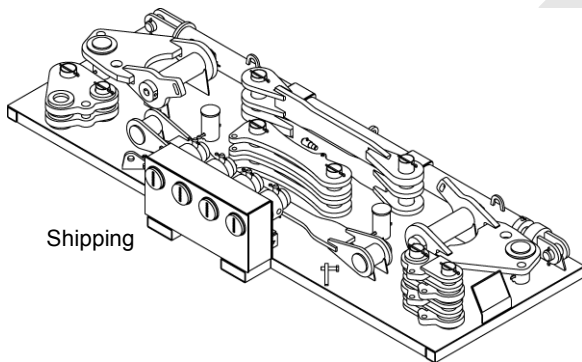
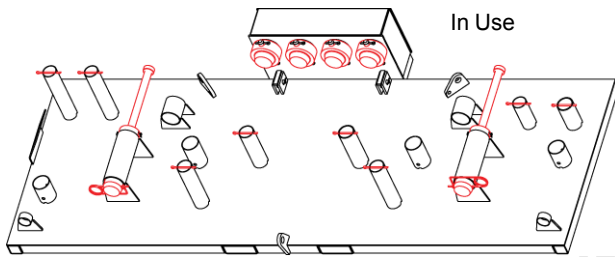
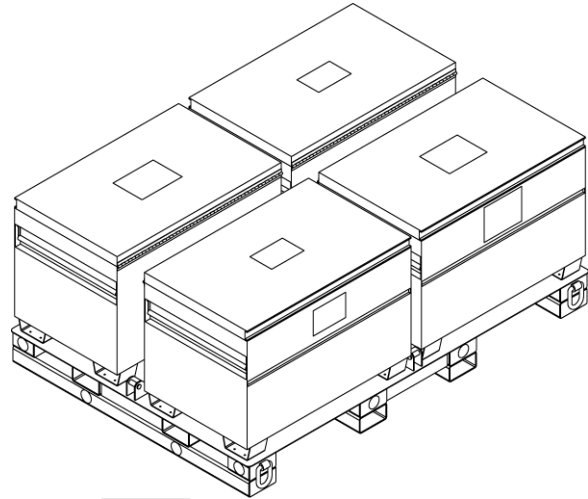
Manitowoc supplies the parts storage boxes and trays shown in [Figure 5-6](#) on [page 5-6](#).

- Intermediate Suspension Trays provide storage of the intermediate suspension parts required for the attachments indicated.
- Rigging Parts Boxes provide storage for rigging parts: swivels, shackles, button sockets, and lifting slings.
- Electric Parts Boxes provide storage for electrical parts: block-up limit, wind speed indicators, aircraft warning lights, remote control.
- Counterweight Parts Boxes provide storage for the counterweight pad tie-down chains.
- Refer to the decals on the trays and boxes for identification of components and packing sequence.

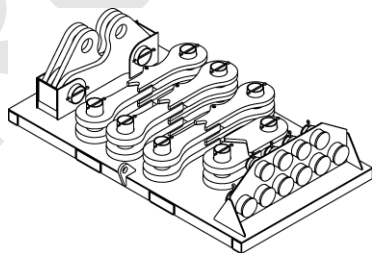
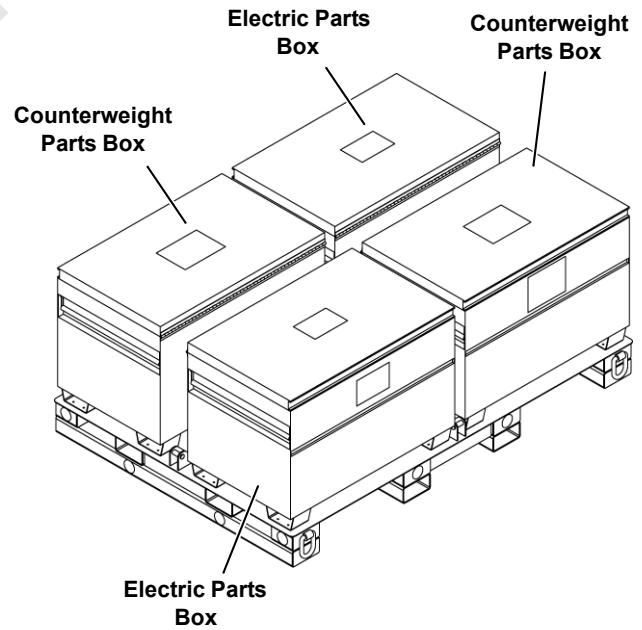
The decals also shown the lifting locations, either with lifting slings or a fork-lift truck.



#91 Luffing Jib Intermediate Suspension Tray

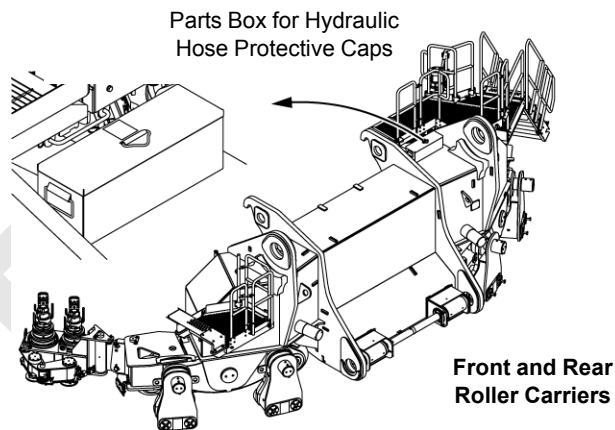
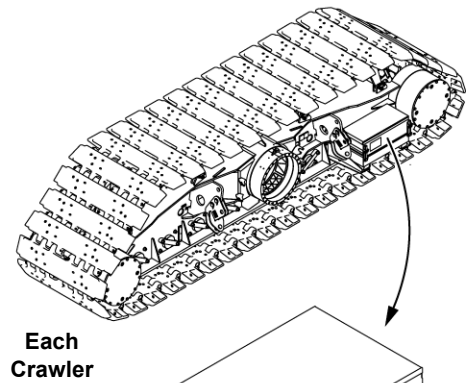
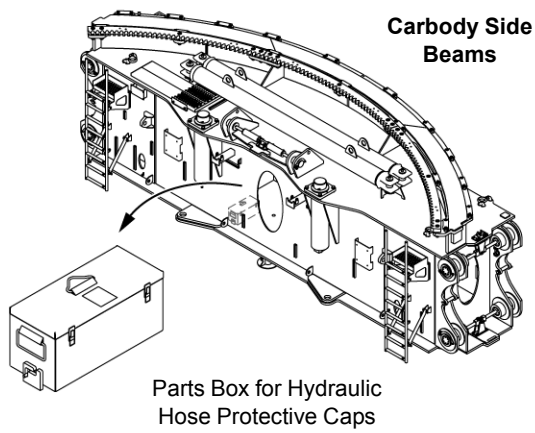
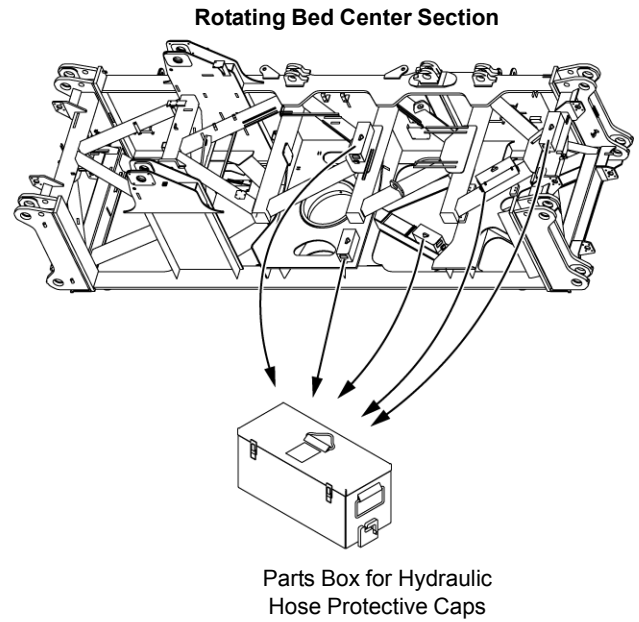
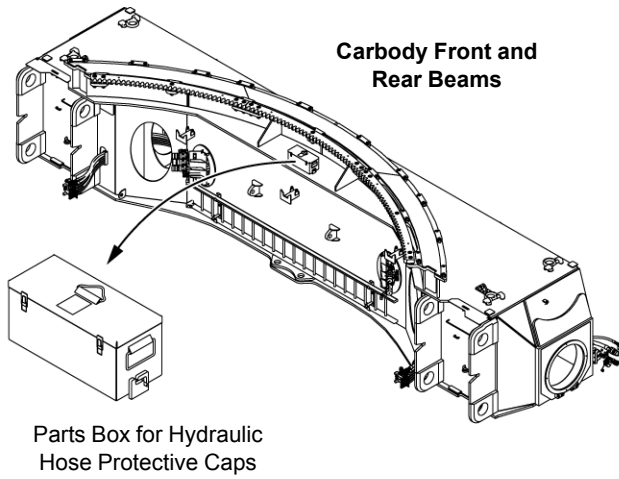


#90/91 Boom Intermediate Suspension Tray #1



#90/91 Boom Intermediate Suspension Tray #2

FIGURE 5-6



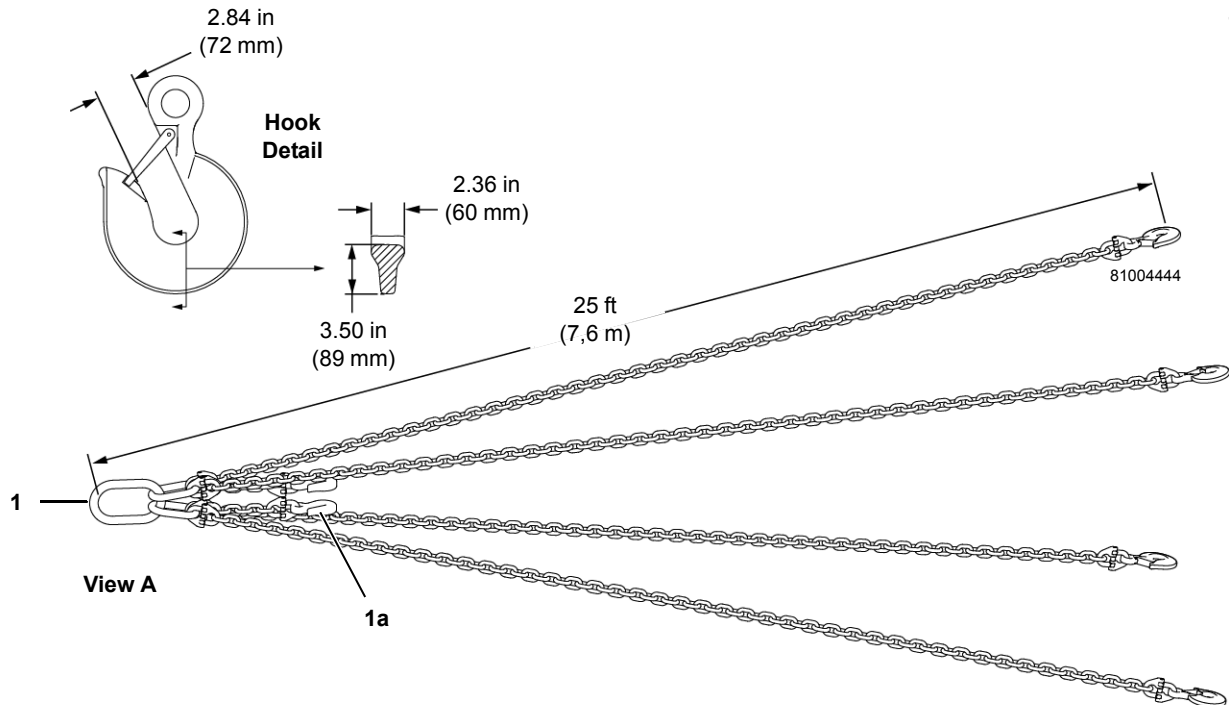
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FIGURE 5-7

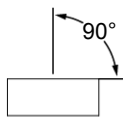
LIFTING SLINGS

The following lifting slings are supplied by Manitowoc.

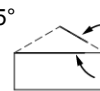
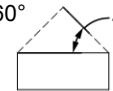
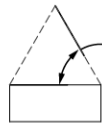
For slings that meet other international codes, contact your Manitowoc dealer.



Single
59,700 lb
27 079 kg



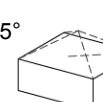
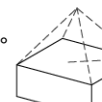
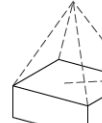
Double
84,400 lb
38 283 kg



Double
103,400 lb
46 901 kg

Double
59,700 lb
27 079 kg

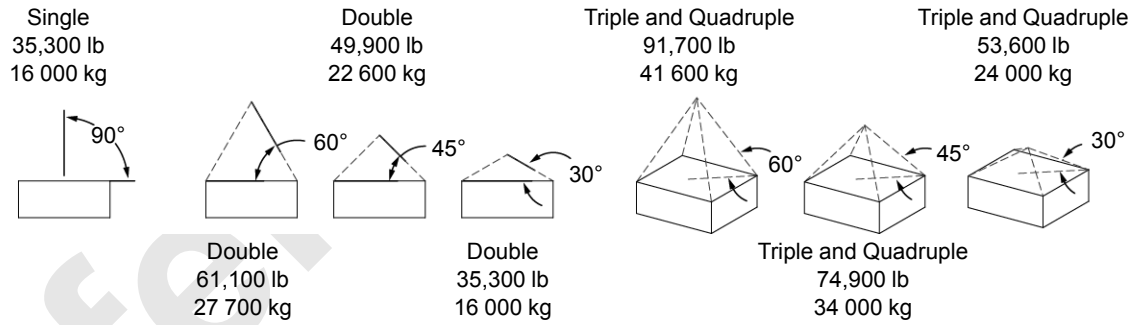
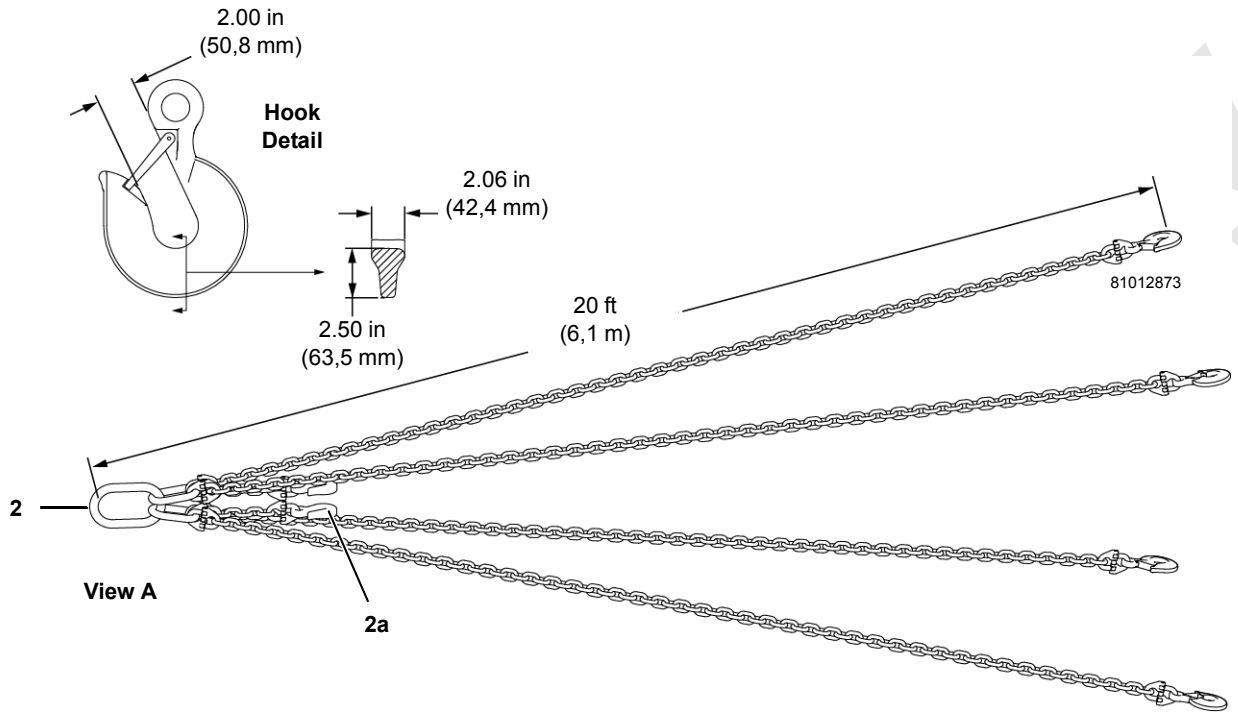
Triple and Quadruple
155,100 lb
70 352 kg



Triple and Quadruple
126,600 lb
57 425 kg

Item	Description
1	4- Leg Chain Lifting Sling — 1 in (25.4 mm) (2 each)
1a	Grab Hooks (2)

FIGURE 5-8



Item	Description
2	4- Leg Chain Lifting Sling — 3/4 in (19.1 mm) (1 each)
2a	Grab Hooks (2)

FIGURE 5-8 continued

Item	Description
3	Nylon Lifting Sling (2 each)
4	Nylon Lifting Sling (4 each)
5	Nylon Lifting Sling (4 each)

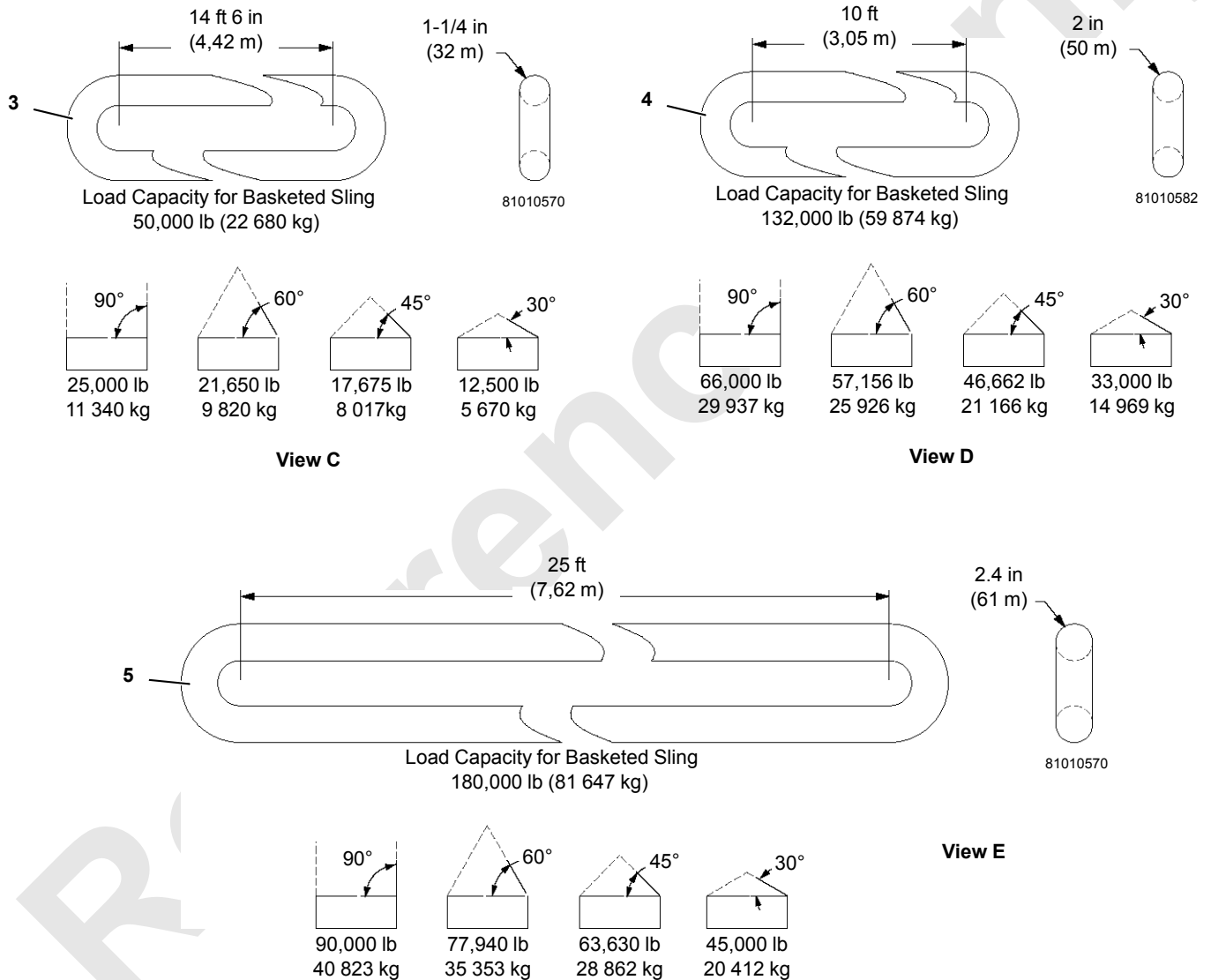


FIGURE 5-8 continued

SHIPPING DATA

Suggested trailer loading diagrams are provided at the end of this section.

SHIPPING CRANE COMPONENTS

It is the owner/user's responsibility to ensure the following:

- That all trailer loads comply with local, state, and federal transportation requirements.
- ***That all crane components are properly blocked and secured so they cannot shift or fall off trailers.***
- To avoid damage to components:

Use synthetic tie-downs to secure components as shown in [Figure 5-9](#), View A.

If chain tie-downs are used, install protective covering (sections of rubber tire) between the chain and the component being secured as shown in [Figure 5-9](#), View B.

When securing boom sections, wrap tie-downs over chords — never over the lacings. Keep tie-downs as close to the blocking as possible (View A) to prevent bending the chords.

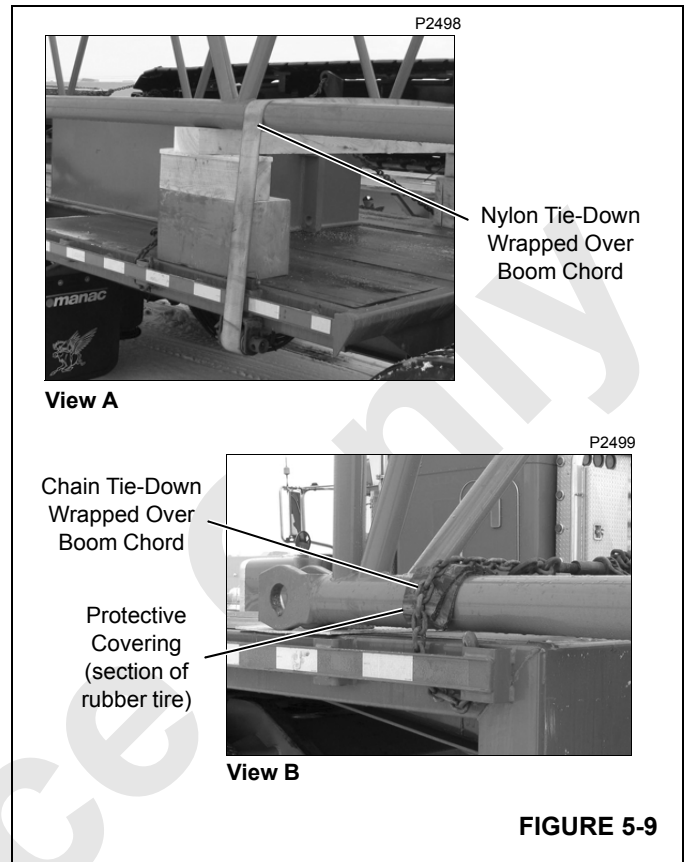
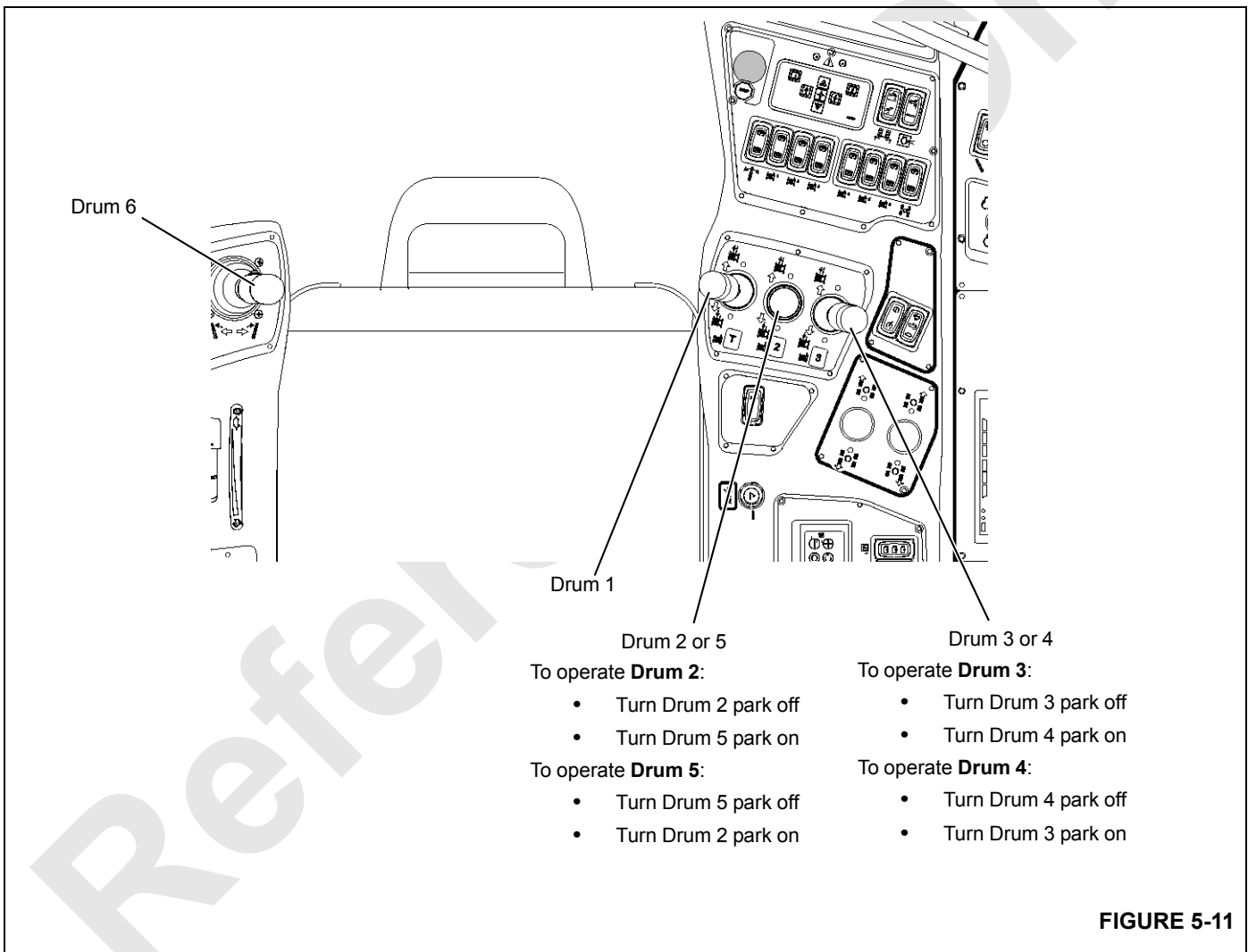
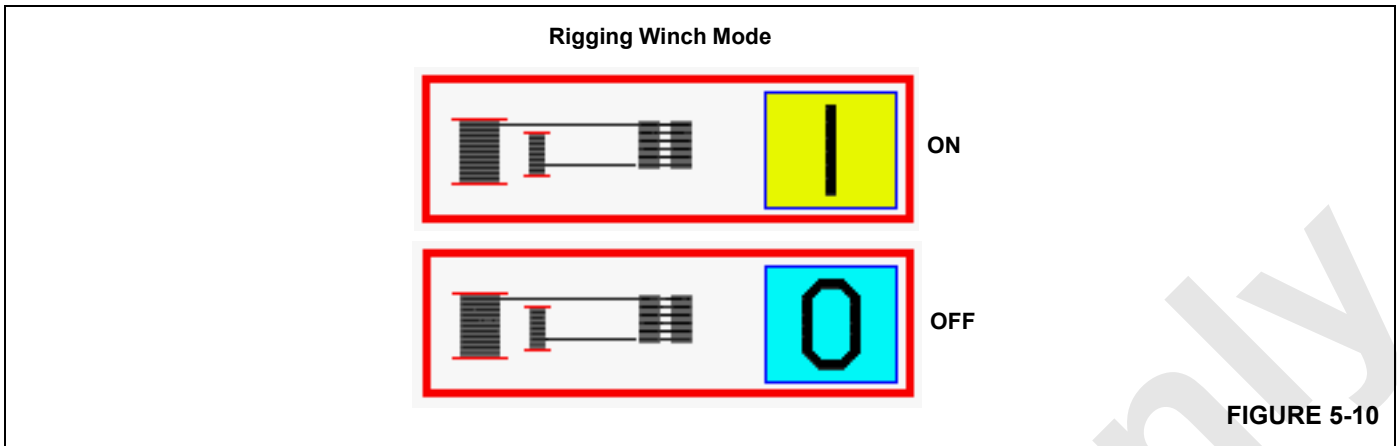


FIGURE 5-9



OPERATING RIGGING WINCH

The rigging winch (Drum 6) is used for the following operations:

- Moving the equalizer from boom insert to the storage position on the mast butt (see [page 5-87](#)).
- Moving the equalizer from storage position on the mast butt to the shipping position on the mast top to the (see [page 5-135](#)).

Selecting Rigging Winch Mode

TO TURN RIGGING MODE ON —

1. Go to the Function Mode screen in the main display.
2. Select the rigging winch data box ([Figure 5-10](#)).
3. Enter the data box and use the select buttons to turn on the rigging winch mode.
4. The boom hoist handle (Drum 4) on the left console is now used to control the rigging winch (Drum 6).

The number 6 will appear in the drum indicator display next to the control handle.

TO TURN RIGGING MODE OFF —

1. Go to the Function Mode screen in the main display.
2. Select the rigging winch data box ([Figure 5-10](#)).
3. Enter the data box and use the select buttons to turn off the rigging winch mode.

NOTE: The rigging winch mode will automatically turn off when power to the control system is turned off.

Operating Rigging Winch

NOTE Engine speed controls tension: the higher the engine speed the higher the tension in the wire rope.

1. Turn on the rigging winch mode.
2. Pay out the rigging line by moving Drum 6 control handle forward.

NOTE Drum 6 is operated independent of the load drums when the load drum control handles are off.

To operate a load drum independent of Drum 6, move Drum 6 control handle to off and turn on Drum 6 park.

3. Reeve the rigging line through the required sheaves in the boom, hook block, or other components.
4. Dead end the rigging line to the required component depending on the operation being performed.
5. Use the engine throttle to snug up the rigging line prior to paying out wire rope from the selected drum. Faulty operation will result if there is slack in the rigging line before engaging the automatic part of the operation.
6. Move Drum 6 control handle to off.
7. Push the corresponding drum control handle forward to pay out wire rope. The rigging winch will haul in the rigging line automatically.

See [Figure 5-11](#) to determine which drum is controlled by which handle in the rigging winch mode.



WARNING Flying Object Hazard!

Do not attempt to disconnect rigging line from wire rope or other component until the rigging line is slack.

Lines could fly apart with explosive force and strike personnel.

8. Once the operation is complete:
 - a. Move the drum control handle to off.
 - b. Slacken (pay out) the rigging by pushing Drum 6 control handle forward.
 - c. Disconnect the rigging line from the equalizer or the wire rope.
 - d. Haul in the rigging line for storage on the rigging winch by pulling Drum 6 control handle back.
 - e. Secure the rigging line to the rigging winch for storage.
 - f. Turn off the rigging winch mode.

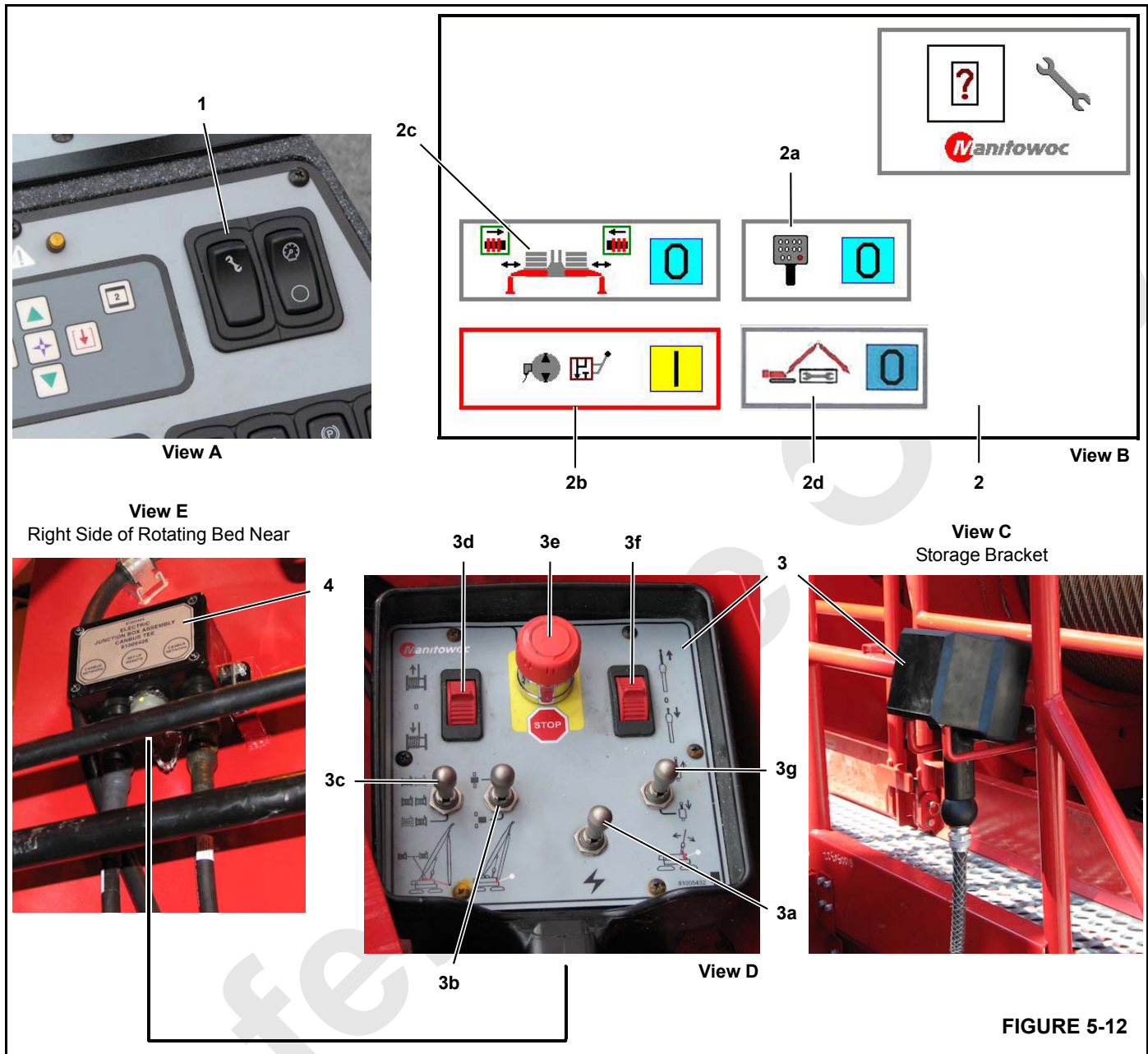


FIGURE 5-12

SETUP MODE AND CONTROLS

NOTE When remote control (3, View D) is disconnected from junction box (4, View E), the terminator plug must be connected to the junction box receptacle. CAN faults and faulty operation will occur if this step is not performed.

See [Figure 5-12](#) for the following instructions.

Setup Modes

To operate the manual control valves and the remote control during the remaining assembly procedures, the appropriate

setup mode must be turned on. There are three setup modes (View B):

2a — Remote Control Mode

Turns on the setup remote control and the accessory hydraulic system for operation of the functions on the remote control.

2b — Accessory Valves Mode

Turns on the accessory hydraulic system for operation of the manual controls for engaging and disengaging hydraulic pins.





2c — VPC Counterweight Mode

Turns on the counterweight switches in the cab and the accessory hydraulic system for operation of the counterweight pins and beams.

2d — Luffing Jib Mode

See Luffing Jib Operator Manual.

Turning on Desired Setup Mode

1. Press setup switch (1, View A) in the cab to display setup screen (2) on the Main Display.
2. Scroll up  or down  until there is blue box around the desired mode (2a, 2b, or 2c, View B).
3. Press the enter  button. The blue box will turn red.
4. Scroll up or down until the mode is on (I) or off (O).
5. Press the exit  button.

Turn off the selected setup mode when you are done with the corresponding assembly process.

Operating the Remote Control

To operate the remote control, the cable must be connected to junction box (4, View E) and the remote control setup mode must be turned on.

3a – Power Switch

NOTE The toggle must be pulled UP to UNLOCK it.

Move the toggle FORWARD to TURN ON electric power to the remote control switches.

RELEASE the toggle to CENTER to TURN OFF electric power to the remote control switches.

3b – Backhitch Pins Switch

NOTE The toggle must be pulled UP to UNLOCK it.

Move the toggle FORWARD from center to ENGAGE the backhitch pins.

Move the toggle to CENTER to LOCK the toggle in position.

Move the toggle REARWARD from center to DISENGAGE the backhitch pins.

3c – Backhitch Winch Selector Switch

NOTE The toggle must be pulled UP to UNLOCK it.

Move the toggle FORWARD from center to TURN ON the LEFT backhitch winch.

Move the toggle to CENTER to TURN ON BOTH backhitch winches.

Move the toggle REARWARD to TURN ON the RIGHT backhitch winch.

3d – Backhitch Winch Direction/Speed Switch

Rotate the thumb wheel FORWARD from center to PAYOUT wire rope at the desired speed from the selected backhitch winch.

Release the thumb wheel to CENTER to STOP the selected backhitch winch.

Rotate the thumb wheel REARWARD from center to HAUL IN wire rope at the desired speed on the selected backhitch winch.

3e – Stop Switch

DEPRESS the knob to STOP the engine and all remote controlled functions in an emergency only — for example: if a function does not stop when the control is released to off or any other uncontrolled motion of a function is observed.

Beware: when the knob is pushed down, the engine stops and any function being operated comes to an abrupt stop.

Always use the ignition switch in the cab to stop the engine for normal operating conditions.

NOTE: The knob must be pulled UP to RESTART the engine and to operate remote controlled functions.

3f – VPC Actuator Switch

VPC = Variable Position Counterweight

Rotate the thumb wheel FORWARD from center to EXTEND the VPC actuator at the desired speed.

Release the thumb wheel to CENTER to STOP the VPC actuator (it will remain at the last position it was moved to).

Rotate the thumb wheel REARWARD from center to RETRACT the VPC actuator at the desired speed.

3g – VPC Actuator Frame Switch

The toggle must be pulled UP to UNLOCK it.

Move the toggle FORWARD from center to RAISE the actuator frame (extend cylinder).

Move the toggle to CENTER to STOP the actuator frame (it will remain at the last position it was moved to).

Move the toggle REARWARD from center to LOWER the actuator frame (retract cylinder).

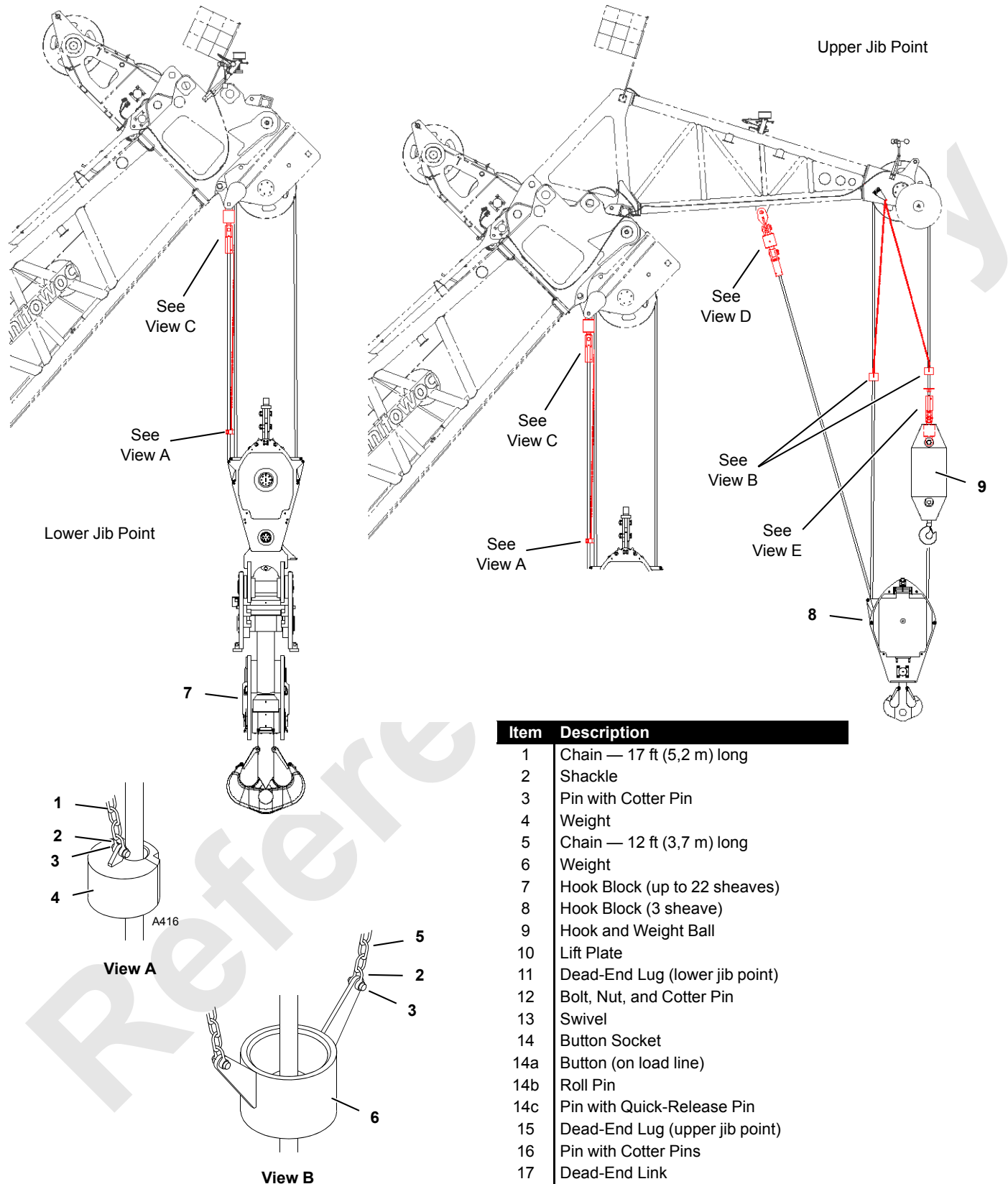


FIGURE 5-13

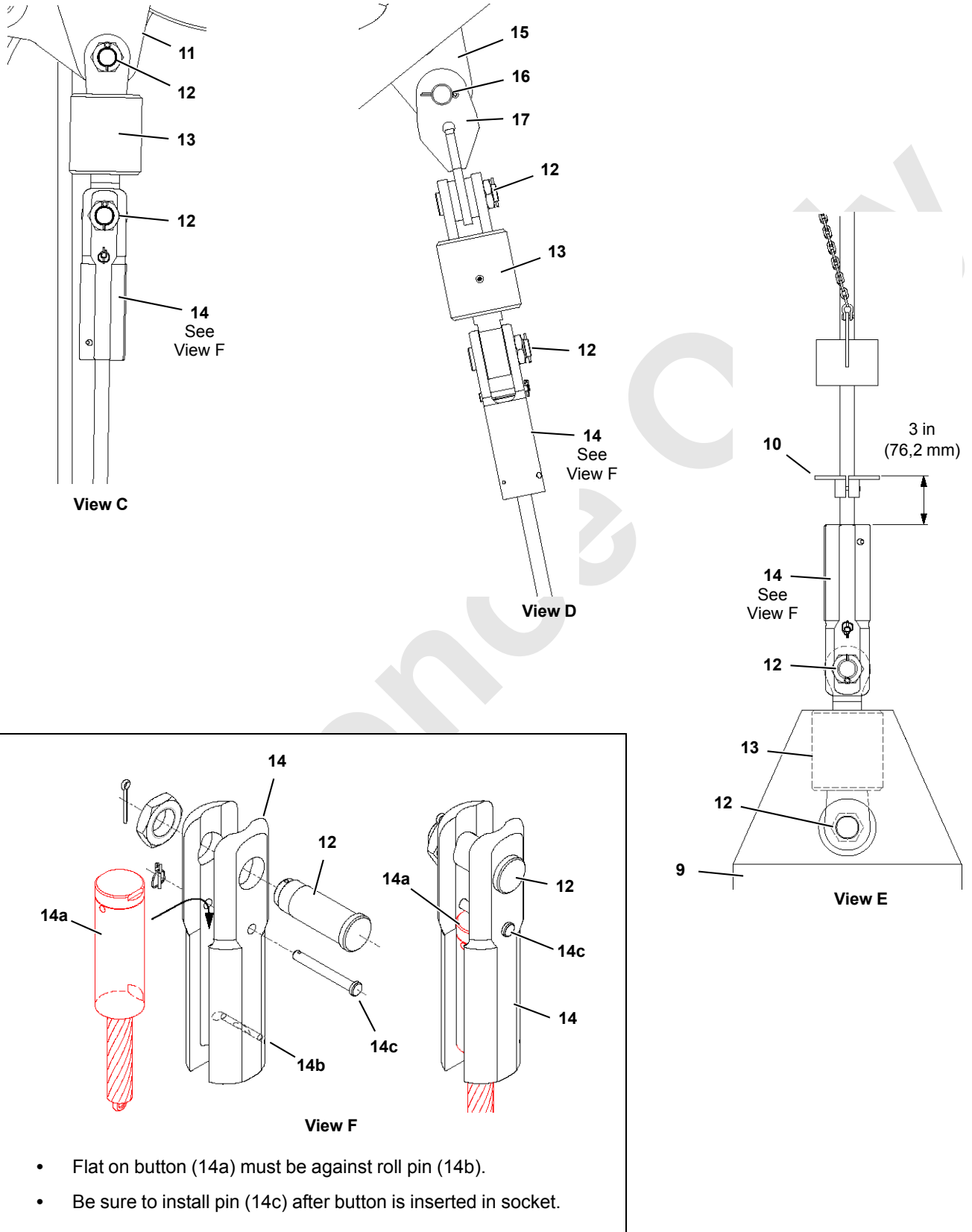


FIGURE 5-13 continued

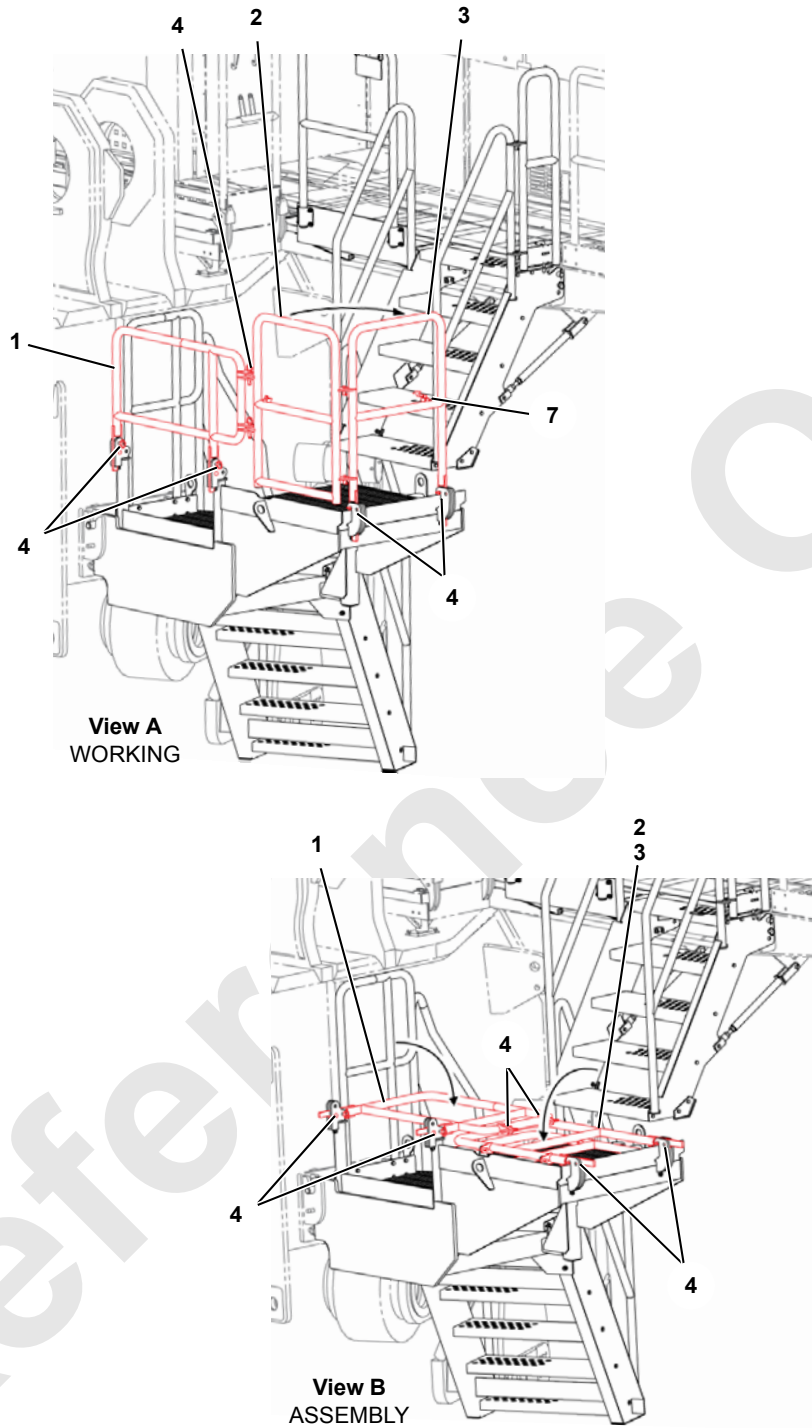


Figure 5-14

CRANE DISASSEMBLY — LOWERING PROCEDURE

Legend for [Figure 5-14](#)

Item	Description
1	Handrail
2	Handrail
3	Handrail
4	Quick-Release Pin (6)
5	Rubber Latch

Lower Railings on Cab Access Platform

See [Figure 5-14](#) for the following procedure.

Lower handrails (1, 2, and 3) from the working position (View A) to the Disassembly position (View B) before lowering the boom butt. **Damage will occur if you do not perform this step.**



WARNING Trip and Fall Hazard!

To prevent tripping and falling off cab access stairway:

- Do not use cab access stairway while handrails are lowered in Disassembly position.
- Use stairway at rear of crane to access operator cab.

1. Unpin handrail (2, View A) from handrail (1).
2. Rotate handrail (2) in and latch it to handrail (3).
3. Unpin handrail (3, View A) from the working position, lower handrails (2 and 3) to the assembly position (View B), and reinstall quick-release pins (4).
4. Unpin handrail (1, View A) from the working position, lower it to the assembly position (View B), and reinstall quick-release pins (4).

Reverse the above steps to raise the handrails after the butt is removed.

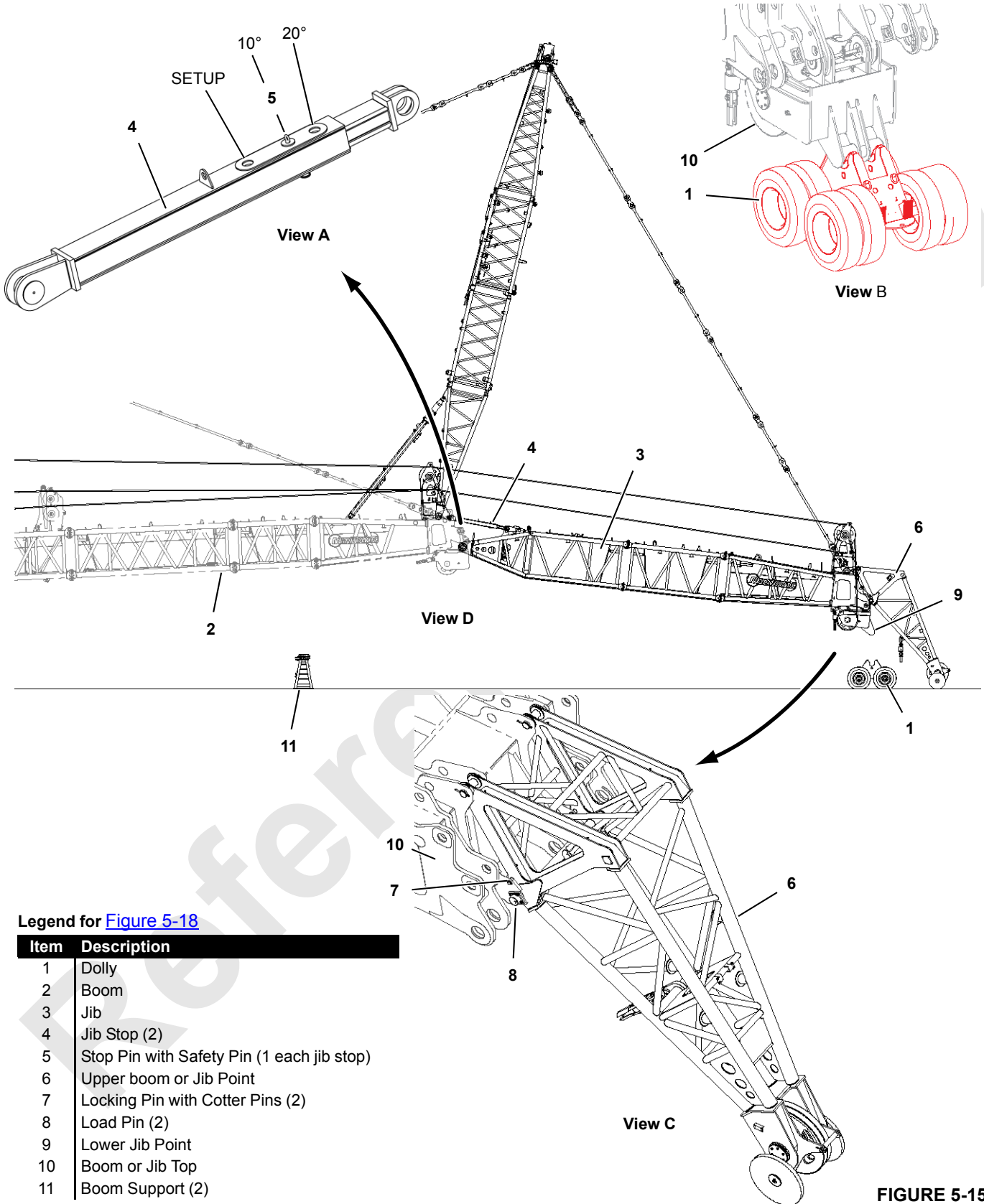


FIGURE 5-15

Lower Boom and Jib

CAUTION

Structural Damage Hazard!

To prevent structural damage to boom top, jib top or upper boom/jib point:

- Do not attempt to support boom or jib on upper boom point or jib point rollers.
- Keep upper boom point or jib point rollers off ground until locking pins are removed.



WARNING

Crush Hazard!

Upper boom point or jib point rollers and dolly tires will roll along ground as boom and jib are lowered.

To prevent personnel from being crushed by rollers or tires:

- Warn all personnel to stay clear of upper boom point or jib point rollers and dolly tires as boom and jib are lowered.

See [Figure 5-15](#) for the following procedure.

NOTE It is normal for the block up limit fault to come on at some point during the lowering procedure. Therefore, if it becomes necessary to raise the boom or to haul in the load lines during the lowering procedure, you will have to use the limit bypass switch.

1. Lower the hook block and/or hook-and-weight ball as required per the capacity chart for the corresponding boom/jib length configuration.
2. For boom only, proceed as follows:
 - a. Lower the boom toward the ground while paying out the load lines. Do not drag the hook block and/or the hook-and-weight ball.
 - b. Lower the boom onto boom supports (11).

NOTE Always add blocking (as needed) between the boom supports and the insert so the boom is as level as possible from side to side. Failing to perform this step will make it difficult to disconnect the inserts.

3. For boom with upper boom point, proceed as follows:
 - a. Lower the boom toward the ground while paying out the load lines. Do not drag the hook block and/or the hook-and-weight ball.
 - b. Stop lowering the boom when the upper boom point rollers are near contact with the ground.

- c. Remove locking pins (7, View C) **before** allowing the upper boom point rollers to contact the ground.
- d. Continue to lower the boom onto boom supports (11). The upper boom point will roll out as the boom lowers.
- e. Reinstall locking pins (7, View C) in the upper boom point holes.

4. For jib, proceed as follows:

- a. Lower the boom and jib toward the ground while paying out the load lines. Do not drag the hook block and/or the hook-and-weight ball.

NOTE Perform steps [4b](#) and [4c](#) only if equipped with an upper jib point. Otherwise go to step [4d](#).

- b. Stop lowering the boom when the upper jib point rollers are near contact with the ground.
- c. Remove locking pins (7, View C) **before** allowing the upper jib point rollers to contact the ground.
- d. Using a fork-lift truck, move dolly (1, View B), into position. Prep the dolly as instructed on [page 5-5](#).
- e. Continue lowering the boom and jib toward the ground while paying out the load lines. If equipped, the upper jib point will roll out as the boom lowers.
- f. Stop lowering the boom when the lower jib point is near contact with the dolly.
- g. Remove jib stop pin (5, View A) from the 10 or 20 degree offset hole in jib stop (4) **before** allowing the lower jib point to contact the dolly.

Do not place the jib stop pins in the setup holes at this time.

- h. Boom down to lower the lower jib point into the dolly.
- i. Retract the spreader cylinders (see [page 5-29](#)).
- j. Open strut stop bypass valves (see [page 5-31](#)).
- k. Boom down to lower the lower jib point into the dolly.
- l. Continue to boom down allowing the dolly to roll out until the boom is resting on the boom supports.
5. Once the boom and jib are fully lowered onto the supports, STOP ENGINE and disconnect the electric cables from the boom butt. This step will turn off the block up limit fault and allow normal operation of the boom hoist and drums.
 - a. Thoroughly clean the ends of all cables and receptacles after the electric cables are disconnected.
 - b. Cover the cables and receptacles with dust caps.
 - c. Store the cables for shipping.
6. Turn ON the VPC stop switch in the cab to prevent unintentional movement of the counterweight during the disassembly procedures.

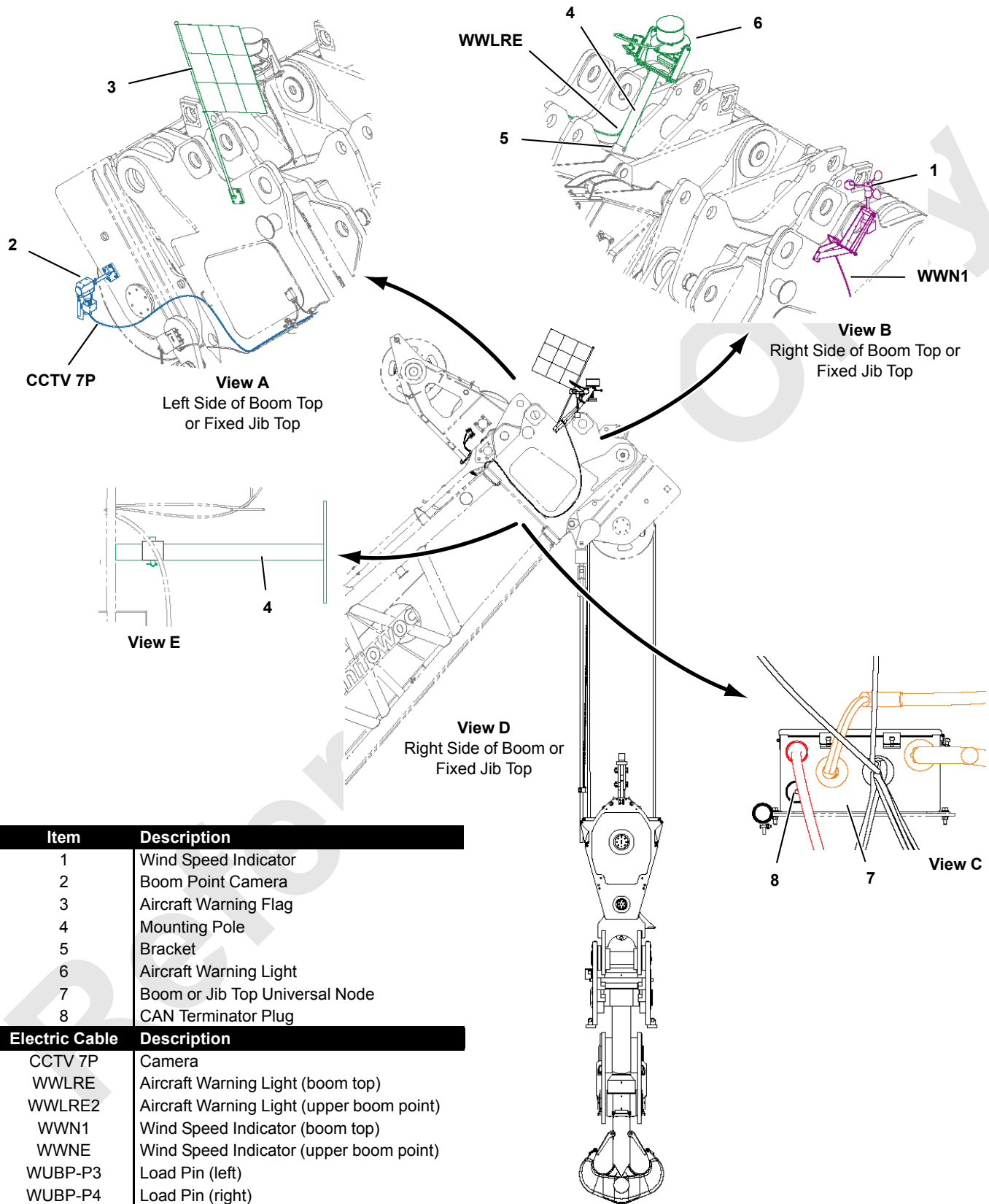


FIGURE 5-16

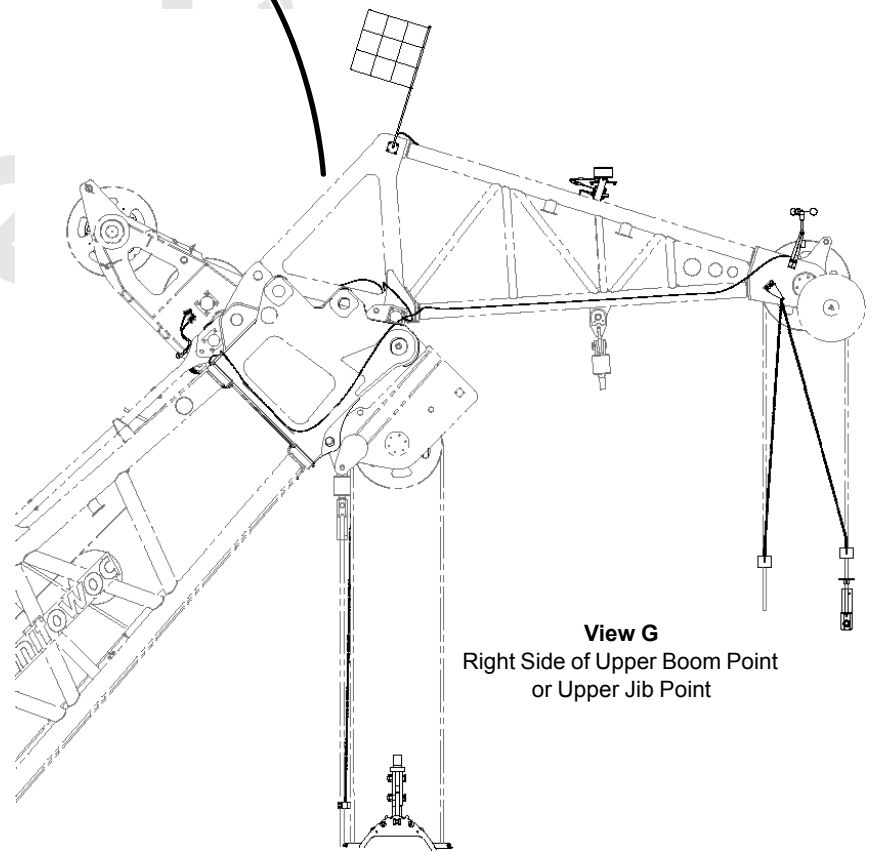
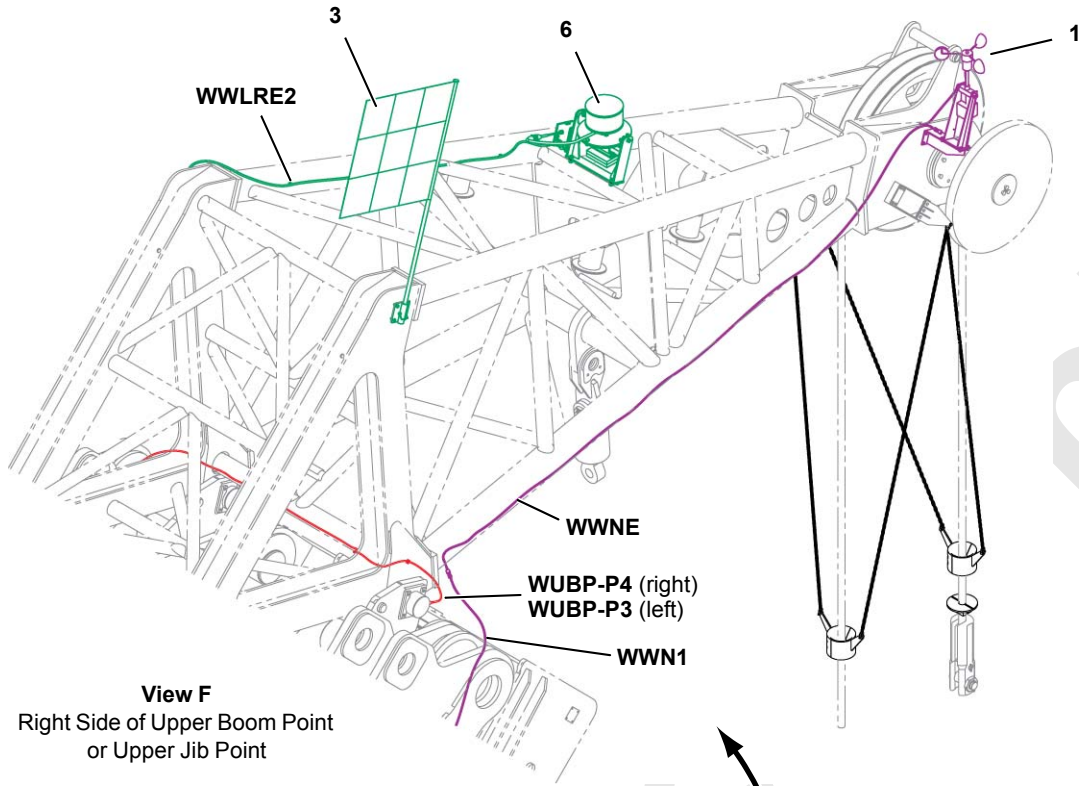


FIGURE 5-16 continued

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CRANE DISASSEMBLY — HOOK BLOCK AND LOAD LINES

See [Figure 5-13](#) for the following procedure.

1. Disconnect the anti-two block weights and chains from the load lines. Store the parts for shipping.
2. Disconnect the load lines from the hook blocks and the hook-and-weight balls.
3. Store the hook blocks and the hook-and-weight balls for shipping.
4. Remove the swivels from the boom and jib points and store them for shipping.
5. Spool the load lines onto the drums for storage.

NOTE Either Drum 1 or Drum 3 load line is required for jib strut lowering. So, if equipped with a jib, leave the load line extended on the ground past the end of the jib point.

CRANE DISASSEMBLY — BOOM AND JIB POINT ELECTRONICS

See [Figure 5-16](#) for the following procedure.

1. Thoroughly clean the ends of all cables and receptacles after the electric cables are disconnected.
2. Cover unused cables and receptacles with dust caps.
3. Store the cables on boom and jib tops.
4. Connect CAN terminator plug (8, View C, [page 5-22](#)) to WN OUT receptacle on boom top universal node (7). **You will get boom faults and not be able to operate functions if you fail to perform this step.**
5. Remove the wind speed indicator as follows:
 - a. Disconnect the electric cables from the wind speed indicator and store cable on the boom or jib top.
 - b. Remove the wind speed indicator from the bracket on the boom job top.
 - c. Store the wind speed indicator for shipping.
6. Remove the boom or jib point camera as follows:
 - a. Disconnect the electric cables from the camera and store the cables on the boom or jib point.
 - b. Remove the camera from the boom jib top.
 - c. Store the camera for shipping.
7. Remove the aircraft warning light as follows:
 - a. Remove the aircraft warning flag from the corresponding boom or jib point.

- b. Store the flag for shipping.

FOR BOOM OR JIB TOP

- c. Disconnect the electric cables and store the cables on the boom or jib point.
- d. Disconnect the aircraft warning light from the mounting bracket.
- e. Store the aircraft warning light for shipping.
- f. Remove the mounting pole from the boom or jib point and store the pole on the inside of the boom top.

FOR UPPER BOOM OR JIB POINT

- g. Disconnect the electric cables and store the cables on the boom or jib point.
- h. Disconnect the aircraft warning light from the mounting bracket on the upper boom or jib point.
- i. Store the aircraft warning light for shipping.
8. Disconnect the electric cables from the cable reels at the corresponding electric components in the boom and jib tops.
9. Disconnect the butt end of the cables from the cable reels in the boom butt. See the wiring diagram in the Electric Control Assembly – Boom Wiring and Limits at the end of Section 4.
10. Disconnect the electric cables from the boom sections and coil the cables onto the cable reels for storage.
11. Disconnect the electric cables from the boom butt.
12. Connect electric cables from the boom butt to the storage receptacles ([Figure 5-17](#)) on the front roller carrier. **You will get CAN faults and not be able to operate functions if you fail to connect electric cable (1) to terminator plug (2).**

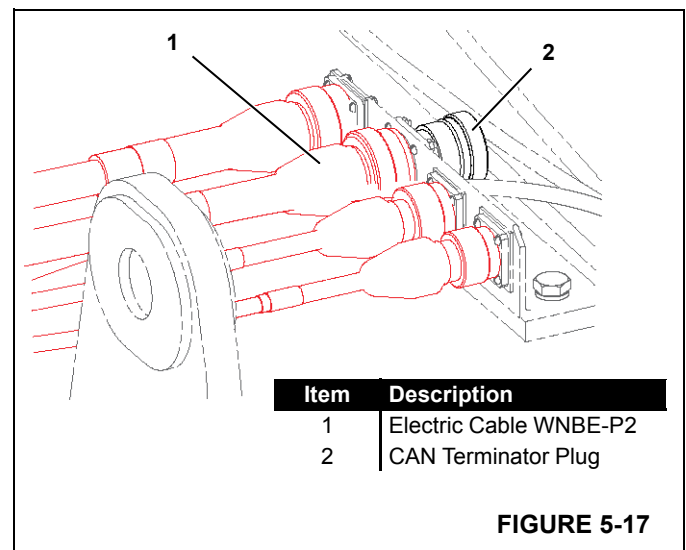


FIGURE 5-17

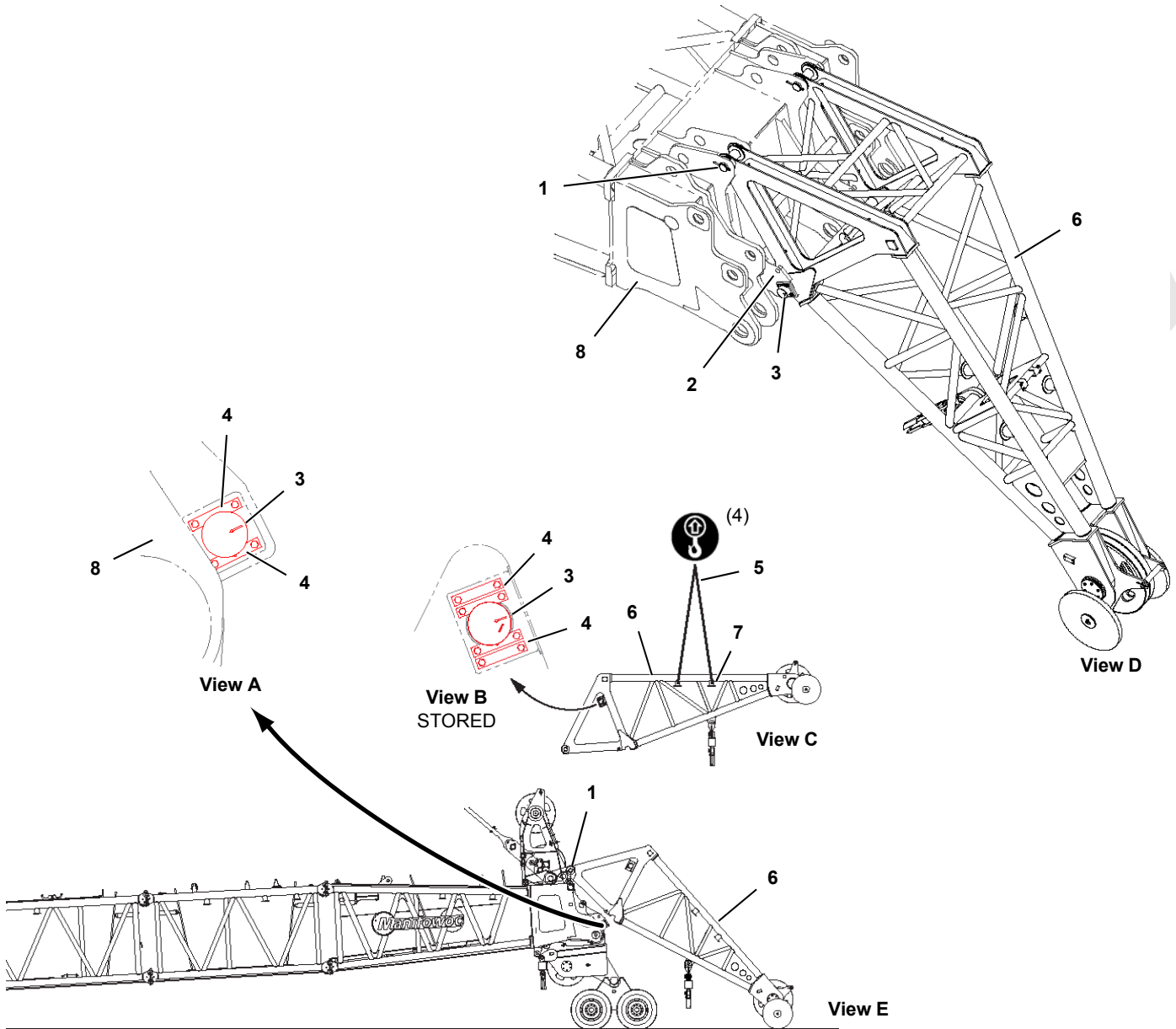


FIGURE 5-18

Legend for [Figure 5-18](#)

Item	Description
1	Pin with Cotter Pins (2)
2	Locking Pin with Cotter Pins (2)
3	Load Pin (2)
4	Keeper Plate with Cap Screws and Lock Washers (8)
5	Lifting Sling (4)
6	Upper Point (Boom or Jib)
7	Lifting Lug (2)
8	Boom or Jib Top

CRANE DISASSEMBLY — UPPER BOOM POINT OR JIB POINT

The upper boom point and the jib point are identical. Removal is the same for both.

See [Figure 5-18](#) for the following procedure.

1. Attach four nylon lifting slings (5, View C) to lifting lugs (7) on upper point (6).
2. Using the assist crane, raise the upper jib point until the rollers are off the ground and the slack is out of the lifting slings.
3. Remove pins (1, Views D and E).
4. Lift the upper point clear of the boom or jib point.
5. Remove load pins and keeper plates:
 - a. Remove the load pins (3, View A) and the keeper plates (4) from boom or jib top (8).
 - b. Store pins (3, View B) and the keeper plates (4) in their storage positions on the upper point.
6. Store pins (1, View D) and locking pins (2, removed earlier) in their respective holes in upper jib point (6).
7. Store upper jib point for shipment.
8. Disconnect lifting slings.

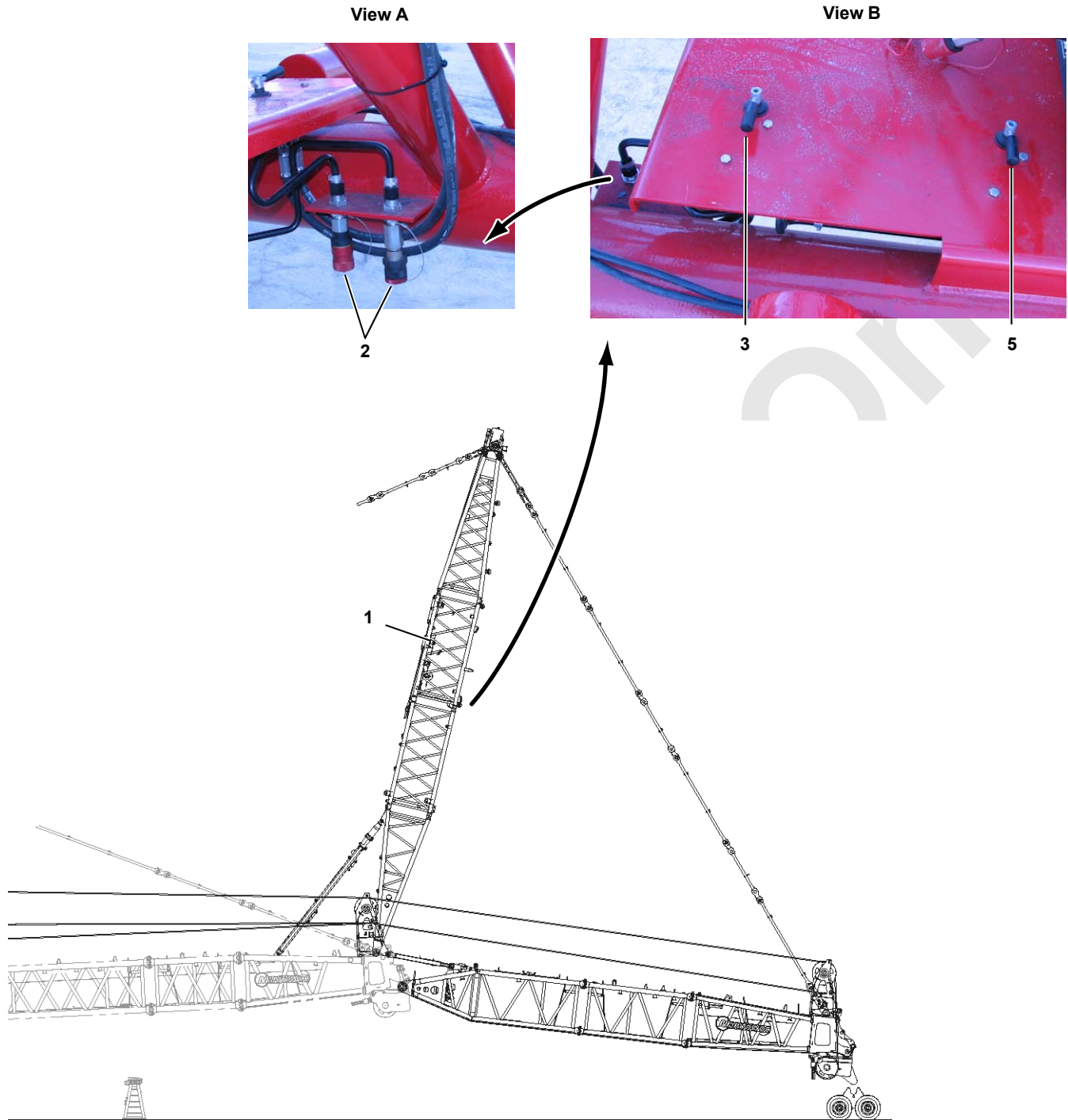


FIGURE 5-19

CRANE DISASSEMBLY — FIXED JIB

Legend for [Figure 5-19](#)

Item	Description
1	Strut
2	Hydraulic Couplers (2)
3	Control Handle — Backstay Strap Spreader
4	Backstay Strap Spreader
5	Control Handle — Strut Connecting Pins
6	Strut Connecting Pins

Retract Spreader Cylinders

See [Figure 5-19](#) for the following procedure.

1. Connect two hydraulic hoses from the PPU to couplers (2, View A) on the strut insert. **Hoses must be from PPU hydraulic Circuit 2 — Arctic 15 Hydraulic Oil.**
2. Turn on the power unit.
3. Fully extend backstay strap spreader (4) with control handle (3, View D).

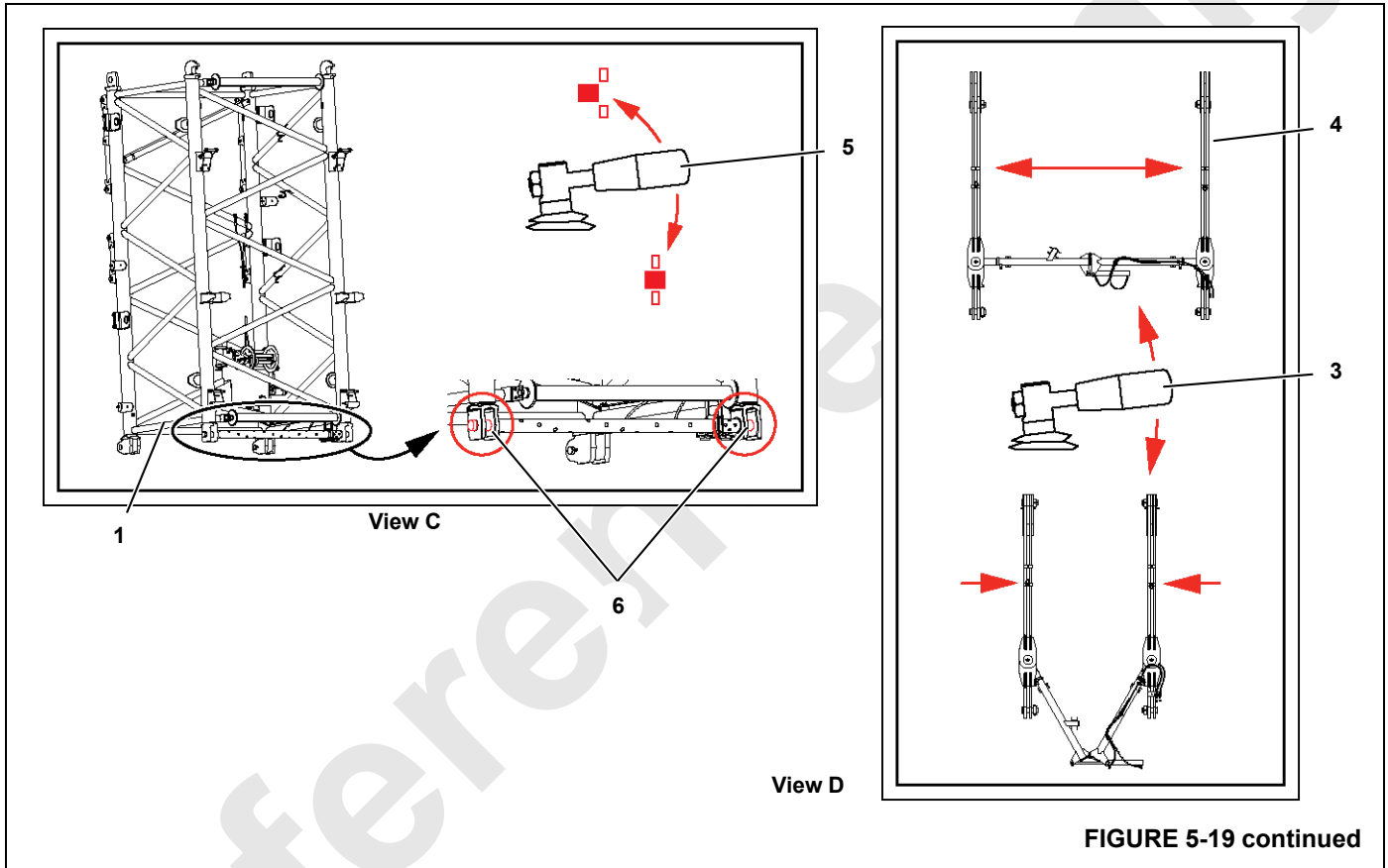


FIGURE 5-19 continued

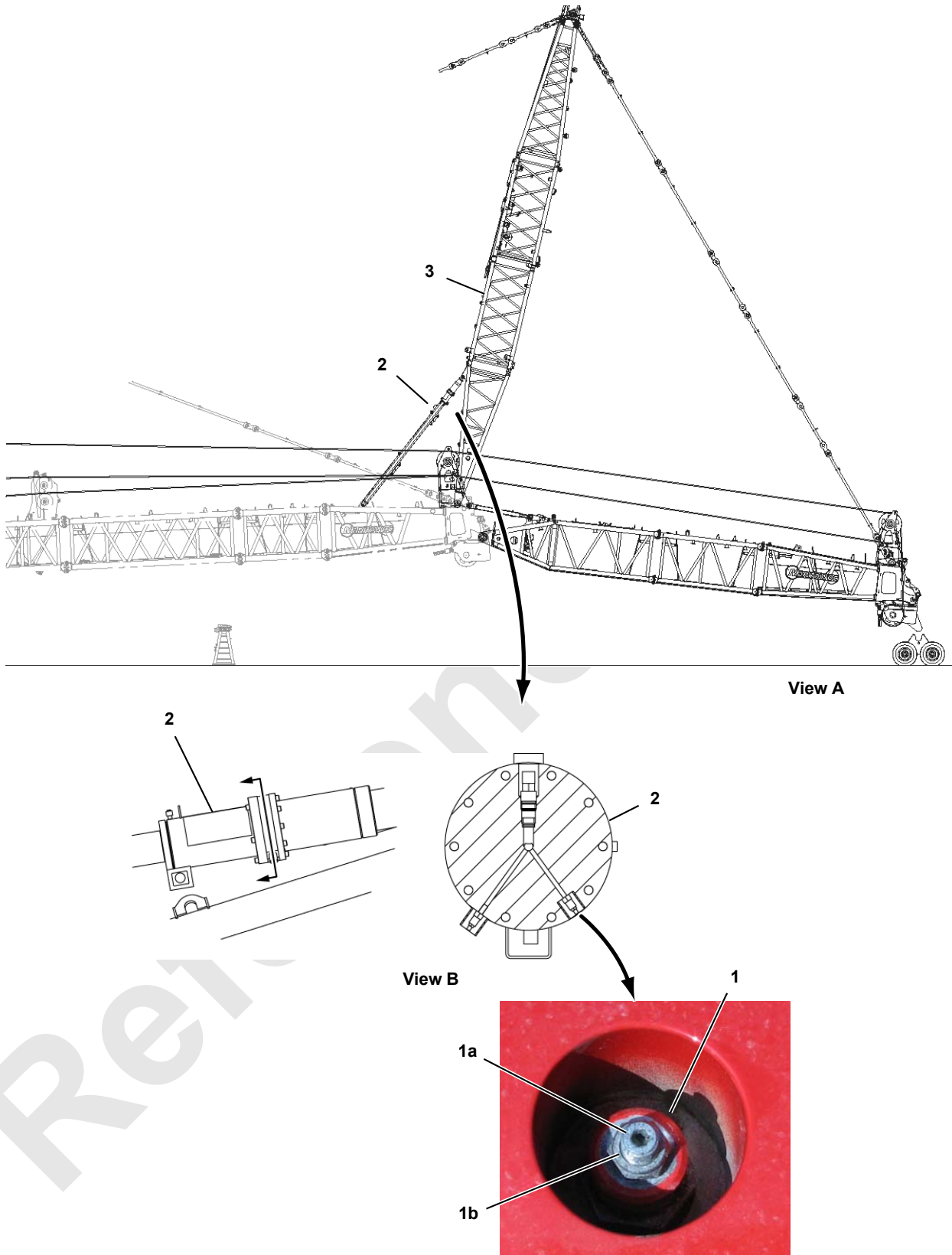


FIGURE 5-20

Legend for Figure [5-20](#)

Item	Description
1	Bypass Valve (2)
1a	Locknut
1b	Adjusting Screw
2	Strut Stop (2)
3	Strut

Open Strut Stop Bypass Valves

See [Figure 5-20](#) for the following procedure.

CAUTION

Avoid Structural Damage!

Failure to have sufficient jib strap tension will cause structural damage when opening strut stop bypass valves.

1. Tighten the jib straps by raising the boom until the jib point starts to come out of the dolly.

NOTE You will not be able to disengage the strut connecting pins until the strut bypass valves are open.

CAUTION

Avoid Structural Damage!

Failing to open strut stop bypass valves can result in structural damage.

2. Fully OPEN bypass valve (1, View B) at both strut stops (2).
 - a. Loosen locknut (1a) with the a 9/16 in wrench.
 - a. Turn adjusting screw (1b) OUT until it stops (COUNTERCLOCKWISE) with a 5/32 in (4 mm) internal hex wrench.
 - b. Hold the adjusting screw in position and tighten the locknut.

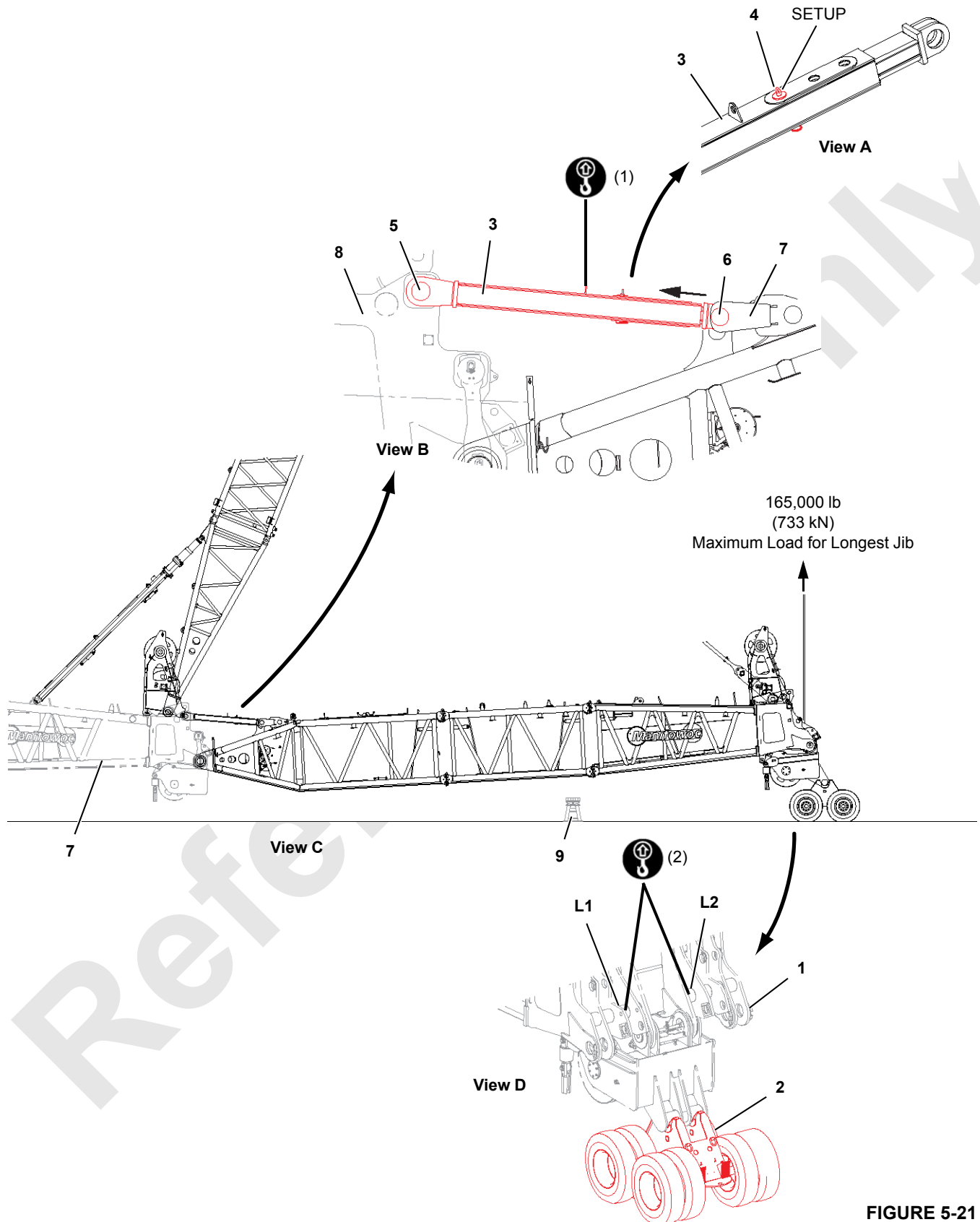


FIGURE 5-21

Legend for [Figure 5-21](#)

Item	Description
1	Jib Top
2	Dolly
3	Jib Stop (2)
4	Stop Pin with Safety Pin (1 each jib stop)
5	Pin with Cotter Pin (1 each jib stop)
6	Pin with Cotter Pin (1 each jib stop)
7	Jib Stop Spreader
8	Boom Top
9	Jib Support (2)

Remove Jib Stops

See [Figure 5-21](#) for the following procedure.

Perform the following steps at each jib stop. The following steps assume the boom has already been lowered onto the boom supports.

1. Install stop pin (4, View A) in the setup hole in jib stop (3).
This position will allow the upper stop tube to extend and retract as needed during removal.
2. Attach one leg of the chain lifting sling to the lifting lug on jib stop (3, View B).
3. Remove pin (6, View B) from jib stop spreader (7), raise the jib stop to horizontal, and retract the upper tube.

4. Store pin (6, View B) in jib stop spreader (7).
5. Remove pin (5, View B) to disconnect the lower tube (3) from boom top (8).
6. Store pin (5, View B) in the end of jib stop (3).
7. Lift jib stop (3, View B) away from the jib butt.
8. Place the jib stop to the side on blocking at ground level. The stops will be pinned to the jib butt for storage later in the procedure.
9. Disconnect the lifting sling.
10. Repeat the steps for the other jib stop.

Remove Dolly

See [Figure 5-21](#) for the following procedure.

1. Using a fork-lift truck, position jib supports (9, View C) under the jib insert next to the jib top.
2. Attach two nylon lifting slings to tubes (L1 and L2, View D) in jib point (3).
3. Lift the jib point off the dolly.
4. Using a fork-lift truck, remove the dolly from the area.
5. SLOWLY lower the jib onto jib supports (9, View C).

NOTE Always add blocking (as needed) between the jib supports and the insert so the jib is as level as possible from side to side. Failing to perform this step will make it difficult to disconnect the inserts.

6. Disconnect the lifting slings.

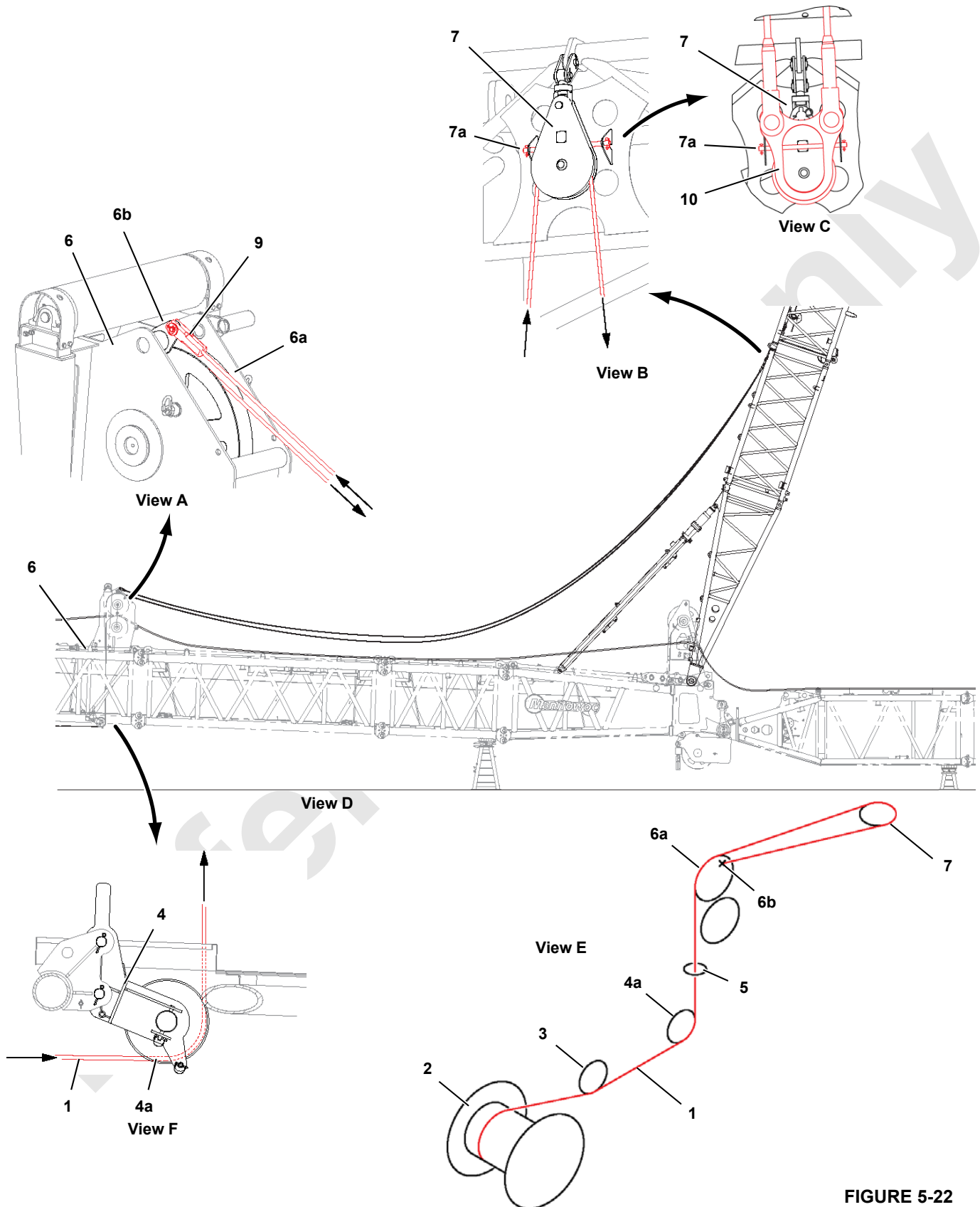


FIGURE 5-22

Legend for [Figures 5-22](#) and [5-23](#)

Item	Description
1	Rigging Line
1a	Button
1b	Alignment Lug
2	Rigging Winch (Drum 6)
3	Guide Sheave (front of rotating bed)
4	Wire Rope Guide (under equalizer insert)
4a	Guide Sheave
5	Hole in Wire Rope Guide
6	Wire Rope Guide (equalizer insert)
6a	Guide Sheave (top)
6b	Dead-End Lug
7	Snatch Block Guide Sheave (on strut insert)
7a	Pin with Snap Pins
9	Button Socket
9a	Pin with Retainer
10	Lifting Link

Route Rigging Line to Wire Rope Guide on Equalizer Insert

See [Figure 5-22](#) for the following procedure.

- Unpin snatch block (7, View C) and lifting link (10) from storage on the strut.
- Reinstall pin (7a, View B) so it is under snatch block (7).
- Route rigging line (1, View E) from rigging winch (2), as follows:
 - Under guide sheave (3, View E).
 - Under guide sheave (4a, View E and F).
 - Through hole (5, View E) in the bottom of wire rope guide (6).
 - Over guide sheave (6a, Views A and E).
 - Around snatch block guide sheave (7, View B).
- Dead end the rigging line to wire rope guide lug (6b, View A) with button socket (9, [Figure 5-23](#)).

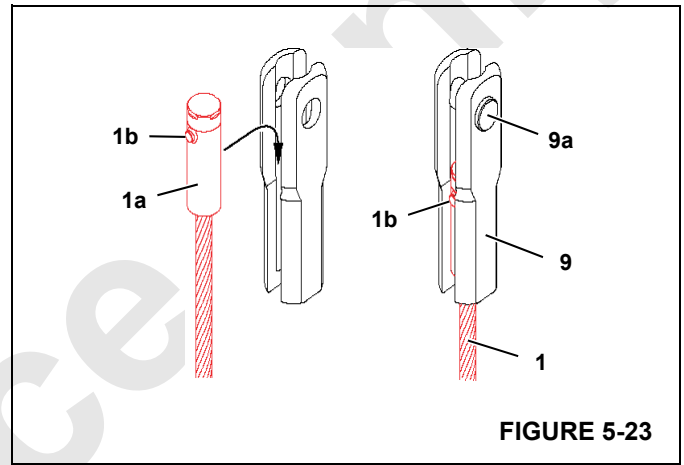


FIGURE 5-23

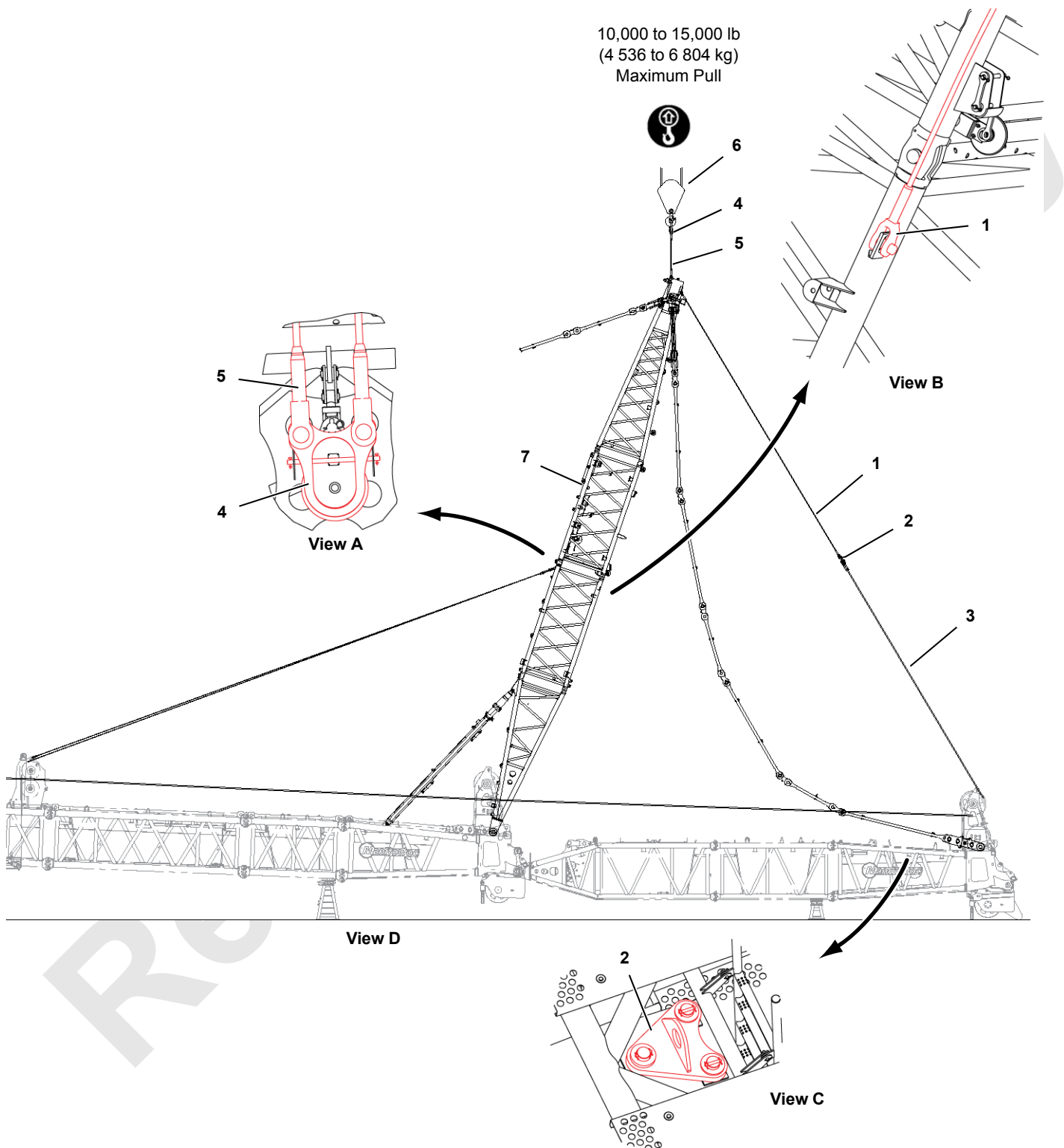


FIGURE 5-24

Legend for [Figure 5-24](#)

Item	Description
1	Pendant (2)
2	Link
3	Drum 1 or 3 Load Line
4	Link
5	Pendant (2)
6	Assist Crane
7	Strut

Connect Strut Lowering Components

See [Figure 5-24](#) for the following procedure.

1. Attach Drum 1 or 3 load line to the strut as follows:
 - a. Detach pendants (1, View B) from the strut insert. Allow the pendants to hang vertical.
 - b. Remove link (2, View C) from the jib top by removing the retaining pins provided.
 - c. Connect Drum 1 or 3 load line (3, View D) and link (2) to pendants (1).
2. Attach link (4, View A) to assist crane hook (6, View D).
3. Raise link (4, View D) and pendants (5) above the strut top just enough to remove the slack from the pendants — **10,000 to 15,000 lb (4 536 to 6 804 kg) maximum pull with assist crane.**

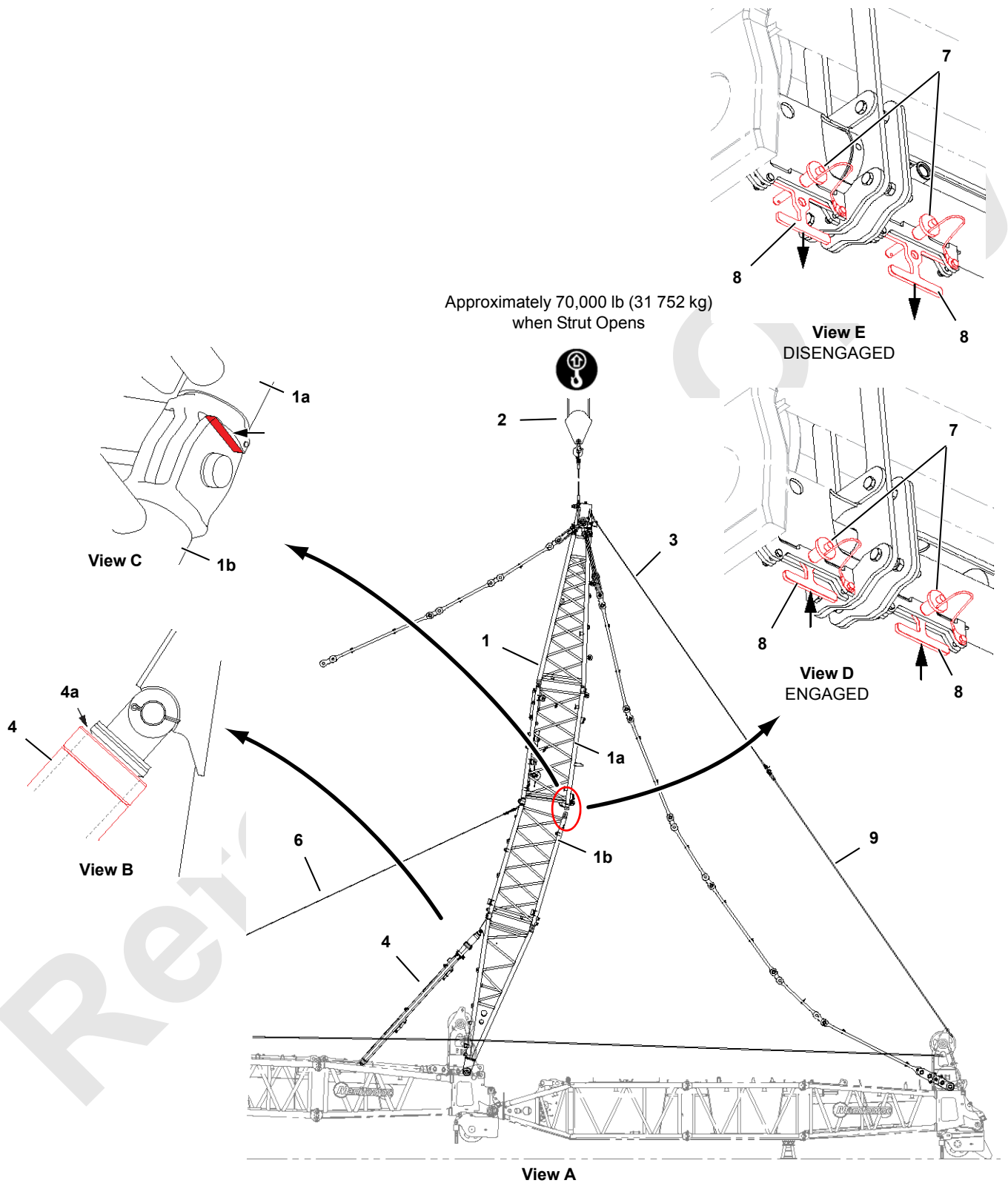


FIGURE 5-25

Legend for [Figure 5-25](#)

Item	Description
1	Strut
1a	Strut Insert
1b	Strut Insert
2	Assist Crane
3	Pendants (2)
4	Strut Stop
4a	Cylinder Rod
5	Pendants (2)
6	Drum 6 Rigging Line
7	Quick-Release Pin (2)
8	Keeper Plate (2)
9	Drum 1 or 3 Load Line

Lower Strut

See [Figure 5-25](#) for the following procedure.

1. Make sure strut stop bypass valves are open as instructed on [page 5-31](#).
2. SLOWLY haul in Drum 6 rigging line (6, View A) to retract strut stop cylinder rods (4a, View B) until strut stop (4) is fully retracted.

No rod should be exposed during strut lowering.

CAUTION**Avoid Structural Damage!**

Continuing to haul in Drum 1 or 3 load line after bearing faces of connectors contact each other will lead to structural damage.

3. Haul in Drum 1 or 3 load line (9, View A) until the bearing faces of the connectors on strut inserts (1a and 1b, View C) contact each other.
4. Disengage keeper plates (8, View D), as follows.
 - a. Pull out quick-release pins (7, View D).
 - b. Pull keeper plates (8, View D) DOWN and reinstall quick-release pins (7, View E).
5. If not already done, connect two hydraulic hoses from the PPU to the couplers on the strut insert (see [Figure 5-19](#) on [page 5-29](#)). **Hoses must be from PPU hydraulic Circuit 2 — Arctic 15 Hydraulic Oil.**
6. Turn on the PPU.
7. Fully retract strut connecting pins (6, View C, [Figure 5-19](#) on [page 5-29](#)) with control handle (5).

CAUTION**Avoid Structural Damage!**

Visually verify that strut connecting pins are fully disengaged before continuing with procedure.

See [Figure 5-25](#) for the following steps.

8. Ensure that assist crane rigging is tight.
9. Slowly pay out Drum 1 or 3 load line (9, View A) until the struts starts to fold (open).

All strut load is transferred to the assist crane when strut starts to open. The assist load can increase to as high as 70,000 lb (31 752 kg).
10. Once the strut starts to fold, disconnect and remove Drum 6 rigging line. Reverse the installation steps on [page 5-35](#).
11. Slacken Drum 1 or 3 load line (9) for the rest of the procedure.

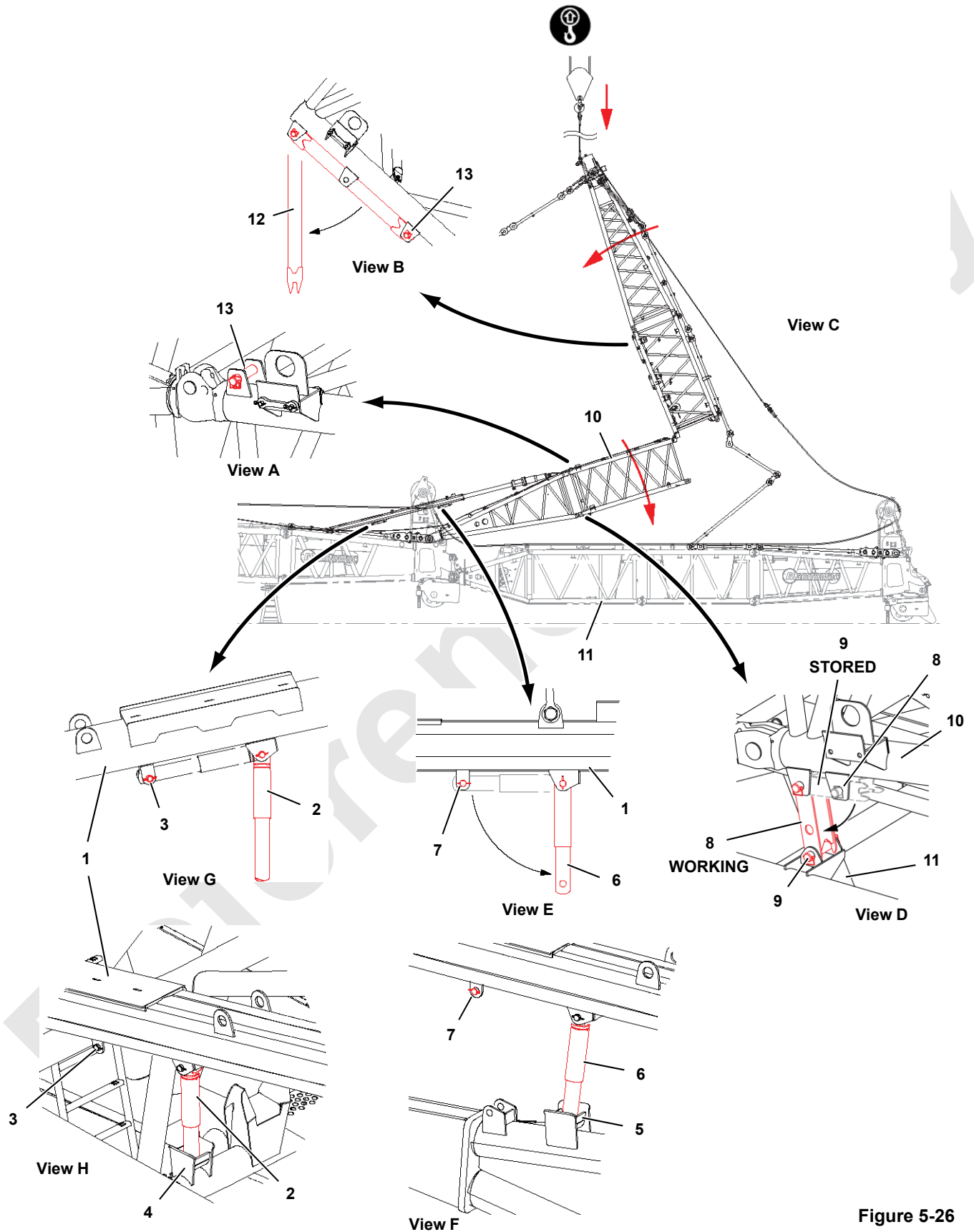


Figure 5-26

Legend for [Figure 5-26](#)

Item	Description
1	Strut Stop (2)
2	Strut Stop Support (2)
3	Pin with Cotter Pins (2)
4	Lug, Boom Top (2)
5	Lug, Strut Butt (2)
6	Strut Stop Support (2)
7	Pin with Cotter Pins (2)
8	Strut Support (2)
9	Pin with Cotter Pins (2)
10	Strut Insert
11	Jib Butt
12	Strut Support (2)
13	Pin with Wire-Lock Pin (2)

See [Figure 5-26](#) for the remaining steps.

12. Lower the strut (fold it) to the approximate position shown in View C.

13. Lower the strut stop supports at both strut stops:

CAUTION

Avoid Structural Damage!

Failure to adjust strut stop supports to minimum length will result in structural damage during strut lowering.

- a. Remove pin (7, View E) from strut stop support (6) and lower the support to vertical.

- b. Reinstall pin (7, View F) in the strut stop lugs for storage.
- c. Adjust strut stop support (7) to its minimum length.
- d. Remove pin (3, View G) from strut stop support (2) and lower the support to vertical.
- e. Reinstall pin (3, View G) in the strut stop lugs for storage.
- f. Adjust strut stop support (2) to its minimum length.

14. Unpin strut supports (8, View D) from the stored position and lower them to vertical.

15. Install pins (9, View D) in jib butt lugs (11);

16. Continue to lower the strut.

As the strut lowers, ensure strut stop supports (2, View H) and (6, View F) engage lugs (4, View H) on the boom top and (5, View F) on the jib butt.

17. STOP when strut supports (8, View D) are seated on pins (9).

18. Adjust the length of strut stop supports (2, View H) so they are snug in the bottom of lugs (4).

19. Adjust the length of strut stop supports (6, View F) so they are snug in the bottom of lugs (5).

20. Unpin strut support (12, View B) from the upper strut insert and allow the supports to hang freely.

21. Reinstall pins (13, View A) in the lugs on lower insert (10).

Reference

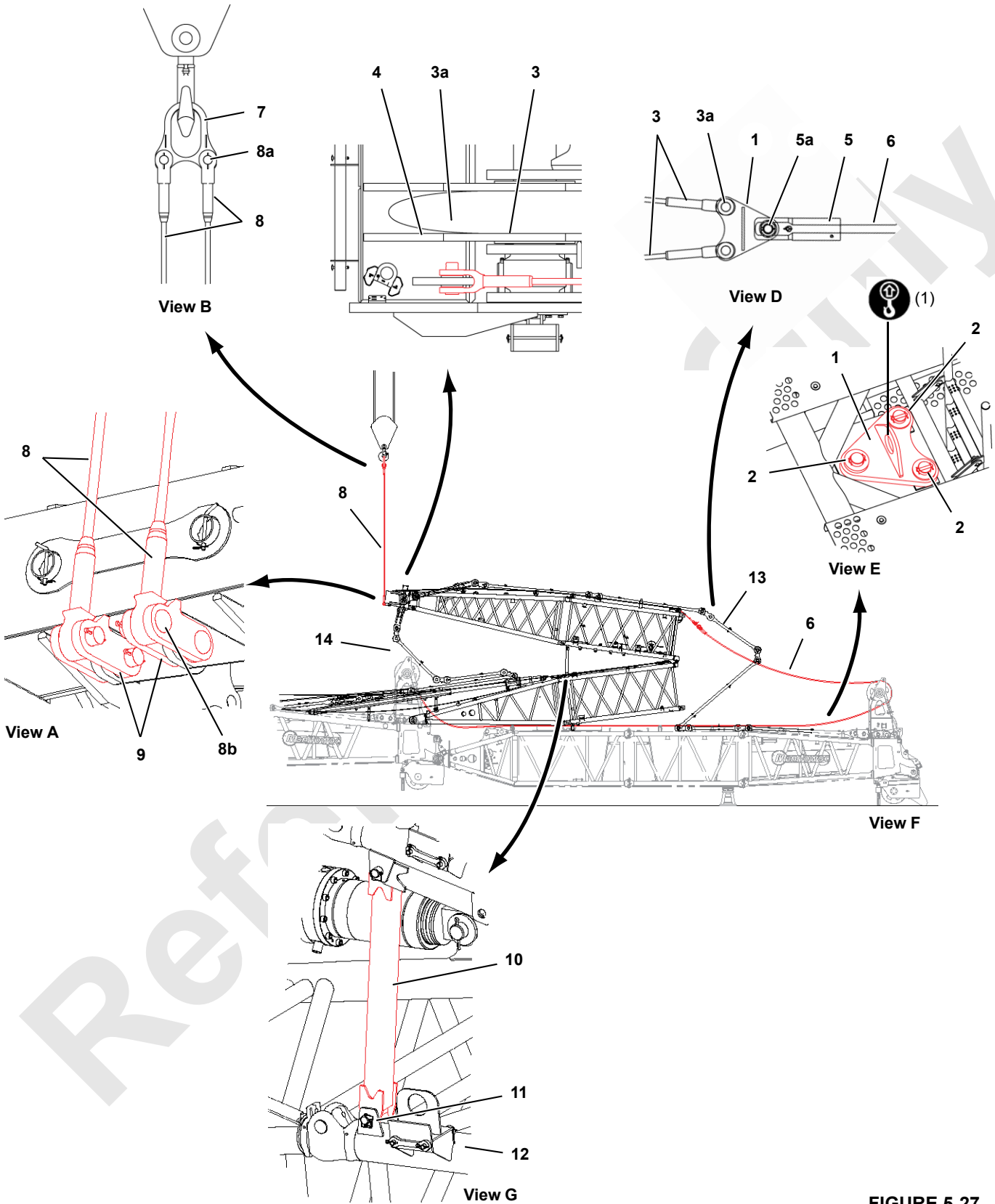


FIGURE 5-27

Legend for [Figure 5-27](#)

Item	Description
1	Link
2	Retaining Pin with Cotter Pins (3)
3	Pendant — 1-1/4 in Diameter (2)
3a	Pin with Cotter Pin (2 with each pendant)
4	Strut Top Lug (2)
5	Button Socket
5a	Bolt with Nut and Cotter Pin
6	Drum 1 or 3 Load Line
7	Link
8	Pendant — 1-1/2 in Diameter (2)
8a	Pin with Cotter Pin (1 with each pendant)
8b	Pin with Cotter Pin (2)
9	Link (2)
10	Strut Support (2)
11	Pin with Cotter Pin (2)
12	Lower Strut Insert
13	Backstay Straps
14	Jib Straps

See [Figure 5-27](#) for the following procedure.

22. SLOWLY continue to lower the strut with the assist crane.

- a. Make sure jib backstay straps (13, View F) fold as shown in the Jib Assembly Drawing at the end of Section 4.
- b. Make sure jib straps (14, View F) fold as shown in the Jib Assembly Drawing at the end of Section 4.

To avoid damage, stop if straps don't fold properly and correct.

23. Stop lowering the strut when both strut supports (10, View G) are seated on the pins in lower strut insert (12).

At this point all load will be off of the assist crane.

24. Disconnect the hydraulic lines from the PPU at the couplers on the strut and coil the hydraulic lines onto the PPU.

Disconnect Strut Lowering Components

See [Figure 5-27](#) for the following procedure.

1. Remove pendants (8), as follows:
 - a. Disconnect two pendants (8, View A) from links (9).
 - b. Store pins (8b, View A) in the pendant holes.
 - c. Lift the pendants away from the strut and lower them onto shipping pallets.
 - d. Disconnect link (7, View B) from the assist crane and from pendants (8).
 - e. Store pins (8a, View B) in the pendant holes.
 - f. Coil the pendants and secure them to the shipping pallets.
2. Remove pendants (3), as follows:
 - a. Disconnect Drum 1 or 3 load line (6, View D) from link (1).
 - b. Spool the load line onto the load drum for storage.
 - c. Disconnect link (1, View D) from pendants (3).
 - d. Store pins (3a) in the pendant holes.
 - e. Pin link (1, View E) to the jib top for storage.
 - f. Disconnect pendants (3, View C) from strut top lugs (4).
 - g. Store pins (3a) in the pendant holes.
 - h. Coil the pendants and secure them to shipping pallets.

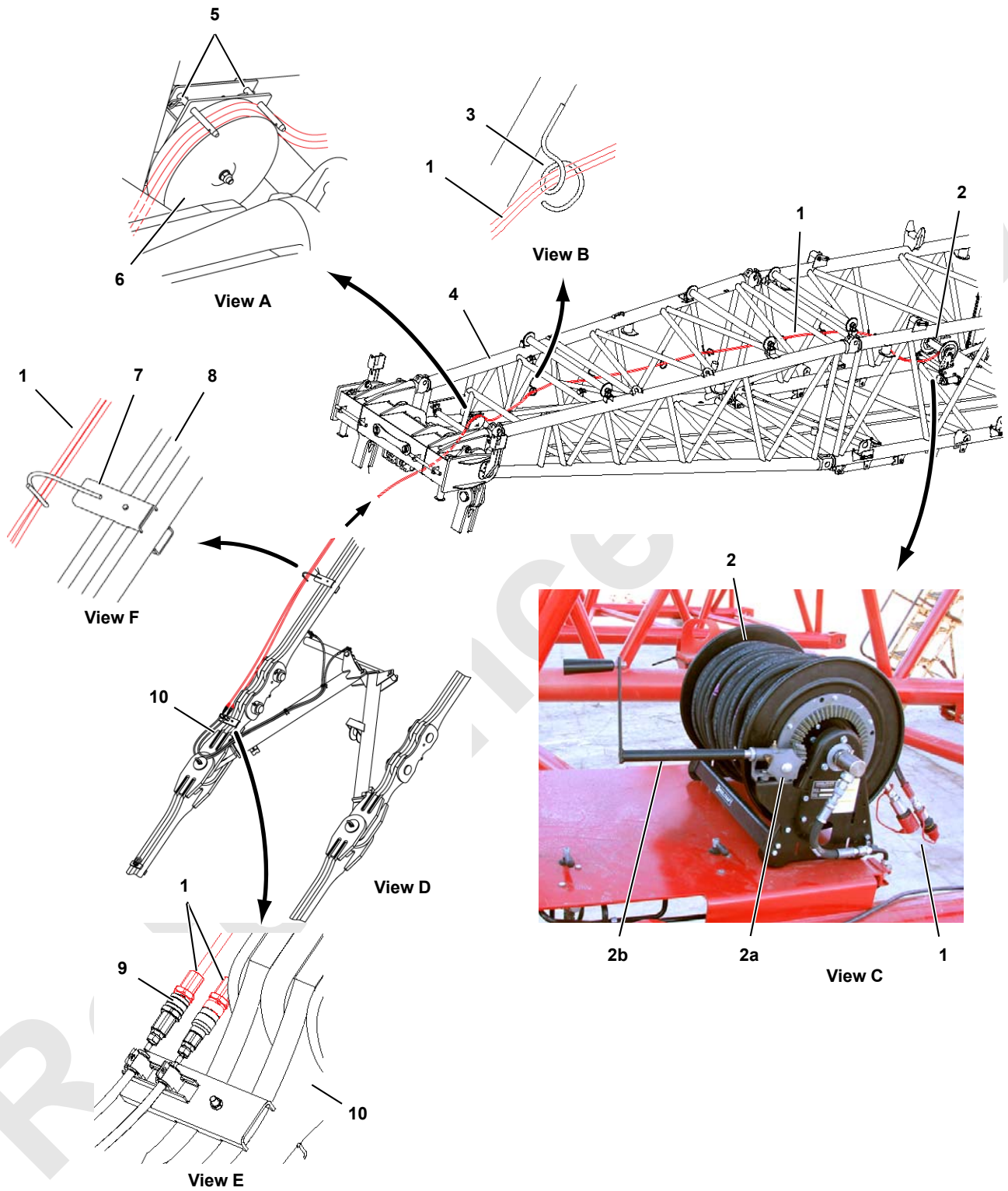


Figure 5-28

Legend for [Figure 5-28](#)

Item	Description
1	Hydraulic Hoses
2	Cable Reel
2a	Tension Knob
2b	Hand Crank (store in power unit when not in use)
3	Hose Hanger
4	Strut
5	Hitch Pin with Hair Pin Cotter (2)
6	Sheave
7	Hose Hanger
8	Backstay Strap
9	Hydraulic Coupler (2)
10	Spreader

Disconnect Hydraulic Lines from Backstay Spreader

See [Figure 5-28](#) for the following procedure.

1. Disconnect the couplers on hydraulic hoses (1, View E) from couplers (9) on spreader (10).
2. Pull the hoses through hose hangers (7, View F).
3. Pull the hydraulic hoses off the sheave (6, View A) as follows:
 - a. Remove hitch pins (5, View A) from sheave (6).
 - b. Pull the hydraulic hoses off the sheave (6).
 - c. Reinstall hitch pins (5).
4. Pull the hoses through hose hangers (3, View B) in strut (4).
5. Recoil hydraulic hoses (1, View C) on cable reel (2) in the strut insert.

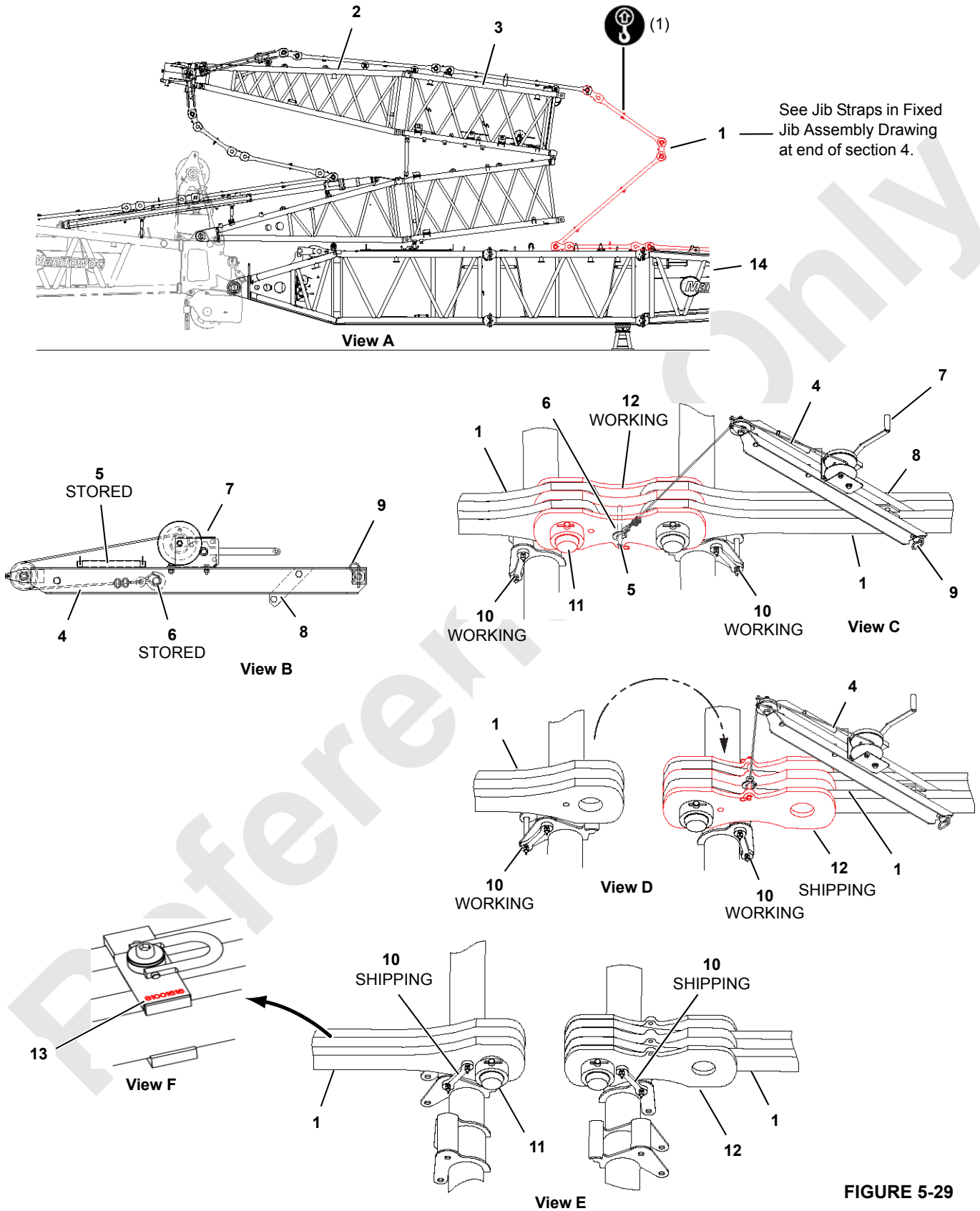


FIGURE 5-29

Legend for [Figure 5-29](#)

Item	Description
1	Jib Backstay Straps (2 each jib insert)
2	Transition Insert
3	Strut Insert
4	Strap Rigging Winch
5	Lifting Pin with Hair-Pin Cotters
6	Hook
7	Winch
8	Guide Bars
9	Hitch with Hair-Pin Cotter
10	Strap Storage Link with Pin and Cotter Pins (4 each insert)
11	Pin with Collar, Retaining Pin and Cotter Pins (2 each boom insert)
12	Jib Strap Links (2 sets of three each insert)
13	Strap Identification Tag (with strap part number)
14	Jib Top

Disconnect Jib Straps

NOTE Refer to [Figure 5-39](#) for identification of the straps that can be shipped on the jib sections.

See [Figure 5-29](#) for the following procedure.

1. Attach two legs of the chain lifting sling to the lifting lug on jib strap (1, View A) nearest the end of strut insert (3).
2. Remove the folded jib straps (1, View A) and lay them on blocking at ground level.

Do not remove the jib straps on the strut sections at this time.

3. Disconnect the lifting sling and repeat steps for the other jib strap.
4. Disconnect and rotate jib strap links (12, View C) from the working position to the shipping position.

Use strap rigging winch (4, View B) as shown in Views C, D, and E.

Reference Fixed Jib Assembly Drawing at end of Section 4.

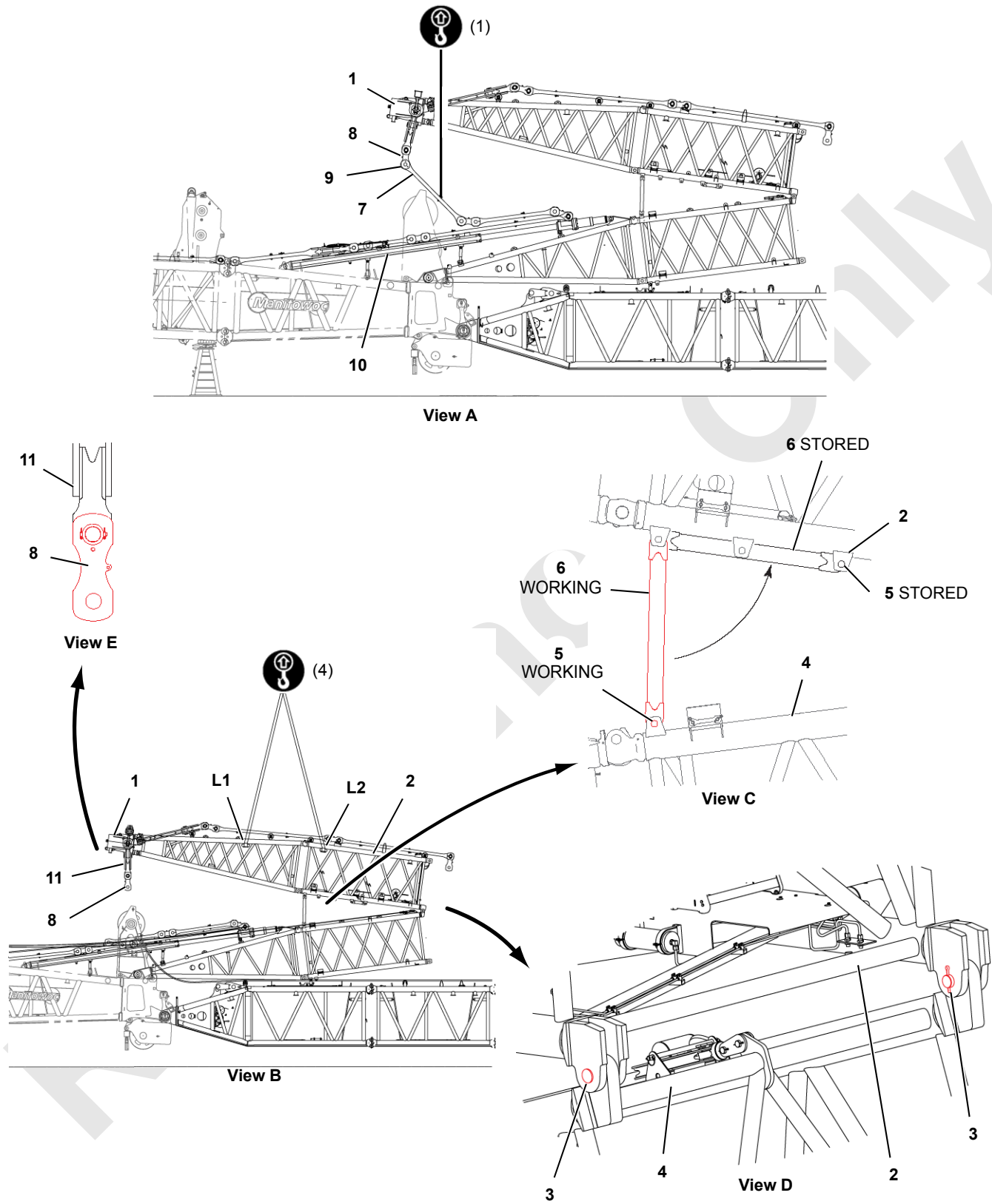


Figure 5-30

Legend for [Figure 5-30](#)

Item	Description
1	Strut Top
2	Strut Upper Insert
3	Hinge Pin with Cotter Pins (2)
4	Strut Lower Insert
5	Pin with Wire Lock Pin
6	Strut Support (2)
7	Backstay Strap (2)
8	Strap Link (2)
9	Pin with Collar, Retaining Pin and Cotter Pins (2)
10	Strut Stop
11	Link (2)

Disconnect Backstay Straps from Strut Top

See [Figure 5-30](#), for the following procedure.

1. Attach one leg of the chain lifting sling to backstay strap (7, View A).

2. Disconnect backstay strap (7, View A) from backstay strap link (8, View A) and fold the strap onto the straps resting on the strut stop (10).

*Backstay straps must be folded on jib stops as shown in **Fixed Jib Assembly Drawing**.*

3. Disconnect the lifting sling and repeat the steps for other backstay strap (7).

Remove Top Half of Strut

See [Figure 5-30](#) for the following procedure.

1. Attach four nylon lifting slings to lifting lugs (L1 and L2, View B) on strut top (1) and upper insert (2).
2. Lift with the assist crane until the lifting slings are tight.
3. Remove pin (5, View C) and raise strut support (6) on both sides of strut insert (2) to stored position.
4. Remove hinge pins (3, View D).
5. Store hinge pins (3, View D) in the bottom lugs of strut upper insert (2).
6. Lift the upper half of the strut away from the jib.

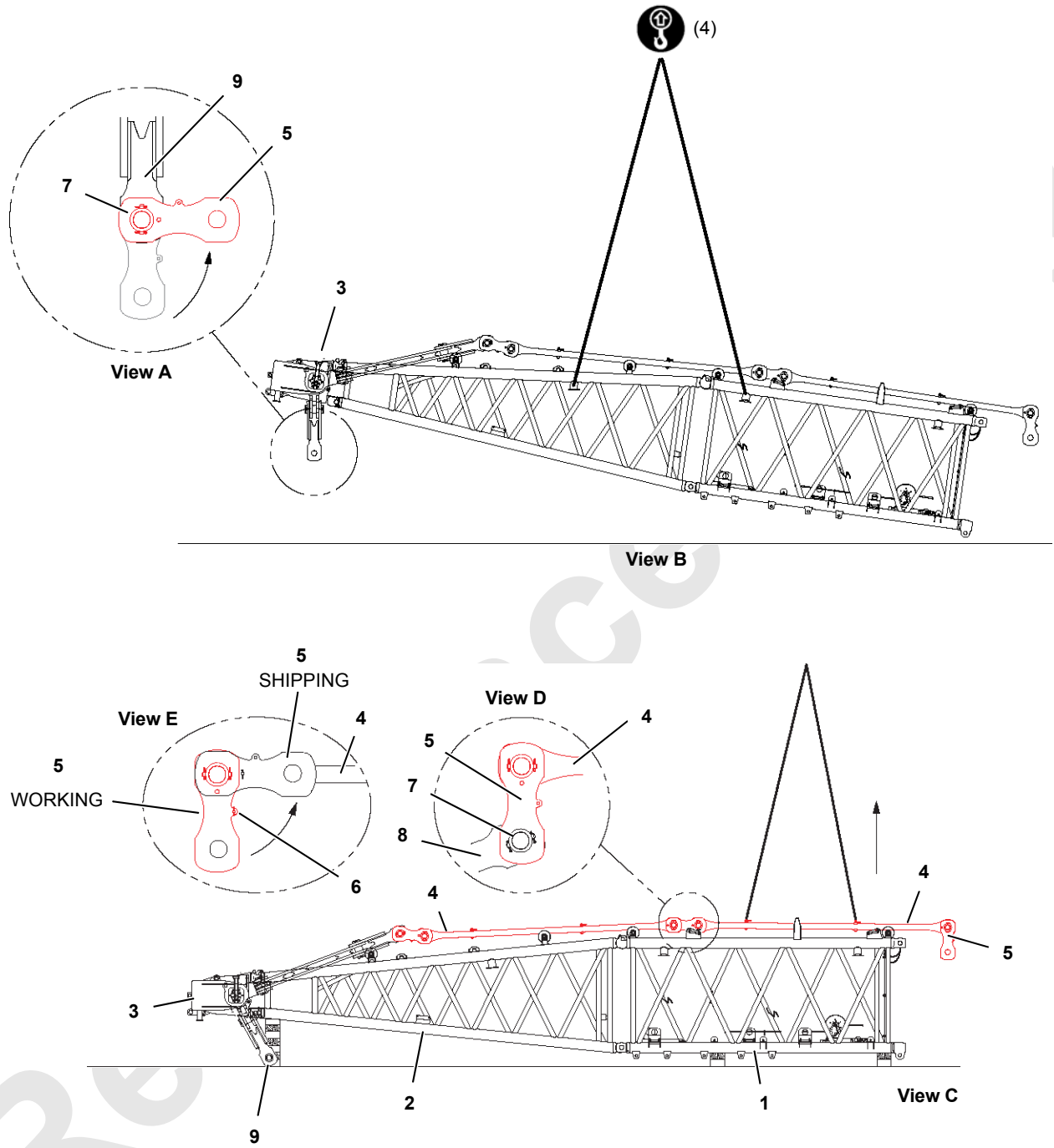


Figure 5-31

Legend for [Figure 5-31](#)

Item	Description
1	Upper Insert
2	Transition Insert
3	Strut Top
4	Strap Assembly — 6 m (4)
5	Strap Links (set of 3 with each strap)
6	Link Storage Pin and Cotter Pins (1 each set of strap links)
7	Pin with Collar, Retaining Pin, and Cotter Pins (1 each strap)
8	Link (2)
9	Link (2)

Disassemble Upper Half of Strut

Break upper half of strut into shipping configurations.

See [Figure 5-31](#) for the following procedure.

1. Disconnect strap links (5, View A) from links (9) in strut top (3, View B) and remove links (5) for shipping.
Store pins (7) in the holes of strap links (5).
2. Place the upper half of the strut on blocking as shown in View C.
 - The blocking must be at least 12 in (0,30 m) high.
 - The center line of the upper half of the strut must be parallel to the ground.
 - The upper half of the strut must be level from side to side.
 - Block under the top end of the strut insert.
 - Rotate links (9, View C) rearward as the upper half of the strut is lowered onto the blocking.
3. Disconnect the lifting slings.
4. Remove strap assemblies (4, View C):
 - a. Attach two legs of the chain lifting sling to the lifting rings on strap assembly (4, View C).
 - b. Raise strap assembly (4) to the position shown in View D.
 - c. Remove pin (7, View B) from link (8).
 - d. Lift the strap assembly away from the strut and place it to the side on blocking at ground level.
 - e. Reinstall pin (7) in strap (4) for storage.
 - f. Repeat the steps for the remaining strap assemblies.

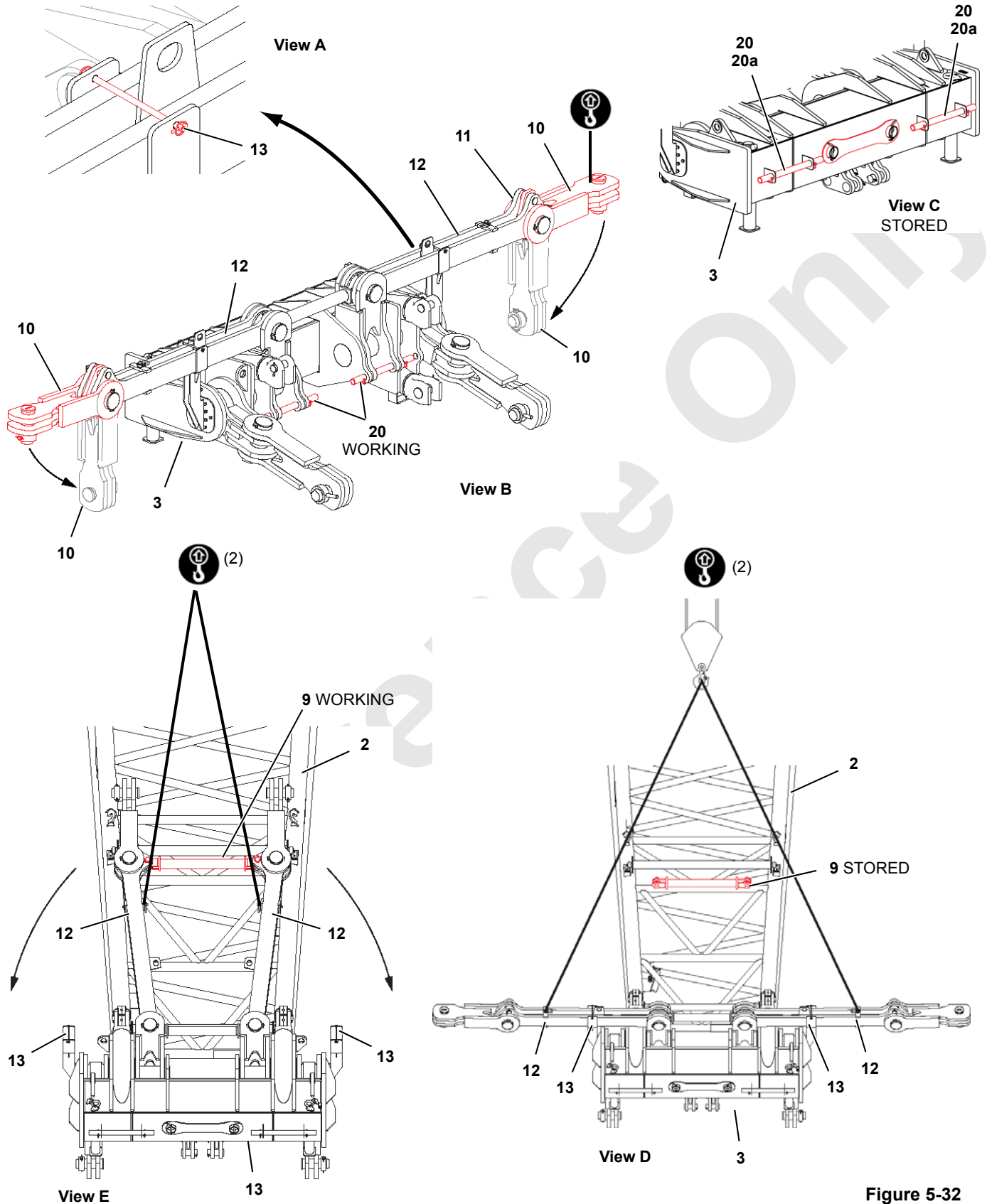


Figure 5-32

Legend for [Figure 5-32](#)

Item	Description
2	Transition Insert
3	Strut Top
20	Pin (2)
20a	Wire Lock Pins (4)
10	Link (2)
11	Pin with Safety Pin (2)
12	Link (2)
13	Pin with Wire Lock Pins (2)
9	Spreader with Pins and Cotter Pins (2)

See [Figure 5-32](#) for the following steps.

5. Unpin and remove spreader (9, View E) from the working position between links (12) and pin it in the stored position (View D).
6. Rotate the links (12, View E) to stored position as follows:
 - a. Attach two legs of the chain lifting sling to the lifting rings on links (12, View E).
 - b. Remove pins (13, View E).
 - c. Make sure the hook block from the assist crane is centered over the links and the center line of the transition insert.
 - d. Lift links (12) to vertical.
 - e. Lower links (12, View D) to horizontal.
 - f. Reinstall pins (13, View A) in the lugs on strut top (3, View E).
 - g. Disconnect the lifting sling.
7. Remove pins (20, View C) from the stored position and insert them in the working position lugs on the strut top (3, View C).
8. Lower links (10, View B) as follows:
 - a. Attach a nylon lifting sling from the assist crane to link (10) and take up slack in the sling with the assist crane.
 - b. Remove pin (11).
 - c. Lower link (10) to vertical.
 - d. Reinstall pin (11).
 - e. Disconnect the lifting sling.
 - f. Repeat the steps for other link (10).

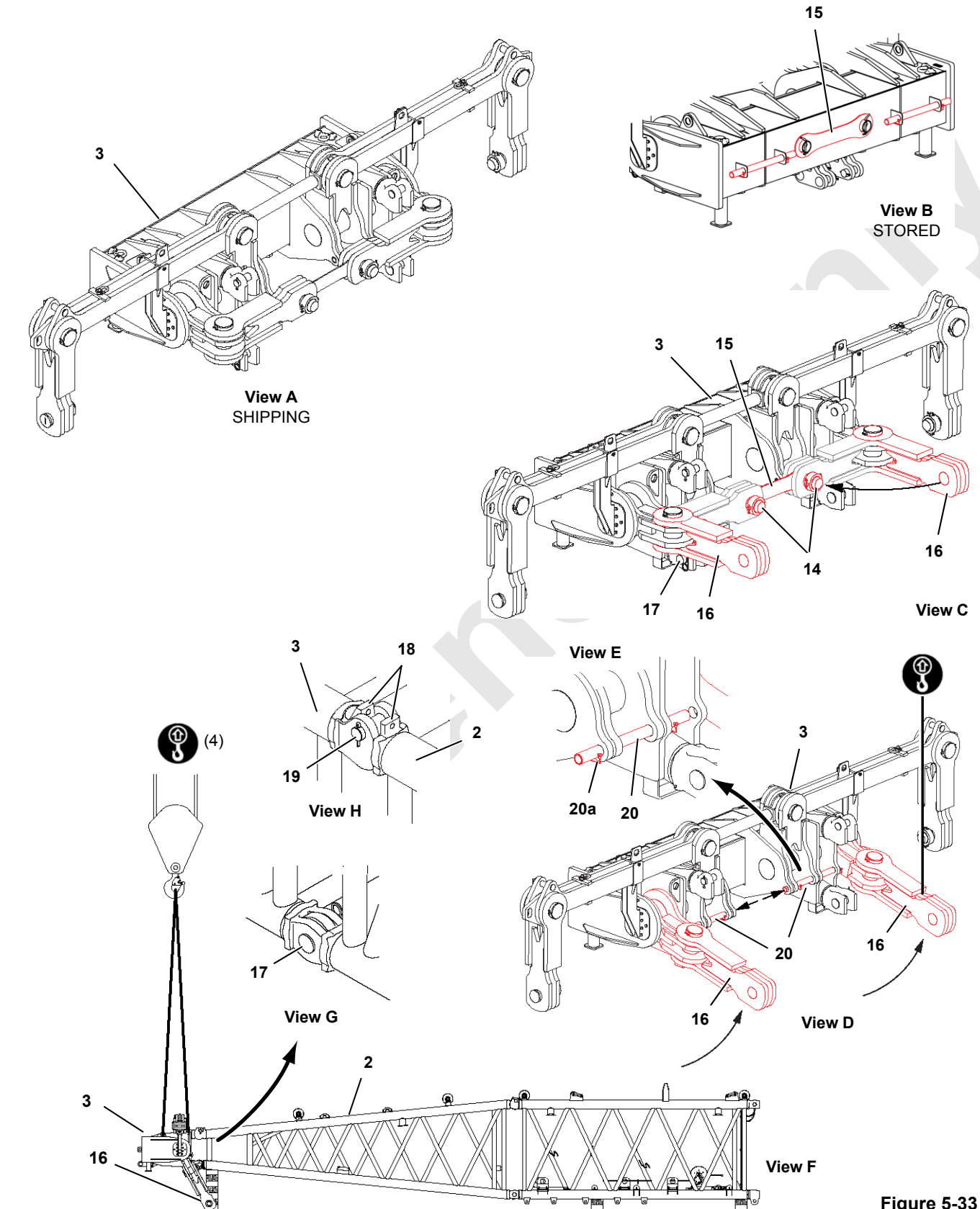


Figure 5-33

Legend for [Figure 5-33](#)

Item	Description
2	Transition Insert
3	Strut Top
14	Pin with Collar, Connecting Pin, and Cotter Pins (2)
15	Link
16	Link (backstay strap) (2)
17	Pin with Safety Pin (2)
18	Hooked Connector (2)
19	Fixed Pin (2)
20	Pin (2)
20a	Wire Lock Pin (4)

See [Figure 5-33](#) for the following steps.

9. Raise links (16, View D) as follows:
 - a. Remove wire lock pins (20a, View E).
 - b. Using a nylon sling from the assist crane, raise link (16, View D) from the ground to horizontal.
 - c. Push pin (20, View D) all the way in and install wire lock pins (20a).
10. Remove strut top (3, View F) as follows:
 - d. Disconnect the lifting sling.
 - e. Repeat the steps for other link (16).
 - a. Attach four legs chain lifting sling to the lifting lugs and rings on strut top (3, View G).
 - b. Take the slack out of the lifting slings with the assist crane.
 - c. Remove pins (17, View G).
 - d. Lift strut top (3, View G) from end of transition insert (2) and place it on blocking.
 - e. Disconnect the lifting slings.
 - f. Install pins (17, View C) in strut top (3) for storage.
11. Prepare strut top (3, View A) for shipping, as follows:
 - a. Rotate links (16, View C) inward.
 - b. Remove link (15, View B) from strut top stored position.
 - c. Connect link (15, View C) to links (16) with pins (14).

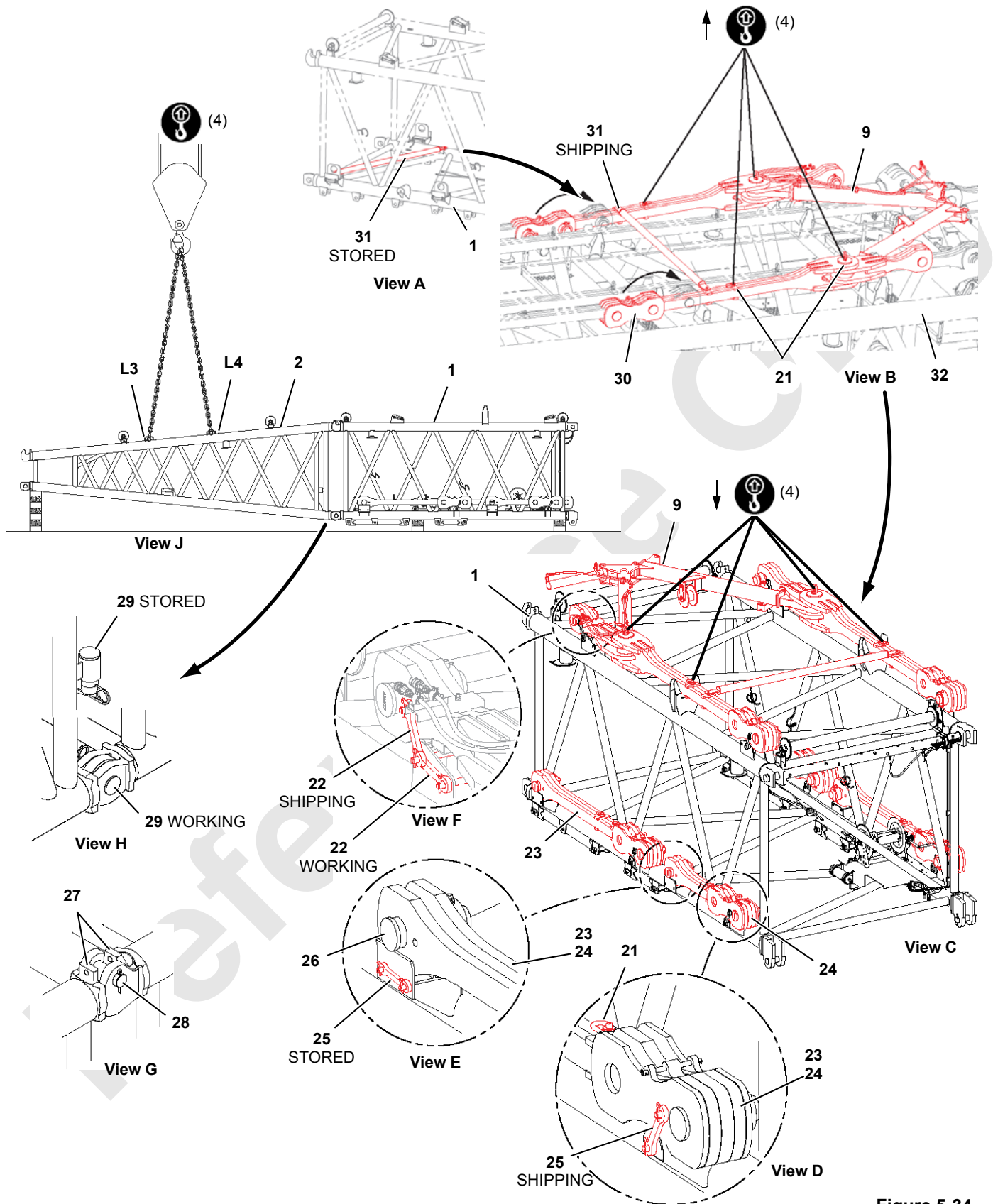


Figure 5-34

Legend for [Figure 5-34](#)

Item	Description
1	Upper Insert
2	Transition Insert
9	Spreader Assembly
21	Lifting Ring (10)
22	Strap Storage Links with Pin and Cotter Pins (4)
23	Strap Assembly – 3,1 m (2)
24	Strap Assembly – 2,2 m (2)
25	Strap Storage Link with Pins and Cotter Pins (43)
26	Pin with Collar, Connecting Pin, and Cotter Pins (4)
27	Hooked Connector (2)
28	Fixed Pin (2)
29	Pin with Safety Pin (2)
30	Backstay Strap Links (2)
31	Tie Rod
32	Boom

See [Figure 5-34](#) for the following steps.

12. Remove transition insert (2, View J) as follows:

- a. Attach four legs of the chain lifting sling to lifting lugs (L3 and L4, View J) on transition insert (2).
- b. Take the slack out of the lifting slings with the assist crane.
- c. Remove pins (29, View H) from the working position and store them.
- d. Lift transition insert (2, View J) from upper insert (1) and place it on blocking for shipping.
- e. Disconnect the lifting slings.

13. Store backstay spreader (9, View C) on upper insert (1) for shipping (if desired), as follows:

- a. Remove tie rod (31, View A) from storage and install it between the spreader straps (View B).
- b. Unpin and rotate backstay links (30, View B) from the working position to the stored position on the spreader straps (View B).

Use the strap rigging winch in the same manner it was used to store the jib straps. See [page 5-47](#) for procedure.

- c. Attach four legs of the chain lifting sling to the lifting rings (21, View B) on backstay spreader (9).
- d. Lift the backstay spreader from the boom and place it in the stored position on upper insert (1, View C).
- e. Secure the backstay spreader with links (22, View F).
- f. Disconnect the lifting slings.

14. Store backstay straps (23 and 24) on both sides of upper insert (1) as shown in Views C, D, and E).

15. The remaining backstay straps can be shipped in the stored position of the boom sections as follows:

- a. Remove strap link pin from the adjacent backstrap.
- b. Using the strap rigging winch, rotate backstrap strap link from the adjacent backstay strap.
- c. Reinstall the strap link pin in the link for storage.
- d. Rotate strap storage links from the shipping position to the working position.
- e. Repeat the above steps at each backstay strap.

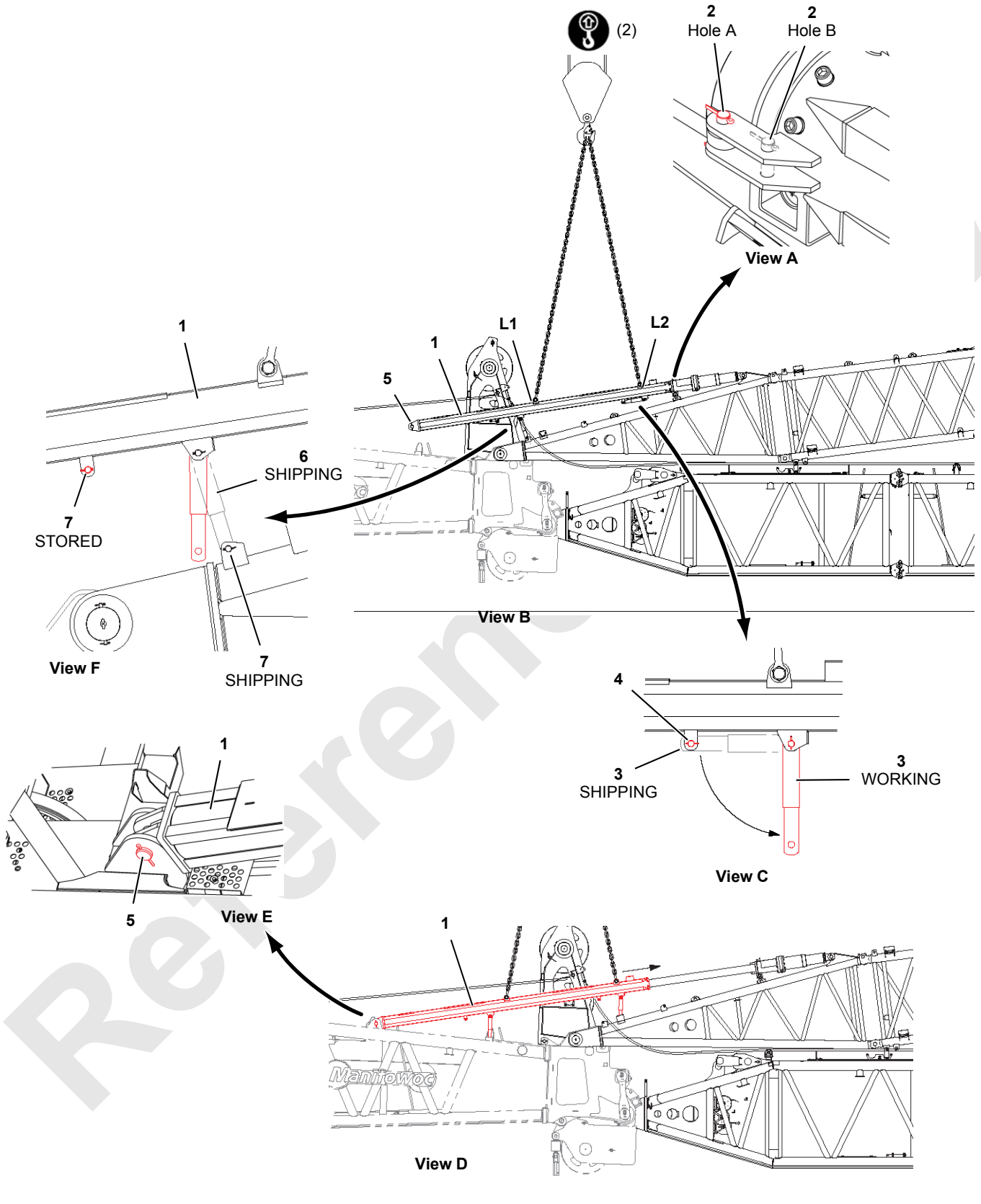


Figure 5-35

Legend for [Figure 5-35](#)

Item	Description
1	Strut Stop (2)
2	Pin with Cotter Pins (1 each strut stop)
3	Strut Stop Support (2)
4	Pin with Cotter Pins (2)
5	Pin with Cotter Pins (2)
6	Strut Support (2)
7	Pin with Cotter Pins (2)

Move Strut Stop to Shipping Position

See [Figure 5-35](#) for the following procedure.

1. Attach two legs of the chain lifting sling to lifting lugs (L1 and L2, View B) on strut stop (1).
2. Lift with the assist crane just enough to support strut the stop.
3. Remove pin (2, View A) from the stored position (Hole B).
4. Remove pin (5, View E) securing strut stop (1) to the boom top.
5. Raise the strut stop to horizontal while fully retracting it.
6. Install pin (2, View A) in the shipping position (Hole A).
7. Pin strut support (3, View C) in the shipping position under the strut stop.
8. Store pin (5, View B) in the end of the strut stop.
9. Pin strut support (6, View F) in the shipping position on the jib butt.
10. Repeat the above steps for the other strut stop.

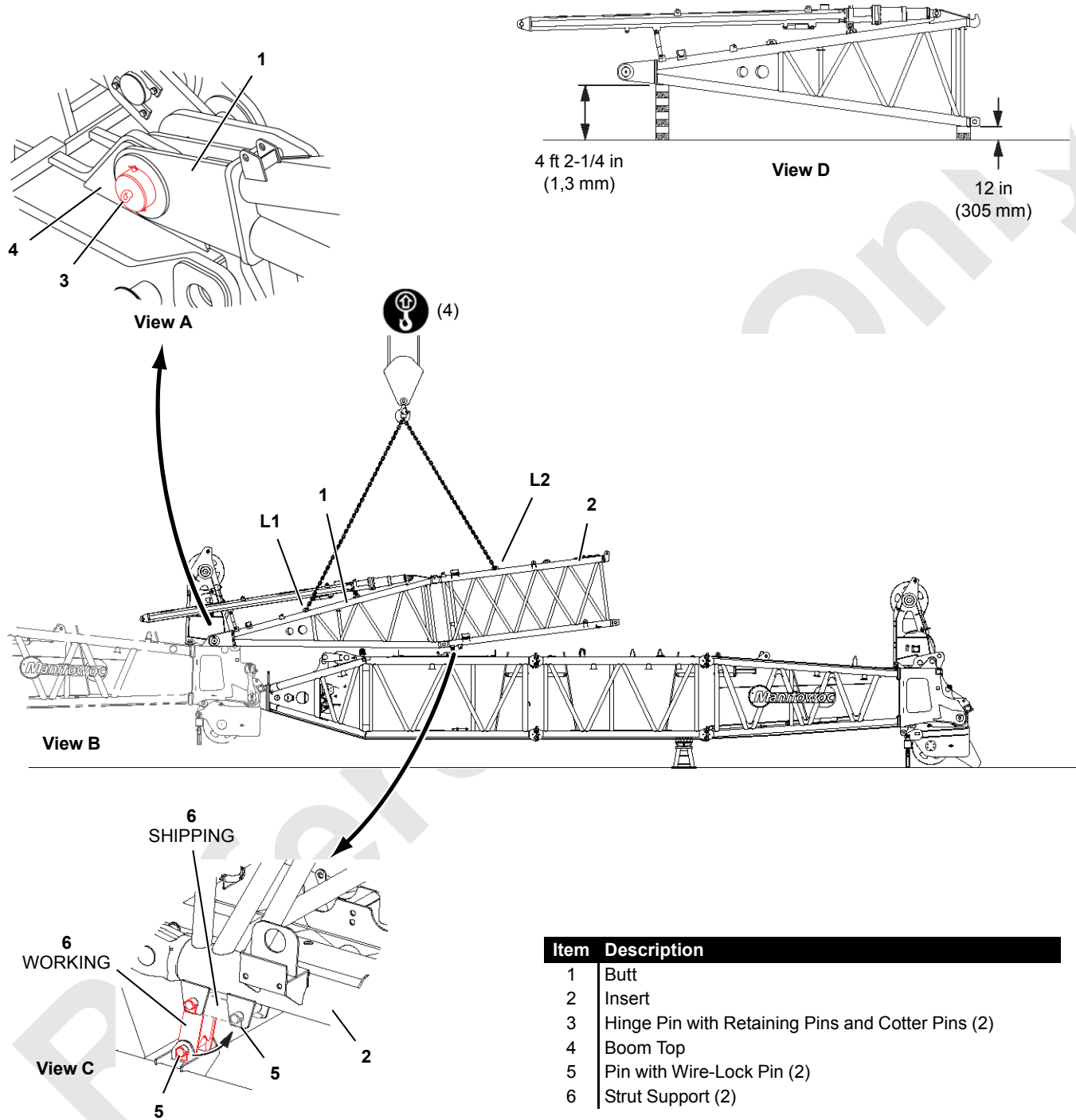


Figure 5-36

Remove Lower Half of Strut

See [Figure 5-36](#) for the following procedure.

1. Attach four legs of the chain lifting sling to lifting lugs (L1 and L2, View B) on butt (1) and insert (2).
Attach the two legs with grab hooks to the lifting lugs on insert (2).
2. Adjust the grab hooks so the bottom chords of butt (1, View B) are parallel to the ground when the butt and insert are lifted.
3. Lift with assist crane just enough to support the lower half of the strut.
4. Remove pin (5, View C) and rotate strut support (6) on both sides of insert to the shipping position on insert (2).
5. Remove hinge pins (3, View A) from boom top (4).
6. Using the assist crane, lift the lower half of the strut away from the jib.
7. Store hinge pins (3, View A) in the lugs on the strut butt.
8. Place the lower half of strut on blocking as shown in View D:
 - The center line of the lower insert must be parallel to the ground.
 - The lower insert must be level from side to side.
9. Disconnect the lifting lings.

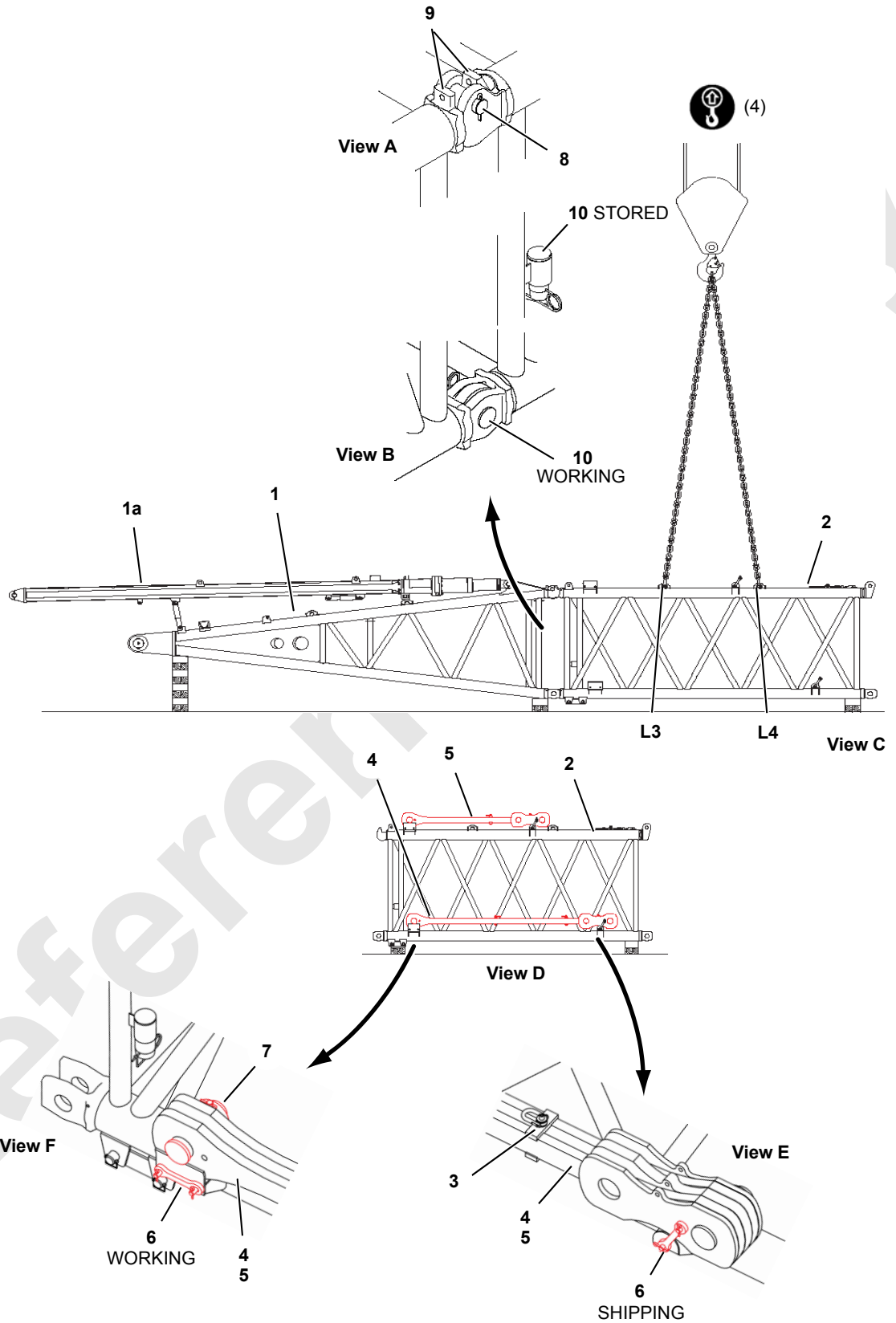


FIGURE 5-37

Legend for [Figure 5-37](#)

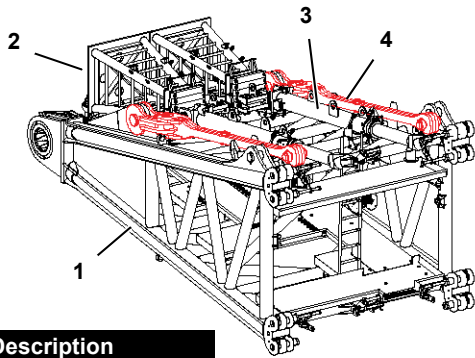
Item	Description
1	Butt
1a	Strut Stop
2	Lower Insert
3	Lifting Ring (1 or 2 each strap assembly)
4	Jib Strap Assembly – 5 m (2)
5	Jib Strap Assembly – 3,6 m (2)
6	Strap Storage Link with Pins and Cotter Pins (3)
7	Pin with Collar, Connecting Pin, and Cotter Pins (3)
8	Fixed Pin (2)
9	Hooked Connector (2)
10	Pin with Safety Pin (2)

Disassemble Lower Half of Strut

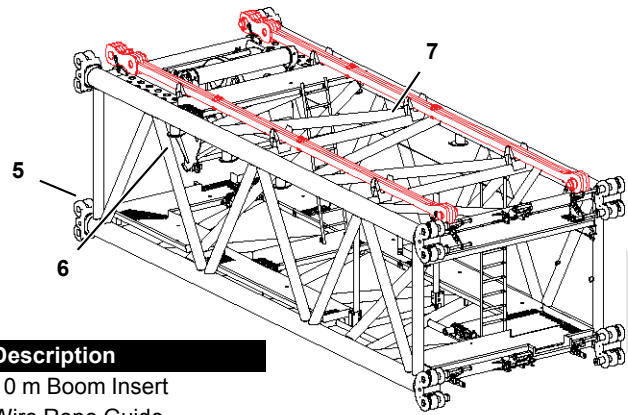
See [Figure 5-37](#) for the following procedure.

1. Remove lower insert (2, View C) from strut butt (1) as follows:
 - a. Attach four legs of the chain lifting sling to lifting lugs (L3 and L4, View C) on lower insert (2).
 - b. Lift with the assist crane until the lifting slings are tight.
 - c. Remove pins (10, View C) from the working position and store them.
 - d. Lift the lower insert away from the strut butt and put the insert on blocking (View D).
 - e. Disconnect the lifting slings.
2. Attach strap assemblies (4 and 5) to lower insert (2) as shown in Views D, E, and F.

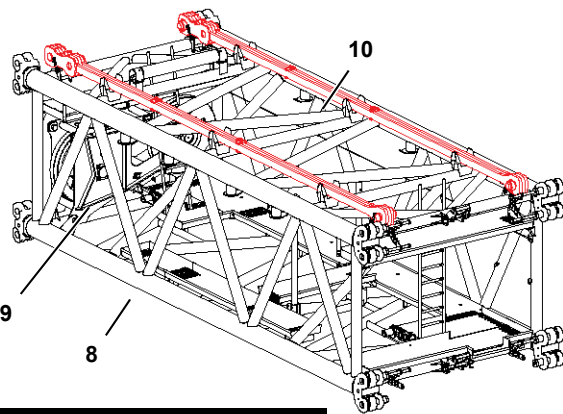
BOOM SECTION STORAGE



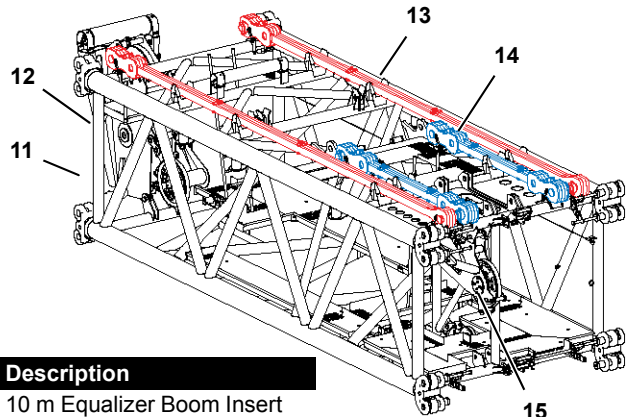
Item	Description
1	Boom Butt
2	Boom Supports
3	Boom Stops
4	Jib Backstay Straps



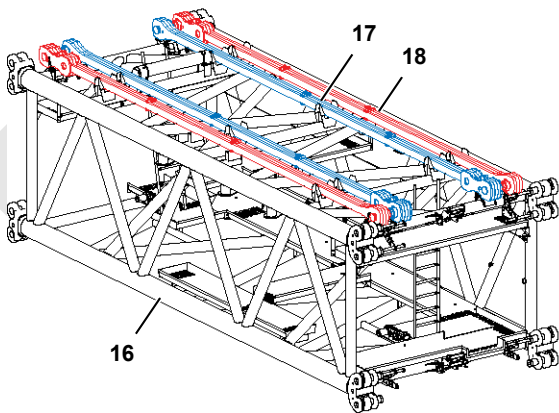
Item	Description
5	10 m Boom Insert
6	Wire Rope Guide
7	10 m Jib Backstay Straps



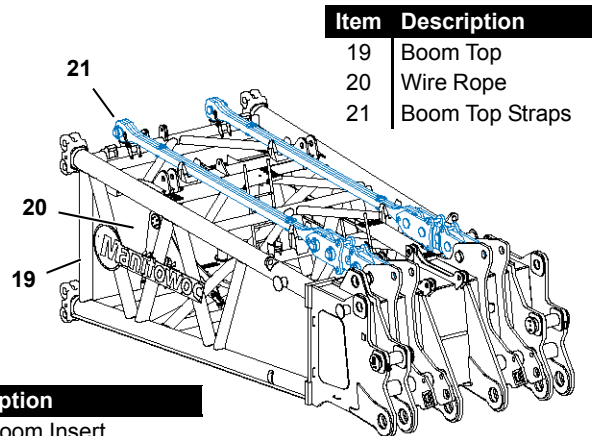
Item	Description
8	10 m Boom Insert
9	Wire Rope Guide
10	10 m Jib Backstay Straps



Item	Description
11	10 m Equalizer Boom Insert
12	Wire Rope Guide
13	10 m Jib Backstay Straps
14	4 m Boom Straps
15	Wire Rope Guide



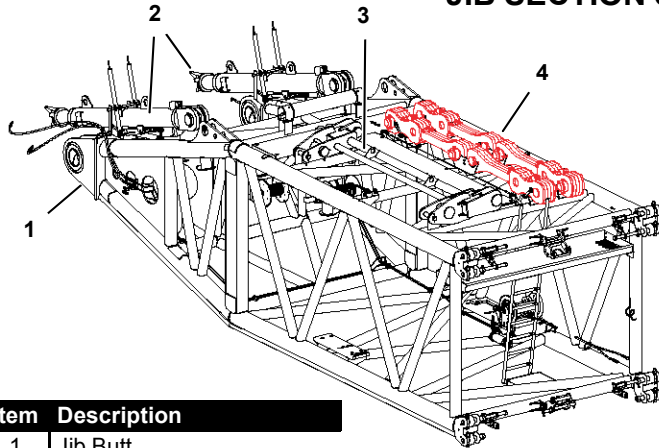
Item	Description
16	10 m Boom Insert
17	10 m Boom Straps
18	10 m Jib Backstay Straps



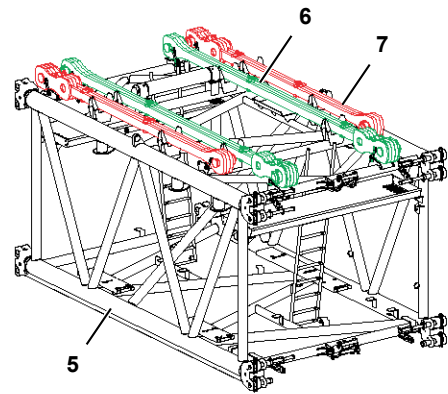
Item	Description
19	Boom Top
20	Wire Rope
21	Boom Top Straps

FIGURE 5-38

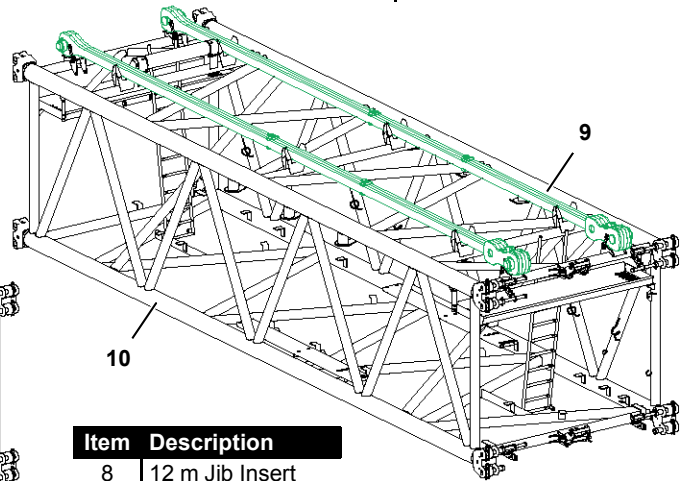
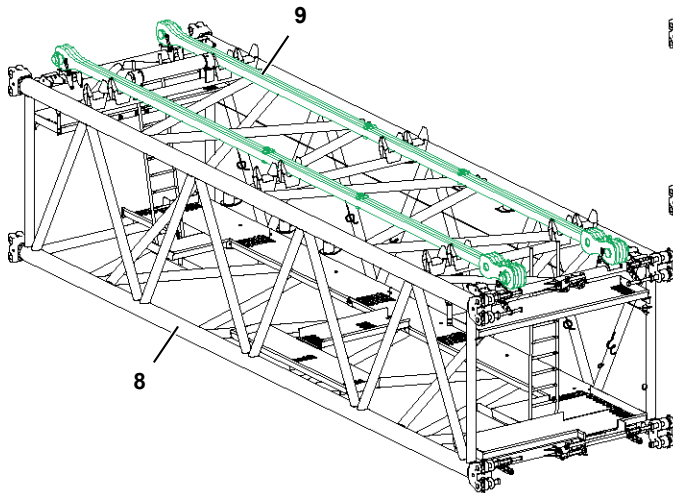
JIB SECTION STORAGE



Item	Description
1	Jib Butt
2	Jib Stops
3	Jib Stop Spreader
4	2.2 m Jib Backstay Straps

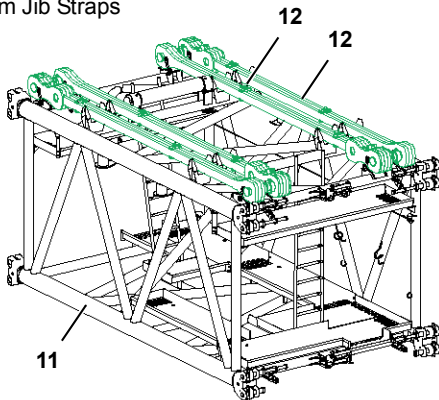


Item	Description
5	6 m Reinforced Jib Insert
6	6 m Jib Straps
7	5 m Jib Backstay Straps



Item	Description
8	12 m Jib Insert
9	12 m Jib Straps
10	12 m Jib Insert

Item	Description
11	6 m Jib Insert
12	6 m Jib Straps



Item	Description
13	Jib Top
14	Jib Top Straps

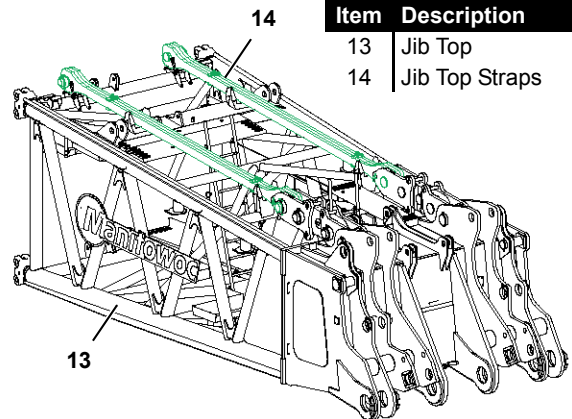


FIGURE 5-39

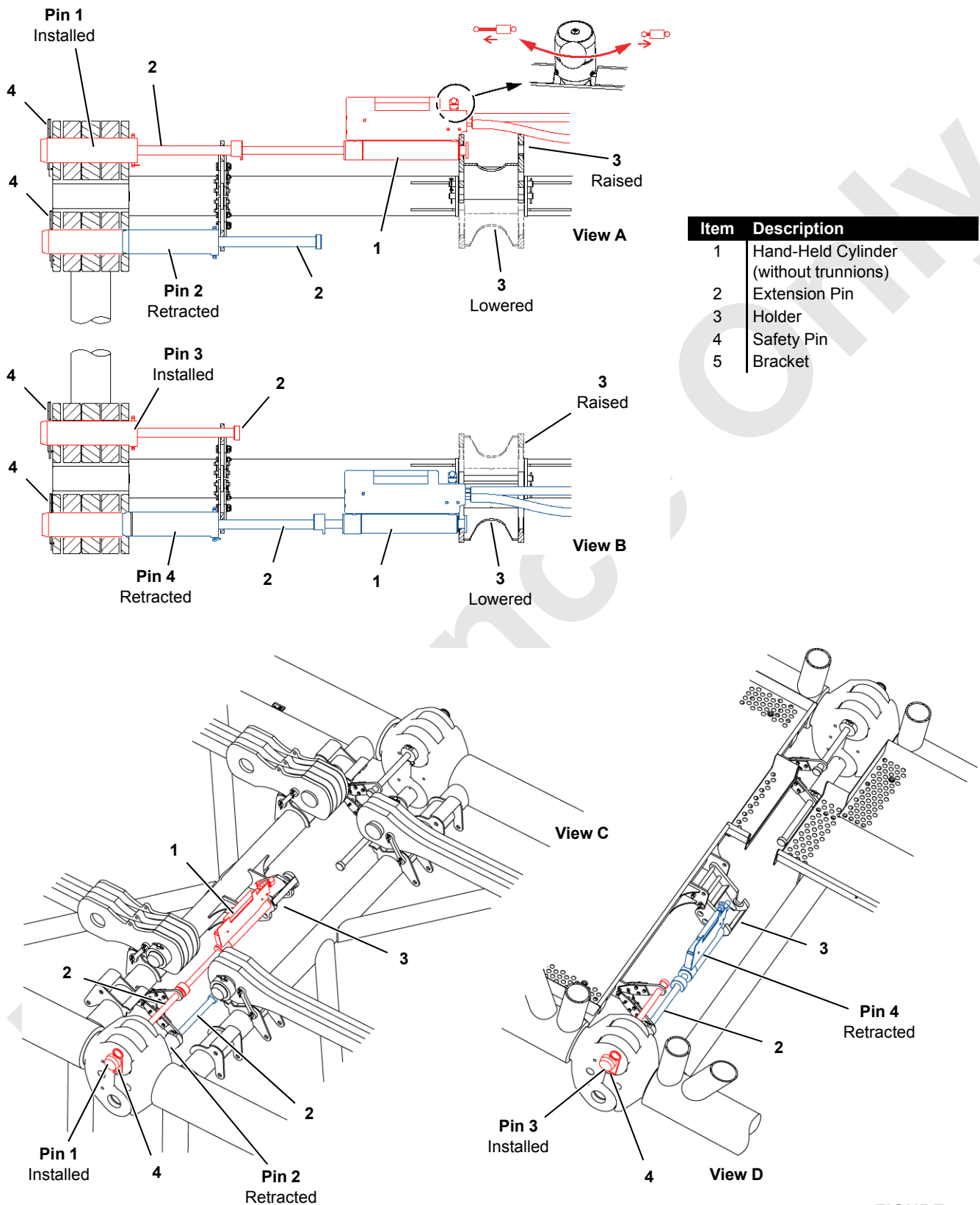
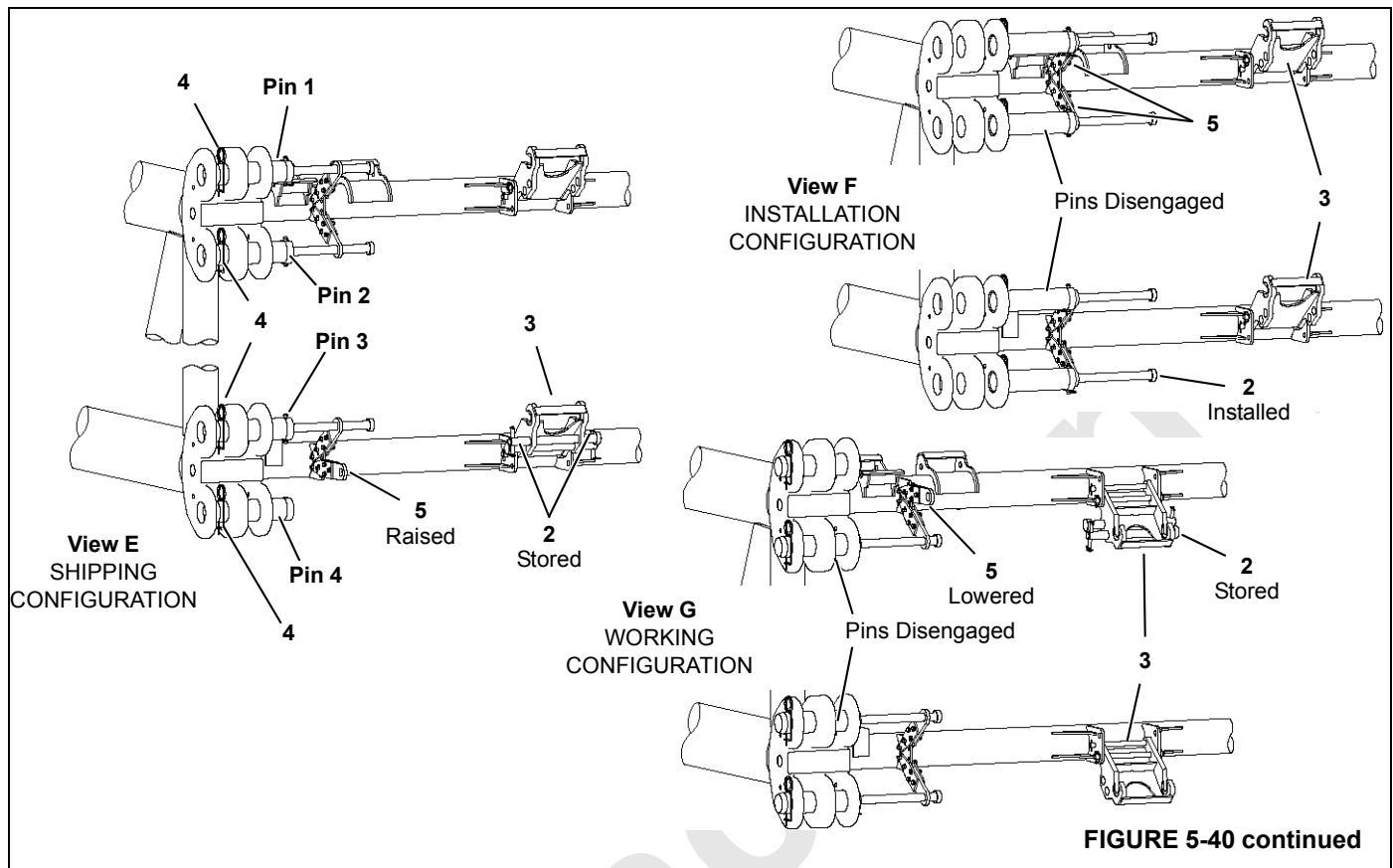


FIGURE 5-40



CRANE DISASSEMBLY — CONNECTOR PINS (BOOM AND JIB)

See [Figure 5-40](#) for the following procedure.

Disconnect Pins 4

- Position the connector pins and components as shown in Views E, F, and G.
- Make sure:
 - Insert being removed is supported by lifting slings from assist crane.
 - Adjacent insert is supported with boom or jib supports.
- Lower bottom holder (3, Views B and G).
- Position hand-held cylinder (1, View B) on extension pin (2) and holder (3).
- Connect hydraulic lines from the PPU to the hand-held cylinder and start the power unit.
- Remove safety pin (4, View B) from the end Pin 4.
- Retract the hand-held cylinder to disengage Pin 4 (View B) from the mating holes.

- Install safety pin (4, View E).
- Repeat the procedure for the opposite side pin.
- Remove hand-held cylinder (1).

Disconnect Pins 3

- Raise bottom holder (3, Views B and F).
- Disconnect Pins 3 following Pin 4 steps [4](#) through [9](#).

Disconnect Pins 2

- Lower top holder (3, Views A and G).
- Disconnect Pins 2 following Pin 4 steps [4](#) through [9](#).

Disconnect Pins 1

- Raise top holder (3, View A and F), remove extension pins (2, View G) from storage and attach them to Pins 1 (View A).
- Disconnect Pins 1 following Pin 4 steps [4](#) through [9](#).
- Remove extension pins (2, View E) from Pins 4 and install them in holder (3) for storage during shipping.

Lift At	Description
L1 and L3	Jib Top without Wire Rope Guide or Lower Point
L2 and L3	Jib Top with Wire Rope Guide and Lower Point

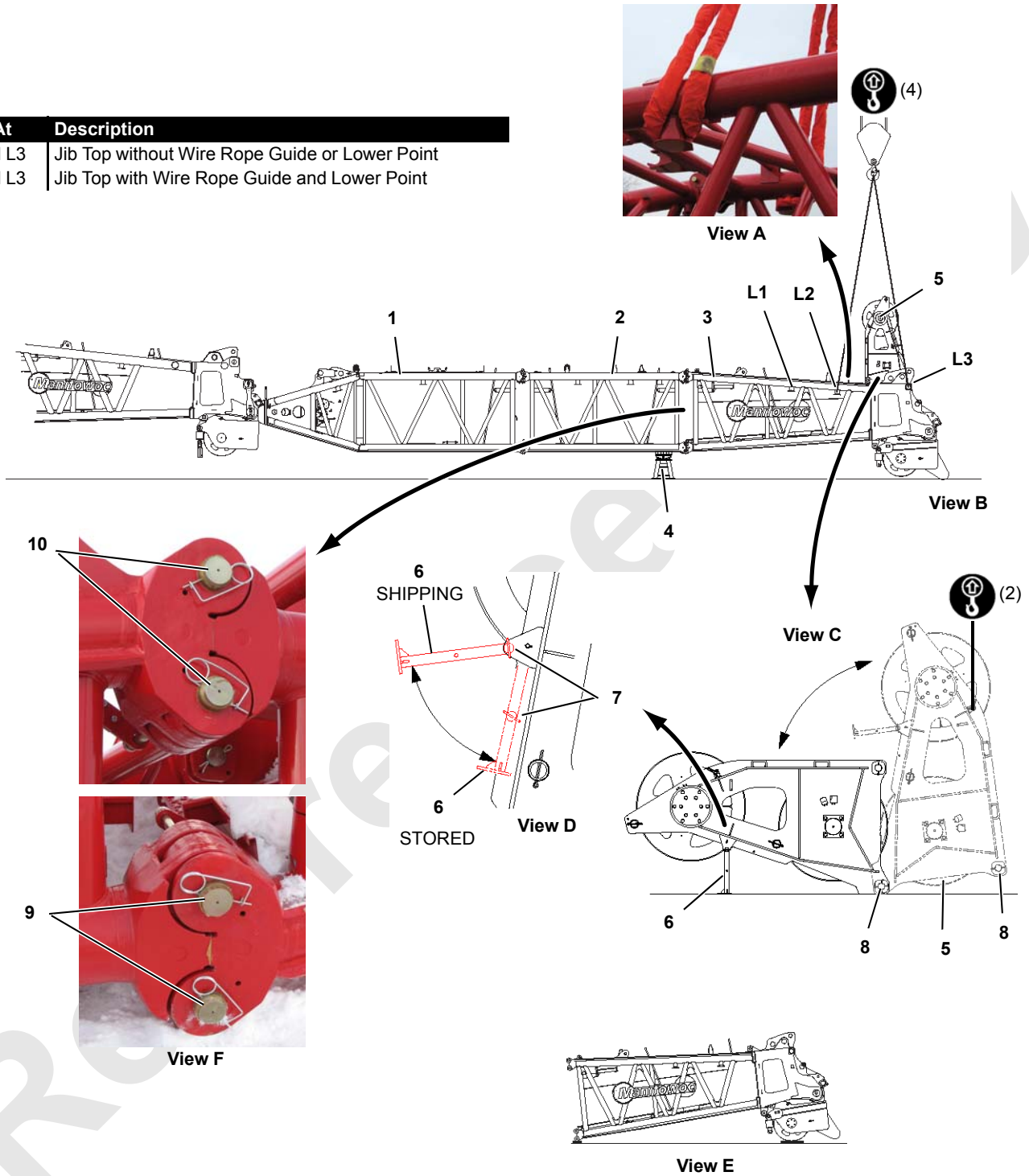


FIGURE 5-41

Legend for [Figure 5-41](#)

Item	Description
1	Jib Butt
2	Jib Insert(s)
3	Jib Top
4	Jib Support
5	Wire Rope Guide
6	Stand (2)
7	Hitch Pin with Hair-Pin Cotter (2)
8	Pin with Cotter Pin (2)
9	Bottom Pins (4)
10	Top Pins (4)

Remove Jib Top

See [Figure 5-41](#) for the following procedure.

1. Attach four nylon lifting slings to lifting lugs (L2 and L3, View B) on jib top (3).
2. Lift with the assist crane until the lifting slings are tight.
3. Remove bottom pins (9, View F) as instructed on [page 5-67](#).
4. Remove top pins (10, View F) as instructed on [page 5-67](#).
5. Lift the jib top away from the jib insert and place it on blocking as shown in View E.
6. Disconnect the lifting slings.

Remove Jib Wire Rope Guide

See [Figure 5-41](#) for the following procedure.

1. Attach two legs of the chain lifting sling to the lifting lugs on wire rope guide (5, View C).
2. Lift with the assist crane until the lifting slings are tight.
3. Remove pins (8, View C) and lift the wire rope guide away from the jib top.
4. Reinstall pins (8) in the wire rope guide holes for storage.
5. Unpin stands (6, View D) from the stored position and pin the stands in the shipping position.
6. Lower the rope guide to horizontal position (View C) so it resting on stands (6).
The wire rope guide will be stored for shipment inside the 10 m boom insert without boom straps once the boom is disassembled.
7. Disconnect the lifting slings.

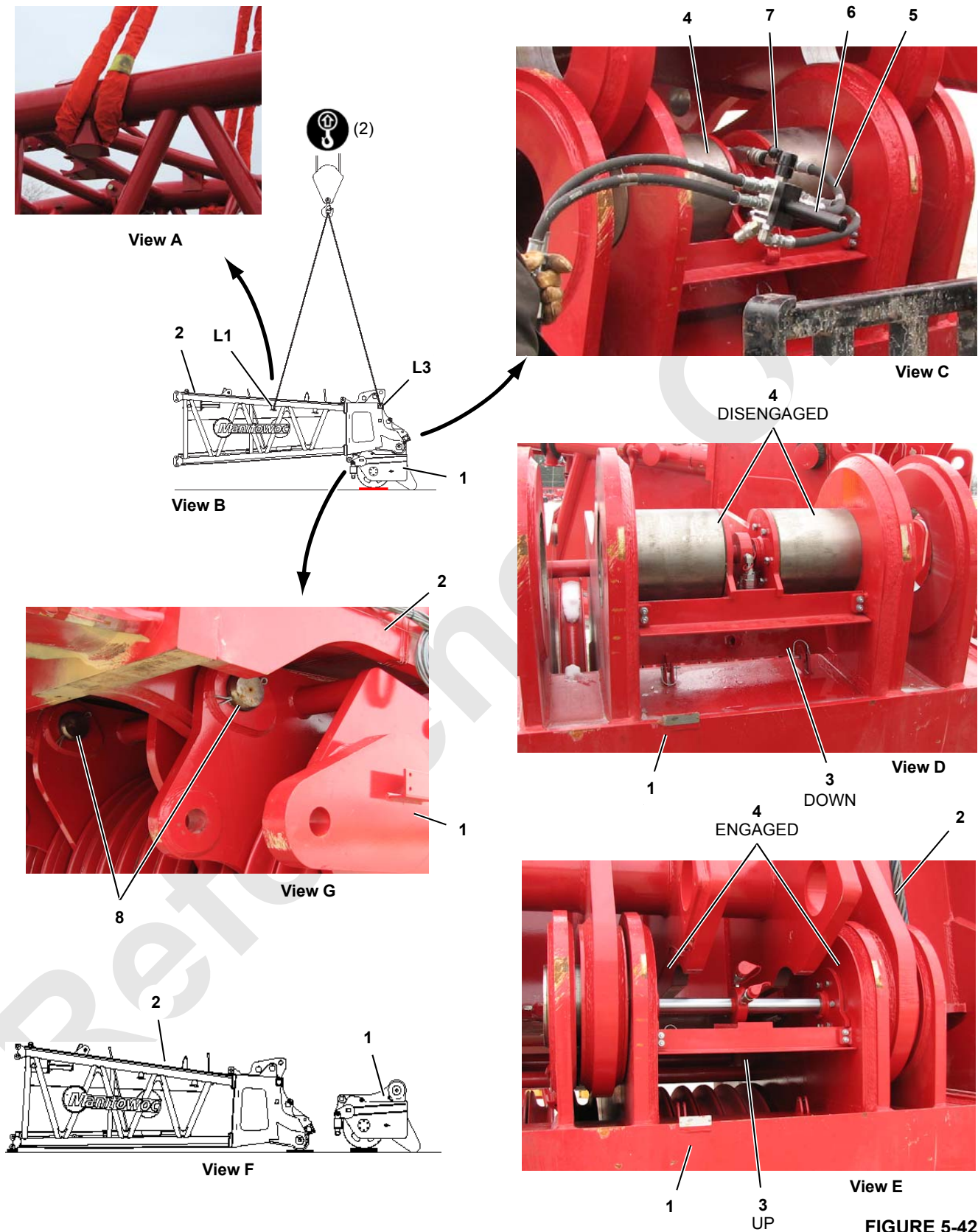


FIGURE 5-42

Legend for [Figure 5-42](#)

Item	Description
1	Lower Jib Point
2	Jib Top
3	Locking Plate with Wire Lock Pins
4	Hydraulic Pins (2)
5	Hydraulic Hoses from PPU (2)
6	Valve Assembly
7	Hydraulic Couplers (2)
8	Pin with Cotter Pin (1 or 2)

Remove Lower Jib Point

See [Figure 5-42](#) for the following procedures.

1. Attach four nylon lifting slings to lifting lugs (L1 and L3, View B) on jib top (2).
2. Lift the jib with the assist crane and position the top so the lower jib point is resting on the ground (View B).
3. Block under the lower jib point sheaves.
4. Remove pins (8, View G).
5. Disengage hydraulic pins (4, View C), as follows:
 - a. Unpin locking plate (3, View E) from the UP position and pin the plate in the DOWN position (View D).
The hydraulic pins cannot be disengaged until the locking plate is down.
 - b. Attach hydraulic hoses (5, View C) and valve assembly (6) from the PPU to hydraulic couplers (7) in the lower jib point.
 - c. Start the PPU.
 - d. Disengage hydraulic pins (4, View D) with the valve assembly.
 - e. Lift jib top (2, View B) away from lower jib point (1) and place it on blocking (View F).
 - f. Engage the hydraulic pins and move locking plate (3, View D) from the down position to the up position (View E).
 - g. Turn off the PPU and disconnect the hydraulic hoses.

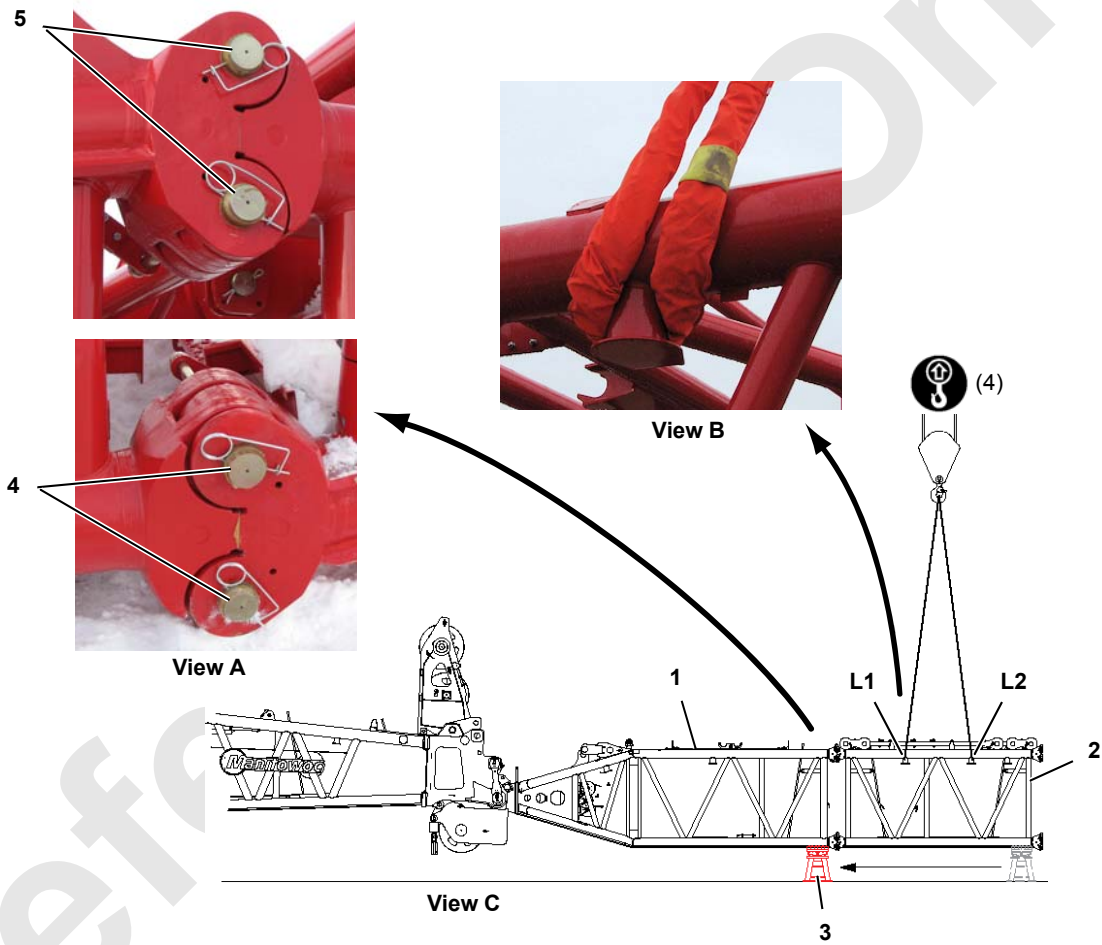


Figure 5-43

Legend for [Figure 5-43](#)

Item	Description
1	Jib Butt
2	Jib Insert
3	Jib Support (2)
4	Bottom Pin (2)
5	Top Pin (2)

Remove Jib Inserts

NOTE Refer to [Figure 5-39](#) for identification of the straps that can be shipped on the jib sections.

See [Figure 5-43](#) for the following procedure.

1. Attach four nylon lifting slings to lifting lugs (L1 and L2, View C) on jib insert (2).
2. Lift the jib off jib supports (3, View C) with the assist crane.
3. Using a fork-lift truck, position boom supports under the adjacent jib insert.
4. Lower the jib onto the jib support.
5. Lift with the assist crane until the lifting slings are tight.
6. Remove bottom pins (4, View A) as instructed on [page 5-67](#).
7. Remove top pins (5, View A) as instructed on [page 5-67](#).
8. Lift the insert away from the adjacent insert and place it to the side on blocking.
9. Disconnect the lifting slings.
10. Repeat the above steps until all jib sections have been removed.

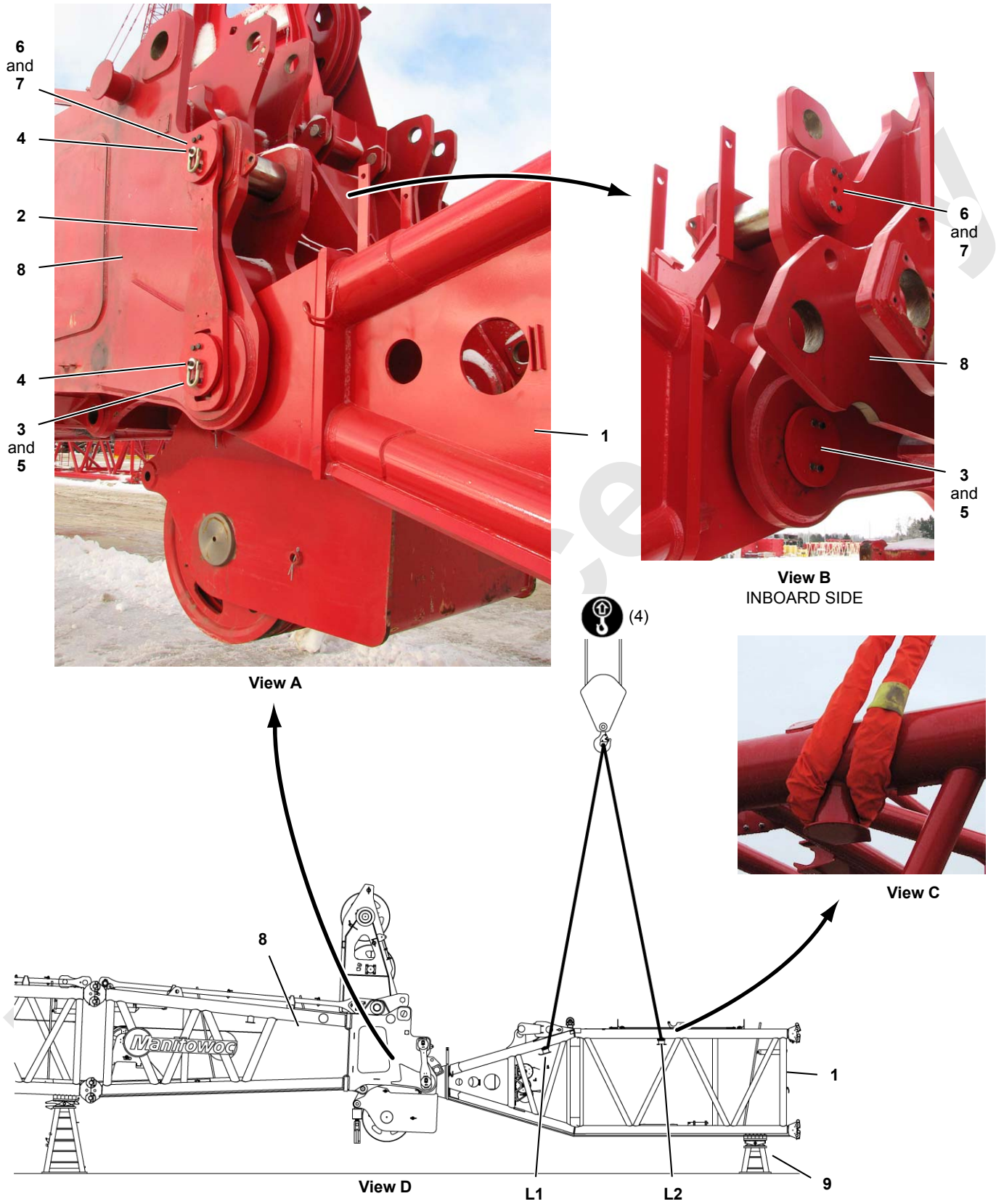


Figure 5-44

Legend for [Figure 5-44](#)

Item	Description
1	Jib Butt
2	Locking Link (2)
3	Hinge Pin (2)
4	Lifting Ring (1 each pin)
5	End Plate with Screws and Lock Washers (4)
6	End Plate with Screws and Lock Washers (4)
7	Jib Strut Pin (2)
8	Boom Top
9	Jib Support (2)

Remove Jib Butt

See [Figure 5-44](#) for the following procedure.

1. On both sides of the boom top (Views A and B):
 - a. Remove lifting rings (4), and outboard end plates (5 and 6).
 - b. Remove locking links (2) and set them to the side.
 - c. Reinstall lifting rings (4) in hinge pins (3).
 - d. Remove inboard end plates (5).
2. Attach four nylon lifting slings to lifting lugs (L1 and L2, View D) on jib butt (1).
3. Lift with the assist crane until the lifting slings are tight.
4. Remove both hinge pins (3, View A).
5. Lift the jib butt away from the boom top and place it to the side on blocking.
6. Disconnect the lifting slings.
7. Referring to Views A and B, reinstall end plates (6), and lifting rings (4) on jib strut pins.
8. The remaining parts will be store on the jib butt (see next page).
9. Store jib support (9) for shipping.

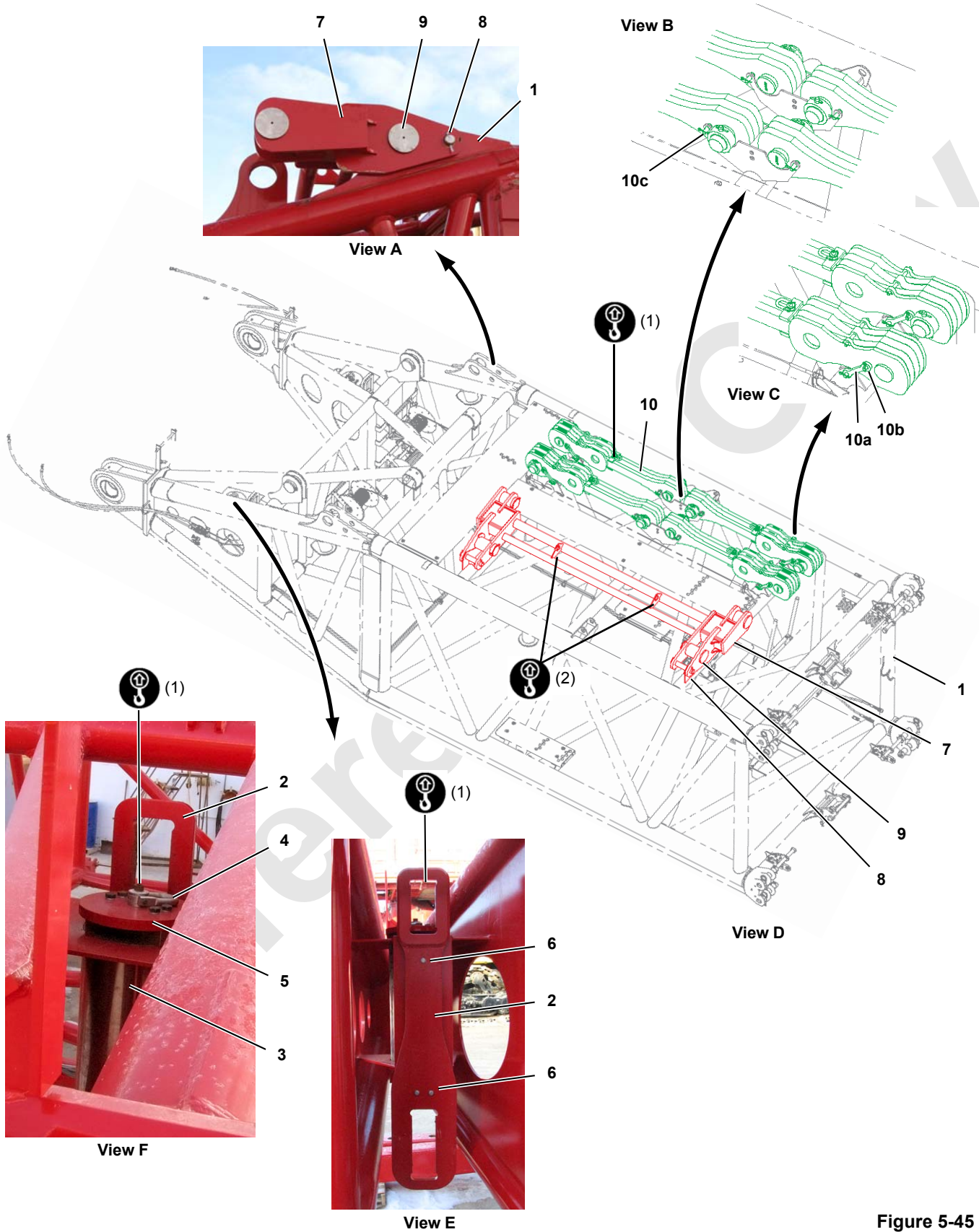


Figure 5-45

Legend for [Figure 5-45](#)

Item	Description
1	Jib Butt
2	Locking Link (2)
3	Hinge Pin (2)
4	Lifting Ring (1 each pin)
5	End Plate with Screws and Lock Washers (4)
6	Screw with Washers and Nut (6)
7	Jib Stop Spreader
8	Pin with Cotter Pins (2)
9	Pin with Cotter Pin (2)
10	Strap Assembly – 2.2 m (4)
10a	Strap Storage Link (8)
10b	Pin with Cotter Pins (4)
10c	Pin with Cotter Pins (4)

Prepare Jib Butt for Shipment

See [Figure 5-45](#) for the following procedure.

1. Store hinge pins (3) on both sides of the jib butt as shown in Views E and F.
2. Move spreader (7, View A), from the working position to the stored position (View D).
3. Store four backstay strap assemblies (10) on the jib butt as shown in Views B, C, and D.

Strap assemblies (10) will not hang level when lifted. They will hang vertically. For that reason, please check the torque of the lifting ring bolts before lifting. The bolts must be torqued to 60 ft-lb (81 Nm).

Item	Description
1	10 m Reinforced Jib Insert
2	Jib Support (2)
3	Pin with Cotter Pin (4)
4	Tray

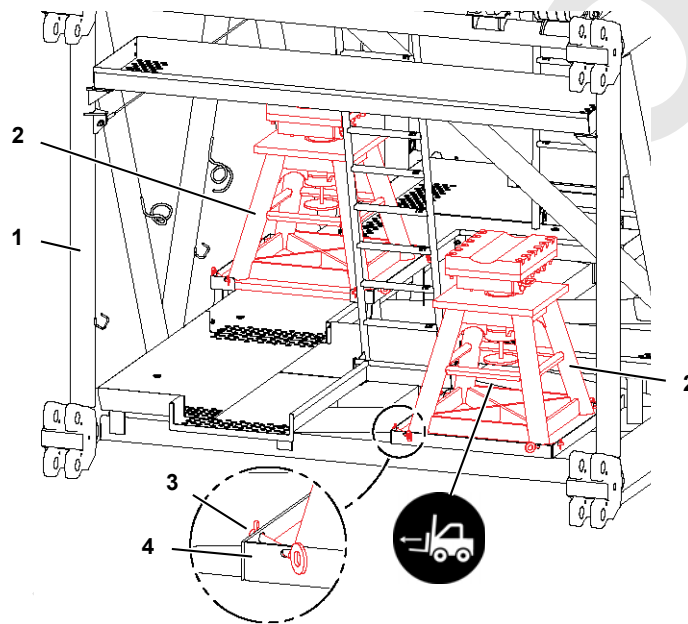


FIGURE 5-46

Store Jib Supports

See [Figure 5-46](#) for the following procedure.

Two jib supports are stored for shipping inside the 6 m reinforced jib insert.

1. Support jib support (2) with a forklift truck.

Lift only under the tubular supports.

2. Remove pins (3) from tray (4).
3. Lift the jib support into tray (4) in insert (1).
4. Install pins (3).
5. Repeat the steps for the other jib support.

Reference Only

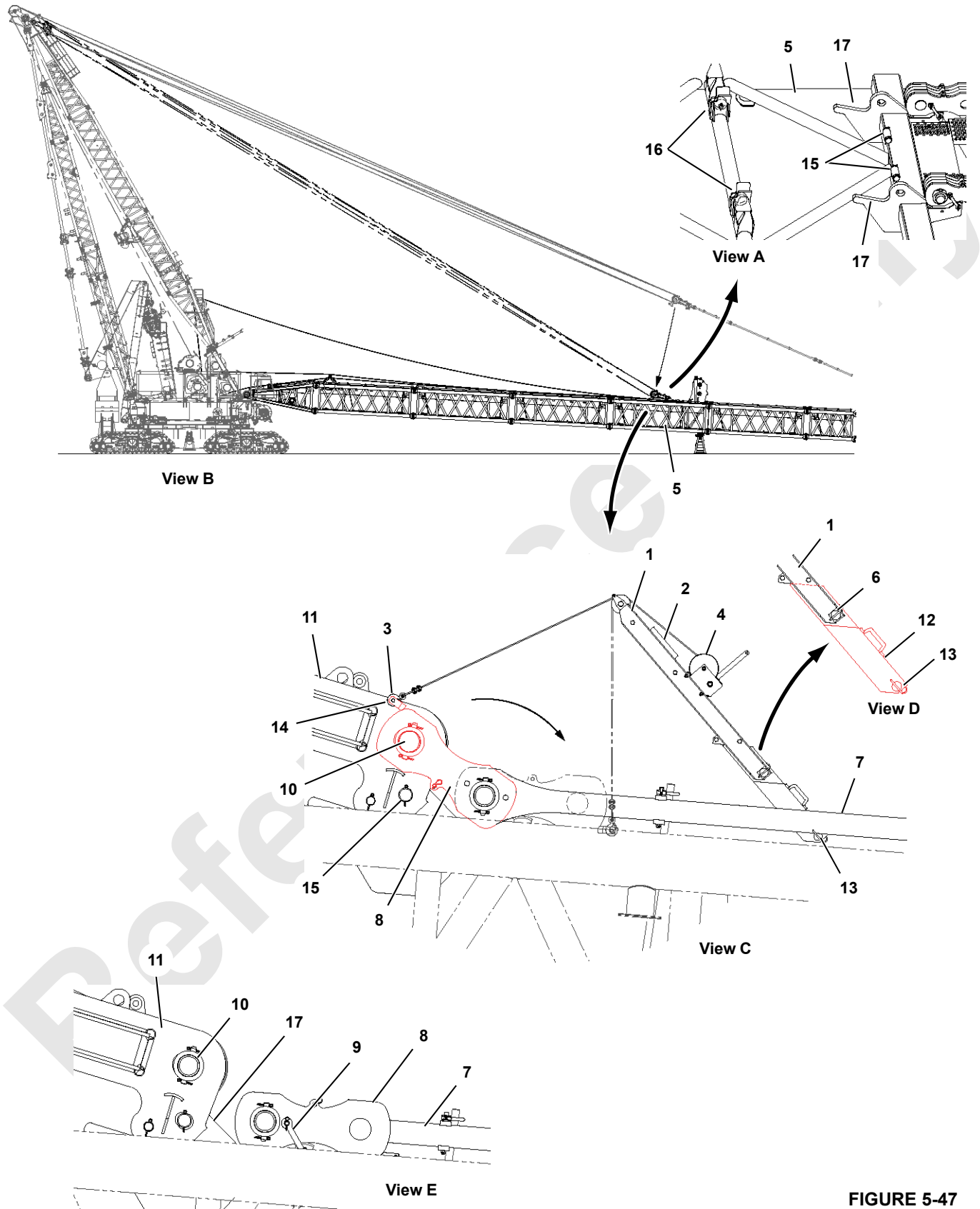


FIGURE 5-47

Legend for [Figure 5-47](#)

Item	Description
1	Strap Rigging Winch
2	Lifting Pin with Hair-Pin Cotter
3	Hook
4	Winch
5	10 m Equalizer Insert
6	Hitch with Hair-Pin Cotter
7	Boom Strap (2 sets of 2 each boom section)
8	Boom Strap Links (2 sets of 3 each boom section)
9	Strap Storage Link with Pin and Cotter Pins (4)
10	Pin with Collar, Retaining Pin and Cotter Pins (2 each boom section)
11	Equalizer
12	Winch Strap Extension
13	Hitch with Hair-Pin Cotter
14	Winch Adapter
15	Pin with Cotter Pins (2)
16	Roller (2)
17	Rail (2)

- Place assembled rigging winch (1, View C) on boom strap (7) and install hitch pin (13).
- Connect hook (3, View C) to winch adapter (14) on the end of the boom strap links (8).
- Haul in cable on the winch until the cable is tight and pins (10, View C) are loose.
- Remove pins (10, View C) and set them to the side.
- Using winch (1, View C), rotate boom strap links (8) to the storage position (View E).
- Store pins (10, View E) in equalizer (11).
- Unpin strap storage links (9, View E) from storage and pin them to boom strap links (8).
- Remove the rigging winch.
- Repeat the above steps on the other side of the equalizer.
- Remove strap extension (12, View D) from the rigging winch and store it on the equalizer insert wire rope guide.

CRANE DISASSEMBLY — BOOM

Pin Equalizer to Equalizer Insert

See [Figure 5-47](#) for the following procedure.

- Remove pins (15, View A) from the storage pockets on equalizer insert (5).
- Slowly lower equalizer (11, View B) onto equalizer insert (5) so the equalizer engages rollers (16, View A) and rails (17).
- Allow the equalizer to roll forward until the connecting holes are aligned.
- Continue to boom down until all of the boom straps have been lowered into the supports on the boom sections.
- Install pin (15, View C) on both sides of the equalizer.

Disconnect Boom Straps from Equalizer

See [Figure 5-47](#) for the following procedure.

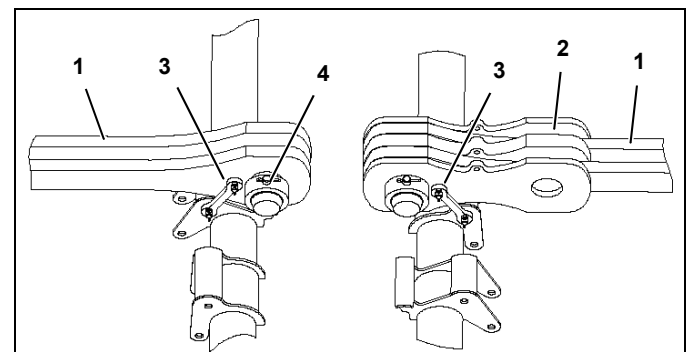
- Prepare strap rigging winch (1, View D) as follows:
 - Remove winch strap extension (12, View D) from storage on the equalizer insert wire rope guide.
 - Pin winch strap extension (12, View D) to strap rigging winch (1) with hitch pin (6).
 - Remove hitch pin (13, View D) from winch strap extension (12).

Disconnect Boom Straps

NOTE Refer to [Figure 5-38](#) for identification of the straps that can be shipped on the boom sections.

Disconnect and rotate the boom strap links from the working position to the shipping position ([Figure 5-48](#)).

Use the strap rigging winch as shown in [Figure 5-29](#) on [page 5-46](#).



Item	Description
1	Boom Strap Assembly
2	Boom Strap Link Assembly
3	Strap Storage Link with Pin and Cotter Pins
4	Pin with Collar, Retaining Pin and Cotter Pins (2 each boom section)

FIGURE 5-48

Lift At	Description
L1 and L2	Boom Top without Wire Rope Guide
L1 and L3	Boom Top with Wire Rope Guide Installed

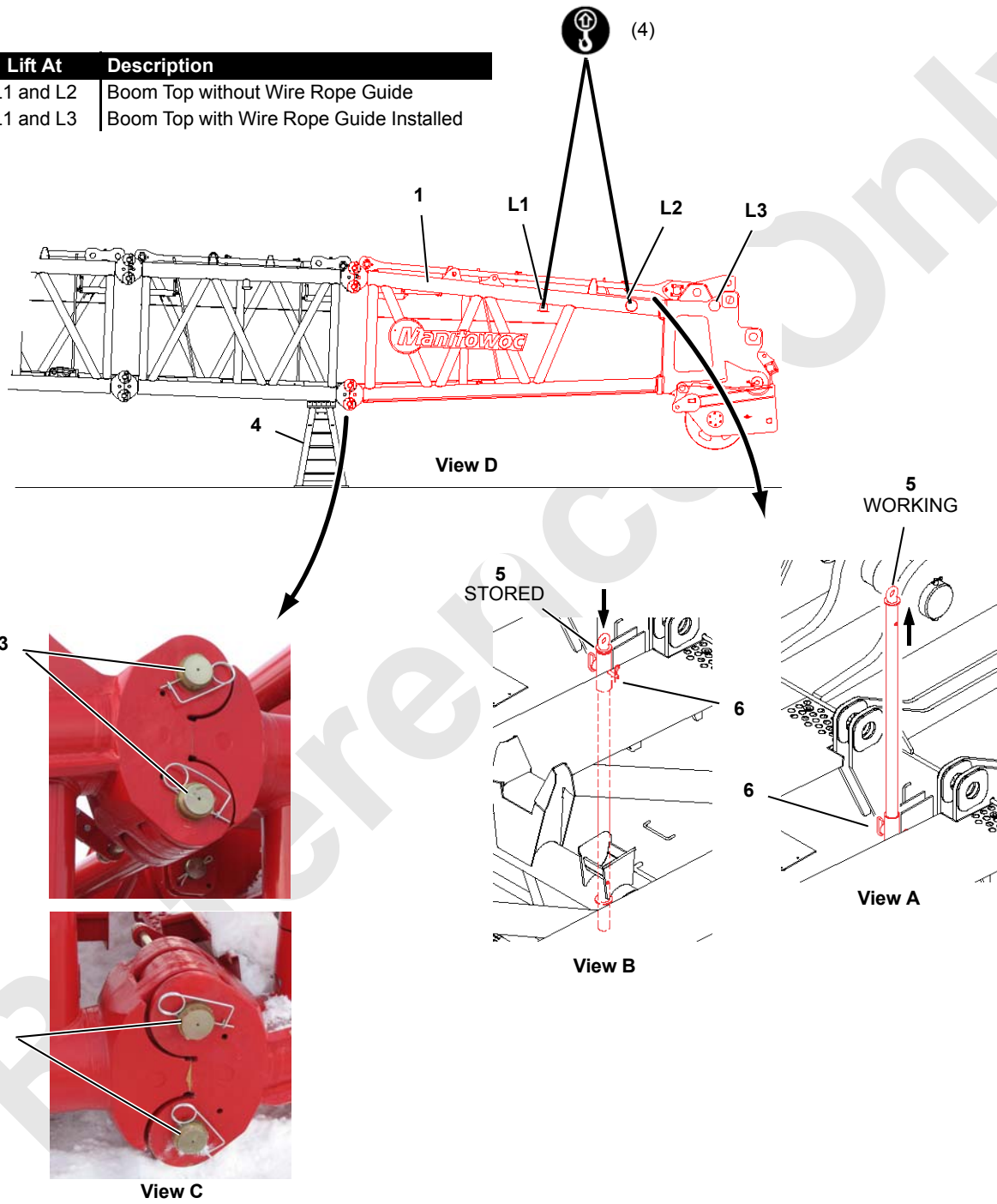


FIGURE 5-49

Legend for [Figure 5-49](#)

Item	Description
1	Boom Top
2	Bottom Pins (4)
3	Top Pins (4)
4	Boom Support (2)
5	Anchor
6	Hitch Pin with Hair-Pin Cotter

NOTE Besides the horizontal lifeline inside each boom section, anchor (5, View B) is provided in the boom top. When personnel are working on top of the boom top:

- Raise the anchor to the Disassembly position (View A).
- Connect the personnel fall protection lanyard to the anchor.
- Lower the anchor to the stored position (View B) when not in use.

Remove Boom Top Wire Rope Guide

The boom top wire rope guide is similar to the jib top wire rope guide, and the removal procedure is the same. Follow the instructions on [page 5-69](#).

Remove Boom Top

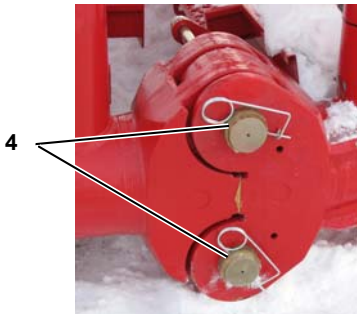
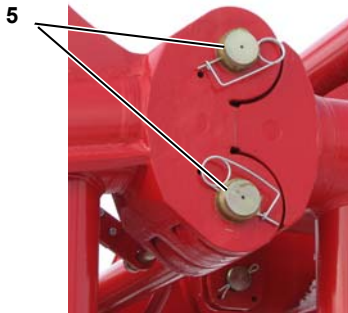
See [Figure 5-49](#) for the following procedure.

1. Attach four nylon lifting slings to proper lifting lugs (L1, L2 or L3, View D) on boom top (1).
2. Lift with the assist crane until the lifting slings are tight.
3. Remove bottom pins (2, View C) as instructed on [page 5-67](#).
4. Remove top pins (3, View C) as instructed on [page 5-67](#).
5. Lift the boom top away from the boom insert and place it to the side on blocking.
6. Disconnect the lifting slings.

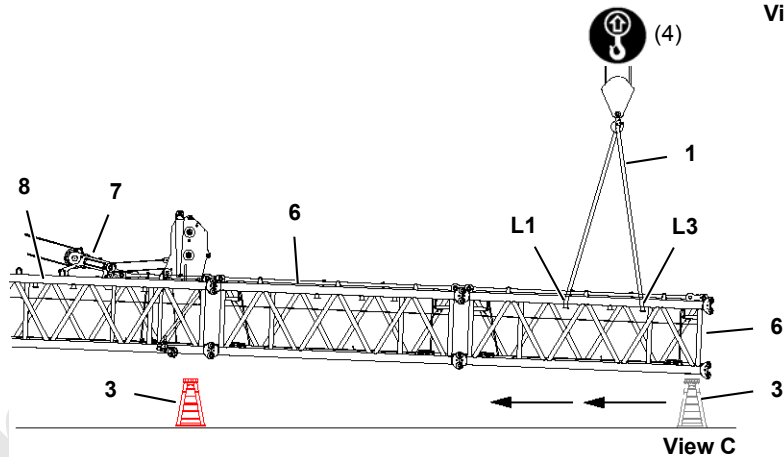
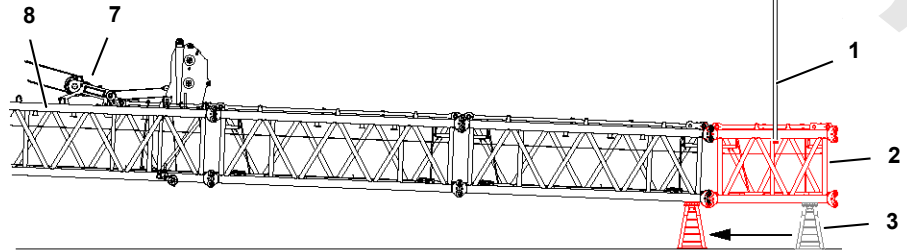
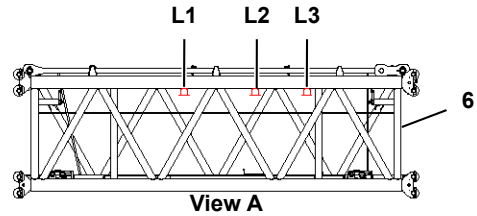
Remove Lower Boom Point

The procedure for removing the lower boom point(s) is the same as the lower jib point. Follow the instructions on [page 5-71](#) for each lower boom point.

Lift At	Description
L1 and L3	Remove Insert from Boom
L1 and L2	Lift Insert on Trailer



View E



! WARNING
Falling Load Hazard!

See Boom Handling with Equalizer Table in Boom Assembly Drawing at end of Section 4 to determine maximum boom that can be cantilevered beyond equalizer.

Equalizer lugs can break allowing boom to fall if equalizer is overloaded.

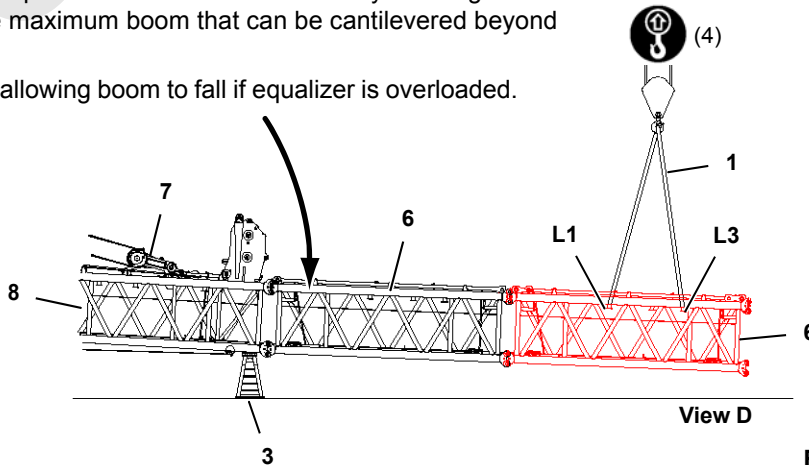


FIGURE 5-50

Legend for [Figure 5-50](#)

Item	Description
1	Nylon Lifting Sling (2 or 4)
2	5 m Insert
3	Boom Support (2)
4	Bottom Pins (2)
5	Top Pins (2)
6	10 m Insert (with boom straps)
7	Equalizer
8	10 m Insert (with equalizer)

Remove Boom Inserts Beyond Equalizer Insert

See [Figure 5-50](#) for the following procedure.

Working toward the boom equalizer:

1. Attach four nylon lifting slings to the lifting lugs on the insert (View B).
 - 10 m inserts (6 and 8, View A) have six lifting lugs.
 - 5 m inserts (2, View B) have two lifting lugs.
2. Adjust the lifting slings so the insert lifts level from side to side.
3. Lift the boom off boom supports (3, View B) using the assist crane.



WARNING

Falling Load Hazard!

If there is more than 30 m of boom inserts beyond equalizer insert, proceed as follows:

See Boom Handling with Equalizer Table in Boom Assembly Drawing at end of Section 4 for minimum assist crane capacity.

- Be sure to use an assist crane as specified in the table.
- 31000 operator must boom up while assist crane operator hoists against boom so that both cranes are loaded equally.
- Operator's must have voice communication.

4. Using a fork-lift truck, position boom supports (3, View B) under the adjacent boom insert.
5. Lower the boom onto the boom supports.
6. Lift with the assist crane until the lifting slings are tight.
7. Remove bottom pins (4, View E) as instructed on [page 5-67](#).
8. Remove top pins (5, View E) as instructed on [page 5-67](#).
9. Lift the insert away from the adjacent insert and place it to the side on blocking.
10. Disconnect the lifting slings.
11. Repeat the above steps until all boom sections have been removed up to equalizer insert (8, View D).

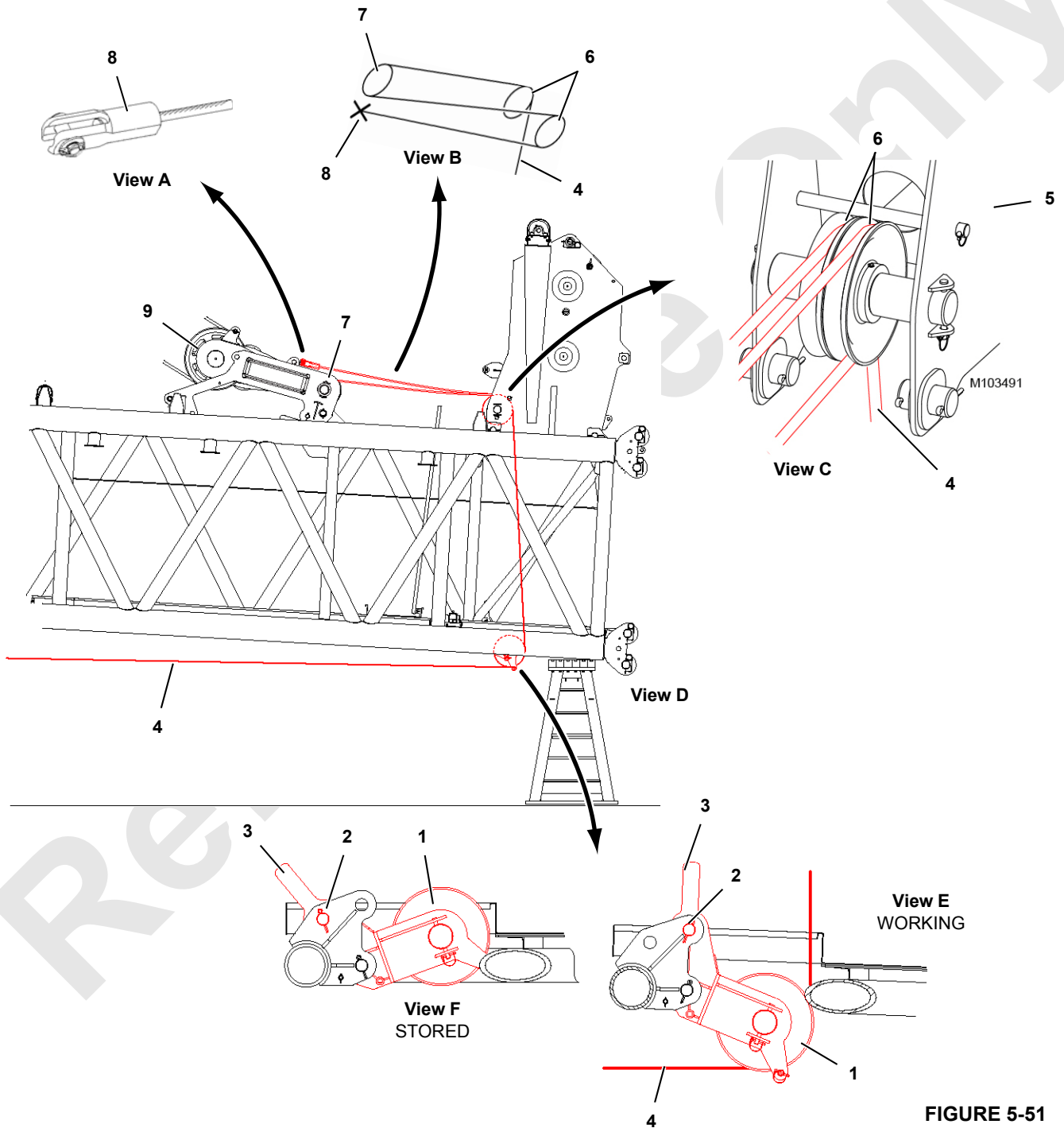


FIGURE 5-51

Legend for [Figure 5-51](#)

Item	Description
1	Sheave
2	Pin with Cotter Pins
3	Handle
4	Rigging Line (from Drum 6)
5	Wire Rope Guide
6	Sheave (2)
7	Sheave
8	Button Socket
9	Equalizer

Move Equalizer from Boom to Mast

See [Figure 5-51](#) for the following procedure.

1. Lower sheave (1, View F) from the stored position to the working position (View E).

2. Turn on the rigging winch mode. See [page 5-13](#) for procedure.
3. Turn on the setup remote mode. See [page 5-14](#) for procedure.
4. Pay out rigging line with Drum 6 control handle in the cab.
5. Route rigging line (4, View D) under the boom, around sheave (1, View E), and through the hole in the bottom of wire rope guide (5, View C).
6. Reeve the rigging line around sheaves (6, View C) and (7, View B). See the reeving diagram in View B.
7. Assemble button socket (8, View A) to the rigging line.
8. Pin the button socket to the lug on equalizer (9, View D).

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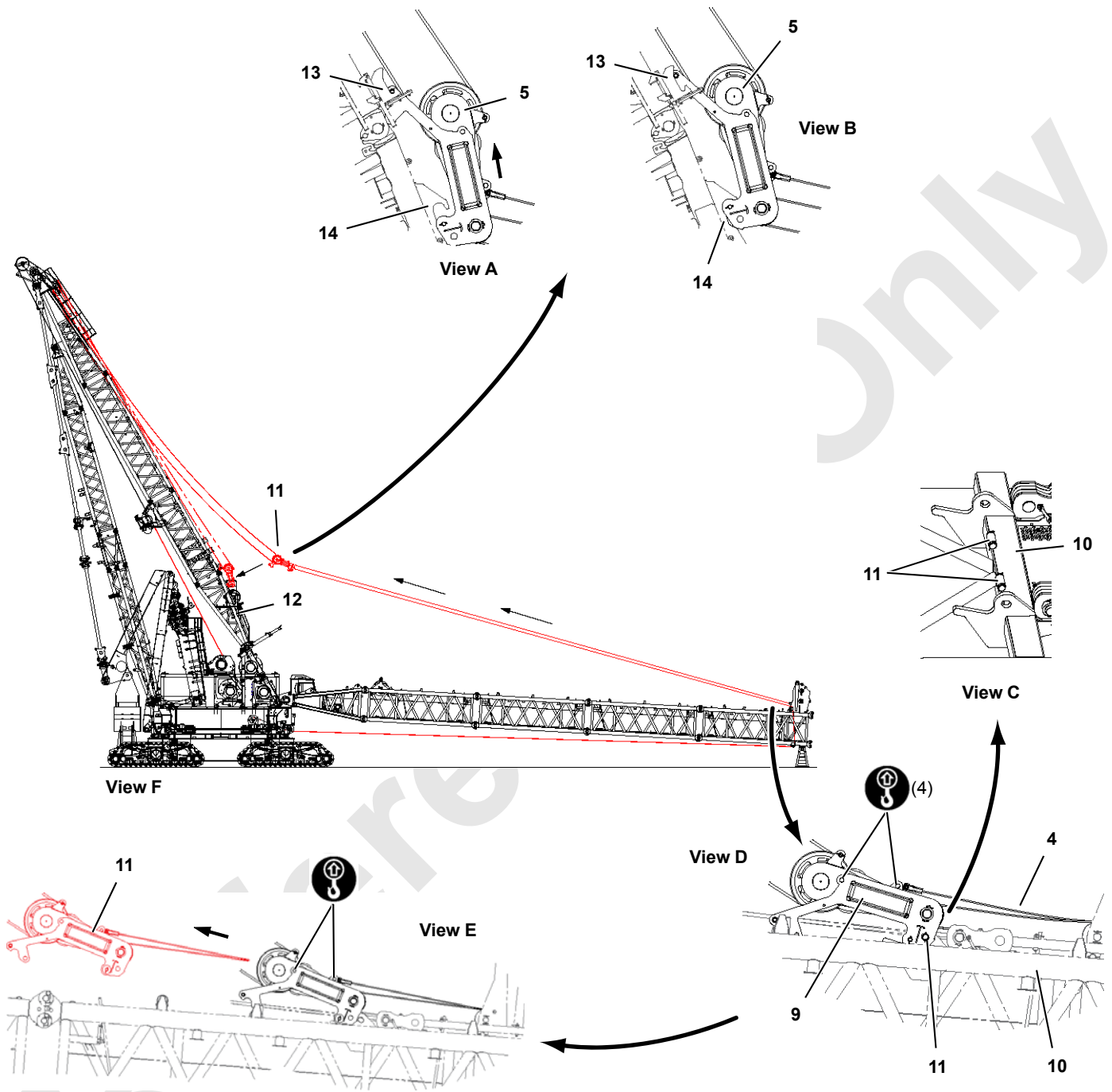


FIGURE 5-52

Legend for [Figure 5-52](#)

Item	Description
4	Rigging Line (from Drum 6)
9	Equalizer
10	10 m Insert
11	Pin with Cotter Pins (2)
12	Mast Butt
13	Hooked Rail (upper) (2)
14	Hooked Rail (lower) (2)

See [Figure 5-52](#) for the remaining steps.

9. Connect four legs of the chain lifting sling from the assist crane to the lifting lugs on equalizer (9, View D).
10. Remove pins (11, View D) securing the equalizer to the rails on 10 m insert (10).
11. Store pins (11, View C) on 10 m insert (10).
12. Lift the equalizer just clear of the rollers and rails on the insert.
13. Turn on the rigging winch mode. See [page 5-13](#) for procedure.
14. Pull back Drum 4 control handle to simultaneously haul in the boom hoist wire rope and pay out the rigging line.

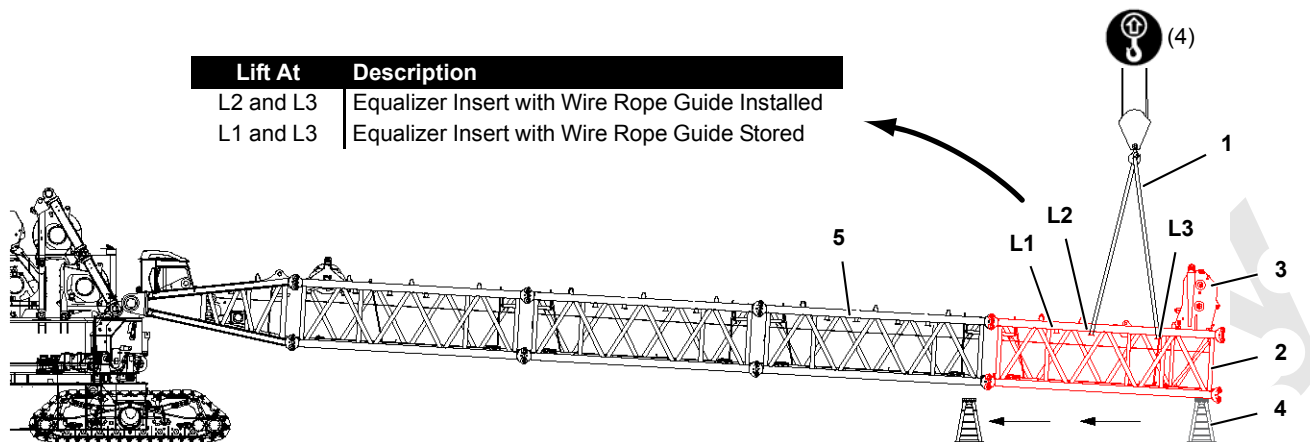
Engine speed controls tension of the rigging line and boom hoist wire rope. The higher the engine speed, the higher the equalizer will rise.

Follow with assist crane so equalizer does not bounce into mast insert and cause damage.

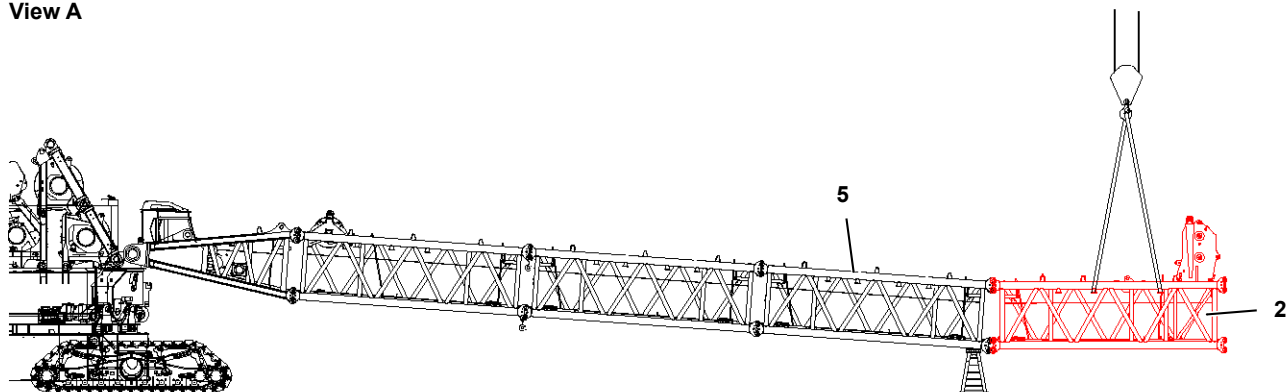
15. Equalizer (9, View D) will lift away from the 10 m equalizer insert and automatically rise toward the mast (View F).

GO SLOW during this process.

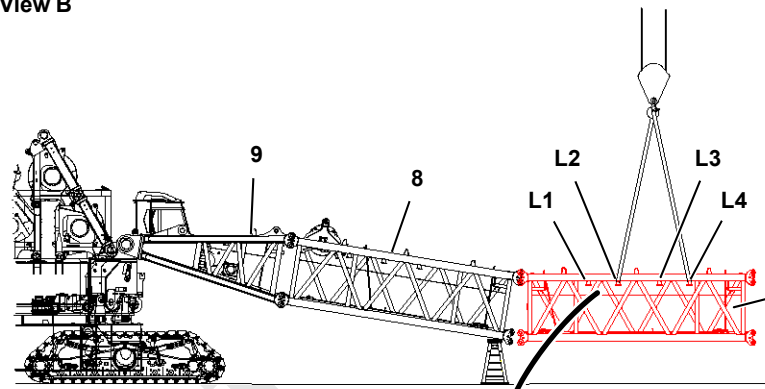
16. Stop when the equalizer is past the end of the 10 m insert and disconnect the lifting slings from the equalizer.
17. Continue the process.
18. Stop the operation when equalizer (9, View F) is over mast butt (12).
19. The drums can be operated independently as follows:
 - Move Drum 4 control handle to off to operate Drum 6 control handle independently.
 - Move Drum 6 control handle to off and turn on Drum 6 park to operate Drum 4 control handle independently.
20. Slowly continue to operate the drums in tandem or independently to lower the equalizer onto upper and lower rails (13 and 14, View B).
21. Once the equalizer is on the rails, pay out the boom hoist wire rope so the equalizer engages the hooks in upper rails (13, View A).
22. Disconnect the rigging line from the equalizer and haul it onto Drum 6 for storage.



View A

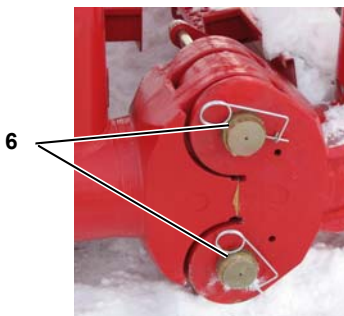
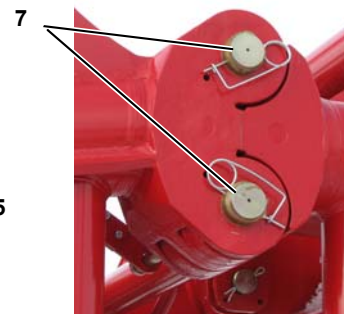


View B



View C

Lift At	Description
L2 and L4	10 m Insert without Wire Rope Guide
L1 and L3	10 m Insert with Wire Rope Guide in Shipping Position



View D

Figure 5-53

Legend for [Figure 5-53](#)

Item	Description
1	Nylon Lifting Sling (4)
2	10 m Equalizer Insert
3	Wire Rope Guide
4	Boom Support (2)
5	10 m Insert without Boom Straps
6	Bottom Pins (4)
7	Top Pins (4)
8	10 m Insert with Wire Rope Guide
9	Boom Butt

Remove 10 m Equalizer Insert

See [Figure 5-53](#) for the following procedure.

1. Attach four nylon lifting slings (1, View A) to the proper lifting lugs on equalizer insert (2).
2. Lift the boom off boom supports (3, View A) using the assist crane.
3. Using a fork-lift truck, position boom supports (3, View B) under the end of adjacent 10 m insert (5).
4. Lower the boom onto the boom supports.
5. Lift with the assist crane until the lifting slings are tight.
6. Remove bottom pins (6, View D) as instructed on [page 5-67](#).
7. Remove top pins (7, View D) as instructed on [page 5-67](#).
8. Lift the insert away from adjacent 10 m insert (5) and place it to the side on blocking.
9. Disconnect the lifting slings.
10. Repeat the above steps until all boom inserts up 10 m insert (8) next to boom butt (9) have been removed.

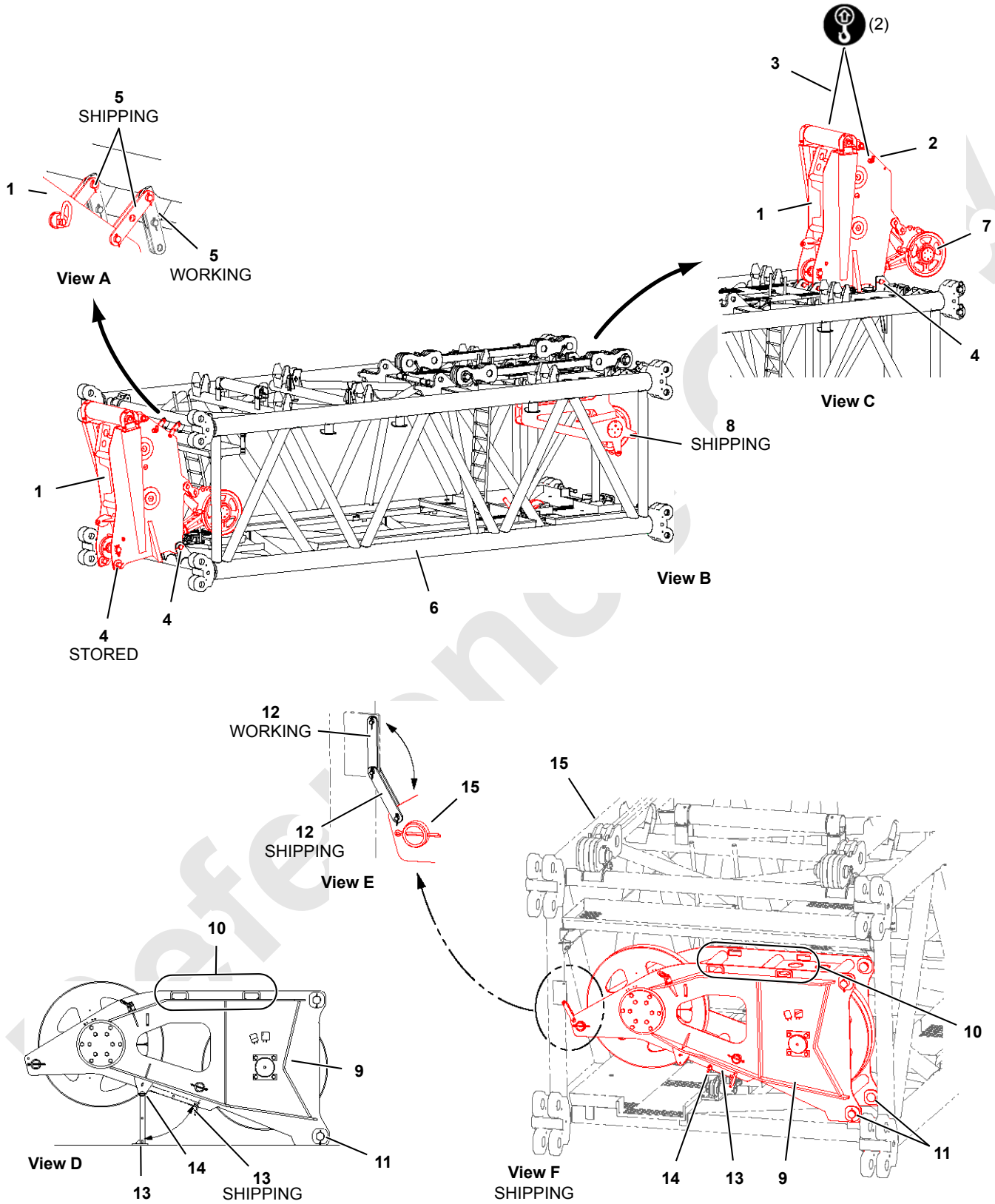


Figure 5-54

Legend for [Figure 5-54](#)

Item	Description
1	Wire Rope Guide
2	Lifting Lug (2)
3	Chain Lifting Slings
4	Pin with Cotter Pins (2)
5	Link with Pins and Cotter Pins
6	10 m Insert with Equalizer
7	Wire Rope Guide (optional Luffing Jib)
8	Wire Rope Guide (optional Luffing Jib)
9	Boom Top Wire Rope Guide (standard)
10	Fork-Lift Truck Slot (2)
11	Pin with Cotter Pin(4)
12	Link with Pin and Cotter Pins (4)
13	Stand
14	Hitch Pin with Hair-Pin Cotter
15	10 m Insert with Boom Straps

Prepare 10 m Equalizer Insert for Shipping

See [Figure 5-54](#) for the following procedure.

1. Connect two legs from chain lifting sling (3, View C) to the lifting lugs (2) on wire rope guide (1).
2. Support the wire rope guide with the lifting slings and remove pins (4, View C).
3. Lift wire rope guide (1, View C) away from the insert.
4. Position wire rope guide (1, View B) in the shipping position on the end of insert (6) and align the connecting holes.
5. Install pins (4, View B).
6. Store other two pins (4, View B) in wire rope guide (1).
7. Unpin links (5, View A) from the working position and pin the links to wire rope guide (1) in the shipping position.

8. Disconnect the lifting sling.
9. The equalizer insert can now be lifted onto a trailer for shipping. See [Figure 5-53](#), View A for lifting lug identification.

Prepare 10 m Insert without Boom Straps for Shipping

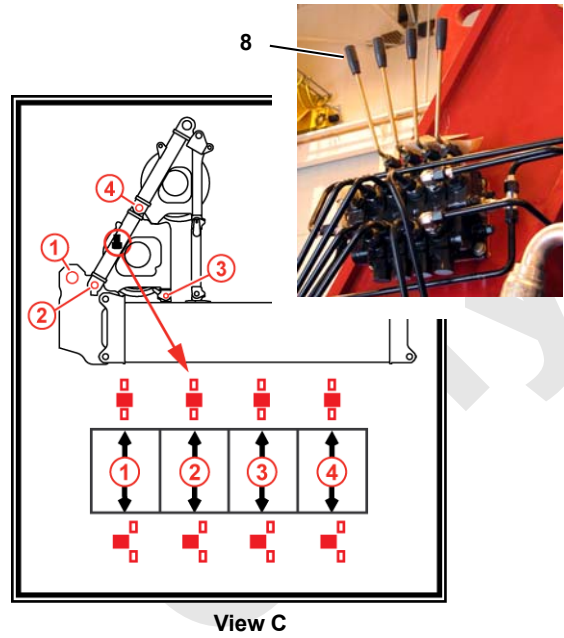
See [Figure 5-54](#) for the following procedure.

NOTE There are two boom top wire rope guides: standard and alternate.

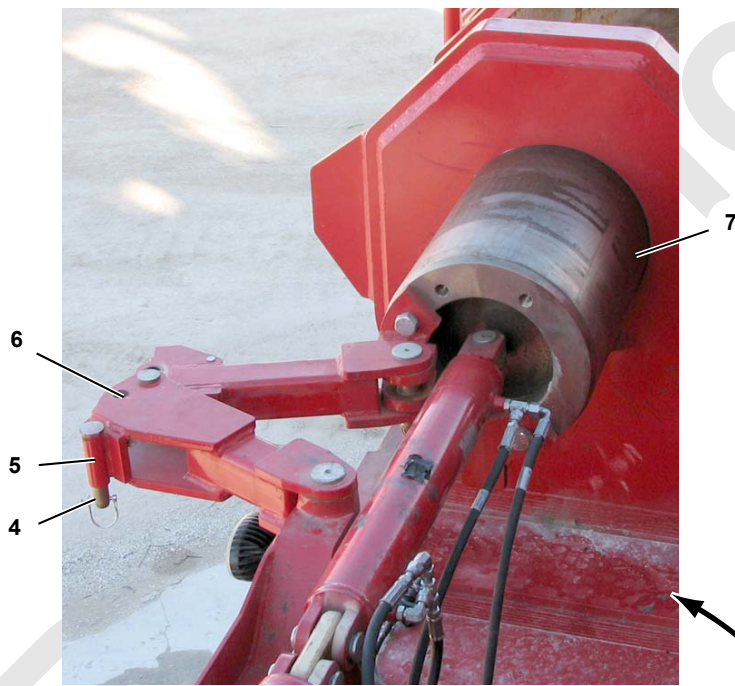
- Standard wire rope guide (9) is approximately 10 ft 5 in (3,2 m) high. It is the wire rope guide that can be installed on the end of the insert.
 - The alternate wire rope guide is approximately 11 ft 5 in (3,5 m) high. It is shipped loose.
1. Insert the forks from a fork-lift truck into slots (10, View D) in boom top wire rope guide (9).
 2. Support the wire rope guide with the fork-lift truck and remove bottom pins (11, View D).
 3. Remove hitch pins (14, View D), raise stands (13) to the shipping position, and reinstall pins (14).
 4. Lift boom top wire rope guide (9, View F) into the shipping position in the end of 10 m insert (15).
 5. Install pins (11, View F).
 6. Unpin links (12, View A) from the working position and pin the links in the shipping position on the wire rope guide.
 7. Remove the fork-lift truck.
 8. The 10 m insert can now be lifted onto a trailer for shipping. See [Figure 5-53](#), View C for lifting lug identification.



View A

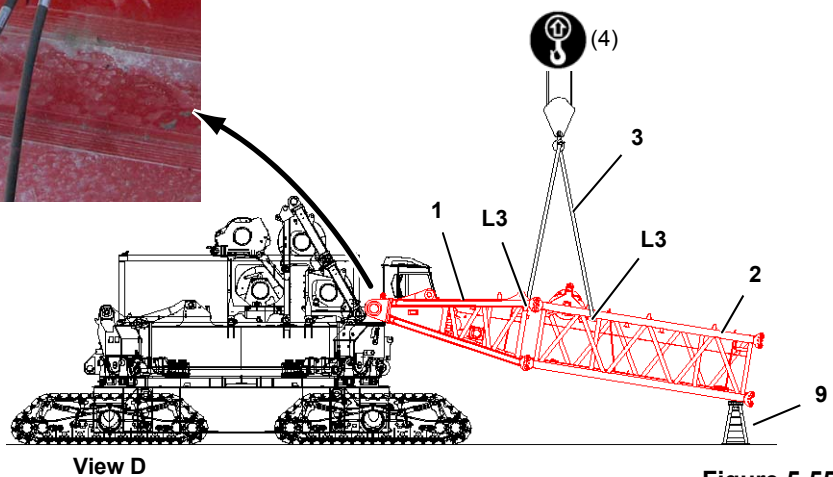


View C



View B

Item	Description
1	Boom Butt
2	10 m Insert
3	Nylon Lifting Sling (4)
4	Pin with Wire Lock Pin (2)
5	Locking Lever (4)
6	Storage Tube
7	Boom Hinge Pin (2)
8	Control Valve
9	Boom Support (2)



View D

Figure 5-55

Remove Boom Butt and 10 m Insert

1. If not already done:
 - a. Disconnect the electric cables from the end of boom butt (1). Store the cables on the front roller carrier.
 - b. Disconnect the grease hose from the end of boom butt (1). Store the hose on the front roller carrier.

See [Figure 5-55](#) for the following procedures.

1. Attach four nylon lifting slings (3, View D) to lifting lugs (L3) on boom butt (1) and 10 m insert (2).

NOTE See [Figure 5-56](#) for lifting lug identification.

2. Hoist with the assist crane until the lifting slings are tight.

3. Remove pins (4, View A) from locking levers (6).
4. Store pins (4, View B) in tubes (5).
5. Retract boom hinge pins (7, View B) using control valve (8, View C) on Drum 3.
6. Using assist crane, lift boom butt (1, View D) and insert (2) off the crane and place them on blocking ([Figure 5-56](#)).
7. Disconnect the lifting slings.
8. Place boom supports (9) to the side. They will be used to support the pivot and counterweight frames later in the disassembly procedure (see [page 5-117](#)).

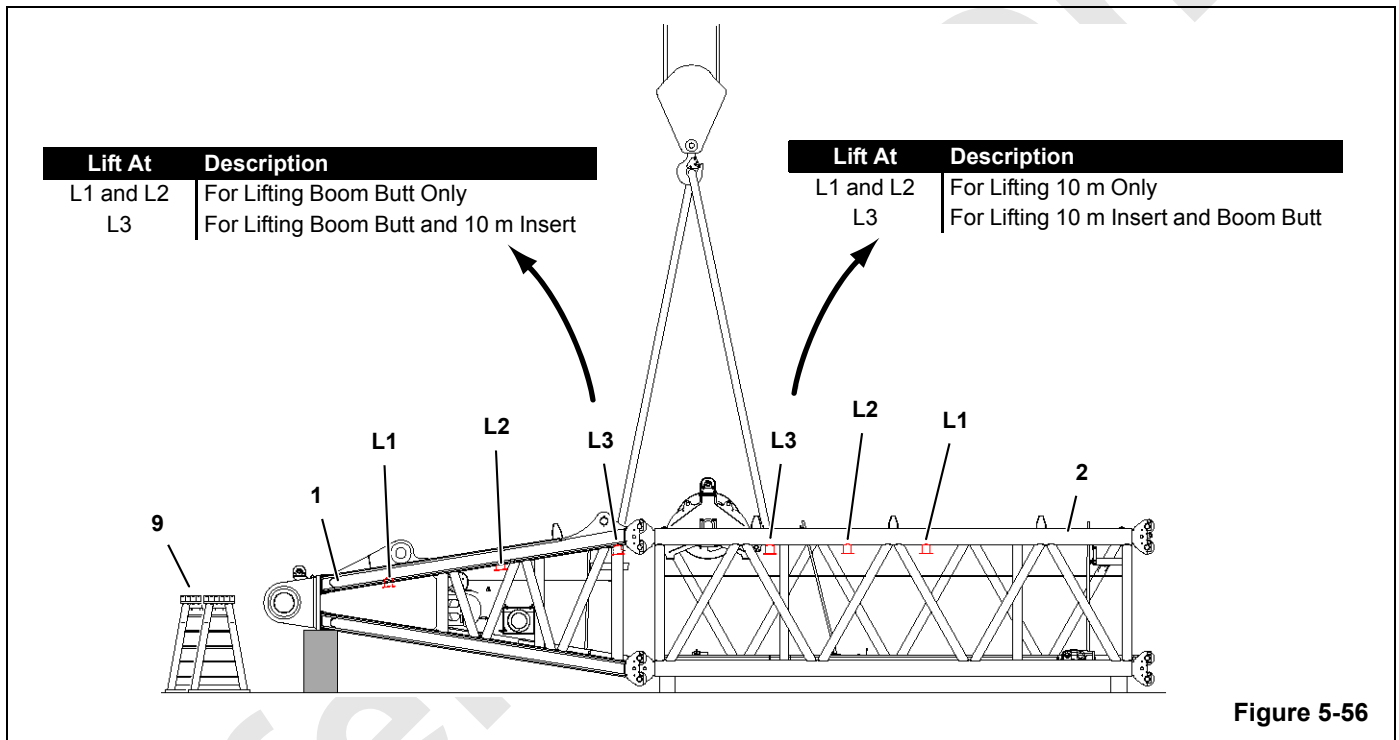


Figure 5-56

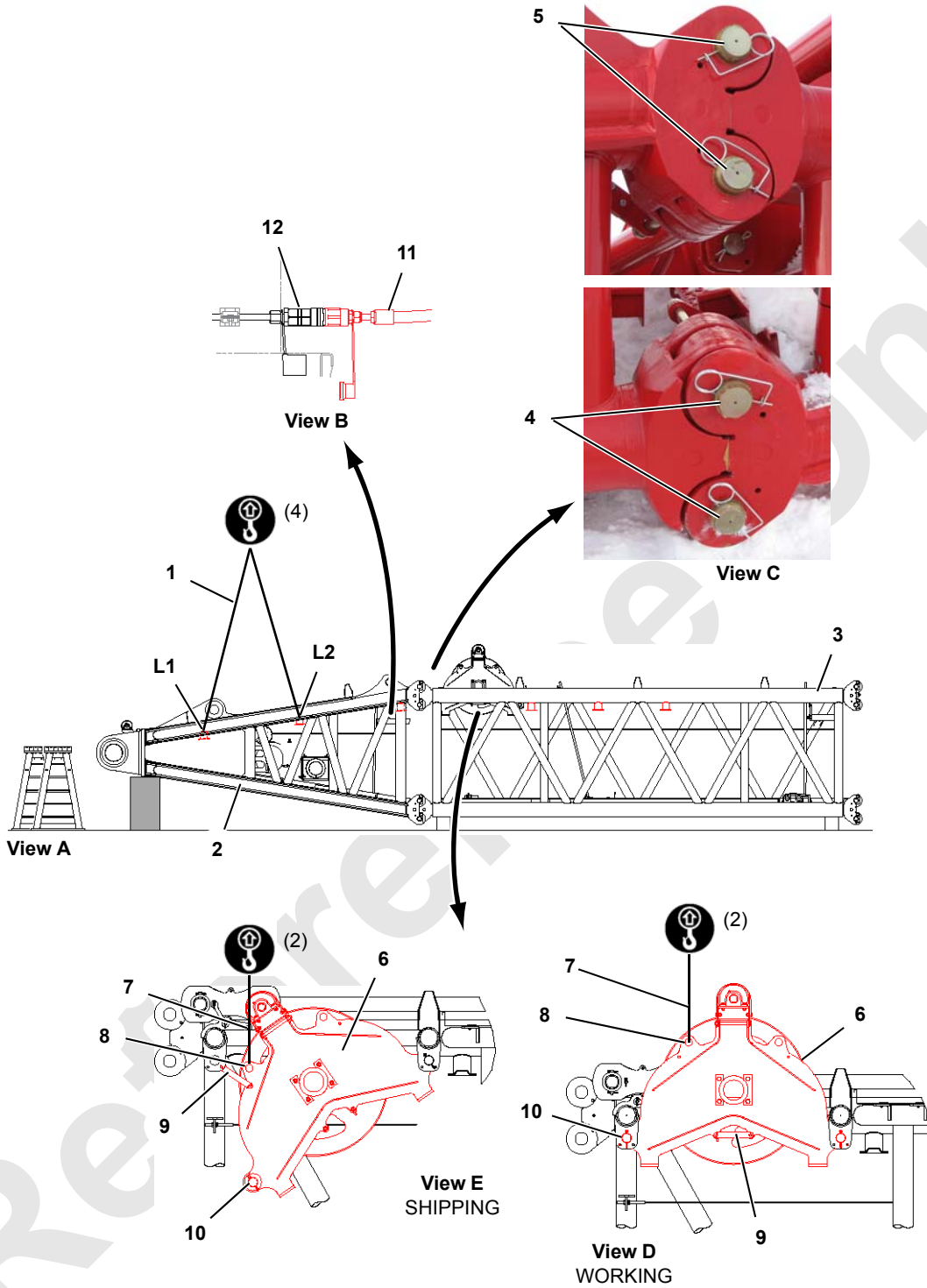


Figure 5-57

Legend for [Figure 5-57](#)

Item	Description
1	Nylon Lifting Sling (4)
2	Boom Butt
3	10 m Insert with Wire Rope Guide
4	Bottom Pin (2)
5	Top Pin (2)
6	Wire Rope Guide
7	Chain Lifting Sling
8	Lifting Hole (2)
9	Link with Pins and Cotter Pins (2)
10	Pin with Cotter Pins (2)
11	Grease Hose
12	Grease Coupler

Disconnect Boom Butt from 10 m Insert with Wire Rope Guide

See [Figure 5-57](#) for the following procedure.

1. Disconnect grease hose (11, View B) from wire rope guide (6) at coupler (12) on the boom butt.
2. Connect protective caps to the coupler and to the end of the hose.
3. Store the hose on wire rope guide (6, View E)

4. Attach four nylon lifting slings (1, View A) to lifting lugs (L1 and L2) on boom butt (2).
5. Lift with the assist crane until the lifting slings are tight.
6. Remove bottom pins (4, View C) as instructed on [page 5-67](#).
7. Remove top pins (5, View C) as instructed on [page 5-67](#).
8. Lift boom butt (2, View A) away from adjacent 10 m insert (3) and place it to the side on blocking.
9. Disconnect the lifting slings.

Lower Wire Rope Guide to Shipping Position in 10 m Insert

See [Figure 5-57](#) for the following procedure.

1. Attach two legs of chain lifting sling (7, View D) to lifting holes (8) in wire rope guide (6).
2. Tension the slings to support the wire rope guide.
3. Remove links (9, View D) from storage on the wire rope guide.
4. Remove pins (10, View D).
5. Lower wire rope guide (6, View E) to the shipping position.
6. Install links (9, View E) to connect the wire rope guide to the insert.
7. Disconnect the lifting slings.
8. Store pins (10, View E) in the wire rope guide holes.

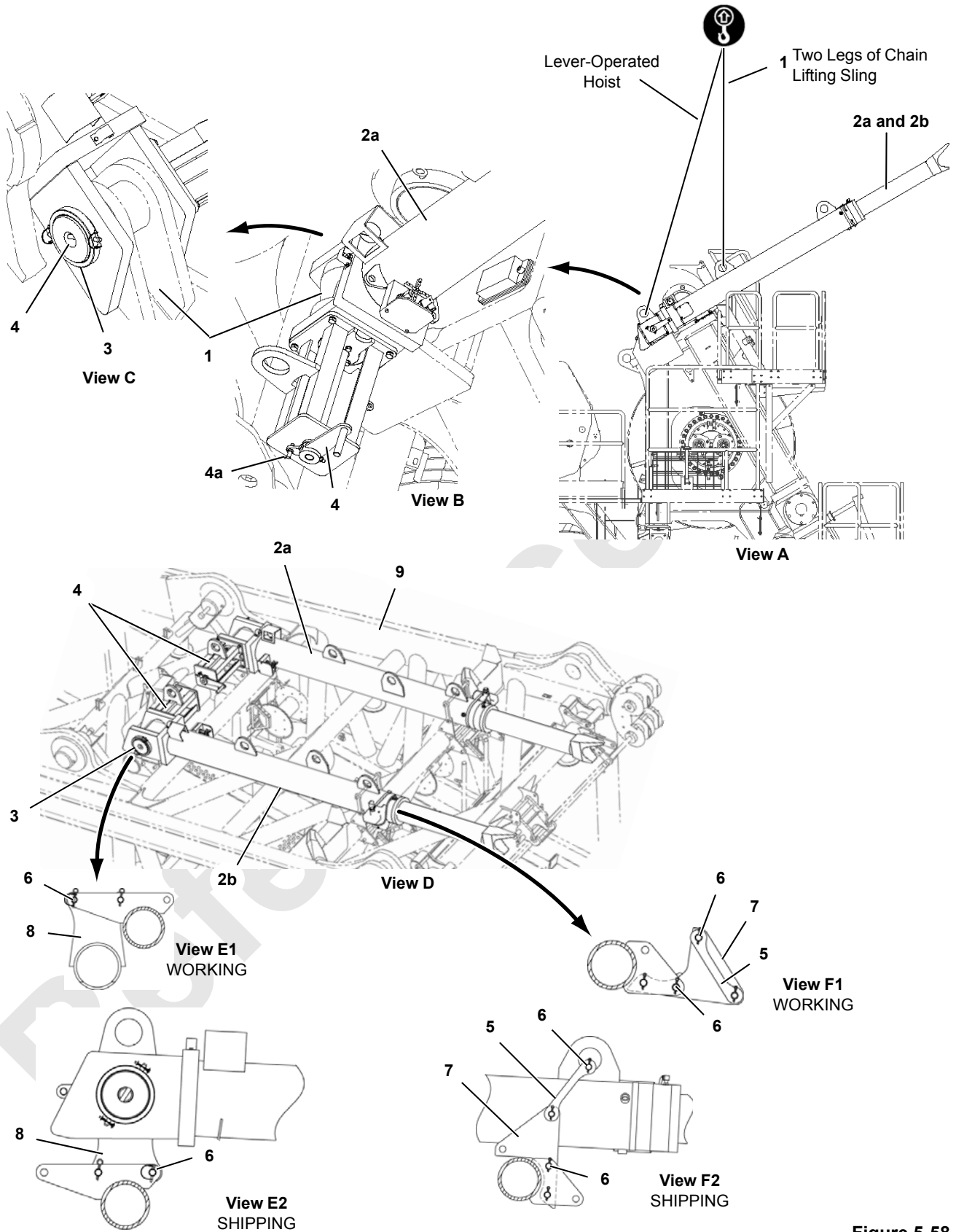


Figure 5-58

Legend for [Figure 5-58](#)

Item	Description
1	4-Leg Chain Lifting Sling
2a	Right Boom Stop
2b	Left Boom Stop
3	Collar with Pin and Wire-Lock Pins
4	Hand-Crank Pin (2)
4a	Spring Plunger
5	Link (4)
6	Pin with Wire Lock Pin (6)
7	Bracket (2)
8	Bracket (2)
9	Boom Butt

Store Boom Stops on Boom Butt

See [Figure 5-58](#) for the following procedure.

1. Lower Drum 1 platform extensions to the working position and raise Drum 1 steps.
2. Attach a lever-operated hoist and two legs of chain lifting sling (1, View A) to the lugs on boom stop (2a or 2b).
3. Adjust the length of the lever-operated hoist so the legs are in equal tension when lifting the boom stop.
4. Hoist with the assist crane until the lifting sling legs are tight.
5. Remove collar (3, View C) from hand-crank pin (4).
6. Disengage spring plunger (4a, View B) from the locking hole.
7. Fully disengage the hand-crank pin with the handle.
8. Lift boom stop (2a or 2b, View A) away from Drum 1.
9. Attach boom stop to boom butt for shipping:
 - a. Raise brackets (8, View E1) and brackets (7, View F1) from the working position to the shipping position (Views E2 and F2).
 - b. SLOWLY lower boom stop (2a or 2b, View D) so the connecting holes in the boom stop line up with the connecting hole in bracket (8).
 - c. Fully engage hand-crank pin (4, View D) with the handle.
 - d. Engage spring plunger (4a, View B) with the locking hole.
 - e. Install collar (3, View D) on hand crank pin (4).
 - f. Lower the boom stop onto bracket (7, View F2) and secure it with links (5).
10. Disconnect the lifting slings.
11. Repeat the steps for the other boom stop.

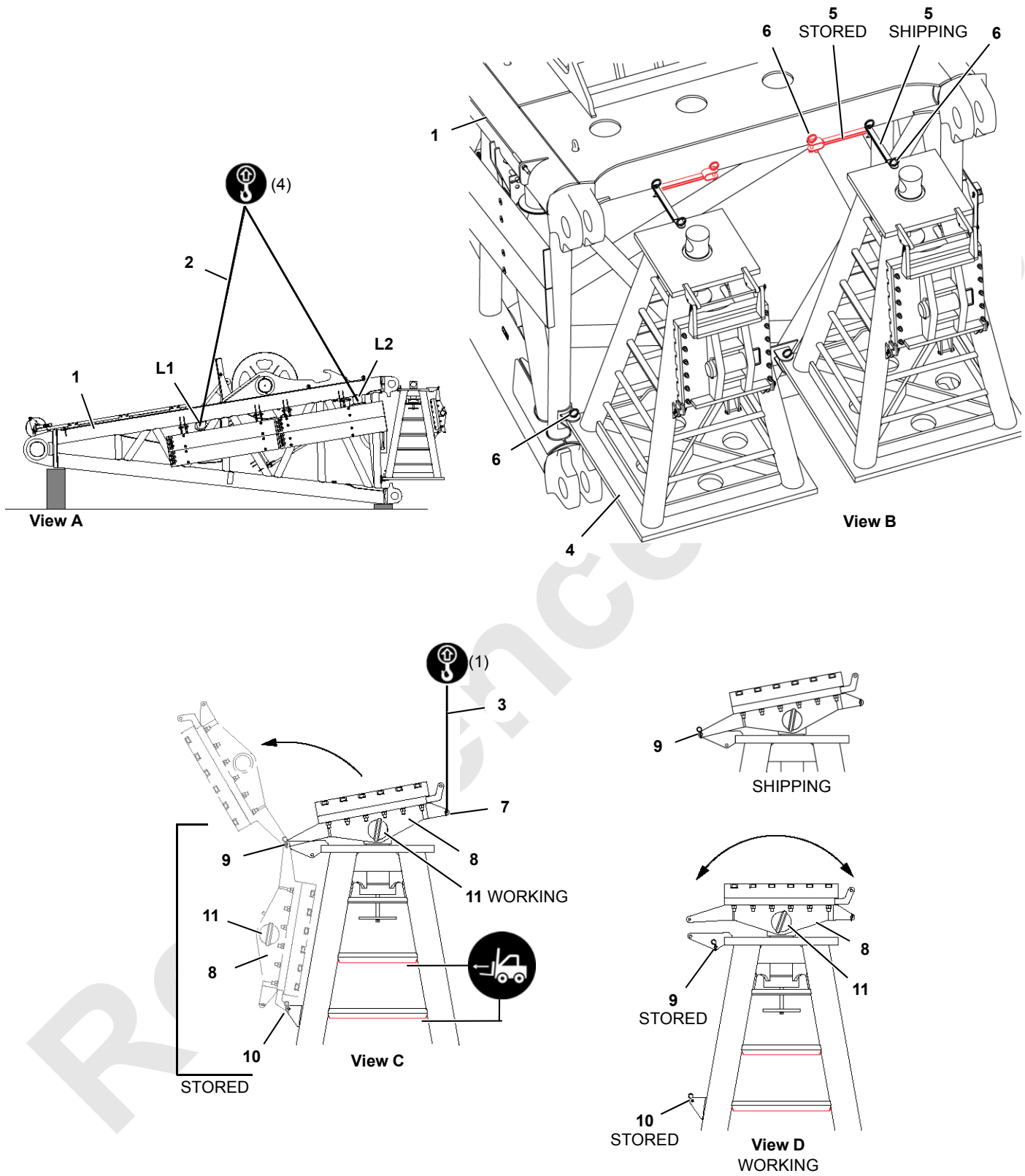


Figure 5-59

Legend for [Figure 5-59](#)

Item	Description
1	Mast Butt
2	Nylon Lifting Slings
3	Lifting Sling (owner supplied)
4	Boom Support (2)
5	Link (2)
6	Hitch Pin with Hair-Pin Cotter (6)
7	Pin
8	Pivoting Top Stand
9	Pin with Hair-Pin Cotters
10	Pin with Hair-Pin Cotters (2)
11	Shaft with Hitch Pin
L1, L2	Lifting Lug (4)(for lifting boom butt)

Store Boom Supports on Mast Butt

NOTE If the boom supports will be used to support the pivot and counterweight frames later in the disassembly procedure ([page 5-117](#)), then store the supports **AFTER** the VPC beam assembly is removed ([page 5-157](#)).

12. Remove pins (9 and 10, View D) from storage.
13. Connect owner supplied lifting sling (3, View C) to pin (7).
14. Hoist against pivoting top (8, View C) until the connecting holes are aligned and install pin (9, View C).
15. Hoist against pivoting top (8) until shaft (11, View C) is loose.
16. Remove shaft (11).
17. Rotate pivoting top (8, View C) to the stored position and install pins (10).
18. Disconnect lifting sling (3).
19. Store shaft (11, View C) in pivoting top (8).
20. Support boom support (4, View C) with a forklift truck.

Lift only under the tubular supports shown in View C (colored red).
21. Remove two bottom hitch pins (6, View B).
22. Unpin link (5, View B) from the stored position.
23. Lift the boom support into position at the end of the mast butt.
24. Pin link (5, View B) in the shipping position.
25. Install two bottom hitch pins (6, View B).
26. Remove the forklift truck.
27. Repeat the steps for the other boom support.

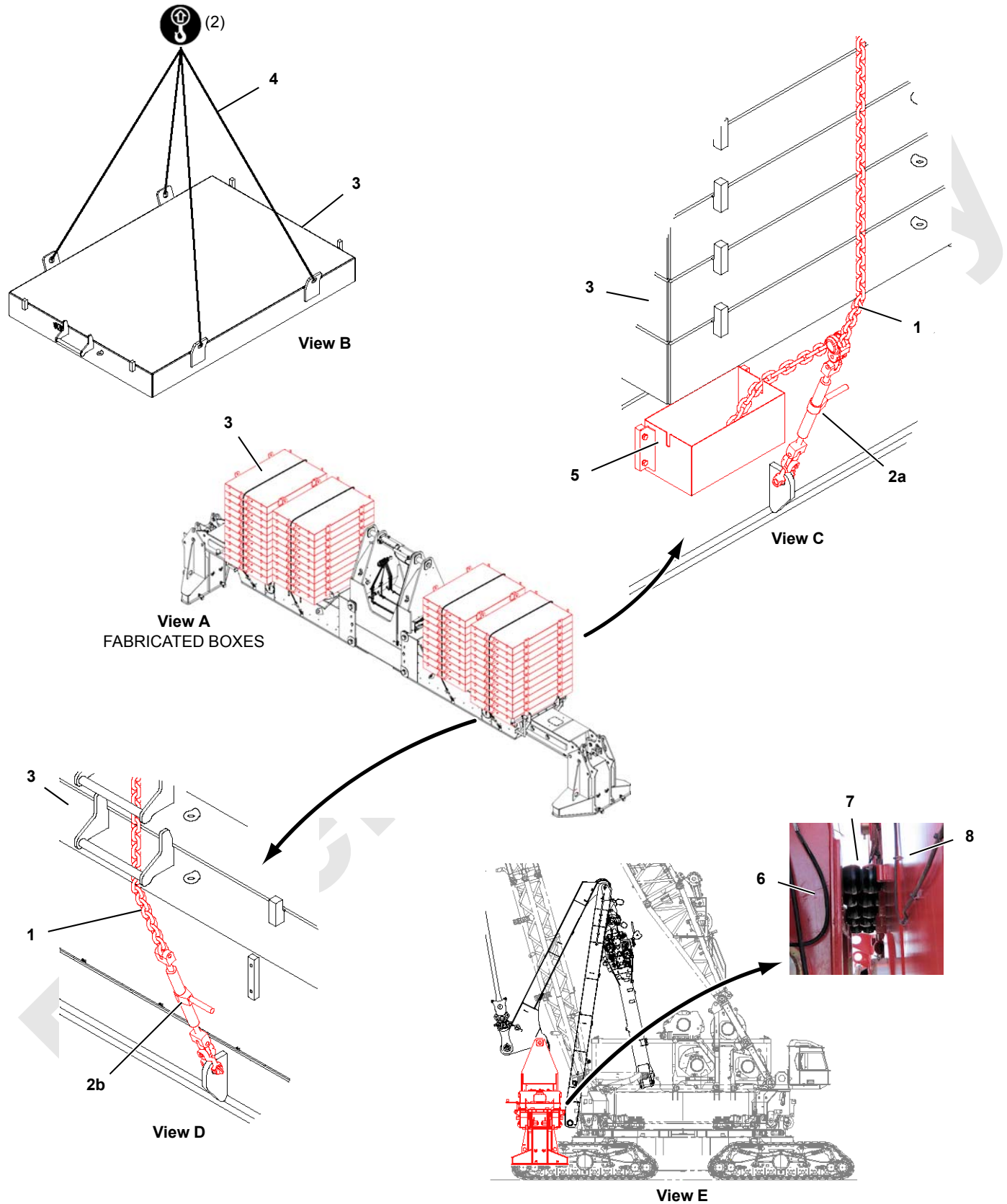


FIGURE 5-60

Legend for [Figure 5-60](#)

Item	Description
1	Tie-Down Chain (4)
2a	Front Chain Tensioner (4)
2b	Rear Chain Tensioner (4)
3	Fabricated Counterweight Box
4	4-Leg Lifting Sling (chain)
5	Chain Storage Box
6	Rubber Bumper
7	Center Tray
8	Pivot Frame

CRANE DISASSEMBLY — COUNTERWEIGHTS



WARNING

Crush Hazards!

To prevent crane from tipping and crushing personnel when boom is not installed:

- VPC actuator must remain fully retracted until all counterweight boxes are removed. Rubber bumpers (6, [Figure 5-60](#), View B) on center tray (7) must be snug against pivot frame (8) on rear of crane.

To prevent counterweight box from falling and crushing personnel:

- Do not lift more than one fabricated box ([Figure 5-60](#), View B) at a time. Lifting lugs may break allowing box(es) to fall.

To prevent counterweight boxes from falling off trays:

- Do not operate crane unless stacks of boxes are chained to side trays.

NOTE 360° swing is permitted with any counterweight series when the VPC actuator is fully retracted and the counterweight beams fully extended.

Remove Fabricated Counterweight Boxes

See [Figure 5-60](#) for the following steps.

1. Remove the outboard stack of counterweight boxes from the side trays first:
 - a. Loosen tie-down chains (1, View C), unhook the chains from front chain tensioners (2a), and remove the chains from the counterweight boxes.
The chain is permanently connected to rear chain tensioner (2b, View D).
 - b. Attach four legs of chain lifting sling (4, View B) to the lugs on fabricated counterweight box (3) as shown.
 - c. Using the assist crane, lift and remove one counterweight box from the side tray and store it for shipping.
 - d. Lift and remove one counterweight box from the other side tray and store it for shipping.
 - e. Continue removing the boxes in an alternating sequence until all are removed.
 - f. Connect the chain to front chain tensioner (2a).
 - g. Tighten front and rear chain tensioners (2a and 2b) to secure chains on side tray.
 - h. Store excess chain in chain storage boxes (5, View C).
2. Once the outboard stacks of boxes are removed, follow the same procedure to remove the inboard stacks of boxes.

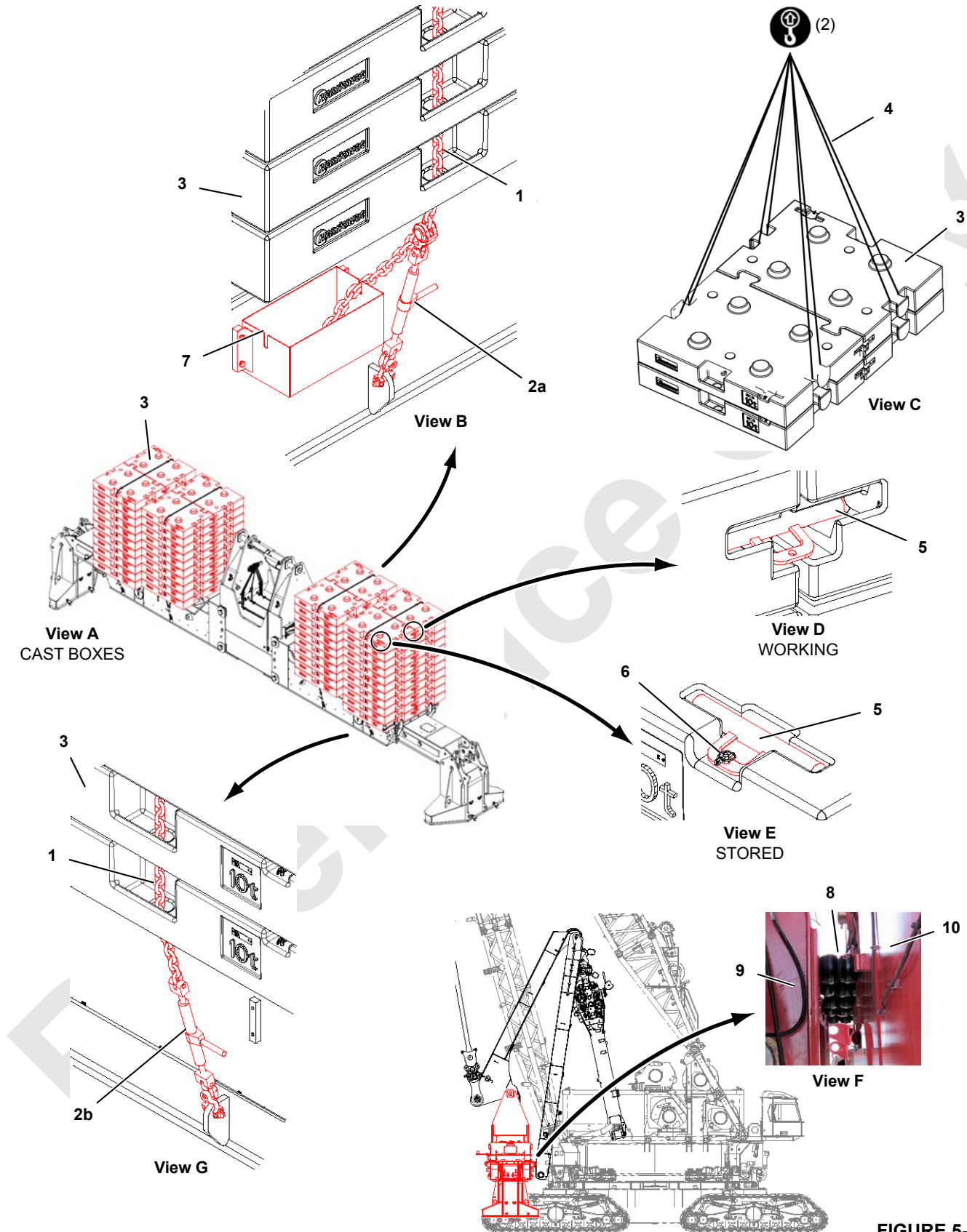


FIGURE 5-61

Legend for [Figure 5-61](#)

Item	Description
1	Tie-Down Chain (4)
2a	Front Chain Tensioner (4)
2b	Rear Chain Tensioner (4)
3	Cast Counterweight Box
4	Nylon Lifting Sling
5	Connecting Pin (1 each box)
6	Quick-Release Pin (1 each box)
7	Chain Storage Box
8	Rubber Bumper
9	Center Tray
10	Pivot Frame

**WARNING****Crush Hazards!**

To prevent crane from tipping and crushing personnel when boom is not installed:

- VPC actuator must remain fully retracted until all counterweight boxes are removed. VPC actuator must remain fully retracted until all counterweight boxes are removed. Rubber bumpers (8, [Figure 5-61](#), View F) on center tray (9) must be snug against pivot frame (10) on rear of crane.

To prevent counterweight box from falling and crushing personnel:

- Do not lift more than four cast boxes (3, [Figure 5-61](#), View C) at a time. Lifting lugs may break allowing box(es) to fall.

To prevent counterweight boxes from falling off trays:

- Do not operate crane unless stacks of boxes are chained to side trays.

NOTE 360° swing is permitted with any counterweight series when the VPC actuator is fully retracted and the counterweight beams fully extended.

Remove Cast Counterweight Boxes

See [Figure 5-61](#) for the following steps.

1. Remove the outboard stack of counterweight boxes from the side trays first:
 - a. Loosen tie-down chains (1, View B), unhook the chains from front chain tensioners (2a), and remove the chains from the counterweight boxes.
The chain is permanently connected to rear chain tensioner (2b, View G).
 - b. Attach nylon lifting sling (4, View C) around the lugs on four cast counterweight boxes (3) as shown.
 - c. Using the assist crane, lift counterweight boxes clear of the counterweight assembly and place them on the ground.
 - d. Remove connecting pins (5, View D) from the working position between mating boxes and secure them in the stored position (View E) with quick release pins (6).
 - e. Separate the boxes at the dovetails and place the boxes on trailers for shipping.
 - f. Repeat steps [1b](#) through [1e](#) on the other side of the tray.
 - g. Continue removing the boxes in an alternating sequence until all are removed.
 - h. Connect the chain to front chain tensioner (2a).
 - i. Tighten front and rear chain tensioners (2a and 2b) to secure chains on the side tray.
 - j. Store excess chain in chain storage boxes (7, View B).
2. Once the outboard stacks of boxes are removed, follow the same procedure to remove the inboard stacks of boxes.

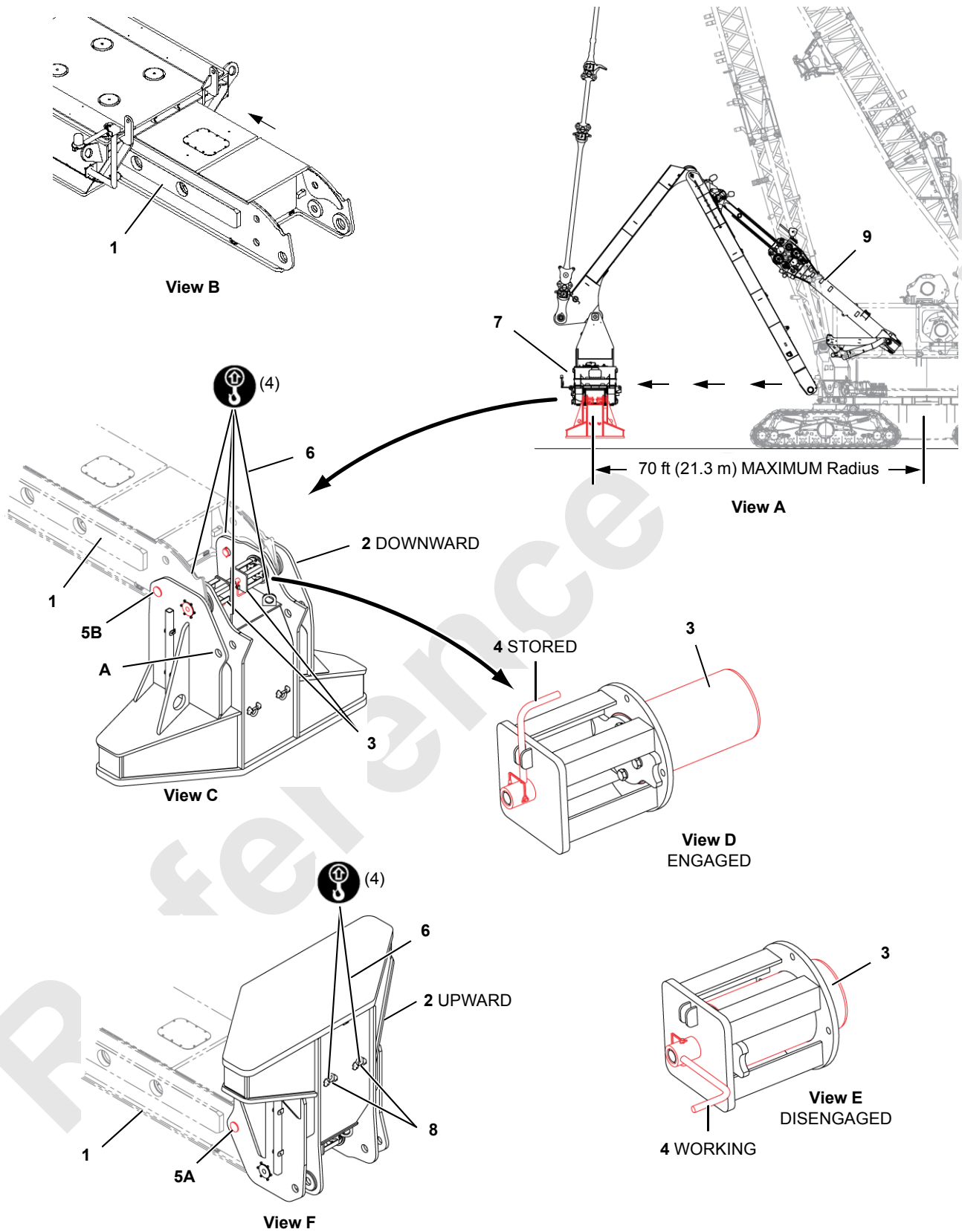


FIGURE 5-62

Legend for [Figure 5-62](#)

Item	Description
1	Counterweight Beam (2)
2	Counterweight Pad (2)
3	Hand-Crank Pin (2 each counterweight pad)
4	Handle with Wire Lock Pin (1 each hand-crank pin)
5	Pin with Cotter Pin (2 each pad)
6	Chain Lifting Sling
7	Counterweight Trays
8	Lifting Lug (2 each counterweight pad)
9	VPC Actuator

Remove Pads from Counterweight Beam



WARNING

Crush Hazard!

To prevent crane from tipping and crushing personnel when boom is not installed:

- Remove all counterweight boxes from the side trays before extending VPC actuator. (See [page 5-103](#)).
- Do not exceed a 70 ft (21.3 m) radius when detaching counterweight pads from counterweight beams.

See [Figure 5-62](#) for the following steps.

NOTE Counterweight beams (1, View C) must be as level as possible to remove counterweight pads (2). For this reason, extend the VPC actuator so the rubber

bumpers are clear of the pivot frame at the rear of the crane.

1. Extend the VPC actuator (9, View A) with the remote control to move the counterweight trays (7) to the desired position within a 70 ft (21.3 m) radius.
2. If the pad is in the upward position as shown in View F, rotate it to the downward position as follows:
 - a. Attach two legs of chain lifting sling (6, View F) to lugs (8) and remove any slack in the lifting sling lines.
 - b. Remove pins (5, View F) from hole **A**.
 - c. Using assist crane, rotate pad to downward position shown in View C.
 - d. Install pins (5, View C) in holes **B**.
 - e. Remove lifting slings.
3. Attach four legs of chain lifting sling (6, View C) to the lifting lugs on counterweight pad (2).
4. Lift with the assist crane until the lifting slings are tight.
5. Remove pins (5, View C) from holes **B** and store them in holes **A**.
6. Remove handles (4, View D) from the stored position on the two hand crank pins (3).
7. Fully retract the two hand-crank pins (3, View D).
8. Reinstall the two handles (4, View D) to lock both hand-crank pins in the working position (View E).
9. Using assist crane, lift counterweight pad (2, View C) from the counterweight beam (1) and store for shipping.
10. Repeat the above steps for the other counterweight pad.

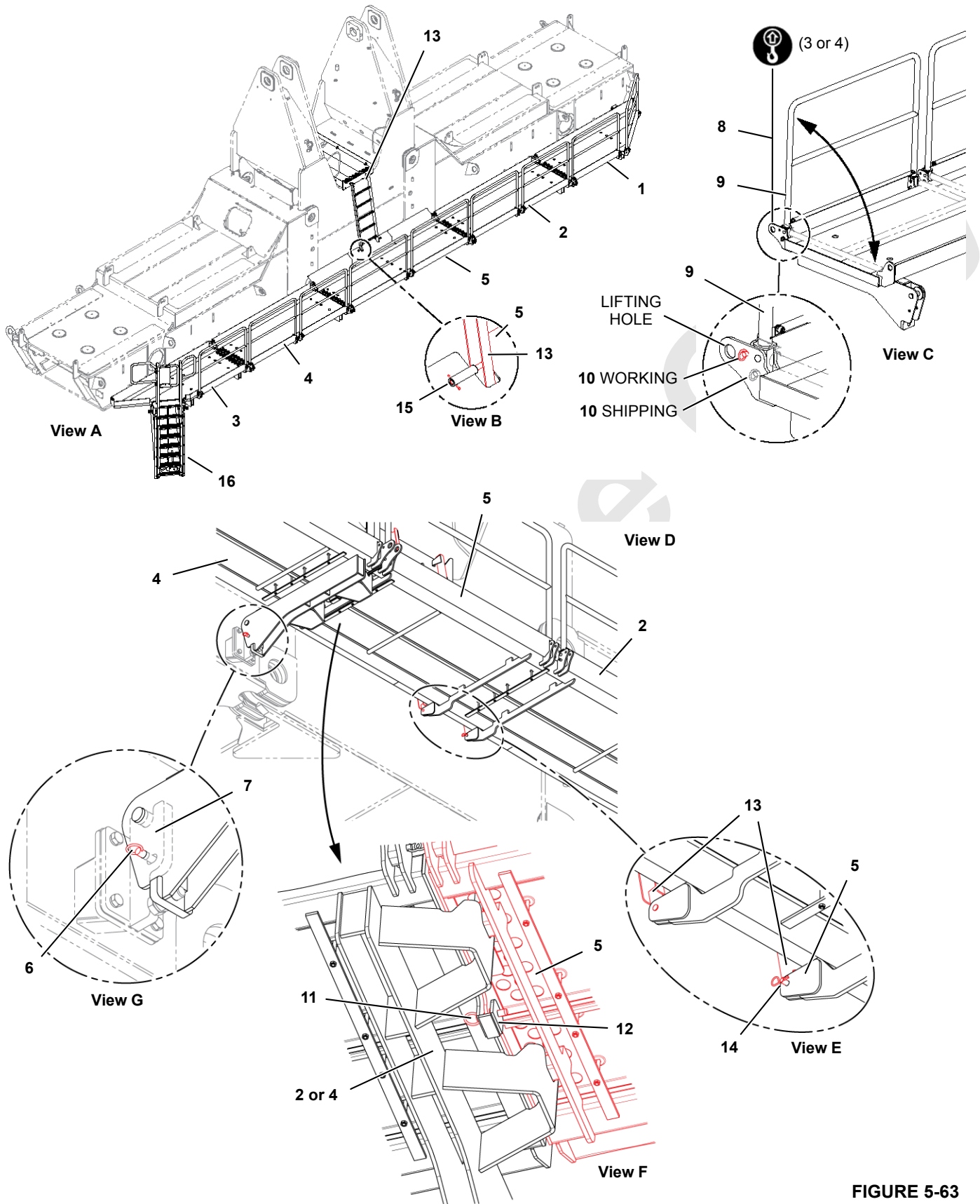
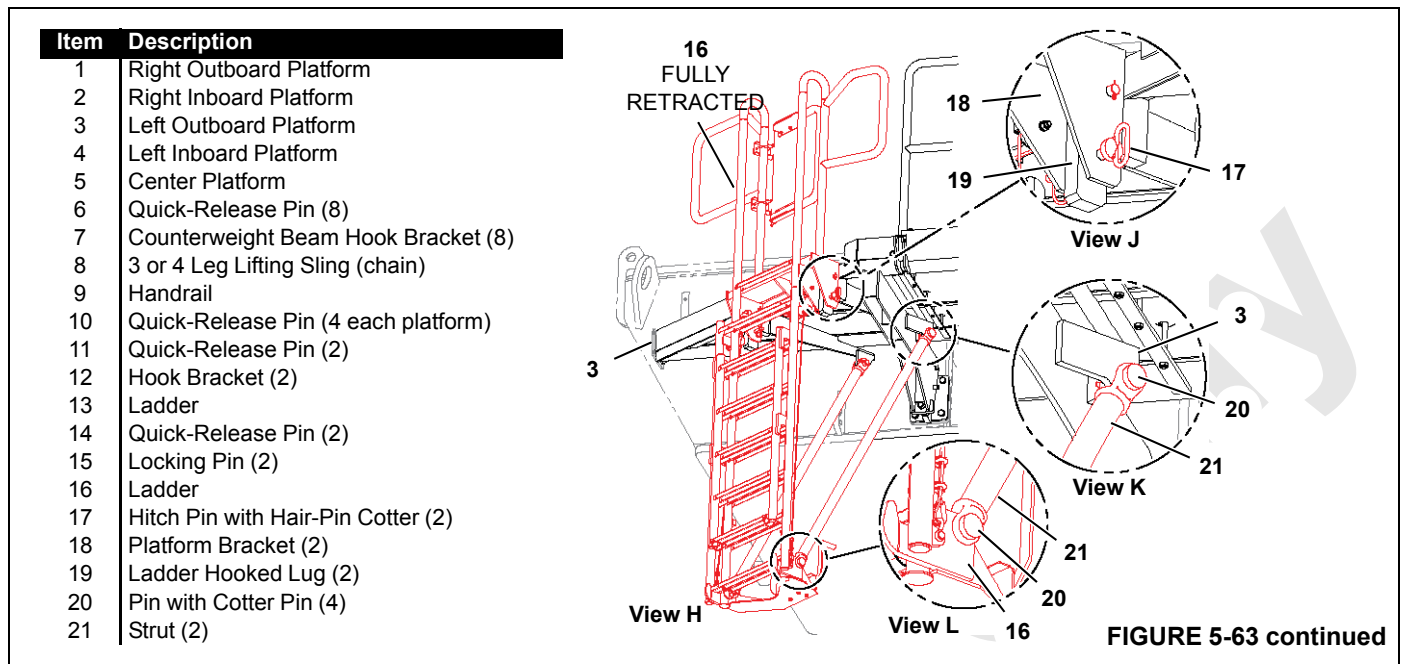


FIGURE 5-63



Remove Counterweight Platforms

See [Figure 5-63](#) for the following steps.

1. Remove ladder (16, View A):
 - a. Fully retract ladder (16, View H).
 - b. Attach two nylon lifting slings from the assist crane to the ladder hand rails.
 - c. Disconnect pins (20, View K and L) and struts (21) from the lugs on platform (3) and ladder (16).
 - d. Remove two hitch pins (17, View J).
 - e. Lift ladder (16) from the platform and store it for shipping.
 - f. Store hitch pins (17, View J) in platform brackets (18).
 - g. Store pins (20, Views K and L) in ladder struts.
2. Remove ladder (13, View A):
 - a. Disengage locking pins (15, View B) on top of platform (5) from both sides of ladder (13).
 - b. Remove pins (14, View E) from ladder (13) and brackets on underside of platform (5).
 - c. Lift ladder (13) from platform and store it for shipping.
3. Remove center platform (5, View A):
 - a. Remove quick-release pins (10, View C), lower handrails (9) to shipping position and secure with pins (10).
 - b. Attach lifting slings (8, View C) to 3 or 4 lifting holes in platform and remove slack from lifting slings.
 - c. Remove two quick-release pins (11, View F) from platform (5) and hooked brackets (12) on inboard platforms (2 and 4).
 - d. Using assist crane, lift center platform (5, View A) from the platform assembly to a trailer for shipping.
 - e. Store quick release pins (11, View F) in hooked brackets (12) on platforms (2 and 4).
4. Remove two inboard platforms (2 and 4, View A):
 - a. Remove quick-release pins (10, View C), lower handrails (9) to shipping position and secure with pins (10).
 - b. Attach lifting slings (8, View C) to 3 or 4 lifting holes in platform and remove slack from lifting slings.
 - c. Remove quick-release pins (6, View G) from the platform and counterweight beam hook bracket (7).
 - d. Using assist crane, lift platform from the counterweight beam to a trailer for shipping.
5. After inboard platforms are removed, follow the same procedure to remove outboard platforms (1 and 3, View A).
6. Store eight quick-release pins (6, View G) in hooked brackets (7) on the counterweight beam.

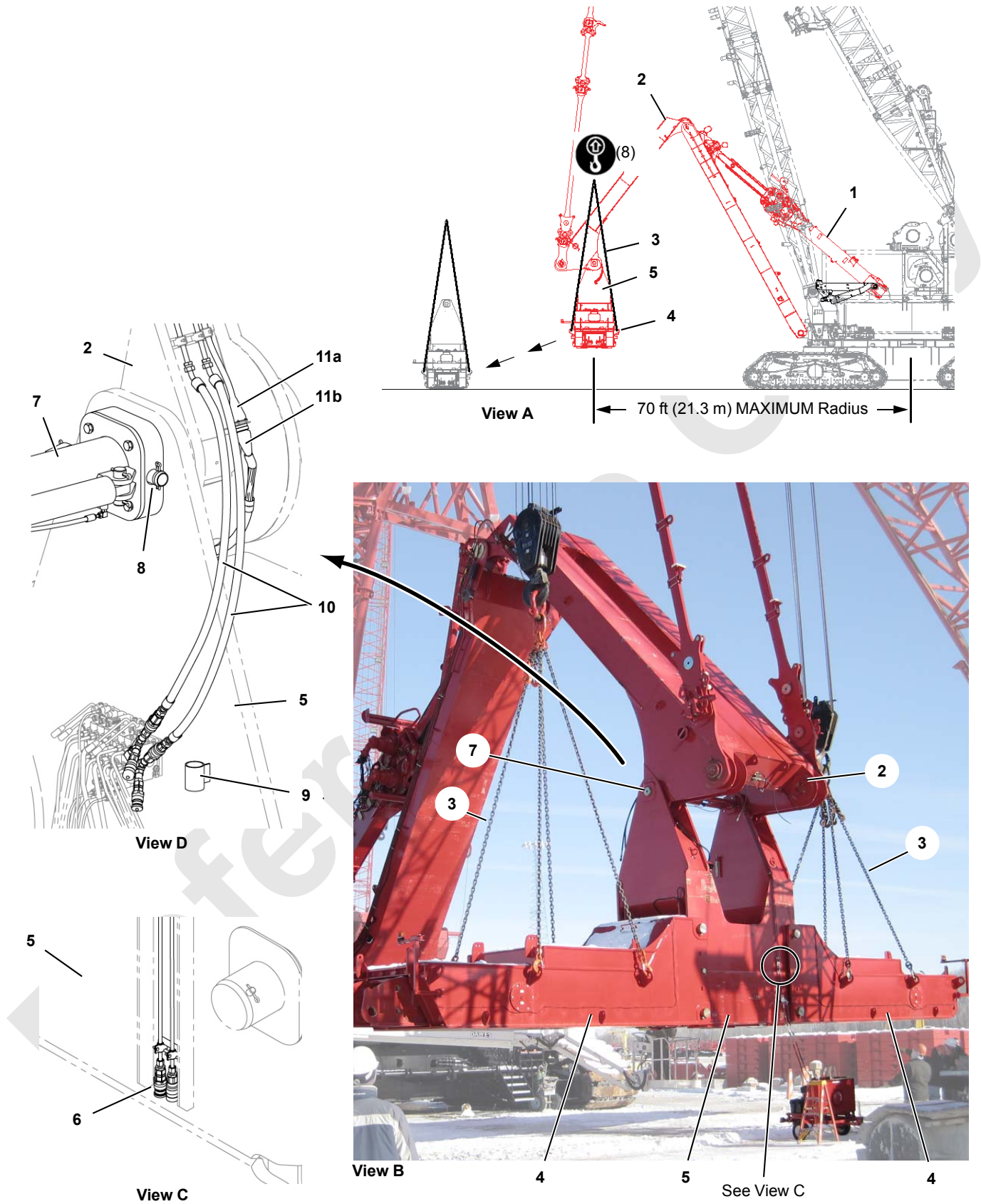


FIGURE 5-64

Legend for [Figure 5-64](#)

Item	Description
1	VPC Actuator
2	Counterweight Frame
3	4-Leg Lifting Sling (chain) (2)
4	Side Tray (2)
5	Center Tray
6	Hydraulic Coupler (2)
7	Hydraulic Pin (2)
8	Pin with Cotter Pins (2)
9	Storage Tube (2)
10	Hydraulic Hose (2) (from counterweight frame)
11a	Electric Cable W61J1 (on counterweight frame)
11b	Electric Cable W60P1 (from center tray)

Remove Counterweight Trays from Counterweight Frame

See [Figure 5-64](#) for the following steps.

1. Extend the VPC actuator (1, View A) with the remote control to move the counterweight trays to the desired position within a 70 ft (21.3 m) radius.

2. Disconnect two hydraulic hoses (10, View D) and electric cables (11a and 11b) from counterweight frame (2) and center tray (5).
3. Attach four legs of chain lifting slings (3, View A) from two assist cranes to the lifting lugs on each side tray (4).
4. Lift with both assist cranes until the lifting slings are tight and hydraulic pins (7, View D) are loose.
5. Connect hydraulic hoses from the PPU and the hand-held accessory valve to couplers (6, View C) on center tray (5).
6. Remove pins (8, View D) and store them in tubes (9) on center tray (5).
7. Disengage hydraulic pins (7, View D) in counterweight frame (2) with the hand-held accessory valve.
8. Using the assist cranes, slowly lift the counterweight tray assembly from counterweight frame and place on blocking (View F).
 - The center line of the counterweight tray assembly must be parallel to the ground.
 - The counterweight tray assembly must be level from side to side and front to rear.
9. Disconnect the lifting slings.
10. Disconnect the hydraulic lines from couplers (6, View C).

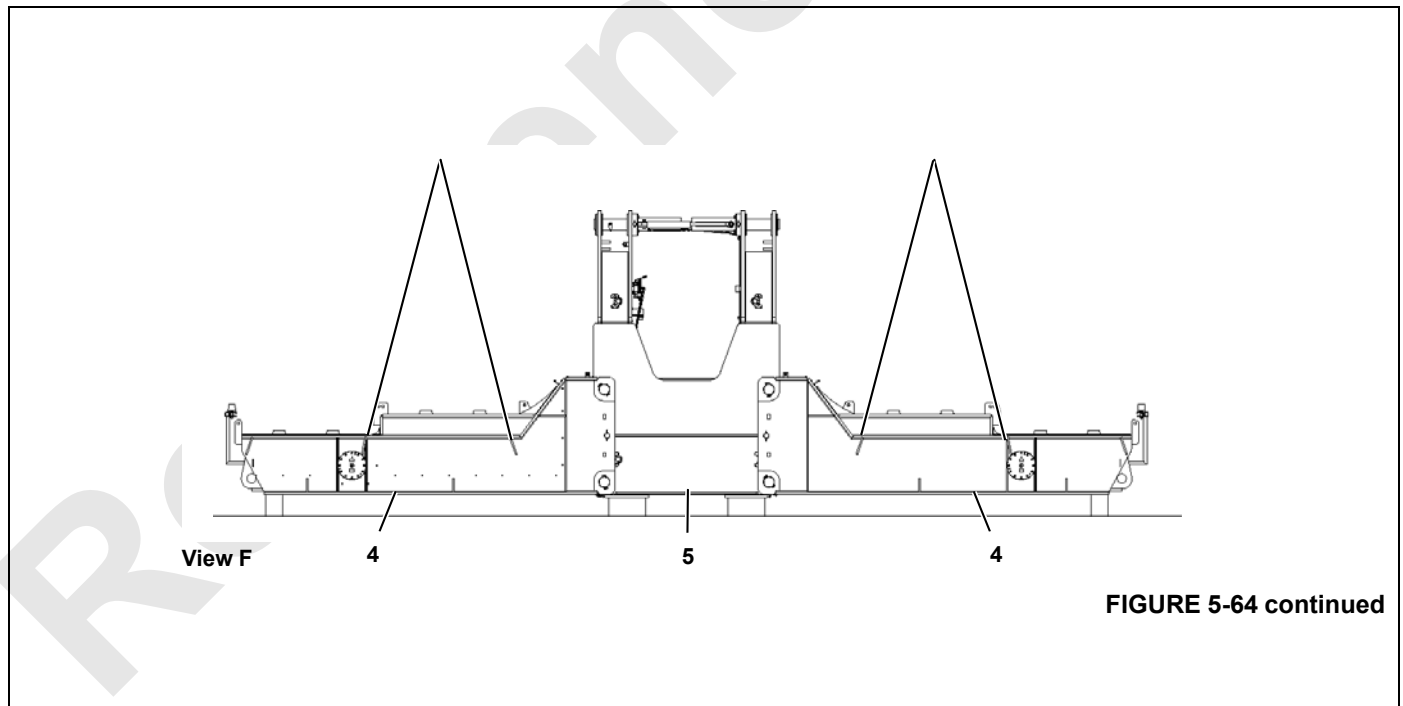


FIGURE 5-64 continued

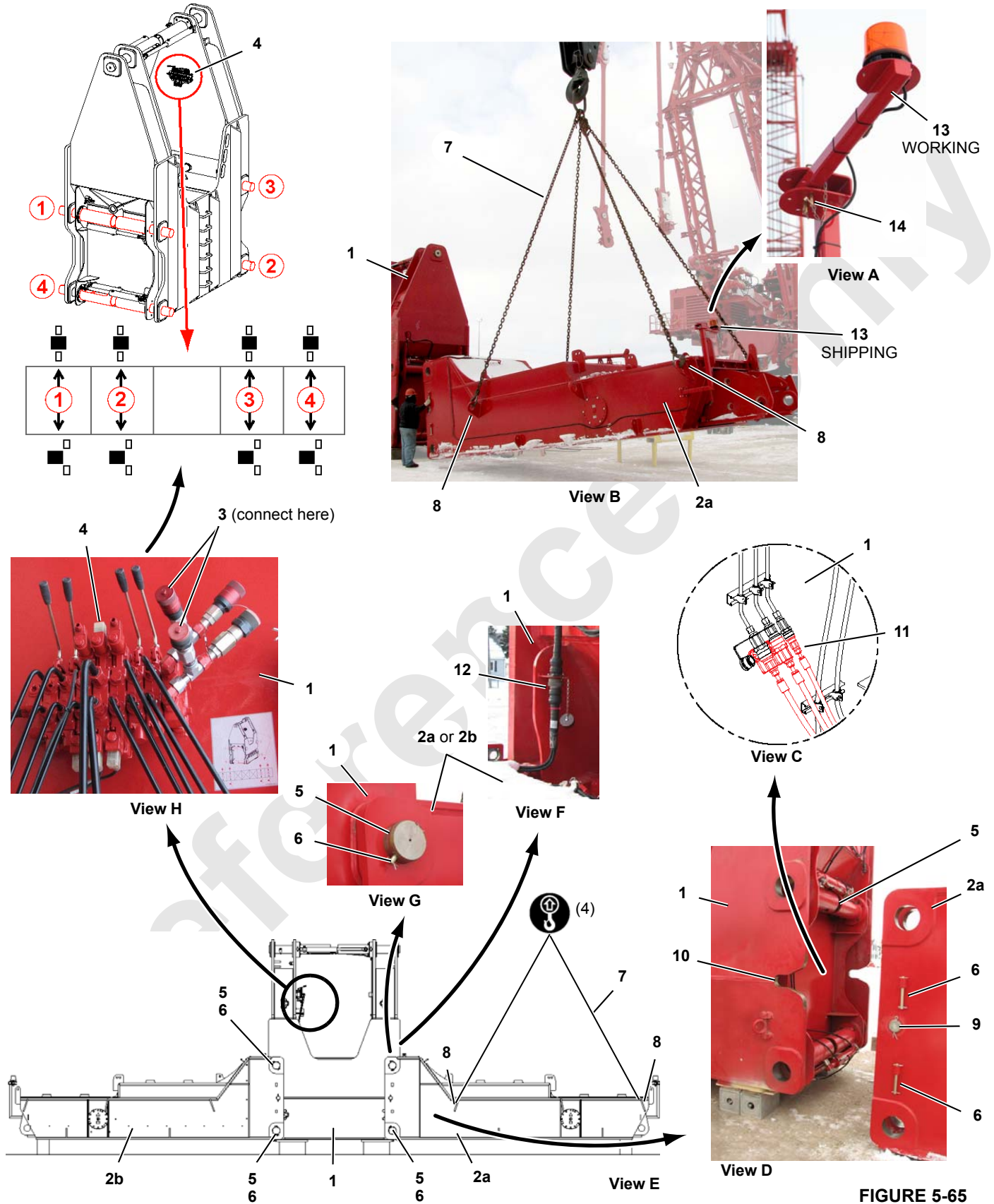


FIGURE 5-65

Legend for [Figure 5-65](#)

Item	Description
1	Center Tray
2a	Side Tray (right)
2b	Side Tray (left)
3	Hydraulic Hose (2) (from PPU)
4	Control Valve
5	Hydraulic Pin (8)
6	Retaining Pin with Cotter Pins (4 each side tray)
7	4-Leg Lifting Sling (chain)
8	Lifting Lug (4 each side tray)
9	Alignment Pin (2 each side tray)
10	Notch (2 each side tray)
11	Hydraulic Hose (3 from each side tray)
12	Electric Cable (1 from each side tray)
13	Warning Light (2)
14	Hitch Pin with Hair-Pin Cotter (2)
15a	Lifting Lug (2)
15b	Lifting Lug (2)
16a	Blocking (2)
16b	Blocking (2)

Disassemble Counterweight Trays

See [Figure 5-65](#) for the following steps.

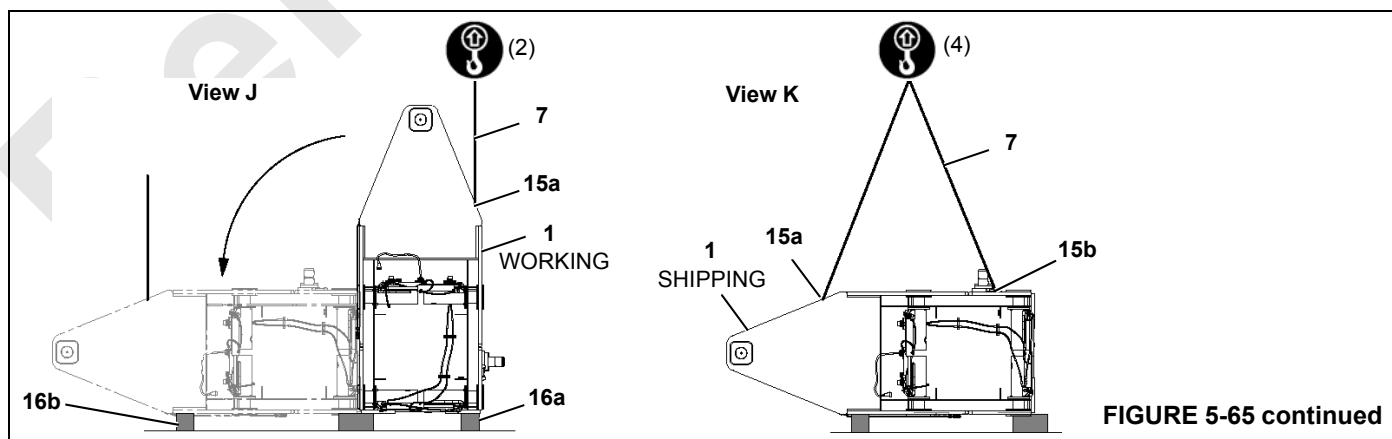
- Rotate warning lights (13, View A) from the working position to the shipping position (View B) and secure.
 - Disconnect electric cable (12, View F) from between each side tray (2a and 2b) and center tray (1).
 - Connect hydraulic hoses (3, View H) from the PPU to the couplers at control valve (4) on center tray (1).
 - Attach four legs of chain lifting sling (7, View E) to lifting lugs (8) on each side tray (2) and tighten them.
 - Remove retaining pins (6, View G) from hydraulic pins (5) and store them in the side tray pockets (View D).
 - Disengage hydraulic pins (5) with the control handles at valve (4, View H).
 - Using the assist crane, slowly lift the side tray away from the center tray (View D).
 - Disconnect hydraulic hoses (11, View C) from between trays.
 - Lift the side tray onto a trailer for shipping.
 - Disconnect the lifting slings.
 - Repeat the above steps for the other side tray.
 - Disconnect hydraulic hoses (3, View H) from the couplers at control valve (4).
 - Attach two legs of chain lifting sling (7, View J) to lifting lugs (15a) on center tray (1).
- NOTE** Center tray hydraulic pins (5) are ship disengaged to prevent damage.
- Place blocking (16a, View H) along the bottom edge of the tray. This blocking will provide a tipping point.

WARNING Crush Hazard!

To prevent personnel from being crushed by a falling load:

- Do not attempt to lift center tray off blocking during following step. Lifting lugs may break causing tray to fall.

- Slowly hoist and travel the assist crane to tip the center tray to horizontal (View J).
- Place blocking (16b, View J) under the tray.
- Attach the other two legs of lifting sling (7, View K) to lifting lugs (15b) on the tray.
- Lift the center tray onto a trailer for shipping.
- Disconnect the lifting slings.



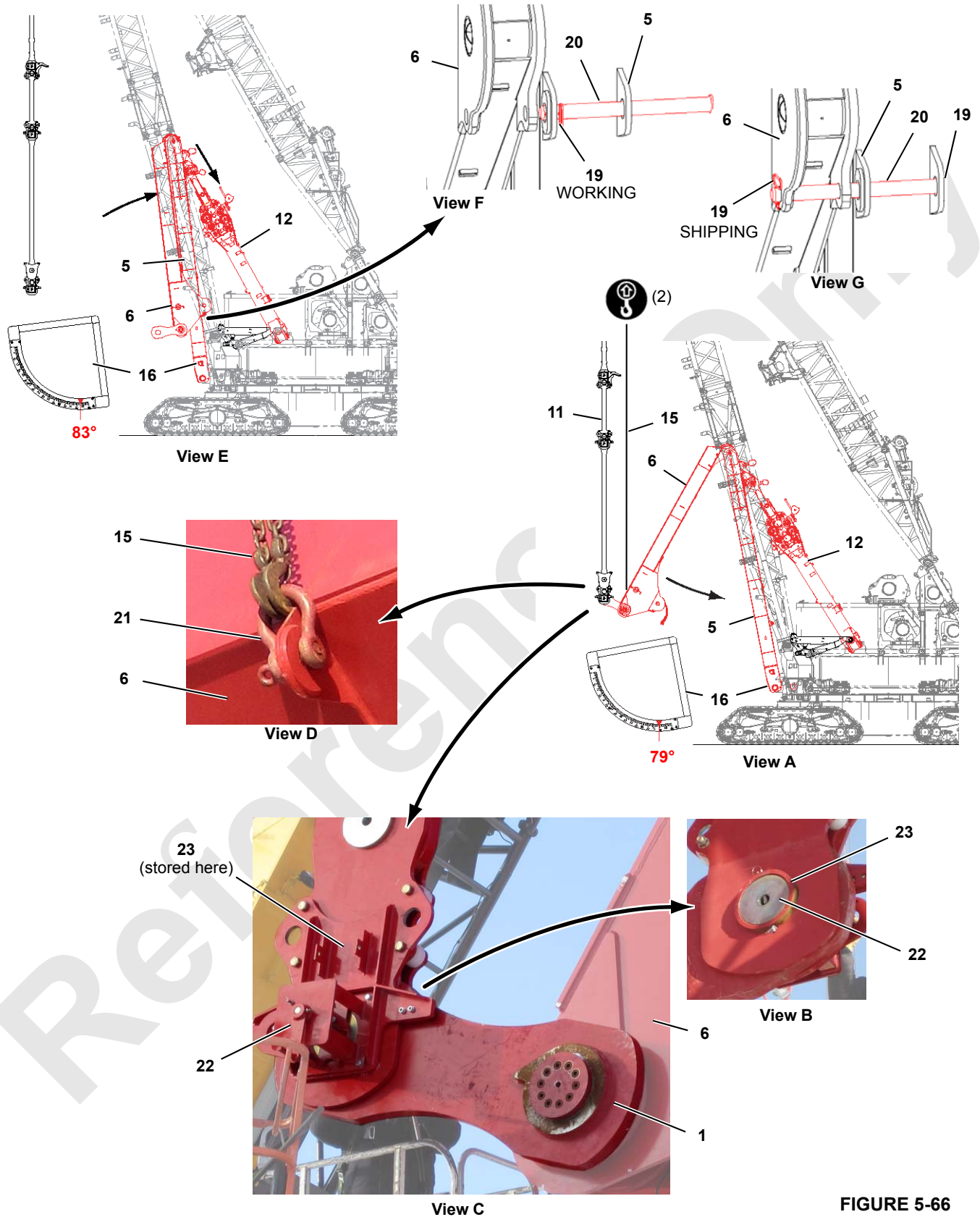


FIGURE 5-66

Legend for [Figure 5-66](#)

Item	Description
1	Link (2)
5	Pivot Frame
6	Counterweight Frame
11	Counterweight Straps
12	VPC Actuator
15	4-Leg Lifting Sling (chain)
16	Angle Indicator
19	Wire Lock Pin (2)
20	Pin (2)
21	Shackle (2)
22	Hand-Crank Pin (2)
23	Collar with Pin and Wire-Lock Pins (2)

Disconnect Counterweight Frame from Counterweight Straps

See [Figure 5-66](#) for the following steps.

- Retract VPC actuator (12, View A) with the remote control until pivot frame (5) is at an angle of 79° as indicated on angle indicator (16).
- Using shackles (21, View D) attach lifting slings (15) from a “rough terrain” crane to the lifting lugs on the end of counterweight frame (6).

The boom of the assist crane must be telescoped between the counterweight straps as the counterweight frame is detached. The load weighs 25,000 lb (11 340 kg).
- Lift with the assist crane until the lifting slings are tight.
- Remove collar (23, View B) from hand-crank pin (22) and store it (View C).
- Fully retract hand-crank pin (22, View C).

Counterweight straps (11) will hang vertically.
- Retract VPC actuator (12, View E) with the remote control until pivot frame (5) is at an angle of 83° as indicated on angle indicator (16).
- Using the assist crane, slowly lower counterweight frame (6) onto pivot frame (5).
- Remove wire-lock pins (19, View F) from the working position.
- Slide pins (20, View G) to the shipping position and reinstall wire-lock pins (19).
- Disconnect the lifting slings and remove the shackles.

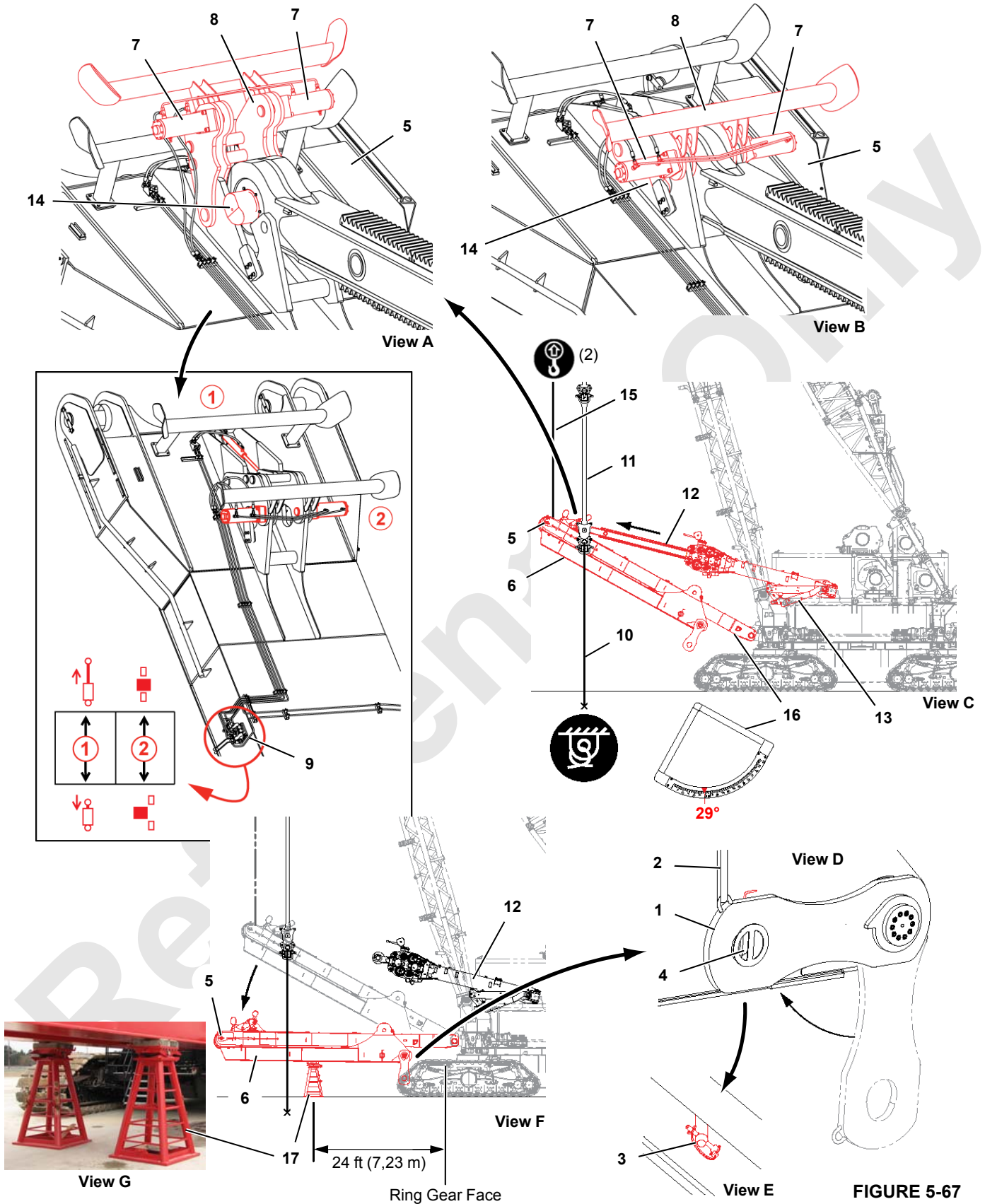


FIGURE 5-67

Legend for [Figure 5-67](#)

Item	Description
1	Link (2)
2	Nylon Lifting Sling
3	Retaining Pin with Wire Lock Pin (2)
4	Pin (2)
5	Pivot Frame
6	Counterweight Frame
7	Catch Pin (2)
8	Catch
9	Control Valve
10	Tagline
11	Counterweight Straps
12	VPC Actuator
13	VPC Raising Frame
14	Actuator Shaft
15	4-Leg Lifting Sling (chain)
16	Angle Indicator
17	Boom Support (2)

Detach VPC Actuator from Pivot Frame

See [Figure 5-67](#) for the following steps.

1. Attach taglines (10, View C) to counterweight straps (11).
2. Using the taglines, pull counterweight straps out — away from the frames — approximately 2 ft (1.5 m) and anchor the taglines.

This step is required to provide clearance for lowering the frames.
3. Extend VPC actuator (12, View C) with the remote control until pivot frame (5) is at an angle of 29° as indicated on angle indicator (16).
4. Raise VPC raising frame (13, View C) with the remote control so the raising frame is against the underside of the pivot frame.
5. Attach two legs of chain lifting sling (15, View C) to the lifting lugs on the end of pivot frame (5). The required

capacity is the weight of the rigging plus 88,000 lb (39 916 kg).

6. Using the assist crane, tighten the lifting slings.
7. Disengage catch pins (7, View B) with control valve (9) and fully open catch (8).
8. Using the remote control, extend VPC actuator (12, View A) and lower the beams with the assist crane so actuator shaft (14, View A) clears the pivot frame slots.
9. Using the remote control, raise VPC actuator (12, View C) slightly above the pivot frame with the VPC raising frame (13).
10. Using the remote control, fully retract VPC actuator (12, View F).
11. Using the assist crane, lower pivot frame (5, View F) and the counterweight frame (6) to horizontal.
12. Using a fork-lift truck, position boom supports (17, Views F and G) under counterweight frame (6).

Do not exceed the dimension given in View F. Side-to-side positioning of the boom supports is not critical.
13. Disconnect the lifting slings.
14. Using control valve (9), close catch (8, View B) and engage catch pins (7) for storage.
15. Disconnect taglines (10) and allow counterweight straps (11) to hang vertically.
16. Raise each link (1, View D) to the storage position as follows:
 - a. Attach nylon lifting sling (2, View D) from the assist crane to link (1).
 - b. Remove retaining pin (3, View E) and pin (4, View D).
 - c. Hoist with assist crane to rotate link (1) up to counterweight frame (5) and align the pin holes.
 - d. Reassemble pin (4) and retaining pin (3) to secure link (1) in the stored position on the counterweight frame (View D).
 - e. Disconnect the lifting sling.

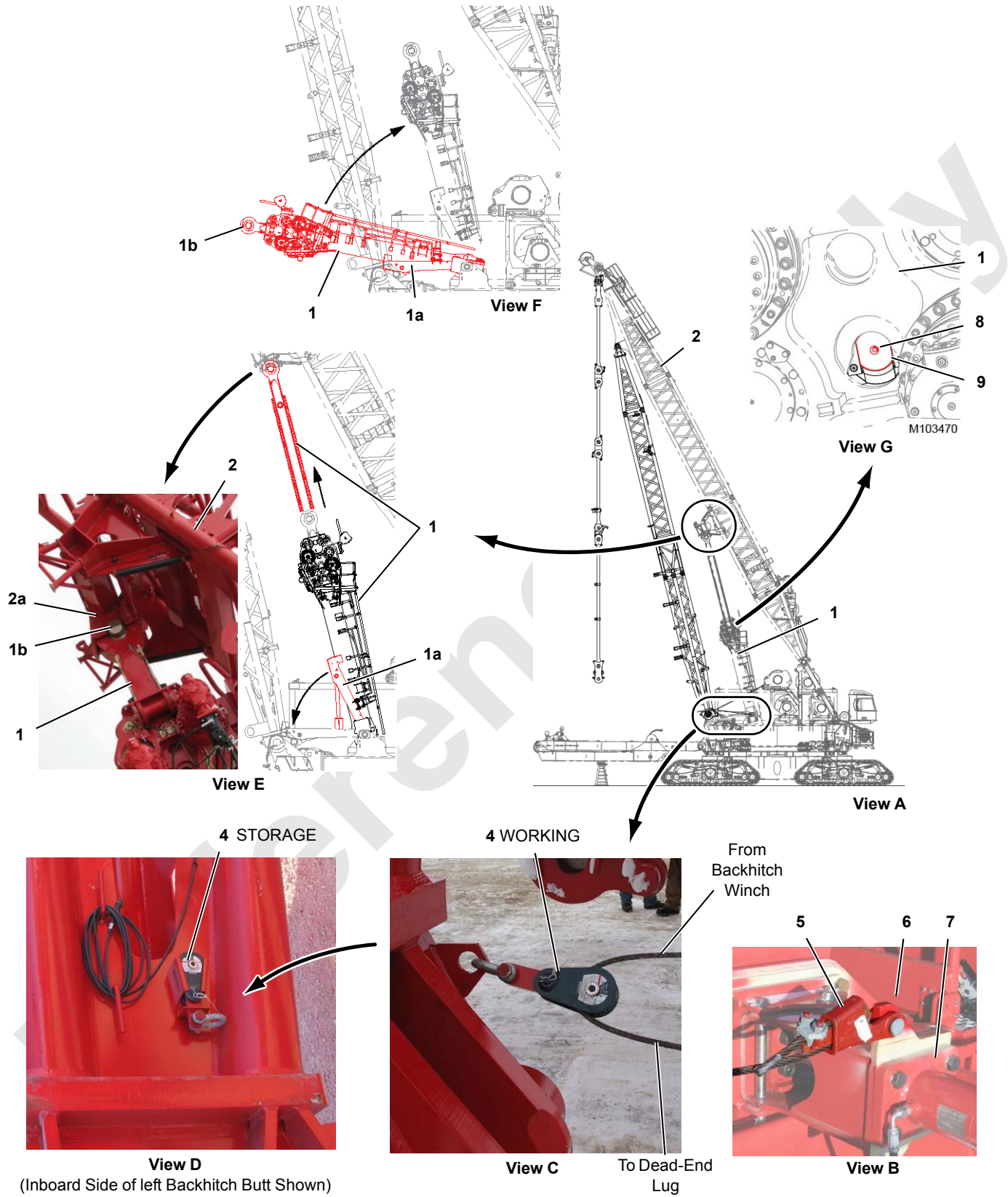


Figure 5-68

Legend for [Figure 5-68](#)

Item	Description
1	VPC Actuator
1a	VPC Actuator Frame
1b	Actuator Head
2	Mast
2a	Mast Raising Frame
3	See Next Page
4	Snatch Block (2)
5	Wedge Socket with Pin and Cotter Pin (2)
6	Dead-End Lug (2)
7	VPC Hydraulic Pin (2)
8	Threaded Rod
9	Max-Extend Stop Pin

CRANE DISASSEMBLY — MAST LOWERING

See [Figure 5-68](#) for the following steps.

NOTE The following personnel are required for this procedure:

- One rigging person to operate the remote controls from the platform on the right-rear corner of the rotating bed.
- A signal person on each side of the backhitch assembly to provide signals to the operator.

Closely watch the counterweight straps as the mast is lowered. Signal the operator to stop lowering the mast if the straps do not fold properly.

1. Apply grease by hand to actuator head (1b, View F).

2. Using the remote control, raise VPC actuator (1, View F) with VPC actuator frame (1a).
3. Extend VPC actuator (1, View E) until actuator head (1b) engages the pocket in mast raising frame (2a).
4. Collapse the VPC max-extend stop pin (9, View G) as follows:
 - a. Have an assembler climb the ladder to the platform on VPC actuator (1, View A).
 - b. Using a 14 mm socket, turn threaded rod (8, View G) in to collapse max-extend stop pin (9) until it is clear of the stops in the VPC actuator (1).
 - c. Get off VPC actuator (1) before proceeding.
5. Using the remote control, fully lower VPC actuator frame (1a, View E).
6. Remove snatch blocks (4, View D) from storage and fasten them to the lug on each backhitch butt (View C).
The snatch blocks are stored in a parts box for shipping.
7. Pay out the wire rope from both rigging winches (Drums 0) using the switches on the remote control.
One winch is mounted on each side of the boom hoist (Drum 4).
8. Route the wire rope over the top of each snatch block (4, View C) and dead-end the wire rope with wedge socket (5, View B) to lug (6) on each VPC hydraulic pin (7).
9. Take the slack out of the wire ropes.

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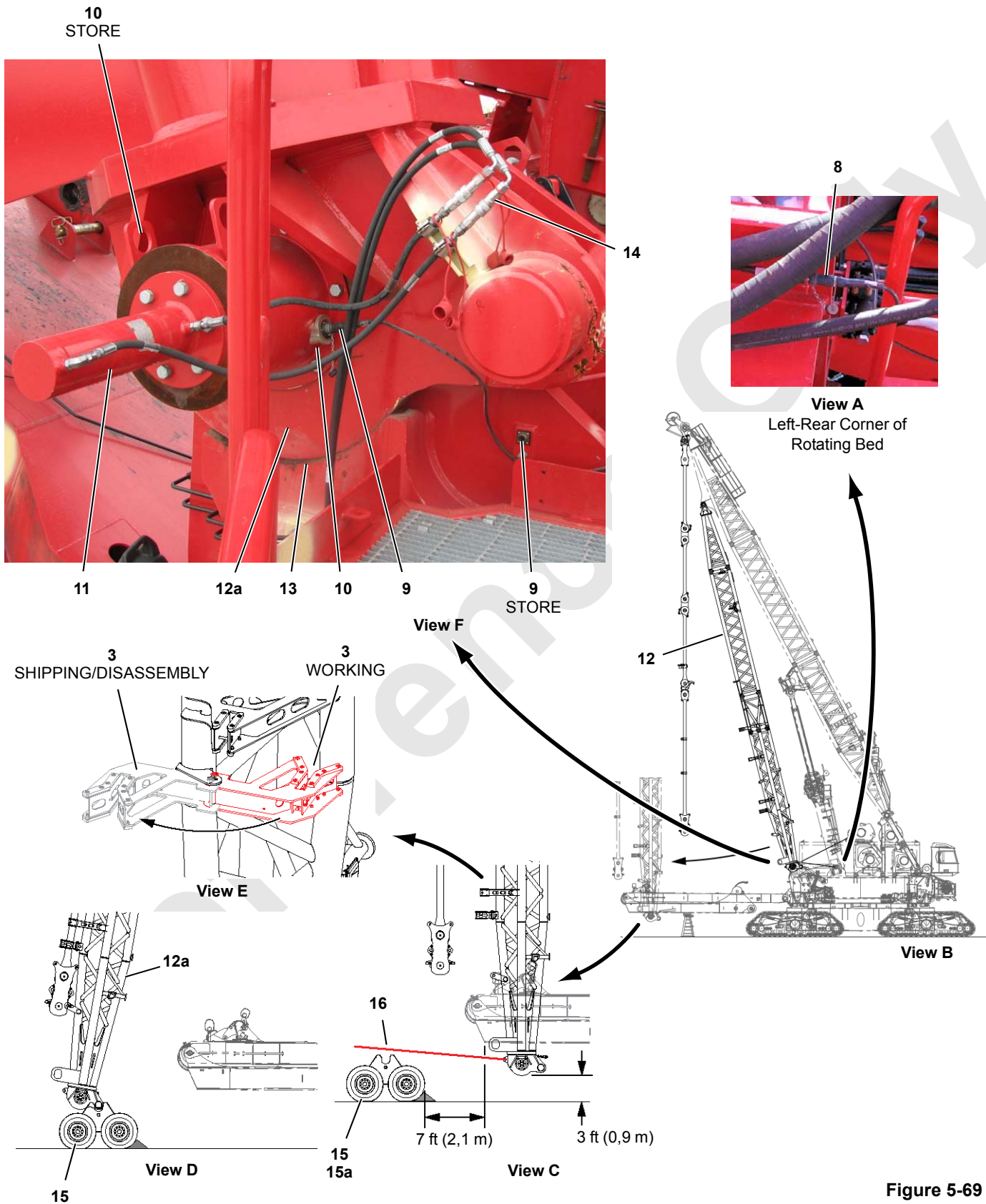


Figure 5-69

Legend for [Figure 5-68](#)

Item	Description
3	Strap Bracket with Pin and Wire-Lock Pin (2)
8	Electric Cable (CCTV 4P 17ME)
9	Electric Cable: <ul style="list-style-type: none"> • W75P2 (left side) • W75P4 (right side)
10	Locking Pin with Cotter Pin (2)
11	Backhitch Pin (2)
12	Backhitch
12a	Backhitch Butt
13	Alignment Saddle (Rear Roller Carrier)
14	Hydraulic Hoses (2 each pin)
15	Dolly (2)
15a	Wheel Chock
16	Assist Crane Rigging

See [Figure 5-69](#) for the following steps.

10. Disconnect electric cable (8, View A) from the receptacle on the left-rear corner of the rotating bed. Store the cable on the left side backhitch butt.
11. Disconnect electric cable (9, View F) from each locking pin (10). Connect electric cables (9) to the storage receptacles.
12. Remove locking pins (10, View F) and store them in the lugs provided.
13. Disengage backhitch pins (11, View F) using the backhitch pins switch on the remote control.
14. Make sure the wire rope from the rigging winches is tight.
15. Extend VPC actuator to raise backhitch butts (12a, View F) out of alignment saddles (13) on the rear roller carrier.
16. Once the backhitch butts are clear of the rear roller carrier, engage the backhitch pins for storage.
17. Disconnect hydraulic hoses (14, View F). Store the hoses on the rear roller carrier.
18. Slowly pay out the wire rope from both rigging winches (Drums 0) using the switches on the remote control until the backhitch is hanging vertical (View B).
19. Slacken the wire rope from the rigging winches.
20. Continue to retract the VPC actuator until the backhitch butts are 3 ft (0,9 m) from the ground (View C).
21. Disconnect and store the wire rope on the rigging winches.
Store the snatch blocks in the parts box for shipping.
22. Using a fork-lift truck, position a 2-axle dolly (15, View C) on both sides of the VPC counterweight frame at the dimension given.
Make sure both dollies are perpendicular to rear of crane (parallel to crawlers) or damage may occur.
23. Unpin strap brackets (3, View E) from the working position, rotate the brackets inward, and pin them in the shipping/disassembly position.
The counterweight straps will fold onto the brackets later in the lowering procedure.
24. Attach rigging (16, View C) from the assist crane to the lug on both backhitch butts.
25. Pull the backhitch butts rearward with the assist crane and extend the VPC actuator as needed to position the backhitch butts above the dollies (View D).
26. Retract the VPC actuator to lower the backhitch butts into the dollies.

Continued on Next Page

CAUTION

Avoid Damage!

Go slowly and do not allow backhitch butts to strike rear roller carrier during remaining steps.

Use care as backhitch butts clear VPC beam assembly. Guide backhitch butts clear of hydraulic piping on either side of VPC beam assembly.

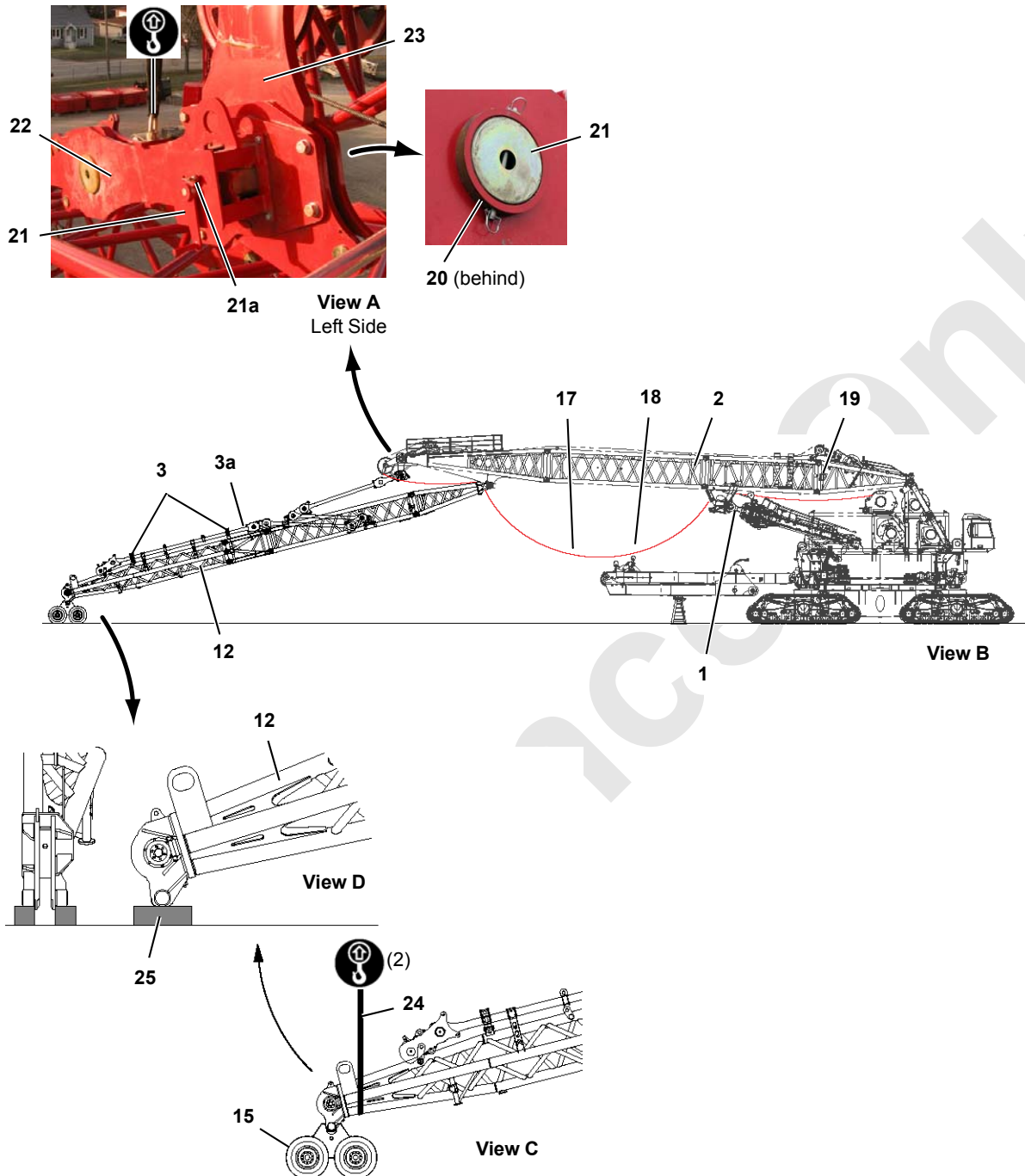


FIGURE 5-70

Legend for [Figure 5-70](#)

Item	Description
1	VPC Actuator
2	Mast
3	Strap Bracket with Pin and Wire-Lock Pin (2)
3a	Counterweight Straps
12	Backhitch
15	Dolly (2)
17	Boom Hoist Wire Rope
18	VPC Beam Assembly
19	Angle Indicator
20	Collar with Pin and Wire Lock Pins (2)
21	Hand-Crank Pin (2)
21a	Spring Plunger
22	Counterweight Strap (2)
23	Mast Link (2)
24	Nylon Lifting Sling (2)
25	Blocking

See [Figure 5-70](#) for the following steps.

27. Disconnect the assist crane rigging and move the assist crane out of the way.
28. Make sure the area to the rear of the backhitch is clear of personnel and obstructions.
29. Using the VPC actuator switch on the remote control, retract VPC actuator (1) to lower mast (2) and backhitch (12) to the rear.

Operate as slowly as possible. Stop operating immediately if signaled to do so.
30. As the mast lowers, boom hoist wire rope (17) will slacken. Haul in the boom hoist wire rope as necessary to keep it just above the guards on VPC beam assembly (18).
31. As the VPC actuator retracts:
 - Mast (2) will lower.
 - Backhitch (12) will lower as dollies (15) roll along the ground.
 - Counterweight straps (3a) will fold automatically into the strap brackets (3).
32. Stop lowering the mast when it is at 2.2° as measured on angle indicator (19, View B).
33. Attach a lifting sling to the lifting lug on counterweight strap (22, View A).
34. Lift with the assist crane until the lifting sling is tight.
35. Remove collar (20, View A) from the inboard side of hand-crank pin (21).
36. Disengage spring plunger (21a, View A) and fully retract hand-crank pin (21).
37. Lower counterweight strap (22, View A) from mast link (22) to the storage bracket on the backhitch.
38. Disconnect the lifting sling.
39. Fully engage hand-crank pin (21, View A) and install collar (20) for storage.

Rotate the hand-crank pin until spring plunger (21a, View A) is in the locking hole.
40. Repeat the procedure for the other counterweight strap.
41. Using the VPC actuator switch on the remote control, raise the mast to 7° as measured on angle indicator (19, View B).
42. Using nylon lifting slings (24, View C) basketed around the end of both backhitch butts, lift the butts out of dollies (15).
43. Remove the dollies from the area with a fork-lift truck.
44. Lower the ends of the backhitch butts onto blocking (25, View D).
45. Disconnect the lifting slings.

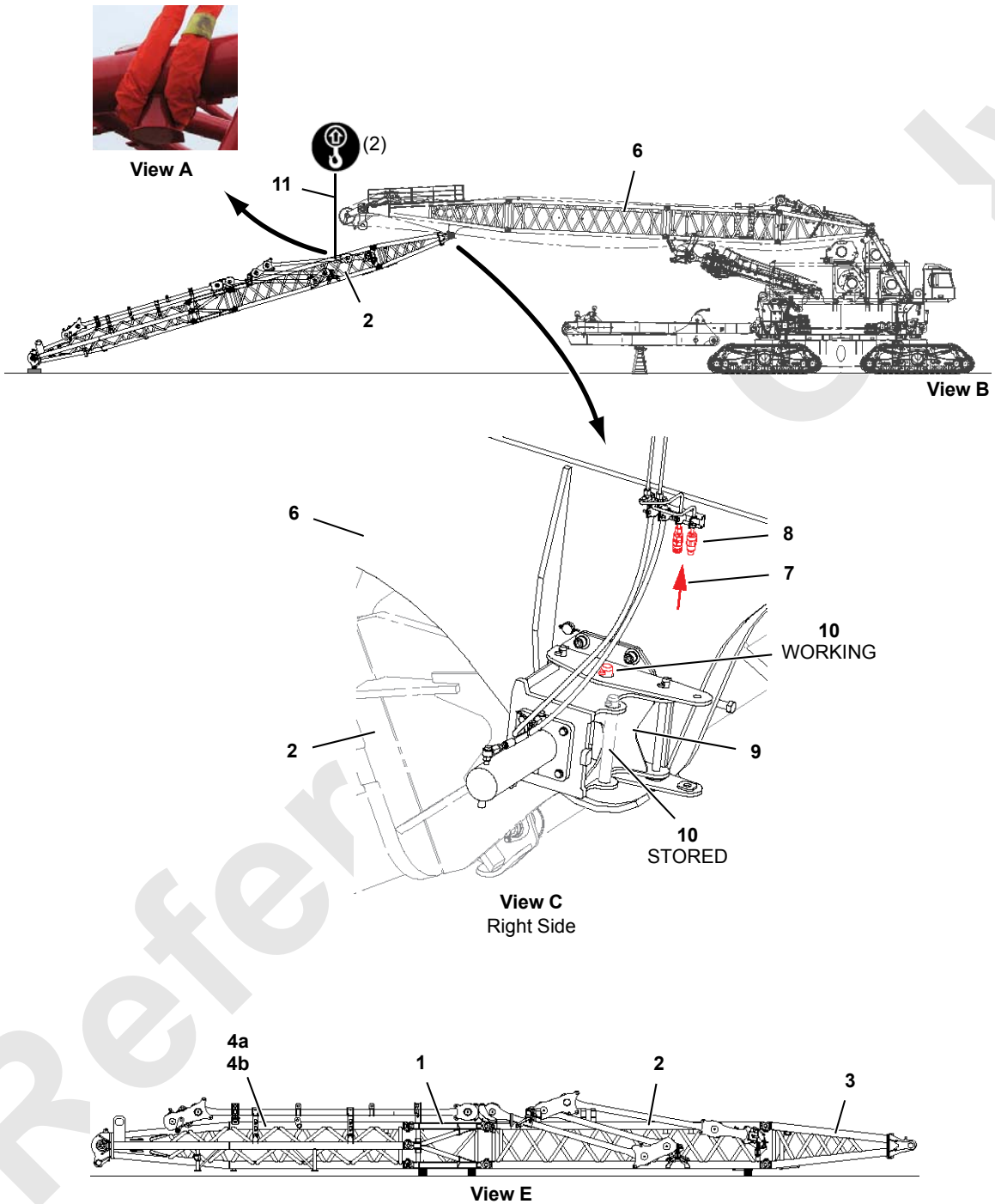


Figure 5-71

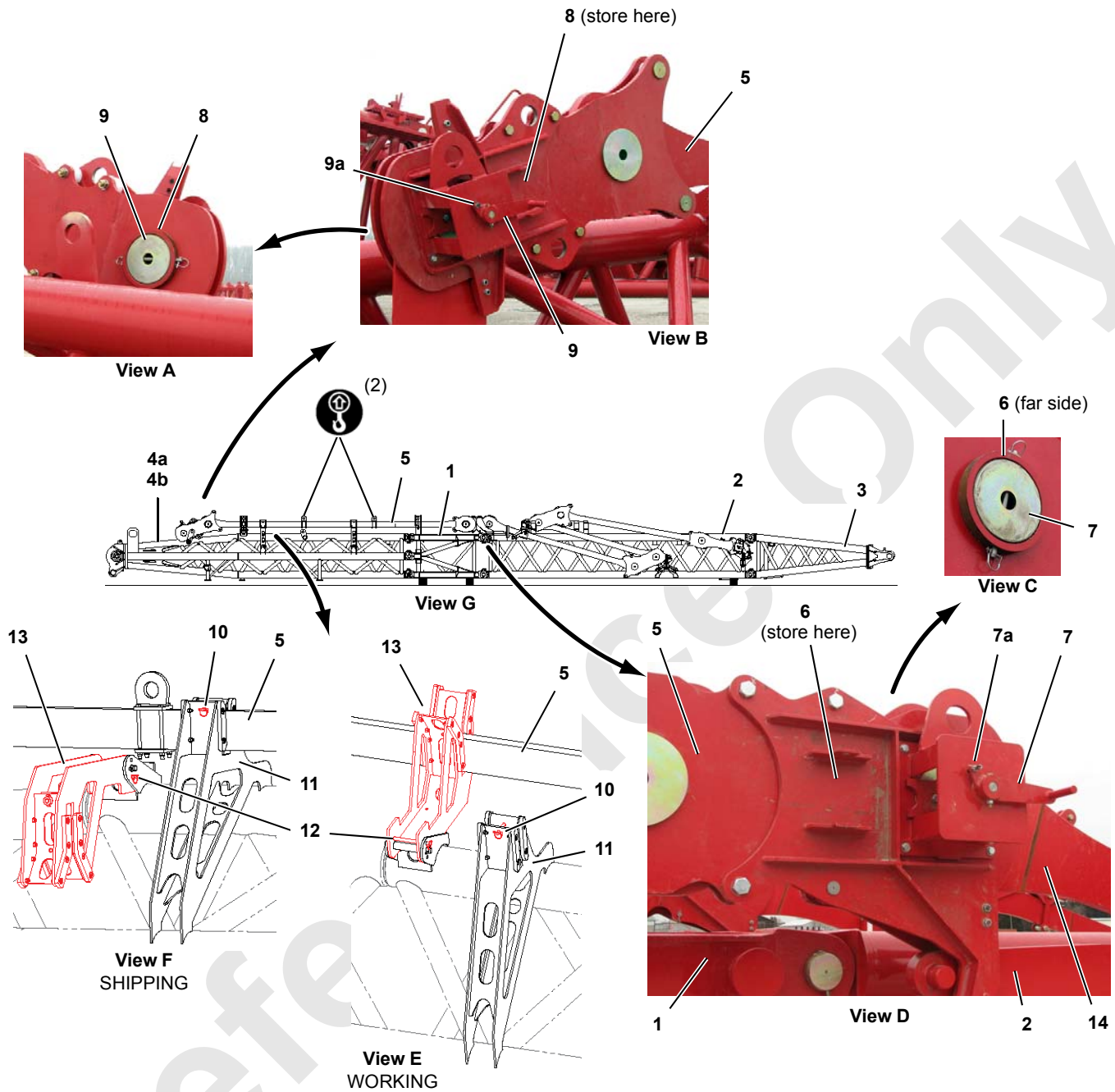
Legend for [Figure 5-71](#)

Item	Description
1	Transition Insert
2	Insert
3	Top
4a	Right Butt
4b	Left Butt
5	Backhitch Assembly
6	Mast
7	Hydraulic Hoses from Hand-Held Accessory Valve)
8	Hydraulic Couplers
9	Pin (hydraulic) (2)
10	Pin with Wire Lock Pin (2)
11	Nylon Lifting Sling (2)

CRANE DISASSEMBLY — BACKHITCH**Remove Backhitch**

See [Figure 5-71](#) for the following steps.

1. Attach two nylon lifting slings (12, View C) to the middle lugs on backhitch insert (2) as shown in View F.
2. Lift with the assist crane until the lifting slings are tight: assist crane LMI should read 87,000 lb (37 648 kg).
3. Connect hydraulic hoses (7, View B) from the hand-held accessory valve to hydraulic couplers (8) on either side of mast (6).
4. Start the PPU.
5. Remove pins (10, View B) from the working position and install them in the shipping position.
6. Fully disengage pins (9, View B) using the hand-held accessory valve.
7. Using the assist crane, slowly lower the backhitch assembly onto blocking at ground level (View E). The blocking must be 8 - 10 in (203 - 254 mm) high
8. Disconnect the lifting slings.
9. Stop the PPU.
10. Disconnect hydraulic hoses (7, View B) from the hand-held accessory valve at hydraulic couplers (8) on either side of mast (6).



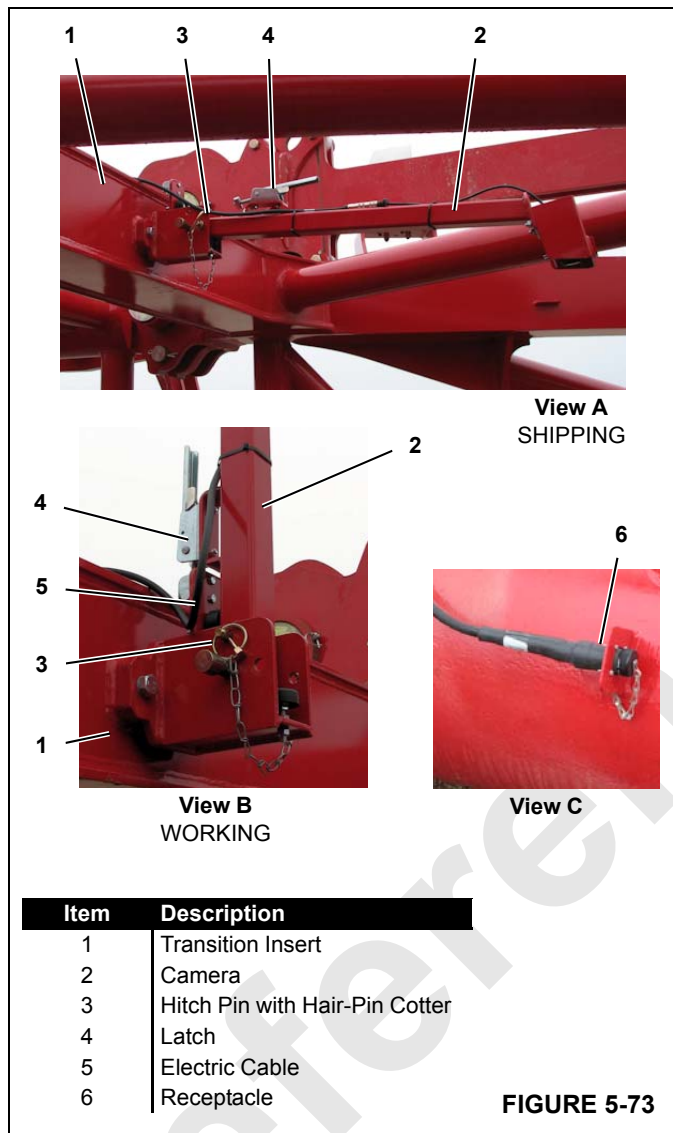
Item	Description	Item	Description
1	Transition Insert	8	Collar with Pin and Wire-Lock Pins (2)
2	Insert	9	Hand-Crank Pin (2)
3	Top	9a	Spring Plunger
4a	Right Butt	10	Pin with Wire-Lock Pin (2)
4b	Left Butt	11	Strap Bracket (2)
5	Straps (2)	12	Pin with Wire-Lock Pin (2)
6	Collar with Pin and Wire-Lock Pins (2)	13	Strap Bracket (1)
7	Hand-Crank Pin (2)	14	Strap (2) (on insert 2)
7a	Spring Plunger (2)		

FIGURE 5-72

Disassemble Backhitch

See [Figure 5-73](#) for the following step.

1. Move backhitch camera (2), mounted on the transition insert, from the working position (View B) to the shipping position (View A).



See [Figure 5-72](#) for the following steps.

2. Attach two legs of the chain lifting sling to the lifting lugs on strap (5, View G).
3. Lift with the assist crane until the lifting slings are tight.
4. Remove collar (6, View C) from hand-crank pin (7) and store the collar (View D).
5. Disengage spring plunger (7a, View D) and fully retract hand-crank pin (7).
6. Using the assist crane, lift strap (5, View G) out of the strap brackets on the backhitch.
7. Support strap bracket (13, View E) with a forklift truck or the whip line from another assist crane and remove pin (12).
8. Rotate strap bracket (13, View E) to the shipping position (View F) and reinstall pin (12).
9. Remove pin (10, View E) from two strap brackets (11).
10. Lower strap (5, View F) into strap brackets (10)
11. Align hand-crank pin (9, View B) with the hole in the lug on the backhitch butt.
12. Install pins (10, View F) in strap brackets (11).
13. Fully engage hand-crank pin (9, View B).
14. Remove collar (8, View B) from storage and install it on hand-crank pin (9, View A).
Rotate the hand-crank pin until spring plunger (9a, View B) is in the locking hole.
15. Disconnect the lifting slings.
16. Repeat the above steps for other strap (5).
17. Fully engage hand-crank pin (7, View D) for storage and install collar (6, View C).

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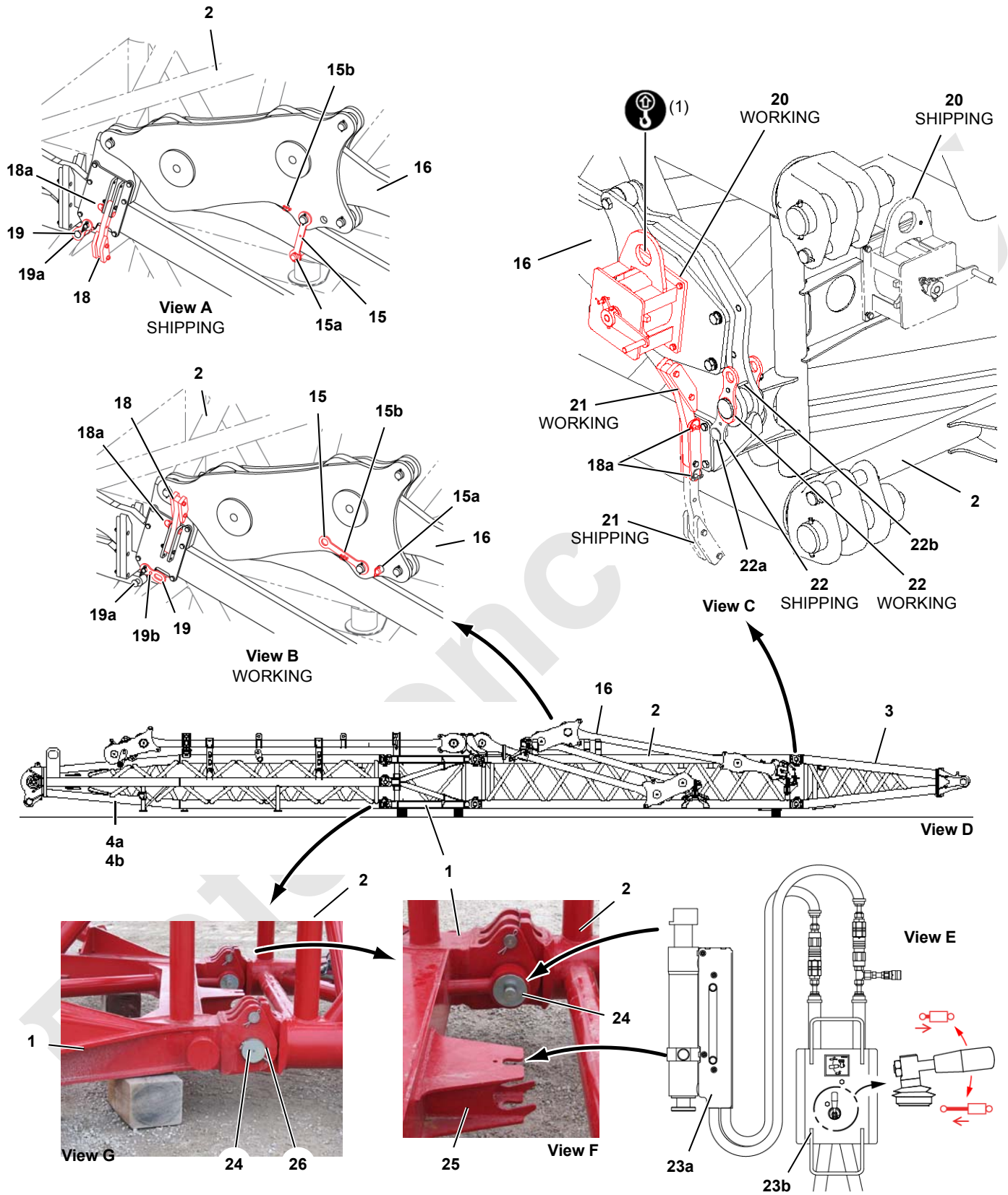


FIGURE 5-74

Legend for [Figure 5-74](#)

Item	Description
1	Transition Insert
2	Insert
3	Top
4a	Right Butt
4b	Left Butt
15	Link (4)
15a	Pin with Wire-Lock Pin (2)
15b	Pin with Wire-Lock Pin (2)
16	Strap (2)
18	Strap Guide Bracket (2)
18a	Pin with Wire-Lock Pin (6)
19	Link (4)
19a	Pin with Wire-Lock Pin (2)
19b	Pin with Wire-Lock Pin (2)
20	Hand-Crank Pin (2)
21	Strap Guide Bracket (4)
22	Links (2)
22a	Pin with Wire-Lock Pin (2)
22b	Pin with Wire-Lock Pin (2)
23a	Hand-Held Cylinder (with trunnions)
23b	Hand-Held Accessory Valve
24	Connecting Pin
25	Bracket
26	Pin with Cotter Pins

See [Figure 5-74](#) for the following steps.

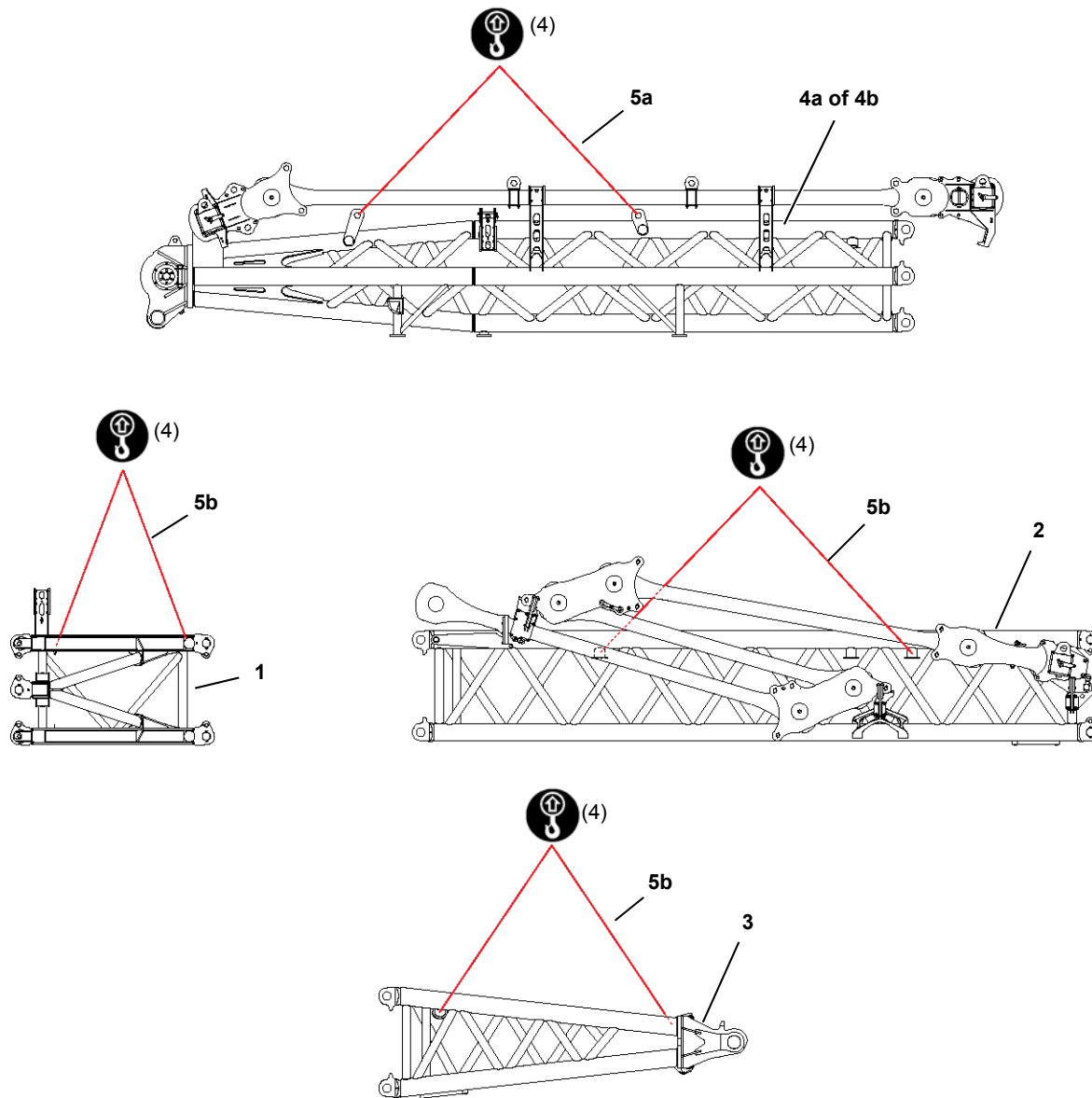
18. Unpin links (19, View B) from the working position and pin them in the shipping position (View A). Perform this step at two locations.
19. Unpin strap guide brackets (18, View B) from the working position and pin them in the shipping position (View A). Perform this step at two locations.
20. Unpin links (15, View B) from the working position and pin them in the shipping position (View A). Perform this step at two locations.
21. Unpin links (22, View C) from the working position and pin them in the shipping position. Perform this step at two locations.
22. Move hand-crank pins (20, View C) from the working position to the shipping position. Perform this step at two locations.

Use a chain lifting sling attached to the lifting hole in the hand-crank pin.

23. Unpin strap guide brackets (21, View C) from the working position and pin them in the shipping position. Perform this step at four locations.
24. To ensure stability, disassemble the backhitch sections in the following order (View D):
 - Right and left butts (4a and 4b).
 - Top (3).
 - Insert (2).
 - Transition insert (1).
25. Connect the hydraulic lines from the PPU to hand-held cylinder (23, View E).
26. Remove each section as follows:
 - a. Attach lifting slings to the lugs on the section. See [Figure 5-75](#) for lifting points.
 - b. Lift with the assist crane so the lifting slings are tight.
 - c. Place hand-held cylinder (23a, View E) in position so the cylinder trunnion engages the slots in bracket (25, View F) and the cylinder rod end engages the head of connecting pin (24).
 - d. Connect hand-held accessory valve (23b, View E) to the PPU and to hand-held cylinder (23a) and start the PPU.
 - e. Remove pin (26, View G) from connecting pin (24).
 - f. Fully retract connecting pin (24).
 - g. Move the hand-held cylinder to the next position.
 - h. Repeat the steps for each connecting pin (24) in the section.
 - i. Lift the section away from the adjacent section.
27. Prepare each section for shipping as follows:
 - a. Engage connecting pins (24) for storage using the hand-held cylinder.
 - b. Install pins (26).
28. Using the assist crane, lift the section onto a trailer for shipping.
29. Disconnect the lifting slings.
30. Repeat the procedure for the remaining sections of the backhitch assembly.
31. Remove the hand-held cylinder and accessory valve.

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Reference Only



Item	Description
1	Transition Insert
2	Insert
3	Top
4a	Right Butt
4b	Left Butt
5a	Chain Lifting Sling
5b	Nylon Lifting Sling

Figure 5-75

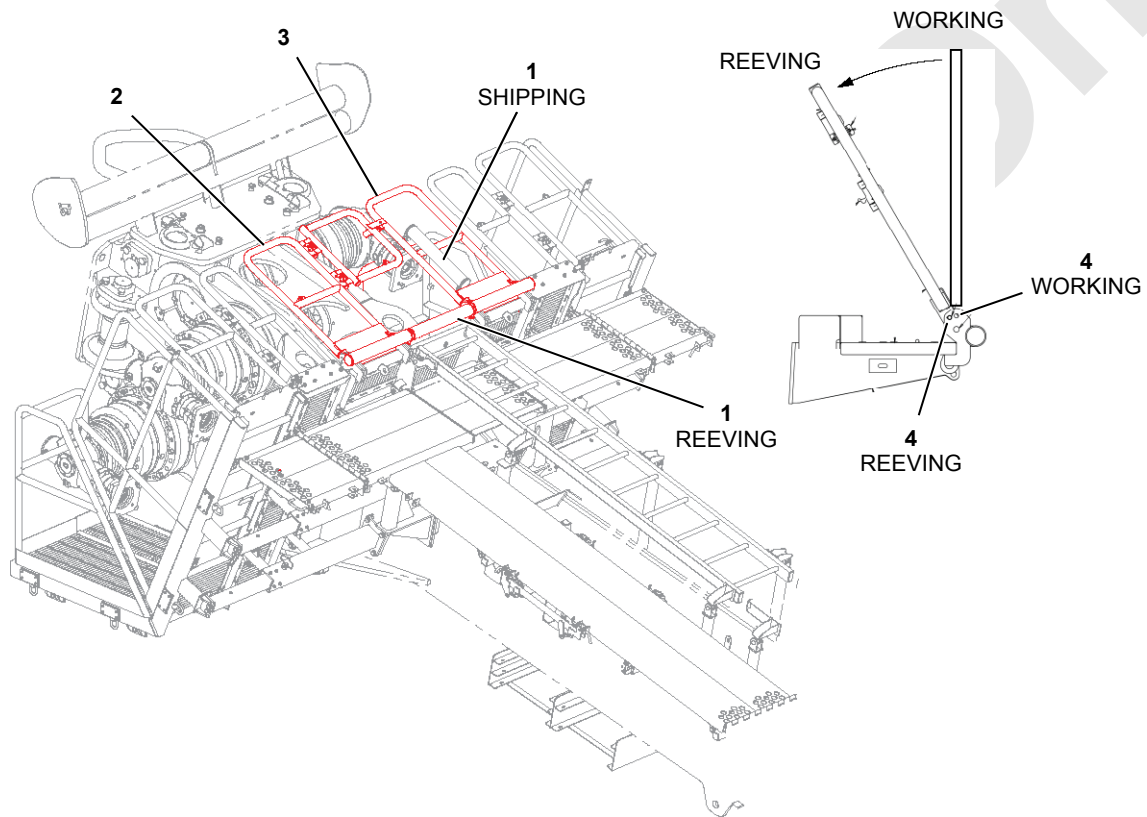


Figure 5-76

Legend for [Figure 5-76](#)

Item	Description
1	Roller
2	Handrail
3	Handrail
4	Quick-Release Pin (4)

Prepare VPC Actuator Platform for Reeving

See [Figure 5-76](#) for the following procedure.

Damage will occur during mast removal if you do not perform the following steps.

1. Move roller (1) from the shipping position to the reeving position.
2. Rotate handrails (2 and 3) from the working position to the reeving position.

Reference Only

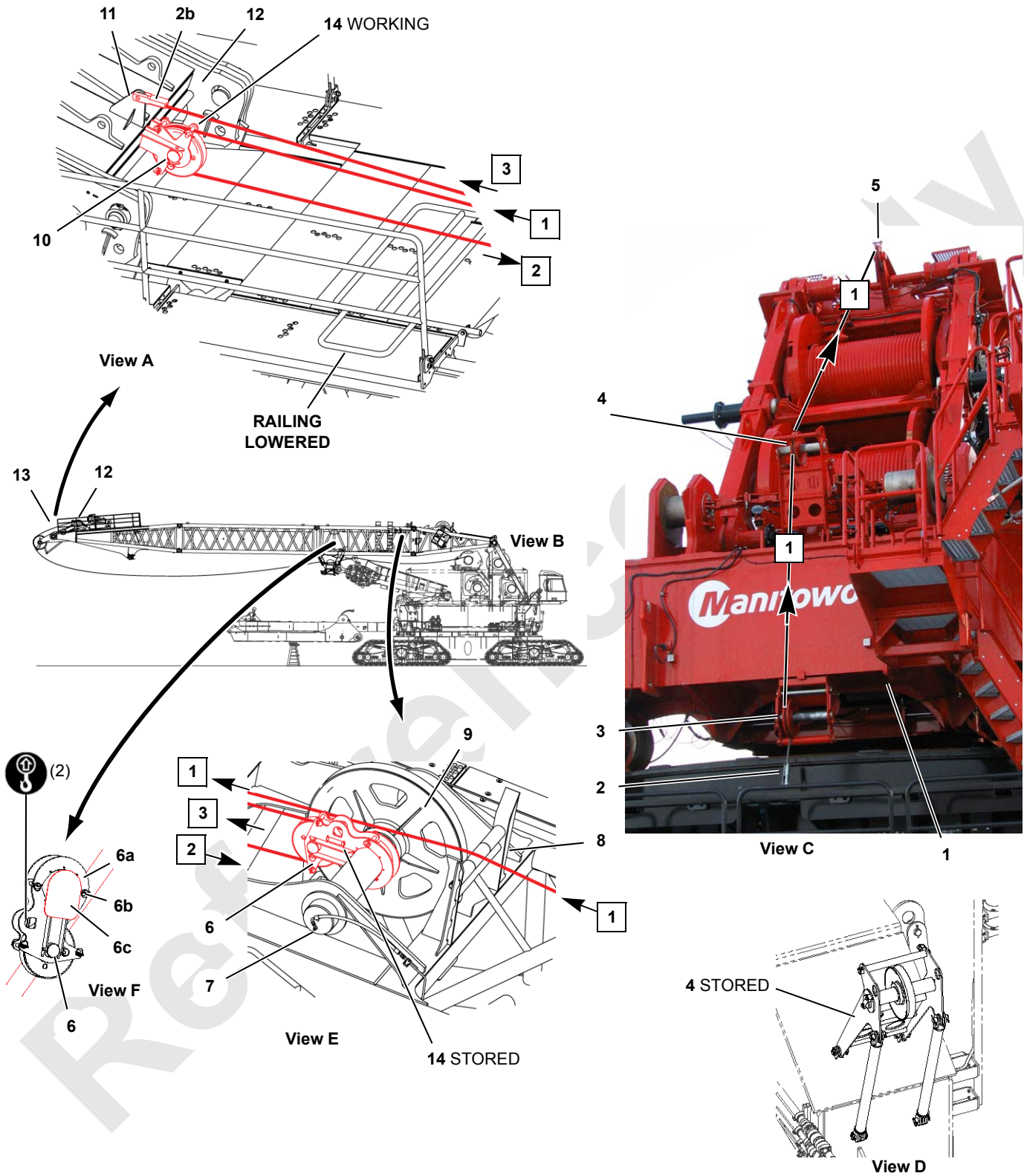


Figure 5-77

CRANE DISASSEMBLY — MAST

Move Equalizer from Mast Butt to Mast Top

Legend for [Figure 5-77](#) and [Figure 5-78](#)

Item	Description
1	Drum 6
2	Rigging Line with Button
2a	Alignment Lug
2b	Button Socket
2c	Pin with Cotter Pin
3	Wire Rope Guide
4	Wire Rope Guide
5	Wire Rope Guide
6	Wire Rope Guide
6a	Clamp
6b	Pin with Wire Lock Pin
6c	Storage Lug
7	Shaft
8	Roller
9	Sheave
10	Guide Sheave
11	Lug
12	Equalizer
13	Sheave Bank
14	Pin with Cotter Pins

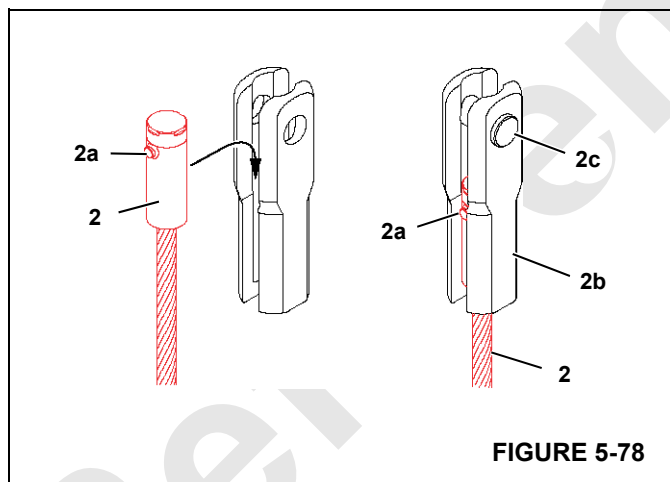


FIGURE 5-78

See [Figure 5-77](#) for the following steps.

1. If not already done, lower the front railing on the mast top platform (View A).

2. Remove wire rope guide (4, View D) from storage on the right end of the front roller carrier and install the wire rope guide on the center of the front roller carrier (View C).
3. Attach lifting slings from the assist crane to the lifting holes in wire rope guide (6, View F). The wire rope guide is stored on the diagonal lacing inside the 8,5 m mast insert.
4. Raise wire rope guide (6, View F) to horizontal, remove pin (6b) and lift the wire rope guide out of the insert.
5. Assemble wire rope guide (6, View E) to shaft (7).
6. Grease sheaves (3, 4, 5, 6, and 10). Make sure shafts of wire rope guides (3 and 4) are coated with grease.
7. Turn on the rigging winch mode (see [page 5-13](#)).
8. Pay out rigging line (2) from Drum 6 (see [page 5-13](#)).

NOTE During the following steps, it will be necessary to remove the rope guards from the sheaves. Reinstall the rope guards once the rigging line is engaged with the sheaves.

Pull the rigging line with the assist crane. Use a nylon lifting sling from the assist crane “chocked” around the rigging line.

9. Route the rigging line, as follows (follow numbered boxes):
 - Under guide sheave (3, View C).
 - Over guide sheave (4, View C).
 - Over guide sheave (5, View C).
 - Over roller (8, View E) in mast butt.
 - Over shaft (7, View E) in the mast butt. **Do not route the rigging line over sheave (9).**
 - Over guide sheave (10, View A).
 - Under guide sheave (6, View E).
 - Over guide sheave (6, View E) to lug (11, View A) on equalizer (12).
10. Attach the rigging line to lug (11, View A) with button socket (2a, [Figure 5-78](#)).
11. Remove pin (14, View E) from storage on wire rope guide (6) and install the pin over guide sheave (10, View A).

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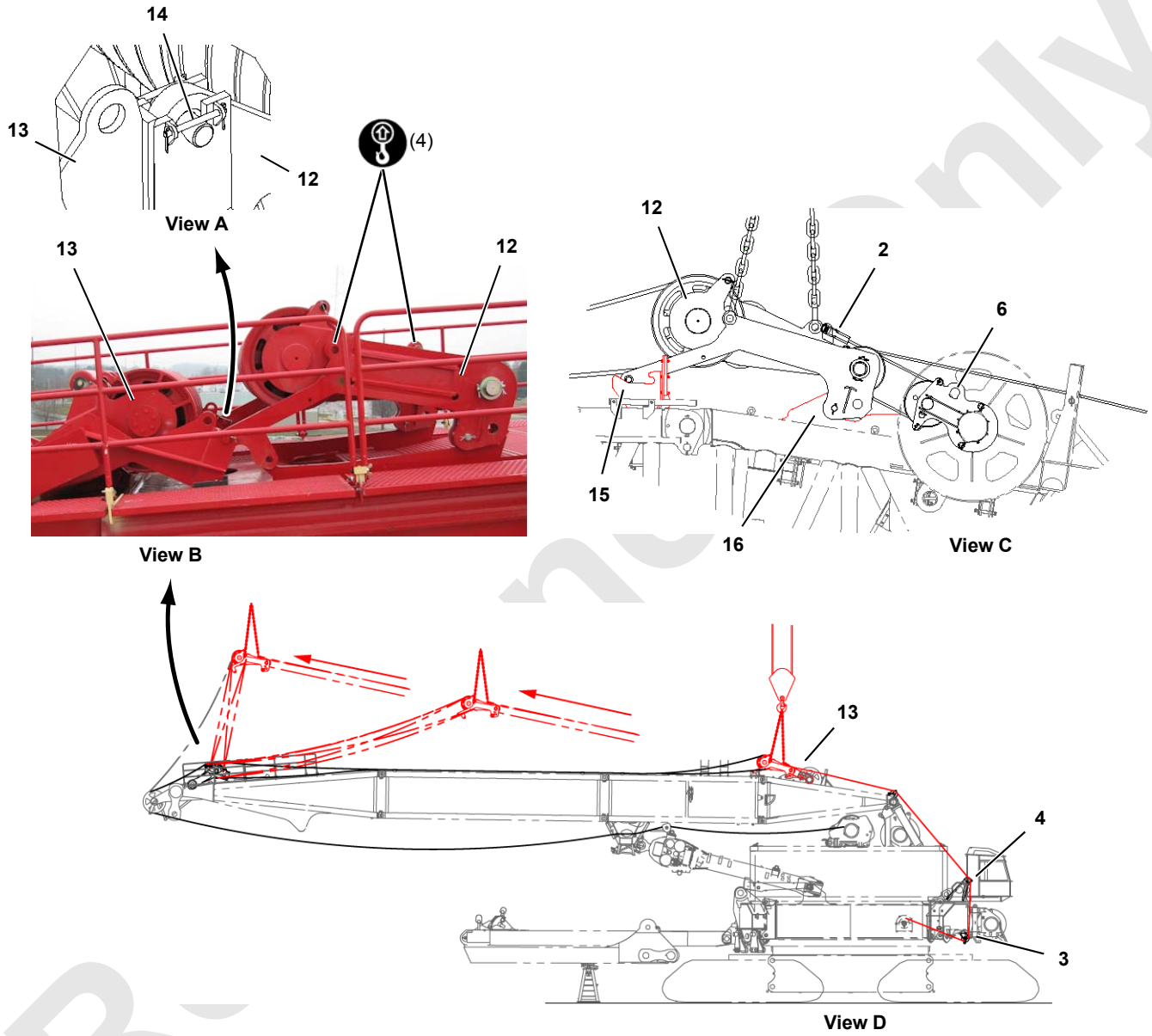


FIGURE 5-79

Legend for [Figure 5-79](#)

Item	Description
2	Rigging Line with Button Socket
3	Wire Rope Guide
4	Wire Rope Guide
6	Wire Rope Guide
12	Equalizer
13	Sheave Bank
14	Pin with Cotter Pins (2)
15	Rail, Insert (2)
16	Rail, Butt (2)

See [Figure 5-79](#) for the following steps.

12. Attach four legs of the chain lifting sling ([Figure 5-8](#), View A) to the lifting holes in equalizer (12, View B).

CAUTION

Avoid Damage!

Keep slack in boom hoist reeving while handling equalizer with assist crane.

Failing to do so could result in mast being lifted off VPC actuator.

Damage to VPC actuator or raising frame could occur.

Maximum reading of assist crane's Rated Capacity Indicator must not exceed 25,000 lb (11 340 kg).

13. Using the assist crane, lift equalizer (12, View B) off rails (16) and (11) while paying out the rigging line. Hold the equalizer 2-3 ft (0,6-0,9 m) above the mast.
14. Pull back the boom hoist control to haul in the boom hoist wire rope — the rigging line will automatically follow. Engine speed controls wire rope tension.
15. Follow with the assist crane as the equalizer is pulled to the storage position on the mast top.
16. Stop when the equalizer is close to the end of sheave bank (13, View B).
17. Remove pins (14, View A).
18. Lower the equalizer with the assist crane so the pins in the equalizer engage the hooks in the sheave bank (View B) and the equalizer lands on the mast top rails.
19. Install pins (14, View A) to secure the equalizer.
20. Disconnect the lifting slings.
21. Disconnect the rigging line and store it on Drum 6.
22. Move wire rope guide (4, View D) to the storage position on the right end of the front roller carrier ([Figure 5-77](#), View F).
23. Move wire rope guide (6, View C) from the working position to the storage position ([Figure 5-77](#), View F).

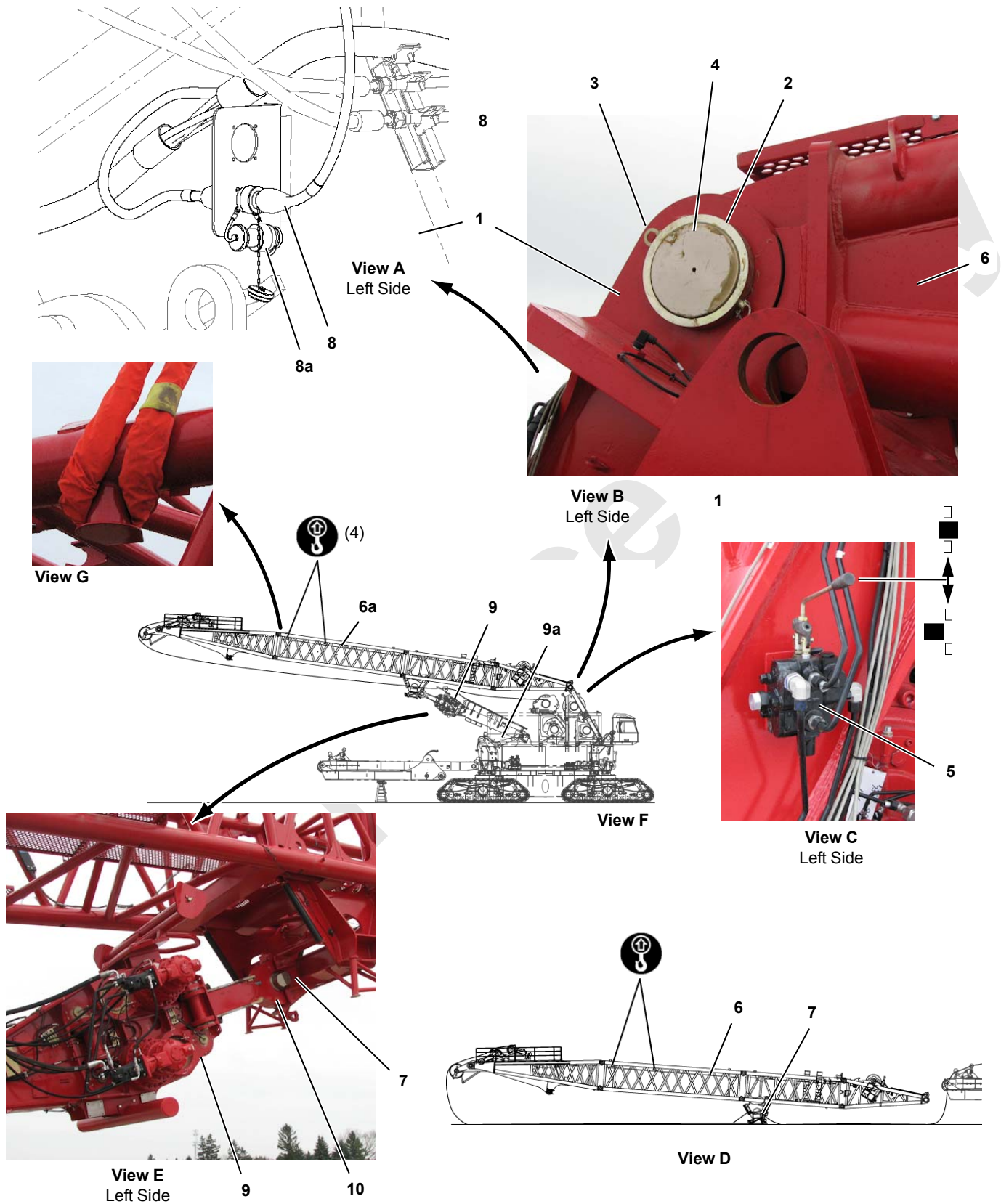


Figure 5-80

Legend for [Figure 5-80](#)

Item	Description
1	Drum 1
2	Collar (2)
3	Pin with Wire Lock Pin
4	Connecting Pin
5	Control Valve
6	Mast
6a	Mast Insert
7	Mast Raising Frame
8	Electric Cable
8a	Terminator Plug
9	VPC Actuator
9a	VPC Actuator Frame
10	Head

Remove Mast from Crane

See [Figure 5-80](#) for the following steps.

- Using the remote control, raise the mast with the VPC actuator until the mast is at 10°.
- Attach nylon lifting slings to the four lifting lugs nearest the top end of mast insert (6a, View F) as shown in View G.
- Lift with the assist crane until the assist crane is supporting the weight of the mast. The assist crane's LMI should read 163,000 lb (73 936 kg).
- Using the remote control, raise VPC actuator frame (9a, View F) against the underside of VPC actuator (9).

CAUTION

Avoid Structural Damage!

Do not retract VPC actuator from mast raising frame until VPC actuator frame is raised.

VPC actuator will fall uncontrolled onto rotating bed.

- Fully retract VPC actuator (9, View F).
- Fully lower VPC actuator frame (9a, View F) and VPC actuator (9).
- Disconnect electric cable (8, View A) from the receptacle on Drum 1. Connect a protective cap to the cable and store the cable on the mast butt.
- Connect the small diameter end of terminator plug (8a, View A) to the receptacle on Drum 1. **You will not be able to operate the VPC raising frame when crane is reassembled if fail to perform this step.**
- Unpin and remove collars (2, View B) from connecting pins (4).
- Start the engine and disengage the connecting pins with control valve (5, View C).
- Lift the mast away from the crane while paying out the boom hoist wire rope as needed.
- Engage connecting pins (4, View B) with control valve (5, View C) for storage.
- Reinstall collars (2, View B) for storage and secure with pins (3).
- Lower mast (6, View D) until mast raising frame (7) contacts the ground directly to the rear of the crane. Maintain support of the mast weight with the assist crane.

Store Remote Control

See [Figure 5-12](#) on [page 5-14](#) for the following steps.

- Disconnect remote control (3, View D) from junction box (4, View E).
- Clean all plugs and receptacles.
- Connect the protective cap on the remote control cable and store the remote control in the operator cab.
- Connect the terminator plug to the junction box receptacle. CAN faults and faulty operation will occur if this step is not performed.

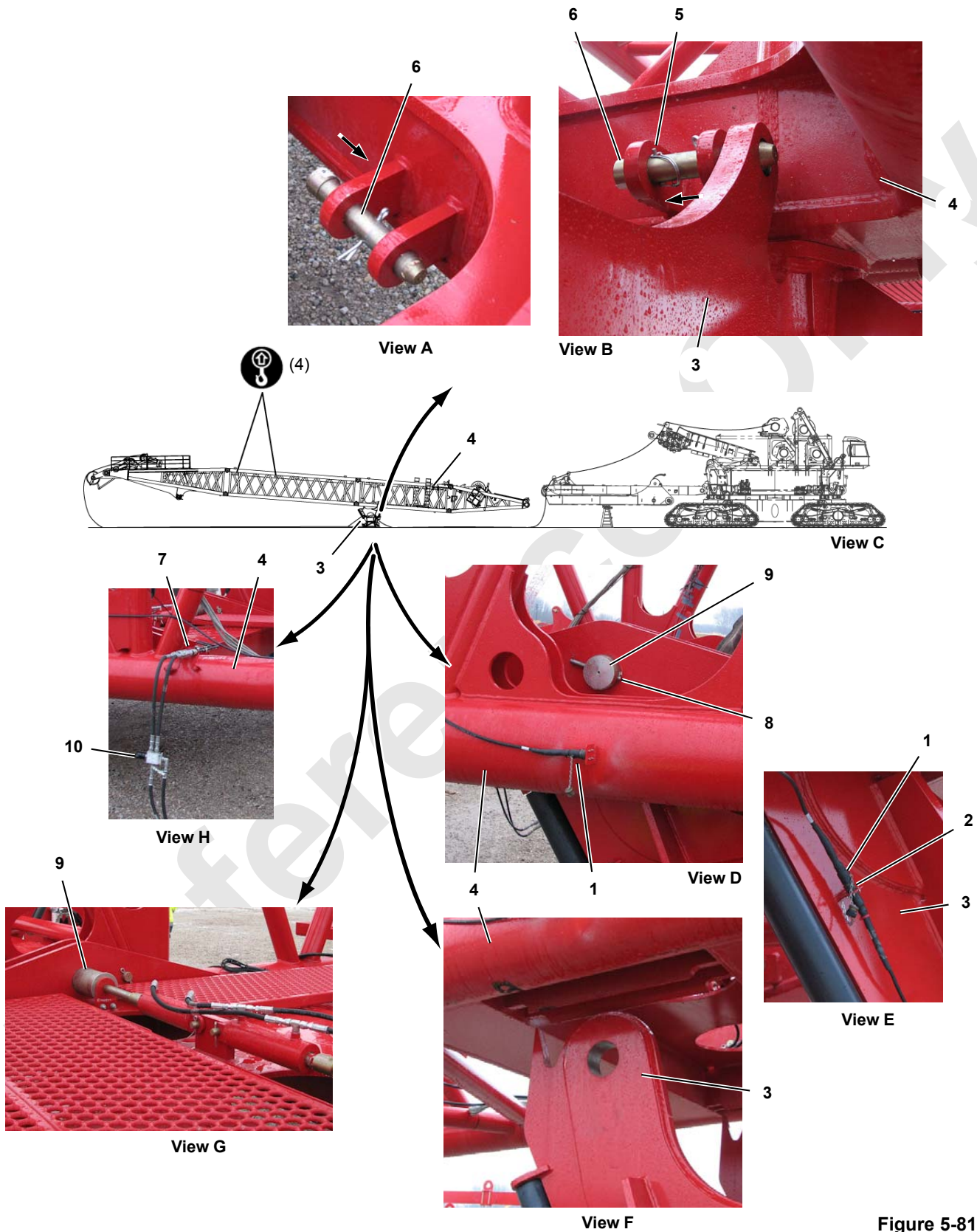


Figure 5-81

Legend for [Figure 5-81](#)

Item	Description
1	Electric Cable
2	Receptacle
3	Mast Raising Frame
4	Mast Insert
5	Wire Lock Pin (2)
6	Pin (2)
7	Hydraulic Couplers
8	Pin with Cotter Pins (2)
9	Connecting Pin (2)
10	Hand-Held Valve Assembly

Disconnect Mast from Raising Frame

See [Figure 5-81](#) for the following steps.

1. Disconnect electric cable (1, View E) from receptacle (2) on mast raising frame (3) and plug cable (1, View D) into the dummy receptacle on mast insert (4).
2. Remove wire lock pins (5, View B) and pull pins (6, View B) inward against the cotter pins to disengage one end of the mast raising frame from the insert.
3. Connect hand-held accessory valve (10, View H) from the PPU to hydraulic couplers (7, View H) on mast insert (4).
4. Remove pins (8, View D) from connecting pins (9).
5. Start the PPU and disengage connecting pins (9, View G) with the hand-held accessory valve.
6. Lift the mast clear of mast raising frame (3).
Take every precaution to prevent damaging the boom hoist wire rope.
7. Lower the mast assembly onto blocking directly to the rear of the raising frame. Pay out boom hoist wire rope as required.
 - Blocking must be at least 30 in (762 mm) high.
 - The blocking must straddle the boom hoist wire rope.
 - Block both ends of the 8,5 m mast insert.
 - Block under top end of the 12 m mast insert.
 - The center line of the mast assembly must be parallel to the ground.
 - The mast assembly must be level from side to side.
8. Disconnect the lifting slings.
9. Engage pins (6, View B) for storage and install wire lock pins (5).
10. Using the hand-held accessory valve, engage connecting pins (9, View D) for storage and reinstall pins (8).
11. Stop the PPU and disconnect hand-held accessory valve (10, View H) from hydraulic couplers (3).

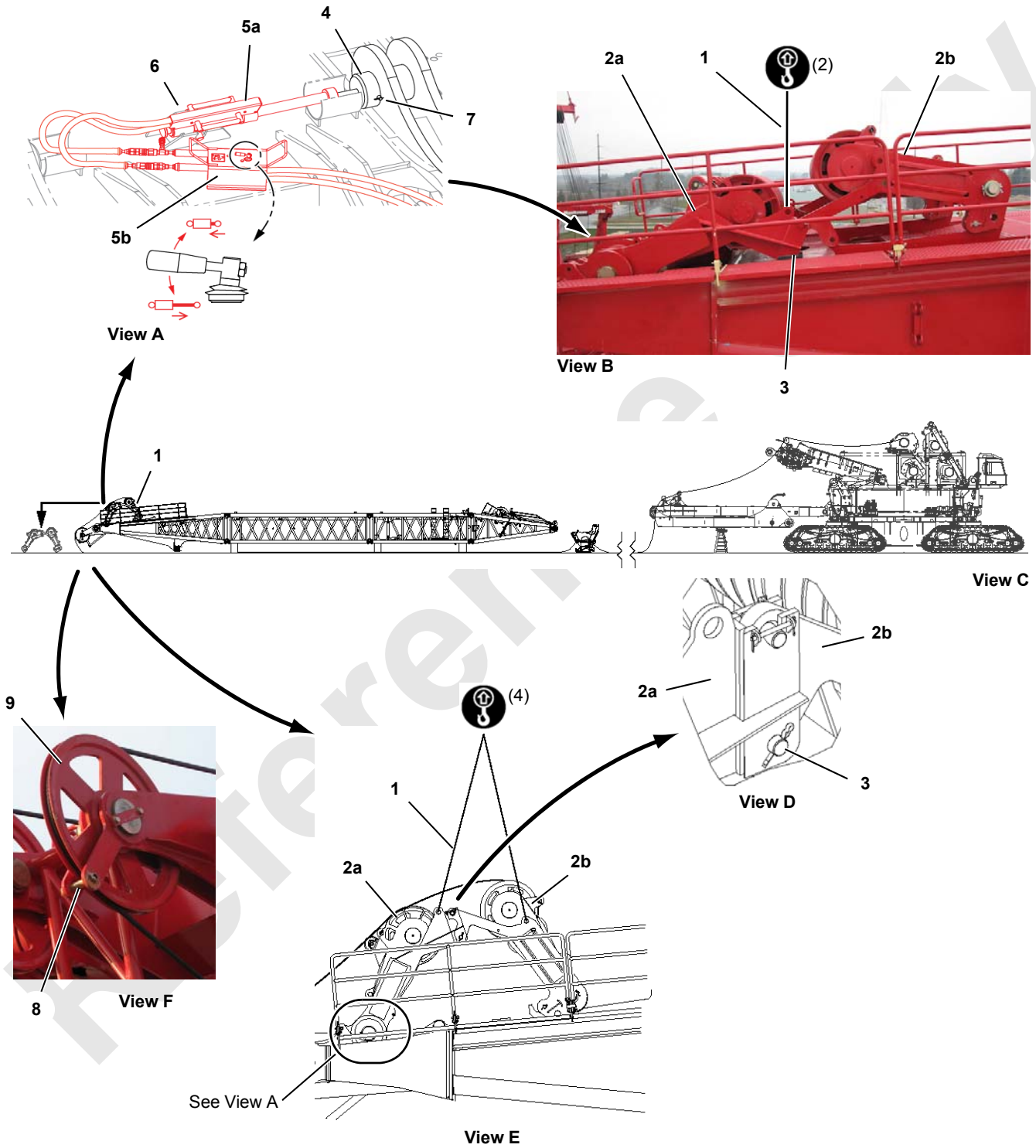


Figure 5-82

Legend for [Figure 5-82](#)

Item	Description
1	4-Leg Chain Lifting Sling
2a	Sheave Bank
2b	Equalizer
3	Pin with Cotter Pins (2)
4	Connecting Pin (2)
5a	Hand-Held Cylinder
5b	Hand-Held Accessory Valve
6	Bracket
7	Pin with Cotter Pins (4)
8	Rope Guard with Wire Lock Pins (2)
9	Guide Sheave (2)

Remove Sheave Bank and Equalizer from Mast

See [Figure 5-82](#) for the following steps.

1. Attach two legs of 4-leg chain lifting sling (1, View B) to the lifting holes in sheave bank (2a).
2. Remove pins (3, View B) from the storage position in the sheave bank holes.

DO NOT remove the pins connecting the top holes between sheave bank (2a) and equalizer (2b).

3. Slowly hoist with the assist crane to fold sheave bank (2a, View D) and equalizer (2b) until the bottom holes in the sheave bank and the equalizer are aligned.

4. Reinstall pins (3, View D) to secure.
5. Attach all four legs of chain lifting sling (1, View E) to the lifting holes in sheave bank (2a) and equalizer (2b).
6. Lift with the assist crane so the lifting slings are tight.
7. Disengage connecting pins (4, View A) as follows:
 - a. Place hand-held cylinder (5a) in position so the cylinder trunnion engages the slots in bracket (6) and the cylinder rod end engages the pin head in connecting pin (4).
 - b. Connect hand-held accessory valve (5b) to the PPU and to hand-held cylinder (5a).
 - c. Start the PPU.
 - d. Remove pins (7) from connecting pin (4).
 - e. Fully retract connecting pin (4).
 - f. Repeat steps [7a](#) – [7e](#) for the other connecting pin.
8. Remove rope guard (8, View F) at both mast top guide sheaves (9).
9. Using the assist crane, lift sheave bank (2a, View E) and equalizer (2b) from the mast top and set them on the ground directly to the rear of the mast.

The sheave bank and equalizer will be stored later on Drum 4.
10. Disconnect the lifting slings.
11. Using hand-held cylinder (5a, View A), engage each mast connecting pin (4) and install pins (6) for storage.
12. Remove the hand-held cylinder and accessory valve.

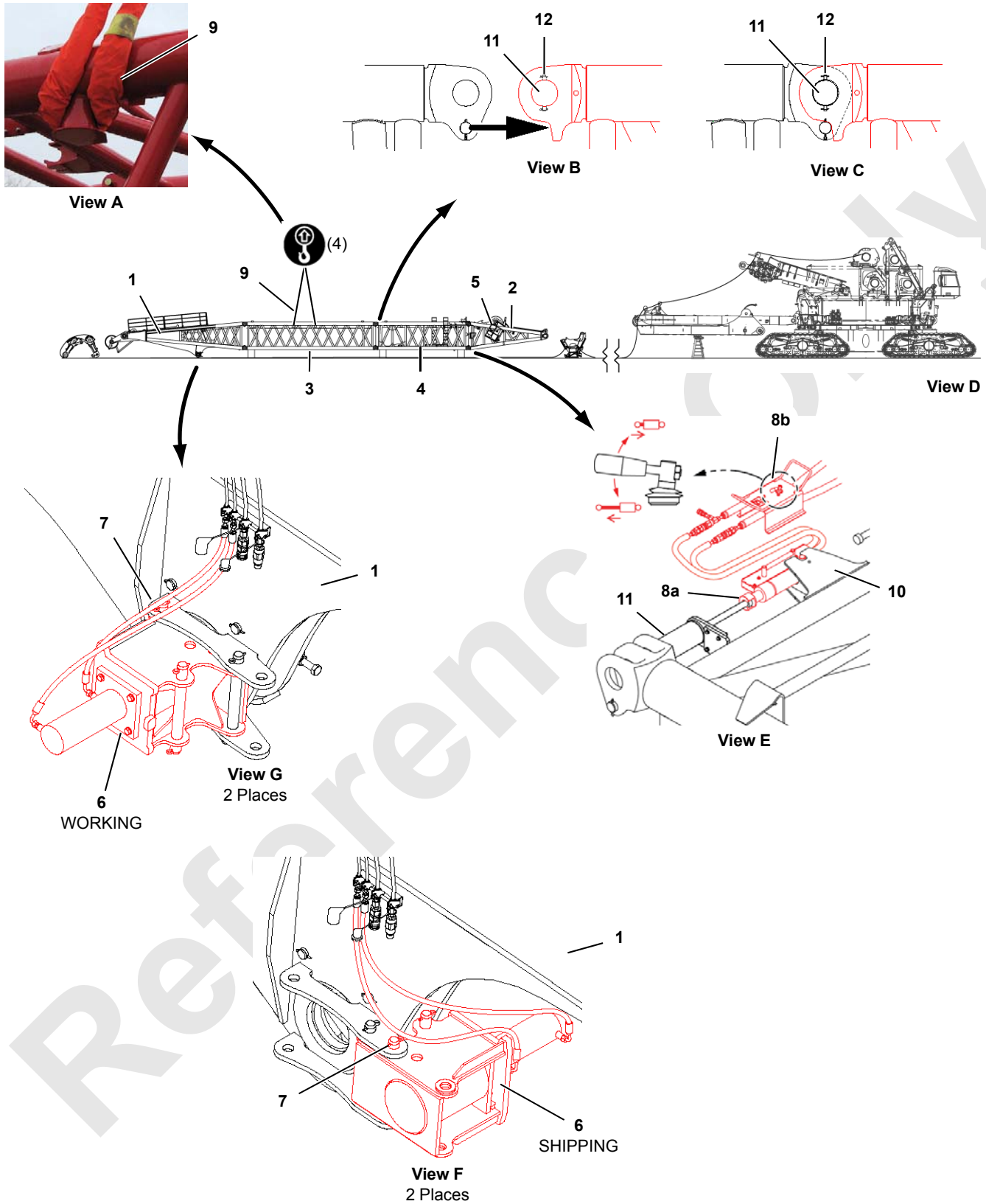


FIGURE 5-83

Legend for [Figure 5-83](#)

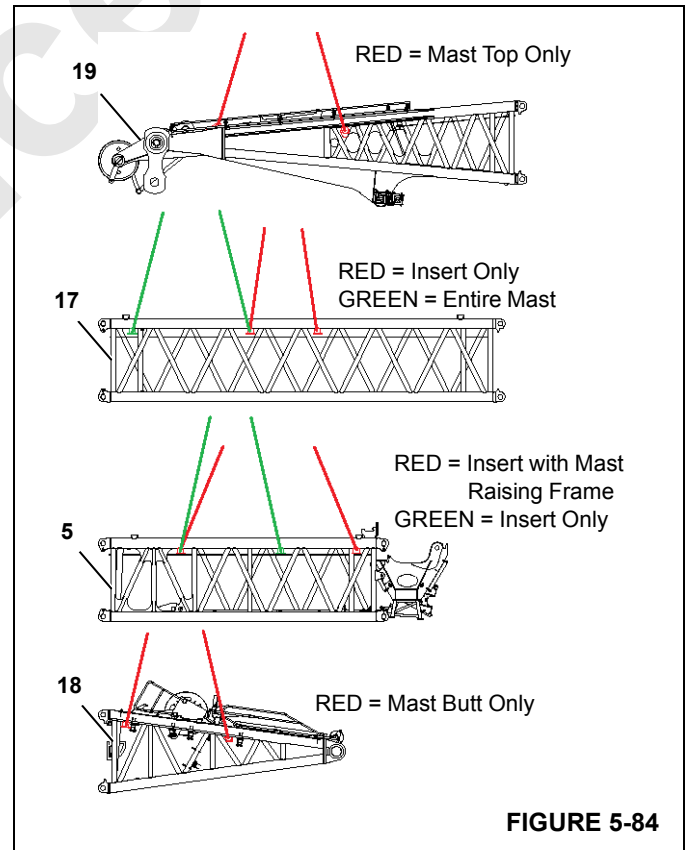
Item	Description
1	Mast Top
2	Mast Butt
3	Mast Insert — 12 m
4	Mast Insert — 8.5 m
5	Catwalk
6	Backhitch Pin (2)
7	Pin with Cotter Pins (2)
8a	Hand-Held Cylinder
8b	Hand-Held Accessory Valve
9	Nylon Lifting Sling
10	Bracket
11	Connecting Pin
12	Pin with Cotter Pins

Disassemble Mast

- Remove catwalk (5, View D), from the right side of mast butt (2).
- Lower all of the catwalk handrails to the shipping position.
- Unpin the platforms from the working position on mast butt (2), push the platforms in, and repin them.
- Unpin backhitch pins (6, View G) from the working position, rotate them inward, and pin them in the shipping position (View F).
- To ensure stability, disassemble the mast sections in the following order (see View D):
 - Mast top (1)
 - Mast butt (2)
 - Mast insert (3)
 - Mast Insert (4)
- Connect the hydraulic lines from the PPU to hand-held cylinder (8, View E).
- Remove the mast sections as follows:
 - Attach four nylon lifting slings (9) to the lifting lugs in the mast section. See [Figure 5-84](#) for lifting lug identification.
 - Lift with the assist crane until the lifting slings are tight.
 - Place hand-held cylinder (8a, View E) in position so the cylinder trunnion engages the slots in bracket

(10) and the cylinder rod end engages the pin head in connecting pin (11).

- Connect hand-held accessory valve (8b, View E) to the PPU and to hand-held cylinder (8a).
- Start the PPU.
- Remove pin (12, View C) from connecting pin (11).
- Disengage connecting pin (11, View E) using the control on hand-held accessory valve (8b).
- Remove the hand-held cylinder.
- Reinstall pins (12, View B) in connecting pins (11).
The connecting pins are shipped in the retracted position.
- Repeat steps [7c](#) – [7i](#) for the remaining pins of the mast section being removed.
- Lift the mast section from the mast assembly onto a trailer for shipping.
- Disconnect the lifting slings.
- Repeat the mast section removal steps for each mast section.



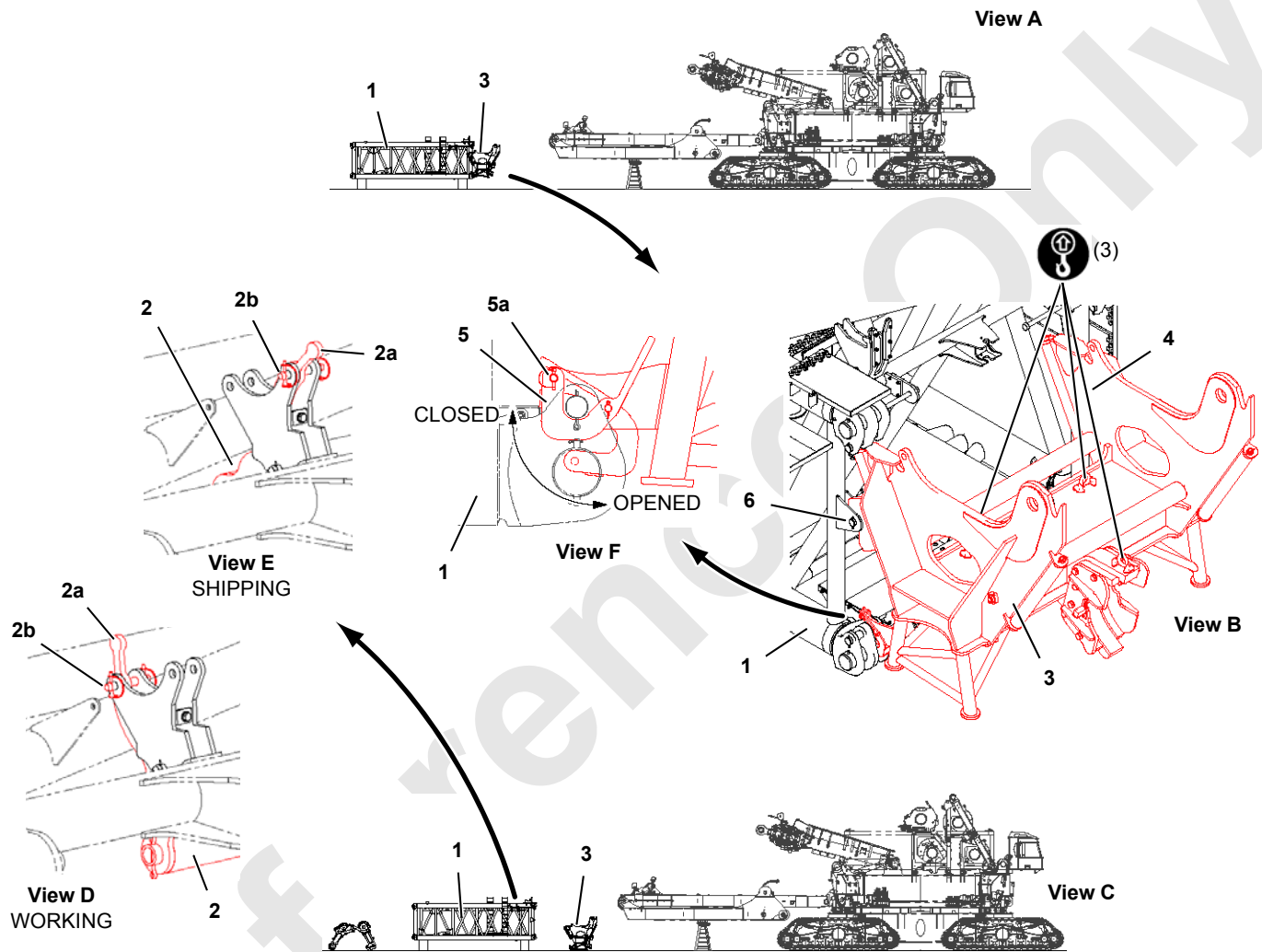


Figure 5-85

Legend for [Figure 5-85](#)

Item	Description
1	Mast Insert — 8.5 m
2	Wire Rope Guide Roller (2)
2a	Handle (2)
2b	Pin with Wire Lock Pin (4)
3	Mast Raising Frame
4	4-Leg Chain Lifting Sling
5	Bracket (2)
5a	Pin with Wire Lock Pin (2)
6	Pin (2)

Prepare 8,5 m Mast Insert for Shipping

See [Figure 5-85](#) for the following procedure.

1. Lift the boom hoist wire rope off mast raising frame (3, View C).
2. Store each wire rope guide roller (2, View D), as follows:
 - a. Grasp handles (2a, View D) and remove pins (2b) from the working position.
 - b. Rotate wire rope guide roller (2, View E) to the shipping position and reinstall pins (2b).
3. Store mast raising frame (3, View B), as follows:
 - a. Remove pins (5a, View F) and open brackets (5) on insert (1).
 - b. Attach three legs of chain lifting sling (4, View B) to the lifting lugs on mast raising frame (3).
 - c. Lift mast raising frame (3, View B) onto pins (6) on the end of insert (1).
 - d. Close brackets (5, View F) and reinstall pins (5a).
 - e. Disconnect the lifting slings.
4. Insert (1) can now be lifted onto a trailer for shipping. See [Figure 5-84](#) for lifting lug identification.

Item	Description
1	Sheave Bank and Equalizer
2	4-Leg Chain Lifting Sling
3	Sheave
4	Digital Level
5	Shackles (owner furnished)
6	Drum 4
7a	Link (2)
7b	Hitch Pin with Hair-Pin Cotter (4)
7c	Hitch Pin with Hair-Pin Cotter (2)
8	Pin with Cotter Pins (2)
9	Tagline (2) (owner furnished)

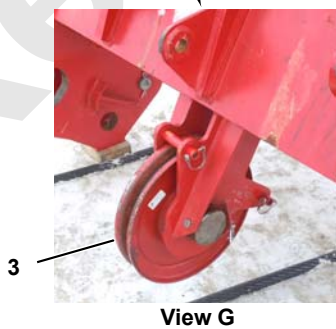
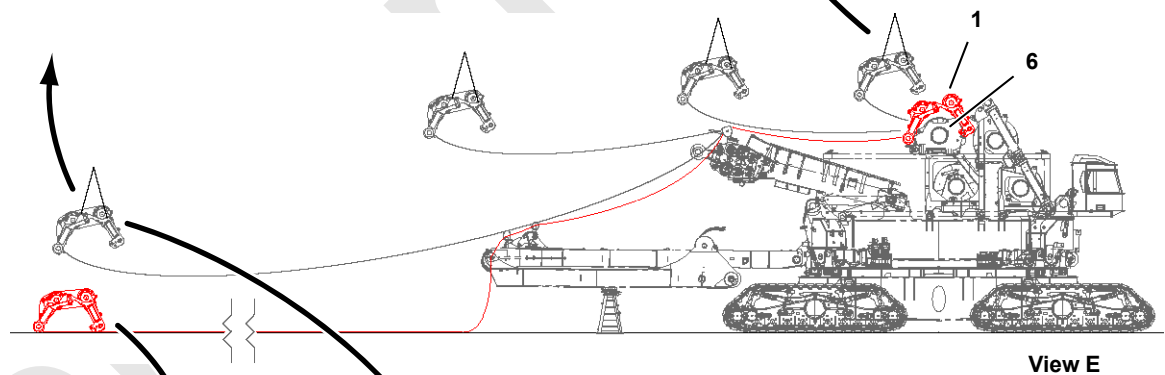
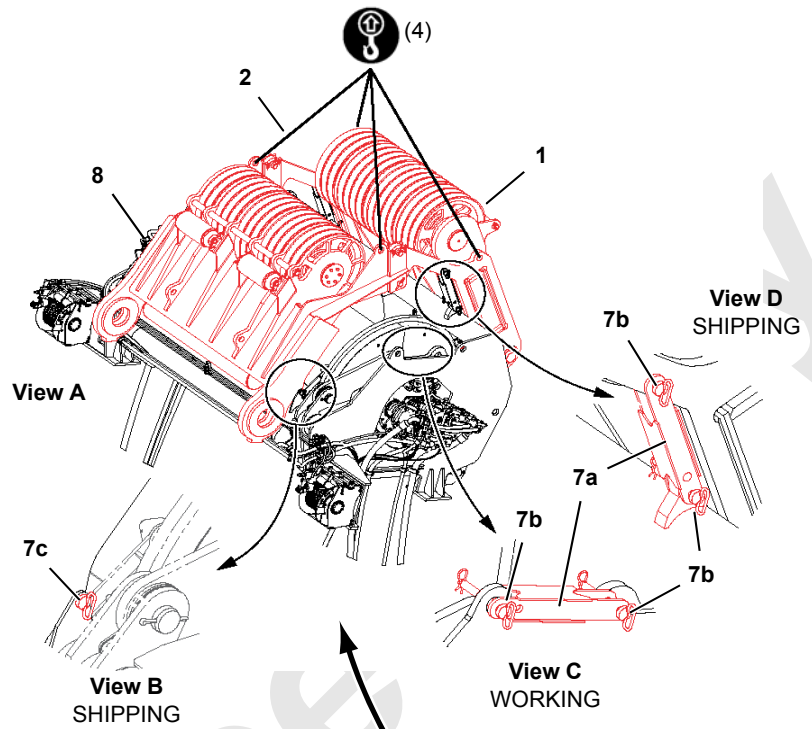
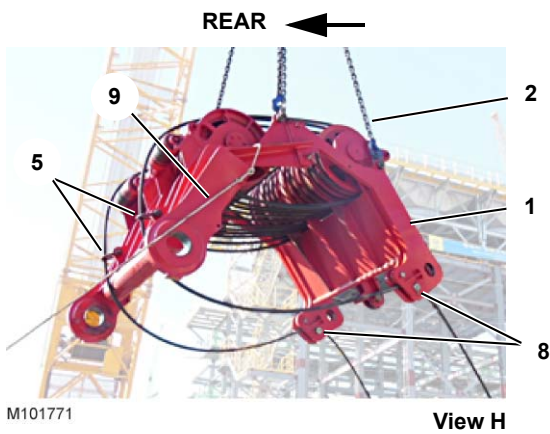


Figure 5-86

Store Sheave Bank and Equalizer

See [Figure 5-86](#) for the following procedure.

NOTE Sheave (3, View G) will interfere with Drum 1. You have two options:

- Remove sheave (3) and store it.

OR

- Remove Drum 1 before sheave bank and equalizer (1) are stored Drum 5 (see [page 5-185](#)).

1. Attach four legs of chain lifting sling (2, Views A and H) to the lifting holes in sheave bank and equalizer (1). Pin the adjustable legs of the lifting sling to the rear lugs of the sheave bank and equalizer.
 - If using the large chain lifting sling, shorten both rear legs 11 links.
 - If using the small chain lifting sling, shorten both rear legs 8 links.

The front side of the sheave bank and equalizer is at 55-56° as measured with digital protractor (4, View F).
2. Secure the boom hoist wire rope with shackles (5, View H). This step will prevent the wire rope from falling off the rollers on the sheave bank and equalizer.
3. Route the boom hoist wire rope over pins (8, View H). This step will help to prevent the sheave bank and equalizer from spinning during lifting.

4. Attach two 100 ft (30,2 m) long taglines (9, View H) to the sheave bank and equalizer (one each side) so ground personnel can keep the sheave bank and equalizer from spinning during lifting.
5. Slowly lift the sheave bank and equalizer into position over Drum 4 while hauling in boom hoist wire rope onto the drums.
 - a. Make sure the wire rope does not catch on other parts of the crane as the sheave bank and equalizer and lifted into position.
 - b. Make sure the wire rope is spooled properly onto the drums.
6. Stop when sheave bank and equalizer (1, View E) is positioned over Drum 4.

Keep some slack in boom hoist wire rope so as not to kink it.
7. Remove links (7a, View C) and hitch pins (7b) from the working position.
8. Pin links (7a, View D) to sheave bank and equalizer (1).
9. Remove hitch pins (7c, View B) from storage.
10. Align the mounting holes in sheave bank and equalizer (1, View B) with the shipping holes and install hitch pins (7c).
11. Pin links (7a, View D) to the BOTTOM holes in the lugs on Drum 4.
12. Disconnect the lifting slings and taglines.
13. You can leave shackles (5) installed.

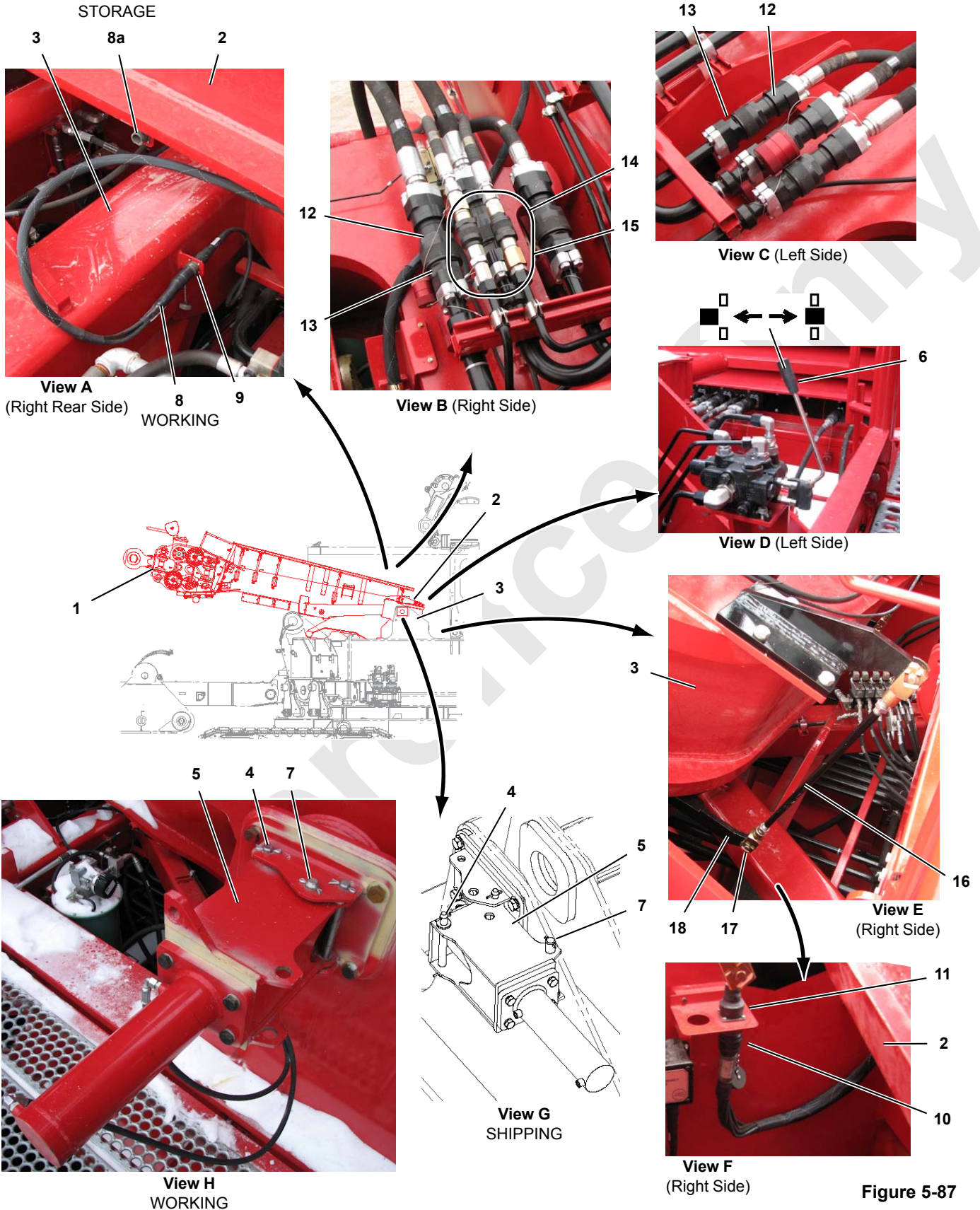


Figure 5-87

Legend for [Figure 5-87](#)

Item	Description
1	VPC Actuator
2	Actuator Frame
3	Rotating Bed
4	Pin with Cotter Pins (2)
5	Hydraulic Pin (2)
6	Control Valve
7	Pin with Cotter Pins (2)
8	Electric Cable W65P1 from VPC Actuator Assembly
8a	Storage Receptacle
9	Electric Cable W64J1 on Rotating Bed
10	Electric Cable W66P1 from Rotating Bed
11	Electric Cable W67P10 on VPC Actuator Assembly
12	Hydraulic Hoses from Rotating Bed (3 each side)
13	Hydraulic Couplers on VPC Actuator (3 each side)
14	Grease Hoses from Rotating Bed (2)
15	Grease Couplers on VPC Actuator (2)
16	Rod (2)
17	Pin with Keeper Plate (2)
18	Hydraulic Swivel Lever (2)
19	4-Leg Lifting Sling (chain)
20	Hitch Pin with Hair-Pin Cotter (2)

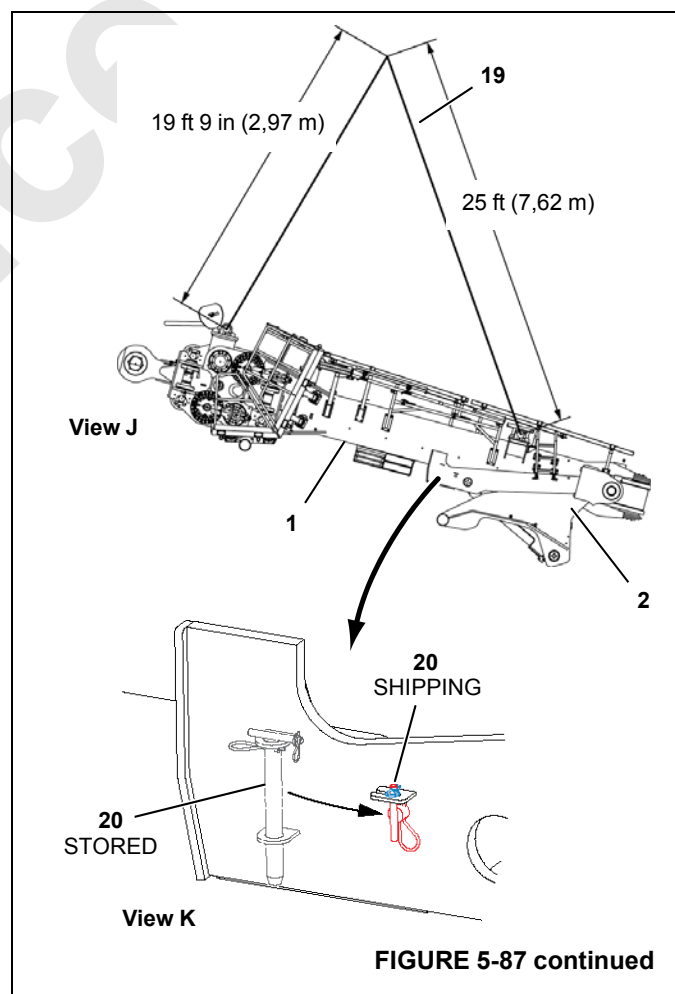
CRANE DISASSEMBLY — VPC ACTUATOR

Remove VPC Actuator Assembly

See [Figure 5-87](#) for the following steps.

1. Disconnect rods (16, View E) from hydraulic swivel levers (18).
2. Disconnect grease hoses (14, View B) from grease couplers (15) on the VPC actuator.
3. Disconnect hydraulic hoses (12, Views B and C) from the hydraulic couplers (13) on the VPC actuator.
4. Store the hydraulic and grease hoses on the rotating bed.
5. Disconnect electric cable (10, View F) and store it on the rotating bed.
6. Disconnect electric cable (8, View A) and connect it to storage receptacle (8a).
7. Remove pins (7) from the working position (View H) and install them in the shipping position (View G).
8. Move hitch pins (20, View K) from the stored position to the shipping position (two places). This step connects the actuator frame to the VPC actuator.

9. Attach four legs of chain lifting sling (19, View J) to VPC actuator (1).
 - Adjust the length of the rear legs to the specified dimension.
 - Unpin and rotate walkway extension (3, [Figure 5-88](#), View C) out of the way to access the bottom-right lifting lug.
10. Lift with the assist crane until the lifting slings are tight.
11. Disengage hydraulic pins (5, View H) with control valve (6, View D).
12. Remove pins (4) and rotate hydraulic pins (5) from the working position (View H) to the shipping position (View G).
13. Install pins (4, View G) in the shipping position.
14. Lift VPC actuator (1) and actuator frame (2) from the rear of the rotating bed and place them on the ground in the disassembly area.
15. Disconnect the lifting slings.



VPC Actuator Platform Assembly
WORKING POSITIONS

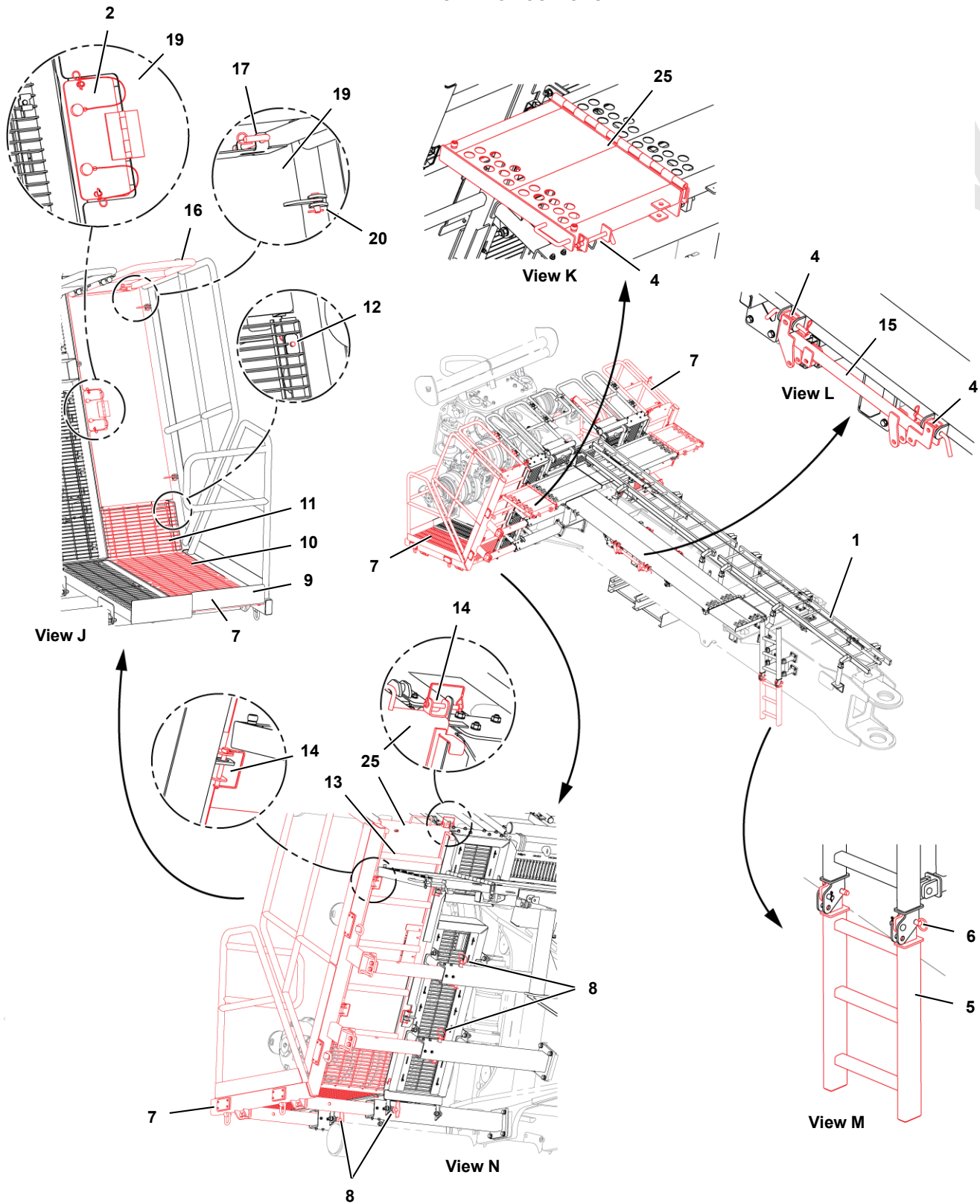


FIGURE 5-88

VPC Actuator Platform Assembly
SHIPPING POSITIONS

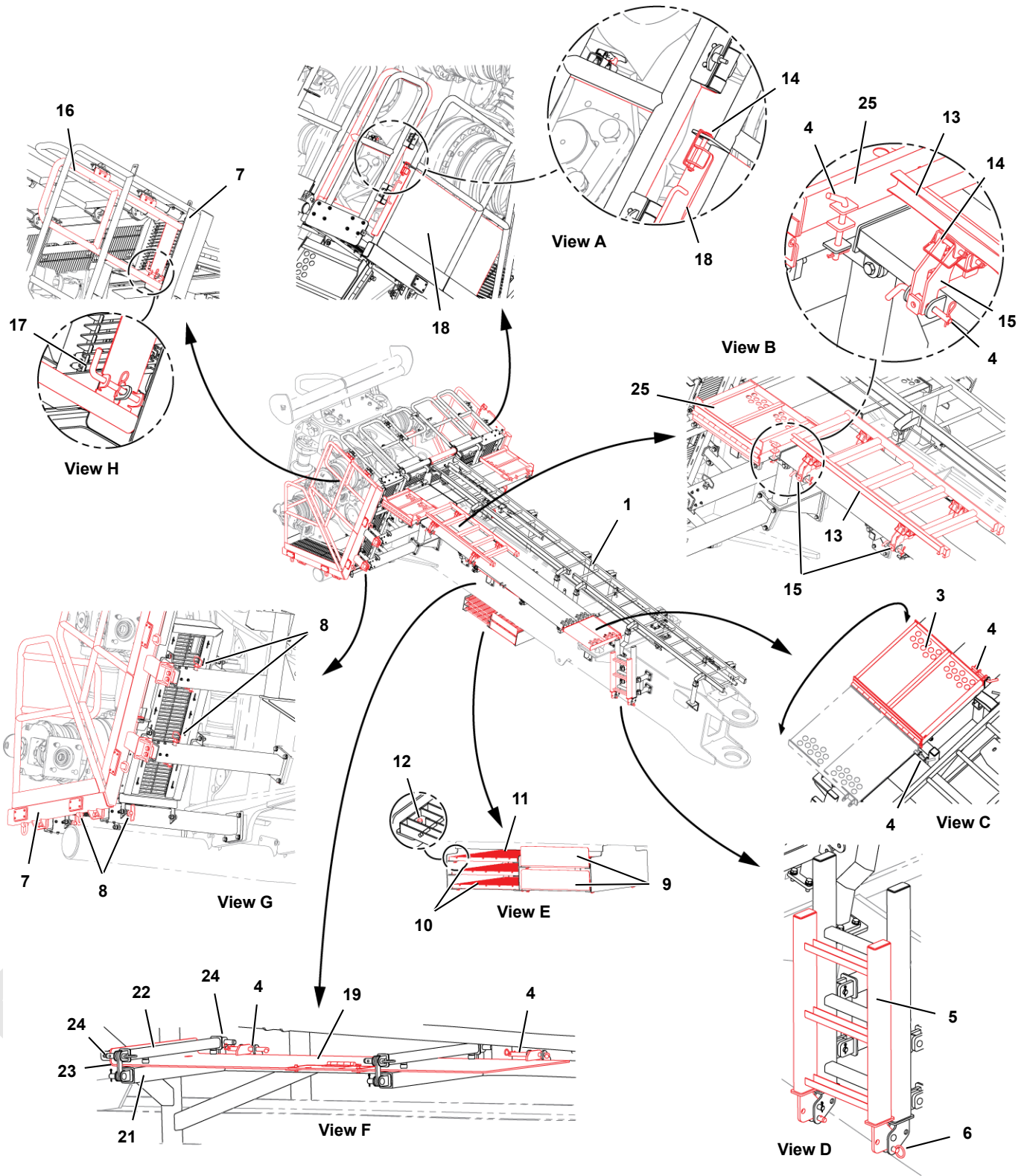


FIGURE 5-88 continued

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Legend for [Figure 5-88](#)

Item	Description
1	VPC Actuator
2	Door with Hair-Pin Cotters
3	Walkway Extension
4	Hitch Pin with Hair-Pin Cotter (8)
5	Ladder
6	Quick-Release Pin (2)
7	Platform (2)
8	Hitch Pin with Hair-Pin Cotter (8)
9	Grate (2)
10	Grate (2)
11	Grate (2)
12	Stud with Hair-Pin Cotter (4 each grate)
13	Ladder (2)
14	Wire-Lock Pin (10)
15	Ladder Bracket (2)
16	Handrail (2)
17	Hitch Pin with Hair-Pin Cotter (2)
18	Walkway
19	Walkway
20	Pin with Cotter Pin (2)
21	Walkway Shipping Support (2)
22	Hold-Down Bracket (2)
23	Hold-Down Link (2)
24	Quick-Release Pin (4)
25	Walkway Extension

Store VPC Actuator Platform Assembly

See [Figure 5-88](#) for the following steps.

- Remove hitch pins (4, View K) on both sides of the VPC actuator (1) and rotate walkways (25) from the working position (View K) to the shipping position (View B). Reinstall hitch pins (4) to secure.
- On the right side of the VPC actuator, remove quick-release pins (24, View F) from the shipping position on hold-down brackets (22) and hold-down links (23).
- On the right side of the VPC actuator, remove pins (14, View N) and (20, View J). Remove walkway (19) from the working position (View J) and pin it in the shipping position (View F).
- On the right side of the VPC actuator, repin hold-down brackets (22) and hold-down links (23) in the shipping position with quick-release pins (24, View F).
- On the left side of the VPC actuator, remove walkway wire-lock pin (14) and raise walkway (18) from the working position. Repin it in the shipping position (View A).
- At both platforms (7), unpin handrail (16) from the working position (View J) and pin it in the shipping position (View H) with hitch pin (17).
- Remove ladder brackets (15) from the working position (View L) and pin them in the shipping position (View B) with hitch pins (4).
- Remove ladders (13) from the working position (View N) and pin them in the shipping position (View B) with wire lock pins (14).
- Remove grates (9, 10, and 11) from the working position (View J) and pin them in the shipping position (View E) at both platforms (7) with hair pin cotters (12).
- On both sides of the VPC actuator, remove pins (8) and push platform (7) from the working position (View N) to the shipping position (View G).
Synthetic pads are provided on the platforms for pushing them to the shipping position.
- Reinstall pins (8, View N).
- Unpin ladder (5) from the working position (View M) and raise it to the shipping position (View D).
- Reinstall pins (6, View M).
- Reattach four legs of the chain lifting sling to VPC actuator (1) and actuator frame (2) as shown in View K, [Figure 5-87](#).
 - Adjust the length of the rear legs to the specified dimension.
 - Unpin and rotate walkway extension (3, View C) out of the way to access the bottom-right lifting lug.
- Lift with assist crane until slack is out of lifting slings.
- Lift VPC actuator (1, [Figure 5-87](#)) and actuator frame (2) onto a trailer for shipping.
- Disconnect the lifting slings.
- Remove the detachable cable sleeves from the cable going up the VPC actuator ladder (see manufacturer's instructions in OEM Manual stored in the operator cab).
Store the detachable cable sleeves in the one of the rigging parts boxes.

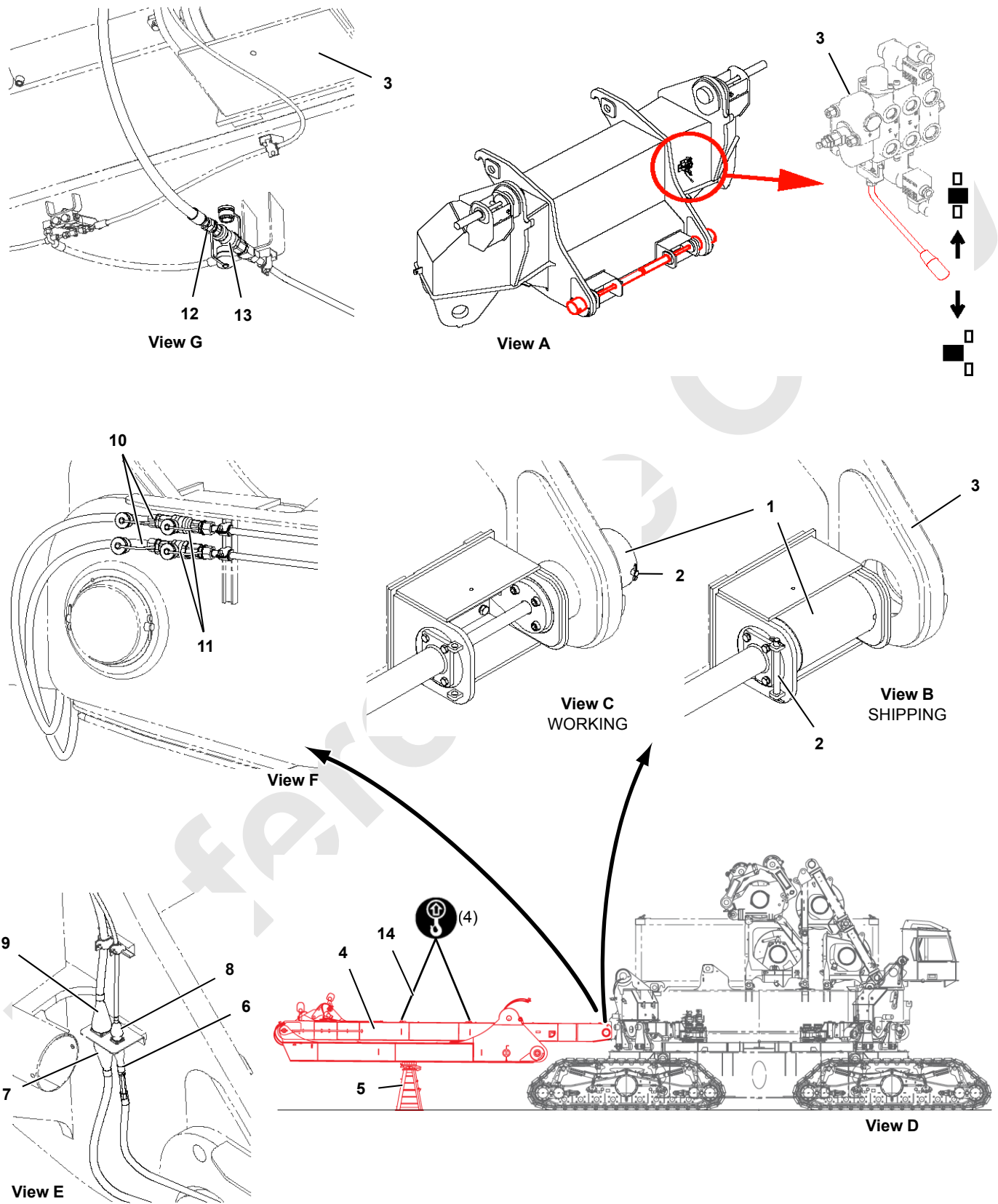


FIGURE 5-89

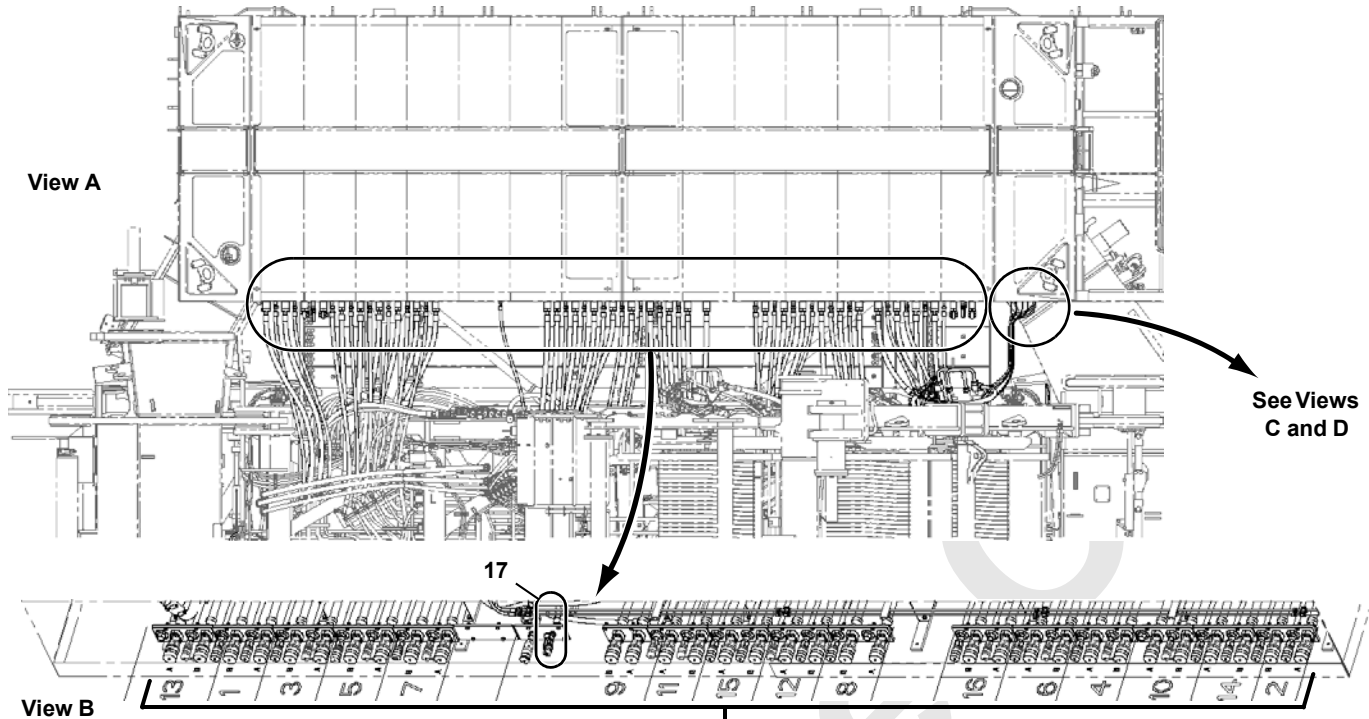
Legend for [Figure 5-89](#)

Item	Description
1	Hydraulic Pin
2	Pin with Cotter Pins
3	Rear Roller Carrier
4	VPC Beam Assembly
5	Boom Support (2)
6	Electric Cable W77P1 from VPC Beam Assembly
7	Electric Cable W61P1 from VPC Beam Assembly
8	Electric Cable W75J1 on Rear Roller Carrier
9	Electric Cable W62J1 on Rear Roller Carrier
10	Hydraulic Hoses from Rear Roller Carrier
11	Hydraulic Couplers on VPC Beam Assembly
12	Grease Hose from VPC Beam Assembly
13	Grease Coupler on Underside of Rear Roller Carrier
14	4-Leg Lifting Sling (chain)

Remove VPC Beam Assembly

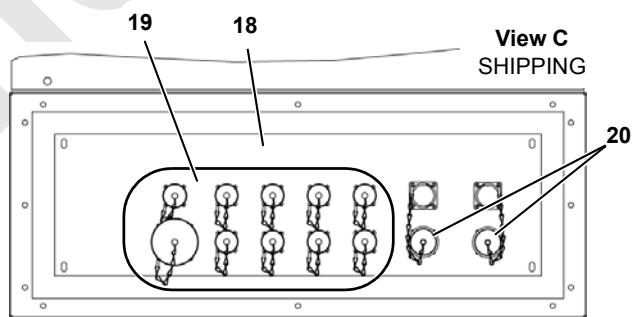
See [Figure 5-89](#) for the following procedure.

1. Disconnect grease hose (12, View G) from grease coupler (13) on the underside of rear roller carrier (3).
2. Store the grease hose on the VPC beam assembly.
3. Disconnect hydraulic hoses (10, View F) from hydraulic couplers (11) on VPC beam assembly (4).
4. Store the hydraulic hoses on the VPC beam assembly.
5. Disconnect electric cables (6 and 7, View E) from electric cables (8 and 9) on rear roller carrier (3).
6. Connect the electric cables to the dummy receptacles on the VPC beam assembly.
7. Attach four legs of chain lifting sling (14, View D) to the lifting lugs on VPC beam assembly (4).
8. Lift with the assist crane until the lifting slings are tight.
9. Start the primary engine.
10. Remove retaining pins (2, View C).
11. Disengage hydraulic pins (1, View C) using the control handle on rear roller carrier (3, View A).
12. Store retaining pins (2, View B) in the shipping position.
Hydraulic pins (1, View B) are shipped disengaged.
13. Lift VPC beam assembly (4, View D) from the rear roller carrier and place on a trailer for shipping.
The beam assembly will lift level.
14. Stop the primary engine.
15. Store the boom supports (see [page 5-101](#)).



These Item Numbers Correspond to This Table

Item	Description	Item	Description
1	Swing	10	Drum 3
2	Swing	11	Right Rear Crawler
3	Drum 2	12	Left Rear Crawler
4	Drum 1	13	Counterweight
5	Drum 1	14	Counterweight
6	Drum 4	15	Drum 3
7	Drum 4	16	Drum 2
8	Right Front Crawler	17	Accessory Supply
9	Left Front Crawler		



Item	Description
18	Electric Bulkhead
19	Protective Cap (each receptacle)
20	Terminator Plug (2)
Boom	Boom Camera
C2-D6	Camera 2-Drum 6
C3-CW	Camera 3-Counterweight
C5-D1	Camera 5-Drum 1
C6-D2	Camera 6-Drum 2
C8-D4	Camera 7-Drum 4
C9-D3	Camera 9-Drum 3
C10-D5	Camera 10-Drum 5
WN16	Cable Connects to Receptacle WNE27
LWE	Lowerworks Extension Power
WLCE	Lights Control
WLPE	Lights Power

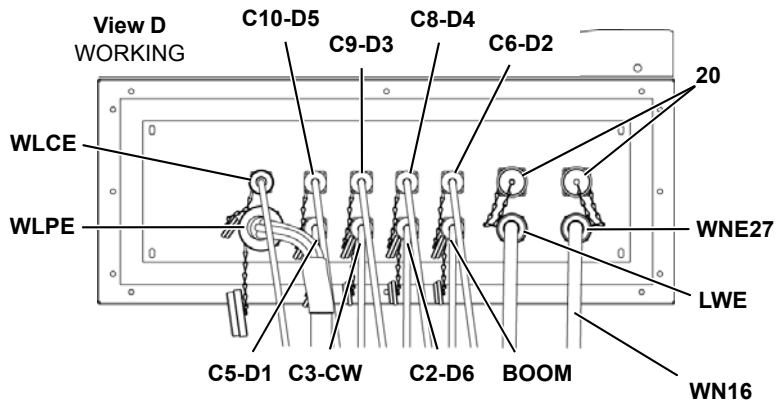


FIGURE 5-90

CRANE DISASSEMBLY — CAB AND POWER PLANT ENCLOSURE

Disconnect Hydraulic Hoses and Electric Cables from Power Plant Enclosure

1. Stop the engines.
2. Disconnect the hydraulic hoses between the power plant enclosure, the drums, and the rotating bed as shown in [Figure 5-90](#), Views A and B.
 - Clean the ends of the hoses.
 - Clean and install protective caps ([Figure 5-91](#)) on the ends of the hoses. The protective caps are stored in the parts boxes.
 - Store the hoses on the drums and the rotating bed.
3. Disconnect the electric cables between the power plant enclosure, the rotating bed, and the front roller carrier as shown in [Figure 5-90](#), Views C and D.
 - Clean the ends of the electric cables and receptacles.
 - Clean and install protective caps on the ends of the ends of the electric cables and all receptacles.
4. Disconnect terminator plugs (20, View D) from the working position and connect them to the shipping position (View C). **You will get CAN faults and not be able to operate functions if you fail to perform this step.**
 - Store the electric cables on the drums, the rotating bed, and the front roller carrier.



FIGURE 5-91

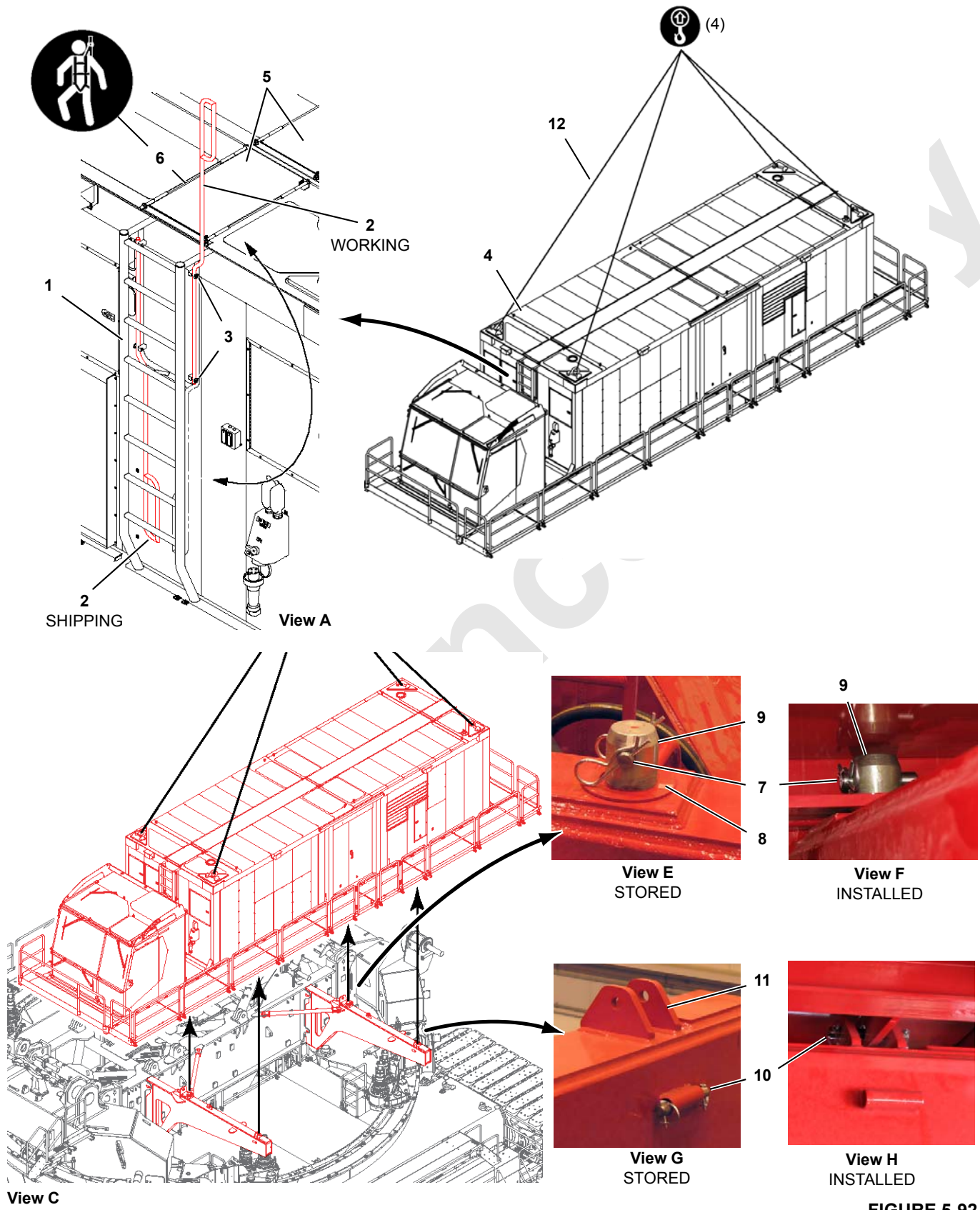


FIGURE 5-92

Legend for [Figure 5-92](#)

Item	Description
1	Ladder
2	Ladder Extension (2)
3	Wire Lock Pin (4)
4	Power Plant Enclosure
5	Catwalk (4)
6	Tie Wire (8)
7	Pin with Hair-Pin Cotter (2)
8	Flat Washer (2)
9	Fixed Pin (2)
10	Pin with Wire Lock Pins (2)
11	Lugs (4)
12	4-Leg Chain Lifting Sling

Lift Cab and Power Plant Enclosure Off Upperworks

See [Figure 5-92](#) for the following procedure.

1. Unpin ladder extensions (2, View A) from the shipping position and pin them in the working position.
2. It is necessary to climb onto power plant enclosure roof (4) to connect the lifting slings.

Tie wires (6) are provided along both sides of roof catwalks (5).

 **WARNING**
Fall Hazard!

Avoid falling off power plant enclosure roof:

- Climb onto roof only at ladder (1).
- Fully extend ladder extensions (2) before using ladder.
- Wear personnel fall-protection equipment and attached it to tie wires (6) upon climbing onto roof.

3. Attach the four legs of chain lifting sling (12) to the lifting lugs on the power plant enclosure roof.
4. Lift with the assist crane until the lifting slings are tight.
5. Remove pins (7, View F) and flat washers (8) from fixed pins (9) and place them to the side.
6. Remove pins (10, View H) and store them (View G).
7. Lift the cab and power plant enclosure off the upperworks' supports.
8. Swing the cab and power plant enclosure clear of the crane and lower it until the stair on the right side of the cab are 2-3 ft (0,6-0,9 m) clear of the ground.
9. Install flat washers (8, View E) and pins (7) on fixed pins (9) for storage.

Reference

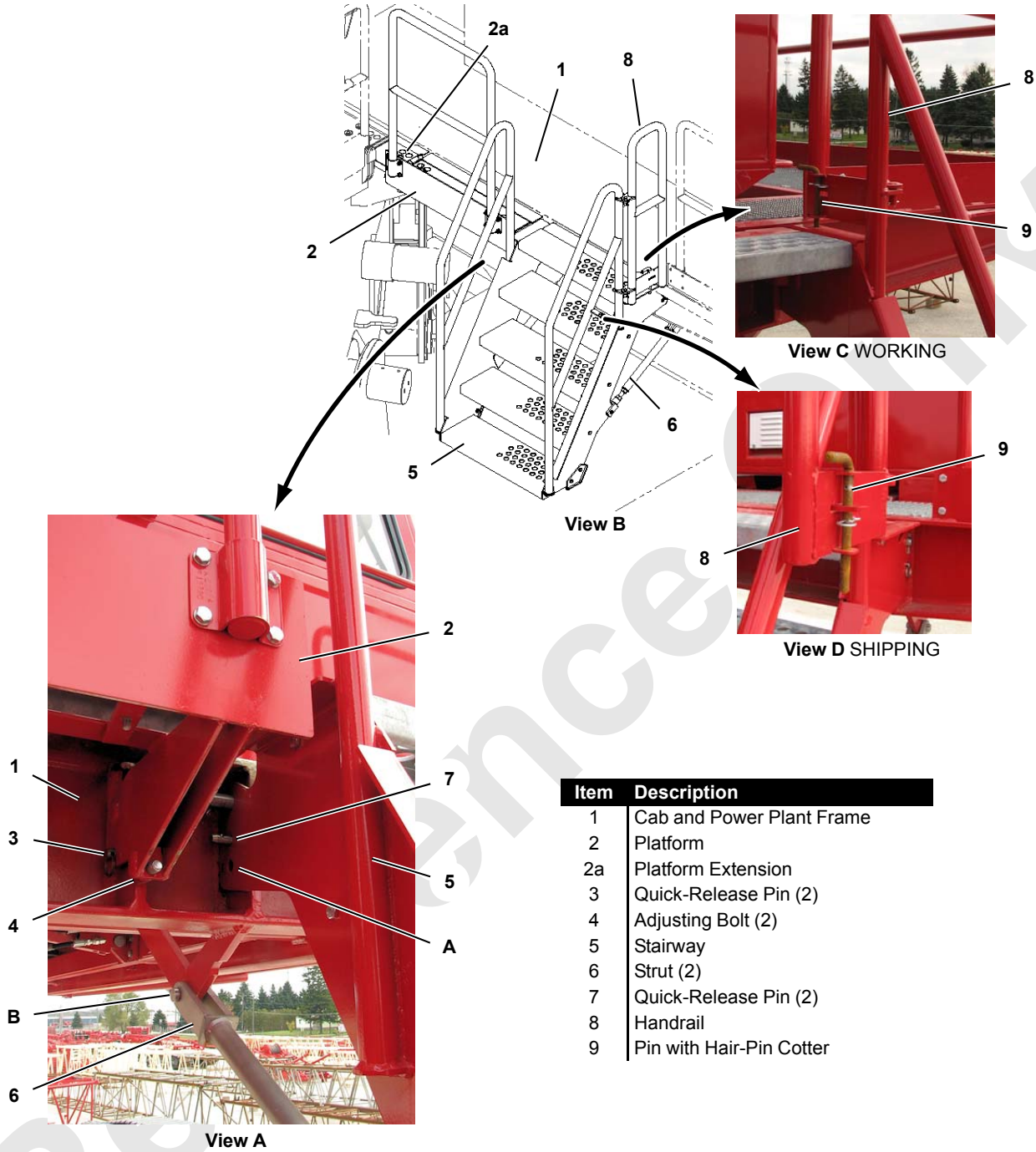


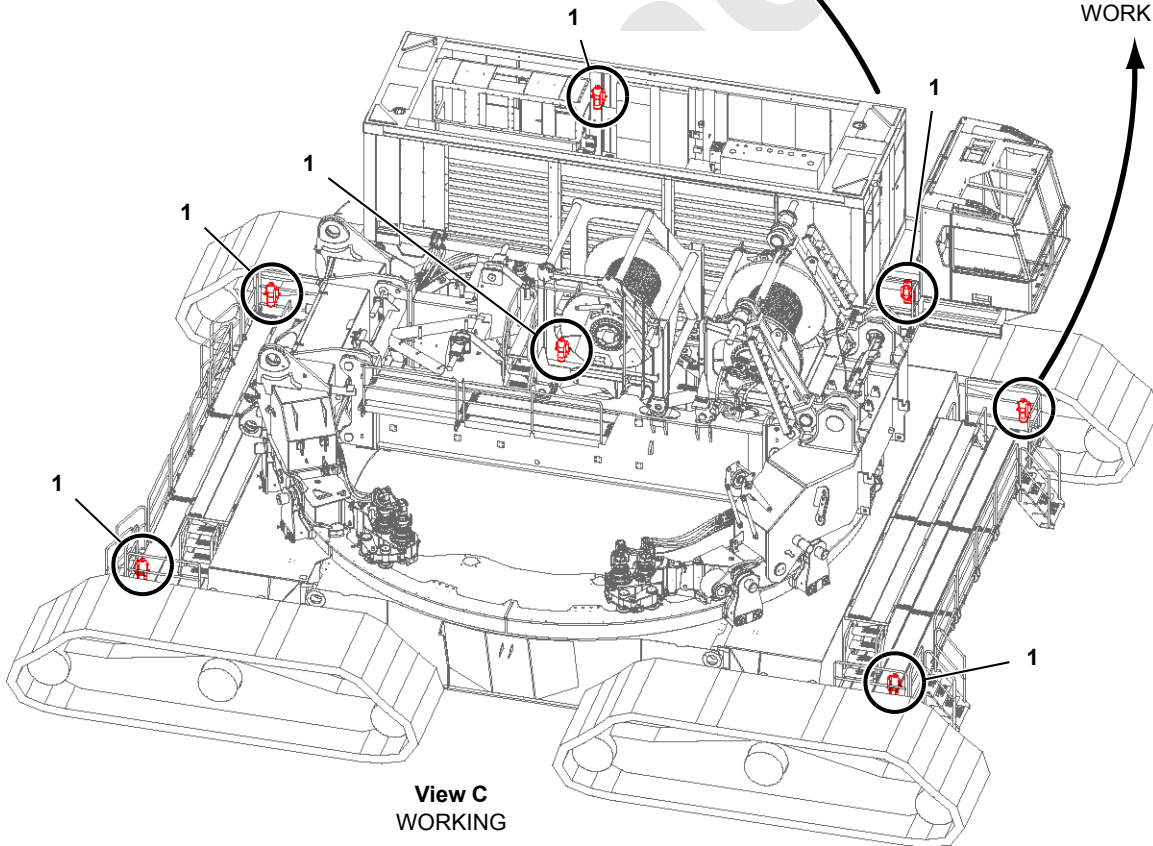
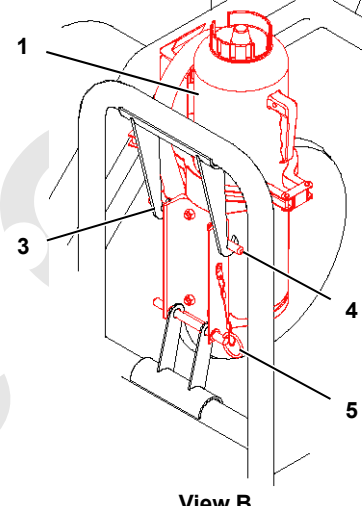
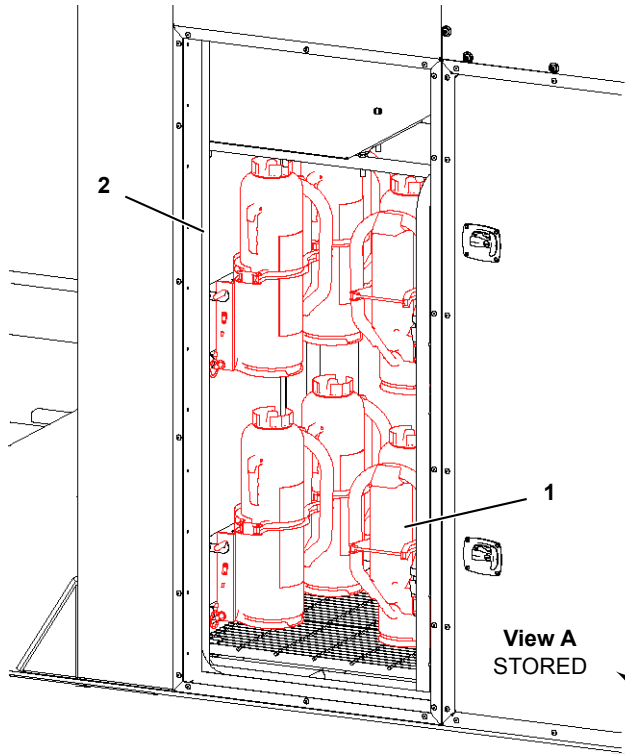
FIGURE 5-93

Remove Cab and Power Plant Enclosure Stairs and Platform

See [Figure 5-93](#) for the following procedure

1. Unpin handrail (8, View C) from the working position and pin it in the shipping position (View D).
2. Unpin struts (6, View A) from holes (B) under the cab and power plant assembly and lower the struts to the ground.
Reinstall the pins in the strut holes for storage.
3. Remove quick-release pins (7, View A).
4. Using a fork-lift truck, lift stairway (5, View B) to unhook it from the brackets on cab and power plant frame (1).
5. Lift the stairway away from cab and power plant enclosure. Take care not to damage struts (6, View B).
6. Reinstall quick-release pins (7, View A) in the stairway holes for shipping.
7. Pin struts (6, View A) to holes (A) on stairway (5).
8. Place the stairway on a trailer from shipping.
9. Rotate platform extension (2a, View B) forward to the shipping position.
10. Remove quick-release pins (3, View A).
11. Using nylon lifting slings from the assist crane, lift platform (2, View A) to unhook it from the brackets on cab and power plant frame (1).
12. Place the stairway on a trailer from shipping.
13. Reinstall quick-release pins (3, View A) in the platform holes for shipping.
14. Lower the cab and power plant enclosure onto the ground. Do not disconnect the lifting slings.

Item	Description
1	Fire Extinguisher (7)
2	Storage Compartment
3	Hooked Bracket
4	Fixed Pin
5	Quick-Release Pin



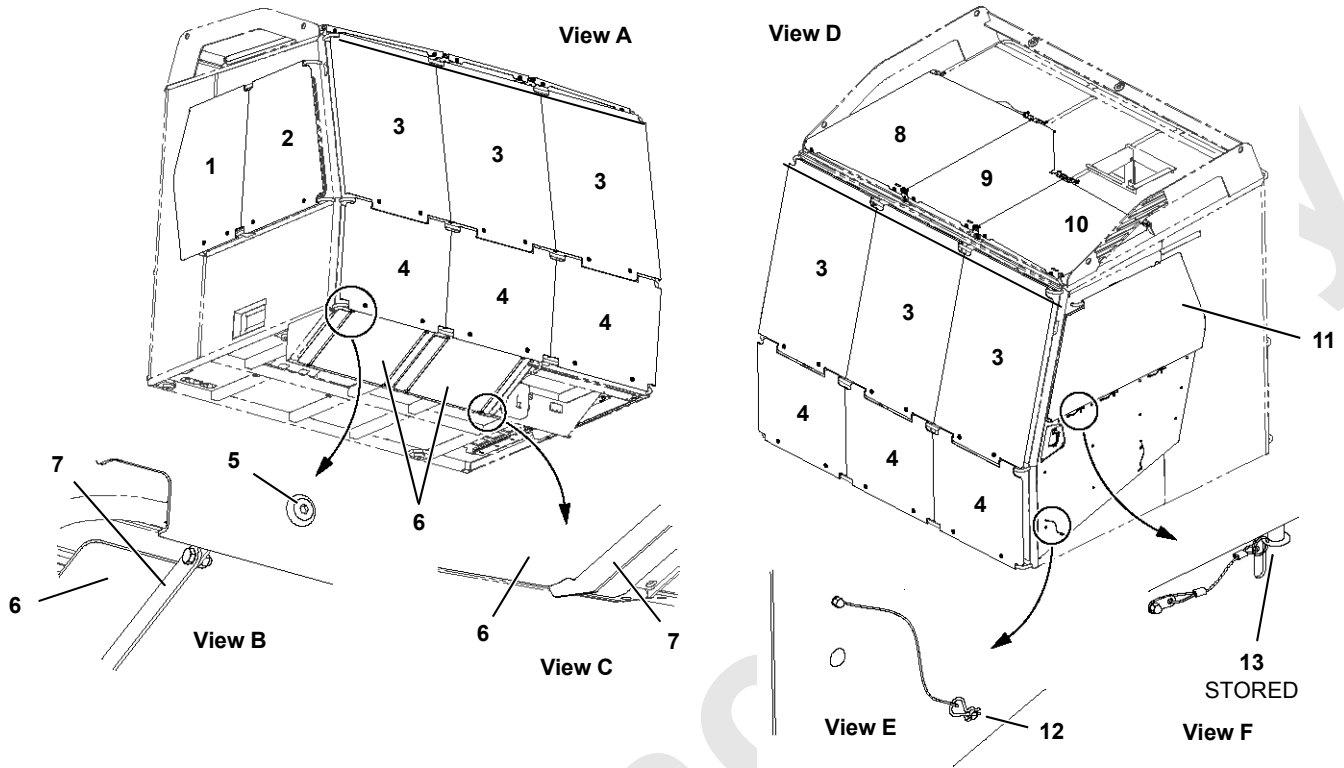
Store Fire Extinguishers

Remove seven fire extinguishes (1, View B) from their working positions and store them in left-front compartment (2, View A) of the power plant enclosure.

The fire extinguishers hook onto brackets (3, View B) and are retained with quick-release pins (5).

Reference Only

SHIPPING POSITIONS



STORAGE POSITIONS

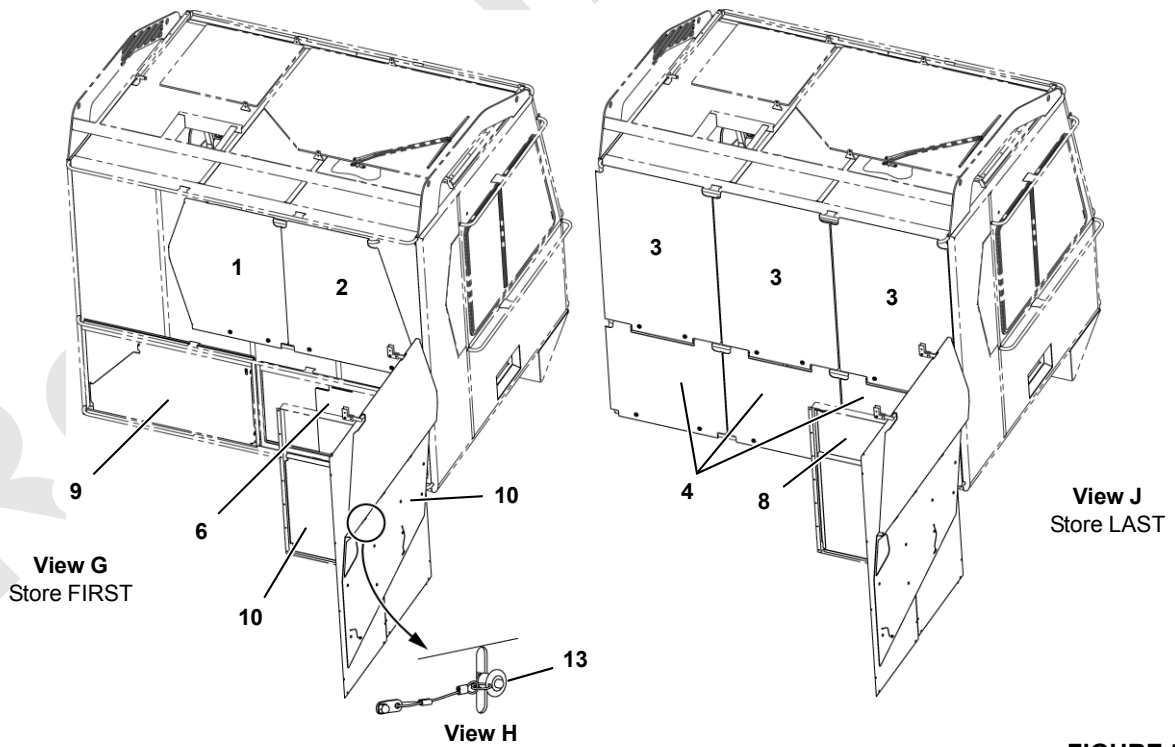


FIGURE 5-94

Legend for [Figure 5-94](#)

Item	Description
1	Right Rear Side Window Cover
2	Right Front Side Window Cover
3	Upper Front Window Cover (3)
4	Lower Front Window Cover (3)
5	Latch (22, 8 mm internal hex key)
6	Floor Window Cover (2)
7	Bracket with Screw, Lock Washer, and Nut (4)
8	Right Roof Window Cover
9	Center Roof Window Cover
10	Left Roof Window Cover
11	Door Window Cover
12	Hair-Pin Cotter (2)
13	Quick-Release Pin (3)

Install Cab Window Covers

Remove the cab window covers from storage ([Figure 5-94](#), Views G and J) and install them on the cab (Views A and B).

- Window covers (1 – 4) hook onto the cab handrails and are retained with latches (5, View B).
- Window covers (6) are retained with brackets (7, Views B and C).
- Window covers (8 – 10) slide onto rails and are retained with latches (5).
- Door window cover (11) hooks onto the cab door handrail and is retained with hair-pin cotters (12, View E) attached to studs on the door.

Raise Warning Light

The rated capacity indicator/limiter warning light is stored for shipping as shown in [Figure 5-95](#), View A.

1. Remove pin (2).
2. Disengage latch (3) and lower warning light (1) to the stored position.
3. Install pin (2).

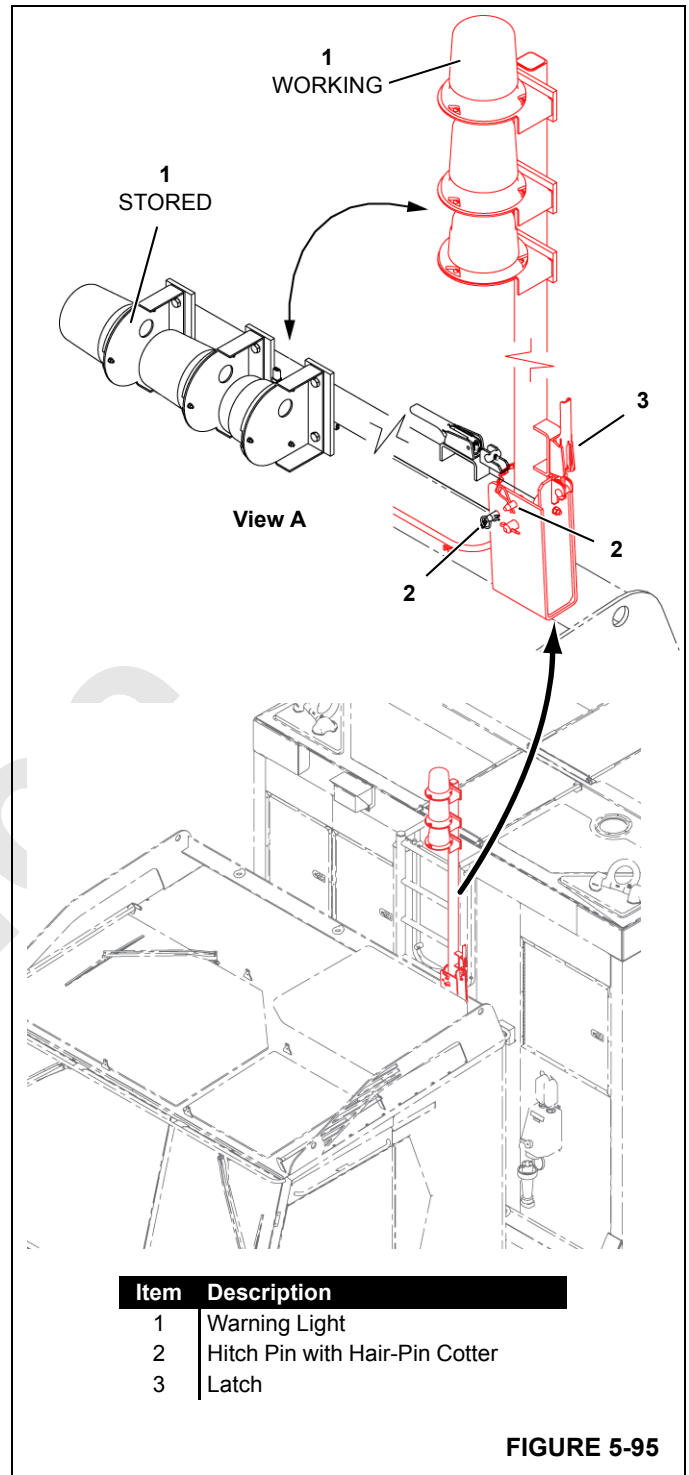


FIGURE 5-95

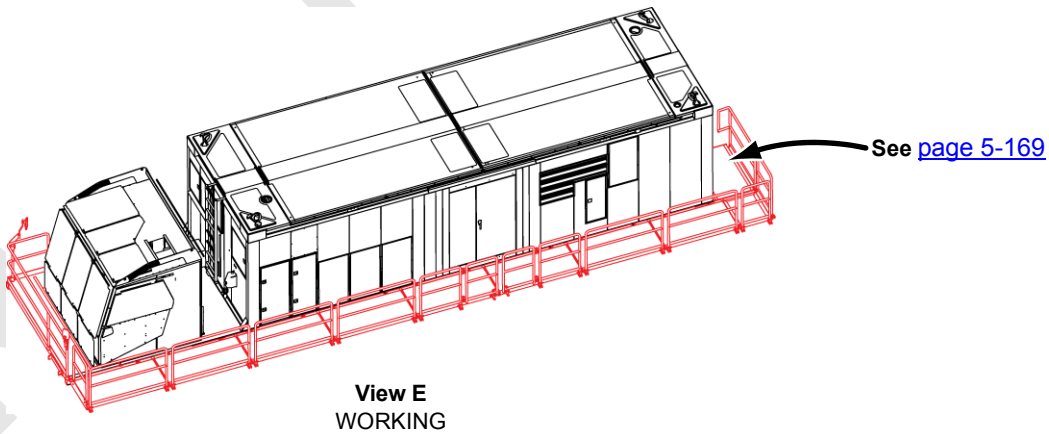
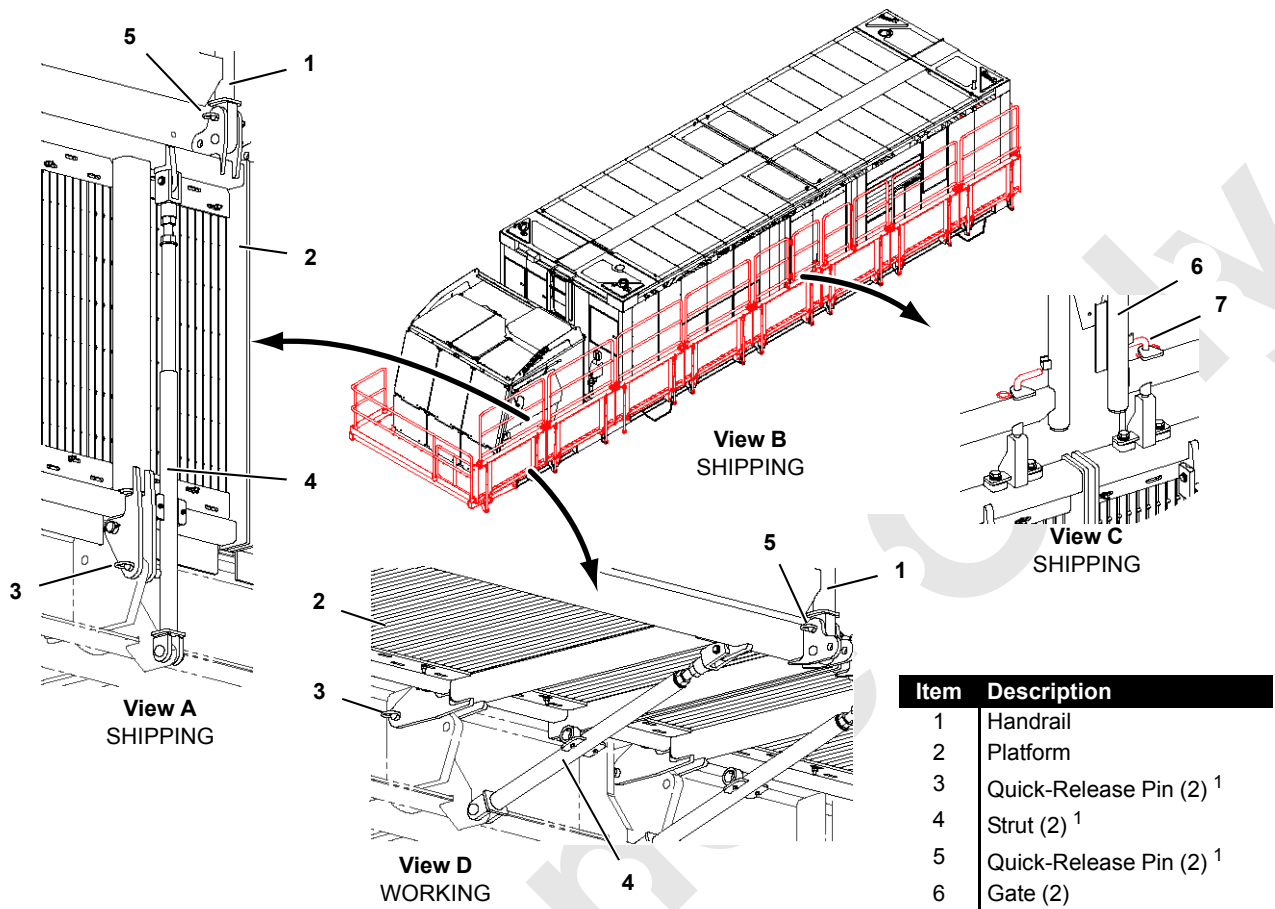


FIGURE 5-96

Lower Cab and Power Plant Enclosure Platforms

NOTE The platforms along the front of the cab and power plant enclosure are fixed in the working position.

Use nylon lifting slings to lift the handrails and platforms. Attach the slings to the handrails.

1. Starting at the left-rear corner of the cab and power plant enclosure, proceed as follows:
 - a. Lower handrails (1, View D) for platforms (8 and 9, View F) to horizontal and pin in the shipping position (View A).
 - b. Raise platforms (8 and 9, View F) from the working position (View D) to the shipping position (View A) and pin.

- c. Struts (4) will automatically retract to the shipping position.
- d. Rotate platform (8, View G) to the shipping position (View H) and pin.

2. Proceed as follows for remaining platforms (2):
 - a. Lower handrail (1) to horizontal and pin it in the shipping position (View A).
 - b. Raise platform (2, View F) from the working position (View D) to the shipping position (View A) and pin.
 - c. Struts (4) will automatically retract to the working position.

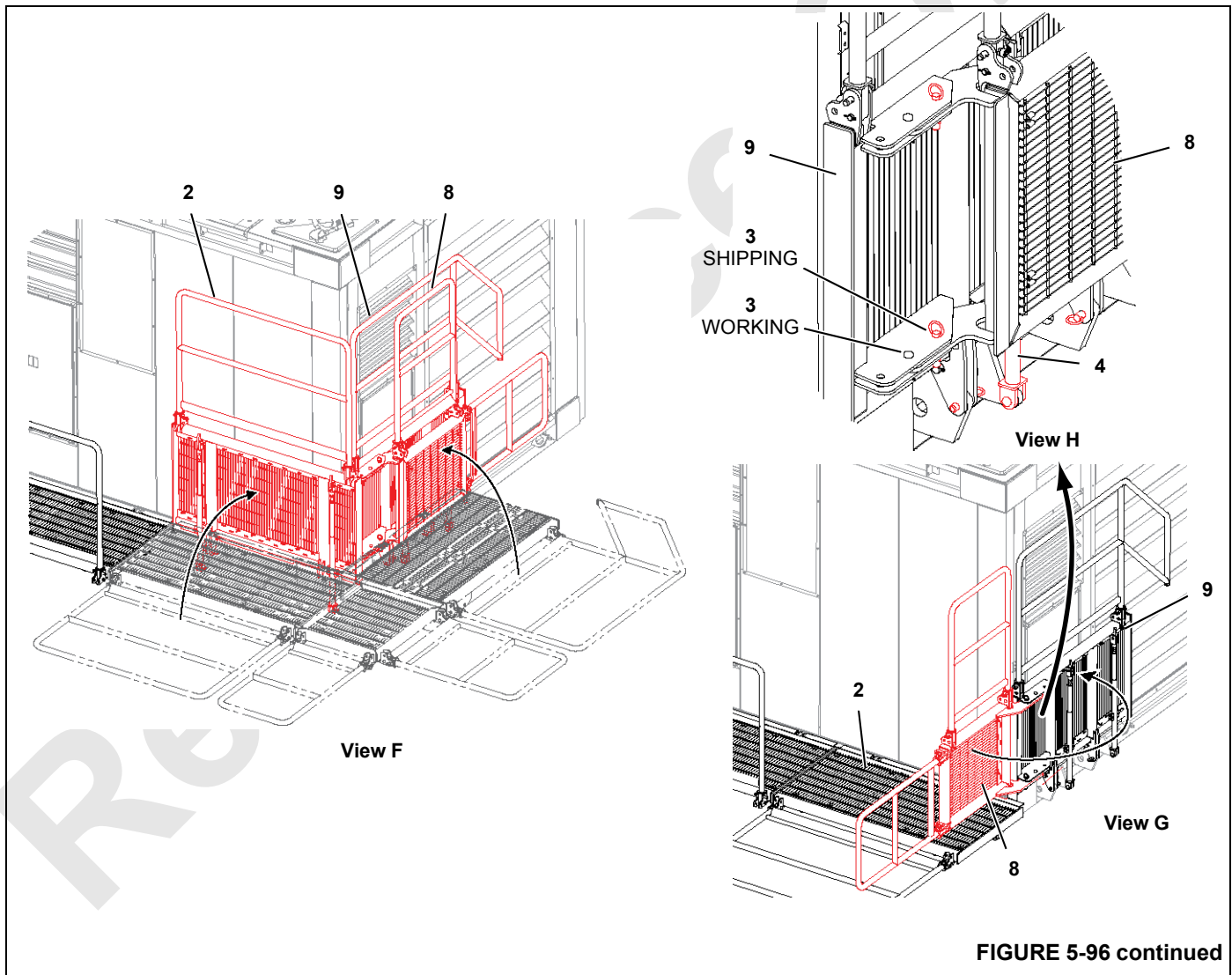


FIGURE 5-96 continued

Item	Description
1	Support (2)
2	Fixed Pin (2)
3	Pin with Cotter Pins (2)
4	Strut (2)
5	Pin with Cotter Pin (2)
6	4-Leg Chain Lifting Sling

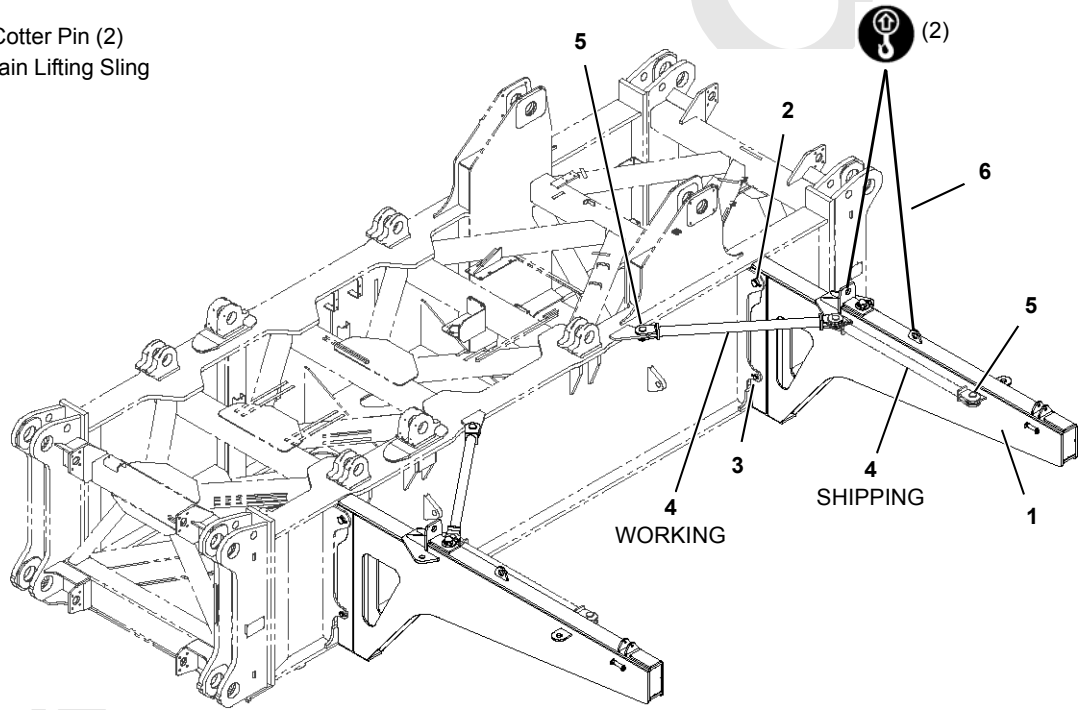


FIGURE 5-97

Lift Cab and Power Plant Enclosure onto Trailer

The cab and power plant enclosure can now be lifted onto a trailer for shipping.

Be sure to lower ladder extensions (2, [Figure 5-92](#), View A) to the shipping position.

Remove Supports

See [Figure 5-97](#) for the following procedure.

1. Attach two legs of the chain lifting sling (6) to the lifting lugs on either support (1).
2. Unpin strut (4) from the working position and pin it in the shipping position on the support.
3. Remove pin (3).
4. Lift the support clear of fixed pin (2) and place the support on a trailer for shipping.
5. Reinstall pin (3) in the support holes for storage.
6. Repeat the steps for the other support.

Reference Only

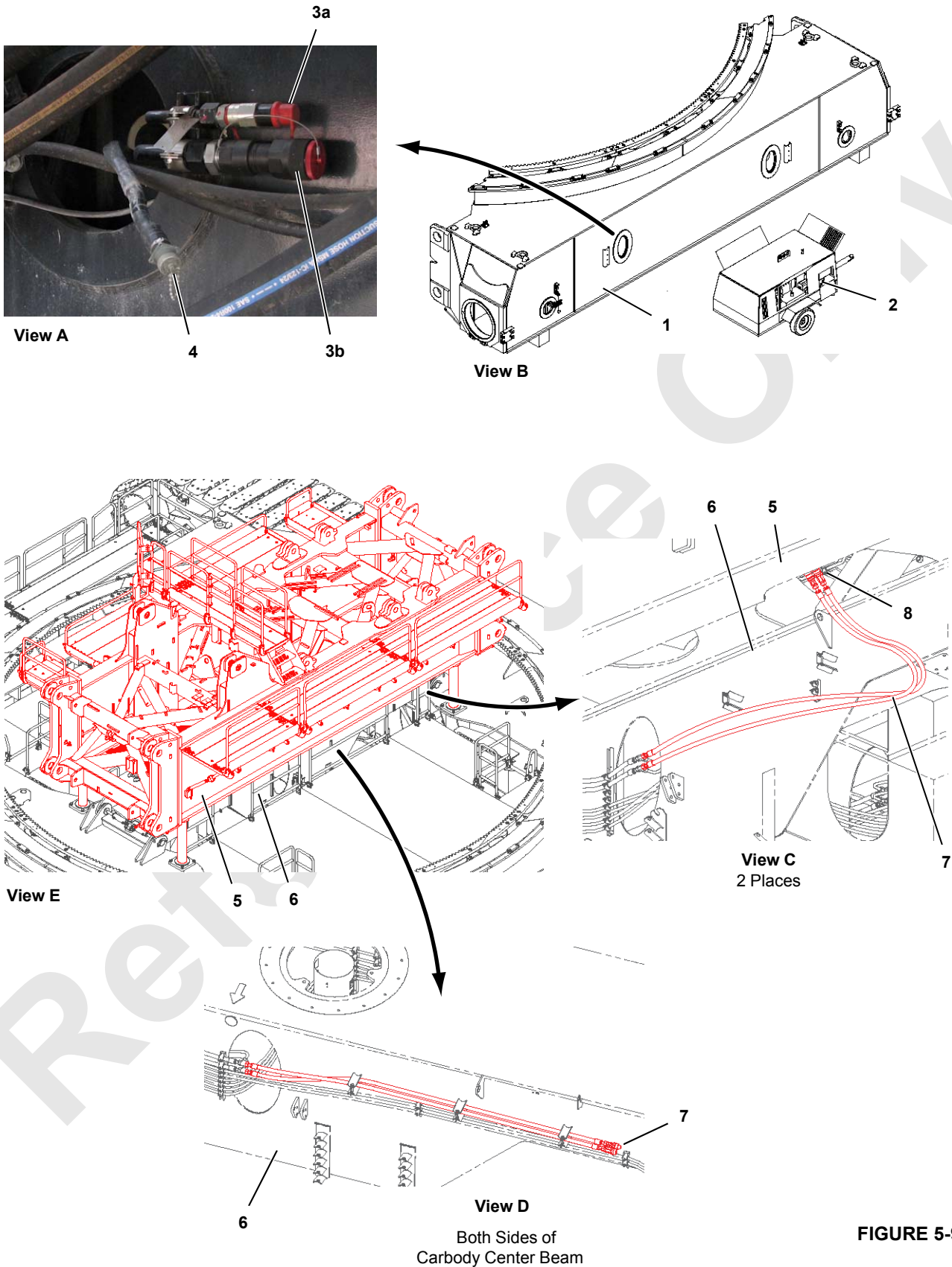


FIGURE 5-98

Legend for [Figure 5-94](#)

Item	Description
1	Front or Rear Beam
2	PPU
3a	Hydraulic Coupler (1/2 in [12,7 mm] supply)
3b	Hydraulic Coupler (1 in [25,4] return)
4	Electric Cable
5	Carbody Center Section
6	Rotating Bed
7	Hydraulic Hose (2 each side of carbody center beam)
8	Hydraulic Coupler (2 each side of rotating bed)

CRANE DISASSEMBLY — ACCESSORY HYDRAULIC PIPING

Connect Portable Power Unit (PPU)

See [Figure 5-98](#) for the following procedure.

1. Position PPU (2, View B) next to desired beam (1), front or rear, as shown.

The PPU remains in this position until the carbody is disassembled.

2. Connect two 20 ft 5 in (6,2 m) long hydraulic hoses from the couplers on the left side of the PPU to couplers (3a and 3b, View C) on front or rear beam (1). The hoses are stored in the PPU.

3. Connect the 30 ft (9,1 m) long electric cable from the receptacle on the PPU control panel to electric cable (4, View C) on front or rear beam (1). The electric cable is stored in the PPU.

Connect Accessory System Hydraulic Hoses

See [Figure 5-98](#) for the following procedure.

The hydraulic pins for the front roller carrier, the rear roller carrier, and the drums cannot be operated until this procedure is performed.

CAUTION

Avoid Hydraulic Piping Damage!

Do not swing upperworks while hydraulic hoses are connected. Damage will occur.

1. If running, stop the PPU.
2. Disconnect two hydraulic hoses (7, View D) from storage on either side of carbody center beam (6).
3. Connect hydraulic hoses (7) to hydraulic couplers (8, View C) on the corresponding side of rotating bed (5).
It is only necessary to connect the hydraulic hoses from one side of the carbody center beam, not both.
4. Start the PPU to pressurize the rotating bed accessory system.

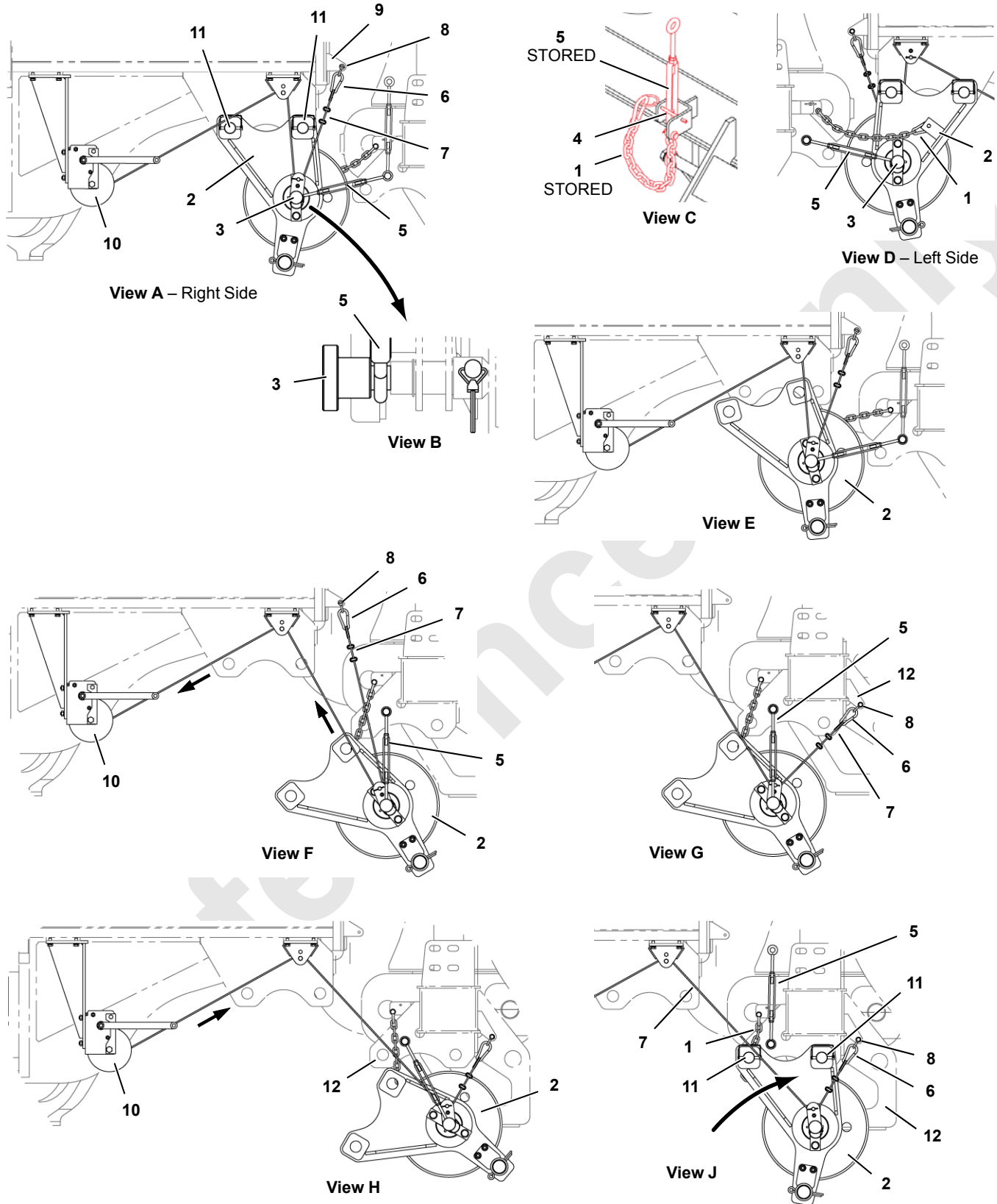


FIGURE 5-99

Item	Description
1	Chain
2	Wire Rope Guide
3	Pin with Wire-Lock Pin (2)
4	Wire-Lock Pin
5	Turnbuckle (2)
6	Snap Hook
7	Wire Rope
8	Shackle
9	Front Roller Carrier
10	Hand Winch
11	Pin with Cotter Pins (4)
12	Drum 5 Frame

CRANE DISASSEMBLY — DRUMS

Relocate Rigging Winch Wire Rope Guide

If your crane is equipped with a luffing hoist (Drum 5), the rigging winch lower wire rope guide, relocated it from under Drum 5 to under the front roller carrier, as follows.

See [Figure 5-99](#) for the following procedure.

1. Disconnect chain (1, View C) from the stored position and connect it to wire rope guide (2, View D).
2. Remove pins (3, Views A and D) from wire rope guide (2).
3. Remove wire lock pin (4, View C) and rotate turnbuckles (5) down to the working position.
4. Pin turnbuckles (5, View B) to the wire rope guide with pins (3).

NOTE Adjust the length of the turnbuckles if needed. Securely tighten the locknuts when done.

5. Route wire rope (7, View J) from hand winch (10) over the guide sheave under the front roller carrier and under the guide sheave on wire rope guide (2).
6. Pin snap hook (6, View J) on wire rope (7) to shackle (8) on Drum 5 frame (12).
7. Haul in wire rope with hand winch (10, View A) just enough to loosen pins (11, View J) and remove both pins.
 - When the winch handle is turned in the raise direction (haul in), the winch makes a loud clicking noise.
 - When the winch handle is turned in the lower direction (pay out), the winch brake is actuated and there is no clicking noise.
 - When the winch handle is stopped and released, the brake applies.
8. Pay out the wire rope to allow wire rope guide (2) to swing down as shown in View H.
9. Continue to pay out wire rope from the hand winch to lower the wire rope guide until turnbuckles (5, View G) are vertical and the wire rope is slack.
10. Disconnect snap hook (6, View G) on wire rope (7) from shackle (8) on Drum 5 frame (12) and pin the snap hook to shackle (8) on the front roller carrier (View F).
11. Haul in wire rope with hand winch (10) to raise wire rope guide (2) to the mounting position under the front roller carrier (View E).
12. Rotate the wire rope guide by hand to align the connecting holes and install pins (11, View A).
13. Unpin the turnbuckles from the working position on the wire rope guide, rotate the turnbuckles to the storage position, and install quick-release pin (4, View C).
14. Store chain (1, View C).

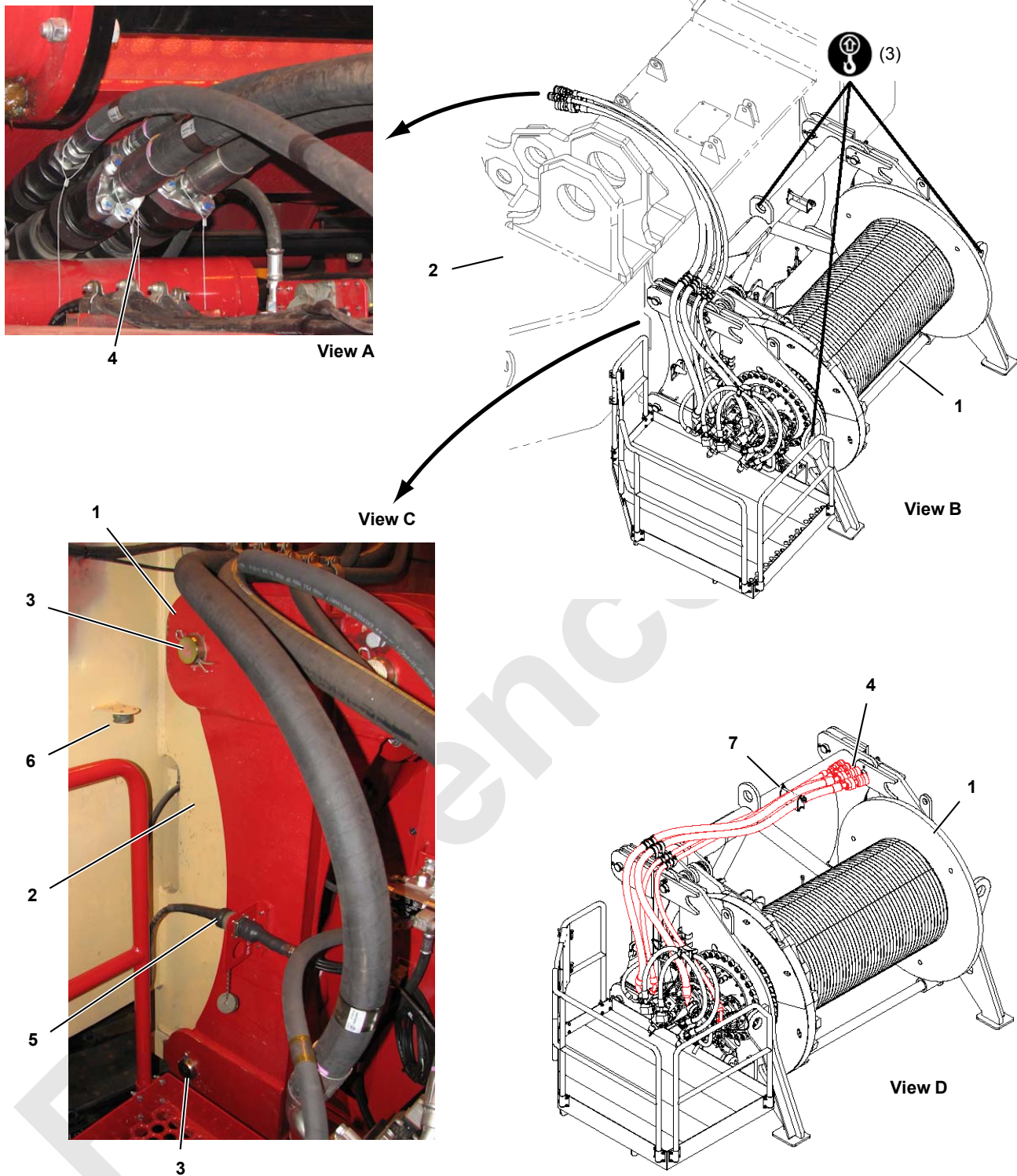


FIGURE 5-100

Item	Description
1	Drum 5 (Luffing Hoist)
2	Front Roller Carrier
3	Pin with Cotter Pins (4)
4	Hydraulic Hoses (4)
5	Electric Cable (W86P2)
6	Storage Receptacle
7	Storage Bracket

NOTE The drum lifting arrangements shown in Figures [5-100](#), [5-103](#), [5-106](#), [5-110](#), and [5-114](#) are for the complete drum assembly — with or without wire rope installed.

Remove Drum 5

Perform the following procedure if your crane has a luffing jib.

See [Figure 5-100](#) for the following procedure.

- Attach three legs of the chain lifting sling to drum (1, View B).
- Disconnect four hydraulic hoses (4, View A) from drum (1) at the hydraulic hoses on the front of the rotating bed.
 - Clean the ends of the hoses.
 - Clean and install protective caps on the ends of the hoses. The protective caps are stored in the parts boxes.
- Connect the hoses to bracket (7, View D) for storage.
- Disconnect electric cable (5, View C) from drum (1).
 - Clean the end of the electric cable and receptacle.
- Connect electric cable (5, View C) to storage receptacle (6).
- Hoist with the assist crane so the lifting slings are tight.
- Remove pins (7, View C).
- Lift drum (5) away from front roller carrier (6, View B).
- Reinstall pins (7, View C) in the drum holes for storage.
- Place the drum on a trailer for shipping.

Disconnect Hydraulic Hoses and Electric Cables between Drums and Rotating Bed

- Disconnect the hydraulic hoses between the drums and the rotating bed as shown in [Figure 5-101](#).
 - Clean the ends of the hoses.
 - Clean and install protective caps on the ends of the hoses. The protective caps are stored in the parts boxes.
 - Store the hoses on the drums and the rotating bed.
- Disconnect the electric cables between the drums and the rotating bed as shown in [Figure 5-102](#).
 - Clean the ends of the electric cables and receptacles.
 - Clean and install protective caps on the ends of the electric cables and all receptacles.
 - Store the electric cables on the drums and the rotating bed.

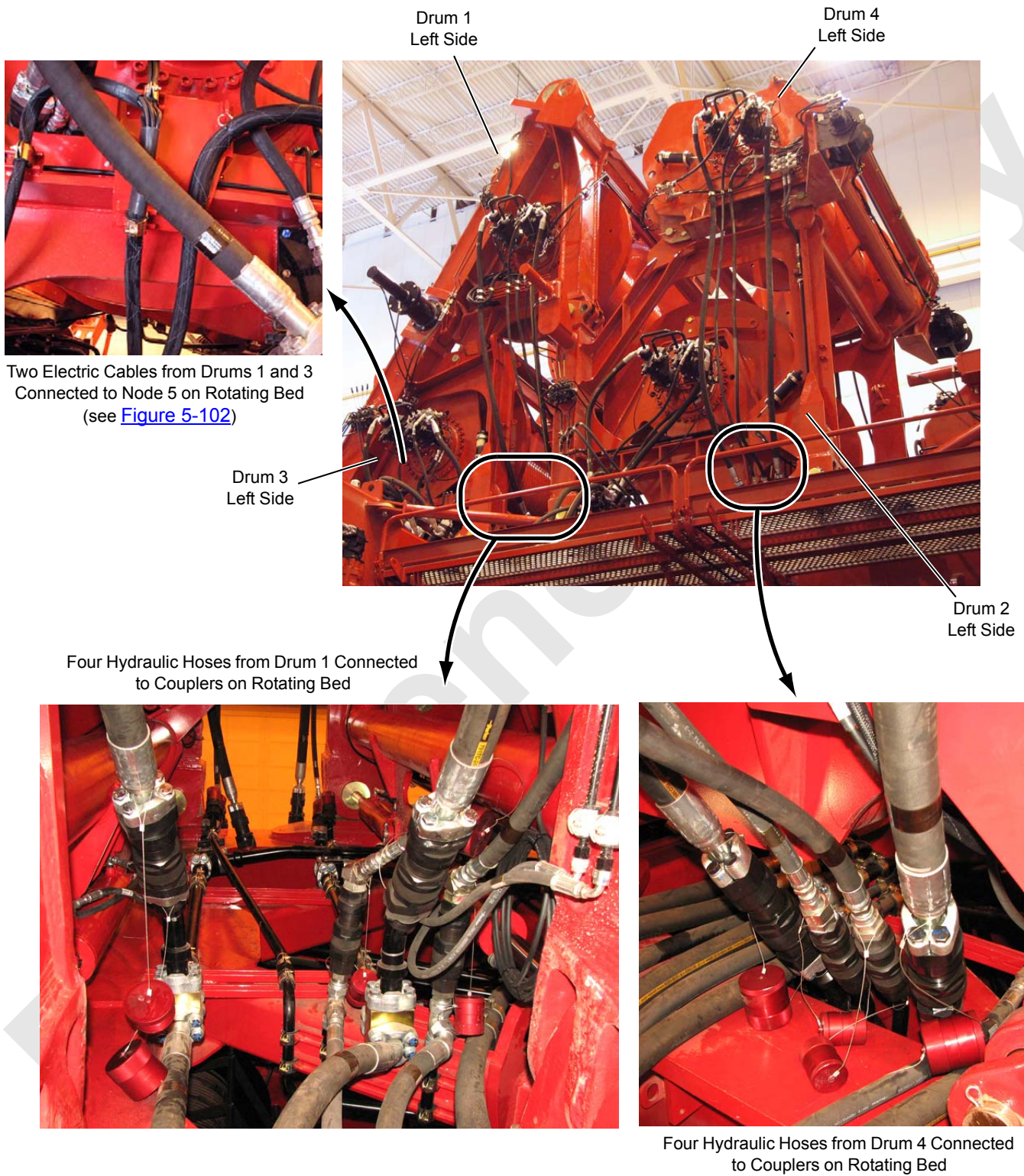
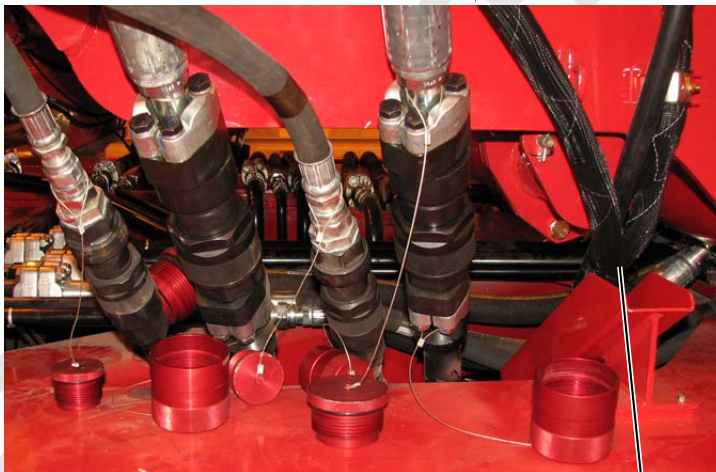
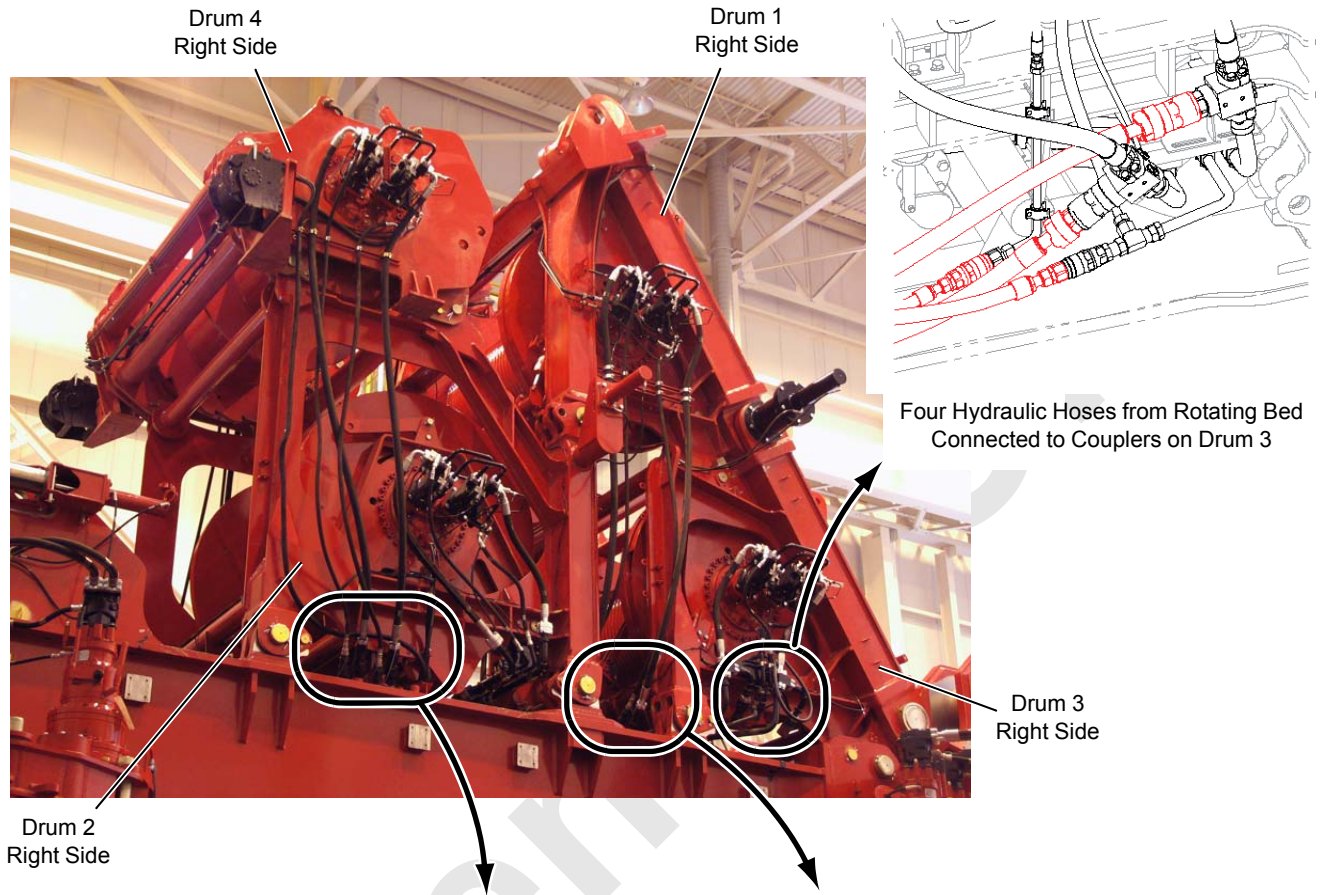


FIGURE 5-101



Two Electric Cables from Drums 2 and 4 Connected to Node 7 on Rotating Bed Center Section (see [Figure 5-102](#))

FIGURE 5-101 continued

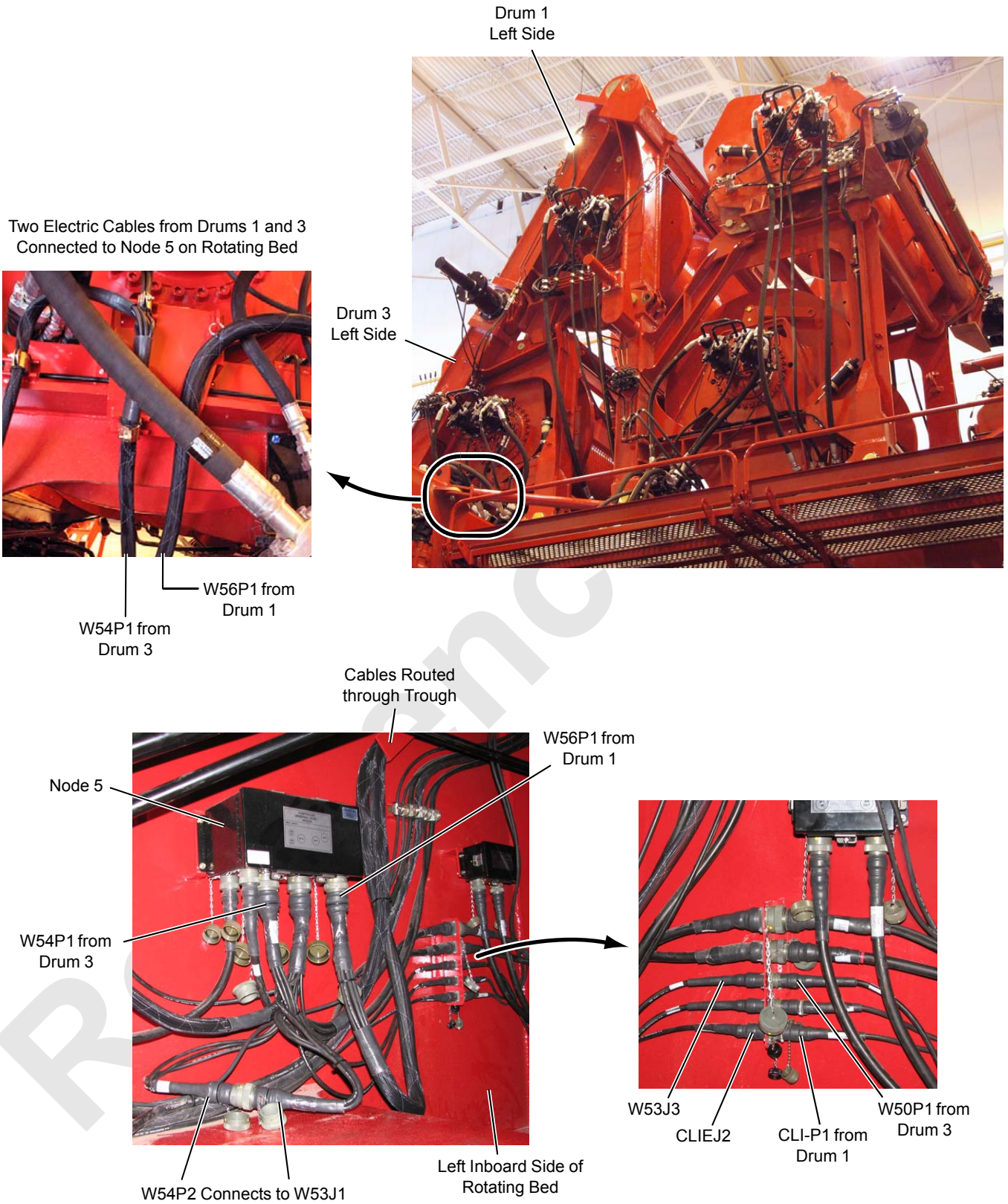


FIGURE 5-102

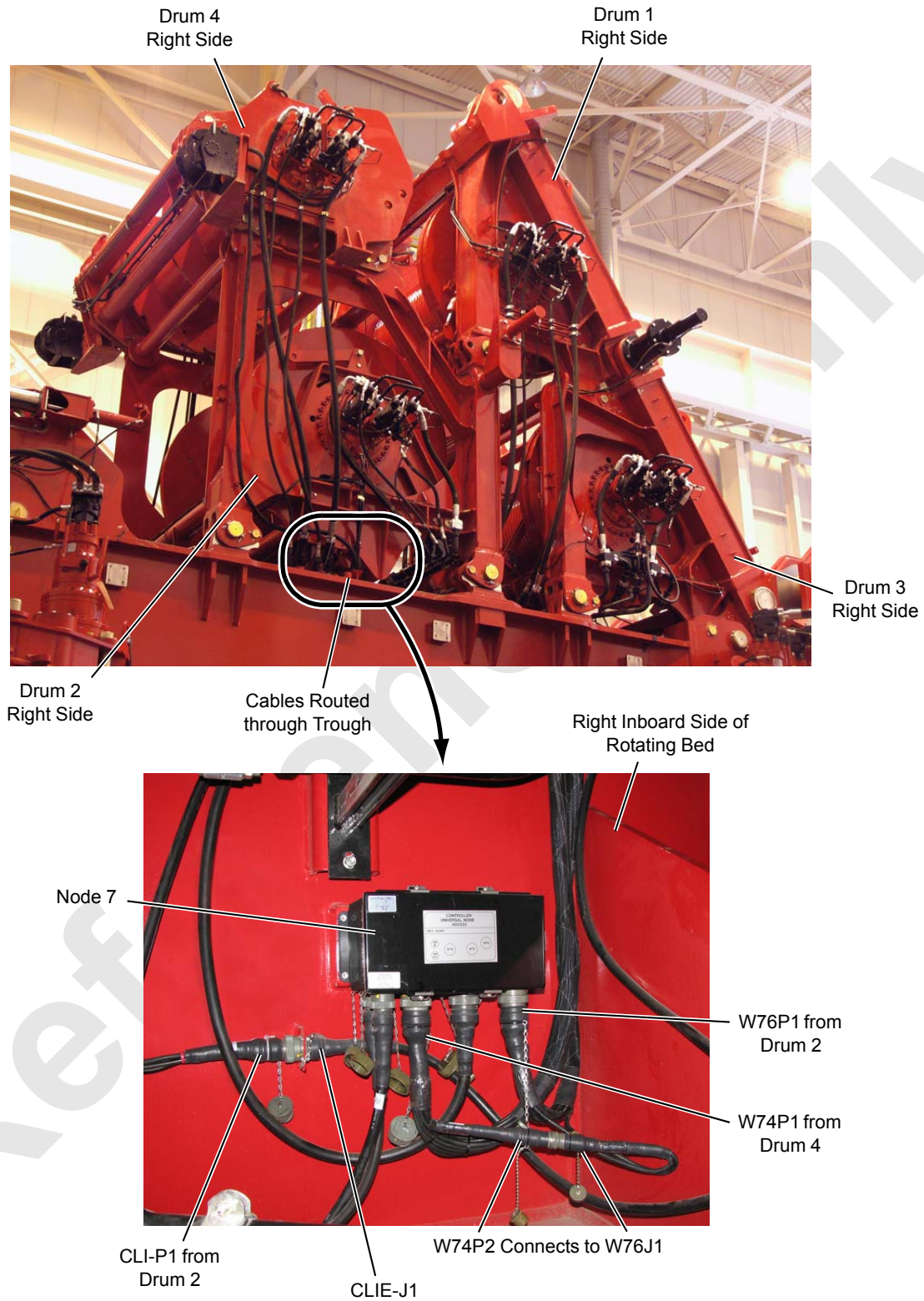


FIGURE 5-102 continued

Item	Description
1	Drum 1
2	Drum 2
3	Drum 3
4	Drum 4
4a	Pin with Cotter Pins (4)
4b	Alignment Pin (4)
4c	Hydraulic Hoses from Rotating Bed
4d	Hydraulic Couplers
5	Rotating Bed Center Section
8	Equalizer

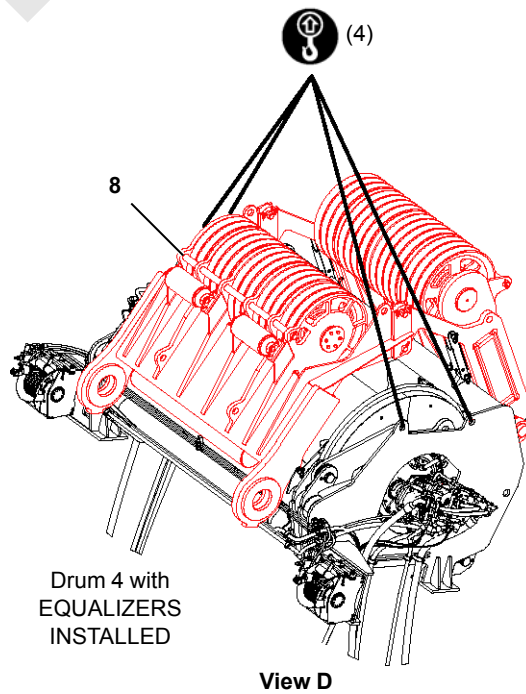
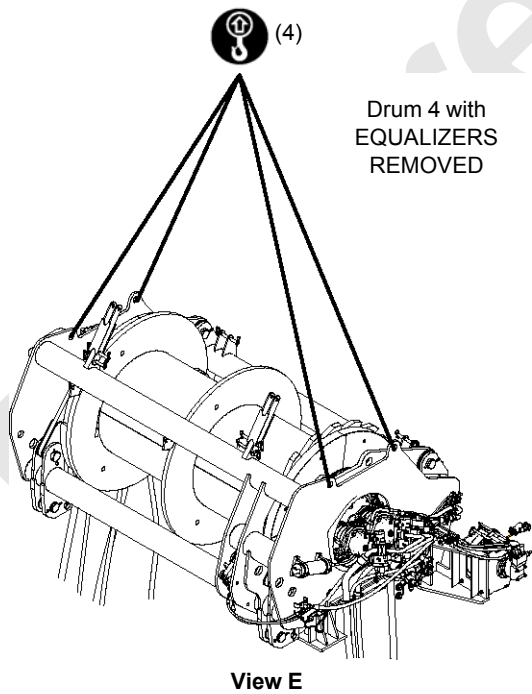
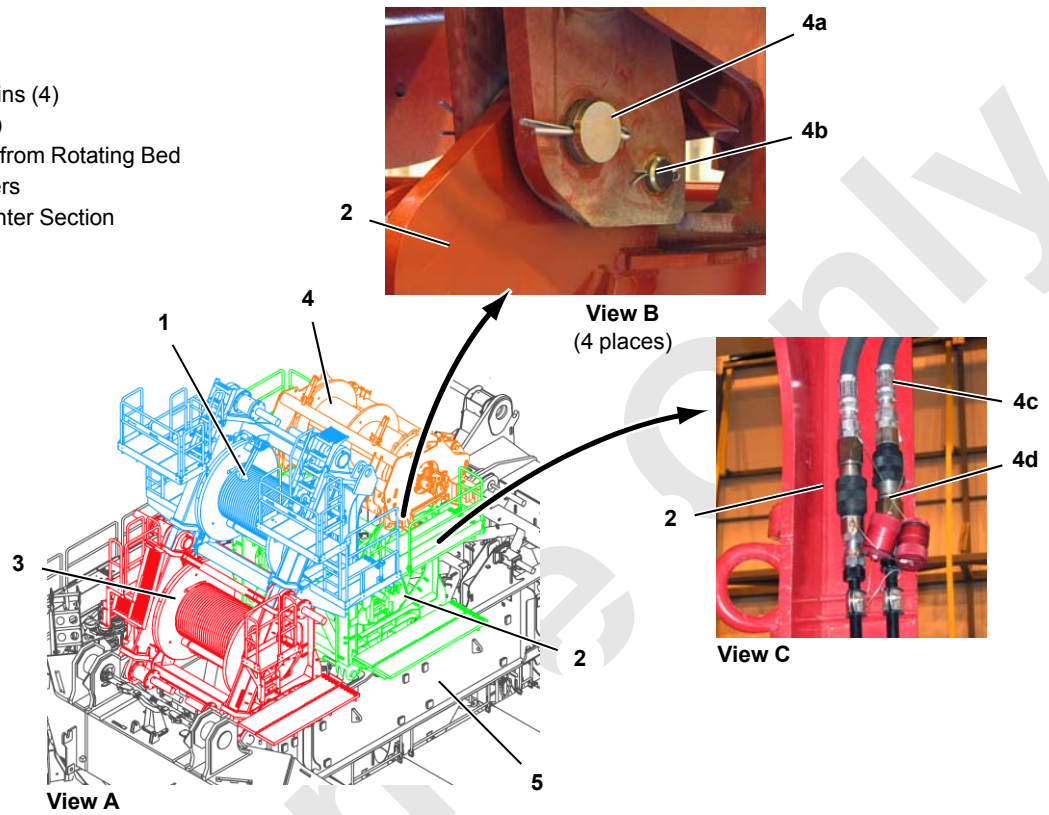
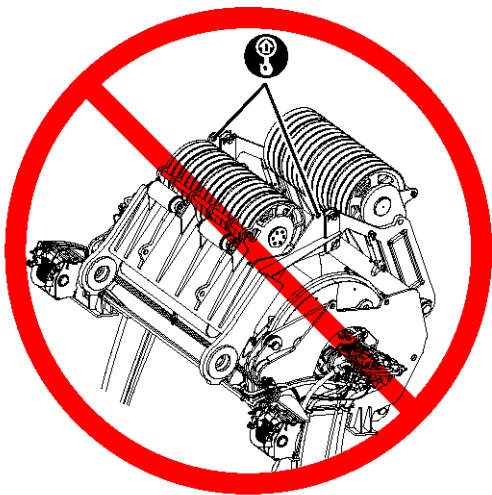


FIGURE 5-103

CAUTION**Avoid Structural Damage!**

Do not attempt to lift entire drum (4) assembly using lifting lugs on equalizer. Lifting lugs on equalizer are provided for lifting only the equalizer.



Lift entire drum (4) assembly — with equalizer installed or removed — as shown in [Figure 5-103](#), View D or E.

Remove Drum 4

See [Figure 5-103](#) for the following procedure.

1. Attach four legs of the chain lifting sling to drum (4) as shown in View D or E.
2. Disconnect two hydraulic hoses (4c, View C) from drum (4) at hydraulic couplers (4d) on drum (2).
 - Clean the ends of the hoses.
 - Clean and install protective caps on the ends of the hoses.
 - Store the hoses on the drum.
3. Hoist with the assist crane so the lifting slings are tight.
4. Remove pins (4a, View B) from the drum.
5. Lift drum (4) away from drum (2).
6. Reinstall pins (4a, View B) in the drum holes for storage.
7. Store the hydraulic hoses and electric cables on drum (4) as shown in [Figure 5-104](#).
8. Lift drum (4) onto a trailer for shipping
9. Disconnect the lifting slings.

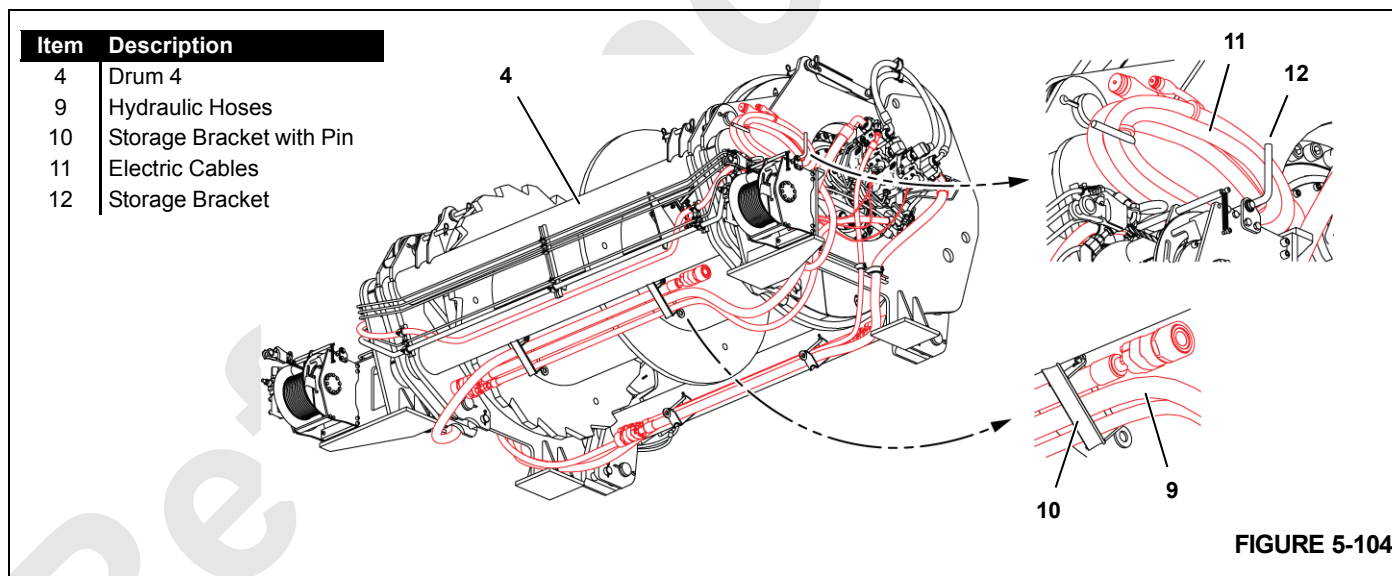


FIGURE 5-104

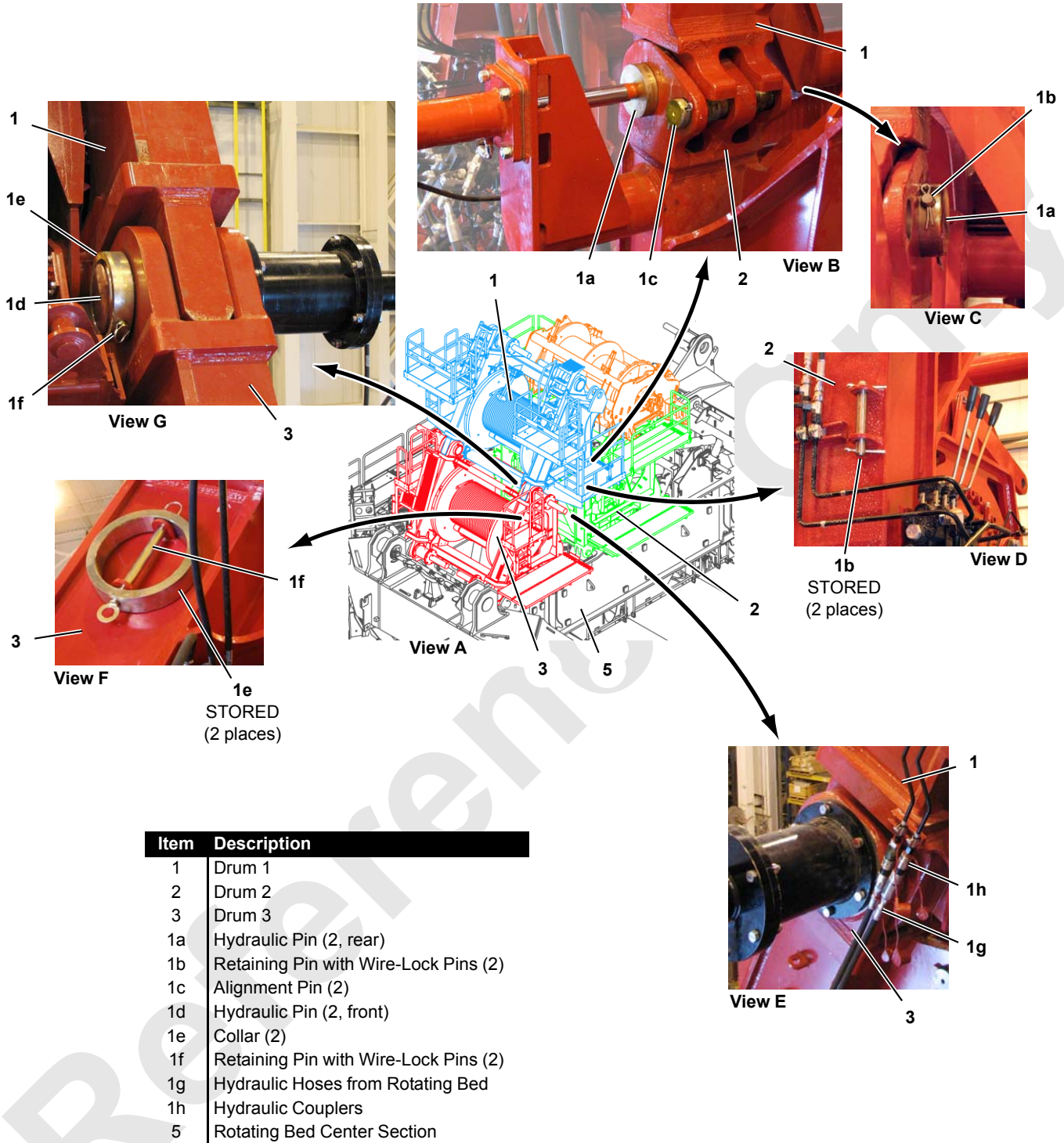


FIGURE 5-105

Remove Drum 1

1. Attach three legs of the chain lifting sling to drum (1) as shown in [Figure 5-106](#).

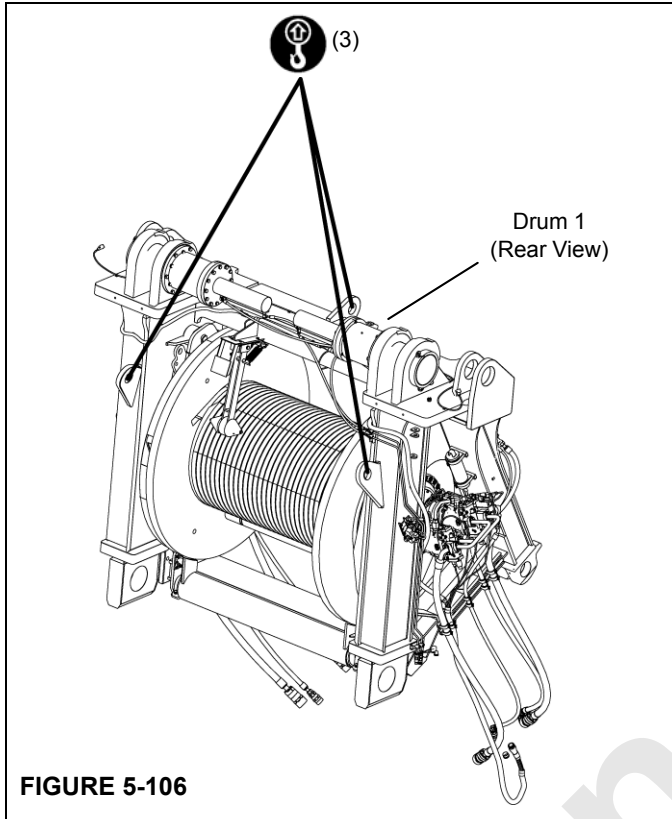


FIGURE 5-106

See [Figure 5-105](#) for the remaining steps.

2. Remove retaining pins (1b, View C) from hydraulic pins (1a) and store them (View D).
3. Remove retaining pins (1f, View G) and collars (1e) from hydraulic pins (1d) and store them (View F).
4. Hoist with the assist crane until the lifting slings are tight.
5. Start the PPU and disengage hydraulic pins (1a, View B) and (1d, View G) using the control handles on drums (2 and 3) — see [Figures 5-109](#) and [5-113](#).
6. Lift drum (1) away from drums (2 and 3).
7. Disconnect two hydraulic hoses (1g, View E) from (3) to hydraulic couplers (1h) on drum (1).
 - Clean the ends of the hoses.
 - Clean and install protective caps on the ends of the hoses.
 - Store the hoses on the rotating bed.
8. Store drum (1) platforms as instructed on [page 5-187](#).
9. Store the hydraulic hoses and electric cables on drum (1) as shown in [Figure 5-107](#).
10. Lift drum (1) onto a trailer for shipping.
11. Disconnect the lifting slings.

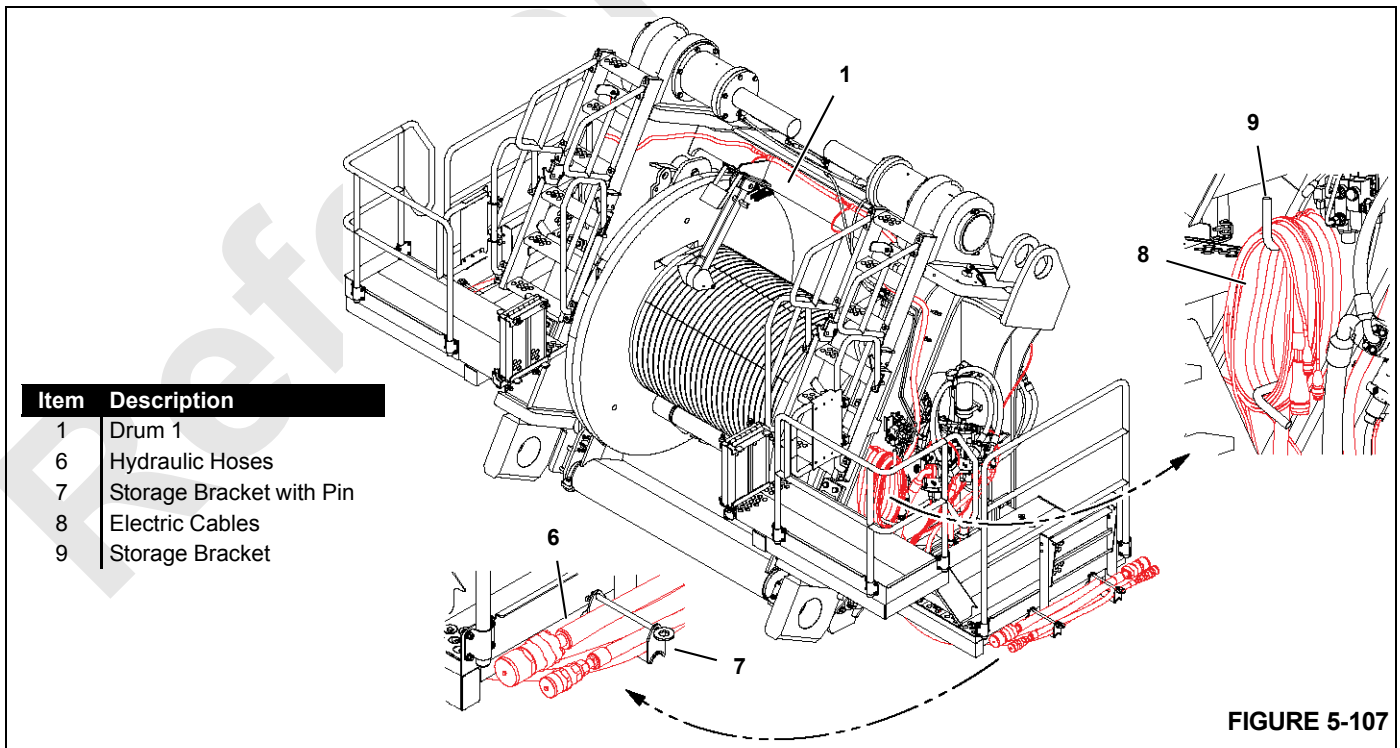


FIGURE 5-107

Item	Description
1	Platform (right rear)
2	Platform (right front)
3	Platform Extension (right)
4	Stairway (right)
5	Platform (left rear)
6	Platform (left front)
7	Platform Extension (right)
8	Stairway (left)
9	Pin with Hair-Pin Cotter (4)
10	Pin with Hair-Pin Cotter (4)
11	Step (2)
12	Pin with Hair-Pin Cotter (4)

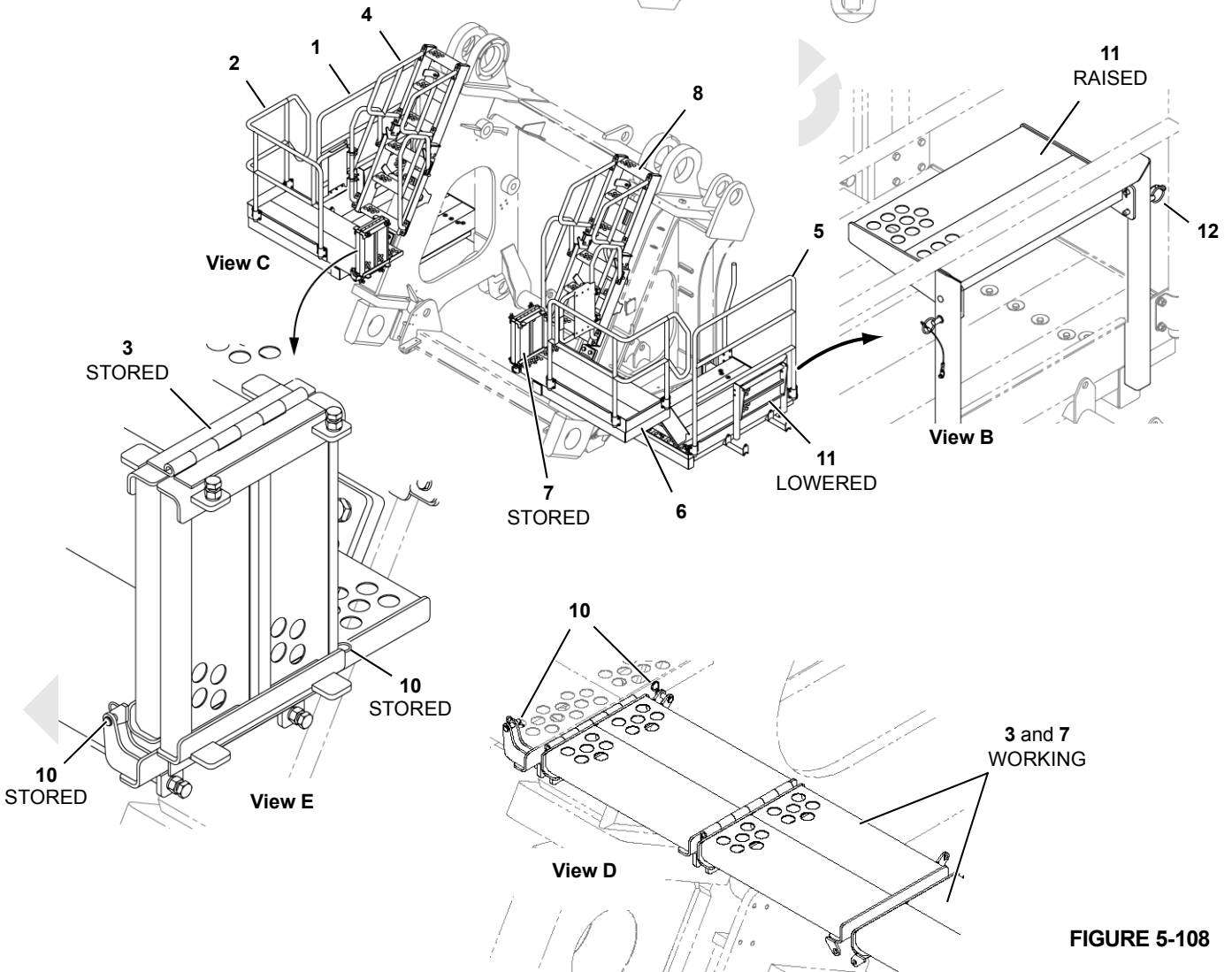
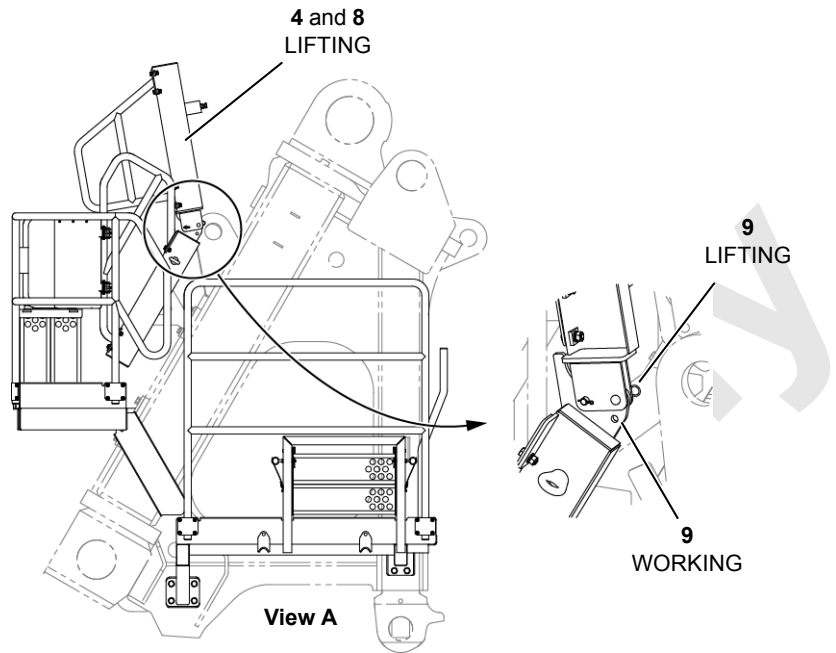


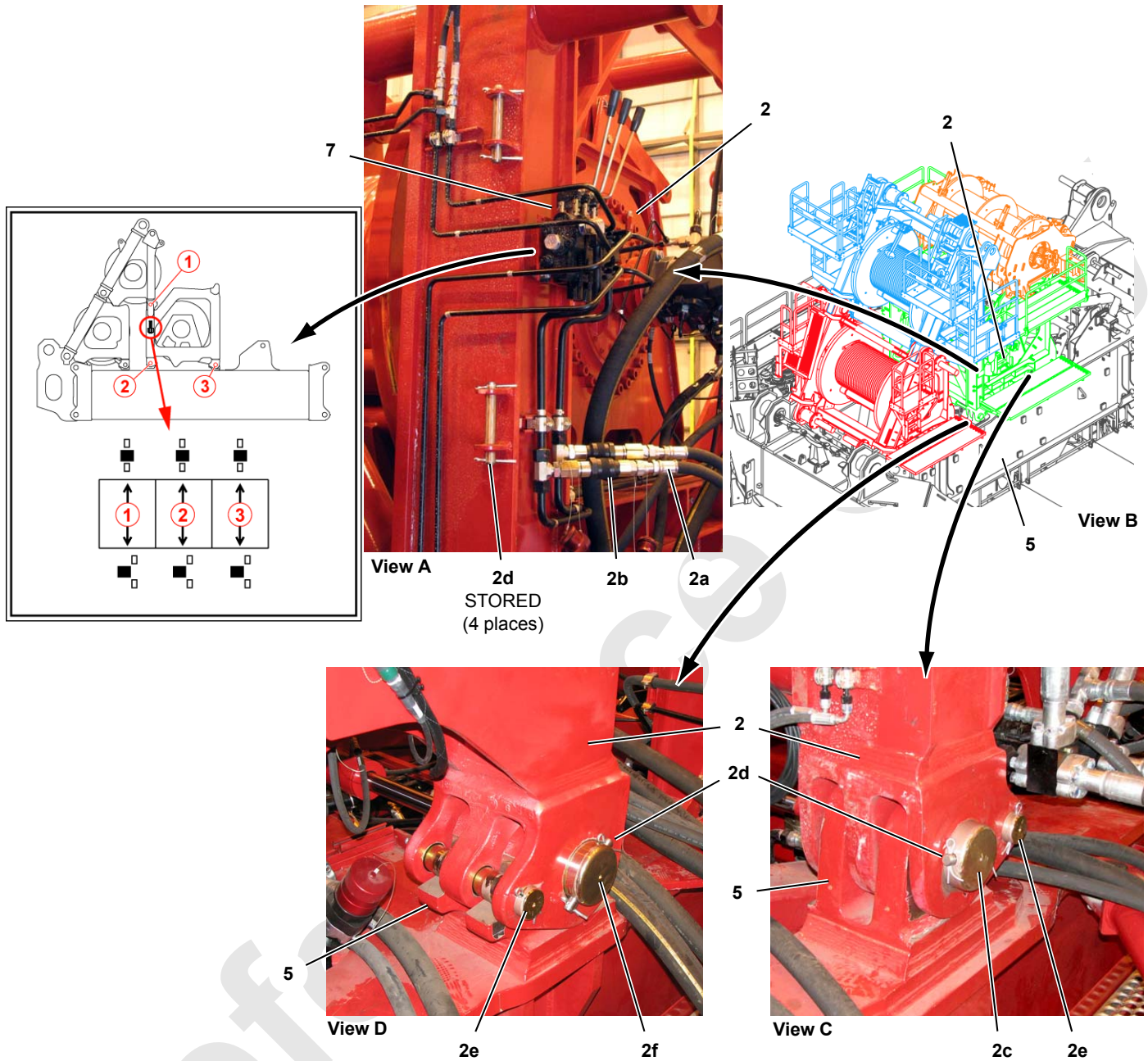
FIGURE 5-108

Store Drum 1 Platforms

See [Figure 5-108](#) for the following procedure.

1. Unpin steps (11, View B) from the raised position and pin them in the lowered position (View C).
2. Raise platform extensions (3 and 7, View D) from the working position and pin them in the stored position (View E).
3. Disconnect the lifting sling.

Reference Only

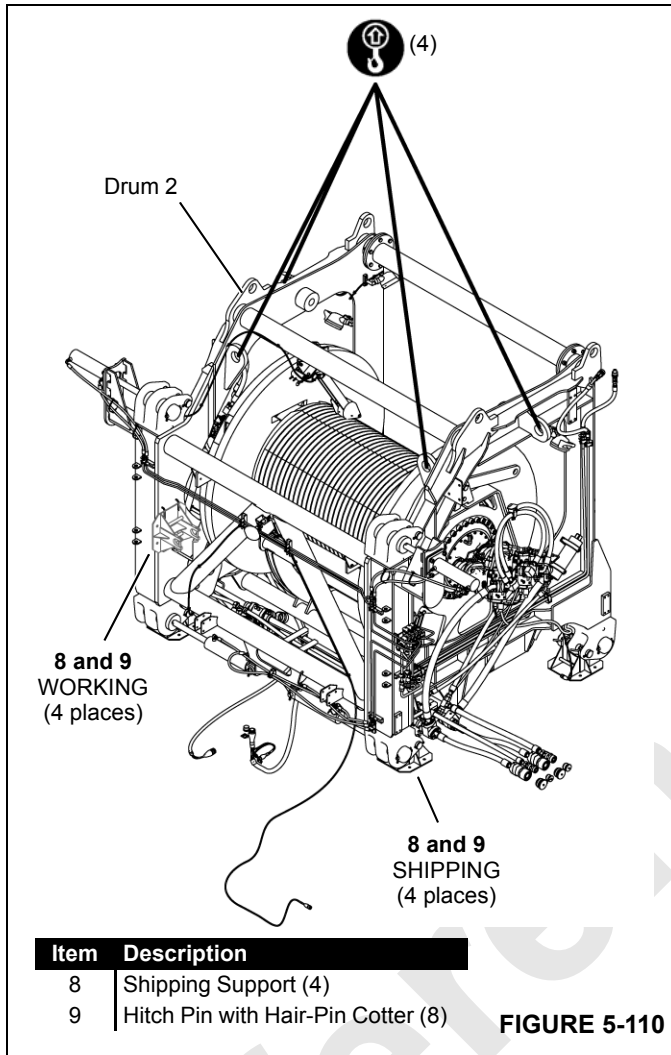


Item	Description
2	Drum 2
2a	Hydraulic Hoses from Rotating Bed
2b	Hydraulic Couplers
2c	Hydraulic Pin (2, rear)
2d	Retaining Pin with Wire-Lock Pins (4)
2e	Alignment Pin (4)
2f	Hydraulic Pin (2, front)
5	Rotating Bed Center Section
7	Hydraulic Pins Control Valve

FIGURE 5-109

Remove Drum 2

1. Attach four legs of the chain lifting sling to drum (2) as shown in [Figure 5-110](#).

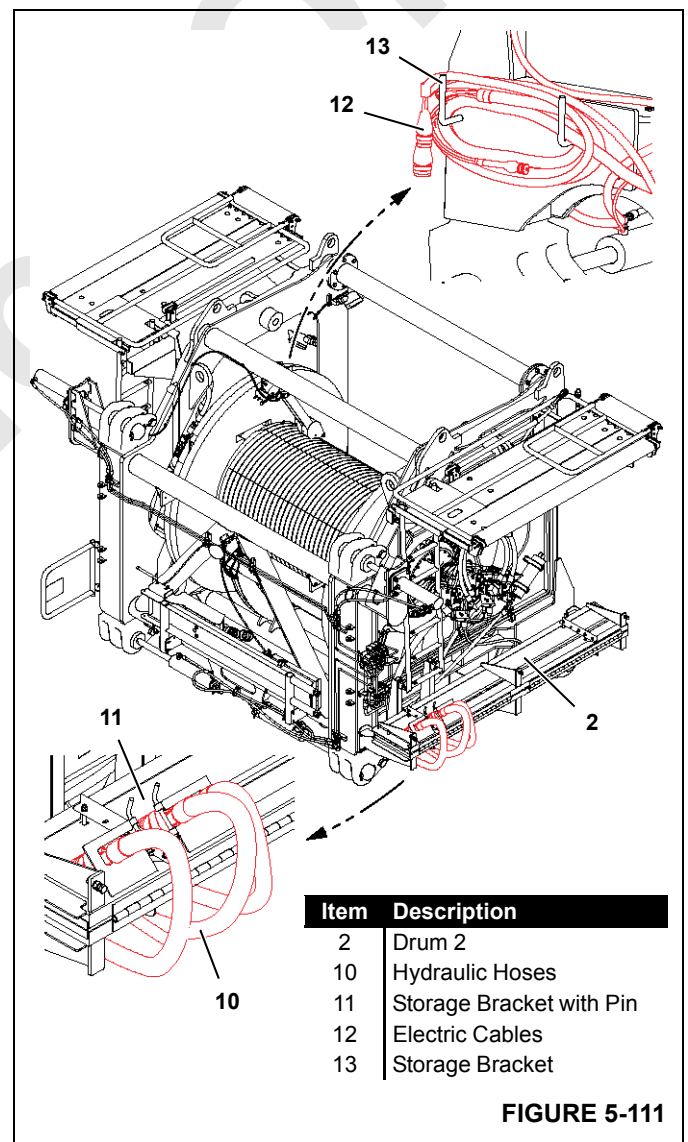


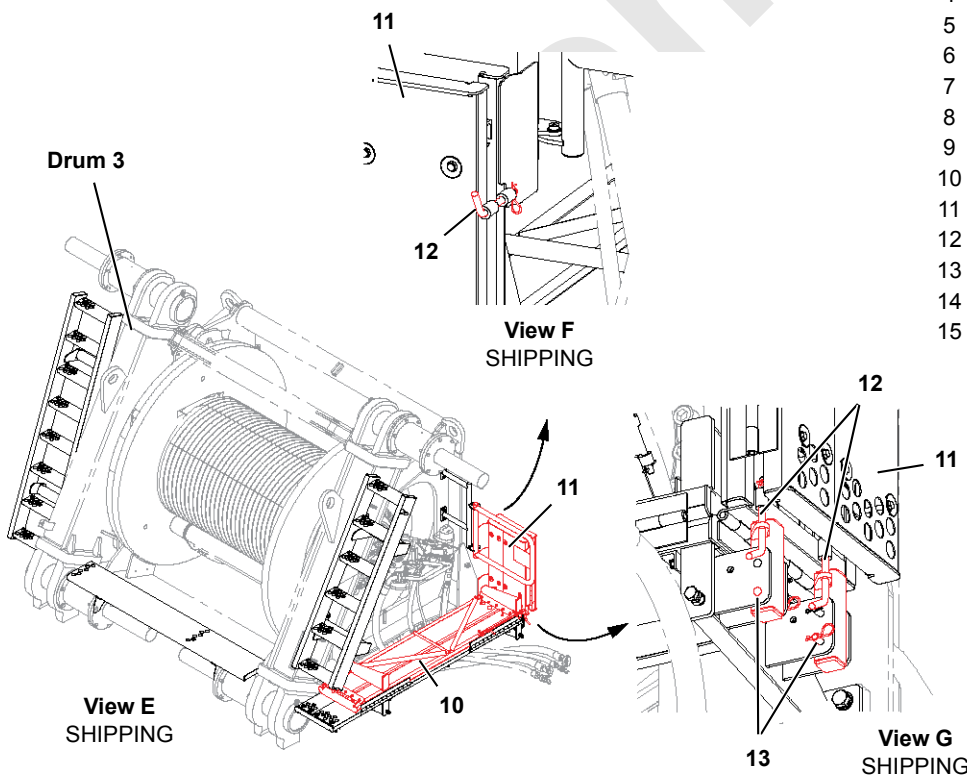
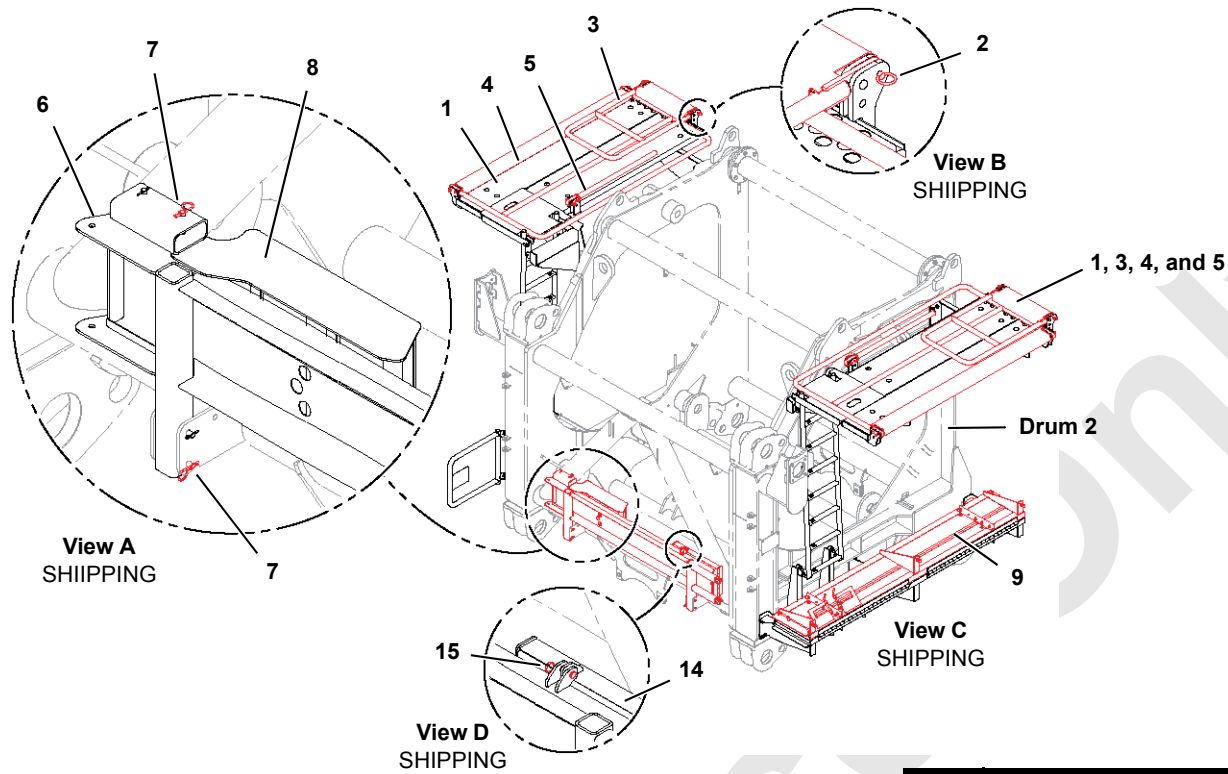
See [Figure 5-109](#) for the remaining steps.

2. Remove retaining pins (2d, Views C and D) from hydraulic pins (2c and 2f).
3. Store retaining pins (2d, View A).
4. Hoist with the assist crane so the lifting slings are tight.
5. Start the PPU and disengage hydraulic pins (2c, View C) and (2f, View D) using the control handles on hydraulic pins control valve (7, View A).
6. Lift drum (2) away from the crane.
7. Disconnect two hydraulic hoses (2a, View A) from rotating bed center section (5) to hydraulic couplers (2b) on drum (2).

- Clean the ends of the hoses.
- Clean and install protective caps on the ends of the hoses.
- Store the hoses on the rotating bed.

8. Remove shipping supports (8, [Figure 5-110](#)) from the working position and pin them in the shipping position.
9. Move drum (2) handrails and platforms from the working positions to the shipping positions as shown on pages [page 5-190](#) and [page 5-191](#).
10. Store the hydraulic hoses and electric cables on drum (2) as shown in [Figure 5-111](#).
11. Lift drum (2) onto a trailer for shipping.
12. Disconnect the lifting slings.





Item	Description
1	Platform (2, shipped on Drum 2)
2	Quick-Release Pin (2 each handrail)
3	Handrail (2)
4	Handrail (2)
5	Handrail (2)
6	Platform
7	Pin with Hair-Pin Cotter (4)
8	Stairway
9	Platform
10	Platform
11	Platform Extension
12	Hitch Pin with Hair-Pin Cotter (3)
13	Pin with Hair-Pin Cotter (2)
14	Platform Extension
15	Pin with Hair-Pin Cotter (2)

FIGURE 5-112

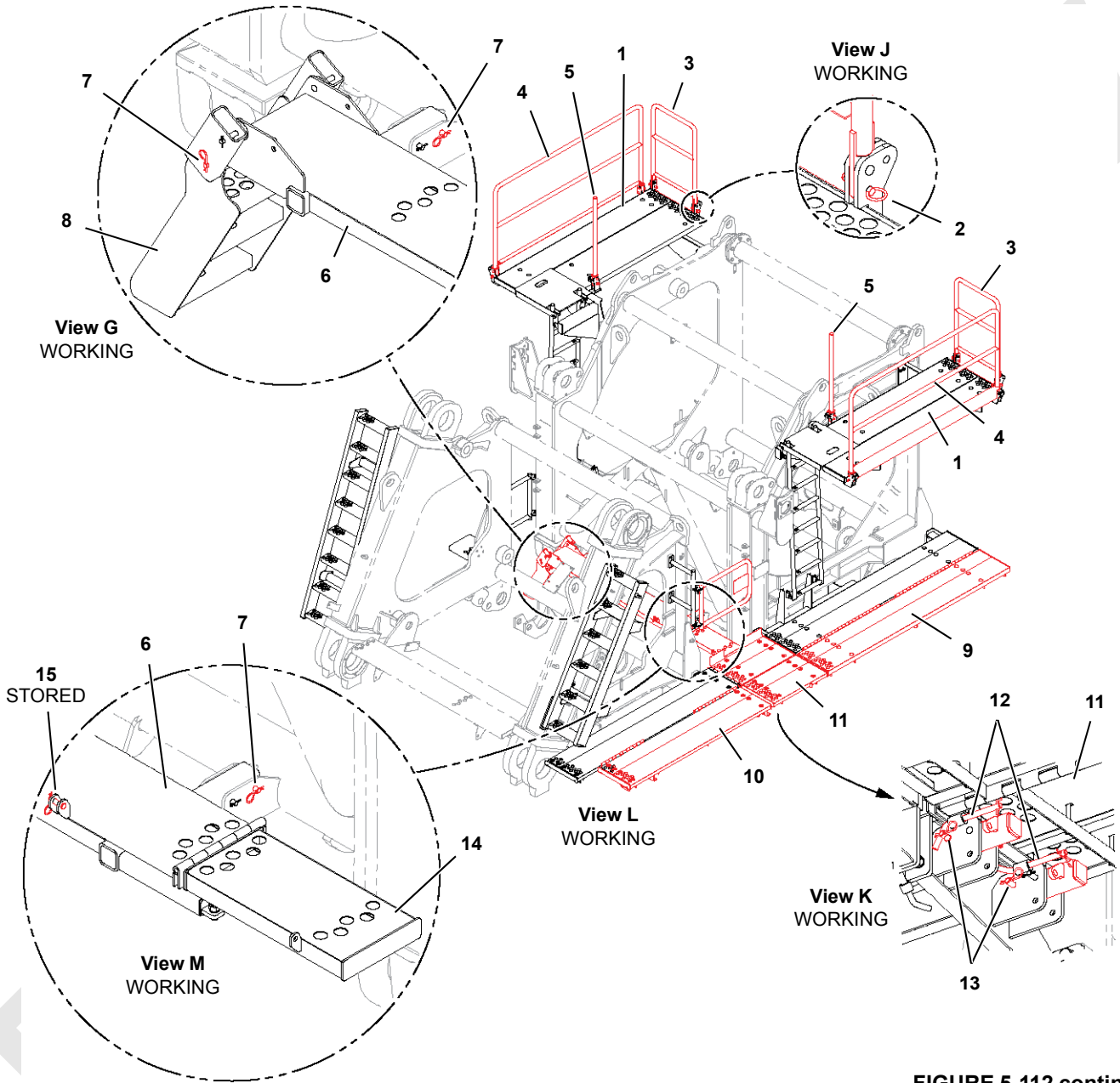
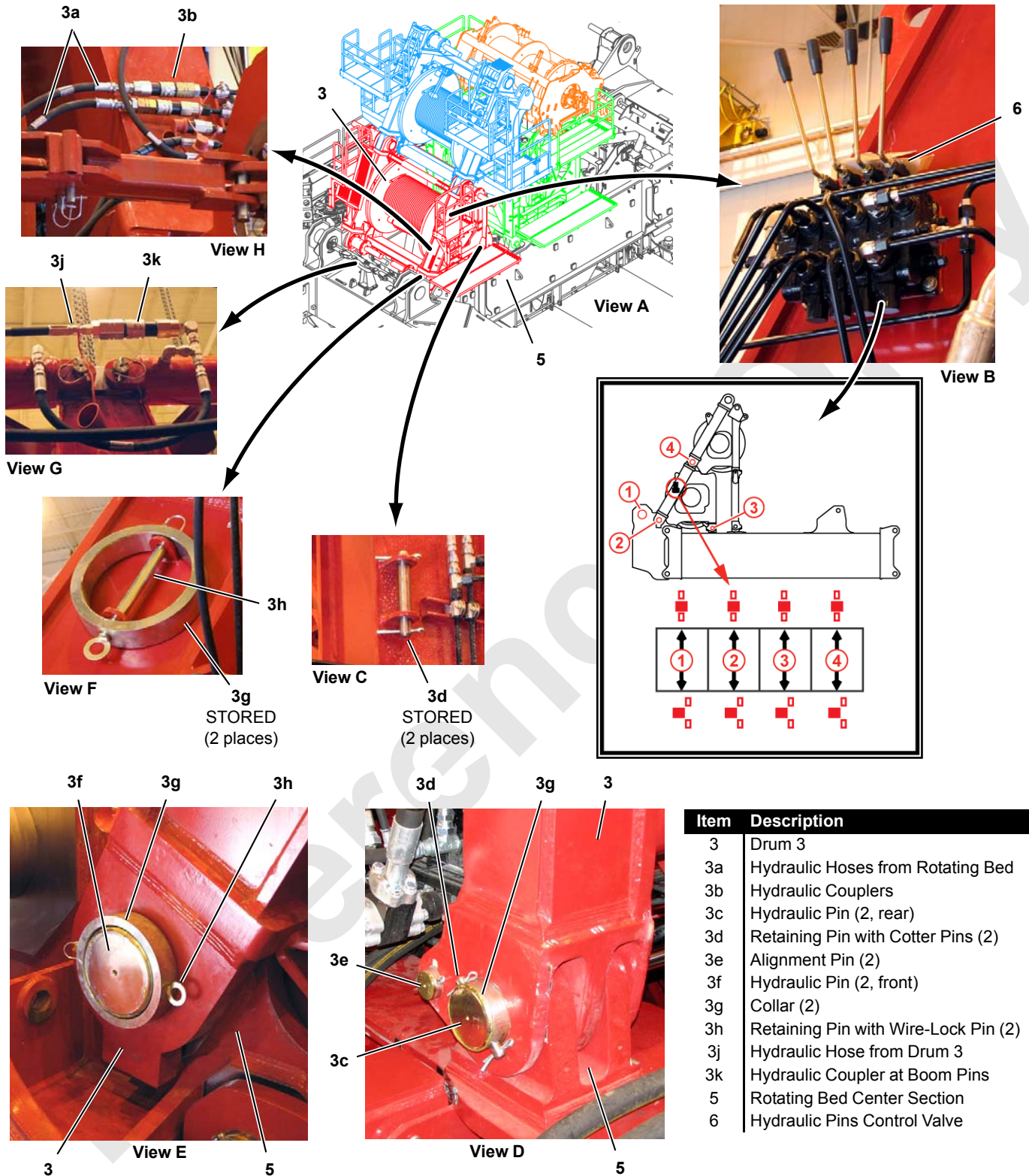


FIGURE 5-112 continued



Item	Description
3	Drum 3
3a	Hydraulic Hoses from Rotating Bed
3b	Hydraulic Couplers
3c	Hydraulic Pin (2, rear)
3d	Retaining Pin with Cotter Pins (2)
3e	Alignment Pin (2)
3f	Hydraulic Pin (2, front)
3g	Collar (2)
3h	Retaining Pin with Wire-Lock Pin (2)
3j	Hydraulic Hose from Drum 3
3k	Hydraulic Coupler at Boom Pins
5	Rotating Bed Center Section
6	Hydraulic Pins Control Valve

FIGURE 5-113

Remove Drum 3

1. Attach four legs of the chain lifting sling to drum (3) as shown in [Figure 5-114](#).

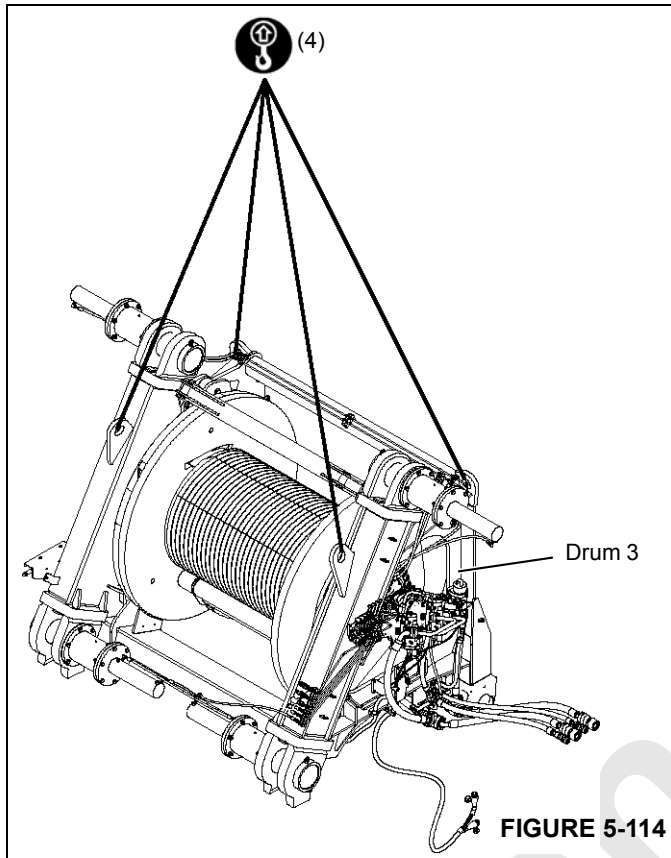
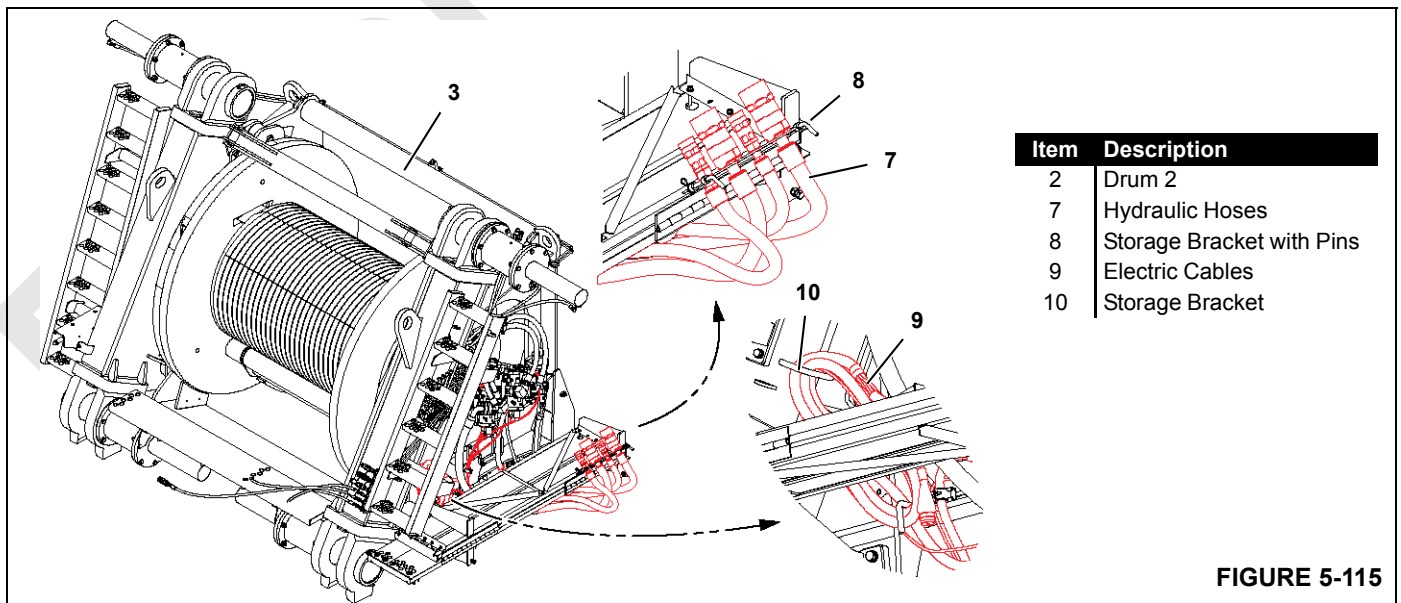


FIGURE 5-114

See [Figure 5-113](#) for the remaining steps.

2. Disconnect hydraulic hose (3j, View G) from drum (3) to hydraulic coupler (3k) at the boom hydraulic pins.

- Clean the end of the hose and coupler.
 - Clean and install protective caps on the end of the hose and coupler.
 - Store the hose on the drum.
3. Remove retaining pins (3h, View E) and collars (3g) from hydraulic pins (3f) and store them (View F).
 4. Remove retaining pins (3d, View E) from hydraulic pins (3c) and store them (View C).
 5. Hoist with the assist crane until the lifting slings are tight.
 6. Start the PPU and disengage hydraulic pins (3c, View D) and (3f, View E) using the control handles on hydraulic pins control valve (6, View B).
 7. Disconnect two hydraulic hoses (3a, View H) from rotating bed center section (5) at hydraulic couplers (3b) on drum (3).
 - Clean the ends of the hoses and couplers.
 - Clean and install protective caps on the ends of the hoses and couplers.
 - Store the hoses on the rotating bed.
 8. Lift drum (3) away from rotating bed center section (5).
 9. Move drum (3) platforms and handrails from the working positions to the shipping positions as shown on pages [page 5-190](#) and [page 5-191](#).
 10. Store the hydraulic hoses and electric cables on drum (2) as shown in [Figure 5-115](#).
 11. Lift drum (3) onto a trailer for shipping.
 12. Disconnect the lifting slings.



Item	Description
2	Drum 2
7	Hydraulic Hoses
8	Storage Bracket with Pins
9	Electric Cables
10	Storage Bracket

FIGURE 5-115

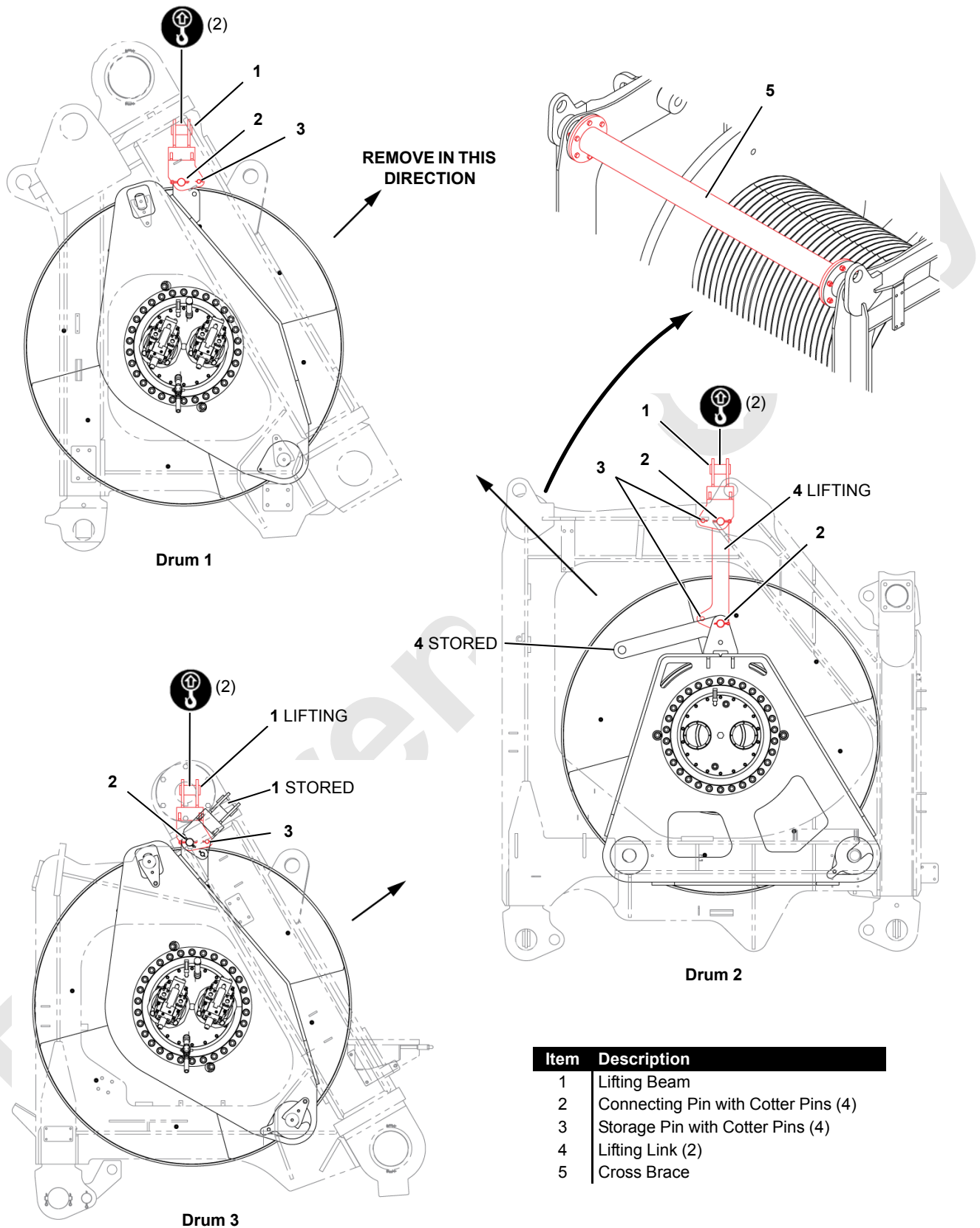


FIGURE 5-116

Using Drum Lifting Beam

See [Figure 5-116](#) for the following procedure.

Lifting beam (1) is provided for lifting Drum 1, 2, or 3 out of the corresponding drum frame with wire rope installed.



WARNING

Crush Hazard!

A Falling drum can crush personnel:

- Use lifting beam (1) only for lifting a drum assembly with wire rope. **DO NOT** use lifting beam to lift drum assembly and drum frame.
 - Lifting beam must only be stored on Drum 3.
-

1. Attach lifting beam (1) to each drum as shown.
2. Unpin lifting beam (1) from the stored position before attempting to lift the drum. **Structural damage will occur if you ignore this step.**
3. Lifting links (4) must be used to lift Drum 2.
4. Cross brace (5) must be removed before Drum 2 can be removed
5. Remove each drum in the direction of the arrow.
6. Use two legs of the chain lifting sling attached to the assist crane to lift a drum
7. Store lifting beam (1) only on Drum 3. Do not attempt to store the lifting beam on any other drum. **Wire rope damage will occur if you ignore this step.**

CRANE DISASSEMBLY — ROTATING BED

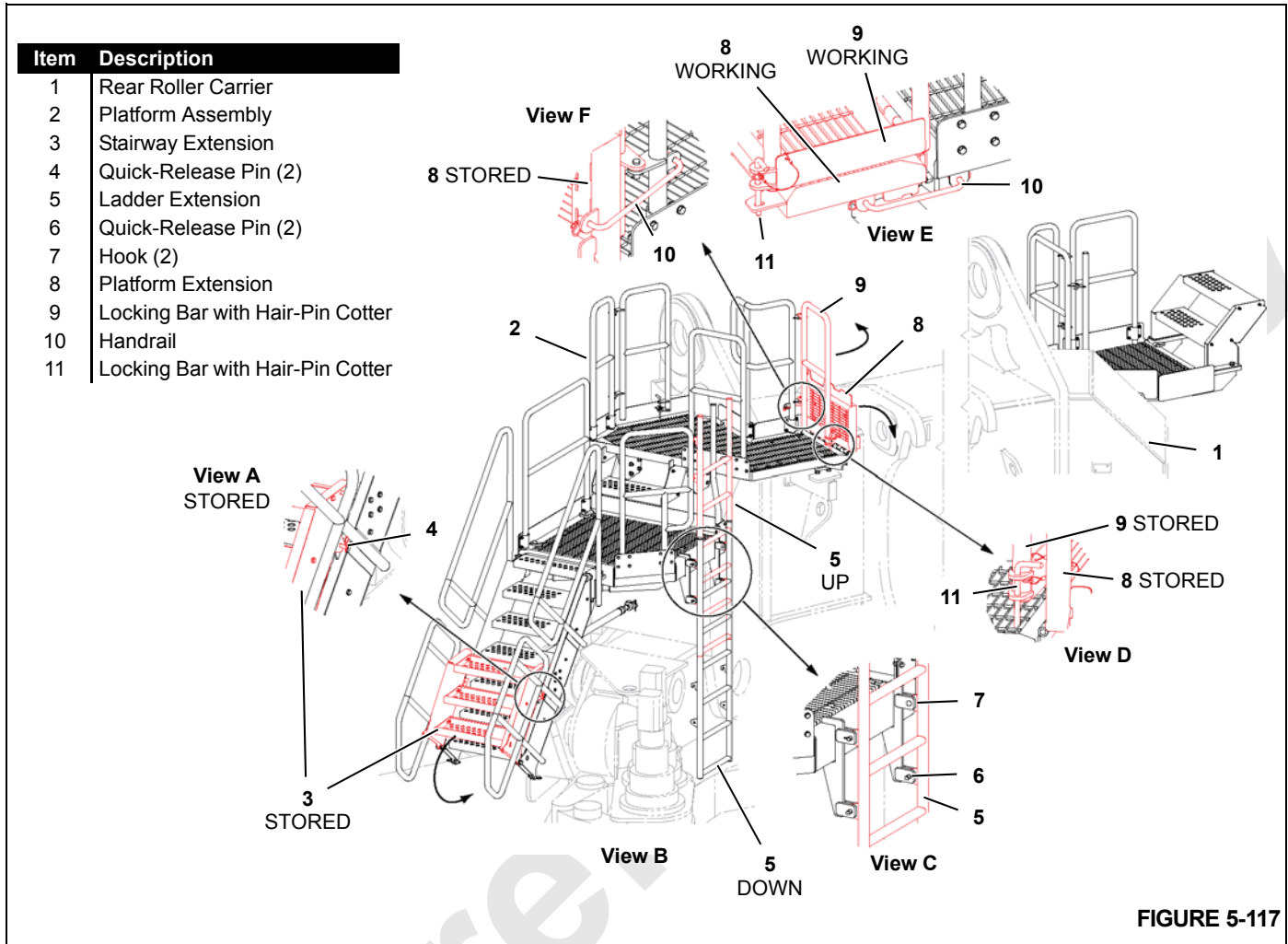


FIGURE 5-117

Remove Rear Roller Carrier Platforms

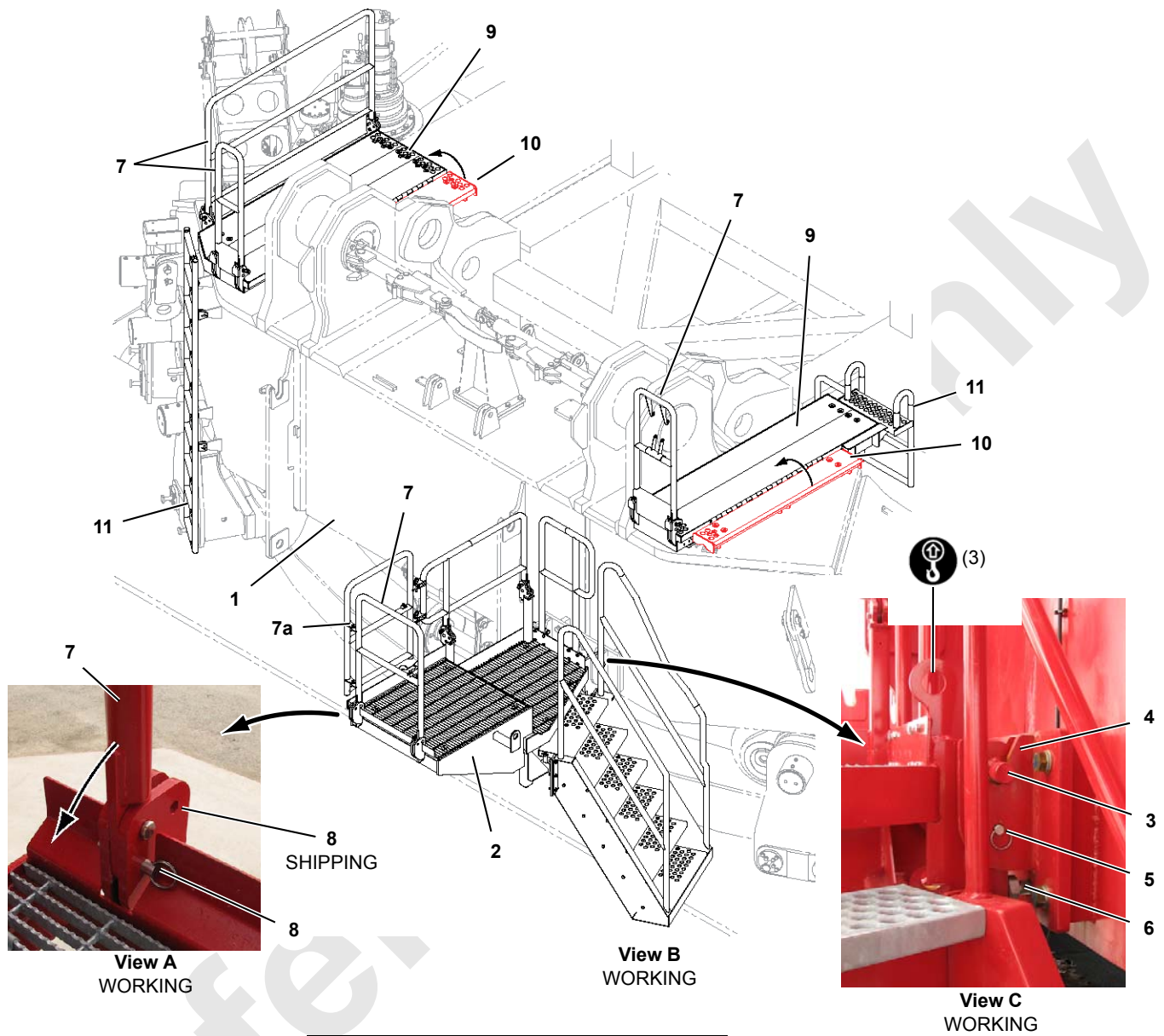
See [Figure 5-117](#) for the following procedure.

1. Unpin stairway extension (3, View B), raise it to the stored position, and pin it (View A).
2. Move ladder (5, View B) from the down position to the up position.
3. Unpin handrail (9, View E) from the working position, rotate it inward, and pin it in the stored position (View D).
4. Unpin platform extension (8, View E) from the working position, rotate it up, and pin it in the stored position (View E).

Remove Front Roller Carrier Platforms

See [Figure 5-118](#) for the following procedure.

1. Rotate platform extensions (10, View B) from the working to the shipping position.
2. Lower all handrails (7, View A) from the working position to the shipping and pin.
3. Attach three legs of the chain lifting sling to the lifting holes in platform (2, View B).
4. Remove quick-release pins (5, View C).
5. Lift platform (2, View B) off hooked brackets (4, View C) on front roller carrier (1).
6. Reinstall quick-release pins (5, View C) in the platform holes for storage.
7. Place the platform on a trailer for shipping.
8. Disconnect the lifting slings.



Item	Description
1	Front Roller Carrier
2	Platform Assembly with Stairway
3	Fixed Pin (2)
4	Hooked Bracket
5	Quick-Release Pin (2)
6	Adjusting Bolt
7	Handrail (4)
7a	Gate
8	Quick-Release Pin (2 each handrail)
9	Platform (2, ship on front roller carrier)
10	Platform Extension
11	Ladder (2, ship on front roller carrier)

FIGURE 5-118

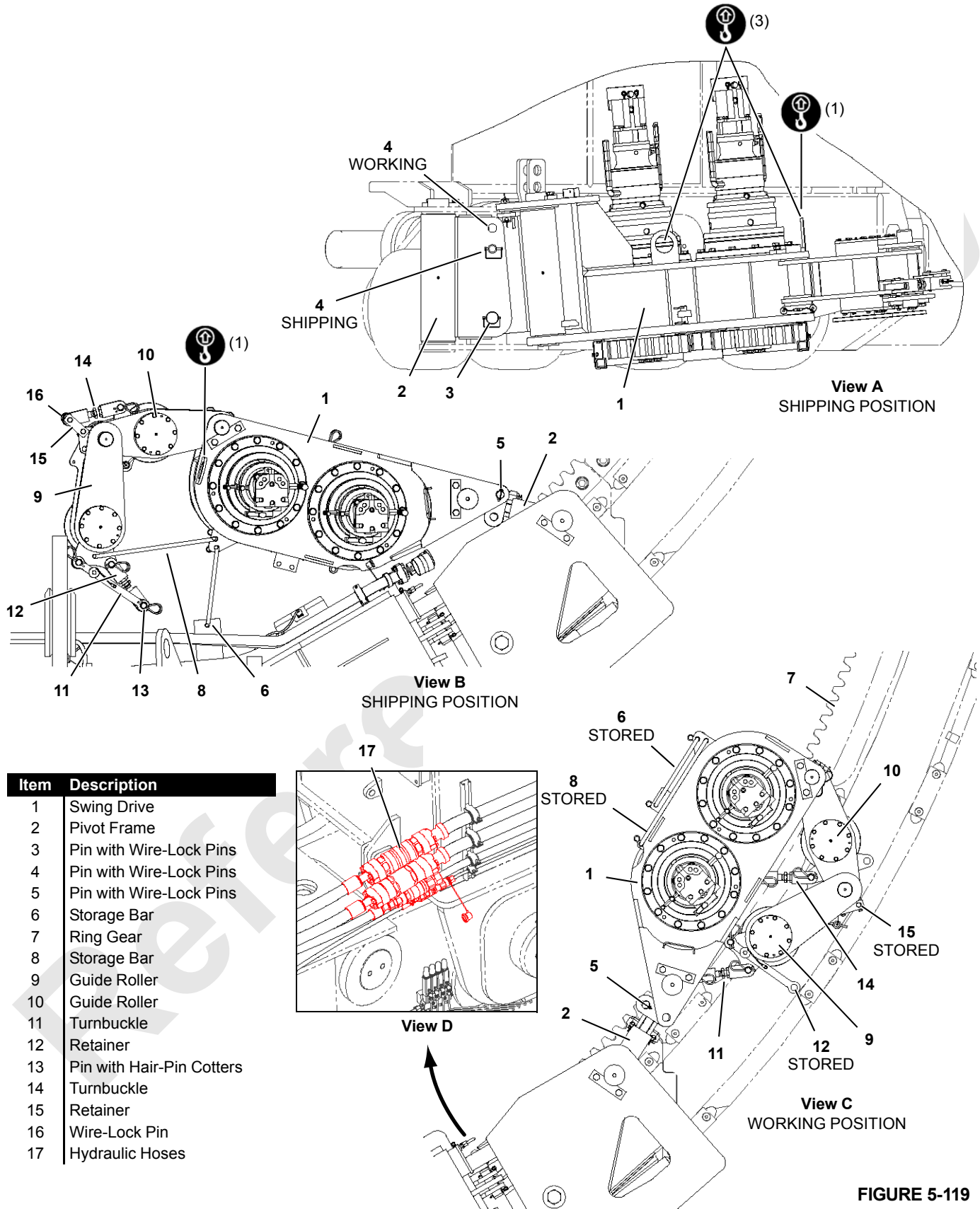


FIGURE 5-119

NOTE The left front and left rear platforms must be removed before you can store or remove the left side swing drives. Remove the left front and left rear platforms as instructed on [page 5-221](#). Store the platforms later.

Store Swing Drives

See [Figure 5-119](#) for the following procedure.

1. Disconnect hydraulic hoses (17, View D) between the swing drive and the roller carrier.
 - Clean the ends of the hoses and the couplers.
 - Clean and install protective caps on the ends of the hoses and the couplers.
 - Secure the hoses for shipping.
2. Attach one leg of the chain lifting sling from the assist crane to the outboard lifting lug on the swing drive (View A).
3. Unpin turnbuckles (11 and 14, View C) from swing drive (1).
4. Rotate guide rollers (9 and 10, View C) away from ring gear.
5. Move pin (5, View C) from the working position to the shipping position (View B).
6. Lift the swing drive as needed and remove pin (4, View A) from the WORKING holes in pivot frame (2).
7. Lift the swing drive and install pin (4, View A) in the SHIPPING holes in pivot frame (2).
8. Rotate guide rollers (9 and 10) to the inboard side of ring gear (7).
9. Unpin retainer (15, View C) from storage and pin turnbuckle (14, View B) to retainer (15).
10. Unpin retainer (12, View C) from storage and pin turnbuckle (11, View B) to retainer (12).
11. Unpin storage bars (6 and 8, View C) from the stored position on swing drive (1).
12. Pin storage bar (8, View B) to swing guide (9).
13. Pin storage bar (6, View B) to the roller carrier.
14. Disconnect the lifting sling.
15. Perform the above steps at both swing drives on each roller carrier (front and rear).

Remove Swing Drives

Perform the following steps only if the swing drives will be removed for shipping.

See [Figure 5-119](#) for the following procedure.

1. Attach three legs of the chain lifting sling to the lifting lugs on swing drive (1, View A).
2. Unpin storage bar (6, View B) from the roller carrier and pin it the swing drive for storage.
3. Hoist with the assist crane so the inboard lifting sling is tight.
4. Remove pin (4, View A) from the shipping holes and lower the swing drive until all three legs of the lifting sling are taut.
5. Remove pin (3, View A).
6. Lift the swing drive away from the roller carrier.
7. Reinstall pins (3 and 4, View A) in the swing drive holes for storage.
8. Place the swing drive on a trailer for shipping.
9. Disconnect the lifting slings.
10. Perform the above steps at both swing drives on each roller carrier (front and rear).

Disconnect Hoses and Cables between Rotating Bed Center Section and Roller Carriers

1. Disconnect the hydraulic and grease hoses between the rotating bed and the front and rear roller carriers.
 - Clean the ends of the hoses.
 - Clean and install protective caps on the ends of the hoses.
 - Store the hoses as shown on pages [page 5-200](#) and [page 5-201](#).
2. Disconnect the electric cables between the rotating bed and the front and rear roller carriers.
 - Clean the ends of the electric cables and the storage receptacles.
 - Clean and install protective caps on the ends of the electric cables.
 - Store the electric cables on the front and rear roller carriers as shown on pages [page 5-200](#) and [page 5-201](#).

Front Roller Carrier Hydraulic and Electrical Storage

Hoses and Cables are Red for Clarity

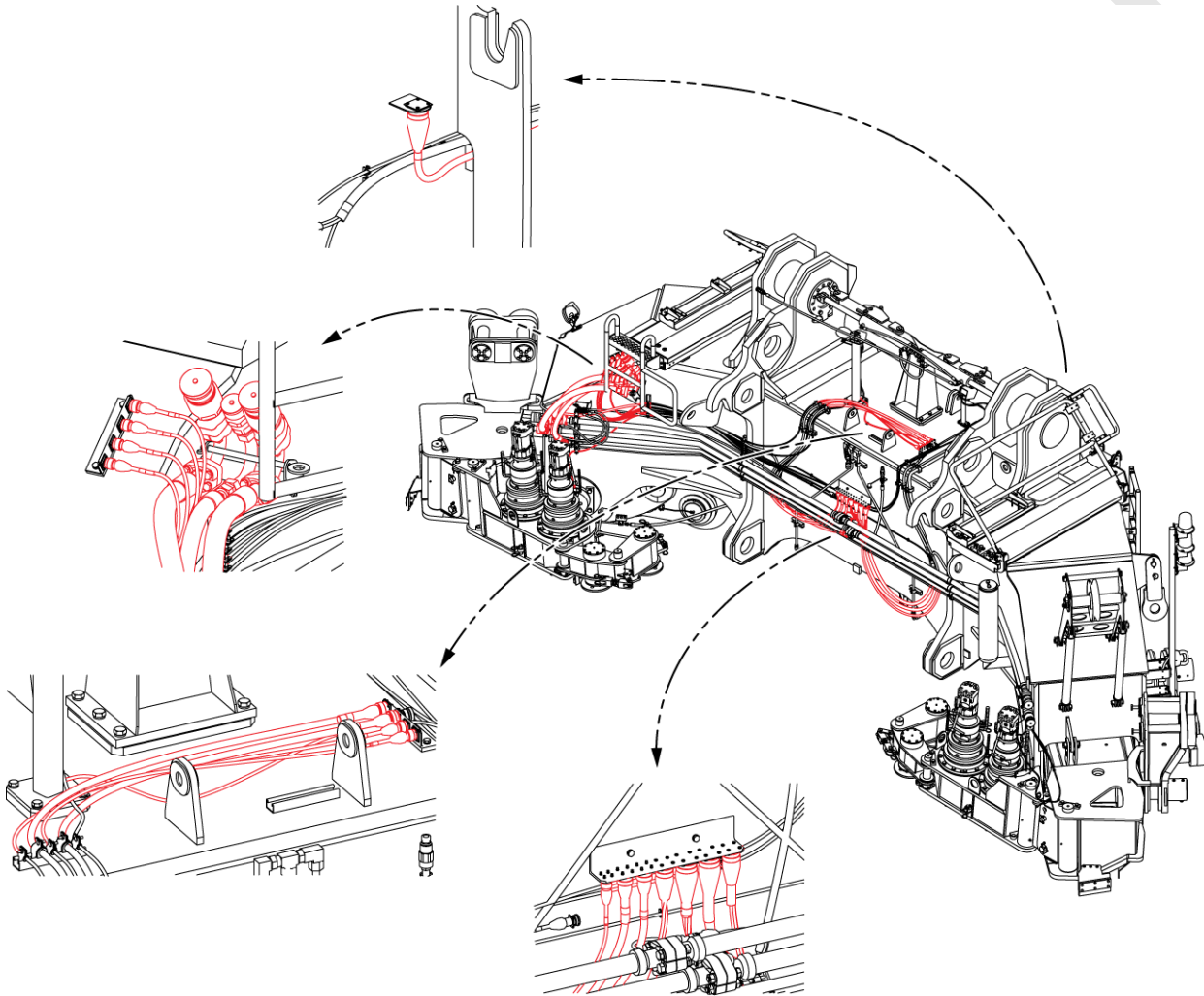


FIGURE 5-120

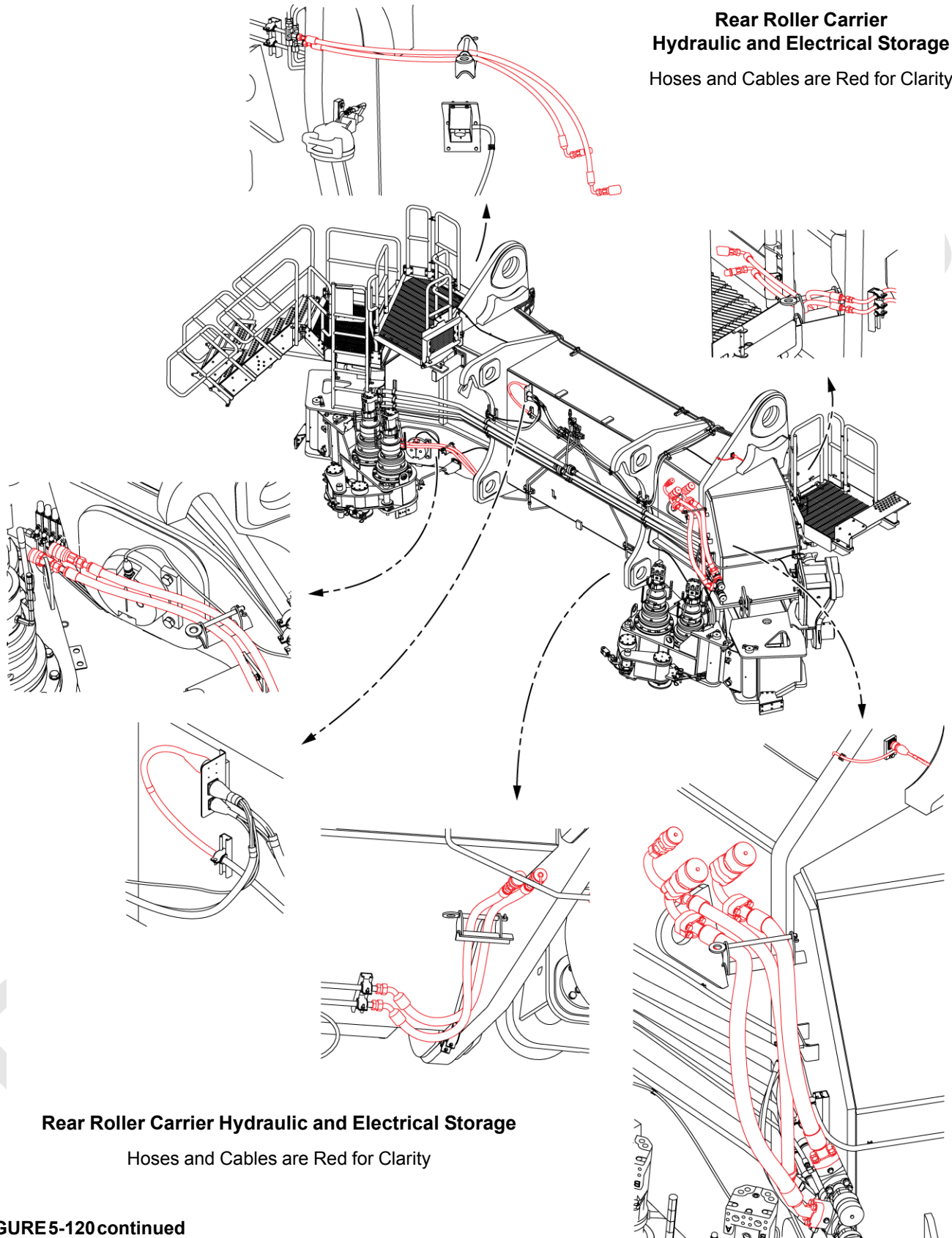


FIGURE 5-120 continued

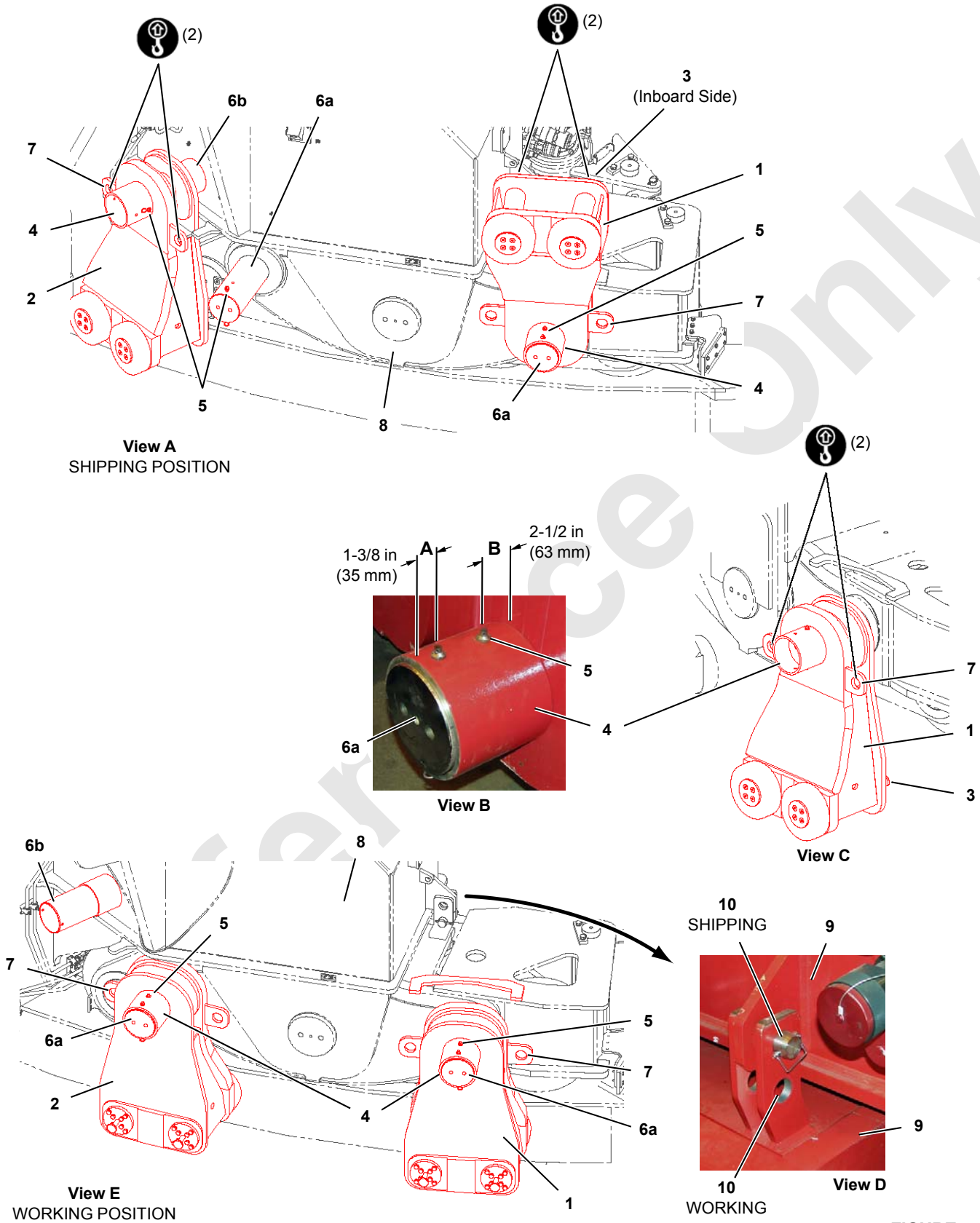


FIGURE 5-121

Legend for [Figure 5-121](#)

Item	Description
1	Outboard Hook Roller (4)
2	Inboard Hook Roller (4)
3	Lifting Stud (2 each outboard hook roller)
4	Spacer
5	Pin with Hair-Pin Cotter (2 each spacer)
6a	Pivot Pin (working)
6b	Pivot Pin (shipping)
7	Lifting Lug (2 each inboard hook roller)
8	Rear Roller Carrier
9	Roller Frame (4)
10	Stabilizer Pin with Wire Lock Pins (4)

Install Roller Frame Stabilizer Pins

The stabilizer pins prevent the roller frames from tipping when the front and rear roller carriers are lifted.

Perform the following steps at all four roller frames (9, [Figure 5-121](#), View D).

1. Remove stabilizer pin (10) from the working holes.
2. Install stabilizer pin (10) in the shipping holes.

Rotate Hook Rollers to Shipping Position

See [Figure 5-121](#) for the following procedure.

Rear roller carrier (8) is shown in [Figure 5-121](#), but the procedure is identical for both roller carriers.

1. Proceed as follows for each outboard hook roller (1, View E):
 - d. Attach the chain lifting sling to lifting lugs (7, View E) on hook roller (1).
 - e. Remove spacer (4, View E) from pivot pin (6a).
 - f. Slide hook roller (1, View E) off pivot pin (6a).
2. Proceed as follows for each inboard hook roller (2, View E):
 - a. Attach the chain lifting sling to lifting lugs (7, View E) on hook roller (2).
 - b. Hoist with the assist crane to tighten the lifting slings.
 - c. Remove spacer (4, View E) from pivot pin (6a).
 - d. Slide hook roller (2) off the pivot pin.
 - e. Rotate the hook roller 180° and slide it onto pivot pin (6b, View A).
 - f. Rotate spacer (4) end for end and install it — end A first (View B) — on pivot pin (6b).
 - g. Store extra pin (5, View A) on pivot pin (6a).
 - h. Disconnect the lifting slings.

- g. Rotate the hook roller 180° and slide it back onto the pivot pin (View C).
- h. Rotate spacer (4) end for end and install it — end A first (View B) — on pivot pin.
- i. Pin the spacer to the outer hole in the pivot pin (View C).
- j. Disconnect the lifting slings.
- k. Attach the chain lifting sling to outboard lifting stud (3, View A).
- l. Hoist with the assist crane to rotate hook roller (1, View A) up.
- m. Push hook roller (1) in to engage it with the retaining lugs on the roller carrier.
- n. Remove spacer (4, View A) from pivot pin (6a).
- o. Rotate spacer (4) end for end and install it — end B first (View B) — on pivot pin (6a, View B).
- p. Disconnect the lifting sling.

2. Proceed as follows for each inboard hook roller (2, View E):

- a. Attach the chain lifting sling to lifting lugs (7, View E) on hook roller (2).
- b. Hoist with the assist crane to tighten the lifting slings.
- c. Remove spacer (4, View E) from pivot pin (6a).
- d. Slide hook roller (2) off the pivot pin.
- e. Rotate the hook roller 180° and slide it onto pivot pin (6b, View A).
- f. Rotate spacer (4) end for end and install it — end A first (View B) — on pivot pin (6b).
- g. Store extra pin (5, View A) on pivot pin (6a).
- h. Disconnect the lifting slings.

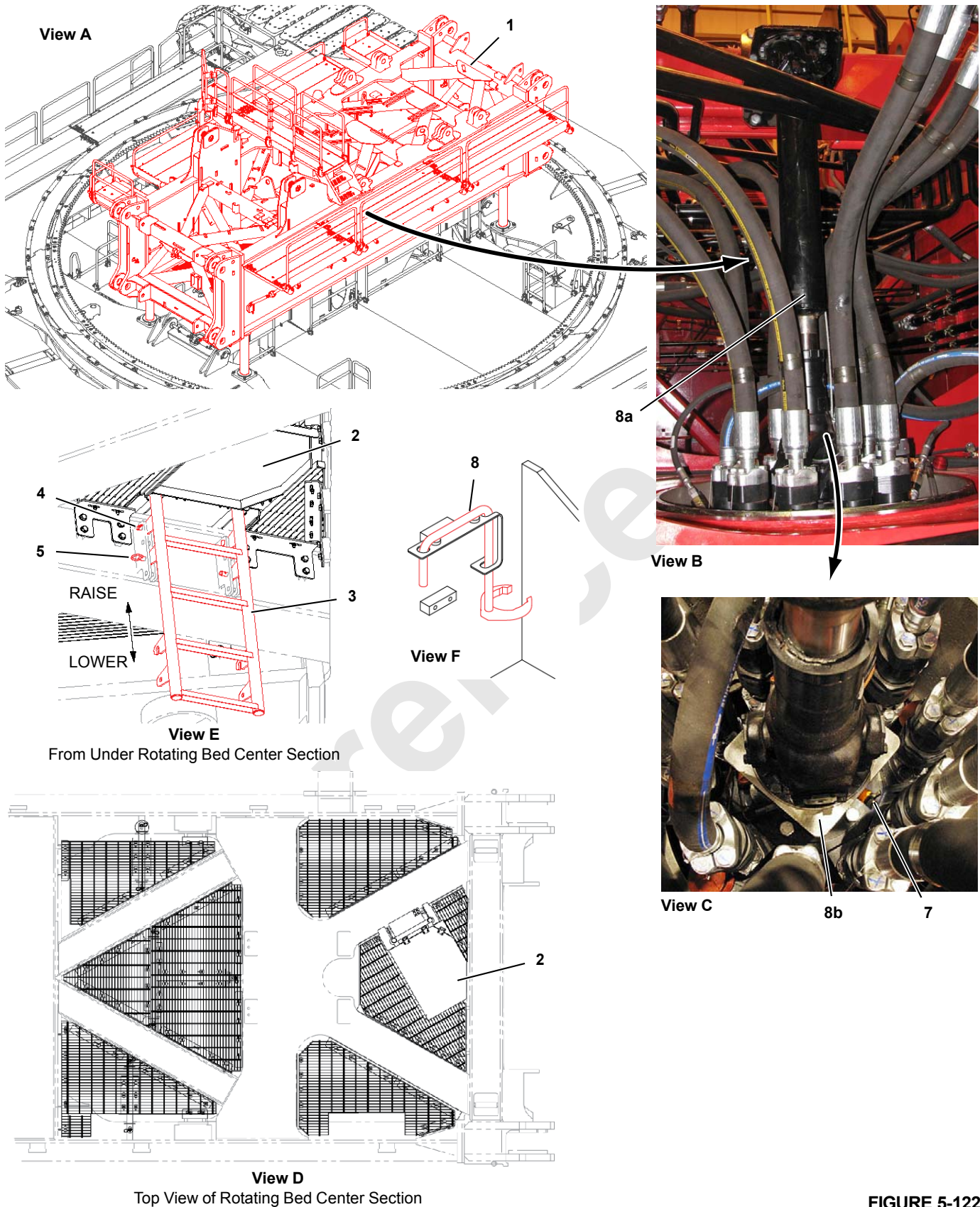


FIGURE 5-122

Legend for [Figure 5-122](#)

Item	Description
1	Rotating Bed Center Section
2	Trapdoor
3	Ladder
4	Fixed Pin (2)
5	Quick-Release Pin (2)
6	Wrench
7	Quick-Release Pin
8a	Driveshaft
8b	Driveshaft Adapter

See [Figure 5-122](#) for the following procedures.

Disconnect Hoses and Cables from Rotating Bed Center Section at King Pin

1. Lower ladder (3, View E) to gain access through trapdoor (2, View D) to the platforms inside the rotating bed center section.
2. Disconnect the hydraulic hoses from the rotating bed center section (View B) at the couplers in the kingpin.

Use wrench (6, View F) to loosen the couplers. The wrench is stored on a bracket near the kingpin.

3. Disconnect the electric cable from the rotating bed center section to the cable in the kingpin.

Extend Rotating Bed Jacking Cylinders

1. Remove quick-release pin (7, View C) to disconnect drive shaft adapter (8b) from the torque adapter.
2. RAISE ladder (3, View E) upon exiting the rotating bed center section. **Damage will occur if you do not perform this step.**

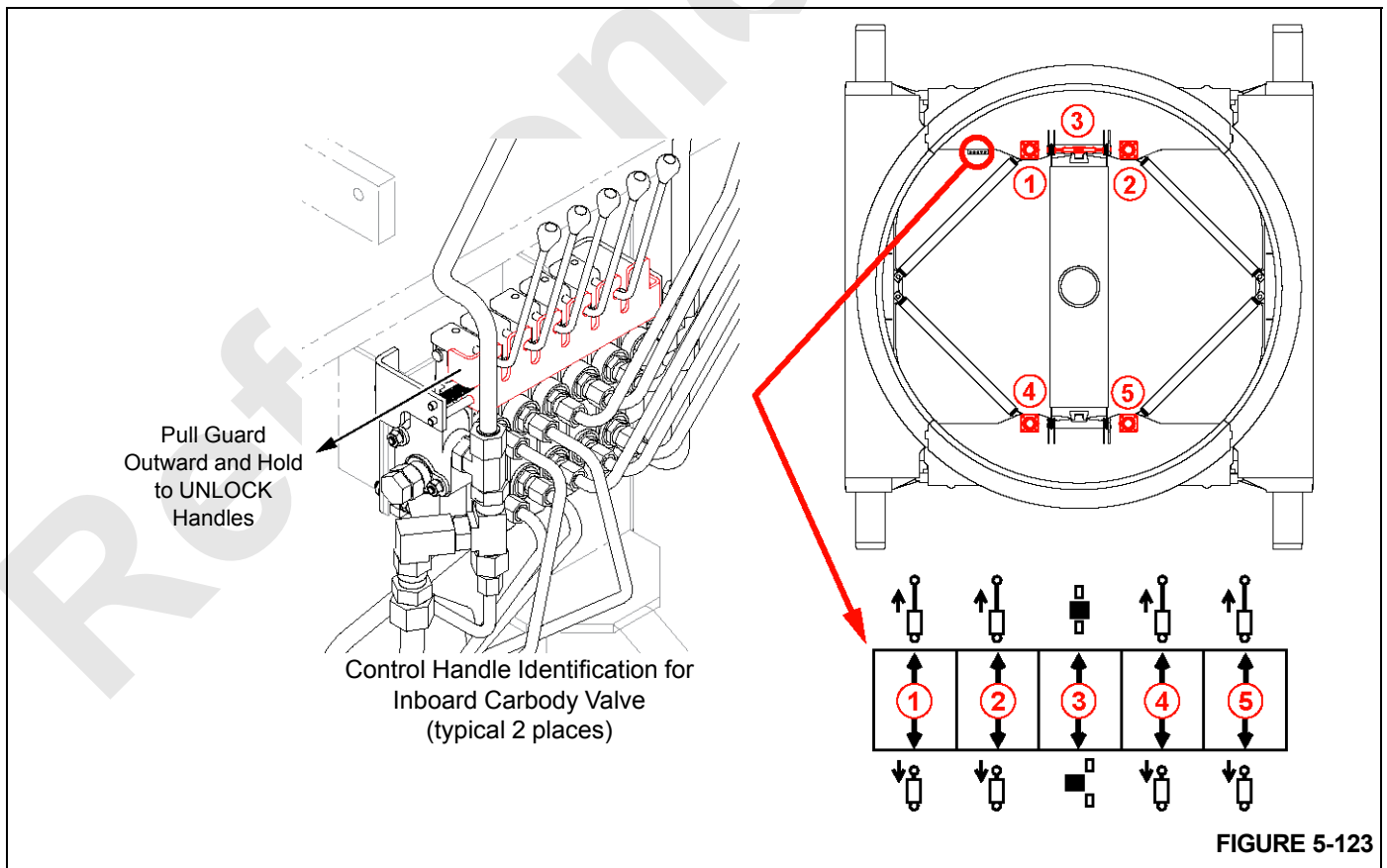
CAUTION

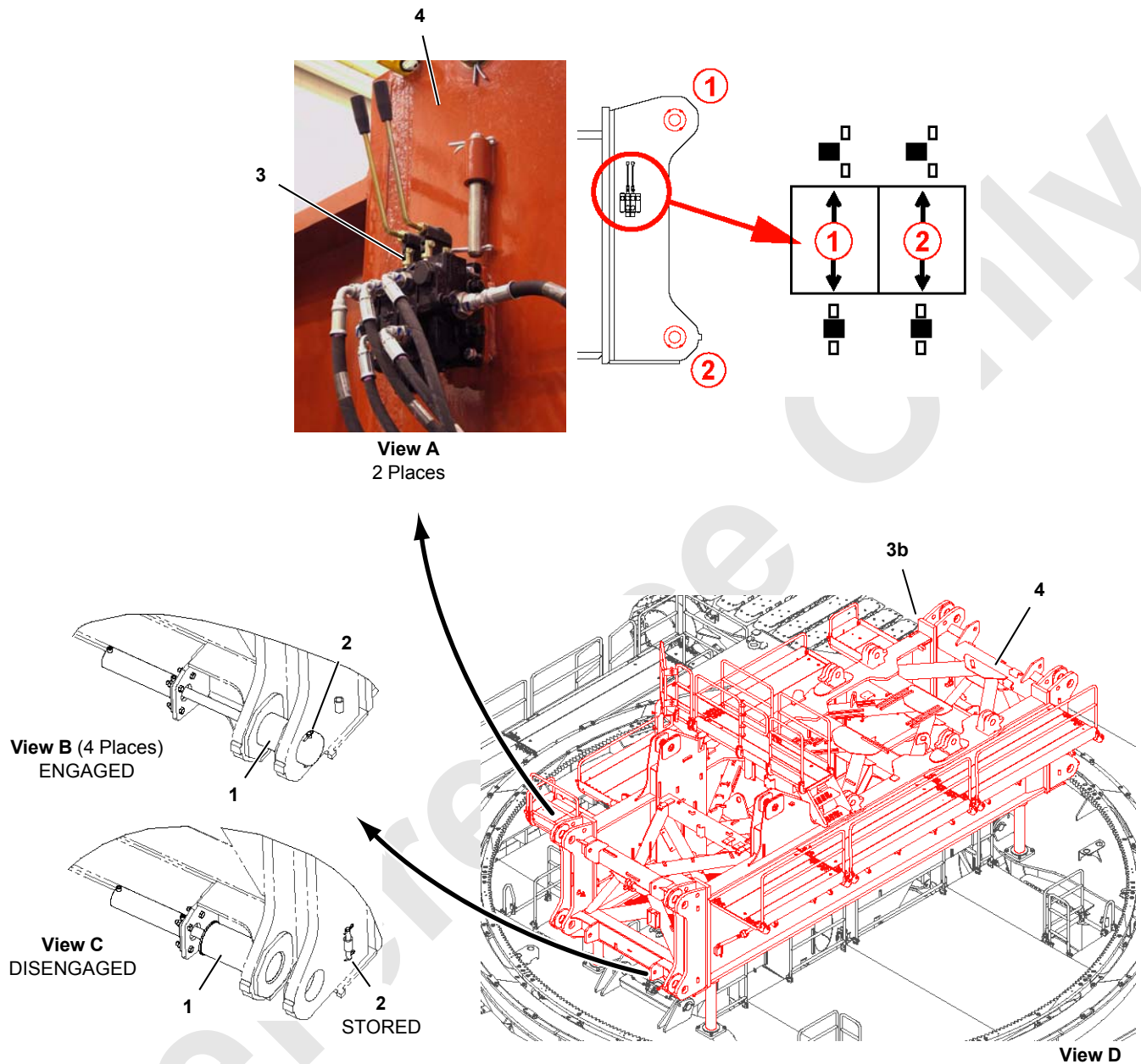
Avoid Cylinder Damage!

All four rotating bed jacking cylinders must be extended simultaneously to keep the rotating bed level to within 2° from front to rear and from side to side. Otherwise, jacking cylinders can be damaged.

3. Fully extend the rotating bed jacking cylinders to raise the rotating bed center section off the carbody.

Use the carbody controls at either or both carbody end beams. See [Figure 5-123](#) for control handle identification and operation.





Item	Description
1	Roller Carrier Pin (4 rear)
2	Locking Pin with Cotter Pins (8)
3	Rear Rotating Bed Pins Control Valve
4	Rotating Bed Center Section
5	Rear Roller Carrier
6	Lifting Lug (2 inboard)
7	Lifting Lug (2 outboard)

FIGURE 5-124

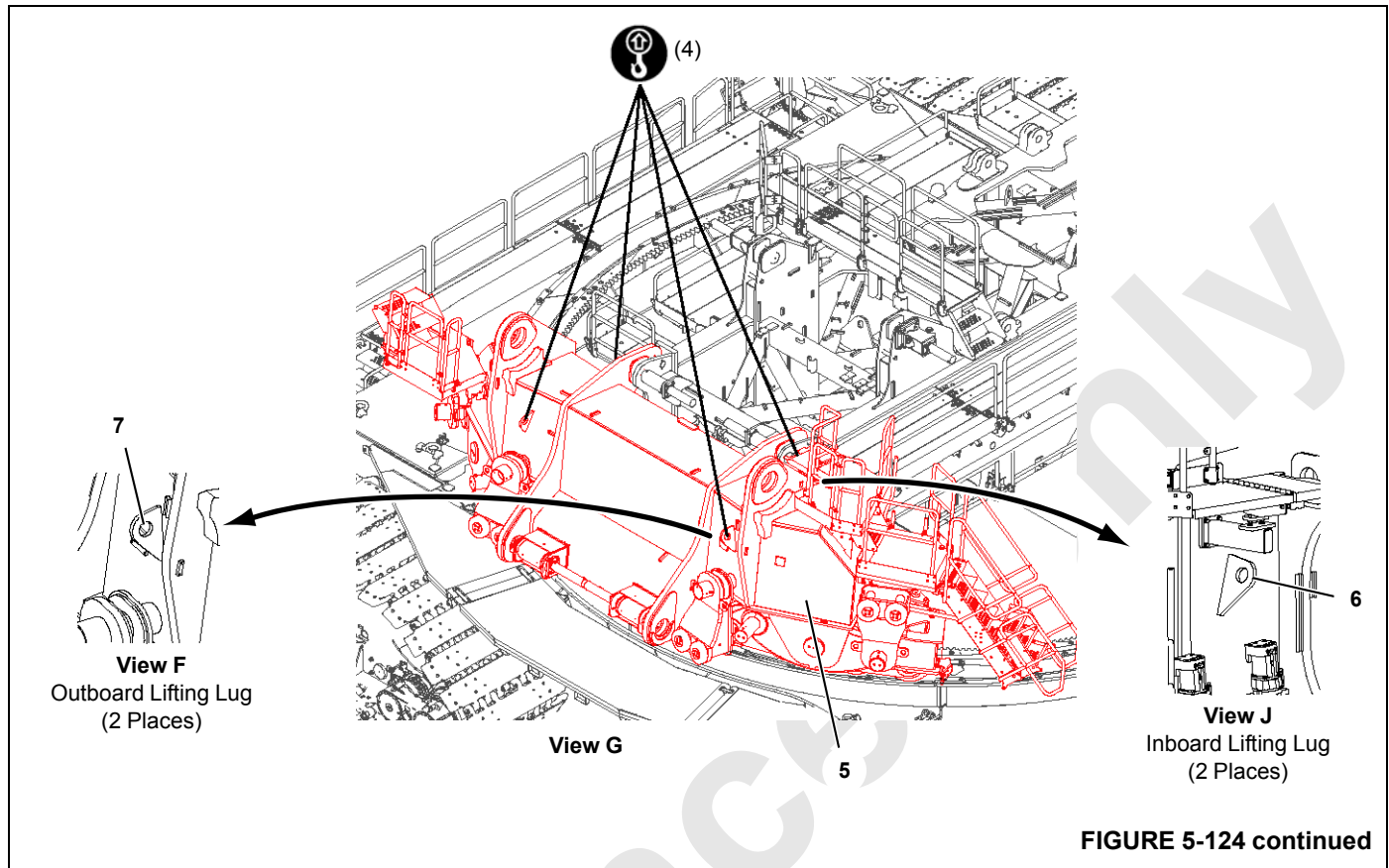


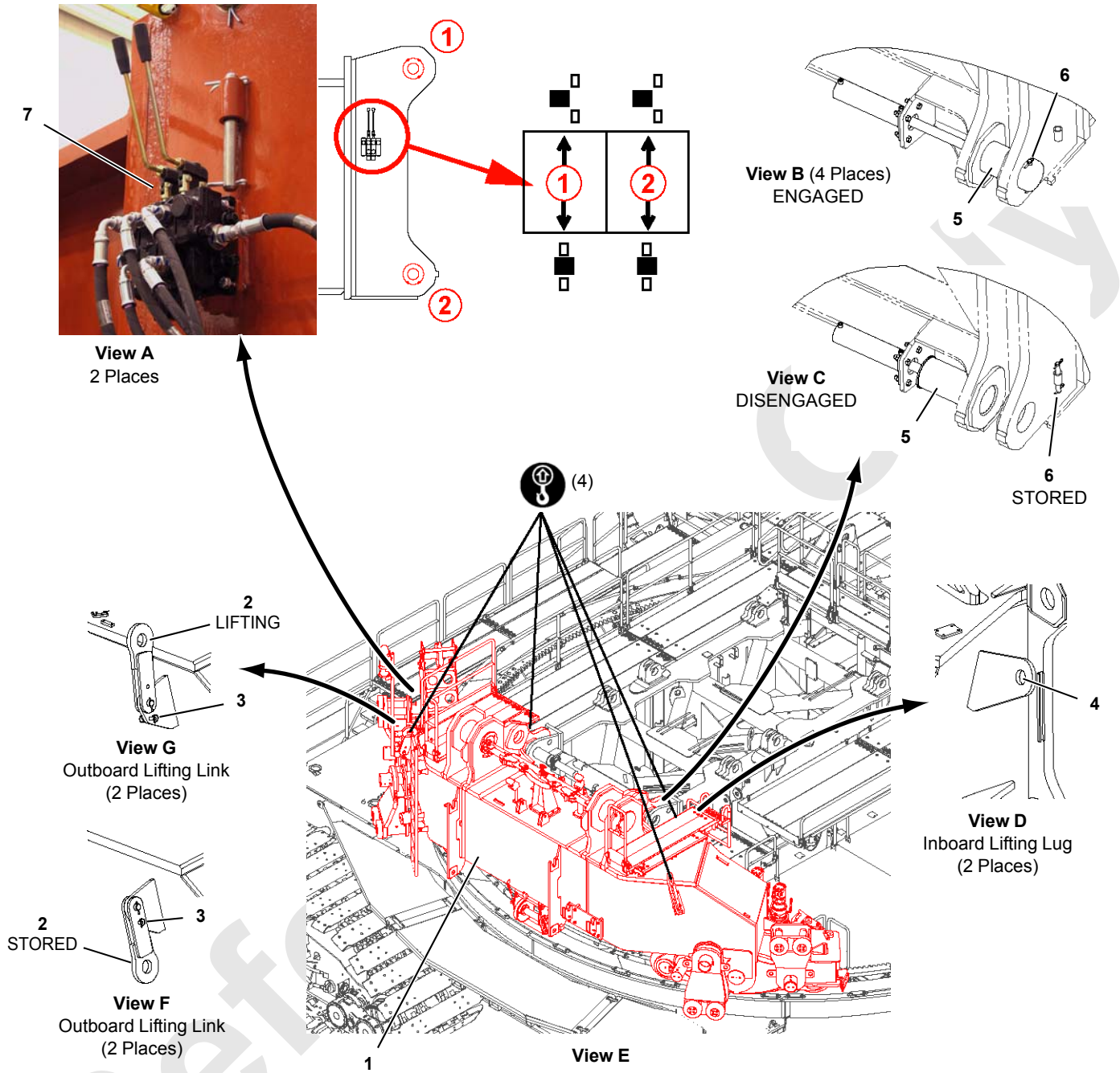
FIGURE 5-124 continued

NOTE The roller carriers can be removed in either order: rear then front OR front then rear.

Remove Rear Roller Carrier

See [Figure 5-124](#) for the following procedure.

1. Make sure the rotating bed jacking cylinders are **fully extended**.
2. Attach four legs of the chain lifting sling to lifting lugs (6 and 7, Views F and J).
 - Shorten both outboard legs of the chain 11 links.
3. Hoist with the assist crane to tighten the lifting slings.
4. Disengage the roller carrier pins, as follows:
 - a. Remove locking pins (2, View B) from roller carrier pins (1).
 - b. Store the locking pins (View C).
 - c. Disengage top and bottom roller carrier pins (1, View C) with control valve (3, View A) at the rear of rotating bed center section (4).
5. Lift rear roller carrier (5, View G) away from rotating bed center section (4) and place it on a trailer for shipping.
6. Disconnect the lifting slings.
7. Engage roller carrier pins (1, View B) and install locking pins (2).



Item	Description
1	Front Roller Carrier
2	Lifting Lug (2 outboard)
3	Pin with Wire Lock Pins (2)
4	Lifting Lug (2 inboard)
5	Roller Carrier Pin (4 rear)
6	Locking Pin with Cotter Pins (8)
7	Rear Rotating Bed Pins Control Valve

FIGURE 5-125

Remove Front Roller Carrier

See [Figure 5-125](#) for the following procedure.

1. Make sure the rotating bed jacking cylinders are **fully extended**
2. Unpin lifting links (2, View F) from the stored position and rotate the links to the lifting position.
3. Attach four legs of the chain lifting sling to lifting links (2, View G) and lifting lugs (4, View D).
 - Shorten both outboard legs of the chain 11 links.
4. Hoist with the assist crane to tighten the lifting slings.
5. Disengage the roller carrier pins, as follows:
 - a. Remove locking links (6, View B) from roller carrier pins (5).
 - b. Store the locking pins (View C).
 - c. Disengage top and bottom roller carrier pins (5, View C) with control valve (7, View A) at the front of rotating bed center section.
6. Lift front roller carrier (1, View E) away from the rotating bed center section and place it on a trailer for shipping.
7. Disconnect the lifting slings.
8. Store links (2, View F).
9. Engage roller carrier pins (5, View B) and install locking pins (2).

Disconnect Accessory System Hydraulic Hoses

Once the drums and roller carriers are removed, proceed as follows:

1. Stop the PPU.
2. Disconnect the accessory system hydraulic hoses from the rotating bed and store the hoses on the carbody center beam. Reverse the steps on [page 5-173](#).

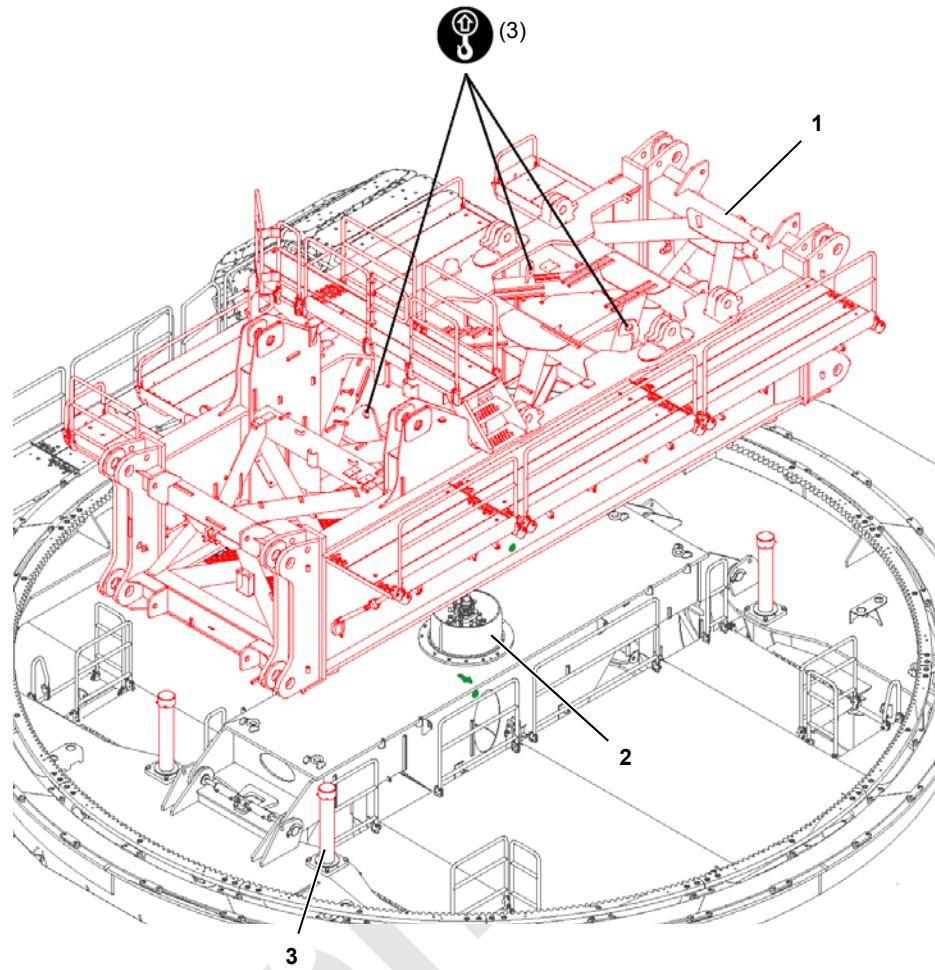
CAUTION

Avoid Hydraulic Piping Damage!

Do not swing upperworks while accessory system hydraulic hoses are connected between carbody center beam and rotating bed. Damage will occur.

Hydraulic Oil Leakage Hazard!

Do not connect hydraulic hoses from cab and power plant to rotating bed until PPU and accessory hydraulic system hydraulic hoses are disconnected. Hydraulic oil will overflow from PPU hydraulic tank.



Item	Description
1	Rotating Bed Center Section
2	Kingpin
3	Rotating Bed Jacking Cylinders (4)

FIGURE 5-126

Lift Rotating Bed Center Section off Jacking Cylinders

See [Figure 5-126](#) for the following procedure.

1. Attach 3-legs of the chain lifting sling to the lifting lugs on rotating bed center section (1).
 - Shorten the rear leg of the chain 11 links.
2. Lift the rotating bed center section (1) off rotating bed jacking cylinders (3).
3. Place the rotating bed center section on blocking at ground level.
4. Disconnect the lifting slings.

Make sure assist crane point is centered over rotating bed center section. The rotating bed center section must be lifted straight up to avoid damage to the bushing as the center section is lifted off kingpin (2).

Reference Only

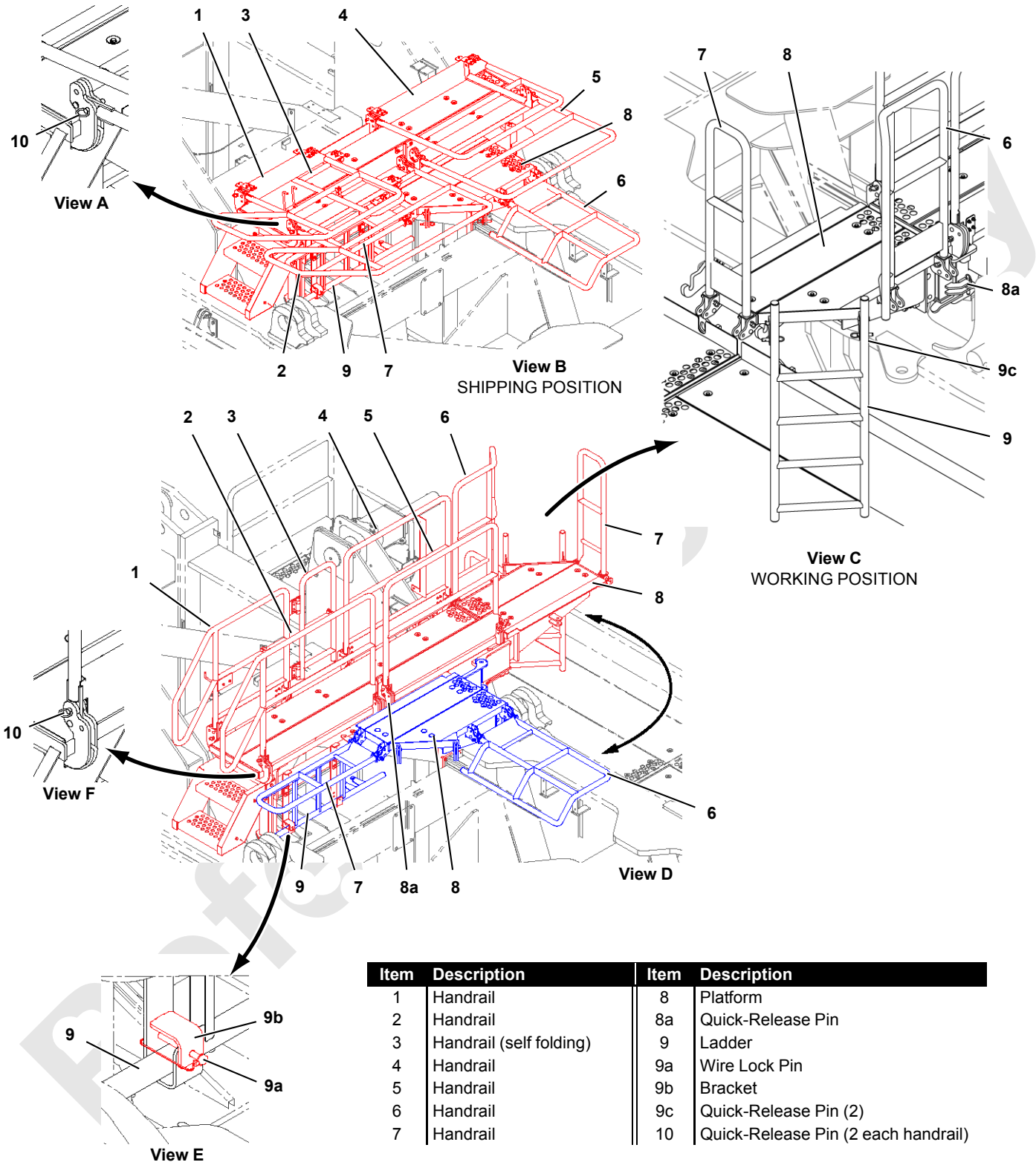


FIGURE 5-127

Store Rotating Bed Center Platform

See [Figure 5-127](#) for the following procedure.

1. Remove ladder (9, View C) from the working position and store it as shown in Views D and E.
2. Remove quick-release pin (8a, View C) and rotate platform (8) from the working position to the working position (View D).
3. Install quick-release pin (8a, View D).
4. Unpin handrails (6 and 7, View D) from the working position, lower the handrails, and pin them in the shipping position.
5. Rotate handrail (3, View D) inward and latch it to handrail (1).
6. Unpin handrails (2 and 5, View D) from the working position, lower the handrails, and pin them in the shipping position (View B).
7. Unpin handrails (1 and 4, View D) from the working position, lower the handrails, and pin them in the shipping position (View B).

Store Rotating Bed Center Section Hydraulic Hoses

Store the hydraulic hoses on the rotating bed center section as shown in [Figure 5-128](#).

- Clean the ends of the hoses.
- Clean and install protective caps on the ends of the hoses.

Store Rotating Bed Center Section Grease Hoses

Store the grease hoses on the rotating bed center section as shown in [Figure 5-129](#).

- Clean the ends of the hoses.
- Clean and install protective caps on the ends of the hoses.

Store Rotating Bed Center Section Electric Cables

Store the electric cables on the rotating bed center section as shown in [Figure 5-130](#).

- Clean the ends of the electric cables and the storage receptacles.
- Clean and install protective caps on the ends of the electric cables, as required.

Rotating Bed Center Section Hydraulic Hose Storage

Hoses are Red for Clarity

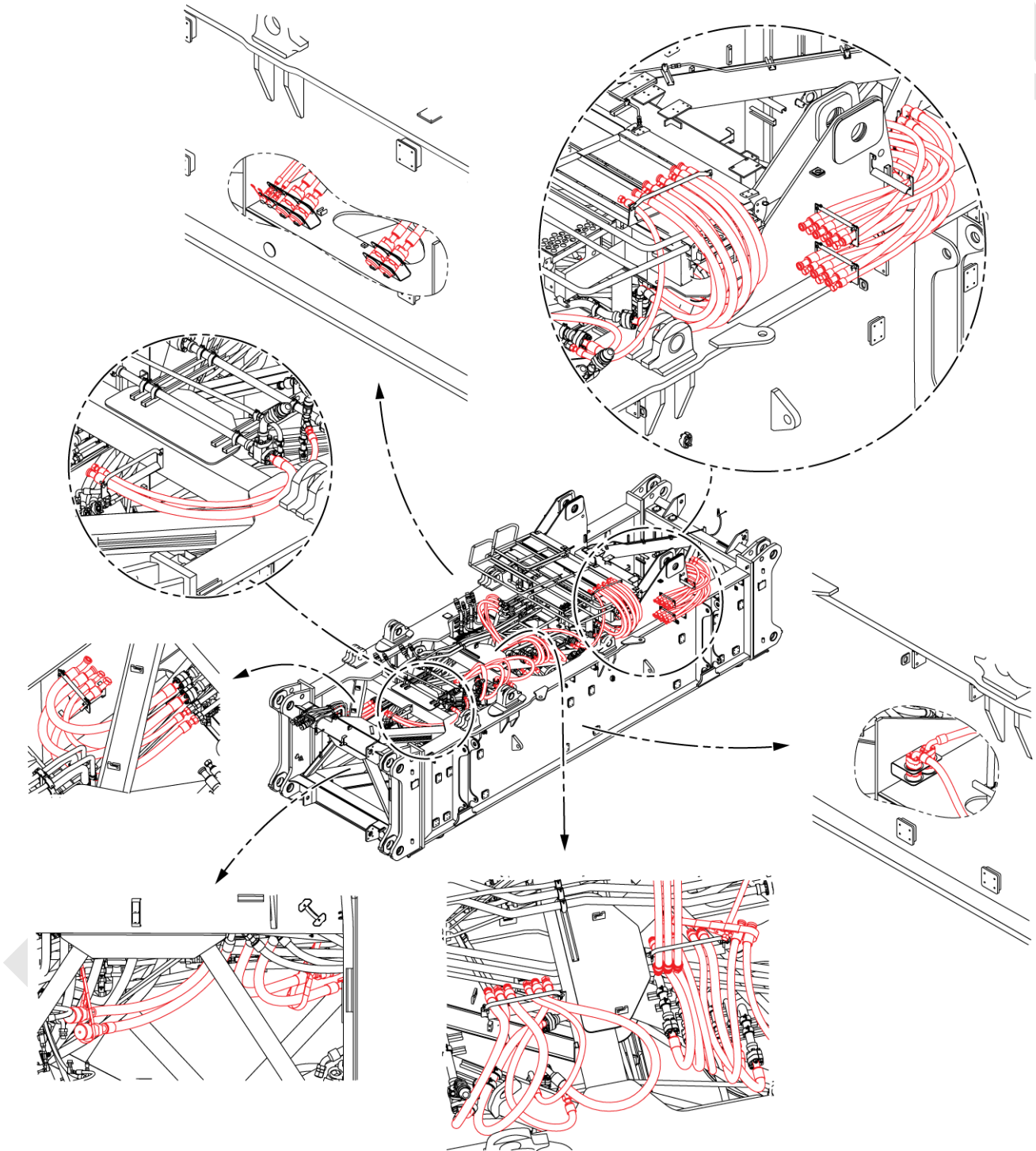


FIGURE 5-128

Rotating Bed Center Section Hydraulic Hose Storage

Hoses are Red for Clarity

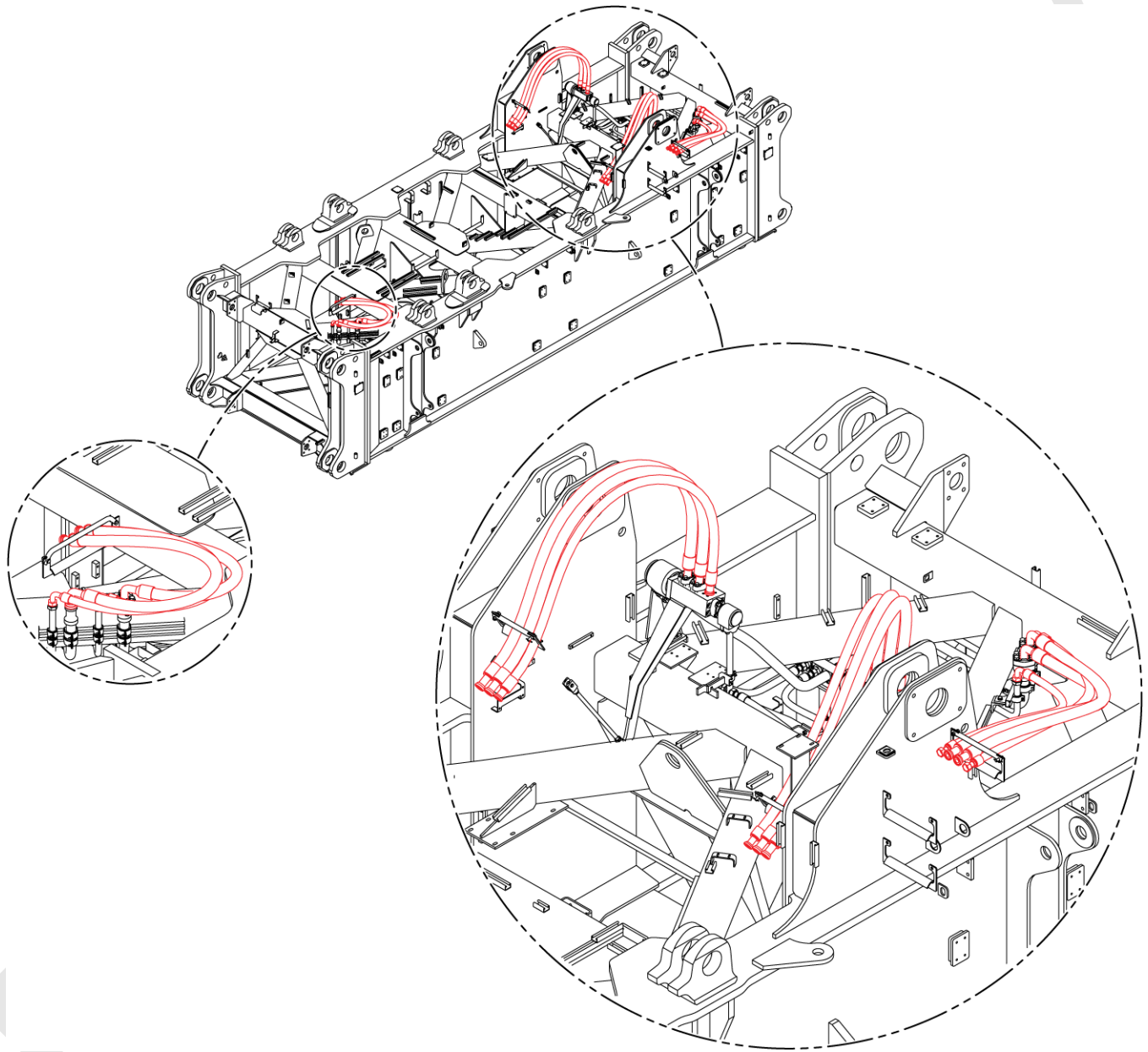


FIGURE 5-128 continued

Rotating Bed Center Section Grease Hose Storage

Hoses are Red for Clarity

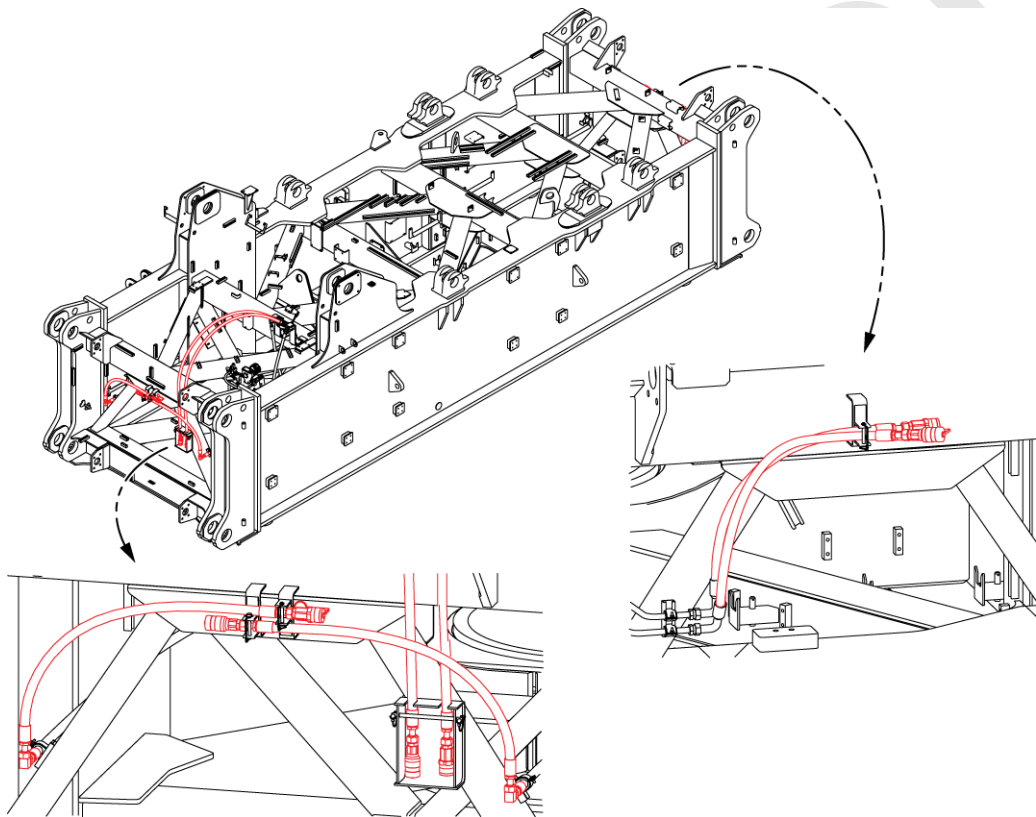


FIGURE 5-129

Rotating Bed Center Section Electric Cable Storage

Cables are Red for Clarity

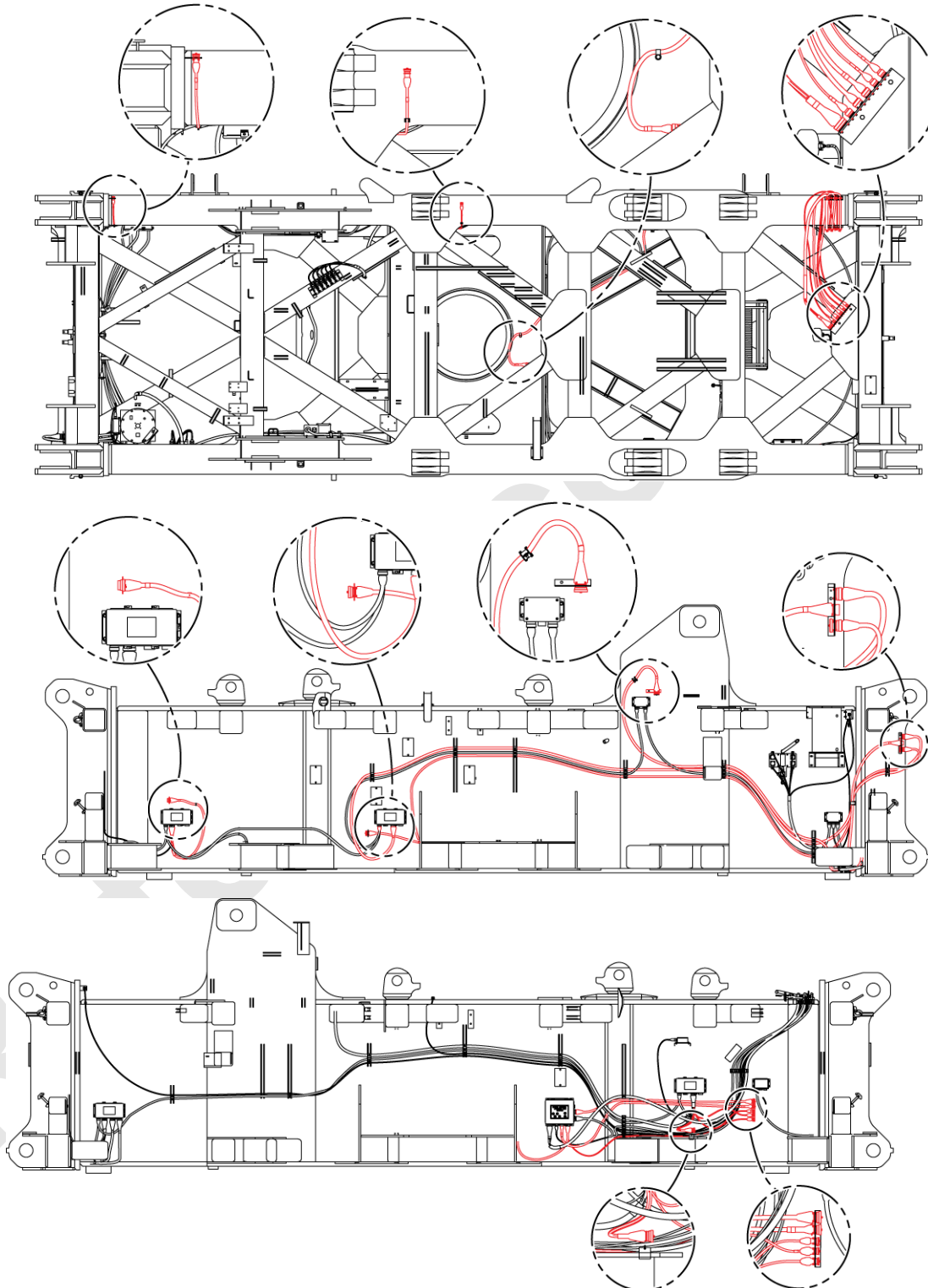
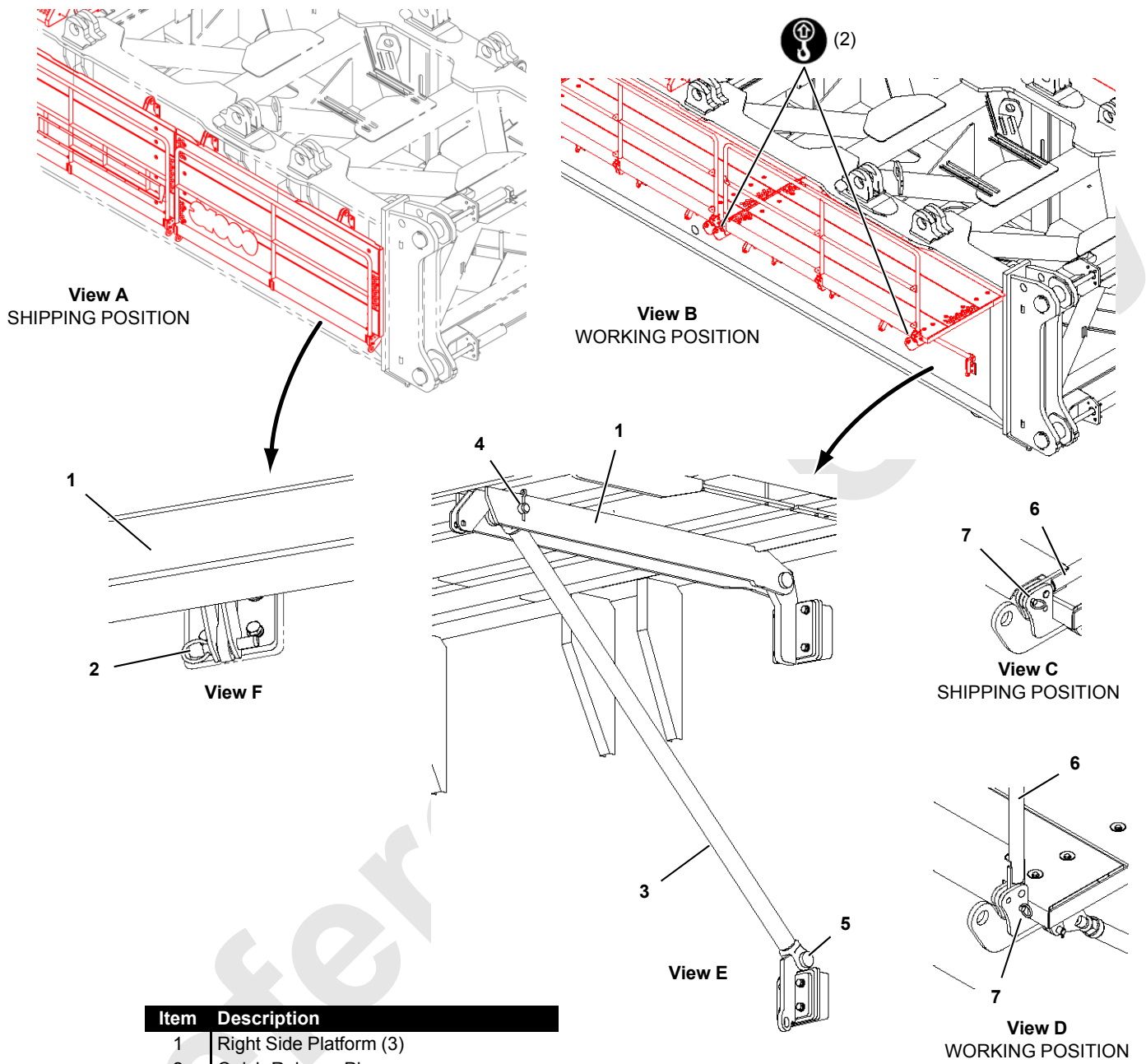


FIGURE 5-130



Item	Description
1	Right Side Platform (3)
2	Quick-Release Pin
3	Strut (2 each platform)
4	Pin with Cotter Pins (2 each platform)
5	Pin with Cotter Pin (2 each platform)
6	Handrail (1 each platform)
7	Quick-Release Pin (2 each platform)

FIGURE 5-131

Store Rotating Bed Center Section Right Side Platforms

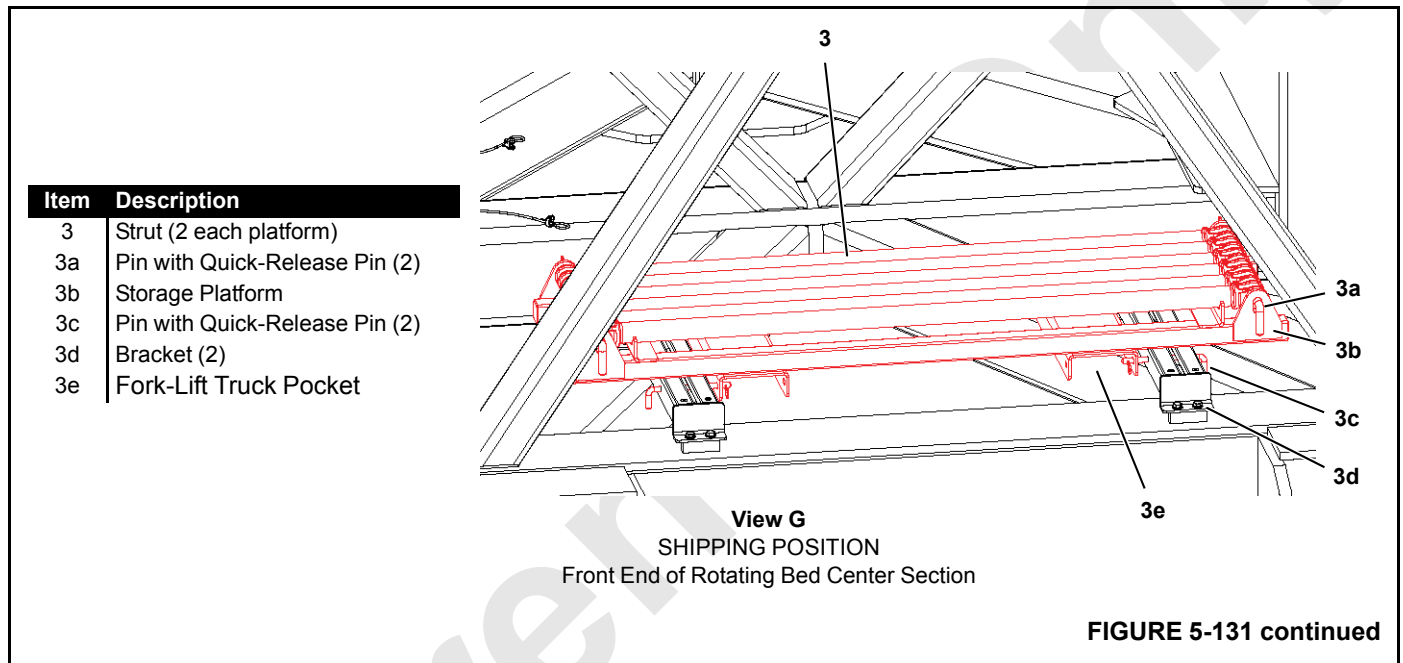
See [Figure 5-131](#) for the following procedure.

1. Lower handrail (6, View D) from the working position and pin it in the shipping position (View C).
2. Attach chain lifting slings from the assist crane to the lifting lugs on the platform (View B).
3. Hoist with the assist crane until the lifting slings are taut.
4. Remove struts (3, View E) from the underside of platform (1).

5. Store pins (4 and 5, View E) in the platform and rotating bed holes.
6. Lower platform (1, View A) to the shipping position and install pin (2, View F).
7. Store struts (3, View G).

NOTE If desired, storage platform (3b, View G) can be removed from the rotating bed center section with a fork-lift truck. Reinstall the platform after the struts are stored.

8. Repeat the above steps for each right side platform.



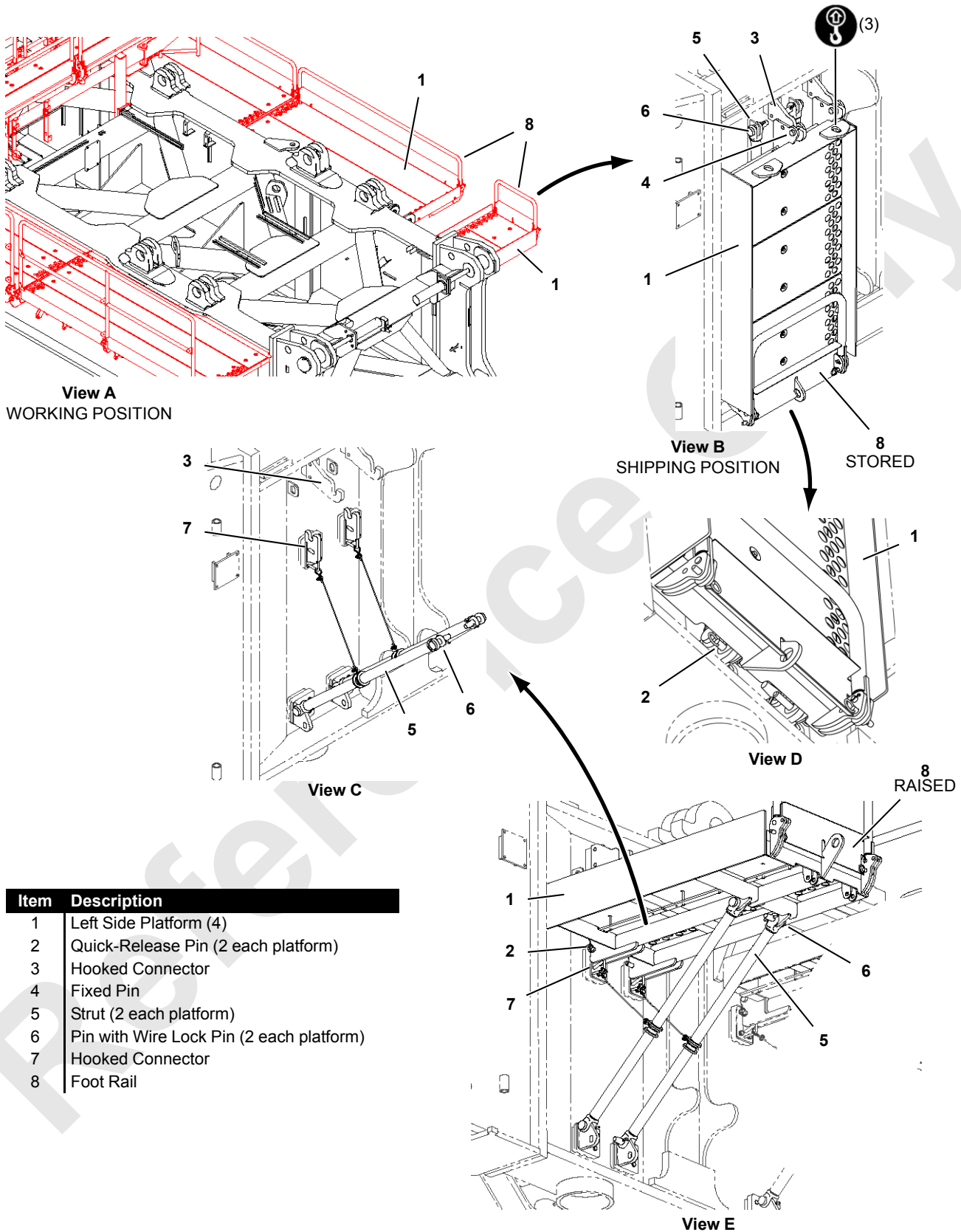


FIGURE 5-132

Store Rotating Bed Center Section Left Side Platforms

See [Figure 5-132](#) for the following procedure.

1. Lower foot rail (8, View A) from the working position and pin it in the shipping position (View B).
2. Attach chain lifting slings from the assist crane to three lifting lugs on the platform (View A).
3. Hoist with the assist crane until the lifting slings are taut.
4. Unpin struts (5, View E) from the platform.
5. Remove quick-release pins (2, View E).
6. Lift the platform off hooked connectors (7, View E) and lower the platform to the ground.
7. Pin struts (5, View B) to the rotating bed lugs with pins (6).
8. Disconnect the outboard lifting sling.
9. Using two legs of the lifting sling, lift platform (1, View B) onto hooked connectors (3).
10. Pin the platform to the rotating bed with quick-release pins (2, View D).
11. Repeat the above steps for each left side platform.

NOTE The rear platform has a handrail that must be raised from the shipping position and pinned in the working position before the foot rail can be raised.

Lift Rotating Bed Center Section onto Trailer

See [Figure 5-126](#) for the following procedure.

1. Attach 3-legs of the chain lifting sling to the lifting lugs on rotating bed center section.
2. Lift the rotating bed center section onto a trailer for shipping.
3. Disconnect the lifting slings.

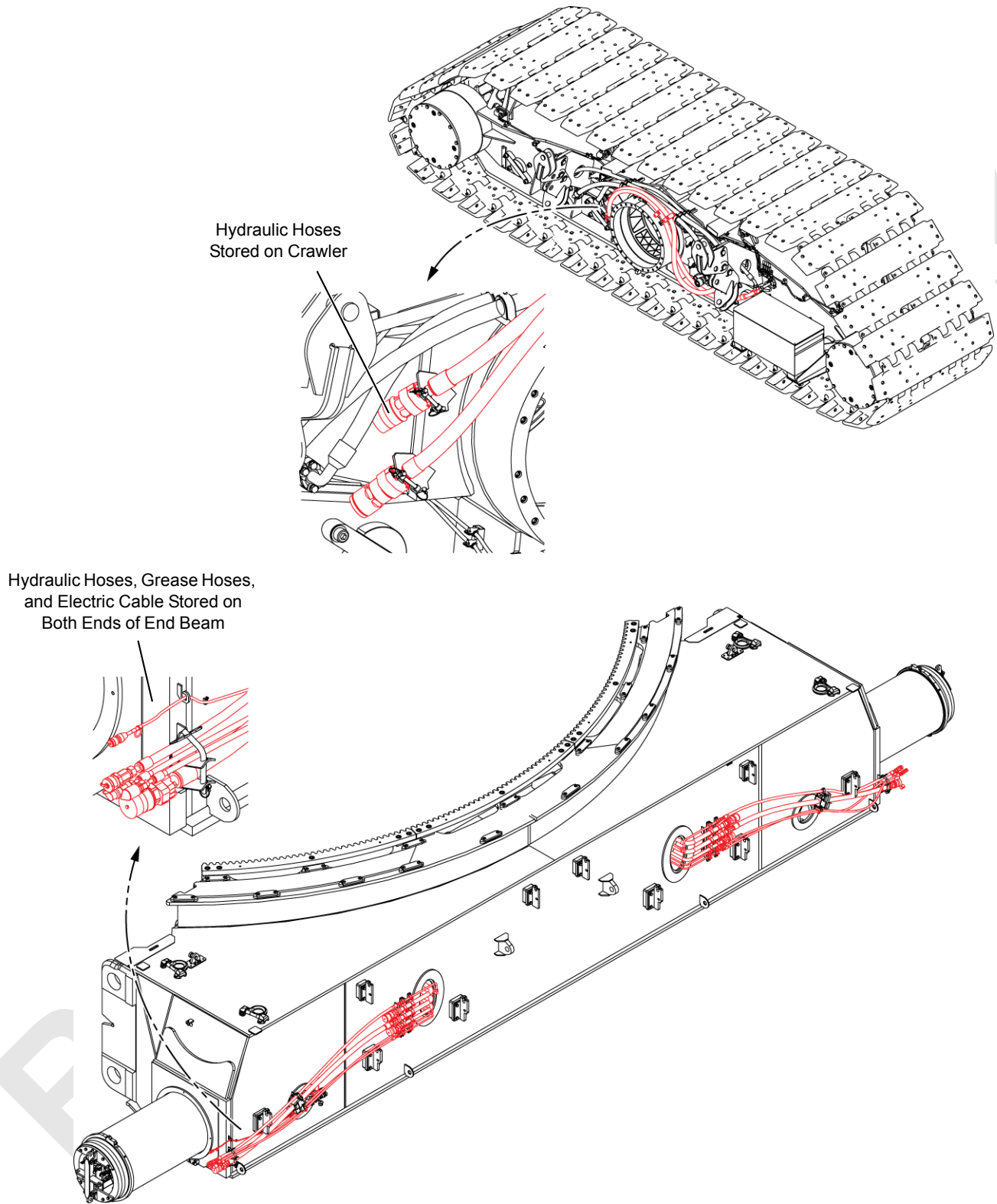


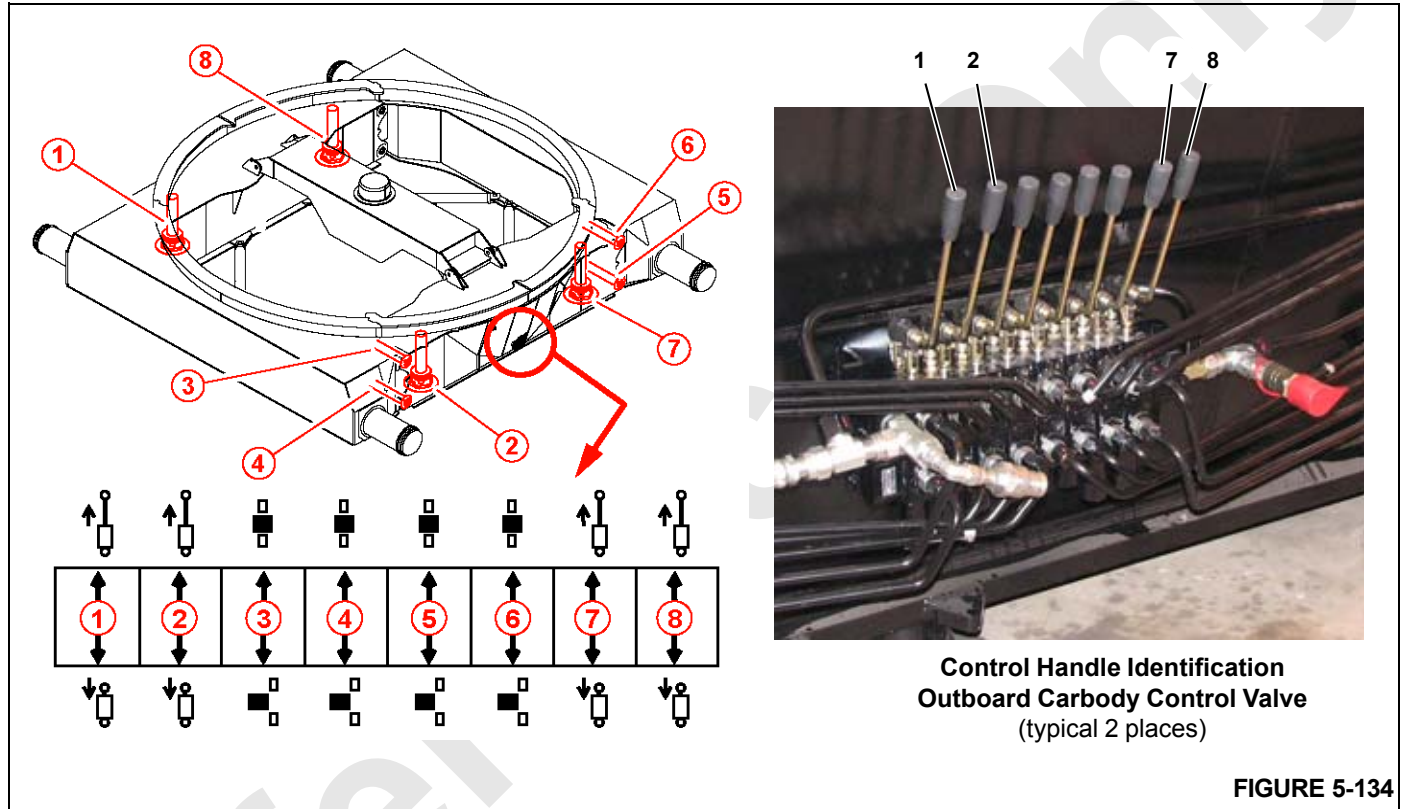
FIGURE 5-133

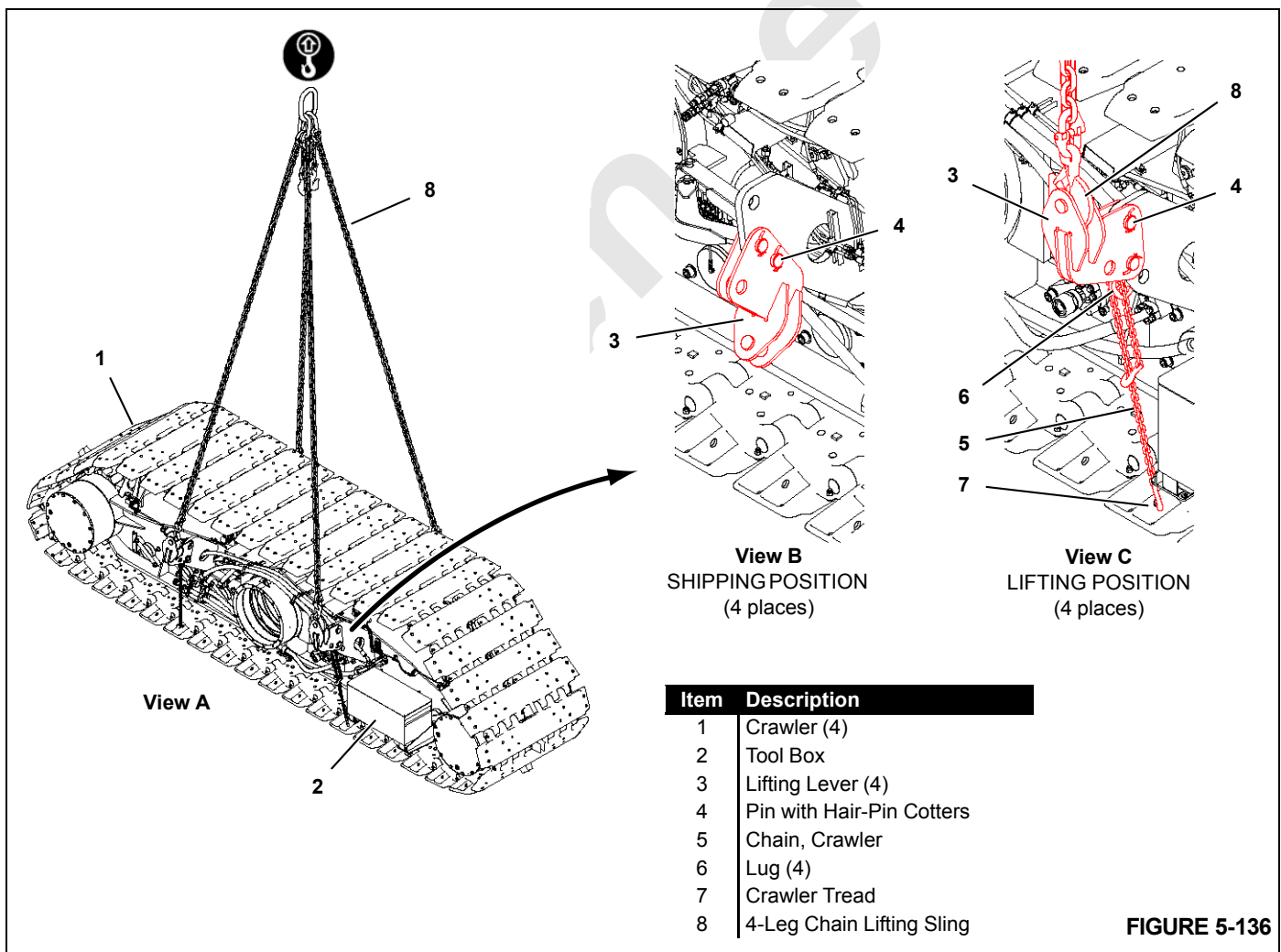
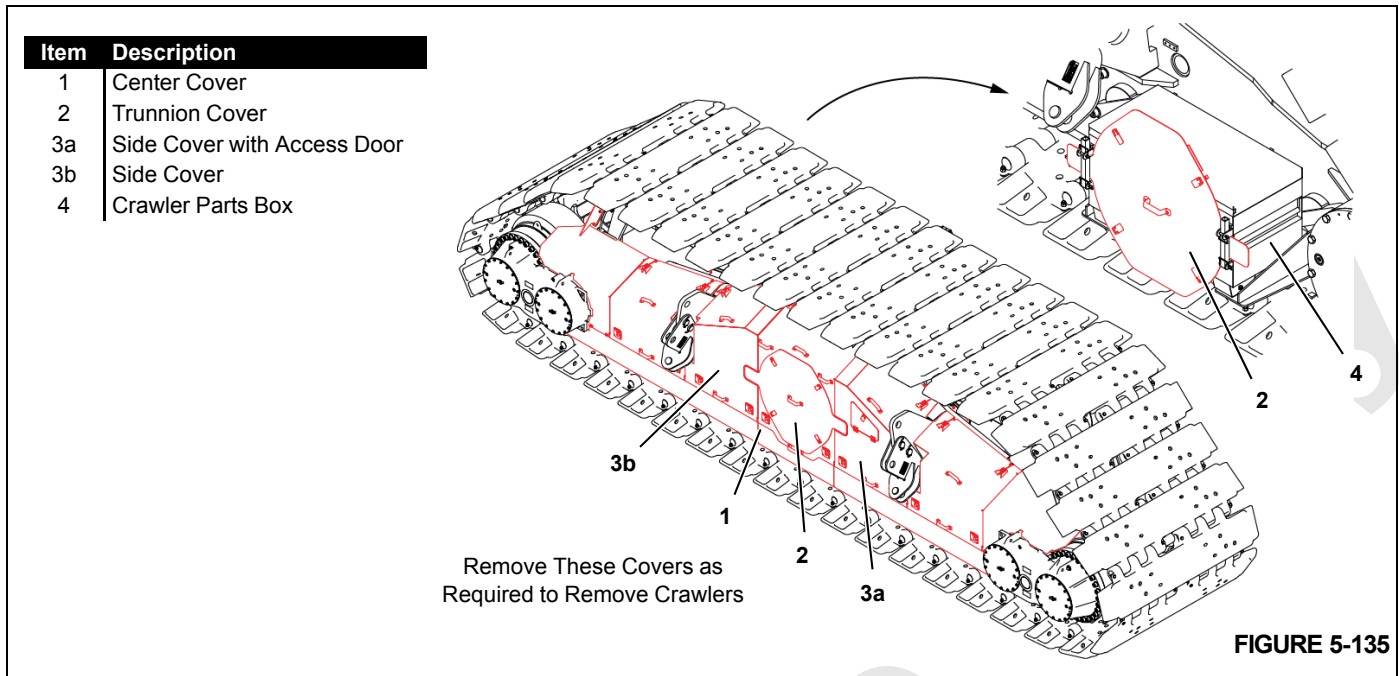
CRANE DISASSEMBLY — CRAWLERS

Disconnect Crawler Hoses and Electric Cables

1. Disconnect the hydraulic and grease hoses between each corner of the carbody and the adjacent crawler.
 - Clean the ends of the hoses.
 - Clean and install protective caps on the ends of the hoses. The protective caps are stored in the crawler parts boxes.

- Store the hoses as shown in [Figure 5-133](#).
2. Disconnect the electric cable between each corner of the carbody and the adjacent crawler.
 - Clean the ends of the electric cables.
 - Clean and install protective caps on the ends of the electric cables.
 - Store the electric cables as shown in [Figure 5-133](#).





Remove Crawler Covers

The outboard side of each crawler is equipped with covers ([Figure 5-135](#)) to protect components. During crawler removal it is necessary to remove covers:

- Remove covers (1 and 2) to access components if the trunnion will not be removed with the crawler.
- Remove all four covers (1, 2, 3a, and 3b) to access components if the trunnion will be removed with the crawler.
- Store the covers in a safe location during disassembly.
- Reinstall the covers after the crawlers are removed.

If the trunnion will be shipped in the crawler, store trunnion cover (2) on crawler parts box (4).

Handle Crawlers

See [Figure 5-136](#) for the following procedure.

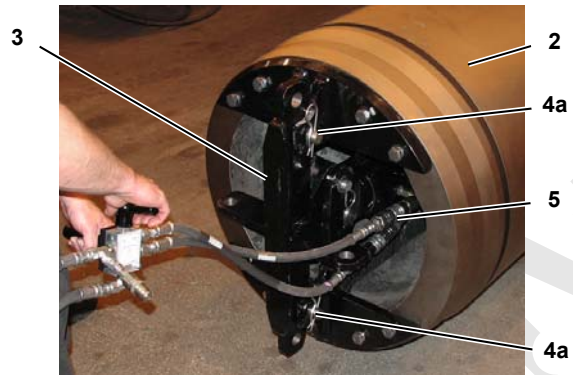
1. Rotate lifting levers (3, View B) from the shipping position to the lifting position and pin (View C).
2. Before lifting a crawler with the treads installed, snugly attach four chains (5, View C) between lugs (6) and a hole in four treads (7).

The chains are stored in tool box (2, View A) on each crawler.

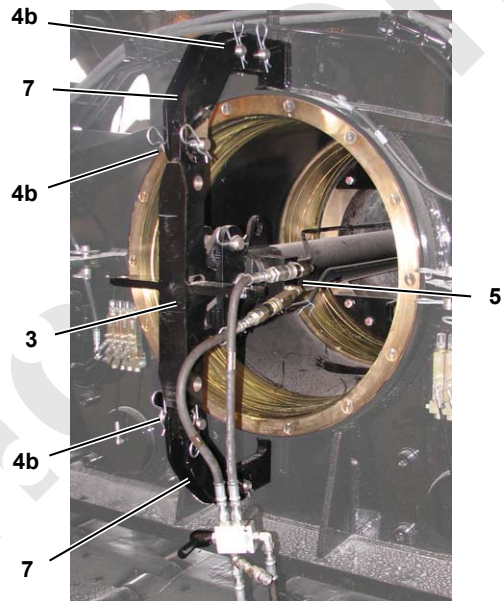
The chains prevent the treads from sagging excessively when the crawler is lifted.

3. Attach four legs of chain lifting sling (8) to the lifting levers.
4. Lift the crawler with the assist crane.

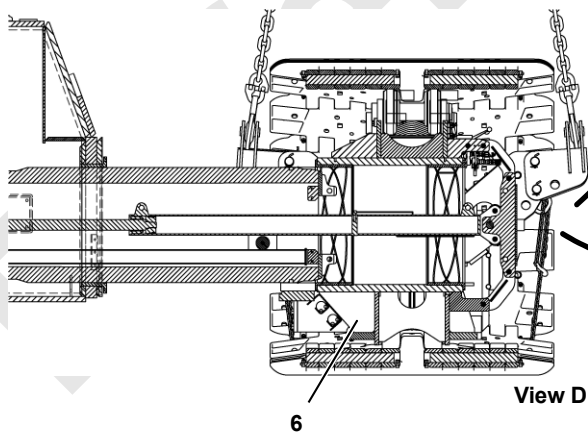
Item	Description
1	Retaining Ring (2 halves)
2	Trunnion
3	Support
4a	Pin with Hair-Pin Cotter (2) 3-21/32 in (93 mm) Long
4b	Pin with Hair-Pin Cotter (2) 2-7/8 in (73 mm) Long
5	Couplers (2)
6	Crawler
7	Links (2)
8	Screw with Flat Washer, Lock Washer, and Nut (2)



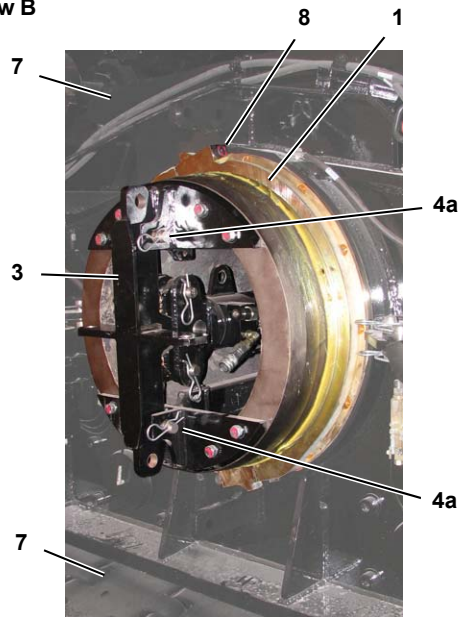
View A



View B



View D



View C

FIGURE 5-137

Remove Crawlers — Method 1

Use the following method to remove the crawlers without the trunnions. The trunnions will remain with the end beams.

NOTE The four crawlers can be removed from the carbody in any order, to include two on one side at a time.

The carbody must remain fully supported by all four jacking cylinders until all four crawlers are removed.

1. Remove the carbody side beam platforms.
 2. Remove the center cover from all four crawlers (Figure 5-135).
 3. Install crawler chains (5, Figure 5-136, View C) at all four crawlers.
-
- CAUTION**

Avoid Cylinder Damage!

All four side beam jacking cylinders must be extended simultaneously to keep carbody level to within 4° from front to rear and from side to side. Otherwise, side beam jacking cylinders can be damaged.
-
4. Raise the carbody with side beam jacking cylinder controls (1, 2, 7, and 8, Figure 5-134).
 - Keep the carbody as level as possible.
 - Raise the carbody only as high as needed to remove the crawlers.
 - *Keep carbody fully supported by all four jacking cylinders until all four crawlers are removed.*
 5. Attach lifting slings from the assist crane to the crawler as shown in Figure 5-136, View A.
 6. Hoist with the assist crane until the lifting slings are taut. See Figure 5-137 for the remaining steps.
 7. Connect the hydraulic hoses from the hand-held accessory valve to couplers (5, View B) in the end of the trunnion.
 8. Connect the hoses on the other of the hand-held accessory valve to the PPU.
 9. Remove retaining ring halves (1, View C) from the trunnion groove and set them to the side in a safe area.
 10. Pin links (7, View B) to support (3). The links are stored in the crawler parts box.
 11. Remove two pins (4a, View C) connecting support (3) to the trunnion. Place the pins to the side in a safe area.
 12. Start the PPU.
 13. ***Make sure the full weight of the crawler is supported by the assist crane during steps 14 and 15.***
 14. Slowly extend the trunnion hydraulic cylinder with the hand-held accessory valve while following with the assist crane. This step will push the crawler off the trunnion.
 15. Once the trunnion hydraulic cylinder is fully extended, disconnect the hydraulic hoses from couplers (5, View B).
 16. Unpin links (7, View B) from support (3) and store the links in the crawler parts box.
 17. Lift the crawler away from the trunnion and lower it to the ground clear of the lowerworks.
 18. Disconnect the lifting slings.
 19. Connect the hydraulic hoses from the hand-held accessory valve to couplers (5, View A) in the end of the trunnion.
 20. Start the PPU and retract the trunnion hydraulic cylinder with the hand-held accessory valve.
 21. Stop when the pin holes in support (3, View A) are aligned with the pin holes in the trunnion.
 22. Install two pins (4a, View A).
 23. Disconnect the hydraulic hoses from the trunnion.
 24. Install retaining ring halves (1, View C) in the trunnion groove and retain them with screws (8). Securely tighten the screws.
 25. Install trunnion bore covers (1, Figure 5-141, View C) on both sides of the crawler. The covers are stored in the trunnion shipping containers (View D).
 26. Repeat the above steps for the remaining crawlers.
 27. Once all four crawlers are removed, fully lower the carbody with side beam jacking cylinder controls (1, 2, 7, and 8, Figure 5-134).

All four side beam jacking cylinders must be retracted simultaneously so the carbody remains as level as possible at all times. Otherwise, side beam jacking cylinders can be damaged.
 28. Install the center covers on all four crawlers (Figure 5-135).
 29. If required for shipping, remove the trunnions from the front and rear carbody beams (see page 5-235).

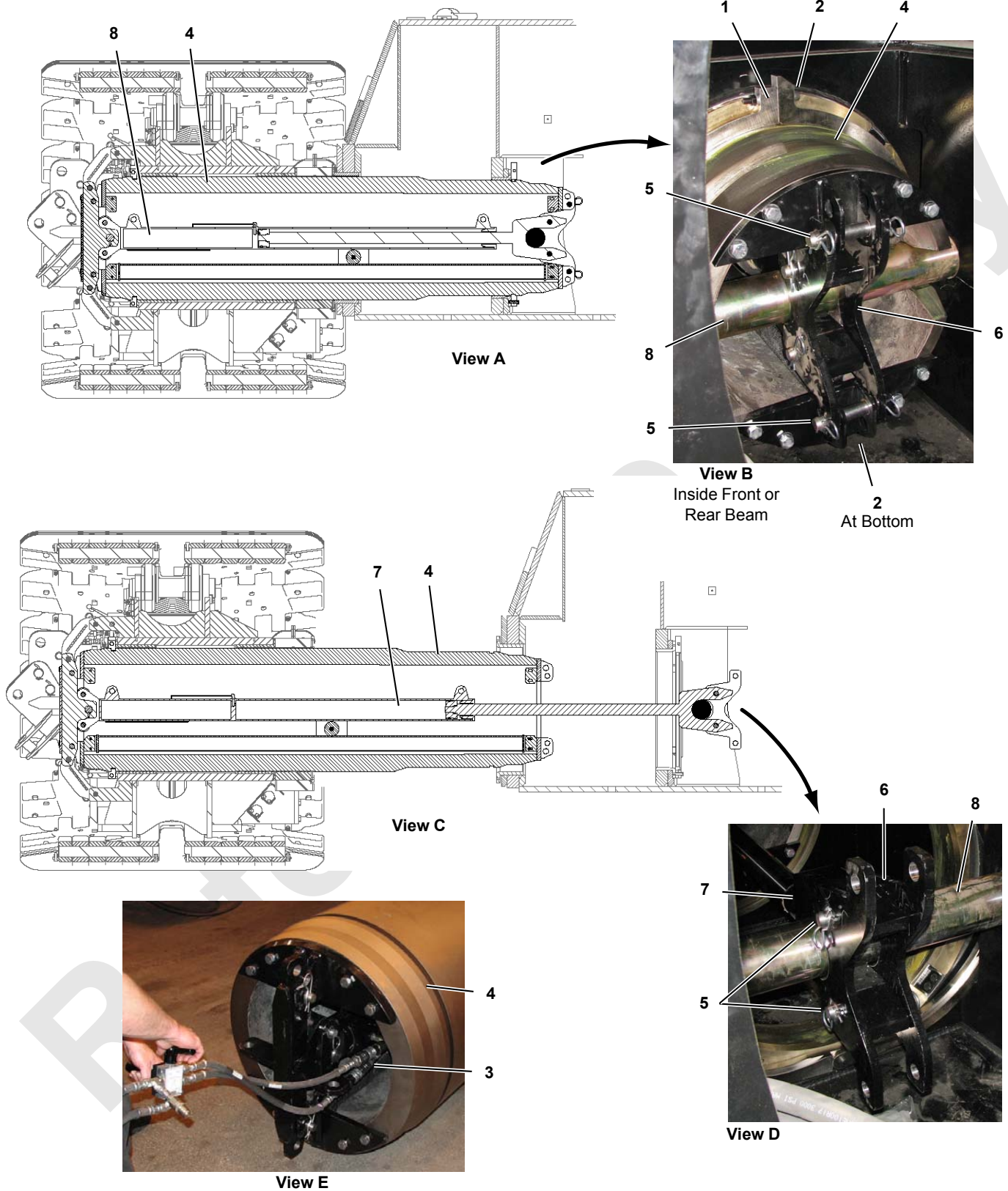


FIGURE 5-138

Legend for [Figure 5-138](#)

Item	Description
1	Retaining Ring (2 halves)
2	Screw
3	Coupler (2)
4	Trunnion
5	Pin with Hair-Pin Cotter Pins (5)
6	Retaining Plate
7	Trunnion Hydraulic Cylinder
8	Pin

Remove Crawlers — Method 2

Use the following method to remove the crawlers with the trunnions.

NOTE The four crawlers can be removed from the carbody in any order, to include two on one side at a time.

The carbody must remain fully supported by all four jacking cylinders until all four crawlers are removed.

1. Remove the carbody side beam platforms.
2. Remove covers (1, 2, 3a, and 3b, [Figure 5-135](#)) from all four crawlers.
3. Install crawler chains (5, [Figure 5-136](#), View C) at all four crawlers. The chains are stored in the tool box on each crawler.

CAUTION

Avoid Cylinder Damage!

All four side beam jacking cylinders must be extended simultaneously to keep carbody level to within 4° from front to rear and from side to side. Otherwise, side beam jacking cylinders can be damaged.

4. Raise the carbody with side beam jacking cylinder controls (1, 2, 7, and 8, [Figure 5-134](#)).
 - Keep the carbody as level as possible.
 - Raise the carbody only as high as needed to remove the crawlers.
 - *Keep carbody fully supported by all four jacking cylinders until all four crawlers are removed.*

5. Attach lifting slings from the assist crane to the crawler as shown in [Figure 5-136](#), View A.

6. Hoist with the assist crane so the lifting slings are taut.

See [Figure 5-138](#) for the following steps.

NOTE An assembly person must go inside the end beam to perform step 7.

Lights (powered by PPU) are located inside the beams.

Maintain communication between the assembly person inside the end beam and the assembly person operating the hand-held accessory valve.

7. Loosen screw (2, View B) at the bottom of retaining ring (1).

8. Remove top screw (2, View B) and open the retaining ring halves as far as possible.

The bump in the bottom of the retaining ring should rest in the bottom of the end beam once the retaining ring is opened.

9. Reinstall top screw (2, View B) in the retaining ring hole for storage.

10. Connect the hydraulic hoses from the hand-held accessory valve to couplers (3, View E) in the end of the trunnion.

11. Connect the hoses on the other of the hand-held accessory valve to the PPU.

12. Remove pins (5, View B) securing trunnion (4) to retaining plate (6).

13. Start the PPU.

14. ***Make sure the full weight of the crawler is supported by the assist crane during steps 15 and 16.***

15. Slowly extend trunnion hydraulic cylinder (7, View C) with the hand-held accessory valve while following with the assist crane. This step will push the crawler and the trunnion away from the end beam.

16. Remove pins (5, View D) and retaining plates (6) from the end of the hydraulic cylinder rod. This step disconnects the cylinder rod from pin (8).

17. Lift the crawler and trunnion away from the end beam and lower the crawler onto the ground.

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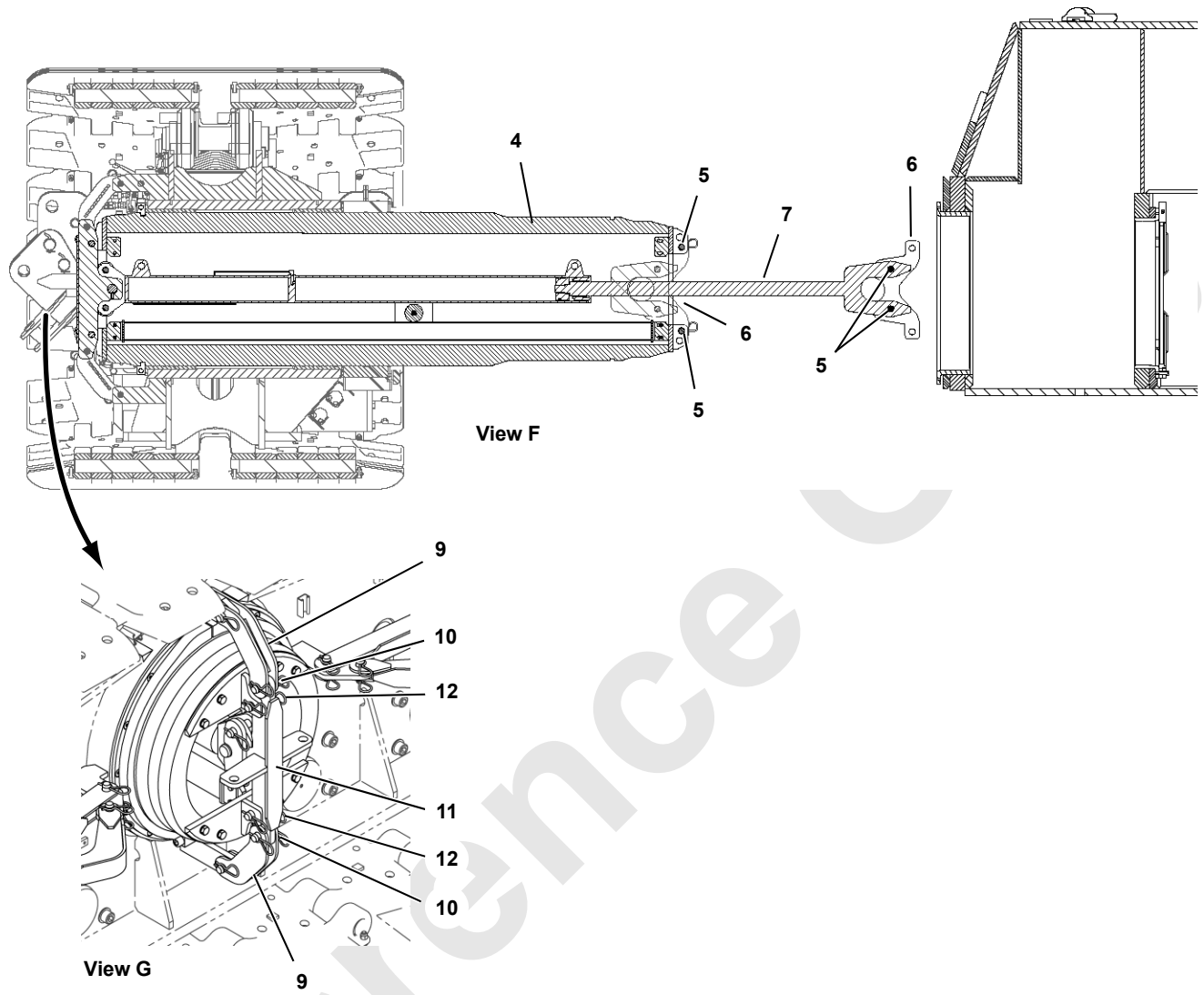


FIGURE5-138continued

Legend for [Figure 5-138](#)

Item	Description
4	Trunnion
5	Pin with Hair-Pin Cotter Pins (5)
6	Retaining Plate
7	Trunnion Hydraulic Cylinder
9	Link (2)
10	Pin with Hair-Pin Cotter (2) 2-7/8 in (73 mm) Long
11	Support
12	Pin with Hair-Pin Cotter (2) 3-21/32 in (93 mm) Long

18. Reinstall retaining plate (6, View F) on the end of trunnion hydraulic cylinder (7).
19. Slowly retract trunnion hydraulic cylinder (7) with the hand-held accessory valve.
20. Stop when the pin holes in retaining plate (6, View F) are aligned with the pin holes in the trunnion.

21. Install two pins (5, View F).
22. Unpin links (9, View G) from support (11) and store the links in the crawler parts box.
23. Remove pins (12, View G).

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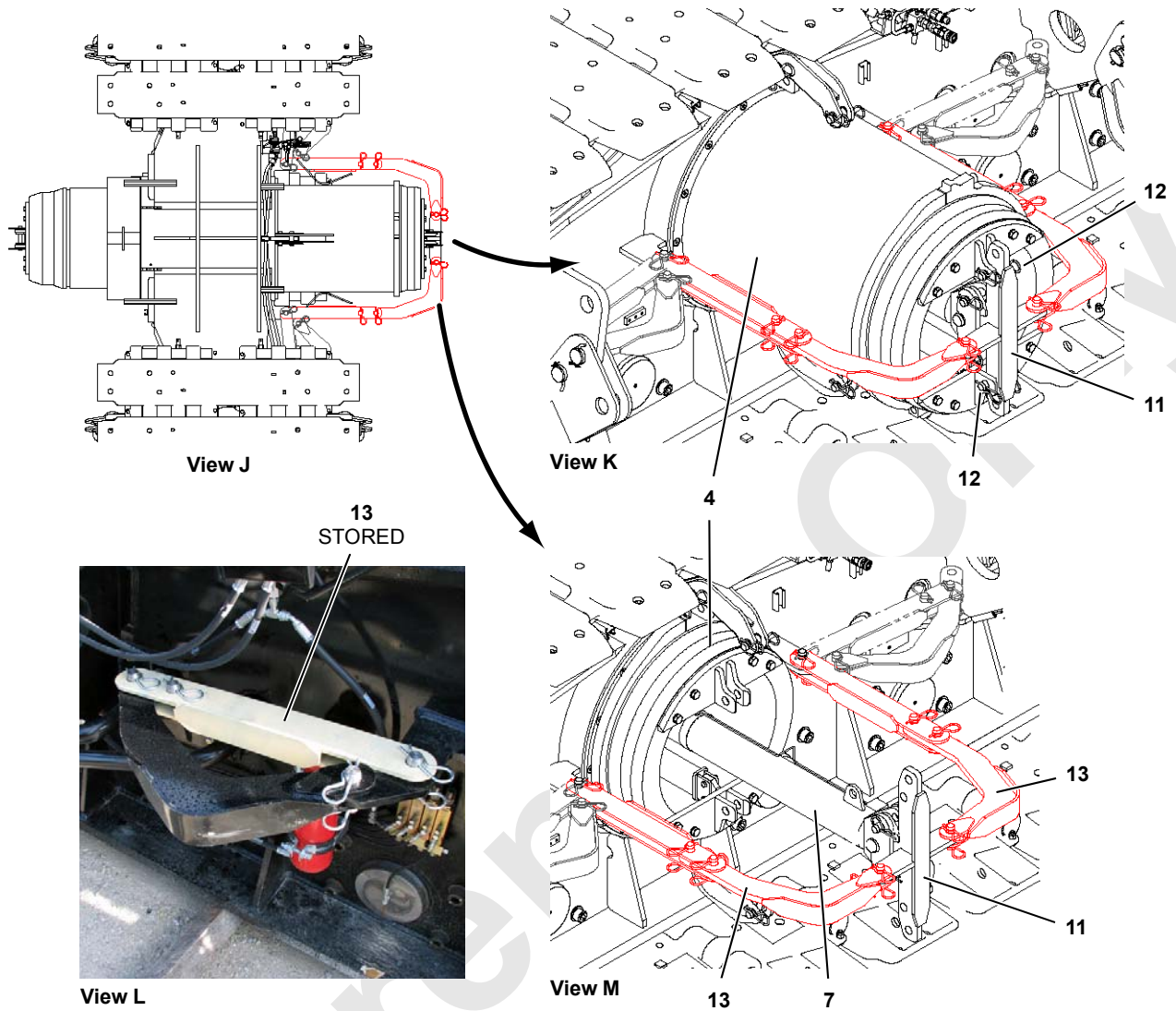


FIGURE 5-139

Legend for [Figure 5-139](#)

Item	Description
4	Trunnion
7	Trunnion Hydraulic Cylinder
11	Support
12	Pin with Hair-Pin Cotter (2) 3-21/32 in (93 mm) Long
13	Links (2 sets)

24. Start the PPU.
25. Fully extend trunnion hydraulic cylinder (7, View M) with the hand-held accessory valve.
26. Unpin links (13, View L) from storage and pin them to support (11, View M).
27. Retract the trunnion hydraulic cylinder with the hand-held accessory valve. This will center the trunnion for shipping in the crawler.
28. Stop when the holes in support (11, View K) are aligned with the holes in the trunnion and install pins (12).
29. Disconnect the hydraulic hoses from the end of the trunnion.
30. Repeat the above steps for the remaining crawlers.
31. Once all four crawlers are removed, fully lower the carbody with side beam jacking cylinder controls (1, 2, 7, and 8, [Figure 5-134](#)).
All four side beam jacking cylinders must be retracted simultaneously so the carbody remains as level as possible at all times. Otherwise, side beam jacking cylinders can be damaged.
32. Install covers 1, 3a, and 3b, [Figure 5-135](#)) on all four crawlers. Install trunnion covers (2) on the crawler parts boxes.

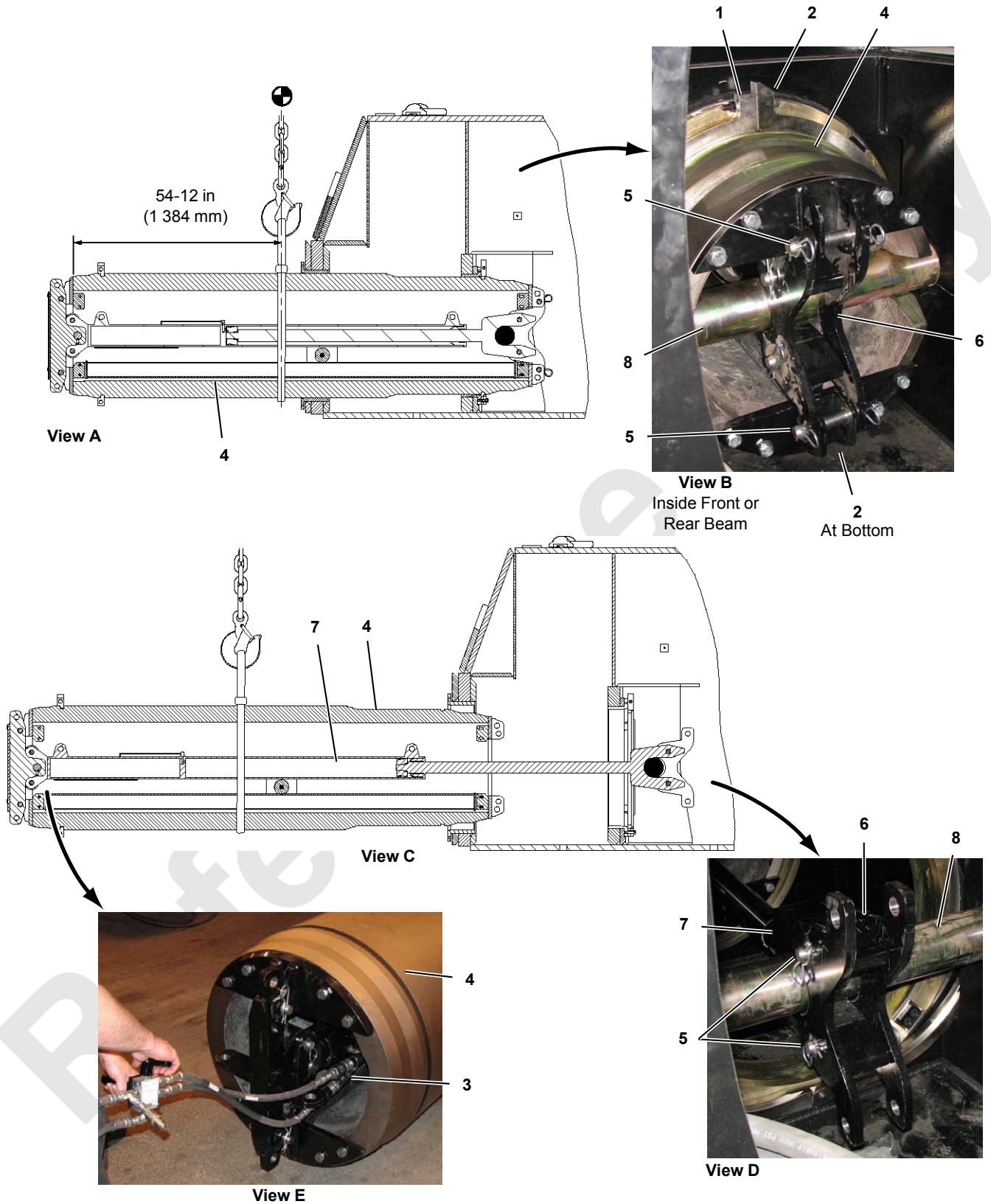


FIGURE 5-140

Legend for [Figure 5-140](#)

Item	Description
1	Retaining Ring (2 halves)
2	Screw
3	Coupler (2)
4	Trunnion
5	Pin with Hair-Pin Cotter Pins (5)
6	Retaining Plate
7	Trunnion Hydraulic Cylinder
8	Pin

Remove Trunnions

Perform this procedure if it is necessary to remove the trunnions from the end beams.

See [Figure 5-140](#) for the following steps.

1. Attach lifting slings from the assist crane to trunnion (4, View A) at the specified dimension.
2. Hoist with the assist crane so the lifting slings are taut.
3. Make sure the carbody is level in all directions.

NOTE An assembly person must go inside the end beam for the following steps.

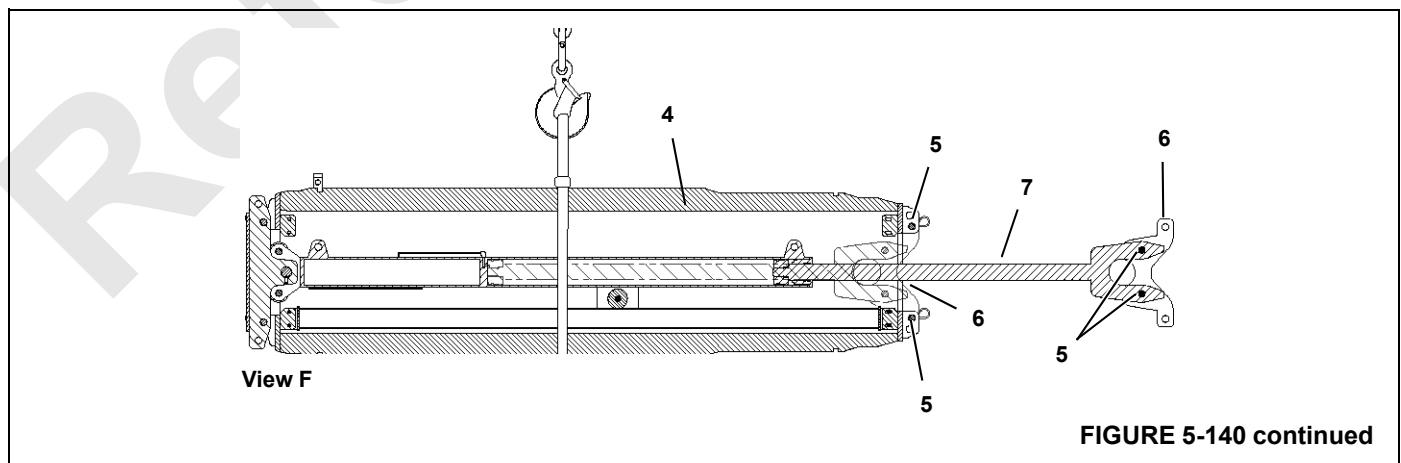
Lights (powered by PPU) are located inside the beams.

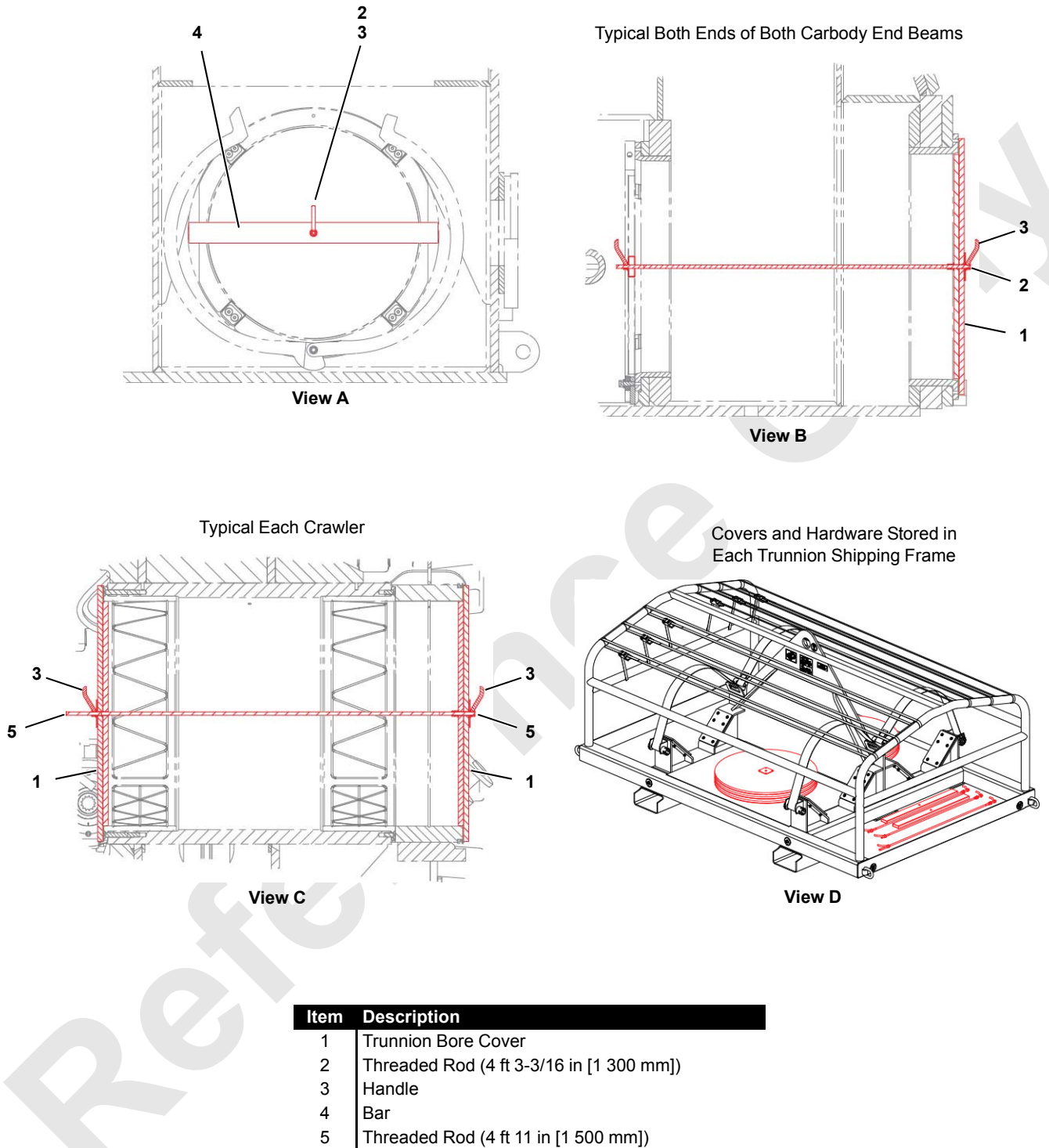
Maintain communication between the assembly person inside the end beam and the assembly person operating the hand-held accessory valve.

4. Loosen screw (2, View B) at the bottom of retaining ring (1).
5. Remove top screw (2, View B) and open the retaining ring halves as far as possible.

NOTE The bump in the bottom of the retaining ring should rest in the bottom of the end beam once the retaining ring is opened.

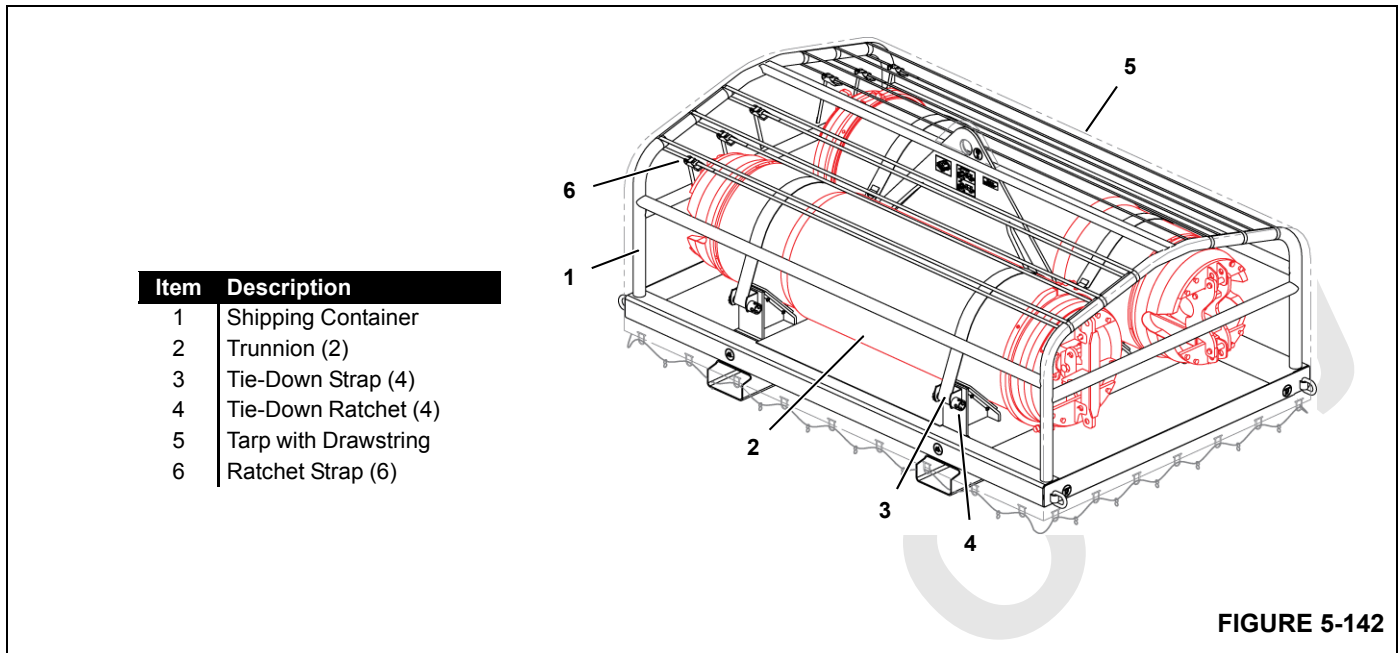
6. Reinstall screws, washers, and nuts (2, View B) in the retaining ring holes for storage.
7. Connect the hydraulic hoses from the hand-held accessory valve to couplers (3, View E) in the end of the trunnion.
8. Connect the hoses on the other of the hand-held accessory valve to the PPU.
9. Remove pins (5, View B) securing trunnion (4) to retaining plate (6).
10. Start the PPU.
11. Slowly extend trunnion hydraulic cylinder (7, View C) with the hand-held accessory valve while following with the assist crane. This step will push the trunnion out of the end beam.
12. Remove pins (5, View D) and retaining plates (6) from the end of the hydraulic cylinder rod. This step disconnects the cylinder rod from pin (8).
13. Lift the trunnion away from the end beam.
14. Reinstall retaining plate (6, View F) on the end of trunnion hydraulic cylinder (7).
15. Slowly retract trunnion hydraulic cylinder (7) with the hand-held accessory valve.
16. Stop when the pin holes in retaining plate (6, View F) are aligned with the pin holes in the trunnion.
17. Install two pins (5, View F).
18. Store the trunnion for shipping as shown in [Figure 5-142](#) on [page 5-237](#).
19. Install trunnion bore cover (1, [Figure 5-141](#), Views A and B) over both ends of the end beam. The covers are store in the trunnion shipping containers (View D).
20. Repeat the above steps for each trunnion.





Item	Description
1	Trunnion Bore Cover
2	Threaded Rod (4 ft 3-3/16 in [1 300 mm])
3	Handle
4	Bar
5	Threaded Rod (4 ft 11 in [1 500 mm])

FIGURE 5-141



Store Trunnions for Shipping

- Loosen and disconnect tie-down straps (3).
- Lift each trunnion (2) into position in shipping container (1). Center the trunnions end-to-end.
- Attach tie-down straps (3) and securely tighten them with tie-down ratchet (4). A 31/32 in (24.5 mm) diameter bar is required.
- Install and secure tarp (5).
- Lift the shipping container onto a trailer:
 - With a chain lifting sling from the assist crane OR
 - With forks from a fork-lift truck.

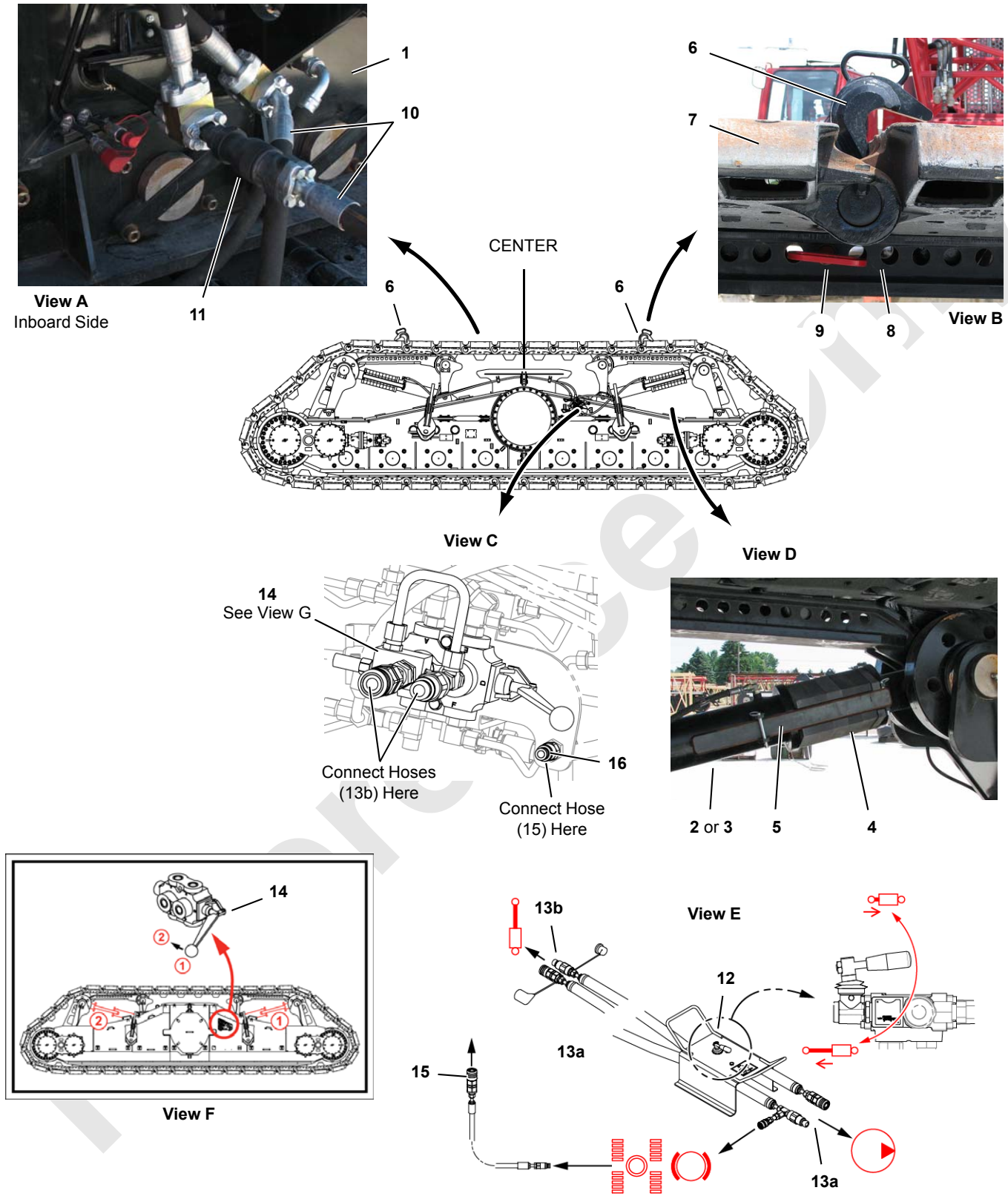


FIGURE 5-143

Legend for [Figure 5-143](#)

Item	Description
1	Crawler
2	Crawler Tensioner (right)
3	Crawler Tensioner (left)
4	Shim
5	Shim Retaining Bar
6	Tensioning Lug
7	Crawler Tread
8	Tensioner Frame
9	Hitch Pin with Hair-Pin Cotter
10	Hydraulic Hose (high pressure)
11	Coupler (high pressure)
12	Hand-Held Accessory Valve
13a	Hydraulic Hoses (to PPU)
13b	Hydraulic Hoses (to tensioner select valve)
14	Tensioner Select Valve
15	Hose Assembly — 15 ft (4.6 m)
16	Coupler (brake release)

Remove Crawler Treads

Perform this procedure only if the crawler treads will be removed to reduce shipping weight.

See [Figure 5-143](#) for the following steps.

1. At both crawler tensioners (2 and 3, View D), remove all shims (4).

2. Store the shims in the crawler parts box.
3. Install a tensioning lug (6, View B) at the outboard end of the fourth tread on both sides of the crawler centerline.
 - a. Lift tensioning lug (6, View B) into position between two crawler treads (7).
 - The tensioning lugs are stored in the PPU.
 - The hooked end of the lug must point toward the outboard end of the crawler.
 - b. Pin the tensioning lug to the holes in tensioner frame (8, View B) with pin (9).
4. Disconnect hydraulic hose (10, View B) from storage on the crawler and connect the hose to coupler (11). This step allows the crawler motors to rotate freely during the remaining steps.
5. Connect hoses (13a) from hand-held accessory valve (12, View E) to the PPU.
6. Connect hoses (13b) from hand-held accessory valve (12, View E) to tensioner select valve (14, View C).
7. Connect hose assembly (15, View E) to the brake release coupler at hand-held accessory valve (12) and to coupler (16, View C).
8. Start the PPU. The crawler brakes will release.

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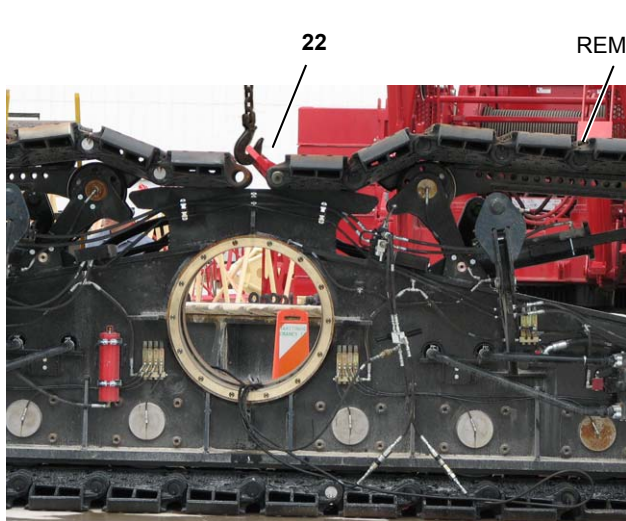
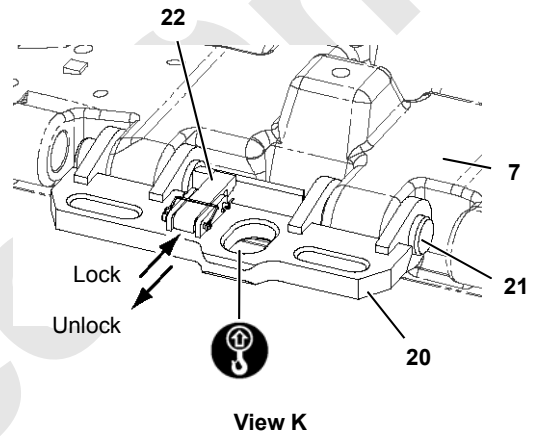
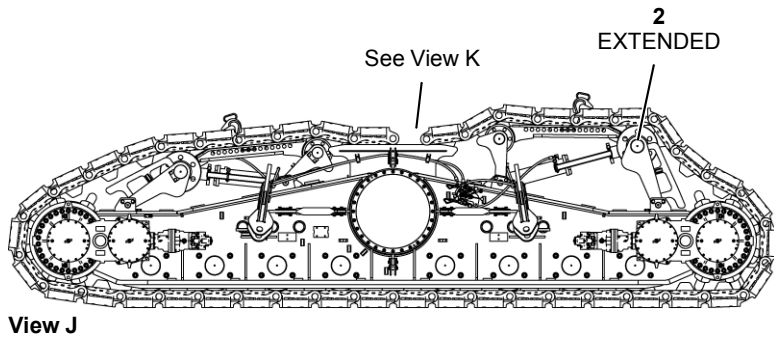
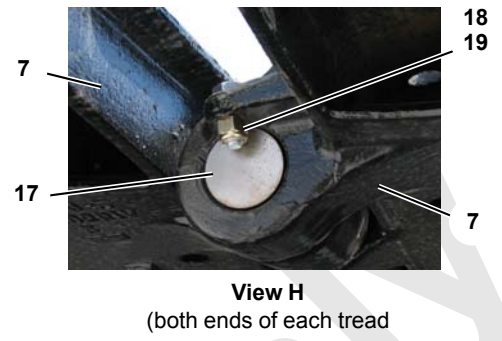
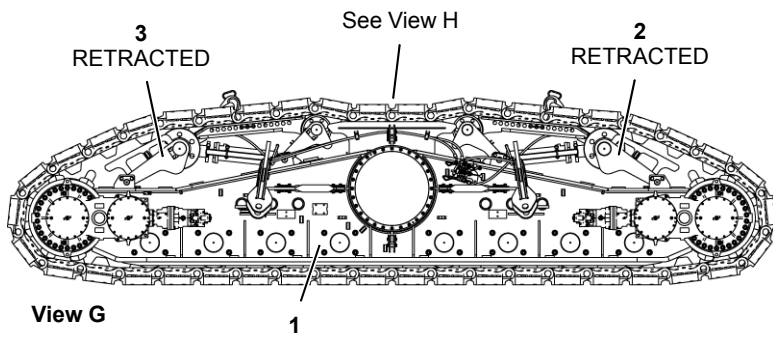


FIGURE 5-144

Legend for [Figure 5-143](#)

Item	Description
1	Crawler
2	Crawler Tensioner (right)
3	Crawler Tensioner (left)
6	Tensioning Lug
7	Crawler Tread
17	Pin
18	Screw
19	Lock Nut
20	Lifting link
21	Pin (2)
22	Retainer

See [Figure 5-145](#) for following steps.

9. Fully retract both crawler tensioners (2 and 3, View G).
 - Use the tensioner select valve (View F, [page 5-238](#)) to select which tensioner is operated.

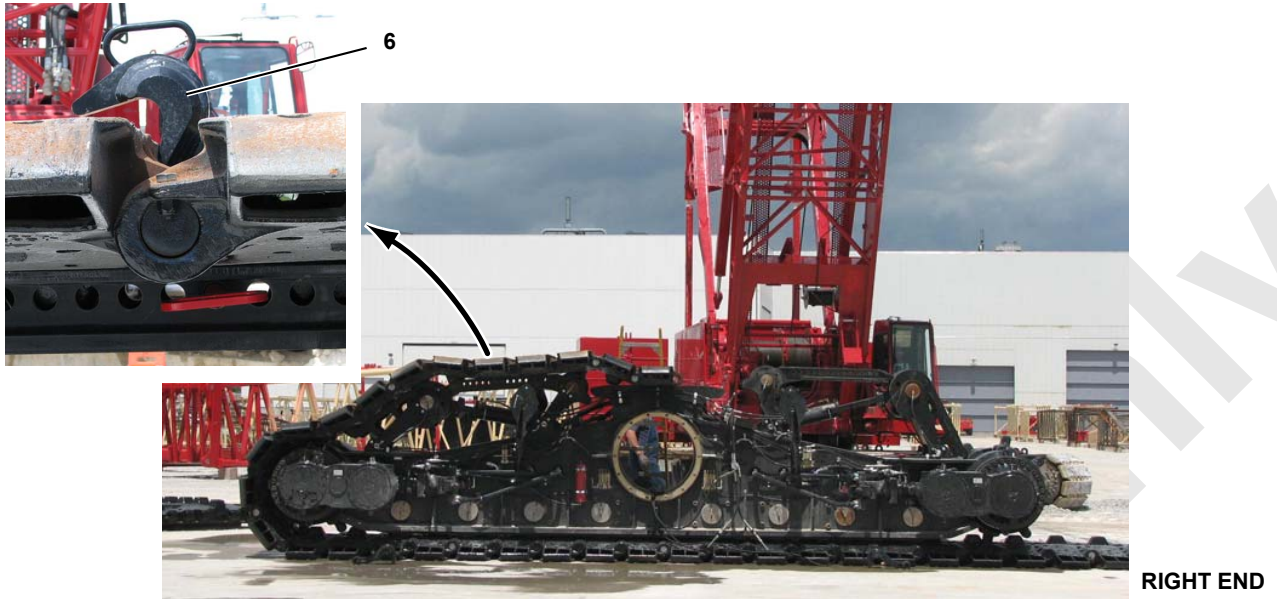
- Retract or extend the selected crawler tensioner with the hand-held accessory valve (View E, [page 5-238](#)).

10. Remove pin (17, View H) on both sides of center two crawler treads (7).

NOTE The following steps describe tread removal starting on the right side of the crawler. You can start on the left side if desired.

11. Fully extend right end crawler tensioner (2, View J) to pull the treads apart.
12. Pin and lock lifting link (20, View K) to crawler tread (6). The lifting link is stored in the PPU.
13. Connect the hook from the chain lifting sling to the lifting hole in lifting link (22, View L).
14. Remove and store tensioning lug (6, View L) on the right side of the crawler treads.
15. Lift the crawler treads off the crawler (View M).

Continued on Next Page



Item	Description
3	Lifting link
7	Crawler Treads



FIGURE 5-145

See [Figure 5-145](#) for following steps.

16. Lay the crawler treads on the ground at the right end of the crawler (View N).
17. Unpin the lifting link (View K, [page 5-240](#)) from the crawler tread.
18. Lift the lifting link into position over the left end of the crawler and pin and lock it to the tread.
19. Remove and store tensioning lug (6, View N) on the left side of the crawler treads.
20. Lift the crawler treads off the crawler (View P) and lay them on the ground at the left end of the crawler.
21. Disconnect the lifting sling.
22. Fully retract both crawler tensioners.
23. Disconnect the hydraulic hoses at the tensioning select valve (View C), [page 5-238](#).
24. Disconnect and store hydraulic hose (10, View A, [page 5-238](#)).
25. Thoroughly clean and cap the ends of all couplers and hoses.
26. Lift the crawler onto a trailer for shipping. See [Figure 5-136](#) on [page 5-224](#) for the lifting arrangement.
27. Using the lifting link, lift the crawler treads onto a trailer for shipping. Fold the treads as required to accommodate shipping space.
28. Remove the lifting link and store it in the PPU.
29. Repeat the above steps for each crawler.

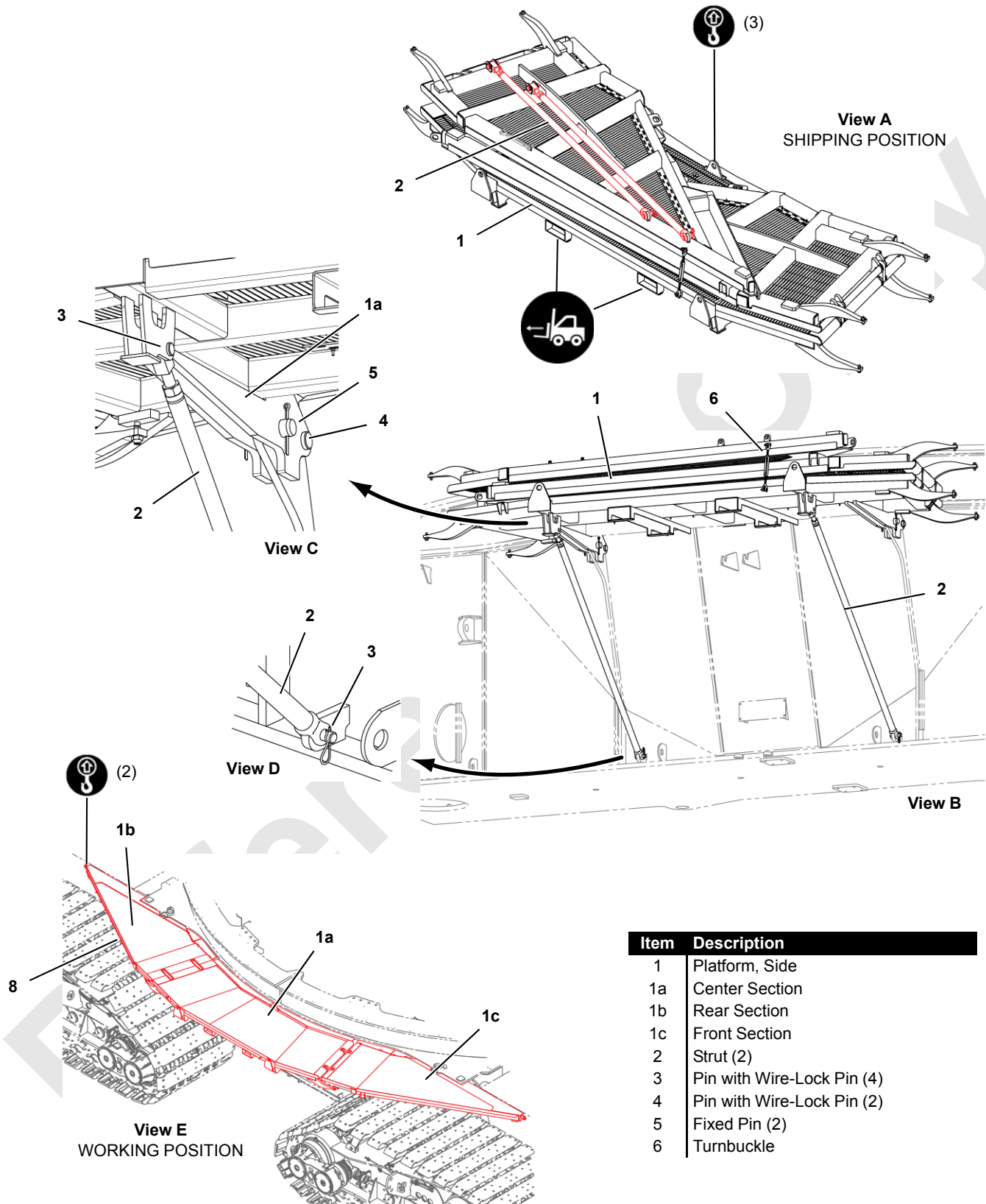


FIGURE 5-146

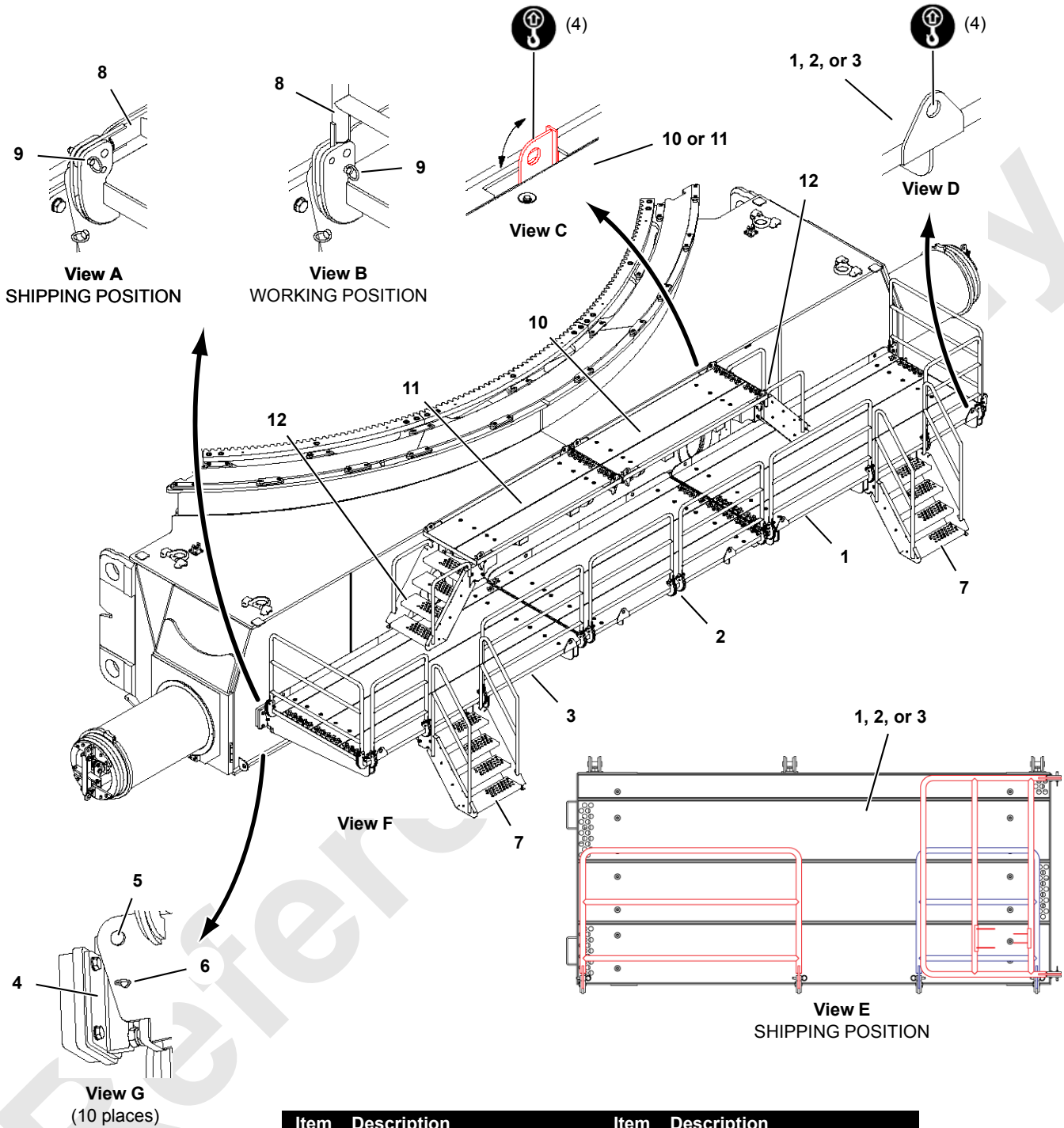
CRANE DISASSEMBLY — CARBODY

Remove Carbody Side Exterior Platforms

See [Figure 5-146](#) for the following procedure.

Perform the following steps at both sides of the carbody — right and left.

1. Using a chain sling from the assist crane, fold front and rear sections (1b and 1c, View E) from the working position to the shipping position (Views A and B).
2. Install and tighten turnbuckle (6, View B).
3. Support side platform (1, View A):
 - With chain lifting slings from the assist crane OR
 - With forks from a fork-lift truck.
4. Remove struts (2, View B) from the working position and pin them in the shipping position (View A).
5. Remove pins (4, View C).
6. Lift side platform (1, View B) off the carbody side beam.
7. Reinstall pins (4, View C) in the platform holes for storage.
8. Place the side platform on a trailer for shipping.



Item	Description	Item	Description
1	Platform, Lower End	8	Handrail
2	Platform, Lower Center	9	Quick-Release Pin
3	Platform, Lower End	10	Platform, Upper
4	Hooked Bracket	11	Platform, Upper
5	Fixed Pin	12	Stairway, Upper (2)
6	Quick-Release Pin		
7	Stairway, Lower (2)		

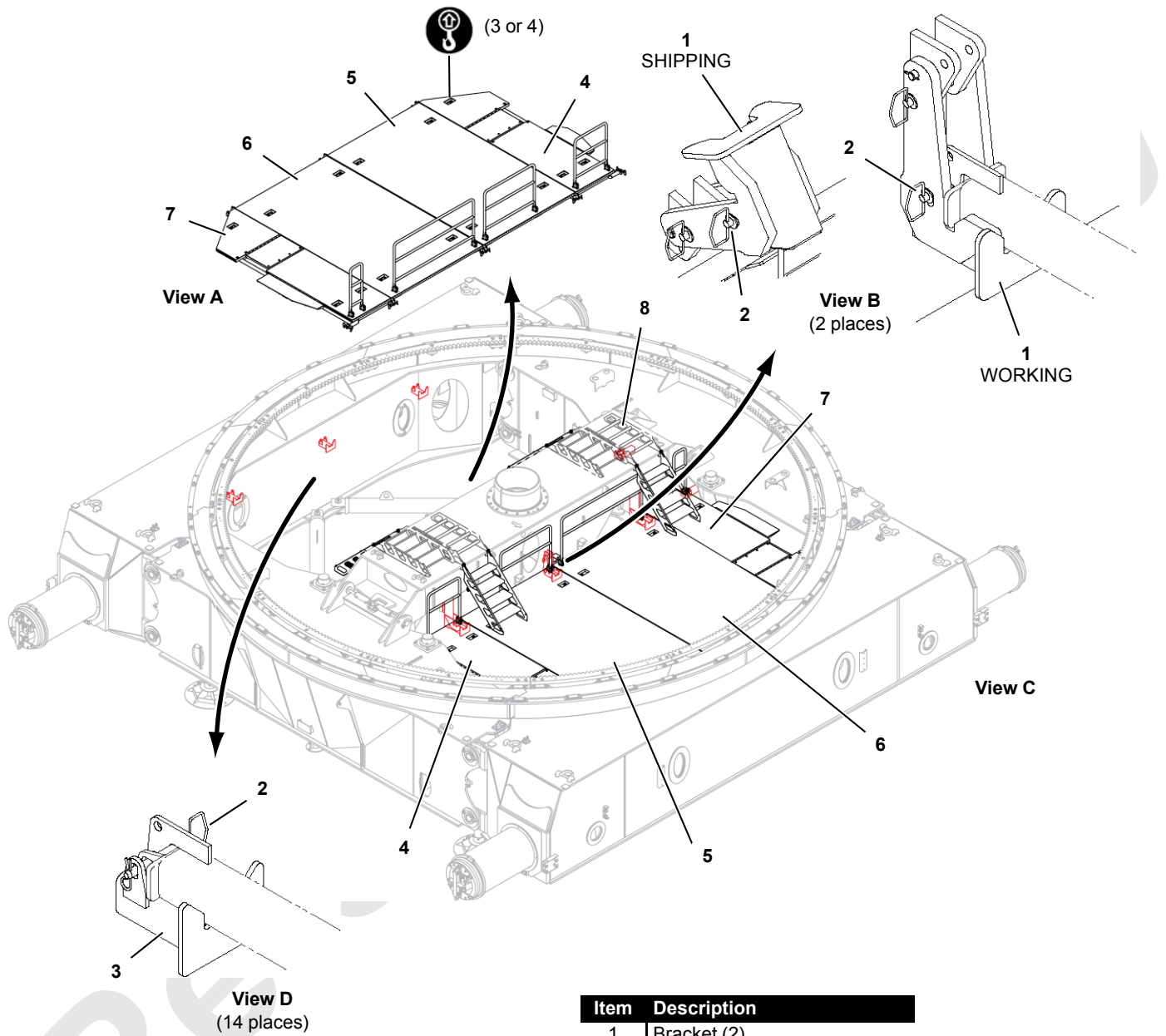
FIGURE 5-147

Remove Carbody Front and Rear Exterior Platforms

See [Figure 5-147](#) for the following procedure.

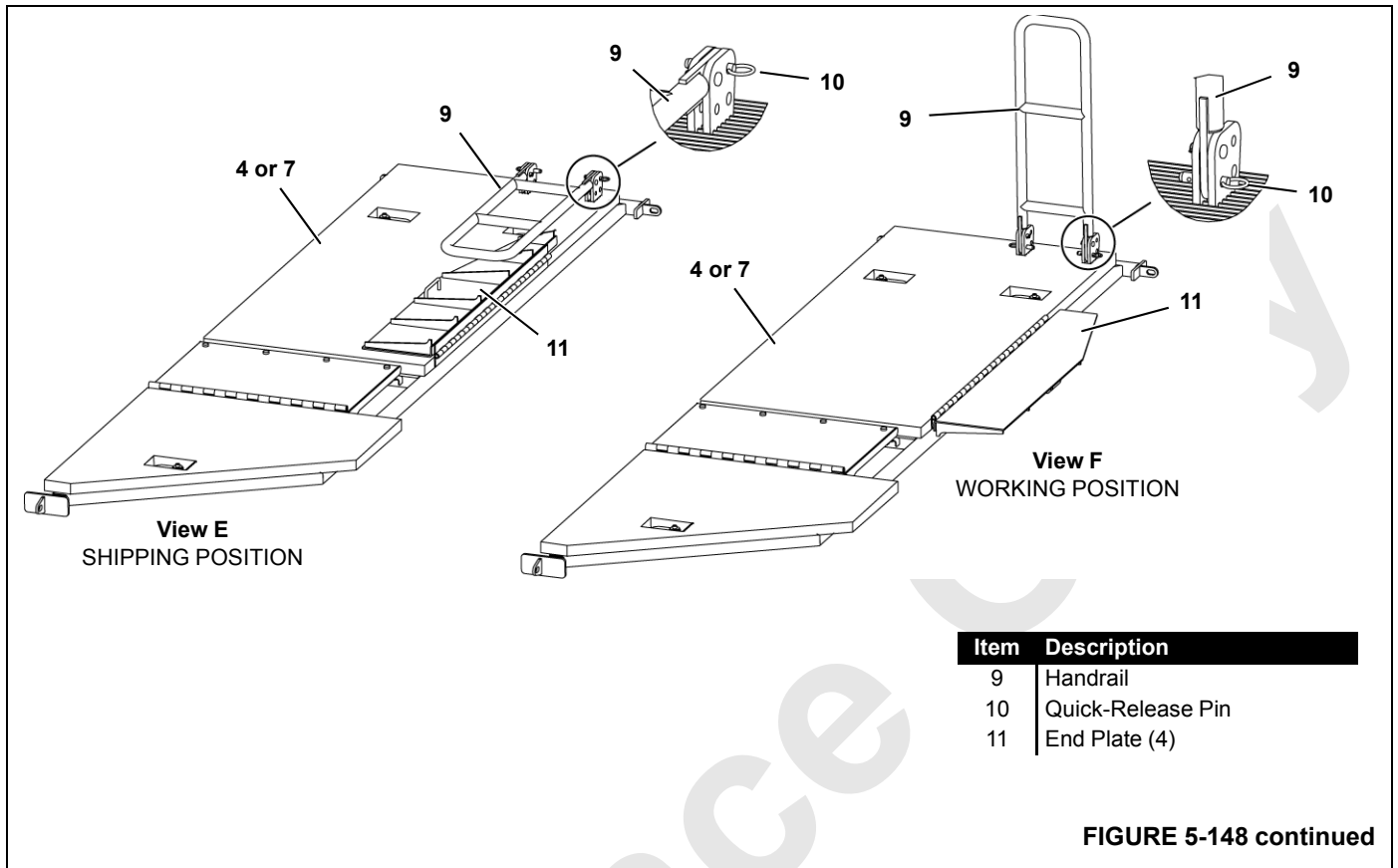
Perform the following steps at both ends of the carbody — front and rear.

1. Remove stairways (12, View F), as follows:
 - a. Attach nylon lifting slings from the assist crane to the stairway handrails.
 - b. Remove the quick-release pins securing the stairway to the upper platform.
 - c. Lift the stairway away from the upper platform and reinstall the quick-release pins in the stairway holes for storage.
 - d. Place the stairway on a trailer from shipping and disconnect the lifting slings.
 - e. Repeat the steps for the other upper stairway.
2. Remove upper platforms (10 and 11, View F), as follows:
 - a. Support the platform:
 - With chain lifting slings from the assist crane OR
 - With forks from a fork-lift truck.
 - b. Remove the quick-release pins securing the platform to the carbody.
 - c. Lift the platform away from the carbody and reinstall the quick-release pins in the platform holes for storage.
 - d. Place the platform on a trailer from shipping and disconnect the lifting slings.
 - e. Repeat the steps for the other upper platform.
3. Remove lower platforms (1, 2, and 3, View F), as follows:
 - a. Lower handrails (8, View B) from the working position and pin them in the shipping position (View A).
 - b. Remove lower stairways (7) in the same manner the upper stairways were removed.
 - c. Remove lower platforms in the same manner the upper platforms were removed.



Item	Description
1	Bracket (2)
2	Hitch Pin with Hair-Pin Cotter
3	Bracket (14)
4	Platform
5	Platform
6	Platform
7	Platform
8	Stairway (4)

FIGURE 5-148



Remove Carbody Interior Platforms

See [Figure 5-148](#) for the following procedure.

Perform the following steps at both ends of the carbody.

1. For platforms (4 and 7, View E), rotate end plates (11, View F) from the working position to the shipping position (View E).
2. Lower handrails (9, View F) from the working position and pin them in the shipping position (View E).
3. Rotate stairways (8, View C) from the working position to the shipping position on the center beam.

4. Remove hitch pins (2, Views B and D).

The brackets can be reached from the tops of the platforms.

5. Lift platforms (4 through 7, View A) — one at a time — off brackets (1 and 3) at both ends of the carbody.

NOTE Adjust the length of the lifting the slings so that when lifted the inboard end of each platform is 3 ft (0,9 m) higher than the outboard end of the platform. Platform installation will be difficult if you don't perform this step.

6. Raise two brackets (1, View B) on the center beam from the working position to the shipping position.
7. Install hitch pins (2, Views B and D) to secure brackets (1 and 3) to the beams (16 places).

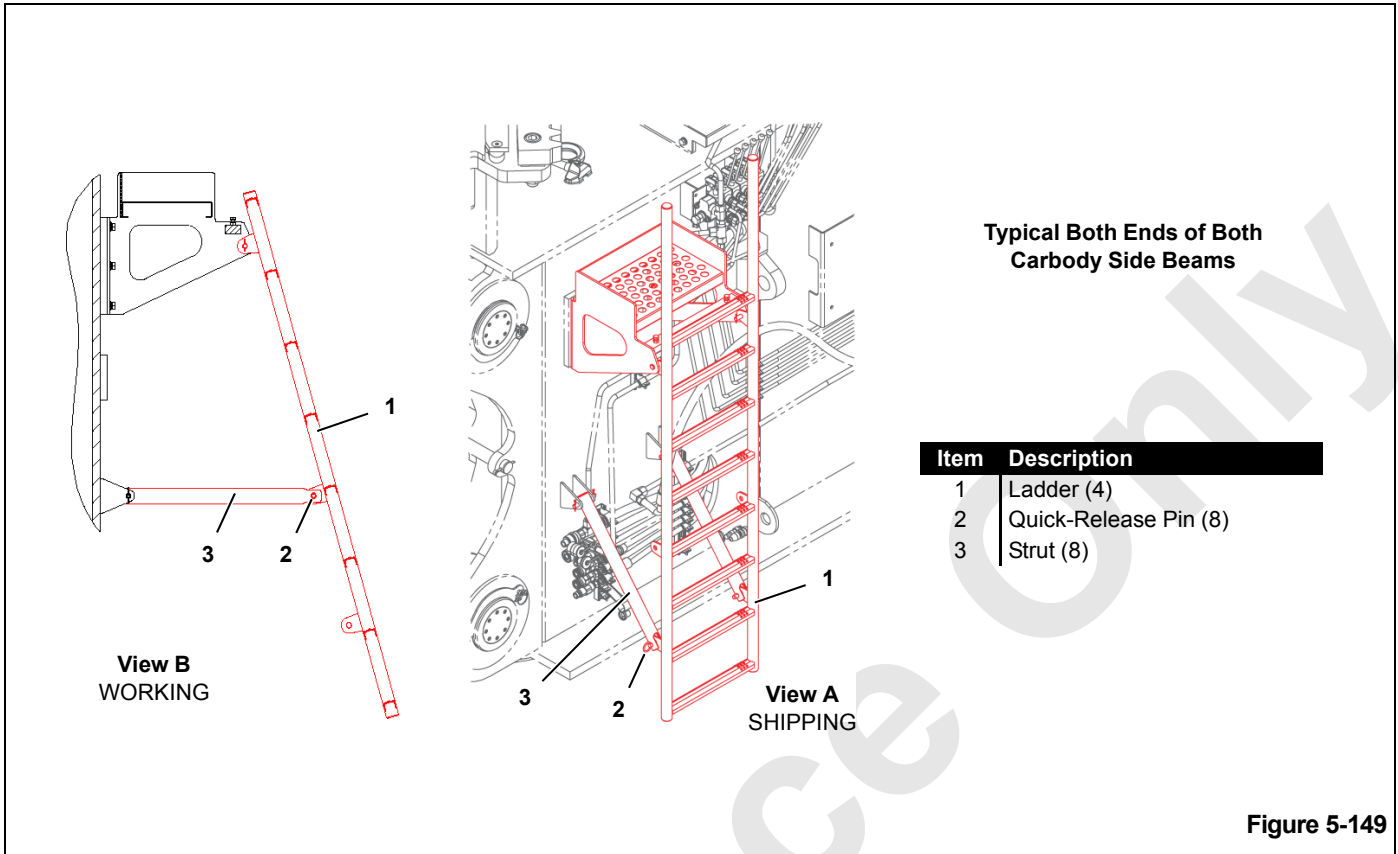


Figure 5-149

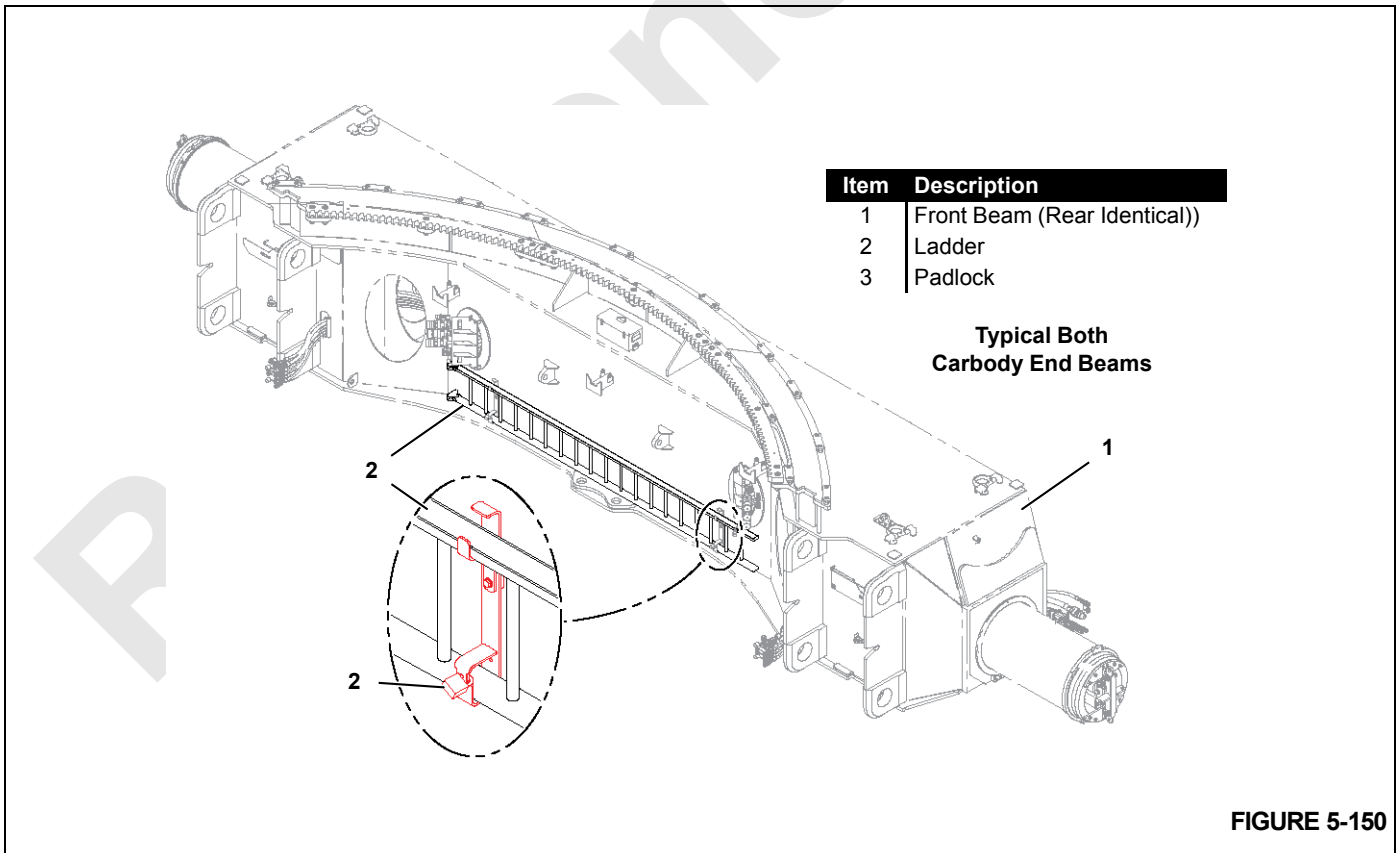


FIGURE 5-150

Deploy Carbody Ladders

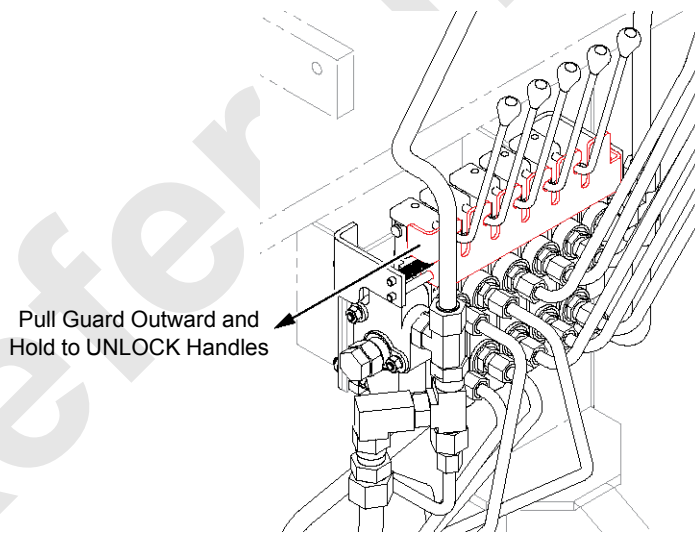
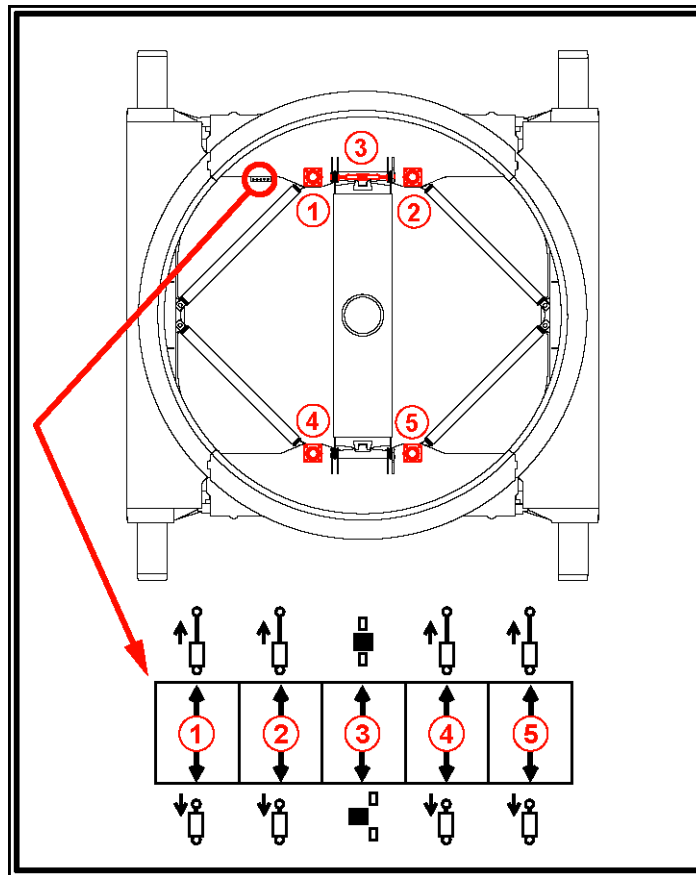
See [Figure 5-149](#) for the following procedure.

1. Unpin ladders (1, View A) from the shipping position on the side beams.

2. Pin the ladders in the working position (View B).

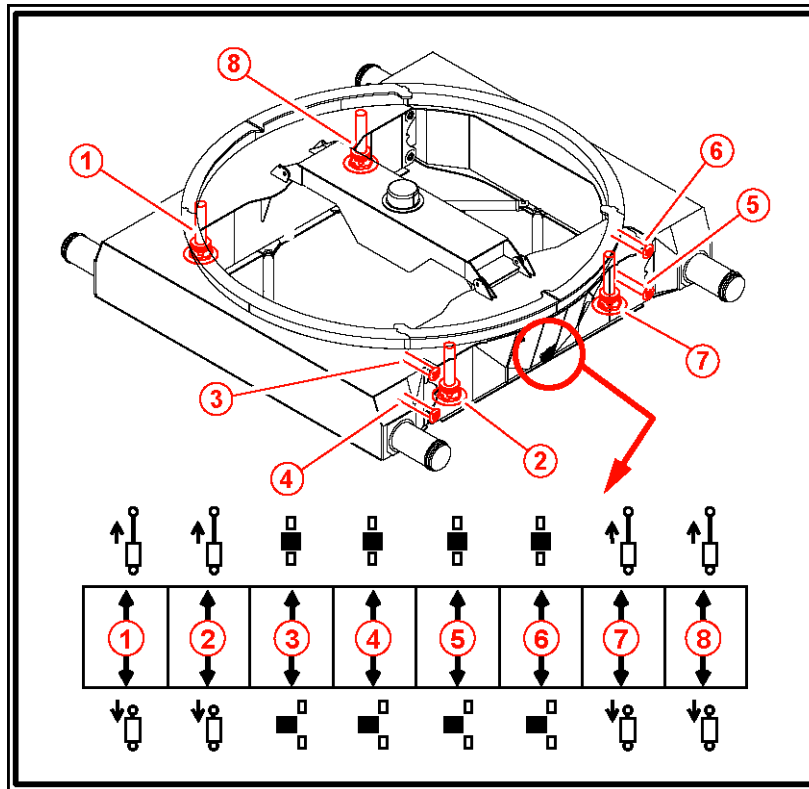
NOTE To further assist personnel in accessing parts during carbody Disassembly, a ladder is locked to storage brackets on the front and rear carbody beams (see [Figure 5-150](#)).

Reference Only



Control Handle Identification
Inboard Carbody Control Valve
(typical 2 places)

FIGURE 5-151



**Control Handle Identification
Outboard Carbody Control Valve**
(typical 2 places)

CAUTION

Avoid Damage to Control Valve!

Do not connect hydraulic hoses from PPU cable reel to hydraulic couplers at either outboard carbody valve.

Valve will be damaged when PPU is started.

FIGURE 5-152

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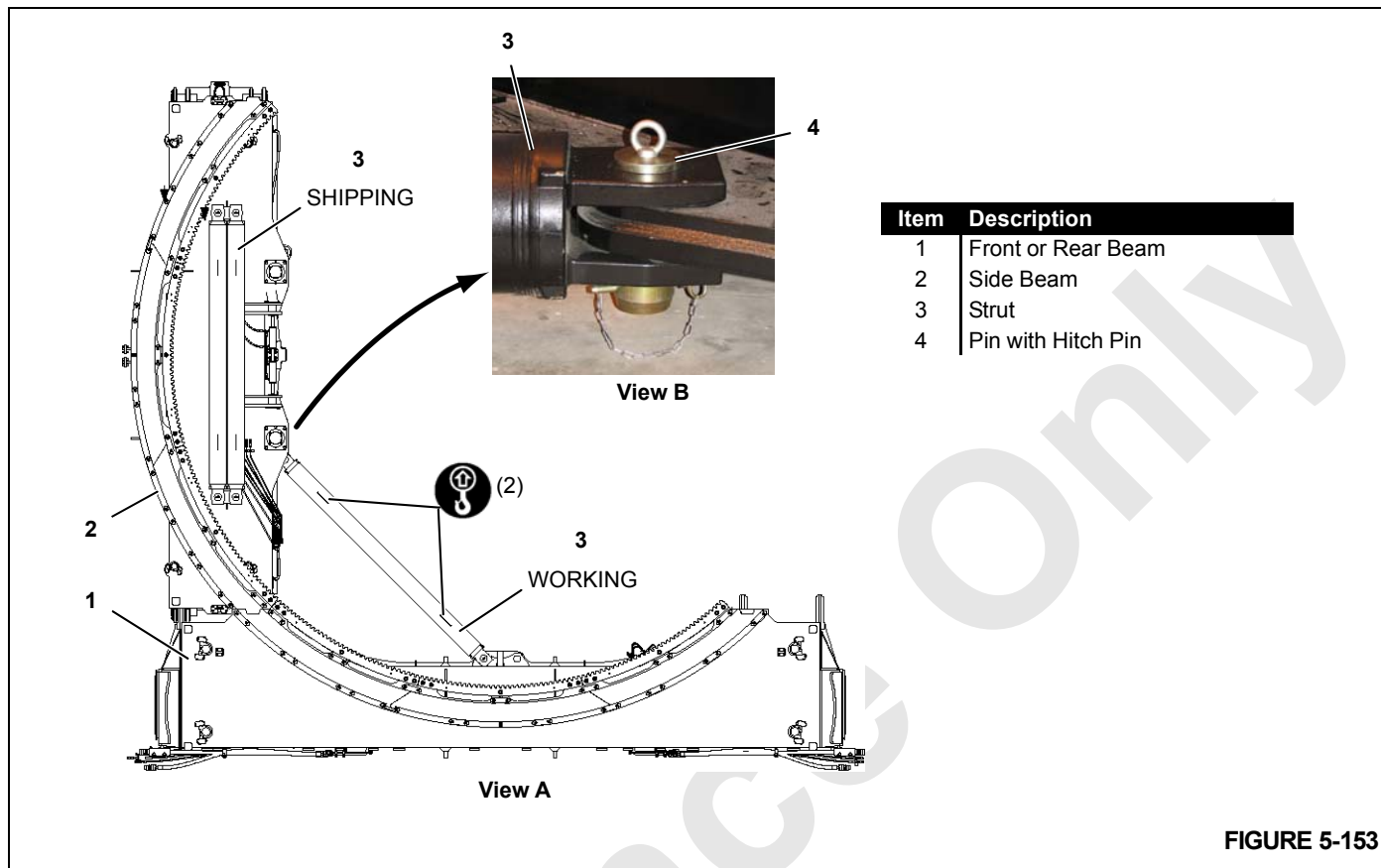


FIGURE 5-153

Remove Struts

1. Attach two legs of the chain lifting sling to the lifting lugs on strut (3, View A).
2. Hoist with the assist crane so the slings are taut.
3. Unpin both ends of strut (3) from the working position.
4. Lift strut (2, View A) to the shipping position on side beam (2) and pin the strut to the side beam.
5. Disconnect the lifting slings.
6. Repeat the steps for each strut.

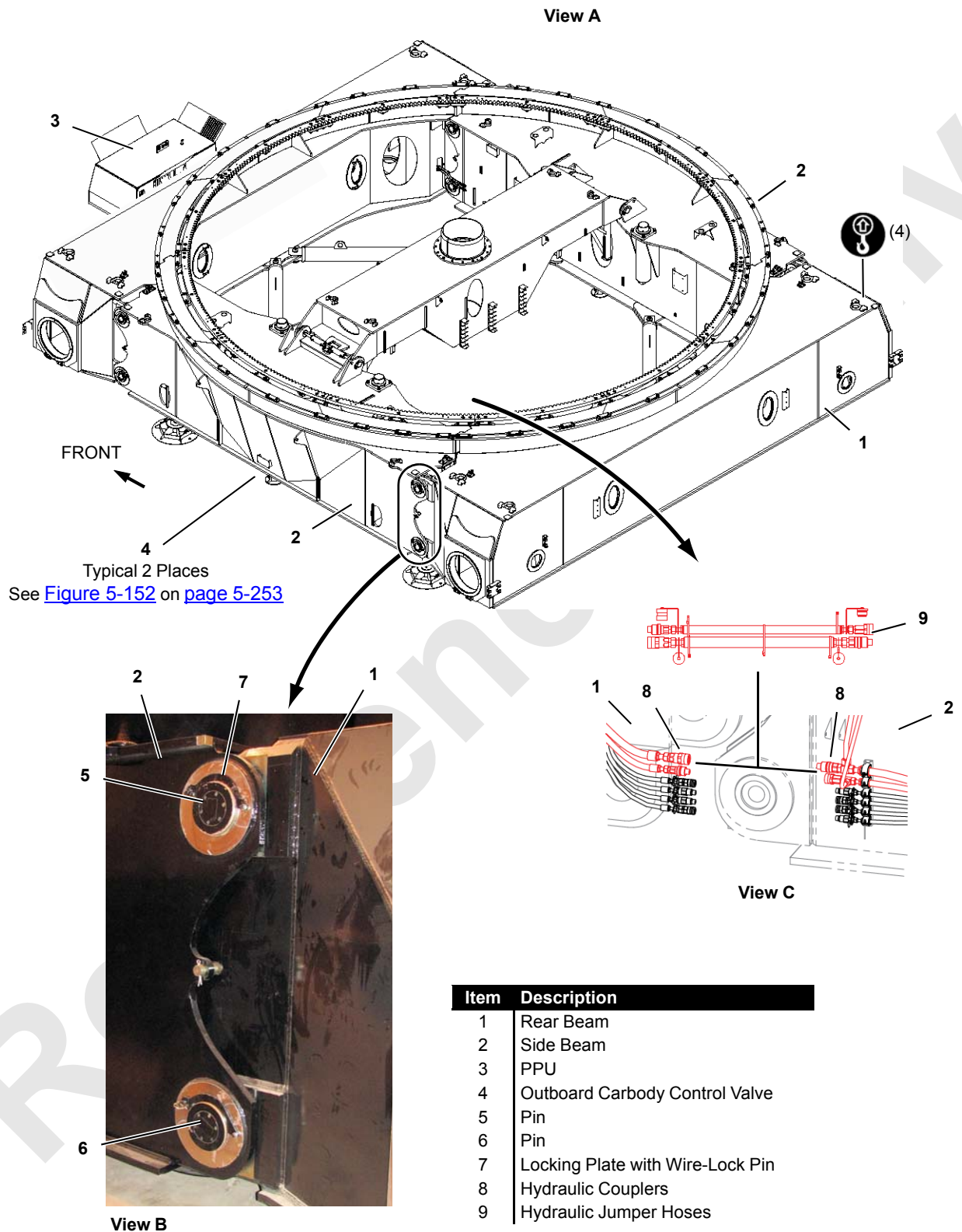


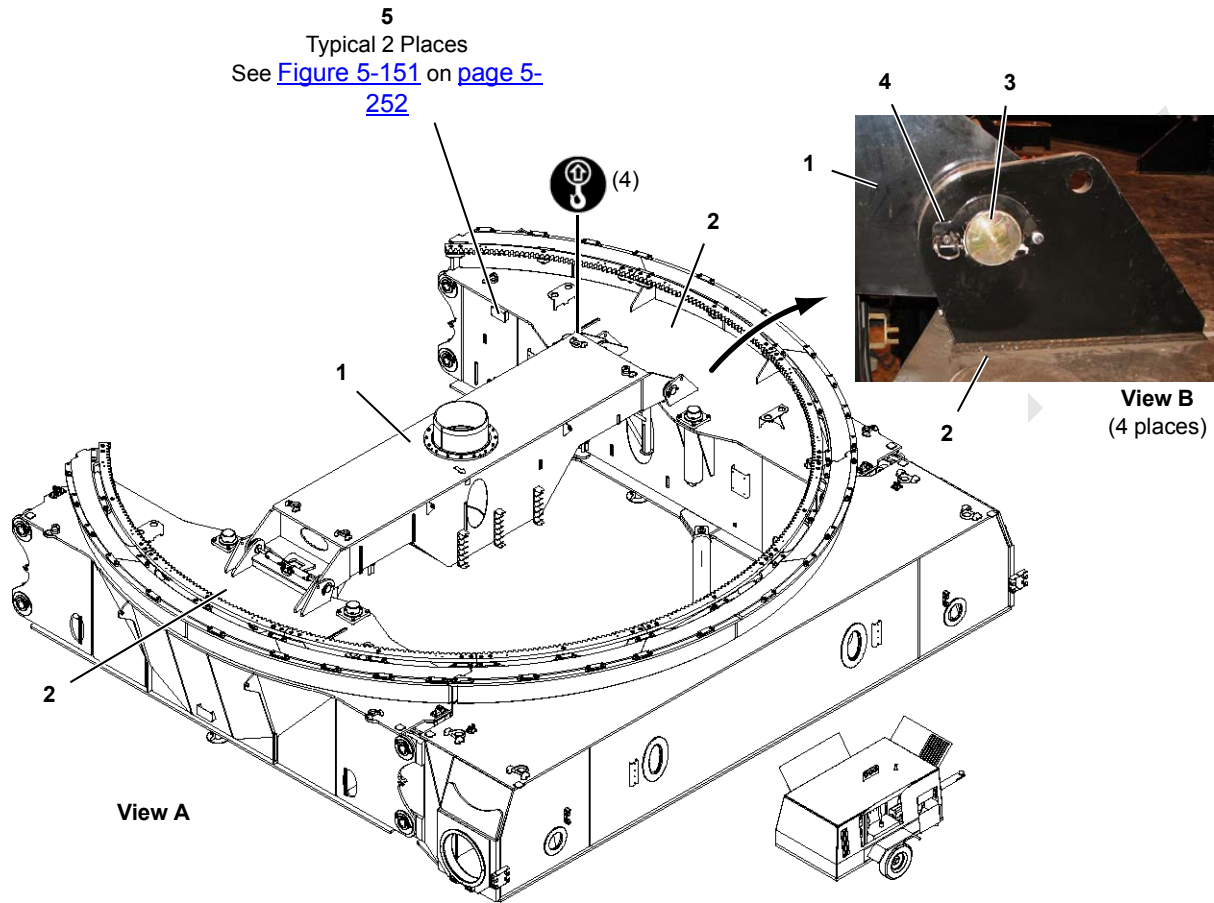
FIGURE 5-154

Remove Rear Beam

See [Figure 5-154](#) for the following procedure.

NOTE The following instructions assume that the PPU is connected to the front beam. If the PPU is connected to the rear beam, then remove the front beam first using this procedure.

1. Extend all four side beam jacking cylinders with outboard carbony valves (4, View A) only enough to level the carbony beams from side to and from front to rear.
2. Connect four legs of the chain lifting sling to the lifting lugs on rear (beam (1, View A).
3. Hoist with the assist crane so the lifting slings are taut.
4. Unpin and rotate locking plates (7, View B) out of the grooves in side beam pins (5 and 6).
5. Disconnect the hydraulic hoses, grease hoses, and electric cables between the side beams and the rear beam.
6. Start the PPU and disengage side beam pins (5 and 6, View B) at both ends of the rear beam using outboard carbony control valve (4).
7. Slowly lift the side beam just clear of the front beam.
8. Proceed as follows at each end of the rear beam:
 - a. Connect hydraulic jumper hoses (9, View C) between hydraulic couplers (8) at the desired end of the rear beam. The jumper hoses are stored in the PPU.
 - b. Re-engage corresponding side beam pins (5 and 6, View B).
 - c. Remove the hydraulic jumper hoses.
 - d. Repeat steps [8a](#) and [8c](#) at the other end of the rear beam.
9. Rotate locking plates (7, View B) into the grooves in the side beam pins and install the wire-lock pins.
10. Store the hydraulic hoses, grease hoses, and electric cables between the side beams and the rear beam.
 - Clean the ends of the hoses and the couplers.
 - Clean and install protective caps on the ends of the hoses and the couplers.
 - Store the hoses as shown in [Figure 5-157](#).
 - Clean the ends of the electric cables and receptacles.
 - Clean and install protective caps on the ends of the electric cables and the receptacles.
 - Store the electric cable as shown in [Figure 5-157](#).
11. Place the rear beam on a trailer for shipping.
12. Disconnect the lifting slings from the rear beam.



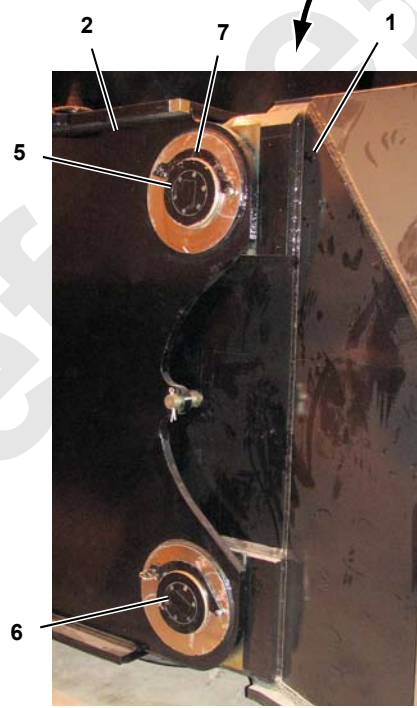
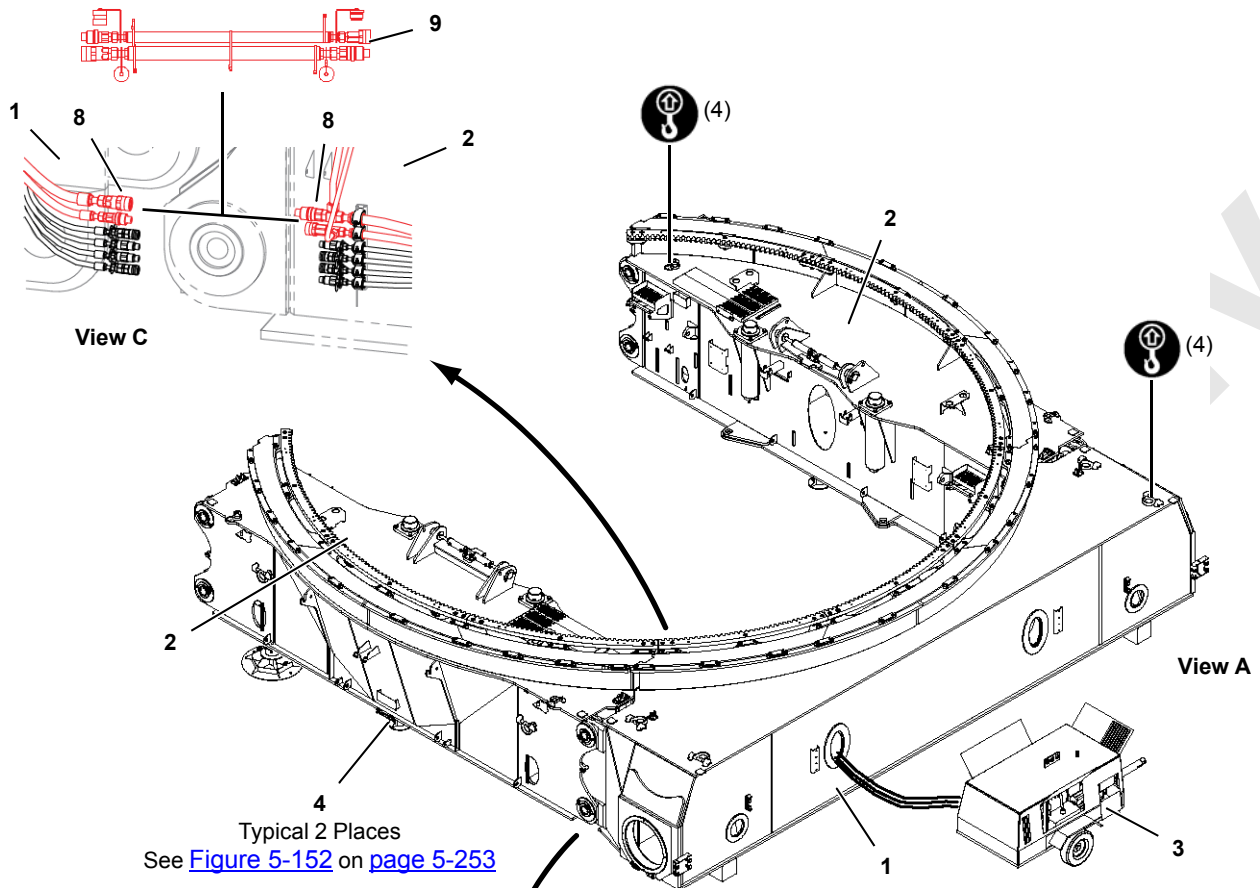
Item	Description
1	Center Beam
2	Side Beam
3	Pin
4	Locking Plate with Wire-Lock Pin
5	Inboard Carbody Control Valve

FIGURE 5-155

Remove Center Beam

See [Figure 5-155](#) for the following procedure.

1. Disconnect the hydraulic hoses, grease hoses, and electric cables between the side beams and the center beam.
 - Clean the ends of the hoses and the couplers.
 - Clean and install protective caps on the ends of the hoses and the couplers.
 - Store the hoses as shown in [Figure 5-157](#).
 - Clean the ends of the electric cables and receptacles.
 - Clean and install protective caps on the end of the electric cables and the receptacles.
 - Store the electric cable as shown in [Figure 5-157](#).
2. Connect four legs of the chain lifting sling to the lifting lugs on center beam (1, View A).
3. Hoist with the assist crane so the lifting slings are taut.
4. Unpin and rotate locking plates (4, View B) out of the grooves in pins (3).
5. Start the PPU and disengage center beam pins (3, View B) using the control handles on inboard carbody control valve (5).
6. Lift the center beam straight up and away from the carbody.
7. Place the center beam on a trailer for shipping.
8. Disconnect the lifting slings from the rear beam.
9. Re-engage pins (3, View B).
10. Rotate locking plates (4, View B) into the grooves in pins (3) and install the wire-lock pins.



Item	Description
1	Front Beam
2	Side Beam
3	PPU
4	Outboard Carbod Control Valve
5	Pin
6	Pin
7	Locking Plate with Wire-Lock Pin
8	Hydraulic Couplers
9	Hydraulic Jumper Hoses

View B

FIGURE 5-156

Remove Side Beams

See [Figure 5-156](#) for the following procedure.

1. Extend all four side beam jacking cylinders with outboard carbody valves (4, View A).
2. Install blocking at least 12 in (305 mm) high under both sides of front beam (1).
3. Make sure the front beam and both side beams are level from side to and from front to rear.
4. Fully retract the side beam jacking cylinders closest to the front beam.
5. Connect four legs of the chain lifting sling to the lifting lugs on desired side beam (2, View A).
6. Hoist with the assist crane so the lifting slings are taut.
7. Fully retract the rear side beam jacking cylinder with outboard carbody control valve (4, View A).
8. Unpin and rotate locking plates (7, View B) out of the grooves in side beam pins (5 and 6).
9. Start the PPU and disengage side beam pins (5 and 6, View B) using the handles on outboard carbody control valve (4).
10. Slowly lift the side beam just clear of the front beam.
11. Proceed as follows at the end of the side beam:
 - a. Connect hydraulic jumper hoses (9, View C) between hydraulic couplers (8) at the end of the side beam. The jumper hoses are stored in the PPU.
 - b. Re-engage side beam pins (5 and 6, View B).
 - c. Remove the hydraulic jumper hoses.
12. Rotate locking plates (7, View B) into the grooves in the side beam pins and install the wire-lock pins.
13. Disconnect and store the hydraulic hoses, grease hose, and electric cable between the side beam and the front beam.
 - Clean the ends of the hoses and the couplers.
 - Clean and install protective caps on the ends of the hoses and the couplers.
- Store the hoses as shown in [Figure 5-157](#).
- Clean the end of the electric cable and receptacle.
- Clean and install protective caps on the end of the electric cable and the receptacle.
- Store the electric cable as shown in [Figure 5-157](#).
14. Place the side beam on a trailer for shipping.
15. Disconnect the lifting slings from the side beam.
16. Repeat the above steps for the other side beam.

Disconnect Portable Power Unit (PPU)

See [Figure 5-156](#) for the following procedure.

1. If running, stop the PPU.
2. Disconnect the electric cable from the PPU at the receptacle on the front beam.
 - Clean the end of the electric cable and receptacle.
 - Clean and install protective caps on the end of the electric cable and the receptacle.
 - Store the electric cable on the PPU.
3. Disconnect the hydraulic hoses from the PPU at the hydraulic couplers on the front beam.
 - Clean the ends of the hoses and the couplers.
 - Clean and install protective caps on the ends of the hoses and the couplers.
 - Store the hoses on the PPU.
4. Store the PPU for shipping.

Remove Front Beam

See [Figure 5-156](#) for the following procedure.

1. Connect four legs of the chain lifting sling to the lifting lugs on front beam (1, View A).
2. Lift the front beam onto a trailer for shipping.
3. Disconnect the lifting slings from the front beam.

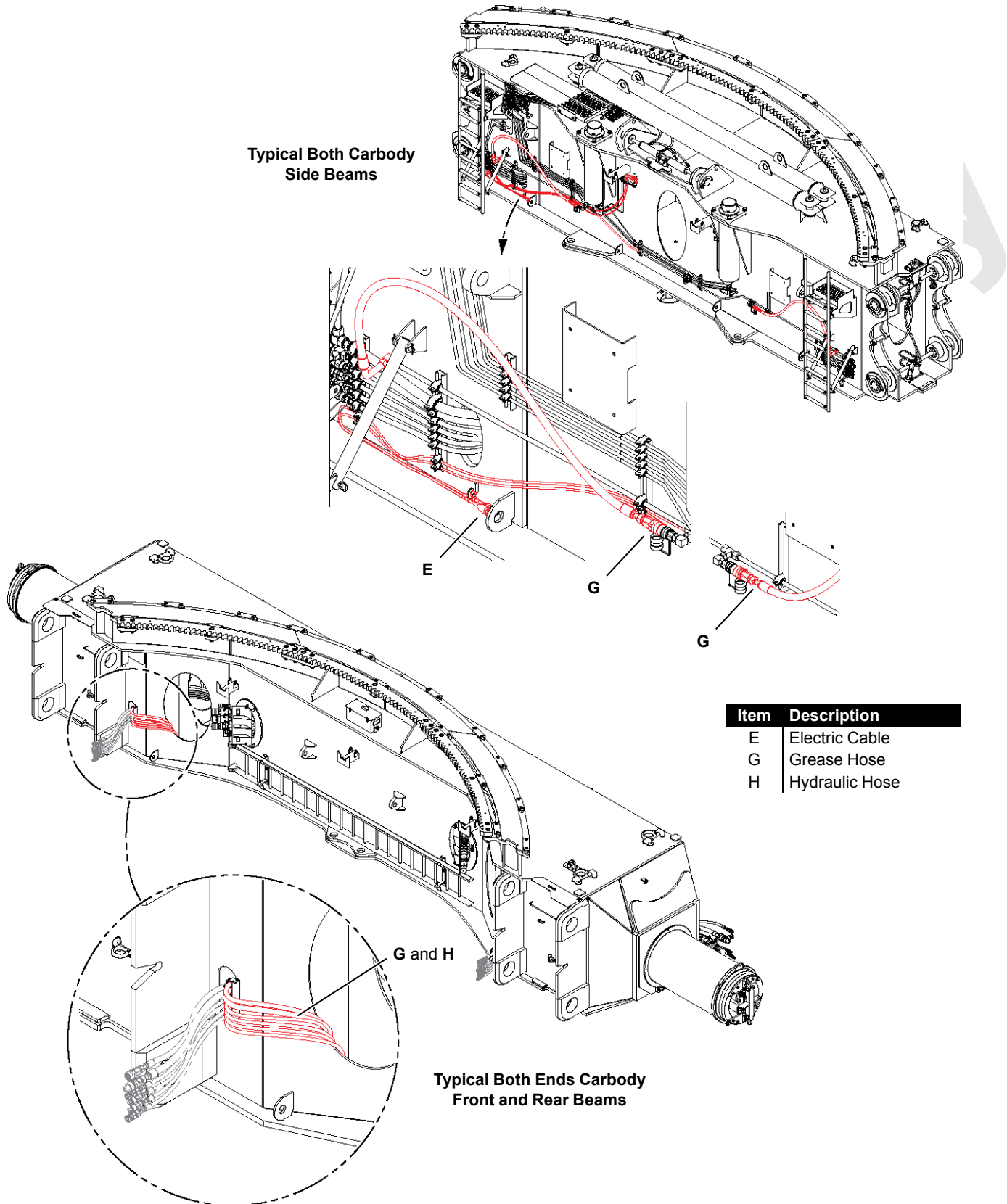


FIGURE 5-157

Item	Description
E	Electric Cable
G	Grease Hose
H	Hydraulic Hose

Strap Looped Around Seven Hoses Here. Adjust Strap so Hoses are Off Bracket.

Strap Looped Around Hoses and Couplers Here. Adjust Strap so Hoses are Off Ground.

Typical Both Sides Carbody Center Beam

E

H

G

Typical Both Ends Carbody Center Beam

Eight Hoses Bundled Together with Strap


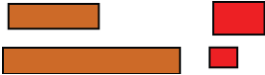




Strap Looped Around Five Hoses Here. Adjust Strap so Hoses are Off Bracket.

Strap Looped Around Hoses and Couplers Here. Adjust Strap so Hoses are Off Ground.

FIGURE 5-157 continued

SUGGESTED TRAILER LOADINGS

Symbols

	<p>Bands</p>
	<p>Blocking</p>
	<p>Bolts/Rods</p>
	<p>Pallet</p>
	<p>Steel plate</p>
	<p>Tie-down strap</p>

Blocking Kits

Kit 001
• 2, 6" x 8" x 7'
• 2, 3" x 6" x 7'
• 4, 3/4" rods
Kit 002
• 4, 4" x 6" x 3'
• 4, 4" x 8" x 3'
• 4 3/4" rods
Kit 003
• 2, 4" x 6" x 8.5'
Kit 004
• 2, 3" x 6" x 18"
• 2, 4" x 6" x 6'
• 2, steel plates
• 4, 3/4" rods
Kit 005
• 4, 4" x 6" x 3'
• 4, 3" x 6" x 3'
• 2, pallets
• 6, 3/4" rods
Kit 006
• 4, pallets
Kit 007
• 4, 3" x 6" x 3'
• 2, 10" x 12" x 3'
• 2, 4" x 6" x 3'
• 4, 3/4" rods
Kit 008
• 3, 3" x 6" x 5'
• 2, 4" x 6" x 7.5'
• 4, 3/4" rods
Kit 009
• 2, 4" x 6" x 8.5'
• 2, 3" x 6" x 8.5'
• 4, 3/4" rods
Kit 010
• 2, 4" x 6" x 6.5'

Kit 011
• 1, 10" x 12" x 5'
• 2, 4" x 6" x 3'
• 2, 3" x 6" x 16"
• 2, 3" x 6" x 3'
• 4, 3/4" rods
Kit 012
• 2, 10" x 12" x 18"
• 1, 3" x 6" x 4'
• 1, 10" x 12" x 4'
• 1, 3" x 6" x 6.5'
• 1, 6" x 6" x 6.5'
• 4, 3/4" rods
Kit 013
• 2, 4" x 6" x 3'
• 3, 3" x 6" x cut
• 1, 6" x 8" x 3'
• 3, 3/4" rods
Kit 014
• 1, pallet
• 16, 4" x 6" x 12"
• 8, 2" x 8" x 8'
• 8, 6" x 6" x 12"
Kit 015
• 4, 4" x 6" x cut
• 2, 3" x 6" x cut
• 2, 3" x 6" x 3'
• 2, 4" x 6" x 3'
• 2, 10" x 12" x 3'
• 5, 3/4" rods
Kit 016
• 4, 4" x 6" x cut
• 4, 3" x 6" x cut
• 1, pallet
• 4, 3/4" rods

Kit 017
• 2, 3" x 6" x 5'
• 2, 4" x 6" x 5'
• 1, 3" x 6" x 8.5'
• 1, 6" x 6" x 8.5'
• 2, 10" x 12" x 12"
• 6, 3/4" rods
Kit 018
—
Kit 019
• 4, 10" x 12" x 3'
• 4, 3" x 6" x 3'
• 4, 3/4" rods
Kit 020
• 4, 4" x 6" x 3'
• 4, 10" x 12" x 3'
Kit 021
• 4, 6" x 8" x 7.5'
• 4, 6" x 8" x 6.5'
• 8, 3/4" bolts
Kit 022
2, 6" x 8" x 4'
4, steel plates
4, 3/4" rods
Kit 023
• 4, 6" x 6" x 8'
• 4, 4" x 6" x 7'
• 4, 3/4" rods
Kit 024
• 2, 4" x 6" x cut
• 2, 3" x 4" x cut
• 1, pallet
• 3, rods
Kit 025
• 2, 4" x 6" x 6'
• 2, 3" x 6" x 6'
• 2, rods

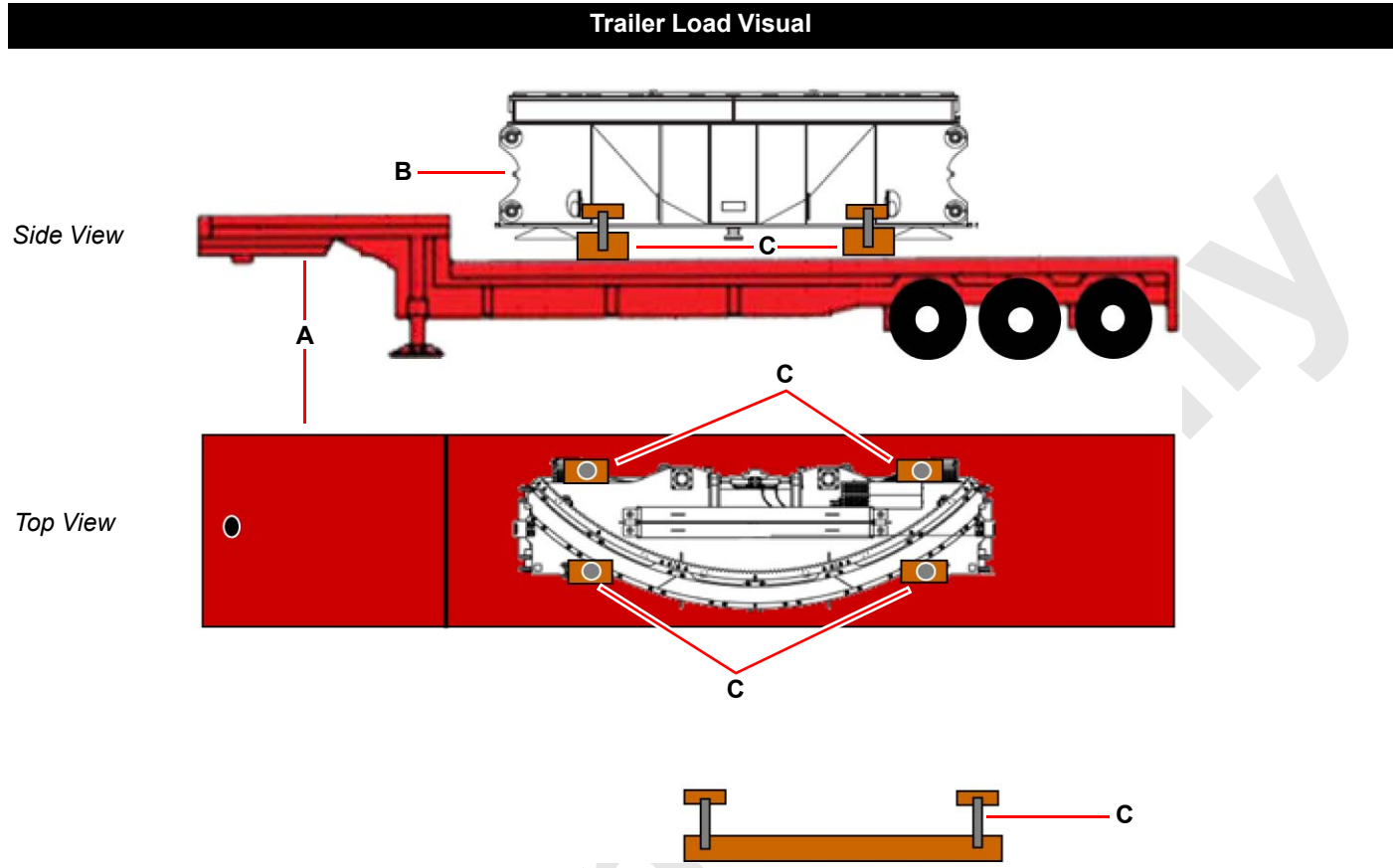
Kit 026
2, 3" x 6" x 8.5'
1, 6" x 8" x 8.5'
Kit 027
• 4, 4" x 6" x 5'
• 8, steel plates
• 8, 3/4" rods
Kit 028
4, pallets
3, 2" x 8" x 6.5'
40, 4" x 6" x 15"
12, 6" x 6" x 12"
2, 2" x 8" x 15"
Kit 029
• 2, 3" x 6" x 18"
• 2, 10" x 12" x 18"
• 2, 3" x 6" x 3'
• 2, 4" x 6" x 3'
• 2, 2" x 2" x 15"
• 2, 4" x 10" x 15"
• 8, 3/4" rods
Kit 030
2, 10" x 12" x 18"
4, 3" x 6" x 18"
2, 4" x 6" x 18"
2, 2" x 2" x 12"
2, 4" x 10" x 12"
6, 3/4" rods
Kit 031
• 2, 3" x 6" x 2'
• 2, 4" x 6" x 2'
• 1, 4" x 6" x 6'
• 1, 10" x 12" x 8' 4"
• 2, 10" x 12" x 18"
• 4, 3/4" rods

Kit 032	Kit 035	Kit 038	Kit 041
• 2, 2" x 8" x 5'	• 2, 3" x 6" x 18"	• 4, 6" x 8" x 8'	• 2, 3" x 6" x 5'
• 1, pallet	• 2, 10" x 12" x 18"	• 4, 3" x 6" x 8'	• 2, 4" x 6" x 5'
Kit 033	• 2, 3" x 6" x 3'	• 12, 3/4" rods	• 2, 3/4" rods
• 2, pallets	• 2, 4" x 6" x 3'	Kit 039	Kit 042
• 1, 2" x 8" x 32"	• 6, 3/4" rods	• 4, 2" x 8" x 5'	• 2, 2" x 8" x 6'
• 1, 4" x 6" x 32"	Kit 036	• 8, steel plates	• 8, steel plates
• 3, 2" x 8" x 4'	• 4, 3" x 6" x 2'	• 8, 3/4" rods	• 8, 3/4" rods
• 48, 4" x 6" x 15"	• 4, 4" x 6" x 2'	Kit 040	Kit 043
• 8, 6" x 6" x 12"	• 4, 3/4" rods	• 2, 10" x 12" x 7'	• 2, 2" x 8" x 5.5'
Kit 034	Kit 037	• 4, 4" x 6" x 15"	• 4, 2" x 4" x 6"
• 4, 6" x 6" x cut	• 4, 3" x 6" x 2'	• 4, 3/4" rods	• 2, 3" x 4" x 15"
• 2, pallets	• 4, 4" x 6" x 2'		• 2, 3/4" rods
• 4, 3/4" rods	• 4, 3/4" rods		

Fixture Kits

Kit A001	Kit A006
• 1, Front Roller Carrier Fixture	• 1, Main Hoist Drum #1 Fixture
Kit A002	Kit A007
• 1, Rear Roller Carrier Fixture	• 1, Drum Assembly Frame #5 (luffing) Fixture
Kit A003	Kit A008
• 1, Boom Hoist Drum Fixture	• 1, Loose Straps Fixture
Kit A004	Kit A009
• 1, Whip Hoist Drum and Beam Stop Fixture	• 1, Trunnion Fixture
Kit A005	Kit A010
• 1, Main Hoist Drum #2 Fixture	• 1, Intermediate Suspension Fixture

Carbody Side Beam with Struts (Load #2)

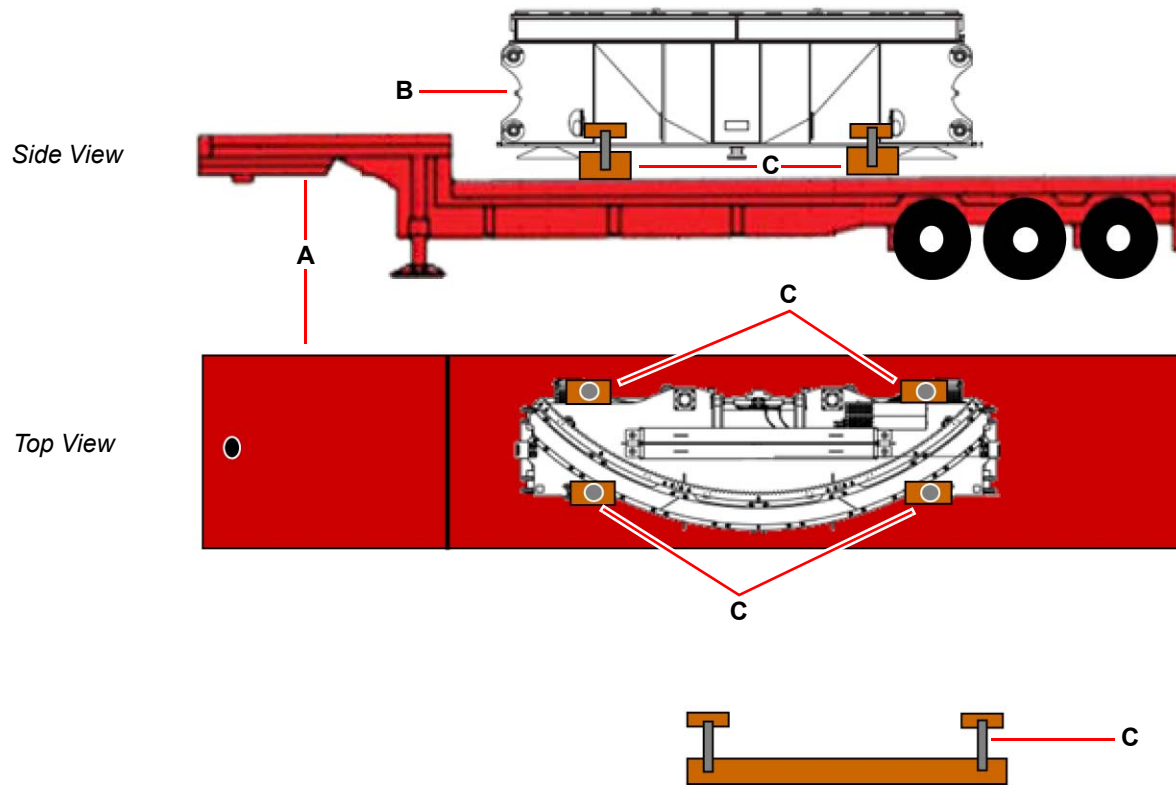


Item	Description
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	Carbody Side Beam with Struts (76,800 pounds): <ul style="list-style-type: none"> • Height: 9' 2" (2.8m) • Length: 29' 6" (9.0m) • Width: 9' 6" (2.9m)
C	Blocking kit #040 (see page 5-265).

Trailer Load Steps	
Step	Description
1	Cut and assembly blocking kit #040 (see page 5-265).
2	Load 1 piece of 9.1m Carbody Side Beam with Struts.

Carbody Side Beam with Struts (Load #3)

Trailer Load Visual

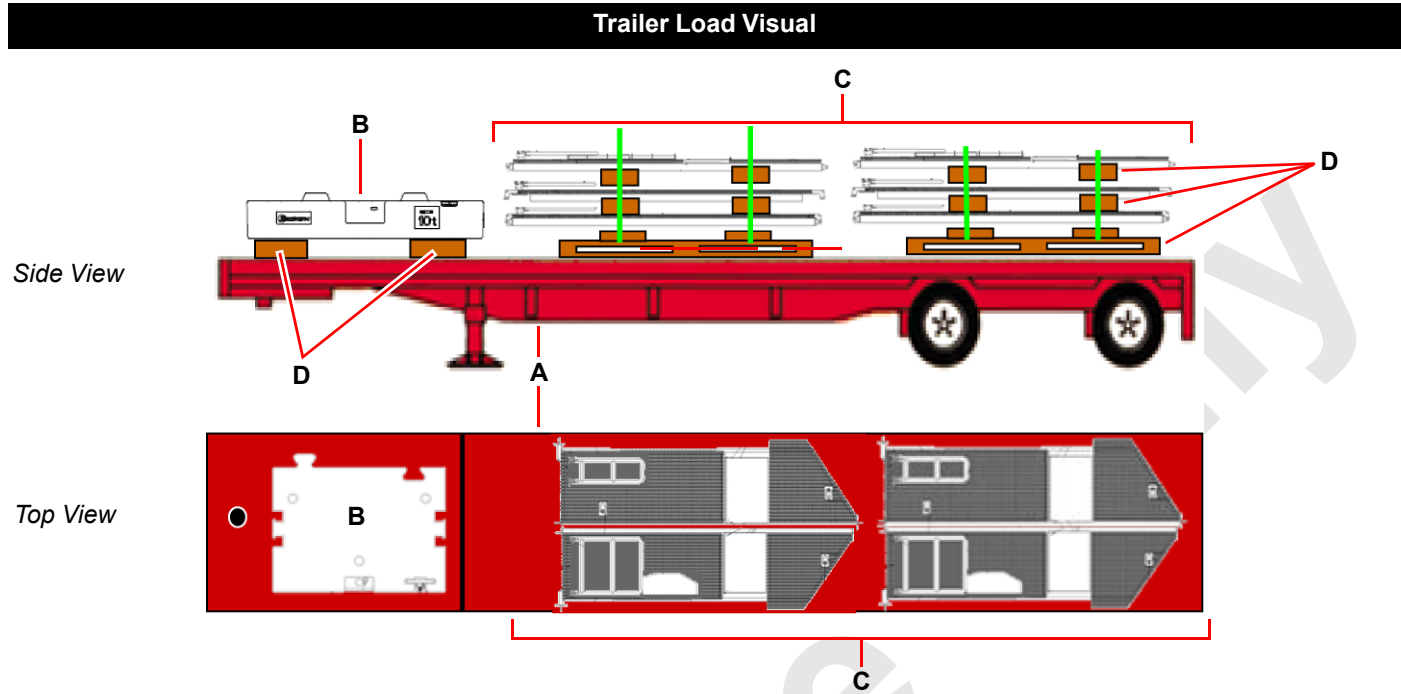


Item	Description
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	Carbody Side Beam with Struts (76,800 pounds): <ul style="list-style-type: none"> • Height: 9' 2" (2.8m) • Length: 29' 6" (9.0m) • Width: 9' 6" (2.9m)
C	Blocking kit #040 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #040 (see page 5-265).
2	Load 1 piece of 9.1m Carbody Side Beam with Struts.

Interior Carbody Platform (Load #7)



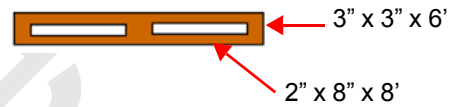
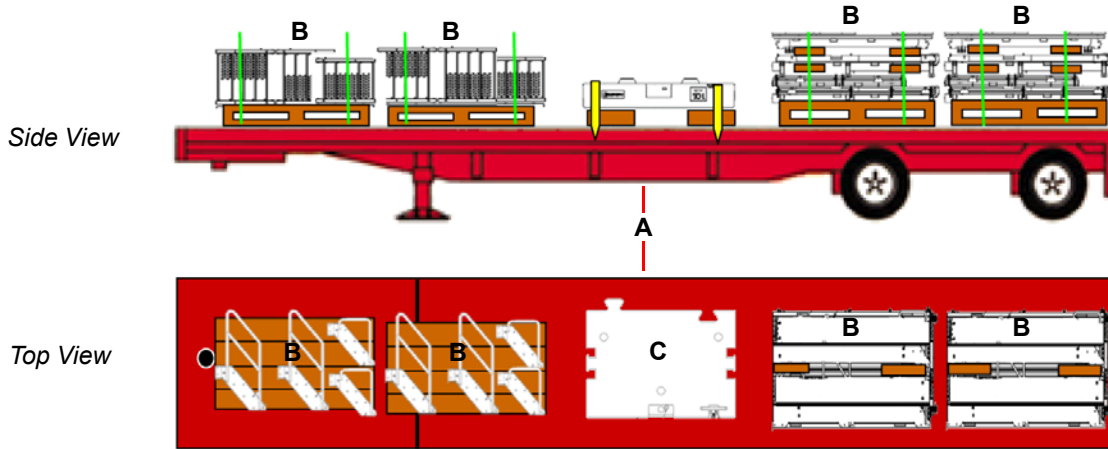
Item	Description
A	Trailer — 2-axle, flatbed: • Height (ground to top of bed): 54" • Length: 48' • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	Interior Carbody Platform (3,615 pounds x 2 = 7,230 pounds): • Height: 4' 3" (1.3m) • Length: 14' 5" (4.4m) • Width: 8' 6" (2.6m)
D	Blocking kit #014 (see page 5-265).

Trailer Load Steps

Step	Description										
1	<p>Cut and assembly blocking kit #014 (see page 5-265):</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th style="text-align: left;">Item</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>2" x 8" x 8'</td> </tr> <tr> <td>B</td> <td>4" x 6" x 12"</td> </tr> <tr> <td>C</td> <td>3" x 6" x 4'</td> </tr> <tr> <td>D</td> <td>6" x 6" x 12"</td> </tr> </tbody> </table>	Item	Description	A	2" x 8" x 8'	B	4" x 6" x 12"	C	3" x 6" x 4'	D	6" x 6" x 12"
Item	Description										
A	2" x 8" x 8'										
B	4" x 6" x 12"										
C	3" x 6" x 4'										
D	6" x 6" x 12"										
2	Load each Interior Carbody Platform where shown. Place shims or spacer between handrails and grating if necessary.										
3	Load the Cast Counterweight.										

Platform Assembly — Carbody Front/Rear (Load #6)

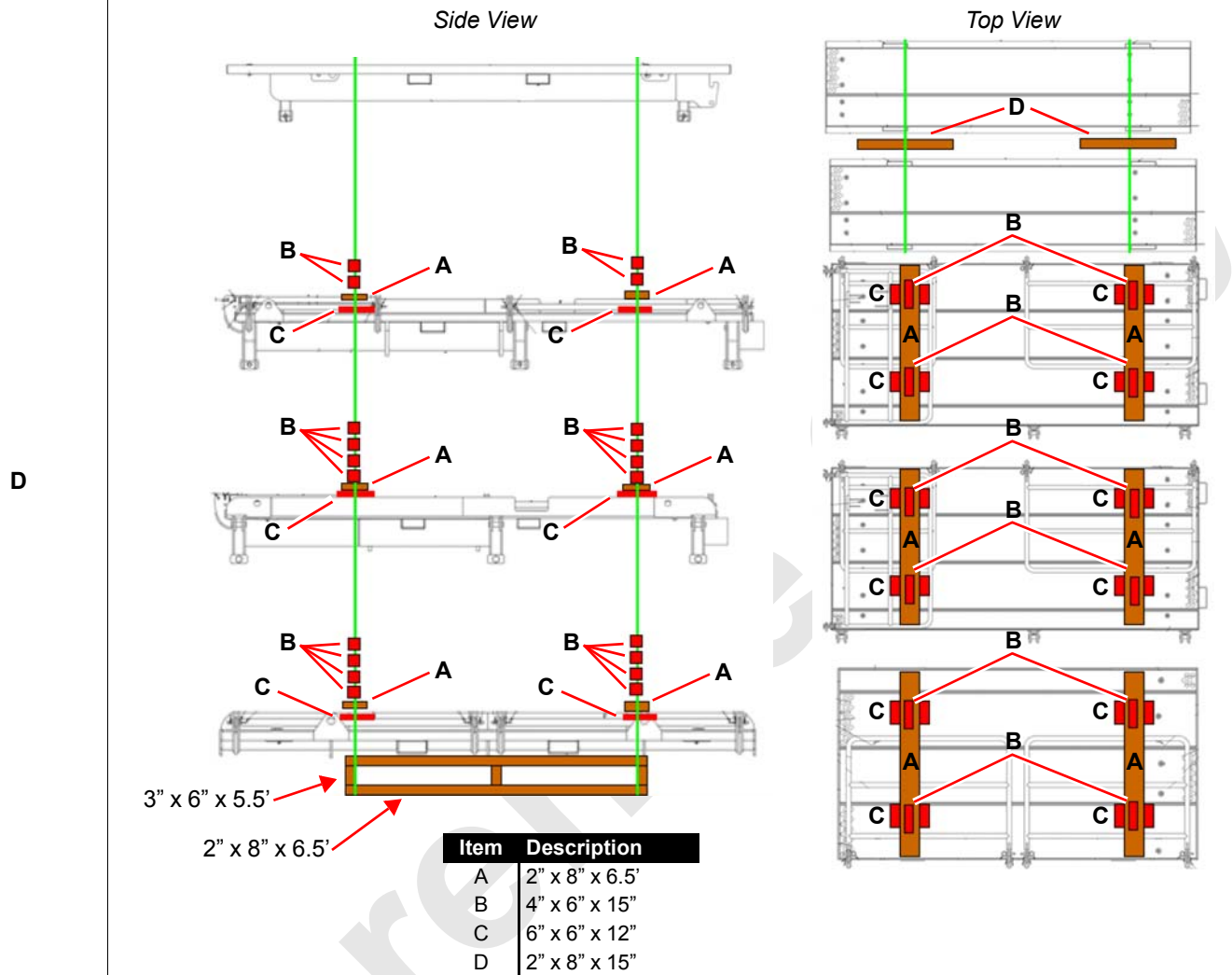
Trailer Load Visual



Item	Description
A	Trailer — 2-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Platform Assembly — Carbody Front/Rear (7,427 pounds x 2 = 14,854 pounds): <ul style="list-style-type: none"> • Height: 9' 2" (2.8m) • Length: 29' 6" (9.0m) • Width: 9' 6" (2.9m)
C	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)

Trailer Load Visual

Blocking kit #028 (see [page 5-265](#)):

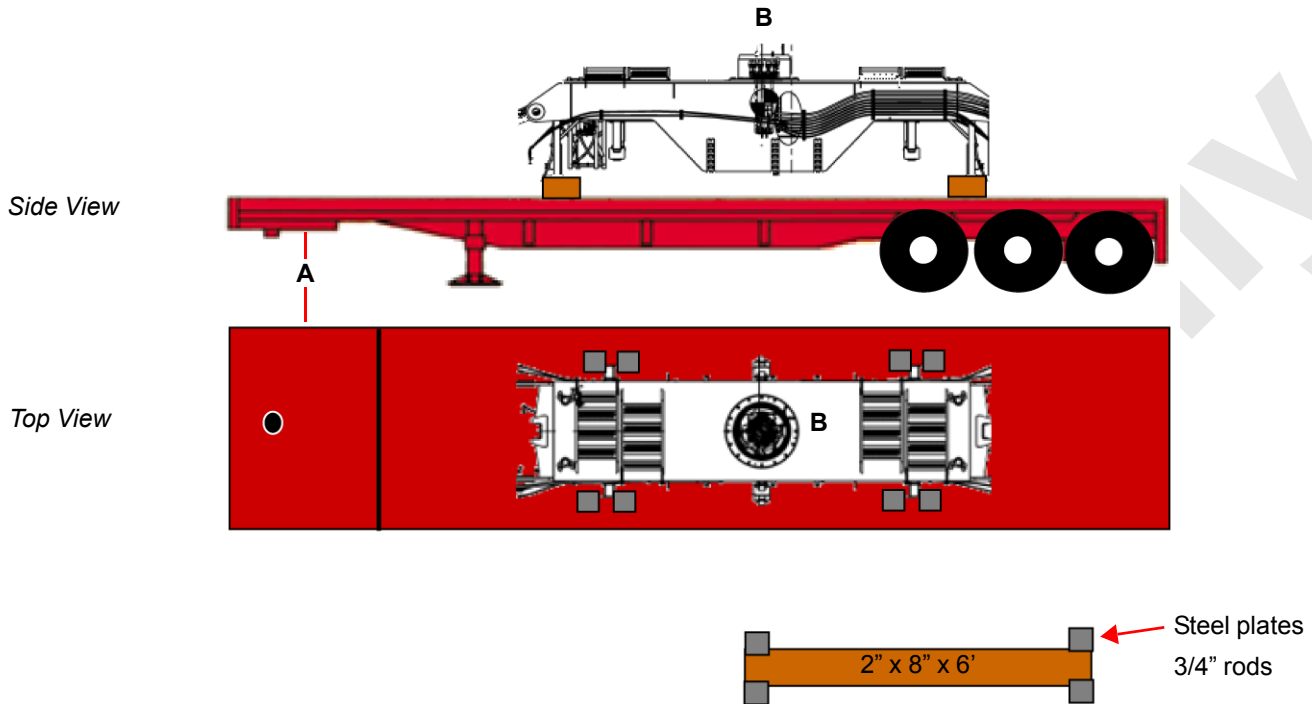


Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #028 (see page 5-265).
2	Load the Platform Assembly — Carbody Front/Rear where shown.
3	Load the Cast Counterweight.

Carbody Center Beam (Load #4)

Trailer Load Visual



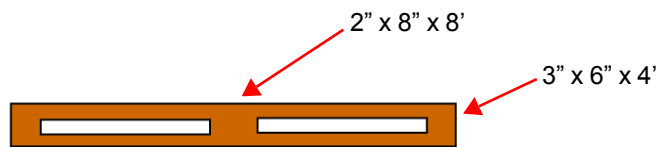
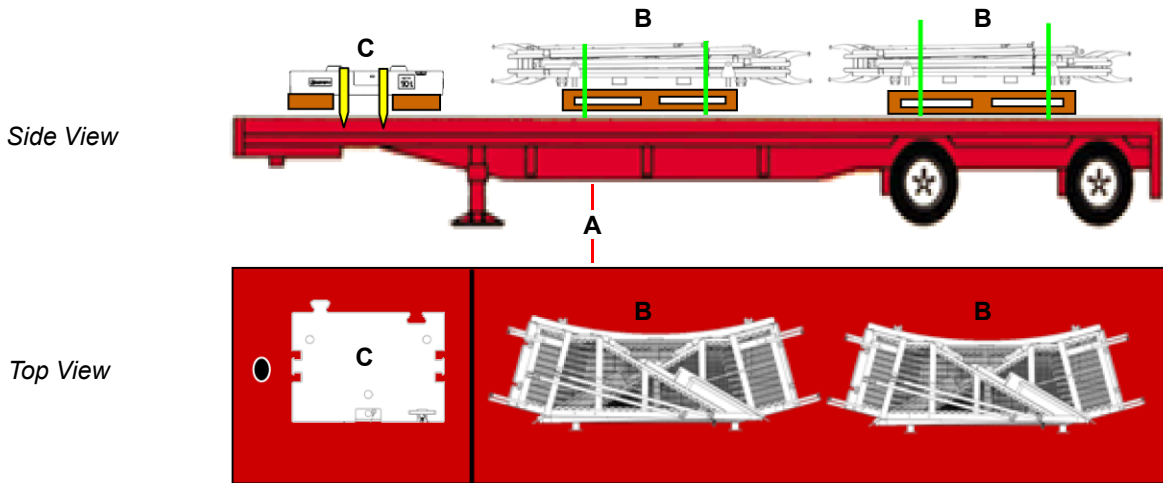
Item	Description
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 53' • Width: 8' 6"
B	Carbody Center Beam (22,891 pounds): <ul style="list-style-type: none"> • Height: 6' 6" (2.0m) • Length: 25' (14.6m) • Width: 7' 6" (2.3m)
C	Blocking kit #042 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #042 (see page 5-265).
2	Load the Carbody Center Beam.
3	Load the PPU (not pictured).

Platform Assembly — Side Platform (Load #19)

Trailer Load Visual



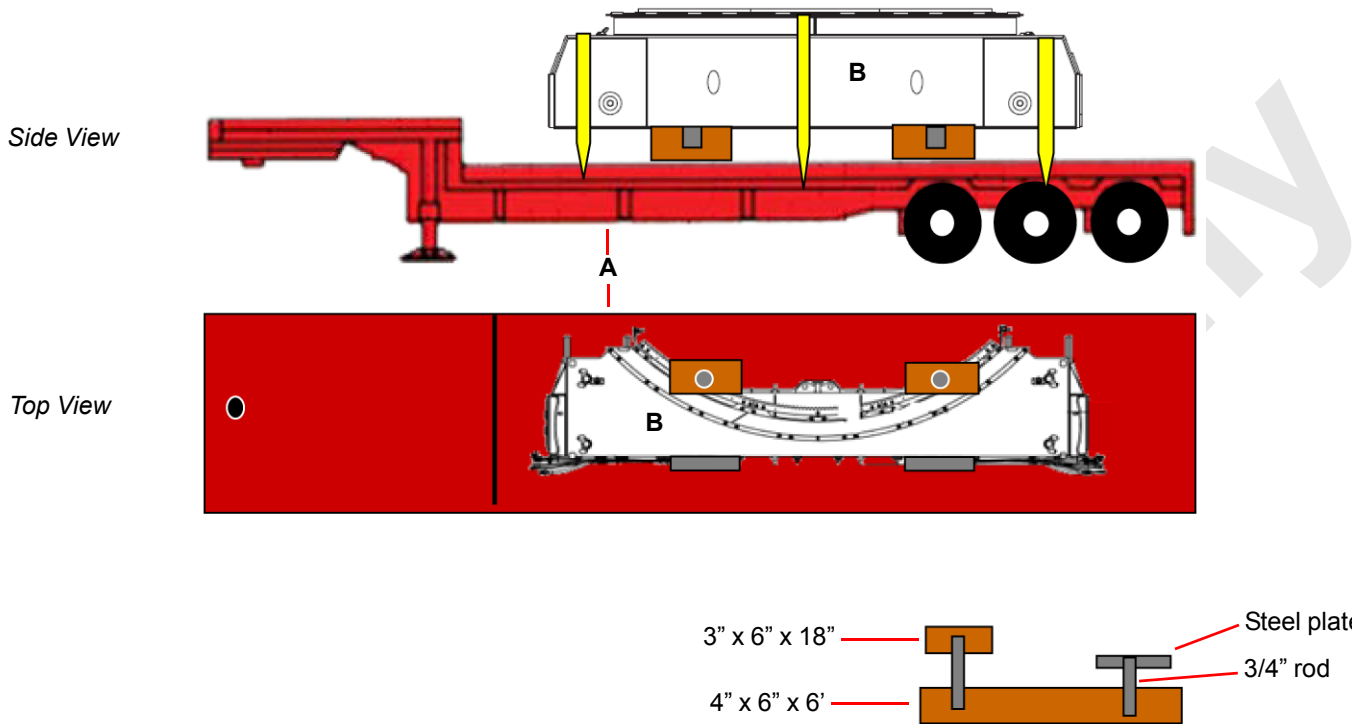
Item	Description
A	Trailer — 2-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Platform Assembly — Side Platform (3,615 pounds x 2 = 7230 pounds): <ul style="list-style-type: none"> • Height: 2' 4" (0.72m) • Length: 16' 5" (5.0m) • Width: 5' 6" (1.7m)
C	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
D	Blocking kit #032 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #032 (see page 5-265).
2	Load the carbody center beam.
3	Load the PPU (not pictured).

Carbody — Front/Rear Beam (Load #5)

Trailer Load Visual



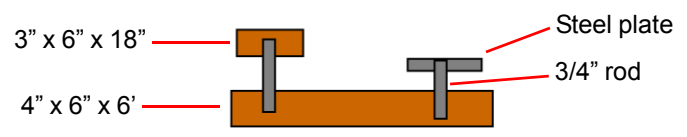
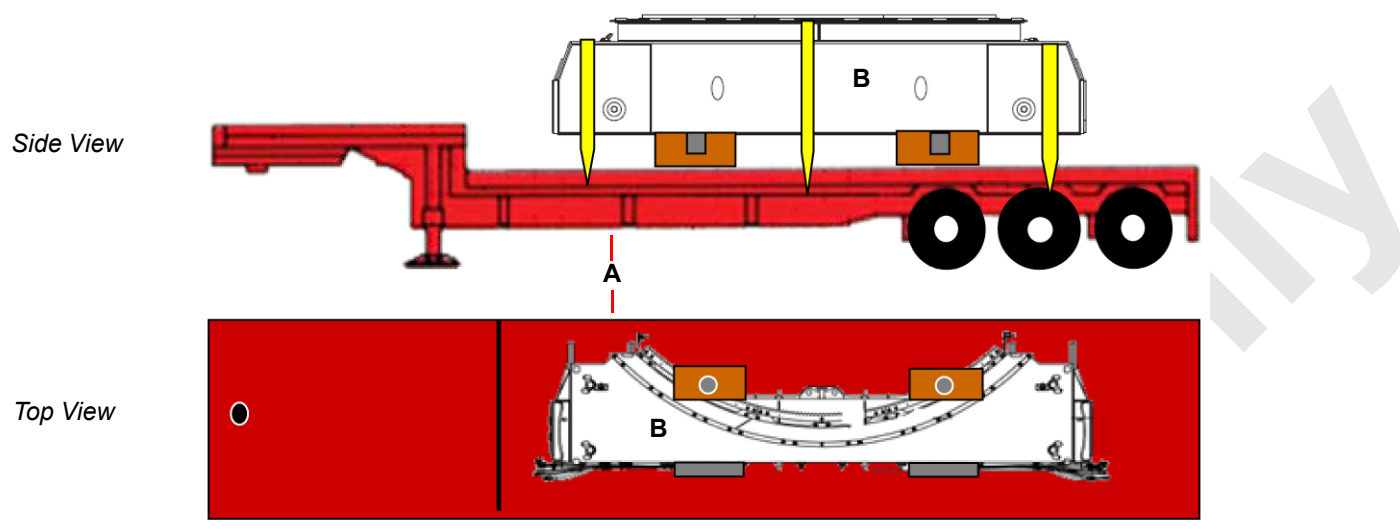
Item	Description
A	Trailer — 3-axle, single-drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	Carbody — Front/Rear Beam (109,000 pounds): <ul style="list-style-type: none"> • Height: 8' 6" (2.6m) • Length: 37' 9" (11.1m) • Width: 8' 10" (2.7m)
C	Blocking kit #004 (see page 5-265). Place the 3" x 6" blocks on the inside lip of the carbody to assure a good clamp.

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #004 (see page 5-265).
2	Load the Carbody — Front/Rear Beam.

Carbody — Front/Rear Beam (Load #1)

Trailer Load Visual



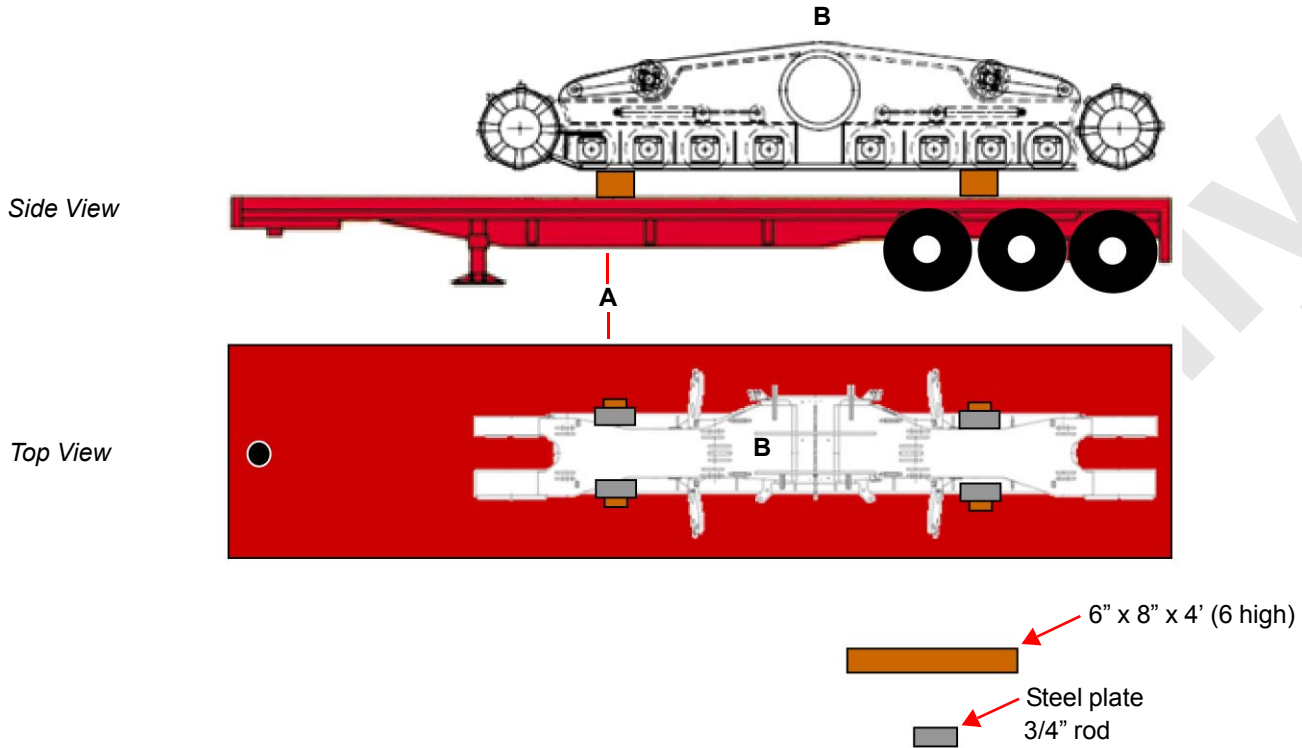
Item	Description
A	Trailer — 3-axle, single-drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	Carbody — Front/Rear Beam (109,000 pounds): <ul style="list-style-type: none"> • Height: 8' 6" (2.6m) • Length: 37' 9" (11.1m) • Width: 8' 10" (2.7m)
C	Blocking kit #004 (see page 5-265). Place the 3" x 6" blocks on the inside lip of the carbody to assure a good clamp.

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #004 (see page 5-265).
2	Load the Carbody — Front/Rear Beam as shown.

Crawler (Load #10)

Trailer Load Visual



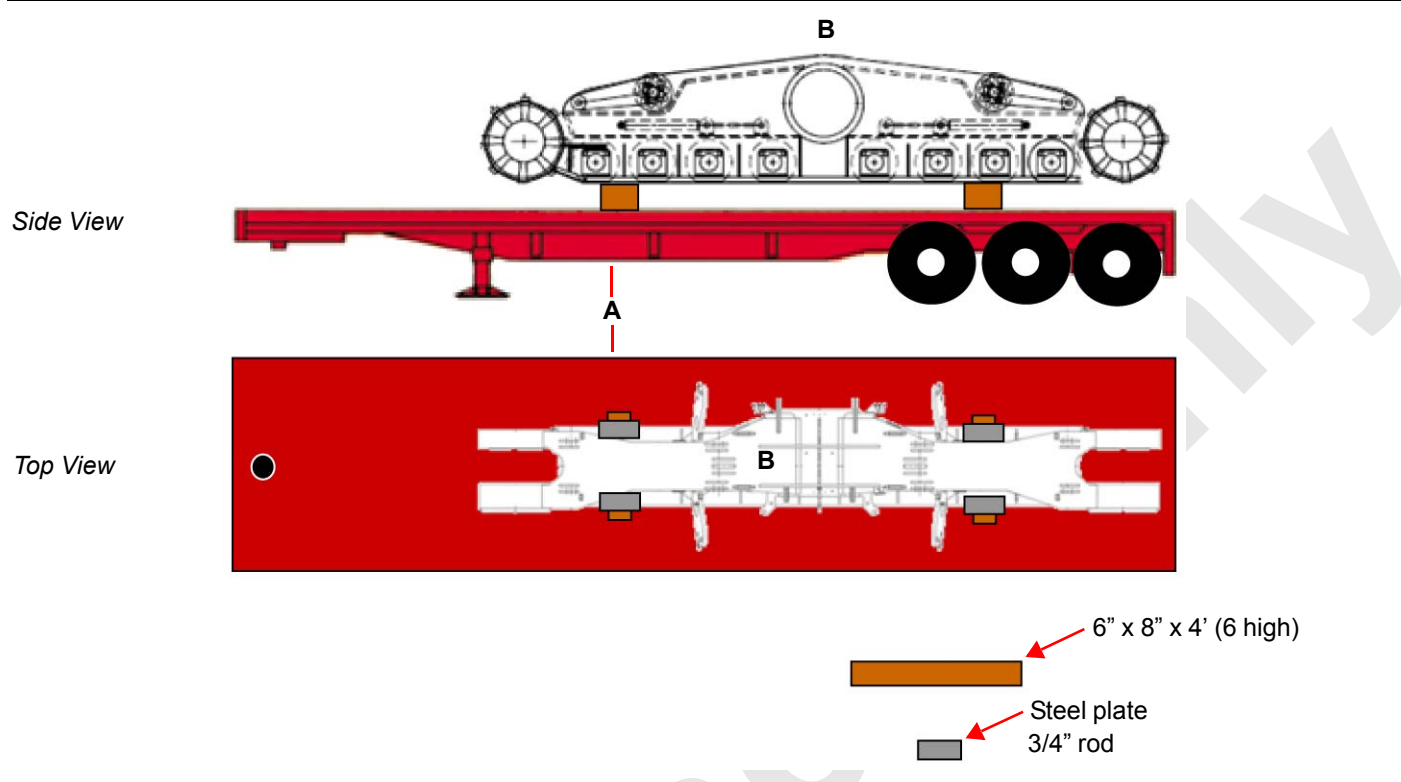
Item	Description
A	Trailer — 3-axle, flatbed: • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Crawler (65,200 pounds): • Height: 27' 10" (8.5m) • Length: 37' 9" (11.1m) • Width: 7' 3" (2.2m)
C	Blocking kit #022 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #022 (see page 5-265).
2	Load the Crawler as shown.

Crawler (Load #13)

Trailer Load Visual



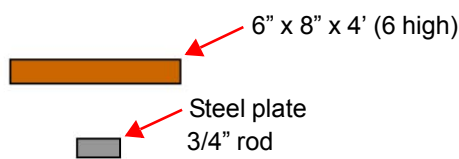
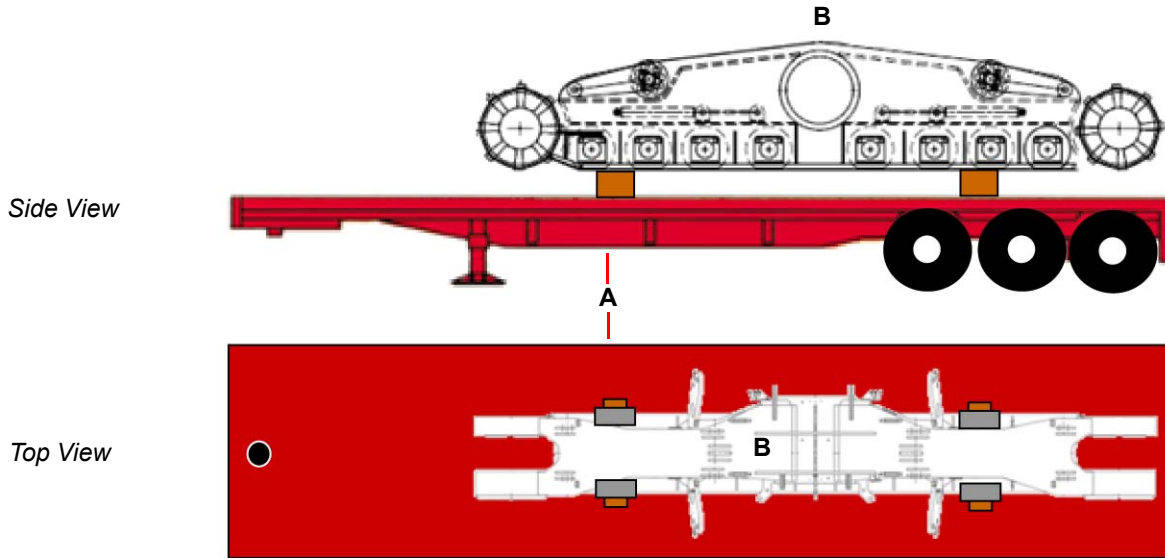
Item	Description
A	Trailer — 3-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Crawler (65,200 pounds): <ul style="list-style-type: none"> • Height: 27' 10" (8.5m) • Length: 37' 9" (11.1m) • Width: 7' 3" (2.2m)
C	Blocking kit #022 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #022 (see page 5-265).
2	Load the Crawler as shown.

Crawler (Load #15)

Trailer Load Visual



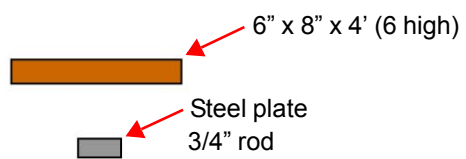
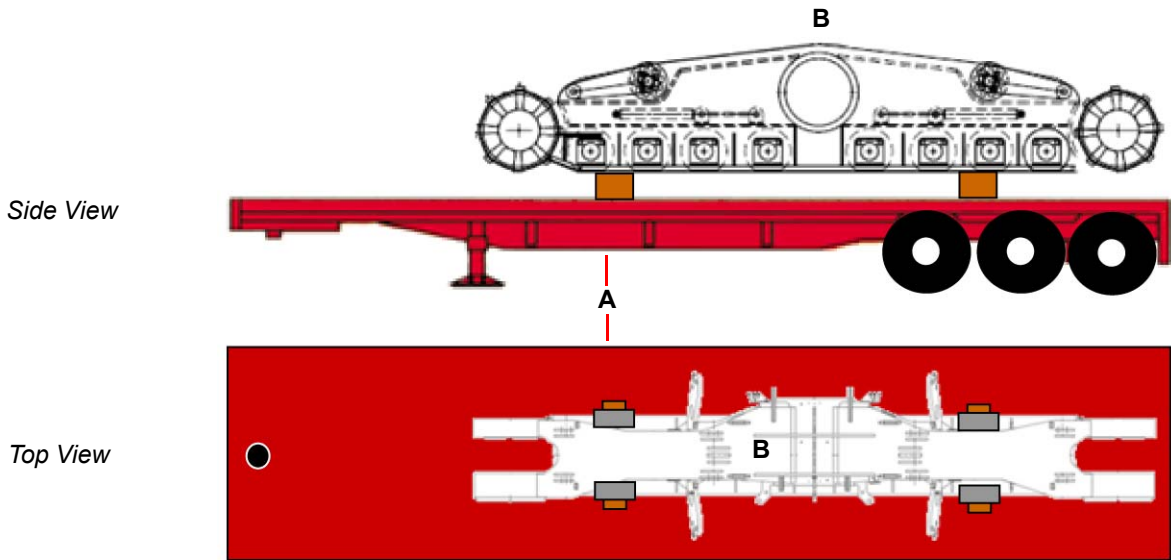
Item	Description
A	Trailer — 3-axle, flatbed: • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Crawler (65,200 pounds): • Height: 27' 10" (8.5m) • Length: 37' 9" (11.1m) • Width: 7' 3" (2.2m)
C	Blocking kit #022 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #022 (see page 5-265).
2	Load the Crawler as shown.

Crawler (Load #17)

Trailer Load Visual



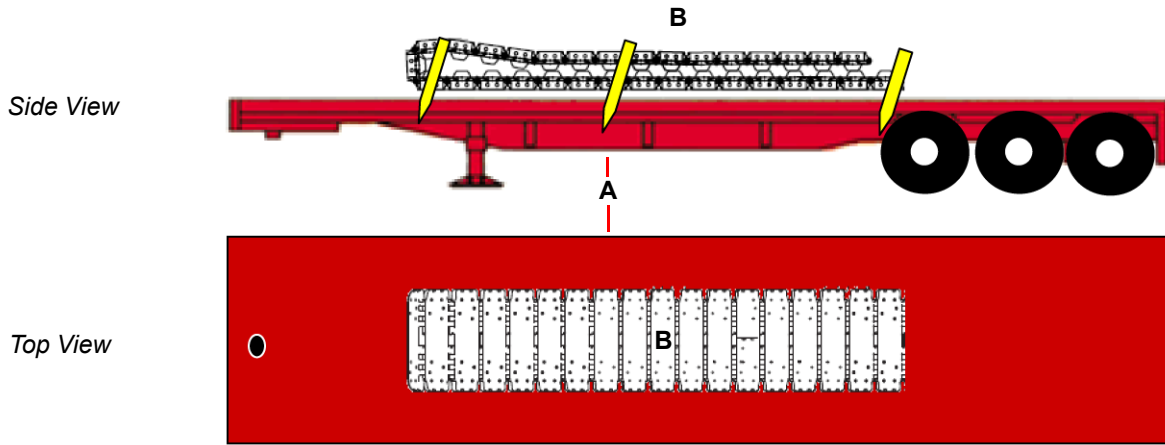
Item	Description
A	Trailer — 3-axle, flatbed: • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Crawler (65,200 pounds): • Height: 27' 10" (8.5m) • Length: 37' 9" (11.1m) • Width: 7' 3" (2.2m)
C	Blocking kit #022 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #022 (see page 5-265).
2	Load the Crawler as shown.

Crawler Pads (Load #11)

Trailer Load Visual



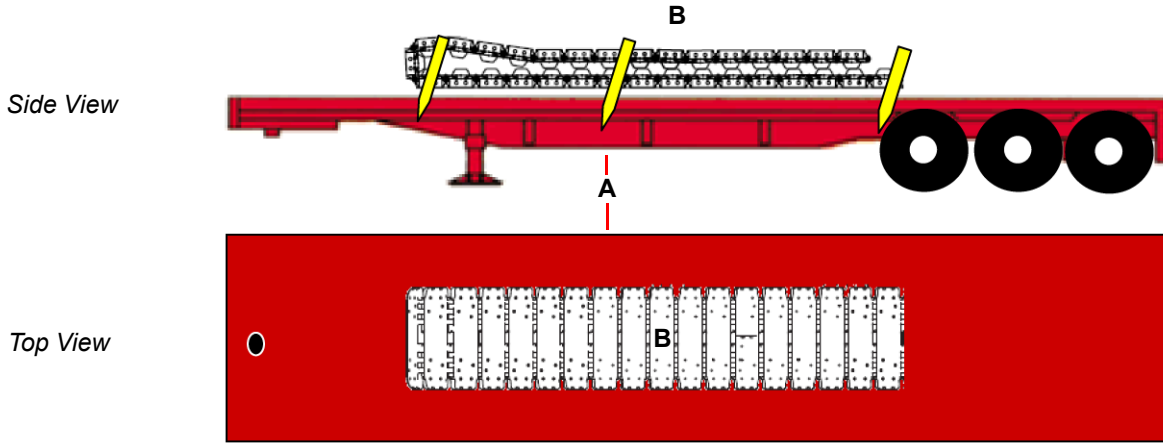
Item	Description
A	Trailer — 3-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Crawler Pads (40,086 pounds): <ul style="list-style-type: none"> • Height: 11" (0.28m) • Length: 60' (18.3m) • Width: 6' 6" (2.0m)

Trailer Load Steps

Step	Description
1	Load the Crawler Pads as shown. <i>There is no blocking.</i>

Crawler Pads (Load #12)

Trailer Load Visual



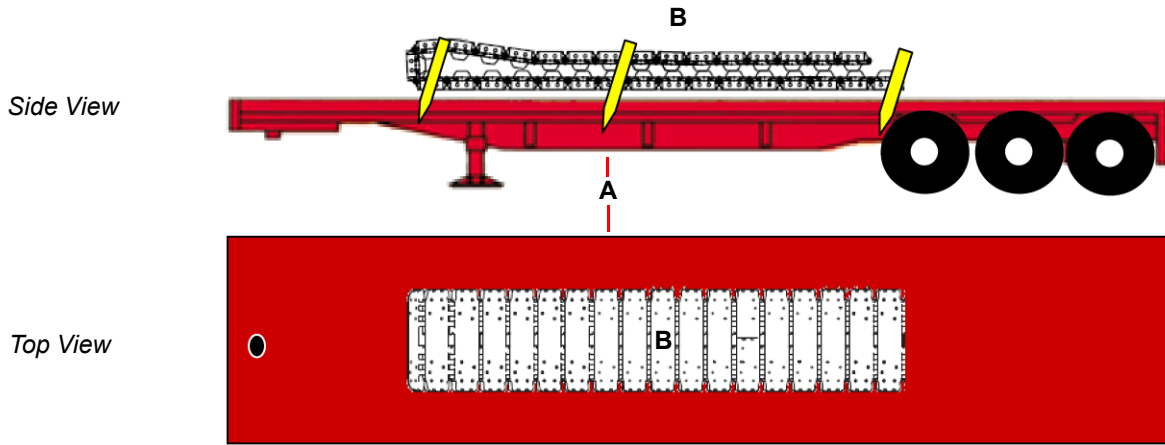
Item	Description
A	Trailer — 3-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Crawler Pads (40,086 pounds): <ul style="list-style-type: none"> • Height: 11" (0.28m) • Length: 60' (18.3m) • Width: 6' 6" (2.0m)

Trailer Load Steps

Step	Description
1	Load the Crawler Pads as shown. <i>There is no blocking.</i>

Crawler Pads (Load #14)

Trailer Load Visual



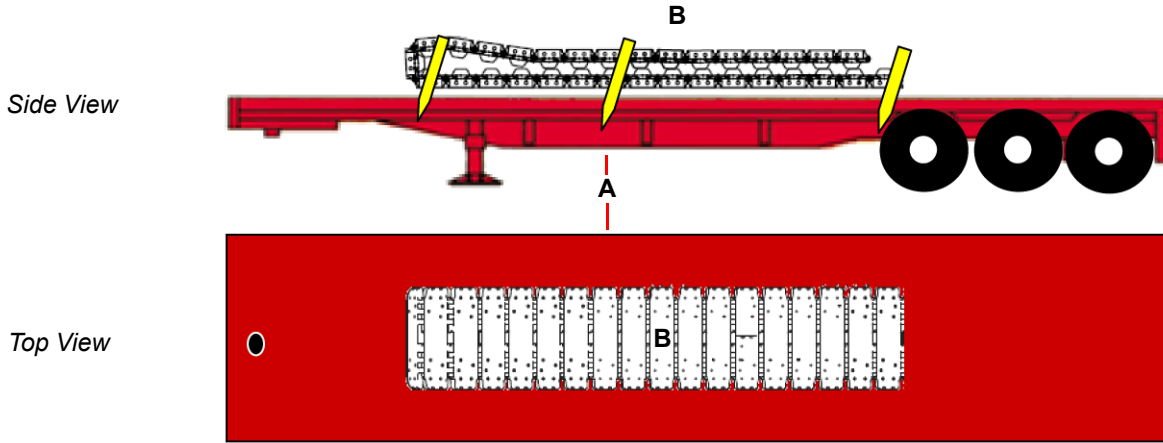
Item	Description
A	Trailer — 3-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Crawler Pads (40,086 pounds): <ul style="list-style-type: none"> • Height: 11" (0.28m) • Length: 60' (18.3m) • Width: 6' 6" (2.0m)

Trailer Load Steps

Step	Description
1	Load the Crawler Pads as shown. <i>There is no blocking.</i>

Crawler Pads (Load #16)

Trailer Load Visual



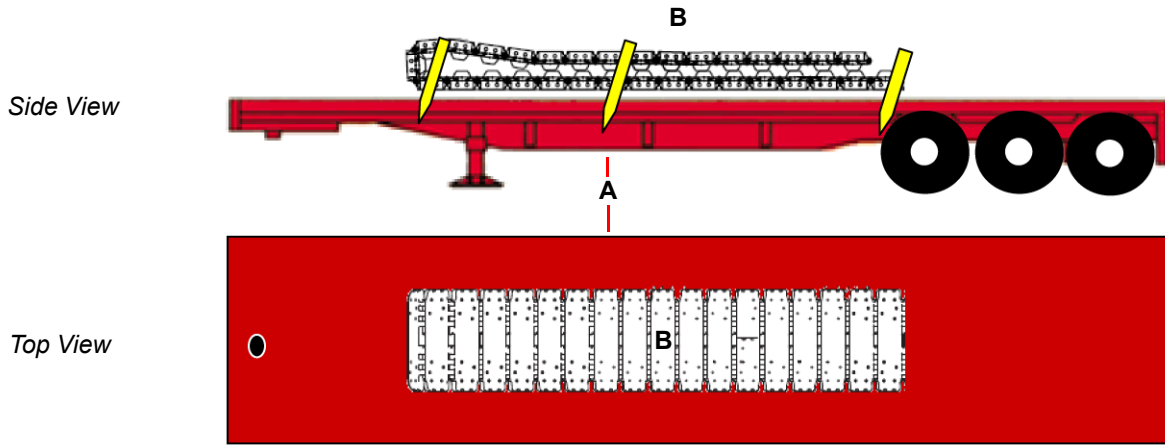
Item	Description
A	Trailer — 3-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Crawler Pads (40,086 pounds): <ul style="list-style-type: none"> • Height: 11" (0.28m) • Length: 60' (18.3m) • Width: 6' 6" (2.0m)

Trailer Load Steps

Step	Description
1	Load the Crawler Pads as shown. <i>There is no blocking.</i>

Crawler Pads (Load #18)

Trailer Load Visual



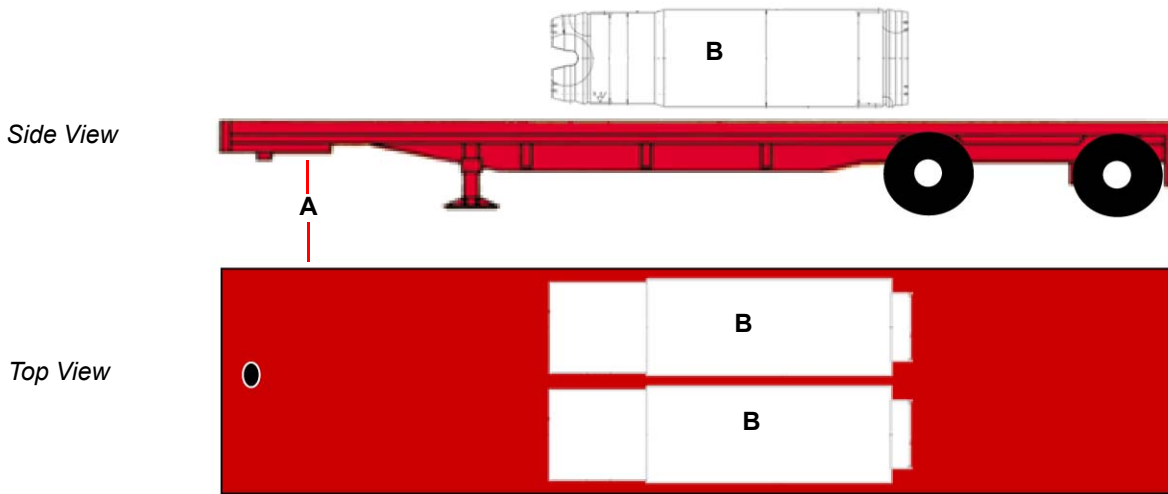
Item	Description
A	Trailer — 3-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Crawler Pads (40,086 pounds): <ul style="list-style-type: none"> • Height: 11" (0.28m) • Length: 60' (18.3m) • Width: 6' 6" (2.0m)

Trailer Load Steps

Step	Description
1	Load the Crawler Pads as shown. <i>There is no blocking.</i>

Trunnion (Load #8)

Trailer Load Visual



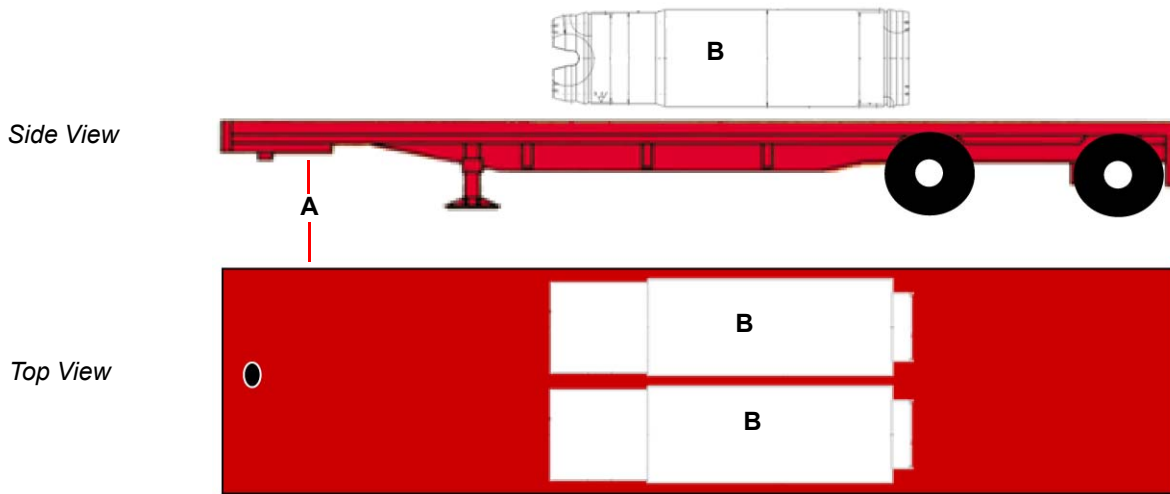
Item	Description
A	Trailer — 2-axle, Conestoga (tarp): <ul style="list-style-type: none"> • Height (ground to top of bed): 60" • Length: 53' • Width: 8' 6"
B	Trunnion (12,485 pounds x 2 = 24,970 pounds): <ul style="list-style-type: none"> • Height: 3' 2" (0.97m) • Length: 10' 1" (3.3m) • Width: 2' 11" (0.89m)

Trailer Load Steps

Step	Description
1	<i>A special fixture (which is not shown) is required.</i>
2	Load the Trunnions as shown.

Trunnion (Load #9)

Trailer Load Visual



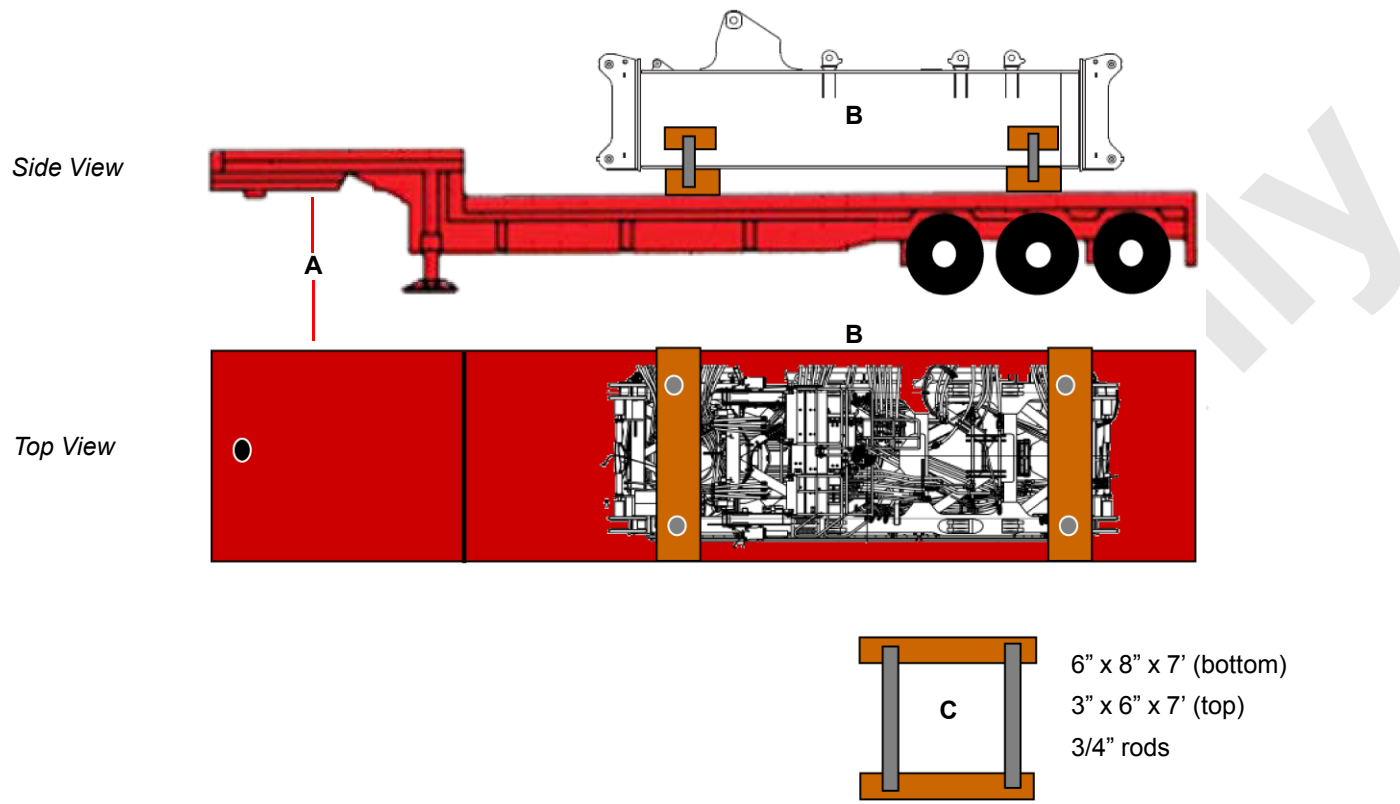
Item	Description
A	Trailer — 2-axle, Conestoga (tarp): <ul style="list-style-type: none"> • Height (ground to top of bed): 60" • Length: 53' • Width: 8' 6"
B	Trunnion (12,485 pounds x 2 = 24,970 pounds): <ul style="list-style-type: none"> • Height: 3' 2" (0.97m) • Length: 10' 1" (3.3m) • Width: 2' 11" (0.89m)

Trailer Load Steps

Step	Description
1	Use fixture A009 (see page 5-266) which is not shown.
2	Load the Trunnions as shown.

Rotating Bed (Load #20)

Trailer Load Visual

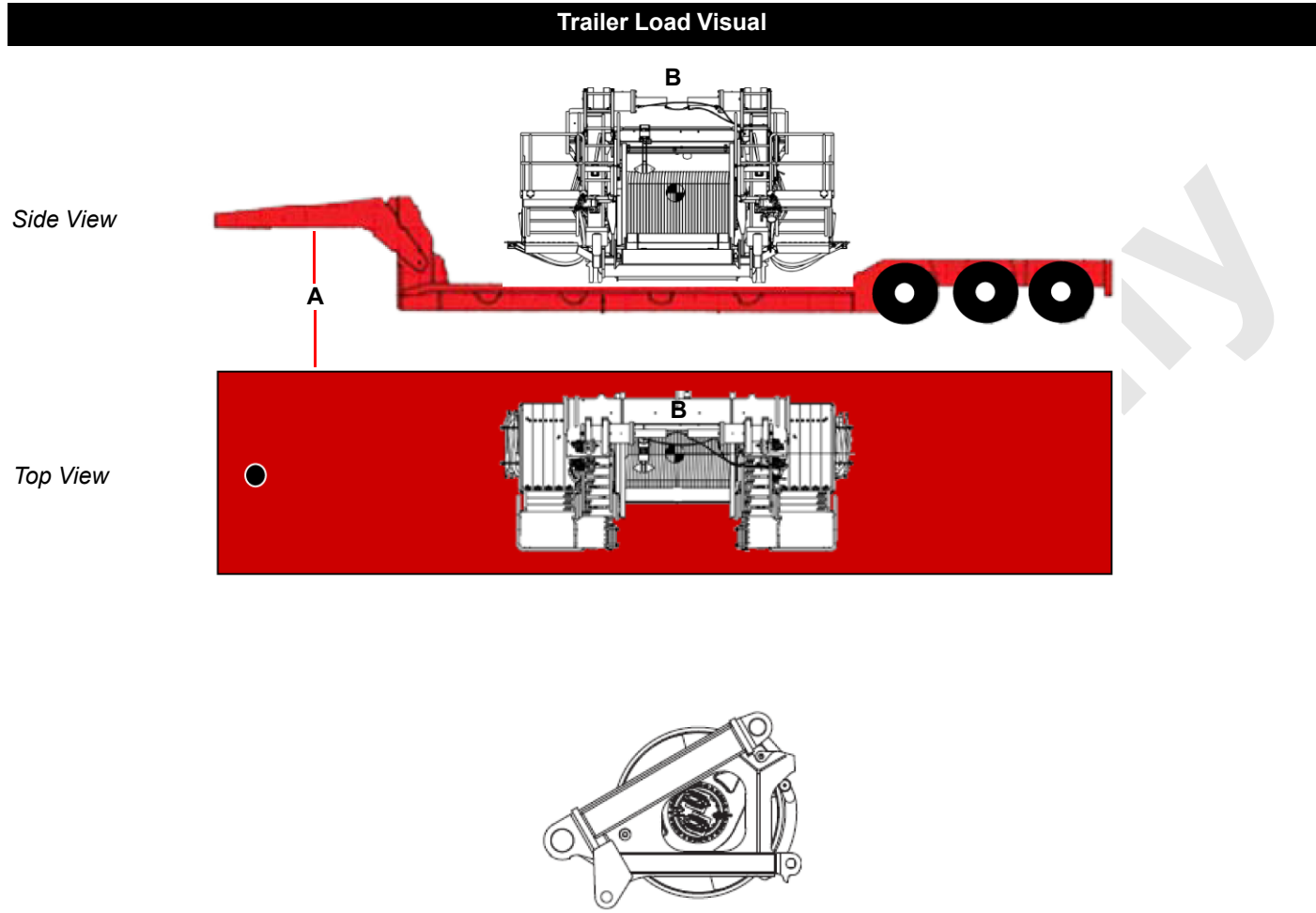


Item	Description
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Rotating Bed (90,420 pounds): <ul style="list-style-type: none"> • Height: 9' 10" (3.0m) • Length: 31' 10" (9.7m) • Width: 11' 6" (3.5m)
C	Blocking kit #001 (see page 5-265). Place the top cross members inside the rotating bed.

Trailer Load Steps

Step	Description
1	Cut and assemble the blocking kit #001 (see page 5-265).
2	Load the Rotating Bed as shown.

Main Hoist Drum #1 (Load #30)



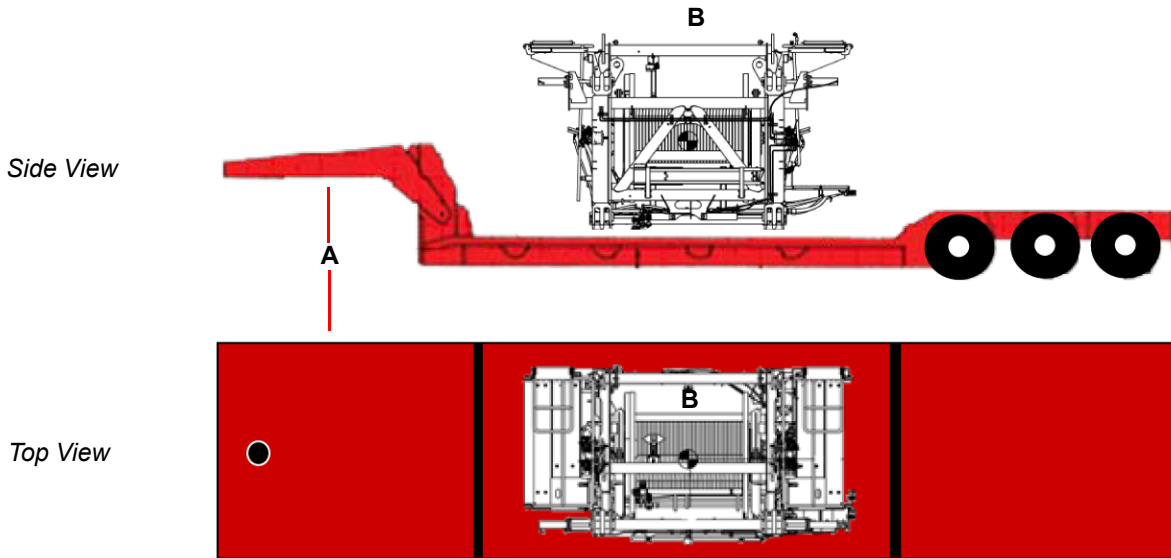
Item	Description
A	Trailer — 3-axle, double drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 18" • Length: 30' 11" (1st drop to 2nd drop) • Width: 8' 6"
B	Drum #1 (91,000 pounds): <ul style="list-style-type: none"> • Height: 11' 2" (3.4m) • Length: 19' 4" (5.9m) • Width: 9' 2" (2.8m)
C	Use fixture A006 (see page 5-266) which is not shown.

Trailer Load Steps

Step	Description
1	Use fixture A006 (see page 5-266) which is not shown.
2	Load Drum #1 as shown.

Main Hoist Drum #2 (Load #27)

Trailer Load Visual



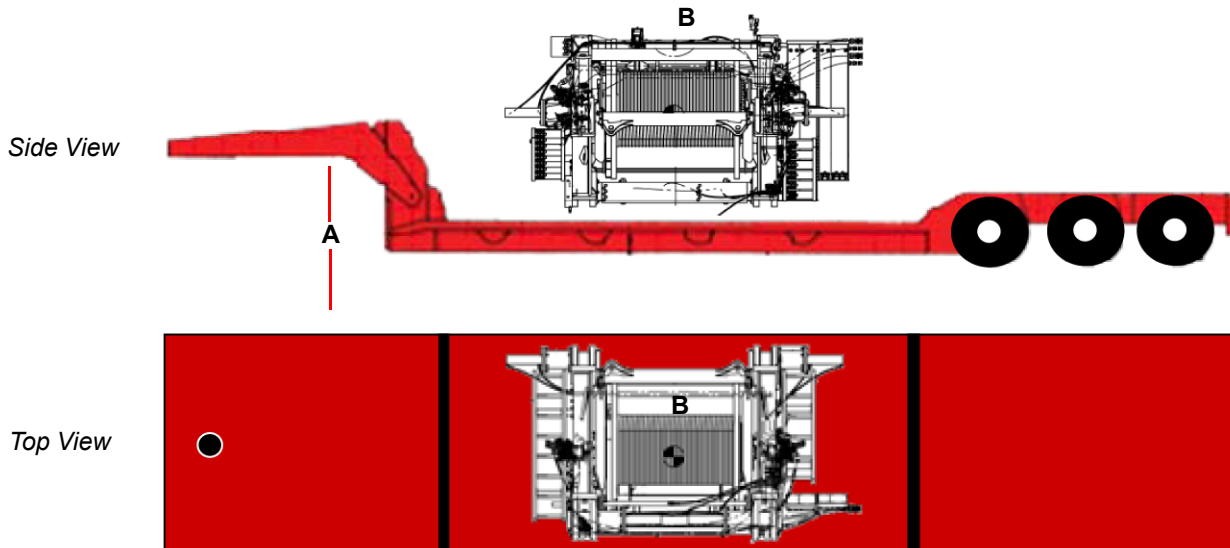
Item	Description
A	Trailer — 3-axle, double drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 18" • Length: 30' 11" (1st drop to 2nd drop) • Width: 8' 6"
B	Drum #2 (84,000 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 17' 9" (5.4m) • Width: 9' 6" (2.9m)
C	Use fixture A005 (see page 5-266) which is not shown.

Trailer Load Steps

Step	Description
1	Use fixture A005 (see page 5-266) which is not shown.
2	Load Drum #2 as shown.

Whip Hoist Drum #3 and Boom Stops (Load #29)

Trailer Load Visual



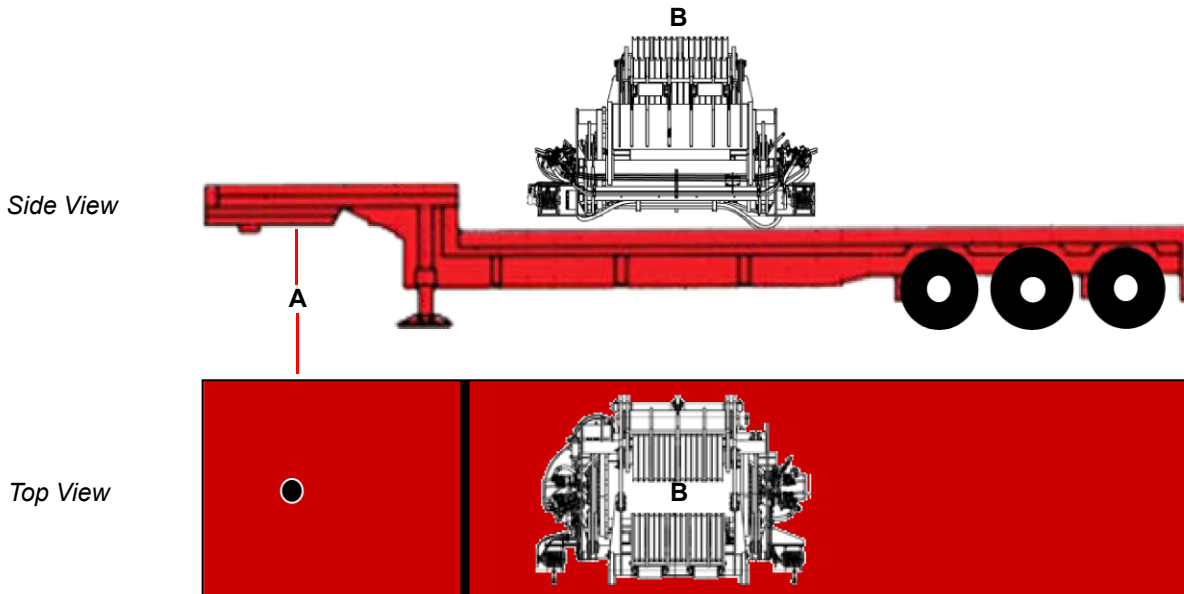
Item	Description
A	Trailer — 3-axle, double drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 18" • Length: 30' 11" (1st drop to 2nd drop) • Width: 8' 6"
B	Drum #3 (84,000 pounds): <ul style="list-style-type: none"> • Height: 9' 10" (3.0m) • Length: 17' (5.2m) • Width: 8' 10" (2.7m)
C	Use fixture A004 (see page 5-266) which is not shown.

Trailer Load Steps

Step	Description
1	Use fixture A004 (see page 5-266) which is not shown.
2	Load Drum #3 as shown.

Boom Hoist Drum #4 with Sheave Bank and Equalizer (Load #28)

Trailer Load Visual



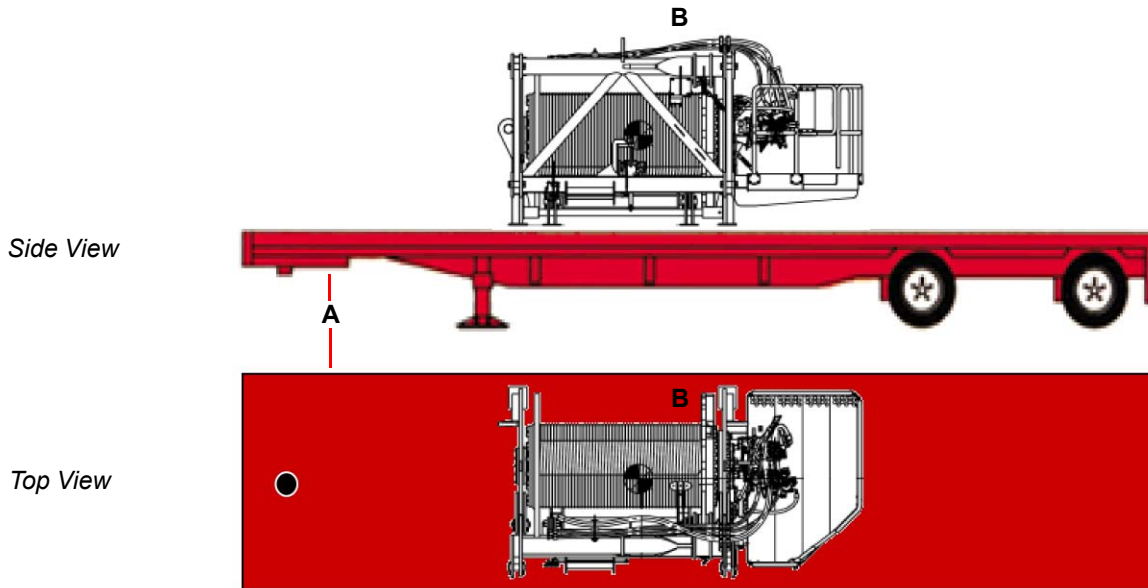
Item	Description
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Boom Hoist Drum #4 with Sheave Bank Equalizer (84,000 pounds): <ul style="list-style-type: none"> • Height: 14' 7" (4.45m) • Length: 17'(5.2m) • Width: 10' 10" (3.3m)
C	Use fixture A003 (see page 5-266) which is not shown.

Trailer Load Steps

Step	Description
1	Use fixture A003 (see page 5-266) which is not shown.
2	Load Boom Hoist Drum #4 with Sheave Bank Equalizer as shown.

Drum #5 Assembly Frame (Load #26)

Trailer Load Visual



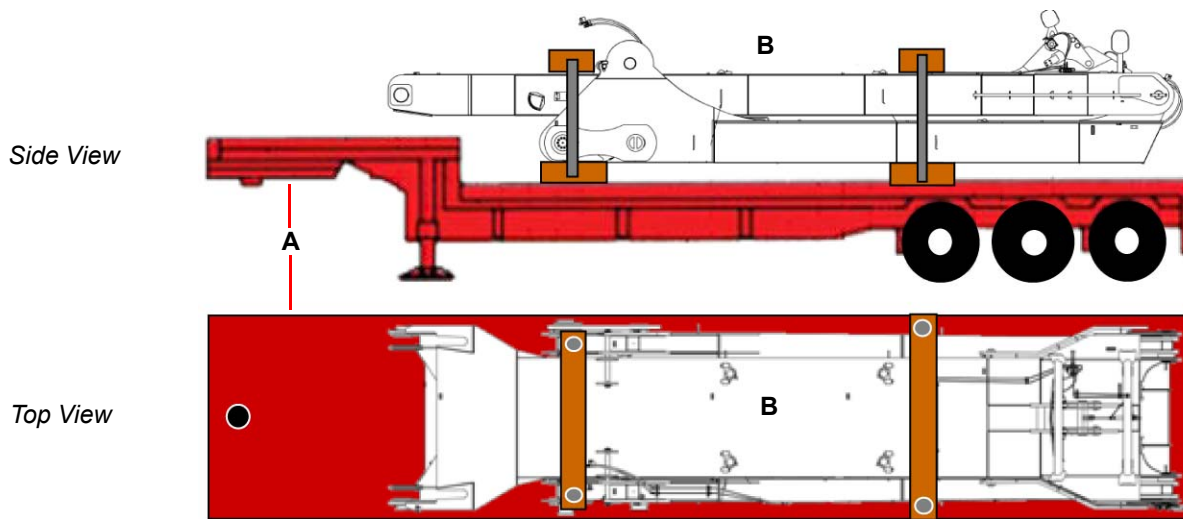
Item	Description
A	Trailer — 2-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length: 48' • Width: 8' 6"
B	Drum #5 Assembly Frame (43,000 pounds): <ul style="list-style-type: none"> • Height: 13' 2" (4.0m) • Length: 6' 3" (1.9m) • Width: 6' 6" (2.0m)
C	Use fixture A007 (see page 5-266) which is not shown.

Trailer Load Steps

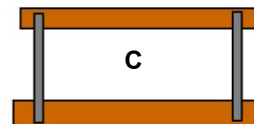
Step	Description
1	Use fixture A007 (see page 5-266) which is not shown.
2	Load Drum #5 Assembly Frame as shown.

Counterweight Positioning Frame (Load #31)

Trailer Load Visual



3" x 6" x 8.5' (top)
 4" x 6" x 8.5' (bottom)
 3/4" rods



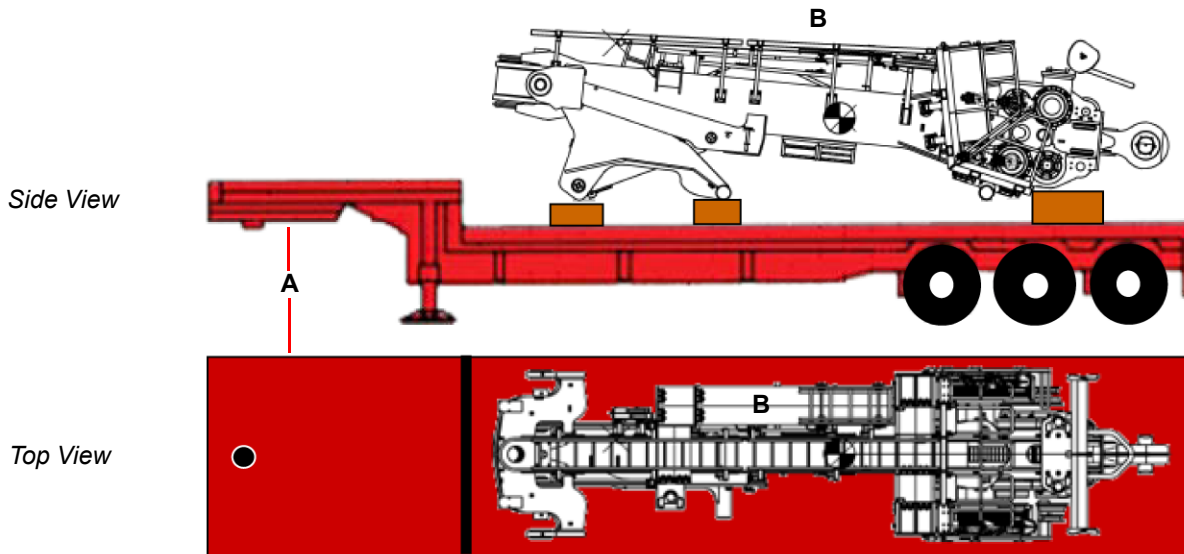
Item	Description
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Counterweight Positioning Frame (85,235 pounds): <ul style="list-style-type: none"> • Height: 9' 9" (2.98m) • Length: 47' 6" (14.5m) • Width: 11' 6" (3.5m)
C	Blocking kit #009 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assembly blocking kit #009 (see page 5-265).
2	Load Counterweight Positioning Frame as shown.

Counterweight Positioning Actuator (Load #32)

Trailer Load Visual



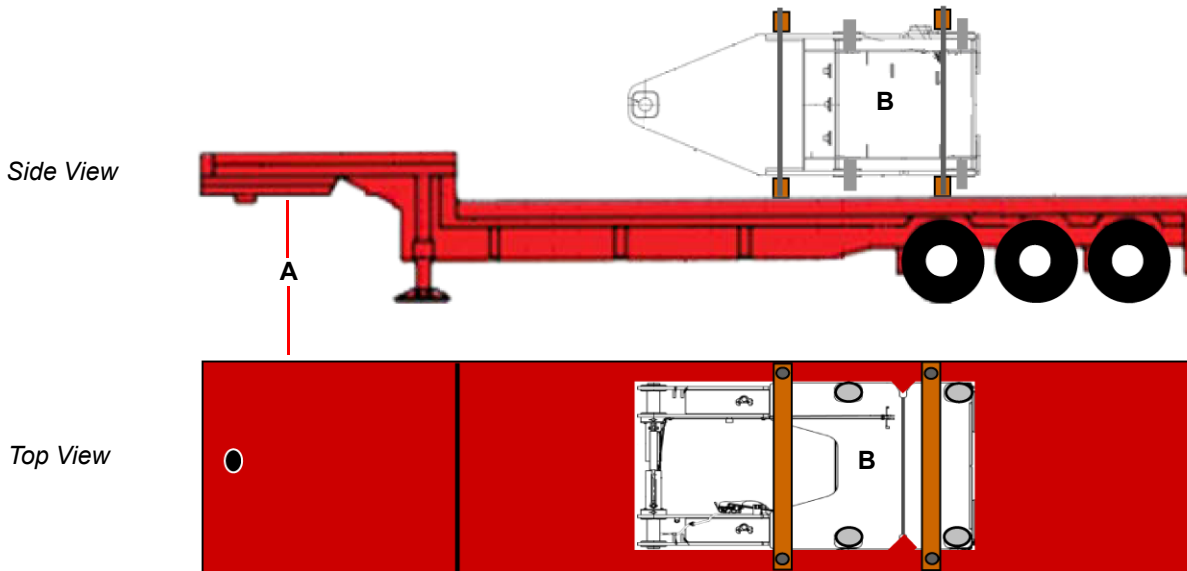
Item	Description
A	Trailer — 3-axle, single drop: • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Counterweight Positioning Actuator (83,286 pounds): • Height: 8' 6" (2.6m) • Length: 39' 2" (10.4m) • Width: 8' 6" (2.6m)
C	<i>The blocking kit has not been developed.</i>

Trailer Load Steps

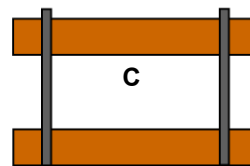
Step	Description
1	Cut and assembly blocking kit. <i>The blocking kit has not been developed.</i>
2	Load Counterweight Positioning Actuator as shown.

Counterweight Tray (Load #42)

Trailer Load Visual



6" x 8" x 11' 6" (top)
 6" x 8" x 11' 6" (bottom)
 3/4" rods



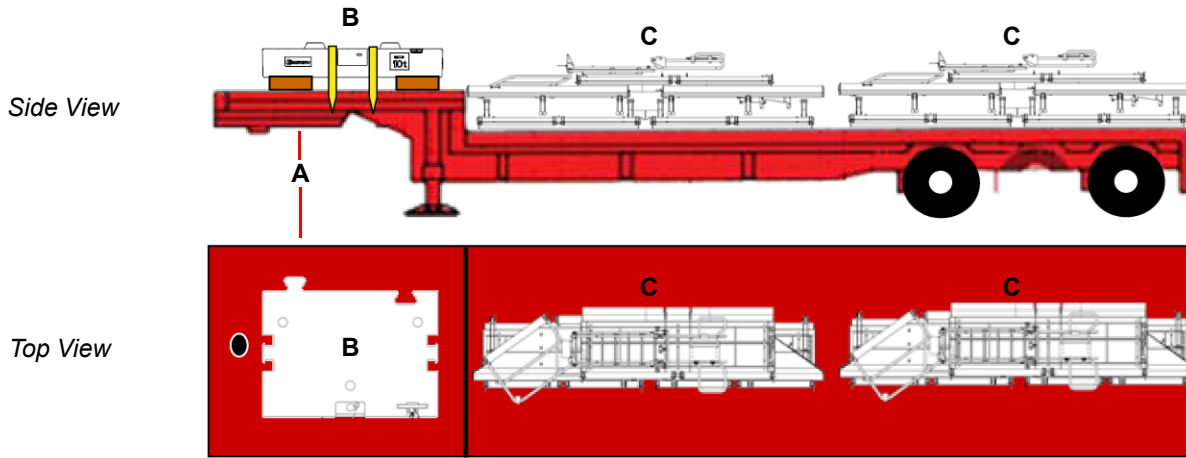
Item	Description
A	Trailer — 3-axle, single drop: • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Counterweight Tray (68,437 pounds): • Height: 8' 3" (2.5m) • Length: 17' 5" (5.3m) • Width: 11' 6" (3.5m)
C	Blocking kit #008 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #008 (see page 5-265).
2	Load Counterweight Tray as shown.

Counterweight and Catwalks (Load #46)

Trailer Load Visual



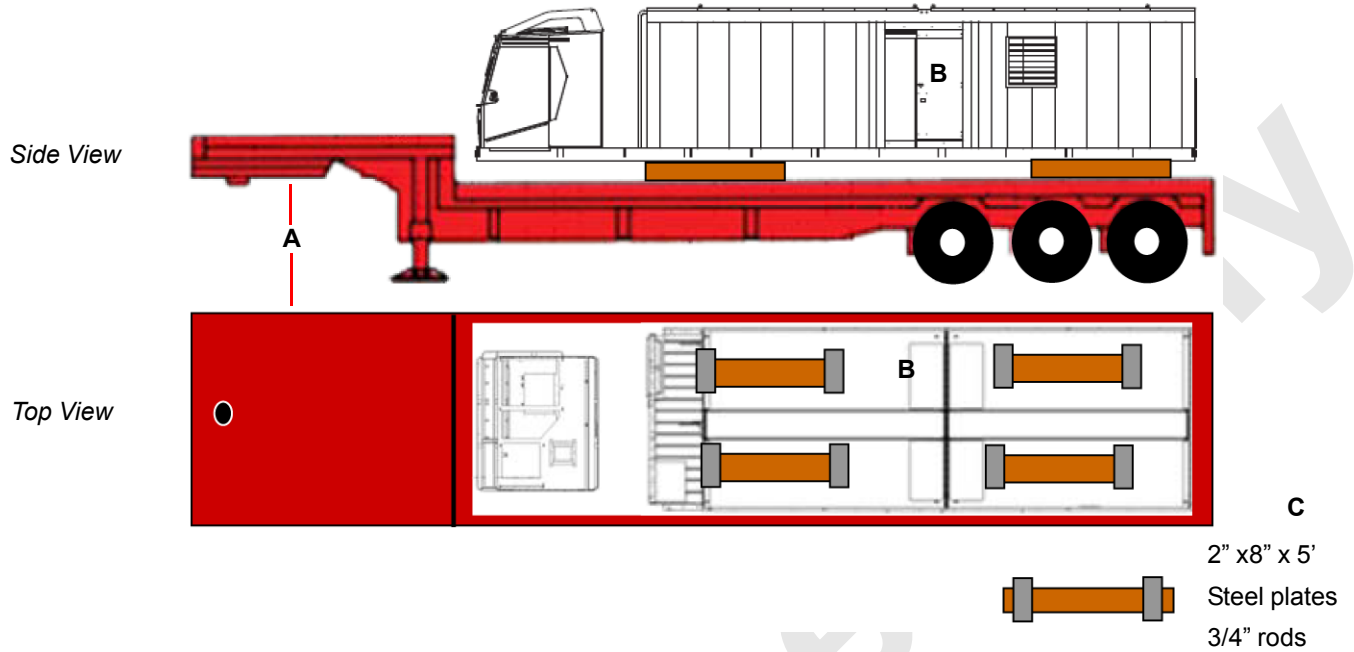
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	Catwalks (4,652 pounds) <ul style="list-style-type: none"> • Height: 8' 3" (2.5m) • Length: 11' 2" (3.4m) • Width: 4' 11" (1.5m)
D	Blocking kit #033 (see page 5-265).

Trailer Load Steps

Step	Description																
1	<p>Cut and assemble blocking kit #033 (see page 5-265):</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Item</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>3" x 6" x 4'</td> </tr> <tr> <td>B</td> <td>2" x 8" x 8'</td> </tr> <tr> <td>C</td> <td>6" x 6" x 12"</td> </tr> <tr> <td>D</td> <td>2" x 8" x 32"</td> </tr> <tr> <td>E</td> <td>4" x 6" x 32"</td> </tr> <tr> <td>F</td> <td>2" x 8" x 4'</td> </tr> <tr> <td>G</td> <td>4" x 6" x 15"</td> </tr> </tbody> </table>	Item	Description	A	3" x 6" x 4'	B	2" x 8" x 8'	C	6" x 6" x 12"	D	2" x 8" x 32"	E	4" x 6" x 32"	F	2" x 8" x 4'	G	4" x 6" x 15"
Item	Description																
A	3" x 6" x 4'																
B	2" x 8" x 8'																
C	6" x 6" x 12"																
D	2" x 8" x 32"																
E	4" x 6" x 32"																
F	2" x 8" x 4'																
G	4" x 6" x 15"																
2	Load the Catwalks as shown.																
3	Load the Cast Counterweight as shown.																

Upperworks Enclosure (Load #25)

Trailer Load Visual

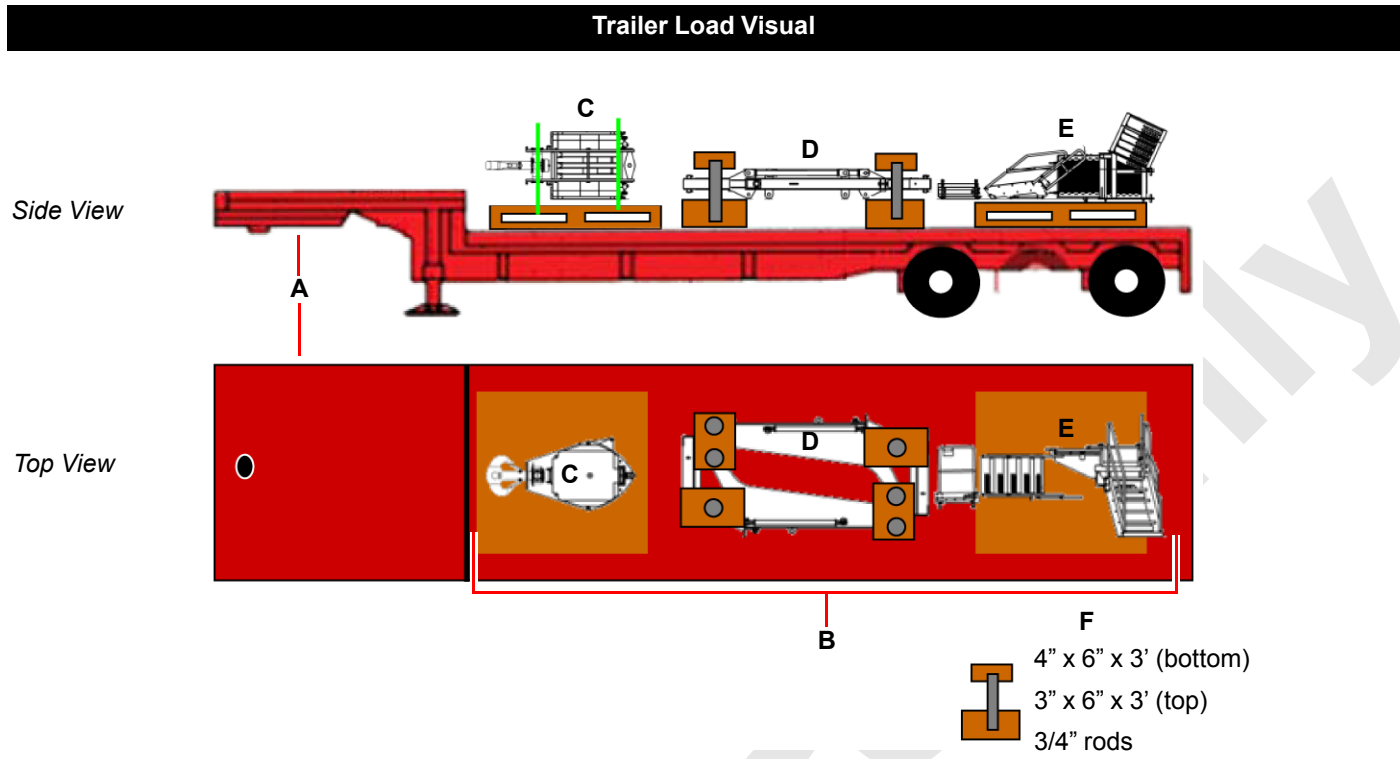


Item	Description
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Upperworks Enclosure (80,801 pounds): <ul style="list-style-type: none"> • Height: 9' 10" (3m) • Length: 39' 11" (12.17m) • Width: 11' 6" (3.5m)
C	Blocking kit #039 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #039 (see page 5-265).
2	Load Upperworks Enclosure as shown.

Support/Platform Assembly and Block Hook (Load #24)



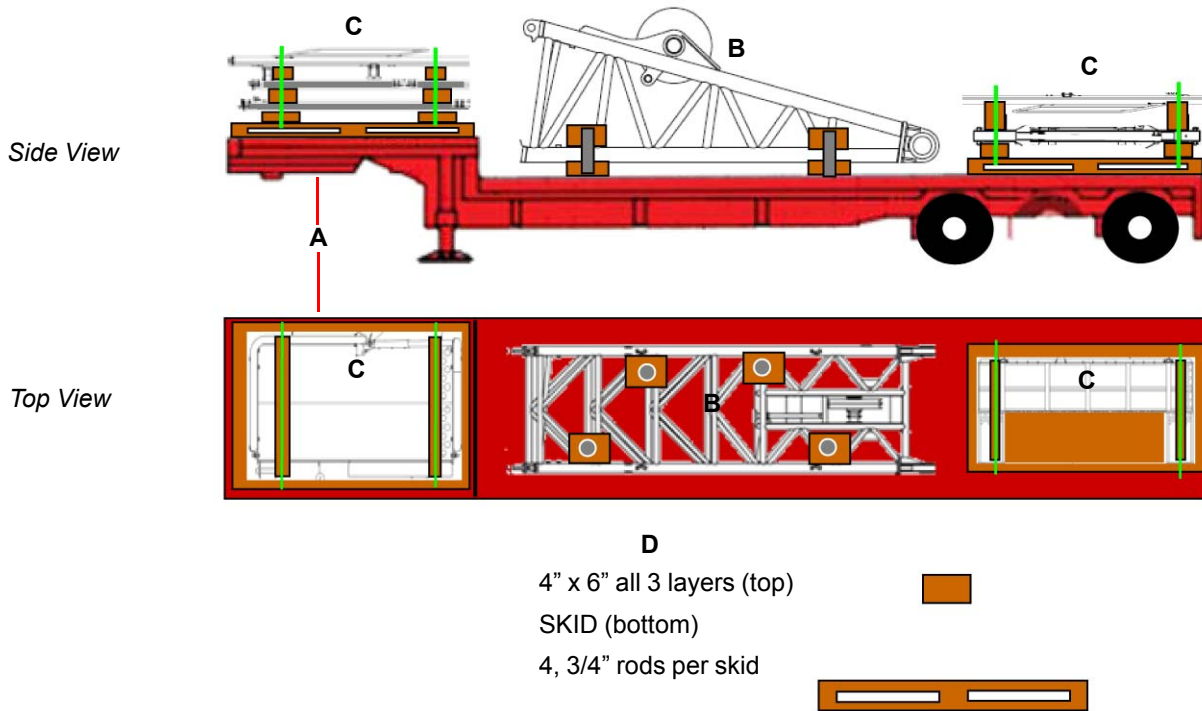
Item	Description
A	Trailer — 3-axle, single drop: • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Support/Platform Assembly (22,670 + 3,860 + 7,940 = 34,470 pounds): • Height: 9' 10" (3m) • Length: 39' 11" (12.17m) • Width: 11' 6" (3.5m)
C	Block hook (22,670 pounds)
D	Power Plant Enclosure Support (3,860 pounds)
E	Platform Assembly (7,940 pounds)
F	Blocking kit #005 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #005 (see page 5-265).
2	Load Block Hook as shown.
3	Load Power Plant Enclosure Support as shown.
4	Load Platform Assembly as shown.

Mast Butt (Load #35)

Trailer Load Visual



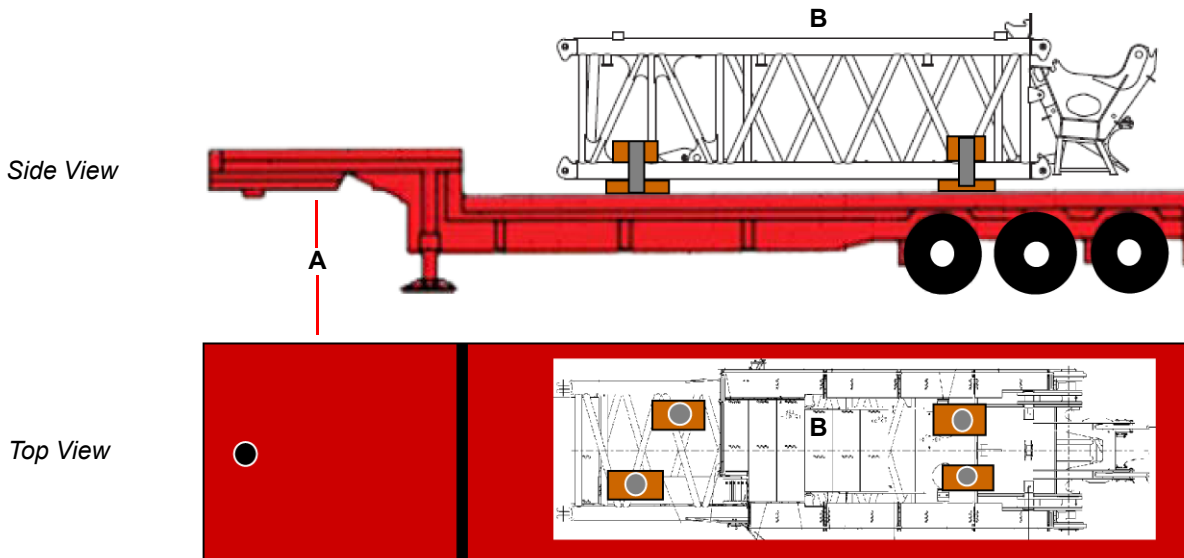
Item	Description
A	Trailer — 2-axle, single drop: • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Mast Butt (25,200 pounds): • Height: 10' 2" (3.1m) • Length: 24' 7" (7.5m) • Width: 10' 6" (3.2m)
C	Mast Butt Platform Assembly (660 pounds).
D	Blocking kit #002 (see page 5-265).


Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #002 (see page 5-265).
2	Load Mast Butt onto the front of the trailer as shown.
3	Load Mast Butt Platform Assembly onto the front and the rear of the trailer as shown.

#92 Mast Insert Raising Frame (Load #33)

Trailer Load Visual



- C**
- 3" x 6" x 2" (top)
 - 4" x 6" x 2" (bottom)
 - 3/4" rods
- 

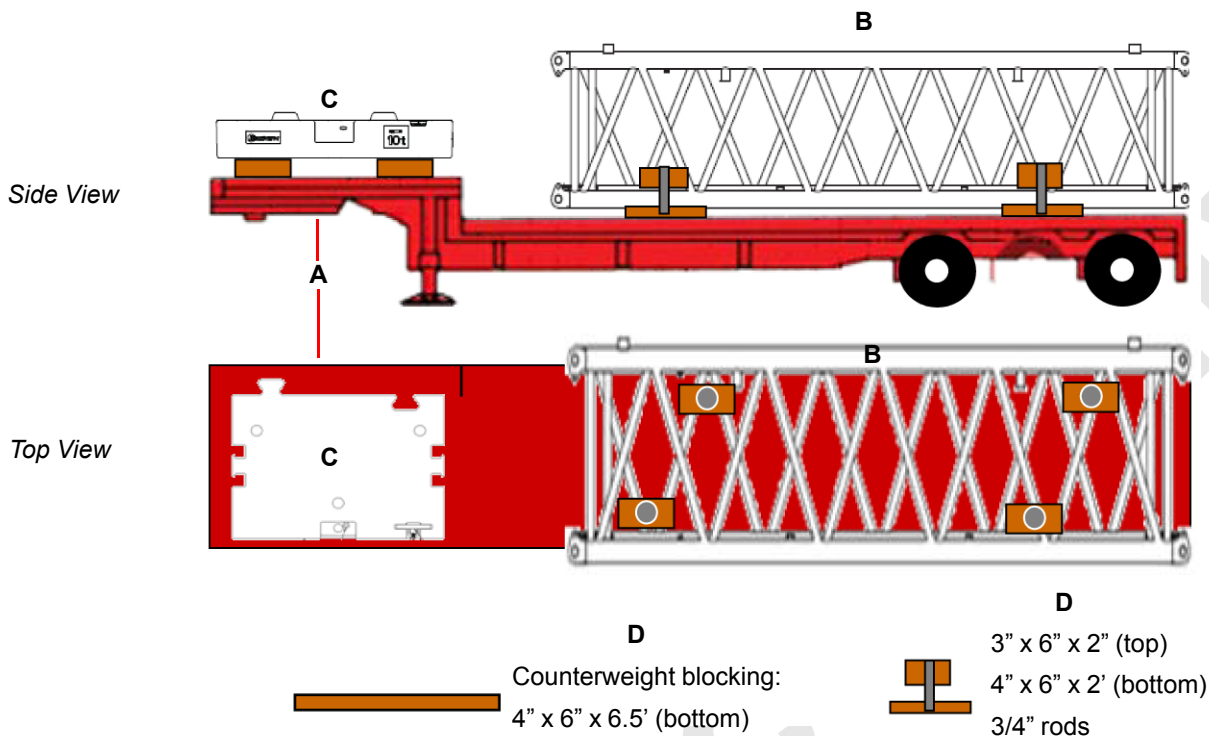
Item	Description
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Raising Frame (36,525 pounds): <ul style="list-style-type: none"> • Height: 9' 10" (3.0m) • Length: 34' 6" (7.5m) • Width: 10' 10" (3.3m)
C	Blocking kit #037 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #037 (see page 5-265).
2	Load the Raising Frame as shown.

#92 Mast Insert and Counterweight (Load #34)

Trailer Load Visual



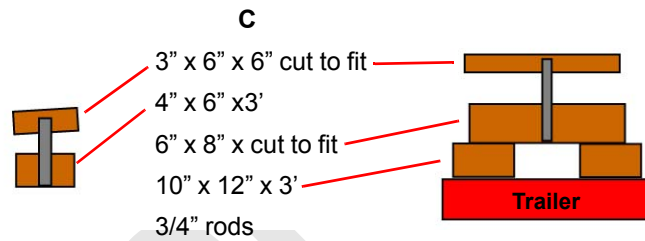
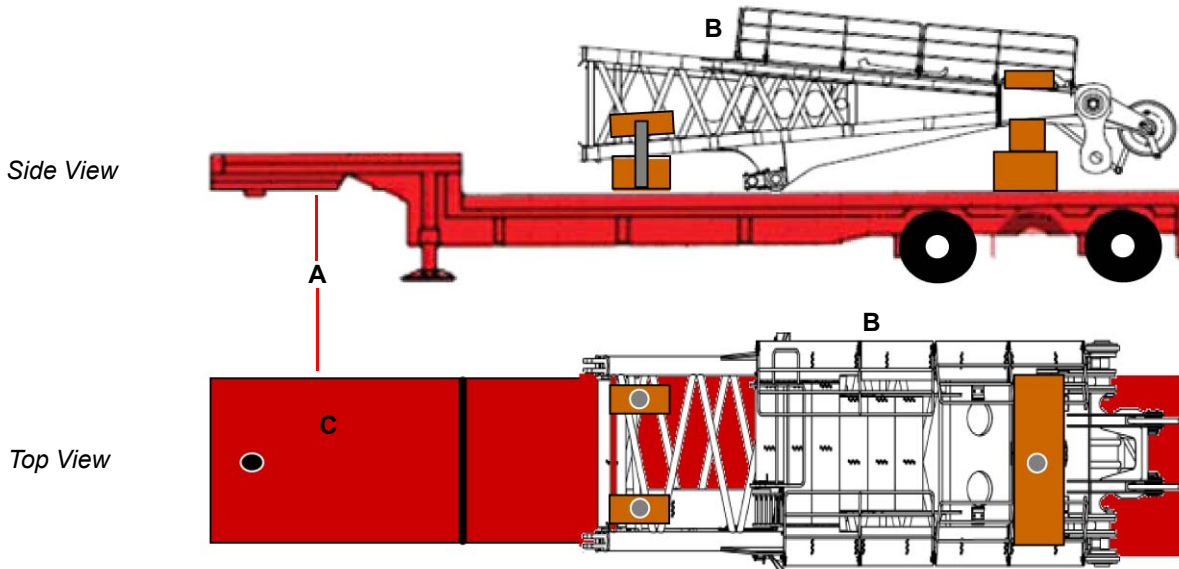
Item	Description
A	Trailer — 2-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Mast Insert (21,500 pounds): <ul style="list-style-type: none"> • Height: 8' 6" (2.6m) • Length: 40' 5" (12.3m) • Width: 9' 10" (3.0m)
C	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
D	Blocking kit #037 and #010 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #037 and #010 (see page 5-265).
2	Load the Mast Insert as shown.
3	Load the Cast Counterweight as shown.

#92 Mast Top (Load #36)

Trailer Load Visual



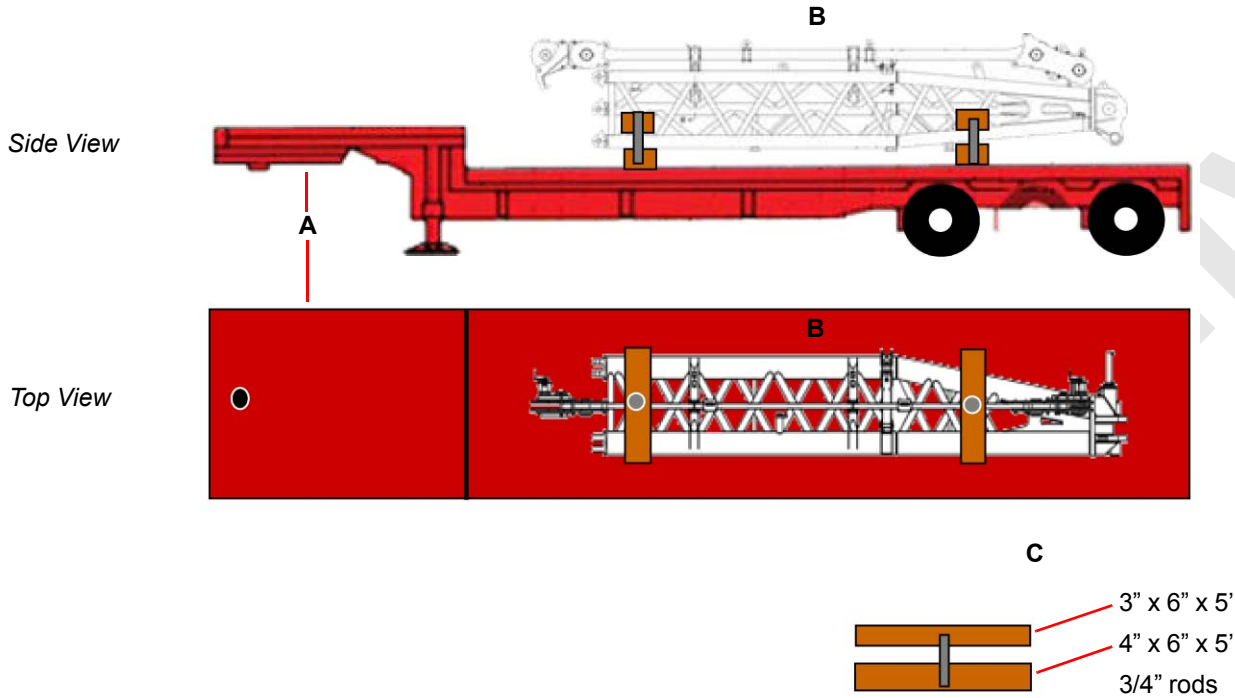
Item	Description
A	Trailer — 2-axle, single drop: • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	#92 Mast Top (73,760 pounds): • Height: 10' 2" (3.1m) • Length: 38' 5" (11.7m) • Width: 11' 6" (3.5m)
C	Blocking kit #013 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #013 (see page 5-265).
2	Load the #92 Mast Top as shown.

#93 Backhitch Butt — Right (Load #39)

Trailer Load Visual



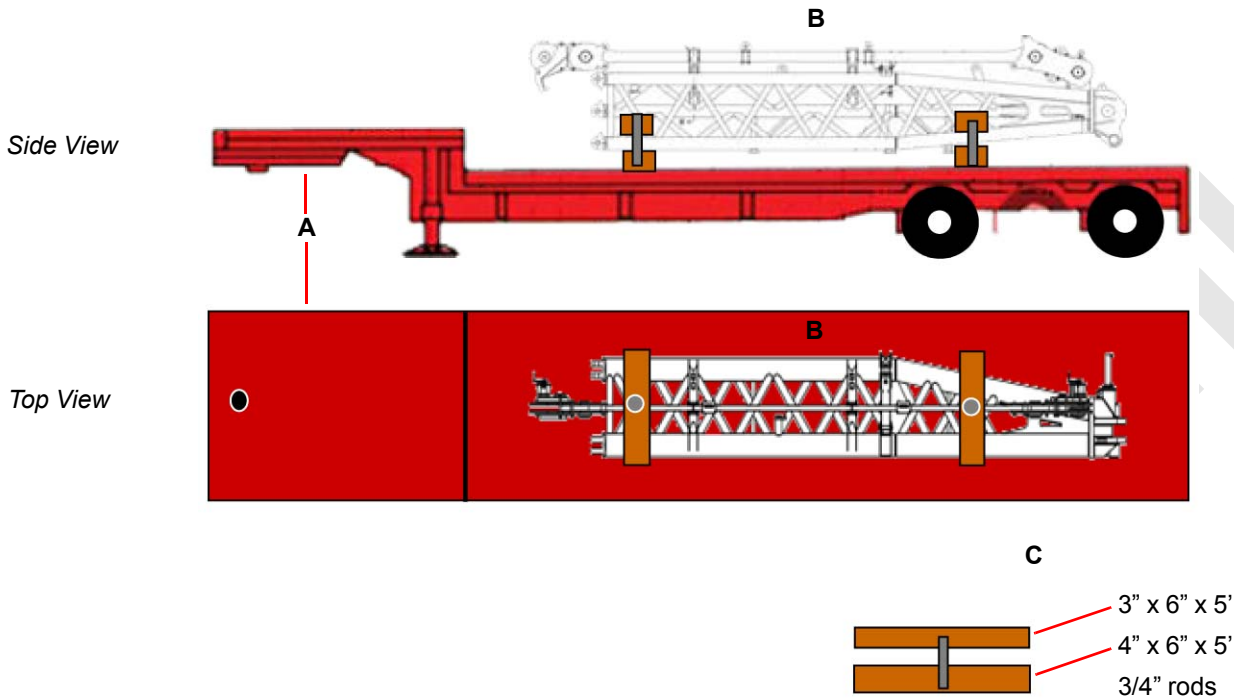
Item	Description
A	Trailer — 2-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Backhitch Butt — Right (29,720 pounds): <ul style="list-style-type: none"> • Height: 9' 6" (2.9m) • Length: 43' (13.1m) — not including strap overhang on the top. • Width: 4' 7" (1.4m)
C	Blocking kit #041 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #041 (see page 5-265).
2	Load the Backhitch Butt — Right as shown.

#93 Backhitch Butt — Left (Load #40)

Trailer Load Visual



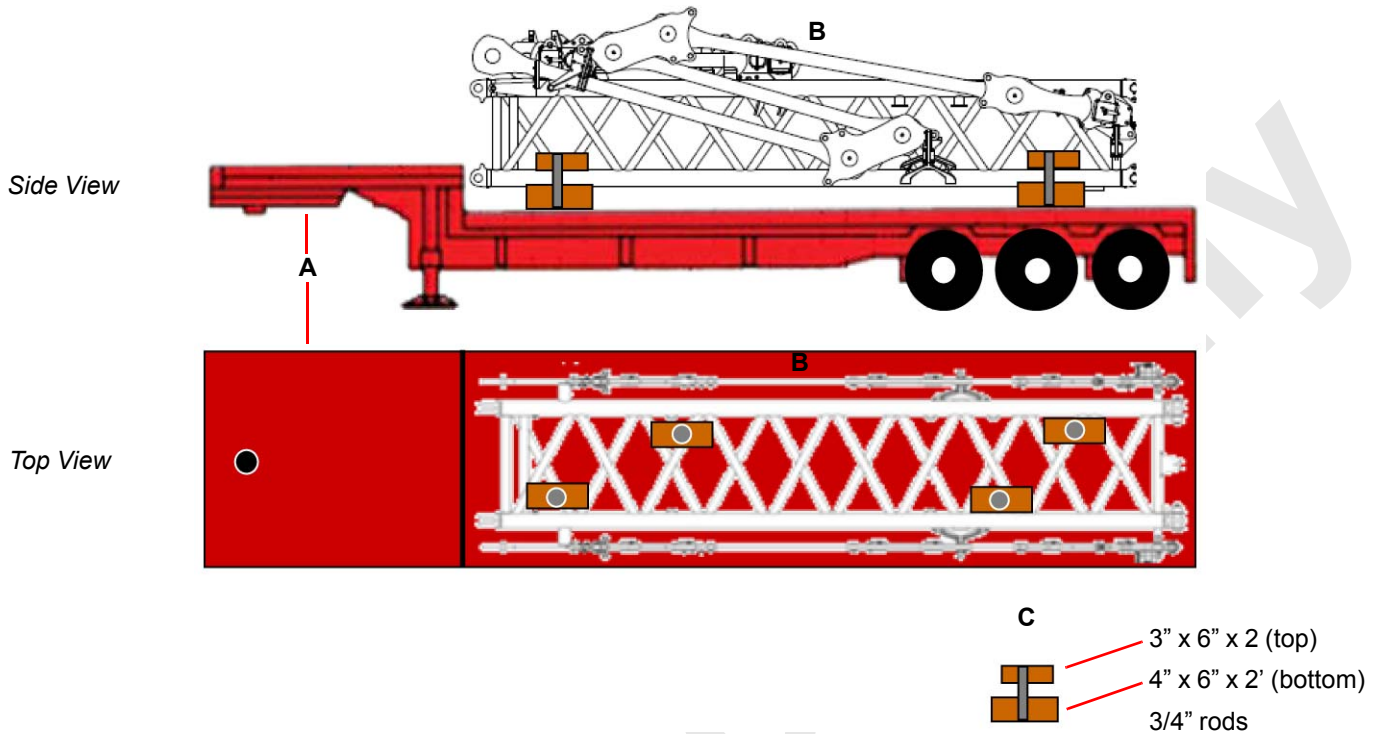
Item	Description
A	Trailer — 2-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Backhitch Butt — Left (29,730 pounds): <ul style="list-style-type: none"> • Height: 9' 6" (2.9m) • Length: 48' (14.6m) • Width: 4' 7" (1.4m)
C	Blocking kit #041 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #041 (see page 5-265).
2	Load the Backhitch Butt — Left as shown.

#93 Backhitch Insert (Load #38)

Trailer Load Visual



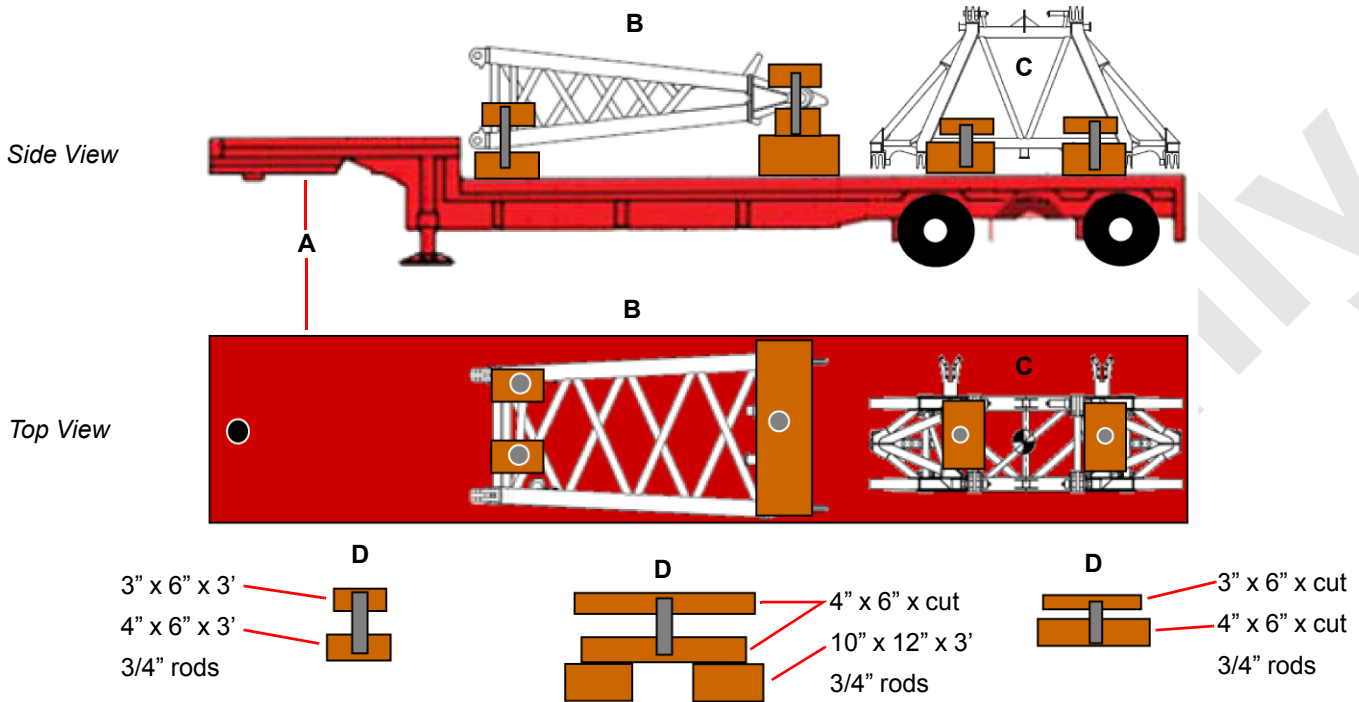
Item	Description
A	Trailer — 3-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Backhitch Insert (48,900 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 38' 5" (11.7m) • Width: 11' 6" (3.5m)
C	Blocking kit #037 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #037 (see page 5-265).
2	Load the Backhitch Insert as shown.

#93 Backhitch Transition Insert and Top (Load #37)

Trailer Load Visual



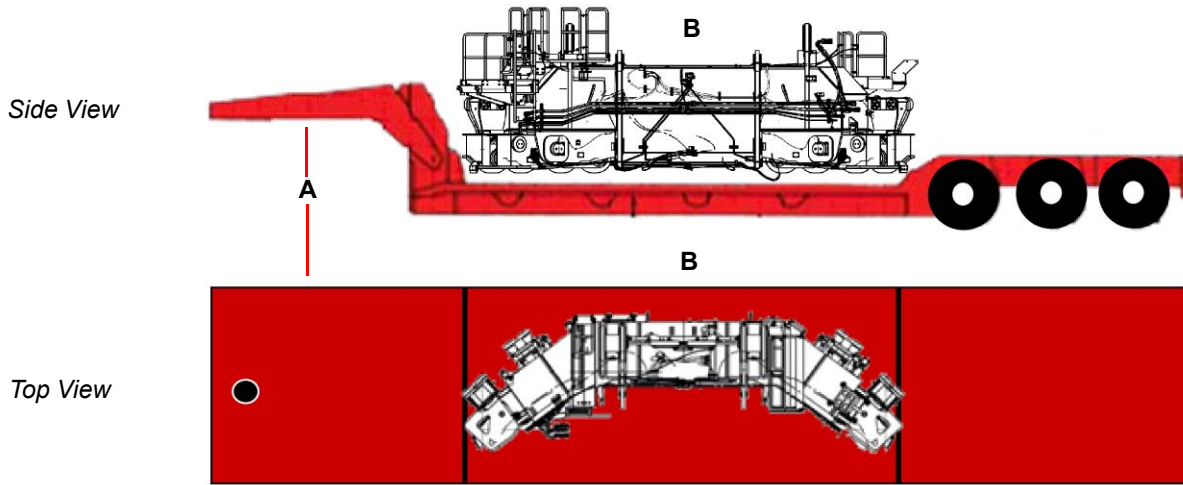
Item	Description
A	Trailer — 2-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Backhitch Transition Insert (22,000 pounds): <ul style="list-style-type: none"> • Height: 8' 10" (2.7m) • Length: 22' (6.7m) • Width: 11' 2" (3.4m)
C	Backhitch Top (11,680 pounds): <ul style="list-style-type: none"> • Height: 6' 7" (2.0m) • Length: 20' 8" (6.3m) • Width: 10' 2" (3.1m)
D	Blocking kit #015 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #015 (see page 5-265).
2	Load the Backhitch Transition Insert as shown.
3	Load the Backhitch Top as shown.

Front Roller Carrier and Hook Roller (Load #23)

Trailer Load Visual



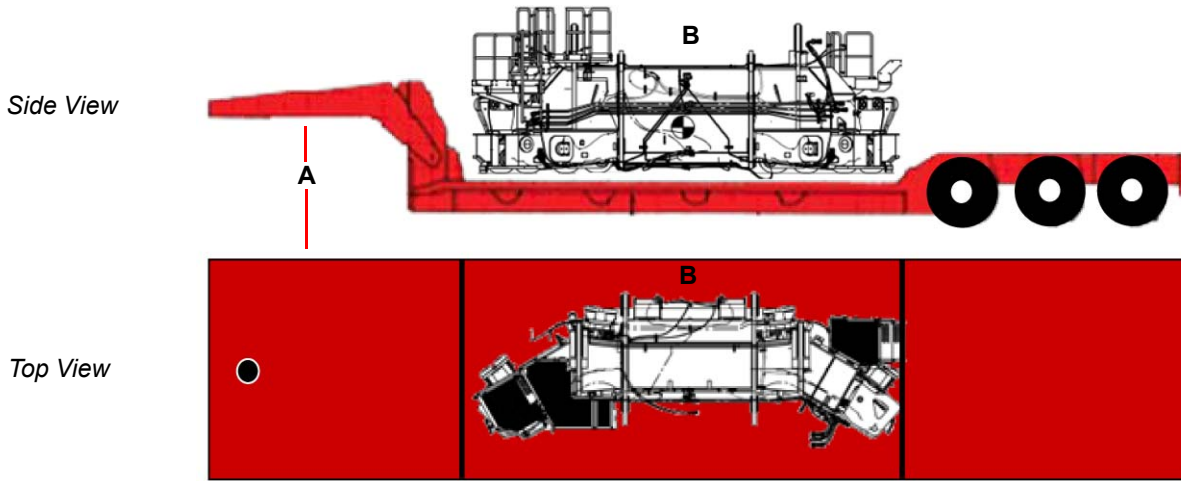
Item	Description
A	Trailer — 3-axle, double drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 18" • Length: 30' 11" (1st drop to 2nd drop) • Width: 8' 6"
B	Roller Carrier (109,180 pounds): <ul style="list-style-type: none"> • Height: 11' 1" (3.4m) • Length: 32' 10" (10m) • Width: 10' 4" (3.15m)

Trailer Load Steps

Step	Description
1	Use fixture A001 (see page 5-266) which is not shown.
2	Load the Roller Carrier as shown.

Rear Roller Carrier and Hook Roller (Load #21)

Trailer Load Visual

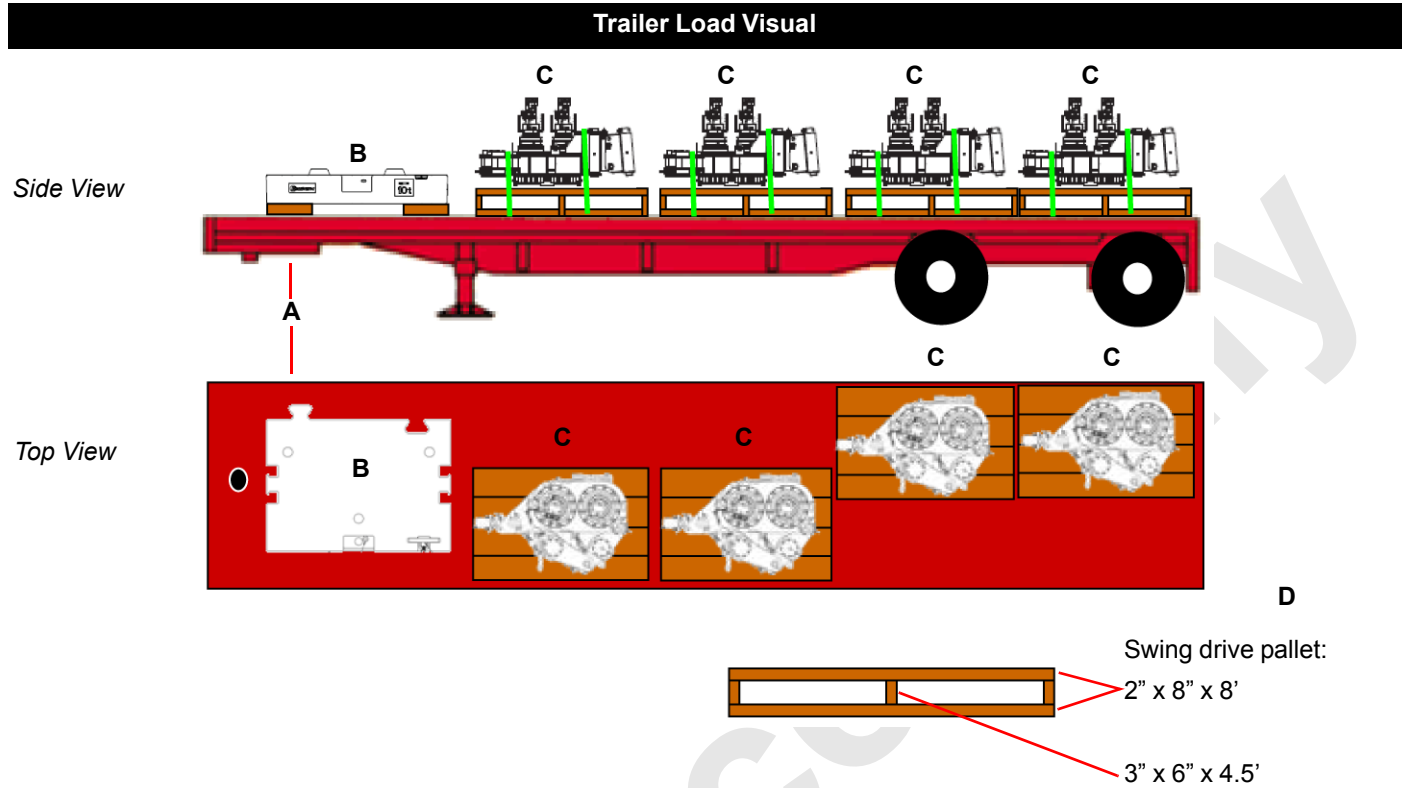


Item	Description
A	Trailer — 3-axle, double drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 18" • Length: 30' 11" (1st drop to 2nd drop) • Width: 8' 6"
B	Roller Carrier (88,290 pounds): <ul style="list-style-type: none"> • Height: 11' 6" (3.5m) • Length: 30' 3" (9.2m) • Width: 10' 2" (3.1m)

Trailer Load Steps

Step	Description
1	Use fixture A002 (see page 5-266) which is not shown.
2	Load the Roller Carrier as shown.

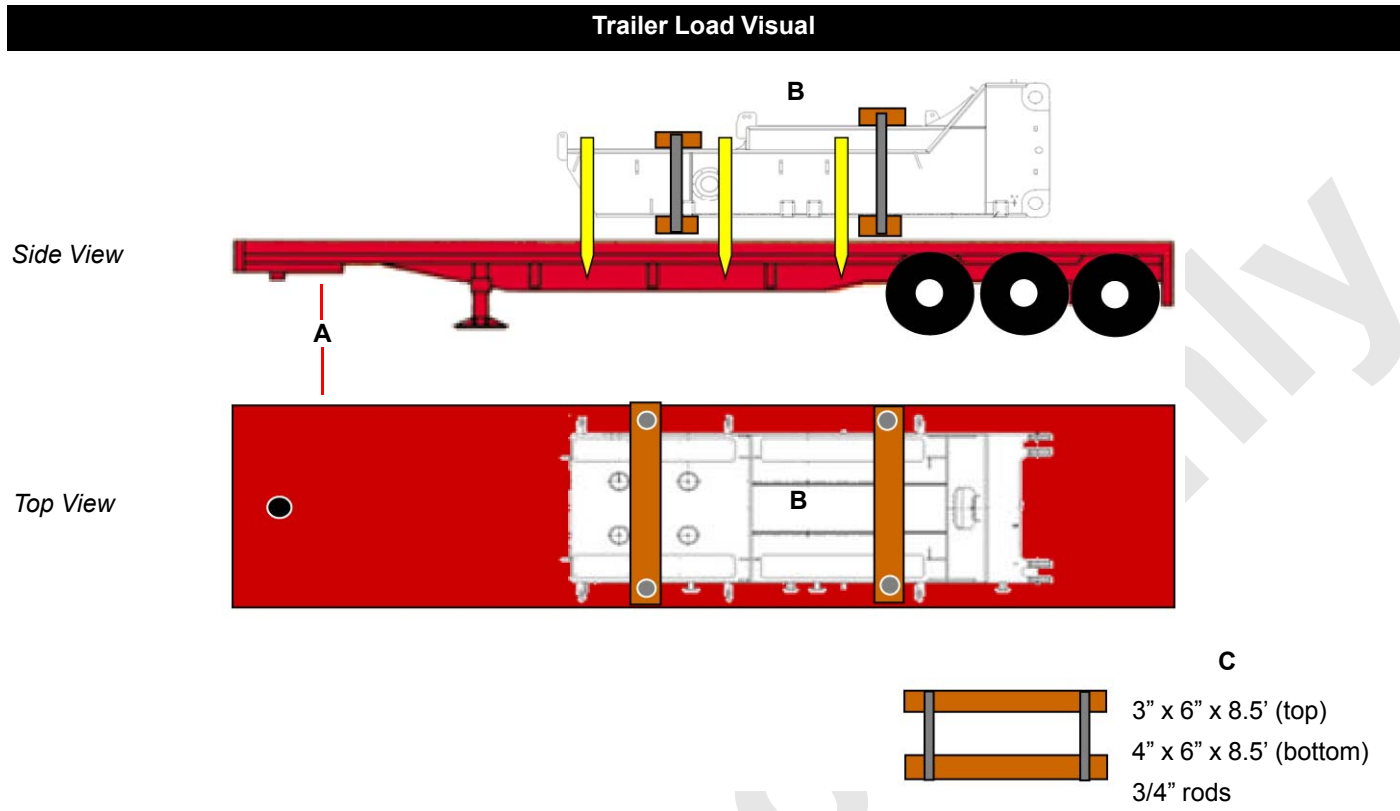
Swing Drive Assembly (Load #22)



Item	Description
A	Trailer — 2-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length: 48' • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	Swing Drive (7,930 pounds): <ul style="list-style-type: none"> • Height: 6' 7" (2.0m) • Length: 9' 10" (3.0m) • Width: 4' 3" (1.3m)
D	Blocking kit #006 (see page 5-265).

Trailer Load Steps	
Step	Description
1	Cut and assemble blocking kit #006 (see page 5-265).
2	Load each Swing Drive as shown.
3	Load the Cast Counterweight (cast) as shown.

Counterweight Tray Side (Load #43)

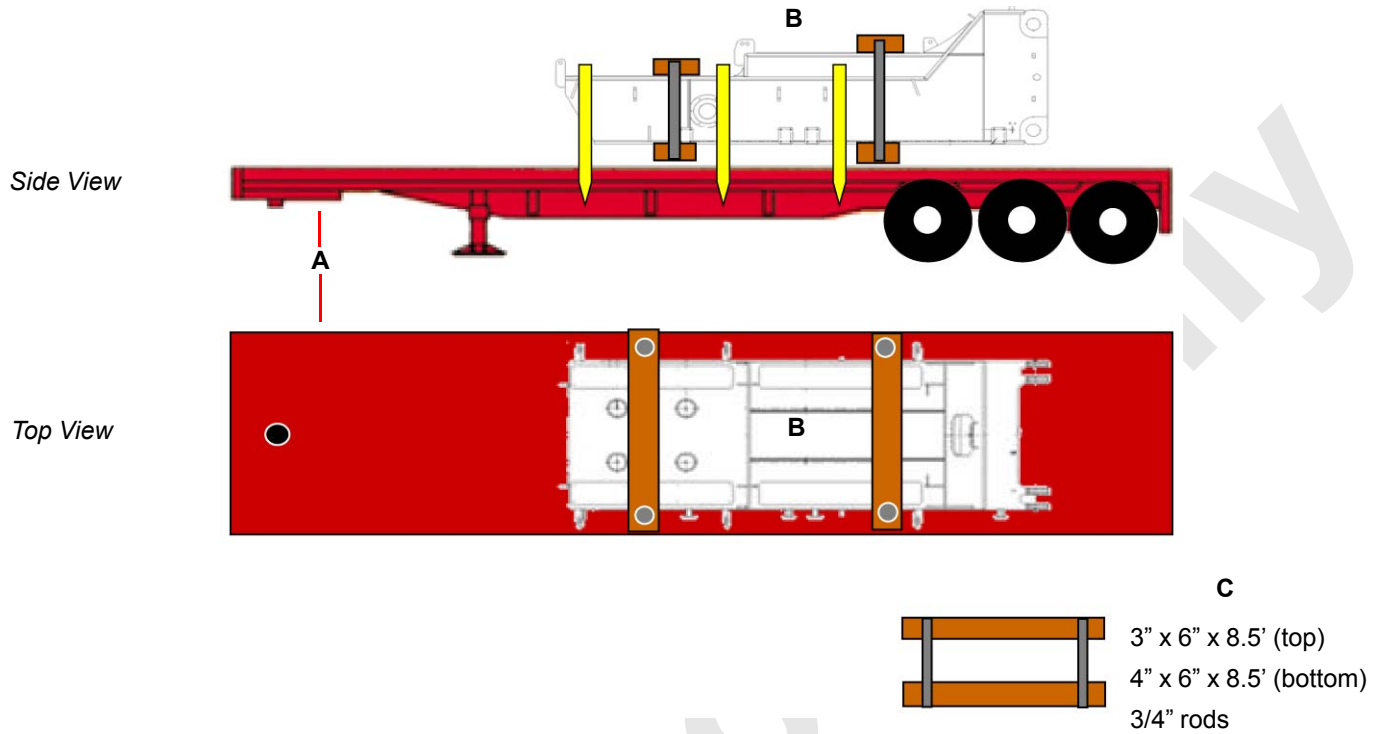


Item	Description
A	Trailer — 3-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length: 48' • Width: 8' 6"
B	Counterweight Tray Side (83,749 pounds): <ul style="list-style-type: none"> • Height: 7' 3" (2.2m) • Length: 23' 4" (7.1m) • Width: 9' 10" (3.0m)
C	Blocking kit #009 (see page 5-265).

Trailer Load Steps	
Step	Description
1	Cut and assemble blocking kit #009 (see page 5-265).
2	Load the Counterweight Tray Side as shown.

Counterweight Tray Side (Load #44)

Trailer Load Visual

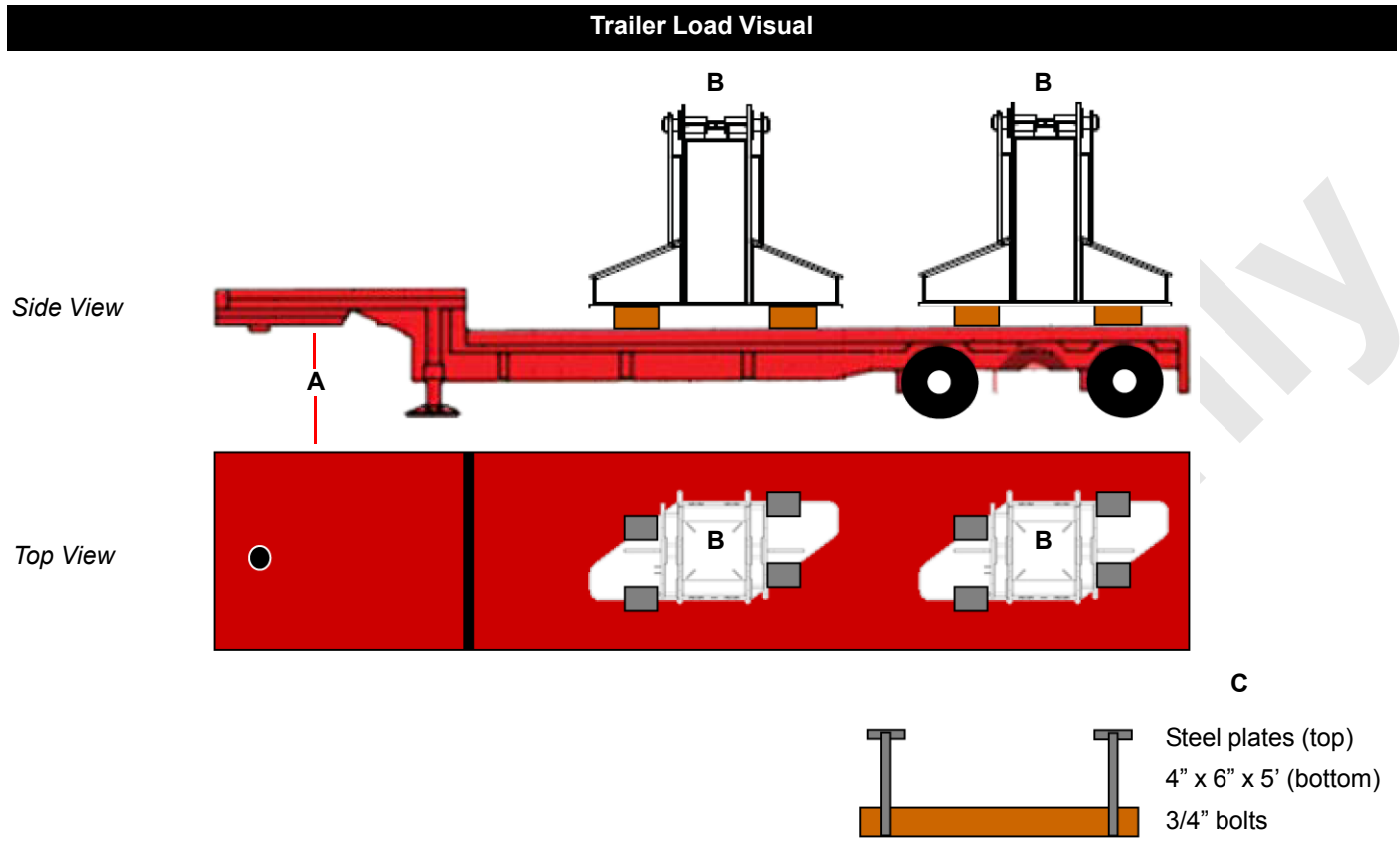


Item	Description
A	Trailer — 3-axle, flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length: 48' • Width: 8' 6"
B	Counterweight Tray Side (83,749 pounds): <ul style="list-style-type: none"> • Height: 7' 3" (2.2m) • Length: 23' 4" (7.1m) • Width: 9' 10" (3.0m)
C	Blocking kit #009 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #009 (see page 5-265).
2	Load the Counterweight Tray Side as shown.

Counterweight Pad — RH and LH (Load #45)



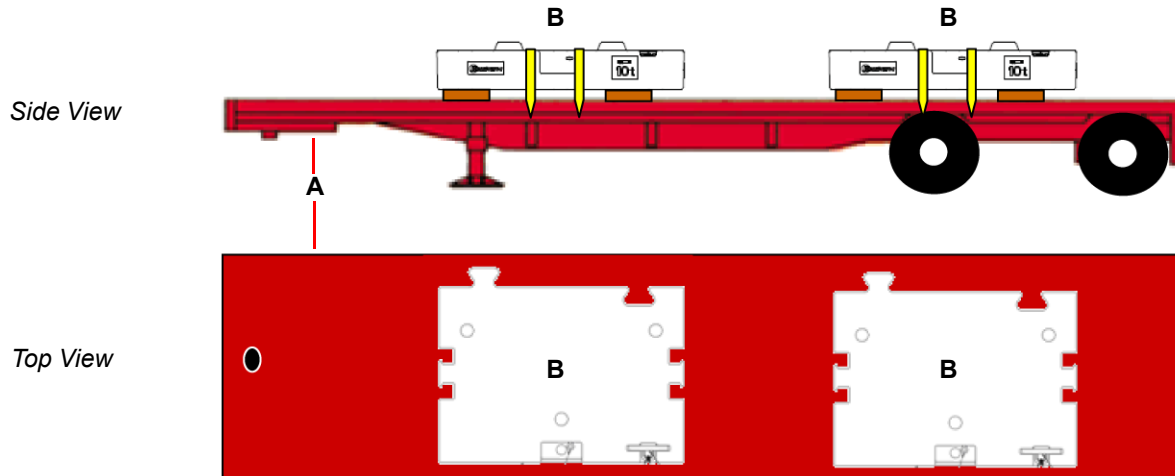
Item	Description
A	Trailer — 2-axle, single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: 43' 6" (drop to end of trailer) • Width: 8' 6"
B	Counterweight Pad (21,550 pounds each): <ul style="list-style-type: none"> • Height: 8' 3" (2.5m) • Length: 11' (3.35m) • Width: 5' (1.5m)
C	Blocking kit #027 (see page 5-265).

Trailer Load Steps


Step	Description
1	Cut and assemble blocking kit #027 (see page 5-265).
2	Load each Counterweight Pad as shown.

Counterweight — Cast (Load #47 through Load #80)

Trailer Load Visual



C
Counterweight blocking:
4" x 6" x 6.5' (bottom)



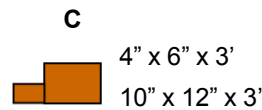
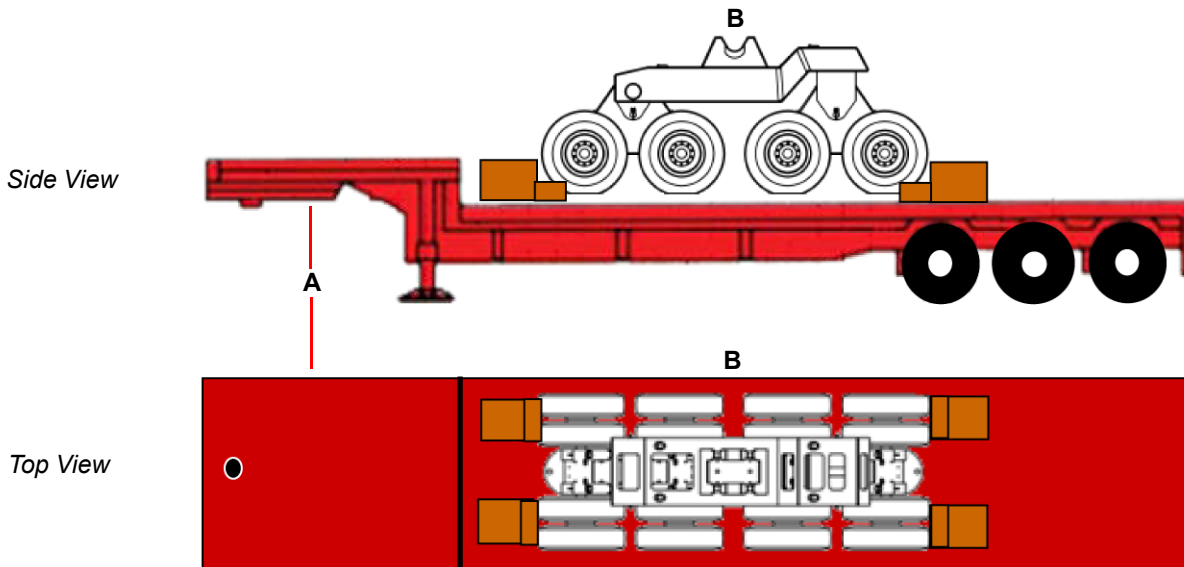
Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length: 48' • Width: 8' 6"
B	Cast Counterweight (22,000 pounds each): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	Blocking kit #010 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #010 (see page 5-265).
2	Load each Cast Counterweight as shown.

Dolly — 4-Axle (Load #41)

Trailer Load Visual



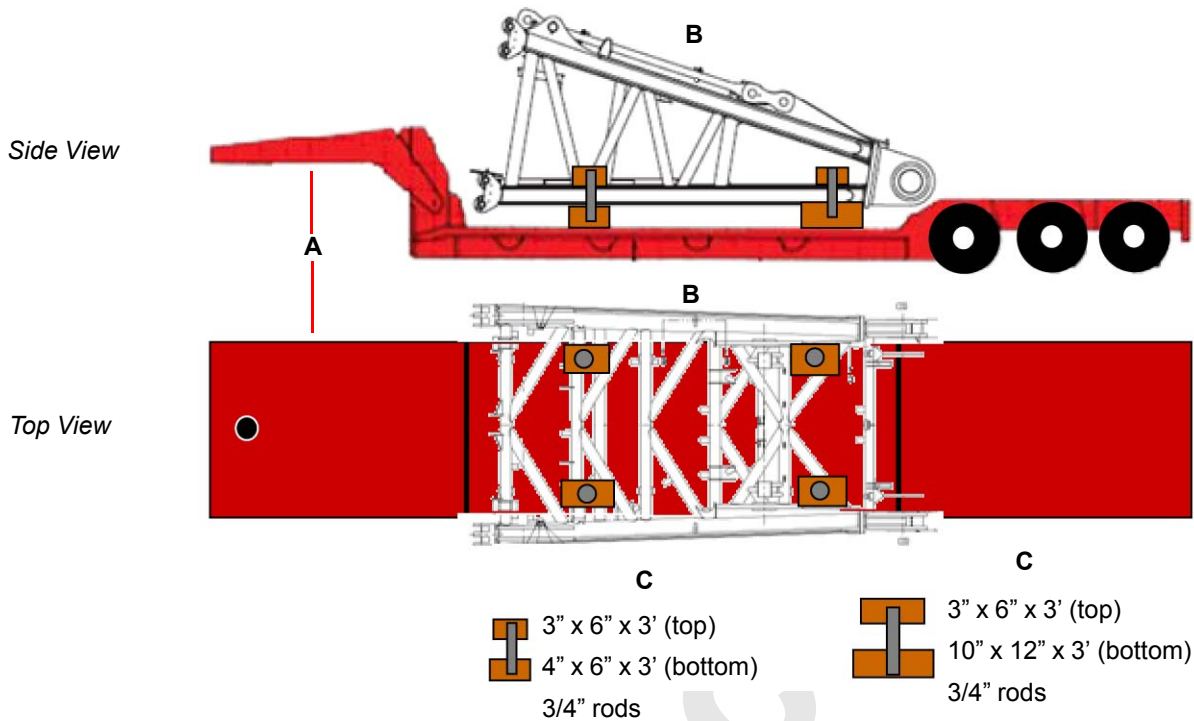
Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: (drop to end of trailer) 43' 6" • Width: 8' 6"
B	Dolly — 4-Axle (25,673 pounds): <ul style="list-style-type: none"> • Height: 8' 3" (2.5m) • Length: 19' 8" (6m) • Width: 8' 3" (2.5m)
C	Blocking kit #020 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #020 (see page 5-265).
2	Load the Dolly — 4-Axle as shown.

Boom Butt (Load #81)

Trailer Load Visual



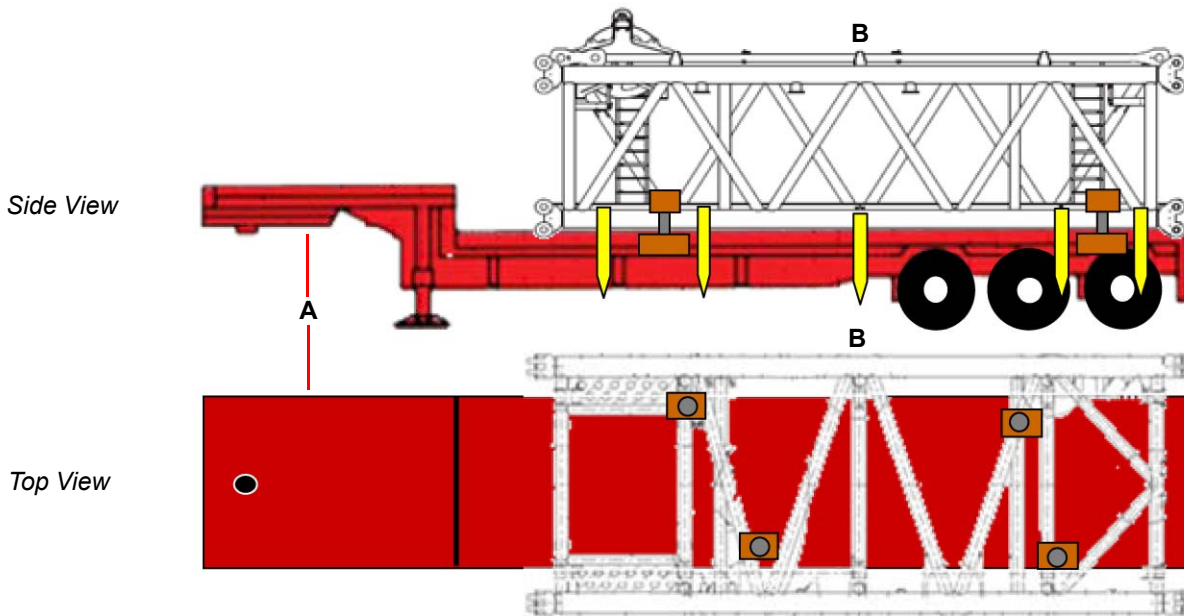
Item	Description
A	Trailer — 3-axle double drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 18" • Length: (1st drop to 2nd drop) 30' 11" • Width: 8' 6"
B	Boom Butt (60,720 pounds): <ul style="list-style-type: none"> • Height: 10' 6" (3.2m) • Length: 25' 3" (7.7m) • Width: 13' 2" (4.0m)
C	Blocking kit #007 (see page 5-265).


Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #007 (see page 5-265).
2	Load the Boom Butt as shown.

#90 Boom Insert with Rope Guide (Load #82)

Trailer Load Visual



- C**
- 3" x 6" x 3' (top)
 - 4" x 8" x 3' (bottom)
 - 3/4" x 15" rods
 - 3/4" x 17" rods
- 

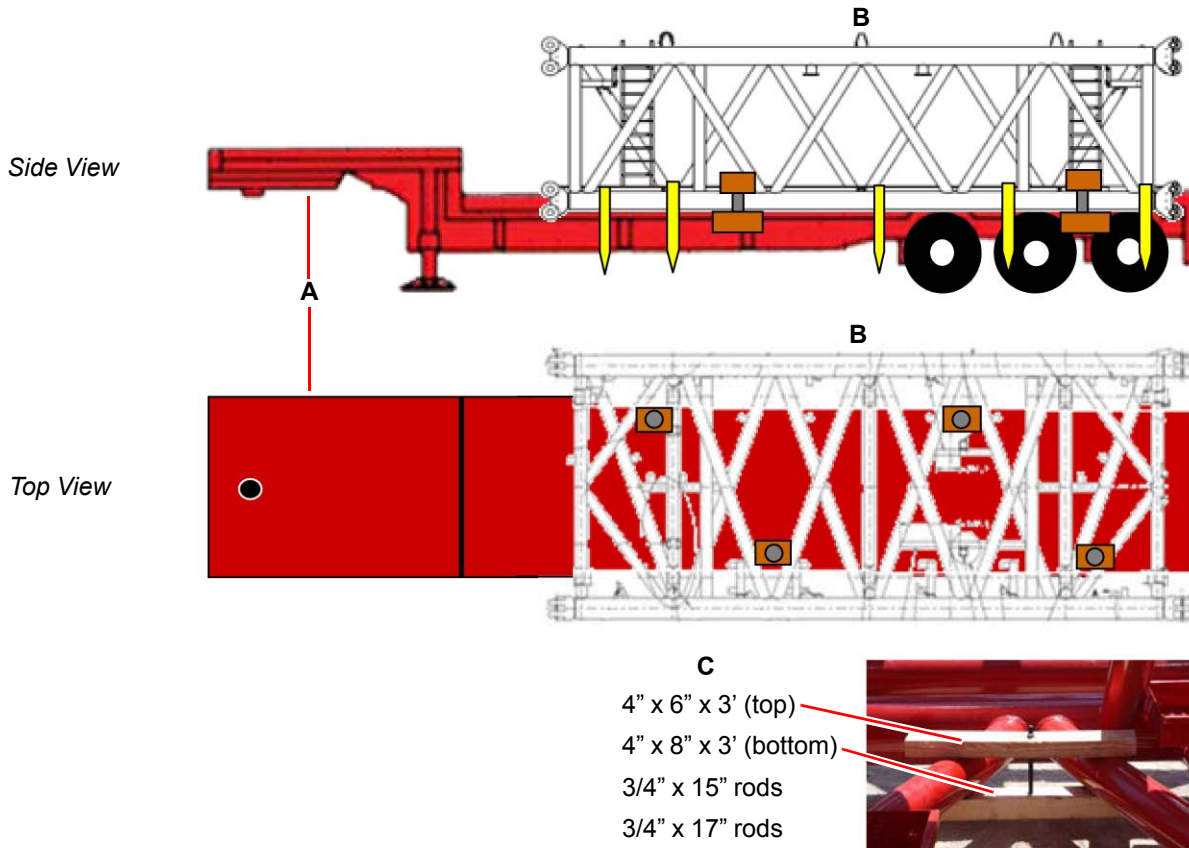
Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: (drop to end of trailer) 43' 6" • Width: 8' 6"
B	#90 Boom Insert with Rope Guide (55,133 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 33' 10" (10.3m) • Width: 13' 2" (4.0m)
C	Blocking kit #002 and #018 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #002 and #018 (see page 5-265).
2	Load the #90 Boom Insert with Rope Guide as shown. Suggested tie-downs: 10, 4-inch nylon straps.

#90 Boom Insert without Straps (Load #83)

Trailer Load Visual

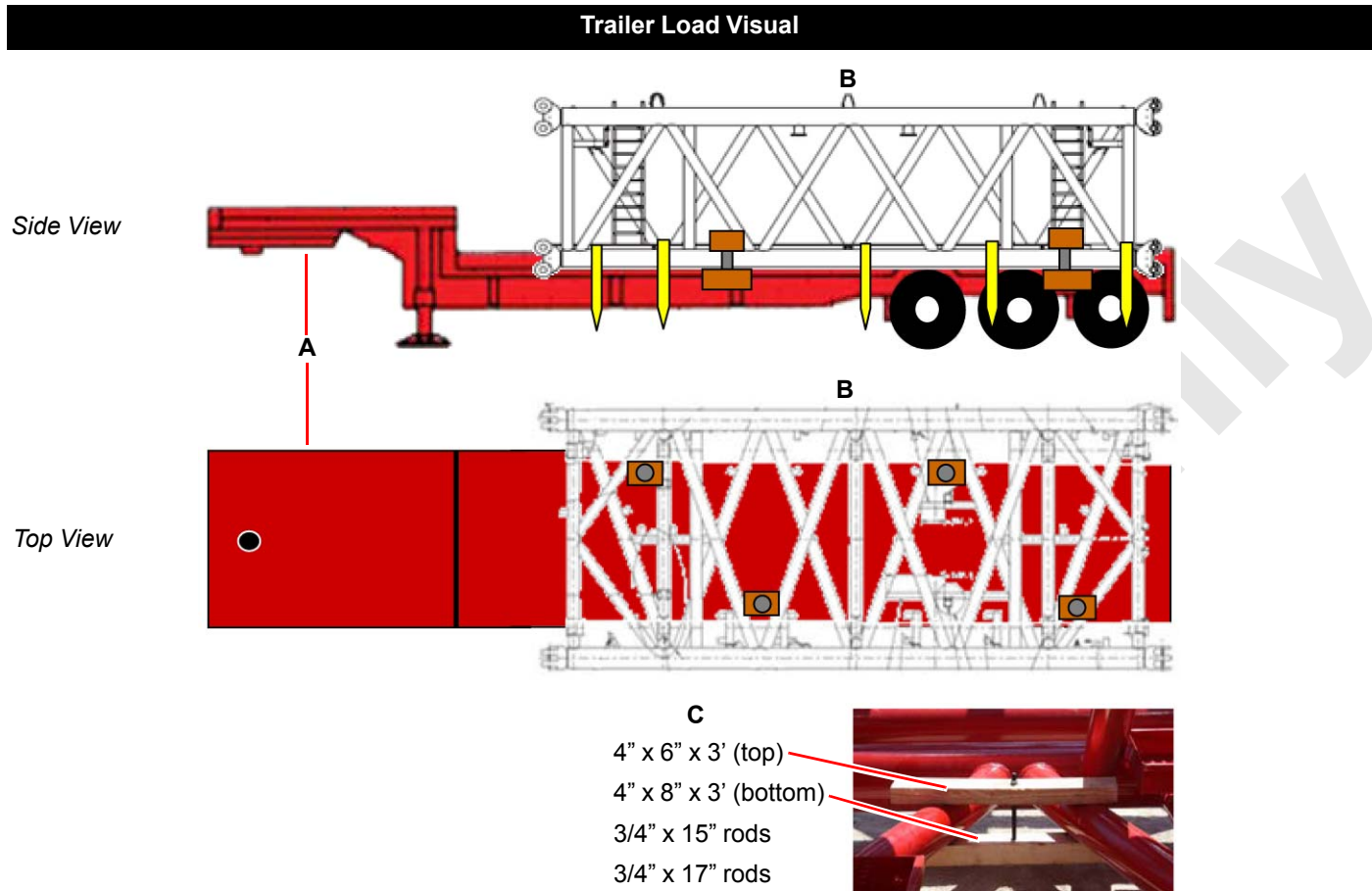


Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: (drop to end of trailer) 43' 6" • Width: 8' 6"
B	#90 Boom Insert without Straps (58,608 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 33' 10" (10.3m) • Width: 13' 2" (4.0m)
C	Blocking kit #002 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #002 (see page 5-265).
2	Load the #90 Boom Insert without Straps as shown. Suggested tie-downs: 10, 4-inch nylon straps.

#90 Boom Insert without Straps (Load #84)

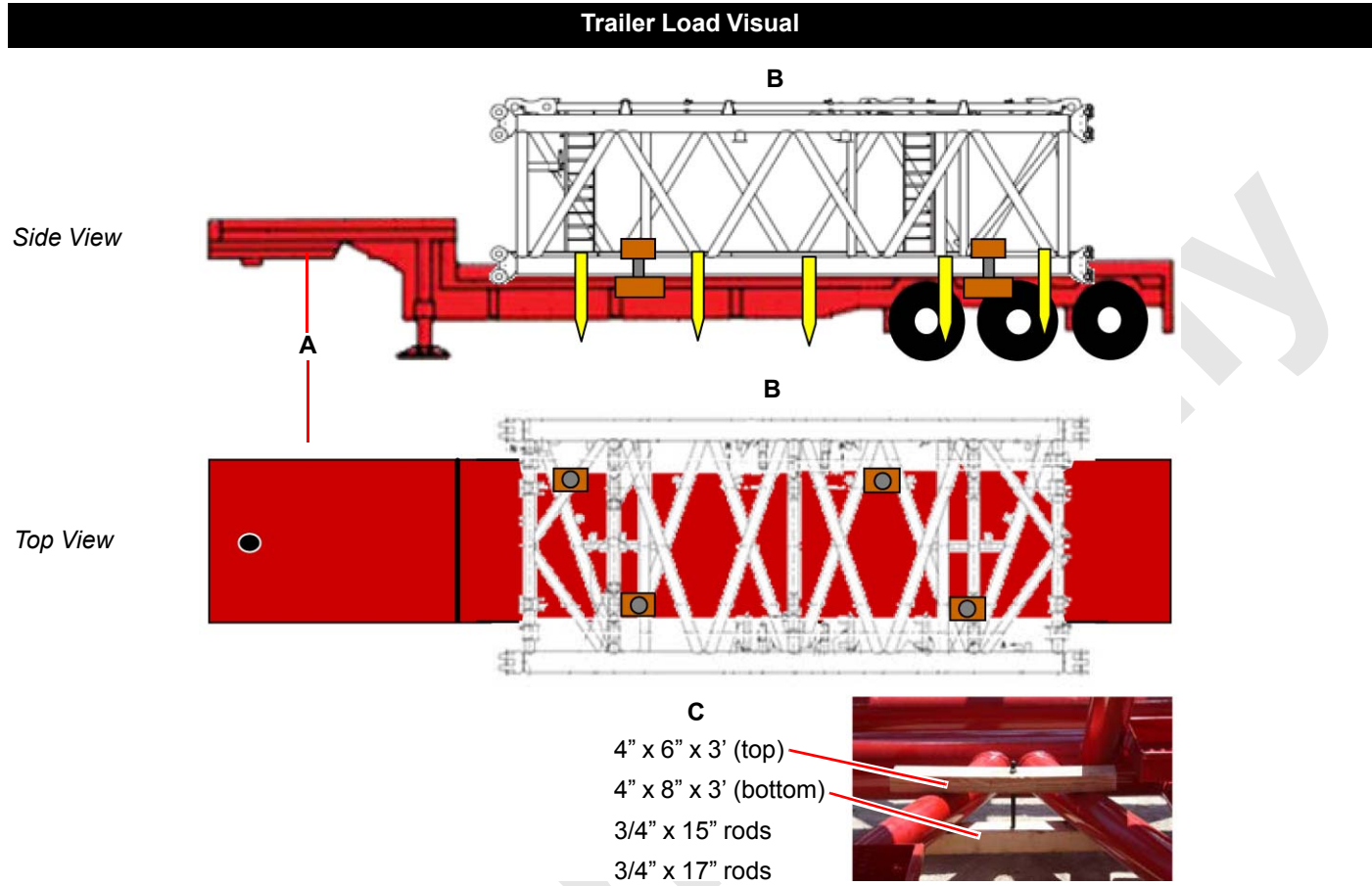


Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: (drop to end of trailer) 43' 6" • Width: 8' 6"
B	#90 Boom Insert without Straps (58,608 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 33' 10" (10.3m) • Width: 13' 2" (4.0m)
C	Blocking kit #002 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #002 (see page 5-265).
2	Load the #90 Boom Insert without Straps as shown. Suggested tie-downs: 10, 4-inch nylon straps.

#90 Boom Insert with Equalizer (Load #85)

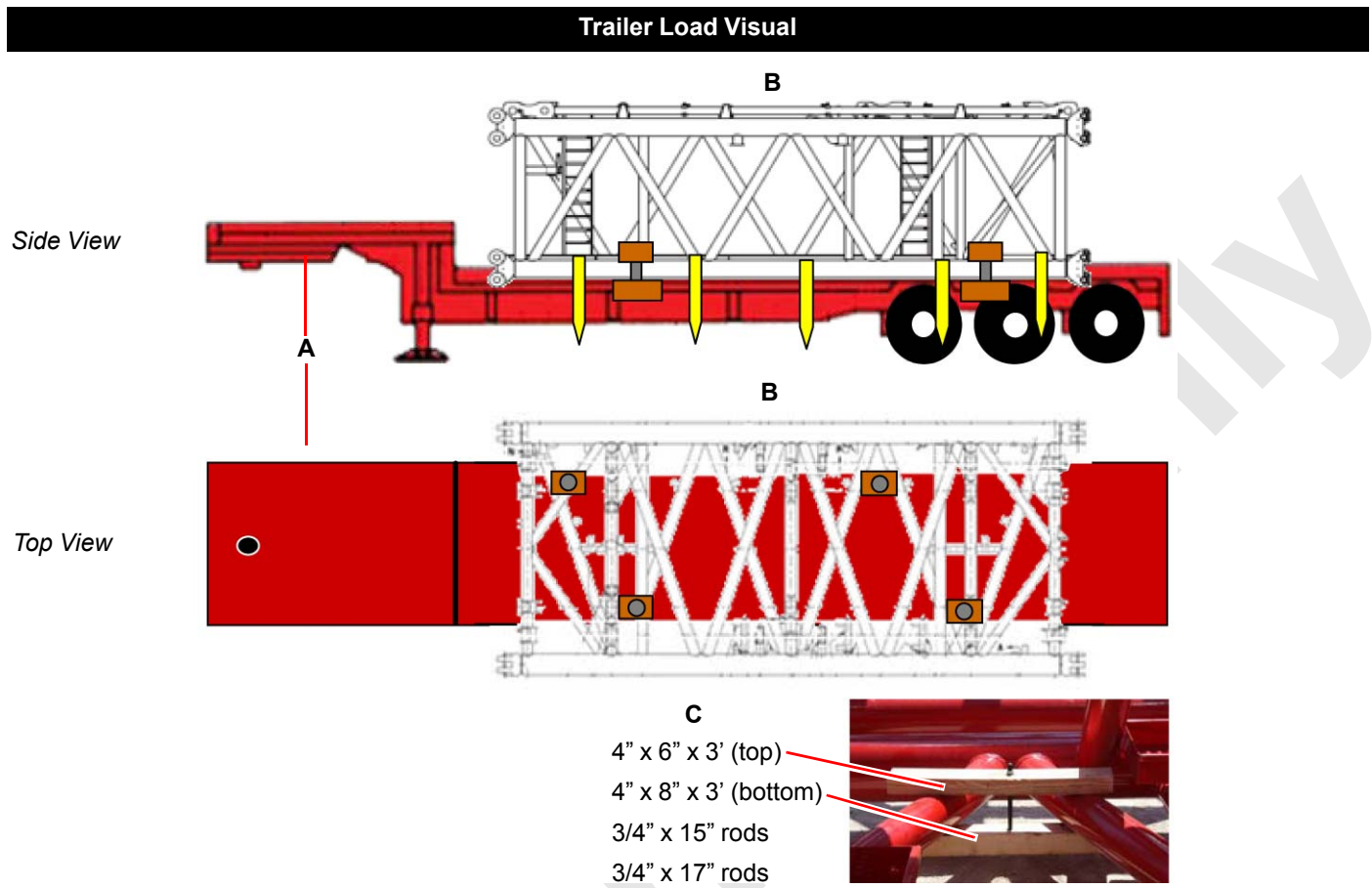


Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: (drop to end of trailer) 43' 6" • Width: 8' 6"
B	#90 Boom Insert without Straps (67,659 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 37' 9" (11.5m) • Width: 13' 2" (4.0m)
C	Blocking kit #002 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #002 (see page 5-265).
2	Load the #90 Boom Insert without Straps as shown. Suggested tie-downs: 10, 4-inch nylon straps.

#90 Boom Insert with Straps (Load #86 through Load #90)

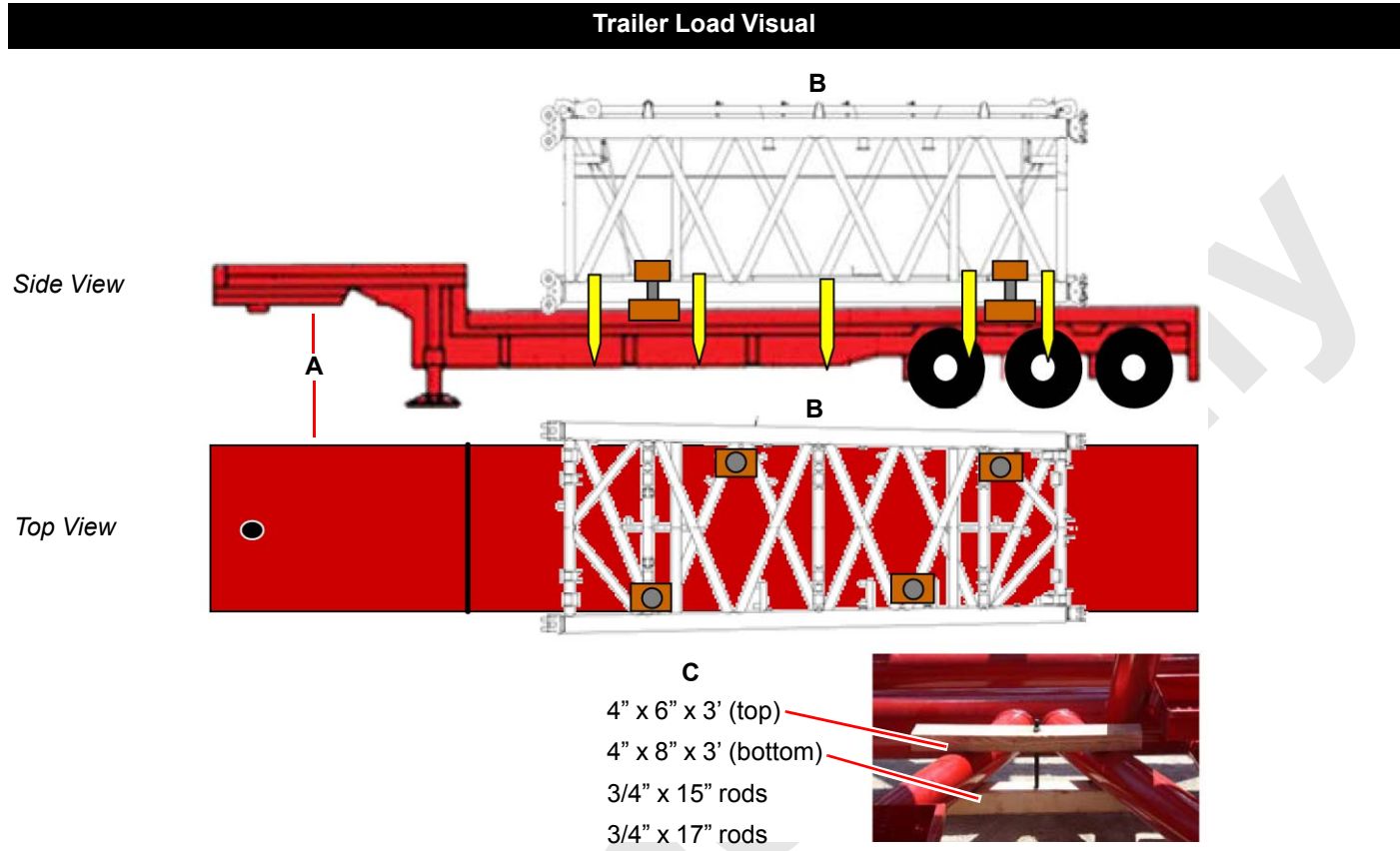


Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: (drop to end of trailer) 43' 6" • Width: 8' 6"
B	#90 Boom Insert with Straps (57,497 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 33' 10" (10.3m) • Width: 13' 2" (4.0m)
C	Blocking kit #002 and #018 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #002 and #018 (see page 5-265).
2	Load the #90 Boom Insert with Straps as shown. Suggested tie-downs: 10, 4-inch nylon straps.

#90/91 Insert Transition (Load #107)



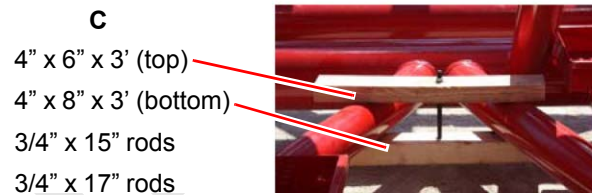
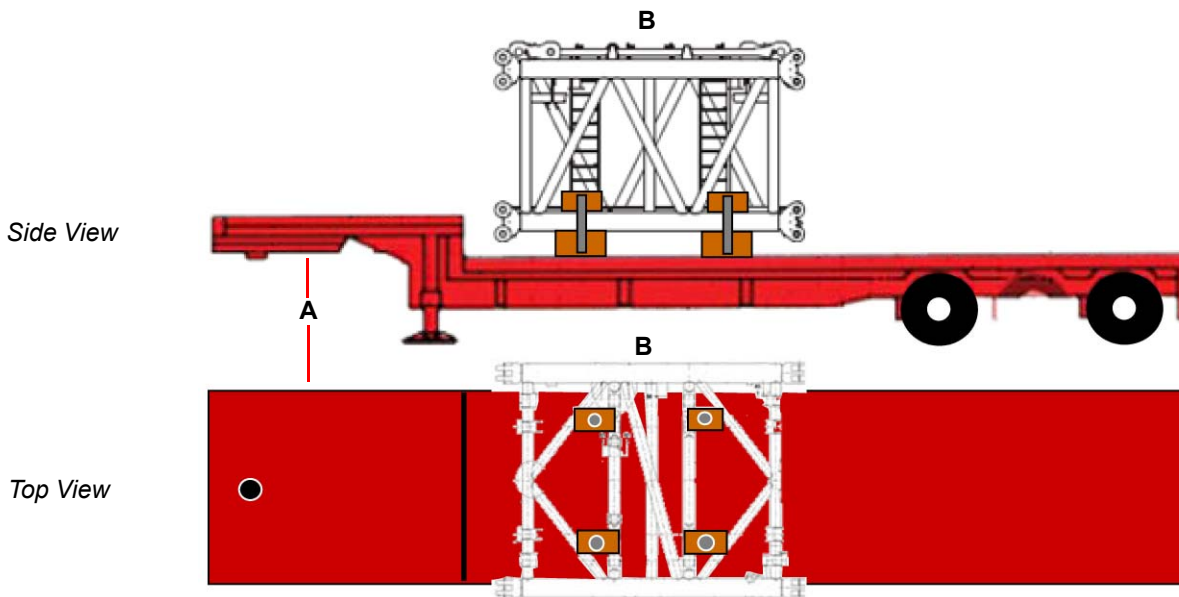
Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: (drop to end of trailer) 43' 6" • Width: 8' 6"
B	#90/91 Insert Transition (55,812 pounds): <ul style="list-style-type: none"> • Height: 11' 2" (3.4m) • Length: 33' 6" (10.2m) • Width: 13' (3.9m)
C	Blocking kit #002 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #002 (see page 5-265).
2	Load the #90/91 Insert Transition as shown. Suggested tie-downs: 10, 4-inch nylon straps.

#90 Boom Insert with Straps (Load #91)

Trailer Load Visual



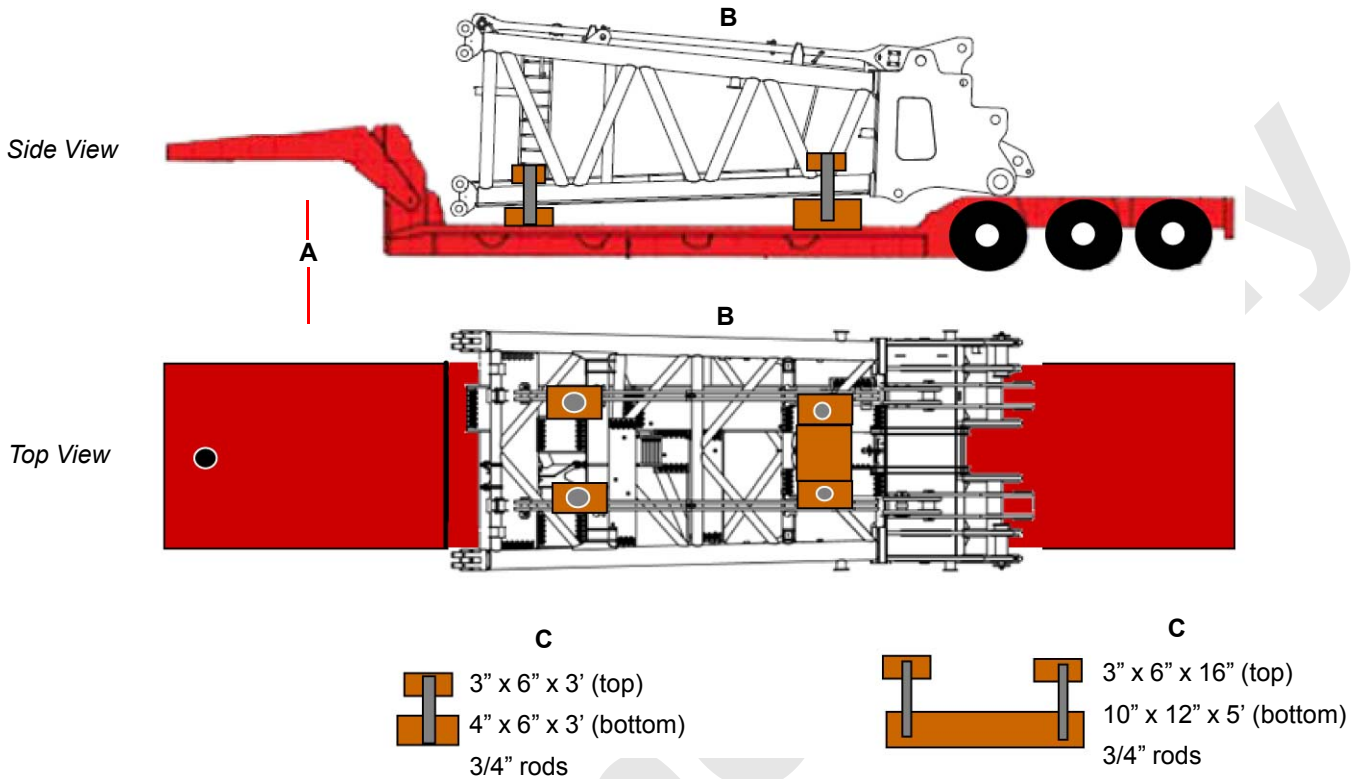
Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: (drop to end of trailer) 43' 6" • Width: 8' 6"
B	Boom Insert with Straps (35,035 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 17' 4" (5.3m) • Width: 13' 2" (4.0m)
C	Blocking kit #002 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #002 (see page 5-265).
2	Load the Boom Insert with Straps as shown. Suggested tie-downs: 10, 4-inch nylon straps.

#90 Boom Top (Load #92)

Trailer Load Visual



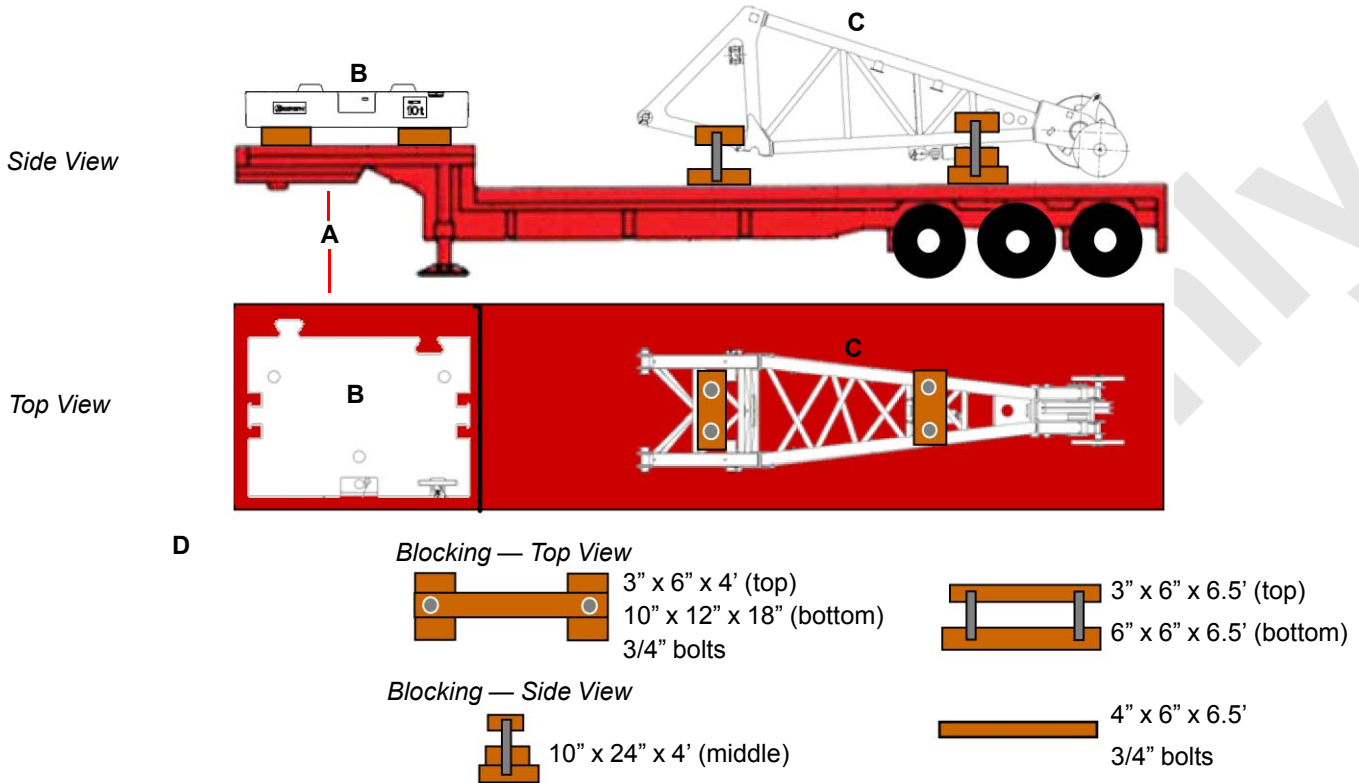
Item	Description
A	Trailer — 3-axle double drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 18" • Length: (1st drop to 2nd drop) 30' 11" • Width: 8' 6"
B	Boom Top (82,980 pounds): <ul style="list-style-type: none"> • Height: 10' 6" (3.2m) • Length: 31' 10" (9.7m) • Width: 13' 2" (4.0m)
C	Blocking kit #011 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #011 (see page 5-265).
2	Load the Boom Top as shown.

Upper Boom Point and Counterweight (Load #94)

Trailer Load Visual



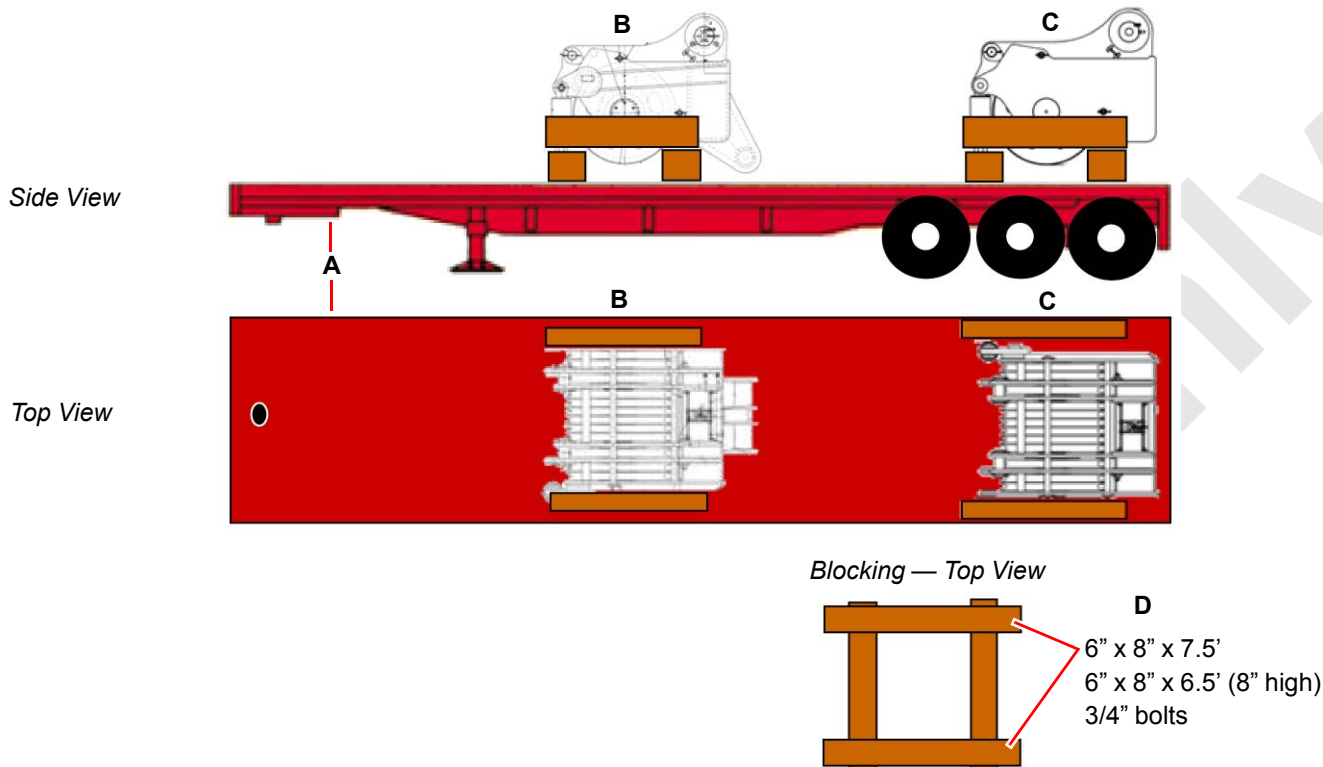
Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length: (drop to end of trailer) 43' 6" • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	Upper Boom Point (15,730 pounds): <ul style="list-style-type: none"> • Height: 9' 3" (2.8m) • Length: 29' 6" (9.0m) • Width: 7' 6" (2.3m)
D	Blocking kit #012 and #010 (see page 5-265).

Trailer Load Steps	
Step	Description
1	Cut and assemble blocking kit #012 and #010 (see page 5-265).
2	Load the Upper Boom Point as shown.
3	Load the Cast Counterweight as shown.

Reference Only

Lower Boom Point — RH and LH (Load #93)

Trailer Load Visual



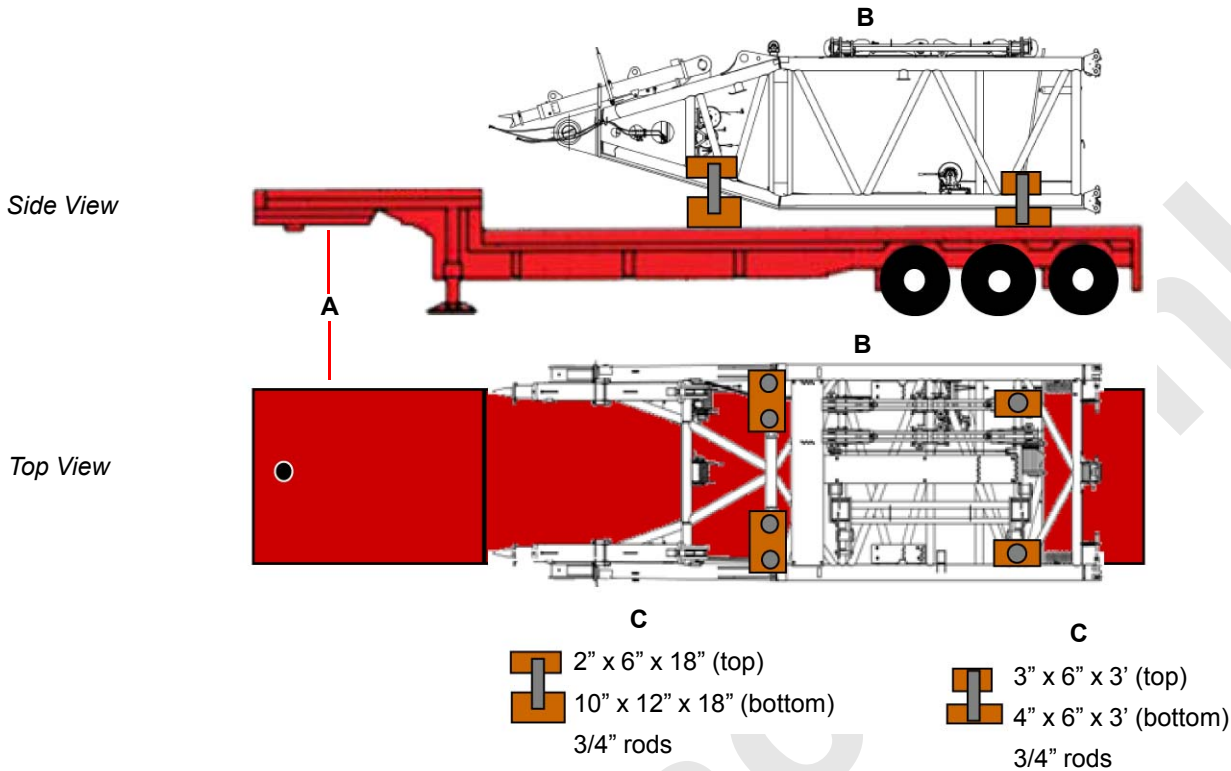
Item	Description
A	Trailer — 3-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length: 48' • Width: 8' 6"
B	Lower Boom Point — RH (23,369 pounds): <ul style="list-style-type: none"> • Height: 6' 3" (1.9m) • Length: 7' 7" (2.3m) • Width: 6' 7" (2.0m)
C	Lower Boom Point — LH (23,369 pounds): <ul style="list-style-type: none"> • Height: 6' 3" (1.9m) • Length: 7' 7" (2.3m) • Width: 6' 7" (2.0m)
D	Blocking kit #021 (see page 5-265).

Trailer Load Steps	
Step	Description
1	Cut and assemble blocking kit #021 (see page 5-265).
2	Load the Lower Boom Point — RH as shown.
3	Load the Lower Boom Point — LH as shown.

Reference Only

#91 Butt Assembly — 10m (Load #109)

Trailer Load Visual



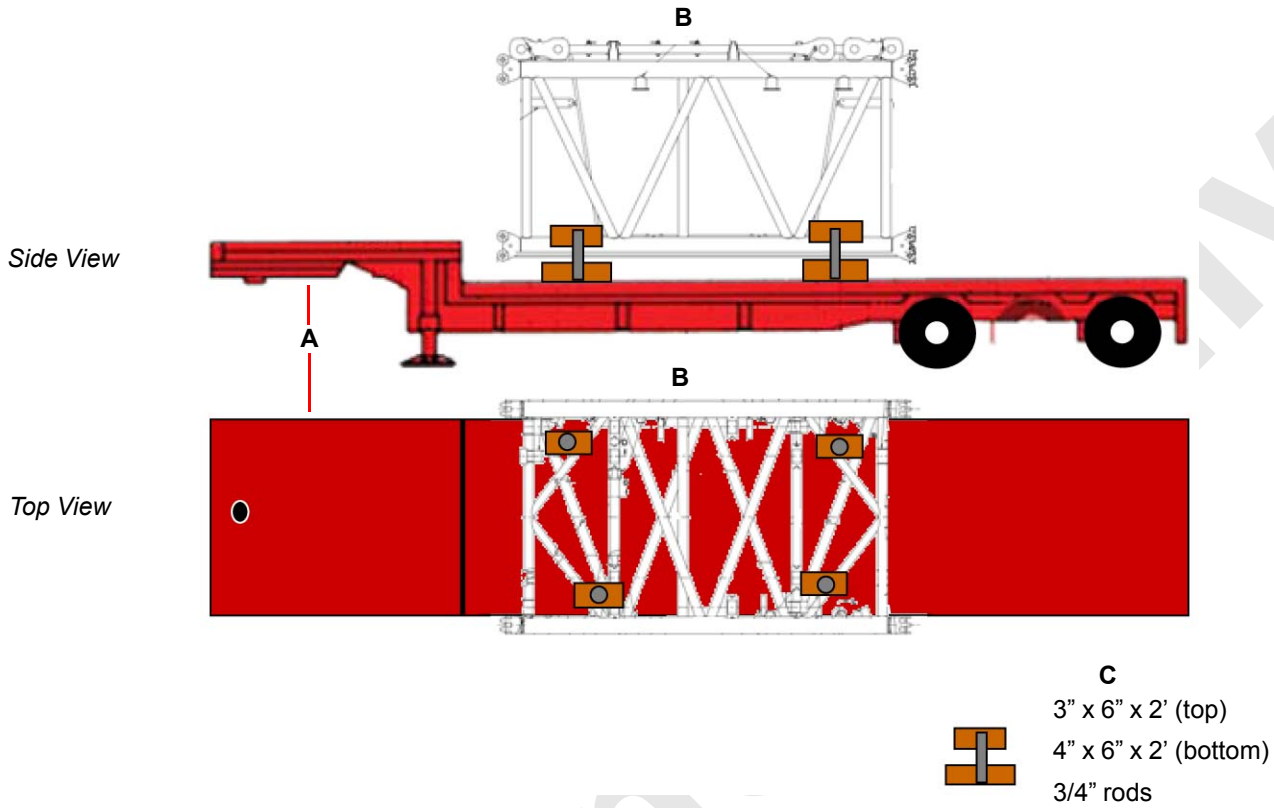
Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	#91 Butt Assembly — 10m (49,428 pounds): <ul style="list-style-type: none"> • Height: 10' 6" (3.2m) • Length: 8' 6" (2.6m) • Width: 11' 6" (3.5m)
C	Blocking kit #035 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #035 (see page 5-265).
2	Load the Lower Boom Point — RH as shown.

#91 Reinforced Insert — 6m (Load #110)

Trailer Load Visual



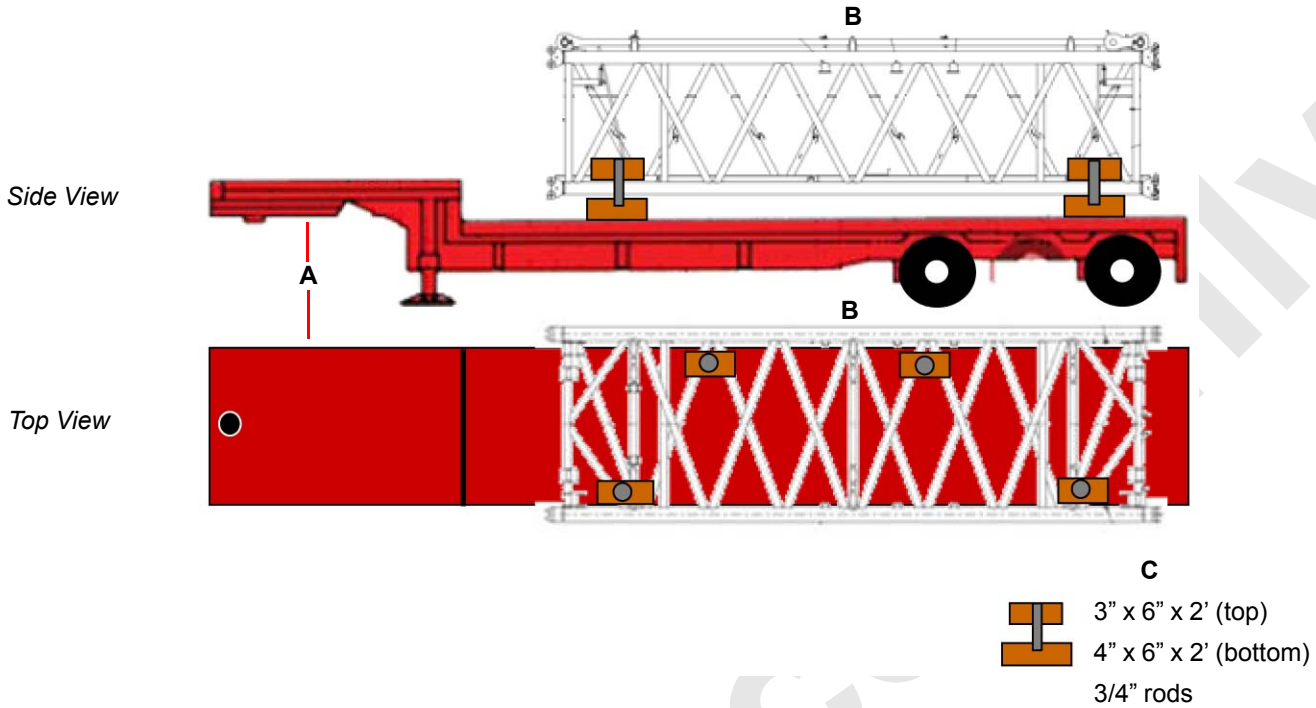
Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	#91 Reinforced Insert — 6m (26,436 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 20' (6.1m) • Width: 11' 6" (3.5m)
C	Blocking kit #036 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #036 (see page 5-265).
2	Load the #91 Reinforced Insert — 6m as shown.

#91 Insert without Backstays — 12m (Load #111 through Load #116)

Trailer Load Visual



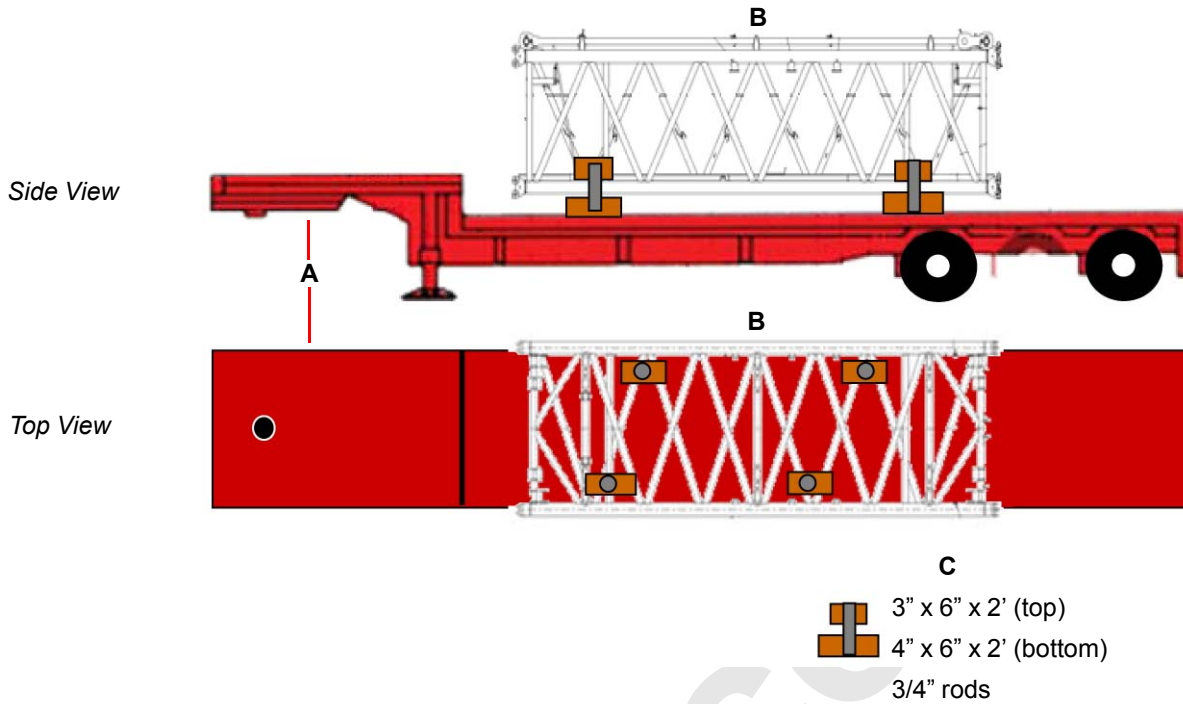
Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	#91 Insert without Backstays — 12m (35,455 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 39' 8" (12.1m) • Width: 11' 6" (3.5m)
C	Blocking kit #036 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #036 (see page 5-265).
2	Load the #91 Insert without Backstays — 12m as shown.

#91 Insert — 12m (Load #117)

Trailer Load Visual

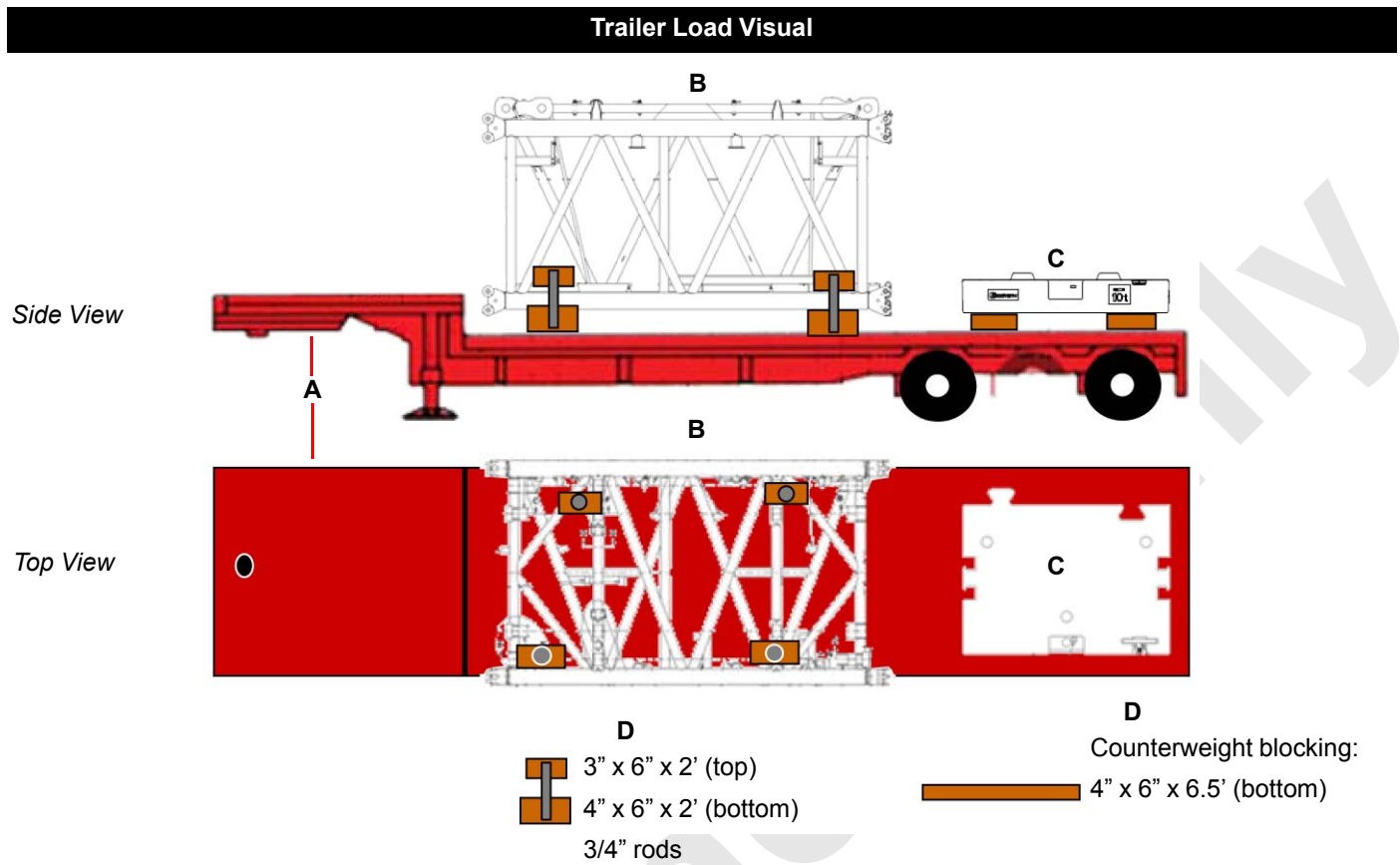


Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	#91 Insert — 12m (28,000 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 39' 8" (12.1m) • Width: 11' 6" (3.5m)
C	Blocking kit #036 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #036 (see page 5-265).
2	Load the #91 Insert — 12m as shown.

#91 Insert — 6m and Counterweight (Load #118)



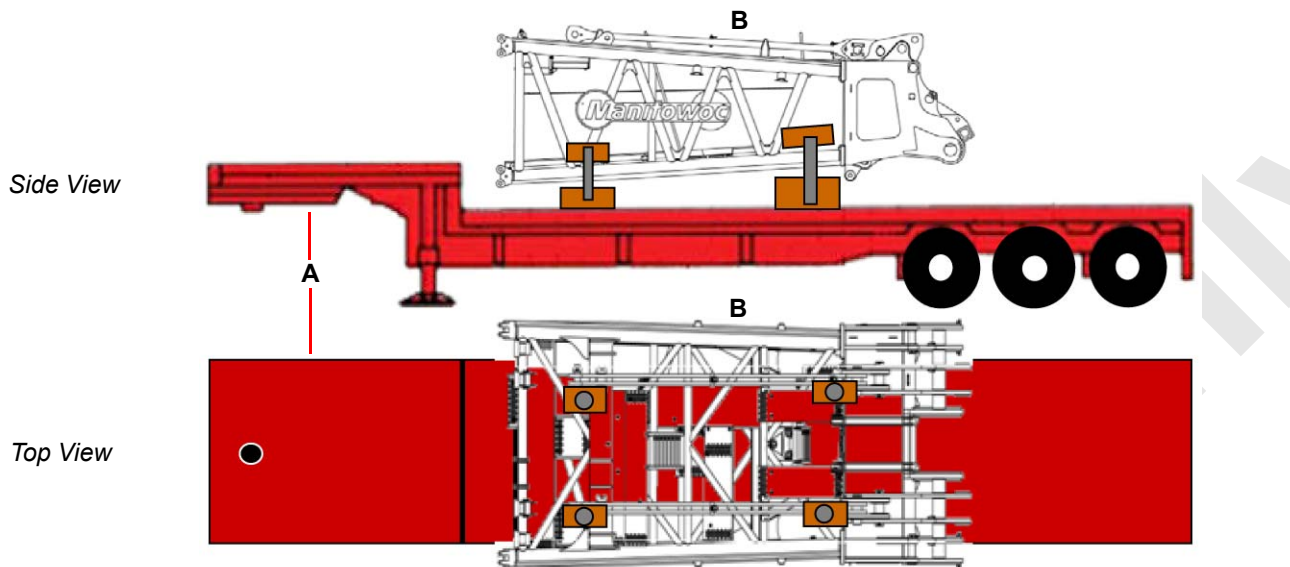
Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	#91 Insert — 6m (16,050 pounds): <ul style="list-style-type: none"> • Height: 10' 2" (3.1m) • Length: 39' 8" (12.1m) • Width: 11' 6" (3.5m)
C	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
D	Blocking kit #036 and #010 (see page 5-265).




Trailer Load Steps	
Step	Description
1	Cut and assemble blocking kit #036 and #010 (see page 5-265).
2	Load the #91 Insert — 6m as shown.
3	Load the Cast Counterweight as shown.

Reference Only

#91 Boom Top (Load #119)

Trailer Load Visual



- C**
- | | | | |
|--|------------------------|--|--------------------------|
|  | 3" x 6" x 18" (top) |  | 10" x 12" x 18" (bottom) |
|  | 4" x 6" x 18" (bottom) | | |
| | 2" x 2" x 12" | | |
| | 4" x 10" x 12" | | |
| | 3/4" rods | | |

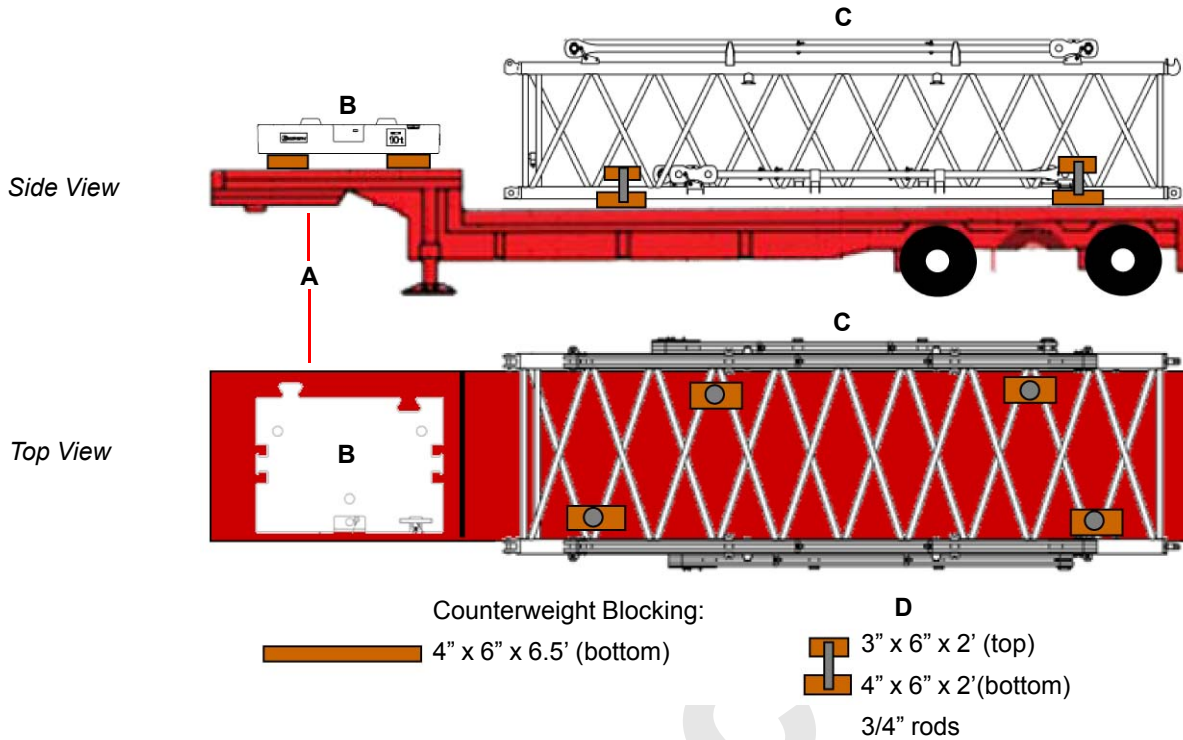
Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	#91 Boom Top (66,365 pounds): <ul style="list-style-type: none"> • Height: 10' 3" (3.1m) • Length: 11' 6" (3.5m) • Width: 11' 6" (3.5m)
C	Blocking kit #030 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #030 (see page 5-265).
2	Load the #91 Boom Top as shown.

#91 Insert — 12m and Counterweight (Load #101)

Trailer Load Visual



Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	#91 Insert — 12m (24,000 pounds): <ul style="list-style-type: none"> • Height: 9' 6" (2.9m) • Length: 40' 8" (12.4m) • Width: 11' 2" (3.4m)
D	Blocking kit #037 and #010 (see page 5-265).

Trailer Load Steps

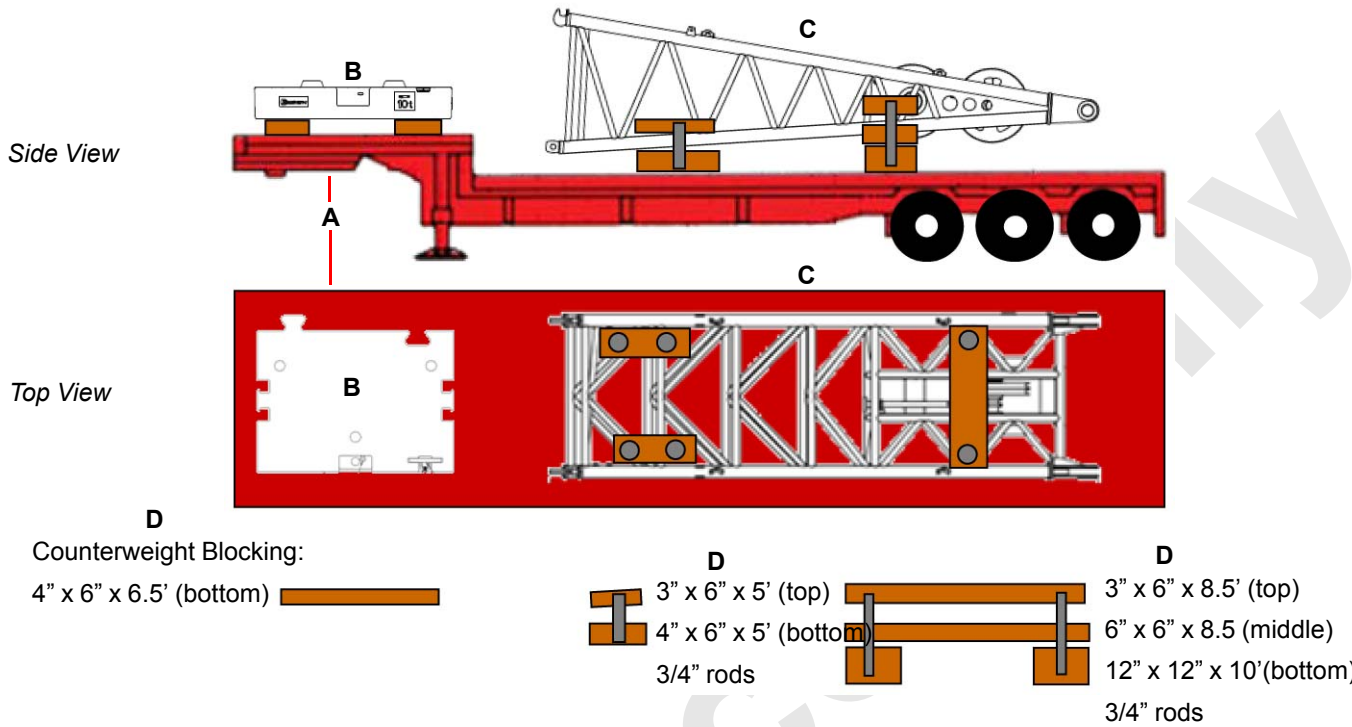
Step	Description
1	Cut and assemble blocking kit #037 and #010 (see page 5-265).

Trailer Load Steps	
Step	Description
2	Load the #91 Insert — 12 as shown.
3	Load the Cast Counterweight as shown.

Reference Only

Strut Assembly Butt — 9.5m and Counterweight (Load #100)

Trailer Load Visual



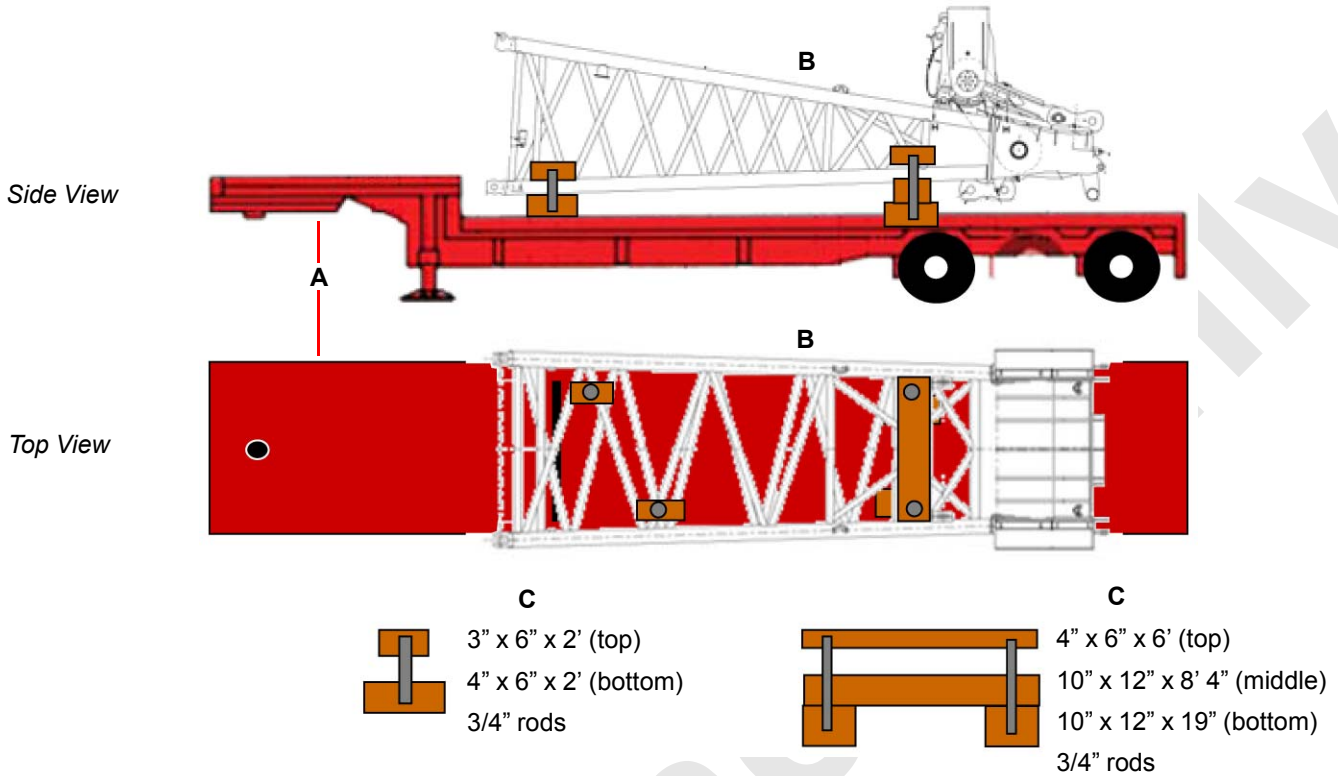
Item	Description
A	Trailer — 3-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	Strut Assembly Butt — 9.5m (17,100 pounds): <ul style="list-style-type: none"> • Height: 9' 6" (2.9m) • Length: 32' 6" (9.9m) • Width: 9' 10" (3.0m)
D	Blocking kit #017 and #010 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #017 and #010 (see page 5-265).
2	Load the Strut Assembly Butt — 9.5m as shown.
3	Load the Cast Counterweight as shown.

#91 Jib Top (Load #102)

Trailer Load Visual



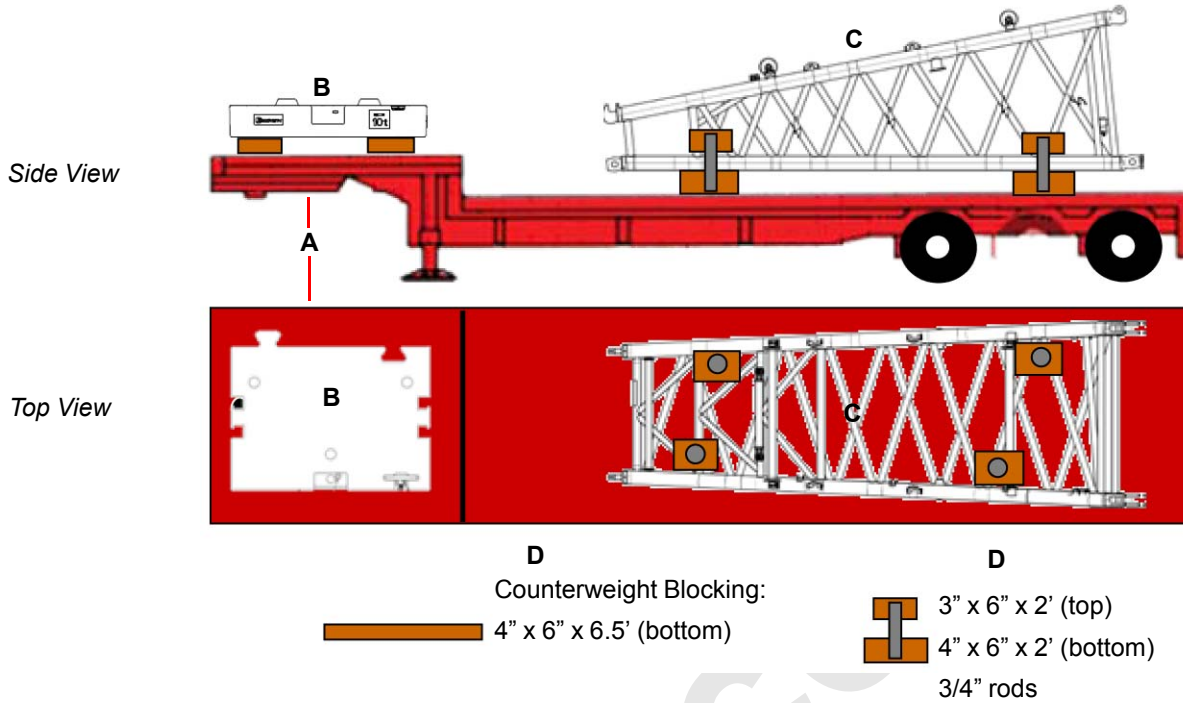
Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	#91 Jib Top (44,840 pounds): <ul style="list-style-type: none"> • Height: 9' 10" (3m) • Length: 32' 2" (9.8m) • Width: 10' 10" (3.3m)
C	Blocking kit #031 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #031 (see page 5-265).
2	Load the #91 Jib Top as shown.

Strut Transition Insert — 8m and Counterweight (Load #108)

Trailer Load Visual



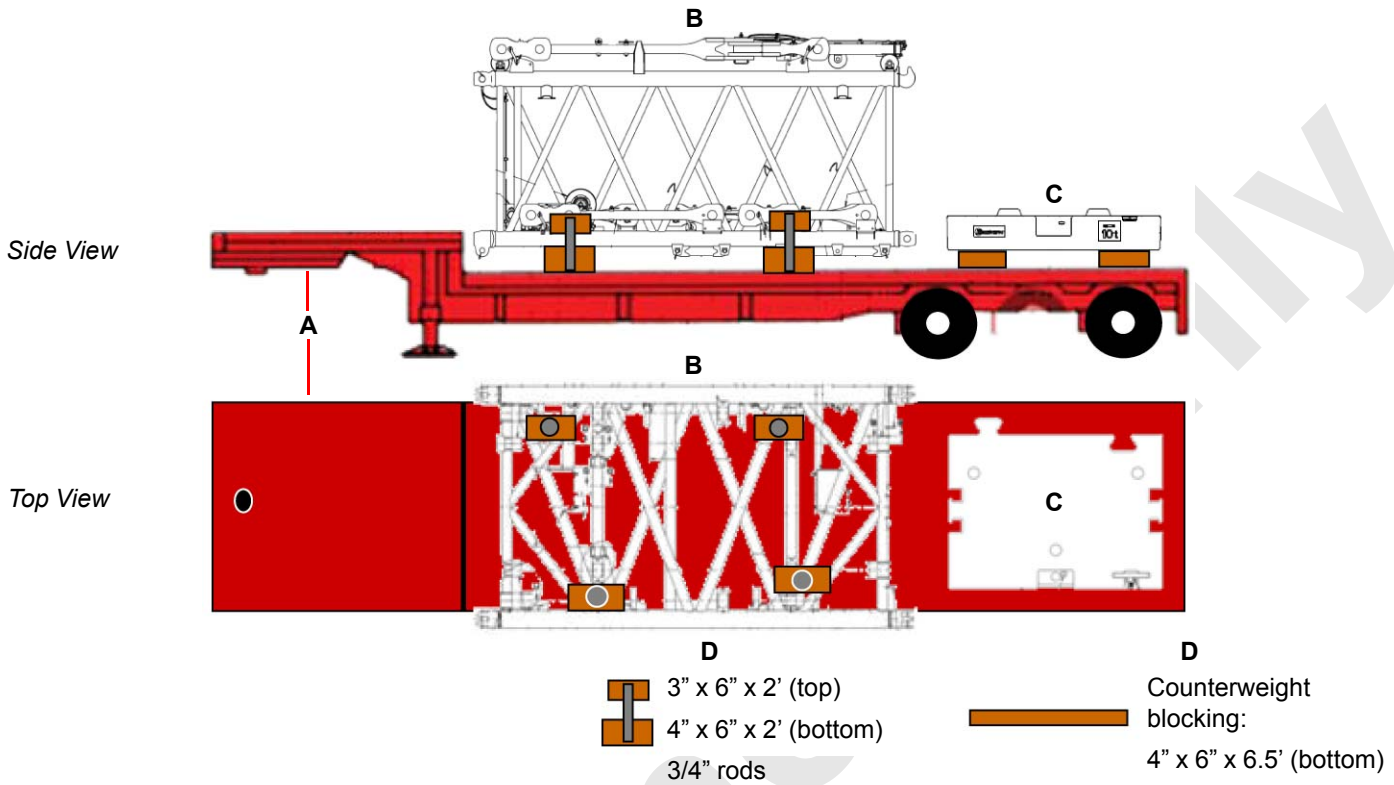
Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	Strut Transition Insert — 8m (10,000 pounds): <ul style="list-style-type: none"> • Height: 9' 10" (3m) • Length: 32' 2" (9.8m) • Width: 10' 10" (3.3m)
D	Blocking kit #037 and #010 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #037 and #010 (see page 5-265).
2	Load the Strut Transition Insert — 8m as shown.
3	Load the Cast Counterweight as shown.

#91 Insert — 6.1m and Counterweight (Load #103)

Trailer Load Visual



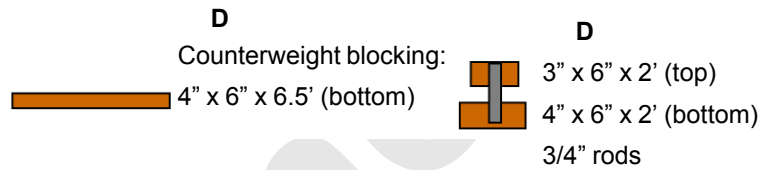
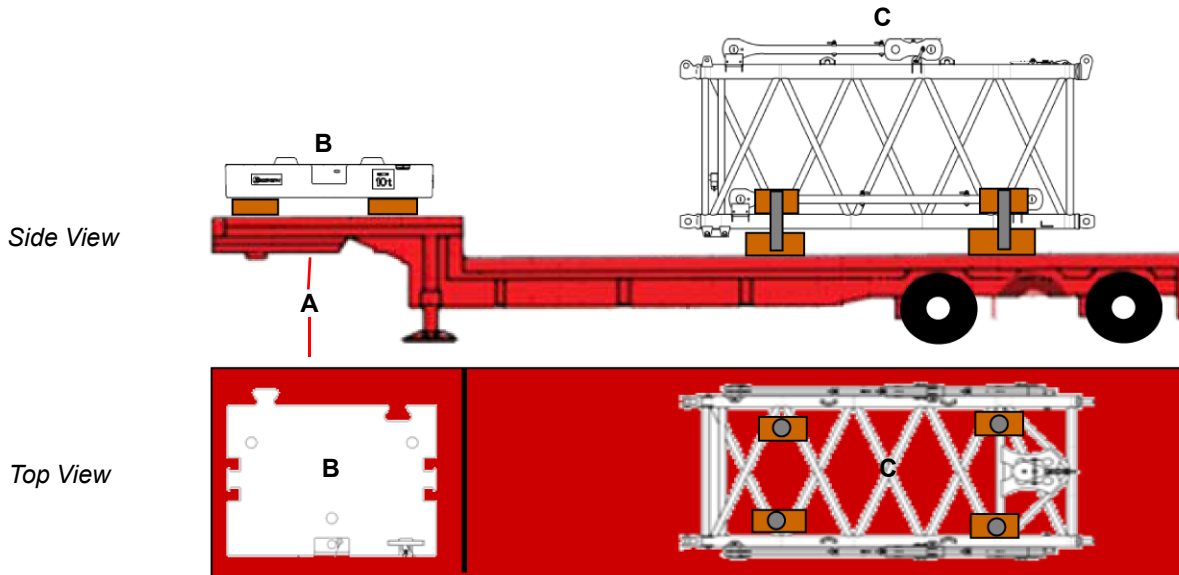
Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	#91 Insert — 6.1m (14,800 pounds): <ul style="list-style-type: none"> • Height: 10' 6" (3.2m) • Length: 20' 8" (6.3m) • Width: 11' 2" (3.4m)
C	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
D	Blocking kit #036 and #010 (see page 5-265).

Trailer Load Steps	
Step	Description
1	Cut and assemble blocking kit #036 and #010 (see page 5-265).
2	Load the #91 Insert — 6.1m as shown.
3	Load the Cast Counterweight as shown.

Reference Only

#91 Insert — 6.1m and Counterweight (Load #104)

Trailer Load Visual



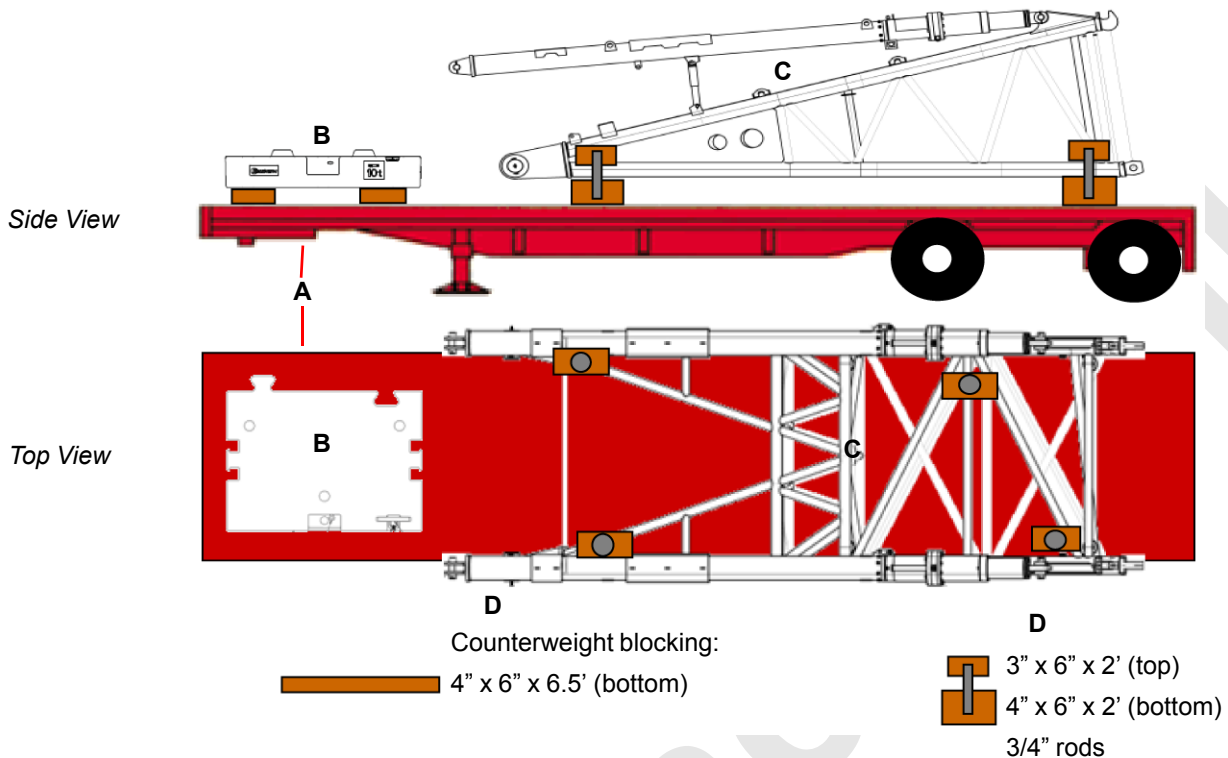
Item	Description
A	Trailer — 2-axle single drop: <ul style="list-style-type: none"> • Height (ground to top of bed): 35" • Length (drop to end of trailer): 43' 6" • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	#91 Insert — 6.1m (14,707 pounds): <ul style="list-style-type: none"> • Height: 9' 6" (2.9m) • Length: 20' 10" (6.34m) • Width: 4' 7" (1.4m)
D	Blocking kit #037 and #010 (see page 5-265).

Trailer Load Steps	
Step	Description
1	Cut and assemble blocking kit #037 and #010 (see page 5-265).
2	Load the #91 Insert — 6.1m as shown.
3	Load the Cast Counterweight as shown.

Reference Only

#91 Strut Butt and Counterweight (Load #105)

Trailer Load Visual



Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	#91 Strut Butt (21,200 pounds): <ul style="list-style-type: none"> • Height: 7' 6" (2.3m) • Length: 29' 10" (9.1m) • Width: 10' 10" (3.3m)
D	Blocking kit #037 and #010 (see page 5-265).

Trailer Load Steps

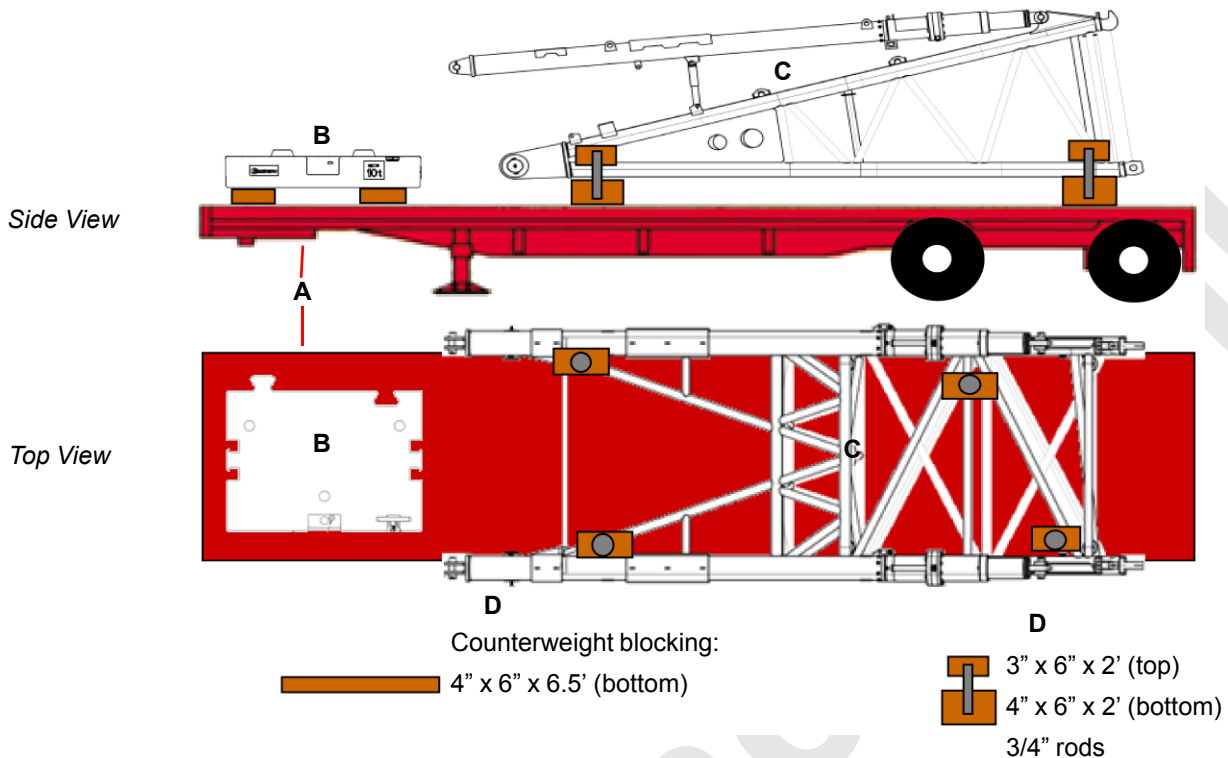
Step	Description
1	Cut and assemble blocking kit #037 and #010 (see page 5-265).

Trailer Load Steps	
Step	Description
2	Load the #91 Strut Butt as shown.
3	Load the Cast Counterweight as shown.

Reference Only

#91 Strut Butt and Counterweight (Load #106)

Trailer Load Visual



Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	#91 Strut Butt (21,200 pounds): <ul style="list-style-type: none"> • Height: 7' 6" (2.3m) • Length: 29' 10" (9.1m) • Width: 10' 10" (3.3m)
D	Blocking kit #037 and #010 (see page 5-265).

Trailer Load Steps

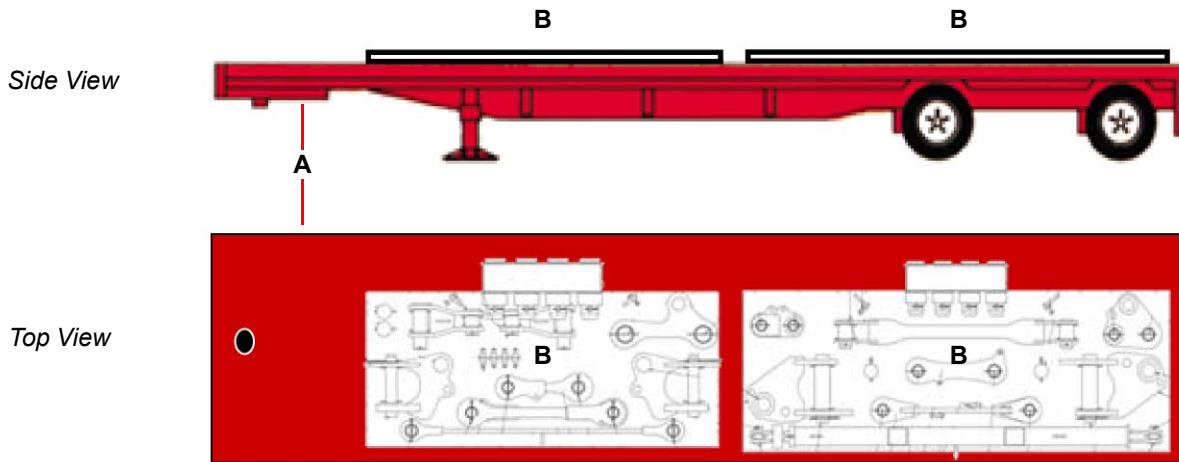
Step	Description
1	Cut and assemble blocking kit #037 and #010 (see page 5-265).

Trailer Load Steps	
Step	Description
2	Load the #91 Strut Butt as shown.
3	Load the Cast Counterweight as shown.

Reference Only

Intermediate Suspension (Load #120)

Trailer Load Visual



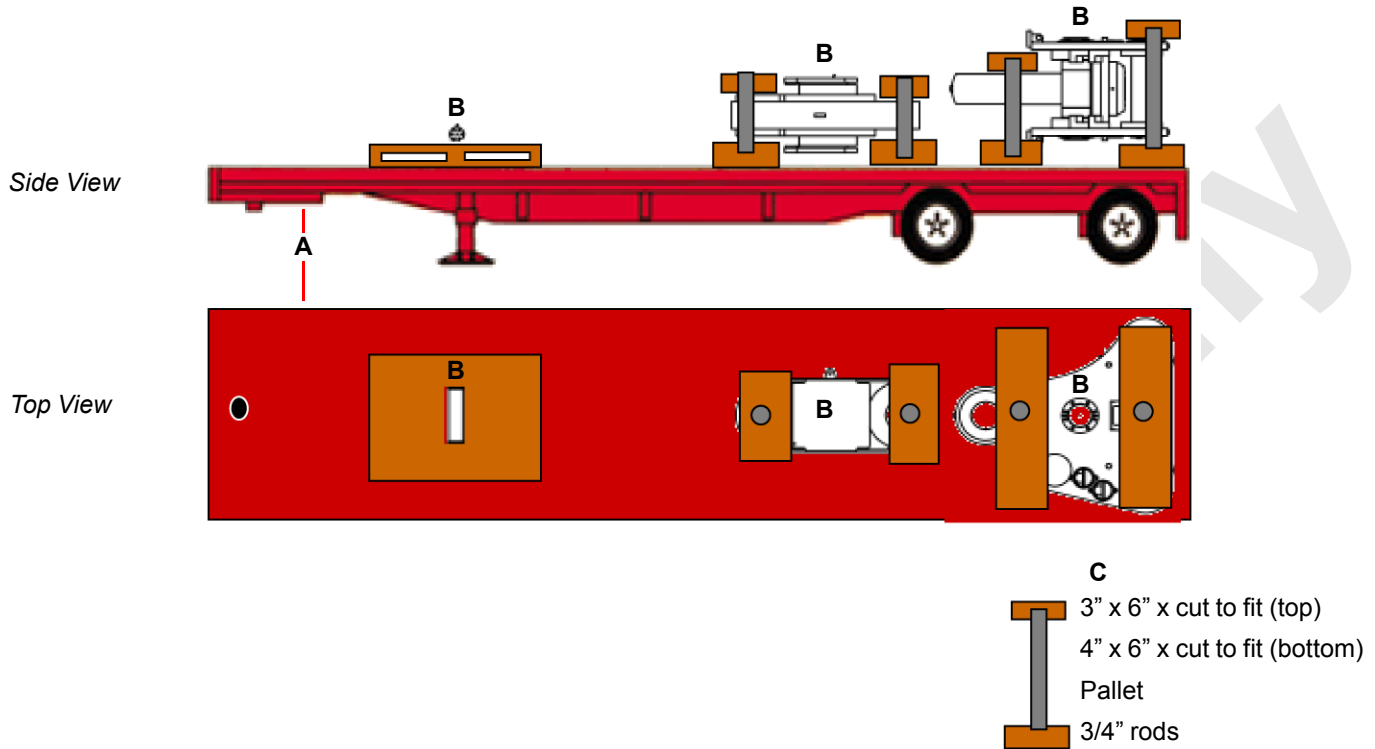
Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Intermediate Suspension (2,754 + 2,365 = 5,119 pounds): <ul style="list-style-type: none"> • Height: • Length: 23' (7m) • Width: 4' 10" (1.5m)

Trailer Load Steps

Step	Description
1	Use fixture kit A010 (see page 5-266).
2	Load the Intermediate Suspension as shown.

Block Hook Equalizer (Load #96)

Trailer Load Visual



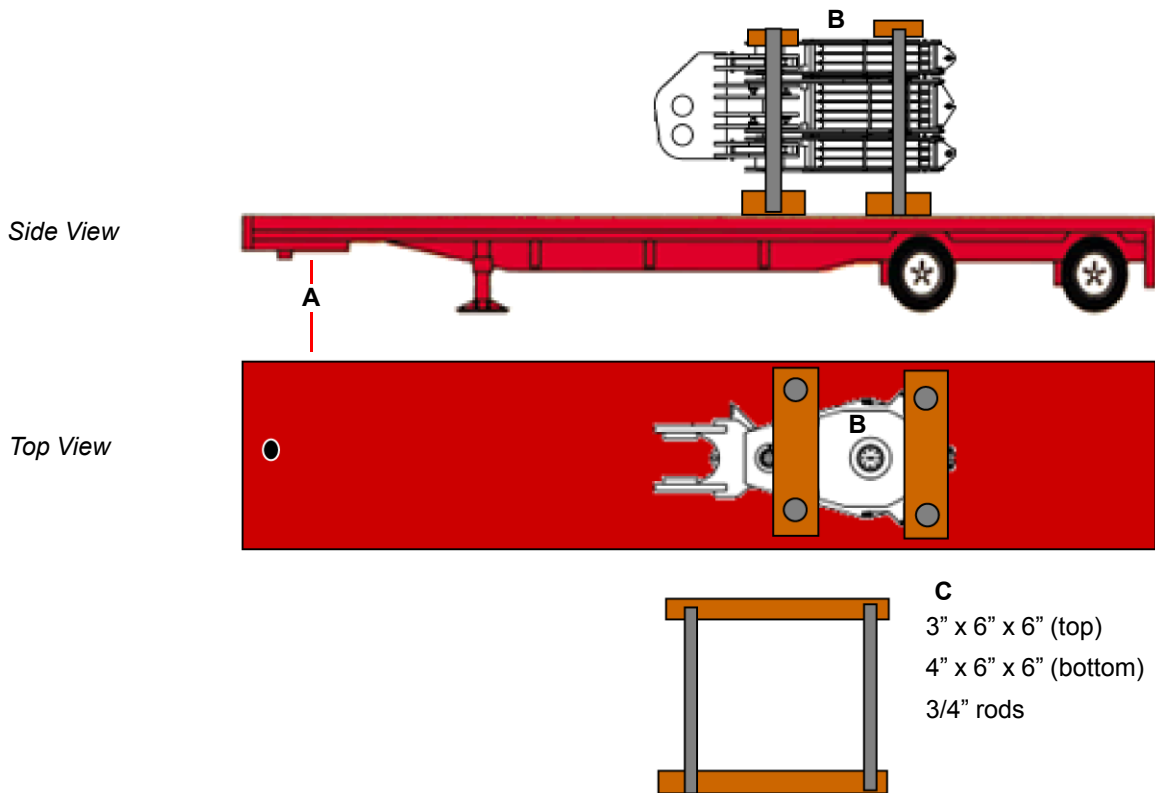
Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Block Hook Equalizer (45,000 pounds): <ul style="list-style-type: none"> • Height: 5' 3" (1.6m) • Length: 47' 11" (14.6m) • Width: 8' 7" (2.6m)
C	Blocking kit #016 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #016 (see page 5-265).
2	Load the Block Hook Equalizer as shown.

Block Assembly LT (Load #97)

Trailer Load Visual



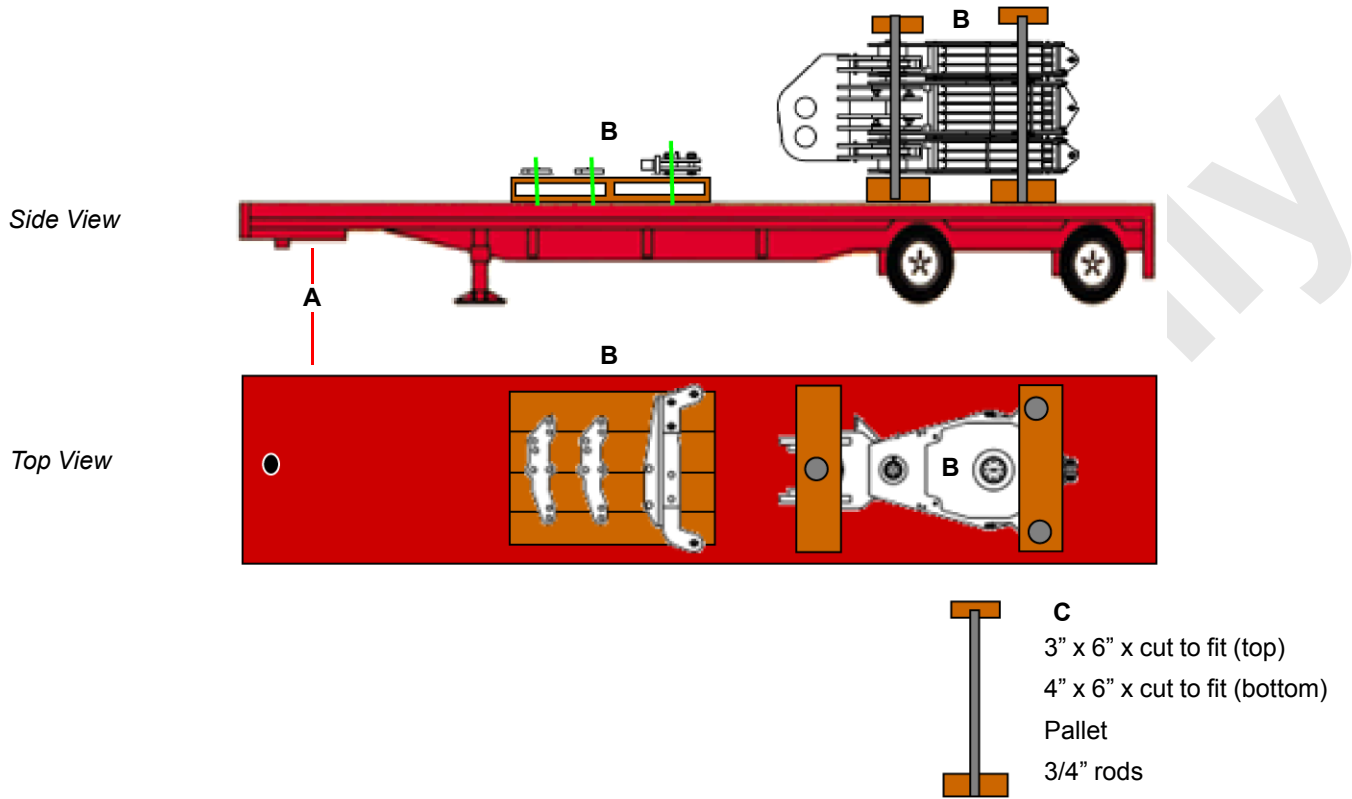
Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Block Assembly LT (30,515 pounds): <ul style="list-style-type: none"> • Height: 5' 3" (1.6m) • Length: 12' 1" (3.7m) • Width: 5' 3" (1.6m)
C	Blocking kit #025 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #025 (see page 5-265).
2	Load the Block Assembly LT as shown.

Block Assembly (Load #98)

Trailer Load Visual



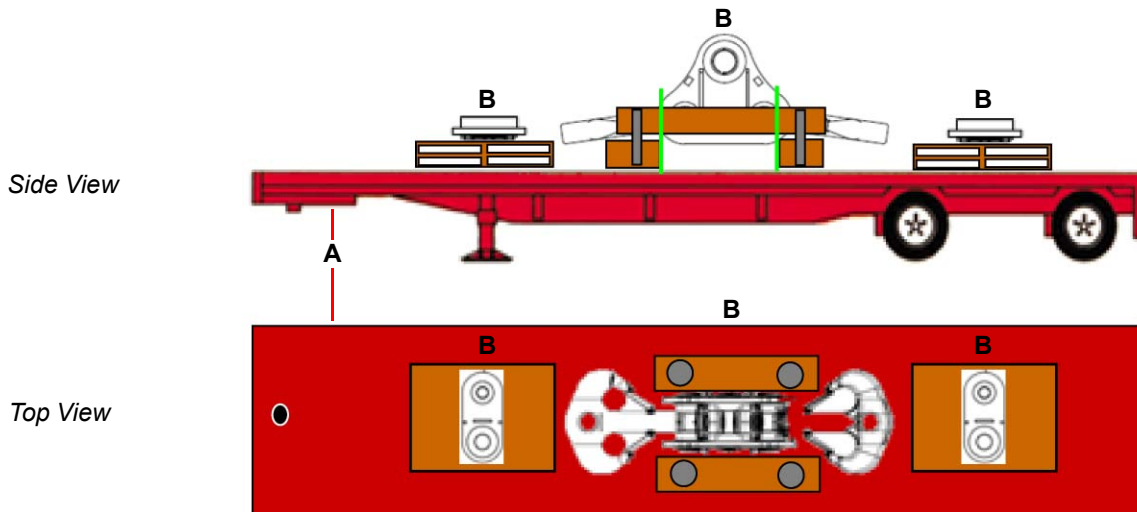
Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Block Assembly (32,585 pounds): <ul style="list-style-type: none"> • Height: 5' 3" (1.6m) • Length: 47' 11" (14.6m) • Width: 8' 7" (2.6m)
C	Blocking kit #024 (see page 5-265).

Trailer Load Steps

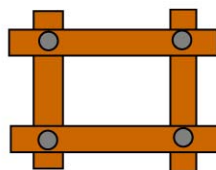
Step	Description
1	Cut and assemble blocking kit #024 (see page 5-265).
2	Load the Block Assembly as shown.

Hook Assembly and Hook Block (Load #99)

Trailer Load Visual



Blocking — Top View



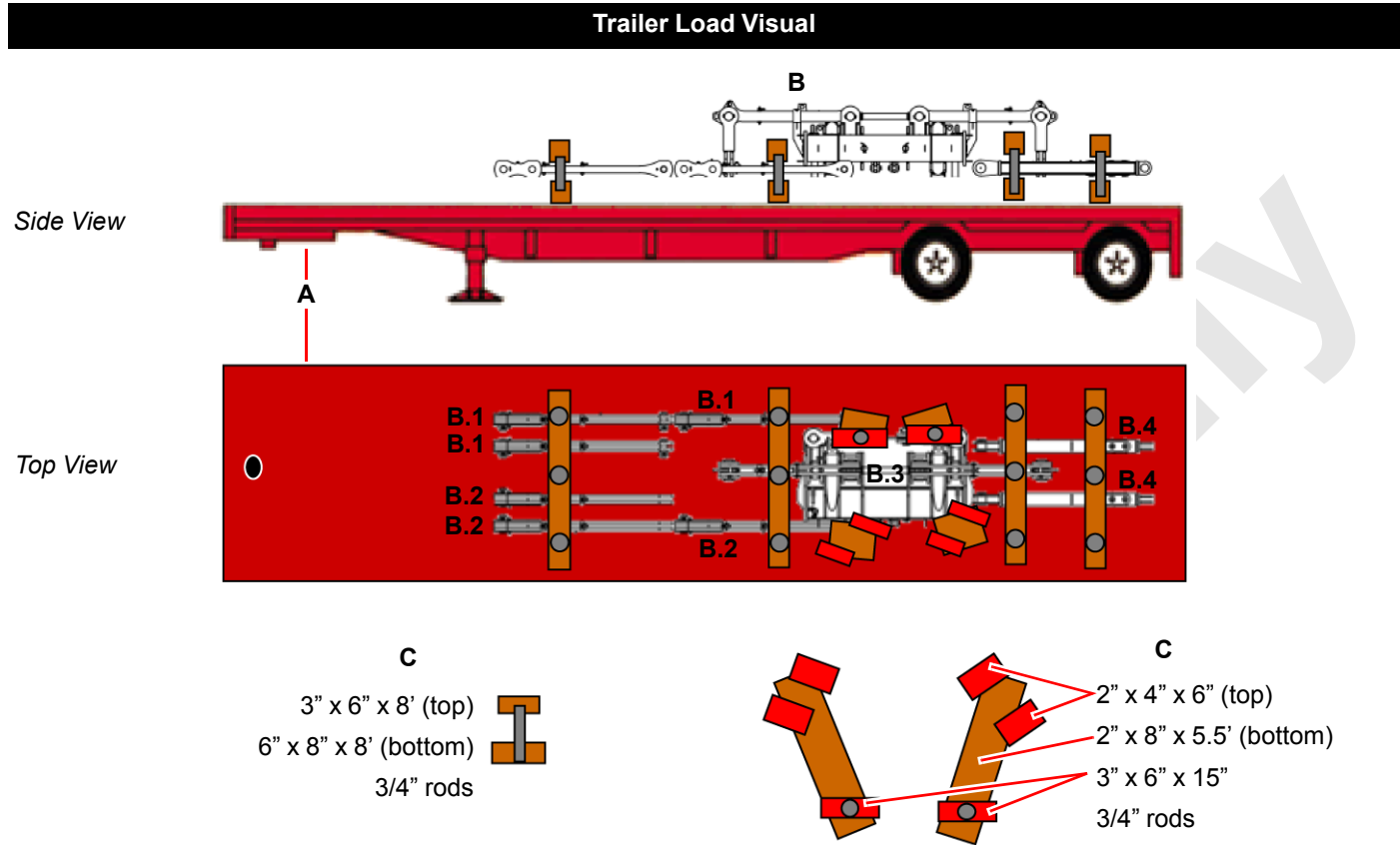
- C**
 6" x 6" x cut to fit
 Pallet
 3/4" rods

Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Hook Assembly and Hook Block (39,750 pounds): <ul style="list-style-type: none"> • Height: 5' 11" (1.8m) • Length: 47' 11" (14.6m) • Width: 8' 7" (2.6m)
C	Blocking kit #034 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #034 (see page 5-265).
2	Load the Hook Assembly and Hook Block as shown.

Fixed Jib Loose Pieces (Load #121)

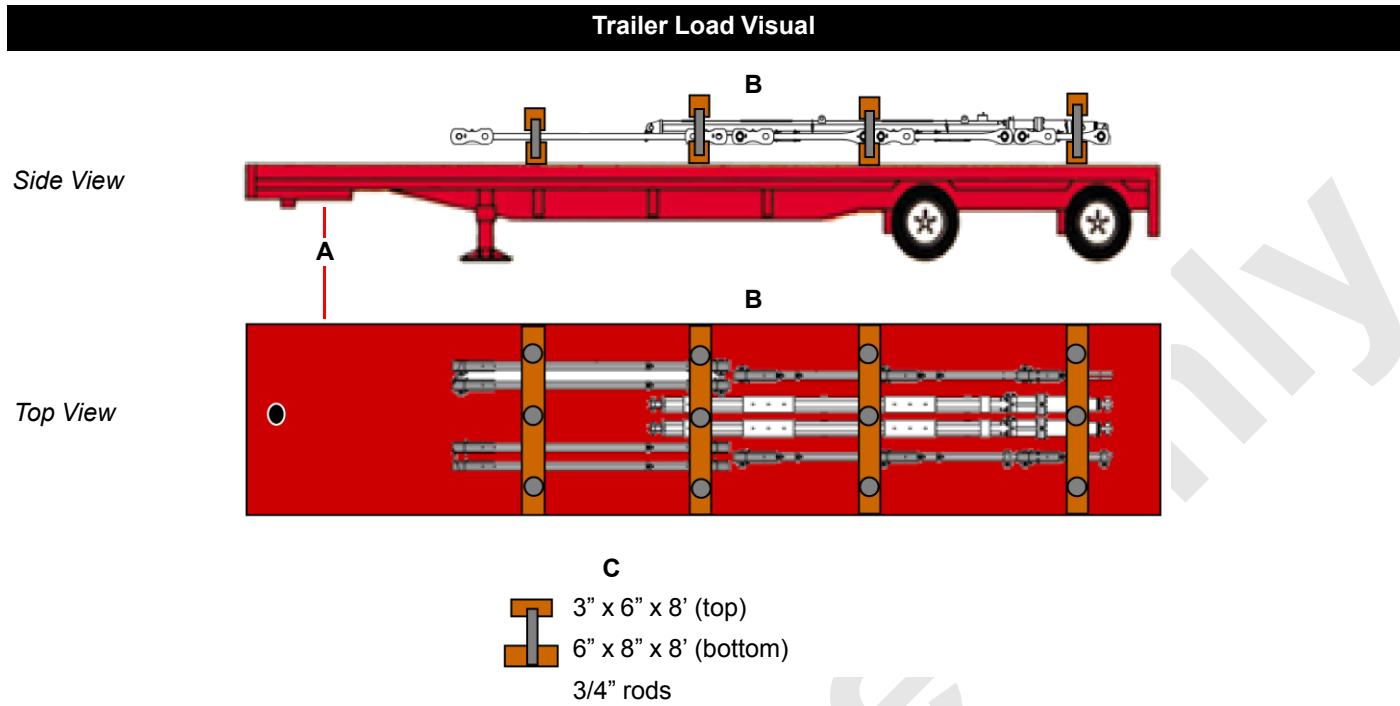


Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Fixed Jib Loose Pieces (30,860 pounds): <ul style="list-style-type: none"> • Height: 4' 11" (1.5m) • Length: 47' 11" (14.6m) • Width: 8' 7" (2.6m)
C	Blocking kit #038 and #043 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #038 and #043 (see page 5-265).
2	Load B.1 (3 pieces) as shown.
3	Load B.2 (3 pieces) as shown.
4	Load B.3 (1 piece) as shown.
5	Load B.4 (2 pieces) as shown.

Fixed Jib Straps (Load #122)



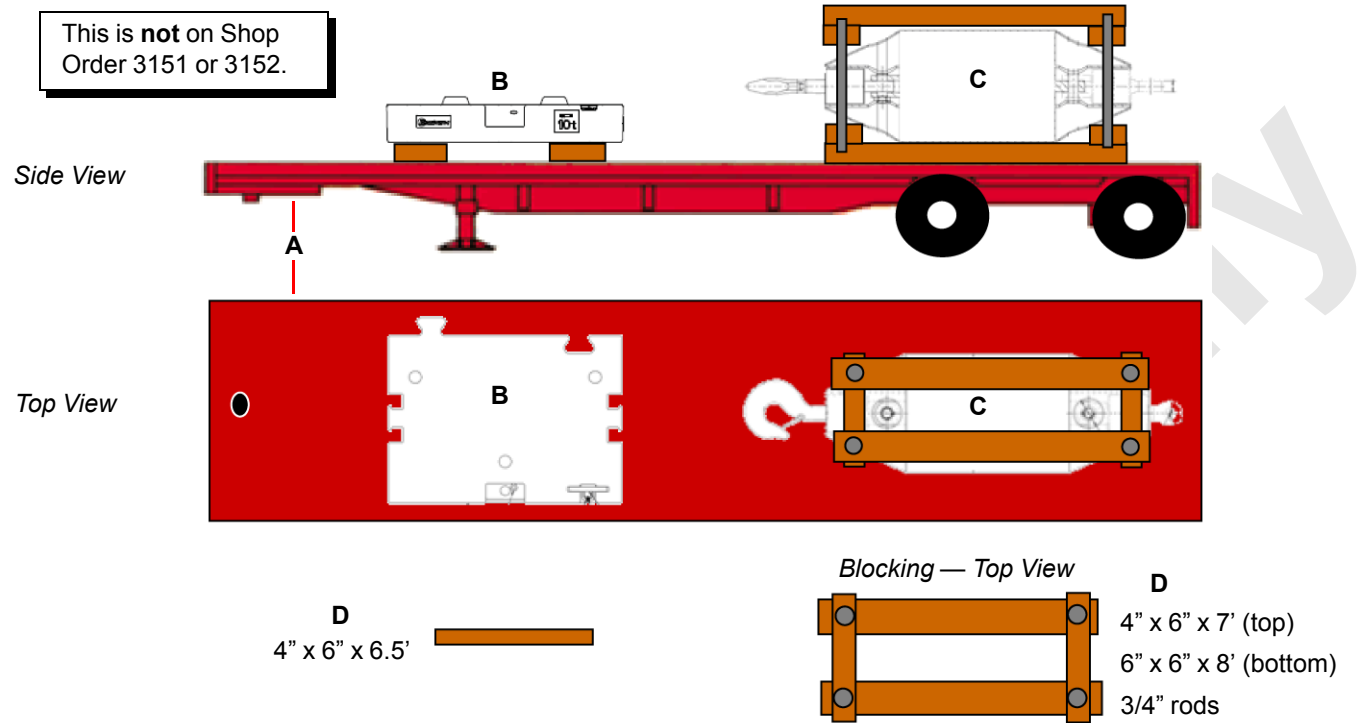
Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Fixed Jib Straps (28,292 pounds): <ul style="list-style-type: none"> • Height: 2' (0.6m) • Length: 47' 11" (14.6m) • Width: 7' 10" (2.4m)
C	Blocking kit #038 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #038 (see page 5-265).
2	Load the Fixed Jib Straps as shown.

Weight Ball and Counterweight (Load #95)

Trailer Load Visual

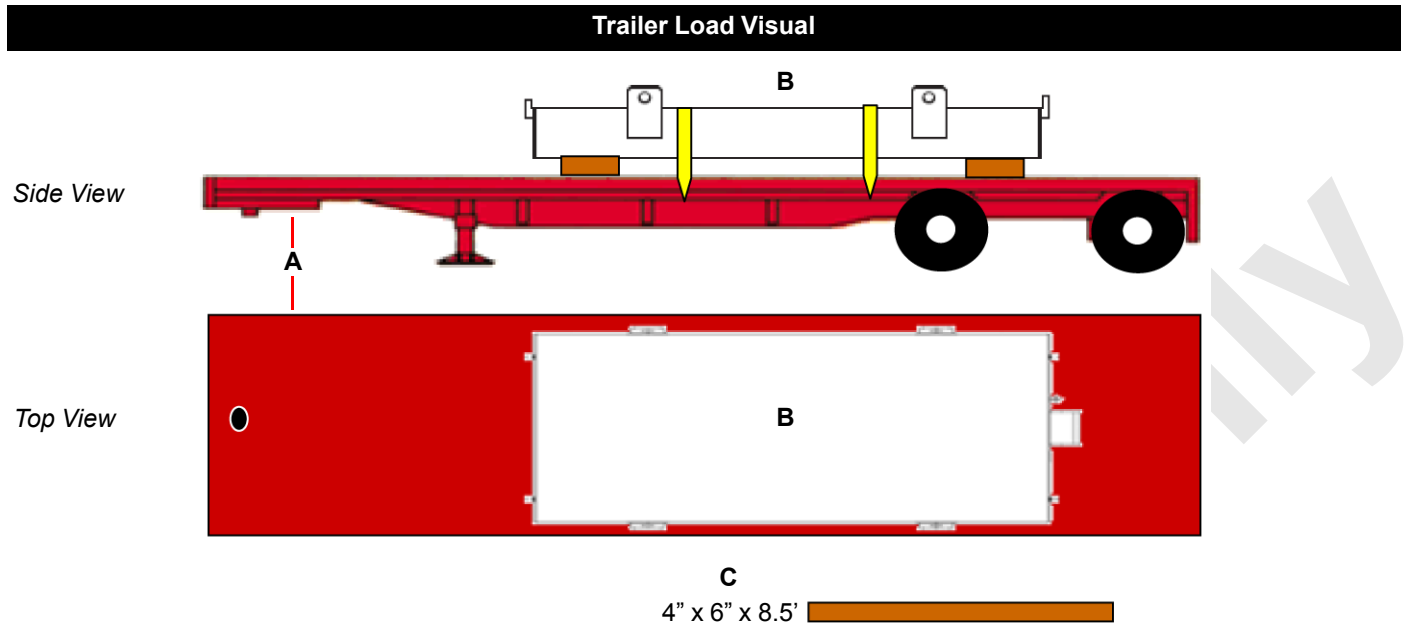


Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Cast Counterweight (22,000 pounds): <ul style="list-style-type: none"> • Height: 1' 6" (0.462m) • Length: 7' 11" (2.4m) • Width: 6' 3" (1.9m)
C	Weight Ball (11,000 pounds): <ul style="list-style-type: none"> • Height: 2' 9" (0.8m) • Length: 8' 11" (2.7m) • Width: 2' 9" (0.8m)
D	Blocking kit #023 and #010 (see page 5-265).

Trailer Load Steps

Step	Description
1	Cut and assemble blocking kit #023 and #010 (see page 5-265).
2	Load the Weight Ball as shown.
3	Load the Cast Counterweight as shown.

Fabricated Counterweights (Fabricated Counterweight Loads 1 through 43)



Item	Description
A	Trailer — 2-axle flatbed: <ul style="list-style-type: none"> • Height (ground to top of bed): 54" • Length (drop to end of trailer): 48' • Width: 8' 6"
B	Fabricated Counterweight (44,000 pounds): <ul style="list-style-type: none"> • Height: 1' 9" (0.52m) • Length: 10' 9" (3.3m) • Width: 8' 6" (2.6m)
C	Blocking kit #003 (see page 5-265).

Trailer Load Steps	
Step	Description
1	Cut and assemble blocking kit #003 (see page 5-265).
2	Load the Fabricated Counterweight as shown.

SECTION 6

MAINTENANCE CHECKS AND LUBRICATION

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Lubrication Guide	6-1
Fiberglass Maintenance	6-1

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SECTION 6

MAINTENANCE CHECKS AND LUBRICATION

PREVENTIVE MAINTENANCE CHECKLIST

See F2200 at the end of this section.

LUBRICATION GUIDE

See F2201 at the end of this section.

FIBERGLASS MAINTENANCE

See Bulletin W04-009 at the end of this section.

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