

Manitowoc MLC300

Operator Manual Luffing Jib Attachment





WARNING

California Proposition 65

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Always start and operate the engine in a well-ventilated area.

If in an enclosed area, vent the exhaust to the outside.

Do not modify or tamper with the exhaust system.

Do not idle the engine except as necessary.

For more information, go to www.P65warnings.ca.gov/diesel

Batteries, battery posts, terminals, and related accessories can expose you to chemicals, including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling. For more information, go to www.P65warnings.ca.gov



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.





OPERATOR MANUAL

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

MLC300

Luffing Jib Model Number

XXXXXRef

Luffing Jib 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	SET-UP AND INSTALLATION
SECTION 5	LUBRICATION
SECTION 6	MAINTENANCE

NOTICE

The serial number of the crane and applicable attachments (i.e. luffing jib, VPC-MAX™) is the only method your Manitowoc dealer or the Manitowoc Crane Care Lattice Team 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 each attachment. Refer to the Nameplate and Decal Assembly Drawing in Section 2 of this manual for the exact location of the crane identification plate.

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 distributor for a new one.</p>

THE ORIGINAL LANGUAGE OF THIS MANUAL IS ENGLISH

See end of this manual for Alphabetical Index

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SECTION 1 INTRODUCTION

CRANE DATA

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

- Basic Specifications
- EC Declaration (if applicable)



FIGURE 1-1

CRANE WEIGHTS

See the end of this section for crane weights.

OUTLINE DIMENSIONS

See the end of this section for outline dimensions.

CHANGE OF OWNERSHIP REGISTRATION

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

1. Go to www.manitowoccranes.com.
2. Go to Parts & Service > Service Support > Change of Ownership Form.
3. Complete the form.

MANITOWOC DEALER

For questions about this manual or the MLC300 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.

CRANE/ATTACHMENT IDENTIFICATION

An identification plate is attached to the outside of the cab ([Figure 1-1](#)) and to the attachments (luffing jib or VPC-MAX) available for this crane.

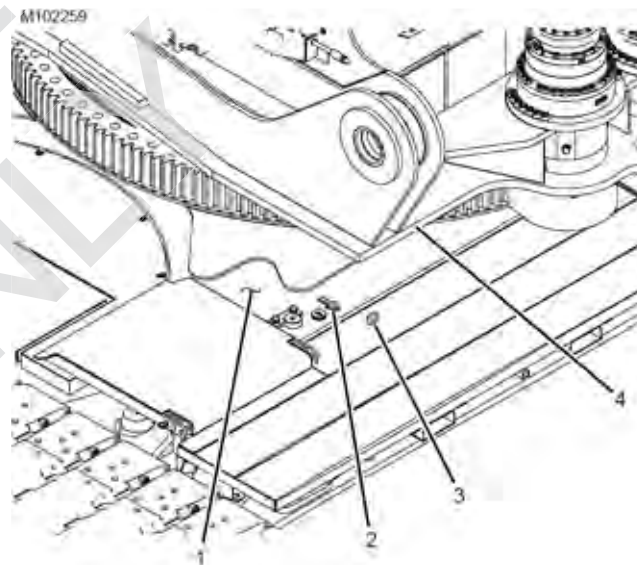
The crane or attachment model and serial number are provided on the plate.

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

CRANE ORIENTATION

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

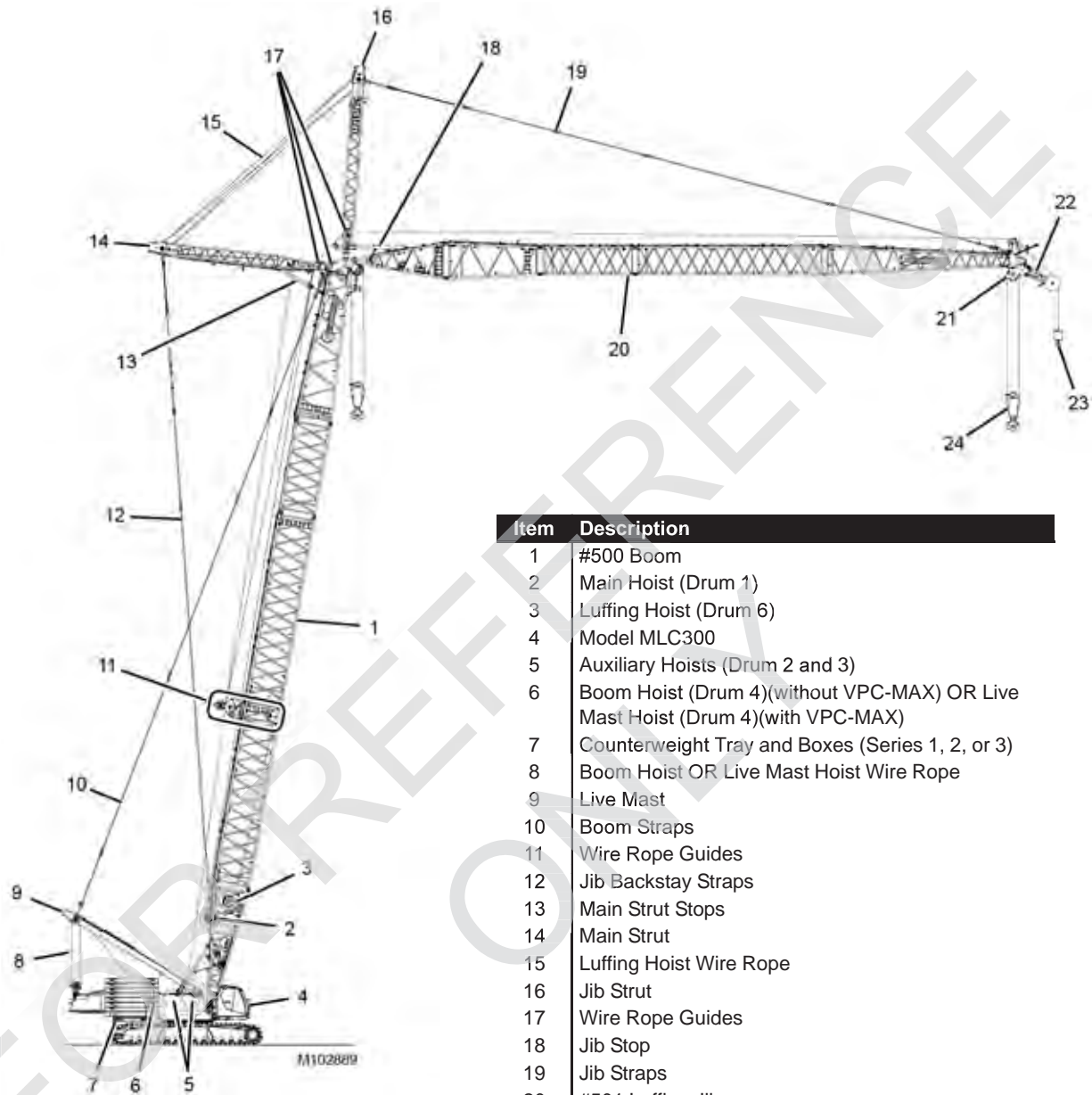
- The swing drives are on the front of the rotating bed.
- The operator cab is on the left side of the rotating bed.
- A yellow arrow (2) and dot (3) on the right top and right front sides of the carbody indicate the FRONT of the carbody (see [Figure 1-2](#)).



Item	Description
1	Carbody
2	Yellow Arrow on Front of Carbody
3	Yellow Dot on Front of Carbody
4	Front of Rotating Bed

FIGURE 1-2

IDENTIFICATION AND LOCATION OF COMPONENTS



Item	Description
1	#500 Boom
2	Main Hoist (Drum 1)
3	Luffing Hoist (Drum 6)
4	Model MLC300
5	Auxiliary Hoists (Drum 2 and 3)
6	Boom Hoist (Drum 4)(without VPC-MAX) OR Live Mast Hoist (Drum 4)(with VPC-MAX)
7	Counterweight Tray and Boxes (Series 1, 2, or 3)
8	Boom Hoist OR Live Mast Hoist Wire Rope
9	Live Mast
10	Boom Straps
11	Wire Rope Guides
12	Jib Backstay Straps
13	Main Strut Stops
14	Main Strut
15	Luffing Hoist Wire Rope
16	Jib Strut
17	Wire Rope Guides
18	Jib Stop
19	Jib Straps
20	#501 Luffing Jib
21	Lower Jib Point
22	Upper Jib Point with Rollers
23	Hook and Weight Ball
24	Load Block
25	VPC-MAX Beam
26	Boom Hoist (Drum 5)(with VPC-MAX)
27	Fixed Mast
28	Mast Straps
29	Counterweight Straps

FIGURE 1-3

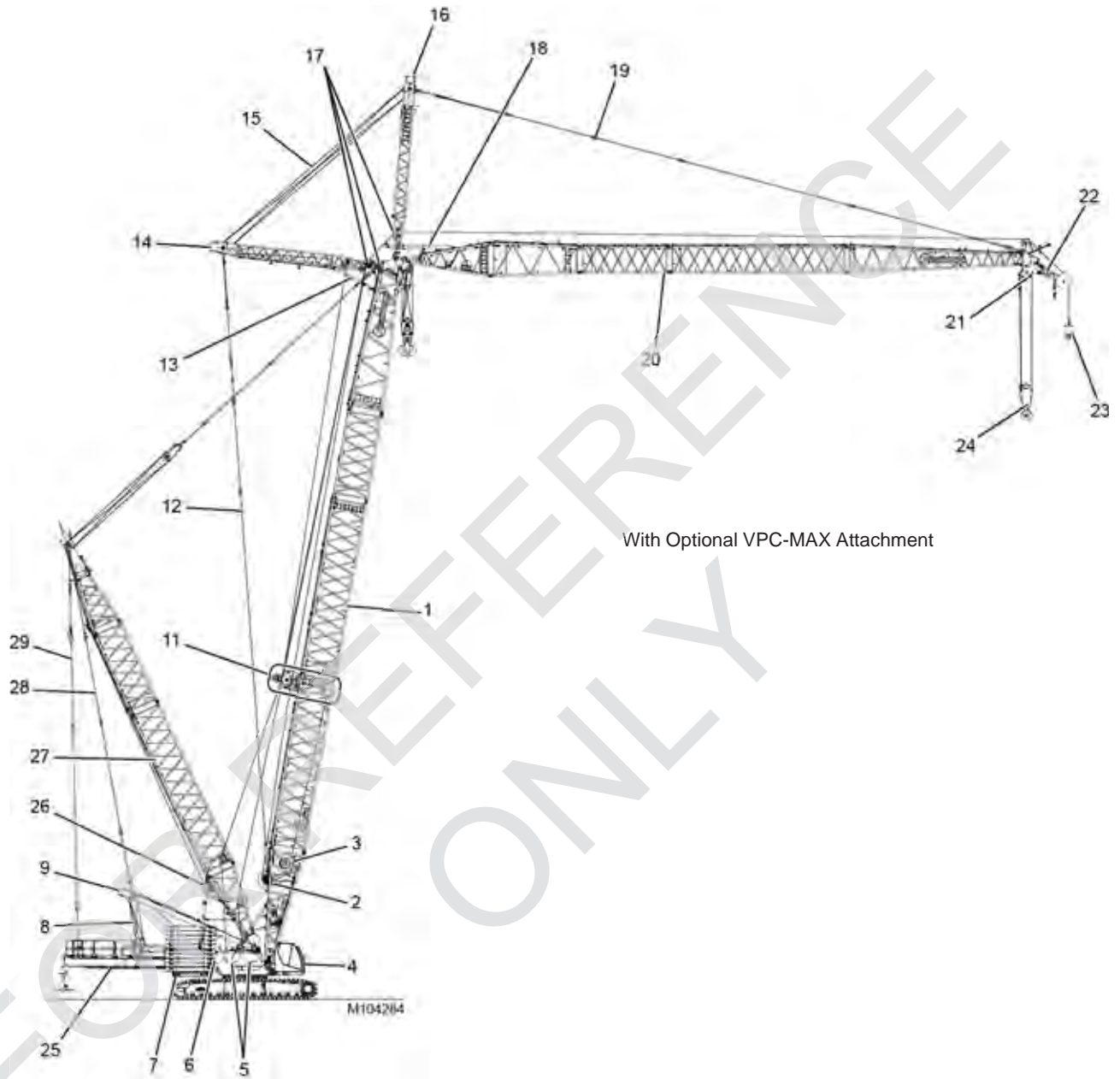


FIGURE 1-3 continued

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:

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

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
Ton (2,000 lb.)	USt	Load Ratings	Metric Ton	t	0.9072
Ton (2,000 lb.)	USt		Kilogram	kg	907.1847

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SAFETY INFORMATION

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SECTION 2

SAFETY INFORMATION



WARNING

California Proposition 65

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- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel.

Batteries, battery posts, terminals, and related accessories can expose you to chemicals, including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling. For more information go to www.P65warnings.ca.gov.

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 the 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

Many of the symbols used in the safety and information signs and nameplates on this crane are identified in [Table 2-1 on page 2-2](#) and [Table 2-2 on page 2-3](#).

Table 2-1 Common Safety Symbols

Cut or Crush Hazards					Cut Hazard
 M100090	 M100091	 M100066	 M100065	 M100069	 M100067
Crush Hazards					Fire Extinguisher
 M100070	 M100071	 M100072	 M100073	 M100074	 M100082
Fall Hazards			Falling Boom (Crush) Hazards		Explosion Hazard
 M100083	 M100084	 M100085	 M100068	 M100075	 M100080
Falling Load Hazards		Flying Objects Hazards		Overhead Obstruction Hazard	Pressure Release Hazard
 M100076	 M100077	 M100088	 M100088	 M100089	 M100081
Electrocution Hazards		Personal Fall Protection	Pressure Cleaning	Sound Power Level	Read Manual
 M100078	 M100079	 M100095	 M100087	 M100096	 M100093

Table 2-1 Common Safety Symbols










Emergency Cab Exit				
 <small>M1002466</small>				

Table 2-2 Miscellaneous Symbols

Diesel Fuel	Engine Coolant	Engine Coolant Vent	Engine Oil Level	Hydraulic Filter	Hydraulic Oil
 <small>M100271</small>	 <small>M100267</small>	 <small>M100268</small>	 <small>M100269</small>	 <small>M100272</small>	 <small>M100273</small>
Pump Drive Oil Level	Tire Pressure (if equipped)				
 <small>M100270</small>	 <small>M100266</small>				

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 on the sign.

Item	Description
1	Operator Cab Platform with Handrails
2	Carbody Platform (both ends and sides)
3	Mast Platform
4	Engine Enclosure (non-skid)
5	Rotating Bed Handrails (both side)
6	Folding Ladder (left side only)
7	Rotating Bed Platform (both sides)
8	Counterweight Tray and Boxes (non-skid)
9	Ladder (left side only)
10	Ladder (both crawlers)
11	Catwalk (each boom and jib section)
12	Ladder (each boom and jib section)

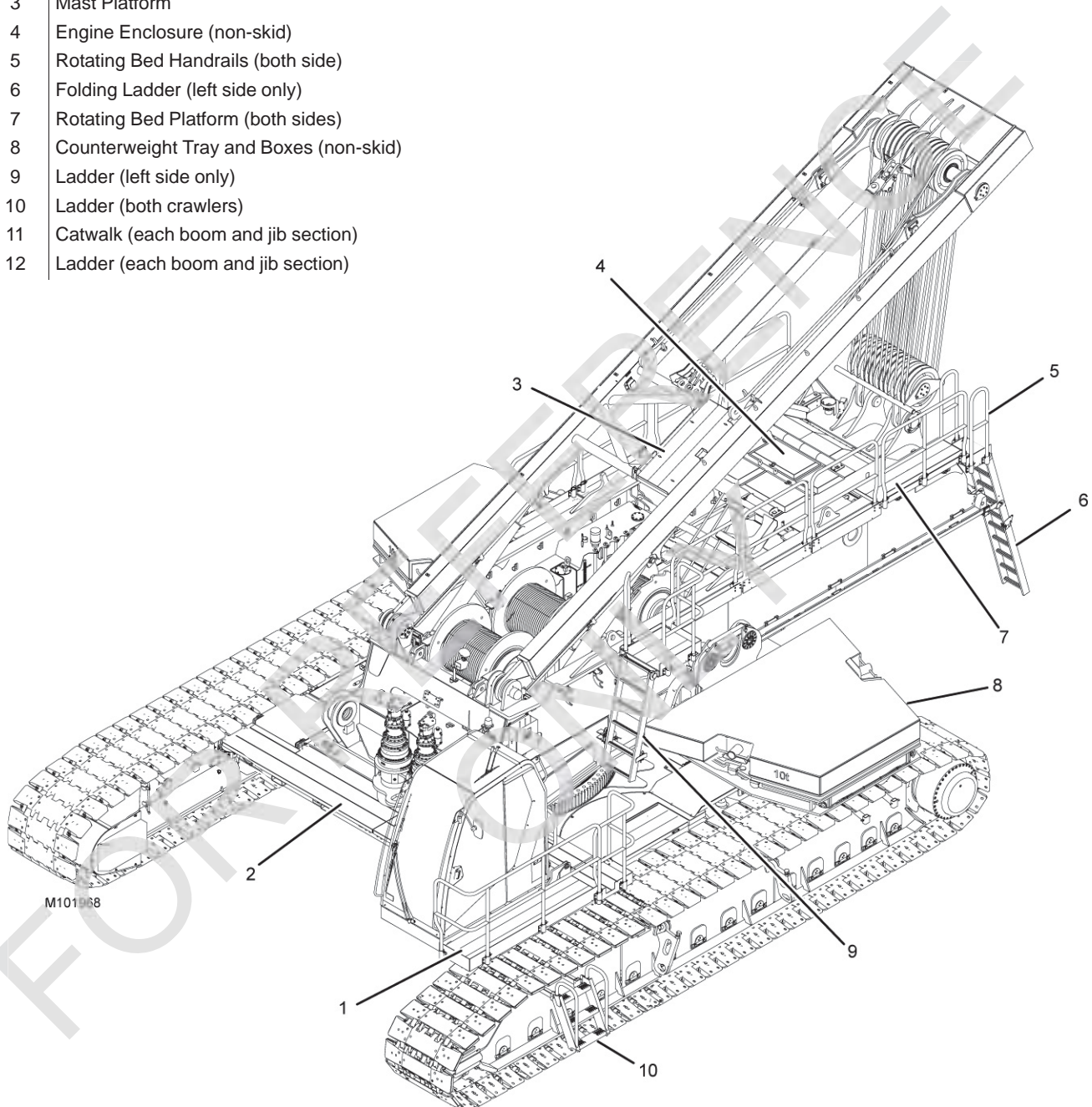


FIGURE 2-1

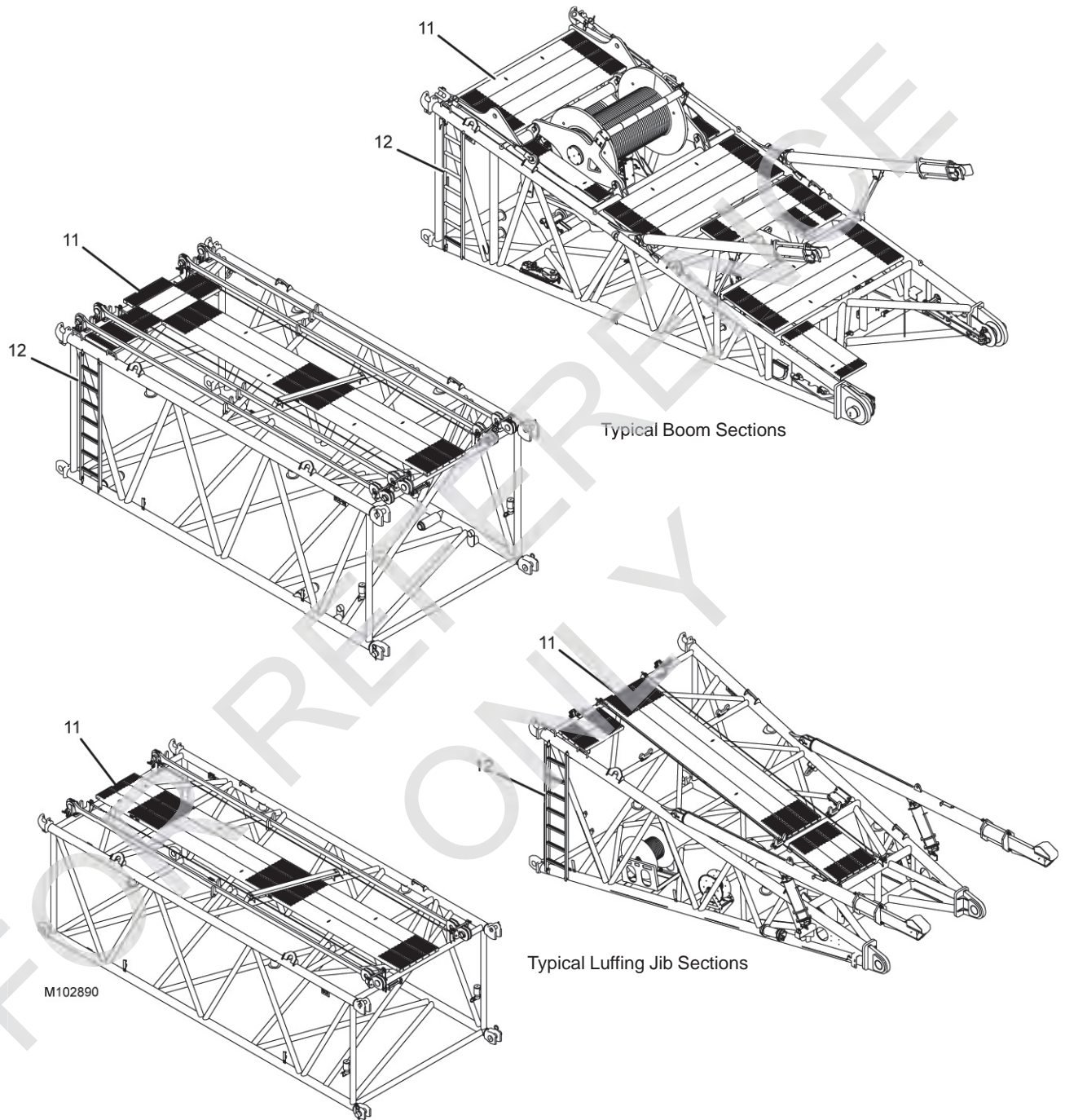


FIGURE 2-1 continued

CRANE ACCESS POINTS



WARNING

Crush Hazard!

The upperworks can swing into and crush personnel climbing on or off the crane.

Moving crawlers can crush personnel climbing on or off the crane.

To prevent death or serious injury:

- Barricade all accessible areas to the crane so personnel cannot be struck or crushed when the upperworks is swung.
- Do not climb onto or off the crane while the upperworks is being swung or the crane is being traveled.
- Signal the operator for permission to climb onto/off the crane.
- Operator: do not swing or travel while personnel are climbing onto or off the crane. Stop the swing and travel motions. Apply the swing brake and turn on travel park.
- Operator: Always sound the horn to alert personnel before you swing or travel.
- 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 shall alert personnel to crane movement using the horn on the control console.

General

Take the necessary precautions 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 ladders and platforms at the locations shown in [Figure 2-1 on page 2-5](#).

The owner/user shall provide workers with approved ladders or aerial work platforms 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 crane. Store clothing and other personal belongings so they do not interfere with controls in operator cab or with operation of 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 personal 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 operators cab or on steps, ladders, catwalks, and platforms.
- To reduce risk of slipping, non-skid material (sand in paint) has been applied to painted walkways and platforms.

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 shoes before entering the crane cab or climbing onto the cab. 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 system that have not been evaluated and approved by Manitowoc.

GETTING ON OR OFF CRANE

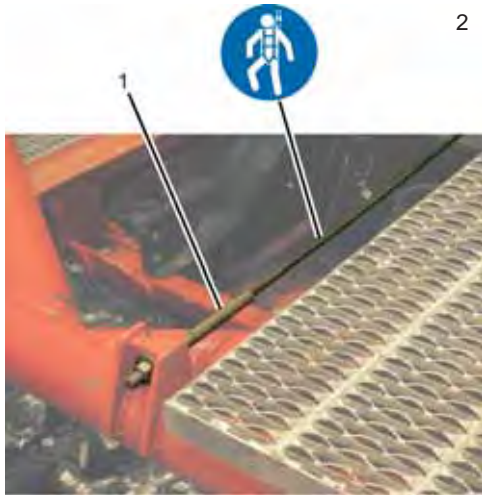
Personnel getting on and off crane shall do so only at steps or ladders provided and only **while crane is parked**.

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

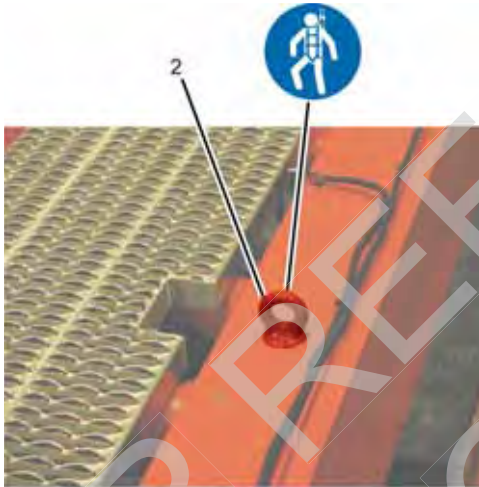
When personnel use ladders to get on or off the crane, their hands shall be free of any objects. Objects which cannot be carried in pockets or tool belts must be lifted into place with a hand line or hoist.

Always maintain a three-point contact with the ladder: two feet and one hand, or two hands and one foot.

Item	Description
1	Lifeline
2	Anchor



M101966



M101967

FIGURE 2-2

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 shall 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.

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.
- RCI/RCL 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 an 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 Manitowoc dealer for the proper manual 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 on the bookshelf in the operator cab (Figure 2-3).

Attach the chain from the manual in use to the link behind the operator seat.

Keep all other manuals provided with the crane in the crane owner's/user's office so they are readily available when needed.



M101903

Item	Description
1	Operator Information Manual
2	Bookshelf Behind Operator Seat
3	Link
4	Chain Ring

FIGURE 2-3

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 cannot 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 must 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 must 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, 07004-2900 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 must 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 must 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 must 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 must 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 must 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.

12. 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 shall 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.

13. 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.

14. 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 must be illuminated.

15. 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 12 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.

16. 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 16 m/s (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.

17. Booms, jibs, or masts which are being assembled or disassembled on the ground (with or without support of boom rigging) must 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.

18. Each outrigger must be visible to the operator or the signal person during extension and retraction.

Handling Load

Size of Load

1. The crane must 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 shall 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 must take priority over RCI/RCL readings.

Attaching Load

1. Attach the hook to the load with slings, or other suitable rigging. Each hook must have a latch that is in proper working order. **Hook latches must 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 must be *level to within 1%* — 0,3 m (1ft) rise or fall in 30,5 m (100 ft) distance.

When such a surface is not available, it must 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.

- b. The load is secured and properly balanced in the slings or the lifting device before lifting the load more than 76 to 152 mm (3 to 6 in).
- 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 76 to 152 mm (3 to 6 in) 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 must 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 must 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.

- I. 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 must 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 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 must 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 must be thoroughly inspected by a qualified person prior to setup.
4. The crane must be thoroughly inspected for load line interference caused by routing and reeving of multiple load lines. If interference is found, it must 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 shall 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 must 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 must be in accordance with the standard signals shown in Section 3, unless communications equipment (telephone, radio, etc.) is used.
3. All signals must 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 must be agreed upon in advance by the operator and the signal person. The signals used must 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 must 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 must 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 shall 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 shall 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 they have 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 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.

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 judgment. 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 must be deenergized OR,
 - Tests must 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 shall 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 shall:

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 shall 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 must be a safety-type can equipped with an automatic closing cap and a flame arrester.
- The engine must be **stopped** before refueling crane.
- Smoking and open flames must be prohibited in refueling area.

FIRE EXTINGUISHERS

- A portable fire extinguisher with a minimum rating of 10 BC must be installed in operator 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



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 shall **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

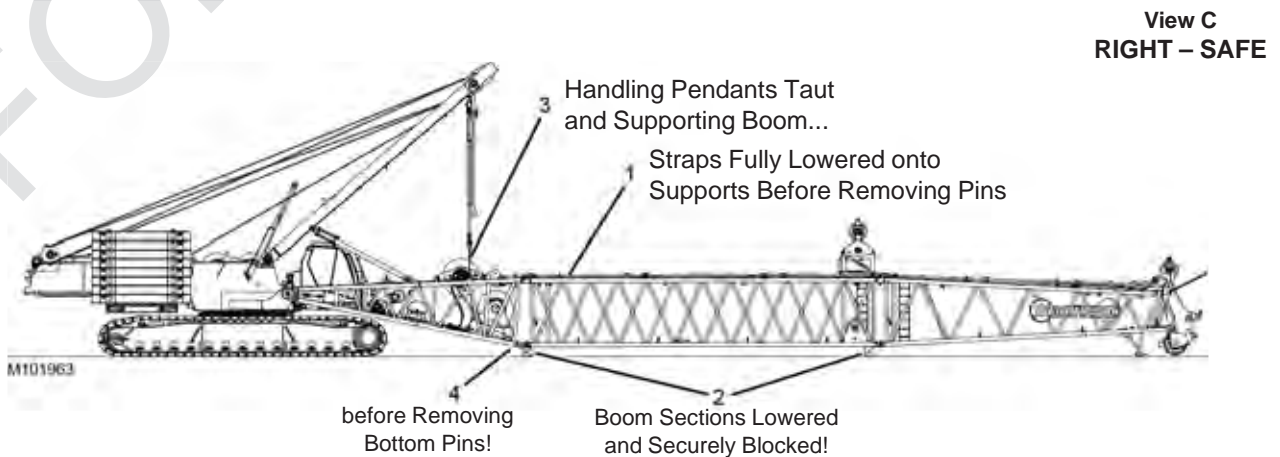
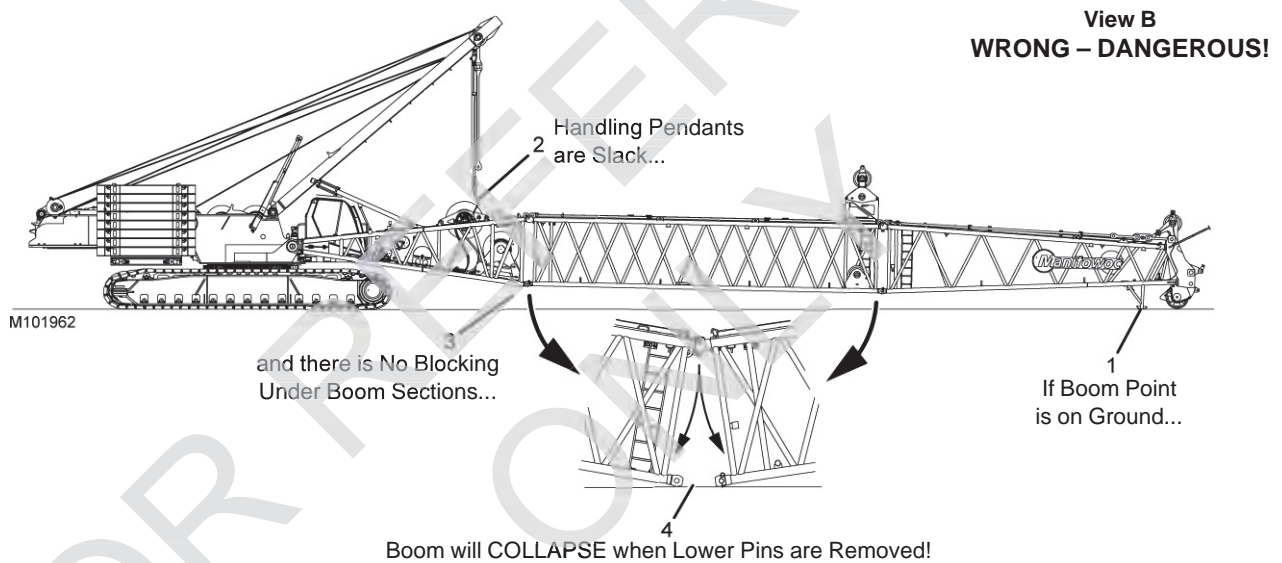
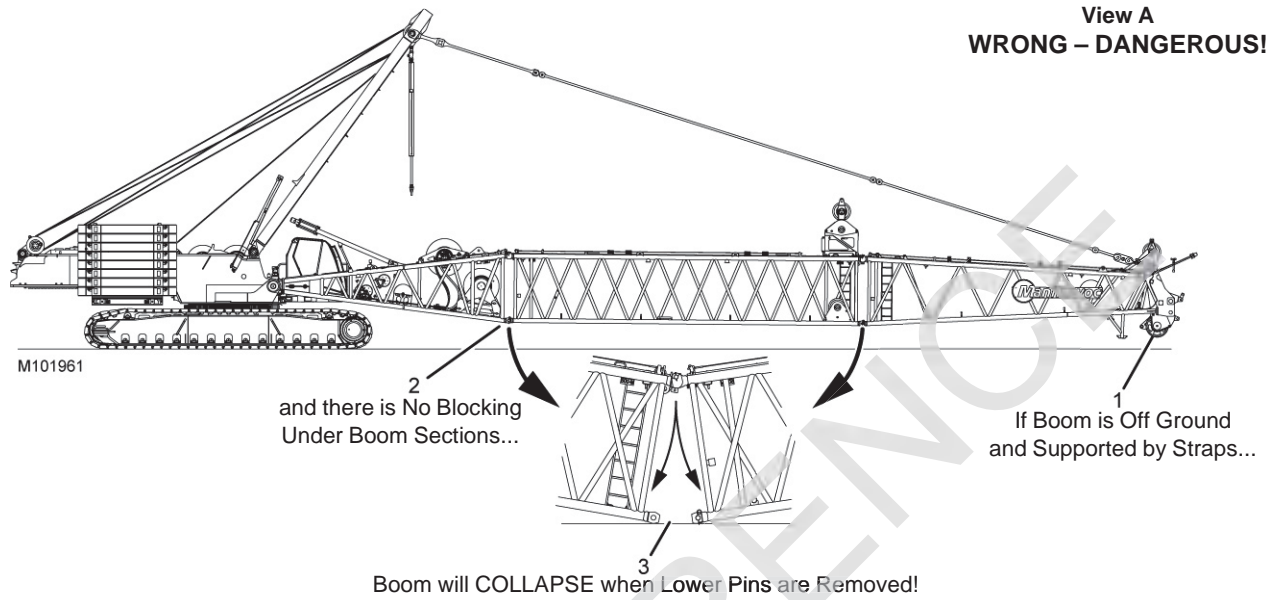


FIGURE 2-4

BOOM DISASSEMBLY SAFETY

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



DANGER!

Collapsing Boom Hazard!

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

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

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

- Workers are not familiar with equipment or are not properly trained.
- Disassembly area is not suitable.
- Safe procedures are overlooked because not enough time is allocated for the task.

General

Safety decals ([Figure 2-5](#)) 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 disassembly shall be trained and experienced in the operation and disassembly of construction cranes. Everyone shall read and understand these instructions, the information in the Boom Assembly Drawing, and the instructions in Section 4 of this manual before beginning disassembly. Anyone who has a question should ask for an explanation. **One worker who does not fully understand or fails to follow correct procedures can endanger other workers.**

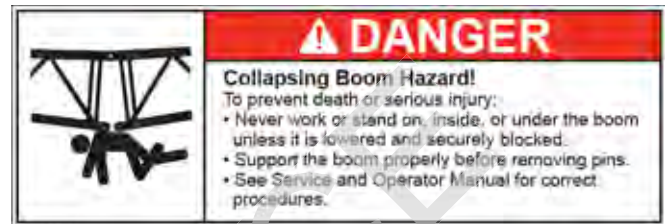
Location

Select a suitable location for boom disassembly. It must be firm, level, and be free of obstructions. It should have enough open space to accommodate the crane, the length of boom, and – if required – movement of an assist crane or other equipment. If possible, secure the area to keep unauthorized personnel and vehicles away.

Pin Removal

When removing pins from boom sections, stand clear of pins being removed. Even though the boom is resting on

blocking, individual pin connections may still be under load. Pins can be ejected forcefully if the boom has any pressure on it or if the boom is not supported properly.



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FIGURE 2-5

Disassembly Precaution

Always block boom sections so they are securely supported and cannot shift or move suddenly when pins are removed. If there is any doubt about a boom disassembly procedure, **block tightly under boom sections before removing any pin.**



DANGER

Collapsing Boom Hazard!

Boom can collapse or jerk when pins are removed. To avoid death or serious injury:

- Do not remove bottom connecting pins from any boom section when boom is supported by straps as shown in [Figure 2-4](#), View A.
- Do not remove strap connecting pins until straps are fully lowered into supports as shown in [Figure 2-4](#), View C.
- Do not remove bottom connecting pins from any boom section when boom point is resting on ground and handling pendants are slack as shown in [Figure 2-4](#), View B.
- Never work or stand inside boom unless it is lowered and securely blocked as shown in [Figure 2-4](#), View C.
- Do not stand or walk on top of boom unless it has walkways.



DANGER

Falling Boom Hazard!

Crane can tip or boom can collapse if excess boom is cantilevered. Never cantilever more boom than allowed in rigging drawings or capacity charts.

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 must 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 shall 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 must 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 load block or overhaul ball and the boom tip (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 must 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 must 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 must 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 fall-protection system is provided.
- 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 9 m/s (20 mph) 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 6 m (20 ft) of a power line that is up to 350 kV or within 15 m (50 ft) 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) must 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 shall 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 2-6).

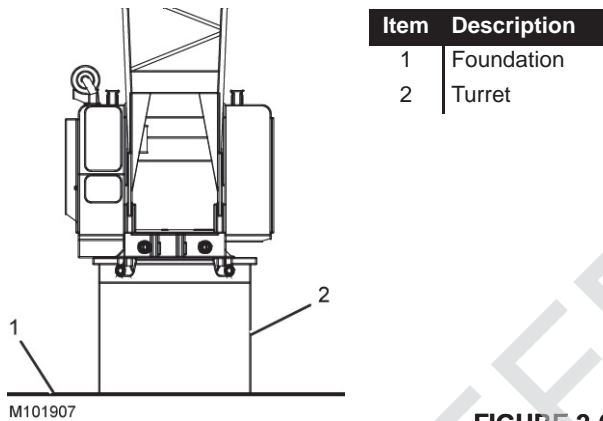


FIGURE 2-6

2. Crane rotating bed mounted on a carbody (crawlers removed) which is securely fastened to the foundation (Figure 2-7).

NOTE: If the carbody will be bolted to the foundation, contact your Manitowoc dealer for the recommended bolt pattern and for the type and quantity of bolts to be used.

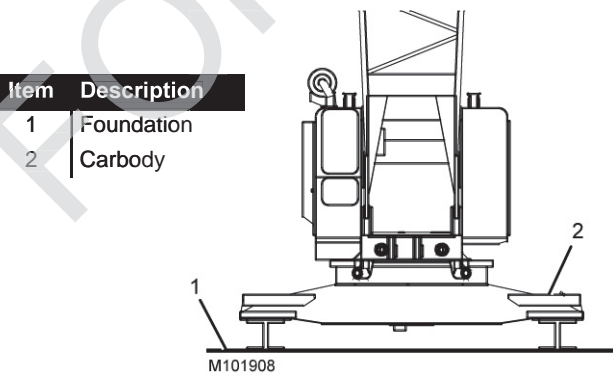


FIGURE 2-7

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 2-8).

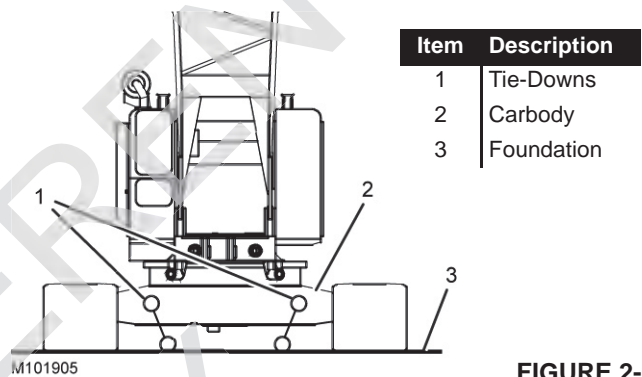


FIGURE 2-8

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 2-9). When not working, the crane carbody is anchored with tie-downs to the foundation. **Traveling with load is not permitted.**

NOTE: Manitowoc does not permit traveling on a barge deck with load.

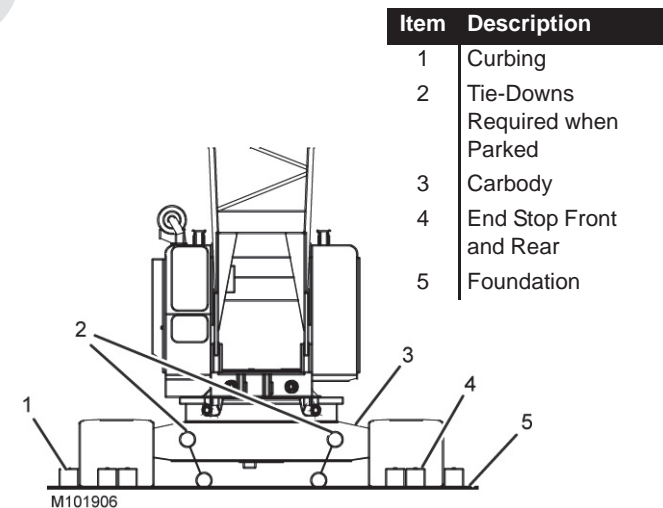


FIGURE 2-9

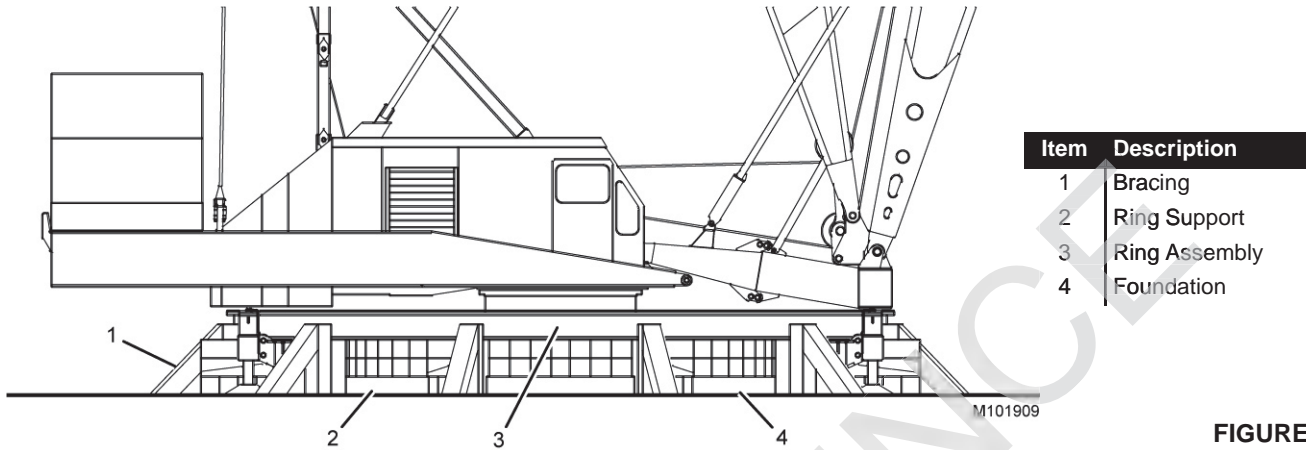
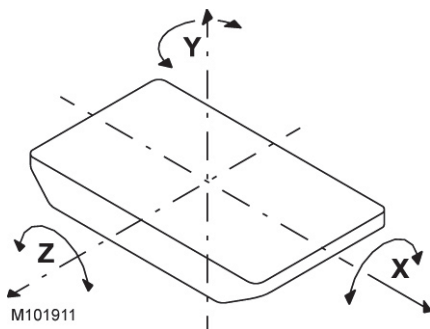


FIGURE 2-10



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

FIGURE 2-11

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 2-10).

NOTE RINGERS must be equipped with hook rollers on the boom carrier and the counterweight carrier.

4. RINGER (platform mounted) which has the ring braced and fastened directly to the foundation in such a manner as to prevent movement.

Capacity Charts for Barge Mounted Crane

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 Caused by Barge Dynamics

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 2-11 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 must 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

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.

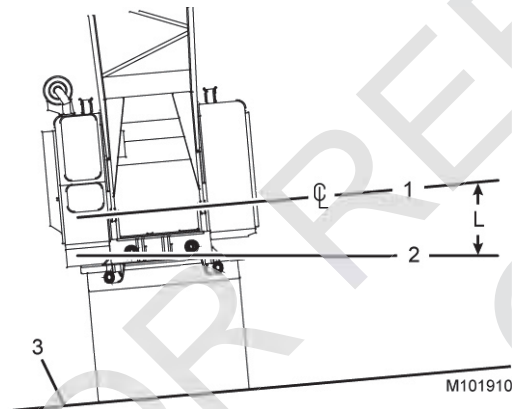
**WARNING****Tipping Crane Hazard!**

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 the correct Capacity Chart can result in an accident.

Barge Mount 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 on page 2-27). This out-of-level condition creates side load and affects the crane's lifting capacity.



Item	Description
1	Centerline through Boom Hinge Pins
2	Horizontal
3	Barge Deck
L	Degrees of Machine List (Maximum allowable is specified in Capacity Chart)

FIGURE 2-12

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 the 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.

Inspection of Barge-Mounted Crane

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 must be lowered onto a cradle (or other support) and the crane's boom, rotating bed, and lowerworks must be secured against movement. If the crane is equipped with a mast, the mast must 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.

SECTION 3

OPERATING CONTROLS AND PROCEDURES

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SECTION 3 OPERATING CONTROLS AND PROCEDURES


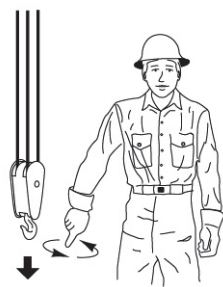
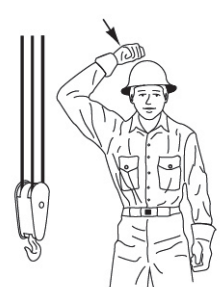
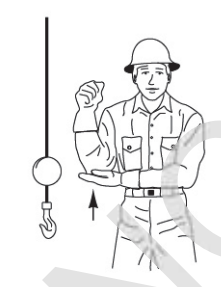
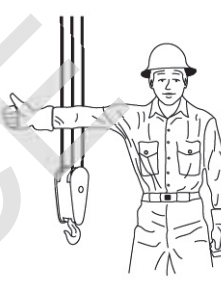

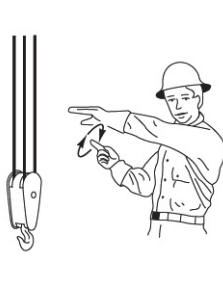
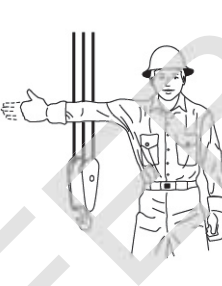



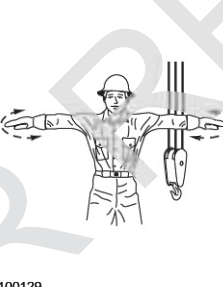
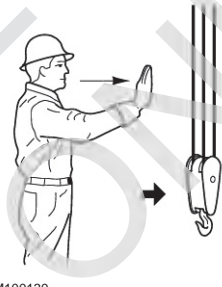
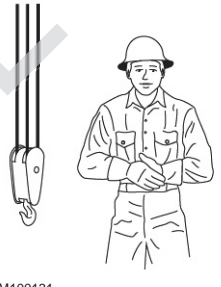
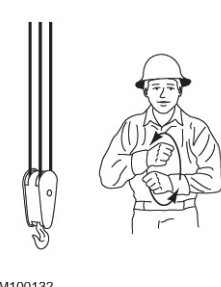
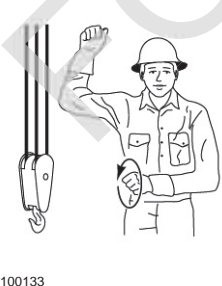
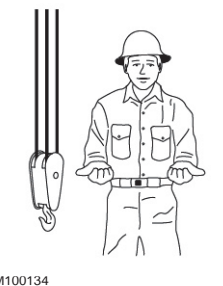
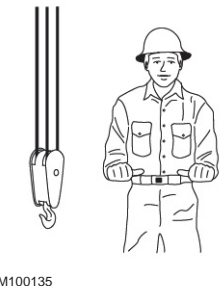


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FOR REFERENCE ONLY

STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

The following standard hand signals comply with ASME B30.5.

Table 3-1 Standard Hand Signals for Crane Operation

<p>1</p>  <p>M100116</p>	<p>2</p>  <p>M100119</p>	<p>3</p> 	<p>4</p>  <p>M100121</p>	<p>5</p>  <p>M100122</p>
<p>6</p>  <p>M100123</p>	<p>7</p>  <p>M100124</p>	<p>8</p>  <p>M100125</p>	<p>9</p>  <p>M100126</p>	<p>10</p>  <p>M100127</p>
<p>11</p>  <p>M100128</p>	<p>12</p>  <p>M100129</p>	<p>13</p>  <p>M100130</p>	<p>14</p>  <p>M100131</p>	<p>15</p>  <p>M100132</p>
<p>16</p>  <p>M100133</p>	<p>17</p>  <p>M100134</p>	<p>18</p>  <p>M100135</p>	<p>19</p>  <p>M100136</p>	<p>20</p>  <p>M100137</p>

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Table 3-1 Standard Hand Signals for Crane Operation

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, fingers 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.

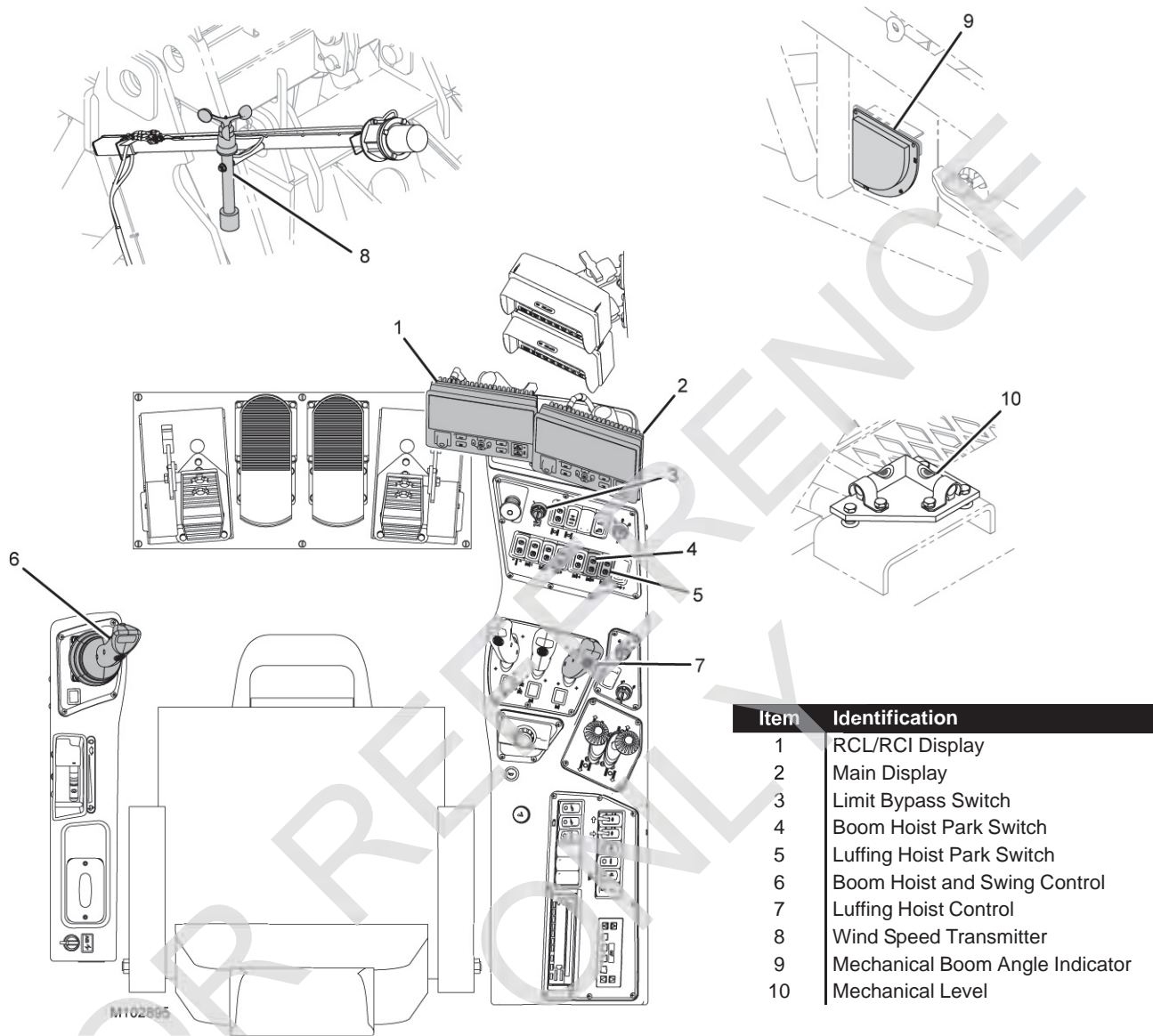


FIGURE 3-1

! WARNING

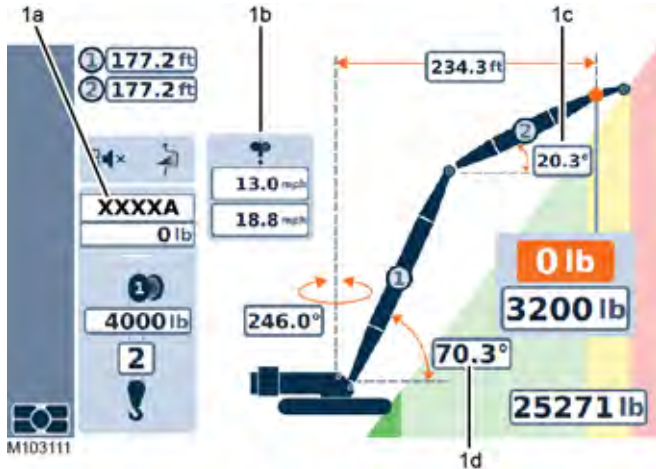
Prevent death or serious injury to personnel!

The luffing jib attachment must be installed and operated by experienced personnel trained in erection and operation of construction cranes. These personnel shall read, understand, and comply with the instructions in this manual, in the Luffing Jib Rigging drawing, in the Liftcrane Luffing Jib Capacity charts, in the Crane Operator Manual, and in the VPC-MAX Operator Manual (if equipped).

GENERAL OPERATION

The instructions in this section supplement the operating control instructions in Section 3 of the Crane Operator Manual. This section has two purposes:

- To familiarize *qualified operators* with the location of the controls used for luffing jib operation
- To alert operators to important safety information



Item	Identification
1a	Capacity Chart Number
1b	Boom Angle
1c	Luffing Jib Angle
1d	Wind Speed

FIGURE 3-2

LUFFING JIB OPERATING CONTROLS

See [Figure 3-1](#) for the location of controls 1-10.

1 – Rated Capacity Limiter/Indicator (RCL/RCI) Display

Read and become thoroughly familiar with MLC300 RCL/RCI Operation Manual located in the Operator Information Manual in the operator cab.

To operate the LUFFING JIB, the operator must select the correct luffing jib capacity chart in the RCL/RCI Display.

When selected, the capacity chart number (1a, [Figure 3-2](#)) will appear in the working screen of the display. See the Luffing Jib Operator Information Manual in the crane cab for a complete list of luffing jib capacity charts for your crane.

The RCL/RCI working screen shows all capacity related information required to operate the crane, to include:

Boom Angle

See item 1b, [Figure 3-2](#).

The angle between the centerline of the boom and horizontal ([Figure 3-3](#)). Monitor this angle when raising and lowering the boom during operation.

Luffing Jib Angle

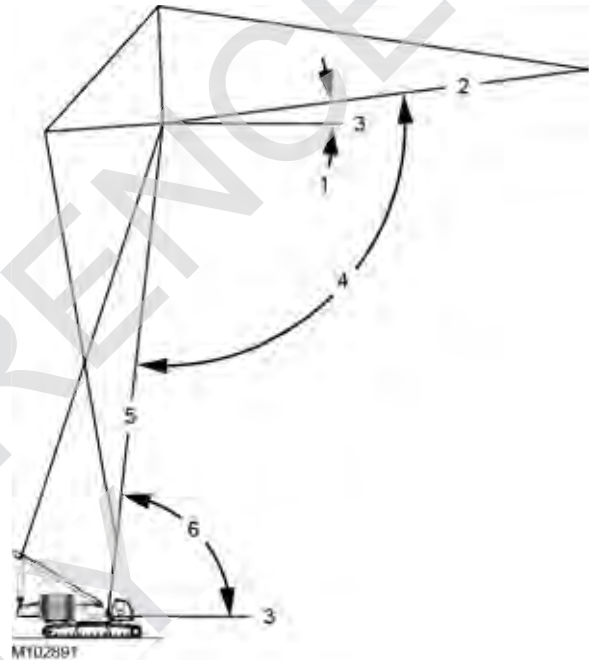
See item 1c, [Figure 3-2](#).

The angle between the centerline of the jib and horizontal ([Figure 3-3](#)). Monitor this angle when raising and lowering the jib during operation.

Wind Speed

See item 1d, [Figure 3-2](#).

Shows the steady wind speed (A) and the maximum gust wind speed (B) at the luffing jib point. See Wind Conditions later in this section.



Item	Identification
1	Luffing Jib Angle
2	Centerline of Luffing Jib
3	Horizontal
4	Boom-to-Luffing Jib Angle
5	Centerline of Boom
6	Boom Angle

FIGURE 3-3

2 – Main Display

Read and become thoroughly familiar with the MLC300 Main Display Operation Manual located in the Operator Information Manual in the operator cab.

The Main Display Working Screen shows information required to operate the crane and luffing jib, to include:

Crane Levelness

Shows how level the crane is from side to side and front to rear.



Levelness is also indicated on the level (10, [Figure 3-1](#)).

Unless otherwise specified in the capacity charts, all crane operations must be performed with the crane level to within 1% of grade in all directions — 0,3 m in 30 m (1 ft in 100 ft).

Boom-to-Luffing Jib Angle

Shows the angle between the centerline of the boom and the centerline of the jib (Figure 3-3 on page 3-5).



Monitor this angle when raising and lowering the boom and jib from and to the ground.

The Main Display Working Screen also shows the operating limits and system faults that may occur during operation.

3 – Limit Bypass Switch

This switch bypasses the limits identified in Table 3-2 on page 3-7.

Insert the key and turn it CLOCKWISE and hold to BYPASS (deactivate) reached operating limits. This position allows the functions to be operated beyond the limits.

RELEASE the key to ENABLE (activate) the operating limits. This position allows the limits to stop the functions in the normal manner.

Remove the key to prevent unauthorized operation.

5 – Drum 4 (Boom Hoist) Park Switch

6 – Drum 6 (Luffing Hoist) Park Switch

7 – Boom Hoist Control

8 – Luffing Hoist and Swing Control

See the Operating Controls in Section 3 of the Crane Operator Manual for operation of these controls.

The handle locations can vary depending on operation. See Drum and Control Handle Identification on page 3-14.

9 – Wind Speed Transmitter

Sends wind speed information from the jib point to RCL/RCI Display.

10 – Mechanical Boom Angle Indicator

Shows the angle of the boom in degrees above horizontal (visible through right cab window).

The boom's angle is also shown in the RCL/RCI working screen.

11 – Crane Level

The bubble level (Figure 3-4) indicates crane levelness from front-to-rear (2) and from side-to-side (3).

- The crane is level when the bubbles (1) are centered in the glass.
- The crane is approximately one percent of grade out of level in the corresponding direction when half of a bubble (1) is off center.

Crane levelness can also be viewed in the Main Display.



WARNING

Tipping Hazard!

Unless otherwise specified on capacity chart, all crane operations must be performed with crane **level** to within one percent of grade in all directions – 1 ft in 100 ft (0,3 m in 30 m); otherwise, crane could tip.

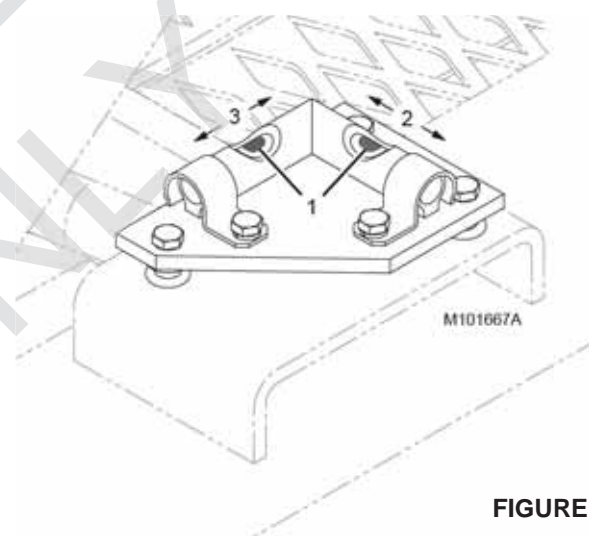


FIGURE 3-4

OPERATING LIMITS IDENTIFICATION AND OPERATION

The following table lists the operating limits this crane is equipped with and identifies which of those limits are bypassable. When a limit is reached, the operating limit fault is activated and the corresponding fault icon appears in the fault bar of the information screen in the main display (see [Table 3-3 Operating Limits Description on page 3-8](#)).

Table 3-2 Operating Limits Identification

Limit	Bypassable		Bypassable in Luffing Jib Setup Mode On ¹		Bypassable with External Override Switch ²
	See 3 – Limit Bypass Switch, on page 3-6				
	Non-CE ³	CE ³	Non-CE ³	CE ³	CE ³
Bail, Minimum (each drum)	No	No	No	No	No
Block Up (each drum)	Yes	Yes ⁴	Yes	Yes	No
Boom Max Up	No	No	No	No	No
Function Diverted	No	No	No	No	No
Function Parked	No	No	No	No	No
Inactive Control Station (CE only)	No	No	No	No	No
Luffing Jib Maximum Down 1	Yes	No	Yes	Yes	No
Luffing Jib Maximum Down 2	No	No	No	No	No
Luffing Jib Maximum Up 1	Yes	No	Yes	Yes	No
Luffing Jib Maximum Up 2	Yes ⁵	No	Yes ⁵	Yes ⁵	No
Luffing Jib Stop Latch	Yes	Yes	Yes ⁵	Yes ⁵	No
Mast (live) Accessory Fault	No	No	No	No	No
Mast Arms Down	Yes	Yes	No	No	No
Mast Arms Up	Yes	Yes	No	No	No
Mast Too Far Back	Yes	Yes	No	No	No
Mast Too Far Forward	Yes	Yes	No	No	No
Mast (fixed) Stop	No	No	No	No	No
Operator Out of Seat	No	No	No	No	No
Pawl Engaged	No	No	No	No	No
Rated Capacity Indicator/Limiter	Yes	Yes ⁴	Yes	Yes ⁴	Yes ⁶
Transducer Fault	No	No	No	No	No
Travel on Grade with VPC Unlocked	No	No	No	No	No
VPC Setup Prohibited	No	No	No	No	No
VPC Setup Required	No	No	No	No	No
VPC Sensor	No	No	No	No	No

¹ Use only for rigging. See [Bypassing Limits in Luffing Jib Setup Mode, on page 3-12](#).

² Cranes meeting European requirements (CE) are equipped with an RCI/RCL External Override Switch located outside the operator cab. See MLC300 Rated Capacity Indicator/Limiter Operation Manual.

³ CE = Cranes that comply with 2010 European requirements.






⁴ 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).






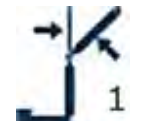
⁵ Only when boom is below 50°.







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









The following table describes the operating limits this crane is equipped with. When a limit is reached, the operating limit fault is activated and the corresponding fault icon appears in the fault bar of the information screen in the main display.




Table 3-3 Operating Limits Description

Operating Limit	Icon
<p>Bail, Minimum</p> <p>This limit stops the corresponding drum from lowering when there are three to four wraps of wire rope remaining on the drum.</p> <ul style="list-style-type: none"> • The load can be raised after the limit is contacted. • This limit can only be bypassed by disconnecting the electric cable from the limit switch and connecting the shorting plug. <p style="text-align: center;"> WARNING Falling Load Hazard!</p> <p>When lowering a load below the minimum bail limit, do so slowly with extreme caution. Do not lower the load to the point where less than three full wraps of wire rope are on the drum. The wire rope could be pulled out of the drum allowing the load to fall.</p>	 <p>M102775</p>
<p>Block Up</p> <p>In the non-setup mode, this limit stops the boom or luffing jib from lowering and the load drum from hoisting when the load contacts a block-up limit switch.</p> <ul style="list-style-type: none"> • The load on the corresponding drum can be lowered and the boom or luffing jib can be raised after a block-up limit switch is contacted. • The limit bypass switch must be turned to the bypass position before a load can be hoisted above the limit. <p style="text-align: center;"> WARNING Two-Blocking Hazard!</p> <p>If it is necessary to hoist a load above the block-up limit, do so slowly with extreme caution to prevent two-blocking.</p> <p>Do not hoist the load above the minimum block clearance given in the Reeving Diagrams (see Section 4 of the MLC300 Operator Manual).</p> <p>Do not use the limit bypass switch to lower the boom or the luffing jib after the block-up limit is contacted, or two-blocking could occur. The load could fall.</p>	 <p>M102773</p>
<p>Boom Max Up</p> <p>This limit stops the boom when the boom is raised to one of the following maximum angles:</p> <p>85° for boom only with or without VPC-MAX attachment</p> <p>86° for boom with luffing jib and without VPC-MAX attachment</p> <p>85° for boom and luffing jib with VPC-MAX attachment</p> <p>The boom can be lowered after this limit is reached.</p> <p>The boom max up angle must be adjusted each time the luffing jib is installed or removed. See Section 6 in this manual for the adjustment procedure.</p>	 <p>M102777</p>

Operating Limit	Icon
<p>Function Diverted</p> <p>This limit prevents Drums 1 and 3 from being operated at the same time. Drum 3 must be parked to operate Drum 1. Drum 1 must be parked to operate Drum 3.</p>	 <p>M102779</p>
<p>Function Parked</p> <p>This limit prevents the selected crane function from being operated until the park switch is turned off (un-parked).</p>	 <p>M102772</p>
<p>Inactive Control Station</p> <p>This limit applies only to cranes meeting CE requirements.</p> <p>This limit prevents the cab controls from being operated when the remote control is being operated.</p> <p>The remote control has priority. Therefore, if the cab controls are being operated and the remote control becomes active, the cab controls will be disabled.</p>	 <p>M102791</p>
<p>Luffing Jib Maximum Down 1 (minimum working angle)</p> <p>This programmed limit stops the luffing jib from lowering when the boom-to-luffing jib angle is 70°.</p> <ul style="list-style-type: none"> The luffing jib can be raised after this limit is reached. The limit bypass switch must be turned to the bypass position to lower the jib to the Luffing Jib Maximum Down 2 limit. 	 <p>M102792</p>
<p>Luffing Jib Maximum Down 2 (minimum angle)</p> <p>A limit switch stops the luffing jib from lowering when the boom-to-luffing jib angle is 68.5°.</p> <ul style="list-style-type: none"> This limit cannot be bypassed. If this limit is contacted on cranes meeting CE requirements, the luffing jib cannot be raised until the limit is reset. See Resetting Luffing Jib Limits, on page 3-13. <p style="text-align: center;">! WARNING Falling Boom/Jib Hazard!</p> <p>Do not lower the luffing jib below the minimum angle given in the Luffing Jib Raising (and lowering) Procedure chart. Structural damage could result, possibly causing the boom and luffing jib to collapse.</p>	 <p>M102781</p>
<p>Luffing Jib Maximum Up 1 (maximum working angle)</p> <p>This programmed limit stops the luffing jib when the boom-to-luffing jib angle is 169°.</p> <ul style="list-style-type: none"> The luffing jib can be lowered after this limit is reached. The limit bypass switch must be turned to the bypass position to raise the jib an additional 1.5° to the Luffing Jib Maximum Up 2 limit. <p style="text-align: center;">! WARNING Falling Boom/Jib Hazard!</p> <p>Proceed slowly when operating the luffing jib above the Luffing Jib Maximum Up 1 limit.</p> <p>Do not raise the luffing jib above the Luffing Jib Maximum Up 2 limit. Structural damage will occur, possibly causing the boom and luffing jib to be pulled over backwards.</p>	 <p>M102782</p>

Operating Limit	Icon
<p>Luffing Jib Maximum Up 2 (maximum angle)</p> <p>A limit switch stops the luffing jib when the boom-to-luffing jib angle is 170.5°.</p> <ul style="list-style-type: none"> This limit cannot be bypassed. If this limit is contacted on cranes meeting CE requirements, the luffing jib cannot be raised until the limit is reset. See Resetting Luffing Jib Limits, on page 3-13. 	 <p>M102783</p>
<p>Luffing Jib Stop Latch</p> <p>See Section 6 of this manual for a complete description of the luffing jib physical jib stop latch.</p> <p>This limit stops the corresponding hoist if:</p> <ul style="list-style-type: none"> You try to luff up when either jib stop latch is LOCKED (proximity sensor electrically open) and the boom-to-luffing jib angle is greater than 145°. This limit can be bypassed only in the luffing jib setup mode if the boom angle is less than 50°. You try to boom down or you try to luff up when either latch is UNLOCKED (proximity sensor electrically closed) and the boom angle is less than 30°. This limit can be bypassed. 	 <p>M103337</p>
<p>Mast (live) Accessory Fault</p> <p>If the crane is configured with a live mast only, this limit stops the mast hoist from operating in either direction. Check the pressure transducers for the live mast hoist and the accessory system.</p>	 <p>M103769</p>
<p>Mast Assist Arms Down</p> <p>With the Setup Mode ON, this limit stops the boom hoist if you attempt to raise the mast to vertical when the mast assist arms are down.</p> <p style="text-align: center;"> WARNING Falling Mast/Boom Hazard!</p> <p>Prevent the mast from falling over backwards:</p> <ul style="list-style-type: none"> Fully raise the mast assist arms before raising the mast to vertical. The mast can fall over backwards if this precaution is not taken. 	 <p>M102799</p>
<p>Mast Assist Arms Up</p> <p>With the Setup Mode OFF, this limit stops the boom hoist if you attempt to raise the boom when the mast assist arms are up.</p> <p style="text-align: center;"> WARNING Falling Mast/Boom Hazard!</p> <p>Prevent the mast and the boom from falling:</p> <ul style="list-style-type: none"> Fully lower the mast assist arms before raising the boom. The mast can buckle and collapse if it contacts the mast-assist arms with a fully rigged boom. 	 <p>M102798</p>
<p>Mast too Far Back</p> <p>This limit stops the boom hoist when the live mast is lowered rearward to 2°. Finish lowering the mast to the transport position (0°) manually with the switch on the remote control or on the right console in the cab.</p>	 <p>M102784</p>

Operating Limit	Icon
<p>Mast too Far Forward</p> <p>The fault alarm for this limit is activated when the live mast is lowered forward to 158° during crane assembly and disassembly.</p> <p style="text-align: center;"> WARNING Falling Mast Hazard!</p> <p>Do not lower the mast below the specified angle. Raise the live mast when this fault is activated. Further lowering is not approved - the mast could fall.</p>	 <p>M102785</p>
<p>Mast (fixed) Stop</p> <p>This limit stops boom hoist operation if the mast stop cylinders retract for any reason. The cylinders must be extended at all times.</p>	 <p>M103770</p>
<p>Operator Out of Seat</p> <p>This limit prevents the crane functions from being operated when the operator is out of the seat. Sit down in the seat to operate the crane functions.</p>	 <p>M102790</p>
<p>Pawl Engaged</p> <p>This limit prevents the drum from lowering until the pawl is disengaged from the ratchet. It may be necessary to hoist slightly to fully disengage the pawl.</p>	 <p>M102794</p>
<p>Rated Capacity Limiter</p> <p>This fault is activated for the following conditions. Take immediate corrective action.</p> <ul style="list-style-type: none"> • Overload • Sensor fault • Out of the capacity chart (a condition that is not covered by the current capacity chart) • Unconfirmed or invalid RCL/RCl configuration. 	 <p>M102787</p>
<p>Transducer Fault</p> <p>In the setup mode, this limit stops operation if there is a transducer fault. Troubleshoot the hydraulic system using the screens in the Main Display to determine the faulty transducer. Take corrective action to correct the fault.</p>	 <p>M102793</p>
<p>Travel on Grade with VPC Unlocked (only for a crane without VPC-MAX)</p> <p>This limit prevents travel on a grade greater than 7%. Always lock the VPC before traveling onto any grade.</p>	 <p>M103070</p>

Operating Limit	Icon
<p>VPC Setup Required</p> <p>NOTE The VPC setup mode must be ON anytime the boom is suspended and operated out of the capacity chart.</p> <p>It is normal for the counterweight to move in or out when the VPC setup mode is on.</p> <p>This limit prevents the boom from being raised from ground level until the VPC Setup Mode is turned on.</p> <p>When the boom angle is out of the capacity chart, this limit stops the boom from being lowered until the VPC setup mode is turned on.</p>	 <p>M102795</p>
<p>VPC Setup Prohibited</p> <p>NOTE The VPC setup mode must be OFF anytime the boom is supported and operated within the capacity chart.</p> <p>When the boom angle is within the capacity chart, this limit stops the boom from being raised until the VPC setup mode is turned off.</p>	 <p>M102796</p>
<p>VPC Sensor</p> <p>This limit prevents operation if the VPC has not been properly calibrated or if there is a boom angle or jib angle sensor fault.</p>	 <p>M102797</p>

BYPASSING LIMITS IN LUFFING JIB SETUP MODE

- Go to the Luffing Jib Setup Screen (1) in the Main Display (Figure 3-5).
See the MLC300 Main Display Operation Manual for detailed instructions.
- Turn the luffing jib setup mode ON (2).
- The luffing jib setup icon (3) in the Status Bar of the main display will turn orange.
- Rotate the limit bypass key CLOCKWISE and release it. The limits will remain bypassed for 10 seconds.
- Move the desired control handle (luffing hoist, boom hoist, load drum) in the required direction. The limits will remain bypassed for as long as the control handle is moved in either direction.
- The limits will remain bypassed for 10 seconds after the control handle(s) is returned to off.
- Turn the luffing jib setup mode OFF (4) for normal operation when the boom and luffing jib are within the applicable capacity chart.

The luffing jib setup icon (5) in the Status Bar of the main display will turn light blue.

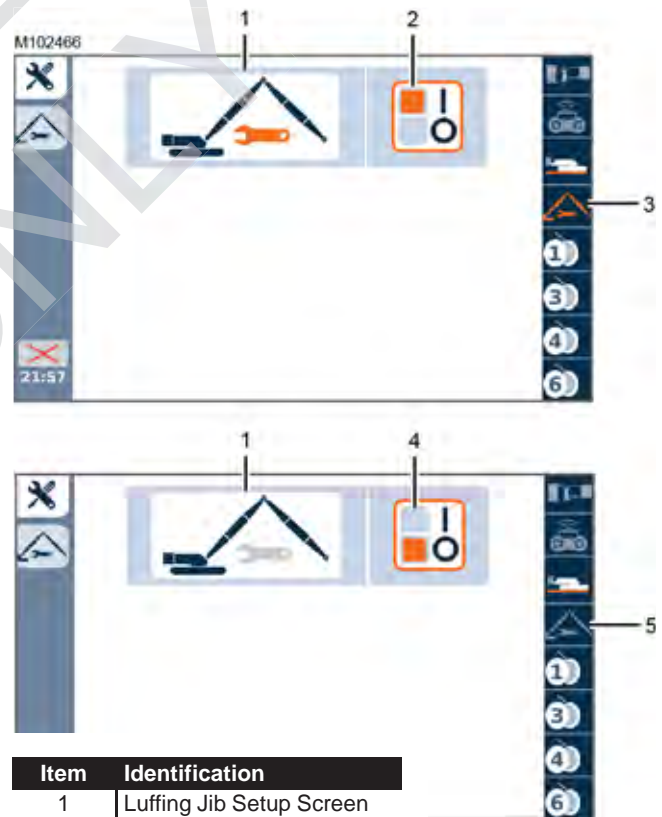


FIGURE 3-5

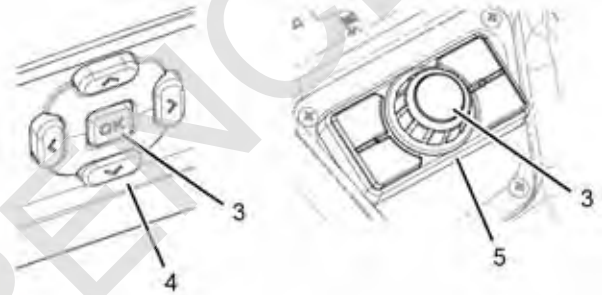
RESETTING LUFFING JIB LIMITS

This procedure applies only to cranes meeting CE requirements. See [Figure 3-6](#).

When the Luffing Jib Maximum Up 2 limit or the Luffing Jib Maximum Down 2 limit is contacted, operation will stop and the jib up prompt (1) or the jib down prompt (2) will appear in the main display.

When either prompt appears:

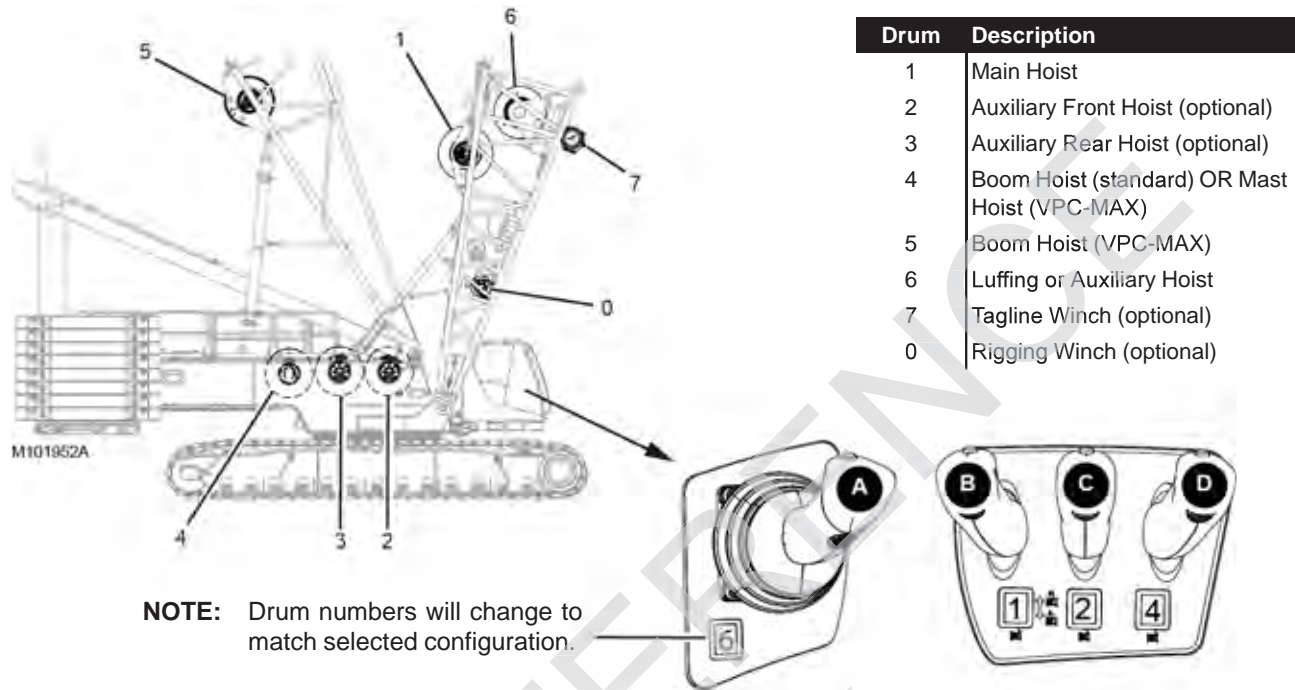
1. Release the control handle to off.
2. Press either select button (3) to reset the limit.
3. The prompt will go off and you will be able to operate the luffing jib in the opposite direction of the limit, down or up.



Drum	Description
1	Jib Up Prompt
2	Jib Down Prompt
3	Select Button
4	Main Display
5	Jog Dial on Right Console

Figure 3-6. Resetting Luffing Jib Limits

DRUM AND CONTROL HANDLE IDENTIFICATION



Drum	Description
1	Main Hoist
2	Auxiliary Front Hoist (optional)
3	Auxiliary Rear Hoist (optional)
4	Boom Hoist (standard) OR Mast Hoist (VPC-MAX)
5	Boom Hoist (VPC-MAX)
6	Luffing or Auxiliary Hoist
7	Tagline Winch (optional)
0	Rigging Winch (optional)

NOTE: Drum numbers will change to match selected configuration.

Configuration	HANDLE A Controls Drum	HANDLE B Controls Drum	HANDLE C Controls Drum	HANDLE D Controls Drum
With Live Mast (without fixed mast)				
Live Mast Handling (crane assembly) ¹	4	1	AC ² or 2 or 3 ³	6 or 5 ³
Boom only	4	1	2 or 3 ³	3 or 6 ³
Boom with Luffing Jib	6	1	2 or 3 ³	3 or 4 ³
Boom with Fixed Jib	4	1	2 or 3 ³	3 or 6 ³
Boom with Luffing Jib and Fixed Jib Attached	6	1	2 or 3 ³	3 or 4 ³
With Live Mast and Fixed Mast				
Fixed Mast Handling (crane assembly) ⁴	4	1	2, 3, or 6 ³	5
Boom only	5	1	2 or 3 ³	3 or 6 ³
Boom with Luffing Jib	6	1	2 or 3 ³	3 or 5 ³
Boom with Fixed Jib	5	1	2 or 3 ³	3 or 6 ³
Boom with Luffing Jib and Fixed Jib Attached	6	1	2 or 3 ³	3 or 5 ³

¹ Live Mast Configuration selected in RCL/RCI display.

² AC: Handle C provides proportional control of the self-erect cylinder (assembly cylinder). For current production cranes (CCM-10 software version 0.022 and newer), the self-erect cylinder must be turned ON in the Mode Selection Group of the main display.

³ Combination of parked and un-parked drums determines which drum is operable.

⁴ Fixed Mast Configuration selected in RCL/RCI display.

FIGURE 3-7

OPERATING PRECAUTIONS

1. Read and comply with the instructions in the Liftcrane Luffing Jib Capacity charts provided with the luffing jib attachment. Do not operate beyond the limits given in the capacity charts.

Make sure the proper counterweight is installed on the crane.

2. Read and comply with the instructions in this manual and in the Crane Operator Manual.
3. Read and comply with the Maximum Allowable Travel Specifications in the Luffing Jib Capacity Chart Manual.

For **travel on grade**, the VPC Lockout Key Switch (on right console) must be in the LOCK position (not applicable to VPC-MAX).



WARNING

Tipping Crane Hazard



The crane can tip if the VPC (counterweight) is not locked, as follows, **prior to traveling onto a grade**:

- Position the crane on a level surface.
- Unlock the VPC.
- Position the boom (and luffing jib if equipped) so it is facing the proper direction and is within the boom/jib angle range specified in the Maximum Allowable Travel Specifications chart.
- Lock the VPC.


The VPC must be locked before traveling on the grade. Do not change the boom/jib angle after the crane has been traveled onto the grade.

Do not exceed the grade specified in the Maximum Allowable Travel Specifications chart.

For cranes without VPC-MAX:

- The **Travel on Grade Permitted** icon will appear in the Information/Notifications Bar of the RCL/RCI display when the VPC is locked and positioned for travel on a grade that corresponds to the current boom/jib angle. See Maximum Allowable Travel Specification chart for details. 
- The **Travel on Grade Prohibited** icon will appear in the Information Bar of the RCL/RCI display if the VPC is locked and positioned such that travel on grade 

is not permitted. See Maximum Allowable Travel Specification chart for details.

- The **Travel on Grade with VPC Unlocked** fault will come on in the main display and travel will stop if the crane is traveled onto a grade greater than 7% with the VPC unlocked. 

4. Make sure the luffing jib attachment is installed properly. Read and comply with the instructions in Section 4 of this manual.
5. If required per the rigging drawing in use (boom and luffing jib), make sure the intermediate suspension is properly installed. Otherwise, damage to the boom and jib sections can occur.

For some boom and luffing jib configurations, it is normal for the intermediate suspension to appear slack during boom and luffing jib raising and operation. If your intermediate suspension appears slack —

- make sure it is installed in the proper location,
- make sure the proper pendant buttons are pinned to the sockets,

and continue operation.

6. Make sure all operating limits — block-up, boom and jib stops, boom and jib angle indicators, and RCL/RCI — are installed and operating properly. See Section 6 of this manual for adjustment procedures.

See the separate RCL/RCI Operation Manual for operation and calibration of the RCL/RCI.

7. Make sure the proper luffing jib capacity chart is selected in the RCL/RCI Display.
8. Raise and lower the luffing jib as instructed in Section 4 of this manual.
9. Perform all operations with the crane on a firm, level, uniformly supporting surface.
10. Operate all crane functions slowly and smoothly. Avoid sudden starts and stops which could side load or shock load the attachment.
11. Do not operate the crane, to include raising the boom and jib from the ground level, if the wind exceeds the limits given in the capacity charts. Contact your local weather station for the wind velocity.

LEAVING CRANE UNATTENDED

When the crane is left unattended, it must be parked as instructed in Section 3 of the Crane Operator Manual.

WIND CONDITIONS

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



WARNING

Tipping Crane Hazard!

The 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 the crane to tip or the boom and/or jib to collapse. Death or serious injury to personnel can result.

Wind speed (to include wind gusts) must be monitored by job planners and supervisors.

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:

The 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 chart at the end of this section or, if applicable, see the wind conditions in capacity charts provided with the crane and luffing jib.

SECTION 4

SET-UP AND INSTALLATION

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SECTION 4

SET-UP AND INSTALLATION



WARNING

Avoid Death or Serious injury!

Read and understand the instructions in this section before attempting to install or remove the attachment.

Moving Parts/Pinch Points!

Avoid death or crushing injury during crane assembly and disassembly:

- 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 the crane.

Falling Load Hazard!

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

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

GENERAL SETUP AND INSTALLATION

This section contains installation and removal instructions for the #501 Luffing Jib Attachment used on the Model MLC300 without or with a VPC-MAX attachment.

There are two methods for installing, raising, lowering, and removing the struts (main and jib):

- **Method 1**, utilizing the jib butt and the first insert as the holdback. Method 1 is provided in MLC300 Operator Manual Section 4, Version 1.
- **Method 2**, utilizing a 10 t (11 USt) counterweight as the holdback. Method 2 is provided in this section.

For the remainder of this section, luffing jib attachment is referred to as *jib or attachment*.

The instructions in this section assume that the crane, the VPC-MAX attachment (if equipped), and the required length of boom are already installed and ready for jib installation.

The jib must be installed, operated, and removed by experienced personnel trained in the operation and erection of construction cranes. These personnel shall read, understand, and comply with the instructions in this section,

in the Luffing Jib Rigging drawing at the end of this section, and in the Liftcrane Luffing Jib Capacity Charts provided with the attachment.

Contact your Manitowoc dealer for a detailed explanation of any procedure not fully understood.

The installation/removal area must be a firm, level, uniformly supporting surface and free of ground and overhead obstructions.

Level = 1% of grade or
0,3 m (1 ft) in 30,5 m (100 ft)

The area selected must be large enough to accommodate the crane, the selected boom and jib length, and movement of an assist crane.

See the Luffing Jib Rigging drawing at the end of this section for:

- Maximum combined boom and jib length
- Minimum boom length for use with the jib

CRANE ORIENTATION

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

- The operator cab is on the front of the upperworks.
- The arrow fabricated onto the right-front corner of the carbody points toward the front of the carbody.

ACCESSING PARTS



WARNING

Fall Hazard!

To avoid serious injury, the owner/user shall provide workers with approved ladders or aerial work platforms to access those areas of the crane, mast, boom, and jib that cannot be reached from the ground or from Manitowoc provided, ladders, catwalks and platforms.

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

Some parts of the crane, mast, boom, and jib cannot be reached from the ground. Take the necessary precautions to prevent slipping and/or falling off the crane, mast, boom, or jib during assembly, disassembly, maintenance, or other work. **Falling from any height could result in serious injury or death.**

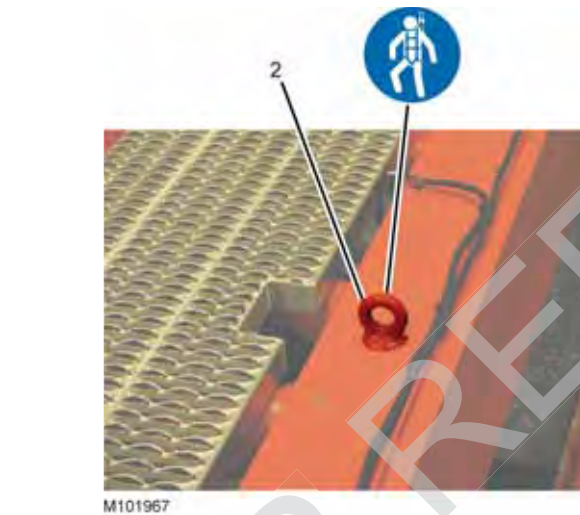
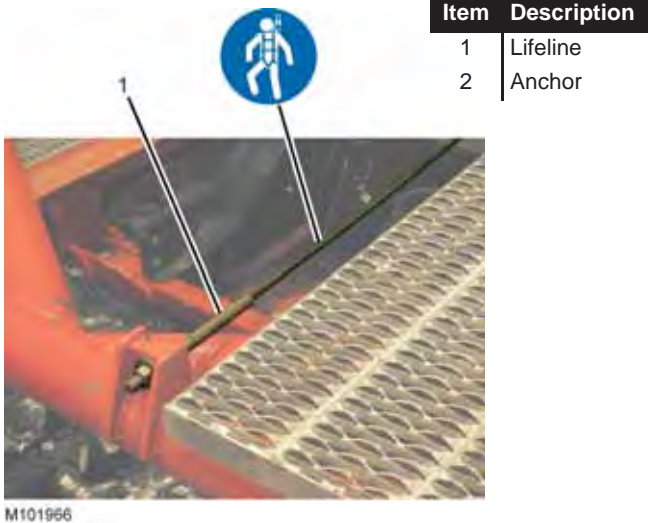


FIGURE 4-1

PERSONAL FALL-PROTECTION

Manitowoc has provided lifelines and anchors throughout the crane and attachment (see [Figure 4-1](#)) 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 shall wear fall-protection equipment.

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

CRANE WEIGHTS AND SHIPPING DATA

See the Crane Weights in Section 1 of this manual for the weights of the individual boom and jib components.

See the MLC300 Product Guide in Section 1 of the Crane Operator Manual for outline and shipping dimensions.

OPERATING CONTROLS

Become thoroughly familiar with the location and function of all operating controls provided for the crane and attachment. Read and understand the instructions in Section 3 of this manual.

COUNTERWEIGHT REQUIREMENT

See the applicable Liftcrane Luffing Jib Capacity Chart and the Luffing Jib Raising Procedure chart for counterweight requirements when operating with the jib.

! WARNING
Tipping Hazard!

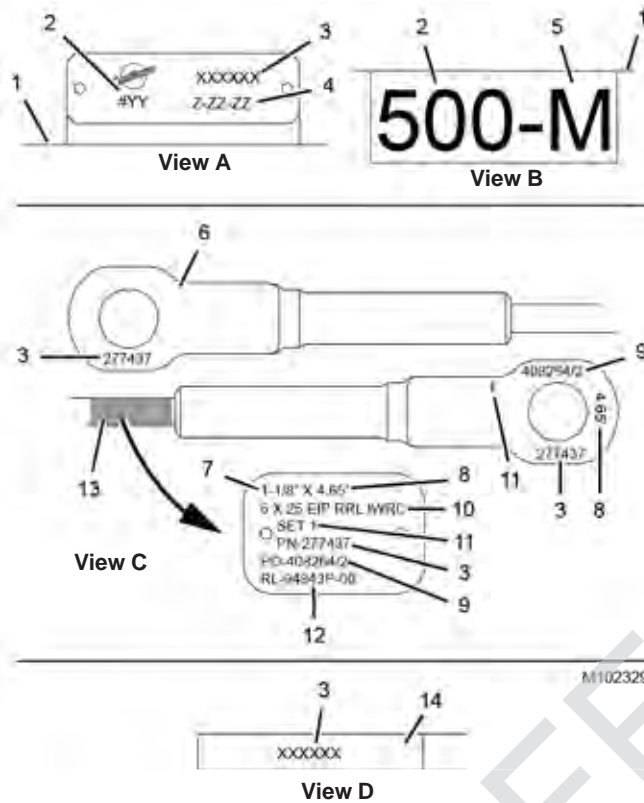
Prevent the crane from tipping. Do not operate the crane until the proper counterweight is installed.

BLOCKED CRAWLERS

To prevent the crane from tipping or structural damage to the attachment, **some boom and jib combinations must be raised and lowered over blocked crawlers**. See the Liftcrane Luffing Jib Capacity Charts and the Luffing Jib Raising Procedure chart for blocked crawler requirements. Also see the Crawler Blocking Diagram in the Luffing Jib Capacity Chart Manual for instructions.

! DANGER
Tipping Hazard!

Prevent the crane from tipping or structural damage to the attachment. Do not attempt to raise or lower the boom and jib from or to the ground until the crawlers are blocked.



Item	Description
1	Boom or Jib Chord
2	Boom or Jib Number
3	Manitowoc Part Number
4	Manitowoc Manufacturing Code
5	Chord Identification (if applicable): H = Heavy L = Light M = Medium
6	Pendant
7	Diameter
8	Length
9	Manitowoc Purchase Order Number
10	Wire Rope Type
11	Set Number
12	Manufacturer's Number
13	Aluminum Tag (if equipped)
14	Boom or Jib Strap

FIGURE 4-2

LUFFING JIB RIGGING DRAWING

See the end of this section for the Luffing Rigging Assembly drawing.

The boom and jib components (butts, inserts, tops, pendants, straps) must be assembled in the proper sequence according to the rigging drawing.

Two tables are provided in the Luffing Jib Rigging drawing:

- One table lists the boom sections and the backstay straps required for various boom lengths.
- The other table lists the jib sections required for various jib lengths.

Make sure the proper table is referred to. Read and comply with all notes on the rigging drawing.

LUFFING JIB RAISING PROCEDURE

See the end of this section for the Luffing Jib Raising (and lowering) Procedure chart.

IDENTIFYING BOOM AND JIB COMPONENTS

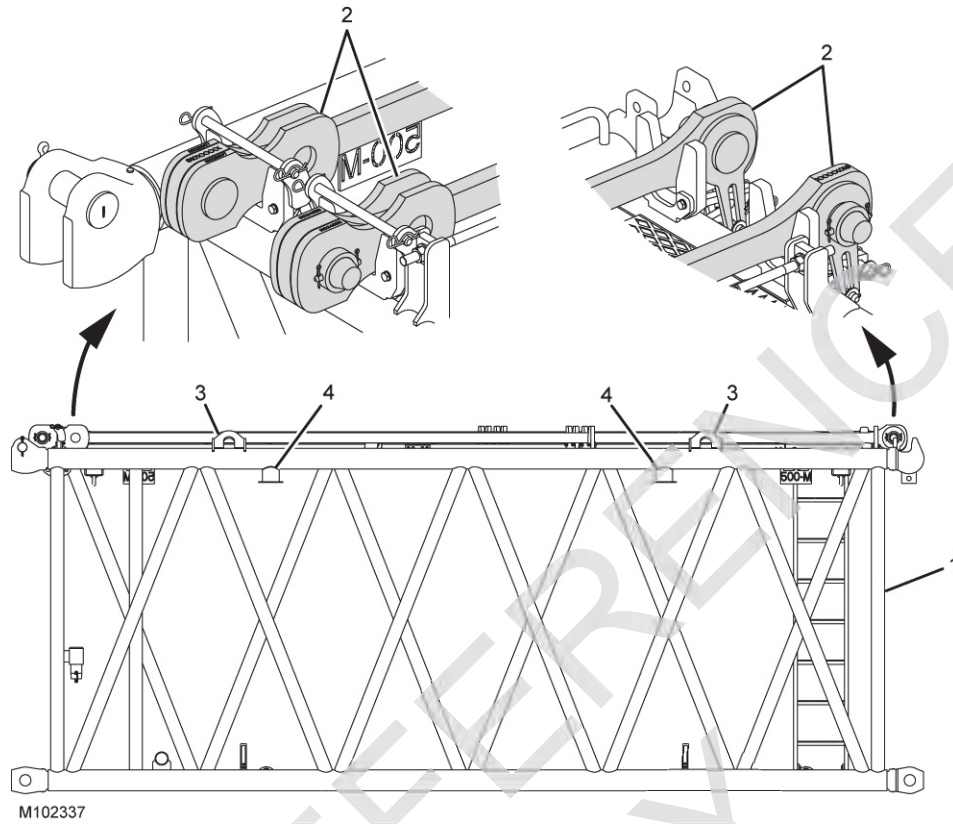
See [Figure 4-2](#) for the following procedure.

The boom and jib sections are marked for proper identification as shown in View A. An identification plate is located near the top end of all four chords.

The boom and jib sections also have two chord identification plates as shown in View B. The plate is located on the top end of the right-top chord and the butt end of the left-top chord.

Pendants are marked for proper identification as shown in View C.

Straps and links are marked for proper identification as shown in View D.



Item	Description
1	Boom Section (typical)
2	Boom and Luffing Jib STRAPS STORED
3	Lifting Lug (4)(if equipped, for shackles of lifting sling hooks)
4	Lifting Lug (4)(for synthetic lifting slings)

FIGURE 4-3

HANDLING COMPONENTS

See [Figure 4-3](#)

Handle the boom and jib sections with care to avoid damaging the lacings and chords.

All boom and jib sections have lifting lugs as shown.



WARNING

Falling Load Hazard!

The lifting lugs on each boom or jib section are designed only for lifting that section. Do not attempt to lift two or more boom or jib sections with the lifting lugs on one section. The lifting lugs may break allowing the boom or jib sections to fall.

When the lifting lugs are not used:

- Lift against the chords only, never against the lacings.
- Use synthetic lifting slings. If wire rope or chain slings are used, install protective covering (such as sections of rubber tire) between the slings and the chords.

CAUTION

Lacing Damage!

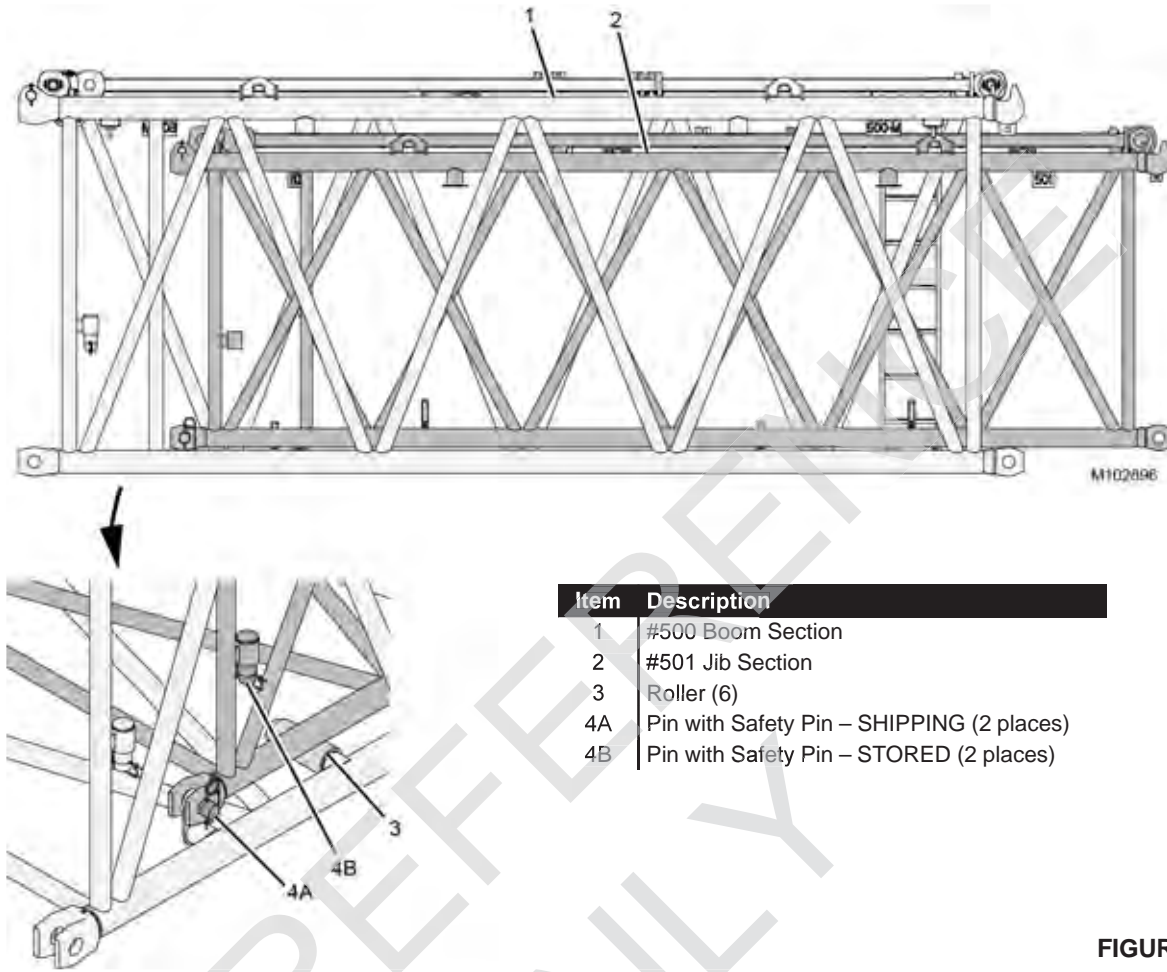
Ensure the boom and jib straps and links are secured in the shipping position on the boom or jib sections during handling and transportation unloading.



WARNING

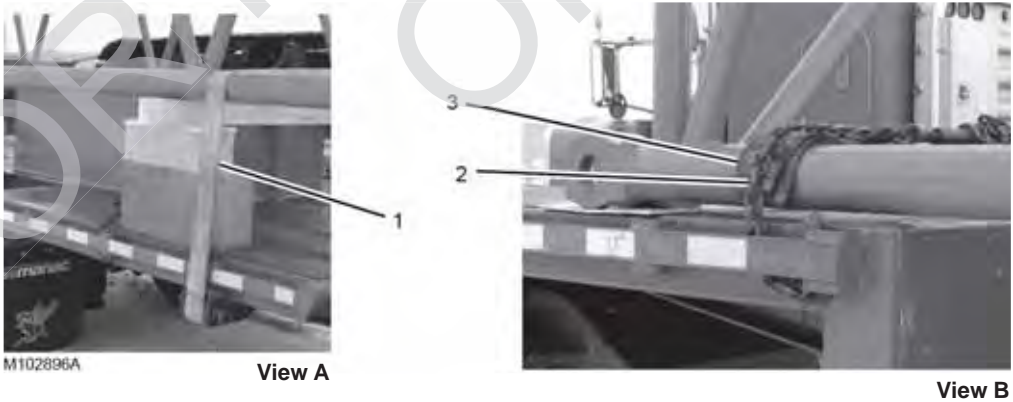
Personal Injury or Property Damage!

Ensure the boom and jib straps and links remain properly secured in the shipping position on the boom or jib sections during transportation loading or unloading and assembly or disassembly of the boom and jib. The straps and links could shift or fall resulting in personal injury or property damage if not properly secured.



Item	Description
1	#500 Boom Section
2	#501 Jib Section
3	Roller (6)
4A	Pin with Safety Pin – SHIPPING (2 places)
4B	Pin with Safety Pin – STORED (2 places)

FIGURE 4-4



Item	Description
1	Nylon Tie-Down Wrapped Over Boom Chord
2	Chain Tie-Down Wrapped Over Boom Chord
3	Protective Covering (section of rubber tire)

FIGURE 4-5

SHIPPING JIB INSERTS

The jib inserts can be shipped inside the boom sections as shown in [Figure 4-4](#).

Refer to the Stowable Insert Configuration table in the Luffing Jib Rigging Drawing at the end of this section.

SHIPPING CRANE COMPONENTS

It is the owner/user's responsibility to ensure the following:

- All trailer loads comply with local, state, and federal transportation requirements.
- **All crane components are properly blocked and secured so they cannot shift or fall off trailers.**
- To avoid damage to components:

Use nylon tie-downs to secure components as shown in [Figure 4-5](#), View A.

If chain tie-downs are used, install protective covering (such as sections of rubber tire) between the chain and component being secured as shown in [Figure 4-5](#), View B.

When securing boom and jib sections, wrap tie-downs over chords — never over lacings. Keep tie-downs as close to blocking as possible (View A) to prevent bending the chords.

ASSIST CRANE REQUIREMENTS

An assist crane is required for jib installation and removal.

The heaviest individual parts to be lifted are:

- Struts (shipped as assembled unit): 9 525 kg (21,000 lb)
- Partially assembled jib: up to 12 700 kg (28,000 lb)

The assist crane must also be capable of handling at least one-half the weight of the fully assembled jib.

RETAINING CONNECTING PINS

Connecting pins are retained in various ways:

- Snap pins
- Quick-release pins
- Cotter pins
- Keeper plates with cap screws and lock washers

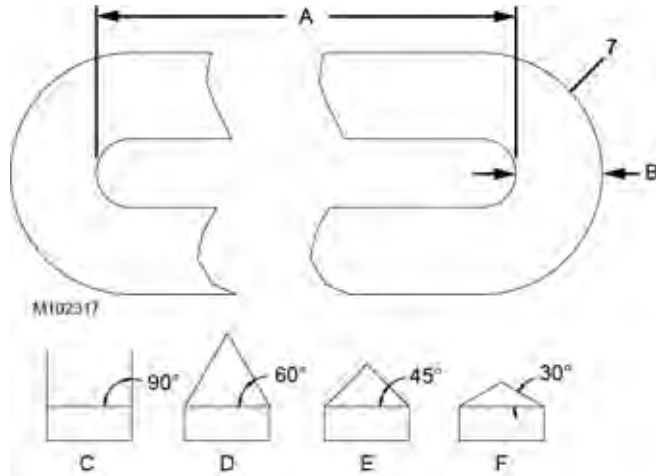
Do not operate crane until all connecting pins are installed and properly retained.

MANITOWOC SUPPLIED LIFTING SLINGS AND SHACKLES

Manitowoc has supplied the lifting slings and shackles shown in [Figure 4-6 on page 4-8](#) and [page 4-9](#).

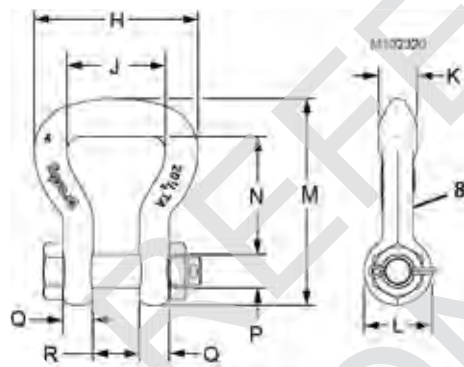
The lifting slings and shackles are stored in the parts box supplied with the MLC300.

Item Numbers in this Illustration Correspond to Item Numbers in [Figure 4-7](#)



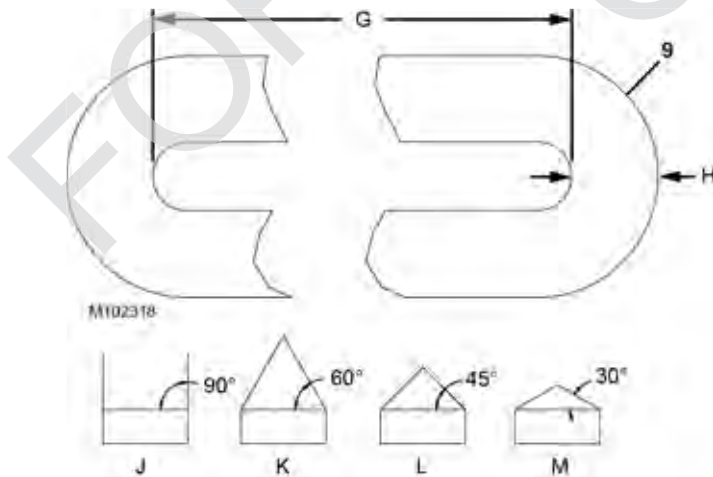
PAST AND CURRENT PRODUCTION

Item	Description	
7	Endless Synthetic Rope Sling	
	Working Load Limit:	
	18 144 kg (40,000 lb) Straight	
	14 515 kg (32,000 lb) Choker	
	36 287 kg (80,000 lb) Basket	
	Four Supplied by Manitowoc	
Item	m	ft
A	2,8	9
Item	mm	in
B	59,7	2-11/32
Item	kg	lb
C	18 144	40,000
D	15 712	34,640
E	12 828	28,280
F	9 072	20,000



PAST AND CURRENT PRODUCTION

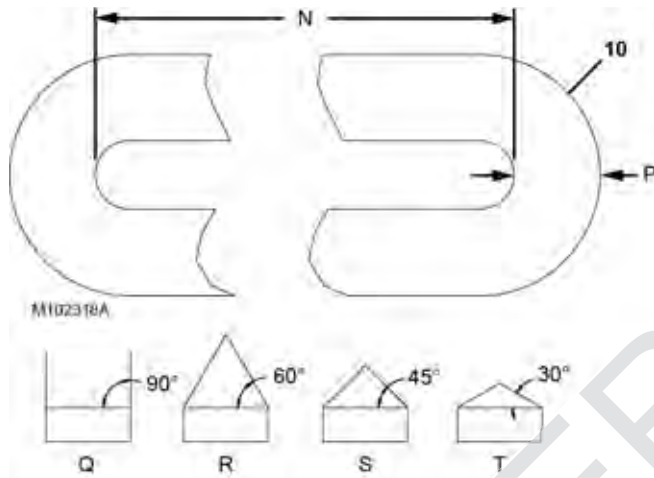
Item	Description	
8	Shackle: 20,5 t (23 USt)	
	Four Supplied by Manitowoc	
Item	mm	in
H	190,5	7.5
J	114,3	4.5
K	44,5	1.75
L	79,2	3.12
M	240,0	9.45
N	136,5	5.37
P	38,9	1.53
Q	35,1	1.38
R	54,1	2.13



PAST PRODUCTION

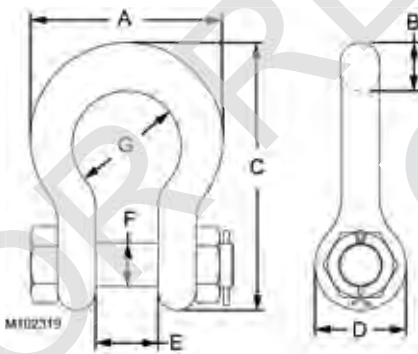
Item	Description	
9	Endless Synthetic Rope Sling	
	Working Load Limit:	
	18 144 kg (40,000 lb) Straight	
	14 515 kg (32,000 lb) Choker	
	36 287 kg (80,000 lb) Basket	
	Four Supplied by Manitowoc	
Item	m	ft
G	1	3,3
Item	mm	in
H	44,5	1-3/4
Item	kg	lb
J	18 144	40,000
K	15 712	34,640
L	12 828	28,280
M	9 072	20,000

FIGURE 4-6



CURRENT PRODUCTION

Item	Description	
10	Endless Synthetic Rope Sling	
	Working Load Limit:	
	18 144 kg (40,000 lb)	Straight
	14 515 kg (32,000 lb)	Chocker
	36 287 kg (80,000 lb)	Basket
	Four Supplied by Manitowoc	
Item	m	ft
N	4	13.0
Item	mm	in
P	59,7	2-3/8
Item	kg	lb
Q	18 144	40,000
R	15 712	34,640
S	12 828	28,280
T	9 072	20,000

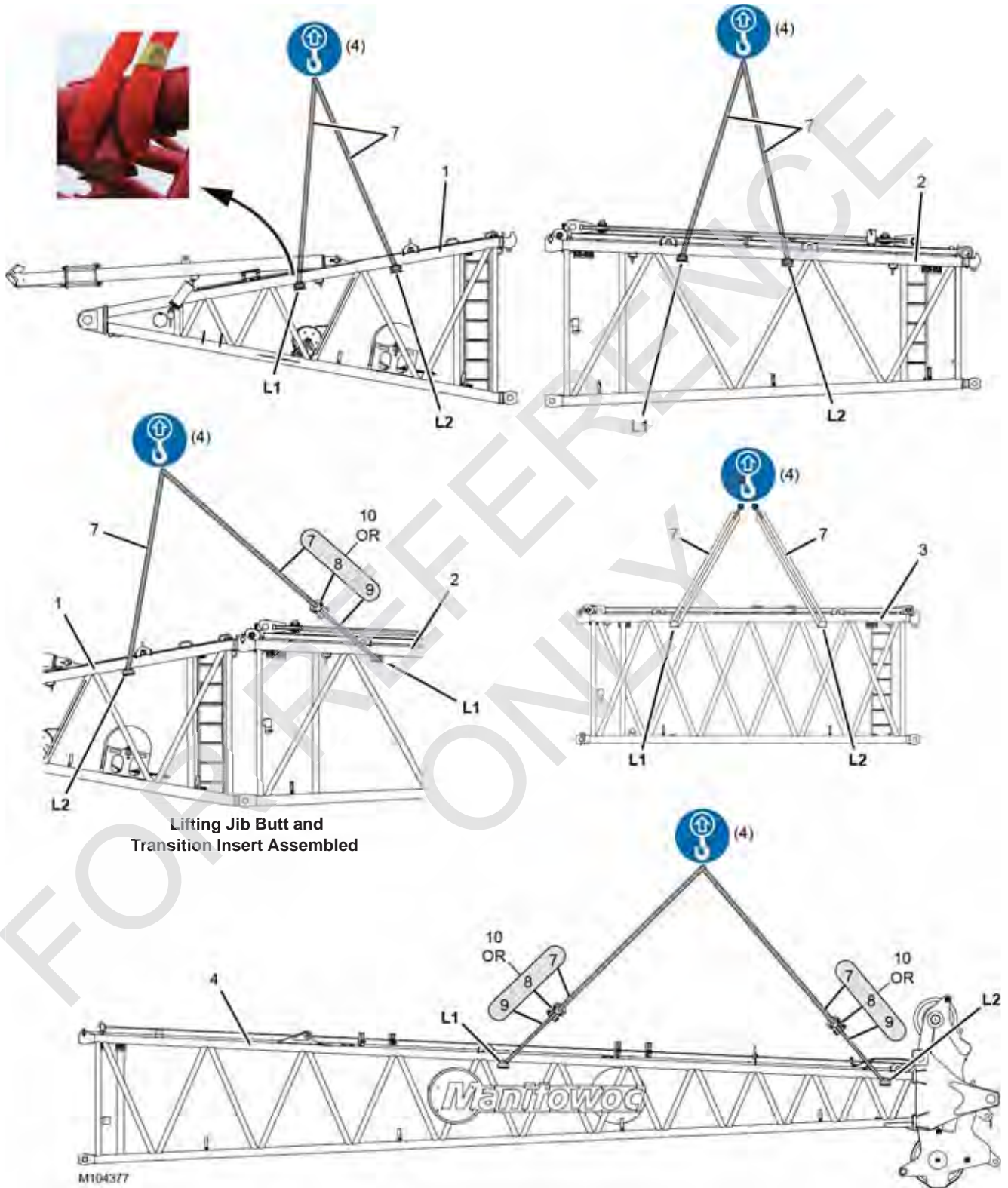


OPTIONAL (not required for luffing jib assembly)

Item	Description	
	Shackle: 25 t (28 USt)	
	Six Supplied by Manitowoc, Past Production	
	Two, Supplied by Manitowoc, Current Production	
Item	mm	in
A	225,0	8.86
B	57,0	2.25
C	313,0	12.34
D	106,0	4.19
E	73,0	2.88
F	51,0	2.00
G	127,0	5.00

FIGURE 4-6 continued

JIB SECTION LIFTING ARRANGEMENTS
(legend on next page)



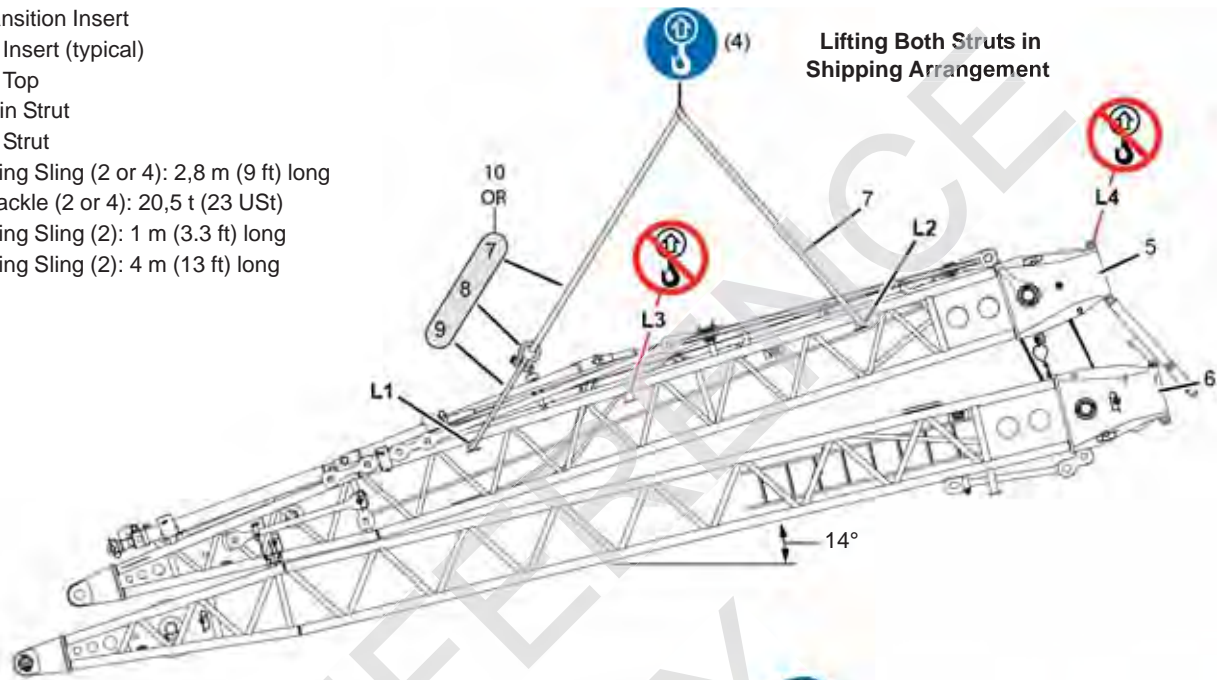
Lifting Jib Butt and
Transition Insert Assembled

FIGURE 4-7

Sling and Shackle Item Numbers Correspond to Item Numbers in [Figure 4-6](#)

STRUT LIFTING ARRANGEMENTS

Item	Description
1	Jib Butt
2	Transition Insert
3	Jib Insert (typical)
4	Jib Top
5	Main Strut
6	Jib Strut
7	Lifting Sling (2 or 4): 2,8 m (9 ft) long
8	Shackle (2 or 4): 20,5 t (23 USt)
9	Lifting Sling (2): 1 m (3.3 ft) long
10	Lifting Sling (2): 4 m (13 ft) long



Item	Description
L1	Lifting Lug (lower)
L2	Lifting Lug (upper)
L3	Lifting Lug (middle) (main strut only)
L4	Lifting Lug (main strut head section)

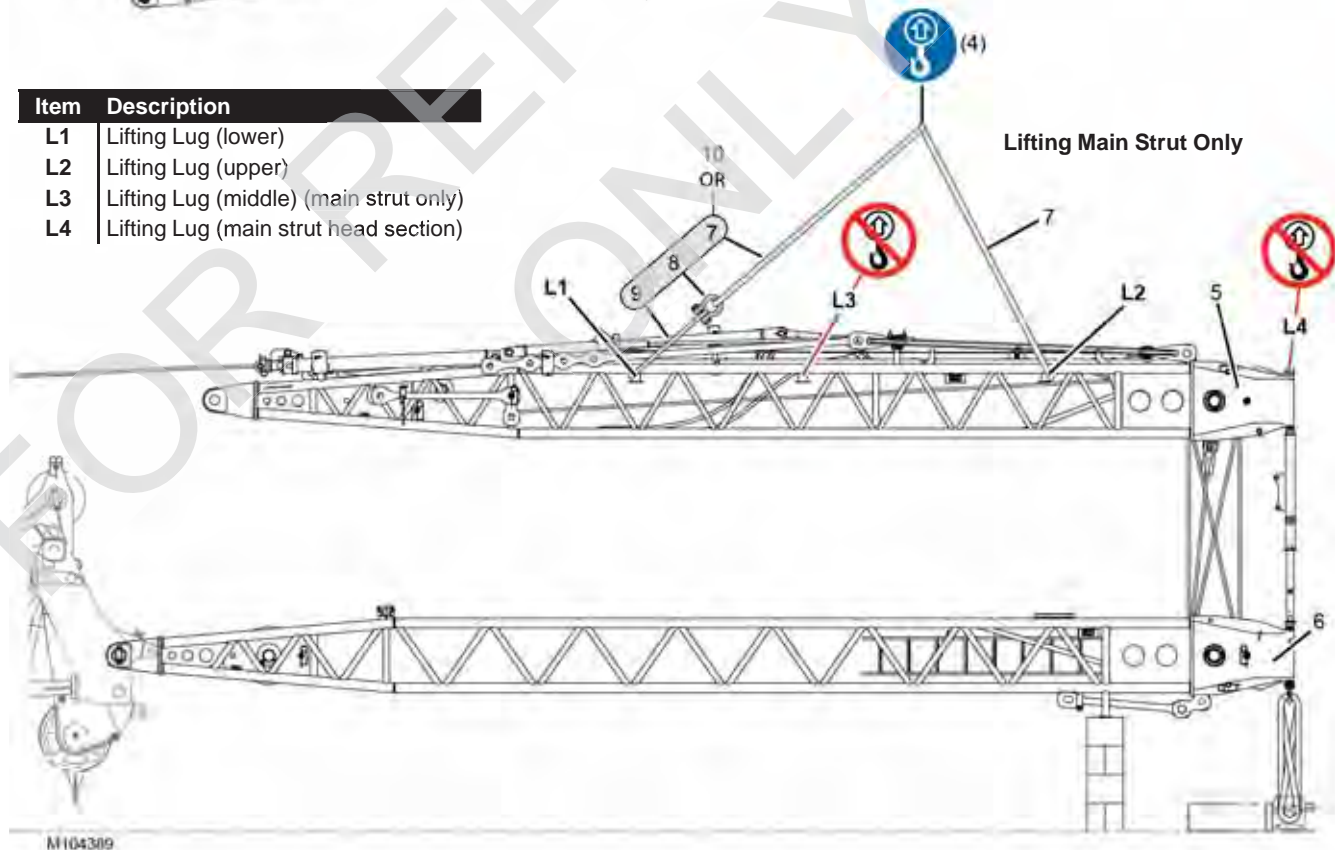
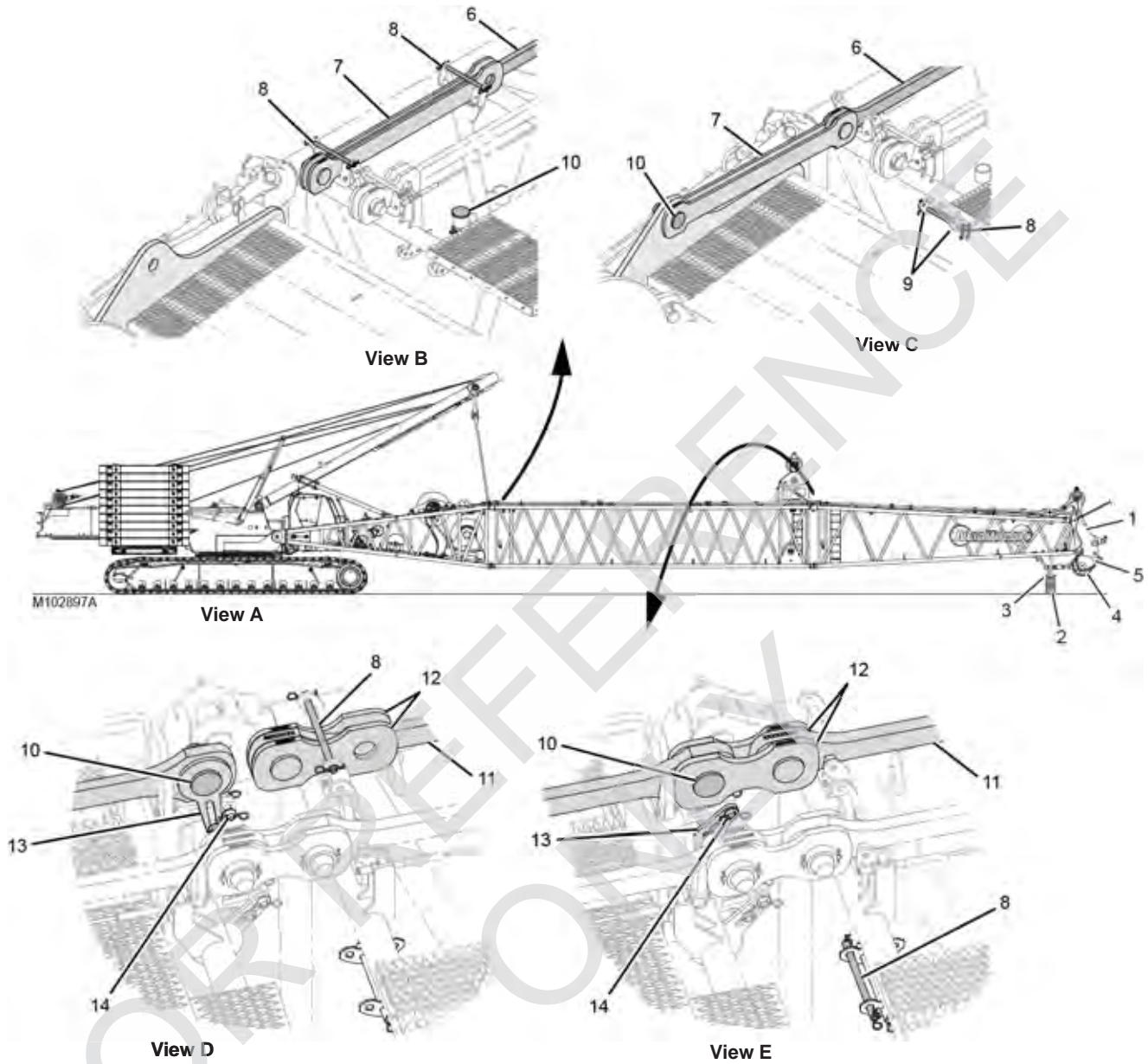


FIGURE 4-7 continued

4



Item	Description	Item	Description
1	Boom	8	Pin with Cotter Pins
2	Blocking	9	Bracket
3	Boom Top Stand	10	Pin with Collar, Retaining Pin, and Cotter Pins
4	Sheave Cluster	11	Strap
5	Lower Boom Point	12	Lug
6	Strap	13	Strap Bracket
7	Links	14	Pin with Safety Pin and Flat Washer

FIGURE 4-8

PREPARING CRANE AND BOOM

The instructions in this section assume the boom and the VPC-MAX attachment (if equipped) are already installed.

See [Figure 4-8](#) for the following procedure.

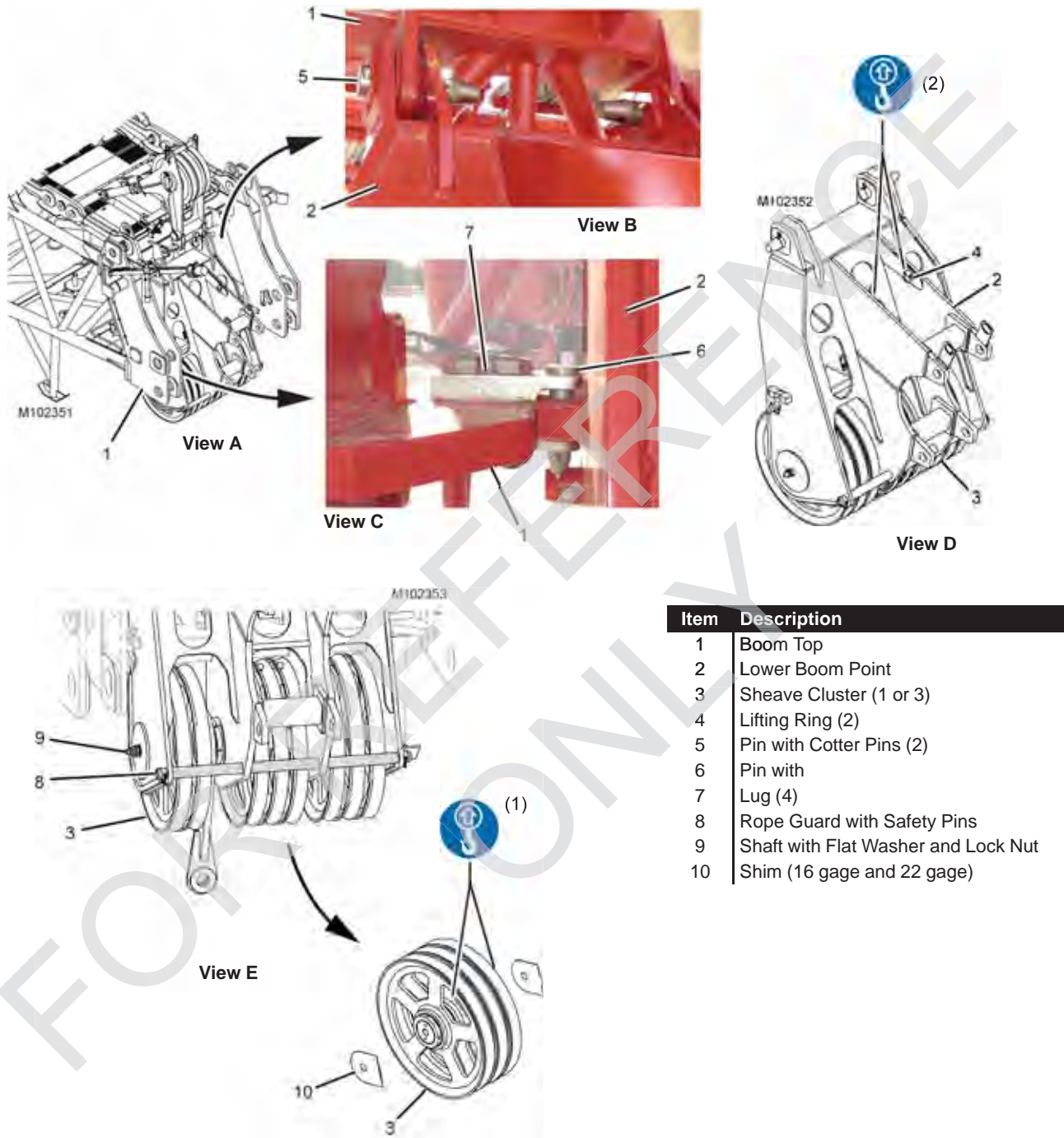
1. Adjust the automatic boom stop to the specified angle for operation with a luffing jib. See Section 6 of this manual.
2. If blocking is required to raise and lower the luffing jib per the Luffing Jib Raising (and lowering) Procedure chart at the end of this section, proceed as follows:
 - a. Position the crawlers so the front crawler rollers are under the boom end of the upperworks.
 - b. Travel the front crawler rollers onto blocking.
See the Capacity Chart Information folio in the Luffing Jib Capacity Chart Manual for blocking instructions.
3. Lower the boom (1, View A) to horizontal.
4. Securely block the boom top by placing blocking (2, View A) under the boom top stands (3).
5. If necessary, remove the load block from the lower boom point.
6. If installed, remove the fixed jib or the upper boom point from the boom top. See Section 4 of the MLC300 Crane Operator Manual for details.
7. If necessary, remove the outer two sheave clusters (4, View A) from the lower boom point (5) and install the sheave clusters on the lower jib point.

See the following topics:

- [Removing Sheave Clusters from Lower Boom Point, on page 4-15](#)
- [Installing Sheave Clusters in Lower Jib Point, on page 4-15](#)

NOTE: If the lower jib point is already equipped with two sheave clusters, the outer sheave clusters do not have to be removed from the lower boom point, unless specified in the Liftcrane Luffing Jib Capacity Chart.

8. If required per the capacity chart, remove the lower boom point (5, View A) from the boom top.
See [Removing Lower Boom Point, on page 4-15](#) of this section.
9. If not already stored on the boom sections, install the backstay straps according to the Luffing Jib Rigging drawing.
10. At the boom butt, connect the backstay straps as follows:
 - a. Remove retaining pins (8, View B) and store them in the brackets (9, View C).
 - b. Remove pin (10, View B).
 - c. Rotate links (7, View B) from the stored position to the working position and pin them to lugs on the boom butt.
 - d. Repeat the steps for the other side of the boom butt.
11. At the boom inserts, connect the backstay straps as follows:
 - a. Remove the retaining pins (8, View D) and store them in the brackets (9, View E).
 - b. Remove the pin (10, View D).
 - c. Rotate the strap bracket (13, View D) down and pin it in the working position (View E) with the pin (14).
 - d. Rotate the links (12, View D) rearward from the shipping position to the working position (View E).
 - e. Install the pin (10, View E). The PIN HEADS for the backstay straps MUST FACE IN.
 - f. Repeat [step 11a](#) through [step 11e](#) for both straps at both ends of each boom section.



Item	Description
1	Boom Top
2	Lower Boom Point
3	Sheave Cluster (1 or 3)
4	Lifting Ring (2)
5	Pin with Cotter Pins (2)
6	Pin with
7	Lug (4)
8	Rope Guard with Safety Pins
9	Shaft with Flat Washer and Lock Nut
10	Shim (16 gage and 22 gage)

FIGURE 4-9

**WARNING****Crane Tipping Hazard!**

To raise some boom and jib lengths, the complete lower boom point (to include frame) must be removed. The crane will tip if this is not done.

Refer to the appropriate Liftcrane Boom or Liftcrane Luffing Jib Capacity Chart to determine lower boom point sheave requirements and deducts.

REMOVING LOWER BOOM POINT

See [Figure 4-9](#) for the following procedure.

If required per the Liftcrane Luffing Jib Capacity Chart, it may be necessary to remove the lower boom point for some boom and luffing jib combinations.

1. Attach owner furnished lifting slings from the assist crane to the lifting rings (4, View D) on the lower boom point (2).
2. Hoist just enough to tighten the lifting slings
3. Remove the pins (5, View B) and the pins (6, View A).
4. Lift the lower boom point (2) away from the boom top.
5. Install the pins (5, View B) and the pins (6, View C) in the lugs on the lower boom point.

REMOVING SHEAVE CLUSTERS FROM LOWER BOOM POINT

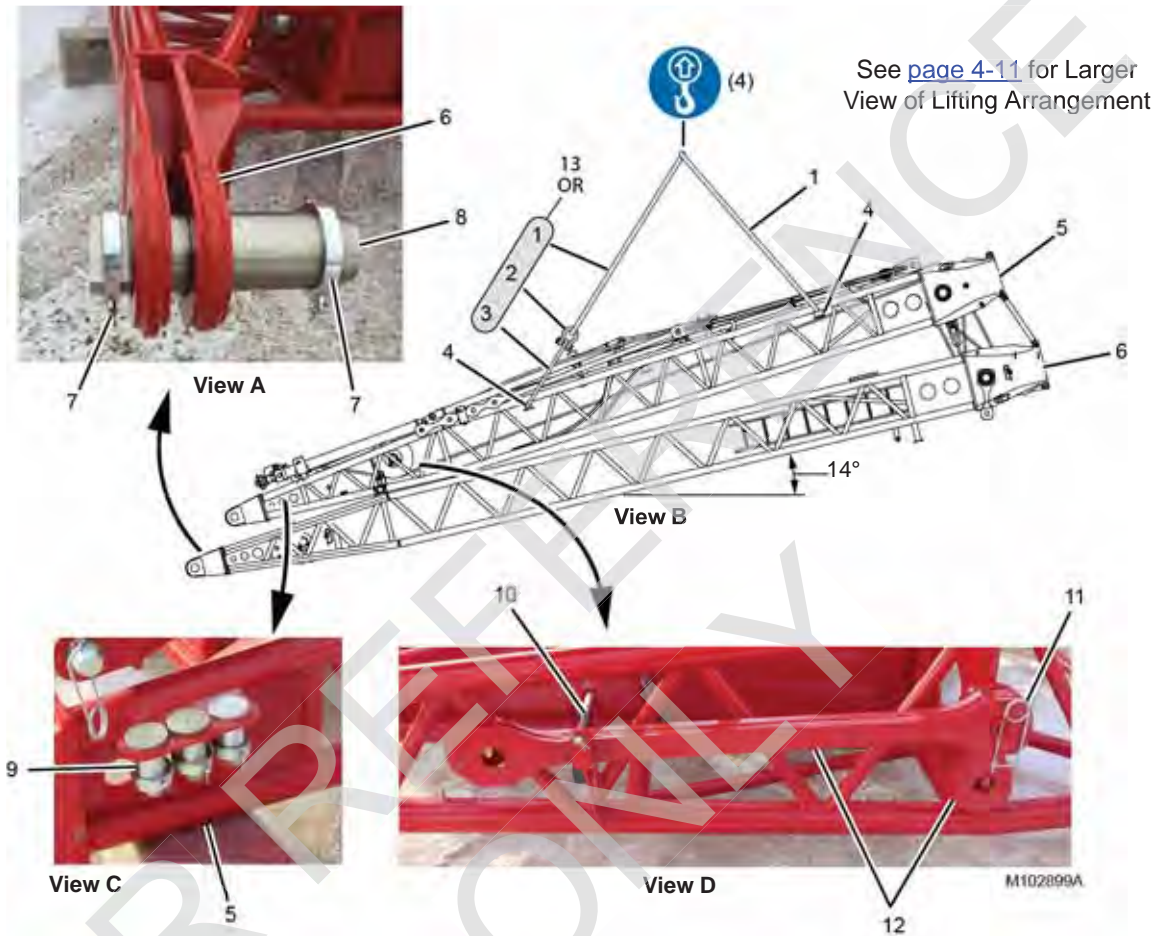
See [Figure 4-9](#) View E, for the following procedure.

1. Remove the rope guard (8).
2. Remove the shaft (9).
3. Using appropriate lifting equipment, pull the sheave clusters (3) out of their saddles in the lower boom point.
Each sheave cluster weighs approximately 240 kg (530 lb).
4. Keep the shims (10) that come out with the sheave clusters.
5. Reinstall the shaft (9) with the flat washer and lock nut. Securely tighten the lock nut.
6. Reinstall the rope guard (8).

INSTALLING SHEAVE CLUSTERS IN LOWER JIB POINT

Reverse the removal steps to install the sheave clusters in the lower luffing jib point.

Install the shims (10) on both sides of each sheave cluster to limit side play of each sheave cluster to 0,76 mm (1/32 in).



Item	Description	Item	Description
1	Lifting Sling (2 or 4): 2,8 m (9 ft) long	9	Strap/Link Pins and Collars (6)
2	Shackle: 20,5 t (23 USt) (2)	10	Storage Pin with Hair-Pin Cotters (2)
3	Lifting Sling (2): 1 m (3.3 ft) long	11	Safety Pin (2)
4	Lifting Lug (4)	12	Backstay Straps and Links
5	Main Strut	13	Lifting Sling (2): 4 m (13 ft) long
6	Jib Strut	14	Boom Top
7	Collar with Retaining Pin and Cotter Pins (4)		
8	Jib Strut Hinge Pin (2)		

FIGURE 4-10

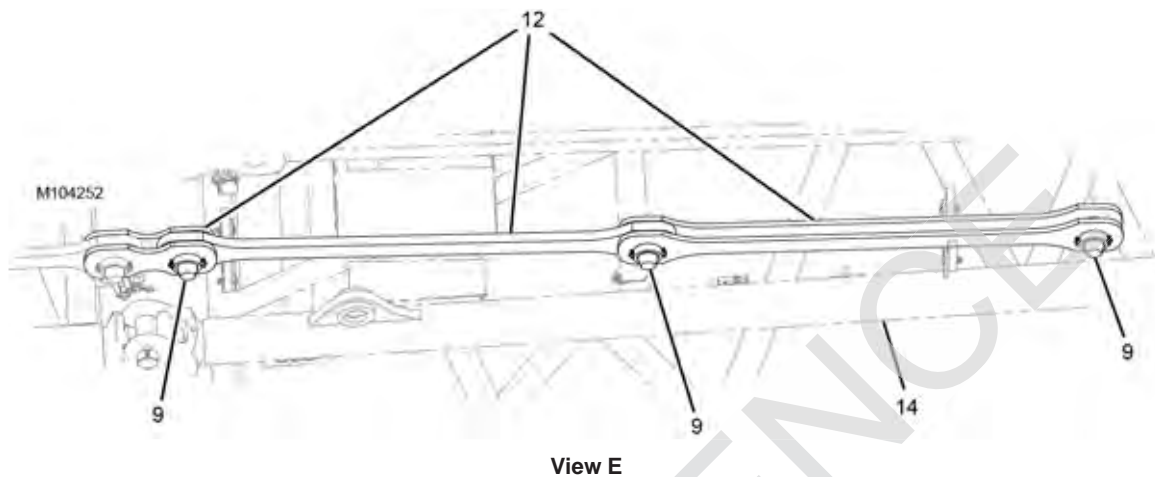


FIGURE 4-10 continued

INSTALLING LUFFING JIB

Install Struts

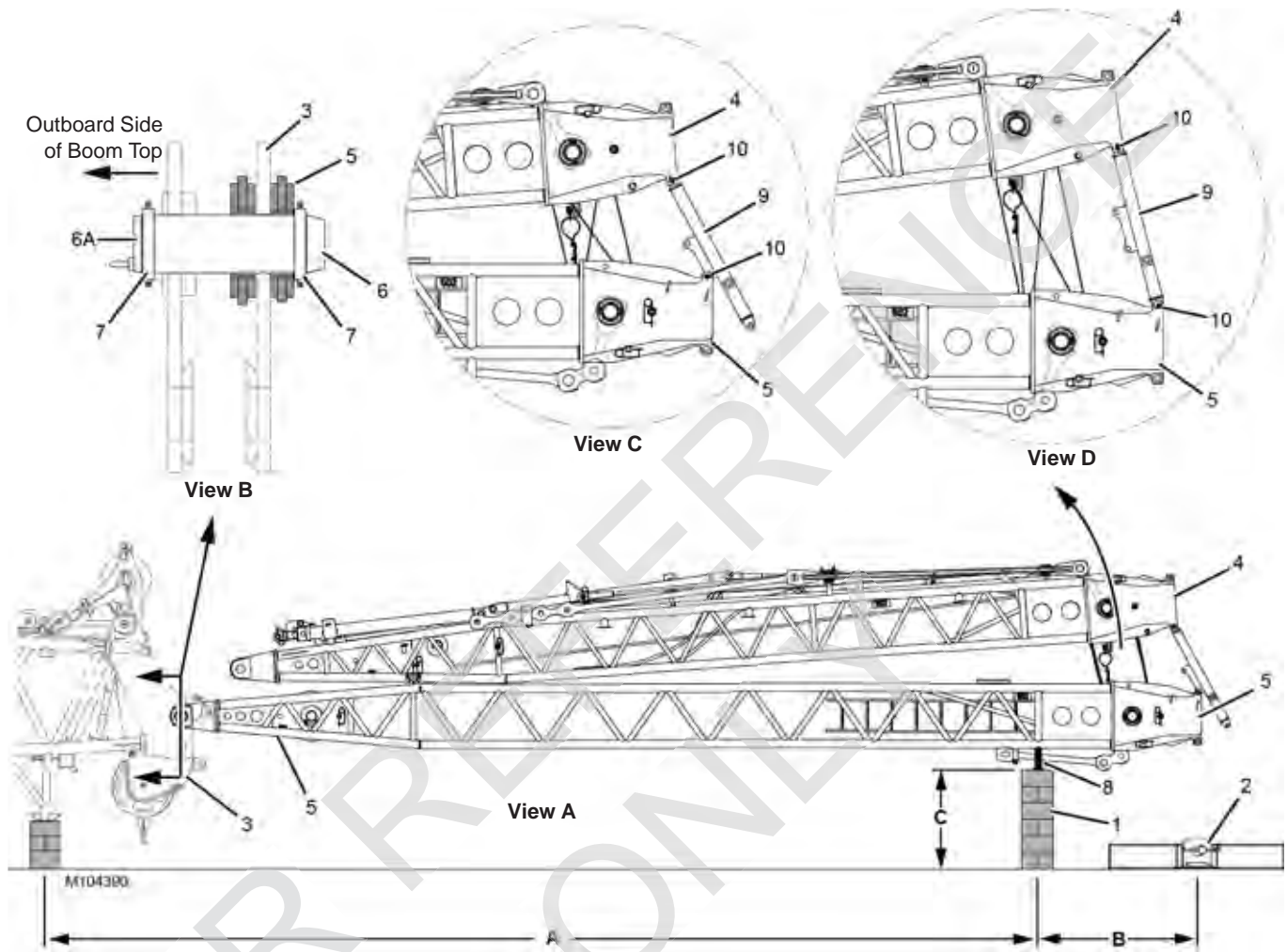
See [Figure 4-10](#) for the following procedure.

The main strut (5) and the jib strut (6) are shipped as an assembled unit.

1. Attach the Manitowoc supplied slings and shackles to the lifting lugs (4, View B) on the main strut (5).
 - PAST production: use items 1, 2, and 3 for rear legs.
 - CURRENT production: use item 13 for rear legs.
2. Remove the tie-downs and blocking that are securing the struts to the trailer.
3. Lift the struts off the trailer and remove the trailer from the area.

NOTE: The jib strut (6) will hang at an angle of 14° or greater as shown in View B.

4. Place the struts on blocking at ground level and proceed as follows:
 - a. Remove the collars (7, View A) and the jib strut hinge pins (8) from both legs of the jib strut (6).
Place the pins and collars along both sides of the boom top for installation later.
 - b. Remove the strap/link pins and collars (9, View C) from storage on both sides of the main strut (5).
 - c. Remove the storage pins (10, View D) and the safety pins (11). Then remove the backstay straps and links (12) from storage on both sides of the main strut (5).
Reinstall the storage pins (10, View D) and the safety pins (11) on the main strut.
 - d. Install the backstay straps and links on the boom top as shown in View E.
5. Reattach the Manitowoc supplied slings and shackles to the lifting lugs (4, View B) on the main strut (5).



Item	Description	Item	Description
1	Blocking	7	Collar with Retaining Pin and Cotter Pins (qty 4)
2	10 t Counterweight Box	8	Strut Supports (qty 2)
3	Boom Top	9	Shipping Strut (qty 2)
4	Main Strut	10	Pin with Safety Pins (qty 4)
5	Jib Strut	A	12 m (39 ft 4-716 in)
6	Jib Strut Hinge Pin (qty 2)	B	1,9 m (6 ft 2-13/16 in)
6A	Rectangular End	C	0,9 m (2 ft 11-7/16 in)

FIGURE 4-11

See [Figure 4-11](#) for the following steps.

6. Place blocking (1, View A) and a counterweight box (2) on the ground in front of the boom (3) at the specified dimensions.
7. Lift the struts (4 and 5, View A) into position at the end of the boom top (3, View A).
8. Align the connecting holes in the jib strut (5, View B) with those in the boom top (3).
9. Install the jib strut hinge pins (6, View B) so the RECTANGULAR END (6A) of each pin faces OUT.
Rotate the pins so the rectangular ends are perpendicular to the centerline of the jib.
10. Install the inboard collars (7, View B) on the jib strut hinge pins (6).
11. Temporarily install the outboard collars (7, View B) on the pins.
12. Lower the struts so the strut supports (8, View A) are resting on the blocking (1).

CAUTION

Avoid Strut Damage!

Use care when performing step [step 13](#). The sucker line will tighten as the main strut is raised.

If the sucker line gets too tight, disconnect it from the shipping position (see View F, [Figure 4-13 on page 4-23](#)).

-
13. Prepare the struts for reeving if the shipping struts are in the "flatbed" shipping arrangement (View C):
 - a. Hoist with the assist crane just enough to loosen the lower pins (10, View C).
 - b. Remove the lower pins (10).
 - c. Raise the main strut (4, View D) with the assist crane and pin the shipping struts (9) to the jib strut (5) with the lower pins (10).
 14. Disconnect the lifting slings.

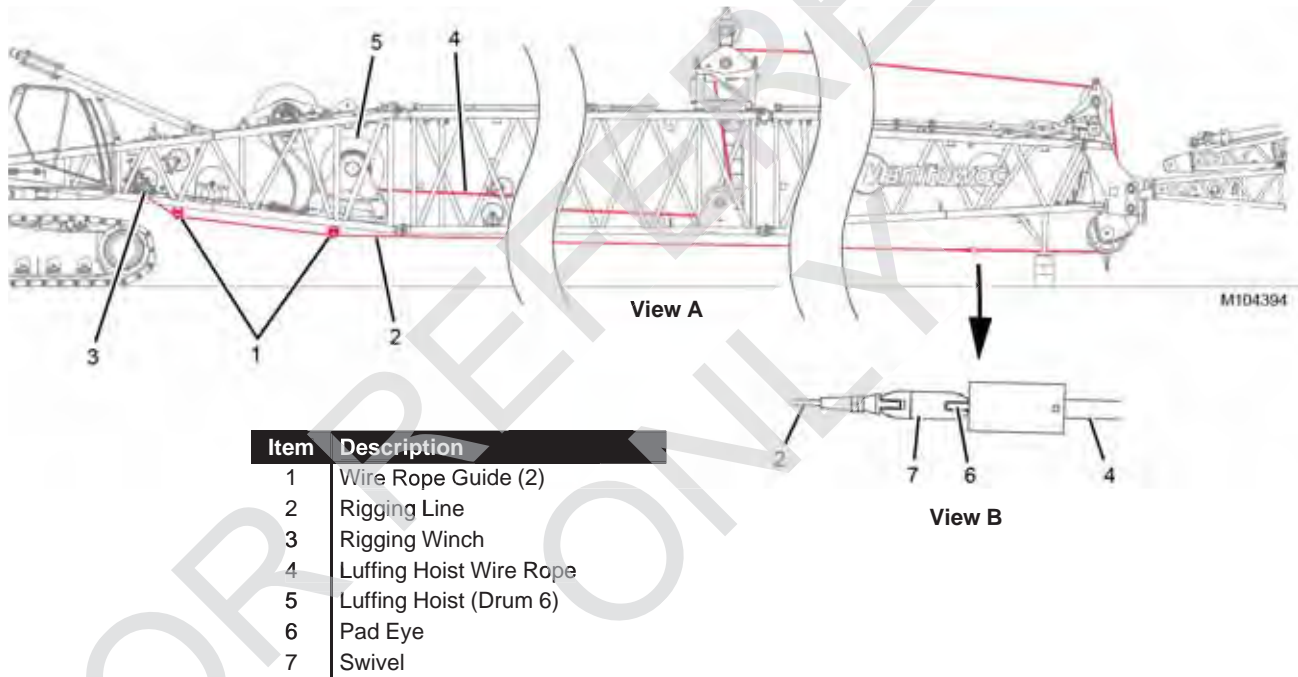


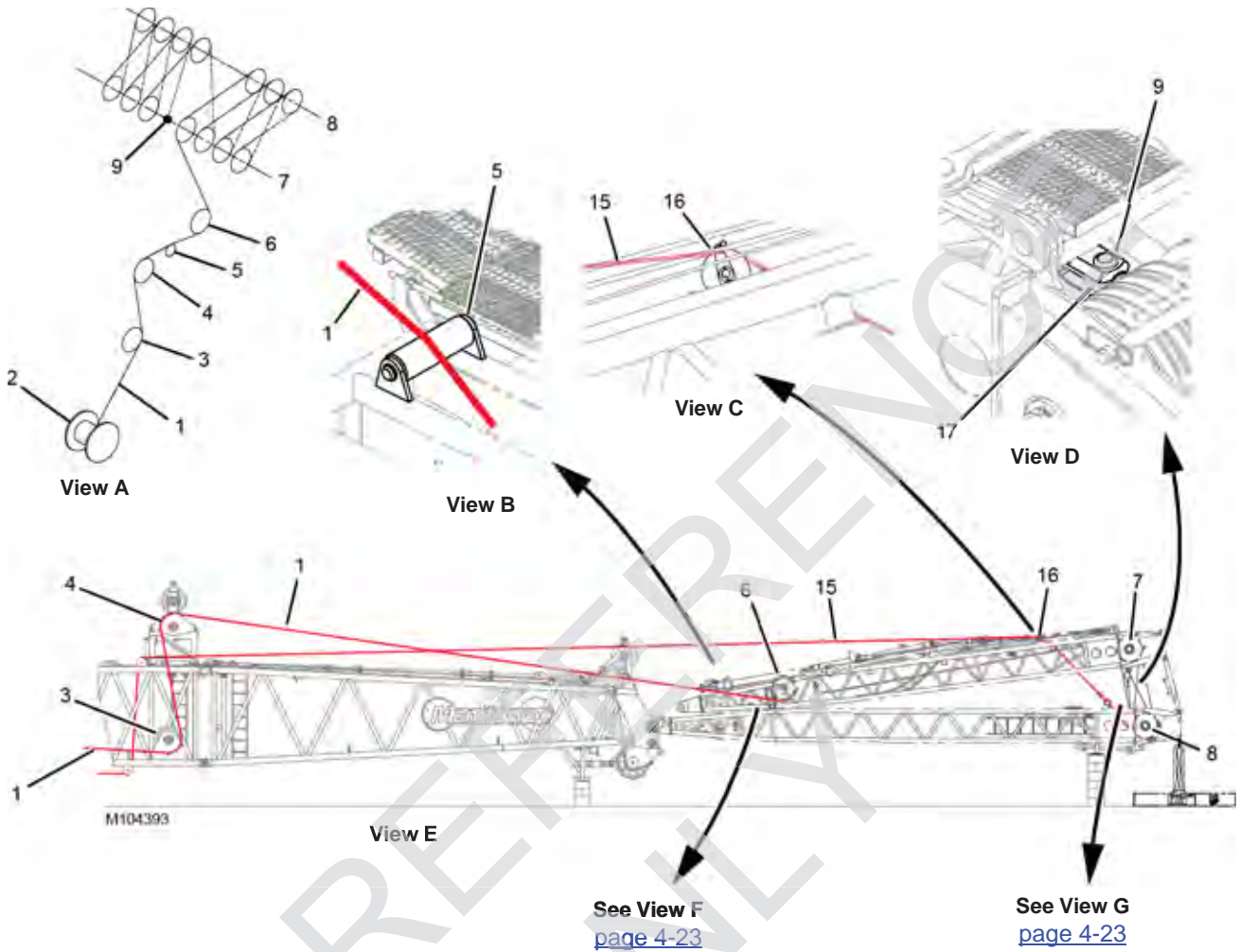
FIGURE 4-12

Prepare for Strut Reeving

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

The rigging winch can be used to pull the luffing hoist wire rope from the luffing hoist (Drum 6) to the end of the end of the boom top.

- See the Rigging Winch Assembly drawing at the end of this section.
 - See [Rigging Winch Operation, on page 4-98](#).
1. Lower the rigging winch wire rope guides (1) to the working position.
 2. Payout the rigging line (2) from the rigging winch (3) and route the rigging line through the lower boom point and the wire rope guides to the end of the luffing hoist wire rope (4) as shown in View A.
 3. Attach the rigging line (2, View B) to the pad eye (6) with the swivel (7).
 4. Pay out the luffing hoist wire rope (4) and haul in the rigging line as instructed in [Rigging Winch Operation, on page 4-98](#).
 5. Stop when the luffing hoist wire rope is under the bottom of the lower boom point.
 6. Disconnect the rigging line from the luffing hoist wire rope.
 7. The rigging line will be used to reeve the luffing hoist wire rope ([page 23](#)).



Item	Description
1	Luffing Hoist Wire Rope
2	Luffing Hoist (Drum 6)
3	Lower Guide Sheave
4	Upper Guide Sheave
5	Roller (Main Strut)
6	Guide Sheave (Main Strut)
7	Guide Sheaves (Jib Strut)
8	Guide Sheaves (Main Strut)
9	Dead-End Socket (Button Type)
10	Not Used
11	Not Used
12	Sucker Line
13	Shackle (2)
14	Pin
15	Rigging Line
16	Guide Sheave
17	Dead-End Link

FIGURE 4-13

Reeve Luffing Hoist Wire Rope

See [Figure 4-13](#) for the following steps.

NOTE: Manitowoc reeves the jib strut sheaves and the main strut sheaves with a sucker line (12) as shown in Views F and G prior to shipping the strut package.

1. Disconnect the shackle (13, View F) from the lug on the main strut.
2. Using the shackle (13, View F), connect the sucker line (12) to the pad eye on the end of the luffing hoist wire rope (1).
3. Make sure the luffing hoist wire rope passes over the roller (5, View B).
4. Disconnect the shackle (13, View G) from the pin (14) in the dead-end link (17) and remove the pin.
5. Store the shackle and the pin in the parts box.
6. Pay out the rigging line (15, View E) from the rigging winch.
7. Route the rigging line over the guide sheave (16, View C) in the main strut to the end of the sucker line (12, View G).
8. Connect the sucker line (12, View G) to the swivel on the end of the rigging line (15).
9. Pay out the luffing hoist wire rope (1) and haul in the rigging line (15) as instructed in [Rigging Winch Operation, on page 4-98](#) until the button on the end of the luffing hoist wire rope is at the dead-end link (17, View G) in the main strut.
10. Disconnect, remove, and store the sucker line (12), the shackles (13), and the pin (14) in the parts box for future use.
11. Attach the button on the end of the luffing hoist wire rope (1) to the button socket (9, View D) and pin the button socket to the dead-end link (17) in the main strut.

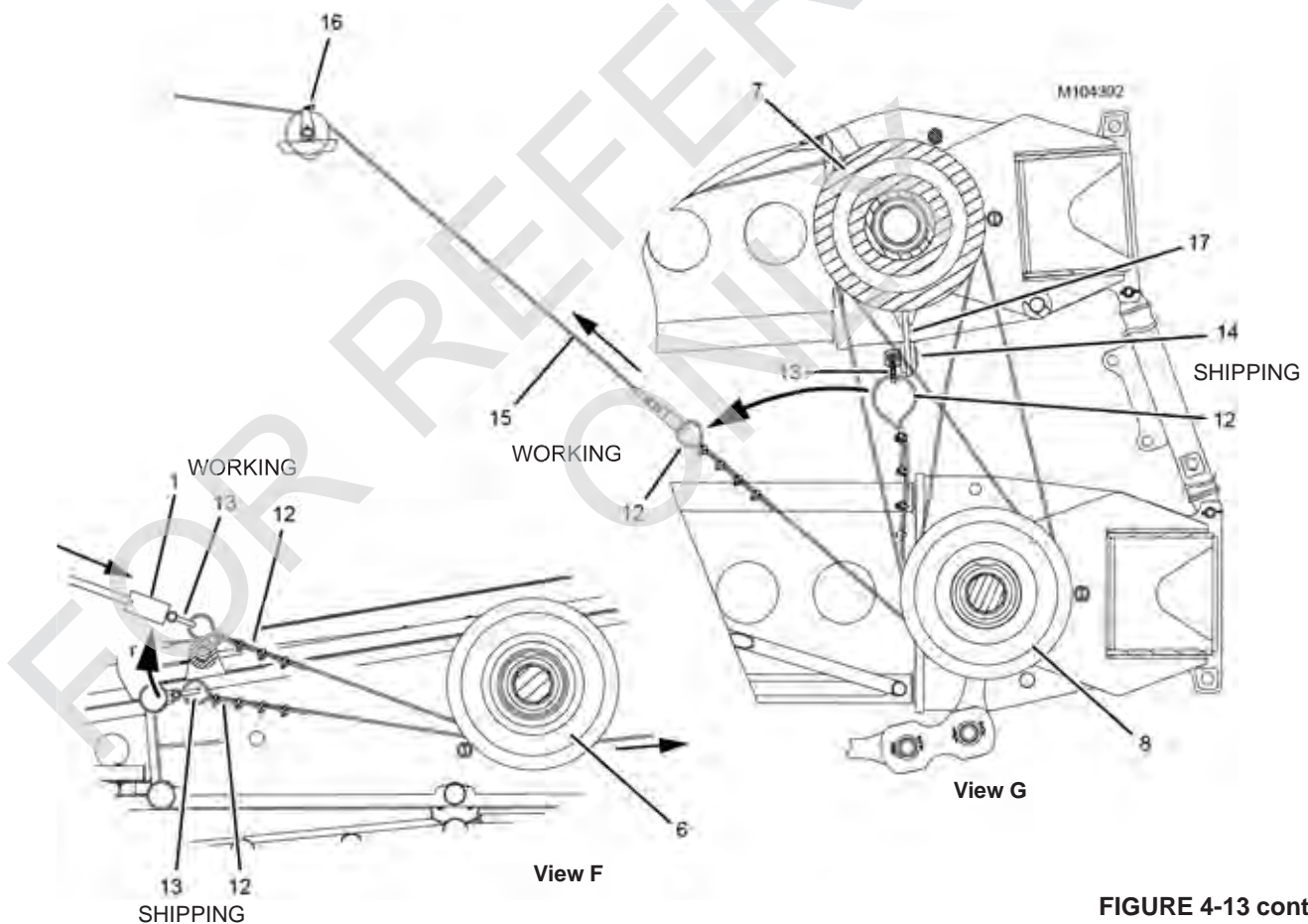
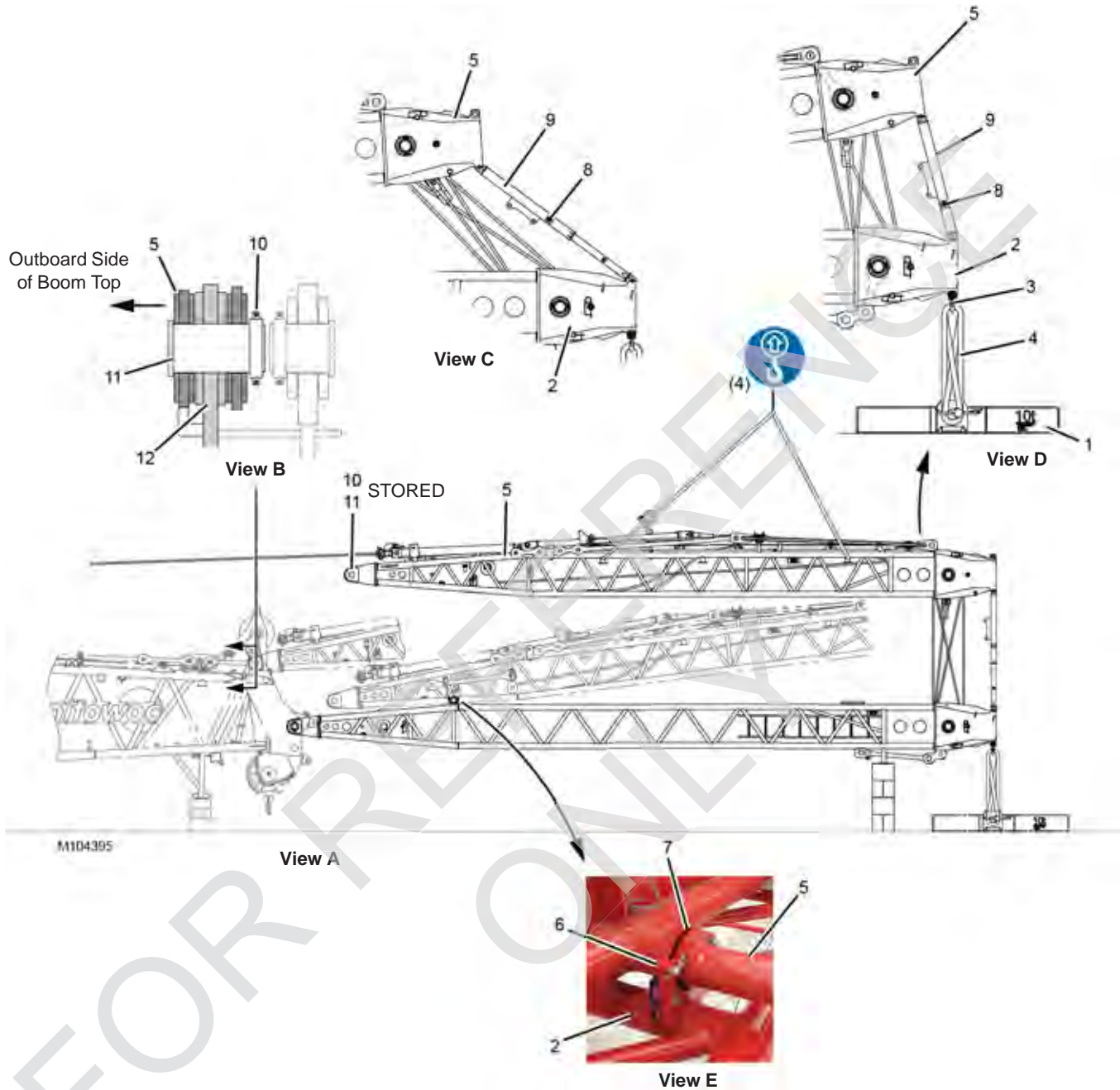


FIGURE 4-13 continued



Item	Description	Item	Description
1	10 t Counterweight Box	7	Shipping Link (qty 2)
2	Jib Strut	8	Pin with Safety Pin (qty 2)
3	Shackle: 20,5 t (23 USt) (2)	9	Shipping Strut (qty 2)
4	Lifting Sling (2 or 4): 2,8 m (9 ft) long	10	Collar with Retaining Pin and Cotter Pins (qty 4)
5	Main Strut	11	Main Strut Hinge Pin (qty 2)
6	Pin with Hair-Pin Cotter (qty 2)	12	Boom Top

FIGURE 4-14

Connect Main Strut to Boom Top

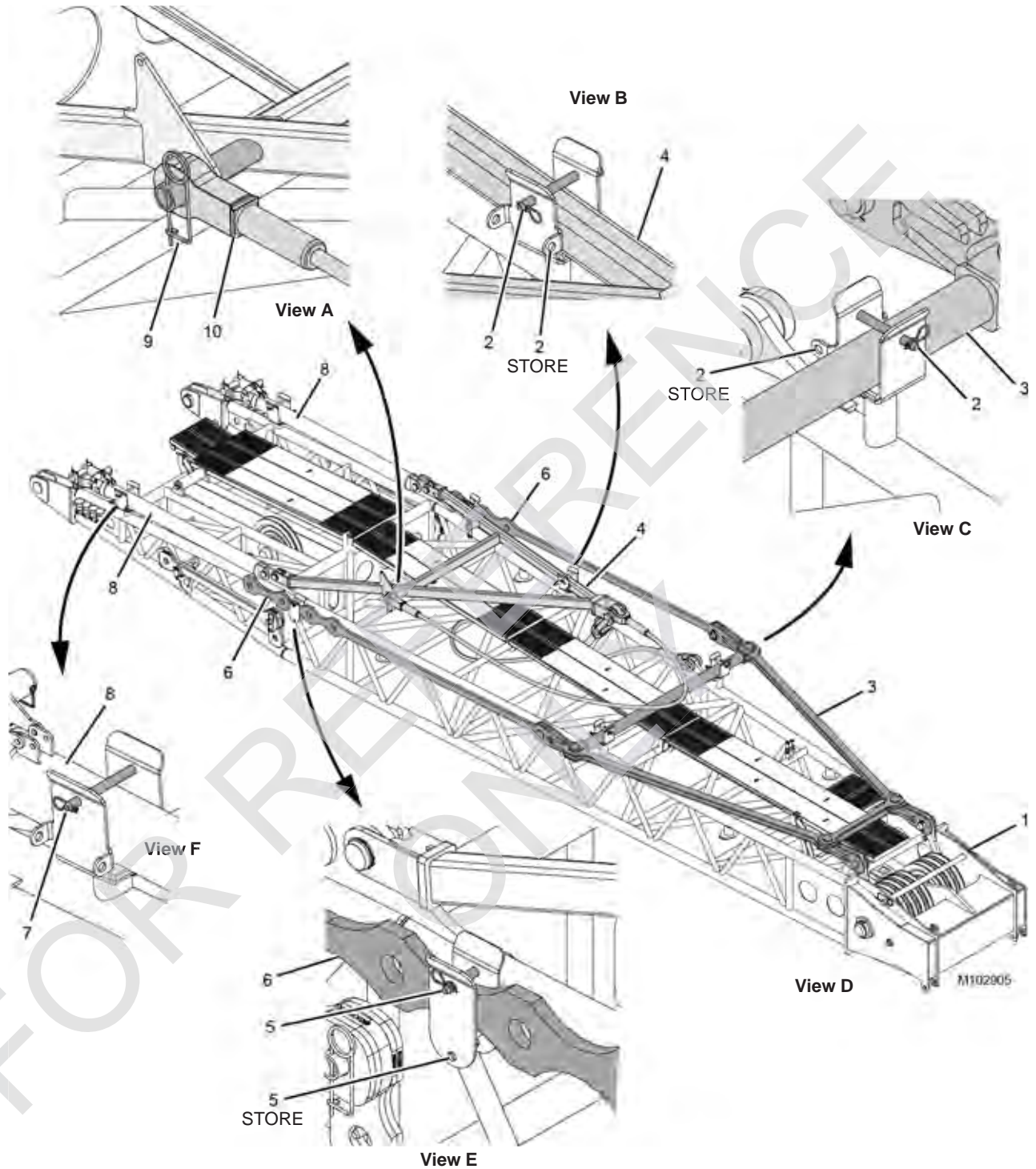
See [Figure 4-14](#) for the following steps.

1. Center the counterweight box (1, View D) under the jib strut (2) as shown.
2. Using the shackles (3, View D) and the slings (4), secure the counterweight box (1) to the lugs on the jib strut (2).
Double wrap the slings through the shackles and around the lifting lugs on the counterweight box.
3. Reconnect the lifting slings to the main strut (View A) as shown in [Figure 4-7 on page 4-11](#).
4. Hoist with the assist crane just enough to support the main strut.
5. Remove the pins (6, View E) and rotate the shipping links (7) forward to disconnect them from the shipping lugs on the main strut (5).
Once the strut is lifted clear of the shipping lugs, rotate the shipping links (7, View E) rearward and repin them to the shipping lugs with the pins (6).
6. Remove the pin (8, View D) from both shipping struts (9).
7. Slowly lift the main strut with the assist crane while paying out the luffing hoist wire rope.
8. STOP when the extended holes are aligned in both shipping struts (9, View C).
9. Install pin (8, View C) in the extended holes in both shipping struts (9).
10. With the main strut free of the jib strut, pivot the main strut into position at the boom top.

CAUTION

Do not allow the main strut to pivot below horizontal when it is pinned to the boom top. Damage can occur.

11. Remove the collars (10, View A) and the main strut hinge pins (11) from storage in the ends of the main strut (5).
12. Align the connecting holes in the main strut (5, View B) and the boom top (12).
13. Install the main strut hinge pins (11, View B) and the collars (10).
14. Disconnect the lifting slings from the main strut.



Item	Description	Item	Description
1	Main Strut	6	Basic Backstay Strap
2	Pin with Hair-Pin Cotters (3)	7	Pin with Hair-Pin Cotters (2)
3	Spreader	8	Main Strut Stop (2)
4	Strut Raising Arm	9	Safety Pin
5	Pin with Hair-Pin Cotters (2)	10	Strut Raising Pendant

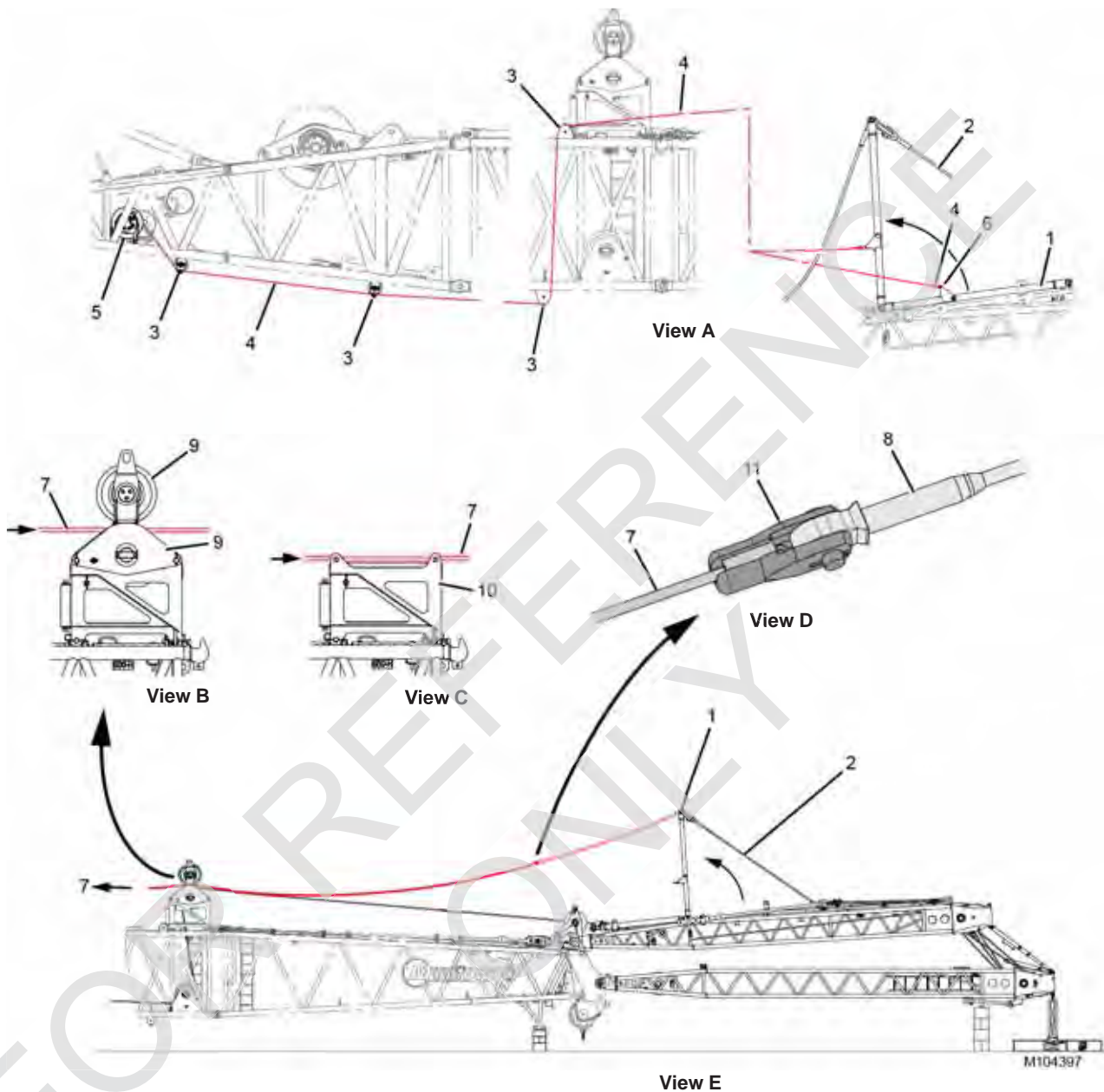
FIGURE 4-15

Prepare Main Strut

See [Figure 4-15](#) for the following steps.

Prepare the main strut (1, View D), as follows:

1. Remove the pin (2, View B) holding the strut raising arm (4) in the shipping position and store the pin (2).
2. Remove the pins (2, View C) holding the spreader (3) in the shipping position and store the pins (2).
3. Remove the pins (5, View E) holding the basic backstay straps (6) in the shipping position and store the pins (5).
4. **DO NOT REMOVE** the pins (7, View F) holding the main strut stops (8) in the shipping position at this time. The main strut stops will be unpinned after the main strut is raised.
5. Remove the safety pin (9, View A) holding the strut raising pendant (10) in the shipping position. Store the pin (9) in the stud on the main strut.
6. Position the strut raising pendant (10) so it is lying over the strut raising arm (4) and on the main strut catwalk.



Item	Description
1	Strut Raising Arm
2	Tieback Pendant
3	Rigging Winch Guide Sheaves
4	Rigging Line
5	Rigging Winch
6	Lug
7	Load Line (Drum 1, 2, or 3)
8	Strut Raising Pendant
9	Wire Rope Guide (2)
10	Wire Rope Guide Frame
11	Button Socket

FIGURE 4-16

Raise Strut Raising Arm

See [Figure 4-16](#) for the following steps.

CAUTION

Do not attempt to raise the strut raising arm with the load line attached to the strut raising pendant.

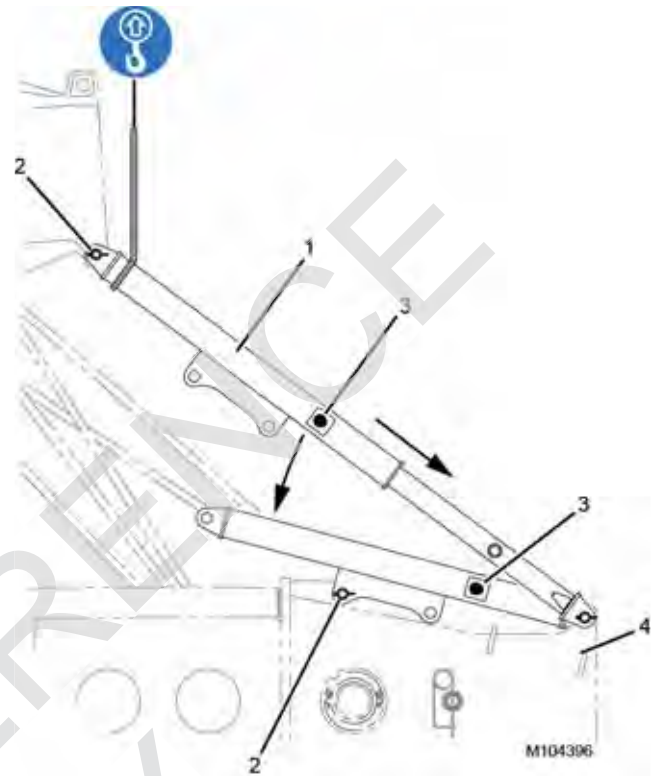
The raising arm will flip up extremely fast with considerable force. Damage could occur.

Use the rigging line to raise the strut raising arm as instructed in the following step.

1. Raise the strut raising arm (1, View A) as follows:

See [Rigging Winch Operation, on page 4-98](#).

 - a. Rotate the rigging winch sheaves (3, View A) to the working position and pin them.
 - b. Route the rigging line (4, View A) from the rigging winch (5) around the guide sheaves (3).
 - c. Pin the rigging line (4, View A) to the lug (6) on the strut raising arm (1).
 - d. Haul in the rigging line to raise the strut raising arm (1, View A) until the tieback pendant (2) is taut.
2. Route the desired load line (7, View D) to the end of the strut raising pendant (8).
 - If equipped with Drum 2, the load line from Drum 2 must be used for strut raising. The load line from Drum 1 or 3 cannot be used. Route the load line (7, View B) from Drum 2 BETWEEN the wire rope guides (9).
 - If not equipped with Drum 2, route the load line (7) from Drum 1 OVER the wire rope guide frame (10, View C). The wire rope guides (9) for Drums 2 and 3 must be removed, if equipped.
3. Connect the load line (7, View D) to the strut raising pendant (8) with the button socket (11) from the lower boom point.
4. Haul in the load line just enough to keep the tieback pendant (2, View E) taut
5. Unpin the rigging line (4, View A) from the strut raising arm (1).
6. Store the rigging line on the boom butt and store the rigging winch guide sheaves.



Item	Description
1	Shipping Strut (qty 2)
2	Pin with Safety Pins (qty 2)
3	Pin with Safety Pin (qty 2)
4	Jib Strut

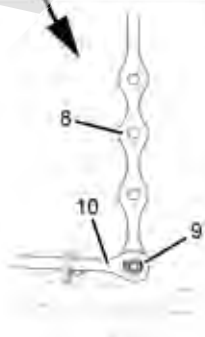
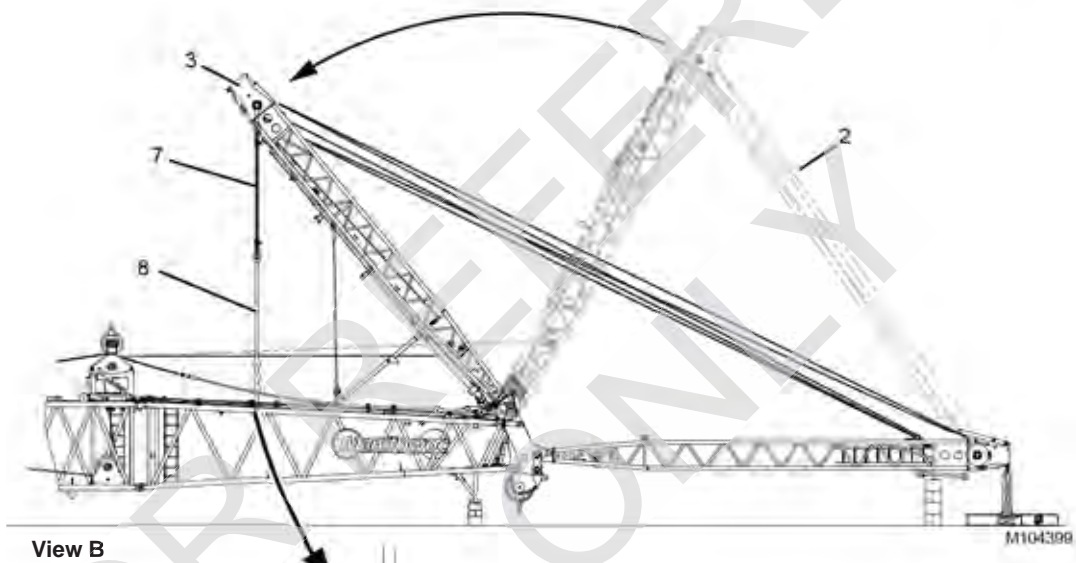
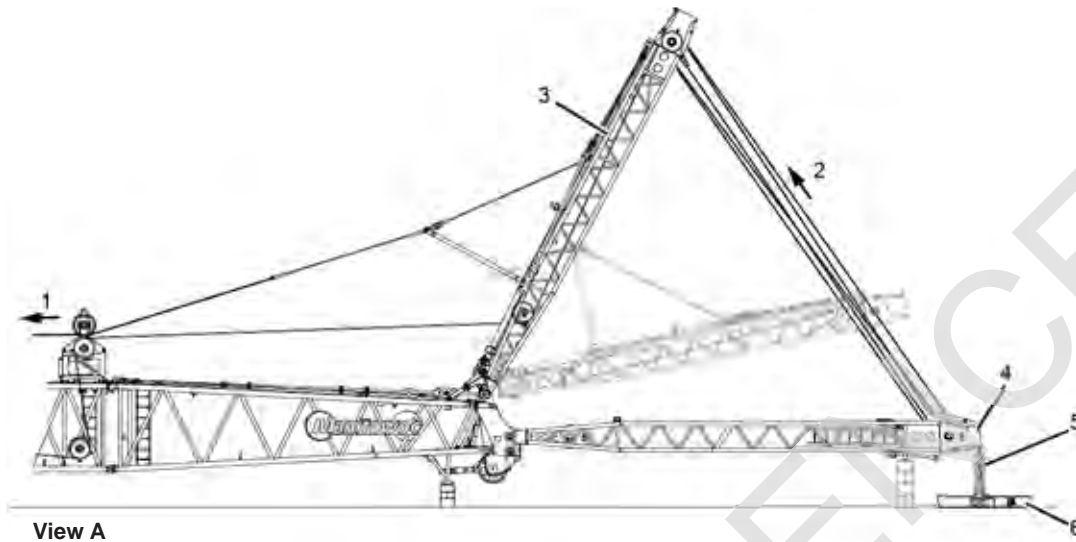
FIGURE 4-17

Store Shipping Struts

While still supporting the main strut with the load line, store the shipping struts.

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

1. Using a choker hitch, attach a lifting sling from the assist crane to either shipping strut (1).
2. Haul in or pay out the load line just enough to loosen the pin (3) and remove the pin.
3. Remove the pin (2) from the shipping strut (1).
4. Retract the shipping strut until the shipping holes are aligned and install the pin (3).
5. Lower the shipping strut to the storage location on the jib strut and install the pin (2).
6. Disconnect the lifting sling.
7. Repeat the steps for the other shipping strut.



Item	Description
1	Load Line (Drum 1, 2, or 3)
2	Luffing Hoist Wire Rope
3	Main Strut
4	Jib Strut
5	Pendants
6	Counterweight Box
7	Backstay Spreader
8	Basic Backstay Strap (2)
9	Pin with Collar, Retaining Pin, and Cotter Pins (8)
10	Links (4)

FIGURE 4-18

Raise Main Strut

See [Figure 4-18](#) for the following steps.

1. Use extreme care to ensure that the load line spools properly onto the drum during the following steps.
2. Slowly haul in the load line (1, View A) while paying out the luffing hoist wire rope (2) to raise the main strut (3).
3. Continue to raise the main strut (3, View B) past vertical while ensuring that the luffing hoist wire rope (2) does not become slack.

Once the main strut is past vertical, control of its angle switches from the load line to the luffing hoist reeving.

As the main strut continues to lower, the backstay spreader (7, View B) and the basic backstay straps (8) will swing away from the main strut.

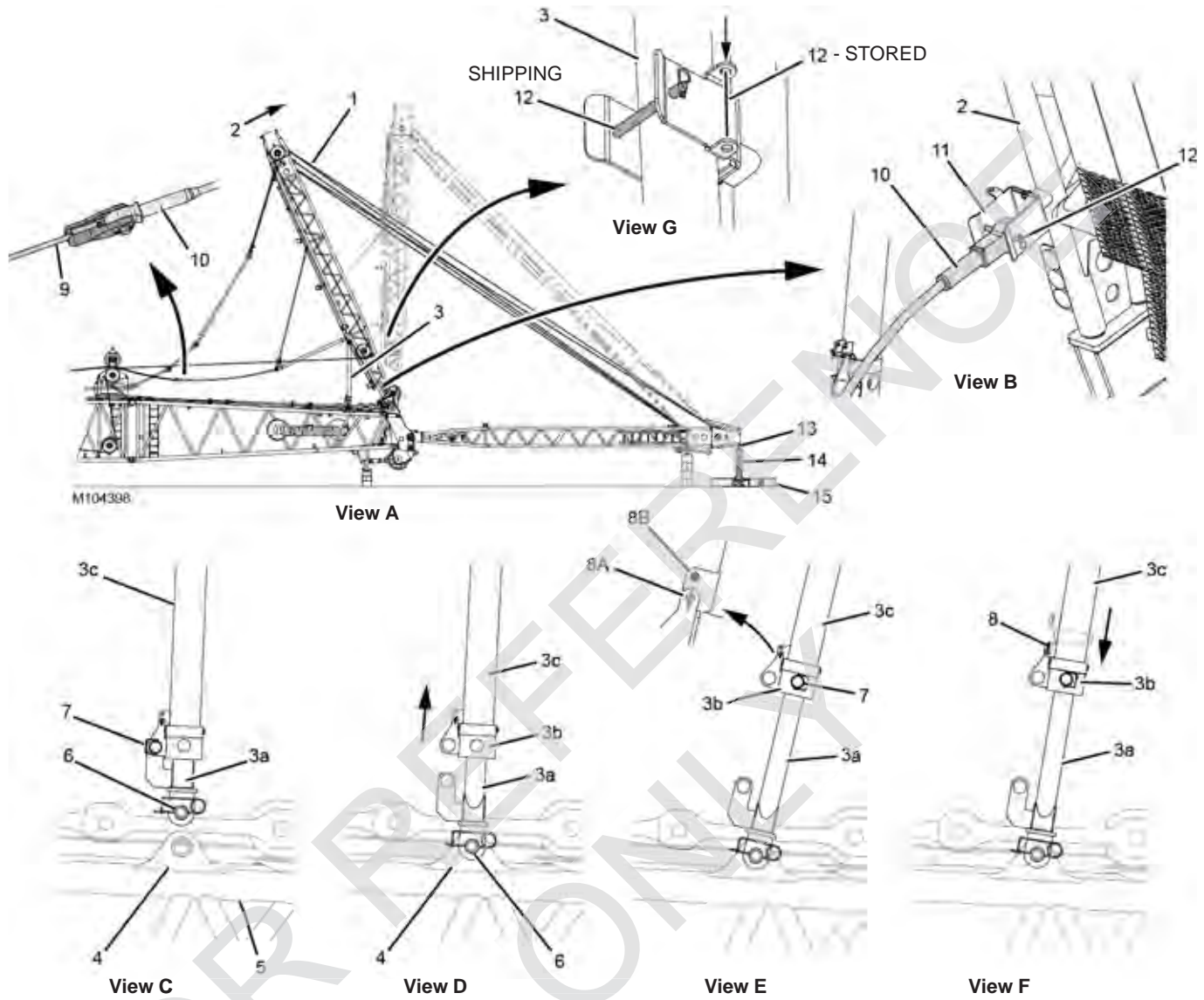
4. Continue to lower the main strut until the basic backstay straps (8, View B) are hanging in position over the luffing jib backstay straps and links located on the boom top.

CAUTION

Avoid Lacing Damage

Use care not to allow the basic backstay straps (8, View B) to contact the lacings in the boom top. Damage could occur.

-
5. Using the pins (9, View C), attach the links (10) to the proper hole in the basic backstay straps (8). See the table in the Luffing Jib Rigging drawing at the end of this section to determine the proper pin holes.



Item	Description	Item	Description
1	Luffing Hoist Wire Rope	8	Quick-Release Pin (2)
2	Main Strut	A	Erecting Hole
3	Main Strut Stop (2)	B	Storage Hole
3a	Lower Stop Tube (2)	9	Load Line with Button Socket
3b	Middle Stop Tube (2)	10	Strut Raising Pendant
3c	Upper Stop Tube (2)	11	Bracket
4	Stop Lug (2)	12	Pin with Hair-Pin Cotters
5	Boom Top	13	Shackle (qty 2)
6	Pin with Safety Pins (2)	14	Lifting Sling (qty 2)
7	Pin with Safety Pins (2)	15	Counterweight Box

FIGURE 4-19

See [Figure 4-19](#) for the following steps.

6. Haul in the luffing hoist wire rope (1, View A) and pay out the load line to raise the main strut (2) back to vertical.
7. Remove and store pins (12, View G) to disconnect the main strut stops (3) from the main strut.

NOTE: If you choose to disconnect the main strut stops before the main strut is vertical, make sure you support the main strut stops so they don't swing uncontrollably away from the main strut. A 45 kg (100 lb) force is required.

8. Pay out the luffing hoist wire rope until the main strut stops (3, View C) are positioned over the stop lugs (4) on the boom top (5).
9. Remove pins (6, View C) from the lower stop tubes (3a).
10. Support the lower stop tubes so they cannot drop, then remove the pins (7, View C).
Each stop tube weighs approximately 23 kg (50 lb).
11. Allow the lower stop tubes to telescope down until the end of each tube can be pinned to the stop lug (4, View D).
12. Install pins (6, View D).
13. Slowly haul in the luffing hoist wire to raise the main strut. The middle stop tubes (3b, View D) and the outer stop tubes (3c) will telescope up the lower stop tubes (3a) during this step.
14. STOP when the holes in the middle stop tubes (3b, View E) are aligned with the hole in each lower stop tube (3a).
15. Install pins (7, View E) to lock the inner stop tubes (3b) to the lower stop tubes (3a).
16. Remove the quick-release pins (8, View E) from the erecting holes (A) and install the quick-release pins (8) in the storage holes (B).
17. Pay out the luffing hoist wire rope until the main strut is resting on the strut stops. The upper stop tubes (3c, View F) should be resting on the middle stop tubes (3b).
18. Disconnect the load line (9, View A) from the strut raising pendant (10).
19. Connect the strut raising pendant (10, View B) to the bracket (11) on the left side of the main strut (2) with the pin (12).
20. Remove and store the shackles (13, View A) and the lifting slings (14).
21. Remove the counterweight box (15, View A) and install it on the counterweight tray.

Item	Description
1	Jib Butt
2	Transition Insert
3	One of the following: <ul style="list-style-type: none"> • Jib Top, or • 6 m Insert and Jib Top, or • 6 m Insert and 12 m insert, or • 12 m Insert
4	Fixed Horizontal Pin (qty 2 each jib section)
5	Hooked Connector (qty 2 each jib section)
6	Pin with Safety Pin (qty 2 each jib section)
7	Storage Tube (qty 2 each jib section)
8	Hair-Pin Cotter (qty 4)
9	Jib Stop Strut (qty 2)
10	Jib Stop Stand (qty 2)
11	Hitch Pin (qty 2)
12	Jib Stop (qty 2)

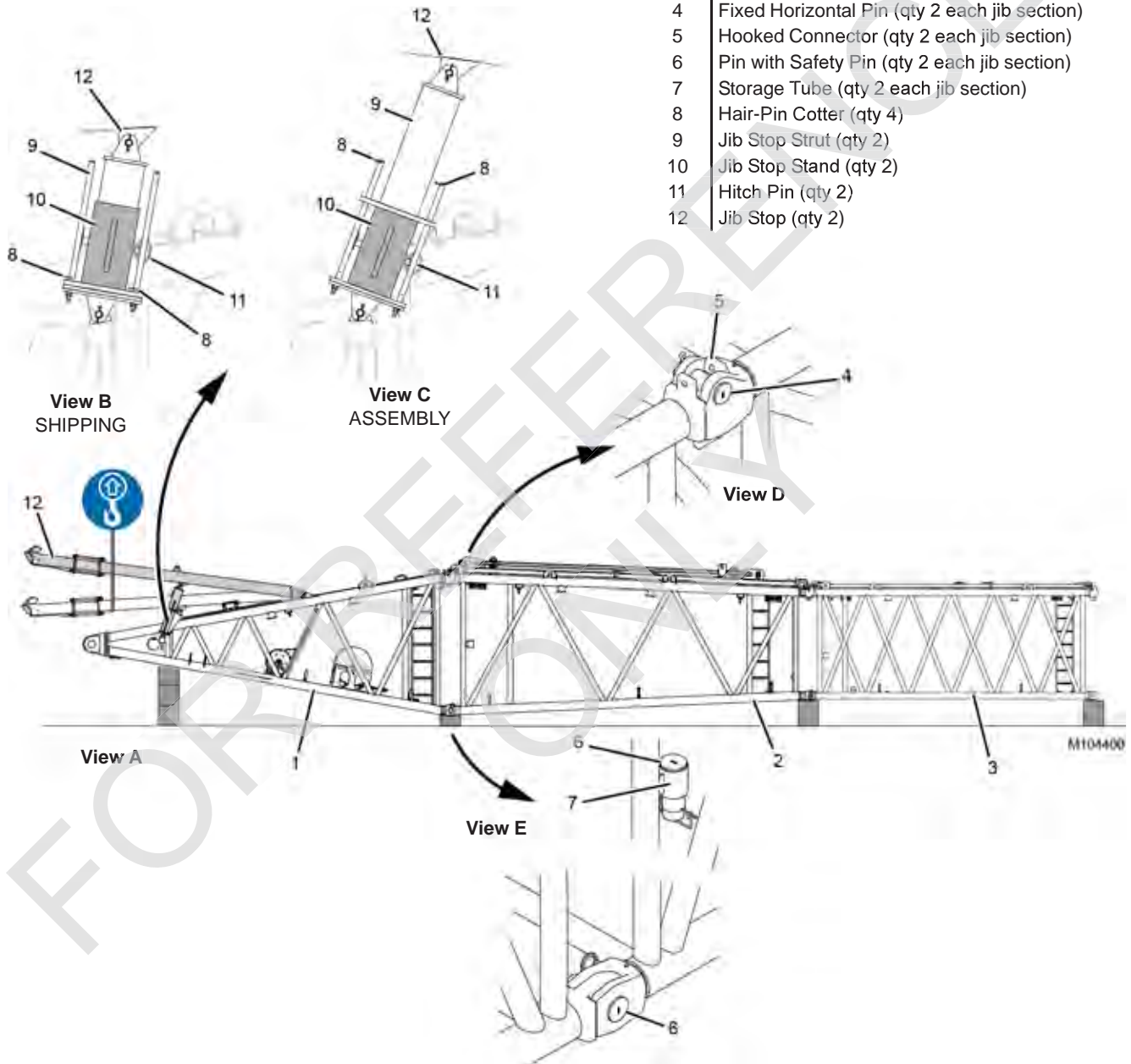


FIGURE 4-20

Assemble Partial Jib

Refer to [Figure 4-7 on page 4-10](#) for lifting arrangements.

See [Figure 4-20](#) for the following steps.

1. Using the lifting slings specified in [Figure 4-7 on page 4-10](#), place the jib butt (1, View A) on blocking.
2. Using the lifting slings specified in [Figure 4-7 on page 4-10](#), lift the transition insert (2, View A) into position at the end of the jib butt (1).
3. Engage the fixed horizontal pins (4, View D) on the transition insert (2) with the hooked connectors (5) on the boom butt (1).
4. Lower the insert until the bottom connector holes are aligned.
5. Remove the pins (6, View E) from the storage tubes (7) and install the pins in the bottom connector holes.
6. Block under the top end of the insert.
7. Disconnect the lifting slings.
8. Repeat the above steps for the next boom section (3). Item 3 can be one of the following:
 - Jib top
 - 6 m insert and jib top
 - 6 m insert and 12 m insert
 - 12 m insert
9. Remove the hair-pin cotters (8, View B) from the shipping position in the jib stop struts (9) and install the hair-pin cotters in the assembly position (View C).
10. Remove the jib stop stands (10, View B) from the shipping position in the jib stop struts (9).
11. Using a lifting sling from the assist crane, raise either jib stop (12, View B) from the shipping position to the assembly position (View C) and install the jib stop stand (10) with the hitch pin (11).
12. Disconnect the lifting sling.
13. Repeat [step 11](#) and [step 12](#) for the other jib stop.

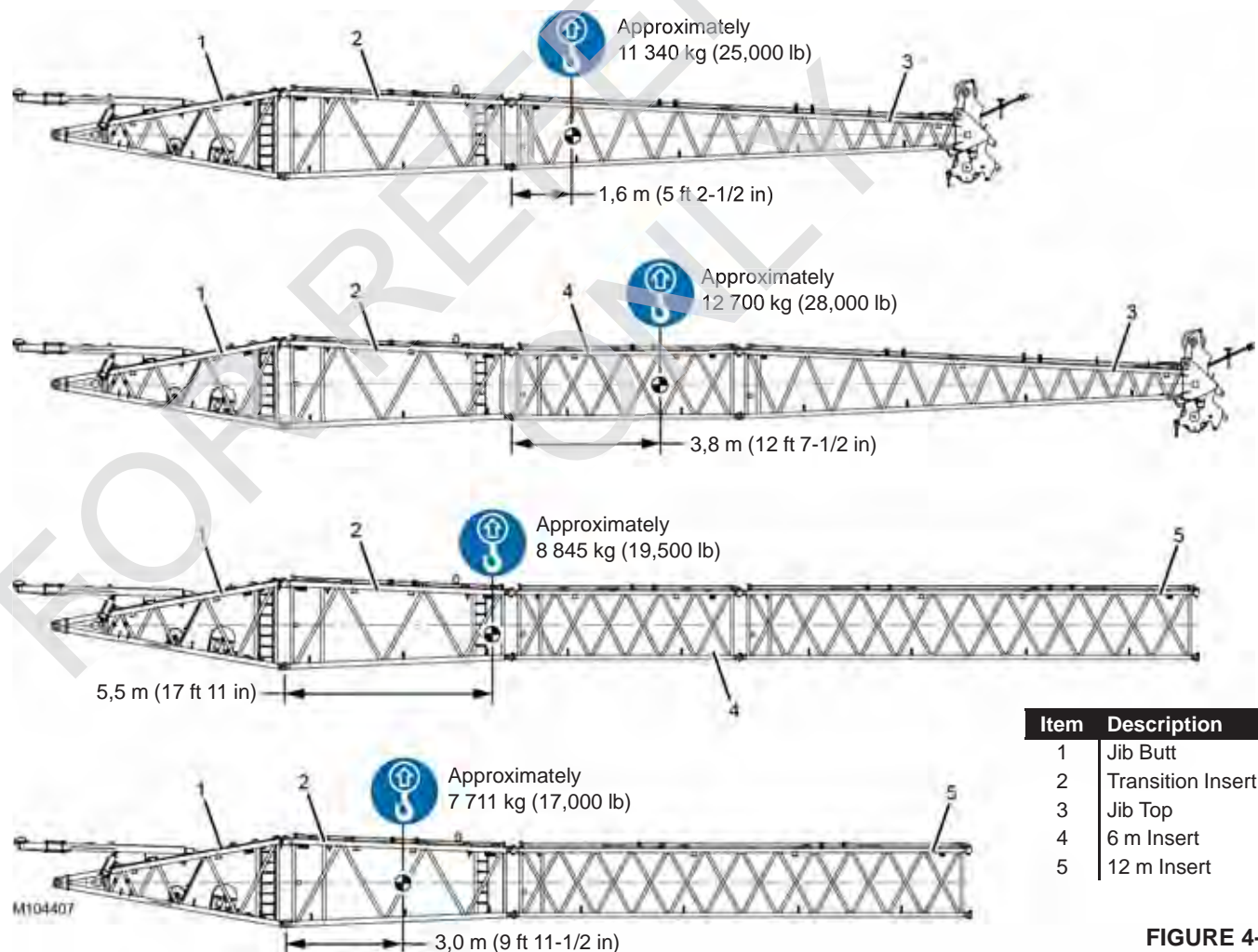
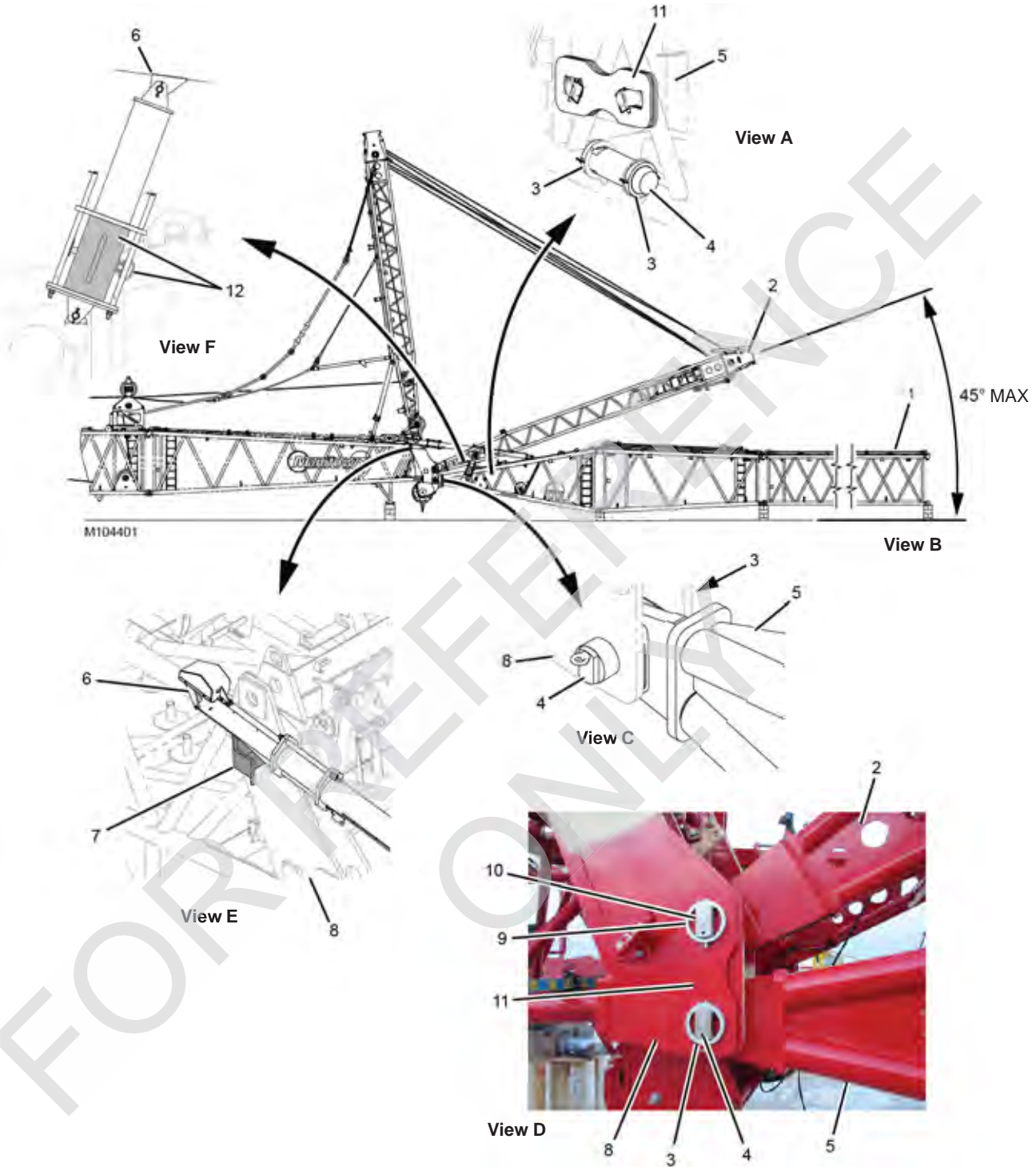


FIGURE 4-21



Item	Description	Item	Description
1	Partial Jib	7	Jib Stop Lug (qty 2)
2	Jib Strut	8	Boom Top
3	Collar with Retaining Pin and Cotter Pins (qty 4)	9	Collar with Retaining Pin and Cotter Pins (qty 2)
4	Jib Butt Hinge Pin (qty 2)	10	Jib Strut Hinge Pin
5	Jib Butt	11	Keeper Plate with Safety Pin (qty 2)
6	Jib Stop (qty 2)	12	Jib Stop Stand

FIGURE 4-22

Install Partial Jib

1. Attach four 4 m (13 ft) long lifting slings from the assist crane to the partial jib (1). Adjust the lifting slings so the partial jib lifts level about the center of gravity shown [Figure 4-21 on page 4-35](#).

See [Figure 4-22](#) for the remaining steps.

2. Luff up so the jib strut (2, View B) is no higher than 45°. **The strut may not lower under its own weight if it is raised higher than 45°.**
3. Remove the collars (3, View A) and the jib hinge pins (4) from both sides of the jib butt (5).
4. Lift the partial jib into position so the jib stops (6, View E) rest ON TOP of the jib stop lugs (7) on both sides of the boom top (8).
5. Align the connecting holes between the jib butt (5, View C) and the boom top (8).
6. Install the jib hinge pins (4, View C) and the inboard collars (3) so the RECTANGULAR END of each pin faces OUT.

Rotate the pins so the rectangular ends are perpendicular to the centerline of the jib.

7. Block under the partial jib so it is horizontal.
8. Disconnect the lifting slings.

9. Remove the keeper plates (11, View A) from the storage tubes on the jib butt. Reinstall the safety pins in the storage tubes.
10. On both sides of the boom top:
 - a. Remove the outboard collar (9, View D) from the jib strut hinge pin (10).
 - b. Install the keeper plate (7, View D) over the rectangular end of the jib strut hinge pin (10) and the jib hinge pin (4).
 - c. Install the outboard collars (3, View D) and (9) on the pins (4 and 10).
 - d. Remove the jib stop stand (12, View F). If necessary, use a lifting sling from the assist crane to lift the jib stop (6).
11. Store the jib stop stands in the parts box

Assemble Remaining Jib Sections

Assemble the remaining jib sections ([Figure 4-23](#)):

- In the same manner the partial boom was assembled (see ["Assemble Partial Jib" on page 4-35](#)).
- In the proper sequence per the Luffing Jib Rigging Drawing at the end of this section.
- If required, be sure to install the insert with intermediate suspension in the proper location.

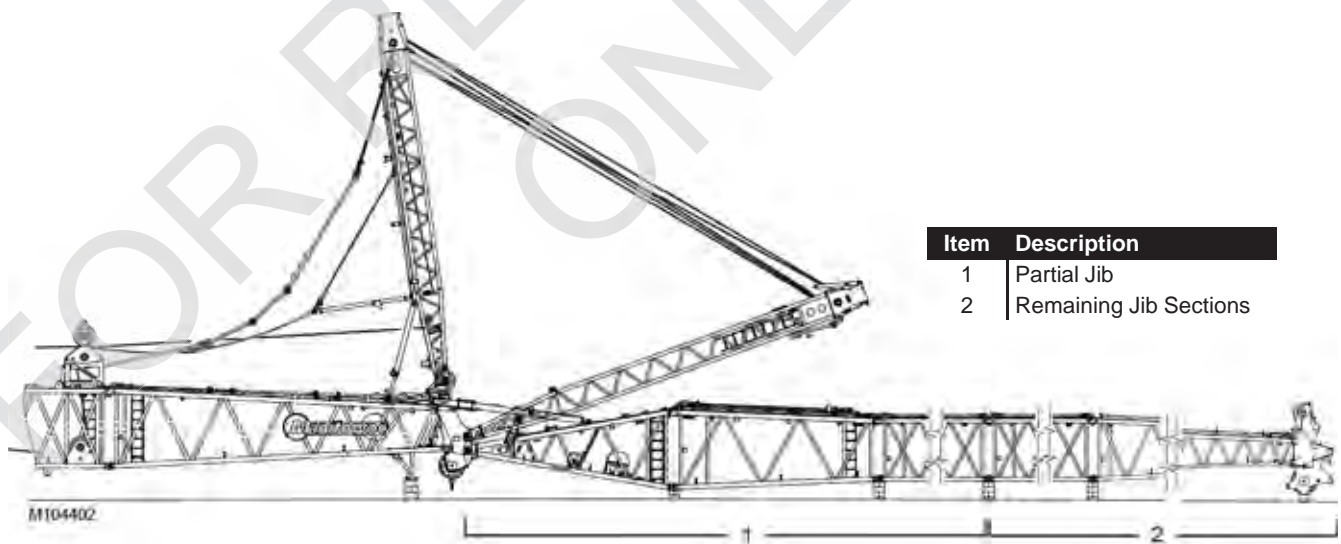


FIGURE 4-23

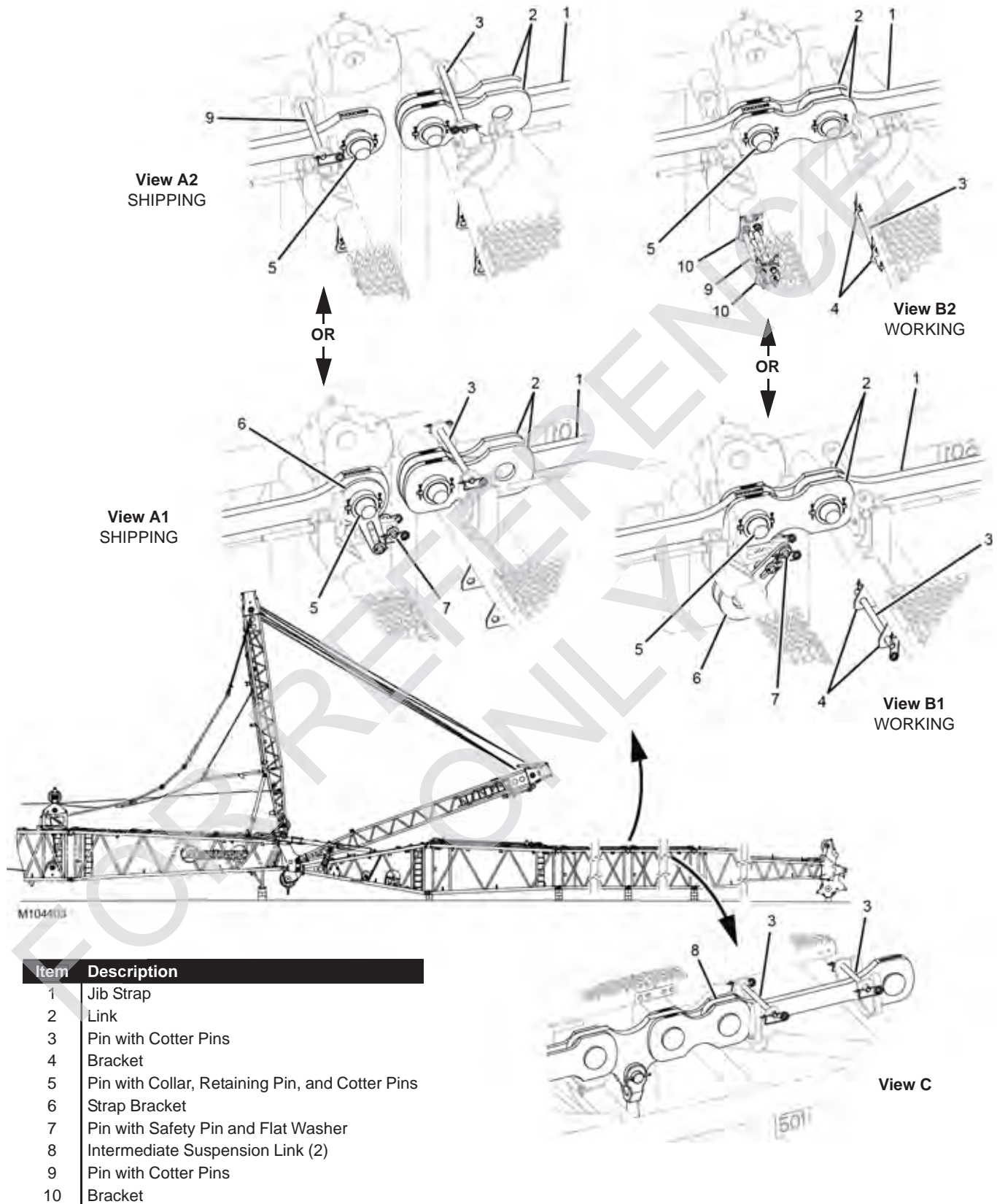


FIGURE 4-24

Connect Jib Straps between Jib Sections

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

The jib straps (1) are shipped on the jib sections as shown in View A.

Starting at the jib top, proceed as follows:

1. Remove the retaining pins (3, View A1 or A2) and store them in the brackets (4, View B1 or B2).
2. Remove the pin (5, View A1 or A2).
3. Rotate the strap bracket (6, View A1) down and pin it in the working position (View B1) with the pin (7).

OR

Remove the retaining pins (9, View A2) and store them in the brackets (10, View B2).

4. Rotate the links (2, View A1 or A2) rearward from the shipping position to the working position (View B1 or B2).
5. Install the pin (5, View B1 or B2). The PIN HEADS for the boom straps MUST FACE OUT (collars face center of boom sections).
6. Repeat the above steps for both straps at both ends of each boom section, to include the transition insert.
7. If equipped with the intermediate suspension insert, remove the pins (3, View C) from the intermediate suspension links (8) and store the pins in the brackets (4, View B1 and B2).

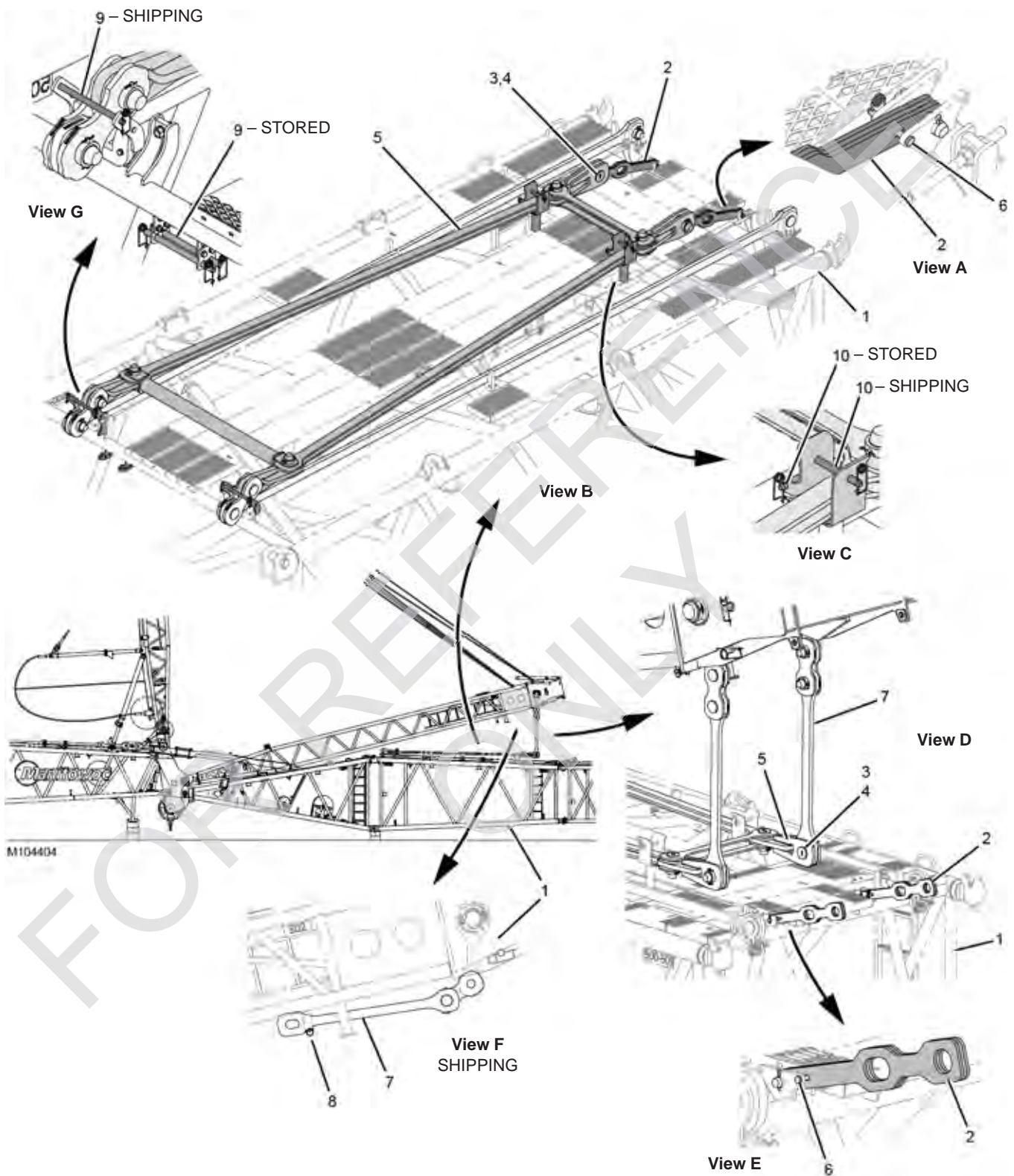


FIGURE 4-25

Legend for [Figure 4-25](#)

Item	Description
1	Transition Insert
2	Shipping Link (4)
3	Pin (2)
4	Collar with Retaining Pin and Cotter Pins (2)
5	Spreader
6	Pin with Safety Pins (2)
7	Jib Strut Basic Straps (2)
8	Storage Pin with Safety Pins (2)
9	Storage Pin with Safety Pins (2)
10	Storage Pin with Safety Pins (2)

Connect Jib Strut Basic Straps to Spreader

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

- At the transition insert (1, View B), disconnect the shipping links (2) by removing the strap pins (3) and the collars (4) from the ends of the spreader (5).
- Temporarily set the pins (3) and the collars (4) to the side.
- Remove the pins (6, View A) from the shipping links (2), rotate the shipping links (2, View E) forward to the storage position, and install the pins (6).

- Support the jib strut basic straps (7, View F) so they cannot drop and remove the storage pins (8).

The total weight of the strap, links, and pins on each side of the jib strut is 75 kg (165 lb).

- Lower the jib strut basic straps (7, View D) and pin them to the spreader (5) with the strap pins (3) and the collars (4).

Luff down as required to align the connecting holes.

- Reinstall the storage pins (8, View F) in the lugs on the jib strut.

- Remove the storage pins (9, View G) from the shipping position and store them.

- Remove the storage pins (10, View C) from the shipping position and store them.

Raise Jib Strut

See [Figure 4-26](#) for the following procedure.

- Slowly luff up to raise the jib strut (2) from the assembly position.
- Stop when the jib straps (4) start to lift off the transition insert (5).

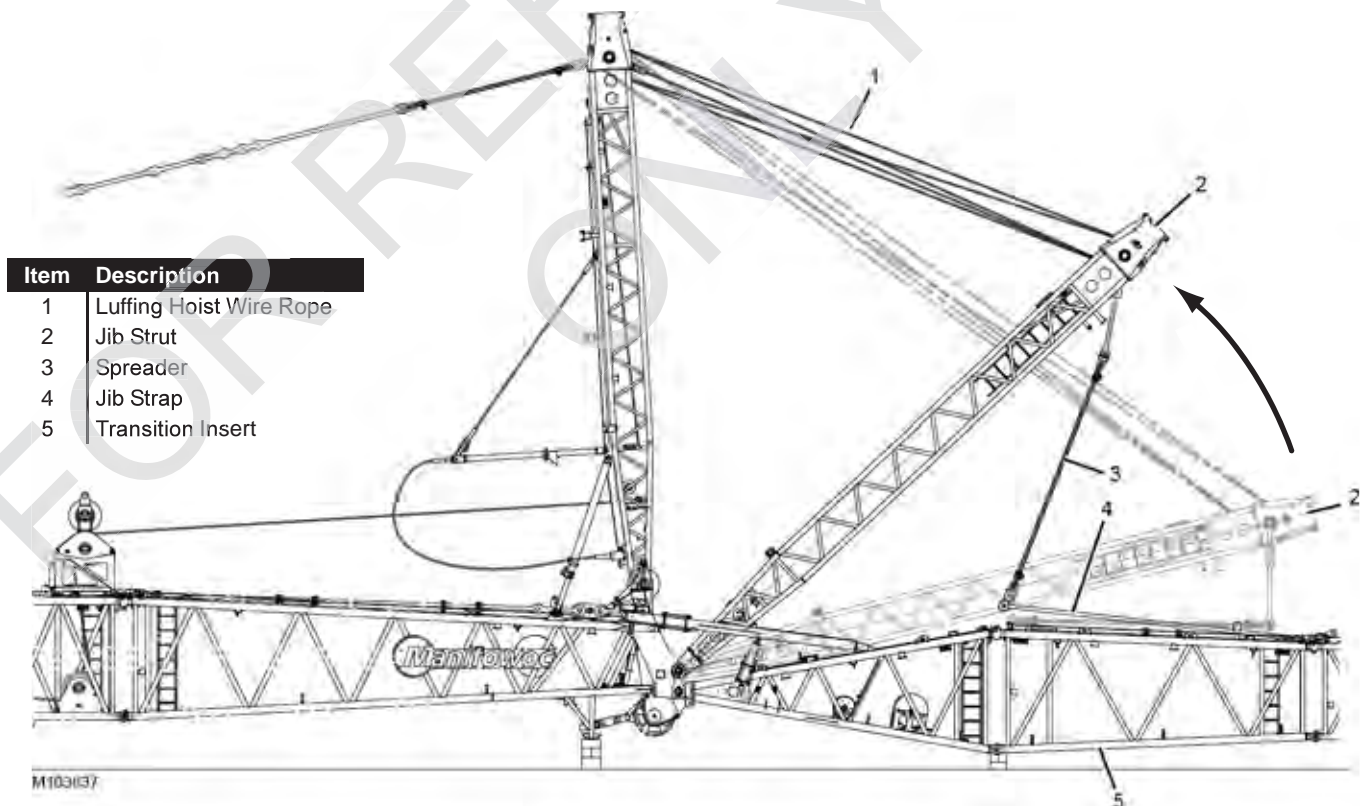
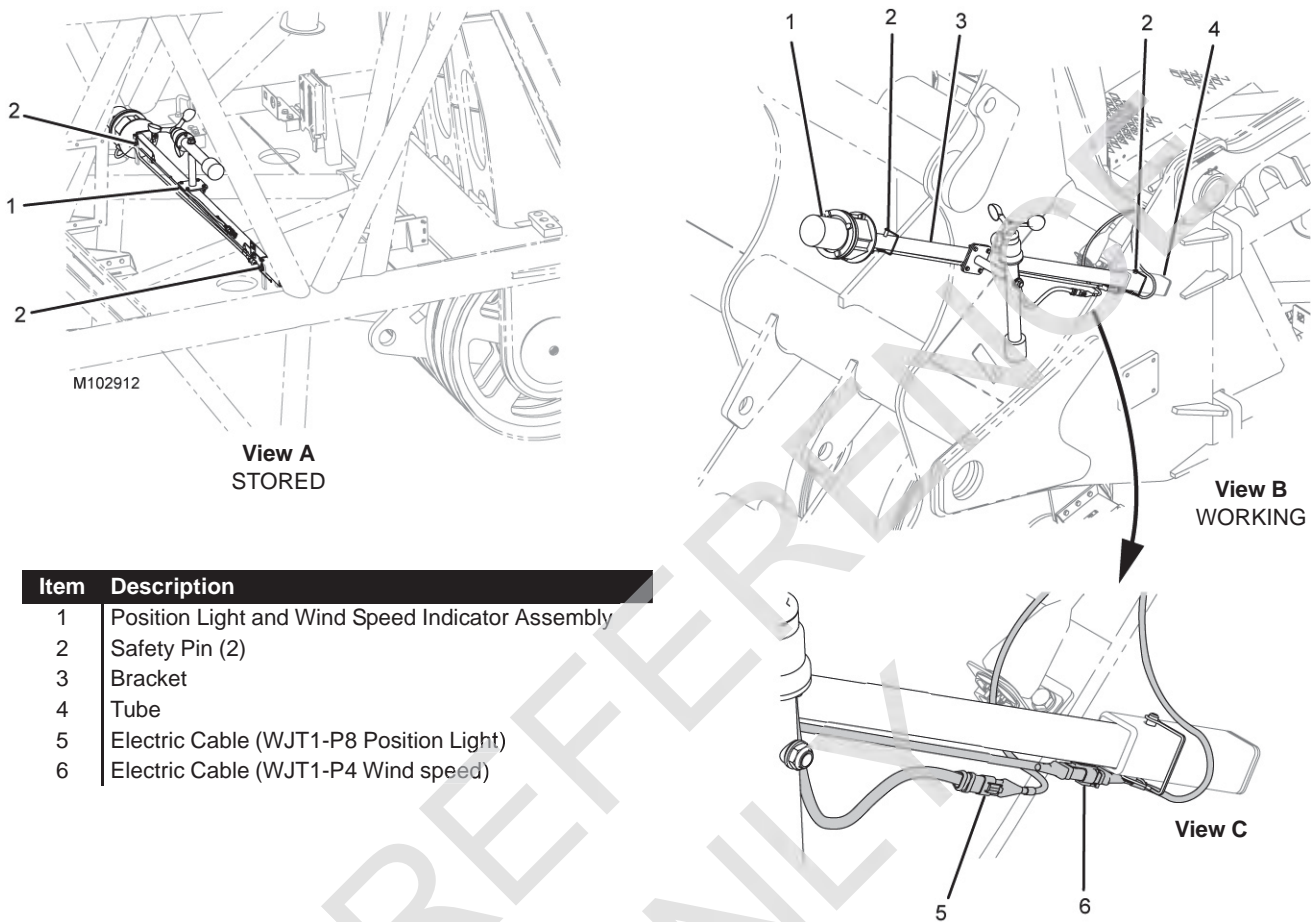


FIGURE 4-26



Item	Description
1	Position Light and Wind Speed Indicator Assembly
2	Safety Pin (2)
3	Bracket
4	Tube
5	Electric Cable (WJT1-P8 Position Light)
6	Electric Cable (WJT1-P4 Wind speed)

FIGURE 4-27

Install Position Light and Wind Speed Indicator

See [Figure 4-27](#) for the following procedure.

1. If stored in the boom top, unpin the position light and wind speed indicator assembly (1, View A) from the storage lugs in the boom top.
2. If attached in the working position on the boom top, disconnect the electric cables and remove the position light and wind speed indicator assembly from the boom top.
3. Insert the position light and wind speed indicator bracket (3, View B) into the tube (4) on the left side of the jib top and install the safety pin (2).
4. Install the other safety pin (2) in the top hole of the bracket (3, View B).
5. Connect the electric cable (5, View C) from the jib top to the electric cable from the position light.
6. Connect the electric cable (6, View C) from the jib top to the electric cable from the wind speed indicator.

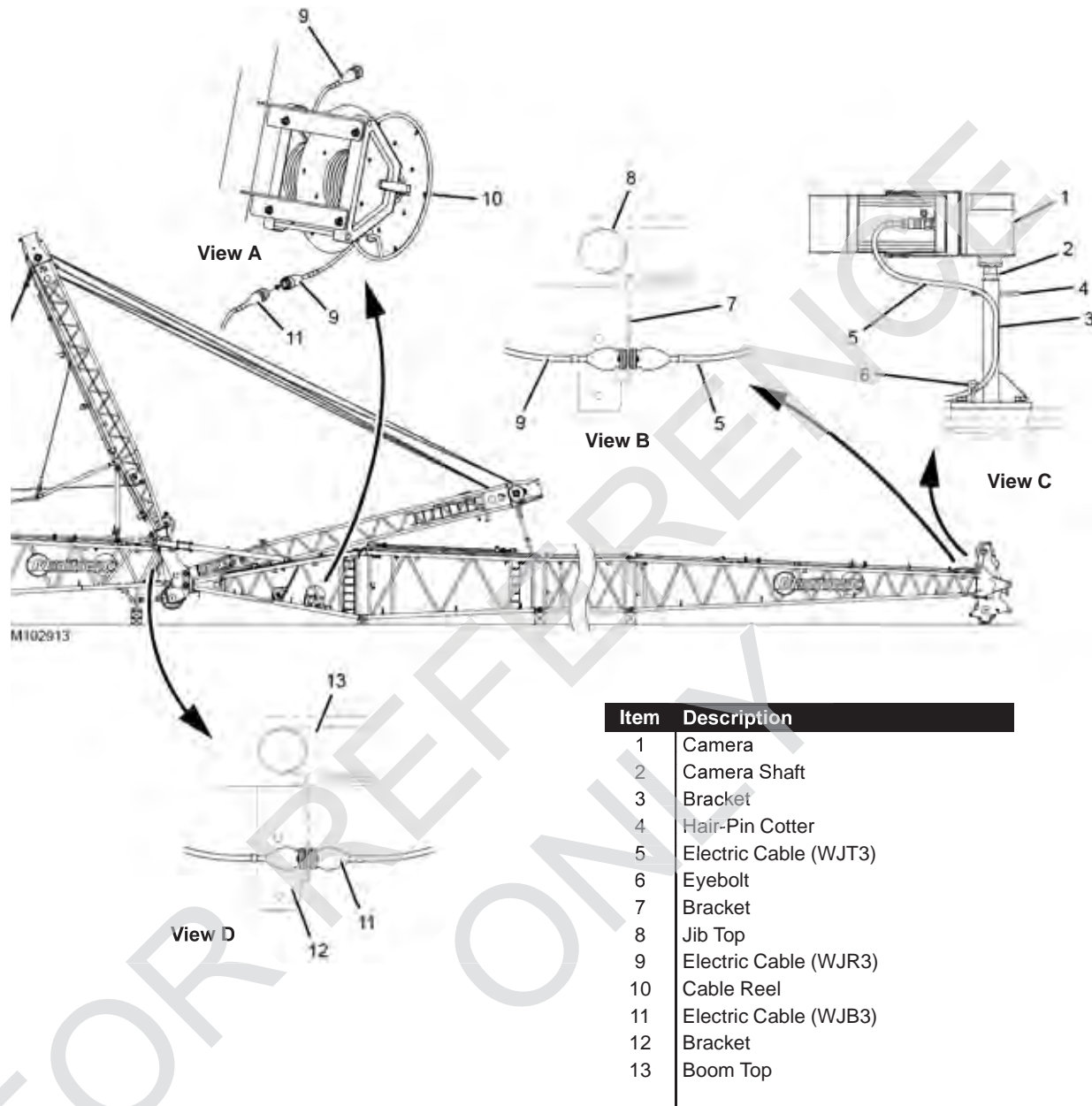
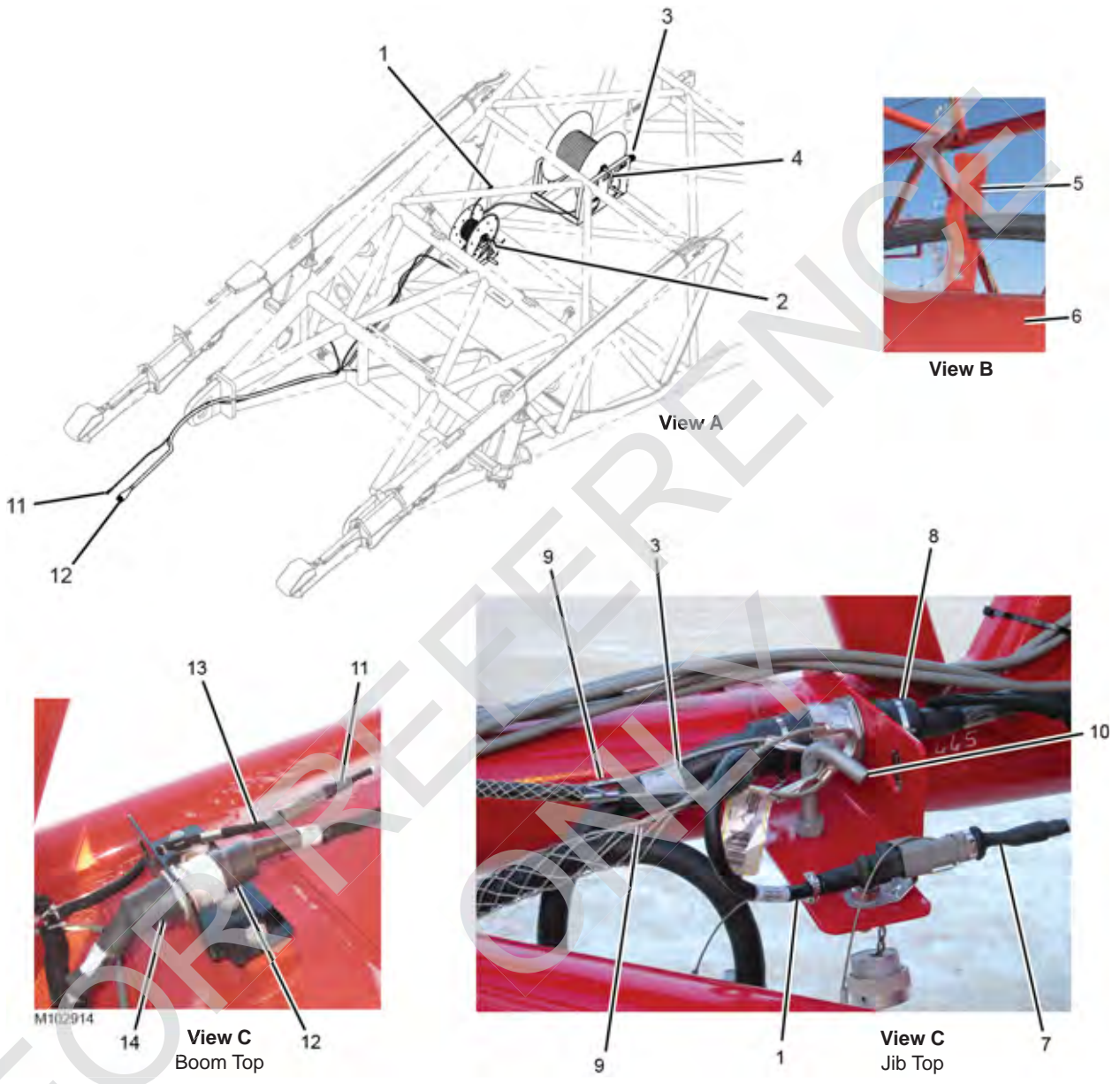


FIGURE 4-28

Install Jib Top Camera and Connect Electric Cables

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

1. Remove the camera (1, View C) from storage in the job box or from the boom top.
2. Slide the camera shaft (2, View C) into the bracket (3) and install the hair-pin cotter (4).
3. Attach the security chain from the camera to the eyebolt (6, View C).
4. Connect the electric cable (5, View B) to the bracket (7) in the jib top (8).
5. Pay out the electric cable (9, View A) from the cable reel (10) to the jib top.
6. Connect the electric cable (9, View B) to the receptacle on the bracket (7) in the jib top (8).
7. Secure the cable to the cable clips on the bottom left chord of the jib sections.
8. Uncoil the electric cable (11, View A) from storage in the jib butt.
9. Connect the electric cable (11, View A) to the butt end of the electric cable (9) from the cable reel (10).
10. Connect the other end of the electric cable (11, View D) to the receptacle on the bracket (12) in the boom top (13).



Item	Description	Item	Description
1	Electric Cable WN100000 -P2	8	Receptacle WJT1-J1
2	Cable Reel	9	Strain Relief (2)
3	Electric Cable WJR1-P2	10	J-Bolt
4	Cable Reel	11	Electric Cable WJB2-P1
5	Cable Clip	12	Electric Cable WJB1-P1
6	Jib Section	13	Electric Cable CAN NET OUT
7	Electric Cable CAN NET IN	14	Receptacle ATTACHMENTS

FIGURE 4-29

Connect Jib Top Electric Cables

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

1. Payout the electric cables (1 and 3, View A) from the cable reels (2 and 4) in the jib butt.
2. Pull the cables all the way to the boom top (View C).
3. Secure the cables in the cable clips (5, View B) on the jib sections (6).
4. Disconnect the CAN terminator (not shown) from the CAN NET IN electric cable (7, View C). Connect the dust cap to the terminator.
5. Connect the electric cable (1, View C) to the CAN NET IN electric cable (7)
6. Connect the electric cable (3, View C) to the receptacle (8).
7. Connect the strain reliefs (9, View C) to the J-bolt (10).
8. Disconnect and uncoil the electric cables (11 and 12, View A) from the storage brackets on the jib butt.
9. Connect the top end of the electric cable (11, View A) to the electric cable from cable reel (2).
10. Connect the top end of the electric cable (12, View A) to the electric cable from cable reel (3).
11. At the boom top:
 - a. Disconnect the CAN terminator (not shown) from the CAN NET OUT electric cable (13, View D). Connect the dust cap to the terminator.
 - b. Connect the electric cable (11, View D) from the jib butt to the CAN NET OUT electric cable (13).
 - c. Connect the electric cable (12, View D) from the jib butt to the receptacle (14).

NOTE: If the block-up limit is disconnected at either jib point (lower or upper) the shorting plug must be connected to the corresponding electric cable.

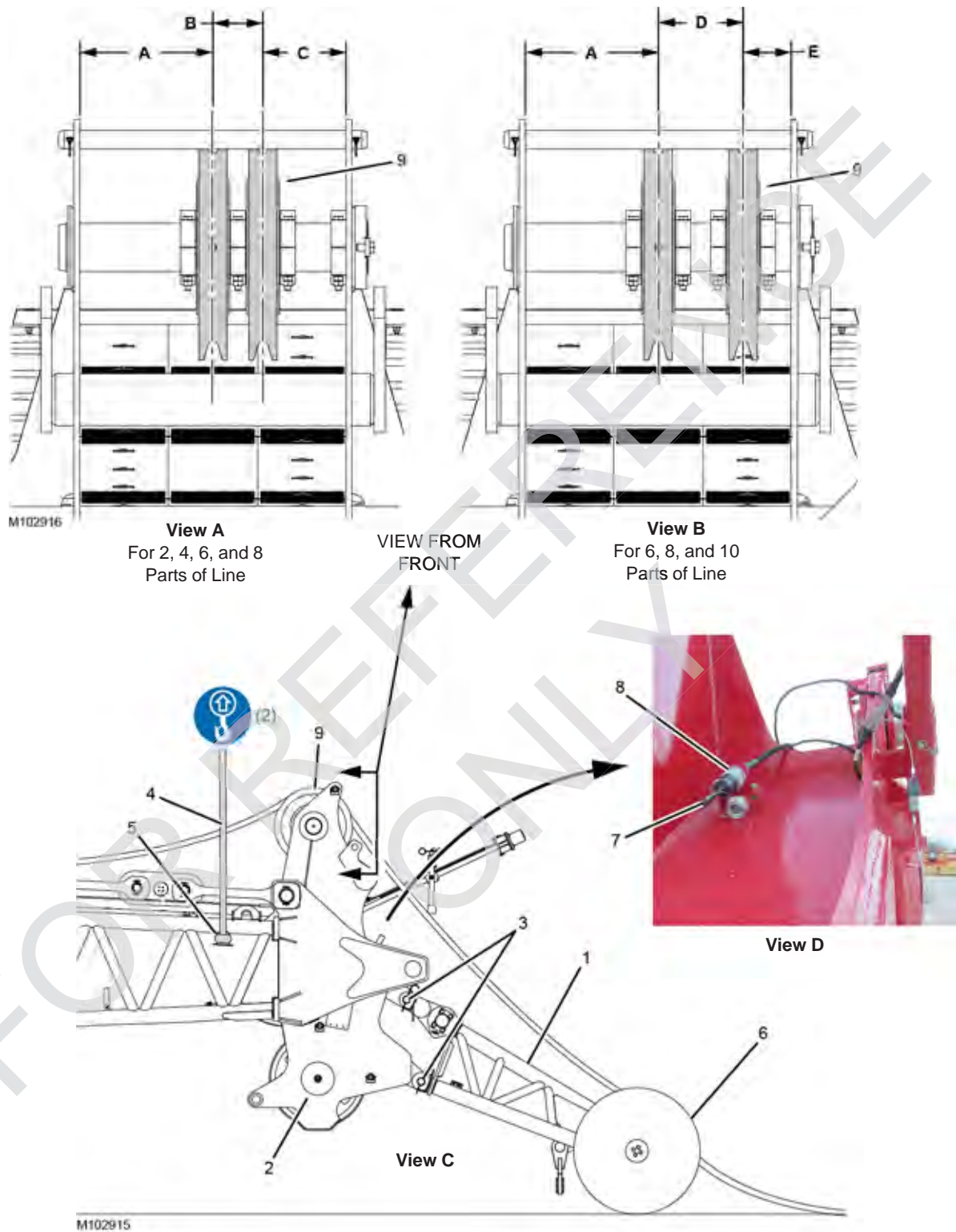


FIGURE 4-30

Legend for [Figure 4-30](#)

Item	Description
1	Upper Jib Point
2	Jib Top
3	Pin with Safety Pins (4)
4	Lifting Slings from Assist Crane
5	Lifting Lug (2)
6	Roller (2)
7	Shorting Plug
8	Receptacle WJT1-J2
9	Jib Top Wire Rope Guide Sheaves
A	359 mm (14-1/8 in)
B	135 mm (5-5/16 in)
C	224 mm (8-13/16 in)
D	229 mm (9-1/32 in)
E	130 mm (5-1/8 in)

Install Lower Jib Point Sheave Clusters

If not already done, install the lower jib point sheave clusters. See [Installing Sheave Clusters in Lower Jib Point, on page 4-15](#).

Adjust the position of the jib top wire rope guide sheaves (9) so they are at the dimensions given in Views A and B.

Install Upper Jib Point

NOTE: An assist crane capable of lifting half the weight of the luffing jib is required for this procedure.

The upper jib point must be equipped with two rollers.

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

- Lift the upper jib point (1) into position at the end of the jib top (2).
A second crane or a forklift truck can be used for this step.
- Remove the pins (3) from the upper jib point.
- Align the upper holes in the upper jib point (1) with the holes in the jib top (2) and install the upper pins (3).
- Attach lifting slings (4) from the assist crane to the lifting lugs (5) on the jib top (2).
- Lift the jib top until the lower holes in the upper jib point are aligned with the holes in the jib top.
- Install the lower pins (3).
- Lower the jib top until the rollers (6) are on the ground and the lifting slings are slack.

- Disconnect the lifting slings.

See [Figure 4-30](#), View B for the remaining steps.

- Disconnect the shorting plug (7) from the receptacle (8) on the jib top.
- Connect the electric cable from the upper jib point to the receptacle (8) on the jib top.
The electric cable is stored on brackets on the left side of the upper boom point.
- If the upper jib point will not be used for an alternate load line, the shorting plug (7) must remain connected to the receptacle (8).

NOTE: If the block-up limit is disconnected at the upper jib point, the shorting plug must be connected to the corresponding electric cable.

Route Load Lines to End of Luffing Jib

The rigging winch (if equipped) can be used to pull the load lines to the end of the jib points:

- See the Rigging Winch Assembly drawing at the end of this section for wire rope routing and anchoring.
- See [Rigging Winch Operation, on page 4-98](#).

Route the load lines through the proper guide sheaves on the boom insert, on the boom top, and in the jib strut. See [Figure 4-63 on page 4-100](#).

Pull the load lines approximately 12,2 m (40 ft) past the end of jib and lay them on the ground.

Securely fasten the load lines to the jib point with owner furnished slings and shackles.

NOTE: The load block(s) and/or the hook and weight balls will be installed after the boom and jib are jacked to the required angle.



WARNING **Falling Wire Rope Hazard!**

For long boom and short jib combinations, the wire rope on the boom side of attachment can overhaul the unsecured wire rope on the jib side of attachment.

The wire rope could fall off the boom.

Securely fasten the load lines to jib point before raising the attachment.

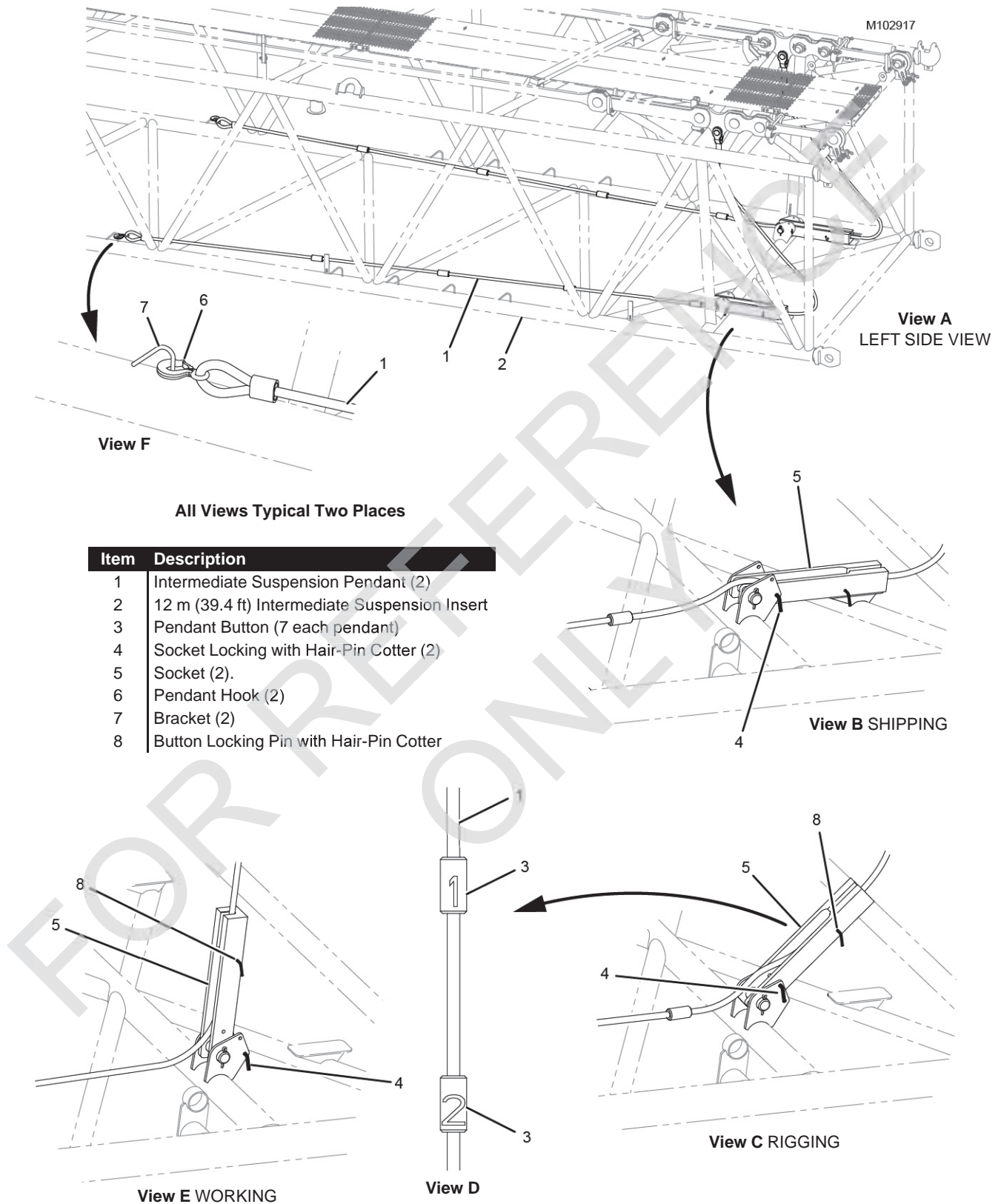


FIGURE 4-31

Prepare Intermediate Suspension Pendants

See [Figure 4-31](#) for the following steps.

The intermediate suspension pendants (1, View A) and rigging components are pre-assembled and shipped in the 12 m (39.4 ft) intermediate suspension insert (2).

Each pendant (2) is equipped with seven buttons (3, View D) The pendant buttons are numbered 1 through 7.

1. Make sure the intermediate suspension insert (2) is installed at the proper location in the jib.
2. Refer to Luffing Jib Rigging drawing at the end of this section to determine the pendant button number that must be pinned to the sockets (see the example in [Figure 4-32](#)).

3. Remove the socket locking pins (4, View B) and raise the sockets (5) from the shipping position to the rigging position (View C).
4. Reinstall the socket locking pins (4, View C) in the top bracket holes.
5. Disconnect the pendant hooks (6, View F) from the brackets (7).
6. Remove the button locking pins (8, View C).
7. Pull the intermediate suspension pendants (1) toward the jib top until the proper pendant socket (3, View D) is positioned in each button (5).
8. Reinstall button locking pins (8, View C).
9. Remove the socket locking pins (4, View C) and raise the sockets from the rigging position to the working position (View E).
10. Reinstall the socket locking pins (4, View E) in the bottom bracket holes.
11. Connect the pendant hooks (6, View F) to the closest brackets (7) which remove the slack from the pendants.

HS - SEE SHEET 101

Jib Makeup Table in Luffing Jib Rigging Drawing

BUTTON	INTERMEDIATE SUSPENSION SEE (1)	INSE 6M (19.7 ASS)
0	0	0
0	0	1
0	0	0
0	0	1
24	3	0
24	4	1
24	1	0
24	2	1
24	3	0
24	4	1
24	2	0
24	3	1
24	4	0

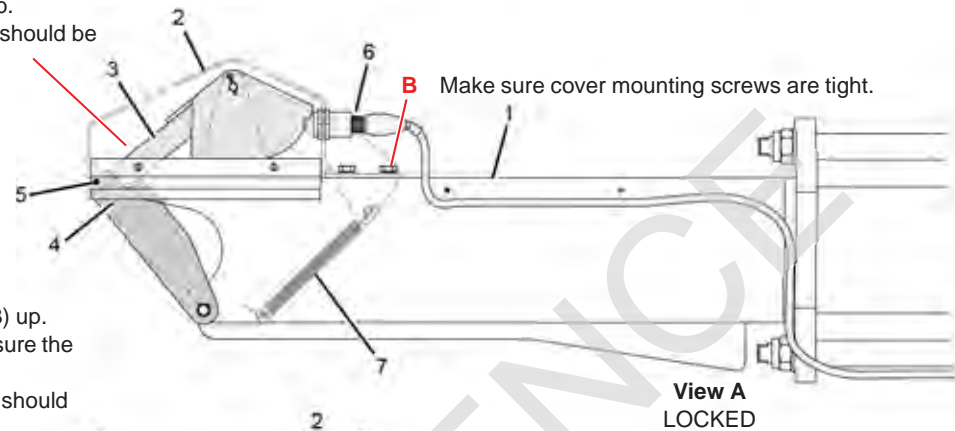
Button Number

M102917A

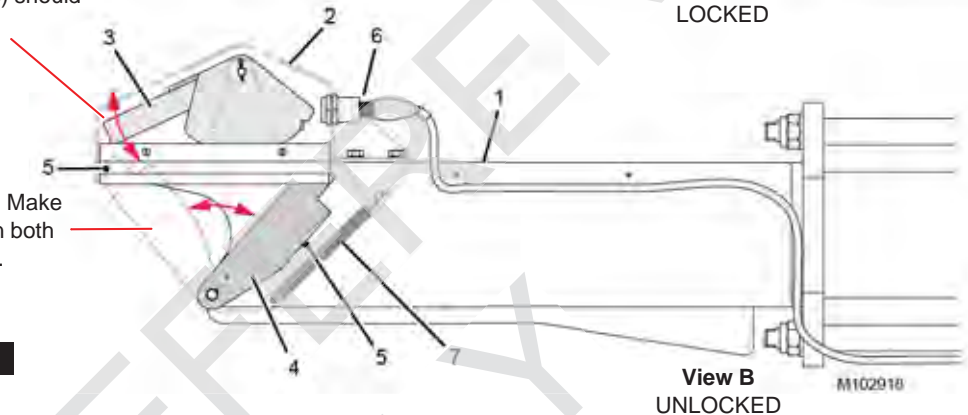
FIGURE 4-32

- G** Make sure the latches and the lock are locked before raising the boom and luffing jib.
- E** With power on, the sensor LED's (6) should be ON when the lock is locked.

A Do not lubricate parts. Make sure all parts are clean.



- C** Using a screwdriver, push the lock (3) up.
- E** Operate the lock by hand. Make the sure the lock operates up and down freely.
- F** With power on, the sensor LED's (6) should be OFF when the lock is unlocked.



- D** Operate the latches (4) by hand. Make the sure latches operate freely in both directions between the stops (5).

Item	Description
1	Jib Stop
2	Cover
3	Lock
4	Latch (2)
5	Stop Pin (2)
6	Sensor LED (2)
7	Spring (2), Current Production

FIGURE 4-33

PRE-RAISING CHECKS

Make the following checks and correct any defects before raising the attachment.

- All installation steps given in this section have been performed.
- The boom and jib inserts are installed in the proper sequence according to the Luffing Jib Rigging drawing.
- The boom, jib, and backstay straps are installed in proper sequence and unpinned from the storage positions.
- All connecting pins are installed and properly retained.
- The boom and luffing hoist wire rope is anchored properly to the drums, spooled tightly onto the drums, and engaged with the proper sheaves. Make sure all rope guard pins, bars, or rollers are installed to retain the wire rope in the sheaves.

- The main strut is raised and the strut stops are pinned in the operating position.
- The jib stops are resting on the jib stop lugs on the boom top.
- The jib stop latch/lock is operating properly. Perform lettered steps in [Figure 4-33](#).
- The load lines are anchored properly to the drums, spooled tightly onto the drums, and engaged with the proper sheaves. Make sure all rope guard pins, bars, and rollers are installed to retain the wire rope on the sheaves.
- The load lines going to the jib point are securely attached to the end of jib so the load lines cannot fall off the jib and the boom.
- All safety devices are installed, electric cables connected, and limits adjusted.
- The proper amount of crane counterweight is installed.

- All lubrication points are greased.
- The Luffing Jib Raising Procedure chart has been read and thoroughly understood.
- The proper Liftcrane Luffing Jib Capacity Chart has been selected and confirmed in the RCL/RCI display.
- The wind is within the allowable limits for raising the boom and jib. See the Wind Conditions chart at the end of Section 3.

**WARNING****Falling Boom And Jib Hazard!**

To operate the luffing jib, select the proper Liftcrane Luffing Jib Capacity Chart in the RCL/RCI display. Operating the luffing jib with any other type of chart selected is prohibited.

The luffing jib limits are disabled if a Liftcrane Luffing Jib Capacity Chart is not selected. The boom and jib could be pulled over backwards.

RAISING BOOM AND LUFFING JIB

See the Luffing Jib Raising Procedure chart for the following:

- Crane counterweight requirements
- Maximum boom and jib lengths that can be raised or lowered
 - Over end of blocked crawlers
 - Over end or side of unblocked crawlers
- Boom-to-luffing jib angle that the boom and jib must be jack-knifed to

**WARNING****Moving Part Hazard!**

Warn all personnel to stand clear of the jib point rollers while the raising the boom and jib.

Death or severe crushing injuries will occur if personnel come into contact with the rollers.

Tipping Hazard!

Determine the boom-to-luffing jib angle that the boom and jib must be positioned at before the jib can be raised (see Luffing Jib Raising Procedure chart at the end of this section). The crane will tip or structural damage will result if the specified angle is not adhered to.

Monitor the angle in the main display as the boom and jib are raised (see MLC300 Main Display Operation Manual).

The crane must remain in line with the crawlers when raising the boom and jib over blocked crawlers until the operating radius and crane configuration is within the 360° capacity chart.

NOTE: It is normal for the following limits to come on during the raising procedure:

- **BLOCK UP** – this fault will go off once the boom and luffing jib are raised and the load lines/block-up limit chains are hanging freely.
- **Luffing Jib Max UP 1 and Max UP 2** – these faults will go off once the boom-to-luffing jib is less 170°.

See Section 3 of this manual for instructions on bypassing the limits in the luffing jib setup mode.

Turn off the luffing jib setup mode once the boom and jib have been raised to the operating range (within applicable capacity chart).

Continued on next page.

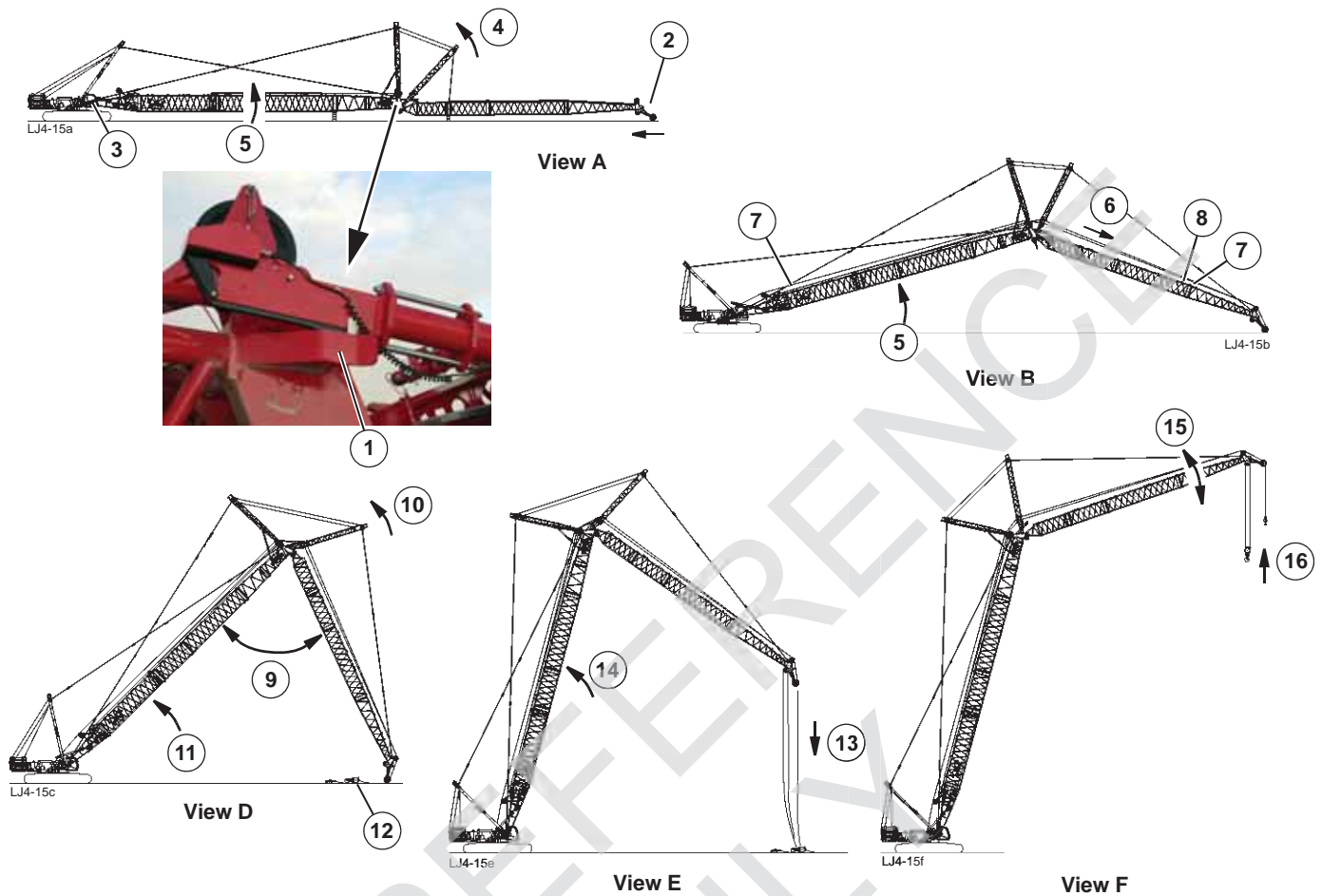


FIGURE 4-34

The circled numbers in [Figure 4-34](#) correspond to the numbered steps in the following procedure.

1. Make sure the jib stops are resting on top of the jib stop lugs on the boom top. Also make sure the jib stop latch/lock is operating properly. See [Figure 4-33](#).
2. Make sure the load lines are fastened to the jib point (see [Route Load Lines to End of Luffing Jib, on page 4-49](#)).
3. Determine the boom-to-luffing jib angle that the boom and jib must be raised to before the jib can be raised. See the Luffing Jib Raising Procedure chart at the end of this section.
4. Luff up to raise the jib strut until the jib straps are clear of strap supports on the butt and the first insert.
5. Slowly boom up.
The jib point rollers will roll along the ground as the boom and jib are jack-knifed into position.

6. Pay out the load lines so they do not become taut as the boom and jib rise.
7. The jib straps and the backstay straps will tighten as the boom and jib rise:

OPERATOR AND SIGNAL PERSON — watch the backstay straps and the jib straps along the left side of the boom and jib as they rise.

- Pay out the luffing hoist wire rope (luff down) so the straps remain slack.
- Allow the backstay straps to float up and down 152 to 305 mm (6 to 12 in) above the strap supports at the top end of the boom butt.
- Allow the jib straps to float up and down above the strap supports at the butt end of the jib top.
- It will be necessary to use the limit bypass switch to luff down if the BLOCK UP limit comes on.

**WARNING****Tipping Hazard!**

Do not allow the jib straps to become too tight during the raising steps. The crane will tip or structural damage will result.

Do not allow the jib and backstay straps to become too slack during the raising steps. The jib strut could fall onto jib butt.

8. If equipped with intermediate suspension, watch the pendants closely. **Do not allow the pendants to get caught on the insert or the load lines as the boom and jib rise.**

NOTE: For some boom and luffing jib configurations, it is normal for the intermediate suspension to appear slack during boom and luffing jib raising and operation. If your intermediate suspension appears slack —

- make sure it is installed in the proper location,
- make sure the proper pendant buttons are pinned to the sockets,

and continue operation.

9. Slowly continue steps 5 - 7 until the specified boom-to-luffing jib angle is reached or the luffing jib is vertical, whichever occurs first.

**WARNING****Falling Jib Hazard!**

Do not raise the boom and jib off the ground until the boom-to-luffing jib angle is 145° or less. The jib stops will not operate properly, possibly resulting in loss of stability.

Do not position the boom and jib at any boom-to-luffing jib angle less than the minimum stop (70°). Structural damage to the jib butt will occur, possibly causing the jib to collapse.

10. Slowly luff up until the jib straps start to go into tension and stop.
11. Boom up to raise the jib point rollers clear of ground.

12. Install the load blocks and/or the hook-and-hook weight balls and the block-up limit components:

- See [Load Line Reeving, on page 4-102](#).
- See [Figure 4-35 on page 4-56](#) for installation of the block-up limit components.

NOTE: The dead-end link, pins, swivel, and button socket are stored in the parts box supplied with the MLC300.

**WARNING****Falling Load Hazard!**

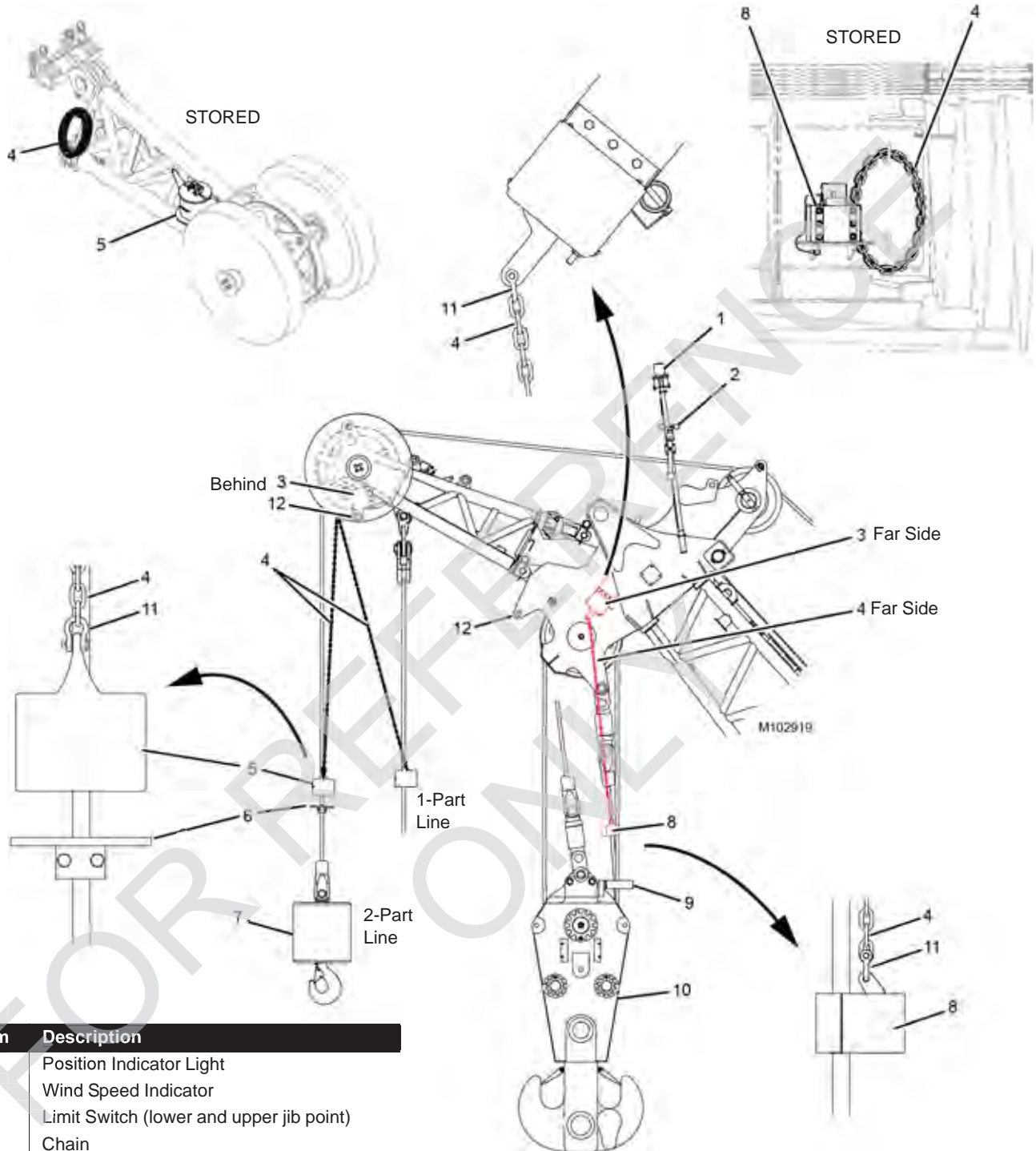
- Do not lift the load blocks and/or the hook and weight balls off the ground until the boom has been raised to the desired operating angle and the jib has been positioned at the required operating radius for the load to be handled. Structural damage can occur and the attachment can collapse if this precaution is not observed.
- The load lines going up the boom can overhaul the load lines going down the jib. Do not untie the load lines from the jib until the load blocks and/or hook and weight balls have been installed. The load lines can fall off the boom if this precaution is not followed.

13. Pay out the load lines as the boom and jib are raised during the following step.

14. Slowly raise the boom and jib until the boom angle is 83° OR the operating radius is within the capacity chart and the jib is above horizontal before changing the luffing jib angle.

If the jib is below horizontal, raise the jib until the operating radius is within the capacity chart before changing the boom angle to the desired operating configuration (see capacity chart for boom angles).

15. Position the jib at the required operating radius.
16. Lift the load blocks and/or the hook and hook weight balls to the desired position. **Travel forward, as required so the load blocks and/or the hook and weight balls are directly below the jib point before lifting them.**
17. Turn off the luffing jib setup mode once the boom and jib have been raised to the operating range (within applicable capacity chart).



Item	Description
1	Position Indicator Light
2	Wind Speed Indicator
3	Limit Switch (lower and upper jib point)
4	Chain
5	Weight with 2-Chain Attachments
6	Lift Plate
7	Hook and Weight Ball
8	Weight with 1-Chain Attachment
9	Lift Block
10	Load Block
11	Shackle
12	Rollers

See Load Block Reeving Diagrams for Suggested Location of Weight with Multiple Part Reeving

FIGURE 4-35

LOWERING BOOM AND LUFFING JIB

See the Luffing Jib Raising Procedure chart for the following:

- Crane counterweight requirements
- Maximum boom and jib lengths that can be raised or lowered
 - Over end of blocked crawlers
 - Over end or side of unblocked crawlers
- Boom-to-luffing jib angle that the boom and jib must be jack-knifed to



DANGER

Moving Part Hazard!

Warn all personnel to stand clear of the jib point rollers while lowering the boom and jib.

Death or severe crushing injuries will occur if personnel come into contact with the rollers.



WARNING

Tipping Hazard!

Determine the boom-to-luffing jib angle that the boom and jib must be positioned at before the boom and jib can be lowered (see Luffing Jib Raising Procedure chart at the end of this section). The crane will tip or structural damage will result if the specified angle is not adhered to.

Monitor the angle in the main display as the boom and jib are lowered (see MLC300 Main Display Operation Manual).

Do not allow the BOOM-TO-LUFFING JIB ANGLE to become less than 70°. Structural damage to the jib can occur.

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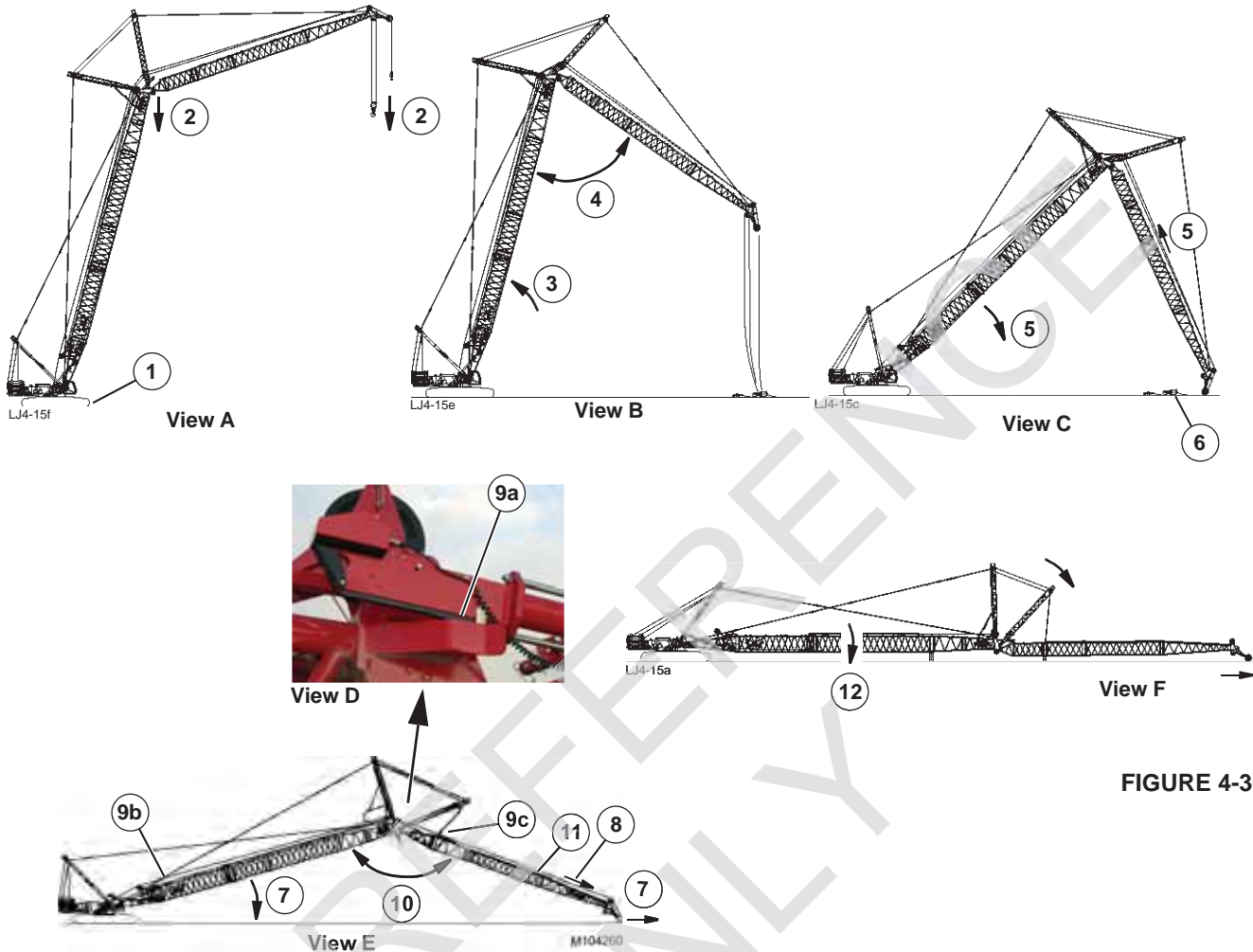


FIGURE 4-36

The circled numbers in [Figure 4-36](#) correspond to the numbered steps in the following procedure.

NOTE: It is normal for the following limits to come on during the raising procedure:

- BLOCK UP
- Luffing Jib Max UP 1 and Max UP 2

See Section 3 of this manual for instructions on bypassing the limits in the luffing jib setup mode.

1. If necessary, travel the ends of the crawlers under the boom onto blocking.

Adhere to the raising and lowering limitations given in Liftcrane Luffing Jib Capacity Chart.

2. Refer to the Luffing Jib Raising (Lowering) Procedure to determine if raising and lowering with the load blocks and/or hook and weight balls hanging under the boom

and/or jib points is permitted.

If raising and lowering with the load blocks and/or hook and weight balls hanging under the boom and/or jib points is not permitted, swing the boom and jib slightly to either side of center and lower the load blocks and/or the hook and weight balls onto the ground. Then swing the boom and jib to the desired position with relation to the crawlers.



WARNING

Tipping Crane Hazard!

If necessary, lower the load blocks and/or the hook and weight balls onto the ground before lowering the boom and jib. Structural damage can occur and the attachment can collapse if this precaution is not observed.

Refer to the Luffing Jib Raising (Lowering) Procedures for load block and/or the hook and weight ball limitations.

**DANGER****Tipping Crane Hazard!**

Do not lower the boom and jib to the ground until the boom has been positioned at the minimum angle of 83° and the jib has been positioned at the specified boom-to-luffing jib angle. The crane will tip, or structural damage will occur, possibly causing the attachment to collapse.

Also, the jib stop lock will not will not operate properly if this precaution is not observed.

3. Position the boom at the minimum angle of 83°. Monitor the boom angle in the RCL/RCI working screen
4. Position the jib at the required boom-to-luffing jib angle. Monitor the boom-to-luffing jib angle in the crane status bar of the main display.
5. While hauling in the load line so it doesn't become entangled, slowly lower the boom until the upper jib point is just clear of ground.

It will be necessary to use the limit bypass switch to lower the boom if the BLOCK UP limit is on.

6. Remove the load blocks and/or the hook and weight balls:
 - a. Remove the block-up limit weights and the chains. Store them as shown in [Figure 4-35 on page 4-56](#).
 - b. Store the dead-end link, pins, swivel, and button socket in the parts box supplied with the MLC300.
 - c. Securely fasten the load lines to the jib point so the load lines cannot fall off the boom and jib.

**WARNING****Falling Wire Rope Hazard!**

For long boom and short jib combinations, the wire rope on the boom side of the attachment can overhaul unsecured wire rope on the jib side of the attachment. The wire rope could fall off the boom. Securely fasten the load lines to the jib point before removing the load blocks and/or the hook and weight balls.

7. Slowly boom down until the jib point rollers contact the ground.

The jib point rollers will roll along the ground as the boom and jib are lowered.

Use extreme care not to roll over the load line.

**WARNING****Falling Load Hazard!**

Do not under any condition allow the boom-to-luffing jib angle to exceed 145° before the jib point rollers contact the ground. The jib stops may engage the boom top during lowering

8. Pay out the load lines so they don't become taut as the boom and jib lower.
9. The jib straps and the backstay straps will slacken as the boom and jib lower.

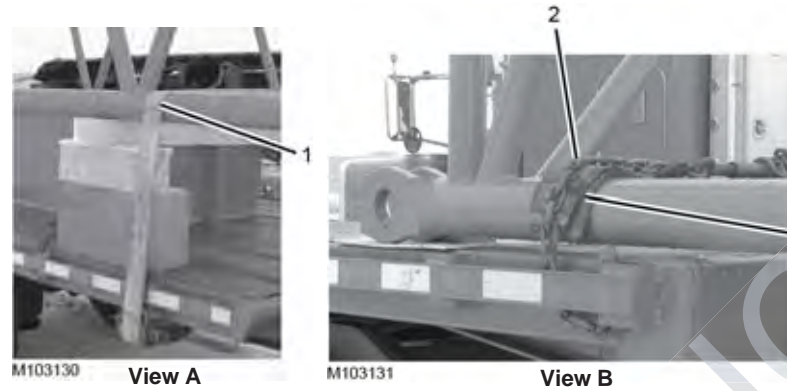
OPERATOR AND SIGNAL PERSON —

- a. Watch the jib stops. Make sure they ride over the top of the jib stop lugs as shown in View D.
- b. Watch the backstay straps along the left side of boom as the boom and jib lower. Allow the backstay straps to float up and down above the strap supports at the top end of the boom butt.
- c. Watch the jib straps along the left side of jib as the boom and jib lower. Allow the jib straps to slowly lower into the strap supports on the jib so that the ends of the spreader assembly are 6-8 inches above the jib butt and first insert. The jib strut will be at approximately 45° with relation to the jib.

Use care not to allow the jib straps to slide down the jib sections and hang up in the strap supports.

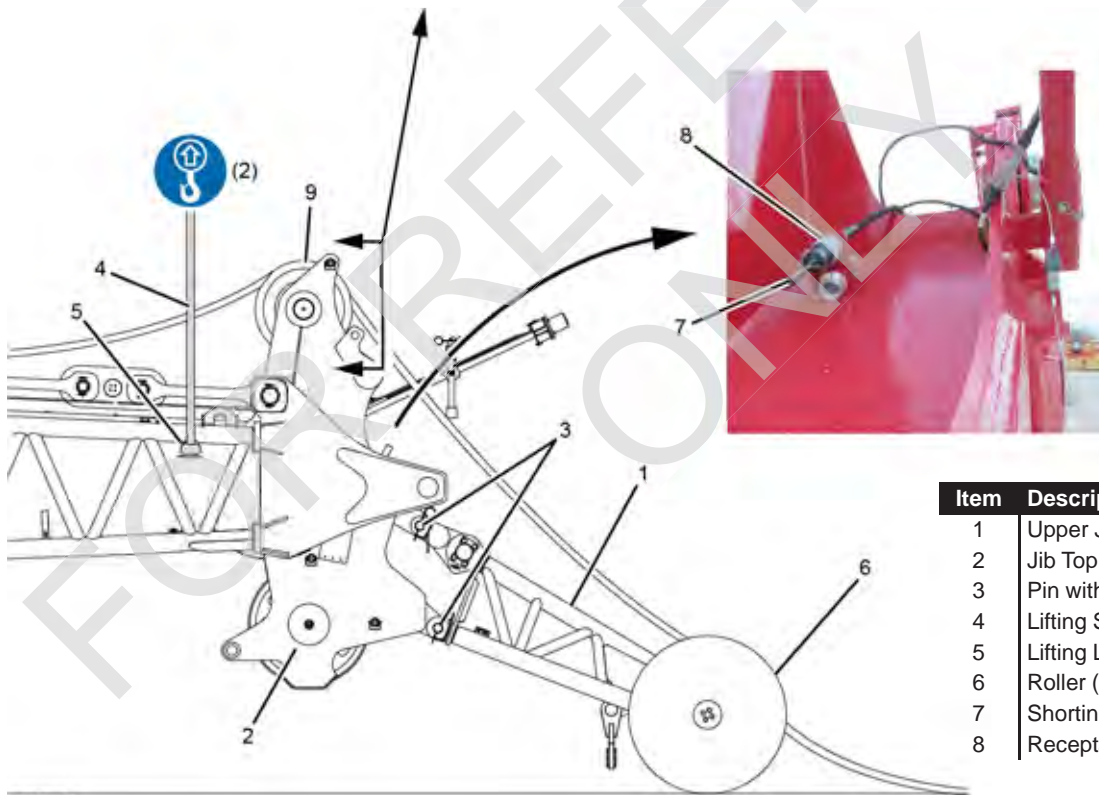
It will be necessary to use the limit bypass switch to luff down if the BLOCK UP limit is on.

10. Slowly continue steps 7 - 9.
11. If equipped with intermediate suspension, watch the pendants closely. They must lower into the insert smoothly without getting caught on the insert or the load lines as the boom and jib lower.
12. Slowly continue the lowering procedure until the jib is horizontal.



Item	Description
1	Synthetic Tie-Down Wrapped Over Boom Chord
2	Chain Tie-Down Wrapped Over Boom Chord
3	Protective Covering (section of rubber tire)

FIGURE 4-37



Item	Description
1	Upper Jib Point
2	Jib Top
3	Pin with Safety Pins (4)
4	Lifting Slings from Assist Crane
5	Lifting Lug (2)
6	Roller (2)
7	Shorting Plug
8	Receptacle WJT1-J2

M102915

FIGURE 4-38

SHIPPING CRANE COMPONENTS

It is the owner/user's responsibility to ensure the following:

- All trailer loads comply with local, state, and federal transportation requirements.
- 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 4-37](#), View A.

If chain tie-downs are used, install protective covering (such as sections of rubber tire) between the chain and the component being secured as shown in [Figure 4-37](#), View B.

When securing boom sections, wrap the tie-downs over the chords — never over the lacings. Keep the tie-downs as close to the blocking as possible (View A) to prevent bending the chords.

REMOVING LUFFING JIB

Store Intermediate Suspension

If equipped with intermediate suspension, store the pendants as shown in [Figure 4-31 on page 4-50](#).

Store Load Lines

Haul in the load lines on the load drums until:

- The load lines are at the boom top if the boom is going to be used
- The load lines are spooled onto the load drums if the boom is going to be removed

Remove Upper Jib Point

NOTE: An assist crane capable of lifting half the weight of the luffing jib is required for this procedure.

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

1. If connected, disconnect the electric cable from the upper jib point (1) at the receptacle (8) on the jib top (2).
 - Store the electric cable on the brackets on the upper boom point (see [Figure 4-35 on page 4-56](#)).
 - Store the block-up limit weight on the upper boom point (see [Figure 4-35 on page 4-56](#)).
2. Connect the shorting plug (7) to the receptacle (8) on the jib top.
3. Attach the lifting slings (4) from the assist crane to the lifting lugs (5) on the jib top (2).

4. Hoist with the assist crane so the upper jib point rollers (6) are just clear of the ground.
5. Support the upper jib point with lifting slings from a second crane or a forklift truck.
6. Remove the pins (3) and lift the upper jib point away from the jib top (2).
7. Reinstall the pins (3) in the upper jib point and place the upper jib point on a trailer for shipping or store it on the job site.
8. Lower the jib top onto blocking and disconnect the lifting slings (4).

Disconnect Jib Top Electric Cables

Reverse the installation steps to disconnect the jib top electric cables. See [Connect Jib Top Electric Cables, on page 4-47](#).

- Clean all cable connectors and dust caps.
- Wind the cable onto the cable reels for storage.
- Securely fasten dust caps or terminator plugs to all cable ends and receptacles.

Remove Jib Top Camera

Reverse the installation steps to remove the jib top camera. See [Install Jib Top Camera and Connect Electric Cables, on page 4-45](#).

- Clean all cable connectors and dust caps.
- Securely fasten dust caps to all cable ends and receptacles.

Remove Position Light and Wind Speed Indicator

Reverse the installation steps to remove the position light and wind speed indicator. See [Install Position Light and Wind Speed Indicator, on page 4-43](#).

- Clean all cable connectors and dust caps.
- Securely fasten dust caps to all cable ends and receptacles.

Item	Description
1	Luffing Hoist Wire Rope
2	Jib Strut
3	Spreader
4	Jib Strap
5	Transition Insert

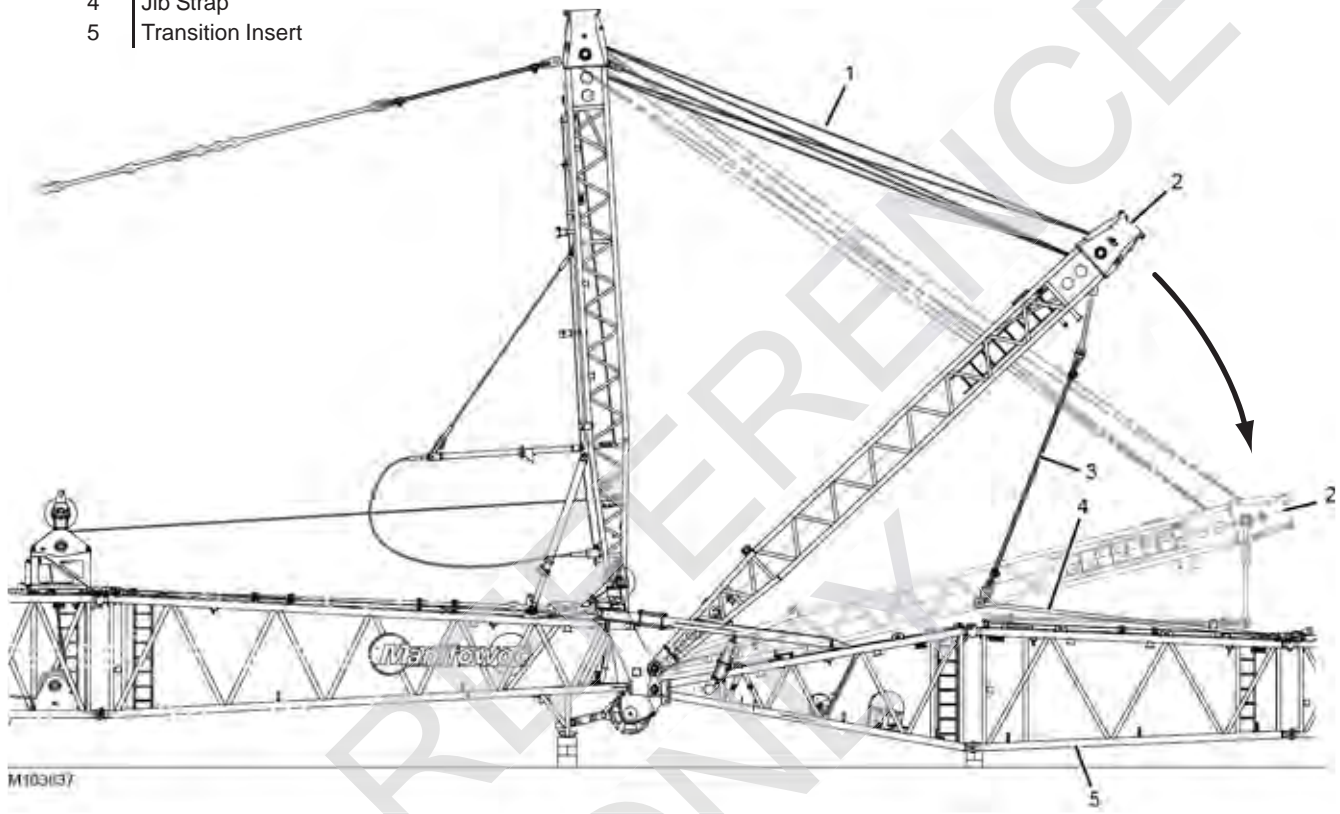


FIGURE 4-39

Lower Jib Strut

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

1. Slowly luff down to lower the jib strut (2).
2. Stop when the jib straps (4) and the spreader (3) have folded into the storage brackets on the transition insert (5).

NOTE: If the jib strut will not lower on its own, use an outside assist (for example, a forklift) and slings to pull it down to the point that it will lower on its own. Shackle the slings to the lugs on the end of the jib strut.

FOR REFERENCE ONLY

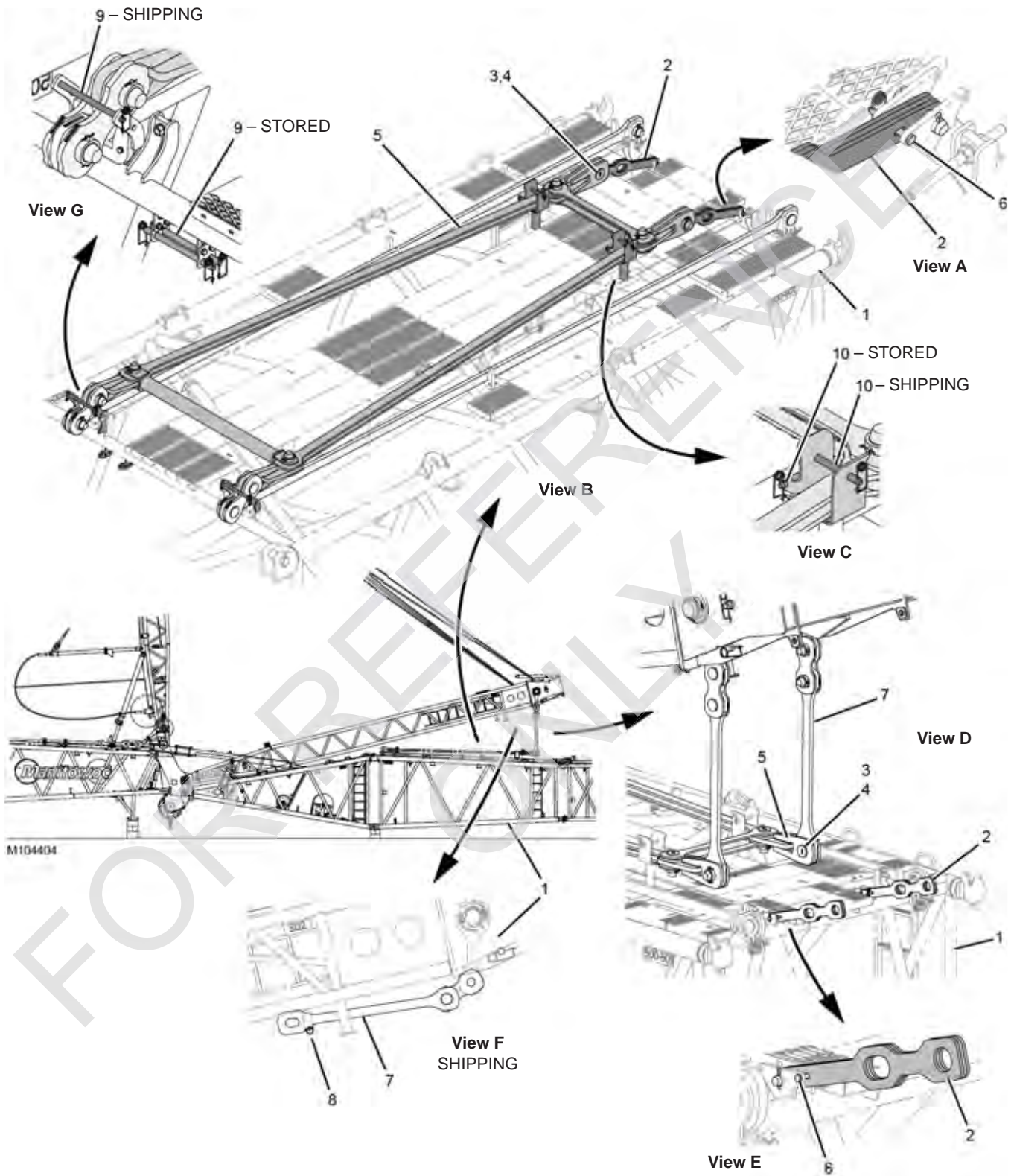


FIGURE 4-40

Legend for [Figure 4-25](#)

Item	Description
1	Transition Insert
2	Shipping Link (4)
3	Pin (2)
4	Collar with Retaining Pin and Cotter Pins (2)
5	Spreader
6	Pin with Safety Pins (2)
7	Jib Strut Basic Straps (2)
8	Storage Pin with Safety Pins (2)
9	Storage Pin with Safety Pins (2)
10	Storage Pin with Safety Pins (2)

Disconnect Jib Strut Basic Straps from Spreader

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

- Remove the storage pins (9, View G) from the stored position and install them in the shipping position.
- Remove the storage pins (10, View C) from the stored position and install them in the shipping position.
- Luff up/down as required to loosen the pins (3, View D).
- Remove the collars (4, View D) and the pins (3) and place them to side.
- Luff up until the jib strut basic straps (7, View D) are clear of the spreader (5).
- Remove the storage pins (8, View F) from the lugs on the jib strut.
- Raise the jib strut basic straps (7, View F) to the shipping position and install the pins (8).
The total weight of the strap, links, and pins on each side of the jib strut is 75 kg (165 lb).
- Remove the pins (6, View E) and rotate the shipping links (2) rearward to the storage position (View A).
- Install the pins (6, View A).
- Connect the shipping links (2, View B) to the ends of the spreader (5) with the pins (3) and the collars (4).

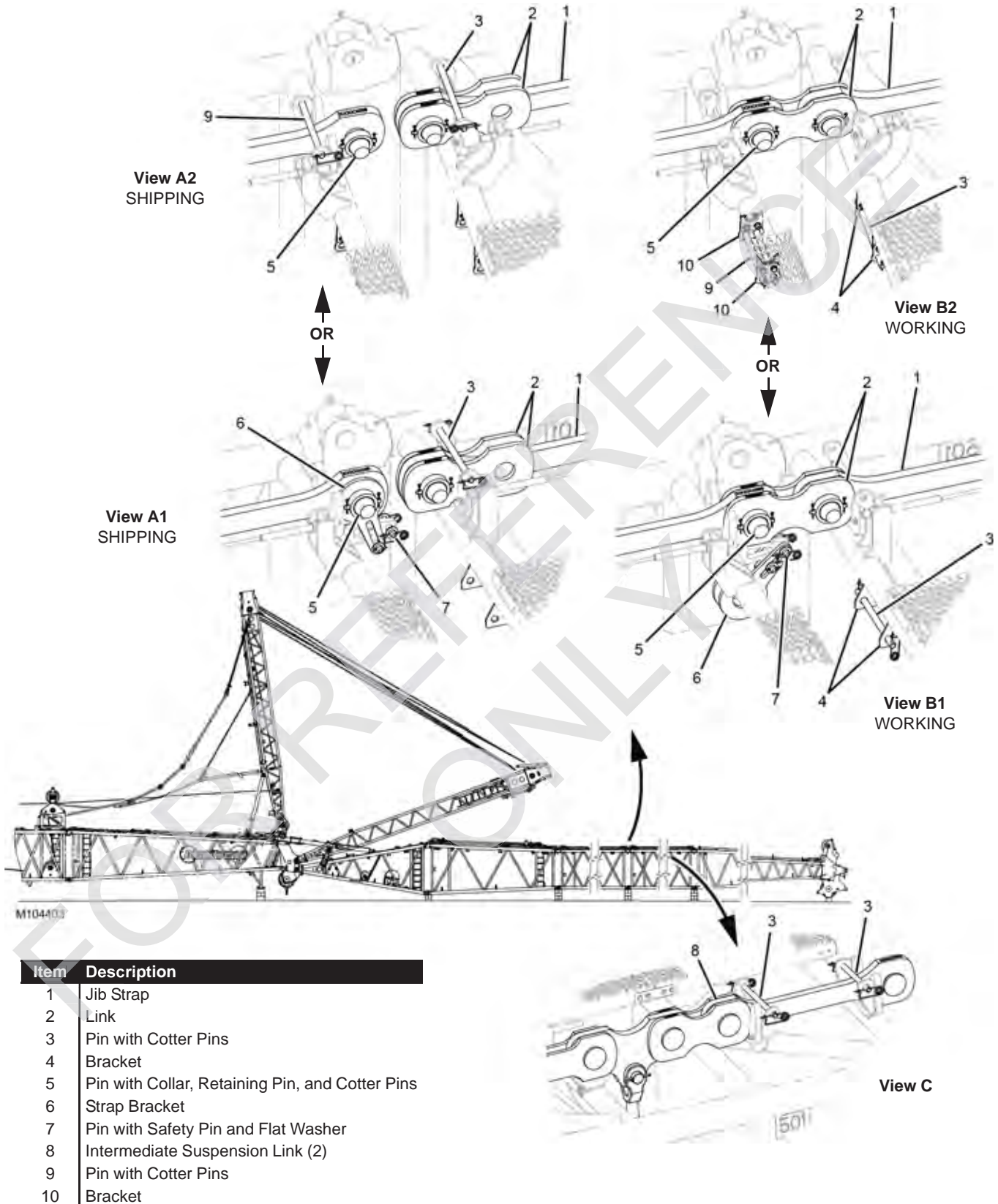


FIGURE 4-41

Disconnect Jib Straps between Jib Sections

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

The jib straps (1) are shipped on the jib sections as shown in View A1 or A2.

Starting at the transition insert and working toward the jib top, proceed as follows:

1. Remove pin (5, View B1 or B2).
2. Rotate links (2, View B1 or B2) forward from the working position to the shipping position (View A1 or A2).
3. Remove the retaining pins (3, View B1 or B2) from storage and install them (View A1 or A2).
4. Rotate the strap bracket (6, View B1) up and pin it in the shipping position (View A1) with pin (7).

OR

Remove retaining pins (9, View B2) from storage and install them in the shipping position (View A2).

5. Install pin (5, View A1 or A2).
6. Repeat the above steps for both straps at both ends of each boom section.
7. If equipped with the intermediate suspension insert (View C), remove pins (3) from the brackets (4, View B1 and B2) and install the pins over the intermediate suspension links (8, View C).

Remove Jib Sections

Remove the jib sections up to the partial jib identified in [Figure 4-21 on page 4-35](#).

Reverse the assembly steps on [page 4-35](#) to remove the jib sections.

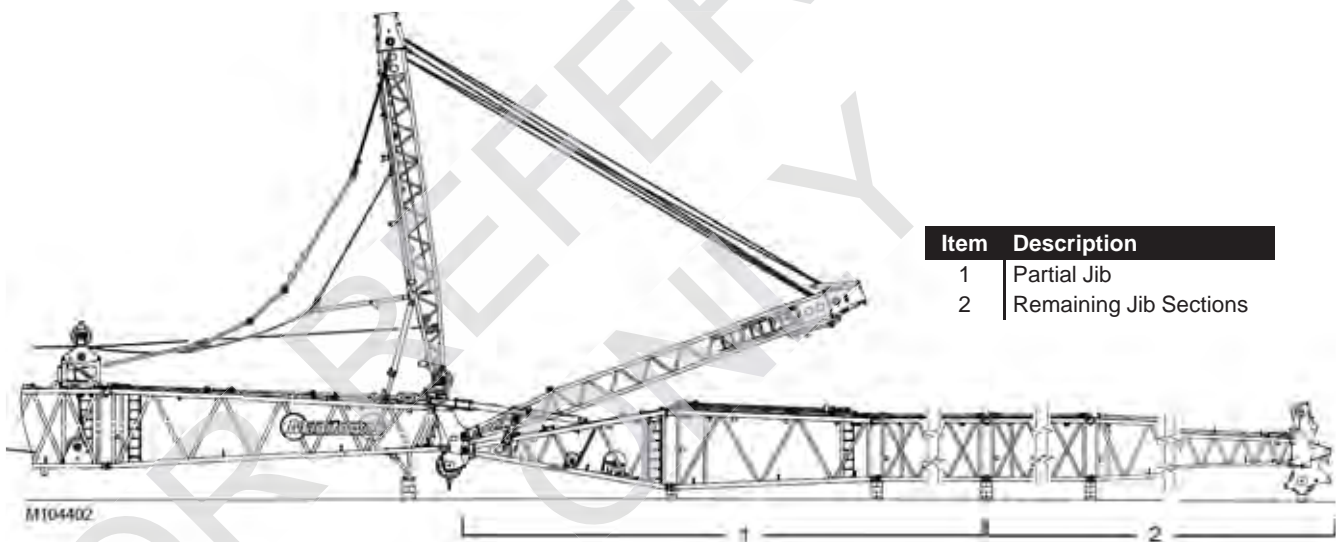
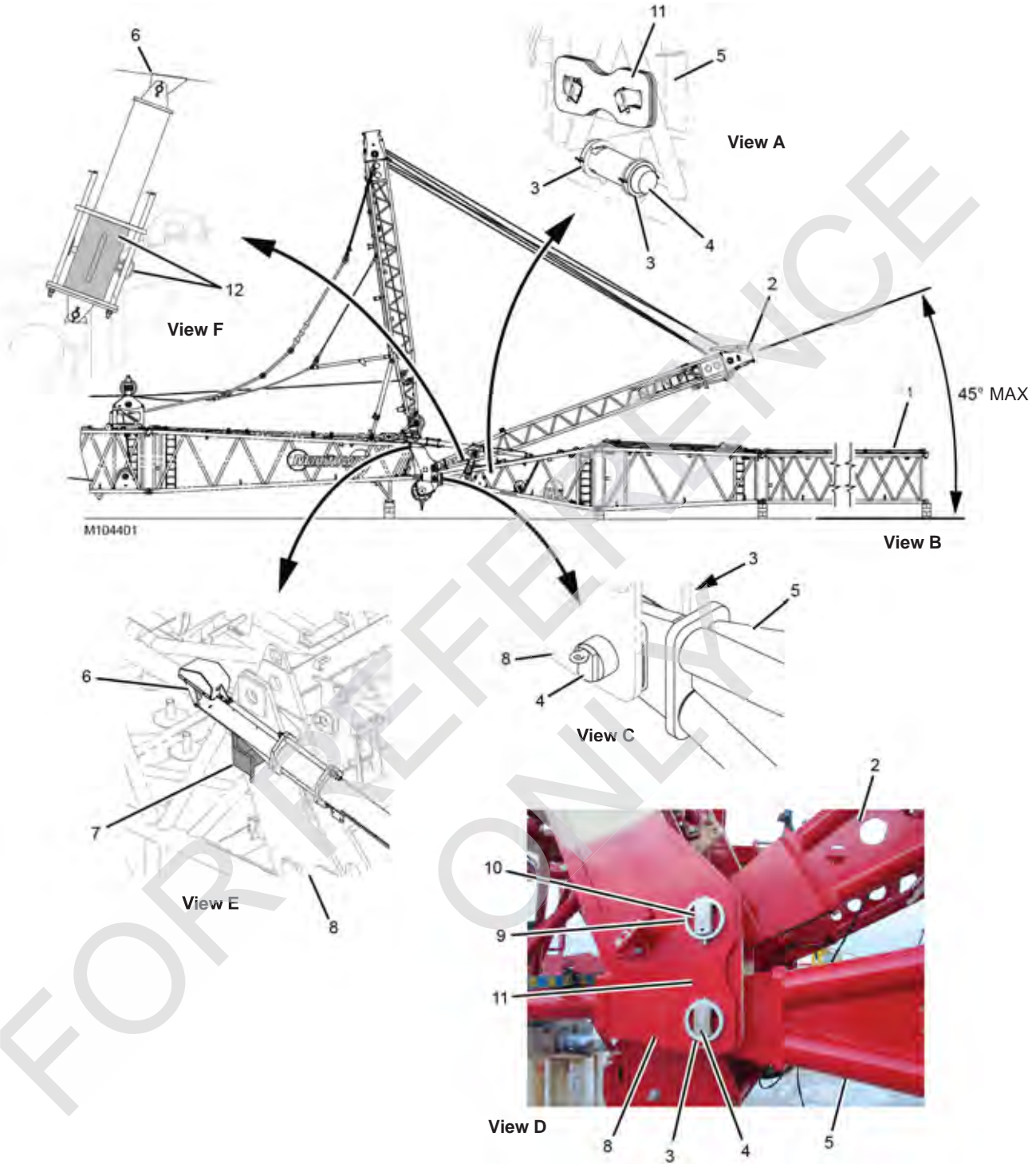


FIGURE 4-42



Item	Description	Item	Description
1	Partial Jib	7	Jib Stop Lug (qty 2)
2	Jib Strut	8	Boom Top
3	Collar with Retaining Pin and Cotter Pins (qty 4)	9	Collar with Retaining Pin and Cotter Pins (qty 2)
4	Jib Butt Hinge Pin (qty 2)	10	Jib Strut Hinge Pin
5	Jib Butt	11	Keeper Plate with Safety Pin (qty 2)
6	Jib Stop (qty 2)	12	Jib Stop Stand with Hair-Pin Cotter (qty 2)

FIGURE 4-43

Remove Partial Jib

1. Install a jib stop stand (12, View F, [Figure 4-43](#)) at both jib stops (6). If necessary, use a lifting sling from the assist crane to raise the jib stops. The stands are stored in the parts box.
2. Attach four 4 m (13 ft) long lifting slings from the assist crane to the partial jib (1). Adjust the lifting slings so the partial jib lifts level about the center of gravity shown [Figure 4-21 on page 4-35](#).

See [Figure 4-43](#) for the remaining steps.

3. Luff up so the jib strut (2, View B) is no higher than 45°. **The strut may not lower under its own weight if it is raised higher than 45°.**
4. Remove the outboard collar (9, View D) from both jib strut hinge pins (10).
5. Remove the inboard and outboard collars (3, View C and D) from both jib hinge pins (4).
6. Remove the keeper plates (11, View D) and store them as shown in View A.
7. Reinstall the collar (9, View D) on both jib strut hinge pins (10).
8. Hoist with the assist crane just enough to support the partial jib.
9. Remove the jib hinge pins (4, View C).
10. Store the jib hinge pins (4, View A) and the collars (3).
11. Using care not to damage the jib stops (6, View E), lift the partial jib away from the boom top.
12. Place the partial jib on blocking as shown in [Figure 4-44 on page 4-70](#).

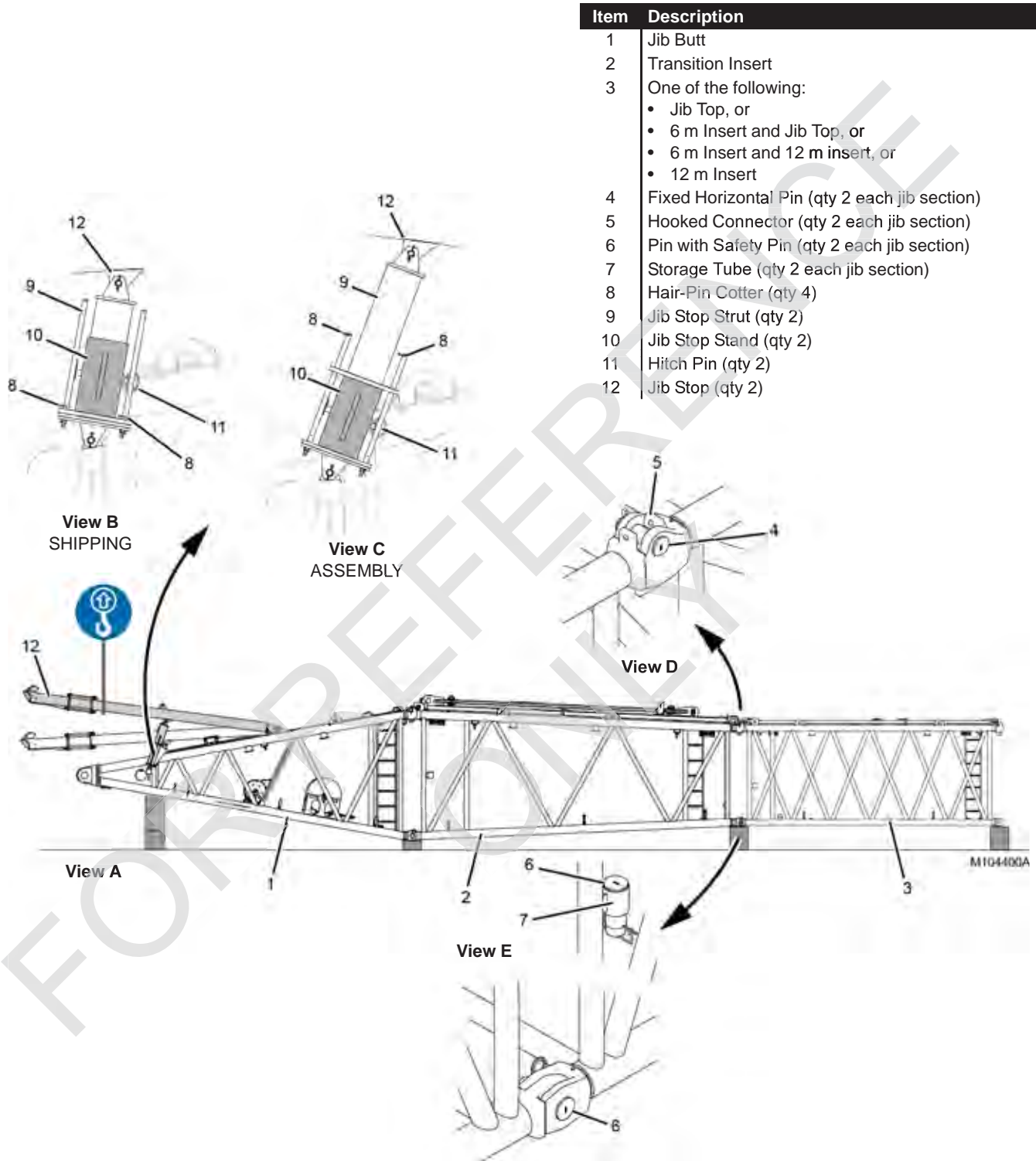


FIGURE 4-44

Disassemble Partial Jib

See [Figure 4-7 on page 4-10](#) for lifting arrangements.

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

1. Attach a lifting sling from the assist crane to either jib stop (12, View A) and hoist just enough to support the jib stop.
2. Remove the jib stop stand (10, View C) from the assembly position in the jib stop strut (9).
3. Lower the jib stop from the assembly position (View C) to the shipping position (View B) and install the jib stop stand (10) with the hitch pin (11).
4. Remove the hair-pin cotters (8, View C) from the assembly position in the jib stop strut (9) and install the hair-pin cotters in the shipping position (View B).
5. Disconnect the lifting sling.
6. Repeat [step 1](#) through [step 5](#) for the other jib stop.
7. From the assist crane, connect the lifting slings specified in [Figure 4-7 on page 4-10](#) to the boom section (3, View A). Item 3 can be one of the following:
 - Jib top
 - 6 m insert and jib top
 - 6 m insert and 12 m insert
 - 12 m insert
8. Hoist with the assist crane so the lifting slings are taut.
9. Remove the pins (6, View E) from the bottom connector holes and store the pins.
10. Disengage the fixed horizontal pins (4, View D) on the boom section (3) from the hooked connectors (5) on the transition insert (2).
11. Lift the boom section away from the transition insert and place the boom section on the trailer for shipping or store the boom section on the job site.
12. Disconnect the lifting slings.
13. Repeat the above steps for the next boom section.

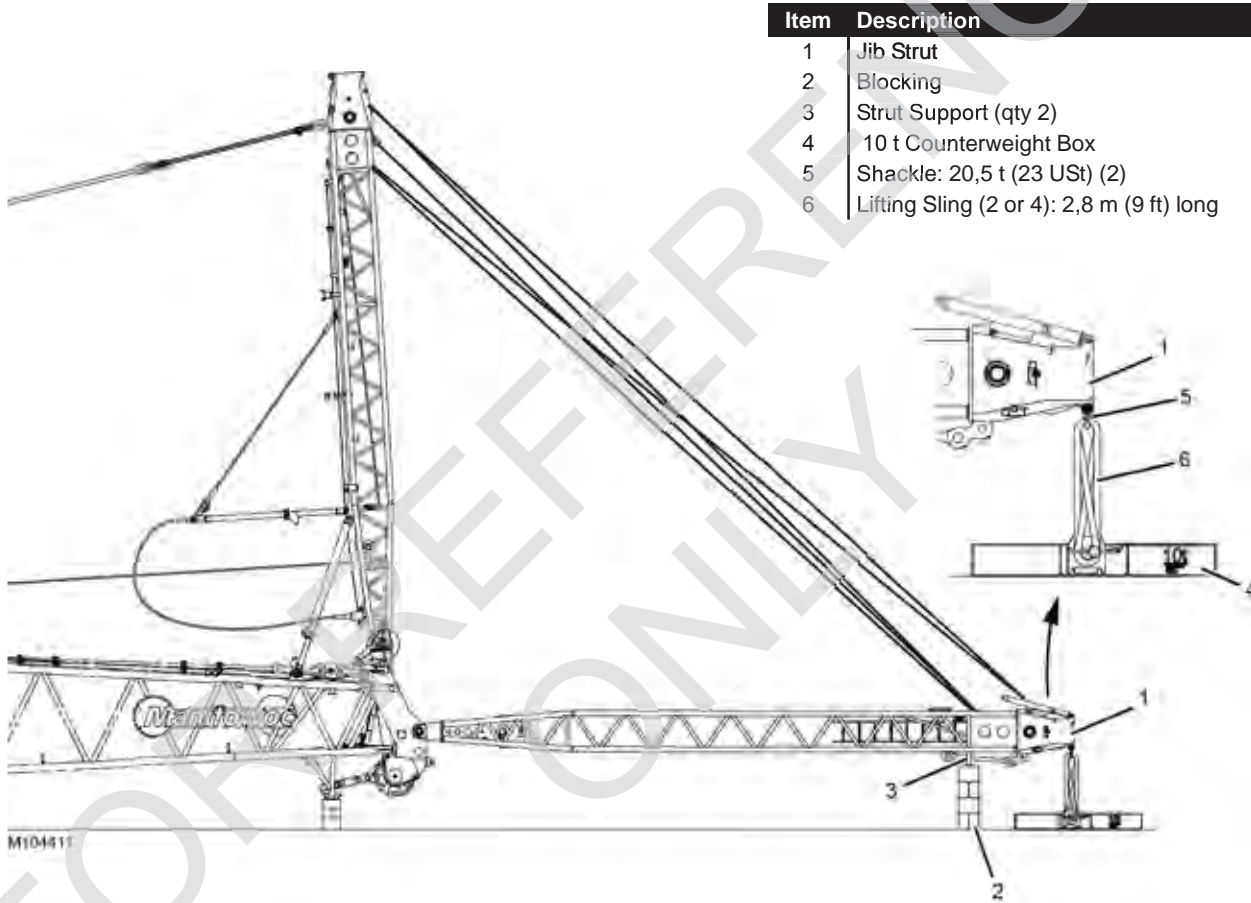


FIGURE 4-45

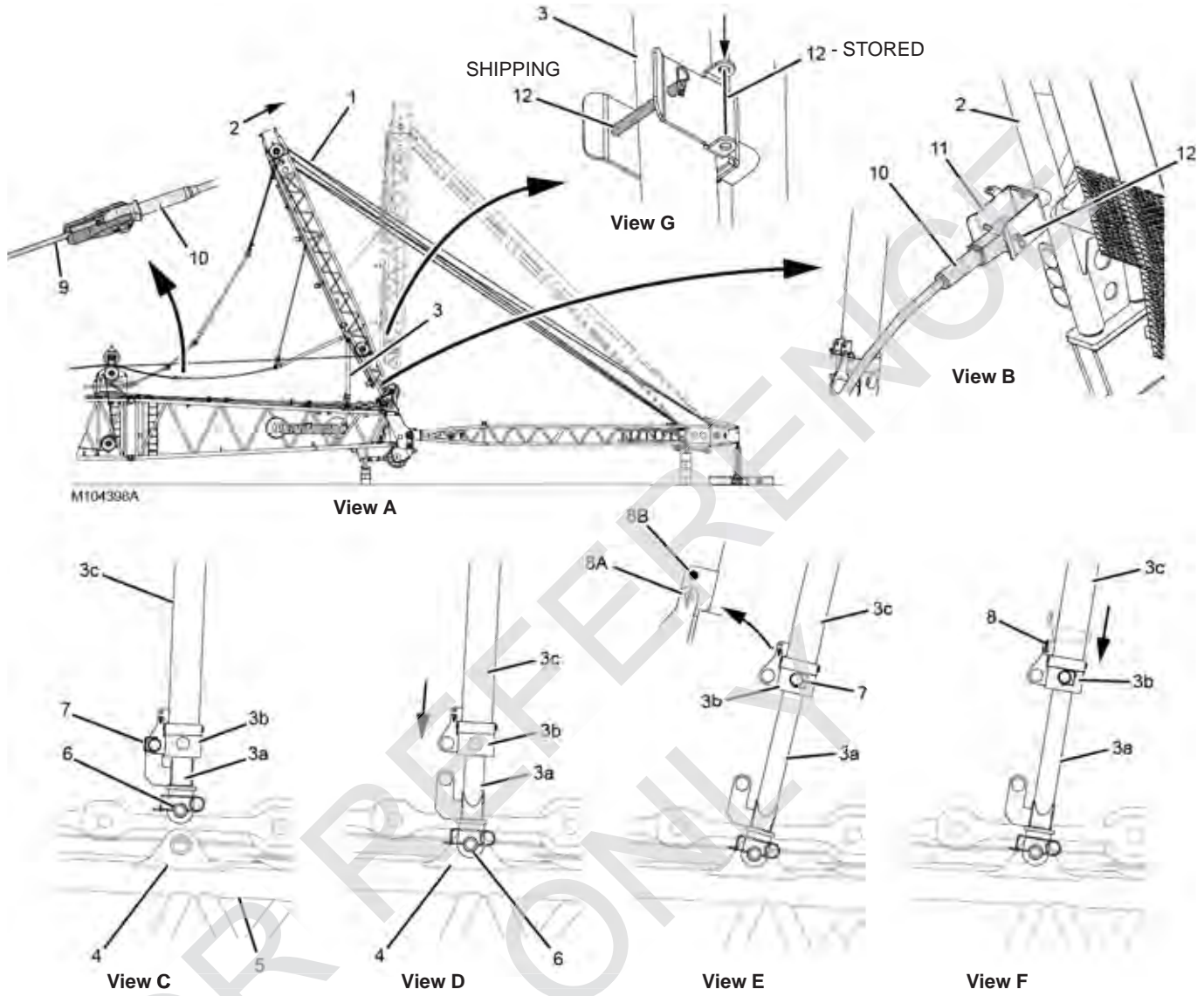
Lower Jib Strut onto Blocking and Connect Counterweight Holdback

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

1. Luff down to lower the jib strut (1) onto blocking (2) that is 0,9 m (2 ft 11-7/16 in) high under the strut supports (3).
2. Using the assist crane, lift one of the counterweight boxes (4) from the crane into position at the end of the jib strut (1).
3. Center the counterweight box (4) under the jib strut (1) as shown.
4. Using the shackles (5) and the lifting slings (6), secure the counterweight box (4) to the lugs on the jib strut (1).

Double wrap the slings through the shackles and around the lifting lugs on the counterweight box.

FOR REFERENCE ONLY



Item	Description	Item	Description
1	Luffing Hoist Wire Rope	7	Pin with Safety Pins (2)
2	Main Strut	8	Quick-Release Pin (2)
3	Main Strut Stop (2)	A	Erecting Hole
3a	Lower Stop Tube (2)	B	Storage Hole
3b	Middle Stop Tube (2)	9	Load Line with Button Socket
3c	Upper Stop Tube (2)	10	Strut Raising Pendant
4	Stop Lug (2)	11	Bracket
5	Boom Top	12	Pin with Hair-Pin Cotters
6	Pin with Safety Pins (2)		

FIGURE 4-46

Store Main Strut Stops

See [Figure 4-46](#) for the following steps.

1. Remove the pin (12, View B) to disconnect the strut raising pendant (10) from the bracket (11) on the left side of the main strut (2).
2. Reinstall the pin (12, View B) in the bracket on the main strut (2).
3. Connect the load line (9, View A) to the strut raising pendant (10).
4. Haul in the load line while paying out the luffing hoist wire rope until the quick release pins (8, View E) can be moved from the storage holes (B) to the erecting holes (A).
5. Remove the quick-release pins (8, View E) from the storage holes (B) and install the quick-release pins (8) in the erecting holes (A).
6. Luff up as needed to loosen pins (7, View E).
7. Remove pins (7, View E) to unlock the inner stop tubes (3b) from the lower stop tubes (3a).
8. Slowly pay out the luffing hoist wire rope to lower the main strut. The middle stop tubes (3b, View D) and the outer stop tubes (3c) will telescope down the lower stop tubes (3a) during this step.
9. STOP when the connecting holes in the middle stop tubes are aligned with the connecting holes in the lower stop tubes (3a, View C).
10. Install the pins (7, View C) to lock the inner stop tubes to the lower stop tubes.
11. Remove the pins (6, View D).
12. Haul in the luffing hoist wire rope (1, View A) and pay out the load line to raise the main strut (2) until the main strut stops are clear of the boom top.
13. Install pins (6, View C) in the lower stop tubes (3a).
14. Remove the pins (12, View G) from the storage brackets on the main strut.
15. Rotate the main strut stops (3, View G) to the storage position and install pins (12).

NOTE: A 45 kg (100 lb) force may be required if the main strut is not raised to vertical when performing [step 15](#).

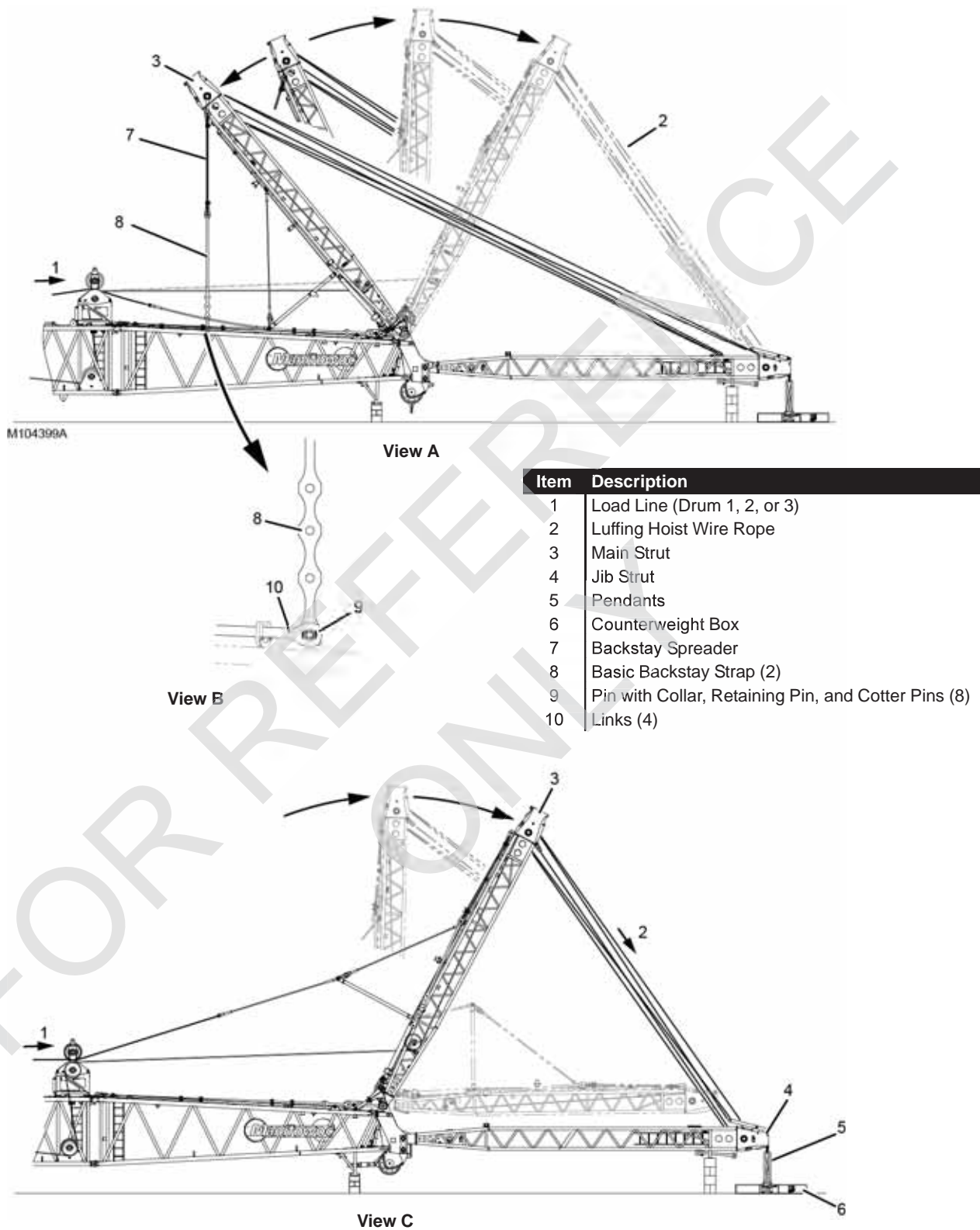


FIGURE 4-47

Store Backstay Straps and Lower Main Strut

See [Figure 4-47](#) for the following steps.

CAUTION

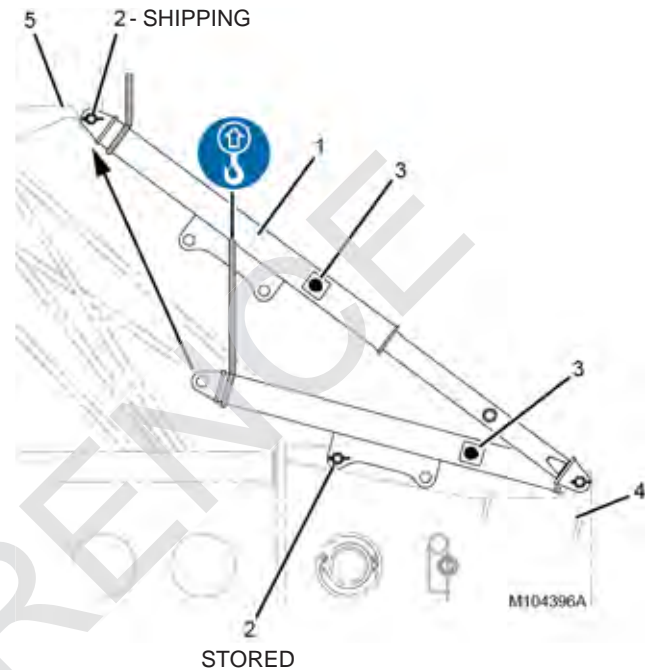
Avoid Lacing Damage

Use care not to allow the basic backstay straps (8, View B) to contact the lacings in the boom top. Damage could occur.

1. Slowly luff down to lower the main strut (3, View A) until the backstay straps and links are resting on the boom top and the pins (9, View B) are loose.
2. Remove the pins (9, View B) and luff up until the basic backstay straps (8) are clear of the links (10).
3. Place the pins (9, View B) to the side for storage later.
4. Slowly pay out the load line (1, View A) and luff up to raise the main strut (3).
5. Keep the load line slightly slack until the main strut nears vertical, then tighten the load line so the main strut travels smoothly over center.
6. As the main strut nears vertical, the backstay spreader (7, View A) and the basic backstay straps (8) will swing into the storage brackets on the main strut.
7. Once the main strut is past vertical, control of its angle switches from the luffing hoist reeving to the load line.
8. Continue to pay out the load line and haul in the luffing hoist until the main strut is near horizontal.

CAUTION

Do not allow the main strut to pivot below horizontal when it is pinned to the boom top. Damage can occur.



Item	Description
1	Shipping Strut (qty 2)
2	Pin with Safety Pins (qty 2)
3	Pin with Safety Pin (qty 2)
4	Jib Strut
5	Main Strut

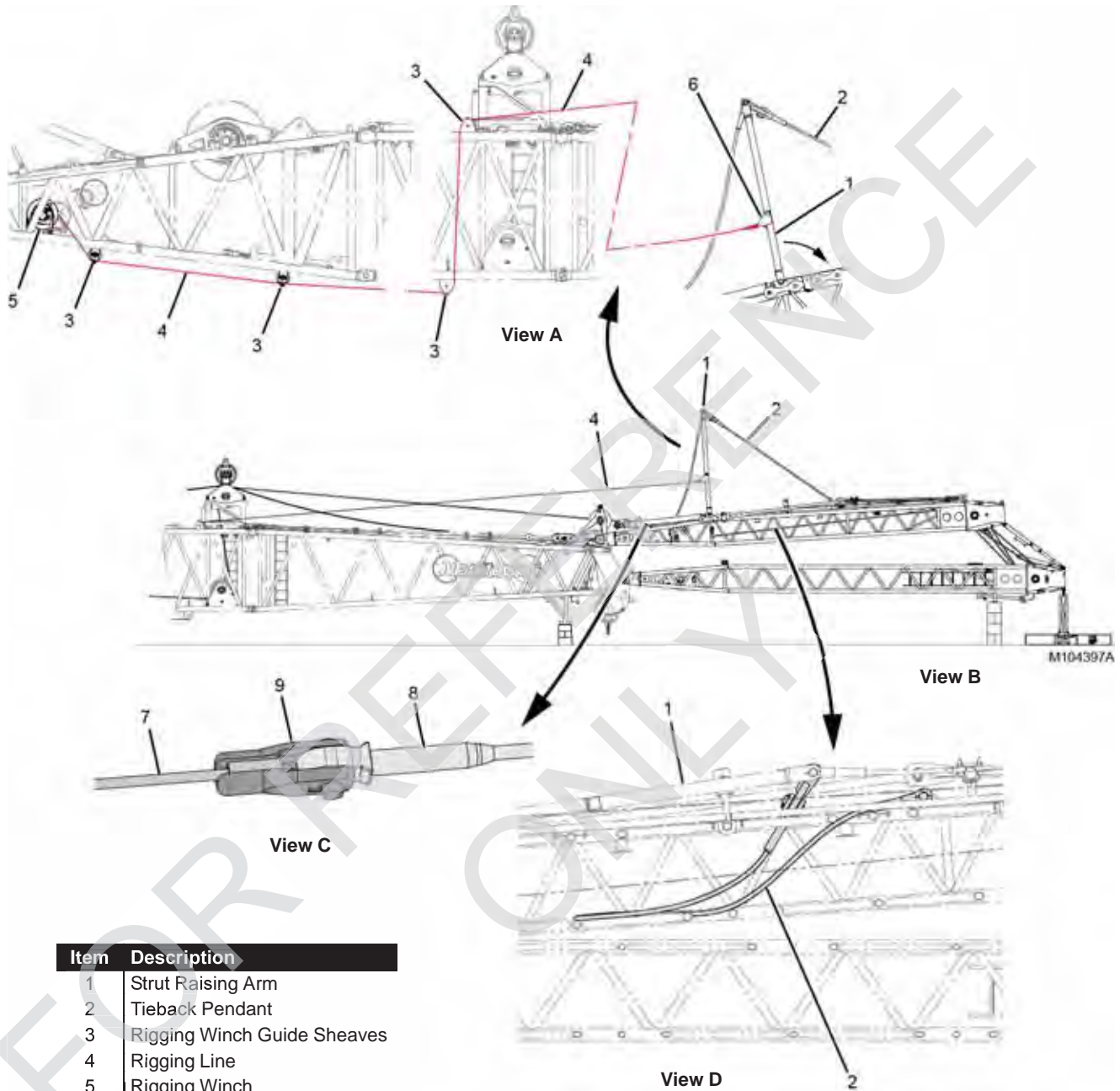
FIGURE 4-48

Deploy Shipping Struts

While still supporting the main strut with the load line, deploy the shipping struts.

See [Figure 4-48](#) for the following steps.

1. Using a choker hitch, attach a lifting sling from the assist crane to either shipping strut (1).
2. Hoist with the assist crane just enough to loosen the pin (2) in the storage hole and remove the pin.
3. Remove the pin (3) from the shipping strut (1).
4. Extend the shipping strut until the upper holes in the shipping strut are aligned with the holes in the main strut (5). Haul in/payout the load line as need to align the holes.
5. Install the pin (2).
6. Install the pin (3).
7. Disconnect the lifting sling.
8. Repeat the steps for the other shipping strut.



Item	Description
1	Strut Raising Arm
2	Tieback Pendant
3	Rigging Winch Guide Sheaves
4	Rigging Line
5	Rigging Winch
6	Lug
7	Load Line (Drum 1, 2, or 3)
8	Strut Raising Pendant
9	Button Socket

FIGURE 4-49

Lower Strut Raising Arm

See [Figure 4-49](#) for the following steps.

CAUTION

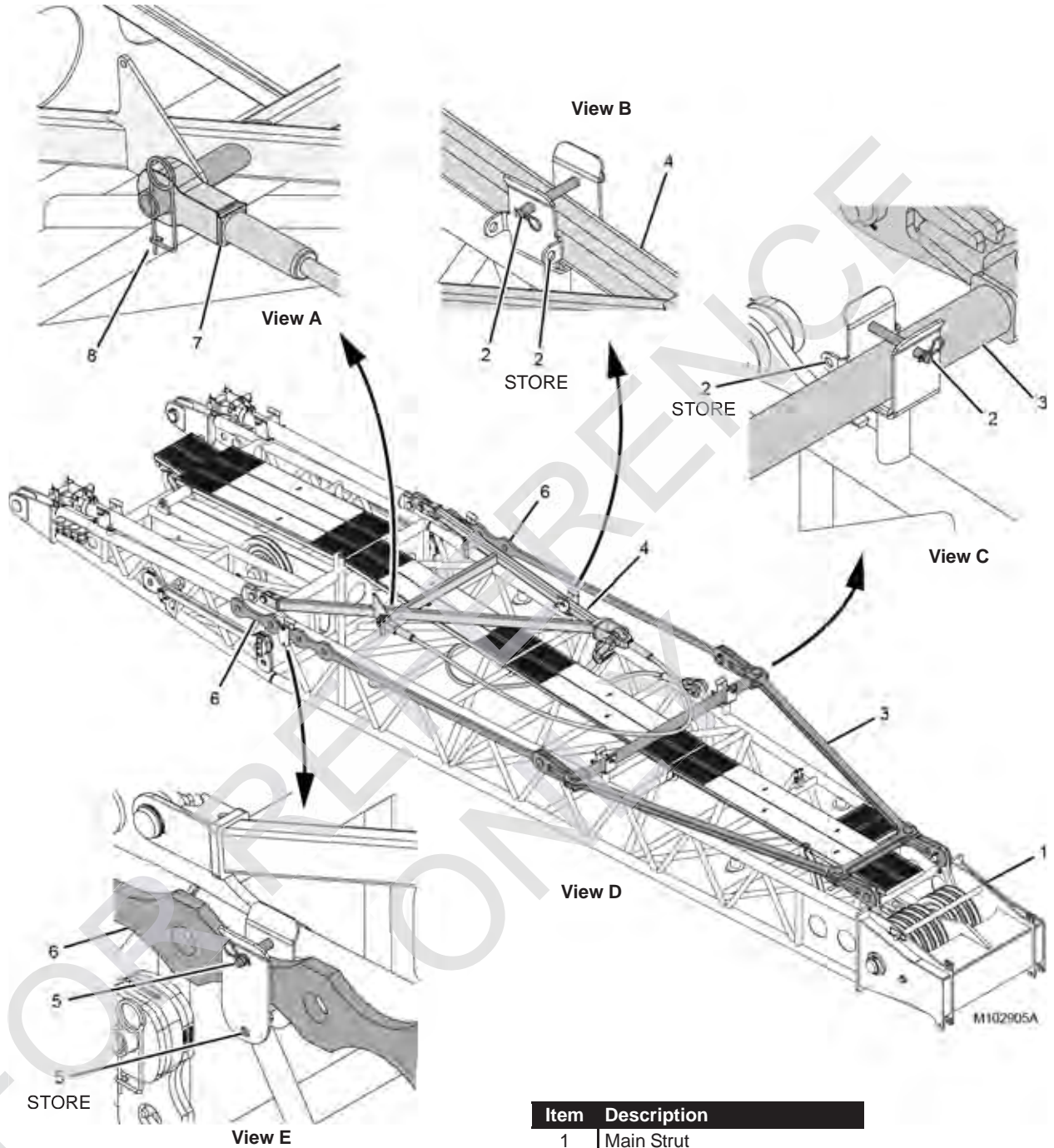
Do not attempt to lower the strut raising arm with the load line attached to the strut raising pendant.

The raising arm will flip down extremely fast with considerable force. Damage could occur.

Use the rigging line to lower the strut raising arm as instructed in the following steps.

See [Rigging Winch Operation, on page 4-98](#).

1. Rotate the rigging winch sheaves (3, View A) to the working position and pin them.
2. Route the rigging line (4, View A) from the rigging winch (5) around the guide sheaves (3).
3. Pin the rigging line (4, View A) to the lug (6) on the strut raising arm (1).
4. Haul in the rigging line until it is taut and supporting the strut raising arm (1, View B) so the tieback pendant (2) is taut.
5. Slacken the load line (7, View C) until the strut raising pendant (8) is slack and resting on the main strut.
6. Disconnect the load line (7, View C) from the strut raising pendant (8).
7. Slowly pay out the rigging line (4, View A) to lower the strut raising arm onto the main strut.
As the arm lowers, guide the tieback pendant (2, View D) into the main strut.
8. Unpin the rigging line from the strut raising arm.
9. Store the rigging line on the boom butt and store the rigging winch guide sheaves.



Item	Description
1	Main Strut
2	Pin with Hair-Pin Cotters (3)
3	Spreader
4	Strut Raising Arm
5	Pin with Hair-Pin Cotters (2)
6	Basic Backstay Strap
7	Strut Raising Pendant
8	Safety Pin

FIGURE 4-50

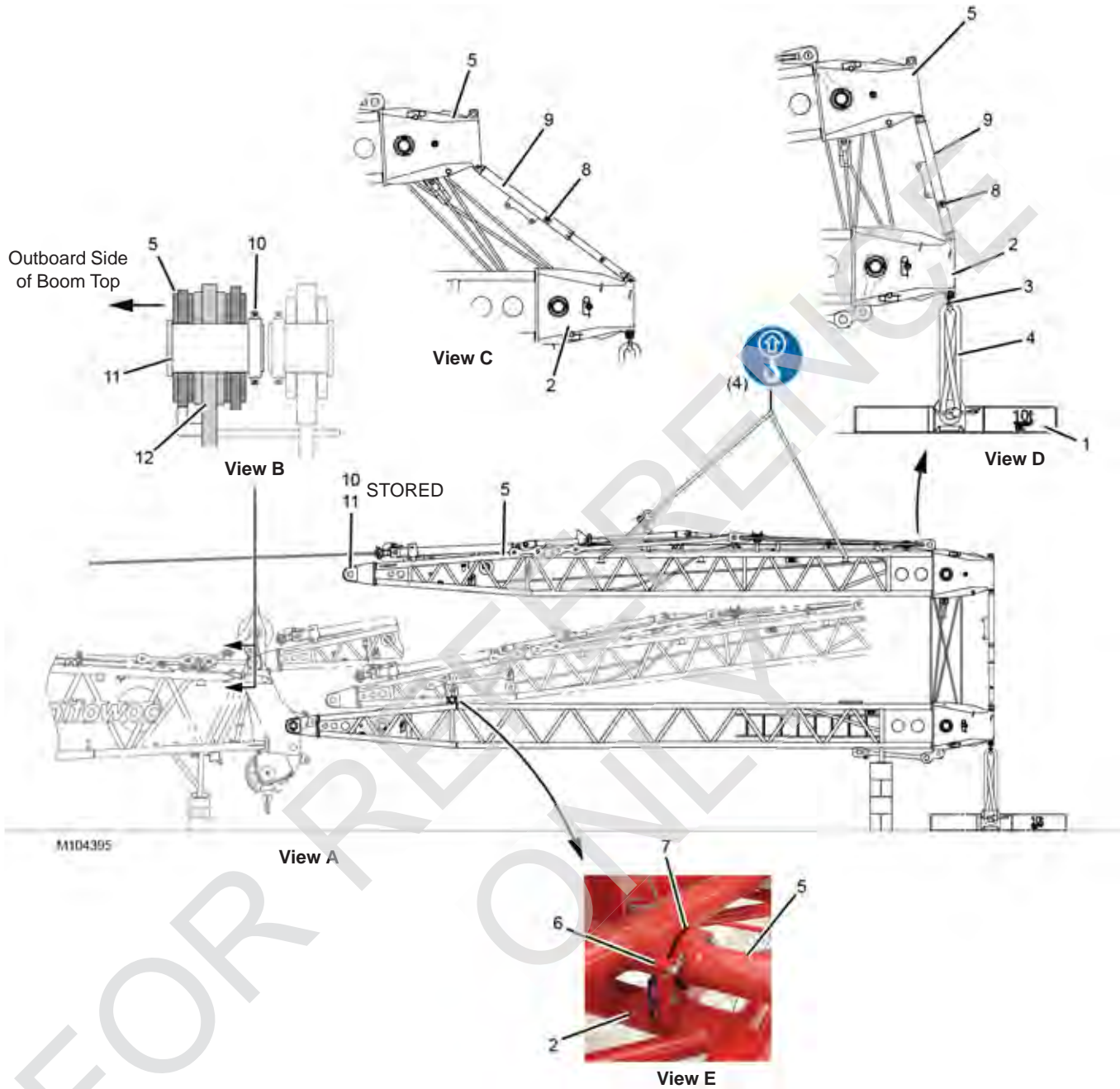
Prepare Main Strut for Removal

See [Figure 4-50](#) for the following steps.

Prepare the main strut (1, View D), as follows:

1. Pin the strut raising arm (4, View B) in the shipping position.
2. Pin the spreader (3, View C) in the shipping position.
3. Pin the basic backstay straps (6, View E) in the shipping position.
4. Pin the strut raising pendant (7, View A) in the shipping position.

FOR REFERENCE ONLY



Item	Description	Item	Description
1	10 t Counterweight Box	7	Shipping Link (qty 2)
2	Jib Strut	8	Pin with Safety Pin (qty 2)
3	Shackle: 20,5 t (23 USt) (2)	9	Shipping Strut (qty 2)
4	Lifting Sling (2 or 4): 2,8 m (9 ft) long	10	Collar with Retaining Pin and Cotter Pins (qty 4)
5	Main Strut	11	Main Strut Hinge Pin (qty 2)
6	Pin with Hair-Pin Cotter (qty 2)	12	Boom Top

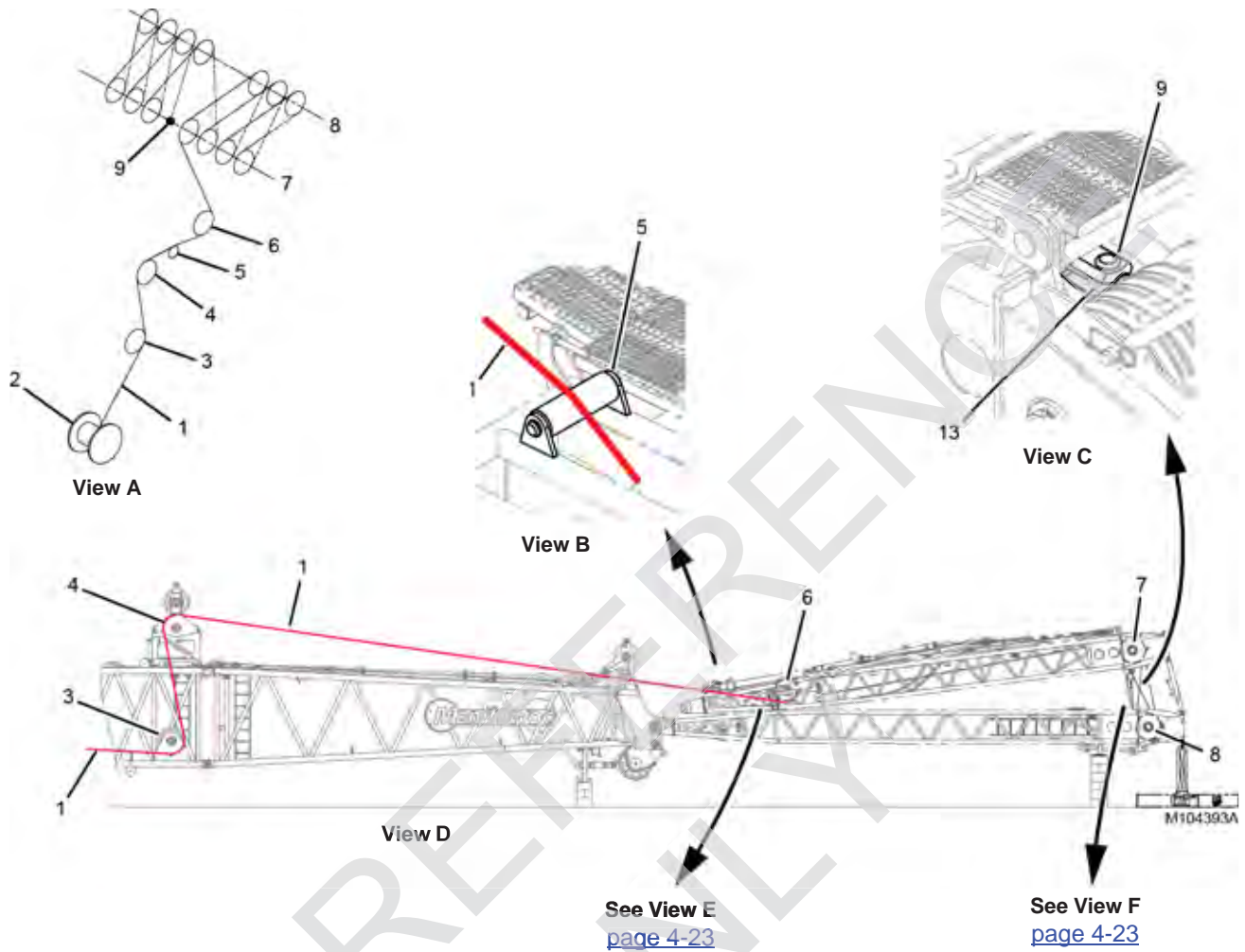
FIGURE 4-51

Store Main Strut on Jib Strut

1. Connect the lifting slings to the main strut (View A) as shown in [Figure 4-7 on page 4-11](#).

See [Figure 4-51](#) for the following steps.

2. Remove the pins (6, View E) and rotate the shipping links (7) forward to disconnect them from the shipping lugs on the jib strut (2).
3. Hoist with the assist crane just enough to support the main strut.
4. Remove the collars (10, View B) and the main strut hinge pins (11).
5. Once the strut is lifted clear of the boom top lugs, store the main strut hinge pins (11, View B) and the collars (10) in the main strut hinge holes.
6. With the main strut free of the boom top, pivot the main strut into position over the jib strut while hauling in the luffing hoist wire rope.
7. Remove pin (8, View C) from the extended holes in both shipping struts (9).
8. Lower the main strut until the shipping struts (9, View D) are fully retracted and the main strut is engaged with the shipping lugs on the jib strut (2, View E).
9. Install the pin (8, View D) in both shipping struts (9).
10. Rotate the shipping links (7, View E) rearward and pin them to the shipping lugs with the pins (6).



Item	Description
1	Luffing Hoist Wire Rope
2	Luffing Hoist (Drum 6)
3	Lower Guide Sheave
4	Upper Guide Sheave
5	Roller (Main Strut)
6	Guide Sheave (Main Strut)
7	Guide Sheaves (Jib Strut)
8	Guide Sheaves (Main Strut)
9	Dead-End Socket (Button Type)
10	Sucker Line
11	Shackle (2)
12	Pin
13	Dead-End Link

FIGURE 4-52

Reeve Sucker Line in Place of Luffing Hoist Wire Rope

See [Figure 4-52](#) for the following steps.

1. Remove the sucker line (10), the two shackles (11), and the pin (12) from the parts box. Uncoil the sucker line and make sure it is not kinked or otherwise damaged.
2. Unpin the button socket (9, View C) from the dead-end link (13) in the main strut.
3. Remove the button socket from the end of the luffing hoist wire rope and store the button socket and pin in the parts box.
4. Using the shackle (11, View F), connect the sucker line (10) to the pad eye on the end of the luffing hoist wire rope (1).
5. SLOWLY haul in the luffing hoist wire rope (1) until the button on the end of the luffing hoist wire rope is at the shipping lug in the main strut (View E).

Use extreme care not to damage lacings while pulling the luffing hoist wire rope through the main strut.

6. Connect the end of the sucker line (10, View F) to the dead-end link (13) with the shackle (11) and the pin (12).
7. Disconnect the shackle (11, View E) from the button on the end of the luffing hoist wire rope (1).
8. Connect the sucker line (10, View E) to the shipping lug in the main strut with the shackle (11).

Store Luffing Hoist Wire Rope

Haul in the luffing hoist wire rope to store it on Drum 6.

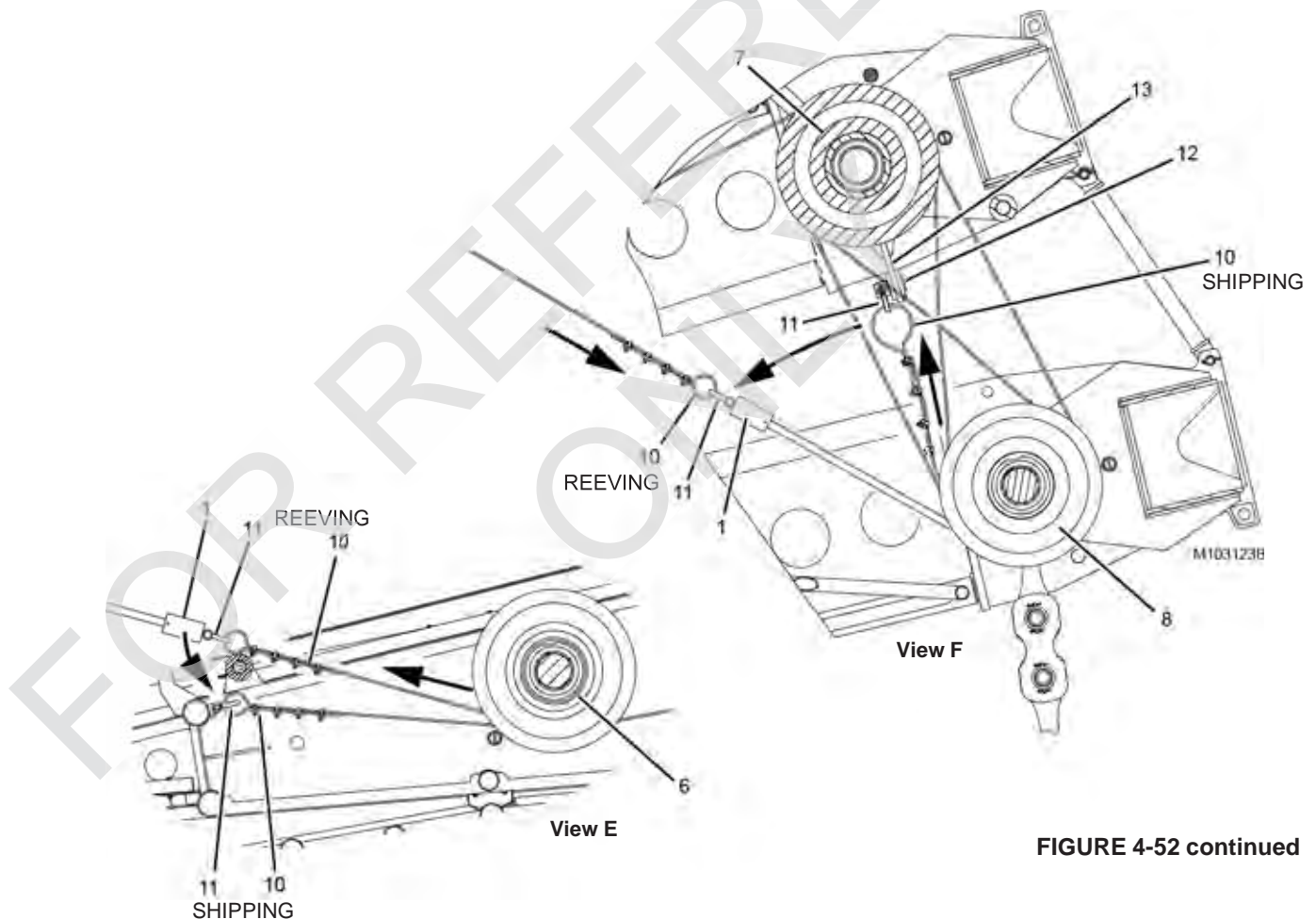


FIGURE 4-52 continued

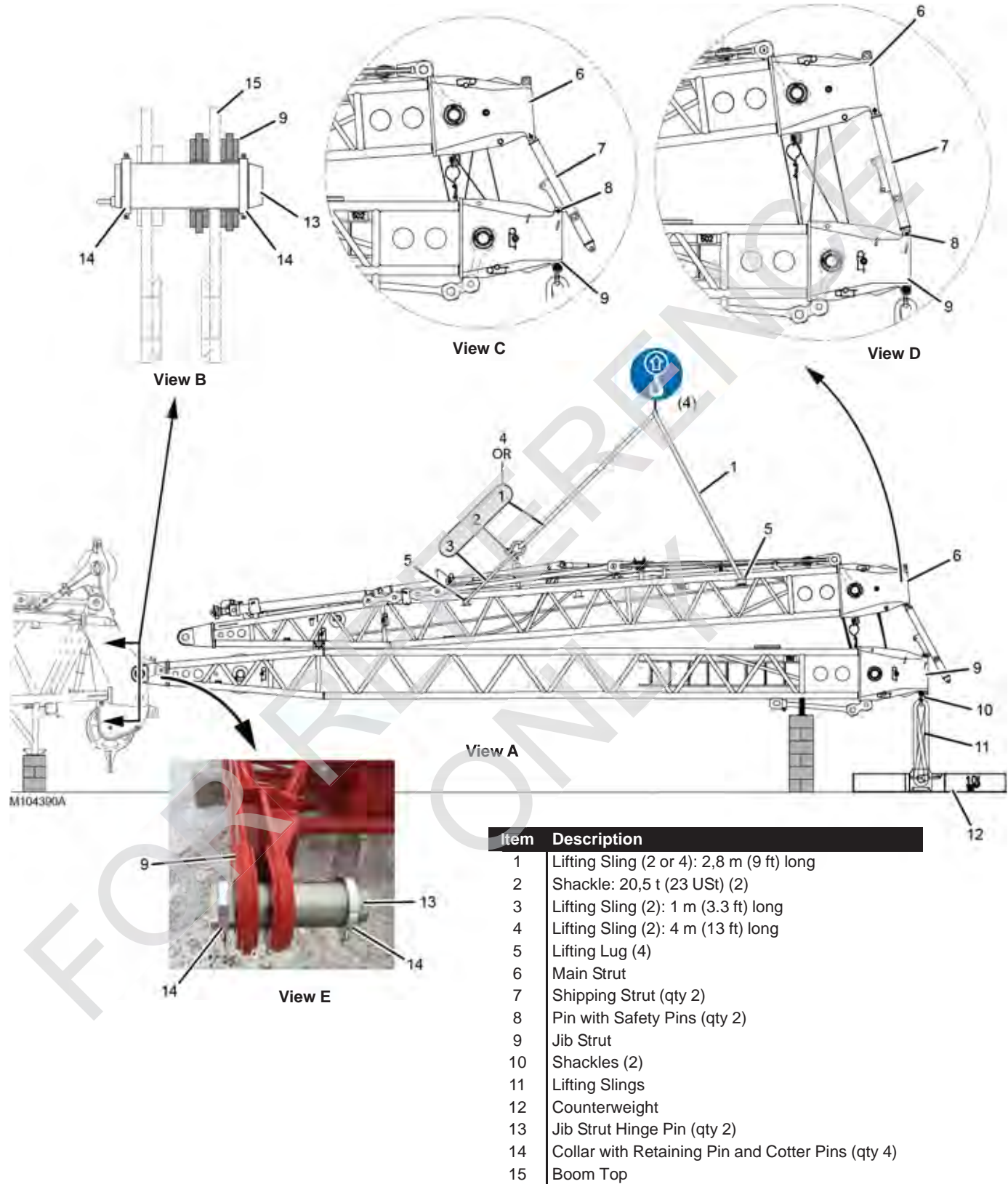


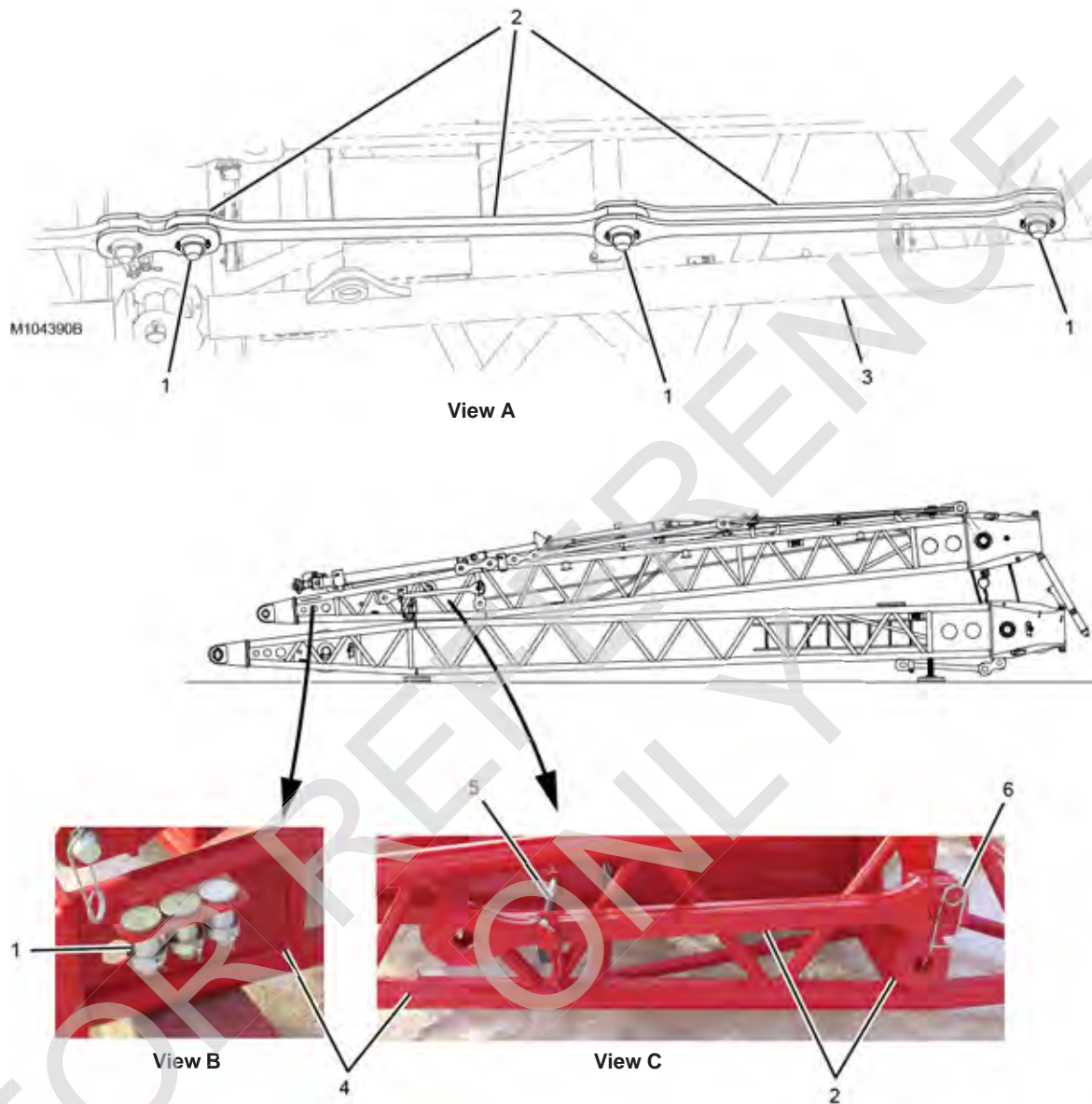
FIGURE 4-53

Remove Struts

The struts are shipped as an assembled unit as shown in [Figure 4-7 on page 4-11](#).

See [Figure 4-53](#) for the following steps.

1. Attach the Manitowoc supplied slings and shackles to the lifting lugs (5, View A) on the main strut (6). See [Figure 4-7 on page 4-11](#) for a larger view.
 - PAST production: use items 1, 2, and 3 for rear legs.
 - CURRENT production: use item 4 for rear legs.
2. For shipping on a drop-deck trailer, the shipping struts (7, View D) can be kept in the position shown in View D.
For shipping on a flatbed trailer, lower the jib strut as follows:
 - a. Hoist with the assist crane just enough to loosen the pins (8, View D).
 - b. Remove the pins (8).
 - c. Lower the main strut (6, View C) with the assist crane and pin the shipping struts (7) to the jib strut (9) with the pins (8).
3. Remove the shackles (10, View A) and the lifting slings (11) from between the jib strut (9) and the counterweight (12).
4. Store the shackles and the lifting slings.
5. Hoist with the assist crane to support the struts.
6. Remove the jib strut hinge pins (13, View B).
7. Lift the struts clear of the boom top and place them on blocking at ground level.
8. Store the jib strut hinge pins (13, View E) and the collars (14) in the jib strut hinge pin holes.
9. Store the backstay straps, links, and pins as instructed on [page 89](#).
10. Lift the struts onto a trailer for shipping or store them on the job site.
11. Disconnect the lifting slings.
12. Using the assist crane, remove the counterweight (12, View A) and install the counterweight on the crane.
13. Remove and store the blocking.



Item	Description
1	Strap/Link Pins and Collars (6)
2	Backstay Straps and Links
3	Boom Top
4	Main Strut
5	Storage Pin with Hair-Pin Cotters (2)
6	Safety Pin (2)

FIGURE 4-54

Store Backstay Straps, Links, and Pins

1. Using lifting slings from the assist crane, remove the pins (1, View A) and the straps and links (2) from the boom top (3).
2. Store the pins (1, View B) on both sides of the main strut (4).
3. Store the backstay straps and links (2, View C) on both sides of the main strut (4) and secure them with the storage pins (5) and the safety pins (6).

Complete Luffing Jib Removal

Luffing jib removal is now complete.

Make sure of the following:

- All loads are secured to trailers if the luffing jib is being shipped to another job site. See [Shipping Crane Components, on page 4-61](#).
- All components are protected against the elements if the luffing jib is being stored on the job site.
- All loose parts are stored in the parts box supplied with the luffing jib.

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FOR REFERENCE ONLY

WIRE ROPE INSTALLATION

NOTE: The wire rope manufacturer's recommendations takes precedence over the following information.

Wire Rope Specifications

See the Wire Rope Specifications Chart in the Capacity Chart Manual for the correct type, size, and amount of wire rope to be installed on the crane.

The Wire Rope Specifications Chart contains the following information:

- Parts of line required for various loads
- Wire rope lengths and notes about hoisting distance for various parts of line
- Maximum spooling capacity of load drums

Wire Rope Storage

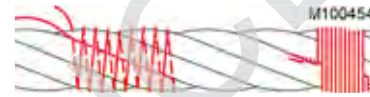
Store the wire rope in coils or on reels off the ground or floor in a clean, dry, indoor location. If outdoor storage is necessary, the wire rope must be covered with a protective wrapper.

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 the periodic inspection given the Service Manual at least monthly.

Wire Rope Type	Seizings Required
Preformed	1
Non-preformed	3

Place the free end of the seizing wire in the valley between two stands. Then wind the seizing wire over the free end as shown. Finally, twist and pull the two ends of seizing wire together until the seizing is tight.



View A—Rope Diameter 1 in (26 mm) and Larger

Wind the seizing wire around the wire rope as shown. Then twist the two ends of seizing wire together at the center of the seizing. Alternately twist and pull the ends until the seizing is tight.



View B—Rope Diameter Smaller than 1 in (26 mm)

FIGURE 4-55

Seizing and Cutting Wire Rope

Apply tight seizings of annealed wire to the ends of all wire rope. If not done, the rope wires and strands may slacken. This will result in overloading of some strands and underloading of others. Bird-caging and breakage of the wire rope can occur.

Before cutting the wire rope, apply seizings on both sides of the point where the cut will be made. Then cut the wire rope with a torch, rope cutter, or abrasive cut-off wheel.

See [Figure 4-55](#) for:

- The number of seizings to be applied to the ends of the wire rope and to both sides of the point where a cut will be made.
- The proper application method. Each seizing should be one rope diameter long.

Item	Description
1	Wire Rope
2	Pocket in Drum Barrel
3	Straight Wedge
4	Seizing

Don't Allow End of Wire Rope to Extend Out of Socket Opening

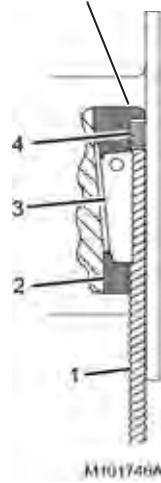
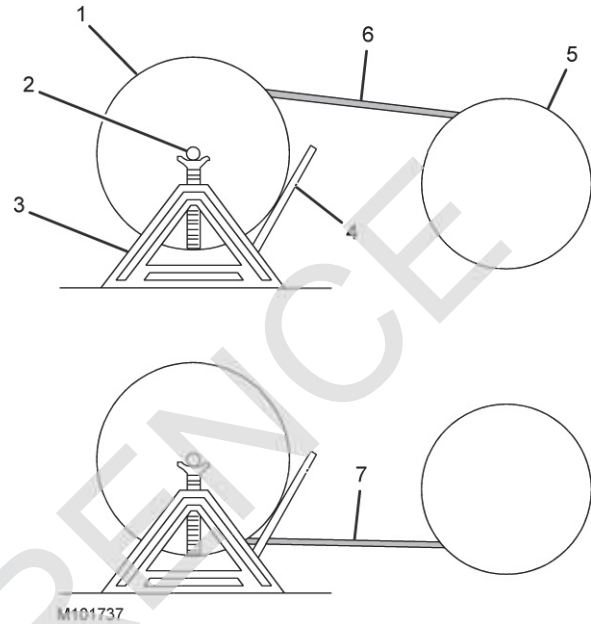


FIGURE 4-56



Item	Description	Item	Description
1	Shipping Reel	5	Drum
2	Shaft	6	Top to Top Winding
3	Jack Stand	7	Bottom to Bottom Winding
4	Brake		

FIGURE 4-57

Anchoring Wire Rope to Drum

See [Figure 4-56](#) for the following procedure.

Use the correct wedge part number for the size of wire rope being used; see parts drawing for the boom hoist drums or for the load drum shaft to obtain the correct part number.

1. Assemble the wire rope and the wedge to the drum socket.
2. Tighten the wedge by rapping the back of the wedge with a brass drift pin and hammer.

Winding Wire Rope onto Drum



WARNING!

Falling Load Hazard!

The wire rope can be pulled out of the drum if the following steps are not taken.

- Install the straight wedge so the corrugated side is against the wire rope.
- Install the wedge so the end of the wire rope extends past the end of wedge, but not out of the drum socket.
- Make sure the seizing is not under the wedge. Remove the seizing if it interferes with assembly.

CAUTION

Avoid Wire Rope Damage

The shipping reel must rotate when the wire rope is unwound.

Attempting to remove the wire rope from a stationary reel can result in a kinked wire rope, and the wire rope will be ruined.

1. Remove the wire rope from the shipping reel:
 - a. Mount the wire rope shipping reel (1, [Figure 4-57](#)) on a shaft (2) supported at both ends by jacks (3) or blocks.
 - b. Provide a brake at the shipping reel so that the wire rope can be wound tightly on the drum.
 - c. Avoid a reverse bend when winding the wire rope onto the drum: wind from the top of the reel to the top of drum (upper view) or from the bottom of the reel to the bottom of the drum (lower view).

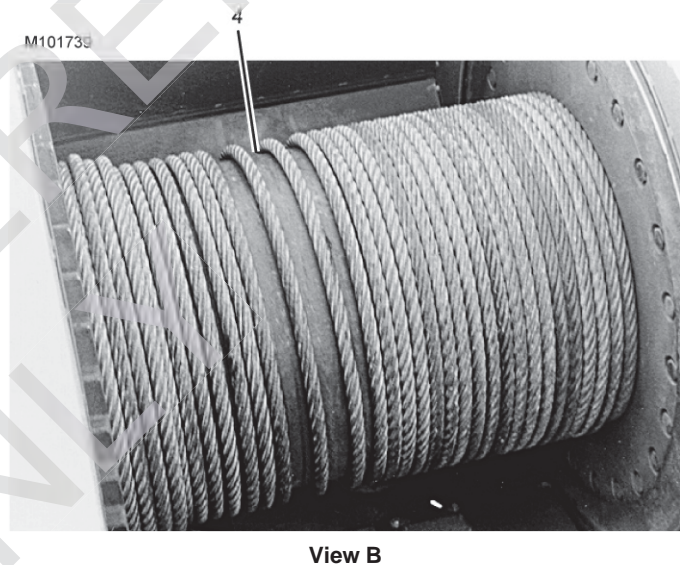
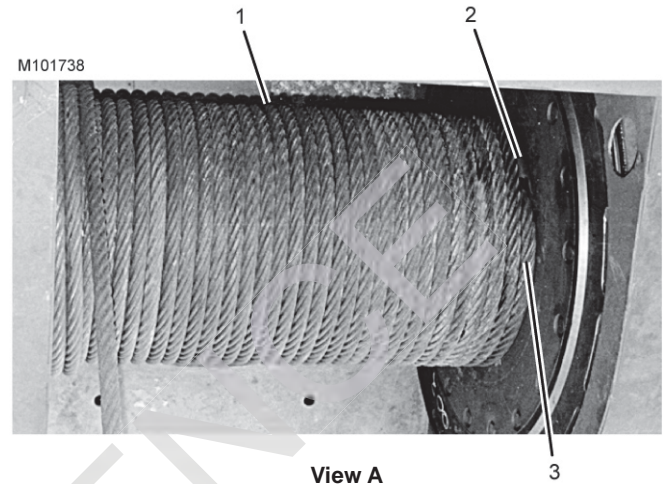
- d. Avoid dragging the wire rope in the dirt or around objects that can scrape, nick, cut, or crush the wire rope.
2. Carefully inspect the drums and all rope guides, rollers, and sheaves for defects that can cause the wire rope to wear or be cut. If defects cannot be fixed, replace the faulty parts.
 3. Apply tension to the wire rope as it is wound slowly onto the drum.
 - a. The first wrap of wire rope must be tight against the drum flange for approximately three-fourths of the drum diameter (View A, [Figure 4-58](#)).
 - b. Tap the adjacent wraps against each other with a soft metal or wooden mallet as wire rope is spooled onto the drum.
 - c. Use extreme care not to put twists or turns in the wire rope. Allow the rope to assume its natural lay.

CAUTION

Avoid Wire Rope Damage

Voids or spaced wraps (View B, [Figure 4-58](#)) in the first layer will permit movement and a wedging action with the subsequent layers. Crushing and abrasion of the wire rope will occur.

Never allow the wire rope to "cross-wind" on the drum.



Item	Description
1	Wraps of first layer tight against drum flanges and each other
2	Wedge
3	Tight against drum flange for 3/4 of diameter
4	Voids and loose wraps in first layer will cause sever wear of wire rope

FIGURE 4-58

Item	Description
1	Seizing
2	Dead End
3	Live End in Straight Line with Socket
4	Socket
5	Wedge
6	Rope Clip
7	Short Piece of Wire Rope
8	Terminator Wedge
9	Shipping holes: Do not reinstall any shipping material (bolt, plastic strap, or wire) in shippings holes of wedge or socket after assembling.

T (Rope Clip Nut Torque)

inch (mm)	Wire Rope/Clip Size			
	7/8 (22,23)	1 (25,4)	1-1/8 (28,58)	1-1/4 (31,75)
Torque				
* ft/lb (kN/m)	225 (0,30)	225 (0,30)	225 (0,30)	360 (0,49)

* Tightening torque values shown are based on threads being clean, dry and free of lubrication.

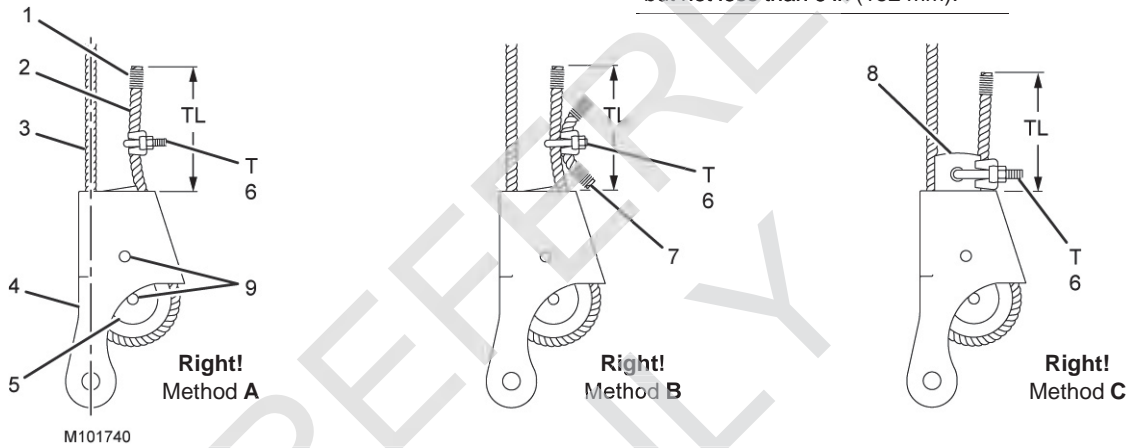
TL (Tail Length)

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!

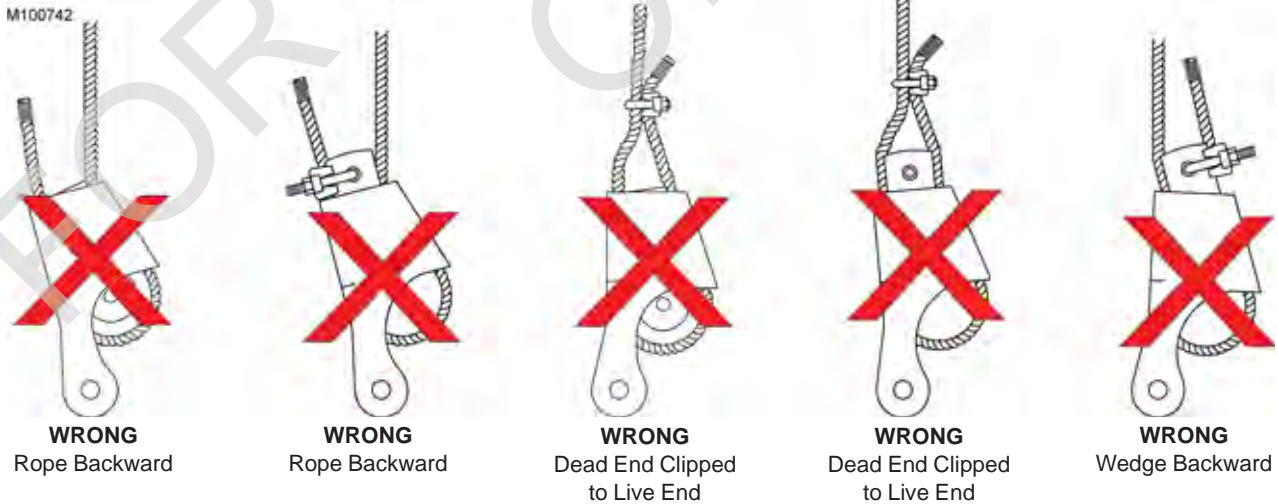


FIGURE 4-59

Anchoring Wire Rope to Wedge Socket



WARNING

Falling Load Hazard!

- 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 the shipping holes (9) of the wedge or the socket after assembling them. Discard these materials because they can prevent the wedge from tightening in the socket.
- Only use a wedge and socket which are the correct size for the wire rope being used. Do not mix and match parts from one assembly with parts from another assembly.
- The Terminator™ socket and wedge has “go” and “no go” holes to check for proper rope size.
- Attach the wire rope clip to the dead end of the wire rope after assembling the wire rope to the wedge and socket.

See [Figure 4-59](#) for the following procedure.

1. Assemble the wire rope and the wedge to the socket so the live end of the 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 the 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.
5. Use a brass hammer to seat the wedge and wire rope as deep into the socket as possible.
6. 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 the 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 use with a Terminator wedge socket.

7. After the socket is pinned in place, hoist the load slowly so the wedge seats tightly. Do not shock load the socket and wedge.

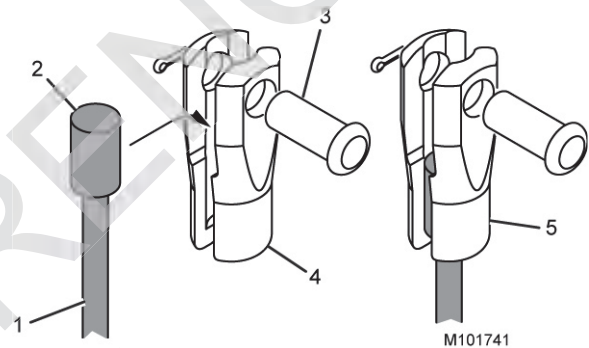


WARNING

Falling Load Hazard!

The wire rope can break if the following precaution is not observed:

- Do not attach the dead end of wire rope to the live end of wire rope with a wire rope clip. The wire rope clip will transfer the load from the live side of the wire rope to the dead end, **seriously weakening** the attachment.



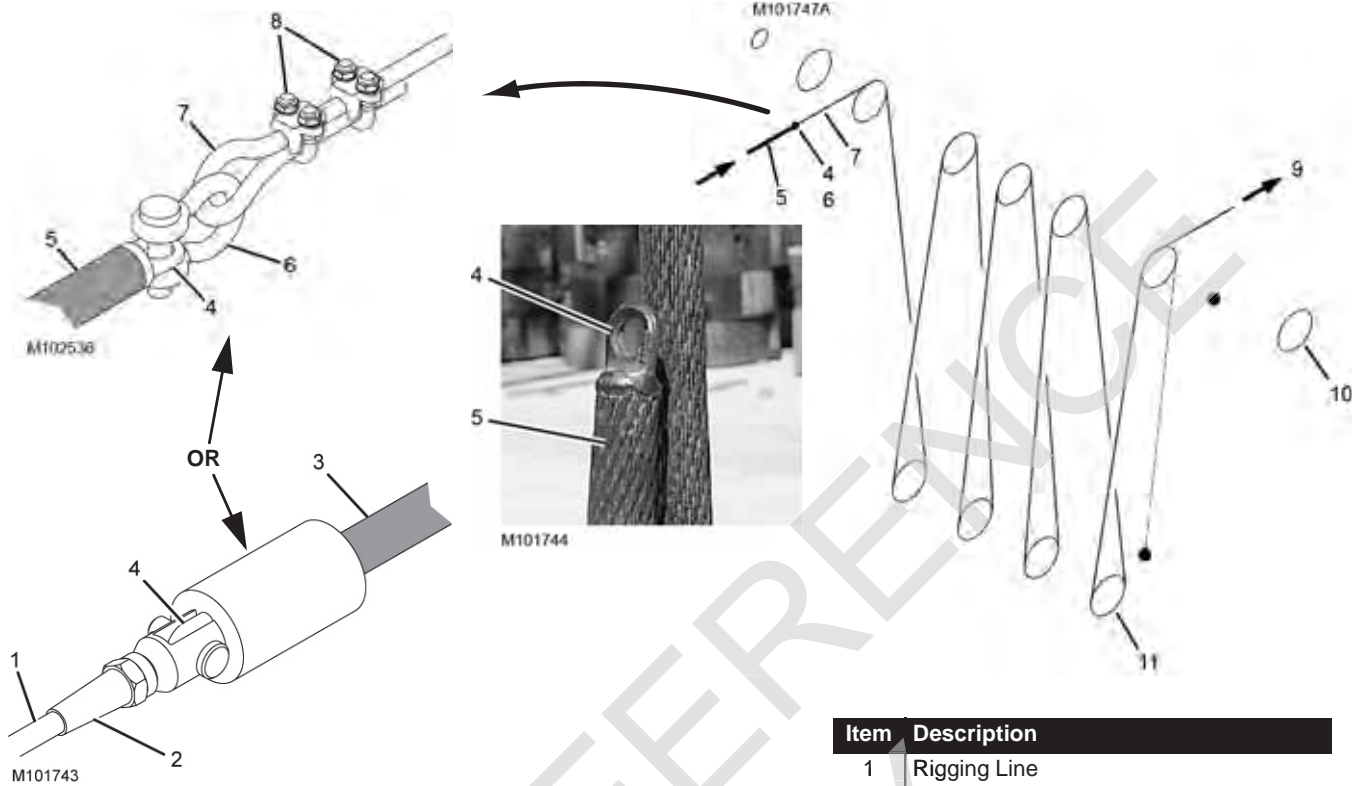
Item	Description
1	Load Line
2	Button
3	Pin
4	Button Socket
5	Locking Screw (behind if equipped)

FIGURE 4-60

Anchoring Wire Rope to Button Socket

See [Figure 4-60](#)

1. Remove the pin (3) from the socket (4).
2. Install the button (2) end of the load line (1) in the socket (4).
3. Pin the socket to the anchor point.
4. Securely tighten the locking screw (5).



Item	Description
1	Rigging Line
2	Connector
3	Wire Rope with Button
4	Pad Eye
5	Wire Rope without Button
6	Shackle
7	Rigging Line
8	Rope Clips
9	Pull Rigging Line with Winch or Forklift
10	Boom Point Sheaves
11	Load Block Sheaves EXAMPLE

No. 1.5 Pad Eye			
Approximate Capacity 1,220 lb (553 kg)			
Item	Inch	mm	
A	5/8	16,00	
B	1/4	6,35	
C	1	25,40	
D	7/16	11,18	
E	1-1/8	28,70	
F	1/16	4,06	
G	1-5/16	33,27	

No. 1 Pad Eye			
Approximate Capacity 1,220 lb (553 kg)			
Item	Inch	mm	
A	3/8	9,65	
B	1/4	6,35	
C	7/8	22,40	
D	13/32	10,40	
E	7/8	22,40	
F	1/8	3,30	
G	1-1/32	25,40	

No. 2 Pad Eye			
Approximate Capacity 2,600 lb (1 179 kg)			
Item	Inch	mm	
A	3/4	19,05	
B	3/8	9,65	
C	1-1/16	26,92	
D	1/2	12,70	
E	1-1/2	38,10	
F	3/16	4,83	
G	1-5/8	41,26	

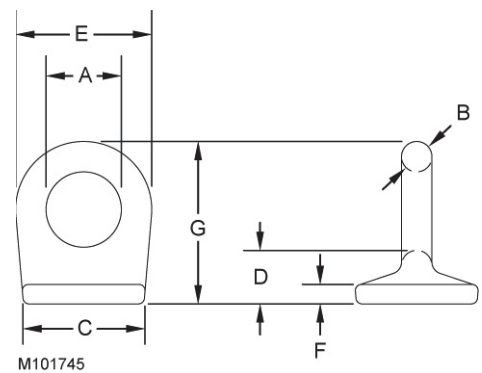


FIGURE 4-61

Pad Eye Usage for Wire Rope Reeving



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.

See [Figure 4-61](#) for the following procedure.

Some rotation-resistant wire rope supplied by Manitowoc is equipped with a pad eye welded to the leading end of the wire rope or to the button on the end of the wire rope.

A rigging line can be attached to the pad eye to make it easier to reeve the load block.

1. Do not exceed the approximate capacities listed in [Figure 4-61](#).
2. Make sure the rigging line and the attaching hardware (clips and rope connectors) are rated for the approximate capacities shown in [Figure 4-61](#).
3. Inspect the pad eye prior to each use. **Replace it if:**
 - Any original dimensions have changed
 - Cracks or breaks exist in the metal or the weld

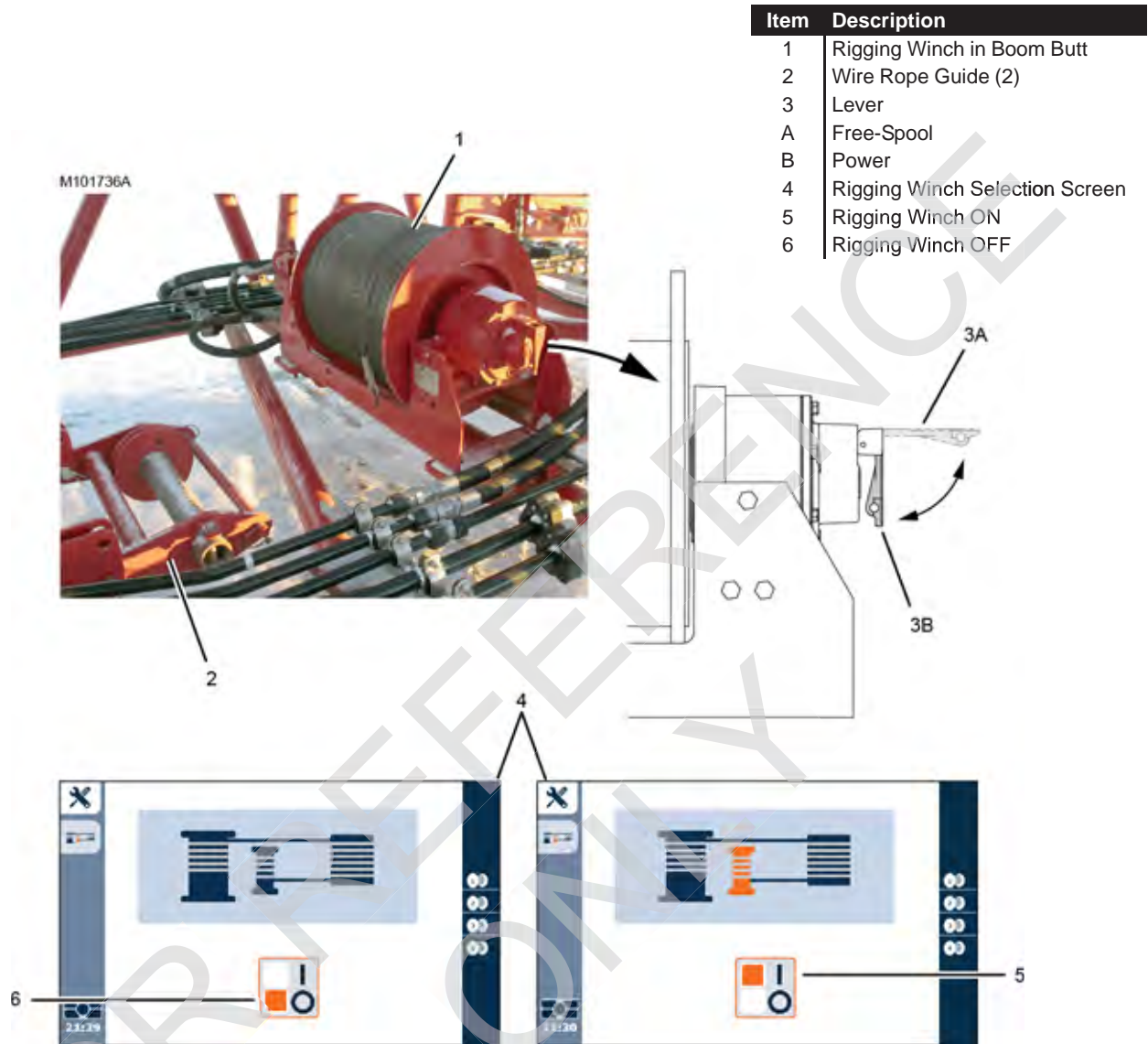
Breaking in Wire Rope

After installing a new wire rope, **break it in** by operating it several times under light load at reduced speed. This practice allows the wire rope to form its natural lay and the strands to seat properly.

NOTE: The 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.



Item	Description
1	Rigging Winch in Boom Butt
2	Wire Rope Guide (2)
3	Lever
A	Free-Spool
B	Power
4	Rigging Winch Selection Screen
5	Rigging Winch ON
6	Rigging Winch OFF

FIGURE 4-62

RIGGING WINCH OPERATION

If your crane is equipped with the optional rigging winch (Drum 0), see the Rigging Winch Assembly drawing at the end of this section for wire rope routing and anchoring.

See [Figure 4-62](#) for the following procedures.

Selecting Rigging Winch Mode

TO TURN RIGGING WINCH ON —

1. Scroll to the rigging winch selection screen (4) in the main display. See MLC300 Main Display Operation Manual for instructions.

2. Use either the jog dial on the right console or the scroll keys on the main display to highlight the ON (I) icon (5) in the selection box.
3. Press the select button on the jog dial or on the main display to select the highlighted mode. The screen will change to indicate the rigging winch is ON (I).

TO TURN RIGGING WINCH OFF —

1. Scroll to the rigging winch selection screen (4) in the main display. See MLC300 Main Display Operation Manual for instructions.

2. Use either the jog dial on the right console or the scroll keys on the main display to highlight the OFF (O) icon (6) in the selection box.
3. Press the select button on the jog dial or on the main display to select the highlighted mode. The screen will change to indicate the rigging winch is OFF (O).

Operating Rigging Winch

Free-Spool Operation

The winch has a free-spool clutch which allows the drum barrel to be disengaged from the drive mechanism. This position allows the drum to be turned by hand.

TO TURN FREE-SPOOL OFF —

1. Make sure the rigging winch is at rest with no load on the rigging line.
2. Rotate the lever (3) UP to the free-spool position (A).

TO TURN FREE-SPOOL ON—

1. Make sure the rigging winch is at rest with no load on the rigging line.
2. Rotate the lever (3) DOWN to the power position (B)

Power Operation

1. Turn free-spool off to provide power operation.
2. Turn on the rigging winch mode.
3. To ensure the winch gears are properly engaged, proceed as follows:
 - a. Push the Drum 0 control handle forward to slowly rotate the winch drum 90° in the pay out direction.
 - b. Pull the Drum 0 control handle back to slowly rotate the winch drum 90° in the haul in direction.
4. Pay out the rigging line by moving the Drum 0 control handle forward.
5. Reeve the rigging line through the load block and the boom point and connect it to the desired load line as shown in the Rigging Winch Assembly drawing at end of this section.
6. Move the Drum 0 control handle to off and push the corresponding load drum control handle forward to pay out the load line. The rigging winch will haul in the rigging line automatically.

NOTE: Use the engine throttle to increase and decrease rigging winch line pull and to control line slack at the rigging winch.

The stall line pull of the rigging winch is regulated with a proportional relief valve controlled by the crane's programmable controller.

CAUTION!

Avoid Rigging Winch or Wire Rope Damage!

The rigging winch will not automatically pay out line if the selected load drum control handle is pulled back to the hoist position.

Structural damage to the winch and rigging line will occur!

If it is necessary to haul in the load line on the load drum when the load line is connected to the rigging line, proceed as follows:

- Pay out the rigging line with the Drum 0 control handle while hauling in the load line with the load drum control handle.



WARNING Flying Object Hazard!

Do not attempt to disconnect the rigging line from the load line until the lines are slack.

The lines could fly apart with explosive force and strike personnel.

7. Once the load line is reeved through the load block and the boom point:
 - a. Move the load drum control handle to off.
 - b. Pay out the rigging line to slacken the load line by pushing the Drum 0 handle forward.
 - c. Disconnect the rigging line from the load line.
 - d. Haul in the rigging line for storage on the rigging winch by pulling the Drum 0 control handle back.
 - e. Secure the end of rigging line to the boom butt for storage.
 - f. Turn OFF the rigging winch mode.
 - g. Connect the load line to dead-end socket. See instructions in this section.

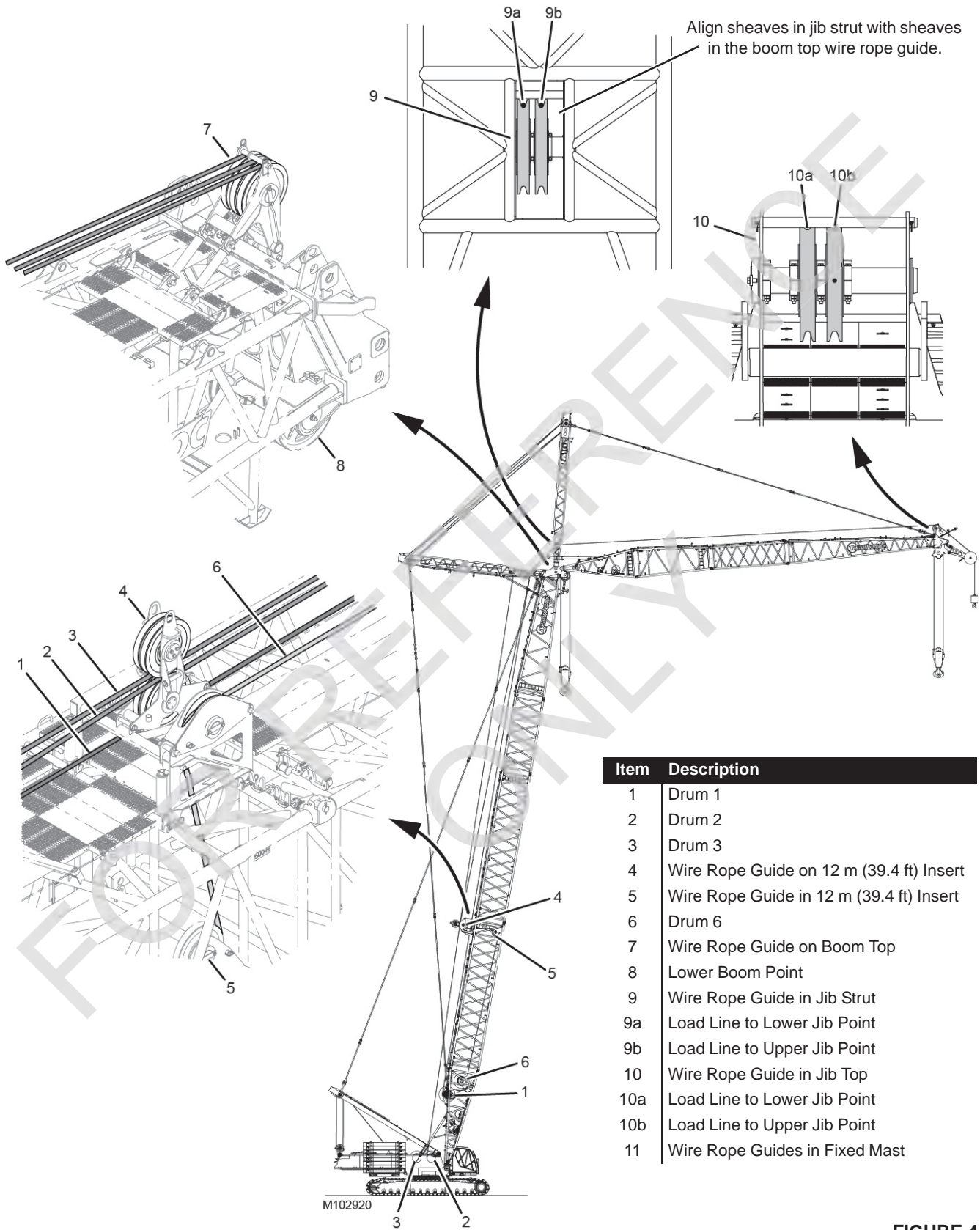


FIGURE 4-63

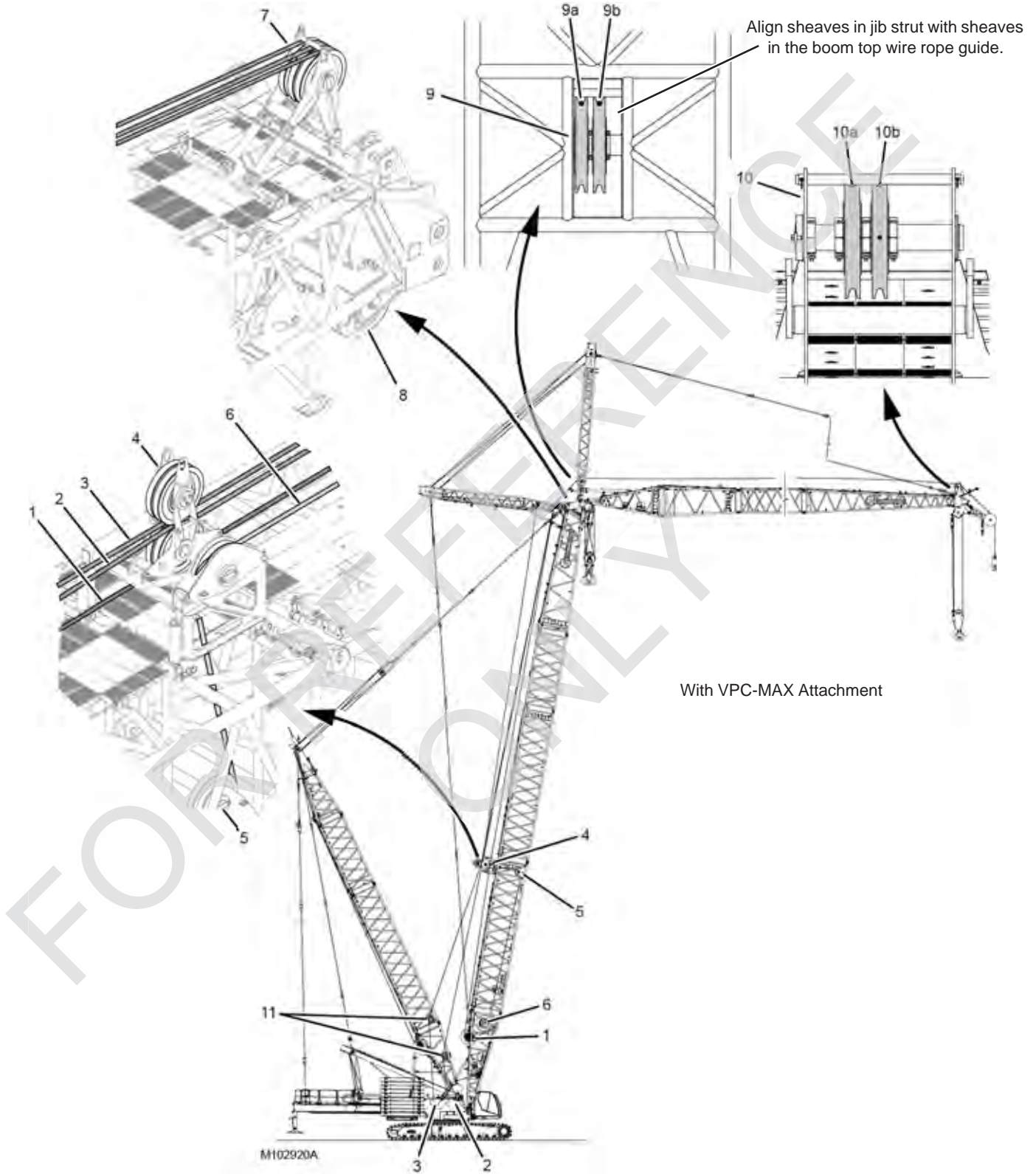


FIGURE 4-63 continued

LOAD LINE REEVING



WARNING

Falling Load Hazard!

Use only a load block or hook and weight ball with a capacity equal to or greater than load to be handled.

The load block can fail if overloaded, allowing the load to fall.

Guide Sheaves and Drums

See [Figure 4-63 on page 4-100](#) and [page 4-101](#) for identification of the load drums and the guide sheaves.

Refer to the Reeving Diagrams at the end of this section for rope routing over the boom top wire rope guide (7).

The wire rope guide sheaves (9 and 10) in the jib top must be positioned as shown.

If equipped with a VPC-MAX attachment, the load lines from Drums 2 and 3 must be routed through the guide sheaves (11) in the fixed mast.

Once the wire rope is routed through the guide sheaves, install all the rope guard pins, bars, and rollers to retain the wire rope on the sheaves. **Wire rope and sheaves can be damaged if the rope is not properly retained on sheaves.**

Dead End Locations

See [Figure 4-65 on page 4-103](#) and for the dead end locations and required hardware. All hardware is stored in the job boxes provided with the crane.

Load Block Identification

See the Boom Assembly Drawing at the end of this section for a complete list of load blocks and hook and weight balls available for use with this crane.

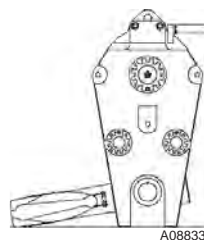


WARNING

Avoid Death or Serious Injury!

Exercise care when the block is standing in the vertical position, as the potential for tipping exists. Potential causes of tipping are unstable work area, boom movement and the reeving process.

If work area is unstable, lay the block flat on side plate.



Duplex Hook

Attach the load so it is balanced equally on the hook. The lifting slings must be within the angles given in [Figure 4-64](#) to achieve maximum hook capacity. The duplex hook has a hole to which an optional shackle can be attached as shown in [Figure 4-64](#).



WARNING

Falling Load Hazard!

Limit load to be handled with shackle to capacity of load block or shackle, whichever is less.

Load block or shackle can fail if overloaded, allowing load to fall.

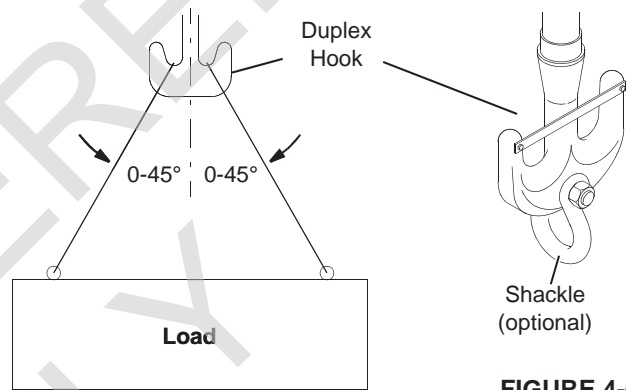


FIGURE 4-64

Wire Rope Specifications

Refer to the Wire Rope Specifications chart in the Capacity Chart Manual for:

- Parts of the line required to handle desired load
- Wire rope length required for various boom lengths and parts of line
- Maximum spooling capacity of load drums

Load Block Reeving

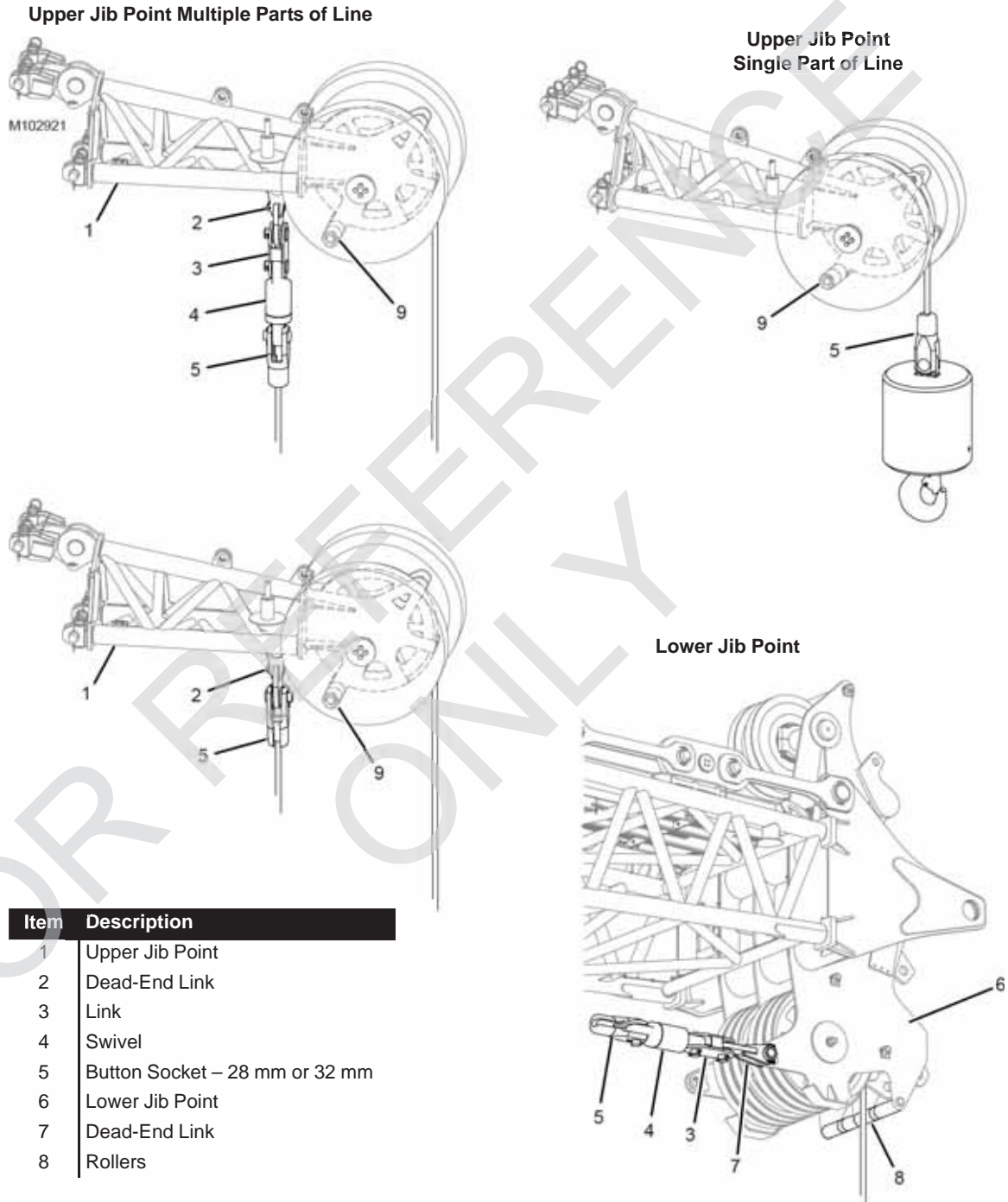
For reeving of the lower jib point, see the Reeving Diagrams at the end of this section.

Reeving in any manner other than shown can result in excessive block twist.

CAUTION

Wire Rope Damage!

Do not hoist the load block closer to the jib point than shown in the reeving diagrams. Improper fleet angle or contact with other parts can damage the wire rope.



4

FIGURE 4-65

LOAD BLOCK TIEBACK

General

Tieback hole (1, [Figure 4-66](#)) is provided on the front of the rotating bed for tying back the load block when not in use.

Specifications

Sling Length

The sling must be long enough to connect it to the shackles in the tieback hole and to the hook of the freely suspended load block. This will prevent personnel from having to swing the block in, toward the crane, to make the connection.

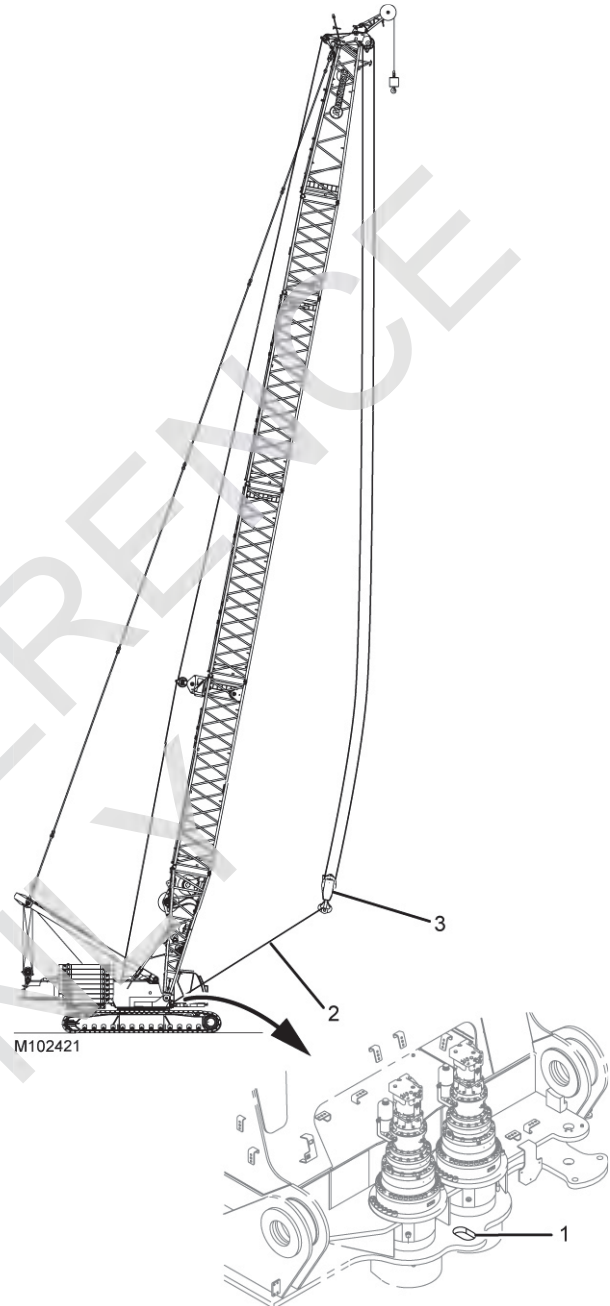
Sling and Shackle Capacity

The sling and shackles must be capable of supporting the weight of the load block and on-half the weight of the wire rope suspended from the boom point. When sizing the sling and shackles, take into account the dynamic affects of traveling and swinging the crane. **It is the crane user's responsibility to calculate this load.**

CAUTION

Avoid damage:

- Haul in the load line only until the tieback sling is taut. The purpose of the tieback is only to prevent the load block from swinging when not in use.
 - Do not tighten the load line to the point that the load line rubs against the lacings in the boom sections or to the point that the load block can bounce into the lacings.
 - Operator, be aware that as you boom down, the load lines and tieback sling will tighten even more. Pay out the load line while booming down so that you don't pull the load block into the boom. Damage to lacings or chords could result.
 - Only use the hole for tying back the load block. Using the hole for any other purpose could result in damage to the hole and the rotating bed.
-



Item	Description
1	Tieback Hole
2	Sling (owner furnished)
3	Load Block

FIGURE 4-66

**SECTION 5
LUBRICATION**

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SECTION 5 LUBRICATION

LUBRICATION

See F2280 at the end of this section.

LUBE AND COOLANT PRODUCT GUIDE

See the publication at the end of this section.

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SECTION 6 MAINTENANCE

GENERAL MAINTENANCE

This section contains maintenance and adjustment instructions for the limit devices used with the luffing jib attachment.

For maintenance and inspection of the following components, see the Service Manual supplied with your crane:

- Straps
- Wire Rope
- Load Block and Hook-and-Weight Ball
- Boom and Jib

BOOM AND LUFFING JIB ANGLE INDICATOR CALIBRATION

Angle sensors ([Figure 6-1](#)) are mounted at the following locations:

- Boom Top
- Boom Butt
- Luffing Jib Top
- Luffing jib Butt

The sensors are calibrated in the RCL/RCI Display and do not require adjustment.



M102472

FIGURE 6-1

AUTOMATIC BOOM STOP ADJUSTMENT

The automatic boom stop limit switch assembly (1, [Figure 6-2](#)) automatically stops the boom (2) and applies the boom hoist brake if the boom is raised to the maximum boom angle (3).



WARNING

Falling Attachment Hazard

Do not operate the crane unless the automatic boom stop is properly adjusted and operational. Do not adjust the maximum operating angle higher than specified. The boom could be pulled over backwards or collapse, causing death or serious injury.

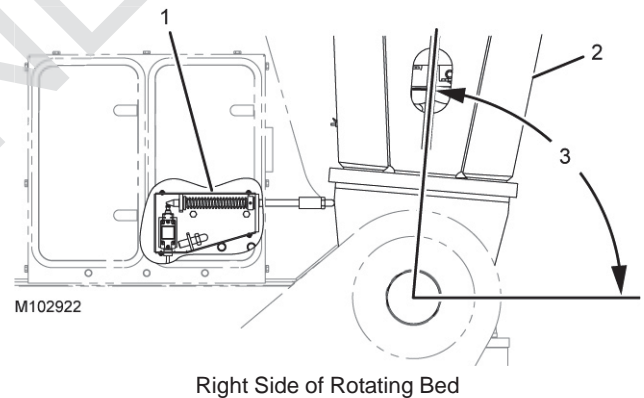
When the maximum boom angle is reached, the fault alarm comes on and the boom maximum up icon appears in the information screen of the main display.



To correct the fault once it is activated, lower the boom. The fault cannot be bypassed.

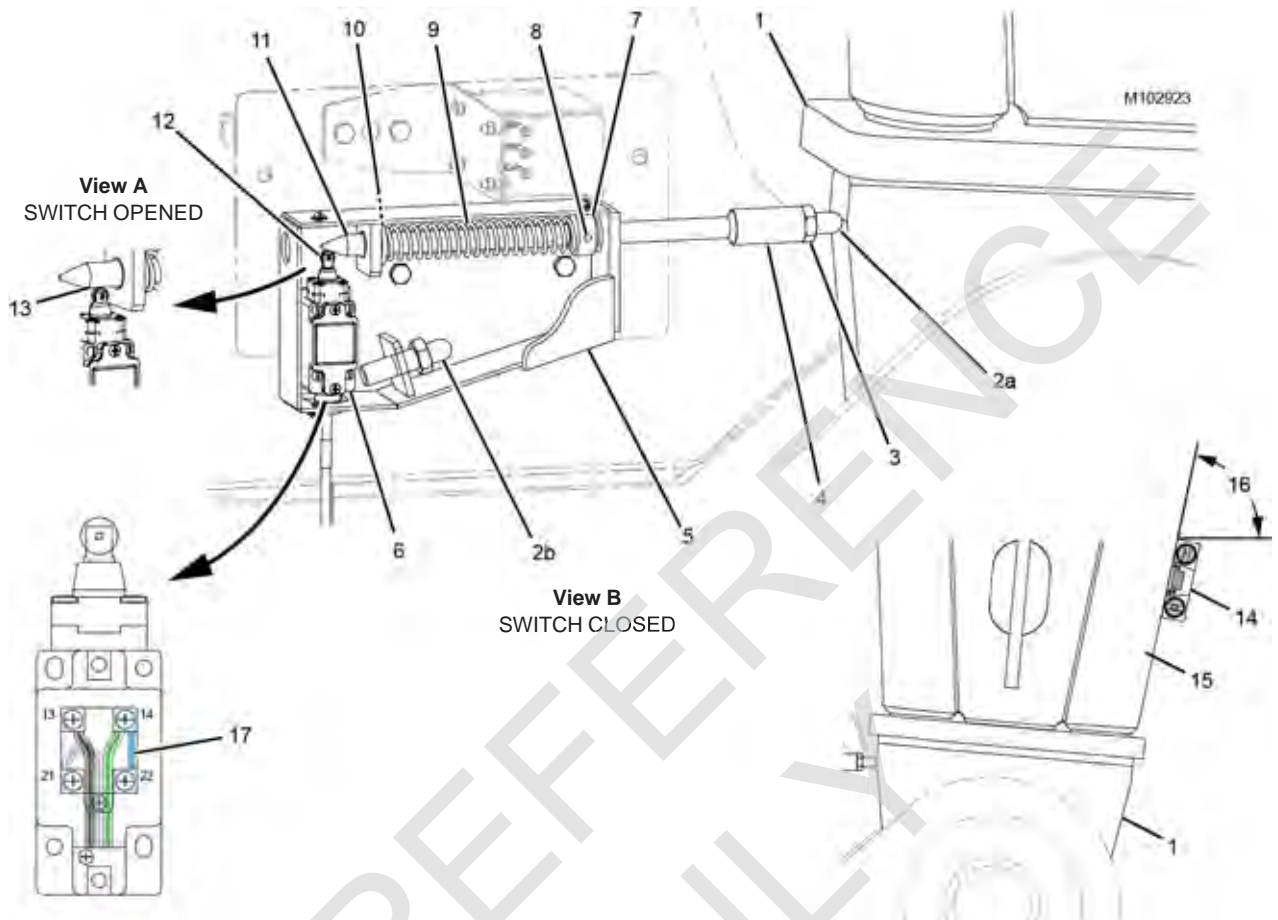
Maintenance

At least once weekly, check that the automatic boom stop stops the boom at the specified maximum boom angle. If it doesn't, replace any worn or damaged parts and/or adjust the automatic boom stop.



Item	Description
1	Limit Switch Assembly
2	Boom Butt
3	Maximum boom angle:
	85° Boom only with or without VPC-MAX
	86° Boom with Luffing Jib and without VPC-MAX
	85° Boom with Luffing Jib and with VPC-MAX

FIGURE 6-2



View D Limit Switch Wiring

Receptacle	Switch Terminals	Function
Black	13	Ground
Green	14	Maximum Angle
White	21	24 VDC Supply
Blue	14 22	Jumper

View C Right Side of Boom Butt

Maximum Boom Angle	Digital Level Angle (16)
85° Boom only with or without VPC-MAX	78°
86° Boom with Luffing Jib and without VPC-MAX	79°
85° Boom with Luffing Jib and with VPC-MAX	78°

Item	Item	Item	Description
1	Boom Butt	9	Spring
2a	Adjusting Rod for 85° Boom Angle: 89 mm (3-1/2 in)	10	Spring Washer
2b	Adjusting Rod for 86° Boom Angle: 85 mm (3-11/32 in)	11	Actuator Rod
3	Jam Nut	12	Switch Closed
4	Coupling (part of actuator rod 11)	13	Over-Travel—Switch Opened
5	Cover	14	Digital Protractor-Level
6	Limit Switch	15	Boom Butt Bottom Chord
7	Spring Washer	16	Digital Level Angle
8	Spring Pin	17	Blue Jumper Wire

FIGURE 6-3

Adjusting Automatic Boom Stop

See [Figure 6-3](#) for the following procedure.

The limit switch for the automatic boom stop was set at the factory and should not require periodic adjustment. Adjustment is necessary when:

- Parts are replaced
- The boom/luffing jib configuration is changed

The following instructions assume that the Rated Capacity Limiter/Indicator (RCL/RCI) is installed and properly calibrated.

During the following procedure, the boom angle is monitored on the working screen of the RCL/RCI and on a digital protractor-level (14, View C).

1. Park the crane on a firm level surface or level the crane by blocking under the crawlers.
2. Check that the proper adjusting rod (2a or 2b) is installed:
 - Rod (2a) for 85°
 - Rod (2b) for 86°
3. Boom up slowly while monitoring the boom angle on the RCL/RCI working screen.
4. Stop booming up when the boom reaches the specified maximum boom angle given in the table for View C.
5. Verify the boom angle with an accurate digital protractor-level (14) placed on the boom butt bottom chord (15) as shown in View C. The corresponding digital level angle (16) should appear on the protractor-level.
 - If the boom stops at the specified angle, further adjustment is not needed.
 - If the boom stops before reaching the specified angle, go to [step 6](#).
 - If the boom reaches the specified angle before it stops, go to [step 7](#).
6. If the boom stops before reaching the specified angle:
 - a. Loosen the jam nut (3, View B).

- b. Turn the adjusting rod (2a or 2b) all the way into the coupling (4).
 - c. Boom up slowly until the boom reaches the specified angle.
 - d. Turn the adjusting rod (2a or 2b) out against the boom butt (1) until the limit switch (5) “CLICKS” open.
 - e. Tighten the jam nut (3).
7. If the boom reaches the specified angle before it stops:
 - a. Loosen the jam nut (3, View B).
 - b. Turn the adjusting rod (2a or 2b) out against the boom butt (1) until the limit switch (5) “CLICKS” open.
 - c. Tighten the jam nut (3).
8. Check that the actuator rod (11) over-travels the limit switch (13, View A) as shown.
9. Boom down and then back up. The boom must stop at the specified maximum boom angle.
10. If the boom fails to stop, repeat [step 3](#) through [step 9](#).

Replacing Boom Stop Limit Switch Actuator Rod

1. Disassemble the unit.
2. Reassemble the unit as shown.
3. Position the actuator rod (4) so the tapered end just touches the limit switch (12) roller. The actuator rod must not depress the limit switch shaft.
4. Drill a 6,35 mm (1/4 in) hole through the spring washer (7) and actuator rod (4).
5. Install the spring pin (8).
6. Push the actuator rod (11) in until the limit switch clicks open. Check the limit switch roller to insure there is over-travel (13, View A) as shown.
7. Adjust the automatic boom stop.

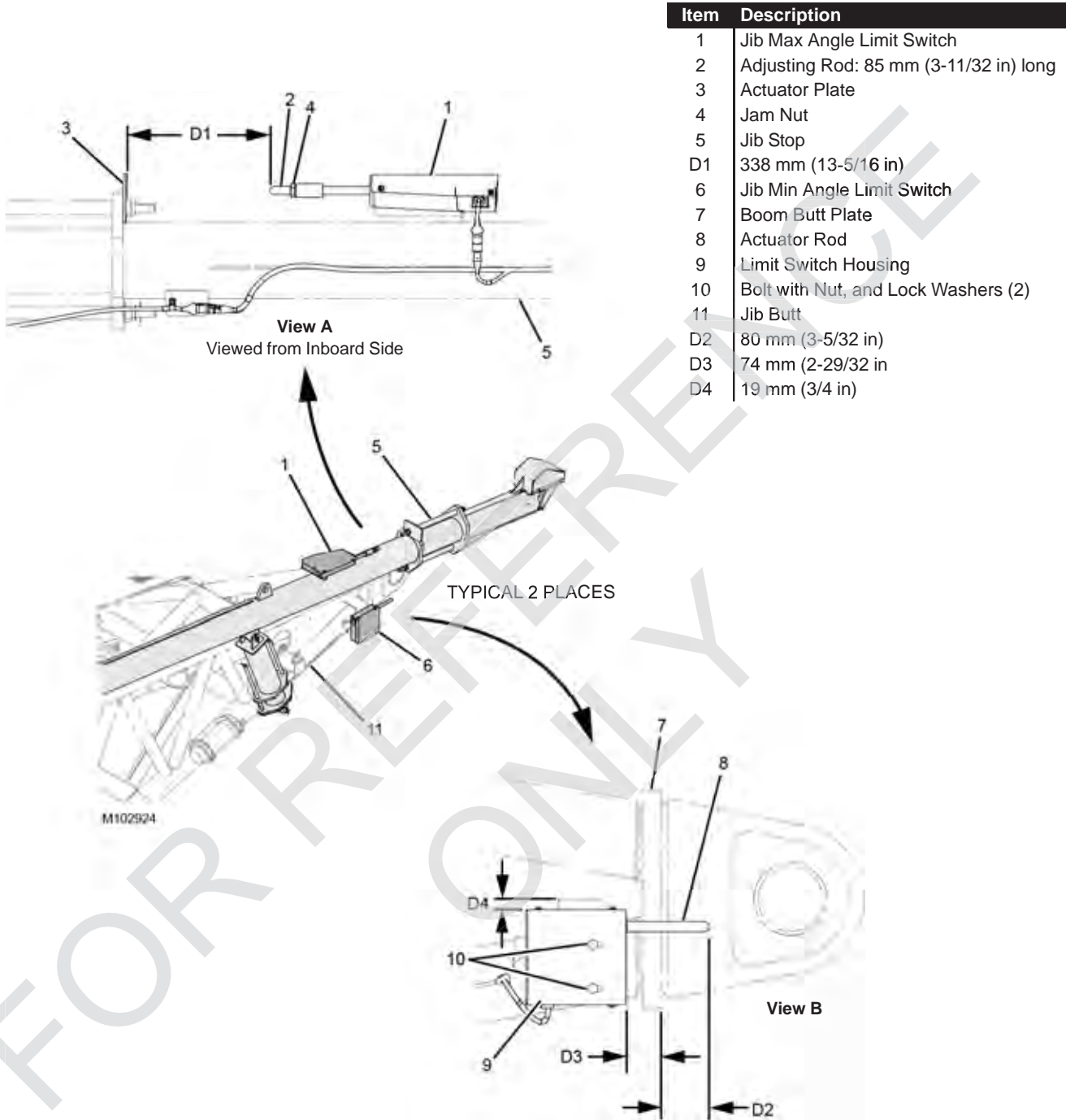


FIGURE 6-4

AUTOMATIC LUFFING JIB STOP ADJUSTMENT



WARNING

Falling Attachment Hazard!

Do not operate crane unless the luffing jib stops are properly adjusted and operational.

Operating the luffing jib above the Maximum Up 2 limit or below the Maximum Down 2 limit is neither intended nor approved. The jib can be pulled over backwards or collapse.

The luffing jib attachment is equipped with four limits which automatically stop the luffing hoist and apply its brake when the luffing jib is raised or lowered to the following angles.

Luffing Jib Maximum Up 1 (maximum working angle). This programmed limit automatically stops the luffing jib and activates fault in the main display when the boom to luffing jib angle is 169°.

- The luffing jib can be lowered after this limit is reached.
- The limit bypass switch must be turned to the bypass position to raise the luffing jib an additional 1.5° to the Luffing Jib Maximum Up 2 limit.



Luffing Jib Maximum Up 2 (maximum angle). This limit is controlled by the limit switch 1 (Figure 6-4). It automatically stops the luffing jib and activates the fault in the main display when the boom to luffing jib angle is 170.5°.

- This limit cannot be bypassed.

Luffing Jib Maximum Down 1 (minimum working angle). This programmed limit automatically stops the luffing jib and activates the fault in the main display when the boom to luffing jib angle is 70°.

- The luffing jib can be raised after this limit is reached.
- The limit bypass switch must be turned to the bypass position to lower the luffing jib to the Luffing Jib Maximum Down 2 limit.



Luffing Jib Maximum Down 2 (minimum angle). This limit is controlled by the limit switch (6, Figure 6-4). It automatically stops the luffing jib and activates fault in the main display when the boom to luffing jib angle is 68.5°.



- This limit cannot be bypassed.

Luffing Jib Stop Maintenance

At least once weekly and each time the attachment is erected, check that the luffing jib stops stop the luffing jib at the specified angles.

Luffing Jib Stop Pre-Erection Checks

To insure proper operation of the luffing jib stops:

- The luffing jib angles must be properly calibrated in the RCL/RCI Display. See Rated Capacity Limiter/Indicator Operation Guide for instructions.
- The jib stop limit switches must be mounted properly.

Luffing Jib Maximum Up Limit Checks

See View A, Figure 6-4 for the following procedure.

Perform the following steps with the boom and luffing jib on the ground:

1. Check the Dimension (D1) from the end of the adjusting rod (2) to the edge of the actuator plate (3).
2. If necessary, adjust the adjusting rod (2) to obtain the specified dimension.
3. Securely tighten the jam nut (4).

Jib Maximum Down Limit Checks

See View B, Figure 6-4 for the following procedure.

Perform the following steps with the boom and luffing jib on the ground:

1. Check Dimension D2 from the edge of the boom butt plate (7) to the end of the actuator rod (8).
2. If necessary, adjust the limit switch housing (9) in its mounting slots to obtain the specified Dimension (D2).
3. Securely tighten the nuts on the mounting bolts (10)

Perform the remaining steps with the engine running and the appropriate Liftcrane Luffing Jib Capacities chart selected in the RCL/RCI Display.

4. Depress the actuator rod (8) to the activated Dimension (D3) from the edge of the limit switch housing to the end of the rod and hold. Listen for the limit switch to “click” open.
5. Turn the limit bypass key clockwise and hold.
6. Push the luffing jib handle forward.

The luffing hoist must not turn in the down direction and the Luffing Jib Maximum Down 2 fault must come on.

Luffing Jib Stop Operational Checks

Make the following operational checks after the boom and jib are raised.

1. Travel the crane onto a firm level surface or level the crane by blocking under the crawlers.
2. Raise the boom and luffing jib until the boom is at the lowest possible angle for the boom and jib length in use.
3. Monitor the BOOM TO LUFFING JIB ANGLE on the main display information screen while the performing remaining steps.
4. SLOWLY raise the luffing jib.
5. The luffing hoist must stop and be inoperable in the up direction when the boom to luffing jib angle is 169°.
6. The fault alarm must come on indicating that the Luffing Jib Maximum Up 1 limit has been reached.
7. Turn the limit bypass key clockwise to bypass the Luffing Jib Maximum Up 1 limit.
8. SLOWLY raise the luffing jib to the Luffing Jib Maximum Up 2 limit.
9. The Luffing hoist must stop and be inoperable in up direction when the boom to luffing jib angle is 170.5°.
10. The fault alarm must come on indicating that the Luffing Jib Maximum Up 2 limit has been reached.
11. **Troubleshoot the system if the up limits do not operate properly.**
12. SLOWLY lower the luffing jib.
13. The luffing hoist must stop and be inoperable when the boom to luffing jib angle is 70°.
14. The fault alarm must come on indicating that the Luffing Jib Maximum Down 1 limit has been reached.
15. Turn the limit bypass key clockwise to bypass the Luffing Jib Maximum Down 1 limit.
16. SLOWLY lower the luffing jib to the Luffing Jib Maximum Down 2 limit.
17. The luffing hoist must stop and be inoperable in the down direction when the boom to luffing jib angle is 68.5°.
18. The fault alarm must come on indicating that the Luffing Jib Maximum Down 2 limit has been reached.
19. **Troubleshoot the system if the down limits do not operate properly.**

Luffing Jib Stop Actuator Rod Replacement

The following instructions apply to both jib stop limit switches. See [Figure 6-5](#) for the following procedure.

1. Disassemble the unit.
2. Reassemble the unit as shown.
3. Position the actuator rod (1) so the tapered end just touches the limit switch (8) roller. The actuator rod must not depress the limit switch shaft.
4. Drill a 6,35 mm (1/4 in) hole through the spring washer (5) and the actuator rod (1).
5. Install the spring pin (2).
6. Push the actuator rod (1) in until the limit switch clicks open. Check the limit switch roller to insure there is over-travel (11) as shown.

Item	Description
1	Actuator Rod
2	Adjusting Rod
3	Jam Nut
4	Spring Pin
5	Spring Washer
6	Spring
7	Spring Washer
8	Limit Switch
9	Cover
10	Housing
11	Over-Travel
12	Jumper Wire (blue)

Limit Switch Wiring

Receptacle	Switch Terminals	Function
Black	13	Ground
Green	14	Maximum Angle
White	21	24 VDC Supply
Blue	14	22

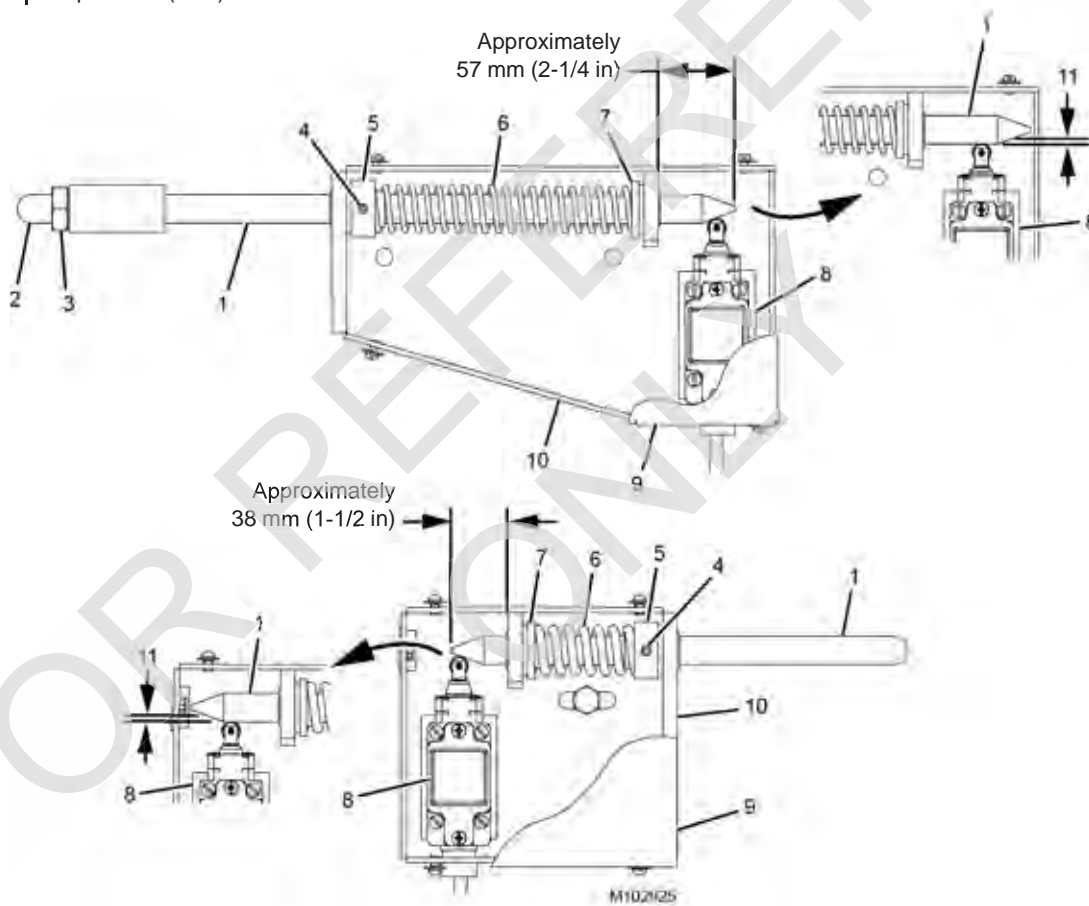
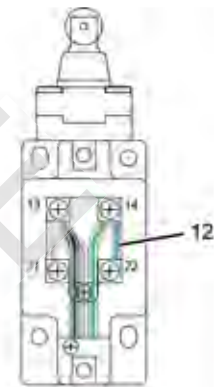


FIGURE 6-5

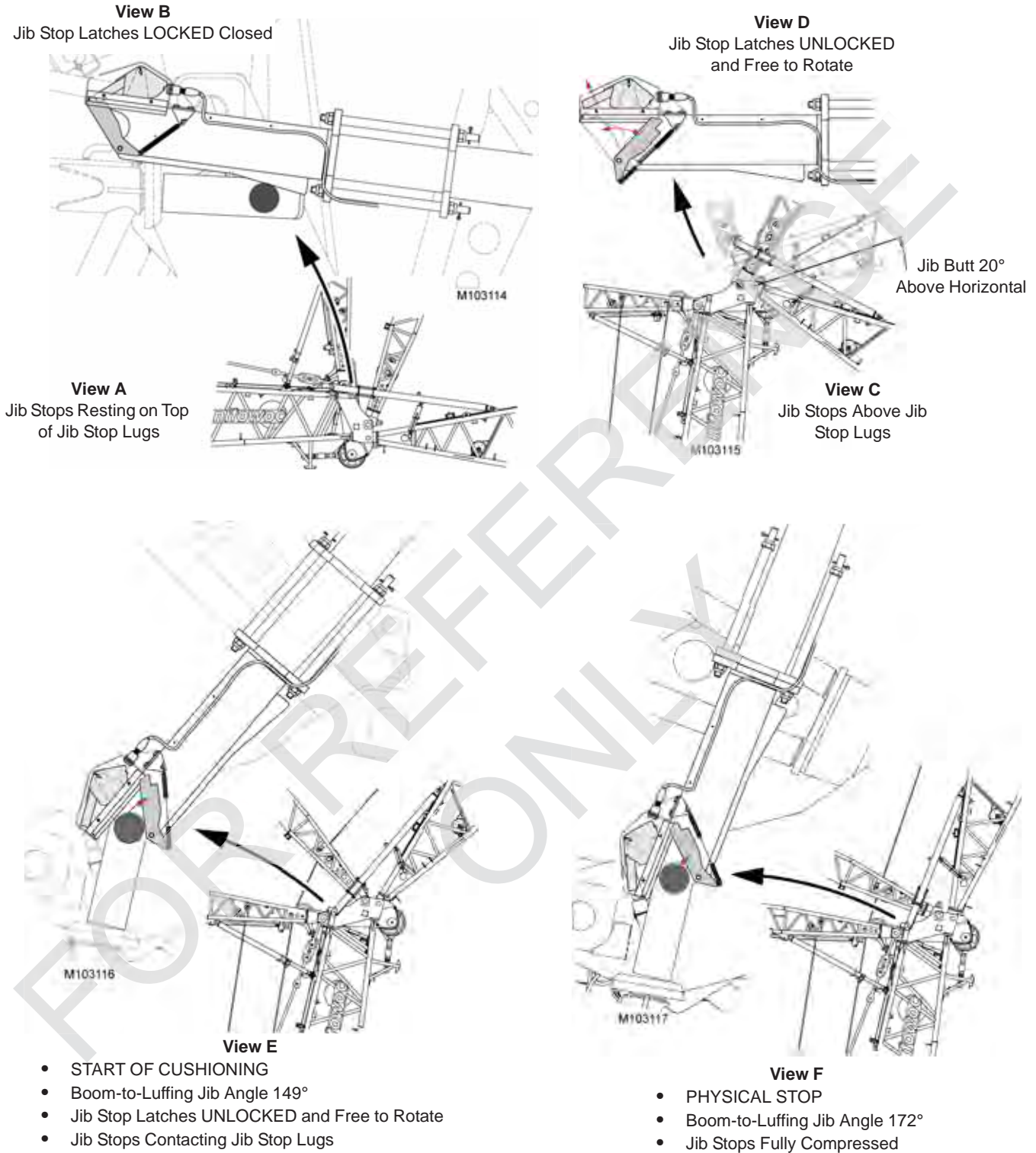


FIGURE 6-6

PHYSICAL JIB STOP OPERATION

Both physical jib stops have a latch and lock mechanism (see [Figure 6-7 on page 6-10](#)) that ensures the jib stops properly engage and disengage the jib stop lugs on the boom top.

Refer to the Luffing Jib Raising (Lowering) Procedure chart in Section 4 of this manual for detailed raising and lower instructions.

See [Figure 6-6](#) for the following procedure.

Raising Operation

1. At the start of the raising procedure, the jib stops rest on top of the jib stop lugs on the boom top (View A).
2. Each latch is closed by torsion springs and the locks are engaged to LOCK the latches closed (View B).
3. As the boom and jib are raised to the required boom-to-luffing jib angle, the jib stops rise off the jib stop lugs (View C).
4. As the jib is raised to the required operating radius, the center of gravity of the locks causes them to disengage (UNLOCK) the latches when the jib is approximately 20° above horizontal (View D).

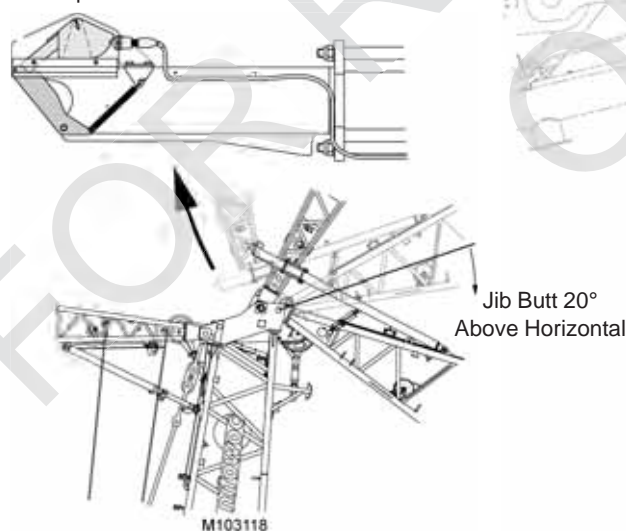
5. The jib stops will now operate as follows:
 - a. When the boom-to-luffing jib angle is 149° (View E), the ends of the jib stops engage the jib stop lugs on the boom top and the lugs force the latches open. This is the START OF CUSHIONING.
 - b. The jib stops are fully compressed to provide a PHYSICAL STOP if for any reason the jib is raised to boom-to-luffing jib angle of 172° (View F).

Reminder: the Luffing Jib Maximum Up 2 limit is activated at a boom-to-luffing jib angle of 170.5° (see [page 6-5](#)).

Lowering Operation

1. At the start of the lowering procedure, the boom is positioned at 83° (View G).
2. As the jib is lowered, the following occurs:
 - a. The jib stops rotate away from the jib stop lugs.
 - b. The center of gravity of the locks causes them to engage (LOCK) the latches when the jib is approximately 20° above horizontal (View G).
3. As the jib rolls along the ground, the LOCKED latches force the jib stops to travel to the top of the jib stop lugs on the boom top (View H).

View G
Jib Stop Latches Closed and LOCKED



View H
Closed and LOCKED Jib Stop Latches Force Jib Stops Up and Over the Top of the Jib Stop Lugs

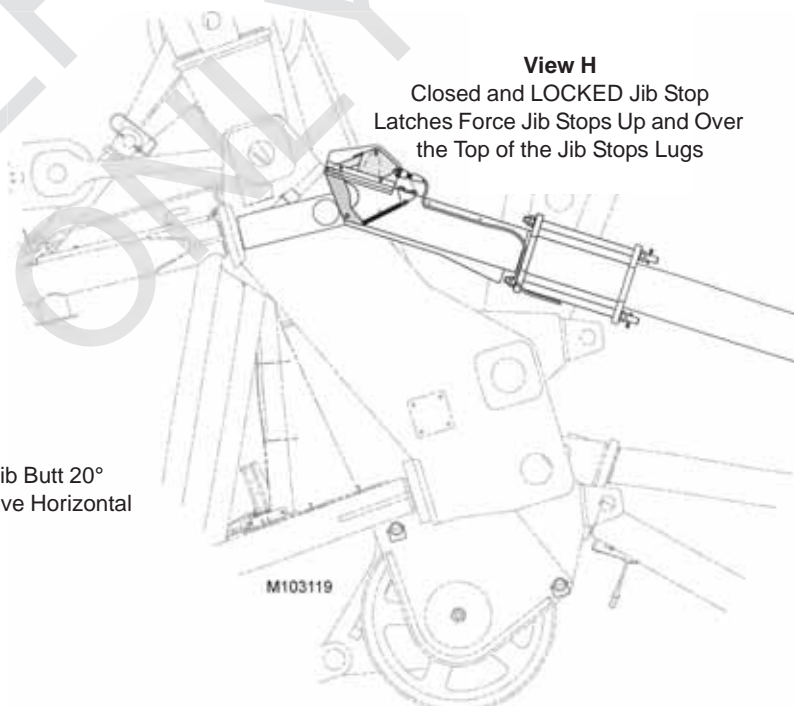


FIGURE 6-6 continued

Item	Description
1	Physical Luffing Jib Stop
2	Proximity Sensor
3	Jam Nut
4	Wear Pad
5	Jib Stop Latch, Spring Loaded (2)
6	Cover
7	Jib Stop Lock
8	Sensor LED's (yellow lights)

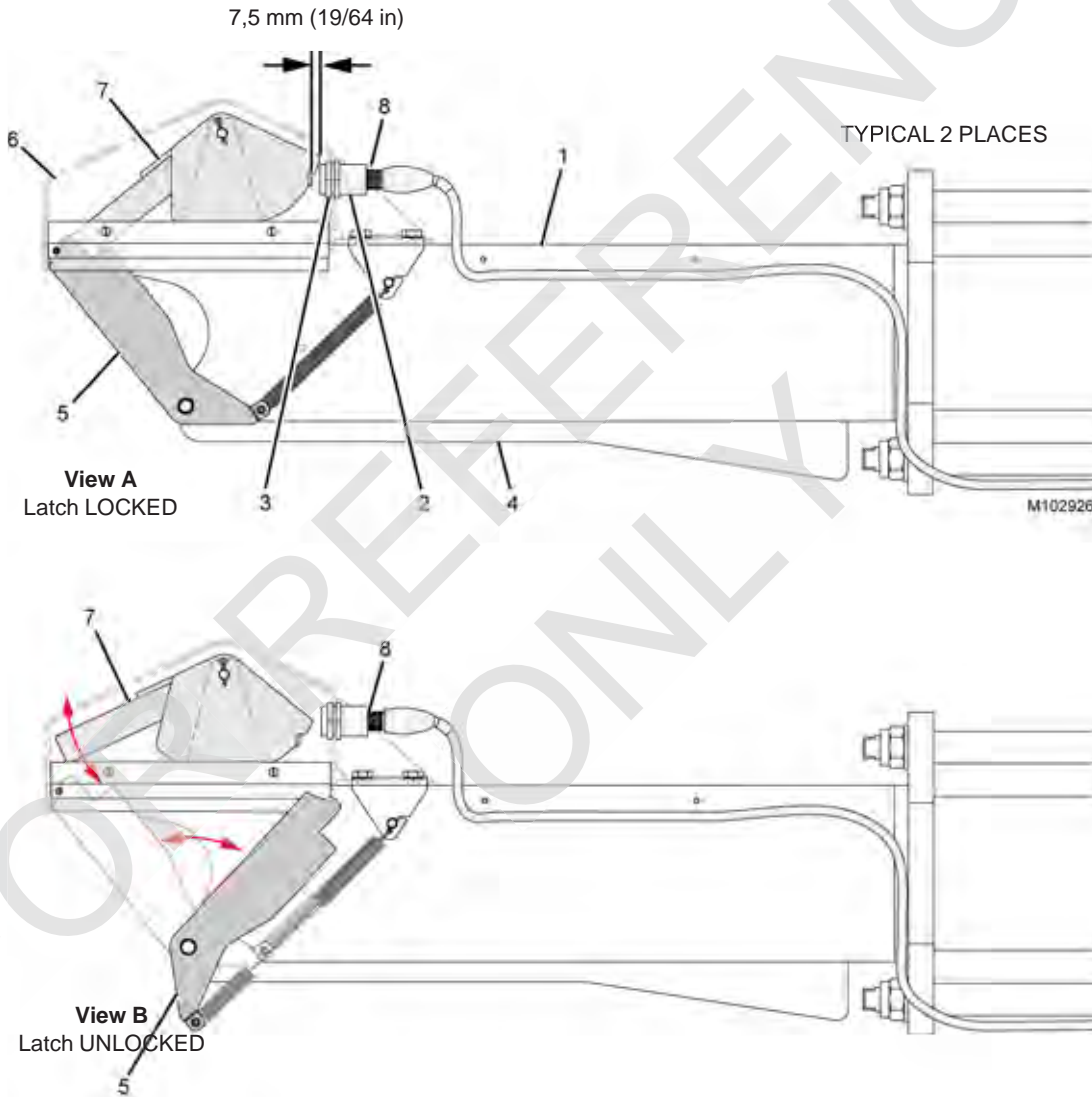


FIGURE 6-7

PHYSICAL JIB STOP SENSOR ADJUSTMENT



WARNING

Falling Attachment Hazard

Do not operate the crane unless the luffing jib stop sensor is properly adjusted and operational.

See "[Physical Jib Stop Operation](#)" on page 6-9.

NOTE: The Luffing Jib Stop Latch operating limit will come on and stop the corresponding hoist if:

- You try to luff up when either jib stop latch is **LOCKED** (proximity sensor electrically open) and the boom-to-luffing jib angle is greater than 145°. This limit can be bypassed only in the luffing jib setup mode if the boom angle is less than 50°.

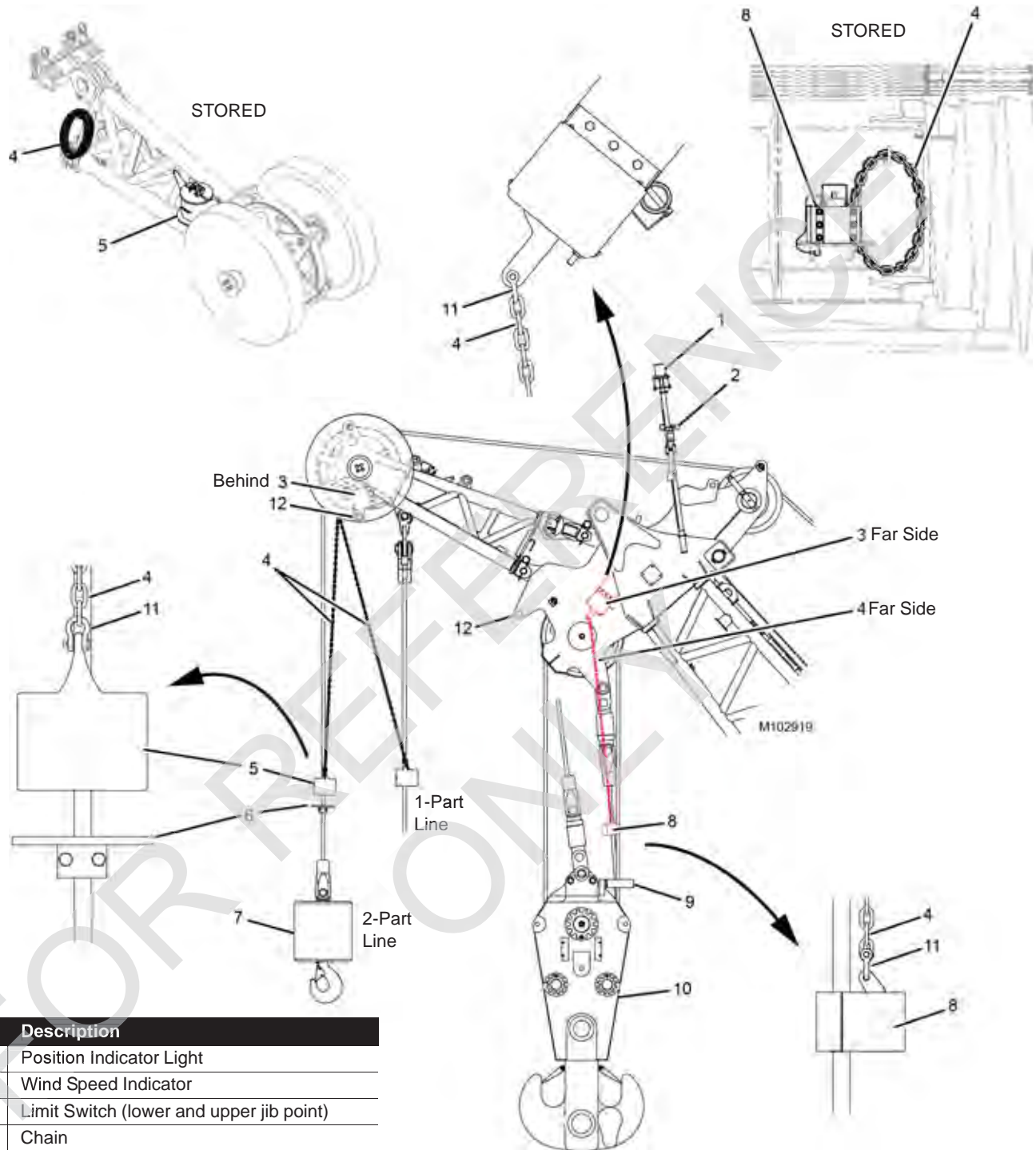


- You try to boom down or you try to luff up when either latch is **UNLOCKED** (proximity sensor electrically closed) and the boom angle is less than 30°. This limit can be bypassed.

See [Figure 6-7](#) for the following procedure.

Prior to raising the luffing jib, perform the following steps at both physical luffing jib stops (1):

- Adjust the position of the proximity sensor (2) so the distance from the edge of the proximity sensor to the edge of the cross brace on the jib stop lock (7) is 7,5 mm (19/64 in).
- Securely tighten jam nut (3).
- Test operation with the engine running as follows, as follows:
 - With the jib stop latch (5, View A) **LOCKED**, the sensor LED's (8) should be **ON**.
 - With the jib stop latch (5, View B) **UNLATCHED**, the sensor LED's (8) should be **OFF**.



Item	Description
1	Position Indicator Light
2	Wind Speed Indicator
3	Limit Switch (lower and upper jib point)
4	Chain
5	Weight with 2-Chain Attachments
6	Lift Plate
7	Hook-and-Weight Ball
8	Weight with 1-Chain Attachment
9	Lift Block
10	Load Block
11	Shackle
12	Rollers

FIGURE 6-8

BLOCK-UP LIMIT INSTALLATION AND ADJUSTMENT



WARNING **Two-Blocking Hazard!**

The block-up limit control is a protective device designed only to assist the operator in preventing a two-blocking condition; any other use is neither intended nor approved.

The block-up limit control may not prevent two-blocking when the load is hoisted at the maximum single line speed. The operator must determine the fastest line speed that allows the block-up limit control to function properly and, thereafter, not exceed that line speed.

General

The block-up limit control (also called anti two-block device) is a two-blocking prevention device which automatically stops the load drum from hoisting and the luffing jib (and boom) from lowering when a load is hoisted a predetermined distance from either jib point.

DEFINITION: Two-blocking is the unsafe condition in which the load block or the hook-and-weight ball contacts the sheave assembly from which either is suspended.

Two-blocking can result in failure of the sheaves and the wire rope, possibly causing the load to fall.

The luffing jib block-up limit system consists of the following components ([Figure 6-8](#)):

4. A normally closed limit switch assembly (3) fastened at either or both of the following locations:
 - a. Lower Jib Point
 - b. Upper Jib Point
5. A weight (5 or 8) freely suspended by the chain (4) from each limit switch actuating lever (weight encircles load line as shown).
6. A lift plate (6) fastened to the load line or a lift block (9) fastened to the load block.

For identification and location of the block-up limit components in the boom, see the Operator and Service Manuals supplied with the crane.

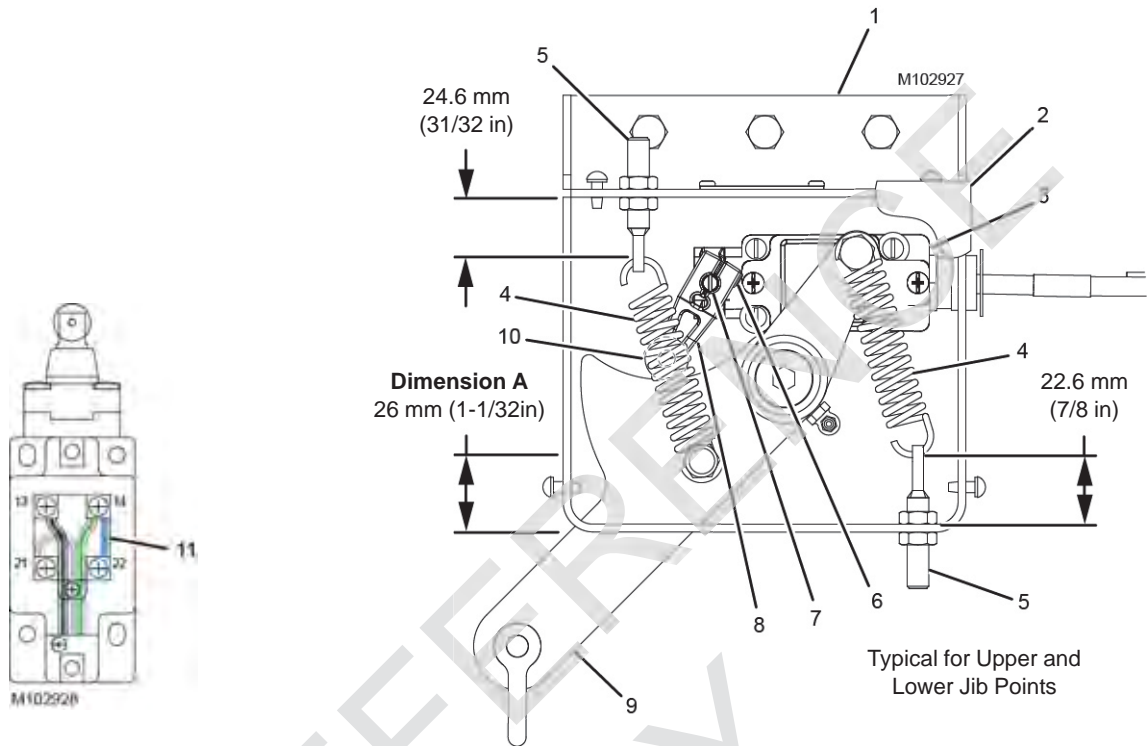
Removing Luffing Jib

When removing the luffing jib it is necessary to disconnect the electric cables from the jib at the electric cables in the boom top.

Be sure to do the following:

1. Thoroughly clean all cable connectors and dust caps.
2. Connect the dust caps to the cable connectors.
3. Connect the terminators to the cables on the boom top.

Failing to perform this step will result in faulty operation. Also, the fault alarm will come on in the main display.



Limit Switch Wiring

Receptacle	Switch Terminals	Function
Black	13	Ground
Green	14	Maximum Angle
White	21	24 VDC Supply
Blue	14 22	Jumper

Item	Description
1	Bracket
2	Cover
3	Limit Switch
4	Spring (2)
5	Eyebolt with Nuts (2)
6	Set Screw
7	Shaft
8	Limit Switch Lever
9	Actuating Lever
10	Roller
11	Jumper Wire (blue)

FIGURE 6-9

Maintenance

CAUTION

Prevent Damage

To prevent two-blocking from occurring, do not operate crane until cause for improper operation and all hazardous conditions have been found and corrected.

At least once weekly, inspect and test the block-up limit switches, as follows:

1. Lower the boom and jib onto blocking at ground level and carefully inspect the following items:
 - a. Inspect each limit switch lever and actuating lever ([Figure 6-8 on page 6-12](#)) for freedom of movement. Apply one-half shot of grease to the fitting on the actuating lever. Wipe away any excess grease.
 - b. Inspect each weight ([Figure 6-8 on page 6-12](#)) for freedom of movement on the load line.
 - c. Inspect each weight, chain, shackle and connecting pin ([Figure 6-8 on page 6-12](#)) for excessive or abnormal wear. Make sure the cotter pins for the shackles are installed and spread.
 - d. Inspect the entire length of the electric cables for damage.
 - e. Check that the electric cables are clear of all moving parts in the boom and jib and that the cables are securely fastened to the boom and jib.
 - f. Check that all cables and terminating plugs are securely fastened.
2. Test the block-up limit controls for proper operation with the engine running using either of the following methods:
 - a. **BOOM AND JIB LOWERED:** Manually lift each weight — **one at a time**. The corresponding load drum should not operate in the up direction and the boom/luffing hoist should not operate in the down direction.
 - b. **BOOM AND JIB RAISED:** **Slowly** hoist each load block and hook-and-weight ball — **one at a time** —

against the weight. When the chain goes slack, the corresponding load drum should stop hoisting and the boom/luffing hoist should not operate in the down direction.

CAUTION

Avoid Sheave Damage

Use extreme care when testing the block-up limit control when the boom and jib are raised. If the block-up limit control fails to the stop load, immediately stop the load by moving the drum control handle to off. Otherwise, two-blocking may occur.

Adjustment

See [Figure 6-8 on page 6-12](#) for the following procedure.

Lower the boom and jib onto blocking at ground level and adjust each limit switch as follows:

1. Remove the cover (1) from the bracket (2).
2. Adjust the tension of both springs (4) with the eyebolts and nuts (5) so there is enough force to lift the weight of the chain and rotate the actuating lever (9) up when the weight is lifted.
The initial setting of eyebolt is shown.
3. Loosen the setscrew (6) in the limit switch lever (8) so the lever is free to rotate.
4. Manually lift the weight to allow the actuating lever (9) to rotate up.
5. Hold the lever (9) at Dimension A.
6. Hold the roller (10) on the limit switch lever (8) against the actuating lever (9) while performing [step 7](#).
7. Turn the limit switch shaft (7) **CLOCKWISE only enough to “click” the limit switch open and hold**.
8. Securely tighten the setscrew (6) in the limit switch lever (8).
9. Test the limit switch for proper operation and repeat the adjustment steps until the limit switch operates properly.
10. Install the cover (1) on the bracket (2).

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