GROVE®
CRANE

A GROVE WORLDWIDE COMPANY

OPERATOR'S AND SAFETY HANDBOOK

RT635C Series

S/N 78479

REVISED: JANUARY, 1996

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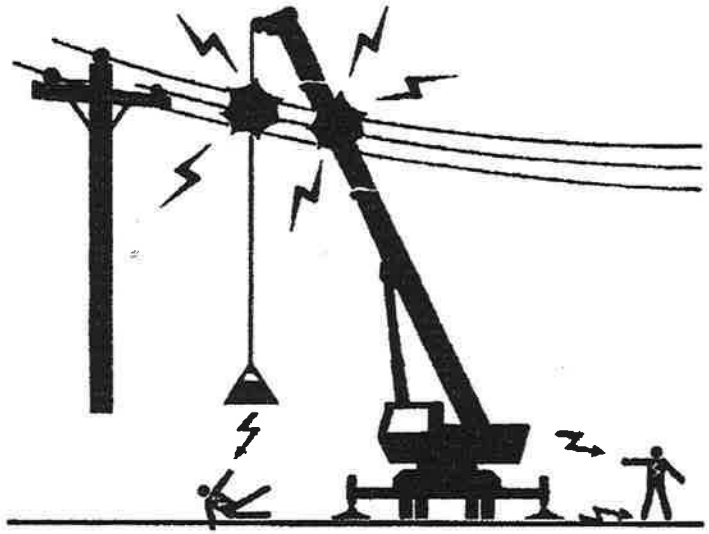

THIS MACHINE IS NOT INSULATED.

⚠ DANGER

ELECTROCUTION HAZARD

- TO AVOID DEATH OR SERIOUS INJURY, KEEP ALL PARTS OF THIS MACHINE, THE RIGGING, AND MATERIALS BEING LIFTED AT LEAST 20 FEET AWAY FROM ALL ELECTRICAL POWER LINES AND EQUIPMENT.
- KEEP AWAY FROM THIS MACHINE IF IT IS BEING OPERATED NEAR ELECTRICAL POWER LINES OR EQUIPMENT.
- BEFORE OPERATING THIS CRANE IN THE VICINITY OF POWER LINES OR EQUIPMENT, NOTIFY THE POWER UTILITY COMPANY. HAVE POWER TURNED OFF.
- FOLLOW INSTRUCTIONS IN OPERATOR'S AND SAFETY HANDBOOK.

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NOTICE TO OWNER/USER

Should this crane become involved in an accident, please contact your local Grove distributor immediately and relate details of the incident so he can notify Grove Worldwide. If the distributor is unknown and/or cannot be reached, please contact:

Grove Worldwide
Product Support
1086 Wayne Avenue
Chambersburg, Pennsylvania,17201
Ph. (717) 263-5100

FOREWORD

This handbook has been compiled to assist you in properly operating and maintaining your Grove Crane.

Before placing the crane in service, take time to thoroughly familiarize yourself with the contents of this manual. After all sections have been read and understood, retain the manual for future reference in a readily accessible location.

The Grove Crane has been designed for maximum performance with minimum maintenance. With proper care, years of trouble–free service can be expected.

Constant improvement and engineering progress makes it necessary that we reserve the right to make specification and equipment changes without notice.

Engine operating procedures and routine maintenance procedures are supplied in a separate manual with each crane, and should be referred to for detailed information.

Information in this manual does not replace federal, state, or local regulations, safety codes, or insurance requirements.

The definitions of DANGER, CAUTION, and NOTE as used in this manual apply as follows.

DANGER

A DANGER NOTE IS USED TO EMPHASIZE THAT IF AN OPERATION, PROCEDURE, OR PRACTICE IS NOT FOLLOWED EXACTLY, DEATH OR INJURY TO PERSONNEL MAY RESULT.

CAUTION

A CAUTION IS USED TO EMPHASIZE THAT IF AN OPERATION, PROCEDURE, OR PRACTICE IS NOT FOLLOWED EXACTLY, EQUIPMENT DAMAGE MAY RESULT.

NOTE

A note is used to emphasize an important procedure or condition.

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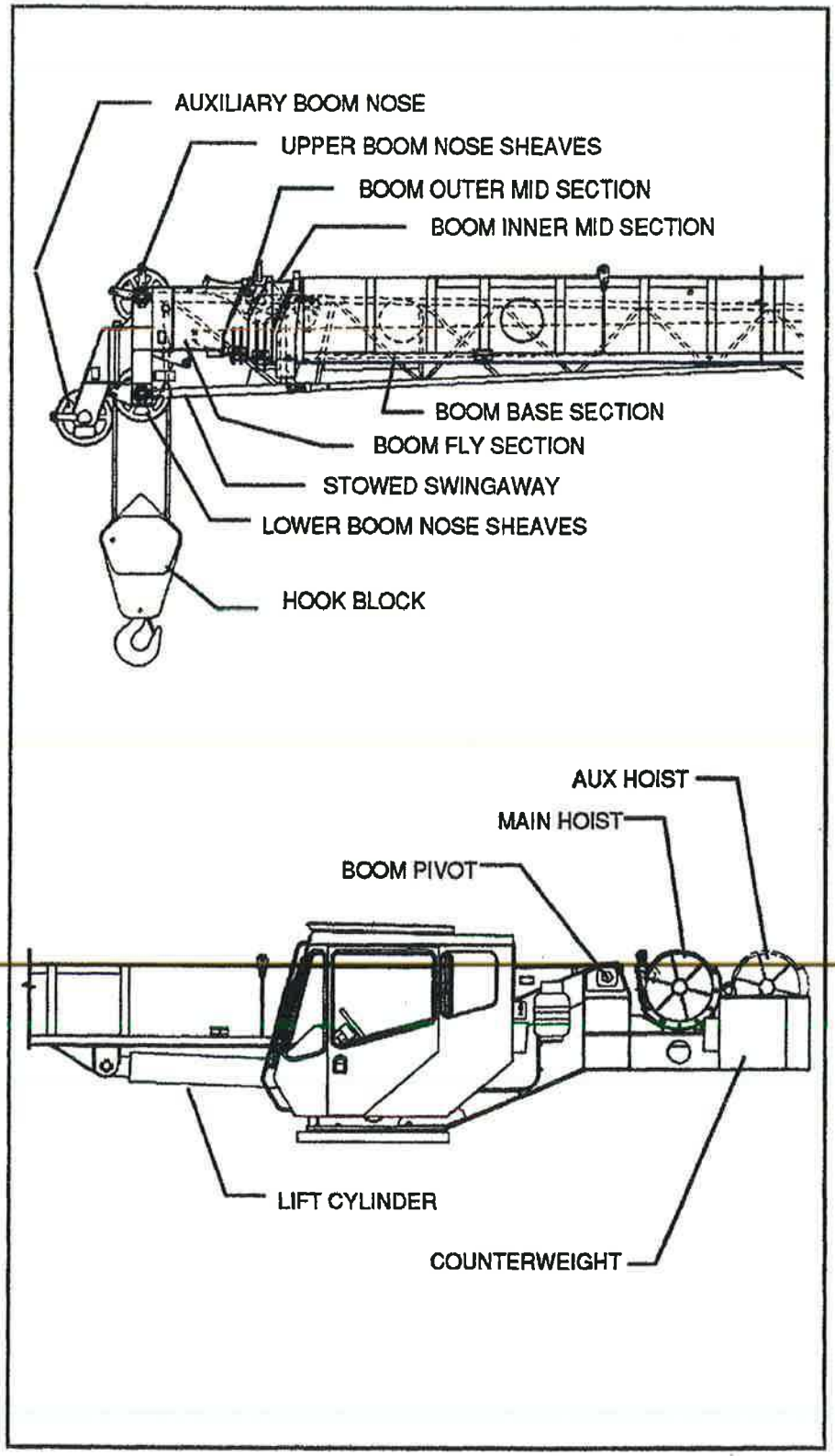
Section 1
INTRODUCTION

This handbook provides information for the operator of the RT635C Series Grove Crane.

The crane incorporates an all welded steel frame, using planetary drive axles to provide four–wheel drive. Axle steering is accomplished utilizing hydraulic steer cylinders. The engine is mounted at the rear of the crane and provides motive power through a remote mounted, six speed forward and three speed reverse transmission. Hydraulic, double box, sliding beam outriggers with inverted style stabilizer (jack) cylinders are integral with the carrier frame.

The carrier frame incorporates an integral fifth wheel, to which the rear axle is mounted, to provide axle oscillation. Axle oscillation lockout is automatic when the superstructure rotates from the travel position.

The superstructure is capable of 360 degree rotation in either direction. All Crane functions are controlled from the fully–enclosed cab mounted on the superstructure. The crane is equipped with a full power, four section, sequenced boom with a cable synchronized fly section. Additional reach is obtained by utilizing the 29 foot fixed length offsettable boom extension or an optional 29 to 51 foot offsettable boom extension. Lifting is provided by a main hoist and an optional auxiliary hoist.



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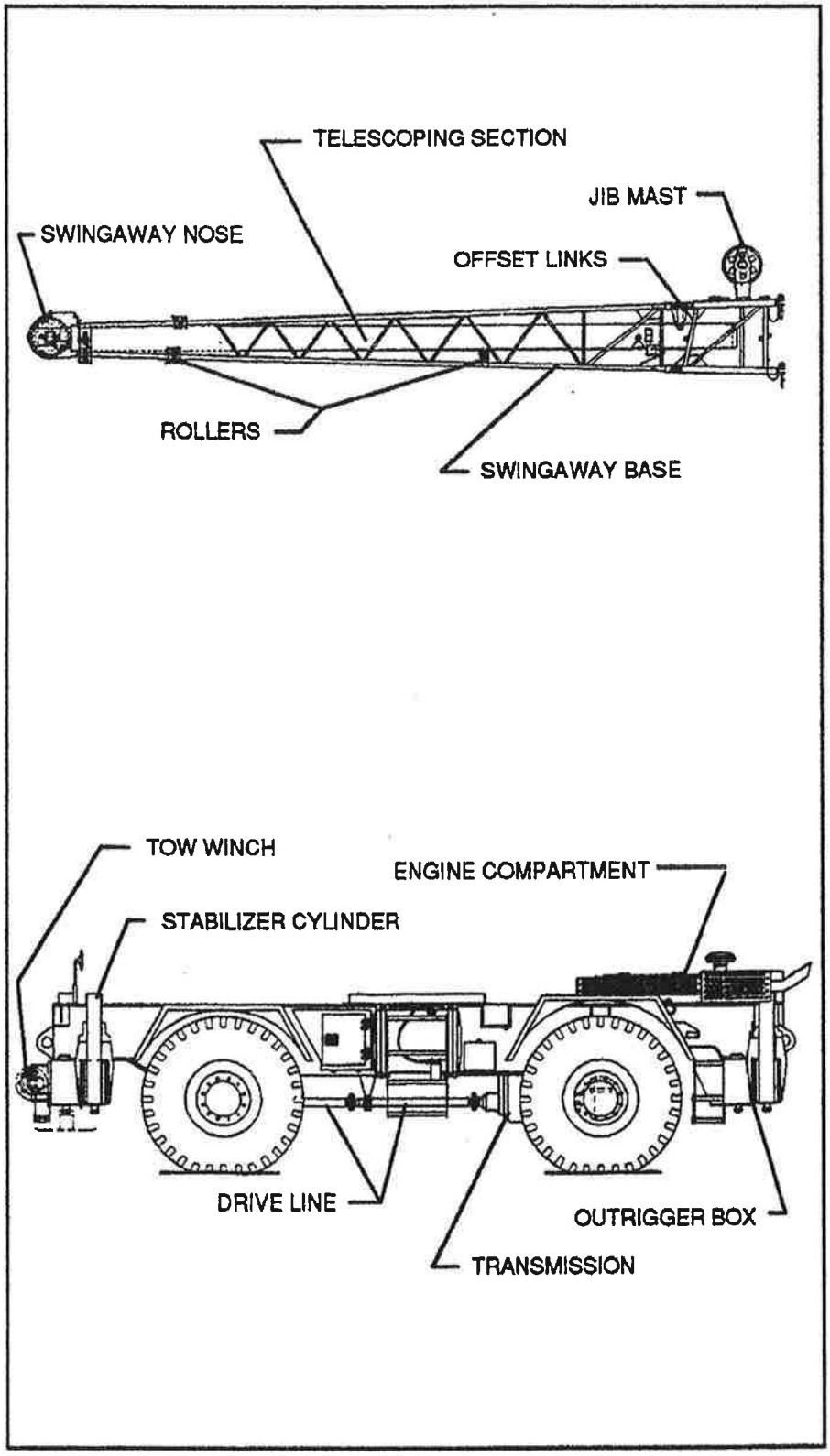

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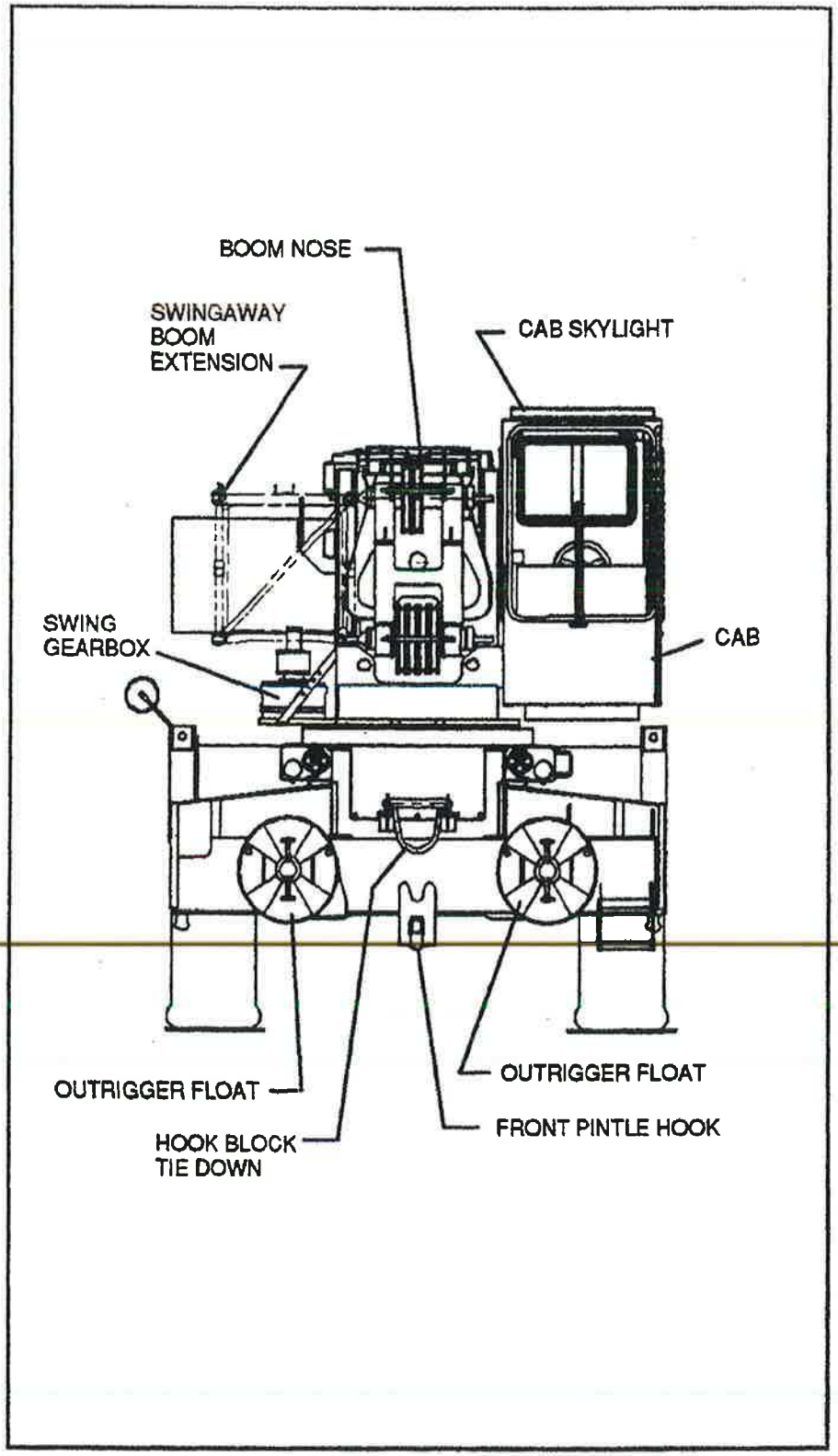

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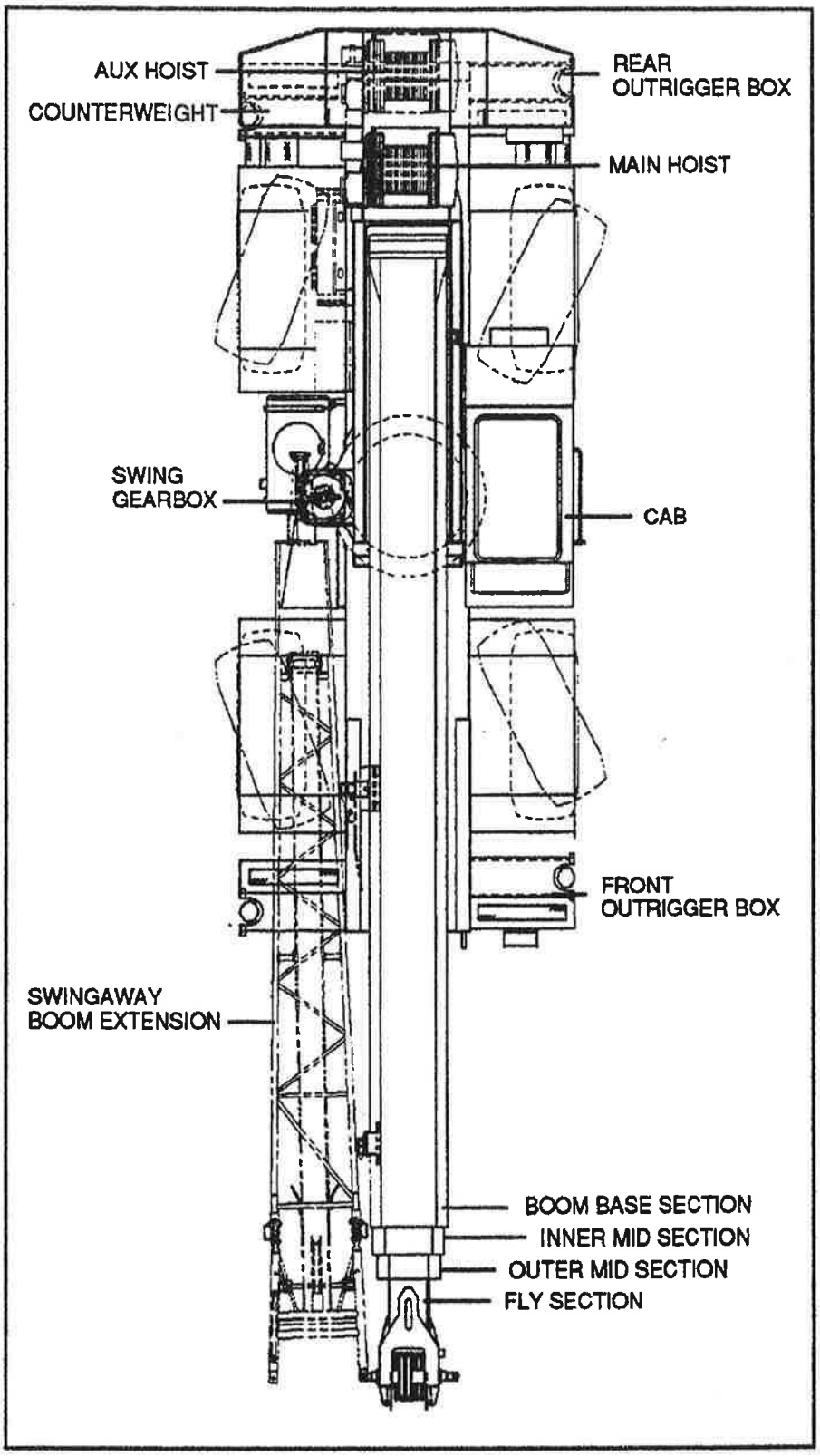

Basic Nomenclature (Sheet 4 of 4)

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Section 2
SAFETY PRECAUTIONS

GENERAL

NOTE

Illustrations have been included in this section to emphasize certain proper and improper points; READ AND FOLLOW PRINTED INSTRUCTIONS.

It is impossible to compile a list of safety precautions covering all situations. However, there are basic principles that MUST be followed during your daily routine. Safety is YOUR PRIMARY RESPONSIBILITY, since any piece of equipment is only as safe AS THE PERSON AT THE CONTROLS.

With this thought in mind, this information has been provided to assist you, the operator, in promoting a safe working atmosphere for yourself and those around you. It is not meant to cover every conceivable circumstance which could arise. It is intended to present basic safety precautions that should be followed in daily operation.

Because you, the operator, are the only part of the crane that can think and reason, your responsibility is not lessened by the addition of operational aids or warning devices. Indeed, you must guard against acquiring a false sense of security when using them. They are there to assist, not direct the operation. Operational aids or warning devices can be mechanical, electrical, electronic, or a combination thereof. They are subject to failure or misuse and should not be relied upon in place of good operating practices.

You, the operator, are the only one who can be relied upon to assure the safety of yourself and those around you. Be a PROFESSIONAL and follow the RULES of SAFETY.

REMEMBER, failure to follow just one safety precaution could cause an accident that results in death or serious injury to personnel or damage to equipment.

You are responsible for the safety of yourself and those around you.

IMMEDIATELY report all accidents, malfunctions, and equipment damages to your local Grove distributor. Following any accident or damage to equipment the local Grove distributor must be immediately advised of the incident and consulted on necessary inspections and repairs. Should the distributor not be immediately available, contact should be made directly with Grove Worldwide

Product Support. 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 your local Grove Worldwide distributor and/or Grove Worldwide.

OPERATOR'S INFORMATION

You must READ and UNDERSTAND the Operator's and Safety Handbook and the Load Chart before operating the crane. This handbook and the Load Chart must be readily available to the operator at all times and they must remain in the cab while the crane is in use.

Ensure that all personnel working around the crane are thoroughly familiar with safe operating practices. You must be thoroughly familiar with the location and content of all placards and decals on the crane. Decals provide important instructions and warnings and must be read prior to any operational or maintenance function.

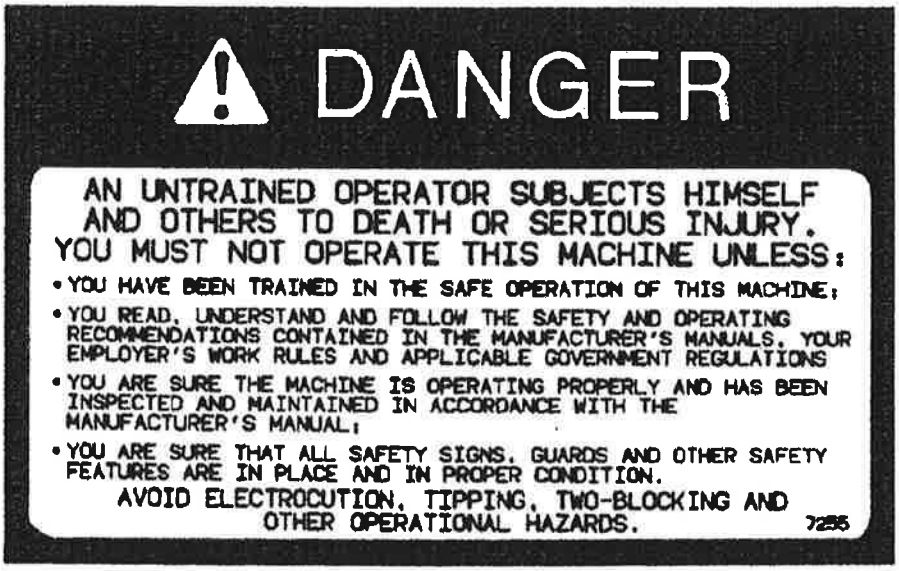
You must be familiar with the regulations and standards governing cranes and their operation. Work practice requirements may vary slightly between government regulations, industry standards, and employer policies so a thorough knowledge of all such relevant work rules is necessary.

DO NOT REMOVE the load chart, this Operator's and Safety Handbook or any decal from this crane.

Inspect the crane every day (before the start of each shift). Ensure that routine maintenance and lubrication are being dutifully performed. Don't operate a damaged or poorly maintained crane. You risk lives when operating faulty machinery, including your own.

Only the crane operator shall occupy the crane when traveling or in operation.

OPERATOR'S QUALIFICATION



An untrained operator subjects himself and others to death or serious injury.

YOU MUST NOT OPERATE THIS MACHINE UNLESS:

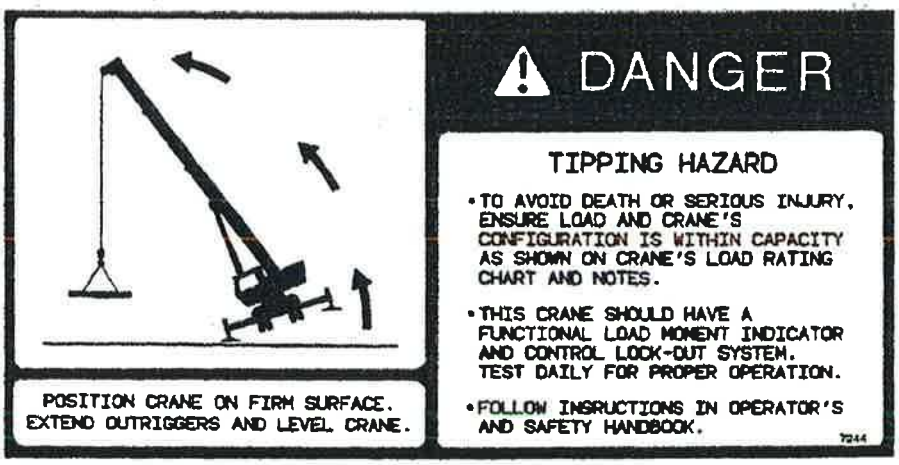
- You have been trained in the safe operation of this machine;
- You read, understand and follow the safety and operating recommendations contained in the manufacturer's manuals, your employer's work rules and applicable government regulations;
- You are sure the machine is operating properly and has been inspected and maintained in accordance with the manufacturer's manuals;
- You are sure that all safety signs, guards and other safety features are in place and in proper condition.

Do not attempt to operate the crane unless you are trained and thoroughly familiar with all operational functions. Controls and design may vary from crane to crane, therefore, it is important that you have specific training on the particular crane you will be operating.

Training is ESSENTIAL for proper crane operation. Never jeopardize your own well–being or that of others by attempting to operate a crane on which you have not been trained.

You must be mentally and physically fit to operate a crane. Never attempt to operate a crane while under the influence of medication, narcotics or alcohol. Any type of drug could impair physical, visual and mental reactions and capabilities.

CRANE STABILITY/STRUCTURAL STRENGTH



To avoid death or serious injury, ensure that the crane is on a firm surface with load and crane's configuration within capacity as shown on the crane's load rating chart and notes.

Do not lift loads unless the outriggers are properly extended and the crane leveled. On models equipped with outriggers that can be pinned at the mid–extend position, the outriggers must also be pinned when operating from the mid–extend position.

This crane should have a functional load moment indicator and control lock–out system. Test daily for proper operation. Never interfere with the proper functioning of operational aids or warning devices.

Before swinging the superstructure over the side when the outriggers are retracted, check the load chart for backwards stability.

Long cantilever booms can create a tipping condition when in an extended and lowered position. Retract the boom proportionally with reference to the capacity of the applicable load chart.

Check crane stability before lifting loads. Ensure the outriggers (or tires if lifting on rubber) are firmly positioned on solid surfaces. Ensure the crane is level, brakes are set, and the load is properly rigged and attached to the hook. Check the load chart against the weight of the load. Lift the load slightly off the ground and recheck the stability before proceeding with the lift. Determine the weight of the load before you attempt the lift.

Ensure all pins and floats are properly installed and outrigger beams are properly extended before lifting on outriggers.

Unless lifting within On Rubber capacities, outrigger beams must be properly extended , jack cylinders extended and set, to provide maximum leveling of the crane. On models equipped with outriggers that can be pinned at the mid–extend position, the outriggers must also be pinned when operating from the mid–extend position. Tires must be clear of the ground before lifting on outriggers. Remove all weight from tires before lifting on outriggers.

Use adequate cribbing under outrigger floats to distribute weight over a greater area. Check frequently for settling.

Carefully follow the procedures in this handbook when extending or retracting the outriggers. Death or serious injury could result from improper crane set–up on outriggers.

Be sure the outriggers are properly extended and set and the crane is level for operation on outriggers.

All four outrigger beams must be equally extended to the appropriate vertical stripe before beginning operation.

All four outrigger beam lock pins must be engaged before operating from the mid–extend position.

The operator must select the proper load chart and LMI program for the outrigger position selected.

KEEP THE BOOM SHORT. Swinging loads with a long line can create an unstable condition and possible structural failure of the boom.

LOAD CHARTS

Load charts represent the absolute maximum allowable loads, which are based on either tipping or structural limitations of the crane under specific conditions. Knowing the precise load radius, boom length, and boom angle should be a part of your routine planning and operation. Actual loads, including necessary allowances, should be kept below the capacity shown on the applicable load chart.

You must use the appropriate load chart when determining the capability of the crane in the configuration required to perform the lift.

Maximum lifting capacity is available at the shortest radius, minimum boom length and highest boom angle.

Do not remove the load charts from the crane.

WORK SITE

Prior to any operation, you must inspect the ENTIRE work–site, including ground conditions, where the crane will travel and operate. Be sure that the surfaces will support a load greater than the crane's weight and maximum capacity.

Barricade the area where the crane is working and keep all unnecessary personnel out of that area.

Be aware of all conditions that could adversely affect the stability of the crane.

Use caution when operating in the vicinity of overhanging banks and edges.

Wind and other factors such as boom length, boom angle, size and weight of load, etc. can affect crane stability and crane structures. If wind velocity exceeds 20 MPH (32 km/h), rated loads and boom lengths shall be appropriately reduced. Practical working loads for each particular job and lift shall be established by the user depending upon conditions that exist at the time a lift is being made. Appropriate capacity reductions shall be made whenever conditions indicate the possibility that a loss of crane stability or structural damage could occur.

LIFTING OPERATIONS

If the boom extension, jib, or auxiliary boom nose is to be used, ensure the electrical cable and the weight for the antitwo–block switch are properly installed and the LMI is programmed for the crane configuration. Refer to the LMI handbook supplied with the crane.

Before lifting, position the crane on a firm surface, properly extend and set the outriggers and level the crane.

If the boom extension or auxiliary boom nose is to be used, you must ensure that the cable for the LMI system is properly connected at the junction box located on the boom nose.

Depending on the nature of the supporting surface, adequate cribbing may be required to obtain a larger bearing surface.

DO NOT OVERLOAD THE CRANE by exceeding the capacities shown on the appropriate load chart. Death or serious injury could result from the crane tipping over or failing structurally from overload.

Do not rely on the crane's tipping to determine your lifting capacity.

If you should encounter a tipping condition, immediately lower the load with the hoist line and retract or elevate the boom to decrease the load radius. Never lower or extend the boom, this will aggravate the condition.

Be sure the load is properly rigged and attached. Always determine the weight of the load before you attempt to lift it and remember that all rigging (slings, etc.) and lifting devices (hook block, jib, etc.) must be considered part of the load.

Measure the load radius before making a lift and stay within approved lifting areas based on the range diagrams and working area diagrams on the crane's load chart.

Verify the crane's capacity by checking the load chart against the weight of the load then lift the load slightly at first to ensure stability before proceeding with the lift.

Always keep the load as near to the crane and as close to the ground as possible.

The crane can tip over or fail structurally if:

- the load and crane's configuration is not within the capacity as shown on the applicable load rating chart and notes,
- the ground is soft and/or the surface conditions are poor,
- outriggers are not properly extended and set. On models equipped with outriggers that can be pinned at the mid–extend position, the outriggers must also be pinned when operating from the mid–extend position.
- cribbing under the outrigger pads is inadequate,
- or the crane is improperly operated.

Wind and other factors such as boom length, boom angle, size and weight of load being lifted, etc. can affect crane stability and crane structures. Practical working loads for each particular job and lift shall be established by the user depending upon conditions that exist at the time a lift is being made. Appropriate capacity reductions shall be made whenever conditions indicate the possibility that a loss of crane stability or structural damage could occur. Be extremely cautious if wind velocity approaches 20 miles per hour.

The crane cab is equipped with a sight level bubble that should be used to determine whether the crane is level. The load line can also be used to estimate the levelness of the crane by checking to be sure it is in–line with the center of the boom at all points on the swing circle.

Use tag lines whenever possible to help control the movement of the load.

When lifting loads, the crane will lean toward the boom and the load will swing out, increasing the load radius. Ensure the load capacity chart is not exceeded when this occurs.

Be sure the hoist line is vertical before lifting. Do not subject the crane to side loading. A side load can tip the crane or cause it to fail structurally.

Do not strike any obstruction with the boom. If the boom should accidentally contact an object; stop immediately. Inspect the boom. Remove the crane from service if the boom is damaged.

Never push or pull with the crane boom.

Avoid sudden starts and stops when moving the load. The inertia and an increased load radius could tip the crane over or cause it to fail structurally.

Load chart capacities are based on freely suspended loads. Do not pull posts, pilings, or submerged articles. Be sure the load is not frozen or otherwise attached to the ground before lifting.

Use only one hoist at a time when lifting loads.

Always use enough parts–of–line to accommodate the load to be lifted. Lifting with too few parts–of–line can result in failure of the wire rope.

Never operate the crane with less than two wraps of wire rope on the hoist drum.

COUNTERWEIGHT

On cranes equipped with removable counterweights, ensure the appropriate counterweight sections are properly installed for the lift being considered.

Death or serious injury could result from being crushed by moving machinery. Clear all personnel from the counterweight and superstructure area before raising or lowering the counterweight or when rotating the superstructure.

To reduce the crushing hazard and to prevent death or serious injury, always clear all personnel from the counterweight area before moving the counterweight.

Federal law prohibits modification or additions which affect the capacity or safe operation of the equipment without the manufacturer's written approval. [29CFR 1926.550]

Do not add material to the counterweight to increase capacity.

MULTIPLE CRANE LIFTS

Multiple crane lifts are not recommended. Any lift that requires more that one crane must be precisely planed and coordinated by a qualified engineer. You, the operator, shall be responsible for assuring that one qualified signal person is used, communication between all parties is maintained, and load lines are kept directly over the attach points to avoid side loading and transfer of loading from one crane to another.

Use cranes and rigging of equal capabilities and use the same boom lengths.

Be certain of adequate lifting capacity. Calculate the amount of weight to be lifted by each crane and attach slings at the correct points for proper weight distribution.

DO NOT TRAVEL – Lift only from a stationary position.

If it is necessary to perform a multi–crane lift, the operator shall be responsible for assuring that the following minimum safety precautions are taken.

1. Secure the services of a qualified engineer to direct the operation.

2. Use one signal person and be sure he is qualified.

3. Coordinate lifting plans with the operator, engineer and signal person prior to beginning the lift.

4. Use cranes and rigging of equal capabilities and use the same boom length. Be certain cranes are of adequate lifting capacity.

5. Use outriggers on cranes so equipped.

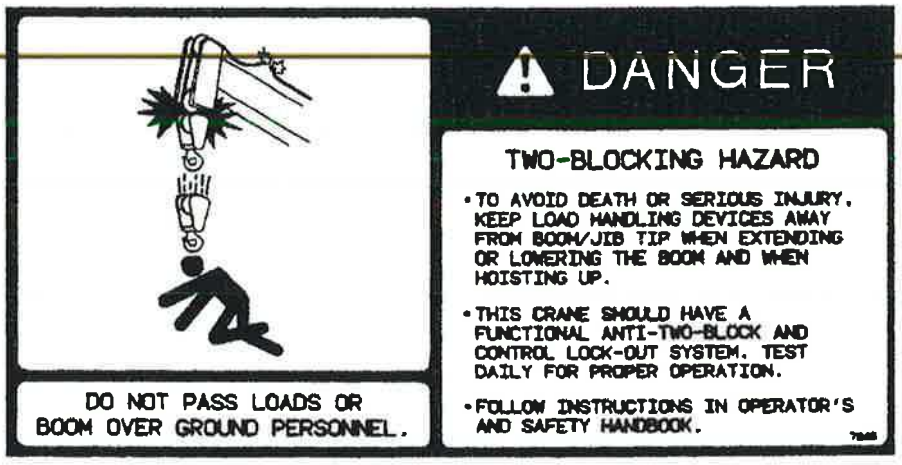
6. Calculate the amount of weight to be lifted by each crane and attach slings at the correct points for proper weight distribution.

7. Lift only from a stationary position – DO NOT TRAVEL.

8. If possible, provide approved radio equipment for voice communication between all parties engaged in the lift.

9. Ensure the load lines are directly over the attach points to avoid side loading the cranes.

TWO–BLOCKING



To avoid death or serious injury, keep load handling devices away from boom/jib tip when extending or lowering the boom and when hoisting up.

This crane should have a functional ANTI–TWO–BLOCK and CONTROL LOCK– OUT system. Test daily for proper operation.

Do not pass loads or boom over ground personnel.

Two–blocking occurs whenever the load block (hook block, headache ball, rigging, etc.) comes into physical contact with the boom (boom nose, sheaves, jib, etc.). Two–blocking can cause hoist lines (wire rope) rigging, reeving, and other components to become highly stressed and overloaded in which case the wire rope may fail allowing the load, block, etc. to free fall.

Two–blocking is more likely to occur when both the main and auxiliary hoist lines are reeved over the main boom nose and boom extension/jib nose respectively. An operator, concentrating on the specific line being used, may telescope or lower the boom allowing the other hoist line attachment to contact the boom or boom extension/jib nose, thus causing damage to the sheaves, or causing the wire rope to fail, dropping the lifting device to the ground and possibly injuring personnel working below.

Caution must be used when lowering or extending the boom. Let out load line(s) simultaneously to prevent two–blocking the boom tip(s) and the hook block, etc. The closer the load is carried to the boom nose the more important it becomes to simultaneously let out wire rope as the boom is lowered. Keep load handling devices a minimum of 18 inches (45.7 cm) below the boom nose at all times.

Two–blocking can be prevented. Operator awareness of the hazards of two–blocking is the most important factor in preventing this condition. An anti two–block system is intended to assist the operator in preventing dangerous two–block conditions. It is not a replacement for operator awareness and competence.

Barricade the area where the crane is working and keep all unnecessary personnel out of that area. DO NOT allow personnel to be under the load or boom.

Never pass loads, load handling devices or the crane boom over people on the ground.

Never operate the crane with less than two wraps of wire rope on the hoist drum.

Never interfere with the proper functioning of operational aids or warning devices.

LOAD MOMENT INDICATING SYSTEMS

Electronic equipment on this crane is intended as an aid to the operator.

Under NO CONDITION should it be relied upon to replace the use of capacity charts and operating instructions. Sole reliance upon these electronic aids in place of good operating practices can cause an accident.

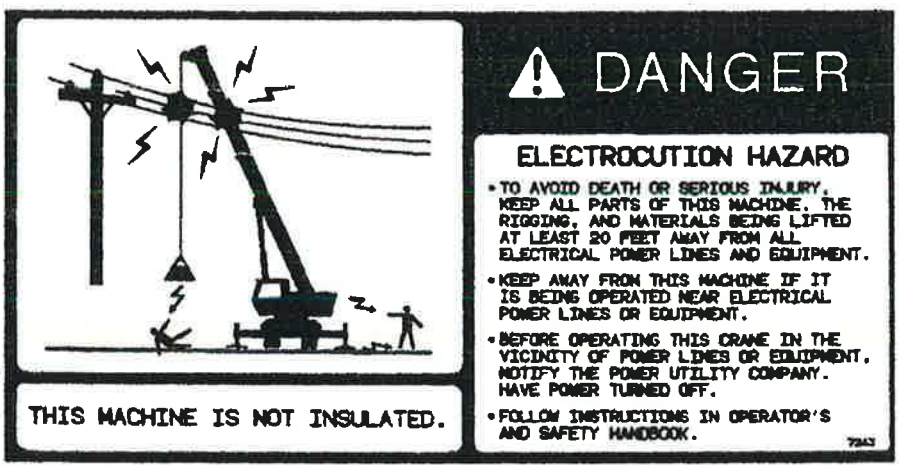
Know the weight of all loads and always check the capacity of the crane as shown on the load chart before making any lifts.

NEVER exceed the rated capacity shown on the load chart. Always check the load chart to ensure the load to be lifted at the desired radius is within the rated capacity of the crane.

Never interfere with the proper functioning of operational aids or warning devices.

For detailed information concerning the operation and maintenance of the load moment indicating system installed on the crane see the manufacturer's manual supplied with the crane.

ELECTROCUTION HAZARD



To avoid death or serious injury, keep all parts of this machine, the rigging, and materials being lifted at least twenty (20) feet away from all electrical power lines and equipment.

Keep all personnel away from this machine if it is being operated near electrical power lines or equipment.

Before operating this 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.

This machine is NOT INSULATED. Always consider all parts of the load and the crane, including the wire rope, hoist cable, pendant cables and tag lines, as conductors.

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 handbook must be followed at all times, even if the electrical power lines or equipment have been de–energized.

Crane operation is dangerous when close to an energized electrical power source. Exercise extreme caution and prudent judgement. Operate slowly and cautiously when in the vicinity of power lines.

If the load, wire rope, crane 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.

You, the operator, are responsible for alerting all personnel of 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, tag lines or rigging gear.

Even if the crane operator is not affected by an electrical contact, others in the area may become seriously injured or killed.

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.

Thoroughly read, understand and abide by all applicable federal, state and local regulations.

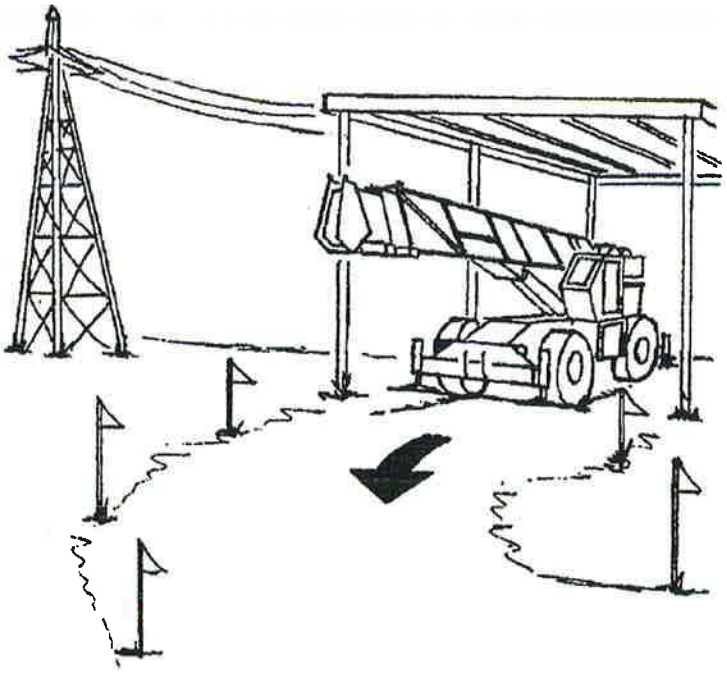
Federal law prohibits the use of cranes closer than 10 feet (3.05 m) to power sources up to 50,000 volts and greater distances for higher voltages. [29CFR1910.180 and 29CFR1926.550] Grove recommends keeping cranes twice the minimum distance (e.g., 20 FEET (6.10 m)) as specified by US Department of Labor – Occupational Safety and Health Administration (OSHA) standards.

SET–UP AND OPERATION

During crane use, assume that every line is energized ("hot" or "live") and take the necessary precautions.

Set–up the crane in a position such that the load, boom or any part of the crane and its attachments cannot be moved to within 20 FEET of electrical power lines or equipment. This includes the crane boom (fully extended to maximum height, radius and length) and all attachments (jibs, boom extensions, rigging, loads, etc.). Overhead lines tend to blow in the wind so allow for lines' movement when determining safe operating distance.

A suitable barricade should be erected to physically restrain the crane and all attachments (including the load) from entering into an unsafe distance from electrical power lines or equipment.



Plan ahead and always plan a safe route before traveling under power lines. Rider poles should be erected on each side of a crossing to assure sufficient clearance is maintained.

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.

Tag lines should always be made of non–conductive materials. Any tag line that is wet or dirty can conduct electricity.

DO NOT store materials under power lines or close to electrical power sources.

ELECTROCUTION HAZARD DEVICES

The use of insulated links, insulated boom cages/guards, proximity warning devices, or mechanical limit stops does not assure that electrical contact will not occur. Even if codes or regulations require the use of such devices, failure to follow the rules listed here may result in serious injury or death. You should be aware that such devices have limitations and you should follow the rules and precautions outlined in this handbook at all times even if the crane is equipped with these devices.

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.

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.

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.

Proximity sensing and warning devices are available in different types. Some use boom nose (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. Much reliance is placed upon you, the operator, in selecting and properly setting the sensitivity of these devices.

Never rely solely on a device to protect you and your fellow workers from danger.

Some variables you must know and understand are:

- Proximity devices are supposed to detect the existence of electricity and not its quantity or magnitude.
- Some proximity devices will 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.

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 should come in contact with an energized power source, you must:

1. Stay in the crane cab. DON'T PANIC.

2. Immediately warn personnel in the vicinity to stay away.

3. Attempt to move the crane away from the contacted power source using the crane's controls which are likely to remain functional.

4. Stay in the crane until the power company has been contacted and the power source has been de–energized. NO ONE must attempt to come close to the crane or load until the power has been turned–off.

Only as a last resort should an operator attempt to leave the crane upon contacting a power source. If it is absolutely necessary to leave the operator station, JUMP COMPLETELY CLEAR OF THE CRANE. DO NOT STEP OFF. Hop away with both feet together. DO NOT walk or run.

Following any contact with an energized electrical source the local, authorized Grove Worldwide distributor must be immediately advised of the incident and consulted on necessary inspections and repairs. Thoroughly inspect the wire rope and all points of contact on the crane. Should the distributor not be immediately available, contact Grove Worldwide Product Support. 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 Grove Worldwide or your local Grove Worldwide distributor.

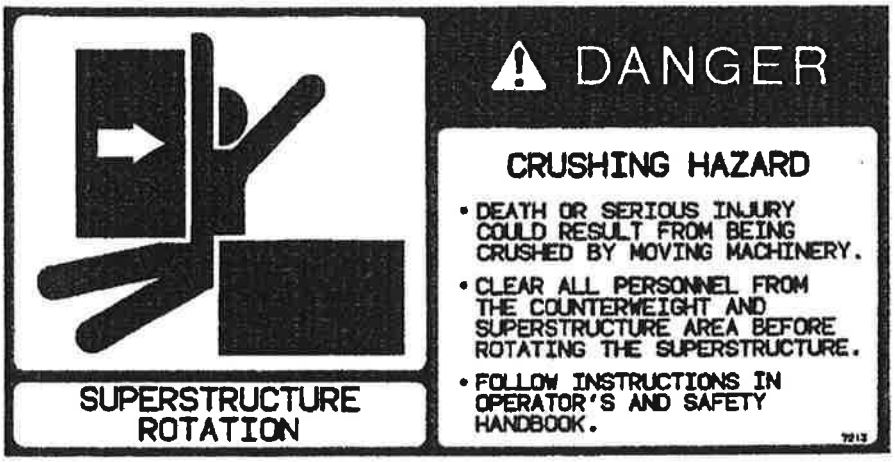
SPECIAL OPERATING CONDITIONS AND EQUIPMENT

Never operate the crane during an electrical thunderstorm.

Working in the vicinity of radio frequency transmission towers and other transmission sources may cause a crane to become "electrically charged".

When operating cranes equipped with electromagnets you must take additional precautions. Permit no one to touch the magnet or load. Alert personnel by sounding a warning signal when moving a load. Do not allow the cover of the electromagnet power supply to be open during operation or at any time the electrical system is activated. Shut down the crane completely and open the magnet controls switch prior to connecting or disconnecting magnet leads. Use only a non–conductive device when positioning a load. Lower the magnet to the stowing area and shut off power before leaving the operator's cab.

CRUSHING HAZARDS



Death or serious injury could result from being crushed by moving machinery.

Clear all personnel from the counterweight and superstructure area before removing the counterweight or rotating the superstructure.

Barricade the entire area where the crane is working and keep all unnecessary personnel out of the work area.

Never allow anyone to stand or work on or near the superstructure while the crane is in operation. Always barricade the tail–swing of the rotating superstructure.

Before actuating swing or any other crane function, sound the horn and verify that all personnel are clear of rotating and moving parts.

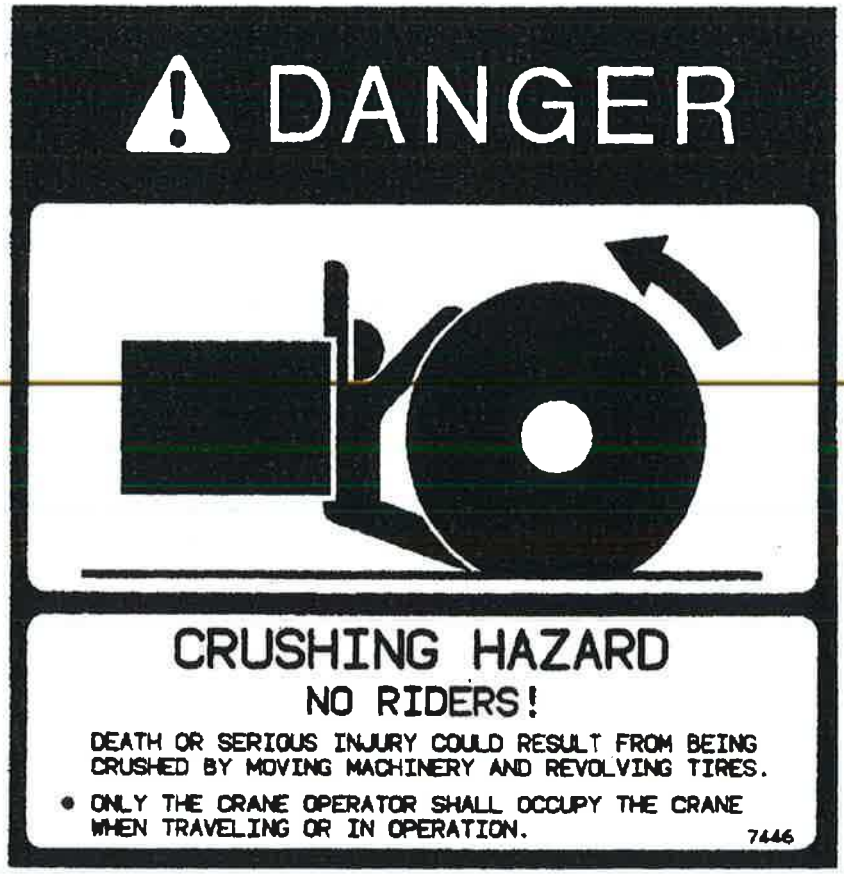
Watch the path of the boom and load when swinging. Avoid lowering or swinging the boom and load into ground personnel, equipment or other objects.

Always be aware of your working environment during operation of the crane. Avoid contacting any part of the crane with external objects.

You must always be aware of everything around the crane while lifting or traveling. If you are unable to clearly see in the direction of motion, you must post a look–out or signal person before moving the crane or making a lift. Sound the horn to warn personnel.

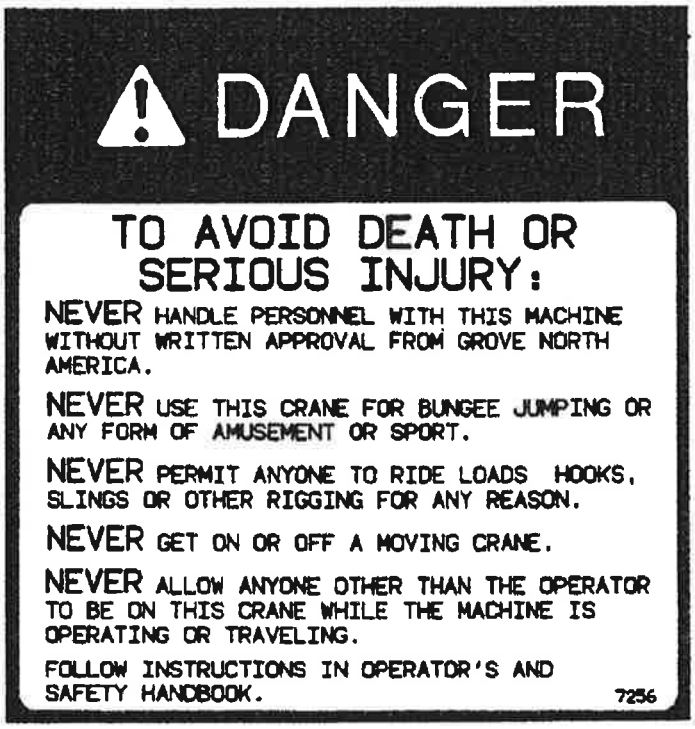
Death or serious injury could result from being crushed by moving machinery.

Clear all personnel from the outrigger area before extending or retracting the outriggers.



Death or serious injury could result from being crushed by moving machinery and revolving tires.

PERSONNEL HANDLING



To avoid death or serious injury: NEVER handle personnel with this machine without written approval from Grove North America. NEVER use this crane for bungee jumping or any form of amusement or sport. NEVER permit anyone to ride loads, hooks, slings or other rigging for any reason. NEVER get on or off a moving crane. NEVER allow anyone other than the operator to be on this crane while the machine is operating or traveling.

It is against federal law (OSHA – 29CFR1926.550(g)) to use a crane to handle personnel unless there is no less hazardous means to perform the work that needs to be done.

If you wish to use a Grove crane to handle personnel, you must contact your local, authorized Grove Worldwide distributor for further information on how to obtain Grove Worldwide's approval for your particular crane and application.

TRAVEL OPERATION

Strictly adhere to the guidelines and restrictions in the load chart for pick and carry operations.

Check load limit of bridges. Before traveling across bridges, ensure they will carry a load greater than the crane's weight.

Watch clearances when traveling. Do not take a chance of running into overhead or side obstructions.

When moving in tight quarters, post a look-out to help guard against collisions or bumping structures.

Never back up without the aid of a signalman to verify the area behind the crane is clear of obstructions and/or personnel.

When traveling, the boom should be completely retracted and lowered to the travel position.

If equipped with HI-SPEED GLIDE, follow instructions and conditions in Section 4 of this handbook. Never engage the HI-SPEED GLIDE system with a load on the hook.

On cranes equipped with air operated brakes, do not attempt to move the crane until brake system air pressure is at operating level.

Secure the hook block and other items before moving the crane.

When traveling, keep the lights on, use traffic warning flags and signs, and use front and rear flag vehicles. Check state and local restrictions and regulations.

Drive carefully and avoid speeding.

Before traveling a crane, check suitability of proposed route with regard to crane height, width, and length.

Secure the turntable before moving crane, use the swing lock.

Stay alert at the wheel.

When parking on a grade, apply the parking brake and chock the wheels.

When shutting down the crane adhere to the following:

- engage the parking brakes
- lower the boom and the load
- place the controls in neutral
- chock the wheels
- ensure the swing lock is engaged
- remove the ignition key
- lock the machine and install vandal guards, if used.

MAINTENANCE

The crane must be inspected prior to use on each work shift. The owner, user and operator must ensure that routine maintenance and lubrication are being dutifully performed. NEVER operate a damaged or poorly maintained crane.

Keep the crane properly maintained and adjusted at all times. Shut down the crane while making repairs or adjustments.

Always perform a function check after repairs have been made to ensure proper operation. Load tests should be performed when structural or lifting members are involved.

Follow all applicable safety precautions in this handbook when performing crane maintenance as well as crane operations.

Before crane use:

- Conduct a visual inspection for cracked welds, damaged components, loose pin/bolt, and wire connections. Any item or component that is found to be loose or damaged (broken, chipped, cracked, worn–through, etc.) must be repaired or replaced.
- Check for proper functioning of all controls and operator aids (e.g. LMI).
- Check all braking (e.g. wheel, hoist and swing brakes) and holding devices before operation.

Keep the crane clean at all times, free of mud, dirt and grease. Dirty equipment introduces hazards, wears–out faster and makes proper maintenance difficult. Cleaning solutions used should be appropriate for the job and non–flammable/toxic.

ROUTINE MAINTENANCE and INSPECTION of this crane must be performed by a qualified person(s) according to the recommendations in the Grove Worldwide Crane Maintenance and Inspection Manual. Any questions regarding procedures and specifications should be directed to the your local, authorized Grove Worldwide Distributor.

SERVICE AND REPAIRS

Service and repairs to the crane must only be performed by a qualified person. All service and repairs must be performed in accordance with manufacturer's recommendations, this handbook and the Service Manual for this machine. All replacement parts must be Grove approved.

Any modification, alteration or change to a crane which affects its original design and is not authorized and approved by Grove Worldwide is STRICTLY PROHIBITED. Such action invalidates all warranties and makes the owner/user liable for any resultant accidents.

Before performing any maintenance, service or repairs on the crane:

- The boom should be fully retracted and lowered and the load placed on the ground.
- Stop the engine and disconnect the battery.
- Controls should be properly tagged. Never operate the crane if it is TAGGED–OUT nor attempt to do so until it is restored to proper operating condition and all tags have been removed by the person(s) who installed them.

Recognize and avoid pinch–points while performing maintenance. Stay clear of sheave wheels, holes, and lattice work in crane booms.

After maintenance or repairs:

- Replace all guards and covers that had been removed.
- Remove all tags, connect the battery and perform a function check of all operating controls.
- Load tests must be performed when a structural or lifting member is involved in a repair.

LUBRICATION

The crane must be lubricated according to the factory recommendations for lubrication points, time intervals and types. Lubricate at more frequent intervals when working under severe conditions.

Exercise care when servicing the hydraulic system of the crane, as pressurized hydraulic oil can cause serious injury. The following precautions must be taken when servicing the hydraulic system:

1. Follow the manufacturer's recommendations when adding oil to the system. Mixing the wrong fluids could destroy seals, causing machine failure.

2. Be certain all lines, components and fittings are tight before resuming operation.

3. When checking for suspected leaks, use a piece of wood or cardboard and wear appropriate personal protective equipment.

4. Never exceed the manufacturers recommended relief valve settings.

TIRES

Inspect the tires for nicks, cuts, imbedded material and abnormal wear.

Ensure all lug nuts are properly torqued.

Ensure pneumatic tires are inflated to the proper pressure (Refer to the Tire Inflation Decal on the crane). When inflating tires, use a tire gauge, clip–on inflator, and extension hose which will permit standing clear of the tire while inflating.

WIRE ROPE

Use ONLY the wire rope specified by Grove as indicated on the crane's load capacity chart. Substitution of an alternate wire rope may require the use of a different permissible line pull and, therefore, require different reeving.

Always make daily inspections of the wire rope, keeping in mind that all wire rope will eventually deteriorate to a point where it is no longer usable. Wire rope shall be taken out of service when any of the following conditions exist:

1. For rotation resistant running ropes – more than two (2) broken wires in a length of rope equal to six(6) times the rope diameter, or more than four (4) broken wires in a length of rope equal to thirty (30) times the rope diameter.

2. For running ropes other than rotation resistant – six (6) broken wires in one rope lay or three (3) broken wires in one strand.

3. One valley break where the wire fractures between strands in a running rope is cause for removal.

4. Abrasion of the rope resulting in wear of the individual outside wires of 1/3 of the original wire diameter.

5. Any kinking, bird caging, crushing, corrosion or other damage resulting in distortion of the rope structure.

6. Rope that has been in contact with a live power line or been used as a ground in an electric circuit (eg. welding) may have wires that are fused or annealed and must be removed from service.

7. In standing ropes, more than three (3) breaks in one rope lay in sections beyond the end connection or more than two (2) broken wires at an end connection.

8. Core deterioration is usually observed as a rapid reduction in rope diameter and is cause for immediate removal of the rope.

Refuse to work with worn or damaged wire rope.

When installing and inspecting wire ropes and attachments keep all parts of your body and clothing away from rotating hoist drums and all rotating sheaves.

Never handle the wire rope with bare hands.

Periodic rope inspection records are required by law. Make sure these records have been reviewed and are up to date.

When installing a new rope –

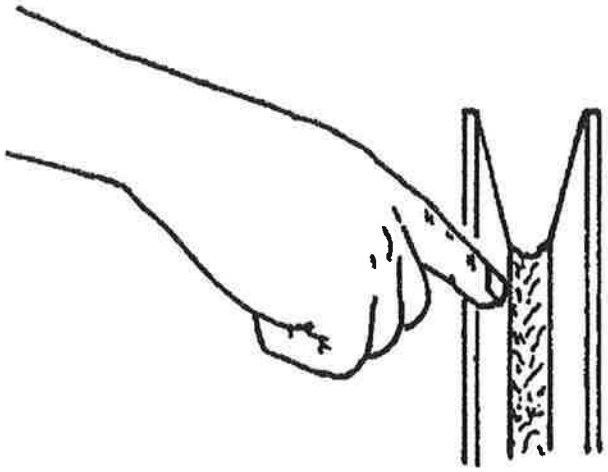
- Follow proper instructions for removing rope from a reel.
- Apply back tension to the storage/payoff reel of the new rope to insure tight, even spooling onto the hoist drum.
- Operate the new rope, first through several cycles at light load and then through several cycles at intermediate load to allow the rope to adjust to operating conditions.

When using a wedge socket –

- Always inspect socket, wedge and pin for correct size and condition.
- Do not use parts that are damaged, cracked or modified.
- Assemble the wedge socket with live end of rope aligned with the centerline of pin and assure proper length of tail (dead end) protrudes beyond the socket.

Never overload or shock load a wire rope.

Lubricate the wire rope periodically as the lubricant becomes depleted.



Inspect the boom nose and Hook block sheaves for wear. Damaged sheaves cause rapid deterioration of wire rope.

The use of nylon (nylatron) sheaves, as compared with metallic sheaves, may change the replacement criteria of rotation resistant wire rope.

The use of cast nylon (nylatron) sheaves, as compared with steel sheaves,will substantially increase the service life of wire rope. However, conventional rope retirement criteria based only upon visible wire breaks may prove inadequate in predicting rope failure. The user of cast nylon sheaves is therefore cautioned that a retirement criteria should be established based upon the user's experience and the demands of his application.

BATTERIES

Battery electrolyte must not be allowed to contact the skin or eyes. If this occurs, flush the contacted area with water and consult a doctor immediately.

When checking and maintaining batteries exercise the following procedures and precautions:

- Disconnect the batteries.
- Wear safety glasses when servicing batteries.
- Do not short across the battery posts to check charge. Short circuit, spark or flame could cause battery explosion.
- Maintain battery electrolyte at the proper level. Check the electrolyte with a flashlight.

- Check battery test indicator on maintenance–free batteries.
- Do not break a live circuit at the battery terminal. Disconnect the ground battery cable first when removing a battery and connect it last when installing a battery.
- Check battery condition only with proper test equipment. Batteries shall not be charged except in an open, well ventilated area free of flame, smoking, sparks and fire.

ENGINE

Be careful when checking the engine coolant level. The fluid may be hot and under pressure. Shut down the engine and allow the radiator time to cool before removing the radiator cap.

Shut–down the engine and disconnect the battery before performing maintenance. If unable to do so for the task required, keep hands clear of the engine fan and other moving parts while performing maintenance.

Be careful of hot surfaces and hot fluids when performing maintenance on or around the engine.

WORK PRACTICES

CRANE ACCESS

You must take every precaution to ensure you do not slip and/or fall off the crane. Falling from any elevation could result in serious injury or death.

Never exit or enter the crane cab or deck by any other means than the access system(s) provided (i.e., steps and grab handles).

If necessary, use a ladder or aerial work platform to access the boom nose.

Do not step on surfaces on the crane that are not approved or suitable for walking and working. All walking and working surfaces on the crane should be clean, dry, slip–resistant, and have adequate supporting capacity. Do not walk on a surface if slip–resistant material is missing or excessively worn.

Do not use the top of the boom as a walkway.

Do not step on the outrigger beams or outrigger pads (floats) to enter or exit the crane.

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 crane superstructure. Excessive dirt and debris on the hand–holds, access steps or walking/working surfaces could cause a slipping accident. 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 Grove Worldwide.

JOB PREPARATION

You must inspect the crane prior to your work shift; checking for cracked welds, damaged components, and evidence of improper maintenance (consult Maintenance–Inspection and Service manuals).

You must ensure that the crane is properly equipped including access steps, covers, doors, guards and controls.

You must ensure that the outriggers are properly extended and set before performing any lifting operations. On models equipped with outriggers that can be pinned at the mid–extend position, the outriggers must also be pinned when operating from the mid–extend position.

Wear appropriate clothing and personal protective equipment whether or not required by local or job regulations. Be prepared for the work day.

Before entering the cab, you must be THOROUGHLY familiar with the planned route of travel and area of operation, including surface conditions and the presence of over–head obstructions and power lines.

Always keep the crane clean, free of dirt, debris and grease.

Fuel the crane ONLY with the engine turned–off. Do not smoke while fueling the crane. Do not store flammable materials on the crane or in the operator's cab.

Follow standard safety precautions when refueling. FUEL IT SAFELY.

Be familiar with the location and use of the nearest fire extinguisher.

Cold weather requires special starting procedures, use of built– in starting aids, if provided, and ample time for hydraulic oil to warm–up. Keep the crane free of ice and snow.

WORKING

Never operate the crane when darkness, fog or other visibility restrictions make operation unsafe. Never operate a crane in thunderstorms or high winds.

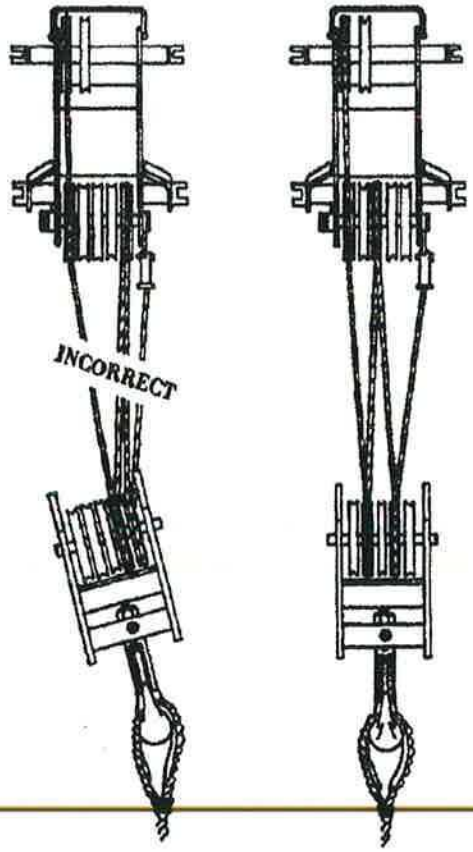
Keep unauthorized personnel clear of the working area during operation.

Operate the crane only from the operator's seat. Do not reach in a window or door to operate any controls.

Operate the crane slowly and cautiously, looking carefully in the direction of movement.

"Stunt" driving and "horse–play" is strictly prohibited. Never allow anyone to hitch a ride or get on or off a moving crane.

A good practice is to make a "dry run" without a load before making the first lift. Become familiar with all factors peculiar to the job site.



Ensure the wire rope is properly routed on the hook block and boom nose and that all rope guards are in place.

USE ENOUGH PARTS OF LINE FOR HEAVY LIFTS AND CHECK ALL LINES, SLINGS, AND CHAINS FOR CORRECT ATTACHMENT. To obtain maximum lifting capacities the hook block must be set up with enough parts of line. NO LESS THAN TWO WRAPS of wire rope should remain on the hoist drum. When slings, ties, hooks, etc., are used, make certain they are correctly positioned and secured before raising or lowering the loads.

Be sure the rigging is adequate before lifting and use tag lines when possible to position and restrain loads. Personnel using tag lines should be on the ground.

Be sure good rigging practices are being used. Refuse to use any poorly maintained or damaged equipment. Never wrap the hoist cable around a load.

LIFTING

Operate the crane at or near governed RPM during all lifting operations.

Check the hoist brake by raising the load a few inches, stopping the hoist and holding the load. Be sure the hoist brake is working correctly before continuing the lift.

When lowering a load always slow down the load's descent before stopping the hoist. Do not attempt to change speeds on multiple speed hoists while the hoist is in motion.

LIFT ONE LOAD AT A TIME. Do not lift two or more separately rigged loads at one time, even if the loads are within the crane's rated capacity.

Never leave the crane with a load suspended. Should it become necessary to leave the crane, lower the load to the ground and stop the engine before leaving the cab.

Remember – all rigging equipment must be considered as part of the load. Lifting capacities vary with working areas. Permissible working areas are posted in the crane cab. When swinging from one working area to another, ensure load chart capacities are not exceeded. Know your crane!

Never swing or lower the boom into the carrier cab.

Stop the hook block from swinging when unhooking a load.

Swinging rapidly can cause the load to swing out and increase the load radius. Swing the load slowly. Swing with caution and keep the load lines vertical.

Look before swinging your crane. Even though the original set–up may have been checked, situations do change.

Keep everyone away from suspended loads. Allow no one to walk under a load. Ensure that all slings, ties, and hooks are correctly placed and secured before raising or lowering the load.

Use tag lines, as appropriate, for positioning and restraining loads. Check the load slings before lifting.

Be sure everyone is clear of the crane and work area before making any lifts.

Never swing over personnel, regardless of whether load is suspended from or attached to the boom.

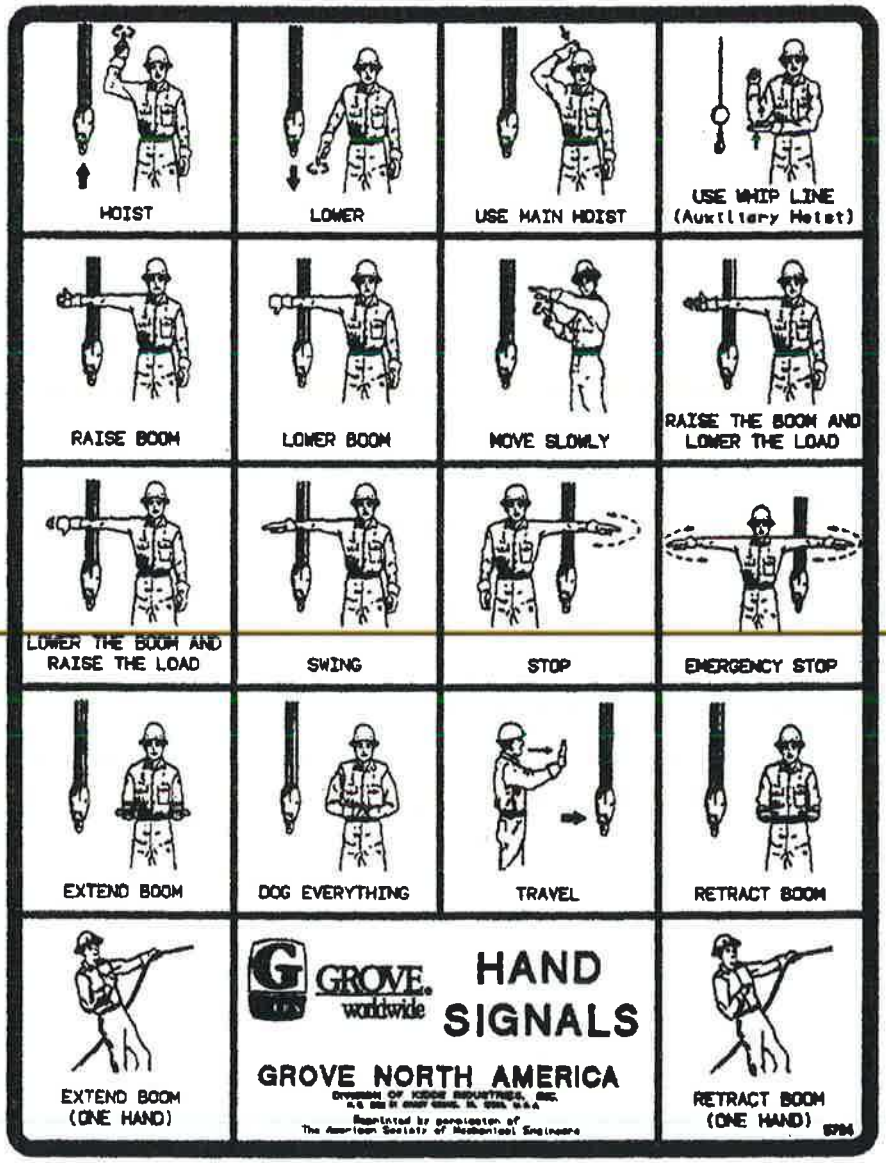
Be sure the load is well secured and attached to the hook with rigging of proper size and in good condition.

Use only slings or other rigging devices rated for the job and use them properly. Never wrap the hoist cable around a load.

Check all tackle, hardware, and slings before use. Refuse to use faulty equipment.

Never work the crane when darkness, fog, or other visibility restrictions make such operations unsafe.

HAND SIGNALS



A qualified signal person shall be used at all times when;

- working in the vicinity of power lines;
- the crane operator cannot clearly see the load at all times;
- moving the crane in an area or direction in which the operator cannot clearly see the path of travel.

At all times use standardized hand signals previously agreed upon and completely understood by the operator and signal person.

If communication with the signal person is lost, crane movement must be stopped until communications are restored.

Keep your attention focused on the crane's operation. If for some reason you must look in another direction, stop all crane movement first.

When vision is obscured, use and follow the directions of a single qualified signal person.

Obey a signal to stop from anyone.

TRANSPORTING THE CRANE

When loading or unloading the crane on a trailer or railroad car, use a ramp capable of supporting the weight of the crane.

Ensure the crane is adequately secured to the transporting vehicle.

If it is necessary to take the crane on a road or highway, first check state and local restrictions and regulations.

Check load limits of bridges on the travel route and ensure they are greater than the combined weight of the crane and transporting vehicle.

Always drive the crane carefully, obeying speed limits and highway regulations. Keep lights on, use traffic warning flags and signs, and use front and rear flag vehicles as applicable.

SHUT-DOWN

Never leave the crane with a load suspended. Lower the load to the ground before shutting down the crane.

Use the following steps when shutting down the crane:

- Engage the parking brake.
- Fully retract and lower the boom.
- Engage the swing lock.
- Place controls in neutral position.
- Shut down the engine & remove the ignition key.
- Lock the operator's cab.

In cold weather, never park the crane where the tires can become frozen to the ground.

BOOM EXTENSION/JIB

To avoid death or serious injury, follow proper procedures during erection, stowage and use of the boom extension/jib.

Install and secure all pins properly.

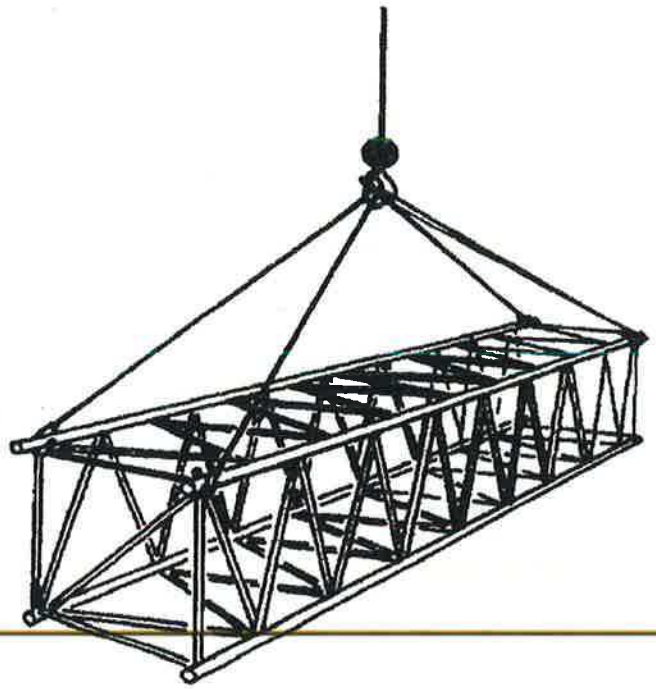
Control movement of boom extension/jib at all times.

Do not remove right side boom nose pins unless boom extension is properly pinned and secured on front and/or rear stowage brackets.

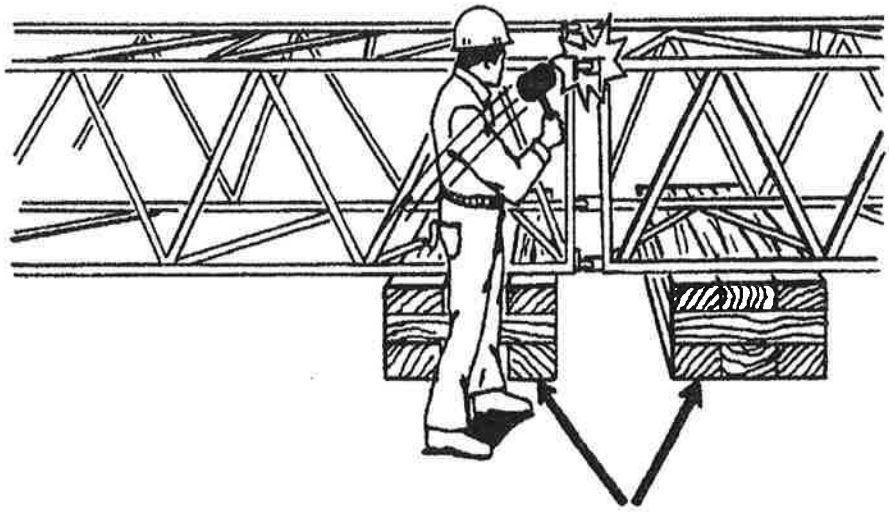
Do not remove all the pins from both front and rear stowage brackets unless the boom extension is pinned to the right side of the boom nose.

See the appropriate section of this handbook for the proper boom extension/jib erection and stowage procedure.

Properly inspect maintain and adjust boom extension/jib and mounting.



Sling jib sections from the main chords or the end fittings.



When assembling and disassembling jib sections, use blocking to adequately support each section and to provide proper alignment.

Stay outside of jib sections and lattice work.

Watch for falling or flying pins when they are being removed.

COLD WEATHER OPERATION

Cold weather operation requires additional caution on the part of the operator.

Check operating procedures for cold weather starting.

Don't touch metal surfaces that could freeze you to them.

Clean the crane of all ice and snow.

Allow ample time for hydraulic oil to warm up.

In freezing weather, park the crane in an area where it cannot become frozen to the ground. The drive line can be damaged when attempting to free a frozen crane.

In freezing weather, frequently check all air tanks for water.

Always handle propane tanks according to the supplier's instructions.

Never store flammable materials on the crane.

If cold weather starting aids are provided on your crane, use them. The use of aerosol spray or other types of starting fluids containing ether/volatiles can cause explosions or fire.

Section 3
CAB CONTROLS AND INDICATORS

NOTE

The following paragraphs describe all the available (standard and optional; some machines may not be equipped with the optional controls shown) controls and indicators located in the cab. The numbers in ( ) represent the index number from the figure titled Cab Control and Indicators.

ENGINE CONTROLS AND INDICATORS

HAND THROTTLE LOCK CONTROL

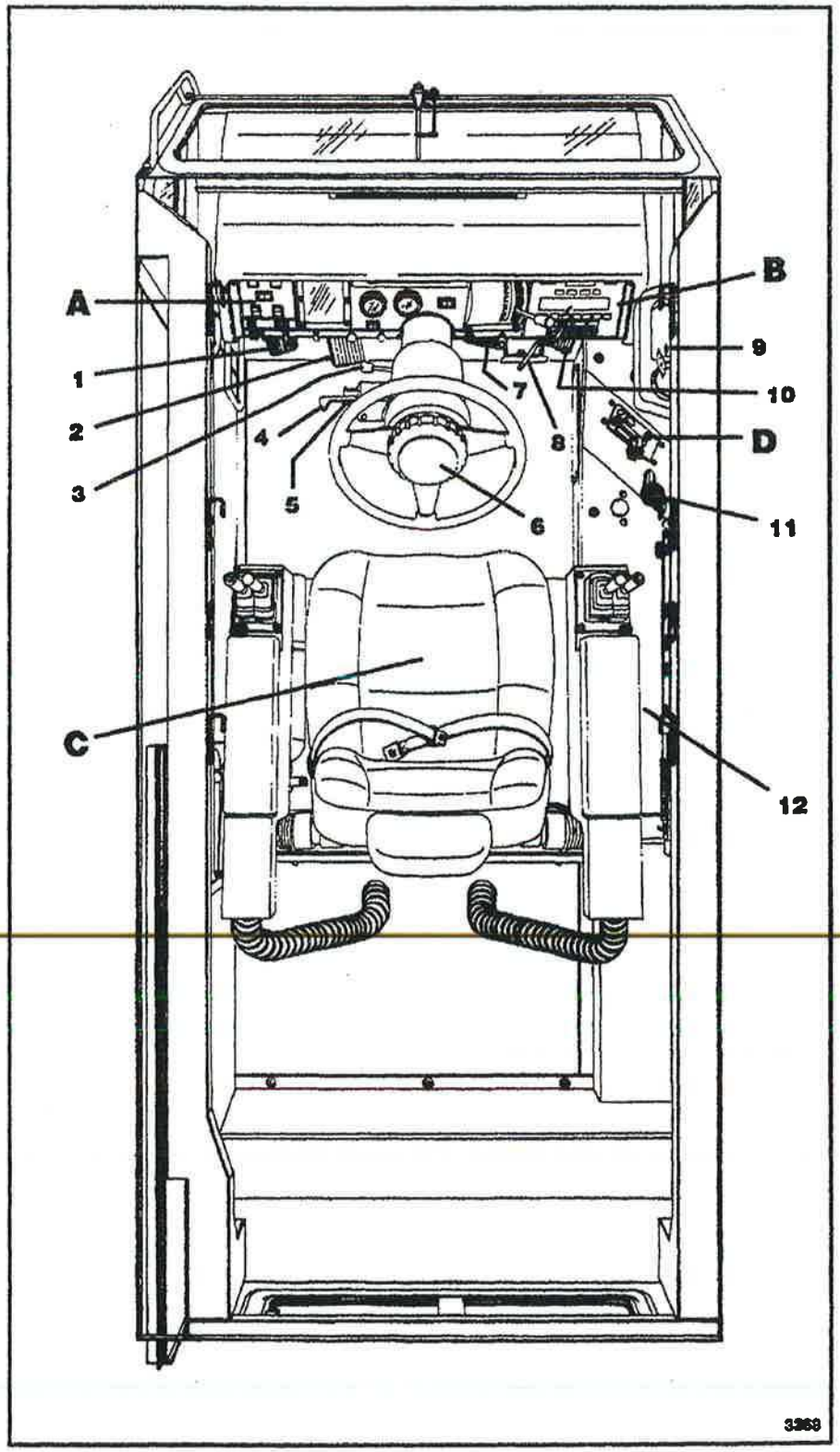
The THROTTLE lock control (19) is located on the right side console. The throttle lock is mechanically connected to the foot throttle and provides the operator with a means of maintaining specified engine rpm for crane operation. To use the throttle lock, depress the foot throttle to obtain the desired engine rpm, push the button on the throttle lock control knob and pull out on the knob. When pressure is felt, release the button and turn the collar in a clockwise direction to lock the throttle at the desired rpm. To release the throttle, rotate the collar counterclockwise, depress the button and push in on the cable.

ENGINE OIL PRESSURE GAUGE

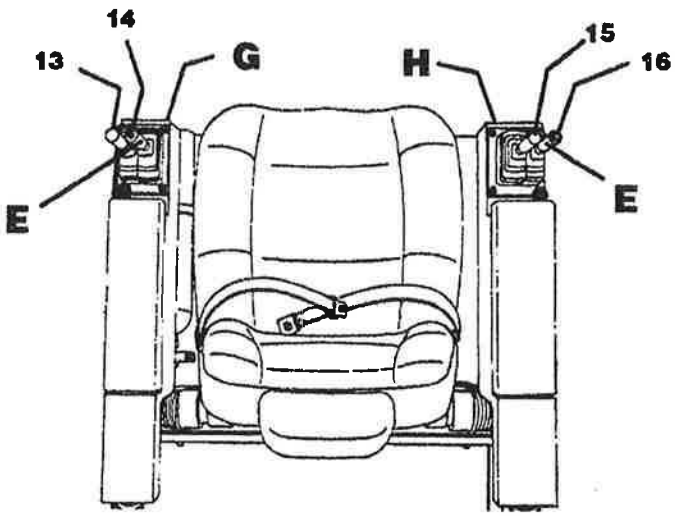
The engine oil pressure (OIL PRESS) gauge (46) is located on the gauge cluster at the left side of the front console. The gauge indicates the engine oil pressure on the dual scale calibrated from zero (0) to 100 psi and zero (0) to 690 kPa. It receives a signal from an oil pressure sending unit on the engine.

TRANSMISSION OIL TEMPERATURE GAUGE

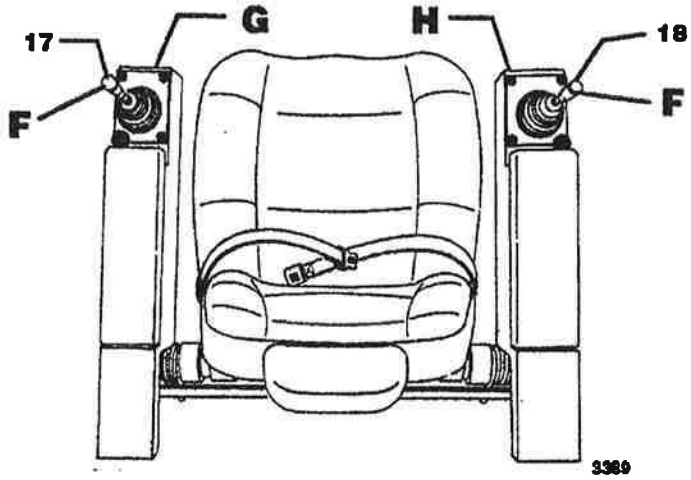
The transmission oil temperature (OIL TEMP) gauge (43) is located near the center of the front console. The gauge indicates the temperature of the transmission oil on a dual scale calibrated from 140 to 320 degrees F and 60 to 160 degrees C. The gauge receives a signal from a temperature sending unit in the oil line at the torque converter.



Cab Controls and Indicators (Sheet 1 of 9)



CAB WITH SINGLE AXIS CONTROLLERS



CAB WITH DUAL AXIS CONTROLLERS

DETAIL C

1. Swing Brake Pedal
2. Telescope Control Pedal
3. Steering Column Tilt Lever
4. Turn Signal Lever
5. Four–Way Flasher Switch
6. Horn
7. Brake Foot Pedal
8. Ash Tray
9. Cup Holder
10. Foot Throttle Pedal
11. Swing Lock Control (Pin Type)
12. Swing Lock Control (Positive Type)
13. Swing Control Lever
14. Telescope or Auxiliary Hoist Control Lever
15. Lift Control Lever
16. Main Hoist Control Lever
17. Swing and Telescope or Auxiliary Hoist Control Lever
18. Boom Lift and Main Hoist Control Lever

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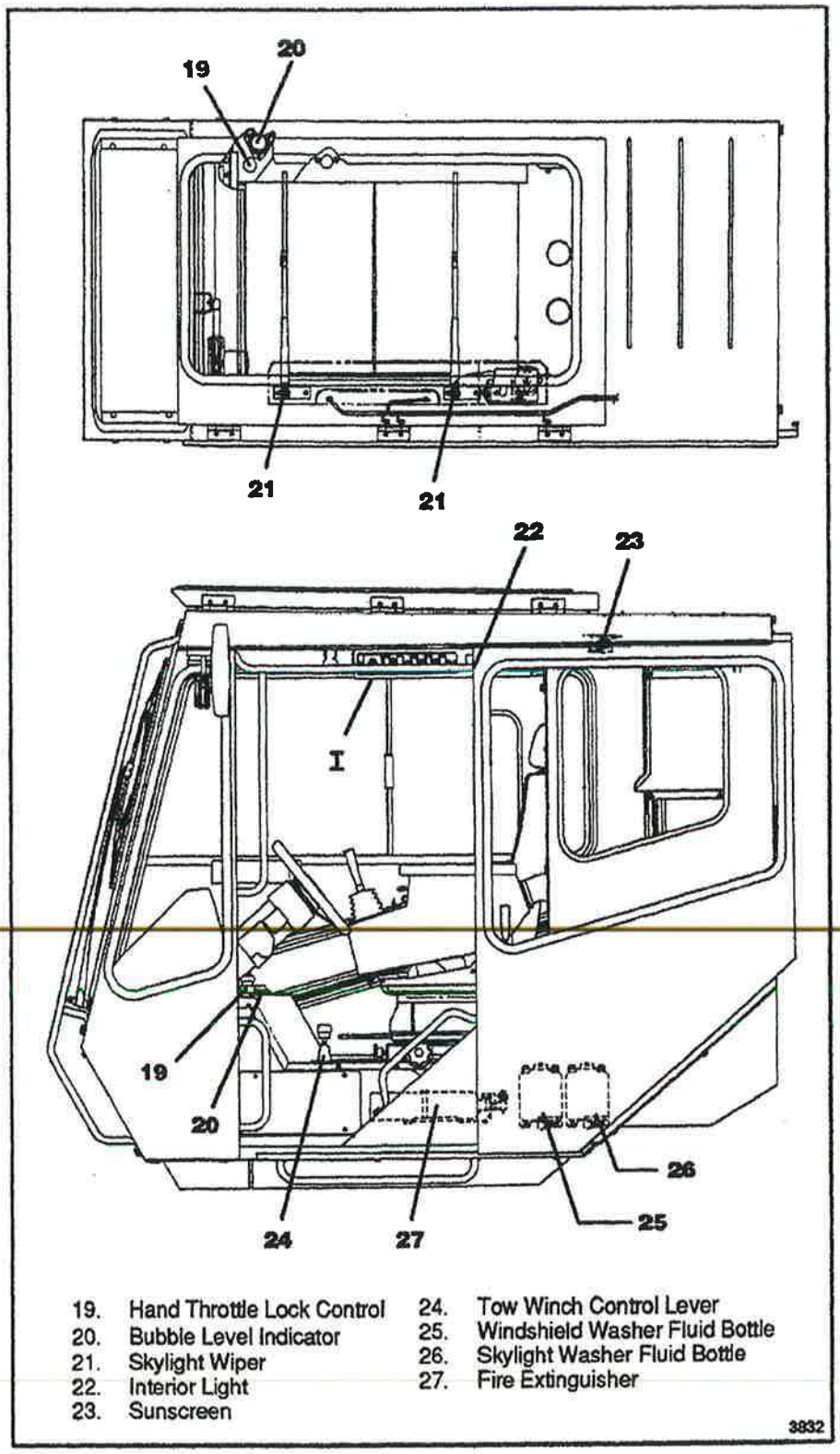
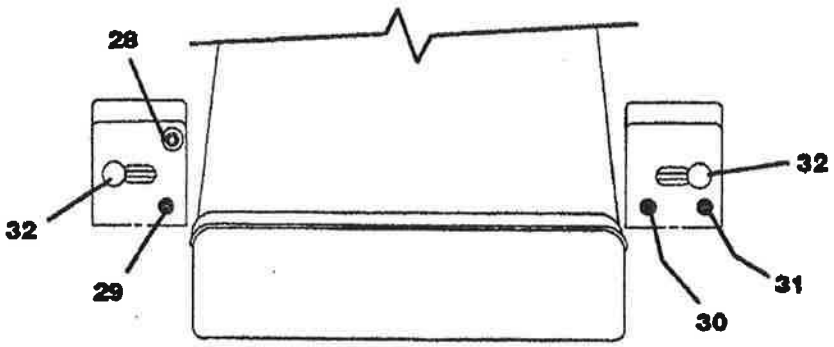
Cab Controls and Indicators (Sheet 2 of 9)

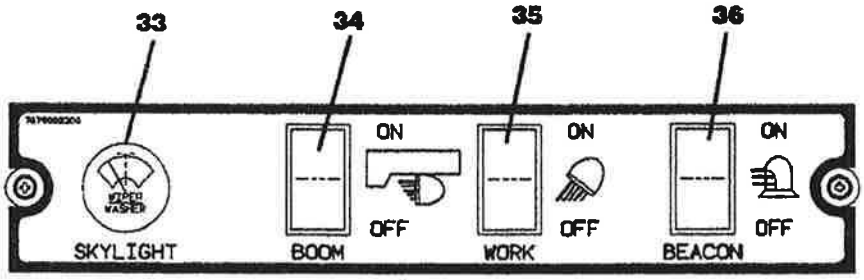


19. Hand Throttle Lock Control
20. Bubble Level Indicator
21. Skylight Wiper
22. Interior Light
23. Sunscreen
24. Tow Winch Control Lever
25. Windshield Washer Fluid Bottle
26. Skylight Washer Fluid Bottle
27. Fire Extinguisher

Cab Controls and Indicators (Sheet 3 of 9)



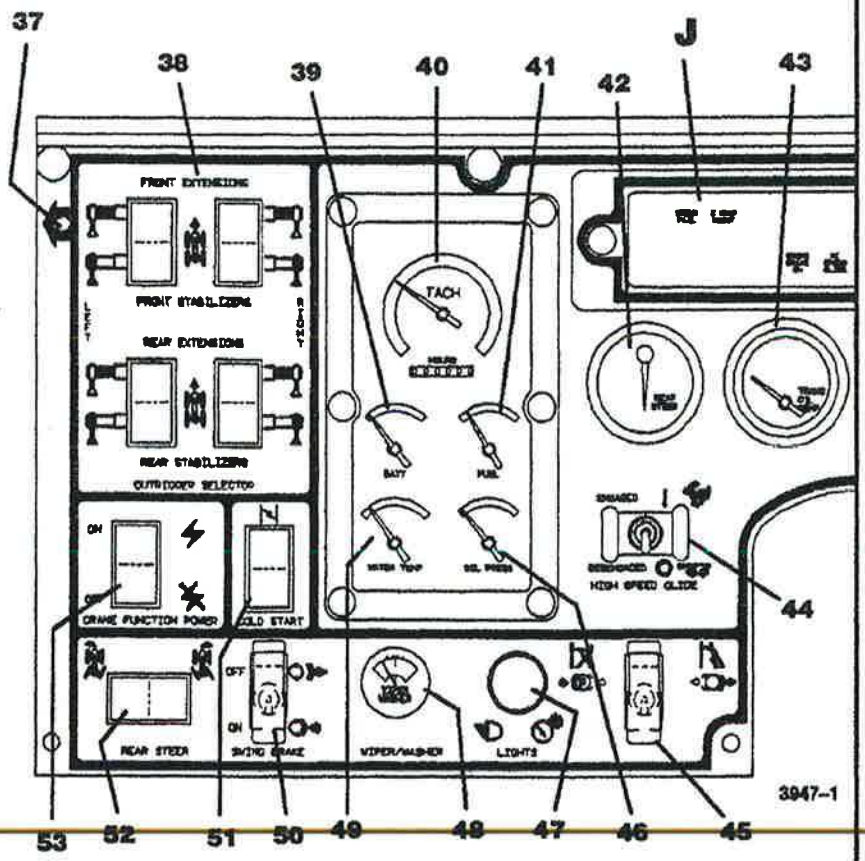
DETAILS G & H
(Front View of Seat)



DETAIL I

28. Swing Horn Button
29. Main Hoist Speed Selector Switch
30. Aux Hoist Speed Selector Switch
31. Aux Hoist On Off Switch
32. Armrest Adjustment Lever
33. Skylight Wiper/Washer Switch
34. Boom Lights Switch
35. Work Lights Switch
36. Beacon Light Switch

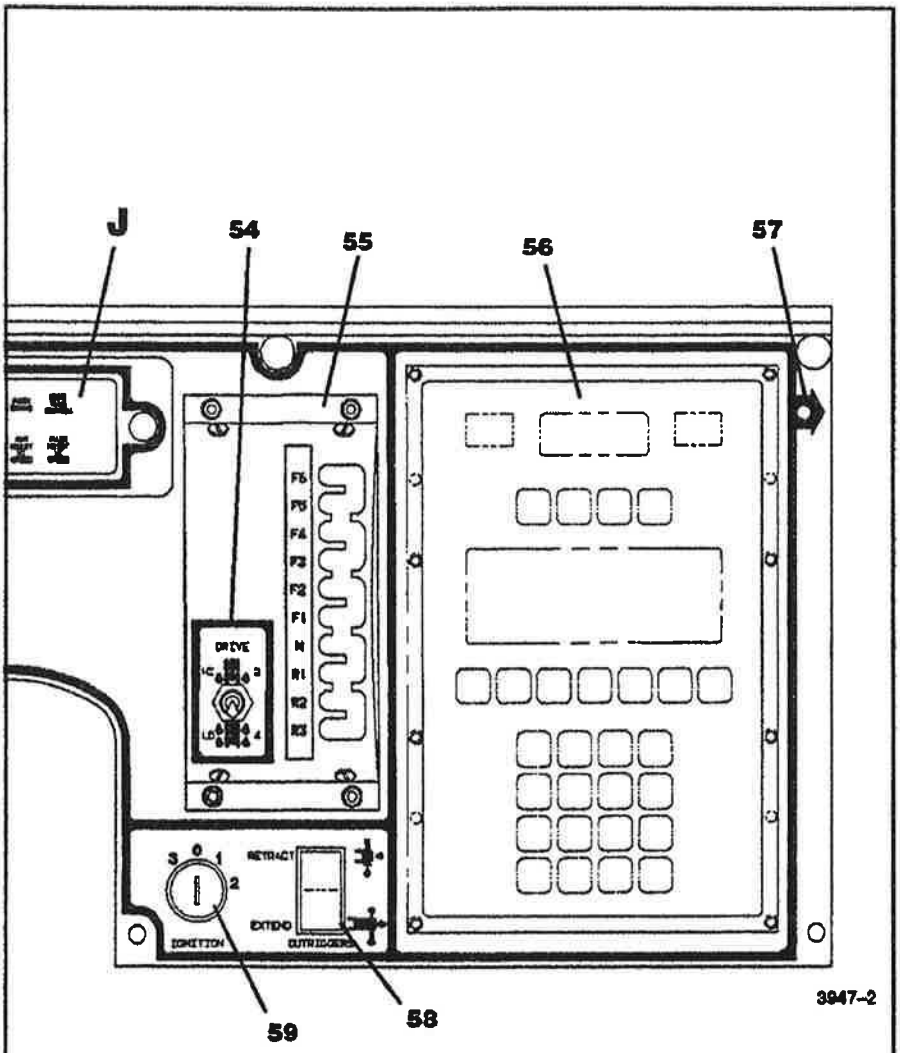
Cab Controls and Indicators (Sheet 4 of 9)



DETAIL A

37. Left Turn Signal Indicator
38. Outrigger Selector Panel
39. Voltmeter
40. Tachometer/Hourmeter
41. Fuel Gauge
42. Rear Steer Indicator
43. Transmission Oil Temperature Gauge
44. Hi Speed Glide Control Switch
45. Park Brake Control Switch
46. Oil Pressure Gauge
47. Lights Switch
48. Windshield Wiper/Washer Switch
49. Engine Temperature Gauge
50. Swing Brake Control Switch
51. Cold Start Switch
52. Rear Steer Control
53. Crane Function Power Switch

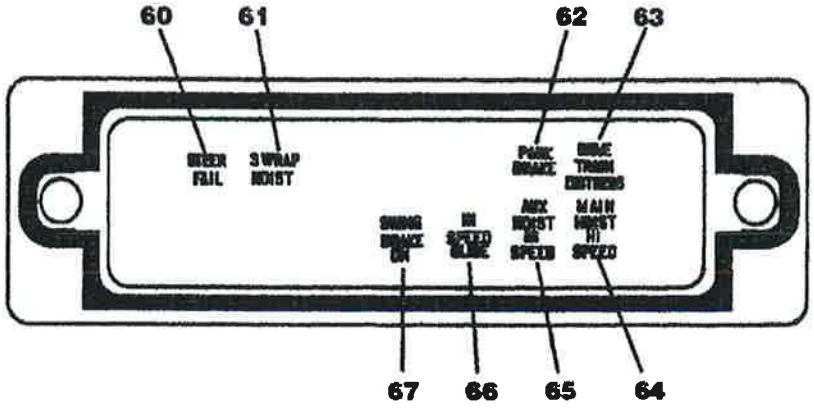
Cab Controls and Indicators (Sheet 5 of 9)



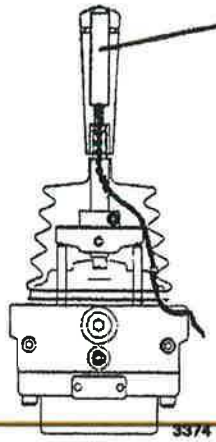
DETAIL B

54. Range Selector Switch
55. Transmission Shift Control
56. LMI Console
57. Right Turn Signal Indicator
58. Outrigger Extension/ Retraction Switch
59. Ignition Switch

Cab Controls and Indicators (Sheet 6 of 9)

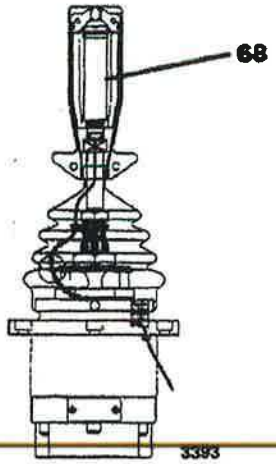


DETAIL J



SINGLE AXIS CONTROLLER

DETAIL E

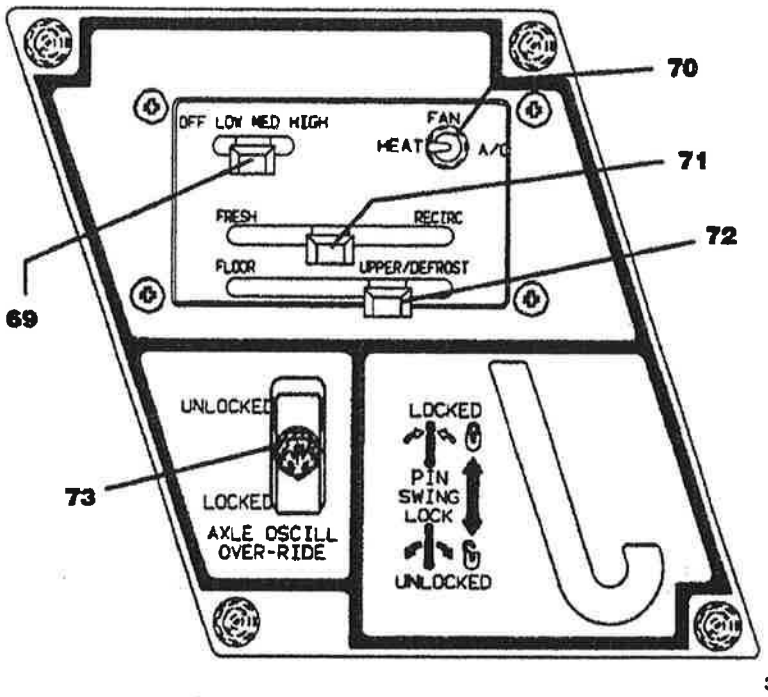


DUAL AXIS CONTROLLER

DETAIL F

60. Steer/Brake Pump Indicator
61. Third Wrap Indicator
62. Park Brake Indicator
63. Drive Train Distress Indicator
64. Main Hoist Hi Speed Indicator
65. Aux Hoist Hi Speed Indicator
66. Hi Speed Glide Indicator
67. Swing Brake On Indicator
68. Hoist Rotation Indicator

Cab Controls and Indicators (Sheet 7 of 9)

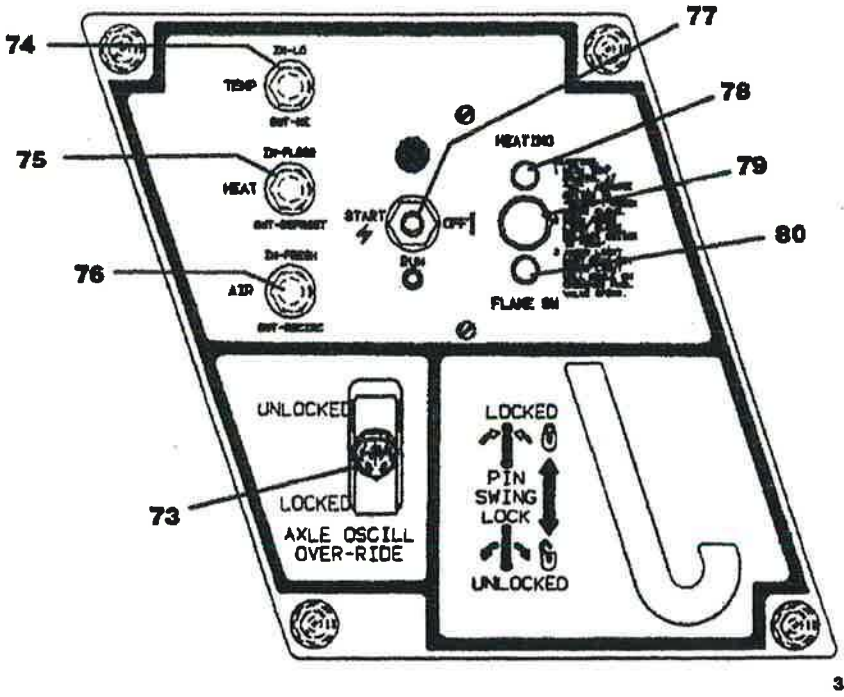


CAB WITH HYDRAULIC HEATER/AIR CONDITIONER

DETAIL D

69. Heater Fan Speed Switch
70. Heater Fan Mode Switch
71. Air Control Lever
72. Air Flow Control Lever
73. Axle Lockout Override Switch

Cab Controls and Indicators (Sheet 8 of 9)



CAB WITH PROPANE HEATER

DETAIL D

73. Axle Lockout Override Switch
74. Heater Air Temperature Control
75. Heater Air Flow Control
76. Heater Air Circulation Control
77. Heater Control Switch
78. Heating Indicator Light
79. Heater Fuse
80. Flame Switch Indicator Light

Cab Controls and Indicators (Sheet 9 of 9)

FUEL GAUGE

The fuel (FUEL) gauge (41) is located on the gauge cluster at the left side of the front console. The gauge indicates the quantity of fuel in the fuel tank and has a scale calibrated from zero (0) to 4/4. The fuel quantity gauge receives a signal from a sending unit in the fuel tank.

VOLTMETER

The voltmeter (BATT) gauge (39) is located on the gauge cluster at the left side of the front console. The voltmeter indicates the voltage being supplied to or from the battery and has a green and red scale. Green indicates proper state of charge and red indicates an overcharging or undercharging condition.

IGNITION SWITCH

The IGNITION switch (59) is located at the bottom of the front console and to the right of the steering column. It is a key operated switch with four positions; acc (3), off (0), run (1), and start (2). The switch is spring returned from start to run. With the switch in the off position, all electrical power of the machine is off except for headlights, marker lights, floodlights, and work lights. Positioning the switch to acc energizes all electrical components except the engine fuel solenoid valve. Positioning the switch to on is the same as acc except the engine fuel solenoid valve becomes energized. Positioning the switch to start energizes the start relay which in turn energizes the cranking motor solenoid and cranks the engine for starting. Releasing the switch will spring return it to run. To shut down the engine, position the switch to off, which will close the fuel solenoid valve.

TACHOMETER/HOURMETER

The tachometer/hourmeter (40) is the largest of all gauges and is located on the gauge cluster at the left side of the front console.

The tachometer (TACH) portion of the gauge makes up the main body of the gauge. The tachometer registers engine rpm and is calibrated in rpm x 100 with a range of zero (0) to 40. It receives a signal from a sending unit on the engine and does not utilize the machine's 12–volt dc electrical system.

The hourmeter (HOURS) portion of the gauge is located at the bottom of the gauge and registers hours of engine operation.

COLD START SWITCH

The COLD START switch (51) is located at the bottom of the front console on the left side. The switch is a two position, spring centered to off rocker switch and is used to inject shots of starting aid into a cold engine during starting. The ignition switch must be in the start position for cold start operation.

ENGINE COOLANT TEMPERATURE GAUGE

The engine coolant temperature (WATER TEMP) gauge (49) is located on the gauge cluster at the left side of the front console. The gauge indicates the engine coolant temperature on a dual scale calibrated from 100 to 240 degrees F and 38 to 116 degrees C. The gauge receives a signal from a temperature sending unit in the engine cooling system.

FOOT THROTTLE PEDAL

The foot throttle pedal (10) is the right most pedal on the cab floor. Depressing the pedal actuates a hydraulic valve that positions a throttle cylinder attached to the engine throttle control.

DRIVE TRAIN DISTRESS INDICATOR

The DRIVE TRAIN DISTRESS indicator (63) is located on the LED alert display at the top of the front console. The indicator is a red light that will illuminate if the engine oil pressure and/or coolant temperature or level becomes abnormal. The indicator is energized by two switches electrically connected in parallel. To determine which system is abnormal, observe the appropriate gauge. In addition to the indicator, the switches also energize a warning buzzer.

CRANE CONTROLS AND INDICATORS

TRANSMISSION SHIFT CONTROL

The transmission shift control (55) is located on the right side of the front console. The control lever operates the transmission selector valve electrically. The lever has nine different shift positions allowing the operator to select from three reverse speeds, neutral, and six forward speeds.

SWING AND TELESCOPE OR AUXILIARY HOIST CONTROL LEVER (DUAL AXIS CONTROLLER)

The swing and telescope or auxiliary hoist (SWING/TELE or SWING/AUX) control lever (17) is located on the end of the left armrest. The lever controls the swing and telescope functions when the crane is not equipped with an auxiliary hoist. When equipped with an auxiliary hoist, the lever controls swing and auxiliary hoist functions and telescope functions are controlled through a foot pedal. The lever, when positioned to the left or right actuates a control valve through hydraulic pilot pressure to provide 360 degree continuous rotation in the desired direction. Positioning the lever forward actuates the control valve to telescope the boom out and pulling the lever back actuates the boom to telescope in. If equipped with an auxiliary hoist, positioning the lever forward actuates the control valve to let out hoist cable and pulling the lever back reels the cable in. Moving the lever in a diagonal direction actuates the two functions simultaneously.

TELESCOPE OR AUXILIARY HOIST CONTROL LEVER (SINGLE AXIS CONTROLLER)

The telescope or auxiliary hoist (TELE or AUX) control lever (14) is located on the end of the left armrest. The lever controls the telescope functions when the crane is not equipped with an auxiliary hoist. When equipped with an auxiliary hoist, the lever controls auxiliary hoist functions and telescope functions are controlled through a foot pedal. Positioning the lever forward actuates the control valve to telescope the boom out and pulling the lever back actuates the boom to telescope in. If equipped with an auxiliary hoist, positioning the lever forward actuates the control valve to let out hoist cable and pulling the lever back reels the cable in.

SWING CONTROL LEVER (SINGLE AXIS CONTROLLER)

The SWING control lever (13) is located on the end of the left armrest. The lever controls the swing functions. The lever, when positioned forward or back actuates a control valve through hydraulic pilot pressure to provide 360 degree continuous rotation in the desired direction.

REAR STEER CONTROL

The REAR STEER control (52) is a three position, spring centered to off, rocker switch located on the left side of the front console. By positioning the switch to the right, a control valve is actuated to turn the rear wheels to the left, which causes the crane to turn to the right. By positioning the switch to the left, a control valve is actuated to turn the rear wheels to the right, which causes the crane to turn to the left. Releasing the switch allows it to spring center to the off position.

REAR STEER INDICATOR

The REAR STEER indicator (42) is located on the left side of the front console above the REAR STEER control. The indicator consists of a gauge with an indicator needle that shows the positioning of the rear wheels.

AXLE LOCKOUT OVERRIDE SWITCH

The axle lockout override (AXLE OSCILL OVER–RIDE) switch (73) is located on the right side console. The switch is a two position toggle switch marked UNLOCKED and LOCKED which controls a solenoid valve in the rear axle lockout hydraulic circuit. With the switch in the UNLOCKED position, the solenoid valve is deenergized and the valve is closed allowing automatic rear axle oscillation lockout to occur. With the switch in the LOCKED position, the solenoid valve is energized to open the valve and allow the rear axle to oscillate.

BOOM LIFT CONTROL LEVER (SINGLE AXIS CONTROLLER)

The boom LIFT control lever (15) is located on the right armrest. The lever, when positioned forward or back, actuates the control valve through hydraulic pilot pressure to raise or lower the boom.

MAIN HOIST CONTROL LEVER (SINGLE AXIS CONTROLLER)

The MAIN hoist control lever (16) is located on the right armrest. Pushing the lever forward will let out the hoist cable and pulling the lever back reels the cable in.

BOOM LIFT AND MAIN HOIST CONTROL LEVER (DUAL AXIS CONTROLLER)

The boom lift and main hoist (LIFT/MAIN) control lever (18) is located on the right armrest. The lever, when positioned to the left, actuates the control valve through hydraulic pilot pressure to raise the boom. Positioning the lever to the right lowers the boom. Pushing the lever forward will let out the hoist cable and pulling the lever back reels the cable in. Moving the lever in a diagonal direction actuates the two functions simultaneously.

TELESCOPE CONTROL PEDAL

The telescope control pedal (2) is located on the left side of the cab floor. The telescope control pedal is usually provided when the crane is equipped with an auxiliary hoist. Pushing forward on the top of the pedal actuates a control valve through hydraulic pilot pressure to telescope the boom out. Pushing down on the bottom of the pedal will telescope the boom in.

MAIN HOIST SPEED SELECTOR SWITCH

The MAIN HOIST SPEED selector switch (29) is located on the right armrest at the front. It is a two position toggle switch placarded HIGH to LOW. The switch operates a solenoid controlled valve on the main hoist which in turn determines the flow of hydraulic oil to the hoist motors.

MAIN HOIST HI SPEED INDICATOR

The MAIN HOIST HI SPEED indicator (64) is located at the top of the front console on the LED alert display. The indicator is a red light that will illuminate when the MAIN HOIST SPEED selector switch is positioned to HIGH.

AUXILIARY HOIST SPEED SELECTOR SWITCH

The AUXILIARY HOIST SPEED selector switch (30) is located on the left armrest at the front. It is a two position toggle switch placarded HIGH and LOW. The switch operates a solenoid controlled valve on the auxiliary hoist which in turn determines the flow of hydraulic oil to the hoist motors.

AUXILIARY HOIST HI SPEED INDICATOR

The AUX HOIST HI SPEED indicator (65) is located at the top of the front console on the LED alert display. The indicator is a red light that will illuminate when the AUXILIARY HOIST SPEED selector switch is positioned to HIGH.

AUXILIARY HOIST ON OFF SWITCH

The AUXILIARY HOIST on off switch (31) is located on the right armrest. It is a two position toggle switch placarded ON and OFF. The switch is used to turn off the auxiliary hoist control lever to prevent the control from being inadvertently activated during other crane functions.

HOIST ROTATION INDICATORS

The hoist rotation indicators (68) are located on the top of each hoist control lever. The indicators are electronically driven by a signal from an electronic transmitter attached to each hoist frame. A pulsating signal is sensed by the operator's thumb during operation.

THIRD WRAP INDICATOR LIGHT

The third wrap (3 WRAP HOIST) indicator (61) is located on the LED alert panel at the top of front console. The indicator is a red light that will illuminate when three wraps or less of cable is on the hoist drum.

CRANE FUNCTION POWER SWITCH

The CRANE FUNCTION POWER switch (53) is located on the left side of the front console near the middle. The switch has two placarded positions; ON and OFF. Positioning the switch to off takes all power away from the crane functions controlled by the hydraulic remote controllers on the armrests. This prevents inadvertent operation of functions due to bumping of the controllers while traveling on the road or any other operation.

RANGE SELECTOR SWITCH

The range selector (DRIVE AXLE) switch (54) is located on the right side of the front console. The switch is a two position rocker switch placarded 2WD (high range) and 4WD (low range). The switch controls a solenoid operated valve that operates the axle disconnect cylinders on the transmission.

OUTRIGGER SELECTOR PANEL

The OUTRIGGER SELECTOR panel (38) is located on the left side of the front console. There are four two position, spring centered to off rocker switches on the panel. These switches in conjunction with the outrigger extension/retraction switch provide control of all four outrigger extension and stabilizer cylinders. Positioning any one of the rocker switches energizes a solenoid valve for the appropriate component to be operated. Positioning the outrigger extension/retraction switch energizes the control solenoid to allow hydraulic fluid to flow through the control solenoid valve and move the selected component in the desired direction.

OUTRIGGER EXTENSION/RETRACTION SWITCH

The outrigger extension/retraction switch (58) is located on the right side of the front console at the bottom. It has two placarded positions, EXTEND and RETRACT. It must be used in conjunction with the switches on the OUTRIGGER SELECTOR panel to control the operation of the stabilizer and extension cylinders. After positioning the switch on the OUTRIGGER SELECTOR panel, positioning the outrigger extension/retraction switch energizes the control solenoid to allow hydraulic fluid to flow through the control solenoid valve and the individual solenoid valve and move the selected component in the desired direction.

SWING BRAKE CONTROL SWITCH

The SWING BRAKE control switch (50) is located on the left side of the front console at the bottom. The switch has two positions; ON and OFF. It is used to control a hydraulic valve that directs a regulated flow of pressure to or from the swing brake.

SWING BRAKE PEDAL

The swing brake pedal (1) is located on the left side of the cab under the front console. The brake pedal is used to actuate the swing brake to slow or stop motion. Braking is proportional to pedal depression. With the pedal not depressed and the swing brake control valve disengaged, hydraulic pressure is applied to the brake, thereby, overcoming spring pressure and releasing the brake. Depressing the pedal actuates a swing power brake valve to apply pressure to the brake assembly. This pressure aids the spring pressure to overcome the hydraulic pressure being applied to the brake release circuit and applies the spring brake according to the pressure from the spring power brake valve.

SWING BRAKE ON INDICATOR

The SWING BRAKE ON indicator (67) is located at the top of the front console on the LED alert display. The indicator is a red light that will illuminate when the swing brake is applied.

SWING HORN BUTTON

The swing horn button (28) is located on the right armrest. The swing horn is used by the operator to provide a warning that the superstructure is rotating.

BRAKE FOOT PEDAL

The brake foot pedal is the second pedal (7) from the right on the cab floor. Depressing the pedal controls application of the hydraulic brakes.

PARK BRAKE CONTROL SWITCH

The PARK BRAKE control switch (45) is located on the left side of the control panel at the bottom. The control switch has two positions; ON and OFF. The switch is used to set and release the parking brake on the transmission.

PARK BRAKE INDICATOR

The PARK BRAKE indicator (62) is located at the top of the front console on the LED alert display. The indicator is a red light that will illuminate when the PARK BRAKE control switch is in the ON position.

SWING LOCK CONTROL (PIN TYPE)

The swing lock control handle (11) is located in the right side console. The purpose of the swing lock is to secure the superstructure in position. When the control handle is pulled down and to the right, the swing lock is disengaged and swing can be accomplished. When the control handle is pushed up and the superstructure is directly over the front, the swing lock pin is engaged in the socket in the turntable thus preventing swing.

SWING LOCK CONTROL (POSITIVE LOCK TYPE)

The swing lock control handle (12) is located on the right side of the operator's seat beneath the right armrest. The purpose of the swing lock is to secure the superstructure. When the control handle is pulled up, the swing lock is disengaged and swing can be accomplished. Pushing down on the control handle engages the lock.

HI SPEED GLIDE CONTROL SWITCH

The HI SPEED GLIDE control switch (44) is located on the left side of the front console at the bottom. It is a two position, spring returned toggle switch placarded ENGAGED and DISENGAGED.

HI SPEED GLIDE ENGAGED INDICATOR

The HI SPEED GLIDE ENGAGED indicator (66) is located at the top of the front console on the LED alert display. The indicator is a red light that will illuminate when the HI SPEED GLIDE control switch is in the ENGAGED position.

EMERGENCY STEER/BRAKE BOOST INDICATOR

The emergency steer/brake boost (STEER FAIL) indicator (60) is located at the top of the front console on the LED alert display. The indicator is a red light that illuminates when the pressure in the steering circuit drops low enough to activate the emergency steering pump or when the pressure in the brake circuit drops low enough to activate the brake boost circuit. A buzzer sounds when the light illuminates.

LMI CONSOLE

The LMI console (56) is located on the right side of the front console panel. The console contains the controls and indicators for the crane's Load Moment Indicating System. Refer to the LMI Manual for detailed information.

ACCESSORY CONTROLS AND INDICATORS

TOW WINCH CONTROL LEVER

The two winch control lever (24) is located on the right side of the crane cab. By positioning the lever to in or out the tow winch cable will move in or out.

WORK LIGHT SWITCH

The WORK light switch (35) is a two position rocker switch placarded ON and OFF. It is located on the right console panel above the window. The switch controls the crane's work light.

BEACON LIGHT SWITCH

The BEACON light switch (36) is a two position rocker switch placarded ON and OFF. It is located on the right console panel above the window. The switch controls the crane's beacon light.

BOOM FLOOD LIGHTS SWITCH

The BOOM flood lights switch (34) is a two position rocker switch placarded ON and OFF that is located on the right console panel above the window. The switch controls the floodlights located on the boom base section.

LIGHTS SWITCH

The LIGHTS switch (47) is located on the left side of the front console at the bottom. The switch is a two position push–pull switch, on and off. Positioning the switch to the on position illuminates the driving lights on the front and rear of the crane and the panel lights. Rotating the control knob dims the panel lights.

FIRE EXTINGUISHER

The fire extinguisher (27) is located at the left side of the cab. The fire extinguisher is a BC rated dry type fire extinguisher for emergency use.

HORN

The horn button (6) is a push–button type switch located in the center of the steering wheel. Depressing the horn button energizes a relay that in turn sounds the horn on the cab exterior.

TURN SIGNAL LEVER

The turn signal lever (4) is located on the steering column forward of the steering wheel. Positioning the switch handle to the left causes the left front and left rear turn signals to flash. Positioning the switch handle to the right causes the right front and right rear turn signals to flash.

FOUR–WAY FLASHER SWITCH

The four–way flasher switch (5) is located on the steering column just behind the turn signal lever. Pushing the switch in causes all four turn signal lights to flash. The lights will continue to flash until the switch is pulled out.

STEERING COLUMN TILT LEVER

The steering column tilt lever (3) is located on the steering column behind the turn signal lever and the four–way flasher switch. Pulling back on the lever allows the operator to tilt the steering column to one of six different positions.

RIGHT TURN SIGNAL INDICATOR

The right turn signal indicator (57) is located on the right side of the front console panel. It is a green light that flashes when the turn signal lever is pushed up.

LEFT TURN SIGNAL INDICATOR

The left turn signal indicator (37) is located on the left side of the front console panel. It is a green light that flashes when the turn signal lever is pushed down.

CAB INTERIOR LIGHT

The cab interior light (22) is located on the right side of the cab above the window and provides illumination of the cab. The light is controlled by a switch on the light.

SPOTLIGHT (NOT SHOWN)

The spotlight is mounted on the outside of the cab roof in the right front corner. The light can be tilted 180 degrees and rotated 360 degrees. The switch that activates the spotlight is located on the end of the spotlight arm.

ARMREST ADJUSTMENT LEVER

The armrest adjustment lever (32) is located at the front of each armrest. When the adjustment lever is pushed, the armrest can be pulled out or pushed in to a length that is suitable to the operator.

SKYLIGHT WIPER

A skylight wiper (21) is provided to remove moisture from the skylight. The wiper is controlled by a control switch (SKYLIGHT) (33) on the right console above the window. The switch has four positions; off, on, low, and high. The on position consists of an operating range for variable intermittent operation. In addition, pushing the switch energizes the motor on the windshield washer pump assembly in the skylight washer fluid bottle (26). Positioning the switch to low energizes the wiper motor in low speed and positioning it to high energizes the motor for high speed. Positioning the switch to off stops the motor and causes the automatic park function of the wiper motor to return the wiper blade to the parked position.

WINDSHIELD WIPER SWITCH

The windshield wiper (WIPER/WASHER) switch (48) is located on the left side of the front console at the bottom. The switch has four positions; off, on, low, and high. The on position consists of an operating range for variable intermittent operation. In addition, pushing the switch energizes the motor on the windshield washer pump assembly in the windshield washer fluid bottle (25). Positioning the switch to low energizes the wiper motor in low speed and positioning it to high energizes the motor for high speed. Positioning the switch to off stops the motor and causes the automatic park function of the wiper motor to return the wiper blade to the parked position.

BUBBLE LEVEL INDICATOR

The bubble lever indicator (20) is located on the right side console. The indicator provides the operator with a visual indication for determining the levelness of the machine.

HEATER FAN SPEED SWITCH (HYDRAULIC HEATER/AIR CONDITIONER)

The heater fan speed switch (69) is located on the right side console. The switch has four placarded positions (OFF, LOW, MED, and HIGH) and is used to control the speed of the heater fan.

HEATER FAN MODE SWITCH (HYDRAULIC HEATER/AIR CONDITIONER)

The heater fan mode switch (70) is located on the right side console. The switch has three placarded positions (HEAT, FAN, A/C) and is used to select fan operation in the heater mode, fan mode, or the A/C mode.

AIR CONTROL LEVER (HYDRAULIC HEATER/AIR CONDITIONER)

The air control lever (71) is located on the right side console. The control has two placarded positions, FRESH and RECIRC and is used to control air flow during air conditioning operation. When in the FRESH position, outside air is brought into the cab. When in the RECIRC position, the air in the cab is recirculated for maximum cooling efficiency.

AIR FLOW CONTROL LEVER (HYDRAULIC HEATER/AIR CONDITIONER)

The air flow control lever (72) is located on the right side console. The control has two placarded positions, FLOOR and UPPER/DEFROST and is used to control air flow during air conditioning and heater operation. When in the FLOOR position, air from the heating/cooling system is directed through the lower heating/cooling ducts on the floor. When in the UPPER/DEFROST position, air from the heating/cooling system is directed through the upper heating/cooling ducts.

HEATER AIR TEMPERATURE CONTROL (PROPANE HEATER)

The heater air temperature (TEMP) control (74) is located on the right side console. It is a push–pull cable control that positions the temperature control on the propane heater unit. Pull the control knob for high temperature and push it in for low temperature.

HEATER AIR FLOW CONTROL (PROPANE HEATER)

The heater air flow (HEAT) control (75) is located on the right side console. It is a push–pull cable control that moves a heating duct to control the placement of heated air for cab heating or defrosting the windshield. Pull out on the knob for defrosting and push in on the knob for heating.

HEATER AIR CIRCULATION CONTROL (PROPANE HEATER)

The heater air circulation (AIR) control (76) is located on the right side console. It is a push–pull cable control that moves a heating duct to control the operation of the heater to pull outside air into the cab to be heated or to recirculate the air already in the cab for heating. Pull out on the knob for recirculating air and push in on the knob for fresh outside air.

HEATER CONTROL SWITCH (PROPANE HEATER)

The heater control switch (77) is located on the right side console. The switch has three placarded positions; START, RUN, and OFF.

When held in the START position, this switch energizes the blower motor, fuel solenoid valve, and the ignition pack.

After the amber flame switch (FLAME SW) indicator illuminates, the switch is moved to the RUN position. This transfers power to the flame switch, with maintains the fuel, ignition, and blower motor circuits so the heater cycles under control of the HI–LO control.

When moved to the OFF position, this switch deenergizes the fuel and ignition circuits to stop spark and fuel flow, but it allow the blower motor to run until fuel remaining in the burner is consumed and the heat exchanger has cooled. The motor then shuts off under control of the flame switch.

HEATING INDICATOR LIGHT (PROPANE HEATER)

The HEATING indicator light (78) is located on the right side console. It is a green light that illuminates to indicate that electrical power is applied to the heater circuits during starting and running. The light goes out when the burner is cycled off under control of the HI–LO microswitch or thermostat, and when the heater control switch is positioned to OFF.

HEATING FUSE (PROPANE HEATER)

The heating fuse (79) is located on the right side console. Press in and rotate the cap to remove the fuse.

FLAME SWITCH INDICATOR LIGHT (PROPANE HEATER)

The flame switch indicator light (80) is located on the right side console. During starting, the amber indicator illuminates to show that the burner has ignited and is burning properly. After the heater is turned off, the light will remain on indicating that the heater is in the purge cycle.

Section 4
OPERATING PROCEDURES

PRE-STARTING CHECKS

A complete walk-around visual inspection of the machine should always be made with special attention to structural damage, loose equipment, leaks, or other conditions that would require immediate correction for safety of operation. The following checklist items are suggested specifically for the operator's benefit to make certain his machine is prepared for starting the days work.

FUEL SUPPLY

Ensure the fuel tank is full and the cap is on tight.

ENGINE OIL

Check oil level in the crankcase; fill to FULL mark on the dipstick. Do not overfill.

ENGINE COOLANT

Check coolant level in the radiator; fill to proper level, Do not overfill. Check cap for security.

BATTERIES

If the machine is equipped with a standard or low maintenance battery, check each cell for the correct electrolyte level. Add only clean, distilled water. Do not over fill. If equipped with a maintenance free battery, check the state of charge indicator if applicable. On all batteries ensure the cables and clamps are tight and not corroded. The battery disconnect switch is used to remove electrical power from the crane by interrupting the batteries negative ground. Be sure this switch is disengaged before attempting to start the crane.

SIGNAL AND RUNNING LIGHTS

Check all signal and running lights for proper operation. Replace burned out lamps with those of the same number, or equivalent.

FOOT AND PARKING BRAKES

Check for proper operation.

DAILY LUBRICATION

Make certain that all components requiring daily lubrication have been serviced. (Refer to Section 5, Lubrication.)

HYDRAULIC RESERVOIR AND FILTER

Check hydraulic fluid quantity level gauge and check filter condition indicator. Check breather for cleanliness and security.

TIRES

Check for severe cuts, foreign objects imbedded in treads, and for correct inflation pressures. A tire inflation chart is located in the load chart in the cab providing the correct tire pressures.

WIRE ROPE

Inspect wire rope in accordance with applicable Federal Regulations.

Sheaves, guards, guides, drums, flanges, and any other surfaces that come in contact with the rope should be inspected for any condition that could cause possible damage to the rope.

HOOK BLOCK

Visually inspect for nicks, gouges, cracks, and evidence of any other damage. Replace a hook containing cracks or showing evidence of excessive deformation of the hook opening (including twist). Be sure the safety latch is free and aligned.

SWINGAWAY EXTENSION

DANGER

FAILURE TO MAINTAIN THE CLEARANCE BETWEEN THE SWINGAWAY ANCHOR LUGS AND BOOM NOSE ANCHOR FITTINGS COULD CAUSE THESE FITTINGS AND LUGS TO COME INTO CONTACT WITH EACH OTHER DURING FULL RETRACTION OF THE BOOM. THIS ACTION COULD RESULT IN DAMAGE TO THE CRANE AND POSSIBLE SERIOUS INJURY OR DEATH TO PERSONNEL.

Check to ensure there is sufficient clearance between the boom nose anchor fittings and swingaway extension anchor lugs when the boom is fully retracted and the swingaway is properly stowed.

AIR CLEANER

Check the filter condition indicator. Check filter and tubing for security.

ENGINE OPERATION

Starting and shutdown procedures for most diesel engines generally follow the same pattern. Therefore, the following procedures can be applied except where specific differences are noted. (Refer to applicable engine manufacturer's manual for detailed procedures.)

STARTING PROCEDURE

DANGER

BEFORE STARTING THE ENGINE, ENSURE THE PARKING BRAKE IS APPLIED AND SWING LOCK IS ENGAGED.

CAUTION

NEVER CRANK THE ENGINE FOR MORE THAN 30 SECONDS DURING AN ATTEMPTED START. IF THE ENGINE FAILS TO START AFTER 30 SECONDS, ALLOW THE STARTER MOTOR TO COOL FOR APPROXIMATELY TWO MINUTES BEFORE ATTEMPTING ANOTHER START.

CAUTION

IF THE ENGINE FAILS TO START AFTER FOUR ATTEMPTS, CORRECT THE MALFUNCTION BEFORE ATTEMPTING ANY FURTHER STARTS.

NOTE

The engine will not crank unless the transmission gearshift lever is in the neutral position.

NOTE

When starting a cold engine, ensure the hydraulic pumps are disengaged.

1. Turn the ignition switch to START and release immediately when the engine starts.

2. When start has been accomplished, check engine instruments for proper indications.

CAUTION

IF OIL PRESSURE AND/OR TEMPERATURE INDICATOR(S) DO NOT DISPLAY PROPER READINGS, SHUT DOWN THE ENGINE AND CORRECT THE MALFUNCTION BEFORE RESUMING OPERATION.

3. Allow the engine and hydraulic oil to warm up at least five minutes before applying a load. Do not race the engine for a faster warm up.

COLD WEATHER STARTING

The correct grade of oil for the prevailing temperature should be used in the crankcase to prevent hard cranking. Diesel fuel should have a pour point of 10 degrees F (–12 degrees C) less than the lowest expected temperature. In case of emergency, white kerosene may be added to the fuel to bring the pour point down to the required temperature to prevent clogging of filters and small passages by wax crystals. The addition of kerosene is NOT recommended for general use. If low temperatures are ONLY expected at start–up, it is advisable to use starting aids such as preheating, ether compound metering equipment, or ether spray application into the air cleaner intake.

Ensure the hydraulic pump disconnect has been disengaged prior to starting a cold engine.

To start the engine, position the ignition switch to START and push the QUICK START button for one or two seconds and release. If the engine does not start within 30 seconds, allow the starter to cool a minute or two and repeat the procedure.

CAUTION

AVOID OVERLOADING THE AIR BOX WITH HIGHLY VOLATILE FLUID WHICH COULD RESULT IN A MINOR EXPLOSION.

Detailed recommendations for cold weather starting and operation are covered by specific sections of your applicable engine manual.

IDLING THE ENGINE

Idling the engine unnecessarily for long periods of time wastes fuel and fouls injector nozzles. Unburned fuel causes carbon formation; oil dilution; formation of lacquer or gummy deposits on the valves, pistons, and rings; and rapid accumulation of sludge in the engine.

NOTE

When prolonged engine idling is necessary, maintain at least 800 rpm.

RACING THE ENGINE

NEVER race the engine during the warm–up period. NEVER operate the engine beyond governed speed (as might occur in down hill operation or downshifting). Engine bearings, pistons, and valves may be damaged if these precautions are not taken.

SHUTDOWN PROCEDURE

1. Allow the engine to operate at fast idle speed for approximately five minutes to avoid high internal heat rise and allow for heat dissipation.

2. Position ignition switch to OFF.

CRANE TRAVEL OPERATION

TRAVEL – GENERAL

DANGER

BEFORE TRAVELING, ENSURE THE CRANE FUNCTION POWER SWITCH IS IN THE OFF POSITION. THIS WILL PREVENT INADVERTENT OPERATION OF CRANING FUNCTIONS DUE TO BUMPING OF THE CONTROLLERS WHILE TRAVELING.

CAUTION

ON CRANES EQUIPPED WITH THE PUMP DISCONNECT FEATURE, DISENGAGE THE HYDRAULIC PUMP FOR EXTENDED TRAVELING, COLD WEATHER STARTING OR ENGINE CHECKS.

RT machines are subject to the same road regulations as any truck, regarding gross weight, width, and length limitations.

CAUTION

FOR EXTENDED TRAVEL, CHECK THE COLD TIRE PRESSURE PRIOR TO START. (REFER TO TIRE INFLATION CHART.) REGARDLESS OF AMBIENT TEMPERATURE, AFTER EVERY ONE HOUR OF TRAVEL TIME, STOP AND ALLOW THE TIRES TO COOL OFF FOR AT LEAST A 30 MINUTE PERIOD. AT DESTINATION, THE TIRES MUST BE ALLOWED TO COOL TO AMBIENT TEMPERATURE BEFORE CRANE LIFTING ON RUBBER.

Although RT machines are specifically designed for rough terrain applications, the operator should be extremely cautious and aware of the terrain in which he is operating.

DANGER

DO NOT DRIVE THE CRANE WITH THE BOOM OFF CENTER AS AUTOMATIC OSCILLATION LOCKOUT WILL OCCUR, MAKING THE CRANE SUBJECT TO TIPPING ON UNEVEN SURFACES.

DANGER

DO NOT TRAVEL WITH AN EMPTY HOOK IN A POSITION WHERE IT CAN SWING FREELY.

DANGER

AVOID HOLES, ROCKS, EXTREMELY SOFT SURFACES, AND ANY OTHER OBSTACLES WHICH MIGHT SUBJECT THE CRANE TO UNDUE STRESSES OR POSSIBLE OVERTURN.

CAUTION

DO NOT DRIVE THE CRANE WITH THE LIFT CYLINDER BOTTOMED. POSITION THE BOOM SLIGHTLY ABOVE HORIZONTAL.

Use four–wheel drive only when greater traction is necessary. (Refer to FOUR–WHEEL DRIVE OPERATION, this section, for operating instructions).

DANGER

ON OPEN GROUND, TOW OR PULL ONLY ON THE PINTLE HOOKS OR LIFT LUGS.

CAUTION

SHOULD THE CRANE BECOME MIRED DOWN, USE A TOW TRUCK OR TRACTOR TO FREE THE VEHICLE. SEVERE DAMAGE TO THE TRANSMISSION OR AXLES MAY OCCUR IF THE OPERATOR ATTEMPTS TO FREE THE CRANE UNASSISTED.

CAUTION

IF THE CRANE IS MIRED DOWN, UTILIZE THE LUGS TO PULL OR TOW.

There are two lift/tow lugs installed on each end of the crane. When using these lugs, always tow or pull using both lugs.

MOVING THE CRANE

The following superstructure conditions should be strictly adhered to before moving the crane. Procedures for accomplishing the following can be found in the various Sections of this manual.

1. Ensure all boom sections are fully retracted.

2. Ensure the swingaway, if so equipped, is properly stowed and secured.

3. Swing the boom to over–the–front and lower the boom to slightly above horizontal.

4. Position the SWING BRAKE switch on the control console to ON and engage the swing lock by pushing down on the handle.

5. Remove the hook block and/or headache ball from the hoist cable(s) and stow securely before traveling or ensure the hook block or headache ball is properly secured to the tie down provided for that purpose.

6. Ensure the outrigger stabilizers and outriggers are fully retracted and the floats are removed.

7. Ensure all four stabilizer floats are properly stowed.

8. Ensure the CRANE FUNCTION POWER switch is in the OFF position.

STEERING

Steering is accomplished by the steering wheel and the rear steer control switch. These controls, used singly or together provide front wheel steering, rear wheel steering, four–wheel steering, and crabbing capabilities.

Front Wheel Steering

Conventional front wheel steering is accomplished with the steering wheel. This method of steering should always be used when traveling at higher speeds.

Rear Wheel Steering

DANGER

OPERATE THE REAR STEER ONLY FOR ADDED JOB SITE MANEUVERABILITY.

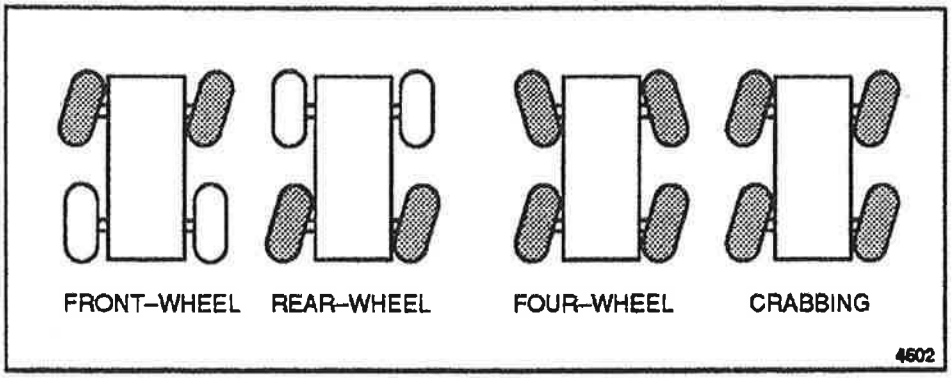
Rear wheel steering is controlled by a REAR STEER control switch. Actuating the control to the desired position activates the rear steer cylinders, thereby steering the machine in the selected direction.

Four Wheel Steering

Four–wheel steering is accomplished by using both the steering wheel and the REAR STEER control. Depending upon which direction the operator wishes to travel, the REAR STEER control switch is positioned left or right when the steering wheel is turned left or right. This method of steering allows the machine to turn or maneuver in close, restricted areas.

Crabbing

Crabbing is also accomplished by using both the steering wheel and the REAR STEER control. Depending upon which direction the operator wishes to travel (crab), the rear steer control switch is positioned in the opposite direction of the steering wheel. This method permits driving the machine forward or in reverse at an angle from straight ahead in a crabbing manner.



Steering Methods

TRAVELING – FORWARD

DANGER

ENSURE THE SWING LOCK IS ENGAGED BEFORE STARTING EXTENDED TRAVELING.

1. After the engine has warmed up, shift the directional control lever from neutral (N) to forward (F) position.

2. Position the DRIVE axle switch to either high speed (2WD) or low speed (4WD).

CAUTION

USE FOUR WHEEL DRIVE ONLY WHEN MORE TRACTION IS REQUIRED.

3. Position the transmission shifting lever to first (1) gear position and release the parking brake; depress the foot throttle until maximum gear speed is attained.

4. Shift the transmission lever to second (2) gear position; accelerate until the maximum gear speed is attained.

5. Repeat the above procedure for the remaining gear positions until the desired travel speed is attained.

CAUTION

DO NOT DOWNSHIFT TO A LOWER GEAR IF CRANE IS TRAVELING AT A GREATER ROAD SPEED THAN THE MAXIMUM SPEED OF THE LOWER GEAR.

TRAVELING – REVERSE

CAUTION

APPLY THE SERVICE BRAKES AND BRING THE CRANE TO A COMPLETE STOP BEFORE SHIFTING THE TRANSMISSION INTO REVERSE.

Traveling in reverse is accomplished the same way as traveling forward, except for shifting the directional control lever to reverse (R) position. (Refer to TRAVELING – FORWARD).

FOUR–WHEEL DRIVE OPERATION

CAUTION

DO NOT OPERATE IN 4–WHEEL DRIVE ON A DRY, HARD SURFACE.

If more traction is required due to slipping or spinning wheels, engage the front axle drive. Engage four–wheel drive as follows.

CAUTION

BEFORE SHIFTING FROM TWO–WHEEL DRIVE TO FOUR–WHEEL DRIVE (OR FROM FOUR BACK TO TWO), CRANE TRAVEL MUST BE STOPPED.

1. Position the DRIVE AXLE selector switch to 4WD.

2. Select gear speed and direction of travel as described under TRAVELING – FORWARD.

CAUTION

IF THE CRANE IS EQUIPPED WITH A NO SPIN DIFFERENTIAL IN THE FRONT AXLE, TWO WHEEL DRIVE OPERATION MUST BE SELECTED AS SOON AS THE CRANE IS ON A SOLID SURFACE TO PREVENT DAMAGE TO THE NO SPIN DIFFERENTIAL.

3. Return the DRIVE AXLE selector switch to the 2WD position as soon as two–wheel traction will suffice.

PROPER OPERATION OF AXLE OSCILLATION LOCKOUTS

NOTE

The following procedure should be used to periodically check the axle oscillation system and ensure that it is in proper working condition.

1. Ensure the tires are inflated to the recommended pressure. Refer to the Load Chart or Tire Inflation Decal for proper inflation pressures.

2. With the hook unloaded, the boom fully retracted and centered over the front at no more than a 10 to 15 degree boom angle, position the crane on a block or curb so that one rear tire is approximately 6 to 12 inches (15 to 30 cm) above the level of the opposite tire.

3. Slowly swing the superstructure to the right or left until the axle oscillation lockout valve is activated. This will lock the rear axle out of level. Do not swing beyond the tire track.

4. After engaging the swing lock, slowly drive off of the block or curb and stop. The rear tires should both be touching the road surface and the opposite front tire should be light or may come off of the road surface.

5. Release the swing lock and swing the superstructure until it is centered over the front.

CAUTION

DO NOT OPERATE THE CRANE IF THE AXLE OSCILLATION LOCKOUT SYSTEM IS NOT OPERATING PROPERLY.

6. If the axle oscillation lockout valve is functioning properly, the crane will re-level itself. If the rear axle does not lock or unlock properly, evaluate the lockout system and repair as necessary.

GENERAL CRANE OPERATION

PUMP DRIVE

The hydraulic pump is mounted on the torque converter drive pad and operates any time the engine is running, except for those cranes that are equipped with the optional pump disconnect.

The manual pump disconnect is installed with an engine bump switch to aid in engaging the splines of the pump and converter drive shaft.

The pump disconnect is a lever located on the deck between the turntable and the front grill of the engine, and the bump switch is located on the back of the engine hood. The engine will not start using this switch and the switch will not work if the ignition switch in the cab is in the ON position. Also, the transmission must be in neutral.

For cranes equipped with the manual pump disconnect, the following cautions and warnings apply.

DANGER

THE ENGINE MUST BE SHUT DOWN BEFORE ATTEMPTING TO ENGAGE THE HYDRAULIC PUMP.

CAUTION

ALWAYS DISENGAGE THE HYDRAULIC PUMP FOR EXTENDED TRAVELING, COLD WEATHER STARTING, OR ENGINE CHECKS.

CAUTION

DO NOT FORCE THE PUMP DISCONNECT LEVER IN AN ATTEMPT TO ENGAGE THE PUMP DRIVE. USE THE ENGINE BUMP SWITCH TO ACHIEVE ENGAGEMENT.

SETTING THE PARK BRAKE WHEN CRANE IS ON OUTRIGGERS

When operating certain crane functions with the crane on outriggers at high engine speeds it may be necessary to set the parking brake in order to keep the rear drive axle from rotating. This rotation is caused by a small amount of slippage in the hydraulic clutch resulting in rotation in the rear wheels.

When operating the crane on outriggers the transmission should be shifted into Low (four–wheel–drive) and the parking brake set. When this procedure is correctly followed the wheels will not rotate with the crane on outriggers during any crane function.

CONTROL LEVER OPERATION

The control lever operation for crane functions is standard, i.e., the closer the lever is to neutral (center), the slower the system responds. This applies to forward, rear, or side movement of the applicable lever. The control lever should be returned to neutral to hold the load. Never feather the hoist control to hold the load.

NOTE

Always operate the control levers with slow, even pressure.

PRELOAD CHECK

After the crane has been readied for service, an operational check of all crane functions (with no load applied) should be performed. Accomplish the Preload Check as follows.

CAUTION

OPERATE THE ENGINE AT OR NEAR THE GOVERNED RPM DURING PERFORMANCE OF ALL CRANE FUNCTIONS.

NOTE

Carefully read and become familiar with all crane operating instructions before attempting a preload check and operating the crane under load.

1. Extend and set the outriggers.

2. Raise, lower, and swing the boom right and left a minimum of 45 degrees.

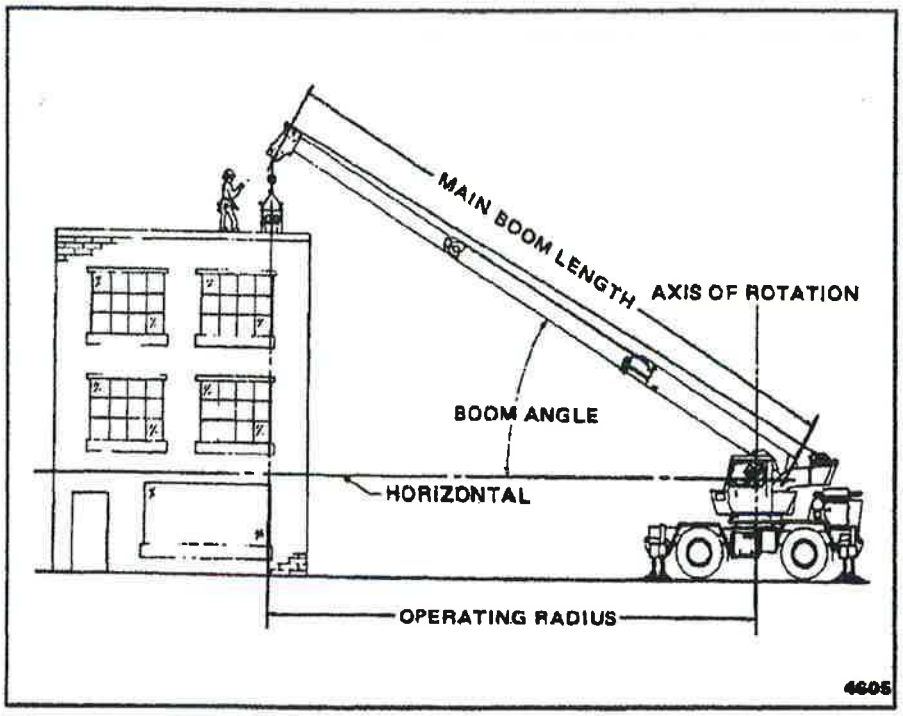
3. Telescope the boom in and out, extending and retracting the boom sections equally at all times.

4. Raise and lower the cable a few times at various boom lengths. Ensure there is no kinking.

USING YOUR LOAD CHART

NOTE

One of the most important tools of every Grove crane is the load chart found in the crane operator's cab.



Terms To Know

The load chart contains a large amount of information, which must be thoroughly understood by the operator.

The capacity charts are divided into capacities limited by structural strength and capacities limited by stability. This is shown by the bold line across the chart. Capacities above the line are limited by structural strength and capacities below the line are limited by machine stability.

The chart shows the radius of the load in a column at the left. The radius is the distance between the centerline of rotation of the crane and the center of gravity of the load. Various boom lengths are listed across the top, ranging from fully retracted to fully extended and with the swingaway extension in use. The boom angle (in degrees) required for the given lift is shown in parenthesis below the maximum total weight which can be lifted. Note that the boom lengths in between the increments shown should always be treated as if the boom was extended to the next longer length. For example, if the load chart has capacities for 48 foot and 54 foot boom lengths and the actual length of the boom in use is 50 feet, then the maximum capacity will be listed under the 54 foot boom length because the boom is beyond 48 feet in length.

Another important section of the load chart is the range diagram. The range diagram illustrates the tip height which can be achieved at each boom length, angle, and radius. If the operator knows the radius required for a specific lift and the tip height necessary, he can calculate the required boom length and angle needed for the lift. He then checks the capacity chart for the specific boom length and radius to find out if the crane is capable of performing the lift safely. Or, on the other hand, if the boom length and angle are known, the radius can be determined from the range diagram.

A lifting area diagram is included as part of the load chart to describe over side, over rear, and over front lifting areas. An examination of the lifting area diagram shows that the locations of the outrigger stabilizer cylinders in the fully extended position are used to mark the boundaries of the lifting areas.

A jib or boom extension capacity chart and notes are also included as part of the load chart to list the capacities for the degree of offset and boom angle.

The last major portion of the load chart is the section concerning notes to lifting capacities. Be sure to read all notes carefully so you understand what each one means. The load chart also gives weight reductions for Grove load handling devices such as hook blocks, headache balls, boom extension sections, etc., which must be taken into consideration as part of the load. Remember, any other load handling devices such as chains, slings, or spreader bars must also be considered, and the weight of these devices must be added to the weight of the load.

CRANE FUNCTIONS

DANGER

DEATH OR SERIOUS INJURY COULD RESULT FROM IMPROPER CRANE SET-UP ON OUTRIGGERS.

DANGER

THE OUTRIGGERS MUST BE PROPERLY EXTENDED AND SET BEFORE ANY OTHER OPERATION OF THE CRANE IS ATTEMPTED, UNLESS LIFTING ON RUBBER.

SETTING THE OUTRIGGERS

1. Position the outrigger floats directly out from each outrigger to where the outriggers will be properly extended.

CAUTION

ALWAYS POSITION A SWITCH ON THE OUTRIGGER SELECTOR PANEL BEFORE POSITIONING THE OUTRIGGER EXTENSION/RETRACTION SWITCH TO EXTEND OR RETRACT. FAILURE TO DO THIS MAY CAUSE A HYDRAULIC LOCK AGAINST THE INDIVIDUAL SOLENOID VALVES, PREVENTING THEM FROM OPENING.

2. Position the appropriate OUTRIGGER SELECTOR switch and position the outrigger extension/retraction toggle switch to EXTEND. The appropriate outrigger should begin to extend. Refer to Engaging the Mid–Extend Lock Pin if the crane is to be operated at the mid–extend position.

DANGER

ALL FOUR OUTRIGGER BEAMS MUST BE EQUALLY EXTENDED TO THE APPROPRIATE VERTICAL STRIPE BEFORE BEGINNING OPERATION.

NOTE

More than one outrigger may be extended at one time. However, to ensure that each outrigger is fully extended, each OUTRIGGER SELECTOR switch should be depressed individually and the outrigger extension/retraction switch momentarily positioned to EXTEND after multi–outrigger extension.

3. After all four outrigger beams have been fully extended, position the appropriate STABILIZER switch and position the outrigger extension/retraction switch to EXTEND.

4. Extend each stabilizer, positioning the float as necessary, until the locking levers of the float engage the stabilizer cylinder rod.

NOTE

More than one stabilizer may be extended at one time.

5. With each stabilizer float firmly touching the ground, depress the front STABILIZER switches and position the extension/retraction switch to EXTEND, and extend the front stabilizers approximately 3 to 4 inches (7.6 to 10.2 cm).

6. Depress the rear STABILIZER switches and position the toggle switch to EXTEND, and extend the rear stabilizers approximately 3 to 4 inches (7.6 to 10.2 cm).

DANGER

ALL FOUR OUTRIGGER BEAM LOCK PINS MUST BE ENGAGED BEFORE OPERATING FROM THE FULLY RETRACTED OR MID–EXTEND POSITION.

DANGER

THE OPERATOR MUST SELECT THE PROPER LOAD CHART AND LMI PROGRAM FOR THE OUTRIGGER POSITION SELECTED.

7. Repeat the procedures in steps 5 and 6 until all wheels are clear of the ground and the crane is level, as indicated by the sight level bubble located on the front console. If suspected that the bubble level indicator is out of adjustment, verify and adjust it as follows.

a. Locate the crane on a firm level surface.

b. Extend and set the outriggers. Level the crane, as indicated by the bubble level indicator, using the outriggers.

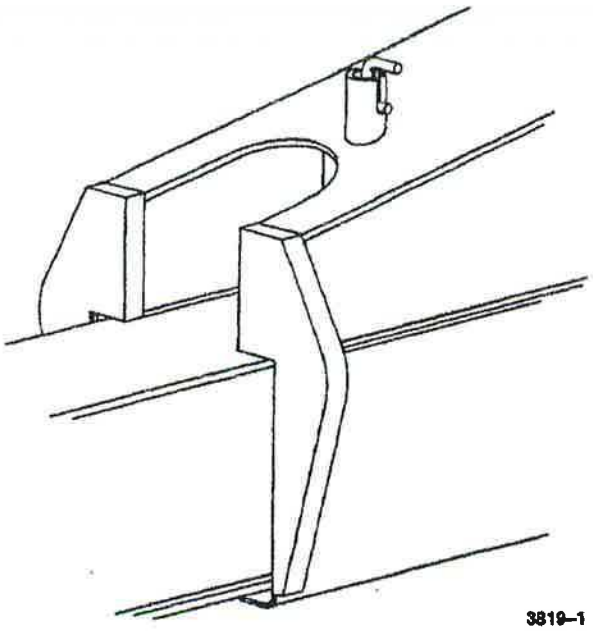
c. Place a miracle pointer, carpenter level, or similar type device on a machined surface such as the turntable bearing or bearing mounting surfaces.

d. Using the outriggers, level the crane as indicated on the device used in step c.

e. Using the mounting screws, adjust the bubble level indicator to show level.

Engaging the Lock Pin

1. Turn the locking pin 90 degrees from its stowed position and allow the pin to rest on top of the outrigger beam.



NOTE

It may be necessary to jog the outrigger extension/retraction switch slightly to ensure proper pin engagement.

2. Slowly extend or retract the outrigger beam, allowing the locking pin to drop into the hole in the top of the outrigger beam, engaging the outrigger beam at the desired length.

STOWING THE OUTRIGGERS

1. Position the rear STABILIZER switches and position the extension/retraction switch to RETRACT until the rear stabilizers have retracted several inches.

2. Position the front STABILIZER push–button switches and position the extension/retraction switch to RETRACT until the front stabilizers have retracted several inches.

3. Repeat steps 1 and 2 until the crane is resting on all 4 wheels and the stabilizer floats are several inches off the ground.

DANGER

KEEP FEET AND HANDS CLEAR OF THE FLOATS WHEN UNLOCKING THEM FROM THE STABILIZERS.

4. Release the locking levers and allow the floats to drop to the ground.

5. Continue to retract the stabilizers until they are fully retracted.

6. Position the appropriate EXTENSION switch and position the extension/retraction switch to RETRACT to retract each outrigger. Refer to Stowing the Mid–Extend Lock Pin if the crane was operated at the mid–extend position.

NOTE

More than one outrigger may be retracted at a time.

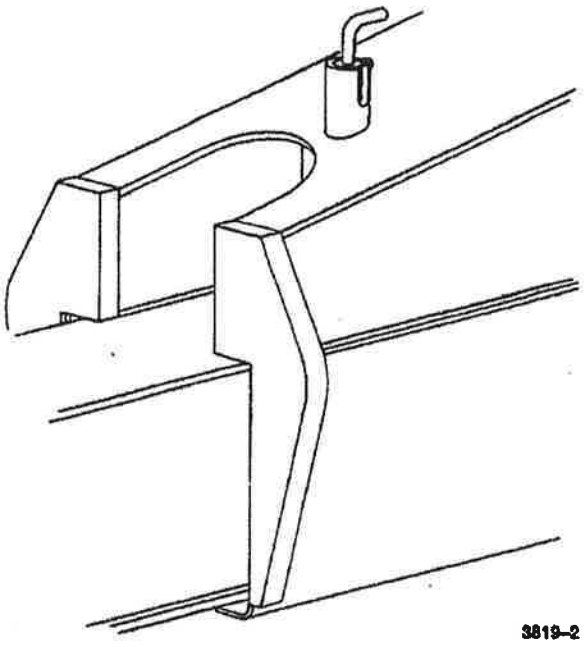
7. Stow the outrigger floats.

Stowing the Lock Pin

1. Retract the outrigger jack cylinder.

NOTE

If the lock pin is wedged in the hole in the outrigger beam, it may be necessary to jog the outrigger extension/retraction switch slightly while pulling upward on the pin.



2. Lift the lock pin and turn it 90 degrees to its stowed position.

SWINGING THE BOOM

DANGER

DEATH OR SERIOUS INJURY COULD RESULT FROM BEING CRUSHED BY MOVING MACHINERY. BEFORE ACTUATING SWING, SOUND THE SWING HORN AND VERIFY THAT ALL PERSONNEL ARE CLEAR OF ROTATING AND MOVING PARTS.

DANGER

BEFORE INITIATING ANY SWING OPERATIONS, ENSURE THE AREA IN THE SWING PATH OF THE HOOK AND/OR LOAD, AS WELL AS THE TAIL SWING AREA, IS CLEAR OF ALL OBSTRUCTIONS AND PERSONNEL.

DANGER

WHEN SWINGING THE LOAD FROM OVER–THE–FRONT TO OVER–THE–SIDE OF THE CRANE, REFER TO THE OVER–THE–SIDE LOAD CHART TO MAKE CERTAIN THE APPLICABLE CAPACITY IS NOT EXCEEDED. TRAVELING WITH ANY LOAD OVER–THE–SIDE IS PROHIBITED.

CAUTION

ENSURE THE SWING LOCK IS DISENGAGED AND THE SWING BRAKE SWITCH IS IN THE DISENGAGE POSITION BEFORE ATTEMPTING TO SWING.

CAUTION

NEVER PUSH OR PULL THE SWING CONTROL LEVER THROUGH NEUTRAL TO THE OPPOSITE DIRECTION TO STOP SWING MOTION.

NOTE

Automatic rear axle oscillation lockout will activate when the boom swings right or left of the crane centerline.

Before actuating swing, sound the swing horn and verify that all personnel are clear of rotating and moving parts. To swing the boom, the SWING control is pushed to the proper position to achieve the desired swing direction. Always operate the control lever with a slow, even pressure. With free swing, rotation is stopped utilizing the swing brake foot pedal. When rotation is stopped, put the SWING BRAKE switch in the engage position to prevent further rotation.

ELEVATING AND LOWERING THE BOOM.

Elevating The Boom.

DANGER

BEFORE ELEVATING THE BOOM, ENSURE THE AREA ABOVE AND BENEATH THE BOOM IS CLEAR OF ALL OBSTRUCTIONS AND PERSONNEL.

To elevate the boom, the BOOM control is pushed to the proper position and held until the boom reaches the desired elevation angle.

Lowering The Boom

DANGER

BEFORE LOWERING THE BOOM, MAKE CERTAIN THE AREA BENEATH THE BOOM IS CLEAR OF ALL OBSTRUCTIONS AND PERSONNEL.

DANGER

LONG CANTILEVER BOOMS CAN CREATE A TIPPING CONDITION EVEN WHEN UNLOADED AND IN AN EXTENDED AND LOWERED POSITION.

CAUTION

WHEN LOWERING THE BOOM, LET OUT THE CABLE SIMULTANEOUSLY TO PREVENT TWO-BLOCKING THE BOOM NOSE AND THE HOOK BLOCK.

CAUTION

THE CLOSER THE LOAD IS CARRIED TO THE BOOM NOSE, THE MORE IMPORTANT IT BECOMES TO SIMULTANEOUSLY LET OUT CABLE AS THE BOOM IS LOWERED.

CAUTION

WHEN LOWERING THE BOOM, LOWER THE CABLE AT THE SAME TIME TO PREVENT TWO–BLOCKING THE BOOM NOSE AND THE HOOK BLOCK.

To lower the boom, the BOOM control is pushed to the proper position and held until the boom is lowered to the desired position.

EMERGENCY BOOM OPERATING PROCEDURES

Although highly improbable if proper maintenance and frequent inspections are made, there remains the possibility that the boom lift cylinder hydraulic line could fail. If this occurs, there are restricting devices provided that allow continued operation of the crane. All crane functions remain operable until the hydraulic oil in the reservoir is depleted. The most important thing is to get the boom in a safe position so that repairs can be made. The following procedures are recommended for getting the boom to a safe position.

1. Remain at the operator's station as all functions can be accomplished from this position.

2. Accelerate the engine to normal operating rpm.

3. Maintain the desired boom angle by pushing on the BOOM control lever to the left, as necessary.

4. While maintaining the boom at this angle, activate swing, telescope in the boom sections, and operate the hoist(s) as necessary until the load is safely lowered to the ground.

5. If over–the–side, telescope in as much boom as possible and then lower the boom. If over–the–front or over–the–rear, it will not be necessary to telescope in.

TELESCOPING THE BOOM

Extending The Boom

DANGER

WHEN EXTENDING THE BOOM, LET OUT CABLE SIMULTANEOUSLY TO PREVENT TWO–BLOCKING THE BOOM NOSE AND HOOK BLOCK.

DANGER

CHECK THE LOAD CHART FOR MAXIMUM LOAD AT GIVEN RADIUS, BOOM ANGLE, AND LENGTH BEFORE EXTENDING BOOM WITH A LOAD.

To extend the boom, the TELESCOPE control lever is pushed forward away from the operator, to the OUT position and held until the boom extends to the desired length.

Retracting The Boom

DANGER

WHEN RETRACTING THE BOOM, THE LOAD WILL LOWER UNLESS THE CABLE IS TAKEN IN SIMULTANEOUSLY.

To retract the boom, the TELESCOPE control lever is pulled back, toward the operator, to the IN position and held until the boom retracts to the desired length.

NOTE

When the crane is equipped with an auxiliary hoist the telescope function is controlled by a foot pedal.

LOWERING AND RAISING THE CABLE

DANGER

BEFORE LOWERING OR RAISING THE CABLE (LOAD), ENSURE THE AREA BENEATH THE LOAD IS CLEAR OF ALL OBSTRUCTIONS AND PERSONNEL.

DANGER

WHEN STARTING OR STOPPING THE HOIST, DO NOT JERK THE CONTROL LEVER. JERKING THE LEVER CAUSES THE LOAD TO BOUNCE, WHICH COULD RESULT IN POSSIBLE DAMAGE TO THE CRANE.

NOTE

When the load is stopped at the desired height, the automatic brake will engage and hold the load as long as the control lever remains in neutral.

Lowering The Cable

To lower the cable, the MAIN hoist or AUX hoist control lever is pushed forward, away from the operator, to the down position and held until the hook or load is lowered to the desired height.

Raising The Cable

To raise the cable, the MAIN hoist or AUX hoist control lever is pulled back, toward the operator, to the up position and held until the hook or load is raised to the desired height.

STOWING AND PARKING

DANGER

NEVER PARK THE CRANE NEAR HOLES, OR ON ROCKY OR EXTREMELY SOFT SURFACES. THIS MAY CAUSE THE CRANE TO OVERTURN, RESULTING IN INJURY TO PERSONNEL.

After the crane is parked, complete the following.

1. Remove the load from the hook.
2. Remove or stow boom extensions if so equipped.
3. Fully retract all boom sections.
4. Lower the boom to normal travel position.
5. Engage the swing brake and/or swing lock.
6. Retract all stabilizer cylinders and outrigger beams.
7. Park the crane on a stable surface.
8. Apply the parking brakes and chock wheels.
9. Ensure all operating controls are in neutral position.
10. Shut down engine following proper procedures specified in this Handbook and the applicable Engine manual.
11. Remove the keys.
12. Close and lock, if applicable, all windows, covers, and doors.

OPTIONAL EQUIPMENT OPERATION

ENGINE COLD START SYSTEM

CAUTION

DO NOT USE THE COLD START SYSTEM FEATURE WITH A WARM ENGINE.

The engine cold start system is provided as an aid for starting the engine during cold weather. The system consists of a switch, a solenoid valve, an ether container, and the necessary tubing. The COLD START switch is located on the front control panel in the cab. The solenoid valve and ether container are mounted inside the engine compartment. The cold start is energized only when the ignition switch is in the START position and the COLD START button is pushed. (See COLD WEATHER STARTING).

HI-SPEED GLIDE SYSTEM

Before operating the hi-speed glide system the following conditions must be met.

1. The boom must be fully retracted.
2. The boom must be elevated approximately 15 degrees.
3. There must be no load on the hook.

After the above conditions are met, place the hi-speed glide control switch in the ENGAGE position. When the indicator light illuminates, begin traveling. Place the switch in the DISENGAGE position when hi-speed glide travel is complete.

OPERATIONAL AIDS

DANGER

ELECTRONIC EQUIPMENT ON THIS CRANE IS INTENDED AS AN AID TO THE OPERATOR. UNDER NO CONDITION SHOULD IT BE RELIED UPON TO REPLACE THE USE OF CAPACITY CHARTS AND OPERATING INSTRUCTIONS. SOLE RELIANCE UPON THESE ELECTRONIC AIDS IN PLACE OF GOOD OPERATING PRACTICES CAN CAUSE AN ACCIDENT.

LOAD MOMENT INDICATING (LMI) SYSTEM

The Load Moment Indicator system has been designed to provide the crane operator with the essential information required to enable the machine to be used

within its design parameters. Using various sensing devices, the LMI monitors various crane functions and provides the operator with a continuous reading of the crane's capacity. The readings continuously change as the crane moves through the motions needed to make the lift. The LMI provides the operator with information regarding the length and angle of the boom, tip height, working radius, rated load and the total calculated weight being lifted by the crane. Refer to the LMI Operator's Handbook for more detailed information on the function and use of the LMI system.

Section 5
LUBRICATION

GENERAL

Following the designated lubrication procedures is important in ensuring maximum crane lifetime and utilization. The procedures and lubrication charts in this section include information on the types of lubricants used, the location of the lubrication points, the frequency of lubrication, and other information.

LUBRICATION POINTS

The service intervals specified are for normal operation where moderate temperature, humidity, and atmospheric conditions prevail. In areas of extreme conditions, the service periods and lubrication specifications should be altered to meet existing conditions. For information on extreme condition lubrication, contact your local service representative or Grove Product Support, Chambersburg, Pennsylvania.

A regular frequency of lubrication must be established for all lubrication points. Normally, this is based on component operating time. The most efficient method of keeping track of lube requirements is to maintain a job log indicating crane usage. The log must use the engine hourmeter to ensure coverage of lube points that will receive attention based on their readings. Other lubrication requirements must be made on a time basis, i.e. weekly, monthly, etc.

All oil levels are to be checked with the crane parked on a level surface in transport position, and while the oil is cold, unless otherwise specified.

On plug type check points, the oil levels are to be at the bottom edge of the check port.

On all hoists with a check plug in the drum, the fill plug shall be directly on top of the hoist, and the check plug level.

All grease fittings are SAE STANDARD unless otherwise indicated. Grease non–sealed fittings until grease is seen extruding from the fitting. One ounce(28 grams) of EP–MPG equals one pump on a standard one pound (0.45 kg) grease gun.

Over lubrication on non–sealed fittings will not harm the fittings or components, but under lubrication will definitely lead to a shorter lifetime.

On sealed U–joints, care must be exercised to prevent rupturing seals. Fill only until expansion of the seals first becomes visible.

Unless otherwise indicated, items not equipped with grease fittings, such as linkages, pins, levers, etc., should be lubricated with oil once a week. Motor oil, applied sparingly, will provide the necessary lubrication and help prevent the formation of rust. An Anti–Seize compound may be used if rust has not formed, otherwise the component must be cleaned first.

Grease fittings that are worn and will not hold the grease gun, or those that have a stuck check ball, must be replaced. Where wear pads are used, cycle the components and relubricate to ensure complete lubrication of the entire wear area.

The following describe the lubrication points and gives the lube type, lube interval, lube amount, and application of each. Each lubrication point is numbered, and this number corresponds to the index number shown on the Lubrication Diagram.

CAUTION

THE FOLLOWING LUBE INTERVALS ARE TO BE USED AS A GUIDELINE ONLY. ACTUAL LUBE INTERVALS SHOULD BE FORMULATED BY THE OPERATOR TO CORRESPOND ACCORDINGLY TO CONDITIONS SUCH AS CONTINUOUS DUTY CYCLES AND/OR HAZARDOUS ENVIRONMENTS.

1. **Hook Block Swivel Bearing.**

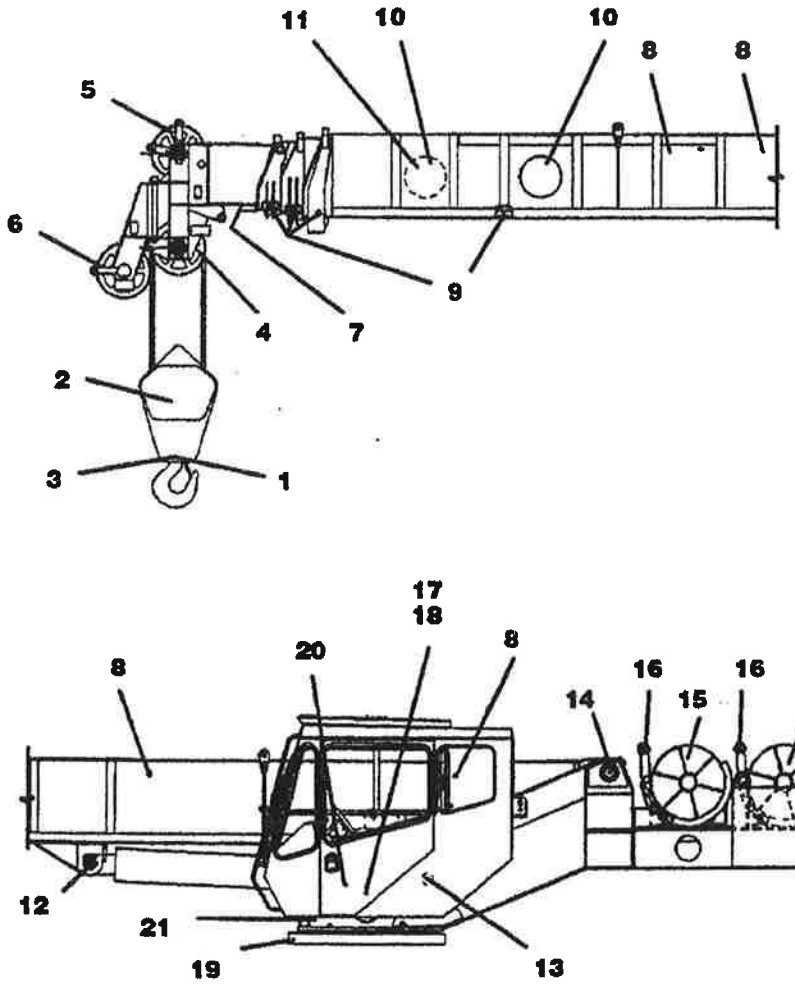
   Lube Type – EP–MPG
   Lube Interval – 100 hours
   Lube Amount – Until grease extrudes
   Application – 3 grease fittings

2. **Hook Block Sheaves.**

   Lube Type – EP – MPG
   Lube Interval – 100 hours
   Lube Amount – Until grease extrudes
   Application – 1 grease fitting per sheave

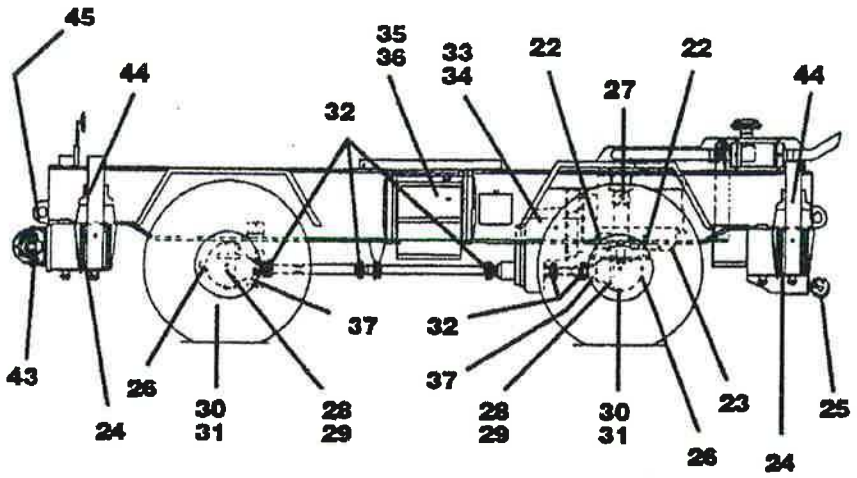
3. **Hook Shank and Hex Nut.**

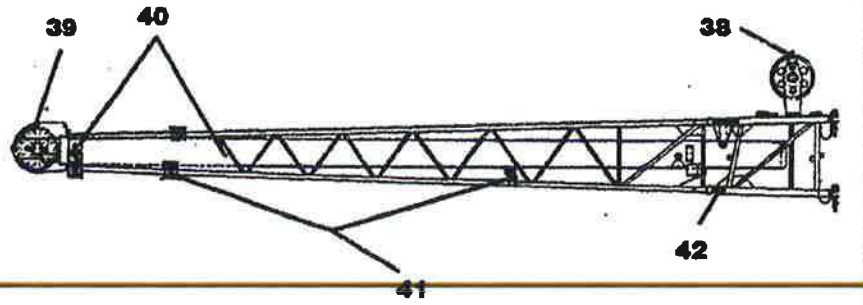
   Lube Type – EP – MPG
   Lube Interval – 100 hours
   Lube Amount – Apply a liberal coating to the hook shank threads and the top of the nut to prevent dust, water, etc. from entering the threads.
   Application – By brush or hand



1. Hook Block Swivel Bearing
2. Hook Block Sheaves
3. Hook Shank and Hex Nut
4. Lower Boom Nose Sheaves
5. Upper Boom Nose Sheaves
6. Rooster Sheave
7. Boom Section Lower Wear Pads
8. Boom Section Upper Wear Pads
9. Adjustable Wear Pads
10. Retraction and Extend Cable Sheave.
11. Telescope Cylinder Wear Pads
12. Upper Lift Cylinder Pivot Shaft
13. Lower Lift Cylinder Pivot Shaft
14. Boom Pivot Shaft
15. HO–30 Hoist
16. Cable Follower and Idler Assembly
17. Swing Box
18. Swing Brake
19. Swing Bearing
20. Swing Gear and Pinion
21. Brake Master Cylinder

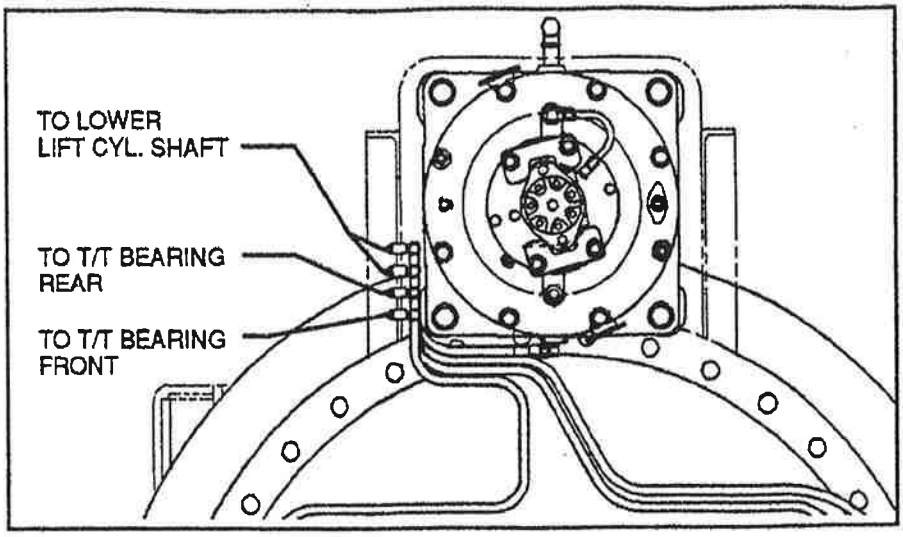
Lubrication Chart (Sheet 1 of 3)





22. Fifth Wheel Oscillation Bushings
23. Engine
24. Outrigger Beams
25. Pintle Hook
26. Steer Cylinder
27. Oscillation Lockout Cylinder
28. Planetary Axle Ends
29. Axle Drive Units
30. Trunnion Bearings and Bushings
31. Cardan Joint
32. Drive Lines and Universal Joints
33. Transmission
34. Transmission Oil Filter
35. Hydraulic Reservoir
36. Hydraulic Reservoir Filter
37. Tie Rods
38. Jib Mast
39. Swingaway Sheave
40. Swingaway Side Wear Pads
41. Swingaway Rollers
42. Jib Lower Cord Adapter
43. Tow Winch
44. Jack Cylinder Support Tubes
45. Hook Block Tie Down

Lubrication Chart (Sheet 2 of 3)



Lubrication Chart (Sheet 3 of 3)

4. **Lower Boom Nose Sheaves.**

   Lube Type – EP – MPG
   Lube Interval – 50 hours
   Lube Amount – Until grease extrudes
   Application – 1 grease fitting per sheave

5. **Upper Boom Nose Sheaves.**

   Lube Type – EP – MPG
   Lube Interval – 50 hours
   Lube Amount – Until grease extrudes
   Application – 1 grease fitting per sheave

6. **Rooster Sheave.**

   Lube Type – EP – MPG
   Lube Interval – 50 hours
   Lube Amount – Until grease extrudes
   Application – 1 grease fitting

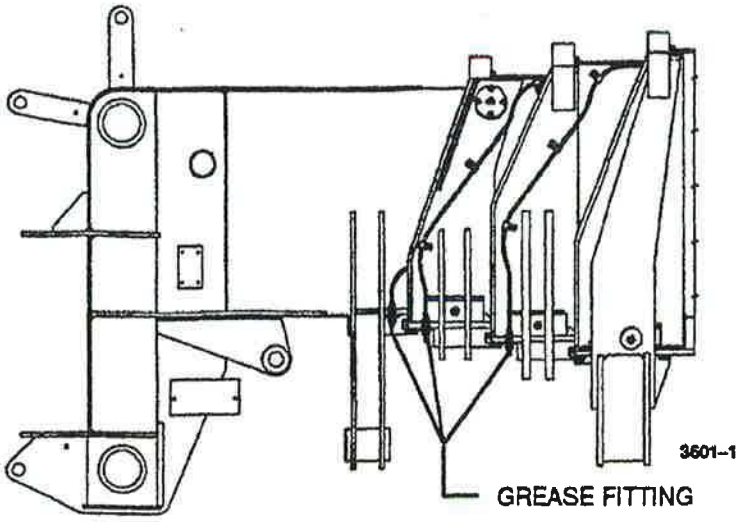
7. **Boom Section Lower Wear Pads.**

   NOTE

   The boom sections must be extended to gain entry through the access holes in the boom.

   Lube Type – EP – MPG
   Lube Interval – 25 hours
   Lube Amount – Thoroughly coat the area the wear pad moves on
   Application – By brush: three places; fully extend the boom sections and coat the entire length of the bottom rail with grease.

8. **Boom Section Upper Wear Pads.**



NOTE

The boom sections must be extended to gain entry through the access holes in the boom.

Lube Type – EP – MPG
Lube Interval – 25 hours
Lube Amount – Thoroughly coat the area the wear pad moves on
Application – 6 grease fittings: three each side; boom needs to be extended and retracted slowly while grease is being pumped into the fittings.

9. **Adjustable Wear Pads.**

Lube Type – EP – MPG
Lube Interval – 25 hours
Lube Amount – Thoroughly coat the area the wear pad moves on
Application – By brush with boom in extended position

10. **Retraction and Extend Cable Sheave.**

NOTE

The boom sections must be extended to gain entry through the access holes in the boom.

Lube Type – EP – MPG
Lube Interval – 50 hours
Lube Amount – Until grease extrudes
Application – 2 grease fitting

11. Telescope Cylinder Wear Pads.

NOTE

The boom sections must be extended to gain entry through the access holes in the boom.

Lube Type – EP – MPG
Lube Interval – 25 hours
Lube Amount – Thoroughly coat the area the wear pad moves on
Application – Three places; By brush

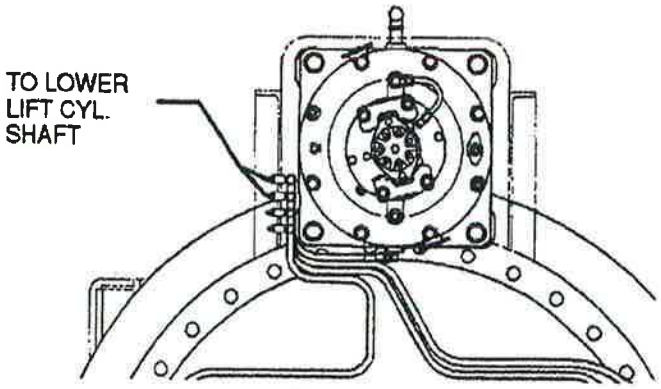
12. Upper Lift Cylinder Pivot Shaft.

NOTE

When greasing the lift cylinder pivot shafts, better distribution of grease within the shafts is obtained if the weight of the boom is removed from the shafts. If this is not possible, slowly elevate and lower the boom while pumping grease into the fitting.

Lube Type – EP–MPG
Lube Interval – 10 hours
Lube Amount – Until grease extrudes
Application – 2 grease fittings – 1 each side

13. **Lower Lift Cylinder Pivot Shaft.**



NOTE

When greasing the lift cylinder pivot shafts, better distribution of grease within the shafts is obtained if the weight of the boom is removed from the shafts. If this is not possible, slowly elevate and lower the boom while pumping grease into the fitting.

Lube Type – EP–MPG
Lube Interval – 10 hours
Lube Amount – Until grease extrudes
Application – 2 grease fittings – 1 each side

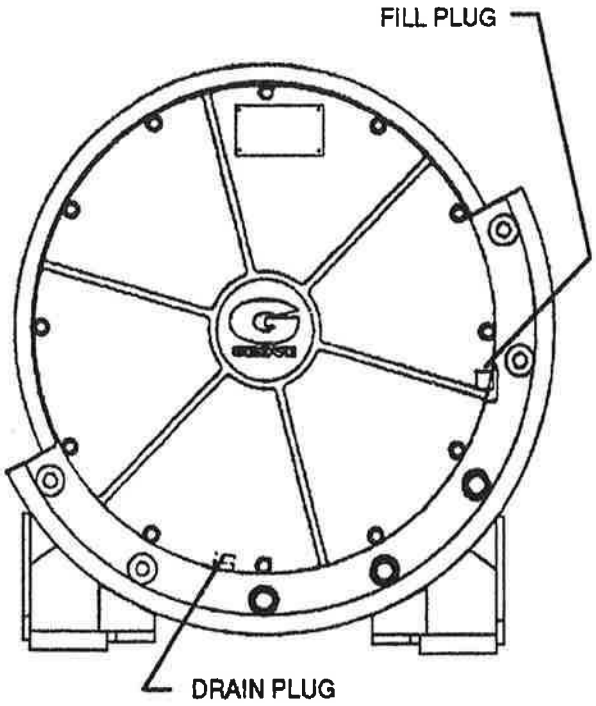
14. **Boom Pivot Shaft.**

NOTE

When greasing the lift cylinder and boom pivot shafts, better distribution of grease within the shafts is obtained if the weight of the boom is removed from the shafts. If this is not possible, slowly elevate and lower the boom while pumping grease into the fitting.

Lube Type – EP–MPG
Lube Interval – 10 hours
Lube Amount – Until grease extrudes
Application – 2 grease fittings – 1 each side

15. **Model HO–30 Hoist.**



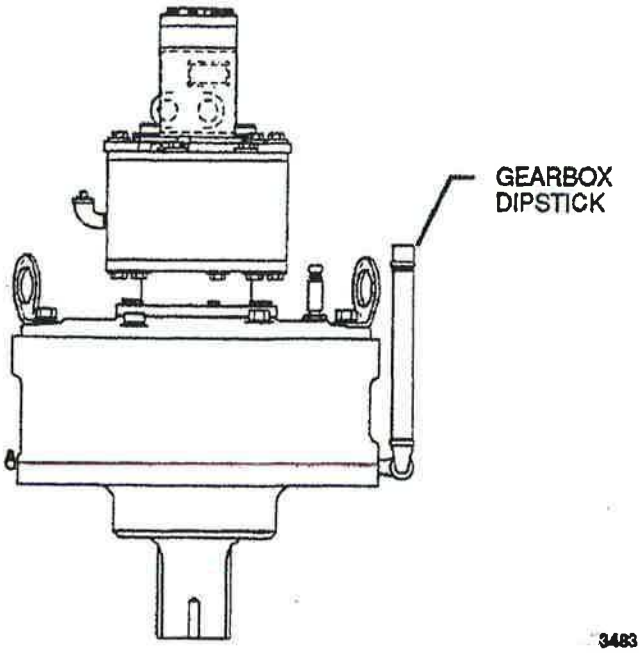
Lube Type – EPGL–5H
Lube Interval – Check every 250 hours
Lube Amount – Capacity 16 in. (40.6 cm) Drum – 12 qts. (11.6 L)
Application – Fill until level with the fill plug opening

16. **Cable Follower and Idler Assembly.**

Lube – EP–MPG
Lube Interval – Weekly
Lube Amount – Until grease extrudes
Application – 2 fitting on idler, 2 fittings on follower

17. **Swing Box.**

A. **Gearbox**



Lube Type – EPGL–5H
Lube Interval –

CAUTION

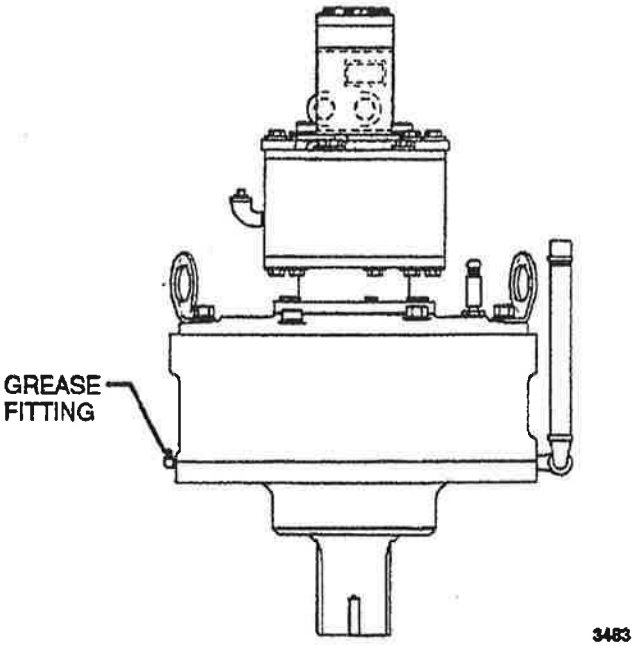
WHEN CHECKING THE SWING GEARBOX OIL LEVEL, PLACE THE DIPSTICK INTO THE SLEEVE UNTIL THE CAP IS FLUSH WITH THE END OF THE SLEEVE. DO NOT SCREW THE CAP ONTO THE SLEEVE TO CHECK THE LEVEL.

Check every 50 hours Drain 1st time after 250 hours and every 500 hours or 12 months thereafter

Lube Amount – Capacity 7 quarts (6.6 l)

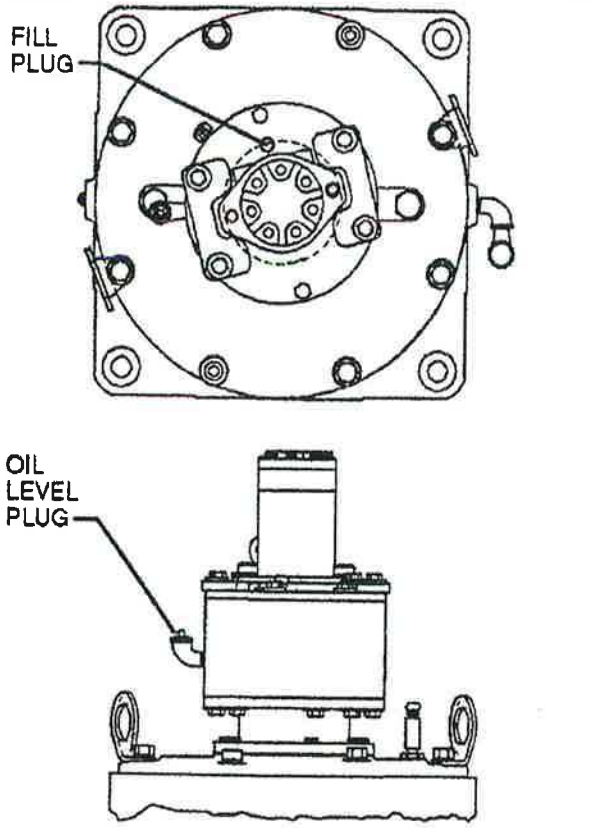
Application – Fill to mark on dipstick. Gain access to dipstick and drain through the rear access plate

B. Pinion Gear Bearing.



Lube Type – EP–MPG
Lube Interval – 100 hours
Lube Amount – Until grease extrudes
Application – 1 grease fitting.

18. Swing Brake.



Lube Type – HYDO
Lube Interval – Check weekly Drain and refill twice a year
Lube Amount – Approximately 0.5 pint (0.47 L)
Application – Fill till oil runs out oil level plug

19. Swing Bearing.

Lube Type – EP–MPG
Lube Interval – 50 hours
Lube Amount – Until grease extrudes from the whole circumference of bearing
Application – 2 grease fittings. Walk around as the superstructure is being rotated. Ensure the entire bearing is lubed

20. Swing Gear and Pinion.

Lube Type – EP–MPG
Lube Interval – 10 hours
Lube Amount – Coat all teeth
Application – Brush on

21. **Brake Master Cylinder.**

Lube Type – SBF
Lube Interval – Check daily
Lube Amount – 4 pints (1.9 L)
Application – Fill cap on top of master cylinder

22. **Fifth Wheel Oscillation Bushings.**

Lube Type – EP–MPG
Lube Interval – 25 hours
Lube Amount – Until grease extrudes
Application – 2 fittings

23. **Engine.**

Lube Type – EO–15W40
Lube Interval – Check daily Drain per Engine Service Manual
Lube Amount – 17.3 quarts (16.2 liters)
Application – See Engine Service Manual

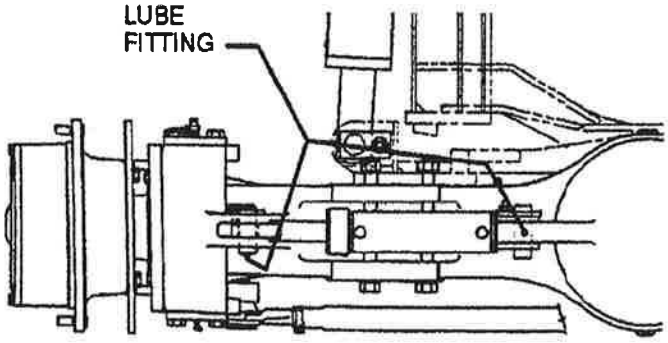
24. **Outrigger Beams.**

Lube Type – EP–MPG
Lube Interval – 25 hours
Lube Amount – Thoroughly coat the area the beam moves on
Application – By brush; extend beams fully and coat the bottom plate

25. **Pintle Hook (Front and Rear)**

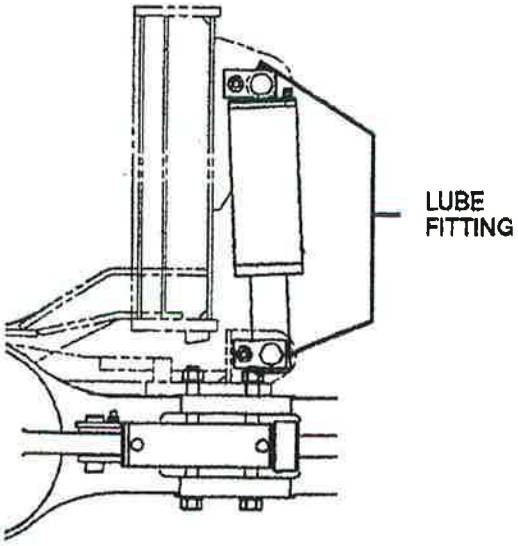
Lube Type – EP–MPG
Lube Interval – Weekly
Lube Amount – Until grease extrudes
Application – 3 grease fitting on each. If a tow winch is supplied there is no front pintle hook

26. **Steer Cylinder.**



Lube Type – EP–MPG
Lube Interval – 50 hours
Lube Amount – Until grease extrudes
Application – 1 grease fitting each end

27. Oscillation Lockout Cylinder.



Lube Type – EP–MPG
Lube Interval – 25 hours
Lube Amount – Until grease extrudes
Application – 1 grease fitting each end

28. Planetary Axle Ends.

Lube Type – EPGL–5H
Lube Interval – Drain while warm
New Axles – Make first change after 75 to 100 hours of operation
Normal – 1. Whenever seals are replaced, brakes are relined, or the drive unit lubricant is changed
2. 1000 to 1500 hours of operation
3. No less than twice a year –Spring and Fall
Lube Amount – Capacity 7 pints (3.3 L)
Application – Fill to bottom of level hole in housing with fill plug at the top and the oil level mark horizontal

29. Axle Drive Units.

Lube Type – EPGL–5H
Lube Interval – Check every 1000 miles (1609 km)
New Axles – 1st change before 3000 miles (4828 km)
Normal – 2000 hours or 25,000 – 30,000 miles (40,234 – 48,280 km) – No less than twice yearly

CAUTION

IF THE MAKEUP AMOUNT IS SUBSTANTIALLY MORE THAN 0.5 PINT (0.23 L) CHECK FOR LEAKS.

Lube Amount – Capacity approximately 30 pints (14.1 L). Normal makeup – less than 0.5 pint (0.23 L)
Application – Fill to bottom of hole in the housing on the steer cylinder side

30. Trunnion Bearings and Bushings.

Lube Type – EP–MPG
Lube Interval – Weekly
Lube Amount – Until grease extrudes
Application – 2 fittings on each axle end

31. Cardan Joint.

Lube Type – EP–MPG
Lube Interval – Weekly
Lube Amount – Until grease extrudes
Application – 1 grease fitting per joint

32. Drive Lines and Universal Joints.

Lube Type – CG or EP–MPG
Lube Interval – Weekly
Lube Amount – Until grease extrudes
Application – 3 grease fittings per drive line

33. **Transmission.**

Lube Type – ATF
Lube Interval –
Check daily with engine running at 500 to 600 rpm and oil at 180 degrees to 200 degrees F (82.2 degrees to 93.3 degrees C)
Drain and refill every 500 hours with the oil at 150 degrees to 200 degrees F (65.6 degrees to 93.3 degrees C)

1. Replace oil filter and clean filter shell
2. Fill to FULL mark on dipstick
3. Run engine at 500 to 600 rpm to prime torque converter and lines
4. Check oil level with engine running at 500 to 600 rpm and oil at 180 degrees to 200 degrees F (82.2 degrees to 93.3 degrees C). Add oil to bring level to FULL mark on dipstick

NOTE

When checking oil level, the oil temperature must be stabilized at 180 degrees to 200 degrees F (82.2 degrees to 93.3 degrees C) to properly check the oil level. Do not attempt an oil level check with cold oil. To bring the oil temperature to this range, it is necessary to either work the crane or stall the converter. Converter stall should be accomplished by engaging the shift levers in forward and high range with the brakes applied and then accelerating the engine to half or three–quarter throttle. Hold the stall until the desired converter temperature is reached and stabilized.

CAUTION

FULL THROTTLE STALL SPEEDS FOR AN EXCESSIVE LENGTH OF TIME WILL OVERHEAT THE CONVERTER AND CAUSE SERIOUS DAMAGE.

Lube Amount – Capacity Torque converter, lines, and transmission as a system –Approximately 20 quarts (19 L)
Application – Through the fill pipe to the FULL mark on the dipstick

34. **Transmission Oil Filter.**

Lube Type – ATF
Lube Interval – Change filter every 250 hours
Lube Amount – N/A
Application – N/A

35. **Hydraulic Reservoir.**

Lube Type – HYDO
Lube Interval – Check daily. Drain as necessary
Lube Amount – Capacity 101 gallons (382 L)
Application – Fill through the cap on top of the tank. When tank is drained, clean the magnetic pipe plug

36. **Hydraulic Reservoir Filter.**

Lube Type – HYDO
Lube Interval – Check with oil temperature above 80 degrees F (27 degrees C). Change the filter when the flag is red
Lube Amount – N/A
Application – N/A

37. **Tie Rods.**

Lube Type – EP–MPG
Lube Interval – 50 hours
Lube Amount – Until grease extrudes
Application – 1 grease fitting at each end

38. **Jib Mast.**

Lube Type – EP–MPG
Lube Interval – 25 hours
Lube Amount – Until grease extrudes
Application – 1 grease fitting on sheave wheel

39. **Swingaway Sheave.**

Lube Type – EP–MPG
Lube Interval – 50 hours
Lube Amount – Until grease extrudes
Application – 1 grease fitting per sheave wheel

40. **Swingaway Side Wear Pads.**

Lube Type – EP–MPG
Lube Interval – 25 hours
Lube Amount – Thoroughly coat the area the wear pad moves on
Application – By brush

41. **Swingaway Rollers.**

Lube Type – EP–MPG
Lube Interval – 25 hours
Lube Amount – Thoroughly coat all sliding contract surfaces
Application – By brush

42. **Jib Lower Cord Adapter.**

Lube Type – EP–MPG
Lube Interval – 25 hours
Lube Amount – Until grease extrudes
Application – 1 grease fitting on each side

43. **Tow Winch.**

Lube Type – Internally lubricated by manufacturer. No lubrication required.

44. **Jack Cylinder Support Tubes.**

Lube Type – EP–MPG
Lube Interval – 25 hours
Lube Amount – Thoroughly coat the area the cylinder rides on
Application – By brush

45. **Hook Block Tie Down.**

Lube Type – EP–MPG
Lube Interval – As needed
Lube Amount – Until grease extrudes
Application – 1 grease fitting

WIRE ROPE LUBRICATION

Wire rope is lubricated during manufacturing so the strands, and individual wires in strands, may move and adjust as the rope moves and bends. A wire rope cannot be lubricated sufficiently during manufacture to last its entire life. Therefore, new lubricant must be added periodically throughout the life of a rope to replace factory lubricant which is used or lost. For more detailed information concerning the lubrication and inspection of wire rope, refer to WIRE ROPE in Chapter 1, Section 2 – GENERAL MAINTENANCE in the Service Manual.

Section 6
SET UP AND INSTALLATION PROCEDURES

GENERAL

This section provides procedures for installing the hoist cable on the hoist drum, cable reeving, and erecting and stowing the swingaway boom extension.

INSTALLING CABLE ON THE HOIST

CAUTION

IF CABLE IS WOUND FROM THE STORAGE DRUM, THE REEL SHOULD BE ROTATED IN THE SAME DIRECTION AS THE HOIST.

NOTE

The cable should preferably be straightened before installation on the hoist drum.

Install cable on the hoist drum in accordance with the following procedure.

1. Position the cable over the boom nose sheave and route to the hoist drum.

2. Position the hoist drum with the cable anchor slot on top.

3. Insert the cable through the slot and position around the anchor wedge.

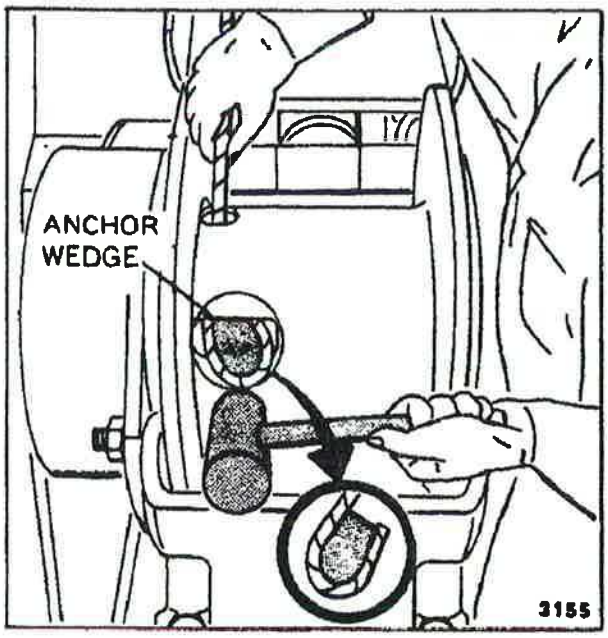
NOTE

The end of the cable should be even with the bottom of the anchor wedge.

4. Position the anchor wedge in the drum slot; pull firmly on the free end of the cable to secure the wedge.

NOTE

If the wedge does not seat securely in the slot, carefully tap the top of the wedge with a mallet.



Installing Cable Anchor Wedge

5. Slowly rotate the drum, ensuring the first layer of cable is evenly wound onto the drum.

6. Install the remainder of the cable, as applicable.

CABLE REEVING

Within the limits of the load and range charts and permissible line pull, multi–part lines allow the operator to raise a greater load than can be raised with a single part line. Various cable reeving (part line) is possible with the boom nose and hook block. This reeving should be accomplished by a qualified rigger using standard rigging procedures.

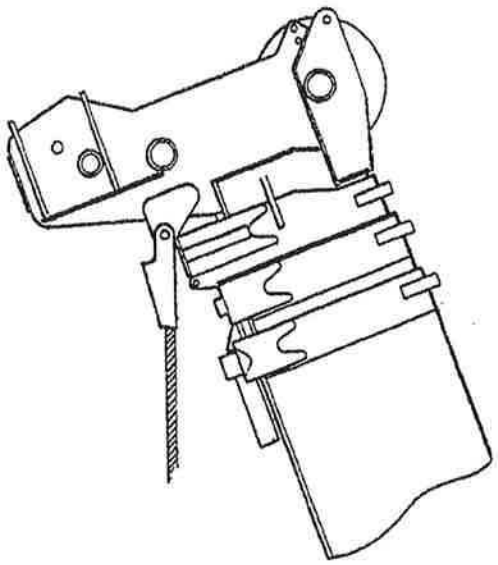
DEAD–END RIGGING/WEDGE SOCKETS

The wedge socket is a very popular cable end attachment and is easily installed and dismantled, but it must be installed correctly as stated in the following procedure. If variations are made to suit special conditions, they should be carefully evaluated before proceeding. Since state and local laws may vary, alternate attachment methods may be necessary depending upon work conditions. If alternate methods are selected, the user is responsible and should proceed in compliance with the regulations in force. If there are any questions, contact your local Grove Distributor or Grove Product Support.

It is essential to use only a wedge and socket of the correct size for the rope fitted. Failure to do so may result in the rope pulling through the fitting.

Do not mix components from different manufacturers. The fitting of the wedge (with rope) in the socket should always be checked at the time of assembly.

When assembly is complete, the boom should be raised to a working position and a load suspended to firmly seal the wedge and rope into the socket before the crane is used operationally.



CAUTION

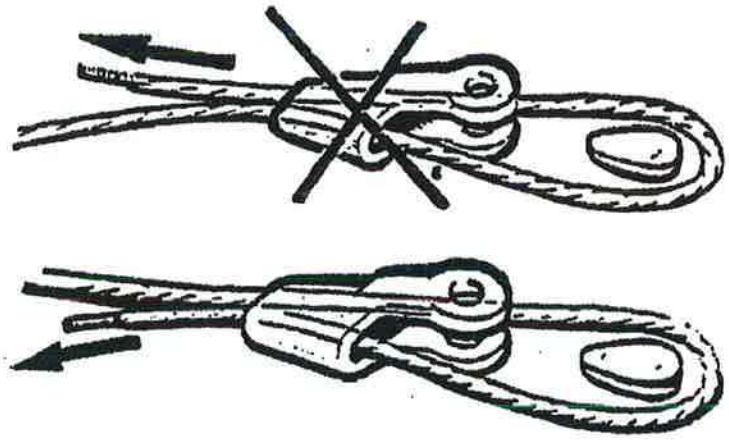
IF THE SOCKET IS NOT POSITIONED WITH THE FLAT FACE TOWARDS THE BOOM SECTIONS, STRUCTURAL DAMAGE WILL OCCUR.

When anchoring the socket to the boom, ensure the flat face of the socket is in position as shown towards the boom sections.

INSTALLING THE WEDGE AND SOCKET

1. Inspect the wedge and socket; remove any rough edges and burrs.

2. If the end of the rope is welded, the welded end should be cut off. This will allow the distortion of the rope strands, caused by the bend around the wedge, to adjust themselves at the end of the line.



3. Ensure the live–loaded–side of the rope is in line with the ears of the socket. If the rope is loaded into the socket incorrectly, under a load the rope will bend as it leaves the socket and the edge of the socket will wear into the rope causing damage to the rope and eventual failure.

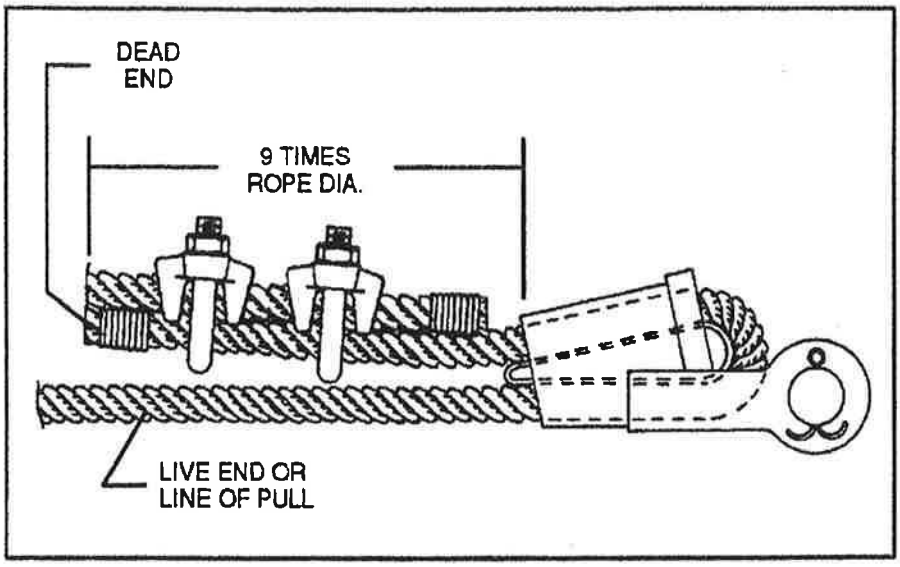
4. The dead end of the rope should extend from the socket for a distance approximately nine times the rope diameter, (a minimum of 6 inches [15.2 cm]).

5. Place the wedge in the socket.

6. Place a wire rope clip around the dead end by clamping a short extra piece of rope to the dead end. DO NOT CLAMP THE LIVE END. The U–bolt should bear against the dead end. The saddle of the clip should bear against the short extra piece. Torque the U–bolts according to the figures listed in the chart titled Wire Rope Clip Torque Values.

7. Secure the ears of the socket to a sturdy support. Pull the wedge and rope into position with tension on the live side of the rope sufficiently tight enough to hold them in place.

8. After final pin connections are made, increase the loads gradually until the wedge is properly seated.



Dead–End Rigging/Wedge Socket

Clip Size (Inches)	*Torque in Lbs.–Ft
1/8	3
3/16	4.5
1/4	15
5/16	15
3/8	30
7/16	40
1/2	45
9/16	50
5/8	75
3/4	75
7/8	130
1	130
1–1/8	200
1–1/4	200
1–3/8	360
1–1/2	360

* The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

Wire Rope Clip Torque Values

ERECTING AND STOWING THE SWINGAWAY BOOM EXTENSION

DANGER

BEFORE ATTEMPTING TO ERECT OR STOW THE SWINGAWAY, READ AND STRICTLY ADHERE TO ALL DANGER DECALS INSTALLED ON THE SWINGAWAY AND STOWAGE BRACKETS.

ERECTING

1. Extend and set the outriggers.

2. Position the boom over the front.

3. If extended, fully retract all the boom sections and lower to minimum elevation to permit ease of installation of pins and access to the boom nose.

NOTE

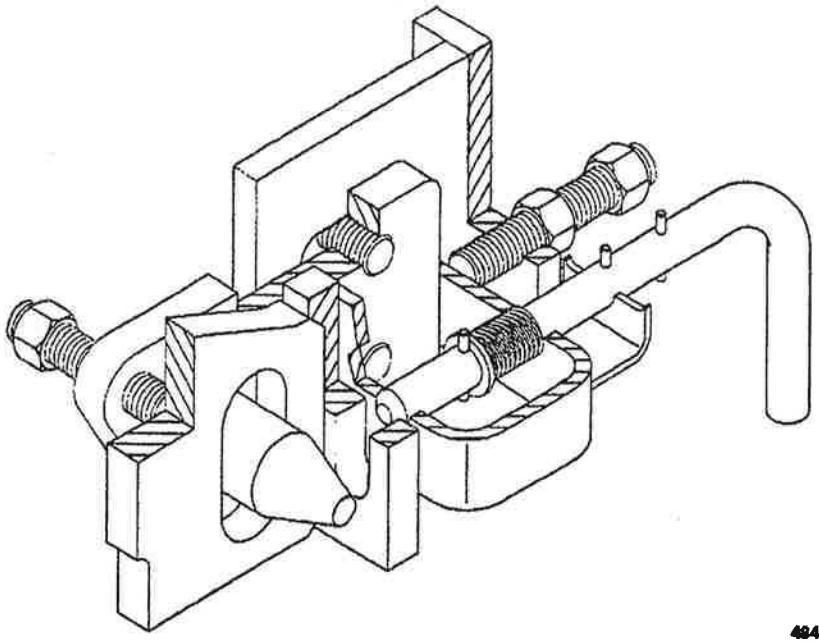
The auxiliary boom nose (rooster sheave) does not have to be removed.

4. Rig either the main hoist or optional auxiliary hoist cable for single part line with nothing but the becket on the end of the cable.

5. Extend the boom enough (approximately 1/2 inch) to disengage the spring loaded boom extension stop blocks from underneath the front of the mid section.

6. Disengage the spring loaded boom extension stop blocks and fully retract the boom.

7. Remove the retainer clips from the attach pins stowed in the base of the swingaway and insert the attach pins through the attach and anchor fittings on the right side of the boom nose. Install the retainer clips in the attach pins.



4943–1

8. Pull the pin securing the swingaway to the front stowage bracket. Ensure the pin is pulled out to the second roll pin and turned as shown above.

9. Attach a length of rope to the swingaway tip to aid in swinging the swingaway into place ahead of the boom nose.

10. Raise the boom to horizontal and extend the boom just enough to clear the swingaway stowage lugs from the guide pins and ramp on the front and rear stowage brackets (approximately 15 inches).

DANGER

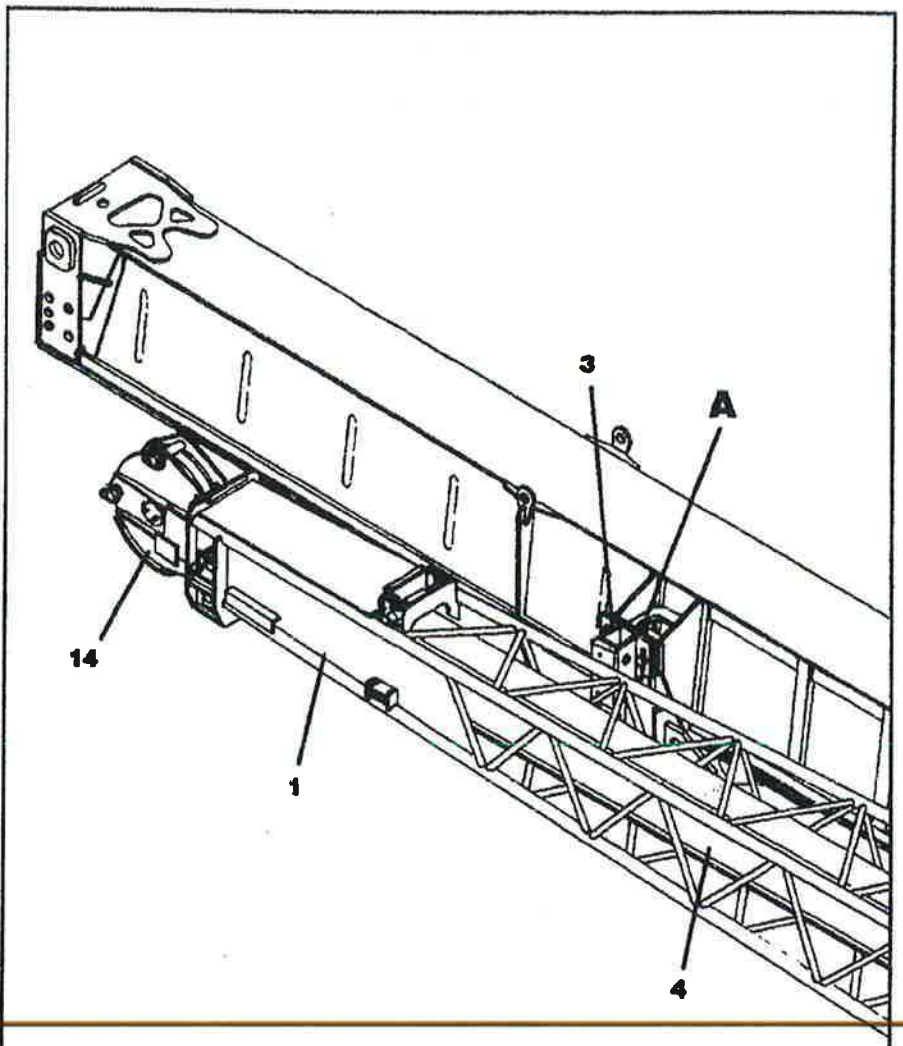
WHEN ERECTING THE SWINGAWAY, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE KEPT CLEAR OF THE SWING PATH.

11. Slightly raise and/or lower the boom to help control the swingaway. Using the rope attached to the tip of the swingaway, swing the swingaway into place ahead of the boom nose, engaging the anchor fittings with the attach fittings on the left side of the boom nose.

DANGER

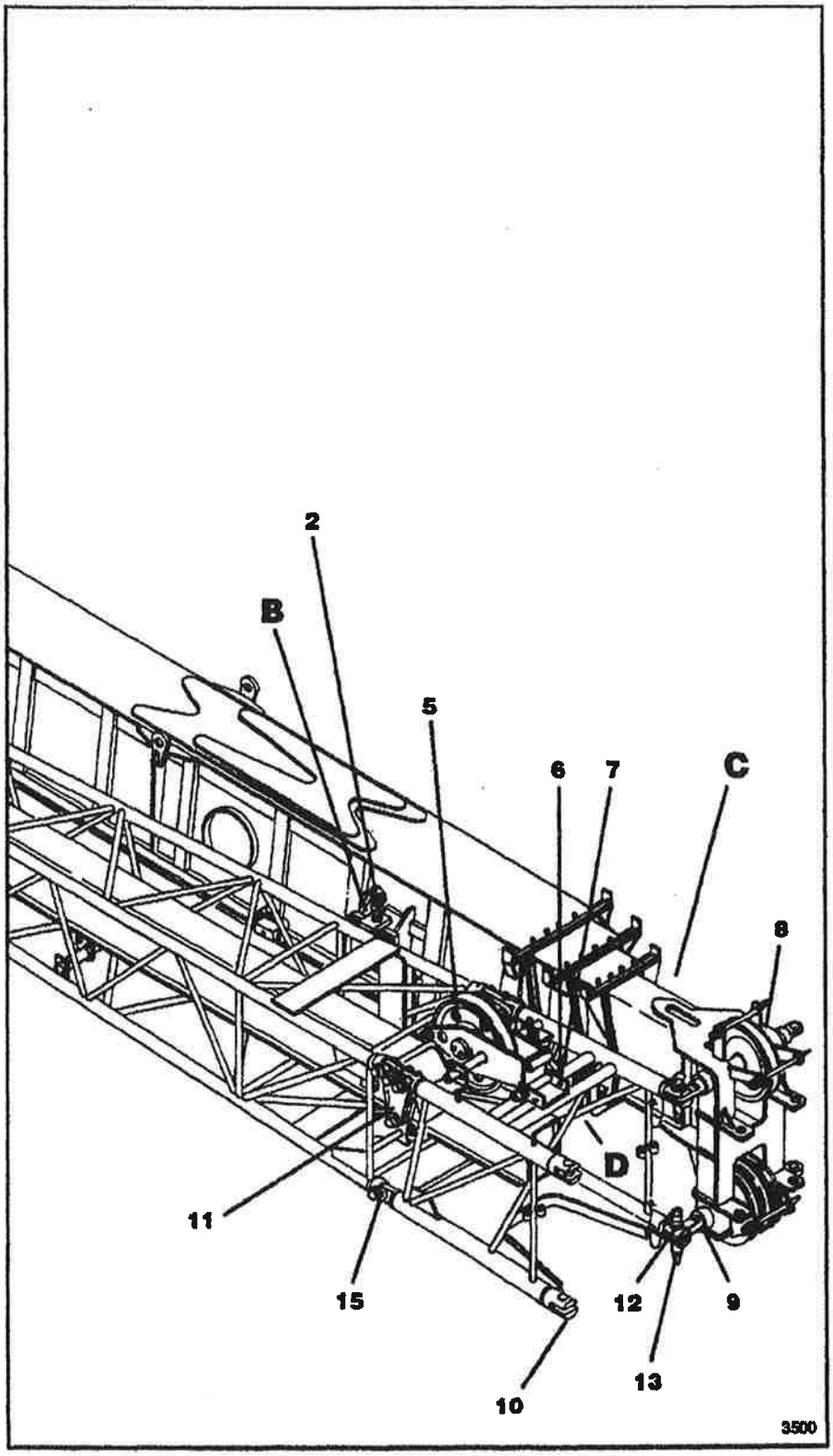
DO NOT MODIFY THE ATTACH POINTS TO PERMIT THE INSTALLATION OF THE ATTACH PINS.

12. Install the attach pin and retainer clip into the upper anchor and attach fittings on the left side of the boom nose.

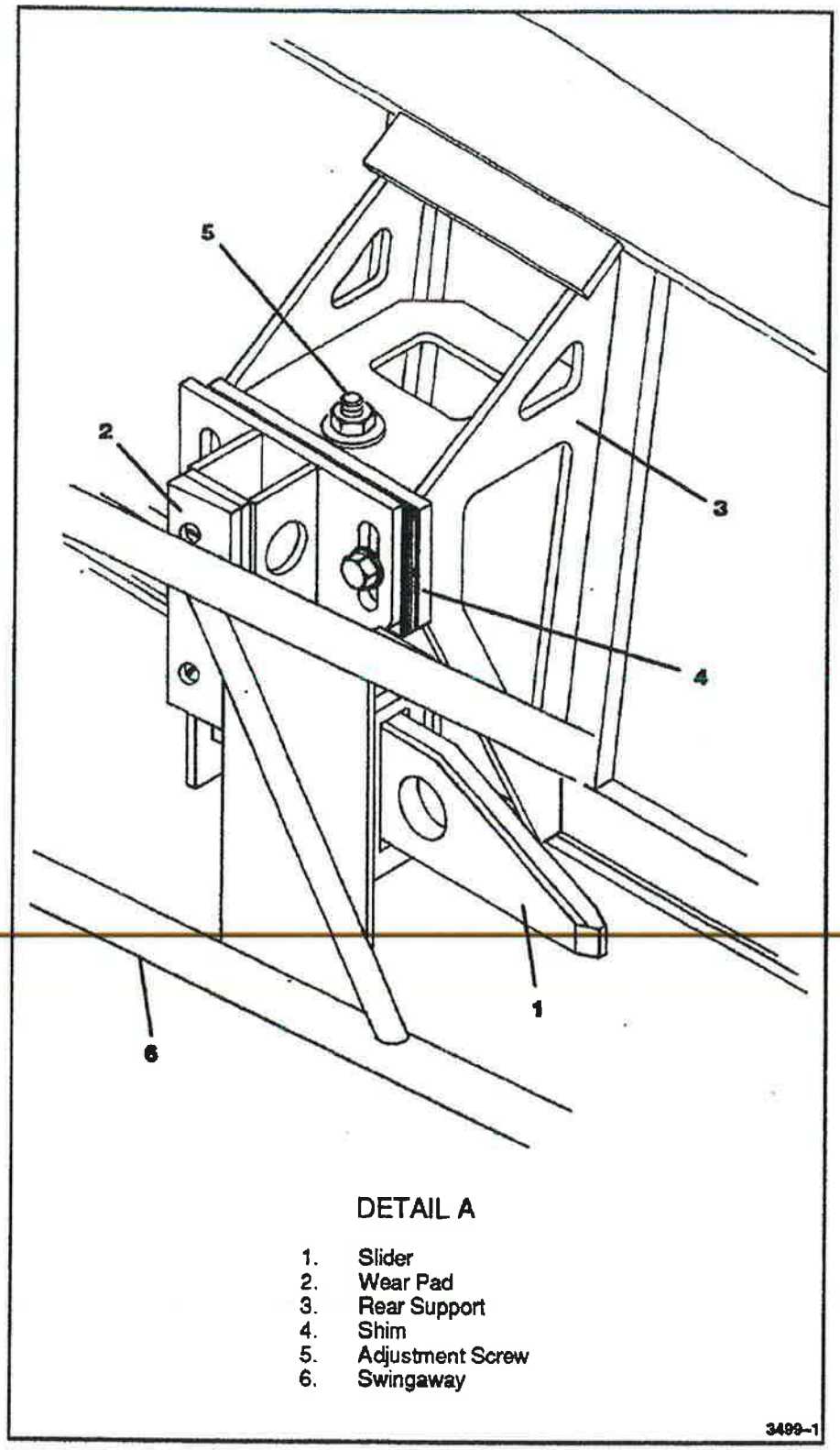


1. Swingaway
2. Front Stowage Bracket
3. Rear Stowage Bracket
4. Telescoping Section
5. Mast Assembly
6. Clip Pin
7. Pin
8. Boom Nose
9. Swingaway Anchor Fitting
10. Boom Attach Fitting
11. Offset Link
12. Attach Pin
13. Retainer Clip
14. Swingaway Nose
15. Offset Pivot Point

Erecting and Stowing the Swingaway Boom Extension (Sheet 1 of 6)



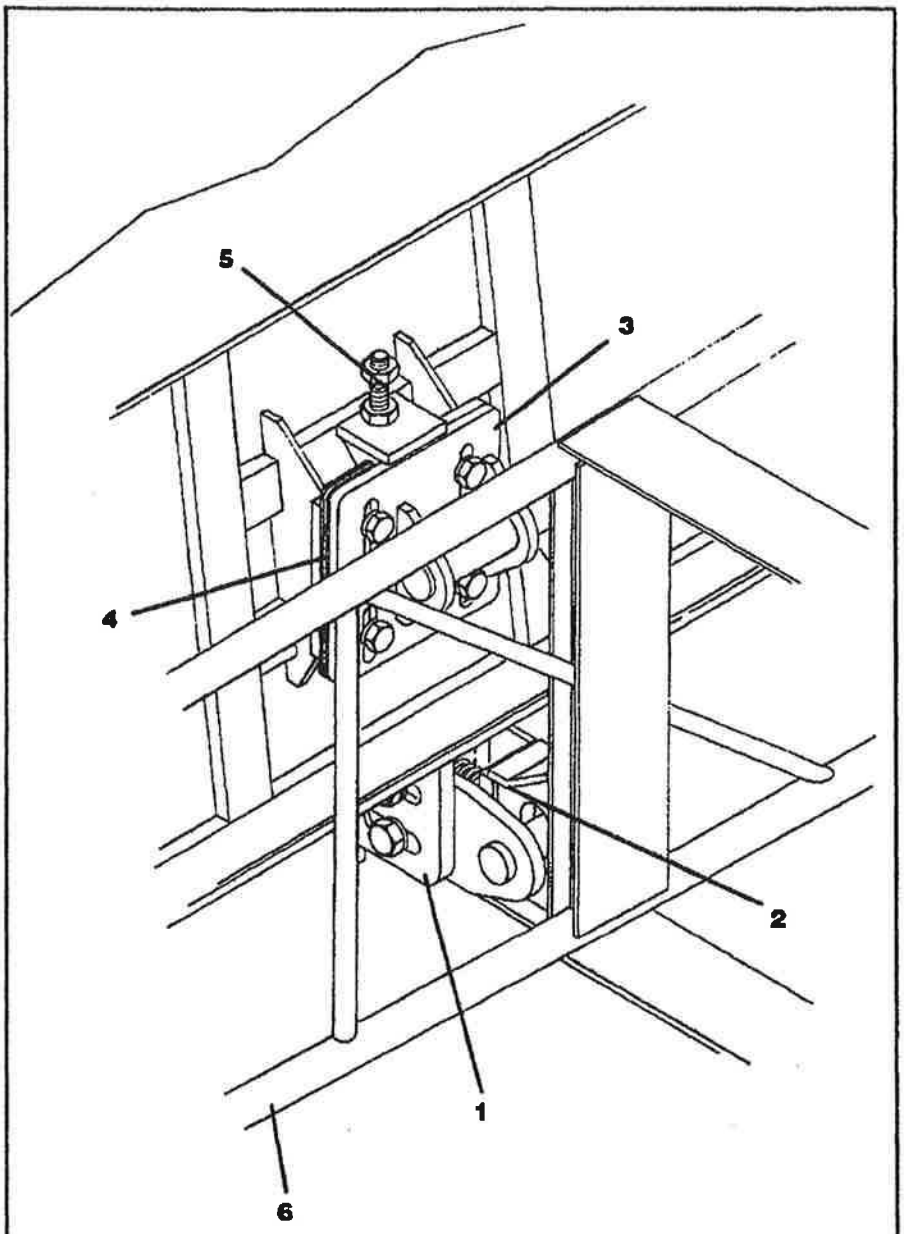
Erecting and Stowing the Swingaway Boom Extension (Sheet 2 of 6)



DETAIL A

1. Slider
2. Wear Pad
3. Rear Support
4. Shim
5. Adjustment Screw
6. Swingaway

Erecting and Stowing the Swingaway Boom Extension (Sheet 3 of 6)

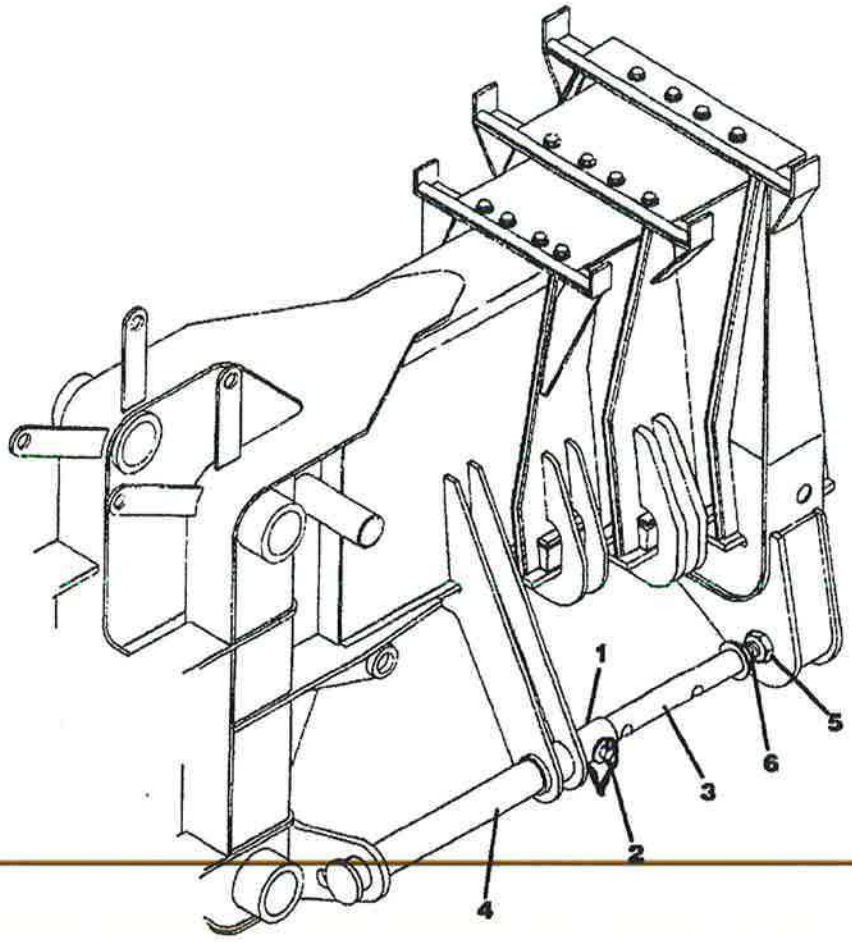


DETAIL B

1. Lower Front Bracket
2. Lower Front Support
3. Front Hanger
4. Shims
5. Adjustment Screw
6. Swingaway

3490-2

Erecting and Stowing the Swingaway Boom Extension (Sheet 4 of 6)



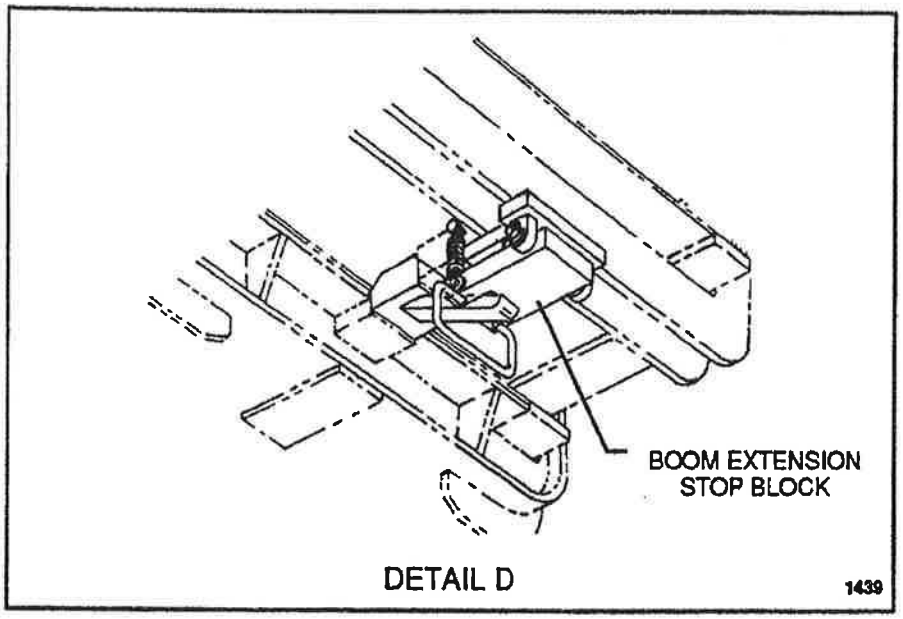
1. Hitch Pin
2. Retaining Pin
3. Adjustment Bar
4. Adjustment Bar Tube
5. Adjustment Bolt
6. Jam Nut

Boom Extension Alignment Device

DETAIL C

3497

Erecting and Stowing the Swingaway Boom Extension (Sheet 5 of 6)



Erecting and Stowing the Swingaway Boom Extension (Sheet 6 of 6)

13. Remove the pin and clip pin securing the boom extension alignment device in the stowed position. Pull the alignment device out to the working position and secure it in place with the pin and clip pin.

14. Disengage the spring loaded boom extension stop blocks.

NOTE

If the boom extension alignment device does not properly align the lower anchor and attach fittings to allow installation of the attach pin and retainer clip, refer to the service manual and adjust the boom extension alignment device.

15. Fully retract the boom until the bottom swingaway anchor fitting is against the boom extension alignment device and install the attach pin and retainer clip in the lower anchor and attach fittings on the left side of the boom nose.

16. Extend boom approximately 6 inches and secure boom extension alignment device in the stowed position.

17. Lower the boom and remove the rope from the tip of the swingaway.

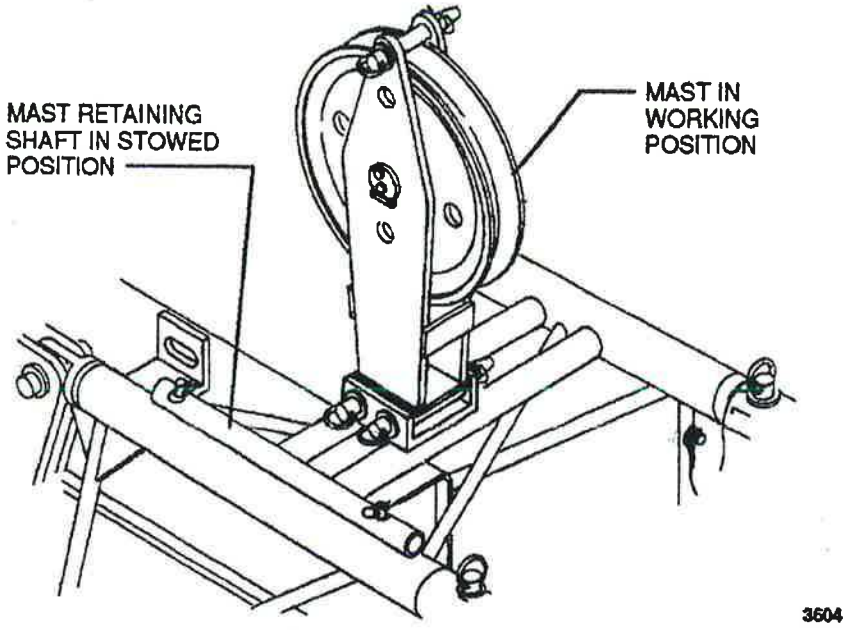
NOTE

Refer to SETTING THE OFFSET in this Section to obtain a 30 degree offset with the swingaway.

NOTE

Refer to SETTING THE TELESCOPING EXTENSION LENGTH in this Section for extending or retracting the telescoping extension section.

18. Lower the boom to minimum elevation and remove the cable retainer pins from the tip of the swingaway.



19. Remove the mast assembly clip pin and pin from the stowed position on the swingaway and raise the mast assembly to an upright position. Rotate the mast 90 degrees and install the pin and clip pin. Remove the cable retainer pin and clip pin from the mast.

20. Route the hoist cable over the mast sheave and the sheave on the swingaway tip. Install the cable retainer pins and clip pins.

21. Rig the hoist cable.

STOWING

NOTE

The swingaway boom extension must be set at the minimum offset, and if used, the telescoping section must be fully retracted or replaced with the standard nose section in order to be stowed. Refer to SETTING THE OFFSET and/or SETTING THE TELESCOPING EXTENSION LENGTH in this Section.

1. Fully retract the boom and swing to over–the–front.

2. Lower the boom to minimum elevation.

3. Remove the cable retainer pins and clip pins from the swingaway tip and mast assembly. Remove the hoist cable from the swingaway sheave and mast. Install the cable retainer pins and clip pins.

4. Remove the mast assembly pin and clip pin securing the mast in the upright position. Rotate the mast and lay the mast over to the stowed position and install the mast assembly pin and clip pin.

5. Attach a length of rope to the swingaway tip.

6. Raise the boom to horizontal and extend approximately 15 inches.

7. Remove the pin and clip pin securing the boom extension alignment device in the stowed position. Pull the alignment device out to the working position and secure it in place with the pin and clip pin.

8. Disengage the spring loaded boom extension stop blocks.

9. Fully retract boom until lower swingaway anchor fitting is against boom extension alignment device.

10. Remove the retainer clip and attach pin from the lower anchor and attach fittings on the left side of the boom nose and stow them in the base of the swingaway.

11. Extend the boom approximately 15 inches so that the swingaway stowage lugs will line up in front of the guide pins and ramp on the stowage brackets when the swingaway is positioned to the right side of the boom.

12. Remove the retainer clip and attach pin from the upper anchor and attach fittings on the left side of the boom nose and stow them in the base of the swingaway.

DANGER

WHEN STOWING THE SWINGAWAY, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE KEPT CLEAR OF THE SWING PATH.

CAUTION

DO NOT ALLOW THE SWINGAWAY TO SLAM INTO THE STOWAGE BRACKET WHEN SWINGING INTO THE STOWED POSITION.

13. Raise and/or lower the boom to help control the swingaway and using the rope attached to the tip of the swingaway, swing the swingaway to the side of the boom.

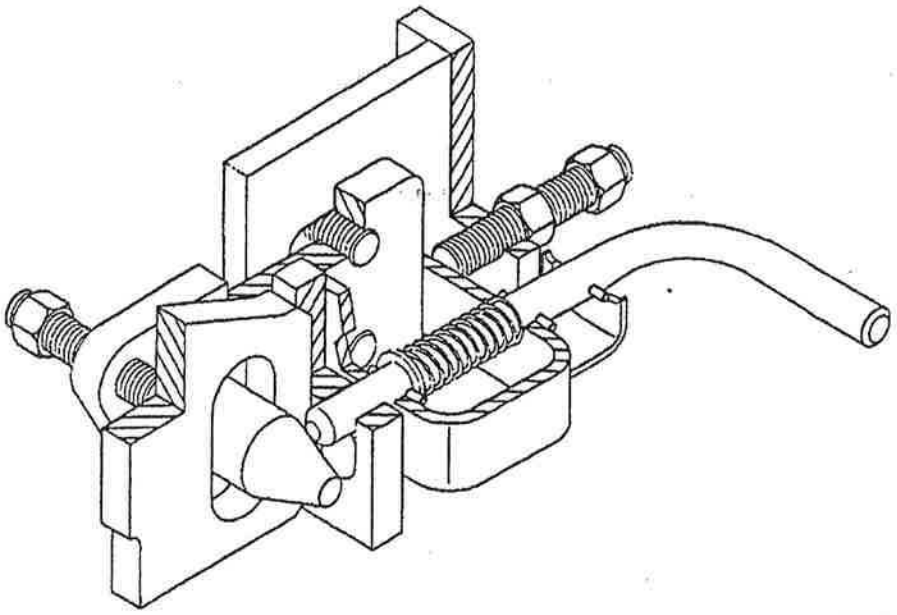
14. Align the stowage lugs on the swingaway with the guide pins and ramp on the stowage brackets and fully retract the boom.

DANGER

DURING DISENGAGEMENT OF THE STOP BLOCK, EXTEND THE BOOM ONLY ENOUGH TO FREE THE BLOCK. EXTENDING THE BOOM TOO FAR WILL CAUSE THE SWINGAWAY TO SLIDE OFF THE GUIDE RAMPS AND ALLOW THE SWINGAWAY TO SWING.

15. Extend the boom enough to disengage the spring loaded boom extension stop block from underneath the front of the mid section.

16. Disengage the stop block and fully retract the boom.



4843-2

17. Install the pin securing the swingaway to the front stowage bracket. Ensure the pin is pushed the whole way in as shown above.

18. Remove the attach pins and retainer clips from the anchor and attach fittings on the right side of the boom nose and stow them in the base of the swingaway.

19. Remove the clip pin and pin securing the boom extension alignment device. Place the boom extension alignment device in the stowed position and secure it in place with the pin and clip pin.

DANGER

FAILURE TO MAINTAIN THE PROPER CLEARANCE BETWEEN THE SWINGAWAY ANCHOR FITTINGS AND THE BOOM NOSE ATTACH FITTINGS COULD CAUSE THESE FITTINGS TO CONTACT EACH OTHER DURING OPERATION OF THE BOOM.

20. Extend the boom to disengage the swingaway boom extension from the boom nose and ensure that the spring loaded boom extension stop block is engaged between the sections to prevent accidental contact between the boom nose and the swingaway during normal boom operations.

21. Rig the boom nose and hoist cable as desired and operate the crane using normal operating procedures.

SETTING THE OFFSET

DANGER

ENSURE ANY BLOCKING MATERIAL USED IS ADEQUATE TO SUPPORT THE WEIGHT OF THE SWINGAWAY WITHOUT TIPPING OR FALLING.

1. Extend and set the outriggers and swing the boom to over the front. Position the boom to above horizontal.

2. Block up under the tip of the swingaway base section.

3. To set the offset from zero (0) degrees to 30 degrees perform the following procedures.

CAUTION

DO NOT OVERLOAD THE SWINGAWAY ANCHOR FITTINGS OR THE SWINGAWAY BASE SECTION WHEN LOWERING THE BOOM.

a. Slowly lower the boom until the pressure is relieved on the offset pin.

b. Remove the offset pin securing the offset links in the zero (0) degree offset position and store it in the stowage lug.

c. Slowly elevate and telescope the boom at the same time so that the swingaway does not move off of the blocking until the offset links take the full weight of the swingaway.

d. Reeve the hoist cable over the mast sheave.

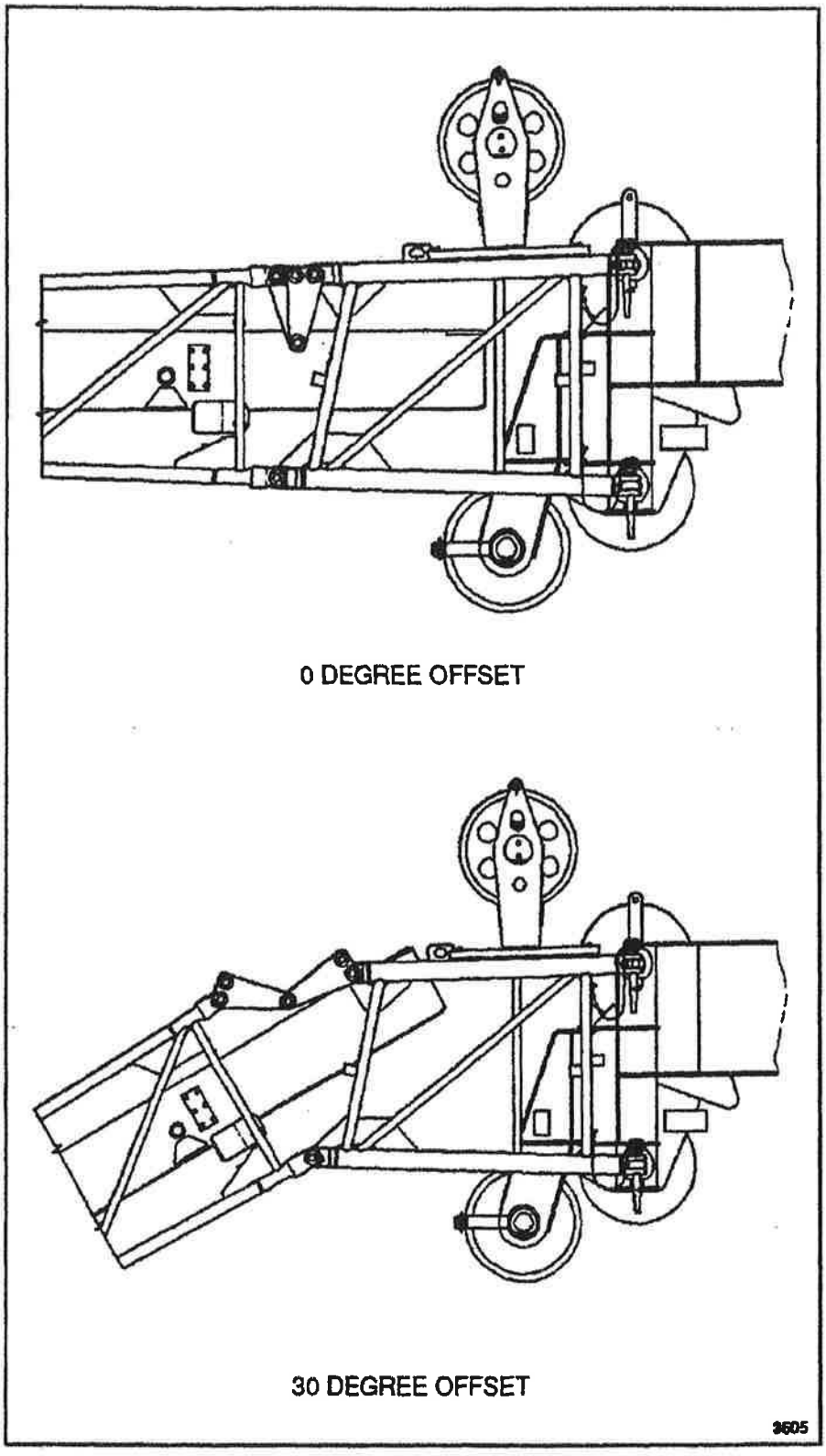
4. To set the offset from 30 back to zero (0) degrees, perform the following procedures.

CAUTION

DO NOT OVERLOAD THE SWINGAWAY ANCHOR FITTINGS OR THE SWINGAWAY BASE SECTION WHEN LOWERING THE BOOM.

a. Slowly lower the boom until the pressure is relieved from the offset links (30 degree offset).

b. Remove the offset pin and lower the boom until the holes for the zero (0) degree offset position align with the offset links. Install the offset pin.



Offset Positions

c. Slowly elevate and telescope the boom at the same time so that the swingaway does not move off of the blocking until the offset links take the full weight of the swingaway.

d. Reeve the hoist cable as outlined in step 3 d.

CHANGING THE BOOM EXTENSION NOSE

1. Attach an adequate lifting device to the swingaway nose section being removed.

2. Remove the hitch pin and retaining pin securing the swingaway nose to the swingaway base section and remove the nose.

3. Attach an adequate lifting device to the swingaway nose section being installed.

4. Install the swingaway nose section into the swingaway base section and secure it in place with the retaining pin and hitch pin.

SETTING THE TELESCOPING EXTENSION LENGTH

Extending

1. Extend and set the outriggers and swing the boom to over the front.

NOTE

Depending upon how well the swingaway is lubricated, it might be possible to pull the telescoping section to the desired length without setting the offset. If so, skip step 2 and continue with step 4. It is not desirable to change the offset, perform step 3.

2. Set the swingaway to maximum offset according to the procedures in SETTING THE OFFSET in this section.

3. Loosen the side wear pads on the swingaway until the telescoping section is free.

4. Within the limits of the load chart, extend the boom to at least the length of telescoping swingaway to be extended, and lower the boom until the swingaway sheave touches the ground or is as low as it will go.

DANGER

BEFORE REMOVING THE HITCH PIN AND PIN SECURING THE TELESCOPING SECTION INSIDE THE BASE SECTION. ENSURE THE TELESCOPING SECTION CANNOT SLIDE COMPLETELY OUT OF THE BASE SECTION.

NOTE

Use the hoist cable to control the extension of the telescoping swingaway.

5. Remove the pin and hitch pin securing the telescoping section to the base section.

6. While controlling the extension of the telescoping swingaway section with the hoist cable, raise and/or retract the boom allowing the section to slide out of the base to the desired length.

7. Install the pin and hitch pin.

8. If the wear pads were loosened, retighten the wear pads as necessary to ensure the telescoping section is straight with the base section.

Retracting

1. Attach the hoist cable to the lug at the front of the swingaway.

2. Remove the pin and hitch pin.

DANGER

WHEN USING THE HOIST CABLE TO PULL THE TELESCOPING SECTION INTO THE SWINGAWAY BASE, DO NOT DAMAGE THE HOIST CABLE OR SWINGAWAY BY PULLING THE SECTION PAST ITS FULLY STOWED POSITION.

CAUTION

IF A BINDING CONDITION OCCURS DURING RETRACTION STOP IMMEDIATELY. RESOLVE THE PROBLEM BEFORE CONTINUING THE RETRACTION OF THE TELESCOPING SECTION.

3. Slowly reel in the hoist cable pulling the section into the swingaway base until the hitch pin can be installed.

GROVE®
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OPERATOR'S AND SAFETY HANDBOOK

SUPPLEMENT

ALL CRANE MODELS

S/N_____

PUBLISHED: NOVEMBER, 1997

This Supplement supplements the Safety Section of all TM/TMS/AT model Superstructure Operator's and Safety Handbooks and all RT/AP/CM model Operator's and Safety Handbooks.

In the basic Safety Section of the Operator's and Safety Handbook, you will find one or two paragraphs that reads as follows.

Wind and other factors such as boom length, boom angle, size and weight of load, etc. can affect crane stability and crane structures. If wind velocity exceeds 32 km/h (20 mph), rated loads and boom lengths shall be appropriately reduced. Practical working loads for each particular job and lift shall be established by the user depending upon conditions that exist at the time a lift is being made. Appropriate capacity reductions shall be made whenever conditions indicate the possibility that a loss of crane stability or structural damage could occur.

Replace the above paragraph(s) with the following Paragraph and add the Wind Velocity Chart.

Wind can have a significant affect on loads that may be lifted by a crane. Wind forces act differently on a crane depending upon the direction from which the wind is blowing (e.g., wind on the rear of the boom can result in decreased forward stability, wind on the underside of the boom can result in decreased backward stability, wind on the side of the boom can result in structural damages, etc.). Since wind forces can exert extreme dynamic loads, Grove recommends that a lift not be made if the wind can cause a loss of control in handling the load. Grove recommends if the wind speed (velocity) is between 32.2 km/h (20 mph) to 48.3 km/h (30 mph), that the load capacities shall be reduced to account for the size and shape of the load and the wind direction in relation to the machine for all boom, boom extension, and jib lengths. Further, operation of the crane in wind velocities over 48.3 km/h (30 mph) is not recommended. To assist you in determining prevailing wind conditions, refer to the Wind Velocity Chart.

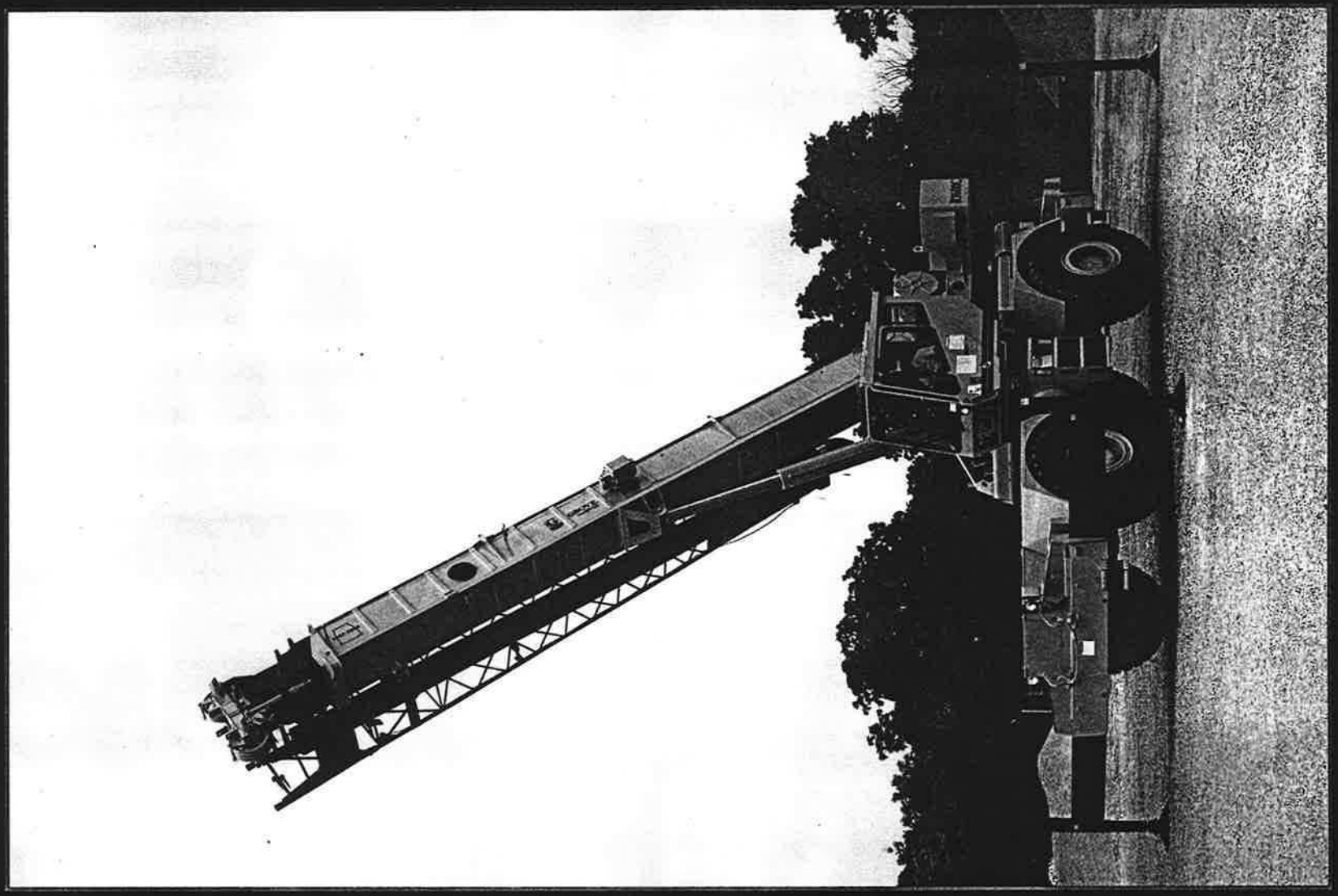
Wind Velocity Chart

Wind Force		Wind Velocity km/h (mph)	Visible Indicator Effects of wind as observed on land
Beauford Scale	Designation		
Zero (0	Clam	<2 (<1)	No wind: smoke rises vertically
1	Light Air	2-5 (1-3)	Wind direction seen by smoke but not by wind vanes
2	Light Breeze	6-11 (4-7)	Wind felt on face: leaves rustle: wind vane moves slightly
3	Gentle Breeze	13-19 (8-12)	Leaves/small twigs in constant motion: wind extends flag
4	Moderate Breeze	21-29 (13-18)	Raises dust & loose paper: moves small branches
Redane load ratings and operating parameters @ 32.2 km/h (20 mph)			
5	Fresh Breeze	31-39 (19-24)	Small trees in leaf begin to sway: on ponds, crested wavelets form
6	Strong Breeze	40-50 (25-31)	Large branches in motion: telegraph wires whistle: umbrellas used with difficulty
Ceaning operations @ 48.3 km/h (30 mph); lower & retract boom			
7	Moderate Gale	52-61 (32-38)	Whole trees in motion: walking against wind is inconvenient

NOTES

RT600C

Rough-Terrain Hydraulic Crane Specifications



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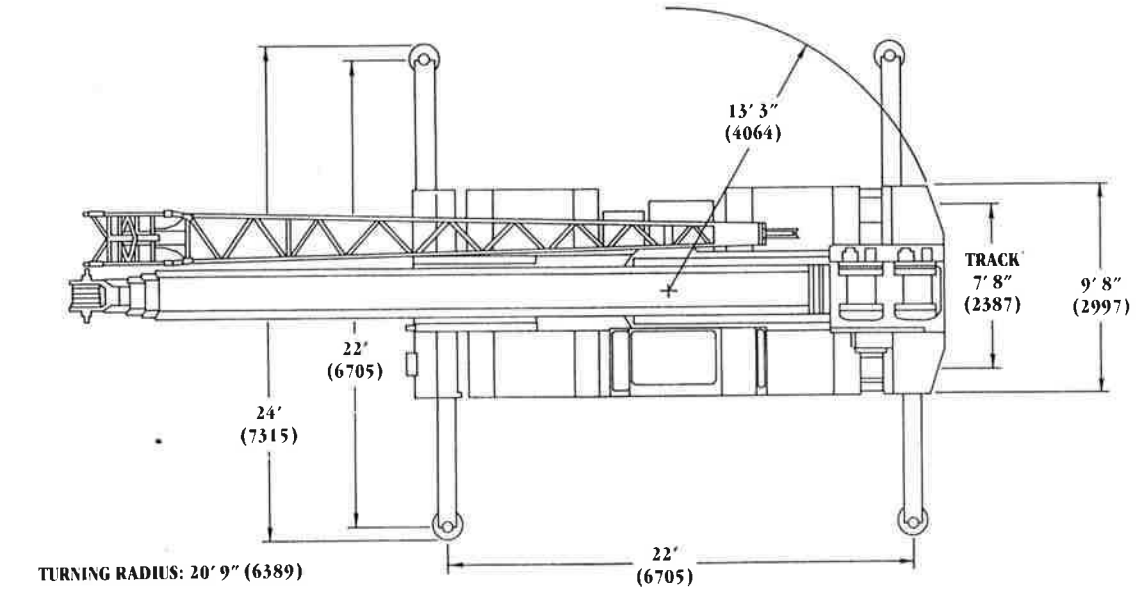
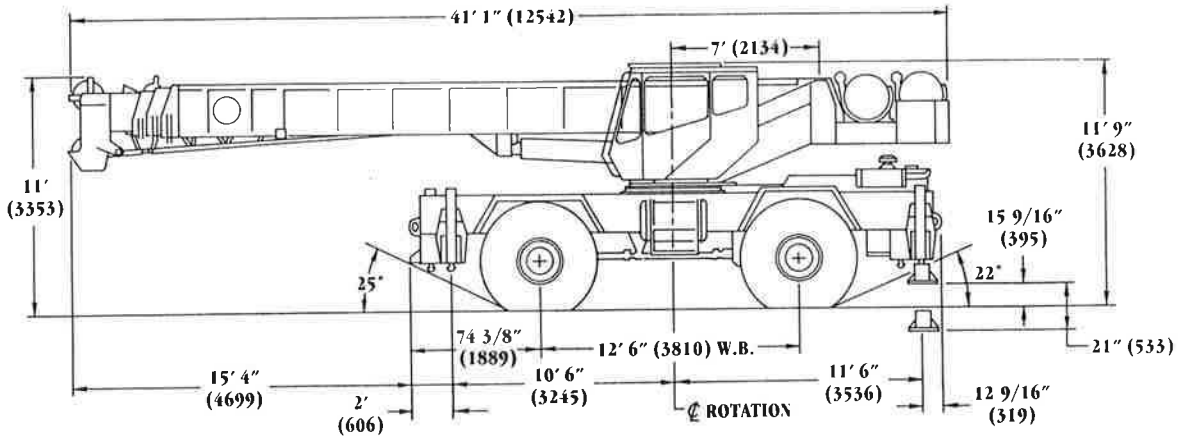
GROVE cranes

Dimensions

RT600C





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Superstructure specifications

Boom	34 ft. - 105 ft. (10.4m - 32m) four section Trapezoidal full power boom. Telescoping is sequenced-synchronized with single lever control. Telescoping sections slide on adjustable and replaceable Nylatron wear pads. Maximum Tip Height: 112 ft. (34.0m).
Fixed Swingaway Extension	29 ft. (8.8m) lattice swingaway boom extension with integral offset mechanism, offsettable at 0° or 30°. Stows alongside base boom section when not in use. Maximum Tip Height: 141 ft. (43m).
Optional Telescopic Swingaway Extension	29 ft. to 51 ft. (8.8m-15.5m) telescoping lattice swingaway extension with integral offset mechanism, offsettable at 0° or 30°. Stows alongside base boom section when not in use. Maximum Tip Height: 162 ft. (49.3m).
Boom Nose	Three steel sheaves mounted on heavy duty tapered roller bearings with removable pin-type rope guards. *Optional removable auxiliary boom nose with removable pin type rope guard.
Boom Elevation	One double acting hydraulic cylinder with integral holding valve provides elevation from -3° to 78°.
Load Moment & Anti-Two Block System	Standard load moment and anti-two block system with audio-visual warning and control lever lockout. These systems provide electronic display of boom angle, length, radius, tip height, relative load moment, maximum permissible load, load indication and warning of impending two-block condition.
Cab	Full vision, all steel fabricated with acoustical lining and tinted safety glass throughout. Deluxe seat incorporates armrest mounted hydraulic single-axis controllers. Dash panel incorporates gauges for all engine functions. Other standard features include: hydraulic oil cab heater, telescoping tilt wheel, sliding side and rear windows, opening skylight, skylight sunscreen, electric windshield wash-wipe, circulating air fan, electric skylight wiper, fire extinguisher, seat belt and ashtray.
Swing	Ball bearing swing circle with 360° continuous rotation. Grove planetary glide-swing with foot applied multi-disc wet brake. Spring applied hydraulically released swing brake and plunger type, 1 position, mechanical house lock operated from cab. Maximum speed: 2.5 RPM.
Counterweight	Integral with superstructure. 5787 lb. (2624 kg), 1900 lb. (861 kg) slab I.P.O. auxiliary hoist.
HYDRAULIC SYSTEM	
Pumps	4 main gear pumps, combined capacity 119 GPM (451 LPM) driven by carrier engine through P.T.O. Standard pump disconnect with engine jogging switch.
Valves	Precision four way double acting pilot operated control valves, 3 individual valve banks permit simultaneous control of multiple crane functions.
Filter	Return line type, full flow with bypass protection and service indicator. Replaceable cartridge with micron filtration rating of 5/12/16.
Reservoir	103 gallon (390 L) with spin-on breather filter, external sight gauge, oil temperature gauge, clean out access, strap mounted to frame.
Oil Cooler	Remote mounted with thermostatically controlled electric motor driven fan.
Pressure Check Panel	System pressure test panel with quick release type fittings for each circuit.
HOIST SPECIFICATIONS	
	Power up and down equal speed, planetary reduction with automatic spring applied multi-disc brake. Electronic hoist drum rotation indicator and hoist drum cable followers.

Main and *Auxiliary Hoist
Grove HO30G-16

Make/Model		**High Range**	**Low Range**
Maximum single line speed	lst layer	403 FPM (122m/min)	212 FPM (65m/min)
	2nd layer	438 FPM (133m/min)	231 FPM (70m/min)
	3rd layer	474 FPM (144m/min)	250 FPM (76m/min)
	4th layer	509 FPM (155m/min)	268 FPM (82m/min)
	5th layer	545 FPM (166m/min)	287 FPM (87m/min)
	6th layer	580 FPM (177m/min)	306 FPM (93 m/min)
Maximum single line pull	lst layer	8254 lbs. (3744 kg)	16508 lbs. (7488 kg)
	2nd layer	7587 lbs. (3441 kg)	15173 lbs. (6882 kg)
	3rd layer	7019 lbs. (3184 kg)	14038 lbs. (6368 kg)
	4th layer	6530 lbs. (2962 kg)	13061 lbs. (5924 kg)
	5th layer	6105 lbs. (2769 kg)	12211 lbs. (5539 kg)
	6th layer	5732 lbs. (2600 kg)	11465 lbs. (5200 kg)
Maximum permissible line pull w/5:1 strength factor		12,920 lbs. (5860 kg)	
		3/4 in. (19mm) 18x19 class	
Maximum rope stowage		690 ft. (210m) 3/4 in. (19mm)	
		Note: 450 ft. (137m) length of wire rope supplied with basic standard unit.	

*Denotes optional equipment

Carrier specifications

Frame	High strength alloy steel all welded box section design with integral outrigger housings and front/rear lifting, towing and tie down lugs.
Outrigger System	Hydraulic single stage double box telescopic beam and inverted jack outriggers with integral holding valves. All steel fabricated quick release type outrigger floats, 24" (610mm) diameter. Maximum outrigger pad load 47,604 lbs. (21593 kg).
Outrigger Controls	Located in cab on front dash panel requires two hand operation. Crane level indicator located in cab.
Engine	Cummins 6BT 5.9 six cylinder turbocharged water cooled diesel - 5.9L 152 bhp (116 kw) (Gross) @ 2,500 RPM. Maximum torque 400 ft. lbs. (553 kg/m) @ 1,600 RPM.
Fuel Tank Capacity	60 gallons (227 L)
Electrical System	Two 12-volt - maintenance free batteries, 815 CCA @ 0 degree F. 12 volt starting.
Drive	4 x 4
Steering	Fully independent power steering: Front: Full hydraulic controlled by steering wheel. Rear: Full hydraulic hand lever controlled. Provides infinite variations of 4 main steering modes - front only, rear only, crab and coordinated. Rear steer indicating gauge.
Transmission	Engine mounted full powershift with 6 forward and 3 reverse speeds. Front axle disconnect for 4x2 travel.
Axles	Front: Drive-steer with differential and planetary reduction hubs rigid mounted to the chassis frame. *Optional no-spin differential. Rear: Drive-steer with differential and planetary reduction hubs pivot mounted at the center of chassis frame providing up to 12" oscillation (305mm).
Oscillation Lockouts	Automatic full hydraulic lockouts on rear axle permits oscillation only with boom centered over the front. *Optional oscillation lockout override control.
Brakes	Full hydraulic, split circuit operating on all wheels. Spring applied, hydraulically released front axle mounted parking brake.
Tires	23.5R25 Radial Earthmover type, tubeless. *26.5x25-26PR bias, Earthmover type, tubeless.
Lights	Full lighting including turn indicators, head, tail, brake and hazard warning lights.
Maximum Speed	24 MPH (39 kph)
Maximum Gradeability	74% (Theoretical based on 63,151 lbs. [28645 kg] GVW). 23.5R25 tires, pumps disengaged, 105 ft. (32m) boom, plus 29 ft. to 51 ft. (8.8m-155m) telescopic swingaway.
	STANDARD MACHINE
Gross Vehicle Weight & Axle Loads	Front: 32,258 lbs. (14,632 kg) Rear: 30,893 lbs. (14,013 kg) G.V.W.: 63,151 lbs. (28,645 kg)
Miscellaneous Standard Equipment	Full width steel fenders, dual rear view mirrors, hookblock tiedown, electronic back-up alarm, light package, front stowage well, tachometer, cold start aid (less canister), rear wheel position indicator, hydraulic cab heater, hoist mirrors, engine distress AV warning system.
Optional Equipment	* Auxiliary hoist * Worklights * 360° rotating beacon * Cab spotlight * Engine block heater * Hookblocks * Tow winch - front mounted-maximum pull - 15,000 lbs. (6804 kg); maximum speed - 92 ft/min (28m/min) * Spare wheel assembly * Tool kit * Pintle hook front/rear * High Speed Glide† system * Air conditioning * Dual axis joystick controllers

***Denotes optional equipment.**

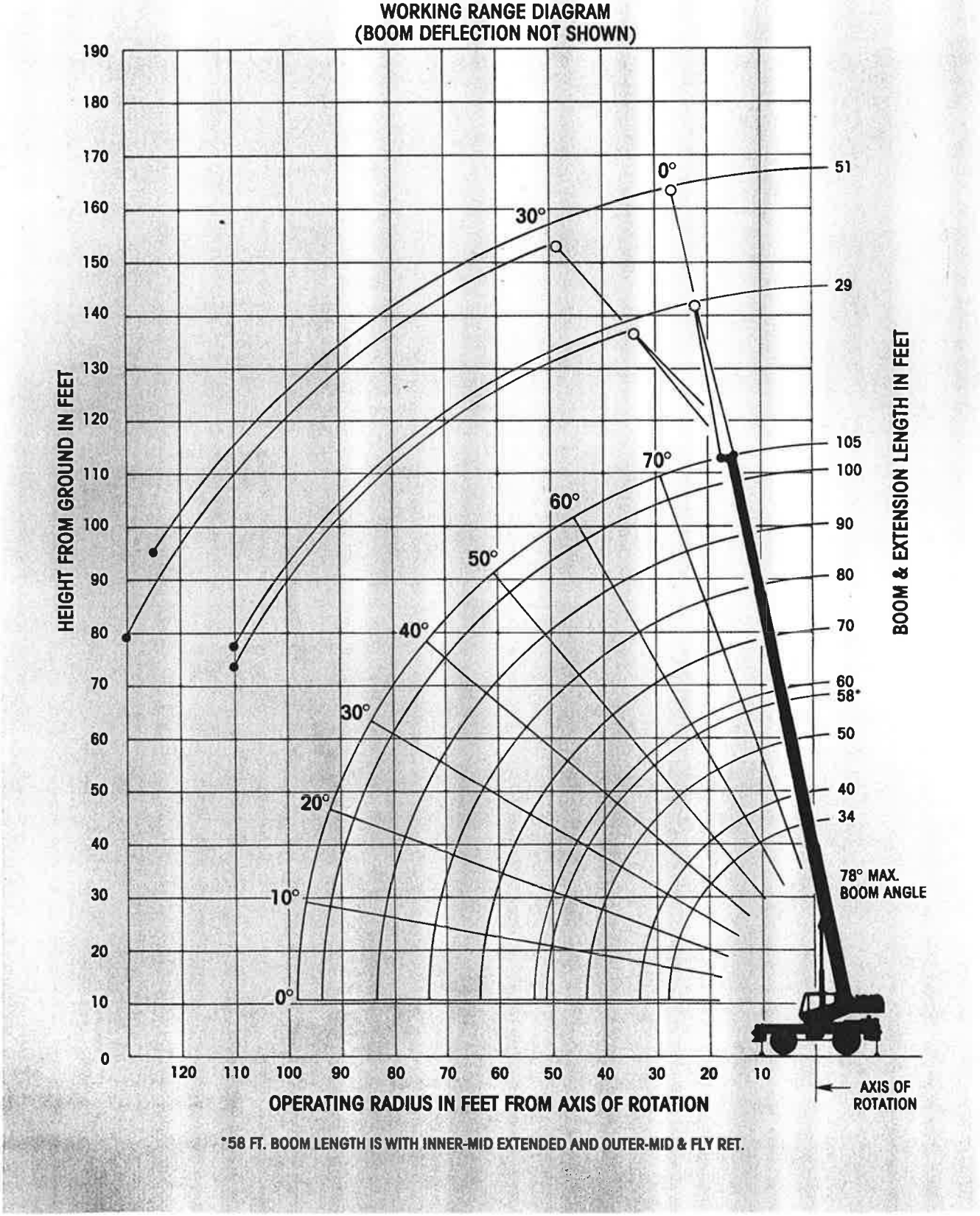
GROVE cranes

GROVE® worldwide

RT635C

Rough terrain hydraulic crane/85% Domestic

34 ft. - 105 ft. full power boom



*58 FT. BOOM LENGTH IS WITH INNER-MID EXTENDED AND OUTER-MID & FLY RET.

29 FT. - 51 FT. TELE. EXTENSION ON OUTRIGGERS - 360°

Radius in Feet	29 ft. LENGTH		51 ft. LENGTH	
	0° OFFSET	30° OFFSET	0° OFFSET	30° OFFSET
30	9,000 (77.5)			
35	8,600 (75.5)		*5,065 (78)	
40	8,250 (73)	*5,000 (78)	4,900 (76.5)	
45	7,500 (71)	4,800 (75.5)	4,700 (74.5)	
50	6,850 (68.5)	4,600 (73.5)	4,400 (73)	
55	6,250 (66)	4,400 (71)	4,000 (71)	*2,800 (78)
60	5,600 (64)	4,350 (68.5)	3,800 (69)	2,700 (77)
65	5,000 (61.5)	4,300 (66)	3,700 (67)	2,600 (75)
70	4,450 (58.5)	4,250 (63.5)	3,500 (65)	2,500 (72.5)
75	4,000 (56)	4,200 (60.5)	3,400 (62.5)	2,400 (70.5)
80	3,550 (53.5)	3,400 (58)	3,300 (60.5)	2,350 (68)
85	3,150 (50.5)	3,300 (55)	3,100 (58.5)	2,300 (66)
90	2,800 (47.5)	2,860 (52)	2,900 (56)	2,250 (63.5)
95	2,360 (44.5)	2,360 (48.5)	2,700 (54)	2,200 (61)
100	1,910 (41)	1,910 (45)	2,360 (51.5)	2,150 (58.5)
105	1,510 (37.5)	1,510 (41.5)	2,050 (49)	2,150 (55.5)
110	1,150 (33)	1,150 (37)	1,900 (46)	2,040 (52.5)
115			1,660 (43.5)	1,680 (49.5)
120			1,360 (40.5)	1,360 (46.5)
125			1,060 (37)	1,060 (43)

A6-829-011361B

29 FT. BOOM EXTENSION ON OUTRIGGERS - 360°

Radius in Feet	29 ft. LENGTH	
	0° OFFSET	30° OFFSET
30	9,360 (77.5)	
35	8,960 (75.5)	
40	8,610 (73)	*5,360 (78)
45	7,860 (71)	5,160 (75.5)
50	7,210 (68.5)	4,960 (73.5)
55	6,610 (66)	4,760 (71)
60	5,960 (64)	4,710 (68.5)
65	5,360 (61.5)	4,660 (66)
70	4,810 (58.5)	4,610 (63.5)
75	4,360 (56)	4,560 (60.5)
80	3,910 (53.5)	4,160 (58)
85	3,510 (50.5)	3,660 (55)
90	3,160 (47.5)	3,260 (52)
95	2,860 (44.5)	2,860 (48.5)
100	2,430 (41)	2,430 (45)
105	2,020 (37.5)	2,020 (41.5)
110	1,670 (33)	1,670 (37)

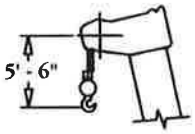
A6-829-011544

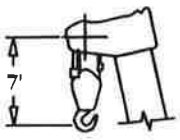
MAIN BOOM ON OUTRIGGERS FULLY EXTENDED - 360°

Radius in Feet	Main Boom Length in Feet									
	34	40	50	*58	60	70	80	90	100	105
10	70,000 (66)	66,900 (70)	58,650 (74.5)	44,600 (76.5)	29,300 (77)					
12	68,050 (62)	64,100 (67)	55,000 (72)	44,600 (74.5)	29,300 (75)	29,300 (78)				
15	59,150 (55.5)	57,650 (62)	48,000 (68.5)	41,500 (71.5)	29,300 (72.5)	29,300 (75.5)				
20	45,900 (43.5)	45,450 (52.5)	38,500 (61.5)	35,900 (66)	29,300 (67.5)	29,300 (72)	29,300 (75)	27,000 (77)		
25	35,550 (26.5)	35,250 (42)	32,400 (54.5)	30,500 (60.5)	29,300 (62.5)	27,950 (67.5)	26,350 (71)	23,250 (74)	18,550 (75.5)	@15,850 (76.5)
30		27,150 (27.5)	26,500 (46.5)	25,550 (54)	25,300 (56.5)	24,000 (62.5)	22,950 (67)	20,300 (70.5)	16,500 (72.5)	15,850 (74)
35			19,550 (37.5)	19,150 (47.5)	19,350 (50.0)	20,250 (57.5)	20,000 (63)	17,950 (67)	14,800 (69.5)	14,350 (71)
40			15,000 (24.5)	14,650 (39.5)	14,850 (43)	15,650 (52.5)	16,450 (58.5)	16,000 (63)	13,400 (66.5)	12,850 (68)
45				11,500 (30)	11,650 (34.5)	12,400 (46.5)	13,100 (54)	13,450 (59)	12,500 (63)	11,550 (64.5)
50				9,180 (13.5)	9,330 (23)	10,000 (40)	10,650 (49)	10,950 (55)	11,300 (59.5)	10,400 (61.5)
55						8,170 (32)	8,770 (43.5)	9,080 (51)	9,390 (56)	9,450 (58)
60						6,710 (21.5)	7,250 (37.5)	7,560 (46)	7,870 (52)	8,020 (54.5)
65							6,020 (30.5)	6,320 (41)	6,630 (48)	6,790 (51)
70							4,990 (20.5)	5,300 (35)	5,610 (43.5)	5,760 (47)
75								4,450 (28.5)	4,750 (38.5)	4,890 (42.5)
80								3,740 (18.5)	4,020 (33.5)	4,150 (38)
85									3,390 (26.5)	3,510 (32.5)
90									2,830 (18)	2,950 (26)
95										2,460 (17.5)

Note: ( ) Boom angles are in degrees.

A6-829-011360A





DIMENSIONS ARE FOR LARGEST GROVE FURNISHED HOOK BLOCK AND HEADACHE BALL, WITH ANTI-TWO BLOCK ACTIVATED.

WEIGHT REDUCTIONS FOR LOAD HANDLING DEVICES

29 ft. BOOM EXTENSION	
*Stowed -	421 lbs.
*Erected -	2,875 lbs.

29 ft. - 51 ft. TELE. EXT.	
*Stowed -	641 lbs.
*Erected (Retracted) -	4,378 lbs.
*Erected (Extended) -	6,628 lbs.

*Reduction of main boom capacities

AUXILIARY BOOM HEAD	143 lbs.
HOOKBLOCKS and HEADACHE BALLS:	
35 Ton, 3 Sheave	872 lbs.+
35 Ton, 3 Sheave (w/cheekplates)	1065 lbs.+
15 Ton, 1 Sheave	380 lbs.+
10 Ton Headache Ball	560 lbs.+
7 1/2 Ton Headache Ball	338 lbs.+

+ Refer to rating plate for actual weight.

NO LOAD STABILITY ON RUBBER

	No Load Stability Data	Main Boom 100 ft.
Front (No load)	Min. boom angle (deg.) for indicated length	31
	Max. boom length (ft.) at 0 deg. boom angle	80
360 Deg. (No load)	Min. boom angle (deg.) for indicated length	53
	Max. boom length (ft.) at 0 deg. boom angle	50

HEIGHT FROM GROUND IN FEET

NOTES FOR LIFTING CAPACITIES

WARNING: THIS CHART IS ONLY A GUIDE. The Notes below are for illustration only and should not be relied upon to operate the crane. The individual crane's load chart, operating instructions and other instruction plates must be read and understood prior to operating the crane.

1. All rated loads have been tested to and meet minimum requirements of SAEJ1063 OCT80 - Cantilevered Boom Crane Structures - Method of Test, and do not exceed 85% of the tipping load on outriggers (75% of tipping load on rubber) as determined by SAEJ765 OCT80 Crane Stability Test Code.
2. Capacities given do not include the weight of hookblocks, slings, auxiliary lifting equipment and load handling devices. Their weights MUST be added to the load to be lifted. When more than minimum required reeving is used, the additional rope weight shall be considered part of the load.
3. Defined Arc ±6° on either side of longitudinal centerline of machine.
4. Capacities appearing above the bold line are based on structural strength and tipping should not be relied upon as a capacity limitation.
5. All capacities are for crane on firm, level surface. It may be necessary to have structural supports under the outrigger floats or tires to spread the load to a larger bearing surface.
6. When either boom length or radius or both are between values listed, the smallest load shown at either the next larger radius or boom length shall be used.
7. Tires shall be inflated to the recommended pressure before lifting on rubber.
8. For outrigger operation, ALL outriggers shall be fully extended with tires raised free of ground before raising the boom or lifting loads.
9. Unless otherwise stated, capacities are with powered boom sections equally extended.
10. With tele boom extension in working position and main boom length greater than 100 ft., boom angle must not be less than 30°, since loss of stability will occur causing a tipping condition.

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FORM NO.: LC-RT635C DOM. P/N: 3-662 892-5M PRINTED IN U.S.A.

ON RUBBER 23.5R25 TIRES (STATIONARY - DEFINED ARC OVER FRONT)

Radius in Feet	Main Boom Length in Feet								
	34	40	50	*58	60	70	80	90	100
10	36,850 (66)	34,600 (70)							
12	32,550 (62)	30,650 (67)	27,450 (72)	24,400 (74.5)	24,400 (75.5)				
15	27,400 (56)	25,900 (62)	21,100 (68.5)	21,100 (71.5)	21,100 (72.5)				
20	21,100 (44)	20,050 (53)	18,300 (61.5)	16,900 (66)	16,900 (67)	16,400 (71)	14,450 (74)		
25	16,900 (27)	15,600 (42.5)	14,650 (54.5)	13,650 (60.5)	13,650 (61.5)	13,650 (66.5)	13,000 (70)	11,250 (72.5)	
30		11,150 (28)	9,070 (46.5)	10,250 (54)	10,400 (56)	11,200 (61.5)	11,200 (66)	10,150 (69)	8,090 (71.5)
35			7,760 (37.5)	7,440 (47.5)	7,590 (49.5)	8,260 (57)	8,920 (62)	8,920 (65.5)	7,370 (68.5)
40			5,720 (24.5)	5,450 (39.5)	5,580 (42.5)	6,190 (51.5)	6,800 (57.5)	7,140 (62)	6,660 (65.5)
45				3,970 (30)	4,100 (34)	4,660 (45.5)	5,220 (53)	5,530 (58)	5,840 (62)
50				2,840 (13.5)	2,950 (22)	3,480 (39)	3,990 (48)	4,300 (54)	4,600 (58.5)
55						2,550 (31.5)	3,010 (42.5)	3,320 (50)	3,620 (55)
60						1,800 (20.5)	2,220 (36.5)	2,520 (45.5)	2,820 (51.5)
65							1,550 (29.5)	1,860 (40.5)	2,150 (47.5)
70							1,000 (19.5)	1,300 (34.5)	1,580 (43)
75									1,100 (38.5)

Note: ( ) Boom angles are in degrees. A6-829-011622
*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

ON RUBBER (STATIONARY CAPACITIES - 360°)

Radius in Feet	Main Boom Length in Feet								
	34	40	50	*58	60	70	80	90	100
10	31,700 (66)	31,200 (70)							
12	26,900 (62)	26,250 (67)	25,200 (72)	24,400 (74.5)	24,400 (75.5)				
15	19,650 (56)	19,400 (62)	19,050 (68.5)	18,700 (71.5)	18,700 (72.5)				
20	11,850 (44)	11,600 (53)	11,250 (61.5)	11,100 (66)	11,150 (67)	11,950 (71)			
25	7,770 (27)	7,560 (42.5)	7,210 (54.5)	6,820 (60.5)	7,090 (61.5)	7,780 (66.5)	8,480 (70)	8,810 (72.5)	
30		4,980 (28)	4,400 (46.5)	4,110 (54)	4,420 (56)	5,210 (61.5)	5,820 (66)	6,170 (69)	6,170 (71.5)
35			2,580 (37.5)	2,166 (47.5)	2,360 (49.5)	3,420 (57)	3,690 (62)	4,230 (65.5)	4,230 (68.5)
40						1,900 (51.5)	2,100 (57.5)	2,760 (62)	2,760 (65.5)
45								1,600 (58)	1,600 (62)

Note: ( ) Boom angles are in degrees. A6-829-011623
*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

ON RUBBER (PICK & CARRY CAPACITIES - UP TO 2.5 MPH)

Radius in Feet	Main Boom Length in Feet								
	34	40	50	*58	60	70	80	90	*100
10	38,150 (66)	38,150 (70)							
12	33,350 (62)	33,350 (67)							
15	27,800 (56)	27,700 (62)							
20	21,450 (44)	21,250 (53)	20,900 (61.5)	20,650 (66)	20,850 (67)				
25	15,900 (27)	15,600 (42.5)	15,050 (54.5)	14,600 (60.5)	14,800 (61.5)				
30		11,150 (28)	9,070 (46.5)	10,250 (54)	10,400 (56)	11,200 (61.5)	11,950 (66)		
35			7,760 (37.5)	7,440 (47.5)	7,590 (49.5)	8,260 (57)	8,920 (62)	9,300 (65.5)	9,620 (68.5)
40			5,720 (24.5)	5,450 (39.5)	5,580 (42.5)	6,190 (51.5)	6,800 (57.5)	7,140 (62)	7,450 (65.5)
45				3,970 (30)	4,100 (34)	4,660 (45.5)	5,220 (53)	5,530 (58)	5,840 (62)
50				2,840 (13.5)	2,510 (22)	3,480 (39)	3,990 (48)	4,300 (54)	4,600 (58.5)
55						2,550 (31.5)	3,010 (42.5)	3,320 (50)	3,620 (55)
60						1,800 (20.5)	2,220 (36.5)	2,520 (45.5)	2,820 (51.5)
65							1,550 (29.5)	1,860 (40.5)	2,150 (47.5)
70							1,000 (19.5)	1,300 (34.5)	1,580 (43)
75									1,100 (38.5)

NOTE: ( ) Boom angles are in degrees. A6-829-011624
*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

ON RUBBER 26.5 X 25 - 26PR TIRES
(STATIONARY - DEFINED ARC OVER FRONT)

Radius in Feet	Main Boom Length in Feet								
	34	40	50	*58	60	70	80	90	100
10	38,650 (66)	35,550 (69.5)							
12	36,000 (62)	33,250 (66.5)							
15	32,300 (56)	30,050 (61.5)	23,350 (68)						
20	24,350 (44)	24,200 (52.5)	22,400 (61.5)	20,250 (65.5)	17,500 (66.5)				
25	16,350 (27)	16,150 (42)	15,850 (54.5)	15,600 (60)	15,700 (61)	16,050 (66)	13,350 (69)		
30		11,400 (27.5)	11,150 (46.5)	10,900 (54)	11,000 (55.5)	11,400 (61)	11,800 (65)	8,020 (68)	
35			8,060 (37)	7,880 (47)	7,980 (49)	8,400 (56)	8,810 (61)	8,020 (64.5)	8,420 (67.5)
40			5,890 (24)	5,740 (39)	5,840 (42)	6,270 (51)	6,710 (57)	7,070 (61)	7,430 (64.5)
45				4,150 (29.5)	4,250 (33.5)	4,700 (46)	5,150 (52)	5,490 (57)	5,820 (61)
50				2,920 (13)	3,030 (22)	3,490 (38.5)	3,950 (47.5)	4,270 (53)	4,580 (58)
55						2,580 (31)	3,000 (42)	3,300 (49)	3,600 (54)
60						1,840 (20)	2,220 (36)	2,510 (44.5)	2,790 (50.5)
65							1,580 (28.5)	1,850 (39.5)	2,130 (46.5)
70							1,040 (18.5)	1,300 (33.5)	1,570 (42)
75									1,090 (37.5)

A6-829-11674

ON RUBBER
(STATIONARY CAPACITIES - 360°)

Radius in Feet	Main Boom Length in Feet								
	34	40	50	*58	60	70	80	90	100
10	37,600 (66)	35,550 (69.5)							
12	31,450 (62)	31,200 (66.5)							
15	21,550 (56)	21,200 (61.5)	20,600 (68)						
20	12,950 (44)	12,650 (52.5)	12,200 (61.5)	11,800 (65.5)	11,950 (66.5)				
25	8,510 (27)	8,250 (42)	7,800 (54.5)	7,460 (60)	7,690 (61)	8,760 (66)	8,920 (69)		
30		5,470 (27.5)	5,080 (46.5)	4,780 (54)	4,920 (55.5)	5,530 (61)	6,130 (65)	6,510 (68)	
35			3,230 (37)	2,970 (47)	3,100 (49)	3,680 (56)	4,250 (61)	4,570 (64.5)	4,900 (67.5)
40			1,890 (24)	1,670 (39)	1,790 (42)	2,340 (51)	2,900 (57)	3,180 (61)	3,460 (64.5)
45						1,340 (45)	1,760 (52)	1,760 (57)	1,760 (61)

A6-829-11675

ON RUBBER
(PICK & CARRY CAPACITIES - UP TO 2.5 MPH)

Radius in Feet	Main Boom Length in Feet								
	34	40	50	*58	60	70	80	90	100
10	49,200 (66)	49,200 (69.5)							
12	42,950 (62)	42,950 (66.5)							
15	35,850 (56)	35,800 (61.5)	29,300 (68)	29,300 (71)	29,300 (72)				
20	24,350 (44)	24,200 (52.5)	23,950 (61.5)	23,750 (65.5)	23,850 (66.5)				
25	16,350 (27)	16,150 (42)	15,850 (54.5)	15,600 (60)	15,700 (61)	16,050 (66)	16,400 (69)	16,900 (71.5)	
30		11,400 (27.5)	11,150 (46.5)	10,900 (54)	11,000 (55.5)	11,400 (61)	11,800 (65)	12,250 (68)	12,700 (71)
35			8,060 (37)	7,880 (47)	7,980 (49)	8,400 (56)	8,810 (61)	9,210 (64.5)	9,600 (67.5)
40			5,890 (24)	5,740 (39)	5,840 (42)	6,270 (51)	6,710 (57)	7,070 (61)	7,430 (64.5)
45				4,150 (29.5)	4,250 (33.5)	4,700 (46)	5,150 (52)	5,490 (57)	5,820 (61)
50				2,920 (13)	3,030 (22)	3,490 (38.5)	3,950 (47.5)	4,270 (53)	4,580 (58)
55						2,580 (31)	3,000 (42)	3,300 (49)	3,600 (54)
60						1,840 (20)	2,220 (36)	2,510 (44.5)	2,790 (50.5)
65							1,580 (28.5)	1,850 (39.5)	2,130 (46.5)
70							1,040 (18.5)	1,300 (33.5)	1,570 (42)
75									1,090 (37.5)

Note: ( ) Boom angles are in degrees.

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

A6-829-11676

ZERO DEGREE BOOM ANGLE CHARTS

ON OUTRIGGERS - 360°
23.5R25 / 26.5 X 25 TIRES

Boom Angle	Main Boom Length In Feet									
	34	40	50	*58	60	70	80	90	100	105
0°	16,350 (27.1)	12,700 (33)	8,390 (43)	6,030 (50.8)	5,710 (53)	4,380 (63)	3,370 (73)	2,590 (83)	1,960 (93)	1,700 (98)

ON RUBBER 23.5R25 TIRES

Stationary Capacity Defined Arc (3) Over Front

Boom Angle	Main Boom Length In Feet					
	34	40	50	*58	60	70
0°	13,850 (27.1)	9,240 (33)	4,760 (43)	2,690 (50.8)	2,410 (53)	1,410 (63)

Stationary Capacity 360° Arc

Boom Angle	Main Boom Length In Feet		
	34	40	
0°	6,560 (27.1)	3,840 (33)	

Pick & Carry Capacities Up to 2.5 MPH Boom Centered (7) Over Front

Boom Angle	Main Boom Length In Feet					
	34	40	50	*58	60	70
0°	13,850 (27.1)	9,170 (33)	4,760 (43)	2,690 (50.8)	2,410 (53)	1,410 (63)

A6-829-011625

ON RUBBER 26.5 X 25 TIRES

Stationary Capacity Defined Arc (3) Over Front

Boom Angle	Main Boom Length In Feet					
	34	40	50	*58	60	70
0°	14,100 (27.1)	9,410 (33)	4,870 (43)	2,760 (50.8)	2,470 (53)	1,460 (63)

Stationary Capacity 360° Arc

Boom Angle	Main Boom Length In Feet		
	34	40	50
0°	7,200 (27.1)	4,240 (33)	1,250 (43)

Pick & Carry Capacities Up to 2.5 MPH Boom Centered (7) Over Front

Boom Angle	Main Boom Length In Feet					
	34	40	50	*58	60	70
0°	14,100 (27.1)	9,410 (33)	4,870 (43)	2,760 (50.8)	2,470 (53)	1,460 (63)

A6-829-011677

NOTE: ( ) Reference radii in feet.
***58 ft. boom length is with inner-mid extended and outer-mid & fly ret.**
Refer to in-cab load chart for notes.

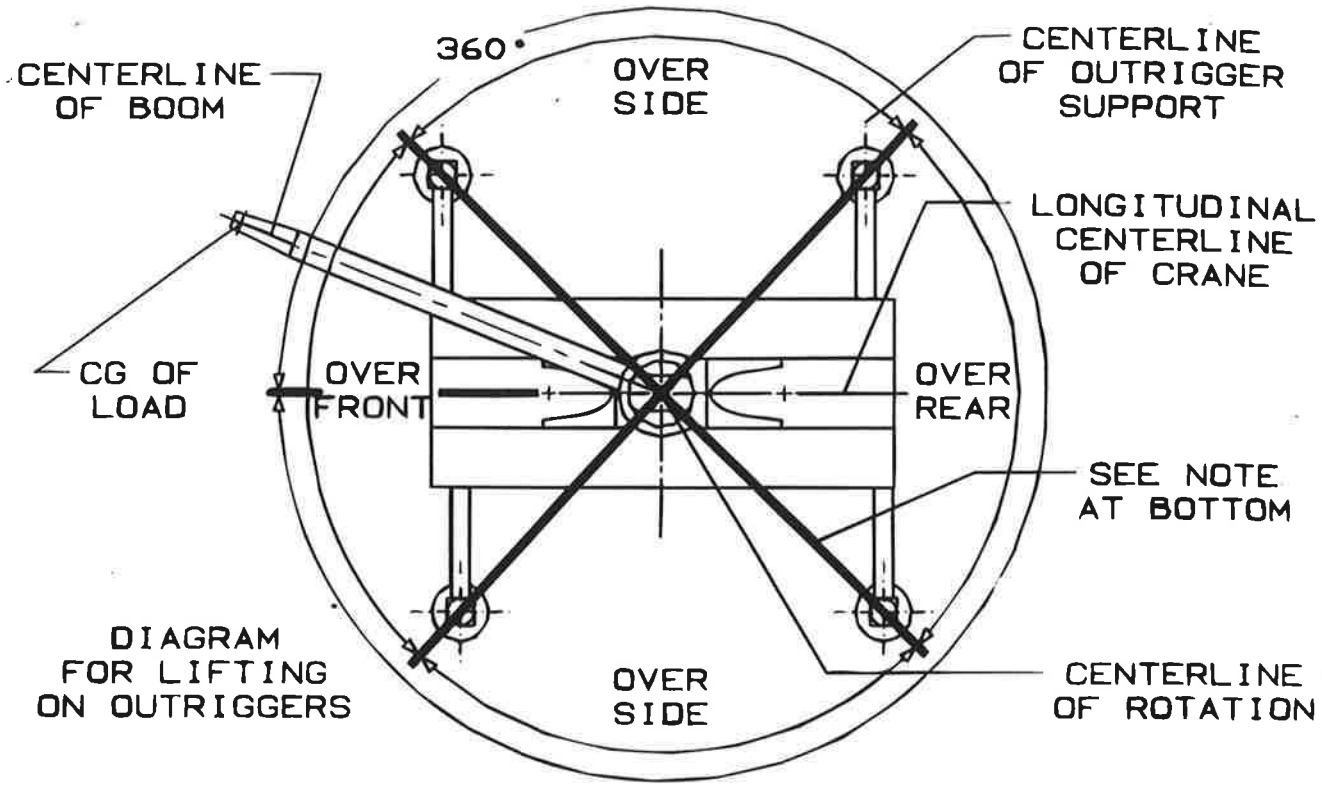

DIAGRAM FOR LIFTING ON OUTRIGGERS

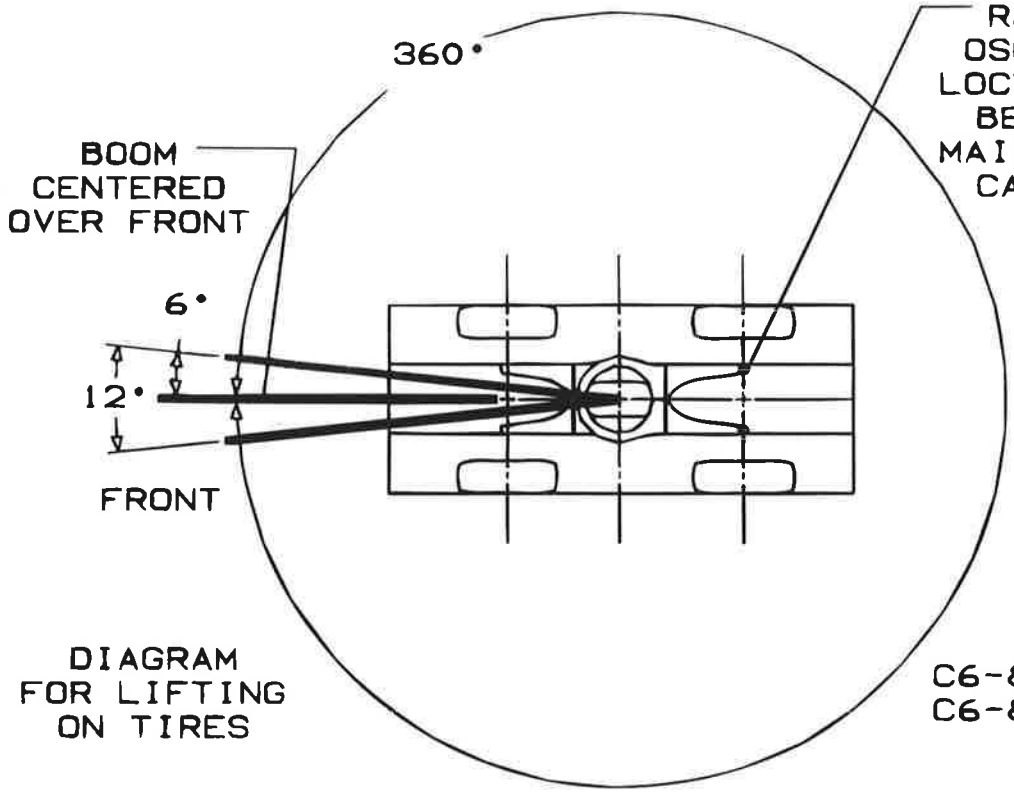

DIAGRAM FOR LIFTING ON TIRES

C6-829-003529
C6-829-001159

BOLD LINES DETERMINE THE LIMITING POSITION OF ANY LOAD FOR OPERATION WITHIN WORKING AREAS INDICATED

WORKING AREA DIAGRAM