GROVE®

OPERATOR'S AND SAFETY HANDBOOK

RT 500E SERIES

CRANE

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SECTION 1
INTRODUCTION

GENERAL

NOTE

Throughout this handbook, reference is made to left, front, and rear when describing locations. These reference locations are to be considered as those viewed from the operator's seat with the superstructure facing forward over the front of the carrier frame.

This Handbook provides important information for the operator of the Model RT500E Series Grove Crane.

The rough terrain 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 six speed forward and reverse transmission. Hydraulic, double box, sliding beam outriggers are integral with the 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° rotation in either direction. All crane functions are controlled from the fully-enclosed cab mounted on the superstructure. The RT525E model is equipped with a three-section, cable-synchronized boom and the RT530E is equipped with a four-section. Additional reach is obtained by utilizing a swingaway boom extension. Lifting is provided by a main hoist and an optional auxiliary hoist.

NOISE/VIBRATION TEST RESULTS

NOISE LEVEL TEST RESULTS ARE AS FOLLOWS:

- At the operator's station with closed cab operation, the value is 78 dba maximum when measured according to the directives 98/37/EC and Kebomatief 27.

VIBRATION LEVEL TEST RESULTS ARE AS FOLLOWS:

- At the operator's station with closed cab operation, vibration levels are less than 0.5 m/s/s for Whole Body Vibration exposure and are less than 2.5 m/s/s for Hand Arm Vibration exposure when measured according to 89/392/EEC Community Legislation on Machinery per standard ISO 2631/1 - Evaluation of Human Exposure to Work Body Vibration, ISO 5349 - Guidelines for the Measurement and Assessment of Human Exposure to Hand Transmitted Vibrations, and ISO/DIS 8041 - Human Response Vibration Measuring Instrumentation.

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.

- Lock the operator's cab and install vandal guards, if used.

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.

If applicable to your crane, frequently check all air tanks for water in freezing weather.

If applicable to your crane, 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.

BOOM LIGHT SWITCH (OPTIONAL)

The BOOM LIGHT switch (optional) (37) is located on the left side of the front console. This two-position rocker switch (ON/OFF) controls operation of the boom flood lights. When the switch is in the ON position, the square LED on the switch is illuminated.

TURN SIGNAL LEVER AND WINDSHIELD WIPER/ WASHER CONTROLS

The turn signal lever and windshield wiper/washer controls (38) are located on the left side of the steering column. Pushing the turn signal lever down causes the left front and left rear turn signals to flash. Pushing the turn signal lever up causes the right front and right rear turn signals to flash. The windshield wiper switch is incorporated in the turn signal lever. The knob of the lever has three positions: O, I, and II. Pushing the button in the end of the knob energizes the windshield washer pump to spray washer fluid on the windshield. Positioning the knob to I operates the wiper at low speed and positioning the knob to II operates the wiper at high speed. Positioning the knob to O turns the wiper motor off and automatically returns the wiper to the parked position.

CAB DOME LIGHT

The cab dome light (39) is located on the right rear corner of the cab roof and provides illumination in the cab. The dome light is controlled by a switch on the light.

SKYLIGHT WIPER (NOT SHOWN)

The electrically-operated skylight wiper is installed to remove moisture from the skylight. The wiper is located on the left side of the skylight frame.The skylight wiper is controlled by a switch on the wiper motor.

BUBBLE LEVEL INDICATOR

The bubble level indicator (40) is located on the right side of the cab, between the front console and the operator's seat. The indicator provides the operator with a visual aid in determining the levelness of the crane.

AIR CONDITIONER CONTROL SWITCH (OPTIONAL)

The air conditioner (AIR COND) control switch (41) is located on the right side of the front console. The switch is a two-position rocker switch (OFF, ON) that controls the operation of the optional air conditioning system in conjunction with the FAN switch. When the switch is in the ON position, the square LED on the switch is illuminated.

HEAT CONTROL KNOB

The HEAT control knob (42) is located on the left side of front console. The knob is a push-pull control that positions a flow diverter valve in the hot water heater supply line. Pull out on the knob (PULL ON) to allow hot water to flow through the heater coil and push in on the knob (PUSH OFF) to shut off the flow of hot water to the coil.

FAN SWITCH

The FAN control switch (43) is located on the left side of the front console. The switch is a four-position rotary switch (OFF, LOW, MED, HIGH) that controls operation of the heater or air conditioning blower to circulate heated or cool air throughout the cab.

DEFROSTER SWITCH

The DEFROSTER switch (44) is located on the right side of the front console, next to the HEATER control switch. The switch is a three-position rocker switch (HIGH, OFF, LOW) that controls operation of the defroster fan, which is located on top of the front console.When the switch is in the HIGH or LOW position, the square LED on the switch is illuminated.

SPOTLIGHT (OPTIONAL) (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 from inside the cab. The switch that activates the spotlight is located on the end of the spotlight arm.

BEACON LIGHT (OPTIONAL) (NOT SHOWN)

The beacon light is located on the left rear corner of the cab roof. It is operational anytime the ignition switch is in the ACC or RUN position.

FIRE EXTINGUISHER

The fire extinguisher (45) is located on the left side of the cab behind the operator's seat. The fire extinguisher is a BC rated dry type fire extinguisher for emergency use.

DEFROSTER FAN

A defroster fan (46) is located at the front of the dashboard. The fan is controlled by a switch on the front console, and is used to circulate air to remove moisture and fog from the inside of the windshield.

6. If the axle oscillation lockout valve is not functioning properly, the crane will not 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 main hydraulic pump is mounted on the torque converter drive pad. The steering pump and the optional air conditioning pump are mounted on the engine. The pumps operate any time the engine is running.

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 rotating is caused by a small amount of drag in the hydraulic clutch, resulting in rotation of the rear wheels.

When operating the crane on outriggers, the transmission should be shifted into 4WD (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 all crane functions is standard, i.e. the closer the lever is to neutral (center), the slower the system responds. The control lever should be returned to neutral to hold the load. Never feather the hoist control lever 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. The Preload Check is as follows:

CAUTION

OPERATE ENGINE AT OR NEAR GOVERNED RPM DURING PRELOAD CHECK OF CRANE FUNCTIONS.

NOTE

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

1. Extend and set outriggers.
2. Raise, lower, and swing the boom a minimum of 45° right and left.
3. Telescope the boom in and out.
4. Raise and lower the cable a few times at various boom lengths. Ensure there is no kinking.

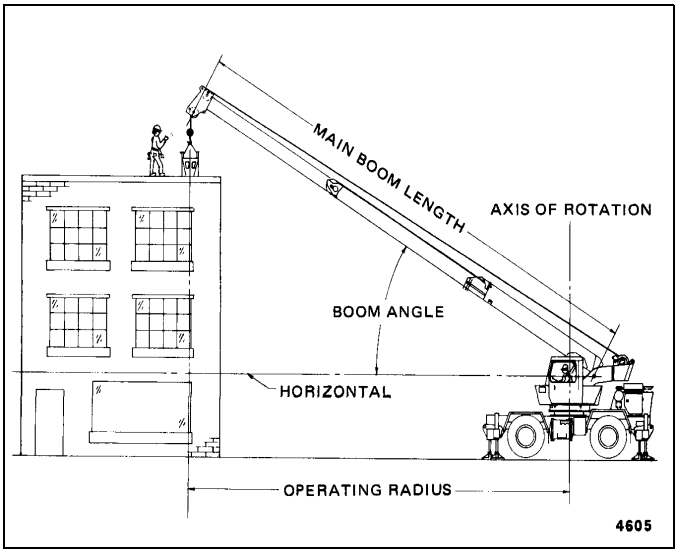
USING YOUR LOAD CHART

NOTE

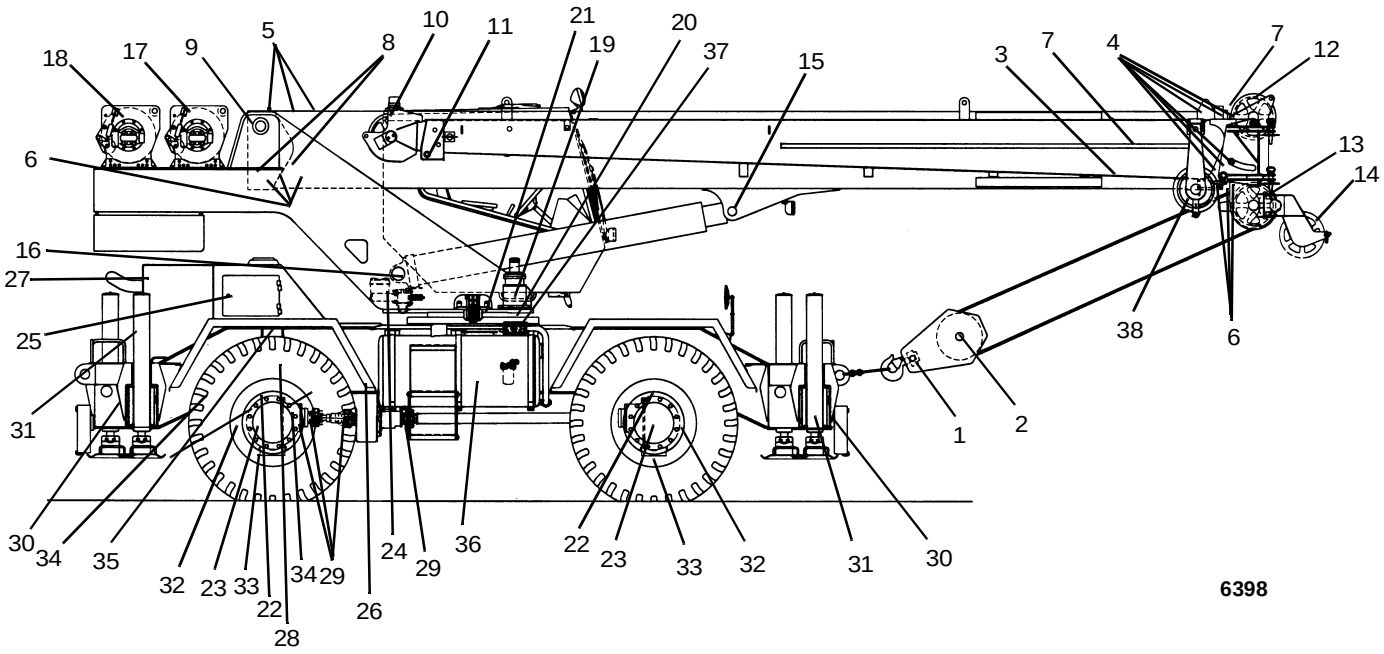
One of the most important tools of every Grove crane is the load chart found in the crane operator's cab.

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

The load chart contains four outrigger capacity charts: fully, mid, and retracted outriggers main boom and boom extension with full outriggers. In addition, the load chart contains three on-rubber capacity charts: over front stationary, 360° stationary, and pick and carry over front.



Terms to Know



1. Hook Block Swivel Bearing
2. Hook Block Sheaves
3. Telescope Cylinder Wear Pads
4. Side Wear Pads
5. Boom Section Upper Wear Pads
6. Boom Section Lower Wear Pads
7. Extend Cable Sheaves
8. Retract Cable Sheave
9. Boom Pivot Shaft
10. Boom Extension Sheave
11. Boom Extension Roller
12. Upper Boom Nose Sheave
13. Lower Boom Nose Sheave
14. Auxiliary Boom Nose Sheave
15. Upper Lift Cylinder Pivot Pin
16. Lower Lift Cylinder Pivot Pins
17. Main Hoist
18. Auxiliary Hoist (Optional)
19. Turntable Gearbox
20. Turntable Gear and Drive Pinion
21. Turntable Bearing
22. Differentials
23. Planetary Hubs and Wheel Bearings
24. Brake Master Cylinder (Far Side)
25. Engine Crankcase
26. Transmission, Torque Converter and Filter
27. Engine Cooling System
28. Coolant Strainer
29. Drive Line - Slip and U-Joints
30. Outrigger Beams
31. Jack Cylinder Support Tubes
32. Steer Cylinder Pivot Pins
33. Upper and Lower King Pins
34. Fifth Wheel Pivots
35. Lockout Cylinder pivot Pins
36. Hydraulic Reservoir
37. Hydraulic Filter
38. Mast Sheave

Lubrication Chart

of pull to which the rope will be subjected. 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. Insert the end of a wire rope into the socket, form a loop in the rope, and route the rope back through the socket allowing the "dead" end to protrude from the socket. Ensure the dead end of the rope is of sufficient length to apply end treatment to the dead end after the wedge has been seated.

5. Insert the wedge into the loop and pull the live end of the rope until the wedge and rope are snug inside the socket. It is recommended that the wedge be seated inside the socket to properly secure the wire rope by using the crane's hoist to first apply a light load to the live line.

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

7. The wire rope and wedge must be properly secured inside the socket before placing the crane into lifting service. It is the wedge that secures the wire rope inside the socket whereas the dead-end treatment is used to restrain the wedge from becoming dislodged from the socket should the rope suddenly become unloaded from the headache ball or hook block striking the ground, etc.

Sketches A through F illustrate various methods for treating the dead-ends of wire ropes which exit a wedge socket assembly. While use of the loop-back method is acceptable, care must be exercised to avoid the loop becoming entangled with tree branches and other components during crane transport and with the anti-two block system and other components during use of the crane.

Of the methods shown below, Grove prefers that method A or B or F be used on Grove cranes, i.e., clipping a short piece of wire rope to the dead-end or using a commercially available specialty clip or wedge. Typically, it is recommended that the tail length of the dead-end should be a minimum of 6 rope diameters but not less that 15.2 cm (6 in) for standard 6 to 8 strand ropes and 20 rope diameters but not less than 15.2 cm (6 in) for rotation resistant wire ropes.

When using method A, place a wire rope clip around the dead end by clamping a short extra piece of rope to the rope 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.

Other sources for information with which crane users should be familiar and follow is provided by the American Society of Mechanical Engineers, American National Standard, ASME B30.5, latest revised. ASME (formerly ANSI) B30.5 applies to cableways, cranes, derricks, hoists, hooks, jacks, and slings. It states, in section 5-1.7.3, "(c) Swagged, compressed, or wedge socket fittings shall be applied as recommended by the rope, crane or fitting manufacture." Wire ropes are addressed in ASME B30.5, section 5-1.7.2, ROPES, It states, in pertinent part, "(a) The ropes shall be of a construction recommended by the rope or crane manufacturer, or person qualified for that service." Additional information is published by the Wire Rope Technical Board in the Wire Rope Users Manual, latest revised.

WIRE ROPE CLIP TORQUE VALUES

Clip Sizes		*Torque	
mm	**Inches**	**Nm**	**Ft-Lbs**
3.18	1/8	6	4.5
4.76	3/16	10	7.5
6.35	1/4	20	15
7.94	5/16	40	30
13.28	3/8	60	45
11.11	7/16	90	65
12.70	1/2	90	65
14.29	9/16	130	95
15.88	5/8	130	95
19.05	3/4	175	130
22.23	7/8	300	225
25.40	1	300	225
28.58	1-1/8	300	225
31.75	1-1/4	490	360
38.68	1-3/8	490	360
38.10	1-1/2	490	360

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