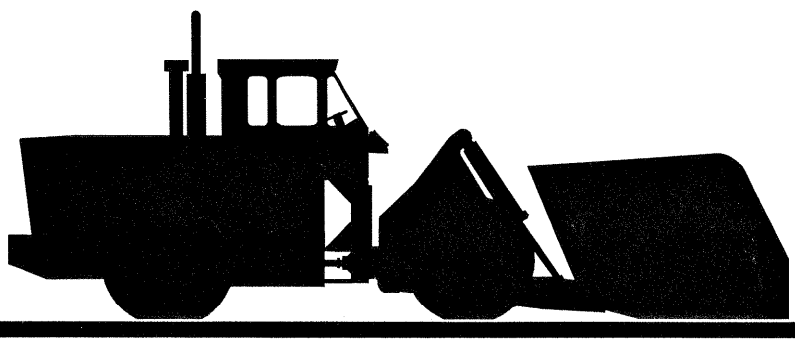
OPERATOR'S MANUAL

CHD-100
CHIP DOZER



Allied Wagner

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Section 1

General

Fig. 1-1 Wagner CHD-100 Chip Dozer

1.1 Introduction

This manual is your guide to correct operation of the Wagner CHD-100 Chip Dozer. Become familiar with it, understand it, and use it. Read all instructions carefully prior to operation. They will help you understand the unit, its capabilities, and its limitations.

As an operator, it's your responsibility to make certain that your Chip Dozer operates at maximum efficiency, with the greatest possible safety. It is also your responsibility to keep it in top operating condition through proper operating techniques and correct operator maintenance. Remember, safe and efficient operation is up to you - the operator.

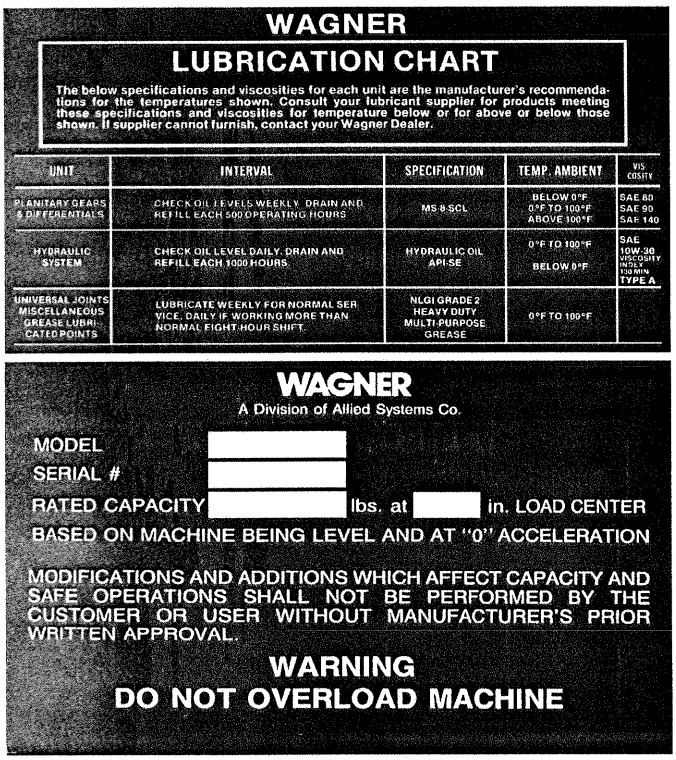
The Wagner Chip Dozer was designed and developed specifically to move material faster, further, and at less cost. It is unique in that it can carry a load and doze at the same time, thus greatly increasing its efficiency. The weight of the carried load adds to the traction needed to doze a volume comparable to the bucket load.

Rugged construction and ease of service contribute to the Chip Dozer's long life and low maintenance. And the Chip Dozer's superior visibility and responsive controls result in a fast, efficient and safe operation.

1.2 Machine Identification

Typical MODEL, SERIAL NUMBER, and LUBRICATION plates are shown in Fig. 1-2. These plates are securely fastened to the cab superstructure on the right side.

The lubrication plate lists the time intervals, specifications, temperature limits, and viscosity requirements of lubricating oils and greases. For further lubrication information, see Section 5 of this manual.



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LUBRICATION CHART

The below specifications and viscosities for each unit are the manufacturer's recommendations for the temperatures shown. Consult your lubricant supplier for products meeting these specifications and viscosities for temperature below or for above or below those shown. If supplier cannot furnish, contact your Wagner Dealer.

UNIT	INTERVAL	SPECIFICATION	TEMP. AMBIENT	VISCOSITY
PLANITARY GEARS & DIFFERENTIALS	CHECK OIL LEVELS WEEKLY. DRAIN AND REFILL EACH 500 OPERATING HOURS	MS-8 SCL	BELOW 0°F 0°F TO 100°F ABOVE 100°F	SAE 80 SAE 90 SAE 140
HYDRAULIC SYSTEM	CHECK OIL LEVEL DAILY. DRAIN AND REFILL EACH 1000 HOURS	HYDRAULIC OIL API-SE	0°F TO 100°F BELOW 0°F	SAE 10W-30 VISCOSITY INDEX 130 MIN. TYPE A
UNIVERSAL JOINTS MISCELLANEOUS GREASE LUBRICATED POINTS	LUBRICATE WEEKLY FOR NORMAL SERVICE. DAILY IF WORKING MORE THAN NORMAL EIGHT HOUR SHIFT.	NLGI GRADE 2 HEAVY DUTY MULTI-PURPOSE GREASE	0°F TO 100°F	

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A Division of Allied Systems Co.

MODEL

SERIAL #

RATED CAPACITY _____ lbs. at _____ in. LOAD CENTER

BASED ON MACHINE BEING LEVEL AND AT "0" ACCELERATION

MODIFICATIONS AND ADDITIONS WHICH AFFECT CAPACITY AND SAFE OPERATIONS SHALL NOT BE PERFORMED BY THE CUSTOMER OR USER WITHOUT MANUFACTURER'S PRIOR WRITTEN APPROVAL.

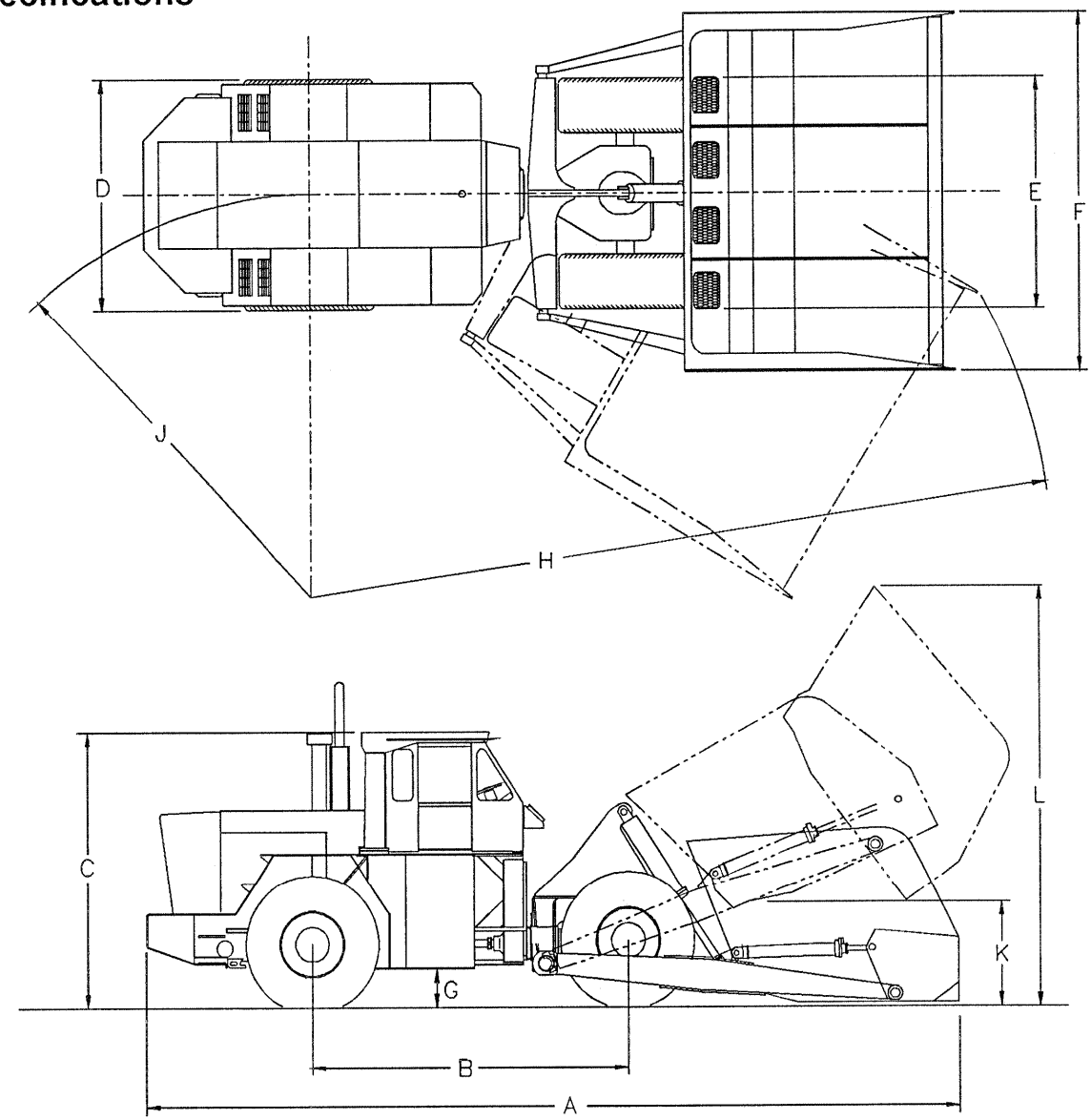
WARNING

DO NOT OVERLOAD MACHINE

Fig. 1-2 Lubrication and Identification Plates

NOTE: The importance of the machine's model and serial numbers cannot be overstated. Always have these numbers at your fingertips when requesting parts, service, or operation information of any kind. It is from these numbers that our Service Department creates a unit file in which a complete history of your machine is maintained.

1.3 Specifications



Dimensions

* A.	Overall Length	36' - 10"	(11227 mm)
B.	Wheelbase	14' - 10"	(4521 mm)
C.	Cab Height	12' - 9"	(3886 mm)
D.	Outside Chassis Width (Tires)	10' - 10"	(3302 mm)
E.	Outside Bogie Width (Tires)	10' - 8"	(3251 mm)
F.	Bucket Width	14' - 7"	(4445 mm)
* F.	Bucket Width	17' - 0"	(5182 mm)
G.	Ground Clearance (Chassis)	1' - 10"	(559 mm)
	Ground Clearance (Differential)	2' - 0"	(610 mm)
H.	Turning Radius - Outside Bucket	28' - 4"	(8636 mm)
* H.	Turning Radius - Outside Bucket	29' - 4"	(8941 mm)
J.	Turning Radius - Centerline Mach.	18' - 2"	(5537 mm)
K.	Max. Dump Height	4' - 0"	(1219 mm)
L.	Max. Height in Dump Position	18' - 4"	(5588 mm)

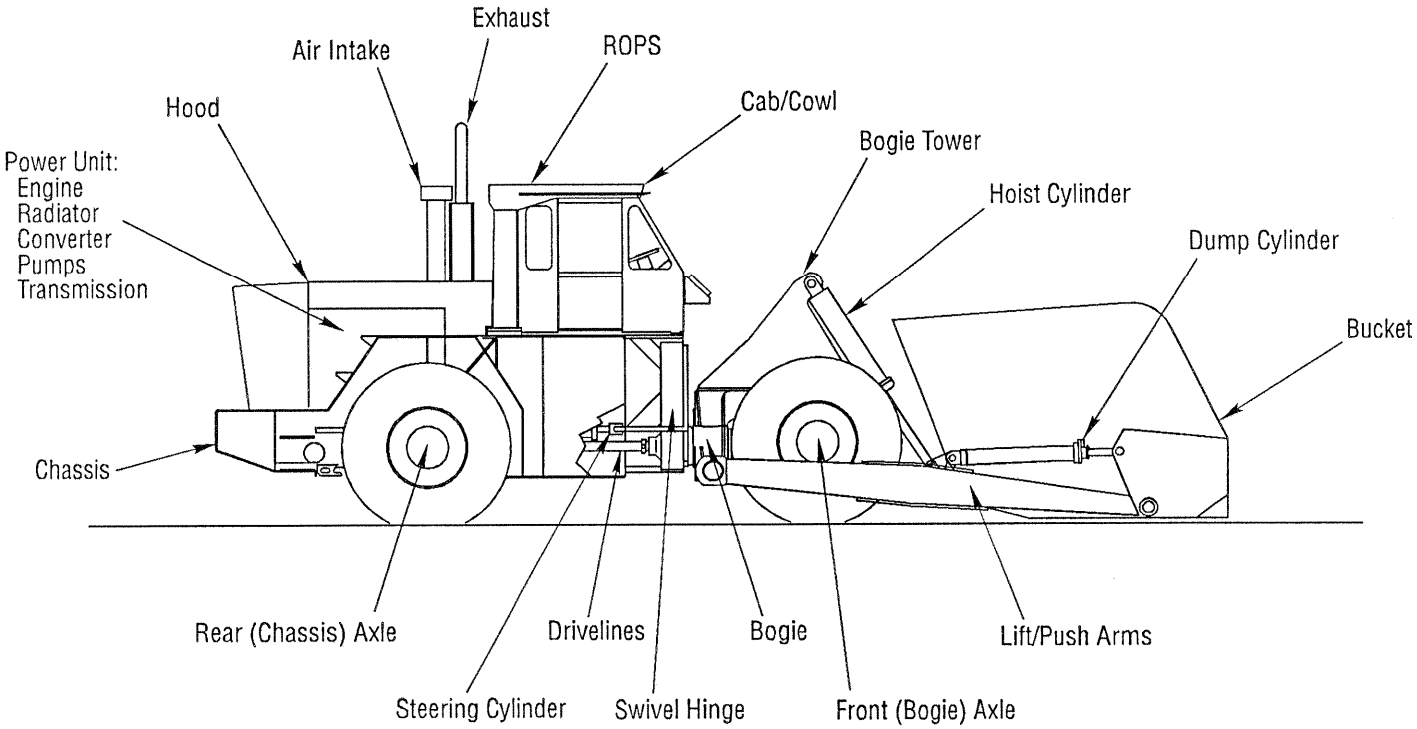
Weights and Functions

	Unit Weight/Hydroflation	93,300 lbs (42358 kg)
	Bogie End/Hydroflation	56,550 lbs (25674kg)
	Chassis End/Hydroflation	36,750 lbs (16685 kg)
	Dump Angle at Maximum Height	54°
	Bucket Push & Carry Capacity	80 cu/yd (61 cu/m)
*	Bucket Push & Carry Capacity	100 cu/yd(75 cu/m)
	Bucket Lift & Carry Capacity	40 cu/yd
*	Bucket Lift & Carry Capacity	50 cu/yd
	Articulation	40° each way
	Oscillation	15° each way
	Maximum Bucket Forward Tip	17°
	Side Tilt (optional on 80 yd bucket)	6" each way from horizontal

* Optional 100 cu/yd Push and Carry Bucket w/Side Tilt

NOTE: The specifications shown in this manual are based on information available at the time of publication and are subject to change without notice or obligation

Nomenclature



Engine Make and Model	Cummins KT-19C-450
Max Horsepower	450 @ 2100 RPM
Max Torque	350 Ft/Lbs @ 1500 RPM
Bore and Stroke	6.25" x 6"
No. of Cylinders	6
Displacement	1150 Cu/In (19 liters)
Air Cleaner	Donaldson Two-stage Dry Type
Electrical System Type	24 Volt Negative Ground/24 Volt Start
Alternator	100 AMP
Circuit Breakers (lights)	30 AMP
Circuit Breakers (accessory)	20 AMP
Batteries	(2)12 Volt-8D @ 205 AMP Hr. each

Torque Converter:
Clark 8000 Series 1-stage, 3 Elements - Stall Torque Ratio 2.53:1

Transmission:
Clark 8000 Series Power Shift - Spur Gear; 4 Speeds Fwd and Rev. with 1:1 Converter Ratio

Range	Ratio	Speed (Unladen)
1	4.07:1	4.1 mph (6.6 km/h)
2	2.27:1	7.2 mph (11.6 km/h)
3	1.29:1	12.2 mph (19.6 km/h)
4	.71:1	21.1 mph (33.9 lm/h)

Axles Make	Clark
Model (Chassis)	75790 w/No-Spin
Model (Bogie)	75790
Type	Planetary
Brakes	S-Cam, Air Operated
Brake Size	20" x 7"
Carrier Ratio	5.125:1
Planetary Ratio	4.895:1
Total Reduction	25.087:1
Tires Size	29.50 x 29 Radial
Hydroflation:	Weight each Tire 2386 Lbs

All Tires are Hydroflated

Hydraulic System

Steering Pump	72 GPM @ 2100 Engine RPM
Hoist Pump	72 GPM @ 2100 Engine RPM
Dump Pump	56 GPM @ 2100 Engine RPM
Side Tilt/Pilot Pump	12.5 GPM @ 2100 Engine RPM
Steering Cylinder (2)	6" x 32"
Dump Cylinder(2)	6" x 36"
Hoist Cylinder (1)	9" x 41"
Side-Tilt Cylinder(optional) (1)	6" x 5"

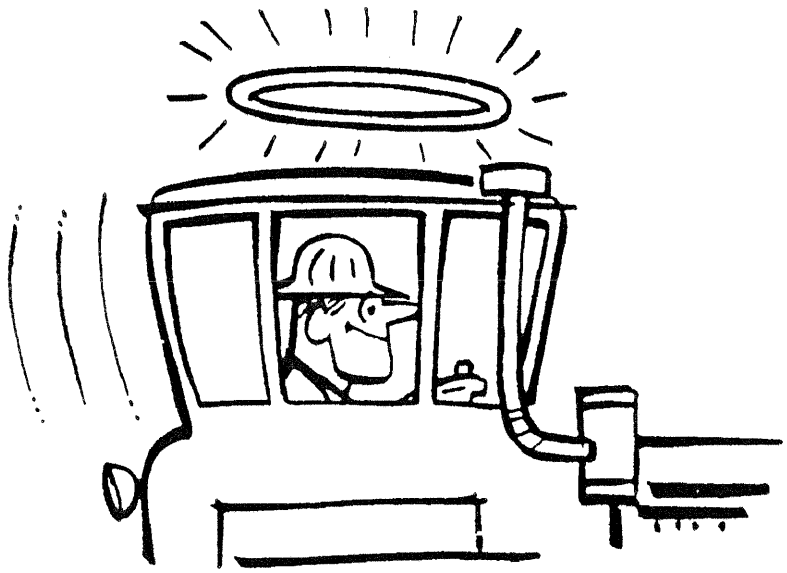
Service Refill Capcities

Fuel Tank	295 Gals (1117 liters)
Hydraulic oil	160 Gals (606 liters)
Crankcase w/Filter	13 Gals (49 liters)
Cooling System	22.5 Gals (85 liters)

NOTE: The specifications shown in this manual are based on information available at the time of publication and are subject to change without notice or obligation

Section 2

Safety



2.1 Safety Is Your Business

Why? Because **SAFETY**, based on knowledge, technical skill, and years of experience has been carefully built into your Wagner Chip Dozer. Time, money and effort have been invested in making your machine a safe product. The dividend from this investment is **YOUR PERSONAL SAFETY.**

However, it must be realized that no power-driven equipment can be any safer than the person behind the controls. If you don't operate and maintain your Chip Dozer safely, our efforts will have been in vain.

The safety instructions and warnings, as documented in this manual and shipped with the machine, provide the most reliable procedures for the safe operation and maintenance of your Chip Dozer. It's your responsibility to see that they are carried out.

The following terms define the various precautions and notices in this manual:

NOTE: Whenever information exists that requires additional emphasis beyond the standard text, the term "**NOTE**" is used.

IMPORTANT: Whenever information exists that requires special attention to procedures or to ensure proper operation of the equipment or to prevent its possible failure, the term "**IMPORTANT**" is used.

CAUTION: Whenever potential damage to equipment exists, requiring correct procedures for prevention, the term "CAUTION" is used.

⚠ WARNING

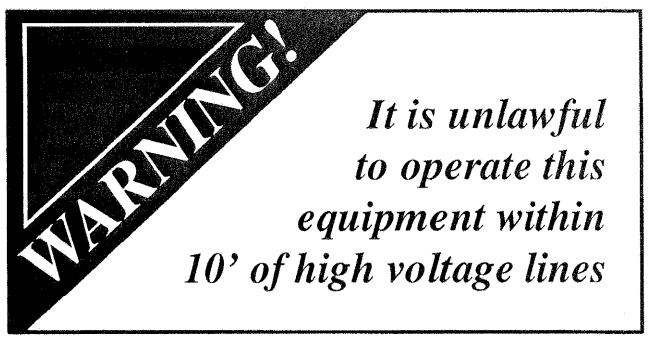
Whenever potential personal injury or death situations exist, requiring correct procedures or practices for prevention, this "WARNING" symbol is used.

This safety alert symbol indicates important safety messages in this manual. When you see this symbol, carefully read the message that follows and be alert to the possibility of personal injury or death.

NOTE: All possible safety hazards cannot be foreseen so as to be included in this manual. Therefore, the operator must always be alert to possible hazards that could endanger personnel or damage the equipment.

2.2 Operation Warnings

- You must be trained in the operation of this machine prior to operation.
- Be extremely careful if you do not normally operate this machine. Re-orient yourself to the machine before starting, and then proceed slowly. However, you must not operate it without having received proper training.
- Know your company's safety rules. Some have specific directions and procedures. The methods outlined in this manual provide a basis for safe operation. Because of special conditions, your company's chip handling procedures may be somewhat different from those shown in this manual.
- Always face the ladder when going up and down ladders. Use both hands.
- Never jump on or off the machine.
- All walking surfaces (steps, ladders, etc.) must be free of ice, grease, oil, or other materials that could cause or contribute to a slip or fall.
- The only person required on the machine is the operator. Never allow anyone to ride on the machine or its attachments.
- Do not operate this machine if you know of malfunctions, missing parts, and/or mis-adjustments. These situations can cause or contribute to an accident or damage to the machine. Stop the machine immediately if problems arise after starting.
- The hydraulic tank heater and/or engine block heater use a 110 or 220VAC external power source. An electrical shock could be fatal.
- All electrical cables and connectors must be in good condition. Use caution in wet weather to avoid danger from electric shock. The hydraulic tank and/or engine block heater must be properly grounded.
- Do not operate the machine before disconnecting hydraulic tank or engine block heaters.
- Do not start the engine if the key has been tagged with a **"DO NOT START"** or **"RED"** tag.
- Never operate any of the cab controls from anywhere other than the operator's seat.
- Sound the horn to alert personnel in the area before starting the engine, and make sure everyone is clear. Be sure that all controls are in neutral before starting the engine.
- Lower the bucket before leaving the cab or shutting down the engine.
- Electrical energy under high voltage can discharge to ground through the machine without direct contact with the machine's structure. Minimum clearances from energized power lines or other power sources must be maintained. If electrical energy does discharge through the machine, **Remain In The Cab. Do Not Permit Anyone To Come Into Contact With The Machine's Structure.**



2.3 Maintenance Warnings

- Maintenance, lubrication and repair of this machine can be dangerous unless performed properly. Each person must satisfy himself that he has the necessary skills and information, proper tools and equipment, and that his work method is safe, correct, and meets his own company's requirements.

- Do not attempt to make adjustments, or perform maintenance or service unless you are authorized and qualified to do so.

- Unless specified in this manual, never attempt maintenance or lubrication procedures while the machine is moving or the engine is running.

- Keep hands, feet, long hair and clothing away from power-driven parts. Do not wear loose fitting clothing or jewelry while performing maintenance and lubrication.

- Before performing maintenance or service under the machine, move the machine to a level surface, engage the parking brake and stop the engine.

- Tag the key switch with a **"DO NOT START"** sign, and/or remove the key.

- Block the tires to keep the machine from rolling.

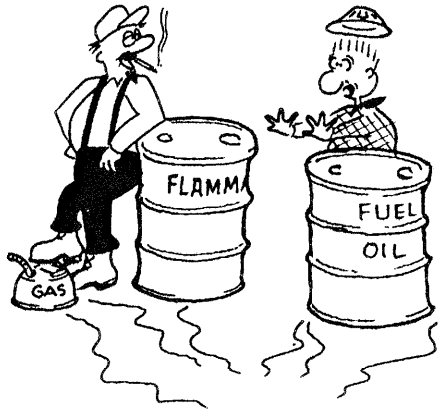
- Perform all maintenance and lubrication procedures with the machine on level ground, parked away from traffic lanes.

- Never rely on the hydraulic system to support any part of the machine during maintenance or lubrication. If necessary, support components with appropriate safety stands. Never stand under a component that is supported only by the hydraulics. Make sure it is resting on its mechanical stops.

- Use caution when working around hot oils. Always allow lubricating and hydraulic oil to cool before draining. Burns can be severe.

- Diesel fuel and hydraulic oil are flammable. Do not smoke when checking levels or filling tanks. Keep open flames and sparks away from the machine.

- Keep the machine free of oil, grease, chips, and trash accumulations. Regular steam cleaning is recommended for fire prevention and general safety.



- Never overfill the fuel or hydraulic tanks. Any overflow could cause a fire. Immediately repair any hydraulic or fuel leaks and clean up any spills.

- Use extreme caution when using compressed air to blow parts dry. The pressure should not exceed 30 psi (208 kPa). Never use air to blow yourself off. Air pressure penetrating your skin can be fatal.

- Engine exhaust fumes can cause death. If it is necessary to run the engine in an enclosed space, remove the exhaust fumes from the area with an exhaust pipe extension. Use ventilation fans and open shop doors to provide adequate ventilation.

- DO NOT remove the radiator cap when the engine is hot. The coolant will be under pressure and can flash to steam with explosive force, causing severe burns. To prevent burns, remove the radiator cap only when the engine is cool.

- Before disconnecting hydraulic lines, be sure to lower all loads and relieve all hydraulic pressure. The load could fall on you, or escaping hydraulic oil could cause severe personal injury.

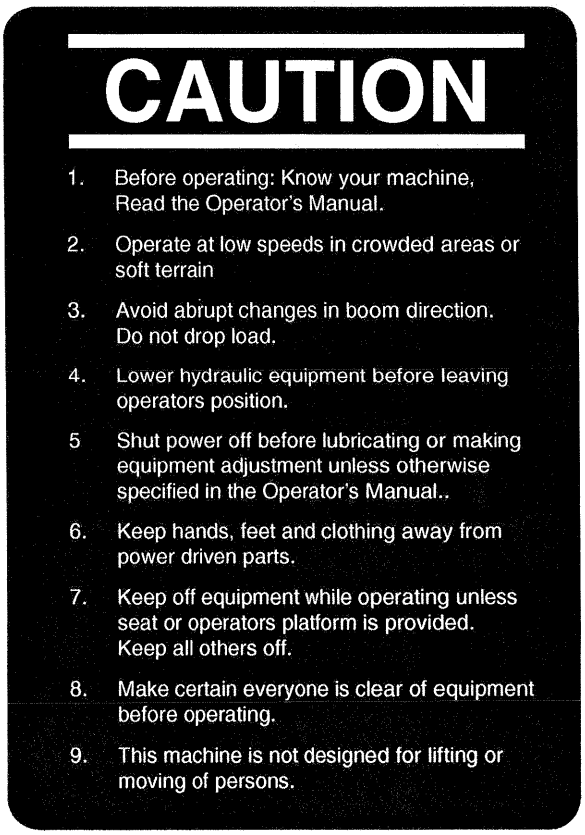
- Batteries produce explosive gases. Keep sparks, flame and cigarettes away. Ventilate when charging

or using in an enclosed space. Always shield your eyes when working near batteries.
When removing battery cables, always turn the battery disconnect switches OFF first, then disconnect the negative (-) cable.
When installing a battery, always connect the positive (+) cable first.
This procedure will help to prevent a spark which could cause an explosion.

- Before making adjustments on the engine or electrical system, disconnect the battery. An electrical spark could cause a fire, explosion or severe burns.

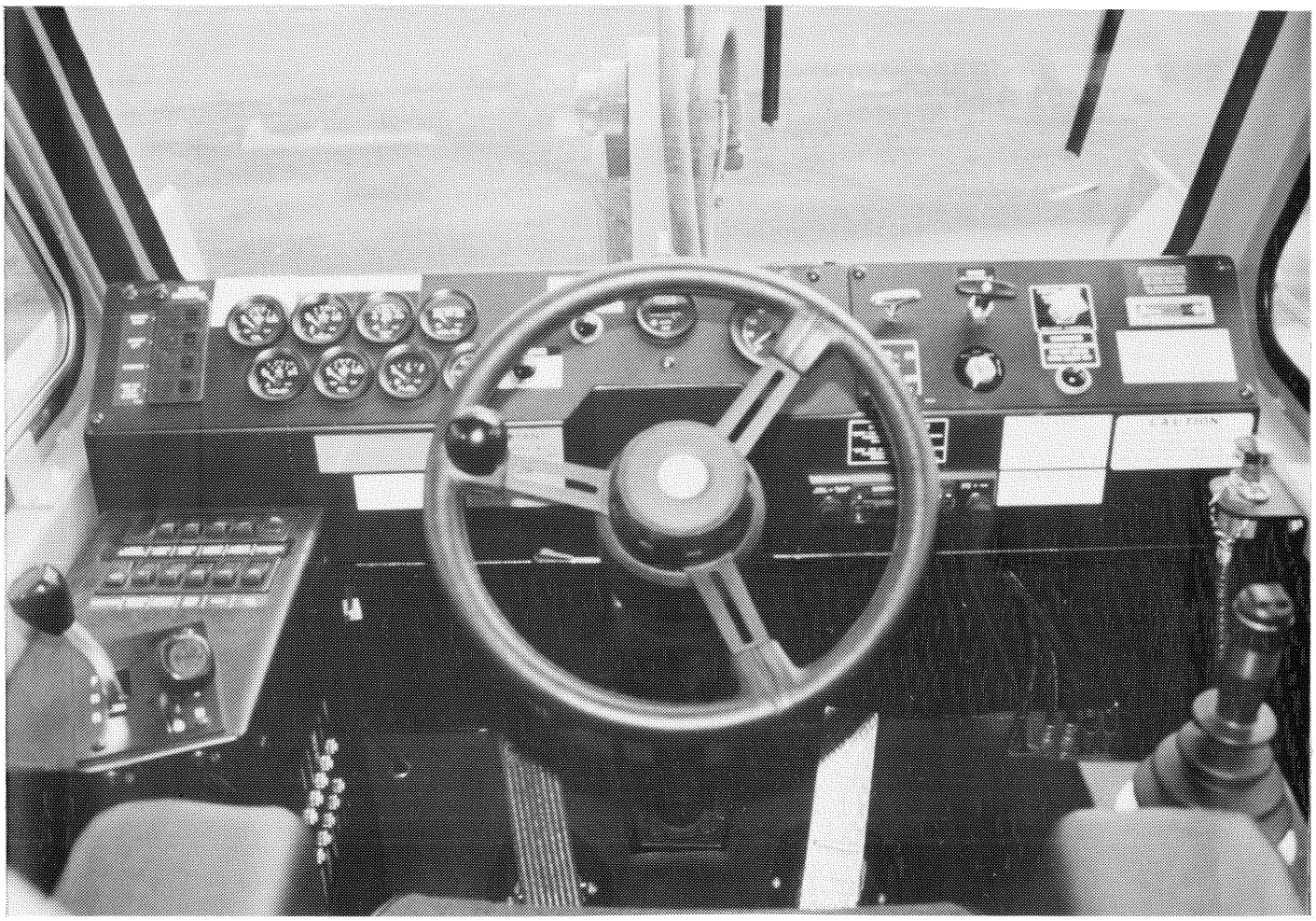
- Batteries contain sulfuric acid which can cause severe burns. Avoid contact with skin, eyes or clothing.

- It is essential to personnel safety that safe ladders, personnel lifts and/or scaffolding be used while servicing this machine. Always use safety tread walks and hand holds to reach lubrication points or to inspect or adjust the machine. These areas can be dangerously slick under conditions of rain, frost or oil smears.



Section 3

Instruments and Controls



3.1 General

Become thoroughly familiar with the location and use of all instruments and controls before operating this machine. Check all instruments immediately upon starting, again after reaching operating temperatures, and at frequent intervals during operation to assure proper care through prompt detection of irregularities. If any of the instruments does not register properly, stop the engine, and have the problem corrected as soon as practical.

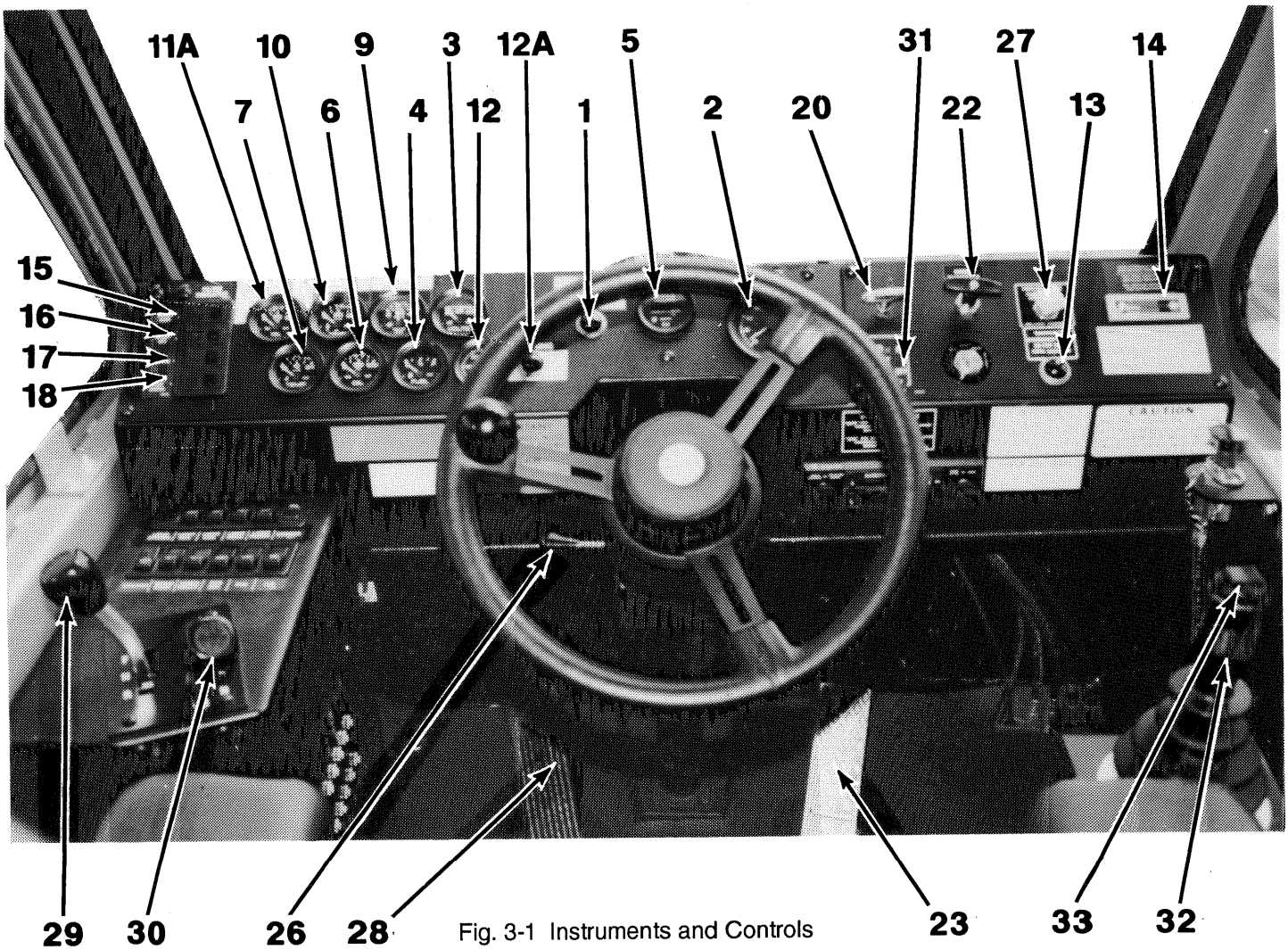


Fig. 3-1 Instruments and Controls

3.2 Operator's Instruments

Engine Instruments

1. Engine Warning Light (red)
This light comes on and a warning bell sounds whenever engine oil pressure drops below a safe operating level or when engine temperature is excessive. On some models, the engine will shut-down automatically if the problem continues.
The light and bell are activated when the ignition switch is turned to ON. This ensures that the system is working.

2. Tachometer See Fig 3-2
An electrical tachometer indicating engine revolutions per minute (rpm). To read, multiply the indicated number by 100.
Example: indicated 20 x 100 = 2000 rpm.

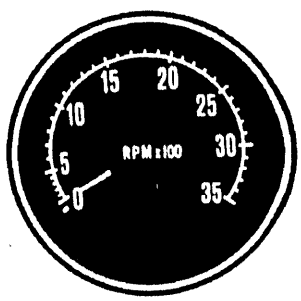


Fig. 3-2 Tachometer

3. Voltmeter See Fig. 3-3
The voltmeter indicates the voltage condition of the electrical system - whether the alternator is or is not charging. The numbers indicate volts (12V shown). During operation, the needle should stay within the green area of the dial.

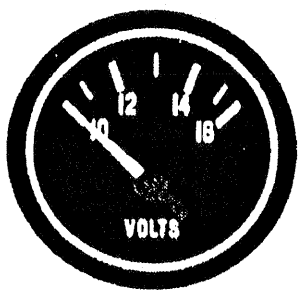


Fig. 3-3 Voltmeter

4. Fuel Level Gauge

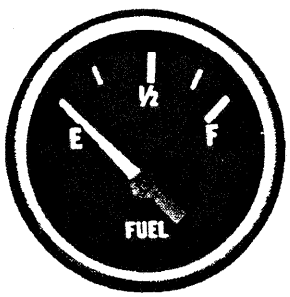


Fig. 3-4 Fuel Level Gauge

5. Hour Meter See Fig. 3-5
Activated by engine oil pressure. It records the total elapsed time of actual engine operation.

6. Engine Oil Pressure Gauge See Fig. 3-6
Displays engine lubricating oil pressure. Determines pressure only - not amount. Should this pressure drop below that required by the engine manufacturer's specifications during operation, **STOP THE ENGINE IMMEDIATELY AND DETERMINE THE CAUSE.**

Fig. 3-5 Hour Meter

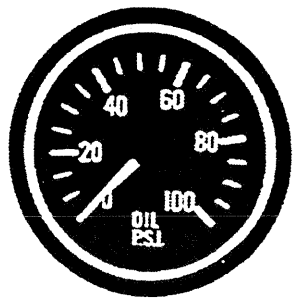


Fig. 3-6 Engine Oil Pressure Gauge

7. Engine Coolant Temperature Gauge See Fig. 3-7
Displays engine coolant temperature. If the temperature holds steady at 200° F or higher, discontinue operation, allow the engine to idle for 3 to 5 minutes, and shut it down. Determine the cause before continuing operation.
If a coolant hose failure occurs, shut the engine down immediately.

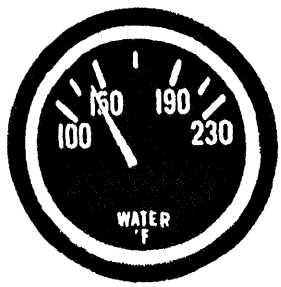


Fig. 3-7 Engine Coolant Temperature Gauge

8. Air Filter Indicator
Standard location is outside the cab, mounted on the air cleaner housing. It indicates air filter restriction by showing "red" or "green". When the indicator locks into the "red" zone, the element must be serviced as soon as possible. To reset the indicator, press the button on top.

Transmission System Instruments

9. Transmission Circuit Pressure Gauge See Fig. 3-8
Displays the oil pressure that drives the transmission oil clutches. Clutch pressure should be between 180 and 220 psi at engine idle speed. The pressure should not vary more than 5 psi between the four speed ranges.

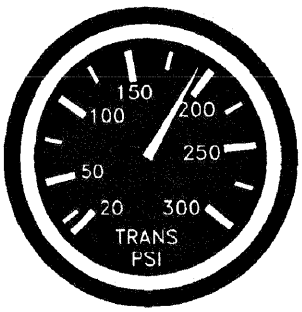


Fig. 3-8 Transmission Circuit Pressure Gauge

10. Transmission Circuit Temperature Gauge
See Fig. 3-9
Displays converter oil temperature. This gauge should read between 200° - 250° F. If the temperature exceeds the maximum allowable, discontinue operation and report to appropriate service personnel.

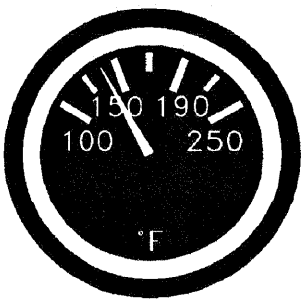


Fig. 3-9 Transmission Circuit Temperature Gauge

11. Forward and Reverse Indicator Lights (optional)
Lights indicate whether the transmission is engaged in "forward" or "reverse".
11A.Converter Back Pressure Gauge

Brake System Instruments

12. Air Pressure Gauge
Displays air system pressure. Operating pressure is 60 to 120 PSI.
12A.Low Air Warning light
Buzzer sounds if air pressure drops below 60 psi.

13. Parking Brake Indicator Light (red)
If the key switch is ON and the parking brake is ON, this light will be on.

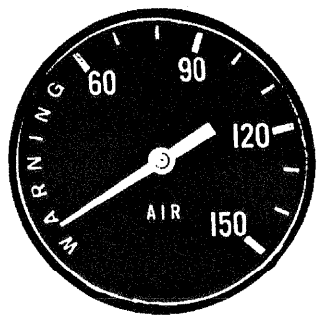


Fig. 3-10 Air Pressure Gauge

Hydraulic System Instruments

14. Hydraulic System Return Filter Indicator
Indicates the condition of the in-tank return filters. With the machine running and at operating temperature, the indicator should be in the green (safe) zone.
If the indicator moves into the red zone at operating temperature, the filter elements are restricted and should be changed.

15. Pilot System Supply Filter Indicator Lights*

16. Steering System Supply Filter Indicator Lights*

17. Bucket Hoist System Supply Filter Indicator Lights*

18. Bucket Dump System Supply Filter Indicator Lights*

*These lights indicate the condition of the high pressure supply filters.
With the machine running and at operating temperature, all four green lights should be on.
If the red light(s) come on and stay on, filter service is required immediately.

NOTE: These lights (items 15,16,17, and 18) may come on and flicker until oil reaches operating temperature. This is normal.

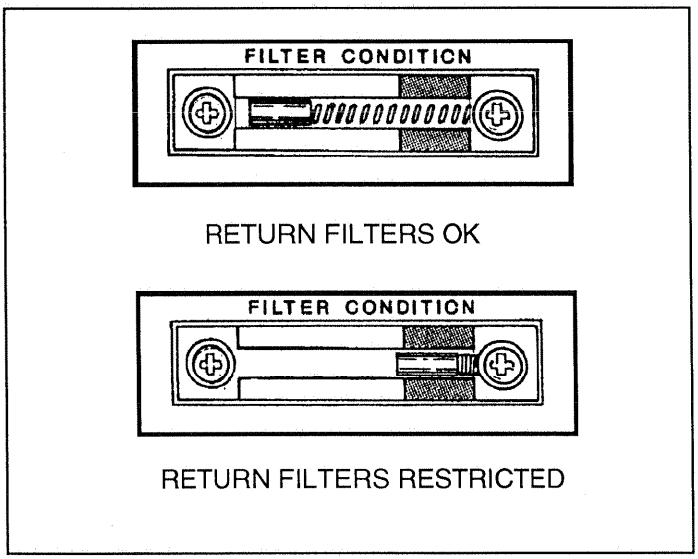


Fig. 3-11 Hydraulic Return Filter Indicator

NOTES: When the white indicator moves into the red area, the Hydraulic Return Filter should be serviced. See Fig. 3-11.

3.3 Operator's Controls

Engine Controls

19. Battery Disconnect Switches (not shown)
Located on the cab floor, mounted behind the seat on the RH sde.

This switch isolates the batteries from the electrical circuits and should be set to "off" when the machine is not in use, or during maintenance and repair, to prevent unauthorized starting or electrical shorts. Turn the switch counter-clockwise to disconnect the battery.

CAUTION: If any arc welding is to be carried out on the machine's structure, it is extremely important that both disconnect switches be OFF. If the switches are left on, severe damage to the electrical system can result.

NOTE: On machines equipped with a fire suppression system, the batteries are automatically disconnected whenever the system is actuated.

20. Cold Start Control
This control applies a measured amount of ether vapor to the intake manifold to ease cold engine starting.

21. Key Switch
The key switch is used to start and stop the engine and to turn the accessories on and off. This is a four position switch: ACC, OFF, RUN, and START.
When turning the key clockwise from the center, or OFF position, the first position to the right is RUN. The second position is START. The START position is spring loaded, and will return the key to the RUN position when released. ACC is to the left of OFF: this position is used for accessories only.

22. Hand Throttle
Manual control, pull for rpm increase. Overrides foot throttle. To lock in the OUT position, turn handle clockwise.

NOTE: Use for engine warm-up only.

23. Accelerator Pedal
Foot controlled engine accelerator pedal.

24. Emergency Engine Shutdown (not shown)
Used only with Caterpillar and Detroit Diesel engines. Use only in emergencies. Pull handle to stop engine.

Steering and Brakes

25. Steering Wheel and Column

26. Tilt Column Release Lever
To tilt steering wheel, pull lever back. To move telescopic wheel in or out, pull center knob to release the lock.

27. Parking Brake Control
To apply the parking brakes, pull the button out. To release the brakes push the button in.

28. Brake Pedal
Will also "declutch" the transmission if the declutch valve (item 31) is ON.

Transmission Controls

29. Transmission Direction Control See Fig. 3-12
To shift into "forward", move handle forward.
To shift into "reverse", pull handle back.
Neutral is the middle detent position.

30.Transmission Range Control See Fig. 3-12
This control lever selects the transmission gear range.

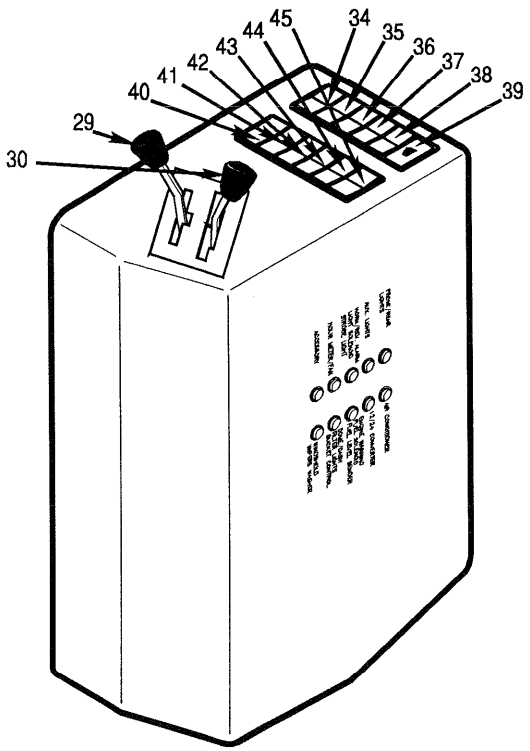


Fig. 3-12 LH Console

IMPORTANT: Always release the throttle slightly when shifting speed ranges. This will significantly reduce shock loads to drivetrain components. Also, you should always reduce engine rpm when down-shifting, as you can over-speed the engine.

31. Declutch Control
If the control is ON, the declutch system automatically shifts the transmission into neutral when you apply the brakes. This allows you to perform all hydraulic functions at any rpm smoothly, without causing converter stall or other unnecessary strains on the brakes or drivetrain components.
If downgrades are encountered, the control may be turned to the OFF position, and the transmission will remain in gear when the brakes are applied.
This control should be left in the ON position for normal operations.

Implement Controls

32. Hoist & Dump Control See Fig. 3-13
Single lever (mono-stick) control for both functions.
Push the lever forward to lower the bucket. Pull the lever back to raise the bucket.
Push the lever right to dump the bucket. Push the lever left to tilt (roll) it back.
The valve is spring loaded to neutral for both functions and will hold the load in its position at time of release.

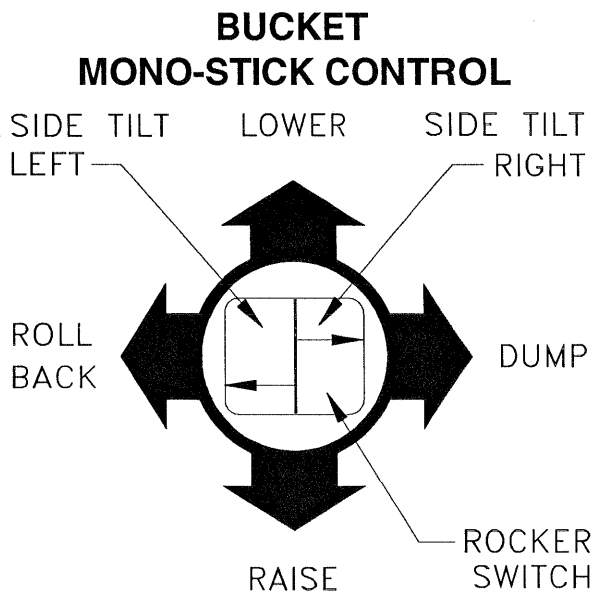


Fig. 3-13 Implement Control Handle

33. Side Tilt Control (used with Side Tilt option)
Push the rocker switch to the right to tilt the bogie to the right.
Push the rocker switch to the left to tilt the bogie to the left.

Cab Controls

34. Warning Flasher Switch (optional)
ON/OFF switch for cab mounted flasher.

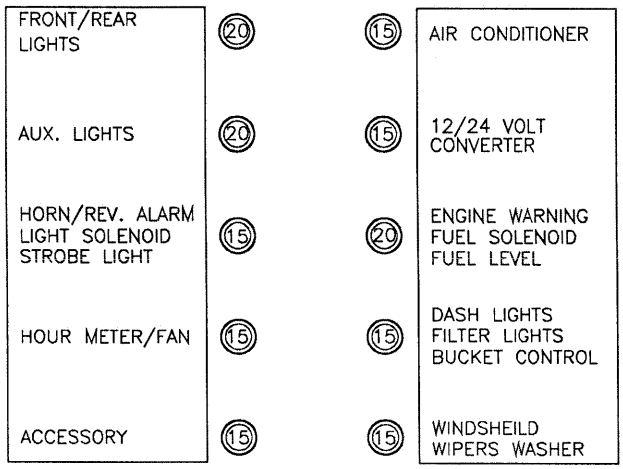


Fig. 3-14 Circuit Breakers

35. & 36. Auxiliary Lights Switch
Cab mounted front lights.

37. Rear Lights Switch
Cab mounted rear lights.

38. Front Lights Switch
Cab mounted front lights.

39. Panel Lights Dimmer Control

40. Windshield Washer Control

41. Rear Windshield Wiper ON/OFF Switch.

42. Front Windshield Wiper ON/OFF Switch (optional)

43. Defroster Fan Switch (window mounted fan)

44. Cab Heater/Air. Cond. Fan Switch

45. Air Conditioner Switch
Activates A/C compressor clutch.

46. Heater Temperature Control

47. Fresh Air/ Recirculate Control
Regulates ratio of fresh air to recirculated air.

48. Defrost/Heater Control
Regulates distribution of air flow for heating the cab or defrost.

49. Dome Light Switch (not shown)
ON/OFF switch, mounted on light.

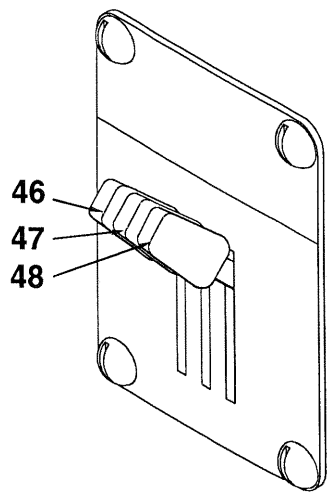


Fig. 3-15 Heater Controls

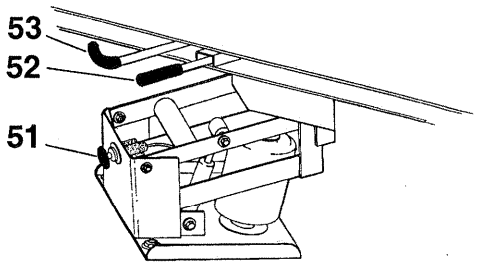


Fig. 3-16 Seat Adjustment Controls

50. Stereo Cassette
AM/FM Radio and cassette player.

51. Seat Height Adjustment Control See Fig. 3-16
Push button to raise seat.
Pull button to lower seat.

52. Seat Forward and Aft Adjustment Release Lever
See Fig. 3-16

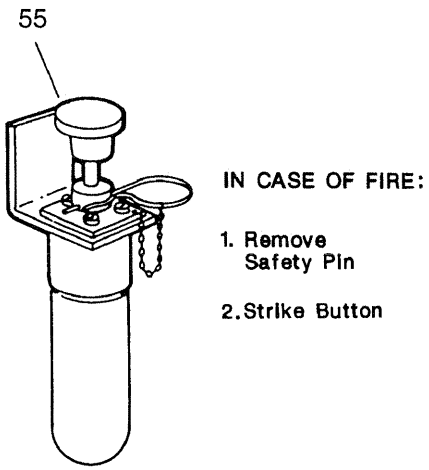


Fig. 3-17 Fire Suppression System Actuator

53. Seat Swivel Release Lever
Locks seat in forward facing position.

54. Air Horn Pull Chain (not shown)
Suspended above operator's head.

55. Fire Extinguisher (hand held)
Mounted to the chassis to the rear of the boarding ladder.

56. Fire Suppression System See Fig.3-17
In case of fire, pull the safety pin on the actuator and strike the button. Fire retardant will be released, the engine will shut down and the batteries will be disconnected from the electrical system.
If possible, take the hand held fire extinguisher, and **LEAVE THE VEHICLE**. After the system has discharged, watch carefully for flare-ups and spot fires.
Notify the Fire Department and/or service personnel as soon as possible.

> **NOTE:** Two fire suppression system actuators are provided. Either one can set off the system. One is located behind the operator's seat. The other is mounted outside the chassis, at ground level, to the left of the RH boarding ladder. Memorize the location of each. Some machines are equipped with an optional automatic fire detection and activation system.

57. Circuit Breakers
Electrical circuit protection. Push to reset. See Fig. 3-14.

Section 4

Operation

4.1 Introduction

You, the operator, have a key position in your company's chip handling operation. Skill and alertness on your part are essential for maximum productivity as well as the safety of yourself and others.

The operating instructions in this manual are here to help you get the maximum use of your Chip Dozer, with the greatest possible safety. Become completely familiar with all of the instruments and controls. Learn the unit, its capabilities and limitations. Study the operating techniques given so that through experience, you can develop additional techniques of your own and contribute to the success of your team.

Safety First

Your co-workers depend on you to operate safely. Before operating the machine, read and observe the safety precautions given in this manual. BE A SAFE OPERATOR. A good safety record can be rewarding.

4.2 General

The Wagner Chip Dozer is easy to operate, even though it has the capacity to handle tremendous loads and perform many operations. To get the most production from this unit with the least effort, and in a safe, reliable manner, it's important to become familiar with all the components and their functions.

Drivetrain

The drivetrain consists of a diesel engine, a torque converter combined with a full power shift transmission, drivelines and planetary drive axles.

Engine

The diesel engines are standard industrial units, selected for the power characteristics and operating speeds required for each size model. They are equipped with electric starting motors and cold weather starting aids and will start in the same easy way as your automobile. We want to emphasize the importance of maintaining the correct engine rpm, for maximum engine service life and proper hydraulic pump operation.

Torque Converter

The torque converter is connected directly to the engine flywheel, eliminating a manually operated clutch, thereby simplifying operation and reducing operator fatigue. It also, to a major degree, hydraulically protects the engine, transmission, drivelines and axle from damaging shock loads and harmful engine lugging and stalling - provided the correct engine rpm is maintained. It also multiplies engine torque in each transmission gear range, automatically adjusting the power output to the load demand.

Transmission

The transmission is a "full power shift - full reversing" unit.

"Full power shift" means that the transmission can be shifted from one range to the next, either up or down.

When shifting down, the engine rpm must be reduced sufficiently to prevent over-speeding the engine when the lower range engages.

> **IMPORTANT:** Never shift the range selector up or down without momentarily relaxing the throttle pedal. Severe damage to the drivetrain could result.

"Full reversing" means that you have approximately the same speeds forward and reverse in all speed ranges.

> **CAUTION: Always brake to a full stop when changing directions. Drivelines are simply not strong enough to withstand the forces created when tons of vehicle and load are reversed suddenly.**

The transmission uses constant mesh gearing in all ranges, forward and reverse. All gears are engaged by means of hydraulically controlled multiple disc clutches, through the control valve actuated by the shift lever in the cab.

Drivelines

Drivelines transmit the engine torque (after being multiplied by the converter and transmission) to the drive axles.

Drive Axles

The drive axles not only support the unit, but also further multiply the engine torque through gear reductions. The first reduction occurs at the ring gear and pinion in the differential. The second reduction is made in the outer planetary ends of the axle. The rear (chassis) axle is equipped with a no-spin unit.

Chassis & Bogie

The chassis provides a mounting for the rear axle. The bogie provides a mounting for the front axle. The chassis & bogie assembly is fully articulated - hinged for steering, and can swivel to negotiate rough terrain. Steering is accomplished by hydraulic cylinders.

Hydraulic System

The Wagner Chip Dozer features advanced principles of hydraulic engineering. Instead of a single pump operating each function, all multiple pump applications have a primary and a secondary function. When any pump output is not being used for its primary function, instead of returning directly to the reservoir, the control valve diverts its flow to its secondary function. This principle is known as "power beyond".

The steering system is a sophisticated hydrostatic type designed specially for heavy mobile equipment. This system has proportional control with load sensing. As the name suggests, it is a system in which the load is sensed, where the sensed signal is used to control the priority valve in the flow amplifier valve, so that oil flow and oil pressure precisely match momentary demands.

A steering unit mounted on the steering column provides a fixed displacement of oil per revolution of the wheel. This flow is amplified by the flow amplifier valve by a factor of 8.

With this system, it is possible to combine the steering and working hydraulics. A priority valve built into the flow amplifier valve ensures that the steering system has first priority on oil from the pump.

Chip Handling

The Wagner Chip Dozer was developed for fast cycle times in pushing light to medium bulk materials distances of 200 to 800+ feet. Cycle times and volumes under 200 feet are limited by the distance required to load the bucket, and the time required for bucket roll-out and dump.

In comparing the Chip Dozer bucket to the conventional straight, or "U" type dozer blade, four unique and basic ideas are engineered into the Chip Dozer bucket:

1. The bucket retains all of the original material within the limits of the bucket throughout the dozing cycle.

2. The bucket will retain all of the material within the bucket when it becomes necessary to lift the bucket to reduce a spin-out tendency and maintain maximum speed.

3. The bucket, in addition to pushing a full load, will push half again as much in front of the bucket, thus producing more volume per hour than a conventional dozer of the same size. This capability is possible because the material weight within the bucket is transferred to the drive wheels, producing maximum traction throughout the dozing cycle.

4. The bucket permits dozing maximum bucket loads around turns without losing the load.

4.3 Break-in Period

The initial break-in period for your unit is limited to engine break-in. The hydraulic system and other components are ready for full operation.

The way you operate your new engine during the first 50 - 100 hours will have an important effect on its service life. Its moving parts are closely fitted, and even though most diesel engines are dynamometer run before leaving the factory, an additional period may be required before uniform oil films are established between mating surfaces.

Generally speaking, proceed with a new engine as follows:

1. Operate most of the time at one half to three quarters full throttle. Do not operate at maximum horsepower for more than five or ten minutes at a time.

2. Don't idle the engine for long periods. This may cause cylinder wall glazing, resulting in excessive oil consumption and loss of power.

3. Keep a close watch on the instruments. Reduce rpm if water temperature reaches 200 ° F.

4. Operate in a gear low enough so that you can accelerate under any condition.

5. Study and follow the engine's operation manual for specific information.

The operator must assume the responsibility of engine care during operation. This is an important job and one that will determine to a large extent the success of the operation. Premature engine failures are very expensive because of lost productivity and the high cost of engine repairs or replacement. Protect your company's investment!

4.4 Start and Stop Procedures

Engine Pre-Start

Before operating this machine, the operator must have prior operator training, a familiarity with this manual, and a complete understanding of all the procedures and functions that may be performed with this machine.

Pre-start Inspection

Planned maintenance and inspections are to be performed after the machine has been delivered, and prior to each shift. The operator should be aware of these procedures and be able to perform spot checks during operation.

> **NOTE:** These inspections may be performed by maintenance personnel or by the operator. In either case, it is the operator's responsibility to see that the machine is ready for operation prior to starting.

Refer to the planned maintenance chart, Section 5, for a complete list of the daily checks that are to be performed.

Engine Oil Level

The oil level should be checked prior to starting the engine.

> **NOTE:** A 15 minute drain-back time is recommended (if the engine has been running) to obtain an accurate reading.

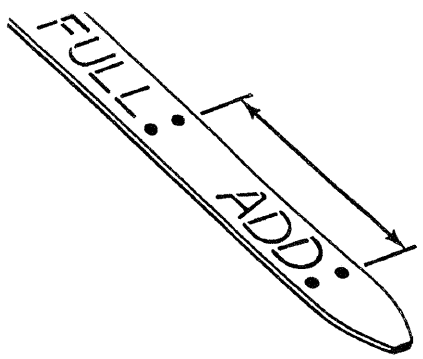


Fig. 4-1 Typical Dipstick

The oil level must be maintained between the "L" (low) or "add" mark, and the "H" (high) or "full" mark. Maintain the oil level as close to the "H" or "full" mark as possible.

CAUTION: Never operate the engine with the oil level below the "L" (low) mark, or above the "H" (high) mark. Refer to the engine's Operation and Maintenance manual for detailed engine service information.

CAUTION: Use only approved engine oil (see Lubricant Specifications Chart, Section 5). Do not overfill.

⚠ WARNING

Never remove the radiator cap if the engine is hot. The coolant will be under pressure and could flash to steam with explosive force, causing severe burns. Remove the radiator cap only when the engine is cool.

Daily inspection of the coolant level is recommended. Cooling systems using anti-aeration baffles restrict visual observation of the true coolant level. Even if the coolant can be seen, the system may not be full. To gain a true fill, add water slowly up to the bottom of the fill neck and allow a 30 second settling period. Remember to compensate for the loss of anti-freeze when adding water.

NOTE: If the engine is hot, the coolant level will be higher than when it is cold.

Inspect the radiator daily for restriction caused by leaves, paper or other foreign material. Inspect the radiator, cap, hoses, and connectors for any signs of leakage or damage.

Hydraulic Oil Level

Always check the hydraulic oil level prior to operation. The dipstick and fill pipe are located on the RH chassis deck, to the right of the operator's cab.

⚠ WARNING

CAUTION: Always open the tank breather petcock (located on the breather pipe) before removing the dipstick, filler cap, or in-tank filter cover plate. Failure to vent the tank can result in personal injury and/or a substantial oil spill.

Be sure to close the petcock before operating the machine.

The oil level should be checked with the hoist cylinder retracted. The oil level should be at or near the "H" (high) mark on the dipstick. Fill with approved hydraulic fluid as required (See Lubricant Specifications Chart, Section 5). Do not overfill.

Transmission Oil Level

Always check that the transmission dipstick shows at least some oil prior to starting the engine. The level should be checked after engine warm-up, with the transmission at normal operating temperature. The dipstick and fill tube are located at the rear of the transmission by the output shaft. Always check the level with the engine running, at operating temperature, with the transmission in neutral. The oil level should be between the "H" (high) and "L" (low) marks. Fill with approved fluid only (See Lubricant Specification Chart, Section 5).

"Walk Around" Inspection

Perform a "walk around" inspection, looking for leaks, loose or missing fasteners, damaged hoses, structural cracks or damage, etc.

Do Not operate the machine until all problems have been corrected.

Tires

Visually inspect the tires for low air pressure and damage to the tread and side walls. If a tire appears suspect, appropriate maintenance personnel should thoroughly check it prior to operation.

Engine Pre-start

1. Make sure that oil and coolant levels have been checked before attempting to start the engine.
2. Sit in your normal operating position and adjust the seat for your personal comfort. It is recommended that you wear your seat belt.
3. Check for emergency/parking brake engagement: Pull the knob to set the brake.

4. Place the transmission range selector in the "neutral" position, "N" on the gear quadrant.

   NOTE: All current Wagner units are equipped with a neutral start switch which prevents the engine from starting unless the transmission is in neutral.

5. Give warning that you are going to start the engine. Make sure that all personnel are clear of the machine, as you may not be able to see them from the cab. Be sure that the area around the machine is clear of all obstructions.

⚠ WARNING

DO NOT start the engine if the key switch has been tagged with a "Do Not Start" or "red" tag.

6. Turn the key switch to the ON position. The emergency brake light and circuit lights should come on. Also, the engine protection system bell and light should come on.

7. With Caterpillar and Detroit Diesel Engines, check that the emergency shutdown control is pushed IN.

Engine Start-up

1. Turn the key switch to the START position. Release the switch to the RUN position as soon as the engine starts.

   CAUTION: If the engine does not start within 30 seconds, allow the starter to cool for at least 2 minutes before re-engagement.

In cold weather it may be necessary to use the cold weather starting procedure.

2. After the engine starts, let it idle. Do not accelerate. Remember, high rpm and full load conditions on cold oil can severely damage the engine, transmission and hydraulic system.

The engine warning light and bell should go out within a few seconds after starting. If engine oil pressure fails to rise sufficiently after approximately 40 seconds of running, the engine may automatically shut down.

IMPORTANT: Your Chip Dozer is equipped with an audiovisual engine protection system. If oil pressure drops below a safe level, or coolant temperature becomes excessive, the engine warning light and bell will come on. With some models, if the condition continues, the engine will shut down automatically. If your unit is not equipped to shut down automatically, it is vitally important that you immediately shut down the engine if the light and bell go on.

3. If a rise in oil pressure of the engine or transmission is not observed within 5 seconds, or a rise in air pressure is not observed in 10 seconds, shut down the engine and have maintenance determine the cause of the problem. Do not operate the machine until the problem has been corrected.

4. Warm the engine at idle until the air pressure reaches at least 60 psi, then recheck that the transmission is in neutral and that the parking brake is applied.

Using the hand throttle, continue to warm the engine at 1000 rpm until the engine temperature reaches at least 130° F, and the air pressure rises to 120 psi.

5. Release the hand throttle. Meanwhile, observe the gauges for proper readings and operation. Also, check the operation of all safety equipment and accessries.

Cold Weather Starting Procedure:

NOTE: For maximum engine protection and easier starting:

Keep the batteries fully charged.

Keep the fuel clean and free of water.

Change the engine oil to the recommended viscosity for the air temperature.

1. Before cranking the engine, pull the "cold start" handle out. Wait 3 seconds for the valve to fill.

2. While cranking the engine, push the handle in to discharge the ether into the engine.

3. In extremely cold weather additional shots may be required to keep the engine running.

⚠ WARNING

Starting fluid is extremely flammable and toxic. Never smoke while using starting fluid. Never make a hole in the starting fluid container. Do not use near an open flame or put the container

into a fire. Use only small amounts of starting fluid. Never store starting fluid in a hot area or the operator's cab.

Temperatures below 32° F (0° C):

1. Let the engine idle for approximately 15 to 20 minutes before putting any load on the engine. Check all gauges for normal readings.

2. After the engine is warm, move the machine to full work capacity slowly until the hydraulic oil is at operating temperature.

Temperatures below 0° F (-18° C):

CAUTION: If the temperature of the hydraulic oil is below its pour point, do not start the engine. The high oil viscosity could cause immediate pump cavitation, resulting in severe damage. The oil in the hydraulic tank must be heated prior to engine start-up.

If the machine will be shut down for several hours or longer with ambient temperatures below 32° F (0° C), the hydraulic tank heater should be plugged in as soon as the machine is shut down. This will help to maintain hydraulic oil temperature.

⚠ WARNING

The hydraulic tank heater uses a 220 or 110 VAC external power source. An electrical shock could be fatal. Don't forget to disconnect the heater cable before beginning operation. All electrical cables and connectors must be in good condition. Use caution in wet weather to avoid danger from electric shock. The heater must be properly grounded.

Let the engine idle for approximately 10 minutes before putting any load on the engine. Check all gauges for normal readings. In extremely cold temperatures, allow sufficient warm-up time.

Engine Shut-down

1. Move the throttle to idle speed, and let the engine idle for at least 5 minutes in order to normalize internal engine temperatures.

CAUTION: Except in emergencies, never shut the engine down immediately after operation. Allow the engine to idle for at least 5 minutes. Failure to do this could cause severe engine damage.

2. Meanwhile, place all controls in neutral and set the emergency brake.

3. To stop the engine, turn the key switch to the OFF position.

Detroit Diesel and Caterpillar engines

Normal shut-down is with the key switch. An emergency shut-down control is provided with these engines. Pull the handle to stop the engine. After the engine stops, push the "stop" control in and turn the key switch to the OFF position. If emergency stop procedures are ever required to stop the engine, make sure that the problem is checked by maintenance personnel before resuming operation.

4.5 Using Booster Batteries

⚠ WARNING

Batteries produce explosive gases. Keep sparks, flame and cigarettes away. Ventilate when charging or using in an enclosed space. Always shield your eyes when working near batteries.

If the batteries on the machine are weak or discharged, use booster batteries to start the engine. Never try to start the engine by towing or pushing. Use the following procedures:

1. Make sure that the parking brake is applied and that all electrical loads are stopped.

2. To prevent damage to the alternator, use care not to reverse the battery connections. Immediate damage to the alternator can be caused by making an incorrect wiring connection during the starting procedure.

⚠ WARNING

Batteries contain sulfuric acid which can cause severe burns. Avoid contact with skin, eyes or clothing.

3. Connect one jumper cable to the (+) positive terminal of the booster battery. Connect the other end of the same cable to the (+) positive terminal on the machine's battery.

4. Connect the other jumper cable to (-) negative terminal of the booster battery. Connect the other end of this cable to a good ground connection on the machine's frame, away from the battery. This procedure will prevent a spark near the battery which could cause an explosion.

5. Start the engine in the normal manner.

6. After the engine has been started, disconnect the negative cable first, then remove the positive cable.

⚠ WARNING

When removing battery terminals, always disconnect the (-) negative cable first. When installing battery terminals, always connect the (-) negative cable last. This procedure can prevent a spark at the battery which could cause an explosion.
Always make the last cable connection away from the battery, such as on the engine block. Use care to keep the cables clear of the fan or any other moving parts.

4.6 Moving, Stopping and Steering

To move the machine:

1. Make sure that the area is clear of obstructions and/or personnel. It is possible for several people to stand under or near the machine, out of sight of the operator. It is recommended that you sound the horn before moving the machine.

CAUTION: This machine cannot be stopped instantly. A varying distance is required to stop the machine, depending on load and speed. To avoid collisions, be sure to allow ample stopping distance.

2. Check that the air pressure gauge reads between 110 and 120 psi

3. Release the hand throttle.

CAUTION: Never attempt to operate with the hand throttle instead of the foot throttle. The hand throttle is to be used for warm-up only.

4. Place the Declutch control in the ON position.

5. Lift the bucket, if required, to clear any obstructions you might encounter.

6. Release the parking brake and put the transmission range selector into 1st gear.

CAUTION: It is recommended that you operate in 1st gear only, until you develop a "feel" for the machine and become familiar with all of its operating characteristics.

7. Place the shift lever into the "forward" or "reverse" position. Moving the lever not only selects the direction of travel, but also shifts the transmission from neutral to "in gear".

8. Depress the throttle pedal slowly and smoothly. Avoid sudden or jerky starts. Depress the pedal just enough to begin moving slowly.

Steering:

With the operator facing the front, turning the steering wheel clockwise will turn the machine right, while turning the wheel counter-clockwise will turn the machine left.

9. Practice moving the machine around the yard. Make several practice stops to develop a "feel" for the brakes. Practice driving and steering in forward and reverse. Always use the brakes to slow and stop the machine - never gear down.

CAUTION: Keep the speed low until you feel comfortable with the machine.
Always bring the machine to a complete stop before changing direction. Changing direction while in motion will put tremendous loads on drivetrain components, especially the drivelines. Premature wear and failure can result.

NOTE: It is recommended that you keep the declutch control in the OFF position for normal traveling. In this position, the transmission is "declutched" or disconnected whenever the brake pedal is depressed. If a downgrade is encountered, the declutch control may be placed in the OFF position, and the transmission will remain in gear while braking.

4.7 Dozing on the Level

1. To obtain maximum load retrieval of chip dozer, **start doze on as level a grade as possible.** Lower the bucket and move into the chip pile.

2. Fill the bucket gradually.
See Fig. 4-2.

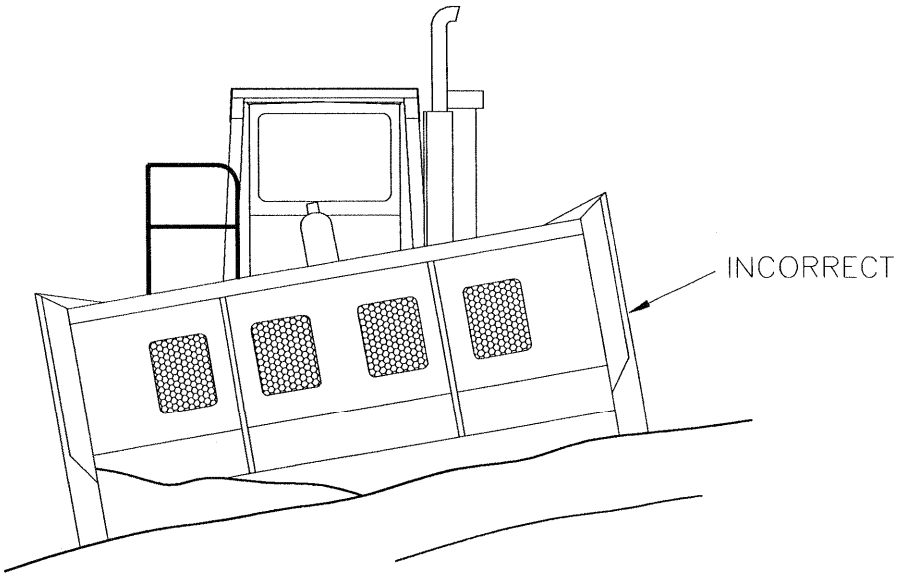


Fig. 4-2

3. Do not cut in one slot only, keep pile as level as possible.
See Fig. 4-3.

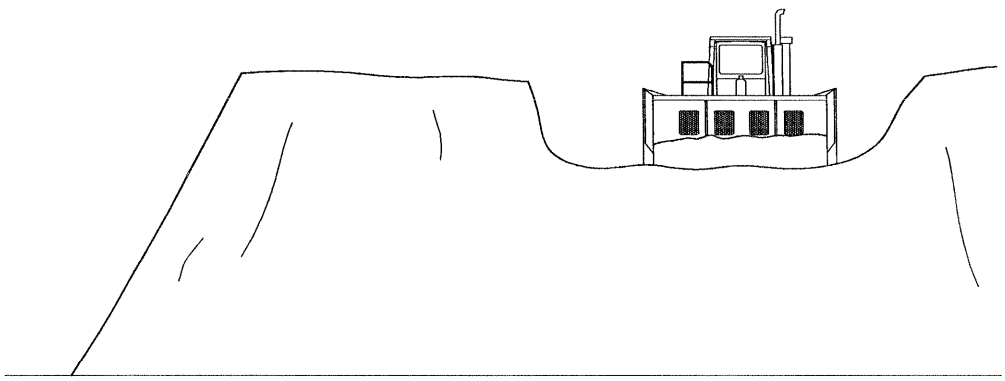


Fig. 4-3

4. Tilt the bucket slightly forward to increase the cut when working in compacted material. This will reduce the drag on the bottom of the bucket.
See Fig. 4-4.

   Note: Tilting the bucket to far forward will make it difficult to produce a smooth cut.

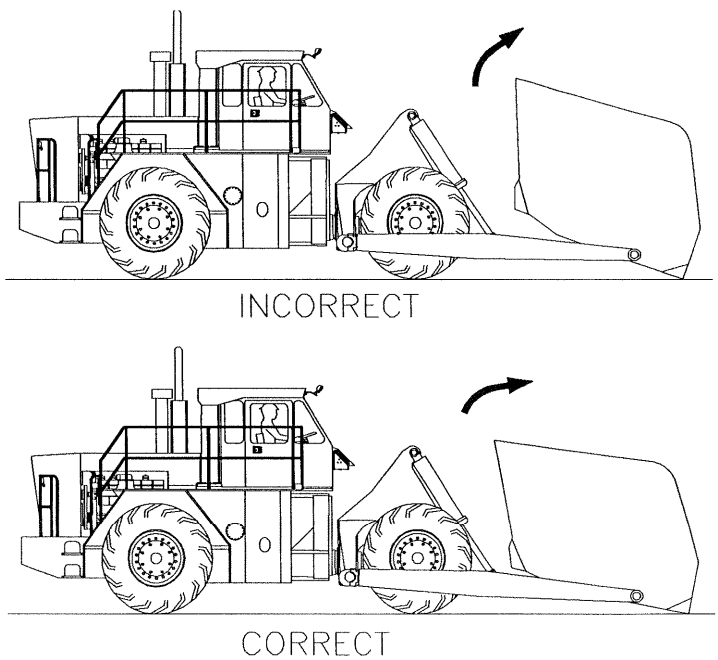


Fig. 4-4

4.8 Cutting on a Knoll

1. When cutting on a knoll or up a steep grade, tilt the bucket slightly. This allows the bucket to load more freely. See Fig. 4-5.

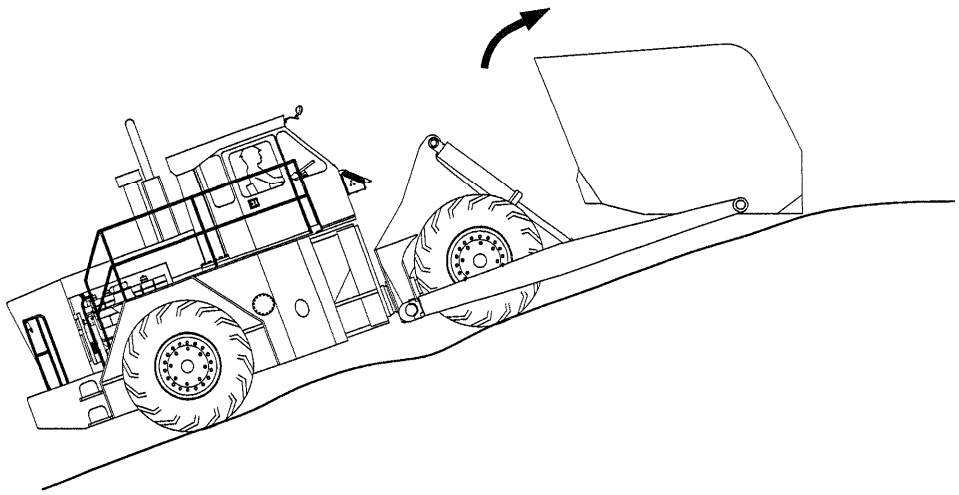


Fig. 4-5

4.9 Reclaiming

1. Start to hoist and dump a load approximately 20 feet from the reclaim infeed or the edge of the pile. Spending less time at the reclaim will increase the cycle time. This will also reduce the chance of slipping into the reclaim. See Fig. 4-6.

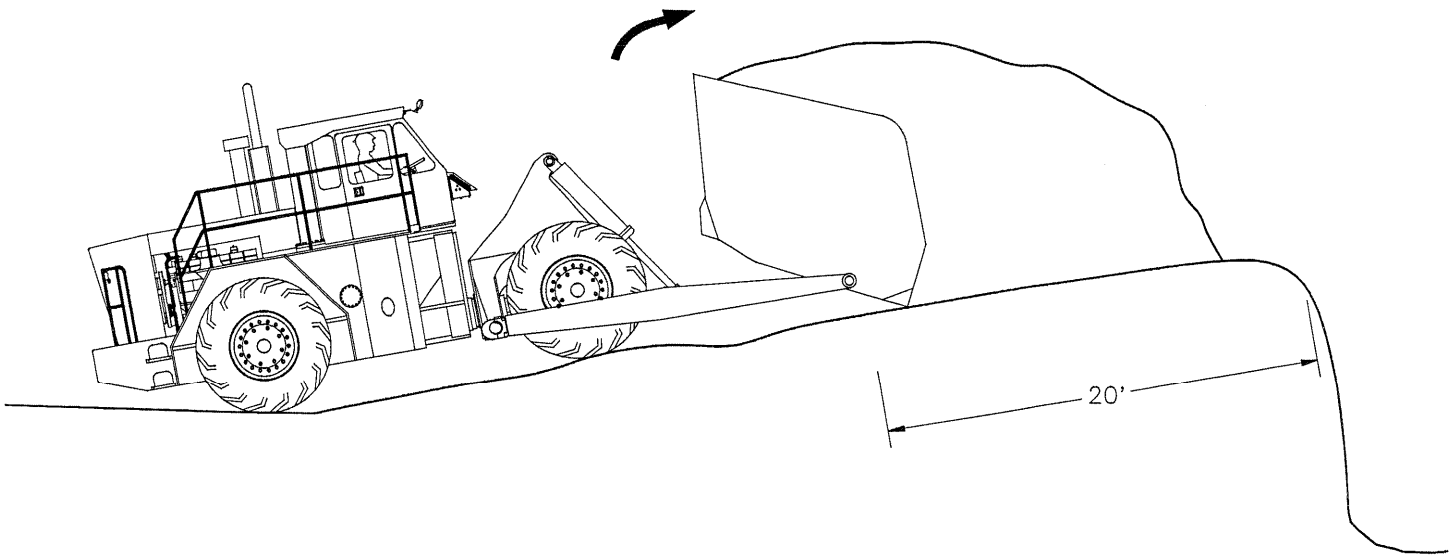


Fig. 4-6

4.10 Knocking down a Cone

1. If it becomes necessary to knock down a overhang, use the following procedure as shown in Fig.4-7.

⚠ WARNING

Never place yourself or dozer under the overhang. Approach from the outside of the overhang and break down with the bucket as shown in Fig. 4-7.

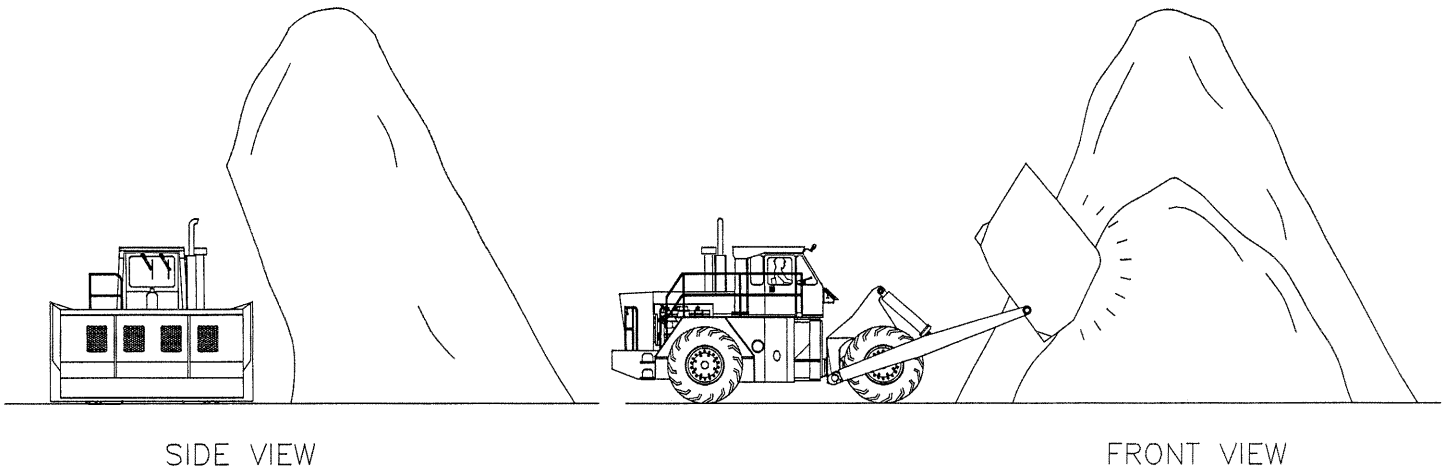


Fig. 4-7

2. Do not cut into a cone with the bucket too high.
   If you enter the pile with the bucket too high the wheel opposite the pile will be much lower making an un-even cut.
   See Fig. 4-8.

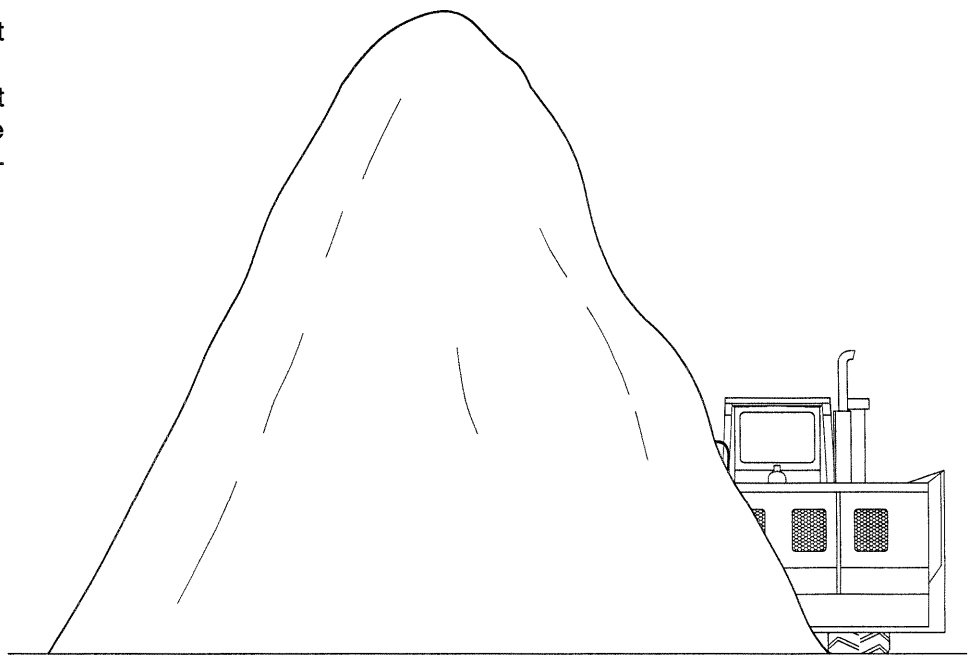


Fig. 4-8

3. Cut down the hump in dozing path.
   If you have a build-up or mound of material in the path in which you are dozing, you will need to cut the mound out or you will continue to loose material when dozing over it. Thus increasing the size of the mound with each pass.
   See Fig.4-9.

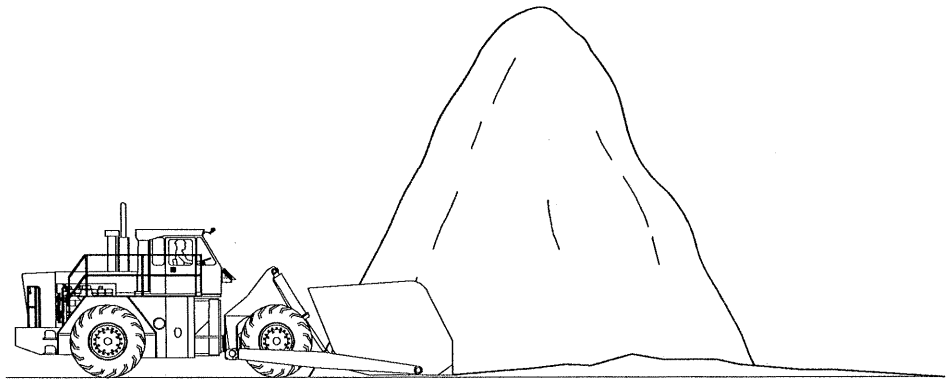


Fig. 4-9.

4. Cut at different angles This will make the job of knocking down a discharge pile much easier.
   See Fig. 4-10.

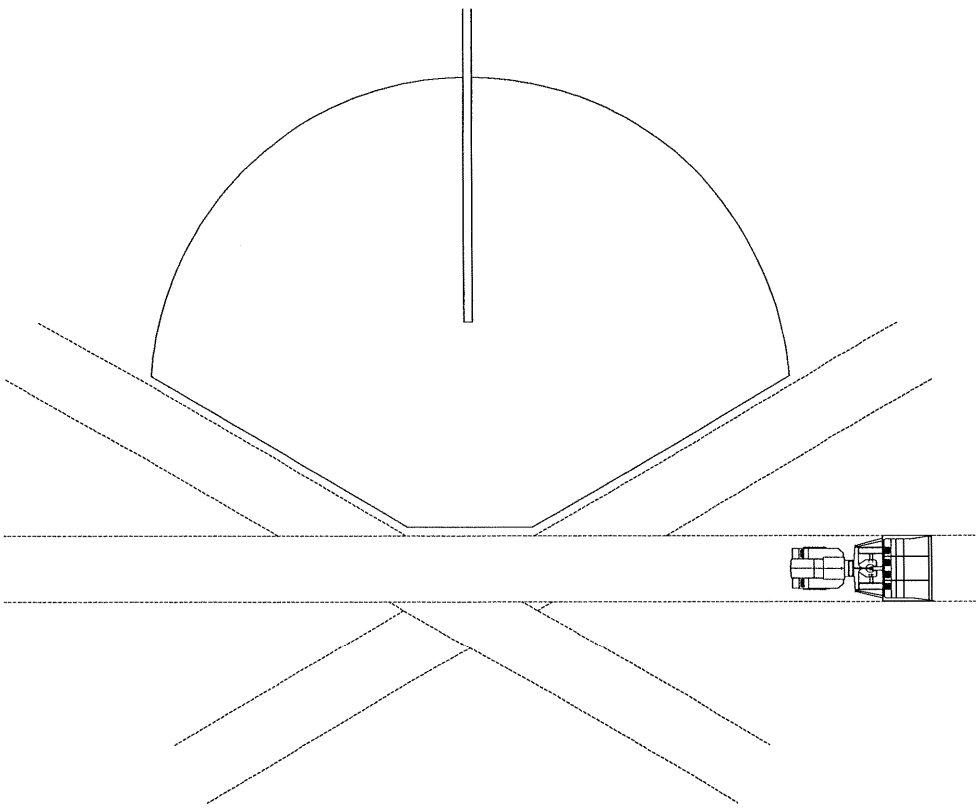


Fig. 4-10.

4.11 Cutting on the Edge of a Pile

1. When cutting on the edge of a pile, be certain to leave at least a 2 foot berm. There are safety as well as practical reasons for this procedure.
   See Fig. 4-11.

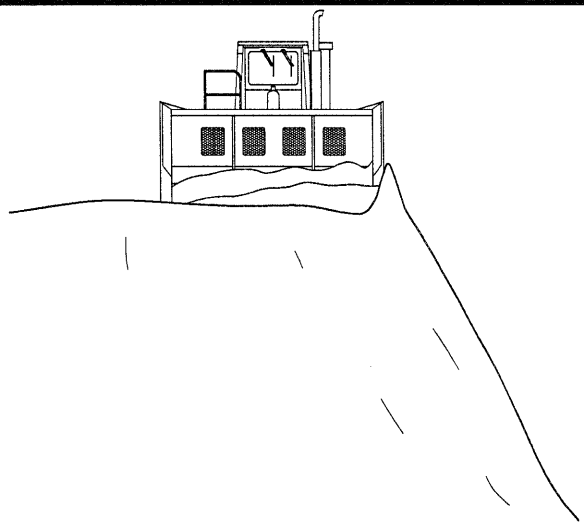


Fig. 4-11

2. You can back blade with the bucket tilted forward, with no damage to the machine.
   See Fig. 4-12.

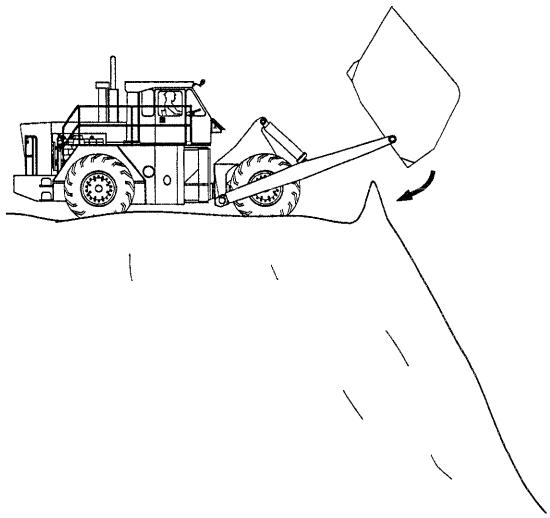


Fig. 4-12

3. Building a road off a pile.
   See Fig. 4-13.

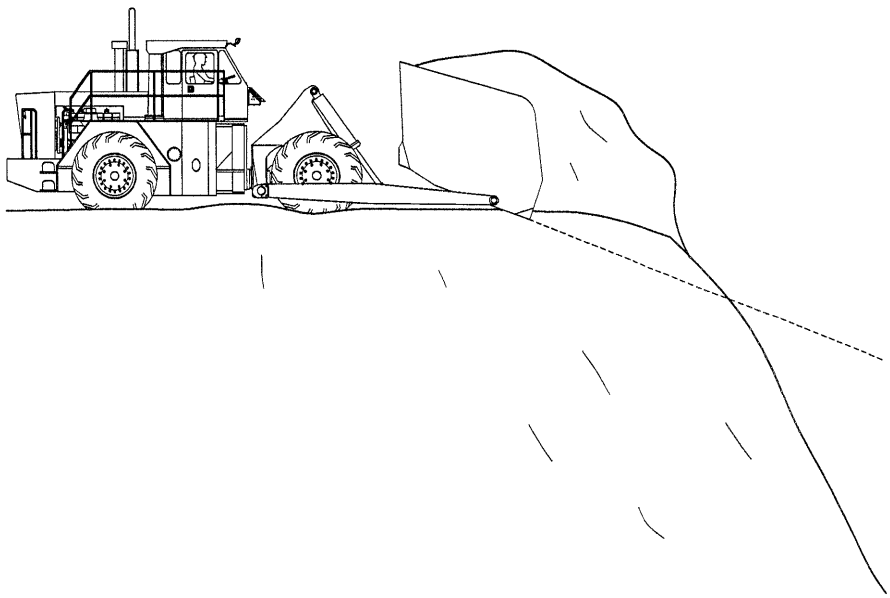


Fig. 4-13

4.12 Familiarize Yourself

1. During the familiarization period we suggest your passes be made on relatively level terrain. This will aquaint you with the true feel of the controls and machine handling while loading.

2. Start your pass with the bucket rolled back against the stops. The angle of the cutting bit has been set at the factory for the correct loading angle, or draft.

3. Position the machine as far back as possible, and headed toward the dump area. This will give you time to fill the bucket and feel the control action without being in a hurry.

4. As you become familiar with the feel of the controls, and the action of the bucket during different loading actions, you will recognize the advantages and where to use the procedure of "tilting the bucket forward" to gain additional cutting pressure.

4.13 Getting the Job Done

1. Lower the bucket until it is resting flat on the ground. Selecting first gear and forward direction, proceed at about one half (1/2) the trottle and observe the material flow into the bucket. At this point if the material appears not to be flowing fast enough, apply slight down pressure. This will immediately increase the flow, and the material will appear to "boil." As this occurs, release the down pressure and maintain the boil until the bucket becomes full and the engine begins to lose RPM's. Slowly apply throttle to maintain boil, being careful not to spin the wheels. (With a little practice you will be able to perceive this before it occurs). Now you are ready for the feel of **Weight Transfer** and a real surprise.

2. Apply slight up pressure, return to neutral as soon as engine RPM's pick up or spin-out is avoided. You will immediately notice an increase of material boiling into the bucket. Maintain this until the bucket is full. At this time you can raise the bucket to the planing position, advancing up and down as necessary to maintain load without losing or boiling material. With a little practice on this phase of operation , you will discover easy it is to maintain a smooth work area. This is very important to fast cycle times, particularly on return runs. Learning to spread to an even smooth depth is perhaps the most difficult phase of operating. As with any machine you have operated, soon with familiarity and understanding you will find yourself making all the correct moves automatically.

3. Take a good look at the bucket cutting edge. Notice how it projects below the bucket hinge pin as it tilts forward during the dump cycle. First it is ever so slight, continuing to increase at a very fast rate as the bucket rolls out, until the total projection is about 12" to 18", depending on the model.

4. With the projection below the grade so to speak, you realize if the bucket is not raised this amount during dump or roll out, you would actually start to dig at a time when you were ready to dump. This, of course, would not only cause you to stall or spin-out, but would leave a very rough or washboard dump area, as you attempt to raise the bucket after the digging started.

5. With this in mind, you know as you start to roll the bucket out to dump you must hoist, or raise the bucket the amount of the projection below grade. Because the hoist control and the roll-out control lever are on the same lever, the dump and hoist function is relatively easy to coordinate at this critical moment.
   Here again, the usual **practice makes perfect** cliche is a fact. Understanding this requirement, it soon becomes automatic for perfect grade and dump control. Remember you only have to hoist 12" to 18" for clearance when dumping and maintaining grade. However, the thinner you spread the slower you roll out the bucket. This is because dumping the material too fast reduces the traction weight and more material is dumped in front of the bucket than be pushed with an empty machine.
   Thin spread requires constant practice, and precise control. Once achieved, this skill is very useful for stocking out where compaction is so important.

4.14 Conveyor Chute Operation

1. Side casting, or dozing out from discharge pile usually is a matter of moving high volumes of material in a relative short period of time. This requires picking up a full load in a short space, and dozing it out 300 to 800 feet.

2. Because traction is so important, try to keep loose material from building up in the area where you are dozing and filling the bucket. You can do this by starting back from the base of the pile, lowering the bucket to ground level without digging or picking up material. Approach the pile at an angle to penetrate it with approximate one third to one half the width of the bucket. As the bucket fills and slip-out appears imminent, apply lift or hoist pressure only as needed to prevent tire slippage, and steer slightly away from the pile. This will also give additional relief to the engine RPM's and tire slippage.

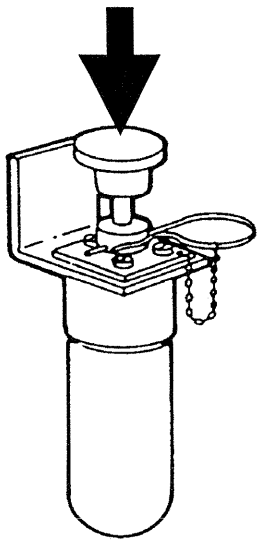
3. While this type operation makes it difficult to completely fill the off corner, the excess amount in the full corner usually will offset the low corner. The average volume moved each pass far exceeds the straight or "U" blade type machine. In addition, you must remember the material picked up in the bucket each pass remains there until you selectively dump it. Several passes from each side will aid in obtaining maximum loads, and keeping a smooth level grade.

4. Continued dozing from one side and the occasional sloughing of the pile will sometimes cause an undesirable slope to the grade. This can easily be straightened out by moving away from the pile approximately one half the machine width for one pass. This allows one half the bucket on the high side to cut the out to the lowest level, thus leveling to the original grade.

5. We know of no one who has read a "How To Do" instructions and become an expert in one try, However, we are confident that after you have read these instructions and familiarized yourself with the concepts and capabilities of this unique Chip Dozer, you will know how to start and with practice become an efficient operator.

4.15 In Case of Fire

1. Pull the safety pin on the actuator and strike the button. Fire retardant will be released, the engine will shut down, and the batteries will be disconnected from the electrical system.



IN CASE OF FIRE:

1. Remove Safety Pin

2. Strike Button

2. Take the hand held fire extinguisher, if possible, and LEAVE THE VEHICLE. After the system has discharged, watch carefully for flare-ups and spot fires. Call the Fire Department and/or service personnel as soon as possible.

3. Any time the system is discharged, the system must be refilled and recharged before resuming operation. Refer to the Service Manual for complete maintenance procedures.

IMPORTANT: Each unit is equipped with two actuators. One is located in the operator's cab behind the seat to the left. The other is located on the chassis near ground level. This way, the system may be actuated by either the operator or by ground personnel.

NOTE: Some models are equipped with a fire detection system that will automatically discharge the system in the event of a fire. See the Service Manual for details.

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Section 5

Maintenance and Lubrication

5.1 General

A machine that receives regular care from its operators and mechanics generally rewards them with decreased down-time and greater reliability. With the help of the information in this section, you should be able to maintain your Lumberjack at top operating efficiency. The maintenance and lubrication procedures given here can be performed with a minimum of shop tools.

5.2 Safety Precautions

Before performing any maintenance or lubrication, review the following safety precautions. They're included for your protection.

1. **Read This Manual**
   Be sure you understand the procedures outlined in this manual before attempting to carry them out. Pay particular attention to any safety warnings presented. If you have any questions, don't hesitate to ask your WAGNER dealer.

2. **Perform Maintenance on Level Ground**
   The machine should be on level ground and clear of traffic lanes whenever possible. The parking brake should be set and the wheels blocked.

3. **Remove Loads**
   The machine should be unloaded, with the carriage down.

⚠ WARNING

Never rely on the hydraulic system to support any part of the machine during maintenance or lubrication. If necessary, support components with appropriate safety stands. NEVER stand under a component that is supported only by the hydraulic system. Make sure it is resting on its mechanical stops or safety stands.

4. **Stop the Engine**
   Before performing any maintenance or lubrication, remove the key from the switch, or tag the key switch **"DO NOT START"**, to ensure that the engine is not inadvertently started.

5. **Install Swivel Locking Pin**
   All four-wheel-drive units are equipped with these pins. Always install this pin when working in the area of the swivel hinge. The machine must be on a level surface. A single swivel locking pin can be installed with the bogie turned right or left. Both pins can be used to lock the bogie in a straight line with the dozer.

Note : Never operate the dozer with the locking pins in the locked position. Damage to the machine could result.

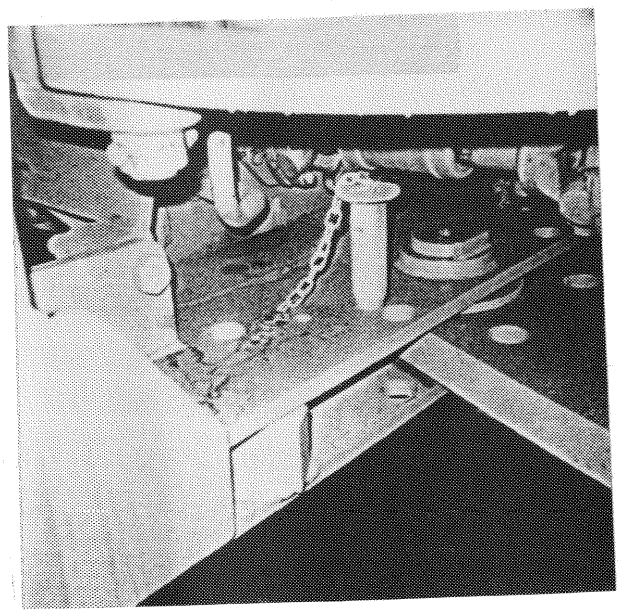

Fig. 5-1 Swivel Locking Pins

6. **Use Safe Ladders/Scaffolding**
   Due to the extreme height of the upper lube points, it is essential to personnel safety that safe ladders, personnel lifts and/or scaffolding be used while servicing. These areas can be dangerously slick under conditions of rain, frost or oil smears.

5.3 Preventive Maintenance

Preventive maintenance is a system that is designed to detect problem areas and prevent equipment failure before trouble can develop to a critical point. The system is based on a series of maintenance checks and servicing points. To be effective, a preventive maintenance program demands strict adherence to a planned schedule of maintenance.

Benefits of Preventive Maintenance

Time spent making the required periodic checks is a real investment in working equipment and efficient use of man hours. Valuable benefits can be realized, all of which mean savings in time and resources.

Preventive Maintenance

- **Promotes Safety** - properly maintained equipment is better able to operate within its design specifications and react positively to the operator's control.
- **Improves Equipment Availability** - by minimizing the chances of breakdown.
- **Reduces Unexpected Downtime** - crash repairs are expensive and detract from normal scheduled maintenance.
- **Reduces Equipment Abuse** - provides the ability to predict component life and helps avoid operating equipment to destruction, by replacing parts before they fail.
- **Allows Planning of Daily Production** - by knowing the condition of available equipment.
- **Allows Planning of Maintenance Man Hours** - by distribution of duties and necessary lead time for parts ordering.
- **Provides Complete History of Equipment** - based on performance, frequency and type of repairs and actual man hours expended on maintenance.

Establishing a Preventive Maintenance Program

The key to an effective preventive maintenance program is diligence in following a maintenance schedule set at regular planned intervals. Such intervals should be made compatible with the nature of operation of the equipment and with the capabilities of the maintenance facility. In any event, the intervals and inspection requirements must be planned, regular, and consistent.

This program proposes the following basic schedule which is based on intervals generally used and accepted in the wood products industry.

Specific maintenance should be completed using the following intervals:

- 10 hours (each shift or daily)
- 50 hours (weekly)
- 250 hours (monthly)
- 500 hours (quarterly)
- 1000 hours (semi-annually)
- 2000 hours (annually)

Each successive schedule (e.g. weekly, monthly, quarterly, etc) builds on the former and is accumulative in nature. For example, when performing monthly maintenance, the mechanic will first take note of the shift maintenance reports and remedy any discrepancy; then comply with the shift and weekly maintenance, and in addition will perform the checks specified in the monthly schedule.

Maintenance Record Keeping

The importance of good record keeping cannot be overemphasized. Each scheduled maintenance form should be checked off as the inspections and service is performed. Quantities of replenished lubricants should be recorded, as well as hydraulic pressure readings. All discrepancies should be recorded whether remedied or pending. Operators and mechanics should sign off forms and return them to the maintenance supervisor for approval and retention in an equipment unit file.

Accurately recorded maintenance forms will give the maintenance personnel an overall view of how particular equipment is holding up under normal operating conditions. Good records, and the ease by which they can be reviewed also enable maintenance personnel to identify and evaluate problem areas and allow adjustment in the maintenance scheduling for their particular operation.

5.4 Shift Maintenance

Shift maintenance is where preventive maintenance begins. The operator normally completes this inspection. It consists of the routine servicing and lubrication of the machine's major systems. On a daily basis, the operator is in a position to identify, remedy and/or record potential problem areas and is able to quickly recognize any change in the performance of his machine. The comments he records on the shift maintenance report become a valuable tool to the maintenance department, and is an important ingredient to the overall success of a preventive maintenance program.

Shift Maintenance Checklist

A recommended checklist is given here as an aid in developing a practical shift maintenance program if one has not been developed by your company. A shift maintenance report, based on this checklist, should be used to report defects found when making maintenance checks at the beginning of each shift.

Your company may have a different reporting method, however, it is usually a requirement that this form be filled out at the end of each shift. Accurate shift maintenance reports can help your company anticipate maintenance problems and take action to prevent costly failures.

Using the Checklist

The reference numbers in the left-hand column of the checklist indicate the physical location of each check point or lubrication point as it appears on the shift maintenance diagram. Circled reference numbers on the diagram indicate lubrication points. Boxed numbers indicate maintenance check points.

Shift maintenance details are provided in section 5.10, Maintenance Procedures. These procedures consist of checks that can be performed by the operator.

5.5 Scheduled Maintenance

Periodic scheduled maintenance is intended to be performed in a complete maintenance facility by trained mechanics. The timely scheduling and completion of these periodic inspections by the maintenance department will determine the length of downtime of a particular machine. Therefore, maintenance scheduling becomes a critical factor in the effective use of man hours and the availability of serviceable equipment.

Scheduled Maintenance Checklist

Actual operating environment governs the maintenance schedule. Some checks should be performed more often under severe conditions, such as heavy dust, extreme temperatures or extremely heavy loads.

These maintenance checklists are designed to be used as a guide until adequate experience is obtained in establishing a schedule to meet your specific needs.

A detailed list of component checks is provided with a suggested schedule basis given in hours of operation, or calendar time.

The engine manufacturer's operation and maintenance manual should be consulted for additional engine related checks and/or details.

A maintenance schedule should be established using these checklists as a guide. The result will be a maintenance program to fit your specific operation.

Using the Checklist

Although specific maintenance is identified in these checklists, location and procedure references are not provided in the columns.

Scheduled maintenance is normally carried out by trained mechanics, who are knowledgeable of the equipment systems and component locations. Scheduled maintenance procedures can be found by referring to the appropriate section of the service manual.

5.6 Scheduled Oil Sampling

Use scheduled oil sampling (SOS) to monitor machine condition and maintenance requirements. Oil samples from engine, transmission, axles, and hydraulic system should be taken when the oil is hot and well mixed to ensure an accurate analysis. Contact your Wagner dealer for complete information and assistance in establishing a scheduled oil sampling analysis program for your equipment.

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5.7 Shift Maintenance Checklist

EVERY 10 HOURS OR DAILY

Note general vehicle condition. Clear away all collected debris - steam clean if necessary. Check for mechanical damage and loose or leaking components. Report faults to maintenance department.

Before Starting Engine - Check The Following:

REF	ITEM	OK	NO	ADD
16	ENGINE (Check oil level - check for leaks)	☐	☐	_____
8	HYDRAULIC TANK (Check oil level - check for leaks)	☐	☐	_____
1	RADIATOR (Check coolant level - check for leaks)	☐	☐	_____
3	AIR CLEANER (Check indicator - clean or change element as required, empty dust cup)	☐	☐	
7	ENGINE BELTS (Check for adjustment and wear)	☐	☐	
2	AIR TANKS (Check drain valves for correct operation)	☐	☐	
1	RADIATOR & OIL COOLER (Are fins clean and unobstructed?)	☐	☐	
18	WHEELS & TIRES (Check condition and pressure)	☐	☐	_____
—	LUBRICATE CHASSIS (Refer to lube chart)	☐	☐	

After Starting Engine - Check The Following:

16	ENGINE (Does it sound normal?)	☐	☐
11	INSTRUMENTS (Check for normal readings)	☐	☐
11	CONTROLS (Check for normal operation)	☐	☐
5	EXHAUST SYSTEM (Check for leaks and excessive smoke)	☐	☐
4	AIR INTAKE SYSTEM (Check for leaks and damage)	☐	☐
10	TRANSMISSION (Check oil level - check for leaks)	☐	☐ _____

Note Anything Abnormal Or In Need Of Repair:

LIGHTS_____ DEFROSTER _____ REVERSE WARNING HORN_____

HORN _____ WINDSHIELD WIPERS _____ _____

HEATER _____ AIR CONDITIONER _____ _____

OPERATOR _____ SUPERVISOR_____ DATE _____

MODEL _____ SERIAL NUMBER _____ HOUR METER _____

5.8 Lubrication Points

10 HOURS

REF		FITTINGS
(9)	STEERING CYLINDER PINS	4
(15)	HOIST CYLINDER PINS	2
(28)	DUMP CYLINDER PINS	4
(14)	SIDE TILT CYLINDER PINS	2
(29)	LIFT ARM TO BUCKET PINS	2
(6)	HINGE PIN - UPPER	1
(24)	HINGE PIN - LOWER	1

50 HOURS

(21)	DRIVELINE - CONV TO TRANS *	3
(20)	DRIVELINE - TRANS TO REAR AXLE *	3
(22)	DRIVELINE - TRANS TO SWIVEL *	3
(25)	DRIVELINE - SWIVEL FRONT AXLE *	2
(23)	DRIVELINE - SUPPORT BEARING	1
(19)	SLACK ADJUST CAM/SHAFT - REAR	6
(26)	SLACK ADJUST CAM/SHAFT - FRONT	6
(13)	SWIVEL BEARING	1
(27)	CRADLE BEARING	1

* **Use handgun or low pressure adapter; lubricate sparingly.**

250 HOURS

(7)	FAN DRIVE BEARING (not all engines)	1

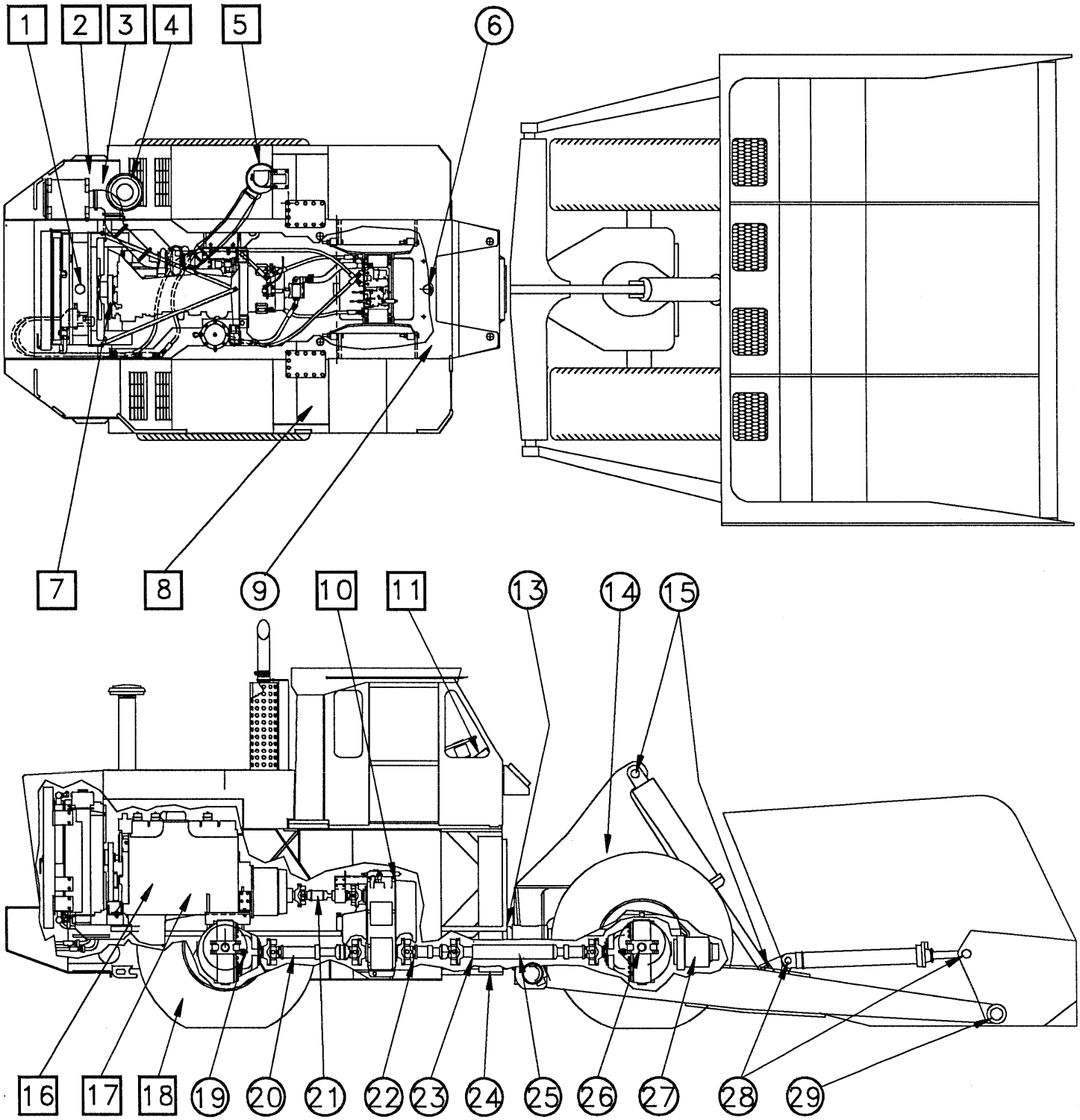

FIG. 5-2 MAINTENANCE AND LUBRICATION CHART

NOTE: Due to variations in engine types and models, the indicated location of engine filters(fuel, oil, coolant) may not be exact. Consult your specific engine service manual for exact locations.

5.9 Maintenance Checklist

EVERY 50 HOURS OR WEEKLY

1.	Repeat the 10 hour check	OK_____ NO _____
2.	Check for fluid leaks - oil, fuel, water	OK_____ REPAIR _____
3.	Check brakes for adjustment and wear	OK_____ REPAIR _____
4.	Check wheel lug nuts and studs mechanically	OK_____ REPAIR _____
5.	Check battery electrolyte level	OK_____ ADD _____
6.	Lubricate chassis - refer to Lubrication chart (page 5-7)	OK_____ NO _____
7.	Record engine rpm	HIGH_____ STALL_____
8.	Check for structural damage - inspect chassis & attachments for bending, cracking & broken welds	OK_____ REPAIR _____

EVERY 250 HOURS OR MONTHLY

1.	Repeat the 50 hour check	OK_____ NO _____
2.	Change engine oil & filters *	OK_____ ADDED _____
3.	Take engine oil sample for analysis *	OK _____ NO _____
4.	Check axle differential oil level	OK_____ ADDED _____
5.	Check axle planetary oil level	OK_____ ADDED _____
6.	Change cooling system filter	OK_____ REPLACE_____
7.	Check all hydraulic pressures and record	OK_____ NO _____
8.	Check fire suppression actuator	OK_____ NO _____

EVERY 500 HOURS OR QUARTERLY

1.	Repeat the 250 hour check	OK_____ NO _____
2.	Service fuel filters *	OK_____ REPLACE _____
3.	Service hydraulic filters *	OK_____ REPLACE _____
4.	Service transmission filters *	OK_____ REPLACE_____
5.	Take oil samples from transmission, axle, and hydraulic system for analysis *	OK_____ NO _____
6.	Inspect brake system & components	OK_____ REPAIR _____

5.9 Maintenance Checklist (Continued)

1000 HOURS OR SEMI-ANNUALLY

1.	Repeat the 500 hour check	OK _____	NO _____
2.	Change transmission oil and filters	OK _____	ADDED _____
3.	Clean and flush cooling system	OK _____	ADDED _____
4.	Check pins and bushings for wear	OK _____	REPLACE _____

2000 HOURS OR ANNUALLY

1.	Repeat the 1000 hour check	OK _____	NO _____
2.	Drain, flush and fill differential *	OK _____	ADDED _____
3.	Drain, flush & fill planetaries *	OK _____	ADDED _____
4.	Change hydraulic oil and filters *	OK _____	ADDED _____

* Normal drain period and filter change intervals are for average environmental and duty-cycle conditions. Severe or sustained high operating temperatures or very dusty atmospheric conditions will cause accelerated deterioration and contamination.
Change intervals should be adjusted according to the results of oil sampling analysis. Consult your Wagner dealer for assistance in establishing an oil sampling program for your equipment.

IMPORTANT: Consult the engine manufacturer's Operation and Maintenance Manual for additional engine related checks and/or details.

Repairs:

Problem: _____

_____

_____

_____

Parts: _____

_____

_____

_____

Mechanic: _____ Hours Labor: _____

Operator: _____ Supervisor: _____

Machine Model: _____ Equipment No: _____

Date: _____ Shift: _____ Hour Meter: _____

5.10 Maintenance Procedures

General

The following maintenance procedures should be performed at the beginning of each work shift. The number before each maintenance procedure corresponds with the numbers given in the Maintenance and Lubrication Chart (Fig. 5-2). This provides an additional aid in locating each check point.

Before starting engine

16 Engine Oil Level

The oil level should be checked prior to starting the engine. Make sure that the area around the dipstick is clean and the machine is sitting on level ground.

NOTE: A 15 minute drain-back time is recommended if the engine has been running.

The oil level must be maintained between the "L" (low) mark and the "H" (high) mark, but as close to the "H" mark as possible.

CAUTION: Never operate the engine with the oil level below the "L" mark or above the "H" mark. Refer to the engine's Operation and Maintenance manual for detailed engine service information.

Use only approved engine oil (see Lubricant Specifications Chart, page 5-17). Do not over-fill. Check engine for leaks.

8 Hydraulic Oil Level

Always check the hydraulic oil level prior to operation. The dipstick and fill pipe are located on the RH chassis deck, to the right of the operator's cab.

CAUTION: Always open the tank breather petcock (located on the breather pipe) before removing the dipstick, filler cap, or in-tank filter cover plate. Failure to vent the tank can result in injury or a substantial oil spill. Be sure to close the petcock before operating the machine.

The oil level should be checked with the hoist cylinders retracted (down). The oil level should be at or near the "H" (high) mark on the dipstick. Fill with approved hydraulic fluid as required (see Lubricant Specifications Chart, page 5-17). Do not overfill.

1 Engine Coolant Level

Daily inspection of the coolant level is recommended. Cooling systems using anti-aeration baffles restrict visual observation of the true coolant level. Although the coolant can be seen, the system may not be full. To gain a true fill, add water slowly up to the bottom of the fill neck and allow a 30 second settling period. Remember to compensate for the loss of anti-freeze when adding water.

⚠ WARNING

Never remove the radiator cap if the engine is hot. The coolant will be under pressure and could flash to steam with explosive force, causing severe burns. Remove the radiator cap only when the engine is cool.

NOTE: If the engine is hot, the coolant level will be higher than when it is cold.

Inspect the radiator daily for restriction caused by leaves, paper or bent fins. Inspect the radiator cap, hoses, and connectors for any signs of leakage or damage.

3 Air Cleaner

The air cleaner is a cyclonic-type, dry air filter. A service indicator shows the condition of the filter. The indicator will show in the green zone when the filter is clean. The indicator will show red when the filter is restricted. If red appears in the indicator window, clean or change the element and press the reset button on the indicator.

The air cleaner is also equipped with a pre-cleaner dust cup. It should be emptied daily. Never allow the dust level to come within 1/2 inch of the pre-cleaner tubes. Be sure that the dust cup seals are in place and in good condition. Complete sealing here is essential.

7 Engine Belts

Check the tension of the drive belts by pressing with the thumb halfway between the pulleys. The belts should not deflect more than the values shown in the table (Fig. 5-3). If any belt is loose or worn, report to maintenance for corrective action.

Engine	Belt Deflection Inches (mm)
Cummins	3/8 to 5/8 (9.5 to 15.9)
Cat	
Detroit	1/2 to 3/4 (13 to 19)

Fig. 5-3 Engine Belt Deflection

2 Air Tank Drain Valves

Visually inspect the valves and connections for damage or leaks. There should be signs of water being ejected from the drain hoses. If not, report the condition to maintenance.

18 Wheels and Tires

Visually inspect the tires for low air pressure and damage. Also check the wheel assemblies for cracks, loose or missing lug nuts, broken studs, etc. Report any problems to maintenance.

After starting engine

16 Engine

After starting, check that the engine runs and sounds normal. It should come up to operating temperature within a few minutes after starting. If you notice unusual noises or excessive smoke, have maintenance check it out.

11 Instruments

Check all instruments for normal readings immediately after starting the engine. Make sure that pressures and temperatures are within acceptable limits. Also, check that all controls function properly. They should be smooth and responsive.

4 Air Intake System

Inspect all connections for damage and air leaks. Look for damaged fittings and loose connections. Do not operate the machine if leaks are present. Dirt could enter the engine intake and cause severe damage.

5 Exhaust System

Check for exhaust leaks. Make sure that exhaust gases are not entering the operator's cab. Mounting brackets must be in place and all connections tight. Check for excessive smoke.

10 Transmission Oil Level

The level should be checked after engine warm-up, with 180° to 200° showing on the transmission temperature gauge. The dipstick and fill tubes are located on the chassis deck, directly above the transmission. Check the level with the engine running at idle, at operating temperature, and with the transmission in neutral. The level should be between the "H" (high) and "L" (low) marks. Fill with approved fluid only. See Lubricant Specifications Chart, Page 5-17. Do not overfill. Inspect for leaks.

5.11 Operator Troubleshooting

The following table lists the most common problems that may be encountered by operators. If the problem cannot be solved using the corrective actions listed in this table, notify maintenance personnel.

Engine *

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Engine turns over but fails to start	Emergency shutdown control pulled out.	Push control in.
	Fuel tank empty	Fill tank
	Fuel shutoff valve at tank closed	Open valve
	Fuel filter blocked	Replace filter
Engine fails to turn over	Battery disconnect switches open	Close switches
	Transmission not in neutral	Place lever in neutral
	Battery low	Have charging system checked
	Battery terminals corroded or loose	Clean and tighten terminals
Engine runs unsteadily and power output low	Insufficient fuel supply	Clean fuel strainers, replace filter, fill tank, tighten fuel lines
	Contaminated fuel	Drain tank, lines, clean strainers, and replace fuel
	Wrong fuel	Drain tank and fill with proper fuel
	Air intake restricted	Remove restriction
Exhaust smokes badly	Too much oil in sump	Drain to proper level
	Air intake restricted	Remove restriction
Engine overheats	Radiator fins restricted	Clean fins
	Low coolant level	Check coolant level
Engine oil pressure low	Low oil level	Check oil level
	Oil leaks	Tighten connections
	Contaminated oil	Change oil and filters

* Also see manufacturer's Operation and Maintenance Manual for additional information

Transmission/Converter *

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Transmission or converter overheats	Low oil level	Fill to proper level
	Oil cooler restricted	Remove restriction
Lack of power	Low engine rpm at converter stall	Have engine checked (governor)

Air & Brake Systems

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Brakes won't release	Low air system pressure	Allow system pressure to build to 120 psi
Loss of braking efficiency	Air in hydraulic brake system	Check fluid level Bleed system
	Low air system pressure	Have maintenance check air system

Hydraulic System

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
No response to controls	Closed tank shutoff valve	Open valve
	Low oil level	Fill tank to proper level
Sluggish operation or response to controls	Hydraulic oil cold	Allow adequate warm-up time
	Low oil level	Fill tank to proper level
	Suction leak	Correct suction leak
	Plugged tank breather	Replace breather
	Restriction in circuit	Remove restriction, check filters
	Pump speed too slow	Check engine speed
Excessive noise	Cavitation	Eliminate restriction in suction line Replace tank breather
	Aeration	Fill tank to proper level Correct suction leak
	Tubing vibrating	Tighten mounting clamps
Hydraulic system overheating	Low oil level	Fill tank to proper level
	Operating over pressure reliefs	Correct operating procedure

* Also see manufacturer's Operation and Maintenance Manual for additional information

Electrical System

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Engine fails to turn over	Battery disconnect switch(es) open	Close switch(es)
	Neutral start switch open	Place transmission shift lever in neutral
	Battery low	Have start/charge system tested
	Battery terminals corroded or loose	Clean and tighten terminals
	Other connections loose	Tighten connections
Voltmeter indicates discharge	Alternator drive belt slipping	Tighten or replace belt
	Loose or corroded battery connections	Clean and tighten terminals

5.12 Maintenance Specifications

Hydraulic Pressure Relief Settings

NOTE: Hydraulic pressures should be set at 1500 rpm and double checked at maximum rpm. Override should not be over 50-100 psi on control valves. Check or set pressures in sequence shown and only when hydraulic oil is hot (above 120°F). Calibrate your gauge periodically.

Steering

Main	2550 PSI
Circuit	3500 PSI

Hoist

Main	2000 PSI
Circuit	2100 PSI (Base) 1000 PSI (Stem)

Dump

Main	2050 PSI
Circuit	2500 PSI

Side Tilt

Main	2050 PSI
Circuit	2500 PSI

Pilot Controls

Main	450 PSI

NOTE: Set main reliefs with engine at 1500 rpm.
Set circuit reliefs with engine at 1000 rpm or less.

Wheel Lug Nut Torque

Front	500 lb/ft (678 N • m)
Rear	500 lb/ft (678 N • m)

Tire Inflation Pressure

Front	29.5 x 29	65 psi Max (448 kPa)
Rear	29.5 x 29	55 psi Max (380 kPa)

NOTE: The specifications shown in this manual are based on information available at the time of publication and are subject to change without notice or obligation.

Component Capacities & Lubricants

Component or System	Refill Capacity (Approx.) U.S. Gallons		Refill Capacity (Approx.) Liters	Lubricant Type *
Engine crankcase (includes filters)	13		49	Engine oil
Fuel tank	295		1117	Diesel fuel
Cooling system	24.8		94	Water/antifreeze * *
Hydraulic system	160		606	Hydraulic oil
Transmission system	15		57	Transmission oil
Differential	16		61	Gear lube
Planetary hubs (each)	2.5		9.5	Gear lube
Brake resevoirs	—	As required	—	Transmission oil
Chassis grease fittings	—	As required	—	Chassis grease

* See Lubricant Specifications, Page 5-17

* * Some engines require additional coolant treatment. See engine Operation and Maintenance Manual for specific information

NOTE: The specifications shown in this manual are based on information available at the time of publication and are subject to change without notice or obligation.

5.13 Lubricant Specifications

	MANUFACTURER & SPECIFICATIONS	RECOMMENDED VISCOSITY	PREVAILING AMBEINT TEMPERATURES (FAHRENHEIT)	(CELSIUS)
ENGINE	CUMMINS MIL-L-2104D (API CE)	SAE 10W-30 SAE 15W-40 SAE 20W-40	-13 ° F to 95 ° F 14 ° F and Above (Normal) 32 ° F and Above	-25 ° C to 35 ° C -10 ° C and Above (Normal) 0 ° C and Above
	DETROIT DIESEL MIL-L-46152 (API CD II)	SAE 30 SAE 40 **NOTE:** Multi-Grade oils are not recommended in Detroit Diesel Engines	Below 32° F Above 32° F	Below 0° C Above 0° C
	CATERPILLAR MIL-L-2104D (API CE)	SAE 5W-20 SAE 10W-30 SAE 15W-40	-13°F to 50° F -4°F to 104° F 5°F to 122° F(Normal)	-25°C to 10° C -20°C to 40° C -15°C to 50° C (Normal)
TRANSMISSION	CLARK MIL-L-2104D (API SE) TYPE C-3	MIL-L-46167 SAE 10W SAE 30	-65 ° F to 0 ° F -10 ° F to 140 ° F (Normal) 30 ° F to 140 ° F	-54 ° C to -18 ° C -23 ° C to 60 ° C (Normal) - 1 ° C to 60 ° C
	ALLISON MIL-L-2104D (API SE) TYPE C-3	SAE 5W-20 SAE 10W SAE 15W-40 SAE 30	Below -10° F Below 10° F(Normal) Below 30° F Below 35° F	Below -23° C Below -12° C (Normal) Below - 1° C Below 2° C
		NOTE: Preheat transmission fluid to indicated minimum temperature before operating transmission...or if preheating equipment is not available, operate transmission in NEUTRAL for minimum of 20 minutes prior to engaging FORWARD or REVERSE ranges		
	TWIN-DISC MIL-L-2104D (API SE) TYPE C-3	SAE 5W-20 SAE 10W SAE 30	-60° F to 0° F -10° F to 140° F(Normal) 30° F to 140° F	-51° C to -18° C -23° C to 60° C -1° C to 60° C
AXLE	CLARK MIL-L-2105C (API GL-5)	SAE 75W SAE 75W-80 SAE 80W-90 SAE 85W-140	-40 ° F to -10 ° F -40 ° F to -0 ° F -13 ° F to 100 ° F (Normal) Above 10 ° F	-40 ° C to -23 ° C -40 ° C to -18 ° C -27 ° C to 37 ° C (Normal) Above -12 ° C
	RIMPULL/BRYAN MIL-L-2105C (API GL-5)	SAE 75W-90 SAE 80W-90 SAE 120	-65° F to 20° F -20° F and Above(Normal) -90° F to 120° F	-54° C to -29° C -29° C and Above(Normal) -32° C to 49° C
HYDRAULIC	WAGNER Premium Grade Anti-wear Hydraulic Oil (Mobil DTE 13M)	NOTE: Mobil DTE 13M is recommended for use in Allied Wager hydraulic systems operating at very low to widely varying ambient temperatures. It provides a high viscosity index with a low pour point and improved fluidity at sub-zero temperatures. IMPORTANT: As a condition of new machine warranty, Mobil DTE 13M must be used in hydraulic system during warranty period.		
CHASSIS	WAGNER Multipurpose Chassis Grease w/EP & MoS_2	NLGI-1 NLGI-2	Below 10 ° F Above 10 ° F	Below -12 ° C Above -12 ° C

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