

1986 SEAGRAVE TRIPLE

Make SEAGRAVE TRIPLE Model HB-50CH Year 1986

Laden Weight 32.080 Front 13.880 Rear 17,760

Tire Size Front 12R-22.5 Rear 12R-22.5

Make of Engine CUMMINS Model NTC-400 Horsepower 400

No. of Cylinders 6 Cubic Inches 855

Capacity: Fuel 50 gal

Crankcase 36 qts SAE 15w-40 + 8 qts for filter

Transmission 5.1 gal SAE 50

Pump Transmission 22 pts SAE Dextron II

Differential 43 pts SAE 90-140

Power Steering *ar pts SAE 10w

Water Tank 500 gal

Transmission SPICER SST-2 1362-C 6 SPEED

Main Pump WATEROUS CMUYCX Type 2-STAGE CENTRIFUGAL

Rated Capacity 1500_gpm @ 150_psi

Priming Pump WATEROUS, Type -ROTARY VANE- POSITIVE DISPLACEMENT

*As required

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ENGINE:

Model.....	NTC – 400, Cummings, Diesel
Max. horsepower.....	400 hp at 2100 rpm
Peak torque.....	1245 ft. lbs. At 1350 rpm
Number of Cylinders.....	6
Base and stroke.....	5½” stroke, 6” stroke
Engine Displacement.....	855 cubic inches
Compression Ratio.....	13.9 to 1
Oil System Capacity.....	44 qts. total
Oil Pressure.....	35 psi at 1200 rpm 45 psi at 2100 rpm minimum 10 psi idle
Operating Range.....	1900, shift at 2100 rpm
Engine Temperature Operating Range.....	160° to 190° degrees
Engine Heater.....	120° to 140° F
Fire Pump.....	Waterous, 1500 gpm
Pump Gear.....	6 th
Relief Valve.....	Waterous
Primary Pump.....	Rotary Valve
Water Tank.....	500 gal.; steel
Transfer Valve.....	Electric/manual
Transmission.....	6 speed manual; Spicer
Start Gear.....	2 nd
Fuel Tank.....	50 U.S. Gal.
Starter Motor.....	12V, heavy duty
Batteries.....	Lead acid, 12 Volt, 6 batteries
Alternator.....	140 amps, 14 volts
Rear Axle.....	Rockwell
Gear Ratio.....	4.111 to 1

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ENGINE:

- ◆ CUMMINGS NTC-400 diesel, 6 cylinder valve-in head type.
- ◆ 5½" bore and 6" stroke.
- ◆ 855 cubic inch.
- ◆ Compression ratio - 13.9 to 1
- ◆ Highest torque - 1245 ft. lbs. at 1350 RPM.
- ◆ Highest horsepower - 400 at 2100 RPM.
- ◆ Operating range - 1350 RPM to 2100 RPM,
- ◆ Engine operating speed should be maintained at 1900 RPM.
- ◆ Diesel engine should never be lugged. What is lugging?
- ◆ Can run an additional 7% on high idle. *This can be very harmful if engine is cold.
- ◆ Engine temperature operating range – 160° to 190° degrees
- ◆ Red warning light set at 212 degrees, if possible don't allow engine temp. to exceed 200° F
- ◆ During prolonged idling - maintain at least **900 - 1100 RPM**
- ◆ After heavy use - idle for 5 minutes to cool engine prior to shutdown. Turbo temp. may be 100° F above engine temp. if shut down suddenly.
- ◆ Engine heater operates at 120 to 140 degrees. 110 volt – 1000 watt direct immersion type kim hotstart.

ENGINE LUBRICATION SYSTEM:

- ◆ Force feed wet sump system. Lower case holds 28 qts. of oil.
- ◆ An oil cooler of the heat exchanger type is located on right side of engine block.
- ◆ Minimum 10 psi at idle.
- ◆ 35 psi @ 1200 RPM.
- ◆ 45 psi @ 2100 RPM.
- ◆ Because of impaired access to the oil filler hole, the use of flexible neck funnel is recommended.
- ◆ Oil filter is full flow

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ENGINE COOLING SYSTEM:

- ◆ Water pump mounted on front of engine.
 - Water pump has packless seal and requires no lubrication
 - Delivers 100 gpm at 2100 rpm
- ◆ System Conditioner
 1. Filters
 2. Provides electrolytic protection
 3. Acts as a rust inhibitor
- ◆ FD-1 fan clutch – controlled by a temp. sensitive air valve which is installed in engine block, senses coolant temp.
- ◆ Cooling fan -automatically engage by this “thermostatic sensor” @ approximately **190 degrees F.**
- ◆ FD-1 fan hub – if fittings are present lube with 2 cu. Inches of general purpose grease every 15,000 miles.
- ◆ Clutch is pneumatically operated and thermostatically controlled. During pumping mode, air pressure is exhausted causing full fan operation.
- ◆ Water circulates through the oil cooler until temperature reaches about 170° degrees, then water circulates from top to bottom of radiator.
- ◆ Maintain engine coolant temperature at approximately 180° for max. engine.
- ◆ Radiator Cap is pressure relief type with 7 lbs. rating. This allows the coolants temperature to rise to 233 degrees before boiling.
- ◆ **Deaeration tank** purges air, which could become trapped in the cooling system from circulating through the system.

FUEL SYSTEM:

- ◆ Shut-off is mounted forward of the fuel tank above the rear axle.
- ◆ Fuel pump is equipped with a knurled knob mechanical valve for opening an emergency.
- ◆ Ignition switch on instrument panel operates fuel pump with a solenoid valve.
- ◆ To insure correct fuel temperature a full fuel tank should be maintained.
- ◆ Fuel system has one fuel filter.

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ELECTRICAL SYSTEM:

- ◆ **REFER TO TRAINING BULLETIN #65**
- ◆ When shutting down engine, do not switch battery master switch to "off" position until engine is completely stopped.
- ◆ Turning switch "OFF" while engine is still in operation can damage the voltage regulator and destroy the alternator's diodes
- ◆ Ignition switch on instrument panel turns on fuel pump solenoid which pumps fuel into injectors. When ignition switch is shut-off, engine is deprived of fuel.
- ◆ Fuses and breakers protect electrical system. Operating and cooling of breakers will produce clicking sound. Notify shops.
- ◆ 12 volt starting motor - Do not crank over 30 seconds. Hesitate about 30 seconds before retrying.
- ◆ Alternator capacity of 140 amps at 14 volts Built in rectifier changes AC to DC.
- ◆ Idling slightly above idle speed will be enough to supply the electrical system with adequate voltage.

Voltmeter Reading:

Ignition on, battery on, engine off:

12.2. – 12.8

Battery ok

below 12.2

Recharge battery

Engine running (1 min. or more) @ 1000 rpm no load:

13.8 – 14.8

Charging System ok

below 13.8

Check belts, alternator

Engine running (1 min. or more) @ 1000 rpm with load:

13.5 – 14

Charging System ok

below 13.5

Check belts, alternator

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BRAKE SYSTEM:

- ◆ Dual brake system (also called split brake system)
BENDIX – WESTINGHOUSE – E8 brake application valve
- ◆ Anchorlock spring brake system on rear brakes only. Brake is applied by absence of air by spring pressure.

Three Primary Uses of the Spring Brake:

1. Emergency brake
2. Parking brake
3. "Low pressure starting" protective device

Brakes are SELF-ADJUSTING

Adjusting procedure:

1. Start engine and achieve full system pressure (120 psi)
2. Depress brake pedal fully and hold for one second.
3. Repeat four or more times.
4. Recheck slack adjuster travel

- ◆ New pads are different thickness

Rear

Outer pad - 9/16"

Inner pad - 7/8"

Front

Pads are 5/8"

WEEKLY:

1. Check brakes for wear, and Rotors for checks & cracks
2. Check outboard pad for wear.
3. At least 4/32" of slide pin should show.
4. Check rotors for checks and cracks.

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AIR RESERVOIR SYSTEM:

◆ Components:

Brake chamber at each wheel, check valves, switch, compressor, dryer
Quick release valves, reservoir tanks, safety valves

◆ Air storage tanks:

1 primary
3 secondary

- ◆ @ 90 psi, the SECONDARY tanks will begin to fill.
- ◆ Apparatus may be moved when primary reaches 90 psi, however, only rear brakes have full braking power prior to secondary tanks reaching 90 psi.
- ◆ Two air gauges on dash, left gauge on dash indicates pressure in primary tank.
- ◆ Red lights and buzzer on dash will operate when pressure falls below 60 psi and ignition switch is on.
- ◆ Moisture Rejection System - Desiccant type, removes both liquid and water vapor from the compressor discharge before it reaches air brake reservoir. Serviced yearly in shops. Operate weekly by hand. (see handout for explanation of how this works)

AIR FILTER:

- ◆ Has an exterior "FARR" intake screen located on outside of apparatus behind transverse bed, on curbside of apparatus. A periodic check of air cleaner is essential. A clogged filter results in high exhaust temperature which will damage turbine, bearings, and shaft. Also will cause engine to run over-rich. This will cause engine to smoke excessively.
- ◆ Dry type, replaced or serviced yearly at shops
- ◆ Procedure for determining need to replace air filter:
 1. Obtain reading on air restriction gauge at top governed RPM's under load when is new.
 2. An increase of 10 inches above original normal reading indicates need for replacement by shops.

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- ◆ A new filter will register approximately 5" at full throttle under load.
- ◆ When washing apparatus avoid direct water into filter intake.
- ◆ An aftercooler (sometimes called an intercooler), is a device in the engine intake system designed to reduce intake air temperature and/or preheat intake air temperatures.

TRANSMISSION:

- ◆ Spicer SST-2, 6 speed, manual shift.

Maximum speed in each gear:

1 st -	7.1 mph
2 nd -	12.4 mph
3 rd -	20.2 mph
4 th -	32.0 mph
5 th -	45.6 mph
6 th -	63.0 mph
Rev. -	7.1 mph

- ◆ Ordinary starts are in second gear
- ◆ Shift to next gear at 2100 RPM. Operate at 1800 - 1900 RPM.

Shifting down hill

- ◆ Governor WILL NOT control engine when descending hill. Back wheels are driving engine. 200-300 RPM above maximum range will **cause valves to float** which makes the valves come in contact with the pistons. This breaks the engine.
- ◆ When descending grades hold rpm to max. 1800-1900 rpm or less.

CLUTCH:

- ◆ 15½ inches in diameter
- ◆ Spicer twin plate dry disc equipped with clutch brake.
- ◆ Clutch brake should engage one inch above floor.
- ◆ When free travel or "lash" is reduced to 1" - call shops

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FOOT THROTTLE:

- ◆ Air actuated
- ◆ Requires 30 psi to be operational.

TURBOCHARGER:

- ◆ Consists of a turbine wheel and a centrifugal blower, or compressor wheel, separately encased but mounted on and rotating with a common shaft.
- ◆ Forces additional air into engine so it can:
 1. Burn more fuel
 2. Develop more horsepower
 3. Maintain engine's efficiency
- ◆ The power to drive the turbine wheel, which in turn drives the compressor, is obtained from energy of engine exhaust gases.
- ◆ Is cooled and lubricated by engine lubricating oil.
- ◆ Oil lag or oil starvation to the turbo will cause premature wear on the bearings.
- ◆ Monthly inspect the connections, clamps, and couplings between the air cleaner and the turbocharger.
- ◆ **Do not over rev the engine on cold starts. (oil lag to turbo bearings)**

STEERING:

- ◆ **Ross hydropower** integral power steering gear. Maximum operating pressure - 2000 psi
- ◆ This system can steer a vehicle with a front end weight rating of about 14000 lbs. through a turn at low speed and engine idle.
- ◆ Maximum operating pressure is 2000 psi.
- ◆ Maximum flow rate 6 gpm

NOTE: Recommend minimum flow rate at 1½ hand wheel turns/second must be no less than 2.9 gpm.

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PUMP:

- ◆ Waterous Centrifugal - 2 stage pump
- ◆ Series/parallel type.
- ◆ Chain driven
- ◆ Capacity - 1500 gpm @ 150 psi.
- ◆ High pressure 150 gpm at 600 psi.
- ◆ Pump is hydrostatically tested at 600 psi.

PUMP PACKING:

Some rigs have mech. seals; some had adj. packings.

- ◆ Mechanical type - no adjustment

PUMP TRANSMISSION:

- ◆ Lubrication is provided to pump transmission by two methods.
 1. Splash System
 2. Externally mounted oil pump
- ◆ Splash System; lubricates lower section of the pump transmission when in “road” position.
- ◆ Externally mounted oil pump is connected to the pump shaft. Will supply oil to the upper section of the pump transmission at a very low pressure, only when pump is in gear.
- ◆ Lubrication to lower section is via the “splash system.” This system operates at all times.
- ◆ Expect to see a transmission oil pressure reading of @ 2 to 5 psi on the transmission oil pressure gauge on the pump panel.

PUMP PACKING:

- ◆ **Acceptable leakage - 10 drops** per min to 1 to 2 per **second**
- ◆ To keep packing gland from drying out, pump should be operated for at least 10 minutes each month at a minimum pressure of 150 psi. Unless pump has been used in normal service.

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PRIMING PUMP:

- ◆ Electric driven rotary vane priming pump.

TRANSFER VALVE:

- ◆ Electric transfer valve with manual back up (changed back to normal).
- ◆ Manual hand crank located below 4" suction inlet on engineer's panel,
- ◆ Manual operation is usually difficult unless pump pressure is below 100 psi.

RELIEF VALVE:

- ◆ Waterous relief valve.
- ◆ A spring loaded, pressure actuated unit that is installed between the discharge and suction sides of the pump.
- ◆ WATEROUS relief valve system consists of two units:
 1. Relief valve proper
 2. Pilot valve (This unit controls the relief valves operation)
- ◆ Controls discharge of 75 psi to 300 psi.
- ◆ Can't control discharge pressure to an amount lower than suction pressure plus 50 psi.
- ◆ When operating from draft or tank. The relief valve will not control at discharge pressures less than 75 psi.

WATER TANK:

- ◆ 500 gallons, 3/16" steel tank
- ◆ Flow capacity from tank to pump of 600 gpm.
- ◆ Internal tank is corrosion protected with six cathodic sacrificial rods
- ◆ Fill only through inlets with strainers.

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SUCTION INLETS:

- ◆ Two 6" inlets, one on each side, reduced to 4" with 4" keystones attached, no friction loss.
- ◆ 4" front suction 5 psi friction loss
- ◆ 3½" auxiliary inlets 50 psi FL plus 100 gpm less

FRONT SUCTION:

- ◆ Air operated front section valve.
- ◆ Carried in closed position with control handle in "neutral" position.
- ◆ This will prevent air leaks when using side suction when pumping.

PUMPING PROCEDURES:

1. Spot apparatus at hydrant and apply spring brake. Set chocks.
2. With engine at idle depress clutch pedal.
3. Shift gear selector lever to direct drive (6th gear).
4. Engage fire pump by raising pump shift lever handle high enough to allow lock pins to clear pin lock grooves, move shift lever forward until lock pins fall into forward pin grooves thus locking pump shift lever into pumping mode.
5. CAUTION: Do not open the throttle to start pumping unless the green light is on. indicates the pump shift has been completed into pump position and it is safe open throttle.
6. Close all discharge valves and drain openings. Close all valves between tank and pump.
7. Connect suction.
8. Open suction.
9. Transfer valve to desired position.
10. Open discharge valves and accelerate engine to obtain desired pressure.

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MISCELLANEOUS INFORMATION:

- ◆ Cleaning of BUDD CADGARD wheels, water not to exceed 170 degrees F, DO NOT USE ABRASIVE CLEANERS. Products at higher concentration than .20 percent acid or .04 percent caustic can cause permanent damage to chemical shield.
- ◆ When idling the engine for a long time, increase engine RPM with throttle to **900 to 1100 RPM**.
- ◆ Excessive idling creates two problems:
 1. Burning gas about 1/2 gal per hour.
 2. Causes engine to operate at dangerously low temperatures and this causes a build up of carbon deposits around injectors, valves, pistons and valve seats.

Jake brake with three positions – (See handout)

1. Minimum - opens exhaust valves on two cylinders
 2. Moderate - opens exhaust valves on four cylinders
 3. Maximum - opens exhaust valves on six cylinders
- ◆ Engine should be fairly warm. Preheat temperature is ok. No time limit to Jake operation. Engine cooling system absorbs heat.
 - ◆ After drafting in salt or dirty water, or handling chemicals flush pump with fresh water for several minutes to remove all traces of impurities.
 - ◆ Keep pump completely full or completely drained never partially full.