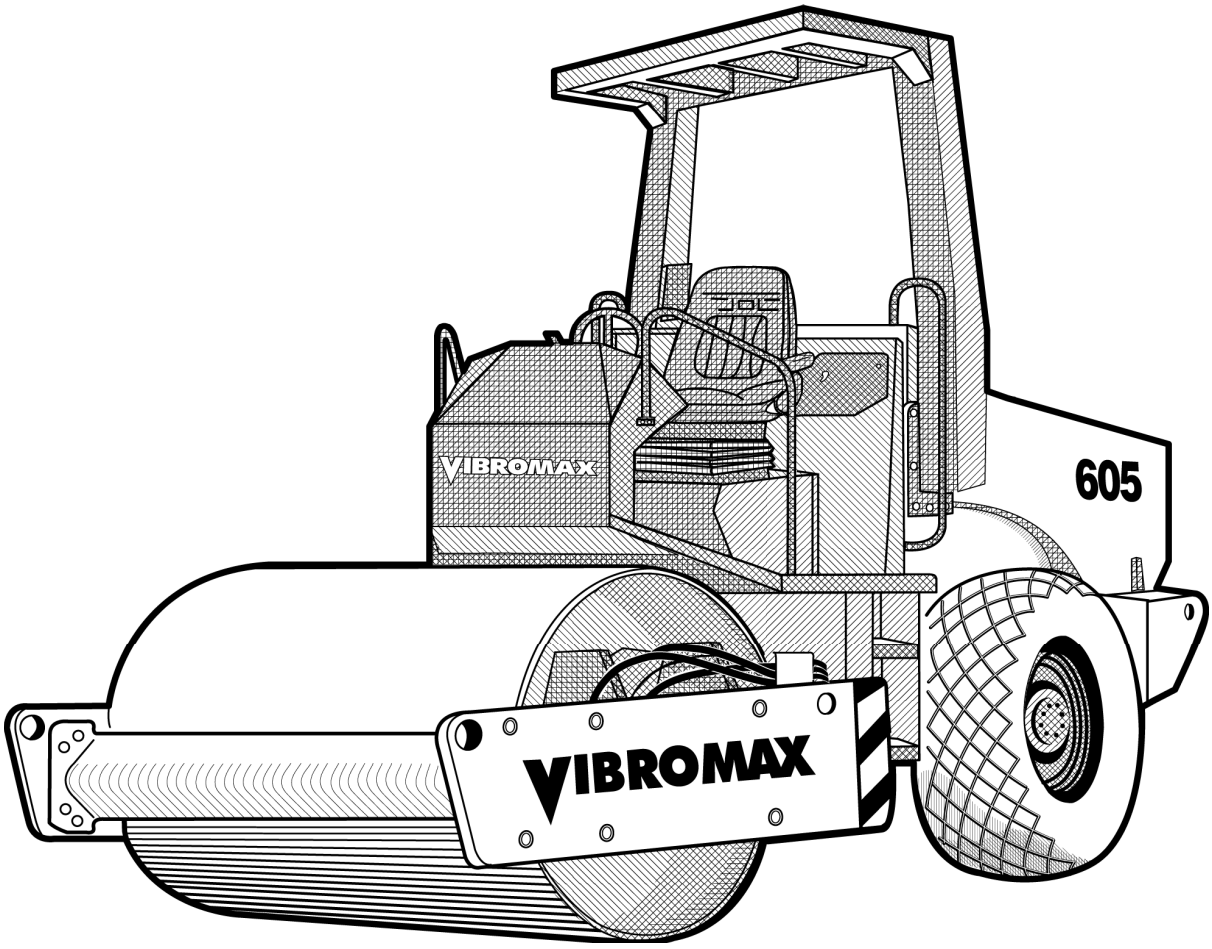
VIBROMAX

SINGLE DRUM ROLLER

SERVICE MANUAL SM85005

March 2003

Models 405, 605, 606



CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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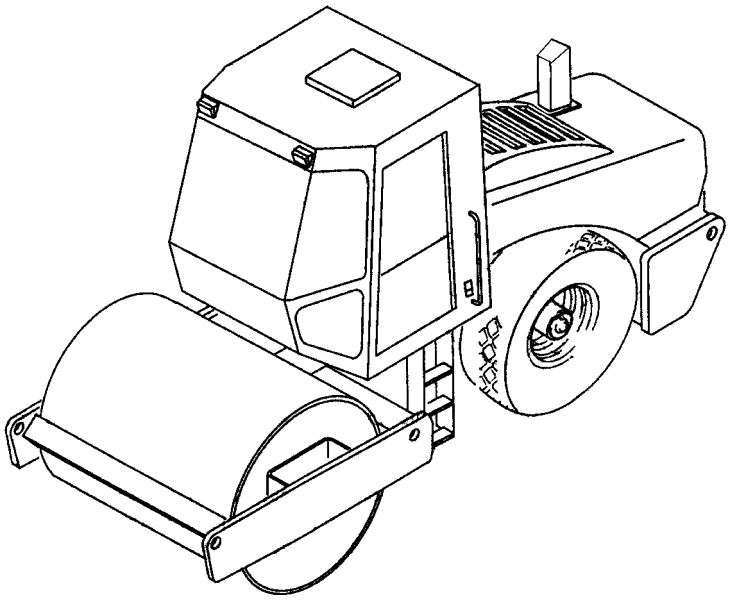
SECTION ONE

GENERAL INFORMATION

MACHINE DESCRIPTION



In the fall of 1998 Vibromax introduced a new series of single drum vibratory rollers. Included in the new series are the models 405, 605, and 606.

These new rollers use the Cummins 3.9 liter 4 cylinder engine. Some engines are turbocharged depending on the machine model. All of the new engines are tuned to meet the latest EPA emissions standards.

A Mannesman Rexroth variable displacement, axial piston hydrostatic pump, used for machine propulsion, is mounted to the flywheel end of the engine. It provides oil to a Rexroth 2 speed drum drive motor and a 2 speed axle drive motor in a parallel path. The Rexroth drum motor is mounted on the left side of the drum, drives through a L&S planetary gearbox and is isolated from the drum by rubber buffers. This arrangement is used in the heavy roller models with a great deal of success. The axle drive motor is attached directly to the intermediate gearbox incorporated into the rear axle.

The vibration system on the 605 & 606 use a Rexroth hydrostatic pump mounted directly behind the propulsion pump. It is similar in design to the propulsion pump. On the model 405 the vibratory pump is a Rexroth gear type pump. The vibratory pump supplies oil to a Rexroth hydrostatic motor mounted at the right side of the drum. The new 605 & 606 models operate at frequencies of 1740 or 2160 vibrations per minute on both the smooth drum and pad foot versions. The model 405 has only one vibration frequency of 2016 vibrations per minute.

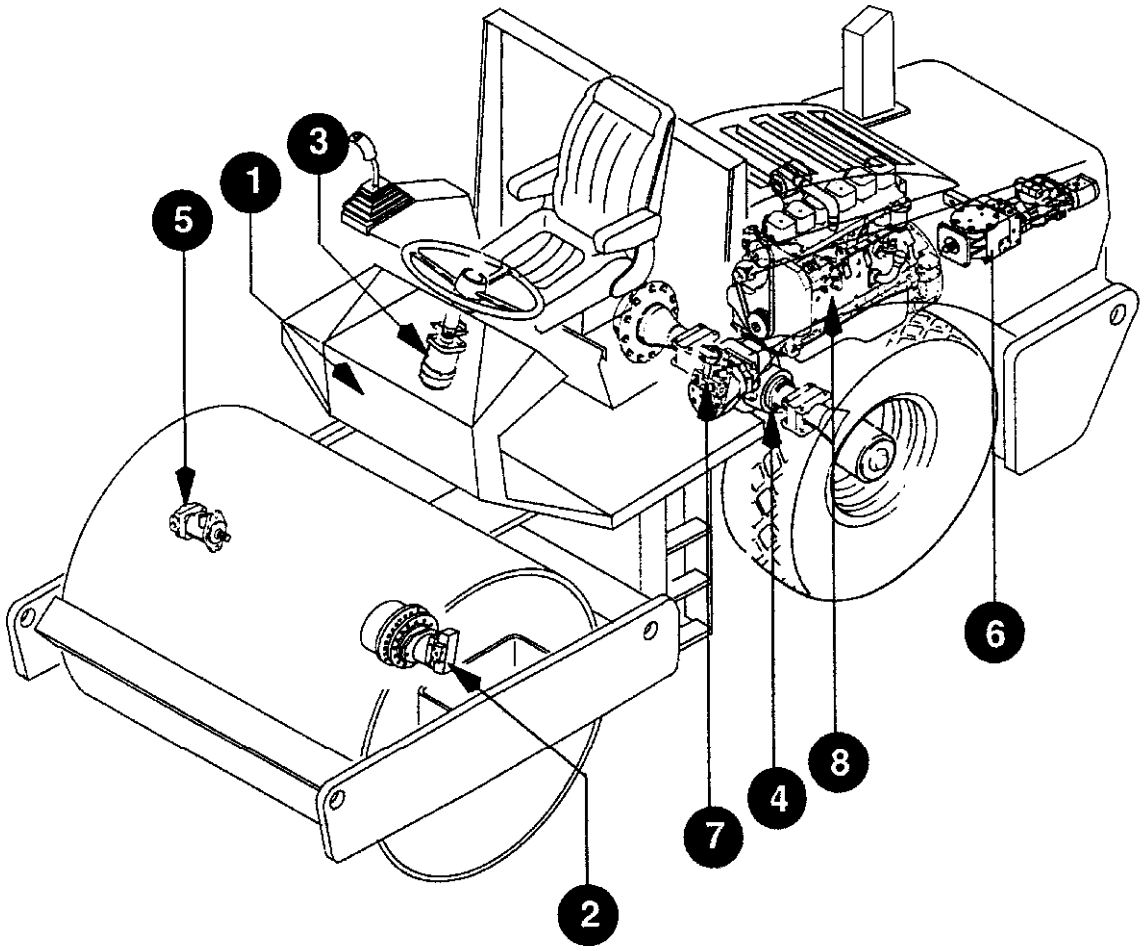
A steering pump, mounted to the rear of the vibratory pump, provides the oil needed for steering. The steering pump also acts as the charge pump in the propulsion/vibration circuit. The steering pump draws oil from the reservoir, passes it through the steering control valve, through the inline hydraulic filter, and into the charge circuit.

These machines come standard with parking brakes at both the front drum and the rear axle. A spring applied-hydraulically released multi disc brake is part of the drum drive motor gearbox. The axle uses a spring applied hydraulically released multiple disc brake at the intermediate gearbox input shaft.

Pressure testing has been made easier by placing all the test ports at a centrally located test station under the engine hood.

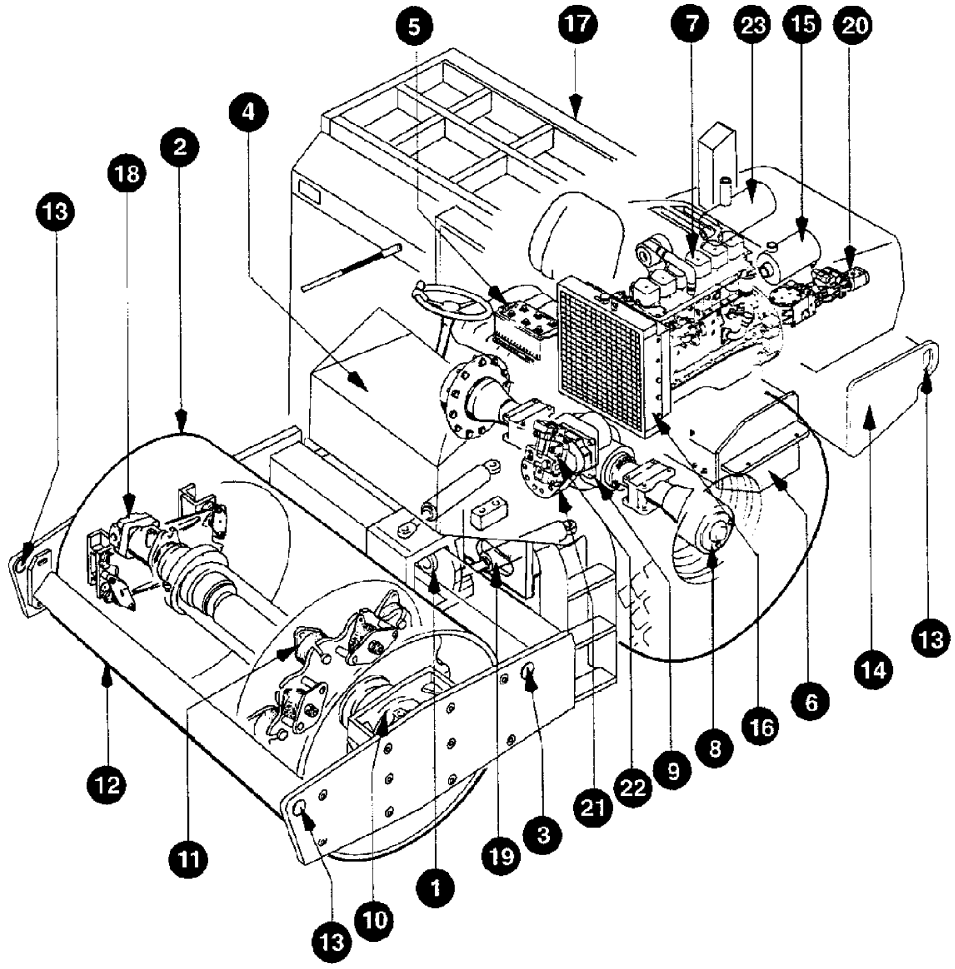
The electrical system consists of a 12 volt battery, starter, alternator system, optional lighting and standard instrumentation.

The most notable changes from the earlier model is the mounting of the engine in a forward position and the tilting hood. These changes result in a substantial ambient noise level reduction.



SERIAL NUMBERS

1	Model / Serial Number	
2	Front Drum Drive Motor S/N	
3	Steering Unit S/N	
4	Axle S/N	
5	Vibratory Motor S/N	
6	Hydraulic Pumps S/N	
7	Axle Drive Motor S/N	
8	Engine S/N	



IDENTIFYING MACHINE COMPONENTS

1	Articulation joint	13	Lifting and towing eyes
2	Smooth drum	14	Fuel tank
3	Lifting eye	15	Air filter system
4	Operator's stand	16	Engine radiator
5	Battery	17	Roll over protective structure
6	Hydraulic tank	18	Vibration motor
7	Engine	19	Steering cylinder
8	Planetary gear	20	Hydraulic pumps
9	Differential	21	Intermediate gearbox
10	Drum drive motor	22	Axle drive motor
11	Isolation buffer	23	Engine exhaust
12	Scraper		

FLUID SPECIFICATIONS - 405

MACHINE PART	CAPACITY USA (metric)	SPECIFICATIONS
Fuel tank	47.5 gal (180 ltr)	see diesel fuel
Engine crankcase	11.5 qts(10.9 ltr)	engine oil API classification API-CD MIL-L-2104C multigrade engine oil (see oil chart) single grade engine oil (see oil chart)
Hydraulic system Reservoir only	15.9 gal (60 ltr) 11.8 gal (45 ltr)	cold weather HLP 46 DIN 51524/2 hot weather HLP 68 DIN 51524/2 Mobil DTE 25,26 Shell Tellus OL 46,68 Amoco Rykon HD 46,68 Texaco Rando HD 46,68
Vibration system	2.6 qts. (2.5 ltr)	CLP DIN 51517/3 Mobil Gear 629 Shell Omala 150 Texaco Meropa 150
Battery	as required	Distilled water
Grease	as required	KP3K DIN 51502 Mobil Oil - Mobilux 3 Shell Oil - Alvania 3 Texaco Oil - Starplex 3
Engine coolant	14.8 qts (14 ltr)	50% ethylene glycol and 50% water
Tire ballast	none	
Intermediate gear and Axle gear and Planetary gear	5.5 qts (5.25 ltr)	SAE 90 API GL-5 gear lubricant
Drum gearbox	1.4 qts (1.3 l)	CLP 220 LS 2 DIN 51517/3 Mobilgear 630 Mobilgear SHC 220 Texaco Syngear 220

FLUID SPECIFICATIONS - 605

MACHINE PART	CAPACITY USA (metric)	SPECIFICATIONS
Fuel tank	60.8 gal (230 ltr)	see diesel fuel
Engine crankcase	11.5 qts(10.9 ltr)	engine oil API classification API-CD MIL-L-2104C multigrade engine oil (see oil chart) single grade engine oil (see oil chart)
Hydraulic system Reservoir only	15.9 gal (60 ltr) 11.8 gal (45 ltr)	cold weather HLP 46 DIN 51524/2 hot weather HLP 68 DIN 51524/2 Mobil DTE 25,26 Shell Tellus OL 46,68 Amoco Rykon HD 46,68 Texaco Rando HD 46,68
Vibration system	3.8 qts. (3 ltr)	CLP DIN 51517/3 Mobil Gear 629 Shell Omala 150 Texaco Meropa 150
Battery	as required	Distilled water
Grease	as required	KP3K DIN 51502 Mobil Oil - Mobilux 3 Shell Oil - Alvania 3 Texaco Oil - Starplex 3
Engine coolant	14.8 qts (14 ltr)	50% ethylene glycol and 50% water
Tire ballast	see chart	Calcium Chloride (77%$CaCl^2$)
Intermediate gear and Axle gear and Planetary gear	11.1 qts (10.5 ltr)	SAE 90 API GL-5 gear lubricant
Drum gearbox	1.4 qts (1.3 l)	CLP 220 LS 2 DIN 51517/3 Mobilgear 630 Mobilgear SHC 220 Texaco Syngear 220

FLUID SPECIFICATIONS - 606

MACHINE PART	CAPACITY USA (metric)	SPECIFICATIONS
Fuel tank	60.8 gal (230 ltr)	see diesel fuel
Engine crankcase	11.5 qts(10.9 ltr)	engine oil API classification API-CD MIL-L-2104C multigrade engine oil (see oil chart) single grade engine oil (see oil chart)
Hydraulic system Reservoir only	15.9 gal (60 ltr) 11.8 gal (45 ltr)	cold weather HLP 46 DIN 51524/2 hot weather HLP 68 DIN 51524/2 Mobil DTE 25,26 Shell Tellus OL 46,68 Amoco Rykon HD 46,68 Texaco Rando HD 46,68
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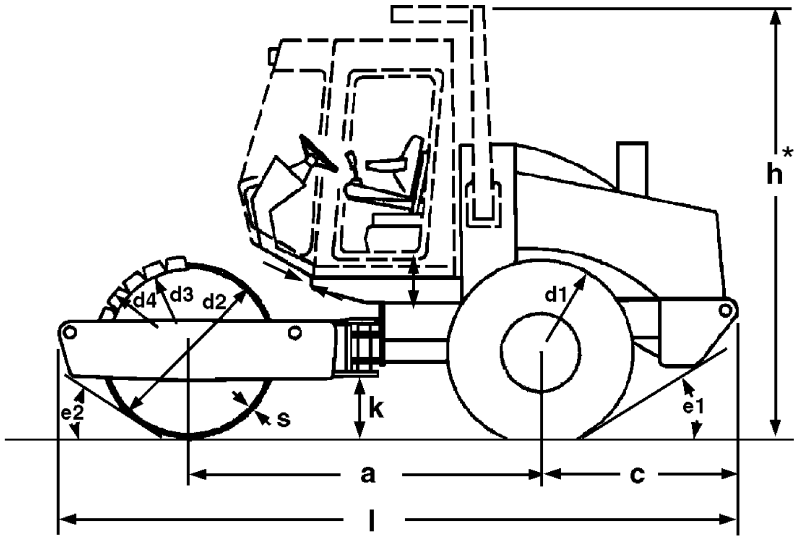
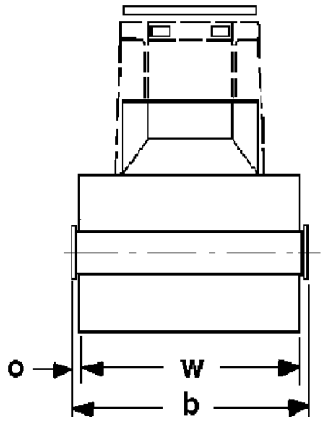
MACHINE SPECIFICATIONS

MODEL 405





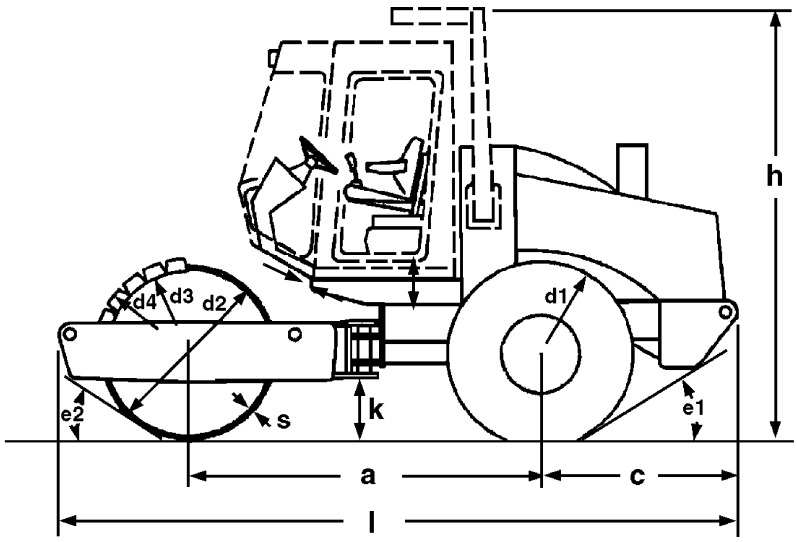
	in.	mm
a	86.6	2200
b	59.1	1500
c	55.5	1410
d1	35.9	912
d2	39.4	1000
d3	35.8	910
d4	42.1	1070
h *	115.4	2930
k	14.4	365
l	174.6	4434
o	2.0	50
s	0.8	20
w	55.1	1400
e1	30 degrees	
e2	33 degrees	

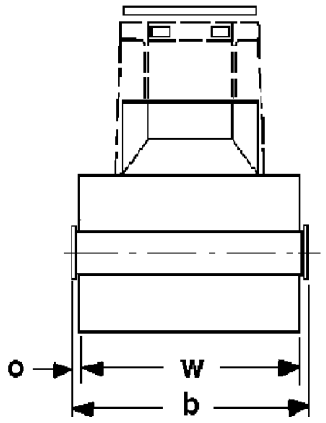
*** NOTE: h = 120 inches (304.8cm) on early models.**

Model 405

ENGINE Make/Model/Type/Displacement - cu. in. (cc) HP, SAE net (kW) @2200 rpm Air Cleaner / Fuel filter Fuel Consumption- gal/hr (l/hr) Fuel capacity - gal (ltr)	Cummins 4B3.9C, 4 cylinder diesel (water cooled), 240 cu.in. (3920cc) 76 (56) Dual replaceable elements, Spin-on cartridge 2.8 (10.7) 47.5 (180)	
	405D	405PD
Operating weight CECE -lb (kg)	10140 (4600)	10500 (4763)
Weight, front-lb (kg)	4740 (2150)	5100 (2313)
Weight, rear axle - lb (kg)	5400 (2450)	5400 (2450)
Static applied linear drum load lb/in (kg/cm)	86 (15.3)	----------
Articulation/oscillation-degrees	35/15	35/15
Turning radius-inside-ft (m)	9.0 (2.7)	9.0 (2.7)
Curb clearance in. (mm)	15 (381)	15 (381)
Drum shell thickness-in. (mm)	0.8 (20)	0.8 (20)
Number of pad feet/height of foot - in. (mm)	----------	77/ 3.15 (80)
Contact area of foot-sq. in. (cm)		17.5 sq.in.(112.9 sq. cm)
Tire size	12.4x24 8PR tractor tread	12.4x24 8PR tractor tread
Travel speed - 1st range mph (km/hr)	0 - 3.6 (0 - 5.8)	0 - 3.6 (0 - 5.8)
- 2nd range mph (km/hr)	0 - 7.8 (0 - 12.6)	0 - 7.8 (0 - 12.6)
Theoretical gradeability, forward -%	58	58
Brakes - front drum	disc	disc
- rear axle	disc - input shaft	disc - input shaft
	1st Stage	1st Stage
Max compaction depth - in. (cm)	25.6 (65)	----------
Frequency - vpm (Hz)	2016 (33)	2016 (33)
Amplitude - in. (mm)	.059 (1.5)	.055 (1.4)
Centrifugal force - lbf (kN)	18698 (83.2)	18698 (83.2)
Centrifugal force/drum width - lb/in. (N/cm)	340 (607)	340 (607)
Total applied force - lb (kN)	23438 (105)	23798 (106)
Total applied linear force - lb/in. (N/cm)	425 (740)	----------

MODEL 605



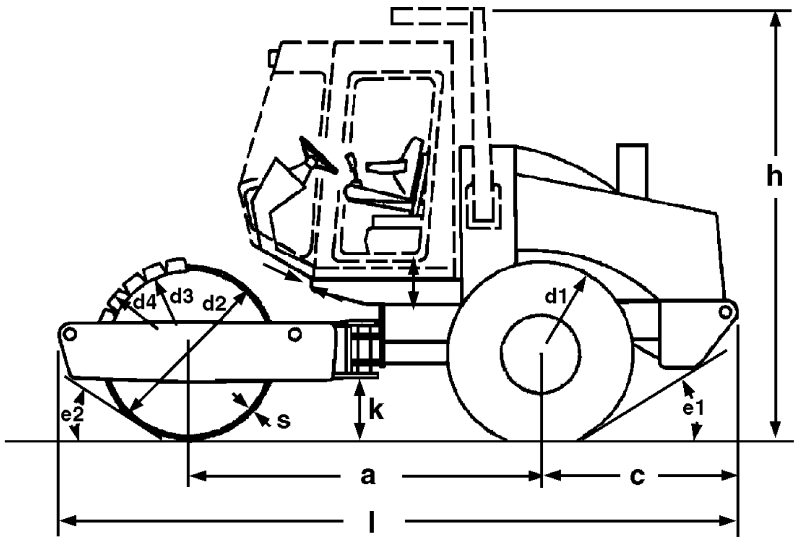


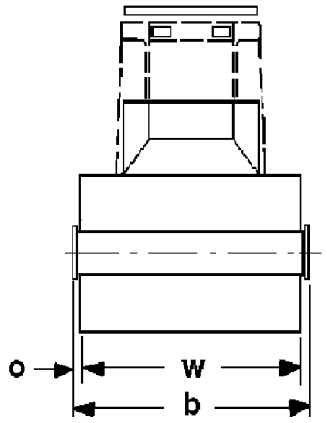
	in.	mm
a	103.9	2640
b	73.6	1870
c	55.1	1400
d1	48.8	1240
d2	48	1220
d3	43.3	1100
d4	52	1320
h	118.9	3020
k	15	380
l	187.8	4770
o	2.4	60
s	1.0	25
w	68.9	1750
e1	31 degrees	
e2	36 degrees	

Model 605

ENGINE Make/Model/Type/Displacement - cu. in. (cc) HP, SAE net (kW) @2200 rpm Air Cleaner / Fuel filter Fuel Consumption- gal/hr (l/hr) Fuel capacity - gal (ltr)	Cummins 4B3.9C, 4 cylinder diesel (water cooled), 240 cu.in. (3920cc) 76 (56) Dual replaceable elements, Spin-on cartridge 2.8 (10.7) 60.8 (230)			
	605D		605PD	
Operating weight CECE -lb (kg)	14850 (6750)		14975 (6807)	
Weight, front-lb (kg)	7482 (3400)		7607 (3457)	
Weight, rear axle - lb (kg)	7368 (3350)		7368 (3350)	
Static applied linear drum load lb/in (kg/cm)	108 (19.4)		----------	
Articulation/oscillation-degrees	35/15		35/15	
Turning radius-inside-ft (m)	9'9" (3.0)		9'9" (3.0)	
Curb clearance in. (mm)	15.5 (394)		15.5 (394)	
Drum shell thickness-in. (mm)	1.0 (25)		1.0 (25)	
Number of pad feet/height of foot - in. (mm)	----------		96/3.94 (100)	
Contact area of foot-sq. in. (cm)			17.5 sq.in.(112.9 sq. cm)	
Tire size	14.9x24 6PR diamond tread		14.9x24 6PR tractor tread	
Travel speed - 1st range mph (km/hr)	0 - 4.3 (0 - 6.9)		0 - 3.6 (0 - 5.8)	
- 2nd range mph (km/hr)	0 - 6.8 (0 - 11.0)		0 - 7.2 (0 - 11.6)	
Theoretical gradeability, forward -%	60		65	
Brakes - front drum	disc		disc	
- rear axle	disc - input shaft		disc - input shaft	
	1st Stage	2nd stage	1st Stage	2nd stage
Max compaction depth - in. (cm)	25.6 (65)		----------	
Frequency - vpm (Hz)	1740 (29)	2160 (36)	1740 (29)	2160 (36)
Amplitude - in. (mm)	.076 (1.93)	.032 (.81)	.076 (1.93)	.032 (.81)
Centrifugal force - lbf (kN)	28766 (128)	18878 (84)	28766 (128)	18878 (84)
Centrifugal force/drum width - lb/in. (N/cm)	417 (730)	274 (480)	417 (730)	274 (480)
Total applied force - lb (kN)	36248 (161)	26360 (117)	36373 (162)	26485 (118)
Total applied linear force - lb/in. (N/cm)	526 (923)	383 (672)	----------	----------

MODEL 606





	in.	mm
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c	55.1	1400
d1	48.8	1240
d2	48	1220
d3	43.3	1100
d4	52	1320
h	118.9	3020
k	15	380
l	187.8	4770
o	2.4	60
s	1.0	25
w	68.9	1750
e1	31 degrees	
e2	36 degrees	

Model 606

ENGINE Make/Model/Type/Displacement - cu. in. (cc) HP, SAE net (kW) @2200 rpm Air Cleaner / Fuel filter Fuel Consumption- gal/hr (l/hr) Fuel capacity - gal (ltr)	Cummins 4BT3.9C, 4 cylinder turbo diesel (water cooled), 240 cu.in. (3920cc) 100 (75) Dual replaceable elements, Spin-on cartridge 2.8 (10.7) 60.8 (230)			
	605D		605PD	
Operating weight CECE -lb (kg)	14850 (6750)		14975 (6807)	
Weight, front-lb (kg)	7482 (3400)		7607 (3457)	
Weight, rear axle - lb (kg)	7368 (3350)		7368 (3350)	
Static applied linear drum load lb/in (kg/cm)	108 (19.4)		----------	
Articulation/oscillation-degrees	35/15		35/15	
Turning radius-inside-ft (m)	9'9" (3.0)		9'9" (3.0)	
Curb clearance in. (mm)	15.5 (394)		15.5 (394)	
Drum shell thickness-in. (mm)	1.0 (25)		1.0 (25)	
Number of pad feet/height of foot - in. (mm)	----------		96/3.94 (100)	
Contact area of foot-sq. in. (cm)			17.5 sq.in.(112.9 sq. cm)	
Tire size	14.9x24 6PR diamond tread		14.9x24 6PR tractor tread	
Travel speed - 1st range mph (km/hr)	0 - 4.3 (0 - 6.9)		0 - 3.6 (0 - 5.8)	
- 2nd range mph (km/hr)	0 - 6.8 (0 - 11.0)		0 - 7.2 (0 - 11.6)	
Theoretical gradeability, forward -%	60		65	
Brakes - front drum	disc		disc	
- rear axle	disc - input shaft		disc - input shaft	
	1st Stage	2nd stage	1st Stage	2nd stage
Max compaction depth - in. (cm)	25.6 (65)		----------	
Frequency - vpm (Hz)	1740 (29)	2160 (36)	1740 (29)	2160 (36)
Amplitude - in. (mm)	.076 (1.93)	.032 (.81)	.076 (1.93)	.032 (.81)
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Total applied force - lb (kN)	36248 (161)	26360 (117)	36373 (162)	26485 (118)
Total applied linear force - lb/in. (N/cm)	526 (923)	383 (672)	----------	----------

STANDARD TORQUE DATA

Where no special torque data is specified, the following torque figures should be applied. Threads should be lubricated with engine oil or grease.

STANDARD TORQUE SPECIFICATIONS +/- 10%

	GRADE 8.8		GRADE 10.9		GRADE 12.9	
SIZE	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm
5mm	4	5.5	5.5	7.5	6.6	9
6mm	6.6	9	9.2	12.5	11	15
8mm	16.5	22.5	23	31.5	26.5	36
10mm	32	44	45	62	55	75
12mm	57	77.5	81	110	95	130
14mm	88	120	125	170	155	210
16mm	140	190	195	265	236	320
18mm	192	260	269	365	320	435
20mm	273	370	383	520	457	620
22mm	369	500	516	700	619	840
24mm	471	640	665	900	796	1080
27mm	702	950	996	1350	1195	1620
30mm	955	1300	1328	1800	1593	2160

NUTS FOR TUBES AND HOSES

DIAMETER & PITCH	NEWTONS/METER	POUNDS/FOOT
16MM X 1.5	20	14.5
18MM X 1.5	35	26
20MMX1.45	45	33.2
24MM X 1.5	60	44

FITTINGS, CONNECTIONS AND PLUGS

DIAMETER & PITCH	NEWTONS/METER	POUNDS/FOOT
10MM X 1	20	14.5
12MM X 1.5	35	26
14MM X 1.5	45	33.2

FITTINGS, CONNECTIONS AND PLUGS

DIAMETER & PITCH	NEWTONS/METER	POUNDS/FOOT
16MM X 1.5	60	44
18MM X 1.5	70	51
22MM X 1.5	100	73
27MM X 2	200	147
33MM X 2	280	207
42MM X 2	380	281

FLANGES

DIAMETER & PITCH	NEWTONS/METER	POUNDS/FOOT
8MM X 1.5	28	21
10MM X 1.5	55	41
12MM X 1.75	90	67
14MM X 2	145	107
16MM X 2	230	170

DIESEL FUEL SPECIFICATION

If fuel is stored for a long time, foreign particles or water can collect in the fuel storage tank. Many engine problems are caused by contaminated fuel. Store fuel outside and keep the fuel as cool as possible. Drain water from the fuel storage tank at regular intervals.

NOTE: Paraffin crystals will start to form in fuel when the fuel temperature falls below the fuel's cloud point. These paraffin crystals will clog the fuel filter and cause the engine to stop or lose power. At ambient temperatures above 32°F (0°C) use #2 diesel fuel. At temperature below 32°F (0°C) use #1 diesel fuel.

Different brands of fuel can exhibit different properties. Make sure that the number 2 diesel fuel you use meets the following minimum requirements.

MINIMUM REQUIREMENTS FOR NO.2 DIESEL FUEL:

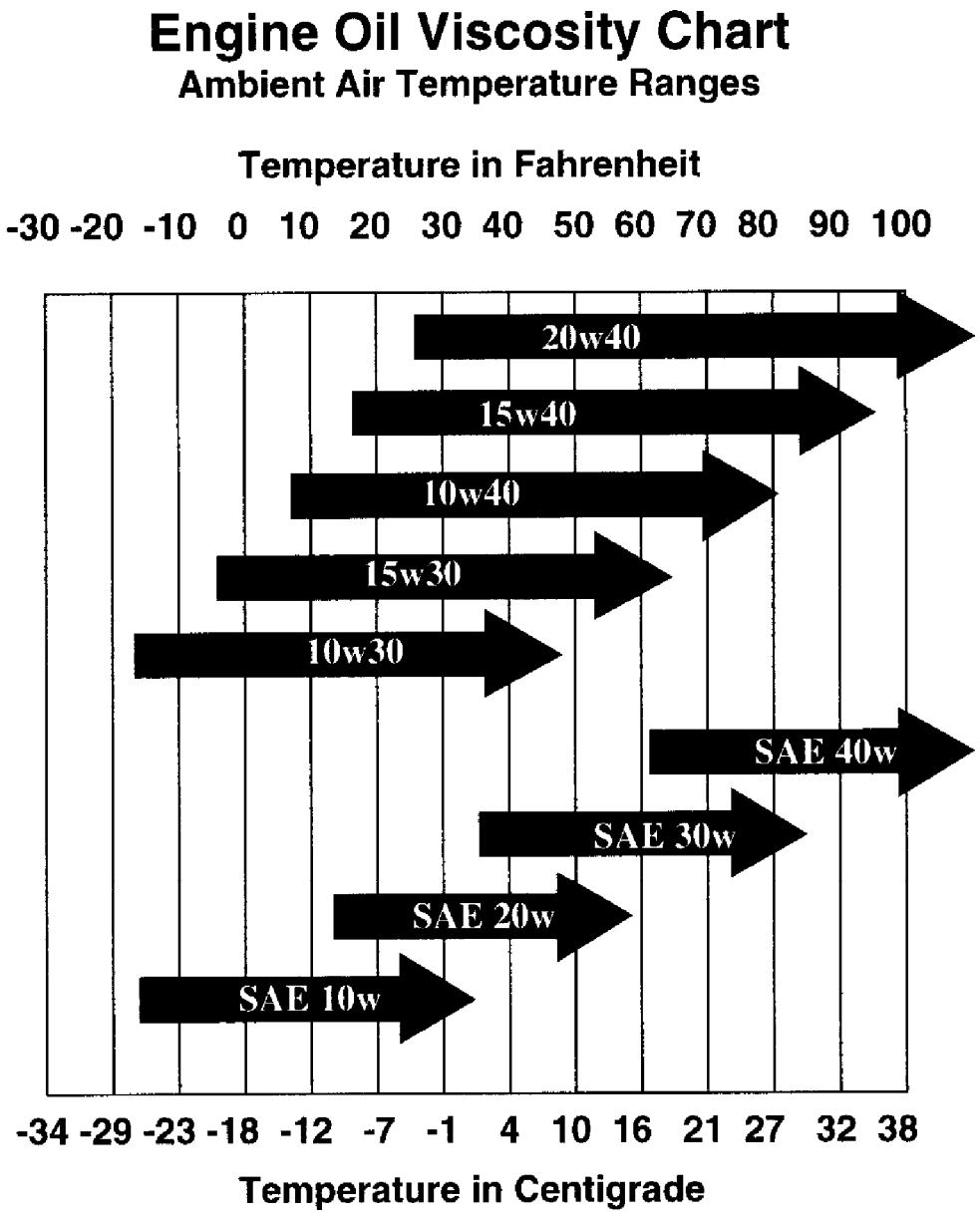
Maximum cloud point	-10°F (-23°C)
Maximum pour point	42°F (6°C) below the lowest ambient air temperature at which the engine must start
Cetane number, min	40 (45 to 55 in winter or at high altitude)
Max. sulphur content, by weight	0.50%
Max. water content & sediment by volume	0.05%
Max, ash content, by weight	0.01%
Max. carbon residue (10% point)	0.20%
Distillation temperature @ 90% point	540 to 625°F (282-329°C)
Distillation temperature @ end point	675°F (357°C)
Minimum flash point	125°F (52°C)
Viscosity at 100°F (38°C)	
Centistokes	2.0 to 4.3
Saybolt Universal Seconds (SUS)	32 to 40
Copper strip test, 3 hours @ 212°F (100°C)	No 3 ASTM
Minimum API gravity	30

ENGINE OIL SPECIFICATION

Use multigrade or single grade engine oil with API engine oil service classification “CD”.

NOTE: DO NOT use performance additives or other oil additives in your engine crankcase.

See the chart below for recommended oil viscosity at the various ambient air temperature range



SAFETY, GENERAL

The information in this manual does not replace any safety rules and laws used in your area. Before operating this machine, learn the rules and laws for your area and make sure your machine has the correct equipment according to these rules and regulations. Before starting the engine study the operator's manual.

- Know the location and function of all machine controls.
- Clear the area of other persons before you start the engine.
- Check all controls in a safe area before you operate the machine.
- Understand the limits of the machine.
- Do not try to do too much too fast.
- Keep the machine under control at all times.

The following decal is located on the right side of the instrument panel. Check the decal daily. Clean or replace as needed.

SPARK ARRESTER

NOTE: Rules or laws in some areas may require that this machine be equipped with a spark arrester or spark arrester muffler. Check the rules or laws in your area.

SAFETY, PERSONAL

⚠ CAUTION

Loose clothing and jewelry can cause an accident. Do not wear loose clothing or jewelry that can catch on controls, etc. Do wear safety shoes, hard hat, heavy gloves, etc. when required for your protection.

Foreign materials and loose objects on the steps, hand rails, and in the operators compartment can cause accidents and injury. Keep the steps, hand rails, and operator's compartment clear at all times.

Make sure cab windows are clean and unobstructed.

Know and understand the arrangements for movement of trucks, machines, and persons on your job site. Understand and follow the instructions of flagmen, road signs, or signals.

⚠ WARNING

Check machine controls for proper operation prior to starting the machine.

A fire can cause injury or death. Always have a fire extinguisher on the job site near the machine. Make sure the fire extinguisher is serviced according to the manufacturer's instructions.

Holes, obstructions, debris, and other work area hazards can cause injury or death. Always walk-around and look for these and other hazards before you operate your machine in a new work area.

Lack of, or incomplete, machine inspection and maintenance can cause accidents. Always follow the instructions in this manual for machine inspection and maintenance.

Always use the seat belt when operating the machine. Make sure the buckle is fully secured.

The following decal is located on the upper right hand corner of the instrument panel. Check the decal daily. Clean or replace as needed.

Always wear the proper ear protection when operating this machine. Permanent hearing loss can result from extended exposure to loud noises.

The following decal is located on the instrument panel to the left side of the main gauge cluster. Check the decal daily. Clean or replace as needed.

SAFETY, MACHINE OPERATION

Dust, smoke, fog, etc. can decrease your vision and cause an accident. Always stop or slow the machine until you can clearly see your work area and the surrounding traffic.