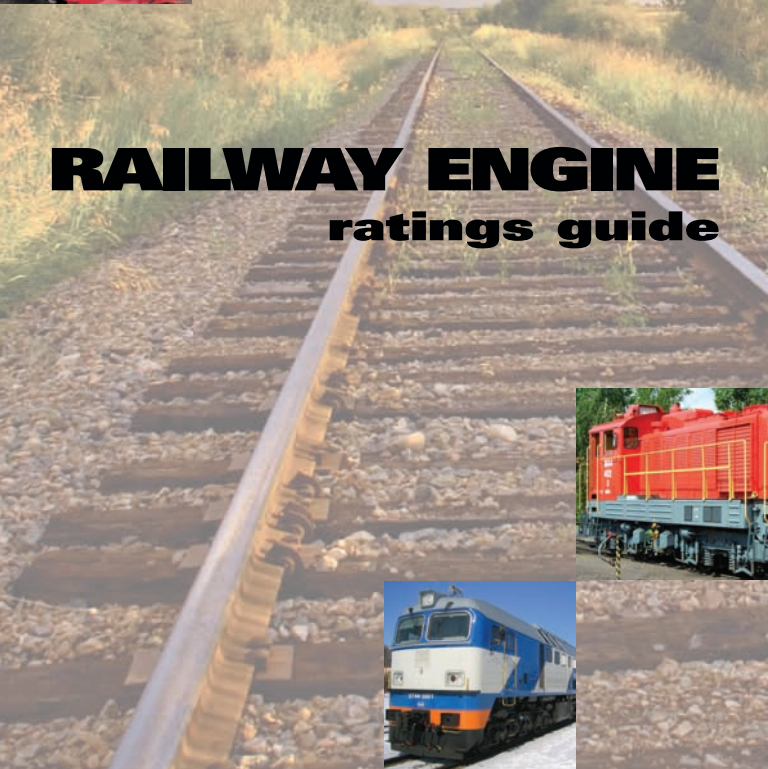
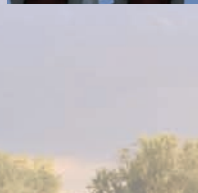
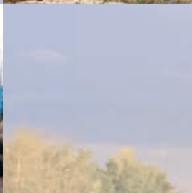
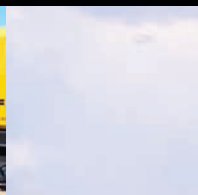


CATERPILLAR®



RAILWAY ENGINE

ratings guide



www.cat-railpower.com

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Caterpillar® diesel engines provide power solutions in five major application sectors of the railway business throughout the world today.

LOCOMOTIVE TRACTION

Diesel-Electric applications use a diesel engine to drive an electric generator/alternator. The generator converts mechanical energy to electrical energy, which is sent to the traction motors that propel the locomotive.

Diesel-Hydraulic applications use a diesel engine to drive through a hydrodynamic transmission. Drainable torque converters and fluid couplings are used in different combinations to provide traction over a wide vehicle speed range. There are no wear parts except bearings, which provide smooth acceleration and shifting. Reverse direction operation is achieved by using a sliding change gear or a second set of torque converters and fluid couplings.

Diesel Multiple Units (DMU) are passenger-carrying railcars with a self-contained driveline, usually consisting of a horizontal or low-height-profile engine, a mechanical or electrical transmission, cooling package, and other major equipment located under the main passenger compartment floor. Usually two or more of these railcars are semi-permanently connected together, hence "multiple unit." DMUs are used when conventional, locomotive-towed passenger trains are not economical or available.

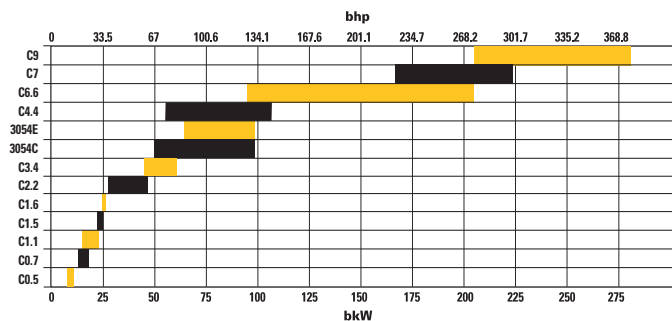
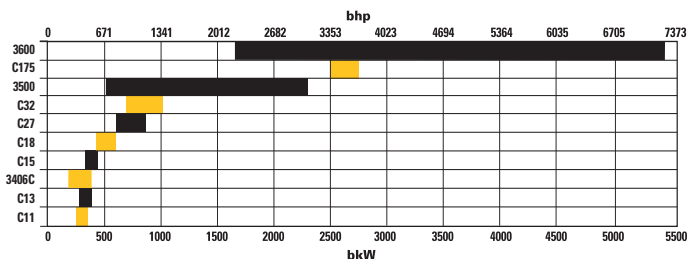
MAINTENANCE OF WAY

Maintenance of Way equipment is specialized to maintain tracks and right-of-ways for safe and efficient operation of trains.

AUXILIARY OR HEAD END POWER

Auxiliary or Head End Power is an electric power engine-generator system located either in a locomotive or separate power car in passenger train applications. This power is used for electric lighting, HVAC, and food/beverage service.

Railway Diesel Engine Ratings Locomotive Traction and Maintenance of Way — Variable Speed



*Additional information available at www.dieselnets.com

Rating Conditions

Diesel Engines — up to 6.6 liter

All rating conditions are based on ISO/TR14396, inlet air standard conditions with a total barometric pressure of 100 kPa (29.5 in. Hg), with a vapor pressure of 1 kPa (.295 in. Hg), and 25°C (77°F).

Performance measured using fuel to specification EPA 2D 89.330-96 with a density of 0.845-0.850 kg/L @ 15° C (59° F) and fuel inlet temperature 40° C (104° F).

Diesel Engines — 7 liter and higher

All rating conditions are based on SAE J1995, inlet air standard conditions of 99 kPa (29.31 in. Hg) dry barometer and 25°C (77°F) temperature. Performance measured using a standard fuel with fuel gravity of 35° API having a lower heating value of 42,780 kJ/kg (18,390 btu/lb) when used at 29° C (84.2° F) with a density of 838.9 g/L.

ISO 9001:2000 Certification

Factory-designed systems built at Caterpillar ISO 9001:2000 certified facilities.

EPA Stationary Regulations

For important information related to the New Source Performance Standard (NSPS) for diesel stationary engines, refer to the EPA web site at www.epa.gov.

Abbreviations

NA	Naturally Aspirated
T	Turbocharged
TA	Turbocharged/Aftercooled
bhp	Brake Horsepower
bkW	Brake Kilowatts

Locomotive Traction Diesel Engine Rating Definitions

Caterpillar engines are tested extensively in both the laboratory and field to identify engine ratings that will provide optimum performance and engine life under varying job conditions. Through these tests it has been possible to establish various ratings which, when properly applied, will provide the kind of engine performance and life that customers expect.

Detailed knowledge of a customer's engine operating requirements is essential to establish a proper rating match. To determine the acceptability of a particular rating for a customer's application, the following must be known.

- Function of engine
- Driven equipment description
- Load quantification
- Speed quantification
- Time per application cycle
- Hours/year
- Life expectancy (time to overhaul)
- Load factor
- Maximum time at full load/cycle
- Power required
- Aspiration desired
- Parasitic loads
- Ambient conditions — temperature/altitude
- Exhaust manifold type

Using this information along with information provided in this document and by your local Caterpillar dealer, the appropriate rating and engine can be selected with confidence.





Locomotive Traction Power Ratings

Engine Model	Low Rating		High Rating		Rated Speed
	bkW	bhp	bkW	bhp	rpm
C9 ACERT™	205	275	280	375	1800-2200
C11 ACERT	242	325	336	450	1800-2100
C13 ACERT	287	385	388	520	1800-2100
3406C	199	267	392	525	1300-2100
C15 ACERT	328	440	444	595	1800-2100
C18 ACERT	429	575	597	800	1800-2100
C18 ACERT-Horizontal*	—	—	522	700	1800
C27 ACERT	597	800	858	1150	1800-2100
C32 ACERT	708	950	1007	1350	1800-2100
3508	503	675	970	1300	1300-1800
3512	746	1000	1700	2280	1300-1800
3516	1200	1600	2300	3085	1300-1800
C175-16 ACERT*	2500	3351	2700	3620	1800
3606	1640	2200	2030	2720	750-1000
3608	2180	2925	2710	3635	750-1000
3612	3280	4400	4060	5445	750-1000
3616	4360	5850	5420	7270	750-1000

*Preliminary Rating

Note: For specific ratings, contact your Cat dealer.

Maintenance of Way Diesel Engine Rating Definitions

Explanation of Ratings A, B, C, D, and E:

For an exact determination of the appropriate rating, contact your local Cat® dealer. Engine rating obtained and presented in accordance with ISO3046/1.

IND-A (Continuous)

Continuous heavy-duty service where the engine is operated at maximum power and speed up to 100% of the time without interruption or load cycling.

IND-B

For service where power and/or speed are cyclic (time at full load not to exceed 80%).

IND-C (Intermittent)

Intermittent service where maximum power and/or speed are cyclic (time at full load not to exceed 50%).

IND-D

For service where maximum power is required for periodic overloads (time at full load not to exceed 10% of the duty cycle).

IND-E

For service where maximum power is required for a short time for initial starting or sudden overload. For emergency service where standard power is unavailable (time at full load not to exceed 5% of the duty cycle).



Maintenance of Way Power Ratings

Engine Model	Aspiration	Power bkW	Power bhp	Rated Speed rpm
C0.5	NA	8.2-10.2	11.0-13.7	2800-3600
C0.7	NA	12.2-15.3	16.3-20.5	2800-3600
C1.1	NA	13.7-21.0	18.3-28.2	2200-3400
C1.5	NA	20.7-25.1	27.8-33.7	2200-3000
C1.6	NA	24.6-26.5	33.0-35.5	2800-3000
C2.2	NA	27.5-38.0	36.9-51.0	2200-3000
C2.2	T	44.7-45.5	60.0-61.0	2800-3000
C3.4 (3044C)	NA	43-47	57.6-63	2600
C3.4 (3044C)	T	60	80.5	2600
3054C	NA	50-64	67-86	2200-2400
3054C	T	60-74.5	80-99.5	2200-2400
3054C	TA	78.5-97	105-130	2400-2200
3054E	NA	64	86	2400
3054E	T	86	115	2500
3054E	TA	97	130	2200
C4.4	NA	52-58	70-78	2200-2400
C4.4	T	56-69	75-93	2200-2400
C4.4	TA	62-87	83-117	2200-2400
C4.4 ACERT	T	62-75	83-99	2200
C4.4 ACERT	TA	75-106	101-142	2200-2400
C6.6 ACERT	TA	90-205	121-275	1800-2500
C7 ACERT	TA	168-224	225-300	1800-2200
C9 ACERT	TA	205-280	275-375	1800-2200
C11 ACERT	TA	242-336	325-450	1800-2100
C13 ACERT	TA	287-388	385-520	1800-2100
3406C	T	201-291	270-390	1800-2100
3406C	TA	199-392	267-525	1300-2100
C15 ACERT	TA	328-444	440-595	1800-2100
C18 ACERT	TA	429-597	575-800	1800-2100
C27 ACERT	TA	597-858	800-1150	1800-2100
C32 ACERT	TA	708-1007	950-1350	1800-2100
3508	TA	507-746	680-1000	1200-1800
3512	TA	761-1119	1020-1500	1200-1800
3516	TA	1011-1492	1355-2000	1200-1800

Ratings meet appropriate non-road mobile emissions regulations.

Specific EPA or EU emissions information is available through your Cat dealer.

Note: For specific ratings, contact your Cat dealer.

Auxiliary Electric (Head End) Power Diesel Engine Rating Definitions

All ratings shown and thermal ratings are subject to manufacturing tolerances of plus or minus three percent. The Typical Load Factor is the sum of the loads a generator set experiences while it is running under load divided by the number of hours it operates under those loads. Extended idling time and the time when the generator set is not operating does not enter into the calculation for load factor.

PRIME RATING:

Typical Load Factor = 60-70%

Typical Hours/Year = No Limit

Typical Peak Demand = 100% of prime rated kW used occasionally, but for less than 10% of operating hours

Auxiliary Electric (Head End) Power Ratings

(Prime with fan)

Engine Model	Rating Hz	Power kW	Emissions Tier
C15 ACERT	50	292	Stage II
C15 ACERT	50	328	Stage II
C15 ACERT	50	364	Stage II
C15 ACERT	50	400	Stage II
C15 ACERT	60	320	Tier 3
C15 ACERT	60	365	Tier 3
C15 ACERT	60	410	Tier 3
C15 ACERT	60	455	Tier 3
C18 ACERT	50	400	Stage II
C18 ACERT	50	436	Stage II
C18 ACERT	50	508	Stage II
C18 ACERT	50	573	Stage II
C18 ACERT	60	500	Tier 2
C18 ACERT	60	545	Tier 2
C27 ACERT	60	590	Tier 2
C27 ACERT	60	635	Tier 2
C27 ACERT	60	680	Tier 2
C27 ACERT	60	725	Tier 2

All 60 Hz ratings are EPA Tier 2 or Tier 3 and CARB emission certified (non-road mobile regulations)

All 50 Hz ratings are EU emission certified (non-road mobile regulations)

Note: For specific ratings, contact your Cat dealer.

Engine Repower — Why Should Old Locomotives be Modernized?

There are large fleets of aging locomotives, many older than 25 years and past the original design life expectation. Operating such locomotives is not only more expensive but also unreliable. Due to high fuel and oil consumption, frequent out-of-service condition, and the fact that many spare parts are no longer manufactured, the continuous rise of operating maintenance costs is an unpleasant reality.

From the driver's point of view, the older locomotives lack current advances in operator comfort and ease of operation. This includes cabin design for reduced noise and vibration, improved visibility, information displays, and accessibility for maintenance and repair.

Ensuring problem-free operation of old locomotives requires major repair work and the location of spare parts, but purchasing a new locomotive is often financially prohibitive. A better choice may be to upgrade, resulting in a big reduction in operational costs while retaining the existing locomotive. The price of an upgraded locomotive is between one- and two-thirds the price of purchasing new, while the performance is fully comparable. Virtually all upgrades are based on the installation of a new engine. The extent of the upgrade depends on the customer's needs.

Cat Dealer Network

The reputation of Caterpillar as a quality supplier of engines has been built on our long commitment to service and support. No other engine manufacturer can boast of the worldwide dealer network and parts distribution system that Caterpillar customers have come to rely on. Repowers, new engine installation, specialized engine arrangements for pumping applications — whatever you need, wherever and whenever you need it, your Cat dealer can provide it. From scheduled maintenance programs to parts and service support, diagnostics and emergency response — the Caterpillar dealer network stands ready with the expertise, technology, and parts to keep you up and running at peak efficiency.



**Caterpillar.
Your Local Resource.
Worldwide.**

Your Cat dealer is prepared to answer any questions you may have about Cat Power Systems, customer support, parts or service capability anywhere in the world. For the name and number of the Cat dealer nearest you, visit our website or contact Caterpillar Inc. World Headquarters in Peoria, Illinois, U.S.A.

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CATERPILLAR®

Materials and specifications are subject to change without notice.

Rating ranges listed include the lowest and highest available for a specific engine or family of engines. Load factor and time at rated load and speed will determine the best engine/rating match.

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