




GRANITE STATE DESIGNERS & INSTALLERS



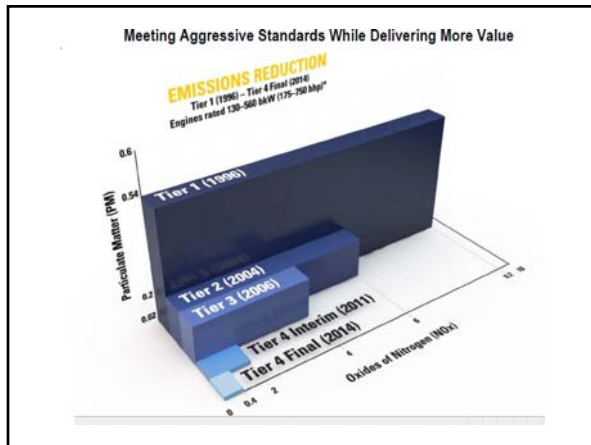
• Heavy Equipment Maintenance
& Open Forum Q & A

- Emissions Update
- Maintaining The Work Tool
- Oil Selection
- Open Forum

Mike Robinson Product Support Representative









Emission Limits and Timing

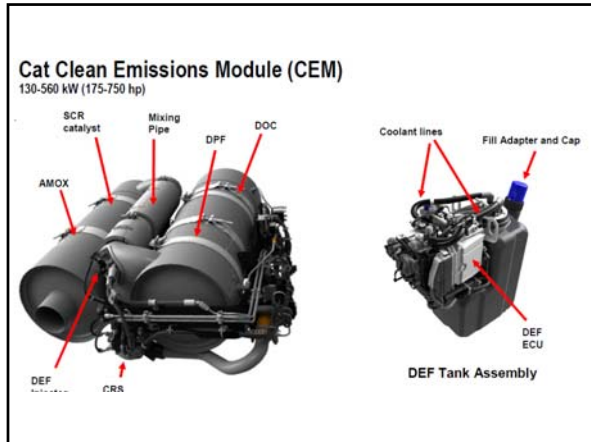
kW (hp)	2011	2012	2013	2014	2015
(25-75)			Tier 4 Final	→	
56-130 (75-175)		NOx 3.4 g/kW-hr PM 0.02 g/kW-hr	→	Tier 4 Interim	→
130-560 (175-750)	NOx 2.0 g/kW-hr PM 0.02 g/kW-hr	→	→	NOx 0.40 g/kW-hr PM 0.02 g/kW-hr	→
>560* (750)	NOx 3.5 g/kW-hr PM 0.10 g/kW-hr	→	→	→	NOx 3.5 g/kW-hr PM 0.04 g/kW-hr

Caterpillar Tier 4 Final Engine Technology

KW Range	56 – 130 kw	130 – 560 kw	560 – 820 kw	> 820 kw
Machine Examples	 SSL, BHL, SHEX	 LHEX, MTTT, MWL	 QCT, LTTT	 LMT
Engines	C3.3 - C7.1	C7.1 - C18	C27 & C32	3500 & C175
Nox Reduction	EGR + SCR	EGR + SCR	EGR	SCR
Particulate Matter After Treatment	DOC/DPF (optional no DPF, on 4.4)	DOC/DPF	DOC	DOC
Regen Technology	Dosing, Passive	Passive, Active burner	NA	NA

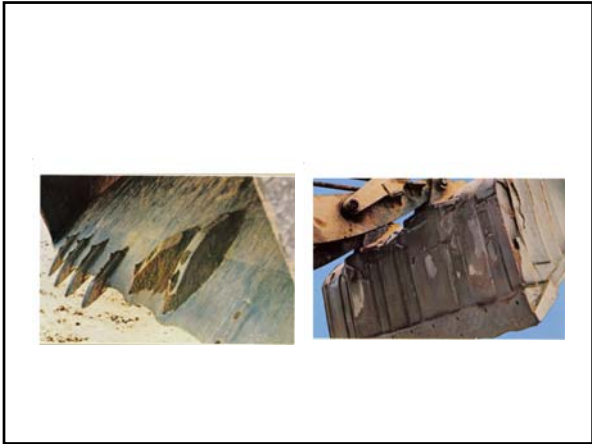


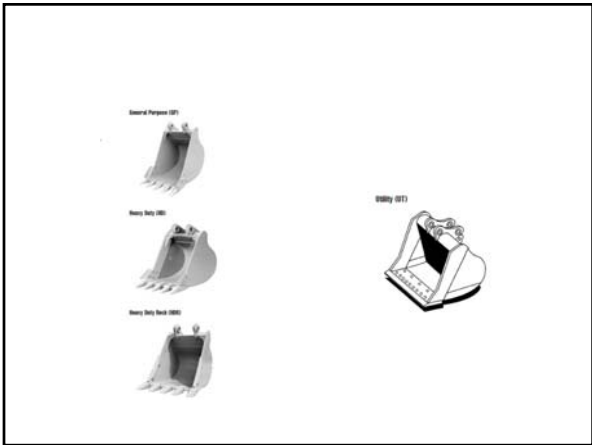


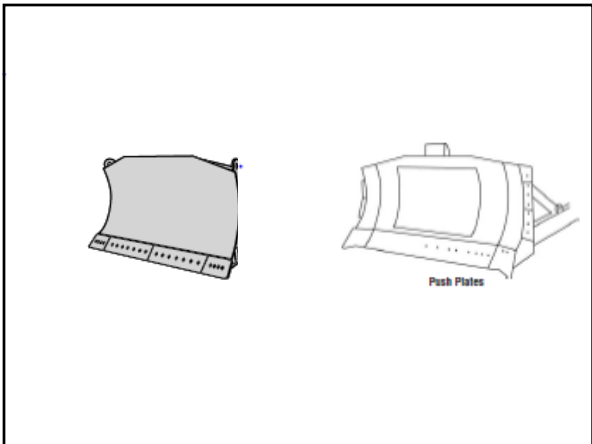


- Exhaust flows through the Cat Regeneration System (CRS) regeneration device housing, and into the diesel oxidation catalyst (DOC).
- The DOC is a flow through device equipped with a catalyst coating that removes hydrocarbons and some carbon monoxide.
- The exhaust then flows into the wall flow diesel particulate filter, where soot is trapped and when necessary removed automatically through a process called regeneration.
- From the DPF, the exhaust stream enters the Selective Catalytic Reduction (SCR) mixing tube. An Electronic Control Unit (ECU) controlled diesel exhaust fluid (or DEF) injector injects DEF into the mixing chamber.
- The hot exhaust gas causes the DEF vapor to produce ammonia
- The exhaust gas/ammonia vapor mixture flows into the SCR catalyst where NOx in the exhaust is reduced to nitrogen and water.
- The exhaust flows through an ammonia clean up catalyst to reduce any remaining ammonia before exiting the system
- The amount and timing of DEF injection is controlled based on inputs from NOx sensors in the exhaust stream









Recommended Base Edge Thickness by Loader Weight

Loader Weight (lb)	Capacity (cu yd)	Typical Loader	Typical Loader	Typical Loader
10,000-15,000	1.0-1.5	1.5-2.0	1.5-2.0	1.5-2.0
15,000-20,000	1.5-2.0	2.0-2.5	2.0-2.5	2.0-2.5
20,000-25,000	2.0-2.5	2.5-3.0	2.5-3.0	2.5-3.0
25,000-30,000	2.5-3.0	3.0-3.5	3.0-3.5	3.0-3.5
30,000-35,000	3.0-3.5	3.5-4.0	3.5-4.0	3.5-4.0
35,000-40,000	3.5-4.0	4.0-4.5	4.0-4.5	4.0-4.5
40,000-45,000	4.0-4.5	4.5-5.0	4.5-5.0	4.5-5.0
45,000-50,000	4.5-5.0	5.0-5.5	5.0-5.5	5.0-5.5
50,000-55,000	5.0-5.5	5.5-6.0	5.5-6.0	5.5-6.0
55,000-60,000	5.5-6.0	6.0-6.5	6.0-6.5	6.0-6.5
60,000-65,000	6.0-6.5	6.5-7.0	6.5-7.0	6.5-7.0
65,000-70,000	6.5-7.0	7.0-7.5	7.0-7.5	7.0-7.5
70,000-75,000	7.0-7.5	7.5-8.0	7.5-8.0	7.5-8.0
75,000-80,000	7.5-8.0	8.0-8.5	8.0-8.5	8.0-8.5
80,000-85,000	8.0-8.5	8.5-9.0	8.5-9.0	8.5-9.0
85,000-90,000	8.5-9.0	9.0-9.5	9.0-9.5	9.0-9.5
90,000-95,000	9.0-9.5	9.5-10.0	9.5-10.0	9.5-10.0
95,000-100,000	9.5-10.0	10.0-10.5	10.0-10.5	10.0-10.5

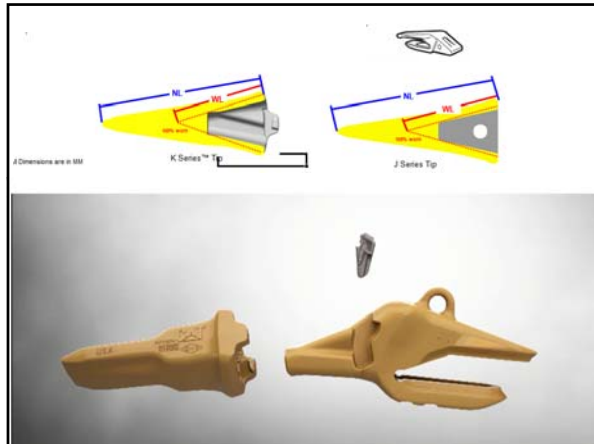
BUCKET TIP SELECTION GUIDE

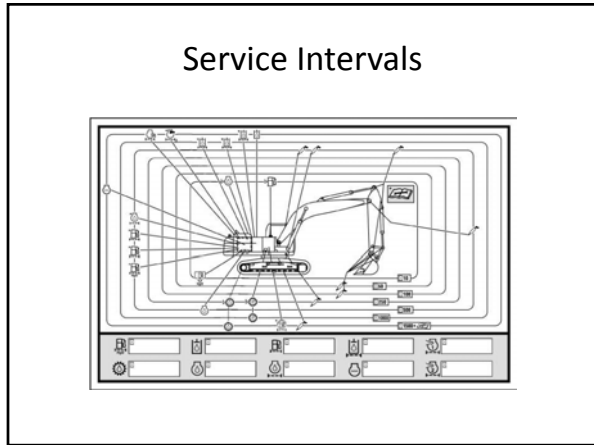
Tip

- Standard** - Use on dense compacted material such as dirt, sand, limestone, sandstone, or shale.
- Rock** - Use on high impact and low cut work such as rock, limestone, brick.
- Heavy** - Use in most general applications where breakage is an option.
- Heavy Duty Long** - Use on hard surfaces in general loading and unloading applications. The longer wear life and greater strength.
- Heavy Duty Short** - Use on hard surfaces when working in hard, rocky and rocky material.
- Heavy Duty Long Life** - Use on hard surfaces to increase wear life and reduce maintenance. Recommended for extreme impact, increased wear life and for applications in extreme conditions.
- Heavy Duty Protection** - Use when maintenance and long life are desired. Good combination of strength and wear life.

*The wear life only refers to the wear life of the bucket tip.

Blue Material Titanium Steel





Extended Engine Oil Drains and Warranty

Failures that result from extended oil drain periods are not Caterpillar factory defects and therefore are not covered by Caterpillar's warranty. In addition, failures that result from not using the recommended oil type are not Caterpillar factory defects and therefore are not covered by Caterpillar's warranty.

Aftermarket Products and Warranty

NOTICE
 When auxiliary devices, accessories or consumables (filters, oil, additives, catalysts, fuel, etc.) made by other manufacturers are used on Caterpillar products, the Caterpillar warranty is not affected simply because of such use. Failures that result from the installation or usage of other manufacturers auxiliary devices, accessories or consumables, however, are not Caterpillar factory defects and therefore are NOT covered by Caterpillar's warranty.

Caterpillar is not in a position to evaluate the many auxiliary devices, accessories or consumables promoted by other manufacturers and their effect on Caterpillar products. Installation or use of such items is at the discretion of the customer who assumes ALL risks for the effects that result from this usage.

Furthermore, Caterpillar does not authorize the use of its trade name, trademark, or logo in a manner which implies our endorsement of these aftermarket products.

Oil Viscosities	°C		°F	
	Min	Max	Min	Max
SAE 10W	-20	40	-4	104
SAE 30	10	50	50	122
ISO 46 Multi-Grade	-30	50	-22	122
SAE10W-30	-20	40	-4	104
SAE15W-40	-15	50	5	122
Multi-Grade	-15	50	5	122
SAE0W-40	-40	40	-40	104
SAE0W-20	-40	40	-40	104

ENGINE OIL

Recommendation for Tier 4 Engines

Cat DEO-ULS or oils that meet the Cat ECF-3 specification and the API CJ-4 oil category are required for use in nonroad Tier 4 United States Environmental Protection Agency (U.S. EPA) certified engines that are equipped with aftertreatment devices.

HYDRAULIC OIL

RECOMMENDED FOR THE FOLLOWING APPLICATIONS:

- **Outstanding wear protection**
Proven zinc-based anti-wear additives are incorporated to be effective throughout the range of operating conditions, including low load and severe duty high load conditions. Outstanding performance in a range of piston and vane pump tests, including the tough Denison TIC (dry and wet versions) and the demanding Vickers 35VQ25, demonstrates how Shell Tellus S2 M Fluids can help system components last longer.

CATERPILLAR TO-2