

George Saseen  
MSHA  
304-547-2072  
saseen.george@dol.gov

- ◆ Engine Requirements
- ◆ Engine's Diesel Particulate Matter Emissions

# § 57.5067 (a) Engines

- ◆ Any Diesel Engine Introduced Underground
  - (a)(1) Have Affixed A Plate Evidencing Approval Under Subpart E of Part 7, Or Under Part 36
  - (a)(2) Meet Or Exceed The Applicable PM Emission Requirements Of The U.S. EPA Listed In Table 57.5067-1

# MSHA Approval Plate

- ◆ Permissible Engines:  
7E-A001 or 07-EPA030001
- ◆ Non-permissible Engines  
7E-B001 or 07-ENA030001
- ◆ <https://lakegovprod1.msha.gov/ReportView.aspx?ReportCategory=EngineAppNumbers>  
or
- ◆ [www.msha.gov](http://www.msha.gov) then click on "Approved Products", then click on "Part 7 Diesel Engines"

# MSHA Approved Diesel Engines

<i>Approval Number</i>	<i>Engine Manufacturer</i>	<i>Model</i>	<i>HP @ RPM at 1000ft Elevation</i>	<i>DPM grams/-hp- hr weighted</i>	<i>Exhaust BP Max Limit, in.H2O</i>
<i>07-ENA040001</i>	<i>CUMMINS</i>	<i>QSB-155C</i>	<i>155 @ 2500</i>	<i>0.11</i>	<i>41</i>
<i>07-ENA040018</i>	<i>DEUTZ</i>	<i>F6L 914</i>	<i>117 @ 2300</i>	<i>0.09</i>	<i>40</i>
<i>07-ENA050001</i>	<i>MITSUBISHI</i>	<i>S4S-DT</i>	<i>77 @ 2500</i>	<i>0.18</i>	<i>32</i>
<i>7E-B001</i>	<i>DEUTZ</i>	<i>MWM 916</i>	<i>94 @ 2300</i>	<i>0.42</i>	<i>40</i>
<i>7E-B003</i>	<i>CATERPILLAR</i>	<i>3306 PCNA</i>	<i>150 @2200</i>	<i>0.49</i>	<i>34</i>
<i>7E-B035</i>	<i>DEUTZ</i>	<i>F8L 413FW</i>	<i>182 @ 2300</i>	<i>0.16</i>	<i>30</i>
<i>7E-B063</i>	<i>CATERPILLAR</i>	<i>3306PCTA</i>	<i>215 @ 2200</i>	<i>0.45</i>	<i>27</i>

# EPA DPM Limits

## MSHA Table 57.5067-1

- |                       |               |        |        |
|-----------------------|---------------|--------|--------|
| ◆ Hp < 11             | 0.75 g/bhp-hr | Tier 1 | MY2000 |
| ◆ $11 \leq HP < 25$   | 0.60 g/bhp-hr | Tier 1 | MY2000 |
| ◆ $25 \leq HP < 50$   | 0.60 g/bhp-hr | Tier 1 | MY1999 |
| ◆ $50 \leq HP < 100$  | 0.30 g/bhp-hr | Tier 2 | MY2004 |
| ◆ $100 \leq HP < 175$ | 0.22 g/bhp-hr | Tier 2 | MY2003 |
| ◆ $175 \leq HP < 750$ | 0.40 g/bhp-hr | Tier 1 | MY1996 |
| ◆ Hp $\geq 750$       | 0.40 g/bhp-hr | Tier 1 | MY2000 |
- ◆ On highway diesel vehicles such as pickup trucks from 1994 vehicle model year

# Engine Combustion Design

- ◆ Pre 1993 Direct Injection Engines
  - 0.5 – 1.0 gm/hp-hr.
- ◆ Indirect Injection (Pre Chamber) Engines
  - 0.3 – 0.5 gm/hp-hr.
- ◆ Post 1993 Direct Injection Engines
  - High Pressure Fuel Direct Injection
  - Turbocharged
  - Computerized Electronic Fuel Injection
  - 0.05 – 0.2 gm/hp-hr for the higher horsepower engines

# Total Engine Out Emissions

Emissions x Horsepower x Hours = DPM

## ◆ Loader:

$$0.1 \times 275 \times 8 = 220 \text{ grams}$$

## ◆ Haul Truck:

$$0.1 \times 350 \times 8 = 280 \text{ grams}$$

## ◆ Haul Truck:

$$0.3 \times 350 \times 8 = 840 \text{ grams}$$

## ◆ Drill:

$$0.5 \times 150 \times 4 = 300 \text{ grams}$$

# Diesel Fuel

- ◆ MSHA §57.5065 requires diesel fuel with a sulfur content of less than 0.05 percent (500 ppm)
- ◆ EPA requirement for on-highway diesel fuel to be at 0.0015 percent (15 ppm) sulfur by mid – 2006
- ◆ EPA requirement for non-road diesel fuel to be at 0.0015 percent (15 ppm) sulfur by 2010



# Session 2

## Underground Mining Diesel Engines

- ◆ George Saseen – MSHA
- ◆ Gareth Estebanez – Caterpillar
- ◆ David Redmond – Cummins
- ◆ Enrique Sauerteig – Deutz
- ◆ John Delahunt – Smith Detroit Diesel