

New MSHA Standard



*Diesel Particulate Matter Exposure Of Underground
Coal and Metal And Nonmetal Miners*

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Purpose

- Establish new health standards on Diesel Particulate Matter (DPM) in underground coal and metal/nonmetal mines.
 - Reduce risks to underground miners of serious health hazards associated with exposure to DPM.

Health Effects Of DPM Exposure

❖ Acute Effects

- Respiratory Irritation (Including Allergic Responses)

❖ Chronic Effects

- Premature Death From Cardiovascular, Cardiopulmonary, and Respiratory Causes
- Lung Cancer

Underground Coal Requirements

Emission Limits: Permissible Equipment §72.500

- Each piece introduced into the mine must emit no more than 2.5 grams per hour of DPM

Effective Date: After May 21, 2001

- Each piece within the mine must emit no more than 2.5 grams per hour of DPM

Effective Date: As of July 19, 2002

Heavy Duty Equipment Definition in §75.1908(a)

- Equipment that cuts or moves rock or coal.
- Equipment that performs drilling or bolting functions.
- Equipment that moves longwall components.
- Self-propelled diesel fuel transportation units and lube units.
- Machines used to transport portable diesel fuel transportation units or lube units.

Emission Limits: Nonpermissible Heavy Duty Equipment, Generators, and Compressors § 72.501

- Each piece introduced into the mine must emit no more than 5.0 grams per hour of DPM

Effective date: After May 21, 2001

- Each piece within the mine must emit no more than 5.0 grams per hour of DPM

Effective date: As of July 21, 2003

**Emission Limits: Nonpermissible Heavy
Duty Equipment, Generators, and
Compressors
§ 72.501**

- Each piece within the mine must emit no more than 2.5 grams per hour of DPM

Effective date: As of January 19, 2005

**Emission Limits: Nonpermissible
Light Duty Equipment
§ 72.502**

- Each piece introduced into the mine must emit no more than 5.0 grams per hour of DPM

Effective date: After May 21, 2001

- Exemptions
 - Engines that meet or exceed EPA DPM emission requirements
 - Ambulances or fire fighting equipment used in accordance with the mine's fire fighting and evacuation plan under 75.1101-23

Compliance Determination Permissible Equipment 2.5 gm/hr

- For permissible machines, the baseline DPM emissions from a Category A diesel engine are multiplied by a filter efficiency to determine compliance.
- Reducing the horsepower rating of an approved engine in order to reduce the emissions will require the engine to be retested at this reduced horsepower.

MSHA Approved Diesel Engines / Filter Efficiency
Engines For Permissible Machines

Approval No.	Manufacturer	Engine Model * Meets EPA	Rated Horsepower	PI CFM	DPM gr/hr Weighted Avg.	Weighted Avg. Horsepower	DPM gr/bhp-hr	Filter Efficiency To Obtain 5.0gr/hr	Filter Efficiency To Obtain 2.5gr/hr
A001	DEUTZ	MWM 916	94	15000	25.49	51.1	0.50		90.2
A002	CATERPILLAR	3306 PCNA	150	27000	45.88	87.2	0.53		94.6
A003	CATERPILLAR	3304 PCNA	100	17500	29.74	58.1	0.51		91.6
A004	ISUZU	QD 100-306	66	10000	16.99	38.3	0.44		85.3
A004	ISUZU	QD 100-306	70	50000	84.96	40.7	2.09		97.1
A005	CATERPILLAR	3306PCTA	190	31000	52.68	121.3	0.43		95.3

Compliance Determination Example

- Caterpillar 3306PCNA diesel engine produces 45.88 gm/hr of DPM emission based on engine approval data.
- A paper filter has a DPM efficiency removal of 95%
- $45.88 \text{ gm/hr} \times 0.05 = 2.29 \text{ gm/hr}$

5.0 gm/hr and 2.5 gm/hr Nonpermissible Machine DPM Limits § 72.501 Heavy Duty Machines, Generators, and Compressors

- These machines normally do not control for exhaust gas temperature, thus precluding the use of paper filters.
- Hot gas filters (ceramic) or other aftertreatment devices can be used to comply.
- Allows mine operators a choice in purchasing aftertreatment devices based on machine's life.

MSHA Approved Diesel Engines / Filter Efficiency									
Example of Engines Used in Nonpermissible Heavy Duty Machines, Generators, and Compressors									
Approval No.	Manufacturer	Engine Model	Rated Horsepower	PI CFM	DPM gr/hr Weighted Avg.	Weighted Avg. Horsepower	DPM gr/bhp-hr	Filter Efficiency To Obtain 5.0gr/hr	Filter Efficiency To Obtain 2.5gr/hr
B001	DEUTZ	MWM 916	94	11500	19.54	46.2	0.42	74.4	87.2
B003	CATERPILLAR	3306 PCNA	150	23000	39.08	79.2	0.49	87.2	93.6
B035	DEUTZ	F8L 413FW	182	9500	16.14	100.6	0.16	69.0	84.5
B063	CATERPILLAR	3306PCTA	215	31000	52.68	116.40	0.45	90.5	95.3
B038	ISUZU	QD60 (C240)	56	5500	9.35	27.6	0.34	46.5	73.3

Compliance Determination Example

- Deutz F6L912W diesel engine produces 8.50 gm/hr of DPM emission based on MSHA engine approval data
- A filter efficiency of 42% is needed to meet the 5.0 gm/hr
- $8.50 \text{ gm/hr} \times 0.58 = 4.93 \text{ gm/hr}$
- A filter efficiency of 71% is needed to meet the 2.5 gm/hr standard
- $8.50 \text{ gm/hr} \times 0.29 = 2.46 \text{ gm/hr}$

Introduced Nonpermissible Light-Duty Equipment § 72.502

- Equipment must emit no more than 5.0 gm/hr of DPM. Compliance will be determined in the same way as permissible and heavy-duty equipment.
- OR -
- Mine operators can purchase equipment using diesel engines that meet or exceed the EPA DPM requirements listed in Table 72.502-1.

EPA Engine Requirements

- 1994 and newer light duty vehicles and trucks
- 1994 and newer heavy duty highway engines
- Tier 2 nonroad engines
 - Less than 11 hp 0.60 g/bhp-hr
 - 11 hp To < 25 0.60 g/bhp-hr
 - 25 hp To < 50 0.45 g/bhp-hr
 - 50 hp To < 100 0.30 g/bhp-hr
 - 100 hp To < 175 0.22 g/bhp-hr
 - 175 hp and Greater 0.15 g/bhp-hr

MSHA Approved Diesel Engines

Example of Engines that Meets the EPA Limits Specified in Table 72.502-1

Approval No.	Manufacturer	Engine Model	Rated Horsepower	PI CFM	DPM/gr/hr Weighted Avg.	Weighted Avg. Horsepower	DPM gr/bhp-hr	Filter Efficiency To Obtain 5.0gr/hr	Filter Efficiency To Obtain 2.5gr/hr
B023	DEUTZ	F6L 912W*	80	5000	8.50	43.4	0.20	41.2	70.6
B051	Cummins	ISB235* - 1998	235	6000	10.20	113.6	0.09	51.0	75.5
B053	Kubota	V1200*	25.8	1500	2.55	12.25	0.21	0.0	1.9
B076	ISUZU	4LC1MA*	41	4500	7.65	20.3	0.38	34.6	67.3
B055	Deutz	F4M1011F*	61	4500	7.65	32.30	0.24	34.6	67.3

**Underground
Metal and Non-metal
Requirements**

Standard Published in Federal Register January 19, 2001

- Administrative Review and Legal Challenge Delayed Effective Date
 - March 20, 2001
 - May 21, 2001
 - July 5, 2001
- Certain Provisions Effective July 5, 2001
- Certain Provisions Delayed
- Certain Provisions Scheduled To Go Into Effect Later

Provisions That Became Effective On July 5, 2001

§57.5065 (a) and (b), Fueling practices

NOTE: Paragraph (c) restricting idling has been removed from Final Rule consistent with the preamble language published on January 19, 2001, clearly stating that MSHA was deleting it.

§57.5066 (a) and (c) Maintenance standards

NOTE: Only paragraphs (a) and (c) are effective

§57.5067, Engines

§57.5070, Miner training

§57.5075, Diesel particulate records

NOTE: Fuel, Maintenance, and Training Records Only

**Provisions That Become Effective
After July 19, 2002**

§57.5060 (a), Concentration limit - $400_{TC}\mu\text{g}/\text{m}^3$ (interim),
where miners normally work or travel.

§57.5061, Compliance determination by collecting a single
sample using the NIOSH Analytical Method 5040

§57.5062, Diesel particulate matter control plan

§57.5071, Environmental monitoring

**Provisions That Become Effective
After January 19, 2006**

§57.5060 (b), Concentration limit $160_{TC}\mu\text{g}/\text{m}^3$ (final),
where miners normally work or travel.

Fueling Practices § 57.5065 (a) & (b)

- Diesel Fuel Used To Power Equipment In Underground Areas Limited To Sulfur Content Of 0.05%
- Operator Must Retain Purchase Records Noting Sulfur Content For 1 Yr
- Fuel Additives Must Be Registered With U.S. Environmental Protection Agency

Maintenance Standards § 57.5066 (a)

- Approved Engines Must Be Maintained In Approved Condition
- Emissions-Related Components Of Non-Approved Engines Must Be Maintained According To Manufacturer Spec's
- Emissions Or Particulate Control Devices Must Be Maintained In Effective Operating Condition

Maintenance Standards Proposed § 57.5066 (b)

- Equipment Operators Would Be Authorized And Required To Tag Equipment If They Note Any Evidence Equipment May Require Maintenance Per Maintenance Standards
- Tagged Equipment Would Have To Be Promptly Examined By Authorized Person

Maintenance Standards § 57.5066 (c)

- Persons Authorized To Maintain Diesel Equipment Must Be Qualified By Virtue Of Training Or Experience
- Mine Operator Must Retain “Appropriate Evidence Of The Competence” Of Any Person Who Performs Specific Maintenance Tasks Per The Maintenance Standards
- “Appropriate Evidence” Must Be Retained For 1 Yr After Any Maintenance

Diesel Engines § 57.5067 (a)

- Any Diesel Engine Introduced Underground After July 5, 2001 Must Either:
 - (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

EPA Emission Requirements § 57.5067(a)(2)

- 1994 and newer light duty vehicles and trucks
- 1994 and newer heavy duty highway engines

Nonroad Engines

Tier 1	Less Than 11 hp	0.75 g/bhp-hr
Tier 1	11 hp To < 50 hp	0.60 g/bhp-hr
Tier 2	50 hp To < 100 hp	0.30 g/bhp-hr
Tier 2	100 hp To < 175 hp	0.22 g/bhp-hr
Tier 1	175 hp and Greater	0.40 g/bhp-hr

Miner Health Training

- Operator must provide annual training to all miners who can reasonably be expected to be exposed to DPM emissions. The training must include:
 - Health risks from DPM exposure
 - Methods used in the mine to control DPM
 - Identification of personnel responsible for maintaining controls
 - Actions miners must take to ensure controls operate as intended

QUESTIONS