

## 15.10 Fuses and Primers

Munitions listed in this section begin with the Department of Defense Identification Code (DODIC) letters “N.” This category of munitions includes fuses and primers, which are devices used to initiate the operation of other munitions. Examples include point detonating fuzes, proximity fuzes, percussion primers, and electric primers for ammunition used in guns and high explosive artillery.

### 15.10.4 N335, M557 Point Detonating Fuze

#### 15.10.4.1 Ordnance Description<sup>1</sup>

The M557 Point Detonating Fuze (DODIC N335) is designed for use in ammunition for 75-mm through 155-mm guns, 75-mm through 105-mm rifles, 75-mm through 8-inch howitzers, and 4.2-inch mortars. The M557 Point Detonating Fuze is a selective super quick (SQ) or 0.05-second delay impact fuze. This ammunition is used during combat and on firing ranges during training. Note that emission factors presented herein include only those associated with the detonation of the fuze; emissions associated with the detonation of the ammunition to which the fuze is attached are not addressed in this section.

The M557 Point Detonating Fuze is comprised of an M48A3 fuze assembled with an M125A1 booster. The M48A3 fuze contains an M24 detonator, an M54 primer, a delay assembly, and an intermediate charge.

#### 15.10.4.2 Emissions And Controls<sup>1-5</sup>

The primary emissions from the ignition of the M557 Point Detonating Fuze are aluminum, carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), and particulate matter. Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically detonated in the field, there are no controls associated with its use.

Table 15.10.4-1 presents emission factors for CO<sub>2</sub>, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.10.4-2 presents emission factors for hazardous air pollutants and toxic chemicals. The emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.10.4-1 EMISSION FACTORS FOR THE USE OF DODIC N335,  
M557 POINT DETONATING FUZE – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE,  
AND TOTAL SUSPENDED PARTICULATE<sup>a</sup>

EMISSION FACTOR RATING: C

CASRN <sup>b</sup>	Pollutant	lb per item	lb per lb NEW <sup>c</sup>
124-38-9	CO <sub>2</sub>	2.8 E-02	5.4 E-01
630-08-0	CO	4.5 E-03	8.6 E-02
7439-92-1	Lead (Pb)	3.0 E-04	5.7 E-03
74-82-8	Methane	1.0 E-05	2.0 E-04
--	Oxides of nitrogen (NO <sub>x</sub> )	7.7 E-04	1.5 E-02
--	PM-2.5 <sup>d</sup>	8.4 E-03	1.6 E-01
--	PM-10 <sup>e</sup>	1.4 E-02	2.6 E-01
12789-66-1	TSP	1.5 E-02	2.8 E-01

<sup>a</sup> Factors represent uncontrolled emissions. References 1, 2, and 5.

<sup>b</sup> CASRN = Chemical Abstracts Service Registry Number.

<sup>c</sup> NEW = net explosive weight. The NEW for this ordnance is 5.22 E-02 pounds per item. Reference 1.

<sup>d</sup> PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).

<sup>e</sup> PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

Table 15.10.4-2 EMISSION FACTORS FOR THE USE OF DODIC N335,  
M557 POINT DETONATING FUZE –  
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS<sup>a</sup>

EMISSION FACTOR RATING: C (except as noted)

CASRN <sup>b</sup>	Pollutant	lb per item	lb per lb NEW <sup>c</sup>
83-32-9	Acenaphthene <sup>d</sup>	5.3 E-10	1.0 E-08
208-96-8	Acenaphthylene <sup>d</sup>	2.7 E-09	5.2 E-08
75-07-0	Acetaldehyde <sup>e</sup>	6.2 E-07	1.2 E-05
75-05-8	Acetonitrile <sup>e</sup>	1.6 E-06	3.1 E-05
98-86-2	Acetophenone <sup>e,f</sup>	2.7 E-08	5.2 E-07
107-13-1	Acrylonitrile <sup>e</sup>	1.3 E-06	2.4 E-05
7429-90-5	Aluminum <sup>g</sup>	1.1 E-03	2.1 E-02
120-12-7	Anthracene <sup>e</sup>	7.4 E-10	1.4 E-08
7440-36-0	Antimony <sup>e</sup>	7.1 E-06	1.4 E-04
7440-39-3	Barium <sup>g</sup>	5.2 E-05	9.9 E-04
71-43-2	Benzene <sup>e</sup>	2.1 E-07	4.1 E-06
205-99-2	Benzo[b]fluoranthene <sup>e</sup>	7.4 E-10	1.4 E-08
7440-43-9	Cadmium <sup>e</sup>	4.9 E-05	9.4 E-04
75-15-0	Carbon disulfide <sup>e,f</sup>	4.3 E-08	8.3 E-07
74-87-3	Chloromethane <sup>e</sup>	2.3 E-08	4.3 E-07
7440-47-3	Chromium <sup>e</sup>	3.3 E-06	6.4 E-05
18540-29-9	Hexavalent chromium <sup>e</sup>	2.8 E-07	5.4 E-06
7440-48-4	Cobalt <sup>e</sup>	4.7 E-07	9.0 E-06
7440-50-8	Copper <sup>g</sup>	3.6 E-04	6.9 E-03
--	Total dioxin/furan compounds <sup>e</sup>	7.0 E-12	1.3 E-10
74-85-1	Ethylene <sup>g</sup>	1.3 E-06	2.4 E-05
117-81-7	bis(2-Ethylhexyl)phthalate <sup>e</sup>	8.5 E-06	1.6 E-04
206-44-0	Fluoranthene <sup>e</sup>	1.2 E-09	2.4 E-08
86-73-7	Fluorene <sup>d</sup>	4.7 E-10	9.0 E-09
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin <sup>e</sup>	5.1 E-13	9.8 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran <sup>e</sup>	6.8 E-13	1.3 E-11
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran <sup>e</sup>	2.6 E-13	4.9 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin <sup>e</sup>	1.1 E-13	2.1 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran <sup>e</sup>	5.6 E-13	1.1 E-11
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran <sup>e</sup>	2.5 E-13	4.7 E-12

Table 15.10.4-2 (cont.)

CASRN <sup>b</sup>	Pollutant	lb per item	lb per lb NEW <sup>c</sup>
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran <sup>e</sup>	2.0 E-13	3.7 E-12
74-90-8	Hydrogen cyanide <sup>e</sup>	1.6 E-05	3.1 E-04
7439-92-1	Lead <sup>e</sup>	3.0 E-04	5.7 E-03
7439-96-5	Manganese <sup>e</sup>	7.0 E-06	1.3 E-04
80-62-6	Methyl methacrylate <sup>e</sup>	7.6 E-08	1.5 E-06
91-20-3	Naphthalene <sup>e</sup>	8.1 E-09	1.5 E-07
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin <sup>e</sup>	2.6 E-12	5.0 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran <sup>e</sup>	8.7 E-13	1.7 E-11
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin <sup>e</sup>	8.5 E-14	1.6 E-12
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran <sup>e</sup>	2.3 E-13	4.4 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran <sup>e</sup>	4.0 E-13	7.6 E-12
85-01-8	Phenanthrene <sup>e</sup>	3.7 E-09	7.1 E-08
129-00-0	Pyrene <sup>d</sup>	2.0 E-09	3.9 E-08
7440-22-4	Silver <sup>g</sup>	1.4 E-06	2.7 E-05
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran <sup>e</sup>	1.9 E-13	3.5 E-12
108-88-3	Toluene <sup>e</sup>	5.6 E-08	1.1 E-06
95-63-6	1,2,4-Trimethylbenzene <sup>g</sup>	1.8 E-08	3.4 E-07
7440-62-2	Vanadium <sup>g</sup>	1.3 E-06	2.5 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene <sup>e,f</sup>	2.0 E-08	3.8 E-07
7440-66-6	Zinc <sup>g</sup>	5.9 E-04	1.1 E-02

<sup>a</sup> Factors represent uncontrolled emissions. References 1, 2, and 5.

<sup>b</sup> CASRN = Chemical Abstracts Service Registry Number.

<sup>c</sup> NEW = net explosive weight. The NEW for this ordnance is 5.22 E-02 pounds per item. Reference 1.

<sup>d</sup> Hazardous air pollutant under CAA Section 112(b).

<sup>e</sup> Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

<sup>f</sup> EMISSION FACTOR RATING D.

<sup>g</sup> Reportable chemical under EPCRA Section 313.

#### References For Section 15.10.4

1. *Report No. 5 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, January 2005.

2. *Detailed Test Plan No. 5 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, May 2002.
3. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.
4. *Background Document, Report on Revisions to 5<sup>th</sup> Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 5 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.
5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team - Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2004 and March 2005.

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## 15.10.5 N340, M739A1 Point Detonating Fuze

### 15.10.5.1 Ordnance Description<sup>1</sup>

The M739A1 Point Detonating Fuze (DODIC N340) is designed for use in all standard high explosive artillery, 4.2-inch mortar, 105-mm through 8-inch howitzers, and 175-mm guns. It is a selective super quick (SQ), 0.05-second delay, or auto-delay impact fuze. This ammunition is used during combat and on firing ranges during training. Note that emission factors presented herein include only those associated with the detonation of the fuze; emissions associated with the detonation of the ammunition to which the fuze is attached are not addressed in this section.

The M739A1 Point Detonating Fuze includes a solid aluminum alloy body, booster charge, and five subassemblies: a crossbar and holder assembly, a firing pin and detonator assembly, a setting sleeve assembly, an impact delay module assembly, and a safe and arming assembly. The detonator assembly contains an intermediate charge and primer mix. The safe and arming assembly contains multiple charges and primer mix.

### 15.10.5.2 Emissions And Controls<sup>1-5</sup>

The primary emissions from the ignition of the M739A1 Point Detonating Fuze are carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), and particulate matter. Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically detonated in the field, there are no controls associated with its use.

Table 15.10.5-1 presents emission factors for CO<sub>2</sub>, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.10.5-2 presents emission factors for hazardous air pollutants and toxic chemicals. The emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.10.5-1 EMISSION FACTORS FOR THE USE OF DODIC N340,  
M739A1 POINT DETONATING FUZE – CARBON DIOXIDE, CRITERIA POLLUTANTS,  
METHANE, AND TOTAL SUSPENDED PARTICULATE<sup>a</sup>

EMISSION FACTOR RATING: C

CASRN <sup>b</sup>	Pollutant	lb per item	lb per lb NEW <sup>c</sup>
124-38-9	CO <sub>2</sub>	2.5 E-02	5.5 E-01
630-08-0	CO	3.5 E-04	7.7 E-03
7439-92-1	Lead (Pb)	1.0 E-04	2.2 E-03
--	Oxides of nitrogen (NO <sub>x</sub> )	5.3 E-04	1.1 E-02
--	PM-2.5 <sup>d</sup>	1.0 E-02	2.2 E-01
--	PM-10 <sup>e</sup>	1.6 E-02	3.6 E-01
12789-66-1	TSP	1.6 E-02	3.6 E-01

<sup>a</sup> Factors represent uncontrolled emissions. References 1, 2, and 5.

<sup>b</sup> CASRN = Chemical Abstracts Service Registry Number.

<sup>c</sup> NEW = net explosive weight. The NEW for this ordnance is 4.59 E-02 pounds per item. Reference 1.

<sup>d</sup> PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).

<sup>e</sup> PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

Table 15.10.5-2 EMISSION FACTORS FOR THE USE OF DODIC N340,  
M739A1 POINT DETONATING FUZE –  
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS<sup>a</sup>

EMISSION FACTOR RATING: C (except as noted)

CASRN <sup>b</sup>	Pollutant	lb per item	lb per lb NEW <sup>c</sup>
208-96-8	Acenaphthylene <sup>d</sup>	1.6 E-09	3.4 E-08
75-07-0	Acetaldehyde <sup>e</sup>	6.5 E-07	1.4 E-05
75-05-8	Acetonitrile <sup>e</sup>	4.1 E-07	8.9 E-06
107-13-1	Acrylonitrile <sup>e</sup>	4.9 E-07	1.1 E-05
7429-90-5	Aluminum <sup>f</sup>	9.6 E-04	2.1 E-02
7440-36-0	Antimony <sup>e</sup>	2.2 E-06	4.9 E-05
7440-39-3	Barium <sup>f</sup>	9.1 E-06	2.0 E-04
71-43-2	Benzene <sup>e</sup>	3.7 E-07	8.1 E-06
7440-43-9	Cadmium <sup>e</sup>	4.9 E-05	1.1 E-03
74-87-3	Chloromethane <sup>e</sup>	2.3 E-08	5.1 E-07
7440-47-3	Chromium <sup>e</sup>	1.1 E-06	2.4 E-05
7440-50-8	Copper <sup>f</sup>	2.3 E-04	5.1 E-03
--	Total dioxin/furan compounds <sup>e</sup>	1.0 E-12	2.3 E-11
100-41-4	Ethylbenzene <sup>e</sup>	4.9 E-08	1.1 E-06
74-85-1	Ethylene <sup>f</sup>	9.3 E-07	2.0 E-05
117-81-7	bis(2-Ethylhexyl)phthalate <sup>e</sup>	5.4 E-06	1.2 E-04
206-44-0	Fluoranthene <sup>e</sup>	1.7 E-09	3.7 E-08
86-73-7	Fluorene <sup>d</sup>	4.8 E-10	1.0 E-08
50-00-0	Formaldehyde <sup>e</sup>	9.7 E-07	2.1 E-05
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran <sup>e</sup>	2.8 E-13	6.2 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran <sup>e</sup>	2.2 E-13	4.7 E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran <sup>e</sup>	1.0 E-13	2.2 E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran <sup>e</sup>	1.1 E-13	2.4 E-12
74-90-8	Hydrogen cyanide <sup>e</sup>	2.0 E-06	4.4 E-05
7439-92-1	Lead <sup>e</sup>	1.0 E-04	2.2 E-03
7439-96-5	Manganese <sup>e</sup>	1.2 E-05	2.6 E-04
80-62-6	Methyl methacrylate <sup>e</sup>	4.6 E-08	1.0 E-06
1634-04-4	Methyl tert-butyl ether <sup>e,g</sup>	7.1 E-09	1.6 E-07
91-20-3	Naphthalene <sup>e</sup>	1.4 E-08	3.1 E-07
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran <sup>e</sup>	1.5 E-13	3.3 E-12

Table 15.10.5-2 (cont.)

CASRN <sup>b</sup>	Pollutant	lb per item	lb per lb NEW <sup>c</sup>
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran <sup>e</sup>	1.8 E-13	4.0 E-12
85-01-8	Phenanthrene <sup>e</sup>	3.3 E-09	7.2 E-08
129-00-0	Pyrene <sup>d</sup>	7.8 E-10	1.7 E-08
100-42-5	Styrene <sup>e</sup>	5.6 E-07	1.2 E-05
108-88-3	Toluene <sup>e</sup>	5.0 E-08	1.1 E-06
75-69-4	Trichlorofluoromethane <sup>f</sup>	1.0 E-08	2.3 E-07
95-63-6	1,2,4-Trimethylbenzene <sup>f</sup>	8.3 E-08	1.8 E-06
7440-62-2	Vanadium <sup>f</sup>	4.5 E-07	9.8 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene <sup>e</sup>	1.6 E-08	3.5 E-07
95-47-6	o-Xylene <sup>e</sup>	4.1 E-08	8.9 E-07
7440-66-6	Zinc <sup>f</sup>	3.0 E-03	6.5 E-02

<sup>a</sup> Factors represent uncontrolled emissions. References 1, 2, and 5.

<sup>b</sup> CASRN = Chemical Abstracts Service Registry Number.

<sup>c</sup> NEW = net explosive weight. The NEW for this ordnance is 4.59 E-02 pounds per item. Reference 1.

<sup>d</sup> Hazardous air pollutant under CAA Section 112(b).

<sup>e</sup> Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

<sup>f</sup> Reportable chemical under EPCRA Section 313.

<sup>g</sup> EMISSION FACTOR RATING D.

#### References For Section 15.10.5

1. *Report No. 5 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, January 2005.
2. *Detailed Test Plan No. 5 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, May 2002.
3. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.
4. *Background Document, Report on Revisions to 5<sup>th</sup> Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 5 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team - Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2004 and March 2005.