

15.9 Blasting Caps, Demolition Charges, And Detonators

Munitions listed in this section begin with the Department of Defense Identification Code (DODIC) letter “M.” This category of munitions includes blasting caps, demolition charges, and detonators. Examples include trinitrotoluene (TNT), Composition C4 demolition block charges, detonation cord, military dynamite, and blasting caps.

15.9.1 M023, M112 Demolition Block Charge

15.9.1.1 Ordnance Description^{1,2}

The M112 Demolition Block Charge (DODIC M023) is a plastic explosive ideally suited for cutting charges as the adhesive backing allows the charge to be attached to any relatively dry, flat surface above freezing. This ammunition is used during combat and on firing ranges during training. The explosive is packed in a mylar wrapper, but it can be removed from the wrapper and hand formed as desired to suit the target. When the charge is detonated, the explosive is converted to compressed gas that exerts pressure in the form of a shock wave. Depending on the placement of the charge in relation to the target, the pressure generated at detonation destroys the target by cutting, breaching, or cratering.

15.9.1.2 Emissions And Controls^{1,3-6}

The primary emission from the use of the M112 Demolition Block Charge is carbon dioxide (CO₂). 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 used in the field, there are no controls associated with its use.

Table 15.9.1-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.1-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.1-1 EMISSION FACTORS FOR THE USE OF DODIC M023,
M112 DEMOLITION BLOCK CHARGE – CARBON DIOXIDE, CRITERIA POLLUTANTS,
METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	7.9 E-01	6.3 E-01
630-08-0	Carbon monoxide (CO) ^g	2.6 E-02	2.1 E-02
7439-92-1	Lead (Pb)	1.7 E-04	1.4 E-04
74-82-8	Methane ^g	1.6 E-03	1.3 E-03
--	Oxides of nitrogen (NO _x) ^f	7.9 E-03	6.3 E-03
--	PM-2.5 ^{d,g}	1.9 E-02	1.5 E-02
--	PM-10 ^e	2.6 E-02	2.1 E-02
7446-09-5	Sulfur dioxide (SO ₂)	1.5 E-04	1.2 E-04
12789-66-1	TSP	3.2 E-02	2.6 E-02

^a Factors represent uncontrolled emissions. References 1, 3, and 6.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.25 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.1-2 EMISSION FACTORS FOR THE USE OF DODIC M023,
M112 DEMOLITION BLOCK CHARGE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
83-32-9	Acenaphthene ^{d,h}	3.2 E-08	2.6 E-08
208-96-8	Acenaphthylene ^{d,h}	3.5 E-07	2.8 E-07
75-05-8	Acetonitrile ^{e,h}	1.2 E-04	9.9 E-05
107-13-1	Acrylonitrile ^{e,h}	9.4 E-06	7.5 E-06
7429-90-5	Aluminum ^{f,h}	2.1 E-04	1.7 E-04
120-12-7	Anthracene ^{e,h}	5.0 E-08	4.0 E-08
7440-36-0	Antimony ^{e,i}	2.9 E-06	2.3 E-06
7440-39-3	Barium ^f	5.5 E-06	4.4 E-06
71-43-2	Benzene ^{e,h}	1.4 E-05	1.1 E-05
85-68-7	Butylbenzylphthalate ^{d,g}	3.5 E-06	2.8 E-06
7440-47-3	Chromium ^{e,h}	9.4 E-06	7.5 E-06
7440-50-8	Copper ^{f,h}	1.2 E-04	9.4 E-05
84-74-2	Dibutyl phthalate ^{e,g}	4.3 E-06	3.5 E-06
75-71-8	Dichlorodifluoromethane ^{f,h}	5.1 E-08	4.1 E-08
107-06-2	1,2-Dichloroethane ^e	2.9 E-07	2.3 E-07
--	Total dioxin/furan compounds ^e	3.8 E-10	3.0 E-10
74-85-1	Ethylene ^{f,h}	1.3 E-04	1.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate ^{e,g}	1.5 E-05	1.2 E-05
206-44-0	Fluoranthene ^{e,h}	7.1 E-08	5.7 E-08
86-73-7	Fluorene ^{d,h}	1.8 E-08	1.5 E-08
50-00-0	Formaldehyde ^e	1.4 E-04	1.1 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	2.9 E-11	2.4 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^e	3.0 E-12	2.4 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^{e,i}	2.3 E-13	1.8 E-13
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^e	2.3 E-13	1.8 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^e	5.2 E-13	4.2 E-13
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^{e,i}	3.9 E-13	3.1 E-13
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^e	8.1 E-13	6.5 E-13
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^e	3.0 E-13	2.4 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^e	1.7 E-13	1.3 E-13

Table 15.9.1-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
110-54-3	Hexane ^e	4.6 E-05	3.7 E-05
74-90-8	Hydrogen cyanide ^e	5.3 E-04	4.2 E-04
7439-92-1	Lead ^e	1.7 E-04	1.4 E-04
7439-96-5	Manganese ^{e,h}	2.8 E-05	2.3 E-05
75-09-2	Methylene chloride ^{e,h}	1.9 E-06	1.5 E-06
91-20-3	Naphthalene ^e	2.2 E-06	1.7 E-06
7697-37-2	Nitric acid ^{f,h}	1.2 E-03	9.9 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	3.3 E-10	2.7 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^{e,i}	6.3 E-12	5.1 E-12
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^e	2.3 E-13	1.8 E-13
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^{e,i}	9.5 E-13	7.6 E-13
85-01-8	Phenanthrene ^{e,h}	2.9 E-07	2.3 E-07
115-07-1	Propylene ^{f,h}	2.4 E-05	2.0 E-05
129-00-0	Pyrene ^{d,h}	1.7 E-07	1.4 E-07
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	1.1 E-12	9.0 E-13
108-88-3	Toluene ^{e,h}	3.7 E-06	3.0 E-06
71-55-6	1,1,1-Trichloroethane ^e	7.6 E-09	6.0 E-09
75-69-4	Trichlorofluoromethane ^f	4.7 E-09	3.7 E-09
95-63-6	1,2,4-Trimethylbenzene ^{f,h}	2.2 E-06	1.7 E-06
7440-66-6	Zinc ^{f,h}	2.6 E-05	2.1 E-05

^a Factors represent uncontrolled emissions. References 1, 3, and 6.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.25 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.1

1. *Report No. 1 for the Exploding Ordnance Emission Study Phase II, Revision 1*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2004.

2. *Training Munitions Health Risk Assessment No. 39-DA-1485-02, Residential Exposure from Inhalation of Air Emissions After Detonation of the M112 Demolition Charge, Department of Defense Identification Code: M023*, U.S. Army Center for Health Promotion and Preventive Medicine, Environmental Health Risk Assessment Program, September 2002.
3. *Detailed Test Plan No. 1 for the Exploding Ordnance Emission Study, Series I*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2000.
4. *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.
5. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series I Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.
6. 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, May 2004.

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15.9.2 M030, 1/4-Pound Demolition Block Charge

15.9.2.1 Ordnance Description¹⁻³

The 1/4-Pound Demolition Block Charge (DODIC M030) is a trinitrotoluene (TNT) filled cylindrical waterproof cardboard container with metal end caps and a threaded cap well on one end. Typically, demolition block charges are used for all types of demolition work, including cutting and breaching of hard surfaced materials. The high detonating velocity of TNT makes it well suited for demolition; however, the 1/4-Pound Demolition Block Charge is primarily used for training purposes.

15.9.2.2 Emissions And Controls^{1,2,4-9}

The primary pollutant emitted from the use of the 1/4-Pound Demolition Block Charge is carbon dioxide (CO₂). 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 used in the field, there are no controls associated with its use.

Table 15.9.2-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.2-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.2-1 EMISSION FACTORS FOR THE USE OF DODIC M030,
 1/4-POUND DEMOLITION BLOCK CHARGE – CARBON DIOXIDE, CRITERIA POLLUTANTS,
 METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	3.4 E-01	1.4
630-08-0	Carbon monoxide (CO) ^g	5.0 E-03	2.0 E-02
7439-92-1	Lead (Pb)	1.4 E-04	5.6 E-04
74-82-8	Methane ^g	2.0 E-05	8.1 E-05
--	Oxides of nitrogen (NO _x) ^f	3.0 E-03	1.2 E-02
--	PM-2.5 ^{d,g}	4.6 E-03	1.9 E-02
--	PM-10 ^e	1.2 E-02	5.0 E-02
7446-09-5	Sulfur dioxide (SO ₂)	8.1 E-05	3.2 E-04
12789-66-1	TSP	1.7 E-02	6.7 E-02

^a Factors represent uncontrolled emissions. References 1, 3, and 6.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.25 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.2-2 EMISSION FACTORS FOR THE USE OF DODIC M030,
1/4-POUND DEMOLITION BLOCK CHARGE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
83-32-9	Acenaphthene ^{d,h}	4.9 E-09	2.0 E-08
208-96-8	Acenaphthylene ^{d,h}	3.8 E-08	1.5 E-07
107-13-1	Acrylonitrile ^{e,i}	5.8 E-07	2.3 E-06
7429-90-5	Aluminum ^{f,h}	2.7 E-04	1.1 E-03
120-12-7	Anthracene ^{e,h}	7.0 E-09	2.8 E-08
7440-39-3	Barium ^f	1.5 E-04	5.9 E-04
71-43-2	Benzene ^e	2.9 E-07	1.2 E-06
56-55-3	Benzo[a]anthracene ^e	2.7 E-09	1.1 E-08
71-36-3	n-Butanol ^{f,i}	6.3 E-06	2.5 E-05
75-65-0	t-Butyl alcohol ^e	3.9 E-07	1.6 E-06
85-68-7	Butylbenzylphthalate ^{d,g}	5.5 E-06	2.2 E-05
74-87-3	Chloromethane ^{e,h}	6.6 E-08	2.6 E-07
7440-47-3	Chromium ^{e,h}	5.4 E-06	2.2 E-05
218-01-9	Chrysene ^e	2.6 E-09	1.0 E-08
7440-50-8	Copper ^{f,h}	1.2 E-04	4.7 E-04
84-74-2	Dibutyl phthalate ^{e,g}	2.2 E-06	8.9 E-06
75-71-8	Dichlorodifluoromethane ^{f,h}	3.7 E-09	1.5 E-08
121-14-2	2,4-Dinitrotoluene ^e	3.6 E-07	1.4 E-06
--	Total dioxin/furan compounds ^e	8.9 E-11	3.6 E-10
100-41-4	Ethylbenzene ^{e,h}	7.6 E-07	3.1 E-06
74-85-1	Ethylene ^{f,h}	6.5 E-06	2.6 E-05
117-81-7	bis(2-Ethylhexyl)phthalate ^{e,g}	3.7 E-06	1.5 E-05
206-44-0	Fluoranthene ^{e,h}	1.2 E-08	4.9 E-08
86-73-7	Fluorene ^{d,h}	1.5 E-08	6.0 E-08
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	6.4 E-12	2.5 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^{e,i}	9.7 E-13	3.9 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^e	1.3 E-13	5.1 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^e	3.3 E-13	1.3 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^e	2.4 E-13	9.7 E-13
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^{e,i}	1.9 E-13	7.8 E-13

Table 15.9.2-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^e	1.3 E-13	5.1 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^e	6.7 E-14	2.7 E-13
74-90-8	Hydrogen cyanide ^e	1.3 E-04	5.2 E-04
7439-92-1	Lead ^e	1.4 E-04	5.6 E-04
7439-96-5	Manganese ^{e,h}	1.9 E-05	7.8 E-05
75-09-2	Methylene chloride ^{e,h}	3.3 E-07	1.3 E-06
91-20-3	Naphthalene ^{e,h}	7.9 E-08	3.2 E-07
7697-37-2	Nitric acid ^{f,i}	5.9 E-05	2.4 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	8.0 E-11	3.2 E-10
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^{e,i}	1.4 E-13	5.5 E-13
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^e	1.7 E-13	6.9 E-13
85-01-8	Phenanthrene ^{e,h}	4.8 E-08	1.9 E-07
129-00-0	Pyrene ^{d,h}	2.2 E-08	8.9 E-08
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	6.7 E-13	2.7 E-12
108-88-3	Toluene ^{e,h}	9.3 E-09	3.7 E-08
71-55-6	1,1,1-Trichloroethane ^{e,i}	5.7 E-06	2.3 E-05
95-63-6	1,2,4-Trimethylbenzene ^f	1.7 E-06	6.9 E-06
108-05-4	Vinyl acetate ^e	3.2 E-07	1.3 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	2.3 E-06	9.2 E-06
95-47-6	o-Xylene ^{e,h}	1.5 E-06	6.1 E-06
7440-66-6	Zinc ^{f,h}	1.4 E-05	5.8 E-05

^a Factors represent uncontrolled emissions. References 1, 3, and 6.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.25 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.2

1. *Report No. 1 for the Exploding Ordnance Emission Study Phase II, Revision 1, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2004.*

2. *Report No. 3 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2004.
3. *Training Munitions Health Risk Assessment No. 39-DA-1485-02, Residential Exposure from Inhalation of Air Emissions After Detonation of the M30 Demolition Charge*, Department of Defense Identification Code: M031, U.S. Army Center for Health Promotion and Preventive Medicine, Environmental Health Risk Assessment Program, September 2002.
4. *Detailed Test Plan No. 1 for the Exploding Ordnance Emission Study, Series I*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2000.
5. *Detailed Test Plan No. 3 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.
6. *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.
7. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 1 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.
8. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 3 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.
9. 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, May 2004 and January 2005.

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15.9.3 M031, 1/2-Pound Demolition Block Charge

15.9.3.1 Ordnance Description¹⁻³

The 1/2-Pound Demolition Block Charge (DODIC M031) is a trinitrotoluene (TNT) filled rectangular waterproof cardboard container with metal end caps and a threaded cap well on one end. The high detonating velocity of TNT makes it well suited for demolition, and these charges are used for all types of demolition work, including cutting and breaching of hard surfaced materials. This ammunition is used during combat and on firing ranges during training.

15.9.3.2 Emissions And Controls^{1,2,4,5}

The primary emissions from the use of the 1/2-Pound Demolition Block Charge are carbon dioxide (CO₂) and particulate matter. 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 used in the field, there are no controls associated with its use.

Table 15.9.3-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.9.3-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in terms of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

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Table 15.9.3-1 EMISSION FACTORS FOR THE USE OF DODIC M031,
 1/2-POUND DEMOLITION BLOCK CHARGE – CARBON DIOXIDE, CRITERIA POLLUTANTS,
 TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	7.2 E-01	1.5
630-08-0	Carbon monoxide (CO) ^g	1.1 E-02	2.3 E-02
7439-92-1	Lead (Pb)	1.1 E-04	2.2 E-04
--	Oxides of nitrogen (NO _x) ^f	7.4 E-03	1.5 E-02
--	PM-2.5 ^{d,g}	6.4 E-03	1.3 E-02
--	PM-10 ^e	6.7 E-02	1.4 E-01
7446-09-5	Sulfur dioxide ^h	7.5 E-07	1.5 E-06
--	TNMHC ^g	2.3 E-03	4.7 E-03
12789-66-1	TSP	1.7 E-01	3.4 E-01

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 5.00 E-01 pounds per item. Reference 2.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

^h EMISSION FACTOR RATING D.

Table 15.9.3-2 EMISSION FACTORS FOR THE USE OF DODIC M031,
 1/2-POUND DEMOLITION BLOCK CHARGE –
 HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7429-90-5	Aluminum ^{d,h}	5.6 E-03	1.1 E-02
7440-36-0	Antimony ^e	3.2 E-05	6.5 E-05
7440-38-2	Arsenic ^e	4.7 E-06	9.6 E-06
7440-39-3	Barium ^d	1.9 E-04	3.9 E-04
71-43-2	Benzene ^{e,h}	3.7 E-05	7.5 E-05
7440-41-7	Beryllium ^e	3.9 E-07	7.9 E-07
106-99-0	1,3-Butadiene ^{e,h}	6.0 E-06	1.2 E-05
71-36-3	n-Butanol ^d	2.7 E-07	5.5 E-07
111-76-2	2-Butoxyethanol ^{d,i}	1.4 E-05	2.9 E-05
85-68-7	Butylbenzylphthalate ^{f,g}	3.1 E-06	6.3 E-06
7440-43-9	Cadmium ^e	6.7 E-06	1.4 E-05
56-23-5	Carbon tetrachloride ^e	7.5 E-07	1.5 E-06
7440-47-3	Chromium ^{e,h}	3.9 E-04	7.9 E-04
7440-48-4	Cobalt ^{e,h}	4.4 E-06	8.9 E-06
7440-50-8	Copper ^{d,h}	1.6 E-03	3.2 E-03
98-82-8	Cumene ^{e,h}	8.7 E-07	1.8 E-06
110-82-7	Cyclohexane ^{d,h}	4.7 E-06	9.6 E-06
84-74-2	Dibutylphthalate ^{e,g}	1.8 E-06	3.7 E-06
131-11-3	Dimethyl phthalate ^{e,i}	3.0 E-07	6.2 E-07
99-65-0	1,3-Dinitrobenzene ^d	2.9 E-07	5.9 E-07
121-14-2	2,4-Dinitrotoluene ^e	4.6 E-07	9.5 E-07
606-20-2	2,6-Dinitrotoluene ^d	6.0 E-06	1.2 E-05
--	Total dioxin/furan compounds ^e	1.4 E-09	2.8 E-09
74-85-1	Ethylene ^{d,h}	7.8 E-05	1.6 E-04
117-81-7	bis(2-Ethylhexyl)phthalate ^{e,g}	2.2 E-05	4.4 E-05
206-44-0	Fluoranthene ^{e,h}	1.4 E-07	2.9 E-07
50-00-0	Formaldehyde ^e	5.4 E-05	1.1 E-04
76-13-1	Freon 113 ^{d,h}	5.0 E-08	1.0 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	1.3 E-10	2.7 E-10
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^e	6.1 E-11	1.2 E-10

Table 15.9.3-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^{e,i}	3.7 E-12	7.5 E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^{e,i}	5.0 E-12	1.0 E-11
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^e	6.3 E-12	1.3 E-11
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^e	5.8 E-12	1.2 E-11
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^{e,i}	3.7 E-12	7.5 E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^{e,i}	4.7 E-12	9.5 E-12
110-54-3	n-Hexane ^e	1.2 E-05	2.3 E-05
1634-04-4	Hydrogen cyanide ^e	1.9 E-06	3.9 E-06
7439-92-1	Lead ^e	1.1 E-04	2.2 E-04
7439-96-5	Manganese ^{e,h}	1.2 E-04	2.4 E-04
7439-97-6	Mercury ^e	3.3 E-08	6.8 E-08
75-09-2	Methylene chloride ^{e,h}	3.7 E-02	7.5 E-02
91-20-3	Naphthalene ^{e,h}	3.7 E-06	7.6 E-06
7440-02-0	Nickel ^{e,h}	1.3 E-05	2.6 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	1.0 E-09	2.1 E-09
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^e	8.9 E-11	1.8 E-10
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ^e	2.3 E-12	4.7 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^e	1.9 E-12	3.8 E-12
85-01-8	Phenanthrene ^{e,h}	3.5 E-07	7.1 E-07
108-95-2	Phenol ^e	3.8 E-06	7.7 E-06
7723-14-0	Phosphorus ^{f,h}	1.7 E-04	3.5 E-04
115-07-1	Propylene ^{d,h}	2.1 E-05	4.3 E-05
129-00-0	Pyrene ^{f,h}	1.3 E-07	2.7 E-07
7440-22-4	Silver ^d	3.3 E-07	6.7 E-07
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^{e,i}	3.7 E-12	7.6 E-12
7440-28-0	Thallium ^d	2.6 E-07	5.2 E-07
108-88-3	Toluene ^{e,h}	2.3 E-05	4.7 E-05
75-69-4	Trichlorofluoromethane ^d	2.4 E-07	4.9 E-07
95-63-6	1,2,4-Trimethylbenzene ^d	1.4 E-06	2.9 E-06
540-84-1	2,2,4-Trimethylpentane ^{f,h}	7.7 E-06	1.6 E-05
7440-66-6	Zinc ^{d,h}	8.5 E-04	1.7 E-03

Table 15.9.3-2 (cont.)

- ^a Factors represent uncontrolled emissions. References 1, 2, and 5.
- ^b CASRN = Chemical Abstracts Service Registry Number.
- ^c NEW = net explosive weight. The NEW for this ordnance is 5.00 E-01 pound per item. Reference 2.
- ^d Reportable chemical under EPCRA Section 313.
- ^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
- ^f Hazardous air pollutant under CAA Section 112(b).
- ^g EMISSION FACTOR RATING A.
- ^h EMISSION FACTOR RATING B.
- ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.3

1. *Detailed Test Plan for Phase IV-A Emission Characterization, Exploding Ordnance: M118 Block Demolition Charge, 1/2-lb TNT Block Demolition Charge, PETN Type 1 Detonating Cord, and 20 gr/ft and 225 gr/ft Flexible Linear-Shaped Demolition Charges*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, May 2001.
2. *Sampling Results for AEC Phase IV-A Exploding Ordnance Emission Characterization*, URS Corporation, Oak Ridge, TN, June 2003.
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 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase IV-A Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2007.
5. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Corporation, Oak Ridge, TN, January 2005.

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15.9.4 M032, 1-Pound Demolition Block Charge

15.9.4.1 Ordnance Description¹⁻³

The 1-Pound Demolition Block Charge (DODIC M032) is a trinitrotoluene (TNT) filled rectangular waterproof cardboard container with metal end caps and a threaded cap well on one end. The high detonating velocity of TNT makes it well suited for demolition, and these charges are used for all types of demolition work, including cutting and breaching of hard surfaced materials. This ammunition is used during combat and on firing ranges during training.

15.9.4.2 Emissions And Controls^{1,2,4-8}

Carbon dioxide (CO₂) is the primary emission from the use of the 1-Pound Demolition Block Charge. 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 fired in the field, there are no controls associated with its use.

Table 15.9.4-1 presents emission factors for CO₂, criteria pollutants, and total suspended particulate (TSP). Table 15.9.4-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.4-1 EMISSION FACTORS FOR THE USE OF DODIC M032,
 1-POUND DEMOLITION BLOCK CHARGE – CARBON DIOXIDE, CRITERIA POLLUTANTS,
 AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW
124-38-9	CO ₂ ^f	1.2	1.2
630-08-0	Carbon monoxide (CO) ^g	4.8 E-03	4.8 E-03
7439-92-1	Lead (Pb)	2.0 E-04	2.0 E-04
--	Oxides of nitrogen (NO _x) ^f	1.3 E-02	1.3 E-02
--	PM-2.5 ^{d,g}	1.4 E-02	1.4 E-02
--	PM-10 ^e	2.5 E-02	2.5 E-02
7446-09-5	Sulfur dioxide	4.0 E-05	4.0 E-05
12789-66-1	Total suspended particulate	3.2 E-02	3.2 E-02

^a Factors represent uncontrolled emissions. References 1-4 and 8.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.0 pound per item. References 1 and 2.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.4-2 EMISSION FACTORS FOR THE USE OF DODIC M032,
 1-POUND DEMOLITION BLOCK CHARGE –
 HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
83-32-9	Acenaphthene ^{d,h}	9.2 E-09	9.2 E-09
208-96-8	Acenaphthylene ^{d,h}	1.0 E-07	1.0 E-07
107-13-1	Acrylonitrile ^{e,h}	3.1 E-07	3.1 E-07
7429-90-5	Aluminum ^{f,h}	9.1 E-04	9.1 E-04
120-12-7	Anthracene ^{e,h}	1.2 E-08	1.2 E-08
7440-39-3	Barium ^f	6.2 E-04	6.2 E-04
71-43-2	Benzene ^{e,h}	1.7 E-07	1.7 E-07
85-68-7	Butylbenzylphthalate ^{d,g}	1.7 E-06	1.7 E-06
74-87-3	Chloromethane ^{e,h}	1.1 E-07	1.1 E-07
7440-47-3	Chromium ^{e,h}	8.7 E-06	8.7 E-06
18540-29-9	Chromium hexavalent ion ^e	2.1 E-06	2.1 E-06
7440-50-8	Copper ^{f,h}	5.3 E-04	5.3 E-04
84-74-2	Dibutyl phthalate ^{e,g}	2.9 E-06	2.9 E-06
75-71-8	Dichlorodifluoromethane ^{f,h}	1.0 E-09	1.0 E-09
121-14-2	2,4-Dinitrotoluene ^e	1.5 E-06	1.5 E-06
--	Total dioxin/furan compounds ^e	2.5 E-10	2.5 E-10
74-85-1	Ethylene ^{f,h}	5.8 E-06	5.8 E-06
117-81-7	bis(2-Ethylhexyl)phthalate ^{e,g}	9.9 E-06	9.9 E-06
86-73-7	Fluorene ^{d,h}	2.1 E-08	2.1 E-08
50-00-0	Formaldehyde ^e	5.8 E-05	5.8 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	1.5 E-11	1.5 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^e	1.8 E-12	1.8 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^e	5.5 E-13	5.5 E-13
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^e	4.4 E-13	4.4 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^e	5.4 E-13	5.4 E-13
74-90-8	Hydrogen cyanide ^e	4.4 E-05	4.4 E-05
7439-92-1	Lead ^e	2.0 E-04	2.0 E-04
7439-96-5	Manganese ^{e,h}	4.3 E-05	4.3 E-05
91-20-3	Naphthalene ^{e,h}	2.6 E-07	2.6 E-07
7697-37-2	Nitric acid ^{f,h}	4.5 E-04	4.5 E-04

Table 15.9.4-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	2.2 E-10	2.2 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^e	3.4 E-12	3.4 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^{e,i}	7.0 E-13	7.0 E-13
85-01-8	Phenanthrene ^{e,h}	1.3 E-07	1.3 E-07
7782-49-2	Selenium ^e	3.8 E-06	3.8 E-06
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	8.6 E-13	8.6 E-13
75-69-4	Trichlorofluoromethane ^f	5.8 E-10	5.8 E-10
7440-62-2	Vanadium ^f	2.6 E-04	2.6 E-04
75-01-4	Vinyl chloride ^{e,i}	8.0 E-08	8.0 E-08
7440-66-6	Zinc ^{f,h}	3.3 E-04	3.3 E-04

^a Factors represent uncontrolled emissions. References 1, 2, 4, 5, and 8.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.0 pounds per item. References 1 and 2.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.4

1. *Report No. 2 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2003.
2. *Report No. 3 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2004.
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. *Detailed Test Plan No. 2 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, March 2001.
5. *Detailed Test Plan No. 3 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

6. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 2 Testing Conducted at Aberdeen Proving Ground, Maryland, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.*
7. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 3 Testing Conducted at Aberdeen Proving Ground, Maryland, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.*
8. 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, May 2004 and January 2005.

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15.9.8 M130, M6 Electric Blasting Cap

15.9.8.1 Ordnance Description¹⁻³

The M6 Electric Blasting Cap (DODIC M130) is used to initiate high explosives with a blasting machine or other suitable source of electric power. It is capable of detonating all standard military explosives. The M6 Electric Blasting Cap consists of a high explosive base charge, an intermediate charge, and an ignition charge contained in an aluminum alloy cup. Upon initiation, the ignition charge detonates the intermediate charge, which detonates the base charge, which in turn detonates the explosive charge. This ammunition is used during combat and on firing ranges during training.

15.9.8.2 Emissions And Controls^{1,2,4,5}

Carbon dioxide (CO₂), carbon monoxide (CO), particulate matter, and lead are the primary emissions from the use of the M6 Electric Blasting Cap. 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 fired in the field, there are no controls associated with its use.

Table 15.9.8-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.8-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.8-1 EMISSION FACTORS FOR THE USE OF DODIC M130,
M6 ELECTRIC BLASTING CAP – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE,
AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW
124-38-9	CO ₂ ^f	7.2 E-04	2.4 E-01
630-08-0	CO ^g	3.2 E-04	1.1 E-01
7439-92-1	Lead (Pb)	1.5 E-04	5.1 E-02
74-82-8	Methane	4.5 E-06	1.6 E-03
--	Oxides of nitrogen (NO _x) ^f	7.7 E-05	2.6 E-02
--	PM-2.5 ^{d,g}	2.4 E-04	8.2 E-02
--	PM-10 ^e	4.0 E-04	1.4 E-01
12789-66-1	TSP	4.1 E-04	1.4 E-01

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.92 E-03 pounds per item. References 1 and 5.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.8-2 EMISSION FACTORS FOR THE USE OF DODIC M130,
M6 ELECTRIC BLASTING CAP –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-07-0	Acetaldehyde ^e	1.5 E-07	5.3 E-05
75-05-8	Acetonitrile ^e	2.3 E-06	7.8 E-04
107-13-1	Acrylonitrile ^e	2.7 E-08	9.3 E-06
7429-90-5	Aluminum ^{f,h}	2.3 E-05	8.0 E-03
7664-41-7	Ammonia ^f	5.0 E-05	1.7 E-02
7440-39-3	Barium ^f	6.2 E-08	2.1 E-05
71-43-2	Benzene ^e	6.9 E-08	2.3 E-05
7440-47-3	Chromium ^e	1.3 E-07	4.6 E-05
7440-48-4	Cobalt ^{e,h}	1.1 E-08	3.7 E-06
7440-50-8	Copper ^{f,h}	3.1 E-07	1.1 E-04
--	Total dioxin/furan compounds ^e	1.1 E-12	3.7 E-10
74-85-1	Ethylene ^f	2.6 E-07	8.8 E-05
206-44-0	Fluoranthene ^{e,h}	2.3 E-09	7.9 E-07
50-00-0	Formaldehyde ^e	5.9 E-07	2.0 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{e,i}	8.7 E-14	3.0 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^e	7.8 E-14	2.7 E-11
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^{e,i}	6.1 E-14	2.1 E-11
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^{e,i}	1.3 E-14	4.5 E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^{e,i}	1.5 E-14	5.1 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^{e,i}	2.1 E-14	7.2 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^e	3.1 E-14	1.1 E-11
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^e	2.5 E-14	8.5 E-12
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran ^{e,i}	1.9 E-14	6.5 E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^{e,i}	2.3 E-14	7.9 E-12
7647-01-0	Hydrochloric acid ^c	2.6 E-06	9.0 E-04
74-90-8	Hydrogen cyanide ^{e,h}	2.2 E-05	7.4 E-03
7439-92-1	Lead ^c	1.5 E-04	5.1 E-02
7439-96-5	Manganese ^{e,h}	2.5 E-07	8.4 E-05
91-20-3	Naphthalene ^{e,h}	6.7 E-09	2.3 E-06
7440-02-0	Nickel ^{e,i}	1.4 E-07	4.7 E-05

Table 15.9.8-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
98-95-3	Nitrobenzene ^e	4.8 E-09	1.6 E-06
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	3.9 E-13	1.3 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^{e,i}	3.0 E-13	1.0 E-10
85-01-8	Phenanthrene ^{e,h}	3.4 E-09	1.2 E-06
123-38-6	Propionaldehyde ^e	4.3 E-08	1.5 E-05
115-07-1	Propylene ^{f,h}	3.1 E-08	1.0 E-05
129-00-0	Pyrene ^{d,g}	1.7 E-09	5.9 E-07
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	1.6 E-14	5.5 E-12
108-88-3	Toluene ^{e,i}	3.4 E-08	1.1 E-05
7440-62-2	Vanadium ^f	1.1 E-08	3.7 E-06
7440-66-6	Zinc ^f	2.4 E-07	8.3 E-05

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.92 E-03 pounds per item. References 1 and 3.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.8

1. *Report No. 7 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2006.
2. *Detailed Test Plan No. 7 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2003.
3. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, May 2007.
4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 7 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, February 2008.

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, January 2007.

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15.9.9 M131, M7 Non-Electric Blasting Cap

15.9.9.1 Ordnance Description¹⁻³

The M7 Non-Electric Blasting Cap (DODIC M131) is used to detonate all military explosives. The M7 Non-Electric Blasting Cap consists of a high explosive base charge, an intermediate charge, and an ignition charge contained in an aluminum alloy cup. Upon initiation by time-blasting fuse, primer, or detonating cord, the ignition charge detonates the intermediate charge, which detonates the base charge, which in turn detonates the explosive charge. This ammunition is used during combat and on firing ranges during training.

15.9.9.2 Emissions And Controls^{1,2,4,5}

Carbon dioxide (CO₂), carbon monoxide (CO), particulate matter, and lead are the primary emissions from the use of the M7 Non-Electric Blasting Cap. 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 fired in the field, there are no controls associated with its use.

Table 15.9.9-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.9-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.9-1 EMISSION FACTORS FOR THE USE OF DODIC M131,
M7 NON-ELECTRIC BLASTING CAP – CARBON DIOXIDE, CRITERIA POLLUTANTS,
METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW
124-38-9	CO ₂ ^f	8.2 E-04	3.0 E-01
630-08-0	CO ^g	2.9 E-04	1.1 E-01
7439-92-1	Lead (Pb)	2.6 E-04	9.5 E-02
74-82-8	Methane	5.2 E-06	1.9 E-03
--	Oxides of nitrogen (NO _x) ^f	7.1 E-05	2.6 E-02
--	PM-2.5 ^{d,g}	3.4 E-04	1.2 E-01
--	PM-10 ^e	4.9 E-04	1.8 E-01
12789-66-1	TSP	5.1 E-04	1.9 E-01

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.76 E-03 pounds per item. References 1 and 3.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.9-2 EMISSION FACTORS FOR THE USE OF DODIC M131,
M7 NON-ELECTRIC BLASTING CAP –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	9.3 E-10	3.4 E-07
75-05-8	Acetonitrile ^e	2.7 E-06	9.8 E-04
107-13-1	Acrylonitrile ^e	4.9 E-07	1.8 E-04
7429-90-5	Aluminum ^f	2.6 E-05	9.6 E-03
7664-41-7	Ammonia ^{f,g}	4.1 E-05	1.5 E-02
7440-36-0	Antimony ^{e,g}	1.4 E-08	5.0 E-06
7440-39-3	Barium ^{f,h}	1.5 E-06	5.3 E-04
71-43-2	Benzene ^e	7.3 E-08	2.7 E-05
106-99-0	1,3-Butadiene ^e	3.5 E-07	1.3 E-04
7440-47-3	Chromium ^{e,g}	1.4 E-07	5.0 E-05
18540-29-9	Hexavalent chromium ^{e,g}	1.4 E-05	5.0 E-03
7440-50-8	Copper ^f	1.9 E-07	6.9 E-05
--	Total dioxin/furan compounds ^{e,g}	2.5 E-14	8.9 E-12
74-85-1	Ethylene ^{f,g}	5.0 E-07	1.8 E-04
206-44-0	Fluoranthene ^e	1.7 E-09	6.2 E-07
50-00-0	Formaldehyde ^{e,g}	2.4 E-07	8.8 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{e,g}	1.6 E-14	5.7 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^{e,g}	8.7 E-15	3.2 E-12
74-90-8	Hydrogen cyanide ^e	1.5 E-05	5.4 E-03
7439-92-1	Lead ^{e,g}	2.6 E-04	9.5 E-02
7439-96-5	Manganese ^e	2.1 E-07	7.5 E-05
80-62-6	Methyl methacrylate ^{e,g}	3.8 E-08	1.4 E-05
91-20-3	Naphthalene ^e	8.2 E-09	3.0 E-06
7440-02-0	Nickel ^e	5.5 E-08	2.0 E-05
85-01-8	Phenanthrene ^e	3.1 E-09	1.1 E-06
115-07-1	Propylene ^f	5.5 E-08	2.0 E-05
7440-66-6	Zinc ^{f,g}	1.8 E-07	6.7 E-05

Table 15.9.9-2 (cont.)

- ^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.
- ^b CASRN = Chemical Abstracts Service Registry Number.
- ^c NEW = net explosive weight. The NEW for this ordnance is 2.76 E-03 pounds per item. References 1 and 3.
- ^d Hazardous air pollutant under CAA Section 112(b).
- ^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
- ^f Reportable chemical under EPCRA Section 313.
- ^g EMISSION FACTOR RATING C.
- ^h EMISSION FACTOR RATING D.

References For Section 15.9.9

1. *Report No. 7 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2006.
2. *Detailed Test Plan No. 7 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2003.
3. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, May 2007.
4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 7 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, February 2008.
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, January 2007.

15.9.10 M174, .50 Caliber Blank Cartridge (Electrically Initiated)

15.9.10.1 Ordnance Description^{1,2}

The .50 Caliber Blank Cartridge (DODIC M174) is primarily used to separate a fuse from a warhead on discovered unexploded ordnance. A special firing device is positioned near the unexploded ordnance, and the cartridge is used to fire a machined projectile at the area where the fuse is threaded into the warhead. The difference between this round and a normal .50 caliber round is that this cartridge is electrically initiated and a blasting machine is used to initiate it. This ammunition is used during combat and on firing ranges during training.

15.9.10.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂) and carbon monoxide (CO) and are the primary emissions from the use of the .50 Caliber Blank Cartridge. 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 used in the field, there are no controls associated with its use.

Table 15.9.10-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.10-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.10-1 EMISSION FACTORS FOR THE USE OF DODIC M174,
 .50 CALIBER BLANK CARTRIDGE – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE,
 AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	6.3 E-03	2.7 E-01
630-08-0	CO ^f	7.9 E-03	3.4 E-01
7439-92-1	Lead (Pb)	1.9 E-06	8.3 E-05
74-82-8	Methane ^f	4.1 E-05	1.7 E-03
--	Oxides of nitrogen (NO _x)	1.3 E-04	5.4 E-03
--	PM-2.5 ^d	1.3 E-03	5.6 E-02
--	PM-10 ^e	1.5 E-03	6.6 E-02
12789-66-1	TSP	1.3 E-03	5.5 E-02

^a Factors represent uncontrolled emissions. References 1 through 4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.33 E-02 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

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Table 15.9.10-2 EMISSION FACTORS FOR THE USE OF DODIC M174, .50 CALIBER BLANK CARTRIDGE – HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
83-32-9	Acenaphthene ^d	1.4 E-09	6.1 E-08
208-96-8	Acenaphthylene ^d	1.4 E-08	6.1 E-07
75-07-0	Acetaldehyde ^e	4.1 E-06	1.7 E-04
75-05-8	Acetonitrile ^e	2.7 E-06	1.2 E-04
107-02-8	Acrolein ^{e,h}	9.3 E-06	4.0 E-04
107-13-1	Acrylonitrile ^e	2.7 E-07	1.2 E-05
7429-90-5	Aluminum ^f	1.6 E-06	6.6 E-05
7664-41-7	Ammonia ^{d,g}	9.5 E-06	4.1 E-04
120-12-7	Anthracene ^e	6.5 E-10	2.8 E-08
7440-36-0	Antimony ^{e,i}	4.7 E-07	2.0 E-05
7440-39-3	Barium ^{f,h}	7.4 E-07	3.2 E-05
71-43-2	Benzene ^{e,h}	1.0 E-05	4.3 E-04
56-55-3	Benzo[a]anthracene ^e	2.3 E-10	9.9 E-09
205-99-2	Benzo[b]fluoranthene ^e	2.6 E-09	1.1 E-07
207-08-9	Benzo[k]fluoranthene ^e	1.1 E-09	4.6 E-08
191-24-2	Benzo[g,h,i]perylene ^e	8.0 E-09	3.4 E-07
192-97-2	Benzo[e]pyrene ^{d,h}	2.5 E-09	1.1 E-07
7440-43-9	Cadmium ^{e,h}	1.1 E-07	4.7 E-06
75-15-0	Carbon disulfide ^{e,h}	2.2 E-06	9.4 E-05
7440-47-3	Chromium ^{e,h}	3.2 E-08	1.4 E-06
7440-48-4	Cobalt ^{e,h}	5.5 E-08	2.4 E-06
7440-50-8	Copper ^f	6.4 E-06	2.7 E-04
57-12-5	Particulate cyanide ^{e,h}	2.9 E-07	1.2 E-05
74-85-1	Ethylene ^f	9.6 E-06	4.1 E-04
206-44-0	Fluoranthene ^e	6.0 E-10	2.6 E-08
86-73-7	Fluorene ^d	3.3 E-09	1.4 E-07
50-00-0	Formaldehyde ^e	3.0 E-07	1.3 E-05
74-90-8	Hydrogen cyanide ^e	2.7 E-06	1.1 E-04
193-39-5	Indeno[1,2,3-cd]pyrene ^{e,g}	3.4 E-09	1.4 E-07
7439-96-5	Manganese ^{e,h}	7.6 E-08	3.2 E-06

Table 15.9.10-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-09-2	Methylene chloride ^e	3.8 E-05	1.6 E-03
91-20-3	Naphthalene ^e	1.8 E-07	7.7 E-06
7440-02-0	Nickel ^{e,h}	3.7 E-08	1.6 E-06
55-63-0	Nitroglycerin ^{f,h}	2.9 E-08	1.2 E-06
123-38-6	Propionaldehyde ^{e,h}	6.4 E-07	2.7 E-05
115-07-1	Propylene ^e	1.9 E-06	8.2 E-05
7664-93-9	Sulfuric acid ^{f,h}	1.8 E-04	7.9 E-03
108-88-3	Toluene ^{e,h}	2.4 E-06	1.0 E-04
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	2.5 E-07	1.1 E-05
7440-66-6	Zinc ^{f,h}	1.7 E-06	7.5 E-05

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.33 E-02 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING C.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.10

1. *Report No. 10 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2006.
2. *Detailed Test Plan No. 10 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, June 2004.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 10 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.
4. 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, September and October 2007.

15.9.11 M241, M10 High Explosive Universal Destructor

15.9.11.1 Ordnance Description¹⁻³

The M10 High Explosive Universal Destructor (DODIC M241) is used to convert high explosive bombs and artillery into improvised demolition charges as well as to destroy deteriorated and abandoned ammunition. It is designed to accommodate ammunition with 3.8-, 4.3-, or 5.1-cm diameter fuse wells. This ammunition is used during combat and on firing ranges during training.

The M10 High Explosive Universal Destructor is a steel adapter-booster assembly. It consists of an ammunition bushing, an activator bushing, a blasting cap bushing, and a booster assembly containing two pellet filled booster cups. Once activated, the pellets in the booster explode resulting in the detonation of the explosive filled target.

15.9.11.2 Emissions And Controls^{1,2,4,5}

The primary emissions from the use of the M10 High Explosive Universal Destructor are carbon dioxide (CO₂) 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 used in the field, there are no controls associated with its use.

Table 15.9.11-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.9.11-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in terms of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.9.11-1 EMISSION FACTORS FOR THE USE OF DODIC M241,
M10 HIGH EXPLOSIVE UNIVERSAL DESTRUCTOR – CARBON DIOXIDE, CRITERIA
POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED
PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	4.4 E-01	1.5
630-08-0	Carbon monoxide (CO) ^g	1.3 E-02	4.4 E-02
7439-92-1	Lead (Pb)	3.3 E-02	1.2 E-01
--	Oxides of nitrogen (NO _x) ^f	5.5 E-03	1.9 E-02
--	PM-2.5 ^{d,g}	5.4 E-02	1.9 E-01
--	PM-10 ^e	1.1 E-01	3.9 E-01
7446-09-5	Sulfur dioxide (SO ₂) ^g	1.4 E-03	5.0 E-03
--	TNMHC	2.5 E-03	8.8 E-03
12789-66-1	Total suspended particulate	2.3 E-01	7.9 E-01

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.86 E-01 pounds per item. Reference 2.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.11-2 EMISSION FACTORS FOR THE USE OF DODIC M241,
M10 HIGH EXPLOSIVE UNIVERSAL DESTRUCTOR –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-05-8	Acetonitrile ^{d,h}	2.5 E-06	8.7 E-06
107-13-1	Acrylonitrile ^{d,h}	5.0 E-07	1.7 E-06
7429-90-5	Aluminum ^{e,h}	4.7 E-03	1.7 E-02
7440-36-0	Antimony ^d	2.6 E-03	9.0 E-03
7440-39-3	Barium ^e	1.8 E-03	6.2 E-03
71-43-2	Benzene ^{d,h}	2.7 E-05	9.5 E-05
106-99-0	1,3-Butadiene ^{d,h}	2.4 E-06	8.5 E-06
85-68-7	Butylbenzylphthalate ^{f,g}	4.1 E-06	1.4 E-05
7440-43-9	Cadmium ^d	1.7 E-03	6.0 E-03
56-23-5	Carbon tetrachloride ^d	1.4 E-06	4.8 E-06
7782-50-5	Chlorine ^d	2.7 E-04	9.5 E-04
7440-47-3	Chromium ^{d,h}	3.7 E-04	1.3 E-03
7440-48-4	Cobalt ^{d,h}	5.5 E-06	1.9 E-05
7440-50-8	Copper ^{e,h}	2.6 E-03	9.0 E-03
98-82-8	Cumene ^{d,i}	3.4 E-07	1.2 E-06
110-82-7	Cyclohexane ^{e,h}	4.3 E-06	1.5 E-05
606-20-2	2,6-Dinitrotoluene ^e	2.0 E-06	6.9 E-06
--	Total dioxin/furan compounds ^d	1.0 E-09	3.6 E-09
100-41-4	Ethylbenzene ^d	3.8 E-06	1.3 E-05
74-85-1	Ethylene ^{e,h}	5.9 E-05	2.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate ^{d,g}	1.0 E-05	3.6 E-05
50-00-0	Formaldehyde ^d	2.0 E-05	7.1 E-05
76-13-1	Freon 113 ^{e,h}	1.0 E-06	3.6 E-06
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^d	1.9 E-10	6.6 E-10
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^d	2.1 E-11	7.5 E-11
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^{d,i}	4.2 E-12	1.5 E-11
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^d	1.2 E-11	4.0 E-11
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^d	2.8 E-11	9.9 E-11
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^d	3.8 E-11	1.3 E-10
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^d	7.3 E-12	2.6 E-11

Table 15.9.11-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^d	4.2 E-12	1.5 E-11
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran ^{d,i}	1.2 E-12	4.3 E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^d	4.7 E-12	1.6 E-11
110-54-3	Hexane ^{d,i}	3.8 E-06	1.3 E-05
74-90-8	Hydrogen cyanide ^d	1.6 E-04	5.4 E-04
7439-92-1	Lead ^d	3.3 E-02	1.2 E-01
7439-96-5	Manganese ^{d,h}	8.7 E-05	3.0 E-04
7439-97-6	Mercury ^d	1.9 E-08	6.6 E-08
75-09-2	Methylene chloride ^{d,h}	8.5 E-03	2.9 E-02
91-57-6	2-Methylnaphthalene ^f	9.7 E-07	3.4 E-06
91-20-3	Naphthalene ^{d,h}	3.5 E-06	1.2 E-05
7440-02-0	Nickel ^{d,h}	7.8 E-06	2.7 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^d	6.4 E-10	2.2 E-09
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^d	4.2 E-11	1.4 E-10
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ^d	1.2 E-11	4.3 E-11
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^d	2.5 E-12	8.8 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^d	2.7 E-12	9.3 E-12
108-95-2	Phenol ^d	1.6 E-06	5.5 E-06
7723-14-0	Phosphorus ^{f,h}	1.2 E-04	4.1 E-04
115-07-1	Propylene ^{e,h}	1.5 E-05	5.3 E-05
7782-49-2	Selenium ^d	5.4 E-07	1.9 E-06
100-42-5	Styrene ^d	9.7 E-07	3.4 E-06
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin ^d	2.6 E-12	8.9 E-12
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^d	4.5 E-12	1.6 E-11
75-69-4	Trichlorofluoromethane ^e	3.9 E-07	1.4 E-06
95-63-6	1,2,4-Trimethylbenzene ^e	2.8 E-06	9.6 E-06
540-84-1	2,2,4-Trimethylpentane ^{f,h}	5.2 E-06	1.8 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene ^d	1.3 E-05	4.5 E-05
95-47-6	o-Xylene ^d	4.3 E-06	1.5 E-05
7440-66-6	Zinc ^{e,h}	5.3 E-03	1.9 E-02

Table 15.9.11-2 (cont.)

- ^a Factors represent uncontrolled emissions. References 1, 2, and 5.
- ^b CASRN = Chemical Abstracts Service Registry Number.
- ^c NEW = net explosive weight. The NEW for this ordnance is 2.86 E-01 pounds per item. Reference 2.
- ^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
- ^e Reportable chemical under EPCRA Section 313.
- ^f Hazardous air pollutant under CAA Section 112(b).
- ^g EMISSION FACTOR RATING A.
- ^h EMISSION FACTOR RATING B.
- ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.11

1. *Detailed Test Plan for Phase IV-B Emission Characterization of Exploding Ordnance: [DODIC# B535] Cartridge 40-mm White Star Parachute (M583A1), [DODIC# B536] Cartridge 40-mm White Star Cluster (M585), [DODIC# L366] Simulator Projectile Air Burst (M74A1), [DODIC# L602] Simulator Flash Artillery (M21), [DODIC# M241] Destructor HE Universal (M10)*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, April 2002.
2. *Sampling Results for AEC Phase IV-B Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, URS Group, Inc., Oak Ridge, TN, October 2004.
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 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase IV-B Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2007.
5. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Corporation, Oak Ridge, TN, January 2005.

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15.9.12 M327, Firing Device Coupling Base

15.9.12.1 Ordnance Description^{1,2}

The Firing Device Coupling Base (DODIC M327) provides the means for holding a primer and positioning it in a firing device so that the firing pin of the firing device will strike it properly. It is designed for assembly to any military standard non-electric blasting cap. This ammunition is used during combat and on firing ranges during training.

15.9.12.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂) and particulate matter are the primary emissions from the use of the Firing Device Coupling Base. 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 used in the field, there are no controls associated with its use.

Table 15.9.12-1 presents emission factors for CO₂, criteria pollutants, and total suspended particulate (TSP). Table 15.9.12-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.12-1 EMISSION FACTORS FOR THE USE OF DODIC M327,
 FIRING DEVICE COUPLING BASE – CARBON DIOXIDE, CRITERIA POLLUTANTS, AND
 TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	1.1 E-05	1.9 E-01
630-08-0	Carbon monoxide (CO) ^f	5.5 E-06	9.6 E-02
7439-92-1	Lead (Pb)	6.7 E-06	1.2 E-01
--	Oxides of nitrogen (NO _x)	7.0 E-07	1.2 E-02
--	PM-2.5 ^{d,f}	1.5 E-05	2.6 E-01
--	PM-10 ^e	1.7 E-05	3.0 E-01
7446-09-5	Sulfur dioxide (SO ₂) ^g	4.2 E-07	7.4 E-03
12789-66-1	TSP ^f	1.7 E-05	3.0 E-01

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 5.71 E-05 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING D.

Table 15.9.12-2 EMISSION FACTORS FOR THE USE OF DODIC M327,
 FIRING DEVICE COUPLING BASE –
 HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-07-0	Acetaldehyde ^d	2.7 E-09	4.8 E-05
7429-90-5	Aluminum ^{e,g}	9.4 E-07	1.6 E-02
7440-36-0	Antimony ^{d,g}	3.1 E-06	5.5 E-02
7440-38-2	Arsenic ^d	7.8 E-10	1.4 E-05
7440-39-3	Barium ^{e,g}	1.8 E-06	3.2 E-02
75-15-0	Carbon disulfide ^d	6.6 E-09	1.2 E-04
7440-47-3	Chromium ^d	3.7 E-09	6.5 E-05
7440-50-8	Copper ^e	2.4 E-08	4.3 E-04
206-44-0	Fluoranthene ^d	1.6 E-11	2.8 E-07
50-00-0	Formaldehyde ^d	4.0 E-10	7.0 E-06
74-90-8	Hydrogen cyanide ^{d,g}	3.5 E-08	6.2 E-04
7439-92-1	Lead ^{d,g}	6.7 E-06	1.2 E-01
7439-96-5	Manganese ^{d,g}	1.4 E-09	2.4 E-05
75-09-2	Methylene chloride ^d	2.2 E-08	3.9 E-04
7440-02-0	Nickel ^d	1.2 E-09	2.0 E-05
129-00-0	Pyrene ^f	1.4 E-11	2.4 E-07
7440-28-0	Thallium ^e	1.9 E-09	3.4 E-05
75-69-4	Trichlorofluoromethane ^{e,h}	3.9 E-09	6.9 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene ^d	1.8 E-09	3.1 E-05
7440-66-6	Zinc ^{e,g}	4.8 E-07	8.4 E-03

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 5.71 E-05 pounds per item. Reference 1.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

^g EMISSION FACTOR RATING B.

^h EMISSION FACTOR RATING D.

References For Section 15.9.12

1. *Report No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2007.
2. *Detailed Test Plan No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2004.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 11 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.
4. 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, April 2008.

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15.9.13 M420, M2A4 15-Pound Demolition Shaped Charge

15.9.13.1 Ordnance Description^{1,2}

The M2A4 15-Pound Demolition Shaped Charge (DODIC M420) is used primarily to bore holes in earth, metal, masonry, concrete, and paved and unpaved roads. This particular shaped charge has been especially designed for use against reinforced concrete. This ammunition is used during combat and on firing ranges during training.

15.9.13.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂) is the primary emission from the use of the M2A4 15-Pound Demolition Shaped Charge. 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 used in the field, there are no controls associated with its use.

Table 15.9.13-1 presents emission factors for CO₂, criteria pollutants, and total suspended particulate (TSP). Table 15.9.13-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.13-1 EMISSION FACTORS FOR THE USE OF DODIC M420,
M2A4 15-POUND DEMOLITION SHAPED CHARGE – CARBON DIOXIDE, CRITERIA
POLLUTANTS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	13	1.3
630-08-0	Carbon monoxide (CO) ^g	6.4 E-02	6.3 E-03
7439-92-1	Lead (Pb)	3.8 E-02	3.7 E-03
--	Oxides of nitrogen (NO _x) ^f	7.0 E-02	6.9 E-03
--	PM-2.5 ^{d,g}	1.5 E-01	1.4 E-02
--	PM-10 ^e	3.5 E-01	3.5 E-02
12789-66-1	TSP	4.0 E-01	4.0 E-02

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 10.1 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

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Table 15.9.13-2 EMISSION FACTORS FOR THE USE OF DODIC M420,
M2A4 15-POUND DEMOLITION SHAPED CHARGE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^{f,h}	9.2 E-07	9.1 E-08
75-07-0	Acetaldehyde ^d	3.9 E-04	3.8 E-05
75-05-8	Acetonitrile ^{d,h}	1.4 E-05	1.3 E-06
107-02-8	Acrolein ^d	7.7 E-05	7.6 E-06
107-13-1	Acrylonitrile ^{d,h}	1.9 E-05	1.9 E-06
7429-90-5	Aluminum ^{e,h}	1.4 E-03	1.3 E-04
7664-41-7	Ammonia ^{e,h}	1.9 E-04	1.8 E-05
120-12-7	Anthracene ^{d,h}	6.0 E-07	6.0 E-08
7440-36-0	Antimony ^d	1.3 E-04	1.3 E-05
7440-38-2	Arsenic ^d	7.6 E-04	7.5 E-05
7440-39-3	Barium ^{e,i}	6.3 E-04	6.2 E-05
71-43-2	Benzene ^d	7.9 E-05	7.8 E-06
56-55-3	Benzo[a]anthracene ^{d,h}	2.1 E-07	2.1 E-08
192-97-2	Benzo[e]pyrene ^f	1.9 E-07	1.9 E-08
7440-43-9	Cadmium ^d	3.3 E-05	3.2 E-06
74-87-3	Chloromethane ^d	2.0 E-05	1.9 E-06
7440-47-3	Chromium ^d	3.4 E-04	3.3 E-05
18540-29-9	Hexavalent chromium ^{d,h}	3.8 E-05	3.7 E-06
218-01-9	Chrysene ^d	2.5 E-07	2.5 E-08
7440-48-4	Cobalt ^{d,h}	4.4 E-04	4.4 E-05
7440-50-8	Copper ^{e,h}	5.3 E-03	5.3 E-04
53-70-3	Dibenz[a,h]anthracene ^d	1.5 E-08	1.5 E-09
84-74-2	Dibutyl phthalate ^{d,h}	3.2 E-06	3.2 E-07
--	Total dioxin/furan compounds ^d	7.4 E-10	7.4 E-11
100-41-4	Ethylbenzene ^{d,h}	3.9 E-06	3.8 E-07
74-85-1	Ethylene ^e	3.9 E-04	3.9 E-05
206-44-0	Fluoranthene ^{d,h}	6.6 E-07	6.5 E-08
86-73-7	Fluorene ^f	6.9 E-07	6.9 E-08
50-00-0	Formaldehyde ^d	6.0 E-04	6.0 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{d,h}	1.1 E-10	1.0 E-11

Table 15.9.13-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^d	1.2 E-11	1.2 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^d	1.6 E-11	1.6 E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^{d,i}	1.2 E-11	1.2 E-12
74-90-8	Hydrogen cyanide ^{d,h}	3.1 E-04	3.0 E-05
7439-92-1	Lead ^d	3.8 E-02	3.7 E-03
7439-96-5	Manganese ^{d,h}	1.1 E-03	1.1 E-04
75-09-2	Methylene chloride ^d	1.0 E-05	1.0 E-06
91-20-3	Naphthalene ^{d,h}	7.1 E-06	7.0 E-07
7440-02-0	Nickel ^{d,g}	8.2 E-04	8.1 E-05
7697-37-2	Nitric acid ^{e,g}	1.2 E-03	1.2 E-04
55-63-0	Nitroglycerin ^{e,i}	8.4 E-07	8.3 E-08
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^d	5.0 E-10	5.0 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^{d,i}	2.8 E-11	2.8 E-12
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^d	1.4 E-11	1.4 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^d	1.8 E-11	1.8 E-12
85-01-8	Phenanthrene ^{d,h}	2.5 E-06	2.5 E-07
115-07-1	Propylene ^{e,h}	4.4 E-05	4.4 E-06
7440-22-4	Silver ^{e,h}	1.0 E-05	1.0 E-06
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^d	6.4 E-11	6.3 E-12
127-18-4	Tetrachloroethylene ^{e,i}	3.3 E-05	3.3 E-06
108-88-3	Toluene ^{d,h}	2.5 E-05	2.5 E-06
75-01-4	Vinyl chloride ^{d,h}	4.6 E-06	4.5 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene ^d	5.5 E-06	5.5 E-07
7440-66-6	Zinc ^e	7.1 E-03	7.1 E-04

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 10.1 pounds per item. Reference 1.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.13

1. *Report No. 13 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2008.
2. *Detailed Test Plan No. 13 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2006.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 13 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2009.
4. 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 2008.

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15.9.14 M448, M2A1 8-Second Delay Percussion Detonator

15.9.14.1 Ordnance Description^{1,2}

The M2A1 8-Second Delay Percussion Detonator (DODIC M448) is a device used to initiate demolition charges after an eight second delay. The detonator can be used under water and is particularly effective during assault demolition. This ammunition is used during combat and on firing ranges during training.

The M2A1 8-Second Delay Percussion Detonator is composed of a firing assembly, delay housing, primer holder assembly, and a special blasting cap. After the safety is removed and the release pin is pulled, the firing pin strikes the primer which ignites the pyrotechnic delay train. At the end of the delay train, the burning powder initiates the blasting cap which in turn initiates the demolition charge.

15.9.14.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂) and particulate matter are the primary emissions from the use of the M2A1 8-Second Delay Percussion Detonator. 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 used in the field, there are no controls associated with its use.

Table 15.9.14-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.14-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.14-1 EMISSION FACTORS FOR THE USE OF DODIC M448,
M2A1 8-SECOND DELAY PERCUSSION DETONATOR – CARBON DIOXIDE, CRITERIA
POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	1.4 E-03	2.2 E-01
630-08-0	Carbon monoxide (CO) ^f	3.5 E-04	5.7 E-02
7439-92-1	Lead (Pb)	2.4 E-04	3.9 E-02
74-82-8	Methane ^g	3.5 E-06	5.7 E-04
--	Oxides of nitrogen (NO _x)	1.6 E-04	2.5 E-02
--	PM-2.5 ^{d,f}	4.8 E-04	7.8 E-02
--	PM-10 ^e	7.7 E-04	1.2 E-01
12789-66-1	TSP ^f	1.0 E-03	1.7 E-01

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 6.20 E-03 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING C.

Table 15.9.14-2 EMISSION FACTORS FOR THE USE OF DODIC M448,
M2A1 8-SECOND DELAY PERCUSSION DETONATOR –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	1.3 E-09	2.2 E-07
75-07-0	Acetaldehyde ^e	2.6 E-07	4.2 E-05
75-05-8	Acetonitrile ^e	3.2 E-06	5.2 E-04
107-02-8	Acrolein ^{e,g}	3.1 E-08	5.0 E-06
107-13-1	Acrylonitrile ^{e,g}	7.8 E-08	1.3 E-05
7429-90-5	Aluminum ^f	6.0 E-05	9.7 E-03
7664-41-7	Ammonia ^{d,g}	1.8 E-05	3.0 E-03
120-12-7	Anthracene ^e	1.7 E-10	2.7 E-08
7440-36-0	Antimony ^e	5.7 E-07	9.3 E-05
7440-38-2	Arsenic ^e	3.4 E-09	5.5 E-07
7440-39-3	Barium ^{f,g}	4.2 E-05	6.8 E-03
71-43-2	Benzene ^e	3.7 E-07	6.0 E-05
205-99-2	Benzo[b]fluoranthene ^e	8.5 E-11	1.4 E-08
192-97-2	Benzo[e]pyrene ^{d,h}	5.7 E-11	9.2 E-09
7440-43-9	Cadmium ^{e,g}	4.3 E-07	6.9 E-05
7440-47-3	Chromium ^e	1.2 E-05	1.9 E-03
18540-29-9	Hexavalent chromium ^{e,h}	7.7 E-04	1.2 E-01
218-01-9	Chrysene ^e	1.3 E-10	2.1 E-08
7440-48-4	Cobalt ^e	3.0 E-09	4.8 E-07
7440-50-8	Copper ^f	7.9 E-07	1.3 E-04
--	Total dioxin/furan compounds ^e	3.5 E-12	5.6 E-10
74-85-1	Ethylene ^{f,g}	2.9 E-07	4.7 E-05
206-44-0	Fluoranthene ^e	5.2 E-10	8.4 E-08
86-73-7	Fluorene ^d	3.6 E-10	5.9 E-08
50-00-0	Formaldehyde ^{e,g}	3.2 E-06	5.2 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	3.0 E-13	4.8 E-11
7647-01-0	Hydrochloric acid ^{e,g}	8.0 E-07	1.3 E-04
74-90-8	Hydrogen cyanide ^{e,g}	3.6 E-05	5.8 E-03
193-39-5	Indeno[1,2,3-cd]pyrene ^e	3.0 E-11	4.8 E-09
7439-96-5	Manganese ^{e,g}	2.5 E-07	4.1 E-05

Table 15.9.14-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
91-20-3	Naphthalene ^e	1.2 E-08	2.0 E-06
7440-02-0	Nickel ^e	4.1 E-06	6.6 E-04
7697-37-2	Nitric acid ^f	2.3 E-06	3.6 E-04
55-63-0	Nitroglycerin ^f	4.0 E-09	6.4 E-07
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	3.1 E-12	5.1 E-10
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^e	1.4 E-15	2.2 E-13
85-01-8	Phenanthrene ^e	1.5 E-09	2.4 E-07
123-38-6	Propionaldehyde ^{e,h}	1.8 E-08	3.0 E-06
7782-49-2	Selenium ^e	3.4 E-09	5.5 E-07
7440-22-4	Silver ^f	3.2 E-08	5.2 E-06
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	1.7 E-14	2.8 E-12
7440-28-0	Thallium ^f	1.6 E-08	2.5 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	1.3 E-08	2.1 E-06
95-47-6	o-Xylene ^e	4.8 E-08	7.8 E-06
7440-66-6	Zinc ^{f,g}	4.3 E-06	7.0 E-04

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 6.20 E-03 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING B.

^h EMISSION FACTOR RATING D.

References For Section 15.9.14

1. *Report No. 10 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2006.
2. *Detailed Test Plan No. 10 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, June 2004.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 10 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.

4. 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, September and October 2007.

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15.9.15 M456, PETN Type 1 Detonating Cord

15.9.15.1 Ordnance Description¹⁻³

The PETN Type 1 Detonating Cord (DODIC M456) is used to prime and detonate other explosives. It consists of a 1,000-foot length of high velocity explosive contained in a seamless cotton tube. The cotton tube is in turn covered with a thin layer of asphalt and sheathed in an outer cover of plastic-coated textile. This ammunition is used during combat and on firing ranges during training.

15.9.15.2 Emissions And Controls^{1,2,4,5}

Carbon dioxide (CO₂) is the primary emission from the use of the PETN Type 1 Detonating Cord. 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 used in the field, there are no controls associated with its use.

Table 15.9.15-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.9.15-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW is dependent upon the length of detonating cord used, emission factors were not developed in units of pounds of emissions per item.

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Table 15.9.15-1 EMISSION FACTORS FOR THE USE OF DODIC M456, PETN TYPE 1 DETONATING CORD – CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per lb NEW ^c
124-38-9	CO ₂ ^f	5.0
630-08-0	Carbon monoxide (CO) ^g	4.7 E-02
7439-92-1	Lead (Pb)	7.3 E-05
--	Oxides of nitrogen (NO _x) ^f	7.0 E-03
--	PM-2.5 ^{d,g}	1.1 E-02
--	PM-10 ^e	1.6 E-01
--	TNMHC ^g	1.5 E-02
12789-66-1	TSP	3.8 E-01

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 7.00 E-03 pounds per linear foot of detonating cord. The complete ordnance includes 1,000 linear feet of charge and has an NEW of 7.00 pounds. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.15-2 EMISSION FACTORS FOR THE USE OF DODIC M456,
 PETN TYPE 1 DETONATING CORD –
 HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per lb NEW ^c
208-96-8	Acenaphthylene ^{d,h}	3.3 E-06
75-05-8	Acetonitrile ^e	6.8 E-07
7429-90-5	Aluminum ^{f,h}	1.6 E-02
120-12-7	Anthracene ^{e,h}	4.1 E-07
7440-36-0	Antimony ^e	7.6 E-05
7440-38-2	Arsenic ^e	1.1 E-05
7440-39-3	Barium ^f	4.3 E-04
71-43-2	Benzene ^{e,h}	3.3 E-04
205-99-2	Benzo[b]fluoranthene ^e	4.7 E-07
207-08-9	Benzo[k]fluoranthene ^{e,i}	1.1 E-06
50-32-8	Benzo[a]pyrene ^e	7.0 E-09
7440-41-7	Beryllium ^e	9.9 E-07
106-99-0	1,3-Butadiene ^{e,h}	1.3 E-04
71-36-3	n-Butanol ^{f,i}	9.2 E-07
85-68-7	Butylbenzylphthalate ^{d,g}	6.4 E-06
7440-43-9	Cadmium ^d	1.6 E-05
7440-47-3	Chromium ^{e,h}	7.1 E-04
7440-48-4	Cobalt ^{e,h}	1.0 E-05
7440-50-8	Copper ^{f,h}	1.3 E-03
98-82-8	Cumene ^e	1.0 E-06
132-64-9	Dibenzofuran ^e	4.2 E-07
84-74-2	Dibutylphthalate ^{e,g}	3.3 E-06
99-65-0	1,3-Dinitrobenzene ^f	4.9 E-07
660-20-2	2,6-Dinitrotoluene ^f	8.0 E-06
--	Total dioxin/furan compounds ^e	2.8 E-09
100-41-4	Ethylbenzene ^{e,h}	3.7 E-05
74-85-1	Ethylene ^{f,h}	1.6 E-03
117-81-7	bis(2-Ethylhexyl)phthalate ^{e,g}	6.1 E-05
206-44-0	Fluoranthene ^{e,h}	1.7 E-06
86-73-7	Fluorene ^{d,h}	8.2 E-07

Table 15.9.15-2 (cont.)

CASRN ^b	Pollutant	lb per lb NEW ^c
50-00-0	Formaldehyde ^e	4.6 E-04
76-13-1	Freon 113 ^f	3.8 E-06
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	2.9 E-10
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^e	1.3 E-10
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^e	6.1 E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^e	1.1 E-11
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^{e,i}	8.4 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^e	2.0 E-11
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^{e,i}	8.0 E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^{e,i}	9.4 E-12
110-54-3	n-Hexane ^e	8.6 E-06
1634-04-4	Hydrogen cyanide ^e	2.1 E-04
7439-92-1	Lead ^e	7.3 E-05
7439-96-5	Manganese ^{e,h}	3.2 E-04
7439-97-6	Mercury ^e	6.6 E-08
75-09-2	Methylene chloride ^{e,h}	1.7 E-01
91-20-3	Naphthalene ^{e,h}	8.4 E-06
7440-02-0	Nickel ^{e,h}	3.1 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	2.1 E-09
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^e	2.4 E-10
85-01-8	Phenanthrene ^{e,h}	3.9 E-06
108-95-2	Phenol ^{e,i}	4.6 E-06
7723-14-0	Phosphorus ^{d,h}	1.5 E-04
115-07-1	Propylene ^{f,h}	7.8 E-04
129-00-0	Pyrene ^{d,h}	2.5 E-06
100-42-5	Styrene ^{e,i}	8.0 E-06
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^{e,i}	2.6 E-11
7440-28-0	Thallium ^f	4.2 E-07
108-88-3	Toluene ^{e,h}	1.9 E-04
75-69-4	Trichlorofluoromethane ^f	1.6 E-06
95-63-6	1,2,4-Trimethylbenzene ^{f,h}	8.6 E-05
540-84-1	2,2,4-Trimethylpentane ^{d,h}	2.7 E-05

Table 15.9.15-2 (cont.)

CASRN ^b	Pollutant	lb per lb NEW ^c
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	2.1 E-04
95-47-6	o-Xylene ^{e,h}	7.6 E-05
7440-66-6	Zinc ^{f,h}	1.8 E-03

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 7.00 E-03 pounds per linear foot of detonating cord. The complete ordnance includes 1,000 linear feet of charge and has an NEW of 7.00 pounds. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.15

1. *Detailed Test Plan for Phase IV-A Emission Characterization, Exploding Ordnance: M118 Block Demolition Charge, 1/2-lb TNT Block Demolition Charge, PETN Type 1 Detonating Cord, and 20 gr/ft and 225 gr/ft Flexible Linear-Shaped Demolition Charges*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, May 2001.
2. *Sampling Results for AEC Phase IV-A Exploding Ordnance Emission Characterization*, URS Corporation, Oak Ridge, TN, June 2003.
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 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase IV-A Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2007.
5. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Corporation, Oak Ridge, TN, January 2005.

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15.9.16 M500, M21 Cartridge Actuated Cutter

15.9.16.1 Ordnance Description^{1,2}

The M21 Cartridge Actuated Cutter (DODIC M500) is used to sever a nylon reefing line which allows a parachute to fully deploy. The M21 Cutter is a cartridge actuated, one shot, disposable mechanical unit with the cartridge sealed internally. This ammunition is used during combat and on firing ranges during training.

15.9.16.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂) and carbon monoxide (CO) are the primary emissions from the use of the M21 Cartridge Actuated Cutter. 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 used in the field, there are no controls associated with its use.

Table 15.9.16-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.16-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.16-1 EMISSION FACTORS FOR THE USE OF DODIC M500,
M21 CARTRIDGE ACTUATED CUTTER – CARBON DIOXIDE, CRITERIA POLLUTANTS,
METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: A (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	1.6 E-04	3.9 E-02
630-08-0	CO ^f	2.1 E-04	5.3 E-02
74-82-8	Methane ^g	7.5 E-06	1.9 E-03
--	Oxides of nitrogen (NO _x)	1.4 E-06	3.5 E-04
--	PM-2.5 ^d	7.4 E-07	1.9 E-04
--	PM-10 ^{e,g}	9.6 E-07	2.4 E-04
12789-66-1	TSP ^g	1.5 E-06	3.7 E-04

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 4.00 E-03 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING B.

^g EMISSION FACTOR RATING C.

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Table 15.9.16-2 EMISSION FACTORS FOR THE USE OF DODIC M500,
M21 CARTRIDGE ACTUATED CUTTER –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	4.1 E-10	1.0 E-07
75-07-0	Acetaldehyde ^{e,h}	1.0 E-08	2.5 E-06
75-05-8	Acetonitrile ^e	1.4 E-07	3.4 E-05
107-13-1	Acrylonitrile ^e	2.0 E-08	5.1 E-06
7429-90-5	Aluminum ^f	3.0 E-08	7.6 E-06
7664-41-7	Ammonia ^d	1.5 E-07	3.7 E-05
7440-39-3	Barium ^{f,h}	4.5 E-08	1.1 E-05
71-43-2	Benzene ^e	1.8 E-06	4.5 E-04
106-99-0	1,3-Butadiene ^{e,g}	3.6 E-08	9.1 E-06
123-72-8	Butyraldehyde ^f	2.0 E-08	5.0 E-06
7440-43-9	Cadmium ^{e,h}	5.3 E-08	1.3 E-05
75-15-0	Carbon disulfide ^{e,h}	6.2 E-08	1.5 E-05
74-87-3	Chloromethane ^{e,h}	8.8 E-09	2.2 E-06
7440-47-3	Chromium ^{e,h}	9.5 E-09	2.4 E-06
18540-29-9	Hexavalent chromium ^{e,h}	1.7 E-06	4.3 E-04
107-06-2	1,2-Dichloroethane ^{e,h}	3.4 E-08	8.6 E-06
100-41-4	Ethylbenzene ^e	1.0 E-08	2.6 E-06
74-85-1	Ethylene ^{f,h}	1.1 E-06	2.8 E-04
50-00-0	Formaldehyde ^{e,h}	1.3 E-08	3.3 E-06
74-90-8	Hydrogen cyanide ^e	1.0 E-07	2.6 E-05
75-09-2	Methylene chloride ^{e,h}	1.5 E-07	3.8 E-05
91-20-3	Naphthalene ^e	2.3 E-08	5.8 E-06
7440-02-0	Nickel ^e	1.5 E-08	3.7 E-06
123-38-6	Propionaldehyde ^{e,h}	1.1 E-08	2.7 E-06
115-07-1	Propylene ^d	1.7 E-07	4.2 E-05
100-42-5	Styrene ^e	3.8 E-08	9.5 E-06
108-88-3	Toluene ^e	1.7 E-07	4.2 E-05
95-63-6	1,2,4-Trimethylbenzene ^f	4.6 E-09	1.2 E-06
7440-62-2	Vanadium ^{f,i}	3.8 E-10	9.5 E-08

Table 15.9.16-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	1.2 E-08	3.1 E-06
95-47-6	o-Xylene ^e	8.2 E-09	2.0 E-06
7440-66-6	Zinc ^{f,h}	5.2 E-09	1.3 E-06

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 4.00 E-03 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING C.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.16

1. *Report No. 10 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2006.
2. *Detailed Test Plan No. 10 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, June 2004.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 10 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.
4. 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, September and October 2007.

15.9.17 M591, M1 Military Dynamite Demolition Block Charge

15.9.17.1 Ordnance Description^{1,2}

The M1 Military Dynamite Demolition Block Charge (DODIC M591) is a medium velocity blasting explosive used in military construction, quarrying, and demolition. This ammunition is used during combat and on firing ranges during training.

15.9.17.2 Emissions And Controls^{1,3-6}

Carbon dioxide (CO₂) is the primary emission from the use of the M1 Military Dynamite Demolition Block Charge. 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 used in the field, there are no controls associated with its use.

Table 15.9.17-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.17-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.17-1 EMISSION FACTORS FOR THE USE OF DODIC M591,
M1 MILITARY DYNAMITE DEMOLITION BLOCK CHARGE – CARBON DIOXIDE, CRITERIA
POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	3.3 E-01	9.0 E-01
630-08-0	Carbon monoxide (CO) ^g	5.4 E-03	1.5 E-02
7439-92-1	Lead (Pb)	1.5 E-04	4.1 E-04
74-82-8	Methane ^g	6.5 E-05	1.7 E-04
--	Oxides of nitrogen (NO _x) ^f	2.4 E-03	6.5 E-03
--	PM-2.5 ^{d,g}	3.5 E-03	9.4 E-03
--	PM-10 ^e	8.9 E-03	2.4 E-02
12789-66-1	TSP	1.6 E-02	4.2 E-02

^a Factors represent uncontrolled emissions. References 1, 3, and 6.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 3.7 E-01 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.17-2 EMISSION FACTORS FOR THE USE OF DODIC M591,
M1 MILITARY DYNAMITE DEMOLITION BLOCK CHARGE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
83-32-9	Acenaphthene ^{d,h}	6.3 E-09	1.7 E-08
208-96-8	Acenaphthylene ^{d,h}	2.9 E-08	7.8 E-08
75-07-0	Acetaldehyde ^{e,h}	6.9 E-06	1.9 E-05
75-05-8	Acetonitrile ^{e,h}	1.3 E-05	3.5 E-05
7429-90-5	Aluminum ^{f,h}	1.4 E-04	3.9 E-04
120-12-7	Anthracene ^{e,h}	7.3 E-09	2.0 E-08
7440-39-3	Barium ^f	1.1 E-05	2.8 E-05
71-43-2	Benzene ^{e,h}	6.1 E-07	1.7 E-06
56-55-3	Benzo[a]anthracene ^e	2.2 E-09	5.9 E-09
85-68-7	Butylbenzylphthalate ^{d,g}	3.6 E-06	9.6 E-06
7440-47-3	Chromium ^{e,h}	2.3 E-06	6.3 E-06
218-01-9	Chrysene ^e	6.9 E-09	1.9 E-08
7440-50-8	Copper ^{f,h}	2.7 E-05	7.4 E-05
84-74-2	Dibutyl phthalate ^{e,g}	4.3 E-06	1.1 E-05
75-71-8	Dichlorodifluoromethane ^{f,h}	4.8 E-08	1.3 E-07
121-14-2	2,4-Dinitrotoluene ^{e,i}	1.1 E-07	3.0 E-07
--	Total dioxin/furan compounds ^e	1.4 E-10	3.8 E-10
111-76-2	Ethanol, 2-butoxy- ^{d,i}	3.0 E-06	8.1 E-06
100-41-4	Ethylbenzene ^{e,h}	6.4 E-07	1.7 E-06
74-85-1	Ethylene ^f	4.6 E-06	1.2 E-05
117-81-7	bis(2-Ethylhexyl)phthalate ^{e,h}	1.1 E-05	3.0 E-05
206-44-0	Fluoranthene ^{e,h}	3.1 E-08	8.4 E-08
86-73-7	Fluorene ^{d,h}	1.1 E-08	2.9 E-08
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	9.9 E-12	2.7 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^{e,i}	1.3 E-12	3.6 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^e	1.4 E-13	3.7 E-13
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^e	2.4 E-13	6.5 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^e	3.2 E-13	8.7 E-13
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^e	2.5 E-13	6.7 E-13
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^{e,i}	1.5 E-13	4.1 E-13

Table 15.9.17-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^e	2.2 E-13	6.0 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^e	1.5 E-13	4.1 E-13
110-54-3	Hexane ^{e,i}	5.5 E-05	1.5 E-04
74-90-8	Hydrogen cyanide ^e	1.4 E-04	3.7 E-04
7439-92-1	Lead ^e	1.5 E-04	4.1 E-04
7439-96-5	Manganese ^{e,h}	2.1 E-05	5.6 E-05
75-09-2	Methylene chloride ^{e,h}	1.8 E-06	4.9 E-06
91-20-3	Naphthalene ^{e,h}	8.9 E-07	2.4 E-06
7697-37-2	Nitric acid ^{f,h}	8.0 E-05	2.2 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	1.3 E-10	3.5 E-10
85-01-8	Phenanthrene ^{e,h}	6.5 E-08	1.8 E-07
129-00-0	Pyrene ^{d,h}	3.7 E-08	1.0 E-07
7664-93-9	Sulfuric acid ^f	3.0 E-05	8.2 E-05
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	4.4 E-13	1.2 E-12
108-88-3	Toluene ^{e,h}	6.8 E-08	1.8 E-07
71-55-6	1,1,1-Trichloroethane ^e	2.2 E-08	6.0 E-08
75-69-4	Trichlorofluoromethane ^f	4.8 E-10	1.3 E-09
95-63-6	1,2,4-Trimethylbenzene ^{f,h}	5.1 E-07	1.4 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	2.1 E-06	5.7 E-06
95-47-6	o-Xylene ^{e,h}	1.0 E-06	2.7 E-06
7440-66-6	Zinc ^{f,h}	1.6 E-05	4.4 E-05

^a Factors represent uncontrolled emissions. References 1, 3, and 6.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 3.7 E-01 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.17

1. *Report No. 1 for the Exploding Ordnance Emission Study Phase II, Revision 1, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2004.*

2. *Training Munitions Health Risk Assessment No. 39-DA-1485-02, Residential Exposure from Inhalation of Air Emissions After Detonation of the M1 Military Dynamite, Department of Defense Identification Code: M591*, U.S. Army Center for Health Promotion and Preventive Medicine, Environmental Health Risk Assessment Program, September 2002.
3. *Detailed Test Plan No. 1 for the Exploding Ordnance Emission Study, Series I*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2000.
4. *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.
5. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series I Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.
6. 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, May 2004.

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15.9.18 M626, M1 Pressure Type Demolition Firing Device

15.9.18.1 Ordnance Description^{1,2}

The M1 Pressure Type Firing Device (DODIC M626) is used in setting up booby traps and booby-trapping mines, and as an actuator for improvised antipersonnel mines. It is activated by the application of pressure on the device. This ammunition is used during combat and on firing ranges during training.

The M1 Pressure Type Firing Device consists of a head, case, and coupling base. The case contains the firing mechanism and has three lugs, each with a hole for use in anchoring the device. The firing mechanism consists of a spring-loaded firing pin held in the cocked position by a firing pin release pin, which is attached to the pressure cap.

15.9.18.2 Emissions And Controls¹⁻⁴

Primary emissions from the use of the M1 Pressure Type Firing Device include carbon dioxide (CO₂) 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 used in the field, there are no controls associated with its use.

Table 15.9.18-1 presents emission factors for CO₂, criteria pollutants, and total suspended particulate (TSP). Table 15.9.18-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.18-1 EMISSION FACTORS FOR THE USE OF DODIC M626,
M1 PRESSURE TYPE DEMOLITION FIRING DEVICE – CARBON DIOXIDE, CRITERIA
POLLUTANTS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: A (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	1.6 E-05	2.9 E-01
630-08-0	Carbon monoxide (CO) ^f	4.5 E-06	7.8 E-02
7439-92-1	Lead (Pb) ^g	4.3 E-06	7.5 E-02
--	Oxides of nitrogen (NO _x)	4.0 E-07	7.0 E-03
--	PM-2.5 ^d	2.2 E-05	3.8 E-01
--	PM-10 ^{e,f}	2.4 E-05	4.1 E-01
7446-09-5	Sulfur dioxide (SO ₂) ^g	6.2 E-07	1.1 E-02
12789-66-1	TSP	2.4 E-05	4.2 E-01

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 5.71 E-05 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING B.

^g EMISSION FACTOR RATING C.

Table 15.9.18-2 EMISSION FACTORS FOR THE USE OF DODIC M626,
M1 PRESSURE TYPE DEMOLITION FIRING DEVICE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: D (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-05-8	Acetonitrile ^d	3.4 E-08	6.0 E-04
107-13-1	Acrylonitrile ^d	4.8 E-09	8.3 E-05
7440-36-0	Antimony ^{d,f}	3.3 E-06	5.9 E-02
7440-38-2	Arsenic ^d	3.1 E-09	5.4 E-05
71-43-2	Benzene ^d	3.6 E-09	6.2 E-05
7440-43-9	Cadmium ^{d,g}	3.6 E-10	6.3 E-06
75-15-0	Carbon disulfide ^{d,g}	9.6 E-09	1.7 E-04
74-87-3	Chloromethane ^d	6.2 E-11	1.1 E-06
7440-50-8	Copper ^e	8.5 E-09	1.5 E-04
--	Total dioxin/furan compounds ^{d,g}	4.1 E-13	7.1 E-09
100-41-4	Ethylbenzene ^d	1.1 E-09	1.8 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^d	3.3 E-14	5.7 E-10
7647-01-0	Hydrochloric acid ^{d,f}	4.2 E-07	7.4 E-03
74-90-8	Hydrogen cyanide ^{d,g}	2.0 E-08	3.5 E-04
7439-92-1	Lead ^{d,g}	4.3 E-06	7.5 E-02
7439-96-5	Manganese ^{d,g}	1.4 E-09	2.5 E-05
75-09-2	Methylene chloride ^d	2.1 E-08	3.7 E-04
7440-02-0	Nickel ^d	4.1 E-10	7.2 E-06
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^d	3.4 E-13	5.9 E-09
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^d	3.0 E-14	5.3 E-10
115-07-1	Propylene ^{e,f}	3.1 E-09	5.5 E-05
7782-49-2	Selenium ^d	3.3 E-10	5.8 E-06
7440-22-4	Silver ^{e,g}	2.5 E-10	4.4 E-06
100-42-5	Styrene ^{d,g}	5.2 E-10	9.0 E-06
108-88-3	Toluene ^d	3.1 E-09	5.4 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene ^d	1.3 E-09	2.3 E-05
95-47-6	o-Xylene ^d	6.6 E-10	1.2 E-05
7440-66-6	Zinc ^{e,f}	3.2 E-07	5.6 E-03

Table 15.9.18-2 (cont.)

- ^a Factors represent uncontrolled emissions. References 1-4.
- ^b CASRN = Chemical Abstracts Service Registry Number.
- ^c NEW = net explosive weight. The NEW for this ordnance is 5.71 E-05 pounds per item. Reference 1.
- ^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
- ^e Reportable chemical under EPCRA Section 313.
- ^f EMISSION FACTOR RATING B.
- ^g EMISSION FACTOR RATING C.

References For Section 15.9.18

1. *Report No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2006.
2. *Detailed Test Plan No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2003.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 9 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2008.
4. 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, June 2007.

15.9.20 M630, M1 Pull Type Demolition Firing Device

15.9.20.1 Ordnance Description¹⁻⁴

The M1 Pull Type Demolition Firing Device (DODIC M630) is used in setting up booby traps and booby-trapping mines, and as an actuator for improvised antipersonnel mines. It is activated by a pull on a trip wire. This ammunition is used during combat and on firing ranges during training.

The M1 Pull Type Demolition Firing Device consists of a cylindrical body, a head, and a coupling base. The head, which is permanently joined to the body, contains a release pin while the body contains the firing mechanism. A primer is contained within the coupling base, which is threaded to fit activators and demolition charge capwells.

15.9.20.2 Emissions And Controls¹⁻⁸

Carbon dioxide (CO₂), carbon monoxide (CO), lead, and particulate matter are the primary pollutants emitted from the use of the M1 Pull Type Demolition Firing Device. 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 used in the field, there are no controls associated with its use.

Table 15.9.20-1 presents emission factors for criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.9.20-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.20-1 EMISSION FACTORS FOR THE USE OF DODIC M630,
M1 PULL TYPE DEMOLITION FIRING DEVICE – CRITERIA POLLUTANTS,
TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	5.4 E-06	9.4 E-02
630-08-0	CO	6.3 E-06	1.1 E-01
7439-92-1	Lead (Pb)	6.9 E-06	1.2 E-01
--	Oxides of nitrogen (NO _x)	7.6 E-07	1.3 E-02
--	PM-2.5 ^{d,g}	5.9 E-06	1.0 E-01
--	PM-10 ^e	1.6 E-05	2.8 E-01
7446-09-5	Sulfur dioxide (SO ₂) ^g	1.3 E-07	2.3 E-03
--	TNMHC ^g	5.8 E-08	1.0 E-03
12789-66-1	TSP ^f	2.0 E-05	3.5 E-01

^a Factors represent uncontrolled emissions. References 1-8.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 5.71 E-05 pounds per item. References 1, 2, and 9.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING C.

Table 15.9.20-2 EMISSION FACTORS FOR THE USE OF DODIC M630,
M1 PULL TYPE DEMOLITION FIRING DEVICE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-07-0	Acetaldehyde ^d	1.5 E-08	2.7 E-04
7429-90-5	Aluminum ^{e,g}	9.6 E-07	1.7 E-02
7440-36-0	Antimony ^d	3.3 E-06	5.8 E-02
7440-38-2	Arsenic ^d	4.4 E-10	7.7 E-06
7440-39-3	Barium ^{e,g}	1.6 E-06	2.8 E-02
71-43-2	Benzene ^d	4.7 E-10	8.3 E-06
123-72-8	Butyraldehyde ^e	6.4 E-09	1.1 E-04
75-15-0	Carbon disulfide ^{d,g}	4.6 E-09	8.1 E-05
74-87-3	Chloromethane ^d	1.0 E-10	1.8 E-06
7440-47-3	Chromium ^d	1.7 E-07	3.1 E-03
7440-50-8	Copper ^e	2.6 E-08	4.5 E-04
4170-30-3	Crotonaldehyde ^{e,h}	1.1 E-08	1.9 E-04
121-14-2	2,4-Dinitrotoluene ^d	6.0 E-10	1.1 E-05
100-41-4	Ethylbenzene ^d	5.4 E-10	9.4 E-06
7439-92-1	Lead ^{d,g}	6.9 E-06	1.2 E-01
7439-96-5	Manganese ^d	2.3 E-08	4.1 E-04
75-09-2	Methylene chloride ^d	3.7 E-08	6.6 E-04
80-62-6	Methyl methacrylate ^{d,h}	4.1 E-10	7.1 E-06
7440-02-0	Nickel ^d	1.1 E-07	2.0 E-03
108-95-2	Phenol ^{d,g}	3.7 E-10	6.5 E-06
7723-14-0	Phosphorus ^f	5.4 E-09	9.4 E-05
123-38-6	Propionaldehyde ^d	2.4 E-09	4.2 E-05
115-07-1	Propylene ^{e,i}	8.5 E-10	1.5 E-05
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin ^d	8.5 E-16	1.5 E-11
108-88-3	Toluene ^d	2.8 E-09	4.9 E-05
95-63-6	1,2,4-Trimethylbenzene ^e	1.1 E-09	1.9 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene ^d	8.6 E-10	1.5 E-05
95-47-6	o-Xylene ^d	7.5 E-10	1.3 E-05
7440-66-6	Zinc ^{e,g}	4.0 E-07	7.1 E-03

Table 15.9.20-2 (cont.)

- ^a Factors represent uncontrolled emissions. References 1-8.
- ^b CASRN = Chemical Abstracts Service Registry Number.
- ^c NEW = net explosive weight. The NEW for this ordnance is 5.71 E-05 pounds per item. References 1, 2, and 9.
- ^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
- ^e Reportable chemical under EPCRA Section 313.
- ^f Hazardous air pollutant under CAA Section 112(b).
- ^g EMISSION FACTOR RATING B.
- ^h EMISSION FACTOR RATING D.
- ⁱ EMISSION FACTOR RATING A.

References For Section 15.9.20

1. *Sampling Results for AEC Phase V Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics, Revision 1*, URS Group, Inc., Oak Ridge, TN, February 2007.
2. *Report No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2006.
3. *Detailed Test Plan for Phase V Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, October 2003.
4. *Detailed Test Plan No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2003.
5. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Group, Inc., Oak Ridge, TN, January 2006 and February 2007.
6. 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, June 2007.
7. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase V-A Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, November 2007.
8. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 9 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2008.
9. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, November 2006.

15.9.21 M670, M700 Time Blasting Fuse

15.9.21.1 Ordnance Description¹⁻³

The M700 Time Blasting Fuse (DODIC M670) is used in military demolitions to ignite non-electric blasting caps. The burning rate of the fuse permits the operator to ignite the fuse and reach cover before detonation. This fuse is similar to, and interchangeable with, the standard safety fuse. This ammunition is used during combat and on firing ranges during training.

15.9.21.2 Emissions And Controls^{1,2,4,5}

Carbon dioxide (CO₂) and carbon monoxide (CO) are the primary emissions from the use of the M700 Time Blasting Fuse. 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 used in the field, there are no controls associated with its use.

Table 15.9.21-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.21-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW is dependent upon the length of fuse used, emission factors were not developed in units of pounds of emissions per item.

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Table 15.9.21-1 EMISSION FACTORS FOR THE USE OF DODIC M670,
M700 TIME BLASTING FUSE – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND
TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: A (except as noted)

CASRN ^b	Pollutant	lb per lb NEW ^c
124-38-9	CO ₂ ^f	2.9 E-01
630-08-0	CO	9.5 E-02
74-82-8	Methane ^g	5.0 E-03
--	Oxides of nitrogen (NO _x) ^f	7.7 E-02
--	PM-2.5 ^d	3.5 E-02
--	PM-10 ^{e,f}	3.4 E-02
7446-09-5	Sulfur dioxide (SO ₂) ^g	7.2 E-04
12789-66-1	TSP	3.4 E-02

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.70 E-03 pounds per linear foot of fuse. References 1 and 3.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING B.

^g EMISSION FACTOR RATING C.

Table 15.9.21-2 EMISSION FACTORS FOR THE USE OF DODIC M670,
M700 TIME BLASTING FUSE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	4.1 E-07
75-07-0	Acetaldehyde ^e	2.3 E-03
75-05-8	Acetonitrile ^e	1.9 E-04
107-13-1	Acrylonitrile ^{e,g}	6.7 E-05
7664-41-7	Ammonia ^f	5.5 E-03
120-12-7	Anthracene ^e	5.8 E-08
71-43-2	Benzene ^e	3.8 E-04
56-55-3	Benzo[a]anthracene ^e	1.2 E-07
205-99-2	Benzo[b]fluoranthene ^e	9.4 E-08
207-08-9	Benzo[k]fluoranthene ^e	3.6 E-08
192-97-2	Benzo[e]pyrene ^d	9.8 E-08
75-15-0	Carbon disulfide ^{e,h}	2.1 E-02
74-87-3	Chloromethane ^e	1.1 E-05
18540-29-9	Hexavalent chromium ^e	1.2 E-06
218-01-9	Chrysene ^e	1.8 E-07
7440-50-8	Copper ^{f,h}	3.0 E-06
106-46-7	1,4-Dichlorobenzene ^e	9.0 E-05
--	Total dioxin/furan compounds ^e	3.2 E-12
100-41-4	Ethylbenzene ^e	2.9 E-05
74-85-1	Ethylene ^{f,g}	1.9 E-03
206-44-0	Fluoranthene ^e	3.7 E-08
50-00-0	Formaldehyde ^{e,g}	1.0 E-03
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^e	3.2 E-12
75-09-2	Methylene chloride ^e	5.1 E-05
108-10-1	Methyl isobutyl ketone ^{e,h}	1.9 E-05
91-20-3	Naphthalene ^e	6.9 E-06
7697-37-2	Nitric acid ^f	3.5 E-04
115-07-1	Propylene ^f	9.1 E-04
129-00-0	Pyrene ^d	8.3 E-08
7664-93-9	Sulfuric acid ^f	1.0 E-03

Table 15.9.21-2 (cont.)

CASRN ^b	Pollutant	lb per lb NEW ^c
79-34-5	1,1,2,2-Tetrachloroethane ^{e,h}	2.3 E-05
108-88-3	Toluene ^e	1.7 E-04
106-42-3, 108-38-3	m-Xylene, p-Xylene ^e	5.6 E-06

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.70 E-03 pounds per linear foot of fuse. References 1 and 3.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING B.

^h EMISSION FACTOR RATING D.

References For Section 15.9.21

1. *Report No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2007.
2. *Detailed Test Plan No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2004.
3. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, August 2008.
4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 11 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.
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, April 2008.

15.9.23 M766, M60 Time Blasting Fuse Igniter

15.9.23.1 Ordnance Description^{1,2}

The weatherproof M60 Time Blasting Fuse Igniter (DODIC M766) is a pull-type assembly that is used to initiate a time blasting fuse. It may be used under all weather conditions and even underwater. This ammunition is used during combat and on firing ranges during training.

The M60 Time Blasting Fuse Igniter consists of three major assemblies: a firing mechanism, a fuse holder, and a primer base. After the fuse is inserted in the igniter and secured, the safety cotter pin is removed.

15.9.23.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂) and particulate matter are the primary pollutants emitted from the use of the M60 Time Blasting Fuse Igniter. 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 used in the field, there are no controls associated with its use.

Table 15.9.23-1 presents emission factors for CO₂, criteria pollutants, methane and total suspended particulate (TSP). Table 15.9.23-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.23-1 EMISSION FACTORS FOR THE USE OF DODIC M766,
M60 TIME BLASTING FUSE IGNITER – CARBON DIOXIDE, CRITERIA POLLUTANTS,
METHANE AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	1.0 E-05	1.8 E-01
630-08-0	Carbon monoxide (CO)	2.4 E-06	4.2 E-02
7439-92-1	Lead (Pb)	2.6 E-06	4.5 E-02
74-82-8	Methane ^g	2.7 E-08	4.7 E-04
--	Oxides of nitrogen (NO _x) ^f	1.8 E-06	3.2 E-02
--	PM-2.5 ^{d,f}	2.9 E-06	5.1 E-02
--	PM-10 ^e	3.6 E-06	6.3 E-02
12789-66-1	TSP ^f	3.8 E-06	6.7 E-02

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 5.71 E-05 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING C.

Table 15.9.23-2 EMISSION FACTORS FOR THE USE OF DODIC M766,
M60 TIME BLASTING FUSE IGNITER –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-07-0	Acetaldehyde ^d	6.0 E-11	1.1 E-06
107-13-1	Acrylonitrile ^d	1.3 E-08	2.2 E-04
7440-36-0	Antimony ^{d,g}	6.1 E-07	1.1 E-02
7440-39-3	Barium ^{e,g}	2.2 E-07	3.8 E-03
71-43-2	Benzene ^d	1.8 E-08	3.1 E-04
75-15-0	Carbon disulfide ^{d,g}	2.5 E-08	4.3 E-04
74-87-3	Chloromethane ^d	8.5 E-11	1.5 E-06
--	Total dioxin/furan compounds ^d	9.9 E-14	1.7 E-09
100-41-4	Ethylbenzene ^d	2.5 E-09	4.3 E-05
74-85-1	Ethylene ^{e,g}	4.4 E-08	7.7 E-04
50-00-0	Formaldehyde ^d	9.8 E-09	1.7 E-04
7647-01-0	Hydrochloric acid ^{d,g}	2.7 E-08	4.8 E-04
74-90-8	Hydrogen cyanide ^d	2.8 E-07	4.9 E-03
7439-92-1	Lead ^{d,g}	2.6 E-06	4.5 E-02
75-09-2	Methylene chloride ^d	2.5 E-07	4.5 E-03
91-20-3	Naphthalene ^d	6.5 E-10	1.1 E-05
7697-37-2	Nitric acid ^e	1.9 E-08	3.3 E-04
115-07-1	Propylene ^{e,i}	8.8 E-09	1.5 E-04
100-42-5	Styrene ^{d,g}	1.5 E-09	2.7 E-05
7664-93-9	Sulfuric acid ^e	8.8 E-08	1.5 E-03
108-88-3	Toluene ^d	1.3 E-08	2.2 E-04
71-55-6	1,1,1-Trichloroethane ^d	1.2 E-09	2.1 E-05
95-63-6	1,2,4-Trimethylbenzene ^e	1.1 E-09	1.9 E-05
75-01-4	Vinyl chloride ^{d,h}	4.9 E-10	8.6 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene ^d	3.9 E-09	6.8 E-05
95-47-6	o-Xylene ^d	2.3 E-09	4.1 E-05
7440-66-6	Zinc ^{e,g}	4.4 E-09	7.7 E-05

Table 15.9.23-2 (cont.)

- ^a Factors represent uncontrolled emissions. References 1-4.
- ^b CASRN = Chemical Abstracts Service Registry Number.
- ^c NEW = net explosive weight. The NEW for this ordnance is 5.71 E-05 pounds per item. Reference 1.
- ^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
- ^e Reportable chemical under EPCRA Section 313.
- ^f Hazardous air pollutant under CAA Section 112(b).
- ^g EMISSION FACTOR RATING B.
- ^h EMISSION FACTOR RATING D.
- ⁱ EMISSION FACTOR RATING A.

References For Section 15.9.23

1. *Report No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2006.
2. *Detailed Test Plan No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2003.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 9 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2008.
4. 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, June 2007.

15.9.25 M913, M58A3 Linear Demolition Charge

15.9.25.1 Ordnance Description¹

The M58A3 Linear Demolition Charge (DODIC M913) is a mine clearing device used to clear a path for tanks, vehicles, and personnel through minefields or other obstacles. The charge consists of a 350-foot sausage-like flexible explosive charge packed in a specialized container along with a steel towing cable assembly, a nylon arresting cable, and an electrically operated fuse. It is designed to be towed out over the target minefield by a rocket motor where it drops onto the ground and is then detonated on command by means of an electrical cable. This ammunition is used during combat and on ranges during training. Note that emission factors presented herein are only associated with the use of linear charge; emissions associated with the propelling rocket motor are not addressed in this section.

The M58A3 Linear Demolition Charge contains a core of 3/4-inch nylon rope, a detonating cord, and a bursting charge. A nylon sleeve is wrapped around the core, detonating cord, and bursting charge assembly. An M1134 fuse that contains an initiating charge is used to detonate the demolition charge.

15.9.25.2 Emissions And Controls¹⁻⁵

Carbon dioxide (CO₂) is the primary emission from the use of the M58A3 Linear Demolition Charge. 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 used in the field, there are no controls associated with its use.

Table 15.9.25-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.25-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW is dependent upon the length of demolition charge used, emission factors were not developed in units of pounds of emissions per item.

Table 15.9.25-1 EMISSION FACTORS FOR THE USE OF DODIC M913, M58A3 LINEAR DEMOLITION CHARGE (LINEAR CHARGE AND FUSE) – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per lb NEW
124-38-9	CO ₂ ^f	1.2
630-08-0	Carbon monoxide (CO) ^g	1.1 E-02
7439-92-1	Lead (Pb)	3.4 E-05
74-82-8	Methane ^g	2.6 E-04
--	Oxides of nitrogen (NO _x) ^f	1.8 E-02
--	PM-2.5 ^{c,g}	2.1 E-02
--	PM-10 ^d	4.6 E-02
12789-66-1	TSP	4.8 E-02

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 5.02 pounds per linear foot of demolition charge, not including the NEW associated with the fuse (2.6 E-03 pounds). The complete ordnance includes three 100-foot sections and one 50-foot section that are joined together, and has an NEW of 1,757 pounds. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.25-2 EMISSION FACTORS FOR THE USE OF DODIC M913,
M58A3 LINEAR DEMOLITION CHARGE (LINEAR CHARGE AND FUSE) –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per lb NEW ^c
83-32-9	Acenaphthene ^{d,h}	3.8 E-08
208-96-8	Acenaphthylene ^{d,h}	2.6 E-07
75-07-0	Acetaldehyde ^{e,h}	4.5 E-05
75-05-8	Acetonitrile ^{e,h}	4.3 E-05
107-02-8	Acrolein ^e	7.4 E-06
107-13-1	Acrylonitrile ^{e,h}	6.6 E-05
7429-90-5	Aluminum ^{f,h}	1.1 E-06
107-18-6	Allyl alcohol ^{e,i}	3.7 E-03
120-12-7	Anthracene ^{e,h}	5.8 E-08
7440-39-3	Barium ^f	6.4 E-06
71-43-2	Benzene ^{e,h}	1.4 E-05
56-55-3	Benzo[a]anthracene ^e	8.7 E-09
205-99-2	Benzo[b]fluoranthene ^e	3.9 E-09
50-32-8	Benzo[a]pyrene ^e	2.4 E-09
192-97-2	Benzo[e]pyrene ^d	5.6 E-09
74-83-9	Bromomethane ^e	6.6 E-07
75-65-0	t-Butyl alcohol ^e	2.7 E-07
85-68-7	Butylbenzylphthalate ^{d,g}	3.3 E-06
123-72-8	Butyraldehyde ^{f,i}	2.5 E-06
7440-43-9	Cadmium ^e	1.9 E-04
74-87-3	Chloromethane ^{e,h}	5.2 E-07
7440-47-3	Chromium ^{e,h}	1.0 E-05
18540-29-9	Hexavalent chromium ^e	1.4 E-07
218-01-9	Chrysene ^e	1.5 E-08
7440-50-8	Copper ^{f,h}	4.4 E-04
4170-30-3	Crotonaldehyde ^f	3.1 E-06
84-74-2	Dibutyl phthalate ^{e,g}	6.3 E-06
--	Total dioxin/furan compounds ^e	3.1 E-10
100-41-4	Ethylbenzene ^{e,h}	6.2 E-07
74-85-1	Ethylene ^{f,h}	3.4 E-04

Table 15.9.25-2 (cont.)

CASRN ^b	Pollutant	lb per lb NEW ^c
117-81-7	bis(2-Ethylhexyl)phthalate ^e	9.4 E-06
206-44-0	Fluoranthene ^{e,h}	1.1 E-07
86-73-7	Fluorene ^{d,h}	9.9 E-08
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	3.4 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^e	2.7 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^e	8.5 E-13
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^e	4.7 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^e	1.1 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^e	1.0 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^e	8.0 E-13
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^e	4.6 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^e	3.3 E-13
74-90-8	Hydrogen cyanide ^e	2.7 E-04
7439-92-1	Lead ^e	3.4 E-05
7439-96-5	Manganese ^{e,h}	9.3 E-05
74-88-4	Methyl iodide ^e	2.6 E-07
80-62-6	Methyl methacrylate ^e	5.2 E-07
91-20-3	Naphthalene ^{e,h}	1.0 E-06
7697-37-2	Nitric acid ^{f,h}	1.6 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	2.7 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^e	9.7 E-12
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ^e	3.4 E-13
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^e	6.8 E-13
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^e	1.0 E-12
85-01-8	Phenanthrene ^{e,h}	3.6 E-07
123-38-6	Propionaldehyde ^e	5.9 E-06
107-12-0	Propionitrile ^{d,i}	1.2 E-06
115-07-1	Propylene ^{f,h}	5.0 E-05
129-00-0	Pyrene ^{d,h}	2.3 E-07
7440-22-4	Silver ^f	5.0 E-06
100-42-5	Styrene ^e	6.1 E-07
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	1.9 E-12

Table 15.9.25-2 (cont.)

CASRN ^b	Pollutant	lb per lb NEW ^c
108-88-3	Toluene ^{e,h}	5.5 E-06
95-63-6	1,2,4-Trimethylbenzene ^{f,h}	4.0 E-07
75-01-4	Vinyl chloride ^e	9.2 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	5.9 E-07
95-47-6	o-Xylene ^{e,h}	3.9 E-07
7440-66-6	Zinc ^{f,h}	1.5 E-04

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 5.02 pounds per linear foot of demolition charge, not including the NEW associated with the fuse (2.6 E-03 pounds). Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.25

1. *Report No. 3 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2004.
2. *Detailed Test Plan No. 3 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.
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 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 3 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, January 2005.

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15.9.26 MD73, M796 Impulse Cartridge

15.9.26.1 Ordnance Description^{1,2}

The M796 Impulse Cartridge (DODIC MD73) is used as an ignition source for the M1 chaff device of the M206 flare cartridge. It is used on a one-to-one match with the M206 flare cartridges in the M130 dispenser pod on various aircraft. This ammunition is used during combat and on firing ranges during training.

15.9.26.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂), carbon monoxide (CO), oxides of nitrogen (NO_x), and particulate matter are the primary emissions from the use of the M796 Impulse Cartridge. 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 used in the field, there are no controls associated with its use.

Table 15.9.26-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.26-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.26-1 EMISSION FACTORS FOR THE USE OF DODIC MD73,
M796 IMPULSE CARTRIDGE – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND
TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	3.0 E-05	3.9 E-02
630-08-0	CO ^f	1.7 E-05	2.1 E-02
7439-92-1	Lead (Pb)	3.6 E-09	4.6 E-06
74-82-8	Methane ^f	2.3 E-07	3.0 E-04
--	NO _x	4.2 E-05	5.4 E-02
--	PM-2.5 ^d	7.2 E-05	9.2 E-02
--	PM-10 ^e	8.0 E-05	1.0 E-01
7446-09-5	Sulfur dioxide (SO ₂) ^g	1.4 E-07	1.8 E-04
12789-66-1	TSP	8.1 E-05	1.0 E-01

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 7.83 E-04 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING C.

Table 15.9.26-2 EMISSION FACTORS FOR THE USE OF DODIC MD73,
M796 IMPULSE CARTRIDGE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	3.4 E-11	4.4 E-08
75-07-0	Acetaldehyde ^e	5.4 E-08	6.9 E-05
75-05-8	Acetonitrile ^{e,h}	6.2 E-08	7.9 E-05
107-13-1	Acrylonitrile ^{e,h}	9.3 E-09	1.2 E-05
7429-90-5	Aluminum ^f	2.1 E-08	2.7 E-05
7664-41-7	Ammonia ^f	1.4 E-07	1.8 E-04
71-43-2	Benzene ^{e,i}	3.0 E-08	3.8 E-05
56-55-3	Benzo[a]anthracene ^e	6.7 E-12	8.5 E-09
205-99-2	Benzo[b]fluoranthene ^e	8.6 E-12	1.1 E-08
207-08-9	Benzo[k]fluoranthene ^e	6.7 E-12	8.5 E-09
191-24-2	Benzo[g,h,i]perylene ^e	7.6 E-12	9.8 E-09
7440-43-9	Cadmium ^{e,h}	2.3 E-10	2.9 E-07
7440-47-3	Chromium ^{e,h}	5.5 E-07	7.1 E-04
18540-29-9	Hexavalent chromium ^{e,h}	4.5 E-07	5.7 E-04
218-01-9	Chrysene ^{e,h}	7.3 E-12	9.4 E-09
7440-50-8	Copper ^f	9.5 E-09	1.2 E-05
98-82-8	Cumene ^{e,i}	2.2 E-09	2.8 E-06
57-12-5	Particulate cyanide ^{e,h}	8.7 E-09	1.1 E-05
53-70-3	Dibenz[a,h]anthracene ^e	7.3 E-12	9.4 E-09
--	Total dioxin/furan compounds ^{e,h}	1.2 E-15	1.6 E-12
100-41-4	Ethylbenzene ^{e,i}	1.7 E-08	2.2 E-05
74-85-1	Ethylene ^f	1.1 E-07	1.4 E-04
206-44-0	Fluoranthene ^e	1.8 E-12	2.4 E-09
50-00-0	Formaldehyde ^e	5.9 E-07	7.5 E-04
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^{e,h}	2.4 E-16	3.1 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^{e,h}	2.0 E-16	2.6 E-13
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^{e,i}	3.0 E-16	3.8 E-13
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran ^{e,h}	4.9 E-16	6.3 E-13
7647-01-0	Hydrochloric acid ^{e,h}	2.9 E-08	3.7 E-05
74-90-8	Hydrogen cyanide ^e	6.9 E-08	8.8 E-05

Table 15.9.26-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
193-39-5	Indeno[1,2,3-cd]pyrene ^{e,g}	7.6 E-12	9.8 E-09
7439-92-1	Lead ^e	3.6 E-09	4.6 E-06
7439-96-5	Manganese ^{e,g}	8.4 E-09	1.1 E-05
75-09-2	Methylene chloride ^e	7.7 E-09	9.8 E-06
108-10-1	Methyl isobutyl ketone ^{e,i}	1.8 E-09	2.3 E-06
7440-02-0	Nickel ^{e,h}	3.6 E-10	4.6 E-07
7697-37-2	Nitric acid ^f	1.4 E-06	1.7 E-03
55-63-0	Nitroglycerin ^{f,i}	5.6 E-08	7.1 E-05
129-00-0	Pyrene ^d	8.6 E-13	1.1 E-09
108-88-3	Toluene ^{e,i}	1.5 E-08	1.9 E-05
95-63-6	1,2,4-Trimethylbenzene ^{f,i}	5.6 E-09	7.2 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,i}	8.4 E-08	1.1 E-04
95-47-6	o-Xylene ^{e,i}	3.1 E-08	3.9 E-05
7440-66-6	Zinc ^{f,h}	8.1 E-09	1.0 E-05

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 7.83 E-04 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING C.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.26

1. *Report No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2007.
2. *Detailed Test Plan No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2004.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 11 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.

4. 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, April 2008.

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15.9.27 ML03, M142 Multipurpose Demolition Firing Device

15.9.27.1 Ordnance Description^{1,2}

The M142 Multipurpose Demolition Firing Device (DODIC ML03) is a mechanical firing device for use with antipersonnel mines and when setting up booby-traps using demolition charges. This ammunition is used during combat and on firing ranges during training.

15.9.27.2 Emissions And Controls¹⁻⁴

Particulate matter and lead are the primary emissions from the use of the M142 Multipurpose Demolition Firing Device. 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 used in the field, there are no controls associated with its use.

Table 15.9.27-1 presents emission factors for criteria pollutants and total suspended particulate (TSP). Table 15.9.27-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.27-1 EMISSION FACTORS FOR THE USE OF DODIC ML03,
M142 MULTIPURPOSE DEMOLITION FIRING DEVICE –CRITERIA POLLUTANTS AND TOTAL
SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: A (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
630-08-0	Carbon monoxide (CO)	3.8 E-06	8.1 E-02
7439-92-1	Lead (Pb) ^f	5.0 E-06	1.1 E-01
--	Oxides of nitrogen (NO _x) ^f	1.2 E-06	2.5 E-02
--	PM-2.5 ^d	7.7 E-06	1.6 E-01
--	PM-10 ^{e,f}	8.8 E-06	1.9 E-01
12789-66-1	Total suspended particulate (TSP)	8.3 E-06	1.8 E-01

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 4.71 E-05 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING B.

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Table 15.9.27-2 EMISSION FACTORS FOR THE USE OF DODIC ML03,
M142 MULTIPURPOSE DEMOLITION FIRING DEVICE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	1.0 E-10	2.1 E-06
75-07-0	Acetaldehyde ^{e,h}	6.3 E-09	1.3 E-04
75-05-8	Acetonitrile ^e	8.2 E-08	1.7 E-03
107-13-1	Acrylonitrile ^{e,g}	8.4 E-09	1.8 E-04
7429-90-5	Aluminum ^{f,g}	2.7 E-07	5.6 E-03
7440-36-0	Antimony ^{e,g}	5.6 E-07	1.2 E-02
7440-38-2	Arsenic ^e	5.2 E-10	1.1 E-05
7440-39-3	Barium ^{f,g}	2.4 E-07	5.1 E-03
71-43-2	Benzene ^e	8.2 E-09	1.7 E-04
7440-43-9	Cadmium ^{e,g}	1.0 E-09	2.2 E-05
75-15-0	Carbon disulfide ^e	2.3 E-08	4.9 E-04
74-87-3	Chloromethane ^e	7.9 E-10	1.7 E-05
7440-47-3	Chromium ^e	1.1 E-09	2.2 E-05
7440-50-8	Copper ^f	2.4 E-09	5.2 E-05
75-71-8	Dichlorodifluoromethane ^f	2.5 E-09	5.4 E-05
74-85-1	Ethylene ^f	3.4 E-08	7.1 E-04
206-44-0	Fluoranthene ^e	9.8 E-12	2.1 E-07
50-00-0	Formaldehyde ^{e,g}	2.4 E-08	5.2 E-04
74-90-8	Hydrogen cyanide ^{e,g}	3.8 E-07	8.1 E-03
7439-96-5	Manganese ^{e,g}	1.9 E-10	3.9 E-06
75-09-2	Methylene chloride ^e	8.6 E-08	1.8 E-03
7440-02-0	Nickel ^e	5.3 E-10	1.1 E-05
7440-28-0	Thallium ^f	1.0 E-09	2.2 E-05
108-88-3	Toluene ^{e,h}	1.9 E-08	4.0 E-04
7440-66-6	Zinc ^{f,g}	7.7 E-09	1.6 E-04

Table 15.9.27-2 (cont.)

- ^a Factors represent uncontrolled emissions. References 1-4.
- ^b CASRN = Chemical Abstracts Service Registry Number.
- ^c NEW = net explosive weight. The NEW for this ordnance is 4.71 E-05 pounds per item. Reference 1.
- ^d Hazardous air pollutant under CAA Section 112(b).
- ^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
- ^f Reportable chemical under EPCRA Section 313.
- ^g EMISSION FACTOR RATING B.
- ^h EMISSION FACTOR RATING D.

References For Section 15.9.27

1. *Report No. 10 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2006.
2. *Detailed Test Plan No. 10 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, June 2004.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 10 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.
4. 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, September and October 2007.

15.9.28 ML05, MK24 Powder Actuated Cutter

15.9.28.1 Ordnance Description^{1,2}

The MK24 Powder Actuated Cutter (DODIC ML05) is used to remotely render bombs or projectiles safe by forceful removal of either the fuse, the fuse base plate containing the fuse, or by striking the item at a strategic location with an explosively propelled ballistic disc. This ammunition is used during combat and on firing ranges during training.

15.9.28.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂) is the primary emission from the use of the MK24 Powder Actuated Cutter. 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 used in the field, there are no controls associated with its use.

Table 15.9.28-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.28-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.28-1 EMISSION FACTORS FOR THE USE OF DODIC ML05,
MK24 POWDER ACTUATED CUTTER – CARBON DIOXIDE, CRITERIA POLLUTANTS,
METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	1.5	1.2
630-08-0	Carbon monoxide (CO) ^g	2.3 E-02	1.8 E-02
7439-92-1	Lead (Pb)	1.1 E-03	8.5 E-04
74-82-8	Methane	2.5 E-04	2.0 E-04
--	Oxides of nitrogen (NO _x) ^f	1.9 E-02	1.5 E-02
--	PM-2.5 ^{d,f}	2.9 E-02	2.3 E-02
--	PM-10 ^e	6.6 E-02	5.3 E-02
7446-09-5	Sulfur dioxide (SO ₂)	1.2 E-04	9.5 E-05
12789-66-1	Total suspended particulate (TSP)	7.4 E-02	5.8 E-02

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.26 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.28-2 EMISSION FACTORS FOR THE USE OF DODIC ML05,
MK24 POWDER ACTUATED CUTTER –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
83-32-9	Acenaphthene ^{d,h}	4.3 E-08	3.4 E-08
208-96-8	Acenaphthylene ^{d,h}	1.1 E-06	8.6 E-07
75-07-0	Acetaldehyde ^e	3.2 E-05	2.5 E-05
75-05-8	Acetonitrile ^{e,h}	1.2 E-04	9.2 E-05
98-86-2	Acetophenone	8.7 E-06	6.9 E-06
107-13-1	Acrylonitrile ^{e,h}	2.4 E-04	1.9 E-04
7429-90-5	Aluminum ^{f,h}	3.4 E-03	2.7 E-03
7664-41-7	Ammonia ^{f,h}	3.0 E-04	2.3 E-04
120-12-7	Anthracene ^{e,h}	1.3 E-07	1.0 E-07
7440-36-0	Antimony ^e	7.1 E-06	5.6 E-06
7440-38-2	Arsenic ^e	1.6 E-06	1.3 E-06
7440-39-3	Barium ^f	3.2 E-05	2.6 E-05
71-43-2	Benzene ^{e,h}	1.1 E-04	8.4 E-05
56-55-3	Benzo[a]anthracene ^{e,h}	5.6 E-08	4.4 E-08
205-99-2	Benzo[b]fluoranthene ^{e,h}	2.6 E-08	2.1 E-08
207-08-9	Benzo[k]fluoranthene ^{e,h}	2.9 E-08	2.3 E-08
191-24-2	Benzo[g,h,i]perylene ^{e,h}	9.3 E-09	7.4 E-09
192-97-2	Benzo[e]pyrene ^{d,h}	2.5 E-08	2.0 E-08
7440-43-9	Cadmium ^e	3.3 E-06	2.6 E-06
74-87-3	Chloromethane ^e	1.9 E-06	1.5 E-06
7440-47-3	Chromium ^e	2.7 E-05	2.2 E-05
218-01-9	Chrysene ^e	6.9 E-08	5.5 E-08
7440-48-4	Cobalt ^{e,h}	2.1 E-06	1.6 E-06
7440-50-8	Copper ^{f,h}	2.1 E-03	1.7 E-03
98-82-8	Cumene ^{e,h}	9.5 E-06	7.5 E-06
107-06-2	1,2-Dichloroethane ^e	2.3 E-06	1.8 E-06
--	Total dioxin/furan compounds ^e	1.6 E-10	1.2 E-10
100-41-4	Ethylbenzene ^{e,h}	9.4 E-06	7.4 E-06
74-85-1	Ethylene ^f	6.8 E-05	5.4 E-05
206-44-0	Fluoranthene ^{e,h}	3.2 E-07	2.5 E-07

Table 15.9.28-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
86-73-7	Fluorene ^d	1.1 E-07	8.8 E-08
50-00-0	Formaldehyde ^e	8.4 E-05	6.7 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	1.7 E-11	1.3 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^e	8.8 E-12	7.0 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^e	2.3 E-12	1.8 E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^e	3.6 E-12	2.9 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^e	2.8 E-12	2.2 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^e	3.3 E-12	2.6 E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^e	1.5 E-12	1.2 E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^e	1.7 E-12	1.4 E-12
74-90-8	Hydrogen cyanide ^{e,h}	3.3 E-04	2.7 E-04
193-39-5	Indeno[1,2,3-cd]pyrene ^e	5.9 E-09	4.7 E-09
7439-92-1	Lead	1.1 E-03	8.5 E-04
7439-96-5	Manganese ^{e,h}	2.4 E-04	1.9 E-04
75-09-2	Methylene chloride ^e	2.4 E-07	1.9 E-07
91-20-3	Naphthalene ^{e,h}	4.4 E-06	3.5 E-06
7440-02-0	Nickel ^{e,h}	2.8 E-05	2.2 E-05
7697-37-2	Nitric acid ^{f,g}	2.4 E-04	1.9 E-04
55-63-0	Nitroglycerin ^f	5.1 E-07	4.1 E-07
88-75-5	2-Nitrophenol ^f	3.0 E-06	2.4 E-06
100-02-7	4-Nitrophenol ^{e,i}	3.9 E-06	3.1 E-06
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	1.0 E-10	8.0 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^e	9.4 E-12	7.4 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^e	3.4 E-12	2.7 E-12
85-01-8	Phenanthrene ^{e,h}	8.9 E-07	7.0 E-07
108-95-2	Phenol ^{e,h}	3.5 E-06	2.8 E-06
115-07-1	Propylene ^{f,h}	1.6 E-05	1.3 E-05
129-00-0	Pyrene ^{d,g}	3.5 E-07	2.8 E-07
7440-22-4	Silver ^f	1.2 E-06	9.5 E-07
100-42-5	Styrene ^e	3.6 E-06	2.8 E-06
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	1.0 E-12	8.2 E-13
7440-28-0	Thallium ^f	2.2 E-07	1.7 E-07
108-88-3	Toluene ^{e,h}	2.1 E-05	1.6 E-05

Table 15.9.28-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
95-63-6	1,2,4-Trimethylbenzene ^{f,i}	1.4 E-06	1.1 E-06
7440-62-2	Vanadium ^f	5.3 E-06	4.2 E-06
75-01-4	Vinyl chloride ^e	1.5 E-06	1.2 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene ^e	5.4 E-06	4.3 E-06
95-47-6	o-Xylene ^{e,h}	2.5 E-06	2.0 E-06
7440-66-6	Zinc ^f	2.4 E-03	1.9 E-03

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.26 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.28

1. *Report No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2007.
2. *Detailed Test Plan No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2004.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 11 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.
4. 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, April 2008.

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15.9.29 ML09, Linear Shaped Demolition Charge, 20 gr/ft

15.9.29.1 Ordnance Description¹⁻³

The Linear Shaped Demolition Charge, 20 gr/ft (DODIC ML09) is part of a family of “flexilinear” shaped charges used by Explosive Ordnance Disposal (EOD) personnel to cut open or blow apart explosive ordnance devices in order to render them safe to handle or transport. This ammunition is used during combat and on ranges during training.

The Linear Shaped Demolition Charge consist of a long, thin lead alloy-sheathed rod of explosive which has a special V-shaped cross section to concentrate the explosive energy in a line to provide a cutting edge. The demolition charge comes in 4-ft lengths but can be cut to varying size lengths depending on the job at hand. Once the demolition charge is secured in place, it is primed with a military blasting cap which will detonate the charge’s explosive load.

15.9.29.2 Emissions And Controls^{1,2,4,5}

Particulate matter is the primary emission from the use of the Linear Shaped Demolition Charge. 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 used in the field, there are no controls associated with its use.

Table 15.9.29-1 presents emission factors for carbon dioxide, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.9.29-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW is dependent upon the length of detonating charge used, emission factors were not developed in units of pounds of emissions per item.

Table 15.9.29-1 EMISSION FACTORS FOR THE USE OF DODIC ML09,
 LINEAR SHAPED DEMOLITION CHARGE, 20 GR/FT – CARBON DIOXIDE, CRITERIA
 POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED
 PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per lb NEW ^c
124-38-9	Carbon dioxide (CO ₂) ^f	2.4 E-01
630-08-0	Carbon monoxide (CO) ^g	1.7 E-01
7439-92-1	Lead (Pb)	3.4 E-01
--	Oxides of nitrogen (NO _x) ^f	4.2 E-02
--	PM-2.5 ^{d,g}	1.3 E-02
--	PM-10 ^e	4.3 E-01
--	TNMHC ^g	2.1 E-02
12789-66-1	TSP	1.6

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.86 E-03 pounds per linear foot of demolition charge. The complete ordnance includes 4 linear feet of charge and has an NEW of 1.14 E-02 pounds. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.29-2 EMISSION FACTORS FOR THE USE OF DODIC ML09,
 LINEAR SHAPED DEMOLITION CHARGE, 20 GR/FT –
 HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per lb NEW ^c
83-32-9	Acenaphthene ^{d,h}	6.9 E-07
208-96-8	Acenaphthylene ^d	2.7 E-06
75-05-8	Acetonitrile ^e	1.7 E-04
107-13-1	Acrylonitrile ^e	1.8 E-05
7429-90-5	Aluminum ^f	5.0 E-03
7664-41-7	Ammonia ^{f,h}	2.9 E-02
120-12-7	Anthracene ^e	2.7 E-07
7440-36-0	Antimony ^{e,h}	9.2 E-02
7440-38-2	Arsenic ^{e,h}	3.6 E-04
7440-39-3	Barium ^{f,h}	1.3 E-04
71-43-2	Benzene ^e	4.4 E-04
50-32-8	Benzo[a]pyrene ^{e,h}	3.7 E-07
7440-41-7	Beryllium ^{e,h}	6.9 E-07
106-99-0	1,3-Butadiene ^e	8.3 E-05
85-68-7	Butylbenzylphthalate ^{d,g}	4.1 E-06
7440-43-9	Cadmium ^{e,h}	8.6 E-06
56-23-5	Carbon tetrachloride ^{e,h}	1.2 E-06
7440-47-3	Chromium ^e	6.0 E-04
7440-48-4	Cobalt ^e	5.9 E-06
7440-50-8	Copper ^f	1.0 E-03
98-82-8	Cumene ^{e,h}	3.5 E-06
110-82-7	Cyclohexane ^f	1.4 E-05
132-64-9	Dibenzofuran ^{e,i}	3.8 E-07
84-74-2	Dibutylphthalate ^{e,g}	1.1 E-06
120-83-2	2,4-Dichlorophenol ^{f,i}	9.2 E-07
99-65-0	1,3-Dinitrobenzene ^{f,h}	1.0 E-05
606-20-2	2,6-Dinitrotoluene ^{f,h}	3.0 E-06
--	Total dioxin/furan compounds ^{e,h}	4.5 E-07
100-41-4	Ethylbenzene ^e	2.7 E-05

Table 15.9.29-2 (cont.)

CASRN ^b	Pollutant	lb per lb NEW ^c
74-85-1	Ethylene ^f	2.1 E-03
117-81-7	bis(2-Ethylhexyl)phthalate ^e	1.5 E-05
206-44-0	Fluoranthene ^e	9.4 E-07
86-73-7	Fluorene ^d	1.3 E-06
50-00-0	Formaldehyde ^{e,h}	6.7 E-03
76-13-1	Freon 113 ^f	6.8 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{e,i}	1.1 E-07
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^{e,i}	3.8 E-09
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^{e,i}	3.6 E-09
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^{e,i}	6.2 E-09
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^{e,i}	1.6 E-08
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^{e,i}	2.0 E-08
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^{e,i}	1.6 E-09
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^{e,h}	1.1 E-09
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran ^{e,i}	4.3 E-10
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^{e,i}	1.4 E-09
110-54-3	n-Hexane ^{e,h}	7.7 E-06
1634-04-4	Hydrogen cyanide ^{e,h}	2.3 E-02
7439-92-1	Lead ^{e,h}	3.4 E-01
7439-96-5	Manganese ^e	9.5 E-05
7439-97-6	Mercury ^{e,i}	6.8 E-08
75-09-2	Methylene chloride ^{e,h}	1.5 E-01
91-57-6	2-Methylnaphthalene ^{d,h}	5.3 E-06
91-20-3	Naphthalene ^e	2.2 E-05
7440-02-0	Nickel ^e	2.2 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^{e,i}	2.7 E-07
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^{e,i}	7.4 E-09
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ^{e,i}	7.1 E-09
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^{e,i}	5.6 E-10
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^{e,i}	6.8 E-10
87-86-5	Pentachlorophenol ^{e,i}	1.8 E-05
85-01-8	Phenanthrene ^e	2.5 E-06
108-95-2	Phenol ^{e,h}	2.5 E-05

Table 15.9.29-2 (cont.)

CASRN ^b	Pollutant	lb per lb NEW ^c
7723-14-0	Phosphorus ^d	2.4 E-04
115-07-1	Propylene ^f	9.6 E-04
129-00-0	Pyrene ^d	1.6 E-06
7440-22-4	Silver ^{f,h}	3.5 E-05
100-42-5	Styrene ^{e,h}	2.2 E-05
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin ^{e,i}	1.1 E-09
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^{e,i}	7.1 E-10
7440-28-0	Thallium ^{f,h}	1.5 E-05
108-88-3	Toluene ^e	1.7 E-04
71-55-6	1,1,1-Trichloroethane ^{e,i}	4.8 E-06
95-63-6	1,2,4-Trimethylbenzene ^f	3.8 E-05
540-84-1	2,2,4-Trimethylpentane ^d	4.9 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene ^e	7.1 E-05
95-47-6	o-Xylene ^e	2.7 E-05
7440-66-6	Zinc ^f	1.0 E-03

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.86 E-03 pounds per linear foot of demolition charge. The complete ordnance includes 4 linear feet of charge and has an NEW of 1.14 E-02 pounds. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING C.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.29

1. *Detailed Test Plan for Phase IV-A Emission Characterization, Exploding Ordnance: M118 Block Demolition Charge, 1/2-lb TNT Block Demolition Charge, PETN Type 1 Detonating Cord, and 20 gr/ft and 225 gr/ft Flexible Linear-Shaped Demolition Charges*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, May 2001.
2. *Sampling Results for AEC Phase IV-A Exploding Ordnance Emission Characterization*, URS Corporation, Oak Ridge, TN, June 2003.

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 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase IV-A Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2007.
5. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Corporation, Oak Ridge, TN, January 2005.

DRAFT

15.9.30 ML15, Linear Shaped Demolition Charge, 225 gr/ft

15.9.30.1 Ordnance Description¹⁻³

The Linear Shaped Demolition Charge, 225 gr/ft (DODIC ML15) is part of a family of “flexilinear” shaped charges used by Explosive Ordnance Disposal (EOD) personnel to cut open or blow apart explosive ordnance devices in order to render them safe to handle or transport. This ammunition is used during combat and on ranges during training.

The Linear Shaped Demolition Charge consist of a long, thin lead alloy-sheathed rod of explosive which has a special V-shaped cross section to concentrate the explosive energy in a line to provide a cutting edge. The demolition charge comes in 4-ft lengths but can be cut to varying size lengths depending on the job at hand. Once the demolition charge is secured in place, it is primed with a military blasting cap which will detonate the charge’s explosive load.

15.9.30.2 Emissions And Controls^{1,2,4,5}

Particulate matter and lead are the primary emissions from the use of the Linear Shaped Demolition Charge. 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 used in the field, there are no controls associated with its use.

Table 15.9.30-1 presents emission factors for carbon dioxide, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.9.30-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW is dependent upon the length of detonating charge used, emission factors were not developed in units of pounds of emissions per item.

Table 15.9.30-1 EMISSION FACTORS FOR THE USE OF DODIC ML15,
 LINEAR SHAPED DEMOLITION CHARGE, 225 GR/FT – CARBON DIOXIDE, CRITERIA
 POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED
 PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per lb NEW ^c
124-38-9	Carbon dioxide (CO ₂) ^f	4.4 E-01
630-08-0	Carbon monoxide (CO) ^g	1.8 E-01
7439-92-1	Lead (Pb)	8.5 E-01
--	Oxides of nitrogen (NO _x) ^f	4.6 E-02
--	PM-2.5 ^{d,g}	8.1 E-02
--	PM-10 ^e	2.3
7446-09-5	Sulfur dioxide ^h	7.4 E-07
--	TNMHC	2.0 E-02
12789-66-1	TSP	5.1

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 3.21 E-02 pounds per linear foot of demolition charge. The complete ordnance includes 4 linear feet of charge and has an NEW of 1.28 E-01 pounds. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

^h EMISSION FACTOR RATING D.

Table 15.9.30-2 EMISSION FACTORS FOR THE USE OF DODIC ML15,
 LINEAR SHAPED DEMOLITION CHARGE, 225 GR/FT –
 HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per lb NEW ^c
83-32-9	Acenaphthene ^{d,h}	4.3 E-07
208-96-8	Acenaphthylene ^{d,h}	2.9 E-06
75-05-8	Acetonitrile ^{e,h}	7.4 E-05
107-13-1	Acrylonitrile ^e	3.3 E-06
7429-90-5	Aluminum ^{f,h}	7.7 E-03
7664-41-7	Ammonia ^f	2.3 E-02
120-12-7	Anthracene ^{e,h}	4.0 E-07
7440-36-0	Antimony ^e	3.0 E-01
7440-38-2	Arsenic ^e	8.3 E-04
7440-39-3	Barium ^f	2.2 E-04
71-43-2	Benzene ^{e,h}	5.9 E-04
191-24-2	Benzo[g,h,i]perylene ^e	6.9 E-07
7440-41-7	Beryllium ^e	3.5 E-06
106-99-0	1,3-Butadiene ^{e,h}	6.9 E-05
111-76-2	2-Butoxyethanol ^{f,i}	9.4 E-05
85-68-7	Butylbenzylphthalate ^{d,g}	5.0 E-06
7440-43-9	Cadmium ^e	1.9 E-05
56-23-5	Carbon tetrachloride ^e	2.9 E-07
7440-47-3	Chromium ^{e,h}	3.7 E-03
7440-48-4	Cobalt ^{e,h}	3.2 E-05
7440-50-8	Copper ^{f,h}	4.4 E-03
98-82-8	Cumene ^{e,h}	3.6 E-06
110-82-7	Cyclohexane ^f	8.0 E-06
132-64-9	Dibenzofuran ^e	2.0 E-06
84-74-2	Dibutylphthalate ^{e,g}	2.0 E-06
131-11-3	Dimethyl phthalate ^{e,i}	6.7 E-07
606-20-2	2,6-Dinitrotoluene ^f	1.1 E-05
--	Total dioxin/furan compounds ^e	2.2 E-07
100-41-4	Ethylbenzene ^{e,h}	6.2 E-05
74-85-1	Ethylene ^{f,h}	2.3 E-03

Table 15.9.30-2 (cont.)

CASRN ^b	Pollutant	lb per lb NEW ^c
117-81-7	bis(2-Ethylhexyl)phthalate ^{e,g}	1.9 E-05
206-44-0	Fluoranthene ^{e,h}	9.4 E-07
86-73-7	Fluorene ^{d,h}	1.5 E-06
50-00-0	Formaldehyde ^e	2.4 E-03
76-13-1	Freon 113 ^{f,h}	8.3 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	5.2 E-08
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^e	1.1 E-09
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^e	1.0 E-09
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^e	1.6 E-09
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^e	4.3 E-09
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^e	5.0 E-09
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^e	3.8 E-10
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^e	2.8 E-10
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran ^e	9.5 E-11
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^e	3.6 E-10
110-54-3	n-Hexane ^{e,i}	2.0 E-05
1634-04-4	Hydrogen cyanide ^e	6.3 E-03
7439-92-1	Lead ^e	8.5 E-01
7439-96-5	Manganese ^{e,h}	1.7 E-04
7439-97-6	Mercury ^e	4.2 E-07
75-09-2	Methylene chloride ^e	1.1 E-01
90-12-0	1-Methylnaphthalene ^d	1.5 E-06
91-57-6	2-Methylnaphthalene ^d	9.0 E-07
91-20-3	Naphthalene ^{e,h}	1.8 E-05
7440-02-0	Nickel ^{e,h}	4.8 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	1.5 E-07
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^e	2.4 E-09
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ^e	1.8 E-09
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^e	1.3 E-10
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^e	1.5 E-10
85-01-8	Phenanthrene ^{e,h}	2.4 E-06
108-95-2	Phenol ^e	2.6 E-05
7723-14-0	Phosphorus ^{d,h}	4.9 E-04

Table 15.9.30-3 (cont.)

CASRN ^b	Pollutant	lb per lb NEW ^c
115-07-1	Propylene ^{f,h}	6.4 E-04
129-00-0	Pyrene ^{d,h}	1.5 E-06
7440-22-4	Silver ^f	1.1 E-04
100-42-5	Styrene ^e	3.3 E-05
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin ^e	2.9 E-10
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	2.1 E-10
7440-28-0	Thallium ^{f,i}	3.3 E-05
108-88-3	Toluene ^{e,h}	3.0 E-04
95-63-6	1,2,4-Trimethylbenzene ^{f,h}	8.4 E-05
540-84-1	2,2,4-Trimethylpentane ^{d,h}	7.5 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	2.4 E-04
95-47-6	o-Xylene ^{e,h}	8.3 E-05
7440-66-6	Zinc ^{f,h}	5.3 E-03

^a Factors represent uncontrolled emissions. References 1, 2, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 3.21 E-02 pounds per linear foot of demolition charge. The complete ordnance includes 4 linear feet of charge and has an NEW of 1.28 E-01 pounds. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.30

1. *Detailed Test Plan for Phase IV-A Emission Characterization, Exploding Ordnance: M118 Block Demolition Charge, 1/2-lb TNT Block Demolition Charge, PETN Type 1 Detonating Cord, and 20 gr/ft and 225 gr/ft Flexible Linear-Shaped Demolition Charges*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, May 2001.
2. *Sampling Results for AEC Phase IV-A Exploding Ordnance Emission Characterization*, URS Corporation, Oak Ridge, TN, June 2003.
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 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase IV-A Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2007.
5. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Corporation, Oak Ridge, TN, January 2005.

DRAFT

15.9.31 ML47, M11 Non-Electric Blasting Cap with 30-foot Shock Tube

15.9.31.1 Ordnance Description¹⁻³

The M11 Non-Electric Blasting Cap with 30-foot Shock Tube (DODIC ML47) is used to detonate all standard military explosives or initiate shock tube blasting caps. The M11 consists of a small aluminum tube filled with explosives that is factory-crimped to a 30-foot length of shock tube. The aluminum tube serves as a detonator while the shock tube is a thin plastic tube with a thin layer of special explosive material deposited on its interior surface. This ammunition is used during combat and on firing ranges during training.

Upon initiation, the M11 transmits an initiating shock (or small detonation) through the shock tube into the detonator. The shock wave initiates a small amount of sensitive explosive in the aluminum tube detonator which in turn initiates the external charge or device to which the cap is attached. The explosion of the shock tube is totally contained within the plastic tubing, but the explosion of the detonator releases air emissions.

15.9.31.2 Emissions And Controls^{1,2,4,5}

Carbon dioxide (CO₂) is the primary emission from the use of the M11 Non-Electric Blasting Cap with 30-foot Shock Tube. 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 fired in the field, there are no controls associated with its use.

Table 15.9.31-1 presents emission factors for CO₂, criteria pollutants, methane and total suspended particulate (TSP). Table 15.9.31-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.31-1 EMISSION FACTORS FOR THE USE OF DODIC ML47,
M11 NON-ELECTRIC BLASTING CAP WITH 30-FOOT SHOCK TUBE– CARBON DIOXIDE,
CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW
124-38-9	CO ₂ ^f	1.8 E-03	6.5 E-01
630-08-0	Carbon monoxide (CO) ^g	3.1 E-04	1.2 E-01
7439-92-1	Lead (Pb)	1.3 E-04	4.8 E-02
74-82-8	Methane	2.8 E-05	1.0 E-02
--	Oxides of nitrogen (NO _x) ^f	4.5 E-05	1.7 E-02
--	PM-2.5 ^{d,g}	2.9 E-04	1.1 E-01
--	PM-10 ^e	4.6 E-04	1.7 E-01
12789-66-1	TSP	4.8 E-04	1.8 E-01

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.73 E-03 pounds per item. References 1 and 3.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.31-2 EMISSION FACTORS FOR THE USE OF DODIC ML47,
M11 NON-ELECTRIC BLASTING CAP WITH 30-FOOT SHOCK TUBE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	4.3 E-09	1.6 E-06
75-07-0	Acetaldehyde ^{e,h}	1.6 E-07	5.9 E-05
75-05-8	Acetonitrile ^e	1.3 E-06	4.9 E-04
107-13-1	Acrylonitrile ^e	3.2 E-07	1.2 E-04
7429-90-5	Aluminum ^f	5.5 E-05	2.0 E-02
7440-39-3	Barium ^{f,h}	1.2 E-07	4.5 E-05
71-43-2	Benzene ^e	2.1 E-06	7.8 E-04
207-08-9	Benzo[k]fluoranthene ^e	1.8 E-09	6.7 E-07
191-24-2	Benzo[g,h,i]perylene ^{e,h}	2.6 E-09	9.5 E-07
50-32-8	Benzo[a]pyrene ^e	1.7 E-09	6.2 E-07
7440-47-3	Chromium ^{e,h}	2.4 E-07	8.6 E-05
18540-29-9	Hexavalent chromium ^{e,h}	2.2 E-05	8.2 E-03
7440-48-4	Cobalt ^e	1.8 E-08	6.8 E-06
7440-50-8	Copper ^f	2.3 E-07	8.5 E-05
--	Total dioxin/furan compounds ^{e,h}	3.5 E-13	1.3 E-10
74-85-1	Ethylene ^{f,h}	1.0 E-05	3.8 E-03
206-44-0	Fluoranthene ^e	4.4 E-09	1.6 E-06
50-00-0	Formaldehyde ^{e,h}	5.3 E-07	1.9 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{e,h}	8.6 E-15	3.1 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^{e,i}	1.0 E-13	3.8 E-11
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^{e,i}	5.6 E-14	2.1 E-11
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^{e,h}	2.0 E-14	7.5 E-12
74-90-8	Hydrogen cyanide ^e	6.9 E-06	2.5 E-03
7439-92-1	Lead ^{e,h}	1.3 E-04	4.8 E-02
7439-96-5	Manganese ^e	3.2 E-07	1.2 E-04
75-09-2	Methylene chloride ^{e,h}	5.2 E-07	1.9 E-04
91-20-3	Naphthalene ^e	7.5 E-08	2.7 E-05
7440-02-0	Nickel ^e	6.9 E-08	2.5 E-05
7697-37-2	Nitric acid ^{f,g}	1.8 E-06	6.4 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^{e,h}	1.3 E-13	4.7 E-11

Table 15.9.31-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^{e,h}	1.8 E-14	6.7 E-12
85-01-8	Phenanthrene ^e	4.1 E-09	1.5 E-06
115-07-1	Propylene ^f	2.0 E-06	7.5 E-04
129-00-0	Pyrene ^{d,g}	6.3 E-09	2.3 E-06
7440-22-4	Silver ^{f,h}	1.4 E-08	5.1 E-06
100-42-5	Styrene ^e	5.8 E-08	2.1 E-05
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^{e,h}	1.7 E-14	6.3 E-12
108-88-3	Toluene ^e	2.4 E-07	8.8 E-05
7440-62-2	Vanadium ^{f,h}	2.2 E-10	7.9 E-08
7440-66-6	Zinc ^{f,h}	3.4 E-07	1.2 E-04

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.73 E-03 pounds per item. References 1 and 3.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING C.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.31

1. *Report No. 7 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2006.
2. *Detailed Test Plan No. 7 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2003.
3. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, May 2007.
4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 7 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, February 2008.
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, January 2007.

15.9.32 MM50, M221 Clipped Shaped Demolition Charge

15.9.32.1 Ordnance Description^{1,2}

The M221 Clipped Shaped Demolition Charge (DODIC MM50) is used in the disposal of many different types of explosive loaded munitions and bulk explosives. It is an easy-to-use alternate to composition C4 and is capable of being initiated by electric/non-electric blasting caps or detonating cord. This ammunition is used during combat and on firing ranges during training.

The M221 Clipped Shaped Demolition Charge is a lightweight, easily placed, two piece assembly. It consists of demolition charge and a clip. The clip is formed in such a manner as to snap on the demolition charge and to hold detonating cord or blasting caps in contact with the explosive lead. The clip is also used to position the charge relative to the item to be destroyed. When the charge is initiated, a shaped charge jet is formed which penetrates the target causing the destruction of the target.

15.9.32.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂), carbon monoxide (CO), and particulate matter are the primary emissions from the use of the M221 Clipped Shaped Demolition Charge. 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 used in the field, there are no controls associated with its use.

Table 15.9.32-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.32-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.32-1 EMISSION FACTORS FOR THE USE OF DODIC MM50,
M221 CLIPPED SHAPED DEMOLITION CHARGE – CARBON DIOXIDE, CRITERIA
POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	2.1 E-02	3.2 E-01
630-08-0	CO ^g	9.7 E-03	1.5 E-01
7439-92-1	Lead (Pb)	1.9 E-04	2.9 E-03
74-82-8	Methane	3.5 E-04	5.3 E-03
--	Oxides of nitrogen (NO _x) ^f	3.6 E-04	5.4 E-03
--	PM-2.5 ^{d,f}	1.3 E-03	1.9 E-02
--	PM-10 ^e	5.2 E-03	7.8 E-02
12789-66-1	TSP	6.5 E-03	9.8 E-02

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 6.62 E-02 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^f EMISSION FACTOR RATING B.

Table 15.9.32-2 EMISSION FACTORS FOR THE USE OF DODIC MM50,
M221 CLIPPED SHAPED DEMOLITION CHARGE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	6.2 E-08	9.4 E-07
75-07-0	Acetaldehyde ^{e,h}	2.2 E-06	3.4 E-05
75-05-8	Acetonitrile ^e	5.8 E-05	8.8 E-04
107-13-1	Acrylonitrile ^e	9.0 E-07	1.4 E-05
7429-90-5	Aluminum ^f	6.5 E-05	9.9 E-04
7664-41-7	Ammonia ^f	1.4 E-03	2.2 E-02
120-12-7	Anthracene ^e	1.1 E-08	1.7 E-07
7440-38-2	Arsenic ^{e,i}	1.2 E-07	1.8 E-06
71-43-2	Benzene ^e	5.2 E-06	7.8 E-05
56-55-3	Benzo[a]anthracene ^e	5.8 E-09	8.7 E-08
205-99-2	Benzo[b]fluoranthene ^e	3.3 E-09	4.9 E-08
207-08-9	Benzo[k]fluoranthene ^e	3.8 E-09	5.7 E-08
191-24-2	Benzo[g,h,i]perylene ^e	1.4 E-09	2.2 E-08
192-97-2	Benzo[e]pyrene ^d	3.4 E-09	5.1 E-08
7440-43-9	Cadmium ^{e,i}	1.7 E-07	2.6 E-06
74-87-3	Chloromethane ^{e,i}	7.8 E-10	1.2 E-08
7440-47-3	Chromium ^{e,h}	5.5 E-06	8.4 E-05
18540-29-9	Hexavalent chromium ^{e,h}	2.6 E-08	4.0 E-07
218-01-9	Chrysene ^{e,h}	5.3 E-09	8.1 E-08
7440-48-4	Cobalt ^{e,h}	1.6 E-07	2.5 E-06
7440-50-8	Copper ^f	5.4 E-04	8.2 E-03
--	Total dioxin/furan compounds ^{e,h}	2.3 E-11	3.4 E-10
74-85-1	Ethylene ^{f,h}	1.6 E-05	2.4 E-04
206-44-0	Fluoranthene ^e	1.6 E-08	2.4 E-07
86-73-7	Fluorene ^{d,h}	2.3 E-08	3.5 E-07
50-00-0	Formaldehyde ^{e,h}	1.1 E-06	1.7 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{e,i}	2.1 E-12	3.2 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^{e,h}	6.1 E-13	9.2 E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^{e,h}	5.5 E-13	8.4 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^{e,h}	4.9 E-13	7.4 E-12

Table 15.9.32-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
74-90-8	Hydrogen cyanide ^e	9.2 E-05	1.4 E-03
193-39-5	Indeno[1,2,3-cd]pyrene ^{e,h}	1.1 E-09	1.6 E-08
7439-92-1	Lead ^{e,h}	1.9 E-04	2.9 E-03
7439-96-5	Manganese ^e	2.4 E-05	3.6 E-04
75-09-2	Methylene chloride ^{e,h}	7.1 E-09	1.1 E-07
91-20-3	Naphthalene ^e	1.7 E-07	2.6 E-06
7440-02-0	Nickel ^{e,h}	2.5 E-06	3.8 E-05
7697-37-2	Nitric acid ^{f,g}	1.2 E-06	1.8 E-05
55-63-0	Nitroglycerin ^{f,i}	7.9 E-07	1.2 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^{e,i}	1.9 E-11	2.9 E-10
85-01-8	Phenanthrene ^e	4.8 E-08	7.3 E-07
115-07-1	Propylene ^f	3.9 E-06	6.0 E-05
129-00-0	Pyrene ^{d,g}	3.0 E-08	4.6 E-07
7440-22-4	Silver ^{f,i}	5.1 E-08	7.6 E-07
100-42-5	Styrene ^e	8.8 E-07	1.3 E-05
7440-28-0	Thallium ^{f,i}	2.8 E-08	4.2 E-07
108-88-3	Toluene ^e	1.4 E-06	2.1 E-05
7440-62-2	Vanadium ^{e,i}	5.0 E-07	7.6 E-06
7440-66-6	Zinc ^{f,h}	3.4 E-04	5.1 E-03

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 6.62 E-02 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING C.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.32

1. *Report No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2007.
2. *Detailed Test Plan No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2004.

3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 11 Testing Conducted at Aberdeen Proving Ground, Maryland, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.*
4. 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, April 2008.

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15.9.33 MN02, M12 Non-Electric Blasting Cap with 500-foot Shock Tube

15.9.33.1 Ordnance Description¹⁻³

The M12 Non-Electric Blasting Cap with 500-foot Shock Tube (DODIC MN02) is used to relay a shock tube detonation impulse from an initiator (or another relay cap) to another relay cap or to a high strength shock tube blasting cap (e.g., the M11 Non-Electric Blasting Cap) that initiates standard military explosives. This device is used only as a relay device and does not have sufficient output to initiate most military explosives. The M12 consists of a small aluminum tube filled with explosives that is factory-crimped to a 500-foot length of shock tube. The aluminum tube serves as a detonator while the shock tube is a thin plastic tube with a thin layer of special explosive material deposited on its interior surface. This ammunition is used during combat and on firing ranges during training.

Upon initiation, the M12 transmits an initiating shock (or small detonation) through the shock tube into the detonator. The shock wave initiates a small amount of sensitive explosive in the aluminum tube detonator which in turn initiates the external charge or device to which the cap is attached. The explosion of the shock tube is totally contained within the plastic tubing, but the explosion of the detonator releases air emissions.

15.9.33.2 Emissions And Controls^{1,2,4,5}

The primary emissions from the use of the M12 Non-Electric Blasting Cap with 500-foot Shock Tube are carbon dioxide (CO₂) and carbon monoxide (CO). 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 fired in the field, there are no controls associated with its use.

Table 15.9.33-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.33-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.33-1 EMISSION FACTORS FOR THE USE OF DODIC MN02,
M12 NON-ELECTRIC BLASTING CAP WITH 500-FOOT SHOCK TUBE- CARBON DIOXIDE,
CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW
124-38-9	CO ₂ ^f	1.1 E-03	1.7 E-01
630-08-0	CO ^g	2.9 E-03	4.8 E-01
7439-92-1	Lead (Pb)	5.3 E-05	8.6 E-03
74-82-8	Methane	4.1 E-04	6.6 E-02
--	Oxides of nitrogen (NO _x) ^f	1.2 E-04	1.9 E-02
--	PM-2.5 ^{d,g}	1.2 E-04	2.0 E-02
--	PM-10 ^e	2.2 E-04	3.5 E-02
12789-66-1	TSP	2.5 E-04	4.1 E-02

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 6.18 E-03 pounds per item. References 1 and 3.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.33-2 EMISSION FACTORS FOR THE USE OF DODIC MN02,
M12 NON-ELECTRIC BLASTING CAP WITH 500-FOOT SHOCK TUBE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
83-32-9	Acenaphthene ^d	2.5 E-09	4.1 E-07
208-96-8	Acenaphthylene ^d	2.8 E-08	4.4 E-06
75-05-8	Acetonitrile ^e	6.2 E-06	1.0 E-03
107-02-8	Acrolein ^{e,h}	7.6 E-08	1.2 E-05
107-13-1	Acrylonitrile ^e	1.2 E-06	2.0 E-04
7429-90-5	Aluminum ^f	3.7 E-05	5.9 E-03
7664-41-7	Ammonia ^{f,h}	4.7 E-06	7.5 E-04
7440-36-0	Antimony ^{e,h}	3.7 E-08	5.9 E-06
7440-39-3	Barium ^{f,h}	2.2 E-09	3.6 E-07
71-43-2	Benzene ^e	1.1 E-05	1.8 E-03
56-55-3	Benzo[a]anthracene ^e	4.9 E-09	7.9 E-07
205-99-2	Benzo[b]fluoranthene ^e	4.8 E-09	7.7 E-07
207-08-9	Benzo[k]fluoranthene ^e	3.4 E-09	5.6 E-07
191-24-2	Benzo[g,h,i]perylene ^{e,h}	1.4 E-08	2.2 E-06
50-32-8	Benzo[a]pyrene ^e	9.4 E-09	1.5 E-06
192-97-2	Benzo[e]pyrene ^{d,h}	6.5 E-09	1.0 E-06
106-99-0	1,3-Butadiene ^e	1.8 E-06	2.9 E-04
7440-47-3	Chromium ^{e,h}	1.3 E-07	2.1 E-05
18540-29-9	Hexavalent chromium ^{e,h}	1.6 E-05	2.5 E-03
218-01-9	Chrysene ^{e,h}	4.6 E-09	7.4 E-07
7440-50-8	Copper ^f	2.8 E-07	4.4 E-05
--	Total dioxin/furan compounds ^{e,h}	7.0 E-14	1.1 E-11
100-41-4	Ethylbenzene ^e	1.1 E-07	1.7 E-05
74-85-1	Ethylene ^{f,h}	7.4 E-05	1.2 E-02
206-44-0	Fluoranthene ^e	5.0 E-09	8.0 E-07
86-73-7	Fluorene ^{d,h}	4.5 E-09	7.3 E-07
50-00-0	Formaldehyde ^{e,h}	7.6 E-07	1.2 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{e,h}	8.7 E-16	1.4 E-13
74-90-8	Hydrogen cyanide ^e	7.2 E-05	1.2 E-02
193-39-5	Indeno[1,2,3-cd]pyrene ^{e,h}	6.2 E-09	1.0 E-06

Table 15.9.33-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7439-92-1	Lead ^{e,h}	5.3 E-05	8.6 E-03
7439-96-5	Manganese ^e	1.2 E-07	2.0 E-05
75-09-2	Methylene chloride ^{e,h}	1.9 E-06	3.2 E-04
91-20-3	Naphthalene ^e	2.8 E-07	4.5 E-05
7440-02-0	Nickel ^e	1.8 E-08	3.0 E-06
85-01-8	Phenanthrene ^e	5.5 E-09	8.8 E-07
115-07-1	Propylene ^f	7.2 E-06	1.2 E-03
129-00-0	Pyrene ^{d,g}	1.1 E-08	1.8 E-06
100-42-5	Styrene ^e	5.7 E-07	9.2 E-05
108-88-3	Toluene ^e	1.0 E-06	1.7 E-04
95-63-6	1,2,4-Trimethylbenzene ^f	5.9 E-08	9.6 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene ^e	1.1 E-07	1.7 E-05
7440-66-6	Zinc ^{f,h}	1.1 E-06	1.8 E-04

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 6.18 E-03 pounds per item. References 1 and 3.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING C.

References For Section 15.9.33

1. *Report No. 7 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2006.
2. *Detailed Test Plan No. 7 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2003.
3. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, May 2007.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 7 Testing Conducted at Aberdeen Proving Ground, Maryland, MACTEC Federal Programs, Inc., Research Triangle Park, NC, February 2008.*
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, January 2007.

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15.9.34 MN03, M13 Non-Electric Blasting Cap with 1,000-foot Shock Tube

15.9.34.1 Ordnance Description¹⁻³

The M13 Non-Electric Blasting Cap with 1,000-foot Shock Tube (DODIC MN03) is used to relay a shock tube detonation impulse from an initiator (or another relay cap) to another relay cap or to a high strength shock tube blasting cap (e.g., the M11 Non-Electric Blasting Cap) that initiates standard military explosives. This device is used only as a relay device and does not have sufficient output to initiate most military explosives. The M13 consists of a small aluminum tube filled with explosives that is factory-crimped to a 1,000-foot length of shock tube. The aluminum tube serves as a detonator while the shock tube is a thin plastic tube with a thin layer of special explosive material deposited on its interior surface. This ammunition is used during combat and on firing ranges during training.

Upon initiation, the M13 transmits an initiating shock (or small detonation) through the shock tube into the detonator. The shock wave initiates a small amount of sensitive explosive in the aluminum tube detonator which in turn initiates the external charge or device to which the cap is attached. The explosion of the shock tube is totally contained within the plastic tubing, but the explosion of the detonator releases air emissions.

15.9.34.2 Emissions And Controls^{1,2,4,5}

The primary emissions from the use of the M13 Non-Electric Blasting Cap with 1,000-foot Shock Tube are carbon dioxide (CO₂), carbon monoxide (CO), and methane. 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 fired in the field, there are no controls associated with its use.

Table 15.9.34-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.34-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.34-1 EMISSION FACTORS FOR THE USE OF DODIC MN03,
M13 NON-ELECTRIC BLASTING CAP WITH 1,000-FOOT SHOCK TUBE – CARBON DIOXIDE,
CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW
124-38-9	CO ₂ ^f	1.3 E-03	1.2 E-01
630-08-0	CO ^g	6.5 E-03	5.9 E-01
7439-92-1	Lead (Pb)	5.5 E-05	5.0 E-03
74-82-8	Methane	9.1 E-04	8.2 E-02
--	Oxides of nitrogen (NO _x) ^f	2.7 E-04	2.5 E-02
--	PM-2.5 ^{d,g}	1.6 E-04	1.4 E-02
--	PM-10 ^e	2.5 E-04	2.2 E-02
12789-66-1	TSP	2.7 E-04	2.4 E-02

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.11 E-02 pounds per item. References 1 and 3.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.34-2 EMISSION FACTORS FOR THE USE OF DODIC MN03,
M13 NON-ELECTRIC BLASTING CAP WITH 1,000-FOOT SHOCK TUBE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
83-32-9	Acenaphthene ^d	2.7 E-09	2.5 E-07
208-96-8	Acenaphthylene ^d	3.3 E-08	3.0 E-06
75-05-8	Acetonitrile ^{e,h}	1.3 E-05	1.2 E-03
107-13-1	Acrylonitrile ^e	2.5 E-06	2.2 E-04
7429-90-5	Aluminum ^f	3.7 E-05	3.3 E-03
7664-41-7	Ammonia ^{d,h}	3.2 E-06	2.8 E-04
7440-36-0	Antimony ^{e,i}	2.1 E-07	1.9 E-05
7440-39-3	Barium ^{f,h}	8.2 E-09	7.3 E-07
71-43-2	Benzene ^e	2.5 E-05	2.2 E-03
56-55-3	Benzo[a]anthracene ^e	4.7 E-09	4.2 E-07
205-99-2	Benzo[b]fluoranthene ^e	4.7 E-09	4.2 E-07
207-08-9	Benzo[k]fluoranthene ^e	3.3 E-09	3.0 E-07
191-24-2	Benzo[g,h,i]perylene ^{e,h}	1.9 E-08	1.7 E-06
50-32-8	Benzo[a]pyrene ^e	1.0 E-08	9.1 E-07
192-97-2	Benzo[e]pyrene ^{d,h}	7.2 E-09	6.5 E-07
106-99-0	1,3-Butadiene ^e	2.0 E-06	1.8 E-04
7440-47-3	Chromium ^{e,h}	1.1 E-07	9.7 E-06
18540-29-9	Hexavalent chromium ^{e,h}	3.8 E-05	3.4 E-03
218-01-9	Chrysene ^{e,h}	4.4 E-09	3.9 E-07
7440-50-8	Copper ^{f,h}	1.0 E-06	9.0 E-05
53-70-3	Dibenz[a,h]anthracene ^{e,h}	3.6 E-10	3.2 E-08
100-41-4	Ethylbenzene ^e	7.9 E-08	7.1 E-06
74-85-1	Ethylene ^{d,h}	1.6 E-04	1.4 E-02
206-44-0	Fluoranthene ^e	5.6 E-09	5.0 E-07
86-73-7	Fluorene ^{d,h}	5.1 E-09	4.6 E-07
50-00-0	Formaldehyde ^{e,h}	8.7 E-07	7.8 E-05
7647-01-0	Hydrochloric acid ^{e,h}	1.1 E-06	9.7 E-05
74-90-8	Hydrogen cyanide ^e	1.7 E-04	1.5 E-02
193-39-5	Indeno[1,2,3-cd]pyrene ^{e,h}	7.1 E-09	6.3 E-07
7439-92-1	Lead ^{e,h}	5.5 E-05	5.0 E-03

Table 15.9.34-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7439-96-5	Manganese ^e	9.0 E-08	8.0 E-06
75-09-2	Methylene chloride ^{e,h}	2.5 E-06	2.3 E-04
91-20-3	Naphthalene ^e	3.2 E-07	2.9 E-05
85-01-8	Phenanthrene ^e	6.0 E-09	5.4 E-07
115-07-1	Propylene ^f	1.3 E-05	1.2 E-03
129-00-0	Pyrene ^{d,g}	1.3 E-08	1.2 E-06
100-42-5	Styrene ^e	5.0 E-07	4.5 E-05
108-88-3	Toluene ^e	1.4 E-06	1.2 E-04
106-42-3, 108-38-3	m-Xylene, p-Xylene ^e	7.9 E-08	7.1 E-06
7440-66-6	Zinc ^{f,h}	1.1 E-06	9.7 E-05

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.11 E-02 pounds per item. References 1 and 3.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING C.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.34

1. *Report No. 7 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2006.
2. *Detailed Test Plan No. 7 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2003.
3. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, May 2007.
4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 7 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, February 2008.

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, January 2007.

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15.9.35 MN06, M14 Non-Electric Time Delay Blasting Cap

15.9.35.1 Ordnance Description¹⁻³

The M14 Non-Electric Time Delay Blasting Cap (DODIC MN06) is used to detonate all standard military explosives or to initiate shock tube blasting caps approximately 5 minutes after they are ignited by the user. The M14 consists of a small aluminum tube filled with explosives that serves as a detonator and that is factory-crimped to an approximately 7-1/2 foot length of time-blasting fuse. The fuse is factory calibrated to a 5-minute burn time marked in 1-minute increments. This ammunition is used during combat and on firing ranges during training.

The M14 functions by transmitting an initiating flame from a time-blasting fuse igniter or a match and then slowly burning through its length of time-blasting fuse into its detonator. The flame coming through the fuse initiates a small amount of sensitive explosive in the detonator. This explosive, in turn, initiates a larger amount of a less sensitive, more powerful explosive that actuates the external charge or device to which the cap is attached by the user.

15.9.35.2 Emissions And Controls^{1,2,4,5}

Carbon dioxide (CO₂) is the primary emission from the use of the M14 Non-Electric Time Delay Blasting Cap. 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 fired in the field, there are no controls associated with its use.

Table 15.9.35-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.35-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.35-1 EMISSION FACTORS FOR THE USE OF DODIC MN06,
M14 NON-ELECTRIC TIME DELAY BLASTING CAP – CARBON DIOXIDE, CRITERIA
POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW
124-38-9	CO ₂ ^f	6.8 E-03	2.6 E-01
630-08-0	Carbon monoxide (CO) ^g	1.8 E-03	6.8 E-02
7439-92-1	Lead (Pb)	3.8 E-05	1.5 E-03
74-82-8	Methane	1.7 E-04	6.6 E-03
--	Oxides of nitrogen (NO _x) ^f	5.7 E-04	2.2 E-02
--	PM-2.5 ^{d,g}	2.3 E-03	8.8 E-02
--	PM-10 ^e	2.3 E-03	9.0 E-02
12789-66-1	TSP	2.3 E-03	9.1 E-02

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.59 E-02 pounds per item. References 1 and 3.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.35-2 EMISSION FACTORS FOR THE USE OF DODIC MN06,
M14 NON-ELECTRIC TIME DELAY BLASTING CAP –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
83-32-9	Acenaphthene ^{d,h}	1.1 E-08	4.2 E-07
208-96-8	Acenaphthylene ^{d,h}	1.6 E-07	6.1 E-06
75-07-0	Acetaldehyde ^e	7.3 E-05	2.8 E-03
75-05-8	Acetonitrile ^{e,h}	8.5 E-05	3.3 E-03
107-13-1	Acrylonitrile ^{e,h}	1.4 E-06	5.5 E-05
7429-90-5	Aluminum ^{f,h}	4.8 E-06	1.8 E-04
7664-41-7	Ammonia ^d	3.2 E-04	1.2 E-02
71-43-2	Benzene ^{e,h}	7.9 E-05	3.0 E-03
56-55-3	Benzo[a]anthracene ^{e,h}	1.7 E-08	6.7 E-07
205-99-2	Benzo[b]fluoranthene ^{e,h}	3.2 E-08	1.3 E-06
191-24-2	Benzo[g,h,i]perylene ^e	7.5 E-09	2.9 E-07
50-32-8	Benzo[a]pyrene ^{e,h}	7.8 E-09	3.0 E-07
192-97-2	Benzo[e]pyrene ^d	1.9 E-08	7.5 E-07
92-52-4	Biphenyl ^{e,i}	2.7 E-06	1.0 E-04
4170-30-3	2-Butenal ^{f,i}	9.6 E-07	3.7 E-05
75-15-0	Carbon disulfide ^e	1.5 E-05	5.9 E-04
74-87-3	Chloromethane ^e	4.9 E-05	1.9 E-03
18540-29-9	Hexavalent chromium ^e	1.0 E-05	3.9 E-04
218-01-9	Chrysene ^e	1.5 E-07	5.6 E-06
7440-50-8	Copper ^{f,h}	6.4 E-08	2.5 E-06
106-44-5	p-Cresol ^e	2.4 E-06	9.2 E-05
53-70-3	Dibenz[a,h]anthracene ^e	4.7 E-09	1.8 E-07
105-67-9	2,4-Dimethylphenol ^f	1.5 E-06	5.8 E-05
100-41-4	Ethylbenzene ^{e,h}	8.8 E-07	3.4 E-05
74-85-1	Ethylene ^f	6.6 E-05	2.6 E-03
206-44-0	Fluoranthene ^{e,h}	5.4 E-08	2.1 E-06
86-73-7	Fluorene ^d	1.6 E-07	6.1 E-06
50-00-0	Formaldehyde ^e	1.1 E-05	4.4 E-04
110-54-3	Hexane ^e	1.0 E-06	3.9 E-05
74-90-8	Hydrogen cyanide ^{e,h}	9.9 E-06	3.8 E-04

Table 15.9.35-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7664-39-3	Hydrogen fluoride ^e	3.5 E-06	1.4 E-04
193-39-5	Indeno[1,2,3-cd]pyrene ^e	5.0 E-09	1.9 E-07
7439-92-1	Lead ^e	3.8 E-05	1.5 E-03
7439-96-5	Manganese ^{e,h}	1.5 E-07	6.0 E-06
96-33-3	Methyl acrylate ^{f,i}	4.1 E-07	1.6 E-05
75-09-2	Methylene chloride ^e	3.1 E-06	1.2 E-04
91-57-6	2-Methylnaphthalene ^d	3.0 E-07	1.2 E-05
95-48-7	2-Methylphenol ^e	2.0 E-06	7.6 E-05
91-20-3	Naphthalene ^{e,h}	1.2 E-06	4.8 E-05
7697-37-2	Nitric acid ^{f,g}	2.3 E-06	8.9 E-05
85-01-8	Phenanthrene ^{e,h}	2.1 E-07	8.0 E-06
108-95-2	Phenol ^e	3.0 E-06	1.2 E-04
123-38-6	Propionaldehyde ^e	1.4 E-05	5.3 E-04
115-07-1	Propylene ^{f,h}	5.0 E-05	2.0 E-03
129-00-0	Pyrene ^{d,g}	4.0 E-08	1.5 E-06
100-42-5	Styrene ^{e,h}	4.3 E-07	1.7 E-05
7664-93-9	Sulfuric acid ^f	2.7 E-05	1.1 E-03
108-88-3	Toluene ^{e,h}	1.0 E-05	4.0 E-04
95-63-6	1,2,4-Trimethylbenzene ^{f,h}	4.3 E-07	1.7 E-05
540-84-1	2,2,4-Trimethylpentane ^{d,h}	4.1 E-07	1.6 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	2.2 E-06	8.6 E-05
95-47-6	o-Xylene ^{e,h}	8.8 E-07	3.4 E-05
7440-66-6	Zinc ^f	2.8 E-07	1.1 E-05

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 2.59 E-02 pounds per item. References 1 and 3.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING B.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.35

1. *Report No. 7 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2006.
2. *Detailed Test Plan No. 7 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2003.
3. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, May 2007.
4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 7 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, February 2008.
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, January 2007.

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15.9.36 MN07, M15 Non-Electric Time Delay Blasting Cap

15.9.36.1 Ordnance Description^{1,2}

The M15 Non-Electric Time Delay Blasting Cap (DODIC MN07) is used to provide a delay element in a shock tube blasting cap priming system to obtain staged detonations such as are needed in quarrying operations. Normally, several M15 Non-Electric Time Delay Blasting Caps would be used in tandem to obtain a multistage detonation with a slight delay between each stage to allow the outer layer of rock to start moving before the next layer's detonation occurs. This ammunition is used during combat and on firing ranges during training.

The M15 Non-Electric Time Delay Blasting Cap functions by transmitting an initiating shock (or small detonation) through its shock tube into its detonators which contain pyrotechnic delay elements. The shock wave initiates burning of the pyrotechnic delay element which then initiates a small amount of a less sensitive, more powerful explosive which actuates an attached length of shock tube or an explosive device.

15.9.36.2 Emissions And Controls¹⁻⁴

Carbon dioxide (CO₂) is the primary emission from the use of the M15 Non-Electric Time Delay Blasting Cap. 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 used in the field, there are no controls associated with its use.

Table 15.9.36-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.36-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.36-1 EMISSION FACTORS FOR THE USE OF DODIC MN07,
M15 NON-ELECTRIC TIME DELAY BLASTING CAP – CARBON DIOXIDE, CRITERIA
POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂ ^f	1.1 E-03	2.7 E-01
630-08-0	Carbon monoxide (CO) ^g	5.7 E-04	1.4 E-01
7439-92-1	Lead (Pb)	1.8 E-04	4.3 E-02
74-82-8	Methane	3.9 E-05	9.7 E-03
--	Oxides of nitrogen (NO _x) ^f	4.2 E-05	1.0 E-02
--	PM-2.5 ^{d,f}	2.7 E-04	6.6 E-02
--	PM-10 ^e	3.7 E-04	9.0 E-02
12789-66-1	TSP	3.8 E-04	9.3 E-02

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 4.06 E-03 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.36-2 EMISSION FACTORS FOR THE USE OF DODIC MN07,
M15 NON-ELECTRIC TIME DELAY BLASTING CAP –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	1.0 E-09	2.5 E-07
75-07-0	Acetaldehyde ^{e,h}	1.0 E-07	2.6 E-05
75-05-8	Acetonitrile ^e	1.3 E-06	3.2 E-04
107-13-1	Acrylonitrile ^e	2.2 E-07	5.3 E-05
7429-90-5	Aluminum ^f	1.8 E-05	4.4 E-03
7664-41-7	Ammonia ^f	5.7 E-06	1.4 E-03
120-12-7	Anthracene ^{e,h}	2.8 E-10	6.9 E-08
71-43-2	Benzene ^e	1.5 E-06	3.7 E-04
56-55-3	Benzo[a]anthracene ^e	3.8 E-10	9.4 E-08
205-99-2	Benzo[b]fluoranthene ^e	3.5 E-10	8.5 E-08
207-08-9	Benzo[k]fluoranthene ^e	2.8 E-10	7.0 E-08
191-24-2	Benzo[g,h,i]perylene ^e	1.0 E-09	2.5 E-07
192-97-2	Benzo[e]pyrene ^d	5.0 E-10	1.2 E-07
7440-43-9	Cadmium ^{e,h}	1.9 E-08	4.6 E-06
7440-47-3	Chromium ^{e,h}	7.1 E-08	1.7 E-05
18540-29-9	Hexavalent chromium ^e	6.2 E-09	1.5 E-06
218-01-9	Chrysene ^{e,h}	3.8 E-10	9.3 E-08
7440-50-8	Copper ^f	4.4 E-08	1.1 E-05
--	Total dioxin/furan compounds ^{e,h}	7.2 E-13	1.8 E-10
74-85-1	Ethylene ^{f,h}	8.6 E-06	2.1 E-03
206-44-0	Fluoranthene ^e	1.4 E-09	3.5 E-07
50-00-0	Formaldehyde ^{e,h}	4.8 E-07	1.2 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{e,i}	4.1 E-13	1.0 E-10
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^{e,i}	3.1 E-15	7.6 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^{e,i}	2.0 E-14	5.0 E-12
74-90-8	Hydrogen cyanide ^e	4.5 E-06	1.1 E-03
193-39-5	Indeno[1,2,3-cd]pyrene ^{e,h}	4.1 E-10	1.0 E-07
7439-92-1	Lead ^{e,h}	1.8 E-04	4.3 E-02
7439-96-5	Manganese ^e	9.4 E-08	2.3 E-05
91-20-3	Naphthalene ^e	1.8 E-08	4.6 E-06

Table 15.9.36-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7440-02-0	Nickel ^e	1.2 E-08	3.0 E-06
55-63-0	Nitroglycerin ^{f,h}	3.3 E-07	8.1 E-05
85-01-8	Phenanthrene ^e	1.4 E-09	3.5 E-07
115-07-1	Propylene ^f	6.8 E-07	1.7 E-04
129-00-0	Pyrene ^{d,g}	2.8 E-09	7.0 E-07
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^{e,i}	1.3 E-14	3.3 E-12
7440-28-0	Thallium ^{f,h}	4.0 E-08	9.8 E-06
108-88-3	Toluene ^e	9.4 E-08	2.3 E-05
7440-62-2	Vanadium ^{f,h}	4.0 E-09	9.8 E-07
7440-66-6	Zinc ^{f,h}	1.9 E-06	4.6 E-04

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 4.06 E-03 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING A.

^h EMISSION FACTOR RATING C.

ⁱ EMISSION FACTOR RATING D.

References For Section 15.9.36

1. *Report No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2007.
2. *Detailed Test Plan No. 11 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2004.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 11 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.
4. 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, April 2008.

15.9.37 MN08, M81 Time Blasting Fuse Igniter

15.9.37.1 Ordnance Description^{1,2}

The M81 Time Blasting Fuse Igniter (DODIC MN08) is used to ignite a time blasting fuse or to initiate the shock tube of the new shock tube non-electric blasting caps. This ammunition is used during combat and on firing ranges during training.

The M81 Time Blasting Fuse Igniter consists of a small plastic tube with a pull ring on a thin rod projecting from one end, a safety (cotter) pin that goes laterally through the tube, and a screw cap that secures a holding mechanism for the fuse or shock tube on the other end. Removal of the pull ring rod releases the firing pin, which is forced by the spring into the M42 primer, which fires with a flame and an explosive shock, igniting the fuse or initiating the shock tube.

15.9.37.2 Emissions And Controls¹⁻⁴

Primary emissions from the use of the M81 Time Blasting Fuse Igniter include carbon dioxide (CO₂) 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 fired in the field, there are no controls associated with its use.

Table 15.9.37-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.37-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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 15.9.37-1 EMISSION FACTORS FOR THE USE OF DODIC MN08,
M81 TIME BLASTING FUSE IGNITER – CARBON DIOXIDE, CRITERIA POLLUTANTS,
METHANE, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW
124-38-9	CO ₂ ^f	8.4 E-06	1.7 E-01
630-08-0	Carbon monoxide (CO) ^g	2.8 E-06	5.7 E-02
7439-92-1	Lead (Pb)	4.4 E-06	9.0 E-02
74-82-8	Methane	6.3 E-08	1.3 E-03
--	Oxides of nitrogen (NO _x) ^f	1.9 E-06	3.9 E-02
--	PM-2.5 ^{d,g}	4.7 E-06	9.6 E-02
--	PM-10 ^e	5.4 E-06	1.1 E-01
12789-66-1	TSP	5.6 E-06	1.1 E-01

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 4.86 E-05 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING A.

^g EMISSION FACTOR RATING B.

Table 15.9.37-2 EMISSION FACTORS FOR THE USE OF DODIC MN08,
M81 TIME BLASTING FUSE IGNITER –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-07-0	Acetaldehyde ^d	8.6 E-09	1.8 E-04
75-05-8	Acetonitrile ^d	4.2 E-08	8.7 E-04
107-13-1	Acrylonitrile ^{d,f}	1.4 E-08	2.8 E-04
7429-90-5	Aluminum ^{e,f}	1.7 E-07	3.4 E-03
7440-36-0	Antimony ^d	6.5 E-07	1.3 E-02
7440-38-2	Arsenic ^d	1.1 E-09	2.3 E-05
7440-39-3	Barium ^e	1.6 E-07	3.3 E-03
71-43-2	Benzene ^{d,f}	8.8 E-09	1.8 E-04
75-15-0	Carbon disulfide ^d	1.2 E-08	2.4 E-04
74-87-3	Chloromethane ^d	6.7 E-11	1.4 E-06
100-41-4	Ethylbenzene ^{d,f}	4.1 E-10	8.5 E-06
74-85-1	Ethylene ^e	8.7 E-08	1.8 E-03
50-00-0	Formaldehyde ^d	8.6 E-09	1.8 E-04
74-90-8	Hydrogen cyanide ^{d,f}	4.2 E-07	8.7 E-03
7439-92-1	Lead ^d	4.4 E-06	9.0 E-02
96-33-3	Methyl acrylate ^{e,g}	1.3 E-09	2.6 E-05
115-07-1	Propylene ^{e,f}	1.5 E-08	3.0 E-04
108-88-3	Toluene ^{d,f}	2.6 E-09	5.4 E-05
75-69-4	Trichlorofluoromethane ^e	1.8 E-10	3.8 E-06
95-63-6	1,2,4-Trimethylbenzene ^e	1.5 E-10	3.1 E-06
7440-66-6	Zinc ^e	6.2 E-10	1.3 E-05

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 4.86 E-05 pounds per item. Reference 1.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f EMISSION FACTOR RATING B.

^g EMISSION FACTOR RATING D.

References For Section 15.9.37

1. *Report No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2006.
2. *Detailed Test Plan No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2003.
3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 9 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2008.
4. 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, June 2007.

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15.9.38 MN60, M79 Electric Match Igniter

15.9.38.1 Ordnance Description^{1,2}

The M79 Electric Match Igniter (DODIC MN60) is an electrically-actuated device for initiating combustion of various munitions. The M79 Igniter contains its energetic mixture in a train of energetic compounds that is similar to a blasting cap. This igniter is typically used for remote electrical initiation of devices that would usually require a match, such as time fuse. The device is actuated by standard blasting machines typically used in the field for detonation of blasting caps. This ammunition is used during combat and on firing ranges during training.

15.9.38.2 Emissions And Controls¹⁻⁴

Primary emissions from the use of the M79 Electric Match Igniter include carbon dioxide (CO₂) 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 fired in the field, there are no controls associated with its use.

Table 15.9.38-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.9.38-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.38-1 EMISSION FACTORS FOR THE USE OF DODIC MN60,
M79 ELECTRIC MATCH IGNITER – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE,
AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: A (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW
124-38-9	CO ₂	9.9 E-03	7.9 E-01
630-08-0	Carbon monoxide (CO)	1.7 E-04	1.4 E-02
7439-92-1	Lead (Pb) ^f	1.4 E-05	1.1 E-03
74-82-8	Methane	2.1 E-06	1.7 E-04
--	Oxides of nitrogen (NO _x)	1.2 E-04	9.3 E-03
--	PM-2.5 ^{d,f}	9.1 E-04	7.3 E-02
--	PM-10 ^{e,f}	1.3 E-03	1.0 E-01
7446-09-5	Sulfur dioxide (SO ₂) ^g	8.4 E-07	6.7 E-05
12789-66-1	TSP ^f	1.4 E-03	1.2 E-01

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.26 E-02 pounds per item. Reference 1.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING B.

^g EMISSION FACTOR RATING C.

Table 15.9.38-2 EMISSION FACTORS FOR THE USE OF DODIC MN60,
M79 ELECTRIC MATCH IGNITER –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: B (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^d	1.6 E-08	1.2 E-06
75-07-0	Acetaldehyde ^e	5.4 E-07	4.3 E-05
75-05-8	Acetonitrile ^{e,g}	1.4 E-07	1.1 E-05
107-13-1	Acrylonitrile ^e	5.4 E-08	4.3 E-06
7429-90-5	Aluminum ^{f,g}	5.9 E-07	4.7 E-05
120-12-7	Anthracene ^e	1.8 E-09	1.4 E-07
7440-38-2	Arsenic ^{e,g}	2.6 E-09	2.1 E-07
7440-39-3	Barium ^{f,g}	2.5 E-05	2.0 E-03
71-43-2	Benzene ^{e,g}	1.2 E-06	9.2 E-05
56-55-3	Benzo[a]anthracene ^e	1.3 E-09	1.0 E-07
205-99-2	Benzo[b]fluoranthene ^e	1.5 E-09	1.2 E-07
207-08-9	Benzo[k]fluoranthene ^e	2.0 E-09	1.6 E-07
191-24-2	Benzo[g,h,i]perylene ^e	3.0 E-09	2.4 E-07
50-32-8	Benzo[a]pyrene ^d	2.2 E-09	1.8 E-07
192-97-2	Benzo[e]pyrene ^e	1.3 E-09	1.0 E-07
75-15-0	Carbon disulfide ^{e,g}	4.7 E-08	3.8 E-06
74-87-3	Chloromethane ^{e,g}	4.0 E-10	3.1 E-08
18540-29-9	Hexavalent chromium ^{e,h}	2.6 E-09	2.0 E-07
218-01-9	Chrysene ^{e,g}	1.6 E-09	1.3 E-07
7440-50-8	Copper ^{f,g}	1.8 E-07	1.5 E-05
--	Total dioxin/furan compounds ^{e,g}	2.0 E-13	1.6 E-11
100-41-4	Ethylbenzene ^{e,g}	3.3 E-08	2.6 E-06
74-85-1	Ethylene ^f	2.1 E-06	1.7 E-04
206-44-0	Fluoranthene ^e	9.1 E-09	7.2 E-07
86-73-7	Fluorene ^d	1.3 E-09	1.1 E-07
50-00-0	Formaldehyde ^e	2.7 E-07	2.2 E-05
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^{e,g}	3.1 E-14	2.5 E-12
7647-01-0	Hydrochloric acid ^e	2.8 E-07	2.2 E-05
74-90-8	Hydrogen cyanide ^e	1.7 E-07	1.3 E-05
193-39-5	Indeno[1,2,3-cd]pyrene ^{e,i}	1.9 E-09	1.5 E-07

Table 15.9.38-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7439-92-1	Lead ^e	1.4 E-05	1.1 E-03
7439-96-5	Manganese ^e	6.4 E-08	5.1 E-06
75-09-2	Methylene chloride ^e	2.0 E-08	1.6 E-06
108-10-1	Methyl isobutyl ketone ^{e,g}	3.9 E-08	3.1 E-06
91-20-3	Naphthalene ^e	5.9 E-08	4.7 E-06
85-01-8	Phenanthrene ^e	1.2 E-08	9.8 E-07
123-38-6	Propionaldehyde ^{e,g}	1.1 E-07	8.9 E-06
115-07-1	Propylene ^f	2.6 E-06	2.1 E-04
129-00-0	Pyrene ^d	1.2 E-08	9.5 E-07
100-42-5	Styrene ^{e,g}	3.2 E-09	2.6 E-07
7664-93-9	Sulfuric acid ^{f,h}	1.1 E-05	8.7 E-04
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	7.9 E-15	6.3 E-13
108-88-3	Toluene ^{e,g}	2.7 E-07	2.2 E-05
95-63-6	1,2,4-Trimethylbenzene ^{f,g}	5.6 E-09	4.4 E-07
7440-62-2	Vanadium ^{f,g}	1.7 E-09	1.4 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene ^e	7.9 E-08	6.3 E-06
95-47-6	o-Xylene ^{e,i}	1.5 E-08	1.2 E-06
7440-66-6	Zinc ^{f,g}	8.0 E-08	6.4 E-06

^a Factors represent uncontrolled emissions. References 1-4.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.26 E-02 pounds per item. Reference 1.

^d Hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^f Reportable chemical under EPCRA Section 313.

^g EMISSION FACTOR RATING C.

^h EMISSION FACTOR RATING D.

ⁱ EMISSION FACTOR RATING A.

References For Section 15.9.38

1. *Report No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2006.
2. *Detailed Test Plan No. 9 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2003.

3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 9 Testing Conducted at Aberdeen Proving Ground, Maryland, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2008.*
4. 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, June 2007.

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15.9.41 MN68, M151 Booster Demolition Charge

15.9.41.1 Ordnance Description¹⁻³

The M151 Booster Demolition Charge (DODIC MN68) is used as a booster charge. It is a no-delay, non-electric, insensitive initiation system with a length of 10 feet. It has a solid core detonating cord and a secondary explosive booster. This ammunition is used during combat and on firing ranges during training.

15.9.41.2 Emissions And Controls^{1,2,4,5}

Carbon dioxide (CO₂) and carbon monoxide (CO) and are the primary emissions from the use of the M151 Booster Demolition Charge. 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 used in the field, there are no controls associated with its use.

Table 15.9.41-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.9.41-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, 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).

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Table 15.9.41-1 EMISSION FACTORS FOR THE USE OF DODIC MN68, M151 BOOSTER DEMOLITION CHARGE – CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: A (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	4.5 E-03	4.6 E-01
630-08-0	CO ^f	1.2 E-03	1.2 E-01
7439-92-1	Lead (Pb) ^g	1.1 E-04	1.2 E-02
--	Oxides of nitrogen (NO _x)	9.2 E-05	9.5 E-03
--	PM-2.5 ^d	6.1 E-04	6.3 E-02
--	PM-10 ^{e,g}	7.3 E-04	7.5 E-02
7446-09-5	Sulfur dioxide (SO ₂) ^g	3.6 E-05	3.8 E-03
--	TNMHC ^f	3.6 E-05	3.7 E-03
12789-66-1	TSP ^g	7.2 E-04	7.5 E-02

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 9.70 E-03 pounds per item. References 1 and 3.

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

^e PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

^f EMISSION FACTOR RATING B.

^g EMISSION FACTOR RATING C.

^h EMISSION FACTOR RATING D.

Table 15.9.41-2 EMISSION FACTORS FOR THE USE OF DODIC MN68, M151 BOOSTER DEMOLITION CHARGE – HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-07-0	Acetaldehyde ^d	1.9 E-06	2.0 E-04
75-05-8	Acetonitrile ^{d,g}	3.1 E-06	3.2 E-04
98-86-2	Acetophenone ^{d,g}	1.8 E-07	1.9 E-05
107-02-8	Acrolein ^d	2.3 E-07	2.4 E-05
107-13-1	Acrylonitrile ^{d,g}	8.4 E-07	8.7 E-05
7664-41-7	Ammonia ^{e,g}	2.8 E-06	2.9 E-04
71-43-2	Benzene ^{d,g}	5.9 E-06	6.1 E-04
92-52-4	Biphenyl ^{d,h}	1.1 E-07	1.1 E-05
106-99-0	1,3-Butadiene ^d	1.1 E-06	1.2 E-04
85-68-7	Butylbenzylphthalate ^{f,g}	1.3 E-08	1.3 E-06
7440-43-9	Cadmium ^d	1.4E-07	1.4 E-05
75-15-0	Carbon disulfide ^d	1.0 E-07	1.0 E-05
7440-47-3	Chromium ^d	1.6 E-06	1.6 E-04
7440-48-4	Cobalt ^{d,g}	1.2 E-08	1.2 E-06
7440-50-8	Copper ^{e,g}	7.4 E-07	7.6 E-05
--	Total dioxin/furan compounds ^d	2.1 E-09	2.2 E-07
100-41-4	Ethylbenzene ^{d,g}	3.3 E-09	3.4 E-07
74-85-1	Ethylene ^e	1.6 E-05	1.7 E-03
50-00-0	Formaldehyde ^d	4.2 E-07	4.4 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{d,h}	1.0 E-10	1.0 E-08
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^{d,h}	2.2 E-11	2.2 E-09
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^{d,h}	2.6 E-12	2.7 E-10
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^{d,h}	1.2 E-12	1.2 E-10
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^{d,h}	2.6 E-12	2.7 E-10
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^{d,h}	1.8 E-12	1.8 E-10
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^{d,h}	1.2 E-12	1.2 E-10
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^{d,h}	9.3 E-13	9.6 E-11
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran ^{d,h}	1.3 E-12	1.4 E-10
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^{d,h}	1.6 E-12	1.6 E-10
74-90-8	Hydrogen cyanide ^{d,g}	1.5 E-05	1.5 E-03
7439-92-1	Lead ^d	1.1 E-04	1.2 E-02

Table 15.9.41-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
91-57-6	2-Methylnaphthalene ^f	1.6 E-08	1.6 E-06
91-20-3	Naphthalene ^{d,g}	1.1 E-07	1.2 E-05
7440-02-0	Nickel ^{d,g}	7.3 E-07	7.5 E-05
55-63-0	Nitroglycerin ^e	1.3 E-07	1.3 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^d	1.9 E-09	2.0 E-07
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^{d,h}	1.2 E-10	1.2 E-08
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ^{d,h}	1.9 E-12	2.0 E-10
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^{d,h}	9.0 E-13	9.3 E-11
108-95-2	Phenol ^{d,g}	5.5 E-08	5.6 E-06
123-38-6	Propionaldehyde ^d	5.9 E-07	6.1 E-05
115-07-1	Propylene ^{e,g}	3.5 E-06	3.6 E-04
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin ^d	4.2 E-14	4.4 E-12

^a Factors represent uncontrolled emissions. References 1, 2, 4, and 5.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 9.70 E-03 pounds per item. References 1 and 3.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

^g EMISSION FACTOR RATING B.

^h EMISSION FACTOR RATING D.

References For Section 15.9.41

1. *Sampling Results for AEC Phase VIII Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, URS Group, Inc., Oak Ridge, TN, February 2008.
2. *Detailed Test Plan for Phase VIII Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, November 2005.
3. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, August 2008.
4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase VIII Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, August 2008.
5. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Group, Inc., Oak Ridge, TN, March 2008.

15.9.43 Updates Since July 2006

Section 15.9 was created during July 2006. Revisions to this section since that date are summarized below.

Revision 6, July 2009

- Section 15.9.13, which presents emission factors for DODIC M420, the M2A4 15-Pound Demolition Shaped Charge, was added.

Revision 5, August 2008

- Section 15.9.10, which presents emission factors for DODIC M174, the .50 Caliber Blank Cartridge (Electrically Initiated), was added.
- Section 15.9.12, which presents emission factors for DODIC M327, the Firing Device Coupling Base, was added.
- Section 15.9.14, which presents emission factors for DODIC M448, the M2A1 8-Second Delay Percussion Detonator, was added.
- Section 15.9.16, which presents emission factors for DODIC M500, the M21 Cartridge Actuated Cutter, was added.
- Section 15.9.21, which presents emission factors for DODIC M670, the M700 Time Blasting Fuse, was added.
- Section 15.9.26, which presents emission factors for DODIC MD73, the M796 Impulse Cartridge, was added.
- Section 15.9.27, which presents emission factors for DODIC ML03, the M142 Multipurpose Demolition Firing Device, was added.
- Section 15.9.28, which presents emission factors for DODIC ML05, the MK24 Powder Actuated Cutter, was added.
- Section 15.9.32, which presents emission factors for DODIC MM50, the M221 Clipped Shaped Demolition Charge, was added.
- Section 15.9.36, which presents emission factors for DODIC MN07, the M15 Non-Electric Time Delay Blasting Cap, was added.
- Section 15.9.41, which presents emission factors for DODIC MN68, the M151 Booster Demolition Charge, was added.

Revision 4, June 2008

- Section 15.9.18, which presents emission factors for DODIC M626, the M1 Pressure Type Demolition Firing Device, was added.
- Section 15.9.20, which presents emission factors for DODIC M630, the M1 Pull Type Demolition Firing Device, was updated to include additional data.

- Section 15.9.23, which presents emission factors for DODIC M766, the M60 Time Blasting Fuse Igniter, was added.
- Section 15.9.37, which presents emission factors for DODIC MN08, the M81 Time Blasting Fuse Igniter, was added.
- Section 15.9.38, which presents emission factors for DODIC MN60, the M79 Electric Match Igniter, was added.

Revision 3, February 2008

- Section 15.9.8, which presents emission factors for DODIC M130, the M6 Electric Blasting Cap, was added.
- Section 15.9.9, which presents emission factors for DODIC M131, the M7 Non-Electric Blasting Cap, was added.
- Section 15.9.31, which presents emission factors for DODIC ML47, the M11 Non-Electric Blasting Cap with 30-foot Shock Tube, was added.
- Section 15.9.33, which presents emission factors for DODIC MN02, the M12 Non-Electric Blasting Cap with 500-foot Shock Tube, was added.
- Section 15.9.34, which presents emission factors for DODIC MN03, the M13 Non-Electric Blasting Cap with 1,000-foot Shock Tube, was added.
- Section 15.9.35, which presents emission factors for DODIC MN06, the M14 Non-Electric Time Delay Blasting Cap, was added.

Revision 2, November 2007

- Section 15.9.20, which presents emission factors for DODIC M630, the M1 Pull Type Demolition Firing Device, was added.

Revision 1, June 2007

- Section 15.9.3, which presents emission factors for DODIC M031, the ½-Pound Demolition Block Charge, was added.
- Section 15.9.11, which presents emission factors for DODIC M241, the M10 High Explosive Universal Destructor, was added.
- Section 15.9.15, which presents emission factors for DODIC M456, the PETN Type 1 Detonating Cord, was added.
- Section 15.9.29, which presents emission factors for DODIC ML09, the Linear Shaped Demolition Charge (20 gr/ft), was added.
- Section 15.9.30, which presents emission factors for DODIC ML15, the Linear Shaped Demolition Charge (225 gr/ft), was added.

- Where present, data regarding the average annual quantities of ordnance used on Army installations during training exercises were deleted because the quantities used vary from installation to installation and from year to year.

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