15.2 Cartridges 30-75 mm

Munitions listed in this section begin with the Department of Defense Identification Code (DODIC) letter "B." This category of munitions includes cartridges between 30-mm and 75-mm in size. Examples include 40-mm practice cartridges, 40-mm high explosive antitank rounds, and 60-mm high explosive mortars.

15.2.2 B519, M781 40-mm Practice Cartridge

15.2.2.1 Ordnance Description[1,2]

The M781 40-mm Practice Cartridge (DODIC B519) is a practice round used to train soldiers on the operation of the M203 grenade launcher, which is attached to the M16 rifle series or M4 series carbine. When launched, the M781 can reach a maximum distance of 400 meters. Upon impact with a target, the projectile releases a dye, causing a puff of bright yellow-orange smoke that simulates an explosion. Note that emission factors presented herein are only associated with the firing of the practice charge; emissions associated with the impact and detonation of the projectile are not addressed in this section.

The M781 40-mm Practice Cartridge consists of a zinc or aluminum projectile attached to a plastic cartridge case that contains a .38 caliber blank cartridge primer. When the firing pin of the weapon strikes the .38 caliber blank cartridge primer, the propellant of the blank cartridge is ignited, propelling the projectile through the launcher barrel to the target.

The M781 40-mm Practice Cartridge is used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. On average, 15,488 M781 cartridges are used per year at a given training facility.[2]

15.2.2.2 Emissions And Controls[1,3-6]

Primary emissions from the use of the M781 40-mm Practice Cartridge include carbon dioxide (CO_2) 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 used in the field, there are no controls associated with its use.

Table 15.2.2-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.2.2-2 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).

Table 15.2.2-1 EMISSION FACTORS FOR THE USE OF DODIC B519, M781 40-MM PRACTICE 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	2.6 E-04	3.2 E-01
630-08-0	CO	3.5 E-04	4.4 E-01
7439-92-1	Lead (Pb)[f]	6.7 E-06	8.3 E-03
74-82-8	Methane	3.7 E-06	4.6 E-03
--	Oxides of nitrogen (NO_x)[f]	3.6 E-05	4.5 E-02
--	PM-2.5[d]	2.3 E-05	2.9 E-02
--	PM-10[e]	2.6 E-05	3.3 E-02
12789-66-1	TSP	2.3 E-05	2.9 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 8.0 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 C.

Table 15.2.2-2 EMISSION FACTORS FOR THE USE OF DODIC B519, M781 40-MM PRACTICE CARTRIDGE – 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]	1.1 E-10	1.4 E-07
208-96-8	Acenaphthylene[d]	2.1 E-09	2.7 E-06
75-07-0	Acetaldehyde[e]	6.8 E-08	8.4 E-05
75-05-8	Acetonitrile[e,g]	6.0 E-08	7.5 E-05
98-86-2	Acetophenone[e,h]	4.4 E-08	5.5 E-05
107-13-1	Acrylonitrile[e]	9.5 E-08	1.2 E-04
120-12-7	Anthracene[e,g]	6.0 E-11	7.5 E-08
7440-36-0	Antimony[e]	1.2 E-06	1.5 E-03
7440-39-3	Barium[f]	6.7 E-07	8.3 E-04
71-43-2	Benzene[e]	6.8 E-07	8.5 E-04
56-55-3	Benzo[a]anthracene[e]	1.8 E-11	2.2 E-08
205-99-2	Benzo[b]fluoranthene[e]	1.1 E-10	1.4 E-07
191-24-2	Benzo[g,h,i]perylene[e]	2.2 E-10	2.7 E-07
50-32-8	Benzo[a]pyrene[e]	8.0 E-11	1.0 E-07
75-15-0	Carbon disulfide[e]	1.3 E-07	1.7 E-04
56-23-5	Carbon tetrachloride[e]	2.7 E-09	3.3 E-06
7440-47-3	Chromium[e]	1.5 E-08	1.8 E-05
218-01-9	Chrysene[e]	4.0 E-11	5.0 E-08
7440-50-8	Copper[f]	7.2 E-08	8.9 E-05
98-82-8	Cumene[e]	3.6 E-09	4.5 E-06
107-06-2	1,2-Dichloroethane[e]	9.8 E-09	1.2 E-05
--	Total dioxin/furan compounds[e]	2.0 E-13	2.5 E-10
100-41-4	Ethylbenzene[e]	2.1 E-08	2.6 E-05
74-85-1	Ethylene[f]	1.7 E-06	2.2 E-03
206-44-0	Fluoranthene[e]	1.0 E-10	1.3 E-07
86-73-7	Fluorene[d]	2.7 E-10	3.3 E-07
50-00-0	Formaldehyde[e]	9.2 E-08	1.2 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e,h]	2.4 E-14	3.0 E-11
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[e]	1.9 E-15	2.4 E-12

Table 15.2.2-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
74-90-8	Hydrogen cyanide[e,g]	6.1 E-07	7.6 E-04
193-39-5	Indeno[1,2,3-cd]pyrene[e]	1.2 E-10	1.4 E-07
7439-92-1	Lead	6.7 E-06	8.3 E-03
7439-96-5	Manganese[e]	1.1 E-09	1.4 E-06
75-09-2	Methylene chloride[e]	3.2 E-07	4.0 E-04
91-20-3	Naphthalene[e]	1.2 E-08	1.5 E-05
7697-37-2	Nitric acid[f]	4.0 E-07	5.0 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e,h]	1.7 E-13	2.2 E-10
85-01-8	Phenanthrene[e]	3.2 E-10	4.0 E-07
115-07-1	Propylene[f]	1.6 E-07	2.0 E-04
129-00-0	Pyrene[d,g]	1.1 E-10	1.3 E-07
100-42-5	Styrene[e]	2.4 E-07	3.0 E-04
108-88-3	Toluene[e]	8.6 E-08	1.1 E-04
71-55-6	1,1,1-Trichloroethane[e,h]	1.2 E-07	1.4 E-04
95-63-6	1,2,4-Trimethylbenzene[f]	5.1 E-08	6.3 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	7.4 E-08	9.2 E-05
95-47-6	o-Xylene[e]	5.3 E-08	6.6 E-05
7440-66-6	Zinc[f]	4.2 E-06	5.2 E-03

[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 8.0 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 B.
[h] EMISSION FACTOR RATING D.

References For Section 15.2.2

1. *Report No. 2 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

2. *Training Munitions Health Risk Assessment No. 39-EJ-1485-00, Residential Exposure from Inhalation of Air Emissions from the M918 40-mm Practice Cartridge or the M781 40-mm Practice Cartridge, Department of Defense Identification Codes: B584 and B519,* U.S. Army Center for Health Promotion and Preventive Medicine, Environmental Health Risk Assessment Program, June 2001.

3. *Detailed Test Plan No. 2 for the Firing Point Emission Study Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

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 Firing Point Emission Study Phase II Series 2 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, July 2004.

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15.2.5 B542, M430 40-mm High Explosive Dual Purpose Cartridge

15.2.5.1 Ordnance Description[1]

The M430 40-mm High Explosive Dual Purpose (HEDP) Cartridge (DODIC B542) is a standard round for the MK 19 Mod 3, 40-mm grenade machine gun. This ammunition is used during combat and on firing ranges during training. The M430 functions both as an armor-piercing weapon and as an anti-personnel round. Note that emission factors presented herein are only associated with the detonation of the projectile; emissions associated with the propelling charge are not addressed in this section.

The M430 40-mm HEDP Cartridge consists of a copper-lined steel projectile body attached to an M169 cartridge base. The projectile contains a bursting charge, a booster charge, and an initiator charge. The cartridge base contains a percussion primer and propelling charge. When the firing pin strikes the percussion primer, the propelling charge is ignited, propelling the projectile through the launcher barrel to the target.

15.2.5.2 Emissions And Controls[1-5]

Primary emissions from the use of the M430 40-mm HEDP Cartridge include carbon dioxide (CO_2), carbon monoxide (CO), and particulate matter. Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.2.5-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.2.5-2 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 15.2.5-1 EMISSION FACTORS FOR THE USE OF DODIC B542, M430 40-MM HIGH EXPLOSIVE DUAL PURPOSE CARTRIDGE (PROJECTILE) – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	4.9 E-02	5.8 E-01
630-08-0	CO	4.0 E-03	4.8 E-02
7439-92-1	Lead (Pb)	8.0 E-05	9.6 E-04
74-82-8	Methane	8.9 E-05	1.1 E-03
--	Oxides of nitrogen (NO_X)	1.3 E-03	1.5 E-02
--	PM-2.5[d]	5.1 E-03	6.1 E-02
--	PM-10[e]	9.5 E-03	1.1 E-01
12789-66-1	TSP	1.1 E-02	1.4 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 8.35 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.

Table 15.2.5-2 EMISSION FACTORS FOR THE USE OF DODIC B542, M430 40-MM HIGH EXPLOSIVE DUAL PURPOSE CARTRIDGE (PROJECTILE) – 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,g]	8.0 E-06	9.6 E-05
98-86-2	Acetophenone[d,h]	9.6 E-07	1.2 E-05
107-13-1	Acrylonitrile[d,g]	3.2 E-07	3.8 E-06
7429-90-5	Aluminum[e,g]	7.7 E-04	9.2 E-03
7664-41-7	Ammonia[f,g]	1.5 E-04	1.8 E-03
71-43-2	Benzene[d,g]	1.5 E-06	1.8 E-05
56-55-3	Benzo[a]anthracene[d,g]	2.7 E-10	3.2 E-09
205-99-2	Benzo[b]fluoranthene[d,g]	5.8 E-10	6.9 E-09
207-08-9	Benzo[k]fluoranthene[d]	1.0 E-10	1.2 E-09
191-24-2	Benzo[g,h,i]perylene[d,g]	7.6 E-10	9.1 E-09
50-32-8	Benzo[a]pyrene[d,g]	1.6 E-10	2.0 E-09
192-97-2	Benzo[e]pyrene[f,g]	5.2 E-10	6.2 E-09
108-90-7	Chlorobenzene[d]	5.0 E-08	6.0 E-07
74-87-3	Chloromethane[d,g]	1.5 E-07	1.8 E-06
7440-47-3	Chromium[d]	3.4 E-06	4.1 E-05
18540-29-9	Hexavalent chromium[d]	2.2 E-08	2.6 E-07
218-01-9	Chrysene[d,g]	4.0 E-10	4.8 E-09
7440-50-8	Copper[e]	2.0 E-03	2.4 E-02
--	Total dioxin/furan compounds[d]	8.3 E-12	9.9 E-11
100-41-4	Ethylbenzene[d]	1.8 E-08	2.2 E-07
74-85-1	Ethylene[e,g]	5.2 E-06	6.3 E-05
117-81-7	bis(2-Ethylhexyl)phthalate[d,g]	1.3 E-06	1.5 E-05
206-44-0	Fluoranthene[d]	8.5 E-10	1.0 E-08
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[d,h]	4.4 E-13	5.3 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[d,h]	1.9 E-13	2.3 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[d]	6.7 E-14	8.0 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[d]	1.2 E-13	1.5 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[d,h]	1.8 E-13	2.2 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[d,h]	6.8 E-13	8.1 E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[d,h]	1.3 E-13	1.6 E-12

Table 15.2.5-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran[d,h]	2.7 E-13	3.3 E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[d,h]	1.3 E-13	1.6 E-12
74-90-8	Hydrogen cyanide[d,g]	1.1 E-05	1.3 E-04
193-39-5	Indeno[1,2,3-cd]pyrene[d]	2.4 E-10	2.9 E-09
7439-92-1	Lead[d,g]	8.0 E-05	9.6 E-04
7439-96-5	Manganese[d,g]	2.2 E-05	2.7 E-04
1634-04-4	Methyl tert-butyl ether[d,h]	1.8 E-09	2.2 E-08
91-20-3	Naphthalene[d,g]	1.3 E-08	1.6 E-07
7697-37-2	Nitric acid[e,g]	1.4 E-05	1.6 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[d,h]	4.6 E-12	5.5 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[d,h]	1.9 E-13	2.2 E-12
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin[d,h]	2.4 E-13	2.9 E-12
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran[d,h]	4.0 E-13	4.8 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[d,h]	4.5 E-13	5.4 E-12
129-00-0	Pyrene[f]	1.8 E-09	2.1 E-08
100-42-5	Styrene[d,g]	2.2 E-07	2.6 E-06
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[d,h]	4.0 E-13	4.7 E-12
108-88-3	Toluene[d,g]	2.9 E-07	3.5 E-06
95-63-6	1,2,4-Trimethylbenzene[e,h]	1.0 E-08	1.2 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene[h]	1.1 E-08	1.3 E-07
95-47-6	o-Xylene[d,h]	9.8 E-09	1.2 E-07
7440-66-6	Zinc[e,g]	1.2 E-04	1.4 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 8.35 E-02 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 15.2.5

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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15.2.6 B571, M383 40-mm High Explosive Cartridge

15.2.6.1 Ordnance Description[1]

The M383 40-mm High Explosive Cartridge (DODIC B571) is an anti-personnel round that causes casualties by ground-burst effect. This ammunition is used during combat and on firing ranges during training. The cartridge is fired from the MK19 Mod 1, 40-mm grenade machine gun and also from the M75 and M129 grenade launchers. Note that emission factors presented herein are only associated with the detonation of the projectile; emissions associated with the propelling charge are not addressed in this section.

The M383 40-mm High Explosive Cartridge consists of a one-piece steel projectile body and an aluminum cartridge case assembly containing a propelling charge and a percussion primer. The projectile contains a bursting charge, a booster charge, and an initiator charge, as well as an aluminum ogive.

15.2.6.2 Emissions And Controls[1-5]

Carbon dioxide (CO_2) is the primary emission from the use of the M383 High Explosive 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 15.2.6-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.2.6-2 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 15.2.6-1 EMISSION FACTORS FOR THE USE OF DODIC B571, M383 40-MM HIGH EXPLOSIVE CARTRIDGE (PROJECTILE) – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	6.6 E-02	5.7 E-01
630-08-0	Carbon monoxide (CO)	7.0 E-03	6.0 E-02
7439-92-1	Lead (Pb)	7.3 E-05	6.2 E-04
74-82-8	Methane	1.4 E-04	1.2 E-03
--	Oxides of nitrogen (NO_X)	1.6 E-03	1.3 E-02
--	PM-2.5[d]	6.6 E-03	5.6 E-02
--	PM-10[e]	1.3 E-02	1.1 E-01
12789-66-1	TSP	1.6 E-02	1.4 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 1.17 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.

Table 15.2.6-2 EMISSION FACTORS FOR THE USE OF DODIC B571, M383 40-MM HIGH EXPLOSIVE CARTRIDGE (PROJECTILE) – 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,g]	6.8 E-09	5.8 E-08
208-96-8	Acenaphthylene[d]	1.4 E-07	1.2 E-06
75-05-8	Acetonitrile[e,g]	1.1 E-05	9.4 E-05
98-86-2	Acetophenone[e,h]	2.7 E-07	2.3 E-06
107-02-8	Acrolein[e]	8.4 E-07	7.2 E-06
107-13-1	Acrylonitrile[e,g]	1.9 E-06	1.6 E-05
7429-90-5	Aluminum[f,g]	8.8 E-04	7.5 E-03
7664-41-7	Ammonia[d,g]	2.6 E-04	2.2 E-03
120-12-7	Anthracene[e,g]	1.2 E-08	1.0 E-07
7440-39-3	Barium[f]	3.3 E-06	2.8 E-05
71-43-2	Benzene[e,g]	7.4 E-06	6.4 E-05
56-55-3	Benzo[a]anthracene[e,g]	6.2 E-09	5.3 E-08
205-99-2	Benzo[b]fluoranthene[e,g]	6.8 E-09	5.8 E-08
207-08-9	Benzo[k]fluoranthene[e]	3.5 E-09	3.0 E-08
191-24-2	Benzo[g,h,i]perylene[e,g]	8.2 E-09	7.0 E-08
50-32-8	Benzo[a]pyrene[e,g]	6.4 E-09	5.5 E-08
192-97-2	Benzo[e]pyrene[d,g]	6.4 E-09	5.5 E-08
85-68-7	Butylbenzylphthalate[d]	3.4 E-07	2.9 E-06
108-90-7	Chlorobenzene[e]	1.6 E-07	1.4 E-06
74-87-3	Chloromethane[e,g]	2.2 E-07	1.9 E-06
7440-47-3	Chromium[e]	5.3 E-06	4.6 E-05
18540-29-9	Hexavalent chromium[e]	2.2 E-08	1.9 E-07
218-01-9	Chrysene[e,g]	9.3 E-09	8.0 E-08
7440-50-8	Copper[f]	9.6 E-04	8.2 E-03
53-70-3	Dibenz[a,h]anthracene[e]	4.3 E-10	3.6 E-09
84-74-2	Dibutyl phthalate[e]	3.7 E-07	3.1 E-06
--	Total dioxin/furan compounds[e]	1.1 E-11	9.0 E-11
100-41-4	Ethylbenzene[e,h]	2.0 E-07	1.7 E-06
74-85-1	Ethylene[f,g]	1.8 E-05	1.5 E-04
117-81-7	bis(2-Ethylhexyl)phthalate[e,g]	4.7 E-07	4.0 E-06

Table 15.2.6-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
206-44-0	Fluoranthene[e]	3.3 E-08	2.8 E-07
86-73-7	Fluorene[d]	4.2 E-08	3.6 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e]	1.0 E-12	8.8 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	1.3 E-13	1.1 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[e]	4.7 E-14	4.0 E-13
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[e]	2.8 E-14	2.4 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e]	1.9 E-13	1.6 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e]	1.3 E-13	1.2 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[e]	1.4 E-13	1.2 E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[e]	5.3 E-14	4.6 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[e]	6.9 E-14	5.9 E-13
74-90-8	Hydrogen cyanide[e,g]	5.4 E-05	4.6 E-04
193-39-5	Indeno[1,2,3-cd]pyrene[e]	4.8 E-09	4.1 E-08
7439-92-1	Lead[e,g]	7.3 E-05	6.2 E-04
7439-96-5	Manganese[e,g]	1.9 E-05	1.6 E-04
80-62-6	Methyl methacrylate[e]	1.0 E-07	8.6 E-07
91-20-3	Naphthalene[e,g]	2.0 E-07	1.7 E-06
7697-37-2	Nitric acid[f,g]	1.2 E-05	1.0 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e]	7.7 E-12	6.6 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e]	3.4 E-13	2.9 E-12
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin[e]	6.6 E-14	5.6 E-13
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran[e]	9.1 E-14	7.8 E-13
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[e]	2.0 E-13	1.7 E-12
85-01-8	Phenanthrene[e,g]	9.0 E-08	7.7 E-07
115-07-1	Propylene[f,g]	6.8 E-06	5.8 E-05
129-00-0	Pyrene[d.]	4.6 E-08	3.9 E-07
100-42-5	Styrene[e,g]	2.2 E-07	1.9 E-06
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin[e]	1.2 E-14	1.0 E-13
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[e]	2.5 E-13	2.1 E-12
108-88-3	Toluene[e,g]	1.6 E-06	1.4 E-05
75-69-4	Trichlorofluoromethane[f]	8.8 E-08	7.6 E-07
95-63-6	1,2,4-Trimethylbenzene[f,h]	9.0 E-08	7.7 E-07

Table 15.2.6-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
540-84-1	2,2,4-Trimethylpentane[d]	5.2 E-08	4.4 E-07
75-01-4	Vinyl chloride[e,h]	2.4 E-08	2.1 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene[e,h]	7.1 E-07	6.1 E-06
95-47-6	o-Xylene[e,h]	2.4 E-07	2.0 E-06
7440-66-6	Zinc[f,g]	1.1 E-04	9.2 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 1.17 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 B.
[h] EMISSION FACTOR RATING D.

References For Section 15.2.6

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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15.2.7 B584, M918 40-mm Practice Cartridge

15.2.7.1 Ordnance Description[1,2]

The M918 40-mm Practice Cartridge (DODIC B584) is a practice round used only in training. Multiple cartridges are linked together and fired at targets of varying distance. The M918 mimics the appearance and behavior of the M430 cartridge used in combat. The M918 cartridge is designed to be fired from the MK 19 Mod 3, 40-mm grenade machine gun. It is also used in the M970 CSAT to simulate the loading and firing of large caliber ammunition. Upon impact with the target, gases generated by burning flash powder cause the base of the projectile body to rupture and produce a flash, smoke, and a loud report. Note that emission factors presented herein are only associated with the firing of the practice cartridge; emissions associated with the impact of the projectile are not addressed in this section.

The M918 40-mm Practice Cartridge contains a propellant and a primer mix. The projectile body is steel and contains an insert that has a flash charge chamber filled with flash charge composition. When the firing pin of the weapon strikes the percussion primer, the propellant within the chamber is ignited, propelling the projectile through the launcher barrel to the target.

The M918 40-mm Practice Cartridge is used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. On average, 15,432 M918 cartridges are used per year at a given training facility.[2]

15.2.7.2 Emissions And Controls[1,3-6]

Primary emissions from the use of the M918 40-mm Practice Cartridge include carbon dioxide (CO_2) 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 used in the field, there are no controls associated with its use.

Table 15.2.7-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.2.7-2 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 15.2.7-1 EMISSION FACTORS FOR THE USE OF DODIC B584, M918 40-MM PRACTICE 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	2.7 E-03	2.6 E-01
630-08-0	CO	2.6 E-03	2.5 E-01
7439-92-1	Lead (Pb)[f]	1.1 E-05	1.1 E-03
74-82-8	Methane[f]	5.4 E-06	5.3 E-04
--	Oxides of nitrogen (NO_x)[f]	9.7 E-05	9.5 E-03
--	PM-2.5[d]	1.2 E-04	1.1 E-02
--	PM-10[e]	1.4 E-04	1.4 E-02
12789-66-1	TSP	1.4 E-04	1.4 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 1.03 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 C.

Table 15.2.7-2 EMISSION FACTORS FOR THE USE OF DODIC B584, M918 40-MM PRACTICE CARTRIDGE – 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]	2.4 E-10	2.4 E-08
208-96-8	Acenaphthylene[d]	3.3 E-09	3.2 E-07
75-07-0	Acetaldehyde[e,h]	5.9 E-08	5.7 E-06
75-05-8	Acetonitrile[e,g]	1.5 E-07	1.5 E-05
107-02-8	Acrolein[e]	4.3 E-08	4.2 E-06
107-13-1	Acrylonitrile[e]	1.9 E-07	1.8 E-05
7664-41-7	Ammonia[d]	8.6 E-06	8.4 E-04
120-12-7	Anthracene[e,g]	1.3 E-10	1.3 E-08
7440-36-0	Antimony[e]	1.3 E-06	1.2 E-04
7440-38-2	Arsenic[e]	2.8 E-09	2.7 E-07
7440-39-3	Barium[f]	1.6 E-05	1.5 E-03
71-43-2	Benzene[e]	8.9 E-07	8.7 E-05
56-55-3	Benzo[a]anthracene[e]	2.4 E-10	2.3 E-08
205-99-2	Benzo[b]fluoranthene[e]	1.3 E-10	1.3 E-08
207-08-9	Benzo[k]fluoranthene[e]	2.9 E-10	2.8 E-08
191-24-2	Benzo[g,h,i]perylene[e]	8.2 E-10	8.0 E-08
50-32-8	Benzo[a]pyrene[e]	3.1 E-10	3.1 E-08
75-65-0	t-Butyl alcohol[e,h]	7.2 E-08	7.0 E-06
75-15-0	Carbon disulfide[e]	4.0 E-09	3.9 E-07
75-68-3	1-Chloro-1,1-difluoroethane[f,h]	5.7 E-08	5.6 E-06
75-45-6	Chlorodifluoromethane[f]	4.9 E-09	4.8 E-07
74-87-3	Chloromethane	2.7 E-09	2.6 E-07
7440-47-3	Chromium[e]	1.1 E-08	1.1 E-06
7440-48-4	Cobalt[e]	3.2 E-09	3.1 E-07
7440-50-8	Copper[f]	2.5 E-05	2.5 E-03
98-82-8	Cumene[e]	3.2 E-09	3.1 E-07
57-12-5	Particulate cyanide[e]	2.2 E-07	2.1 E-05
53-70-3	Dibenz[a,h]anthracene[e]	2.4 E-11	2.4 E-09
75-71-8	Dichlorodifluoromethane[f]	4.1 E-09	4.0 E-07
107-06-2	1,2-Dichloroethane[e]	1.9 E-08	1.8 E-06

Table 15.2.7-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
--	Total dioxin/furan compounds[e]	8.9 E-14	8.7 E-12
100-41-4	Ethylbenzene[e]	2.0 E-08	2.0 E-06
74-85-1	Ethylene[f,h]	2.1 E-06	2.1 E-04
206-44-0	Fluoranthene[e]	5.3 E-10	5.2 E-08
86-73-7	Fluorene[d]	6.3 E-10	6.1 E-08
50-00-0	Formaldehyde[e,h]	1.7 E-07	1.7 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e]	7.0 E-15	6.8 E-13
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	5.1 E-15	4.9 E-13
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[e,h]	2.1 E-15	2.1 E-13
110-54-3	Hexane[e]	4.9 E-07	4.8 E-05
7647-01-0	Hydrochloric acid[e]	6.5 E-07	6.4 E-05
74-90-8	Hydrogen cyanide[e,g]	1.3 E-06	1.3 E-04
193-39-5	Indeno[1,2,3-cd]pyrene[e]	2.5 E-10	2.4 E-08
7439-92-1	Lead	1.1 E-05	1.1 E-03
7439-96-5	Manganese[e]	2.1 E-08	2.0 E-06
74-87-3	Methyl chloride[e]	2.7 E-09	2.6 E-07
75-09-2	Methylene chloride[e]	1.4 E-07	1.4 E-05
91-20-3	Naphthalene[e]	2.2 E-08	2.2 E-06
7440-02-0	Nickel[e]	5.9 E-08	5.7 E-06
7697-37-2	Nitric acid[f]	1.4 E-06	1.4 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e,h]	6.8 E-14	6.6 E-12
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e]	7.0 E-15	6.8 E-13
85-01-8	Phenanthrene[e]	7.7 E-10	7.5 E-08
115-07-1	Propylene[f]	3.8 E-07	3.7 E-05
129-00-0	Pyrene[d,g]	1.1 E-09	1.1 E-07
7440-22-4	Silver[f]	7.4 E-10	7.2 E-08
100-42-5	Styrene[e]	2.4 E-08	2.3 E-06
127-18-4	Tetrachloroethylene[e]	4.4 E-09	4.3 E-07
108-88-3	Toluene[e]	1.4 E-07	1.4 E-05
75-69-4	Trichlorofluoromethane[f,g]	3.1 E-09	3.1 E-07
95-63-6	1,2,4-Trimethylbenzene[f]	9.1 E-09	8.9 E-07
75-01-4	Vinyl chloride[e]	2.4 E-09	2.3 E-07

Table 15.2.7-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	3.2 E-08	3.1 E-06
95-47-6	o-Xylene[e]	1.6 E-08	1.6 E-06
7440-66-6	Zinc[f]	1.9 E-06	1.9 E-04

[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 1.03 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 B.
[h] EMISSION FACTOR RATING D.

References For Section 15.2.7

1. *Report No. 2 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

2. *Training Munitions Health Risk Assessment No. 39-EJ-1485-00, Residential Exposure from Inhalation of Air Emissions from the M918 40-mm Practice Cartridge or the M781 40-mm Practice Cartridge, Department of Defense Identification Codes: B584 and B519,* U.S. Army Center for Health Promotion and Preventive Medicine, Environmental Health Risk Assessment Program, June 2001.

3. *Detailed Test Plan No. 2 for the Firing Point Emission Study Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

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 Firing Point Emission Study Phase II Series 2 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, July 2004.

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15.2.9 B632, M49A4 60-mm High Explosive Cartridge

15.2.9.1 Ordnance Description[1]

The M49A4 60-mm High Explosive Cartridge (DODIC B632) is a mortar used against personnel and light material, providing both a fragmentation and blast effect. This ammunition is used during combat and on firing ranges during training. The cartridge is fired from the M2 and M19 60-mm mortars. Note that emission factors presented herein are only associated with the detonation of the projectile; emissions associated with the propelling charge are not addressed in this section.

The M49A4 60-mm High Explosive Cartridge consists of a projectile body, a point detonation fuze, and a fin-stabilized assembly. The projectile body is made of forged steel or pearlitic malleable iron and contains a bursting charge. The point detonation fuze is attached to the nose of the projectile and contains a booster charge and an initiator charge.

15.2.9.2 Emissions And Controls[1-5]

Carbon dioxide (CO_2) is the primary emission from the use of the M49A4 60-mm High Explosive 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 15.2.9-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.2.9-2 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).

Table 15.2.9-1 EMISSION FACTORS FOR THE USE OF DODIC B632, M49A4 60-MM HIGH EXPLOSIVE CARTRIDGE (PROJECTILE) – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	2.9 E-01	6.2 E-01
630-08-0	Carbon monoxide (CO)	3.0 E-02	6.5 E-02
7439-92-1	Lead (Pb)	2.3 E-04	5.1 E-04
74-82-8	Methane	8.4 E-04	1.8 E-03
--	Oxides of nitrogen (NO_X)	4.2 E-03	9.2 E-03
--	PM-2.5[d]	1.7 E-02	3.7 E-02
--	PM-10[e]	3.2 E-02	7.1 E-02
12789-66-1	TSP	3.9 E-02	8.5 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 4.57 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.

Table 15.2.9-2 EMISSION FACTORS FOR THE USE OF DODIC B632, M49A4 60-MM HIGH EXPLOSIVE CARTRIDGE (PROJECTILE) – 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]	2.8 E-08	6.1 E-08
208-96-8	Acenaphthylene[d,g]	1.6 E-07	3.5 E-07
75-05-8	Acetonitrile[e]	4.6 E-05	1.0 E-04
107-13-1	Acrylonitrile[e]	3.5 E-06	7.6 E-06
7429-90-5	Aluminum[f]	2.2 E-03	4.8 E-03
7664-41-7	Ammonia[d]	1.4 E-03	3.1 E-03
120-12-7	Anthracene[e]	3.1 E-08	6.7 E-08
7440-39-3	Barium[f,g]	1.4 E-05	3.1 E-05
71-43-2	Benzene[e]	1.0 E-05	2.3 E-05
56-55-3	Benzo[a]anthracene[e]	1.2 E-08	2.5 E-08
205-99-2	Benzo[b]fluoranthene[e]	6.6 E-09	1.4 E-08
207-08-9	Benzo[k]fluoranthene[e,g]	3.4 E-09	7.5 E-09
191-24-2	Benzo[g,h,i]perylene[e]	5.2 E-09	1.1 E-08
50-32-8	Benzo[a]pyrene[e]	6.6 E-09	1.4 E-08
192-97-2	Benzo[e]pyrene[d]	1.2 E-08	2.5 E-08
7440-43-9	Cadmium[e,g]	8.2 E-05	1.8 E-04
7440-47-3	Chromium[e,g]	1.1 E-05	2.5 E-05
218-01-9	Chrysene[e]	1.7 E-08	3.8 E-08
7440-50-8	Copper[f,g]	6.1 E-04	1.3 E-03
--	Total dioxin/furan compounds[e,g]	1.4 E-11	3.1 E-11
74-85-1	Ethylene[f]	5.4 E-05	1.2 E-04
117-81-7	bis(2-Ethylhexyl)phthalate[e]	2.4 E-06	5.2 E-06
206-44-0	Fluoranthene[e,g]	7.0 E-08	1.5 E-07
86-73-7	Fluorene[d,g]	3.4 E-08	7.4 E-08
50-00-0	Formaldehyde[e,g]	9.7 E-06	2.1 E-05
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[e,g]	2.3 E-13	5.1 E-13
74-90-8	Hydrogen cyanide[e]	3.3 E-04	7.3 E-04
7439-92-1	Lead[e]	2.3 E-04	5.1 E-04
7439-96-5	Manganese[e]	1.1 E-04	2.3 E-04

Table 15.2.9-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
1634-04-4	Methyl tert-butyl ether[e,h]	1.1 E-07	2.4 E-07
91-20-3	Naphthalene[e]	8.3 E-07	1.8 E-06
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e,h]	1.3 E-11	2.9 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e,h]	8.4 E-13	1.8 E-12
85-01-8	Phenanthrene[e]	2.3 E-07	5.0 E-07
115-07-1	Propylene[f]	1.2 E-05	2.7 E-05
129-00-0	Pyrene[d,g]	1.7 E-07	3.8 E-07
100-42-5	Styrene[e]	3.8 E-07	8.3 E-07
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[e,h]	1.0 E-13	2.2 E-13
108-88-3	Toluene[e]	1.7 E-06	3.7 E-06
75-69-4	Trichlorofluoromethane[f,g]	5.2 E-08	1.1 E-07
75-01-4	Vinyl chloride[e,g]	2.3 E-07	5.0 E-07
7440-66-6	Zinc[f]	4.2 E-04	9.2 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 4.57 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 C.
[h] EMISSION FACTOR RATING D.

References For Section 15.2.9

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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15.2.10 B642, M720 60-mm High Explosive Cartridge

15.2.10.1 Ordnance Description[1,2]

The M720 60-mm High Explosive Cartridge (DODIC B642) is a mortar used against personnel, light vehicles, light bunkers, and similar targets. This ammunition is used during combat and on firing ranges during training. The cartridge is fired from the M224 mortar tube in the Lightweight Company System. Note that emission factors presented herein are divided into those associated with firing the cartridge and those associated with the detonation of the projectile.

The M720 60-mm High Explosive Cartridge consists of a projectile body, a multi-option fuze, a fin assembly, between zero and four propellant charge increments (depending upon the range desired), and an ignition cartridge. The number of propellant charge increments used indicates the zone into which the mortar is fired (e.g., one propellant charge increment is used to fire the mortar into "Zone 1"). The projectile body is made of alloy steel and contains a bursting charge.

15.2.10.2 Emissions And Controls[1-8]

Primary emissions from the use of the M720 60-mm High Explosive Cartridge include CO_2 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 15.2.10-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP) for the firing of the cartridge. Table 15.2.10-2 presents similar data for the detonation of the projectile, while Table 15.2.10-3 presents combined emission factors for the firing of the cartridge and the detonation of the projectile. Table 15.2.10-4 presents emission factors for hazardous air pollutants and toxic chemicals for the firing of the cartridge. Table 15.2.10-5 presents similar data for the detonation of the projectile, while Table 15.2.10-6 presents combined emission factors for the firing of the cartridge and the detonation of the projectile. In each of the tables, the emission factors are presented in terms of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW for the propelling charge is dependent upon the number of propelling charge increments used, the emission factors are not presented in terms of pounds of emissions per item (lb per item) except in Tables 15.2.10-2 and 15.2.10-5, which present emission factors for the detonation of the projectile.

15.2.10.3 Updates Since July 2006

Section 15.2 was created during July 2006. Revisions to the section since that date are summarized below.

Revision 1, September 2006

- Section, 15.2.10, which presents emission factors for DODIC B642, the M720 60-mm High Explosive Cartridge, was updated to include additional data.

Table 15.2.10-1 EMISSION FACTORS FOR THE USE OF DODIC B642, M720 60-MM HIGH EXPLOSIVE CARTRIDGE (PROPELLING CHARGE) – 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	1.5 E-01
630-08-0	Carbon monoxide (CO)	2.8 E-01
7439-92-1	Lead (Pb)[f]	1.0 E-04
74-82-8	Methane	1.0 E-03
--	Oxides of nitrogen (NO_X)	2.6 E-03
--	PM-2.5[d,f]	8.9 E-03
--	PM-10[e,f]	1.1 E-02
12789-66-1	TSP[f]	7.8 E-03

[a] Factors represent uncontrolled emissions. References 1, 3, and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 7.93 E-03 pounds per item and 1.03 E-01 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 7.93 E-03 pounds per item and between zero and four propelling charge increments, each of which weighs 2.37 E-02 pounds. Reference 8.
[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.

Table 15.2.10-2 EMISSION FACTORS FOR THE USE OF DODIC B642, M720 60-MM HIGH EXPLOSIVE CARTRIDGE (PROJECTILE) – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	4.2 E-01	5.3 E-01
630-08-0	CO	4.8 E-02	6.1 E-02
7439-92-1	Lead	4.4 E-04	5.5 E-04
74-82-8	Methane	1.5 E-03	1.9 E-03
--	NO_x	5.3 E-03	6.6 E-03
--	PM-2.5	3.0 E-02	3.8 E-02
--	PM-10	6.5 E-02	8.2 E-02
12789-66-1	TSP	7.3 E-02	9.3 E-02

[a] Factors represent uncontrolled emissions. References 2, 4, and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 7.91 E-01 pounds per item. Reference 8.

Table 15.2.10-3 EMISSION FACTORS FOR THE USE OF DODIC B642, M720 60-MM HIGH EXPLOSIVE CARTRIDGE (TOTAL) – CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B

CASRN[b]	Pollutant	lb per lb NEW[c]
124-38-9	CO_2	5.0 E-01
630-08-0	CO	7.5 E-02
7439-92-1	Lead	5.2 E-04
74-82-8	Methane	1.9 E-03
--	NO_x	6.4 E-03
--	PM-2.5	3.7 E-02
--	PM-10	7.7 E-02
12789-66-1	TSP	8.7 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 varies between 7.99 E-01 pounds per item and 8.94 E-01 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 7.93 E-03 pounds per item, between zero and four propelling charge increments, each of which weighs 2.37 E-02 pounds, and a 7.91 E-01 pound high explosive charge located in the projectile. Reference 8.

Table 15.2.10-4 EMISSION FACTORS FOR THE USE OF DODIC B642, M720 60-MM HIGH EXPLOSIVE CARTRIDGE (PROPELLING CHARGE) – HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per lb NEW[c]
75-07-0	Acetaldehyde[d]	7.2 E-05
75-05-8	Acetonitrile[d]	1.4 E-05
107-13-1	Acrylonitrile[d]	4.5 E-05
7440-36-0	Antimony[d,g]	4.2 E-05
7440-39-3	Barium[e,g]	3.6 E-05
71-43-2	Benzene[d]	2.7 E-04
191-24-2	Benzo[g,h,i]perylene[d]	1.0 E-07
50-32-8	Benzo[a]pyrene[d]	3.6 E-08
463-58-1	Carbonyl sulfide[d,h]	4.5 E-05
7440-47-3	Chromium[d,g]	8.1 E-06
7440-50-8	Copper[e]	5.1 E-05
57-12-5	Particulate cyanide[d,g]	1.2 E-05
107-06-2	1,2-Dichloroethane[d]	5.2 E-06
74-85-1	Ethylene[e,f]	2.5 E-04
50-00-0	Formaldehyde[d]	5.1 E-04
74-90-8	Hydrogen cyanide[d]	3.2 E-04
7439-92-1	Lead[d]	1.0 E-04
75-09-2	Methylene chloride[d,g]	5.4 E-05
80-62-6	Methyl methacrylate[d,g]	2.6 E-06
91-20-3	Naphthalene[d,f]	4.7 E-06
7697-37-2	Nitric acid[e,g]	1.7 E-04
115-07-1	Propylene[e]	3.9 E-05
100-42-5	Styrene[d,g]	5.5 E-06
108-88-3	Toluene[d]	1.3 E-05
71-55-6	1,1,1-Trichloroethane[d,h]	1.9 E-06
7440-66-6	Zinc[e,g]	3.0 E-05

Table 15.2.10-4 (cont.)

[a] Factors represent uncontrolled emissions. References 1, 3, and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 7.93 E-03 pounds per item and 1.03 E-01 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 7.93 E-03 pounds per item and between zero and four propelling charge increments, each of which weighs 2.37 E-02 pounds. Reference 8.
[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 A.
[g] EMISSION FACTOR RATING C.
[h] EMISSION FACTOR RATING D.

Table 15.2.10-5 EMISSION FACTORS FOR THE USE OF DODIC B642, M720 60-MM HIGH EXPLOSIVE CARTRIDGE (PROJECTILE) – 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,g]	6.3 E-08	7.9 E-08
208-96-8	Acenaphthylene[d]	1.4 E-06	1.8 E-06
75-07-0	Acetaldehyde[e]	3.2 E-05	4.0 E-05
107-13-1	Acrylonitrile[e]	2.4 E-07	3.1 E-07
7429-90-5	Aluminum[f,g]	1.9 E-03	2.3 E-03
7664-41-7	Ammonia[d,g]	2.6 E-03	3.3 E-03
120-12-7	Anthracene[e,g]	1.2 E-07	1.5 E-07
7440-39-3	Barium[f]	7.6 E-05	9.6 E-05
71-43-2	Benzene[e,g]	3.3 E-06	4.2 E-06
56-55-3	Benzo[a]anthracene[e,g]	7.9 E-08	1.0 E-07
205-99-2	Benzo[b]fluoranthene[e,g]	7.4 E-08	9.4 E-08
207-08-9	Benzo[k]fluoranthene[e]	2.0 E-07	2.6 E-07
191-24-2	Benzo[g,h,i]perylene[e,g]	3.9 E-08	4.9 E-08
50-32-8	Benzo[a]pyrene[e,g]	5.0 E-08	6.3 E-08
192-97-2	Benzo[e]pyrene[d,g]	7.2 E-08	9.1 E-08
74-87-3	Chloromethane[e,g]	6.1 E-07	7.8 E-07
7440-47-3	Chromium[e]	7.2 E-05	9.1 E-05
18540-29-9	Hexavalent chromium[e]	3.4 E-06	4.3 E-06
218-01-9	Chrysene[e,g]	1.2 E-07	1.6 E-07
7440-48-4	Cobalt[e]	2.1 E-05	2.7 E-05
7440-50-8	Copper[f]	1.0 E-03	1.3 E-03
75-71-8	Dichlorodifluoromethane[f]	4.0 E-08	5.0 E-08
--	Total dioxin/furan compounds[e]	5.9 E-11	7.5 E-11
74-85-1	Ethylene[f]	8.0 E-05	1.0 E-04
117-81-7	bis(2-Ethylhexyl)phthalate[f,g]	3.6 E-07	4.5 E-07
206-44-0	Fluoranthene[e]	6.2 E-07	7.9 E-07
86-73-7	Fluorene[d]	7.0 E-08	8.8 E-08
50-00-0	Formaldehyde[e]	2.8 E-05	3.6 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e]	4.4 E-12	5.6 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	4.6 E-12	5.8 E-12

Table 15.2.10-5 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[e]	1.4 E-12	1.8 E-12
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[e]	5.5 E-13	6.9 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e]	1.4 E-12	1.8 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e]	1.4 E-12	1.8 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[e]	4.2 E-12	5.3 E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[e]	1.5 E-12	1.9 E-12
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran[e]	2.6 E-13	3.3 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[e]	1.5 E-12	2.0 E-12
7647-01-0	Hydrochloric acid[e]	1.9 E-05	2.4 E-05
74-90-8	Hydrogen cyanide[e,g]	7.7 E-04	9.7 E-04
7664-39-3	Hydrogen fluoride[e]	4.0 E-05	5.1 E-05
193-39-5	Indeno[1,2,3-cd]pyrene[e]	2.7 E-08	3.4 E-08
7439-92-1	Lead[e,g]	4.4 E-04	5.5 E-04
7439-96-5	Manganese[e,g]	2.2 E-04	2.8 E-04
91-20-3	Naphthalene[e,g]	2.9 E-06	3.6 E-06
7440-02-0	Nickel[e]	1.2 E-04	1.5 E-04
7697-37-2	Nitric acid[f,g]	2.4 E-05	3.1 E-05
55-63-0	Nitroglycerin[f]	4.5 E-07	5.7 E-07
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e]	1.8 E-11	2.3 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e]	8.6 E-12	1.1 E-11
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin[e]	1.1 E-12	1.4 E-12
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran[e]	1.8 E-12	2.3 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[e]	3.4 E-12	4.2 E-12
85-01-8	Phenanthrene[e,g]	9.9 E-07	1.3 E-06
108-95-2	Phenol[e]	2.2 E-06	2.7 E-06
123-38-6	Propionaldehyde[e]	7.1 E-06	8.9 E-06
115-07-1	Propylene[f,g]	2.1 E-05	2.7 E-05
129-00-0	Pyrene[d]	6.9 E-07	8.7 E-07
7440-22-4	Silver[g]	1.3 E-05	1.6 E-05
100-42-5	Styrene[e,g]	4.6 E-07	5.9 E-07
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin[e]	1.6 E-12	2.0 E-12
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[e]	3.6 E-12	4.5 E-12

Table 15.2.10-5 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
108-88-3	Toluene[e,g]	3.2 E-07	4.0 E-07
75-69-4	Trichlorofluoromethane[f]	2.3 E-08	2.9 E-08
106-42-3, 108-38-3	m-Xylene, p-Xylene[e,h]	1.1 E-07	1.3 E-07
7440-66-6	Zinc[f,g]	3.6 E-04	4.6 E-04

[a] Factors represent uncontrolled emissions. References 2, 4, and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 7.91 E-01 pounds per item. Reference 8.
[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.

Table 15.2.10-6 EMISSION FACTORS FOR THE USE OF DODIC B642, M720 60-MM HIGH EXPLOSIVE CARTRIDGE (TOTAL) – 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,g]	7.4 E-08
208-96-8	Acenaphthylene[d]	1.7 E-06
75-07-0	Acetaldehyde[e]	4.3 E-05
75-05-8	Acetonitrile[e,g]	9.2 E-07
107-13-1	Acrylonitrile[e,g]	3.3 E-06
7429-90-5	Aluminum[f,g]	2.2 E-03
7664-41-7	Ammonia[d,g]	3.1 E-03
120-12-7	Anthracene[e,g]	1.4 E-07
7440-36-0	Antimony[e]	2.7 E-06
7440-39-3	Barium[f]	9.2 E-05
71-43-2	Benzene[e,g]	2.1 E-05
56-55-3	Benzo[a]anthracene[e,g]	9.3 E-08
205-99-2	Benzo[b]fluoranthene[e,g]	8.7 E-08
207-08-9	Benzo[k]fluoranthene[e]	2.4 E-07
191-24-2	Benzo[g,h,i]perylene[e,g]	5.2 E-08
50-32-8	Benzo[a]pyrene[e,g]	6.1 E-08
192-97-2	Benzo[e]pyrene[e,g]	8.6 E-08
463-58-1	Carbonyl sulfide[e,h]	3.0 E-06
74-87-3	Chloromethane[e,g]	7.3 E-07
7440-47-3	Chromium[e]	8.5 E-05
18540-29-9	Hexavalent chromium[e]	4.0 E-06
218-01-9	Chrysene[e,g]	1.5 E-07
7440-48-4	Cobalt[e]	2.5 E-05
7440-50-8	Copper[f]	1.2 E-03
57-12-5	Particulate cyanide[e]	8.0 E-07
75-71-8	Dichlorodifluoromethane[f]	4.7 E-08
107-06-2	1,2-Dichloroethane[e,g]	3.4 E-07
--	Total dioxin/furan compounds[e]	7.0 E-11
74-85-1	Ethylene[f]	1.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate[f,g]	4.2 E-07

Table 15.2.10-6 (cont.)

CASRN[b]	Pollutant	lb per lb NEW[c]
206-44-0	Fluoranthene[e]	7.3 E-07
86-73-7	Fluorene[d]	8.2 E-08
50-00-0	Formaldehyde[e]	6.7 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e]	5.2 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	5.4 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[e]	1.6 E-12
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[e]	6.5 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e]	1.7 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e]	1.7 E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[e]	5.0 E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[e]	1.8 E-12
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran[e]	3.1 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[e]	1.8 E-12
7647-01-0	Hydrochloric acid[e]	2.2 E-05
74-90-8	Hydrogen cyanide[e,g]	9.3 E-04
7664-39-3	Hydrogen fluoride[e]	4.8 E-05
193-39-5	Indeno[1,2,3-cd]pyrene[e]	3.2 E-08
7439-92-1	Lead[e,g]	5.2 E-04
7439-96-5	Manganese[e,g]	2.6 E-04
75-09-2	Methylene chloride[e]	3.5 E-06
80-62-6	Methyl methacrylate[e]	1.7 E-07
91-20-3	Naphthalene[e,g]	3.7 E-06
7440-02-0	Nickel[e]	1.4 E-04
7697-37-2	Nitric acid[f,g]	4.0 E-05
55-63-0	Nitroglycerin[f]	5.4 E-07
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e]	2.1 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e]	1.0 E-11
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin[e]	1.3 E-12
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran[e]	2.1 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[e]	4.0 E-12
85-01-8	Phenanthrene[e,g]	1.2 E-06
108-95-2	Phenol[e]	2.6 E-06

Table 15.2.10-6 (cont.)

CASRN[b]	Pollutant	lb per lb NEW[c]
123-38-6	Propionaldehyde[e]	8.3 E-06
115-07-1	Propylene[f,g]	2.8 E-05
129-00-0	Pyrene[d]	8.1 E-07
7440-22-4	Silver[f]	1.5 E-05
100-42-5	Styrene[e,g]	9.1 E-07
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin[e]	1.9 E-12
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[e]	4.2 E-12
108-88-3	Toluene[e,g]	1.2 E-06
71-55-6	1,1,1-Trichloroethane[e,h]	1.3 E-07
75-69-4	Trichlorofluoromethane[f]	2.7 E-08
106-42-3, 108-38-3	m-Xylene, p-Xylene[e,h]	1.2 E-07
7440-66-6	Zinc[f,g]	4.3 E-04

[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 varies between 7.99 E-01 pounds per item and 8.94 E-01 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 7.93 E-03 pounds per item, between zero and four propelling charge increments, each of which weighs 2.37 E-02 pounds, and a 7.91 E-01 pound high explosive charge located in the projectile. Reference 8.
[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 15.2.10

1. *Report No. 4 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2002.

2. *Report No. 6 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, March 2005.

3. *Detailed Test Plan No. 4 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

4. *Detailed Test Plan No.6 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, November 2002.

5. *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.

6. *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 4 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 6 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, September 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, October 2004, March 2005, April 2005, and May 2005.