

15.7 Mines And Smoke Pots

Munitions listed in this section begin with the Department of Defense Identification Code (DODIC) letter “K.” Almost all munitions included in this category are mines or smoke pots. Examples include antipersonnel mines, antitank mines, ground smoke pots, and floating smoke pots.

15.7.1 K010, M4 Field Incendiary Burster

15.7.1.1 Ordnance Description¹

The M4 Field Incendiary Burster (DODIC K010) is used primarily to ignite field improvised incendiary munitions. The burster consists of a tubular steel container that contains a burster charge and an incendiary charge. It can be initiated by a fuze, blasting cap, detonating cord, or any standard booby-trap firing device. This ammunition is used during combat and on firing ranges during training.

15.7.1.2 Emissions And Controls¹⁻⁵

The primary emissions from the use of the M4 Field Incendiary Burster 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 15.7.1-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.7.1-2 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 15.7.1-1 EMISSION FACTORS FOR THE USE OF DODIC K010,
M4 FIELD INCENDIARY BURSTER - 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	3.4 E-01	1.7
630-08-0	Carbon monoxide (CO)	4.2 E-03	2.0 E-02
74-82-8	Methane	1.3 E-05	6.1 E-05
--	Oxides of nitrogen (NO _x) ^f	4.2 E-03	2.0 E-02
--	PM-2.5 ^d	1.7 E-02	8.3 E-02
--	PM-10 ^{e,g}	5.1 E-02	2.5 E-01
12789-66-1	TSP ^g	5.7 E-02	2.8 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 2.04 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 15.7.1-2 EMISSION FACTORS FOR THE USE OF DODIC K010,
M4 FIELD INCENDIARY BURSTER -
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	4.3 E-09	2.1 E-08
208-96-8	Acenaphthylene ^d	3.1 E-08	1.5 E-07
75-07-0	Acetaldehyde ^e	1.5 E-05	7.1 E-05
75-05-8	Acetonitrile ^e	3.7 E-06	1.8 E-05
107-02-8	Acrolein ^{e,h}	2.0 E-05	9.9 E-05
107-13-1	Acrylonitrile ^e	1.5 E-06	7.1 E-06
7429-90-5	Aluminum ^f	1.8 E-04	8.8 E-04
120-12-7	Anthracene ^e	9.4 E-09	4.6 E-08
7440-39-3	Barium ^{f,h}	9.6 E-06	4.7 E-05
71-43-2	Benzene ^e	5.8 E-06	2.8 E-05
56-55-3	Benzo[a]anthracene ^{e,h}	5.2 E-09	2.6 E-08
205-99-2	Benzo[b]fluoranthene ^{e,h}	2.2 E-09	1.1 E-08
191-24-2	Benzo[g,h,i]perylene ^{d,h}	3.5 E-09	1.7 E-08
192-97-2	Benzo[e]pyrene ^{d,h}	2.4 E-09	1.2 E-08
74-87-3	Chloromethane ^e	7.9 E-08	3.9 E-07
7440-47-3	Chromium ^e	1.8 E-05	8.7 E-05
18540-29-9	Hexavalent chromium ^{e,h}	1.1 E-07	5.6 E-07
218-01-9	Chrysene ^{e,h}	5.9 E-09	2.9 E-08
7440-50-8	Copper ^f	1.2 E-04	6.0 E-04
84-74-2	Dibutyl phthalate ^{e,g}	1.6 E-06	7.8 E-06
--	Total dioxin/furan compounds ^{e,h}	3.5 E-12	1.7 E-11
100-41-4	Ethylbenzene ^e	6.2 E-07	3.0 E-06
74-85-1	Ethylene ^f	1.3 E-05	6.2 E-05
117-81-7	bis(2-Ethylhexyl)phthalate ^{e,g}	8.5 E-06	4.2 E-05
206-44-0	Fluoranthene ^e	1.6 E-08	8.1 E-08
86-73-7	Fluorene ^d	1.8 E-08	8.9 E-08
50-00-0	Formaldehyde ^{e,h}	4.7 E-05	2.3 E-04
74-90-8	Hydrogen cyanide ^{e,h}	1.6 E-04	7.8 E-04
7439-96-5	Manganese ^e	1.5 E-04	7.5 E-04
75-09-2	Methylene chloride ^e	2.7 E-06	1.3 E-05

Table 15.7.1-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
108-10-1	Methyl isobutyl ketone ^{e,h}	4.7 E-07	2.3 E-06
91-20-3	Naphthalene ^e	1.6 E-07	7.9 E-07
7440-02-0	Nickel ^e	2.9 E-05	1.4 E-04
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^{e,h}	2.7 E-12	1.3 E-11
85-01-8	Phenanthrene ^e	6.7 E-08	3.3 E-07
129-00-0	Pyrene ^d	3.0 E-08	1.5 E-07
7440-22-4	Silver ^{f,h}	8.2 E-06	4.0 E-05
100-42-5	Styrene ^{e,h}	7.3 E-07	3.6 E-06
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^{e,h}	7.6 E-13	3.7 E-12
108-88-3	Toluene ^e	2.4 E-06	1.2 E-05
95-63-6	1,2,4-Trimethylbenzene ^f	1.3 E-06	6.4 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene ^e	1.6 E-06	7.7 E-06
95-47-6	o-Xylene ^e	1.3 E-06	6.5 E-06
7440-66-6	Zinc ^f	6.7 E-05	3.3 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 2.04 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 C.

References for Section 15.7.1

1. *Report No. 5 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, January 2005.
2. *Detailed Test Plan No. 5 for the Exploding Ordnance Emission Study, Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, May 2002.
3. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 5 Testing Conducted at Aberdeen Proving Ground, Maryland, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.*
5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team - Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2004 and March 2005.

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15.7.2 K051, M604 Anti-Tank Practice Mine Fuze

15.7.2.1 Ordnance Description¹

The M604 Anti-Tank Practice Mine Fuze (DODIC K051) is an instantaneous, mechanical pressure-actuated fuze used to activate the M12, M12A1, and M20 antitank practice mines. The fuze is issued separately from the practice mine. Once fired, the fuze is replaced by a new one, allowing for the practice mines to be reused. This ammunition is used on firing ranges during training; it is not used during combat.

The M604 Anti-Tank Practice Mine Fuze is a steel body containing a firing pin assembly, cover assembly, initiator, and flash/rapport charge. Upon activation, the initiator ignites the flash/rapport charge which generates a flash, smoke, and a loud rapport.

15.7.2.2 Emissions And Controls¹⁻⁵

Particulate matter is the primary emission from the use of the M604 Anti-Tank Practice Mine Fuze. 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 15.7.2-1 presents emission factors for carbon dioxide (CO₂), criteria pollutants, methane, and total suspended particulate (TSP). Table 15.7.2-2 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 15.7.2-1 EMISSION FACTORS FOR THE USE OF DODIC K051,
M604 ANTI-TANK PRACTICE MINE FUZE - 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	3.6 E-03	9.6 E-02
630-08-0	Carbon monoxide (CO)	2.2 E-04	5.8 E-03
7439-92-1	Lead ^d (Pb)	1.5 E-05	3.9 E-04
--	PM-2.5 ^e	1.5 E-02	4.1 E-01
--	PM-10 ^f	2.0 E-02	5.2 E-01
12789-66-1	TSP	1.9 E-02	5.1 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 3.81 E-02 pounds per item. Reference 5.

^d EMISSION FACTOR RATING D.

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

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

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Table 15.7.2-2 EMISSION FACTORS FOR THE USE OF DODIC K051,
M604 ANTI-TANK PRACTICE MINE FUZE -
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	6.1 E-08	1.6 E-06
107-13-1	Acrylonitrile ^{d,e}	3.6 E-07	9.4 E-06
7429-90-5	Aluminum ^f	3.9 E-04	1.0 E-02
120-12-7	Anthracene ^d	3.2 E-09	8.4 E-08
7440-36-0	Antimony ^d	9.0 E-06	2.4 E-04
7440-39-3	Barium ^f	1.6 E-06	4.3 E-05
71-43-2	Benzene ^{d,e}	2.0 E-07	5.2 E-06
56-55-3	Benzo[a]anthracene ^d	5.6 E-09	1.5 E-07
205-99-2	Benzo[b]fluoranthene ^d	1.4 E-08	3.6 E-07
207-08-9	Benzo[k]fluoranthene ^d	5.2 E-08	1.4 E-06
191-24-2	Benzo[g,h,i]perylene ^d	1.1 E-08	2.9 E-07
50-32-8	Benzo[a]pyrene ^d	5.6 E-09	1.5 E-07
192-97-2	Benzo[e]pyrene ^g	6.0 E-09	1.6 E-07
7440-43-9	Cadmium ^d	5.8 E-05	1.5 E-03
218-01-9	Chrysene ^d	1.0 E-08	2.6 E-07
7440-50-8	Copper ^f	4.9 E-06	1.3 E-04
--	Total dioxin/furan compounds ^d	1.4 E-10	3.6 E-09
74-85-1	Ethylene ^{e,f}	1.0 E-06	2.6 E-05
206-44-0	Fluoranthene ^d	4.2 E-08	1.1 E-06
86-73-7	Fluorene ^g	5.7 E-10	1.5 E-08
50-00-0	Formaldehyde ^d	3.7 E-08	9.7 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^d	1.2 E-12	3.0 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^d	1.9 E-11	5.1 E-10
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^d	4.6 E-12	1.2 E-10
118-74-1	Hexachlorobenzene ^{d,e}	8.6 E-06	2.2 E-04
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^d	1.3 E-13	3.5 E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^d	2.3 E-13	6.1 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^d	4.5 E-13	1.2 E-11
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^d	5.6 E-12	1.5 E-10
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^d	2.1 E-12	5.6 E-11

Table 15.7.2-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran ^d	1.9 E-13	5.1 E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^d	1.9 E-12	4.9 E-11
7647-01-0	Hydrochloric acid ^d	2.0 E-04	5.3 E-03
193-39-5	Indeno[1,2,3-cd]pyrene ^d	1.9 E-08	4.9 E-07
7439-92-1	Lead ^{d,e}	1.5 E-05	3.9 E-04
7439-96-5	Manganese ^d	8.3 E-07	2.2 E-05
75-09-2	Methylene chloride ^d	6.4 E-08	1.7 E-06
80-62-6	Methyl methacrylate ^{d,e}	2.7 E-08	7.0 E-07
91-20-3	Naphthalene ^d	3.0 E-09	7.8 E-08
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^d	2.1 E-11	5.5 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^d	6.3 E-11	1.7 E-09
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ^d	1.6 E-12	4.3 E-11
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^d	1.2 E-12	3.2 E-11
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^d	1.6 E-12	4.1 E-11
85-01-8	Phenanthrene ^d	3.3 E-08	8.6 E-07
129-00-0	Pyrene ^g	2.5 E-08	6.5 E-07
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin ^d	1.1 E-11	2.8 E-10
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^d	3.0 E-12	7.8 E-11
108-88-3	Toluene ^d	4.8 E-08	1.3 E-06
7440-66-6	Zinc ^f	1.3 E-03	3.5 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 3.81 E-02 pounds per item. Reference 5.

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

^e EMISSION FACTOR RATING D.

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

^g Reportable chemical under EPCRA Section 313.

References For Section 15.7.2

1. *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.
2. *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.

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

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15.7.3 K145, M18A1 Antipersonnel Mine

15.7.3.1 Ordnance Description¹

The M18A1 Antipersonnel Mine (DODIC K145) is a fixed directional fragmentation mine that is used for the defense of bivouac areas and outposts, to defend against infiltration tactics, and against thin-skinned vehicles. When the mine is detonated, steel spheres are projected at the target. This ammunition is used during combat and on firing ranges during training.

The M18A1 Antipersonnel Mine is constructed of a fiberglass-filled plastic case. The back portion of the case contains a bursting charge, while the front portion of the case is lined with steel spheres. The M18A1 also includes an initiator charge and a booster charge.

15.7.3.2 Emissions And Controls¹⁻⁵

Carbon dioxide (CO₂) is the primary emission from the use of the M18A1 Antipersonnel Mine. 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 15.7.3-1 presents emission factors for CO₂, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.7.3-2 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 units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

15.7.3.3 Updates Since July 2006

Section 15.7 was created during July 2006. Revisions to this section since that date are summarized below.

Revision 2, September 2006

- Section 15.7.2, which presents emission factors for DODIC K051, the M604 Anti-Tank Practice Mine Fuze, was added.

Revision 1, July 2006

- Section 15.7.1, which presents emission factors for DODIC K010, the M4 Field Incendiary Burster, was added.

TABLE 15.7.3-1 EMISSION FACTORS FOR THE USE OF DODIC K145,
M18A1 ANTIPERSONNEL MINE - 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	1.6	1.0
630-08-0	Carbon monoxide (CO)	2.0 E-02	1.3 E-02
7439-92-1	Lead (Pb) ^g	5.7 E-05	3.8 E-05
74-82-8	Methane	3.8 E-04	2.5 E-04
--	Oxides of nitrogen (NO _x) ^f	1.8 E-02	1.2 E-02
--	PM-2.5 ^d	2.6 E-02	1.7 E-02
--	PM-10 ^{e,g}	4.9 E-02	3.2 E-02
7446-09-5	Sulfur dioxide ^g	9.1 E-05	6.1 E-05
12789-66-1	TSP ^g	5.4 E-02	3.6 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 1.5 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 15.7.3-2 EMISSION FACTORS FOR THE USE OF DODIC K145,
M18A1 ANTIPERSONNEL MINE -
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-08	4.2 E-08
208-96-8	Acenaphthylene ^{d,h}	1.6 E-06	1.1 E-06
75-07-0	Acetaldehyde ^{e,h}	5.4 E-05	3.6 E-05
75-05-8	Acetonitrile ^{e,h}	4.5 E-05	3.0 E-05
98-86-2	Acetophenone ^{e,i}	2.6 E-06	1.8 E-06
107-13-1	Acrylonitrile ^{e,h}	9.7 E-06	6.5 E-06
7429-90-5	Aluminum ^{f,h}	6.3 E-04	4.2 E-04
120-12-7	Anthracene ^{e,h}	2.0 E-07	1.3 E-07
7440-39-3	Barium ^f	2.4 E-04	1.6 E-04
71-43-2	Benzene ^{e,h}	1.3 E-04	8.9 E-05
56-55-3	Benzo[a]anthracene ^e	5.1 E-08	3.4 E-08
205-99-2	Benzo[b]fluoranthene ^e	2.6 E-08	1.7 E-08
207-08-9	Benzo[k]fluoranthene ^e	2.6 E-08	1.7 E-08
50-32-8	Benzo[a]pyrene ^e	1.6 E-08	1.0 E-08
192-97-2	Benzo[e]pyrene ^d	2.5 E-08	1.7 E-08
100-44-7	Benzyl chloride ^e	3.3 E-06	2.2 E-06
85-68-7	Butylbenzylphthalate ^{d,g}	2.7 E-06	1.8 E-06
7440-43-9	Cadmium ^e	1.1 E-04	7.4 E-05
108-90-7	Chlorobenzene ^e	3.3 E-07	2.2 E-07
74-87-3	Chloromethane ^{e,h}	1.3 E-06	8.7 E-07
7440-47-3	Chromium ^{e,h}	1.0 E-04	6.7 E-05
18540-29-9	Hexavalent chromium ^e	2.9 E-06	2.0 E-06
218-01-9	Chrysene ^e	6.7 E-08	4.5 E-08
7440-50-8	Copper ^{f,h}	1.3 E-04	8.8 E-05
98-82-8	Cumene ^{e,h}	1.8 E-06	1.2 E-06
84-74-2	Dibutyl phthalate ^{e,g}	6.6 E-06	4.4 E-06
75-71-8	Dichlorodifluoromethane ^{d,h}	5.3 E-09	3.5 E-09
107-06-2	1,2-Dichloroethane ^e	3.4 E-05	2.3 E-05
121-14-2	2,4-Dinitrotoluene ^e	7.3 E-07	4.9 E-07
--	Total dioxin/furan compounds ^e	2.5 E-10	1.7 E-10

Table 15.7.3-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
100-41-4	Ethylbenzene ^{e,h}	1.0 E-05	6.7 E-06
74-85-1	Ethylene ^{d,h}	1.2 E-04	8.3 E-05
117-81-7	bis(2-Ethylhexyl)phthalate ^{e,g}	6.3 E-06	4.2 E-06
206-44-0	Fluoranthene ^{e,h}	4.0 E-07	2.6 E-07
86-73-7	Fluorene ^{d,h}	5.8 E-07	3.9 E-07
50-00-0	Formaldehyde ^e	1.7 E-04	1.1 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^e	2.3 E-11	1.5 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^e	2.9 E-12	1.9 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^e	3.9 E-13	2.6 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^e	8.2 E-13	5.5 E-13
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^e	8.8 E-13	5.9 E-13
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^{e,i}	3.6 E-13	2.4 E-13
74-90-8	Hydrogen cyanide ^e	3.6 E-04	2.4 E-04
193-39-5	Indeno[1,2,3-cd]pyrene ^e	7.4 E-09	4.9 E-09
7439-92-1	Lead ^e	5.7 E-05	3.8 E-05
7439-96-5	Manganese ^{e,h}	7.3 E-05	4.9 E-05
75-09-2	Methylene chloride ^{e,h}	3.8 E-07	2.5 E-07
80-62-6	Methyl methacrylate ^{e,i}	1.7 E-07	1.1 E-07
95-48-7	2-Methylphenol ^e	1.4 E-06	9.6 E-07
91-20-3	Naphthalene ^{e,h}	5.4 E-06	3.6 E-06
7697-37-2	Nitric acid ^{f,h}	8.5 E-04	5.6 E-04
88-75-5	2-Nitrophenol ^f	5.5 E-06	3.7 E-06
100-02-7	4-Nitrophenol ^e	7.3 E-06	4.8 E-06
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^e	2.2 E-10	1.4 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^e	5.7 E-12	3.8 E-12
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^e	4.5 E-13	3.0 E-13
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^e	8.4 E-13	5.6 E-13
85-01-8	Phenanthrene ^{e,h}	1.8 E-06	1.2 E-06
108-95-2	Phenol ^e	3.9 E-06	2.6 E-06
115-07-1	Propylene ^{f,h}	2.2 E-05	1.5 E-05
129-00-0	Pyrene ^{d,h}	4.1 E-07	2.7 E-07
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^e	1.3 E-12	8.6 E-13

Table 15.7.3-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
108-88-3	Toluene ^{e,h}	2.0 E-05	1.3 E-05
75-69-4	Trichlorofluoromethane ^f	3.7 E-09	2.4 E-09
95-63-6	1,2,4-Trimethylbenzene ^{f,h}	7.2 E-06	4.8 E-06
7440-62-2	Vanadium ^f	5.4 E-04	3.6 E-04
75-01-4	Vinyl chloride ^e	3.0 E-06	2.0 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{e,h}	4.0 E-06	2.6 E-06
95-47-6	o-Xylene ^{e,h}	1.9 E-06	1.3 E-06
7440-66-6	Zinc ^{f,h}	8.2 E-04	5.5 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 1.5 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 15.7.3

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. *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.
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 2 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.
5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team – Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2004.

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15.7.5 K765, CS Riot Control Agent Capsule

15.7.5.1 Ordnance Description^{1,2}

The CS Riot Control Agent Capsule (DODIC K765) is a capsule filled with ground CS riot control agent (i.e., tear gas). It is used to demonstrate to trainees the protection afforded by properly fitted chemical-biological masks and to demonstrate to unmasked trainees the effects of CS riot control agents. The CS is aerosolized by placing the capsule on a suspended empty can that is placed over a burning candle. This item is used on firing ranges during training; it is not used during combat.

15.7.5.2 Emissions And Controls¹⁻⁴

Primary emissions from the use of the CS Riot Control Agent Capsule include carbon dioxide (CO₂), carbon monoxide (CO), total nonmethane hydrocarbons (TNMHC), 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 15.7.5-1 presents emission factors for CO₂, criteria pollutants, TNMHC, and total suspended particulate (TSP). Table 15.7.2-2 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). Because the net explosive weight (NEW) for this ordnance is not defined, the emission factors are not presented in units of pounds of emissions per pound NEW contained in the item (lb per lb NEW).

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TABLE 15.7.5-1 EMISSION FACTORS FOR THE USE OF DODIC K765,
CS RIOT CONTROL AGENT CAPSULE – 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
124-38-9	CO ₂	9.0 E-05
630-08-0	Carbon monoxide (CO)	1.0 E-05
--	Oxides of nitrogen (NO _x)	1.8 E-06
--	PM-2.5 ^c	2.9 E-05
--	PM-10 ^d	3.2 E-05
7446-09-5	Sulfur dioxide (SO ₂)	6.3 E-08
--	TNMHC ^e	1.0 E-05
12789-66-1	TSP	2.8 E-05

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

^b CASRN = Chemical Abstracts Service Registry Number.

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

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

^e EMISSION FACTOR RATING D.

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Table 15.7.5-2 EMISSION FACTORS FOR THE USE OF DODIC K765,
 CS RIOT CONTROL AGENT CAPSULE -
 HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C (except as noted)

CASRN ^b	Pollutant	lb per item
75-05-8	Acetonitrile ^c	1.5 E-06
107-02-8	Acrolein ^c	4.4 E-08
7664-41-7	Ammonia ^d	2.1 E-06
71-43-2	Benzene ^c	8.8 E-08
123-72-8	Butyraldehyde ^d	6.2 E-08
108-90-7	Chlorobenzene ^{c,f}	9.5 E-08
75-00-3	Chloroethane ^c	1.4 E-08
74-87-3	Chloromethane ^c	9.0 E-08
7440-47-3	Chromium ^c	2.1 E-08
99-65-0	1,3-Dinitrobenzene ^c	4.6 E-08
606-20-2	2,6-Dinitrotoluene ^{d,f}	2.5 E-08
--	Total dioxin/furan compounds ^c	2.4 E-12
100-41-4	Ethylbenzene ^{c,f}	4.1 E-08
74-85-1	Ethylene ^c	8.9 E-08
50-00-0	Formaldehyde ^c	7.0 E-09
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^c	3.9 E-13
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^c	3.9 E-13
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^c	1.6 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^c	1.3 E-13
110-54-3	Hexane ^c	2.4 E-08
74-90-8	Hydrogen cyanide ^c	6.5 E-06
75-09-2	Methylene chloride ^c	2.0 E-07
91-57-6	2-Methylnaphthalene ^c	1.9 E-09
95-48-7	2-Methylphenol ^{c,f}	4.2 E-08
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^c	1.1 E-12
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^c	9.8 E-14
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^c	4.5 E-14
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^c	1.3 E-13
108-95-2	Phenol ^c	2.1 E-07
109-77-3	Propanedinitrile ^{d,f}	1.4 E-06

Table 15.7.5-2 (cont.)

CASRN ^b	Pollutant	lb per item
115-07-1	Propylene ^d	1.4 E-07
100-42-5	Styrene ^{c,f}	3.0 E-08
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^c	3.2 E-14
108-88-3	Toluene ^c	6.5 E-07
95-63-6	1,2,4-Trimethylbenzene ^d	2.6 E-08
106-42-3, 108-38-3	m-Xylene, p-Xylene ^{c,f}	6.6 E-08
95-47-6	o-Xylene ^c	2.7 E-08
7440-66-6	Zinc ^d	1.8 E-06

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

^b CASRN = Chemical Abstracts Service Registry Number.

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

^d Reportable chemical under EPCRA Section 313.

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

^f EMISSION FACTOR RATING D.

References For Section 15.7.5

1. *Sampling Results for AEC Phase VI Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, URS Group, Inc., Oak Ridge, TN, April 2006.
2. *Detailed Test Plan for Phase VI Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, June 2004.
3. 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, February 2007.
4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase VI Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2008.

15.7.6 K866, ABC-M5 30-Pound HC Smoke Pot

15.7.6.1 Ordnance Description^{1,2}

The ABC-M5 30-Pound HC Smoke Pot (DODIC K866) is used to produce screening smoke for training exercises and demonstrations as well as during combat situations. Upon initiation, the smoke pot produces a dense white smoke cloud for 12 to 22 minutes.

The ABC-M5 30-Pound HC Smoke Pot consists of a cylindrical sheet-metal container filled with a Type-C, hexachloroethane (HC) smoke mixture. The smoke pot can be ignited either by remote electric ignition or by using an attached scratcher block to ignite a matchhead. After ignition of the matchhead the starter mixture is ignited which in turn ignites the HC filling.

15.7.6.2 Emissions And Controls¹⁻⁴

Particulate matter is the primary emission from the use of the ABC-M5 30-Pound HC Smoke Pot. 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 15.7.6-1 presents emission factors for carbon dioxide (CO₂), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.7.6-2 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 15.7.6-1 EMISSION FACTORS FOR THE USE OF DODIC K866,
ABC-M5 30-POUND HC SMOKE POT - 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	4.6 E-01	1.5 E-02
630-08-0	Carbon monoxide (CO) ^f	7.9 E-01	2.5 E-02
7439-92-1	Lead (Pb) ^g	2.4 E-02	7.9 E-04
--	Oxides of nitrogen (NO _x) ^f	2.6 E-03	8.4 E-05
--	PM-2.5 ^{d,f}	17	5.6 E-01
--	PM-10 ^e	32	1.0
7446-09-5	Sulfur dioxide (SO ₂) ^g	4.4 E-03	1.4 E-04
--	TNMHC ^g	1.7 E-02	5.4 E-04
12789-66-1	TSP	21	6.9 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 31.0 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 B.

^g EMISSION FACTOR RATING C.

Table 15.7.6-2 EMISSION FACTORS FOR THE USE OF DODIC K866,
 ABC-M5 30-POUND HC SMOKE POT -
 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	3.1 E-04	1.0 E-05
7429-90-5	Aluminum ^{e,h}	1.6 E-01	5.1 E-03
7440-36-0	Antimony ^d	1.3 E-03	4.2 E-05
7440-38-2	Arsenic ^{d,h}	1.5 E-04	4.8 E-06
71-43-2	Benzene ^{d,g}	4.9 E-04	1.6 E-05
29082-74-4	Benzene, pentachloro(trichloroethenyl)- ^{e,h}	3.7 E-04	1.2 E-05
7440-43-9	Cadmium ^{d,h}	1.8 E-03	5.7 E-05
75-15-0	Carbon disulfide ^d	4.6 E-03	1.5 E-04
56-23-5	Carbon tetrachloride ^{d,h}	2.7 E-02	8.6 E-04
67-66-3	Chloroform ^d	1.4 E-03	4.4 E-05
74-87-3	Chloromethane ^{d,h}	5.4 E-04	1.7 E-05
7440-47-3	Chromium ^d	2.7 E-04	8.6 E-06
7440-50-8	Copper ^{e,h}	3.7 E-02	1.2 E-03
78-87-5	1,2-Dichloropropane ^{d,h}	1.4 E-04	4.4 E-06
121-14-2	2,4-Dinitrotoluene ^d	1.6 E-03	5.3 E-05
--	Total dioxin/furan compounds ^{d,g}	1.2 E-05	4.0 E-07
74-85-1	Ethylene ^e	6.7 E-04	2.2 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{d,g}	1.5 E-08	4.9 E-10
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^{d,h}	1.5 E-06	4.8 E-08
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^{d,h}	1.7 E-07	5.6 E-09
118-74-1	Hexachlorobenzene ^d	2.1 E-02	6.9 E-04
87-68-3	Hexachlorobutadiene ^d	1.4 E-03	4.5 E-05
77-47-4	Hexachlorocyclopentadiene ^{d,h}	1.3 E-02	4.2 E-04
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^d	1.5 E-09	4.8 E-11
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^d	3.8 E-09	1.2 E-10
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^d	4.1 E-09	1.3 E-10
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^{d,h}	1.8 E-07	5.9 E-09
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^d	7.8 E-08	2.5 E-09
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran ^d	1.2 E-08	3.9 E-10
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^d	6.8 E-08	2.2 E-09

Table 15.7.6-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
67-72-1	Hexachloroethane ^{d,h}	2.0 E-03	6.5 E-05
7647-01-0	Hydrochloric acid ^d	2.8 E-01	9.1 E-03
193-39-5	Indeno[1,2,3-cd]pyrene ^{d,h}	6.9 E-04	2.2 E-05
78-59-1	Isophorone ^{f,h}	5.5 E-03	1.8 E-04
7439-92-1	Lead ^d	2.4 E-02	7.9 E-04
7439-96-5	Manganese ^d	6.6 E-03	2.1 E-04
75-09-2	Methylene chloride ^{d,h}	7.0 E-04	2.3 E-05
2234-13-1	Naphthalene, octachloro- ^{e,h}	7.6 E-04	2.5 E-05
7440-02-0	Nickel ^{d,g}	3.4 E-04	1.1 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^{d,g}	5.3 E-08	1.7 E-09
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^{d,h}	1.2 E-05	3.7 E-07
608-93-5	Pentachlorobenzene ^e	8.8 E-04	2.8 E-05
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ^{d,g}	2.8 E-09	8.9 E-11
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^d	3.5 E-08	1.1 E-09
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^{d,h}	5.9 E-08	1.9 E-09
115-07-1	Propylene ^e	1.5 E-05	4.9 E-07
7440-22-4	Silver ^e	5.5 E-05	1.8 E-06
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin ^{d,g}	1.5 E-09	4.9 E-11
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^d	1.1 E-08	3.6 E-10
127-18-4	Tetrachloroethylene ^d	4.3 E-02	1.4 E-03
79-01-6	Trichloroethylene ^d	3.2 E-04	1.0 E-05
88-06-2	2,4,6-Trichlorophenol ^{d,h}	9.5 E-04	3.1 E-05
75-01-4	Vinyl chloride ^{d,g}	1.2 E-04	4.0 E-06
7440-66-6	Zinc ^e	9.5 E-02	3.1 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 31.0 pounds per item. References 1 and 5.

^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 15.7.6

1. *Sampling Results for AEC Phase VII Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, URS Group, Inc., Oak Ridge, TN, April 2007.
2. *Detailed Test Plan for Phase VII Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, February 2005.
3. 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, August 2007.
4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase VII Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2008.
5. *Munitions Items Disposition Action System (MIDAS)* website, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, December 2007.

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15.7.7 K867, M4A2 Floating Type HC Smoke Pot

15.7.7.1 Ordnance Description^{1,2}

The M4A2 Floating Type HC Smoke Pot (DODIC K867) is used to generate screening smoke when a floating source of smoke is required for river crossings and beach landings. It can also be used on land. Upon initiation, the smoke pot produces a dense white smoke cloud for 10 to 15 minutes. This ammunition is used during combat and on firing ranges during training.

The M4A2 Floating Type HC Smoke Pot consists of a 5-gallon metal pail with its lower third filled with a Type-C, hexachloroethane (HC) smoke mixture and fused with an M207A1 floating smoke pot fuse. When the fuze safety lever is released, the striker spring drives the striker which hits the primer. The primer ignites the firstfire charge, which, in turn, ignites the delay charge and subsequently the ignition charge. Flame from the ignition charge travels through the pot's igniter tube to ignite the starter mixture, which then ignites the HC smoke-mixture filling.

15.7.7.2 Emissions And Controls¹⁻⁴

Particulate matter is the primary emission from the use of the M4A2 Floating Type HC Smoke Pot. 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 15.7.7-1 presents emission factors for carbon dioxide (CO₂), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.7.7-2 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 15.7.7-1 EMISSION FACTORS FOR THE USE OF DODIC K867,
M4A2 FLOATING TYPE HC SMOKE POT - CARBON DIOXIDE, 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 ^f	5.3 E-01	1.9 E-02
630-08-0	Carbon monoxide (CO)	8.9 E-01	3.2 E-02
7439-92-1	Lead (Pb)	1.6 E-02	5.9 E-04
--	Oxides of nitrogen (NO _x)	2.8 E-03	1.0 E-04
--	PM-2.5 ^d	23	8.2 E-01
--	PM-10 ^{e,f}	30	1.1
7446-09-5	Sulfur dioxide (SO ₂) ^g	3.2 E-03	1.1 E-04
--	TNMHC	2.2 E-02	7.9 E-04
12789-66-1	TSP ^f	42	1.5

^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 27.5 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 C.

Table 15.7.7-2 EMISSION FACTORS FOR THE USE OF DODIC K867,
M4A2 FLOATING TYPE HC SMOKE POT -
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	2.3E-04	8.2E-06
7429-90-5	Aluminum ^e	1.5E-01	5.3E-03
7440-38-2	Arsenic ^d	7.1E-06	2.6E-07
71-43-2	Benzene ^{d,g}	3.9E-04	1.4E-05
106-99-0	1,3-Butadiene ^d	1.0E-04	3.8E-06
7440-43-9	Cadmium ^d	5.4E-03	2.0E-04
75-15-0	Carbon disulfide ^d	9.7E-04	3.5E-05
56-23-5	Carbon tetrachloride ^d	1.1E-02	4.1E-04
67-66-3	Chloroform ^{d,g}	5.4E-04	2.0E-05
7440-47-3	Chromium ^{d,g}	1.6E-04	6.0E-06
7440-48-4	Cobalt ^d	1.3E-05	4.8E-07
7440-50-8	Copper ^e	2.3E-02	8.4E-04
--	Total dioxin/furan compounds ^{d,g}	4.1E-06	1.5E-07
74-85-1	Ethylene ^{e,g}	4.9E-04	1.8E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^{d,g}	1.0E-08	3.8E-10
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran ^d	3.3E-07	1.2E-08
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran ^d	8.7E-08	3.2E-09
118-74-1	Hexachlorobenzene ^d	7.4E-02	2.7E-03
87-68-3	Hexachlorobutadiene ^d	1.5E-03	5.5E-05
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ^{d,h}	8.4E-10	3.1E-11
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ^d	1.5E-09	5.5E-11
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ^d	1.9E-09	6.8E-11
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran ^d	1.0E-07	3.8E-09
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran ^{d,g}	5.7E-08	2.1E-09
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran ^{d,g}	1.2E-08	4.3E-10
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran ^{d,g}	3.6E-08	1.3E-09
7647-01-0	Hydrochloric acid ^d	4.5E-01	1.7E-02
7439-92-1	Lead ^{d,g}	1.6E-02	5.9E-04
7439-96-5	Manganese ^{d,g}	5.3E-03	1.9E-04
75-09-2	Methylene chloride ^d	4.2E-04	1.5E-05

Table 15.7.7-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7440-02-0	Nickel ^{d,h}	2.8E-04	1.0E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^{d,g}	1.8E-08	6.6E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^d	3.7E-06	1.3E-07
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ^{d,g}	2.0E-09	7.3E-11
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran ^d	4.0E-08	1.5E-09
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran ^d	3.5E-08	1.3E-09
7723-14-0	Phosphorus ^f	1.5E-03	5.3E-05
123-38-6	Propionaldehyde ^d	7.0E-05	2.6E-06
115-07-1	Propylene ^{e,g}	1.5E-04	5.5E-06
7782-49-2	Selenium ^{d,g}	2.9E-05	1.1E-06
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin ^{d,g}	8.3E-10	3.0E-11
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran ^d	2.1E-08	7.5E-10
127-18-4	Tetrachloroethylene ^d	7.9E-02	2.9E-03
108-88-3	Toluene ^{d,g}	2.0E-04	7.3E-06
79-01-6	Trichloroethylene ^{d,g}	3.7E-04	1.3E-05
75-01-4	Vinyl chloride ^{d,g}	2.2E-04	7.8E-06
75-35-4	Vinylidene chloride ^d	1.3E-04	4.6E-06
7440-66-6	Zinc ^e	11	3.9E-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 27.5 pounds per item. References 1 and 5.

^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 15.7.7

1. *Sampling Results for AEC Phase VII Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, URS Group, Inc., Oak Ridge, TN, April 2007.
2. *Detailed Test Plan for Phase VII Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, February 2005.
3. 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, August 2007.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase VII Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2008.
5. *Munitions Items Disposition Action System (MIDAS) website*, <https://midas.dac.army.mil/>, U.S. Army Defense Ammunition Center, McAlester, OK, December 2007.

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15.7.8 K042, M88 Practice Canister Mine (Volcano)

15.7.8.1 Ordnance Description¹⁻³

The M88 Practice Canister Mine (Volcano) (DODIC K042) is used with the M139 mine dispenser (Volcano) in field training in the handling and operation of the M88 canister mine and M139 mine dispenser. This ammunition is used on firing ranges during training; it is not used during combat.

The M88 Practice Canister Mine is an expendable item consisting of an aluminum tube and breech assembly containing a propulsion system and six dummy mines. When an electrical pulse is received, the propulsion system is initiated, expelling the mines from the canister.

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

Carbon dioxide (CO₂), oxides of nitrogen (NO_x), and particulate matter are the primary emissions from the use of the M88 Practice Canister Mine. 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 15.7.8-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.7.8-2 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 15.7.8-1 EMISSION FACTORS FOR THE USE OF DODIC K042, M88 PRACTICE CANISTER MINE (VOLCANO) – CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	1.5 E-04	1.1 E-02
630-08-0	Carbon monoxide (CO)	6.8 E-05	4.9 E-03
7439-92-1	Lead (Pb)	7.6 E-06	5.5 E-04
--	NO _x	9.4 E-05	6.8 E-03
--	PM-2.5 ^d	2.2 E-04	1.6 E-02
--	PM-10 ^e	2.5 E-04	1.8 E-02
7446-09-5	Sulfur dioxide (SO ₂)	1.6 E-05	1.2 E-03
--	TNMHC	4.9 E-06	3.5 E-04
12789-66-1	TSP	2.4 E-04	1.7 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 1.39 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.

Table 15.7.8-2 EMISSION FACTORS FOR THE USE OF DODIC K042, M88 PRACTICE CANISTER MINE (VOLCANO) – 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	1.4 E-06	1.0 E-04
7664-41-7	Ammonia ^{e,g}	4.7 E-07	3.4 E-05
7440-36-0	Antimony ^d	3.7 E-06	2.6 E-04
71-43-2	Benzene ^d	2.1 E-07	1.5 E-05
106-99-0	1,3-Butadiene ^d	1.4 E-07	1.0 E-05
85-68-7	Butylbenzylphthalate ^f	1.4 E-08	1.0 E-06
7440-43-9	Cadmium ^d	1.4 E-08	9.8 E-07
75-15-0	Carbon disulfide ^d	1.5 E-07	1.1 E-05
7440-47-3	Chromium ^d	8.1 E-07	5.8 E-05
7440-50-8	Copper ^e	3.8 E-06	2.7 E-04
--	Total dioxin/furan compounds ^d	5.8 E-12	4.2 E-10
74-85-1	Ethylene ^e	9.5 E-07	6.8 E-05
50-00-0	Formaldehyde ^d	1.6 E-06	1.1 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ^d	8.2 E-13	5.9 E-11
7439-92-1	Lead ^d	7.6 E-06	5.5 E-04
91-20-3	Naphthalene ^d	1.5 E-08	1.1 E-06
7440-02-0	Nickel ^d	1.7 E-07	1.3 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin ^d	4.8 E-12	3.4 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran ^d	1.9 E-13	1.4 E-11
108-95-2	Phenol ^d	3.1 E-08	2.2 E-06
123-38-6	Propionaldehyde ^d	8.5 E-07	6.1 E-05
115-07-1	Propylene ^e	2.9 E-07	2.1 E-05
108-88-3	Toluene ^d	3.7 E-07	2.7 E-05
7440-66-6	Zinc ^e	3.7 E-06	2.7 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 1.39 E-02 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 D.

References For Section 15.7.8

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 Corporation, Oak Ridge, TN, March 2008.

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15.7.9 Updates Since September 2006

Section 15.7 was created during September 2006. Revisions to this section since that date are summarized below.

Revision 2, October 2008

- Section 15.7.8, which presents emission factors for DODIC K042, the M88 Practice Canister Mine (Volcano) was added.

Revision 1, June 2008

- Section 15.7.5, which presents emission factors for DODIC K765, the CS Riot Control Agent Capsule, was added.
- Section 15.7.6, which presents emission factors for DODIC K866, the ABC-M5 30-Pound HC Smoke Pot, was added.
- Section 15.7.7, which presents emission factors for DODIC K867, the M4A2 Floating Type HC Smoke Pot, was added.

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