15.8 Signals And Simulators

Munitions listed in this section begin with the Department of Defense Identification Code (DODIC) letter "L." Almost all munitions beginning with the DODIC letter L are used for signaling, although simulators used in training also fall under this category. Examples include green parachute signal flares, surface trip flares, ground burst simulators, and flash artillery simulators.

15.8.1 L305, M195 Green Star Parachute Signal Flare

15.8.1.1 Ordnance Description[1]

Signal flares are pyrotechnic devices used for signaling and illumination. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Signal flares are used for communication among troops in the field and for illumination.

The M195 Green Star Parachute Signal Flare (DODIC L305) is used for signaling and illumination. It uses a rocket that is launched from a hand-held device. After ignition, the rocket reaches a height of about 200 feet and produces a single, green-star illumination resembling a firework. The signal extends to a height of 700 to 750 feet and can be seen from a distance of 30 to 35 miles at night.

This signal flare uses a rocket motor propulsion assembly contained in an aluminum launching tube. The M195 Green Star Parachute Signal Flare uses a parachute-suspended illuminant assembly.

15.8.1.2 Emissions And Controls[2-5]

The primary emissions from the use of the M195 Green Star Parachute Signal Flare are particulate matter and carbon dioxide (CO_2). 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.1-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.1-2 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 15.8.1-1 EMISSION FACTORS FOR THE USE OF DODIC L305, M195 GREEN STAR PARACHUTE SIGNAL FLARE - 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	8.8 E-02	2.8 E-01
630-08-0	Carbon monoxide (CO)	9.4 E-03	3.0 E-02
7439-92-1	Lead (Pb)[f]	4.7 E-07	1.5 E-06
10102-44-0	Nitrogen dioxide (NO_2)[f]	1.1 E-04	3.4 E-04
10102-43-9	Nitrogen oxide (NO)[e]	1.5 E-03	4.7 E-03
--	Nitrogen oxides (NO_X)	2.4 E-03	7.6 E-03
--	PM-10[d]	1.2 E-01	3.7 E-01
7446-09-5	Sulfur dioxide (SO_2)[e]	7.8 E-05	2.5 E-04
--	TNMHC[e]	1.7 E-04	5.5 E-04
12789-66-1	TSP	1.3 E-01	4.2 E-01

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 3.16 E-01 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING B.
[f] EMISSION FACTOR RATING C.

Table 15.8.1-2 EMISSION FACTORS FOR THE USE OF DODIC L305, M195 GREEN STAR PARACHUTE SIGNAL FLARE - 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]	1.3 E-06	4.1 E-06
98-86-2	Acetophenone[d]	3.9 E-07	1.2 E-06
107-02-8	Acrolein[d,h]	1.1 E-06	3.4 E-06
107-13-1	Acrylonitrile[d,h]	1.3 E-06	4.0 E-06
7429-90-5	Aluminum[e,g]	9.3 E-05	3.0 E-04
7440-36-0	Antimony[d]	1.2 E-06	3.7 E-06
7440-39-3	Barium[e]	8.7 E-03	2.7 E-02
71-43-2	Benzene[d,g]	1.3 E-05	4.2 E-05
7440-41-7	Beryllium[d]	1.6 E-08	5.2 E-08
106-99-0	1,3-Butadiene[d,h]	3.6 E-06	1.1 E-05
123-72-8	Butanal[e]	1.5 E-07	4.7 E-07
7440-43-9	Cadmium[d,h]	1.2 E-06	3.7 E-06
75-15-0	Carbon disulfide[d,h]	1.0 E-05	3.3 E-05
56-23-5	Carbon tetrachloride[d,h]	2.9 E-07	9.2 E-07
463-58-1	Carbonyl sulfide[d]	2.6 E-07	8.1 E-07
7782-50-5	Chlorine[d]	3.1 E-06	9.8 E-06
7440-47-3	Chromium[e,h]	7.3 E-06	2.3 E-05
7440-48-4	Cobalt[d,h]	3.7 E-06	1.2 E-05
7440-50-8	Copper[e,g]	1.4 E-05	4.4 E-05
75-71-8	Dichlorodifluoromethane[e]	8.0 E-07	2.5 E-06
100-41-4	Ethylbenzene[d,h]	5.2 E-07	1.6 E-06
74-85-1	Ethylene[e,h]	5.7 E-05	1.8 E-04
7439-92-1	Lead[d]	4.7 E-07	1.5 E-06
7439-96-5	Manganese[d,h]	1.1 E-05	3.6 E-05
7439-97-6	Mercury[d]	1.3 E-08	4.3 E-08
1634-04-4	Methyl tert-butyl ether[d]	2.1 E-07	6.6 E-07
75-09-2	Methylene chloride[d]	1.2 E-04	3.9 E-04
91-57-6	2-Methylnaphthalene	6.8 E-07	2.1 E-06

Table 15.8.1-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
91-20-3	Naphthalene[d,h]	8.0 E-07	2.5 E-06
7440-02-0	Nickel[d,g]	5.2 E-07	1.6 E-06
115-07-1	Propylene[e,h]	1.6 E-05	5.0 E-05
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d]	2.0 E-12	6.2 E-12
108-88-3	Toluene[d,h]	1.6 E-06	5.1 E-06
75-69-4	Trichloromonofluoromethane[e]	9.7 E-08	3.1 E-07
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	1.3 E-07	4.2 E-07
95-63-6	1,2,4-Trimethylbenzene[e]	5.5 E-07	1.7 E-06
106-42-3	m-Xylene, p-Xylene[d,h]	1.1 E-06	3.4 E-06
108-38-3, 95-47-6	o-Xylene[d]	3.5 E-07	1.1 E-06
7440-66-6	Zinc[e]	3.7 E-06	1.2 E-05

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 3.16 E-01 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.1

1. *M195 Green Star Parachute Signal Flare, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.

2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 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 Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.2 L306, M158 Red Star Cluster Signal Flare

15.8.2.1 Ordnance Description[1]

The M158 Red Star Cluster Signal Flare (DODIC L306) is a pyrotechnic device used for signaling and illuminating. Pyrotechnics give off smoke, light, and/or a loud noise when activated. The M158 Red Star Cluster Signal Flare produces a cluster of five red, free-falling stars. Troops use the star cluster signals to communicate with one another. Because the flare illuminates, it can also be used to provide light for nighttime ground operations or to reveal an enemy's suspected hiding place.

The M158 Red Star Cluster Signal Flare consists of a rocket motor propulsion assembly contained in an aluminum launching tube. The rocket is launched from a hand-held device and reaches a height of about 200 feet after ignition. It produces a five-star illumination similar to a firework, and the stars reach a height between 650 and 800 feet.

15.8.2.2 Emissions And Controls[2-5]

The primary emissions from the use of the M158 Red Star Cluster Signal Flare are carbon dioxide (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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.2-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.2-2 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 15.8.2-1 EMISSION FACTORS FOR THE USE OF DODIC L306, M158 RED STAR CLUSTER SIGNAL FLARE - 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	1.8 E-01	6.6 E-01
630-08-0	Carbon monoxide (CO)	8.8 E-03	3.2 E-02
7439-92-1	Lead (Pb)[f]	1.7 E-06	6.1 E-06
10102-43-9	Nitrogen oxide (NO)[e]	2.1 E-03	7.7 E-03
--	Nitrogen oxides (NO_X)	3.3 E-03	1.2 E-02
--	PM-10[d]	8.9 E-02	3.2 E-01
7446-09-5	Sulfur dioxide (SO_2)[e]	1.5 E-04	5.4 E-04
--	TNMHC[e]	2.8 E-04	9.9 E-04
12789-66-1	TSP	9.0 E-02	3.2 E-01

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.8 E-01 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING B.
[f] EMISSION FACTOR RATING C.

Table 15.8.2-2 EMISSION FACTORS FOR THE USE OF DODIC L306, M158 RED STAR CLUSTER SIGNAL FLARE - 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]	9.0 E-07	3.2 E-06
75-05-8	Acetonitrile[d]	1.6 E-06	5.8 E-06
98-86-2	Acetophenone[d]	5.5 E-07	2.0 E-06
107-02-8	Acrolein[d,h]	2.9 E-06	1.0 E-05
107-13-1	Acrylonitrile[d,h]	2.0 E-06	7.2 E-06
7429-90-5	Aluminum[e,g]	8.0 E-05	2.8 E-04
7440-39-3	Barium[e]	1.1 E-04	4.0 E-04
71-43-2	Benzene[d,g]	2.3 E-05	8.1 E-05
106-99-0	1,3-Butadiene[d,h]	2.8 E-06	1.0 E-05
123-72-8	Butanal[e]	1.7 E-07	6.2 E-07
85-68-7	Butylbenzylphthalate[f]	9.5 E-07	3.4 E-06
7440-43-9	Cadmium[d,h]	6.2 E-07	2.2 E-06
75-15-0	Carbon disulfide[d,h]	1.5 E-05	5.2 E-05
56-23-5	Carbon tetrachloride[d,h]	2.5 E-07	8.9 E-07
782-50-5	Chlorine[d]	1.8 E-05	6.5 E-05
7440-47-3	Chromium[d,h]	1.0 E-06	3.6 E-06
7440-48-4	Cobalt[d,h]	1.3 E-07	4.5 E-07
7440-50-8	Copper[e,g]	4.0 E-06	1.4 E-05
100-41-4	Ethylbenzene[d,h]	4.8 E-06	1.7 E-05
74-85-1	Ethylene[e,h]	5.0 E-05	1.8 E-04
117-81-7	bis(2-ethylhexyl)phthalate[d]	2.1 E-06	7.4 E-06
110-54-3	n-Hexane[d]	5.8 E-07	2.1 E-06
7647-01-0	Hydrochloric acid[d]	1.7 E-04	5.9 E-04
7439-92-1	Lead[d]	1.7 E-06	6.1 E-06
7439-96-5	Manganese[d,h]	1.3 E-06	4.7 E-06
7439-97-6	Mercury[d]	9.5 E-08	3.4 E-07
91-20-3	Naphthalene[d,h]	1.1 E-06	3.8 E-06
7440-02-0	Nickel[d,g]	6.0 E-07	2.1 E-06

Table 15.8.2-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
115-07-1	Propylene[e,h]	2.1 E-05	7.4 E-05
100-42-5	Styrene[d,h]	2.4 E-06	8.4 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d]	7.3 E-13	2.6 E-12
108-88-3	Toluene[d,h]	8.1 E-06	2.9 E-05
75-69-4	Trichloromonofluoromethane[e]	1.8 E-07	6.6 E-07
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	6.6 E-07	2.3 E-06
95-63-6	1,2,4-Trimethylbenzene[e]	3.5 E-07	1.3 E-06
540-84-1	2,2,4-Trimethylpentane[f]	1.3 E-06	4.5 E-06
106-42-3 108-38-3	m-Xylene, p-Xylene[d,h]	1.0 E-05	3.6 E-05
95-47-6	o-Xylene[d]	3.4 E-06	1.2 E-05

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.8 E-01 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.2

1. *M158 Red Star Cluster Signal Flare, Pyrotechnics Fact Sheet*. U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD. Undated.

2. *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, July 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*. URS Corporation, Oak Ridge, TN. July 11, 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 Phase II Testing Conducted at Dugway Proving Ground, UT*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.3 L307, M159 White Star Cluster Signal Flare

15.8.3.1 Ordnance Description[1]

The M159 White Star Cluster Signal Flare (DODIC L307) is a pyrotechnic device used for signaling and illuminating. Pyrotechnics give off smoke, light, and/or a loud noise when activated. The M159 White Star Cluster Signal Flare produces a cluster of five white, free-falling stars. Troops use the star cluster signals to communicate with one another. Because the flare illuminates, it can also be used to provide light for nighttime ground operations or to reveal an enemy's suspected hiding place.

The M159 White Star Cluster Signal Flare consists of a rocket motor propulsion assembly contained in an aluminum launching tube. The rocket is launched from a hand-held device and reaches a height of about 200 feet after ignition. It produces a five-star illumination similar to a firework, and the stars reach a height between 650 and 800 feet.

15.8.3.2 Emissions And Controls[2-5]

The primary emissions from the use of the M159 White Star Cluster Signal Flare are carbon dioxide (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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.3-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.3-2 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).

Table 15.8.3-1 EMISSION FACTORS FOR THE USE OF DODIC L307, M159 WHITE STAR CLUSTER SIGNAL FLARE - 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	1.8 E-01	5.6 E-01
630-08-0	Carbon monoxide (CO)	7.5 E-03	2.3 E-02
7439-92-1	Lead (Pb)[f]	3.8 E-06	1.2 E-05
10102-43-9	Nitrogen oxide (NO)[e]	1.7 E-03	5.2 E-03
--	Nitrogen oxides (NO_X)	2.5 E-03	7.8 E-03
--	PM-10[d]	5.0 E-02	1.6 E-01
7446-09-5	Sulfur dioxide (SO_2)[e]	7.1 E-05	2.2 E-04
--	TNMHC[e]	2.4 E-04	7.4 E-04
12789-66-1	TSP	8.7 E-02	2.7 E-01

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 3.2 E-01 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING B.
[f] EMISSION FACTOR RATING C.

Table 15.8.3-2 EMISSION FACTORS FOR THE USE OF DODIC L307, M159 WHITE STAR CLUSTER SIGNAL FLARE - 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]	5.5 E-07	1.7 E-06
75-05-8	Acetonitrile[d]	9.8 E-07	3.1 E-06
98-86-2	Acetophenone[d]	6.8 E-07	2.1 E-06
107-02-8	Acrolein[d,h]	3.4 E-06	1.1 E-05
107-13-1	Acrylonitrile[d,h]	9.1 E-07	2.9 E-06
7429-90-5	Aluminum[e,g]	1.0 E-04	3.3 E-04
7440-39-3	Barium[e]	4.8 E-03	1.5 E-02
71-43-2	Benzene[d,g]	1.7 E-05	5.3 E-05
106-99-0	1,3-Butadiene[d,h]	5.0 E-06	1.6 E-05
111-76-2	2-Butoxy ethanol[e]	4.8 E-06	1.5 E-05
7440-43-9	Cadmium[d,h]	1.5 E-07	4.7 E-07
75-15-0	Carbon disulfide[d,h]	1.2 E-05	3.8 E-05
56-23-5	Carbon tetrachloride[d,h]	1.1 E-07	3.3 E-07
7782-50-5	Chlorine[d]	3.5 E-05	1.1 E-04
7440-47-3	Chromium[e,h]	2.9 E-06	9.0 E-06
7440-48-4	Cobalt[d,h]	1.1 E-06	3.3 E-06
7440-50-8	Copper[e,g]	8.1 E-06	2.5 E-05
84-74-2	Dibutyl phthalate[d]	2.1 E-06	6.4 E-06
75-71-8	Dichlorodifluoromethane[e]	1.3 E-07	4.0 E-07
100-41-4	Ethylbenzene[d,h]	4.7 E-06	1.5 E-05
74-85-1	Ethylene[e,h]	5.6 E-05	1.7 E-04
117-81-7	bis(2-ethylhexyl)phthalate[d]	6.8 E-06	2.1 E-05
110-54-3	n-Hexane[d]	2.2 E-07	7.0 E-07
7439-92-1	Lead[d]	3.8 E-06	1.2 E-05
7439-96-5	Manganese[d,h]	3.0 E-05	9.3 E-05
7439-97-6	Mercury[d]	3.6 E-08	1.1 E-07
75-09-2	Methylene chloride[d]	1.8 E-05	5.8 E-05
91-20-3	Naphthalene[d,h]	9.8 E-06	3.1 E-06
7440-02-0	Nickel[d,g]	5.8 E-07	1.8 E-06
115-07-1	Propylene[e,h]	2.5 E-05	7.9 E-05

Table 15.8.3-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7440-22-4	Silver[e]	8.1 E-08	2.5 E-07
100-42-5	Styrene[d,h]	1.6 E-06	5.0 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d]	7.2 E-13	2.2 E-12
108-88-3	Toluene[d,h]	6.3 E-06	2.0 E-05
75-69-4	Trichloromonofluoromethane[e]	2.6 E-07	8.1 E-07
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	7.5 E-08	2.3 E-07
95-63-6	1,2,4-Trimethylbenzene[e]	4.6 E-07	1.4 E-06
540-84-1	2,2,4-Trimethylpentane[f]	3.4 E-07	1.1 E-06
106-42-3 108-38-3	m-Xylene, p-Xylene[d,h]	1.1 E-05	3.5 E-05
95-47-6	o-Xylene[d]	3.3 E-06	1.0 E-05
7440-66-6	Zinc[e]	6.5 E-05	2.0 E-04

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 3.2 E-01 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.3

1. *M159 White Star Cluster Signal Flare, Pyrotechnics Fact Sheet*. U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD. Undated.

2. *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, July 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*. URS Corporation, Oak Ridge, TN. July 11, 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 Phase II Testing Conducted at Dugway Proving Ground, UT*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.4 L311, M126A1 Red Star Parachute Signal Flare

15.8.4.1 Ordnance Description[1]

The M126A1 Red Star Parachute Signal Flare (DODIC L311) is a pyrotechnic device used for signaling and illuminating. Pyrotechnics give off smoke, light, and/or a loud noise when activated. The M126A1 Red Star Parachute Signal Flare produces a single, red, parachute-suspended illuminating star. Troops use the parachute signal for communication in the field.

The M126A1 Red Star Parachute Signal Flare consists of a parachute-suspended illumination assembly and a rocket motor propulsion assembly contained in a hand-held aluminum launching tube. The rocket is launched from a hand-held device and reaches a height of about 200 feet after ignition. The signal extends to a height of 700 to 750 feet and can be seen from a distance of 30 to 35 miles at night.

15.8.4.2 Emissions And Controls[2-5]

The primary emissions from the use of the M126A1 Red Star Parachute Signal Flare are carbon dioxide (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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.4-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.4-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.4-1 EMISSION FACTORS FOR THE USE OF DODIC L311, M126A1 RED STAR PARACHUTE SIGNAL FLARE - 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	1.4 E-01	4.9 E-01
630-08-0	Carbon monoxide (CO)	1.1 E-02	3.8 E-02
7439-92-1	Lead (Pb)[f]	2.3 E-06	8.0 E-06
10102-43-9	Nitrogen oxide (NO)[e]	2.1 E-03	7.1 E-03
--	Nitrogen oxides (NO_X)	3.1 E-03	1.1 E-02
--	PM-10[d]	1.2 E-01	4.0 E-01
7446-09-5	Sulfur dioxide (SO_2)[e]	7.3 E-05	2.5 E-04
--	TNMHC[e]	3.3 E-04	1.2 E-03
12789-66-1	TSP	1.2 E-01	4.2 E-01

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.96 E-01 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING B.
[f] EMISSION FACTOR RATING C.

Table 15.8.4-2 EMISSION FACTORS FOR THE USE OF DODIC L311, M126A1 RED STAR PARACHUTE SIGNAL FLARE - 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	4.9 E-06
75-05-8	Acetonitrile[d]	1.1 E-06	3.8 E-06
98-86-2	Acetophenone[d]	2.8 E-06	9.8 E-06
107-02-8	Acrolein[d,h]	4.2 E-07	1.5 E-06
107-13-1	Acrylonitrile[d,h]	8.5 E-07	2.9 E-06
7429-90-5	Aluminum[e,g]	1.6 E-04	5.4 E-04
7440-36-0	Antimony[d]	4.7 E-07	1.6 E-06
7440-39-3	Barium[e]	3.3 E-04	1.1 E-03
71-43-2	Benzene[d,g]	1.3 E-05	4.5 E-05
106-99-0	1,3-Butadiene[d,h]	7.2 E-06	2.5 E-05
123-72-8	Butanal[e]	3.3 E-07	1.1 E-06
85-68-7	Butylbenzylphthalate[f]	5.0 E-07	1.7 E-06
7440-43-9	Cadmium[d,h]	6.1 E-07	2.1 E-06
75-15-0	Carbon disulfide[d,h]	1.4 E-05	4.7 E-05
7440-47-3	Chromium[d,h]	3.2 E-06	1.1 E-05
7440-48-4	Cobalt[d,h]	4.1 E-07	1.4 E-06
7440-50-8	Copper[e,g]	6.4 E-06	2.2 E-05
110-82-7	Cyclohexane[e]	5.0 E-07	1.7 E-06
84-74-2	Dibutyl phthalate[d]	2.0 E-07	6.9 E-07
75-71-8	Dichlorodifluoromethane[e]	2.2 E-07	7.5 E-07
100-41-4	Ethylbenzene[d,h]	3.4 E-07	1.2 E-06
74-85-1	Ethylene[e,h]	1.3 E-04	4.5 E-04
117-81-7	bis(2-ethylhexyl)phthalate[d]	7.2 E-07	2.5 E-06
110-54-3	n-Hexane[d]	2.2 E-07	7.7 E-07
7439-92-1	Lead[d]	2.3 E-06	8.0 E-06
7439-96-5	Manganese[d,h]	2.2 E-05	7.5 E-05
7439-97-6	Mercury[d]	8.6 E-08	3.0 E-07
1634-04-4	Methyl tert-butyl ether[d]	8.7 E-08	3.0 E-07

Table 15.8.4-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7440-02-0	Nickel[d,g]	6.3 E-07	2.2 E-06
115-07-1	Propylene[e,h]	2.8 E-05	9.8 E-05
100-42-5	Styrene[d,h]	8.1 E-07	2.8 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d]	7.0 E-13	2.4 E-12
108-88-3	Toluene[d,h]	2.7 E-06	9.4 E-06
95-63-6	1,2,4-Trimethylbenzene[e]	1.4 E-06	4.7 E-06
540-84-1	2,2,4-Trimethylpentane[f]	1.1 E-07	3.8 E-07
106-42-3 108-38-3	m-Xylene, p-Xylene[d,h]	6.8 E-07	2.3 E-06
7440-66-6	Zinc[e]	6.0 E-06	2.1 E-05

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.9 E-01 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.4

1. *M126A1 Red Star Parachute Signal Flare, Pyrotechnics Fact Sheet*. U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD. Undated.

2. *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, July 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*. URS Corporation, Oak Ridge, TN. July 11, 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 Phase II Testing Conducted at Dugway Proving Ground, UT*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.5 L312, M127A1 White Star Parachute Signal Flare

15.8.5.1 Ordnance Description[1]

Signal flares are pyrotechnic devices used for signaling and illumination. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Signal flares are used for communication among troops in the field and for illumination.

The M127A1 White Star Parachute Signal Flare (DODIC L312) is used for signaling and illumination. After ignition, the rocket reaches a height of about 200 feet and produces a single, white-star illumination resembling a firework. The signal extends to a height of 700 to 750 feet and can be seen from a distance of 30 to 35 miles at night.

15.8.5.2 Emissions And Controls[2-5]

Particulate matter is the primary pollutant emitted from the use of the M127A1 White Star Parachute Signal Flare. 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.5-1 presents emission factors for carbon dioxide (CO_2), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.5-2 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 15.8.5-1 EMISSION FACTORS FOR THE USE OF DODIC L312, M127A1 WHITE STAR PARACHUTE SIGNAL FLARE - 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	3.8 E-03	1.3 E-02
630-08-0	Carbon monoxide (CO)	4.4 E-03	1.6 E-02
7439-92-1	Lead (Pb)[f]	5.5 E-06	1.9 E-05
10102-44-0	Nitrogen dioxide (NO_2)[f]	9.9 E-05	3.5 E-04
10102-43-9	Nitrogen oxide (NO)[e]	3.6 E-03	1.3 E-02
--	Nitrogen oxides (NO_X)	5.7 E-03	2.0 E-02
--	PM-10[d]	1.7 E-01	6.1 E-01
7446-09-5	Sulfur dioxide (SO_2)[e]	1.3 E-04	4.7 E-04
--	TNMHC[e]	8.5 E-05	3.0 E-04
12789-66-1	TSP	1.8 E-01	6.4 E-01

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.83 E-01 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING B.
[f] EMISSION FACTOR RATING C.

Table 15.8.5-2 EMISSION FACTORS FOR THE USE OF DODIC L312, M127A1 WHITE STAR PARACHUTE SIGNAL FLARE - 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]	1.7 E-06	6.1 E-06
98-86-2	Acetophenone[d]	7.9 E-07	2.8 E-06
107-02-8	Acrolein[d,h]	1.2 E-06	4.1 E-06
107-13-1	Acrylonitrile[d,h]	2.0 E-06	7.0 E-06
7429-90-5	Aluminum[e,g]	2.2 E-05	7.9 E-05
7440-36-0	Antimony[d]	1.6 E-06	5.6 E-06
7440-39-3	Barium[e]	8.9 E-05	3.1 E-04
71-43-2	Benzene[d,g]	9.6 E-06	3.4 E-05
7440-41-7	Beryllium[d]	2.5 E-08	9.0 E-08
106-99-0	1,3-Butadiene[d,h]	1.8 E-06	6.2 E-06
7440-43-9	Cadmium[d,h]	1.3 E-07	4.4 E-07
75-15-0	Carbon disulfide[d,h]	2.0 E-05	7.1 E-05
56-23-5	Carbon tetrachloride[d,h]	2.0 E-07	7.2 E-07
463-58-1	Carbonyl sulfide[d]	6.9 E-07	2.4 E-06
7782-50-5	Chlorine[d]	1.0 E-04	3.6 E-04
7440-47-3	Chromium[e,h]	7.5 E-06	2.6 E-05
7440-48-4	Cobalt[d,h]	2.6 E-07	9.1 E-07
7440-50-8	Copper[e,g]	7.6 E-06	2.7 E-05
84-74-2	Dibutyl phthalate[d]	2.7 E-06	9.5 E-06
75-71-8	Dichlorodifluoromethane[e]	8.8 E-07	3.1 E-06
100-41-4	Ethylbenzene[d,h]	8.9 E-07	3.1 E-06
74-85-1	Ethylene[e,h]	2.1 E-05	7.4 E-05
7439-92-1	Lead[d]	5.5 E-06	1.9 E-05
7439-96-5	Manganese[d,h]	3.1 E-05	1.1 E-04
7439-97-6	Mercury[d]	4.1 E-08	1.5 E-07
1634-04-4	Methyl tert-butyl ether[d]	1.3 E-07	4.6 E-07
75-09-2	Methylene chloride[d]	4.7 E-06	1.7 E-05
91-20-3	Naphthalene[d,h]	4.6 E-07	1.6 E-06

Table 15.8.5-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7440-02-0	Nickel[d,g]	9.2 E-07	3.3 E-06
115-07-1	Propylene[e,h]	7.4 E-06	2.6 E-05
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d]	1.4 E-12	4.8 E-12
108-88-3	Toluene[d,h]	1.8 E-06	6.2 E-06
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	1.3 E-08	4.7 E-08
95-63-6	1,2,4-Trimethylbenzene[e]	3.3 E-08	1.2 E-07
106-42-3 108-38-3	m-Xylene, p-Xylene[d,h]	2.5 E-07	9.0 E-07
95-47-6	o-Xylene[d]	5.9 E-07	2.1 E-06
7440-66-6	Zinc[e]	4.9 E-06	1.7 E-05

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.83 E-01 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.5

1. M127A1 White Star Parachute Signal Flare, Pyrotechnics Fact Sheet, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.

2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 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 Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.6 L314, M125A1 Green Star Cluster Signal Flare

15.8.6.1 Ordnance Description[1]

Signal flares are pyrotechnic devices used for signaling and illumination. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Signal flares are used for communication among troops in the field and for illumination.

The M125A1 Green Star Cluster Signal Flare (DODIC L314) is used for signaling and illumination. It consists of a hand-held signal rocket that produces a cluster of five green, free-falling stars. After launch, the rocket reaches a height of about 200 feet and produces a five-star illumination, resembling a firework. The stars extend to a height of 650 to 800 feet.

15.8.6.2 Emissions And Controls[2-5]

The primary emissions from the use of the M125A1 Green Star Cluster Signal Flare are carbon dioxide (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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.6-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.6-2 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 15.8.6-1 EMISSION FACTORS FOR THE USE OF DODIC L314, M125A1 GREEN STAR CLUSTER SIGNAL FLARE - 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	1.4 E-01	8.5 E-02
630-08-0	Carbon monoxide (CO)	1.0 E-02	6.2 E-03
7439-92-1	Lead (Pb)[f]	2.0 E-06	1.2 E-06
10102-44-0	Nitrogen dioxide (NO_2)[f]	1.6 E-05	9.4 E-06
10102-43-9	Nitrogen oxide (NO)[e]	1.1 E-03	6.4 E-04
--	Nitrogen oxides (NO_X)	1.7 E-03	9.9 E-04
--	PM-10[d]	6.6 E-02	3.9 E-02
7446-09-5	Sulfur dioxide (SO_2)[e]	2.9 E-07	1.8 E-07
--	TNMHC[e]	2.5 E-04	1.5 E-04
12789-66-1	TSP	7.6 E-02	4.5 E-02

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.669 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING B.
[f] EMISSION FACTOR RATING C.

Table 15.8.6-2 EMISSION FACTORS FOR THE USE OF DODIC L314, M125A1 GREEN STAR CLUSTER SIGNAL FLARE - 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]	2.1 E-06	1.3 E-06
98-86-2	Acetophenone[d]	8.0 E-07	4.8 E-07
107-02-8	Acrolein[d,h]	1.3 E-06	7.9 E-07
107-13-1	Acrylonitrile[d,h]	4.3 E-06	2.6 E-06
7429-90-5	Aluminum[e,g]	2.5 E-05	1.5 E-05
7440-36-0	Antimony[d]	1.3 E-06	7.8 E-07
7440-39-3	Barium[e]	1.3 E-03	7.6 E-04
71-43-2	Benzene[d,g]	1.7 E-05	1.0 E-05
7440-41-7	Beryllium[d]	1.7 E-08	1.0 E-08
106-99-0	1,3-Butadiene[d,h]	3.7 E-06	2.2 E-06
123-72-8	Butanal[e]	1.4 E-07	8.5 E-08
7440-43-9	Cadmium[d,h]	8.4 E-08	5.1 E-08
75-15-0	Carbon disulfide[d,h]	1.7 E-05	1.0 E-05
56-23-5	Carbon tetrachloride[d,h]	2.5 E-07	1.5 E-07
463-58-1	Carbonyl sulfide[d]	7.6 E-08	4.5 E-08
7782-50-5	Chlorine[d]	1.2 E-05	7.2 E-06
7440-47-3	Chromium[e,h]	6.5 E-06	3.9 E-06
7440-48-4	Cobalt[d,h]	7.8 E-07	4.6 E-07
7440-50-8	Copper[e,g]	9.7 E-06	5.8 E-06
84-74-2	Dibutyl phthalate[d]	9.9 E-07	6.0 E-07
75-71-8	Dichlorodifluoromethane[e]	4.9 E-07	3.0 E-07
100-41-4	Ethylbenzene[d,h]	1.7 E-06	1.0 E-06
74-85-1	Ethylene[e,h]	5.3 E-05	3.2 E-05
117-87-7	bis(2-Ethylhexyl)phthalate[d]	1.8 E-05	1.1 E-05
7647-01-0	Hydrochloric acid[d]	1.3 E-04	8.0 E-05
7439-92-1	Lead[d]	2.0 E-06	1.2 E-06
7439-96-5	Manganese[d,h]	1.6 E-05	9.7 E-06
7439-97-6	Mercury[d]	8.2 E-09	4.9 E-09
1634-04-4	Methyl tert-butyl ether[d]	1.2 E-07	7.0 E-08
75-09-2	Methylene chloride[d]	9.3 E-05	5.6 E-05

Table 15.8.6-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
91-57-6	2-Methylnaphthalene	6.9 E-07	4.1 E-07
91-20-3	Naphthalene[d,h]	1.0 E-06	6.1 E-07
7440-02-0	Nickel[d,g]	4.9 E-07	2.9 E-07
115-07-1	Propylene[e,h]	1.9 E-05	1.1 E-05
100-42-5	Styrene[d,h]	6.7 E-07	4.0 E-07
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d]	2.5 E-13	1.5 E-13
108-88-3	Toluene[d,h]	4.8 E-06	2.9 E-06
75-69-4	Trichloromonofluoromethane[e]	1.4 E-07	8.4 E-08
95-63-6	1,2,4-Trimethylbenzene[e]	7.1 E-07	4.3 E-07
106-42-3 108-38-3	m-Xylene, p-Xylene[d,h]	1.5 E-06	9.1 E-07
95-47-6	o-Xylene[d]	1.8 E-06	1.1 E-06
7440-66-6	Zinc[e]	1.7 E-05	1.0 E-05

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.669 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.6

1. *M125A1 Green Star Cluster Signal Flare, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.

2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization,* Radian International LLC, Oak Ridge, TN, March 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground,* URS Corporation, Oak Ridge, TN, July 11, 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 Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.7 L366, M74A1 Air Burst Projectile Simulator

15.8.7.1 Ordnance Description[1-3]

The M74A1 Air Burst Projectile Simulator (DODIC L366) is a pyrotechnic device used to simulate artillery fire air bursts. It is fired from the AN-MS pyrotechnic pistol and produces a bright flash and a loud noise. This ammunition is used on firing ranges during training; it is not used during combat.

The M74A1 Air Burst Projectile Simulator consists of a one-piece aluminum case containing a percussion primer, propelling charge, and a projectile. The projectile contains a delay fuse and a flash charge.

15.8.7.2 Emissions And Controls[1,2,4,5]

The primary emissions from the use of the M74A1 Air Burst Projectile Simulator are carbon dioxide (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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.7-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.7-2 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 terms of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.7-1 EMISSION FACTORS FOR THE USE OF DODIC L366, M74A1 AIR BURST PROJECTILE SIMULATOR - 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	1.7 E-02	1.9 E-01
630-08-0	Carbon monoxide (CO)	5.2 E-03	5.7 E-02
7439-92-1	Lead (Pb)	1.4 E-03	1.5 E-02
--	Oxides of nitrogen (NO_x)	8.6 E-04	9.6 E-03
--	PM-2.5[d,f]	4.0 E-03	4.4 E-02
--	PM-10[e]	5.8 E-03	6.4 E-02
7446-09-5	Sulfur dioxide (SO_2)[f]	4.3 E-05	4.8 E-04
--	TNMHC[f]	4.9 E-04	5.5 E-03
12789-66-1	TSP	1.0 E-02	1.1 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 8.99 E-02 pounds per item. Reference 2.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (μm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 μm.
[f] EMISSION FACTOR RATING C.

Table 15.8.7-2 EMISSION FACTORS FOR THE USE OF DODIC L366, M74A1 AIR BURST PROJECTILE SIMULATOR - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-05-8	Acetonitrile[d,h]	5.4 E-07	5.9 E-06
107-13-1	Acrylonitrile[d,h]	7.6 E-07	8.4 E-06
7429-90-5	Aluminum[e,h]	2.6 E-04	2.9 E-03
7440-36-0	Antimony[d]	8.9 E-05	9.9 E-04
7440-39-3	Barium[e]	1.9 E-05	2.1 E-04
71-43-2	Benzene[d]	3.9 E-06	4.4 E-05
106-99-0	1,3-Butadiene[d]	4.0 E-07	4.4 E-06
7440-43-9	Cadmium[d]	2.6 E-07	2.9 E-06
56-23-5	Carbon tetrachloride[d]	3.3 E-10	3.6 E-09
7440-47-3	Chromium[d,h]	9.9 E-07	1.1 E-05
7440-48-4	Cobalt[d]	4.1 E-08	4.5 E-07
7440-50-8	Copper[e]	5.5 E-06	6.1 E-05
110-82-7	Cyclohexane[e]	7.1 E-07	7.9 E-06
606-20-2	2,6-Dinitrotoluene[e]	8.9 E-08	9.9 E-07
--	Total dioxin/furan compounds[d]	1.6 E-10	1.8 E-09
100-41-4	Ethylbenzene[d]	5.1 E-07	5.7 E-06
74-85-1	Ethylene[e,h]	7.7 E-06	8.6 E-05
50-00-0	Formaldehyde[d]	2.9 E-06	3.2 E-05
76-13-1	Freon 113[e]	6.1 E-08	6.8 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[d,h]	1.0 E-11	1.2 E-10
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[d,i]	4.5 E-12	5.0 E-11
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[d,i]	2.8 E-12	3.1 E-11
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[d,i]	2.5 E-12	2.7 E-11
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[d,i]	3.4 E-12	3.7 E-11
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[d,i]	5.4 E-12	6.0 E-11
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[d,i]	1.8 E-12	2.0 E-11
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[d,i]	2.3 E-12	2.5 E-11
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran[d,i]	4.4 E-12	4.9 E-11
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[d,i]	1.9 E-12	2.1 E-11
110-54-3	Hexane[d,i]	4.0 E-07	4.5 E-06

Table 15.8.7-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7439-92-1	Lead[d,h]	1.4 E-03	1.5 E-02
7439-96-5	Manganese[d,h]	1.9 E-06	2.1 E-05
75-09-2	Methylene chloride[d]	1.9 E-03	2.2 E-02
90-12-0	1-Methylnaphthalene[f]	7.5 E-08	8.4 E-07
91-57-6	2-Methylnaphthalene[f]	1.2 E-08	1.3 E-07
91-20-3	Naphthalene[d]	3.0 E-07	3.5 E-06
7440-02-0	Nickel[d,h]	1.8 E-07	2.0 E-06
55-63-0	Nitroglycerin[e]	4.7 E-10	5.2 E-09
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[d]	3.1 E-11	3.5 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[d,i]	1.1 E-11	1.2 E-10
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin[d,i]	3.4 E-12	3.8 E-11
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran[d,i]	3.0 E-12	3.4 E-11
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[d,i]	2.4 E-12	2.6 E-11
108-95-2	Phenol[d]	1.7 E-07	1.8 E-06
7723-14-0	Phosphorus[f,h]	4.0 E-06	4.5 E-05
115-07-1	Propylene[e,h]	2.3 E-06	2.6 E-05
7782-49-2	Selenium[d]	1.2 E-08	1.3 E-07
7440-22-4	Silver[e]	8.9 E-08	9.9 E-07
100-42-5	Styrene[d]	2.4 E-07	2.7 E-06
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin[d,i]	1.1 E-11	1.3 E-10
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[d,i]	6.1 E-11	6.8 E-10
95-63-6	1,2,4-Trimethylbenzene[e]	4.9 E-07	5.4 E-06
540-84-1	2,2,4-Trimethylpentane[f,i]	2.4 E-07	2.7 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene[d]	2.2 E-06	2.4 E-05
95-47-6	o-Xylene[d]	2.3 E-07	2.6 E-06
7440-66-6	Zinc[e,g]	4.9 E-06	5.4 E-05

Table 15.8.7-2 (cont.)

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 8.99 E-02 pounds per item. Reference 2.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.
[i] EMISSION FACTOR RATING D.

References For Section 15.8.7

1. *Detailed Test Plan for Phase IV-B Emission Characterization of Exploding Ordnance: [DODIC# B535] Cartridge 40-mm White Star Parachute (M583A1), [DODIC# B536] Cartridge 40-mm White Star Cluster (M585), [DODIC# L366] Simulator Projectile Air Burst (M74A1), [DODIC# L602] Simulator Flash Artillery (M21), [DODIC# M241] Destructor HE Universal (M10),* West Desert Test Center, U.S. Army Dugway Proving Ground, UT, April 2002.

2. *Sampling Results for AEC Phase IV-B Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics,* URS Group, Inc., Oak Ridge, TN, October 2004.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase IV-B Testing Conducted at Dugway Proving Ground, Utah,* MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2007.

5. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Corporation, Oak Ridge, TN, January 2005.

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15.8.8 L367, M22 Anti-Tank Guided Missile and Rocket Launching Simulator

15.8.8.1 Ordnance Description[1,2]

The M22 Anti-Tank Guided Missile and Rocket Launching Simulator (DODIC L367) is a pyrotechnic device used to simulate the Multiple Integrated Laser Engagement System (MILES). This simulator is employed with the MILES tube-launched, optically-tracked, wire-guided (TOW), DRAGON, and VIPER firing devices. It produces a report, flash, and smoke. This ammunition is used on firing ranges during training; it is not used during combat.

The M22 Anti-Tank Guided Missile and Rocket Launching Simulator is a three-piece, injection-molded unit consisting of a cylindrical housing with a flange on one end, a snap-in primer plate, and a snap-in closure disc for the flanged end of the unit. The simulator contains a flash and smoke composition as well as a bang composition. A standard primer is used to initiate the simulator.

15.8.8.2 Emissions And Controls[1-4]

Primary emissions from the use of the M22 Anti-Tank Guided Missile and Rocket Launching Simulator include carbon dioxide (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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.8-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.8-2 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 terms of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.8-1 EMISSION FACTORS FOR THE USE OF DODIC L367, M22 ANTI-TANK GUIDED MISSILE AND ROCKET LAUNCHING SIMULATOR – 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	1.1 E-02	3.1 E-01
630-08-0	Carbon monoxide (CO)	4.3 E-05	1.2 E-03
--	Oxides of nitrogen (NO_x)[f]	2.5 E-03	7.0 E-02
--	PM-2.5[d,g]	1.3 E-02	3.8 E-01
--	PM-10[e,g]	1.4 E-02	4.0 E-01
7446-09-5	Sulfur dioxide (SO_2)[g]	7.6 E-05	2.2 E-03
--	TNMHC[h]	7.3 E-06	2.1 E-04
12789-66-1	TSP	1.9 E-02	5.5 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 3.12 E-02 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.
[h] EMISSION FACTOR RATING D.

Table 15.8.8-2 EMISSION FACTORS FOR THE USE OF DODIC L367, M22 ANTI-TANK GUIDED MISSILE AND ROCKET LAUNCHING SIMULATOR - 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]
71-43-2	Benzene[d,g]	3.2 E-06	9.0 E-05
7440-47-3	Chromium[d]	3.5 E-07	9.9 E-06
7440-50-8	Copper[e,g]	5.3 E-07	1.5 E-05
--	Total dioxin/furan compounds[d,h]	4.5 E-11	1.3 E-09
100-41-4	Ethylbenzene[d]	2.8 E-07	7.9 E-06
74-85-1	Ethylene[e]	5.6 E-07	1.6 E-05
117-81-7	bis(2-Ethylhexyl)phthalate[d]	1.6 E-06	4.5 E-05
50-00-0	Formaldehyde[d]	7.9 E-07	2.2 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[d,i]	2.8 E-12	8.0 E-11
74-90-8	Hydrogen cyanide[d,h]	9.0 E-07	2.6 E-05
7439-96-5	Manganese[d]	5.8 E-06	1.6 E-04
75-09-2	Methylene chloride[d,h]	5.9 E-07	1.7 E-05
91-57-6	2-Methylnaphthalene[f]	3.3 E-08	9.4 E-07
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[d,i]	3.6 E-11	1.0 E-09
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[d,i]	6.6 E-12	1.9 E-10
108-95-2	Phenol[d]	1.3 E-07	3.6 E-06
108-88-3	Toluene[d]	2.8 E-07	8.1 E-06
95-63-6	1,2,4-Trimethylbenzene[e,i]	3.8 E-07	1.1 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene[d]	3.0 E-07	8.5 E-06
7440-66-6	Zinc[e,h]	1.6 E-05	4.5 E-04

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 3.12 E-02 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 A.
[h] EMISSION FACTOR RATING B.
[i] EMISSION FACTOR RATING D.

References For Section 15.8.8

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.

5. *Munitions Items Disposition Action System (MIDAS)* website, https://midas.dac.army.mil/, U.S. Army Defense Ammunition Center, McAlester, OK, December 2007.

15.8.9 L495, M49A1 Surface Trip Flare

15.8.9.1 Ordnance Description[1]

The M49A1 Surface Trip Flare (DODIC L495) is a pyrotechnic device used for illuminating. Pyrotechnics give off smoke, light, and/or a loud noise when activated. The M49A1 Surface Trip Flare produces a single, red, parachute-suspended illuminating star. The surface trip flare warns of infiltrating troops by lighting up the field.

The M49A1 Surface Trip Flare contains a pyrotechnic charge that provides a bright light. The surface trip flare is attached to a sturdy object, and a 50-foot trip wire is run across a path likely to be crossed by the enemy. The flare is set off when someone stumbles over the trip wire. The light from the flare illuminates the field to reveal the enemy's position and warn troops that someone is coming.

15.8.9.2 Emissions And Controls[2-5]

The primary emissions from the use of the M49A1 Surface Trip Flare are particulate matter and carbon dioxide (CO_2). 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.9-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.9-2 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 15.8.9-1 EMISSION FACTORS FOR THE USE OF DODIC L495, M49A1 SURFACE TRIP FLARE - 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	5.2 E-02	4.9 E-02
630-08-0	Carbon monoxide (CO)	5.3 E-04	4.9 E-04
7439-92-1	Lead (Pb)	9.9 E-06	9.2 E-06
10102-44-0	Nitrogen dioxide (NO_2)[e]	5.8 E-05	5.3 E-05
10102-43-9	Nitrogen oxide (NO)[e]	1.8 E-03	1.7 E-03
--	Nitrogen oxides (NO_X)	2.9 E-03	2.7 E-03
--	PM-10[d]	1.3 E-01	1.2 E-01
7446-09-5	Sulfur dioxide (SO_2)[e]	1.2 E-04	1.1 E-04
--	TNMHC[e]	1.0 E-05	9.2 E-06
12789-66-1	TSP	1.7 E-01	1.5 E-01

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.08 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING C.

Table 15.8.9-2 EMISSION FACTORS FOR THE USE OF DODIC L495, M49A1 SURFACE TRIP FLARE - 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]	5.6 E-07	5.1 E-07
98-86-2	Acetophenone[d,h]	1.2 E-06	1.2 E-06
107-02-8	Acrolein[d]	6.5 E-07	6.1 E-07
7429-90-5	Aluminum[e,h]	1.6 E-05	1.5 E-05
7440-36-0	Antimony[d]	5.0 E-07	4.6 E-07
7440-39-3	Barium[e]	9.7 E-05	8.9 E-05
71-43-2	Benzene[d]	4.0 E-06	3.7 E-06
85-68-7	Butylbenzylphthalate[f,h]	6.2 E-07	5.7 E-07
111-76-2	2-Butoxy ethanol[e]	1.1 E-05	9.9 E-06
7440-43-9	Cadmium[d]	2.4 E-07	2.2 E-07
75-15-0	Carbon disulfide[d,h]	6.8 E-07	6.3 E-07
56-23-5	Carbon tetrachloride[d]	2.8 E-07	2.6 E-07
7782-50-5	Chlorine[d]	2.4 E-05	2.2 E-05
7440-47-3	Chromium[e,h]	1.5 E-05	1.4 E-05
7440-48-4	Cobalt[d]	9.0 E-07	8.3 E-07
7440-50-8	Copper[e]	7.8 E-06	7.2 E-06
110-82-7	Cyclohexane[e]	2.2 E-07	2.0 E-07
84-74-2	Dibutyl phthalate[d]	1.9 E-06	1.7 E-06
75-71-8	Dichlorodifluoromethane[e]	1.2 E-08	1.1 E-08
74-85-1	Ethylene[e,h]	2.3 E-06	2.1 E-06
117-81-7	bis(2-ethylhexyl)phthalate[d]	2.2 E-06	2.0 E-06
110-54-3	n-Hexane[d]	4.4 E-07	4.1 E-07
7647-01-0	Hydrochloric Acid[d]	8.2 E-06	7.6 E-06
7439-92-1	Lead[d,h]	9.9 E-06	9.2 E-06
7439-96-5	Manganese[d,h]	2.9 E-05	2.7 E-05
7439-97-6	Mercury[d]	8.6 E-08	7.9 E-08
75-09-2	Methylene chloride[d]	2.4 E-05	2.2 E-05
1634-04-4	Methyl tert-butyl ether[d]	6.3 E-07	5.8 E-07
91-20-3	Naphthalene[d]	3.7 E-07	3.5 E-07

Table 15.8.9-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7440-02-0	Nickel[d,h]	3.6 E-07	3.4 E-07
115-07-1	Propylene[e]	7.7 E-07	7.1 E-07
100-42-5	Styrene[d]	9.9 E-06	9.1 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-Dioxin toxic equivalent[d,h]	5.3 E-13	4.9 E-13
108-88-3	Toluene[d]	2.4 E-06	2.2 E-06
75-69-4	Trichloromonofluoromethane[e]	2.5 E-07	2.3 E-07
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	6.4 E-08	5.9 E-08
95-63-6	1,2,4-Trimethylbenzene[e]	1.1 E-07	1 E-07
540-84-1	2,2,4-Trimethylpentane[f]	8.8 E-07	8.2 E-07
7440-66-6	Zinc[g]	1.8 E-04	1.6 E-04

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.08 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.9

1. *M49A1 Surface Trip Flare, Pyrotechnics Fact Sheet*. U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD. Undated.

2. *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, July 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*. URS Corporation, Oak Ridge, TN. July 11, 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 Phase II Testing Conducted at Dugway Proving Ground, UT*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.10 L594, M115A2 Ground Burst Simulator

15.8.10.1 Ordnance Description

The M115A2 Ground Burst Simulator (DODIC L594) is a pyrotechnic device used exclusively in training to mimic battle sounds and flashes. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Since it is used to imitate the sounds and flashes of combat, it is a simulator.

The M115A2 Ground Burst Simulator creates battle noises and flashes mimicking that of shells in flight and ground explosions. It is only used on land and is hand-thrown, similar to a live grenade. It creates a high-pitched whistle that starts 6 to 10 seconds after ignition and lasts 2 to 4 seconds. Detonation follows, producing a flash and loud bang.

The M115A2 Ground Burst Simulator consists of a cylindrical paper tube containing a photoflash charge and a whistling assembly. The whistler assembly is joined to a fuse lighter by a length of safety fuse.

15.8.10.2 Emissions And Controls[2-5]

Particulate matter is the primary pollutant emitted from the use of the M115A2 Ground Burst Simulator. 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.10-1 presents emission factors for carbon dioxide (CO_2), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.10-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.10-1 EMISSION FACTORS FOR THE USE OF DODIC L594, M115A2 GROUND BURST SIMULATOR - 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	3.4 E-03	2.4 E-02
630-08-0	Carbon monoxide (CO)	2.1 E-03	1.5 E-02
7439-92-1	Lead (Pb)	4.1 E-06	2.9 E-05
10102-44-0	Nitrogen dioxide (NO_2)[e]	1.5 E-04	1.1 E-03
10102-43-9	Nitrogen oxide (NO)[e]	3.5 E-03	2.5 E-02
--	Nitrogen oxides (NO_X)	5.5 E-03	3.9 E-02
--	PM-10[d]	1.9 E-01	1.4
7446-09-5	Sulfur dioxide (SO_2)[e]	1.5 E-04	1.1 E-03
--	TNMHC[e]	1.3 E-04	9.1 E-04
12789-66-1	TSP	1.6 E-01	1.1

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.41 E-01 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING C.

Table 15.8.10-2 EMISSION FACTORS FOR THE USE OF DODIC L594, M115A2 GROUND BURST SIMULATOR - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-05-8	Acetonitrile[d,h]	2.6 E-07	1.8 E-06
98-86-2	Acetophenone[d,h]	6.1 E-07	4.3 E-06
107-02-8	Acrolein[d]	2.7 E-06	1.9 E-05
7429-90-5	Aluminum[e,h]	1.9 E-02	1.3 E-01
7440-36-0	Antimony[d]	2.7 E-05	1.9 E-04
7440-38-2	Arsenic[d]	2.6 E-07	1.9 E-06
7440-39-3	Barium[e]	6.0 E-05	4.3 E-04
71-43-2	Benzene[d]	8.8 E-06	6.3 E-05
7440-41-7	Beryllium[d]	4.8 E-08	3.4 E-07
106-99-0	1,3-Butadiene[d]	9.7 E-07	7.0 E-06
123-72-8	Butanal[e]	1.7 E-07	1.2 E-06
85-68-7	Butylbenzylphthalate[f,h]	2.1 E-06	1.5 E-05
7440-43-9	Cadmium[d]	3.8 E-07	2.7 E-06
75-15-0	Carbon disulfide[d,h]	5.1 E-05	3.6 E-04
56-23-5	Carbon tetrachloride[d]	9.7 E-08	6.9 E-07
463-58-1	Carbonyl sulfide[d]	3.9 E-07	2.8 E-06
7782-50-5	Chlorine[d]	5.5 E-05	4.0 E-04
7440-47-3	Chromium[e,h]	1.2 E-06	8.3 E-06
7440-48-4	Cobalt[d]	5.9 E-07	4.2 E-06
7440-50-8	Copper[e]	3.9 E-05	2.8 E-04
84-74-2	Dibutyl phthalate[d]	2.2 E-06	1.6 E-05
100-41-4	Ethylbenzene[d]	7.5 E-07	5.4 E-06
74-85-1	Ethylene[e,h]	3.2 E-05	2.3 E-04
7647-01-0	Hydrochloric acid[d]	6.4 E-05	4.6 E-04
7439-92-1	Lead[d,h]	4.1 E-06	2.9 E-05
7439-96-5	Manganese[d,h]	3.7 E-05	2.7 E-04
7439-97-6	Mercury[d]	1.8 E-08	1.3 E-07
75-09-2	Methylene chloride[d]	9.0 E-06	6.4 E-05

Table 15.8.10-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
91-57-6	2-Methylnaphthalene[f]	3.1 E-07	2.2 E-06
91-20-3	Naphthalene[d]	1.3 E-06	9.3 E-06
7440-02-0	Nickel[d,h]	2.1 E-06	1.5 E-05
115-07-1	Propylene[e]	7.0 E-06	5.0 E-05
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d,h]	1.7 E-12	1.2 E-11
108-88-3	Toluene[d]	1.8 E-06	1.3 E-05
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	1.9 E-08	1.3 E-07
95-63-6	1,2,4-Trimethylbenzene[e]	6.7 E-07	4.8 E-06
540-84-1	2,2,4-Trimethylpentane[f]	4.2 E-07	3.0 E-06
106-42-3 108-38-3	m-Xylene, p-Xylene[d]	8.3 E-07	5.9 E-06
95-47-6	o-Xylene[d]	6.4 E-07	4.6 E-06
7440-66-6	Zinc[e,g]	3.0 E-05	2.1 E-04

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.41 E-01 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.10

1. *M115A2 Ground Burst Simulator, Pyrotechnics Fact Sheet*. U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD. Undated.

2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization,* Radian International LLC, Oak Ridge, TN, March 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground,* URS Corporation, Oak Ridge, TN, July 11, 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 Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.11 L596, M110 Flash Artillery Simulator

15.8.11 Ordnance Description[1]

The M110 Flash Artillery Simulator (DODIC L596) or "gunflash" is a pyrotechnic device that is used to mimic the sounds and flames of battle. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Since it is used to imitate the sounds and flashes of combat, it is a simulator.

The M110 Flash Artillery Simulator is used as a "blank" during training exercises in place of an actual weapon. It produces a flash that is similar to the 90 mm Gun M2 series and the 155 mm Howitzer M1 series. Conducting this simulation during training exercises allows service men and women to prepare for real-life situations.

The M110 Flash Artillery Simulator contains a pyrotechnic charge referred to as the flash composition. It is electrically initiated and functions instantaneously when current is applied to the electric squib. The simulator is dangerous, producing fragmentation out to 50 yards while exposing users to the hazards of gasoline-enhanced flash burns.

15.8.11.2 Emissions And Controls[2-5]

The primary emissions from the use of the M110 Flash Artillery Simulator are carbon dioxide (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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.11-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.11-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.11-1 EMISSION FACTORS FOR THE USE OF DODIC L596, M110 FLASH ARTILLERY SIMULATOR - 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	2.5 E-01	1.3
630-08-0	Carbon monoxide (CO)	6.8 E-03	3.6 E-02
7439-92-1	Lead (Pb)	1.1 E-05	5.8 E-05
10102-44-0	Nitrogen dioxide (NO_2)[e]	3.1 E-04	1.7 E-03
10102-43-9	Nitrogen oxide (NO)[e]	1.1 E-03	5.7 E-03
--	Nitrogen oxides (NO_X)	2.0 E-03	1.0 E-02
--	PM-10[d]	4.5 E-02	2.4 E-01
7446-09-5	Sulfur dioxide (SO_2)[e]	1.8 E-04	9.4 E-04
--	TNMHC[e]	4.9 E-03	2.6 E-02
12789-66-1	TSP	5.8 E-02	3.1 E-01

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.88 E-01 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING C.

Table 15.8.11-2 EMISSION FACTORS FOR THE USE OF DODIC L596, M110 FLASH ARTILLERY SIMULATOR - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
208-96-8	Acenaphthylene[f]	1.0 E-06	5.6 E-06
107-02-8	Acrolein[d]	1.8 E-05	9.4 E-05
7429-90-5	Aluminum[e,h]	3.1 E-04	1.7 E-03
7440-36-0	Antimony[d]	4.5 E-05	2.4 E-04
7440-39-3	Barium[e]	3.4 E-03	1.8 E-02
71-43-2	Benzene[d]	2.1 E-03	1.1 E-02
106-99-0	1,3-Butadiene[d]	4.4 E-05	2.3 E-04
7440-43-9	Cadmium[d]	3.0 E-07	1.6 E-06
75-15-0	Carbon disulfide[d]	1.8 E-05	9.8 E-05
463-58-1	Carbonyl sulfide[d]	5.1 E-06	2.7 E-05
7782-50-5	Chlorine[d]	4.7 E-05	2.5 E-04
7440-47-3	Chromium[e,h]	8.5 E-06	4.5 E-05
7440-48-4	Cobalt[d]	9.6 E-07	5.1 E-06
7440-50-8	Copper[e]	7.6 E-05	4.1 E-04
106-44-5, 108-39-4	p-Cresol, m-Cresol[d]	1.3 E-06	6.8 E-06
98-82-8	Cumene[d]	4.7 E-06	2.5 E-05
110-82-7	Cyclohexane[e]	9.9 E-05	5.3 E-04
75-71-8	Dichlorodifluoromethane[e]	2.2 E-06	1.2 E-05
100-41-4	Ethylbenzene[d]	2.0 E-03	1.1 E-02
74-85-1	Ethylene[e,h]	4.7 E-05	2.5 E-04
86-73-7	Fluorene[f]	2.1 E-07	1.1 E-06
110-54-3	n-Hexane[d]	2.3 E-04	1.2 E-03
7647-01-0	Hydrochloric acid[d]	1.3 E-04	6.9 E-04
7439-92-1	Lead[d,h]	1.1 E-05	5.8 E-05
7439-96-5	Manganese[d,h]	1.3 E-05	6.8 E-05
1634-04-4	Methyl tert-butyl ether[d]	2.1 E-03	1.1 E-02
75-09-2	Methylene chloride[d]	1.8 E-05	9.6 E-05
91-57-6	2-Methylnaphthalene[f]	3.1 E-05	1.6 E-04
91-20-3	Naphthalene[d]	7.1 E-05	3.8 E-04

Table 15.8.11-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7440-02-0	Nickel[d,h]	5.1 E-07	2.7 E-06
127-18-4	Perchloroethylene[d]	5.7 E-04	3.1 E-04
85-01-8	Phenanthrene[e]	6.7 E-07	3.6 E-06
115-07-1	Propylene[e]	2.1 E-05	1.1 E-04
129-00-0	Pyrene[f]	1.9 E-07	1.0 E-06
100-42-5	Styrene[d]	1.5 E-05	8.0 E-05
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d,h]	1.4 E-12	7.5 E-12
108-88-3	Toluene[d]	5.2 E-03	2.8 E-02
95-63-6	1,2,4-Trimethylbenzene[e]	1.5 E-03	8.2 E-03
540-84-1	2,2,4-Trimethylpentane[f]	3.3 E-05	1.8 E-04
106-42-3 108-38-3	m-Xylene, p-Xylene[d]	3.7 E-03	2.0 E-02
95-47-6	o-Xylene[d]	2.3 E-03	1.2 E-02
7440-66-6	Zinc[e,g]	1.7 E-05	9.1 E-05

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.88 E-01 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.11

1. *M110 Flash Artillery Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.

2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 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 Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

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15.8.12 L598, M117 Flash Booby Trap Simulator

15.8.12.1 Ordnance Description[1]

Booby trap simulators are pyrotechnic devices used to alert troops to an approaching enemy. Pyrotechnics give off smoke, light, and/or a loud noise when activated. These simulators imitate the sounds and flashes of combat. Troops are taught how to set up these devices during training exercises and how to be cautious when they are exposed to similar devices set by an enemy.

The M117 Flash Booby Trap Simulator (DODIC L598) is attached to a sturdy object, such as a tree. A wire is run from that object across a path that is expected to be crossed by the enemy and fastened to another object on the other side of the path. The M117 Booby Trap Simulator is activated (i.e., produces a loud bang and a bright flash) when someone trips over the hidden wire.

15.8.12.2 Emissions And Controls[2-5]

Particulate matter is the primary pollutant emitted from the use of the M117 Flash Booby Trap Simulator. 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.12-1 presents emission factors for criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.12-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.12-1 EMISSIONS FACTORS FOR THE USE OF DODIC L598, M117 FLASH BOOBY TRAP SIMULATOR - CRITERIA POLLUTANTS, TOTAL NONMETHANEHYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
630-08-0	Carbon monoxide (CO)	5.3 E-05	6.8 E-03
7439-92-1	Lead (Pb)	2.3 E-06	3.0 E-04
10102-44-0	Nitrogen dioxide (NO_2)[e]	2.6 E-06	3.4 E-04
10102-43-9	Nitrogen oxide (NO)[e]	2.9 E-05	3.8 E-03
--	Nitrogen oxides (NO_X)	5.0 E-05	6.5 E-03
--	PM-10[d]	2.5 E-03	3.3 E-01
7446-09-5	Sulfur dioxide (SO_2)[e]	4.4 E-04	5.7 E-02
--	TNMHC[e]	3.8 E-06	4.9 E-04
12789-66-1	TSP	3.2 E-03	4.2 E-01

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 7.7 E-03 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING C.

Table 15.8.12-2 EMISSION FACTORS FOR THE USE OF DODIC L598, M117 FLASH BOOBY TRAP SIMULATOR - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-05-8	Acetonitrile[d,h]	2.9 E-08	3.8 E-06
98-86-2	Acetophenone[d,h]	3.9 E-09	5.1 E-07
107-02-8	Acrolein[d]	1.6 E-07	2.1 E-05
107-13-1	Acrylonitrile[d,h]	2.5 E-08	3.3 E-06
7429-90-5	Aluminum[e,h]	9.3 E-06	1.2 E-03
7440-36-0	Antimony[d]	8.9 E-04	1.2 E-01
7440-38-2	Arsenic[d]	1.8 E-06	2.3 E-04
7440-39-3	Barium[e]	1.5 E-07	1.9 E-05
71-43-2	Benzene[d]	3.5 E-07	4.6 E-05
106-99-0	1,3-Butadiene[d]	7.8 E-08	1.0 E-05
123-72-8	Butanal[e]	6.1 E-09	7.9 E-07
85-68-7	Butylbenzylphthalate[f,h]	3.2 E-08	4.2 E-06
84-74-2	Di-n-butylphthalate[d]	6.2 E-08	8.1 E-06
7440-43-9	Cadmium[d]	6.9 E-09	9.0 E-07
75-15-0	Carbon disulfide[d,h]	2.9 E-06	3.7 E-04
56-23-5	Carbon tetrachloride[d]	6.6 E-08	8.5 E-06
463-58-1	Carbonyl sulfide[d]	1.2 E-08	1.6 E-06
7782-50-5	Chlorine[d]	4.3 E-04	5.6 E-02
7440-47-3	Chromium[e,h]	1.5 E-07	2.0 E-05
7440-48-4	Cobalt[d]	9.1 E-09	1.2 E-06
7440-50-8	Copper[e]	1.5 E-06	2.0 E-04
84-74-2	Dibutyl phthalate[d]	6.2 E-08	8.1 E-06
75-71-8	Dichlorodifluoromethane[e]	1.3 E-07	1.7 E-05
74-85-1	Ethylene[e,h]	4.8 E-07	6.3 E-05
110-54-3	n-Hexane[d]	8.5 E-08	1.1 E-05
7439-92-1	Lead[d,h]	2.3 E-06	3.0 E-04
7439-96-5	Manganese[d,h]	4.2 E-07	5.4 E-05
1634-04-4	Methyl tert-butyl ether[d]	8.8 E-08	1.1 E-05
75-09-2	Methylene chloride[d]	4.5 E-07	5.9 E-05

Table 15.8.12-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
91-20-3	Naphthalene[d]	3.0 E-08	3.9 E-06
7440-02-0	Nickel[d,h]	2.6 E-08	3.4 E-06
7782-49-2	Selenium[d]	1.9 E-08	2.5 E-06
7440-22-4	Silver[e]	3.8 E-08	4.9 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d,h]	6.5 E-14	8.4 E-12
108-88-3	Toluene[d]	1.9 E-07	2.5 E-05
75-69-4	Trichloromonofluoromethane[e]	2.1 E-07	2.7 E-05
95-63-6	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	8.5 E-10	1.1 E-07
540-84-1	2,2,4-Trimethylpentane[f]	3.4 E-07	4.4 E-05
106-42-3 108-38-3	m-Xylene, p-Xylene[d]	7.0 E-08	9.1 E-06
7440-66-6	Zinc[e,g]	1.0 E-06	1.3 E-04

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 7.7 E-03 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.12

1. *M117 Flash Booby Trap Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.

2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 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 Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.13 L599, M118 Illuminating Booby Trap Simulator

15.8.13.1 Ordnance Description[1]

Booby trap simulators are pyrotechnic devices used to alert troops to an approaching enemy. Pyrotechnics give off smoke, light, and/or a loud noise when activated. These simulators imitate the sounds and flashes of combat. Troops are taught how to set up these devices during training exercises and how to be cautious when they are exposed to similar devices set by an enemy.

The M118 Illuminating Booby Trap Simulator (DODIC L599) is attached to a sturdy object, such as a tree. A wire is run from that object across a path that is expected to be crossed by the enemy and fastened to another object on the other side of the path. The M118 Illuminating Booby Trap Simulator is activated (i.e., produces an illumination) when someone trips over the hidden wire.

15.8.13.2 Emissions And Controls[2-5]

Carbon dioxide (CO_2) is the primary pollutant emitted from the use of the M118 Illuminating Booby Trap Simulator. 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.13-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.13-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.13-1 EMISSION FACTORS FOR THE USE OF DODIC L599, M118 ILLUMINATING BOOBY TRAP SIMULATOR - CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATES[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-6	CO_2	1.7 E-02	1.3
630-08-0	Carbon monoxide (CO)	2.7 E-04	2.0 E-02
7439-92-1	Lead (Pb)	5.5 E-08	4.2 E-06
10102-44-0	Nitrogen dioxide (NO_2)[e]	5.0 E-05	3.9 E-03
10102-43-9	Nitrogen oxide (NO)[e]	2.0 E-06	1.5 E-04
--	Nitrogen oxides (NO_X)	1.9 E-06	1.5 E-04
--	PM-10[d]	3.9 E-03	3.0 E-01
7446-09-5	Sulfur dioxide (SO_2)[e]	2.1 E-06	1.6 E-04
--	TNMHC[e]	2.0 E-05	1.5 E-03
12789-66-1	TSP	3.8 E-03	2.9 E-01

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.34 E-02 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING C.

Table 15.8.13-2 EMISSION FACTORS FOR USE OF DODIC L599, M118 ILLUMINATING BOOBY TRAP SIMULATOR - 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]	1.8 E-07	1.4 E-05
75-05-8	Acetonitrile[d]	3.0 E-08	2.3 E-06
98-86-2	Acetophenone[d,h]	1.9 E-08	1.4 E-06
107-02-8	Acrolein[d,h]	1.5 E-07	1.2 E-05
107-13-1	Acrylonitrile[d,h]	1.1 E-08	8.6 E-07
7429-90-5	Aluminum[e,h]	4.5 E-07	3.5 E-05
7440-36-0	Antimony[d]	8.4 E-06	6.5 E-04
7440-38-2	Arsenic[d]	1.2 E-08	9.0 E-07
7440-39-3	Barium[e]	3.0 E-08	2.3 E-06
71-43-2	Benzene[d]	1.1 E-06	8.8 E-05
106-99-0	1,3-Butadiene[d]	2.4 E-07	1.8 E-05
123-72-8	Butanal[e]	1.1 E-07	8.6 E-06
7440-43-9	Cadmium[d]	1.5 E-08	1.1 E-06
75-15-0	Carbon disulfide[d,h]	7.6 E-07	5.9 E-05
56-23-5	Carbon tetrachloride[d]	9.8 E-09	7.5 E-07
463-58-1	Carbonyl sulfide[d]	1.4 E-08	1.1 E-06
7782-50-5	Chlorine[d]	1.1 E-07	8.1 E-06
7440-47-3	Chromium[e,h]	9.3 E-09	7.2 E-07
7440-48-4	Cobalt[d]	6.7 E-09	5.2 E-07
7440-50-8	Copper[e]	7.3 E-08	5.6 E-06
84-74-2	Dibutyl phthalate[d]	6.0 E-08	4.6 E-06
75-71-8	Dichlorodifluoromethane[e]	4.9 E-08	3.8 E-06
100-41-4	Ethylbenzene[d]	2.6 E-07	2.0 E-05
74-85-1	Ethylene[e,h]	3.9 E-06	3.0 E-04
117-81-7	bis(2-Ethylhexyl)phthalate[d]	8.9 E-08	6.8 E-06
110-54-3	n-Hexane[d]	2.5 E-08	2.0 E-06
7647-01-0	Hydrochloric acid[d]	2.5 E-07	1.9 E-05
7439-92-1	Lead[d,h]	5.5 E-08	4.2 E-06

Table 15.8.13-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7439-96-5	Manganese[d,h]	1.4 E-08	1.1 E-06
7439-97-6	Mercury[d]	3.8 E-10	3.0 E-08
75-09-2	Methylene chloride[d]	6.7 E-07	5.1 E-05
91-20-3	Naphthalene[d]	8.2 E-08	6.3 E-06
7440-02-0	Nickel[d,h]	2.5 E-08	1.9 E-06
108-95-2	Phenol[d]	5.6 E-08	4.3 E-06
115-07-1	Propylene[e]	8.0 E-07	6.1 E-05
129-00-0	Pyrene[f]	1.1 E-08	8.7 E-07
100-42-5	Styrene[d]	1.0 E-07	7.7 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d,h]	3.2 E-14	2.5 E-12
108-88-3	Toluene[d]	3.6 E-07	2.7 E-05
75-69-4	Trichloromonofluoromethane[e]	6.2 E-10	4.8 E-08
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	2.3 E-09	1.8 E-07
540-84-1	2,2,4-Trimethylpentane[f]	4.5 E-08	3.4 E-06
106-42-3 108-38-3	m-Xylene, p-Xylene[d]	7.3 E-07	5.6 E-05
95-47-6	o-Xylene[d]	2.5 E-07	1.9 E-05
7440-66-6	Zinc[e,g]	3.4 E-06	2.6 E-04

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.34 E-02 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.13

1. *M118 Illuminating Booby Trap Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.

2. *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, July 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 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 Phase II Testing Conducted at Dugway Proving Ground, UT*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

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15.8.14 L600, M119 Whistling Booby Trap Simulator

15.8.14.1 Ordnance Description[1]

Booby trap simulators are pyrotechnic devices used to alert troops to an approaching enemy. Pyrotechnics give off smoke, light, and/or a loud noise when activated. These simulators imitate the sounds and flashes of combat. Troops are taught how to set up these devices during training exercises and how to be cautious when they are exposed to similar devices set by an enemy.

The M119 Whistling Booby Trap Simulator (DODIC L600) is attached to a sturdy object, such as a tree. A wire is run from that object across the path that is expected to be crossed by the enemy and fastened to another object on the other side of the path. The M119 Whistling Booby Trap Simulator is activated (i.e., producing a whistling sound) when someone trips over the hidden wire.

15.8.14.2 Emissions And Controls[2-5]

The primary emissions from the use of the M119 Whistling Booby Trap Simulator are carbon dioxide (CO_2), particulate matter, 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.14-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.14-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.14-1 EMISSION FACTORS FOR THE USE OF DODIC L600, M119 WHISTLING BOOBY TRAP SIMULATOR - 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	4.1 E-03	3.9 E-02
630-08-0	CO	1.4 E-03	1.3 E-02
10102-44-0	Nitrogen dioxide (NO_2)[e]	1.4 E-05	1.4 E-04
10102-43-9	Nitrogen oxide (NO)[e]	3.7 E-05	3.5 E-04
--	Nitrogen oxides (NO_X)	6.6 E-05	6.3 E-04
--	PM-10[d]	2.4 E-03	2.2 E-02
7446-09-5	Sulfur dioxide (SO_2)[e]	8.1 E-06	7.6 E-05
--	TNMHC[e]	6.2 E-05	5.8 E-04
12789-66-1	TSP	2.4 E-03	2.2 E-02

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.06 E-01 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING C.

Table 15.8.14-2 EMISSION FACTORS FOR THE USE OF DODIC L600, M119 WHISTLING BOOBY TRAP SIMULATOR - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-07-0	Acetaldehyde[d]	2.7 E-07	2.5 E-06
98-86-2	Acetophenone[d,g]	3.4 E-08	3.2 E-07
107-02-8	Acrolein[d]	2.7 E-07	2.5 E-06
71-43-2	Benzene[d]	7.1 E-06	6.7 E-05
106-99-0	1,3-Butadiene[d]	1.1 E-06	1.1 E-05
123-72-8	Butanal[e]	4.0 E-07	3.7 E-06
75-15-0	Carbon disulfide[d,g]	1.7 E-06	1.6 E-05
56-23-5	Carbon tetrachloride[d]	3.6 E-08	3.4 E-07
7782-50-5	Chlorine[d]	8.8 E-06	8.3 E-05
84-74-2	Dibutyl phthalate[d]	3.8 E-07	3.5 E-06
75-71-8	Dichlorodifluoromethane[e]	9.1 E-09	8.6 E-08
100-41-4	Ethylbenzene[d]	2.9 E-06	2.8 E-05
74-85-1	Ethylene[e,g]	1.2 E-05	1.1 E-04
7647-01-0	Hydrochloric acid[d]	2.3 E-06	2.2 E-05
1634-04-4	Methyl tert-butyl ether[d]	8.7 E-09	8.2 E-08
75-09-2	Methylene chloride[d]	1.7 E-06	1.6 E-05
91-20-3	Naphthalene[d]	3.4 E-07	3.2 E-06
67-63-0	2-Propanol[e]	1.9 E-07	1.8 E-06
115-07-1	Propylene[e]	1.9 E-06	1.7 E-05
100-42-5	Styrene[d]	5.8 E-07	5.5 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d,g]	1.0 E-13	9.5 E-13
108-88-3	Toluene[d]	1.6 E-06	1.5 E-05
75-69-4	Trichloromonofluoromethane[e]	8.4 E-08	7.9 E-07
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	2.6 E-08	2.5 E-07
95-63-6	1,2,4-Trimethylbenzene[e]	1.7 E-07	1.6 E-06
540-84-1	2,2,4-Trimethylpentane[f]	5.7 E-08	5.4 E-07

Table 15.8.14-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
106-42-3 108-38-3	m-Xylene, p-Xylene[d]	7.3 E-06	6.9 E-05
95-47-6	o-Xylene[d]	2.4 E-06	2.2 E-05

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.06 E-01 pounds per item. Reference 4.
[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.

References For Section 15.8.14

1. *M119 Whistling Booby Trap Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.

2. *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, July 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 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, Revision11, February 2001.

5. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase II Testing Conducted at Dugway Proving Ground, UT*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.15 L601, M116A1 Hand Grenade Simulator

15.8.15.1 Ordnance Description[1]

The M116A1 Hand Grenade Simulator (DODIC L601) is a pyrotechnic device used exclusively in training to mimic battle sounds and flashes. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Since it is used to imitate the sounds and flashes of combat, it is a simulator.

The M116A1 Hand Grenade Simulator mimics the sounds and flashes of actual grenades used during combat and is only used on land. It is thrown in the same manner as a live grenade and creates a loud bang and flash 5 to 10 seconds after igniting. The M116A1 Hand Grenade Simulator looks and sounds very similar to a live grenade, creating a realistic combat environment.

The M116A1 Hand Grenade Simulator consists of a cylindrical paper tube containing a sealed charge of photoflash powder. This charge creates the flash and bang after the M116A1 Hand Grenade Simulator is ignited. A fuse igniter is attached to the outside of the tube and is joined to the photoflash by a safety fuse.

15.8.15.2 Emissions And Controls[2-5]

Particulate matter is the primary pollutant emitted from the use of the M116A1 Hand Grenade Simulator. 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.15-1 presents emission factors for carbon dioxide (CO_2), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.15-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per 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 15.8.15-1 EMISSION FACTORS FOR THE USE OF DODIC L601, M116A1 HAND GRENADE SIMULATOR - 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	4.1 E-03	5.1 E-02
630-08-0	Carbon monoxide (CO)	3.7 E-04	4.5 E-03
7439-92-1	Lead (Pb)	1.4 E-06	1.7 E-05
10102-44-0	Nitrogen dioxide (NO_2)[e]	1.7 E-04	2.1 E-03
10102-43-9	Nitrogen oxide (NO)[e]	3.6 E-03	4.4 E-02
--	Nitrogen oxides (NO_X)	5.6 E-03	6.9 E-02
--	PM-10[d]	1.2 E-01	1.5
7446-09-5	Sulfur dioxide (SO_2)[e]	4.7 E-04	5.8 E-03
--	TNMHC[e]	4.2 E-05	5.1 E-04
12789-66-1	TSP	1.1 E-01	1.4

[a] Factors represent uncontrolled emissions. References 2 and 3.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 8.13 E-02 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).
[e] EMISSION FACTOR RATING C.

Table 15.8.15-2 EMISSION FACTORS FOR THE USE OF DODIC L601, M116A1 HAND GRENADE SIMULATOR - 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]
98-86-2	Acetophenone[d,h]	3.8 E-07	4.7 E-06
107-02-8	Acrolein[d]	1.7 E-06	2.1 E-05
107-13-1	Acrylonitrile[d,h]	3.4 E-07	4.2 E-06
7429-90-5	Aluminum[e,h]	1.1 E-02	1.4 E-01
7440-36-0	Antimony[d]	2.0 E-05	2.4 E-04
7440-38-2	Arsenic[d]	2.7 E-07	3.3 E-06
7440-39-3	Barium[e]	3.9 E-05	4.8 E-04
71-43-2	Benzene[d]	1.5 E-06	1.8 E-05
7440-41-7	Beryllium[d]	3.6 E-08	4.4 E-07
106-99-0	1,3-Butadiene[d]	1.3 E-07	1.6 E-06
85-68-7	Butylbenzylphthalate[f,h]	1.1 E-06	1.3 E-05
7440-43-9	Cadmium[d]	2.3 E-07	2.8 E-06
75-15-0	Carbon disulfide[d,h]	5.4 E-05	6.7 E-04
56-23-5	Carbon tetrachloride[d]	3.1 E-08	3.8 E-07
463-58-1	Carbonyl sulfide[d]	2.7 E-07	3.3 E-06
7782-50-5	Chlorine[d]	3.9 E-06	4.8 E-05
7440-47-3	Chromium[e,h]	6.2 E-07	7.6 E-06
7440-48-4	Cobalt[d]	3.3 E-07	4.1 E-06
7440-50-8	Copper[e]	1.8 E-05	2.3 E-04
84-74-2	Dibutyl phthalate[d]	3.0 E-06	3.7 E-05
75-71-8	Dichlorodifluoromethane[e]	1.6 E-07	2.0 E-06
100-41-4	Ethylbenzene[d]	3.3 E-07	4.1 E-06
74-85-1	Ethylene[e,h]	7.7 E-06	9.4 E-05
117-81-7	bis(2-Ethylhexyl)phthalate[d]	3.4 E-07	4.2 E-06
110-54-3	n-Hexane[d]	6.1 E-08	7.6 E-07
7439-92-1	Lead[d,h]	1.4 E-06	1.7 E-05
7439-96-5	Manganese[d,h]	1.2 E-05	1.5 E-04
7439-97-6	Mercury[d]	1.6 E-09	2.0 E-08
75-09-2	Methylene chloride[d]	3.8 E-06	4.7 E-05

Table 15.8.15-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
91-57-6	2-Methylnaphthalene[f]	1.4 E-07	1.7 E-06
91-20-3	Naphthalene[d]	4.5 E-07	5.6 E-06
7440-02-0	Nickel[d,h]	1.2 E-06	1.5 E-05
115-07-1	Propylene[e]	2.6 E-06	3.2 E-05
7782-49-2	Selenium[d]	1.3 E-07	1.6 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent[d,h]	4.7 E-13	5.8 E-12
108-88-3	Toluene[d]	6.8 E-07	8.4 E-06
95-63-6	1,2,4-Trimethylbenzene[e]	2.6 E-07	3.2 E-06
540-84-1	2,2,4-Trimethylpentane[f]	2.4 E-07	3.0 E-06
106-42-3 108-38-3	m-Xylene, p-Xylene[d]	3.2 E-07	4.0 E-06
95-47-6	o-Xylene[d]	2.8 E-07	3.5 E-06
7440-66-6	Zinc[e,g]	1.3 E-05	1.6 E-04

[a] References 2 and 3. Factors represent uncontrolled emissions.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 8.13 E-02 pounds per item. Reference 4.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.

References For Section 15.8.15

1. *M116A1 Hand Grenade Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.

2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 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 Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

15.8.16 L410, M206 Aircraft Countermeasure Flare

15.8.16.1 Ordnance Description[1,2]

The M206 Aircraft Countermeasure Flare (DODIC L410) is a pyrotechnic device that is dispensed from aircraft to decoy infrared-seeking missile threats away from the aircraft. This ammunition is used during combat and on firing ranges during training.

The M206 Aircraft Countermeasure Flare consists of an aluminum case that houses a flare pellet, piston, and end cap. The flare is approximately 8 inches long, has a square 1 inch by 1 inch cross-section, and weighs approximately 0.43 pounds. An M796 impulse cartridge is used to initiate the flare. Upon initiation, expanding hot gas, developed by the impulse cartridge, causes the piston to expel the flare pellet from the cartridge case; simultaneously, the flare pellet is ignited.

15.8.16.2 Emissions And Controls[1-4]

The primary emissions from the use of the M206 Aircraft Countermeasure Flare are carbon dioxide (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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.16-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.16-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in terms of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.16-1 EMISSION FACTORS FOR THE USE OF DODIC L410, M206 AIRCRAFT COUNTERMEASURE FLARE - 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]	1.1 E-02	3.4 E-02
630-08-0	Carbon monoxide (CO)[f]	1.3 E-03	4.2 E-03
--	Oxides of nitrogen (NO_x)	1.3 E-04	4.3 E-04
--	PM-2.5[d,g]	6.2 E-03	2.0 E-02
--	PM-10[e]	6.2 E-03	2.0 E-02
7446-09-5	Sulfur dioxide (SO_2)	7.9 E-06	2.6 E-05
--	TNMHC	4.0 E-04	1.3 E-03
12789-66-1	TSP[f]	8.6 E-03	2.8 E-02

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.84 E-01 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 15.8.16-2 EMISSION FACTORS FOR THE USE OF DODIC L410, M206 AIRCRAFT COUNTERMEASURE FLARE - 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]
71-43-2	Benzene[d,f]	8.4 E-06	2.8 E-05
106-99-0	1,3-Butadiene[d,f]	4.3 E-07	1.4 E-06
7440-43-9	Cadmium[d]	8.2 E-08	2.7 E-07
75-15-0	Carbon disulfide[d]	1.5 E-07	4.8 E-07
7440-47-3	Chromium[d]	6.6 E-07	2.2 E-06
606-20-2	2,6-Dinitrotoluene[e,g]	1.7 E-08	5.4 E-08
--	Total dioxin/furan compounds[d,g]	2.7 E-11	8.7 E-11
74-85-1	Ethylene[e]	1.6 E-05	5.2 E-05
117-81-7	bis(2-Ethylhexyl)phthalate[d]	2.4 E-06	7.8 E-06
50-00-0	Formaldehyde[d]	2.3 E-06	7.5 E-06
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[d,g]	3.2 E-12	1.1 E-11
110-54-3	Hexane[d,h]	3.7 E-08	1.2 E-07
74-90-8	Hydrogen cyanide[d,g]	9.0 E-06	2.9 E-05
75-09-2	Methylene chloride[d,g]	7.8 E-06	2.6 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[d,h]	1.8 E-11	5.8 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[d,g]	5.5 E-12	1.8 E-11
115-07-1	Propylene[e,f]	8.7 E-06	2.8 E-05
100-42-5	Styrene[d]	2.9 E-07	9.7 E-07
108-88-3	Toluene[d]	2.6 E-07	8.4 E-07
7440-66-6	Zinc[e,g]	3.2 E-05	1.1 E-04

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.84 E-01 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] EMISSION FACTOR RATING A.
[g] EMISSION FACTOR RATING C.
[h] EMISSION FACTOR RATING D.

References For Section 15.8.16

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.

5. *Munitions Items Disposition Action System (MIDAS)* website, https://midas.dac.army.mil/, U.S. Army Defense Ammunition Center, McAlester, OK, December 2007.

15.8.17 L592, TOW Blast Simulator

15.8.17.1 Ordnance Description[1,2]

The TOW Blast Simulator (DODIC L592) is used to mimic the sound of the launching of a tactical tube-launched, optically-tracked, wire command-link guided (TOW) missile. It is a pyrotechnic device used exclusively in training; this ammunition is not used during combat.

The TOW Blast Simulator consists of a cylindrical tube 1.7 inches long by 0.7 inches in diameter containing a pyrotechnic charge. A squib electric match is contained within the device and is used to initiate the pyrotechnic charge.

15.8.17.2 Emissions And Controls[1-4]

Particulate matter is the primary pollutant emitted from the use of the TOW Blast Simulator. 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.17-1 presents emission factors for carbon dioxide (CO_2), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.17-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.17-1 EMISSION FACTORS FOR THE USE OF DODIC L592, TOW BLAST SIMULATOR - 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	3.6 E-04	6.3 E-02
630-08-0	Carbon monoxide (CO)	2.5 E-05	4.3 E-03
7439-92-1	Lead (Pb)[g]	1.6 E-05	2.9 E-03
--	Nitrogen oxides (NO_X)	4.9 E-05	8.7 E-03
--	PM-2.5[d,g]	1.3 E-03	2.2 E-01
--	PM-10[e]	1.5 E-03	2.6 E-01
7446-09-5	Sulfur dioxide (SO_2)[g]	3.1 E-04	5.4 E-02
--	TNMHC[e,g]	3.7 E-06	6.6 E-04
12789-66-1	TSP[f]	1.6 E-03	2.8 E-01

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 5.65 E-03 pounds per item. Reference 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 15.8.17-2 EMISSION FACTORS FOR THE USE OF DODIC L592, TOW BLAST SIMULATOR - 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,h]	4.4 E-07	7.8 E-05
107-02-8	Acrolein[d]	1.9 E-07	3.3 E-05
7429-90-5	Aluminum[e,g]	1.7 E-04	3.0 E-02
7440-36-0	Antimony[d]	5.9 E-08	1.0 E-05
7440-39-3	Barium[e,g]	1.3 E-07	2.3 E-05
71-43-2	Benzene[d]	1.1 E-07	2.0 E-05
92-52-4	Biphenyl[d,h]	2.3 E-07	4.1 E-05
106-99-0	1,3-Butadiene[d]	2.6 E-08	4.5 E-06
71-36-3	n-Butanol[e]	8.2 E-08	1.4 E-05
7440-43-9	Cadmium[d]	7.1 E-09	1.3 E-06
75-15-0	Carbon disulfide[d,g]	2.1 E-07	3.8 E-05
74-87-3	Chloromethane[d]	5.4 E-08	9.6 E-06
7440-47-3	Chromium[d]	5.5 E-08	9.7 E-06
7440-50-8	Copper[e]	5.8 E-07	1.0 E-04
132-64-9	Dibenzofuran[d]	6.4 E-09	1.1 E-06
99-65-0	1,3-Dinitrobenzene[e]	7.6 E-09	1.3 E-06
--	Total dioxin/furan compounds[d]	1.4 E-11	2.5 E-09
50-00-0	Formaldehyde[d]	7.1 E-08	1.3 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[d,h]	1.0 E-12	1.8 E-10
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[d,h]	2.3 E-13	4.0 E-11
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[d,h]	5.2 E-14	9.3 E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[d,h]	7.2 E-14	1.3 E-11
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[d,h]	7.5 E-14	1.3 E-11
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[d,h]	9.0 E-14	1.6 E-11
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran[d,h]	9.5 E-14	1.7 E-11
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[d]	2.7 E-14	4.8 E-12
7647-01-0	Hydrochloric acid[d,h]	4.3 E-05	7.6 E-03
7439-92-1	Lead[d]	1.6 E-05	2.9 E-03
7439-96-5	Manganese[d,g]	2.5 E-08	4.5 E-06
75-09-2	Methylene chloride[d]	2.0 E-08	3.6 E-06

Table 15.8.17-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7440-02-0	Nickel[d]	8.8 E-08	1.6 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[d,h]	1.2 E-11	2.1 E-09
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[d]	6.9 E-13	1.2 E-10
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin[d,h]	5.3 E-14	9.3 E-12
108-95-2	Phenol[d,g]	8.4 E-08	1.5 E-05
7723-14-0	Phosphorus[f,g]	1.1 E-07	1.9 E-05
123-38-6	Propionaldehyde[d,h]	2.7 E-08	4.7 E-06
7440-28-0	Thallium[e]	1.4 E-08	2.5 E-06
75-01-4	Vinyl chloride[d,h]	2.8 E-08	5.0 E-06
7440-66-6	Zinc[e]	1.1 E-06	1.9 E-04

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 5.65 E-03 pounds per item. Reference 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 15.8.17

1. *Sampling Results for AEC Phase V Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics, Revision 1*, URS Group, Inc., Oak Ridge, TN, February 2007.

2. *Detailed Test Plan for Phase V Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, October 2003.

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, January 2006 and February 2007.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase V-A Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, November 2007.

5. *Munitions Items Disposition Action System (MIDAS)* website, https://midas.dac.army.mil/, U.S. Army Defense Ammunition Center, McAlester, OK, November 2006.

15.8.18 L602, M21 Artillery Flash Simulator

15.8.18.1 Ordnance Description[1-3]

The M21 Artillery Flash Simulator (DODIC L602) is a pyrotechnic device used to simulate main gun tank fire. It produces a bright flash and a loud noise. This ammunition is used on firing ranges during training; it is not used during combat.

The M21 Flash Artillery Simulator consists of a plastic container containing flash powder. It is initiated electrically.

15.8.18.2 Emissions And Controls[1,2,4,5]

Particulate matter is the primary emission from the use of the M21 Artillery Flash Simulator. 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.18-1 presents emission factors for criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.18-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.18-1 EMISSION FACTORS FOR THE USE OF DODIC L602, M21 ARTILLERY FLASH SIMULATOR - 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]
630-08-0	Carbon monoxide (CO)[f]	1.3 E-05	1.3 E-04
7439-92-1	Lead (Pb)	2.0 E-03	2.1 E-02
--	Oxides of nitrogen (NO_x)	2.8 E-03	3.0 E-02
--	PM-2.5[d,f]	1.7 E-02	1.8 E-01
--	PM-10[e]	3.2 E-02	3.5 E-01
7446-09-5	Sulfur dioxide (SO_x) [f]	2.6 E-02	2.7 E-01
--	TNMHC[f]	3.6 E-04	3.9 E-03
12789-66-1	TSP	4.8 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 9.38 E-02 pounds per item. Reference 2.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (μm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 μm.
[f] EMISSION FACTOR RATING C.

Table 15.8.18-2 EMISSION FACTORS FOR THE USE OF DODIC L602, M21 ARTILLERY FLASH SIMULATOR - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-05-8	Acetonitrile[d,h]	3.6 E-07	3.8 E-06
7429-90-5	Aluminum[e,h]	5.8 E-03	6.2 E-02
7440-36-0	Antimony[d]	1.2 E-04	1.2 E-03
7440-39-3	Barium[e]	6.7 E-03	7.1 E-02
71-43-2	Benzene[d]	1.3 E-06	1.4 E-05
106-99-0	1,3-Butadiene[d]	1.2 E-07	1.2 E-06
85-68-7	Butylbenzylphthalate[f,h]	1.0 E-07	1.1 E-06
7440-43-9	Cadmium[d,i]	1.0 E-05	1.1 E-04
7782-50-5	Chlorine[d,i]	9.4 E-04	1.0 E-02
7440-47-3	Chromium[d,h]	2.0 E-05	2.1 E-04
7440-48-4	Cobalt[d]	1.0 E-06	1.1 E-05
7440-50-8	Copper[e]	8.1 E-04	8.6 E-03
110-82-7	Cyclohexane[e]	1.0 E-06	1.1 E-05
606-20-2	2,6-Dinitrotoluene[e]	2.3 E-07	2.5 E-06
--	Total dioxin/furan compounds[d]	4.4 E-11	4.6 E-10
100-41-4	Ethylbenzene[d]	7.3 E-07	7.7 E-06
74-85-1	Ethylene[e]	3.3 E-06	3.5 E-05
50-00-0	Formaldehyde[d]	3.0 E-06	3.2 E-05
76-13-1	Freon 113[e]	8.8 E-08	9.4 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[d,h]	1.0 E-11	1.1 E-10
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[d]	1.2 E-12	1.3 E-11
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[d]	9.4 E-13	1.0 E-11
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[d,i]	1.2 E-12	1.3 E-11
110-54-3	Hexane[d]	6.6 E-07	7.0 E-06
7439-92-1	Lead[d,h]	2.0 E-03	2.1 E-02
7439-96-5	Manganese[d,h]	4.1 E-06	4.4 E-05
75-09-2	Methylene chloride[d]	1.4 E-03	1.5 E-02
91-20-3	Naphthalene[d]	6.8 E-07	7.0 E-06
7440-02-0	Nickel[e,h]	7.3 E-07	7.8 E-06
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[d]	2.8 E-11	3.0 E-10

Table 15.8.18-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[d]	1.7 E-12	1.8 E-11
108-95-2	Phenol[d]	2.8 E-07	3.0 E-06
7723-14-0	Phosphorus[f,h]	2.0 E-05	2.1 E-04
115-07-1	Propylene[e]	9.0 E-07	9.6 E-06
7782-49-2	Selenium[d]	5.1 E-08	5.4 E-07
100-42-5	Styrene[d]	4.4 E-07	4.7 E-06
95-63-6	1,2,4-Trimethylbenzene[e]	6.1 E-07	6.5 E-06
540-84-1	2,2,4-Trimethylpentane[f]	7.7 E-07	8.2 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene[d]	3.1 E-06	3.3 E-05
95-47-6	o-Xylene[d]	1.0 E-06	1.1 E-05
7440-66-6	Zinc[e,g]	6.0 E-05	6.4 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 9.38 E-02 pounds per item. Reference 2.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.
[i] EMISSION FACTOR RATING D.

References For Section 15.8.18

1. *Detailed Test Plan for Phase IV-B Emission Characterization of Exploding Ordnance: [DODIC# B535] Cartridge 40-mm White Star Parachute (M583A1), [DODIC# B536] Cartridge 40-mm White Star Cluster (M585), [DODIC# L366] Simulator Projectile Air Burst (M74A1), [DODIC# L602] Simulator Flash Artillery (M21), [DODIC# M241] Destructor HE Universal (M10),* West Desert Test Center, U.S. Army Dugway Proving Ground, UT, April 2002.

2. *Sampling Results for AEC Phase IV-B Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, URS Group, Inc., Oak Ridge, TN, October 2004.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase IV-B Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2007.

5. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Corporation, Oak Ridge, TN, January 2005.

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15.8.19 L709, M25 Target-Hit Simulator

15.8.19.1 Ordnance Description[1-4]

The M25 Target Hit Simulator (DODIC L709) is a pyrotechnic device used exclusively in training to mimic battle sounds and flashes. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Since it is used to imitate the sounds and flashes of combat, it is a simulator.

The M25 Target Hit Simulator is designed to inform gunners/crews that an armored target has been hit. The simulator is placed in a pit near a tank silhouette or target, usually made of plywood. If the target is hit, the simulator produces a flash, bang, and shower of sparks.

The M25 Target Hit Simulator consists of an outer plastic case encompassing two sections that are taped together. The upper section contains the ignition leads and plugs designed to initiate the cartridge contained within the lower section. A pyrotechnic charge and electrical igniter assembly are contained in the lower section. The pyrotechnic charge includes a combustible composition, a booster charge, a star ignition compound, and a star mix compound.

15.8.19.2 Emissions And Controls[1-8]

The primary emissions from the use of the M25 Target Hit Simulator are carbon dioxide (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 15.8.19.-1 presents emission factors for CO_2, criteria pollutants, methane, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.19-2 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 15.8.19-1 EMISSION FACTORS FOR THE USE OF DODIC L709, M25 TARGET HIT SIMULATOR - CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2[g]	2.9 E-02	5.3 E-01
630-08-0	Carbon monoxide (CO)[g]	9.8 E-04	1.8 E-02
7439-92-1	Lead (Pb)	2.1 E-05	3.8 E-04
74-82-8	Methane	5.8 E-06	1.1 E-04
--	Oxides of nitrogen (NO_X)	1.2 E-03	2.3 E-02
--	PM-2.5[d,h]	1.7 E-02	3.3 E-01
--	PM-10[e,g]	2.5 E-02	4.7 E-01
7446-09-5	Sulfur dioxide (SO_2)	4.2 E-06	7.0 E-05
--	TNMHC	1.9 E-04	3.2 E-03
12789-66-1	TSP[f]	2.6 E-02	4.9 E-01

[a] Factors represent uncontrolled emissions. References 1-8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 6.00 E-02 pounds per item. Reference 9.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.
[f] EMISSION FACTOR RATING A.
[g] EMISSION FACTOR RATING B.
[h] EMISSION FACTOR RATING D.

Table 15.8.19-2 EMISSION FACTORS FOR THE USE OF DODIC L709, M25 TARGET HIT SIMULATOR - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-07-0	Acetaldehyde[d]	6.5 E-07	1.1 E-05
75-05-8	Acetonitrile[d,h]	3.7 E-04	6.2 E-03
98-86-2	Acetophenone[d,g]	4.6 E-07	7.7 E-06
7429-90-5	Aluminum[e,g]	2.4 E-05	4.3 E-04
7440-36-0	Antimony[d]	2.8 E-07	4.7 E-06
7440-39-3	Barium[e]	2.4 E-04	4.7 E-03
71-43-2	Benzene[d,h]	2.4 E-06	4.2 E-05
7440-41-7	Beryllium[d]	3.6 E-09	5.9 E-08
7440-43-9	Cadmium[d]	7.5 E-08	1.3 E-06
75-15-0	Carbon disulfide[d,g]	1.7 E-06	3.2 E-05
74-87-3	Chloromethane[d]	1.8 E-08	3.6 E-07
7440-47-3	Chromium[d,h]	1.1 E-07	2.2 E-06
7440-50-8	Copper[e,h]	1.3 E-06	2.3 E-05
4170-30-3	Crotonaldehyde[e]	3.2 E-07	5.3 E-06
131-11-3	Dimethyl phthalate[d,h]	5.0 E-08	8.4 E-07
--	Total dioxin/furan compounds[d,h]	9.9 E-09	1.6 E-07
100-41-4	Ethylbenzene[d,h]	9.1 E-08	1.8 E-06
117-81-7	bis(2-Ethylhexyl)phthalate[d,h]	5.2 E-06	1.0 E-04
206-44-0	Fluoranthene[d]	4.0 E-09	7.8 E-08
86-73-7	Fluorene[f]	1.6 E-10	3.1 E-09
50-00-0	Formaldehyde[d,g]	1.3 E-06	2.2 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[d,h]	7.2 E-10	1.2 E-08
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[d,h]	3.3 E-09	5.5 E-08
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[d,h]	7.8 E-10	1.3 E-08
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[d,h]	5.1 E-10	8.5 E-09
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[d,h]	3.7 E-10	6.1 E-09
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[d,h]	7.2 E-10	1.2 E-08
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[d,h]	2.4 E-09	3.9 E-08
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[d,h]	9.1 E-10	1.5 E-08
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran[d,h]	2.9 E-10	4.9 E-09

Table 15.8.19-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[d,h]	9.0 E-10	1.5 E-08
7647-01-0	Hydrochloric acid[d]	5.7 E-05	1.1 E-03
7439-92-1	Lead[d]	2.1 E-05	3.8 E-04
7439-96-5	Manganese[d,g]	1.9 E-06	3.5 E-05
91-57-6	2-Methylnaphthalene[f]	5.1 E-08	8.5 E-07
91-20-3	Naphthalene[d]	2.5 E-07	4.1 E-06
7440-02-0	Nickel[d]	4.7 E-08	7.8 E-07
7697-37-2	Nitric acid[e]	3.8 E-06	7.3 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[d,h]	8.9 E-10	1.5 E-08
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[d,h]	3.4 E-09	5.6 E-08
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin[d,h]	4.9 E-10	8.1 E-09
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran[d,h]	4.7 E-10	7.8 E-09
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[d,h]	1.3 E-09	2.2 E-08
85-01-8	Phenanthrene[d]	4.8 E-08	8.0 E-07
108-95-2	Phenol[d,g]	2.2 E-07	3.7 E-06
7723-14-0	Phosphorus[f,g]	4.4 E-06	7.3 E-05
100-42-5	Styrene[d]	4.1 E-06	6.9 E-05
7664-93-9	Sulfuric acid[e]	1.6 E-04	3.1 E-03
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[d]	6.9 E-10	1.1 E-08
7440-28-0	Thallium[e]	1.9 E-08	3.2 E-07
108-88-3	Toluene[d,h]	4.3 E-07	7.4 E-06
71-55-6	1,1,1-Trichloroethane[d,h]	1.2 E-07	2.3 E-06
95-63-6	1,2,4-Trimethylbenzene[e]	6.7 E-07	1.1 E-05
7440-62-2	Vanadium[e]	1.6 E-05	3.2 E-04
106-42-3, 108-38-3	m-Xylene, p-Xylene[d]	1.8 E-07	3.3 E-06
95-47-6	o-Xylene[d,h]	1.4 E-07	2.7 E-06
7440-66-6	Zinc[e]	1.5 E-06	2.5 E-05

Table 15.8.19-2 (cont.)

[a] Factors represent uncontrolled emissions. References 1-8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 6.00 E-02 pounds per item. Reference 9.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING B.
[h] EMISSION FACTOR RATING D.

References For Section 15.8.19

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. *Sampling Results for AEC Phase V Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics, Revision 1*, URS Group, Inc., Oak Ridge, TN, February 2007.

4. *Detailed Test Plan for Phase V Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, October 2003.

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.

6. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Group, Inc., Oak Ridge, TN, January 2006 and February 2007.

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 2 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

8. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase V-B Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, November 2007.

9. *Munitions Items Disposition Action System (MIDAS)* website, https://midas.dac.army.mil/, U.S. Army Defense Ammunition Center, McAlester, OK, November 2006.

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15.8.20 L720, M26 Target Kill Simulator

15.8.20.1 Ordnance Description[1]

The M26 Target Kill Simulator (DODIC L720) is a pyrotechnic device that is designed to provide a visual and audible signal to gunners/crews to indicate that an armored target has been killed. The simulator is placed in a pit near a tank silhouette or target, usually made of plywood. If the target is killed, the simulator produces a flash, bang, and shower of sparks. This ammunition is used on firing ranges during training; it is not used during combat.

The M26 Target Kill Simulator consists of an outer plastic case encompassing two sections that are joined together. The upper section contains the ignition leads and plugs designed to initiate the cartridge contained within the lower section. A pyrotechnic charge and electrical igniter assembly are contained in the lower section. The pyrotechnic charge includes a match composition, a priming paste, an ignition composition, and a bursting composition.

15.8.20.2 Emissions And Controls[1-5]

The primary emissions from the use of the M26 Target Kill Simulator are 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 15.8.20-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.8.20-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.8.20-1 EMISSION FACTORS FOR THE USE OF DODIC L720, M26 TARGET KILL SIMULATOR - 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	3.9 E-01	2.9 E-01
630-08-0	CO	2.1 E-01	1.5 E-01
74-82-8	Methane[f]	1.2 E-04	8.9 E-05
--	Oxides of nitrogen (NO_x)	4.4 E-04	3.2 E-04
--	PM-2.5[d,f]	2.7 E-02	2.0 E-02
--	PM-10[e]	5.2 E-02	3.8 E-02
7446-09-5	Sulfur dioxide (SO_2)[f]	3.2 E-05	2.4 E-05
12789-66-1	TSP	6.8 E-02	5.0 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 1.35 pounds per item. Reference 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 C.

Table 15.8.20-2 EMISSION FACTORS FOR THE USE OF DODIC L720, M26 TARGET KILL SIMULATOR - 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]	1.9 E-06	1.4 E-06
208-96-8	Acenaphthylene[d]	3.2 E-04	2.4 E-04
75-07-0	Acetaldehyde[e]	1.1 E-05	7.8 E-06
75-05-8	Acetonitrile[e,g]	1.5 E-06	1.1 E-06
107-02-8	Acrolein[e]	1.8 E-05	1.3 E-05
107-13-1	Acrylonitrile[e,g]	3.2 E-07	2.4 E-07
120-12-7	Anthracene[e]	7.6 E-06	5.6 E-06
71-43-2	Benzene[e]	3.8 E-03	2.8 E-03
56-55-3	Benzo[a]anthracene[e]	6.6 E-06	4.9 E-06
205-99-2	Benzo[b]fluoranthene[e]	2.7 E-05	2.0 E-05
207-08-9	Benzo[k]fluoranthene[e]	3.5 E-05	2.6 E-05
191-24-2	Benzo[g,h,i]perylene[e]	8.4 E-06	6.3 E-06
50-32-8	Benzo[a]pyrene[e]	8.9 E-06	6.6 E-06
192-97-2	Benzo[e]pyrene[d]	5.6 E-06	4.2 E-06
106-99-0	1,3-Butadiene[e]	4.9 E-05	3.6 E-05
75-15-0	Carbon disulfide[e,g]	2.4 E-06	1.8 E-06
108-90-7	Chlorobenzene[e]	8.0 E-07	6.0 E-07
74-87-3	Chloromethane[e]	2.3 E-06	1.7 E-06
218-01-9	Chrysene[e]	8.9 E-06	6.6 E-06
53-70-3	Dibenz[a,h]anthracene[e]	6.6 E-07	4.9 E-07
107-06-2	1,2-Dichloroethane[e,h]	7.8 E-06	5.8 E-06
--	Total dioxin/furan compounds[e]	4.1 E-12	3.0 E-12
100-41-4	Ethylbenzene[e]	3.8 E-06	2.8 E-06
74-85-1	Ethylene[g]	1.1 E-03	8.4 E-04
117-81-7	bis(2-Ethylhexyl)phthalate[f]	3.4 E-06	2.5 E-06
206-44-0	Fluoranthene[e]	4.1 E-05	3.0 E-05
86-73-7	Fluorene[d]	4.5 E-06	3.3 E-06
50-00-0	Formaldehyde[e]	7.4 E-07	5.5 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e,g]	1.9 E-13	1.4 E-13
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	6.0 E-13	4.4 E-13

Table 15.8.20-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[e]	2.4 E-13	1.8 E-13
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[e,h]	2.4 E-13	1.8 E-13
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[e]	2.0 E-13	1.5 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[e]	1.7 E-13	1.3 E-13
7647-01-0	Hydrochloric acid[e]	1.3 E-05	9.7 E-06
193-39-5	Indeno[1,2,3-cd]pyrene[e]	1.7 E-05	1.2 E-05
75-09-2	Methylene chloride[e]	2.4 E-06	1.8 E-06
91-57-6	2-Methylnaphthalene[d]	4.6 E-05	3.4 E-05
91-20-3	Naphthalene[e]	1.0 E-03	7.7 E-04
7440-02-0	Nickel[e,g]	6.1 E-06	4.5 E-06
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e]	1.2 E-12	9.0 E-13
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran[e]	1.5 E-13	1.1 E-13
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[e]	2.2 E-13	1.6 E-13
85-01-8	Phenanthrene[e]	4.2 E-05	3.1 E-05
115-07-1	Propylene[f,g]	1.5 E-04	1.1 E-04
129-00-0	Pyrene[d]	2.5 E-05	1.9 E-05
100-42-5	Styrene[e]	2.4 E-04	1.8 E-04
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[e]	9.1 E-13	6.7 E-13
108-88-3	Toluene[e]	2.1 E-04	1.5 E-04
75-01-4	Vinyl chloride[e]	3.1 E-07	2.3 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	6.9 E-06	5.1 E-06
95-47-6	o-Xylene[e]	2.6 E-06	2.0 E-06

[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 1.35 pounds per item. Reference 5.
[d] Reportable chemical under EPCRA Section 313.
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING B.
[h] EMISSION FACTOR RATING D.

References For Section 15.8.20

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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15.8.21 L508, M72 Red Railroad Warning Fusee

15.8.21.1 Ordnance Description[1,2]

The M72 Red Railroad Warning Fusee (DODIC L508) is a flare that is used to outline emergency airfield boundaries under poor visibility conditions and for recognition and signaling along railroad rights-of-way. The flare resembles a standard roadside flare used to warn motorists of a traffic obstruction. This item is used during combat and on firing ranges during training.

The M72 Red Railroad Warning Fusee consists of a cylindrical paper tube filled with a red flare composition. The base of the tube is sealed with a wooden block from which a spike protrudes approximately 1.5 inches. The spike is used for securing the fusee to the ground or to soft wood surfaces. Embedded in the firing end of the flare composition are a priming charge and a friction type initiator. The initiator ignites the priming charge, and the priming charge ignites the flare composition. Burning time is 10, 15, or 20 minutes.

15.8.21.2 Emissions And Controls[1-4]

Carbon dioxide (CO_2) is the primary pollutant emitted from the use of the M72 Red Railroad Warning Fusee. 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 very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.21-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.21-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per 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).

Table 15.8.21-1 EMISSION FACTORS FOR THE USE OF DODIC L508, M72 RED RAILROAD WARNING FUSEE - 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
124-38-9	CO_2	8.5 E-02
630-08-0	Carbon monoxide (CO)	2.1 E-03
--	Oxides of nitrogen (NO_x)[e]	9.7 E-03
--	PM-2.5[c,e]	4.4 E-03
--	PM-10[d]	4.6 E-03
7446-09-5	Sulfur dioxide (SO_2)[f]	5.6 E-03
--	TNMHC	2.6 E-04
12789-66-1	TSP[e]	4.9 E-03

[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 A.
[f] EMISSION FACTOR RATING C.

Table 15.8.21-2 EMISSION FACTORS FOR THE USE OF DODIC L508, M72 RED RAILROAD WARNING FUSEE - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item
208-96-8	Acenaphthylene[c]	5.0 E-08
75-05-8	Acetonitrile[d]	3.4 E-06
98-86-2	Acetophenone[d,g]	5.7 E-07
107-02-8	Acrolein[d,g]	9.0 E-06
107-13-1	Acrylonitrile[d]	9.3 E-07
7664-41-7	Ammonia[e]	6.7 E-06
71-43-2	Benzene[d]	2.7 E-05
75-15-0	Carbon disulfide[d,g]	1.2 E-06
7440-47-3	Chromium[d]	3.7 E-07
132-64-9	Dibenzofuran[d]	7.2 E-08
--	Total dioxin/furan compounds[d]	1.5 E-11
100-41-4	Ethylbenzene[d]	6.2 E-07
74-85-1	Ethylene[e,g]	9.8 E-05
117-81-7	bis(2-Ethylhexyl)phthalate[d,h]	4.4 E-07
86-73-7	Fluorene[c]	3.3 E-08
50-00-0	Formaldehyde[d]	3.8 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[d]	3.6 E-12
7647-01-0	Hydrochloric acid[d,g]	9.0 E-05
75-09-2	Methylene chloride[d,h]	2.0 E-06
91-57-6	2-Methylnaphthalene[c]	3.8 E-07
91-20-3	Naphthalene[d]	1.6 E-06
7440-02-0	Nickel[d]	3.8 E-07
55-63-0	Nitroglycerin[e,h]	2.6 E-07
88-75-5	2-Nitrophenol[e]	7.1 E-07
100-02-7	4-Nitrophenol[d]	6.1 E-07
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[d]	8.0 E-12
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[d]	3.0 E-12
85-01-8	Phenanthrene[d]	8.0 E-08
108-95-2	Phenol[d,g]	5.0 E-07
115-07-1	Propylene[e,f]	3.5 E-05

Table 15.8.21-2 (cont.)

CASRN[b]	Pollutant	lb per item
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[d,h]	1.3 E-13
7440-28-0	Thallium[e]	7.1 E-08
108-88-3	Toluene[d]	6.4 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene[d]	9.2 E-07
95-47-6	o-Xylene[de,g]	5.0 E-07
7440-66-6	Zinc	7.7 E-06

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] Hazardous air pollutant under CAA Section 112(b).
[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 B.
[h] EMISSION FACTOR RATING D.

References For Section 15.8.21

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.

15.8.22 L595, M9 Liquid Projectile Air Burst Simulator

15.8.22.1 Ordnance Description[1,2]

The M9 Liquid Projectile Air Burst Simulator (DODIC L595) simulates a toxic rain attack when used and provides realistic chemical defense training for Army troops. Five simulators will produce a 50-meter wide band of toxic agent stimulant 100 meters downwind of the firing point. This item is used on firing ranges during training; it is not used during combat.

15.8.22.2 Emissions And Controls[1-4]

Primary emissions from the use of the M9 Liquid Projectile Air Burst Simulator include carbon dioxide (CO_2) and particulate matter. Criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at very low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.8.22-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.8.22-2 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 15.8.22-1 EMISSION FACTORS FOR THE USE OF DODIC L595, M9 LIQUID PROJECTILE AIR BURST SIMULATOR - 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	8.9 E-03	6.5 E-02
630-08-0	Carbon monoxide (CO)	1.3 E-03	9.0 E-03
7439-92-1	Lead (Pb)	4.2 E-06	3.0 E-05
74-82-8	Methane[g]	8.1 E-05	5.9 E-04
--	Oxides of nitrogen (NO_x)[f]	6.1 E-04	4.4 E-03
--	PM-2.5[d]	4.9 E-03	3.6 E-02
--	PM-10[e,g]	5.5 E-03	4.0 E-02
12789-66-1	TSP[b,f]	5.4 E-03	3.9 E-02

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.38 E-01 pounds per item. Reference 1.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.
[f] EMISSION FACTOR RATING A.
[g] EMISSION FACTOR RATING C.

Table 15.8.22-2 EMISSION FACTORS FOR THE USE OF DODIC L595, M9 LIQUID PROJECTILE AIR BURST SIMULATOR - 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]	1.8 E-04	1.3 E-03
7429-90-5	Aluminum[e]	1.1 E-07	7.7 E-07
7664-41-7	Ammonia[e]	5.4 E-06	3.9 E-05
120-12-7	Anthracene[d]	6.3 E-08	4.5 E-07
71-43-2	Benzene[d]	2.7 E-06	2.0 E-05
75-15-0	Carbon disulfide[d]	8.8 E-06	6.4 E-05
7440-50-8	Copper[e]	8.9 E-07	6.4 E-06
98-82-8	Cumene[d]	8.8 E-07	6.4 E-06
53-70-3	Dibenz[a,h]anthracene[d]	1.2 E-09	8.4 E-09
--	Total dioxin/furan compounds[d]	3.7 E-12	2.7 E-11
74-85-1	Ethylene[e]	3.6 E-05	2.6 E-04
50-00-0	Formaldehyde[d,f]	9.4 E-06	6.8 E-05
7647-01-0	Hydrochloric acid[d,f]	6.2 E-06	4.5 E-05
193-39-5	Indeno[1,2,3-cd]pyrene[d]	1.2 E-09	8.9 E-09
7439-92-1	Lead[d]	4.2 E-06	3.0 E-05
75-09-2	Methylene chloride[d]	3.0 E-06	2.2 E-05
7440-02-0	Nickel[d]	4.9 E-07	3.6 E-06
7697-37-2	Nitric acid[e,f]	8.2 E-06	6.0 E-05
123-38-6	Propionaldehyde[d,g]	7.7 E-07	5.6 E-06
100-42-5	Styrene[d,f]	4.6 E-06	3.3 E-05
7664-93-9	Sulfuric acid[e]	1.1 E-03	7.6 E-03
7440-28-0	Thallium[e]	4.1 E-07	2.9 E-06
108-88-3	Toluene[d]	1.0 E-06	7.3 E-06
7440-66-6	Zinc[e,g]	5.1 E-07	3.7 E-06

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.38 E-01 pounds per item. Reference 1.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] EMISSION FACTOR RATING B.
[g] EMISSION FACTOR RATING D.

References For Section 15.8.22

1. *Report No. 12 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, April 2008.

2. *Detailed Test Plan No. 12 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, June 2005.

3. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 12 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2009.

4. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team – Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, May and October 2008.

15.8.23 Updates Since August 2004

Section 15.8 was created during August 2004. Revisions to this section since that date are summarized below.

Revision 6, July 2009

- Section 15.8.22, which presents emission factors for DODIC L595, the M9 Liquid Projectile Air Burst Simulator, was added.

Revision 5, June 2008

- Section 15.8.8, which presents emission factors for DODIC L367, the M22 Anti-Tank Guided Missile and Rocket Launching Simulator, was added.
- Section 15.8.16, which presents emission factors for DODIC L410, the M206 Aircraft Countermeasure Flare, was added.
- Section 15.8.21, which presents emission factors for DODIC L508, the M72 Red Railroad Warning Fusee, was added.

Revision 4, November 2007

- Section 15.8.17, which presents emission factors for DODIC L592, the TOW Blast Simulator, was added.
- Section 15.8.19, which presents emission factors for DODIC L709, the M25 Target-hit Simulator, was updated to include additional data.

Revision 3, June 2007

- Section 15.8.7, which presents emission factors for DODIC L366, the M74A1 Air Burst Projectile Simulator, was added.
- Section 15.8.18, which presents emission factors for DODIC L602, the M21 Artillery Flash Simulator, was added.
- Where present, data regarding the average annual quantities of ordnance used on Army installations during training exercises were deleted because the quantities used vary from installation to installation and from year to year.

Revision 2, September 2006

- Section 15.8.20, which presents emission factors for DODIC L720, the M25 Target Kill Simulator, was added.

Revision 1, July 2006

- The methodology used to assign emission factor ratings was revised as described in the associated background documents.
- Minor formatting changes were made to several sections.

- Section 15.8.2, which presents emission factors for DODIC L306, M158 Red Star Cluster Signal Flare, was added.
- Section 15.8.3, which presents emission factors for DODIC L307, M159 White Star Cluster Signal Flare, was added.
- Section 15.8.4, which presents emission factors for DODIC L311, M126A1 Red Star Parachute Signal Flare, was added.
- Section 15.8.9, which presents emission factors for DODIC L495, M49A1 Surface Trip Flare, was added.
- Section 15.8.19, which presents emission factors for DODIC L709, M25 Target-hit Simulator, was added.