15.4 Projectiles, Canisters, and Charges

Munitions listed in this section begin with the Department of Defense Identification Code (DODIC) letter "D." A variety of munitions fall under this category, including bursters, projectiles, canisters, and charges. Examples include illumination rounds and propellant bags.

15.4.1 D505, M485A2 155 mm Illumination Round

15.4.1.1 Ordnance Description[1]

The M485A2 155 mm Illumination Round (DODIC D505) is a relatively large pyrotechnic device that is used to spot infiltrating troops by lighting up the field. It is fired from a 155 mm howitzer, a cannon used for firing projectiles at medium muzzle velocities and with relatively high trajectories. A propellant charge carries the round to a height of about 1,800 feet. The propellant charge is not included in these emission factors. The illumination charge then activates and a parachute opens, creating a bright light that lasts for about 2 minutes as the parachute drifts to the ground.

The M485A2 155 mm Illumination Round is used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, three M485A2 155 mm Illumination Rounds are used during each training event, which occur approximately five times a year at a given training facility.

The M485A2 155 mm Illumination Round contains a pyrotechnic charge that provides the bright light. This charge is made up mostly of sodium nitrate and magnesium powder.

15.4.1.2 Emissions and Controls[2-5]

The primary emissions from the detonation of the M485A2 155 mm Illumination Round are particulate matter and carbon dioxide (CO_2). Other criteria pollutants, hazardous air pollutants in 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 detonated in the field, there are no controls associated with its use.

Table 15.4.1-1 presents emission factors for CO_2, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.4.1-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.4.1-1 EMISSION FACTORS FOR THE DETONATION OF DODIC D505, M485A2 155 mm ILLUMINATION ROUND – CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: C

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	1.8	3.0 E-01
630-08-0	Carbon monoxide (CO)	2.6 E-02	4.3 E-03
7439-92-1	Lead (Pb)	5.8 E-05	9.5 E-06
10102-44-0	Nitrogen dioxide (NO_2)	5.9 E-02	9.6 E-03
10102-43-9	Nitric oxide (NO)	3.9 E-03	6.4 E-04
--	Nitrogen oxides (NO_X)	9.4 E-02	1.5 E-02
--	PM-10[d]	3.0	4.9 E-01
7446-09-5	Sulfur dioxide (SO_2)	2.7 E-03	4.5 E-04
--	TNMHC	1.5 E-03	2.5 E-04
12789-66-1	TSP	2.1	3.5 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 6.123 pounds per item. Reference 4.
[d] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (μm).

Table 15.4.1-2 EMISSION FACTORS FOR THE DETONATION OF DODIC D505, M485A2 155 mm ILLUMINATION ROUND – HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-05-8	Acetonitrile[d]	2.6 E-05	4.2 E-06
98-86-2	Acetophenone[d]	7.7 E-06	1.3 E-06
107-02-8	Acrolein[d]	2.9 E-05	4.7 E-06
107-13-1	Acrylonitrile[d]	2.1 E-05	3.4 E-06
7429-90-5	Aluminum[e]	3.6 E-04	5.8 E-05
7440-36-0	Antimony[d]	2.1 E-05	3.5 E-06
7440-39-3	Barium[e]	3.9 E-04	6.4 E-05
71-43-2	Benzene[d]	1.1 E-04	1.8 E-05
7440-41-7	Beryllium[d]	2.1 E-07	3.4 E-08
123-72-8	Butanal[e]	3.5 E-06	5.7 E-07
85-68-7	Butylbenzylphthalate[e]	5.1 E-06	8.4 E-07
7440-43-9	Cadmium[d]	7.4 E-05	1.2 E-05
75-15-0	Carbon disulfide[d]	6.4 E-05	1.0 E-05
56-23-5	Carbon tetrachloride[d]	1.7 E-07	2.7 E-08
463-58-1	Carbonyl sulfide[d]	3.8 E-06	6.3 E-07
7782-50-5	Chlorine[d]	2.0 E-06	3.3 E-07
7440-47-3	Chromium[e]	7.0 E-06	1.1 E-06
7440-48-4	Cobalt[d]	1.8 E-06	3.0 E-07
7440-50-8	Copper[e]	7.6 E-05	1.2 E-05
110-82-7	Cyclohexane[e]	5.7 E-07	9.2 E-08
84-74-2	Dibutyl phthalate[d]	9.5 E-06	1.6 E-06
75-71-8	Dichlorodifluoromethane[e]	1.0 E-06	1.6 E-07
100-41-4	Ethyl benzene[d]	7.3 E-06	1.2 E-06
74-85-1	Ethylene[e]	2.8 E-04	4.6 E-05
110-54-3	n-Hexane[d]	2.6 E-06	4.3 E-07
7439-92-1	Lead[d]	5.8 E-05	9.5 E-06
7439-96-5	Manganese[d]	5.4 E-05	8.9 E-06
7439-97-6	Mercury[d]	1.2 E-08	2.0 E-09
1634-04-4	Methyl tert-butyl ether[d]	2.1 E-07	3.4 E-08

Table 15.4.1-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-09-2	Methylene chloride[d]	1.6 E-03	2.6 E-04
78-93-3	Methyl ethyl ketone[d]	1.6 E-05	2.6 E-06
91-20-3	Naphthalene[d]	1.6 E-05	2.6 E-06
7440-02-0	Nickel[d]	9.2 E-06	1.5 E-06
85-01-8	Phenanthrene[d]	3.5 E-06	5.7 E-07
7723-14-0	Phosphorus[d]	6.0 E-05	9.7 E-06
115-07-1	Propene[e]	4.3 E-05	7.0 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent	2.1 E-11	3.5 E-12
108-88-3	Toluene[d]	2.4 E-05	4.0 E-06
75-69-4	Trichloromonofluoromethane[e]	1.3 E-07	2.1 E-08
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane[e]	4.7 E-08	7.6 E-09
95-63-6	1,2,4-Trimethylbenzene[e]	2.1 E-06	3.4 E-07
540-84-1	2,2,4-Trimethylpentane[f]	4.1 E-06	6.7 E-07
108-38-3,106-42-3	m-Xylene, p-Xylene[d]	4.2 E-06	6.9 E-07
95-47-6	o-Xylene[d]	4.5 E-06	7.3 E-07
7440-66-6	Zinc[e]	1.2 E-03	1.9 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 6.123 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).

References For Section15.4.1

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5. *Background Document, Report on Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.