

Appendix J Explosives

DISTANCE FOR STORAGE:

Table J-1.—Distances for storage of explosives

Explosives		Distances in feet when storage is barricaded			
Pounds over	Pounds not over	Inhabited buildings	Passenger railways	Public highways	Separation of magazines
2	5	70	51	30	6
5	10	90	64	35	8
10	20	110	81	45	10
20	30	125	93	50	11
30	40	140	103	55	12
40	50	150	110	60	14
50	75	170	127	70	15
75	100	190	139	75	16
100	125	200	150	80	18
125	150	215	159	85	19
150	200	235	175	95	21
200	250	255	189	105	23
250	300	270	201	110	24
300	400	295	221	120	27
400	500	320	238	130	29
500	600	340	253	135	31
600	700	355	266	145	32
700	800	375	278	150	33
800	900	390	289	155	35
900	1,000	400	300	160	36
1,000	1,200	425	318	165	39
1,200	1,400	450	336	170	41
1,400	1,600	470	351	175	43
1,600	1,800	490	366	180	44

Table J-1.—Distances for storage of explosives (continued)

Explosives		Distances in feet when storage is barricaded			
Pounds over	Pounds not over	Inhabited buildings	Passenger railways	Public highways	Separation of magazines
1,800	2,000	505	378	185	45
2,000	2,500	545	408	190	49
2,500	3,000	580	432	195	52
3,000	4,000	635	474	210	58
4,000	5,000	685	513	225	61
5,000	6,000	730	546	235	65
6,000	7,000	770	573	245	68
7,000	8,000	800	600	250	72
8,000	9,000	835	624	255	75
9,000	10,000	865	645	260	78
10,000	12,000	875	687	270	82
12,000	14,000	885	723	275	87
14,000	16,000	900	756	280	90
16,000	18,000	940	786	285	94
18,000	20,000	975	813	290	98
20,000	25,000	1,055	876	315	105
25,000	30,000	1,130	933	340	112
30,000	35,000	1,205	981	360	119
35,000	40,000	1,275	1,026	380	124
40,000	45,000	1,340	1,068	400	129
45,000	50,000	1,400	1,104	420	135
50,000	55,000	1,460	1,140	440	140
55,000	60,000	1,515	1,173	455	145
60,000	65,000	1,565	1,206	470	150
65,000	70,000	1,610	1,236	485	155

Table J-1.—Distances for storage of explosives (continued)

Explosives		Distances in feet when storage is barricaded			
Pounds over	Pounds not over	Inhabited buildings	Passenger railways	Public highways	Separation of magazines
70,000	75,000	1,655	1,263	500	160
75,000	80,000	1,695	1,293	510	165
80,000	85,000	1,730	1,317	520	170
85,000	90,000	1,760	1,344	530	175
90,000	95,000	1,790	1,368	540	180
95,000	100,000	1,815	1,392	545	185
100,000	110,000	1,835	1,437	550	195
110,000	120,000	1,855	1,479	555	205
120,000	130,000	1,875	1,521	560	215
130,000	140,000	1,890	1,557	565	225
140,000	150,000	1,900	1,593	570	235
150,000	160,000	1,935	1,629	580	245
160,000	170,000	1,965	1,662	590	255
170,000	180,000	1,990	1,695	600	265
180,000	190,000	2,010	1,725	605	275
190,000	200,000	2,030	1,755	610	285
200,000	210,000	2,055	1,782	620	295
210,000	230,000	2,100	1,836	635	315
230,000	250,000	2,155	1,890	650	337
250,000	275,000	2,215	1,950	670	360
275,000	300,000	2,275	2,000	690	385

Note 1. "Explosive materials" means explosives, blasting agents, and detonators.

Note 2. "Explosives" means any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion. A list of explosives determined to be within the coverage of "18 U.S.C. Chapter 40, Importation, Manufacture, Distribution and Storage of Explosive Materials" is issued annually by the Director of the Alcohol, Tobacco, and Firearms Division.

Note 3. "Blasting agents" means any material or mixture, consisting of fuel and oxidizer, intended for blasting, not otherwise defined as an explosive, provided that the finished product, as mixed for use or shipment, cannot be detonated by means of a number 8 test blasting cap when unconfined.

Note 4. "Detonator" means any device containing a detonating charge that is used for initiating detonation in an explosive. The term includes, but is not limited to, electric blasting caps of instantaneous and delay types, blasting caps for use with safety fuses, and detonating-cord delay connectors.

Note 5. "Magazine" means any building or structure, other than an explosives manufacturing building, used for the permanent storage of explosive materials.

Note 6. "Natural barricade" means natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the magazine when the trees are bare of leaves.

Note 7. "Artificial barricade" means an artificial mound or revetted wall of earth with a minimum thickness of 3 feet.

Note 8. "Barricaded" means that a building containing explosives is effectually screened from a magazine, building, railway, or highway, either by a natural barricade, or by an artificial barricade of such height that a straight line from the top of any sidewall of the building containing explosives to the eave line of any magazine, or building, or to a point above the center of a railway or highway, will pass through such intervening natural or artificial barricade.

Note 9. "Inhabited building distance" is the minimum allowable separation between explosive storage areas and public/private places of residence or assembly, commercial facilities and utilities, recreational facilities, project visitor areas, and Government and contractor work and storage areas or places where workers gather, whether indoors or outdoors.

Note 10. "Railway" means any steam, electric, or other railroad or railway which carries passengers for hire.

Note 11. "Highway" means any street or public road. "Public Highways Class A to D" are highways with average traffic volume of 3,000 or less vehicles per day as specified in "American Civil Engineering Practice" (Abbett, Vol. 1, Table 46, Sec. 3-74, 1956 Edition, John Wiley and Sons).

Note 12. When two or more storage magazines are located on the same property, each magazine must comply with the minimum distances specified from inhabited buildings, railways, and highways, and, in addition, they should be separated from each other by not less than the distances shown for "Separation of magazines," except that the quantity of explosives contained in cap magazines shall govern in regard to the spacing of said cap magazines from magazines containing other explosives. If any two or more magazines are separated from each other by less than the specified "Separation of magazines" distances, then such two or more magazines, as a group, must be considered as one magazine, and the total quantity of explosives stored in such group must be treated as if stored in a single magazine located on the site of any magazine of the group, and must comply with the minimum distances specified from other magazines, inhabited buildings, railways, and highways.

Note 13. Storage in excess of 300,000 pounds of explosives in one magazine is prohibited.

Note 14. This table is not applicable to transportation of explosives or any handling or temporary storage necessary or incident thereto. It is not intended to apply to bombs, projectiles, or other heavily encased explosives.

For transportation purposes, the Department of Transportation in Title 49 Transportation CFR Parts 1-199 subdivides explosives into three classes:

- Class A—Maximum Hazard
- Class B—Flammable Hazard
- Class C—Minimum Hazard

Note 15. All types of blasting caps in strengths through No. 8 cap should be rated at 1½ pounds of explosives per 1,000 caps. For strengths higher than No. 8 cap, consult the manufacturer.

Note 16. For quantity and distance purposes, detonating cord of 50 or 60 grains per foot should be calculated as equivalent to 9 pounds of high explosives per 1,000 feet. Heavier or lighter core loads should be rated proportionately.

Note 17. When a building containing explosives is not barricaded, the distance shown in the above tables should be doubled.

Note 18. These tables are for minimum distances applicable to any human exposed to explosive hazards on or off Government-owned property.

Table J-2.—Recommended separation distances of ammonium nitrate and blasting agents from explosives or blasting agents¹

Donor weight		Minimum separation distance of receptor when barricaded ² (feet)		Minimum thickness of artificial barricades ⁵ (inches)
Pounds over	Pounds not over	Ammonium nitrate ³	Blasting agent ⁴	
	100	3	11	12
100	300	4	14	12
300	600	5	18	12
600	1,000	6	22	12
1,000	1,600	7	25	12
1,600	2,000	8	29	12
2,000	3,000	9	32	15
3,000	4,000	10	36	15
4,000	6,000	11	40	15
6,000	8,000	12	43	20
8,000	10,000	13	47	20
10,000	12,000	14	50	20
12,000	16,000	15	54	25
16,000	20,000	16	58	25
20,000	25,000	18	65	25
25,000	30,000	19	68	30
30,000	35,000	20	72	30
35,000	40,000	21	76	30
40,000	45,000	22	79	35
45,000	50,000	23	83	35
50,000	55,000	24	86	35
55,000	60,000	25	90	35
60,000	70,000	26	94	40
70,000	80,000	28	101	40
80,000	90,000	30	108	40

Table J-2.—Recommended separation distances of ammonium nitrate and blasting agents from explosives or blasting agents¹ (continued)

Donor weight		Minimum separation distance of receptor when barricaded ² (feet)		Minimum thickness of artificial barricades ⁵ (inches)
Pounds over	Pounds not over	Ammonium nitrate ³	Blasting agent ⁴	
90,000	100,000	32	115	40
100,000	120,000	34	122	50
120,000	140,000	37	133	50
140,000	160,000	40	144	50
160,000	180,000	44	158	50
180,000	200,000	48	173	50
200,000	220,000	52	187	60
220,000	250,000	56	202	60
250,000	275,000	60	216	60
275,000	300,000	64	230	60

Note 1. Recommended separation distances to prevent explosion of ammonium nitrate and ammonium nitrate-based blasting agents by propagation from nearby stores of high explosives or blasting agents referred to in the table as the “donor.” Ammonium nitrate, by itself, is not considered to be a donor when applying this table. Ammonium nitrate, ammonium nitrate-fuel oil or combinations thereof are acceptors. If stores of ammonium nitrate are located within the sympathetic detonation distance of explosives or blasting agents, one-half the mass of the ammonium nitrate should be included in the mass of the donor. The distances apply to the separation of stores only. The “Table of Distances” shall be used in determining separation distances from inhabited buildings, passenger railways, and public highways.

Note 2. When the ammonium nitrate gas and/or blasting agent is not barricaded, the distances shown in the table shall be multiplied by six. These distances allow for the possibility of high velocity metal fragments from mixers, hoppers, truck bodies, sheet metal structures, metal containers, and the like which may enclose the “donor.” Where storage is in bullet-resistant magazines¹ recommended for explosives or where the storage is protected by a bullet-resistant wall, distances and barricade thicknesses in excess of those prescribed in the “Table of Distances” are not required.

Note 3. The distances in the table apply to ammonium nitrate that passes the insensitivity test prescribed in the definition of ammonium nitrate fertilizer promulgated by the National Plant Food Institute;² and ammonium nitrate failing to pass said test shall be stored at separation distances determined by competent persons and approved by the authority having jurisdiction.

Note 4. The distances referred to in Note 3 apply to nitro-carbo-nitrates and blasting agents which pass the insensitivity test prescribed in the U.S. Department of Transportation (DOT) regulations.

Note 5. Earth, or sand dikes, or enclosures filled with the prescribed minimum thickness of earth or sand are acceptable artificial barricades. Natural barricades, such as hills or timber of sufficient density that the surrounding exposures, which require protection, cannot be seen from the “donor” when the trees are bare of leaves, are also acceptable.

Note 6. When the ammonium nitrate must be counted in determining the distances to be maintained from inhabited buildings, passenger railways, and public highways, it may be counted at one-half its actual weight because its blast effect is lower.

¹ For construction of bullet-resistant magazines, see *IME Publication No. 1*.

² *Definition and Test Procedures for Ammonium Nitrate, Fertilizer*, National Plant Food Institute, November 1964.

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