

CHAPTER 3 SITE SELECTION

3-1. General.

a. When selecting a site for a temporary OB/OD area, the district Office of Counsel should be consulted to determine the applicable Federal and state environmental laws and regulations. The OB/OD site must not be located in any sensitive environmental areas (e.g., wetlands, floodplains, or threatened endangered species habitats).

b. There are three distance aspects of a detonation that must be considered when siting an OB/OD area. These include the distance that fragments will be thrown, the overpressure effects, and the noise that is generated during an OE detonation. In general, the site selected for the destruction of OE will be located at the maximum practicable distance from all explosives storage areas, temporary holding magazines, inhabited buildings, public traffic routes, and operating buildings, unless engineering controls, pits, or similar aids are used to limit the range of fragments and debris. Where possible, natural barricades will be used between the OB/OD site and public areas, roads, and other field operations.

c. OB/OD sites must also be sited in relation to the direction of prevailing winds so that any sparks that are generated from the OB/OD operations will not be blown to an area where explosives are stored or where fires are likely to start. Disposal by open burning will not be undertaken when wind velocity exceeds 15 mph. Dry grass, leaves, and other extraneous combustible material in amounts sufficient to spread fire will be removed from a 61-meter (200-foot) radius from the point of destruction. The grounds shall be of well-packed earth and will be free from loose stones and deep cracks in which explosives might lodge. Explosive materials will not be burned or detonated on concrete mats. When destroying explosives by burning, the possibility that the mass of explosives may detonate must be recognized (see paragraph 2-7 for additional special siting considerations to be used in siting an OB area).

d. The design and construction of the temporary OB/OD site will take into consideration the live and dead loads that will be experienced in the area, the local soil and hydrostatic pressures, and any rain or snow loads that may be encountered. The temporary OB/OD site will not be located directly on rock strata.

e. OB/OD areas will be located in areas that provide adequate lighting and visibility.

f. OB/OD areas will not be sited near overhead power lines or near any underground utilities.

3-2. Topography. When determining potential locations for a temporary OB/OD area, maps of the local area will be reviewed prior to the site visit to locate areas that have topography preferential for locating an OB/OD area (e.g., sites remote from public areas, hillsides located between potential OB/OD area and public areas, etc.). After the map reconnaissance has been performed and potential sites have been selected, a site walk over will be conducted to determine the best potential area.

3-3. Criteria for OB/OD Area Site Layout. The following discussion introduces the general distance criteria to consider for siting a temporary OB/OD area. These distance criteria have been developed to ensure that OB/OD operations can be safely conducted.

a. Personnel Separation Distance (PSD) Criteria.

(1) The minimum separation distances required between OB/OD operations and personnel have been established in order to provide a degree of safety when establishing a temporary OB/OD area. The safe separation distance for all personnel will be the greater of the overpressure distance or the appropriate fragment range as determined by the maximum fragment range or mitigated fragment range, but never less than 61 meters (200 feet). Table 3-1 presents the default separation distances, as detailed in Chapter 5, Paragraph 5-7.c of DA Pam 385-64.

TABLE 3-1
Default Personnel Separation Distances From Aboveground Detonations¹

	Blast Overpressure Distance Meters (Feet)	Fragment/ Debris Distance Meters (Feet)
Non-fragmenting Explosive Material	$D = 130Q^{1/3}$, where Q in kg. ² ($D = 328W^{1/3}$, where W in lb.) ³	381 (1,250)
Bombs and Projectiles of Diameter Less Than 127 mm (5 Inches)	$D = 130Q^{1/3}$, where Q in kg. ($D = 328W^{1/3}$, where W in lb.)	762 (2,500)
Bombs and Projectiles With a Diameter of 127 mm (5 Inches) or More	$D = 130Q^{1/3}$, where Q in kg. ($D = 328W^{1/3}$, where W in lb.)	1219 (4,000)
All Other Ammunition	$D = 130Q^{1/3}$, where Q in kg. ($D = 328W^{1/3}$, where W in lb.)	762 (2,500)

¹ From DA Pam 385-64, Table 5-7

² Q is the Net Explosive Quantity (NEQ)

³ W is the Net Explosive Weight (NEW)

(2) If known, maximum debris throw ranges with a applicable safety factor may be used to replace the default personnel separation distances. Contact the OE Mandatory Center of Expertise (MCX) for calculation of the maximum fragmentation distance. The personnel separation distance is the maximum of this fragmentation distance, the blast overpressure distance from Table 3-1, or 61-meters (200-feet).

(3) Multiple rounds may be demolished by a single detonation (consolidated shot) using the procedures detailed in Appendix D. The personnel separation distance for a consolidated shot is calculated as shown in Appendix D.

b. Figure 3-1 provides a general layout and distance guidelines for a temporary OD area using the default personnel separation distance guidelines. The guidelines portrayed in this figure are covered in greater detail in the following paragraphs.

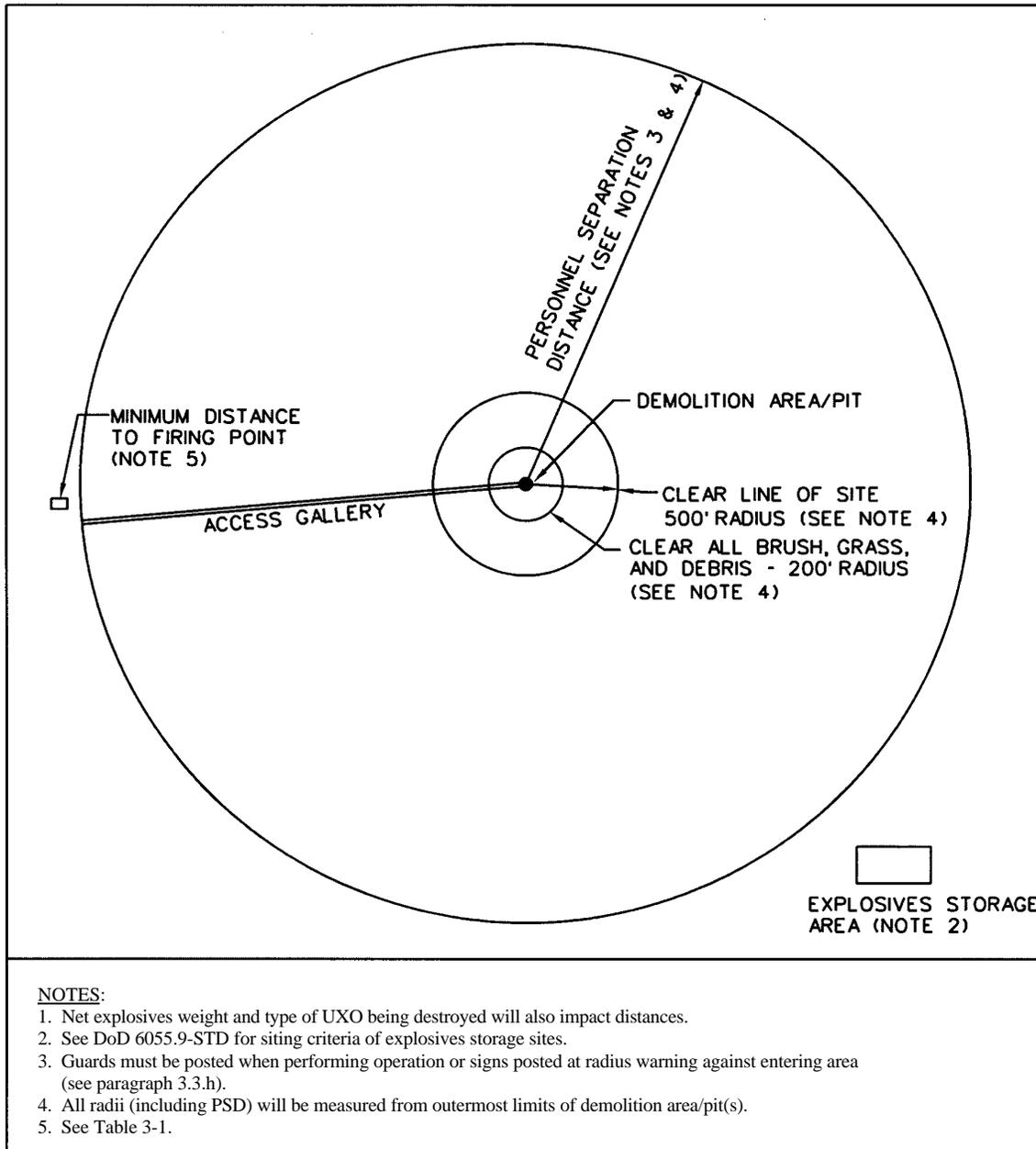


FIGURE 3-1: TEMPORARY OD AREA DISTANCE REQUIREMENTS

c. The center of the OB/OD site typically consists of a central detonation area or pit, or in the case of an OB operation, a central burning tray or burning pit. For an OD site, all combustible materials and loose stones must be cleared within a 61-meter (200-foot) radius of the center of the site.

d. Engineering controls and/or protective structures for personnel or other measures to suppress the blast and/or fragment effects may be used to reduce the required separation distance. Engineering controls will be determined on a site-specific, munition-specific basis. The designs for engineering controls must be included in the Explosives Safety Submission (ESS) and submitted to the OE MCX for review and approval. Figures 3-2 and 3-3 provide general examples of engineering controls that can be constructed where the minimum safe fragmentation distance requirement cannot be met. Tables 3-2.A and 3-2.B may be used to determine the required personnel separation distances due to overpressure when using burial as an engineering control.

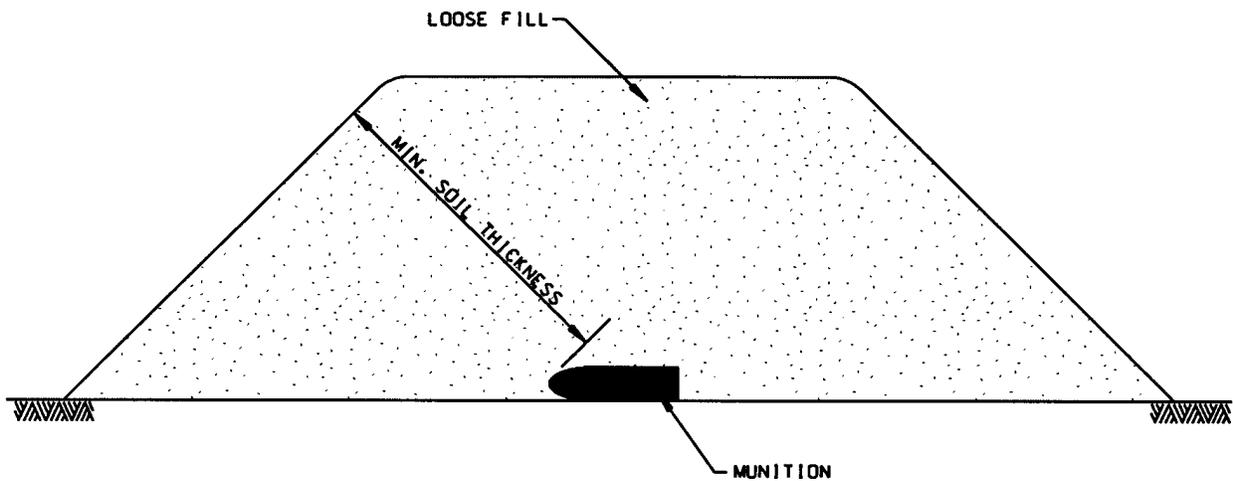


FIGURE 3-2: CROSS-SECTION OF ENGINEERING CONTROL (TAMPED EARTH) FOR INTENTIONAL DETONATION



FIGURE 3-3: SIDE VIEW – SANDBAG ENCLOSURE

e. Distance Criteria for Personnel Protective Shelters. Generally, personnel protective shelters are not used at temporary OB/OD sites; however, if personnel protective shelters are built, they will be located as far from the OD area as possible. All plans for proposed personnel protective shelters will be designed IAW DOD 6055.9-STD and Army TM 5-1300, and reviewed and approved by the OE MCX.

f. Distance Criteria for an Explosives Storage Area or Donor Explosives. The explosives storage area or donor explosives will be located outside the PSD with a separation distance IAW DOD 6055.9-STD. The actual distance to the explosives storage area will be determined by the quantity of materials being held in the explosives storage area, the amount of material being destroyed in the OD area during a single destruction event, and the type of munitions being destroyed.

g. When a temporary OB/OD site is established near radar or radio transmission facilities or near electrical energy sources where testing has shown that radio frequency (RF) energy or stray electrical current may present a hazard to electrical blasting, an approved non-electrical initiation system will be employed. The distances prescribed in Table 3-3, Table 3-4, and Table 3-5 will be used as a guide in the selection of an OB/OD site when using electric detonation in the vicinity of radar and other microwave transmissions.

h. Roadblocks must be established at the fragmentation zone perimeter of the OB/OD site. In addition, an adequate number of guards must be posted at the fragmentation zone perimeter to ensure that unauthorized personnel do not accidentally enter the PSD. A means of communication will be maintained between all site personnel conducting the OB/OD operations. Prior to the start of operations, the PSD will be searched for unauthorized personnel. Guards will then be posted to prevent entry into the OB/OD area. The guards will be posted at a distance to afford them protection from the explosive effects of the OB/OD operations.

3-4. Noise. The noise criteria that must be followed during OB/OD operations are presented in Tables 5.10 and Table 5.11 of DA PAM 385-64. Local regulators should be contacted during the planning process to determine whether there are any noise ordinances that could impact the proposed OB/OD operation.

3-5. OB Site Specific Requirements. In addition to paragraphs 3-1 through 3-6 above, the following present requirements that must be adhered to during OB operations.

a. The OB site will consist of a completely cleared square area or pad, measuring a minimum of 92 meters by 92 meters (300 feet by 300 feet). The pad will be completely cleared so that a flat bed of only sand or dirt remains. The area around the OB area will be free of all combustible material (brush, grass, debris, and leaves) for a distance of 15 meters (50 feet) beyond the square pad in all directions. Figure 3-4 presents the general distance guidelines for an OB area. In the event that these minimum distances cannot be met, engineering controls, pits, or other similar aids may be used to decrease these distance requirements.

b. Pit or trench burning is normally used when the material to be burned may detonate or become propulsive. Figure 3-5 illustrates a typical burning trench. Figure 3-5 is an example of an OE burning trench that can be used at an OB area where the minimum safe distance requirements for surface burning cannot be met.

TABLE 3-2.A
Required Blast Overpressure Protection Distance for Personnel for Detonating Ammunition for
the Purpose of Explosive Ordnance Disposal (Metric)

NEQ (kg.)	Burial Depth in Meters							
	0	0.30	0.61	0.91	1.22	1.52	3.05	4.57
	Distance Required in Meters							
0.45	100	24.1	4.9	4.9	4.9	4.9	4.9	4.9
2.27	171	79.6	31.7	12.5	8.5	8.5	8.5	8.5
4.54	215	121	58.2	28.0	13.4	10.7	10.7	10.7
9.07	271	141	99.4	55.5	31.1	17.4	13.7	13.7
13.6	311	173	112	79.2	47.9	28.7	15.5	15.5
18.1	342	198	134	100	63.4	39.9	17.1	17.1
22.7	368	220	153	106	77.7	50.3	18.3	18.3
45.4	464	300	225	169	126	99.4	23.2	23.2
68.0	531	357	278	216	168	130	32.0	26.5
90.7	585	403	321	255	203	161	46.0	29.3
113	630	442	357	289	234	189	60.4	31.4
136	669	476	390	319	262	214	74.1	33.5
159	705	507	419	347	287	237	87.8	35.4
181	737	535	446	372	310	259	101	36.9
204	766	561	471	395	332	279	114	40.8
227	793	585	494	417	353	298	127	46.9
454	1000	767	671	586	513	449	230	110
680	1145	895	796	708	630	561	312	169
907	1260	998	897	807	725	652	383	225
1134	1357	1084	983	890	807	731	447	272
1361	1442	1161	1058	964	879	801	504	317
1814	1587	1291	1187	1091	1002	921	604	397
2268	1710	1401	1296	1198	1108	1025	693	468
2722	1817	1498	1392	1293	1201	1116	772	534
3175	1912	1585	1477	1378	1284	1198	844	595
3629	2000	1663	1556	1455	1361	1273	911	652
4082	2080	1736	1628	1526	1431	1342	973	705
4536	2154	1803	1695	1593	1497	1406	1031	756

NOTES FOR TABLE 3-2.A:

1. This table is derived from DA PAM 385-64.
2. This table provides distances for protection from blast overpressure only.
3. The 0 meter column distances are for above ground or open pit detonations and are based on the formula $D = 130Q^{1/3}$ (D in meters, Q in kg.). The columns 0.30 meter through 4.57 meter are for buried detonations and are generated from the program EARTHEX. These distances assume the use of alluvium soil, a silty material which is the lightest soil type. They also assume "base weather conditions," meaning low winds and high clouds. In lieu of this table, EARTHEX is recommended for soil types other than alluvium (heavier soils may allow smaller distances), for atmospheric conditions such as low stable clouds (which may increase distances), and for interpolation between table values. EARTHEX, an IBM compatible program, is available from the U.S. Army Technical Center for Explosives Safety, ATTN: SMCAC-ES, Savanna, IL 61074-9639.

TABLE 3-2.B
**Required Blast Overpressure Protection Distance for Personnel for Detonating Ammunition for
the Purpose of Explosive Ordnance Disposal (English)**

NEW (lbs)	Burial Depth in Feet							
	0	1	2	3	4	5	10	15
	Distance Required in Feet							
1	328	79	16	16	16	16	16	16
5	561	261	104	41	28	28	28	28
10	707	398	191	92	44	35	35	35
20	890	464	326	182	102	57	45	45
30	1019	566	368	260	157	94	51	51
40	1122	650	439	329	208	131	56	56
50	1208	721	501	349	255	165	60	60
100	1522	984	737	553	414	326	76	76
150	1743	1171	911	708	550	428	105	87
200	1918	1322	1052	837	665	529	151	96
250	2066	1450	1172	948	767	620	198	103
300	2196	1562	1279	1047	858	702	243	110
350	2312	1663	1375	1137	941	778	288	116
400	2417	1755	1463	1220	1018	849	332	121
450	2514	1839	1545	1297	1089	915	375	134
500	2603	1918	1620	1369	1157	977	417	154
1000	3280	2515	2200	1924	1683	1472	754	360
1500	3755	2936	2612	2324	2067	1839	1025	556
2000	4133	3273	2943	2646	2380	2140	1258	739
2500	4452	3558	3224	2921	2647	2398	1465	894
3000	4731	3808	3471	3163	2883	2627	1652	1039
4000	5207	4236	3893	3578	3289	3023	1983	1301
5000	5609	4598	4251	3931	3635	3362	2273	1537
6000	5960	4915	4566	4241	3940	3660	2533	1752
7000	6274	5199	4847	4520	4214	3929	2769	1952
8000	6560	5457	5104	4773	4464	4175	2988	2138
9000	6823	5695	5340	5007	4695	4402	3191	2313
10000	7067	5916	5560	5225	4910	4614	3382	2479

NOTES FOR TABLE 3-2.B:

1. This table is derived from DA PAM 385-64.
2. This table provides distances for protection from blast overpressure only.
3. The 0 foot column distances are for above ground or open pit detonations and are based on the formula $D = 328W^{1/3}$ (D in feet, W in lbs.). The columns 1 foot through 15 feet are for buried detonations and are generated from the program EARTHEX. These distances assume the use of alluvium soil, a silty material which is the lightest soil type. They also assume "base weather conditions," meaning low winds and high clouds. In lieu of this table, EARTHEX is recommended for soil types other than alluvium (heavier soils may allow smaller distances), for atmospheric conditions such as low stable clouds (which may increase distances), and for interpolation between table values. EARTHEX, an IBM compatible program, is available from the U.S. Army Technical Center for Explosives Safety, ATTN: SMCAC-ES, Savanna, IL 61074-9639.

TABLE 3-3
Minimum Safe Distances Between RF Transmitters and Electric Blasting Operations¹

Transmitter Power (watts)	Minimum Safe Distance in Meters (Feet)			
	Commercial AM Broadcast Transmitters		HF Transmitters Other Than AM Broadcast	
100	228.6	(750)	228.6	(750)
500	228.6	(750)	518.2	(1,700)
1,000	228.6	(750)	731.5	(2,400)
4,000	228.6	(750)	1,463.0	(4,800)
5,000	259.1	(850)	1,676.4	(5,500)
10,000	396.2	(1,300)	2,316.5	(7,600)
25,000	609.6	(2,000)	3,657.6	(12,000)
50,000 ²	853.4	(2,800)	5,181.6	(17,000)
100,000	1,188.7	(3,900)	7,315.2	(24,000)
500,000 ³	2,682.2	(8,800)	16,764.0	(55,000)

¹ From TM 9-1300-214.

² Present maximum power of US broadcast transmitters in Commercial AM Broadcast Frequency Range (0.535 to 1.605 MHz).

³ Present maximum for international broadcast.

TABLE 3-4
Minimum Safe Distances Between TV and FM Broadcasting
Transmitters And Electric Blasting Operations¹

Effective Radiative Power (watts)	Minimum Safe Distances in Meters (Feet)					
	Channels 2 to 6 and FM		Channels 7 to 13		UHF	
Up to 1,000	304.8	(1,000)	228.6	(750)	182.9	(600)
10,000	548.6	(1,800)	396.2	(1,300)	182.9	(600)
100,000 ²	975.4	(3,200)	701.0	(2,300)	335.3	(1,100)
316,000 ³	1,310.6	(4,300)	914.4	(3,000)	442.0	(1,450)
1,000,000	1,767.8	(5,800)	1,219.2	(4,000)	610.0	(2,000)
5,000,000 ⁴	2,743.2	(9,000)	1,889.8	(6,200)	914.4	(3,000)
10,000,000	3,109.0	(10,200)	2,255.5	(7,400)	1,066.8	(3,500)
100,000,000					1,828.8	(6,000)

¹ From TM 9-1300-214.

² Present maximum power, channels 2 to 6 and FM.

³ Present maximum power, channels 7 to 13.

⁴ Present maximum power, channels 14 to 83.

TABLE 3-5
Minimum Safe Distances Between Mobile RF Transmitters
and Electric Blasting Operations¹

Transmitter Power Watts	Minimum Safe Distance in Meters (Feet)									
	MF 1.6 - 3.4 MHz Industrial		HF 28-29.7 MHz Amateur		VHF 35 - 36 MHz Pub. Use 42 - 44 MHz Pub. Use 50 - 54 MHz Amateur		VHF 144 - 148 MHz Amateur, 150.8 - 161.5 MHz Public Use		UHF 450 - 460 MHz Public Use	
5 ²										
10	12.2	(40)	30.5	(100)	12.2	(40)	4.6	(15)	3.0	(10)
50	27.4	(90)	67.0	(220)	27.4	(90)	10.7	(35)	6.1	(20)
100	38.1	(125)	94.5	(310)	39.6	(130)	15.2	(50)	9.1	(30)
180 ³							19.8	(65)	12.2	(40)
250	61.0	(200)	149.4	(490)	62.5	(205)	22.9	(75)	13.7	(45)
500 ⁴					88.4	(290)				
600 ⁵	91.4	(300)	231.6	(760)	96.0	(315)	35.0	(115)	21.3	(70)
1,000 ⁶	122.0	(400)	298.7	(980)	125.0	(410)	45.7	(150)	27.4	(90)
10,000 ⁷	381.0	(1,250)			396.2	(1,3000)				

¹ From TM 9-1300-214.

² Citizens band radio (walkie-talkie) (26.96 to 27.23 MHz) - Minimum safe distance - five feet.

³ Maximum power for 2-way mobile units in VHF (150.8 to 161.6 MHz range) and for 2-way mobile and fixed station units in UHF (450 to 460 MHz range).

⁴ Maximum power for major VHF 2-way mobile and fixed station units in 35 to 44 MHz range.

⁵ Maximum power for 2-way fixed station units in VHF (150.8 to 161.6 MHz range).

⁶ Maximum power for amateur radio mobile units.

⁷ Maximum power for some base stations in 42 to 44 MHz band and 1.6 to 1.8 MHz band.

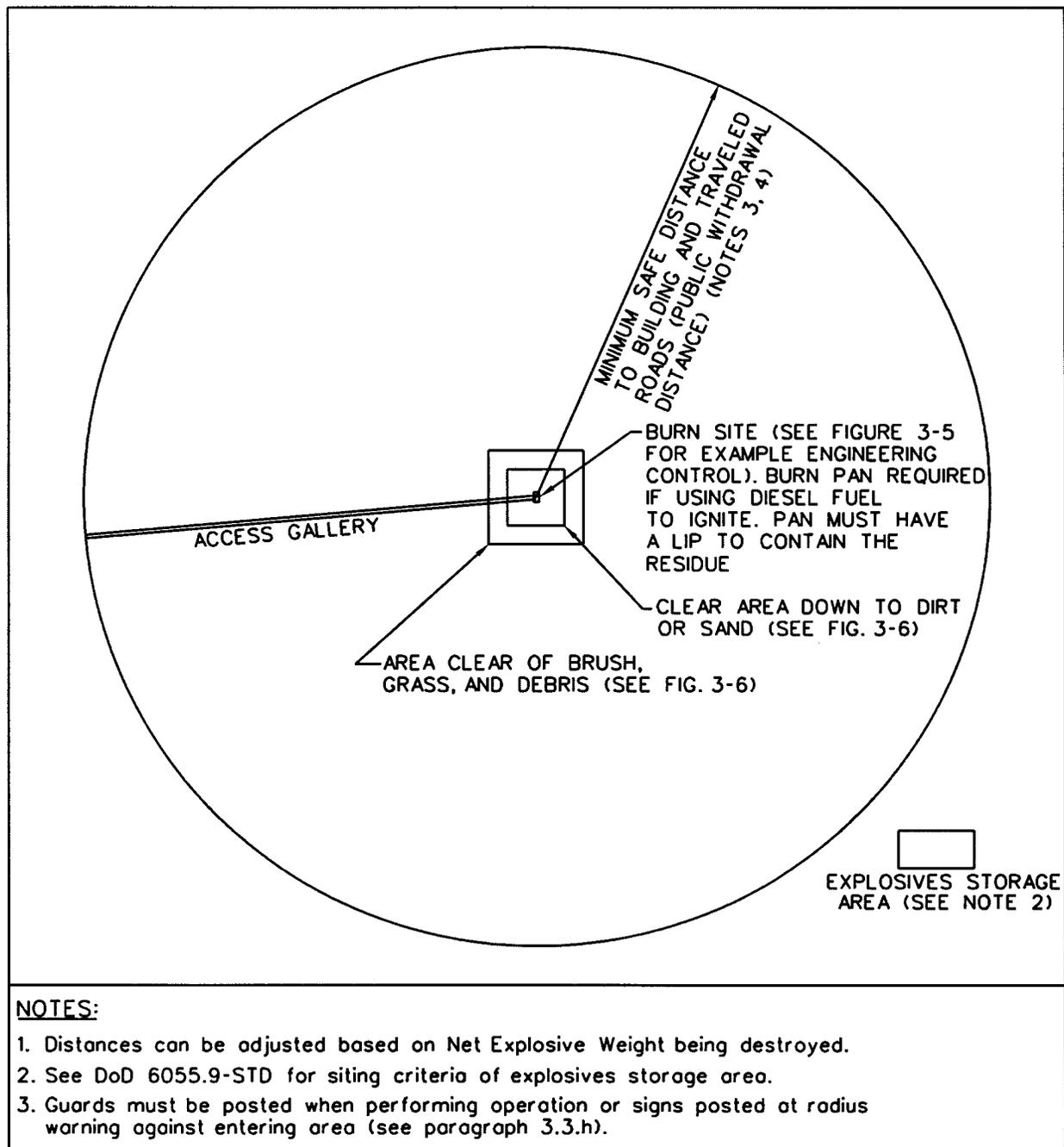


FIGURE 3-4: TEMPORARY OB AREA DISTANCE REQUIREMENTS

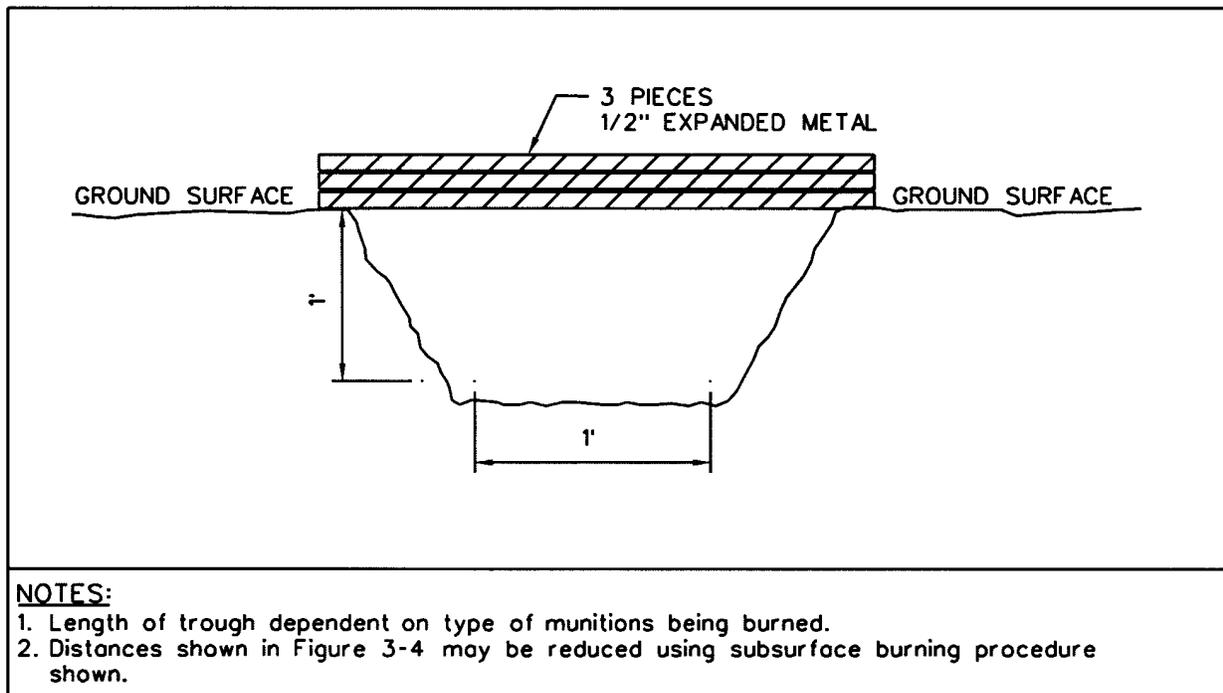


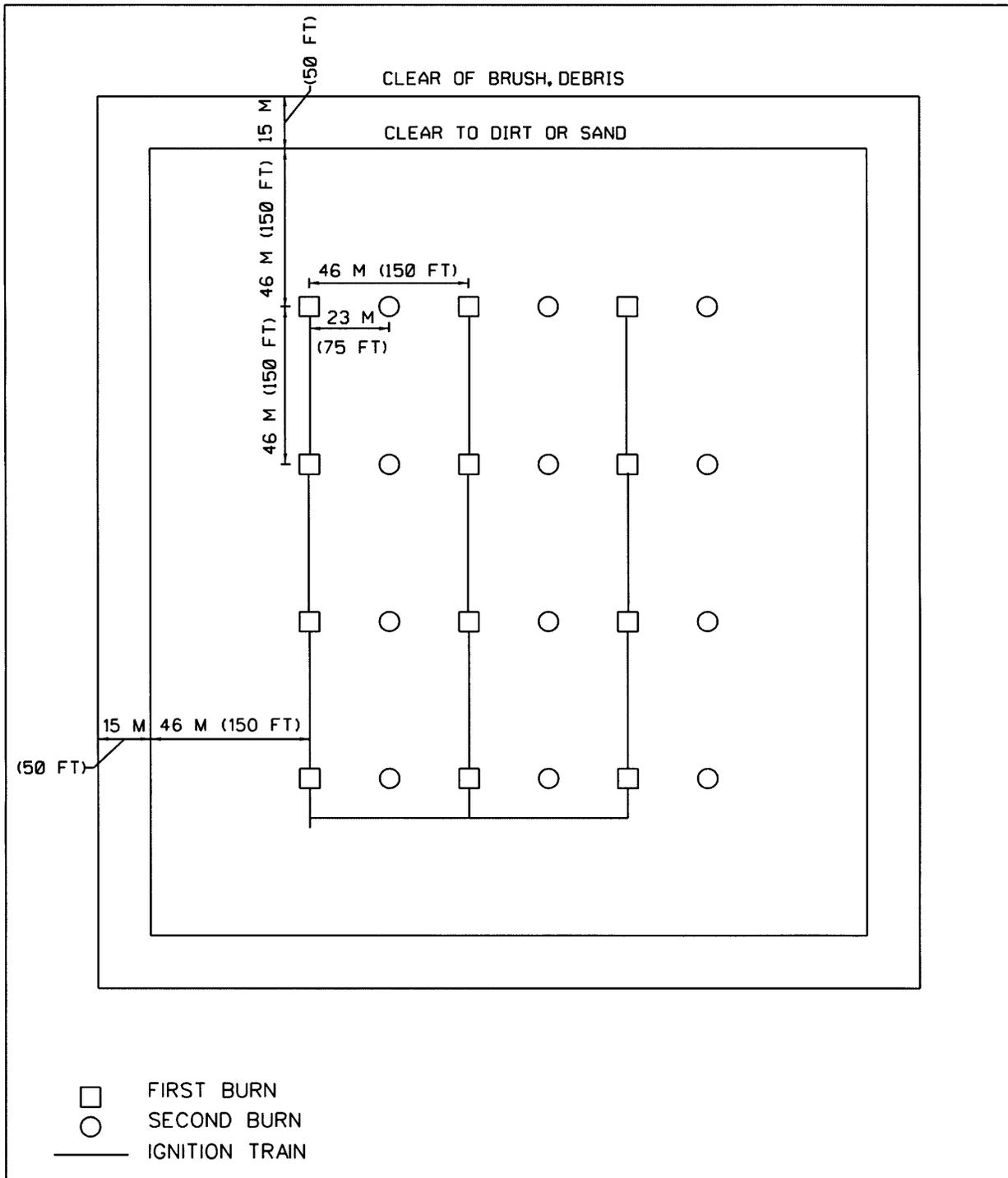
FIGURE 3-5: EXAMPLE OF BURNING TRENCH

c. Burning pans/pads will be constructed IAW DA PAM 385-64 and other applicable explosives safety regulations. All burning pans/pads will have at least a four-inch bed of sand over a burning pan for the burning of items other than propellants. Upon removal from the pan, the sand must be tested to determine if it is listed or characteristic of a hazardous waste, and then handled, packaged and treated or disposed of accordingly.

d. All burning sites will have a means of collecting and evaluating whether or not the remnants are hazardous waste. Proper disposal will then be arranged accordingly.

e. When using more than one burn area, parallel beds of explosives prepared for burning will be separated by not less than 46 meters (150 feet). In repeated burning operations, care must be taken to guard against material being ignited from smoldering residue or from heat retained in the ground. Burnings will not be repeated on previously burned-over plots for 24 hours unless the burning area has been thoroughly soaked with water and an inspection of the plot by competent personnel has been made to assure the safety of personnel during a subsequent burning operation. Figure 3-6 presents a diagram of the distances required between multiple burning pad areas.

f. Burning sites will be selected to ensure that the items to be burned are unconfined, and spread evenly over the burning site, so that the depth of the material being burned will not exceed three inches. In addition, OB sites will be constructed so that the distance between each active burning site will be sufficient to prevent a burning ember from landing on an adjoining site.



NOTES:

1. From TM 60A-1-1-31
2. When more than one pad of explosives is prepared, the pads may be connected with a continuous ignition train as shown above.
3. The distance between successive burns shall be a minimum of 23 meters (75 feet).

FIGURE 3-6: TYPICAL SURFACE BURNING AREA

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3-6. Available Facilities. If an OB/OD area has already been established at a site, the Standing Operating Procedures (SOPs) developed for the use of that site will be reviewed and incorporated into the new Work Plan, SSHP, and ESS.