

APPENDIX B

RANGE INFORMATION/DESCRIPTIONS/CELLS

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RANGE INFORMATION / DESCRIPTIONS / CELLS

Range cells included in this appendix were created, which included *historical* regulations, manuals, photos, drawings, and documents. They represent typical (general) layouts, which include firing lines, target areas, target berms, and danger areas (aka SDZ). Each cell is a two-dimensional model, which does not take into account (during time of use) terrain, boundaries, or local requirements and/or restrictions.

As stated in an obsolete Army Regulation, AR 750-10, *Range Regulations for Firing Ammunition in Time of Peace*, dated May 22, 1939, "It is obviously impossible for any general range regulation to cover each local situation completely. Such additional regulations as may be necessary to meet local condition will therefore, be prepared and enforced by the post, camp, or station commander."

When the ranges were established, regulations such as AR 750-10 (now obsolete), along with others, such as TM 9-855, *Targets, Target Material, and Training Course Lay-Outs*, dated August 17, 1944 (now obsolete) would have been referenced. These guidelines would have been applied to the local environment at the time of construction.

Where applicable, right and left firing limits and down-range limits were required and set based on the local conditions. Taking in-to account the scores of ranges and the lack of first-hand knowledge, many ranges were estimated using the best available resources. Topographic maps were analyzed to determine if terrain features could be used to limit the extent of the range.

For most sites it's likely to locate numerous historical maps displaying firing ranges drawn in a various configurations, but not necessarily with a true representation. For instance, they may show the range as nothing more than a dot, a box, circles, or a V-shaped fan. However, in rare cases, a range map displays what appears to be a true fan with a calculated danger area. In these cases, the range fans may be a true representation of the actual range boundaries, and therefore be considered for use instead of the general *Range Cells*. An example where this applies is shown below:

A historical range map found for Fort Custer, Michigan identified numerous ranges, all having range fans drawn. The fans displayed on this map appear to be proportioned, and closely represent correct angles and distances according to regulations. It is believed this map was done with a high degree of accuracy; therefore the range fans were used instead of the general *Range Cells*. Also recovered, was a document referring to the artillery range. It explained the necessity to discontinue firing of artillery on this facility because of the inconvenience of reducing the propelling charges

on 155mm Artillery Shells. The rationale behind this reduced charge was to minimize the down-range distance the projectile would travel. At charge 7 (max), a 155mm projectile had a maximum range of approximately 17,400 yards. In addition to this distance, regulations required a mandatory 1,000-yard buffer zone beyond the max range. If the max charge had been used to calculate the danger area, the downrange distance for this artillery range would have extended more than 6-miles beyond the installation boundary. Maximum distance on artillery munitions can be calculated using appropriate Ammunition Firing Tables.

Unfortunately, this detailed information is seldom available. Other options to consider are included in the following example where the use of topographic maps and site inspections were used to determine the boundaries of Spencer Mountain Rifle Range in North Carolina.

The only available map displayed the range as a small rectangular box. Documents recovered stated that the range was positioned at the base of the mountain in order to reduce the danger area. The *range cell* for a rifle range was designed to include 50 firing positions, which calculates to a width of 400 yards. However, during the site inspection, the actual width of the range was determined to be no more than 150 feet. By reducing the width of the *range cell*, and using contour lines on a topographic map the delineated boundaries was realistically reduced from the standard 1259 acres down to 72 acres.

As indicated, there are many variables to account for when developing range boundaries, and it is unlikely that all of the data used when the range was originally laid out will be available. Therefore, the historical data found during research (maps, aerial photos, documentation, etc.) was utilized to represent the range as accurately as possible. In most cases, the only option was to use the general *Range Cell*.

Each range description contains a list of Ammunition Data sheets. The intention of this list is to provide a general idea of the ordnance that could have been used on the range. It is not intended to be all-inclusive and by no-means is an indication that these munitions are actually present.

A significant number of manuals, drawings, letters, instructions, reports, and miscellaneous documents were referenced in order to calculate the *Range Cells*. The following non-inclusive list are published Range Manuals that were referenced to create the range cells.

- TR 140-5, *Range Regulations for Firing Ammunition in Time of Peace*, dated November 1931
- AR 750-10, *Range Regulations for Firing Ammunition in Time of Peace*, dated May 1939

- AAF Manual 85-0.1, *Army Air Forces Gunnery and Bombardment Ranges*, dated June 1945
- AD-A954 905, *Training in the Ground Army 1942-1945, Study No. 11*, dated May 1948
- *Second Air Force Ground Gunnery Range*, dated July 24, 1943
- TM 9-855, *Targets, Target Material, and Training Course Lay-Outs*, dated August 1944
- TM 9-855, *Targets, Target Material, and Training Course Lay-Outs*, dated November 1951
- AFM No. 66, *Poorman Flexible Gunnery Trainer*, dated March 1945
- TC 25-1, *Training Land*, dated August 1978
- TC 25-8, *Training Ranges*, dated February 1992
- AFI 13-212, Vols 1,2,3, *Space, Missile, Command, and Control, Weapons Ranges*, dated July 1994
- AR 210-21, *Army Ranges and Training Land Programs*, dated May 1997
- AR 385-62, *Regulation for Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat*, dated June 1983
- AR 385-63, *Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat*, dated November 1983

HISTORIC USE: ARTILLERY

ANTI-AIRCRAFT, up to 4.7-inch (aka: AA Range, AAA Range)

Range Type: Artillery

Cell Name(s): AA4.7

Regardless of the elevation at which the firing is conducted, the maximum ground impact range of the piece will always be considered when determining the safe field of fire of antiaircraft cannon of any caliber. In addition to the limits of fire, the danger area includes areas 1,000 yards wide, which flank both the right and left limits of fire and extends 1,000 yards beyond the maximum ground impact range.

The field of fire would have been locally determined. However, arbitrary right and left limits of 20° have been used for the range cell. The 3" A.P., M62, which has a maximum range of 15,300 yards, was selected for calculating the down-range limit for the cell.

The down range distance needs to be calculated if munitions used are suspected to be larger than 3-inch.

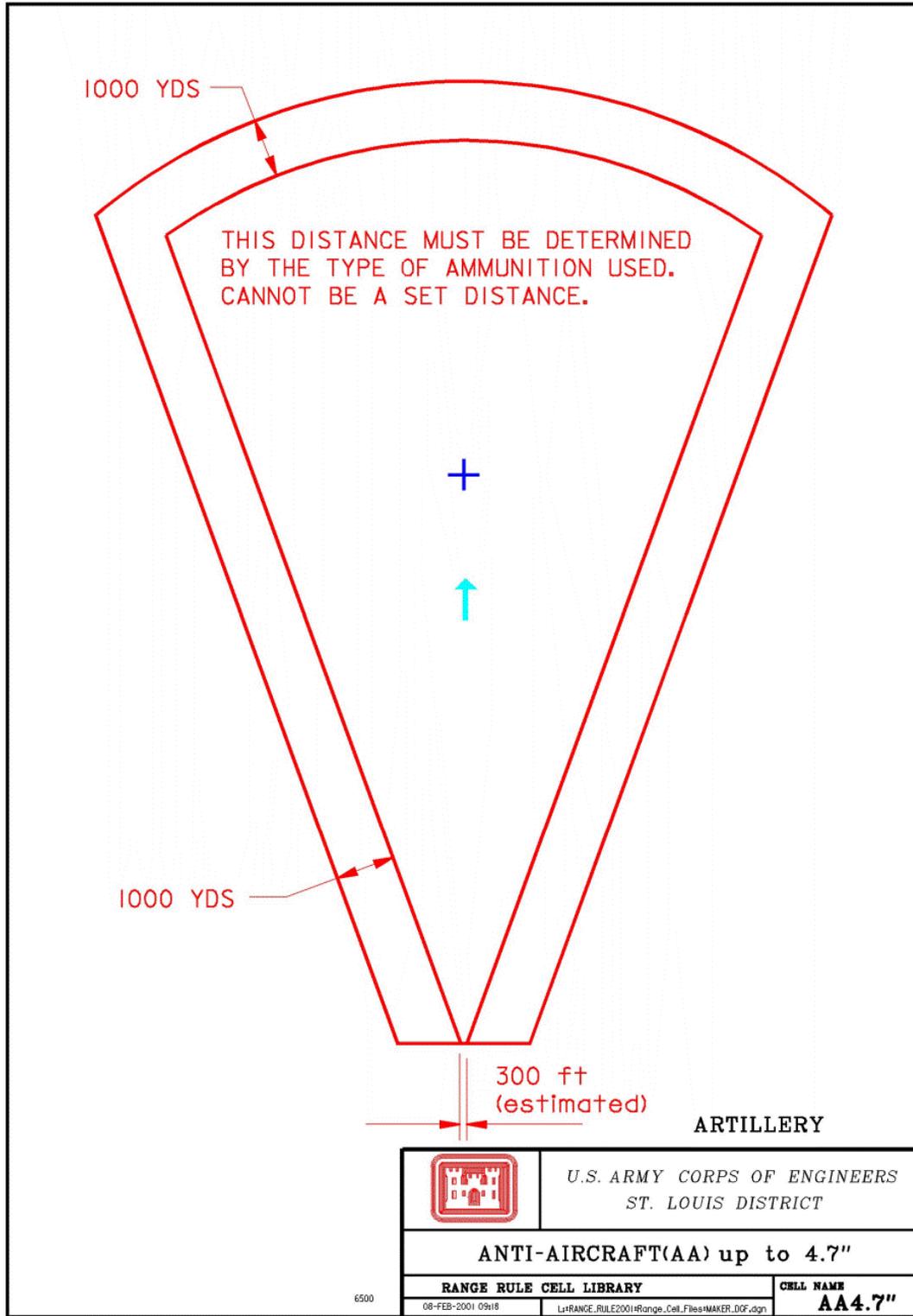
<u>Ammunition (probable)</u>	<u>Max Range (yards)</u>	<u>Muzzle Velocity (fps)</u>
.30 caliber	3,450	2,700
.50 caliber	7,500	2,545
20mm, HE, HEI, AP	6,500	2,850
37mm, HE; Practice; AP; APC	8,875	2,600
40mm, HE; AP	10,850	2,870
75mm, Shrapnel	10,450	1,825
3-inch, HE; Shrapnel, AP	15,300	2,800
90mm, HE	18,000	2,700
105mm, HE; Practice	20,000	2,800
4.7-inch, HE	28,250	3,100

Data sheet(s):

CTT01 Small arms, General
CTT11 20mm, Ball, M55A1
CTT13 37mm, AP, M74
37mm, APC, M59
37mm, APC, M54
37mm, HE, MkII
40mm, AP-T, M81
40mm, HE & HEI, MkII
75mm, AP, M72

75mm, HE M48
75mm, Shrapnel, MKI
90mm, APC, M82
90mm, AP, M77
105mm AA (currently, no data sheet available)
4.7-inch, HE, M73
CTT15 37mm, Practice, M55A1
90mm, Practice, M58

Reference(s): *AR 750-10, Range Regulations for Firing Ammunition in Time of Peace*, May 1939 – January 1944; *TM 9-855, Targets, Target Material, and Training Course Lay-outs*, August 1944 & November 1951



ARTILLERY

Range Type: Artillery

Cell Name(s): ARTILL

The danger area for an artillery range, which is based on the caliber of ammunition, consists of the impact area and danger areas to the rear, sides, and fronts. Without information concerning elevation and charge used, the impact area needs to extend out to the maximum range of the weapons. Right and left limits of fire were the responsibilities of gun crews and range personnel at the time and are generally not identified on historical documents. The safety limits for cannon positions will apply to the individual cannon, except in the case of a battery, where the limits will be measured from the flank cannons. The estimated width of the impact area is 712 mils (40°).

Coastal Defense Guns: Unlike training ranges, these sites were established for national defense, therefore, would not have been subject to range regulations. The fans typically found on historical maps generally represent sectors of fire (the sector/area in which a particular gun (or guns) was responsible). Sectors were used to ensure total coverage in the event of an attack. Do not consider these as safety fans.

Targets may have included towed or moored barges and ships or target sleeves towed by aircraft.

It is likely that if a gun were fired it would have been directed towards the center of its sector, furthest from land. This fan should be drawn so that land is not within the SDZ. However, a small insignificant, uninhabited island may not have been excluded. The fan begins from the gun position; or in the case of a battery, from the two outside guns.

<u>Caliber of Ammunition</u>	<u>Sides (yds)</u>	<u>Danger Area</u>	
		<u>Rear (yds)</u>	<u>Front (yds)</u>
37mm or less	600	2,000	200
40mm to 75mm	800	2,000	500
90mm to 155mm	800	2,000	600
7" to 240mm	1,000	2,000	1,000

* 3,000 yards if firing is less than 12° elevation

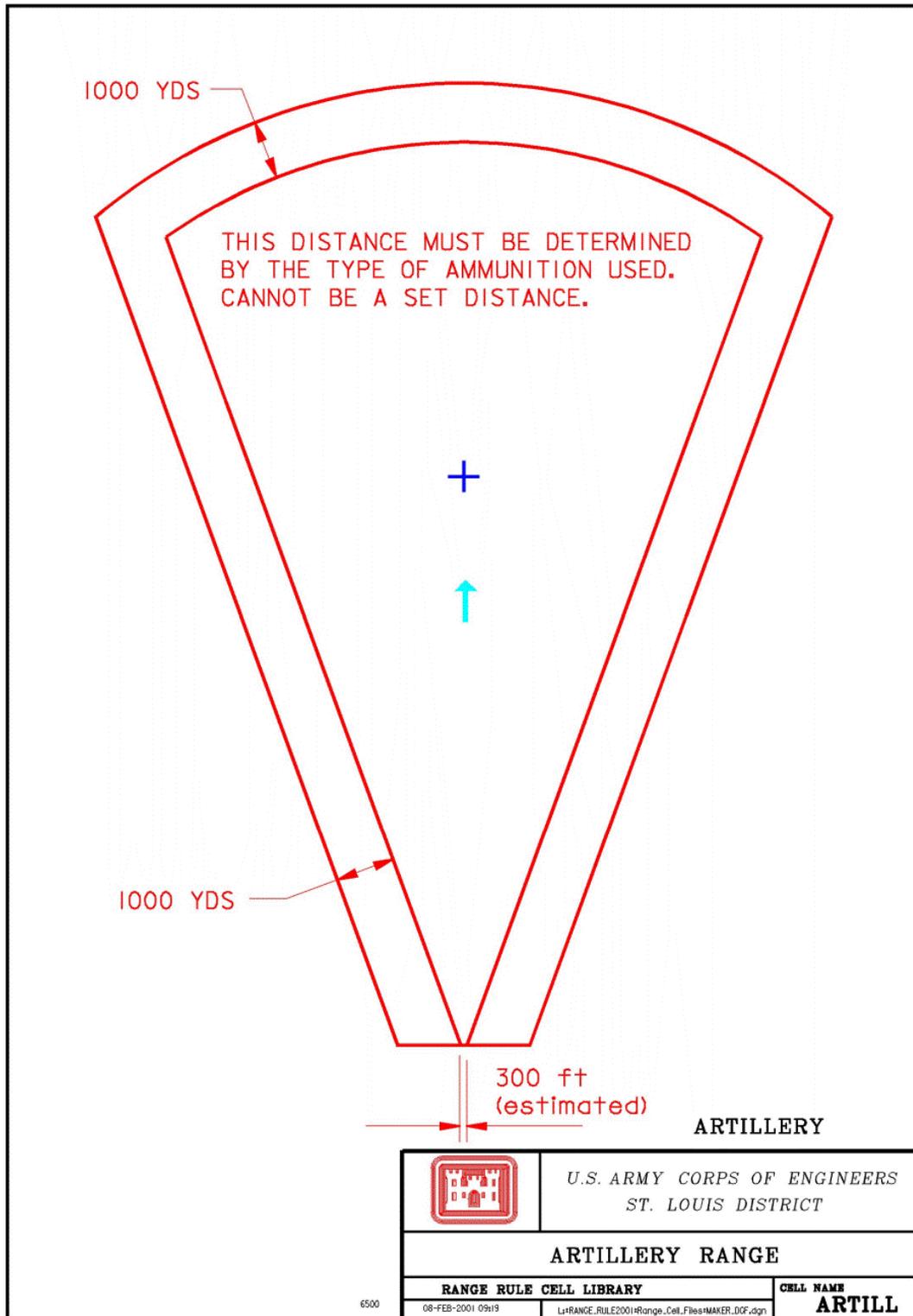
The following approximate maximum ground impact ranges can be used to estimate safety zones. The list is only a select few compiled to assist with estimating safety zones. It was not uncommon for restrictions to be placed on gun elevations and propelling charges. These restrictions were used to reduce maximum ranges in order to comply with local restrictions. Example: The maximum range for a 155mm, HE, M102 fired with charge 1 at 367 mils (20.6°) elevation is equal to 3,000 yards. The same

round fired with charge 7 at 843.8 mils (47°) elevation has a maximum range equal to 12,700 yards.

<u>Weapon</u>	<u>Ammunition</u>	<u>Elevation</u>	<u>Muzzle Vel (fps)</u>	<u>Max (approx) Range (yds)</u>
37mm gun	Fixed, HE, MkII	22° 10'	1,276	4,300
	Practice, MkII	22° 10'	1,276	4,300
75mm gun	HE, M48, normal	43° 00'	1,500	11,195
	HE, M48, supercharged	44° 00'	1,950	13,595
	HE, M48, reduced	44° 00'	950	6,960
	Shot, AP, M61	44° 00'	2,000	13,650
	Shrapnel, MkI	43° 40'	1,755	9,750
75mm pack Howitzer	HE, M48	44° 00'	1,250	9,800
105mm Howitzer, M2	HE, M1	44° 00'	1,550	12,150
	Smoke, M84	43° 40'	1,550	12,210
105mm Howitzer, M3	HE, M1	45° 00'	1,020	8,490
	Smoke, M84	45° 00'	1,020	8,490
155mm Howitzer, M19170-18	HE, M105	44° 16'	1,476	12,775
	Sand-loaded, MkI	44° 23'	1,479	12,300
	Shrapnel, MkI	47° 26'	1,434	10,850
155mm Howitzer, M1	HE, M107	44° 00'	1,850	16,000
	HE, M101	47° 00'	2,800	25,400
	Smoke, M116	45° 00'	1,850	16,200
4.5-inch Gun, M1	HE	45° 00'	2,275	21,125
8-inch Howitzer	HE, MkI	42° 30'	1,305	10,900
	Sand-loaded, MkI	43° 45'	1,525	12,700
240mm Howitzer	HE, MkII	45° 10'	1,700	16,400
	Sand-loaded, MkIII	45° 10'	1,700	16,400

Data sheet: selection depends on known or suspected ordnance. Refer to Artillery, all types.

Reference(s): *AR 750-10, Range Regulations for Firing Ammunition in Time of Peace*, May 1939 – January 1944; *TM 9-855, Targets, Target Material, and Training Course Lay-outs*, August 1944 & November 1951



RECOILLESS RIFLE, KNOWN DISTANCE (aka: Reckless Rifle, Known Distance; Recoilless Rifle, KD; Reckless Rifle, KD)

Range Type: Artillery

Cell Name(s): RERIKD

The references used to derive this range cell illustrate these types of ranges as being 800 yards long with individual lanes spread across its width. Each firing point has a 10-yard back blast area extending to each side. This indicates that the lanes would be approximately 20 yards wide. The number of lanes depends on local conditions. As illustrated in the references, 4 lanes are specified for 57mm ammunition, and two lanes for 75mm. Targets would have consisted of 55-gal drums or 3-ft by 5-ft log barriers, and positioned at 300, 500, and 800 yards for 57mm ammunition, and at 400 and 800 yards for 75mm.

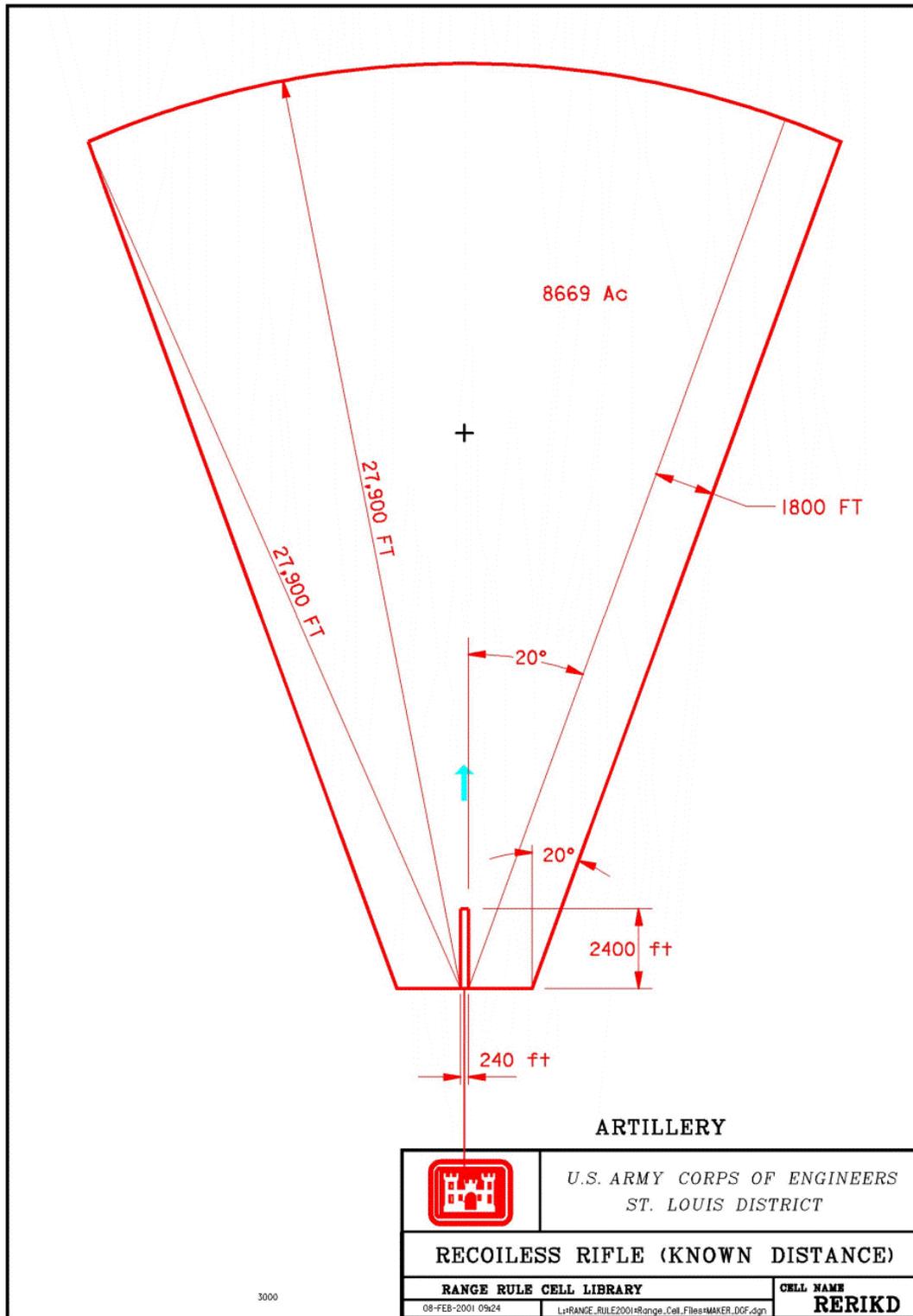
The danger area for the range consists of the impact area and danger area. The impact area extends out to the maximum range of the weapon corresponding to an elevation of 15°. Without information as to right and left limits of fire (which would have been established locally) it is estimated that limits of 20° are sufficient. Danger areas of 600 yards and 2,000 yards are added to both sides and the rear of the range, respectively.

<u>Ammunition (probable)</u>	<u>Max Range (yards)</u>	<u>Muzzle Velocity (fps)</u>
.30 caliber	3,450	2,700
.50 caliber	7,500	2,545

Data sheet(s):

CTT13 57mm Recoilless Rifle, M306A1
 57mm Recoilless Rifle, HEAT, M307
 75mm Recoilless Rifle, HE, M309A1
CTT14 57mm Recoilless Rifle, WP, M308A1
 75mm Recoilless Rifle, WP, M48A3

Reference(s): *AR 750-10, Range Regulations for Firing Ammunition in Time of Peace*, May 1939 – January 1944; *TM 9-855, Targets, Target Material, and Training Course Lay-outs*, August 1944 & November 1951



TANK (MAIN GUN)

Range Type: Artillery

Cell Name(s): Refer to artillery

A Tank Gun is considered a direct fire weapon.

HISTORIC USE: BOMBING

BOMBING TARGET, LIVE (aka: PBR, Precision Bombing Target, Bombing Range)

Range Type: Bombing

Cell Name(s): BOMB

The Purpose of the range for use with tactical bombs is to familiarize students of handling and releasing combat ammunition.

The range area, adequate for use with 100-lb. demolition bombs below 15,000', will be a minimum of One and one-half miles square with the target located centrally. The target is a cross-shaped ground area scraped free from vegetation and whitewashed. A night target is not used on this type range.

Although OE will be concentrated around the target, evidence of bombing is almost always found beyond the scoring arcs. OE debris is typically found throughout the entire property and occasionally beyond the property boundaries. The range cell area was calculated to extend beyond the target center 3000 feet, for a total of 649 acres. Many factors, all of which are unknown, such as altitude and flight speed, affect targeting accuracy. From studies completed in WWII, 99 percent of the bombs should be found within 3,000 feet for bombers flying at 25,000 feet or below and at speeds up to 250 mph. The same study implied a 2,000-foot radius should include 95 percent of the bombs under the same conditions.

Ammunition (probable)

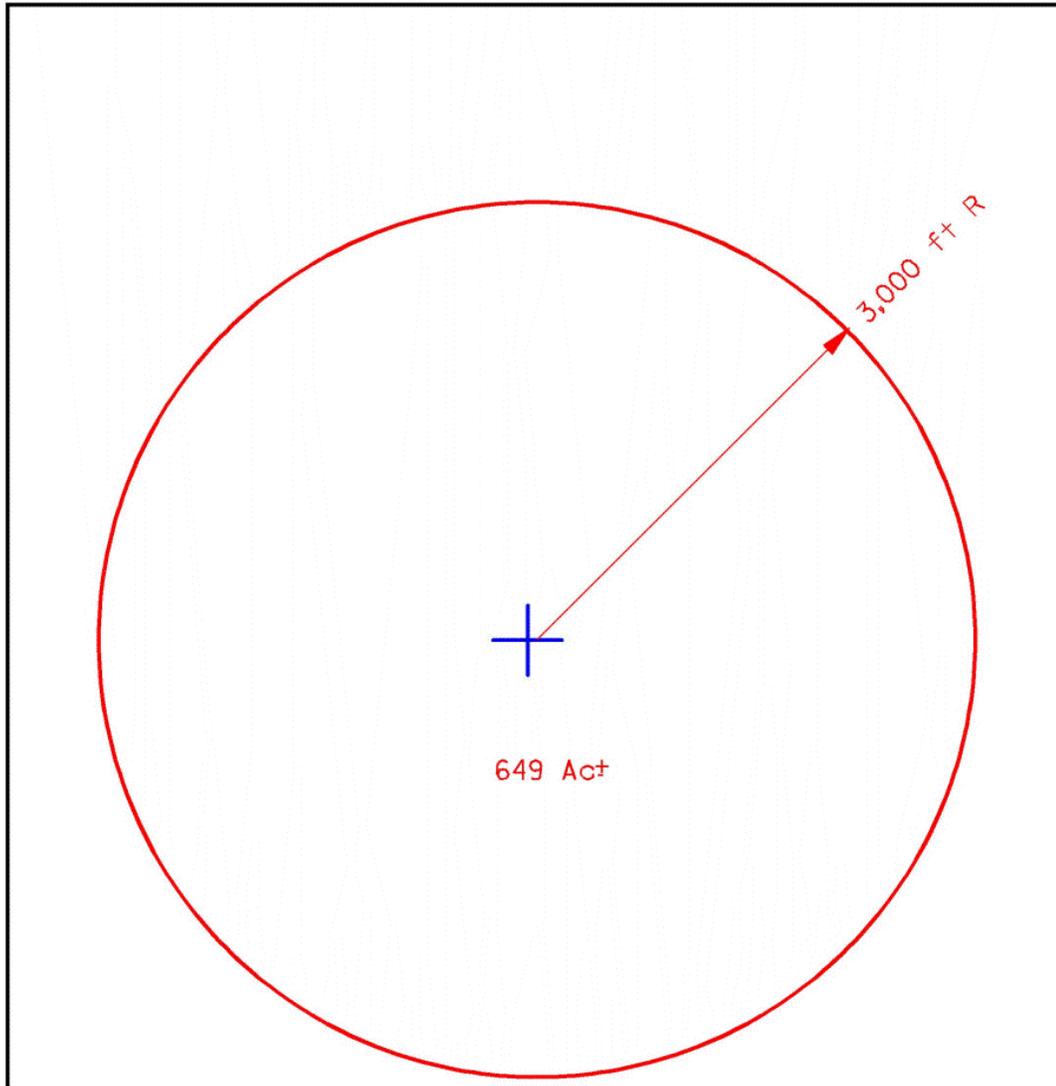
Bomb, High Explosive

Data sheet(s):

When selecting datasheets, it is important to consider the time frame the range was used. Possibilities include:

CTT05 Bomb, General Purpose, Old Style
 AN-M30, General Purpose Bomb, 100-lbs
 AN-M57 & AN-M57A1, GP, 250-lbs

Reference(s): *AR 750-10, Range Regulations for Firing Ammunition in Time of Peace*, May 1939 – January 1944; *AAF Manual 85-0-1, Army Air Forces Gunnery and Bombardment Ranges*, June 1945; *Army Air Corps Studies and Reports on Bombing Analysis and Bombing Accuracy*, 1942



BOMBING



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BOMBING TARGET (LIVE)

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CELL NAME

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BOMB

BOMBING TARGET, PRACTICE (aka: PBR, Precision Bombing Target, Bombing Range)

Range Type: Bombing

Cell Name(s): BOMB (same as Bombing Target, Live)

The range area should be sufficiently large so that the center of any target placed on it will be a minimum of 2500' from the range boundary. For bombing from 25,000' and above, a 5000' radius is advisable.

The typical and widely used target design consists of a series of concentric circles with four legs indicating N/S and E/W in True direction. Four reference squares were placed along each leg at 100' intervals to facilitate scoring. For the purpose of indicating True North, the north leg is extended within the 100' circle towards the target center a distance of 40'. At the extreme end of the north leg, a numeral (75' to 150' in size) is set with its base towards the center of the target. While the 100' circle is an essential feature of the target, the 200' and 500' circles should be described, whenever possible, to facilitate scoring. For bombing above 15,000', it is recommended that only the 200' and 500' circles be described. The legs and circles of the target were constructed of crushed rock or dirt sprayed with white paint, whitewash, or with a contrasting color to the surrounding soil. In the center of the target circle, a pyramid, 12' high with a base approximately 30'x30', is constructed of native earth, or wood, and is whitewashed.

Target lighting was provided by mounting light bulbs on 8' poles, at 22½ feet intervals around the circle. Lights were also mounted at each of the four legs intersecting the 100' circle. Numerals were also illuminated with light bulbs.

Although OE will be concentrated around the target, evidence of bombing is almost always found beyond the scoring arcs. OE debris is typically found throughout the entire property and occasionally beyond the property boundaries. The range cell area was calculated to extend beyond the target center 3000 feet, for a total of 649 acres. Many factors, all of which are unknown, such as altitude and flight speed, affect targeting accuracy. From studies completed in WWII, 99 percent of the bombs should be found within 3,000 feet for bombers flying at 25,000 feet or below and at speeds up to 250 mph. The same study implied a 2,000-foot radius should include 95 percent of the bombs under the same conditions.

Ammunition (probable)

Bomb, Practice

Data sheet(s):

When selecting datasheets, it is important to consider the time frame the range was used. Possibilities include:

CTT07 AN-Mk 5, AN-Mk 23, AN-Mk 43, Prac
 M38A2 Practice Bomb, 100-lbs
 M85 Practice Bomb, 100-lbs
 Mk 15 Mod 3, Practice Bomb, 100 lbs
 Mk 15 series, Practice Bomb, 100 lbs
 Mk 5, Mk 15, Mk21, Prac., 500lbs
 Spotting Charge, M1A1

Reference(s): *AR 750-10, Range Regulations for Firing Ammunition in Time of Peace*, May 1939 – January 1944; *AAF Manual 85-0-1, Army Air Forces Gunnery and Bombardment Ranges*, June 1945; *Army Air Corps Studies and Reports on Bombing Analysis and Bombing Accuracy*, 1942

DEMONSTRATION BOMBING TARGET, (PRACTICE)

Range Type: Bombing

Cell Name(s): DEMBMB

Demonstration bombing targets were typically utilized for competition and/or public demonstrations. Typically, targets were located adjacent to runways and observation points. Under normal circumstances one can expect bombs to have been released from a relatively low altitude with substantial accuracy. Although OE will be concentrated around the target, evidence of bombing is almost always found beyond the scoring arcs. The Characterization Acreage for this type of bombing target is calculated to extend beyond the target center 1,000 feet, for a total of 72 acres

Ammunition (probable)

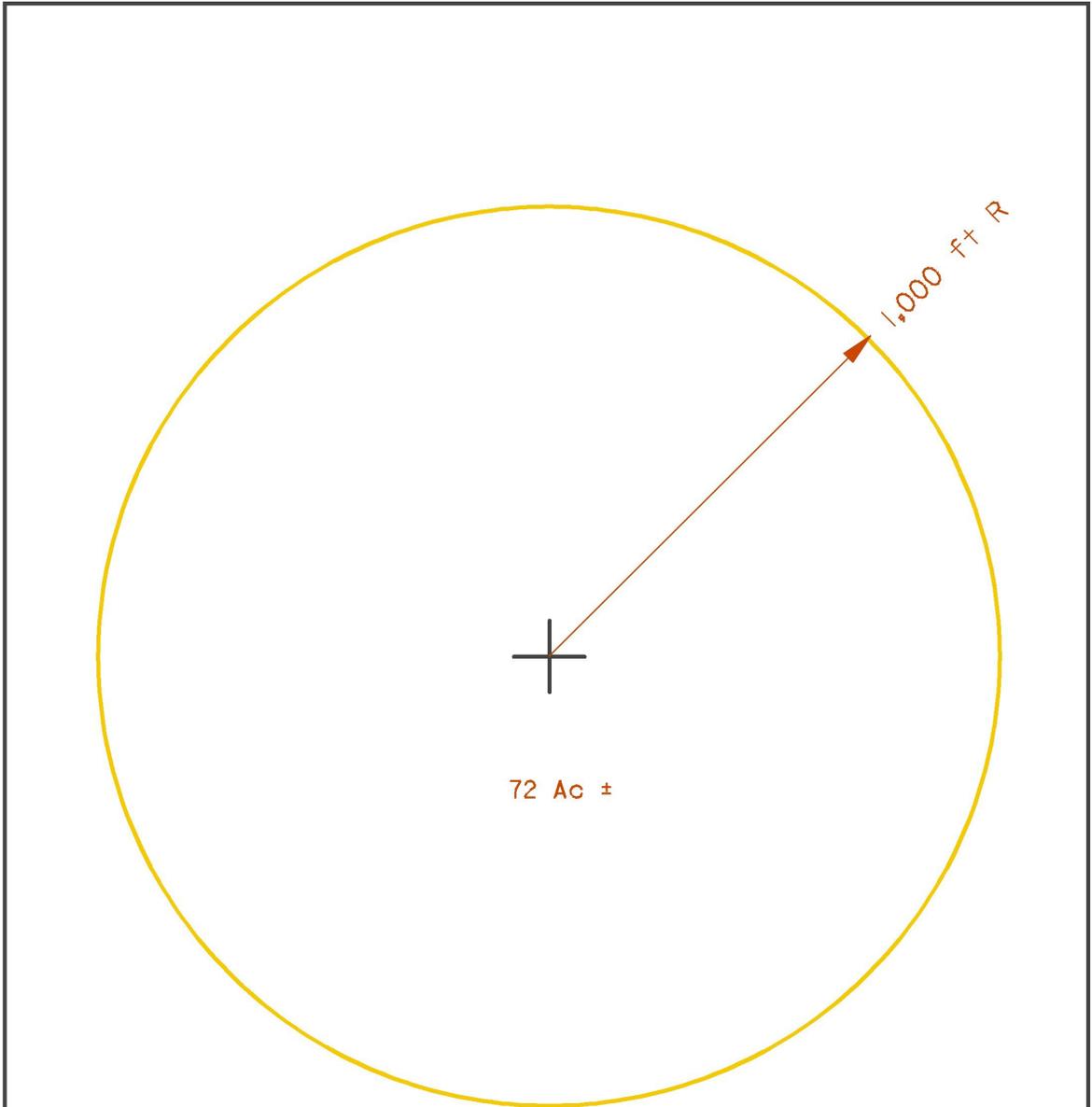
Bomb, Practice

Data sheet(s):

When selecting datasheets, it is important to consider the time frame the range was used. Possibilities include:

CTT07 AN-Mk 5, AN-Mk 23, AN-Mk 43, Prac
 M38A2 Practice Bomb, 100 lbs
 M85 Practice Bomb, 100 lbs
 Mk 15 Mod 3, Practice Bomb, 100 lbs
 Mk 15 series, Practice Bomb, 100 lbs
 Spotting Charge, M1A1

Reference(s): *AR 750-10, Range Regulations for Firing Ammunition in Time of Peace,*
May 1939 – January 1944



BOMBING



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DEMONSTRATION BOMBING TARGET

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DEMBMB

HISTORIC USE: OB/OD

BURN AREA

Range Type: OB/OD

Cell Name(s): BURNAR

The range is typically used to destroy unserviceable small arms ammunition, pyrotechnics, propellants, and explosives.

A danger area is established by application of the criteria given below.

If the net explosive weight (NEW) of burn material is more than 100 pounds the minimum safe distance shall be at least 1,250 feet. If the NEW of burn material is 100 pounds or less, the danger area shall be at least 670 feet.

If the facility is a military range and the material being destroyed is unknown consider the NEW to be 100 pounds or less and select a danger area of 670 feet.

If the facility is an ammunition plant or explosive manufacturing plant assume the danger area to be a minimum of 1,250 feet unless evidence indicates a lesser distance is applicable.

Unless the location of the actual burn pit is known, the danger area should be established from all edges of the working area the range.

Ammunition (probable)

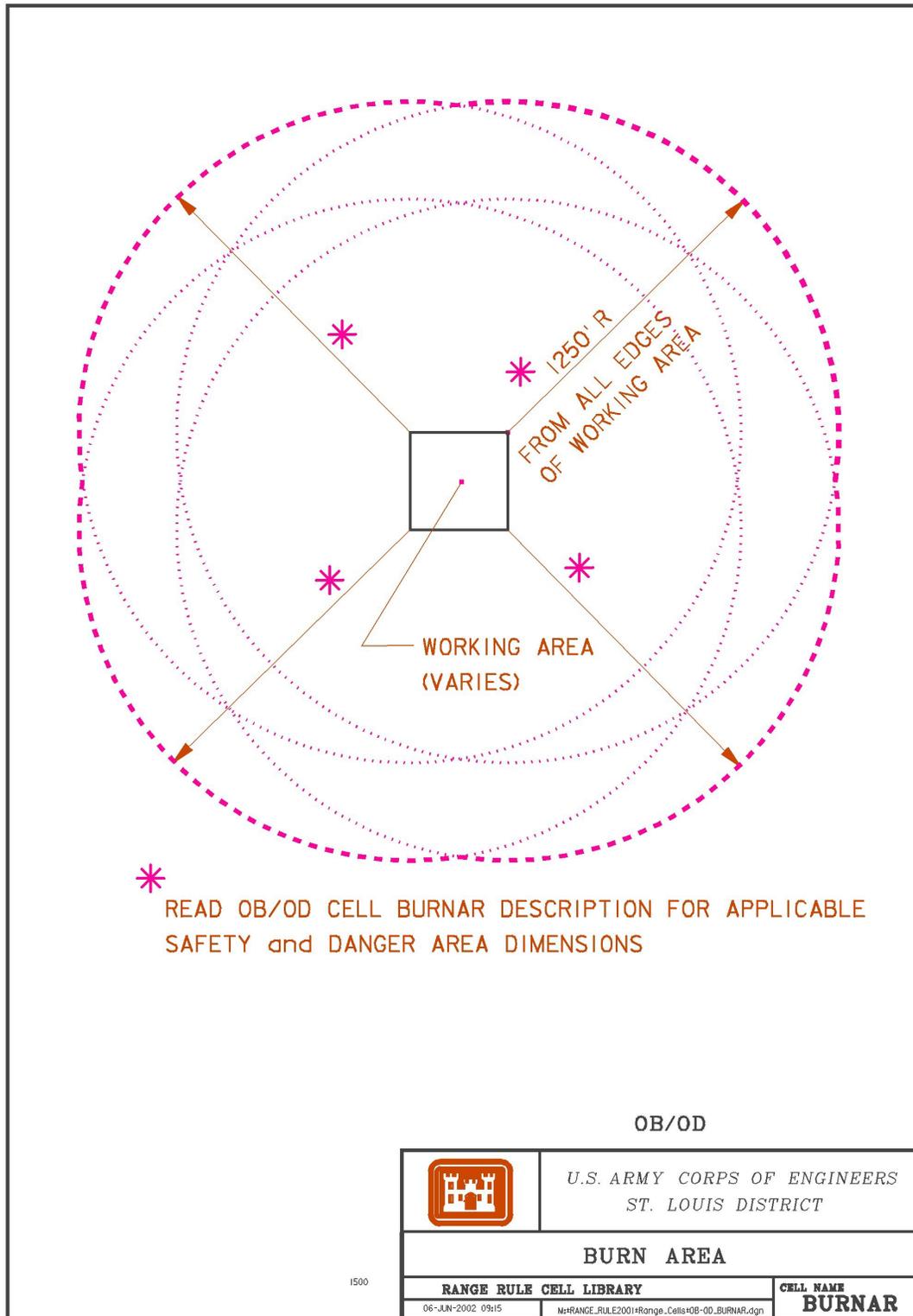
Small Arms ammunition, or applicable munitions

Data sheet(s):

When selecting datasheets, it is important to consider the time frame the range was used. Possibilities include:

CTT01 Small arms, General

Reference(s): DOD 6055.9-STD, *DOD Ammunition and Explosives Safety Standards*, July 1999



RANGE USED FOR DESTRUCTION OF AMMUNITION, DEMONSTRATIONS, AND EXPLOSIVE ORDNANCE DISPOSAL (EOD)

Range Type: OB/OD

Cell Name(s): EODRNG

The danger area for explosive demolitions, demonstrations, and EOD explosives operations is determined by application of the criteria given below.

The danger area should not be less than 1250 feet, for non-fragmenting explosive materials. This would generally pertain to explosive demonstrations, training, etc.

The danger area should not be less than 2500 feet, for fragmenting explosive materials. For bombs and projectiles with caliber 5-inches or greater use a minimum distance of 4000 feet.

If the type of ammunition destroyed on the range is unknown then the maximum distance should be applied.

Because the actual disposal pits may be positioned anywhere within the range area, the danger area should be established from all edges of the working area of the range.

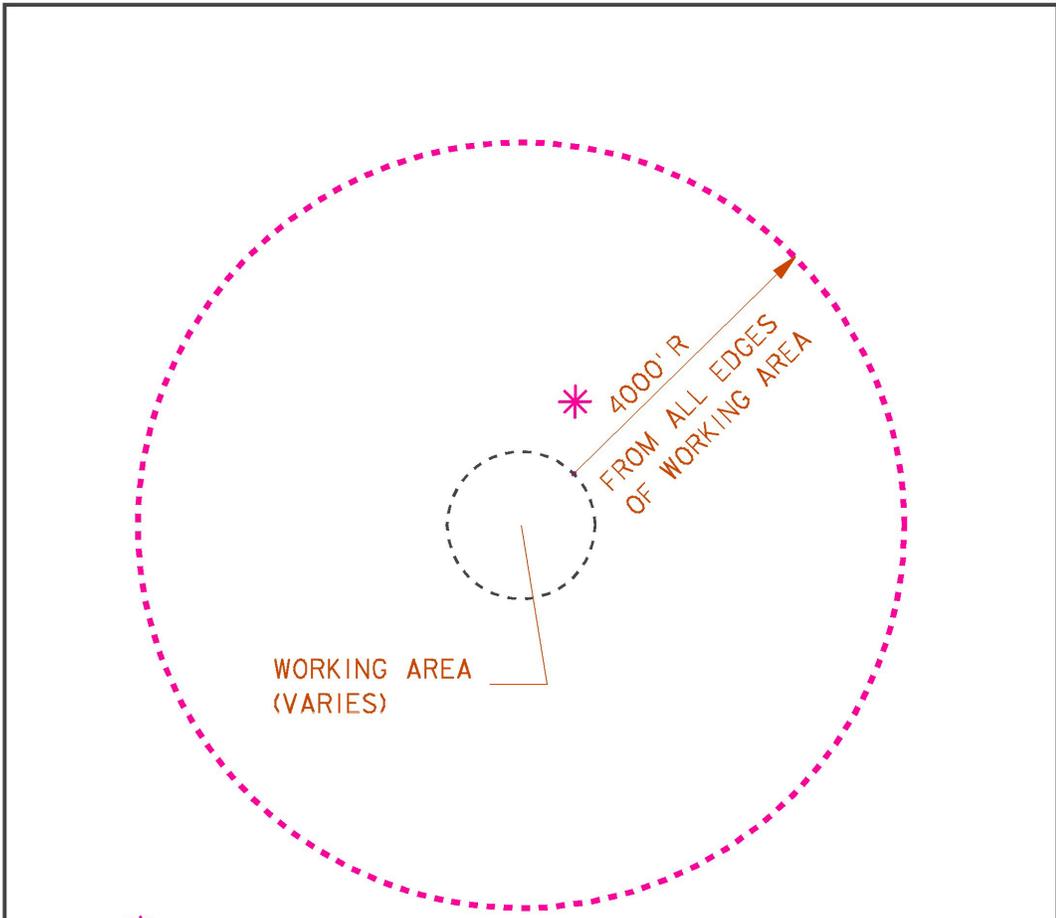
Ammunition (probable)

All ammunition, applicable to the installation. To include demolition materials.

Data sheet(s):

Must be determined for each site

Reference(s): DOD 6055.9-STD, *DOD Ammunition and Explosives Safety Standards*, July 1999



* READ OB/OD CELL EODRNG DESCRIPTION FOR APPLICABLE SAFETY and DANGER AREA DIMENSIONS

OB/OD



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DEMOLITION RANGE

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