STATIONARY INFANTRY TARGET (SIT)

General

The SIT emplacement is primarily used for the installation of a SIT target. It is also used for installation of a Double Target Arm (DTA) SIT, Mortar Simulation Device (MSD), Battle Effects or Sound Effects Simulator (BES or SES), Hostile Fire Simulator (HFS), Radio Frequency (RF) mesh network access point or other similar devices. The widened emplacement is used when two SIT lifters (double SIT) are installed in the same emplacement, and sometimes when two or more devices are required. Refer to the SIT Cluster section of the RDG for the additional special requirements for SIT emplacements placed in an Array or Cluster. See the standard Civil and Electrical detail drawings for additional specific dimensions and details.

Checklist

Range designers should refer to the Design and the Construction Checklists provided in the RDG to ensure that all required items are included in the design.

Civil/Siting

This section covers the Civil Engineering and Siting issues unique to this type of emplacement for all types of ranges. Siting issues for specific ranges are covered in the separate sections of the RDG.

Emplacement

The standard SIT emplacement is a concrete emplacement with a geotextile/gravel drainage layer, a treated timber front wall protection, and a protective earthen berm. Installations may prefer other materials, which are acceptable as long as the material is compatible with, and provides protection for, electrical and target equipment and is durable. The compacted earth berm, placed in front and on the sides, is used to protect the equipment from all directions of fire; the concrete emplacement does not provide significant protection. Either precast or cast-in-place concrete is acceptable. All SIT emplacement permanent electrical and communication boxes are mounted on the front wall of the emplacement no less than 50 mm (2 in) below the top of the emplacement wall. This mounting height helps protect them from rounds that might skim over the top of the berm. The targetry provider will install the target mechanism on the floor of the concrete emplacement as far forward as practical to minimize its potential to be hit by a low round, yet still allow access to the electrical/data boxes.

Above-Grade Emplacement:

Above-grade emplacements are more common in range construction due to their ease of drainage, ease of obtaining line-of-sight, and small disturbance to the existing grade.

Below-Grade Emplacement:

Below grade emplacements blend with the natural terrain and do not present the target position profile to the soldier/firer. Unfortunately, below-grade emplacements present several design issues as follows:

Drainage:

Positive drainage is harder to achieve on a below grade emplacement. Floor drains are problematic in that they require a lower elevation nearby for a daylight drain and tend to clog. Drainage swales increase excavation requirements.

Unexploded Ordnance (UXO):

UXO disturbance potential increases with the depth of excavation. While an above-grade emplacement might only require disturbing the surface to 150mm (6in) below natural grade, below-grade emplacements often require excavation of 1m (3ft) or more. For medium and high risk areas, normally a subsurface clearance to a depth of one foot below the construction footprint is required.

Line-of-Sight:

Line-of-sight between the firing position and the target emplacement may not be possible using the natural terrain.

Other debris:

Below-grade emplacements also tend to gather more sand, dirt, trash, and any windblown objects, which can cause maintenance problems.

The designer should discuss with the installation whether they desire above or below-grade SIT emplacements, while ensuring that the installation understands the design issues and costs associated with either choice.

Target Clearance

No obstruction may be present which interferes with travel of the target from the up to down position. A minimum of 2.3m (7.5ft) clear space must be provided from the face of the emplacement wall.

Wall Height

The minimum front wall height is 457 mm (18 in). The front wall and berm must be high enough to protect the targetry equipment while still allowing a minimum of 90% of the target to be visible from the firing position. The minimum wall height provides target equipment protection, including target arms and clamps, up to a 10^{o} angle of fire. (Note: a positive angle is used for a downward shot at the target). The berm slope may need to be adjusted for positive angles of fire. It also allows 90% visibility up to -2° angle of fire. A geometric analysis is required for angles of fire greater than 10° or less than -2°. Excessive angles of fire may require increasing the height of the front wall or installing the emplacement off-level to match the angle of fire. Angles of fire less than -2° may require raising the target lifter or installing longer target arms. Leaning the emplacement forward is not generally recommended due to drainage considerations. On ranges where targets are engaged from multiple points the designer must coordinate closely with the installation and the targetry provider to determine the correct front wall height. The emplacement protection is especially critical when used for aviation gunnery.

Drainage

Ensuring proper drainage is critical in the design and construction of target emplacements. Even though the electrical and target equipment is designed for outdoor installation, many of the issues with range targetry can be avoided with proper emplacement drainage. The ground should slope away from the emplacement whenever possible; add swales as necessary to ensure positive drainage. The floor of the emplacement must slope to the rear. Special care is required in the use of floor and trench drains as they tend to clog easily and freeze in some climates. Ensure proper compaction under the emplacement to avoid differential settlement. Drainage is especially critical on newly constructed ranges before vegetation is fully established

Berm Criteria

Recommended widths for protective berms of SIT emplacements are determined from the Target Protection Design Curves in the Appendix of this document. The berm must protect the emplacement from all anticipated directions of fire.

These berm widths are based upon projectile type, soil compaction, and the in-place soil density. However, the designer must also coordinate with the range trainer or user in order to determine the appropriate berm width for each target, since individual target sites may dictate added target protection. For example, when SIT emplacements are sited in front of or behind a Moving Armor Target (MAT) or Stationary Armor Target (SAT), the emplacements will need to be designed to withstand the largest weapon system that will engage that group of targets. At a minimum, berm widths will be at least 4 feet to facilitate ease of maintenance.

Historical experience shows that, under normal usage, well-compacted berms, designed with the recommended widths require maintenance on 6-month cycles. Heavily used ranges and individual targets often require increased berm thicknesses.

Weather Considerations

In regions with large quantities of blowing sand or snow, consideration should be given to providing elevated target mechanism platforms and emplacement covers. The elevated target mechanism platform allows for shoveling out snow and sand, while the emplacement cover keeps the accumulation of blown or fallen material to a minimum. Consider access for snow removal equipment as well.

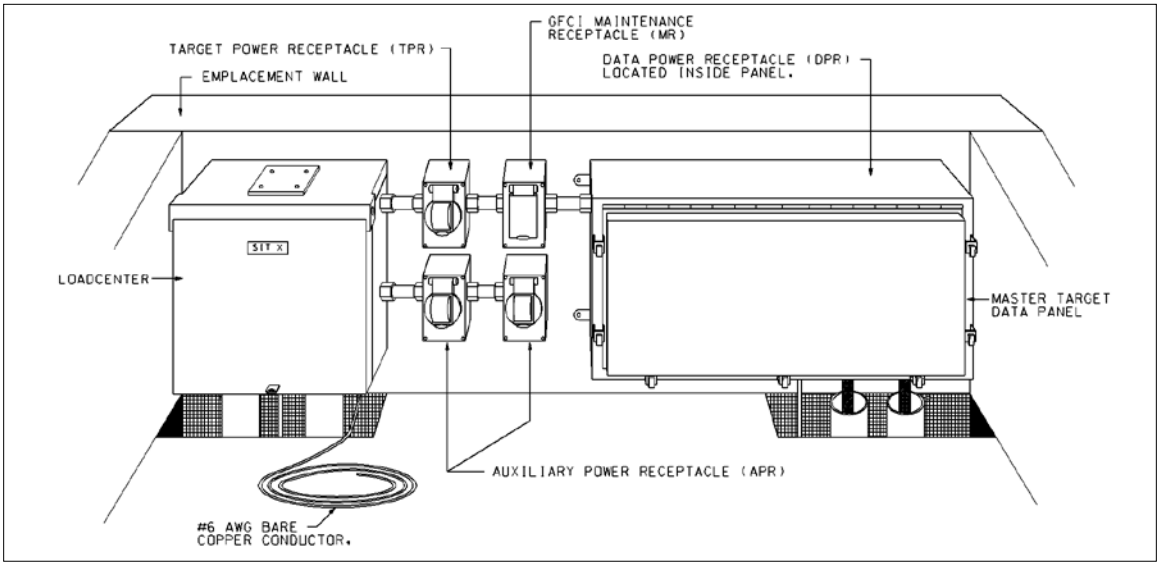
Electrical/Communications

This section discusses electrical/communication considerations unique to this specific emplacement type. Downrange power, communication, transformers, trenching requirements, etc., are discussed in the Downrange Distribution Section of this document.

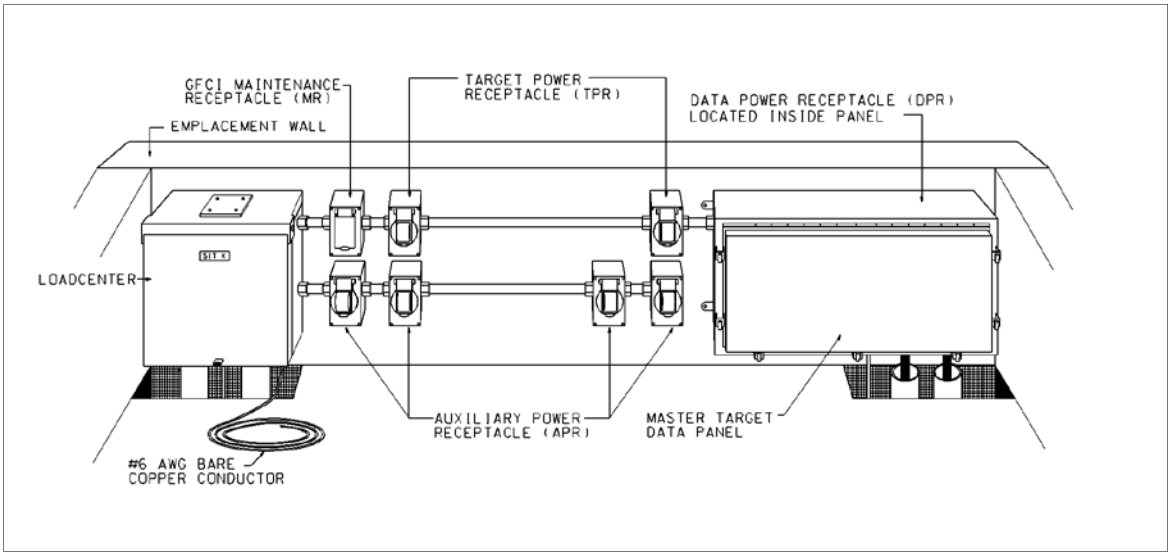
Target Emplacement Wall Configuration

Refer to Emplacement Elevation Drawings for a typical target emplacement wall configuration. The electrical equipment required in each SIT emplacement are the 1) Load Center (LC), 2) Target Power Receptacle (TPR), 3) Auxiliary Power Receptacles, 4) GFCI Maintenance Receptacle (MR), 5) and the Master Target Data Panel (MTDP), along with the associated wiring and conduits which are not detailed in this document. The LC contains the secondary branch circuits and provides feed-through capability to the next adjoining LC. The LC branch circuit breakers provide power to the TPR, APR, MR and the TDR. The TDR is located inside the data panel (not visible in the details).

The Master Target Data Panel (MTDP), or the smaller enclosure called the Target Data Panel (TDP) must be rated NEMA 4, 4X, or 6P depending on environmental conditions (refer to Conduit and Cable Fittings section below for connections). The MTDP/TDP contains the electronics for local target operation, including data cable splicing and terminations. Data cabling shall enter and exit the data panels through approved cable seal fittings (refer to Conduit and Cable Fittings below). All fiber optic cabling will be terminated with SC type connectors, and the network cables will be terminated with CAT 5e or better rated RJ45 connectors. The MTDP and TDP provides space for Other Appropriations-Army (OPA) funded equipment which may include the fiber optic jumpers, switch/media converter, target data outlet, and network cables. The OPA equipment is installed by others and not the MILCON contractor. The designer must ensure the dimensions of the data panel are consistent with those dimensions stated on the detail plans for the MTDP and TDP equipment. A 120v AC power outlet is provided in the TDP for "Use by Others". The TDP and the GFCI MR may utilize the same power circuit, but the TDP equipment must be wired ahead of the MR to ensure no nuisance tripping occurs. All boxes and receptacles on the front wall of the emplacement should be mounted no higher than two inches from the top of the emplacement wall; this protects the boxes and receptacles from low rounds that might skim the top of the emplacement wall. Reference the Electrical and Civil Details in the directory of the Range Design Guide for more information pertaining to the MTDP, TDP and their mounting requirements.



Representative SIT Elevation Drawing (Not to Scale)



Representative Double SIT Elevation Drawing (Not to Scale)

Routing

All conduits and/or cables should enter and exit from the side or rear of the emplacement. This cable routing helps to minimize damage to the cables from range operations and maintenance crews performing berm repair.

Grounding

Grounding is required for safety at each downrange emplacement or equipment location. A 19mm (3/4 in) by 3,050mm (10ft) copper-clad steel ground rod will be driven to a depth of 305mm (1 ft) below finished grade at each emplacement or equipment location. The MTDP/TDP and LC equipment will be connected to the emplacement's single ground rod with a #6 AWG bare copper conductor and exothermically welded connections. All data cable armor or shields must be bonded to the ground bar in the TDP. The design will leave an 1829 mm (6') coil of #6 AWG bare copper that will be used to ground the target mechanism.

Surge Suppression

Surge protective devices (SPD) shall be provided in the LC and data surge suppression equipment shall be provided on both ends of the CAT 5e or better data cables entering the MTDP or TDP.

Conduit and Cable Fittings

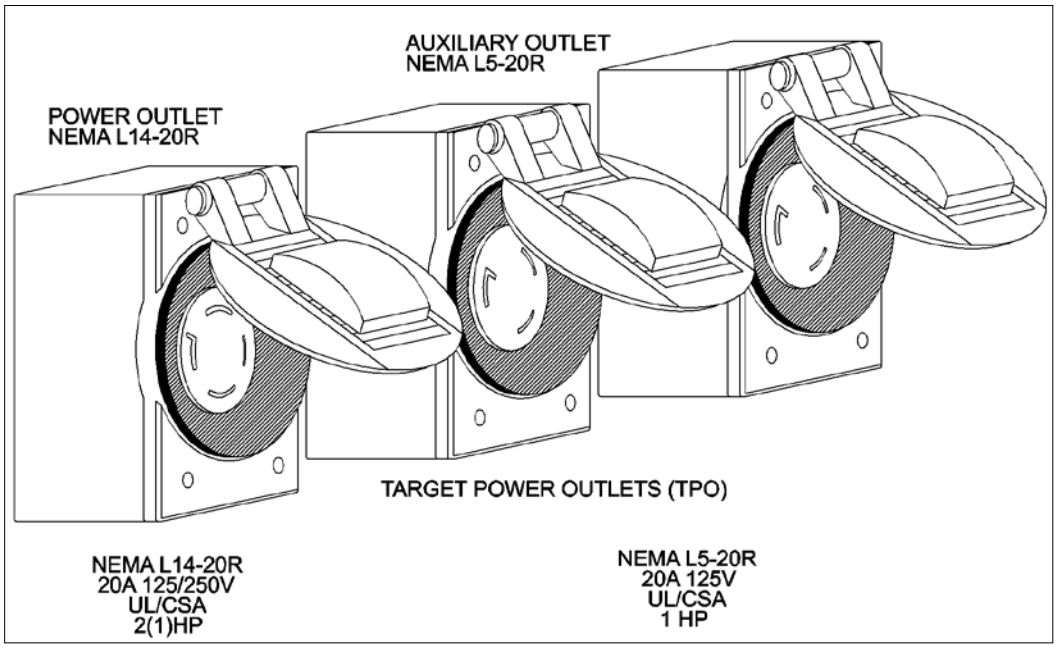
All penetrations into the MTDP or TDP must be made with fittings approved for use with a NEMA 4, 4X or 6P enclosure. Non-compliance with this requirement will result in equipment failure. Sheet ED-01 in the Range Design Guide illustrates the preferred sealing method. **Foam filled conduits alone is not acceptable.** The SIT LC only requires a NEMA 3R rated enclosure. Provide fittings approved for use with a NEMA 3R enclosure for connection to the LC.

Target Outlets

TPRs and APRs must be equipped with a waterproof enclosure approved for use with the power plug inserted and unattended, according to NEC 406.8(B) (2). The standard TPR configuration is shown in the Table below:

TARGET POWER RECEPTACLE	AUXILIARY POWER RECEPTACLE	FIBER OPTIC CABLE CONNECTORS	CATEGORY 5e OR BETTER CABLE CONNECTORS
NEMA L14-20R	NEMA L5-20R	Type "SC"	MALE, RJ45

SIT Emplacement Target Interface Specifics



Target Power Receptacle (TPR) – Auxiliary Receptacle (AR)

EMPLACEMENT TYPE	POWER FEED TYPE	PEAK	STATIC LOAD	DESIGN LOAD
SIT with Thermal Blanket	120/240V, Single Phase	700VA while raising or lowering target. Add 260VA if Thermal Blanket is utilized	50VA Thermal Blanket 260VA	960VA
			Total	**960VA**

SIT Emplacement Target Power Table

Environmental Limits

The temperature and humidity limits for electronic equipment are as follows:

Outdoor:

- Non-operating and operating temperature: -34°C (-30°F) to 60°C (140°F).
- Humidity: 5% to 95% RH (non-condensing).