M67854-10-D-8045

Attachment J.2

System Specification
For
Range Training Systems

Version 1.0

MARINE CORPS SYSTEMS COMMAND

PROGRAM MANAGEMENT TRAINING SYSTEM

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System Specification

For

Range Training Systems (RTS)

1. SCOPE

The Marine Corps has a current operational requirement to modernize its Range Training Systems (RTS) with various types of automated and non automated target equipment and simulators as listed herein. This document establishes the system requirements for the development, fabrication, installation, and testing for the training automated and non automated target systems to be deployed at these various ranges.

2. APPLICABLE DOCUMENTS

The following documents of the exact issue listed form a part of this specification to the extent specified herein. This specification is designated as a first tier document. The documents referenced directly in this specification are designated as second tier documents and are considered part of this specification to the extent specified herein. Documents referenced in successive tiers are not part of this specification and are to be used for guidance only.

2.1 Government documents

Statement of Work		Statement of Work for Range Training Systems (RTS) M67854-10-D-8045
21 CFR 1040	-	Code of Federal Regulations, Title 21, Part 1040, Performance Standards for Light-Emitting Products
MCC 97 Standard PMT-90-S002G	-	Miles Communication Code 97 (MCC97) Standard
MIL-HDBK-1027/3B		Army Corps of Engineers Standards for site prep and target enclosures
MIL STD 810F		Military Standard: Test Methods, Environmental Engineering Considerations and Laboratory Tests

2.2 Non-Government documents

American National Standards Institute (ANSI)

ANSI Z35.1-72	-	Accident Prevention Signs, Specification for
ANSI Z35.4-73	-	Informational Signs Complementary to ANSI Z35.1, Accident Prevention Signs, Specification for

ANSI Z53.1-79	-	Safety Color Code for Marking Physical Hazards
ANSI-Z-136.1 (1993)	-	For The Safe Use of Lasers

Electronic Industries Alliance (EIA)

EIA RS-471	-	Symbol and Label for Electrostatic Sensitive Devices

Institute of Electrical and Electronics Engineers (IEEE)

ANSI/IEEE 446-1987	-	Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications

Uniform Facilities Criteria (UFC) 1-200-01, General Building Requirements is the building code guide and contains references to other UFCs and Codes that are to be used for all sections in this contract. State and Local codes and requirements will take precedence.

UFC 1-200-01, General Building Requirements

UFC 3-400-10N, Mechanical Engineering

UFC 3-500-10N, Electrical Engineering

UFC 3-520-01 Interior Electrical Systems

UFC 3-550-03N, Power Distribution Systems

American Society of Heating, Refrigeration, and Air Conditioning Engineering (ASHRAE)

Sheet Metal and Air Conditioning Contractors National Association (SMACNA) guidelines

National Electrical Manufactures Association (NEMA)

Federal, State, County, and local environmental regulations

American Society of Testing and Materials

National Fire Protection Association (NFPA) Codes and Standards

IEEE C2, National Electrical Safety Code

2.3 Order of precedence

In the event of a conflict between the text of this specification and the references cited herein, the text of this specification takes precedence. Nothing in this specification, however, supersedes applicable laws and regulations, unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Range Control Systems

The Range Control System consists of stationary Range Control Stations (RCS), and/or portable Range Control Stations. The RCS operates both portable and fixed range target equipment and

associated target simulation devices (e.g., Night Muzzle Flash Simulator (NMFS), Sound Effects Simulator (SES), Black Smoke Generator (BSG), Battlefield Effects Simulators (BES) and Omega 36/B2 and Omega 60/B2).

3.1.1 Range Control Station (RCS)

The following requirements apply to both the stationary and portable Range Control Stations (RCS):

Interface:

- wireless control or target control cable
- Open Interface Architecture
- MS Windows-based range control software application to:
  - Control targets
  - Monitor targets
  - record training scenario data
  - store the training scenario data
- display all the range equipment graphically on the operator's visual display in a manner representative of the range layout.
- provide RCS components that are in compliance with common criteria and/or Federal Information Processing Standards (FIPS) FIPS140-2 evaluated products.

Radio Data:

- wireless interface capability
- operate in the frequency range of 130 MHz to 174 MHz with a narrow band mode (12.5Khz spacing)
- adjustable/field programmable operating frequency
- communicate with various range equipment at a minimum distance of 2 Kilometers
- have current DD Form 1494 Application For Equipment Frequency Allocation

Requirements:

- ruggedized laptop computer and docking station with associated peripheral hardware including laser printer, mouse, LCD monitors, keyboard, cabling, and uninterruptible power supplies.
- allow the operator to remotely command target exposure/concealment, the number of hits required to register a kill on the target, and adjust the various target attributes.
- permit selection of individual targets, groups of targets, or all targets in manual or programmed mode.
- Primary selection of target grouping from RCS graphical user interface display
- RCS to be delivered with training exercise scenario template allowing range personnel to develop and save multiple training scenarios
- able to control and display status for a minimum of 500 individual range equipment devices (i.e., targets and battlefield effects simulation equipment on same/common frequency).

- remote hit sensitivity adjustment of the target mechanisms to allow for various types of ammunition to be fired at the target without the need for personnel to go down range and make manual sensitivity adjustments.
- permit entry, editing and storage of multiple courses of fire/scenarios and programs.
- in the event of an emergency permit all exposed targets to be placed into a concealed position.
- allow sections of programs to be skipped, repeated and executed.
- capability and capacity for range personnel to collect and store data from the hit sensor detection system for the development of After Action Reviews (AAR). The data collected for each firing exercise shall be immediately available after the exercise to transfer to another computer for debriefing or reviews. System automatically provide scoring for the selected course of fire/scenario in progress.
- include an application to pull up SES software and operate with ability to produce sound effects at any time, ease of use is significant in design.

Security:

- have unique addressing scheme for each target and range simulation equipment so same frequency can be used to communicate to all and each device.
- information assurance / computer security features to allow only approved range personnel to logon and operate the system.

Power:

- operate from AC power within the control room and be furnished with an uninterruptible power supply (UPS) in order to bring down the range system in an orderly manner upon power failure. The UPS provides a minimum of 30 minutes of backup power.

3.1.2 Hand Held Controller

The following requirements apply to the Hand Held Controller (HHC):

Interface:

- able to communicate with the range target equipment via a two-way radio link.
- Open Interface Architecture
- contain a windows-based range control software application to control, monitor, record scenario data, and store the scenario data for later use.
- have capability to send and receive course of fire/scenario and scoring results to and from the RCS.

Radio Data

- capable for wireless interfaces
- operate in the frequency range of 130MHz to 174 MHz with a narrow band mode (12.5Khz spacing).
- have adjustable/field programmable operating frequency.
- able to communicate with various range equipment at a minimum distance of 2 Kilometers.
- have current DD Form 1494 Application For Equipment Frequency Allocation.

Requirement:

- send various commands to the range equipment and receive status and hit count for display.
- capable of controlling up to 512 range equipment devices on the range, i.e.: targets and range simulation equipment.
- able to store up to 100 scenarios and allow the operator to enter, edit, store in memory, recall from memory, delete from memory, and execute a program.
- pause feature during the execution of a programmed scenario, ability to switch to a manual control mode for the range equipment, resume the execution of the programmed scenario from the manual mode.
- able to control direction of travel, target exposure/conceal, number of hit required to indicate a kill, and various hit attributes.
- allow remote hit sensitivity adjustment to allow various types of ammunition to be fired at the target.
- permit selection of individual targets, groups of targets, or all targets in manual or programmed mode.
- viewable LCD display for sunlight conditions.
- key and display backlight for nighttime operations.
- contain some means, such as a carrying strap or shoulder strap to allow the operator the ability to interact with the HHC without having to set it down.
- ruggedized and weather resistant for outdoor use and an anti reflective readable screen.

Security

- unique addressing scheme for each target and range simulation equipment so same frequency can be used to communicate to all and each device.
- information assurance / computer security features to allow only selected range personnel to logon and operate the system.

Power

- operate from its own rechargeable battery pack and include its own charger

3.1.3 Targets

All Targets must have the following requirements:

- Time to expose target – 0.5 to 1 Second
- Time to retract target – 0.5 to 1 Second
- Adjustable Time of Exposure
- Minimum Operational Temperature – Minus 10 degrees F
- Maximum Operational Temperature – 130 degrees F
- All electrical and electronic boxes must meet NEMA Standards
- All electrical and electronic boxes must be weather proof

3.1.3.1 Power:

- Battery Powered Targets:
    - powered from a sealed, external rechargeable battery

- Battery Requirement include:
  - maintenance free immobilized electrolyte type
  - minimum of 5 days stand by mode
  - minimum of 300 cycles (1 cycle= lift and fall) before recharge
  - connectivity on hardwire ranges with single phase 60Hz 110/120 volts for U.S. Installations and single phase 50Hz 110/120 volts for overseas installations
- Recharging Station Requirement:
  - recharging with solar panel either/or power source
  - MIT and MAT battery recharging system at one end of the track system which will have the capability to monitor battery status and charge battery when necessary
    - Recharging docking station will provide power through generator and/or shore power

- AC Powered Targets:
  - Powered by hard-wired AC single-phase 60Hz 110/120 volts for U.S. Installations and single phase 50Hz 110/120 volts for overseas installations.
- AC/DC Powered Targets:
  - Hard-wired installations must be AC single-phase 60Hz 110/120 volts for U.S. Installations and single phase 50Hz 110/120 volts for overseas installations.
  - Battery powered installations must be 12 VDC

3.1.3.2 Control:

- Target control is via Target Control Cable and/or Wireless RF
- Interfacing with and providing control for Sound Effects Simulators (SES), Night Muzzle Flash Simulators (NMFS), Black Smoke Generator (BSG), and Omega 36/B2 and 60/B2 BES range equipment

3.1.3.3 Target Motions

- Pop up- standard
- Slashing motion
- Horizontal motion
- Swivel motion
  - Have a Friend/Foe Turning capability
  - Friend/Foe Target transition not to exceed 1 second and not be visible to trainee

3.1.4 Stationary Infantry Targets (SIT)

For SIT specific requirements for SIT:

The following requirements apply to all SIT variations:

Requirements:

- RF targets operate with an internal two-way radio
- Capable of up/down, bob, swing, and swivel operations
- support both 90 and 180 degree swings in swing operating mode
- durable hit sensor as an integral part of the target holder, transmit status, and hit count data to the controller via two-way radio or landline.
- hit sensitivity adjustment to accommodate various ammunition (small arms .50 cal or less and 40mm TP rounds), Multiple Integrated Laser Engagement System (MILES) 2000 Laser Systems, and Special Effects Small Arms Marking System (SESAMS) rounds (both 5.56mm and 9mm small arms marking rounds)
- The hit sensitivity adjustments to be carried out remotely from the RCS and HHC.
- no less than ten variable hit sensitivity adjustments.
- adjustable actuation and hit modes such as expose, conceal, hit-hold, hit-fall, hit-bob, and hit-stop.
- able to detect up to 500 hits per minute
- capable to record hit time and report back to RCS/HHC for AAR
- Must have an electro-mechanical actuator, which exposes and conceals a silhouette target on command
- Must be electrically powered
- man-portable and suited for permanent or temporary installation in a sheltered emplacement with a total weight of less than 50 pounds (excluding target and battery). Handle designed to allow multiple movements without failure
- stackable for deployment and storage
- consist of but not limited to infantry lifters which support 3D and 2D infantry targets
- Must mount and lift Military type E, F, and 3D silhouette
- Target Lifter (clamping/attachment) arm must support both curved and flat type targets
- Must have watertight enclosures for all electronic-related components

3.1.5 Moving Infantry Targets (MIT)

For MIT specific requirements for MIT A:

The following requirements apply to all MIT variations:

- communicate and be controlled using both the RCS and HHC, hardwire or RF as designated by DO
- Must include SIT as part of this system
- SIT mechanisms interchangeable with other like SIT mechanisms
- able to position SIT for frontal, oblique, and flank presentations
- Must interface with and provide control for range equipment such as the SES, NMFS, BSG, Omega 36 and 60 BES

Trolley

- internal two-way radio
- self-contained power drive system
- capable of forward, back, stop, stop and go movements
- variable speed ranging from 0 to 12 miles per hour on length of track
- capable to report track position in real time back to RCS and HHC

- wheel and roller system which prevents trolley from being blown over or off tracks when target is in the upright position by high winds (60 mph)
- man-portable and suited for permanent or temporary installation
- Must have watertight enclosures for all electronic-related components

Track

- Rust free metal
- No special tools
- limited or no earth moving equipment to lay tracks
- contain travel limit switches in order to slow down or stop the trolley at ends of the track, or within the path of travel
- contain bumper cushions at each end of the track

3.1.6 MIT Track

For MIT Track specific requirements:

The following requirements apply to all MIT Track:

- Rust free metal
- No special tools
- limited or no earth moving equipment to lay tracks
- contain travel limit switches in order to slow down or stop the trolley at ends of the track, or within the path of travel
- contain bumper cushions at each end of the track

3.1.7 Stationary Armor Targets (SAT)

For SAT specific features for SAT :

The following requirements apply to all SAT variations:

Interface

- Must communicate with, and be controlled from the stationary RCS, portable RCS, and HHC.
- Must have wireless control and/or range control cable to the RCS
- Must be compatible to operate with live rounds (from .50 cal up to 120mm and 120mm TP), and MILES 2000 Laser Systems

Requirements:

- internal two-way radio
- consist of armor lifters which support but not limited to 3D and 2D armor targets and capable of mounting and lifting of type “military type E”, F and 3D silhouette.
- multiple hit sensor (not attached to the lifter) and transmit status and hit data to the controller via two-way radio or landline.
- hit sensitivity adjustment to accommodate various ammunition types. The hit sensitivity adjustments carried out remotely from the RCS and HHC.
- no less than ten variable hit sensitivity adjustments.
- actuation and hit modes such as expose, conceal, hit-hold, hit-fall, hit-bob, and hit-stop.

- detect multiple hits per minutes.
- Changing the number of hits required to cause the target to conceal remotely selected from the controller and executed at the SAT.
- capable to record hit time and report back to RCS or HHC for AAR.
- electro-mechanical actuator, which exposes and conceals a silhouette target on command
- capable of lifting targets weighting up to 150 pounds
- man-portable and suited for permanent or temporary installation in a sheltered emplacement and stackable for deployment and storage
- capability to support thermal signature materials.

- 3D Armored Vehicle Target
    - replicate BMP (1,2, & 3 variants), BTR (60,70,& 90 variants), and BRDM (2 & 3) type armored vehicle targets.
    - collapsible and raised via cable attached to armor lifter.
    - detectable by Fixed/Rotary Wing aviation
    - detectable in both day and night by visual and thermal signatures
    - furnished with repair kit
    - portable and emplace within 1 Hr
    - survivable (near misses by 40mm TP)

- 3D Armored Vehicle Steel Target
    - targets designed specifically to be helicopter transportable
    - environmentally friendly and extremely durable to withstand impacts from large caliber weapons and rockets
    - made from sheet steel with interlocking slots that fit together to keep it erect and three-dimensional
    - have coatings to give the appearance of the actual vehicle without having any material that is harmful to the environment.

- 2D Armored Vehicle Target
    - replicate Front views of BMP (1,2, & 3 variants), BTR (60,70,& 90 variants), and BRDM (2 & 3) type armored vehicle targets with limited depth view
    - mounted using 2x4 on armor lifter
    - not exceed weight limit of 150 lbs
    - detectable by Fixed or Rotary Wing aviation
    - detectable in both day and night by visual and thermal signatures
    - furnished with repair kits
    - portable and emplace within 1 Hr
    - survivable (near misses from 40mm TP)

3.1.8 Moving Armor Targets (MAT)

For MAT specific Requirement for MAT:

The following requirements apply to all MAT variations:

Interface

- communicate and be controlled using both the RCS and HHC, hard wire or RF as designated by DO.
- include SITs as part of this system
- capable to interchange SIT mechanisms with other alike SIT mechanisms
- able to interface with the SIT and the SITs functional capability is the same as described above
- able to position SAT for frontal, oblique, and flank presentations

Trolley

- internal two-way radio
- self-contained power drive system
- capable forward, back, stop, stop and go movements
- variable speed ranging from 0 to 25 miles per hour
- report track position in real time back to RCS and HHC
- wheel and roller system which prevents trolley from being blown over or off tracks when target is in the upright position by sustained winds up to 70 mph
- man-portable and suited for permanent or temporary installation
- watertight enclosures for all electronic related components

Track

- No special tools
- limited or no earth moving equipment to lay tracks.
- contain travel limit switches in order to slow down or stop the trolley at it approached the ends of the track.
- contain bumper cushions at each end of the track.
- contain a max of 100 feet of track.

3.1.9 MAT Track

The following requirements apply to all MAT track:

- No special tools
- limited or no earth moving equipment to lay tracks.
- contain travel limit switches in order to slow down or stop the trolley at it approached the ends of the track.
- contain bumper cushions at each end of the track.
- contain a max of 100 feet of track.

3.1.10 Pistol Pneumatic Target System

The Pistol Pneumatic Target System consists of the following requirements:

- Target power must be AC
- Target control must be hard wired
- Ammunition up to .45 caliber
- SESAMS 5.56mm and 9mm
- Target turners to be placed at a designated yard line

- A new concrete firing line may be required at designated yard lines.
- Benches and tables may be required or desired on the firing line.
- The targets must be placed 54 inches on center and be capable of turning 90 degrees to repeatedly face and face away from the shooter at a rate of 0.5 to 1 second
- Target holders must be designed to hold a standard military 20” x 40” E-type silhouette without modification and be designed using material that prevents ricochets
- The control system must include a removable control box and must include a “Toughbook” laptop computer (Mil Std 810F compliant) for automatic operation
- The control system computer must be fully installed with programmable, MS Windows-based software to operate the targets according to standard Marine Corps marksmanship standards.
- The system must be programmable to allow facing of any and/or all targets simultaneously and independently
- pneumatic operating system to power the pneumatic range.
- operating system including an air compressor with dryer package to include: a pressure gauge, regulator, filter, an air-cooled after-cooler, and a desiccant dryer assembly.
- Must have a fully enclosed weatherproof shelter to protect the compressor from inclement weather.
- control station installed behind the designated yard line, centered to provide environmental protection and allow maximum control for the operator.
- target mechanisms must be installed below the protective barrier

3.1.11 Heavy Duty Target Carriages (HDTC)

Heavy Duty Target Carriages (HDTC) in accordance with the following specifications:

- KD rifle target carriages are counter-balanced carriages that hold two 72”x72” targets connected by chain and sprocket
- The Target Carriages designed so that when one target is lifted the other is down and not visible from the firing lines.
- The carriage is approximately 84” in width, 23” in depth and 107.5” in height.
- bolted to an existing concrete pad.
- Heavy Duty chain and sprocket with replaceable links made of stainless steel to resist corrosion.
- All steel galvanized to resist corrosion from high humidity and salt air.
- targets move with minimal effort and move smoothly even in windy conditions.
- Must avoid metal to metal contact by using neoprene rollers with greaseless bearings.
- Counter-weights must be included with each carriage to replace one of the targets to allow use of only one target when desired.
- carriages anchored and braced sufficiently to withstand tropical storm winds up to 130 knots with the targets removed.

3.1.12 Non-automated Steel Targets

Non-automated Steel Targets in accordance with the following requirement:

- Must use the standard 20”x40” E silhouette

- made of 1/2” steel with a Brinnell hardness of AR 500
- Must be capable of receiving impacts up to .50 cal
- target and stand must be a two piece design and assemble by means of a slot in the top of the concrete block to slide the steel silhouette into.
- block stands have lifting rings installed to facilitate movement and installation using a forklift.
- concrete stands of sufficient weight and mass capable of holding the targets upright and withstanding multiple bullet strikes without allowing the target to fall.
- concrete Stand approximately 20” deep x 20” Wide x 12” tall and reinforced at the slot area to allow the secure installation of the steel targets.
- Upper and Lower band supported in each corner with a vertical band for support and stability.

3.1.13 Remote Sniper Targets

Remote sniper targets as required in accordance with the following specifications:

- Steel remote-controlled, programmable automatic reset rifle targets.
- targets designed specifically for use in long range rifle shooting.
- targets made with 3/8 inch Brinnell AR 500 hardness steel for .50 Cal ammunition.
- targets made with 1/2 inch Brinnell AR 500 hardness steel for .223 or less Cal ammunition.
- targets must automatically reset in 2 second using a battery-powered electric motor.
- Must be delivered with a remote control device that can operate the targets at a maximum distance of 1000 meters
- targets have steel protective plates to protect the target mechanism from round impacts
- delivered with storage/charging racks and the appropriate number of battery chargers to accommodate the total number of targets

3.1.14 Environmental Friendly Steel 3D Targets

Environmentally-friendly Steel 3D Targets (i.e., BMP armored vehicle, etc.) in accordance with the following:

- developed without any type of paint, sealant, liquid or products that is harmful to the environment.
- made from 1” thick A36 Mild sheet steel capable of withstanding impacts from weapons up to .50 Cal ammunition.
- designed in a 3D format and made to resemble a variety of enemy tank hulks. (i.e. BMP, T-72, BRDM, technical trucks , etc.)
- interlocking slots that fit together to keep them erect and three-dimensional.
- coatings to give the appearance of the actual vehicle in a variety of colors i.e., sand, black and olive drab
- lifting rings that will allow a balanced lift and transportation via heavy duty military helicopter.

3.1.15 Steel Silhouette Targets

Steel Silhouette Targets in accordance with the following:

- The “F” Silhouette made out of 1/4”- 3/4” thick Brinnell AR 500 steel. Steel silhouette targets are 26” Wide x 13” Tall
- The “E” Silhouette made out of 1/4”- 3/4” thick Brinnell AR 500 steel. Steel silhouette targets are 19.5” Wide x 40” Tall

3.1.16 2D/3D Target Silhouettes

2Dimensional/3Dimensional Steel and Non Steel Target Silhouettes in accordance with the following:

- The 2D/3D steel silhouettes designed to represent AK-47/Rocket Propelled Grenade (RPG) team insurgents.
- The 2D/3D steel silhouettes made of “1” thick Brinnell AR 500 steel built to 9/10 scale of an average size man.
- The 2D/3D steel silhouettes fashioned after a person in a crouching or kneeling position.
- Non-steel targets simulate insurgent personnel mimicing the clothing, facial hair, weapons, complexion, etc
- made of a self-sealing material that is highly resistant to flame and heat, be water resistant, UV resistant, and environmentally friendly.
- Two man-portable and modified to fit on the Stationary Infantry Target (SIT) and the Portable Infantry Target (PIT) systems so that the weight of the target does not reduce the function of the target.
- capability of having a cell phone, small bag Improvised Explosive Device (IED), rifle (AK-47), and RPG affixed to them.
- interchangeable to present a friend or foe capability without the use of special tools.

3.1.17 Portable Target Holder Platforms

Portable Target holders designed to hold a stationary infantry target (SIT) on its surface. Two types of portable target holders must be produced in accordance with the following:

Window Platform:

- minimum dimensions of 32” wide X 30” deep
- affixed to a window opening locating the platform below the window opening at a minimum of 12 inches.
- Overall height of the platform mounting bracket not to exceed 34”.
- height adjustable over a 6 inch range of vertical movement.
- remain solid when the target is presented (raised) and lowered.
- The platform floor made of wire or expanded metal with drainage openings not exceeding 1.5” and capable of allowing ½” bolts to be installed through it.
- capable of supporting 150 lbs.
- height adjustable over a 6 inch range of movement vertically.
- remain solid when the target is presented (raised) and lowered.

- wire or expanded metal floor with drainage openings not exceeding 1.5” and capable of allowing ½” bolts to be installed through it.
- capable of supporting 150 lbs.

Top-Wall Platforms:

- minimum dimensions 32” wide X 30” deep
- affixed to the top of a wall and the floor of the platform
- Placed below the top of the wall at a minimum of 12 inches.
- height adjustable over a 6 inch range of movement vertically.
- remain solid when the target is presented (raised) and lowered.
- wire or expanded metal floor with drainage openings not exceeding 1.5” and capable of allowing ½” bolts to be installed through it
- capable of supporting 150 lbs

3.1.18 Targetry Solar Panels

- Charge 12v and/or 24v batteries
- Cabling to charge standard target lifter batteries

3.1.19 Bullet Traps

There are 2 types of traps. A small portable and a large permanent. Bullet traps in accordance with the following:

Portable

- “Picture Frame” type bullet traps.
- 24 to 30 inches wide and no less than 46 inches tall.
- All impact material at least 3/8” thick AR-500 steel or equivalent and covered with a material that allows the bullet to pass through and be captured after impacting the steel.
- contain all bullets and fragments fired from weapons as close as seven feet.
- removable, replaceable membrane to prevent fragment splash back.
- removable and reusable container that allows for removal of bullets and fragments.
- capable of hanging on the top of the Shoot House walls using brackets that can accommodate both steel walls and SACON with no ricochet hazard
- be detachable without requiring tools.
- capable of withstanding a minimum of 1,000 rounds without requiring replacement of the membrane or emptying of the bullet/fragment container.
- capable of withstanding a minimum of 10,000 rounds without requiring maintenance.
- capable of containing all standard handgun rounds up to .45 caliber and all rifle ammunition up to 7.62mm.
- Must not exceed 2-man lift limits and not exceed 12 inches from front to back, including all brackets
- capable of holding standard military “E” silhouettes which are 20” x 40” and capturing projectiles from small arms weapons up to 7.62mm excluding machine guns.
- constructed to prevent ricochets

Permanent

- made from galvanized steel and granulated rubber.
- be approximately 150 feet wide and extend from ground level to a vertical height of 12 feet on average. These traps will have various dimensions based on the location.
- All supporting structures must be hidden to prevent ricochets.
- a permeable cover to prevent the media from being blown away during high winds.
- Rubber media coated with non flammable material.
- built to allow periodic filtering of the expended bullets from the impact media.
- capable of withstanding hits from up to .45 caliber for pistol, 12 gauge shotgun and 7.62 mm for rifle.
- permanently attached to concrete pads and or an earthen impact area.

3.1.20 Power Generators

The generator sizing will be determined based upon the needs and requirements on the local regulations. As a minimum one of the following size generators will be specified:

- 25 kW
- 50kW
- 75 kW

The Primary Power Generator supplied must include the following:

- Electro-Magnetic Interference (EMI)/Radio Frequency Interference (RFI) Package, With Auto Start, Heavy Duty Application
- Generator power provide single phase 120/240VAC power at 60Hz
- Single phase 50Hz 110/120 volts for overseas installations
- Generators rated for the electrical infrastructure and must meet NEC (National Electrical Code) Article 445 requirements and National Fire Protection Association (NFPA) 101 (Life Safety Code)
- Generator must meet local, state or federal generator air pollution regulations (as required)
- Diesel Particulate Filter Muffler with filter service monitor (if required)
- Total Maximum Power Demand must be within 70 – 80 % of rated power capacity
- A standard weatherproof and sound attenuated housing
- An industrial grade exhaust silencer
- A double wall fuel tank for a 7 day refueling cycle
- Audible engine shut-down alarm
- The generator and fuel tank connected and placed on an isolated concrete containment slab and located within an acceptable distance (power load/safe operating distance) from the interface to distribution of power.
- Preventative maintenance held to minimum.
- Mean time to repair NTE 8 hrs
- Availability 98%
- Reliability: continuous operation for 10 hrs daily

3.1.21 Ballistic Protection

3.1.21.1 Ballistic Rubber Block/Panels

Dura Bloc wall and/or panel or like material in accordance with the following:

- Super Dura Panels that measure 48” W x 24” H x 2” Thick.
- Dura Blocks that measure 24” W x 12” H x 9” Thick.
- Super Dura Blocks that measure 24” W x 48” H x 9” Thick
- The ballistic rubber glue is approved industry standard glue designed for ballistic rubber.
- The glue currently dated and not expired.

3.1.22 SACON

Shock Absorbing Concrete (SACON) block and or panels in accordance with the following:

- SACON Facades 8’ tall made of modular SACON panels 48’L x 8” thick
- 90lb/cu-ft SACON Panel 8’ tall x 46” W x 30” thick.
- 130 lb Individual block, 12” W x 18” H x 12” thick.

3.1.23 Dust Generator

Dust generator designed of the following requirements:

- Replicate visual dust effects generated by track vehicles in the desert
- Duration: minimum 10 minutes effect
- Visible at 20Km with aided eyes (7x5 binoculars)
- Battery operated, rechargeable with solar panel
- comply with environmental and safety regulations

3.1.24 Sound Effect Simulator (SES)

The SES consists of the following requirements:

- Controlled and monitored through the RCS, HHC, and/or interface with associated target systems (SIT, SAT, MIT, MAT, VM, as define above).
- Multiple channels and speakers system to play different sound simultaneously. A minimum of 4 channel system required with either 4 speaker units and omni directional speakers offering a 360 degree sound output.
- Digital system which contains realistic battle effects sound cues, recording and editing software, and control feature. No analog system and external tape systems considered.
- Pre-recorded variety of sound effects and also be able to record and play user own special sound effects.
    - Pre-programmed sound cues include small arms, mortar and artillery, helicopter, vehicle both tracked and wheeled, civilian crowd noise such as calls for help due to injury, calls for prayer, and other related sound cues as defined during the System Requirement Review (SRR).
    - sound cues capable of linking together to generate longer sound effect cues.
- Public address system and microphone
- Battery operated or powered from associated range equipment.

- If SES has its own battery for power supply, then a battery recharging feature.
- watertight enclosure for all electronics and speaker design for outdoor use.
- Speaker output loudness to be remotely controlled in order to be heard within a 10 acres area.

3.1.25 Night Muzzle Flash Simulators (NMFS).

The NMFS consist of the following requirements:

- controlled and monitored through the RCS, HHC, and/or associated target systems (SIT, SAT, MIT, MAT, VM, as define above).
- Replicate visual effect from small arms fire in both daylight and night operations.
- Visual flash effects up to 800 meters.
- operate in both single shot and multiple burst mode.
- battery operated with features that allows recharging with solar panel, and constructed for maintenance free electrolyte type batteries.
- comply with local, state, and federal environmental and safety regulations.
- watertight enclosure for all electronics.

3.1.26 Omega 36/B2 and Omega 60/B2

Omega 36 and/or Omega 60 devices w/cabling in accordance with the following requirements:

- Omega 36/B2
    - Provide WSESRB approved Omega 36/B2 launcher
    - Cabling that interfaces with respective targets or stand alone power source
    - Special tools
    - Approved Omega 36 simulator includes: NSN: 1055-01-523-5600
- Omega 60/B2
    - Provide WSESRB approved Omega 60/B2 Launcher
    - Cabling that interface with respective targets or stand alone power source
    - Special tools
    - Approved Omega 60 launcher includes:NSN:6920-01-530-3932
- Comply with environmental and safety regulations

3.2 Stand-Alone Items

3.2.1 Attachable Printed Targets

Attachable Printed Targets in accordance with the following:

- Friend/Foe representations
- Withstand simulated munitions without puncture
- Clear laminate protects image from paint residue to extend life of target
- Multiple images: men, women, children, foreign and domestic
- Attaches to standard E silhouettes and Full Size armored vehicle targets
- Overlays or sleeves

3.2.2 Mounted Convoy Operations (MCO) Improvised Munitions Explosive Effects Simulator System (IMEESS)

Mounted Convoy Operations IMEESS in accordance Marine Corps Safety of Use Memorandum (SOUM) 3-09 .

- Approved systems include MIL-MCO-IMEESS

3.2.3 Urban Dismounted Operation (UDO) IMEESS

UDO IMEESS in accordance with Marine Corps SOUM 3-09.

- Approved systems include MIL-UDO-IMEESS manufactured by MIL-SIM-FX

3.2.4 Suicide Vest Version 3.2/3.4

Suicide Vest versions 3.2 or 3.4 in accordance with the Marine Corps SOUM 3-09.

- Suicide Vest version 3.2 contains the following requirements
    - two tube suicide vest
    - Right angle heads to blow powder away from user
    - Use 12 gram CO_2 cartridges
    - contain a Trigger command detonator
    - Utilize neck, belt and pouch harnesses
    - Weight 12.5 lbs
    - Length 18”x8”x10”
    - Approved systems include: MIL-SV32
- Suicide Vest version 3.4 contains the following requirements
    - Four tube suicide vest simulator
    - All others requirements included in the 3.2

3.2.5 CO_2 Fill Station System

CO_2 Fill station system with associated hardware in accordance with the following requirements:

- CO_2 Fill station
- Vent hose muffler, vent hose, weigh scale, adapter hose assembly with pin depress
- adapter with pin depress
- Fill station service kit
- adjustable wrench
- Carrying case
- weight -15lbs
- 13”x9”x10”
- Approved fill station systems include MIL-FIL-SYS

3.2.6 C02 Tank w/High Flow Valve

9 Ounce C02 Tank w/High Flow Valve in accordance with the following specification:

- Refillable 9 oz $C0_2$ tank with high flow valve
- Machined brass
- Length 12”x 2” diameter

- Approved $C0_2$ tank includes: MIL-9R-HFV

3.2.7 Pressure Sensitive/ Tripwire Improvised Explosive Device (IED) Set

Pressure Sensitive/ Tripwire Improvised Explosive Device (IED) Set in accordance with the following requirements:

- Simulates an Improvised M-14 IED and M-16 IED
- Use 12g CO_2 and FX powder
- include two iterations per set up
- Approved Pressure sensitive/tripwire IED sets include: M-30-APS

3.2.8 Magnetic R/X Pipe Bomb Simulator

Magnetic R/X Pipe Bomb Simulator in accordance with the following requirements:

- include a remote controlled pipe bomb simulator
- radio controlled (315MHz) frequency (500 ft line of sight (LOS))
- uses 12g CO_2 and FX powder
- include a Two channel transmitter
- Approved Magnetic R/X Pipe Bomb simulators include: MIL-RX-IED

3.2.9 Magnetic Squib

Magnetic Squib in accordance with the following requirements:

- Use $C0_2$ and F/X powder
- include a magnetic bottom
- use rubber burst discs
- Approved Magnetic squibs include: MIL-RB-SQB

3.2.10 Multifunction Detonator (MFD)

Multifunction Detonator in accordance with the following requirements:

- detonate any MIL-SIM-FX device
- Use 12g $C0_2$ cartridge for initiation
- consist of machined aluminum
- include MIL Spec anodized matte finish
- Weight 1.1lb
- Approved MFD include: MIL-12G-MFD

3.2.11 Trigger Command Detonator (TCD)

Trigger Command Detonator in accordance with the following requirements:

- Detonates any MIL-SIM-FX device
- Uses 12g $C0_2$ cartridge for initiation
- Approved TCD include: MIL-12G-TCD

3.2.12 Pressure Applied Detonator (PAD)

Pressure Applied Detonator in accordance with the following requirements:

- 10 lb pressure applied detonation

- Uses 12g $C0_2$ cartridge for initiation
- Machined aluminum
- MIL-Spec anodized matte finish
- Weight 1.5lbs
- 6”x1.5”x2”
- Approved PAD include: MIL-12G-PAD

3.2.13 Electronic Firing Device (EFD)

Electronic Firing Device in accordance with the following requirements:

- Radio controlled detonator w/2 channel transmitter
- 315 MHz- 500 ft LOS
- Uses 12g $C0_2$ cartridge for initiation
- 10”x3”x3.75
- Weight 2.1 lbs
- Approved EFD include: MIL-RX-EFD

3.2.14 Illumination FX

Illumination FX in accordance with the following requirements:

- High output LED strobe for night training
- 2 LED lights mounted on steel powder coated base with magnetic feet
- Approved Illumination FX include: MIL-ILLUM-FX

3.2.15 Trigger Command Fill Valve Assembly

Trigger Command Fill Valve Assembly in accordance with the following requirements:

- Fills low pressure devices such as MIL-RX-75S and MIL-RXL-EFD
- Uses 12g $C0_2$ cartridge
- Weight 3 oz
- Length 5” x 2 ½”
- Approved Fill Valve Assembly include: MIL-12G-QFT

3.2.16 Machine gun simulator- Badger/XM2A

Badger machine gun simulator and/or XM2A in accordance with the following requirements:

- Badger- AK-47 simulator
    - produces the sound and flash of a live machine gun
    - uses oxygen and propane
    - wireless remote control
        - 900 MHz Digital Spread Spectrum (DSS)
    - wireless receiver
    - propane regulator is compatible with the standard propane tank
    - oxygen regulator is compatible with standard oxygen cylinders
    - Commercial grade flexible gas lines
    - removable barrels
    - wiring harness with quick disconnect fitting
    - removable/adjustable tripod

  - storage case
  - use a common 12 VDC battery
- XM2A
  - produces the sound and flash of a live machine gun
  - uses oxygen and propane gas for small industrial type bottles
  - self contained unit housing the controls and rechargeable battery
  - Rate of fire is adjustable from 08-14 cycles per second
  - Controls are solid-state, fully fused protected
  - power requirement is 12Volts at 6Amp Hour Battery
  - remote control unit to control multiple devices
- Comply with environmental and safety regulations

3.2.17 Explosive Effects Simulator

Explosive effects simulator in accordance with the following:

- Oxygen and propane ignited in an open chamber to achieve the sound level and simulated blast effect of a variety of threats
- All components enclosed
- One man lift/two man carry
- O_2 cylinder (20cu ft)-150shots
- Propane cylinder (4.25lbs) – 250 shots
- Cover to replicate environment installed
- Weather resistant
- 100-130db
- Approved explosive effects simulator is: X-02
- Comply with environmental and safety regulations

3.3 Target installation

Installation of all targets in accordance with the following:

- US Army Corps of Engineers standards for site preparation and target enclosures MIL-HDBK-1027/3B
- Ballistic protection against damage from weapons up to .50 caliber

3.3.1 Range Secondary power

Installation of all Range secondary power from base point of service junction box to the range power destination in accordance with the following:

- US Army Corps of Engineers standards for site preparation and target enclosures MIL-HDBK-1027/3B

3.3.2 Target Control Cable

Installation of all Target control cable from RCS to range system components in accordance with the following:

- US Army Corps of Engineers standards for site preparation and target enclosures MIL-HDBK-1027/3B

- Ballistic protection against damage from weapons up to .50 caliber

3.4 Environmental Conditions

The equipment must operate within the following environmental conditions without deterioration:

- Temperature: Operating and Non-operating: -20°C to +55°C (-4°F to +131°F)
- Relative humidity: Operating and Non-operating: 0% to 100%
- Up to 75 mph winds with associated desert sand storms
- Operational in all types of precipitation

3.5 Materials and processes

Materials and processes in accordance with the following requirements. Commercial and Non-Developmental Items (CaNDI) and GFE are exempt from these requirements, unless otherwise specified in this section. CaNDI must comply with the Government's definitions in order to be exempt. Range must be restored to original condition or better to prevent soil erosion using sod, seed, straw, gravel or crushed rock as appropriate.

3.5.1 Parts

The trainer hardware comprised of CaNDI to the maximum extent practicable. Trainer Peculiar Equipment kept to a minimum.

3.5.2 Materials

Materials selected for the trainer hardware meet the primary design requirements of their application and the following additional performance requirements:

a. Except in the case of consumable items, materials used in the construction of nonexempt equipment preclude deterioration in performance and appearance over the design service life of the equipment.
b. When it is commercially practicable, materials selected allow trainer-peculiar parts to be repairable by commonly applied commercial processes.
c. Materials withstand, without deterioration, the effects of the environment in which the equipment will be operated, stored, and transported.
d. Materials selected preclude exposure of personnel, facilities, and the environment to toxic, explosive, and fire hazards throughout the life cycle of the equipment and thereafter.
e. Materials selected conform to restrictions peculiar to the installation site.

3.5.2.1 Flammable materials

Materials noncombustible or fire retardant in the most hazardous conditions of atmosphere, pressure, and temperature to be expected in their application. Nonpermanent fire retardant additives can not used to achieve fire retardation.

3.5.2.2 Hazardous materials

The trainer shall not expose personnel or the environment to excessive levels of toxic, carcinogenic, teratogenic, and otherwise hazardous materials as defined by OSHA and the Environmental Protection Agency (EPA). If hazardous materials must be used in order to meet

the performance requirements of this specification, only Government-authorized materials shall be used, the hazardous items shall be suitably marked, and all due precautions shall be taken to prevent whatever harm the hazardous material may cause.

3.5.2.3 Metals

Metals shall be corrosion-resistant, or shall be coated or metallurgically processed to resist corrosion. The environmental conditions to which the equipment will be exposed shall not cause corrosion and shall not cause deterioration of metal parts.

3.5.2.4 Ozone-Depleting Substances (ODS)

The use of substances classified as Class I ODS, shall be avoided unless there is no suitable non-ODS alternative available.

3.5.2.5 Radioactive material

Radioactive materials shall not be utilized unless specifically authorized in writing by the Government.

3.5.3 Processes

Processes shall be in accordance with established industry standards (e.g., American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), Institute of Electrical and Electronic Engineers (IEEE), etc.). The following additional requirements shall apply to the fabrication of TPE, unless otherwise specified.

3.5.3.1 Protective finishes and coatings

Class I ODS-based primers, coatings, and solvents shall be avoided.

3.5.3.1.1 Painting, and preparation for

Surfaces to be painted shall be prepared and painted in accordance with the paint manufacturer's recommendations. Class I ODS-based solvents shall be avoided in the surface preparation process.

3.5.3.1.2 Nonskid surfaces

Surfaces where personnel normally step during trainer use and maintenance shall be inherently nonskid surfaces, or shall be covered with nonskid paint or material.

3.5.3.2 Corrosion prevention

The trainer shall not be subject to corrosion and shall not be subject to other forms of physical deterioration in its intended use. The following is a list of characteristics that may contribute to such corrosion and deterioration and shall be avoided:

a. Crevices susceptible to moisture collection.
b. Galvanic metal couples over 100 mV potential difference.
c. Moisture-tight designs without proper seals.
d. Unprotected bearings.
e. Untested adhesively bonded designs (stress and humidity tests).
f. Metallic construction where nonmetallic is suitable.
g. Hardware requiring field maintenance for corrosion control.

3.6 Product markings

Trainer equipment and cables shall be identified and marked in accordance with the following requirements. Markings shall be permanent, securely fastened, and shall withstand the operational and storage environment of the trainer, environmental testing, and cleaning procedures. Legibility shall be as required for ready readability. Markings shall be of a color, which is in contrast to the color of the background surface. Markings of items shall not adversely affect the life and utility of the item.

3.6.1.1 Plug-in assemblies

Plug-in assemblies and subassemblies shall be keyed or permanently color-coded so as to minimize the probability of incorrect connection and insertion. Where keying or color coding are impractical, a permanent, legible directory or chart shall be posted conspicuously on or adjacent to the equipment, showing location and orientation of such assemblies and subassemblies.

3.6.1.2 Controls and indicating devices

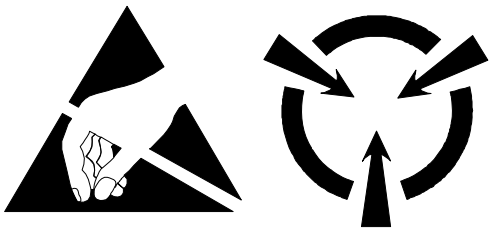
Markings shall be provided on the front of each exterior and interior panel, panel door, control mounting surfaces of each chassis, subpanel, etc., to clearly (though necessarily briefly) designate the functions and operations of all controls, fuses, and indicating devices mounted thereon, protruding through, or available through access holes therein. All markings shall be located on the panel or chassis in correct relationship to the respective designated items. The requirements of this paragraph shall apply to TPE and CaNDI, which are procured using CDs. Unmodified commercial items, GFE, and CAOE are exempt from the requirements of this paragraph.

3.6.1.3 ESD marking

Unless otherwise specified herein, electrostatic discharge sensitive assemblies and equipment shall be marked as follows.

3.6.1.3.1 ESD sensitive assemblies

Electrostatic discharge sensitive assemblies shall be marked with either the EIA RS-471 or the military symbol as illustrated in Figure 1. The symbol shall be located in a position readily visible to personnel when the assembly is incorporated in its next higher assembly. The requirements of this paragraph shall apply to TPE and CaNDI. Unmodified GFE is exempt from the requirements of this paragraph.



(RS-471)

Figure 1. ESD Symbols

3.6.1.3.2 ESD sensitive equipment

Equipment containing ESD sensitive parts and assemblies shall be marked with the EIA RS-471 or military symbol. The symbol shall be located on the exterior surface of the equipment and readily visible to personnel prior to gaining access to ESD sensitive parts and assemblies within the equipment. The following ESD caution statements shall be placed adjacent to the ESD sensitive symbol:

CAUTION
CONTAINS PARTS AND
ASSEMBLIES SUSCEPTIBLE TO DAMAGE
BY ELECTROSTATIC DISCHARGE

Figure 2. ESD Sensitive Equipment

3.6.1.4 Fluid and gaseous lines

Fluid lines shall be marked with the type of line; e.g., Supply, Return, Drain, Vent. All pressurized lines shall also be marked with the direction of flow. Where hazardous fluids or dangerous gases are utilized or where inadvertent cross connection of lines could result in a dangerous mixture, the name of the material conducted by the lines shall also be part of the line markings. Marking shall be legible, permanent, and shall be on bands of material suitable for the environment, affixed with adhesive or other means which will assure permanency of attachment for the life of the trainer without damage to the line. Location of markers shall be within one foot of line connection points, oriented for readability by maintenance personnel.

3.6.2 Cable and wire markings

Disconnectable cables and wires shall be permanently and legibly marked in accordance with the following requirements, which shall apply to all equipment categories (i.e., TPE, CaNDI, GFE, CAOE). Types of disconnectables include plugs, jacks, lugged terminals, and push-on captivated wires. Jumpers or links located on terminal boards, jacks or plugs are exempt from such marking. Soldered or wire wrap connections are also exempt from such marking. Markings shall not damage the wires or cables attached to and shall be located within approximately 8 cm from the connector, terminal or plug, oriented in such a manner as to be readable without removal of the wire or cable or support clamps.

3.6.2.1 Cable marking method.

The following methods shall be used to mark cables and wires:

a. Molded on the cable.
b. Stamped on the cable.
c. Securely attached, appropriately marked plastic bands. (no less than .25 mm thickness).
d. Bands of appropriately marked heat shrinkable tubing.

3.6.2.2 Cable marking information.

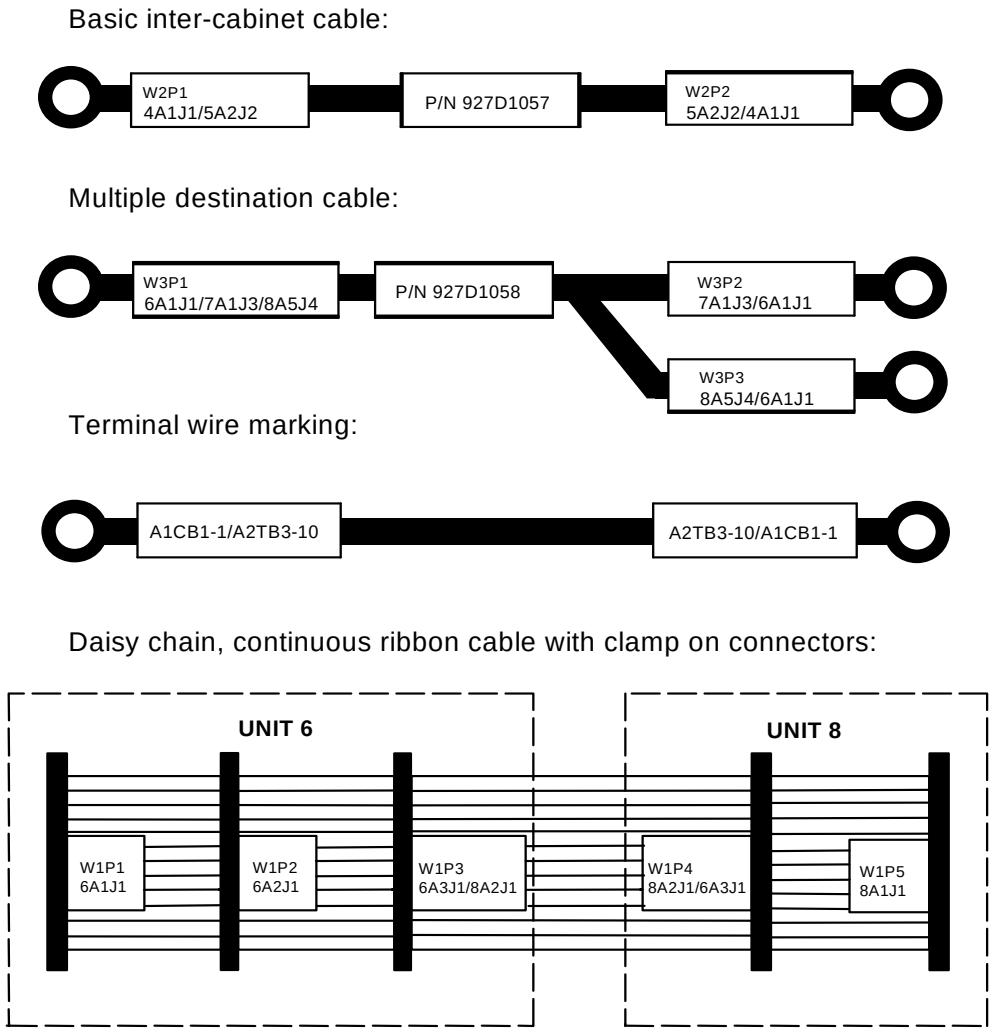
The following information shall be marked on all disconnectable cables.

3.6.2.2.1 "W" and "P" cable designations.

A "W" designation (W1, W2, etc.) shall be assigned to uniquely identify cables and wires. The numerical portion of the "W" designations shall be consecutive throughout the trainer. In addition, each connector within the same cable shall be identified with a "P" designation (P1, P2, etc). The numerical portion of the "P" designations shall be consecutive for a given cable. The "W" and "P" designations shall be marked on cables in accordance with Figure 3.

3.6.2.2.2 To-from designators.

In addition to the "W" and "P" designations, cable and wire markings shall also include "to-from" reference designators to identify the locations where they are connected. Cables and wires internal to subassemblies are not required to be marked with the "from" designator. The "to-from" designators shall be marked on cables in accordance with Figure 3.



NOTE (1) PREFIX MAY BE OMITTED FOR WIRES OR CABLES LOCATED ENTIRELY WITHIN THE SAME CABINET.

NOTE (2) FOR PURPOSES OF THESE MARKING REQUIREMENTS, UNITS COMPRISED OF MULTIPLE CABINETS OR BAYS PERMANENTLY WELDED OR BOLTED TOGETHER SHALL BE CONSIDERED AS HAVING SEPARATE CABINETS.

NOTE (3) THE UNDERLYING CRITERIA FOR WIRE AND CABLE MARKING SHALL BE EASE OF MAINTENANCE AND REDUCTION OF CHANCES FOR MISCONNECTION.

Figure 3. Examples of Cable Markings

3.6.2.2.3 Assembly/part number

Trainer-peculiar wires, cables, and harnesses shall also be identified and marked with the applicable assembly or part number. The number may be included with other required cable markings where space permits. Otherwise, a separate marking shall be made adjacent to the “W”, “P”, and “to-from” designator markings.

3.6.3 CaNDI marking

Where CaNDI is authorized for use in the trainer, and the equipment external marking or identification of controls, fuses, or connectors is absent, such equipment shall be marked with function or rating. Method, permanency, and legibility of CaNDI markings shall be as specified in 3.6. Where the equipment contains plug-in modules which are not keyed so as to prevent incorrect connection or insertion, a permanent legible directory or chart showing identification number, location, or orientation of such modules, shall be provided and posted conspicuously on or adjacent to the equipment.

3.6.3.1 CaNDI identification, nameplates, and labels

All nameplates, instruction labels, and equipment identification furnished with authorized CaNDI shall be written in the English language and numbering system.

3.6.4 Safety markings

Danger, caution, and warning signs, labels, and markings shall be used to warn of specific hazards such as voltage, current, thermal, or physical. Method, permanency, and legibility of equipment safety markings shall be as specified in 3.6. Guards, barriers, and access doors, covers, or plates shall be marked to indicate the hazard, which may be present upon removal of such devices. When possible, marking shall be located such that it is not removed when the barrier or access door is removed. Additionally, hazards internal to units shall be marked adjacent to hazards if they are significantly different from those surrounding items.

a. Physical hazards shall be marked in accordance with ANSI Z53.1-79.
b. Voltage hazards shall be marked in accordance with ANSI Z35.1-72, and ANSI Z35.4-73.
c. Laser labels shall be in accordance with 21 CFR 1040

3.6.5 Interchangeability

Where practicable, TPE parts shall be made identical and Interchangeable. For example, circuit card types shall be kept to as few as practicable so that a large inventory of spare circuit cards is unnecessary.

3.6.6 Safety

3.6.6.1 Emergency equipment power disconnect

The trainer power distribution system shall include the power disconnects required by OSHA 1910.302 - 308. Additional disconnects shall be provided at the instructor station(s). Each of the disconnecting points shall be legibly and permanently marked to indicate its purpose and operating instructions.

3.6.6.2 Equipment energized from multiple power sources.

A warning label in accordance with Figure 4 shall be securely affixed to electrical and electronic units, which have more than one source of electrical power. The warning label shall be located in such a manner as to allow operation and maintenance personnel to identify all of the circuits providing electrical power, and the location and designation of the de-energizing switches. Method of applying, permanency, legibility, and lettering shall be as specified in 3.6.

Figure 4. Multiple Power Source Label

3.7 Logistics

Life cycle costs should be minimized for both hardware and/or any related software with emphasis on logistics cost drivers such as component removal/replacement cycles, product obsolescence, multiple source availability, complexity of maintenance procedures, and handling, storage, and disposal.

3.7.1 Maintenance

3.7.1.1 Maintenance concept

The maintenance concept consists of on-site (organizational) and off-site (depot) maintenance. The on-site maintenance consists of preventive maintenance and corrective maintenance. The on-site corrective maintenance shall include any fault detection, fault isolation, and removal and replacement to the lowest replaceable unit (LRU) in order to restore the Live Training System to operational status in minimal time. Off-site (depot) level maintenance consists of repairs that exceed the capability of the on-site maintenance level.

3.7.1.1.1 Availability

The Live Training System shall demonstrate a 95% probability of completing fully operational missions for 6,696 operational hours (supporting 279 annual training days at 24 hours a day). In the event of equipment failure(s), the Live Training System should have a <30 minute Mean Time to Repair (MTTR), to the 90th percentile (accept time inclusive), and restorable to fully operational condition in 24 hours or less. Maintenance design should be such that all tasks may be routinely performed by journeyman level technicians. NOTE: Does not establish a survivability requirement for targets, components, or LRUs which may be damaged or destroyed due to operational training conditions on those items.

3.7.1.2 Qualitative maintainability requirements

General maintainability characteristics of the trainer equipment shall be as specified in the following paragraphs.

3.7.1.2.1 Special tools

There shall be no need to use special tools for equipment maintenance unless common tools are inadequate. Special tools shall be retained in holders provided inside of the equipment near where the tools are normally used.

3.7.1.2.2 Lamps

All lamps used in TPE shall be replaceable from the front. Government authorized CaNDI, GFE, and CAOE are exempt from this requirement.

3.7.1.2.3 Blown fuse indicator lights

Blown fuse indicator lights shall be provided and shall be visible on the outside of the equipment racks when all doors are closed and when standing in front of the racks. Government authorized CaNDI, GFE, and CAOE are exempt from this requirement; however, CaNDI and GFE having blown fuse indicator lights shall be installed so that the indicator lights are not hidden by other equipment installed in the same area.

3.7.1.2.4 Accessibility

Trainer equipment shall provide for the necessary access to its interior parts, terminals, and wiring, for adjustments, required circuit checking, and the removal and replacement of maintenance parts. Accessibility for testing shall not apply to parts located in nonrepairable assemblies. For routine servicing and maintenance, unsoldering of wires, wire harnesses, parts, or subassemblies shall not be required in order to gain access to terminals, soldered connections, mounting screws, and the like. The following additional requirements shall also apply.

3.7.1.2.4.1 Cable slack

Adequate cable slack and cable bending features shall be provided to assure full extension access to multiple equipment extensions during maintenance without stressing the cables and associated connectors. Adequate cable slack shall also be provided in the cables behind equipment panels to permit removal of each instrument, display, or control panel and disconnection from associated cables in one maintenance operation from the front of the equipment without stressing the cables and associated connectors. The need for rear access to disconnect or reconnect the equipment from associated mounting, shall be prevented by selection and use of appropriate hardware fasteners.

3.7.1.2.4.1.1 Parts

Replaceable parts shall be readily removable. For example, replaceable parts shall not be permanently mounted by means such as rivets, spot welding, or hard curing compounds. No unsoldering of connections shall be necessary in order to remove front panels or subchassis for maintenance purposes.

3.7.1.2.4.1.2 Assemblies

All parts shall be readily accessible for maintenance. Tracks, rollers, hinges, pivots, or a combination thereof shall be installed for providing accessibility to units, assemblies, subassemblies, and parts. Locking devices shall be provided to lock the chassis in the servicing position and in the fully opened and fully closed positions. Each major assembly, subassembly, and unit of the trainer shall permit access to its interior components and parts for maintenance. It shall not be necessary to displace or remove wires, cables, subassemblies, or assemblies in order

to gain access to mounting screws, test points, adjustment points, lubricating points, and the like. Where visual inspection is necessary, and open access is not feasible, transparent access panels shall be used. The placement of parts shall be such as to provide space for the use of test probes and maintenance tools. Assemblies subject to replacement or service shall not be permanently fastened.

3.7.1.2.4.1.3 Wiring board extender cards

Where connector termination points are not accessible for testing, extender cards shall be provided. Extender cards shall have matching indexing system and shall be identified with their corresponding wiring boards. Insulating materials shall not be applied to the conducting surfaces of extender cards.

3.7.1.2.4.1.4 Covers, panels, and doors

Hinged covers and doors shall be equipped with means to retain them in their open positions. When opened, hinged covers and doors shall not cause the equipment to become unbalanced. Removable covers for which no convenient location is available during maintenance shall be equipped with a chain or lanyard fastened to the equipment. Front panels containing parts that require maintenance, such as instruments, switches, potentiometers, and the like, shall be hinged. Where parts or assemblies are mounted on hinged doors, on panels, and on covers, the electrical ground return shall not depend on the hinge contact for electrical continuity. Means shall be provided on hinged panels to retain the panels in the open position to permit accessibility to all parts mounted on the panels, to prevent damage to the panels, and to prevent injury to personnel performing maintenance.

3.7.1.2.4.1.5 Handles

Handles and handgrips shall be provided for removing units or chassis from enclosures. Handles on enclosures shall be recessed.

3.7.1.2.4.1.6 Replacement of modular assemblies

Modular assemblies such as circuit boards shall be equipped with connectors so that they may be removed without desoldering. All modular assemblies shall be designed so that they can be inserted into the equipment in one position only. All sockets within each assembly shall be oriented in the same direction and positioned so that they are visible. Modular circuits shall be grouped in functional units.

3.7.1.2.5 Circuit cards

Where practicable, functions shall be apportioned to circuit cards so as to take advantage of standardization and commonality of components, such that the need for spare parts inventory is minimized.

3.7.1.2.5.1 Circuit card connectors

Circuit card connectors shall have means of positive connection without diminishing the life of the connector under normal mating and unmating cycles.

3.7.1.2.5.2 Circuit card connectors, power and ground

Power and ground connections to circuit boards shall be arranged so that inadvertent insertion of a card in the wrong slot will not result in damage to the card or to other parts of the trainer.

3.7.1.2.6 Trainer power requirements

The trainer will be positioned in remote locations requiring the trainer power to be provided by one or more sources. These sources may include solar, battery, or generator.

3.7.1.2.6.1 Power-line monitoring/protection

The trainer shall be protected against damage and malfunctions resulting from power line abnormalities described herein. Appropriate monitors and indicators shall be provided to reveal the nature of the abnormality detected.

3.7.1.2.6.2 Under/overvoltage

If power line voltage at the trainer input power distribution panel exceeds the operating limits specified for the trainer by more than ± 5 percent for a period of 5 seconds or more, automatic shutdown of the trainer shall occur. When the trainer is supplied by multiphase line power, automatic shutdown of the trainer shall occur when these limits are exceeded on one or more of the phases. A visual indication of the condition shall be provided. If operating limits are not specified elsewhere, the limits shall be presumed to be +6 percent and -13 percent of the nominal power line voltage supplied.

3.7.1.2.6.3 Voltage transients

Phase-to-phase or phase-to-neutral voltage transients falling within the curve of figure 4 in ANSI/IEEE 446-1987 shall not cause part failures, prevent resumption of normal operation, or require the equipment to recycle when the transients have ceased.

3.7.1.2.6.4 Phase rotation

Trainers that are supplied by multiphase line power and which have phase sensitive equipment, shall be protected against inadvertent phase-reversal conditions. Means shall be provided in the power distribution system, to prevent the energizing of phase sensitive equipment with incorrect phase sequence.

3.7.1.2.6.5 Under-frequency

Trainers that are expected to be powered by mobile electric power generation equipment shall be protected against under-frequency conditions. Means shall be provided to automatically initiate safe shutdown of the trainer, or critical equipment within the trainer, when a deviation of more than 15 percent below the nominal operating frequency occurs for a period of 5 or more seconds.

3.7.1.2.6.6 Frequency transients

The trainer shall continue operation during transients within ±3 percent of nominal frequency. A frequency variation of ±15 percent for periods up to ten seconds, occurring not more than once every five minutes, shall not result in permanent damage, modification of characteristics, and loss or change of computer stored memory information.

3.7.1.2.6.7 Power interruption

The equipment shall be protected from permanent damage, modification of characteristics, and loss or change of computer stored memory information, resulting from a power interruption with power restored within 1 to 30 seconds and occurring not more than once every five minutes.

3.8 Construction

3.8.1 Workmanship

The following requirements shall apply.

3.8.1.1 Cleaning

After fabrication, parts and assembled equipment shall be clean of smudges; loose, spattered, or excess solder; weld metal; metal chips and mold release agents; or any other foreign material that might detract from the intended operation, function, or appearance of the equipment.

3.8.1.2 Threaded fasteners

Screws, nuts, and bolts shall show no evidence of cross threading, mutilation, or burrs, and shall be firmly secured.

3.8.1.3 Wiring

Wires and cables shall be positioned or protected to avoid contact with rough surfaces, irregular surfaces and sharp edges, and to avoid damage to conductors and adjacent parts. Harnesses and cable form containment means shall be neat in appearance, uniformly applied, and positioned to retain critical form factors and breakout locations. The containment means (lacing, ties, tiedown straps, etc.) shall not cause the insulation to deform to the point where performance is adversely affected. There shall be no evidence of burns, of abrading, or of pinch marks in the insulation, which could cause short circuits or leakage. Sufficient clearance shall be provided between wires or cables and heat generating parts to avoid deterioration of the wires and cables.

3.8.1.4 Shielding

Shielding on wires and cables shall be secured in a manner that will prevent it from contacting or shorting exposed current-carrying parts. The ends of the shielding or braid shall be secured to prevent fraying.

4. VERIFICATION

4.1 Methods of verification.

The following methods will be utilized to accomplish the verification of requirements:

a. Analysis
b. Demonstrations
c. Examinations
d. Tests

4.2 Classes of verifications

The trainer will be subject to the verification classes listed below. Under each verification class, the trainer will be subject to inspections and tests as specified in 4.3 below.

a. In-process inspections
b. Contractor/Government Inspection (ICPI)

4.3 Inspections and tests

The trainer shall be subject to the following inspections and tests.

4.3.1 Visual inspections

The visual inspection shall consist of verification of the availability of trainer system documentation relative to testing requirements, a walk through inspection to determine compliance with safety requirements, and familiarization with emergency power-off procedures.

4.3.2 System Test and Evaluation (T&E)

The contractor shall establish an overall T&E program. The T&E program shall be designed to verify that the RTS and the integration of all subsystems and equipment meet the technical and operational requirements as identified in the RTS specifications.

4.3.2.1 Responsibility for Tests

Unless otherwise specified in the contract, the contractor shall be responsible for the performance of all test requirements. The Government reserves the right to perform any tests deemed necessary to ensure that the trainer conforms to the contract requirements.

4.3.2.2 Test Authority

Test results shall be recorded by a responsible officer of the contractor's organization during preliminary and final contractor's inspection and certified by the Administrative Contracting Officer's (ACO's) or Procuring Contracting Officer's (PCO's) representative. The PCO's representative will verify government inspection results.

4.3.2.3 Test Resources and Facilities

The contractor shall furnish the inspection and testing equipment and personnel for all tests onsite required to ensure that the trainer meets the requirements. The contractor shall be solely responsible for and assure that all contractor personnel, test equipment, test facilities, other supporting equipment, spare assemblies and parts, test and data logs, and other items necessary for testing are available for the start and during all phases of testing.

4.3.2.4 Test Methods

The contractor shall perform in accordance with the contractor-prepared and Government-accepted Test Procedures. All Test, examination, demonstration, inspection, and verification procedures shall be documented in the Test Procedures. Test, examination, and inspection procedures shall be written so that they can be performed by a qualified technician. Test results must satisfy the specified test criteria within specified tolerances to be acceptable. All verification, test, examination, and inspection results shall be documented in the Test/Inspection Report. The contractor shall prepare the Test Procedures and the Test/Inspection Report in accordance with CDRL A001.

4.3.2.5 Test Criteria

The test criteria for tests and examinations shall include both quantitative and qualitative performance data of the operational system(s). Quantitative test criteria shall be used to the maximum extent possible. Government approval is required for any test criteria, which is not based on actual operational system performance data. Where appropriate, test criteria for

individual inspections, tests, demonstrations, and examinations shall consist of both quantitative and qualitative test criteria.

4.3.2.6 Tolerance Data

Test tolerances shall be identified for all test criteria. Each test tolerance and the source from which the specified tolerances are derived shall be identified. Specified tolerances shall be derived from the trainer specification, design criteria reports, manufacturing criteria, and operational equipment data.

4.3.2.7 Alignment

The contractor shall perform all necessary equipment alignments prior to the initiation of each increment of the T&E program.

4.3.2.8 Test Log

The contractor shall maintain a log of all subsystem and system tests conducted in-plant and on-site. The log shall contain information by date, as to the equipment activated, maintenance performed, including adjustments and alignments, equipment failure, redesign, and replacement. The contractor shall present the information in the log to help the Government technical representative determine that the maintenance, alignment, or replacement has not invalidated previously completed tests. The log shall be made available to the Government technical representative upon request.

4.3.2.9 Changes During Testing

All changes made in the alignment, programming, or adjustments during the T&E program shall be recorded in the contractor's test log. All tests conducted prior to such changes shall be repeated unless a Government technical representative determines that such changes have not invalidated the related test data.

4.3.2.10 Changes After Testing

All modifications or changes in design, which are determined to be necessary as a result of testing, shall be recorded in the contractor's test log. All tests run prior to such modifications shall be repeated unless a Government technical representative determines that such changes have not invalidated the related test data.

4.3.2.11 T&E Deficiency Reporting System

The contractor shall establish and implement a Deficiency Reporting System for the identification, tracking, and resolution of all hardware and software problems (including tactical subsystem) discovered during inspections.

4.3.2.12 T&E Program Components

The T&E program shall consist of the following:

a. In-process inspections
b. Site Acceptance Test
    a. In-process
    b. Final
c. Physical Configuration Audit

4.3.2.12.1 In-Process Inspections

The contractor shall perform in-process inspections including: visual, electrical, and mechanical examinations and testing of materials, subassemblies, parts and accessories (including purchased items) that may be required to assure conformance to all requirements.

4.3.2.12.2 Site Acceptance Test

Site Acceptance Test will consist of both in-process testing(s) and a final Site Acceptance Test.

4.3.2.12.2.1 In-Process - Site Acceptance Test (IP-SAT)

Upon partial installation of the range equipment on-site, the contractor and government shall perform incremental IP-SAT testing in accordance with the Government-accepted Test Procedures. IP-SAT tests will be witnessed and certified by a representative of the PCO who will determine the test procedures to be run. The contractor shall use a copy of the Test Procedures. The contractor shall record, in the Test/Inspection Report, the results of IP-SAT and shall record, in the Test Procedures, any corrections made to the procedures as a result of performing IP-SAT. Hardware and software configuration item testing shall be conducted as an integral part of IP-SAT. Any deficiencies found during these tests shall be corrected by the contractor prior to Final – Site Acceptance Test.

4.3.2.12.2.2 Final - Site Acceptance Test (F-SAT)

Upon completion of the installation of the range equipment on-site, the contractor and government shall perform F-SAT in accordance with the Government-accepted Test Procedures. F-SAT tests will be witnessed and certified by a representative of the PCO who will determine the test procedures to be run. The contractor shall use a copy of the Test Procedures. The contractor shall record, in the Test/Inspection Report, the results of F-SAT and shall record, in the Test Procedures, any corrections made to the procedures as a result of performing F-SAT. Hardware and software configuration item testing shall be conducted as an integral part of F-SAT. Any deficiencies found during these tests shall be corrected by the contractor prior to range equipment system acceptance by the Government.

4.3.2.12.3 Physical Configuration Audit (PCA)

The PCA will be conducted in conjunction with the final site acceptance test in order to establish the product baseline prior to acceptance of the training system by a signed DD250. The PCA will consist of non-functional examinations performed to demonstrate the training system's as-built design satisfies the system requirements and that the deliverable documentation accurately reflect the configuration items. Non-deliverable documents may be in contractor format and will be examined only to determine contractor compliance with the configuration management program requirements.

4.3.3 Functional tests

Functional tests shall include the verification and validation of design documentation and shall include the following test sequence:

4.3.3.1 Radio Control Station and Hand Held Controller tests

The tests shall consist, as a minimum, of system initialization, start-up readiness diagnostics, operator self teaching capabilities, scenario load and initialization, and system mode selections including keyboard, mouse, track-ball, touch screen and display functions, as applicable. The

Radio Control Station and Hand Held Controller shall be verified to operate in accordance with the specified performance requirements.

4.3.3.2 Stationary Targets tests

The Stationary Targets tests shall consist of visual inspection to ensure equipment installation reflects the layout of the design, suitability of controls and control circuits for satisfactory mechanical and electrical operation. The Stationary Targets shall be verified to operate in accordance with the specified performance requirements and safety requirements.

4.3.3.3 Moving Targets tests

The Moving Targets tests shall consist of visual inspection to ensure equipment installation reflects the layout of the design, suitability of controls and control circuits for satisfactory mechanical and electrical operation. The Moving Targets shall be verified to operate in accordance with the specified performance requirements and safety requirements.

4.3.3.4 Sound Effect Simulators tests

The Sound Effect Simulators tests shall consist of visual and audible inspection to ensure equipment installation reflects the layout of the design, suitability of controls and control circuits for satisfactory mechanical and electrical operation. The Sound Effects Simulators shall be verified to operate in accordance with the specified performance requirements and safety requirements.

4.3.3.5 Night Muzzle Flash Simulators tests

The Night Muzzle Flash Simulators tests shall consist of visual and audible inspection to ensure equipment installation reflects the layout of the design, suitability of controls and control circuits for satisfactory mechanical and electrical operation. The Night Muzzle Flash Simulators shall be verified to operate in accordance with the specified performance requirements and safety requirements.

4.3.4 Operation and mission tests

The Operation and mission tests shall demonstrate compliance with the specified performance requirements.

4.3.5 Product assurance tests

The product assurance tests shall determine compliance with the specified performance requirements.

4.3.5.1 Nonfunctional examinations

The trainer shall be subject to the non-functional examinations performed to demonstrate the trainer as-built design satisfies the specified requirements. The examinations will encompass all areas, major assemblies, and sub-assemblies of the areas of the completely assembled trainer. The examinations, which shall be performed with trainer power off, shall verify conformance to the requirements for:

a. Materials
b. Parts
c. Design
d. Construction

e. Assembly
f. Wire markings/Product Markings
g. Finish (corrosion protection and treatment)
h. Safety
i. Workmanship