NOTICE

This documentation has been reviewed by the technical authority and does not contain controlled goods.

AVIS

Le présent document a été examiné par l'autorité technique et ne vise pas de marchandises contrôlées.

SPECIFICATION FOR THE MODULAR INDOOR RANGE

1. SCOPE

1.1 Purpose

This document describes the technical requirements for the modular indoor range required by the Government of Canada.

1.2 Background

The Department of National Defence (DND) is establishing a unit's training capability at Canadian Forces Base (CFB) Kingston. Canadian Armed Forces (CAF) members must maintain a high level of proficiency in firing of small arms (9 mm; 5.56 mm) in static and tactical situations. DND has a requirement for a twenty-five meter (25 m) indoor range that allows for lane firing at stationary targets, as well as the integration of a DND owned simulation system enabling the simulation of realistic operational scenarios requiring fast decision making.

1.3 Terminology

The following terms provided are applicable to Annex C – Technical Specification.

a. "Range" will be used in place of "modular indoor range", "modular range", and "indoor range";
b. "Firing Point" is defined as the point at the beginning of a lane a shooter holds the muzzle of their weapon over when shooting at targets from the shooting stall;
c. "Firing Line" is defined as the straight line a shooter holds the muzzle of their weapon over when shooting at targets from their shooting stall. The firing line is parallel to the floor and perpendicular to the direction of fire;
d. "Downrange" or "Forward" is defined as the distance measured from the firing point in the intended direction of fire. Downrange is parallel to the floor, parallel to the long side of the range, and perpendicular to the firing line;
e. The "primary direction of fire" is downrange;

f. "Permitted" is defined as enabled or allowed through range doctrine and documented policies and procedures. "Not-permitted" activities do not require a physical barrier preventing the activity;

g. Range Status: The following terms are used to describe the various range statuses:

i. Live (For shooting practice):
1. The range is on and all systems are active;
2. Doors and access points are secured and confirmed closed;
3. Weapons are permitted to be loaded and shooting is permitted;
4. The only permitted access to the shooting area is from the control room;
5. The range is occupied with proper compliment of operators; and
6. Lights in the shooting area are on or off, and set to the lighting level required.

ii. Standby (Pre and post shooting activities including: briefing, emergency situations, acclimatization to low light conditions and debriefing):
1. The range is on and all systems are active;
2. Doors and access points are not secured or confirmed closed;
3. Weapons might be loaded but shooting is not permitted;
4. The only permitted access to the shooting area is from the control room;
5. The range is occupied with proper compliment of operators; and
6. Lights in the shooting area are on and set to at least a 50% lighting level.

iii. Maintenance (For maintenance purposes including cleaning):
1. The range is on and not all systems are active;
2. Doors and access points are not secured;
3. Weapons may not be loaded and shooting is not permitted;
4. All doors may be used to access the shooting area;
5. The range is minimally occupied; and
6. Lights are on or off as required

iv. Preparation / Setup (For setup and preparation of training serials, and review of shooter data);
1. The range is on and not all systems are active;
2. Doors and access points are not secured;
3. Weapons may not be loaded and shooting is not permitted;
4. All doors may be used to access the shooting area;
5. The range is minimally occupied; and
6. Lights are on or off as required.

v. Closed (Not in use, but maintain minimum temperatures and security)
1. The range is on and minimally required systems are active;
2. Doors and access points are secured and confirmed closed;
3. Weapons may not be loaded and shooting is not permitted;
4. All doors may be used to access the shooting area;
5. The range is not occupied; and
6. Lights are off in the shooting area.

vi. Off (Not in use, all systems off)
1. The range is off and no systems are active;
2. Doors and access points are secured;
3. Weapons may not be loaded and shooting is not permitted;
4. All doors may be used to access the shooting area;

5. The range might be minimally occupied (e.g., maintenance); and
6. Lights are not active.

h. "Loaded weapon" modes applies to "live" and "standby" statuses;
i. "Non-loaded weapon" modes applies to "maintenance" and "preparation / setup" statuses;
j. "Operator" is defined as the personnel operating the range including:
   i. Range Safety Officers;
   ii. Range Staff; and
   iii. Training staff.
k. "Shooter" is defined as the personnel utilizing the range with either live fire or simulated-fire weapons;
l. "Shooting Area" refers to the area in the range where weapons will be loaded with ammunition, and can be unloaded. The shooting area includes the open preparation area / shooting gallery and the shooting stall and lanes between the ballistic barrier at the control room and the bullet trap; and
m. A Professional Engineer (P.Eng) is licensed by and registered with a professional engineering society in Canada, to perform engineering work. Engineers licensed by or registered with an engineering society outside of Canada, which has an equivalency agreement with or is considered equivalent by a Canadian Engineering Society, will be considered equivalent for the purposes of this document.

2. APPLICABLE DOCUMENTS

2.1 General

The following documents form part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract. The version of document enforced must be the version active as of RFP posting date.

2.2 Order of Precedence

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

2.3 Documents and Standards

2.3.1 Government of Canada Standards

a. B-GL-381-001/TS-000 – Operational Training – Training Safety
b. C-98-015-001/DD-006 – Ventilation of Indoor Firing Ranges;
c. C-02-006-002/AG-000 – Information Markings on Canadian Forces Equipment;
d. FMD-4003 – Fire Protection and Life Safety Engineering Design;
e. FMD-4011 – Fire Protection for Information Technology Facilities and Equipment;
f. SOR/86-304 – Canada Occupational Health and Safety Regulations (http://laws.justice.gc.ca/eng/regulations/sor-86-304/index.html); and
g. NBCC 2015 – National Building Code of Canada (www.nrc-cnrc.gc.ca)

2.3.2 Other Government Standards

a. MIL-STD-1472G-Human Engineering (http://www.public.navy.mil/navsafecen/Documents/acquisition/MILSTD1472F.pdf)

b. OSHA – (CFR) 29 CFR1910.1025 - Occupational Health & Safety Administration (www.osha.gov/law-regs.html);
c. Ontario Ministry of Labour Guideline for the installation and use of fall arrest anchor points guidelines (http://www.labour.gov.on.ca/english/hs/pubs/gl_windowcleaning.php);
d. CAN/CSA Z271-10 – Safety code for suspended platforms (shop.csa.ca);
e. NEHC-TM6290.99-10 – Navy Environmental Health Center: Indoor Firing Ranges Industrial Hygiene Technical Guide (http://www.med.navy.mil/sites/nmcphc/Documents/policy-and-instruction/ih-indoor-firing-ranges-technical-guide.pdf); and
f. NFPA 13 – Standard for the Installation of Sprinkler Systems (www.nfpa.org).

2.3.3 Commercial Publications

a. NSSF (National Shooting Sport Foundation) – Division 15 – Lead Management and OSHA Compliance for Indoor Ranges.

3. RANGE REQUIREMENTS

3.1 In Service Design

The range must:

a. Be based on a design:
   i. Previously manufactured by the manufacturer; and
   ii. That has been in service for at least three (3) years within the last 20 years as of the RFP posting date.
b. Be designed and manufactured by a manufacturer having at least 5 years' experience manufacturing modular indoor ranges, within the last 20 years as of the RFP posting date;
c. Have installation lead by an installer with at least 5 years' experience with modular indoor ranges, within the last 20 years as of the RFP posting date; and
d. Be a design approved, certified, and sealed by a P.Eng.

3.1.1 New Material

a. The range must be new and unused. Ranges that have previously been used for firing weapons will not be accepted;
b. All range ballistic material must new and unused;
c. Range HVAC systems and subsystems must be new and unused, and contain new materials only;
d. Materials, components and subsystems manufactured to compose the range control systems must be new and unused;
e. All wiring, communications, electrical, and sprinkler systems must contain new material only; and
f. If the range structure is composed of intermodal containers, used one-trip intermodal containers will be accepted. Used intermodal containers must be rust-free at range installation, and certified approved for use by a P.Eng.

3.2 Ballistic Requirements

The range will be used with weapons firing:

a. NATO standard 9 mm (9 x 19 mm Parabellum);

b. NATO standard 5.56 mm (5.56 x 45 mm);
c. With handgun munitions up to and including: Maximum impact velocity: 2200 ft/sec, Maximum impact energy: 2000 foot-pound ("ft-lb"), at an impact angle: 0 degrees (0 rad), 147 grains ("gr.");
d. Centre fire rifle munitions up to and including Maximum impact velocity 3,300 ft/sec and, Maximum impact energy 3,000 ft-lb; at an impact angle of 0 degrees (0 rad); and
e. On full automatic at a sustained rate of up to 1,000 rds/min, for a maximum three-round burst per interval with a minimum of 15 second interval between burst.

3.2.1 Lead-Free Ammunition

It is desirable that the range is be compatible with lead-free ammunition with the same maximum ballistic properties of the current lead NATO standard ammunition as specified in paragraph 3.2 - Ballistic Requirements without degradation in performance or increase in maintenance cost.

3.2.2 Estimated Usage

a. An estimated minimum 35,000 rounds of 9mm and 5.56mm combined will be fired in the range each month;
b. An estimated maximum 875 rounds, per lane, of 9mm and 5.56mm combined will be fired in an 8 hour training period; and
c. If the range enables multi-directional shooting as specified in paragraph 3.4.1 a.i. – Desired Configuration, an estimated 1,000 rounds per month will be fired at each side wall available.

3.2.3 Ballistic Protection Coverage

The range must:

a. Offer 100% ballistic containment and protection;
b. Fully contain and prevent all projectiles, which meet the ballistic requirements outlined in paragraph 3.2 - Ballistic Requirements, fired from any point in the shooting area, in any direction or angle up-range, downrange, or cross-range from exiting the range and shooting areas;
c. Have a Zero Surface Danger Zone (0-SDZ) and be certifiable as a zero-template range by the CF authority in accordance with B-GL-381-001/TS-000;
d. Utilize, at a minimum, a ballistic envelope composed of 3/8" AR500 steel;
e. Be designed and constructed to prevent any ricochets back towards the origin of fire;
f. Be designed and constructed to prevent any ricochets back towards the firing line;
g. Provide complete ballistic protection to all conduits, lighting, electrical, fire protection systems, and equipment downrange of the firing line, from direct fire in the designed direction(s) of fire. All ballistic protection and protrusions for ceiling mounted equipment and components must have a height clearance of 2.2 m unless otherwise specified;
h. All ballistic rubber tiles must be:
    i. At least 5 cm thick; and
    ii. Removable and replaceable.
i. Not included concrete or wood as a bullet capture or ricochet prevention material;
j. Ballistic Rubber tiles must have no spaces in-between adjacent rubber tiles in order to provide complete protection and containment where applicable; and
k. Ballistic and sound damping tiles must not be bright in colour. Neon colours will not be accepted. Bright orange, yellow, pink or green will not be permitted.

3.3 Lead Contamination Control

Lead contaminate control must be inherent to the design of the range such that conscious effort on the part of all occupants is minimized. The range must be designed, and have the equipment and accessories necessary to:

a. Ensure that lead contamination is minimized in the control room;
b. Ensure that lead contamination does not occur exterior to the range; and
c. Limit the amount of lead exposure to all range occupants.

3.4 Configuration

The range must:

a. Be fully compatible with the ammunition and fire-rates in paragraph 3.2 - Ballistic Requirements;
b. Consist of eight (8) shooting lanes that:
    i. Share the same firing line;
    ii. Have parallel primary directions of fire;
    iii. Have a maximum target distance that are on the same straight line; and
    iv. Have a parallel wall opening, at least 5 m long and 2.2 m tall, beginning at least 5m downrange and no more than 10 m downrange, to allow shooters to pass laterally from the first lane to the last lane without moving down or up range;
c. Allow shooters to move downrange to engage targets shooting from any point from the firing line to at least 2 m from the farthest target position;
d. Have an area downrange of the farthest target position to capture projectiles;
e. An open preparation area/shooting gallery, the entire width of the range, located behind the shooting stalls;
f. Have one (1) control room for all lanes;
g. Have the control room separated from the preparation area by a rigid barrier;
h. Have a maximum exterior footprint of 45.72 m x 15.00 m (150' x 49.21') with all rooms, lanes, accessories, and support systems;
    i. Stairs, steps and ramps on the west-south-west end of the range (towards the loading docks) will be permitted to extend a maximum of 1.5m beyond the assigned maximum exterior footprint.
i. Have a minimum interior ceiling height of 2.2 m; and
j. Be designed and manufactured to enable the standard policies and procedures outlined in B-GL-38-001/TS-000, Section 2, Chapter 3, Paragraphs 30 to 37.

3.4.1 Desired Configuration

It is desired that the range:

a. Has no interior walls, supports, or obstructions between the firing line and the bullet trap;
    i. If there are no interior obstructions it is desired that the range enables intentional multi-directional, and cross-lane shooting in a secondary direction towards one side wall, perpendicular to the primary direction of fire and all angles in between for up to 90 degrees, or towards both side walls perpendicular to the primary direction of fire and all angles in between for up to 180 degrees of shooting.
        1. Shooters must be able to safely engage targets on the side wall(s) shooting perpendicular to the primary direction at a distance of 2 m from the side wall(s);

2. Shooters must be able to engage targets along the entire wall(s) from firing line to the furthest target position;
3. Walls, floors, and ceilings, between the firing line and the bullet trap, must be lined with ballistic rubber tiles. Wall mounted tiles, between the firing line and the bullet trap, must be provided with an air gap of at least 13mm between the wall and tiles to enable the recovery of rounds at the base of the wall; and
4. It is desired that all projectiles shot at the side wall(s) are collected in removable bins at the base of the side wall for disposal. Each bin must have a minimum capacity of 200 - 9 mm rounds and be no wider than 1 m.

b. Consists of nine (9) or more shooting lanes meeting the requirements of section 3.4 - Configuration sub-section b;
c. Includes a covered entry vestibule, no deeper than 1.5 m, with a removable, cleanable mat and a three-sided boot brush, at the main entrance to the control room;
d. Is provided with a shot counter to count the number of rounds. The shot counter must:
   i. Relay the shot count to the range control system to be recorded by the range control system;
   ii. Be accurate to within 0.1 % for 1000 rounds fired;
   iii. Not require any effort on the part of the shooters;
   iv. Not require any additional components or accessories to be mounted to the weapons being utilized, the shooters, or the operators; and
   v. Be fully compatible with the ammunition and fire rates specified in paragraph 3.2 Ballistic Requirements.
e. Has a minimum interior ballistic and non-ballistic ceiling height, including the parallel wall openings, of 2.5 m.

3.5 Shooting Lanes

Each shooting lane must:

a. Be assigned a separate shooting lane number;
b. Be, at a minimum, grouped in quantities of no less than two, such that grouped shooting lanes have no dividing walls or vertical obstructions in between them, except shooting stall dividers;
c. Has a maximum number of dividing walls, M, between lane groups as defined by:

$$M = \left(S \times \frac{1}{2}\right) - 2,$$

Where: M = Maximum number of dividing walls,
$M \in \mathbb{N}$ (rounded down to the nearest Natural Number)
S = Number of shooting lanes

d. Have each shooting lane wall (exterior and dividing) separated by at least 4.064 m (160 in);
e. Have a clearly marked firing line and firing point;
f. Have a length of 25 m measured from the firing point to the farthest possible target position;
g. Have a width at least 1.2 m;
h. Be provided with a target retrieval system as described paragraph 3.7 - Target Retrieval System;

i. Be designed and constructed to eliminate the possibility of a projectile directed downrange from ricocheting back towards the firing line;
j. Have a line or markings on the floor at every 5 m interval starting from the firing line to the farthest target position; and
k. Have one shooting stall at the beginning of each lane.

3.5.1 Lane Desired Criteria

a. For ranges with interior lane walls, it is desired that the shooting lanes include less than the maximum number dividing walls as defined by paragraph 3.5 c;
b. It is desired that all shooting lanes are wider than 1.2 m; and
c. It is desired that the distance from each wall to the center of the lane(s) adjacent to the wall is 1.25m

3.6 Shooting Stall

Each shooting stall provided with the range must:

a. Have signage in the stall and at the top of the stall to clearly indicate the shooting lane number to both the shooter, and an operator in the control booth;
b. Be fitted with a swing out barricade for strong hand / weak hand training that:
    i. Is over the firing line when open;
    ii. Can be secured open and closed with one hand;
    iii. Is secured towards the rear of the shooting stall in the stored ("not-in-use") position;
    iv. Does not swing forward of the firing line;
    v. Is opaque;
    vi. Is made of such rigid material that a round will pass through unobstructed without debris coming back at the shooter;
    vii. Is between 1.4 and 2 m tall, height to be determined upon contract award;
    viii. Has a width between 0.25 m to 0.45 m; and
    ix. Is centered between both sides of the stall when out,
c. Not have a stall table;
d. Have shooting stall walls that:
    i. Are made of a rigid and non-porous material, with a smooth finish;
    ii. Provide protection to the shooter from spent casings from the shooters on either side;
    iii. Are fully cleanable by no more than ecologically-friendly household agents;
    iv. Extend from the floor to a minimum height of 2 m;
    v. Extend no more than 0.16 m forward of the firing line and no more than 1.5 m rear of the firing line;
    vi. Are installed between the shooting stall for each lane;
    vii. Have at a minimum the rear half of the stall wall made using a transparent, scratch, scuff, and temperature resistant material to resist damage from spent casings;
e. Allow a shooter to shoot at targets from the standing, prone and kneeling positions;
f. Have a wall mounted control panel that is simple to operate with the following operations available:
    i. Maximum four-button presses to set targets to pre-set depths at intervals of 5 m;
    ii. Single button operation to retrieve a target;
    iii. Single button operation to move a target down or up lane, with the target stopping within the next 1 m interval upon button release;

   iv. Adjust the lane and target lighting; and
   v. Select from and run the range's library of shooting sequences.
g. Have the control panel and light switches located and designed to prevent accidental activation;
h. Have a pen cup at back of stall walls, capable of holding at least three (3) Sharpie® Magnum Permanent Marker, Chisel Tip;
i. Be provided with one wireless ear defender, hearing protection headset that reduces gunfire, from the weapons types specified, with an attenuation rating of at least 30dB, and prevent sound transmission above 85dB; and
j. Be provided with at least one speaker, to output sound distractions towards a shooter at the firing line.

3.7 Target Retrieval System

Each lane must have a powered, retrieval system that allows the retrieval of targets to the firing line from any location downrange up to and including the farthest target position.

The retrieval system must:

a. Not position targets in line with any seams in the bullet trap system;
b. Be compatible with and use paper targets;
c. Not require any occupant to move forward of the firing line to mount or dismount a paper target. Occupants are permitted to reach forward to mount or remove a paper target, with only the occupant's arms and hands moving forward of the firing line;
d. Be fully enclosed to prevent debris from entering and impeding the system;
e. Provide ballistic protection against the projectiles, that is designed to prevent ricochet rounds back towards the firing line;
f. Have means to easily install, release and secure targets without the use of any tools;
g. Ensure that targets do not fall off during firing;
h. Be capable of moving targets a distance of 25 m downrange;
i. Be capable or rotating targets 360 degree rotation with a minimum of 90 degree increments in either direction;
j. Have the option of facing targets perpendicular and parallel to the direction of fire;
k. Have a turn time of 180 degrees in 0.5 sec;
l. Move targets up and down range at variable speeds up to at least 2.4 m/s;
m. Be capable of being stopped at a minimum of 1 m intervals for the entire target shooting lane;
n. Have target actions that include at a minimum:
   i. Edge or face after a predetermined amount of time (timed exposure); and
   ii. Independent, coordinated, and simultaneous movement between lanes.
o. Be pre-programmable with sequences containing at least ten (10) independent target actions as described in paragraph 3.7 n;
p. Have on-board lighting to light up the target, including front lighting;
q. Have on-board lighting capable of performing short strobe or burst lighting (to simulate muzzle flashes);
r. Have signage on the target holder / retriever to indicate the shooting lane number to the firing line; and
s. Have a rail with a height clearance of 2.1 m.

3.7.1 Target Desirable options

It is desirable that the target retriever:

a. Is wireless and does not use wires or cables to transmit power or data to and from the target retriever. When at low power, wireless target retrievers must automatically dock, and indicate low power;
b. Has hit sensors that can detect, and respond to hits on the installed target at a minimum rate of 1000 rounds per minute. The retriever must be capable of the following movements
    i. Edge or back when hit; and
    ii. Edge or back when hit after a predetermined number of hits.
c. Is provided with at least two redundant drive motor for each retriever;
d. Allows for the adjustment of the height, by at least 0.5 m, of installed targets for use with different shooting positions:
    i. Adjustment of height must take no longer than 2 minutes and require no special tools or requirement to be performed.
e. Has on-board lighting to light up the target, including back lighting.

3.8 Bullet Traps

The range must be provided with a bullet trap system for all shooting lanes.

The bullet trap system must direct, contain, de-energize, capture, and collect all projectiles fired downrange.

All rounds captured by the bullet trap system must be recoverable to enable recycling of material.

If the range enables multi-directional shooting the bullet trap must not have any vertical supports or partitions that pose a ricochet hazard to personnel.

3.8.1 Bullet Trap Design

The bullet trap system must be utilize one of two methods: deceleration chamber or rubber mound.

3.8.1.1 Steel Deceleration Chamber: If the range utilizes a steel deceleration chamber, the bullet trap must:

a. Collect and contain spent rounds and bullet fragments in removable containers capable of holding at minimum of 2,000 rounds per lane of coverage;
b. Have a full container indicator for each container;
c. Provide for quick access to, and replacement of, the bullet recovery containers without any special tools;
d. Have impact plates that are interchangeable and reversible;
e. Must include a removable and replaceable curtain wall made of a self-healing/self-sealing rubber covering the front of the bullet trap to prevent ricochets and fragments from returning to the shooter;
f. Utilize a dust collection system separate from the Heating, Ventilation and Air Conditioning (HVAC) filtration system to manage particulates in the deceleration chamber. The dust collection system must:
    i. Pull dust, particulates, and air by negative pressure through an independent dedicated filtration system, with at a minimum its own fans, filters and filter housings dedicated

to the steel deceleration chambers. The dust filtration system must meet the requirements for contaminated air of paragraph 3.15.3.2 Air Filtration.

g. Must not include vertical structures, which are not in line with lane walls, that could cause ricochets;
h. Must contain no mechanical system or moving parts for bullet and fragment deceleration or collection and containment, and normal operation; and
i. For the purpose of minimizing hazardous waste management costs, not rely on, or employ, any secondary media (including but not limited to wood, sand, water, rubber, or oil) to de-energize and capture bullet fragments and spent rounds, or contain lead dust.

3.8.1.2 Rubber mound: If the range includes a rubber mound trap design, the bullet trap must:

a. Collect and contain spent rounds and bullet fragments at minimum of 5,000 rounds per lane;
b. Not include vertical structures, that could cause ricochets;
c. Utilize a ballistic rubber as the friction material;
d. Not be designed to capture rounds by having the round become imbedded in the rubber material, limiting or complicating round recovery;
e. Provide quick access to, and replacement of, the rubber mound without any special tools;
f. Direct airborne particles to be captured by the HVAC system and directed towards the filtration system;
g. Contain no mechanical system or moving parts for bullet and fragment deceleration or collection and containment, and normal operation. Granulated rubber is not considered a moving part;
h. Be provided with a secondary method at the rear of the trap to prevent projectiles from exiting the range in the event that the operator momentarily does not notice that rubber levels have temporarily fallen below the range specification. Secondary methods can include but are not limited to: ballistic rubber lined steel plates at the rear of the trap; and increased depth of granulated rubber of at least 30%; and
i. For the purpose of minimizing hazardous waste management costs, not rely on, or employ, any secondary media (including but not limited to wood, sand, water, or oil) to de-energize and capture bullet fragments and spent rounds, or contain lead dust.

3.8.2 Desirable Bullet Trap

It is desired that:

a. The range includes a usage, available round. or capacity indicator for each bullet trap to estimate remaining availability, in increments of at least 25%;
b. The range utilizes a rubber friction trap;
c. If the range utilizes a rubber mound friction trap it is desired that the mound:
    i. Utilize stepped bed plates;
    ii. Includes a back-up safety rubber source; and
    iii. Has a capacity higher than 5,000 rounds per lane.

3.8.3 Bullet Trap Access

The range must:

a. Have clearance space around the bullet trap system to enable full maintenance access; and

b. Provide maintenance doors to enable full access to the rear of the bullet traps for maintenance purposes.

3.9 Open Preparation Area / Shooting Gallery

The range must be provided with an open preparation area / shooting gallery between the shooting stalls and control room.

The shooting gallery must:

a. Be the width of the range interior;
b. Be separated from the control room by an air-tight rigid barrier that:
   i. Extends from the floor to the ceiling;
   ii. Offers full ballistic protection to the control room;
   iii. Has one (1) doorway, to allow direct access from the control room to the preparation area; and
   iv. Enables each shooting lane to be viewed from the control room.
c. Measure at least 3 m deep from the control room barrier to the rear of the shooting stalls;
d. Be provided with removable sound insulating and bullet containment ballistic rubber tiles on the floor walls and ceiling to protect against ricochets of errant shots and sound echo's;
e. Have no interior obstructions, vertical supports, partitions or walls that block the view of the firing line or down the shooting lanes from the control room;
f. Be provided with at least two (2), wall mounted "Master Stop" emergency buttons, locations to be confirmed after contract award;
g. Be provided with at least one (1) movable table that has:
   i. Manually lockable wheels;
   ii. A working surface between 0.8 m and 1 m tall; and
   iii. A surface area at least 1 m x 0.7 m for weapons preparation prior to shooting and spare target holding during shooting;
h. Be provided with at least 4 NEMA-15 outlets, locations to be determined after contract award; and
i. Be provided with one (1) 38 mm (1.5 in) conduit and electrical box to allow the installation of an RJ11 telephone sockets using shielded cable, to the external communication box, by the Crown. Exact location of the electrical box will be determined upon contract award;
j. Be provided with at least one (1) wall mounted 20 lb ABCD portable fire extinguisher; and
k. Be protected by an automatic sprinkler system in accordance with FMD-4003.

3.10 Control Room

The range must have a control room. The control room must:

a. Have a width that is at least 75% as wide as the shooting area;
b. Have a walking space at least 1.5 m wide and a length equal to the width of the room;
c. Provide a clear and unobstructed view, through a panel of windows at least 1 m high, 0.75 m tall, and the width of the control room, of the firing line from the primary operating station without the aid of additional equipment;
d. Provide a clear and unobstructed view down each firing lane without the aid of additional equipment;
e. Be sound insulated to lower all sound from exterior to the control room to below 85dB, when the door to the shooting gallery is closed;

f. Be capable of two-way communication with the main entrance without exiting the room;
    i. The two-way communication system must include a camera system to enable operators to visually verify the identity of personnel at the door exterior, without requiring the door to be opened.
g. Be provided with a microphone and speaker to communicate with the shooting area and, if available, with individual shooting lanes;
h. Be provided with an audio jack to allow the use of a wired headset instead of the microphone and speaker for communication with the shooting area;
i. Have a system included to monitor all safety controls such as, but not limited to, door locks, "loaded weapon" and "non-loaded weapon" mode lights, HVAC system and supply/exhaust fans, and set range and control room temperature;
j. Have audible alarms to alert operators for any safety reason and unsafe shooting condition.
    i. The unsafe shooting conditions that activate the alarm must include:
        1. HVAC system not operating within manufacturers specified parameters;
        2. HVAC system filters require immediate replacement;
        3. While in a loaded weapon mode or status, any exterior door is not fully closed;
        4. While in a loaded weapon mode or status, the interior door between the shooting area and the storage room is not fully closed;
        5. Sprinkler system is activated and the valves have not been closed; and
        6. Any maintenance panel or door is open.
    ii. The operator's control stations must be able to temporarily override the audible alarm on a per activation basis, after each activation
k. Have the range primary operating station;
l. Be provided two "Master Stop" emergency buttons, locations to be confirmed after contract award;
m. Be provided with a total of at least three (3) paired unallocated NEMA-15 outlets on at least one (1) independent circuit. Specific locations to be confirmed after contract award;
n. Be provided with at least four (4) of the same ear defenders provided with the shooting lanes;
o. Contain cabinets, shelving, storage space and utility hooks for the storage of:
    i. Range manuals and documentation;
    ii. Range electrical panel; and
    iii. An additional 2 cubic meters of miscellaneous storage.
p. Have floor mats that are:
    i. At least 1 m x 1 m;
    ii. Removable;
    iii. Located:
        1. One (1) bristled mat at the exterior of the entry door; and
        2. One (1) sticky mat at the interior of every door.
    iv. Designed and placed to allow all entrants to wipe their footwear clean of salt, snow, mud and debris, or lead dust, as required by location.
q. Be protected by an automatic sprinkler system in accordance with FMD-4003; and
r. Be provided with two (2) – 38 mm (1.5 in) communications conduits and mounting boxes to allow two (2) RJ11 telephone sockets to be installed in separate locations and connected to the external communication box. Mounting box and conduit locations to be confirmed after contract award. Cabling will be installed by the Crown; and

s. Be provided with one (1) - 38 mm (1.5 in) communications conduit and mounting box to allow an RJ45 communication socket to be installed and connected to the external communications box. Mounting box and conduit locations to be confirmed after contract award. Cabling will be installed by the Crown.

3.10.1 Range Control

a. The range must be provided with an additional portable handheld controller with the same functionality as the primary operating station that can be used anywhere inside the range.
   i. The portable handheld controller must be provided with:
      1. A rechargeable battery; and
      2. A charging station.
b. The range primary operating station and portable handheld controller must:
   i. Stop all range shooting operations with one action;
   ii. Fully control and monitor the range lighting;
   iii. Be able to control all functions of the Target Retrieval System in any combination from one to the all lanes;
   iv. Be programmable by an operator to create, edit, and store shooting sequences;
   v. Enable the selection, and initiation of shooting sequences;
   vi. Be capable or pausing and restarting programmed shooting sequences;
   vii. Be capable of controlling the sound output to the stall speakers:
      1. Each individual shooting stall;
      2. Each lane group of speakers; and
      3. All the lanes.
   viii. Control speed of the target retrieval system from stationary to full speed;
   ix. Monitor all access point status (Open/closed); and
   x. Identify, on screen or through a menu selection, the cause for each audible alarm.
c. The portable handheld controller, individual lane controllers and primary operating station must immediately reflect changes made to the current range conditions by each other.
d. The range primary operating station must:
   i. At all times be able to disable control and override the handheld and individual lane controllers.
   ii. Be capable of receiving one (1) 3.5 mm auxiliary connection from an external audio source and transmitting the audio signal to the lane speakers or ear defenders; and
   iii. Have at least one USB port to enable data to be added or copied from the Range control system.
e. The range control system must:
   i. Automatically track the number of minutes (to the nearest minute), and the daily schedule the range is in a loaded weapon mode;
   ii. Automatically track the number of minutes (to the nearest minutes), and the daily schedule the range is in a non-loaded weapon mode;
   iii. Be able to export the range status data to an external file and format such as comma or tab separated values.

3.10.1.1 Range Control Desirable

It is desirable that:

a. The range primary operating station is capable of receiving up to one (1) auxiliary audio signal by 3.5 mm audio connection, per lane and relaying that signal to an individual lane speaker or ear defender headset. The system must output each signal to a different speaker or headset; and
b. The range control system can differentiate between, and automatically track the number of minutes (to the nearest minute), and daily schedule the range is in, the following different statuses:
    i. Live;
    ii. Standby;
    iii. Maintenance;
    iv. Preparation /Setup; and
    v. Closed.

3.10.2 Range Communication and Sound

The range must:

a. Enable two-way communication between the control room and either:
    i. Each shooting stall; or
    ii. Each person in the shooting area.
b. Include range wide PA announcement system controlled from the control room;

3.10.2.1 Wireless Ear Defender Headsets

It is desirable that ear defenders provided with the range be wireless ear defender headsets. It is desired that the wireless ear defender headsets:

a. Are capable of 1-way communication from the control room to the operators and shooters, across all the ear defender headsets or to individual ear defender headsets as designated by the Operator;
b. Are capable of 2-way communication between the control room to individual ear defender headsets;
c. Are capable of receiving digital or analog signals from the range control system, if the control system is capable of transmitting one, and outputting sound to the wearer for individual or group scenario or sequence sound, in addition to the stall speakers. It is not required that both the stall speaker and designated ear defender headset output the sound signal simultaneously.

3.10.2.2 Stall Communication

It is desirable that the control room can:

a. Communicate with individual shooting stalls on separate channels; and
b. Select multiple stalls to communicate with at the same time, from as few as two stalls up to all stalls.

3.10.3 Shooter Scoring

It is desirable that the range:

a. Include a program that enables operators to record scores, generate reports and store all shooting results of each lane and shooter. Scores must be exportable to either a .xlsx or a comma separated values (.csv) file compatible with Microsoft Office 2010; and
b. Uses a hit detection system mounted to the target retriever to automatically score shooters.

3.10.4 Master Stop

While in "live" status, upon activation of a master stop button, the range must automatically switch to "standby" status, including triggering the following actions:

a. Raising the light level if below the minimal light level for "standby" status;
b. Edge all targets and turn off retrieval system lighting;
c. Sound a brief audible alarm; and
d. Indicate "standby" status at the operator control station, handheld controller(s), and all lane control panels.

3.10.5 Control Room Desirable

It is desirable that the control room has a width that is at least the same width as the shooting area.

3.11 Storage Room

The range must have a storage room that:

a. Has an entrance located level with the shooting area;
b. Has an interior floor space with a minimum width of 2 m;
c. Has an interior floor space with a minimum area of 40 m^2;
d. Can be accessed from the range interior without the use of stairs ladder or escalator.
    i. If an internal ramp or slope is included, the ramp must not have a slope inclination greater to a 1:12 ratio; and
    ii. If the range includes a hallway to access the storage area, it must be at least 1.5 m wide.
e. Can be accessed from the shooting area through a maintenance doorway, locations to be confirmed after contract award;
f. Has an access ramp on the exterior to allow a pallet jack to be wheeled in;
g. Has cabinets or shelving for the storage of:
    i. Ear defenders provided with the range;
    ii. Spare Paper targets (minimum 1000, dimensions 58.4 cm x 88.9 cm); and
    iii. Lane rubber mats
h. Has a lockable cabinet for the storage of portable range electronics, with at least two (2) GFI NEMA-15 outlets;
i. Has at least two (2) GFI NEMA-15/20 outlets, on at least 2 independent circuits; and
j. Has sticky floor mats that are:
    i. At least 1 m x 1 m;
    ii. Removable;
    iii. Located one (1) at the interior of every door; and
    iv. Designed and placed to allow all entrants to wipe their footwear clean of lead dust.

3.12 Lighting

The range must have a complete lighting system that:

a. Uses LED lighting only;

b. Uses lights that are replaceable using commercially available components without specialized training;
c. Has positioned and protected in a manner to ensure they will not be damaged or accidently changed during normal operation of the range;
d. Is made up of, and separately adjustable and controllable in, at a minimum the following location groups:
    i. Exterior lighting;
    ii. Each shooting lane or lane group;
    iii. Control room;
    iv. Shooting gallery / preparation area;
    v. Each Shooting stall; and
    vi. Complete range.
e. Provides illumination levels for white light in accordance with MIL-STD-1472G Section 5.5.3; Illuminance: Minimum: 540 lux (50 fc); Preferred: 755 lux (70.0 fc); Maximum: 1075 lux (100 fc), in all areas of the range, measured at a height of 76 cm;
f. Is fully adjustable in intensity by a minimum of 5% increments for the entire range interior from 100% light emissions to 0% light emissions
g. Is fully dimmable between 10% and 0% light emissions by a minimum of 1% increments (Star Light), for the entire range interior, for use with night vision goggles (NVGs);
h. Is in compliance with MIL-STD-1472G, Section 5.5.3.1.1 Workspace lighting - General;
i. Is in compliance with MIL-STD-1472G, Section 5.5.3.1.2 Workspace lighting - Location;
j. Is in compliance with MIL-STD-1472G, Section 5.5.3.1.3 Workspace lighting - Reach;
k. Is in compliance with MIL-STD-1472G, Section 5.5.3.1.4 Workspace lighting - Mounting;
l. Include strobe lighting or flashing coloured lighting in the lanes to provide shooter distraction training;
m. Includes clearly labelled exterior red/green lighting mounted outside and next to the entrance doors and maintenance hatches to be used as a range status indicator, where red colour indicates “No Entry” / “Loaded Weapon” modes; and green colour indicates “Entry” / “Non-Loaded Weapon” modes;
n. Includes lighting to illuminate a minimum 3 m by 3 m area just outside the main entry way;
o. Includes lighting to illuminate the exterior area within 2 m of the bullet trap collection areas and maintenance doors;
p. Includes lighting to illuminate inside the maintenance and storage areas;
q. Includes lighting controls in the maintenance areas for maintenance lighting ;
r. Has exterior ground illuminating lighting that is automatically activated at night or in the low light conditions. The exterior ground lighting must include a high/low setting controlled by motion sensors; and
s. Includes an emergency lighting system in accordance with the National Building Code of Canada 2010 (NBCC 2010). The emergency lighting system must:
    i. Be independently powered;
    ii. Automatically activate in the event of loss of power, or emergency situation requiring evacuation of the range, such as a fire;
    iii. Provide full light for a at least 60 minutes;
    iv. Light up the primary interior areas of the range to enable safe evacuation of the range; and

v. Provide light to the doorway landings both inside and outside the range covering a minimum area of 1 m x 2 m.

3.13 Doorways

The range must be provided with at least 3 exterior doorways.

3.13.1 General Doorway Requirements

a. All doors and frames for access to the shooting area must be armored with 3/8" AR500 steel; and
b. All shooting area doorways must have, at a minimum, a 2 cm tall removable rubber lip across the entire base of the doorway opposite the direction of swing, installed to prevent water egress; and
c. All exterior doorways must have, at a minimum a 1 cm tall removable rubber lip across the entire base of the doorway opposite the direction of swing, installed to prevent water egress.

3.13.2 Entrance (Primary Range Access)

The primary access to the range from the outside must be through a door into the control room. The primary entrance must:

a. Be at least 0.85 m wide;
b. Have a wheelchair ramp;
c. Be secured by two separately keyed locks including :
   i. One deadbolt lock that is not capable of being remotely unlocked; and
   ii. One lever handle lock that is capable of being remotely unlocked from the control room by an operator in the control room.
d. Have each lock must use the MEDECO lock system;
e. Be provided with 5 keys copies for each lock;
f. Automatically close after being opened;
g. Have a "peep" hole to allow the identification of entrants to be verified without requiring the door to be opened;
h. Have a two-way intercom to allow operators in the control room to communicate with persons outside the main entrance;
i. Have a closed-circuit camera with an un-obstructed view of the entrance way to allow an operator in the control room to verify a requested entrant's identification without opening the door. The video must not be recorded; and
j. Not have a window in the doorway.

3.13.3 Control Room to Shooting Gallery access

A door must be provided to allow access to the shooting gallery / preparation area from the control room;

The door must:

a. Be at least 0.85 m wide;
b. Have a window at least 0.75 m tall and 0.5 m wide; and
c. Have a lever handle.

3.13.4 Emergency Exits

Two (2) emergency exits must be provided for the range. The emergency exits must:

a. Open outward only;
b. Be secured closed;
c. Not have a window in the doorway;
d. When opened initiate a "Master Stop" Condition.
e. Not be capable of being opened from the exterior of the range;
f. Be at least 0.85 m wide;
g. Use push-bars to be opened:
    i. Push-bars and door hardware in the shooting area must be provided with ballistic protection meeting the requirements of paragraph 3.2.3.
h. Have a hydraulic closing mechanism to slowly close the door after opened:
    i. Closing mechanisms in the shooting area must be provided with ballistic protection, meeting the requirements of paragraph 3.2.3.
i. Be located:
    i. One in the open preparation area / shooting gallery, opening to the exterior; and
    ii. One for the control room, as far from the primary entrance as possible. If the emergency exit leads to the storage area or a maintenance area, occupants using this doorway must be able to get to an exterior doorway without changing directions after leaving the control room.

3.13.5 Maintenance Access

Three (3) maintenance access doorways must be provided for the range. The doorways must:

a. Be secured closed;
b. Not have a window in the doorway;
c. Not be capable of being opened from outside the shooting area while the range is in a loaded weapon mode;
d. Be at least 2 m wide;
e. Have doors that open more than 115 degrees;
f. Two (2) must be located in the shooting area, with at least one located to allow access to the storage area (locations to be confirmed after contract award); and
g. One (1) must be located in the storage area to allow external access to the storage area with a pallet jack.

A maintenance access doorway will also be considered an emergency exit if it meets the requirements defined in paragraph 3.13.4, and is clearly label for both purposes.

3.13.6 Doorway Lighting

Each entrance and emergency doorway must have a sign. The sign must:

a. Be located next to or above the doorway to aid evacuees in locating the doorway in the event of an a emergency;
b. Be illuminated or photo luminescent green;
c. Use a standard pictogram to indicate an exit;
d. Be installed in a direction such that light is not directly shone downrange towards the targets; and

e. Be provided with removable covers for any doorway located in the shooting area.

3.13.7 Maintenance Access

All maintenance access points must:

a. Be as large as possible;
b. Be locked and secured by locks utilizing the MEDECO lock system; and
c. Be provided with 5 key copies for each lock which has been set to a different key.

It is desired that all maintenance access points are set to use the same key.

3.14 Fire Protection System

For the purposes of fire protection the range must be divided into fire zones:

a. Zone I - The control room and all areas behind the dividing wall between the control room and the open preparation area;
b. Zone II - The open preparation area, shooting lanes and all areas forward of the dividing wall between the control room and open preparation area; and
c. Zone III – Any storage areas provided.

Each fire zone must be separated by a barrier:

a. That provides and is designed to be rated one (1) hour fire protection; and
b. Which is comprised of materials rated to provide one (1) hour fire protection.

The Fire Protection System must meet the requirements FMD-4003 and FMD-4011.

3.14.1 Range Sprinkler System

The range must be provided with a water sprinkler system. The sprinkler system must:

a. Meet the requirements as outlined in FMD-4003;
b. Upon activation:
    i. indicate and activate the "standby" status; and
    ii. Unlock all doors
c. Activate the Master Stop according to paragraph 3.10.4 Master Stop;
d. Include individual emergency control valves for each zones, and a system wide control valve, inside the control room. Locations to be confirmed after contract award;
e. Include an emergency control valve for the shooting lanes and open preparation area in the open preparation area. Locations to be confirmed after contract award;
f. Include an emergency control valve in the storage areas. Locations to be confirmed after contract award;
g. Have all control valves:
    i. provided with a tamper switch; and
    ii. be connected to the fire alarm system.
h. Connect to the Crown-provided, above ground water connection;
i. Be a single interlock closed head pre-action sprinkler system;
j. Be designed to enable the complete purging the water and replacement with air in the event of activation;
k. Be designed and installed in accordance with the latest published edition of the National Fire Prevention Association 13 (NFPA 13);

l. Be hydraulically determined in accordance with NFPA 13;
m. Provide sprinkler piping with seismic bracing and restrains (where applicable) in accordance with NFPA 13; and
n. Have all sprinkler heads be 68 degree Celsius (155 degree Fahrenheit) quick response sprinklers.

3.14.2 Fire Alarm

The range must be provided with an air aspiration system. The air aspiration system must:

a. Be provided with a control panel that is connected to the main building fire alarm system;
b. Be used for water release of the pre-action single interlock sprinkler system; and
c. Be listed to function at the air movement (velocity) to be used within the enclosure.

3.15 Environmental Conditions

3.15.1 General

The range must be designed to minimize health concerns from hazardous materials being released into the exterior environment. It must also be capable of operating at a wide range of outside temperatures without degrading the performance of the range.

3.15.2 External Temperature

The range must operate in:

a. Outside temperatures ranging from -35C to +35C; and
b. Outside humidity from 0% to 100%.

3.15.3 Heating Ventilation and Air Conditioning System (HVAC)

The HVAC must

a. Utilize natural gas as the heating source;;
b. Be provided with a means to maintain the interior humidity between 35% and 55%;
c. Use outside air for 100% of supply air in the shooting gallery.
    i. Circulate fresh clean air in the shooting gallery and lanes while maintaining the set temperature;
d. Use outside air for at least 50% of supply air in the control room.
    i. Circulate fresh clean air in the control room while maintaining the set temperature.
e. Use outside air for at least 50% of supply air in the storage area.
    i. Circulate fresh clean air in the storage area, while maintain a temperature between 16 and 24 degrees Celsius.
f. Be provided with an airflow monitoring system with a pressure drop indicator that will continuously monitor air flow in the shooting area;
g. Maintain a negative static pressure of -0.04 in + 0.02 water gauge during operations;
h. Ensure that the shooting area operates with negative pressure to ensure that no lead, smoke or airborne particles gets back to the shooter;
i. Move all air the full length of the shooting area, beginning at the barrier between the open preparation area / shooting gallery and the control room, moving downrange, and exhausting out the filtration system at the end of the lanes;
    i. The air outlet into the shooting gallery must be at least 4.5m up-range of the firing line.

j. Have all exhaust exit out stacks that are located as far from building adjacent to the range installation site as possible.
k. Have a minimum 5 m lateral from each exhaust to all air intakes;
l. Have all exhausts and air intakes separated such that air from the exhaust is not circulated back into the air intakes, taking into account typical weather conditions in the installation location;
m. Ensure and maintain a balance between the exhaust system and air supply system such that the specified negative static pressure is maintained during normal operation of the range;
n. Meet the requirements outlined in NSSF (National Shooting Sport Foundation) – Division 15 – Lead Management and OSHA Compliance for Indoor Ranges;
o. Meet the requirements outlined in C-98-015-001/DD-006; and
p. Meet and pass the ventilation assessment criteria outlined in NEHC-TM6290.99-10

3.15.3.1 Air Flow

To protect the health of all occupants the supply air system must

a. Provide clean, conditioned air, in a near-laminar (non-turbulent) flow across the firing line aperture (wall to wall and floor to ceiling across entire firing line);
b. Maintain non-turbulent air flow from the back of the shooting gallery to the end of the shooting lanes from ceiling to floor;
c. Maintain a minimum air flow of 0.38 m/s (75 fpm), with an optimal air flow of 0.43 m/s (84 fpm), across the shooters breathing zones (prone, kneeling, sitting, and standing, from 4 in / 10 cm to 74 in /190 cm) at the firing line in each lane, during "live" and "standby" statuses, as well as "maintenance" status when required;
d. Not have an average air flow greater than 0.50 m/s (99 fpm), and an air flow greater than 1.0 m/s (197 fpm);
e. Maintain a minimum downrange conveying air velocity of 0.32 m/s (63 fpm) in each lane, during "preparation / setup" status and "maintenance" status as required;
f. Not utilize dampers or diffusers exterior to the range ductwork to distribute air flow (Radial air plenums will be accepted); and
g. Pass the ventilation assessment criteria outlined in NEHC-TM6290.99-10.

3.15.3.2 Air Filtration

a. All exhaust air and air for recirculation must pass through an air filtration system with a minimum MERV 11 filter.
b. All contaminated air must:
    i. Pass through the return / exhaust filter housing, with the necessary gaskets and clamping mechanisms to ensure that no air can bypass any filter; and
    ii. Pass through a filtration system that utilizes at least three (3) filtration stages including:
        1. First stage: MERV 6 filter (minimum). The MERV 6 filter must be a commercially available filter;
        2. Second stage: MERV 14 filter (minimum). The MERV 14 filter must be a commercially available filter; and
        3. Third stage: HEPA filter (99.97% efficient at 0.3 microns particle size). The HEPA filter must be enclosed in a certified HEPA housing, designed and constructed to house critical filters.

3.15.3.3 Range Internal Temperature

The range must:

a. Be provided with a control to independently and separately adjust the set target shooting gallery incoming air temperature to between 17 degrees Celsius and 25 degrees Celsius, when in "live", "standby", and "preparation / setup" status, and "maintenance" status as required;
b. Be provided with a control to independently and separately adjust the set target control room air temperature to between 17 degrees and 25 degrees Celsius when in "live", "standby" and "preparation / setup" status, and "maintenance" status as required;
c. Be provided with a control to independently and separately adjust the set target storage room air temperature to between 17 degrees and 25 degrees Celsius when in "live", "standby", and "preparation / setup" status, and "maintenance" status as required;
d. Be capable of independently maintaining incoming air temperature in the range shooting gallery and lanes to within a 1.0 degree Celsius of the set temperature while the outside temperature is in accordance with section 3.15.2 - External Temperature;
e. Maintain a maximum 1.0 degree Celsius variation in air temperature across all lanes;
f. Be capable of independently maintaining the air temperature in the range control room to within 1.5 degrees Celsius of the set air temperature while the outside temperature is in accordance with section 3.15.2 - External Temperature;
g. Be capable of independently maintaining the air temperature in the storage room to within 1.5 degrees Celsius of the set air temperature while the outside temperature is in accordance with section 3.15.2 - External Temperature;
h. Maintain a minimum temperature of 10 degrees Celsius;
i. Maintain a maximum temperature of 15 degrees Celsius when in "closed" status, when the outside temperature is 15 degrees Celsius or less;
j. Maintain a maximum temperature of 35 degrees Celsius; and
k. Require no more than 1 hour to raise or lower the temperature of any temperature controlled area by 5 degrees Celsius.

3.15.4 Humidity

The range must utilize a design proven capable of controlling the level of humidity within the entire range to eliminate moisture build up.

3.15.5 Weather

The range must be able to withstand the normal amount of precipitation that usually accumulates in the proposed installation location, as determined by historical information from Environment Canada. The HVAC units must be protected in a manner that will minimize the risk of being damaged by the build-up of all forms of precipitation.

3.15.6 Noise

The range must provide and maintain a minimum OSHA – (CFR) 29 CFR1910.1025 or SOR/86-304, whichever is most stringent, standard 8 hour time-weighted average (TWA) of 65 dB sound limit at 20 m (60 ft), and 85dB sound limit at 0.3 m (1 ft) from the any point of the range. This standard must be met based on the maximum use specified in paragraph 3.2 Ballistic Requirements.

3.15.7 Desirable HVAC

It is desirable that the range

a. Be capable of a fully reversible conversion to full functionality with propane, where natural gas is not available; and
b. Maintains the airflow requirements as specified in paragraph 3.15.3.1 Air Flow with the movable table specified in paragraph 3.9 g present in the open preparation area.

3.16 Mobility

The range must be:

a. Capable of being disassembled, transported by road and re-assembled at a new location, by personnel that have been trained and qualified by the supplier;
b. Total time required for disassembly, preparation for shipping, unpacking and reassembly after relocation must be no more than 120 calendar days not including the transportation time; and
c. Total time required for transport to a location within 25 km must be no more than 21 calendar days.

3.17 Design and Construction

3.17.1 Material Selection

The range must be constructed of such material:

a. That is consistent with a proven in use design of a similar scope and nature as that being requested by DND; and
b. Meets all the applicable requirements of all local, provincial, and national building codes.

3.17.2 Installation Requirements

The range must meet or exceed all applicable codes and health and safety regulations. If there is a discrepancy between municipal, provincial and federal guidelines or regulations than the more stringent one must be satisfied.

3.17.3 Structural Framing and Foundation

The range final design must:

a. Consist primarily of metal;
b. Be reviewed and stamped by a P.Eng; and
c. Be designed to resist all the loads as prescribed in Part 4 of the NBCC 2010.

3.17.4 Roofs

The entire range must be covered by a sloped roof. If the range base design includes a flat roof a sloped exterior roof must be added.

The range interior roof must:

a. Be sealed to prevent water and moisture ingress; and
b. Be provided with a stairwell and a lockable maintenance door or gate to enable ease of access from the ground level to the attic space for maintenance.

A sloped exterior outer roof or structure with a sloped roof must be installed over the range. The roof must:

a. Cover the entire range and all provided support systems, without interfering with their performance or operation;
b. Be an Apex or single pitch roof with a minimum pitch of 6:12, or be a domed roof;
c. Be composed of metal;
d. Have an exterior coating to resist rust, sun, scratching and surface damage;
e. Be sealed to prevent water and moisture ingress through the roof;
f. Have rain gutters that:
    i. Are along the entire lower edge of the roof;
    ii. Are covered to prevent leaves and debris from collecting in the gutter, without impeding water collection;
    iii. Are sloped to direct water towards downspouts;
    iv. Have downspouts that:
        1. Direct collected water toward the east-north-east (water runoff pond) side of the range
        2. Direct collect water at least 0.5 m away from the base of the range; and
        3. Are located at least 2 m away from each doorway.
    v. Downspout outlet runs will not be considered part of the footprint of the range;
g. Prevent debris (such as leaves, dirt, branches and garbage) from collecting on and around any equipment, installed on top of the interior roof or next to the range;
h. Facilitate full functioning of all equipment installed below the roof;
i. Be capable of continually supporting a snow and ice load with an areal density of 2.08 kPa (45 psf);
j. Be capable of resisting a minimum wind uplift of 2.5 kPa (52 psf); and
k. Be provided with fall arrest anchor, for safety harnesses. The anchor points must:
    i. Be located to ensure full safety coverage of the roof; and
    ii. Meet the guidelines outlined in by the Ontario Ministry of Labour guideline for the design, installation and use of fall arrest anchor points including:
        1. Be designed to resist the application of a force of 22.2 kN (5000 lbf) in any direction without fracture of any component or pullout, or both from the anchorage [clause 9.4.3(a) CAN/CSA Z271-10]; and
        2. Resist a test loading of 11.1 kN without permanent deformation of any component when subjected to test loading in the direction(s) that generate the most critical effect on the anchorage system with respect to stability and strength [clause 9.4.3 (b) CAN/CSA Z271-10].

3.17.5 External Communications Box

The range must be provided with an external communications box:

a. Located on the exterior of the Range control room;
b. That is at least 0.5 m x 0.5 m x 0.05 m;
c. That is lockable; and
d. That is sealed against the elements (including snow, rain, dirt, dust, mud, ice, wind, temperatures from -40 C to +40 C, and humidity from 0% to 100%).

All conduits, cables and wires in or passing though the communications box must be labelled.

3.17.6 Finish

3.17.6.1 General Finishing

3.17.6.1.1 Corners, Edges, and Surfaces

To prevent injury:

a. All corners and edges must be rounded or protected by a rubber or plastic barrier; and
b. All surfaces must have a smooth finish.

3.17.6.1.2 Warning and Information Signs

The range must:

a. Contain all the appropriate labels and warning signs in accordance with C-02-006-002/AG-000;
b. Contain signs and warning labels in accordance with B-GL-381-000/TS-001; and
c. Contain all appropriate labels and warning in accordance with OSHA – (CFR) 29 CFR1910.1025 or SOR/86-304, whichever is most stringent;
d. Have prominently placed signs inside the range to indicate:
    i. All occupants may have come in contact with lead and must wash hands and face after exiting and prior to eating;
    ii. The consumption of food and beverages is prohibited in the range;
    iii. The ammunition that is authorized for use on the range;
    iv. Proper Eye protection is to be worn during firing;
    v. Proper Ear protection is to be worn during firing;
    vi. Dry sweeping is prohibited; and
    vii. The storage of furniture or unauthorized equipment is not permitted in the range;
e. Have prominently placed signed outside the range to indicate:
    i. Noise Hazardous Area;
    ii. Danger Lead Hazard Area; and
    iii. Children under the age of six, pregnant women or women who are breastfeeding are not permitted in this area.

3.17.6.2 Exterior finishing

3.17.6.2.1 Paint work

The range exterior must be painted with a flat paint, which is light grey in colour.

3.17.6.2.2 Insulation

All exterior walls, including the floor and doors, of the range must have a minimum R20 insulation rating, with a properly placed vapour barrier, to protect against moisture formation on the range interior and reduce heat loss. Insulation must be installed as an envelope outside of the ballistic protection.

The ceiling and interior roof, of the range must have a minimum R40 insulation rating to protect against moisture formation on the range interior and reduce heat loss. Insulation must be installed as an envelope outside of the ballistic protection.

3.17.6.3 Interior

3.17.6.3.1 Interior surfaces

The range interior surfaces including floors, ceiling, and walls must:

a. Not utilize carpets or related fabric textiles; and
b. Have all interior surfaces which are painted, be painted flat grey, except the shooting lane walls, and all ceilings, which if painted, must be painted white, off-white, or light grey.

3.18 Simulator System Compatibility

The range must be fitted for and fully compatible with the virtual / live fire simulator systems to be installed by the Crown and its authorized installer. The simulator system that will be installed is the "Meggitt FATS 100-MIL". The range must provide protection to and enable the full functionality of the simulator systems. Two (2) simulator systems will be installed in the range.

a. Each simulator system includes the following components:
    i. Quantity 1 – Tension mounted single layer self-healing rubber image screen, with bullet detection system (2 light bar sections, cameras, and diffusion plates) dimensions: 3650 mm wide, 2187 mm tall, 577 mm deep;
    ii. Quantity 1 – Projector;
    iii. Quantity 1 – Operator station (Monitor, keyboard, mouse, joystick controller);
    iv. Quantity 1 – Rack mounted computer components (router, image generator, OCR and simulator computer) mounted in a portable box;
    v. Quantity 1 – Shooter tablet; and
    Power cables and Cat 6 cables.

b. The following accessories will also be provided
    i. Quantity 1 – Trainer tablet;
    ii. Quantity 1 – Look-back camera; and
    iii. Quantity 1 – Mobile hostile Shoot back gun with Joystick controller.

Figure 1 – Image screen and projector layout (not to scale), has been included to identify the screen layout.

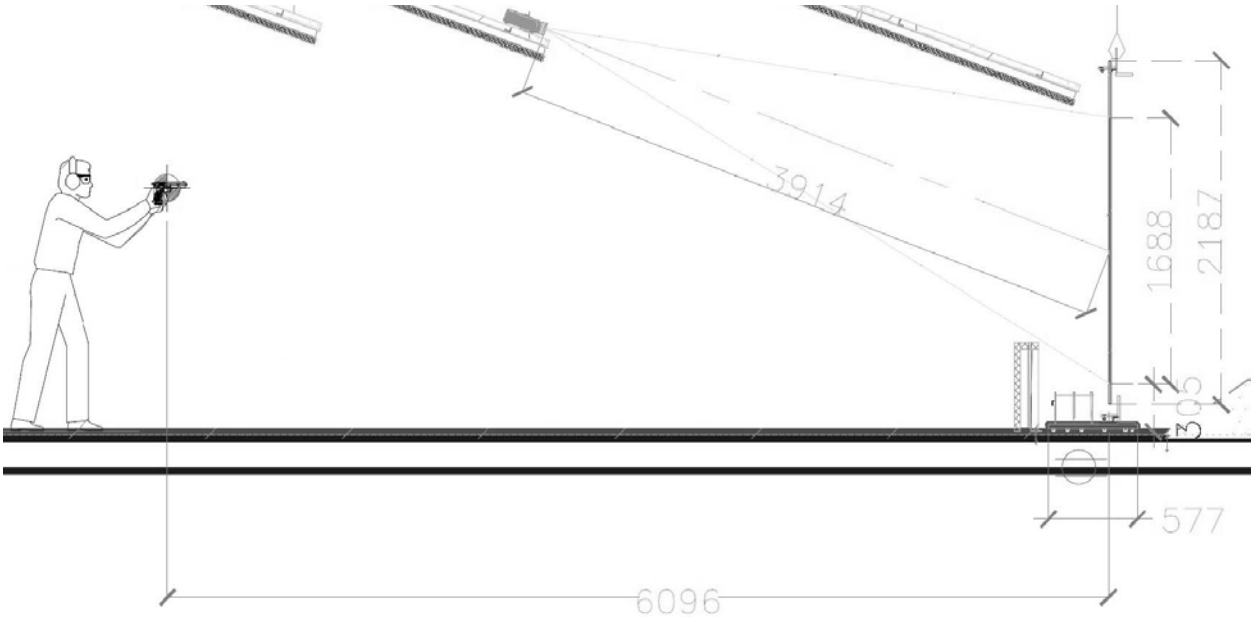

Figure 1 – Image screen and projector layout (not to scale)

3.18.1 General Requirements

The locations of the electrical requirements, infrastructure requirements, hardware mounting points, and conduit runs and endpoints will be confirmed after contract award. The range must allow each simulator system to be used simultaneously. Each simulator system consists of the following components and requirements to be met for a range to be considered "fitted for".

a. Image Screen with Bullet Detection System;
   i. Infrastructure Requirements:
      1. A clearance space:
         I. Ceiling clearance: 2250 mm;
         II. Width clearance: 4285 mm;
         III. Depth clearance: 900 mm (including 300 mm downrange of the screen);
         IV. Located between 5800 mm and 6300 mm downrange from the firing line. It is permitted that shooters are required to be located forward of the firing line to be positioned approximately 6100 mm from the image screen. If shooters are required to fire at the simulator from a location other than the firing line, a "Simulator Firing Line" must be marked on the range floor;
         V. Located to allow the light bar, cameras, and lower mounts to remain installed when the image screen is removed, without interfering with operation of the range, including the target retrieval system.
      2. Accommodate a projected image measuring 1688 mm high by 3000 mm wide.
      3. Include bars to which the image screen and bullet detection system top bar mounts will be affixed. The range bars must:
         I. Be located in the clearance space;

II. Enable at least a 5 cm height adjustment of the light bar to properly tension the image screen; and
III. Be located to enable the image screen top and light bar to remain installed when not in use, without interfering with the operation of the range including the target retrieval system.

4. Provide ballistic protection:
I. For the top bar, including light bar and cameras, from all projectiles fired down range. Ballistic protection for the top bar must have at least a 2.2 m height clearance;
II. For the bottom mounting brackets and diffusion plates. Lower mount ballistic protection must be rubber lined to capture rounds;
III. That is positioned to allow the light bar, cameras, and lower mounts to remain installed when the image screen is removed; and
IV. That is designed to prevent ricochets back towards the shooter.
5. Include ventilation in front of the bullet detection system to redirect smoke and gasses away from the hit detection system, without decreasing the downrange velocity of the air and gasses by more than 0.05 m/s (10 fpm).

ii. Electrical Requirement:
1. Quantity 4 – GFI NEMA-15/20 outlets installed in the firing range within 500 mm of the clearance space; and
2. Quantity 4 – GFI NEMA-15/20 outlets installed in the storage room; and
3. Conduit Requirement: Quantity 1- 103 mm (4 in) conduit from the lane control module to a location at least 6 m downrange from the firing line.

b. Projector:
i. Infrastructure Requirement:
1. Ballistic protection must be provided for the projector, to protect from projectiles fired downrange from the firing line. Ballistic protection for the projector must have at least a 2.3 m height clearance when the projector is not in use;
2. Ventilation enabling air flow to prevent overheating of the projector;
3. Lead contamination protection in the form of either:
I. An air vent installed just uprange of the projector providing direct ventilation, cooling, positive air pressure, and air flow from rear to the front of the projector;
II. An appropriate protective casing that does not obstruct cooling air flow causing and does not interfere with the projected image; or
III. A Technical Authority approved alternate solution.
4. Installation of a projector mounting bracket such that range components and systems (including retriever rails) do not interfere with the projected image when the simulator system is in use; and
5. Installed approximately 4000 mm up range from the image screen

ii. Electrical Requirement: Quantity 1-GFI NEMA-15 outlet installed in the firing range within 300 mm of the base of the projector mount; and
iii. Conduit Requirement: Quantity 1- 103 mm (4 in) conduit from the rack mounted computer components to a location between the shooting stall and the clearance space.

c. Operator station (desktop computer):
    i. Infrastructure Requirement: Table top space in the control room:
        1. Located behind the shooter position in line with the shooter and projector, to allow clear view of the projected image; and
        2. At least 1000 mm wide and 1000 mm deep, and as large as necessary to allow:
            I. The placement and use of a monitor (minimum 20 in) keyboard, mouse control, joystick, and printer; and
            II. Space next to the control station for note taking.
    ii. Electrical Requirement: Quantity 2-GFI NEMA-15 outlets in the allocated space on the table top or on a wall immediately next to the allocated space; and
    iii. Conduit requirement: Quantity 1- 103 mm (4 in) conduit hole put through the table top to allow cabling to connected to the rack mounted computer components.
d. Rack mounted computer components:
    i. Infrastructure Requirement: Space to install a computer rack measuring (0.92 m deep by 0.61 m wide by 0.92 m high (36 in x 26 in x 36 in);
    ii. Electrical Requirement: Quantity 1- GFI NEMA 15/20 outlet on an independent breaker and circuit no more than 300 mm from the allocated space; and
    iii. Conduit requirement:
        1. Located no more than 300 mm from the allocated space, the endpoints of conduit from projector, projector screen, control station, and hostile shoot back paint gun; and
        2. Quantity 1- 38 mm (1.5 in) conduit from the station to a point within 2000 mm of the firing point and no more than 10 000 mm from the lane control module.
e. Shooter Lane controller / tablet;
    i. Infrastructure requirement:
        1. One lockable storage cabinet in the storage room with:
            I. a minimum allocated volume of 0.75 cubic meters
            II. Three (3) NEMA-15 Outlets;
            III. A MEDECO lock; and
            IV. Five (5) copies of the key
        2. Installation of an in-wall tablet mount:
            I. In one of each grouped shooter stalls; and
            II. That includes a security locking mechanism utilizing the MEDECO lock system, to enable the operator to secure the tablet in the mount and discourage relocation of the tablet.
                1 At least 2 copies of the key must be provided for each wall mount provided; and
                2 Each wall mount must be keyed to use the same key.
            III. If the simulator firing line is not the same non-simulator firing line a pedestal for holding the shooter lane controller must be provided.
    ii. Electrical Requirement:
        1. Quantity 1- GFI NEMA-15 outlet located no more than 300 mm from the mount or in the in-wall mount;
            I. If the simulator firing line is not the same as the non-simulator firing line the electrical outlet must be located within 2000 mm of the simulator firing line, and behind the shooter.

2. Quantity 1 – GFI NEMA-15 outlet located in the lockable storage cabinet.

f. Hostile shoot back remote paint gun (1 total, moved between lanes).
   i. Electrical Requirement: Quantity 2-GFI NEMA-15 outlets installed in the firing range between the firing line and farthest target position; and
   ii. Conduit Requirement: Quantity 1- 103 mm (4 in) conduit from the control room to a location between the firing line and furthers target position.

3.18.2 Conduit Requirements

Conduit must:

a. Have at least one conduit fishing line that is at least 2000 mm longer than the conduit run between the conduit access points to allow easier fishing of cables;
b. Be provided as a separate conduit run for each conduit requirement;
c. Have ends that:
   i. Are protected from projectiles and ricochets; and
   ii. Positioned to reduce sound transmission.
d. Be provided with end caps for each conduit end to allow conduit runs not in use to be closed off and temporarily sealed; and
e. Be provided with rubber or foam stoppers that can be inserted around cabling, without damaging the cables and wiring, to prevent air flow and sound transmission in the conduits.

3.18.3 Electrical Requirements

A simulator system:

a. At a minimum requires an independent circuit, with a separately allocated circuit breaker in the electrical panel be provided for:
   i. Each projector, and in-lane accessories;
   ii. Light bar section
   iii. Each rack mounted computer components;
   iv. Each operator station; and
   v. The storage room.
b. Has the following estimated power consumption:
   i. Maximum 1700W;
   ii. Average 900W, 13.5A; and
   iii. 110/120V.

3.18.4 Range /Simulator integration

It is desired that the range control system can communicate to the Simulator system to indicate the current range condition and a change in range condition, including the following range statuses:

a. Live Fire; and
b. Standby.

The system condition and condition change can be communicated by either digital or analog signal, and though either 9–pin serial, USB, optical, or RJ-45 connection.

3.18.5 Desirable Simulator Installation Requirements

It is desirable that:

a. Each control station allocated space is provided with quantity 1 – 3.5 mm Audio input jack, to enable audio from the simulator system to be transmitted to the appropriate lanes speaker or headset as chosen by the operator;
b. Space is allocated in the range control room cabinets for a standard 19 inch network rack at least 1500 mm in height, with the network rack and appropriate conduit runs to allow the simulator systems to be mounted in the cabinets provided;
c. A third downrange simulator system (projector, bullet detection system, and image screen, with control room operator station and rack mounted computer components) be installable and
d. If the range provided permits intentional shooting in a secondary direction (Paragraph 3.4.1a.i), it is desired that in addition to the two (2) downrange simulator installations, at least one (1) additional simulator system (projector, bullet detection system, and image screen, with control room operator station and rack mounted computer components) be installable and usable perpendicular to the primary direction of fire on at least one side wall.

4. ACCESSORIES

4.1 Chairs

The range must be provided with at least 3 office chairs for use by the operators in the control room. The chairs must:

a. Have soft cushioning on the seat and back;
b. Have an adjustable height, back tilt, seat tilt and depth;
c. Be mounted on wheels;
d. Have arm rests that are adjustable in height, spread and rotation; and
e. Have adjustable lumbar support.

4.2 Cleaning Equipment

The range must be provided with:

a. An explosion-proof, HEPA filter (99.97% efficient at 0.3 microns particle size) equipped vacuum, for dedicated lead dust cleanup; and
b. Three (3) wooden "casino rake" to clean-up spent shell casings ("brass").

4.3 Emergency Eye Wash Station

The range must be provided with an easily accessible emergency eye wash station located in either the control room or open preparation area.