

PART 1 - GENERAL

1.1 DESCRIPTION OF
WORK

- .1 The extent of the firing range equipment is shown on the drawings and described herein.
- .2 The installation shall be under the direct supervision of the firing range equipment manufacturer.
- .3 Any necessary part not specifically shown on the drawings or specified herein shall be furnished and installed if the omission is clearly a part of the equipment, unless work is designated "by others" in specifications.
- .4 All equipment specified under this section shall be provided by one (1) manufacturer to insure compatibility and product performance capability.

1.2 QUALITY
ASSURANCE

- .1 Range equipment manufacturers must meet the following qualifications:
 - .1 A manufacturer must have at least five (5) years' experience in fabrication and installation of police or military firing ranges of similar scope.
 - .2 A manufacturer must have experience in fabrication and installation for at least one project to "RCMP Range Design and Construction Guidelines".
 - .3 Acceptable known materials:
 - .1 Action Target Inc.,
www.actiontarget.com, 1-801-380-8973.
 - .2 Meggitt Training Systems,
www.meggitttrainingsystems.com,
1-514-339-9938.
 - .3 Savage Range System,
www.savagerangesystems.com,
1-800-370-0712.
- .2 Upon request provide a list of five (5) representative completed law enforcement type pistol range equipment installations in continuous use for three (3) years, with name, address and phone number of the owner and a brief description for each project.
- .3 Range equipment system and its components shall be designed and tested by a professional engineer as required by "RCMP Range Design and Construction

Guidelines". Manufacturer must submit shop drawings for the system stamped, and provide field testing performed by a professional engineer.

- .4 Service shall be promptly performed by a factory authorized and certified technician.
- .5 Manufacturer shall stock all components for the bullet trap and containment system such that they shall be available for shipment within 24 hours of order.
- .6 The manufacturer must have a minimum of five years' experience fabricating steel baffles according to the preceding specifications. Fabrication shall not be subcontracted out but must be done on-sight at manufacturer's property.
- .7 Manufacturer must provide a toll-free telephone number and a dedicated toll-free customer service number with access to a customer service representative.

1.3 QUALITY CONTROL

- .1 Shooting range equipment specifications constitute the design and quality standards for product required by the Departmental Representative for this project. The work must be completed in accordance with standard practice in equipment manufacture and in a manner acceptable to the Departmental Representative.

1.4 SUBSTITUTIONS

- .1 Proposed substitutions shall be submitted prior to the bid date. Allow sufficient time for review. No substitutions will be reviewed later than 10 working days prior to the bid date.
- .2 Substitution proposal shall include samples of proposed product. Samples shall be working models of the exact dimensions proposed.
- .3 All substitution proposals shall list equipment proposed and an item-by-item comparison stating why the items are equal to the specified item. Proposals shall include the manufacturer's specifications, cut sheets, and other data needed to demonstrate compliance with the specified requirements.
- .4 Substitution proposal shall list no less than five clients who have the same equipment that is being proposed.

1.5 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Section 01 33 00. Submit shop drawings for the installation of this equipment. Include all electrical data and connection details. Coordinate all details on drawings of the exact locations for mechanical work.
- .2 The Contractor shall submit a complete written commissioning and maintenance plan for approval by the Departmental Representative.
- .3 Provide all conduits, junction boxes, lighting fixtures, and other components and products for all electrical service and control wiring needs. Architectural drawings may not completely illustrate all range equipment needs. The range equipment electrical requirements shall be illustrated on the submittal drawings package provided by the equipment manufacturer after placement of order.

1.6 DELIVERY,
STORAGE AND
HANDLING

- .1 Deliver all equipment boxed or crated to provide protection during transit and job storage.
- .2 Inspect equipment upon delivery for damage. Minor damages may be repaired, provided the finish items are equal in all respects to new work and acceptable to the Departmental Representative; otherwise, remove and replace damaged items immediately.
- .3 Store equipment at the site under cover in a secured place. Store equipment off the floor and in a manner to promote air circulation. Avoid the use of non-vented plastic or canvas shelters that could create a humidity chamber.

1.7 GUARANTEE

- .1 Equipment shall be fully guaranteed against defects in workmanship and materials for a period of one (1) year from the date of substantial completion of this project.
- .2 The manufacturer shall instruct the Owner as to the proper operation and maintenance of the equipment at time of acceptance of the work.

PART 2 - MATERIALS

2.1 BULLET TRAP

- .1 Performance Criteria:
 - .1 Trap shall, without allowing bullet penetration and without sustaining other damage, be capable of stopping and containing the following projectiles (and others of equivalent power factor and penetration factor) when fired at a "point blank" distance from the front aperture of the trap: 9 mm, 40 cal., 45 cal., .223 fmj, 5.56 fmj, .308 fmj, 7.62 fmj, 7 mm Rem Mag, 12 ga buckshot, 12 ga rifled slug.
 - .2 Trap shall be capable of stopping and containing 0.50 cal. Hard-ball (green tips and/or 5.56 mm M885) up through and including .223 cal.
 - .3 Trap shall be fully modular such that it may be assembled on-site or disassembled and moved. Assembly shall not require "permanent" connection means such as welding, riveting, etc. Assembly shall not require cutting of materials or other sizing operations. Rather, all modules shall be completely prefabricated for simple assembly on site. All modules shall be small enough to be carried through a standard 3.0 doorway.
- .2 Bullet Trap:
 - .1 The bullet trap and containment system is a self-supporting, self-contained, bullet backstop and containment unit of steel plate construction for heavy use on high-volume ranges both indoors and outdoors, employing a reconfigurable 8-course sloping funnel design with top and bottom impact plates to be constructed of a minimum of AR 500 steel plates.
 - .1 Impact plates shall be replaceable 10 mm (3/8") substitutes.
 - .2 Trap shall utilize a minimum of AR 500 steel impact plates to direct the bullet into an enclosed, sealed, and fully shielded (solid steel in 360 degrees) chamber where its velocity is safely removed.
 - .3 The deceleration design shall incorporate an arcuate shape, which minimizes primary and secondary impacts, which will increase the life of the chamber.
 - .4 The throat is designed in such a way that the combination of the primary impact plates and the secondary impact plates are such that the initial impact of a projectile will be 15 degrees or less. On the secondary impact inside the throat, all surfaces are designed such that impact is 18 degrees or less. No primary impact shall

be capable of impacting the deceleration surface inside the chamber.

.5 Projectile shall be contained in a deceleration chamber which provides a generally circular trajectory to decelerate the projectile.

.6 Containment chamber is of modular construction with no welding between components and is a sealed system such that once lead fragments enter the chamber they are contained within said chamber when it is under negative pressure.

.7 The radius of the deceleration chamber shall be no less than 305 mm (12") in order to minimize lead accumulation and wear on the deceleration surfaces.

.8 Aperture where projectiles enter the chamber shall be one continuous opening from left to right without interruption by sidewalls or deflectors in order to accommodate cross-range shooting into the trap.

.9 Upper deflector plates shall extend far enough and at such an angle as to completely cover the area between the tops of the deflection plates and the roof such that the roof, support members and hanging structures cannot be impacted by bullets.

.10 The trap shall be designed such that the upper plates are supported by an integral cantilevered system extending from the rear of the trap such that the trap system can be extended indefinitely, to the right or to the left, in either direction, with no intervening columns or walls.

.11 There shall be no area where lead particulates accumulate which need to be cleaned by any other method other than canister removal, i.e., HEPA vacuuming, brushing, blowing, wiping, etc.

.12 Trap shall be capable of accepting modular plates ranging in width from 3' to 8' using either a surface or sub-surface joint system, without modification to the chamber.

.1 If trap is using a surface mount joint system it should be designed with a convex stiffener.

.13 Trap shall have a horizontal center-line of 1200 mm (4') off the ground. Trap shall have a front aperture height of 2400 mm (8').

.3 Construction:

.1 Body of Trap:

.1 Majority of chamber plate must be native metal and non-stressed to maintain full integrity of hardened steel.

- .2 Steel panels must be blasted and prepared to be in compliance with painting specification SP-6.
- .3 No ballistic panel shall be subjected to flame cutting (oxygen fuel cutting, such as acetylene, propane or MAPP gas, etc.). All ballistic panel cutting must be done on computer-controlled plasma equipment.
- .4 No projectile impact surface may be constructed of permeable or flammable materials such as rubber, wood, plastics, etc.
- .5 Modular components shall be small enough to be carried through a standard 3.0 doorway.
- .6 No impact plate surfaces shall present a bullet fired straight into the trap with an impact at an angle greater than 15 degrees from parallel with the plate.
- .7 No vertical joints are installed in the impact area eliminating the need for deflectors to reduce the possibility of ricochet.
- .8 All surfaces in the path of the projectile shall be made of steel with an AR500 rating. Joints shall have no exposed bolt heads.
- .9 No welding shall be permitted on impact plates.
- .10 Deceleration chamber shall be constructed with no sidewalls or deflectors, creating a continuous opening at the mouth.
- .11 The chamber components can be replaced individually and independently to the other chamber components. The front and back chamber sections shall be 10 mm (3/8") in thickness. The replacement can be done using hand tools and without cutting, welding or through-bolting.
- .12 The chamber shall be constructed in a modular method using clamping forces which apply sufficient force to conform the chamber back to the rigid rib using hand tools and manual force of 200# or less.
- .13 The mouth shall be designed such that no projectile can have a primary impact on the deceleration shell.
- .14 The discharge spout shall allow for multiple collection methods of spent projectiles.
- .15 The deceleration chamber system shall be capable of facilitating expansion and contraction without transferring force energy to adjacent sections.

- .16 The deceleration shells shall be of an arcuate design without rolling or a continuous bend.
- .2 Containment Canister:
 - .1 Each containment canister shall form an airtight seal to the deceleration chamber such that all lead particles coming out of the deceleration chamber shall not accumulate anywhere other than inside the containment canister.
 - .2 Each canister shall be removed from the trap by means of one or two bolts. Containment canisters shall have a total volume not to exceed 4 gallons.
 - .3 Canister shall be approved for transportation and storage of lead.
 - .4 Each canister shall employ a permanently locking, airtight lid. Once the canister is filled with lead, it may be removed from the trap and the lid secured in place. The canister may then be used to contain the lead permanently, or during transit to recycling.
 - .5 Containment canister shall be removable and serviceable by one person without the need for mechanical assistance.
 - .6 Canisters, which have been returned after recycling, shall be able to be reused on the trap.
- .4 Operation:
 - .1 Deceleration shall occur in free-air and not in any other medium such as rubber, water, etc. Trap shall not require the use of or introduce any chemical media such as oils, anti-freezes, chlorine, etc.
 - .1 Trap shall not introduce any substance that is EPA regulated, i.e.; ethylene glycol, mineral oil, anti-freeze.
 - .2 Trap shall not introduce any substance, which might act as a solvent for spent bullets, or their by-products, i.e.; water can be a solvent for some frangible materials.
 - .2 The inside of the chamber shall be readily accessible and inspectable without requiring prior removal of any kind of internal deceleration medium such as rubber, sand or water, etc.
 - .3 Bullet components, which have lost their momentum, will be directed into a series of containment canisters. Removal of contained lead shall not require any process such as scooping, pouring, shoveling, sifting, etc. which would disturb the settled state of the lead and lead particulates.

- .5 Basic trap shall require no prior construction or site preparation other than an appropriate, flat, concrete pad. Must be capable of being fully self-supported with an appropriate concrete pad.
- .6 Lead Filtration:
 - .1 Trap deceleration unit shall employ an active lead accumulation system to capture and remove airborne lead particulates within and surrounding the chamber. This system shall then direct captured bullet components into a containment canister or projectile removal system where they can be readily removed for disposal or recycling. Each canister, or system, shall be connected to the accumulation system by means of an airtight seal.
 - .2 Trap shall employ an air collection and filtration system to collect and purify the air within the main deflection aperture/collection chamber. Air shall flow into the mouth of each bullet deceleration chamber at an average rate of at least 4.25 cu.m./m (150 cfm) for 1500 mm (5') of linear trap. The velocity of the air entering each chamber shall be at least 1.83 m/s (360 fpm) through whatever aperture(s) provided.
 - .3 Air collection and filtration system shall be able to balance airflow along length of trap.
 - .4 Said purification apparatus shall process the required airflow at an efficiency exceeding 99.99% on 1-micron particulates and exceeding 99.6% on 0.12-micron particulates.
 - .5 Said purification apparatus shall be self-cleaning. Any filter elements, which are disposable, shall have an average life expectancy of 5000 operating hours.
 - .6 A second stage, redundant HEPA grade filtration system shall be available which shall filter all air processed by the primary filtration system. The HEPA filter shall exceed 99.99% efficiency on 0.12-micron particulates.

2.2 BULLET BAFFLE SYSTEM

- .1 Shooting Range Wide Span Baffles:
 - .1 Baffles shall be for the purpose of containing misdirected rounds within a shooting range.
 - .2 Baffles shall be capable of mounting from the ceiling in order to provide an armored strike surface covering the ceiling in any direction in which the shooter may point his gun.
 - .3 Baffle panels shall consist solely of a rectangular sheet of steel. The fabrication of these panels shall not include any welded components or field cut-outs (holes, notches,

grooves, etc.).

.4 Rounds fired into the baffles shall not reflect splatter back toward the shooter. All lead fragments shall either be contained by the baffle or shall be expelled toward the bullet trap.

.5 Baffles shall interconnect one to another in a modular fashion so that they may be taken apart again, replaced, or moved.

.6 In addition to being stackable horizontally, rows of baffles may also be connected vertically to provide armoring of a larger total area than the standard 48 vertical inches. All standard baffle interconnection kits shall contain the means to stack in both the horizontal and vertical direction without the addition of further components. As with horizontal stacking, vertical stacking will also guarantee overlap in the joints to provide a resulting single, contiguous, bullet-proof surface.

.2 Construction:

.1 All joints shall provide overlapping surfaces so there is no potential for small cracks where bullets or bullet fragments might escape.

.2 All joints shall be capable of containing high power rifle rounds such as .223 and .308 caliber.

.3 Wide Span Joints are all connected from the back with the carriage bolts flush on the under surface of the baffle.

.4 When installed in hanging applications, baffles shall be suspended at 1200 mm (4') intervals along each joint by 5 mm (3/16") steel cable. Each connection point shall contain an integral adjustment device so that the exact height of each joint may be fine-tuned. Each adjustment point shall provide for both fine adjustment (+/-38 mm; +/-1.5") and coarse adjustment (+300 mm (12")/ -unlimited) without the need to replace or re-size the cable.

.5 In addition to the cable mounted system there is chain and bracket mounting option for the Wide Span Baffle system.

.6 In addition Wide Span Baffles can be mounted directly to a Joist or Truss running side to side on the range, hanging points to be up-to 16 foot apart.

.7 The Wide Span Baffle has bracket system for attaching to a wall that is adjustable (+/-38 mm; +/-1/2" in).

.8 All joints shall be constructed such that no small gaps remain through which bullet fragments might escape the joint by deflecting

a total of less than 180 degrees (two consecutive 90 degree impacts).

.9 Joints shall be used to interconnect panels which cover a 1200 mm x 2400 mm (48"x 96") standard area. Panels shall be available in a variety of different grades for containment of a variety of rounds:

.1 Rifle grade containment panels shall be 10 mm (3/8") armor plate with a nominal Brinell hardness of at least 485 and shall deflect high power rifle rounds (.223, .308 etc.) at perpendicular angles. High power rounds will be deflected without deformation if fired at angles over 45 degrees or at distances greater than 100 yards.

.10 Baffle interconnection system shall include a wooden facade system which includes a 2x4 nailer strip which is fastened to a bracket bolted to the baffles at least every 600 mm (24"). Also included is a 2x4 nailer strip which runs across the base of each baffle. Wherever a facade system is used it must include a 13 mm (1/2") plywood panel which covers the 3 sq.m. (32 sq.ft.) baffle area and connects along the edges to the 2x4 nailer strip. An acoustic tile facade shall also be included which attaches on the face of the plywood panel to provide sound deadening and acoustic dampening.

.11 Baffle interconnection system shall include a wooden facade system which includes a Z type bracket at each baffle joint which is through-bolted to the joint strip at least every 600 mm (24"). Also included is a Z type bracket which runs across the base of each baffle, providing a 10 mm (3/8") air gap for expulsion of lead toward the bullet trap. Wherever a facade system is used it must include a 13 mm (1/2") plywood panel which covers the 1.5 to 3 sq.m. (16 to 32 sq.ft.) baffle area and connects along the edges to the Z type bracket. An acoustic tile facade may also be included which attaches on the face of the plywood panel to provide sound deadening and acoustic dampening.

.12 No ballistic panel shall be subjected to flame cutting (oxygen fuel cutting, such as acetylene, propane or MAPP gas, etc.). All ballistic panel cutting must be done on computer-controlled plasma equipment.

.13 Steel panels must be sandblasted and be in compliance with painting specification SP-6.

2.3 SAFETY STALLS

.1 Modular Shooting Stall:

.1 Stall:

.1 Stall shall be available in height of 2150 mm (86") as measured at highest point.

.2 Stall design shall enhance the laminar airflow. Ancillary features or equipment shall not interfere with airflow; such that eddies would form causing disruption of the laminar airflow.

.3 Stall shall be available 1500 mm (5') width.

.4 Stall frame shall be available in Hammer-tone powder-coat finish.

.2 Stall Wall:

.1 The stall wall shall be designed in a contemporary style that allows a completely unobstructed view by using a single support member with a transparent panel of polycarbonate 6 mm in thickness, to create a barrier between shooters.

.2 The transparent panel shall be easily replaced using standard hand tools.

.1 The transparent panel has the option of being replaced by a non-transparent wall consisting of 6 mm (1/4") A36 steel plating or 6 mm (1/4") AR-500 steel, laminated on each side by layers of 13 mm (1/2") composite wood sheeting covered by an applied polyurethane coating. This will allow the wall to be able to stop .556 mm/.223 ammunition fired at point blank range perpendicular to the wall.

.3 All structural members shall be of 6 mm (1/4") steel.

.4 The stall wall shall provide a large protection zone between shooters.

.3 Barricade:

.1 The barricade shall be attached to the stall frame with hinges, which allow the barricade to be swung down-range when not in use. Barricade will not impede any portion of the stall when in the down-range position.

.1 Barricade shall be available in a multi-level version.

.2 The barricade will "lock" into position and not move when in use.

.3 Barricade shall be designed in such a way that it is robust enough to withstand continuous use of simulated shooting from cover or concealment. The replaceable wooden panel shall be easily removed if desired and the user may replace it with varying shapes and designs.

.4 Pivot Table:

.1 Stall may have a pivot table which attaches to either side of the stall. The pivot table will be 900 mm (3') wide and lock into the 90-degree position for the shooters use. Table will be able to pivot back into the stall against the wall.

2.4 STATIONARY TARGET HOLDERS

- .1 Provide a quantity of twelve (12) overhead mounted target holders - adequate for holding full silhouette targets and their cardboard backer panels. Holders to have either a continuous clip / clamp across the top or 2 separate clip attachment points at 450 mm (18") apart at the targets top outer ends. Holders to be designed for easy removal or relocation with no tools required, across the width of the range room. The holders upper attachment point shall be designed to hold the target in a straight presentation to the shooter. Holders to be fabricated from formed steel bar stock - in a semicircular form with the clips protected via small angle iron sections.
- .2 Target holders are to be suspended upon a cross-member support that consists of angle iron or other suitable steel structure which extends wall to wall - with vertical supports to the structure - and at an elevation that will allow for a clear target height of approximately 1800 mm (6'). The cross-member support shall be located within a protected area behind a ceiling baffle panel and not visible from the primary firing line.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install bullet trap, baffle system and safety stalls in strict accordance with manufacturer's written instructions. Provide a commissioning plan for approval of the Departmental Representative at least two weeks before completion of construction. Follow the commissioning plan and demonstrate to the satisfaction of the Departmental Representative that the installation and equipment are ready for their intended use prior to Substantial Performance.
- .2 Install equipment under the direct supervision

of the equipment manufacturer.

- .3 Adjust equipment for proper operation, and as requested by Departmental Representative.
- .4 Demonstrate all aspects of operation and maintenance of the installed equipment to the Departmental Representative's satisfaction. At installation completion provide services of a representative of the firearms training equipment to demonstrate and carry out a proper operation and maintenance training for the CSC/PWGSC staff on the complete system.
- .5 All exposed steel shall have a prime coat to the Departmental Representative's approval.