



SECTION 3.0 TECHNICAL SPECIFICATION

3.1 TECHNICAL REQUIREMENTS – BULLET CONTAINMENT/CATCHER

3.1.1 General

The contractor shall provide bullet containment systems as described herein. They shall thoroughly familiarize with all the Tender Conditions and Specifications as they might affect his pricing of this Bullet Containment Performance Specification.

- i. The Contractor is required to design and supply bullet containment systems which comply with this design specification.
- ii. The Contractor shall allow for all requirements to effect a suitable installation satisfactory to the Superintending Officer. Such installation shall ensure that the building is proof against bullet exit via any service ducts or other penetrations or gaps (excluding opening doors).
- iii. The Tenderer shall provide full details of all bullet containment systems inclusive of general layout with all dimensions with his tender as required.
- iv. The Tenderer shall provide full details documents inclusive of dimensions, specifications and technical data during designing and construction phase.
- v. The Contractor shall submit all details to the Structural Engineer to ensure that the building fabric integrity is not compromised by the systems proposed.

i. Weapon Attack

The Contractor's notice is drawn to the weapons intended to be used in the facility:

- i. Not more than 9mm calibre handgun
- ii. 0.38 inches revolver
 - a. The types of ammunition to be used are as follows:
 - a. Ball non-jacketed
 - b. Ball jacketed
 - b. The Contractor shall submit with his Tender the following information for comment and/or acceptance:
 - a. Fully dimensioned and annotated drawings
 - b. Material specification



ii. Anti-Ricochet Walls

- a. Anti-ricochet walls are located in areas deemed likely to receive negligent discharges (NDs) and for this reason are only required to have anti-ricochet capability.
- b. The contractor shall supply, deliver, off-load, position and install shredded rubber (SG). He shall clearly state in his tender quantities (m^2) and clearly shown on the drawings submitted with the tender.
- c. The wall finish shall be shredded rubber (SG Rubber) tiles with 25mm thickness and be resistant to impact deformation caused by boots and shoulders without showing visible damage or permanent distortion. The minimum density of the rubber tile must be $1200kg/m^3$. The rubber tiles shall be padded with hardwood, easily removed and replaced for inspection of the surface behind.
- d. The anti-ricochet finish proposed by the contractor must trap the round in an air gap between the wall and the AR finish so that re-emergence through the AR finish does not occur.

iii. Floor

- a. The contractor shall to supply, deliver, off-load, position and install the rubber tiles, 25mm thickness SG Rubber Tile with density $1200kg/m^3$ – which shall be glued to the floor except at shooting booth area. Vinyl flooring tiles must be applied to the whole flooring at the back of shooting booth area until in front of the shooting booth area (down range).
- b. The contractor is to ensure that the flooring is clean and ready to accept the rubber block. The contractor also required to install the rubber block without any segregation between the block.

iv. Ceiling

- a. Ceiling shall provide along the 25m range.
- b. Mineral Fibre Ceiling Panel (Acoustic ceiling) shall be fixed to the ceiling between the protective baffles, in order to reduce the reverberation of sound waves within the range.

v. Bullet Traps

- a. Bullet trap design must be usable for all shooting range especially at the indoor shooting range.
- b. It must be able to reduce the impact of bullet / debris ricochet effects towards the shooter.
- c. The trap shall be designed to deny direct passage to bullets.
- d. Overall construction depth of the trap shall not be less than 1.5 meter. Design of the trap shall ensure that no supporting structure is exposed to any firing

position within the room. The bullet trap shall be designed to cover the whole length of shooting target RC wall.

- e. The steel plate must be installed in layers and place at a 45° inward slanting position to channel the bullets / debris downwards. By using a strong steel plate with size of 9mm, fixed to the wall (back plate) will allow the bullet trap to stand the impact of a bullet. Steel frame is used to hold the SG Rubber Curtain. The rubber curtain consists of two layer. First layer of rubber curtain sized 500 (w) x 3000 (l) x 10 (t) mm with 95% premium rubber. While the second layer sized 1500 (w) x 3000 (l) x 10 (t) mm with 95% premium rubber. The rubber curtain shall be easily removed and replaced at any time.
- f. The speed of the bullet / debris must be able to be stopped when it strikes the steel plate inside the bullet trap.
- g. The proposed type will also need to be able to absorb the impact of not more than 9mm calibre parabellum up to .38 magnum calibre.
- h. The steel plate proposed is from the following type:
 - i. Resistance reinforced metal 120 N/mm²
 - ii. Elasticity limit reinforced metal 900 N/mm²
- i. In case the bullet trap is anchored or attached to any structure support of the building, appropriate energy absorbing linkages must be applied.
- j. The bullet containment drawer and the rubber block shall be designed for maintenance with easy removal and reinstallation.

vi. Protective baffles

- i. The baffles will act mainly to provide safety element to fitting. This will ensure the strike will ricochet down range and not towards the walls or roof. Thus, it minimized the danger or ricochet escaping the range due to random nature of ricochet angles.
- ii. Floor baffle is located at the end of the Indoor Range that protects the targets and winch mechanism from damage resulting from stray rounds. The baffle shall be constructed to stand for any bullet, and is lined with an anti-ricochet surface of shredded rubber tiles.
- iii. Inclined ceiling baffles are required to be fix across ceiling which placed 30° off on ceiling to provide protection to light fittings, cameras, etc. The baffles shall consist of a welded steel plate framework, plated on the strike face with 6mm thick mild steel. SG Rubber tiles 25mm with density 1200kg/m³ cover the steel plate and are screwed fixed to steel channels. The baffles support must be able to hold the baffles loads and shall be securely fixed to roof structure, to avoid any baffles movements. Chains type support shall not be allowed. The contractor must study the roof structure design by C & S Engineer and shall allow sufficient support and provide adequate fixing method for the baffles to be fixed to the roof structure. The Protection baffles must be designed to cover the whole width of shooting gallery (Wall to wall).



vii. Shooting Booths

- a. The shooting booth shall be minimum 2100mm high and 600mm width with 1200mm high laminated glass. The contractor to liaise and coordinate with the Main Contractor or the Architect on the actual size & dimension designed & allocated.
- b. A transparent screen high will be fitted to the end of the divider to reduce possibility of stray rounds from one firing position to the other, and also to restrict flying cartridges ejected from weapons.
- c. The following accessories shall be provided to the booths.
 - i. Fold down counter with recess for weapons and ammunition.
 - ii. Clips for score sheet and marker.
 - iii. Control for retrievable target, light switch and communication switch.
- d. The entire shooting booth must be secured properly to avoid booths movement or vibration. A proper steel structure support shall be designed and installed by the contractor.
- e. Contractor shall design and install barricade between shooting booth (at both ends) and side wall to prevent direct access to the shooting gallery.
- f. Contractor shall ensure that the distance of the outermost booth must be exactly 500mm from the wall. The centre distance between each of the shooting booths shall not less than 1300mm.
- g. Proposed detail of shooting booths as per detail A.

viii. Door and Partition

- a. Double glazing window for the control room shall be water condensation proof and Splinter Proof with non-corroded metal frame that fixed to the wall between the control room and the shooting gallery.
- b. Gallery door shall be hardwood & robust door with magnetic lock control from control room.
- c. Dry wall adjacent to shooting gallery shall be included in this contract. Contractor shall liaise with the main contractor and architect for this project for the design and construction of this wall.
- d. Sound proof treatment shall be applied to the walls and glass window adjacent to shooting gallery.
- e. Solid nyatoh tables and 4 numbers of chairs shall be installed in the room. A proposal for the table and chair shall be approved by SO before any fabrication and installation. Table shall be designed to fix and place any equipment such as LED Display, Microphone and etc.



ix. Noise Reduction

- a. Hazardous impulse noise will be resulted during firing and trapping a bullet. Therefore , proper protection to hearing shall be provide according to exiting safety and health regulation, which OSHA stated 140dB is a maximum permissible peak impulse sound pressure level (SPL). The protection equipment to be worn while inside the shooting range.
- b. High efficiency noise absorption materials shall be applied accordingly to the shooting range's walls, doors and ceiling.
- c. Materials used for noise absorption should be non-flammable.
- d. Noise abatement shall be considered accordingly during designing a shooting range – where building location, building type and adjacent dwelling to be considered accordingly.
- e. To minimize the effect of peak sound pressure levels on individuals, all reflecting walls should be covered with perforated aluminium or steel sheet with opening equivalent to 10-15% of the area to permit sound absorption. The covering should be designed for easy acoustical flooring as well.



3.2 TECHNICAL REQUIREMENT – MECHANICAL AIR VENTILATION SYSTEM

i. General

- i. Mechanical/ Air ventilation systems must be installed to ensure that the carbon gas and Lead Poisoning Gases from the firearms are not trapped inside the gallery. This is because the gas is a health hazard to all the officers that are going through the shooting training as well as workers at the shooting range.
- ii. The ventilation system should be in operation at all times while the range is in use and during clean-up.

ii. Air Ventilation System

- a. Ventilator motor must be installed at a distance far enough to obviate the sound of the motor from disturbing the concentration of the shooter. Air will be channel through the air duct.
- b. The motor should be inverter type of operation and complete with regulator control speed. This system should be variable speed operation and control regulator should be locating at motor control panel.
- c. The entire range facility should be maintained at a slightly negative pressure with respects to the adjacent areas to prevent the escapes of contaminants. These criteria suggest that the exhaust air should exceed supplied air by 10%.
- d. Indoor shooting range should have its own ventilation system to prevent the circulation of contaminated air to other areas of the building.

iii. Air Flow

- i. An optimum air flow/supply would be 75 fpm at the firing line. The minimum air supply must be 50 fpm at the firing line. When the 75 fpm rate is used, a minimum of 25 % of the air should be exhausted 15-20 feet down range of shooting position and remaining 75% at the bullet trap.
- ii. A minimum down range conveying velocity of 35 fpm must be maintained.
- iii. A system shall designed to provide negative pressure with at minimum (70:100) pressure ratio to ensure that unwanted gas be 100% extracted out from the range. This can be achieved by exhausting of 3-7% more air than it's supplied.

iv. Air Distribution

- i. The supply air to be distributed evenly across the width of firing range – this determines the effectiveness of the ventilation system. If not evenly distributed the air flow at firing line will be turbulent causing lead and other contaminants to be carried back into the shooter's breathing zone. The supply air should be introduced as far up range as possible. Therefore, the distribution of supply air should be uniform, diffuse, and non-turbulent towards the firing line and near laminar flow down range.



- ii. For the uniform of air distribution, Perforated Face air diffuser shall be designed.
- iii. The ductwork construction such as gauge of sheet melt, type of joints and bracing shall be constructed in accordance to latest SMACNA standard.
- iv. The ductwork for the condition supply air shall be externally insulated.

v. Air Filter

- i. The air filtration system shall consist of Primary and Secondary filters. Primary filter shall be of washable type having dust extraction are stance of not less than 85% and dust spot efficiency of within 25% to 30% range and secondary filter shall be of HEPA (High Efficiency Particulate Filter). True or absolute HEPA Filter shall be capable to trap at least 99.97 percent of particles 0.3 microns. Approval by SO must be obtained before any installation to be carried out.
- ii. The contractor is required to design ventilation system and ensure to keep lead levels below the standard requirement of 0.20 mg/m³.
- iii. Filtered air to be supplied from behind the firing line to guarantee an evenly distributed flow of air through the shooting positions. Filter for fresh air shall be of washable type having dust extraction are stance of not less than 85% and dust spot efficiency of within 25% to 30% range.
- iv. Air containing the polluted gas, carbon gas and dust will be removed off the range using the air channel installed at the end of the gallery (at the bullet trap) using the exhaust system. Fresh air will be channelled in through the air duct using the suction fan system.
- v. Filtration of exhausted air is required. Provision for increasing fan size to the handle increased static pressures must be considered if exhaust filtration is retrofitted.
- vi. Provide filters with pressure gauges of dial type. Filter gauges shall monitor both primary and secondary filter banks. Also provide gauges with auxiliary contact to send high pressure filter alarm at control system.
- vii. The contractor shall provide temporary washable filters for testing and commissioning.



vi. Air Intake and Discharge

- i. Fresh air shall be 100% outdoor air and shall be pre-cooled to provide space temperature of 25 degree C around the shooting booth area. Location of air intake should be positioned to avoid recirculation of the exhausted air.
- ii. Supplied air inlets should be placed behind the shooter's position.
- iii. The exhaust discharge must be separated from the supply air intake. The range exhaust should not be located where cross contamination can occurs to adjacent buildings. Note prevailing wind patterns or building projections that may cause turbulence or eddy current may affect ventilation effectiveness.
- iv. The supply and exhaust systems must be electrically interlocked, thereby eliminating an error in turning one system on and not the other. The system should operate on one fan speed only and not variable speed fans.

3.3 TECHNICAL REQUIREMENT – INTERGRATED PA SYSTEM AND INTERCOM SYSTEM

3.3.1 System Requirements

- a. The wired intercom system shall be design for the use of the communication between the operations personal at control room with the shooter at the shooting rank.
- b. The wired intercom system shall be able to support up to 6 intercoms station. Each station shall have a wired headset and control panel. All the station shall be able to address individually.
- c. An emergency public address signal shall be able to send into the wired intercom system and it will override all communication signals during emergency.
- d. A customize programming and touch screen panel is provide for the automation and simplicity control of the wired intercom and closed circuit television system.
- e. The intercom system its complete configuration shall provide the following function:
 - a. Point to point communication.
 - b. Computer software programmable and configurable.
 - c. Shooter control panel to activate the communication with control room personal.
 - d. One touch for wired intercom and closed circuit television system pre-set via external remote control system and touch screen.
 - e. Public announcement inside shooting area.



- f. The following aspects shall take into account in the installation of the intercom system:

The digital intercom system shall be configured as below:-

- a. Base station, which controls and monitors all activities in the system. The base station also provided all the connectivity to the computer, third party and emergency override signal.
- b. Shooter station, which allow the mobile user communicate with control within the area that cover by the active antenna range.
- c. Headset, which allow the mobile used listen and talk to the control room personal. The headset provides shall also act as an ear defender that provides acoustic protection for the personnel subject to high transient sound pressure level product by gun fire. The maximum sound pressure level experienced by the user shall be 95 dB (A) with a cut-off time less than 20 milliseconds.

3.3.2 System Functions

The wired intercom system in its complete configuration shall provide the following function:

- i. Point to point communication.
- ii. Computer software programmable and configurable.
- iii. Shooter control panel to activate the communication with control room personnel.
- iv. One touch for wired intercom and closed circuit television system pre-set recall via external remote control system and touch screen.

i. System Installation and interconnection

The following aspects shall be taken into account in the installation of the wired intercom system:

- a. Communication between the external control system and wired intercom system shall be via RS232. This is to remain two way communications between the both systems.

3.3.4 System Configuration

The wired intercom system shall have the following system configuration:

- i. Audio DSP Processor, which controls the entire signal routing of the system. The audio DSP Processor also provides all the connectivity to the computer, third party control system and emergency override signal.
- ii. Button control panel, which is used to activate the communication between shooter and operation room personnel.
- iii. Gooseneck microphone, allow the control room personnel speaker to the shooter.
- iv. Self-powered speaker, which used to listen the speech of the shooter.



- v. Headset, which allow the user listen and talk to the control room personnel. The headset provide should also act as an ear defender that provided should also act as an ear defender that provided acoustic protection for the personnel subject to high transient sound pressure level produce by gunfire.

3.3.5 System Components and Equipment

a. Audio DSP processor

The audio DSP Processor shall allow the wired communication flow through its 8 audio inputs and 10 audio outputs connection at the rear panel. The audio DSP processor shall be able to program, configurable and control through the RS232 connection that provided.

Specifications:

- i. Mic / Line Input : 8
- ii. Output : 10
- iii. Serial Port : 2 RS 232
- iv. Signal Processing : Five 32 bit floating Point DSP, 24 Bit A/D and D/A Converters,
- v. Signal Processing inputs : 3 Band Shelving EQ With Parametric EQ inputs and Gate on Each input
- vi. Signal processing Outputs : Crossover, Filter , 1/3 Octave Graphic EQ, 5 Bands Parametric EQ, Compressor, Limiter,
- vii. Frequency Response : 20 Hz-20 kHz, 0.5dB
- viii. THD + N : <0.005% Mic in to Master Out
- ix. Crosstalk : < -90 dB
- x. Equivalent Input Noise : -129.5 dB Unweighted
- xi. CMR : > 80 dB @1 kHz Signal

b. Gooseneck Microphone

The gooseneck microphone shall be cardioids polar in pattern, high gain before feedback, flat & wide range frequency response and high quality reproduction of speech.

Specifications:

- i. Transducer Type : Condenser
- ii. Polar pattern : Cardioids
- iii. Frequency Response : 65-20 kHz
- iv. Nominal Output Impedance : 200 Ohms
- v. Load Impedance : >1000 Ohms
- vi. Signal To Noise Ratio : 60 dB
- vii. Phantom Power : Phantom



c. Self-Powered Speaker

The self-powered speaker shall be compact in size which features 4" woofer and high resolution tweeter. It shall also have dedicated volume, bass and treble controls.

Specification:

- | | | |
|------------------------|---|-----------------------|
| i. Tweeter | : | 1.5" |
| ii. Woofer | : | 4" |
| iii. Audio Inputs | : | 1/8" TRS Stereo Input |
| iv. Frequency Response | : | 80 Hz to 20 kHz |

d. Headset

The headset shall offer high sensitivity and a contoured frequency response for maximum intelligibility under high noise condition. The headset vocal range is emphasized so that critical production calls cut through easily. The headset ear cups are unsurpassed in their ability to isolate the wearer from high SPL sound field. The completed sealed, rigid plastic outer ear cups blocks external sound and prevent leakage of the headphone output to the outside. The filter ear cushion creates a comfortable yet soundproof seal over the ear.

The headset noise cancellation microphone shall be mounted on a durable flexible arm for full adjustment of microphone to mouth distance.

The contractor shall supply and hand-over the following quantity and types of headsets to end user:

- d. Eight (8) numbers of headsets (ear defender with listen and talk capability for shooter's use)
- e. Eight (8) numbers of headsets (ear defender type only for general use).

Specification of the headsets is as follows:

- | | | |
|-------------------------------|---|-------------------------------------|
| i. No. of Ear Pieces | : | 2 |
| ii. Ear Piece Type | : | Closed / Sealed |
| iii. External Noise Isolation | : | Highest, 50 dB |
| iv. Frequency Response | : | Contoured for Voice Intelligibility |
| Material | : | Plastic with Heavy Wire |
| v. Microphone transducer type | : | Noise Cancelling Cardioids Dynamic. |
| vi. Mic Frequency Response | : | 80 Hz-10kHz |
| vii. Mic Boom Rotation | : | 300 Degrees |



3.4 **TECHICAL REQUIREMENT – CCTV SYSTEM**

System Requirements

- The closed circuit television (CCTV) system shall be design for the use of the monitor and record the shooting result.
- The CCTV camera shall be allocated for monitoring shooting target at 15m, 20m, and 25m respectively for every lane to capture the shooting result.
- All camera output shall be recorded by Digital Disk Recorder (DDR). Each camera output signal shall also be distributed to individual TV monitor allocated for the shooter. A multi-image display signal and a live image from the DDR shall also send the signal to the multi graphic processor.
- A multi-image signal that consists of the shooting result and the multi-image display signal (from DDR) shall be projected onto a 40" LED display.
- A desktop computer with the camera and DDR management software shall be provide for the system management, monitoring, record, search and playback.
- All the cameras, DDRs, multi-image processor and LED display shall be control by the external control system via RS232 protocol.

System Functions

The closed circuit television system in its complete configuration shall provide the following functions:

- e. Full target result capturing event the distance between the camera and target is 25m.
- f. Multi image signal project on 40" LED display with the shooting result image at the top right and a multi-image (from digital disk recorder) at the left of the LED display.
- g. One touch for wireless intercom and closed circuit television system pre-set recall via external remote control system and touch screen.

System Installation and Interconnection

The installation of the CCTV camera shall be mounted at on the protective ceiling baffles mounted at 10m, 15m and 20m from the shooting booth for every lane.

System Configuration

The closed circuit television system shall be a hardwire configuration with the following system configuration:

- 1) Digital Disk Recorder (DDR), which is used to record all camera inputs signals.
This unit shall come with minimum 16 camera inputs. Computer software is providing for the live monitoring, recording, search and playback of the capturing image.



- 2) CCTV camera shall have high quality varifocal lens function that allows capturing the shooting result image.
- 3) Multi Graphic Processor shall be capable of allowing multiple images projected and displayed at the LCD monitor.
- 4) Minimum 21" LED Monitor shall be provided for the shooter to preview their shooting result. Inputs into these TV monitor shall be a loop through signal from the DVR input.
- 5) LED display shall be provided to project the image.
- 6) Control processor shall be installed to integrate all system such as CCTV cameras, digital disk recorder, multi-image processor, LED display and digital wireless intercom base station. A custom program is needed for the simplified and one touch control by the touch panel.
- 7) Touch screen panel, which is the control device, shall be provided to send commands for all others devices through control processor.

System Components and Equipment

f. Digital Disk Recorder

The digital disk recorder shall be a simultaneous live record and playback device for minimally 16 channels cameras. This digital disk recorder shall also features with RAID 5 and mirror redundant recording. Besides that, the hard disk storage shall be able to expand up to 7.5 terabytes.

Specification:

- | | | | |
|------|----------------|---|--|
| i. | Video Input | : | 16 x 75 Ohms BNC |
| ii. | Cascade Input | : | 1 x 75 Ohms BNC |
| iii. | Video Output | : | 16 x 75 Ohms BNC |
| iv. | Monitor Output | : | 2 x BNC (2 video) and 1 x 15 pin D-sub (VGA) |
| v. | Control Port | : | RS 485 (x 2 RJ 11)
RS 232C (x 19 pin D-sub) and 10/100
Base-T (1 x RJ 45) |

g. Fixed Lens Camera

Provide only CCD colour cameras having, at minimum the following attributes:

- a. Signal System-PAL : 520 Lines
- b. Scanning System- 2:1 Interlace
- c. Image System- 1/3 Inch Interline Transfer Colour CCD
- d. Total Pixels No.-470k
- e. S/N Ratio – More than 48dB (AGC Off)
- f. Resolutions – Horizontal: 480 TV Lines
- g. Video Output Level – 1.0Vp-p (75 ohm Composite)
- h. Lens – Varifocal Lens (f=2.9-9mm)
- i. Sync. System-Internal
- j. Sensitivity -0.1 Lux
- k. Electronic Shutter- 1/50-1/10.000sec



- l. BLC-Auto
- m. White Balance-Auto
- n. AGC-Auto
- o. Supplied Voltage- DC9V-15V (Recommendation: DC 12V+/-0.5V)
- p. Power Consumption- Less Than 150mA
- q. Weight – Approx. 450g
- r. Connector – Video (Yellow), Power (Red) ,GND (Black)

h. Multi Image Processor

The multi-image processor shall be a four windows multi graphic device that combines full motion video and RGB inputs source. This processor shall also output a scaled output that up to UXGA resolution. All the picture image shall able to be control and configure and store as a memory pre-set.

Specification:

- i. Video input : Input 1 to 4, VGA-XGA RGBHV
Input 5 to 19, Configurable Component video,
S-video and composite video.
- ii. Input Nominal Level : 1 Vp-p
- iii. Input Max/Min Level : 0 V to 2.0 Vp-p with no offset at unity gain
- iv. Input Impedance : 75 Ohms
- v. Horizontal Frequency : 15 kHz to 100 kHz
- vi. Vertical Frequency : 50 Hz to 120 Hz
- vii. Input Resolution : 640 x 480 to 1600 x 1200
- viii. Video Processing : 24 Bit, 8 Bit per Colour, 160 Digital Sampling
MHz Standard
- ix. Output Processing Colour : 16.78 Million
- x. Video output Type : 1 Scaled RGBHV
- xi. Output Nominal Level : 1 Vp-p
- xii. Output Impedance : 75 Ohms
- xiii. Output Vertical Frequency : 50 Hz, 60 Hz, 72 Hz, 96 Hz, 100 Hz, 120 Hz
- xiv. Output Scaled Resolution : 640 x 480 till 100 x 1200



a. 21" LED Monitor

The 21" LED monitor shall be a LED monitor come with composite video input

Specifications:

- a. Video : Composite Video
- b. Panel size : 370mm Diagonal

i. LED Display/Monitor

The LED display/monitor shall be a 40" LED display panel that features with RS 232 communication port and RGBHV input port :

- i. Video Input : RGBHV
- ii. Panel Size : 40 inch diagonal
- iii. Resolution : 1800 x 1680
- iv. Control Port : RS 232

a. Control Processor

The Control Processor unit shall be a central control and monitoring equipment for all the cameras, multi-image processor and etc. It shall Feature with a Com control ports, IR control port and I/O control ports. The Control Processor Unit shall be able to expand it control port.

Specifications:

- Processor : 64-bit Cold Fire
- Microprocessor
- Processing Speed : 257 MIPS
- Memory : 12 MB Flash, 128 MB DDR3, 256 KB NVRAM
- Ethernet Port :10/100 Base T
- Com Control Port : 6
- IR Control Port : 8
- I/O Control Port : 8
- Relay Control Port : 8



b. Touch Screen

The colour Touch Screen shall be a stunning colour graphic stylish state to the art 10.4” wired touch screen solution. These vibrant 640 x 480 touch screen display shall also delivery astounding graphic performance to support a host of control application.

Specifications:

- | | |
|---------------------|--|
| a. Display Type | : Active Matrix Colour LED |
| b. Size | : min 10.4” Diagonal |
| c. Resolution | : 640 x 480 |
| d. Illumination | : Edge lit Fluorescent |
| e. Viewing angle | : 70 Degree Horizontal
+ 45/-55 Degree Vertical |
| f. Touch screen | : Resistive Membranes |
| g. CPU | : 64 bit Mot
Cold Fire
Microprocessor |
| h. Processing Speed | : 63 MIPS |
| i. Memory | : 12 MB Flash, 16 MB DDRAM |



3.5 TECHNICAL REQUIREMENTS – ELECTRICAL SYSTEM

3.5.1 Electrical General

- a. The contractor shall provide the electrical services for the indoor 25m shooting range and its associated ancillary facilities to satisfy the following
 - a) Electrical Installations with in Buildings
 - b) Public Utility Regulations
 - c) Malaysian Standards applicable to all elements of the electrical installation.
- b. The contractor shall provide all necessary safety precautions for ballistic protection of the electrical system (s). The contractor shall advise and provide all Necessary details on the protection of electrical services and fittings connected in routed through live fire zones. The Contractor shall consider bullet penetrations and ricochets as well as other precautions deemed necessary.
- c. The scope of work shall include, but not be limited to the following :-
 - a) Distribution Board (DB) for all Mechanical and Electrical (M & E) and shooting range equipment and wirings shall be located inside the Control Room/Utility Room.
 - b) Cabling and wirings for all Mechanical, Electrical and Shooting Range Equipment.
 - c) General lighting
 - d) Special Lighting for Shooting Range and Targets
 - e) Emergency and Exit light
 - f) Range safety lighting and door access control systems
 - g) Power points
 - h) Surge protection system & voltage stabilizing system
 - i) Earthing protection



3.5.2 System of Wiring

The contractor shall deliver, install and commission of G.I conduit, trunking, and cable tray and ladder systems.

All exposed conduits shall be heavy gauge galvanized, class B, screwed steel type complying with BS or other relevant BS standards. All concealed conduit shall be high impact PVC. All conduit fittings, cover lids and accessories shall be of the same material or of the equivalent quality proprietary fitting made of aluminium die casting. Prefabricated conduit bends, elbows, draw boxes and etc. shall conform to be relevant BS standards.

Flexible conduit adaptors shall be malleable cast complying with BS EN 1562:1997 and shall be provided with external earthing lugs.

Trunking shall comply with IEC 61084. They shall be fabricated from galvanized sheet steel and finished with two coats of standard orange enamel. Cable trunking shall be equipped with removal covers at suitable intervals. All trunking shall be spring type and NOT screw to avoid any damage to cable.

All trunking, offset combination elbows, adaptors and tees shall be of same thickness as the straight trunking and shall be the type manufactured and supplied by the same trunking manufacture. The trunking shall be supported by fixing brackets so that the trunking will not be in contact with the walls or floor slabs. The brackets shall be installed at intervals not greater than 1000mm for horizontal runs. The brackets shall be degusted, finished in a primer and coated with standard orange enamel.

The number of PVC cables to be installed in trunking shall be such that a space factor of 45% is not exceeded.

All cable trays/ladders shall be fabricated from hot dip galvanized steel.

All other cabling wiring, whether for electrical or other services, shall be in conduits / in trunkings / on cable trays / on cable ladders. All conduits installed shall be G.I conduit and all trunkings installed shall be of galvanized (standard orange colour).

Colour identification bands shall be provided on the conduit and trunkings and their coverings as a band over an internal length of approximately 1.2m. Colour band shall be 150mm width and used to identify various extra low voltage electrical services such as the following system :-

- i. Electrical System – Orange
- ii. PA System – White
- iii. CCTV System – Pink
- iv. Control System – Blue



3.5.3 Lighting for Range

The contractor shall provide fluorescent lamp to achieve minimum 500 lux for general lighting. 1000 lux lightings spotlight to be installed for shooting target.

All lighting system installed at the shooting table must be able to be controlled by the shooters or the officers at the shooting range from inside the control room. Lighting control must be individually or by group, must be integrated in must control system and must be able to be monitored on LCD panel (with light indication) from inside the Control Room.

Lighting design should provide uniform intensity and be free of glare without shadows. Lighting behind the firing line should not interfere with the shooter's view down range.

Where possible fittings shall be of the energy saving type.

Warning sign lighting (SHOOTING IN PROGRESS) shall be installed at entrances of every door to shooting gallery. This warning sign shall be automatically on during any training or firing.

3.5.4 Emergency Exit Lighting

- a. The Contractor shall supply emergency exit lighting to provide a safe means of escape from the building in the event of a total power failure. Emergency exit lighting shall be capable of providing 1 Lux over the whole area and designed in accordance with local authority requirement.

3.5.5 Range safety, Lighting and Door Access Control

- a. The Contractor shall provide a simple safety system comprising Firing in Progress warning light to warn of the danger of access into the firing areas when there is firing going on. The range safety lighting shall be interlocked with a door entry system to restrict access to the range when activated. The contractor shall satisfy himself that the system proposed is adequate and suitable, if not he shall propose an alternative system with all details and specifications.
- b. The Contractor shall provide door access control and monitoring systems to all doors leading to and from live fire areas. These doors shall be controlled from a central system located in the Control Room and shall comprise all the necessary magnets, contacts, relays, LED indicator lamps, etc, to form a fully functional and composite system.



3.5.6 Power points

The Contractor shall provide a power points for the Shooting Ranges and their associated facilities such as for maintenance purpose.

Sufficient power points of suitable types and ratings shall be provided for all equipment and plan to be installed. Each of equipment shall have its own power point. 13A switched socket outlets shall be provided for general usage, it shall be not less than two (2) per 10 sq. meter of area or one per 5 meter spacing along corridors whichever is more convenient and favourable to the users.

The exact number and type of power points to be provided shall be determined after detailed discussion with representative of SO.

Power points and switches shall be properly labelled and permanently labelled with the circuit number.

Service able circuit breakers of suitable types and ratings shall be provided for all equipment and plants not connected to 13A switched socket outlets.

3.5.7 Surge Protection System & Voltage Stabilizing System

- a. Surge protection system/devices shall be provided for distribution boards and electronic equipment which are susceptible to lighting and switching surges. The propose surge protection system shall consist of Stage One, Two and Three Surge Suppressors. They shall be installed in various locations of two voltage and equipment installation and the Contractor shall indicate these in the design drawings.
- b. The surge suppressors for Stage Two shall be mounted at the Sub-Switch Board/Distribution Boards. The surge suppressors to be located in this category shall be :-
 - a. Installed at Sub-Switch Board/Distribution Boards.
 - b. Able to withstand maximum surge current of 40KA of the 8/20 microsecond waveform.
 - c. Modular design with removable protection plugs
 - d. Incorporated with component damage indicators and touch safe terminals.
 - e. Provided with contacts for remote indication of components damage.
 - f. Able to provide both common and different modes of protection.



3.5.8 Earthing Protection

- The Contractor shall provide a comprehensive earthing protection system for the Ranges and all extraneous metal fabrications.

3.5.9 Mechanical Controls

The Contractor shall provide a control system for mechanical ventilation system to provide automatic control and remote control and alarm indication in the Control Rooms.

The control system shall indicate by both visual and audible means the following features :-

- (I) Dirty filter condition (supply and exhaust air)
- (II) Loss of air flow (supply and exhaust air)
- (III) Fire alarm initiation
- (IV) Lead levels.

3.5.10 Suitability of Equipment

- The Contractor shall study the space planning requirements for the Indoor Range and advise on the proposed system, materials, equipment and accessories he intends to supply and install for this contract.
- Where the Contractor considers there are a number of options to meet the environmental standard he shall provide full technical and cost details for each option in order for the client or their appointed representative to assess the scheme(s) fully.

3.5.11 Testing

- a. The Contractor shall supply and install electrical services and furnish field tests results for each electrical system to the client and acceptable to the local electrical approving organization.

3.5.12 Maintenance

- a. The contractor shall provide a comprehensive maintenance manual for the Operation and maintenance of all electrical systems installed under this contract.



3.6 TECHNICAL REQUIREMENTS – ACOUSTIC

General

- a. The Contractor shall design acoustic treatment to limit the noise nuisance within and outside the Indoor Shooting Ranges.

Acoustic Treatment For Control Room

- a. Acoustic Doors

The door shall be 'Sound Lock' double door system comprise of 2 STC 30 acoustic timber doors, fabric finishes acoustic lining and perimeter seals.

The treatment shall achieve STC 50 (Sound Transmission Coefficient) including lockset.

- b. Windows

The windows shall be anti-shattering material.

- c. Walls

Wall shall be installed with isolated board and acoustic infill to achieve STC 50. They shall include painting and wood-stud support.

3.7 TECHNICAL REQUIREMENTS – TARGETRY SYSTEMS

General

The target systems shall be fully integrated for indoor shooting range with multiple target discipline including retrieval and flipping target to meet wide Range of operational requirement for PDRM.

The target system shall be cable of meeting all the requirements of this specifications and shall be fully fit for purpose in terms of operation, ruggedness of contraction, durability of all materials, ease of replace ability of sub-components and all other factors normally expected of a target system.

All knobs, switches, etc shall be rugged and incapable removal from their shafts.



Overhead Retrievable Targets

- a. The target system comprise of an overhead retrievable target. Target shall be capable of being directed to any pre-set distance from the firing point, to each point as required. The target also can be retrieved for inspection and target changing. Target is moveable along the range by means of railing.
- b. The target height above the floor must be not less than 2100mm (7 feet).
- c. Each lane shall be controlled by the shooter from the fixed firing point of from a central control, using manual control or pre-set programmers, stopping the target at set distance. Control functions include the moving of the target trolleys.
- d. The target carrier travels along a steel wire or nylon cable that is suspended between the firing line and the bullet trap. Motors breakers shell is installed for stopping the target carrier via encoders that identifies the distance travel rotation of the motors without the use of sensor.

Specific Requirements:

- a. Power : 240VAC (single line).
- b. Running speed : 1 meters/sec.
- c. Operating condition : 0 to +50 C.

Control:

- a. Firing point : Forward/ Reverse, it will stop each station.
: Stop via pre-set distance control.
- b. Central : Optional pre-set distance control.

The Target control system shall control target, which are mounted on trolleys and control methods shall be available for selected lanes via computer software.

If the computer has control more than one lane, than all target trolley in those lanes doing different things shall not be possible unless handsets are used.

There shall be five fixed points on each carriers path typically as follows :

- i. Home (0 meters)
- ii. 5 meters
- iii. 10 meters
- iv. 15 meters
- v. 25 meters

Commands may be given to 'GO TO' any of these points.

When a 'GO TO' command is used the trolley shall move forwards the specified point. A command shall be available to halt the trolley.



The target shall be able to be put in a mode as below:

- i. Hold : In this mode, the target shall remain in standing hit.

This is the default mode.

The system shall have the ability to be controlled manually using a Standard designed keyboard.

iii. Performance Characteristics

The Target Carrier : Rate of Travel – 1 m/sec

iv. Tracks

- i. The target carrier shall run on trucks should not be concealed in ceiling space for easy maintenance. However, the contractor is required to protect the tracks and it shall be easy to replace and maintain.

Flipping Targets

- a. The target systems comprise of flipping target. Targets shall be capable of being flipped to 90 degree and capable of turning to both sides.
- b. Each target shall be driven from individual motor, and system shall operate and integrated with main control system.
- c. There shall be ballistic shield to protect the housing. Clamp or any part of the target system.
- d. The target shall be stapled to standard target board held in clamps.

Main Control System

- a. The control system will be programmable and microprocessor based with all the necessary software and hard ware for operation. The software will be user friendly and programmable together with two sets of licensed CD-ROMs. The hardware will consists of a PC (with latest specification), a 40" colour LED monitor, printer I/O interfacing boards, control/power cables and all necessary peripherals in order to complete system can be operated smoothly and effectively.
- b. The he software must allow shooting sequences to be created, tested and allows Preview of the target functions to be displayed on the computer monitor for Analysis by the operator. There must be provisions to edit any program or Part/stage of a program.
- c. There will be provision to activate static target with an off/on control, preferable key switch and to allow any target for maintenance purpose. It will also have a



safety features for emergency stop button to isolate target and/or the moving target system. All functions to be provided with indicating Lamps.

The control system shall perform at least the following functions :

Retrieval target, flipping target and shooting position:

- c. Hit indication and recording for static targets, any portable and moving target system.
 - d. Target mechanism selection and indication selection of any target system.
 - e. Individual lane ON/OFF control and individual indication for the target mechanism from main computer program.
 - f. Manual function controls the target mechanism; the target can be controlled individually or in selected groups by means of the keyboard and pointing device.
 - g. Each program shall have a storage capacity of not less than 15 minutes and contain a minimum of 9 present's movements.
- 3 Control of the target system shall consist of:
- i. Target Selections
 - ii. Target operation mode selection when the target is hit, remain at original face or turn to the edge position.

Target Equipment Schedule

Contractors shall price for the following equipment plus spares :

Description	Quantity
Retrievable Target	10 pcs
Flipping Target	10 pcs
Target Boards	1000 pcs
Target Papers	1000 pcs

3.8 TECHNICAL REQUIREMENTS : CARD ACCESS SYSTEM

- i. A card access system shall be provided at entrance and maintenance door of shooting range.
- ii. For security purpose, the access door must be able to be controlled from inside the Control Room.



3.9 TECHNICAL REQUIREMENTS : ALARM SYSTEM

General

The shooting range may be equipped with alarms. These alarms will function for shooter's safety. It will operate if below condition occurs:

- i. The shooter crossed the shooting line
- ii. The ventilation system is not activated or not functioning properly. A system to Interlock the ventilation system with the lighting at target system must be introduced. This system will give early warning on non-functionality of Ventilation system.
- iii. The shooter crossed the maintenance door.

3.10 TECHNICAL REQUIREMENTS: TESTING & COMMISSIONING AND LOGISTIC SUPPORT

General

All equipment installed under the contract shall be tested in accordance with an agreed and carefully defined testing regime (On-Site Acceptance Test OSAT). An integrated logistic support package (IIS) shall be included within the contract(s), which all defines the spares and long-term equipment maintenance requirements for the facility. Equipment for these purposes shall include but may not be limited to the following systems:

- a. Target Systems
- b. Communication, CCTV and PA
- c. Air Ventilation System and Electrical System
- d. Bullet Protection
- e. Bullet Trap
- f. Public Health
- g. Other Specialist Equipment



On Site Acceptance Test (OSAT)

The Contractor shall be required to conduct the OSAT to ensure that the systems and equipment conform to specifications and performance requirements. The Contractor shall carry out the OSAT, after the systems are delivered installed and tested.

The Contractor shall be required to submit the OSAT procedures 2 months before the commencement of the installation of the system for review and approval. The OSAT procedure shall include the following topic:

- a. Purpose and Scope of Proposal
- b. Title of each test
- c. Objective of each test (parameters to be tested/verified)
- d. Step-by-step description of each test to be conducted
- e. Expected or desired results
- f. Criteria for acceptance (pass/fail) of results
- g. Measured results/ observations
- h. Test site personal and facilities requirements
- i. Record of failure (discrepancy reports, with remedial action identified)
- j. Duration of each test
- k. Any other relevant matters

The contractor shall be responsible for ensuring that proper corrective actions are recommended, implemented and proven effective for defect/faults found during the OSAT.

Integrated Logistics Support (ILS) Package

- a. Concept

The ILS package proposed shall be based on the following inputs:

- i. Utilization Rate
- ii. The utilization rate of the system shall be at least 8 hours each day for the rangers.
- iii. Maintenance Concept
- iv. A two level maintenance support structure shall be adopted for the systems.
- v. Organization Level Maintenance



- v.3.1 This level of maintenance shall be undertaken by the operator/users. The tasks include functional checks, visual inspection and exterior cleaning.

vi. Intermediate/Depot Level Maintenance :

- vi.3.1 This level of maintenance shall be carried out under the maintenance element of this contract. Both preventative and corrective maintenance shall be accomplished at this level.

b. Spares Parts.

The contractor shall be required to propose lists of spares and consumables to support the system for a period of 5 years following the end of the warranty period. The Contractors shall provide the unit price of each spare proposed. The total price of the spares will not be summed into the tender bid.

For exposed accessories (e.g. antenna, brackets, etc) the contractors shall provide 50% as spares (over and above the quality required to operate the system).

The Contractor shall be required to supply all the necessary information to allow the End-User to catalogue the spares.

Spares, which are generally easily available at short notice on the local market, will be purchased by the users as required (e.g. monitors, video projectors etc). The contractor shall make clear in his tender which spares he shall provide with the contracts and shall suggest a suitable budget mount which the user should set aside for locally purchased spares for a period of 3 years following the warranty period.

c. Special Test Equipment (STE)

The Contractor shall indicate in their proposal whether any STE is required to support the maintenance of the system. The following information for each STE shall also be provided:

- i. Quantity Proposed
- ii. Unit Cost
- iii. Functional description of each STE including purpose, configuration, operation and maintenance requirements.

d. Documentation

The Contractor shall be required to provide the following documentation:

Manuals shall be provided to detail out the operation and maintenance procedures. The operation manual shall describe in straightforward terms how each individual unit works and how simple trouble shooting can be undertaken. It shall also include the '0' level maintenance task to be performed. The



maintenance schedules and detailed description of how to fault find, dis-assemble, repair and re-assemble components.

3.10.4 Performance Witness Testing (if necessary)

Targetry equipment shall be witness tested at the manufacturer's premises by four (4) Government representatives to be nominated by the Pengarah Kanan Cawangan Kejuruteraan Mekanikal, Ibu Pejabat JKR, Kuala Lumpur, before being delivered to site.

Performance rating tests shall be carried out and check against specifications and shall comply with the approved standards.

Performance Witness Test on Major Equipment

The contractor shall arrange with the manufacturer to inspect all major equipment and materials of high value such as targetry system to delivery. The objective of such inspections is to check compliance to quality standards and performance standards as stipulated in the Contract. Performance tests witnessing shall be included in the inspection programmed for approval.

Performance Witness Testing is required to ascertain that the targetry component can perform its intended design capacity and safety related function when operating under the most demanding set of limiting conditions defined within the tender specification. The proposed testing guideline shall contain the information which an engineer needs to establish a testing method, perform the test and evaluate the test result. A fully comprehensive Performance Witness Test must be carried out to establish the design compliance.

Performance Witness Test certificates and records for tests done in the manufacturer's factory for any major equipment and materials shall be certified by manufacturer and witnessed by Government's representatives.

The Contractor shall include in the tender all costs that will be incurred for the Performance witness test, including food, travelling (airfares, inland transport, airport taxes, etc.) and hotel accommodation not lower than the current Malaysian Government rates.



3.10.5 Practical Training

The practical training shall be conducted for at least two (2) JKR representatives to be nominated by the Pengarah Kanan Cawangan Kejuruteraan Mekanikal, Ibu Pejabat JKR.

- a. The Contractor shall be required to provide the following training:
 - i. Operators Training (Operation & '0' Level Maintenance)
 - ii. Depot Level maintenance Training

For each individual course, the contractor shall be required to specify :

Qualification of each instructor

Maximum number of trainees per class allowed

A synopsis of each individual course

Course syllabi

Course duration

The skill level/academic level required for the trainees

The skill level which the trainees will attain on completion of the course

The operators and Depot Level Maintenance Training shall commence after the successful completion of the OSAT.

A hands-on session comprising of the above topic shall be provided by the contractor.

The contractor shall include in the tender all cost incurred for the training locally including food, travelling and hotel accommodation not inferior to the current Government practice for a period of three (3) working days, excluding travelling.

3.10.6 As-Built Drawings

Four full sets as-built drawings shall be provided for all installations. These shall clearly show layouts (with dimensions), materials, wiring diagram and connections. A set of drawing in Auto CAD software format shall also be provided.

Warranty Period Maintenance

The Contractor must include in his Tender price for maintenance of the full installation during the Defect Liability Period. Any spare parts used during the Warranty Period Maintenance shall be replaced, unless such parts have failed due to misuse or accidental damage by the user.



Electronic Maintenance

a. Scope of works:

The SOW for electronic maintenance shall include the following:

Preventive and corrective maintenance during DEFECT LIABILITY PERIOD.

b. Preventive maintenance (PM) during Defect Liability period.

The contractor shall be required to perform four (4) PM during the warranty year for the entire monitoring system. Target system and projection system included in the contract. The contractor shall be required to submit to the client the detailed tasks to be carried out for each PM four (4) months after successful completion of the system OSAT.

c. Corrective maintenance (CM) During Defect Liability Period.

The corrective Maintenance shall cover the replacement or repair of all faulty equipment, as defined in the conditions of contract. The contractor shall provide on-call service to rectify all faults onsite to bring the system back to operation within the shortest possible time. On-call service would normally be requested when there is a system failure. Only on exceptional cases, would on-call service be required for non-system failure. Workshop repair of faulty equipment:

When workshop repair is required the contractor shall bring back the faulty equipment to the workshop for repair and deliver the repaired equipment back to the site for on-site testing and acceptance.

d. Reports.

The Contractor shall require submitting the following reports to the employer:

3.10.1.1 Monthly Services Reports

3.10.1.2 Preventive Maintenance Report

3.10.1.3 Bi-Annual Government Furnished Spares (GFS) Return

3.10.1.4 Monthly Defects Description/ Warranty Report

3.10.1.5 Monthly Quality Status of the Company

3.10.1.6 Any others agreed between the contractor and the client



b. Bullet Protection Maintenance

i. Scope of Work

The contractor shall be required to undertake cleaning and maintenance of the bullet protection systems during Defect Liability Period.

Maintenance tasks shall include:

Cleaning of all surfaces in range areas

De-leading bullet traps

Maintenance of bullet traps

Replacement of AR surface

Repair/replacement of steel protection and fixings

Repair/replacement of bullet proof doors

All necessary spares and consumables

The contractor shall submit WITH HIS TENDER a detailed schedule of maintenance works for the bullet protection systems. Typically, floors shall be mopped at least once per week and bullet traps will be cleaned at least once every month.

Reports

The contractor shall be required to submit reports to the Employer in a similar format to that required for the electronic maintenance.

i. Maintenance of Mechanical and Electrical Systems

a. Scope of Work

The Contractor shall provide a planned preventative maintenance scheme to control, manage and implement the maintenance of the mechanical and electrical installation during Defect Liability Period. This shall involve, but is not necessarily limited to the maintenance of all installations involved in the scope of supply and also the cleaning materials and equipment necessary for the cleaning and disposal of lead pollutants from the mechanical ventilation system. The system shall be inclusive of filter and all accessories. The cleaning and disposal of lead pollutants shall be in accordance with:

Waste Management – The Duty of Care – A Code of Practice
FED 0443 (10/91 OSDU) Forum – Controlled Waste Transfer

The Contractor shall also undertake the maintenance of all electrical systems including checking of correct operation, fault finding and replacement of damaged fittings (including those damaged during normal live fire training in the facility).

Maintenance tasks shall include:

Regular inspection of duct, louvers, etc.

Changing/ cleaning of filters

Inspection and servicing of equipment

Inspection and repair of controls



Replacement of failed lamps and electrical fittings
Inspection and repair to switch boards and racking
All necessary spares and consumables

b. Major Repairs

Repairs to faulty equipment occurring during the warranty period shall be undertaken immediately and as defined in the Conditions of Contract.

The Contractor shall provide on-call service to rectify all faults onsite to bring the system back to operation within the shortest possible time. On-call service would normally be requested when there is a system failure. Only on exceptional cases, would on-call service be required for non-system failure.