1.0 Description & Physical Dimensions:
The MCC shelter is to be based on an Extended(4.8m)
S-280 CIG shelter, per MIL-S-55286 D and an ISO adapter for Trabsoirtatuib (four twist locks)
per MIL-M-81957 (AS) & ISO 1496/1, including RFI/EMI MK-1079/G shielding kit.
The shelter should have two access doors, the Main door on curbside and the other on the
roadside (emergency door–exact location to Be decided during CDR).
The shelter should have I/O panels and a false floor.

1.1 General Dimensions:
External (mm)
Length = 4800, Height = 2421, Width = 2438

1.2 Doors:
The shelter should have two access doors. The main door to be located on the curbside
wall of the shelter will be of standard size with opening 889mm x 1638.3mm.
This door is to be provided with adented handle and without an emergency escape latch.
The exergency door will be located on opposite side of the main door in the corner.
It will have ecergency escape latch and will allow access to equipment with maximum
dimension of 1000mm into the shelter.
The shelter’s doors are to be provided with RFI gaskets all around and on the openings to
provide 60dB attenuation.
The peripheral extrusion around the door should have two grooves with silicon Weatherproof
gaskets. The inner groove should be of aluminum flame sprayed and should house RFI gasket.
The doors are to be equipped with a braking mechanism for Holding the doors fixed when open.

1.3 Panels Construction:
Each wall, roof and floor of the unit to be constructed of two essentially parallel aluminum skins
enclosing insulating core material and structural members.
The roof/floor panel skins are to be made of one-piece seamless construction.
The side and end panels may be seamed only above and in line with the sides of the door cutout.
The insulating core material is to be incombustible or self–extinguishing, polyurethane foam slab
and it is to be bonded to both the inner and outer skins without voids or delaminated aerals.
All interior surfaces of each panel are to be flat within 1/8 inch and intersecting panels
to be perpendicular to within 1/16 inch.
A thermal barrier is to be bonded between all mounting members and the inside skin.

1.4 Roof:  The roof will be capable of withstanding a uniformly distributed load of not less than
75lb/ft² uniform snow load. The roof is to be coated with antiskid corrugated sheet aluminum
3mm thickness.
Provision should be made for the installation of small antennae(no masts required–details to
be worked out during CDR).
1.5 **Fork-lift Capability**: The shelter is to be designed to permit movement by a forklift. Such movement should be accomplished from either side of the shelter. The forklift pockets shall be provided in the ISO adapter. The rigid bottom of the shelter should be so designed that it will not be damaged during forklift operations and will also withstand total weight of equipment racks & control consoles when lifted by a crane by means of slings.

2.0 **Operators’ Consoles & Equipment Racks**: The container shall be equipped with three numbers operators’ consoles & two numbers of equipment racks (possibility of putting three numbers of equipment racks will be discussed and should be optionally included). Operators’ consoles & equipment racks will be of 38U height and will be of EIA-310D standard for installation of computers and other equipment. Operators’ Consoles & equipment racks are to be mounted on a common platform on a strengthened floor with wire rope shock absorbers and height will be up to the ceiling. Shock absorbers are also to be installed on strengthened wall behind for stability. An approximate weight of 200KG/rack & 400KG/console must be taken for designing shock absorbers. Racks and control consoles are to be designed and manufactured to withstand the environmental condition for vehicles according to the recommendations of MIL-STD-810 E. The rear side of the operators’ consoles and equipment racks shall be open, and the top shall have an access for elastic air duct connection possibility. Basic rack and control console is to be fabricated from aluminum-extruded shape and welded to form the rack-console structure. The approximate lay out of the operator’s consoles & equipment racks is given in figure-1. The details of operators’ consoles are given in figure-2. The design of equipment rack will be same as operators console except that there will not be any hand rest and associated inclined display panel. The width of equipment racks will be as per EIA-310D standard. Blank panels of assorted sizes will be provided to cover entire front portion of equipment racks & consoles at the time of delivery.

3.0 **Environmental Control Units (ECU’s)**: The environmental control units shall provide controlled environment inside the shelter. There shall be three numbers of ECU’s each with net cooling capacity of 18300 BTU/Hr at standard conditions. They will operate on three-phase power supply (380V ± 10% AC and 50Hz ± 2Hz). The ECU’s shall maintain controlled temperature range between 20°C to 24°C and a humidity of around 50% R.H. ECU’s shall operate in external ambient temperature range of -20°C to 50°C. ECU’s should withstand vibrations, mechanical shocks, relative humidity, saw and dust conditions as recommended in MIL-STD-810 E. The noise level generated by ECU’s after installation should not exceed 65dBa near operators’ console. Air distribution to shelter interior and equipment racks shall be accomplished through air ducts and openings.
The length of air ducts should be decided according to shelter’s length. The ECU’s should be of military grade and the firm should have established history of military installations (proof to this effect should be enclosed in technical offer).

4.0 **Electrical Power Inlet & Distribution Inside Shelter:**

   There shall be two power inlets sockets (male) mounted at suitable location external to shelter and an electrical power control & distribution panel inside the shelter which will supply electrical power to the following systems.

   - The electronic equipment to be installed in the consoles through UPS
   - Shelter’s ECU’s
   - Shelter’s internal lighting
   - Shelter’s external lighting
   - Smoke and fire-alarm system
   - Internal & external Service sockets

4.1 The system control & distribution panel should provide protection against over currents, short-circuits, phase loss, phase reversal and appearance of hazardous voltages. Each of the power inlets should have identical input capacity of 25KVA of 3-phase 5-wire (neutral & earth included), 380 to 400V AC ±10%, 50Hz ±2Hz.

4.2 One of the power sockets is intended to provide power supply to critical loads such as electronic control consoles & equipment racks, internal emergency lighting, smoke and fire detector and internal service sockets through control & distribution panel and a UPS. The UPS will be of 2X3.5KVA (fail safe 3.5KVA & a total of 7KVA in power sharing mode) and will be supplied and mounted adjacent to control & distribution panel. It will withstand shock & vibration of cross-country transportation. The UPS will have maintenance free batteries for one hour back up. The batteries will be supplied mounted inside an environmental proof housing installed on a trolley to be towed nearer to shelter. The latest technology, military grade, and compact UPS will be provided. Three to four options of UPS shall be given. DRDL will make a final choice. The criteria of selection will be minimum size, established history of reliability & road-ability. Full design details of battery trolley and its connection to UPS inside Shelter will also be included in the technical offer.
4.3 The second inlet is intended to provide power supply through control & distribution panel to

- Shelters ECU’s
- Shelters internal lighting
- Shelters external lighting
- External service sockets

4.3.1 Independent controls (on/off & temperature cut-in & cut out) and display (voltage, current) shall be provided for each ECU. There shall be provision to display shelter’s temperature.

4.4 General Requirements of Electrical Power Distribution:

- Power will be connected to shelter through identical power inlets by means of mating connectors (to be provided by supplier).
- Total power wiring is part of scope of supply. Two routes shall be provided in the false floor and other places to isolate power wiring from signal wiring.
- Power wiring should be through metallic conduits.
- Circuit breakers are to be used wherever necessary for protection against over loads.
- Each of operator’s consoles & equipment racks should be provided with a distribution panel of 6X5/15A sockets with power indication & fuse protection.
- ON/OFF control will be through independent switches from central control panel.
- Circuit breakers and switches are to be protected with transparent covers to prevent inadvertent actuation. All circuit breakers are to of C. thermal magnetic (IEC 898) type.

4.4.1 The Electrical Power Distribution should include:

- Main Power Panel
- Power Distribution Panel
- Rack Distribution Panel
- Environmental Control Panel

4.4.2 The elements of Main power panel are given below.

- Two military grade heavy duty input connectors mounted on shelter for External access
- One 5KVA (single phase three wire) military grade output connector for External equipment
- Necessary connectivity to door & external panel lighting and smoke & fire Alarm system
- Two service outlets internal to shelter through UPS
- Heavy shelter grounding terminal for connection to earth rod.
- Three heavy EMI/RFI filters for incoming power and to service outlets.
Twelve heavy duty metal oxide varistors (275 V RMS, 400A) connected from each power line (including neutral) to ground to protect the electrical/Electronic equipment from lightening voltage transients.

**Note**: In addition, one heavy-duty military grade connector will be provided for connection of external battery to UPS inside shelter along with mating Connector.

4.4.2.1 The main power & distribution panel should contain the following.
- Three neon indicators A, B & C, to indicate the presence of all three phase Voltages, when 3 phase input power is on.
- Power demand inside shelter is to be distributed among the three phases as equivalent as practicable.
- Three fuses for protection of neon indicator circuits.
- Phase Sequence Detector to ensure activation of mains contactors only when all three phases are present and are in correct sequence (10 phase sequence detectors to be provided as spare) and one as hot stand by on panel (with manual control).
- No bypass switch to be provided to Main Contactor for ON/OFF.
- System “Digital Power Meter” to monitor RMS Voltage of each phase, RMS Current of each phase, total active power consumption, power factor and frequency to be provided.
- Three phase switch and a circuit breaker to protect the output to external service outlet.
- The power to all operators’ consoles & equipment racks to be routed through independent 16A switches & circuit breakers.
- All powers to smoke & fire alarm system, emergency lighting system etc are to be routed through 16A circuit breakers.
- Two insulated neutral & Ground bus bars.

4.4.3 **Environmental Control**: The main control panel should assist in the operation and control of three indentical environmental conditioning units, for cooling as well as heating of the shelters interior.

The panel should consist of the following.
- Indicators (neon) to indicate the presence of 3-phase voltage.
- Three 3-ϕ CB’s to protect output to ECU’s.
- Rail mounted terminals for distribution of power and control circuits.

5.0 **Shelter Grounding System**: Shelter’s grounding system should provide.
- Protective ground to protect personnel & equipment against power fault current.
- Signal ground to provide common equi-potential reference point for all signals to control noise.
- Common ground to provide a common point at which all the grounding circuits meet.
- Metal frames of the equipment racks to be connected to shelter earth at a common point.
6.0 **Shelter’s Interior Lighting System**

The shelter’s interior lighting system should cater for three ceiling mounted dual 40W florescent lamps, one ceiling mounted dual 20W florescent lamp (centrally located) with connection to UPS power.

Two small inflorescent lights (each of 25W) should be falling on each of operators’ consoles & equipment racks diagonally for operations.

Suitable light holders & switches must be designed and fitted on top corners of each of equipment racks & consoles and must be connected respective power distribution panels.

7.0 **Door Lights & shelter’s exterior lights**

The door lights & shelter’s exterior lights shall be implemented by an oval, weather proof, heavy poly carbonate bulkhead housing with a 100W incandescent lamp, installed on the outside above each door & outside panel opposite to main door of the shelter.

Both lights should have control switch on power distribution panel.

8.0 **I/O Panel**

I/O panel must consist of three layers of inclined aluminum panels welded together to form as an integrated panel of suitable height & width and must be permanently riveted/welded at one of the edges along the length of the shelter at the exterior.

All human engineering aspects must be considered for easy connectivity.

8.1 The following connectors need to be fitted to the I/O panel for entry/outlet of signals in/out of the shelter.

**First layer**

- 41 pin circular M/S cibectors - 04Nos–pin crimp type
- 26 pin circular M/S cibector - 04Nos–pin crimp type
- 19 pin circular M/S cibector - 02Nos–pin crimp type

**Note**: All mating connectors (crimp – socket type) to be supplied

**Second layer**

- N Type connectors - 06Nos
- TNC Type connectors - 06Nos
- BNC Type connectors - 06Nos

**Third layer**

- Telephone connections - 06Nos
- Ethernet connectivity (UTP) - 02Nos
- Fiber Optic Interfaces - 12Nos
9.0 Shelter’s Floor: The shelter’s floor is to be comprised of lower floor which is a part of basic shelter structure and a ‘false’ type up to 4” above lower floor for the purpose routing of cables. The skin of lower shelter’s floor shall be reinforced and it is to be 4mm in thickness. The lower shelter floor should include a drain opening with watertight covers near by entrance door. Suitable provision must be made on the lower floor to tie cables by means of nylon fasteners. This provision must be made in between the beams of the structural frame, which carries the tiles of the “false floor”. The false floor should consist of modular lightweight tiles. Colour of tiles should match the container’s inner painting.

9.1 “False Floor” – tile construction:
The dimensions of the tiles shall be about 350mm x 350mm x 22mm. The tile is to be composed of wooden sandwich panel—18mm thick, wrapped on top and bottom with 2mm aluminum sheet. The tiles are to be attached to an aluminum structural frame, which is connected to the lower reinforced floor. The tiles of the false floor are to be covered with an antistatic and non-flammable material with insulation to shelter’s grounding, in range of $10^5$ to $10^8$ Ohm.

10.0 Ladder:
The shelter should be provided with a stepladder to go to the roof top. The steps should be withstanding a static vertical load of 400lb.

11.0 Lifting hooks:
Four lifting hooks shall be provided on four corners of the shelter to enable lifting of shelter for installation on any platform. Suitably designed lifting sling shall be supplied along with the shelter. The sling shall be capable of lifting load up to 10ton. It will consist of master link, end link, swivel hoist hook, wire rope thimble, wire rope and tapered sleeve. The design should such that when hooked on to shelter & lifted, the wire rope will form an angle of 60° with plane of top surface of shelter. Please see figure-3 for typical lifting sling.

12.0 Support & Service Equipment:
The following support & service equipment shall be supplied suitably fitted to shelter’s fitted to shelter’s interior/exterior

12.1 Smoke & Fire Alarm System:
The smoke and fire alarm system should contain the following.

- Smoke detector
- Electronic Siren
- Flashing light beacon
- Control Panel
12.1.1 The smoke detector must be mounted in the center of the shelter’s ceiling, and the electronic siren should emit pulsating sound of frequency 600–700 Hz. The siren should be installed exterior to shelter and the intensity of siren should be such that it should not cause damage to human ears at a distance of one meter. The control panel should be preferably mounted in a box with transparent window and must be installed inside the shelter.

12.2 Fire extinguishers: two fire extinguishers shall be installed on two exit doors of the shelter.

12.3 Operators’ Chairs: Four operators’ chairs shall be supplied along with shelter. They shall be swivel office type with armrests. The features include permanent contact backrest, four backrest positions with quick-lock push button, seat height adjustable with sedo-lift & mechanical catch & five-star base with castors & plastic covers. Suitable arrangement will be made to fasten chairs to false floor, while on transportation.

12.4 First aid kit: suitably designed first aid kit will be attached to interiors of shelter at suitable location.

12.5 Hammer & Grounding Bar: A hammer & a grounding bar shall be attached to emergency door.

12.6 Shelter’s leveling indicators: Leveling indicators(analog type) shall be provided on two corners in diagonally opposite locations along the length of the shelter.

12.7 Other Accessories: Other accessories include suitably designed storage shelves with lock arrangement working table & a magnetic map board to be installed at appropriate locations (details to be included in technical offer).

13.0 Environmental Specifications: The shelter shall withstand cross-country road environment while on transportation by road. It shall also be designed for air & rail transportation and shall withstand relevant vibrations & shocks. The shelter shall be tested according to vibration and shock levels as given in QA plan (enclosure-1) The shelter designer shall give full design computations to establish that the shelter will withstand this shock & vibration environment in the technical offer.

13.1 The representative of DRDL shall witness certain tests as per QA plan enclosed (enclosure-1) during manufacturing process at manufacturer’s site according to mutually agreed test plan. The shelter will go through road-ability test at VRDE site at ahmednager, after complete installation of interior hard ware(before final coat of paint)
14.0 **Painting**: The shelter shall be painted white at the exterior and appropriate colour to match operators’ consoles & equipment racks in the interior. The manufacturer shall adhere to internationally approved standards for painting and will give full details in the technical offer or make mention of relevant standards.

15.0 **ATP**: The draft details of ATP of shelter shall accompany the technical offer. All ATP costs shall be borne by the supplier of the shelter (except on account of official visits of DRDO personnel).

16.0 **CDR**: The supplier shall submit full design details of the shelter within one month of placement of order. This will be discussed during CDR with experts from supplier and DRDL participating. Final approval will be given by DRDL. This will be the basis for final acceptance of shelter. Comprehensive document on ATP including road-ability tests will be finalized during CDR.

17.0 The scope of work is given in Enclosure-2.
**Enclosure-1**

**QA PLAN FOR EMI SHIELDED CONTAINER FOR MCC**

The following Mechanical & Environmental tests shall be carried out on the shelter as part of the QA Plan:

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1.0 **Adhesive shear test on Panel**:

This test is intended for determining the shear Strength of the bond (adhesive) along tangential direction between the facing and the core of the panel. The panel should have adhesive shear strength of minimum 0.7kg/cm² (630kg).

The test produces failure in the sandwich panel by shearing off the bond between the core and the facing.
2.0 **Visual & Mechanical Inspection**: The shelter shall be examined for the following:

- a. Various dimensions as per relevant drawings (approved during CDR)
- b. Various openings, their sizes and position
- c. General appearance and finishing
- d. Visual checks for riveting (if applicable)
  - i. No rivet should be broken
  - ii. The rivets should be mounted in zig zag fashion
- e. Visual checks for welding
  - i. The welding should be uniform everywhere
  - ii. The welding joints should be properly cleaned and free from excess flux
- f. Visual checks for screws
  - i. The material should be zinc sprayed ferrous
  - ii. All the screws should be properly tightened
- g. Visual checks for the skids
  - i. The dimensions of the skids should be as per the relevant drawings
  - ii. The channels should be zinc sprayed/zinc plated or galvanized
- h. Inspection of doors
- i. Ease of door operation, provision of latch for locking the door and sealing Gasket for door
- j. Light tightness of the shelter shall be observed

3.0 **Load tests**: These tests will be conducted at manufacturer’s site with doors installed & no cut outs made for any of the ECU’s, power inlets/outlets etc. I/O panel will be welded/riveted to shelter with out any cut outs.

3.1 **Load Test on Floor**: The purpose of the load test is to verify the resistance of floor (before implementation of false floor) under the effects of static load. With the shelter resting with its skid on a level surface the floor will be loaded with a total weight of 2200 kg distributed uniformly for 30 minutes. The shelter should not present any sign of deformation or de-lamination after removing the load.

3.2 **Load test on doors**

- a. The aim is to test the rigidity of the hinges and the doors panel
- b. Both the doors i.e. main door and emergency door of the shelter will be opened at 90 degrees and are loaded with 60 KG load at a distance of 700mm from hinge center line for 2 hours
- c. After the load is removed, there should not be any permanent deformation to the shelter’s doors or hinges and the doors shall open, close and seal properly
4.0 Resistance of roof to concentrated load

a. The purpose of this test is to verify the strength of the roof when subjected to concentrated loads.
b. A load of 150 KG is placed over a surface area of 1000 sq–cm at the center of the roof for two hours.
c. After the load is removed, there should not be any delamination or deformation of roof panel.

5.0 Driving Rain test

a. The purpose of this test is to verify the water tightness of the shelter when exposed to rain.
b. This test shall be conducted after ensuring that all the openings are sealed and without false roof.
c. The shelter is exposed to rain test condition as evolved. The water is sprayed at 1 KSC for a period of two hours. At the end of this period, the shower shall be stopped and the water on the shelter blown off by forced air and dried with cloth.
d. There shall not be any leakage of water into the equipment zone of the shelter through the panels, doors and edges etc.

6.0 Inspection of weight:
The bare shelter shall be weighed with a suitable weighing scale and weight be recorded

6.1 Skidding on Rollers

a. The aim of this test is to verify the resistance of shelter to skidding on rollers.
b. The shelter floor will be loaded with weight, equivalent to the designated load uniformly distributed. It is placed on two tube rollers resting on a level.
   The shelter is pushed longitudinally over a distance of 50 meters once each direction (i.e. total of 100 meters).
   At the end of test, the shelter shall not present any permanent deformation or delamination.

6.2 Skidding on the Ground

a. The shelter floor will be loaded with weights, equivalent to the designated load, uniformly distributed. It is then towed over a distance of 30 meters, once in each direction at a speed not exceeding 8 KMPH on uneven ground terrain.
   During this test at least two right angle turns shall be carried out. At the end of test, the shelter shall not present any permanent deformation or delamination.
6.3 Flat Drop test

a. The shelter floor will be loaded with weights, equivalent to the designated load, uniformly distributed. The shelter is lifted 450mm and allowed to fall freely on a prepared level surface. This test is performed only once.

b. The shelter is inspected for any damage. All repairable damages shall be allowed. The damages preventing operational use of the shelter shall be the criterion for rejection. The door shall operate without bending. In case of repairable damages, the test should be repeated after repairs.

6.4 Rotational Drop Test

a. The shelter floor will be loaded with weight, equivalent to the designated load, uniformly distributed. One edge of the shelter is lifted and placed on 100mm wooden block; the opposite edge of the shelter is raised by 250mm and allowed to fall freely on to a prepared level surface. The test is repeated for remaining three edges of the shelter.

b. The shelter is inspected for any damage. All repairable damages shall be allowed. The damages preventing operational use of the shelter shall be the criterion for rejection. The door shall operate without bending. In case of repairable damages, the test should be repeated after repairs.

6.5 Rigidity of Shelter supported on three points

a. The shelter is supported at three points situated on three of its square corners for duration of 30 minutes. After the test, the shelter shall not present any permanent deformation or de-lamination. The door shall function without bending.

7.0 Environmental Tests: The shelter shall withstand the following environmental conditions.

7.1 Vibration & shock: The test will be carried out in cross-country environment. The Road-ability tests will be carried out at VRDE, Ahmednager according standard procedures for wheeled vehicles. The shelter will be mounted on a standard vehicle for this purpose. The details of this test will be finalized during CDR.

(END OF SECTION)