

***Procurement Technical
specification of Driver's Cabin
(RHD) for BEML
High Mobility Vehicle 8x8***



BEML LTD

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(RHD) for BEML
High Mobility Vehicle 8x8***

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1. GENERAL DESCRIPTION:

There is a requirement of strengthened cabin for high mobility vehicle 8X8 vehicle to make a Mounted Gun System (MGS). The strengthened Cabin is to withstand blast pressure and temperature of exhaust gases from muzzle. The requirement of the cabin includes Right Hand Drive, Co-Driver and 4 crew members. The windshields used on the cabin must be blast proof to STANAG Level I standard. The Cabin structure is to be made out of tubular square and rectangle tubes to resist the blast pressure, dynamic loads. The Armored plates are welded over the structure to form a cabin.

The cabin has to accommodate:

- Driver, Co Driver and 4 nos. crew

Refer **Error! Reference source not found.** for installation dimensions.

To the front frame there is attached an all-metal armour four-door tilting cabin for driver and crew. In the cabin roof there is a tilting rectangular manhole. The cabin is locked in the driving position by a system of levers controlled from the LH side of the vehicle. The tipping of the cabin (after unlocking) is done with the help of a hydraulic cylinder and hand pump located on the LH side behind the driver's cabin. The driver and co-driver's seats are adjustable. Behind these two seats there are crew seats for four persons (2 nos either sides) and this seat is fitted with lap belts.

During the driving all crew including driver and Co driver must be tied with safety belts.

On the instrument panel, firmly connected to the cabin front wall, there are check instruments and elements serving for the vehicle control.

2. SCOPE OF WORK:

Development of Armored Driver's cabin for BEML High Mobility Vehicle 8x8, Installation, internal testing, Fabrication, Pre-treatment, CED dip paint & top coat, Furnishing of cabin aggregates with BEML supplied FIM & supplier sourced aggregates, Interior, ABS Trims blast testing & Factory Acceptance Test (FAT). Detailed scope of work is given in APPENDIX - E

3. CABIN STRUCTURE:

The cabin shall have all driving controls on right hand side, made from hollow structural steel with tubular cross section, drop down cab type with four doors and on front wind shield partitioned in the centre. Driver cabin should be equipped with Armored glass for the following places:

- a) Driver Cabin Front Windshield (LH and RH)
- b) Driver, Co Driver Door Fixed Window glasses (LH and RH)
- c) Crew Entry Door Fixed Window glasses (LH and RH)

Windows glass should be made up of armored glass. Technical requirements of armored glass is enclosed in Error! Reference source not found.

The detailed arrangement is as shown in Dwg No: **518 CA 02007**

Front structure, Side structure LH & RH & Roof structure of the cabin should be provided with provision for cladding the outer surface with armored steel sheets so as to withstand blast pressure upto **STANAG Level 1**. Vendor has to obtain confirmation from BEML finalizing the technical details of armored steel plates to be used on the cabin shell for cladding. Strengthened cabin to withstand blast pressure & Temperature of exhaust gases from Muzzle of BARREL. Protection against small arms tentatively as per STANAG Level-I to be provided. Cabin structure should be covered with armored sheet of 6 mm^{*1} (approx) on all surfaces (Front, rear, side wall, top, doors). Cabin floor structure and engine tunnel should be covered using Galvanized carbon steel with extra deep draw of cold rolled /hot rolled sheets of 3 mm thick.

¹ Armoured plate thickness is arrived based on the preliminary design & analysis. Thickness of plate will be mutually finalised during execution. However plate thickness will not be more than 6 mm.

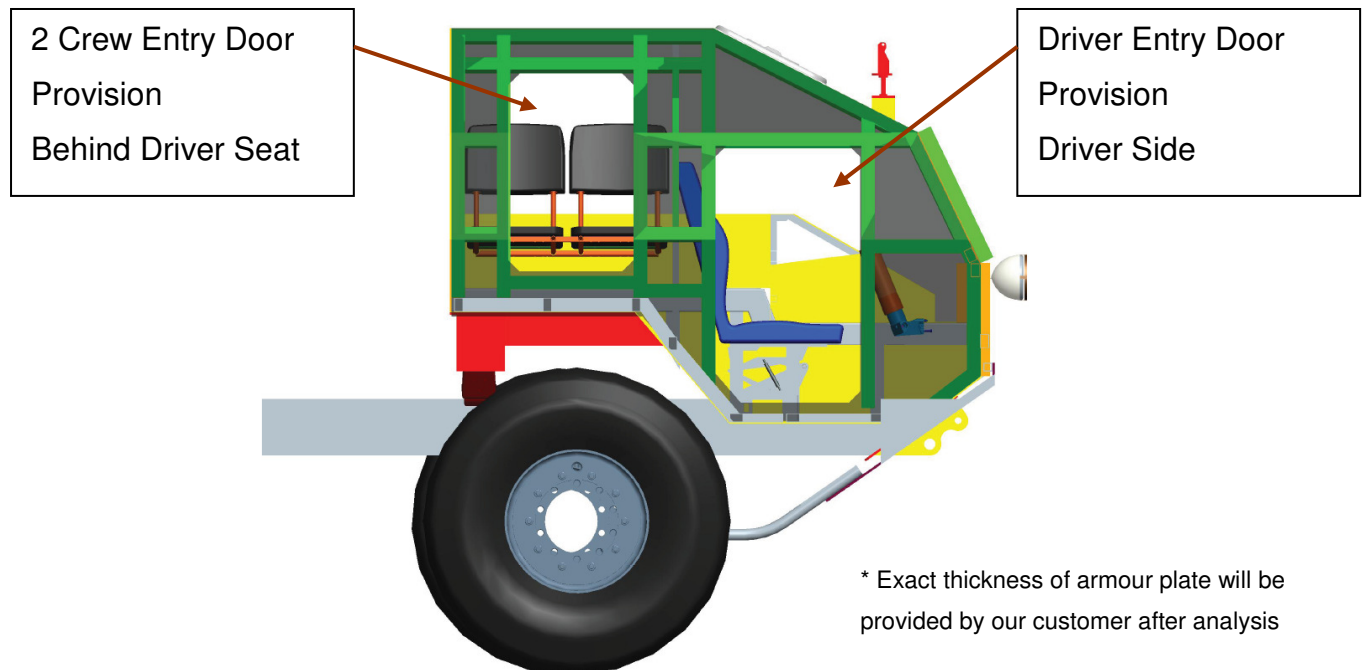


Figure 1 Side View of Cabin

Drivers Cabin should be provided with 4 doors for the entry and egress of following members

1. Driver
2. Co Driver
3. 2 Crew Entry LH side
4. 2 Crew Entry RH side

Each Door should be equipped with major items with following features

1. Fixed Armored glass,
2. Suitable door locking mechanism as per CMVR requirements
3. Handles on the door for Firm Holding
4. Hinges as per CMVR requirements
5. Pockets for storing water bottles (2 nos. 1 ltrs each)
6. Cigarette ash tray (1 no)
7. Suitable footstep for entry of crew
8. Suitable sealing on the door panel to prevent water ingress, dust ingress
9. Door Panels should be reinforced to withstand blast pressure as per STANAG 1
10. Door panels should be covered with armored steel plates with proper bolt on mounting provision.

11. Inner surface of the door to be provided with plastic ABS trims and suitable sound / vibration damping materials.

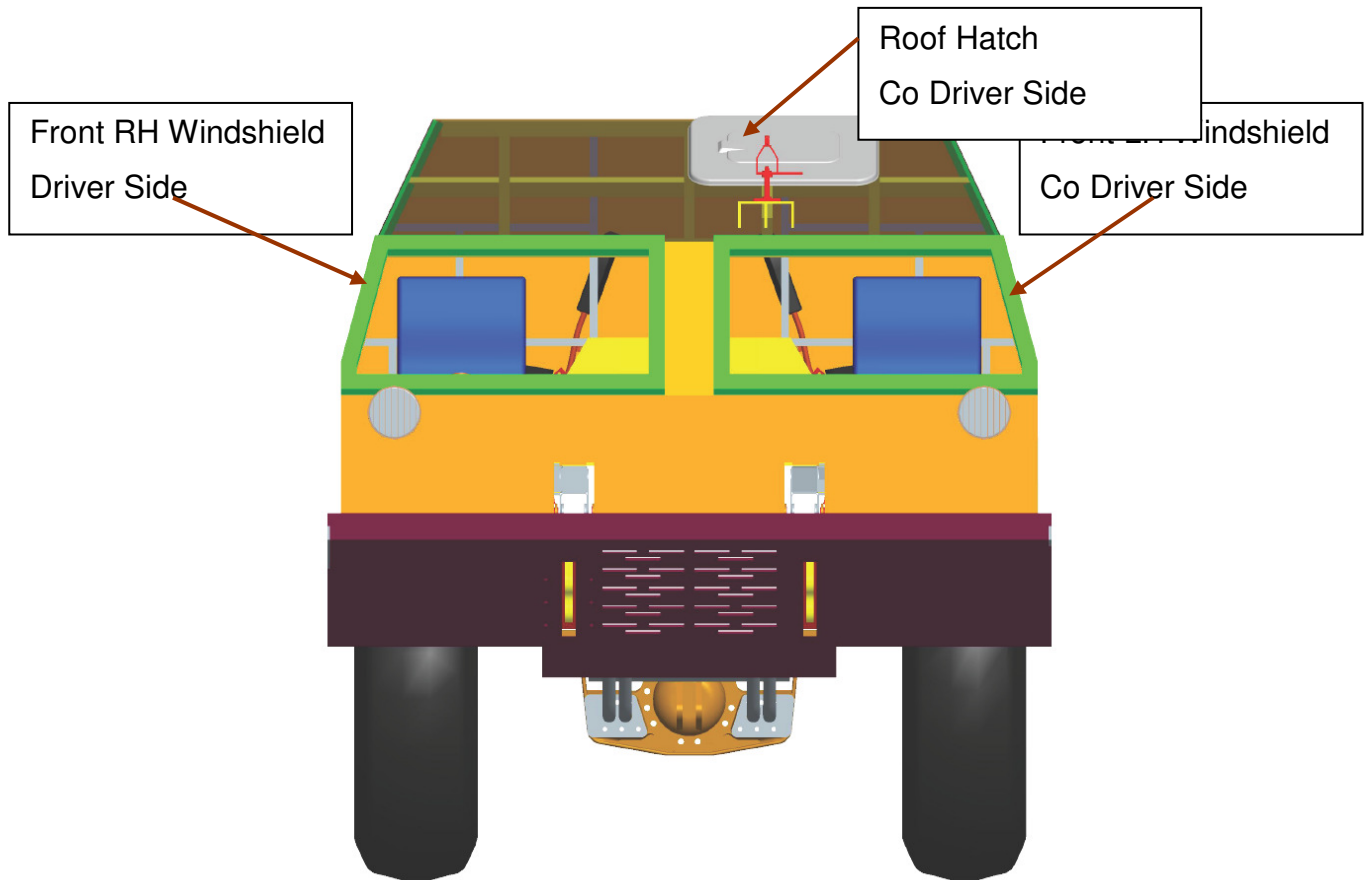


Figure 2 Front View of Cabin

The corner fastenings of the front glass are protected with strips against possible damage due to branches of trees. The cabin is sealed against entry of dust and water. There are two hinged screens on top of the front glass for screening against sunlight. There is a manhole in the roof which could be closed. The lid of the manhole is held against a spring stop in the open position and clamped by a bolt in the closed position.

4. CABIN MOUNTING:

1. Mounting of the swing cabin onto the frame is done using sleeves in the front and prismatic rubber at the rear. Clamping of the cabin in the running condition is done by a control mechanism from the left side.
2. The detailed front mounting as shown in Dwg No: 518 CA 02007

3. The cab lock release mechanism has to be of mechanical linkages arrangement (Tie-rod & Lever to secure the Cabin). Hydraulic system for tilting mechanism of the cabin and Cabin mountings with lock arrangement to be provided.
4. The detailed arrangement is as shown in Dwg No: 518 CA 02007
5. Mechanical stay will be provided in case of failure of Hydraulic system for tilting mechanism as shown in below figure.

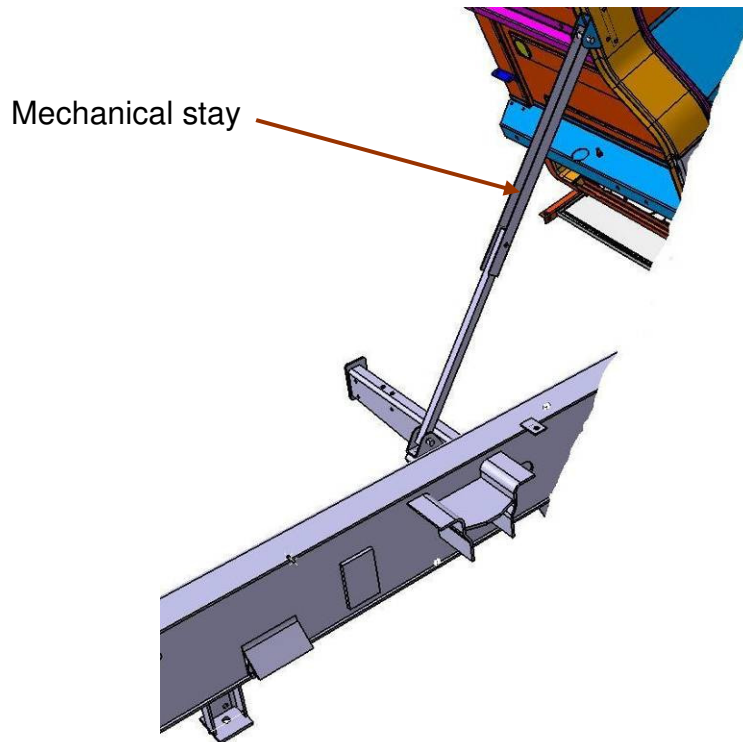


Fig 3: Mechanical Stay

5. CABIN INTERIORS:

- I. FRP Dash board - Supplier to manufacture FRP dash board with HVAC vents. Supplier to make the necessary cut-outs in FRP dash board to mount the accessories. Reference dashboard drawing is shown in Error! Reference source not found.. Supplier to make the dashboard to suit the cabin internal dimensions.



Figure 3 FRP Dash board

- II. Engine tunnel profile to be provided. Reference dwg of rear cutout for engine profile of regular cabin is shown in **Dwg No: 518 CA 02007**
- III. The tunnel bottom is to be covered with thermal insulation of 40 mm thick placed between external & internal panels.
- IV. The Gear Shift Lever (GSL) - (BEML Free issue item) is to be mounted on the engine tunnel ,dimensional details will be provided during detailed design stage.



Figure 4 Gear Shift Lever (GSL)

- V. High & low speed gear pre selector (BEML Free issue item) switch should be fitted on the dashboard suitable cut out and mounting arrangement to be provided by supplier.
- VI. The parking brake and controls (BEML Free issue item) for drive selection has to be placed on the tunnel (driver side) as shown in fig below: suitable cut out and mounting arrangement to be provided by supplier.



Figure 5 Parking brake and controls for drive selection

- VII. Individual switches (BEML Free issue item) have to be provided in dashboard for drive selection as shown in fig below. suitable cut out and mounting arrangement to be provided by supplier.

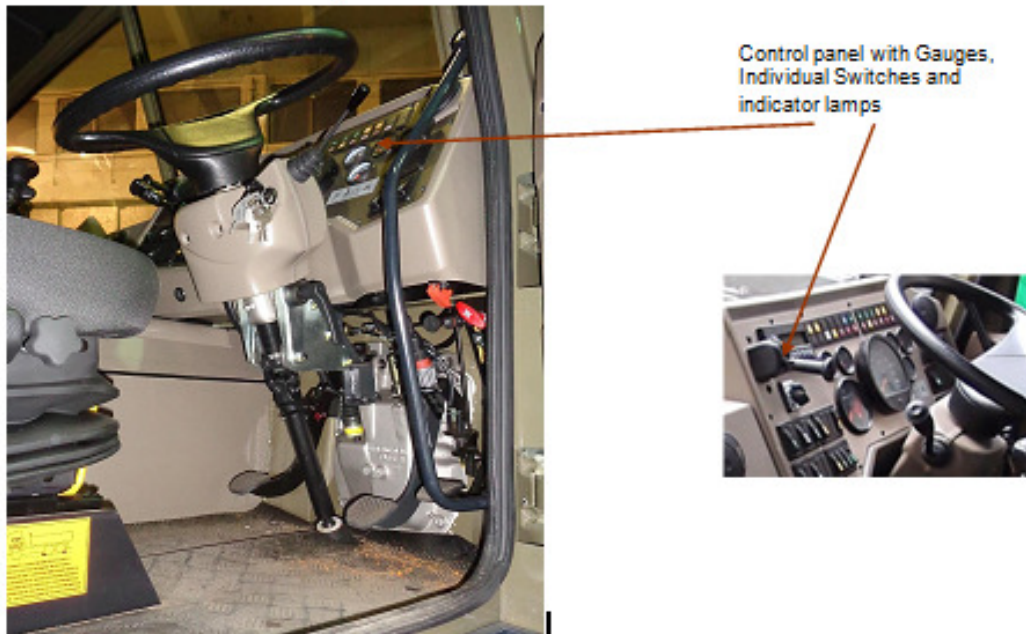


Figure 6 Dashboard with control panel

- VIII. HVAC system requirement : Reduce the temperature at least 15 deg from ambient temperature in summer. Heating arrangement to maintain temperature between 23°C to 27°C during winters. Supplier is requested provide CoC for HVAC systems.
- IX. Integrated pedal unit with pendantal type to be provided by supplier as per CMVR norms

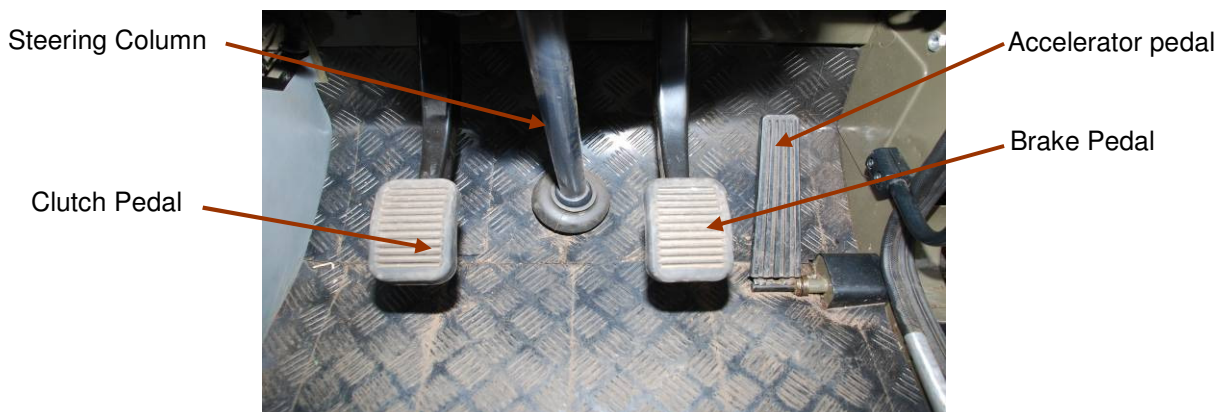


Figure 7 Controls of various systems

- X. A provision has to be made for diesel fired heater of 2 KW/24V system exhaust pipe mounted below floor panel on RH side.
- XI. Wind screen washer tank (5 liters capacity) shall be mounted on the LH side floor panel (near co-driver leg room).

- XII. Provision to be made for storing of first aid box, fire extinguisher bottle inside the cabin
- XIII. Engine compartment lamp shall be provided to facilitate servicing of engine.

5.1 FRONT COWL:

- I. Covering front bonnet cover with through cut for cooling air of engine.
- II. Mechanical linkage with release handle above accelerator pedal shall be provided for hood release mechanism.
- III. The systems & accessories mounted inside the front cowl are shown in pictures below:

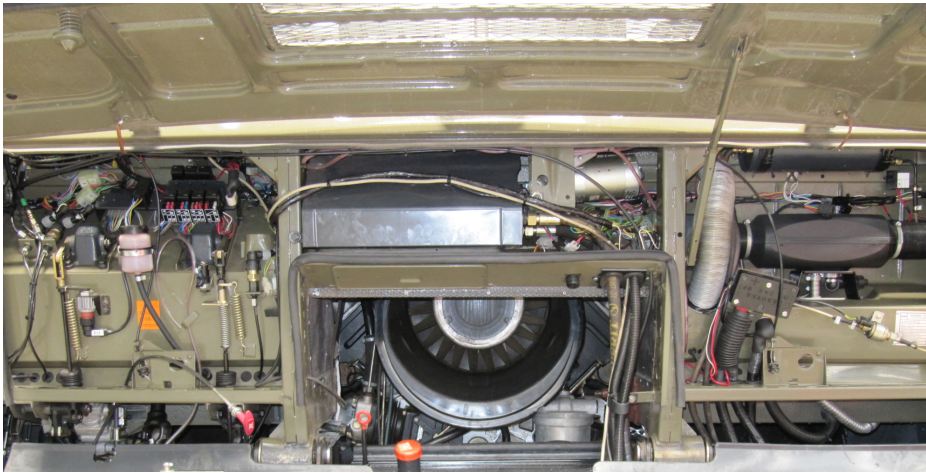


Figure 8 System & accessories mounted inside the front cowl

- IV. Oil heating equipment is placed on the right side under front cowl.
- V. Hinged front cowl to be provided with mechanical stay to facilitate working on the front mounted equipments

5.2 ROOF HATCH:

- I. The roof hatch has to be of rectangular in shape placed above co-driver seat as shown in fig below (shape can be finalized during detailed design)



Figure 9 Roof hatch

- II. Hard board trims with 6mm thick / ABS trims to be provided.
- III. Roof hatch to be provided with spring loaded pull type lock for closed condition.
- IV. Rubber & pressed panel to be provided for sealing during closed condition.
- V. A handle to be provided for roof hatch open & close operation.

5.3 DRIVER'S SEAT:

The driver's seat (BEML Free issue Material) as shown in fig. below, is of adjustable according to the driver's requirement and is adjustable in forward - Reverse, Top - Bottom directions. Driver's seat is capable of being adjusted in height (+/- 100 mm) as well as horizontally (+/- 100 mm) as per leg length of the driver. Supplier to provide suitable mounting provision in the cabin to assemble Driver & Co -driver seat.

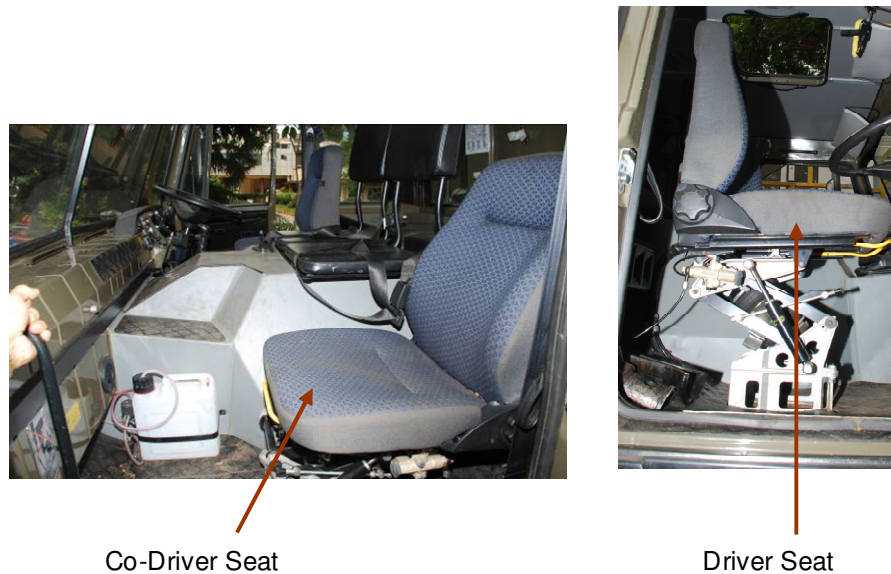


Figure 10 Driver & Co- Driver seat

5.4 CREW SEAT

Supplier to provide seats for 4 crew members (2no's of two seater crew seats), seats to have leather upholstery with safety belts. Layout of the seats are as shown below. The seats to be fitted over engine cover.

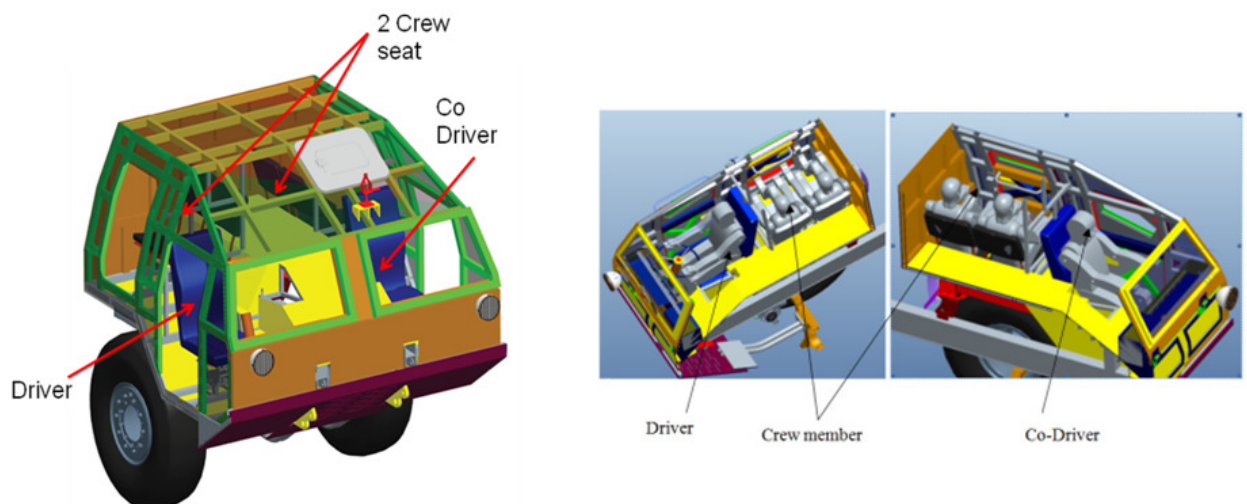


Figure 11 Crew seater layout

6. CABIN FITMENTS & ACCESSORIES:

6.1 LH/RH SIDE FITMENTS:

- I. Rigid type handles shall be provided on "A" & "B" pillars for ingress driver & crew members, meeting the CMVR requirements.
- II. A suitable insulation shall be added between outer skin & interior ABS trim.
- III. Interior lamps (BEML Free issue material) to be fitted above the door cut. Supplier to provide necessary mounting arrangements.-Ref **Error! Reference source not found.** for details

6.2 BULK HEAD & FRONT PANEL FITMENTS:

- I. Engine idle speed and engine shut off lever (BEML Free issue material) has to be fitted on the dashboard. Supplier to make suitable cutout & mounting arrangement
- II. The steering column assy (BEML Free issue material) to be fitted. Supplier to make suitable cutout & mounting arrangement.
- III. Necessary trim for steering column assy (BEML Free issue material) - Supplier to make suitable cutout & mounting arrangement.
- IV. The column is to be fitted with a steering wheel (BEML free issue material) of diameter 475 mm.
- V. Single Lever combination switches (BEML Free issue material)to be used as shown in fig below:



Figure 12 Steering Wheel and Single Lever combination switches

- VI. For fresh air control through louvers inside cabin mechanical linkages to be provided.
- VII. Four demister vents have to be provided.
- VIII. Two numbers of windshield wipers with two speed controls & linkages shall be provided to suit armour glass.
- IX. Two handles to be provided on cabin front end for windshield cleaning.
- X. Engine oil temperature dependent heater to be used (BEML Free issue material) - Mounting provision to be provided by supplier - For details ref **Error! Reference source not found.**

6.3 ROOF FITMENTS:

- I. A search light (BEML free issue material) has to be fitted on the roof of cabin which can be operated by the driver. Supplier to provide mounting provisions - For details refer **Error! Reference source not found.**
- II. Two beacon lamps (BEML free issue material) has to be fitted on the roof of cabin which can be operated by the driver. Supplier to provide mounting provisions with metal guards to be provided diagonally at RH front corner & LH rear corner
- III. Two handles are to be provided inside the cabin on the roof for use by the crew members seated on the emergency seat at middle.



Figure 13 Handle location inside the cabin roof

- IV. Two sun visors to be provided (with provision for rotating & folding)
- V. Roof trim fastening to be done using screw & washer for roof trim mtg.
- VI. Stopper (rubber & strip) to be provide to lock hatch during fully open condition.

6.4 OTHER FITMENTS:

- I. Box for documents and holders for extinguishing equipment, to be placed behind the seats of driver and co-passenger.



Figure 14 Box for documents

- II. Roof lighting (BEML Free issue material) to be placed on top of right door- For details Ref **Error! Reference source not found.**
- III. LH & RH direction indicators (BEML Free issue material), two on the sides and two on the front hinged cowl to be provided.
- IV. Control Unit with knobs (BEML Free issue material) for the operation of centralized tyre inflation system (CTIS) should be fitted on the panel to LH side of Driver, for the inflation/deflation of tyres from the driver cabin. Supplier to make suitable cutout & mounting arrangement
- V. Storage space for documents to be provided on the inner side of doors.
- VI. Adjustable rear view mirrors to be provided on both sides.
- VII. Control Unit with knobs (BEML free issue material) for the operation / engagement of Axle differential lock and Inter-axle Differential Lock to be provided on the panel to LH side of Driver. Supplier to make suitable cutout & mounting arrangement
- VIII. Exhaust Brake engagement lever (BEML Free issue material) should be fitted near the driver's seat. Supplier to make suitable cutout & mounting arrangement
- IX. Electric horn, Head lamp with leveller, side direction indicators, Wide angle & proximity mirror (BEML Free issue material) etc., should be provided to meet CMVR requirements. Supplier to make suitable cutout & mounting arrangement. For details refer **Error! Reference source not found.**

7. CABIN INSULATION:

The floor of the cabin is plain and made of steel plate with internal anti-vibration isolation, and rubber matting. External surface of the floor is also provided with anti-vibration coating. Holes for draining of any water that may enter are provided on the front part of the floor along with rubber plugs for closing the same.

Parts of the floor of the driver's cab form the cover for the engine. On the outer surface of the cover away from the engine thermal and sound insulation is stuck—on, in the front portion and is held in position by punched plate.

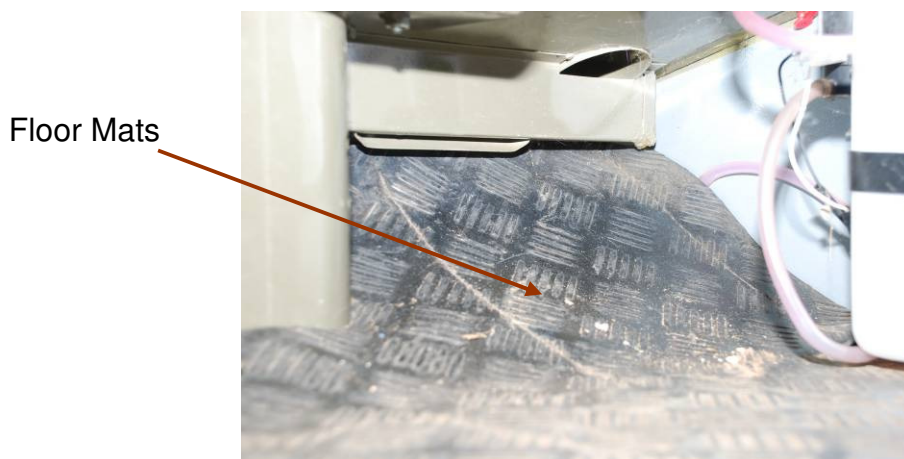


Fig 22: Floor Insulation

The floor mats are of 3 piece construction to be provided with 10 mm thick insulation. Rexin to be used with paste to fix the floor mat on the tunnel surface. Also, rubber sheets with anti skid surface have to be pasted in emergency seat leg room.

8. DIMENSIONS OF CABIN:

Main dimensions and weight for cabin are indicated below for ref.

Length	:	2371 mm
Width	:	2600 mm
Height	:	1746 mm
Weight	:	1850 \pm 3% kg

The dimensional details of cabin as shown in Dwg No: 518 CA 02007

I. ELECTRICAL AND ELECTRONIC SYSTEMS:

Details are enclosed in **Error! Reference source not found.**

II. PAINT DETAILS:

Pre treatment CED painting and top coat painting as per CSN 5450 KHAKI.

Colour Type: AKRYL LV EM 020 - SYMPO, Minimum thickness 55 microns.

Sharp edges to be removed by grinding.

III. SHOWER TEST:

Shower test for Cabin to be conducted as per IS: 11865-2006.

IV. PACKING & FORWARDING:

The cabin assy. shall be packed to withstand transit damages.

V. CAUTION ON STORAGE:

Cabins must be stored in covered areas or alternatively by tarpaulin covers on the product. In the storage area, there must not be any large storage of acids or other harmful materials which cause corrosion.

9. ACCEPTANCE CRITERIA:

The stage inspection & acceptance of Cabin assembly will be carried out in two stages as per mutually agreed ATP as indicated below:

1. Stage inspection: Cabin structure will be inspected as per the approved drawing. Welding checks and DPT Test report to be submitted.
2. BEML team will participate and witness the Factory Acceptance Test (FAT) at Supplier premises, before dispatch
3. One spare vehicle cabin (with seats, accessories etc) with mounting fixtures to be will be tested for blast pressure at TBRL, Chandigarh/ PXE, Balasore or any other suitable agency (mutually discussed).
4. Cabin will be integrated on 8x8 truck chassis at BEML premises. The inspection checks & performance evaluation by road trials will be carried out by BEML quality reps.
5. Integration of Cabin will be carried out at BEML premises. Vendor has to provide technical support at the time of cabin installation on the vehicle.

6. Developed Armored Cabin will be checked jointly by BEML Team and customer as per Provisional Acceptance Test Plan Doc No. BEML/GAT/RD/A-CAB/ATP/001, dt: 05.10.2020. During inspection if any failure occurs, vendor should carry out Modifications to address the failure and meet the technical requirements.

9.1 WARRANTY:

The supplier shall be responsible for any defect or failure of components of cabin due to defective design, material or workmanship for a period of 24 months from the date of acceptance of the cabin.

The repair and/or replacement of failed components and equipment and installation of repaired/replaced components/equipment shall be taken by the supplier on his own charge at the Site.

The supplier shall bear custom duty, freight charges and all other expenses involved in collection of defective components and equipment from the Site, and transportation to the manufacturer's works in India and its return to site after repairs.

Further, should any design modification be required to any components or equipment as a consequence of failure analysis, the period of 24 months shall recommence from the date when the modified part is commissioned into service and modification shall be carried out free of charge.

The supplier shall carry out all replacement and repairs under the warranty promptly and satisfactorily on notification of the defect by BEML.

9.2 SERVICES:

1. Associate with BEML during Integration, Testing and Commissioning of the cabin assembly on BEML High Mobility Truck 8x8 at BEML premises.
2. Associate with BEML during the blast testing at TBRL Chandigarh / PXE Balasore or any other inspection agency mutually agreed.

10. SCOPE OF SUPPLY:

1. On receipt of PO, Supplier has to acknowledge and come out with an action plan for execution of the work involved with timeline.
2. BEML will provide conceptual design of Cabin structure in 3D model format in neutral format (STEP or IGES) with GA drawing in AUTOCAD / PDF format upon placement of order.
3. Development & Supply of fully furnished cabins with BEML supplied FIM and supplier sourced accessories.
4. Supplier has to provide work status report covering the development aspects, manufacturing activities on monthly basis
5. Firm has to execute detailed design (finalizing design of front structure, rear structure, side structure, front structure, cabin floor structure, roof structure) based on the conceptual model in 3D CAD in neutral format provided by BEML.
 - i. At the end of the design, Firm has to provide finalized.
 1. General arrangement drawings with details of Cabin structure
 2. Details of Armored steel to be used on the Cabin structure
 3. Details of following aggregates -
 - a. HVAC and its controls, routings
 - b. Interior Trims (ABS)
 - c. Roof Hatch
 - d. Armored Glass (Type, Contour)
 - e. Seats with 3 point seat belt - Crew Seat
 - ii) BEML will review the drawings and provide feedbacks & clearance for manufacturing.
 - iii) One no. Armored Cabin (with interior seating, accessories etc) will be installed on BEML HMV 8x8 vehicle. Functionality will be demonstrated.
 - iv) One spare vehicle cabin (with Glasses, accessories etc) with mounting fixtures to be supplied for testing purpose. The cabin will be tested for blast pressure at TBRL, Chandigarh/ PXE, Balasore or any other suitable agency (mutually discussed). BEML will help Vendor to obtain the slot for testing. Blast Pressure Testing will be witnessed by BEML & Customer Reps. Testing, Transportation,

consumables charges should be borne by Vendor. Test report should be submitted.

- iv) Since it is a developmental project being executed for one of the DRDO lab, supplier should be flexible to incorporate any minor modifications changes suggested by BEML or end user.
- v) BEML is working to improve the aesthetics of cabin without affecting the functionality. Some of the conceptual images are provided in Annexure C ,supplier should be flexible to incorporate such minor modifications for the improvement of aesthetics.

11. PROJECT SCHEDULE:

The delivery of two cabins should complete within **Four** months from the date of release of PO:The activities to be completed in three phases as given below.

	Details of activities	Duration
Phase 1	<p>Design stage</p> <ul style="list-style-type: none">• Completion of Manufacturing drawings and vetting with BEML• Procurement details of accessories and submission to BEML for approval	1 Month
Phase 2	<p>Fabrication stage</p> <ul style="list-style-type: none">• Assembly of frame structure• Cladding of armored material	Two Months
	Integration , Inspection & testing	1 Month

Phase 3	stage	
	<ul style="list-style-type: none">• ²Integration of accessories (BEML supplied FIM & supplier sourced) in the cabin.• Testing of Spare Cabin for blast pressure at TBRL Chandigarh /PXE Balasore• Supplier has to carry out any minor modifications (additional strengthening) in the main cabin after analyzing the structural performance of spare cabin.• Factory acceptance test & delivery.	

12. PROJECT DELIVERABLES FROM SUPPLIER:

1. Fully furnished cabin assemblies, qty as indicated in the SO.
2. Fixture for mounting the cabin during blast test.
3. Inspection & testing report of cabin.
4. Armour material certificate from TBRL or similar agencies
5. Armored glass certificate.
6. COC for HVAC and heat load calculations.
7. Reports of the Factory Acceptance Test (FAT) and check sheets to be provided along with the supply.

² All accessories except HVAC items & external lighting to be fitted in the spare cabin for blast pressure testing.

8. Material Certification and Staff Qualification documents for fabricated items to be provided along with the supply.
9. One set of soft copy and hard copy of all above documents to be provided.

SI No.	BEML P/N	Description	Qty
1	518 CA 02007	Assy Armored Driver Cabin for BEML HMV 8x8	2 (One for fitting on the vehicle & as spare for testing)

APPENDIX - A

TECHNICAL INFORMATIVE DATA ON BEML HIGH MOBILITY VEHICLE 8X8

a. Cabin Dimensional Data:

1. Main dimensions and weight for Cabin:

- a. Length - 2371 mm
- b. Width - 2600 mm
- c. Height - 1746 mm
- d. Weight of outfitted cabin - 1850 kg $\pm 3\%$

2. Overall dimensions with Cabin mounted on Chassis:

- a. Overall Width : 2700 mm
- b. Overall Height : 2800 mm

(Over cabin hatch)

b. Cross section & thickness :

Tubular structure Cross section = **40X60X3** mm

Weight of Box Channel = **600** Kg (Approx)

Thickness of Roof plate, front, sides and rear plate thickness ,doors = ³**6** mm (armoured material to give protection of STANAG Level -1)

Weight (inclusive of Roof ,front,side,rear & doors) = **800** Kg (Approx)

Floor & cover plate thickness = **3 mm** MS sheet.

Weight of Floor & cover plate = **600** Kg.

c. Technical data on Bulbs & Fuses of Electrical system:

Details enclosed in **Error! Reference source not found.**

³ Thickness of armoured material is arrived based on preliminary design ,exact thickness & material grade will be mutually decided during the detailed design stage. However the plate thickness will not be more than 6 mm.

APPENDIX - B

Technical Requirements of Armored Glass

1. Driver cabin should be equipped with Armored glass for the following places:
 - a) Driver Cabin Front Split Windshield (LH and RH)
 - b) Driver, Co Driver Door Fixed Window glass - single piece
 - c) Crew Entry Door Fixed Window glass
2. Before finalization of glass requirements vendor has to take drawing approval from BEML.
 - a. The blast resistant glass shall meet clause D3 with DIN standard 52290 PART 3 / equivalent IS.14443.1997. meeting STANG Level 1
 - b. The approx. overall size are
 - front windshield glass - 1180 x 565 x 35 thk (mm) (2 no's)
 - Driver & crew driver door - 540 X 310 X 35 thk (mm) 2 no's
 - Crew driver door - 525 X 250 X 35 thk (mm) 2 no's
 - c. The safety glass as per IS:2553 PART 2
 - d. Edge grinding as per SAE J6738 TYPE 4
 - e. Test reports as per above glass standard
3. Proper sealant to be used to fix the glass to frame ensuring water leak proof & vibration resistant.
4. The detail specification of the sealant TERSON PU 8590 UHV-MT,
 - a. Colour - black
 - b. Density - 1.27 g/cm³
 - c. Shore hardness - approx. 60
 - d. Tensile strength - approx. 7 MPa
 - e. Elongation at break - approx. 350%
 - f. Shear modulus g₁₀ - approx. 1.5 MPa
 - g. Shear strength - approx. 5 mpa
 - h. Recommended application temperature : 15° C to 50° C

APPENDIX - C

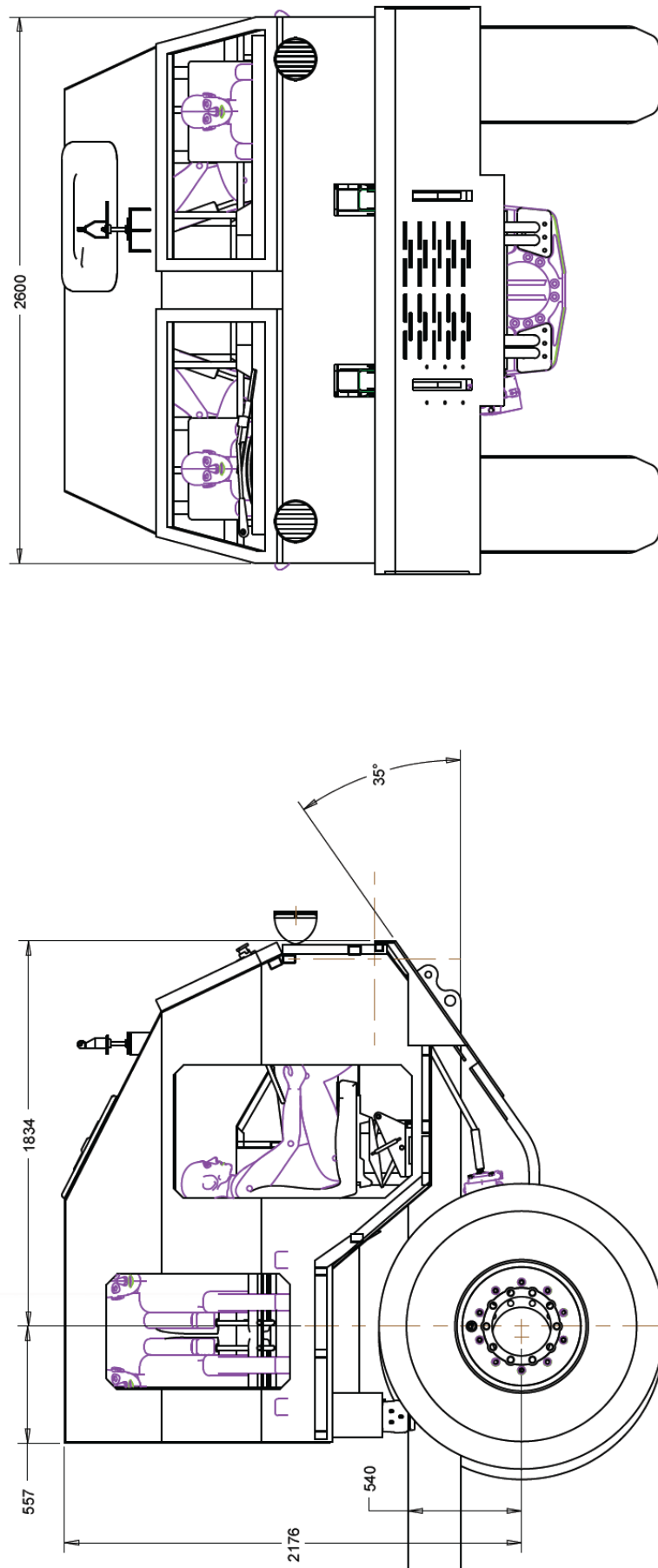
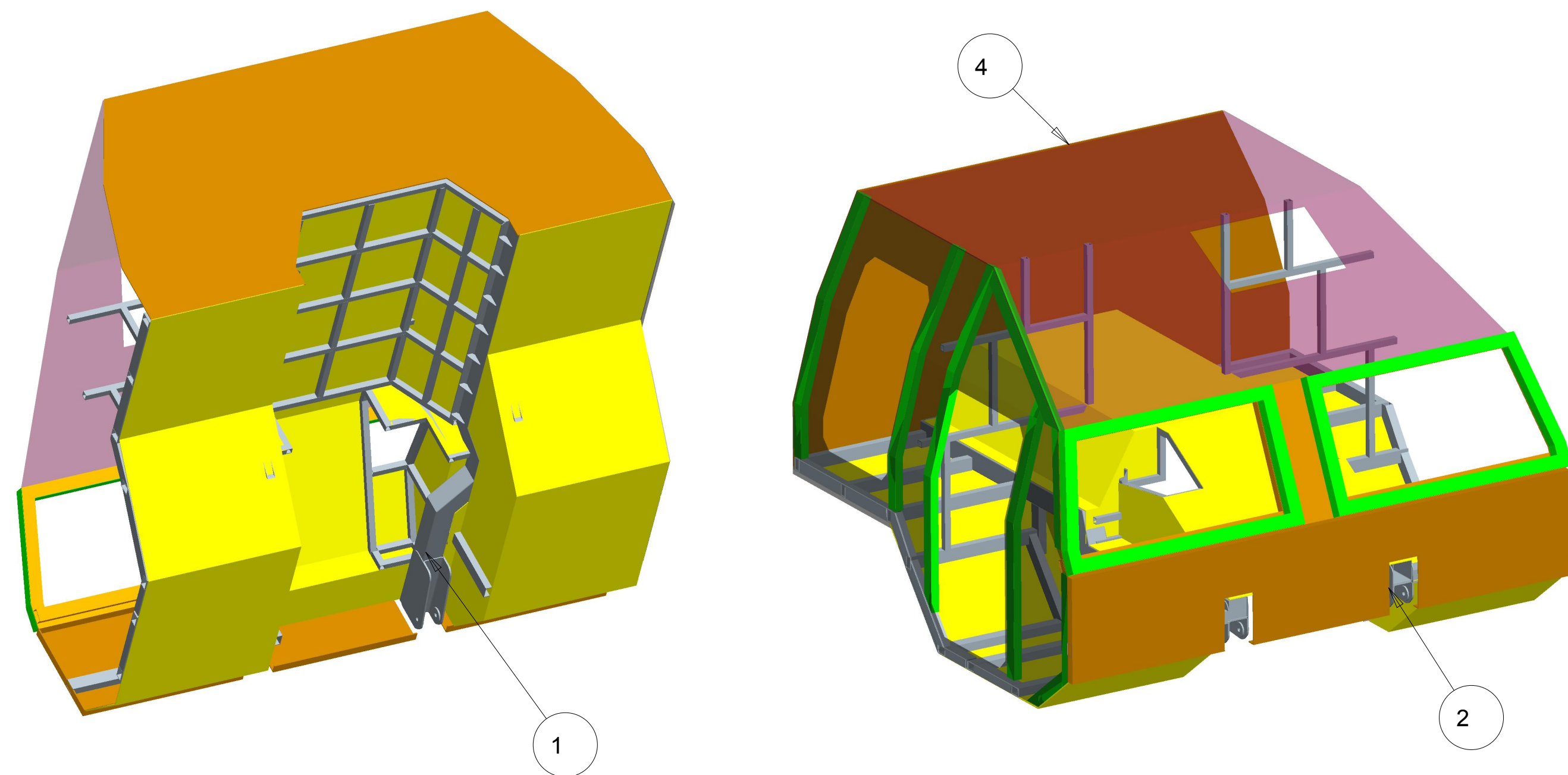
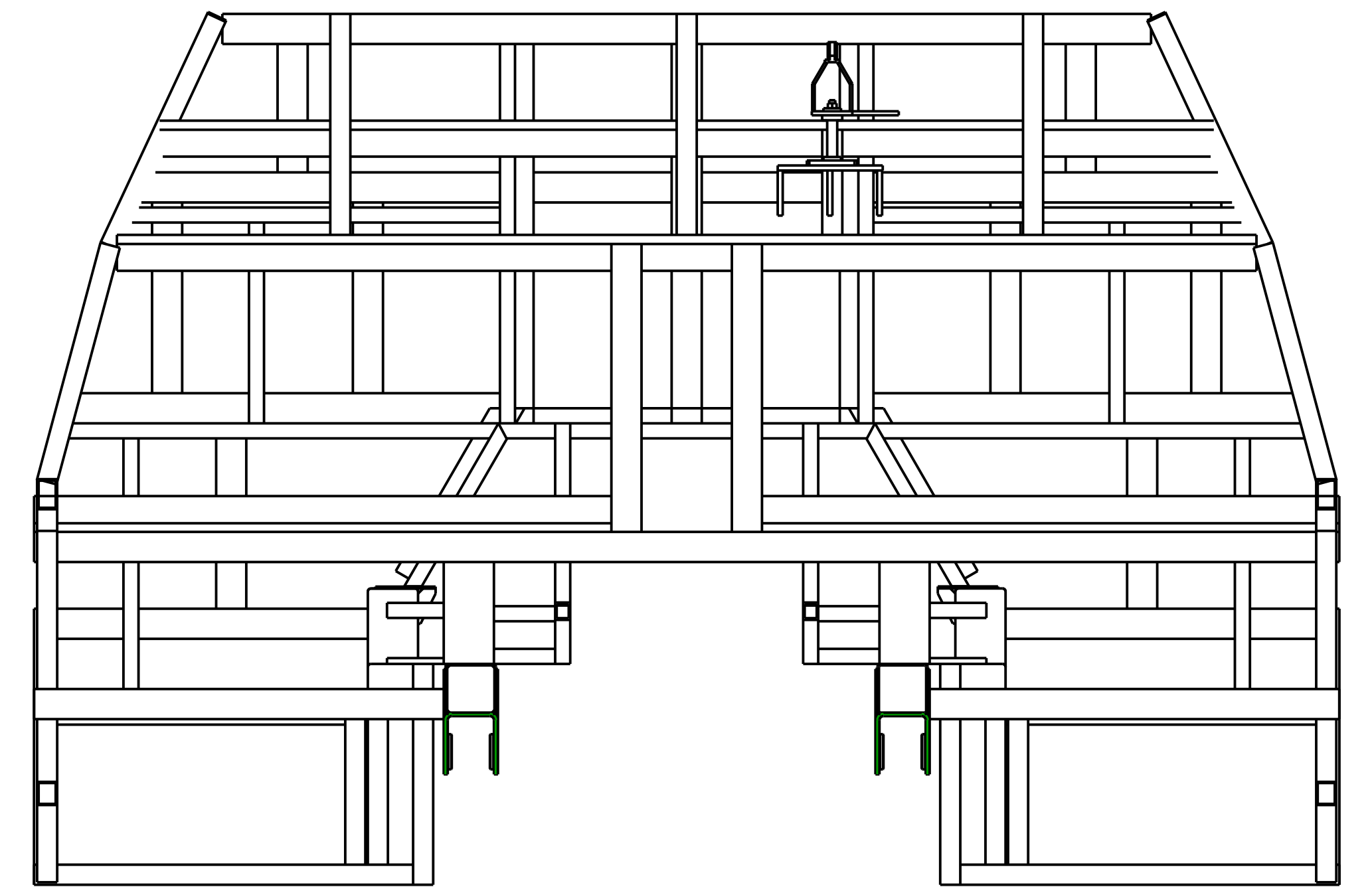
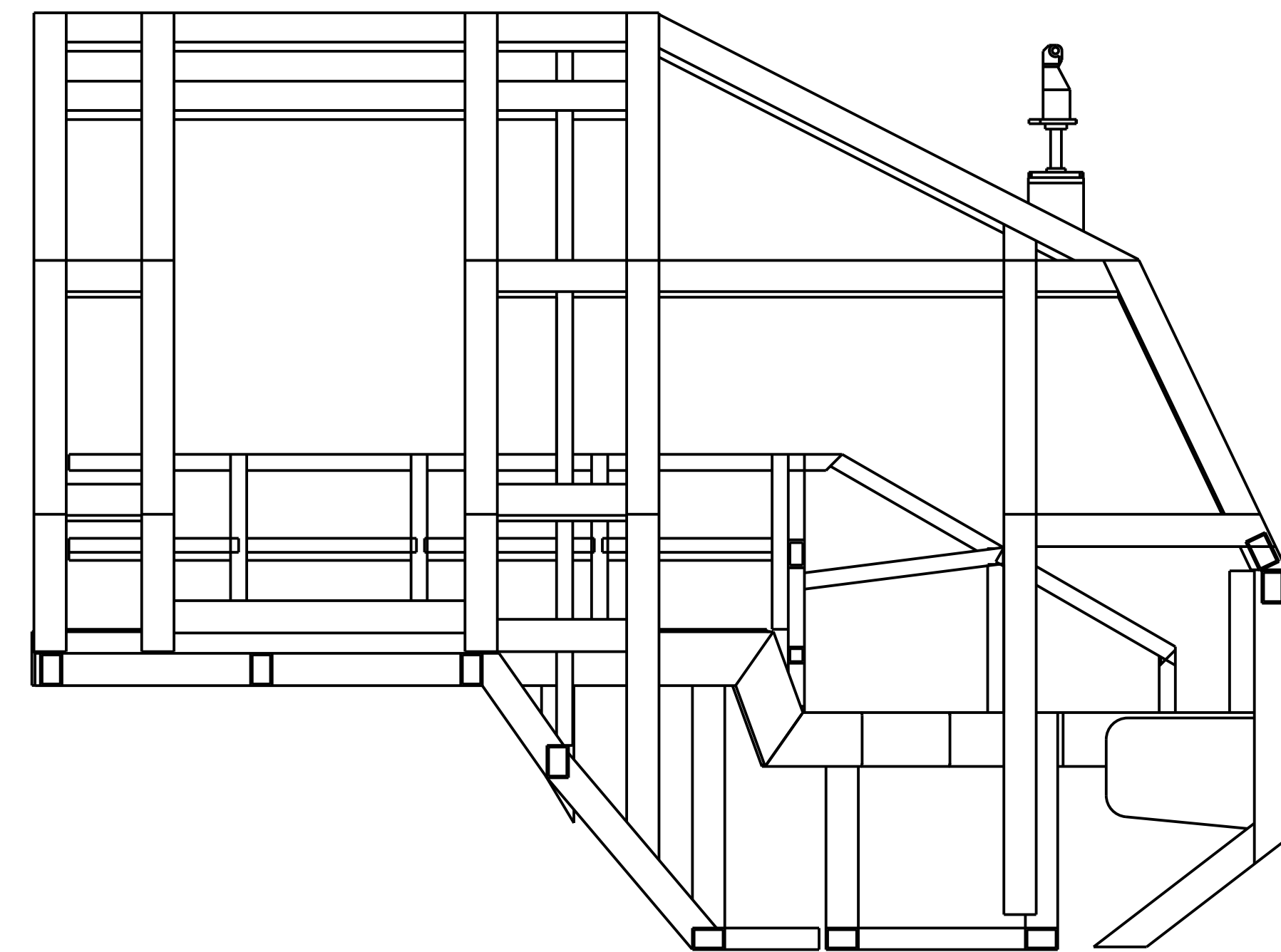
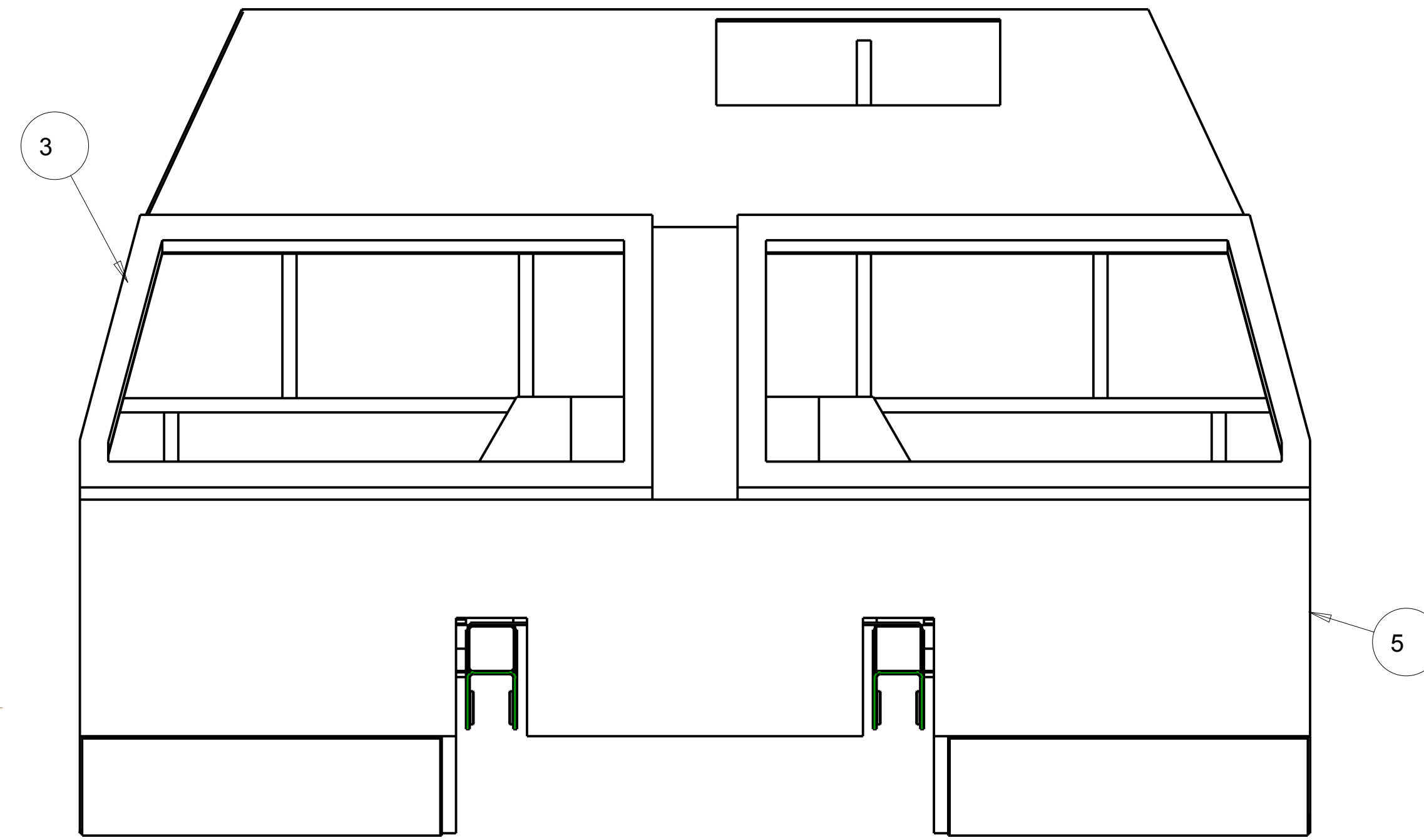
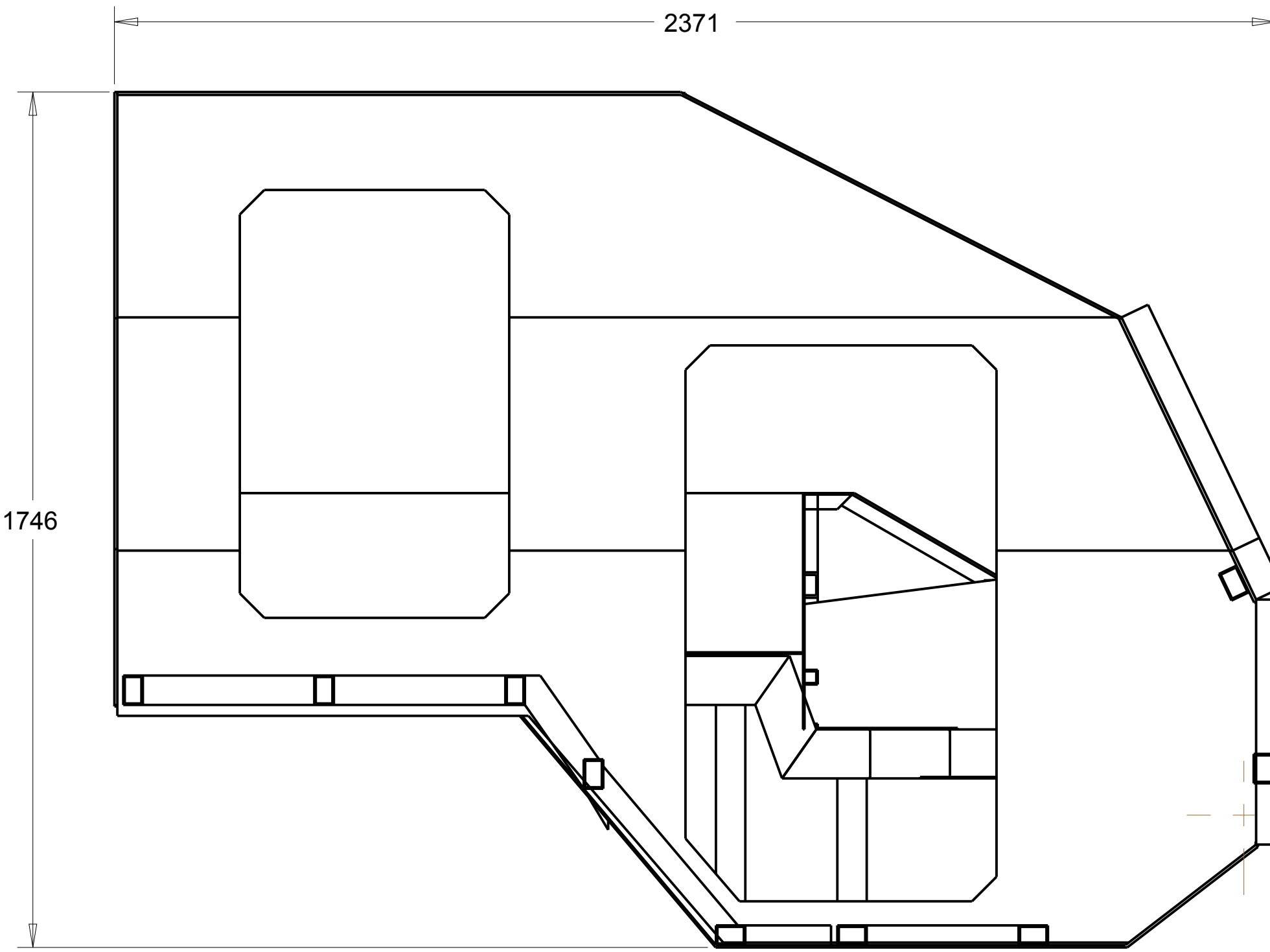
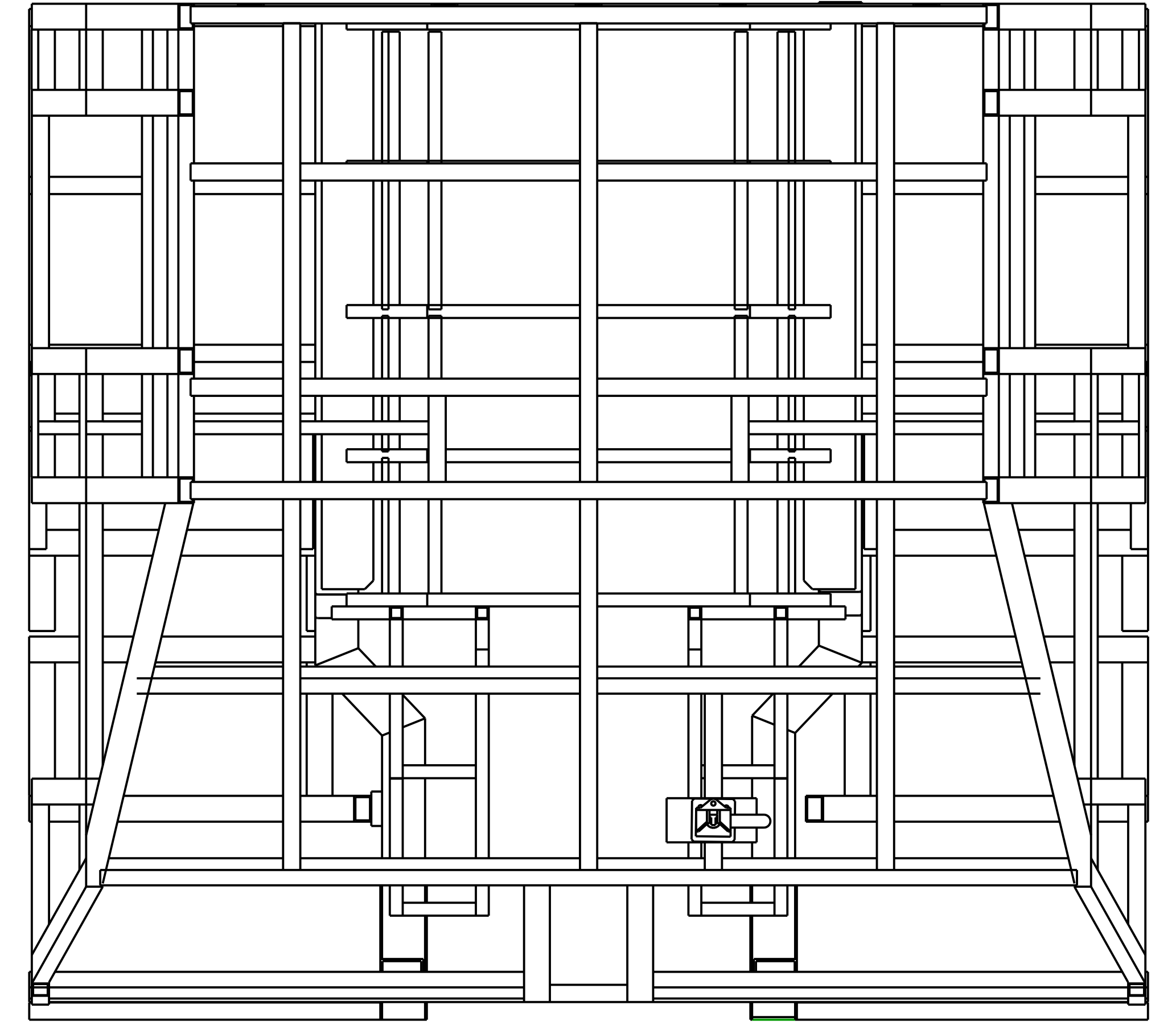
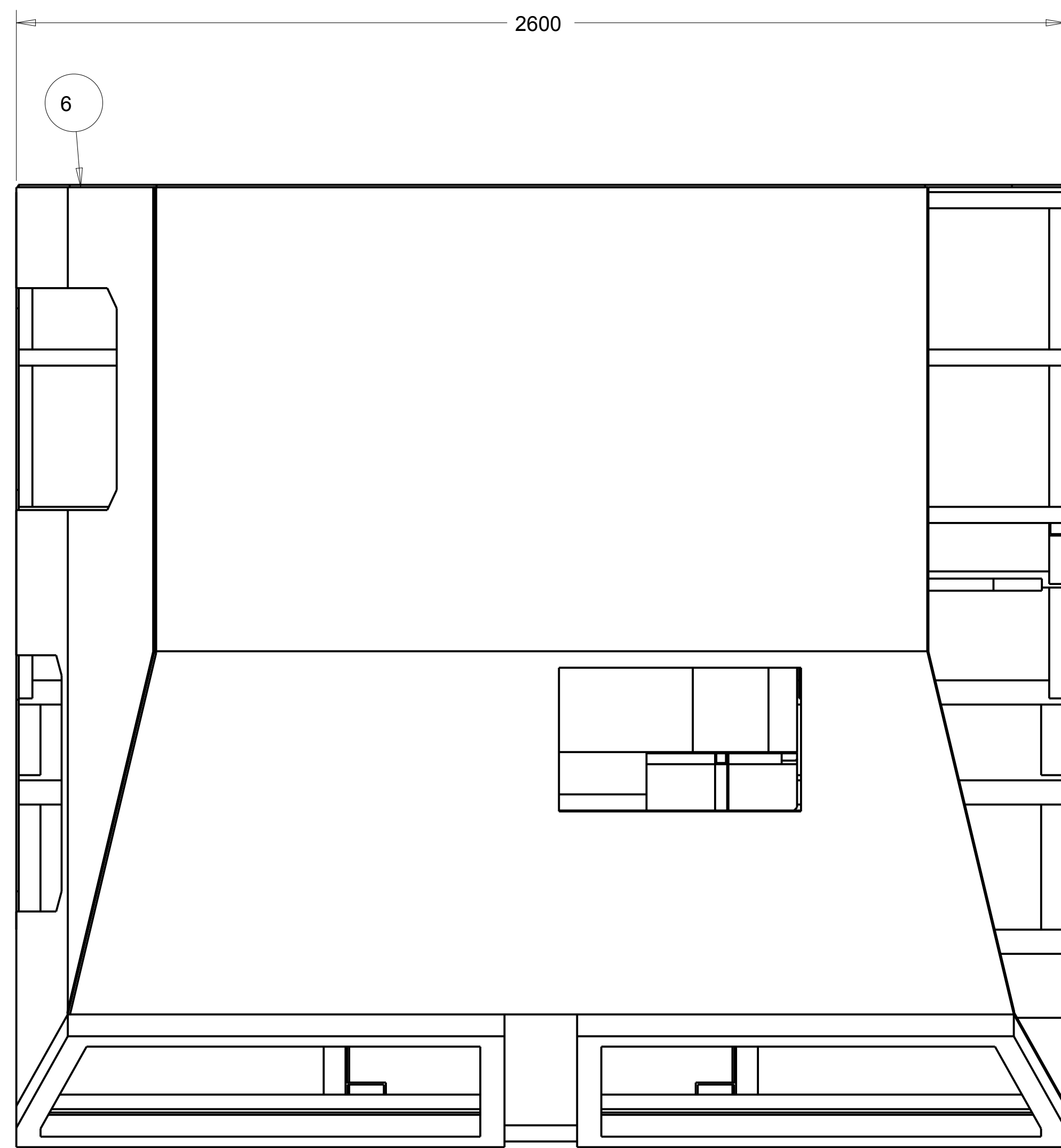
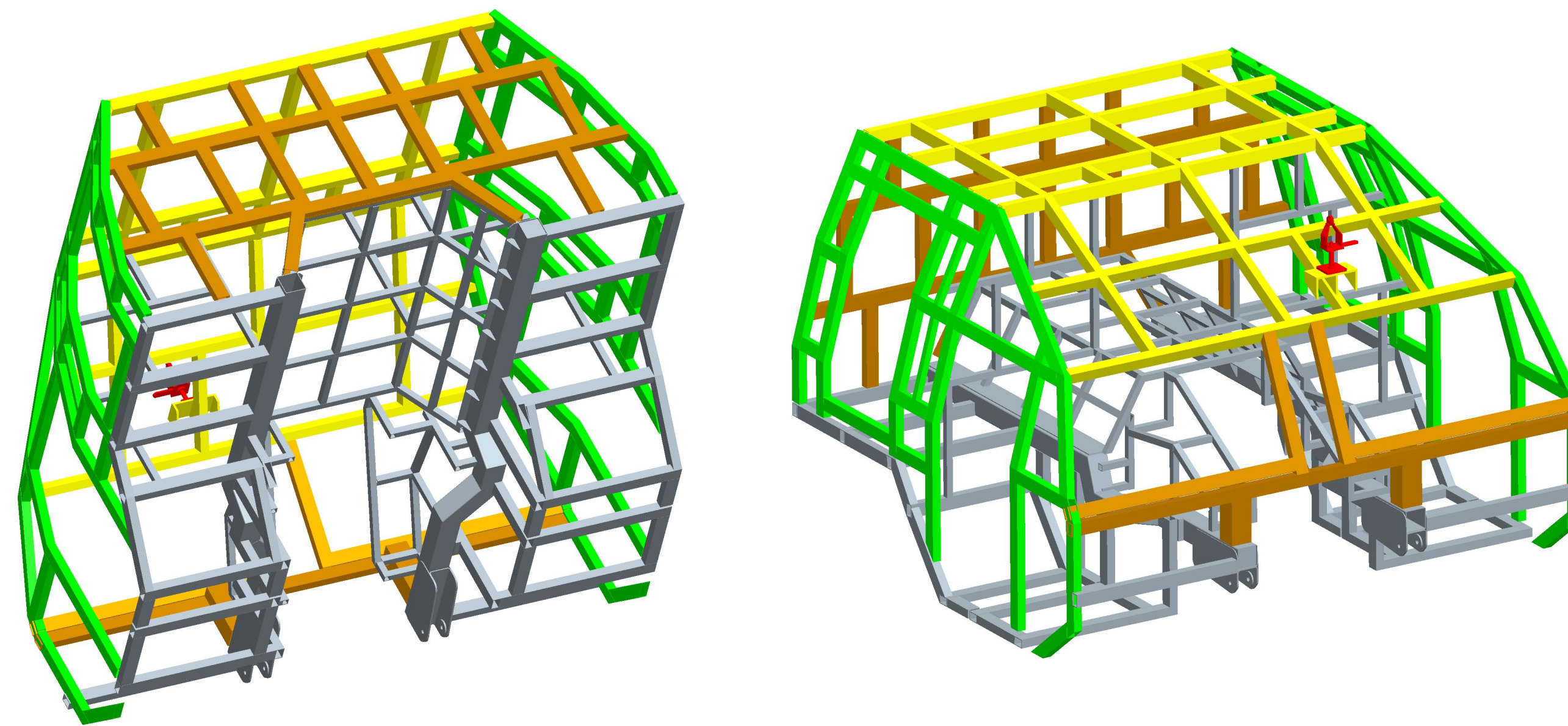


Fig:37 General Arrangement of Armored Cabin on the BEML High Mobility Vehicle 8x8


3			2								1	
			MACHINING DEVIATIONS FOR LINEAR DIMENSIONS								THE REST	
			ABOVE M.C. LOGGING	6	30	120	315	1000	2000	4000		
STATUS OF THE DESIGN			VALUE	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3	



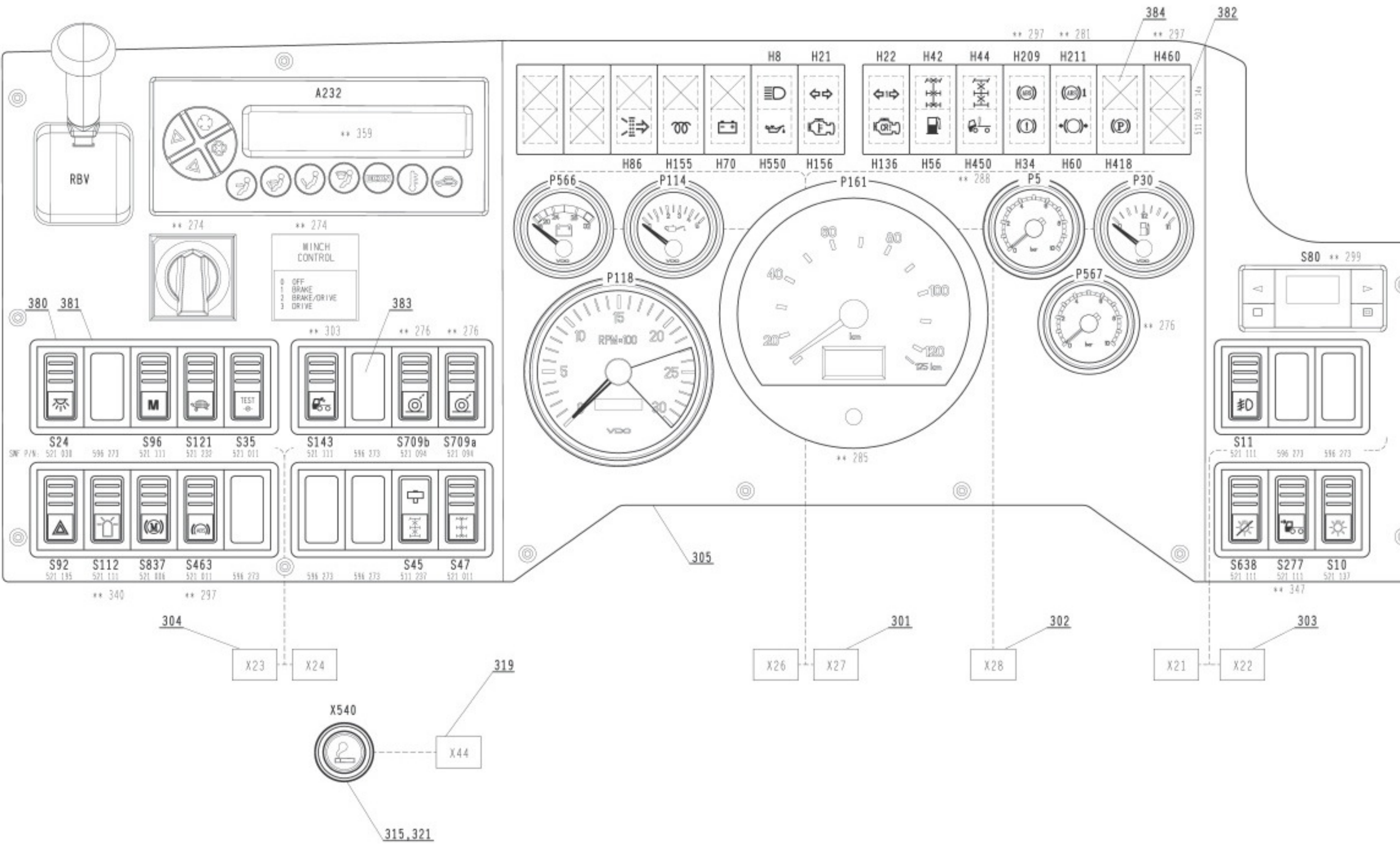
ASSY CABIN WITH STRUCTURE AND CLADDING

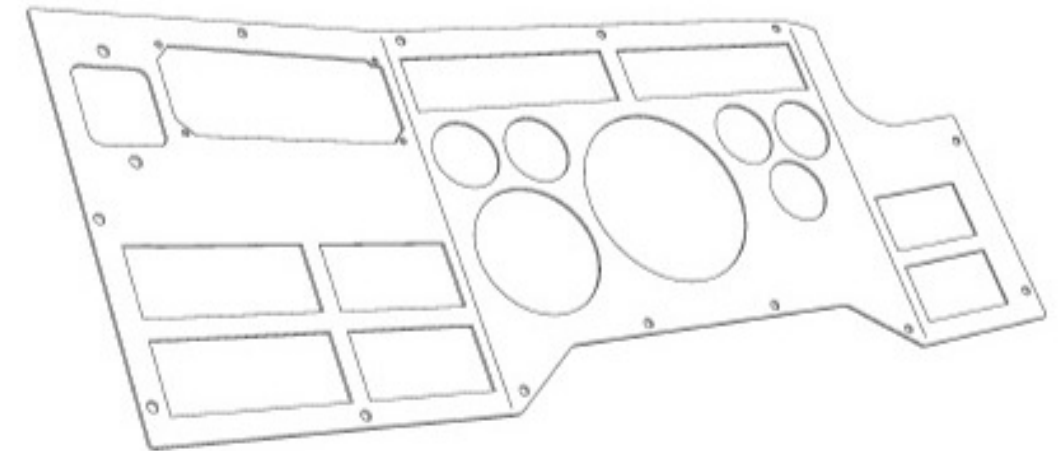
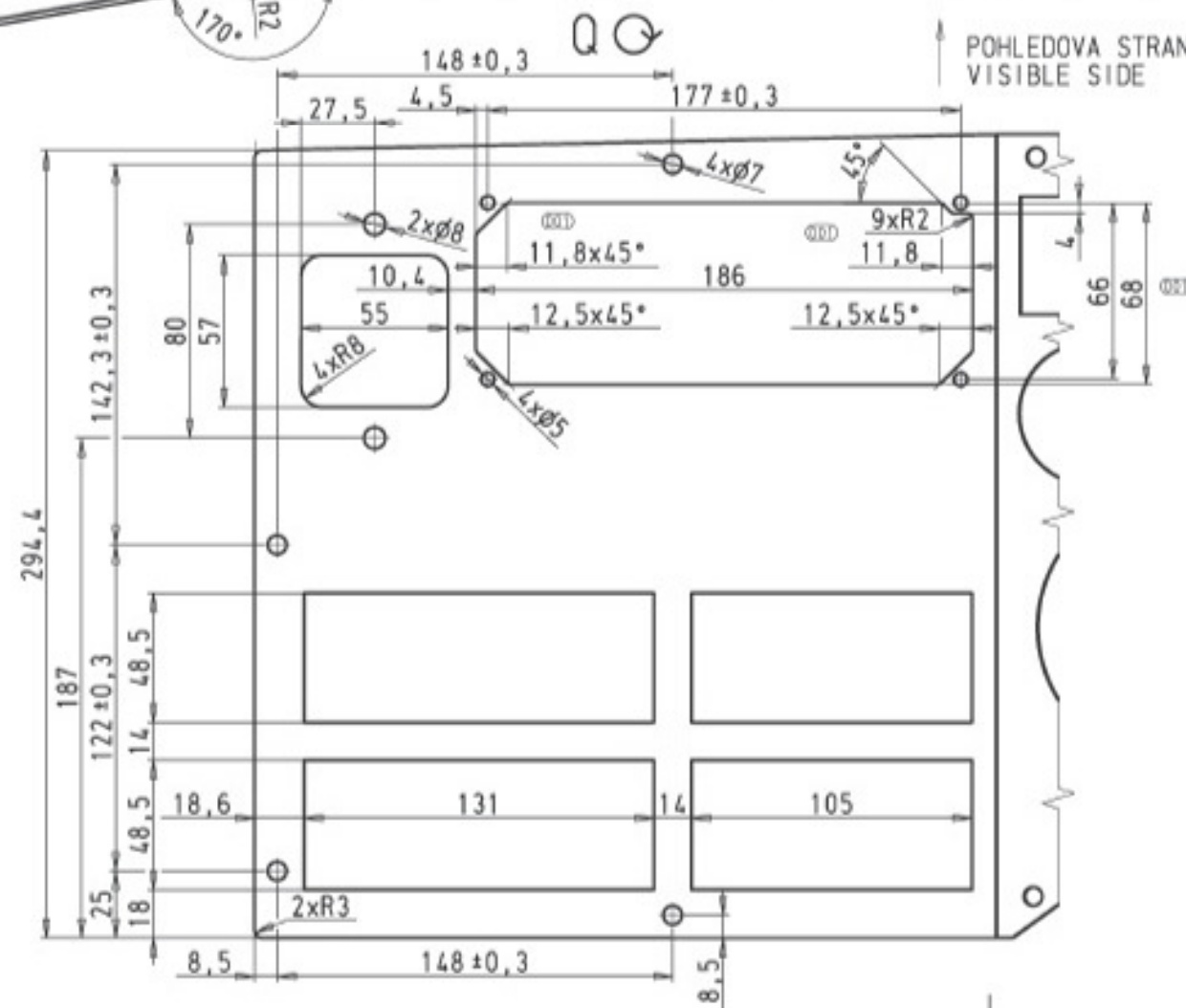
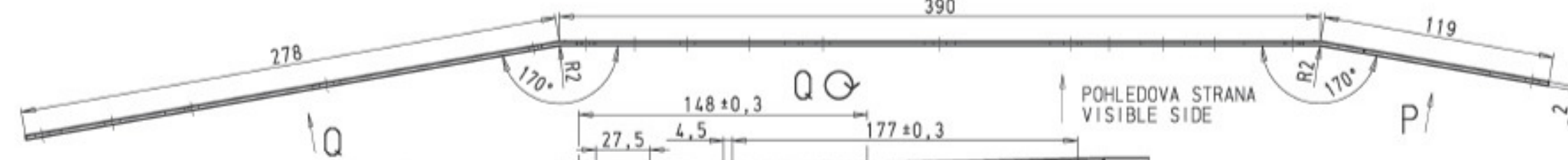


ASSY CABIN STRUCTURE

6	ASB SIDE STRUCTURE WITH CLADDING (H)	1			145,000		
5	ASB SIDE STRUCTURE WITH CLADDING (LH)				145,000		
4	ASB ROOF STRUCTURE WITH CLADDING	1			268,000		
3	ASB REAR WALL STRUCTURE	1			165,000		
2	ASB FRONT STRUCTURE WITH CLADDING				165,000		
1	ASB BOTTOM STRUCTURE WITH CLADDING	1			450,000		
SL NO	DRG/STD NO	DESCRIPTION	QTY	MATERIAL	SPECIFICATION	TOTAL WT IN Kg	LOC
		PRODUCED			DESIGN REF.		
APPROVED DRIVER CABIN - BENIL HIGH MATERIAL VEHICLE 818							
		NEXT ASSY NO:	USED ON:	QTY:	MATL:		
		518 MD 01004	ATAGS MGS	1			
				H.T.			
				S.T.			
					WT IN KG	SCALE	
					500,000	0.026	
AMENDNO.		TITLE				SHEET NO.	
DRAWSN NO: APPROVED		NAME:	DATE:	GENERAL ARRANGEMENT OF CABIN STRUCTURE			NO. OF SHEETS
REVIEWED:		BY:	DATE:	THIS DRG. IS GENERATED BY: JAGADEESH			
CHECKED:		JAGADEESH	14.04.2020	PERENCE: JAGADEESH			
DRAWN:		RASH	14.04.2020	NOT QUALIFIED			
					BEML LIMITED		DRG. NO. 518 CA 02007
				2			1

THIS DRAWING IS PROVISIONAL





Conceptual Images - Aesthetic improvement of cabin



APPENDIX - D

1. ELECTRICAL AND ELECTRONICS SYSTEM:

1.1 INTRODUCTION:

The electrical system in BEML High Mobility Vehicle is a single wire 24 V chassis return path is used. The power source is two accumulator batteries 12V, 200 Ah @ 20hr rate connected in series with the negative terminal connected to vehicle ground. They are located in special case on the RH side of chassis frame behind the driver's cabin and are equipped with circuit breaker. The batteries are charged by a 28 volts 120 A generator driven by the Main Engine.

The vehicle engine is equipped with starter motor. All consumers are protected by fuses located in the fuse boxes on the RH upper part of the instrumentation panel.

1.2 Instrument Panel

The instrument panel shown below is in full outfit including all instruments, controllers, switches and indicator lamps.

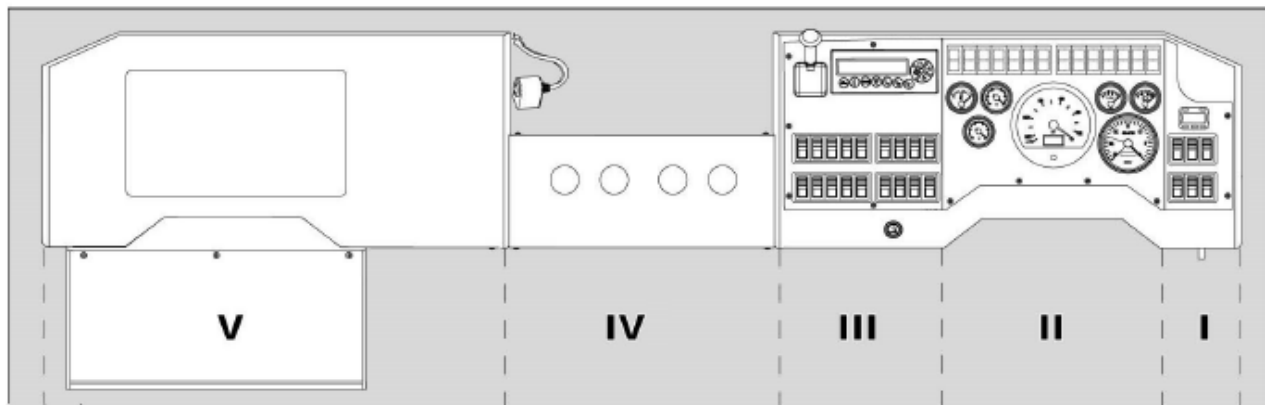


Figure 15 Instrument panel full



Figure 16 Instrument Panel - Driver

The instrument panel is divided in five parts:

- I. Right part of main instrument panel - controllers and switches
- II. Main instrument panel - instruments, controllers and indicator lamps
- III. Left part of main instrument panel - instruments, controllers, indicator lamps, sockets and parking brake
- IV. Central part instrument panel - map reading lamp
- V. Left part of instrument panel - fuse box and power unit panel

1.2.1 Right part of Instrument panel - switches (part I)



Figure 17 Right part of Instrument panel - switches (part I)







1		Not occupied
2		Not occupied
3		Switch for Front fog headlamp with indicator lamp (green) (Can be switched ON with the headlamps ON only)
4		Master lighting switch (green) Position 0 - OFF Position I - parking lights Position II - main headlamps
5		Upper (front auxiliary) headlamps switch with indicator lamp (yellow)
6		Illuminates when the switch 4 is ON Convoy lamps switch c/w indicator lamp (green) Position 0 - Normal lights ON (civil - legislative lights ON). Position I - Military lights ON (all civil lights OFF).

Table 1 Instrument Panel- switches (part I)

1.2.2 Instrument panel - controllers (part I)

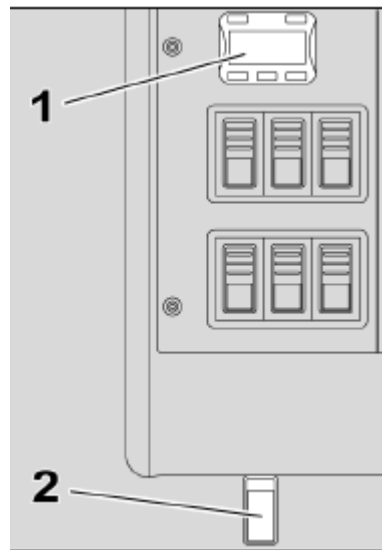


Figure 18 Right part of Instrument panel - controllers (part I)

1. Independent diesel heater timer.

Independent diesel heating is placed inside the cab behind the driver's seat and serves mainly to rapidly heat up the cab before driving. Independent diesel oil heating system operates independently of the engine thermal regime and with the battery disconnecter turned on.

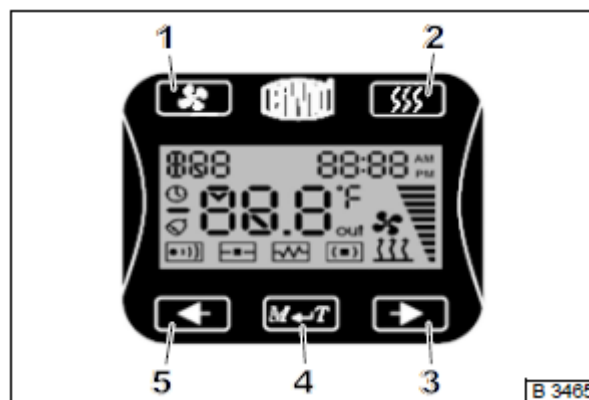


Figure 19 Independent diesel heater timer

- 1 - Turning the ventilation on or off,
- Confirm and exit MENU when moving in the MENU
- Cancel timer - push and hold
- 2 - Turning the heating ON or OFF – push

- Combustion chamber burning – push and hold
 - 3 - Shift to the left or decrease the value
 - 4 - "ENTER" -push and hold to enter the MENU;
 - pushing the key displays the temperature of the external sensor;
 - in timer mode the timer length can be set;
 - in MENU mode confirm your selection and move to the next item in the menu.
 - 5 - Shift to the left or increasing the value
- Error message is cancelled by pressing of any key.

2. Battery disconnecter for vehicle:

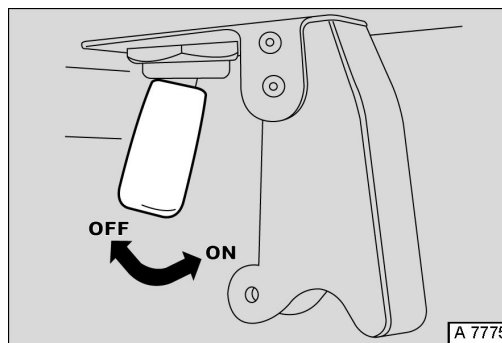


Figure 20 Battery disconnecter

Battery disconnecter is located in the cab under the instrument panel, to the right from the steering wheel shaft. Switch ON-OFF the battery disconnecter will serve for battery disconnect when driver leaves the vehicle for long time to prevent battery discharge by some equipment forgotten switched on, or when repair at electric installation is carried out. When the battery disconnecter is turned off, the independent hot-air heater control panel remains energized and tachograph. Battery disconnect should not be performed prior to 80 seconds following a key-off (engine stop).

1.2.3 Main Instrument Panel - Instruments and controls

The Main instrument panel consists of following instruments and controllers.

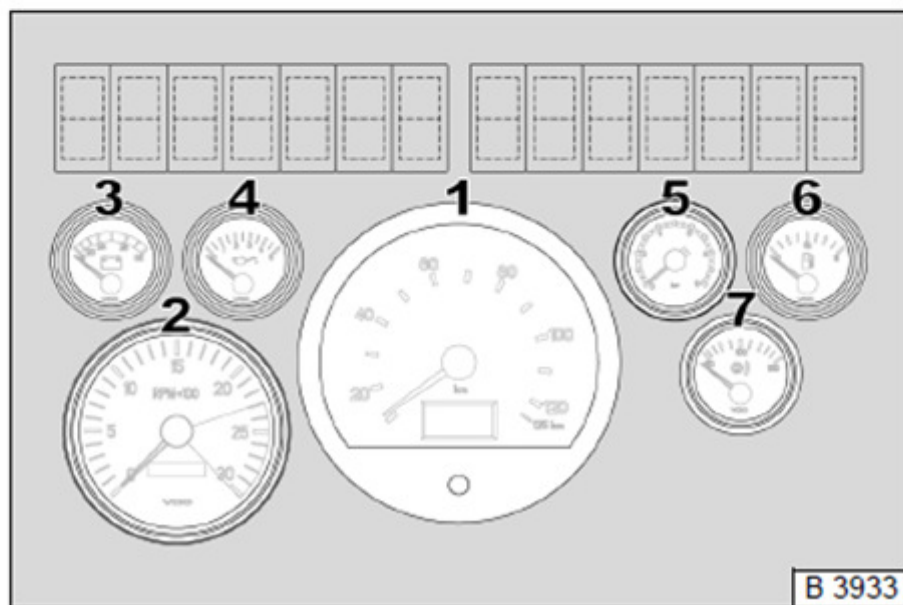


Figure 21 Main Instrument panel-Instruments and controllers (part II)

1. **Speedometer:** Indicates vehicle travelling speed and total kilometres travelled on vehicle. Speedometer is a combined device recording the total and daily distance covered in kilometres and instantaneous speed in relation to time.

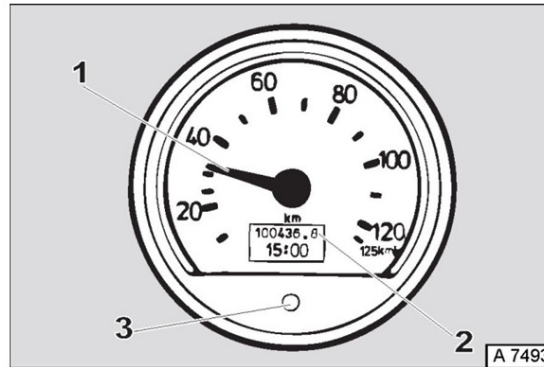


Figure 22 Speedometer

2. **Tachometer** : Indicates engine operating speed (rpm \times 100) and operating time (hours) With the engine running, the tachometer indicates the engine operating speed (RPM \times 100) and counts the total engine time (Hours). It contains colour zones that show the regime in which the engine works:

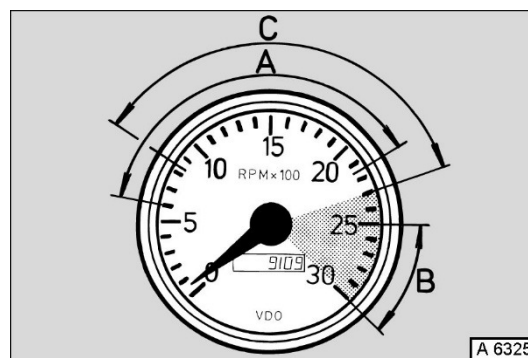


Figure 23 Tachometer

3. **Voltmeter**: Indicates state of charge of batteries and voltage level in 24 volt system. Operating voltage is between 24V and 30V. It informs about battery charging status and voltage while driving. Operating voltage is 24V to 30V.

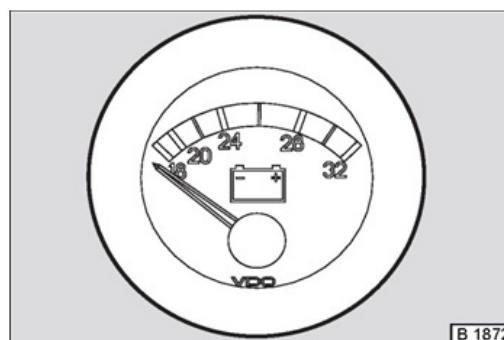


Figure 24 Voltmeter

4. **Engine oil Pressure gauge:** It indicates the engine oil pressure. It ranges from 3 to 5 bars (300 and 500 kPa) with the engine operating temperature. The oil pressure makes 1 bar (100 kPa) with the engine running at idle.

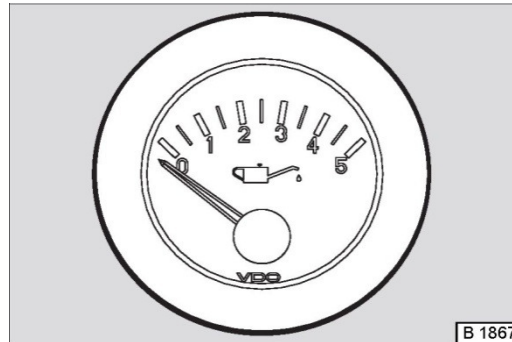


Figure 25 Engine oil Pressure gauge

5. **Vehicle double air pressure gauge:** Indicates the air overpressure in the brake system. The red pointer indicates the air overpressure in the circuit of rear axles while the white pointer indicates the air overpressure in the circuit of the front axle.

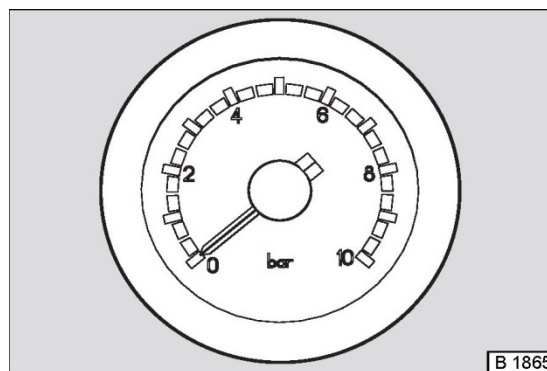


Figure 26 Vehicle double air Pressure gauge

6. **Fuel gauge :** Fuel gauge indicates fuel quantity in the fuel tank. The fuel gauge indicates the fuel quantity in the tank only when the key in the ignition box is in the I position.

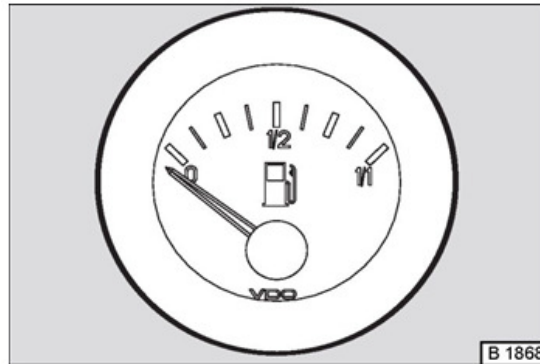


Figure 27 Fuel Gauge

7. **Tire Inflation Pressure Gauge** : The pressure gauge for inflation front and rear axles tires.

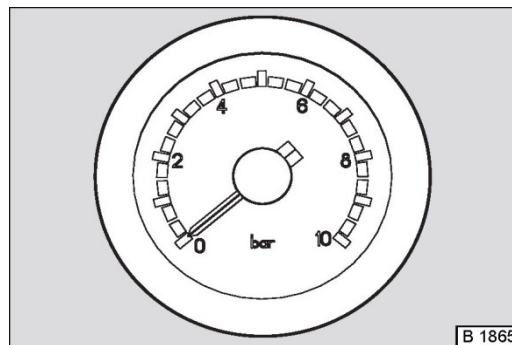


Figure 28 Tyre inflation Pressure gauge

1.2.4 Main Instrument Panel - Indicator lamps

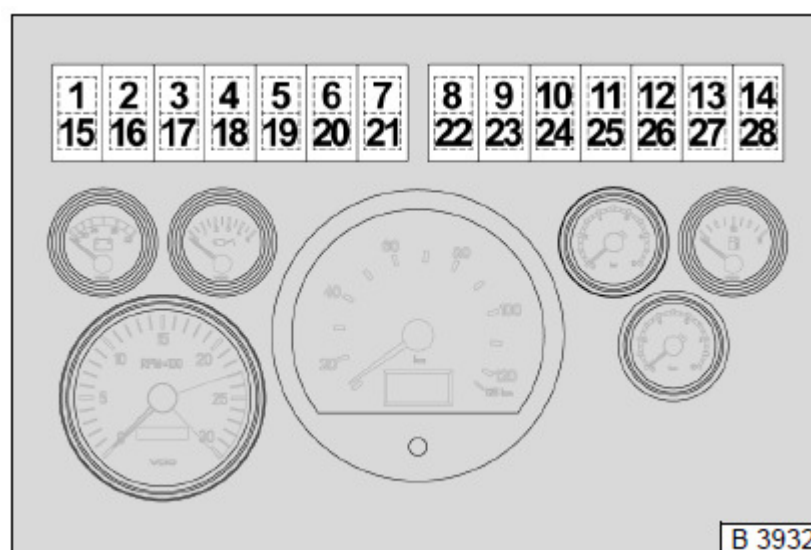






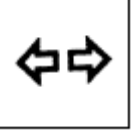
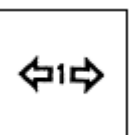

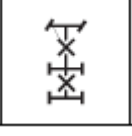







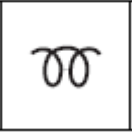
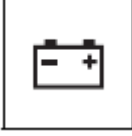






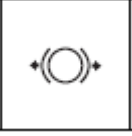



Figure 29 Main Instrument Panel -Instrument & Control

1.		Not occupied
2.		Not occupied
3.		Not occupied
4.		Not occupied
5.		Not occupied
6.		High beam (Blue): This lamp will be connected to switch of upper / lower head lamps for input and other end will be connected to battery “-ve”
7.		Vehicle direction indicator (green): This lamp is connected to the combination switch. During the turning of vehicle, this lamp will be in permanent blinking if driver push the switch lever through the pressure point upwards into position 6(for left turning) or downwards position 7(for right turning). Another end of this indicator will be connected to “-ve”.
8.		Trailer direction indicator (green): This lamp is connected to the combination switch. During the turning of vehicle, this lamp will be in permanent blinking if driver push the

		switch lever through the pressure point upwards into position 6(for left turning) or downwards position 7(for right turning). Another end of this indicator will be connected to “-ve”.
9.		Axle differential lock (green): The lamp is ON when engaged. The signal lamp one end is connected to key switch for electrical input and other end is connected to differential lock control lamp switches in parallel.
10.		Front axle drive and inter-axle differential lock (green): The lamp is ON when engaged. When unequal distribution of loads happen on wheels then on wheel may get skid. Then lock will be made for equal load distribution. The signal lamp one end is connected to key switch for electrical input and other end is connected to divider lock control lamp switch, inter axle diff. lock switch and in turn get connected to “-ve”
11.		Not occupied
12.		Not occupied
13.		Not occupied
14.		Not occupied
15.		Not occupied

16.		Not occupied
17.		<p>Air cleaner (white):</p> <p>When main filter elements are polluted excessively, the signal lamp lights up on the move during engine running. In this case, cleaning/replacement of air filter will be carried out.</p> <p>The signal lamp receives electrical input signal from key switch and other end will be connected to air filter control lamp switch and in turn to battery “-ve”</p>
18.		<p>Engine pre-heating (yellow):</p> <p>In case of preheating of engine, a yellow color indication will be ON on the instrument panel.</p> <p>The lamp one end is connected to ERCH (Electronic regulator cooling & heating) and other end is connected to battery “-ve”.</p>
19.		<p>Charging – failure(red):</p> <p>After starting the engine, this signal lamp will goes OFF which indicates alternator is healthy and charging the batteries. If lamp is not switching off permanently, it signals a defect in electric circuit of the charging set and/or the tensioning of alternator drive belts may be insufficient.</p> <p>The lamp at one end is connected to key switch and other end to the alternator output.</p>
20.		<p>Engine lubrication (red):</p> <p>This lamp is glow during Insufficient engine lubrication.</p> <p>The lamp at one end is connected to key switch and other end to the engine oil pressure switch.</p>
21.		<p>Engine overheating (red):</p> <p>When the engine is in running condition, the engine cylinder head will gets heated up. There is a temperature sensor which will sense the head temperature and the signal will be send to ERCH unit. This lamp is connected to ERCH unit and other end will be connected to</p>

		“-ve”
22.		Engine failure (red): When the engine failure/malfunction occurs, this lamp will glow due to the input signal coming from ERCH unit. One end of this lamp is connected to ERCH unit and other end will be connected to “-ve”
23.		Minimum fuel level (yellow): This lamp is glow during Insufficient fuel level. The lamp at one end is connected to key switch and other end to the engine oil pressure switch.
24.		Cab tilting (red): This lamp will glow, if the driver's cab is not locked/ partially tilted, the signal lamp comes on with the ignition “ON”. The signal lamp will receive electrical input from key switch and other end is connected to locking switch which in turn to battery
25.		Low air pressure in both service brake circuits (red): When the air pressure goes to 7bar or more, the air circuit control lamp is off. The air circuit control lamp one end is connected to the key switch and other end is connected to switch in turn to “-ve”
26.		Low air pressure in the emergency brake circuit (red): When the air pressure goes to 7bar or more, the air circuit control lamp is off. One end of this lamp is connected to the key switch and other end is connected to switch in turn to “-ve”
27.		Parking brake – activated (red): If parking brake lever is ON, this signal lamp on the instrument panel is ON. If parking brake lever is released, this signal lamp will go OFF. The lamp one is connected to the key switch and other end is connected to switch in turn to battery “-ve”

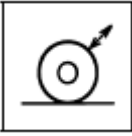




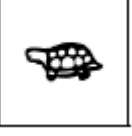


28.		Not occupied
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Table 2 Main Instrument Panel -Instrument & Control

1.2.5 Left part of main instrument panel - switches and indicator lamps



Figure 30 Left part of MIP Switches & Indicator Lamps

1		Front and rear axles tires inflation, under inflation (yellow) Lower position - tire inflation Upper position - tire under inflation
2		Not occupied
3		Not occupied
4		Rear working lamp c/w indicator lamp (yellow) Position 0 – OFF Position I - lights ON Illuminates when the switch 4 is ON (Position I)
5		Service brake indicator lamp bulb 25 check button (green) a) Test of minimum pressure in brake system indicator lamp - the TEST switch to check the bulb in the indicator lamp 25 check button (green)
6		Low range switch in transfer case (green) The switch has three positions. WARNING! Engage in a chassis at rest only, with parking brake engaged. Position I - quick gear (hare) Position N – neutral Position II - slow gear (turtle)
7		Electric fuel delivery pump c/w indicator lamp (white)
8		Fuel pre-heating c/w indicator lamp (green)


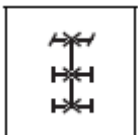
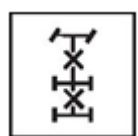
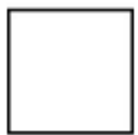
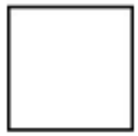
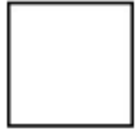




9		Ceiling light (green) Position 0 - Off Position I - On with door open Position II - On with door closed
10		Axle differential lock (green)
11		Front drive and inter - axle differential lock control switch (green)
12		Not occupied
13		Not occupied
14		Not occupied
15		Not occupied
16		Exhaust brake (green) Exhaust brake switch depending on the service brake
17		Beacon c/w indicator lamp (yellow)
18		Warning lights c/w indicator lamp (red)

Table 3 Left part of MIP Switches & Indicator Lamps

1.2.6 Right part of main instrument panel (part III) - instruments and controllers

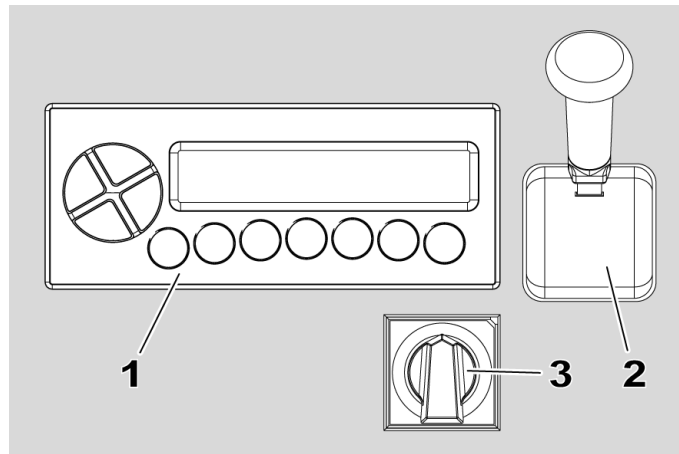


Figure 31 Right part of main instrument panel instruments and controllers (part III)

- 1 - Climate control panel
- 2 - Parking brake
- 3 - Winch switch

1.2.7 Central part instrument panel (part IV) – sockets

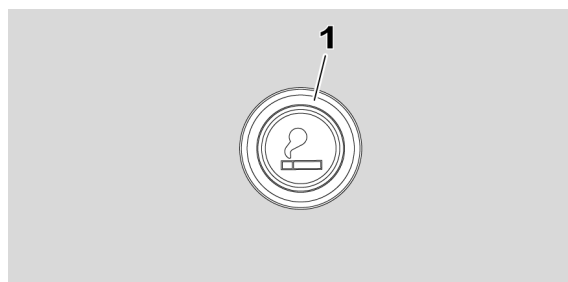


Figure 32 Central part instrument panel (part IV)

1 - 24V/10A socket - cigarette lighter

For use e.g. for cigarette lighter or portable beacon

Push switch with a lock button

Some functions use push switch with a lock button, which need to be unlocked both in order to activate switch.

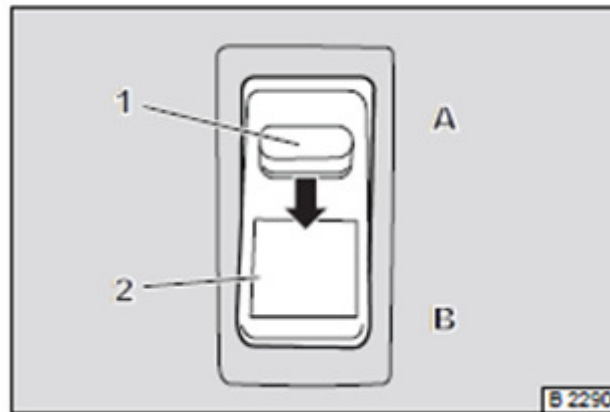


Figure 33 Push switch with a lock button

Legend

1- Blocking button

2- Switch

A,B - Position of the switch

Switch Activation : Press blocking button 1 down and press switch part B

Switch deactivation : Press switch part A only. Press switch 2 in position and the switch returns to the home position.

1.2.8 Right part of instrument panel (Part V) - fuse box and power unit panel

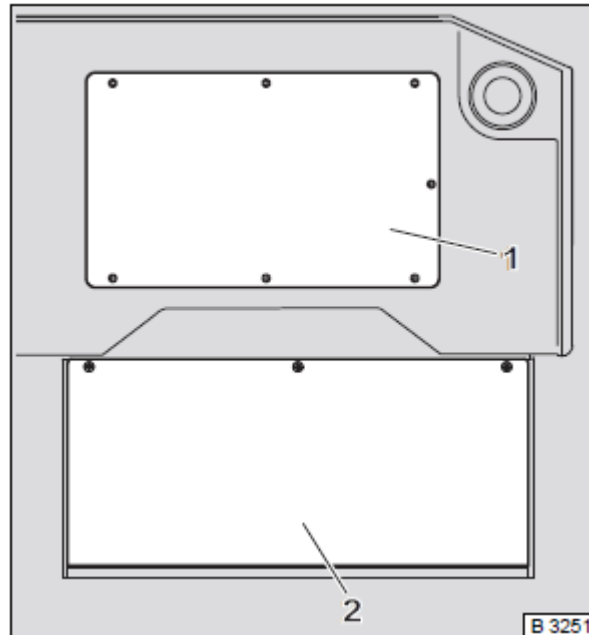


Figure 34 Right part of instrument panel (Part V)

1 - Fuse box cover

2 - Power unit cover

Fuse box

The electric circuits of the vehicle are secured with fuses, relays and diodes located on the fuse box under the fuse box cover 1.

The fuse box 1 is accessible after unscrewing four screws.

Power unit

The following is located in front of the passenger seat, at the instrument panel bottom under the cover of the power unit 2.

The on-vehicle power unit is accessible after unscrewing three bolts.

1.3 FUSES, RELAYS AND DIODES

Electric circuits are protected with fuses, diodes and relays

Possible malfunction of electric installation is indicated by a respective fuse (when blown). Replace a blown fuse after failure removal only with a fuse of the same current value as per the illustration located on the fuse box lid.



Figure 35 Overview of fuses, relays and diodes in the fuses box

1.3.1 Group of fuses, relays and diodes

Fuse box

The group of fuses, relays and diodes are located in the fuse box 1 kept before the passenger instrument panel. The fuse box is accessible after unscrewing four screws.

Sl. No.	Item Description	Voltage/CB rating
F1	High beam Head Lamp, left	5A
F2	High beam Head Lamp, right	5A
F3	Low beam Head Lamp, left	5A
F4	Low beam Head Lamp, right	5A
F5	Right position markers, controller to adjust the instruments and controllers brightness	10 A
F6	Right position markers Front	5 A
F7	Fog headlamps	15 A
F8	Brake lamps	10 A
F9	Main headlamp control (combined switch)	5 A
F10	Warning lamps, ceiling lamp, headlamp flasher, lighter sockets and hand lamps	15 A
F11	Starter switch "15"	5 A
F12	Starter switch "50"	25 A
F13	Reversing lamp, turn indicators	10 A
F14	Wipers, horn, windshield washer	10 A
F15	Not occupied	
F16	Independent diesel heater	15 A
F17	Independent diesel heater	15 A
F18	Voltage converter 24V/12V, sockets 12V	10 A
F19	Not occupied	
F20	Not occupied	
F21	Not occupied	

F22	Fuel preheating	25 A
F23	Filter-ventilation	25 A
F24	Custom connector power supply	10 A
F25	Not occupied	
F26	Not occupied	
F27	Preservation charging sockets	5 A
F28	Auxiliary upper headlights – low beams	10A
F29	Auxiliary upper headlights – low beams	10A
F30	Tachograph or speedometer	5 A
F31	Not occupied	
F32	Not occupied	
F33	Not occupied	
F34	Not occupied	
F35	Power supply of the air-conditioning, ventilation and dependent heating system	5 A
F36	Power supply of the air-conditioning, ventilation and dependent heating system	15 A
F37	Air-conditioning system compressor	5 A
F38	DIAG - Diagnostic sockets, engine TEU	5 A
F39	Power supply of the air-conditioning, ventilation and dependent heating system	15A
F40	Air-conditioning system condenser cooling fan	25 A
F41	Air-conditioning system condenser cooling fan	25 A

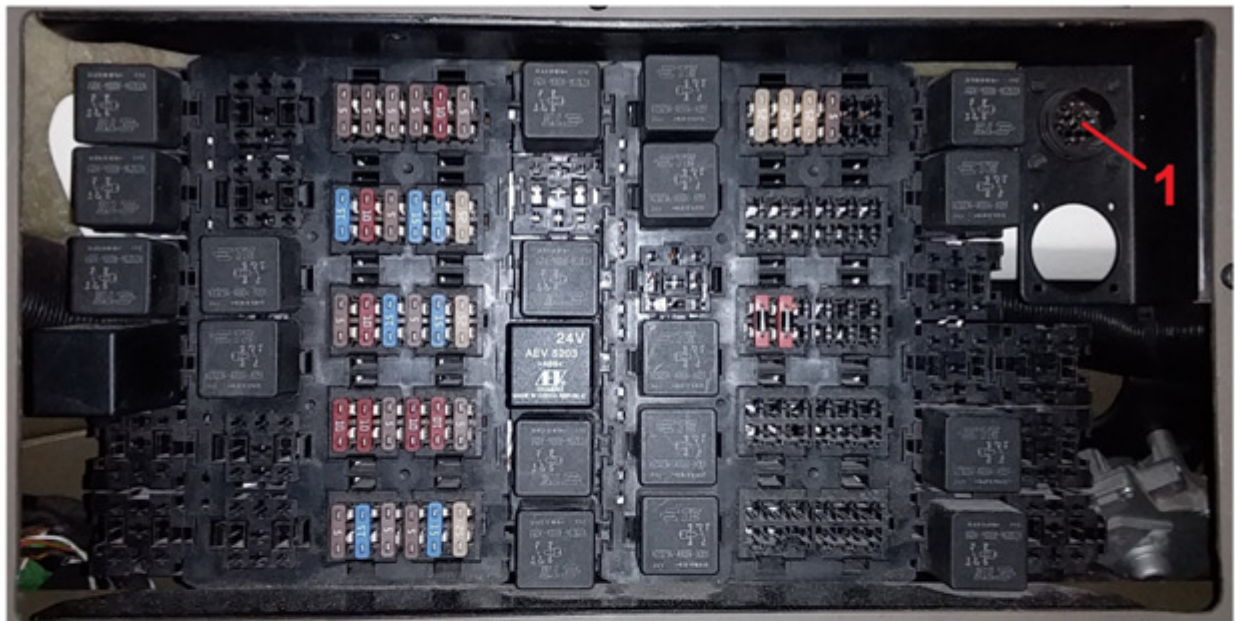
F42	Engine oil auxiliary cooling fan	25 A
F43	Engine oil auxiliary cooling fan	25 A
F44	Not occupied	
F45	Not occupied	
F46	Not occupied	
F47	Not occupied	
F48	Not occupied	
F49	Not occupied	
F50	Battery disconnecting switch	5 A

Table 4 Fuses details

1.3.1.1 Colour marking of knife-blade-contact fuses

Color	Value (A)
light brown	5 A
brown	7.5 A
red	10 A
blue	15 A
yellow	20 A
white	25 A
green	30 A

Table 5 Colour marking of knife-blade-contact fuses

[illegible]

Diodes	
V 549	Transfer case control PTO lock
V641	Up
V771	Battery charging indicator lamp

Table 6 Diodes details

K 89	High beam headlamps
A 120	Wiper cycle timer
K 148	Low beam headlamps
K 149	Front fog headlamps
K 506	Engine start
K 525	Electric circuit connection "15"
K 590	Intake air preheating
K 597	Start blocking
K 630	Fuel filter with pre-heating Acoustic
H 647	signaling Minimum air pressure
K 648	indication Air-conditioning system
K 684	compressor
K 690	Air-conditioning system power supply
K 691 a	Air-conditioning condenser engine

K 691 b	conditioning condenser engine
K 846a	oil cooling fan Engine oil cooling
K 846b	fan

Table 7 Relays details

1.3.2 Central electric panel

Following units are located under the power unit cover

- 1 - Not Occupied
- 2 - Custom connector - Designed for superstructure installers as a point to connect electrical devices (signals) from the superstructure.
- 3 - Not occupied
- 4 - Engine Control Unit (TEU)
- 5 - Not Occupied
- 6 - Turn signal interrupter
- 7 - Voltage Converter 24V / 12 V
- 8 - Instrument panel controls backlight corrector



Figure 37 Central Electric Panel

1.3.3 Ignition box

STOP - Key take-out position and steering lock function

The steering wheel is locked after removing the key

The following is active in this position vehicle illumination warning lights oil heater brake lights

0 - The steering lock cannot be open in this position.

I - Other electric circuits are ON

II - Engine start

Turning the key from position I to position 0 to stop the engine



Figure 38 Ignition Box

1.3.4 Combined switch

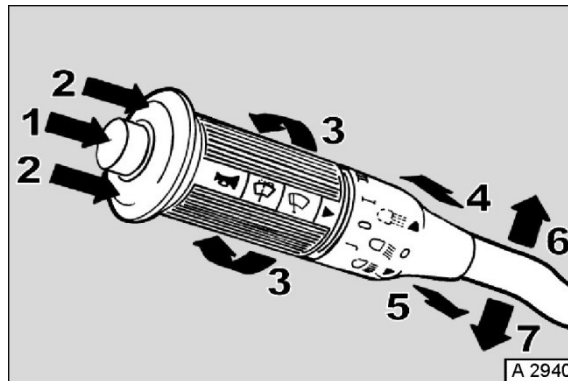


Figure 39 Combination switch Description

1. Horn button -

2. Windshield washer button –

Push to turn the windshield washer pump ON.

Having been sprayed, the windshield will be wiped off by wiper blades automatically (in two cycles). In order to ensure proper operation of this equipment even in winter, it is necessary to keep the spray nozzles free of snow or remove adhering ice with deicing spray.

3. Wiper switch

Has got following options

- 0 - OFF
- I - low speed
- II - high speed
- J - wiper cycle control

The intermittent wiping within the interval range from 0.5 to 60 second can be preset. Required wiping interval is achieved first by setting the switch to position J, the windshield will be wiped off once, then move the switch to position 0 immediately. Required wiper interval will correspond to the time that passed during moving the wipers switch to position J again.

4. Change-over switch between high and low beam.

Headlights are on after depressing the position Switch 4

5. Headlamp flasher –

By pushing the combined switch lever towards the steering wheel. Blue indicator lamp 6 is on. The switch lever shall return to the original position after releasing.

6. Right direction indicator

Permanent blinking to the right. Push the switch lever through the pressure point upwards into position 6. Green indicator lamp 7 is blinking. When with trailer, green control lamp 8 is blinking as well. The switch lever shall return automatically into the original position after driving in straight direction.

7. Left direction indicator

Permanent blinking to the left. Push the switch lever through the pressure point downwards into position 7. Green indicator lamp 7 is blinking. When with trailer, green control lamp 8 is blinking as well.

The switch lever shall return automatically into the original position after driving in straight direction.

1.3.5 Vehicle lighting

Vehicle lighting		
Cabin Interior Lamps	Map lamp	24V, 4W
	Roof Lamp	24V, 21W
Cab Roof	Search Lamp	24V, 70W
	Beacon Lamp	24V, 70W
Cab Exterior	Upper (front auxiliary) lamps	
	Turn Indicator Lamp	24V, 21W
Front bumper lighting	Main headlamps	24V, 70W
	Front Fog Lamp	24V, 70W
	Vehicle width-indicating lamps	24V,4W

Table 8 Vehicle lighting details

1.3.5.1 Cab interior lamp

The following cab interior lamp is installed for the cab interior illumination:

1 - Cab interior lighting in peacetime conditions Ceiling lights 1, operable by the switch 9 located on the right side instrument panel.

1.3.5.2 Map lamp

The map lamp is located in front of the passenger seat on a flexible holder. Use switch 1 on the map lamp body to switch the lamp on / off.

The rating of each lamp is 4W.

Input & output

The input signal is from battery “+ve” and other end is connected to battery “-ve”

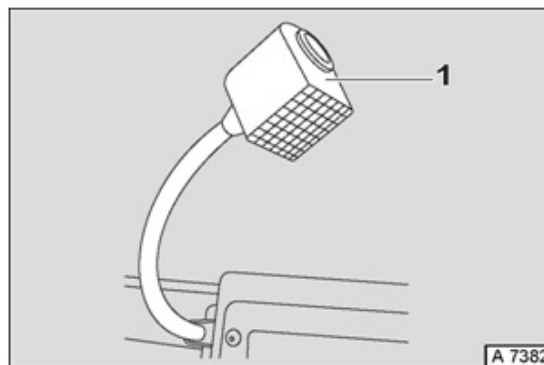


Figure 40 Map lamp

1.3.5.3 Roof lamp

The lamp is fitted inside the driver's cabin. The lamp rating is 24V dc, 21W



Figure 41 Map lamp

Lighting on the cab roof

1.3.5.4 Search lamp

It is located in the roof in front of the driver and it is used for spatial orientation around the vehicle. The rating of the lamp is 24V dc, 70W.

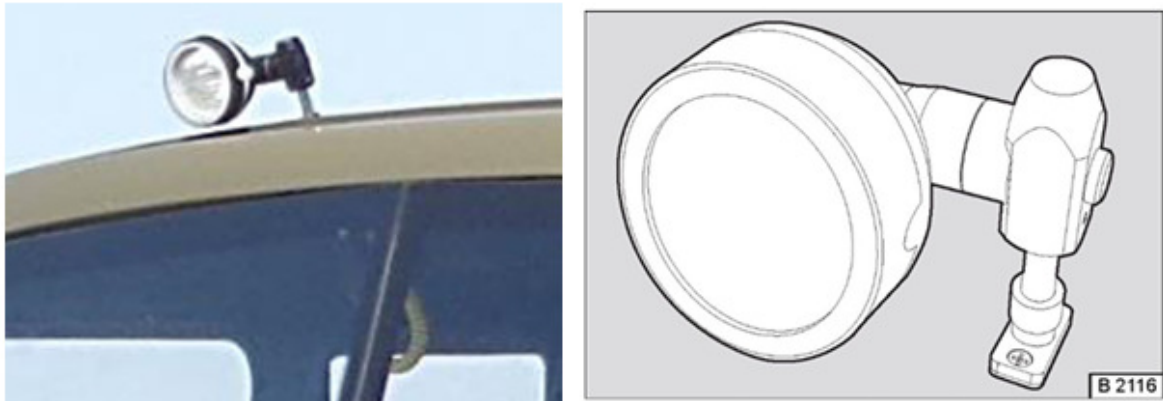


Figure 42 Search lamp

1.3.5.5 Beacons

Two beacons with covers are located on the cab roof.- Turn on the switch 17 located on the right side instrument panel. The indicator lamp located directly in the switch indicates the lamps switched ON

The lamp is used for Warning / flashing purpose. The rating of each lamp is 24V dc, 70W

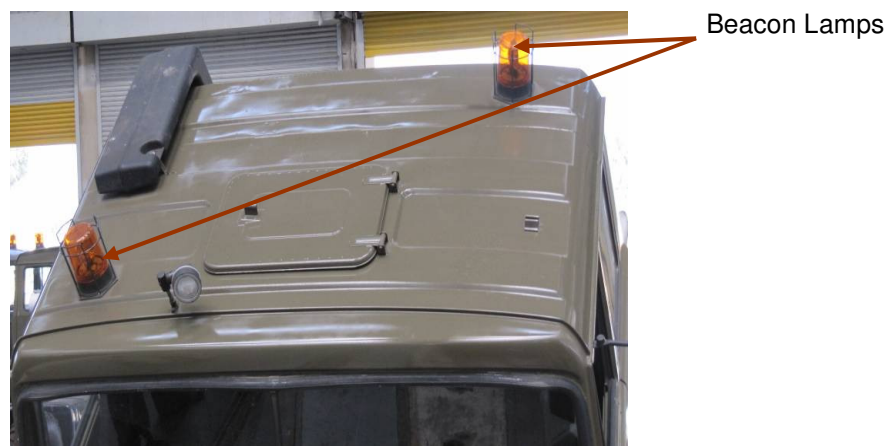


Figure 43 Beacon lamp

Cab exterior lighting

1.3.5.6 Upper (front auxiliary) lamps

The upper (front auxiliary) headlamps 1 are located on the front cab wall. The side marker in the upper (front auxiliary) headlamps turns on together with the vehicle's side markers. Two lamps are fitted on upper side of main head lamps on front side of driver's cabin. When dozer attachment is fitted, these lamps will serve the purpose of lighting

Input & output

The electrical input is from battery +ve. The head lamp is connected to fuse (10A) and in turn to switch off upper / lower head lamp

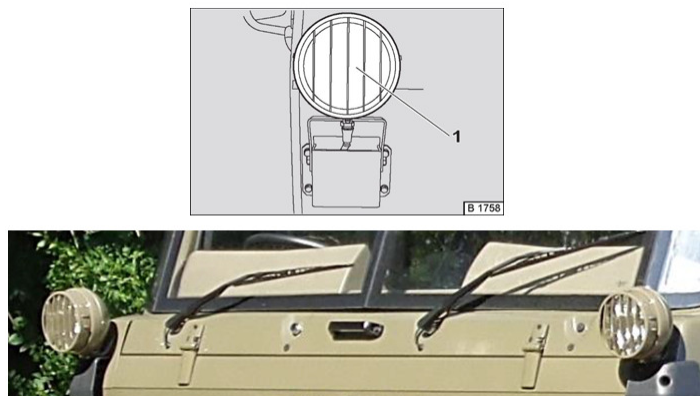


Figure 44 Upper (front auxiliary) head lamps

1.3.5.7 Turn Indicator Lamp

Two vehicle signal control lamp & two trailer turn signal control lamps are mounted on outside of driver's cabin on LH & RH sides.

The rating of each lamp is 24V dc, 21W

Input & output

The input signal for the lamp is from turn signal interrupter. Other end is connected to battery “-ve”

Direction

indicators



Figure 45 LH & RH direction indicators

Front bumper lighting

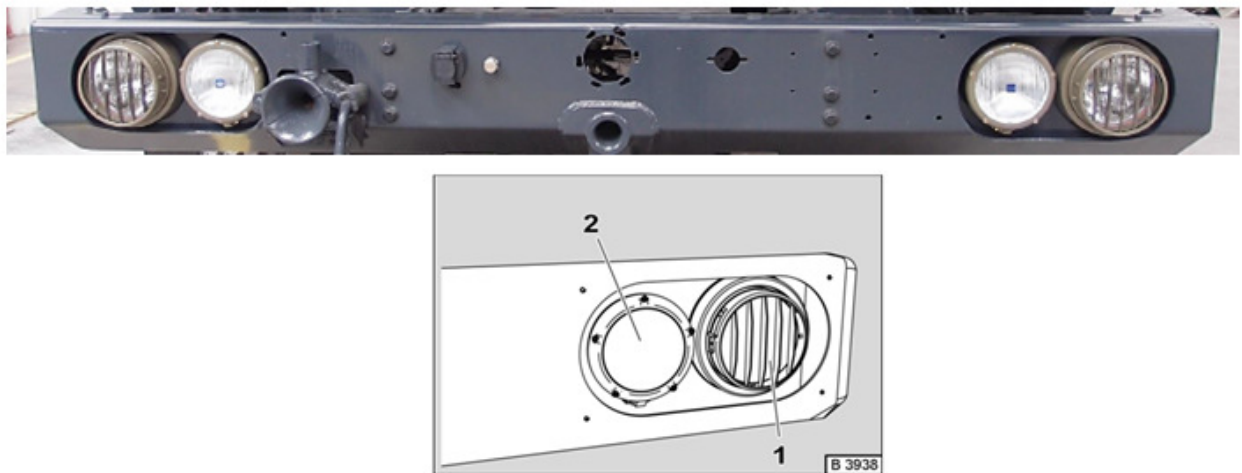


Figure 46 Front bumper lighting

1.3.5.8 Main headlamps

Operable by the lighting switch 3 -position 2

Two head lamps of double filament type are fitted on the outside of driver's cabin. The head lamp will serve the purpose of lighting during nights. The rating of each lamp is 24V

dc, 70W The head lamp one end is connected to “-ve’ and other end is connected to head lamp switch.



Figure 47 Main headlamps

1.3.5.9 Front fog lamps

They are lighting when side marker lights are turned on and are switched on by the rocker switch 3 Two fog lamps are mounted on outside of driver's cabin. The rating of each is 24V dc, 70W. The lamps are used during fogging time

Input & output

The fog lamp is connected to fog lamp relay and in turn to fuse (of 15A). The electric input signal is from battery “+ve”



Figure 48 Front fog lamp

1.3.5.10 Vehicle width-indicating lamps

Adjustable indicators of vehicle combination width with side markers 1 located in the front bumper. These indicators will extend to a required width after loosening the screws 2.

Illuminates when switch 4 is on. The rating of each lamp is 4W

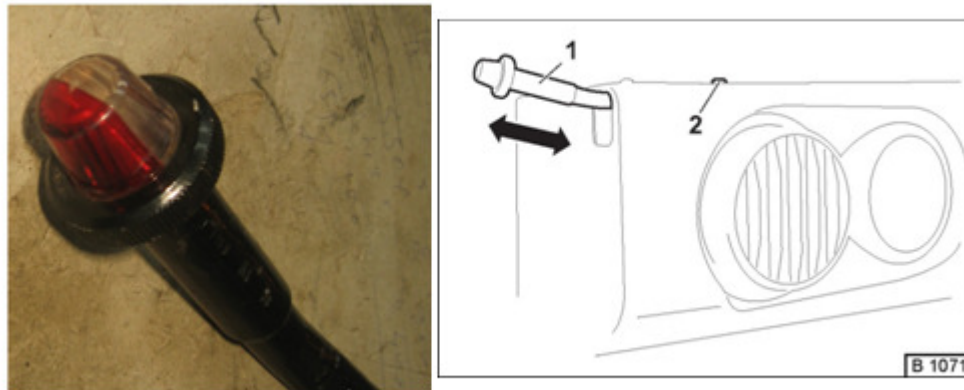
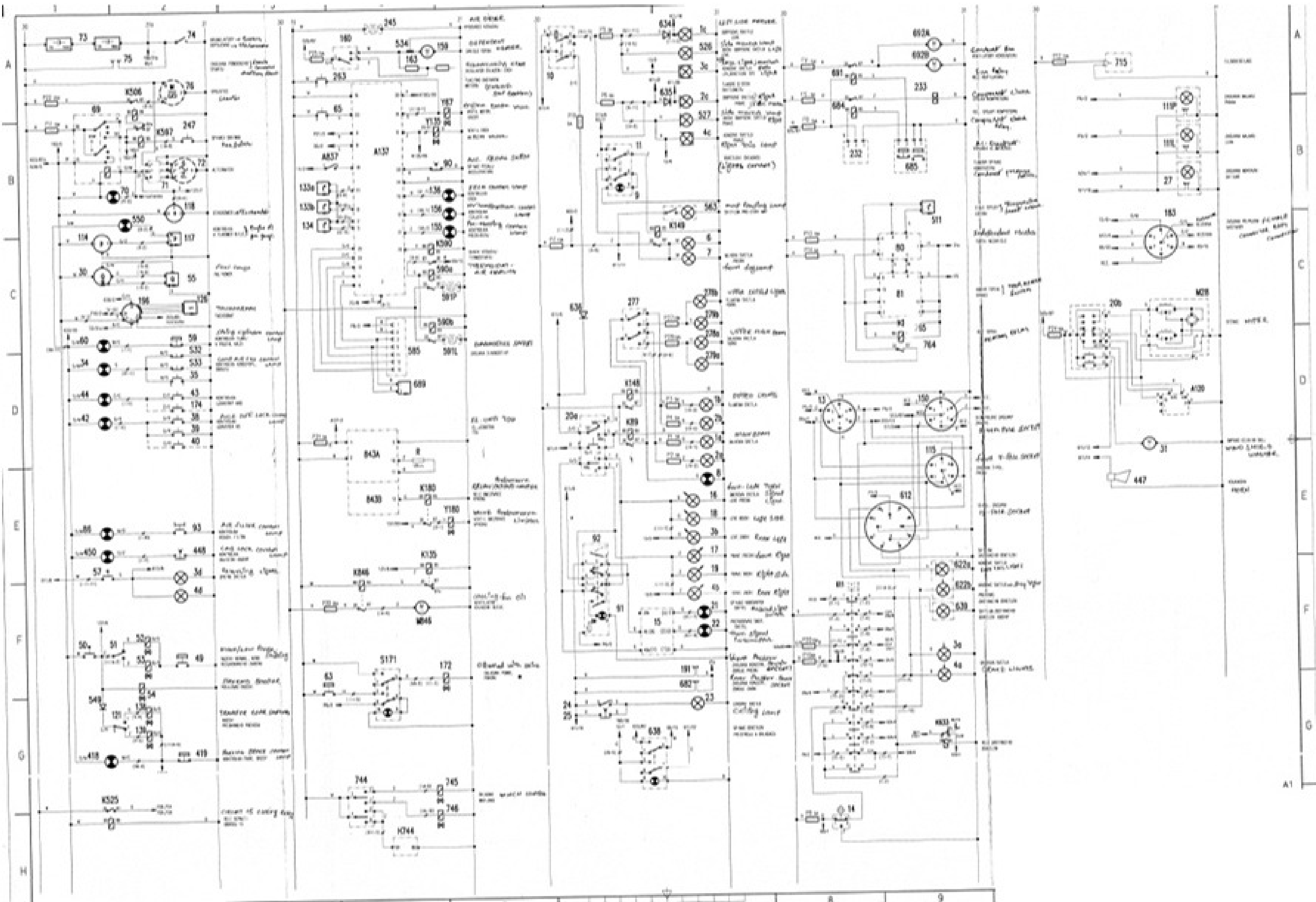


Figure 49 Width indicating lamps



APPENDIX - E

Development of two no Armour cabin shell with Fabrication, Pre-treatment & CED painting

Scope of work (Fabrication+Pre-treatment+CED+Furnishing)

BEML Scope:

1. BEML shall provide kit for cabin furnishing as free issue material (FIM) to supplier. Details of BEML free issue materials are given in the Work scope matrix.
2. Technical assistance will be provided by sharing 3D model of cabin & furnishing of aggregates by BEML along with Technical specification/sample piece.

Supplier scope:

1. Shell Fabrication of Cabin by utilizing the fixtures made by the supplying firm on their own.
2. Furnishing of the Cabin with BEML supplied FIM & supplier sourced accessories. Supplier to make necessary cutouts & mounting arrangements in the cabin to assemble all the accessories.
3. One spare vehicle cabin (with interior seating ,accessories etc) with mounting fixtures to be supplied for testing purpose. The cabin will be tested for blast pressure at TBRL Chandigarh / PXE Balasore or any other suitable agency (mutually agreed).All charges (logistics, instrumentation, transportation etc) related to testing to be borne by supplier.
4. Cabin should comply STANAG Level -1 standard or any other as decided mutually during design stage. The material will have to be tested at TBRL Chandigarh or any other suitable agency. Testing charges to be borne by supplier, All transportation, logistics ,instrumentation etc for this testing to be borne by supplier.
5. Cabin harnessing to be carried out
6. Stage wise integration and final shell assembly has to be carried out with suitable fixtures and offered for BEML for inspection and clearance.
7. Pre-treatment, CED (Cathode electrode deposition) dip coating, top coat paint & baking has to be carried out as per Technical specification / process.

8. The firm shall provide QAP, Dimensional check sheets and obtain welding process & welders qualification from BEML.
9. The final inspection with shower test and clearance to be obtained from BEML before dispatch.
10. The firm should make a fixture to ascertain mounting, lock and unlock, and clearance of the equipped Cabin for final clearance.
11. HVAC system with accessories shall be provided by supplier. COC for HVAC system to be provided by supplier.
12. Functioning of HVAC to be demonstrated.

BOM & WORK SCOPE

Work Scope Matrix						
SI No	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
1	Cabin structure clad with armoured sheets, doors & blast proof glasses	✗	✓	✓	1	7
2	Cabin tilting mechanism	✗	✓	✓	1	10
3	FRP Dashboard	✗	✓	✓	1	11CABIN INTERIORS :
3	Engine tunnel profile	✗	✓	✓	1	11
4	Gear Shift lever	✓	✗	✓	1	11
5	High & low speed gear pre selector	✓	✗	✓	1	12
6	Parking brake and controls	✓	✗	✓	1	12
8	Crew seats	✗	✓	✓	2	
9	HVAC System	✗	✓	✓	1	13
10	Integrated Pedal unit	✗	✓	✓	1	13
11	Wind screen washer tank	✗	✓	✓	1	13
12	Provision for storing first aid box & fire extinguisher bottle	✗	✓	✓	1	14
13	Front bonnet cover	✗	✓	✓	1	14

Work Scope Matrix						
SI No	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
14	Mechanical linkage with release handle for bonnet release	✗	✓	✓	1	14
16	Mechanical stay hinged to front bonnet	✗	✓	✓	1	14
17	Roof hatch	✗	✓	✓	1	14
18	Rigid type handles on "A" & "B" pillars	✗	✓	✓	1	15
19	Driver & Co driver seats	✓	✗	✓	1 each	15
20	Engine idle speed and engine shut off lever	✓	✗	✓	1	17
21	Steering column assy	✓	✗	✓	1	17
22	steering wheel	✓	✗	✓	1	17
24	Windshield wipers	✗	✓	✓	2	18
25	Handles on cabin front end for windshield cleaning	✗	✓	✓	1	18
26	Engine oil temperature dependent heater	✓	✗	✓	1	18
30	Stopper (rubber & strip) to lock hatch during fully open condition	✗	✓	✓	1	18
31	LMG Gun Mount	✗	✓	✓	1	
34	Control Unit with knobs	✓	✗	✓	1	19
35	Adjustable rear view mirrors	✗	✓	✓	1	19

Work Scope Matrix						
SI No	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
36	Exhaust Brake engagement lever	✓	✗	✓	1	19
37	Cabin Insulation	✗	✓	✓	1	20

Electrical items

Work Scope Matrix						
SI No	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
LEFT PART OF INSTRUMENT PANEL						
1	INDEPENDENT DIESEL HEATER TIMER	✓	✗	✓	1	37
2	BATTERY DISCONNECTOR FOR VEHICLE	✓	✗	✓	1	38
	SWITCHES					
3	FRONT FOG HEADLAMP C/W INDICATOR LAMP(GREEN)	✓	✗	✓	1	
4	MASTER LIGHTING SWITCH (GREEN)	✓	✗	✓	1	
5	UPPER HEAD LAMPS C/W INDICATOR	✓	✗	✓	1	

Work Scope Matrix						
Sl No	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
	LAMP(YELLOW)					
6	COVOY LAMPS SWITCH C/W INDICATOR LAMP (GREEN)	✓	✗	✓	1	
	MAIN INSTRUMENT PANEL					35
8	SPEEDOMETER	✓	✗	✓	1	39
9	TACHOMETER	✓	✗	✓	1	40
10	VOLTMETER	✓	✗	✓	1	40
11	ENGINE OIL PRESSURE GAUGE	✓	✗	✓	1	41
12	VEHICLE DOUBLE AIR PRESSURE GAUGE	✓	✗	✓	1	41
13	FUEL GAUGE	✓	✗	✓	1	41
14	TIRE INFLATION PRESSURE GAUGE	✓	✗	✓	1	42
	MAIN INSTRUMENT PANEL-INDICATOR LAMPS					42
16	HIGH BEAMS(BLUE)	✓	✗	✓	1	
17	VEHICLE DIRECTION INDICATOR(GREEN)	✓	✗	✓	1	
18	TRAILER DIRECTION INDICATORS(GREEN)	✓	✗	✓	1	
19	AXLE DIFFERENTIAL LOCK(GREEN)	✓	✗	✓	1	

Work Scope Matrix						
Sl No	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
20	FRONT AXLE DRIVE AND INTER-AXLE DIFFERENTIAL LOCK(GREEN)	✓	✗	✓	1	
21	AIR CLEANER(WHITE)	✓	✗	✓	1	
22	ENGINE PRE- HEATING(YELLOW)	✓	✗	✓	1	
23	CHARGING- FAILURE(RED)	✓	✗	✓	1	
24	ENGINE LUBRICATION(RED)	✓	✗	✓	1	
25	ENGINE OVERHEATING(RED)	✓	✗	✓	1	
26	ENGINE FAILURE(RED)	✓	✗	✓	1	
27	MINIMUM FUEL LEVEL(YELLOW)	✓	✗	✓	1	
28	CAB TILTING (RED)	✓	✗	✓	1	
30	LOW AIR PRESSURE IN BOTH SERVICE BRAKE CIRCUITS(RED)	✓	✗	✓	1	
31	LOW AIR PRESSURE IN THE EMERGENCY BRAKE CIRCUITS(RED)	✓	✗	✓	1	
32	PARKING BRAKE- ACTIVATED(RED)	✓	✗	✓	1	
RIGHT PART OF MAIN INSTRUMENT PANEL-INSTRUMENTS AND CONTROLLERS						50
34	CLIMATIC CONTROL PANEL	✓	✗	✓	1	

Work Scope Matrix						
Sl No	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
35	PARKING BRAKE	✓	✗	✓	1	
36	WINCH SWITCH	✓	✗	✓	1	
CENTRAL PART INSTRUMENT PANEL						50
38	24V/10A SOCKET- CIGARETTE LIGHTER	✓	✗	✓	1	
LEFT PART OF MAIN INSTRUMENT PANEL-SWITCHES AND INDICATOR LAMPS						47
	FRONT AND REAR AXLES TIRES INFLATION, UNDERINFLATION(YEL LOW)	✓	✗	✓	1	
	REAR WORKING LAMP C/W INDICATOR LAMP(YELLOW)	✓	✗	✓	1	
	SERVICE BRAKE INDICATOR LAMP BULB 25 CHECK BUTTON (GREEN)	✓	✗	✓	1	
	LOW RANGE SWITCH IN TRANSFER CASE(GREEN)	✓	✗	✓	1	
	ELECTRIC FUEL DELIVERY PUMP C/W INDICATOR LAMP(WHITE)	✓	✗	✓	1	

Work Scope Matrix						
SI N o	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
	FUEL PRE-HEATING C/W INDICATOR LAMP(GREEN)	✓	✗	✓	1	
	CEILING LIGHT(GREEN)	✓	✗	✓	1	
	AXLE DIFFERENTIAL LOCK(GREEN)	✓	✗	✓	1	
	FRONT DRIVE AND INTER-AXLE DIFFERENTIAL LOCK CONTROL SWITCH(GREEN)	✓	✗	✓	1	
	EXHAUST BRAKE (GREEN)	✓	✗	✓	1	
	BEACON C/W INDICATOR LAMP(YELLOW)	✓	✗	✓	1	
	WARNING LIGHTS C/W INDICATOR LAMP(RED)	✓	✗	✓	1	
RIGHT PART INSTRUMENT PANEL(PART V)						52
	FUSE BOX COVER	✓	✗	✓	1	
	POWER UNIT COVER	✓	✗	✓	1	
	CUSTOM CONNECTOR	✓	✗	✓	1	
	ENGINE CONTROL UNIT(TEU)	✓	✗	✓	1	
	TURN SIGNAL INTERRUPTER	✓	✗	✓	1	
	VOLTAGE CONVERTER 24V/12V	✓	✗	✓	1	

Work Scope Matrix						
SI N o	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
	INSTRUMENT PANEL CONTROLS BACKLIGHT CORRECTOR	✓	✗	✓	1	
	POWER SWITCH WITH A LOCK BUTTON	✓	✗	✓	1	
FUSES						52
	F1- HIGH BEAM HEADLAMPS, LEFT- 5A	✓	✗	✓	1	
	F2- HIGH BEAM HEADLAMPS, RIGHT- 5A	✓	✗	✓	1	
	F3- LOW BEAM HEADLAMPS, LEFT 5A	✓	✗	✓	1	
	F4- LOW BEAM HEADLAMPS, RIGHT 5A	✓	✗	✓	1	
	F5-RIGHT POSITION MARKERS, 10A	✓	✗	✓	1	
	F6-RIGHT POSITION MARKERS-5A	✓	✗	✓	1	
	F7-FRONT FOG HEADLAMPS-15A	✓	✗	✓	1	
	F8-BLAKE LAMPS-10A	✓	✗	✓	1	
	F9-MAIN HEADLAMP CONTROL(COMBINED SWITCH)-5A	✓	✗	✓	1	
	F10-WARNING LAMPS,CEILING LAMP, HEAD LAMP FLSHER,	✓	✗	✓	1	

Work Scope Matrix						
SI N o	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
	LIGHTER SOCKETS AND HAND LAMPS -15A					
	F11-STARTER SWITCH "15" 5A	✓	✗	✓	1	
	F12-STARTER SWITCH "50" 25A	✓	✗	✓	1	
	F13-REVERSING LAMP, TURN INDICATORS-10A	✓	✗	✓	1	
	F14-WIPERS, HORN, WINDSHIELD WASHER- 10A	✓	✗	✓	1	
	F16-INDEPENDENT DIESEL HEATER-15A	✓	✗	✓	1	
	F17-INDEPENDENT DIESEL HEATER-5A	✓	✗	✓	1	
	F18-VOLTAGE CONVERTER 24V/12V, SOCKETS 12V-10A	✓	✗	✓	1	
	F22-FUEL PREHEATING-25A	✓	✗	✓	1	
	F23-FILTER VENTILATION-25A	✓	✗	✓	1	
	F24-CUSTOM CONNECTOR POWER SUPPLY-10A	✓	✗	✓	1	
	F27-PRESERVATION CHARGING SOCKETS- 5A	✓	✗	✓	1	
	F28-AUXILIARY UPPER HEADLIGHTS-LOW	✓	✗	✓	1	

Work Scope Matrix						
SI N o	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
	BEAMS-10A					
	F29-AUXILIARY UPPER HEADLIGHTS-HIGH BEAMS-10A	✓	✗	✓	1	
	F30-TACHOGRAPH OR SPEEDOMETER-5A	✓	✗	✓	1	
	F35-POWER SUPPLY OF THE AIR CONDITIONING VENTILATION AND DEPENDENT HAETING SYSTEM-5A	✓	✗	✓	1	
	F36-POWER SUPPLY OF THE AIR CONDITIONING VENTILATION AND DEPENDENT HAETING SYSTEM-15A	✓	✗	✓	1	
	F37-AIR-CONDITIONING SYSTEM COMPRESSOR-5A	✓	✗	✓	1	
	F38-DIAG-DIAGNOSTIC SOCKETS, ENGINE TEU-5A	✓	✗	✓	1	
	F39-POWER SUPPLY OF THE AIR CONDITIONING VENTILATION AND DEPENDENT HAETING	✓	✗	✓	1	

Work Scope Matrix						
SI N o	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
	SYSTEM-15A					
	F40-AIR CONDITIONING SYSTEM CONDENSER COOLING FAN-25A	✓	✗	✓	1	
	F41-AIR CONDITIONING SYSTEM CONDENSER COOLING FAN-25A	✓	✗	✓	1	
	F42-ENGINE OIL AUXILIARY FAN-25A	✓	✗	✓	1	
	F43-ENGINE OIL AUXILIARY FAN-25A	✓	✗	✓	1	
	F50-BATTERY DISCONNECTING SWITCH-5A	✓	✗	✓	1	
DIODES						53
	V549-TRANSFER CASE CONTROL	✓	✗	✓	1	
	V641-PTO LOCK-UP	✓	✗	✓	1	
	V771-BATTERY CHARGING INDICATOR LAMP	✓	✗	✓	1	
RELAYS						53
	K89-HIGH BEAM HEADLAMPS	✓	✗	✓	1	
	A120-WIPER CYCLE TIMER	✓	✗	✓	1	
	K148-LOW BEAM HEADLAMPS	✓	✗	✓	1	

Work Scope Matrix						
SI N o	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
	K149-FRONT FOG HEADLAMPS	✓	✗	✓	1	
	K506-ENGINE START	✓	✗	✓	1	
	K525-ELECTRIC CIRCUIT CONNECTION "15"	✓	✗	✓	1	
	K590-INTAKE AIR PREHEATING	✓	✗	✓	1	
	K597-START BLOCKING	✓	✗	✓	1	
	K630-FUEL FILTER WITH PRE-HEATING	✓	✗	✓	1	
	K647-ACOUSTIC SIGNALING	✓	✗	✓	1	
	K648-MINIMUM AIR PRESSURE INDICATION	✓	✗	✓	1	
	K684-AIR- CONDITIONING SYSTEM COMPRESSOR	✓	✗	✓	1	
	K690-AIR CONDITIONING SYSTEM POWER SUPPLY	✓	✗	✓	1	
	K691a-AIR CONDITIONING CONDENSER ENGINE	✓	✗	✓	1	
	K691b-AIR CONDITIONING	✓	✗	✓	1	

Work Scope Matrix						
SI N o	Scope Details Description of aggregates	BEML Free issue material	Supplier Procured item	Provisioning of Cut outs & mounting arrangements	Qty	PTS Reference Page no
	CONDENSER ENGINE					
	K846a-ENGINE OIL COOLING FAN	✓	✗	✓	1	
	K846b-ENGINE OIL COOLING FAN	✓	✗	✓	1	
	DIAGNOSTIC CONNECTOR UNDER FUSE BOX COVER	✓	✗	✓	1	
	DIAGNOSTIC CONNECTOR OBD AT PASSENGER SIDE AT THE RIGHT BOTTOM OF THE INSTRUMENT PANEL	✓	✗	✓	1	
VEHICLE LIGHTING						
	CAB INTERIOR LAMP	✓	✗	✓	1	
	MAP LAMP	✓	✗	✓	1	
	SEARCH LAMP	✓	✗	✓	1	
	BEACONS	✓	✗	✓	2	

NOTE : For spare cabin all above accessories except external lightings & HVAC to be fitted.