UN SEALED SPECN NO. C QA(GS)/US/483

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(Supersedes: Specn No. RDEE/ENGR/SPECN/0195

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GOVERNMENT OF INDIA
MINISTRY OF DEFENCE
~~RESEARCH & DEVELOPMENT ESTABLISHMENT (ENGRS)~~
~~-DIGHI, PUNE-411015~~
(DGQA ORGANISATION)

~~SPECIFICATION No. RDEE/ENGR/SPCN/0195~~
SPECIFICATION

FOR

SLEDGE EVACUATION (FRP)

ISSUED BY.
CONTROLLER
CONTROLLERATE OF QUALITY ASSURANCE (GENERAL STORES)
DEPARTMENT OF DEFENCE PRODUCTION & SUPPLIES
POST BOX NO. 127, KANPUR

THIS SPECIFICATION OR ANY PATTERN DRAWING OR OTHER INFORMATION ISSUED IN CONNECTION THEREWITH, MAY ONLY BE USED FOR A SPECIFIC ORDER PLACED BY A COMPETENT OFFICER OF THE MINISTRY OF DEFENCE AND IS NOT TO BE USED FOR ANY OTHER PURPOSE WHATSOEVER

SECTION I - GENERAL

1.1 This specification and other information issued in connection therewith may be used for a particular order placed or to be placed by competent authority. It is not to be used for any other purpose, whatsoever, without **EXPRESS WRITTEN SANCTION OF THE ~~DIRECTOR, R&DE (Engrs), Dighi, PUNE-411015~~.** CONTROLLER, CONTROLLERATE OF QUALITY ASSURANCE (GENERAL STORES) KANPUR ON BEHALF OF THE DIRECTOR GENERAL QUALITY ASSURANCE, MINISTRY OF DEFENCE, NEW DELHI

1.2 This specification must be returned on submission of the tender/on completion of the order.

1.3 Any proposal for any change in this specification and the manufacture will be addressed to the ~~Director, Research & Development Establishment (Engineers), Dighi, PUNE-411015.~~ Controller, Controllerate of Quality Assurance (General Stores) Kanpur. No request for any deviation will be entertained from the sub-contractor, if any, except through the main Contractor.

1.4 The Inspecting authority may, at his discretion, check the test results obtained at manufacturer's works by indepedent test at the Government Test House or elsewhere.

SECTION II - SCOPE

2.1 This specification covers the materials, fabrication, manufacture, workmanship, quality control, inspection/testing and packaging for 'Sledge Evacuation (FRP)', for use at sub-zero temp. conditions in high altitude and glacier areas.

SECTION III - DRAWINGS & SPECIFICATIONS

3.1 **Drawings.** Drawing numbers given below pertaining to Sledge Evacuation (FRP) form a part of this specification. Any modification suggested during the manufacture of pilot sample shall be incorporated in these drawings with prior approval of ~~Inspecting~~ Inspection Authority.

Drawing No.		Nomenclature	Plate No
EGA-239	:	Sledge Evacuation (FRP)	1/31
EGA-908	:	Body L. H. assembly	2/31
ESA-909	:	Body R. H. assembly	3/31
ESA-910	:	Handle pipe	4/31
EPD-9067	:	Bolt Bracket	8/31
EPD-9068	:	Sleeping pad	9/31
EPD-9069	:	Cover curtain	10/31

ESA-911	:	Ind cover Bracket Assembly	5|31
ESA-912	:	Angle Middle L. H. assembly	6|31
ESA-913	:	Angle Middle R. H. assembly	7|31
EPD-9070	:	Body Sledge	11|31
EPD-9071	:	Stiffener Small	12|31
EPD-9072	:	Stiffener Large	13|31
EPD-9073	:	Hook	14|31
EPD-9074	:	End Side Plate	15|31
EPD-9075	:	Bracket Pipe Handle	16|31
EPD-9076	:	Ring	17|31
EPD-9077	:	Side Plate	18|31
EPD-9078	:	Side Slotted Angle	19|31
EPD-9079	:	End Cover Plate	20|31
EPD-9080	:	Handle Plate	21|31
EPD-9081	:	Lever Plate	22|31
EPD-9082	:	Bush	23|31
EPD-9083	:	Eye Bolt	24|31
EPD-9084	:	Angle Middle L. H.	25|31
EPD-9085	:	Cover Plate	26|31
EPD-9086	:	Angle Middle R. H.	27|31
EPD-9087	:	Clamp	28|31
EPD-9088	:	Pipe	29|31
EPD-9089	:	Handle	30|31
EPD-9090	:	Stopper.	31|31

3.2 **Specifications.** All materials used in the manufacture of Sledge Evacuation (FRP) shall conform to the relevant Indian Standard Specifications. Whenever these have not been mentioned relevant BS/ASTM specifications as mentioned shall be applicable.

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3.2.1 The following specifications shall apply :

Indian Standards		**Nomenclature**
IS-733	:	Wrought aluminium and aluminium alloy bars, rods and sections (for general engineering purpose)
IS-4727	:	Nylon webbing for aeronautical purposes
IS-2102	:	General tolerances for dimensions and form and position.
IS-4084	:	Specification for eyelets and washers.
British Standards		
BS-3496	:	Specification for E glass fibre chopped strand mat for reinforcement of polyester resin system.
BS-3749	:	Specification for wovenglass fibre rovings and fabrics for the reinforcement of polyester resin systems
BS-3532	:	Specification for unsaturated polyester resin systems.
ASTM Standards		
ASTM	:	Stainless steel 304/316.

3.3 Copies of Indian Standard Specifications referred to above may be obtained from Bureau of Indian Standards, Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI-110001.

SECTION IV - GENERAL DESCRIPTION

4.1 The main body of the sledge is made of fibreglass reinforced plastics (FRP) having the shape of a small dinghy. Various fittings and fasteners are made out of stainless steel. It is designed to carry a payload of 200 Kg in the snow bound high altitudes and in glacier areas where the movements of conventional wheeled or tracked vehicles are not possible. Basically, it is designed to evacuate casualties in the glacier areas. To meet this requirement, the sledge is fitted with cushion and waterproof cover to accommodate the casualty. The sledge has got the following major components :

a) Sledge Body
b) Cushion and water proof cover
c) Handles.

4.1.1 **Sledge Body.** The sledge body is the main deck on which the load is placed for carriage. It is in two halves and are made of FRP laminate with aluminium alloy angles or angles made of composites embeded and rivetted to the top of the sledge to give strength and rigidity to the body. Different fittings in stainless steel have been used to provide facilities for securing the casualty on a stretcher properly at the time of evacuation. Provisions have also been made on the body for fitting four handles (two on either end) required for towing/dragging/lifting the sledge on snow/ice. The overall dimensions of the body are 1950 mm x 566 mnm x 245 mm.

4.1.2 **Cushion and Waterproof Cover.** A cushion of 980 mm x 290 mm x 40 mm size in flexible foam suitable for use in sb-zero temperature conditions has been provided alongwith a waterproof cover for the comfort of the casualty at the time of evacuation.

4.1.3 **Handles.** Four handles in tubular aluminium alloy extrusions have been provided for towing/dragging/lifting the sledge on snow/ice and on ice pinacles. Each handle is 1620 mm long.

SECTION V - MATERIALS

5.1 The body of the sledge shall be of FRP (Fibreglass Reinforced Plastics) laminates. Aluminium alloy angles or angles made of composites shall be embeded and rivetted to the top edge of the sledge. All fittings and fasteners shall be manufactured out of stainless steel while the cushion and waterproof cover shall be of flexible type foam and nylon cloth respectively. The materials used for the manufacture of the sledge with metallic fittings shall conform to the following specifications.

(a) Aluminium alloy extrusions and sheets	-	Alloy 52000 or 63400 in WP condition as per IS-733.
(b) Stainless steel	-	Grade SS 304/SS 316 as per ASM Vol. 3.
(c) Rivet (Aluminium)	-	NR5 as per IS-733.
(d) Flexible foam (cushion)	-	Polyurethane foam of density 26 Kg/cu.m.

(e) Waterproof cover - Polyurethane coated nylon fabric 600 gms/sq.m. fitted with aluminium eyelets and washers as per IS-4084.

(f) Straps - As per IS-4727.

(g) Chopped Strand Mat (CSM) in 'E' type glass 300 gms/sq.m. and 450 gms/sq.m. conforming to BS-3496.

(h) Woven Roving Mat in 'E' type glass 570 gms/sq.m. conforming to BS-3749.

(j) Bisphenol Resin conforming to BS-3532.

SECTION VI - MANUFACTURE, WORKMANSHIP & FINISH

6.1 The manufacture involves mainly making a mould in FRP for the main body and then building the main body using the FRP mould. Fibreglass reinforcement to be used in the lay-up shall be in the form of chopped strand mat (CSM) of 300 gms/sq.m. and 450 gms/sq.m., woven roving mat of 570 gms/sq.m. and surface mat of 30 gms/sq.m. The layers of CSM and woven roving mat shall be used alternatively. Surface matings shall be used on the top surfaces. A thickness of 4.5 mm to 5 mm shall be achieved by using these layers. The outer surface of the sledge shall have a smooth finish in order to have minimum possible friction at the time of actual use on snow/ice. The inner surface of the sledge also shall have a very smooth finish.

6.2 The materials shall be reasonably free from imperfections, discolour actions, foreign matter and other defects. It is to be stored in the approved manner under clean, dry conditions and is to be withdrawn from storage and its packaging several days before use to allow it to condition in the moulding shop.

6.3 Surface of the mould shall be treated with 0.4 + / - 0.1% of silance conforming to Union Carbide designation A-174 or other approved equivalent.

6.4 Bisphenol resin to be used shall conform to BS-3532. Styrine content of the resin shall not exceed 35 - 40% . The recommendations of the manufacturers in the proportions of the various materials used in the resin system shall be followed. Care shall be taken to ensure accurate measurement and mixing of the quantities of these materials.

6.5 The catalyst used shall be methyl ethyl katone peroxide. Accelerator used shall be cobalt napthanate. The type and quantity of the catalyst and accelerator are to be such that the resin shall set quickly and completely without use of the local heat. The setting time shall

generally not exceed one hour; otherwise suitable precautions and adjustments are to be made to avoid excessive loss of styrinemonomers. The amount of any thixotropic additive is to be the minimum necessary to prevent serious drainage.

6.6 The mechanical properties of the FRP laminate manufactured following the above mentioned conditions in hand lay up method shall be minimum as under :

a) Tensile strength 800 Kg/sq.cm. to 1200 Kg/sq.cm.

b) Flexural strength 800 Kg/sq.cm. to 1200 Kg/sq.cm.

6.7 The colour imparted to the FRP skin shall be saffron.

6.8 Necessary jigs & fixtures required for the successful manufacture/fabrication of the sledge shall be planned, designed and manufactured before commencing the fabrication of the sledge.

6.9 All fitment items required for the assembly of the sledge shall be fabricated and aligned properly before finally fitting on the sledge.

6.10 **Workmanship & Finish.** The workmanship shall be of the highest order. Particular care shall be taken by the contractor at the time of designing the jigs and fixtures. The contractor shall ensure that no air is entraped between the FRP layers. The contractor shall take note of the fact that bad workmanship will result in rejection of the sledge.

SECTION VII - QUALITY CONTROL

7.1 Quality control shall be exercised by adopting the following procedure.

7.1.1 **Sampling and conformity criteria.** The sampling of the raw materials shall be done and the samples shall be tested to ensure the conformity with the relevant specifications. The sampling for testing the mechanical properties of the FRP laminate shall be done. The samples thus collected shall be subjected to tests to ensure the values mentioned in para 6.6 above.

7.1.2 **Pre-inspection.** Manufacture/Contractor must satisfy themselves that the stores are in accordance with the terms of contract and fully conform to the required specifications by carrying out a thorough pre-inspection of all materials before actually tendering the same for inspection to the ~~Inspecting Authority~~ Inspection Authority at the pilot sample stage. A declaration by the Contractor that the necessary pre-inspection has been carried out on the stores tendered shall be submitted alongwith the request for inspection and

clearance of materials for the pilot sample. The declaration will also indicate the method followed in carryingout the pre-inspection showing the features checked/ tested and will be accompanied by manufacturer's test certificate and laboratory test results, wherever relevant.

SECTION VIII - INSPECTION

8.1 It shall be open to the Govt. representative to inspect the components of the sledge at any stage of manufacture namely :

a) Pre-production stage
b) Production stage
c) Stage of preparation for delivery.

The manufacture shall provide all facilities free of charge for carrying out inspection.

8.2 However, the inspection shall be carried out at the following stages of fabrication :

a) Fabrication of FRP mould
b) Moulding of the main body
c) Fabrication of handles
d) Fabrication of fitment items
e) Fabrication of cushions
f) Final assembly
g) Packaging.

8.3 No part of the work shall be repaired or rectified without the approval of the Inspecting Authority.

8.4 The Contractor shall afford, at his own expense, the ~~Inspecting~~ Quality Assurance Officer of reasonable accommodation and inspection and testing facilities for satisfying himself that the stores are being or have been manufactured in accordance with the specifications and for this purpose the ~~Inspector~~ Q.A. Officer shall have full and free access at any time during the contract to the Contractor's work and may require the Contractor to make arrangements for anything pertaining to this contract, to be inspector at his premises or any other connected place and the Contractor shall arrange similar facilities, at his own expenses as regards any sub-contract he may make.

8.5 The Contractor shall pay all the costs connected with such tests and any other tests covered under Quality Control provisions and provide without any extra charges, all material, tools. gauges, labour and assistance of every kind which the ~~Inspector~~ Q.A. Officer may consider necessary

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for any tests and examinations, other than special or independent tests which he shall require to be made on Contractor's premises and shall pay all costs attendant thereon, failing these facilities (in regard to which the Inspector shall be sole judge) at his own premises for making the tests, the Contractor shall bear the cost of carrying out such tests elsewhere.

SECTION IX - PACKING & IDENTIFICATION

9.1 **Identifications.** The sledge shall be legibly and indelibly labelled at a suitable place with the manufacturer's name, recognised trade mark and the year of manufacture.

9.2 **Packaging.** The handles shall be packed in hessian cloth and the identification mentioned in para 9.1 shall be stamped/marked on the packages. Halves shall be assembled and kept inside a polythene bag and then placed inside a wooden crate suiting to the dimensions of the halves.

9.3 **Identification of Packages.** Each wooden crate alongwith the package of handles for each sledge shal have the reference of contract particulars, date of manufacture, lot number and total weight painted/stamped legibly on it. Also each such packing shall have the details giving the following informations :

a) Manufacturer's Name

b) Description of materilas

c) Weight of consignment

d) Any other particulars required by the ~~Inspecting~~ Inspection Officer.

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APPENDIX 'A'

COMPLIANCE MATRIX WITH REFERENCE TO THE INSPECTION OF "SLEDGE EVACUATION (FRP)" AS PER SPECIFICATION NO. ~~RDEE/ENGR/SPCN/0195~~ CQA(GS)/US/

QUALITY CONFORMANCE INSPECTION PARAMETERS

Section/ Paragraph	Description	Complies Yes/No/ Satisfactory	Remarks
VII/12 a)	**INSPECTION OF BASIC MATERIALS**		
1.	Samples of all basic materials as per the relevant standards		
2.	Basic materials accepted based on test certificate from recognised laboratories submitted by the contractor		
3.	Basic materials accepted based on the certificates given by the manufacturers/suppliers		
4.	Basic materials supplied by the Government		
5.	Test results of the sample laminates		
VIII/13 a)	**TOOLINGS**		
1.	Moulds of the main body		
2.	Fixtures for assembling various fitments		

b) **COMPONENTS ON THE SHOPFLOOR**

Visual Inspection:

1. General appearance and finish of all fitment items

2. General appearance and finish of cushions

3. General appearance and finish of water-proof cover

4. General appearance and finish of handles

Dimensional Inspections :

1. Overall dikmensions of fitment items, cushions, waterproof cover and handles.

2. Critical dimensions of fitment items, cushions, waterproor cover and handles.

Moulding of the halves for main body

1. Method of lay-ups (by hand) in the resin system.

2. Embedding and assembling of the fitment items in the main body.

3. General appearance and finish of the main body.

4. Colour of the main body.

5. Overall and critical dimensions of the main body.

c) **ASSEMBLY OF SLEDGE**

1. Assembled sub-assemblies.

2. Fit of sub-assemblies to the main body & complete the sledge.

3. Matching of the two halves.

4. Fitting of handles.

5. Fitment of waterproof cover.

6. Overall dimensions.

7. Critical dimensions.

8. Identification plate on the main body.

9. Weight of the sledge including handles (not to exceed 26 Kgs).

d) **FUNCTIONAL TESTS**

1. Ease of fitting the handles.

2. Ease of joining the two halves of the main body.

3. Placement of cushion on the main body.

4. Placement of a "dummy casualty" on the sledge and covering with water proof cover.

5. Dragging and lifting of the sledge inthe process of carrying the dummy Casualty".

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PACKING & IDENTIFICATION

1. Packing of handles.

2. Packing of sledge.

3. Particulars on the package.

CONCLUSION

The Sledge Evacuation (FRP) comply in all aspects to the extent furnished herein.

Specimens of the materials have been tested as per relevant standards mentioned in the specification.

CERTIFIED TO BE ACCEPTABLE

(SAT PAL SINGH) 2/8
JAG(NFSG)
CONTROLLER.

(D. C. SONKAR) 2/8
JSO.
Gd/GSS (G-7)

2/8/04
(C S N PUROHIT)
Lt. Col
D.C.

(DRYADAY) 2/8
JAG(NFSG)
Addl. CONTROLLER.

AUTHORISED REP FOR
~~INSPECTING~~ AUTHORITY
INSPECTION

PROJECT OFFICER
FOR DIRECTOR