UNSEALED SPECN ON CQA(GS)/US/474

GO/G-11

Supersedes Specn No RDEE/ENGR/SPCN/0205

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

UNSEALED SPECN No CQA(GS)/US/474

~~SPECIFICATION No. RDEE/ENGR/SPCN/0205~~

FOR

LADDER CREVASSE CROSSING

ISSUED BY
THE CONTROLLER
CONTROLLERATE OF QUALITY ASSURANCE (GENERAL STORES)
POST BOX NO - 127
KANPUR

UNSEALED SPECN NO CQA(GS)/US/474

GC/G-11

SECTION I : GENERAL INSTRUCTIONS

1.1 This specification and other information used in connection thereof may be used for a particular order placed or to be placed by a competent authoity. It is not to be used for any other purpose, whatsoever, without **EXPRESS WRITTEN SANCTION OF THE ~~DIRECTOR, R & D E (ENGRS), DIGHI, PUNE-411015~~.** Controller, Controllerate of Quality Assurance (General Store) Kanpur on behalf of the Director General Dte Gen Quality Assurance Min 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 subcontractor, if any, except through the main Contractor.

1.4 The ~~inspecting~~ Inspection authority, at his discretion may check the test results obtained at the manufacturers work by independent test at the Govt. Test House or elsewhere.

SECTION II - SCOPE

2.1 This specification covers the materials, fabrication,manufacture, workmanship, quality control, inspection and packaging for Ladder Crevasse Crossing for high altitude and glacier.

SECTION III - GENERAL DESCRIPTION

3.1 Ladder Crevasse Crossing is an equipment used in high altitude and glacier areas under sub-zero temperature conditions of magnitude upto -50 deg. C for crossing the crevasses encountered in these areas. Light weight, strength, ease of portability and operation are the salient features of this Ladder.

3.2 The ladder consists of two halves each of dimensions 6910 mm long and 430 mm width resting one over the other when in folded condition. By means of rope and set of pulleys fixed to these halves, the ladder's one half is made to slide over the other and get locked after extending upto the desired length depending upon the width of the crevasse to be crossed. Each half of the ladder has 24 Nos of intermediate members (steps) at a spacing of 230 mm each. Each half of the ladder carries wheels at each end for ease of movement on the surface of glacier.

3.3 The weight of the ladder complete with all fitments shall be 45 Kgs gross. The ladder shall be first wrapped with polythene sheet and then with bitumen coated hessian cloth. The ladder then shall be crated at the ends and in the middle with timber battens.

3.4 The materials used for the ladder are aluminium alloy extrusions, stainless steel, nylon, teflon and polypropelene as light weight and strength under the adverse terrain and environmental conditions are of prime importance.

SECTION IV - DRAWINGS AND RELATED SPECIFICATION

4.1 The various standards referred to in this specification are as under :

IS-733	:	Specification for wrought aluminium & aluminium alloy bars, rods and section (for general engineering purpose)
IS-5175	:	Specification for polypropylene lines and ropes for marine purposes.
IS-1285	:	Specification for wrought aluminium and aluminium alloy extruded round tube and hollow section (for general engineering purposes)
IS-740	:	Specification for aluminium and aluminium alloy rivets stock for General Engineering purposes.

4.2 The latest editions of the specifications are to be referred to during manufacture/fabrication.

4.3 Where the specifications are not mentioned, the specifications as mutually agreed to considering the usage of the equipment will be the governing specification.

4.4 All the drawings are enclosed to the General Assembly Drawing No LCC-1-100 and are as follows. These give the details of the components and the assembly.

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Drawing No		Description
LCC-1-100	-	Ladder Crevasse Crossing
LCC-2-010	-	Ladder Assembly
LCC-3-011	-	Side Member
LCC-4-012	-	Intermediate Member (step)
LCC-4-013	-	Cap
LCC-3-014	-	Clip Bracket
LCC-3-015	-	Wheel Nylon
LCC-4-016	-	Bush
LCC-4-017	-	Shaft for wheel
LCC-3-020	-	Pulley Assembly
LCC-3-021	-	Pulley Teflon
LCC-3-022	-	Bracket, Pulley
LCC-4-023	-	Shaft, Pulley
LCC-3-030	-	Lock Arm Assembly
LCC-4-031	-	Stud
LCC-4-032	-	Stud, Hook
LCC-3-033	-	Lock, Arm

All possible dimensions have been given therein with requisite engineering tolerances and allowances as and where applicable. These drawings also form a part of this specification. These are engineering drawings and NOT MANUFACTURING DRAWINGS/ FABRICATION DRAWINGS OR SHOP FLOOR DRAWINGS. Based on these drawings the manufacturer/contractor shall make his own manufacturing drawings if required, compatible with his manufacturing/fabrication potential, process set up and machinery. Capabilities and capacities of the machines and techniques of fabrication may be taken into consideration while preparing his own manufacturing drawings. However any deviations in the dimensions/ tolerances shall be implemented only with prior approval of the ~~**DIRECTOR, R&DE (Engrs), Dighi, PUNE-411015**~~ Controller, Controllerate of Quality Assurance (General Store) Kanpur Post Box No 127 and only the approved set of drawings shall be used for manufacture and inspection.

4.5 The inspection gauges used shall be as per relevant ISS only.

4.6 The manufacturer shall make his own inspection fixtures/special gauges if he desires and the same shall be approved by the ~~**DIRECTOR, R&DE (Engrs), Dighi, PUNE-411015**~~.

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(General Store) Kanpur.

4.7 In case of non-availability of material as per IS standard, material conforming to BS DIN or ISO or any other specification may be used only with the approval of ~~**DIRECTOR, R&DE (Engrs), Dighi, PUNE-411015.**~~ Controller, Controllerate of Quality Assurance (General Store) Kanpur

4.8 The manufacturer shall not change critical dimensions and tolerances and shall use such materials which will not affect gross weight of the equipment.

4.9 These drawings and this specification are to be used for the specific order only and NOT for subsequent orders unless otherwise specifically permitted by the ~~**DIRECTOR, R&DE (Engrs), Dighi, PUNE-411015.**~~ Controller, Controllerate of Quality Assurance (General Store) Kanpur

SECTION V - REQUIREMENTS

5.1 MATERIAL

The Ladder Crevasse Crossing is an equipment intended for crossing of crevasses encountered in high altitude and glacier regions/areas under subzero temperatures upto -50 deg C. As the Ladder has to be light weight, strong, easy to operate and maintain under such adverse and hazardous environmental conditions and terrtain topography, it is fabricated/manufactured out of materials like aluminium alloy, stainless steel, nylon, teflon and rubber which have suitable properties to withstand subzero temperature conditions.

5.2 DESCRIPTION

The ladder consists of two halves - one sliding over the other. Each half is 6910 mm long & 430 mm wide and rests one over the another in folded condition. The side members of each half and 24 intermediate members (steps) are made of two types of special aluminium alloy extrusions. The fitment items/components for each half of the ladder are as follows :

(a) **Nylon Wheels.** One end of both side members of each half is fitted with NYLON WHEELS for easy movement on the ground at both banks of the crevasse i.e. home bank and far bank. The material grade for Nylon shall be NYLON 6 OR 66.

(b) **Pulley Assembly.** A teflon pulley block is fitted to the first intermediate member of each half reckoned from the end with nylon wheel.

(c) **End Rope Connector.** It is a standard eye-bolt in stainless steel and fitted on to the intermediate member having the Teflon pulley block in the top half of the ladder.

(d) **Clip Bracket.** Two aluminium alloy clips are welded/rivetted to the side members at the end of the ladder half fitted with nylon wheels.

(e) **Lock Arm Assembly.** These are of special configuration and design made of aluminium alloy plates and are connected with a connecting rod. The assembly is fitted in between the side members of the ladder and located in between IInd and IIIrd intermediate members reckoned in the opposite end of the side having pulleys. This hook locks the two halves of the locker when in folded condition.

(f) **End Rubber Caps.** These are fitted at the end of the side members blocking the existing holes of the side members.

(g) **Polypropelene Rope.** A Polypropelene rope of length 22000 mm and diameter 10 mm is passed over teflon pulley blocks with one end tied permanently to the eye bolt in one half of the ladder while the other end is taken along traversing the length of the two halves of the ladder after passing over the teflon pulleys and tied to one of the intermediate members at the end of the other half of the ladder.

5.2.1 The gross weight of the ladder inclusive of all fitments shall not be more than 45 Kgs and the wooden packing shall be of proper design to sustain transportation hazards.

5.3 OPERATION

The ladder crevasse crossing is carried to the site of the crevasse to be crossed. The end of the polypropelene rope tied to the intermediate member is untied and pulled so that the top half of the ladder slides over the bottom half and extends to bridge the gap of the crevasse and the other end reaches the far bank of the crevasse and gets well supported.

5.3.1 The clip brackets allow the halves of the ladder to slide through them for adjusting the length of the ladder depending upon the width of the crevasse to be crossed. The maximum width of the crevasse that can be negotiated with the help of this ladder is dependant on site conditions. However normally a gap of 10 m to 11 m can be bridged by this ladder.

5.3.1.1 The ladder crevasse crossing has to be supplied in fully assembled condition. No assembly shall be done at site except its operation.

5.3.1.2 To identify top half and bottom half the ladder TOP and BOTTOM shall be distinctly marked on the respective half of the ladder.

5.3.1.3 The sliding operation has to be smooth and hence the straightness of the side members and uniform width throughout the length of each half must be maintained. The fitment items govern the performance of the ladder and smooth operation of pulley and rope. Clipbrackets (sliding brackets) and rotational freedom of nylon wheels must be ensured.

5.4 SITE CONDITIONS

5.4.1 The ladder crevesse crossing shall be operated under environmental temperature conditions of minus 20 deg. to minus 50 deg. C.

5.4.1.1 The storage condition will be environmental conditions between minus 50 deg. C to plus 40 deg. C.

5.5 FABRICATION / MANUFACTURE

5.5.1 The fabrication involves cutting of aluminium alloy extrusions into the required lengths and machining of the ends of intermediate members, press-fittings of intermediate members into the machined holes of side members and flaring the ends using special tools.

5.5.1.1 Nylon wheels shall be machined out of nylon rounds of grade 6 or 66 moulded to shapes.

5.5.1.2 All threaded fasteners shall be of stainless steel grade 304 as per ASTM.

5.5.1.3 Manufacture of necessary fixtures for assembly and jigs and fixtures for machining of components shall be the responsibility of the Contractor/ Manufacturer. However the Contractor must ensure proper alignments of components during and after assembly.

5.5.2 (a) **Side Frame Structure.** This shall be made of extrusions of aluminium alloy 64430 WP as per IS-733. The straightness of the side members is to be perfect and there shall be no bend, dent or distortion even after the fabrication of the ladder.

(b) **Intermediate Members (Steps).** These shall be made from aluminium alloy 64430 WP extrusions and must be placed equidistantly as shown in the relevant drawings.

(c) **Nylon Wheels.** The wheels shall be made from nylon grade 6 or 66 material and shall be free to rotate. The colour of the material shall be orange red for ease of identification of its placement.

(d) **Teflon Pulley For Rope.** The pulley is for rope polypropelene of 10 mm dia. Superior grade of teflon shall be used.

(e) **Polypropelene Rope.** The rope shall be of 10 mm dia and as per IS-

5175. The ends of the rope shall be properly heat sealed to avoid tissues or fibres coming out during use. The colour of the rope shall be bright yellow to identify its placement.

(f) **Bolts for Fitments.** The material for the bolts shall be Stainless steel of grade ASTM 304.

(g) **Rubber Caps for Ends of side Members.** These shall be of special rubber blended suitably to withstand temperature upto minus 50 deg. C. The moulding shall be high quality. No cracks shall develop during storage conditions as well as during usage.

(h) **Threaded Fastners.** All threaded fastners shall be as per IS standard. The bolts, studs, nuts and washers must be interchangeable to minimise the number of tools required.

5.6 PACKAGING

5.6.1 The ladder shall be first wrapped with polythene sheet or kept in a polythene bag and then shall be wrapped with bitumen coated hessian cloth. Ends of the ladder shall be protected from any damage during transportation, handling and storage by way of providing some cushioning at the ends before putting the ladder in the polythene bag and its subsequent wrapping with hessian cloth.

5.6.1.1 The ladder shall then be packed at three placed viz. at both ends and at the middle along its length with suitable wooden/timber framework which will protect the ladder from damage during transportation, handling and storage by stacking.

5.6.1.2 The gross weight of the ladder shall be 45 Kgs and dimensions in folded conditions length 6936 mm x width 450 mm x height 150 mm.

5.7 IDENTIFICATION

5.7.1 The equipment ladder crevesse crossing shall be fitted with the name plate of proper size. The plate shall be of anodized aluminium plate rivetted to one of the halves of ladder frame preferably the bottom half frame on the outer surface near the nylon wheel end side. The size of the plate shall be L 100 mm x W 35 mm. The thickness shall be between 2 mm to 3 mm. The information on the name plate shall carry the following details in **BOLD CAPITAL ENGLISH LETTERS** engraved and filled with red colour or any other colour making it distinct over the background of the plate.

(a) NOMENCLATURE - LADDER CREVASSE CROSSING

(b) MANUFACTURER'S NAME & ADDRESS

(c) YEAR OF MANUFACTURE

5.8 INSTRUCTION PLATES

5.8.1 Two small plates of aluminium of size 50 mm x 2 mm to 3 mm thick shall be provided for identification of top half and bottom half of the ladder. The plates shall be anodized and engraved with word **'TOP'** on one plate and **'BOTTOM'** on another plate. The plates shall be rivetted on the main frame near the nylon wheels.

5.9 LITERATURE

5.9.1 The Contractor shall supply one set of the following literature with every ladder on the formats enclosed to the specification in printed form in **ENGLISH** Language :

(a) List of normal maintenance tools

(b) List of spares for two years maintenance, if any

(c) List of special maintenance tools, if any

(d) List of special tools, if any.

5.9.1,1 All tools must be of metric size and conforming to IS standard and standard make like **GEDORE**.

5.10 TOOLS & REPAIR KITS

5.10.1 The ladder crevasse crossing being used in remote areas of high altitude the requisite tools and spares shall be provided suitably packed and labelled for identification.

(a) **Tools.** Spanners DE of Gedor or Taparia make. The spanners shall be adequate for all the threaded fasteners used. An insulated cutter plier size 300 mm of standard make.

(b) **Repair Kit.** This shall comprise of two sets of all threaded fastners i.e. nuts, bolts, washers used in the ladder.

(c) **Spares.** One nylon wheel, one Teflon pulley and one length of the polypropelene rope.

5.11 ACCESSORIES

5.11.1 The equipment ladder crevasse crossing shall be packed in folded condition as already mentioned in para 4.3.4 above. The tools and spares for each ladder shall be packed in a separate wooden box and shall be supplied alongwith the packed ladder.

5.12 WORKMANSHIP

5.12.1 The workmanship shall be of the highest order. Proper jigs/fuixtures and tools shall be used to accomplish this. Every component shall be of high quality finish which calls for the best machining process with specially designed jigs/fixtures and tools.

5.12.2 The sharp corners and burrs shall be removed during machining and the fitment shall not pose any problems.

5.12.3 The holes shall be finished and centre to centre distance shall be properly maintained. No interference fits shall be used unless otherwise specifically mentioned in the drawing. Interchangeability shall also be taken into consideration and there shall be no rejection on account of this.

5.12.4 The straightness of the frame members shall be ensured before and after fabrication and assembly. Since the two halves have to slide one over the another, the rubbering surface along the length must be given due care/attention.

SECTION VI - QUALITY CONTROL

6.1 The Contractor shall procure the approved quality of material as per IS/relevant standards and shall furnish test data/test report together with samples for approval before actual use. The approval/ test reports for the material shall be from the recognised laboratories and the materials may be subjected to the **THIRD PARTY INSPECTION** if agreed to between the manufacturer and the Govt. viz. the ~~**Director, R&DE (Engrs), Dighi, PUNE-411015.**~~

6.1.1 If a material is rejected the Contractor shall procure correct material at his own cost and no compensation on account of cost of rejected materials will be made.

6.1.2 The ladder crevasse crossing after inspection and approval togetherwith tool kit, literature, repair kit etc. shall be packed as specified above. The list of packed contents shall be available in each box. The packing box shall be designed by the Contractor and the drawing of the same shall be got approved from the ~~**Director, R&DE (Engrs), Dighi, PUNE-411015.**~~

SECTION VII - INSPECTION

7.1 GENERAL

7.1.1 The inspecting authority shall be the ~~Director, R&DE (Engrs), Dighi, PUNE 411015~~ Controller, Controllerate or his authorised representative and the Contractor shall comply with the standards of inspection, methods of inspection and subsequent requirements as stipulated by the inspecting authority. All IS standards/specifications of materials, inspection facilities shall be arranged/provided free of cost by the Contractor at his premises. The decision of the inspecting authority shall be final and binding on the Contractor.

7.1.2 The stages of inspection are as follows :

(a) Samples of all materials as per the relevant IS standard or as per standard mutually agreed upon.
(b) Approval of jigs and fixtures and first sample component taken out of them.
(c) Shop floor inspection during stages of manufacture of components.
(d) Component assembly inspection and inspection of complete equipment's final assembly.
(e) Inspection of tools, spares, repair kit, packing box etc.
(f) Inspection of the packed ladder.

7.1.3 The Contractor shall tender all the materials, components and also the test reports, relevant standards to the inspecting authority.

7.1.4 The inspecting authority shall have the discretion to take any random samples at any stage of inspection and inspect.

7.1.5 Any defect shall not be repaired without concurence of the Inspector and without presence of the Inspector / inspection authority. Any repaired/rectified items shall be used only after the written approval of the inspecting authority.

7.1.6 The progress report shall be rendered by the Contractor to the inspecting authority for planning the inspection as per the "Compliance Matrix" enclosed as Appendix `A' to this specification.

7.2 DELIVERY

7.2.1 The delivery of the equipment on its approval shall be made to **R&DE (Engrs), Dighi, PUNE-411015** or to any other consignee as directed by the ~~**Director, R&DE (Engrs), Dighi, PUNE-411015.**~~ CQA(GS) Kanpur Controller, Controllerate of Quality Assurance (General Store) Kanpur

COMPLIANCE MATRIX WITH REFERENCE TO THE INSPECTION OF LADDER CREVASSE CROSSING AS PER SPECIFICATION NO. ~~RDE/ENGR/SPEC/0205~~ UNSEALED, SPECN NO CGA(GS)/US/474

Section/ Paragraph	DESCRIPTION	COMPLIES YES / NO/ SATISFACTORY	REMARKS
	QUALITY CONFORMANCE INSPECTION PARAMETERS		
VII/7.1.2			
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 supplied by the Govt.		
4)	Materials procured by the Contractor		
b)	**TOOLINGS**		
1)	Components manufactured by using the jigs & fixtures made by the Contractor		
2)	Fixtures for assembly.		

c) **COMPONENTS IN THE SHOP FLOOR**

Visual inspection :

1) General appearance and finish
2) Free from cracks & burrs
3) Rounding of corners

Dimensional Inspection :

1) Overall dimensions
2) Critical Dimensions

d) **ASSEMBLY OF LADDER**

1) Assembled sub-assemblies
2) Fitment of asub-assemblies to complete the ladder
3) Straightness of Top & Bottom halves
4) Overall dimensions
5) Critical dimensions
6) Instruction plates on two halves as 'TOP' or 'BOTTOM' as per para 5.8
7) Identification plate

e) **FUNCTIONAL TESTS**

1) Smooth sliding of 'top half' on the bottom half
2) Rotational freedom of nylon wheels and pulley
3) Fitment of the polypropelene rope
4) Functioning of lock arm assembly
5) Good condition of mechanical fasteners
6) Optimisation of weight for ease of carriage
7) Testing with simulated loading in a gap of 10 to 11 m.

f) **TOOLS, SPARES, REPAIR KIT, PACKING**

Tools

1) Insulated cutting plier - 1 No
2) D.E. spanner 14/17 mm - 2 Nos

Spares & Repair kit

1) Polypropelene rope 10 dia - 22 m long
2) Teflon Pulley - 1 No
3) Nylon Pulley - 1 No
4) SS Bolt 8 x 50 long - 2 Nos
5) SS Hex. Nut 8 mm - 2 Nos
6) SS Plain washer 8 mm - 2 Nos
7) SS Ring washer 8 mm - 2 Nos
8) SS Lock Nuts 8 mm - 2 Nos

Packing

1) Printed list of tools & spares
2) Packing box

g) **PACKED LADDER**

1) Protection of ends
2) Polythene wrapping / polythene bag
3) Wrapping with bitumen coated hessian cloth
4) Crating

CONCLUSION

The Ladder Crevasse Crossing (LCC) comply in all aspects to the extent furnished herein

Specimens of basic materials used in the manufacture/fabrication of the LCC have been tested as per relevant standards mentioned in the specifications.

CERTIFIED TO BE ACCEPTABLE

AUTHORISED REP FOR INSPECTING AUTHORITY

(A K BANDYOPADHYAY)
JAG (NFSG)

PROJECT OFFICER FOR DIRECTOR

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