KOLKATA METRO RAIL CORPORATION LIMITED

EAST WEST METRO PROJECT

CONTRACT – RRE (R)

DESIGN, MANUFACTURE, SUPPLY, TESTING & COMMISSIONING AND TRAINING OF PERSONNEL OF RE-RAILING & RESCUE EQUIPMENT FOR CENTRAL PARK DEPOT OF KOLKATA METRO RAIL CORPORATION LIMITED

TENDER DOCUMENTS

VOLUME 3

PARTICULAR SPECIFICATION

Date of Issue: 03.01.2018

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1 PROJECT AND PERMANENT WORKS

1.1 Location and Boundaries

The equipment shall be used for the complete network of East West metro project of KMRCL.

1.1.1 Climatic Conditions and Operating Environment

The equipment shall be required to work under the following climatic conditions:

1.1.2 Maximum ambient temperature 45 °C

- Relative humidity during rainy season 100 %
- Minimum ambient temperature 3 °C
- Environment : Dusty with Industrial Pollutants
- Water Hard with high salt content.

1.2 General Description of the Works

1.2.1 The Works shall comprise of design, manufacture, delivery, testing & commissioning of 02 sets of Re-railing & Rescue Equipment (RRE), to be kept and maintained at the Depot cum Workshop of Kolkata Metro Rail Corporation. The arrangement shall be used for rescue and re-railing operation within KMRCL network in Kolkata.

1.2.2 The Works also include design, manufacture, delivery, testing & commissioning of one container, required for systematic stacking and carrying of one set of the Re-railing & Rescue Equipment to be supplied against this tender. The container shall be capable of being lifted by a road mobile crane / EOT Crane for its loading/unloading purposes on/from a road truck / rail vehicle designed exclusively for carrying the container with securing arrangement compatible with the container.

1.3 Detailed Scope of Works

The scope of Works, in addition to those specified in the General Specification, includes the following:

1.3.1 Re-railing & Rescue Equipment

1.3.1.1 Design, manufacture, supply, testing and commissioning of Re-railing & Rescue Equipment, for which the scope of supply shall be as per the list given at Annexure-'A', which shall also include all accessories to make the equipment fully functional, including first fill of oil/grease with sufficient quantity of lubricants for commissioning. The periodicity of maintenance required for individual components of the RRE shall be spelt out in the offer.

1.3.1.2 Preparation and supply of drawings, documents, samples, specimens and Operation & Maintenance Manuals as specified.

1.3.1.3 Arranging resources of materials, tools, plant and manpower for manufacture, supply, testing and commissioning of Re-railing & Rescue Equipment.

1.3.1.4 Arrange Training of Employer's personnel.

1.3.1.5 Maintenance of RRE during Defects Liability Period (DLP).

1.3.1.6 Supply of Recommended Spares as described in this Specification; supply of consumables and supply of other spares required for maintenance of the RRE after completion of the DLP.

1.3.1.7 Where necessary, confirm license applications and statutory submissions in accordance with Enactments up to the commencement of the Defects Liability Period.

1.3.2 Container

1.3.2.1 Design, manufacture, supply, transportation and load testing of the container. Design features shall conform to the following:

(a) Overall dimensions shall be 4250mm (Length) x 2280mm (Width) x 2125mm (Height). These dimensions are approximate and slight variations may be permissible depending on requirements,

(b) The container is required to support and carry the total weight comprising of all the components of the Re-railing & Rescue Equipment and shall be capable to sustain the forces during unloading/loading of the container from/on rail or road vehicle by crane. Calculations shall be submitted in support. Suitable lifting hook shall be provided for unloading/loading of loaded container with the help of crane from/on rail / road vehicle.

(c) Balanced clamping arrangement of container on vehicle for safe transportation.

(d) Any other attachment/accessory/tools, which may be required to conform to full requirements of the above, shall be the part of supply. In addition, bidder may offer any other accessories at an extra cost, which may enhance the capability, utility and efficiency of the container; however the Employer reserves the right to accept or otherwise of such offer for other accessories.

1.4 Design Responsibility

The Contractor shall be responsible for the design of the equipment/containers, which shall include but not be limited to:

1.4.1 The development of the design shall be carried out in conjunction with the information contained in the Drawings and shall be in accordance with the Specification set out in the Contract. The Contractor shall obtain design approval from the Engineer before starting the manufacturing of the Re-railing & Rescue Equipment / Container.

1.4.2 The Contractor being responsible for the development and completion of the design of any other items of the Works as stated in the Contract, including, without limitation, the updating and amendment of the Drawings from time to time.

1.4.3 The Contractor, coordinating with the Engineer and Designated Contractors on all matters relating to design and documentation, shall retain full responsibility for managing such design and for the maintenance of all documentation associated with the design process. The personnel identified to fulfill these roles shall be direct employees of the Contractor.

1.4.4 The Contractor shall determine and verify as appropriate the materials, site measurements and utilization criteria before adopting in the design of the equipment.

1.4.5 The Contractor shall ensure that the information contained in the submissions has been coordinated with the overall requirements of the Works and the works of the Designated Contractors.

1.4.6 The information that is extracted from the Drawings and adopted by the Contractor in his design shall become the Contractor's design for which neither the Employer nor the Engineer shall be responsible.

1.4.7 The Contractor's designs, which are subject to the approval of any Relevant Authority, shall, before submission to the Relevant Authority, be first submitted to the Engineer for review without objection. The Contractor must make all due allowances for the requirements of the Relevant Authorities' approval and consent process in his Project Execution Programme and in the timing of the Works.

1.4.8 Responsibility for the Contractor's design proposals submitted to the Relevant Authorities shall remain with the Contractor who must provide sufficient resources to deal with subsequent questions, alterations etc. requested by the Relevant Authorities. All communications with any Relevant Authority, whether written or oral, must be copied/ recorded to the Engineer.

1.4.9 All materials used by the Contractor shall be established to have adequate corrosion resistance. The Contractor shall demonstrate that the metal components used in the Equipment will last for 20 years without any corrosion.

1.4.10 The Contractor shall solely be responsible for testing & commissioning of the Equipment and shall depute his engineers during testing & commissioning.

1.4.11 Stress analysis of sensitive structures shall be carried out from a reputed Test House and report shall be submitted.

1.5 Preliminary Works:

The Contractor shall inspect the Designated Contractors' enabling works and satisfy himself that all works to be carried out by the Designated Contractors are in accordance with the interface requirements as specified in the interface clause of this Specification.

2 GENERAL DESIGN REQUIREMENTS

2.1 The Equipment Manufacturer shall be responsible for the design of the Re-railing & Rescue Equipment and its accessories, which shall include but not be limited to:

(a) Equipment shall be designed for a 15-year design life.

(b) Work related to the production of the equipment shall comply with relevant European standards, Codes of Practice and the latest statutory requirements of India including, but not be limited to, the following:

BS EN 287	-	Approval testing of welders for fusion welding
BS EN 288	-	Specification and approval of welding procedures for metallic materials
BS 4575	-	Fluid power transmission and control systems
BS 5304	-	Code of practice for safety of machinery
BS 5395	-	Stairs, ladders and walkways
BS EN 60073	-	Specification for coding of indicating devices and actuators by colours and supplementary means
EN 60204	-	Electrical equipment
ISO 2632	-	Surface texture Method of measurement – Roughness comparison specimens
IS 4758	-	Sound level
BS 5378	-	Safety colours and safety signs
ISO 3864	-	Safety colours and safety signs
BS EN 60529	-	Degree of protection provided by enclosures (IP code)

(c) Components of equipment of similar construction or similar application shall be mutually interchangeable.

(d) The Contractor shall, to the extent that he is responsible for the design or component selections of equipment items, recognise and implement all safety requirements and ensure that the design and performance of the equipment are compatible with the safety standards of the Project.

(e) The equipment shall incorporate all necessary safety devices to protect the equipment, operators, buildings and all other people and things in the vicinity of the equipment. No failure of the equipment shall cause or give rise to any damage or catastrophe of any nature whatsoever.

(f) Equipment design shall take into consideration fire protection, elimination of dust and dirt by means of suitable traps or the like, minimum maintenance requirements and ease of access for cleaning, routine maintenance and general disassembly.

(g) Guards shall be fitted to all exposed moving parts of the equipment where the environment and working processes of the system dictate that there is a foreseeable risk of injury or causing ill health to personnel from sources such as moving parts, electricity, noise and vibration, dust and fumes, etc.

(h) Moving parts of the equipment shall be efficiently lubricated to ensure quiet operation as well as durable and reliable service life. Lubrication points shall be clearly identified for easy replenishment with minimum removal of other components of the equipment.

(i) The environment within which the equipment is to operate shall be taken into consideration in the equipment design.

(j) Equipment shall be fully assembled/complete in all respect and ready to use.

2.2 Use of drawings and data

2.2.1 All data concerning the roiling stock and track written in this specification is for information only and there may be slight variations. The data will be confirmed during design stage.

2.2.2 The compatibility of the Equipment with the rolling stock characteristics and track structure is the responsibility of the Contractor and he shall obtain the required data/documents from the respective Designated Contractors.

2.2.3 Data of Track Reference

Track Gauge:	1435 mm (Standard Gauge)
Rail Type (Depot):	UIC 60 (Grade 880)
Curve radius:	100 m for Depot (Minimum)

The track specification may however vary slightly and the Contractor shall obtain the details from the Track Work Contractor.

2.2.4 Vehicle Dimensions

Minimum width of rolling stock:	2880 mm		
Length over body:	20800 mm (21050 mm Driving car)		
Bogie wheel base:	2200 mm to 2400 mm.		
Distance between bogie centres:	14700 ± 250 mm		
Maximum height of coupler above rail level for unloaded vehicle:	815 mm		
Maximum height of coupler above rail level for loaded vehicle:	740 mm		
Weight of coaches (approx.):		Empty	Fully Loaded
	DMC:	40.3 t	61.4 t
	MC:	39.6 t	62.7 t
	TC	38.1 t	61.2 t

3 SPECIFIC TECHNICAL REQUIREMENTS

3.1 Re-railing & Rescue Equipment

3.1.1 The Re-railing & Rescue Equipment shall be capable of quickly lifting, displacing, tilting and slewing into position the de-railed rolling stock operating on complete network of East West metro project of KMRCL (Underground Corridor and Elevated Corridor as well as inside depot areas) and for cutting/spreading of metal parts of rolling stock for rescue purposes. The equipment shall be suitable for use in tunnel as well as on viaduct / at-grade sections.

3.1.2 The Re-railing & Rescue Equipment shall be suitable for operation under dusty/smoke filled atmosphere at accident site.

3.1.3 Component items of the RRE shall be provided with suitable carrying handles for ease of handling at accident site.

3.1.4 RRE components shall be manufactured out of high quality light metal alloy to achieve lowest weight for its components without compromising on their robustness.

3.1.5 3Re-railing & Rescue Equipment shall include all the equipment/components as detailed in this specification and any other equipment/component considered essential for satisfactory operation of equipment. The RRE shall broadly comprise of the items described below. Parameters for each item are specified in Annexure-'B' of this Particular Specification. Reasonable deviations of non-critical nature from the specified parameters would be permissible. The Employer reserves its right to accept such deviations or otherwise. In his Technical Bid, the Tenderer is required to indicate his offered parameters against each of the specified parameters.

i. Hydraulic Pump Set

The portable Hydraulic Pump Set (Power Pack) shall be used to create hydraulic pressure for operation of the various hydraulic devices to be used for re-railing/rescue purposes. It shall be of 4-stroke petrol engine driven and shall be capable of operating on unleaded petrol readily available in India.

The Pump Set shall have two-stage all hydraulic pistons pump capable of generating required output at the specified pressure. It shall have built-in pressure shut-off valve,

pressure relief valve and venting valve etc for safe operation and shall be provided with quick-connect couplings for connection to a Control Console for control of hydraulic consumers such as Jacks. Oil tank shall have oil filter with optical clogging indicator, a filling filter with integral venting filter, oil sight glasses and oil drain screw with magnet insert.

ii. Auxiliary Hand Pump

The portable Auxiliary Hand Pump shall be an independent and complete unit for re-railing operations particularly in areas where Power Pack unit cannot be used. The Hand Pump, which shall have a output pressure rating that is not less than the pressure rating of the Hydraulic Pump Set, shall be complete with minimum two connections suitable for operation of two Jacks. The Hand Pump should have re-pressure system and shall be capable to perform re-railing procedure including lifting, lowering, pushing/pulling without restriction in areas where Power Pack unit cannot be used. Its oil tank shall be provided with a filling filter with integral venting filter.

iii. Control Console

The portable Control Console shall be the central unit from which all operations of the re-railing process can be controlled. It shall be complete with all necessary valves, controls and safety features. It shall have a minimum of six control valves for simultaneous / independent operation of lifting, lowering and moving horizontally, up to six lifting / displacing jacks. Colour coded quick-connect couplings shall be provided for hose connections. Necessary safety valves shall be provided besides pressure gauges for pressure monitoring.

A high-pressure filter shall be used to prevent the dust and sand from the Pump Unit getting into the hydraulic system during lifting, lowering and displacing operations.

The Control Console shall have a sturdy portable frame and shall be provided with protective hood.

iv. High Pressure Hoses

High-pressure hoses of required numbers shall be provided to connect the Power Pack to Control Console as well as pairs of hoses to connect the Control Console to Jacks. Hoses shall have colour coded quick-connect couplings, including oil retaining valves to prevent the leakage of oil when uncoupled and protective caps to prevent soiling. It shall be possible to couple/uncouple the hoses manually even under pressure without oil loss.

The hoses shall be capable of safely withstanding a working pressure exerted by Hydraulic Pump.

v. Hydraulic Lifting Jacks

Portable Hydraulic Lifting Jacks shall be used independently or in conjunction with other components of the Re-railing Equipment for re-railing operation. The Jacks shall be of rating and type as specified and shall be compatible to the Hydraulic Pump / Control Console. The Jacks shall be made of high-strength light-metal alloy and shall operate with hydraulic re-pressure system. The Lifting Jacks shall have colour coded quick-coupling connections. It shall be possible to couple/uncouple the hoses manually even under pressure without oil loss.

The Lifting Jacks shall have hydraulically releasable return valves with pressure protection for safe holding of the load even in the event of hose ruptures. Pressure relief valves shall also be provided to protect against overload. The Jacks shall have overpressure valves to prevent an overpressure on Jacks due to accidental dynamic loads, in both the volumes, i.e. at the piston ring volume and the bottom volume.

Jacks with integrated Base Plate or separate Base Plate are acceptable.

Support Set (piston support pieces and cylinder support rings) shall be provided to extend the effective stroke step by step, as and when necessary.

vi. Hydraulic Displacement Jacks, Roller Carriages and Accessories

The Displacement Jacks shall be used for pushing and pulling of lifted load laterally with the help of Roller Carriage including its accessories and Re-railing Bridge. The salient technical requirements are as under.

(a) Portable Roller Carriage of rating and type as specified and compatible to the Hydraulic Pump / Control Console shall be equipped with low friction rollers and guiding pin to ensure a linear movement and shall be provided with removable sliding plate. The rollers shall have maintenance-free bearings. Required accessories such as single counter supports with stopping device shall be provided for precise and safe movement of Roller Carriage under load.

(b) Portable Displacing Jack of rating as specified and compatible to the Hydraulic Pump / Control Console and the Roller Carriages shall have integral oil retaining valves and colour coded quick-coupling connections. It shall allow shifting in both directions over the full length of the Re-railing Bridge and shall be provided with steel counter support.

(c) The distance bar shall be with adjustable length as indicated in Annexure-'B' and shall be compatible with the Roller Carriage.

vii. Re-railing Bridges

Re-railing Bridge shall be used to provide a smooth and perfectly flat guideway for horizontal movement of Roller Carriages which carry the Lifting Jacks under the rail vehicle being re-railed. Re-railing Bridges having carrying capacity and dimensions as specified shall be manufactured out of high quality light metal alloy in hollow body construction. The load capacity of Re-Railing Bridges shall be tested to 25% overload capacity. The Re-railing Bridge shall be provided with mounting points for bridge couplings.

Hard Wooden Boards, required to be used on uneven surfaces to provide for a level surface for placing the Re-railing Bridges / Jacks during re-railing operation, shall be provided along with the Re-railing Bridges. Dimensions of the Hard Wooden Boards shall be as indicated in Annexure-'B'.

viii. Single Piston Up-righting Jack, Tilting Jack and Accessories

Portable Hydraulic Up-righting Jack and Tilting Jack together with their accessories shall be used for up-righting overturned rail vehicles. The Jacks shall be of rating and type as specified and shall be compatible with the Hydraulic Pump / Control Console. The Jacks shall be made of high-strength light-metal alloy and shall operate with hydraulic re-pressure system and shall have hydraulically releasable return valves with pressure protection for safe holding of the load even in the event of hose ruptures. Pressure relief valves shall also be provided to protect against overload. The Jacks shall have colour coded quick-coupling connections and it shall be possible to couple/uncouple the hoses manually even under pressure without oil loss.

The Jacks shall be provided with the following accessories required for up-righting of over-turned rail vehicles:

- Integrated High Capacity Claw for Up-righting Jack
- Separate Base Plate for Up-righting Jack
- Head Pieces for the Jacks
- Rocker Bearing Support / Radius Plate as swivel base plate for the Jacks
- Lifting Belt complete comprising of ladder-type sling with fastening rope, holding rope & shackle,

ix. Axle Pusher Complete

The Axle Pusher in conjunction with its Displacing Jack shall be used for laterally pushing a wheel resting on the rail by its flange for the purpose of aligning the wheel tread with the rail for proper landing of the wheel on rail (and, thus, it can save from complete lifting operation for re-railment of a vehicle in certain cases). The Axle Pusher shall also be used for lateral displacement of lifted vehicles.

The Pusher Unit shall comprise of a pair of holding links (ropes or bars) with hooks for fastening on to the rail and a crossbeam made of strong light-metal alloy which can safely withstand the reaction force of the Displacing Jack. The holding links and crossbeam arrangement shall have provisions for adjustment of the effective length ropes/bars. The portable Displacing Jack shall be of rating as specified and shall be compatible to the Hydraulic Pump / Control Console and it shall have integral oil retaining valves and colour coded quick-coupling connections.

x. Air Bags & Accessories

Air Bags shall be used, in case there is space constraint under the load for ready use of Lifting Jacks, to raise the load in order to make space for inserting Hydraulic Jacks. The set of Air Bags shall conform to the specified parameters and shall be complete with a portable 4-stroke petrol engine driven air compressor of rating and type specified in Annexure-'B' which shall be used to inflate the Air Bags with compressed air through a Dual Control Device which shall connect and operate one set (2 nos.) of Air Bags at a time. The Air Bags shall be provided with a set of reinforced connecting hoses for connection between the air compressor and the air bags.

xi. Hydraulic Hauling Device Complete

The Hauling Device shall be normally used to separate vehicles that are wedged together due to an accident. It may also be used for other applications such as an assisting device during up-righting operation of an overturned vehicle. The Hauling Device shall comprise of a pulling rope, a hydraulic Pulling Jack with holding ropes and attachments for anchoring on rail/ground. The components of the Hauling Device shall conform to specified parameters. The Pulling Jack shall be made of high-strength light-metal alloy and shall be compatible to the Hydraulic Pump Set to be supplied against this tender. The Pulling Jack shall be provided with necessary safety valves. The Pulling Jack as well as its connecting hose shall have quick-coupling connections.

xii. Modular Auxiliary Tow-Truck

Auxiliary Tow-Truck shall be used to lift & carry (pony-wheel) defective wheelsets (e.g. locked axle, skidded wheel etc) of a rail vehicle stranded on line. It shall consist of side sections with roller wheels and connecting tubes suitable for the track gauge of KMRCL. The Tow-Truck shall be manufactured using high-strength light-weight metal alloy and shall be modular in construction to make it portable. The design of the Tow-Truck shall conform to the specified parameters.

xiii. Petrol Engine Driven Generator

The portable Generator shall be mainly used for providing sufficient lighting at the accident site; however, it may also be used to drive small electrical tools, not covered under the scope of this tender, which may be required to be used at the accident site. It shall be a portable petrol engine driven unit, skid mounted with protective frame and shall be designed for low emission and noise. The unit shall be manually started by means of a retractable toggle starter. The ratings of the Generator shall conform to the specified parameters.

xiv. Rescue Device Set

The Rescue Device Set shall comprise of hydraulically operated Cutter and Spreader complete with high pressure connecting hoses, Pulling Chain with Hook for attachment to spreading arms and 4-stroke petrol engine driven Power Pack suitable for the use with rescue devices. The Cutter/Spreader shall be designed for high reliability and shall have the following special features:

- Cylinder and arms made of high-strength light metal alloy
- Grip control valve with speed control mechanism
- Clearly marked 'Closing' an 'Opening' positions
- Suitable for right & left handed operators

The Power Pack and Connection Hoses shall be provided with non-interchangeable quick-connect couplings with locking ring and dust cap. The Rescue Device Set shall conform to the specified parameters.

3.2 Container

3.2.1 Rigidity & Control

(a) The Container shall be of robust and of sturdy construction to withstand lateral and transverse strains and stresses due to static and dynamic moments during lifting/handling under severe transit and at site conditions.

(b) The Container equipment racks shall be sufficient strong to bear component load and rough handling. The racks shall be provided with locking / securing arrangements to hold the rescue equipment in its position during transit. For the items like rescue beams etc. equipment racks shall be provided with hardened steel rollers in guide ways for ease of handling. Racks shall be modular in construction and shall be fabricated out of MS steel sections and GI sheets of minimum 3mm thickness of reputed makes.

(c) The Container doors and aluminium shutters shall be fitted with ergonomic and high quality handles with integrated locks of only reputed makes. The aluminium shutters shall be strong, light weight, easy to lift/drop fully flushed with container body, ISO standard lifting/locking blocks fixed to the container body corners to facilitate lifting/lowering and placement on truck or flat wagon. The storage and retrieval of Re-railing & Rescue Equipment shall be very easy and safe for the rescue staff.

3.2.2 Mechanical Requirements

(a) Container Body Structure: The Base frame, vertical and roof member shall be constructed from MS sections similar to ISO Container with sufficient number of cross bearers of 'C' channel and MS angles. All the structural members shall be suitably reinforced wherever required by welding and ground properly to form a complete structural frame. All the structural steel members shall be only of reputed makes.

(b) Lifting arrangements: The Container shall be provided with ISO standard lifting /locking blocks for lifting by cranes /locking to the rescue truck/Flat Wagon body floor. The lifting holes shall be machined & not gas cut.

(c) Panelling : Side and roof panelling shall be constructed from 3mm MS corrugated sheet of only reputed makes and properly welded to the structure frame and shall be leak proof joining.

(d) Flooring: 3mm thick CRC corrugated steel sheet of only reputed makes fixed by welding to the base frame.

(e) Rolling Shutters and Doors: To facilitate storage and retrieval of rescue /re-railing tools in the Container, very high quality and high strength Aluminum rolling shutters (02 nos.) with small section for smooth & noise free on each side shall be provided. The shutters shall be sliding type only and shall be accommodated below the roof panelling instead of rolling. On one end of the Container, a double panel door shall be provided with ISO container type locking arrangement. The shutters and doors shall be provided with ergonomically designed high quality & reputed make plastic handles with integrated locking and hinges. Sufficient details shall be furnished for the bought out items with make, model and literature.

(f) Container Interior: The tool racks made in the interior of the Container shall be fabricated shelves with locking arrangements to eliminate possibility of rolling–over / falling of the rescue tools during course of movement of the prime mover on the road/track or handling of the Container. The Contractor shall seek approval of the finalized design before taking up manufacture. All parts shall be designed in such a way that the forces do not exceed half the yield strength of the material used. All wielding points shall be grounded properly to achieve very high quality finish.

(g) Ventilation: Container shall be suitably ventilated by provision of louvers with dampers and wire mesh for fresh air circulation.

3.2.3 Safety Items for Container

(a) Lighting requirement: 12V/24V operated light fittings/fixture are to be provided in the box container with total wattage of 200W approximately. These shall be suitably placed in more than four locations inside the Container for better illumination all round. The light fixtures shall be fixed in such a way that these may provide all round illumination. It shall be possible to feed these fixtures from the battery of truck/Loco through suitable jumper plug with telephone type flexible cable. Suitable receptacles shall be provided for this purpose.

(b) One number of CO_2 based Fire Extinguisher of 5 kg, a First Aid Box and a Stretcher shall also be provided inside the Container for use during rescue operations

4 FINISH

The surface treatment of the Re-railing & Rescue Equipment shall be suitable for the working environment under the climatic conditions in Kolkata.

4.1 Paint for Re-railing & Rescue Equipment

4.1.1 Preparation of work prior to painting:

External surfaces: Brushing, degreasing or sand blasting and blowing.

Anti-corrosion treatment: Application of a coat of anti-corrosion paint. Thickness of this coat after drying should not be less than 180 microns.

Hollow parts: The internal parts shall be treated prior to assembly.

4.1.2 Painting:

External and related parts shall be prepared as described above and then given two coats of polyurethane lacquer with a dry unit thickness of at least 50 microns. The second coat shall be applied over the first coat when it is still wet. The colour scheme to be used shall be decided during detailed design.

4.2 Paint for Containers

4.2.1 Preparation of work prior to painting: All external surfaces shall be prepared by brushing followed by degreasing**.**

4.2.2 Anti-corrosion treatment**:** Application of a coat of anti-corrosion paint. Thickness of this coat after drying should not be less than 180 micron.

4.2.3 Painting**:** External and related parts shall be prepared as described above and then given two coats of polyurethane lacquer with a dry unit thickness of at least 50 microns. The second coat shall be applied over the first coat when it is still wet.

4.2.4 Colour Scheme of the Container**:** Dark red colours to 1805C of Pantone shade card or equivalent in RAL shall be painted all over the cabin and deck body and black in the under frame.

4.2.5 On site, the Contractor shall carry out any touch up to paint work considered necessary during testing & commissioning

4.3 Unpainted parts

All rubbing parts or all unpainted part, those to remain polished shall be covered with a coating designed to protect them from oxidation until such time as the equipment enters service.

4.4 Identification:

A plate indicating the following shall be fixed on the container at a suitable location:-

- Name of the manufacturer,
- Unladen / Laden weights capacity of the container
- Serial numbers etc.

Instructions/ Standard Symbols at respective locations for the following:-

- Slitting, hook fixing location
- Door/ shutter opening direction.
- Panel locking directions
- External power connection location
- First aid box and stretcher
- Fire Extinguisher location etc.

Any other identification which the contractor considers essential shall be mentioned in the offer and approval shall be sought from the consignee.

Night glare quality KMRCL logo & Emergency duty sticker shall be provided on both side shutters, on the rear door and on the roof of the container. Contractor shall get approval of above logo & sticker before supply & fixing.

Similar plate shall also be fixed on the body of each component of the Re-railing & Rescue Equipment.

5 INSPECTION

5.1 The Employer and the Engineer shall at all reasonable times*:*

a. have full access to all parts of the Site and to all places from which natural materials are being obtained, and
b. during production, manufacture, fabrication and construction (at the site and elsewhere) be entitled to inspect, examine, measure and test the materials and workmanship, and to check the progress of manufacture, of all Machine / Equipment and Materials to be supplied under the Contract.

The Contractor shall give the Engineer full opportunity to carry out these activities including providing access, facilities, permissions and safety equipment. No such activity/inspection shall relieve the Contractor from any obligation or responsibility.

5.2 When inspection during manufacture or before delivery or dispatch is required, notice in writing shall be sent by the contractor to the Inspecting Officer when the stores or material to be supplied are ready for inspection and test, and no stores shall be delivered or dispatched until the Inspecting Officer has certified in writing that such stores have been inspected and approved by him. At least 4 weeks' notice must be given to the Inspecting Officer to enable him to arrange the necessary inspection. The examination of stores will be made as soon as practicable after the same have been submitted for inspection and the result of the examination will be notified to the Contractor.

5.3 In cases where the Inspecting authority requires that inspection of the raw material to be used and/or stage inspection during the manufacturing process of the components stores etc. is also be done, notice in writing shall be sent by the Contractor to the Inspecting Officer to visit his premises/works to test the raw materials and/or conduct necessary inspection during the manufacturing process of the component/store etc. as deemed essential.

5.4 *Marking of Inspection*

The Contractor shall, if so required, at his own expense, mark all the approved stores with a recognized Purchaser's mark. The stores which cannot be so marked shall, if so required by the Inspecting Officer, be packed at the Contractor's expense in suitable packages or cases, each of which shall be sealed and marked with such mark.

6 CHECKS AND TESTS

6.1 In Manufacturer's Plant

During manufacture and especially prior to shipment/dispatch, verification and checks shall be carried out in order to ensure that the supply is according to the Particular Specifications and approved design documents.

All quality checks shall be carried out as required during manufacture on the Contractor's or on his vendor's premises. The Contractor shall arrange for quality check of supplies on his vendor's premises before delivery of these supplies to his workshop.

Operation of safety and protection devices shall also be checked.

The checks and tests to be carried out shall include:

- a functional check of all equipment,
- check of vital dimensions as per design,
- check on assemblies, welds, screws etc.
- a check of operation of safety and protection devices,

The entire supply shall be inspected by the Employer's representative at the Contractor's premises before shipment to the consignee.

6.2 At Site

After delivery at consignee's premises, the operating tests shall be carried out at site in presence of a Representative of the Contractor to check that the equipment fulfils the requirements of the specifications. These shall include all tests carried out in the Factory as well additional tests with actual use.

System compatibility tests shall be carried out with metro EMU coaches to check their compatibility.

6.3 Sequence of Tests

The sequence of tests shall be as follows:

a. Type Tests
b. Factory Acceptance Tests (FAT)
c. System Acceptance Tests (SAT)
d. Integration Testing and Commissioning

6.3.1 Type Tests

Not applicable.

6.3.2 Factory Acceptance Tests

a) The Factory Test Plan shall be submitted for the Employer's Representative's review. The plan shall adopt a top down approach and describe the FAT strategy as regards to methodology, procedures to be followed and records to be submitted. Contractor shall submit the comprehensive list of specifications to be followed.
b) The FAT plan/ submission shall include the appropriate testing and inspection items for Notice of No Objection.
d) The FAT shall demonstrate that each subsystem meets its functional specification.
e) No equipment or software should be delivered to the Site until the Contractor has demonstrated to the satisfaction of the Employer's Representative that the equipment or software conforms to the Specification by carrying out the FAT.
f) The Site for the FAT of equipment shall be notified to the Employer's Representative 30 days prior to commencement of the FAT.
g) The Employer's Representative shall have the right to witness the FAT.

6.3.3 System Acceptance Tests

a) System Acceptance Tests shall comprise comprehensive testing of the completely assembled installation to ensure that every item has been installed, adjusted, and to demonstrate that Re-railing & Rescue Equipment operate correctly in accordance with the Specification, perform in accordance with the Specification and the local configuration and are available for integration testing & commissioning.
b) Prior to System Acceptance Testing, the Contractor shall submit a System Acceptance Plan to the Employer's Representative for Notice of No Objection. The plan shall adopt a top down approach and describe the System Acceptance strategies and processes.
c) The System Acceptance Plan shall identify a comprehensive list of specifications, standards, method statements, procedures, drawings and records to be submitted to the Employer's Representative for Notice of No Objection. The Plan shall also include a programme, which identifies the dates for system acceptance submission and tests.
d) Any tests carried out which are deemed as System Acceptance Tests shall be identified. If these tests have been carried out earlier or form the part of earlier carried tests, the same need not be repeated unless desired by the Employer's Representative. However, these tests should be identified and included in the System Acceptance Test Plan.
e) These tests shall be conducted in the presence of the Employer's Representative who may decline for witness.
f) Any defects which become apparent in the course of these tests shall be made good and modifications as approved shall be implemented and recorded. All affected equipment shall be retested and certified before the system is accepted.
g) Prerequisites for SAT:-
   - All documentation for the Safety Report shall be submitted to the Employer's Representative for a Notice.
   - Facilities for the maintenance of the System shall be in place.

- The SAT Plan shall be submitted to the Employer's Representative for a Notice at least 120 days before the commencement of the SAT.

h) System Acceptance Test Requirements:-
- It shall be the Contractor's responsibility to conduct all tests and record data, and restore the Re-railing & Rescue Equipment to full operational use following the SAT.
- During the SAT, all interfaces with external systems other than those pertaining to the designated contractor shall be tested.

6.3.4 Integration Testing and Commissioning

This section is applicable for Re-railing & Rescue Equipment in interface with other systems and contracts.

a) On completion of testing and commissioning of the Contractor's own system to the satisfaction of the Employer's Representative, the Contractor shall carry out all tests necessary to integrate the Re-railing & Rescue Equipment with all other systems of the Employer such as Rolling Stock, Track, Civil, etc. and demonstrate correct operation of all internal and external interfaces.
b) Integration testing & commissioning plan containing the schedule of integration tests in coordination with the interface Contractors and test procedures shall be submitted to the Employer's Representative for a Notice of No Objection. The tests shall be carried out in coordination with the interface Contractors.
c) The Contractor shall be required to lead in certain Integration Testing and Commissioning where such tests are required to prove the performance of system provided by the Contractor.
d) All the defects and shortfalls in the Contractor's system discovered in the course of Integration Testing and Commissioning shall be made good and retested to the satisfaction of the Employer's Representative before the dates fixed for service trials.
e) The test and commissioning shall be managed without perturbation and/or interruption of operation and maintenance.
f) The Employer's Representative may require additional tests if needed.
g) The Taking Over Certificate shall be issued after observing the performance of the equipment for a period of 30 days from the date of commissioning of the complete equipment.

7 PACKING AND MARKING

7.1 Packing

The Contractor shall pack at his own cost the store sufficiently and properly for transit by rail/road, air and/or sea as provided in the contract so as to ensure their being free from loss or damage on arrival at their destination. He shall decide the packing for the stores by taking into account the fact that the stores will have to undergo arduous transportation before reaching the destination and will have to be stored and handled in tropical climatic conditions (Including Monsoons) before being put to actual use. Unless otherwise provided in the contract, all containers (including packing cases, boxes, tins, drums and wrappings) in which the stores are supplied by the Contractor shall be considered as non-returnable and their cost as having been included in the contract price. Each package shall contain a packing note specifying the name and address of the Contractor, the number and date of the acceptance of tender and the Designation of the Purchase Officer issuing the supply orders, the description of the stores and the quantity contained therein.

7.2 Marking

The marking of all goods supplied shall comply with the requirement of the Indian Acts relating to merchandise marks or any amendment thereof and the rules made there under. The following marking of the material is required, which should be stencilled with indelible paint on all the materials/packages:-

a. Contract No.
b. Specification no.
c. Item No.
d. Post Consignee (wherever applicable)
e. Abbreviated Consignee marks.

In addition to the marking as specified above, distinguish colour marks should be given so as to distinguish the ultimate Consignees in India.

8 TRAINING OF EMPLOYER'S STAFF

8.1 The Contractor shall provide comprehensive training to the Employer's staff to enable safe and efficient maintenance and operation of the equipment supplied as part of the contract to achieve maximum reliability and economy of cost. The Contractor shall submit to the Engineers for review and approval a training plan at least two months before the readiness of the equipment for commissioning. The training plan shall include:

- Schedule of training courses,
- Syllabus, size of class and duration of each capsule,
- Training facilities to be provided by the Employer,
- Qualifications and experience level necessary for the trainees,
- Instructor's qualifications.

8.2 The Contractor shall provide following training for use and maintenance of Re-railing & Rescue Equipment.

(a) Four staff for five days for operation of Re-railing & Rescue Equipment.
(b) Four maintenance staff for five days for maintenance and servicing of Re-railing & Rescue Equipment

8.3 Two sets of Operation and Maintenance Manuals along with soft copy in English language shall be supplied besides adequate number of small training material booklet to all the trainees.

8.4 Certificate to each trainee shall be issued after imparting the training.

8.5 All expenses of training except travel & lodging of trainees shall be borne by the Contractor.

8.6 The training shall consist of classroom training and practical hands on training. The Contractor shall depute competent trainers to impart training to a high degree of proficiency with competency certificate issued by OEM.

8.7 The Contractor shall also provide training courses and training materials to the Employer's Training Instructors to a level of competence to allow the Instructors to subsequently train the Employer's staff in maintenance and operation of the machine/equipment.

9 MAINTENANCE DURING DEFECT LIABILITY PERIOD

The following are the general maintenance requirement in line to Clause 10 of General Conditions of Contract.

9.1 The Re-railing & Rescue Equipment shall be maintained for the scheduled and unscheduled maintenance by the successful Tenderer during the Defect Liability Period (DLP) of 24 months from the date of handing over of last Re-railing & Rescue Equipment to the Employer. The Tenderer shall submit in the offer, details/organization to carry out the maintenance during the Defect Liability Period.

9.2 The Tenderer shall have to meet the time frame for breakdown/corrective maintenance as below: -

Minor maintenance: - Inclusive of repairing and replacement of all spares/ components and all defects other than major defects.

a. Response Time (Max) – 6 hours
b. Attention Time (Max) – 8 hours.

Major maintenance: - Attention to all types of major failures/breakdown and major overhaul.

a. Response Time (Max) – 24 hours
b. Attention Time (Max) – 48 hours (Shall be in proportion with type of failure).

The Contractor shall maintain bank of spares at KMRCL's designated premises to optimize the downtime. The Contractor shall themselves arrange for any transportation, loading/unloading, spares, lubricant & other consumables, machinery & plants, tools/ tackles, labour, garbage disposal etc required for attending break down/ maintenance of the Equipment during DLP.

9.3 During maintenance, the Contractor shall follow all statutory acts, regulations, codes and practices in force like Indian Electricity Rules, Electricity Act etc.

9.4 The Equipment entrusted to the Contractor for repair at their workshop shall be at the risk & cost of the Contractor; if any deduction is required to compensate any loss on this account, the same shall be adjusted from balance payments or by means of forfeiting the Performance Bank Guarantee.

9.5 The Contractor shall provide the spares required for scheduled maintenance and unscheduled repair of Re-railing & Rescue Equipment during DLP. The Contractor shall give a list of spares to be maintained by him at Employer's works for the scheduled maintenance and unscheduled repair of Re-railing & Rescue Equipment during DLP. If spares provided fall short of the requirement, it shall be made available by the supplier at his cost at the earliest. The Contractor shall not claim any charge against the maintenance work performed during DLP nor they will claim any cost against the replacement / repairing of defective materials /equipment.

9.6 The breakdown of Re-railing & Rescue Equipment due to unscheduled repairs shall not be more than 2 days after receipt of information from the Engineer/Employer, failing which penalty will be imposed at the rate of 0.01% of the contract value per day during the DLP. The days for calculating the penalty shall be counted from the day defects are brought to the notice of the Contractor by the Engineer.

9.7 The Tenderer shall provide a list of spares required for scheduled maintenance and unscheduled repair of Re-railing & Rescue Equipment for 3 years after completion of DLP.

10 PLANNING, PROGRAMME AND PROGRESS MONITORING

10.1 Preparation and submission of program of work

The Contractor shall interact with Employer / Engineer to provide details and obtain approval where necessary on following for supply and installation of Machine & Equipment as per the stipulated schedule:

Activity
Submission of design documents and other technical documents from the manufacturers for approval
Program for manufacture of the equipment
Documents for execution of works relating to installation
Proposal for factory tests
Program for installation
Program for tests at site and commissioning
Program for training of staff
Program for supply of maintenance manuals and other documents
Program for supply of spares

10.2 Progress Report

The Contractor shall prepare a Progress Report covering all aspects of the execution of works. Such Reports shall be delivered to the Employer's Representative on monthly basis.

10.3 Progress Review Meetings

In order to ensure execution of the Works in an efficient and proper manner, the Employer/Engineer and the Contractor will exchange technical information for approval of the solutions and equipment offered and hold periodical meetings. Two categories of meeting may be held for this purpose:

- **Technical meetings**

  Attended by engineers and technicians, convened upon request by either party, during which, among other subjects, clarifications on additional information relative to the Particular Specifications may be provided.

– **Periodical Progress Review Meetings**

To be held as and when required by Engineer during which:

- Certain problems that maybe holding progress of the work may be examined.
- Interface requirement with Designated Contractors may be discussed.

Progress Review Meetings relative to works will be held in KOLKATA and will be the subject of reports.

11 DOCUMENT SUBMISSION

11.1 In the Bid

- The Tenderer in his Technical Bid Document shall furnish all the information as per Annexure-'B' to enable evaluation of Tenderer's Technical Proposal.
- The Tenderer in his Technical Bid Document shall also furnish procedure for use of the various components of the RRE for effective re-railing of metro cars of KMRCL under different conditions (such as derailment of one wheelset, derailment of both the wheelsets of a bogie, derailment of all wheelsets of a car without the car overturning, derailment of all wheelsets of a car with the car overturned etc) to establish that the components having offered parameters have adequate capability to quickly and safely restore the derailed car back on rails.

11.2 For Execution of Work

Prior to manufacture of the component, the Contractor shall send the following documents for approval:

- design calculation for all important equipment and dimensions,
- a detailed technical note with weight of components and removable parts and including a list of parts with references of the vendors,
- technical data for petrol engine and all other important equipment,
- general drawings, detailed assembly drawings and detailed drawings of mechanical parts,
- descriptive and operating note,
- documents, drawings, notes and references of the vendors,
- details of the provisions concerning personnel safety and use of apparatus in hazardous work areas.

11.3 At Completion of Work

The Contractor shall provide up to date documentation including:

- List of general drawings and detailed drawings of electrical and electronic diagrams with complete nomenclature,
- General nomenclature of supply including the vendor's,
- List of mechanical and electrical parts illustrated and itemised in accordance with the diagrams and drawings. The following information shall be provided for every item of Re-railing & Rescue Equipment:
    a) Part No.
    b) Description
    c) Name and contact address of manufacturer with contract details.
    d) Quantity & unit.
    e) Part of next higher assembly.
    f) Cross reference to figure no.
    g) General or specific purpose.
    h) Purchase & technical specification
- Maintenance Manual with details of maintenance schedules and repair procedure for important equipment, summary of circuits, functions and adjustments and a Lubrication Manual including location of lubricating points, type of lubricants, frequencies and quantities,
- Operating Manual with instructions for start-up and Users' Instructions,
- Complete documentation of equipment from vendors,

12 INTERFACE AND COORDINATION

12.1 Interface with Rolling Stock Contractor-

Scope	RRE Contractor	Rolling Stock Contractor
Design, Manufacture, Testing & Commissioning of the Re-railing & Rescue Equipment	Design, Manufacture, Testing & Commissioning of the Re-railing & Rescue Equipment to suit the Rolling Stock	Provide Rolling Stock dimensions, profile and other details to the Re-railing & Rescue Equipment Contractor.

13 RAM TARGETS

13.1 Reliability

The Mean Time Between Failures (MTBF) target is 8760 hours per equipment. A failure is defined as one event leading to the Equipment being unable to perform its service (equipment out of order).

13.2 Availability

The availability of each Equipment shall be at least 99%. This figure includes both the time when the Equipment is not available due to breakdowns and the call out time. The call out time is the time required to get to the site of breakdown (Response Time). For each Equipment, the maximum call-out time plus the maximum time for minor maintenance shall not be more than 14 hours. Similarly for major maintenance required for breakdown, response time plus attention time should not be more than 72 hrs.

13.3 Maintainability

For each Equipment, the Contractor shall provide routine / preventative maintenance activities, frequencies, and estimated durations. The maintenance requirements and routines shall be included in the maintenance documentation to be supplied with the equipment. The Mean Time to Repair (MTTR) shall be as proposed by the Tenderer in his technical bid and in any case shall not be more than 72 hours after failure including the time to repair. The Calculations with respect to RAM targets shall be done every month based on the data collected in the previous month. The collection of data with respect to RAM targets shall commence from the time of issuance of Provisional Taking Over Certificate by the Engineer.

13.4 Safety

The Contractor shall comply with all local applicable regulations. The Contractor shall liaise with all affected parties in the production of a Method Statement covering all operational and maintenance aspects of the equipment. The Method Statement shall include, but not be limited to risks associated with:

- Requirements for personal protective equipment;
- Safety instructions and control measures for residual risk;
- Records keeping; The Contractor shall demonstrate by assessment that the equipment operational environment is safe at any time during the operation.

13.5 Hazard analysis

The results of a hazard identification exercise carried out by the Contractor shall be entered into a hazard log. The Contractor shall additionally demonstrate that all reasonably foreseeable hazards have been identified and risks reduced to ALARP (As Low As Reasonably Practicable). The Contractor shall produce a hazard analysis, assessing the risks to staff, rolling stock and to the provided equipment resulting from, but not limited to, the following feared events and demonstrate that hazards resulting from these are ALARP:

- Working in confined spaces;
- Societal injury through noise pollution or contamination;
- Noise to surrounding environment;

As a minimum, a safety risk assessment of the equipment shall be carried out at the following stages and the results communicated to the Employer:

- Design stage;
- Initial installation stage;
- Final installation stage, prior to commissioning;

Where control measures are introduced to reduce risk to ALARP, the Contractor shall demonstrate that where residual risk may remain, the control measures are suitable and sufficient. The results obtained from hazard analysis and risk assessment must be compatible with the Employer's safety targets.

Annexure-'A'

LIST OF ITEMS IN ONE SET OF RE-RAILING & RESCUE EQUIPMENT

S.No.	Description	Quantity
	Re-railing Equipment	
1.	Petrol Engine Driven Hydraulic Pump (Power Pack)	1 no.
2.	Auxiliary Hand Pump	1 no.
3.	Control Console	1 no.
4.	High Pressure Hydraulic Hoses with Coupling:	
	i. Colour-coded Pair of Hoses	6 pairs
	ii. Single Hose	4 nos.
5.	Hydraulic Lifting Jack - Telescopic (Jack I) with Base Plate and Support Set (for stroke extension)	2 nos.
6.	Hydraulic Lifting Jack - Telescopic (Jack II) with Base Plate and Support Set (for stroke extension)	2 nos.
7.	Hydraulic Lifting Jack (Jack III) with Base Plate and Support Set (for stroke extension)	2 nos.
8.	Hydraulic Displacement Jack	2 nos.
9.	Roller Carriage with Slide Plate	2 nos.
10.	Distance Bar	1 set (2 nos.)
11.	Counter Support with Stopping Device	2 nos.
12.	Re-railing Bridge I	1 no.
13.	Re-railing Bridge II	1 no.
14.	Re-railing Bridge III	1 no.
15.	Single Piston Up-righting Jack with Head Piece (1 no.), Rounded Head Piece (1 no.), Radius Plate / Rocker Bearing Support (1 no.) and Lifting Belt Complete for Up-righting (1 set)	1 set.
16.	Single Piston Tilting Jack with Head Piece (1 no.), Rounded Head Piece (1 no.), and Radius Plate / Rocker Bearing Support (1 no.)	1 set
17.	Axle Pusher Unit Complete with Displacing Jack	1 no.
18.	High Pressure Lifting Air Bags:	
	i. Air Bag I	2 nos.
	ii. Air Bag II	2 nos.
	iii. Air Bag III	2 nos.
19.	Petrol Engine Driven Air Compressor for Air Bags	1 no.
20.	Dual Control Unit for Air Bags Complete with Connecting Hose Set	1 no.
21.	Hydraulic Hauling Device Complete	1 set
22.	Modular Auxiliary Tow-Truck	1 no.
23.	Hard Wooden Boards of Different Sizes:-	
	i. Board I	14 nos.
	ii. Board II	9 nos.
	iii. Board III	6 nos.
	iv. Board IV	6 nos.
24.	4-stroke Petrol Engine Driven Generator	1 no.
	Rescue Devices	
1.	Hydraulic Cutter with Connection	1 no.
2.	Hydraulic Spreader with Connection	1 no.
3.	Power Pack for Rescue Device Set	1 no.
4.	Pull Chain with Hook for Rescue Devices	2 nos.
5.	Connection Hose for Rescue Devices	10 nos.

Note: Ratings & dimensions of the items shall be as per Annexure-'B'.

Annexure-'B'

TECHNICAL PARAMETERS OF RE-RAILING & RESCUE EQUIPMENT

S. No.	Description	Unit	Specified	Offered*
A.	**Re-railing & Rescue Equipment**			
1	**Petrol Engine Driven Hydraulic Pump** Manufacturer:			
	Engine Power	kW	3.5	
	Working Pressure	MPa	30-50	
	Output	lit/min	2.5 - 6.0	
	Usable Oil Capacity	litre	35	
	Length	mm	600	
	Width	mm	550	
	Height	mm	650	
	Weight	Kg	55	
2	**Auxiliary Hand Pump** Manufacturer:			
	Working Pressure	MPa	30-50	
	Output	cc/stroke	2.5-5.0	
	Oil Capacity	litre	10	
	Length (Working / Transportation)	mm	980	
	Width	mm	250	
	Height	mm	180	
	Weight	Kg	25	
3	**Control Console** Manufacturer:			
	Length	mm	1050	
	Width	mm	700	
	Height	mm	1100	
	Weight	Kg	60	
4	**High Pressure Hoses with Couplings** Manufacturer:			
	Length	m	10	
	Weight	Kg	4.5-8.0	
	Working Pressure	MPa	50	
	Design Pressure	MPa	Minimum 4 times of the working pressure	
5	**Hydraulic Lifting Jacks with Base Plate** Manufacturer:			
	Jack I (Telescopic)			
	Closed Height	mm	220	
	Number of Pistons	Nos.	2	
	Total Stroke	mm	185	
	Stroke 1	mm	90	
	Stroke 2	mm	95	
	Effective Force 1	kN	650	
	Effective Force 2	kN	300	
	Working Pressure	MPa	30-50	
	Oil Capacity	litre	1.5	
	Weight	Kg	15	
	Stroke Extension	mm	260	
	Jack II (Telescopic)			
	Closed Height	mm	470	
	Number of Pistons	Nos.	2	

S. No.	Description	Unit	Specified	Offered*
	Total Stroke	mm	500	
	Stroke 1	mm	250	
	Stroke 2	mm	250	
	Effective Force 1	kN	630	
	Effective Force 2	kN	300	
	Working Pressure	bar	30-50	
	Oil Capacity	litre	3	
	Weight	Kg	25	
	Stroke Extension	mm	130	
	Jack III			
	Closed Height	mm	130	
	No. of Pistons	Nos.	1	
	Stroke	mm	45	
	Effecting Force	kN	600	
	Working Pressure	MPa	30-50	
	Oil Capacity	litre	0.5	
	Weight	Kg	10	
	Stroke Extension	mm	130	
6	**Hydraulic Displacement Jacks, Roller Carriages and Accessories** Manufacturer:			
	Displacement Jack			
	Closed Length	mm	670	
	Stroke	Mm	320	
	No. of Pistons	Nos.	01	
	Effective Pushing Force	kN	175	
	Effective Pulling Force	kN	80	
	Oil Capacity	litre	1.5	
	Weight	Kg	25	
	Roller Carriage with Slide Plate			
	Maximum load	kN	750	
	Height	mm	110	
	Weight	Kg	40	
	Distance Bar			
	Min. Range of adjustments	mm	1000 - 2500	
	Weight	Kg	60	
	Counter Support with Stopping Device			
	Weight	Kg	15	
7	**Re-railing Bridge** Manufacturer:			
	Re-railing Bridge I			
	Length	mm	3300	
	Width	mm	350	
	Height	mm	140	
	Weight	Kg	120	
	Carrying Capacity • Free span 1.43m • Supported over full length	kN	 400 700	
	Re-railing Bridge II			
	Length	mm	2200	
	Width	mm	350	
	Height	mm	140	
	Weight	Kg	80	
	Carrying Capacity • Free span 1.43m • Supported over full	kN	 400 700	

S. No.	Description	Unit	Specified	Offered*
	length			
	Re-railing Bridge III			
	Length	mm	1100	
	Width	mm	350	
	Height	mm	140	
	Weight	Kg	40	
	Carrying Capacity • Free span 1.43m • Supported over full length	kN	 400 700	
8	**Single Piston Up-righting Jack, Tilting Jack and Accessories** Manufacturer:			
	Single Piston Up-righting Jack			
	Closed Height	mm	1100	
	No. of Pistons	Nos.	1	
	Stroke	mm	850	
	Effecting Force	kN	500	
	Working Pressure	MPa	30-50	
	Oil Capacity	litre	8	
	Claw Height	mm	100	
	Weight	Kg	50	
	Single Piston Tilting Jack			
	Closed Height	mm	600	
	No. of Pistons	Nos.	1	
	Stroke	mm	400	
	Effecting Force	kN	250	
	Working Pressure	MPa	50	
	Oil Capacity	litre	2	
	Weight	Kg	20	
	Head Piece			
	Weight	Kg	10	
	Rounded Head Piece			
	Weight	Kg	5	
	Rocker Bearing Support			
	Weight	Kg	15	
	Lifting Belt Complete			
	Load Bearing Capacity	kN	350-400	
	Length of Belt Loop	mm	3000	
	No. of Loops	Nos.	6	
	Length of Fastening Rope	mm	4000	
	Length of Holding Rope (with Shackle)	mm	6000	
	Weight	Kg	50	
9	**Axle Pusher Complete** Manufacturer:			
	Displacing Jack			
	Closed Length	mm	670	
	Stroke	mm	160	
	No. of Pistons	Nos.	1	
	Effective Pushing Force	kN	100	
	Oil Capacity	litre	1.5	
	Weight	Kg	4	
	Pusher Unit Complete with Hooks, Bolts & Crossbeam			
	Length of Holding Link (rope / bar) with Hooks	mm.	2500	
	Weight (excluding crossbeam)	Kg	10	

S. No.	Description	Unit	Specified	Offered*
	Weight of crossbeam	Kg	10	
10	**Air Bags and Accessories** Manufacturer:			
	Air Bag I			
	Size (LxW)	mm	650x690	
	Bag Thickness	mm	25	
	Lifting Capacity	kN	300	
	Working Pressure	MPa	0.8	
	Lifting Height	mm	370	
	Weight	Kg	10	
	Air Bag II			
	Size (LxW)	mm	780x690	
	Bag Thickness	mm	25	
	Lifting Capacity	kN	300	
	Working Pressure	MPa	0.8	
	Lifting Height	mm	400	
	Weight	Kg	15	
	Air Bag III			
	Size (LxW)	mm	950x950	
	Bag Thickness	mm	25	
	Lifting Capacity	kN	300	
	Working Pressure	MPa	0.8	
	Lifting Height	mm	520	
	Weight	Kg	25	
	Petrol Engine Driven Air Compressor			
	Air Output	lit/min	300	
	Operating Pressure	MPa	0.9	
	Dimensions (LxWxH)	mm	950x700x600	
	Weight	Kg	100	
	Dual Control Device			
	Maximum Operating Pressure	MPa	0.8	
	Connecting Hose Length	m	10	
11	**Hydraulic Hauling Device Complete** Manufacturer:			
	Working Pressure of Pulling Jack	MPa	30-50	
	Tractive Force	kN	220	
	Oil Volume	lit	1	
	Length of Pulling Rope	m	10	
	Length of Fastening Rope	m	10	
	Length of Retaining Rope	m	10	
	Length of Connecting Hose	m	30	
	Weight including Accessories (attachments for anchoring on rail/ground etc)	Kg	200	
12	**Modular Auxiliary Tow-Truck** Manufacturer:			
	Gauge	mm	1435	
	Carrying Capacity	kN	200	
	Maximum Towing Speed	km/h	15	
	Weight	Kg	250	
13	**Hard Wooden Boards** Manufacturer			
	Board I Size (LxWxH)	mm	700x300x60	
	Board II Size (LxWxH)	mm	700x350x80	
	Board III Size (LxWxH)	mm	300x120x50	

S. No.	Description	Unit	Specified	Offered*
	Board IV Size (LxWxH)	mm	300x120x30	
14	**4-stroke Petrol Engine Driven Generator** Manufacturer			
	Rated Power Output	kVA	5	
	Output Voltage	V	230V, 1-phase	
	Output Frequency	Hz	50	
	Tank Capacity	lit	25	
	Overall Size (LxWxH)	mm	850x530x575	
	Dry Weight	Kg	90	
B.	**Rescue Device Set**			
1	**Hydraulic Cutter with Connection** Manufacturer:			
	Cutting Force	kN	400 (min).	
	Maximum Jaw Width	mm	225	
	Operating Pressure	MPa	70	
	Weight	Kg	15	
2	**Hydraulic Spreader with Connection** Manufacturer:			
	Spread Force	kN	225	
	Maximum Spread Width	mm	700	
	Pulling Force	kN	45	
	Maximum Pulling Distance	mm	600	
	Operating Pressure	MPa	70	
	Weight	Kg	20	
3	**Power Pack for Rescue Device Set** Manufacturer:			
	Operating Pressure	MPa	70	
	Usable Oil Capacity	lit	2.5	
	Length	mm	470	
	Width	mm	320	
	Height	mm	450	
	Weight	Kg	30	
4	**Pull Chain with Hook** Manufacturer:			
	Length	m	4.5	
5	**Connection Hose** Manufacturer:			
	Length	m	10	

***** *Tenderer to fill in the relevant parameter of the offered equipment in this column.*