

Parameter	Requirements
Height adjustable pitch	100 mm
Height adjusting mechanism	Mechanical with locking arrangement

*Note: The above dimensions are indicative*

### **2.7.3 Design Requirements:**

- ~~2.7.3.1 The equipment shall be designed for heavy duty workshop use and shall be available for throughout the year without any limitation.~~
- ~~2.7.3.2 The equipment shall be designed so as to allow operation without overstressing, damaging in any way whatsoever with the other requirement in the shed and its working. Components of the equipment of similar construction or similar application shall be mutually interchangeable.~~
- ~~2.7.3.3 The basic structure shall be of welded steel construction and shall be fabricated using suitable section as per IS 2062 of 1999 or latest equivalent.~~
- ~~2.7.3.4 The welding shall be carried out as per BS696 of 1960 or latest equivalent.~~
- ~~2.7.3.5 The equipment shall be provided with strong, rigid, and adjustable base plates of suitable size and thickness as per IS2062 of 1999 or latest equivalent.~~
- ~~2.7.3.6 The design structure shall be Ergonomic in design to facilitate quick and easy movement of car body stands within workshop premises.~~
- ~~2.7.3.7 The stands shall easily be moved by means of handles which are welded on the side of the guide pipe and by tilting over the two lower rollers.~~
- ~~2.7.3.8 The car body stand shall have a variable height adjustment mechanism. A split pin bolt shall be used to lock the car body stand at a required height. This split pin bolt shall be fixed to the car Body stand using a chain.~~

### **2.7.4 Regulations:**

~~The Car body stands shall be manufactured in compliance with EN / ISO / DIN / Indian standards and regulations for prevention of accidents as applicable.~~

## **2.8 RELIEF AND RESCUE VEHICLE (RRV)**

### **2.8.1 Purpose of the machine:**

The Relief and Rescue is required to carry the re-railing, rescue device & personnel to attend the derailment of train and any other related accident on mainline as well as in depot of CMRL phase-II. The Relief and Rescue shall be driven on Road as well as on the track. Its design shall be equipped with compatible coupler for shunting up to 3 cars of multiple types of rolling stock in the depot when required.

### **2.8.2 Scope of Works:**

The scope of the Works, includes the following but not limited to:

- ~~2.8.2.1 Design, Manufacture, Supply, Testing Training & commissioning of RRV with Re-railing and Rescue equipment. The vehicle shall be fully compatible with suitable storage racks to carry all the Re-railing & Rescue equipment as include in this contract to the required location on the CMRL phase-II alignment by rail or by road.~~
- ~~2.8.2.2 The Rescue and Re-railing Equipment compartment shall be so designed that it will be easy to retrieve the different items while working in Tunnel / Mainline / Depot etc.~~
- ~~2.8.2.3 Training of CMRL O&M staff in operations and maintenance.~~
- ~~2.8.2.4 The Contractor shall get the Registration of Rail-cum-Road Vehicle with Regional Transport Office in the name of CMRL. Also Speed Certification of Rail-cum-Road Vehicle from statutory authority / RDSO is in scope of Contractor. Necessary support shall be provided by CMRL.~~

**2.8.2.5** The Contractor shall get the vehicle registered in the name of CMRL in the applicable RTO (Regional Transport Office) of Tamil Nadu.

**2** **2.8.2.6** The Contractor shall be responsible for all recurring and non-recurring costs required to keep the RRV eligible to travel on public roads throughout the entire duration of the Project and CMC Periods. This shall include but not be limited to vehicle fitness, permit, Insurance, pollution certificate and any taxes payable.

**2.8.2.7** Provision for the installation of a Mobile Radio Device shall be provided in driver's cab. The Telecom & Radio Contractor shall supply the Radio Device and will coordinate with RRV Contractor for installation, testing and commissioning.

**2.8.2.8** The Vehicle shall preferably be designed and manufactured in India.

Note: Indicative data for Track parameters shall be referred from Schedule of Dimensions (SOD), Part-2.

**2.8.3 Design requirements of Relief and Rescue Vehicle:**

It shall be powered by diesel engine. The rail-to-road and vice-versa changeover functions shall be easy and effortless. The Contractor shall be responsible for the design of the vehicle and any other equipment considered essential for satisfactory operation of vehicle, which shall include but not be limited to the following:

**2.8.3.1 Engine:**

- i. Minimum 4-cylinder diesel engine for high efficiency,
- ii. Minimum 170 kW capacity,
- iii. EURO VI/ Bharat Stage VI standard or latest equivalent.
- iv. Electronic accelerator, hand throttle and governed max speed.
- v. Noise dampening arrangement as per EU regulation 70/157/EU including 90/20/EU or equivalent.

**2.8.3.2 Transmission:**

- i. Synchromesh reversing transmission equipped with gear box inverter or fully synchronized automatic transmission.
- ii. Right Hand Steering wheel to suit left hand driving practice in India.
- iii. Forward and Reverse gear arrangement.

**2.8.3.3 Brake shall consist minimum (but not limited to):**

- i. Dual brake system,
- ii. Anti-lock brake system,
- iii. Parking brake,

**2.8.3.4 Chassis:**

- i. Fuel tank lockable of light material having adequate capacity for movement of vehicle for at least 150 kms of running on rail or road whichever is higher.
- ii. Front & Rear towing jaw with pin,
- iii. Anti-slip steps with handle for wind shield cleaning,
- iv. Front integral support for fitting front mounting,
- v. Air-intake pipe.

**2.8.3.5 Electrical System:**

- i. Low Maintenance Batteries, capacity as per requirements,
- ii. Centrally located electric box, protected within cab.

**2.8.3.6 Driver's Cab & Personnel Compartment:**

- i. Cab / Personnel compartment for accommodating 6 persons including the vehicle driver.
- ii. Separate access door for personnel compartment on both sides with safety lock. The access door shall be designed suitable to meet the requirements of its functioning inside tunnel / mainline.
- iii. Large storage compartment under dashboard,
- iv. Storage area behind driver's seat / rear cab wall,
- v. Provision of speedometer-recorder,
- vi. Driver's seat height tilt, backrest tilt and longitudinal adjustable,
- vii. Large rear window,
- viii. Air Conditioning of driver's cab and personnel compartment for prevailing ambient temperature up to 45 °C,
- ix. Interior lighting with reading light for driver and accompanying staff,
- x. Effective windshield with wind-shield wipers, 3-setting with intermittent setting and windshield washer,
- xi. Seats with integrated safety belts,
- xii. Sun visors

**2.8.3.7 Instruments:**

- i. Vehicle shall have electric controls located in centre console,
- ii. Adjustable dashboard illumination,
- iii. Multi-combination lever,
- iv. Functions of the Levers on left and right Side of Steering Column shall consist of hand throttle, cruise control, speed limiter, exhaust brake, headlight beams, blinker, windshield wash / wipers, and horn.
- v. Large instrument panel LCD displays, and gauge shall indicate the minimum following configurations but will not be limited to:
  - gauges for Speedometer kmph, RPM,
  - brake reservoir pressure,
  - coolant temperature,
  - fuel level, hydraulic oil temperature,
  - differential locks, brake pad wear,
  - coolant level,
  - steering fluid level,
  - air filter maintenance,
  - engine oil level,
  - windshield wiper fluid level,
  - transmission gear,
  - service hour counter,
  - Km and trip Km counter, clock, etc.
- vi. Vehicle shall have facility of GPS based location monitoring system, which shall enable location monitoring of the RRV from Depot Control Centre / Operation Control Centre.

**2.8.3.8** Vehicle shall be fitted with Lights:

- i. Dual Lighting System (Road- Rail): The vehicle shall have 2 ways of lighting system with automatic change over when the vehicle changes from road to rail and vice-versa. When driving on rail, the vehicle uses specific light for rail driving and when on road it shall use the obligatory lights for road driving.
- ii. Headlights,
- iii. Headlight range adjustment,
- iv. Additional side indicators,
- v. Clearance lamps,
- vi. Blinkers,
- vii. Rear lights,
- viii. Fog lights,
- ix. Rear reflector reversing light,
- x. Emergency Light on the cabin of truck.

**2.8.3.9** Speed (vehicle loaded with all rescue and re-railing equipment):

- i. Maximum Running speed on roads  $\geq 80$  kmph,
- ii. Maximum Running speed on rails  $\geq 30$  kmph

**2.8.3.10** Vehicle shall be equipped with minimum following Accessories & Tools:

- i. Suitable no of cameras in the rear of vehicle and monitor screen in the driver's cab for reverse direction movement,
- ii. Rear mounting brackets,
- iii. Spare Wheel,
- iv. Battery main switch at battery box,
- v. Fine dust and pollen filter,
- vi. Single circuit hydraulic system,
- vii. First aid box,
- viii. Wide angle rear mirror,
- ix. Fire extinguisher, ABC Type, 5 kg - 2 Nos. with bracket,
- x. Air filling hose with manometer,
- xi. Hydraulic jack -suitable capacity,
- xii. Warning triangle,
- xiii. Signal lamp,
- xiv. Search light 2 No.
- xv. 2 nos. of tri-colour torch,
- xvi. On-board tools, wheel chokes.

**2.8.3.11** Rail Guidance System:

- i. Rail guiding axles shall be fitted in front of the front vehicle axle and in rear of the rear vehicle axle,
- ii. Rail guiding axles shall take up part of the vehicle weight, which leads to a high safety on rails,
- iii. Full floating rail axle for running on road,

- iv. Telescopic cylinders at front & rear rail guiding axle,
- v. Rail guiding wheel with UIC profile, minimum wheel diameter 400 mm,
- vi. Rail guiding axle to be raised and lowered by suitable and effective hydraulic pressure,
- vii. Separate hydraulic control of front and rear guide axle with pressure compensation and damping from inside the cabin,
- viii. Automatic pressure adjustment for rail guidance system,
- ix. LCD Panel in driver's cab with audio-visual warning in case of pressure decrease.
- x. Provision of cameras and monitor inside the cabin for ease in checking of proper positioning of front and rear rail wheels to help the driver in changeover from road to rail operation,
- xi. Locking of steering wheel in rail mode,
- xii. Locking of rail axles against lowering during road operation,
- xiii. The hydraulic system shall be provided with constantly pressurized control valves for maximum safety against derailment in every driving situation.

**2.8.3.12 Hydraulic hand pump:**

Hydraulic hand pump of suitable capacity shall be provided for emergency operation of rail guidance system in case of failure of vehicle hydraulic system.

**2.8.3.13 Earthing:**

Earthing connection shall be from the mounting parts to the vehicle frame. It shall be connected to flexible Cu-cable with one ball pin at the front side and one at the rear side of the vehicle.

**2.8.3.14 Lighting system:**

- i. Vehicle lighting shall be suitable for movement on rail as well as on road for both running directions,
- ii. Automatic changeover of lighting for forward and reverse,
- iii. Automatic changeover of lighting when changing between rail and road and vice versa,

**2.8.3.15 Super Structure:**

- i. The complete vehicle with its cabin and compartment for Re-railing and Rescue Equipment shall be designed to conform to the Kinematic Envelope of SOD of CMRL phase-II.
- ii. The Vehicle along with compartment for staff and all equipment dimensions shall be finalised at design stage provided all its functions are satisfactorily complied with and that the dimensions are within the SOD of the Project.

**2.8.3.16 Bodywork construction:**

- i. Bodywork construction shall be of suitable material which shall provide adequate strength and protected from the corrosion.
- ii. The Contractor shall justify the selection of material and construction in the design stage.

**2.8.3.17 Compartment for Re-railing and Rescue Equipment and Tools**

- i. Compartment for Re-railing and Rescue Equipment and tools is to be located directly behind the personnel compartment. This compartment has the following requirements.
- ii. Compartments made of section profile, to be hinged down by means of toggle levers (with anti-skid cover inside made of light metal chequered plate).
- iii. Sliding shutters or rolling shutters shall be provided on both sides, viz. on left hand and right-hand side for convenience in working inside tunnel / mainline.
- iv. Buffers with adequate strength at the rear.

- v. Rollers immersed in the body sub frame serving as guide for the re-railing bridge.
- vi. Adequate illumination of the compartment.
- vii. Two telescopic spotlights mounted at suitable location on the vehicle.

**2.8.3.18 Coupling System:**

- i. A suitable coupler adopter / head to match Rolling stock couplers of multiple types shall be provided on each side of the RRV for coupling rail cars from both ends. RRV Contractor to interface with rolling stock Contractor for the coupler type / details.
- ii. Height of coupler shall be manually adjustable if required to match with automatic coupler height of rolling stock for proper coupling.
- iii. RRV shall also have cranked tow bar with flange at both ends.

**2.8.4 Technical Requirements of Re-railing and Rescue Equipment:**

**2.8.4.1 Re-railing Equipment:**

- i. The following Re-railing equipment shall be capable of quickly lifting, displacing, tilting and slewing into position the de-railed rolling stock of CMRL Phase-II.
- ii. The equipment shall be suitable for use in tunnel, mainline as well as on viaducts and inside depot premise.
- iii. The equipment shall be suitable for operation under dusty smoke-filled atmosphere at accident site.
- iv. The quantities of each item are listed in Appendix 1.

**2.8.4.1.1 Power Pack for Jacks:**

- i. Hydraulic Pumping Set shall be powered by Portable 4-stroke Petrol engine complying with BS VI or equivalent smoke emission norms. The engine shall develop capacity of min 4.2 HP and combined discharge of at least 2.5 lpm. All hydraulic piston pumps shall be capable of generating minimum 490 bar pressure. Bypass pressure and maximum pressure valve shall be provided. Bypass valve should switch to idle position when jacks are not in operation.
- ii. Oil tank shall have a capacity of minimum 40 litres and provided with an oil filter with optical clogging indicator, a filling filter with integral venting filter, oil sight glasses and oil drain screw with magnet insert.
- iii. The weight of pumping set including oil filled shall be less than 105 kg.
- iv. Power pack shall have carrying handles to facilitate ease of storage and transportation, even in rough areas.

**2.8.4.1.2 Control Console or Control Table:**

- i. Control Console or Control Table shall be complete with all necessary valves, controls and safety features including dead man switch. Control Console should have minimum four control valves for simultaneous / independent operation of lifting and lowering of four jacks. Necessary pressure gauges for pressure monitoring and safety valves shall be provided. Control Table should have colour coded hose outlet for connecting colour coded hoses to make connections to jacks. Control table should have a sturdy portable frame and the weight shall be less than 70 kg.
- ii. Control Console shall be provided with separate oil flows for simultaneous or independent lifting operation and a provision of inbuilt pressure gauge for individual control valves. It should have selector valve having position for lifting and traversing for a safe re-railing process.
- iii. A suitable filter capable of working under operating pressure shall be used to prevent the dust and sand from the pump unit to get into the hydraulic system during lifting / lowering operation.



- iv. Separate oil flows of same quantity through each control valve shall facilitate simultaneous or independent lifting / lowering operation of jacks with ease, while eliminating chance of load falling from the jack and thus preventing accidents while re-railing due to unbalanced loads on jacks. Separate oil flows for each control valve shall also facilitate functioning of remaining jacks in case one or more jack fails.

#### **2.8.4.1.3 High-Pressure hoses with QC Coupling:**

- i. High pressure hoses, approx. 10 m long (bound in pairs) with quick connection couplings shall be provided with oil retaining valves to prevent the leakage of oil when uncoupled with protective caps to prevent soiling.
- ii. Hoses shall be colour coded for ease of connection. They should be capable of withstanding the working pressure provided by the hydraulic pump. Low-pressure hoses shall be capable to handle return oil.
- iii. The hoses shall be capable of coupling and uncoupling even under pressure without oil loss.

#### **2.8.4.1.4 Telescopic Jack with Base Plate:**

- i. Telescopic jacks of following capacity and specification shall be supplied:
  - a) Capacity 60/30 Tons, close height max. 465 mm, stroke min. 500 mm
  - b) Capacity 60/30 Tons, close height max. 250 mm, min stroke 185 mm
- ii. The telescopic jacks shall have hydraulically releasable non-return valve for safe holding of the load even in the event of hose ruptures. The jacks shall also have over pressure valves.
- iii. The telescopic jacks shall have carrying handles, colour coded connections, working pressure of minimum 300 kg/cm<sup>2</sup> and weight less than 35 kg.
- iv. Jacks with integrated Base Plates or separate Base Plate are acceptable to ensure optimum stability during the operation of lifting / traversing. In case separate Base Plates are proposed, price of Jacks shall be inclusive of Base Plates.

#### **2.8.4.1.5 Displacement Jacks or Auto Traversing Jack:**

- i. Displacement Jacks shall be of minimum 12/6 T capacity (12 T for pushing, 6 T for pulling), closed height max. 575 mm, stroke min. 350 mm with steel counter support. The working pressure shall be minimum 300 kg/cm<sup>2</sup>. The displacing jack shall have integral oil retaining valves, colour coded connections and the weight shall be less than 25 kg.
- ii. Alternatively, Auto Traversing Jack of adequate capacity can be provided. The Traversing Jack shall have single point control from the Control Table.

#### **2.8.4.1.6 Re-Railing Bridges and Bridge Coupling:**

- i. Re-Railing Bridges shall have the carrying capacity of 60±5 Tons for the following dimensions:
- ii. 3.30 m length,
- iii. 2.20 m length,
- iv. 1.10 m length.
- v. The Re-railing bridges shall be fitted out with carrying handles and mounting points for bridge couplings.
- vi. The maximum weight for the longest bridge shall be less than 180 kg.
- vii. Bridge couplings shall be suitable for joining together two Re-Railing Bridges and shall be compatible to the loading capacity and height of Re-Railing Bridges.

#### **2.8.4.1.7 Roller Carriages:**

- i. Roller carriages shall have a capacity of 60 ± 5 T with removable top plate. The height

shall be less than 110 mm (without plate) and 140 mm (with plate). The weight shall be less than 60 kg (without plate) and 85 kg (with plate). The width shall be compatible and suitable to operate with Re-railing Bridge.

- ii. The Roller Carriages shall have carrying handles. It shall be equipped with low friction rollers and guiding pin to ensure a linear movement.
- iii. Roller carriages shall be equipped with Counter supports, stopping device with carrying handle and one distance bar having an adjustable length to couple two roller carriages.

#### **2.8.4.1.8 Tilting Jack:**

- i. Tilting jack shall have 20 T capacity for pulling and have a height of  $575 \pm 25$  mm, working pressure shall be minimum 300 kg/cm<sup>2</sup>, stroke minimum 400 mm with hooked wheel stop. Tilting jack shall be complete with accessories and suitable for quick re-railing of single wheel or car.
- ii. The tilting jacks shall have carrying handles, colour coded connections and the weight shall be less than 25 kg.

#### **2.8.4.1.9 Accessories:**

- i. Lifting cable ladder complete: The lifting cable ladder shall be complete with accessories. The carrying capacity is  $40 \pm 5$  T with factor of safety not less than 3. The length shall be at least 3m.
- ii. Holding Rope: The holding rope shall be complete with accessories. The carrying capacity is  $40 \pm 5$  T with factor of safety not less than 3m.
- iii. D-Shackles: D Shackles shall be complete with accessories and capacity is  $40 \pm 5$  T with factor of safety not less than 3m.

#### **2.8.4.1.10 Single Piston Claw Jack (Step Jack):**

- i. Single Piston Claw jack shall have a minimum capacity of 35 T, working pressure shall be minimum 300 kg/cm<sup>2</sup>, height with claw minimum 1150 mm and accessories including following:

i. Head Piece to Single piston claw jack	2 Nos.
ii. Round Head Piece to Single piston claw jack	2 Nos.
iii. Rocker bearing support (Swivel Radius Plate) to Single piston claw jack.	2 Nos.

- ii. The single piston step jack shall be provided with carrying handles, colour coded connections and the weight shall be less than 70 kg.

#### **2.8.4.1.11 Axle Pusher:**

Axle pusher unit shall be used for movement of wheel resting on the rail by a flange or for lateral displacement of the lifted vehicle consisting of two arms with hooks and with a crossbeam of light metal alloy.

#### **2.8.4.1.12 Auxiliary Trolley 25 T Capacity:**

- i. Auxiliary Trolley shall be suitable for insertion below wheels of bogie of Rolling Stock to carry it to depot for wheel re-profiling as and when need arises due to wheel skidding or any other reason. Its construction shall be such that there is no infringement for its placement beneath bogie and wheel and during its movement while carrying skidded wheel.
- ii. Auxiliary trolley shall consist of side sections with rollers and carrying handle, connecting tubes suitable for a 1435 mm track gauge, rated carrying capacity of 16 T and maximum capacity of 25 T. It shall have its maximum towing speed as 25 km per hour. The maximum weight of any individual part of the Equipment in dis-assembled state shall not



be more than 70 kgs for ease in carrying manually. If however, the equipment is supplied in fully assembled state which cannot be dis-assembled the total weight of the equipment shall not be more than 150 kgs."

#### **2.8.4.1.13 Hauling Device:**

- i. Hauling Device, capacity min. 22 T shall be complete with accessories including following:
  - a) Pulling jack: 1 No.
  - b) Fastening Rope: 1 No.
  - c) Pulling Rope: 1 No.
  - d) Retaining Rope: 1 No.
  - e) Rail Block: 2 Nos.
  - f) Wedges: 4 Nos.
- ii. The diameter of ropes shall be between 25 mm to 32 mm.

#### **2.8.4.1.14 Plates and Boards:**

- i. The following plates and boards, suitable to take the load while the jacks are used to lift load, are to be supplied:
- ii. Steel plates with two handles each, size 800 x 300 x 30 mm – 2 Nos
- iii. Steel plate with handles, size 500 x 250 x 20 mm – 1 No
- iv. Hard wood boards, size 700 x 350 x 60.mm – 14 Nos
- v. Hard wood boards size 700 x 350 x 80 mm – 9 Nos
- vi. Hard wood boards, size 300 x 120 x 50 mm – 4 Nos
- vii. Hard wood blocks, size 300 x 120 x 30 mm – 6 Nos

#### **2.8.4.2 Rescue equipment:**

The quantities of each rescue item are given in Appendix 1.

##### **2.8.4.2.1 Rescue Devices:**

- i. Rescue devices shall comprise the following items:
  - a. Hydraulically Operated Cutter with maximum Cutting Force being at least 600 kN and adequate for cutting 5 mm thick Steel Sheet SS 301LN- HT. The weight of the cutter shall not be more than 15 kgs.
  - b. Hydraulically Operated Spreader with maximum Spreading Force being at least 300 kN and adequate for spreading 5 mm thick Steel Sheet SS 301LN- HT. The weight of the spreader shall not be more than 20 kgs.
- ii. The Contractor shall arrange the samples of above material, viz. SS 301LN-HT 5 mm thick, for FAT at OEM's works and for acceptance tests at Depot site.
- iii. Hydraulically operated cutter and spreader shall be complete with a pair of 10 m long high-pressure hoses. In addition, the following accessories need to be supplied:
  - a. two pairs of replacement blades for cutter,
  - b. two pulling chains, two pairs of spare tips and two pairs of peeling tips for spreader.

##### **2.8.4.2.2 Power Pack for Hydraulic Cutter and Spreader:**

- i. The hydraulically operated cutter and spreader shall be operated with a power pack of 4-stroke petrol engine for their independent simultaneous use for a minimum of 2 hrs continuously.
- ii. The capacity of power pack shall be at least 2.1 kW.

- iii. The weight of power pack of 4-stroke petrol engine shall not be more than 30 Kg including full filled tank with fuel.
- iv. Engine of the Power pack shall comply with the Euro VI / Bharat Stage VI smoke emission norms.

#### 2.8.4.2.3 Airbags:

Airbags of following capacity shall be supplied:

- i. Lifting capacity : 300 ± 10% kN,
- ii. Lifting height : 350 ± 10% mm

#### 2.8.4.2.4 Compressor:

- i. Pneumatic air compressor shall have displacement of at least 230 lpm with in-built air receiver capacity of at least 10 litres at minimum 10 bar pressure for inflating air bags. Compressor shall be provided for connecting and operating 2 airbags at a time and reinforced air hoses at-least 10 m long for connection between air compressor and the air - bags.
- ii. Engine of the Compressor shall be with capacity of at least 2.1 kW and complying with smoke emission norms of Euro VI / Bharat Stage VI shall be supplied.
- iii. Two set of hoses shall be supplied in different colour.

#### 2.8.4.2.5 Portable Inflatable Lights:

Portable inflatable lights shall be suitable for illumination of about 10,000 m<sup>2</sup>, using 400 W HPMH or any other superior lamp mounted at height of about 4.5 m from ground with its independent diesel / petrol operated light weight power pack (Generator) for electricity and air.

#### 2.8.5 Details of Quantities for Re-Railing & Rescue Equipment:

The quantities of different items of Re-railing & Rescue equipment as required to be supplied under the Contract are given in Appendix 1.

#### Appendix 1 Quantities of Items to be supplied.

S. No.	Description of Item	Unit	Qty.
1	Power Pack for Jacks	Nos.	2
2	Control console or Control Table	No.	1
3	High pressure hoses with Quick connection coupling	Pairs	7
4	Telescopic Jack with base plate, 60/30T capacity, maximum closed height 465 mm, minimum stroke 500 mm	Nos.	4
5	Telescopic Jack with base plate, 60/30T capacity, maximum closed height 250 mm, minimum stroke 185 mm	Nos.	2
6	Displacing / Auto Traversing Jacks	Nos.	2
7	Re-railing bridge 3.30 m long,	No.	1
8	Re-railing bridge 2.20 m long,	No.	1
9	Re-railing bridge 1.10 m long,	No.	1
10	Bridge coupling	Nos.	2

S. No.	Description of Item	Unit	Qty.
11	Roller Carriages with distance bar	Nos.	4
12	Tilting jack 20 T Capacity	Nos	2
13	Accessories		
a)	Lifting cable ladder	Nos.	2
b)	Holding rope	Nos.	2
c)	D-Shackles	Nos.	2
14	Single piston Claw jack with claw, 35T, with accessories	Set	2
15	Axle pusher	Nos.	2
16	Auxiliary Truck 25 T capacity	No.	1
17	Hauling device 25T capacity	Set	1
18	Plates & Boards	Set	
19	Rescue device consisting of cutter and spreader		
i	Hydraulically operated Cutter, with high pressure hoses, pulling chains, etc.	No.	1
ii	Hydraulically operated Spreader with high pressure hoses, pulling chains, etc.	No.	1
iii	Power Pack for hydraulically operated Rescue devices	No.	1
20	Airbags	Nos.	2
21	Compressor, 230 lpm at 10 bars	No.	1
22	Portable inflatable emergency light	No.	2

#### 2.8.6 Standards:

Work related to the design and manufacturing of the RRV shall comply with relevant international standard or equivalent Indian standards.

### 2.9 ~~BOGIE WASH PLANT (BWP)~~

#### 2.9.1 ~~Purpose of the machine:~~

~~The Bogie Wash Plant (Automatic) is required for cleaning all types of bogies of multiple rolling stock including frame and other associated accessories / components etc of standard gauge at Madhavaram Depot of Chennai Metro Rail Project phase-II.~~

#### 2.9.2 ~~Scope of Works (but not limited to)~~

~~2.9.2.1 Design, Manufacture, Supply, Installation, Testing & Commissioning of automatic Bogie Wash Plant at Madhavaram Depot of CMRL phase-II. The supply shall include all equipment and accessories required to make the machine fully functional when connected to a power source.~~

~~2.9.2.2 Electrical cables for connecting Power point to Control cabinet of machine shall be supplied by the Contractor as per the requirement.~~